JAPANESE ORBITING ULTRAVIOLET TELESCOPE PROJECT: UVSAT WORKING GROUP REPORT

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The ultraviolet-telescope satellite (UVSAT) project has been proposed to the Institute of Space and Astronautical Science (ISAS/Japan) by the UVSAT Working Group. The main telescope will be an F/4 Cassegrain with a 60cm primary mirror. A design study and some preliminary experiments of an intensified CCD camera with an objective spectroscopic capability are under way.

The main objectives of UVSAT would be to investigate i) the distribution and physical nature of UV sources in selected star clusters, galaxies, and clusters of galaxies, ii) the structure of galactic nebulae, and iii) the activities of stars and galactic nuclei. To these ends, a fast optical system with a moderately large field of view is desirable. The main UV telescope is at present proposed to be an F/4 Cassegrain system with a 60cm primary mirror. A number of focal plane instruments are proposed for this telescope, e.g., a high resolution spectrograph, a low resolution spectrograph, and a CCD camera (Kodaira, 1983).

The scale on the focal plane of the main telescope is 86 arcsec/mm. An electrically cooled CCD with 500 x 500 pixels will cover a field of view of up to 22 arcmin square with a spatial resolution of 2.6 arcsec. A microchannel plate with a CsI photocathode and a phosphor rear window will be mounted in front of the CCD in order to make it sensitive to UV light. An exposure time of up to 30 minutes is planned and the attainment of the required attitude control is endeavoured. There are three modes of observation proposed for this CCD camera, namely, i) the direct imaging mode through various filters, ii) the low resolution objective spectroscopic mode using a grism, and iii) the polarimetric mode using a double-image prism. The direct imaging mode will provide photometric data of point sources and extended objects. Expected limiting magnitude is $m_v \sim 20$ mag for an A0 star. The polarimetric mode will help us to understand the physics of variability observed in many UV sources, e.g., cataclysmic variables and BL Lac objects.

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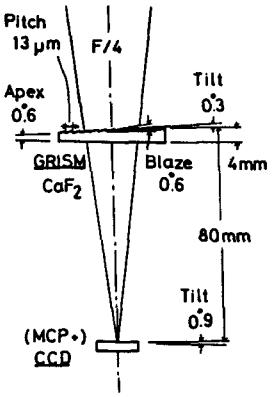

Figure 1. A tentative design of the grism camera.

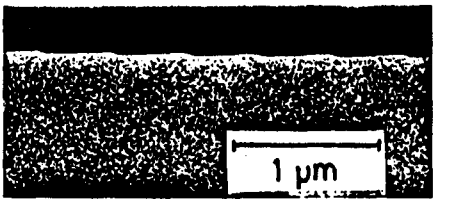

Figure 2. A picture of the groove profile of an Si-grating produced by the ion-etching method. The blaze angle of this holographic grating is 3 degrees (Aritome and Namba, 1983).

Figure 1 shows a tentative design of a CaF_2 grism camera proposed for the objective spectroscopic mode. This grism camera will give a spectrum of each object for the wavelength range of 1300-2000 Å. The inverse dispersion will be 640 Å/mm at 1300 Å and 1460 Å/mm at 2000 Å. In order to make such a rather special grating of very shallow blaze angle, we are experimenting with an ion-etching method. Ion-etching is a method of carving the surface of a sample, on which a photoresist layer of an appropriate grating pattern should be coated, by a uniform flux of energetic ion beams. The necessary grating pattern of a photoresist layer is produced holographically and can be fixed chemically beforehand (Aoyagi and Namba, 1976). This method has proved to be very successful in making a Si or SiO_2 grating for use in optical region (see Figure 2). The preliminary experiment of making a CaF_2 grating by the ion-etching technique showed that this method is promising. However, further efforts are needed to establish the required surface accuracy of the groove profile.

Although UVSAT is not yet funded, it is hoped that UVSAT will be launched in early 1990's by an M3S-III rocket of ISAS in order to contribute UV astronomy in cooperation with other space missions, e.g., Space Telescope, Starlab, Space Schmidt, and so on.

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REFERENCES

Kodaira, K.: 1983, Adv. Space Res., Vol. 2, No. 4, pp. 171-175.
Aoyagi, Y. and Namba, S.: 1976, Optica Acta, Vol. 23, No. 9, pp. 701-707.
Aritome, H. and Namba, S.: 1982, in Optical and Physical Characteristics of Diffraction Gratings (in Japanese), p. 75.

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