The Application of Interferometry to Magnetic Resonance Imaging

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The direct application of interferometry to MR would naturally correlate the signals from multiple receiver coils. This application has been rejected due to the distances that would be necessary between receiver elements of approximately 3*10^8 m [Ernst, Nobel Lecture 1992]. However, the MR experiment is very repeatable, where various parameters can be controlled. This repeatability permits correlating the data of multiple excitations from a single receiver element. The same phase encoding gradients that are used for typical MR imaging can be applied to make each readout contain a relative difference in phase across the image. The signals can then be correlated as in Radio Interferometry (RI), providing Fourier data of the image domain squared.

In our studies, we have applied this technique to both 1-D and 2-D MR spectroscopic imaging. Because every pair of readouts is correlated, the new Fourier domain can be fully mapped using a fraction of the number of excitations. We present results that illustrate a reduction in scan time. Spectroscopic MR imaging benefits directly from the technique, which may extend beyond the spectroscopic modality.