IMPACT OF ATMOSPHERIC CLUTTER ON DOPPLER-LIMITED GAS SENSORS IN THE SUBMILLIMETER/TERAHERTZ

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This paper will discuss the implications of spectral interference from atmospheric constituents on the performance of spectroscopic point sensors in the submillimeter/terahertz (SMM/THz) spectral range. Spectral clutter can be a limiting factor for spectroscopic sensors, especially where high sensitivity and specificity are required. The most abundant atmospheric gases are either transparent or have spectra that are very sparse in the SMM/THz. For SMM/THz sensors that utilize continuous wave (cw) electronic techniques the clutter limit for the detection of common target gases is in the ppt (1 part in 10^{12}) or lower range. This warrants absolute specificity of molecular identification with probability of false alarm well below 10^{-10}. Moreover, the low clutter limit demonstrated for cw electronic systems in the SMM/THz is independent of system size and complexity.