

SAIP2010



Report of Contributions

Contribution ID: 1

Type: **Poster**

The Influence of dielectric parameters on the Reststrahlen region of SiC

The influence of dielectric parameters involved in the simulation of the reflectivity in the reststrahlen region of SiC is investigated as a possible cause for the appearance of an anomalous peak in this region of the reflectance spectrum of SiC. Results will be presented and discussed.

Primary author: Prof. ENGELBRECHT, JAPIE (NMMU)

Co-author: VAN ROOYEN, Isabel (PBMR Company)

Presenter: Prof. ENGELBRECHT, JAPIE (NMMU)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 2

Type: **Presentation**

A Signature of Non-thermal X-ray Emission in AE Aquarii : Swift-XRT Data

Using X-ray data from the Swift satellite, we analysed the spectrum of AE Aqr and found that the emission has both thermal and non-thermal components. The latter shows up in the high energy spectral range, and its origin with respect to particle acceleration and synchrotron radiation will be discussed.

Primary author: Mr ORURU, Bosco (University of the Free State)

Co-author: Prof. MEINTJES, Pieter J. (University of the Free State)

Presenter: Mr ORURU, Bosco (University of the Free State)

Track Classification: Track D1 - Astrophysics

Contribution ID: 3

Type: **Presentation**

Accurate measurement of PV power under pulse width modulation

The monitoring of solar home systems is essential to improve the design and implementation of future systems. This paper discusses problems encountered in accurately measuring PV output power when monitoring systems using pulse width modulation charge controllers. Solutions to these problems are proposed and discussed and results presented.

Primary author: Mr WILLIAMS, Nathan (Nelson Mandela Metropolitan University)

Co-authors: Prof. VAN DYK, Ernest (Nelson Mandela Metropolitan University); Dr VORSTER, Frederik (Nelson Mandela Metropolitan University)

Presenter: Mr WILLIAMS, Nathan (Nelson Mandela Metropolitan University)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 4

Type: **Poster**

The Secret is in the Sauce

The source region for whistlers has been hotly contested for many years. This study aims to show what fraction of lightning detected by WWLLN penetrates the ionosphere, and then to tie up individual fractional hop whistlers detected by the DEMETER satellite with whistlers observed on the ground at Tihany, Hungary.

Primary author: Mr DELPORT, Brett (University of KwaZulu-Natal)

Co-authors: Dr COLLIER, Andrew (Hermanus Magnetic Observatory); Dr LICHTENBERGER, Janos (Eötvös University); Mr OKIKE, Ogbonnaya (University of KwaZulu-Natal)

Presenter: Mr OKIKE, Ogbonnaya (University of KwaZulu-Natal)

Track Classification: Track D2 - Space Science

Contribution ID: 6

Type: **Presentation**

A Comparison of the tolerance of DQPSK, NRZ and RZ Modulation Formats in a PMD-induced Environment

The design of modern wavelength-division-multiplexed (WDM) optical transmission systems has made advanced optical modulation formats a key ingredient. In this paper, we show PMD-induced system degradation through simulation. We found out that DQPSK is highly tolerant compared to RZ, however, RZ is more tolerant than NRZ.

Primary author: Mr IREETA, Winston Tumps (Nelson Mandela Metropolitan University)

Co-authors: Prof. ANDREW W. R., Leitch (Nelson Mandela Metropolitan University); Dr MUSARA, Vitalis (Nelson Mandela Metropolitan University)

Presenter: Mr IREETA, Winston Tumps (Nelson Mandela Metropolitan University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 7

Type: **Presentation**

Field theoretical approach to dense polymer with clusters of Janus particles

We propose a field theoretical approach to a polymer whose backbone is made of Janus particles. The field theory is solved using the saddle point approximation and the Random Phase Approximation valid for a dense polymer. We calculate the free energy density, the radius of gyration, and the Janus clusters concentrations.

Primary author: Dr FANTONI, riccardo (National Institute of Theoretical Physics (NITheP), South Africa)

Presenter: Dr FANTONI, riccardo (National Institute of Theoretical Physics (NITheP), South Africa)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 8

Type: **Presentation**

Performance of Foundation Physics students in First year university physics

This paper reports on the role played by Foundation Physics course in preparing students for first year university physics. The performance of students who enrolled for and those who did not enroll for Foundation Physics after Grade 12 were compared in first year physics. 57 students who enrolled for Foundation Physics before and 107 students who did not enroll for Foundation Physics before first year physics wrote mechanics examinations and a mechanics questionnaire known as the Force Motion and Conceptual Evaluation. The results ind

Primary author: Prof. MUNDALAMO, Fhatuwani (Tshwane University of Technology)

Co-author: Prof. GRAYSON, Diane (University of Pretoria)

Presenter: Prof. MUNDALAMO, Fhatuwani (Tshwane University of Technology)

Track Classification: Track E - Physics Education

Contribution ID: 9

Type: **Presentation**

A Fundamental Description of Quarks using QCD and general relativity

We develop a bound-state approach in quantum field theory which can be used to give an internal description of dressed quarks. The fermionic and bosonic fields are treated as interdependent. The quark is bound by self-consistent infinite binding potentials. By including general relativity and vacuum energy, we can stabilize this system. The average mass for the light quarks is 3.2 MeV, in remarkable agreement with experiment. The radius is 8.8 Planck lengths. These estimates only depend on the gravitational constant G and the Hubble constant H_0

Primary author: Dr GREBEN, Jan (CSIR)

Presenter: Dr GREBEN, Jan (CSIR)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 10

Type: **Poster**

Whistlers as a loss mechanism in the Earth's radiation belts

Lightning induced whistler waves are one of the primary drivers of energetic particle loss from the the Earth's radiation belts. WWLLN data is used to create a model of the distribution of lightning in geomagnetic coordinates and derive the flux and spectrum of VLF whistler waves incident on the ionosphere.

Primary author: Ms VAN ZYL, Marlie (Hermanus Magnetic Observatory, University of KwaZulu--Natal)

Co-authors: Dr COLLIER, Andrew (Hermanus Magnetic Observatory, University of KwaZulu-Natal); Mr MEYER, Steve (Hermanus Magnetic Observatory, University of KwaZulu-Natal)

Presenter: Mr MEYER, Steve (Hermanus Magnetic Observatory, University of KwaZulu-Natal)

Track Classification: Track D2 - Space Science

Contribution ID: 11

Type: **Presentation**

A Multivariate Study of Non-Simultaneous Forbush Decreases

The distribution of the cosmic ray flux over the Earth is not uniform, but the result of complex phenomena within the Sun-Earth environment. A multivariate analysis of non-simultaneous Forbush decreases from an array of cosmic ray detectors will give an indication of the stations' asymptotic cones of acceptance.

Primary author: Mr OKIKE, Ogonnaya (University of KwaZulu-Natal)

Presenter: Mr OKIKE, Ogonnaya (University of KwaZulu-Natal)

Track Classification: Track D2 - Space Science

Contribution ID: 12

Type: **Presentation**

UV-enhancement in brightest cluster galaxies

I will present results of an ongoing investigation of a large sample of brightest cluster galaxies (BCGs), their properties and the relationships between these and the properties of the host clusters. Here, we compare the stellar population properties derived from high signal-to-noise, optical long-slit spectra with the GALEX ultraviolet (UV) colour measurements for 36 nearby BCGs to understand the diversity in the most rapidly evolving feature in old stellar systems, the UV-upturn.

Primary author: Dr LOUBSER, Ilani (North-West University)

Co-author: Dr SANCHEZ-BLAZQUEZ, Patricia (Universidad Autonoma de Madrid)

Presenter: Dr LOUBSER, Ilani (North-West University)

Track Classification: Track D1 - Astrophysics

Contribution ID: 13

Type: **Presentation**

Simulation studies of TIGRESS type Clover detector at iThemba LABS

This work presents the results obtained from GEANT4 simulation study on TIGRESS type segmented HPGe detector. Unlike the usual Clover detector, TIGRESS detector has both longitudinal and lateral segmentation in each cylindrical crystal. The focus of the present study is to calculate the optimal later segmentation depth in the crystals.

Primary author: Dr DATTA, Pradip (iThemba LABS)

Co-author: Dr BARK, Rob (iThemba LABS)

Presenter: Dr DATTA, Pradip (iThemba LABS)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 15

Type: **Presentation**

Satellite Imager Calibration and Validation

The success or failure of any earth observation mission depends on the quality of its data. Data quality is assessed by determining the radiometric, spatial, spectral and geometric fidelity of the satellite sensor. The process is termed calval. This paper will describe calval techniques specific to South Africa.

Primary author: Mr VHENGANI, Lufuno (CSIR, DPSS)

Co-authors: Mr GRIFFITH, Derek (CSIR, DPSS); Dr LYSKO, Meena (CSIR, DPSS); Ms LUBBE, Minette (CSIR, DPSS)

Presenter: Mr VHENGANI, Lufuno (CSIR, DPSS)

Track Classification: Track D2 - Space Science

Contribution ID: 17

Type: **Presentation**

Nuclear Reactor Core Reloads with OSCAR-4

Nuclear reactor core reload calculations are used to determine safety and operational parameters of a nuclear reactor. Accurately determining these parameters plays an important role in the safe operating of a reactor. The OSCAR-4 code was used to simulate reactor reloads, and the simulation results were compared to experimental plant data as verification of the simulation methods.

Primary author: Mr ERASMUS, Bernard (Necsa)

Co-authors: Ms BOTES, Danniëll (Necsa); Ms THERON, Suzanne (Necsa)

Presenter: Mr ERASMUS, Bernard (Necsa)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 18

Type: **Poster**

126 nm VUV emission from an Ar*2 excimer lamp excited by a dielectric barrier discharge

A coaxial Ar excimer lamp excited by a dielectric barrier discharge has been developed and characterized. The effect of discharge gas pressure on the intensity of the Ar 126 nm VUV emission has been investigated. Intensity of the VUV Ar*2 excimer emission increases with pressure according to a second order polynomial.

Primary author: Mr BARICHOLO, Peter (National University of Science and Technology, Stellenbosch University)

Co-authors: Prof. VON BERGMANN, Hubertus M. (Laser Research Institute, University of Stellenbosch); Mr STEHMANN, Timo (laser Research institute, University of Stellenbosch)

Presenter: Mr BARICHOLO, Peter (National University of Science and Technology, Stellenbosch University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 19

Type: **Presentation**

Electrical characterization of an Ar₂* excimer lamp excited by a dielectric barrier discharge

A bipolar pulsed high voltage and high frequency power supply has been developed to excite a dielectric barrier discharge excimer lamp. Voltage and current signals across the 5 mm electrode gap have been measured. Energy through the gas per pulse has been obtained by integrating the power applied. About 300 μJ of energy per pulse is delivered to the gas.

Primary author: Mr BARICHOLO, Peter (National University of Science and Technology, Stellenbosch University)

Co-authors: Prof. VON BERGMANN, Hubertus M. (laser Research institute, University of Stellenbosch); Mr STEHMANN, Timo (laser Research institute, University of Stellenbosch)

Presenter: Mr BARICHOLO, Peter (National University of Science and Technology, Stellenbosch University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 21

Type: **Poster**

Modelling of Eclipsing Binaries

The evolution of contact eclipsing binary stars is uncertain, but some systems undergo orbital period changes that may relate to physical changes in the system. Using ASAS and SuperWASP data, selected EC systems have been modelled using the WD code and an O – C period analysis.

Primary author: Ms SKELTON, Patricia (UNISA)

Presenter: Ms SKELTON, Patricia (UNISA)

Track Classification: Track D1 - Astrophysics

Contribution ID: 22

Type: **Presentation**

Spectral characterization of photovoltaic devices

We investigated the effects of spectral variation on the performance of photovoltaic modules. To quantitatively correlate device performance to different spectra we measured current-voltage data, global irradiance and the corresponding spectrum at different times. This paper presents a detailed discussion of the correlation of device performance with incident spectrum.

Primary author: Dr OKULLO, Willy (Nelson Mandela Metropolitan University)

Co-authors: Prof. VAN DYK, Eugene (Nelson Mandela Metropolitan University); Dr VORSTER, Frederik (Nelson Mandela Metropolitan University); Mr MUNJI, Mathew (Nelson Mandela Metropolitan University)

Presenter: Dr OKULLO, Willy (Nelson Mandela Metropolitan University)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 23

Type: **Presentation**

Solar cell parameter extraction from illuminated current-voltage data using particle swarm optimization algorithm

Solar cell device parameters cannot be obtained directly from measured current-voltage (I-V) characteristics as performance parameters such as power output are, but need to be extracted by curve-fitting procedures. This contribution describes and applies a particle swarm optimization (PSO) algorithm to extract solar cell device parameters from I-V curves.

Primary author: Mr MUNJI, Mathew (Nelson Mandela Metropolitan University)

Co-authors: Prof. VAN DYK, E.E. (Nelson Mandela Metropolitan University); Dr VORSTER, Fredrik (Nelson Mandela Metropolitan University); Dr OKULLO, Willy (Nelson Mandela Metropolitan University)

Presenter: Mr MUNJI, Mathew (Nelson Mandela Metropolitan University)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 24

Type: **Presentation**

Variation of device parameters of multi-crystalline silicon at defect regions

A Solar-Light Beam Induced Current measurement system was used to identify defects regions in a multi-crystalline silicon cell. A particle swarm optimization algorithm was used to extract device parameters from current-voltage data to determine the variation of the device parameters of the cell at the defect locations.

Primary author: Mr MUNJI, Mathew (Nelson Mandela Metropolitan University)

Co-authors: Prof. VAN DYK, E.E. (Nelson Mandela Metropolitan University); Dr VORSTER, Frederik (Nelson Mandela Metropolitan University); Dr OKULLO, Willy (Nelson Mandela Metropolitan University)

Presenter: Mr MUNJI, Mathew (Nelson Mandela Metropolitan University)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 25

Type: **Presentation**

Effect of different ionospheric and ground conductivities on the propagation of VLF radio waves within the Earth-ionosphere waveguide

VLF (3-30 kHz) radio waves propagate with little attenuation within the Earth-ionosphere waveguide. There are numerous factors that determine waveguide propagation conditions such as ionospheric free electron density and the conductivity of the Earth's surface along the propagation path. This paper examines how modifications of these factors alter the propagation of the VLF waves.

Primary author: Mr MEYER, Stephen (University of Kwazulu-Natal)

Co-author: Dr COLLIER, Andrew (University of Kwazulu-Natal)

Presenter: Mr MEYER, Stephen (University of Kwazulu-Natal)

Track Classification: Track D2 - Space Science

Contribution ID: 26

Type: **Presentation**

Particle simulations of space plasmas

PIC simulations are numerical techniques for studying plasma phenomena which do not yield to an analytical solution. These techniques will ultimately be used to study chorus emissions which are whistler mode waves propagating through the Earth's magnetosphere. The two-stream instability is presented as an initial part of the study.

Primary author: Mr KOEN, Etienne (Hermanus Magnetic Observatory)

Co-author: Dr COLLIER, Andrew (University of KwaZulu-Natal)

Presenter: Mr KOEN, Etienne (Hermanus Magnetic Observatory)

Track Classification: Track D2 - Space Science

Contribution ID: 27

Type: **not specified**

Luminescence from rare-earth doped silica prepared by the sol-gel method

Silica doped with rare-earth ions was synthesized by the sol-gel method. The resulting powders were annealed at 600 and 1000°C. X-ray diffraction spectra indicated that all samples were amorphous. Samples doped with Tb³⁺ exhibited the brightest luminescence, both when excited with UV light (photoluminescence) and with an electron beam (cathodoluminescence).

Primary author: Mr SEED AHMED, Hassan (University of the Free State)

Co-authors: Ms DUVENHAGE, Mart-Mari (University of the Free State); Prof. NTWAEABORWA, Martin (University of the Free State)

Presenter: Mr SEED AHMED, Hassan (University of the Free State)

Contribution ID: 28

Type: **Presentation**

An Interferometric Method to Determine the Kerr Constant of Perspex

An adapted Michelson interferometric technique was used to measure strain induced birefringence in perspex. The birefringence was then used to determine the Kerr constant in perspex. The result obtained is compared to a polarimetric result and is shown to be a more sophisticated and reliable method.

Primary author: Ms GOVENDER, Patricia (CSIR DPSS unit)

Co-author: Dr COULING, Vincent (UKZN-pietermaritzburg)

Presenter: Ms GOVENDER, Patricia (CSIR DPSS unit)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 29

Type: **Presentation**

An Atlas of Seyfert Galaxy Spectra

The author presents first results of a project to digitize and characterise the spectra of over 1000 Seyfert galaxies. Due to the already massive and growing size of the lists of known Seyferts, the project at this stage focuses on the following: (a) objects at redshifts of $z < 0.1$, and (b) Seyferts with a clearly visible broad-line component at H-beta. Standardised spectra are obtained from available electronic data as well as computer digitisations of spectral images. Basic spectral parameters are extracted from these spectra, and these are in turn categorised according to a new, sophisticated classification scheme.

Primary author: Prof. WINKLER, Hartmut (Dept. Physics, University of Johannesburg)

Presenter: Prof. WINKLER, Hartmut (Dept. Physics, University of Johannesburg)

Track Classification: Track D1 - Astrophysics

Contribution ID: 30

Type: **Presentation**

Aerodynamics in arbitrarily accelerating frames: application to high-g turns

Fifth-generation missiles accelerate up to 100 g in turns, and higher accelerations are expected as agility increases. We have developed the theory of aerodynamics for arbitrary accelerations, and have validated modelling in a Computational Fluid Dynamics code. In this paper we will show fin disruption by strake vortices.

Primary author: Dr GLEDHILL, Irvy (Igle) (CSIR)

Co-author: Prof. NORDSTRÖM, Jan (FOI Sweden)

Presenter: Dr GLEDHILL, Irvy (Igle) (CSIR)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 31

Type: **Presentation**

Studying Chirality in Nuclei

Characteristic conditions that should be met for two-quasiparticle chiral bands to reach degeneracy were examined using the two-quasiparticle-plus-rotor model for the $A \sim 100, 130, 190$ mass regions. Previously proposed fingerprints of chirality (like intra- and inter-band B(M1) staggering, energy staggering, etc) were also studied.

Primary author: Mr SHIRINDA, OBED (iThemba LABS/University of the Western Cape)

Co-authors: Dr LAWRIE, ELENA ATANASSOVA (iThemba LABS); Mr MASITENG, LUKISI PAULUS (iThemba LABS/University of the Western Cape); Prof. LINDSAY, ROBERT (University of the Western Cape)

Presenter: Mr SHIRINDA, OBED (iThemba LABS/University of the Western Cape)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 32

Type: **Presentation**

Teachers working as a community of practice – Is it a viable alternative or a flat spare tyre?

Various strategic interventions to enhance teacher professional development have been proposed over the years. Mentorship itself is a broad concept open to a variety of scholarly interpretations. This presentation reflects more specifically on the creative interaction amongst science teachers working as a community of practice with professional development efforts forming the nexus of this interaction which may, in turn, result in producing a ripple effect among the science teaching practitioners. Novice science teachers are the envisaged key beneficiaries of this creative partnership. Implications for long-term professional development of sc

Primary author: Mr RAMAILA, Sam (University of Johannesburg)

Co-authors: Dr PADMANABHAN, Nair (University of Johannesburg); Dr RAMNARAIN, Umesh (University of Johannesburg)

Presenter: Mr RAMAILA, Sam (University of Johannesburg)

Track Classification: Track E - Physics Education

Contribution ID: 34

Type: **Presentation**

The development of MOVPE InAs/GaInSb strained layer superlattice structures

InAs/GaInSb strained layer superlattice structures were discovered to have the same detectivities as HgCdTe ternary alloys of the same threshold energy at room temperature. This makes these superlattices suitable replacements for HgCdTe, which presents some technological difficulties. In this paper the optical and structural properties of GaInSb and GaInSb/GaSb quantum wells grown by metal-organic vapour phase epitaxy (MOVPE) are discussed.

Primary author: Mr MIYA, Senzo (Nelson Mandela Metropolitan University)

Co-authors: Prof. BOTHA, Johannes Reinhardt (Nelson Mandela Metropolitan); Dr WAGENER, Viera (Nelson Mandela Metropolitan University)

Presenter: Mr MIYA, Senzo (Nelson Mandela Metropolitan University)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 35

Type: **Presentation**

Hydrothermally grown self-assembled ZnO nanorods on Si substrate

Self assembled ZnO nanorods have been synthesized on seeded Si substrate by a simple hydrothermal route, using an ordinary glass beaker at a temperature of 750C. XRD analysis reveals that the as-grown rods have good crystalline quality and are c-axis oriented. SEM also confirms this orientation and shows single rods having hexagonal features and needle-like tips. Photoluminescence spectra showed strong UV excitonic emission and weak deep-level emission, which indicate good optical properties and very few structural defects.

Primary authors: Dr OLUWAFEMI, OS (Walter Sisulu University); Mr URGESSA, ZN (Nelson Mandela Metropolitan University (NMMU))

Co-authors: Ms OLIVIER, E.J (Nelson Mandela Metropolitan University (NMMU)); Prof. BOTHA, JR (Nelson Mandela Metropolitan University (NMMU))

Presenter: Mr URGESSA, ZN (Nelson Mandela Metropolitan University (NMMU))

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 36

Type: **Poster**

Determination of the Excess Charge Carrier Lifetime in Antimony Based Semiconductor Thin Films

Steady state photo-conductivity measurements are used for the determination of the lifetime of excess charge carriers in antimony based semiconductor (i.e. Ga Sb) thin films. The spectral dependence of the lifetime, as well as the dependence of lifetime on the incident photon flux density, the temperature and the doping level is investigated. In order to evaluate the surface and bulk contributions to the lifetime, samples of different thicknesses, grown under the same conditions, are analyzed.

Primary authors: Prof. WAGENER, M. C. (NMMU); Mr SHURA, Megersa Wodajo (NMMU)

Presenter: Mr SHURA, Megersa Wodajo (NMMU)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 37

Type: **Presentation**

Diffusion of fission products through silicon carbide

Fuel elements of modern high-temperature nuclear reactors are encapsulated by CVD-layers of pyrolytic carbon and silicon carbide to reduce fission product release. The aim of this study is to obtain information on volume and grain boundary diffusion as well as on the influence of radiation damage. For this purpose relevant isotopes were implanted in poly and single crystalline SiC samples at temperatures ranging from room temperature to 900 K. Diffusion coefficients were obtained from the broadening of the implantation profiles after isochronal and isothermal annealing studies up to 1900 K, using RBS analysis and electron microscopy.

Primary author: Prof. FRIEDLAND, Erich (University of Pretoria)

Co-authors: Prof. MALHERBE, Johan (University of Pretoria); Dr VAN DER BERG, Nic (University of Pretoria)

Presenter: Prof. FRIEDLAND, Erich (University of Pretoria)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 38

Type: **Presentation**

SPIN-DENSITY-WAVE EFFECTS IN THE Cr-Al-Mo ALLOY SYSTEM

Electrical resistivity and specific heat measurements on a (Cr_{98.5}Al_{1.5})_{100-y}Mo_y alloy system are reported. The results indicate that antiferromagnetism is fully suppressed to below 2 K in alloys with y larger than 4.5 at.% Mo. The Sommerfeld electronic specific heat coefficient decreases sharply below this concentration.

Primary author: Mr MUCHONO, Blessed (University of Johannesburg)

Co-authors: Prof. STRYDOM, A.M. (University of Johannesburg); Prof. PRINSLOO, A.R.E. (University of Johannesburg); Dr SHEPPARD, C.J. (University of Johannesburg); Prof. ALBERTS, H.L. (University of Johannesburg)

Presenter: Mr MUCHONO, Blessed (University of Johannesburg)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 39

Type: **Presentation**

Power-series expansion of the multi-channel Jost matrix

For the Jost-matrix that describes the multi-channel scattering, the energy dependence at all the branching points on the Riemann surface is factorized analytically. The remaining single-valued matrix functions of the energy are expanded in the power-series near an arbitrary point in the complex energy plane. A systematic and accurate procedure has been developed for calculating the expansion coefficients. This makes it possible to obtain an analytic expression for the S-matrix near an arbitrary point on the Riemann surface and thus to locate the spectral points (bound and resonant states) as the S-matrix poles.

Primary author: Prof. RAKITIANSKI, Sergei (University of Pretoria)

Co-author: Prof. ELANDER, Nils (Stockholm University)

Presenter: Prof. RAKITIANSKI, Sergei (University of Pretoria)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 40

Type: **Presentation**

Phase scintillation observed over a high-latitude Antarctic station

In this paper, GPS transionospheric signals are used to study phase scintillation observations at the South African Antarctic polar research station. A multi-instrument approach shows that the scintillation events are associated with auroral electron precipitation. It is also demonstrated that substorms play an essential role in the production of scintillation in the high-latitude ionosphere.

Primary author: Mr NGWIRA, Chigomezzyo (Rhodes University/Hermanus Magnetic Observatory)

Co-authors: Dr MCKINNELL, Lee-Anne (Hermanus Magnetic Observatory/Rhodes University); Dr CILLIERS, Pierre (Hermanus Magnetic Observatory)

Presenter: Mr NGWIRA, Chigomezzyo (Rhodes University/Hermanus Magnetic Observatory)

Track Classification: Track D2 - Space Science

Contribution ID: 41

Type: **Presentation**

Multivariate Techniques for Constructing Quiet Day Curves

The identification of anomalies in time series data depends on a knowledge of the expected “normal” variations in the data. Numerous techniques exist for deriving such Quiet Day Curves (QDCs). A flexible multivariate technique has been developed which generates QDCs which account for seasonal and other variations.

Primary author: Dr COLLIER, Andrew (Hermanus Magnetic Observatory)

Presenter: Dr COLLIER, Andrew (Hermanus Magnetic Observatory)

Track Classification: Track D2 - Space Science

Contribution ID: 42

Type: **Poster**

Sinusoidal Variation of Lightning Activity Over Africa

The annual cycle in lightning activity is driven by the seasonal variation in solar insolation which results from the passage of the Sun back and forth across the tropics. The annual lightning cycle for all countries in Africa is shown to decompose into annual and semi-annual components.

Primary author: Dr COLLIER, Andrew (Hermanus Magnetic Observatory)

Co-author: Prof. HUGHES, Arthur (University of KwaZulu-Natal)

Presenter: Dr COLLIER, Andrew (Hermanus Magnetic Observatory)

Track Classification: Track D2 - Space Science

Contribution ID: 43

Type: **Presentation**

Ab initio studies of staggered Li adatoms on graphene

We study Li on graphene using the VASP code employing the PAW method within the GGA for the exchange-correlation. We give detailed structural and electronic results for various configurations involving Li on the different two-dimensional unit cells. For 100% coverage, we have new results for Li on the on-top site, which suggests a staggered configuration for the lowest energy structure for which the Li adatoms are alternately pushed into and pulled out of the graphene layer. For 50% coverage, Li favours the hollow site. We have discovered that a careful relaxation of the system also shows a staggered configuration of Lithium adatoms.

Primary author: Mr MAPASHA, Edwin (University of Pretoria)

Presenter: Mr MAPASHA, Edwin (University of Pretoria)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 44

Type: **Presentation**

Tunable Laser Based on Dye-Doped Polymer Gain Media Incorporating Nanoparticles: Novel Polymerization Method

The solid state dye laser active medium prepared from Pyrromethene-567 dissolved in ethylene glycol and added in a 2-hydroxyethyl-methacrylate methyl-methacrylate (volume mixture 1:1) copolymerized by gamma irradiation method (GIM). This new method of processability, to the best of our knowledge, is the fastest way in fabricating Polymeric Dye Laser samples so far. In the present work, a cheap 3 Hz, 5 ns of energy 1mJ @ 571 nm laser output produced from Polymeric Dye Laser active medium by applying a compact air-cooled Nd:YAG laser-pumping technique has been designed and constructed. The optical setup of the present system is extremely simple

Primary author: Dr AL-GHAMDI, Attieh A (Photonics Research Department Manager)

Co-author: Dr MAHROOS, Eiman M (Head of Physics Department,)

Presenter: Dr AL-GHAMDI, Attieh A (Photonics Research Department Manager)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 45

Type: **Poster**

Zero Outward Magnetic Flux From Surfaces Enclosing Non-dipolar Magnetic Sources

In a harmonized representation of elemental field sources, those of magnetic fields are elemental magnetic vector charges. This permits a simple illustration that, unlike the gravitational and electric fluxes, the magnetic flux out of any closed surface is zero for any enclosed magnetic source, dipolar or non-dipolar.

Primary author: Dr CHIRWA, Max (Physics Department, Walter Sisulu University)

Presenter: Dr CHIRWA, Max (Physics Department, Walter Sisulu University)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 46

Type: **Presentation**

Tandem targetry possibilities for the production of the medically-important radionuclides ^{88}Zr and ^{89}Zr

Excitation functions have been measured for the reactions $^{89}\text{Y}+\text{p}$ and $^{93}\text{Nb}+\text{p}$ and thick-target yield curves have been derived for the production of ^{88}Zr and ^{89}Zr up to 70 MeV. Tandem Nb/Y-targets as well as the extraction of medically-important radio-Zr nuclides from used Nb capsules as a by-product are discussed.

Primary author: Dr STEYN, Deon (iThemba LABS)

Presenter: Dr STEYN, Deon (iThemba LABS)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 47

Type: **Presentation**

On the design of a concentrator photovoltaic module

Concentrated photovoltaic (CPV) modules are a cost effective alternative flat-plate photovoltaic modules that concentrate the sun onto small, highly efficient solar cells.[1] This paper addresses the design, and characterization of CPV modules that use 39% efficient triple junction solar cells. The optical, electrical and thermal configuration of the module is investigated.

Primary author: Mr SCHULTZ, Ross (Nelson Mandela Metropolitan University)

Co-authors: Prof. VAN DYK, E.E (Nelson Mandela Metropolitan University); Dr VORSTER, F.J (Nelson Mandela Metropolitan University)

Presenter: Mr SCHULTZ, Ross (Nelson Mandela Metropolitan University)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 48

Type: **Presentation**

Monte Carlo simulation of Pt-Al binary alloy thin films

Pt-Al thin films (Pt₂₅Al₇₅, Pt₅₅Al₄₅ and Pt₆₃Al₃₇) were prepared and heat treated at various annealing- temperatures and times. Elemental maps and depth profiles were obtained with a PHI 700 nanoprobe. A chemical potential Monte Carlo model was developed and simulations were run. Theoretical depth-profiles and microstructures were obtained. Comparisons between experimental and theoretical results show good correlations.

Primary author: Mr HARRIS, Richard (UFS/Mintek)

Co-authors: Dr VAN DER LINGEN, E. (Mintek); Prof. SWART, H.C. (UFS); Prof. TERBLANS, J.J. (UFS)

Presenter: Mr HARRIS, Richard (UFS/Mintek)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 49

Type: **Presentation**

Vacuum Energies of Cosmic Strings

I present a computation of the fermion contribution to the vacuum polarization energy of string-like configurations in a non-Abelian gauge theory. I establish this method by numerically verifying the invariance under (a subset of) local gauge transformations. This also provides further support for the use of spectral methods to compute vacuum polarization energies in general. I confirm that the vacuum energy in the $\overline{\text{MS}}$ renormalization scheme is much smaller than the mass of the fluctuating fermion field. Numerical results for the on-shell scheme are presented and the possibility of string stabilization via quantum effects is discussed.

Primary author: Prof. WEIGEL, Herbert Weigel (Physics Department Stellenbosch University)

Presenter: Prof. WEIGEL, Herbert Weigel (Physics Department Stellenbosch University)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 50

Type: **Poster**

Comparative attenuation spectra of liquid skin-like phantoms

This study aims to extract and compare attenuation coefficients of different liquid skin-like phantoms representing Skin Types I to VI with two methods, Spectrophotometric and Integrating Sphere methods. The correlation between the results of the 2 methods was excellent.

Primary author: Ms SINGH, Ann (CSIR,National Laser Centre)

Co-authors: Mrs KARSTEN, Aletta E. (CSIR,National Laser Centre); Prof. GROBLER, Ann F. (Unit for drug development and research, North-West University, Potchefstroom, South Africa); Dr SMIT, Jacoba E. (CSIR,National Laser Centre); Dr SPARROW, Raymond W. (CSIR, Biosciences)

Presenter: Ms SINGH, Ann (CSIR,National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 51

Type: **Poster**

A Far-IR Absorbing Molecule Showing Highest Molecular Second Order Nonlinear Optical Response: A Computational Study

We report, till date the highest value of molecular first hyperpolarizability (Second order Nonlinear Optical response) for an organic molecule. Calculation shows that low energy absorption (Far-IR) and large ground to excited state dipole difference, are mainly responsible for such a high value first hyperpolarizability even at the molecular level.

Primary author: Dr SITHA, Sanyasi (University of the Witwatersrand)

Presenter: Dr SITHA, Sanyasi (University of the Witwatersrand)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 52

Type: **Poster**

Locating the inner edge of a neutron star crust

Neutron star properties are studied and the transition density from the core to the crust is calculated using fifteen parameter sets of the effective Skyrme nucleon-nucleon interaction, within a method called the dynamical method. Results are used to verify published values.

Primary author: Mr VAN ROOY, Milton (Stellenbosch University)

Presenter: Mr VAN ROOY, Milton (Stellenbosch University)

Track Classification: Track D1 - Astrophysics

Contribution ID: 53

Type: **Presentation**

A perspective on additional structure in local formulations for position measurements in noncommutative quantum mechanics (NCQM)

We contrast two equivalent formulations for NCQM position measurement: a constrained local description in position containing additional degrees of freedom, and an unconstrained nonlocal description without nonpositional degrees of freedom. After analysing corresponding classical theories, we demonstrate that the local formulations allow for natural interpretations of NCQM involving additional structure/extent.

Primary author: Mr ROHWER, Chris (Institute of Theoretical Physics, University of Stellenbosch)

Co-authors: Prof. SCHOLTZ, F. (National Institute for Theoretical Physics (NITheP), Stellenbosch); Dr ZLOSHCHASTIEV, K. (National Institute for Theoretical Physics (NITheP), Stellenbosch); Dr GOUBA, L. (National Institute for Theoretical Physics (NITheP), Stellenbosch)

Presenter: Mr ROHWER, Chris (Institute of Theoretical Physics, University of Stellenbosch)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 54

Type: **Presentation**

Ferromagnetic phase diagram of neutron matter

The magnetic properties of matter under extreme conditions are of particular importance to understand the neutron star interior. One contributing factor to the neutron star's magnetic field could be the ferromagnetic phase of nuclear matter. Using a relativistic model we calculated the ferromagnetic phase diagram for dense neutron matter.

Primary author: Mr DIENER, J P W (Stellenbosch University)

Co-author: Prof. SCHOLTZ, F G (Stellenbosch University/NITheP)

Presenter: Mr DIENER, J P W (Stellenbosch University)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 55

Type: **Presentation**

Geomagnetic storms and solar sources relationships: a statistical analysis during solar cycle 23.

Over a period of 11 years of solar cycle 23 : 1996-2006, the solar sources of 219 geomagnetic storms have been investigated . This investigation focused on a class of coronal mass ejections (CMEs) known as halo CMEs and they subsequent geo-effective conditions in the interplanetary medium. In this paper, we present the results of a statistical analysis of geomagnetic storms solar sources in terms of full halo and partial halo CMEs.

Primary author: Mr UWAMAHORO, Jean (Hermanus Magnetic Observatory)

Co-author: Dr MCKINNELL, Lee-Anne (Hermanus Magnetic Observatory)

Presenter: Mr UWAMAHORO, Jean (Hermanus Magnetic Observatory)

Track Classification: Track D2 - Space Science

Contribution ID: 56

Type: **Presentation**

Selective Excitation of a Vibrational Level within the Electronic Ground State of a Polyatomic Molecule with Ultra Short Pulses

Coherent control of the upper vibrational level populations in the electronic ground state of a polyatomic molecule was simulated. Results indicate that selective excitation of a specific upper state level is possible.

Primary author: Mr DE CLERCQ, Ludwig (NLC)

Co-authors: Dr DU PLESSIS, Anton (CSIR and Stellenbosch University); Prof. ROHWER, Erich (Stellenbosch University); Dr UYS, Hermann (CSIR); Dr BOTHA, Lourens (CSIR and Stellenbosch University)

Presenter: Mr DE CLERCQ, Ludwig (NLC)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 57

Type: **Poster**

A Quantum Hall Effect without Landau Levels in a Carbon Nanotube.

Inspired by known instances of a Quantum Hall Effect without Landau levels, we look for such an effect in a carbon nanotube subjected to a magnetic field that is constant along the axial direction and averages to zero around the tube's circumference.

