The Integrated Remote Imaging System Commercial Suborbital Mission

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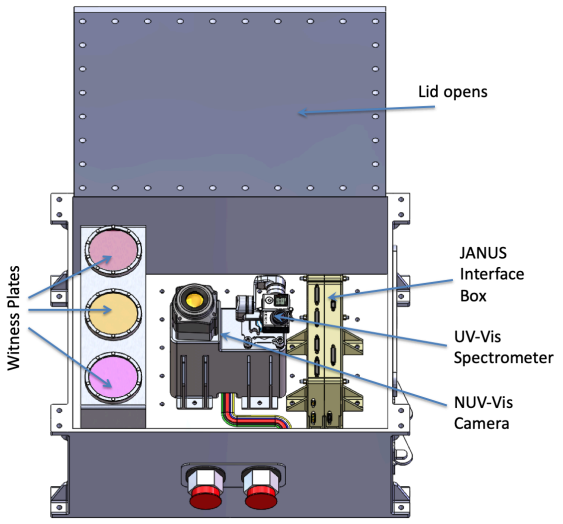
Abstract
The Integrated Remote Imaging System consists of a NUV-Vis imager and a spectrometer that will make measurements to characterize the transmission and the brightness of the atmosphere from 200 nm through 400 nm from a Blue Origin New Shepard suborbital vehicle, beginning prior to apogee through apogee and to just before landing. This will be accomplished through two flights with the package externally mounted on the top of the New Shepard propulsion module. The IRIS is adaptable; future applications could include gimballed articulation of imagers and observations to characterize infrared regions of the atmosphere obscured by telluric absorptions at lower altitudes.

The Motivation
External access on commercial suborbital flights provides an enabling capability that is revolutionary, disruptive and transformative for remote sensing and in-situ observations. To date, little if any remote sensing observations from suborbital space at 80-100 km altitudes exist, including from inside the cabin, despite external access is in many cases as good as a location for conducting measurements as space or from 200+ km that sounding rockets reach, which are less frequent and more expensive. A fundamentally new and enabling approach to conducting measurements can result from operating on these platforms. One way to look at it, this is taking the concept of sounding rocket payloads and allowing them to grow more COTS-like, larger, not as radiation hardened (less expensive), and are reusable thereby enabling a large number of observations and/or exploring time varying investigations.

The Payload
We have selected the Basler acA2040-25gm camera with a 2048x2048 CMOS low noise detector with 5.5 micron pixels, which couples to an achromatic f/10 lens to provide a field of view of 60 degrees at high signal to noise when filtered to transmit at ~ 400nm. Co-boresighted to this camera is the Ocean Optics HDX point spectrometer, with a spectral range of 200 to 925 nm and a spectral resolution of better than 1 nm. We have the option of adding an additional camera. The camera will provide context imaging of the sky at a region of the spectrum that is overlapping with the NUV region of the spectrometer, including characterizing the sky brightness at NUV wavelengths. The spectrometer will extend this characterization spectrally into the deep UV, which is a region obscured from the ground and aircraft altitudes by water vapor and ozone. These combined measurements will provide new and valuable information on the transmission and brightness of the sky at these otherwise inaccessible wavelengths; information that can be used to better understand the distribution of water and ozone in the atmosphere with altitude as well as to characterize the suitability of suborbital platforms for conducting upwards-looking UV measurements, such as for observations of the Moon and other solar system objects.



The IRIS box will provide direct access to space for optical or other instruments. It will mount to the adapter ring on the Blue Origin New Shepard propulsion module.