

SUB-DOPPLER RESOLUTION SPECTROSCOPY OF THE FUNDAMENTAL VIBRATION BAND OF HCl WITH A COMB-REFERENCED SPECTROMETER

KANA IWAKUNI, *Department of Physics, Faculty of Science and Technology, Keio University, Yokohama, Japan*; HIDEYUKI SERA, *Department of Physics, Keio University, Yokohama, IX, Japan*; MASASHI ABE, HIROYUKI SASADA, *Department of Physics, Faculty of Science and Technology, Keio University, Yokohama, Japan*.

Sub-Doppler resolution spectroscopy of the fundamental bands of H^{35}Cl and H^{37}Cl has been carried out from 87 to 90 THz using a comb-referenced difference-frequency-generation (DFG) spectrometer. While the frequencies of the pump and signal waves are locked to that of the individual nearest comb mode, the repetition rate of the comb is varied for sweeping the idler frequency. Therefore, the relative uncertainty of the frequency scale is 10^{-11} , and the spectral resolution remains about 250 kHz even when the spectrum is accumulated for a long time. The hyperfine structures caused by chlorine nucleus are resolved for the R(0) to R(4) transitions. The figure depicts wavelength-modulation spectrum of the R(0) transition of H^{35}Cl . Three Lamb dips correspond to the $F=0$, 1, and -1 components left to right, and the others with arrows are cross-over resonances which are useful for determining the weak $F=-1$ component frequencies for the R(1) to R(3) transitions. We have determined 49 and 44 transition frequencies of H^{35}Cl and H^{37}Cl with an uncertainty of 10 kHz. Six molecular constants of the vibrational excited state for each isotopomer are determined. They reproduce the determined frequencies with a standard deviation of about 10 kHz.

