AbstractID: 7776 Title: Modelling ionisation chamber response to non-standard beam configurations

**Purpose**: To present a framework for the calculation of ionisation chamber response to arbitrary modulated fields as a convolution of responses to narrow fields and to test this approach for realistic chamber geometries in open fields.

**Materials and Methods**: Using the EGSnrc/C++ Monte Carlo (MC) class library system, the response of a detailed model of the Exradin A12 chamber was calculated for $^{60}$Co and 6 MV pencil beams sweeping over a flat phantom. A pencil beam response kernel was collected for an irregularly spaced array of pencil positions. A procedure was developed to reconstitute chamber response in modulated fields by convolution of pencil beam response over the modulated field fluence. We tested the accuracy of this approach by comparing in open fields the relative calibration coefficients obtained for realistic chamber geometries reconstituted from pencil beam kernels with calibration coefficients obtained directly.

**Results**: MC $k_Q$ values within 0.1% and 0.4% of TG-51 for 6 MV and 18 MV photon beams, respectively. Pencil beam kernels showed that the response of the chamber is strongly dependent on the geometrical details of the chamber for pencil beam positions hitting areas such as chamber tip, tip of the electrode, *etc*. Open field reconstituted chamber response was in agreement with direct calculations of the open field response to within 0.3% for $^{60}$Co and 6 MV photon beams.

**Conclusions**: Ionisation chamber response in modulated fields is strongly dependent on the details of the delivery. However, we can accurately account for it with our method, in which chamber response in arbitrarily modulated radiation beams can be calculated by convolving pre-calculated response kernels over the actual fluence profile used in the delivery of modulated radiotherapy. These techniques will allow guidance of chamber-based IMRT QA procedures by correcting chamber readings during deliveries that potentially provoke electronic disequilibrium.