Application for QIBA Project Funding

Title of Proposal: Evaluation of RF Transmit Calibration Options for Quantitative DCE-MRI		
QIBA Biomarker Committee/Task Force: PDF-MRI / DCE Task Force		
NIBIB Contract Objective(s): Objective **3**		
PI (Project Coordinator or Lead Investigator Information)		
Last Name: Nayak	First Name: Krishna	Degree(s): PhD
e-mail:		Tel #:
Institution/Company: **University of Southern California**		
Total Amount Requested:		

Project Description

We will generate two phantom types: (1) a torso shaped phantom that is approximately the size of a human adult torso with a concentric outer shell, creating one large fillable interior volume and one smaller outer volume and (2) a human adult head-sized phantom with a single interior fillable volume. Two versions of each phantom will be created, and the interior volumes will be filled with two different solutions, resulting in a total of four phantoms. The conductivity of both solutions will be matched to that of human tissue (30 mM NaCl). The first will achieve a uniform T1 of approximately 1.5 seconds at 3T (0.60 mM $NiCl_2$), and the second will achieve a uniform T1 of approximately 300 ms at 3T (4.75 mM $NiCl_2$). The outer volume of the torso phantoms will be filled with a fat-mimicking solution (T1 = approximately 350 ms). We will scan these phantoms on two separate occasions separated by roughly 2 months. The B1+ variation is not expected to be a function of T1, however, B1+ mapping techniques could be biased by T1. These two solutions will cover the range of the short and long T1s expected in organ tissue during a DCE-MRI acquisition with a current recommended contrast agent dose.

We will report the amount and spatial pattern of B1+ variation for all MRI scanners and RF transmit geometries. We will report any (unexpected) variation in the pattern due to test-retest and/or due to T1 fill differences. We will report the error (bias and variance) of all B1+ mapping methods compared to the (slow) DAM reference. Finally, we will report the expected error (bias and variance) of derived DCE-MRI metrics if performed without B1+ calibration information, or if performed with inaccurate B1+ calibration information. This will be done using standard DCE-MRI simulation and error propagation analysis, the results of which will be used to directly inform the claims of the v2.0 DCE-MRI Profile.