AbstractID: 5616 Title: Characterisation of dose in SBRT lung via Monte Carlo

Purpose
To accurately characterize the doses received by static lung lesions, as well as doses to the critical structures for the serial tomotherapeutic IMRT delivery method used for SBRT in our clinic.

Method
77 SBRT lung patients previously treated with doses calculated using the effective path length/Finite size pencil beam (EPL/ FSPB were retrieved. The critical structures (ipsi-lateral lung, contra-lateral lung, major airways, spinal cord and esophagus) were redelineated in order to standardize the contouring.

All plans were run with Monte Carlo (MC), EPL/FSPB and No inhomogeneity correction (NI/FSPB). The intensity maps and MUs were the same for all three plans. The minimum, maximum and mean target doses were compared with MC calculation used as the benchmark. The normalized total dose, NTD; minimum, mean and maximum doses for critical structures were also compared.

Results
The mean CTV volume of the 90 lesions presented here is 35.6 cm^3 (range: 0.3-370.2 cm^3). The minimum dose to both CTV and PTV were overestimated by the EPL/FSPB algorithm by an average of 17.3 ± 7.8% and 20.6 ± 10.8% of prescribed dose respectively. The absolute mean deviation in the minimum CTV and PTV doses were 5.7% (0.2-20.1) and 10.6% (0.03-27.3) respectively with NI. The magnitude of deviation depends on target location (embedded dense soft tissue, surrounded by lung and its proximity to a more dense interface) and dimensions. The minimum dose, mean dose and NTD for the lungs were in good agreement with MC. Larger, localized discrepancies exist for maximum dose. Doses to the other critical structures were generally in good agreement with those predicted by MC.

Conclusion
MC dose calculation may prove valuable in accurately assessing the delivered dose in SBRT and may, thus, contribute to a more informed decision on the optimal dose and fractionation scheme.