Purpose: We have developed a fast algorithm to calculate patient specific 2D distribution of absolute dose per MU (D/MU) for megavoltage photon beams.

Method and Materials: To calculate D/MU correctly, one has to perform the scatter-integration with proper weights to account for the primary fluence distribution. In our PC-based MU-calculation program, the ratio of scatter-to-primary dose, D_s/D_p, for a 2-D non-uniform field is calculated as:

$$SPR(x,y,d) = \int\int_{x\,y} \frac{IM(x',y')}{IM(x,y)} \cdot \frac{a(d+d_0)^2}{(w\cdot r + d + d_0)^2 \cdot 2\pi r}\, dx'\, dy' ,$$

with $r = \sqrt{(x-x')^2 + (y-y')^2}$ and $IM(x,y) = \sum_i fMU_i\, p_i(x',y')$ is the 2D intensity profile within the IMRT field, p_i is 1 inside field and 0 outside field collimation for segment field i of the IMRT field. This convolution is calculated using a Fast Fourier Transform. The parameters a, w, and d_0 characterize the phantom scatter properties and can be determined from measured *PDD*.

Results: *SPR* can be calculated on an Intel Pentium 2.8GHz PC for 0.5-cm grid size in less than 0.1 second for a 80x80 grid covering 40 x 40 cm^2. For IMRT patients examined, the standard deviation of all comparisons is 1.5±3.9%.

Conclusion: This algorithm is ideally suitable for calculating patient-specific MU for quality assurance of patient specific IMRT fields for photon beams. The major attraction is the fast speed, which allows potential real-time applications.