AbstractID: 2534 Title: A Proposal of Respiratory Phantom Driven by Double-Motor

Respiratory motion phantom has been widely used in the current study of gated radiotherapy. Most of the phantoms are driven by a single motor, which can only simulate one-dimensional sinusoidal motion. However, many studies had shown the normal breathing pattern is asymmetric between the inhale phase and the exhale phase. Fourier transform analysis shows that a double harmonic model, including the first and second harmonics, could give a good reproduction of the normal breath pattern. Based on this fact, we propose the design of a double-motor driven phantom, which can produce a periodic motion with asymmetric pattern. In this design, the phantom is driven by the first motor. This motor is fixed on a sliding platform, which is further driven by a secondary motor. The frequency for each motor can be adjusted with the input voltage, and should be set exactly according to the first and second harmonics, respectively. Amplitude of each sinusoidal component can be adjusted by changing the location of the arm on the wheel. Based on the Fourier analysis of real volunteer's data, the ratio of their amplitudes should be around 3:1 to 5:1, but could also patient adapted. This design can be valuable in phantom studies where a symmetric sinusoidal motion is not sufficient. Although a programmable phantom shows promising of an ideal solution, this design is easier to be implemented and also cost effective.