

AbstractID: 10956 Title: Study on the modeling of digital couch for proton treatment planning system

Purpose: To evaluate the modeling of couch with a commercial proton treatment planning system (TPS, Eclipse, v8.12).

Method and Materials: To keep the shape and dimensions of an actual proton treatment couch, it was scanned using CT scanner and inserted into the TPS system by replacing CT couch of all transverse CT slices.

Results: The experimental data shows that the range of proton beam is shorten by 0.99 ± 0.01 cm and spread-out Bragg peak (SOBP) varies 0.10 ± 0.09 cm with insertion of proton couch when the beam direction is perpendicular to proton couch (0° in our configuration). While the average range shift in proton beam increases from 0.99cm to 1.70cm as the angle of the beam increases from 0° to 55° , there were no distinct SOBP changes with beam angle revealing less than 0.1cm variation. Our results suggest that the dosimetric factors such as range, profile, output factor remained almost same with the insertion of proton couch, whereas the beam range is largely dependent on both the insertion of couch and beam angle to couch. Using inserted CT scanned proton couch in TPS, the calculated and measured beam range was cross-compared and the results show that the range of proton beam is shorten by ~ 0.7 cm in TPS, which shows ~ 0.3 cm difference with actual measurement. The difference between computed and measured range was compensated by assigning appropriate densities to the inserted proton couch, which is called digital couch. Measured and computed PDD with the digital couch show that the beam range and SOBP are well matched for various beam angles revealing the difference of 0.01 ± 0.02 cm and 0.12 ± 0.03 cm, respectively.

Conclusion: These results suggest that the digital couch with relevant density assignment may be a good solution for proton couch modeling, which can be used for commercial proton TPS.