Primary author: Ms BRAND, J D (Stellenbosch University)

Co-author: Dr SNYMAN, I (NITheP)

Presenter: Ms BRAND, J D (Stellenbosch University)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 58

Type: **Presentation**

Evidence for the early nucleation of single-walled carbon nanotubes

In situ optical emission spectroscopy(OES) was used to investigate the spatial and temporal evolution of the electron temperature(T_e) of laser induced plasmas in the laser-furnace method of synthesizing single-walled carbon nanotubes (SWCNTs). The intensities of the spectral maps of T_e showed a strong temperature dependence. The frequency of sharp fluctuations which appear as hot spots in the spectral maps of T_e increased as the furnace temperature was increased from 1073 K to 1273 K.

Primary author: Mr MOODLEY, Mathew (CSIR)

Co-author: Prof. COVILLE, Neil (University of the Witwatersrand)

Presenter: Mr MOODLEY, Mathew (CSIR)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 59

Type: **Presentation**

Expanding Entropy four-current up to third order in Dissipative Fluxes

From Israel-Sterwart(second order) entropy four-current in kinetic theory, we expand it up to third order in dissipative fluxes, the Viscous stress tensor, heat flux and Viscous pressure. We show the temperature behaviour of our coefficients by plotting them as functions of temperature dependent parameter. Finally we will compare our results with those obtained from Israel-Sterwat theory.

Primary author: Mr NEMULODI, fhumulani (university of cape town)

Co-author: Dr MURONGA, azwinndini (university of cape town)

Presenter: Mr NEMULODI, fhumulani (university of cape town)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 60

Type: **Presentation**

Nuclear Structure and Scattering in ^{20}Ne , ^{44}Ti , ^{94}Mo and ^{212}Po

We investigate the nuclear structure and elastic scattering in nuclei (^{20}Ne , ^{44}Ti , ^{94}Mo , and ^{212}Po) using a model of alpha-cluster orbiting a closed shell core. A purely phenomenological cluster-core potential was found to provide a successful description of low lying positive parity spectra, electromagnetic transition strengths of these nuclei and alpha-decay rates of these states in ^{212}Po . We then consider the same phenomenological potential as the real part of optical model to describe the differential elastic scattering cross-sections for the systems corresponding to $^{20}\text{Ne} = ^{16}\text{O} + \alpha$, $^{44}\text{Ti} = ^{40}\text{Ca} + \alpha$, $^{94}\text{Mo} = ^{90}\text{Zr} + \alpha$, $^{212}\text{Po} = ^{208}\text{Pb} + \alpha$.

Primary author: Mr NDAYISHIMYE, Joram (Stellenbosch University)

Presenter: Mr NDAYISHIMYE, Joram (Stellenbosch University)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 61

Type: **Presentation**

Study of the time dependent modulation of galactic cosmic rays in the inner heliosphere

In this work a fully time-dependent cosmic ray model, based on the numerical solution of the Parker transport equation, is used to compute intensities of galactic cosmic rays in the heliosphere. Results are compared to recent observations of charged particles by the Ulysses spacecraft. We show how computed intensities along the Ulysses trajectory vary over a solar cycle and in particular show that it is possible to simulate cosmic ray modulation realistically during all the three fast latitude scan periods of the spacecraft.

Primary author: Mr MAGIDIMISHA, EDWIN (NWU (POTCHEFSTROOM))

Co-author: Prof. FERREIRA, Stefan (NWU (POTCHEFSTROOM))

Presenter: Mr MAGIDIMISHA, EDWIN (NWU (POTCHEFSTROOM))

Track Classification: Track D2 - Space Science

Contribution ID: 62

Type: **Presentation**

Z-dependent Bessel-like Beams

Bessel beams are generated by the propagation of plane waves along a conical surface. Experimentally such beams exist for a finite distance (near-field) however abruptly transforms into an annular ring (far-field). Here we outline a new optical method which allows a Bessel function to exist in the Far-field as the propagation distance tends to infinity.

Primary author: Ms ISMAIL, Yaseera (CSIR-National Laser Centre)

Co-author: Prof. FORBES, Andrew (CSIR-National Laser Centre)

Presenter: Ms ISMAIL, Yaseera (CSIR-National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 63

Type: **Presentation**

Amplitude screening in solid-state laser resonators

The oscillating mode in laser resonators is dual-directional between the mirrors. Theory describing the field distributions of the beam are compared and supplemented experimentally. The superposition of two Laguerre-Gaussian modes of opposite azimuthal order allows cylindrical “petal” modes to occur. These modes are achieved experimentally and compared to numerical simulations.

Primary author: Mr NAIDOO, Darryl (Council for Scientific and Industrial Research)

Co-authors: Prof. FORBES, Andrew (Council for Scientific and Industrial Research); Prof. AÏT AMEUR, Kamel (CIMAP–ENSICAEN); Mr BRUNEL, Marc (CORIA UMR 6614, Université de Rouen)

Presenter: Mr NAIDOO, Darryl (Council for Scientific and Industrial Research)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 64

Type: **Presentation**

Investigation into the effects of delamination in photovoltaic modules

The mismatch of solar cell currents in a photovoltaic module has a substantial effect on the overall power output of the module. In this study the effects on cell mismatch were examined by characterizing a degraded Edge-defined Film-fed crystalline module and making a comparison with simulated results.

Primary author: Ms CROZIER, Jacqui (NMMU)

Co-authors: Prof. VAN DYK, Ernest (NMMU); Dr VORSTER, Frederik (NMMU)

Presenter: Ms CROZIER, Jacqui (NMMU)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 65

Type: **Poster**

The Integrating Sphere-based Setup as an Accurate System

Determination of the optical properties of solid and liquid samples has great importance. Since the integrating sphere-based setup is used to measure the amount of reflected and transmitted light by the examined samples, optical properties could be calculated. Our study is a preliminary step toward studying the optical properties of bacterial samples.

Primary author: Ms ABDALMONEM, Shaimaa (National Institute for Laser Enhanced Science)

Presenter: Ms ABDALMONEM, Shaimaa (National Institute for Laser Enhanced Science)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 66

Type: **Presentation**

Elemental composition analysis, morphological, and photoluminescence properties of pulsed laser ablated SrAl₂O₄:Eu²⁺,Dy³⁺ thin films

Abstract: SrAl₂O₄:Eu²⁺,Dy³⁺ films ablated in different deposition atmospheres were characterized by Auger electron spectroscopy (AES), scanning electron microscopy (SEM), atomic force microscopy (AFM), and fluorescence spectrophotometer. Superior photoluminescence properties were recorded by films deposited in the different gas atmospheres. Surface morphology played a major role in the luminescent properties of the thin films. Electron degradation during prolonged electron bombardment was also monitored.

Primary author: Mr NSIMAMA, Patrick (The university of the Free State)

Co-authors: Prof. SWART, Hendrik (The University of the Free State); Prof. NTWAEABORWA, Martin (The University of the Free State)

Presenter: Mr NSIMAMA, Patrick (The university of the Free State)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 67

Type: **Presentation**

Collective Field Theory of Schur Polynomials

We develop a collective field theory of single matrix models using the formalism of Jevicki and Sakita in [1] ('The Quantum Collective Field Method and its Application to the Planar Limit'), with Schur polynomials as collective fields. The highly nontrivial Jacobian associated with the change of variables required to obtain the collective field Hamiltonian, is found using group representation theory

Primary authors: Prof. DE MELLO KOCH, Robert (National Institute for Theoretical Physics and Centre for Theoretical Physics); Ms SMITH, Stephanie (University of the Witwatersrand)

Presenter: Ms SMITH, Stephanie (University of the Witwatersrand)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 68

Type: **Presentation**

The Distance to the Great Attractor

Distance measurements to extragalactic sources are a major step towards studies in extragalactic astronomy. We here determine the redshift-independent distance to the Norma cluster, and hence the peculiar velocity in the Cosmic Microwave Background radiation rest frame using the Near-infrared Fundamental Plane for early-type galaxies.

Primary authors: SARAH, Blyth (Astronomy Department, Astrophysics, Cosmology and Gravity Centre (ACGC), University of Cape Town); Mr MUTABAZI, Tom (Astronomy Department, Astrophysics, Cosmology and Gravity Centre (ACGC), University of Cape Town)

Co-author: WOUDT, Patrick (Astronomy Department, Astrophysics, Cosmology and Gravity Centre (ACGC), University of Cape Town)

Presenter: Mr MUTABAZI, Tom (Astronomy Department, Astrophysics, Cosmology and Gravity Centre (ACGC), University of Cape Town)

Track Classification: Track D1 - Astrophysics

Contribution ID: 69

Type: **Presentation**

Atomic Processes in Gaseous Nebulae

The physics of gaseous nebulae is critically examined using modeling software. Certain assumptions that are relevant for the optical spectral lines or low energy levels have been taken for granted to work for radio lines or transitions from high energy levels as well. The validity of these assumptions is tested.

Primary author: Ms PROZESKY, Andri (Unisa)

Co-author: Prof. SMITS, Derck (Unisa)

Presenter: Ms PROZESKY, Andri (Unisa)

Track Classification: Track D1 - Astrophysics

Contribution ID: 70

Type: **Presentation**

Pulsation instability in Young Brown Dwarfs

We use a time-dependent model of turbulent convection which includes turbulent pressure, turbulent diffusion and turbulent viscosity to study stellar pulsations in young brown dwarfs recently proposed by Palla and Baraffe (2005). We find that turbulent pressure dominates in driving the oscillations with growth rates much higher than frozen-in approximation.

Primary author: Mr OKENG'O, Geoffrey (Department of Physics, University of Western Cape and South African Astronomical Observatory)

Co-author: Dr OLIVIER, Enrico (South African Astronomical Observatory and Department of Physics, University of Western Cape)

Presenter: Mr OKENG'O, Geoffrey (Department of Physics, University of Western Cape and South African Astronomical Observatory)

Track Classification: Track D1 - Astrophysics

Contribution ID: 71

Type: **Poster**

Development of an emittance measurement device for the determination of the transverse phase space distribution of ion beams

In this paper we describe the development of a beam emittance device with which the quality of ion beams extracted from ion sources will be investigated.

Primary author: Mr BLAINE B. D. LOMBERG, Blaine (University of the Western Cape & iThemba LABS)

Co-authors: Dr LOWRY CONRADIE, Lowry (iThemba LABS); Dr RAINER THOMAE, Rainer (iThemba LABS)

Presenter: Mr BLAINE B. D. LOMBERG, Blaine (University of the Western Cape & iThemba LABS)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 72

Type: **Presentation**

The K600 zero degree facility

The K600 zero degree facility at iThemba LABS was recently successfully commissioned. The setup and experimental techniques for the high energy resolution measurement of (p,p') and (p,t) reactions at intermediate energies are described, and preliminary results are presented.

Primary authors: Dr SMIT, F.D. (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Dr FUJITA, H. (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Dr NEVELING, R. (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa)

Co-authors: Prof. RICHTER, A (Institut für Kernphysik, TU Darmstadt, Darmstadt 64829, Germany); Prof. TAMII, A (Research Center for Nuclear Physics, Osaka University, Ibaraki, Osaka 567-0047, Japan); Ms HEILMANN, A.M. (Institut für Kernphysik, TU Darmstadt, Darmstadt 64829, Germany); Mr KUREBA, C.O. (School of Physics, University of Witwatersrand, Johannesburg 2050, South Africa); Dr FOURIE, D.T. (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Prof. SIDERAS-HADDAD, E (School of Physics, University of Witwatersrand, Johannesburg 2050, South Africa); Dr BUTHELEZI, E.Z. (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Dr BERG, G.P.A (Department of Physics, University of Notre Dame, Notre Dame, Indiana 46556, USA); Ms POLTORATSKA, I (Institut für Kernphysik, TU Darmstadt, Darmstadt 64829, Germany); Dr USMAN, I.T. (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Prof. CARTER, J. (School of Physics, University of Witwatersrand, Johannesburg 2050, South Africa); Prof. GOERRES, J. (Department of Physics, University of Notre Dame, Notre Dame, Indiana 46556, USA); Mr SWARTZ, J.A. (Physics Department, University of Stellenbosch, Matieland 7602, South Africa); Mr VAN ZYL, J.J (Physics Department, University of Stellenbosch, Matieland 7602, South Africa); Dr CONRADIE, J.L. (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Mr MIRA, J.P. (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Prof. HATANAKA, K (Research Center for Nuclear Physics, Osaka University, Ibaraki, Osaka 567-0047, Japan); Dr COUDER, M. (Department of Physics, University of Notre Dame, Notre Dame, Indiana 46556, USA); Mr JINGO, M. (School of Physics, University of Witwatersrand, Johannesburg 2050, South Africa); Dr PAPKA, P (Physics Department, University of Stellenbosch, Matieland 7602, South Africa); Prof. VON NEUMANN-COSEL, P. (Institut für Kernphysik, TU Darmstadt, Darmstadt 64829, Germany); Prof. FEARICK, R.W. (Physics Department, University of Cape Town, Rondebosch 7700, South Africa); Mr O'BRIEN, S (Department of Physics, University of Notre Dame, Notre Dame, Indiana 46556, USA); Mr MURRAY, S.H.T. (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Dr FOERTSCH, S.V. (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Dr ADACHI, T (KVI, Zernikelaan 25, 9747 AA Groningen, The Netherlands); Prof. FUJITA, Y (Department of Physics, Osaka University, Toyonaka, Osaka 560-0043, Japan)

Presenter: Dr NEVELING, R. (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 73

Type: **Presentation**

One loop anomalous dimension for a class of operators with bare dimension of $O(N)$

For operators of bare dimension of $O(N)$, even in the large N limit the planar approximation is inaccurate. Here we study the anomalous dimension of operators built using two complex N by N matrices Z and Y . A basis for these operators, the restricted Schur polynomials, has been developed in [1]. The present study generalizes the work of [2], which considered operators built using no more than two Y s.

Primary author: Mr DE COMARMOND, Vincent (WITS)

Co-authors: Mrs JEFFERIES, Katherine (WITS); Prof. DE MELLO KOCH, Robert (WITS, National Institute for Theoretical Physics Stellenbosch)

Presenter: Mr DE COMARMOND, Vincent (WITS)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 74

Type: **Presentation**

The Beam Quality Factor of Aberrated Gaussian Laser Beams

A model is used to calculate the beam quality factor of a laser beam from Zernike coefficients. It is tested by programming aberration coefficients on a laser beam and measuring the beam quality using a Shack-Hartmann wavefront sensor. The two show excellent agreement.

Primary author: Mr MAFUSIRE, Cosmas (CSIR National Laser Centre)

Co-author: Prof. FORBES, Andrew (CSIR National Laser Center)

Presenter: Mr MAFUSIRE, Cosmas (CSIR National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 75

Type: **Poster**

Efficiency of different numerical techniques for evaluating global sensitivity indices when input variables are correlated and normally distributed

A recently developed sensitivity analysis technique known as Global Sensitivity Analysis (GSA) is based on the High Dimensional Model Representation and functional ANOVA. The efficiency of the different numerical techniques used in the evaluation for GSA, capable to deal with the curse of dimensionality and correlations between inputs, are evaluated.

Primary author: Mr ADETULA, Bolade Adewale (Northwest university, NECSA)

Co-author: Dr BOKOV, Pavel .M (NECSA)

Presenter: Mr ADETULA, Bolade Adewale (Northwest university, NECSA)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 76

Type: **Presentation**

Geomagnetic survey towards the re-establishment of a magnetic observatory on Marion Island

Marion Island (46d52.740'S, 37d51.442'E), near the edge of the South Atlantic Anomaly, is strategically located for geomagnetic observations. This paper presents the geomagnetic survey done on Marion Island towards the re-establishment of a magnetic observatory to follow up on observations done there during the period 1972 to 1980.

Primary author: Dr CILLIERS, Pierre (Hermanus Magnetic Observatory)

Co-author: Dr KOTZE, Pieter (Hermanus Magnetic Observatory)

Presenter: Dr CILLIERS, Pierre (Hermanus Magnetic Observatory)

Track Classification: Track D2 - Space Science

Contribution ID: 77

Type: **Presentation**

An optical system to study temperature influenced chemical and mechanical changes to the PCD structure

In this investigation a polycrystalline diamond (PCD) body produced under High Pressure High Temperature (HTHP) conditions was heated using a CO₂ laser. The resultant surface temperature profile was measured optically by using the grey body emission from the PCD. This temperature measurement system allows one to study temperature influenced chemical and mechanical changes to the PCD structure.

Primary author: Ms MASINA, Bathusile (CSIR-National Laser Centre)

Co-author: Prof. FORBES, Andrew (CSIR-National Laser Centre)

Presenter: Ms MASINA, Bathusile (CSIR-National Laser Centre)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 78

Type: **Presentation**

Unveiling a massive overdensity behind Vela

Our understanding of local galaxy dynamics is hindered by the Milky Way which obscures a large fraction of the sky. I will present the latest evidence from a redshift survey of galaxies in the Vela region, behind the Milky Way, of the existence of a previously unknown overdensity.

Primary author: Ms VON MALTITZ, Kosma (University of Cape Town)

Co-authors: Prof. WOUTD, Patrick A. (University of Cape Town); Prof. KRAAN-KORTEWEG, Renee C. (University of Cape Town)

Presenter: Ms VON MALTITZ, Kosma (University of Cape Town)

Track Classification: Track D1 - Astrophysics

Contribution ID: 79

Type: **Presentation**

Photo-transfection and selective optical differentiation of embryonic stem cells

Due to their self-renewal and pluripotency characteristics, stem cells possess the potential to dramatically advance current therapies in tissue regeneration and engineering. In this work, we report for the first time that femtosecond laser pulses can be utilised for successful transient photo-transfection and differentiation of mouse embryonic stem cell colonies.

Primary author: Dr MTHUNZI, Patience (CSIR - NLC)

Co-authors: Dr GUNN-MOORE, Frank (University of St. Andrew); Prof. DHOLAKIA, Kishan (University of St. Andrew)

Presenter: Dr MTHUNZI, Patience (CSIR - NLC)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 81

Type: **Presentation**

Theoretical description of quasielastic neutrino-induced strange particle production

We present calculations of the quasifree associate production via the neutrino-nucleus weak interaction. Our formalism is done in the relativistic plane wave impulse approximation. In the plane wave limit, the spectator approximation is used to construct the invariant matrix element. The cross section is constructed as the contraction between the leptonic and hadronic tensors. The numerical results are generated based on the Born-term approximation. The distributions of the differential cross section with respect to varies kinematical inputs are presented.

Primary author: Mr ADERA, Gashaw (PhD Student in the area of Theoretical Nuclear Physics at Physics Department University of Stellenbosch)

Presenter: Mr ADERA, Gashaw (PhD Student in the area of Theoretical Nuclear Physics at Physics Department University of Stellenbosch)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 82

Type: **Presentation**

Amplitude damping of vortex modes

An interferometer, mimicking an amplitude damping channel for vortex modes, is presented. Experimentally the action of the channel is in good agreement with that predicted theoretically. Since we can characterize the action of the channel on orbital angular momentum states, we propose using it to investigate the dynamics of entanglement.

Primary author: Mrs DUDLEY, Angela (CSIR National Laser Centre)

Co-authors: Prof. FORBES, Andrew (CSIR National Laser Centre); Dr ROUX, Filippus Stef (CSIR National Laser Centre); Mr NOCK, Michael (School of Physics UKZN); Prof. KONRAD, Thomas (School of Physics UKZN)

Presenter: Mrs DUDLEY, Angela (CSIR National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 83

Type: **Presentation**

Affects of binary and continuous phase modulations on the structure of Bessel beams

We implement a novel technique to operate a phase-only spatial light modulator (SLM) in amplitude mode, allowing us to reproduce Durnin's ring slit on a liquid crystal display (LCD). The affects of binary and continuous phase modulations on the structure of a zero-order Bessel beam is investigated.

Primary author: Mrs DUDLEY, Angela (CSIR National Laser Centre)

Co-authors: Prof. FORBES, Andrew (CSIR National Laser Centre); Prof. KHILO, Nikolai (B.I. Stepanov Institute of Physics of NAS of Belarus); Dr ROPOT, Piotr (B.I. Stepanov Institute of Physics of NAS of Belarus); Mr VASILYEU, Ruslan (B.I. Stepanov Institute of Physics of NAS of Belarus); Prof. BELYI, Vladimir (B.I. Stepanov Institute of Physics of NAS of Belarus)

Presenter: Mrs DUDLEY, Angela (CSIR National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 84

Type: **Poster**

Strengthening the Output Power of an Optical Fiber Laser

Theory on layout of a fiber laser, how a fiber laser operates and increasing the output power is covered in the paper. The steps followed to increase the output power are discussed, including the experimental results obtained.

Primary authors: Prof. MEYER, Johan (University of Johannesburg); Mr LE ROUX, Josias (University of Johannesburg); Dr MARTINEZ, Rodolfo (University of Johannesburg)

Presenter: Mr LE ROUX, Josias (University of Johannesburg)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 85

Type: **Presentation**

Investigating the rotation rates of superimposed Bessel beams

In this work a spatial light modulator (SLM) and a ring slit are used to generate superpositions of higher-order Bessel beams. We show that even though these fields do not carry any orbital angular momentum (OAM) a rotation in their intensity profile is evident, agreeing well with the theoretical prediction.

Primary author: Mr ROP, Ronald (Moi University, Kenya)

Co-authors: Prof. FORBES, Andrew (CSIR National Laser Centre); Mrs DUDLEY, Angela (CSIR National Laser Centre); Ms ISMAIL, Yaseera (CSIR National Laser Centre)

Presenter: Mr ROP, Ronald (Moi University, Kenya)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 86

Type: **Presentation**

A New Representation for the Dilatation Operator at One Loop

The planar limit of the dilatation operator in the $SU(2)$ sector has been studied extensively. In this presentation the exact one loop dilatation operator in the $SU(2)$ sector will be considered. This is achieved by exploiting a new basis, the restricted Schur polynomial, which allows us to sum all higher genus diagrams.

Primary author: Ms JEFFERIES, Katherine (University of the Witwatersrand)

Co-authors: Prof. DE MELLO KOCH, Robert (University of the Witwatersrand & National Institute for Theoretical Physics, Stellenbosch); Mr DE COMARMOND, Vincent (University of the Witwatersrand)

Presenter: Ms JEFFERIES, Katherine (University of the Witwatersrand)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 87

Type: **Poster**

Evolution of the optical vortex density in phase corrected speckle fields

We numerically investigate the evolution of the optical vortex density in a speckle field after its continuous phase is removed, in other words, after it has been phase corrected. We found that it initially drops to 70% and then increases to 88% of the initial density. The rate of decrease is an order of magnitude faster than the rate of increase.

Primary author: Dr ROUX, Filippus (CSIR National Laser Centre)

Co-author: Dr CHEN, Mingzhou (Applied Optics, School of Physics, National University of Ireland--Galway)

Presenter: Dr ROUX, Filippus (CSIR National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 88

Type: **Presentation**

Ionizing radiation as imaging tool for coal characterization and gasification research

Computer Tomography (CT) has been used extensively in the past to study a variety of samples including coal. This MSc-study will determine the validity of the CT technique specifically with regard to coal research by optimizing a general CT system, characterizing coal non-destructively and observing and studying the gasification process.

Primary author: Mr HOFFMAN, Jakobus (Necsa)

Co-authors: Mr DE BEER, Frikkie (Necsa); Prof. CAMPBELL, Qeuntin (North West University)

Presenter: Mr HOFFMAN, Jakobus (Necsa)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 89

Type: **Presentation**

Time resolved electron diffraction in Stellenbosch

We will present the current status of our first time resolved electron diffraction experiment, which is the investigation of the structure change of an ultrafast heated thin metal foil. We will show how we produce the required freestanding metal films with a thickness of only a few tens of nanometers.

Primary author: Ms HAUPT, Kerstin (LRI, Stellenbosch University)

Co-authors: Prof. ROHWER, Erich (LRI, Stellenbosch University); Dr KASSIER, Günther (LRI, Stellenbosch University); Prof. SCHWOERER, Heinrich (LRI, Stellenbosch University); Ms BOSHOF, Ilana (LRI, Stellenbosch University); Mr ERASMUS, Nicolas (LRI, Stellenbosch University)

Presenter: Ms HAUPT, Kerstin (LRI, Stellenbosch University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 90

Type: **Poster**

Cathodoluminescence degradation of SrGa₂S₄:Ce³⁺ powder phosphor

Cathodoluminescence (CL) of strontium thiogallate doped with cerium was investigated using Auger electron spectroscopy (AES) coupled with CL spectroscopy. The CL data were collected when the samples were irradiated with a beam of electrons accelerated at 1.5 to 2.5 kV. Possible mechanisms of CL degradation are discussed.

Primary author: Ms MOLEME, Pulane (University of the Free State)

Co-authors: Prof. SWART, Hendrik (University of the Free State); Prof. NTWAEABORWA, Martin (University of the Free State)

Presenter: Ms MOLEME, Pulane (University of the Free State)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 91

Type: **Poster**

Numerical simulation of decoherence of quantum entanglement through atmospheric turbulences

A numerical procedure is proposed to study the decoherence of the entanglement between a pair of qubits due to atmospheric turbulence. The qubits are photons entangled in terms orbital angular momentum modes and the turbulent atmosphere is modeled with the von Karman-Tatarski spectrum.

Primary author: Mr HAMADOU IBRAHIM, Alpha (CSIR, National Laser Centre)

Co-author: Dr ROUX, Filippus (CSIR, National Laser Centre)

Presenter: Mr HAMADOU IBRAHIM, Alpha (CSIR, National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 92

Type: **Poster**

Ultrafast Electron Diffraction at Stellenbosch University

Femtosecond electron diffraction in principle allows for the observation of the initial dynamics of photo-induced processes in molecules and condensed phase with atomic spatial and temporal resolution. The method is based on the classical pump-probe spectroscopy with femtosecond laser pulses, but the difference being that the laser probe-pulse is replaced by an ultrashort electron pulse, which is diffracted off the target.

Primary author: Mr ERASMUS, Nicolas (Stellenbosch University)

Presenter: Mr ERASMUS, Nicolas (Stellenbosch University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 93

Type: **Poster**

Non-commutative Quantum Field Theory

Non-commutative field theory is applied to nucleon-nucleon interactions where we assume the spatial coordinates of nucleons do not commute. This assumption leads to the interpretation that nucleons occupy a minimum volume in space which alters our view of NN-interactions. Qualitative descriptions of these interactions are obtained using various approximations.

Primary author: Mr GROENEWALD, Hendrikus (University of Stellenbosch)

Co-authors: Prof. SCHOLTZ, F.G. (National Institute for Theoretical Physics); Dr WYNGAARDT, S.M. (University of Stellenbosch)

Presenter: Mr GROENEWALD, Hendrikus (University of Stellenbosch)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 94

Type: **Presentation**

Overview of the Ultrafast Electron Diffraction Setup at Stellenbosch University

Ultrafast electron diffraction is a new and exciting technique which aims to directly observe photo-induced dynamics of solids and molecules on the atomic level (spatially in the Ångström regime and temporally in the femtosecond regime). This is done by combining two tried-and-trusted techniques, namely static electron diffraction and femtosecond pump-probe spectroscopy.

Primary author: Mr ERASMUS, Nicolas (Stellenbosch University)

Presenter: Mr ERASMUS, Nicolas (Stellenbosch University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 95

Type: **Presentation**

Characterization of Thulium Doped Fiber for Mid Infrared Laser Applications

We present measurements of the slope efficiency and the pump power at threshold for a “triple-clad” thulium doped fiber laser, operating at around 2 μm wavelength. We observe fiber laser efficiencies as high as 47 % and output power of 5 W for 20 W of absorbed pump power. The dependence of the laser efficiency on different cooling methods will be discussed.

Primary author: Mr NDEBEKA, Wilfrid (University of Stellenbosch)

Co-authors: HEIDT, Alexander (University of Stellenbosch/ Institute of Photonic Technology, Albert-Einstein Jena (Germany)); ROHWER, Erich (University of Stellenbosch); SCHWOERER, Henrich (University of Stellenbosch)

Presenter: Mr NDEBEKA, Wilfrid (University of Stellenbosch)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 96

Type: **Poster**

Two-dimensional electronic spectroscopy

A robust, inherently phase-stable Two-dimensional electronic spectroscopy setup employing conventional optics and delay stages is introduced. The setup is suitable for use in the ultraviolet, visible and near infrared spectral regimes.

Primary author: Mr BIRECH, Zephania (laser research institute, university of stellenbosch)

Presenter: Mr BIRECH, Zephania (laser research institute, university of stellenbosch)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 97

Type: **Presentation**

South African Space Weather Prediction Forecast

Space weather describes the conditions in space that affect both Earth- and Space bound technological and biological systems. It is a consequence of the behavior of the Sun, the nature of the Earth's magnetic field and atmosphere, and our location in the solar system. Space weather is one of the principal threats to modern technology. With the increase in technological systems the need for accurate space weather predictions and forecasts has increased.

Primary author: Ms TSHISAPHUNGO, Mpho (Hermanus Magnetic Observatory)

Co-author: Mr OLCKERS, Kobus (Hermanus Magnetic Observatory)

Presenter: Ms TSHISAPHUNGO, Mpho (Hermanus Magnetic Observatory)

Track Classification: Track D2 - Space Science

Contribution ID: 98

Type: **Poster**

Laser pyrolysis at controlled laser power and wavelength for the synthesis of tungsten oxide nano-structures

This work demonstrates a versatile method known as CO₂-laser pyrolysis which is used to synthesize high purity tungsten oxide thin films and nanostructures from gaseous-phase precursors. The results will show how laser pyrolysis can be used to control the phase and particle size of tungsten oxides by varying the laser power density and wavelength.

Primary author: Mr GOVENDER, Malcolm (CSIR)

Co-authors: Prof. FORBES, Andrew (CSIR); Dr MWAKIKUNGA, Bonex (CSIR); Prof. SIDERAS-HADDAD, Elias (University of the Witwatersrand); Mr SHIKWAMBANA, Lerato (CSIR)

Presenter: Mr GOVENDER, Malcolm (CSIR)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 99

Type: **Poster**

Analytical calculation of the microcanonical entropy in the anisotropic quantum Heisenberg model.

The microcanonical entropy $s(e,m)$ as a function of energy e and magnetization m is computed analytically for the anisotropic Heisenberg model with Curie-Weiss-type interactions for anti-ferromagnetic and ferromagnetic cases. The results show non-equivalence of ensembles for certain cases and thermodynamic equivalence to the Ising and Heisenberg models in other cases.

Primary author: Mr OLIVIER, Gerrit (University of Stellenbosch)

Presenter: Mr OLIVIER, Gerrit (University of Stellenbosch)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 100

Type: **Poster**

Comparison of two models for field enhanced emission through phonon assisted tunnelling using DLTS measurements

Deep Level Transient Spectroscopy (DLTS) was used to measure the field enhanced emission rate from a defect introduced in n-type Ge. Nonlinear fits to the models of Pons & Makram-Ebeid (1979) and Ganichev & Prettl (1997) which describe emission due to phonon assisted tunneling were obtained. The model of Pons & Makram-Ebeid predicted the measured emission rate more accurately than Ganichev & Prettl. Both models predicted a transition in the defect from a state of weak electron-phonon coupling to a state of strong electron-phonon coupling. Both models agree on the energy level of the defect and the apparent capture cross section.

Primary author: Mr PIENAAR, Jacques (University of Pretoria)

Co-authors: Prof. AURET, Danie (University of Pretoria); Dr MEYER, Walter (University of Pretoria)

Presenter: Mr PIENAAR, Jacques (University of Pretoria)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: **101**Type: **Poster**

Estimation of the parameters of the “neutron belt” of the COMETA setup using experimental data

A study of a new type of nuclear transformation referred to as “collinear cluster tri-partition” (CCT) has been conducted. Reliable identification of this unusual decay channels involves measurement of neutron multiplicity. A new time-of-flight spectrometer called the Compact Multi-cluster Event Trigger Array (COMETA) has been designed to measure neutron multiplicity.

Primary author: Mr MALAZA, Vusi (Student)

Presenter: Mr MALAZA, Vusi (Student)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 102

Type: **Presentation**

New concepts for broadband coherent supercontinuum generation in microstructured optical fibers and photonic nanowires

We numerically and experimentally investigate supercontinuum (SC) generation in fibers with all-normal group velocity dispersion (GVD) under femtosecond pumping, including photonic crystal fibers (PCF), photonic nanowires and suspended core fibers for octave-spanning recompressible supercontinuum generation in the infrared, visible and ultraviolet spectral regimes.

Primary author: Mr HEIDT, Alexander Heidt (Laser Research Institute, Physics Department, University of Stellenbosch)

Co-authors: Mr HARTUNG, Alexander (Institute of Photonic Technology); Prof. ROHWER, Erich (Laser Research Institute, Physics Department, University of Stellenbosch); Prof. BARTELT, Hartmut (Institute of Photonic Technology)

Presenter: Mr HEIDT, Alexander Heidt (Laser Research Institute, Physics Department, University of Stellenbosch)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: **103**Type: **Presentation**

Characterising the Dwarf Novae Population

I present preliminary results of a follow-up study on Dwarf Novae identified by the Catalina Transient Survey. Photometric observations were performed on the 1m and 1.9m reflector telescopes of the South African Astronomical Observatory. The properties determined by this study are vital in understanding binary evolution and constraining binary synthesis models.

Primary author: Ms DE BUDE, Deanne (University of Cape Town)

Co-author: Prof. WOUDT, Patrick (University of Cape Town)

Presenter: Ms DE BUDE, Deanne (University of Cape Town)

Track Classification: Track D1 - Astrophysics

Contribution ID: **104**Type: **Presentation**

Determination of shape and size of particles in porous media using tomography imaging

The shape and size of particles are used in prediction of permeability (fluid conductivity) in porous media. This talk demonstrates the capability of a neutron/X-ray tomography imaging system in determination of the shape and the size of particles non-destructively.

Primary author: Mr NSHIMIRIMANA, Robert (NECSA)

Co-authors: Mr DE BEER, Frikkie (NECSA); Mr MABUTI, Radebe (NECSA)

Presenter: Mr NSHIMIRIMANA, Robert (NECSA)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 106

Type: **Presentation**

Probing the fine structure of the giant quadrupole resonance in ^{28}Si using hadronic and leptonic reactions

The comparison of proton inelastic scattering from ^{28}Si with data from other probes exciting the Isoscalar Giant Quadrupole Resonance (ISGQR) is investigated. Wavelet coefficients of the ISGQR for the various probes are compared to that of (p,p') using the newly-developed Semblance and Dot product techniques.

Primary author: Dr USMAN, Iyabo (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa)

Co-authors: RICHTER, A (Institut für Kernphysik, Technische Universität Darmstadt, D-64829, Darmstadt, Germany); SHEVCHENKO, A (Institut für Kernphysik, Technische Universität Darmstadt, D-64829, Darmstadt, Germany); SIDERAS-HADDAD, E (School of Physics, University of the Witwatersrand, Johannesburg 2050, South Africa); SMIT, F.D (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); COOPER, G.R.J (School of Earth Sciences, University of the Witwatersrand, Johannesburg 2050, South Africa); FUJITA, H (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); CARTER, J (School of Physics, University of the Witwatersrand, Johannesburg 2050, South Africa); VON NEUMANN-COSEL, P (Institut für Kernphysik, Technische Universität Darmstadt, D-64829, Darmstadt, Germany); NEVELING, R (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); FEARICK, R.W (Physics Department, University of Cape Town, Rondebosch 7700, South Africa); FÖRTSCH, S.V (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); FUJITA, Y (Department of Physics, Osaka University, Toyonaka, Osaka 560-0043, Japan); KALMYKOV, Y (Institut für Kernphysik, Technische Universität Darmstadt, D-64829, Darmstadt, Germany); BUTHELEZI, Z (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa)

Presenter: Dr USMAN, Iyabo (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 107

Type: **Poster**

The Effect of Different Diode Laser Powers in Photodynamic Therapy

This preliminary photodynamic therapy study investigated the effect of different diode laser powers (mW) for the activation of two photosensitizers (AlTSPc, aluminum tetrasulfonatedphthalocyanine and ZnTSPc, zinc tetrasulfonatedphthalocyanine) in healthy normal fibroblast cells.

Primary author: Ms MADURAY, Kaminee (CSIR)

Presenter: Ms MADURAY, Kaminee (CSIR)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: **108**Type: **Presentation**

MTR Reflector Modelling making use of Equivalence Theory

This research focuses on modelling reflectors in typical material testing reactors (MTRs). Equivalence theory is used to homogenise and collapse detailed transport solutions to generate equivalent nodal parameters and albedo boundary conditions, for subsequent use in full core diffusion codes. This study aims to determine if this approach to MTR reflector modelling is an accurate and plausible homogenisation technique for the modelling of small MTR cores.

