



## Application for QIBA Project Funding

Title of Proposal: RSNA DCE-MRI Phantom Automated Analysis Software Package Development		
QIBA Committee/Subgroup: PDF-MRI Technical Committee		
NIBIB Task Number(s) which this project addresses: 2 (primary), 1 & 9 (secondary)		
<b>Project Coordinator or Lead Investigator Information:</b>		
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e-mail:	Tel #:	
Institution/Company: The University of Wisconsin		
Amount Requested:		

### Project Description

As a result of Phase I NIBIB contract funding, the PDF-MRI Technical Committee developed and produced the RSNA QIBA DCE-MRI phantom that has since been field tested as part of the ACRIN6701 test/retest clinical trial site qualification process and ongoing quality control. The DCE-MRI phantom allows for the assessment of contrast response characterization and relaxometry measurement bias and variance and can also be used for compliance testing and ongoing quality control. An associated Phase I NIBIB contract was awarded to VirtualScopics for the initial development of a semi-automated analysis software package. The original goal of the combined projects was to produce the phantom as well as an automated analysis software package allowing a user to acquire the necessary data using the protocols promulgated by RSNA QIBA as defined in the DCE-MRI Profile v1.0 and subsequently analyze the data using vetted, standardized analysis software. The original software package, however, provided only the raw data, *e.g.*, R1 and S0 values with and without ratio map intensity corrections for each sample in the phantom, SNR measurements from each sample, and a single CNR measurement. No further analysis, *e.g.*, plots of the results, correlations with known R1 values for each sample, Bland-Altman analyses, *etc.* was performed by the package, forcing the user to develop his/her own analysis tools and, therefore, introducing additional sources of bias and variance into the resulting data. Furthermore, the original analysis package is now dated, *e.g.*, runs only on 32-bit Windows computers, does not handle larger dynamic range datasets commonly obtained using 3.0T scanners, *etc.* These constraints severely limit the potential use of the RSNA QIBA DCE-MRI Phantom and associated analysis package in site qualification, ongoing quality control, and compliance testing.

As part of the site qualification process for the ACRIN6701 test/retest protocol, the project PI and one of his graduate students (Ryan Bosca, MS) developed a semi-automated analysis package in the Matlab environment that accomplishes all tasks originally proposed, *i.e.*, R1, S0, SNR, and CNR calculations for variable flip angle (VFA), variable TR (VTR), and variable TI (VTI) data sorted by phantom sample location both with and without ratio map signal intensity corrections. The raw data results from this package were validated against those from the VirtualScopics program as well as the GE CineTool/Kinmod program. Associated Excel workbooks provided for the plotting and analysis of the data (correlation of R1 measures for each sample vs. known R1 values for relaxometry acquisitions (VFA, VTI, VTR), Bland-Altman plots and limits of agreement, assessment of linearity of signal intensity vs. R1 for DCE acquisitions, *etc.*), and checks of relevant DICOM header data, *e.g.*, TE, TR, flip angle, bandwidth, *etc.*

For optimal use of the RSNA QIBA DCE-MRI Phantom and associated software analysis package in site qualification, ongoing quality control, and, in particular, compliance testing, the software analysis package must be self-contained, easily used, and robust with respect to the ability to analyze data from all three major vendors, including vendor-specific signal intensity scaling requirements. This project will provide such a software package.