S_p Predictions: Beam Quality and Energy Distribution

The concept of separating the total scatter factor, $S_{C,P}$, into a machine dependent component, S_C – Collimator Scatter, and a phantom dependent component, S_P – Phantom Scatter, has proved useful when estimating dose deposition. Since S_P is, in principal, independent of machine design, it should be possible to predict the field size dependence using a 'generic' photon spectrum. Previous work[1] has implied that the beam quality index can be used, along with a chart of tabulated values to predict S_P. Using this prescription, we compare their predicted values to measured ones. Considering the fact that the machine used to measure S_P here (Varian 21EX), was not included when completing their table, the predictive power of this method will be tested, In an attempt to better understand the energy dependence of S_P on field size, a series of Monte Carlo (MC) data were generated for comparison. Using the EGSnrc DOSXYZ code, mono-energetic photons from a broad parallel source incident on a $50cm^3$ water phantom were used to generate simulated S_P s for different field sizes. We sum different mono-energetic MC data and compare these to both the predicted and measured values for S_P. We investigate different parameters to determine how accurately a minimal number can predict S_P.

[1] 'A table of phantom scatter factors of photon beams as a function of the quality index and field size', P. Storchi and J vanGasteren, Phys. Med. Biol. **41** (1996) 563-571.