

Theme: **Physics**Abstract No: **PTCOG-AO2025-ABS-0069**Abstract Title: **To Improve Efficiency of Daily Quality Assurance Combined with Beam Characteristics and Image Guided System in Proton Therapy**Author Names: **Stephen Tung-Ho Wu, Hsin-Lun Lee, Min-Chin Yu, Jeng-Fong Chiou**
Taipei Medical University Proton Center, Taipei, Taiwan**Background / Aims:**

- To establish an efficient and reproducible daily quality assurance (QA) protocol for proton pencil beam systems, incorporating output verification, range checks, and spot position accuracy, particularly in setups within 5 minutes.

Subjects and Methods:

- The QA workflow utilized the PTW QuickCHECK device along with CBCT imaging and oblique Xray system. Standard proton plan with 12 cm range, SOBP width 4 cm, and square field 14 x 14 cm was designed. Output constancy was assessed at mid-SOBP of 10 cm WET by adding a 2 cm polystyrene slab. Distal and proximal range verifications were conducted at 12 cm and 8 cm WET by adding 4 cm polystyrene slab and inherent buildup, respectively. Another proton plan was created without range shifters (RS) at 4 proton energies 100 MeV, 140 MeV, 180 MeV, and 226.7 MeV using 3 MU per spot. CBCT auto-registration was applied to correct setup offsets, with 3D couch shifts and rotations recorded.

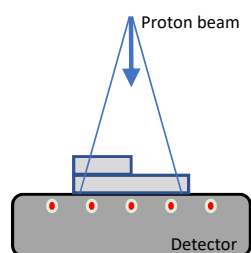


Figure 1: DailyQA measurement design

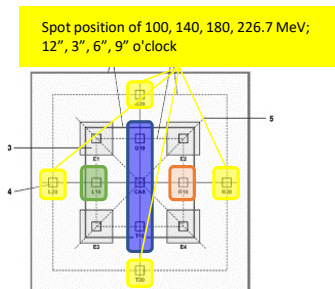


Figure 2: Distribution of measurement location for Output (blue region), Distal (green region), Proximal (Orange region)

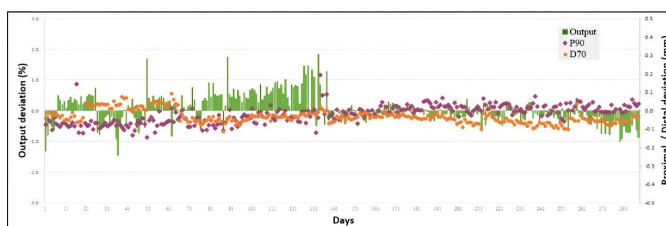


Figure 3: Output and range check of proximal/distal

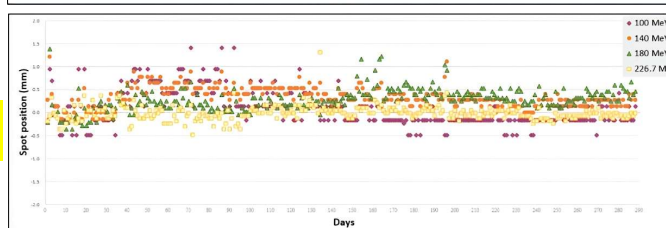


Figure 4: Spot position check of selected energy

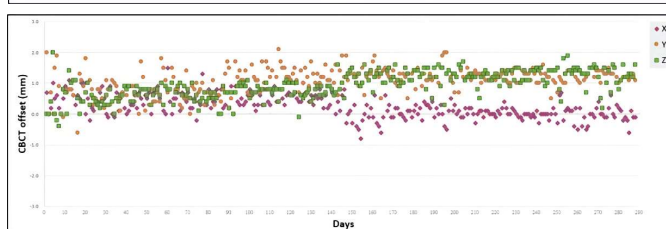


Figure 5: CBCT offset results

Result:

- Within 288 days of observation, output deviation showed 0.05 ± 0.49 %, and range proximal and distal deviation showed -0.0 ± 0.09 mm and -0.03 ± 0.04 mm, respectively. Spot positioning deviations at all energy 100MeV, 140MeV, 180MeV, 226.7MeV were 0.1 ± 0.4 mm, 0.3 ± 0.2 mm, 0.3 ± 0.2 mm, 0.0 ± 0.2 mm, respectively. Setup deviations recorded via CBCT-guided auto-registration showed submillimeter lateral and vertical shifts and minimal rotational offsets. The Results were met goals of TG-224 and TG-142 and total QA process was completed in approximately 15 minutes.
- We will accumulate comprehensive results continuously by this efficient DQA method and evaluate logfiles' analysis without phantom so that improve accuracy and reliability of proton machine.