Purpose: To develop a more efficient monthly quality assurance (QA) process by utilizing one detector with multiple setups instead of multiple detectors with multiple setups.

Method: The Sun Nuclear IC Profiler was used to measure machine output, transverse profiles, and depth-dose profiles. The IC Profiler contains 251 ionization chambers aligned in the X, Y, and diagonal axes, and was designed to measure machine output and transverse profiles. In order to measure depth-doses, a Lucite compensator with an angled surface was fabricated. To test the capability of the detector, a proton beam of 10.5 cm range in water was used. The distal edge coincided with the overall water equivalent depth upstream of the detector on central axis. The measurement was repeated with an additional 1.0 mm of solid water placed in front of the detector. The measured profiles from both measurements were compared to quantify the IC Profiler response for a small range change.

Results: The IC Profiler performs within vendor specification for measuring machine output and transverse profiles. When measuring depth-doses with an angled compensator, the IC profiler measures a change in profile along central axis of 17.0% for a 1.0mm range change. Based on overall reproducibility of the beam delivery system, the IC profiler is capable of detecting 0.3 mm range shift. Therefore, the sensitivity of the IC profiler response is sufficient to detect sub millimeter changes in delivered range.

Conclusion: The Sun Nuclear IC Profiler is capable of measuring machine output, transverse profiles, and depth-dose profile constancy with a high degree of accuracy and precision. Using a single detector for all beam measurements increases the overall QA efficiency by reducing multiple detector overhead while not sacrificing the accuracy and precision of the measurements.