Recent upgrades of the Fragment Mass Analyzer

In preparation for experiments with intense beams from ATLAS, the Fragment Mass Analyzer and its focal plane detection system has been upgraded. The vacuum tank for the first electric dipole was replaced in 2012. In the new tank, the beam is stopped in an external beam dump to minimize number of beam particles hitting the wall of the tank. A new large-area high-resolution micro-channel plate focal plane detector capable of handling high recoil rates has been constructed and is currently undergoing tests. The FMA implantation-decay station was equipped with a digital data acquisition system to accommodate high event rates and process signal waveforms. In addition, an array of Si detectors to catch particles escaping from a high-granularity double-sided Si strip detector (DSSD) is under construction.

Micro-Channel Plate Detector

The horizontal position at the FMA focal plane is proportional to the M/Q value of recoiling heavy ions and is typically measured using a Parallel-Grid Avalanche Counter. In order to accommodate much higher rates a new focal plane detector comprising of a thin foil imaged using a stack of 3 micro-channel plates manufactured by Photonis was constructed. The micro-channel plates are 12 cm wide and 4 cm high and cover the whole FMA focal plane. To improve the position resolution of the detector, electrons knocked out from the foil by heavy ions are guided towards the micro-channel plates by a high electric field and are confined by a magnetic field produced by a set of permanent magnets. Tests with α particles have shown that the detector has a spatial resolution of about FWHM~1 mm. The detector is expected to operate at count rates in excess of 100 kHz. In-beam tests of the new detector are under preparation.

FMA Digital Data Acquisition System

In many FMA experiments, recoiling reaction products are implanted into a high-granularity 64X64 mm^2 160X160 strip DSSD after passing through a focal plane detector. The DSSD can be used in connection with the X-array consisting of 5 Ge clover detectors. More intense beams require a system capable of handling higher implantation rates. The FMA implantation-decay station has been recently equipped with a digital data acquisition system based on the 100-MHz 14-bit digitizers developed for the Gretina Ge tracking array. The original firmware was replaced to meet challenges specific to the implantation-decay station. The system is capable of processing up to 400 channels and is expected to reach event rates of up to 100 kHz, almost 2 orders of magnitude higher than achieved with the existing analog data acquisition system. In addition, the FMA digital DAQ allows collection of signal waveforms which is essential for many applications such as studies of rapidly decaying implants. It has been already used in FMA stand-alone experiments and in connection with digital Gammasphere. The FMA digital DAQ is self-contained and portable and can be used for experiments at other laboratories.

Escape Tunnel Detector

The implantation-decay station will be augmented with an array of 8 SSSD's consisting of 56 individual elements which will form a "tunnel" in front of the DSSD. The array will be used to catch β-delayed protons and α particles escaping from the DSSD thus increasing its efficiency.

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