Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Flow Structures in a Healthy and Plaqued Artificial Artery using Fully Index Matched Vascular Flow Facility FARAZ MEHDI, AKASH JAIN, JIAN SHENG, Texas Tech University — Particle Image Velocimetry measurements are made in a closed loop fully index matched flow facility to study the flow structures and flow wall interactions in healthy and diseased model arteries. The test section is 0.63 m long and the facility is capable of emulating both steady and pulsatile flows under physiologically relevant conditions. The model arteries are in-house developed compliant polymer (PDMS) tubes with 1 cm diameter and 1 mm wall thickness. The Reynolds numbers of flows vary up to 20,000. The plaque is simulated by introducing a radially asymmetric bump that can be varied in shape, size and compliancy. The overall compliancy of the model can be also controlled by varying ratio between the elastomer and the curing agent. The tubes are doped with particles allowing the simultaneous measurements of wall deformation and flows over it. The working fluid in the facility is NaI and is refractive index matched to the PDMS model. This allows flow measurement very close to the wall and measurement of wall shear stress. The aim of this study is to characterize the changes in flow as the compliancy and geometry of blood vessels change due to age or disease. These differences can be used to develop a diagnostic tool to detect early onset of vascular diseases.

Faraz Mehdi
Texas Tech University

Date submitted: 01 Aug 2014 Electronic form version 1.4