AbstractID: 12595 Title: On the suitability of using nanoDot for measuring dose distributions resulting from kV-CBCT acquisitions

Purpose:
There is a growing need to determine radiation exposure and dose distributions resulting from an image-guidance procedure. Although Monte Carlo simulations are capable to calculate the dose distributions, experimental measurements remain the gold standards to validate the accuracy of calculations. This study investigated the suitability of nanoDot dosimeters for measuring accumulative dose at several locations simultaneously to determine 3D dose distributions resulting from a kilovoltage cone-beam CT (kV-CBCT) scan.
Method and Materials:
The nanoDot dosimeters read with a microStar reader by Landauer were used in the study. The system can be calibrated to measure dose from kilovoltage to megavoltage energy beams. The manufacturer provides a set of calibration dosimeters for 80 kVp x-rays. The accuracy of the nanoDot dosimeters for absorbed dose measurements for kV-CBCT scans was validated by using an ionization chamber in which the air-kerma calibration factors were traceable to National Standards Laboratory. The relative dose distributions measured with nanoDot were compared with Monte Carlo calculated dose distributions in a PLASTIC WATER® LR phantom.
Results:
Seven nanoDot dosimeters were placed at different locations to determine dose distributions resulting from each kV-CBCT scan protocol. There are five different kV-CBCT scan protocols in the Varian OBI 1.4 system including Head, Low-dose Thorax, Pelvis and Pelvis Spot Light with two different Bow-tie filters. Both absolute and relative dose distributions were investigated. The dose values measured from 35 points generally agree with that of Monte Carlo calculations within 2-4%.
Conclusion:
The nanoDot dosimeters have been shown to be very suitable detectors for measuring 3D dose distributions resulting from kV-CBCT scans due to its small size, the ease of use, good reproducibility, and manageable photon energy dependence.

Conflict of Interest:
The microStar reader used in the research was provided by Landauer, Inc. Glenwood, IL