Primary author: Ms THERON, Suzanne (Necsa)

Co-author: Mr REITSMA, Frederik (Calvera Consultants)

Presenter: Ms THERON, Suzanne (Necsa)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 109

Type: **Presentation**

Probing the super star cluster luminosity function in interacting luminous infrared galaxies

From a deep NIR adaptive optics imaging survey, we present thus-far the first K-band super star cluster (SSC) luminosity function (LF) to probe the formation and evolution of SSCs. Based on the derived LF one can constrain the cluster initial mass function (CIMF). Our preliminary results are in disagreement with theoretical expectations which suggest that SSC LFs should be well fitted by a single power law -2 . We get power-law indices much shallower than the theoretically expected one.

Primary author: Ms RANDRIAMANAKOTO, Zara (Astronomy Department, Astrophysics, Cosmology and Gravity Centre, University of Cape Town)

Co-authors: Mr VAISANEN, Petri (South African Astronomical Observatory); Mr MATTILA, Seppo (Tuorla Observatory, University of Turku, Finland); Mr RYDER, Stuart (Anglo-Australian Observatory, Australia)

Presenter: Ms RANDRIAMANAKOTO, Zara (Astronomy Department, Astrophysics, Cosmology and Gravity Centre, University of Cape Town)

Track Classification: Track D1 - Astrophysics

Contribution ID: 110

Type: **Poster**

Luminous Red Galaxies in Simulations: Cosmic Chronometers?

The expansion rate of the Universe can potentially be measured using age-dating of Luminous Red Galaxies (LRGs). We explore the validity of the assumptions implicit in this method using LRGs identified in the Millenium Simulation (MS). We use stellar population modelling and spectral synthesis to estimate the errors on ages that can be expected and discuss optimization of such an experiment. We find that $H(z)$ using simulated galaxies can be recovered with high accuracy. Using single stellar populations to age-date LRGs is not sufficient but if the MS star formation histories of galaxies are used, accurate ages are obtainable.

Primary author: Mrs RATSIMBAZAFY, ANDO (UNIVERSITY OF WESTERN CAPE)

Co-authors: Prof. CRESS, Catherine (UNIVERSITY OF WESTERN CAPE); Dr OLIVIER, Enrico (South African Astronomical Observatory); Dr VAN DER HEYDEN, Kurt (UNIVERSITY OF CAPE TOWN); Dr BLYTHE, Sarah (UNIVERSITY OF CAPE TOWN); Dr CRAWFORD, Steve (South African Astronomical Observatory)

Presenter: Mrs RATSIMBAZAFY, ANDO (UNIVERSITY OF WESTERN CAPE)

Track Classification: Track D1 - Astrophysics

Contribution ID: 111

Type: **Presentation**

Electric field induced second harmonic generation from silicon/silicon dioxide interfaces of silicon membranes

A femtosecond laser is used to study second harmonic generation in reflection and for the first time in transmission using a silicon membrane sample. The second harmonic signal measured in transmission is higher than expected and a new interpretation of second harmonic generation results from silicon/silicon dioxide interfaces is proposed.

Primary author: Mr NYAMUDA, Gibson Peter (Stellenbosch University)

Co-authors: Dr STEENKAMP, Christine (Stellenbosch University); Prof. ROHWER, Erich (Stellenbosch University); Prof. STAFAST, Herbert (Institute of Photonic Technology)

Presenter: Mr NYAMUDA, Gibson Peter (Stellenbosch University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 112

Type: **Presentation**

Optimization of the laser pyrolysis parameters to synthesis vanadium oxide (VO_{2+x}) nanostructures

A laser pyrolysis (LP) technique was used to synthesis VO_{2+x} nanostructures at a wavelength of 10.6 μm and power density of 2.4 kW/cm². Scanning electron microscopy (SEM) showed nano-rods with lengths of 185 nm and diameters of 53 nm. Energy dispersive x-ray (EDX) analysis established the presence of vanadium oxide.

Primary author: Mr SHIKWAMBANA, Lerato (CSIR-NLC)

Co-authors: Prof. FORBES, Andrew (CSIR-NLC); Dr MWAKIKUNGA, Bonex (CSIR-NLC); Prof. SIDERAS-HADDAD, Elias (University of the Witwatersrand); Mr GOVENDER, Malcolm (CSIR-NLC)

Presenter: Mr SHIKWAMBANA, Lerato (CSIR-NLC)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 113

Type: **Presentation**

Linear and non-linear regression modelling of TEC

This paper compares both linear and non-linear regression modeling techniques in approximating total electron content (TEC). Both techniques have been applied on a similar dataset and verified on an independent but identical dataset to assess the performance of the developed models

Primary author: Mr HABARULEMA, John Bosco (Hermanus Magnetic Observatory, P.O. Box 32, Hermanus 7200, South Africa and Department of Physics and Electronics, Rhodes University, Grahamstown 6140, South Africa)

Co-authors: Dr LEE-ANNE, McKinnell (Hermanus Magnetic Observatory, P.O. Box 32, Hermanus 7200, South Africa and Department of Physics and Electronics, Rhodes University, Grahamstown 6140, South Africa); Dr BEN, Opperman (Hermanus Magnetic Observatory, P.O. Box 32, Hermanus 7200, South Africa)

Presenter: Mr HABARULEMA, John Bosco (Hermanus Magnetic Observatory, P.O. Box 32, Hermanus 7200, South Africa and Department of Physics and Electronics, Rhodes University, Grahamstown 6140, South Africa)

Track Classification: Track D2 - Space Science

Contribution ID: 114

Type: **Poster**

Spectroscopic studies of nano NaYF₄ doped with RE₃₊ synthesized via thermal decomposition of organic precursors.

The structural and luminescence properties of sodium yttrium fluoride (NaYF₄) nanoparticles co-doped with rare earth ions, prepared using a thermal decomposition of fluoracetates precursors, were investigated. Luminescent NaYF₄:Er₃₊ nanoparticles in the range of 8-30 nm were obtained.

Primary author: Dr GUSOWSKI, Marek (Department of Physics University of the Free State)

Co-author: Prof. SWART, Hendrik (Department of Physics University of the Free State)

Presenter: Dr GUSOWSKI, Marek (Department of Physics University of the Free State)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 115

Type: **Poster**

Time dependent reflectivity from a silicon/silicon dioxide interface observed by pump-probe technique

Stationary, single colour, pump-probe reflectivity measurements were performed for the first time on the silicon/silicon dioxide interface of n-type silicon using a femtosecond laser. The change in the reflected probe beam increased with time of several minutes during irradiation of the sample with a strong pump beam.

Primary author: Mr NYAMUDA, Gibson Peter (Stellenbosch University)

Co-authors: Dr STEENKAMP, Christine (Stellenbosch University); Prof. ROHWER, Erich (Stellenbosch University); Prof. STAFAST, Herbert (Stellenbosch University)

Presenter: Mr NYAMUDA, Gibson Peter (Stellenbosch University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 116

Type: **Presentation**

Existence domains of ion-acoustic and electron-acoustic solitons in two-electron temperature space plasmas

Using the Sagdeev pseudo-potential formalism, the permitted velocity ranges of large amplitude ion-acoustic and electron-acoustic solitons are determined for a plasma comprised of hot and cool electrons, and ions. Adiabatic fluids are used for the cool electrons and the ions, whereas, for the hot electrons, both the cases corresponding to including inertial effects and neglecting the inertia by using the Boltzmann assumption for the hot electron number density, will separately be investigated.

Primary author: Dr MAHARAJ, Shimul Kumar (Hermanus Magnetic Observatory)

Co-authors: Prof. LAKHINA, Gurbax (Indian Institute of Geomagnetism); Prof. BHARUTHRAM, Ramesh (University of the Western Cape); Prof. PILLAY, Sadha (School of Physics, University of KwaZulu-Natal (Westville Campus)); Dr SINGH, Satyavir (Indian Institute of Geomagnetism)

Presenter: Dr MAHARAJ, Shimul Kumar (Hermanus Magnetic Observatory)

Track Classification: Track D2 - Space Science

Contribution ID: 117

Type: **Presentation**

Relativistic description of nucleon-nucleus scattering with DWIA and RPA

We have formulated a fully relativistic model for inclusive quasielastic nucleon-nucleus scattering. Using RIA we show how the behaviours of projectile and target can be separated into two independent tensors. Subsequently we investigate the RPWIA as well as DWIA descriptions of the projectile. We also examine the Hartree and the RRPA responses of the target.

Primary authors: Dr VAN DER VENDEL, Brandon (Stellenbosch University); Mr VAN NIEKERK, David (Stellenbosch University)

Co-author: Mr TITUS, Nortin (Stellenbosch University)

Presenter: Mr VAN NIEKERK, David (Stellenbosch University)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: **118**Type: **Presentation**

Inverse Compton gamma-ray production in Be-pulsar binary systems

The effect of the infrared excess on inverse Compton gamma-ray production in the pulsar binary system PSR B1259-63/SS 2883 is considered. The infrared excess is calculated using catalogue observations and the exact Compton cross-section is used to calculate the expected gamma-ray spectra for an isotropic distribution of target photon.

Primary author: Mr VAN SOELEN, Brian (University of the Free State)

Co-author: Prof. MEINTJES, P. J. (University of the Free State)

Presenter: Mr VAN SOELEN, Brian (University of the Free State)

Track Classification: Track D1 - Astrophysics

Contribution ID: 119

Type: **Presentation**

Formation of Cubic Boron Nitride Nanoparticles by Boron and Lithium Ion Implantation

The structural modification of polycrystalline hexagonal boron nitride implanted with boron and lithium ions at 150keV with various fluences were investigated. This was accomplished by analysis with Raman spectroscopy before and after implantation. Micro-Raman Spectrum showed evidence of implantation induced transformation to c-BN. The shifting of c-BN peak was explained using the phonon confinement model.

Primary author: Ms ARADI, Emily (University of the Witwatersrand)

Co-authors: Mr ERASMUS, Rudolph (University of the Witwaterstand); Prof. DERRY, Trevor (University of the Witwaterstand)

Presenter: Ms ARADI, Emily (University of the Witwatersrand)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 120

Type: **Presentation**

Astrophysical Masers

The laser was invented 50 years ago, but it was preceded six years earlier by the maser - stimulated emission at microwave frequencies - invented by Charles Townes and colleagues. Although it was not known at the time, nature had beaten them to it. Naturally produced masers are found in space, the first being discovered in 1965 by Weaver and colleagues. These masers occur in clouds of gas and dust in which stars are forming, in clouds around some evolved stars, and near the nuclei of certain galaxies. I shall briefly review natural masers and describe some of the current research that makes use of their properties.

Primary author: Dr GAYLARD, Michael (HartRAO)

Presenter: Dr GAYLARD, Michael (HartRAO)

Track Classification: Track D1 - Astrophysics

Contribution ID: 121

Type: **Presentation**

Characterization of a Low Concentrator Photovoltaic Module

Concentrator photovoltaic deals with the focussing of incident sunlight onto solar cells by employing relatively inexpensive optical elements in an attempt to reduce overall photovoltaic system cost. In this study a low concentrator photovoltaic module was designed and constructed to characterize the optics, electrical performance and thermal management.

Primary author: Prof. VAN DYK, Eugene (Nelson Mandela Metropolitan University)

Co-authors: Mr BUTLER, Blake (Nelson Mandela Metropolitan University); Dr VORSTER, Fredrik (Nelson Mandela Metropolitan University); Mr MUNJI, Mathew (Nelson Mandela Metropolitan University); Dr OKULLO, Willy (Nelson Mandela Metropolitan University)

Presenter: Prof. VAN DYK, Eugene (Nelson Mandela Metropolitan University)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 122

Type: **Poster**

Nucleotide Binding to Adenylate Kinase (AK) 1: Effect of Deuteration.

The binding activity of AK1 enzymes in the presence of ATP and deuterated ATP were measured using CD spectroscopy. The data showed conformational changes occurring on the binding of these nucleotides and provided an insight into the possible dynamics of these changes.

Primary author: Dr SPARROW, RAYMOND WALTER (CSIR - SYNTHETIC BIOLOGY ERA (BIOSCIENCES))

Co-authors: Prof. KENYON, Colin (CSIR-Biosciences); Dr ROTH, Robyn (CSIR-Biosciences)

Presenter: Dr SPARROW, RAYMOND WALTER (CSIR - SYNTHETIC BIOLOGY ERA (BIOSCIENCES))

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 123

Type: **Poster**

COVARIANT GAUGE-INVARIANT PERTURBATIONS IN MULTI - FLUID $f(R)$ THEORIES OF GRAVITY

In this paper we studied multi-fluid perturbations to fourth order theories of gravity in a FLRW background. applying the 1+3 covariant gauge-invariant formalism of cosmological perturbations and derive a complete set of evolution equations for matter and curvature inhomogeneities. We then specialize to a radiation-dust fluid described by barotropic equations of state and apply the perturbation equations around a background solution of R_n gravity and look at exact solutions for scales much smaller and much larger than the Hubble radius. In particular, we analyze quasi-static approximations and show the analytic solutions of these approximation.

Primary authors: Mr ABEBE, Amare (uct); Mr ABDELWAHAB, MOHAMED (uct)

Co-author: Mr DUNSBY, Peter (uct)

Presenter: Mr ABDELWAHAB, MOHAMED (uct)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 124

Type: **Presentation**

Ex situ synthesis and optical properties of ZnO-PbS nanocomposites

Abstract: Zinc Oxide (ZnO) and lead sulphide (PbS) nanoparticles separately synthesized by a precipitation method were combined by an ex situ route to prepare ZnO-PbS nanocomposites with different molar ratios of ZnO and PbS. Optical properties, structure and morphology of the samples were analyzed and are discussed.

Primary author: Ms MBULE, Pontsho Sylvia (University of the Free State)

Co-authors: Prof. SWART, Hendrik (University of the Free State); Prof. NTWAEABORWA, Martin (University of the Free State); Dr KROON, Ted (University of the Free State)

Presenter: Ms MBULE, Pontsho Sylvia (University of the Free State)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 125

Type: **Presentation**

Efficiency Study of Solar Trough Receiver

We are considering a solar trough system, with the receiver pipe enclosed in a glass cover under vacuum. We present results for absorption and loss calculations for a general case, and use these to compare two scenarios: 1) receiver pipe is coated with a selective coating, and 2) glass cover is coated with a hot mirror coating. Simulations for both scenarios are presented and compared.

Primary author: Ms CYULINYANA, Marie Chantal (University of the Witwatersrand)

Co-author: Dr FERRER, Philippe (University of The Witwatersrand)

Presenter: Ms CYULINYANA, Marie Chantal (University of the Witwatersrand)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 126

Type: **Presentation**

Utilise the (In)visible to Reveal the Hidden

Several invisible phenomena, which are part of our daily lives, are being used consciously or non-consciously to reveal features hidden from eyesight. One such phenomena is penetrating radiation in the form of neutrons, gammas- or X-rays which are continuously being utilized to reveal hidden features, unseen and undetected by the normal human eye of e.g. precious artifacts, fossils and the human body through radiography and tomography. The basic concepts and unique applications of these processes to unwrap the hidden are being discussed and outlined – not to be missed

Primary author: Mr DE BEER, Frikkie (Necsa)

Co-authors: Mr RADEBE, Jacob (Necsa); Mr HOFFMAN, Kobus (Necsa); Mr NSHIMIRIMANA, Robert (Necsa)

Presenter: Mr DE BEER, Frikkie (Necsa)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 127

Type: **Presentation**

Observing mesospheric gravity waves with an imaging riometer in SANA E

We present the characteristics of small scale (< 100 km) gravity waves in the lower and upper atmosphere derived from imaging riometer at SANA E (710 S,20 W). FFT technique is used to extract wave parameters of the gravity waves. These waves have horizontal phase speed of 0-250 m/s, horizontal wavelength of 16-30 km and the period of 3-30 min. And the propagation direction is ~ 50 degrees.

Primary author: Mr KHANYILE, Bhekumuzi Sfundu (University of Fort Hare)

Presenter: Mr KHANYILE, Bhekumuzi Sfundu (University of Fort Hare)

Track Classification: Track D2 - Space Science

Contribution ID: 128

Type: **Presentation**

Multiwavelength Study of Supersoft X-ray Sources in Magellanic Clouds

Supersoft X-ray sources constitute a fascinating class of X-ray systems. Some of these sources consist of a compact object accreting material from a binary companion. The analysis of X-ray and optical spectra discloses valuable information on the exact nature and temporal variation of the extremely powerful physical processes involved.

Primary author: Mrs ODENDAAL, Alida (University of the Free State)

Co-author: Prof. MEINTJES, Pieter (University of the Free State)

Presenter: Mrs ODENDAAL, Alida (University of the Free State)

Track Classification: Track D1 - Astrophysics

Contribution ID: 129

Type: **Presentation**

Laser Cooling and Trapping of Ultra-cold Rubidium Atoms

An experimental setup for laser cooling and trapping of neutral rubidium atoms is being developed. A three dimensional optical molasses in a Maxwell gradient magnetic field is used. The effects of the trap parameters on the number of trapped atoms will be investigated. The current status and recent results are presented.

Primary author: Mr RIGBY, Charles (Laser Research Institute, Stellenbosch University)

Presenter: Mr RIGBY, Charles (Laser Research Institute, Stellenbosch University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 130

Type: **Poster**

Spica: Custom data acquisition and control software for the Boyden research telescopes.

The development of Spica, a custom designed data acquisition and control software package for the Boyden research telescopes will be considered. The motivation for the development of the package as well as the aims and capabilities of the software in terms of the hardware-software interfacing, and the data acquisition and control will be discussed. Results on the implementation and uses will be shown.

Primary author: Mr VAN HEERDEN, Hendrik Jacobus (University of the Free State)

Co-authors: Mr CALITZ, J.J. (NA); Prof. TERBLANS, J.J. (University of the Free State); Prof. MEINTJES, P.J. (University of the Free State)

Presenter: Mr VAN HEERDEN, Hendrik Jacobus (University of the Free State)

Track Classification: Track D1 - Astrophysics

Contribution ID: 131

Type: **Poster**

Selective deactivation of M13 bacteriophage in E. coli using femtosecond laser pulses.

Potential for the selective deactivation of viruses while leaving the sensitive material such as the host cell unharmed was studied using a femtosecond laser system, and preliminary results will be reported.

Primary author: Ms MOLUKANELE, Palesa (CSIR)

Co-authors: Dr DU PLESSIS, Anton (CSIR); Dr BOTHA, Lourens (CSIR); Dr KHATI, Makobetsa (CSIR); Dr ROBERTS, Ted (CSIR); Dr CAMPOS, Walter (CSIR)

Presenter: Ms MOLUKANELE, Palesa (CSIR)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 132

Type: **Presentation**

Amplitude modulation using a phase only Spatial Light Modulator

Theory presenting amplitude and phase modulation using a phase only spatial light modulator is proposed and experimentally verified. This allows manipulation of any arbitrary light distribution unto developing a transmission function toolbox for quantum experiments.

Primary author: Mr HENDRIKS, Attie (CSIR NLC)

Co-authors: Prof. FORBES, Andrew (CSIR NLC); Dr ROUX, Filippus S. (CSIR NLC)

Presenter: Mr HENDRIKS, Attie (CSIR NLC)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 133

Type: **Presentation**

Contribution Towards Achieving International Standards for Neutron Imaging.

Neutron imaging is a powerful analytical tool with potential and demonstrated industrial and research application to nondestructively investigate internal properties of matter or end products. Standards, through test samples and methods, are essential for industrial application and internationally uniform platform for practice and facility performance assessment. This PhD subproject is a contribution towards establishment of international standards for digital neutron imaging.

Primary author: Mr RADEBE, Mabuti Jacob Radebe (Necsa)

Co-authors: Prof. SIDERAS-HADDAD, Elias (University of Witwatersrand); Mr DE BEER, Frikkie (Necsa); Dr NOTHNAGEL, Gawie (Necsa); Prof. WATTERSON, John (University of Witwatersrand); Mr NSHIMIRIMANA, Robert (Necsa)

Presenter: Mr RADEBE, Mabuti Jacob Radebe (Necsa)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 134

Type: **Poster**

Three wavelength SCALLS setup for analysis of crystallization and particle size estimation

A SCALLS (Solution Crystallization Analysis by Laser Light Scattering) setup has been improved using 3 lasers with different wavelengths. This improvement allows us to not only determine the temperatures at which crystallization starts to occur, but also to estimate the size of the crystallites (as a function of temperature).

Primary author: Dr NEETHLING, Pieter (Laser Research Institute, University of Stellenbosch)

Co-authors: Prof. VAN REENEN, Albert (Department of Chemistry and Polymer Science, University of Stellenbosch); Prof. ROHWER, Erich (Laser Research Institute, University of Stellenbosch); Ms BRAND, Margaretha (Department of Chemistry and Polymer Science, University of Stellenbosch); Prof. WALTERS, Piet (Laser Research Institute, University of Stellenbosch)

Presenter: Dr NEETHLING, Pieter (Laser Research Institute, University of Stellenbosch)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 135

Type: **Presentation**

Luminescence properties of Ce³⁺ and Tb³⁺ –doped ZnAl₂O₄ phosphors prepared by combustion reaction

Cerium- and terbium –doped zinc aluminate oxide nanocrystals with a spinel structure were successfully prepared by a combustion method, using urea as fuel. The solid combustion products thus obtained were identified by their characteristic XRD patterns. The fine-particle nature of these powders was investigated using SEM, TEM, and luminescence spectroscopy

Primary author: Mr TSHABALALA, Kamohelo George (University of the Free State)

Co-authors: Prof. SWART, Hendrik (University of the Free State); Dr PARK, Jong-Ku (Korea Institute of Science and Technology); Dr INDRAJIT, Nagpure (University of the Free State); Prof. NTWAE-ABORWA, Odireleng Martin (University of the Free State); Dr SHREYAS, Pitale (University of the Free State); Dr CHO, SoHye (Korea Institute of Science and Technology)

Presenter: Mr TSHABALALA, Kamohelo George (University of the Free State)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 136

Type: **Presentation**

An Ultrafast Study of Zinc Phthalocyanine in DMSO

The ultrafast dynamics of Zinc Phthalocyanine was studied using transient absorption pump probe spectroscopy. Zinc Phthalocyanine was excited (pumped) at 672nm and probed by a white light continuum. The pump-probe technique used in this study is described and experimental results obtained are discussed.

Primary author: Mr OMBINDA-LEMBOUMBA, Saturnin (CSIR National Laser Centre)

Co-authors: Dr DU PLESSIS, Anton (CSIR National Laser centre); Dr BOTHA, Lourens (CSIR National Laser Centre)

Presenter: Mr OMBINDA-LEMBOUMBA, Saturnin (CSIR National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 137

Type: **Presentation**

Biophysics and its promising contribution to South African Physics

We present a very brief introduction to biophysics – the rapidly developing field that explores physical processes in biological systems – and emphasise the great variety of spectroscopic techniques and applications. The promising role that biophysics can and should play in the context of South African Physics is briefly described.

Primary author: Mr KRÜGER, Tjaart (VU University Amsterdam)

Presenter: Mr KRÜGER, Tjaart (VU University Amsterdam)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 138

Type: **Presentation**

The effect of sulphur-based treatment on the quality of GaSb surfaces

The effect of sulphur treatment on the electrical and optical properties of Te doped bulk n-GaSb has been studied by current-voltage (IV), capacitance-voltage (CV), photoluminescence (PL) and X-Ray photo-spectroscopy (XPS). Treating the GaSb surface with Na₂S·9H₂O, (NH₄)₂S and (NH₄)₂SO₄ resulted in an improvement in the reverse leakage current of up to an order of magnitude for Au/n-GaSb Schottky barrier diodes (SBDs) while an increase in the photoluminescence intensity was also observed. XPS of the sulphur treated surfaces suggest that S²⁻ ions interact with the degenerate GaSb surface resulting in its partial stabilization.

Primary authors: Prof. VENTER, A (NMMU); Mr MURAPE, Davison Munyaradzi (NMMU)

Co-authors: Prof. SWART, HC (UFS); Prof. BOTHA, JR (NMMU)

Presenter: Mr MURAPE, Davison Munyaradzi (NMMU)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 140

Type: **Presentation**

Collisional dynamics of ultracold polar molecules in a microwave field

The collisions at ultracold temperatures between diatomic polar molecules in a microwave field with a circular polarization are theoretically analyzed. We demonstrate the possibility of trapping polar molecules in the standing-wave electromagnetic field and a successful evaporative cooling not only for samples of molecules in their absolute ground states but in some rotationally excited states in the appropriate regions of frequencies of a field.

Primary author: AVDEENKOV, Alexander (NIThep, Stellenbosch University)

Presenter: AVDEENKOV, Alexander (NIThep, Stellenbosch University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 141

Type: **Presentation**

Search for the Giant Pairing Vibration via (p,t) reactions around 60 MeV

A Giant Pairing Vibration (GPV) is a collective mode involving two-neutron transfer. This mode which is of fundamental importance, since it is analogous to a giant resonance in the particle-particle channel, has however not yet been detected and important uncertainties concerning its cross section, width and position remain.

Primary author: Dr FÖRTSCH, Siegfried (iThemba LABS)

Co-authors: RAMUS, A. (Institut de Physique Nucléaire, Université Paris-Sud, IN2P3-CNRS, F-91406 Orsay Cedex, France); MOUGINOT, B. (Institut de Physique Nucléaire, Université Paris-Sud, IN2P3-CNRS, F-91406 Orsay Cedex, France); KHAN, E. (Institut de Physique Nucléaire, Université Paris-Sud, IN2P3-CNRS, F-91406 Orsay Cedex, France); BUTHELEZI, E.Z. (iThemba LABS, Somerset West 7129, South Africa); AZAIEZ, F. (Institut de Physique Nucléaire, Université Paris-Sud, IN2P3-CNRS, F-91406 Orsay Cedex, France); SMIT, F.D. (iThemba LABS, Somerset West 7129, South Africa); FUJITA, H. (iThemba LABS, Somerset West 7129, South Africa, School of Physics, University of the Witwatersrand, Johannesburg 2050, South Africa); STEFAN, I. (Institut de Physique Nucléaire, Université Paris-Sud, IN2P3-CNRS, F-91406 Orsay Cedex, France); USMAN, I.T. (iThemba LABS, Somerset West 7129, South Africa, School of Physics, University of the Witwatersrand, Johannesburg 2050, South Africa); MABIALA, J. (Department of Physics, University of Stellenbosch, Matieland 7602, South Africa); SCARPACI, J.A. (Institut de Physique Nucléaire, Université Paris-Sud, IN2P3-CNRS, F-91406 Orsay Cedex, France); SWARTZ, J.A. (Department of Physics, University of Stellenbosch, Matieland 7602, South Africa); MIRA, J.P. (iThemba LABS, Somerset West 7129, South Africa, Department of Physics, University of Stellenbosch, Matieland 7602, South Africa); NEVELING, R. (iThemba LABS, Somerset West 7129, South Africa); FRANCHOO, S. (Institut de Physique Nucléaire, Université Paris-Sud, IN2P3-CNRS, F-91406 Orsay Cedex, France)

Presenter: Dr FÖRTSCH, Siegfried (iThemba LABS)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 142

Type: **Presentation**

Luminescence studies of CaQ2 organic phosphor for OLED applications

UV photo-excited luminescence from CaQ2 organic phosphors and PMMA based thin films for OLED application has been investigated. The intense emission of the spectrum is assigned to the complex polymer network of the Ca ions in the 1-8 hydroxyl quinoline networks. CaQ2 phosphor was synthesized by the co-precipitation method. The FTIR and photoluminescence (PL) characterization of the phosphors are reported in this paper.

Primary author: Mr NAGPURE, Indrajit (University of the Free State)

Co-authors: Prof. NTWAEABORWA, Martin (University of the Free State); Dr PITALE, SS (University of the Free State); Dr KUMAR, Vinay (University of the Free State)

Presenter: Mr NAGPURE, Indrajit (University of the Free State)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 143

Type: **Poster**

Atomistic Simulation Studies of Lithiated MnO₂ Nanostructures

MnO₂ has found extensive applications as a cathode material in lithium batteries. However MnO₂ suffers from structural degradation during charge/discharge which leads to capacity fading. We use atomistic simulation to explore and mitigate this structural collapse by employing novel porous MnO₂ nanostructures with defects. The nanostructures are lithiated to simulate charge/discharge.

Primary author: Mr KGATWANE, Kenneth (University of Limpopo)

Co-authors: Prof. SAYLE, Dean (Cranfield University); Prof. NGOEPE, Phuti (University of Limpopo); Dr MAPHANGA, Regina (University of Limpopo)

Presenter: Mr KGATWANE, Kenneth (University of Limpopo)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 144

Type: **Poster**

Minimisation using MERLIN on the seismic wave equation for the recovery of material properties in 2 and 3 dimensions

The problem of fitting material properties on earth to certain models by analysing returned seismic signals are investigated here. Analysis proceeds with inverse methods. Seismic wave inversion is tackled by minimisation of objective function with respect to model parameters. Absorbing boundary conditions are implemented using an exponentially decaying ansatz.

Primary author: Mr DE VILLIERS, Jean (University of South Africa)

Co-author: Prof. BRAUN, Moritz (University of South Africa)

Presenter: Mr DE VILLIERS, Jean (University of South Africa)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 145

Type: **Poster**

Modeling of the Corona Ionization space propulsion system

The Corona Ionization (CorIon) Space Propulsion system is a novel electrostatic thruster, which combines the ionization and acceleration steps of conventional technology. The CorIon's small size and simplicity are advantageous in many situations, such as for satellite station keeping and deep space probes. Experimental results are presented and compared to the theoretical model

Primary author: Mr TCHONANG POKAHA, Marius (student)

Co-author: Dr FERRER, Phil (Lecturer)

Presenter: Mr TCHONANG POKAHA, Marius (student)

Track Classification: Track D2 - Space Science

Contribution ID: 146

Type: **Presentation**

Different light sources in photodynamic therapy for use in photorejuvenation

Photodynamic therapy (PDT) has recently emerged as a treatment modality for photorejuvenation of the skin. This study is a preliminary investigation into the effect of different light sources to activate hypericin, a plant-derived photosensitizer in primary human dermal fibroblast cells.

Primary author: Ms VAN KETS, Victoria (University of Cape Town)

Co-authors: Mrs KARSTEN, Aletta (CSIR); Dr DAVIDS, Lester (University of Cape Town)

Presenter: Ms VAN KETS, Victoria (University of Cape Town)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 147

Type: **Presentation**

Probing Dark Energy via Age Dating of Luminous Red Galaxies

The history of entire galaxies is encoded in their spectra.

Thus, from spectra, one can answer questions pertaining to evolutionary histories of galaxies.

Moreover, the Hubble constant can be constrained through spectroscopic ages of red galaxies.

In this work, we analyze how reliably one can age date galaxies, by including the metallicity and star formation history.

Primary author: Mr MONGWANE, Bishop (Department of astronomy, ACGC, university of Capetown)

Presenter: Mr MONGWANE, Bishop (Department of astronomy, ACGC, university of Capetown)

Track Classification: Track D1 - Astrophysics

Contribution ID: 148

Type: **Poster**

Dark Matter signals with the MeerKAT telescope

The identification of dark matter (DM) is one of the most challenging issues of physics today. A theoretical class of candidates involves weakly interacting massive particles (WIMPs) as DM. DM produces sizable fluxes of relativistic electrons and positrons. Observational prospects for the MeerKAT telescope concerning the emission in a few nearby clusters of galaxies are presented.

Primary author: Mr MOHLABENG, Gopolang (Student)

Co-author: Dr REGIS, Marco (Post Doctoral Candidate)

Presenter: Mr MOHLABENG, Gopolang (Student)

Track Classification: Track D1 - Astrophysics

Contribution ID: 149

Type: **Presentation**

Molecular Motors on Strands

Biological filaments can be linked by active crosslinks. Investigating the dynamical behaviour of a system consisting of a large number of filaments and motors would lead to understanding of dynamical mechanical properties and processes in cells. A single motor crosslinked strand is investigated using a functional integral approach.

Primary author: Mr MÖLLER, Karl (Department of Physics, Stellenbosch University)

Co-author: Prof. MÜLLER-NEDEBOCK, Kristian (Department of Physics, Stellenbosch University)

Presenter: Mr MÖLLER, Karl (Department of Physics, Stellenbosch University)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 150

Type: **Presentation**

Chi-square, Maximum Likelihood and Bayes: a simple example

Given a histogram of measurements, we compare the chi-squared goodness-of-fit test and the Kullback-Leibler divergence of different models. We then apply these methods for parameter estimation and relate them to the principle of Maximum Likelihood. These non-Bayesian approaches are finally viewed in the light of a Bayesian solution.

Primary author: Mr DE KOCK, Michiel (University of Stellenbosch)

Presenter: Mr DE KOCK, Michiel (University of Stellenbosch)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 151

Type: **Presentation**

Lifetimes and transition probabilities in ^{194}Tl

Lifetimes (τ) of high spin states in ^{194}Tl have been studied using the DSAM technique with the AFRODITE array. The deduced B(M1) and B(E2) transition probabilities suggest that the two negative parity bands in the ^{194}Tl are built on the same configuration and correspond to similar nuclear deformation.

Primary author: Mr MASITENG, Paulus (iThemba LABS/University of the Western Cape)

Co-authors: Dr PASTERNAK, A.A (3A.F. Ioffe Physical-Technical Institute, St.-Petersburg, Russia); Dr ROUX, D.G. (University of the Western Cape); Dr LAWRIE, E.A (iThemba LABS); Dr LIEDER, E.O (iThemba LABS); Prof. SHARPEY-SHAFFER, J.F. (iThemba LABS/University of the Western Cape); Dr LAWRIE, J.J (iThemba LABS); Mrs KHESWA, N.V (iThemba LABS); Mr SHIRINDA, O. (iThemba LABS/University of the Western Cape); Dr PAPKA, P. (iThemba LABS); Dr BARK, R.A (iThemba LABS); Prof. LIEDER, R.M (iThemba LABS); Mr MURRAY, S.H.T. (University of Cape town); Dr MULLINS, S.M (iThemba LABS); Ms BVUMBI, S.P (iThemba LABS); Mr NTSHANGASE, S.S (iThemba LABS/University of Cape town); Mr MADIBA, T.E (iThemba LABS)

Presenter: Mr MASITENG, Paulus (iThemba LABS/University of the Western Cape)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 152

Type: **Poster**

A Continuum Imaging Survey with MeerKAT

We will undertake a tiered extragalactic continuum survey with MeerKAT to investigate the evolution of AGN, star-forming galaxies and galaxy clusters from the epoch of reionization through to the present day. Our project will fully utilize MeerKAT's unique capabilities, namely high-resolution coupled with a large survey speed, to undertake a five-tier survey strategy at 1.4 GHz. The combination of resolution and sensitivity (outperforming both ASKAP and EVLA) will allow us to make the most precise measurement of the radio luminosity function for radio-loud & radio-quiet AGN and star-forming galaxies over the full range in radio luminosity.

Primary author: Dr VAN DER HEYDEN, Kurt (UCT)

Presenter: Dr VAN DER HEYDEN, Kurt (UCT)

Track Classification: Track D1 - Astrophysics

Contribution ID: 153

Type: **Presentation**

Calibration of an optoelectronic system for the study of solar blind AlGaN-based UV photodiodes

A calibrated optoelectronic system is required for the study of tuneable intrinsically solar blind AlGaN-based ultraviolet (UV) light sensitive photodiodes. The method of calibration is discussed; where by the spectral irradiance of the UV light incident on the photodiodes are calibrated for wavelengths ranging from 200 nm to 400 nm.

Primary author: Mr VAN SCHALKWYK, Louwrens (Student)

Co-authors: Prof. AURET, F.D. (Professor of Physics); Dr MEYER, W.E. (Senior lecturer)

Presenter: Mr VAN SCHALKWYK, Louwrens (Student)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 154

Type: **Presentation**

Study of fusion evaporation channels in the $^{18}\text{O} + ^{18}\text{O}$ $E_{\text{lab}} = 65$ MeV reaction}

The AFRODITE and DIAMANT detectors were used to measure the evaporation channels in the $^{18}\text{O} + ^{18}\text{O}$ reaction. Emission of (p, d, t) and alpha particles were identified with excellent particle identification. The cross sections for evaporation residues production are calculated with the statistical model code CASCADE.

