AbstractID: 2841 Title: Two-dimensional (2D) ion chamber array for radiation dose verification including IMRT

Two-dimensional (2D) ion chamber array for radiation dose verification including IMRT.

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Purpose:
Dosimetry in modulated fields such as soft-wedges and IMRT is often difficult and inaccurate due to temporal and spatial fluence variation. It requires two-dimensional (2D) detectors that should be independent of beam energy, dose rate, dose, and depth. Ion chambers provide these criteria and hence a 2D ion chamber array is evaluated for dosimetry in radiation therapy.

Method and Materials:
A 2D array from PTW of 27x27 parallel-plate ion chambers embedded in 5 mm of PMMA is used. The chambers are 5x5x5 mm^3 and are equally spaced at 10 mm on center. The device provides absolute dose with a resolution of 1mGy/min and includes software for dose and image verification in complex fields. Open beam, wedge fields (physical and soft), and IMRT beam verifications were performed on a linear accelerator that was interfaced to an Eclipse TPS. IMRT dosimetry was compared with film and other devices.

Results:
The 2D-array provides the unique opportunity to measure beam profiles in any gantry angle and 2D-wedge profiles of hard and soft wedges. Accuracy was verified to within ±1%. For IMRT fields the device is robust and measures absolute dose as well as dose in any plane. Being an ion chamber device the results are more reliable and can be taken as a gold standard.

Conclusion:
This device is easy to use, robust and provides highly accurate dose and dose rate measurements. Data is energy independent and ideally suited for complex dosimetry tasks such as IMRT and wedge verification. This device can also be used for other routine tasks, like daily QA, wedge checks, dose calibration and IMRT dosimetry.

Conflict of Interest (only if applicable):
Szeglin, Schuele, and Barker employees of PTW.