

## Spin thermometry: deuterium NMR spectra give a straightforward measure of very low spin temperatures resulting from dynamic nuclear polarization

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Dynamic nuclear polarization of samples at low temperatures, typically between 1.2 and 4.2 K, allows one to achieve spin temperatures as low as 2 mK, so that for many nuclear isotopes the high-temperature approximation is violated. This leads to characteristic asymmetries in powder spectra. We show the lineshapes due to the quadrupolar couplings of deuterium spins that are present in virtually all solvents used for such experiments allows the quick yet accurate determination of the spin temperature, or, equivalently, of the polarization. The observation of quadrupolar echoes excited by short pulses allows one to monitor the build-up and decay of positive or negative hyperpolarization when switching the frequency of the microwave irradiation.

**Co-authors:** AGHELNEJAD, Behdad (Ecole normale supérieure, Paris); CARNEVALE, Diego (Ecole normale supérieure, Paris); BAUDIN, Mathieu (Ecole normale supérieure, Paris); MARHABAIE, Sina (Ecole normale supérieure, Paris)

**Presenter:** BODENHAUSEN, Geoffrey

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