Supporting Information: Tailored Spiral In-Out Spectral-Spatial Water Suppression Pulses for Magnetic Resonance Spectroscopic Imaging

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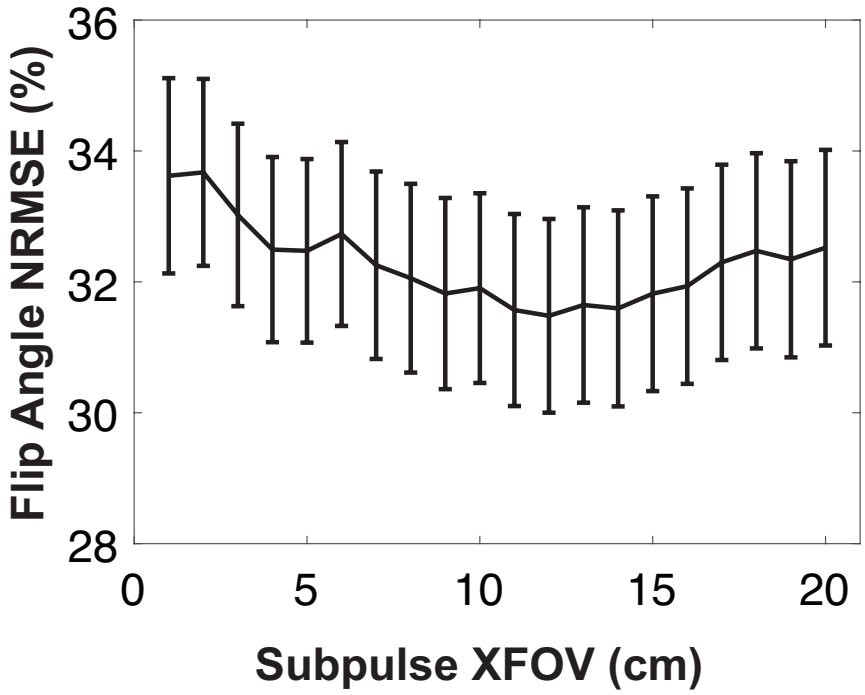

Figure S1: Simulated excitation errors of 0.645 ms spiral in-out subpulses as a function of excitation field-of-view (XFOV), averaged across 28 subjects. For each XFOV, the trajectory rotation angle (out of the set $\{0^\circ, 45^\circ, 90^\circ, \ldots, 315^\circ\}$) with the lowest average error was used. Excitation error did not depend strongly on the trajectory's XFOV since a) the pulses were very short so all trajectories comprised less than two full spiral arcs; and b) due to the fixed pulse duration, resolution decreased as XFOV increased. Even so, across all subjects the average NRMSE was minimized with an XFOV of 12 cm, which is close to the value of 10 cm used experimentally. The best 10 cm trajectory rotation angle was 0 degrees, which was also the value used experimentally.

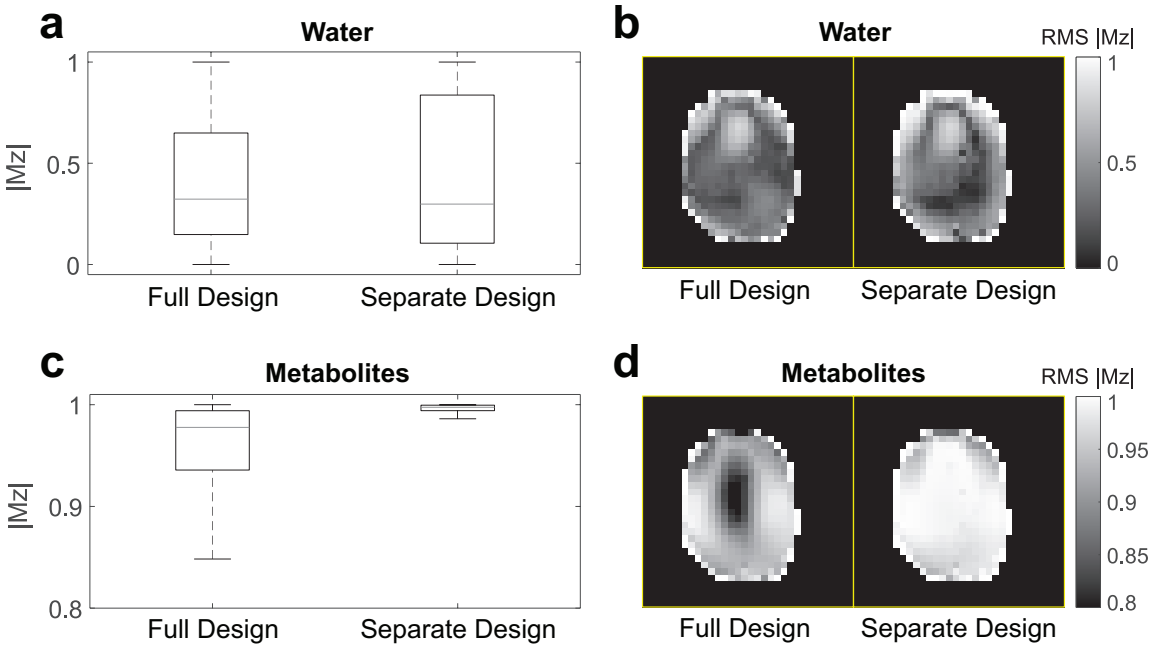

Figure S2: Comparison of full versus separate SPSP RF waveform design in a representative subject. The pulses were designed for a 90 degree flip angle, and the full waveform design was performed using iterative magnitude least squares optimization with off-resonance compensation. The box plots in (a) and (c) show the distribution (across space and frequency) of longitudinal magnetization (M_z) after each pulse, in the water band (a) and the metabolite band (c). (b) and (d) show RMS (across frequency) M_z maps after each pulse, in the water (b) and metabolite (d) bands. The full waveform design produces a tighter distribution of longitudinal magnetization (though with a slightly higher mean value) in the water band, indicating somewhat better water suppression, though it still leaves large RMS M_z above the sinuses where off-resonance is the highest. The separable design leaves higher residual M_z in the metabolite band, which is desirable.