Contribution ID: **19** Type: **Oral Presentation**

Upgrade of the TAMU MDM-Focal Plane Detector with MicroMegas Technology

Tuesday, 19 May 2015 15:40 (25 minutes)

MicroMegas is a relatively new detector technology that operates as a two stage parallel plate avalanche chamber. It consists of a small amplification gap (50-300 um) and a much larger drift gap (on the order of cm) separated by a thin electroformed micromesh. It has been shown to provide gains of up to 10^5. [1]
We have previously used this technology at our Institute in the AstroBox [2], a detector system built specifically for low noise and used to detect very low-energy protons from beta-delayed proton emitters. During these decay experiments, we observed that this device also detected the incoming energetic heaver ions with good resolution for particle identification.
This latter result was the starting point for the upgrade of
the MDM-Oxford detector, which is the principle focal plane detector of the Multipole-Dipole-Multipole spectrometer at Texas A&M Cyclotron Institute. It is used to identify particles and measure their positions along the dispersive x-direction. Using raytrace reconstruction we can determine the scattering angle at the target as a function of the angle of the particle path in the detector. In the nuclear astrophysics group, this setup has been used primarily to study scattering and transfer reactions involving nuclei with A≤26. However at higher masses than that, we found that we are having significant difficulties with the particle identification due to the insufficient resolution of both the dE and E signals.
A detailed description of the MDM detector can be found in ref [3]. Briefly, dE is the energy lost by particles passing through an ionization gas and is measured by three Aluminum anode plates. Currently, the first two plates connected produce a signal we call ΔE1 with energy resolution of 10-15%. This is enough for particles with A <20 but starts becoming problematic above that. The third plate, ΔE2, gives a signal that is too noisy to be of any use. For this reason, we decided to replace this anode with a MicroMegas plate of identical size.
Due to technical constraints, the new plate was divided into 28 pads (4 rows x 7 columns). Therefore, instead of one ΔE2 energy loss signal, we now detect 28. We tested the new setup with three beams, 16O, 22Ne and 28Si scattered elastically off gold foil. Preliminary results indicate a definite improvement in dE detection. We operated the Micromegas without issues at isobutane pressures from 100 Torr down to 30 Torr. Energy resolution varies from 5-6% at higher pressure to 10-11% at lower pressure. For all three beams, we obtained improved Z separation and intend to continue testing with heavier beams, A>28.
Given the current results we feel that we can go forward with using the upgraded system for experiments in the mass region of the tests. Specifically, we intend to continue studying nucleon capture reactions that present an interest in explosive nucleosynthesis, 27Al(n,g), as well various peripheral transfer reaction for optical potential model studies, 22Ne(n,g), 28Si(n,g).
When the facility-wide upgrade is completed, the modified detector is intended to also be used in experiments with radioactive ion beams.

---

[1] Y. Giomataris et al., Nuclear Instruments and Methods in Physics Research A 376 , 29-35 (1996)
[2] Pollacco et al., Nuclear Instruments and Methods in Physics Research A, 723, 102 (2013)
[3] D. H. Youngblood et al., Nuclear Instruments and Methods in Physics Research A 361, 359 (1995)

Primary author: Ms SPIRIDON, Alexandra (Cyclotron Institute-Texas A&M University)

Presenter: Ms SPIRIDON, Alexandra (Cyclotron Institute-Texas A&M University)

Session Classification: Session 7

Track Classification: Techinical issues