Development of the Position Sensitive Ionization Chamber for ANASEN

Hannah Gardiner
Dr. Jeff Blackmon
Motivation

- Understanding radioactive atoms helps explain several astrophysical events, such as novae and X-ray bursts.

- The Array for Nuclear Astrophysics Studies with Exotic Nuclei (ANASEN) is a charged-particle detector array designed for direct radioactive ion beam measurements of reactions that are important in Type I X-ray bursts.
A Reaction of Interest

- $^{17}\text{O}(\text{p},\alpha)$
How the Ion Chamber Works

- Detecting and identifying heavier atoms selects the nuclear reactions of interest.
- The ion chamber consists of alternating anode/cathode planes
How the Ion Chamber Works Pt. 2

- The chamber is filled with an inert gas that is ionized as the heavier atoms move through it.
- High voltage wire planes within the chamber collect the ionized gas.
A Reaction of Interest

- $^{17}\text{O}(p,\alpha)$
- Fairly well described
- Good for comparing detectors
The New and Improved Detector

- Large acceptance
- Two wire plane circuit boards contain 32 signals each, giving 3 millimeter spacing resolution in the x and y directions.
- Track the path of ions as they move through the chamber.
- Alternating anode/cathode planes close together achieves short collection times and allows fast counting rates
Electronics

- High density feed through routes 64 signals to a 72 channel preamplifier box
- From an electronics standpoint this is somewhat difficult
Data Acquisition

- This ionization chamber, in conjunction with ASIC electronics, was tested using oxygen 17 and fluorine 17 beams at FSU
- An iris was installed up beam from the ion chamber so we can focus the beam into the chamber
Acknowledgements

- I would like to thank Dr. Jeff Blackmon for being a very patient and wonderful mentor as well as the rest of the ANASEN group for teaching me to be a better scientist.
- I would also like to thank the NSF, DOE, and the LSU Office of Strategic Initiatives for supporting my work.