# AbstractID: 3753 Title: Dosimetric properties of scattered photon subsources within a source model for different initial electron energies

**Purpose:** Histogram-based Monte Carlo (MC) source models for dose calculations in radiotherapy require methods to scale input data so as to match measured accelerator output. A previous study showed that the photon beam characteristics remain constant when the radial intensity distribution of the initial electron beam varies, but changes for different mean initial electron energies $\overline{E}_e$. This work investigates the dosimetric properties of scattered photon subsources for different $\overline{E}_e$ striking the target and evaluates the scaling needed for those subsources to match dose distributions resulted for different $\overline{E}_e$.

**Method and Materials:** Test scenarios were performed for 6-MV beams using $\overline{E}_e$ =5, 6.2 and 7 MeV and for 18-MV beams using 17, 18, and 19 MeV. Histogram distributions for a previously developed MC source model were created based on phase–space data for these beams. 3D-dose distributions for a 10×10-cm$^2$ field at SSDs 50, 100 and 200-cm and a 30×30-cm$^2$ field at SSD 100-cm were calculated in water using different subsource combinations. The dose distributions are normalized to the same integral dose for the depth dose curve of the 10×10 cm$^2$ field at SSD 100 and compared based upon dose differences.

**Results:** When scattered photon subsources associated with the 5-MeV simulation were used with the 7-MeV target subsource, <0.4% differences were found compared with using all the 7-MeV subsources in all cases studied. Differences were reduced to <0.2% when using the 6.2-MeV scattered subsources with the 7-MeV target subsource and were <0.2% when using either 17- or 18-MeV scatter subsources with the 19-MeV target subsource for 18-MV beams.

**Conclusions:** These results suggest that apart from scaling the scattered subsource intensity, only the target subsource distributions need to be changed to adjust the histogram-based source model to dosimetrically match accelerator outputs due to $\overline{E}_e$ changes.

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