SUBMILLIMETER-WAVE SPECTROSCOPY OF SHORT-LIVED SPECIES USING A BWO

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A submillimeter-wave spectrometer using a BWO (Backward Wave Oscillator) has been constructed and applied to measurements for shrot-lived species. The BWO frequency was stabilized by a phase-lock loop, using a Schottky-type harmonic mixer which mixes the radiation from the BWO with that of a millimeter-wave synthesizer[1]. A part of submillimeter power was reflected by a wire-grid beam-splitter and directed to the absorption cell. The transmitted power was detected by a magnetically-tuned, liquid-helium-cooled InSb bolometer. To test performances of the spectrometer, the rotational spectra of $NH_2OH$, $NH_2$, and CF have been measured in 400 – 500 and 600 – 800 GHz region.

The $NH_2$ radical is known to be an important intermediate in astrochemistry and various chemical reaction process. The submillimeter-wave absorption spectrum was observed toward the dust continuum source Sagittarius B2[2]. Recently, Tonooka *et al.* have measured the microwave spectrum and determined precise molecular constants[3].

$NH_2OH$ has been interested because of its large amplitude internal motions. The submillimter-wave rotational spectra in the ground and vibrationally excited OH-torsion state have been observed for the first time.

The accuracy of submillimeter-wave line positions of the CF radical reported previously using a far-infrared laser sideband spectrometer is not enough to perform astronomical searches for this radical. In the present study the submillimeter-wave spectra of CF have been measured with same precision as microwave spectroscopy.

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[1] G. Winnewisser, *Vib. Spectrosc.*, **8**, 241 (1995); I. Morino et al., *J. Mol. Spectrosc.*, **185**, 142 (1997). [2] E. F. van Dishoeck et al., *Astrophys. J.*, **416**, L83 (1993). [3] M. Tonooka *et al.*, *J. Chem. Phys.*, **106**, 2563 (1997).