REFERENCE DATA FOR AMMONIA SPECTRA IN THE 3900-6300 CM^{-1} RANGE

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Accurate reference laboratory data represents a key element for understanding any remote observations in particular astrophysical surveys. The subject has grown in importance with the recent discovery of the capability to observe spectra of exoplanets or the ability to closely probe space objects like in the case of the Rosetta mission. This need is even timelier with the James Webb telescope being deployed for operation and the new space missions dedicated to the exoplanetary spectroscopic studies like Twinkle, and the Atmospheric Remote-sensing Infrared Exoplanet Large-survey (ARIEL) destined to be launched in 2024 and 2029, respectively.

The current contribution is an overview of our work concerning the acquisition of such accurate reference data in the case of ammonia molecule based on the combination of room temperature Fourier transform spectra (both old and new), tunable laser spectroscopy in cooled Herriott cell, and in a supersonic expansion. In addition, multiple new techniques to improve the whole process of spectra analysis were used, mainly: the enhanced multi-temperature treatment for determination of empirical lower state energies, intensity-based combination differences process for determination of quantum assignments, or the accurate referenced frequency calibration to verify the absolute line positions with a sub 0.001 cm^{-1} accuracy.