

Temporal Resolution Phantom: A Device and Method for Measurement of a CT Scanner's Temporal Resolution

Alexander H. Slocum, Jr., Stephen E. Jones, MD and Rajiv Gupta, MD
MIT, MGH, Cleveland Clinic

A calibration phantom that can be used to measure the temporal resolution of a CT scanner was designed utilizing a deterministic design process. The system was first defined in terms of a set of functional requirements based on parameters of the imaging modality. It was necessary to generate multiple time-varying signals visible to the scanner, each with a pre-determined temporal frequency. Roll-off in the scanner's ability to resolve the modulation

of certain signals would be used to determine the scanner's temporal resolution. Based on size limitations imposed by the scanning environment, the phantom utilizes multiple planetary gear assemblies, driven by a common shaft, to achieve a wide range of rotational velocities. Results obtained with an alpha prototype agreed with the theory. It was determined that further development of the phantom was necessary to increase the sensitivity of the measurement. The latest prototype phantom has been used to measure the temporal resolution of two different scanners and it was shown that temporal resolution of each is different from the gantry rotation time.