HIGH RESOLUTION SPECTRUM OF THE $^{13}C^{12}C^{12}C$ LOWEST BENDING MODE

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Linear C_3 is a floppy molecule which possesses an extremely low lying bending mode, ν_2, at roughly 60 cm^{-1} or 1.9 THz. Based on highly accurate laboratory data[a,b,c] C_3 has been detected in various astronomical sources[d,e] most recently with the HIFI instrument aboard the Herschel satellite[f]. Although C_3 turns out to be quite abundant in interstellar environments which makes a search for ^{13}C substituted isotopologs feasible, other isotopologs could not be detected so far, because no accurate transition frequencies have been available for these species in this frequency range. Relative abundance ratios of C_3 isotopologs might give important hints on its building mechanism and further constraints for chemical networks.

In this work, the spectrum of the ν_2 lowest bending mode of ^{13}CCC has been investigated. We used laser ablation of ^{13}C enriched carbon samples to record absorption spectra in a supersonic jet expansion. The radiation in our setup is generated by a synthesizer referenced to a Rubidium standard in combination with a frequency multiplier chain and detected by a liquid Helium cooled InSb bolometer. The laboratory search has been supported by high-level coupled-cluster calculations, which turns out to compare very favorably with obtained experimental molecular parameters.

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