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IMAGING OBSERVATION OF CONJUGATE AURORAS FROM A LUNAR ORBITER (EXTENDED ABSTRACT)

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We have proposed an upper atmosphere and plasma imager (UPI) which will take monochromatic images of aurora, airglow, geocorona and emission from the plasmasphere in the visible through EUV regions onboard the Japanese lunar orbiter SELENE to be launched in 2003. UPI will promote the investigation of plasma environment of the terrestrial upper atmosphere and plasmasphere by an imaging technique from the moon.

UPI consists of three imagers, UPI-TVIS, UPI-TUV and UPI-TEX and a common electronic device. UPI-TVIS and UPI-TUV will take images of visible and UV auroras, respectively, while UPI-TEX will capture a whole image of the plasmasphere using EUV light. It is difficult to take continuous images of conjugate auroras from ground-based stations at conjugate points in the northern and southern hemisphere on the earth because of weather condition and limitation of field-of-view of an imager. There have been few attempts to take pictures of auroras both in the northern and southern hemisphere at a same time from space (CARRUTHERS and PAGE, 1976; CRAVEN *et al.*, 1991). We will obtain valuable data for studying conjugate aurora, if we take their images in a same frame from a satellite far apart from the earth. SELENE/UPI will be the first sophisticated instrument for that purpose.

Figure 1 shows schematic drawings of UPI-TVIS and UPI-TUV. UPI-TVIS collects visible light from aurora and airglow by a catadioptric telescope ($D=136$ mm, $f=320$ mm). Its field-of-view is 2.2° just covering the whole globe, and the spatial resolution is 30 km at the earth's surface. Wavelength is selected by interference filters inserted in the optical path. The target emissions are N_2^+ 1NG (427.8 nm), OI (557.7 nm), NaD (589.3 nm), OI (630.0 nm) and OH (720–800 nm). Images of the earth are detected by a cooled CCD detector, with two readout modes: high-speed mode and high-precision mode. The CCD will be operated in the high-speed mode for observing aurora with a high time resolution, and in the high-precision mode for observing airglow with low noise.

UPI-TUV operates in the VUV region, observing auroral and geocoronal emissions of H Lyman α and OI (130.4 nm). A Schwarzschildian telescope ($D=25$ mm, $f=100$ mm) is adopted for the collecting optics of UPI-TUV, and an MCP with a 2-D resistive anode detects VUV light. A hydrogen absorption cell which is a negative filter rejecting only H Lyman α emission is used to distinguish weak OI (130.4 nm) emission from bright Lyman α. The field-of-view of UPI-TUV is $12^\circ \times 12^\circ$, and its spatial resolution is 270 km.

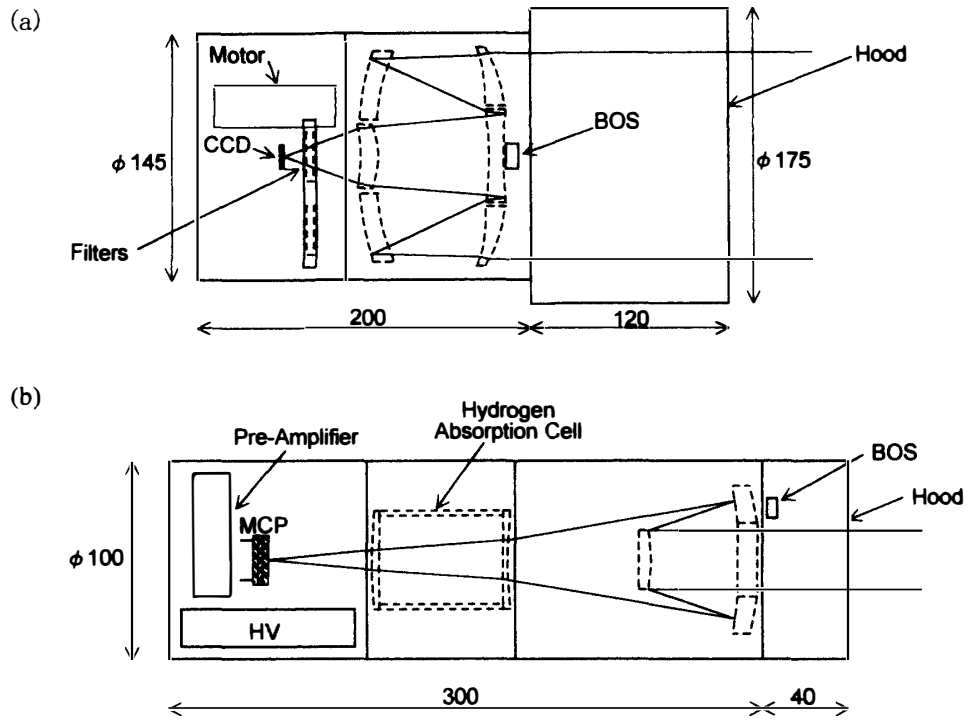

Fig. 1. Schematic drawings of (a) UPI-TVIS and (b) UPI-TUV. Scales are in mm.

UPI will be mounted on the gimbals of the high-gain antenna that will always point to the center of the earth, and usually operated while the spacecraft is seen from the earth and in the shadow of the moon. From computer simulation UPI will observe both the northern and southern auroral oval for about fifty days, and see either of them about sixty days during the mission period of one year.

References

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