SUBMILLIMETER SPECTROSCOPY OF THE OUT-OF-PLANE BENDING STATE ν_{20} OF C_2H_5CN

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Propionitrile is a well known interstellar molecule that is a closely associated with warm dust near ultra compact H_{II} regions. In these regions the C_2H_5CN column can reach 10^{17} and the rotational temperature often equals the vibrational temperature and exceeds 200 K, populating all the low-lying vibrational states. The rotational spectrum of the third lowest excited vibrational state, the 378 cm^{-1} out-of-plane bending state, ν_{20}, of propionitrile, which was previously identified at millimeter wavelengths in both the laboratory and the interstellar medium, has been characterized to high angular momentum quantum numbers. This state is surprisingly isolated considering its proximity to the overtone of the in-plane bend, $2\nu_{13}$, the excited torsional state of the in-plane bend, $\nu_{13}+\nu_{21}$, and the second excited torsional state, $2\nu_{21}$, which lie approximately 35 cm^{-1} higher. The only surprising aspect is the presence of significantly larger torsional A-E splitting than observed in either the ground state or the ν_{13} in the absence of a resonance with ν_{21}. Because ν_{20} has been observed in high mass star forming cores in the millimeter, its higher angular momentum lines are known to be a major source of line confusion in high mass star forming cores. The spectrum, constants and determined barriers will be presented.