AbstractID: 8599 Title: Improvement of Off-axis Energy Sampling in XVMC Beam Model for Varian 2100C/D

Purpose: To improve the off-axis energy sampling in the Virtual Photon Energy Fluence (VEF) model of XVMC using an energy-dependent scaling factor for Varian 2100C/D. **Methods and Materials**: When the VEF model of XVMC was commissioned for Varian 2100C/D, the calculated outputs significantly disagreed with measured outputs. Moreover, the off-axis output becomes lower than measured output as the off-axis distance increases. Because the XVMC does not reflect the monitor backscatter effect, this study employed the monitor backscatter factor to correct the central axis output. The XVMC samples photon energy from the central axis spectrum and then converts to off-axis photon energy by a scaling factor which is the ratio of mean off-axis photon energy to the mean central axis photon energy. Since the spectrum changes with the off-axis distance, the scaling factor must vary with not only off-axis distance but also with energy. This study developed an energy-dependent scaling factor using a fifth order polynomial equation and fitted coefficients to off-axis spectrum generated by a full scope Monte Carlo accelerator head model using BEAMnrc. The coefficients are functions of photon energy to account for the off-axis spectrum changes. **Results**: The calculated outputs agree with the measurement after the monitor backscatter correction is applied. It ensures that the central axis spectrum commissioned is reliable and accurate. The energy-dependent scaling factor enabled the XVMC to sample photon energy correctly at any off-axis distance and to reproduce the measured profiles within an acceptance criterion for all field sizes. **Conclusions**: Although the XVMC photon energy sampling is fast and efficient with the VEF model, the inaccuracy of output has delayed the implementation of XVMC for Varian 2100C/D. It is expected that the improved beam model will enhance the clinical implementation of the XVMC for Varian 2100C/D.