Abstracts

Molecular Transfer Characteristics of Air Between 40 and 140 GHz

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Radio wave propagation in the 40-140-GHz band through the first hundred kilometers of the clear atmosphere is strongly influenced by many (> 30) lines of the oxygen microwave spectrum (O/sub 2/-MS) and to a lesser extent by water vapor. A unified treatment of molecular attenuation and phase dispersion is formulated whereby results of molecular physics are translated into frequency-, temperature-, and pressure-dependencies. The propagation factors are developed for O/sub 2/ continuum --(h <10 km) and line-- (h >20 km) spectra taking into account pressure-broadening (h <40 km), Zeeman-splitting (h >40 km), and Doppler broadening (h >60 km). The influence of water vapor is discussed briefly. The filter characteristics of dry air are evaluated for various path models. Examples of computer plots of attenuation and dispersion rates are given as a function of altitude h for homogeneous, zenith, and tangential path geometries through the 1962 U. S. standard atmosphere.

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