# AbstractID: 8212 Title: A method for removing an artifact in time-dependent dose rate data obtained with an ionization chamber

**Purpose:** To develop an algorithm to remove the RC-like artifact with time-dependent dose-rate measurements using an ionization chamber and electrometer system.

**Method and Materials:** A 0.07-cc Farmer-type ionization chamber, Capintec Model PR05-P, was used for dose measurements. The electrometer was Standard Imaging MAX-4000, which was connected to a laptop computer. Electrometer control software, a special version of the MAXcomm program, was used to sample the electric current readings every 100 msec. We formulated a rate equation for the number of electrons in the cavity by hypothesizing that the RC-like artifact is caused by the finite time needed for electrons to recombine with ions in the cavity of the ionization chamber. The rate equation includes terms for the ionization, the loss of electrons due to two-body recombination, and the loss of electrons due to the electrons flowing out from the chamber cavity to the electrometer. The unknown parameters in the equation were obtained by iteratively adjusting the values until we achieved the best fit of the corrected ionization current data with the ideal time-dependent ionization current curve. For the parameter estimation, we used the data of one 100MU irradiation of a linac photon beam. Next, the correction algorithm with the estimated parameter values was applied to the time-dependent dose-rate data obtained for a test case of Gamma Knife irradiation.

**Results:** By iteratively adjusting the values of the two parameters in the rate equation, we could recover the ideal rectangular shaped beam pulse of the linac photon beam. Using these parameters, the temporal variation of the ionization current for the Gamma Knife experiment was successfully corrected by removing the RC-like artifact.

**Conclusion:** The proposed method is capable to eliminate the artifact in the time-dependent dose-rate measurements.