AbstractID: 13148 Title: Modeling scatter-to-primary dose ratio for megavoltage photons

Purpose:
In radiation oncology, measured x-ray dose (*TPR* or *PDD*) at central axis are usually tabulated and used for clinical dose calculation. An efficient technique to examine these datasets whether contain systematic or random errors can be useful to maintain the accuracy of the data and improve patient treatment. An optimization routine employing a newly developed scatter-to-primary dose ratio (*SPR*) can be used to examine the accuracy of clinical beam data. The *SPR* formula proposed in this study is more accurate than that published previously, especially for low energy beams, because the effect of backscattered photon is taken into account.

Method and Materials:
A formula, involving three fitting parameters, is formulated to express the *SPR*. Because of absence of measurement error and the ability separating scattering and primary dose component, Monte Carlo (MC) data is used to extract these parameters. Based on the results of fitting MC data, we are able to obtain a set of empirical expression for the fitting parameters as a function of photon beam attenuation coefficients. These empirical expressions are implemented into our optimization routine, used to match measured beam data.

Results:
In terms of fitting accuracy for MC, the new *SPR* formula outperforms the previously published form. For clinical data study, our optimization routine successfully fits the measured photon beam data with depth and field size up to 40 cm for a large variety of linear accelerators (6 to 25 MV) and Co60 machine from different manufactures. The maximum error among these fits is 2.8 % for Co60 and better than 2 % for all other energies.

Conclusion:
Because of the high fitting accuracy, our optimization routine, incorporating the new *SPR* form, can serve as a tool performing quality control of x-ray beam data in a fast-pace clinical environment.