

Peak Scatter Factors for High Energy Photon Beams

The peak scatter factor (PSF) for a photon beam is defined as the ratio of the total dose and the primary dose at the depth of dose maximum in phantom. The values of PSF for photon beams ranging from ^{60}Co to 24 MV are calculated using the EGS4 Monte Carlo technique, to avoid measurement limitations. For ^{60}Co beam, the calculation agrees with the data tabulated on BJR Supplement 25 to within 0.8%. The BJR value (1.054) of $10 \times 10 \text{ cm}^2$ for ^{60}Co is 0.6% lower than the present value due to the underestimation of scatters from the source capsule and collimators. For a given field size, PSF is varied by up to 2% when beam quality changes from ^{60}Co to 24 MV. For normalized PSF, the values of BJR Supplement 25 (which are assumed to be the same for beams ranging from ^{60}Co to 50 MV) agree well with the present calculation for small field sizes, but are higher than our data by up to 2% for large field sizes. It is found that the effect of SSD on PSF for high energy photon beams is not significant for small fields, but can be as high as 1% for large fields. The presently calculated PSFs are related to field size (s) by an empirical expression, $PSF = 1 + ms/(s+n)$, where m and n are the fitting parameters. This equation describes the PSFs within 0.4% (0.15% on average).