Purpose: When the treatment couch-top contacts the patient, the skin dose to the patient also generates clinical significance as the radiation beam passes through the couch. In this study, the effect on entrance shallow depth dose was investigated for the carbon fiber exact couch-top from Varian Medical System.

Methods: An Accredited Dosimetry Calibration Laboratory (ADCL) calibrated PTW parallel-plate thin-window chamber was used to measure the doses in the build-up region. Firstly, the shallow depth doses at different field sizes, depths and incident angle beams were measured for 6MV and 18MV photon beams. To test the couch top contribution to the dose distribution, the depth of measurement went down to 10cm. The couch was simulated in the Eclipse treatment planning system and the related point dose was calculated with different depths. The CT number of the couch top was adjusted to generate agreement between measurement and simulation.

Results: At a 2mm depth, the surface dose increased with the decrease of the field size. Comparing with and without the couch top, as field sizes vary from 20cmx20cm to 2cmx2cm, the dose increased from 35% to 53% for 6MV, and from 50% to 113% for 18MV. At 0mm depth, the dose difference was most significant and is at the level of 300%. Angle incident beam dose increase due to couch top varied with complicated dose distribution. Extended Depth Dose measurement shows that couch top effect on dose in build-up region extends to depths of 1cm for 6MV and 2cm for 18MV. An appropriate CT number setting of the couch top is between -200HU to -300HU.

Conclusions: The couch simulation in Eclipse displays better dosimetric accuracy in couch contacted skin dose. However, calculation factors such as surface definition, heterogeneity, calculation resolution and algorithm also need extra consideration.