Purpose: To quantify the spatial orientations of the tabletop and external patient positioning lasers with respect to the couch moving direction and imaging plane in a CT simulation system by indicating as angular deviation.
Method and Materials: A home-made cross-jig is used in this study. The longitudinal arm of the jig is orthogonal with the transverse arm and some BB markers inlaid in the jig to indicate the arms on CT images. We found there are some relationships between the orientations of the jig arms which shown on the images and the orientations among the tabletop, external lasers, couch moving direction, and imaging plane. First, the orientations of CT simulation system had been carefully confirmed by using the approaches mentioned on TG 66. To simulate all possible deviating situations, we designed 8 orientation arrangements for the tabletop and external lasers, respectively, due to these two components cause different effects on CT images. When attaching the cross-jig on tabletop we can check the orientations between the tabletop, couch moving direction, and imaging plane. While aligning the cross-jig with the external lasers we will know the angular deviation between the external lasers, couch moving direction, and imaging plane.
Results: Based on the preliminary analysis, the maximum error is 0.12 degree. After considering the inherent angular deviations in our CT simulator, image analysis errors due to the size of BB and image spatial resolution, and the jig setup errors we can say all of the results conformed to our expectation.
Conclusions: Only two scans, then we will know the spatial orientations in CT simulation. By means of accurately quantifying the deviations we can easily correct the error if it has to be. The method proposed in this study could also be used for detecting an angular deviation in any other orthogonal imaging system.