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Accelerated Acquisition of 2D NMR Spectra using Iterative Projections SEAN BARRETT, Yale University, Physics Dept., ZACHARY SETHNA, Princeton University, Physics Dept., MERIDETH FREY, Yale University, Physics Dept., PATRICK LORIA, Yale University, Chemistry, Dept. — Typically, in 2D NMR (or 2D MRI), only one "row" of the time-dependent (or k-dependent) signal is sampled N times per $\sim T_1$ (spin-lattice relaxation time). Thus, filling a 2D Cartesian grid of $M \times N$ data points requires M additional experiments, for a total spectral acquisition time $T_{\mathrm{acq}} \approx M \times T_1$. Measuring fewer "rows" than required for Fourier reconstruction decreases T_{acq}, but this results in a low-quality spectrum (unless more complicated, computationally slower reconstruction techniques are used). Here, we show that a new approach to this problem, using iterative projections, can work on actual 2D NMR data. This approach is built upon the Fast Fourier Transform, so it can handle large data sets (2D, 3D, 4D). Moreover, this approach is expected to work even better in higher dimensions, yielding greater speed ups. Finally, we will discuss how the accelerated acquisition may also improve signal-to-noise and frequency resolution.

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