AbstractID: 2614 Title: Spectral reconstruction by scatter analysis

Purpose:
To reconstruct accelerator photon beam energy spectra by *scatter analysis*.

Method and Materials:
The method consists in irradiating a plastic phantom at standard 100cm SSD and inferring primary beam spectral information based on the measurement with a standard Farmer chamber of scatter around the phantom at several specific scatter angles: a *scatter curve* is measured which is characteristic of the primary spectrum at hand. A Monte Carlo code is used to simulate the scatter measurement setup and predict the relative magnitude of scatter measurements for mono-energetic primary beams. Based on mono-energetic primary scatter data, measured *scatter curves* are analyzed and the spectrum unfolded as the sum of mono-energetic individual energy bins using the Schiff bremsstrahlung model. In comparison with spectral reconstruction by attenuation analysis, scatter is shown to be a measurable quantity that varies steeper with primary photon energy than attenuation does, providing the potential for a better resolving of adjacent energy bins within the spectrum.

Results:
The method is applied to an Elekta/SL18 6MV photon beam. The reconstructed spectrum matches the Monte Carlo calculated spectrum for the same beam within 6.2% (average error when spectra are compared bin by bin). Depth dose values calculated for the reconstructed spectrum agree with physically measured depth dose data to within 1%.

Conclusion:
The method has potential as a practical spectral reconstruction tool requiring few measurements under standard 100cm SSD and feasible in any radiotherapy department equipped with a conventional plastic scattering phantom and Farmer chamber.

Conflict of Interest (only if applicable):