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FTS Opacity Measurements of the South Pole Submillimeter Sky

Richard A. Chamberlin

Caltech Submillimeter Observatory, 111 Nowelo Street, Hilo, HI 96720

Abstract. A sub-millimeter Fourier Transform Spectrometer (FTS) was used at the South Pole to acquire wide frequency span (300 GHz $< \nu <$ 2 THz) measurements of the atmospheric opacity, $\tau(\nu)$. Comparisons were made with other ongoing measurements to allow inference of typical wintertime observing statistics.

A sub-millimeter wavelength FTS of the Martin-Puplett type (Martin 1982) was deployed to the South Pole in 2001. In 2001 it was operated as frequently as operational constraints allowed to make measurements of $\tau(\nu)$. Comparisons were made with narrow bandwidth τ from the Antarctic Submillimeter Remote Telescope Observatory (AST/RO) near 806 GHz and broad bandwidth τ_{CMU} from the NRAO/CMU 860 GHz atmospheric radiometer (Peterson et al. 2003). Compared to the FTS and the AST/RO telescope, the uncorrected τ_{CMU} were offset but otherwise well correlated. The τ_{CMU} offset was likely caused by uncompensated antenna loss efficiency (Davis & Vanden Bout 1973, Calisse 2003). The observed correlation with the continuous τ_{CMU} record was used to extrapolate the FTS $\tau(\nu)$ to infer statistics for an entire annual cycle, see Chamberlin et al. (2003). The statistics from this extrapolation are probably characteristic of all years since South Pole wintertime sub-millimeter observing conditions are expected to have only a slight inter-annual variation (Chamberlin 2001). In the centers of the 1.3 THz and 1.5 THz windows our results indicate observing is possible about 50 days a year with $\tau < 2$ and about 20 days a year with $\tau < 1.75$.

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