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Hyperpolarized ^{1}H long lived states originating from Parahydrogen accessed by CW irradiation

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In the main text we have introduced the sequence to access the pH_2 singlet state inside the observation field. The sequence is based on the application of a CW pulse with amplitude ω_1 at a particular off-resonance frequency ($\Delta\omega$). In order to enable the singlet-triplet transition both quantities should satisfy the condition depicted in Eq. (14) in the paper.

The amount of singlet state converted into observable magnetization depends on the mentioned parameters (ω_1 and $\Delta\omega$) as well as on the duration of the pulse (d_{cw}). These parameters were optimized by studying the amplitude of the vinyl peak after the singlet-triplet conversion, as shown in figure 1.

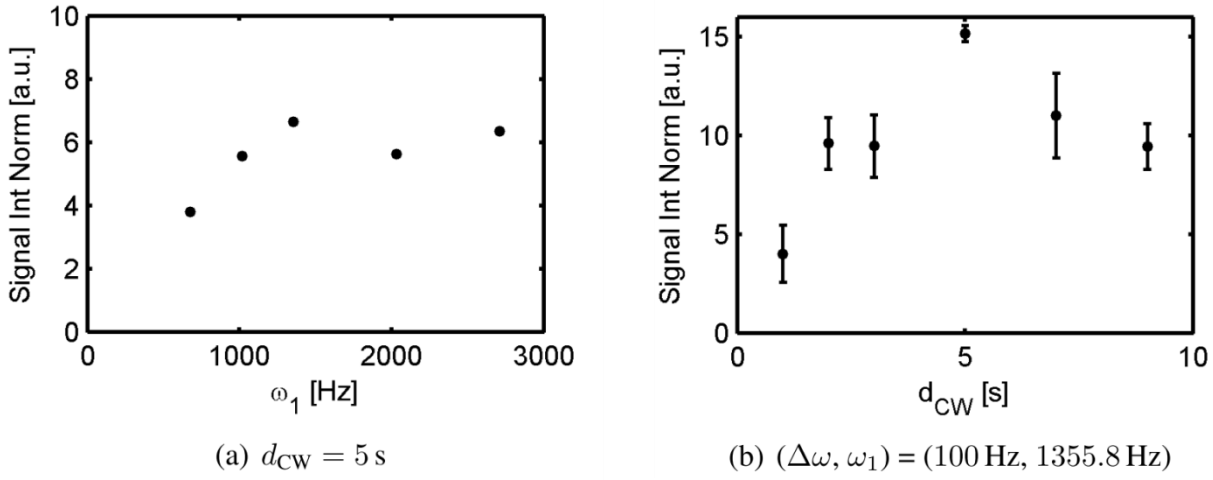

Figure 1 Normalized signal integral of the hyperpolarized vinyl protons after a CW pulse depending on (a) the RF strength ω_1 and (b) the CW pulse duration d_{CW} . In (b) the mean and the standard deviation values of four measurements are shown.

The sequence was tested for the following ($\Delta\omega$, ω_1) combinations: (50 Hz, 677.9 Hz), (75 Hz, 1016.9 Hz), (100 Hz, 1355.8 Hz), (150 Hz,2033.7 Hz) and (200 Hz, 711.6 Hz), using a CW pulse duration d_{CW} of 5 s (Fig. 1 (a)). The signal integral increases fast until ω_1 = 1355.8 Hz and reaches a plateau for higher values . Due to these results, the parameter combination (100 Hz, 1355.8 Hz) was used for further investigations.

In Fig. 1(b) the signal was analyzed for different pulse durations d_{CW}, using the combination (100 Hz, 1355.8 Hz) . The maximum signal was found for a duration of 5 s, hence this value was chosen for the rest of the experiments. The decay of the signal for longer d_{CW} values might be due to the spin lattice relaxation time of the vinyl protons, $T_1 \approx 10$ sec. The measurements were repeated for four times.