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Setup of a Biomedical Facility to Study Physiologically Relevant Flow-Structure Interactions FARAZ MEHDI, JIAN SHENG, Texas Tech University — The design and implementation of a closed loop biomedical facility to study arterial flows is presented. The facility has a test section of 25 inches, and is capable of generating both steady and pulsatile flows via a centrifugal and a dual piston pump respectively. The Reynolds and Womersley numbers occurring in major blood vessels can be matched. The working fluid is a solution of NaI that allows refractive index matching with both rigid glass and compliant polymer models to facilitate tomographic PIV and holographic PIV. The combination of these two techniques allows us to study both large scale flow features as well as flows very close to the wall. The polymer models can be made with different modulus of elasticity and can be pre-stressed using a 5-axis stage. Radially asymmetric patches can also be pre-fabricated and incorporated in the tube during the manufacturing process to simulate plaque formation in arteries. These tubes are doped with tracer particles allowing for the measurement of wall deformation. Preliminary flow data over rigid and compliant walls is presented. One of the aims of this study is to characterize the changes in flow as the compliancy of blood vessels change due to age or disease, and explore the fluid interactions with an evolving surface boundary.

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