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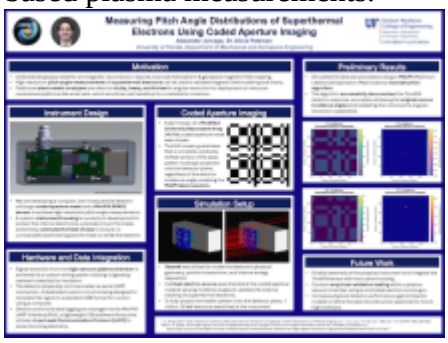
Poster
Understanding the dynamics of superthermal electrons requires high-resolution measurements of their pitch angle distributions. These measurements serve as an important proxy for validating magnetic fields, including the heliospheric magnetic field for mapping space weather to solar source regions, or planetary magnetic fields for identifying reconnection signatures and particle trapping dynamics. Such measurements are typically recorded by electrostatic analyzers, which are often large, heavy, and limited by low angular resolution. This project presents the design and development of a novel particle detector system that utilizes coded aperture imaging to achieve real-time, high-resolution pitch angle measurements. By leveraging a Timepix-based detector, the instrument is significantly smaller and lighter than traditional analyzers, making it highly suitable for resource-constrained platforms such as CubeSats. We present the design considerations for the coded aperture mask and its integration with the detector. To validate the instrument's geometric response, we utilize Geant4 simulations to model the coded aperture imaging process and predict performance. We describe the experimental setup within a plasma vacuum chamber, including the integration of an electron source gun and the development of a custom instrument housing. These laboratory efforts provide a first-pass evaluation of the design, validating the coded aperture technique as a compact, high-performance alternative for future space-based plasma measurements.


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Poster session day
Tuesday, April 28, 2026
Poster location
15
Meeting homepage
2026 Space Weather Workshop
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