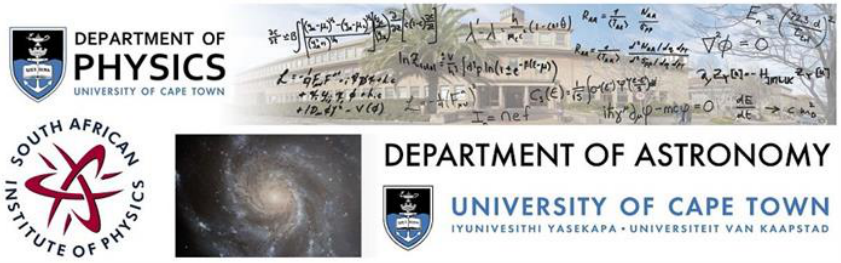

Contribution ID: **209** Type: **Oral Presentation**

Understanding proton induced radiation damage in plastic scintillators using electron paramagnetic resonance and DFT modelling

Tuesday, 5 July 2016 14:20 (20 minutes)

Abstract content
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Plastic scintillators form and integral part of particle detectors, such as the ATLAS detector at the LHC, as they are able to measure energies and track momenta of particles after a collision. Electron paramagnetic resonance (EPR) has been employed to study unpaired electrons and ions that are present in pristine and damaged plastic scintillator samples. Six different types of plastics were investigated, based on either polystyrene or polyvinyl toluene (PVT) . Samples were subjected to irradiation doses between 0.8 − 80.0 MGy using 6 MeV protons. EPR studies conducted on these samples showed a decrease in g-factor of each sample with an increase dose. It is suggested that an increase in dose introduces secondary electrons and ions into the system increasing the spin density and the relaxation time. Computational DFT modeling of polystyrene and PVT monomers and dimers show that damaging the molecules decreases components of the g-tensor and alters the components of the hyperfine tensor related to the g-factor and relaxation time, respectfully.

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Session Classification: Division for Physics of Condensed Matter and Materials (2)

Track Classification: Track A - Division for Physics of Condensed Matter and Materials