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**S1 Figure 1:** Performance of 1D-ISIS slice excitation performance was determined in cylindrical (diameter =16 cm and length = 26 cm) phantom containing 100 mM sodium phosphate. A one-dimensional profile was acquired in a plane parallel to the surface of the coil. (A) High resolution image of the phantom and slice location. The 31P/1H RF coil was placed under the phantom. (B) Experimentally measured 31P excitation slice profile shown in red demonstrates excellent localization with minimal side bands. Non-localized profile (GOIA pulses turned off) is shown in black. The signal decays towards the edges is due to loss of sensitivity of the surface coil.