

A collimation design for double-exposure portal imaging

A collimator design is proposed that would allow the treatment field defined by the collimator and the anatomy outside the field to be imaged simultaneously. This design allows double-exposure portal images to be acquired rapidly at any time during the treatment. The collimator design splits a multi-leaf collimator into two vertically displaced levels with each level or grid consisting of every second leaf. One grid level shields the gaps or slits in the other level. By a small lateral movement of one level, radiation is transmitted through the slits forming an image of the anatomy modulated at the frequency of the grid. To determine the impact of the design of the collimator on the transmitted intensity profiles, distributions transmitted through slits were measured with varying slit height, beam energy, source-slit distance, slit-film distance and slit width. The slits were formed with the accelerator secondary collimators and lead alloy blocks. Film images of the transmitted profiles were recorded and digitized. Modulated intensity profiles that would be transmitted through a grid were constructed from the individual slit profile measurements. The profiles were similar with slit height, source-slit distance and slit-film distance. Decreasing slit width resulted in reduced amplitude of the modulation. For smaller widths, the modulation was removed by filtering the image, therefore smaller slit (leaf) widths would be preferable for the design of the collimator. A prototype collimator is currently under construction.