

Audit of TPS photon beam dataset for small field output factors using OSLDs against RPC standard dataset

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Abstract : Purpose: The aim of the present study was to audit treatment planning system beam dataset for small field output factors against standard dataset produced by radiological physics center (RPC) from a multicenter study. Such data are crucial for validity of special techniques, i.e., IMRT or stereotactic radiosurgery. Materials/Method: In this study, multiple small field size output factor datasets were measured and calculated for 6 to 18 MV x-ray beams using the RPC recommend methods. These beam datasets were measured at 10 cm depth for 10×10 cm² to 2×2 cm² field sizes, defined by collimator jaws at 100 cm. The measurements were made with a Landauer's nanoDot OSLDs whose volume is small enough to gather a full ionization reading even for the 1×1 cm² field size. At our institute the beam data including output factors have been commissioned at 5 cm depth with an SAD setup. For comparison with the RPC data, the output factors were converted to an SSD setup using tissue phantom ratios. SSD setup also enables coverage of the ion chamber in 2×2 cm² field size. The measured output factors were also compared with those calculated by Eclipse™ treatment planning software. Result: The measured and calculated output factors are in agreement with RPC dataset within 1% and 4% respectively. The large discrepancies in TPS reflect the increased challenge in converting measured data into a commissioned beam model for very small fields. Conclusion: OSLDs are simple, durable, and accurate tool to verify doses that delivered using small photon beam fields down to a 1×1 cm² field sizes. The study emphasizes that the treatment planning system should always be evaluated for small field out factors for the accurate dose delivery in clinical setting.

Keywords : small field dosimetry, optically stimulated luminescence, audit treatment, radiological physics center

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