IMPROVED CENTRIFUGAL AND HYPERFINE ANALYSIS OF ND_2H AND NH_2D AND ITSAPPLICATION TO THE SPECTRAL LINE SURVEY OF L1544

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Quantifying molecular abundances of astrochemical species is a key step towards the understanding of the chemistry occurring in the interstellar medium. This process requires a profound knowledge of the molecular energy levels, including their structure resulting from weak interactions between nuclear spins and the molecular rotation. With the aim of increasing the quality of spectral line catalogs for the singly- and doubly-deuterated ammonia (NH_2D and ND_2H), we have revised their rotational spectra by observing many hyperfine-resolved lines and more accurate high-frequency transitions. The measurements have been performed in the submillimeter-wave region (265-1565 GHz) using a frequency modulation submillimeter spectrometer and in the far-infrared domain (45-220 cm^{-1}) with a synchrotron-based Fourier-transform interferometer. The analysis of the new data, with the interpretation of the hyperfine structure supported by state-of-the-art quantum-chemical calculations, led to an overall improvement of all spectroscopic parameters. Moreover, the effect of the inclusion of deuterium splittings in the analysis of astrophysical NH_2D emissions at millimeter wavelengths has been tested using recent observations of the starless core L1544, an ideal astrophysical laboratory for the study of deuterated species. Our results show that accounting for hyperfine interactions leads to a small but significant change in the physical parameters used to model NH_2D line emissions.