

Dynamic Motion Phantoms for the Evaluation of Video Based Respiratory Gating Systems

Several respiratory gating systems are under development that will allow the selective delivery of absorbed dose to moving target volumes during time intervals when the target is within the intended location. Dynamic feedback in these systems is established by correlating the signal from a respiration-monitoring device with the internal location of the target. In order to perform acceptance testing, commissioning, and ongoing quality assurance for clinical respiratory gating treatment programs, dynamic test phantoms must be developed that simulate patient respiration.

A respiratory gating test phantom (RGTP) was designed and built for use with video based patient monitoring systems. The RGTP consists of a cylindrical water tank with a submerged air bladder. The system can be remotely inflated and deflated using an electrically controlled air valve. When the valve is opened, air is forced into the bladder by an air compressor. When the valve is closed, the pressure of the water causes the air in the bladder to vent into the atmosphere. Markers placed on a floating water level indicator are used by the CCD video camera system to track the location of the air bladder. The RGTP is constructed of plastic and can be used in x-ray simulators, CT scanners, and linear accelerators. Because dosimeters and radio-opaque markers can easily be on the surface of the bladder, the RGTP can be used in a variety of acceptance testing, commissioning, and ongoing quality assurance procedures for respiratory gating.