Feasibility of a single-transducer harmonic motion imaging using frequency-based simultaneous multiple harmonic oscillation excitation pulses, Md Murad Hossain[1], and Elisa E. Konofagou[1], [1]-*Department of Biomedical Engineering, Columbia University, New York, NY.* *mh4051@columbia.edu*

Single-transducer harmonic motion imaging (ST-HMI) uses a single transducer to generate the harmonic motion at a particular frequency by modulating excitation pulse duration and then, estimate the motion by collecting tracking pulses in-between the excitation pulses, unlike the conventional HMI which uses focused ultrasound and an imaging transducer. Instead of oscillating at a single frequency, the objective is to use ST-HMI for simultaneously exciting the tissue at multiple frequencies. Six excitation pulses per period were selected by sampling a continuous signal which was generated by summing sinusoids with fundamental and harmonics of 100 Hz and 200-1000 Hz, respectively. A mean peak to peak displacement (MP2PD) image was generated by a weighted average of P2PD at each frequency with a weighting factor derived from the Fourier transform. The new method is evaluated by imaging four inclusions (INC, Young's modulus: 6, 9, 32, and 75 kPa) embedded in 18 kPa background (BKD) and HIFU ablated excised canine liver. The MP2PD image successfully differentiated all four inclusions with R^2=0.99 of the linear regression between the MP2PD ratio of BKD to INC versus Young's modulus ratio of INC to BKD. The MP2PD image detected the ablated region with the MP2PD ratio of non-ablated versus ablated regions of 1.64. These results demonstrate the feasibility of simultaneously exciting the tissue at multiple frequencies and ongoing studies entail the translation of this new elasticity imaging method of detecting breast masses in humans.