# Localized Two-Dimensional Magnetic Resonance Spectroscopy on a Whole-Body Scanner

## Lawrence N Ryner

Three-dimensionally localized versions of several two-dimensional (2D) NMR sequences have been implemented on a 1.5 T MRI/MRS whole-body scanner. Initial phantom and in vivo human studies are presented here.

The pulse sequences were localized versions of 2D J-resolved, 2D zero-quantum, 2D double-quantum, zero-quantum filtered COSY and SECSY, and double-quantum filtered COSY and SECSY. The coherence-selection property of the slice-selective RF pulses used for both coherence transfer and three-dimensional localization was exploited with pulse sequences optimized for particular coherence transfer pathways. Phantom experiments comparing hard pulse and localized pulse 2D spectroscopy experiments verified the efficiency of the localized 2D NMR pulse sequences.

Localized 2D J-resolved plots are presented for ten of the common coupled metabolites found in human brain tissue. Localized 2D J-resolved and double-quantum filtered COSY spectra of a phantom containing physiological concentrations of several metabolites also are presented to demonstrate the feasibility of performing these techniques within time limits reasonable for human comfort. Localized 2D multiple-quantum spectroscopy experiments demonstrate the clinical utility of these experiments and the sensitivity of different multiple quantum coherence orders to B0 inhomogeneity.

The first reported 2D J-resolved and double-quantum-filtered COSY 1H in vivo MR spectra, localized in three-dimensions, are presented here, acquired from the brain of a healthy volunteer and demonstrating the use of localized 2D NMR techniques in vivo. The first reported 2D J-resolved 1H in vivo MR spectrum from tumorous brain tissue is also presented. The necessity for the introduction of localized 2D NMR spectroscopy experiments to aid in the in vivo biochemical analysis of human tissue, in conjunction with standard 1D MR spectroscopy, is stressed.