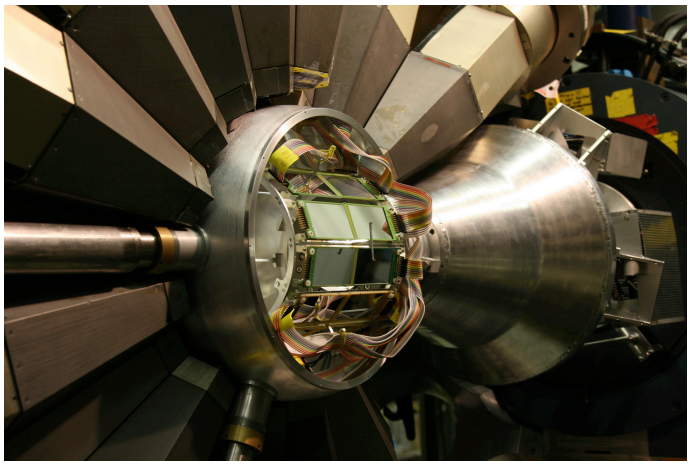
GODDESS — Gammasphere and ORRUBA: Dual Detectors for Experimental Structure Studies

Gammasphere and ORRUBA: Dual Detectors for Experimental Structure Studies (GODDESS) is the result of coupling the Oak Ridge Rutgers University Barrel Array (ORRUBA), a barrel array of position-sensitive silicon detectors, augmented with an array of annular silicon strip detectors at forward and backward angles with Gammasphere, the high-resolution HPGe detector. This particle-gamma spectrometer is designed for high-efficiency, high-resolution measurements of light-ion (e.g. (d,p), (p,t)) transfer, heavy-ion transfer (e.g. (^{9}Be,^{8}Be), (^{13}C,^{12}C)), and inelastic scattering reactions in inverse kinematics.

GODDESS can run in four modes: 1) with the FMA, 2) with AGFA, 3) with a high-rate ionization counter to detect recoils, or 4) stand-alone, when recoil detection is not necessary. None of these operating modes require major modifications to be made to the standard Gammasphere-FMA setup. GODDESS can be instrumented with between 276 (backward hemisphere only) and 648 (complete coverage) electronics channels dedicated to the silicon detectors. The silicon detectors in GODDESS have been implemented through the 320 GRETINA digitizer channels available through the DSSD electronics at the focal plane of the FMA.



Engineering and DAQ tests have demonstrated that the mechanical design of GODDESS is sound and that resolutions better than 28-keV FWHM in energy and 1 mm in position are achievable. The silicon detectors cover better than 75% of the polar angle between 15 and 165 degrees in the laboratory frame, with typical angular resolutions better than 1 degree.

GODDESS can be coupled to a position-sensitive, high-rate (~0.2 MHz) ionization counter, which consists of thin-windowed gas-filled chamber with 22 grids and a thin timing scintillator for contaminant discrimination at the rear. The design of the ionization chamber is complete, manufacture and testing will be completed in the late spring or early summer of 2014.

The entire detector system will be ready for beam in the late summer or early fall of 2014.