

GRETINA: PROGRESS TO-DATE AND FIRST SCIENCE RESULTS

Prof. C.W. Beausang, University of Richmond
Wednesday, November 16, 2011
4:00 P.M. NSH 118
(Refreshments at 3:30 P.M. NSH 202)

Throughout the history of nuclear science, from Rutherford's discovery of the nucleus, the development of new instrumentation has presaged the discovery of new physics. In the 1970's the advent of semiconductor germanium (Ge) detectors opened up a new era of high-resolution γ -ray spectroscopy. In the 1980's and 90's large arrays of Compton suppressed Ge detectors were constructed which again revolutionized the field, allowing the structure of the nucleus to be probed with unprecedented sensitivities. Gammasphere, located at ANL, has a photo-peak efficiency of $\sim 9\%$ and whose 110 Compton suppressed Ge detectors cover about 50% of the available 4π solid angle is the worlds best γ -ray spectrometer marks the culmination of that technology.

GRETINA represents the first stage of a new concept in gamma-ray spectroscopy, the so-called tracking array. The ultimate aim is GRETA, the Gamma Ray Energy Tracking Array, a 4π shell of large-volume, highly-segmented, position-sensitive Ge detectors. GRETINA is the first quarter of this array. GRETINA uses digital pulse processing techniques to identify the interaction points of each γ -ray to 1-2 mm in each dimension (on average each γ -ray interacts 3-4 times before being fully absorbed). Knowing the interaction points one can then track individual γ -rays using the Compton formula. The combination of large volume, high segmentation and tracking enables large increases in detection efficiency, count rate and signal to noise ratio compared to existing arrays. GRETINA is currently being commissioned at LBNL and in this, the centenary of the discovery of the nucleus, is engaged on a science program to study the structure of extremely heavy elements in the vicinity of $Z = 102$, Nobelium and $Z = 104$ Rutherfordium. Progress to date and future science prospects will be discussed.

Colloquium

All interested
persons are
cordially
invited to
attend.