Primary author: Ms KHALEEL, ESRA (Stellenbosch University)

Co-author: Dr PAPKA, Paul (Stellenbosch University and iThemba labs)

Presenter: Ms KHALEEL, ESRA (Stellenbosch University)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 155

Type: **Poster**

Study of fusion evaporation channels in the $^{18}\text{O} + ^{18}\text{O}$ $E_{\text{lab}} = 65$ MeV reaction

The AFRODITE and DIAMANT detectors were used to measure the evaporation channels in the $^{18}\text{O} + ^{18}\text{O}$ reaction. Emission of (p, d, t) and alpha particles were identified with excellent particle identification. The cross sections for evaporation residues production are calculated with the statistical model code CASCADE.

Primary author: Ms KHALEEL, ESRA (Stellenbosch University)

Co-author: Dr PAPKA, Paul (Stellenbosch University and iThemba labs)

Presenter: Ms KHALEEL, ESRA (Stellenbosch University)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 156

Type: **Poster**

Detection of forbidden singlet-triplet transitions of $^{12}\text{C}^{16}\text{O}$

Twenty rovibronic transitions of the $e(v'=5)-X(v''=0)$ band of $^{12}\text{C}^{16}\text{O}$ for which experimental wavelengths were previously unavailable were recently detected by vacuum ultraviolet laser induced fluorescence excitation spectroscopy. The data is important in astrophysical applications and for comparison to the latest model of $^{12}\text{C}^{16}\text{O}$. The experimental techniques that facilitated these measurements will be highlighted.

Primary authors: Dr STEENKAMP, Christine (Laser Research Institute, University of Stellenbosch); Mr DICKENSON, Gareth (Laser Centre Vrije Universiteit, Amsterdam, The Netherlands)

Co-authors: Dr DU PLESSIS, Anton (CSIR National Laser Centre, Pretoria); Mr NORTJE, Anton (Laser Research Institute, University of Stellenbosch); Prof. ROHWER, Erich (Laser Research Institute, University of Stellenbosch)

Presenter: Dr STEENKAMP, Christine (Laser Research Institute, University of Stellenbosch)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 157

Type: **Presentation**

VLBI amplitude calibration for circular polarisation measurement

The two main opposing SiO maser polarisation theories can be tested by comparing the circular polarisation of the $v=1$ J=1-0 and $v=1$ J=2-1 SiO maser lines. This requires accurate measurements of the circular polarisation. The spectral line VLBI amplitude calibration method is investigated in light of this requirement.

Primary author: Ms RICHTER, Laura (Rhodes University)

Co-authors: Prof. KEMBALL, Athol (University of Illinois); Prof. JONAS, Justin (Rhodes University)

Presenter: Ms RICHTER, Laura (Rhodes University)

Track Classification: Track D1 - Astrophysics

Contribution ID: 158

Type: **Presentation**

Investigation of the photovoltaic performance of dye-sensitised solar cells employing TiO₂ nanotubes

This work compares the performance of dye-sensitised solar cells (DSCs) employing films of highly-ordered TiO₂ nanotubes to traditional DSCs using films of tightly interconnected TiO₂ nanoparticles as the electron transport medium. Moreover, the work investigates whether nanotubes enhance the charge transport phenomena in the cell, thereby producing more efficient DSCs.

Primary author: Mr CUMMINGS, Franscious (Energy and Processes, Council for Scientific and Industrial Research, Materials Science and Manufacturing, Meiring Naude Road, P.O. Box 395, Pretoria 0001, South Africa)

Co-authors: Prof. KNOESEN, Dirk (Department of Physics, University of the Western Cape, Private Bag X17, Bellville 7530, South Africa); Dr LE ROUX, Lukas (Energy and Processes, Council for Scientific and Industrial Research, Materials Science and Manufacturing, Meiring Naude Road, P.O. Box 395, Pretoria 0001, South Africa); Mrs MUTANGWA, Nomthandazo (Energy and Processes, Council for Scientific and Industrial Research, Materials Science and Manufacturing, Meiring Naude Road, P.O. Box 395, Pretoria 0001, South Africa)

Presenter: Mr CUMMINGS, Franscious (Energy and Processes, Council for Scientific and Industrial Research, Materials Science and Manufacturing, Meiring Naude Road, P.O. Box 395, Pretoria 0001, South Africa)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 159

Type: **Presentation**

The variability of the peak height of the ionospheric F2 layer over South Africa

This paper presents the investigation into the variability of the maximum height of the ionospheric F2 layer (hmF2) over the South African region. The dependence of hmF2 on solar and magnetic activity is also investigated. An initial result shows larger hmF2 variability around midnight than during the day for all seasons.

Primary author: Mr MBAMBO, Makhangela (University of Fort Hare and Hermanus Magnetic Observatory)

Presenter: Mr MBAMBO, Makhangela (University of Fort Hare and Hermanus Magnetic Observatory)

Track Classification: Track D2 - Space Science

Contribution ID: 160

Type: **Presentation**

Extracting gravity waves parameters during the September 2002 southern hemisphere stratospheric major warming using a SANA E imaging riometer.

Using absorption data measured by imaging riometer for ionospheric studies (IRIS) located at the South Africa National Antarctic Expedition (SANA E), Antarctica (72°S , 3°W), we extracted the parameters of gravity waves (GW) of periods between 35 and 55 minutes during the period from 16 to 30 September 2002, a period of major sudden stratospheric warming (SSW) in the Southern Hemispheric middle atmosphere.

Primary author: Mr MBATHA, Nkanyiso (UKZN and HMO)

Presenter: Mr MBATHA, Nkanyiso (UKZN and HMO)

Track Classification: Track D2 - Space Science

Contribution ID: 161

Type: **Presentation**

Characterization of the Ionosphere over the South Atlantic Anomaly by using a ship based Dual Frequency GPS receiver

This paper briefly describes a novel approach to characterizing the ionosphere over the South Atlantic Geomagnetic Anomaly using a ship-based dual frequency GPS receiver. Applications include but are not limited to HF propagation path prediction for communication and GPS positioning applications, specifically operating in this zone of abnormal magnetic activity.

Primary author: Mr VAN DER MERWE, SJ (University of Pretoria/Hermanus Magnetic Observatory)

Co-authors: Dr CILLIERS, Pierre (Hermanus Magnetic Observatory); Dr DE VILLIERS, Pieter (University of Pretoria)

Presenter: Mr VAN DER MERWE, SJ (University of Pretoria/Hermanus Magnetic Observatory)

Track Classification: Track D2 - Space Science

Contribution ID: 162

Type: **Poster**

The design and construction of an intracavity SLM laser

We describe design considerations and the steps taken to build a laser resonator with an intracavity spatial light modulator. We then discuss the performance of this laser, with observations and problems specific to this configuration.

Primary author: Mrs BURGER, Liesl (National Laser Centre)

Co-authors: Dr FORBES, Andrew (National Laser Centre); Dr LITVIN, Igor (National Laser Centre)

Presenter: Mrs BURGER, Liesl (National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 163

Type: **Presentation**

EFFECTS OF Mo DOPING ON THE SPIN-DENSITY-WAVE BEHAVIOUR OF A Cr + 2.5 at.% Si alloy

The influence of Mo-doping on the first-order Néel transition of a $\text{Cr}_{0.975}\text{Si}_{0.025}$ alloy is investigated through electrical resistivity, specific heat and thermal transport measurements. The results suggest the absence of antiferromagnetism in $(\text{Cr}_{97.5}\text{Si}_{2.5})_{1-y}\text{Mo}_y$ alloys with $y \geq 0.025$.

Primary author: Dr SHEPPARD, Charles (Department of Physics, University of Johannesburg)

Co-authors: Prof. PRINSLOO, Aletta (Department of Physics, University of Johannesburg); Prof. STRYDOM, Andre (Department of Physics, University of Johannesburg); Prof. ALBERTS, Herman (Department of Physics, University of Johannesburg)

Presenter: Dr SHEPPARD, Charles (Department of Physics, University of Johannesburg)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 164

Type: **Poster**

Vacuum ultraviolet laser spectroscopy of four carbon monoxide isotopomers

A tunable, narrow bandwidth vacuum ultraviolet laser source was applied to fluorescence excitation spectroscopy of four carbon monoxide isotopomers. The high spectral resolution and sensitivity of the technique facilitated detection of the lines of rare isotopomers and forbidden transitions. In this poster we give an overview of results and recent progress.

Primary author: Dr STEENKAMP, Christine (Laser Research Institute, University of Stellenbosch)

Co-authors: Dr DU PLESSIS, Anton (CSIR National Laser Centre, Pretoria); Mr NORTJE, Anton (Laser Research Institute, University of Stellenbosch); Prof. ROHWER, Erich (Laser Research Institute, University of Stellenbosch); Mr DICKENSON, Gareth (Laser Centre Vrije Universiteit, Amsterdam, The Netherlands); Prof. WALTERS, Piet (Laser Research Institute, University of Stellenbosch)

Presenter: Dr STEENKAMP, Christine (Laser Research Institute, University of Stellenbosch)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 165

Type: **Presentation**

Pade approximation of the S-matrix as a way of locating quantum resonances and bound states: two-channel case

We extend the method for locating spectral points generated by central potentials to the multichannel case. The key to the method is the combination of analytic properties of the Jost matrices and rational parametrization of the S-matrix obtained at real collision energies. An explicit derivation of some symmetry properties of the Jost matrices is given. Numerical examples demonstrate the stability and accuracy of the proposed method.

Primary author: Mr OGUNBADE, Prince Olusegun (University of Pretoria)

Co-author: RAKITYANSKI, Sergei (University of Pretoria)

Presenter: Mr OGUNBADE, Prince Olusegun (University of Pretoria)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 166

Type: **Presentation**

Measuring neutron fluence at the fast neutron facility at iThemba LABS

A new neutron beam monitoring system was installed at iThemba LABS. The instruments included a parallel plate U238 fission ionization chamber, a gain stabilized NE213 detector which is a high resolution instrument for measuring the spectral distribution of the beam using the time-of-flight method and an NE102 transmission detector. A measurement campaign was successfully performed over three runs at iThemba LABS in August 2009 at 66 MeV, 100 MeV and 200 MeV proton beam energies and the data collected will be used to obtain measurements of the relative fluence and the spectral fluence of the neutron beam.

Primary author: Mr MUSONZA, Emmanuel. T (University of Cape Town)

Co-authors: Prof. BUFFLER, Andy (UCT); Dr NOLTE, Ralph (PTB (Germany)); Dr SMIT, Ricky (iThemba LABS)

Presenter: Mr MUSONZA, Emmanuel. T (University of Cape Town)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 167

Type: **Presentation**

Statistics of continuous weak quantum measurement.

The theory of continuous weak measurement provides a tool to monitor the evolution of the wavefunction of a single quantum system in real time. We study the statistics of continuous monitoring of the position of a particle subject to several potentials.

Primary author: Mr GARAPO, Kevin (Centre for Quantum Technology, University of Kwazulu-Natal.)

Co-author: KONRAD, Thomas (School of Physics, University of Kwazulu-Natal)

Presenter: Mr GARAPO, Kevin (Centre for Quantum Technology, University of Kwazulu-Natal.)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 168

Type: **Poster**

Identification of Threshold Temperature For The Generation of Defects Associated with Superionic Region in BaF₂ Using Positron Annihilation Technique

There is an uncertainty surrounding the generation of defects associated with superionic conductivity in terms of whether these are created at an observed transitional temperature T_c , or at an earlier temperature point. The measured conductivity becomes more pronounced at a temperature coinciding with the deviation of constant lattice parameter from 6.2096 angstrom. The Frenkel pairs responsible for superionic region are generated well below the actual transitional temperature and this is informed by the calculation of S-parameter and positron lifetime.

Primary author: Mr JILLI, Thulani (University of Zululand)

Co-authors: Mrs KIBIRIGE, Betty (University of Zululand); Prof. SIDERAS-HADDAD, Elias (University of the Witwatersrand); Mr NYAWO, Thembinkosi (University of Zululand)

Presenter: Mr JILLI, Thulani (University of Zululand)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 169

Type: **Poster**

Evolution of Magnetic Phase Transition in $\text{Ce}_x\text{La}_{(1-x)}\text{Ru}_2\text{Al}_{10}$ compounds

The magnetic susceptibility and specific heat data are reported for the substitutional compounds $\text{Ce}_x\text{La}_{(1-x)}\text{Ru}_2\text{Al}_{10}$ ($x = 0.99, 0.4$). With decreasing x , i.e., increasing La doping, the antiferromagnetic-like transition, T_0 , shifts down systematically to lower temperatures.

Primary author: Mr PERATHEEPAN, Pararajasingham (Department of Physics, University of Johannesburg, Auckland Park-2006, South Africa)

Co-author: Prof. STRYDOM, Andre M (Department of Physics, University of Johannesburg, Auckland Park-2006, South Africa)

Presenter: Mr PERATHEEPAN, Pararajasingham (Department of Physics, University of Johannesburg, Auckland Park-2006, South Africa)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 170

Type: **Presentation**

An Equilibrium Perspective on the Mechanical Properties of Active networks

The understanding of mechanical properties of active polymer networks can provide insights on the functioning of a range of biological materials. In this paper we first present a simple model for a network of two flexible polymer filaments connected by a molecular motor cluster and the network ideas are further extend to a multi stranded network. We learn that active network components lead to internal stresses which ultimately lead to network contraction.

Primary author: Mr MATEYISI, Mohau (Institute of Theoretical Physics, Department of physics, University of Stellenbosch))

Co-authors: Prof. K. MÜLLER-NEDEBOCK, Kristian (Institute of Theoretical Physics, Department of physics, University of Stellenbosch); Mr BOONZAAIER, Leandro (Institute of Theoretical Physics, Department of physics, University of Stellenbosch)

Presenter: Mr MATEYISI, Mohau (Institute of Theoretical Physics, Department of physics, University of Stellenbosch))

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 171

Type: **Poster**

Thermodynamic stability of VO₂ in contact with thin metal films

Solid state compound phase formation has been investigated between thin metal films (Co, Hf, Ni, Pd and Pt) and VO₂ substrates using RBS and XRD. The thin-film couples were annealed from 45 min to 1 hr between 400 and 900 degrees centigrade. It was found that Hf reacts with VO₂ whereas Co, Ni, Pd and Pt do not. Heats of reaction were calculated for all possible combinations of the vanadium alloy and metal oxide reaction products. Comparison with experimental results show in all cases that reactions take place for negative heats of reaction. Results obtained correlate well with a Miedema parameter providing a way of predicting a reaction.

Primary author: Prof. NDWANDWE, Muzi (University of Zululand)

Co-authors: Mrs KIBIRIGE, Betty (University of Zululand); Prof. NEMRAOUI, Ouassini (University of Zululand); Mr SEFAGE, Percy (University of Zululand); Mr NYAWO, Thembinkosi (University of Zululand)

Presenter: Prof. NDWANDWE, Muzi (University of Zululand)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 172

Type: **Presentation**

CONTROL OF MOLECULAR SINGLET-TRIPLET STATE CHARACTER USING AUTLER-TOWNES EFFECT

We present the use of Autler-Townes effect to control the singlet-triplet state character in molecules. In a three-laser excitation scheme in lithium dimer we demonstrate that application of a strong enough coupling field to the singlet component of a singlet-triplet mixed pair leads to significant enhancement in the mixing coefficients and therefore the amount of singlet or triplet character in the pair of states which are initially mixed by the spin-orbit interaction. Our theoretical model based on solving the density matrix equations of motion gives preliminary simulations which are in good agreement with the experimental data even though

Primary author: Dr KIROVA, Teodora (National Institute for Theoretical Physics)

Co-authors: Prof. LYYRA, A. Marjatta (Department of Physics, Temple University, Philadelphia, USA); Dr AHMED, Ergin H. (Department of Physics, Temple University, Philadelphia, USA); Prof. HUENNEKENS, John (Department of Physics, Lehigh University, Bethlehem, USA); Dr SALIHOGLU, Omer (Department of Physics, Temple University, Philadelphia, USA); Dr INGRAM, Sonja (Department of Physics, Temple University, Philadelphia, USA); Mrs GUAN, Yafei (Department of Physics, Temple University, Philadelphia, USA)

Presenter: Dr KIROVA, Teodora (National Institute for Theoretical Physics)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 173

Type: **Poster**

A Platform for Photon Simulation Using Modern Low Cost Many-Core Processing Architectures

The main research focus is on developing photon simulation algorithms for modern low cost many-core processor architectures. These algorithms all articulate models which offer efficient simulation of the mechanics of photon-material interactions and radiance transport. This paper focusses on the processor architecture for potentially a more general computational application.

Primary author: Mr DUVENHAGE, Bernardt (Optronic Sensor Systems, Defence Peace Safety and Security, CSIR)

Co-author: Mr GRIFFITH, Derek (Optronic Sensor Systems, Defence Peace Safety and Security, CSIR)

Presenter: Mr DUVENHAGE, Bernardt (Optronic Sensor Systems, Defence Peace Safety and Security, CSIR)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 174

Type: **Poster**

Matching Stellar envelopes to ATLAS9 atmospheres.

A comparison of some equilibrium stellar models with stellar pulsation observations is presented. We compare atmosphere models with observations and pulsation models with observed pulsation modes asteroseismology observations

Primary author: Mr MGUDA, Zolile (Dept of Astronomy, Astrophysics, Cosmology and Gravity Center University of Cape Town)

Presenter: Mr MGUDA, Zolile (Dept of Astronomy, Astrophysics, Cosmology and Gravity Center University of Cape Town)

Track Classification: Track D1 - Astrophysics

Contribution ID: 175

Type: **Presentation**

The Shapes of THINGS HI Profile

We present a novel method to study the relationship between gas content of galaxies, their star formation activity and the phase structure of the ISM. We do this by summing all individual profiles in the data cubes of the THINGS samples.

Primary author: Mr IANJAMASIMANANA, Roger (Astronomy Department, Astrophysics, Cosmology and Gravity Centre (ACGC), University of Cape Town, Private Bag X3, Rondebosch 7701, South Africa)

Co-author: W. J. G DE BLOK, Erwin (Astronomy Department, Astrophysics, Cosmology and Gravity Centre (ACGC), University of Cape Town, Private Bag X3, Rondebosch 7701, South Africa)

Presenter: Mr IANJAMASIMANANA, Roger (Astronomy Department, Astrophysics, Cosmology and Gravity Centre (ACGC), University of Cape Town, Private Bag X3, Rondebosch 7701, South Africa)

Track Classification: Track D1 - Astrophysics

Contribution ID: 177

Type: **Presentation**

An algorithm for calculating current transport along a carbon monolayer - superconductor interface

A recursive Green's function algorithm is used to calculate the current transport along the interface of a graphene sheet and a superconductor. The difficulty of hole and particle excitations coupling near the interface is resolved by mapping the Hamiltonian onto another equivalent Hamiltonian that can be represented in the algorithm.

Primary author: Mr VAN ZYL, Hendrik (Stellenbosch University)

Presenter: Mr VAN ZYL, Hendrik (Stellenbosch University)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 178

Type: **Poster**

Structural studies of metal-doped titania systems using XRD and SEM

Au and Pd doped TiO₂ nanocrystals were prepared using sol-gel routes. Scanning Electron Microscopy (SEM) and X-ray diffraction (XRD) techniques were used to characterize the samples. The effects of dopants on the phase transformation and grain growth were investigated. Gold does not affect the anatase-rutile transformation temperature whereas palladium does.

Primary author: Mr MOLOANTOA, RJ (University of Limpopo)

Co-authors: Prof. HILLIE, T (CSIR); Dr MOSUANG, TE (University Limpopo)

Presenter: Mr MOLOANTOA, RJ (University of Limpopo)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 179

Type: **Presentation**

Effects of a secondary concentrator and heat mirror on a solar trough receiver

We consider ways of increasing efficiency of solar trough receiver pipes by decreasing the leading thermal radiation losses. We study the use of a secondary concentrator, a “solar funnel”, which reduces the area that emits thermal radiation. We further increase efficiency by use of a heat mirror on the glass cover which reflects the thermal radiation being emitted by the receiver pipe back onto itself.

Primary author: Mr NAYAGER, laveshan (wits)

Co-author: Dr FERRER, phil (wits)

Presenter: Mr NAYAGER, laveshan (wits)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: **180**Type: **Presentation**

Deep NIR Surface Photometry of HI Galaxies behind the Galactic Plane

I present results from a deep near-infrared survey of gas-rich galaxies behind the plane of our Galaxy. Accurate surface photometry, with careful attention to star-subtraction, has been performed and total magnitudes have been determined for the sample. This data, combined with existing 21-cm spectra, is used to calculate Tully-Fisher distances.

Primary author: Ms WILLIAMS, Wendy (University of Cape Town)

Co-authors: Prof. WOUDT, Patrick (University of Cape Town); Prof. KRAAN-KORTEWEG, Renee (University of Cape Town)

Presenter: Ms WILLIAMS, Wendy (University of Cape Town)

Track Classification: Track D1 - Astrophysics

Contribution ID: **181**Type: **Presentation**

Direct projectile break-up of ^{12}C at 33.3 MeV/nucleon.

The binary breakup of ^{12}C into ^8Be fragments and alpha particles were measured in coincidence in the interaction of 33.3 MeV/nucleon ^{12}C projectiles with ^{197}Au , ^{93}Nb and ^{12}C target nuclei. Preliminary experimental cross-section contributions are extracted for both quasi-elastic and the inelastic break-up processes.

Primary author: Mr JOELE, Mira (University of Stellenbosch/iThemba LABS)

Co-authors: Prof. COWLEY, A. A (iThemba LABS); Dr BUTHELEZI, E. Z (iThemba LABS); Dr SMIT, F. D (iThemba LABS); Dr STEYN, G. F (iThemba LABS); Dr USMAN, I. T (iThemba LABS); Dr MABIALA, J (iThemba LABS/Stellenbosch University); Dr PAPKA, P (iThemba LABS/Stellenbosch University); Dr NEVELING, R (iThemba LABS); Dr CONNELL, S. H (University of Johannesburg); Dr FORTSCH, S. V (iThemba LABS)

Presenter: Mr JOELE, Mira (University of Stellenbosch/iThemba LABS)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 182

Type: **Presentation**

The effect of Hagedorn model in the nuclear matter on thermodynamic quantities

We analyze recent data on particle production yields which is obtained in collider experiments within the statistical model. We calculate the thermodynamic quantities and speed of sound in a resonance hadron gases, whose mass spectrum is assumed to have hagedorn form. Finally, we compared our results with those obtained from other models.

Primary author: Mr WORKU, Dawit (University of Cape Town)

Co-authors: Prof. MURONGA, Azwinndini (University of Cape Town); Prof. CLEYMANS, Jean (University of Cape Town)

Presenter: Mr WORKU, Dawit (University of Cape Town)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 183

Type: **Presentation**

Modern computer based experiments versus “Traditional” experiments: The experience of first year physics students.

The Faculty of Military Science of Stellenbosch University presents Algebra-based Physics courses to military cadets. The practical component comprises experiments that utilise classical apparatus, as well as more modern computer based experiments. Questionnaires are yearly completed by the students to evaluate the theoretical and practical components of the course. This paper will explore some of the results of these surveys, focusing especially on the experience of the student with regards to the types of experiments that are presented.

Primary author: Dr BEZUIDENHOUT, Jacques (Stellenboch University)

Presenter: Dr BEZUIDENHOUT, Jacques (Stellenboch University)

Track Classification: Track E - Physics Education

Contribution ID: **184**Type: **Poster**

Identification of potential lithium-rich stars in the Large Magellanic Cloud for observation with SALT

Combining information from the OGLE-III and 2MASS surveys, we have identified large amplitude, Mira, variables that lie above the well defined period-luminosity relation. It has been suggested that such stars may get additional luminosity from envelope burning and we propose to investigate this by looking for lithium with SALT.

Primary author: Mr HAGSPIHL, Christoph (University of Cape Town)

Presenter: Mr HAGSPIHL, Christoph (University of Cape Town)

Track Classification: Track D1 - Astrophysics

Contribution ID: **185**Type: **Presentation**

Ab initio investigation of Si-C alloys

Silicon and Carbon exist readily in pure form and in the 50/50 combination of Silicon Carbide in cubic and hexagonal forms. Carbon is known to be slightly soluble in Si and vice-versa and the reasons for this are not well known. To investigate this, the stability of various Si_{1-x}C_x alloys were investigated with x ranging between 0 and 1.

Primary author: Mr ANDREW, Richard (University of Pretoria)

Presenter: Mr ANDREW, Richard (University of Pretoria)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: **186**Type: **Presentation**

The covariant approach to $f(R)$ theories of gravity

Modifications to General Relativity have been proposed to accommodate recent observations and for the most part, the focus has been on the $f(R)$ theories of gravity. We review the features of $f(R)$ theories of gravity by presenting their theoretical and observational aspects using the covariant approach.

Primary author: Ms NZIOKI, Anne Marie (Centre for Astrophysics, Cosmology and Gravitation, University of Cape Town)

Presenter: Ms NZIOKI, Anne Marie (Centre for Astrophysics, Cosmology and Gravitation, University of Cape Town)

Track Classification: Track D1 - Astrophysics

Contribution ID: **187**Type: **Poster**

An authentic depiction and classification of elemental electric and magnetic dipole moments

A sequel to representing elemental sources of magnetic fields as elemental magnetic vector charges is realizing that electric and magnetic dipole moments are different classes of first order moments, each being a pair of allied monopolar moments. This shifts acutely from traditional notions like Dirac's magnetic (scalar) charge.

Primary author: Dr CHIRWA, Max (Walter Sisulu University)

Presenter: Dr CHIRWA, Max (Walter Sisulu University)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 188

Type: **Presentation**

Pulse-Laser-Synthesis of FexSiO1-xClx Nanostructures and Their Properties

Several types of Fe-Si mixed oxide composites have been synthesized for biomedical, switching and applications [1, 2]. The synthesis, properties, and environmental applications of nanoscale Iron-based material comparing them with non-nanoscale have already been discussed [3]. In order to enhance the material properties and performance the method of synthesis could have an influence hence the methods of preparation are determining factors in producing different sizes and shapes.

Primary author: Mr NKOSI, Steven (CSIR)

Presenter: Mr NKOSI, Steven (CSIR)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: **189**Type: **Presentation**

Raman spectra of hot-pressed B₆O: Some new results

By means of the application of an efficient fluorescence background suppression scheme, the first-, second-, and higher- order Raman spectra of B₆O was obtained, which till now had been deemed un-observable when the 514.5 nm excitation line is used. We report on the analysis, of the the first-order and second-order Raman spectra and compare these to the Raman spectra or other boron-rich ultra-hard materials.

Primary author: Mr MACHAKA, Ronald (School of Chemical and Metallurgical Engineering, University of the Witwatersrand)

Co-authors: Dr MWAKIKUNGA, B.W. (NLC, Pretoria); Dr MANIKANDAN, E. (CSIR, Pretoria); Prof. SIGALAS, I (School of Chemical and Metallurgical Engineering, University of the Witwatersrand); Prof. DERRY, T.E. (School of Physics, University of the Witwatersrand)

Presenter: Mr MACHAKA, Ronald (School of Chemical and Metallurgical Engineering, University of the Witwatersrand)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 190

Type: **Presentation**

Analysis of the nanoindentation load–depth curves measured on fluorine irradiated B6O ceramics

Using the nanoindentation technique and the Oliver & Pharr analysis method of the measured loading and unloading segments of the load-displacement curves, the hardness and Young's modulus were determined for unirradiated and implanted B6O. The implanted hot-pressed B6O was irradiated with 150 keV fluorine in the dose range of 5×10^{14} to 5×10^{16} ions/cm² at room temperature. The implanted samples showed a decrease in hardness compared to the unimplanted material.

Primary author: Mr MACHAKA, Ronald (School of Chemical and Metallurgical Engineering, University of the Witwatersrand)

Co-authors: Prof. SIGALAS, I (School of Chemical and Metallurgical Engineering, University of the Witwatersrand); Prof. NEETHLING, J (School of Physics, Nelson Mandela Metropolitan University); Prof. DERRY, T.E. (School of Physics, University of the Witwatersrand)

Presenter: Mr MACHAKA, Ronald (School of Chemical and Metallurgical Engineering, University of the Witwatersrand)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 191

Type: **Presentation**

Establishment of the Exact Quantum Numbers of Critical Rotational Bands in Gd-155

Excited states in ^{155}Gd nuclei were populated in the $^{154}\text{Sm}(\alpha, 3n)$ reaction at a beam energy of 33MeV. The aim is to establish firm spin and parity assignments for the many complex rotational bands that have been observed in this nucleus and to observe which couplings are blocked by which quasi-neutrons in order to establish the underlying microstructure of the collective excitations of the ^{154}Gd core.

Primary author: Mr DINOKO, Tshepo (iThemba LABS/University of the western Cape)

Co-author: Prof. SHARPEY-SHAFFER, John (University of the western Cape/University of Zululand)

Presenter: Mr DINOKO, Tshepo (iThemba LABS/University of the western Cape)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 193

Type: **Poster**

Ab-initio Study of the Properties of Advanced Metal Nitrides M_2N_3 (where $M = Ta, V, Nb$)

The structural, elastic, and electronic properties of the advanced metal nitrides M_2N_3 and their ternary phases are investigated using ab-initio plane wave pseudopotentials under the framework of density functional theory. The relative stability of the ternary phases were also computed. Results obtained were compared with the available experimental and theoretical data.

Primary author: Ms ORISAKWE, Esther (University of Witwatersrand)

Co-author: Prof. LOWTHER, J. E (University of Witwatersrand)

Presenter: Ms ORISAKWE, Esther (University of Witwatersrand)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 194

Type: **Presentation**

Experimental investigation of Q-switched Erbium-Doped Fiber Laser

In this project, a design and experimental investigation of a Q-switched fiber lasers are presented. Using the Q switched technique, the peak power and time duration of the laser pulses are analyzed as function of repetition rate, pumping power, cavity length and output coupler transmission.

Primary authors: Mr KABOKO, Jean Jacques (University of Johannesburg); Prof. MEYER, Johan (University of Johanneburg); Dr MARTINEZ, Rodolfo (University of Johannesburg)

Presenter: Mr KABOKO, Jean Jacques (University of Johannesburg)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 195

Type: **Presentation**

Possible chirality in ^{195}Tl , associated with a three quasiparticle configuration.

The level scheme of ^{195}Tl was studied and a few new transitions, belonging to a possible chiral partner band, were found. The measured $B(M1)/B(E2)$ ratios for the partner bands show similarities, in accordance with possible chiral nature. A measurement of the gamma ray intensities is in progress.

Primary author: Mr MOHAMMED, Hussam (iThemba LABS - UCT)

Presenter: Mr MOHAMMED, Hussam (iThemba LABS - UCT)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 196

Type: **Poster**

Frequency Modulation Continuous Wave (FMCW) technique applied to Optical Fiber Temperature Sensors

The application of the FMCW technique to an optical fiber temperature sensor is investigated and tested experimentally in this project. Multiplexing of the sensor and variation of the sensitivity when parameters are varied is also investigated and simulated.

Primary authors: Prof. MEYER, Johan (University of Johannesburg); Ms SHUDA, Nadine (University of Johannesburg); Dr MARTINEZ, Rodolfo (University of Johannesburg)

Presenter: Ms SHUDA, Nadine (University of Johannesburg)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 197

Type: **Poster**

Open Loop Interferometric Fiber Optic Gyroscope

The operation of a fiber optic gyroscope is demonstrated in this project. A fiber optic gyroscope is designed, constructed and tested and the response of the gyroscope to an input rotation is generated. The experimental setup as well as the results are discussed in this paper.

Primary authors: Prof. MEYER, Johan (University of Johannesburg); Dr MARTINEZ, Rodolfo (University of Johannesburg); Mr NAIDOO, Yogan (University of Johannesburg)

Presenter: Mr NAIDOO, Yogan (University of Johannesburg)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 198

Type: **Presentation**

Non-ideal fluid dynamics in (2+1) dimensions planar geometry

The flux corrected transport algorithm FCTHydro provides tools for solving continuity equations. We study the dynamical evolution of non-ideal fluid dynamics in the non-relativistic limit using the (2+1)D planar geometry. The system studied shall be generalised to simulate relativistic hydrodynamic systems, which are of interest in heavy ion collisions.

Primary author: Mr PARADZA, Masimba Wellington (UCT-CERN)

Co-authors: Dr MURONGA, Azwinndini (UCT); Dr ADAMA, Rory (UCT)

Presenter: Mr PARADZA, Masimba Wellington (UCT-CERN)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 199

Type: **Presentation**

Investigating the Teaching and Learning of Problem Solving in Physics at School and University Level

In this study we report that while test scores continue to indicate that students' creative problem solving ability lags their ability to perform routine exercises, preliminary data suggest that instructors at both high school level and at university level are perhaps simply not teaching their students creative problem solving.

Primary author: Mr CLERK, Douglas (School of Physics, University of the Witwatersrand)

Co-author: Dr NAIDOO, Deena (University of the Witwatersrand)

Presenter: Mr CLERK, Douglas (School of Physics, University of the Witwatersrand)

Track Classification: Track E - Physics Education

Contribution ID: 200

Type: **Presentation**

Tropospheric and Stratospheric Temperature Measurements by Vibrational Raman-N₂ LiDAR at Reunion Island (20.8°S, 55.5°E)

The improvement of the laser sources allows LiDAR to probe an increasing altitude range of the atmosphere with improved vertical and time resolutions. Several methods using LiDAR technique have been developed to retrieve temperature in the UTLS. However, the Rayleigh technique is limited and can not operate below the 30km height, while the vibrational Raman-N₂ technique has been developed in order to measure temperature profiles in the UTLS region.

In this study, we present the Raman-N₂ LiDAR operating at Reunion Island; the temperature retrieval method; and the main results about the thermal structures in the UTLS as derived from a 10-year

Primary author: Prof. BENCHERIF, Hassan (Reunion Island University)

Presenter: Prof. BENCHERIF, Hassan (Reunion Island University)

Track Classification: Track D2 - Space Science

Contribution ID: 201

Type: **Presentation**

A new Method for Solving the Three-Dimensional Schroedinger Equation in the Presence of Coulomb Singularities

Solving an effective three-dimensional Schroedinger equation is a key ingredient of computational methods for the calculation of atomic, molecular and solid state properties. However, the presence of Coulomb singularities at the nuclei is a challenge for the convergence of any method. In this contribution a new approach is introduced, which is based on writing the wave function as a product of a function that fulfills the cusp condition at all nuclei and a second function that is expanded in a finite element basis set. This approach is discussed in some detail yielding a variational principle for the second function.

Primary author: Prof. BRAUN, Moritz (University of South Africa)

Presenter: Prof. BRAUN, Moritz (University of South Africa)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 202

Type: **Presentation**

STATUS OF THE ION SOURCES AT iTHEMBA LABS

Heavy ion beams at iThemba LABS have been produced in a 10GHz Minimafof Electron Cyclotron Resonance (ECRIS) for the past two decades. The increase in demand for new ion species and high intensity beams from the nuclear physics community has led to a decision to procure a new 2nd generation ECRIS. The source is a room temperature ECRIS based on the Grenoble Test Source (GTS) design. The source has been assembled and is being commissioned at iThemba LABS. The Hahn-Meitner-Institute (HMI) in Berlin donated their 14.5GHz ECRIS to iThemba LABS where it is presently operational. iThemba LABS also produce polarized proton beams.

Primary author: Mr NTSHANGASE, Sifiso Senzo (University of Cape Town / iThemba LABS)

Presenter: Mr NTSHANGASE, Sifiso Senzo (University of Cape Town / iThemba LABS)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 203

Type: **Poster**

Fe/S sample preparation: A method for the calculation of the S concentration required for doping Fe crystals

A method is proposed for the preparation of Fe/S samples using molecular Sulfur to dope Iron samples at high temperatures. Using Fick's semi-infinite diffusion model the time needed to obtain a certain bulk concentration at a specified temperature is calculated. Experimental results obtained this far confirms the possibility of such an experiment.

Primary author: Mr BARNARD, Pieter (UOVS)

Presenter: Mr BARNARD, Pieter (UOVS)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 204

Type: **Presentation**

FOUR – YEAR PROGRAM STUDENTS PHYSICS DIFFICULTIES

2010 SAIP ABSTRACT

D Dale, N C Moji, Q Motsoeneng, T Hlatshwayo and W Mtangi.

An Investigation of the abilities of students, to infer from an experiment done on the cooling down of hot water to room temperature that the Temperature – time graph of cold water heating up to room temperature will be the opposite. Most students could not accomplish this in a class test.

