Auroral and Airglow Imagers in Visible and Far Ultra-violet Wavelengths for Future Sounding Rocket and Small Satellite Missions

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We report feasible designs of compact-sized optical imagers for future space and rocket missions. In particular, we focus on the project PARM on the Rockat-XN rocket which will be launched from Andoya, Norway in January 2019. We also started the discussion for future small-scale satellite project called FACTORS to understand the coupling processes among magnetosphere, ionosphere and thermosphere.

We will carry out simultaneous auroral imaging and medium- and high-energy particle measurements on the Rocksat-XN rocket to understand the generation and loss process of high-energy electrons associated with pulsating aurora (PsA). The auroral imaging camera (AIC) will measure the optical thickness and imaging of PsA. AIC consists of sensor (AIC-S) and electronics (AIC-E). AIC-S adopts a commercial-based wide field-of-view lens (FOV of 96 deg x 75 deg), RG-665 filter, and CCD (WAT-910HX). AIC-E will make CCD pixel binning to gain the sensitivity, and reduce the data telemetry. We completed the detailed design of AIC, and will fabricate in early 2018.

In addition, we are currently carrying out the design of visible and far-ultraviolet imagers for a future small-satellite mission FACTORS of which apogee will be in the range of 3000 –4000 km. The visible imager will take small-scale auroral image with high-time (~0.1s) and high-spatial (~1km) resolutions. The FOV of 8 x 8 deg covers an area of 400 x 400 km viewed from altitudes of 3000 km. A far-ultraviolet imager will cover ~3000 x 3000 km altitudes viewed from 3000 km altitude with a wide FOV of ~50 x 50 deg. This imager adopts a filter turret to change the wavelength between O 135.6 nm and the N2 LBH band at 140-160 nm. Wide-field N2 image enable us to examine large-scale auroral dynamics like westward-travelling surge during substrom, and N2/O image provide us to understand the global thermospheric activity.

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