

Photon output from clinical linear accelerators is affected by three factors: head scatter, phantom scatter, and backscattered radiation into the monitor chamber. Previously we have shown that by using a dual-source photon beam model accounting for the extra-focal radiation from the head of a machine, the first two factors can be predicted accurately using a convolution algorithm. In this work, we investigated the effect of the backscattered radiation from collimator jaws in a greater depth by using Monte Carlo simulation of Varian Clinac 2100C. The radiation scored within the monitor chamber was identified to be originated from the upper jaws (Y jaws), or from the lower jaws (X jaws). Based on the Monte Carlo results, the relative amount of the backscattered radiation was calculated as functions of Y jaw positions and X jaw positions. Therefore, the backscattered radiation for any field setting was computed as a compound contribution from both the Y jaws and X jaws. The backscatter correction was then applied to the convolution calculation to obtain the total photon output, which was compared to directly measured data. Our results showed that the contribution from the backscattered radiation to the total monitor chamber scored dose was within 4%, among which about 3% was from the upper jaws. If the effect of the backscattered radiation was accounted for, the convolution method can be used to predict the change of the photon output more accurately for a variety of fields including asymmetric fields.