Primary author: Ms DALE, Denise (University of Pretoria)

Presenter: Ms DALE, Denise (University of Pretoria)

Track Classification: Track E - Physics Education

Contribution ID: 205

Type: **Presentation**

High-power diode-end-pumped Tm:YLF slab laser delivering 189 W at 1890 nm

We present a high-power Tm:YLF slab laser double-end-pumped by two 300 W laser diode stacks. The resonator was designed such that the laser emitted at 1890 nm instead of the conventional operating wavelength of 1912 nm. At full incident pump power it delivered up to 189 W of stable output.

Primary author: Mr KOEN, Wayne (CSIR National Laser Centre)

Co-authors: Dr BOLLIG, Christoph (CSIR National Laser Centre); Mr ESSER, Daniel (CSIR National Laser Centre); Dr STRAUSS, Hencharl (CSIR National Laser Centre)

Presenter: Mr KOEN, Wayne (CSIR National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 206

Type: **Presentation**

Are BSc Extended Programmes necessary in South Africa?

A comparison of the BSc extended and mainstream programmes in Physics at the University of the Witwatersrand are reviewed in order to facilitate possible processes to assist the new cohort of Outcome Based Education learners who generally lack the necessary mathematical and conceptual skills required for university.

Primary author: Dr NAIDOO, Deena (School of Physics, University of the Witwatersrand)

Co-authors: Ms MATLOU, Daisy (Science and Teaching Learning Centre, University of the Witwatersrand); Mr CLERK, Douglas (School of Physics, University of the Witwatersrand)

Presenter: Dr NAIDOO, Deena (School of Physics, University of the Witwatersrand)

Track Classification: Track E - Physics Education

Contribution ID: 207

Type: **Poster**

Analysis of IV and CV characteristics of Au/Ni/n-AlGa_{0.35}Ga_{0.65}N Schottky contacts at different temperatures

We report the current-voltage-temperature characteristics of Au/Ni/n-Al_{0.35}Ga_{0.65}N Schottky contacts measured over a wide temperature range. For larger forward bias, the current-voltage characteristics were well described by the thermionic emission model. By means of curve fitting, we could determine the relative contribution of the conduction mechanisms at each temperature.

Primary author: Mr NGOEPE, Phuti (University of Pretoria)

Co-authors: Prof. AURET, Danie (University of Pretoria); Mr LEGODI, Matshisa (University of Pretoria); Dr DIALE, Mmantsae (University of Pretoria); Dr MEYER, Walter (University of Pretoria)

Presenter: Mr NGOEPE, Phuti (University of Pretoria)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 208

Type: **Presentation**

Octupole Excitations in U isotopes

The actinide region attracts considerable interest due to the rich variety of octupole phenomena encountered both theoretically and experimentally[1]. These include octupole vibrational bands which, as a function of neutron number and angular momentum, develop into alternating parity bands that have been interpreted as the onset of octupole deformation, or more recently, in terms of reflection-asymmetric tidal waves[2]. The most spectacular example of octupole shape may well be the hyperdeformed bands known from fission resonances.

Primary author: Mr NTSHANGASE, Sifiso Senzo (University of Cape Town / iThemba LABS)

Presenter: Mr NTSHANGASE, Sifiso Senzo (University of Cape Town / iThemba LABS)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 209

Type: **Poster**

Ab initio study of the crystal structures and mechanical properties of some late transition-metal nitrides

The crystal structures and mechanical properties of some late transition metal-nitrides at different stoichiometries and different structures have been investigated using first-principles density-functional theory. Obtained results were compared with theory and with experiment whenever possible.

Primary author: Mr SULEIMAN, MOHAMMED (University of the Witwatersrand)

Co-author: Prof. JOUBERT, DANIEL (University of the Witwatersrand)

Presenter: Mr SULEIMAN, MOHAMMED (University of the Witwatersrand)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 210

Type: **Presentation**

Experimental phantom verification studies for simulations of light interactions with skin

Raytracing computer models are valuable tools to determine the fluence at a specific depth into tissue, but need to be verified before they can be used with confidence. Such a model for skin showed good agreement (within 10%) when compared with images from experiments on solid resin skin simulation phantoms.

Primary author: Mrs KARSTEN, Aletta (CSIR, National Laser Centre)

Co-authors: Ms SINGH, Ann (CSIR, National Laser Centre); Ms ABD ALMONEM, Shaimaa (Niles intitute, Cairo University)

Presenter: Mrs KARSTEN, Aletta (CSIR, National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 211

Type: **Poster**

Micro Machining of Fabry-Perot Interferometers in Optical Fbers to Manufacture Temperature Sensors

Abstract: We have designed an experimental setup to micro machine Fabry-Perot interferometer in silica and sapphire fiber with a Ti:sapphire femtosecond laser and in comparison with a nanosecond Nd:YAG laser at 355 nm. We achieved spot sizes of 5 μm with the Ti:sapphire and 20 μm with the Nd:YAG laser.

Primary author: Dr SCHMIEDER, Diethelm (University of Johannesburg)

Co-authors: Mr DELLA TAMIN, Michelin (University of Johannesburg); Mr SAMARADIWAKERA, Rajatha (University of Johannesburg)

Presenter: Dr SCHMIEDER, Diethelm (University of Johannesburg)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 212

Type: **Poster**

Structural Phase Transitions and Pressure Dependent Electronic Structure of ZnO

Groundstate and hybrid density functional calculations are used to examine the structural and electronic properties of ZnO under high pressure. The generalized gradient approximation is employed to examine the ground state structural properties while the B3LYP hybrid functional is used for the electronic properties. In agreement with previous studies, it is found that ZnO transforms from the wurtzite structure to the CsCl structure, with the rocksalt structure as the intermediate phase. Emphasis is laid on the behavior of the band-gap with increasing pressure.

Primary author: Mr MOLEPO, Mahlaga (University of the Witwatersrand)

Co-author: Prof. JOUBERT, Daniel (University of the Witwatersrand)

Presenter: Mr MOLEPO, Mahlaga (University of the Witwatersrand)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 214

Type: **Presentation**

PREDICTION AND VERIFICATION OF A HIGH POWER EXPERIMENTAL ROCKET

Over the past five decades a number of South African institutions have developed capabilities and facilities in various fields of space science and technology. This paper describes an experimental rocket launch project in line with the ongoing South African Space programme.

Primary author: Mr NWOSA, chijioko (cj)

Presenter: Mr NWOSA, chijioko (cj)

Track Classification: Track D2 - Space Science

Contribution ID: 215

Type: **Poster**

In-situ, real-time RBS study of thin film growth in Pd and Ge

Palladium germanide formation is studied in ramped anneals of constant ramp rate using real-time RBS. The resulting data is analysed using both Kissinger analysis and fitting an integral to a single ramped anneal. The activation energies determined by both methods are in good agreement.

Primary author: Ms VAN DER WALT, Cornelia (Department of Physics, University of Cape Town)

Co-author: Prof. COMRIE, Craig (Department of Physics, University of Cape Town)

Presenter: Ms VAN DER WALT, Cornelia (Department of Physics, University of Cape Town)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 216

Type: **Presentation**

Prolonging coherence in trapped ions

We study pulse sequences that dynamically decouple ${}^9\text{Be}^+$ ions from their decohering environment. The noise environment the ions see is artificially synthesized to emulate a variety of physical systems. By incorporating measurement feedback, our locally optimized dynamical decoupling sequences (LODD) attain an order of magnitude improved suppression of noise in certain noise environments compared to known sequences.

Primary author: Dr UYS, Hermann (National Laser Centre, CSIR)

Co-authors: Dr VAN DEVENDER, A.P. (National Institute of Standards and Technology, Boulder, Colorado, USA); Dr BOLLINGER, J.J. (National Institute of Standards and Technology, Boulder, Colorado, USA); Dr BIERCUK, M. (School of Physics, University of Sydney, Sydney, Australia)

Presenter: Dr UYS, Hermann (National Laser Centre, CSIR)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 217

Type: **Presentation**

First principles studies of electronic and structural properties of defects in boronitrene

We study the impact of C substitutional atoms, B and N atom swapping and vacancies, and some adatoms on electronic and structural properties of boronitrene (2D boron nitride) using the VASP code. The generalized gradient approximation is the initially used exchange correlation functional. Our results show good agreement with literature.

Primary author: Mr NGWENYA, Bongani (University of Pretoria)

Co-author: Prof. CHETTY, Nithaya (University of Pretoria)

Presenter: Mr NGWENYA, Bongani (University of Pretoria)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 218

Type: **Poster**

Data Reduction Pipeline for Optical Photometry Data

A pipeline for reducing optical photometry data is presented. It is set in the IRAF environment and coded using CL scripting. The main focus of the project is to ease and speed-up the reduction of differential photometry data, with aperture- and psf fitting both supported.

Primary author: Mr WIUM, Daniël (University of the Free State)

Co-authors: Mr VAN DER LINDE, Abraham (University of the Free State); Prof. MEINTJES, Pieter (University of the Free State)

Presenters: Mr VAN DER LINDE, Abraham (University of the Free State); Mr WIUM, Daniël (University of the Free State)

Track Classification: Track D1 - Astrophysics

Contribution ID: 219

Type: **Presentation**

Probing of diffuse radio emission in the Abell 1437 Supercluster

An important aspect of the radio emission from clusters of galaxy is represented as the diffuse radio sources associated with the intracluster medium. These radio sources are known as radio halos, relics and mini halos. The radio halos and relics are indicators of cluster mergers. We are probing the same into the submerger A1437 supercluster.

Primary author: Mr PAREKH, Viral (Astronomy Department, Astrophysics, Cosmology and Gravity Centre (ACGC), University of Cape Town)

Presenter: Mr PAREKH, Viral (Astronomy Department, Astrophysics, Cosmology and Gravity Centre (ACGC), University of Cape Town)

Track Classification: Track D1 - Astrophysics

Contribution ID: 220

Type: **Poster**

Scaling ion traps for quantum computing

The design, fabrication and preliminary testing of a chipscale, multi-zone, surface electrode ion trap is reported. The modular design and fabrication techniques used are anticipated to advance scalability of ion trap quantum computing architectures.

Primary author: Dr UYS, Hermann (National Laser Centre, CSIR)

Co-authors: Dr VANDEVENDER, A.P. (National Institute of Standards and Technology, Boulder, Colorado, USA); Dr OSPELKAUS, C (National Institute of Standards and Technology, Boulder, Colorado, USA); Dr LEIBFRIED, D (National Institute of Standards and Technology, Boulder, Colorado, USA); Dr WINELAND, D.J. (National Institute of Standards and Technology, Boulder, Colorado, USA); Dr BRITTON, J (National Institute of Standards and Technology, Boulder, Colorado, USA); Dr WESENBERG, J.H. (Centre for Quantum Technologies, National University of Singapore, Singapore); Dr BOLLINGER, J.J. (National Institute of Standards and Technology, Boulder, Colorado, USA); Dr AMINI, J.M. (Georgia Tech Quantum Institute, GTRI/STL, Atlanta, Georgia, USA); Dr SEIDELIN, S (Institut Neel-CNRS, BP 166, 25, rue des Martyrs, 38042 Grenoble Cedex 9, France)

Presenter: Dr UYS, Hermann (National Laser Centre, CSIR)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 221

Type: **Poster**

Decoherence of superposition states in trapped ions

We investigate the decoherence of superpositions of hyperfine states of ${}^9\text{Be}^+$ ions due to spontaneous scattering of off-resonant light. We find that, contrary to conventional wisdom, elastic Rayleigh scattering can have major contributions to decoherence when compared to the effect of inelastic Raman scattering.

Primary author: Dr UYS, Hermann (National Laser Centre, CSIR)

Co-authors: Dr VAN DEVENDER, A.P. (National Institute of Standards and Technology, Boulder, Colorado, USA); Dr OSPELKAUS, C. (National Institute of Standards and Technology, Boulder, Colorado, USA); Dr MEISER, D. (JILA, Univ. Colorado, Boulder, Colorado, USA); Dr BOLLINGER, J.J. (National Institute of Standards and Technology, Boulder, Colorado, USA); Dr BIERCUK, M.J. (School of Physics, University of Sydney, Sydney, Australia); Dr OZERI, R. (Dept. of Physics of Complex Systems, Weizmann Institute of Science, Rehovot, Israel)

Presenter: Dr UYS, Hermann (National Laser Centre, CSIR)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 222

Type: **Presentation**

Deposition of thin Cr₃C₂ hard coatings using Radio Frequency Magnetron Sputtering for SBS characterization

Cr₃C₂ films on Si have been grown by RF sputtering at 0 and -60V bias to observe stress relaxation using surface Brillouin scattering. A RF power of 175W and Ar₂ working gas pressure of 5.0 x10⁻³mBar was used to yield a deposition rate of 0.16nm/s. Surface Brillouin studies on the -60V biased and the unbiased samples show high frequency Sezawa modes indicative of high film quality. The dispersion curves have shown an increase in the elastic constants corresponding to an increase in residual stress upon biasing. The elastic constants will be extracted from the dispersion curves.

Primary author: Dr WAMWANGI, Daniel (wits university)

Co-authors: Mr SUMANYA, Clemence (wits university); Prof. COMINS, Darrell (Wits University); Dr WITTKOWSKI, Thomas (I.E.E. Luxemburg)

Presenter: Dr WAMWANGI, Daniel (wits university)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 223

Type: **Presentation**

Detecting yocto(10^{-24})newton forces with trapped ions

We report a calibrated measurement of 174 yoctonewton (1×10^{-24}

textnormal $N = 1$

textnormal N), using a cloud of $60 \text{ } ^9\text{Be}^+$ ion confined in a Penning ion trap. These measurements suggest that ion traps may form the basis of a new class of ultra-sensitive deployable force sensors.

Primary author: Dr UYS, Hermann (National Laser Centre, CSIR)

Co-authors: Dr VAN DEVENDER, A.P. (National Institute of Standards and Technology, Boulder, Colorado, USA); Dr BOLLINGER, J.J. (National Institute of Standards and Technology, Boulder, Colorado, USA); Dr BRITTON, J.W. (National Institute of Standards and Technology, Boulder, Colorado, USA); Dr BIERCUK, M. (School of Physics, University of Sydney, Sydney, Australia)

Presenter: Dr UYS, Hermann (National Laser Centre, CSIR)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 224

Type: **Poster**

EFFECT OF THE PLASMA DEPOSITION PARAMETERS ON THE PROPERTIES OF Ti/TiC MULTILAYERS FOR HARD COATINGS APPLICATIONS

In this study, we present the effect of the plasma deposition parameters on the properties of Ti/TiC multilayers deposited by RF-Magnetron Sputtering (13.56 MHz) under methane and argon reactive plasma at low pressure. The film depositions have been done on silicon and steel substrates. The attention was given to study the influence of different parameters (deposition time, RF power, and total pressure, gas mixture (Ar + CH₄)) on the film growth rates, thickness and hardness. Films of several thickness and compositions have been deposited and characterised.

Primary author: Dr SAOULA, nadia (centre de développement des technologies avancées , CDTA)

Co-authors: Dr HENDA, karim (centre de développement des technologies avancées , CDTA); Prof. KESRI, rafika (USTHB, LECTCM, PO.Box 32 El Alia, BabEzzouar, Algiers, Algeria)

Presenter: Dr SAOULA, nadia (centre de développement des technologies avancées , CDTA)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 225

Type: **Poster**

Ab initio Calculations of Phonon Spectra in PtCr Binary

We investigate the thermal stability at 0 GPa for different phases of PtCr binary alloys. We have detected soft modes at X, G, M and R points of the Brillouin zone from the phonon spectra of Pt₃Cr A15 phase. Pt₃Cr L12 and PtCr₃ A15 are predicted as dynamically stable structures.

Primary author: Mrs TIBANE, Malebo (University of South Africa)

Co-author: Prof. NGOEPE, Phuti (University of Limpopo)

Presenter: Mrs TIBANE, Malebo (University of South Africa)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 226

Type: **Poster**

XRD Characterisation of SnO₂ doped with both Y and Al

There is a growing interest in nano-materials since they have unique physical and chemical properties. The problem is that they tend to grow at relatively moderate temperatures, with subsequent loss of nano-crystalline behaviour. In this contribution we discuss the effects of incorporating both Y and Al in SnO₂ on crystal growth.

Primary author: Mr NTIMANE, JN (University of Limpopo)

Co-authors: Prof. HILLIE, T (CSIR); Dr MOSUANG, TE (University of Limpopo)

Presenter: Mr NTIMANE, JN (University of Limpopo)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 227

Type: **Presentation**

Long-term Optical Properties of High Mass X-ray Binaries in the Small Magellanic Cloud

We present 16 yr baseline optical lightcurves of Be/X-ray binaries (BeX) in the SMC. All the BeX in our sample display both orbital (usually tens of days) modulation, plus a much longer non-orbital variation on timescales of ~ 200 -3000 d. We compare and contrast their behaviour with the prototypical BeX, A0538-66. In addition, the amplitude of their orbital outbursts can vary through the long-term superorbital cycle. We discuss mechanisms which can produce this effect, as well as an apparent correlation between these periodicities.

Primary author: Mr RAJOELIMANANA, Andry Fitiavana (South African Astronomical Observatory / University of Cape Town (SAAO/UCT))

Co-author: Prof. CHARLES, Phil (South African Astronomical Observatory (SAAO) / School of Physics and Astronomy, (Southampton University))

Presenter: Mr RAJOELIMANANA, Andry Fitiavana (South African Astronomical Observatory / University of Cape Town (SAAO/UCT))

Track Classification: Track D1 - Astrophysics

Contribution ID: 228

Type: **Presentation**

The changes caused by magnetospheric electric field on high-latitude ionosphere during magnetosphere-ionosphere coupling.

On the 09/08/2002 the Cluster spacecrafts footprint where located within the field of view of the Syowa East SuperDARN radar. The variations in the magnetospheric electric field observed by the spacecrafts were compared to the line-of-sight velocity observed by radar. The 3 min delay was observed during magnetosphere-ionosphere coupling.

Primary author: Mr MAPHAHA, Fulufhelo Kenneth (University of Kwazulu-Natal)

Co-authors: Dr MAGNUS, Lindsay (Hermanus Magnetic Observatory); Prof. PILLAY, Sadha (University of Kwazulu-Natal)

Presenter: Mr MAPHAHA, Fulufhelo Kenneth (University of Kwazulu-Natal)

Track Classification: Track D2 - Space Science

Contribution ID: 229

Type: **Poster**

Molecular Dynamics Study of Electrolytic Manganese Dioxide (EMD)

The EMD is an intergrowth of pyrolusite and ramsdellite-MnO₂ polymorphs. Amorphization and recrystallization technique has been used to generate MnO₂ structures and study their structural properties. The simulation methodology involves allowing an amorphous transition, enabling various structural modifications to evolve during simulation in response to lattice misfit and underlying support.

Primary author: Dr MAPHANGA, Rapela (University of Limpopo)

Presenter: Dr MAPHANGA, Rapela (University of Limpopo)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 230

Type: **Presentation**

Very long-term behaviour of LMXBs

Certain Low Mass X-ray Binaries show very long-term quasi-periodic modulations in their X-ray lightcurves, as obtained from the All Sky Monitor on board the Rossi X-ray Timing Explorer. This suggests long-term variations in the mass-transfer rate from the donor, possibly as a result of its solar-like magnetic cycles.

Primary author: Mrs KOTZE, Marissa (SAAO & UCT)

Co-author: Prof. CHARLES, Phil (SAAO)

Presenter: Mrs KOTZE, Marissa (SAAO & UCT)

Track Classification: Track D1 - Astrophysics

Contribution ID: 231

Type: **Presentation**

Energetic stability and magnetic ordering properties of 3d transition metals in diamond

The energetic stability and magnetic ordering properties of 3d transition metals in diamond are investigated using ab initio DFT methods. The divacancy is predicted to be the energetically most favourable site, with Cr, Mn, Fe, Co and Ni having the lowest formation energies. Spin polarised impurity bands are induced in the diamond band gap, suggesting that these elements are likely to order ferromagnetically when incorporated into diamond.

Primary authors: Prof. LOMBARDI, E B (Physics Department, University of South Africa(UNISA)); Mr BENECHA, E M (Physics Department, University of South Africa (UNISA))

Presenter: Mr BENECHA, E M (Physics Department, University of South Africa (UNISA))

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 232

Type: **Presentation**

Probing galaxy transformation in Abell 1437

Strong observational evidence for the transformation of galaxies in dense environments exists. The processes responsible for this transformation remains an open question. We report on the use of the GALEV evolutionary synthesis models as a means to probe galaxy transformation processes in the galaxy cluster Abell 1437.

Primary author: Mr KOTZE, J.P. (University of Cape Town)

Co-authors: Dr VAISANEN, P. (South African Astronomical Observatory); Prof. WOUDT, P.A. (University of Cape Town); Prof. KRAAN-KORTEWEG, R. C. (University of Cape Town)

Presenter: Mr KOTZE, J.P. (University of Cape Town)

Track Classification: Track D1 - Astrophysics

Contribution ID: 233

Type: **Presentation**

The nature of the ultraluminous X-ray source NGC 5408 X-1

We report on the recent observation of a 115-day modulation in the X-ray flux of the ultraluminous X-ray source (ULX) NGC 5408 X-1, and in particular, the interpretation of this modulation as the orbital period. We suggest that this modulation is more likely superorbital in nature. Comparing the properties of this ULX with those of the prototype micro-quasar SS 433, we argue that NGC 5408 X-1 may be very similar to SS 433: a hyper-accreting stellar-mass black hole in a shorter-period binary, and hence the 115-day modulation is due to inner-disc/jet precession.

Primary author: Mr FOSTER, Deatrick (South African Astronomical Observatory)

Co-author: Prof. CHARLES, Phil (South African Astronomical Observatory)

Presenter: Mr FOSTER, Deatrick (South African Astronomical Observatory)

Track Classification: Track D1 - Astrophysics

Contribution ID: 234

Type: **Presentation**

One-way Quantum Computing with OAM photons

We study the implementation of the Grover Search Algorithm by means of photons that carry orbital angular momentum (OAM) using the one-way quantum computing (1WQC) model. Our setup is related to a corresponding scheme of Zeilinger et al [1], which realizes a two-bit Grover Search by employing the polarization of photons.

[1] Anton Zeilinger et al. Experimental One-way Quantum Computing, Nature 434, 169-176.

Primary author: Ms BASSA, Humairah (University of KwaZulu-Natal)

Co-authors: Prof. FORBES, Andrew (CSIR National Laser Center); Prof. PETRUCCIONE, Francesco (University of KwaZulu-Natal); Dr ROUX, Stef (CSIR National Laser Center); Prof. KONRAD, Thomas (University of KwaZulu-Natal)

Presenter: Ms BASSA, Humairah (University of KwaZulu-Natal)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 235

Type: **Presentation**

Radiometric analyses of iThemba LABS dam water samples by gamma-ray spectrometry

The iThemba LABS dam water samples were radiometrically analysed using the low-background high-resolution gamma-ray spectrometry for traces of anthropogenic radionuclides. The samples were prepared in a 1-l Marinelli beaker geometry. Traces of anthropogenic radionuclides have been recorded in samples with activity concentrations ranging from 0.3 to 40 Bq/l.

Primary author: Dr MALEKA, Peane Peter (iThemba LABS and University of the Western Cape)

Co-authors: Mr HLATSHWAYO, Israel N. (iThemba LABS); Dr NEWMAN, Richard T. (iThemba LABS)

Presenter: Dr MALEKA, Peane Peter (iThemba LABS and University of the Western Cape)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 236

Type: **Poster**

Dipole Bands in Hg-196

New experimental results from a gamma spectroscopic study of Hg-196 reveal two dipole bands, with even and odd parity respectively. One was previously observed, while the other is new. In both cases spin and parity assignments were possible.

Primary author: Dr LAWRIE, Kobus (iThemba LABS)

Presenter: Dr LAWRIE, Kobus (iThemba LABS)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 237

Type: **Presentation**

Ultrafast Photochromism of Dithizonatephenyl-mercury(II)

The photoinduced isomerisation reaction of dithizonatophenyl-mercury(II) in solution by femtosecond transient absorption spectroscopy is investigated. The C=N isomerisation from the cis reactant to trans product, results in a significantly red shifted absorption band for the product compared to the reactant. We discuss ultrafast photoinduced isomerisation along a reaction pathway.

Primary author: Mr BOSMAN, Gurthwin (Stellenbosch University)

Co-authors: Prof. ROHWER, Erich (Stellenbosch University); Prof. SCHWOERER, Heinrich (Stellenbosch University); Prof. VON ESCHWEGE, Karel (University of the Free State); Dr KROK, Patrizia (Stellenbosch University)

Presenter: Mr BOSMAN, Gurthwin (Stellenbosch University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 238

Type: **Presentation**

Quantum Teleportation with Photons carrying Orbital Angular Momentum

In quantum teleportation an unknown quantum state is transferred from one quantum system to another. Here we study a scheme to realise quantum teleportation for qubits with photons carrying orbital angular momentum and discuss the possibility to teleport qutrits.

Primary author: Ms BOUKAMA-DZOUSSI, Ephifani Patricia (University of KwaZulu-Natal)

Co-authors: Prof. FORBES, Andrew (CSIR National Laser Center); Dr ROUX, Stef (CSIR National Laser Center); Prof. KONRAD, Thomas (University of KwaZulu-Natal)

Presenter: Ms BOUKAMA-DZOUSSI, Ephifani Patricia (University of KwaZulu-Natal)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 239

Type: **Poster**

Computational Study of the Structural and Stability of the Noble Metal Alloys X3Al (where X = Pt, Pd, Os, Ir, Rh and Ru)

We have used electronic structure method based upon Density Functional Theory (DFT) formalism to search for new class of high temperature super-alloys. Our search is focused on alloys between the noble metals and aluminum. Over-estimation of the properties of our target alloys was avoided by approximating only the gradient of the exchange and correlation functional. The behavior of each alloy to stress was investigated using volume-conserving strains. Our calculation's result predicts that alloys based on iridium (Ir) and rhodium (Rh) should combine good high temperature strength with structural stability.

Primary author: Mr POPOOLA, Adewumi (School of Physics, University of the Witwatersrand, Johannesburg)

Co-author: Prof. LOWTHER, John (School of Physics, University of the Witwatersrand)

Presenter: Mr POPOOLA, Adewumi (School of Physics, University of the Witwatersrand, Johannesburg)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 240

Type: **Presentation**

Experiment- A true eye-opener for physics students

Q Motsoeneng, N C Moji, D Dale, T Hlatshwayo and W Mtangi.

An investigation of what happens to the temperature of a mixture of ice and water at zero degrees celsius when left to heat up on its own. Students only learned later that the heat absorbed was used to break the bonds.

Primary author: Mr MOTSOENENG, John (University of Pretoria)

Presenter: Mr MOTSOENENG, John (University of Pretoria)

Track Classification: Track E - Physics Education

Contribution ID: 241

Type: **Presentation**

Effect of film thickness on pulsed laser deposited optically selective solar absorbers

Carbon nanotubes embedded in NiO have been ablated onto aluminium by varying deposition time/thickness using pulsed laser deposition for selective solar absorber coatings. It has been noted that the absorptance increases as the thickness increases for all carbon concentrations. A maximum solar absorptance of 91 % has been achieved so far.

Primary author: Mr YALISI, Brian (CSIR, UKZN)

Co-authors: Prof. FORBES, Andrew (CSIR, UKZN); Mr TILE, Ngcali (CSIR, UKZN); Dr KITTESSA, Roro (CSIR)

Presenter: Mr YALISI, Brian (CSIR, UKZN)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 242

Type: **Presentation**

Primordial Black Holes : Evolution as the Universe Aged

Primordial black holes are believed to have formed from some of the inhomogeneities in the early universe; unlike astrophysical black holes they exhibit a large range of masses. Their mass relation and evaporation via Hawking radiation was explored and a simulation of their numbers as the universe aged was made

Primary author: Mr MOGOTSI, Moses (UCT)

Presenter: Mr MOGOTSI, Moses (UCT)

Track Classification: Track D1 - Astrophysics

Contribution ID: 243

Type: **Presentation**

Comparisons of HI and CO Dynamics of THINGS Galaxies

We present recent results comparing the dynamics of a sample of local galaxies in HI (THINGS) and CO (HERACLES). We will also compare different means of computing velocity fields and verify the interchangeability of HI and CO, especially for the innermost stellar regions, where HI has a very low surface brightness.

Primary author: Mr FRANK, Bradley (Astrophysics, Cosmology and Gravity Centre, Department of Astronomy, University of Cape Town)

Co-author: Prof. DE BLOK, W.J.G. (Astrophysics, Cosmology and Gravity Centre, Department of Astronomy, University of Cape Town)

Presenter: Mr FRANK, Bradley (Astrophysics, Cosmology and Gravity Centre, Department of Astronomy, University of Cape Town)

Track Classification: Track D1 - Astrophysics

Contribution ID: 244

Type: **Presentation**

High Flux Neutron Detection System

A high flux neutron detection system, integrating the neutron converter material ^6Li and ^{12}C and a highly sensitive mass spectrometer, is being developed to detect slow and fast neutrons. The reaction rates and neutron flux will be deduced from the analysis of the ^4He atoms released with the mass spectrometer.

Primary author: Ms SINGO, Thifhelimbilu Daphney (Student-University of Stellenbosch and iThemba LABS)

Co-authors: Dr PAPKA, Paul (Supervisor-University of Stellenbosch and iThemba LABS); Dr SMIT, Ricky (iThemba LABS); Mr DOBSON, Robert (University of Stellenbosch); Dr WYNGAARDT, Shaun (University of Stellenbosch)

Presenter: Ms SINGO, Thifhelimbilu Daphney (Student-University of Stellenbosch and iThemba LABS)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 245

Type: **Poster**

Influence of Sb doping on grain growth of polycrystalline copper

Small concentrations of Sb dopant in Cu can increase the grain boundary energy which suppresses grain growth. XRD results show that after annealing the CuSb alloy, the relative intensities of the (111) and (420) orientations increase. The grain growth results indicate that the Sb inhibits grain growth in Cu and keeps the microstructure intact at higher temperatures.

Primary author: Mr JAFTA, Charl (University of the Free State)

Co-authors: Dr ASANTE, Joseph (Tshwane University of Technology); Mr CRONJE, Shaun (University of the Free State); Prof. ROOS, Wiets (University of the Free State)

Presenter: Mr JAFTA, Charl (University of the Free State)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 246

Type: **Poster**

Sm_{1-x}NdxNiO₃ Thin Films Deposition by KrF laser ablation: Laser fluence optimisation

In this contribution we study the effect of the laser fluence on the stoichiometry and morphology of Sm_{1-x}NdxNiO₃ thin films deposited by KrF laser ablation into vacuum. Using an ion probe, the plasma plume front velocity was determined and related to the films properties. Furthermore, the ablated mass was measured and the ablation threshold was determined. Thereby, the optimal laser fluence was set to be in the range of 1 – 2 Jcm⁻².

Primary author: Mr LAFANE, Slimane (Development centre for advanced technologies)

Co-authors: Prof. MAAZA, Malik (IThemba LABS National Research Foundation); Dr ABDELLI-MESSACI, Samira (Development centre for advanced technologies); Dr KERDJA, Tahar (Development centre for advanced technologies); Mr MALEK, smail (Development centre for advanced technologies)

Presenter: Mr LAFANE, Slimane (Development centre for advanced technologies)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 247

Type: **Poster**

Multi pass 1.9 um Tm:YLF slab laser pump source

A novel multi-pass Tm:YLF laser was demonstrated with an improvement in efficiency, footprint and cost over two diode stack pumped, single pass systems. We report 100 W of output power from 261 W of incident diode pump power with a slope efficiency of 44%.

Primary author: Dr STRAUSS, Hencharl Johan (CSIR (National Laser Centre))

Co-authors: Dr BOLLIG, Christoph (CSIR (National Laser Centre)); Mr JACOBS, Cobus (CSIR (National Laser Centre)); Mr PREUSSLER, Dieter (CSIR (National Laser Centre)); Mr NYANGAZA, Kwanele (CSIR (National Laser Centre)); Mr COLLETT, Oliver (CSIR (National Laser Centre)); Mr BURD, Shaun (University of the Witwatersrand); Mr KOEN, Wayne (CSIR (National Laser Centre))

Presenter: Dr STRAUSS, Hencharl Johan (CSIR (National Laser Centre))

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 248

Type: **Poster**

Data Analysis of Time Critical Emission FTIR Measurements of Countermeasure Flares

Recent emission FTIR measurements were done on countermeasure flares using a passive infrared imaging Fourier transform spectrometer. Problems faced during the data analysis, where part of the data signature is located on dead pixels, and the determination of both temperature and emissivity as unknowns, are discussed.

Primary author: Mr CALITZ, Hannes (CSIR)

Presenter: Mr CALITZ, Hannes (CSIR)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 249

Type: **Presentation**

Temperature dependence of current-voltage characteristics of p-silicon Schottky diodes for radiation-hard detectors.

Current-voltage measurements were carried out on the silicon Schottky diodes in the temperature range of 280–330 K. The results obtained were interpreted in terms of defect levels induced by metal impurities in the energy gap. These levels are responsible for the relaxation behavior of silicon. Properties of these relaxation diodes are not affected by the incident radiation; hence, the diodes are used to devise the radiation-hard detectors.

Primary author: Mr MOLOI, Sabata (University of South Africa)

Presenter: Mr MOLOI, Sabata (University of South Africa)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 250

Type: **Presentation**

Laser-induced breakdown spectroscopy for quantification of heavy metals in soils and sediments

Laser-induced breakdown spectroscopy (LIBS) will be used to determine the contents of heavy metals in soils and sediments. LIBS results will be compared with the results obtained by inductively coupled plasma-optical emission spectrometry (ICP-OES) and inductively coupled plasma-mass spectrometry (ICP-MS).

Primary author: Dr AMBUSHE, Abayneh (CSIR, National Laser Centre)

Co-authors: Dr DU PLESSIS, Anton (CSIR, National Laser Centre); Prof. MCCRINDLE, Robert (Tshwane University of Technology)

Presenter: Dr AMBUSHE, Abayneh (CSIR, National Laser Centre)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 251

Type: **Presentation**

Time Scales in Nuclear Giant Resonances

A many-body approach is used to investigate the regular patterns in scales found in a wavelet analysis of giant resonance fine structure. Our study suggests that the spreading widths of collective excitations in nuclei are determined by the number of fragmentations seen in the power spectrum of the scales.

Primary author: Prof. HEISS, W.D. (National Institute for Theoretical Physics, Stellenbosch Institute for Advanced Study, and Institute of Theoretical Physics, University of Stellenbosch, 7602 Matieland, South Africa)

Co-authors: Dr SMIT, Frederick David (iThemba LABS, , PO Box 722, Somerset West 7129, South Africa); Prof. CARTER, J. (School of Physics, University of the Witwatersrand, PO Wits, Johannesburg 2050, South Africa); Prof. NAZMITDINOV, R.G. (2Department de Fisica, Universitat de les Illes Balears, E-07122 Palma de Mallorca, Spain 3Bogoltubov Laboratory of Theoretical Physics, Joint Institute for Nuclear Research, 141980 Dubna, Russia); Prof. FEARICK, R.W. (Department of Physics, University of Cape Town, Rondebosch 7700, South Africa)

Presenter: Dr SMIT, Frederick David (iThemba LABS, , PO Box 722, Somerset West 7129, South Africa)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 252

Type: **Presentation**

The influence of the initiating and the annealing temperature on the luminescent and structural properties of BaAl₂O₄:Eu²⁺,Nd³⁺,Gd³⁺ phosphors prepared by combustion method

BaAl₂O₄:Eu²⁺, Nd³⁺,Gd³⁺ phosphors prepared at different initiating combustion temperatures (400-1200 oC) were annealed at 400-1200 oC for 3 hours. X-ray diffraction, SEM, FT-IR and Raman were employed to identify the structural phases, surface morphology and vibrational frequencies, respectively, and a 325 nm He-Cd was used for fluorescence measurements.

Primary author: Dr MOTHUDI, Bakang Moses (University of the Free State)

Co-authors: Prof. SWART, Hendrik (University of the Free State); Prof. NTWAEABORWA, Martin (University of the Free State)

Presenter: Dr MOTHUDI, Bakang Moses (University of the Free State)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 253

Type: **Poster**

Hall effect measurements and surface conduction in bulk melt grown single crystal ZnO

Hall effect studies carried out on as-received, melt grown, single crystal ZnO samples show the existence of two shallow donors with energy levels (37.8 ± 0.3) meV and (54.5 ± 0.9) meV. Annealing studies performed on the hydrogen peroxide treated samples reveal the existence of a conductive channel in ZnO.

