



Spatially Resolved Temperature Determination in I2 Gas Using Doppler-Limited Saturation Spectroscopy

By James W. Myers

Biblioscholar Nov 2012, 2012. Taschenbuch. Book Condition: Neu. 246x189x7 mm. This item is printed on demand - Print on Demand Neuware - Saturation spectroscopy techniques were used to demonstrate the ability to make spatially resolved temperature measurements by exploiting the electronic transition in molecular iodine. Doppler-free saturation spectroscopy measurements resulted in hyperfine spectral profiles for the P(70) 17-1 and P(53) 19-2 ro-vibrational transitions between the electronic levels. Doppler-limited saturation spectroscopy, an adaptation of the Doppler-free technique in which beams propagate in the same direction and cross within the gas sample, allowed for the measurement of spatially resolved Doppler profiles for the same transitions. The profiles were measured at several spatial positions in I2 cells with measured temperature gradients. The technique did not produce accurate temperature readings; however, the saturation spectroscopy variant did produce profiles that were spatially resolved, with an interaction volume of approximately 12 x 1 x 1 (mm units). This thesis was motivated by the Air Force's Airborne Laser Laboratory (ABL), which has a need to discriminate a spatially distributed temperature distribution. The Chemical Oxygen Iodine Laser (COIL), which is the high power directed energy source for ABL, has a low concentration as a reaction byproduct. Line-integrated optical...



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