

AbstractID: 5573 Title: Evaluation of an OSL dosimetry system for CT quality assurance and dose optimization

Purpose:

Recent development of wide-beam multidetector CT and cone-beam CT demands alternative methodology to CTDI. In this study, the Optically Stimulated Luminescence (OSL) technique was evaluated for CT quality assurance and dose optimization.

Method and Materials:

CT scans were performed on 38-mm² thin LuxelTM Al₂O₃:C dosimeters oriented in axial plane of a GE LightSpeed Ultra and at the center of a CT body dosimetry phantom. A 5-mm beam collimation was selected to determine the energy response of the OSL detector at 80, 120, and 140 kVp stations. mA response of the OSL detector was evaluated from 60 to 350 mA. Helical scans of varying length coverage were also performed with the detector placed at the isocenter. The exposed OSL discs were measured using a Riso TL/OSL-DA-15 reader. Each OSL measurement was followed by a standard beta source irradiation and subsequent OSL measurement to normalize for the differing mass of the disks. The normalized OSL signal reading was used in the data analysis.

Results:

Good mA linearity was observed at all 3 kVp stations. There are discontinuities seen at ~ 250 mA and it is known to be caused by tube focal spot change. The 120 and 140 kVp data show good correlation with ionization chamber reading. For 80 kVp, OSL signals to ion chamber readings are all higher, particularly at low mA range, indicating higher sensitivity of the OSL detector over the ion chamber. The helical scans show an increased OSL signal with scan length and a leveling of the signal at large scan coverage.

Conclusion:

The OSL detectors are of small size and responded well to CT exposure. It provides a practical technique for quantifying the dose at any location of a phantom for quality assurance and hence exhibits a potential for estimating patient organ dose.