Primary author: Mr MTANGI, Wilbert (University of Pretoria)

Co-authors: Mr CHAWANDA, Albert (University of Pretoria); Dr NYAMHERE, Cloud (Nelson Mandela Metropolitan University); Prof. AURET, Danie F (University of Pretoria); Dr NEL, Jackie (University of Pretoria); Dr DIALE, Mmanstae (University of Pretoria)

Presenter: Mr MTANGI, Wilbert (University of Pretoria)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 255

Type: **Poster**

Development of a high power femtosecond laser

The Laser Research Institute and the CSIR National Laser Centre are developing a high power femtosecond laser system in a joint project with a phased approach. The laser system consists of a fs oscillator and a regenerative amplifier. An OPCPA amplifier and a multi-pass amplifier are under development.

Primary author: Dr NEETHLING, Pieter (Laser Research Institute, University of Stellenbosch)

Co-authors: Prof. ROHWER, Erich (Laser Research Institute, University of Stellenbosch); Prof. SCHWOERER, Heinrich (Laser Research Institute, University of Stellenbosch); Dr BOTHA, Lourens (CSIR National Laser Centre)

Presenter: Dr NEETHLING, Pieter (Laser Research Institute, University of Stellenbosch)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 256

Type: **Poster**

Carbon nanotube/nickel oxide nanocomposite thin films for selective solar absorber

Multi-walled carbon nanotube (MWCNT)/Nickel oxide nanocomposites were prepared on aluminum substrates for selective solar absorber applications. MWCNTs are functionalized in order to disperse in water and ethanol. Results from the characterization of the composite samples using techniques such as transmission and scanning electron microscopies will be presented and discussed.

Primary author: Dr RORO, Kittessa (NLC-CSIR)

Presenter: Dr RORO, Kittessa (NLC-CSIR)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 257

Type: **Presentation**

Star formation thresholds in two atypical star-forming dwarfs

Star formation is a major driver of galaxy evolution. A suite of star formation models is examined for two atypical star-forming dwarf galaxies in order to quantify the relationships between their star formation activity and the properties of their inter-stellar media. High-quality HI, far infrared and far-ultra violet imaging is used to accomplish this. The star formation threshold of each galaxy is shown to depend on global kinematics as well as the stellar and dark matter potentials. Alternatively, adopting the rotational shear as a characterisation of the global kinematics allows for accurate descriptions of the star formation.

Primary author: Dr ELSON, Ed (University of Cape Town + South African Astronomical Observatory)

Co-authors: Prof. DE BLOK, Erwin (UCT); Prof. KRAAN-KORTEWEG, Renee (UCT)

Presenter: Dr ELSON, Ed (University of Cape Town + South African Astronomical Observatory)

Track Classification: Track D1 - Astrophysics

Contribution ID: 258

Type: **Presentation**

Measurements of the Temperature of the Tungsten Hexa-Ethoxide Pyrolysis Flame using IR Camera

In laser pyrolysis, temperature measurement and control plays a vital role during the development of nanoparticles. We present the results of temperature measurements using infrared camera on a tungsten hexa-ethoxide pyrolysis flame used to synthesize nanoparticles from laser pyrolysis technique.

Primary author: Mr MUDAU, Azwitamisi (Defence, Peace, Safety and Security, Council for Scientific and Industrial Research)

Co-authors: Dr MWAKIKUNGA, Bonex (National Laser Centre, Council for Scientific and Industrial Research); Mr NEELS BRINK, Neels (Denel Dynamics)

Presenter: Mr MUDAU, Azwitamisi (Defence, Peace, Safety and Security, Council for Scientific and Industrial Research)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 259

Type: **Presentation**

Network knowledge base on low-energy nuclear physics

The project “Knowledge base on low-energy nuclear physics” allocated in the Web solves the two following problems: 1) Fast and visual getting of experimental data on nuclear structure and cross sections of nuclear reactions, a possibility for processing these data, their comparison and plotting the studied regularities and systematizations. 2) Analysis of experimental data and modeling the processes of nuclear dynamics within the foolproof codes based on the well-established physical approaches just in a window of the Web-browser.

Primary author: Dr KARPOV, Alexander (Flerov Laboratory of Nuclear Reactions, JINR)

Co-authors: Mr ALEXEEV, Alexander (Chuvash State University); Dr DENIKIN, Andrey (International University of Nature, Society and Man, “Dubna”); Mr NAUMENKO, Mikhail (Flerov Laboratory of Nuclear Reactions, JINR); Prof. ZAGREBAEV, Valery (Flerov Laboratory of Nuclear Reactions, JINR)

Presenter: Dr KARPOV, Alexander (Flerov Laboratory of Nuclear Reactions, JINR)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 260

Type: **Poster**

The Search for Short Period Transients in XMM-Newton Data

The XMM-Newton observatory has 10 years worth of data archives. The data is analyzed by a standard pipeline that does not search for transients. I researched into three different methods which would search for transients and found that the Kuiper test was the most sensitive.

Primary author: Mr SIMON, Thuso (Astronomy Department, Astrophysics, Cosmology and Gravity Centre (ACGC), University of Cape Town)

Presenter: Mr SIMON, Thuso (Astronomy Department, Astrophysics, Cosmology and Gravity Centre (ACGC), University of Cape Town)

Track Classification: Track D1 - Astrophysics

Contribution ID: 261

Type: **Poster**

Determination of the Emissivity of Tungsten Hexa-Ethoxide Pyrolysis Flame using Fourier Transform Infrared (FTIR) Spectroscopy

To determine the temperature using infrared cameras, the following issues need to be addressed, the emissivity of the object and atmospheric path effects. The latter is negligible in the setup used. In this paper we present the emissivity of the flame determined from the transmissivity measured using the FTIR Spectroscopy.

Primary author: Mr MUDAU, Azwitamisi Eric (Defence, Peace, Safety and Security (DPSS), Council for Scientific and Industrial Research (CSIR))

Co-authors: Dr FORBES, Andrew (National Laser Centre (NLC), Council for Scientific and Industrial Research (CSIR)); Mr MWAKIKUNGA, Bonex (National Laser Centre (NLC), Council for Scientific and Industrial Research (CSIR)); Mr WILLERS, Cornelius (Defence, Peace, Safety and Security (DPSS), Council for Scientific and Industrial Research (CSIR)); Mr SHIKWAMBANA, Lerato (National Laser Centre (NLC), Council for Scientific and Industrial Research (CSIR)); Mr GOVENDER, Malcolm (National Laser Centre (NLC), Council for Scientific and Industrial Research (CSIR)); Mr BRINK, Neels (Denel Dynamics)

Presenter: Mr MUDAU, Azwitamisi Eric (Defence, Peace, Safety and Security (DPSS), Council for Scientific and Industrial Research (CSIR))

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 262

Type: **Presentation**

Do (anti)neutrinos influence radioactive decay rates?

A recent paper by Jenkins et al. suggested that the radioactive decay rate of certain radionuclides may be influenced by the neutrino flux from the Sun which varies with the distance between the Sun and Earth. This paper reports on measurements made at a reactor to test this claim.

Primary author: Prof. DE MEIJER, R.J. (Stichting EARTH, deWeehorst, 9321 XS 2, Peize, the Netherlands. 2 Department of Physics, University of the Western Cape, Bellville, South Africa)

Co-authors: Dr SMIT, Frederick David (iThemba LABS, , PO Box 722, Somerset West 7129, South Africa); Dr BLAAUW, M. (3Reactor Institute Delft, Faculty of Applied Sciences, Delft University of Technology, Mekelweg 15, 2629 JB Delft, the Netherlands)

Presenter: Dr SMIT, Frederick David (iThemba LABS, , PO Box 722, Somerset West 7129, South Africa)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 263

Type: **Poster**

Temperature measurements of C-NiO sol-gel composite films using a negative temperature coefficient (NTC) thermistor

Sol-gel technique was used for fabrication of C-NiO coatings. These coatings are used as selective solar absorbers for solar water heating purposes. A home-test facility was built to test the absorption efficiency of C-NiO coatings, and performances of these coatings were compared to black-paint coating and a non-coated aluminium plate.

Primary authors: Ms DEGAMA, Mapule (Council for Scientific and Industrial Research (CSIR)); Ms WITTES, Thobeka (Council for Scientific and Industrial Research (CSIR))

Co-authors: Prof. FORBES, Andrew (Council for Scientific and Industrial Research (CSIR)); Dr ROBERTS, Ted (Council for Scientific and Industrial Research (CSIR))

Presenters: Ms DEGAMA, Mapule (Council for Scientific and Industrial Research (CSIR)); Ms WITTES, Thobeka (Council for Scientific and Industrial Research (CSIR))

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 264

Type: **Poster**

Pulse shaping and characterization with a 4f system

The design of the pulse shaping setup as well as factors taken into account in choosing a specific setup will be discussed. We investigate the generation of simple shaped pulses to test our pulse shaper setup. Difference frequency mixing is used to transfer the pulse shape to the mid-infrared regime.

Primary author: Ms BOTHA, Nicolene (CSIR, NLC)

Co-authors: Dr DU PLESSIS, Anton (NLC); Prof. SCHWOERER, Heinrich (LRI); Dr UYS, Hermann (NLC); Dr BOTHA, Lourens (NLC)

Presenter: Ms BOTHA, Nicolene (CSIR, NLC)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 265

Type: **Poster**

The Stability of High Pressure Phase of B₂O₃

The stability of boron trioxide is studied using the plane wave's pseudopotentials calculations. The hydrostatic pressure against volume at room temperature is being varied to determine the minimum energy possible for phase transformation. Our results agree well with various boron trioxide calculations and experiments.

Primary authors: Mr MOLOANTOA, Jacob (University of Limpopo); Dr MOSUANG, Thuto (University of Limpopo)

Co-author: Dr RAMMUTLA, Erasmus (University of Limpopo)

Presenters: Mr MOLOANTOA, Jacob (University of Limpopo); Dr MOSUANG, Thuto (University of Limpopo)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 266

Type: **Poster**

Radiometric analysis of canned fruit sample by Gamma-ray spectrometry

Samples of canned fruits were liquidised and counted using a HPGe detector system. The acquired gamma-ray spectra were analysed for traces of ^{137}Cs and ^{40}K radionuclides and determining the activity concentrations in the samples. Results of a detailed investigation optimisation of the methodology limits will be presented for reference material.

Primary author: Ms ZIWANI, Lungiswa (iThemba labs)

Co-authors: Mr HLATSHWAYO, I.N (iThemba LABS); Dr MALEKA, P.P. (iThemba LABS); Dr NEWMAN, R.T. (iThemba LABS); Ms MUFHADI, T (iThemba LABS)

Presenter: Ms ZIWANI, Lungiswa (iThemba labs)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 267

Type: **Poster**

Towards the all-optical determination of temperatures in invisible plumes by infrared thermography and in-situ IR spectroscopy during the CO₂ laser pyrolysis of metallorganic droplets

We report on the first online observation of invisible plumes in the CO₂ laser system by use of a CEDIP Instruments Inc. infrared camera. Examples of movie clips of the flame are presented. We also present results of ingenious experiments on spectroscopy of such flames by means of an RS Series of the BOMEM FTIR employing two types of the Cincinnati Electronics Laboratories IR detectors operating at liquid nitrogen temperature. The spectra show new absorption peaks. Temperatures vs laser power and vs laser wavelength are presented

Primary author: Dr MWAKIKUNGA, Bonex (CSIR National Laser Centre)

Co-authors: Prof. FORBES, Andrew (CSIR National Laser Centre); Mr MUDAU, Azwitamisi (CSIR Defense Peace Safety and Security); Prof. SIDERAS-HADDAD, Elias (University of the Witwatersrand); Mr SHIKWAMBANA, Lerato (CSIR National Laser Centre); Mr GOVENDER, Malcolm (CSIR National Laser Centre); Mr WILLIERS, N (CSIR Defense Peace Safety and Security)

Presenter: Dr MWAKIKUNGA, Bonex (CSIR National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 268

Type: **Presentation**

Spray deposition of C-NiO thin films for selective solar absorber applications

C-NiO was spray deposited on large scale aluminium substrate for use as cost-effective selective solar absorbers. These films were characterized structurally and optically. Absorptance of up to 0.8 calculated from UV/Vis spectrophotometry was achieved on these coatings. Their SEM images revealed pores while Raman revealed presence of predominantly graphite carbon.

Primary author: Mr TILE, Ngcali (CSIR NLC)

Presenter: Mr TILE, Ngcali (CSIR NLC)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 269

Type: **Poster**

Optimization of a Ho³⁺:YLF amplifier model

A laser amplifier model was produced for Ho³⁺:YLF and used for parametric optimization of the amplifier gain. The interaction is approximated with a rate equation approach. A maximum gain of 2.3 in energy was recorded for the particular model configuration.

Primary author: Mr COLLETT, oliver (National Laser Center)

Co-authors: Dr BOLLIG, Christoph (National Laser Center); Mr ESSER, Daniel (National Laser Center)

Presenter: Mr COLLETT, oliver (National Laser Center)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 270

Type: **Presentation**

Status of the iThemba LABS radioactive beam project

A proposal to develop a radioactive beam facility at iThemba LABS is being developed. It envisages the addition of a new cyclotron, a k70 negative-ion accelerator. Such an accelerator can supply two beams simultaneously, one to be used for isotope production and neutron therapy, the other to create radioactive ions. These can be post accelerated by the existing SSC accelerator to energies of 5~7 MeV/A. It is envisaged that the beamtime available for nuclear physics, presently restricted to weekends only, will more than double.

Primary author: Dr BARK, Robert (iThemba LABS)

Presenter: Dr BARK, Robert (iThemba LABS)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 271

Type: **Poster**

Fine Structure of the Isovector Giant Dipole Resonance: a survey with (p,p') scattering at zero degrees

A survey of the fine structure of the Isovector Giant Dipole Resonance (IVGDR) was investigated using the newly commissioned zero degree capability of the $K = 600$ magnetic spectrometer of iThemba LABS. Scattering (p,p') data were obtained over a wide target-mass range, at 200 MeV. Experimental techniques and preliminary results are presented.

Primary authors: Mr KUREBA, Chamunorwa Oscar (University of the Witwatersrand, South Africa); Mr JINGO, Maxwell (University of the Witwatersrand, South Africa)

Co-authors: Ms HELMANN, Anna-Maria (Institut für Kernphysik, Technische Universität Darmstadt, Germany); Prof. TAMII, Atsushi (Research Center for Nuclear Physics, Osaka University, Japan); Dr FOURIE, Dirk (iThemba LABS, Cape Town, South Africa); Prof. SIDERAS-HADDAD, Elias (University of the Witwatersrand, South Africa); Ms POLTORATSKA, Iryna (Institut für Kernphysik, Technische Universität Darmstadt, Germany); Dr USMAN, Iyabo (iThemba LABS, Cape Town, South Africa); Mr MIRA, Joel (iThemba LABS, Cape Town, University of Stellenbosch, South Africa); Prof. CARTER, John (University of the Witwatersrand, South Africa); Dr PAPKA, Paul (iThemba LABS, Cape Town, University of Stellenbosch, South Africa); Prof. VON NEUMANN-COSEL, Peter (Institut für Kernphysik, Technische Universität Darmstadt, Germany); Dr NEVELING, Retief (iThemba LABS, Cape Town, South Africa); Dr SMIT, Ricky (iThemba LABS, Cape Town, South Africa); Prof. FEARICK, Roger (University of Cape Town, South Africa); Dr MURRAY, Sean (iThemba LABS, Cape Town, South Africa); Dr FORTSCH, Siegfried (iThemba LABS, Cape Town, South Africa); Dr BUTHELEZI, Zinhle (iThemba LABS, Cape Town, South Africa)

Presenter: Mr JINGO, Maxwell (University of the Witwatersrand, South Africa)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 272

Type: **Presentation**

A survey of the experience of selected first year engineering students at the University of Pretoria

In 2009 the first cohort of students who wrote the new National Senior Certificate entered South Africa's universities. Failure rates in the first semester in the sciences were higher than before. A survey conducted with students who moved from BEng to the 4-year BSc reveals what students saw as problems.

Primary author: Prof. GRAYSON, Diane (University of Pretoria)

Presenter: Prof. GRAYSON, Diane (University of Pretoria)

Track Classification: Track E - Physics Education

Contribution ID: 273

Type: **Presentation**

Nature of phonon confinement and phonon splitting in V₂O₅ and VO₂ bi-layered nano-ribbon grown by ultrasonic spray pyrolysis

Raman spectroscopy of the nano-ribbons, about 10 nm thick as found by AFM, is discussed in the framework of the Richter equation for phonon confinement (1) as modified for thin films by Faucet & Campbell¹, (2) as modified by Kim et al² for slabs and (3) our own modification based on the transformation from the spherical coordinates in the Richter equation to Cartesian coordinates; this being in keeping with the ribbon geometry. For ribbons whose thickness is too small for phonon confinement models, phonon splitting is observed and this is explained in terms of Lermann et al³ and Volodin et al's⁴ formalisms.

Primary author: Dr MWAKIKUNGA, Bonex (CSIR National Laser Centre)

Presenter: Dr MWAKIKUNGA, Bonex (CSIR National Laser Centre)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 274

Type: **Presentation**

A description of the University of Pretoria's Engineering Augmented Degree Programme

For many years only about 1/3 of the students who registered for a BEng obtained their degree in four years. Since 1994 a minority of students were registered for a 5-year programme that spread two years over three. But most of these students took longer. In 2010 a new, carefully structured 5-year degree is being offered.

Primary author: Prof. GRAYSON, Diane (University of Pretoria)

Presenter: Prof. GRAYSON, Diane (University of Pretoria)

Track Classification: Track E - Physics Education

Contribution ID: 275

Type: **Poster**

Versatile Interferometer System for Inscription of Fiber Bragg Gratings

In this paper we describe the hardware, software control and experimental results for an interferometric Bragg writing setup at various written wavelengths within the 1550nm and 1310nm telecommunication windows.

Primary authors: Prof. MEYER, Johan (University of Johannesburg); Dr MARTINEZ, Rodolfo (University of Johannesburg); Mr DU TOIT, Ruan (University of Johannesburg)

Presenter: Mr DU TOIT, Ruan (University of Johannesburg)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 276

Type: **Poster**

Electrical characterization of ruthenium and Iridium Schottky contacts on n-Ge (100)

Ruthenium (Ru) and Iridium (Ir) Schottky barrier diodes were electron beam deposited on (100) n-type germanium. Electrical characterization of these contacts using current-voltage and capacitance-voltage measurements was performed under various annealing conditions. The variation of the electrical properties of these Schottky contacts can be attributed to the combined effects of interfacial reactions and phase transition during the annealing process.

Primary author: Mr CHAWANDA, Albert (University of Pretoria)

Co-authors: Dr NYAMHERE, C (Nelson Mandela Metropolitan University); Prof. AURET, F.D (University of Pretoria); Dr NEL, J.M. (University of Pretoria); Dr DIALE, M (University of Pretoria); Mr COELHO, S.M.M (University of Pretoria); Mr MTANGI, W (University of Pretoria)

Presenter: Mr CHAWANDA, Albert (University of Pretoria)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 277

Type: **Presentation**

One parameter scaling for the massive Dirac equation with scalar disorder.

A massive two dimensional Dirac particle in a random electrostatic potential is considered. For a ribbon geometry (width \ll length), the Lyapunov exponent is calculated as a function of ribbon width, for several energies and disorder strengths. Intriguingly, an attempt to demonstrate one parameter scaling is only partially successful.

Primary author: Dr SNYMAN, Izak (NITheP)

Presenter: Dr SNYMAN, Izak (NITheP)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 278

Type: **Poster**

Habitable Zones in the Universe and Around Stars with Discovered Exoplanets

The habitability zone is a region where planets can form with suitable conditions for life, these regions can be localized to galactic habitability zones and circumstellar habitability zones. These will be discussed along with the application of habitability models around stars to the planetary systems that have been discovered.

Primary author: Mr MOGOTSI, Moses (UCT)

Presenter: Mr MOGOTSI, Moses (UCT)

Track Classification: Track D1 - Astrophysics

Contribution ID: 279

Type: **Poster**

Development of ^9Be beam and measurement of $^9\text{Be} + ^9\text{Be}$ elastic scattering at iThemba LABS (Gauteng)

The 6 MV EN tandem accelerator of iThemba LABS (Gauteng) will be used for the measurement of $^9\text{Be} + ^9\text{Be}$ elastic scattering. An excitation function and an angular distribution will be measured. The beam development exercise, experimental techniques and new results will be presented.

Primary author: Mr MAYIDA, Innocent (University of Witwatersrand)

Co-authors: Prof. SIDERAS-HADDAD, Elias (university of Witwatersrand); Prof. CARTER, John (university of Witwatersrand)

Presenter: Mr MAYIDA, Innocent (University of Witwatersrand)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 280

Type: **Presentation**

Single Frequency 2 μ m MOPA delivering 200mJ at 50Hz

We present a high energy master oscillator power amplifier consisting of a Holmium-doped slab amplifier, a diode-pumped Thulium-slab pump laser, and a single frequency Ho:YLF ring seed laser. The amplifier delivered up to 210 mJ at 2064 nm with a beam quality factor of $M2 \leq 1.4$ in both planes.

Primary author: Mr JACOBS, Cobus (CSIR National Laser Centre)

Co-authors: Dr BOLLIG, Christoph (CSIR National Laser Centre); Mr ESSER, Daniel (CSIR National Laser Centre); Mr PREUSSLER, Dieter (CSIR National Laser Centre); Dr STRAUSS, Hencharl (CSIR National Laser Centre); Mr NYANGAZA, Kwanele (CSIR National Laser Centre); Mr COLLETT, Oliver (CSIR National Laser Centre); Mr KOEN, Wayne (CSIR National Laser Centre)

Presenter: Mr JACOBS, Cobus (CSIR National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 281

Type: **Poster**

The confinement of Graphene nanosheets in an isolated one dimensional system

With freakishly mobile electrons that can blaze through the material at nearly the speed of light, 100 times faster than electrons can move through silicon, and its amazing mechanical properties, graphene became the rise of future mecha and optoelectronic. The main goal of this work is to confine Graphene nanosheets in polymeric 1-D systems.

Primary author: Mr KHENFOUCH, MOHAMMED ((1)Faculty of Sciences Dhar el Mahraz, Lab. of solid state physics, Polymers and nanomaterials group , BP 1796 Atlas Fez 30 000.(2) Nanoscience Laboratories, Materials Physics Dept., iThemba LABS-National Research Foundation, P O Box 722, Somerset West 7129, Faure, South Africa)

Co-authors: Prof. AARAB, HASSANE (Faculty of Sciences Dhar el Mahraz, Lab. of solid state physics, Polymers and nanomaterials group , BP 1796 Atlas Fez 30 000); Prof. MAAZA, MALEK ((2) Nanoscience Laboratories, Materials Physics Dept., iThemba LABS-National Research Foundation, P O Box 722, Somerset West 7129, Faure, South Africa); Prof. BAÏTOUL, MIMOUNA ((1)Faculty of Sciences Dhar el Mahraz, Lab. of solid state physics, Polymers and nanomaterials group , BP 1796 Atlas Fez 30 000)

Presenter: Mr KHENFOUCH, MOHAMMED ((1)Faculty of Sciences Dhar el Mahraz, Lab. of solid state physics, Polymers and nanomaterials group , BP 1796 Atlas Fez 30 000.(2) Nanoscience Laboratories, Materials Physics Dept., iThemba LABS-National Research Foundation, P O Box 722, Somerset West 7129, Faure, South Africa)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 282

Type: **Presentation**

Pump-Probe Spectroscopy of photo induced charge transfer in Zinc Phthalocyanine - Carbon Nanotube donor-acceptor pairs

Various derivatives of a zinc phthalocyanine molecule, covalently linked or adsorbed to the surface of carbon nanotubes, are excited at their respective absorption bands to subsequently monitor transmission changes with a delayed probe pulse. The aim is to identify charge separated states, their lifetimes and the pathway of the induced photoreaction.

Primary author: Mr ROHWER, Egmont (Stellenbosch University)

Presenter: Mr ROHWER, Egmont (Stellenbosch University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 283

Type: **Poster**

Ultrafast Transient Absorption Spectroscopy at the LRI

A detailed overview of the current UTA setup at the LRI is presented in poster format. Specific attention is given to the improvements and alterations made in the past year that has allowed for increased sensitivity, spectral versatility, temporal resolution and operational reliability.

Primary author: Mr ROHWER, Egmont (Stellenbosch University)

Presenter: Mr ROHWER, Egmont (Stellenbosch University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 284

Type: **Poster**

Study of Alpha Decay for Heavy and Superheavy Nuclei

Alpha decay characteristics (ground-state masses, Q-values, decay lifetimes and nuclear potentials) have been studied extensively using various methods and models. A computer visualization code will be developed and tested on available experimental data and make predictions for experimentally unexplored region. The final product will be incorporated into low-energy nuclear database.

Primary author: Mr MALULEKE, Tinyiko (Student)

Co-author: Mr KARPOV, Alexander (Researcher)

Presenter: Mr MALULEKE, Tinyiko (Student)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 285

Type: **Presentation**

Antisymmetrised Molecular Dynamics For Realistic Nucleon-Nucleon Potentials

A technique of approximating expectation values of realistic nuclear Hamiltonian with the antisymmetrised molecular dynamics wave function is presented. Phenomenological nucleon-nucleon potentials with analytical expectation values are used for illustration. The results obtained with the approximation are compared with those obtained with analytical evaluation.

Primary author: Mr RAMPHO, Gaotsiwe Joel (University of South Africa)

Presenter: Mr RAMPHO, Gaotsiwe Joel (University of South Africa)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 286

Type: **Poster**

Structure of Light Nuclei Studied with Antisymmetrised Molecular Dynamics

Ground-state properties and cluster structure of Helium and Berilium nuclei are studied with the antisymmetrised molecular dynamics. The Hamiltonian of the nuclei is described with a semi-realistic nucleon-nucleon potential. The results obtained are compared with experimental data

Primary author: Mr RAMPHO, Gaotsiwe Joel (University of South Africa)

Presenter: Mr RAMPHO, Gaotsiwe Joel (University of South Africa)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 287

Type: **Poster**

Charge Form-Factors of Light Nuclei Studied with Antisymmetrised Molecular Dynamics

Charge form-factors of three- and four-nucleon systems are extracted from elastic electron scattering using antisymmetrised molecular dynamics wave functions. The Hamiltonian of the nuclei is described with a semi-realistic nucleon-nucleon potential. The results obtained are compared with some experimental data.

Primary author: Mr RAMPHO, Gaotsiwe Joel (University of South Africa)

Co-author: SOFIANOS, Sofianos A. (University of South Africa)

Presenter: Mr RAMPHO, Gaotsiwe Joel (University of South Africa)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 288

Type: **Presentation**

Test of Fast Neutron Detectors for Spectroscopy

A large volume neutron detector was developed to investigate the very selective $(^3\text{He},n)$ reaction. The performance of the detector was tested using muon cosmic rays and neutrons emitted from the $^{232}\text{Th}(^4\text{He},xn)$ reaction.

Primary author: Mr ELBASHER, Mohamed (Nuclear Physics Research Group)

Presenter: Mr ELBASHER, Mohamed (Nuclear Physics Research Group)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 289

Type: **Poster**

Thermal performance of a Photovoltaic water heating system (PVWHS)

The efficiency of photovoltaic module is largely affected by high operating temperatures. This paper discusses the effect of a batch water system on a SP70 photovoltaic module. Heat exchange in the system was noted to take place. Infrared camera, PVPM1000C device, thermocouples and a data logger were used for data collection.

Primary author: Mr MTUNZI, Busiso (Fort Hare Institute of Technology, University of Fort Hare, Physics Department)

Co-author: Prof. MEYER, Edson (Fort Hare Institute of Technology, Physics Department, University of Fort Hare)

Presenter: Mr MTUNZI, Busiso (Fort Hare Institute of Technology, University of Fort Hare, Physics Department)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 290

Type: **Poster**

Design of anaerobic digester with automatic temperature control

Unnecessary temperature fluctuations due to factors such as self heating effect adversely affect performance and stability of anaerobic digesters [1]. A digester will be designed with an automatic temperature regulation mechanism that incorporates sensors, temperature regulator and cooling/heating system, which will be triggered into action upon receiving sensor instructions resulting from detection of unnecessary temperature fluctuations.

Primary author: Mr PAGONA, Felix (Fort Hare Institute of Technology, Physics Department)

Presenter: Mr PAGONA, Felix (Fort Hare Institute of Technology, Physics Department)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 291

Type: **Poster**

The mechanical stability of PtTi in terms of their heats of formations, phonon dispersions and density of states

We investigate the transformation from B2 to B19/B19' in the PtTi shape memory alloys using density functional theory within the generalized gradient approximation, VASP code [1]. We will present the results on the heats of formation, phonon dispersions and the density of states for the B2, L10, B19 and B19' PtTi structures. Furthermore, we calculated the lattice expansion for the B2 and L10 PtTi structures.

Primary author: Ms MAHLANGU, Rosinah (University of Limpopo)

Co-authors: Dr CHAUKE, Hasani (University of Limpopo); Mr PHASHA, Maje (CSIR); Prof. NGOEPE, Phuti (University of Limpopo)

Presenter: Ms MAHLANGU, Rosinah (University of Limpopo)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 292

Type: **Presentation**

Hydrogen Sensing Behaviour of WO₃ Nanoplatelet Films Synthesized by Aqueous Chemical Growth

We report for the first time the synthesis of WO₃ nanostructured fairly-thin films on transparent glass substrates, this by the low-temperature soft chemistry method of Aqueous Chemical Growth³. The films obtained were structurally and optically characterized. Results on these as well as those on their Hydrogen sensing behaviour as a function of temperature and H₂ concentration (in ppm) are reported.

Primary author: Mr SONE, Bertrand (iThemba LABS-UWC)

Presenter: Mr SONE, Bertrand (iThemba LABS-UWC)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 293

Type: **Poster**

Modelling of the reaction mechanism during laser assisted conversion of methane and carbon dioxide

The direct excitation of CO₂ and CH₄ using a nanosecond pulsed laser was investigated for chemical reaction activation. Results from this study show that carbon dioxide and methane can be activated successfully using nanosecond laser pulses at 355 nm. The results collected from the various experiments were used to create a model of the possible reaction mechanisms using Molecular Modelling.

Primary author: Mr KOTZE, FJ (North-West University)

Co-authors: Dr DU PLESSIS, A (Centre for Scientific and Industrial Research; North-West University); Prof. STRYDOM, CA (North-West University); Dr LACHMAN, G (North-West University); Dr BOTHA, L (Centre for Scientific and Industrial Research)

Presenter: Mr KOTZE, FJ (North-West University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 294

Type: **Presentation**

Computer Controlled DLTS Offset Capacitor System

An offset capacitor system is used to reduce the signal to noise ratio when measuring capacitance transients in Deep Level Transient Spectroscopy (DLTS) to subtract the equilibrium capacitance of the sample. A LabVIEW routine in conjunction with a computer controlled offset capacitance box was build and compared with a standard set capacitor box.

Primary author: Mr DE MEYER, Hannes (University of Pretoria)

Presenter: Mr DE MEYER, Hannes (University of Pretoria)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 295

Type: **Presentation**

Observing structural dynamics of solid state matter with ultrafast electron diffraction

We have constructed an Ultrafast Electron Diffraction setup suitable for studying femtosecond time resolved structural dynamics in solid state matter. The setup has been characterized with respect to its spatial and temporal resolution capability, and measurements confirm that sub-300 femtosecond electron pulses with sufficient spatial resolution capability are achievable.

Primary author: Dr KASSIER, Gunther (Stellenbosch University)

Presenter: Dr KASSIER, Gunther (Stellenbosch University)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 296

Type: **Presentation**

CL stability and surface chemical changes of ZnAl₂O₄:Mn nanocrystalline phosphor

Luminescence characteristics and surface chemical changes of nanocrystalline Mn doped ZnAl₂O₄ powder phosphors are presented. X-ray photoelectron spectroscopy (XPS) was used to determine the chemical composition of the possible compounds formed on the surface as a result of the prolonged electron beam exposure. A stable Al₂O₃ layer was formed on the surface and is possibly contributing to the CL stability of the ZnAl₂O₄:Mn phosphor.

Primary author: Dr PITALE, SS (University of the Free State)

Co-authors: Prof. NTWAEABORWA, OM (University of the Free State); Dr KUMAR, Vinay (University of the Free State)

Presenter: Dr PITALE, SS (University of the Free State)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 297

Type: **Presentation**

Comparison study of polycrystalline and single crystal CeAuGe

The magnetic and electronic properties of polycrystalline and single crystal CeAuGe were investigated from magnetic susceptibility and resistivity measurements. Theoretical resistivity fits describing anisotropic ferromagnetism in the ordered region were performed and illustrates how the energy gap in the magnon excitation spectrum decreases as a function of applied magnetic field.

Primary author: Ms SONDEZI-MHLUNGU, Buyisiwe (University of Johannesburg)

Co-author: Prof. STRYDOM, Andre M. (University of Johannesburg)

Presenter: Ms SONDEZI-MHLUNGU, Buyisiwe (University of Johannesburg)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 298

Type: **Poster**

Vortex Array Oscillations and Their Quantization With Reference to Neutron Stars

We investigate the canonical quantization of axial and Tkachenko oscillation modes of a vortex lattice in a rotating superfluid. We explore possible links between classical vortex theory and the works of Fetter and Owczarek & Slupski. This investigation may be relevant to the timing and glitch behaviour of neutron stars.

Primary author: Mr KEMP, Garreth (University of Johannesburg)

Co-authors: Dr ENGELBRECHT, Christian (University of Johannesburg); Dr FRESCURA, Fabio (University of the Witwatersrand)

Presenter: Mr KEMP, Garreth (University of Johannesburg)

Track Classification: Track D1 - Astrophysics

Contribution ID: 299

Type: **Poster**

Exergy analysis of a building integrated photovoltaic (BIPV) generator of an energy efficient house

In this paper, electrical and exergy analysis of a BIPV generator is presented. Electrical efficiency was found to vary between 13.9% and 17.6% while the indoor Exergy varied from 25.1% to 35.2% between 0900 and 1630hours. Exergy analysis, which deals with maximum energy available from the BIPV generator, gives a more realistic model of the impact that integrated photovoltaic panels have on the built environment.

Primary author: Mr ZIUKU, Sosten (SAIP)

Presenter: Mr ZIUKU, Sosten (SAIP)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 301

Type: **Poster**

Quantitative Investigation of Cu/In thin Films Deposited onto SiO₂ by Electron Beam Evaporation

Thin In/Cu films were grown on a SiO₂ substrate. Both In and Cu layers were grown by e-beam evaporation. The films were characterized with X-ray Diffraction (XRD) and Auger Electron Spectroscopy (AES). The In diffused into the Cu layer during evaporation and formed two intermetallic Cu₁₁In₉ and CuIn₂ phases.

Primary author: Mr MADITI, Moshawe (UFS)

Co-authors: Prof. SWART, HC (UFS); Prof. TERBLANS, JJ (UFS)

Presenter: Mr MADITI, Moshawe (UFS)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: **302**Type: **Presentation**

Recent developments in asteroseismology

Asteroseismology has evolved into a very active research field in stellar astrophysics. The data from a number of recent ground-based surveys and various satellite missions are opening new windows into our understanding of stellar interiors and dynamics. Some of the more prominent new insights are reviewed.

Primary author: Dr ENGELBRECHT, Christian (University of Johannesburg)

Co-author: Dr FRESCURA, Fabio (University of the Witwatersrand)

Presenter: Dr ENGELBRECHT, Christian (University of Johannesburg)

Track Classification: Track D1 - Astrophysics

Contribution ID: 303

Type: **Poster**

Particle multiplicities at RHIC using transport model

Ultrarelativistic heavy ion collisions are useful “tools” to investigate the hot and dense nuclear matter. Particle abundances and ratios have been suggested as possible signatures for exotic states and phase transitions in dense nuclear matter. We used a microscopic transport model to calculate the particle ratios and multiplicities from Au-Au collisions, and compared the preliminary results with the statistical model.

Primary author: Mr THOVHOGI, Tshilidzi (University of Cape Town)

Co-author: Dr AZWINNDINI, Muronga (University of Cape Town)

Presenter: Mr THOVHOGI, Tshilidzi (University of Cape Town)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 304

Type: **Presentation**

Demonstration of a Hybrid Ho:YLF Ho:LuLF Slab Laser

We present a continuous-wave slab laser utilising both Ho:YLF and Ho:LuLF as laser gain media. 30 W of output power at 2 μm was demonstrated in a stable concave-plane resonator while 13 W was achieved in a hybrid stable-unstable configuration when pumped with a high-power Tm:YLF slab laser.

