INTRODUCTION
Monitoring the beam energy of a photon beam is part of a routine QA program\(^1\). In order to establish meaningful tolerances for a given method it is important to know how sensitive it is to actual energy changes.

AIM
To evaluate the sensitivity of different methods of measuring photon beam energy.

RESULTS
- **Baseline scans** for beam energy of a 6MV beam on an Elekta Versa HD accelerator were obtained using five methods.
  - Baseline scans for beam energy of a 6MV beam were measured using five methods:
    - PTW Beamscan 3D scanner with PTW Semiflex 3D ionization chamber
    - Daily QA3 (SunNuclear)
    - IC Profiler (SunNuclear)
    - PTW Farmer Chamber in plastic water
    - IQM transmission detector (IRT Systems)
- Depth dose and profile scans at 90cm SSD were measured using a PTW Beamscan 3D scanner with a PTW Semiflex 3D ionization chamber.
- Measurements were then made using the Daily QA3, IC Profiler, a PTW Farmer chamber in plastic water, and the IQM transmission detector.
- The beam energy was then adjusted by approximately 0.5% and 1.0% and then back to the baseline energy making a total of 4 sets of measurements.
- Percent Depth Dose (PDD) at 10cm and 20cm depth was measured with \(10\times10\text{cm}^2\). The values were 66.17, 66.64, 67.05, and 65.96 after return to baseline. This shows that setting the same values on the linac did not return the energy exactly to baseline. This was confirmed by all of the methods.
- The maximum Off-Axis-Ratio in the water tank was 1.040, 1.018, 1.005, and 1.039.
- The energy percentage from the Daily QA3 device was 2.52, 8.99, 15.77, and 2.23. These are percent difference from the baseline.
- The maximum OAR from the IC Profiler was 1.036, 1.022, 1.009, and 1.035.
- The energy from the IC Profiler using the energy wedge was 69.74, 70.01, 70.62, and 70.02.
- The ratio of ionization chamber readings in the plastic water at 10cm and 5cm depth was 0.848, 0.85, 0.852, and 0.847.
- For 15cm and 5cm depth, it was 0.705, 0.709, 0.714, and 0.703.
- Using the ratio of the 30x30cm\(^2\) and 2x2cm\(^2\) field readings for the IQM device, the values were 154.0, 150.4, 146.7, and 154.7. The ratio to 5x5cm field was also measured.

CONCLUSIONS
- The sensitivity of the 5 methods in detecting the energy change of a 6MV beam was evaluated.
- There was a wide variation among them and the appropriate tolerances for each method should be set based on these findings.
- The Daily QA3 device was very sensitive to energy change and tolerances should be set appropriately.
- The IQM device was approximately twice as sensitive as the other chamber methods.

REFERENCES

CONTACT INFORMATION
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