

AbstractID: 3457 Title: Spatial and contrast resolution of a new electronic portal imaging device

Purpose: A new amorphous silicon portal imager has become available which can be operated in two spatial resolution modes and can gate the beam to avoid irradiating the patient during imager dead time. This study will evaluate the spatial and contrast resolution of this device.

Method and Materials: A diagnostic imaging phantom was placed near isocenter of a megavoltage linac and the portal imager was located 40 cm below the phantom. Near the center of the phantom are 21 groups of five bars and four spaces of various widths. Around the perimeter of the phantom are 18 circular details of various thicknesses. Spatial resolution was determined by locating the highest frequency pattern that could be resolved in the portal images. Contrast resolution, dominated by photon statistics, was evaluated qualitatively by comparing the number of contrast details visible in images of two to eight MU for each scanning mode.

Results: With the imager in half resolution mode neighboring pixels are binned together resulting in pixels that project to approximately 0.6 mm at isocenter. In this mode 0.8 line pairs/mm can be resolved. In the un-binned mode the spatial resolution is increased to only 0.9 line pairs/mm, as the focal spot size of the accelerator begins to dominate the resolution. Contrast resolution is shown to depend on integrated dose. When the imager holds the beam during readout dead time photons are collected more efficiently and contrast resolution for a given MU set is improved compared to the un-gated acquisition.

Conclusion: Operation of the imager in full resolution mode results in modest improvements in spatial resolution. Contrast resolution for a given MU set is improved by the imager's ability to gate the beam during readout dead time.