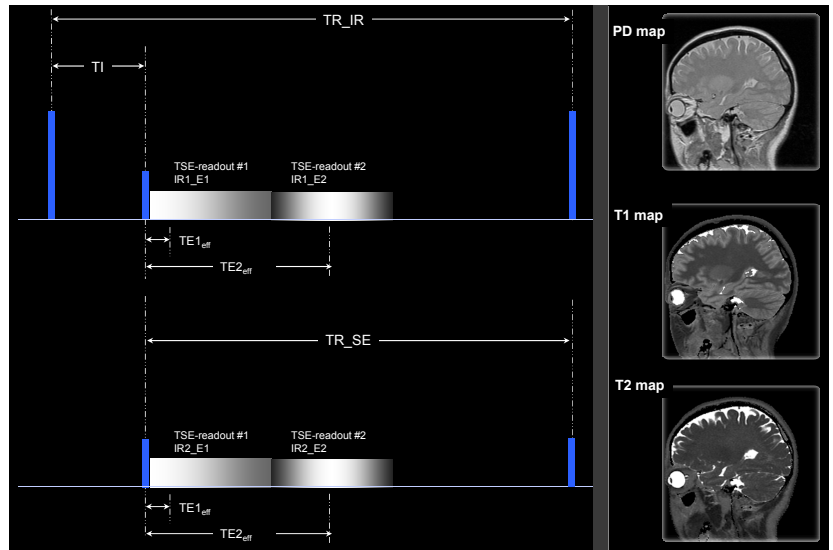


Tandem dual-echo fast spin echo with inversion recovery (Tandem-IR-DE-FSE): a multi-platform pulse sequence for multispectral quantitative-MRI (PD, T1, T2)

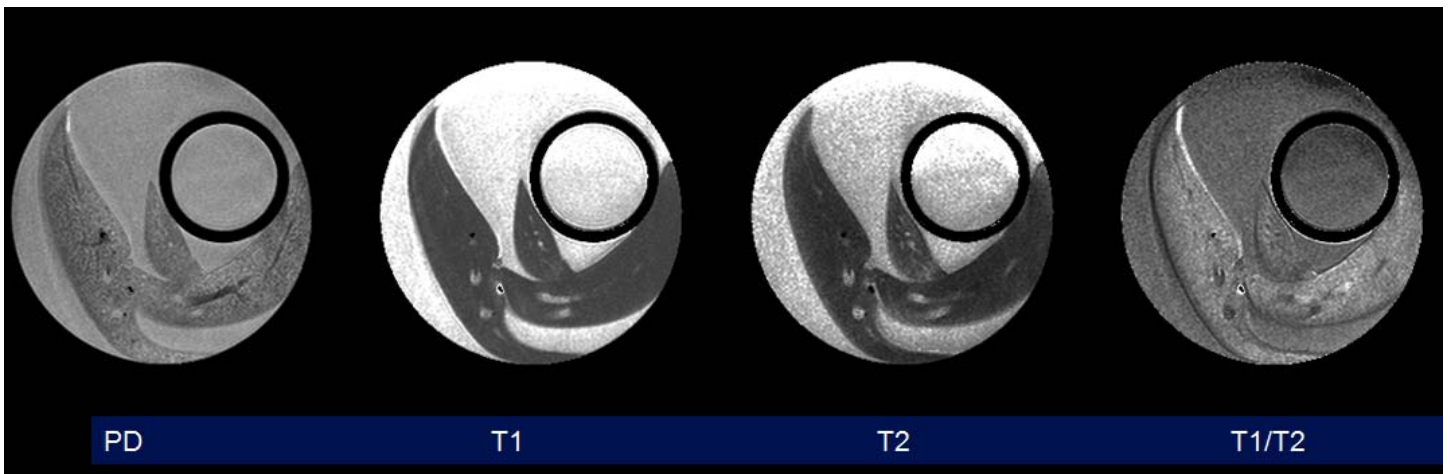
H. Jara¹, S. W. Anderson¹, O. Sakai¹, and J. A. Soto¹
¹Boston University School of Medicine, Boston, MA, United States

Purpose: There is great need for multi-spectral quantitative-MRI (qMRI) pulse sequences that can be readily implemented in MRI scanners of different manufacturers and field strengths. The purpose of this work was to develop one such cross-platform and multispectral qMRI pulse sequence, hereafter *Tandem dual-echo fast spin echo with inversion recovery* (Tandem-IR-DE-FSE) and to develop qMRI processing algorithms for mapping proton density (PD), T1, and T2 from images acquired with both General Electric (brain) and Bruker (phantom).scanners.

Methods: The Tandem-IR-DE-FSE sequences (see *Fig. 1*) were implemented in GE (1.5T-SIGNA HDx) and Bruker 11.7T scanner (BioSpin™, Ultra Shield 500MHz) NMR spectrometer with imaging capabilities. Key imaging parameters (approximate, depending on scanner): 700TI, 12/100TE1,2, 3000/3700TRs. Total acquisition time: less than 10min and SAR (1.5T) 2.3 W/kg for 70 contiguous slices, pixel spacing 0.93x0.93 mm². Model conforming qMRI algorithms for mapping PD, T1, and T2 were programmed in MathCAD (PTC, Needham, MA) based on solving the Bloch equations for each of the Tandem sequences.



Results: Excellent directly-acquired and qMRI map image quality was obtained with both scanners. As shown, in *Fig. 1*, PD, T1, and T2 maps of the brain are of good image quality and also are give qMRI measures in good agreement with accepted values: GM:PD/T1/T2=0.8/1,100/100; WM:PD/T1/T2=0.7/600/95. Also, at 11.7T, maps below are characteristic of the qMRI map quality obtained with mouse liver samples: typical values: PD/T1/T2=0.8/780ms/15ms.



Conclusion: The Tandem IR-DE-FSE sequence can produce multispectral qMRI maps of PD, T1, and T2 that are self co-registered, of high spatial resolution, and with clinical coverage (e.g.70 slices) in clinically compatible scan times (<10min). The Tandem IR-DE-FSE is an analog to the mixed-TSE (*Ref.*) available from Philips Medical Systems and because it is available across all major vendor platforms, it could assist in establishing platform-independent qMRI protocols for both quantitative clinical practice as well as multi-site research studies.