Primary author: Mr ESSER, M J Daniel (CSIR National Laser Centre)

Co-authors: Dr BOLLIG, Christoph (CSIR National Laser Centre); Mr COLLETT, Oliver (CSIR National Laser Centre)

Presenter: Mr ESSER, M J Daniel (CSIR National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 305

Type: **Presentation**

Elastic constants of single crystal InAs_{0.91}Sb_{0.09} determined by surface Brillouin scattering

Surface Brillouin scattering is used to determine the velocities of the Rayleigh surface wave, pseudo-surface wave and longitudinal lateral wave measured in the [100] and [110] directions in a (100) surface of single crystal InAs_{0.91}Sb_{0.09}. Explicit secular functions for the wave velocities are used to extract the elastic constants.

Primary author: Mr KOTANE, Lesias (University of the Witwatersrand)

Co-authors: Prof. EVERY, Arthur (University of the Witwatersrand); Prof. COMINS, Darrell (University of the Witwatersrand); Prof. BOTHA, Reinhardt (Nelson Mandela Metropolitan University)

Presenter: Prof. COMINS, Darrell (University of the Witwatersrand)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 306

Type: **Presentation**

Contactless Power Transfer for Through-Bore Structures - A Study of Rotary Transformers and Capacitors as Probable Avenues

Contact slip rings have inherent characteristics, e.g. contact wear, that hinder their performance. Alternatives include is the use of inductive or capacitive energy storage for contactless power transfer. We investigated the capacitor as an alternative to the standard inductive type contactless slip rings. The resultant prototype system achieves rotary capacitive power transfer at a system efficiency of 17%.

Primary author: Ms SONKO, GLADYS (CSIR)

Co-authors: Mr THERON, HENDRIK (CSIR); Mr SCHLOSS, YAZEED (CSIR)

Presenter: Ms SONKO, GLADYS (CSIR)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: **307**Type: **Presentation**

Mr

The partition function for a single polymer winding around a fixed long rod is calculated. The topological invariance for the system is maintained by modelling the polymer as a sequence of connected flexible chains from which Reidemester moves are applied to enumerate all the accessible conformations.

Primary author: Mr FLORIMOND EUGÈNE, Mpiana Mulamba (Institut of Theoretical Physics, Department of Physics, Stellenbosch University)

Co-author: Prof. MÜLLER-NEDEBOCK, Kristian (Institut of theoretical physics, Department of Physics, Stellenbosch University)

Presenter: Mr FLORIMOND EUGÈNE, Mpiana Mulamba (Institut of Theoretical Physics, Department of Physics, Stellenbosch University)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 308

Type: **Poster**

Forward and Single-Ended Polarization Mode Dispersion Measurements on a Tunable PMD Emulator

Forward and single-ended Polarization Mode Dispersion (PMD) measurements were performed on a tunable PMD emulator. Selected voltages applied to seven electro-optic polarization rotators altered the mode coupling angles between fixed length polarization maintaining fibres thus changing the emulator's PMD statistics to mimic different fibre links.

Primary author: Mr FOSUHENE, Samuel Kofi (Nelson Mandela Metropolitan University)

Presenter: Mr FOSUHENE, Samuel Kofi (Nelson Mandela Metropolitan University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 309

Type: **Presentation**

Some Recent Developments In The Theory of Stellar Convection

We review the essential ingredients of Mixing Length Theory and comment on its effectiveness in modeling stellar convection. We discuss also a competing theory of convection known as the Full Spectrum of Turbulence model, and compare it with Mixing Length Theory. We consider some numerical procedures involved in the implementation of these theories.

Primary author: Mr MOONSAMY, Sashin (University of the Witwatersrand)

Co-authors: Dr ENGELBRECHT, Chris (University of Johannesburg); Dr FRESCURA, Fabio (University of the Witwatersrand)

Presenter: Mr MOONSAMY, Sashin (University of the Witwatersrand)

Track Classification: Track D1 - Astrophysics

Contribution ID: 310

Type: **Poster**

Ab-initio modelling of the electronic and annealing properties of low temperature irradiation-induced defects in silicon and germanium

The electronic and annealing properties of primary radiation induced defects in Si have been studied by means of density functional theory (DFT) calculations using VASP. The results obtained for different functionals have been compared with each other, with results obtained by other groups and where data is available, to experimental values.

Primary author: Dr MEYER, Walter (University of Pretoria)

Co-authors: Prof. AURET, Danie (University of Pretoria); Mr CROUS, Jacq (University of Pretoria); Mr PIENAAR, Jacques (University of Pretoria); Mr JANSE VAN RENSBURG, Johan (University of Pretoria); Prof. CHETTY, Nithaya (University of Pretoria)

Presenter: Dr MEYER, Walter (University of Pretoria)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: **311**Type: **Poster**

Dr

Lie Derivatives and Perturbation of Fluid Flows

We describe the use of the Lie derivative for describing perturbations of fluid flows. We apply the methods developed to some elementary problems in the stability of stellar structure, and discuss the advantages and disadvantages of this approach compared with the standard theory.

Primary author: Dr FRESCURA, Fabio (U Witwatersrand)

Co-author: Dr ENGELBRECHT, Chris (U Johannesburg)

Presenter: Dr FRESCURA, Fabio (U Witwatersrand)

Track Classification: Track D1 - Astrophysics

Contribution ID: 312

Type: **Poster**

Transport and magnetic properties of the rare earth intermetallic cage compounds $\text{Sm}_3\text{Ru}_4\text{Ge}_{13}$

We present electrical resistivity and dc susceptibility measurements in the range of 1.8-300K on cubic $\text{Sm}_3\text{Ru}_4\text{Ge}_{13}$ semiconducting system. At higher temperature the resistivity follows activation type behavior and at lower temperature the onset of antiferromagnetic ordering at $T_N = 5\text{K}$. On the other hand the susceptibility measurement behaves as a Van-Vleck type paramagnet towards higher temperature $240 < T < 400\text{K}$ and modified Curie-Weiss type behavior between $10 < T < 240$, which corresponds to the excited states $J=5/2$ and $J=3/2$ above T_N respectively, under crystal-field interaction.

Primary author: Mr GHOSH, SARIT KUMAR (UNIVERSITY OF JOHANNESBURG)

Co-author: Prof. STRYDOM, A. M. (UNIVERSITY OF JOHANNESBURG)

Presenter: Mr GHOSH, SARIT KUMAR (UNIVERSITY OF JOHANNESBURG)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 313

Type: **Poster**

Implementation of energy dispersive X-ray fluorescence (EDXRF) techniques for rock art painting analysis at iThemba Labs

The complementary use of PIXE (particle induced X-ray emission) and EDXRF (energy dispersive X-ray fluorescence) techniques which was implemented to reduce the analysis time at the Van der Graff accelerator (iThemba Labs). Preliminary results of the rock art elemental composition will be presented.

Primary author: Mr STEYN, Ruan (Stellenbosch University)

Presenter: Mr STEYN, Ruan (Stellenbosch University)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 314

Type: **Poster**

Stellar Masses of Star Forming Galaxies in Cluster

We carry out a chi-square fitting of Spectral Energy Distributions (SEDs) for a set of 25 star forming galaxies in the X-ray luminous cluster MS 0451.6-0305 at $z=0.54$. We determine the best-fit parameters to get clues on stellar populations and physical properties of these galaxies. It shows that derived stellar masses are in good agreement with previous estimates from the literature. However, further analysis is needed, including using different stellar population models, to refine the uncertainties in the stellar mass estimate.

Primary author: Mr RANDRIAMAMPANDRY, Solohery M. (South African Astronomical Observatory)

Co-author: CRAWFORD, S. M. (South African Astronomical Observatory)

Presenter: Mr RANDRIAMAMPANDRY, Solohery M. (South African Astronomical Observatory)

Track Classification: Track D1 - Astrophysics

Contribution ID: 315

Type: **Poster**

Influence of signal input states of polarization on Raman amplification gain in single mode fibres

Raman gain in fibres of low polarization mode dispersion (PMD) depend on the state of polarization (SOP) of the input signal. During forward pumping a large gain variation is observed for certain SOPs when fibre PMD coefficient is below $0.03 \text{ pskm}^{-1/2}$. The gain difference is small for fibres of relatively high PMD parameter.

Primary author: Mr MUGURO, Kennedy (Department of Physics, Nelson Mandela Metropolitan University)

Co-authors: LEITCH, Andrew (Physics Department, Nelson Mandela metropolitan University); CHANGUNDEGA, Jesman (Physics Department, Nelson Mandela metropolitan University)

Presenter: Mr MUGURO, Kennedy (Department of Physics, Nelson Mandela Metropolitan University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 316

Type: **Poster**

Measurements of Boat Motion in Waves at Durban Harbour for Qualitative Validation of Motion Model

The Response Amplitude Operator (RAO) theory was used to develop a mathematical model of boat angular motion. Measurements were made on a harbour patrol boat on sea runs off Durban Harbour. Measurements were first calibrated for axis alignment and then analysed using power spectral density techniques. An estimated roll radius of gyration of 0.4 times the breadth of the vessel was used in the model. Comparison of the measurements to the model shows some correspondence in the frequencies present in the spectra. Discrepancies arise, however, in the spectral power values. The model could be improved by parameter optimisation.

Primary author: Mr MOSIKARE, Oreabetsoe (Council for Scientific and Industrial Research)

Co-authors: Prof. THERON, Nico (University of Pretoria); Dr VAN DER MOLEN, Willem (Council for Scientific and Industrial Research)

Presenter: Mr MOSIKARE, Oreabetsoe (Council for Scientific and Industrial Research)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 317

Type: **Poster**

Dependence of the Degree of Polarization of a Probe Signal on the Pump Wavelength in a Wavelength Division Multiplexed System

For the monitoring of a probe's degree of polarization (DOP), the probe wavelength in a pump-probe Wavelength Division Multiplexed system was fixed while the pump wavelength was varied. Results show the changes in the probe's (DOP). The minimum DOP over the spectrum for varying Pump power was also analyzed.

Primary author: Ms CHANGUNDEGA, Jesman (Nelson Mandela Metropolitan University)

Co-author: Mr MUGURO, Kennedy (Nelson Mandela Metropolitan University)

Presenter: Ms CHANGUNDEGA, Jesman (Nelson Mandela Metropolitan University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 318

Type: **Presentation**

Potential relationship between high energetic particle precipitation over the South Atlantic Magnetic Anomaly and mid-latitude ionospheric scintillation observations – implications to South Africa’s SKA bid.

South Africa’s bid to host the Square Kilometre array (SKA) radio telescope pivots around a number of crucial factors, including the local ionospheric stability. This study investigates the effects of high energetic, electrically-charged particle precipitation over the South Atlantic Magnetic Anomaly on the stability of the South African ionosphere.

Primary author: Dr OPPERMAN, Ben (Hermanus Magnetic Observatory)

Co-author: Dr CILLIERS, Pierre (Hermanus Magnetic Observatory)

Presenter: Dr OPPERMAN, Ben (Hermanus Magnetic Observatory)

Track Classification: Track D2 - Space Science

Contribution ID: 319

Type: **Poster**

MICRORODS AND NANOPATELETS-BASED SENSORS

The optimized and fabricated Zinc Oxide (ZnO) microrods and platelets-based nanostructures were generated using hydrolysis-condensation at mild temperatures. The targeted applications are geared towards ultrasensitive H₂ sensors with detection efficiency as low as 2 ppm. The synthesis and optimization strategy as well as experimental results on hydrogen gas sensing are presented.

Primary author: Mr SITHOLE, Joseph (NRF iThemba Labs)

Co-authors: Dr KNOESEN, Dirk (University of Western Cape); Prof. MAAZA, Malik (NRF iThemba Labs); Dr NKOSI, Mlungisi (NRF iThemba Labs); Dr BUCHER, Remy (NRF iThemba Labs); Mr KHAM-LICH, Saleh (Tshwane University of Technology)

Presenter: Mr SITHOLE, Joseph (NRF iThemba Labs)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 320

Type: **Poster**

Porphyrin nanorods characterization for an artificial light harvesting and energy transfer system

Understanding growth mechanism of porphyrins nanorods by self assembly and molecular recognition is essential for their successful implementation in nanodevices. Optical spectroscopy and FTIR were used to investigate growth mechanism immediately after mixing and onwards. These porphyrins nanorods can be organized into structures performing essential light-harvesting and energy transfer roles.

Primary author: Ms MONGWAKETSI, Nametso (iThemba LABS)

Co-authors: Prof. KLUMPERMAN, Bert (Stellenbosch University); Prof. MAAZA, Malik (iThemba LABS); Dr SPARROW, Raymond (CSIR)

Presenter: Ms MONGWAKETSI, Nametso (iThemba LABS)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 321

Type: **Presentation**

Low temperature H⁺ irradiation and in situ DLTS measurements on ZnO

Semiconductor materials have been irradiated with 1.6 MeV protons at a temperature of 25 K after which in situ electrical characterization was performed to study the electrical active defects created during the irradiation. High resolution Laplace-DLTS was used to determine activation energies, capture cross-sections, defect concentrations and defect annealing kinetics.

Primary author: Mr JANSE VAN RENSBURG, Johan (University of Pretoria)

Presenter: Mr JANSE VAN RENSBURG, Johan (University of Pretoria)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 322

Type: **Presentation**

Unidentified EGRET Blazar Candidates

The Large Area Telescope (LAT) on board the Fermi/GLAST gamma-ray observatory is a pair conversion gamma-ray telescope sensitive to photon energies between 20 MeV and 300 GeV. With its high sensitivity in point source detection, 25 times more than its predecessor the EGRET, and its improved source localisation, Fermi-LAT has shown that it will address some of the unresolved issues left behind by EGRET. In this paper, we report the multi-wavelength properties of the 4 sources detected by Fermi-LAT from our sample of study of high galactic latitudes sources, possibly associated with blazars, selected among the unidentified EGRET sources.

Primary author: Mr NKUNDABAKURA, Pheneas (University of the Free State)

Co-author: Prof. MEINTJES, Pieter (University of the Free State)

Presenter: Mr NKUNDABAKURA, Pheneas (University of the Free State)

Track Classification: Track D1 - Astrophysics

Contribution ID: 323

Type: **Presentation**

Probing the epistemology of senior physics students using EBAPS

EBAPS, a forced-choice instrument designed to probe students' epistemologies, their views about the nature of knowledge and learning in the physical sciences, was administered to groups of senior physics student. The results from preliminary analysis for a group of postgraduate students are presented together with some response data from interviews.

Primary author: Ms NWOSU, VICTORIA (UCT)

Co-author: Prof. SAALIH, Allie (UCT)

Presenter: Ms NWOSU, VICTORIA (UCT)

Track Classification: Track E - Physics Education

Contribution ID: 324

Type: **Poster**

Temperature dependence ESR study of Cr₂O₃.nH₂O nano-particles

In view of devising Chromium III Oxide based photothermal absorbers, the quasi-spherical nano-particles of Cr₂O₃.nH₂O have been synthesized by hydrothermal process. An anomalous thermal hysteresis was detected on Cr₂O₃.nH₂O by using the Electron Spin Resonance Spectroscopy at X-band (9.61 GHz) in the temperature range of 292K–420K. Differential scanning calorimetry (DSC), was used in addition to shed light of the presence of the anomalous thermal hysteresis on Cr₂O₃.nH₂O nano-particles.

Primary author: Mr KHAMLICH, Saleh (Nanoscience)

Co-author: Dr MAAZA, Malik (Nanoscience)

Presenter: Mr KHAMLICH, Saleh (Nanoscience)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 325

Type: **Presentation**

Thin film analysis by Time of Flight– Elastic Recoil Detection

Heavy Ion - Elastic Recoil Detection (HI-ERD) analysis is now a well established ion beam technique in the analysis of thin film materials of technological and medical importance. It is to a large extent the most suitable nuclear analytical technique available for simultaneous identification and quantitative depth profiling of light elements in thin films. This presentation describes a Time of Flight (ToF) spectrometer designed and assembled for Heavy Ion - ERD analysis at iThemba LABS and first analysis results thereof.

Primary author: Mr MSIMANGA, Mandla (iThemba LABS)

Co-authors: Prof. PINEDA-VARGAS, Carlos (iThemba LABS); Prof. COMRIE, Craig (University of Cape Town); Mr MURRAY, Sean (iThemba LABS)

Presenter: Mr MSIMANGA, Mandla (iThemba LABS)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 326

Type: **Presentation**

Planetary wave features and variability of tide at mesosphere/lower thermosphere region

Abstract

The activity of planetary waves and variability of tides in the mesosphere/lower thermosphere (MLT) region was studied using the mesospheric wind velocity. Planetary wave activity observed at the MLT region are the result of upward propagating wave which are excited from the lower region of the atmosphere and sometimes are resulting from tidal modulation at planetary wave. Tidal modulation was investigated as the possible candidate for the planetary wave features in the MLT region.

Primary author: Mr MTHEMBU, Sibusiso (Hermanus Magnetic observatory)

Co-authors: Prof. PILLAY, R. S (UKZN); Dr MALINGA, Sandile (Hermanus Magnetic observatory)

Presenter: Mr MTHEMBU, Sibusiso (Hermanus Magnetic observatory)

Track Classification: Track D2 - Space Science

Contribution ID: 327

Type: **Presentation**

Thermal performance of an oil-pebble/bed thermal energy storage (TES) system for solar cooking

Abstract

Theoretical models of an oil/pebble-bed TES for a solar cooking application are formulated. The experimentally validated models are used to examine the effects of different charging and discharging methods on the thermal performance of the oil/pebble-bed TES system.

Primary author: Dr MAWIRE, Ashmore (North West University, Mafikeng Campus)

Co-author: Prof. TAOLE, Simeon (North West University, Mafikeng Campus)

Presenter: Dr MAWIRE, Ashmore (North West University, Mafikeng Campus)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 328

Type: **Presentation**

Optimisation of two volumetric solar receivers that use oil as a heat transfer fluid

Fluent 6.3 software has been used to optimise the designs of two volumetric receivers. The model results indicate that the use of a wire mesh in these receivers does improve their performance. A wire mesh of porosity ≈ 0.95 has also been found to be sufficient to improve the efficiency

Primary author: Dr MLATHO, JUSTICE S.P (NORTH-WEST UNIVERSITY)

Co-authors: Prof. MCPHERSON, Michael (North-West University); Mr VAN DEN HEETKAMP, Robert J (North-West University); Prof. TAOLE, Simeon H. (North-West University)

Presenter: Dr MLATHO, JUSTICE S.P (NORTH-WEST UNIVERSITY)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 329

Type: **Poster**

Optimizing the conditions for production of hydrogen using biomass gasification

Hydrogen is considered as a novel fuel for the twenty first century, mainly due to its environmentally kindly character. Currently, about 90% of the hydrogen is produced by the reactions of natural gas and steam reforming of light oil fractions. These methods mainly consume fossil fuel as energy source, which is not only full with emission problems, but also fossil fuels are depleting at alarming rate. Therefore, there is need to find alternative ways of hydrogen production based on renewable energy sources such as biomass. The main purpose of this project is to optimize the conditions of high production of hydrogen using biomass gasification

Primary author: Ms MABUDA, Azwihangwisi Iren (University of Fort Hare)

Presenter: Ms MABUDA, Azwihangwisi Iren (University of Fort Hare)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 330

Type: **Poster**

Luminescent properties of nanoparticle CaTiO₃ phosphor

Praseodymium doped calcium titanate phosphors (CaTiO₃:Pr) exhibiting red emission are synthesized by using the sol – gel method and the structures were determined using the X-ray diffraction technique. The photoluminescence properties of the CaTiO₃:Pr were determined using photoluminescence spectroscopy and cathodoluminescence spectroscopy. Particle morphology was determined using Scanning electron microscopy.

Primary author: Mr NOTO, Luyanda Lunga (University of Free State (Student))

Co-authors: Prof. SWART, H. (University of Free State); Prof. TERBLANS, J. J. (University of Free State); Dr PITALE, Shreyas (University of Free State)

Presenter: Mr NOTO, Luyanda Lunga (University of Free State (Student))

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 331

Type: **Poster**

Electronic and Thermal Transport Properties in the $\text{Ce}_x\text{La}_{(1-x)}\text{Ru}_2\text{Al}_{10}$ system

$\text{Ce}_x\text{La}_{(1-x)}\text{Ru}_2\text{Al}_{10}$ ($0.6 \leq x \leq 0.99$) has been investigated by means of electrical resistivity, thermal conductivity and thermopower. Temperature dependence of electrical resistivity reveals metal-insulator transition that shifts systematically towards low temperatures with increasing La concentration. Fairly small thermal conductivity and enhanced thermopower are observed for $x = 0.95$ and 0.99 .

Primary author: Mr PERATHEEPAN, Pararajasingham (Department of Physics, University of Johannesburg, Auckland Park-2006, South Africa)

Co-author: Prof. STRYDOM, Andre M (Department of Physics, University of Johannesburg, Auckland Park-2006, South Africa)

Presenter: Mr PERATHEEPAN, Pararajasingham (Department of Physics, University of Johannesburg, Auckland Park-2006, South Africa)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 332

Type: **Presentation**

Experimental performance of three solar receivers that use oil as a heat transfer fluid

A Conical Tube (CT) and two volumetric solar receivers have been designed. The volumetric receivers have maximum efficiencies of 35 % for outlet temperatures (T_{out}) of 100 oC while that of the CT receiver is 42 %. Thus the CT receiver has best designed.

Primary author: Dr MLATHO, JUSTICE S.P (NORTH-WEST UNIVERSITY)

Co-authors: Prof. MCPHERSON, Michael (North-West University); Mr VAN DEN HEETKAMP, Robert J (North-West University); Prof. TAOLE, Simeon H. (North-West University)

Presenter: Dr MLATHO, JUSTICE S.P (NORTH-WEST UNIVERSITY)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 333

Type: **Poster**

The Development of a Novel Heliostat System for Experimentation and Testing

To perform test on solar energy components and subsystems, a heliostat with louvered mirror-panels mounted on a turntable has been constructed. This paper discusses the development of the control system to direct the reflected radiation to the laboratory hut in which the systems under test are placed.

Primary author: Mr VAN DEN HEETKAMP, Robert Roelof Joseph (North West University (Mafikeng Campus))

Co-authors: Dr MAWIRE, Ashmore (North West University (Mafikeng Campus)); Dr MLATHO, Justice Stanley Peter (North West University (Mafikeng Campus)); Prof. MCPHERSON, Michael (McPherso AcoConsulting)

Presenter: Mr VAN DEN HEETKAMP, Robert Roelof Joseph (North West University (Mafikeng Campus))

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 334

Type: **Poster**

WIRELESS POWER TRANSMISSION FOR WIRELESS SENSOR NETWORKS

Many wireless sensors are getting smaller due to new solid-state devices, increased precision in fabrication and compact layout techniques. Wireless Sensors have been in use for sometime in different applications. Some of these sensors rely on batteries to power them. This makes it cumbersome if a number of them need to be used in some instances with varying distances. These sensors can be made to operate in the presence of microwave field. Microwave wireless power transmission (WPT) is a promising technique for the long-term power supply for small devices such as wireless sensor network (WSN) devices. The primary components include a m

Primary author: Mr TERU, Agboola (University of Fort Hare)

Co-author: Prof. MEYER, Edson (University of Fort Hare)

Presenter: Mr TERU, Agboola (University of Fort Hare)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 335

Type: **Presentation**

Femtosecond Laser Induced Breakdown Spectroscopy applied to depth profiling of 500-micron ZrO₂ spheres

Femtosecond Laser Induced Breakdown Spectroscopy (femto-LIBS) was applied to a depth profiling problem in 500-micron diameter spheres of ZrO₂. The spheres were provided containing silver inside, and in addition they were coated with a thin layer of silver on the surface for this study. This is a feasibility study for diagnosing leakage of radioactive silver through the silicon carbide barrier of fuel particles for a high temperature gas reactor.

Primary authors: Dr DU PLESSIS, Anton (CSIR National Laser Centre); Dr ROBERTS, Ted (CSIR National Laser Centre)

Presenters: Dr DU PLESSIS, Anton (CSIR National Laser Centre); Dr ROBERTS, Ted (CSIR National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 336

Type: **Presentation**

Femtosecond laser control of the chemical reaction of carbon monoxide and hydrogen

Femtosecond laser control of the chemical reaction of CO and H₂ is studied. Specific high-value reaction products can possibly be produced selectively, without need for further separation or purification. In this work, we aim at controlling the reaction between CO and H₂ to produce hydrocarbon products, of interest to the petrochemicals industry. Preliminary experimental results will be presented.

Primary author: Dr DU PLESSIS, Anton (CSIR National Laser Centre)

Presenter: Dr DU PLESSIS, Anton (CSIR National Laser Centre)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 337

Type: **Presentation**

Phootball Physics: The Science of Soccer!

With the World Cup Soccer the biggest talking point of this year, how can we use it to popularise Physics? This show, developed for Sci-Bono Science Centre in Johannesburg, does just that. Investigating the design of the new “Jabulani” soccer ball, how Beckham manages to “bend it” and why peripheral vision is important for passing, it suggests exciting ways to present practical Physics. The Science of Soccer exhibits developed alongside the show will also be presented and evaluated. The presenter has been popularising Physics with exciting shows for over 20 years and will share his experiences.

Primary author: Mr FISH, Derek (Unizul Science Centre)

Presenter: Mr FISH, Derek (Unizul Science Centre)

Track Classification: Track E - Physics Education

Contribution ID: 338

Type: **Presentation**

Seismic waves in the atmospheres of A stars

We discuss the physics of p-modes travelling through the atmospheres of A stars. We show how the fluctuations in opacity affects the perturbations in flux and discuss the new formulae we derived that relates the flux perturbations to temperature and opacity perturbations. Our new formula is compared with other formulae that have been used in the studies of the p-modes

Primary author: Prof. MEDUPE, Rodney (North West University, Mafikeng Campus)

Presenter: Prof. MEDUPE, Rodney (North West University, Mafikeng Campus)

Track Classification: Track D1 - Astrophysics

Contribution ID: 339

Type: **Poster**

Mode-identification using multiphotometric data

Medupe et al (2009) presented a new formula for calculating perturbation in flux as a function of wavelength and mode. They suggested that such a formula will be suitable for mode-identification and will be better than currently used formulae because it takes into consideration the shapes of the eigenfunctions in the atmospheres of A stars, and does not depend on many parameters. In this poster we compare the new formula with multicolor photometric data and see how it compares with existing formula.

Primary author: Prof. MEDUPE, Rodney (North West University, Mafikeng Campus)

Presenter: Prof. MEDUPE, Rodney (North West University, Mafikeng Campus)

Track Classification: Track D1 - Astrophysics

Contribution ID: 340

Type: **Poster**

Mode-identification using multi-colour photometric data of beta Cephei stars

beta Cephei stars are hot massive B stars that pulsate with periods of between 1.6 and 7.7 hours. They oscillate because of seismic waves that travel through these stars. Seismic waves have been used to infer interior conditions and properties of stars. In order for this technique to be used successively, the pulsation modes need to be identified. In this poster we present a mode-identification technique that compares theory with CCD photometric data obtained on the 30inch telescope at Sutherland SAAO observing station.

Primary author: Mr NHLAPO, Daniel (North West University, Mafikeng Campus)

Co-authors: Dr PIGULSKI, Andrzej (Wroclaw University); Prof. MEDUPE, Rodney (North West University, Mafikeng Campus)

Presenter: Mr NHLAPO, Daniel (North West University, Mafikeng Campus)

Track Classification: Track D1 - Astrophysics

Contribution ID: 341

Type: **Presentation**

Effects of target resonances in Multi-Channel Algebraic Scattering

Low-energy nucleon-nucleus elastic scattering involving particle-unbound states in the target spectrum is developed within the framework of a Multi-Channel Algebraic Scattering theory. The effects on the scattering observables when the particle-emission widths are significantly different from zero are discussed.

Primary author: Prof. KARATAGLIDIS, Steven (University of Johannesburg)

Co-authors: Mr VAN DER KNIJFF, Dirk (University of Melbourne); Prof. SVENNE, Juris (University of Manitoba); Prof. AMOS, Ken (University of Melbourne); Prof. CANTON, Luciano (University of Padova); Dr FRASER, Paul (Universidad Nacional Automata de Mexico)

Presenter: Prof. KARATAGLIDIS, Steven (University of Johannesburg)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 342

Type: **Poster**

Effective Interaction of Bosons and Fermions in the Non-Commutative Plane

In non-commutative quantum mechanics position space becomes fuzzy. This has implications for the way particles interact. We show that the effective interaction between fermions and bosons is modified, leading to an apparent violation of Pauli's exclusion principle.

Primary author: Mr HAFVER, Andreas (Stellenbosch University)

Co-author: Prof. SCHOLTZ, Frederik (NITheP)

Presenter: Mr HAFVER, Andreas (Stellenbosch University)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 343

Type: **Presentation**

General Relativistic considerations for Space Geodesy

The accuracy of Space Geodesy techniques have improved to such an extent that routine data analyses need to incorporate the effects of General Relativity Theory (GRT). A comparison between the accelerations perturbing the orbits of the two LAGEOS satellites resulting from GRT and other non-GRT accelerations are made. The analyses of the resulting data have to be done within the framework of a post-Newtonian formalism.

Primary author: Prof. COMBRINCK, Ludwig (HartRAO)

Presenter: Prof. COMBRINCK, Ludwig (HartRAO)

Track Classification: Track D2 - Space Science

Contribution ID: 344

Type: **Poster**

A CdO Based LPD gas Sensor

A CdO based LPG gas sensor has been fabricated from the deposition of CdO thin film on a glass substrate by PLD and Sputtering deposition techniques.

The structural, morphological, chemical compositional analysis and gas sensing properties of the CdO thin films is still needed to be characterized by using SEM,XRD,RBS and UV-VIS Spectrometry, etc. The electrical resistance and gas response of the LPG gas sensor was investigated at different operating temperatures and different gas concentrations.

Primary author: Mr SEFAGE, Amanda (University of Zululand)

Presenter: Mr SEFAGE, Amanda (University of Zululand)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 345

Type: **Poster**

OPTIMISATION OF LASER HARDENING PARAMETERS FOR TURBINE BLADE STEELS

A 4.4 kW Sinar continuous wave Nd: YAG solid-state laser was used for laser hardening of turbine blade steel (chemical composition: 0.19%C; 0.32%Si; 0.38%Mn; 0.01%P; 0.002%S, 12.72%Cr, 0.41%Ni). The laser processing parameter i.e. scan speed and laser power were varied while the temperature was held constant 1050oC. The characterisation of the hardened surfaces was carried out by Optical Microscopy (OPM), Scanning Electron Microscopy (SEM/EDS) and X-ray Diffraction (XRD). Hardness measurements were carried out, a through-thickness hardness profile (indentations from the surface of the alloyed layer through to the base) was determined with a 1

Primary author: Mrs POPOOLA, PATRICIA (TSHWANE UNIVERSITY OF TECHNOLOGY, PRETORIA)

Co-authors: Mr LIPSON, RAMPEDI (NATIONAL LASER CENTRE, CSIR); Mr MANGENA, STEVE LEKEKE (TSHWANE UNIVERSITY OT TECHNOLOGY, PRETORIA)

Presenter: Mr MANGENA, STEVE LEKEKE (TSHWANE UNIVERSITY OT TECHNOLOGY, PRETORIA)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 346

Type: **Poster**

Laser Surface Alloying (LSA) of Martensitic Stainless Steel using Nickel Powder

The current investigation deals with laser surface alloying of nickel powder on martensitic stainless steel, the aim was to improve the hardness of the substrate.

Nd-YAG laser was used with argon as shielding gas and process parameters were varied. The characterization of the alloyed surface was carried out by Optical Microscopy (OPM), Scanning Electron Microscopy (SEM/EDS) and X-ray Diffraction (XRD). The microstructure of alloyed layer shows the nickel powder was well dispersed within the metal matrix. Hardness measures were carried out. The average hardness values for the alloyed layers were calculated. A significant increase in the hard

Primary authors: Mr MUDAU, MALUTA COLBERT (Tshwane University of Technology); Mrs POPOOLA, PATRICIA (Tshwane University of Technology)

Presenter: Mr MUDAU, MALUTA COLBERT (Tshwane University of Technology)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 347

Type: **Poster**

HARDNESS AND MICROSTRUCTURE OF X12CrNiMo MARTENSITIC STAINLESS STEEL LASER ALLOYED WITH TITANIUM CARBIDE

X12CrNiMo martensitic stainless steel was laser alloyed with Titanium Carbide using a 4.4 kW CW Nd-YAG laser. The microstructure of the MMC was investigated using optical microscopy, X-ray diffraction (XRD) meter and scanning electron microscopy (SEM). A Vickers's hardness profile-indentations from the surface of the alloyed zone through to the substrate was measured at 100 μm interval using a load of 200 g. The alloyed Zone reveal a pores and cracks free MSS-TiC MMC. When the laser power and scanning speed were 2 kW and 0.014 m/min respectively, a Vickers's hardness value of two times that of the substrate was achieved in the MMC.

Primary author: Mr ADEBIYI, DAMILOLA ISAAC (TSHWANE UNIVERSITY OF TECHNOLOGY, PRETORIA)

Co-authors: Mrs POPOOLA, A. P. PATRICIAL (TSHWANE UNIVERSITY OF TECHNOLOGY, PRETORIA); Dr OGUNNIYI, IYIOLA OLATUNJI T. (TSHWANE UNIVERSITY OF TECHNOLOGY, PRETORIA)

Presenter: Mr ADEBIYI, DAMILOLA ISAAC (TSHWANE UNIVERSITY OF TECHNOLOGY, PRETORIA)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 348

Type: **Presentation**

Interface energy of multiband superconductors

Using Ginzburg-Landau theory of two band superconductors, we determine the surface energy between coexisting normal and superconducting solutions at the thermodynamic critical field. Close to the transition temperature, T_c , the two band problem maps onto an effective single band problem. While the order parameters of the two bands may have different amplitudes in the homogeneous bulk, near the critical temperature the Josephson coupling between the bands leads to the same spatial dependence of both order parameters near an interface or a vortex. This finding puts into question the possibility of Type 1.5 superconductivity, at least near T_c .

Primary author: Ms GEYER, Jani (NITheP, University of Stellenbosch)

Co-authors: Prof. SCHMALIAN, Joerg (Ames Laboratory, University of Iowa State); Dr FERNANDES, Rafael (Ames Laboratory, University of Iowa State); Dr KOGAN, Vladimir (Ames Laboratory, University of Iowa State)

Presenter: Ms GEYER, Jani (NITheP, University of Stellenbosch)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 349

Type: **Poster**

Thermal characterization of various biomass materials for co-gasification with coal

Investigations into the gasification behavior during co-gasification of coal, biomass materials and coal/biomass blends prepared at different ratios (10:90, 20:80, 30:70, 40:60, and 50:50) have been conducted using a Thermogravimetric analysis (TGA) apparatus. Biomasses (pine wood, eucalyptus and cow dung) and coal (bituminous and lignite) were used. Devolatilization behavior of different coals and biomasses under heating conditions used (20 oC/min and high N₂ flow rate) typical of pyrolysis were investigated for kinetic parameter determination. Simulations were also done for material characterization.

Primary author: Mr MABIZELA, Polycarp (FHIT)

Presenter: Mr MABIZELA, Polycarp (FHIT)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 350

Type: **Poster**

SHORT-PULSE GENERATION IN A DIODE END PUMPED SOLID STATE LASER

A Nd:YVO₄ modelocked laser has been constructed using a resonator designed according to the theoretical parameters. The laser produced pulses in the picosecond region with a maximum average output power of 2.8W. Passive modelocking of the Nd:YVO₄ laser has been demonstrated using a semiconductor saturable absorber mirror (SESAM).

Primary author: Mr NGCOBO, Sandile (CSIR)

Co-authors: Dr BOLLIG, Christoph (CSIR); Prof. VON BERGMANN, Hurbetus (University of Stellenbosch)

Presenter: Mr NGCOBO, Sandile (CSIR)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 351

Type: **Poster**

Design and construction of spray pyrolysis deposition unit for the synthesis of spectrally selective thin solid films

The fabrication of thin solid films was conducted using spray pyrolysis technique where the source solution (Organometallic : Grignard Reagent) was dissolved in diethyl ether and inorganic salts) was sprayed in compressed air for 15 minutes then stop to the heated glass substrate and temperature ranges from 290 oC to 350 oC at the deposition chamber.

