Conclusion: A novel, next-generation anthropomorphic phantom allows a versatile SBRT QA, by assessing high dose target coverage and simultaneous OAR dose or peripheral lung dose in an end-to-end testing setup hereby including inter-fraction rotations. The phantom will be the basis of a multi-center peer-to-peer institutional audit of thoracic IMRT/VMAT and SBRT.

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Characterization of a new stereotactic diode under flattening filter free beams down to small fields
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Purpose or Objective: Stereotactic radiotherapy requires detectors capable of determining the delivered dose with high accuracy. The aim of this study is to characterize the performance of a new unshielded silicon diode prototype, the IBA Razor, for dose measurements in small radiation therapy photon beams in flattening filter free (FFF) mode

Material and Methods: The performance of the newly commercialized stereotactic diode was evaluated relative to that of the previously available SFD diode and the PFD detectors, both from IBA. The Razor is made with an n-type implant in p-type silicon. The active volume is 0.6mm in diameter and 20µm in length. The detector response stability in measured dose, dose rate and dose per pulse were also evaluated. Dark current as function of the received dose was also measured by means of percentage depth dose curves (PDDs), axial beam profiles and output factors.

Results: The short term stability of the Razor was found to be much improved relative to the SFD, exhibiting a variation of less than ±0.1% for a dose of 1.2 kGy delivered in a single-sessio. Dose linearity showed a deviation of less than ±1% in the 0.05-30 Gy range and a dose rate dependence of less than ±0.5% in the 4.24 Gy/min range. The dose per pulse dependence, evaluated in the 0.08-0.21 Gy/pulse range, was found to be within ±0.8%. A larger dark current with increase in dose was observed for the Razor with values of 0.0025pA/Gy compared to the 0.0002pA/Gy for the SFD. This characteristic is attributed to an increased concentration of the recombination centers and can be practically solved by resetting the background before every acquiring.

The measured PDDs agreed to within 1% with those obtained using the PFD detector. The profile analysis showed good results as long as a background correction was applied before each profile acquisition: penumbra differences were below ±0.3 mm relative to PFD, with a slight overestimation of the tails (<1%), due to the absence of the shielding. When background correction was not applied regularly, larger differences were observed in the low dose penumbra region and in the profile tails, probably due to the higher dark current. Output factors were in good agreement with those measured by the PFD detector to within ±1% for fields up to 5x5 cm², for larger fields the absence of the shielding in the stereotactic detector led to differences >2%.

Conclusion: The new IBA Razor unshielded diode replaces the IBA SFD, with the additional advantages of improved stability (up to 1.2 kGy) compared to the reference stereotactic diode. The Razor has the same high spatial resolution and performance in small radiation fields. These features make the Razor diode detector a good candidate for radiation therapy and in small field dosimetry to support advanced radiation therapy techniques.