Purpose: The Varian TrueBeam<sup>TM</sup> STx linear accelerator is equipped with flattening filter free (FFF) mode (6 MV and 10 MV), high definition multileaf collimators (HDMLC), as well as onboard imaging (OBI) devices, making it ideal for SBRT delivery. The purpose of this work is to design an end-to-end test to determine the dosimetric and targeting accuracy achievable with the TrueBeam system.

Methods: An anthropomorphic head phantom with a Ball Cube II insert and FilmQA software were used to evaluate the accuracy of TrueBeam image guidance and dose delivery. Laser cut Gafchromic EBT2 films with 0.15 mm accuracy were used. The phantom with previously irradiated films inserted was first scanned with a CT scanner, and imported into the planning system. Four RapidArc plans and five IMRT plans were created with different energies, target sizes and delivery modalities. Plans were then delivered on the TrueBeam using image guidance to locate the isocenter. Films were analyzed using FilmQA<sup>TM</sup> (3cognition) software. The film dose was compared with Eclipse v8.9 calculated dose, and was analyzed using a Gamma index criterion of 3%/1 mm and 3%/2 mm. The shifts required to align the film with the calculated dose after the auto registration was estimated to be the targeting accuracy.

Results: Targeting accuracy was found to be within 1 mm in all three orthogonal directions. Gamma index (3%, 1 mm) for all the plans was found to be above 90% except the plans with the smaller targets (2 cm and 1 cm) and higher energy (15 MV). Gammas index (3%, 2 mm) for all the plans was found to be above 97%.

Conclusions: An end-to-end test has been designed and found to be excellent in accessing the targeting and dosimetric accuracy of the overall delivery of the TrueBeam system.