A High Temporal, Spatial and Energy Resolution Grid-based Energetic Neutral Atom (ENA) Imager: the Physical Design

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Substorm is the global disruptive activity in Earth’s magnetotail, including phenomena such as reconnection, plasmoid, flux rope, BBFs, energetic particle injection, and aurora etc. The ground based observations are often hard to determine the time sequences of substorm activities, while the satellite in-situ observations often cannot distinguish between temporal and spatial variations, therefore the global imaging observations are very useful in substorm studies. In this study we demonstrate the physical design of a grid-based energetic neutral atom (ENA) imager that can provide high temporal, spatial and energy resolution ENA imaging of Earth's magnetotail. The ENA imager takes advantage of spatial Fourier modulation to the ENA fluxes to construct the ENA images, which is inspired by RHESSI. The physical design including imaging process, the charged particle reflector, and the ENA species discrimination etc. are described, along with the engineering progresses.