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NOISE Spectroscopy: Applications to Solid State NMR

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One of the oldest, still unsolved, and often ignore problems in magnetic resonance remains the issue of how to observe undistorted, normal one-dimensional spectrawhere the frequencies and their relative intensities represent faithfully the distribution of spins and sites in the sample within the magnet. Often distortions in these parameters are accepted, as the price of sensitivity enhancement, or because it is unclear just how these distortions might be avoided. Surprisingly enough, the problem is exacerbated by the use of modern techniques of pulsed Fourier transform NMR. Noise spectroscopy is an approach to solving the problem of distorted NMR spectra, which is largely under appreciated; it promises virtually "unlimited" distortionless bandwidths without costly hardware investments. Nonetheless, its exploitation remains limited. We will discuss why noise spectroscopy belongs in the arsenal of tricks spectroscopists should be aware of, show examples where its use is essential if accurate, quantitative NMR is to be expected, and discuss some recent approaches which extend its applicability yet further, particularly in solid state NMR and in applications to quadrupolar nuclear spins.