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POSTER

The PIPER Instrument (Photometric Imaging of Precipitation of Electron Radiation) applied to sprites and elves

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The PIPER instrument is an array of multianode photomultiplier tubes (PMTs), designed and built at Stanford in 2006 to make measurements of optical signatures of electron precipitation in the upper atmosphere. The instrument uses pairs of 16-anode PMTs, which have their anodes aligned linearly and cover an overall square field-of-view. By co-rotating the PMTs, with one providing vertical 1D stratification and the other horizontal, the two traces can be recombined to form image information at 16 x 16 pixel resolution. This results image and propagation information at up to 25,000 "frames"-per-second with sensitivity much higher than modern high-speed imagers. Recently, the PIPER instrument has been used to make observations of elves, sprites, and sprite halos. Results provide interesting insight into the timing, propagation, and evolution of these optical events. We present the instrument design and components, as well as some example observations of sprites and elves.