AbstractID: 7028 Title: Pediatric Organ Dose Measurements in Axial and Helical Multi-slice CT

Purpose: To determine radiation dose to specific organs in a pediatric phantom from a CT scan, and to determine if there is a significant difference between: axial (step and shoot) and helical acquisitions, when using very similar photon flux values (effective mAs).

Method and Materials: An anthropomorphic pediatric phantom (5 year old equivalent) was used to investigate organ dose at the surface and internal to the phantom. The phantom contains four different tissue equivalent materials: soft tissue, bone, brain, and lung, and was imaged on a 64-channel CT scanner with a head protocol [axial and two helical scans (pitch = 0.516 and 0.984)], and a chest protocol [axial and three helical scans (pitch = 0.516, 0.984, and 1.375)]. Effective mAs was kept constant (within 3%) for head and chest protocols. Dose measurements were acquired using thermoluminescent dosimeter (TLD) powder in capsules placed in the phantom sections in plug holes. The organs of interest for this study were: brain, both eyes, thyroid, sternum, both breasts, and both lungs.

Results: All axial organ dose measurements were significantly higher ($p<0.05$) than all helical organ dose measurements. There was no significant difference ($p>0.05$) in organ dose values between the pitch values 0.516 and 0.984 for both head and chest scans. The chest organ dose measurements obtained using a pitch of 1.375 were significantly higher ($p<0.05$) than the other helical pitches used for chest scans (attributed to the automatic selection of the large focal spot).

Conclusion: Communications with the vendor indicate that there are likely physical explanations for the difference observed in organ doses due to axial versus helical acquisitions. It is unclear if this difference in organ dose is unique to this scanner design, because dose measurements are not typically performed in helical scan mode and have not been investigated using other scanner models.