AbstractID: 8642 Title: A unified dose indicator for tomographic acquisition modalities

Introduction : Tomographic techniques in diagnostic and interventional radiology or radiation therapy are in rapid development. The CTDI formalism that is currently used to assess dose has been challenged by several groups. The goal of this contribution is to evaluate the required scan length to reach equilibrium on various MDCT units and estimate the average dose delivered within a slice when using systems having a cone beam geometry.

Methods and Materials: Measurements were performed on three MDCT systems (GEMS 8, 16 and 64-row), a flat panel fluoroscopy (Allura – Philips), an IGRT (Synergy, Elekta ltd) and on a tomotherapy (TomoTherapy Inc.) using two standard CTDI phantoms and a home made phantoms (PMMA cylinder of 30 cm filled with water) with a conventional small volume ion chamber (0.6 cc Farmer type) and a standard pencil ion chamber. Dose profiles were also recorded at various positions within the slice to study the impact of scatter as a function of the distance between the centre of the phantom and its periphery.

Results: For CT units a theoretical length of 400 mm is required to reach the equilibrium at the center of the phantom. The measurements show that a dose plateau was reached after 420 mm. The average dose within a slice measured in our home made phantom for standard abdominal CT (120 kV, 210 effective mAs) was 15.3 mGy; 26.9 mGy for the fluoro-CT (122kV, 274mAs, 20.7s); 39.0mGy for IGRT system (120kV, 219mAs, 27x27cm^2 field size, one rotation) and 13.1 mGy for the Tomotherapy system (3.5 MV, pitch=0.8).

Conclusion: The CTDI concept should be replaced by a more generic methodology, such as the one presented here, that could be used in all cone beam geometries. Measurements should be done using water equivalent phantoms.