

Abstract Submitted  
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**Long-Lived Nuclear Spin States in Monodeuterated Methyl Groups**<sup>1</sup> STUART ELLIOTT, STUART SAWYER, University of Southampton, DAVID KOLIN, Pomona College, LYNDA BROWN, University of Southampton, DANIEL O'LEARY, Pomona College, MALCOLM LEVITT, University of Southampton — Nuclear magnetic resonance (NMR) experiments are limited by relaxation dynamics. Observing non-equilibrium magnetization is restricted to timescales governed by the longitudinal relaxation time  $T_1$ , which limits potential applications such as hyperpolarization or transport phenomena. Long-lived states (LLS) have relaxation times much longer than  $T_1$ , providing a possible approach to overcome relaxation constraints. Often the duration of information capture is extended by an order of magnitude over  $T_1$ . LLS commonly exist in symmetry-constrained homonuclear pairs termed singlet states, with some multi-spin variants established. Molecular systems exhibiting LLS include; parahydrogen, parawater, gamma-picoline, peptides, fumarates and naphthalenes. A recent addition to the LLS family is the monodeuterated methyl ( $\text{CH}_2\text{D}$ ) group. Radio frequency pumping of NMR silent spin states is achieved using the spin-lock induced crossing (SLIC) pulse sequence. A LLS decay constant ( $T_S$ ) of 27.0 0.6 s was recorded. A number of  $\text{CH}_2\text{D}$ -2-x-piperidine derivatives are currently in synthesis to extend singlet lifetimes and to control chemical shift differences, the later of which are to be compared with computational predictions.

<sup>1</sup>Long-Lived Nuclear Spin States in Monodeuterated Methyl Groups

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