HAW14-2014-000779

Abstract for an Invited Paper
for the HAW14 Meeting of
the American Physical Society

Advanced Gamma-ray Detectors: Science with GRETINA/GRETA[1]

HEATHER CRAWFORD, Ohio University

In 2007 the NSAC Rare Isotope Beam Task force introduced 17 "benchmark experimental programs" to provide a measure of facility performance capabilities for rare-isotope research and to characterize the physics that can be pursued at FRIB. A majority of these topics, and hence the FRIB program and current RIBF programs, will rely on high-resolution, high-efficiency in-flight γ-ray detection. Toward that end, GRETA is proposed to be a high-resolution, high-efficiency 4π γ-ray spectrometer, consisting of highly segmented germanium detectors grouped in quad-crystal modules. Using pulse shape analysis, the array will be capable of reconstructing the individual interaction points of incident γ-rays. When combined with tracking algorithms, this provides a large increase in sensitivity and resolving power over existing arrays. GRETA, with 30 quad-crystal modules, will allow maximization of the physics opportunities at FRIB, and will play a central role in the science program both with fast-fragmentation and reaccelerated beams. The technology of GRETA, and the capabilities in terms of science have already been demonstrated through the performance of the 1π spectrometer, GRETINA. Consisting of 7 quad-crystal modules, GRETINA has proven its capabilities in fast-beam experiments at NSCL, a campaign which saw 24 successful experiments which would not have been possible with previous detector technologies. The capabilities of the array in the energy regime of reaccelerated beams is being put to a similar test in the physics campaign currently underway at ANL. The performance and physics accomplishments to date of GRETINA, and a description and path forward to GRETA, the full 4π tracking array will be discussed. Emphasis will be placed on the role of GRETA or a similar device at facilities like FRIB and RIBF, in terms of experimental capabilities and physics reach.

[1]GRETINA was funded by the US DOE - Office of Science.