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Fluid Dynamics of the Generation and Transmission of Heart Sounds: (1) A Cardiothoracic Phantom Based Study of Aortic Stenosis Murmurs[1] HANI BAKHSHAEE, JUNG-HEE SEO, CHI ZHU, NATHANIEL WELSH, GUILLAUME GARREAU, GASPAR TOGNETTI, ANDREAS ANDREOU, RAJAT MITTAL, Johns Hopkins University — A novel and versatile cardiothoracic phantom has been designed to study the biophysics of heart murmurs associated with aortic stenosis. The key features of the cardiothoracic phantom include the use of tissue-mimetic gel to model the sound transmission through the thorax and the embedded fluid circuit that is designed to mimic the heart sound mechanisms in large vessels with obstructions. The effect of the lungs on heart murmur propagation can also be studied through the insertion of lung-mimicking material into gel. Sounds on the surface of the phantom are measured using a variety of sensors and the spectrum of the recorded signal and the streamwise variation in total signal strength is recorded. Based on these results, we provide insights into the biophysics of heart murmurs and the effect of lungs on sound propagation through the thorax. Data from these experiments is also used to validate the results of a companion computational study.

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