Purpose: To study the dosimetric characteristics of a commercial three-dimensional water scanner (3D SCANNER, Sun Nuclear Corp). The novel cylindrical scanner uses a compact electrometer mounted on the side of the tank, eliminating the need for chamber extension cables. The electrometer has a wide dynamic range, requiring no gain adjustment as scanning conditions change, e.g., field size, dose rate, wedge field, etc.

Methods: Measurements from the 3D SCANNER were compared against those from another commercial scanner (Blue Phantom, IBA Dosimetry). Comparable collection intervals and scanning speeds were used on both systems. Profile and depth measurements were performed for open field beams (6 and 18 MV; 10-cm and 30-cm squared fields; depths of dmax, 10, and 30 cm) and wedged fields (6 and 18 MV; 30-cm squared field; depth of 10 cm). Electron beam profile and depth measurements were performed for a 20-cm squared applicator (6, 12, and 20 MeV; depth of dmax). The root mean square (RMS) values were determined for each scanner's measurements.

Results: The measured field sizes were within 0.06 cm and 0.05 cm for photon and electron beams, respectively. The photon D10/D20 ratios differed by < 0.4% and the electron I50 values were within 0.02 cm. The RMS of the profiles was approximately 0.1% for both the 3D SCANNER and Blue Phantom measurements. Between the two scanners, all measurements agreed within RMS, excluding the penumbra region. Two exceptions occurred: a 0.5% difference was observed in the shoulder of the 12 MeV profiles, and a 0.8% difference was observed in the 6 MeV depth measurements near the surface.

Conclusions: The quality of the scanned profile and depth measurements from the 3D SCANNER is comparable to that of another commercial scanner. Both scanning systems have similar levels of scanning noise.

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