

Origins Space Telescope: The Mid-Infrared Transit Spectrometer Instrument (MISC)

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The Origins Space Telescope (OST) is one of four potential flagship missions that have been funded by NASA for study for consideration in the upcoming Astrophysics Decadal Review expected in 2020. In order to fit inside the NASA cost guidelines, a OST Baseline Mission Concept has been developed that consists of a 5.9m diameter telescope that is cooled to 4.5K and a mission that will be optimized for efficient mid and far-infrared astronomical observations. An initial suite of three focal plane instruments was chosen for the Baseline version of this observatory, although an up-scoped version of this mission will also be presented to the Decadal Review that will include an additional instrument and expanded capabilities within the base-lined instruments. The Mid-Infrared Transit Spectrometer

(MISC) instrument will observe at the shortest wavelengths of any of these instruments, ranging from 2 to 20 microns and is optimized for measurements of bio-signatures in the atmospheres of transiting exoplanets. This wavelength range allows measurements of the surface temperatures of the exoplanets as well as detections of the bio-signature molecules O₃, CH₄, H₂O, CO₂, and N₂O at Earth-levels, should they exist in an exoplanet atmosphere. The MISC instrument has a densified pupil spectrometer design with R~50-100 and is capable of exoplanet transit and emission spectroscopy with very high spectro-photometric stability from 2.8 to 20.0 microns. A dichroic beam-splitter picks off 2.0-2.8 micron light from the host star and sends it to a small detector array that is used to provide fine pointing correction signals to a tip-tilt mirror in the telescope optics. This presentation covers the design and expected performance of both the current Baseline version of this instrument as well as the capabilities of the up-scoped design that will also be provided to the Decadal Review.