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C3Or3D-05: Thermal design of the High-Volatiles and Minerals Moon Mapper (HVM3) Instrument on the Lunar Trailblazer Mission (LTB)

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The Lunar Trailblazer (LTB) Mission consists of a spacecraft that hosts two science instruments, the High-resolution Volatiles and Minerals Moon Mapper (HVM3) and the Lunar Thermal Mapper. Flight system delivery is scheduled for the end of 2022. The purpose of the mission is to understand the form, abundance and distribution of water on the Moon as well as the lunar water cycle. HVM3 is a pushbroom shortwave infrared (SWIR) Offner imaging spectrometer that is optimized for the detection of volatiles to map OH, bound H₂O and water ice. It has a spatial resolution of 70 m/pixel over a 20 km swath width and a spectral resolution of 10 nm over a spectral range of 0.6 to 3.6 μm . The spacecraft will deploy from an ESPA Grande and enter a 100 \pm 30 km lunar polar orbit where it may operate over all beta angles. The HVM3 thermal control architecture consists of active and passive elements. It leverages the passive cryogenic cooler design developed for the Moon Mineralogy Mapper (M3) that underwent a similar orbit. The first stage of the passive cooler is used to reject the heat of a Lockheed Martin Micro1-2 cryocooler that is used to cool the focal plane array (FPA). The second stage of the passive cooler is used to passively cool the optics. An overview of the overall thermal control design approach is presented.

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