AfLS-African Regional Infrastructure

Report of Contributions

https://events.saip.org.za/e/245

Contribution ID: **1** Type: **not specified**

Welcome & Opening Comments

Tuesday, 10 October 2023 15:00 (10 minutes)

Session Moderator: Prof Diouma Kobor and Prof Simon Connell

This presentation is the context for the session.
The AfLS Roadmap toward the new large scale research infrastructure requires a well developed network of smaller but very capable national and regional level research infrastructures. These build the community, build the research infrastructure in a well distributed way across the continent, and lead to deep local training and technology transfer. This will provide employment opportunities to combat or reverse the African Science Diaspora and establish a foundation for the future AfLS, without yet the large price-tag. These intermediate milestones increase the logic for Africa to build ultimately the AfLS.

Presenter: CONNELL, Simon (University of Johannesburg)

Contribution ID: **2** Type: **not specified**

Research Agenda for Improving ICS-based Compact Light Source Technology

Tuesday, 10 October 2023 15:10 (20 minutes)

This contribution is based on the expertise of Lyncean. We give an overview of the landscape, and consider a “best” design for a CW ICS source. From here we project to what a next generation ICS source may look like, and where this is best suited in the X-ray source landscape. A partnership of established X-ray labs, instrument designers and African research institutions could share the development costs as a science project - and novel features could be introduced to optimise the capacity of such a next generation source.

Presenter: LOEWEN, Rod

Contribution ID: **3** Type: **not specified**

Discussion

Tuesday, 10 October 2023 15:30 (20 minutes)

Presenter: NORRIS, Lawrence (African Light Source)

Contribution ID: **4** Type: **not specified**

Lab Scale Facilities

Tuesday, 10 October 2023 15:50 (20 minutes)

An overview of the different types of X-ray imaging and analytical functions and features of Lab Scale facilities. This talk will look at tomography, molecular structure determination and various spectroscopies for analysis, quantitative imaging, scattering based techniques, diffraction topography as well as more exotic applications.

Presenter: Dr MASIELLO, Fabio (Panalytical)

Contribution ID: **5** Type: **not specified**

What is needed to build a CLS based research infrastructure like STAR and what are the enabled applications towards users

Tuesday, 10 October 2023 16:10 (20 minutes)

In this presentation I will describe the resources (funding and human) requested by the construction of a research infrastructure based on an Inverse Compton Scattering source like STAR, under commissioning in Calabria (South Italy) and the technological challenges that must be addressed to develop and maintain such a research infrastructure. ICS sources have a great advantage in their capability to generate advanced X-ray beams in the hard-Xray energy range (100-500 keV) with relatively compact machines, whose cost is in the range O(10 M$), an order of magnitude smaller than a typical synchrotron light source. Advanced X-ray imaging using micro-tomography of thick metallic objects as typical of archeological artefacts can be successfully carried out with ICS like STAR thanks to the tunability, mono-chromaticity, polarisation, collimation and time structure (short pulses) of the generated X-ray beams, together with possible dual-color option for K-edge subtraction imaging. STAR is equipped with two beam lines to cover all possible X-ray spectrum of interest. A low energy beam line generating photon beams in the 20-100 keV energy range, and a high energy beamline serving applications in the 80-350 keV range. STAR has been completely assembled and partially tested so far, and is waiting for the radio-protection authorisation to start beam operation, that is expect to happen by the end of 2023.

Presenter: Prof. SERAFINI, Luca (INFN)

Contribution ID: **6** Type: **not specified**

The Munich Compact Light Source – a laboratory-scale synchrotron facility for biomedical research

Tuesday, 10 October 2023 16:30 (20 minutes)

Synchrotron X-ray sources have enabled scientists to push the limits of X-ray imaging towards nanometer resolution and extremely high sensitivity. However, for many of the techniques developed, the transition from synchrotron to preclinical or even clinical imaging is not straightforward. This is mainly due to the rather different characteristics of the X-ray tube sources typically used in the latter cases. The Munich Compact Light Source (MuCLS) at the Technical University of Munich (TUM) fills this performance gap and aims to provide an X-ray facility that allows modern synchrotron techniques to be applied in a university research laboratory environment. It consists of a commercial inverse Compton X-ray source (Lyncean Technologies Inc., formerly of Fremont, USA) and a beamline with two end stations designed and built by TUM scientists [1, 2].
The different applications exploit the unique properties of the MuCLS beam for a laboratory source [2]: The narrow tunable spectrum allows quantitative computed tomography (CT) without beam hardening [3], K-edge imaging [4, 5] or absorption spectroscopy [6]. The relatively high flux density allows radiotherapy studies [7], high-resolution micro-CT and fast dynamic imaging, e.g. for the study of respiratory processes [8, 9]. Finally, the partial coherence of the source enables grating-based phase-contrast and dark-field imaging [10-15], as well as propagation-based phase-contrast imaging [8].
Following a discussion of the X-ray source and the beamline, exemplary results for several of the aforementioned applications will be presented.

Presenter: Prof. PFEIFFER, Franz (Munich Institute for Biomedical Engineering)

Contribution ID: **7** Type: **not specified**

The Portable X-Ray Fluorescence Instrument

Tuesday, 10 October 2023 16:50 (20 minutes)

portable X-ray fluorescence detection devices. The talk will be focus on how such instrument could participate to training and increasing African researchers skills in Xray Fluorescence detectors. What kind of applications, advantages and limits.

Presenter: Prof. MAHNKE, Heinz-Eberhard

Contribution ID: **8** Type: **not specified**

Panel Discussion

Tuesday, 10 October 2023 17:10 (30 minutes)

Moderator: Philip Kurian, Howard University.

All previous speakers are panelists
The floor can discuss matters towards developing a narrative about the role and description of African Regional Infrastructure as milestones on the Roadmap toward the African Light Source