

FREQUENCY BAND PERFORMANCE COMPARISONS FOR ROOM-TEMPERATURE CHIRPED PULSE MILLIMETER WAVE SPECTROSCOPY

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We present a performance comparison between chirped pulse millimeter wave spectrometers operating over 75-110, 260-290, and 520-580 GHz. For molecules at room temperature, the line strength has an approximately ν^3 dependence until the peak of the Boltzmann distribution (typically in the submillimeter) is reached. However, we find competitive performance for 75-110 GHz spectrometers—with an average sensitivity drop of approximately 3-5 in equal measurement time, compared to a 260-290 GHz instrument with the same excitation power and measurement cell length. The narrower linewidth and lower line density at lower frequency, moreover, increase the usable dynamic range at 75-110 GHz by a factor of approximately 3-10 before reaching the confusion limit, giving better performance for extracting weak lines in a strong forest. This talk will discuss the reasons for and implications of these differences in performance for applications of chirped pulse millimeter wave spectroscopy.