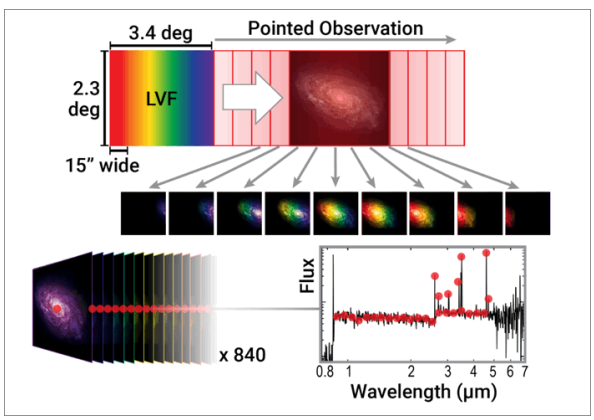
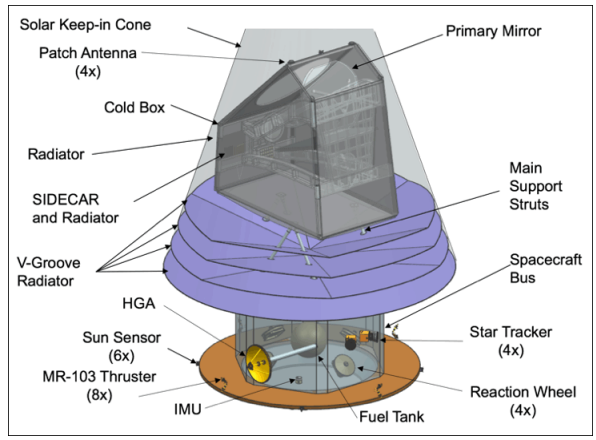
Cosmic Dawn Intensity Mapper (CDIM) Astrophysics Probe: Instrument and Mission Design. S. C. Unwin[1], A. R. Cooray[2], and T.-C. Chang[1], [1]Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena CA 91109, Stephen.c.unwin@jpl.nasa.gov; [2]University of California, Irvine, 4186 Frederick Reines Hall, Mail Code: 4575 Irvine, CA 92697.

Summary: The Cosmic Dawn Intensity Mapper (CDIM) is a Probe-class mission currently under study as part of the preparations for the 2020 Astrophysics Decadal Survey. A detailed Report from the study has been submitted to NASA, for consideration as part of the Survey. We present an overview of the instrument and mission design.

The CDIM telescope features a three-mirror-anistigmat imaging design for good image quality over a wide field. This is a simple imager, with its focal plane filled with a 4 x 6 array of 2k x 2k infrared detectors. The plate scale is 1 arcsec/pixel. CDIM has no spectrometer. Instead, linear variable filters (LVFs) are placed in front of the HgCdTe detectors, providing a narrow-band response with R = 300 at every point in the field. Detectors with four different long-wavelength cutoffs are selected, to match the desired wavelength coverage of each filter. Complete spectra (from 0.75 – 7.5 μm) are obtained by taking a series of images, stepped by small angular offsets in the direction of the wavelength gradient, to Nyquist-sample the spectrum of every object in the field.



The flight system will comprise a spacecraft bus that interfaces to the (EELV) launch vehicle, providing power, propulsion, data storage and processing, and uplink/downlink communications. The instrument payload interfaces to the bus via bipods. It features v-groove radiators of the same design as proven by the Planck mission, to keep direct sunlight off the telescope, and allow it to passively cool. The focal plane has an additional small radiator. The system will be deployed to Sun-Earth L2 orbit, to provide a stable thermal environment, and allow extended observations of selected fields, including the SKA1-LOW



deep 21-cm Epoch of Reionization survey. Ultra-deep surveys will be conducted in continuous viewing zones near the north and south ecliptic poles.

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