Purpose: To develop a method for removing the effect of support arm backscatter from Varian electronic portal imaging devices (EPIDs), improving the dosimetric abilities of the imager.

Methods: A physical, kernel based model of the backscatter signal produced during an exposure was developed. The model parameters were determined through an optimization process, comparing measured images without arm backscatter (EPID removed from arm) to measured images that include arm backscatter. The backscatter model was used to develop a backscatter correction process that removes the support arm backscatter from measured EPID images. The correction process was tested by applying the method to measured images of 17 rectangular asymmetric fields and comparing the result to off-arm images. The same process was repeated with 42 IMRT fields.

Results: The backscatter removal process was able to effectively remove the arm backscatter from all of the measured images and accurately predict the measured off-arm images. Comparing the corrected images to the measured off-arm images, the mean absolute difference at the centre of each rectangular field was 0.29% (standard deviation 0.18%). This is an improvement over the uncorrected images which gave a mean difference of 1.01% (standard deviation 0.73%). The largest discrepancy observed with the corrected images was 0.6%, compared to 2.8% for the uncorrected images. Comparing the corrected IMRT images to the measured off-arm images, an overall mean gamma value of 0.28 (standard deviation 0.04) was found using 2%, 2mm criteria. Comparison of the uncorrected images to the measured off-arm images resulted in an overall mean gamma of 0.40 (standard deviation 0.10).

Conclusions: A method for accurately and reliably removing the effect of support arm backscatter from EPID images has been developed and extensively tested. The method can be applied to any measured EPID image and does not require any additional information about the exposure.