AbstractID: 11321 Title: Quantitative assessment of three dead detector interpolative correction methods for cone beam CT images

Purpose: Dead detectors can occur in the electronic portal imaging devices (EPIDs) used for cone beam computed tomography (CBCT), and their presence can lead to image degradation and artifacts. Methods exist to correct for dead detectors, and the determination of the limitations of these methods could aid in the design of more efficient and longer-lasting imaging systems in the future. We quantitatively assessed the effectiveness of three dead detector correction methods using megavoltage CBCT (MVCBCT) as a test system. **Method and Materials:** The dead detector correction methods considered were: bi-directional linear interpolation (BLI), quad-directional linear interpolation (QLI), and a Laplacian solution (LS) method. A total of 288 MVCBCT test images of an image quality phantom were reconstructed from projections that were acquired from four linear accelerators (linacs). Both 8 and 60 monitor unit (MU) head-and-neck scanning protocols were used for the acquisitions. Dead detector maps were simulated for the cases of randomly distributed singular dead detectors and 13-dead-detector clusters, each with six dead detector percentages: 2%, 25%, 75%, 80%, 90%, and 95%. **Results:** Quantitative image quality assessment was done by calculation of the standard deviation of the test and baseline image differences. Test image quality did not deviate substantially from the baseline case (<0.5% dead detectors) for any of the algorithms until the dead detector fraction reached 80% for the clusters of 13 dead detectors, and 90% for the singular dead detectors. **Conclusion:** It was determined that MVCBCT images are relatively insensitive to randomly distributed dead detectors until 80-90% of the EPID detectors are dead. Image degradation for the same percentage of dead detectors was more pronounced when the EPID was covered with clusters of 13 dead detectors than with singular dead detectors, and was weakly dependent on the MU used during the image acquisition. **No conflict of interest**