Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Flow in cerebral aneurysms: 4D Flow MRI measurements and CFD models. VITALIY RAYZ, Biomedical Engineering, Purdue University, SUSANNE SCHNELL, Radiology, Northwestern University — 4D Flow MRI is capable of measuring blood flow in vivo, providing time-resolved velocity fields in 3D. The dynamic range of the 4D Flow MRI is determined by a velocity sensitivity parameter (venc), set above the expected maximum velocity, which can result in noisy data for slow flow regions. A dual-venc 4D flow MRI technique, where both low- and high-venc data are acquired, can improve velocity-to-noise ratio and, therefore, quantification of clinically-relevant hemodynamic metrics. In this study, patient-specific CFD simulations were used to evaluate the advantages of the dual-venc approach for assessment of the flow in cerebral aneurysms. The flow in 2 cerebral aneurysms was measured in vivo with dual-venc 4D Flow MRI and simulated with CFD, using the MRI data to prescribe flow boundary conditions. The flow fields obtained with computations were compared to those measured with a single- and dual-venc 4D Flow MRI. The numerical models resolved small flow structures near the aneurysmal wall, that were not detected with a single-venc acquisition. Comparison of the numerical and imaging results shows that the dual-venc approach can improve the accuracy of the 4D Flow MRI measurements in regions characterized by high-velocity jets and slow recirculating flows.

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Date submitted: 31 Jul 2017 Electronic form version 1.4