Contribution ID: **124** Type: **Poster Presentation**

Electron paramagnetic resonance analysis of plastic scintillators for the Tile Calorimeter of the ATLAS detector

Wednesday, 9 July 2014 17:10 (1h 50m)

Abstract content
   (Max 300 words)
Formatting &
Special chars

In an attempt to understand the effects of ionizing radiation on various scintillation plastics, a number of studies are currently underway with a hope that favourable properties of scintillator plastics, such as high light output and fast decay time, can be optimized. The Tile Calorimeter (TileCal) is a hadronic calorimeter able to detect hadrons. In this investigation, irradiated plastic scintillators that were situated on the TileCal of the ATLAS detector at CERN were sent to the University of Witwatersrand where they were prepared for electron paramagnetic resonance (EPR) analysis. EPR spectroscopy allows for the study of unpaired electrons within these scintillators and offers a deeper insight into the organic or inorganic free radicals present. This technique was used to validate the assumption that dangling bonds in the plastics were as a result of ionizing radiation damage caused in the testing phase. This was done by detecting the existence of paramagnetic centres and, in addition, magnetic properties of these centres could be characterized. Three Eljen scintillator plastics, EJ200, EJ208, and EJ260 were used in this investigation as well as one Dubna scintillator plastic. These samples were irradiated at the iThemba Labs in Gauteng. The Dubna samples that were irradiated on the TileCal detector were compared to the unirradiated samples as well as irradiated and unirradiated Eljen samples. Experimental results thus far show a stronger signal detected for irradiated samples compared to unirradiated ones, and that a higher radiation dose produces a stronger signal in the irradiated samples. It was observed that, over time, certain bonds would re-form within the plastics and further investigation is required to understand this effect. Over all, the results from the EPR analysis thus far form a small, yet vital, contribution into understanding the various the effects of ionizing radiation in plastic scintillators.

Apply to be
 considered for a student
   award (Yes / No)?

Yes

Level for award
 (Hons, MSc,
   PhD)?

Hons

Main supervisor (name and email)
and his / her institution

Bruce Mellado, School of Physics, University of the Witwatersrand

Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

Yes

Primary authors: Prof. MELLADO, Bruce (University of Witwatersrand); Mr PELWAN, Chad (University of Witwatersrand)

Presenter: Mr PELWAN, Chad (University of Witwatersrand)

Session Classification: Poster2

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