

AbstractID: 2963 Title: A new device for the verification of temporal function of the 4DCT and gating delivery system

Purpose: A quality assurance device was developed for 4DCT (GE Medical System, Waukesha, Wisconsin) and the Real-Time Position Management Respiratory Gating System (Varian Medical Systems, Palo Alto, CA). It verifies the temporal-phase function of the 4DCT and the gated delivery function of the Linac.

Method and Materials: The QA device is composed of a mobile phantom, static phantom, acrylic lobe, AC motor, power transformer and transmission mechanism. There are eight radio-opaque lines embedded in the static phantom, which are used as reference indicators. A "Z" shape radio-opaque marker is fixed on the top of the mobile. This phantom moves periodically with a maximum displacement of 3 cm in a horizontal direction. It was scanned under our 4DCT at a period of 5 seconds. The collected images were divided into 10 groups representing 10 phases of the moving cycle. The digitally reconstructed radiograph of each phase was generated for the verification of the temporal-phase function of the 4DCT. To verify the gated delivery function of the Linac, a radiographic film was attached to the surface of the mobile phantom and a 0.5 cm by 10 cm X-ray field was used to expose the film at certain phases. The expected position of 0% phase was marked by punching 2 small holes on the film.

Results: The "Z" mark was correctly shown and aligned with the reference lines at each phase. The film exposed under the Linac has shown that the radiation had been delivered to the correct position.

Conclusion: A reliable quality assurance device for 4DCT and respiratory gating system is necessary to ensure that the radiation dose is accurately delivered to the patient's target volume. This QA device is effective and convenient for checking temporal-phase function on the 4DCT and RPM gating system.