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Hyperfine structure of low-lying states of ^{14,15}N

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Determination of hyperfine structure constants has various astronomical interests [1]. For ground and metastable states, hyperfine structures can often be determined with good accuracy, providing precious guidelines for *ab initio* calculations. For excited states that are available only through sub-doppler methods in the optical region the experimental values are less reliable, and theoretical evaluations can bring useful informations.

In 1943, Holmes [2] measured a surprisingly large variation of the specific mass isotope shifts from one multiplet component to another in some transitions between the configurations $2p^23s \rightarrow 2p^23p$ of ^{14,15}N. Although this observation was confirmed by sub-doppler spectroscopy experiments [3, 4], Jennerich *et al.* [4] pointed out that the experimental isotope shift values are critically dependent of the interpretation of the hyperfine structures of the ^{14}N and ^{15}N spectra. In the conclusions of their work, they appealed for further theoretical investigation to confirm observations.

Hyperfine structure parameters were calculated recently by Jönsson *et al.* [5] for the $2p^2\,(^3P)\,3s\ ^4P_J$, $2p^2\,(^3P)\ 3p\ ^4P_J^o$ and $2p^2\ (^3P)\ 3p\ ^4D_J^o$ levels, using the *ab initio* multiconfiguration Hartree-Fock method (MCHF) implemented in the ATSP2K package [6]. The resulting theoretical hyperfine coupling constants are in complete disagreement with the experimental values of Jennerich *et al.* [4] deduced from the analysis of the near-infrared Doppler-free saturated absorption spectra. We propose a new interpretation of the recorded weak spectral lines. If the latter are reinterpreted as crossovers signals, a new set of experimental hyperfine constants is deduced, in very good agreement with the *ab initio* predictions. The ambiguity in the assignation of the recorded spectra is due to strong line shape perturbation. The present analysis washes out the J-dependency of specific mass shift (SMS) found for 3p $^4P^o$ and 3p $^4D^o$ multiplets. On the contrary, a somewhat large SMS J-dependency is deduced for the even parity 3s ^4P multiplet and is explained through non-relativistic mixing with the $1s^22s2p^4\ ^4P$ term, which depends strongly of the total atomic electronic momentum J.

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