spectrometer can be achieved in some cases with a concave holographic grating and careful placement of an order-sorting filter. A hologram etched on the single concave surface contains the equivalent of the collimating, dispersing, and camera optics of a conventional grating spectrometer and provides substantial wavelength-dependent corrections for spherical aberrations and a flat focal field. These gratings can be blazed to improve efficiency when used over a small wavelength range or left unblazed for broadband uniform efficiency when used over a wavelength range of up to 2 orders. More than 1 order can be imaged along the dispersion axis by placing an appropriately designed step order-sorting filter in front of the one- or two-dimensional detector. This filter can be shaped for additional aberration corrections. The VIRIS™ imaging spectrometer based on the broadband design provides simultaneous imaging of the entrance slit from $\lambda = 0.9$ to 2.6 μm (1.5 orders) onto a 128 × 128 HgCdTe detector (at 77 K). The VIRIS™ spectrometer has been used for lunar mapping with the UH 24-in telescope at Mauna Kea Observatory. The design is adaptable for small, low-mass, spacebased imaging spectrometers.

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THE ULTRAVIOLET PLUME INSTRUMENT (UVPI).

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The Ultraviolet Plume Instrument (UVPI) was launched aboard the Low-power Atmospheric Compensation Experiment (LACE) satellite on February 14, 1990. Both the spacecraft and the UVPI were sponsored by the Directed Energy Office of the Strategic Defense Initiative Organization. The mission of the UVPI was to obtain radiometrically calibrated images of rocket plumes at high altitude and background image data of the Earth, Earth's limb, and celestial objects in the near- and middle-UV wavebands. The UVPI was designed for nighttime observations, i.e., to acquire and track relatively bright objects against a dark background.

Two coaligned, intensified charge-coupled device cameras were used to locate the object of interest, control UVPI, and obtain images and radiometric data. The tracker camera and the plume camera shared a fixed 10-cm-diameter Cassegrain telescope that used a gimbaled plane steering mirror to view a field of regard that was a 50° half-angle cone about the spacecraft's nadir. Additionally, a plane mirror on the instrument's door could be used with the steering mirror to extend the field of regard to view the Earth's limb and stars near the limb in a southerly direction.

The tracker camera had a relatively wide field of view, 2.0° by 2.6°, and a single bandpass of 255–450 nm. The tracker camera had three functions. First, its wide field of view and bright image were used to find the object of interest. Second, images from the tracker camera could be processed within UVPI and the results used to control the gimbaled mirror for autonomous tracking of the target. Third, the tracker camera was calibrated and could obtain radiometric data within its bandpass.

The plume camera had a much narrower field of view, 0.18° by 0.14°, and had a correspondingly higher resolution than the tracker camera. The plume camera had a four-position filter wheel to provide four bandpasses: 195–295 nm, 220–320 nm, 235–350 nm, and 300–320 nm. Only one bandpass could be selected at a time. The purpose of the plume camera was to obtain high-resolution images and radiometric data within its bandpasses.

The UVPI collected high-quality, calibrated UV emission images from four rocket launches in four attempts. These successful observations have provided more than 150 s of calibrated plume images from space. The plume camera data obtained for these high-altitude plumes in the 195–295 nm and 220–320 nm bandpasses is not obtainable from the ground because it is blocked by the Earth's ozone layer. All UVPI plume observation data have been processed by the NRL LACE Program and archived in the SDIO Plumes Data Center at Arnold AFB, Tennessee, and the SDIO Backgrounds Data Center at NRL.

Background observations include southern auroral events, measurements of the Earth's limb under different lighting conditions, nadir scans, measurements near an erupting volcano, and measurements of emission from city and highway lighting. Data from all UVPI observations has been processed and deposited in the SDIO Backgrounds Data Center at NRL.

Radiometric calibration of the UVPI was done before launch and confirmed after launch by star observations. Stars of known emission spectrum based on measurements by other spaceborne sensors were used. The calibration values obtained using the stars are close to the calibration values obtained before launch.

omit

THE ATMOSPHERIC ULTRAVIOLET RADIANCE INTEGRATED CODE (AURIC): VALIDATION OF VERSION 1.0.

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This abstract was withdrawn by the author.

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MICROTEXTURED METALS FOR STRAY-LIGHT SUPPRESSION IN THE CLEMENTINE STAR-TRACKER.

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Anodized blacks for suppressing stray light in optical systems can now be replaced by microscopically textured metal surfaces.