PRECISION SPECTROSCOPY OF TELLURIUM

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Tellurium (Te_2) is widely used as a frequency reference, largely due to the fact that it has an optical transition roughly every 2-3 GHz throughout a large portion of the visible spectrum. Although a standard atlas encompassing over 5200 cm^{-1} already exists [1], Doppler broadening present in that work buries a significant portion of the features [2]. More recent studies of Te_2 exist which do not exhibit Doppler broadening, such as Refs. [3-5], and each covers different parts of the spectrum. This work adds to that knowledge a few hundred transitions in the vicinity of 444 nm, measured with high precision in order to improve measurement of the spectroscopic constants of Te_2's excited states. Using a Fabry Perot cavity in a shock-absorbing, temperature and pressure regulated chamber, locked to a Zeeman stabilized HeNe laser, we measure changes in frequency of our diode laser to $\sim$1 MHz precision. This diode laser is scanned over 1000 GHz for use in a saturated-absorption spectroscopy cell filled with Te_2 vapor. Details of the cavity and its short and long-term stability are discussed, as well as spectroscopic properties of Te_2.

References:

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