Megavoltage portal CT reconstruction is performed using an amorphous silicon (aSi 500) portal-imaging device to investigate the low contrast detectibility for a limited number of projections. Up to 100 projections are acquired for a few phantoms with 6 MV photon beam. 1 MU is delivered for each projection. For a head phantom and a mini CT phantom, 50 truncated projections are acquired in addition to the 50 full projections in order to reduce the dose to the peripheral regions. For a body phantom, due to the limited size of the device, we only acquired 50 truncated projections around the spinal cord for the verification of intensity-modulated spinal radiosurgery. The Multi-level Scheme algebraic reconstruction technique (MLS-ART) is used for image reconstruction.

The results show that the aSi500 imaging device can produce 1.5% contrast detectibility given 50 full and 50 truncated projections. The high the object’s contrast, the less the number of projections needed to detect. Objects like bone and lung in a mini CT phantom can be discernable from as low as 5 projections. The reconstruction from 50 truncated projections around the spinal cord also shows good anatomical structure around the cord. In comparison, a CCD based EPID system shows about 2.5% contrast detectibility with twice MU. These results indicated that aSi imaging system is dose efficient and is able to produce reasonably good image quality with limited number of projections for potential treatment verification.