

Investigation of Small IMRT Beamlets with a Wellhöfer CC01 “Pinpoint” Chamber

**Introduction:** Most investigators of small IMRT beamlets rely heavily on ion chamber measurements. The PTW Pinpoint chamber ( $0.015 \text{ cm}^3$ ) has recently been reported<sup>1</sup> to be overly sensitive to low energy scatter X-rays. It is therefore appropriate to normalize the PTW Pinpoint response to a 5x5 cm field rather than the conventional 10x10 cm field. For a 10x10 cm field, 10 cm depth, the over response was reported to be 1.4%, whereas for a 1x1 cm field an under-response of 12% was determined. Therefore the PTW Pinpoint chamber is of limited use for fields smaller than 2x2 cm. Here, we used a Wellhöfer CC01 chamber, which is smaller ( $0.01 \text{ cm}^3$ ) than the PTW Pinpoint, but has a comparable geometry. **Technique:** We investigated Varian 6 MV beamlets generated with a 120 leaf MLC, with the chamber axis instead parallel to the direction of the beam and perpendicular to the water surface. Hence the primary radiation of the beam “sees” only a 2 mm diameter cross section of the chamber before reaching the chamber’s stem. A special scanning technique was utilized to position the center of the chamber’s 3.6 mm height effectively at the water surface. Oblique “fan-line” beamlets were also examined. The gantry was rotated so the oblique beamlets would have nearly a perpendicular incidence on the water surface. An average of 18 individually radiated micro-TLDs were used per beamlet to measure the dose for comparison purposes. **Results:** Superior accuracy (< 2%) of the CC01 response was determined for 1x1 cm beamlets along the central axis. This agreement is significantly better than the reported performance of the PTW Pinpoint and allows use of the CC01 for small IMRT beamlets.

1. M. Stasi, et al., Med Phys 31(10), 2004, p2792