Purpose: Quality assurance (QA) and dose output measurements for particle therapy, where the range varies across the field is a challenge. Our goal was to devise a system that was both accurate and efficient.

Methods: We have utilized a MatriXX(IBA) device in a protective sleeve within water to measure absolute dose and profiles. The MatriXX can be positioned remotely to various depths in water. For high energy electrons (using a custom compensator-CC) and protons (range compensator) depths may be chosen according to the therapeutic ranges across the field. Measured data was compared to phantom calculated profiles using the I’mRT software (IBA). Two CC were constructed, CT scanned, and calculated, on top of a test phantom. The CC in front of a water phantom was irradiated with 20 MeV electrons. One CC was intentionally altered (added plastic narrow ring) to ensure a deviation could be detected. Setup and measurement times were recorded.

Results: We found good agreement between measured absolute dose/profiles and calculations for two CCs at three depths (6.17, 8.17 and 10.17 cm). The Gamma index (3 mm, 3%) was calculated to be met over the majority of irradiated field. The MatriXX accurately detected the intentionally altered CC by for the measurement vs. the calculated plan. Setup and measurement times were reasonable for routine patient specific QA (~5 min. per CC tested) excluding setup.

Conclusions: The results indicate our measurement system using the MatriXX device in water was sufficient for measuring dose and profiles for electrons. We plan on performing dose output and profile measurements for proton patients when we go clinical in 2012. We anticipate performing QA for as many as 6 proton fields in <1 hour. We have devised a measurement system that is accurate, efficient and sensitive to deviations.