

The Radiological Physics Center (RPC), through on-site dosimetry review visits to participating institutions, has measured ion-collection efficiency corrections (P_{ion}) for many photon and electron beams from various teletherapy units. Statistical evaluation of the RPC measured P_{ion} , using 0.6 cm³ Farmer type ion chambers (PTW and NEL) for various beams, are presented. The results show that (i) for a specific beam, the NEL and PTW chambers have the same P_{ion} value within the uncertainties of the measurements, (ii) for electron beams, energy dependence is negligible (<0.2%), and (iii) for a given modality and energy the measured P_{ion} is independent of make and model of the linac to the first order. Based on these results, the RPC plans to utilize these standard P_{ion} values during future dosimetry review visits to save time and increase precision. The spread in the RPC data, typically 0.3 % (one SD), should serve as a typical spread in P_{ion} measured routinely by the two-voltage technique. Reduction in the uncertainty of P_{ion} measurement requires ensuring stabilization of the dosimetry system after a change in the bias voltage, and then taking a significant number of measurements after this point. We suggest that for clinical situations, measuring P_{ion} infrequently but carefully, results in higher precision than frequent measurements of P_{ion} with a typical precision. The P_{ion} values presented in this work may serve as a check for those determined clinically using comparable bias voltages.

This work was supported by PHS grant CA10953 awarded by the NCI, DHHS.