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The Fast Auroral Imager Experiment to Investigate the Dynamics of Nighttime Optical Aurora

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The Fast Auroral Imager (FAI) consists of two CCD cameras: one to measure the 630 nm emission of atomic oxygen in aurora and enhanced night airglow; and the other to observe the prompt auroral emissions in the 650 to 1100 nm range. Good optical throughput (etendue) will be realized through the combination of fast lens systems (f/0.8) with CCDs of high quantum efficiency. Both cameras have a common 27 degrees field-of-view, to provide circular images of about 650 km diameter from apogee at 1500 km.

In the nadir viewing mode, the near infrared camera will provide multiple images per second at a spatial resolution of a few kilometres, for studies of dynamic phenomena such as substorm onset, vortices and multiple narrow arcs, and for monitoring the auroral context for the complementary *in situ* measurements onboard. The 630-nm camera will produce images once per minute with an exposure time of 0.5 sec, which is compatible with the radiative lifetime of the O(^{1}D) atom in the atmosphere. Not only will this camera image auroral forms such as discrete arcs that are produced by soft electrons, it will also measure the locations of the auroral oval and polar cap boundaries. With on-chip pixel binning it will be possible to investigate weak emission phenomena such as polar arcs and patches, midlatitude SAR arcs and detached arcs, and enhanced airglow from artificial ionospheric heating. Overall, the FAI instrument represents a major advance in the application of new technology to the study of nighttime auroral phenomena.

キーワード: auroral imaging, nighttime optical aurora, night airglow, CASSIOPE/ePOP Mission, Fast Auroral Imager (FAI), discrete aurora
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