Primary author: Ms NJINGANA, Primrose Nositelo (FHIT)

Presenter: Ms NJINGANA, Primrose Nositelo (FHIT)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 352

Type: **Presentation**

Aspects of DC circuits: a fine grained investigation of student conceptions

Little is known about how fine-grained contextual changes impact student reasoning in the context of DC circuits. We report on a study using an open circuit (battery, single wire, resistive element) in which the resistive element (resistor, heating element, light bulb) and the words (“current’, “charge flow”) are inter-changed.

Primary author: Mr JOHN, Ignatius (CPUT)

Co-author: Prof. ALLIE, Saalih (UCT)

Presenter: Mr JOHN, Ignatius (CPUT)

Track Classification: Track E - Physics Education

Contribution ID: 353

Type: **Presentation**

Photometric Analysis of Beta Cephei Type Star "BW Vul"

In this work; the U, B and V light curves of a β Cephei type variable BW Vulpeculae (BW Vul, HD 199140, B2 III) obtained with photometric observations. Besides obtaining the U, B and V light curves for this star, maxima times were obtained as well. Not only the data have been analysed but also the pulsation mode of BW Vul has been identified by Watson (1988) Method.

As a result of these analyses, it's been concluded that BW Vul is pulsating with radial single mode and BW Vul is a member of a binary system.

Primary author: Dr ULUSOY, Ceren (University of Johannesburg)

Co-author: Prof. AKAN, Can (Ege University)

Presenter: Dr ULUSOY, Ceren (University of Johannesburg)

Track Classification: Track D1 - Astrophysics

Contribution ID: 354

Type: **Presentation**

INVESTIGATION OF LUMINESCENCE PROPERTIES OF TERBIUM DOPED Mg_2SiO_4 DOSIMETERIC MATERIAL

Dosimetric characteristics of thermoluminescence(TL) material principally depend on kinetic parameters describing the TL mechanism in the phosphor. Therefore, any reliable dosimetric study of new thermoluminescent materials should include the determination of kinetic parameters, order of kinetics b , activation energy E and frequency factor s . In this study, kinetic parameters of $Mg_2SiO_4:Tb$ dosimeter have been analyzed in terms of TL and also effect of photo-transferred TL (PTTL) has been investigated via various light sources

Primary author: Mr GÜLMEZ, Timuçin (University Of Johannesburg)

Co-authors: Dr EKDAL, Elçin (Ege University); Dr KARALI, Turgay (Ege University)

Presenter: Mr GÜLMEZ, Timuçin (University Of Johannesburg)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 355

Type: **Poster**

Interface properties of O₂ annealed Au/Ni/n-AlGaN and Ir/n-AlGaN Schottky barrier systems

We systematically annealed Ni/Au and Ir Schottky contacts on Al_{0.35}Ga_{0.65}N in O₂. Our Capacitance-Voltage-Frequency (C-V-f) measurements reveal the presence of anomalous peaks at 0.9V for Au/Ni/Al_{0.35}Ga_{0.65}N and at 0.8V and 1.2V for the Ir/Al_{0.35}Ga_{0.65}N contact system. The overall quality of both Schottky systems improves with O₂ annealing up to 573K.

Primary author: Mr LEGODI, Matshisa (University of Pretoria)

Co-authors: Prof. AURET, Danie (Physics Department); Dr MEYER, Walter (Physics Department)

Presenter: Mr LEGODI, Matshisa (University of Pretoria)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 356

Type: **Presentation**

Development of a software to package for the design and calculation of Research Reactors using Monte Carlo and Analytical Methods

There is a global drive to build new research reactors, currently the calculation of various safely and performance parameters is very time consuming for a single design. In the calculation process there are two classes of solutions, Monte Carlo methods which are accurate and flexible but slow and analytical methods which are very fast but not as accurate or flexible. This paper will look at creating a hybrid solution between MCNP (Monte Carlo) and OSCAR (analytical) as well as create input sets for both code systems using AI, this will take months to do without a code system. The code system will be easy to use and aid in reactor calculation

Primary author: Mr GOVENDER, nicolin (Necsa, UKZN, UJ)

Presenter: Mr GOVENDER, nicolin (Necsa, UKZN, UJ)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 357

Type: **Presentation**

Guided acoustic modes and elastic moduli of ZnO nanorods

Elastic and stiffness moduli of vertically aligned single-crystal ZnO nanorods grown on Si(001) substrates were determined quantitatively by the surface Brillouin scattering technique. A longitudinal guided mode at 16 – 18 GHz enabled the exact determination of c_{11} from which c_{11} and c_{44} were measured to be 116 GPa and 42.4 GPa respectively, at room temperature.

Primary author: Dr MATHE, Bhekumusa (University of the Witwatersrand)

Co-authors: Prof. COMINS, Darrell John (University of the Witwatersrand); Dr NAIDOO, Deena (University of the Witwatersrand)

Presenter: Dr MATHE, Bhekumusa (University of the Witwatersrand)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 358

Type: **Presentation**

Physics learning: F for Fail or F for Feat?

F for “fail” or “feat”? The “system” of learning Physical Science in South Africa keeps on getting an F for “fail” in spite of various efforts to improving it. Examples will be provided of this failure and some suggestions discussed on the possible achievement of an F for “feat”.

Primary author: Prof. BASSON, Ilsa (University of South Africa)

Presenter: Prof. BASSON, Ilsa (University of South Africa)

Track Classification: Track E - Physics Education

Contribution ID: 359

Type: **Presentation**

Lightning Atmospheric count rate from Marion Island

The lightning spheric count rate from the VLF receiver at Marion Island is presented. Time variation on short to long scales is investigated, and modeled in terms of lightning activity in the southern hemisphere, taking into account propagation conditions over land, ocean and ice.

Primary author: Mr BREYTENBACH, Johannes (University of Cape Town)

Co-author: Dr COLLIER, Andrew (Hermanus Magnetic Observatory)

Presenter: Mr BREYTENBACH, Johannes (University of Cape Town)

Track Classification: Track D2 - Space Science

Contribution ID: **360**Type: **Poster**

Oxidation of PtSb₂ using ab-initio techniques

Studies of low index surfaces of PtSb₂ have been carried out using the Density Functional theory to oxidize them and find the stability profiles. Indications are there that the oxygen atom (O) and molecules (O₂) prefers to bind with the antimony rather than the platinum atom.

Primary author: Mr MANGWEJANE, Samuel Seshupo (SAIP)

Presenter: Mr MANGWEJANE, Samuel Seshupo (SAIP)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 361

Type: **Presentation**

Stabilities of low and high pressure structures of FePO₄

On introducing amorphisation recrystallisation methods to LiFePO₄, ternaries (FePO₄), will be more amenable than the quaternary LiFePO₄, since they are less complex. Hence we investigate the stabilities of the different polymorphs of FePO₄, before atomistic simulations, by employing the pseudo-potential planewave calculations within the Local Density Approximation (LDA) and parfew-wang Generalized Gradient Approximation (GGA).

Primary author: Mr LETHOLE, NDANDULENI LESLEY (SAIP)

Co-author: Prof. NGOEPE, Phuti Esrom (material modeling center)

Presenter: Mr LETHOLE, NDANDULENI LESLEY (SAIP)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: **362**Type: **Presentation**

IAU Office for Astronomy Development

This non-specialist presentation will discuss South Africa's recent selection as host of the prestigious Office for Astronomy Development, an initiative of the International Astronomical Union (IAU). This office aims to realise the IAU's decadal strategy to take astronomy to the developing world.

Primary author: Mr GOVENDER, Kevindran (South African Astronomical Observatory)

Presenter: Mr GOVENDER, Kevindran (South African Astronomical Observatory)

Track Classification: Track E - Physics Education

Contribution ID: 363

Type: **Poster**

THE EFFECTS OF RADIATION ON PLATINUM BASED ALLOYS AND COATINGS.

The study of radiation effects on platinum binary systems has both the fundamental and applied aspects. It is due to the fact that the formation of ordered domains with the super-lattice structure increases the strength and surface hardness and could also have an impact on surface activity and chemical properties. The changes of mechanical, physical and chemical properties caused by radiation could be of significant importance for application of platinum systems as catalysis, gas sensors, fuel cells and biomedical and nuclear engineering applications. Therefore, various aspects of radiation effects on platinum systems are addressed in this research.

Primary author: Mr KHUMALO, Zakhelumuzi Mesuli (Student)

Co-author: Dr TOPIC, Mira (Researcher)

Presenter: Mr KHUMALO, Zakhelumuzi Mesuli (Student)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 364

Type: **Poster**

ADOPTING AUTOFLUORESCENCE SPECTROSCOPY IN THE DIAGNOSIS OF HUMAN BREAST AND COLORECTAL CANCERS

Fluorescence spectroscopy is an evolving technology that can rapidly differentiate between non neoplastic and malignant tissues. These differences are thought to be due to endogenous fluorophores. This technique is a non-invasive diagnostic tool that can identify diseased tissue sites in vitro and in real time. It could have a major impact on the detection and treatment of cancer. The current study evaluates the utility of autofluorescence spectroscopy to distinguish tissue transformation associated with the malignant change in two types of human cancer, namely breast and colorectal cancer.

Primary author: Mr EL-HUSSEIN M.KAMEL, Ahmed (The National Institute of Laser Enhanced Science, Cairo University)

Presenter: Mr EL-HUSSEIN M.KAMEL, Ahmed (The National Institute of Laser Enhanced Science, Cairo University)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 365

Type: **Presentation**

PHYSICS FRESHMEN – DIFFICULT TO CHANGE

New students prefer to be taught through being given formulae, memorizing definitions and working through memorandums of previous question papers. They show arrogant attitude when they are not taught differently, such as in Interactive Inquiry Learning manner. They improve their attitude only when the confronting experiments give plausible answers. This is a conceptual change: accommodation.

Primary author: Dr MOJI, cable (university of pretoria)

Presenter: Dr MOJI, cable (university of pretoria)

Track Classification: Track E - Physics Education

Contribution ID: 366

Type: **Presentation**

From Para/Helimagnetic to Ferromagnetic Transition of Pulsed Laser Deposited Fe_{1-x}Co_xSi Thin Films

We report pulsed laser deposition synthesis and characterization of polycrystalline Fe_{1-x}Co_xSi thin films on Si (111). Ferromagnetism with significant magnetic hysteresis is found for all films including nominally pure FeSi which reveals transition from paramagnetic and helimagnetic to ferromagnetic for Fe_{1-x}Co_xSi for FeSi and Co doped FeSi.

Primary authors: Dr NGOM, Balla (Techniques Universte Cheikh Anta Diop de Dakar); Dr MANYALA, Ncholu (University of Pretoria)

Co-authors: Prof. BEYE, Aboubaker (Techniques Universte Cheikh Anta Diop de Dakar); Prof. JOHNSON, Alan (University of Pennsylvania); Prof. STRYDOM, Andre (University of Johannesburg); Prof. FORBES, Andrew (National Laser Center, CSIR); Prof. DITUSA, John (Louisiana State University); Prof. MAAZA, Malik (iThemba LABS); Dr BUCHER, Remy (iThemba LABS)

Presenter: Dr MANYALA, Ncholu (University of Pretoria)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 367

Type: **Presentation**

Biological Shield Design for a 20 MW Materials Testing Reactor

In this study we focus on the biological shielding around a 20 MW Oak-Ridge type Materials Testing Reactor. The design of the biological shielding around this type of research reactor was performed at ORNL in the USA in the late 1950s and early 1960s, i.e. in the days before powerful digital computers, powerful codes or accurate cross-section data were available. We investigate several shielding materials and propose an optimal shield design. This proposed design is compared with the existing shield.

Primary author: Mr ESAU, Andrew (NECSA)

Co-author: Mr VAN ROOYEN, Johann (NECSA)

Presenter: Mr ESAU, Andrew (NECSA)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 368

Type: **Presentation**

Nanostructuring diamond surfaces using highly charged ions

The nanostructuring of diamond and graphite surfaces using highly charged ions is studied. Results are presented in terms of changes in morphology and local electronic states observed using atomic force microscopy (AFM) and scanning and tunnelling microscopy (STM) respectively. Energy dependence of defect formation coupled with the use of advanced nanostructuring facilities such as the electron beam ion trap (EBIT) allow the rare opportunity of fabricating scalable solid state quantum information devices and other devices that have been structured on the nanoscale.

Primary author: Mr MAKGATO, Thuto (non member)

Presenter: Mr MAKGATO, Thuto (non member)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 369

Type: **Presentation**

Determination of neutron energy spectra inside a water phantom irradiated by neutrons of energy up to ~ 64 MeV.

A neutron spectrometer based on NE230 deuterated liquid scintillator was developed to measure neutron energy spectra in water. Neutron energy spectra were obtained from measurements of pulse height spectra using the Bayesian unfolding code MAXED. Results from measurements made along the beam-axis compare well with Monte Carlo calculations using MCNPX.

Primary author: Dr HERBERT, Mark (University of the Western Cape)

Co-authors: Prof. BUFFLER, Andy (University of Cape Town); Prof. BROOKS, Frank (University of Cape Town); Dr NCHODU, Rudolph (University of Cape Town); Prof. ALLIE, Saalih (University of Cape Town)

Presenter: Dr HERBERT, Mark (University of the Western Cape)

Track Classification: Track B - Nuclear, Particle and Radiation Physics

Contribution ID: 370

Type: **Poster**

INFLUENCE OF LOW INTENSITY LASER IRRADIATION (LILI) ON GLOBAL METHYLATION OF THE DNA IN CANCER CELLS

Abstract: Since cancer is a result of erroneous regulation of genes, we investigated whether low intensity laser irradiation has an influence on the epigenetic state, specifically global methylation, of the DNA in five different cancer cell lines in vitro. Possible consequences may include changes in gene expression and DNA conformation.

1. Introduction

Photodynamic therapy (PDT) for cancer is a treatment where low intensity light irradiation (LILI) activates a drug that has accumulated in the tumour resulting in cell death (1). LILI itself has an influence on cell metabolism and viability (2), suggesting that the regulation of gene expre

Primary author: Ms JARDINE, Jocelyn (University of Johannesburg)

Co-author: Prof. ABRAHAMSE, Heidi (University of Johannesburg)

Presenter: Ms JARDINE, Jocelyn (University of Johannesburg)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 371

Type: **Presentation**

Novel polymer - attached Nitrogen - doped Carbon nanotube solar cells

A novel photovoltaic device employing poly-3-hexylthiophene attached N-CNTs as active layer, giving $V_{oc} > 0.3V$ and $J_{sc} \sim 1 \text{ mA/cm}^2$, at 100 mW/cm^2 white light illumination is presented. The polymer attached N-CNTs were produced by polymerizing 3-hexylthiophene using FeCl_3 catalyst in the presence of functionalized N-CNTs that had been synthesized by the floating catalyst CVD method.

Primary author: Mr BEPETE, George (DST/NRF Centre of Excellence in Strong Materials and Molecular Sciences Institute, School of Chemistry, University of the Witwatersrand, Private Bag 3, Johannesburg 2050, South Africa)

Co-authors: Mr MAMO, Messai A. (DST/NRF Centre of Excellence in Strong Materials and Molecular Sciences Institute, School of Chemistry, University of the Witwatersrand, Private Bag 3, Johannesburg 2050, South Africa); Prof. COVILLE, Neil J. (DST/NRF Centre of Excellence in Strong Materials and Molecular Sciences Institute, School of Chemistry, University of the Witwatersrand, Private Bag 3, Johannesburg 2050, South Africa); Dr CHIGUVARE, Zivayi (DST/NRF Centre of Excellence in Strong Materials, School of Physics, University of the Witwatersrand, Private Bag 3, Johannesburg 2050, South Africa)

Presenter: Mr BEPETE, George (DST/NRF Centre of Excellence in Strong Materials and Molecular Sciences Institute, School of Chemistry, University of the Witwatersrand, Private Bag 3, Johannesburg 2050, South Africa)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 372

Type: **Presentation**

Novel electronic properties of nanodiamond films

Nanocrystalline diamond films were synthesized by chemical vapor deposition and characterized to explore their potential device applications. Electrical conductivity measurements at low temperatures and high magnetic fields showed weakly localized transport in three dimensions in ultra-nanocrystalline diamond films. Also a semi-classical model is developed to explain their unusual magneto-resistance properties.

Primary author: Mr CHIMOWA, George (University of the Witwatersrand, Nano-scale transport Physics laboratory, School of Physics, P. Bag 3, Wits 2050, Braamfontein, Johannesburg, South Africa.)

Co-authors: Dr CHUROCHKIN, D (University of the Witwatersrand, Nano-scale transport Physics laboratory, School of Physics, P. Bag 3, Wits 2050, Braamfontein, Johannesburg, South Africa.); Dr SHAH, K V (University of the Witwatersrand, Nano-scale transport Physics laboratory, School of Physics, P. Bag 3, Wits 2050, Braamfontein, Johannesburg, South Africa.); Prof. BHATTACHARYYA, S (University of the Witwatersrand, Nano-scale transport Physics laboratory, School of Physics, P. Bag 3, Wits 2050, Braamfontein, Johannesburg, South Africa.); Dr CHIGUVARE, Z (University of the Witwatersrand, Nano-scale transport Physics laboratory, School of Physics, P. Bag 3, Wits 2050, Braamfontein, Johannesburg, South Africa.)

Presenter: Mr CHIMOWA, George (University of the Witwatersrand, Nano-scale transport Physics laboratory, School of Physics, P. Bag 3, Wits 2050, Braamfontein, Johannesburg, South Africa.)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 373

Type: **Presentation**

The Recent Developments of Quantum-secured Communication in Durban

The Centre for Quantum Technology has recently secured the link between the Moses Mabhida Soccer Stadium in Durban with the Joint Operations Centre (JOC) of the province using quantum based encryption systems. The link was used by the eThekweni Municipality during the 2010 FIFA World Cup to encrypt all communication between the stadium and the JOC. This, being the first ever public global event using quantum communication, marks a major milestone in the commercial acceptance of this technology. We present our results and experiences of this project.

Primary author: Mr MIRZA, Abdul (UKZN)

Presenter: Mr MIRZA, Abdul (UKZN)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: 374

Type: **Presentation**

Resonant tunneling in n-doped multi-layered carbon systems

A tight-binding model of carbon superlattice structures with randomly distributed hopping parameters is developed to interpret the effective nitrogen doping effect on large transmission coefficients of electrons. The calculated current density explains successfully the device characteristics of multilayered carbon including layered graphene structures at low temperatures and high magnetic fields.

Primary author: Dr KATKOV, Mikhail (Nano-scale transport Physics laboratory, School of Physics, University of the Witwatersrand, P. Bag 3, Wits 2050, Braamfontein, Johannesburg, South Africa)

Co-authors: Dr CHUROCHKIN, Dmitry (Nano-scale transport Physics laboratory, School of Physics, University of the Witwatersrand, P. Bag 3, Wits 2050, Braamfontein, Johannesburg, South Africa); Prof. BHATTACHARYYA, Somnath (Nano-scale transport Physics laboratory, School of Physics, University of the Witwatersrand, P. Bag 3, Wits 2050, Braamfontein, Johannesburg, South Africa)

Presenter: Dr KATKOV, Mikhail (Nano-scale transport Physics laboratory, School of Physics, University of the Witwatersrand, P. Bag 3, Wits 2050, Braamfontein, Johannesburg, South Africa)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 375

Type: **Presentation**

High field magneto-transport of metal-filled carbon nanotubes

Synthesis of thin multi-walled carbon nanotubes uniformly filled with over 40% of iron is reported. Magneto-resistance measurements of these novel nano-materials at low temperatures over a wide range of magnetic field, up to 12 Tesla establish one-dimensional behavior and show their potentials for novel spintronic device applications.

Primary author: Ms LINGANISO, Ella (Nano-scale transport Physics laboratory, School of Physics and Chemistry)

Co-authors: Mr COLEMAN, Christopher (Nano-scale transport Physics laboratory, School of Physics); Mr CHIMOWA, George (Nano-scale transport Physics laboratory, School of Physics); Dr SHAH, K V (Nano-scale transport Physics laboratory, School of Physics); Prof. COVILLE, Neil (School of Chemistry, Centre of Excellence in Strong Materials); Prof. BHATTACHARYYA, Somnath (Nano-scale transport Physics laboratory, School of Physics, and Centre of Excellence in Strong Materials, University of the Witwatersrand); Dr CHIGUVARE, Zivayi (Nano-scale transport Physics laboratory, School of Physics, Centre of Excellence in Strong Materials,)

Presenter: Ms LINGANISO, Ella (Nano-scale transport Physics laboratory, School of Physics and Chemistry)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 376

Type: **Poster**

Transport properties of multilayered graphene and related carbon systems

Graphene layers were synthesized chemically and characterized systematically by spectroscopic and microscopic techniques. We study electron transport in these materials at low temperatures as well as at high magnetic fields and compare with device properties of multi-layered carbon films to show their potential in sensor device applications.

Primary author: Dr MAMO, Messai (Nano-scale transport Physics laboratory, School of Physics and Centre of Excellence in Strong Materials,)

Co-authors: Mr COLEMAN, Christopher (Nano-scale transport Physics laboratory, School of Physics and Centre of Excellence in Strong Materials,); Prof. COVILLE, Neil (Nano-scale transport Physics laboratory, School of Physics and Centre of Excellence in Strong Materials,); Mr MCINTOSH, Ross (Nano-scale transport Physics laboratory, School of Physics and Centre of Excellence in Strong Materials,); Dr ERASMUS, Rudolph (Nano-scale transport Physics laboratory, School of Physics and Centre of Excellence in Strong Materials,); Prof. BHATTACHARYYA, Somnath (Nano-scale transport Physics laboratory, School of Physics and Centre of Excellence in Strong Materials,)

Presenter: Dr MAMO, Messai (Nano-scale transport Physics laboratory, School of Physics and Centre of Excellence in Strong Materials,)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 377

Type: **Poster**

On the sign of population lensing effect in Chromium-doped materials

We report measurements of polarisability changes $\Delta\alpha$ between the excited and ground states of the chromium active ions in a laser material by using two different methods (time-resolved divergence diagnostic, Z-scan techniques). The first one indicates that $\Delta\alpha < 0$ (converging population lensing), while the second one gives $\Delta\alpha > 0$ (diverging population lensing). This discrepancy has been resolved by introducing the concept of correlation collapse between the centre and the wings of a laser beam subject to intra-cavity clipping.

Primary authors: Mr TRAICHE, Mohamed (CDTA); Mr GODIN, Thomas (CIMAP)

Co-authors: Prof. AIT-AMEUR, Kamel (CIMAP); Dr FROMAGER, Michael (CIMAP); Prof. MON-CORGÉ, Richard (CIMAP); Prof. CATUNDA, Tomaz (Universidade de Sao Paulo)

Presenter: Mr GODIN, Thomas (CIMAP)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 378

Type: **Presentation**

Phototoxic effect of Zinc sulfophthalocyanine photosensitizer on human (DLD-1) and lung (A549) carcinoma cells (in vitro).

Abstract: Photodynamic therapy (PDT) is a minimally invasive therapeutic modality for different cancers. The aim of this study was to determine the phototoxic pattern of Zinc sulfophthalocyanine (ZnPcSmix) photosensitizer in DLD-1 and A549 cells and the extent of PDT using different concentrations of photosensitizer.

Primary author: Mr MANOTO, Sello (Doctoral student U.J)

Presenter: Mr MANOTO, Sello (Doctoral student U.J)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 379

Type: **Poster**

Lasers in Nuclear Physics: Nuclear Structure by Laser Spectroscopy

Studies of hyperfine structure and isotope shifts form a bridge between nuclear and atomic physics and serve as a tool for investigation of nuclear properties and basic physical principles. This work presents some recent results on investigation of nuclear shape and size of rare earth isotopes by laser spectroscopy methods at JINR, Dubna.

Primary author: Dr ZEMLYANOY, Sergey (Joint Institute for Nuclear Research)

Co-authors: Dr MARKOV, Boris (Joint Institute for Nuclear Research); Dr KARAIVANOV, Dimitry (Joint Institute for Nuclear Research); Dr MARINOVA, Krassimira (Joint Institute for Nuclear Research); Prof. GANGRSKY, Yuri (Joint Institute for Nuclear Research)

Presenter: Dr ZEMLYANOY, Sergey (Joint Institute for Nuclear Research)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: **381**Type: **Presentation**

A Rough Guide to Nanomagnetism

The information revolution, which has modified our way of living over the last few decades, has occurred due to the restless exponential growth of information amount that can be processed, stored, and transferred per unit time and unit area of relevant devices. Nanomagnetism is becoming a very important research area in past decades due to its keyrole in this revolution. The main goal of Nanomagnetism is to gain knowledge on spin-dependent phenomena, and to exploit them for new functionalities. This talk will present a review of some of the current developments of nanomagnetism and expose some of the future trends.

Primary author: Dr DEKADJEVI, David (University of Johannesburg)

Presenter: Dr DEKADJEVI, David (University of Johannesburg)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: **382**Type: **Poster**

Polarization Encoded QKD in Fibre

QKD uses quantum mechanics to ensure a secure line of communication between two parties. The implementation of QKD using the BB84 protocol in fibre optic cables is a challenge due to birefringence. However this can now be compensated for in a fibre optic cable, thus allowing polarization encoded QKD in fibre.

Primary author: Ms PILLAY, Sharmini (University of KwaZulu-Natal)

Co-authors: Mr MIRZA, Abdul (University of KwaZulu-Natal); Prof. PETRUCCIONE, Francesco (University of KwaZulu-Natal)

Presenter: Ms PILLAY, Sharmini (University of KwaZulu-Natal)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: **383**Type: **Poster**

SKA Site Comparison Using Satellite Weather Data

Monthly averaged weather parameters for day and night from satellite infrared and microwave data for the areas containing the proposed Square Kilometre Array (SKA) radio telescope core sites in Australia and South Africa are compared.

Primary authors: Ms KOLBE, Isobel (University of Pretoria); Dr GAYLARD, Michael (HartRAO)

Presenter: Dr GAYLARD, Michael (HartRAO)

Track Classification: Track D1 - Astrophysics

Contribution ID: 384

Type: **Poster**

Ab-initio modeling of non-stoichiometric FeO_{1-x}S_x using the VCA approach

We present an ab-initio study of non-stoichiometric mixed iron oxide / sulfide using the virtual crystal approximation (VCA). This allows us to analyse the cell parameter, the bulk modulus and the density of states as a function of sulfur content.

Primary author: Mr MULAUDZI, Masilu Godfrey (Materials Modelling Center - University of Limpopo)

Co-author: Dr ACKERMANN, Lutz (Materials Modelling Center - University of Limpopo)

Presenter: Mr MULAUDZI, Masilu Godfrey (Materials Modelling Center - University of Limpopo)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 385

Type: **Presentation**

Nonequilibrium thermal entanglement for three spin system

The dynamics of a simple spin chain (three spins) coupled to bosonic baths at different temperatures is studied. The dynamics and temperature dependence of spin-spin entanglement is analyzed. Special attention is given to the entanglement in the stationary state of the system.

Primary author: Dr SINAYSKIY, Ilya (University of KwaZulu-Natal and National Institute for Theoretical Physics)

Co-authors: Prof. PETRUCCIONE, Francesco (University of KwaZulu-Natal and National Institute for Theoretical Physics); Mr PUMULO, Nathan (University of KwaZulu-Natal and National Institute for Theoretical Physics)

Presenter: Dr SINAYSKIY, Ilya (University of KwaZulu-Natal and National Institute for Theoretical Physics)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 386

Type: **Presentation**

The (un)preparedness of learners for FET mechanics

Two questionnaires were administered to probe learners' preparedness for learning mechanics in Grades 10-12. Firstly the knowledge that 1211 Grade 10 learners acquired in the theme Energy and Change in the previous school phase was determined. A second investigation probed 122 Grade 9 learners' primordial conceptions regarding motion. The results indicated fragmented, incoherent cognitive structures with reliance on observational rather than scientific explanations. Both the investigations showed deficiencies for effective elaboration of learners' knowledge in mechanics.

Primary author: Dr LEMMER, Miriam (North-West University (Potchefstroom))

Presenter: Dr LEMMER, Miriam (North-West University (Potchefstroom))

Track Classification: Track E - Physics Education

Contribution ID: 387

Type: **Presentation**

The cognitive refinement model for learning physics

Alternative conceptions are a perennial problem in physics education. The problem can be approached from different historically predominant theoretical frameworks, e.g. the empirist-behaviorist and constructivist frameworks. A hypothesis of the learning process in physics is proposed, termed the cognitive refinement model. It identifies three levels of learning, viz. perceptual, conceptual and formal. Its implications for the physics curriculum are discussed with illustrative examples emanating from physics education research.

Primary authors: Dr LEMMER, Miriam (North-West University (Potchefstroom)); Mr LEMMER, Nico (North-West University (Potchefstroom))

Presenter: Mr LEMMER, Nico (North-West University (Potchefstroom))

Track Classification: Track E - Physics Education

Contribution ID: 388

Type: **Presentation**

Internal and External Oxidation Products on Ni-Based Superalloy TMS-75

Ni-based superalloy TMS-75 was oxidized at 900°C in air. SEM, TEM and Raman Spectroscopy were used to characterize reaction products. At this temperature, an external non-protective (Ni,Co)O scale plus an extensive internal reaction zone consisting of oxide and nitride phases are formed. Orientation relationships were found between the oxide phases.

Primary author: Prof. PRUESSNER, Karin (School of Physics, University of the Witwatersrand)

Co-author: Dr HARADA, Hiroshi (National institute for Materials Science)

Presenter: Prof. PRUESSNER, Karin (School of Physics, University of the Witwatersrand)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: **389**Type: **Poster**

Mr

The dynamics of single photon wave packets interacting with beam splitters, mirrors and interferometers is investigated. In the simulation the beam splitters are microscopically as arrays of two level atoms. The non-trivial simulations will be using Modern Graphics Processing Units (GPUs). These devices offer tremendous potential for performance and efficiency.

Primary author: Mr DE LA REY, David (University of KwaZulu-Natal)

Presenter: Mr DE LA REY, David (University of KwaZulu-Natal)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 390

Type: **Poster**

Doppler-Free Saturation Spectroscopy

Laser cooling and trapping of atoms have become a significant area of research in physics. Saturation absorption spectroscopy is an important element in the laser cooling setup. We have investigated methods to improve the technique of saturation spectroscopy resulting in resolving hyperfine transitions of rubidium atoms which are concealed by Doppler broadening.

Primary author: Ms NAICKER, Sharlene-Asia (University of KwaZulu-Natal)

Co-authors: Prof. PETRUCCIONE, Francesco (University of Kwazulu-Natal); Dr REHN, Magnus (University of Kwazulu-Natal)

Presenter: Ms NAICKER, Sharlene-Asia (University of KwaZulu-Natal)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 391

Type: **Poster**

CN2 profiles from a turbulence-resolving model

Optical turbulence, occurring mostly in the planetary boundary layer (PBL), degrades geodetic data. Site characterisation requires knowledge of the vertical distribution of optical turbulence, the CN2 profile. A CN2 profile, obtained by employing a database of turbulence-resolving simulations, is compared with an observational profile.

Primary author: Mrs NICKOLA, Marisa (HartRAO and UP)

Co-authors: Prof. DJOLOV, George (University of Pretoria (UP)); Dr ESAU, Igor (Nansen Environmental and Remote Sensing Center (NERSC))

Presenter: Mrs NICKOLA, Marisa (HartRAO and UP)

Track Classification: Track D2 - Space Science

Contribution ID: 392

Type: **Presentation**

Security of Quantum Cryptography Protocols-Novelty and Realizations

Protocols for quantum communication, particularly for quantum cryptography are considered. The general theory of privacy in quantum communication will be investigated.

Definition, analysis and validation of the security of quantum cryptographic protocols, support the realization of a secure and reliable quantum communication channel between two distant parties

Primary author: Mr MAFU, Mhlambululi (Centre for Quantum Technology)

Co-authors: MIRZA, Abdul (Centre for Quantum Technology); MARAIS, Adriana (Centre for Quantum Technology); PETRUCCIONE, Francesco (Centre for Quantum Technology)

Presenter: Mr MAFU, Mhlambululi (Centre for Quantum Technology)

Track Classification: Track G - Theoretical and Computational Physics

Contribution ID: 393

Type: **Presentation**

Ab-initio structural and mechanical stability study of the uranium – aluminium alloys (UAL2, UAl3 and UAl4)

We use DFT calculations within GGA-PBE approximation to investigate the structural and mechanical stability of uranium-aluminium systems. Our results provided excellent heats of formation and predict UAl2 to be more stable, in agreement with experiment. Phonon dispersion spectra confirmed relative structural trend, all three compounds where mechanical stability

Primary author: Mr MOTSWARE, Teboho Cyprian (Student)

Co-authors: Dr CHAUKE, Hasani Richard (Member); Prof. NGOEPE, Phuti (Member)

Presenter: Mr MOTSWARE, Teboho Cyprian (Student)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 394

Type: **Presentation**

Ultracold atoms in the Quantum Research group at UKZN

We report on the latest experimental achievements with ultracold atoms in the Quantum Research group at UKZN. As previously reported, we have cooled a dilute gas of Rubidium atoms to mikroKelvins in the first Magneto Optical Trap in Africa. Currently we are implementing methods for better diagnostics as well as transfer to of cold atoms between different vacuum chambers. Some of the long term goals of Quantum Information processing with Ultracold Atoms will also be mentioned.

Primary author: Dr REHN, Magnus (UKZN)

Co-authors: Prof. PETRUCCIONE, Francesco (UKZN); Ms SEMONYO, Malehohonolo (UKZN)

Presenter: Dr REHN, Magnus (UKZN)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 395

Type: **Poster**

Optical properties of metal nanoparticles formed by ion implantation in oxides

Abstract: Ion implantation was used to produce nanostructures in MgO, Al₂O₃ and SiO₂. Optical absorption spectra show surface plasmon resonance bands characteristic of the implanted metal ions. Upon annealing in reducing atmospheres the optical response of metal nanostructures changes what is related directly to their morphology, shape and size.

Primary author: KOZAKIEWICZ, Anna (Wits)

Co-author: DERRY, Trevor (Wits, School of Physics)

Presenter: KOZAKIEWICZ, Anna (Wits)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 396

Type: **Presentation**

Interaction of diamond (1x1) and (2x1) reconstructed (111) surfaces with oxygen: A density functional theory study (DFT)

The properties of oxygen atoms on C(111)-(1x1) and the (2x1) reconstructed surfaces have been investigated using DFT. The on-top site is preferred by oxygen atoms on the (1x1) surface, while the bridge site is favourable on the (2x1) reconstructed surface. Other properties like stability and workfunction are also reported.

Primary author: Dr MAKAU, NICHOLAS (MOI UNIVERSITY, ELDORET, KENYA)

Presenter: Dr MAKAU, NICHOLAS (MOI UNIVERSITY, ELDORET, KENYA)

Track Classification: Track A - Condensed Matter Physics and Material Science

Contribution ID: 397

Type: **Poster**

Intra-cavity generation of Bessel-like beams with longitudinally dependent cone angles

We report on two resonator systems for producing Bessel-like beams with longitudinally dependent cone angles (LDBLBs). Such beams have extended propagation distances as compared to conventional Bessel-Gauss beams, with a far field pattern that is also Bessel-like in structure (i.e. not an annular ring). The first resonator system is based on a lens doublet with spherical aberration, while the second resonator system makes use of intra-cavity axicons and lens. In both cases we show that the LDBLB is the lowest loss fundamental mode of the cavity, and show theoretically the extended propagation distance expected from such beams.

Primary author: Dr LITVIN, Igor (CSIR NLC)

Presenter: Dr LITVIN, Igor (CSIR NLC)

Track Classification: Track C - Lasers, Optics and Spectroscopy

Contribution ID: 398

Type: **Poster**

THE EFFECT OF SILICON CARBIDE CRYSTAL STRUCTURE TRANSFORMATION ON GASEOUS FISSION PRODUCT RELEASE FROM THE TRISO COATED PARTICLE OF THE PEBBLE BED MODULAR REACTOR'S FUEL PEBBLE

The effectiveness of silicon carbide (SiC) to act as a barrier to migration of gaseous fission products (FP) through the (Tri-Isotropic) TRISO coated particle out of the fuel pebble depends on its ability to maintain its crystal structure. However, analyses of irradiated fuel pebbles indicate that the crystal structure of the SiC is greatly affected by the duration of irradiation, irradiation temperature and the neutron flux of the reactor causing the crystal structure to undergo structural changes (amorphisation), changing from α -SiC to β -SiC. The diffusion of fission products through the SiC layer of the TRISO coated has been found to follo

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Presenter: Mr LEOTLELA, Mosebetsi (University of Witwatersrand)

Track Classification: Track F - Applied and Industrial Physics

Contribution ID: **400**

Type: **not specified**

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Monday, 27 September 2010 08:00 (13 minutes)