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EDITORS:
L. W. ABREU
F. X. KNEIZYS

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PHILLIPS LABORATORY
AIR FORCE SYSTEMS COMMAND
HANSCOM AIR FORCE BASE, MASSACHUSETTS 01731-5000

LABORATORY MEASUREMENTS OF THE 60-GHz O₂ SPECTRUM IN AIR

H.J. Liebe

Institute for Telecommunication Sciences, National Telecommunications
and Information Administration, U.S. Department of Commerce,
NTIA/ITS.S1, 325 Broadway, Boulder, CO 80303

The O₂-spectrum of dry air was studied with a resonance spectrometer under controlled laboratory conditions. Key parts of the instrumentation were an automatic network analyzer and a one-port Fabry-Pérot resonator affording an effective path length of 240 m. Measurements were made at frequencies between 49.3 and 67.2 GHz in 0.1 GHz increments for eleven pressure steps (1-100 kPa) and three different temperatures (7-30-53°C). More than 5×10^6 data points (S_{11} parameters) have been recorded and reduced to about 5,000 absorption values α (dB/km). Measurement uncertainties were estimated to be typically the worse of ± 0.05 dB/km or 2 percent. The collective spectral behavior of 38 pressure-broadened O₂ lines is described by the model MPM (NTIA Report 91-272, March 1991). A comparison of the absorption results with MPM predictions reveals systematic differences which correlate with O₂ line width and overlap parameters. An interpretation of the extensive data set with *Rosenkranz's* overlap theory [JQSRT 39(4), 287-297, 1988] is underway.

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