CLEW (Compact Lunar Explorer for Water): State of the Art IR Spectrometer for a Lunar Cubesat Orbiter

P.E. Clark, Space Science Center Morehead State University,
T. Hewagama, T. Livengood, C. Brambora, E. Kan, NASA/GSFC

During the last year we have developed a concept for a follow-on to BIRCHES, a low cost, compact 2.5 to 12.5 micron range IR spectrometer, CLEW, that fits within the next lunar (12U) cubesat payload constraints. CLEW has modest increases in SWAP parameters (approximately 25%) relative to BIRCHES, yet consists of high heritage components with greatly advanced capabilities in sensitivity, spectral coverage, and less active cooling demand at comparable wavelengths [e.g., *Althobaiti and al-naib, 2020]*] as exemplified by the Compact Thermal Imager (CTI) [*Jhabvala et al, 2010, 2019*], which utilizes a Type II Strained Super Lattice detector combined with the ACADIA processor, follow on to the OVIRS SIDECAR ASIC [*Loose et al, 2018; Jennings et al, 2022*]. Although initially developed for astronomical applications, the CTI has already been modified for lunar surface applications as the Compact Lunar Hydration and Mineralogical Explorer (CLuHME) [*Bower et al, 2022*] with the incorporation of a Ricor 508 or later model cryocooler in an IDCA configuration. Limited bandwidth (still <256 kb) precludes configuration as an imaging spectrometer, but our readout design is configured to allow spatial resolution (approximately 1 km) within our 10 x 10 km field of view. CLEW would also have an internal calibration source. A cubesat contextual camera in 'density slice' mode could be added to assist in position determination by matching crater distribution patterns and the terminator position.