PERFORMANCE OF A CRYOGENIC 21 METER-PATH COPPER HERRIOTT CELL VACUUM COUPLED TO A BRUKER 125HR SYSTEM

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Accurate modeling of planetary atmospheres requires a detailed knowledge of the temperature and pressure dependence of spectroscopic line parameters of atmospheric molecules. With this requirement in mind, a new Herriott cell having a 21 meter folded absorption path was designed and fabricated with Oxygen-Free High Conductivity (OFHC) copper body and gold coated OFHC copper mirrors to operate for the first time with a broad-band Fourier transform spectrometer. The cell, enclosed in an isolated vacuum box, is cooled by a CTI Cryogenics, Inc. model 1050 closed-cycle helium refrigerator which also cryopumps the vacuum box. The temperature of the cell is monitored by a silicon temperature sensor and regulated by a Lakeshore model 331 temperature controller.

The new cell system was integrated to the JPL Bruker model 125HR interferometer with transfer optics which are fully evacuated to 12 mTorr (the pressure inside the interferometer). The optics were through-put matched for entrance apertures smaller than 2 mm. The system has successfully operated for several months at gas sample temperatures between 75 and 250 K with extremely good stability to obtain spectra of methane, carbon dioxide, and oxygen bands between 0.76 and 3 μm. We present the characterization and performance of the Herriott cell system and preliminary analyses of newly recorded spectra. [a]

[a]Research described in this paper was performed at Connecticut College, the Jet Propulsion Laboratory, California Institute of Technology, NASA Langley Research Center, and The College of William and Mary under contracts and cooperative agreements with the National Aeronautics and Space Administration.