

Towards a new dosimetry reference quantity for stereotactic radiotherapy: the dose area product.

Développement d'une nouvelle grandeur de référence pour les traitements en conditions stéréotaxiques: le produit dose-surface.

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Introduction: Traceability of delivered doses in external radiotherapy is based on the national reference of absorbed dose to water at a point. Appropriate for conventional radiotherapy, this approach requires correction factors that burden the uncertainty budget for stereotactic irradiations, on the rise in the last few years. To obviate this difficulty, the LNHB suggested replacing the concept of point dose by the dose area product (DAP). In that way, a previous thesis in the laboratory has proven the feasibility of this concept from the metrological point of view^{1,2}.

Methods: This project is part of a PhD started in January 2019. The field sizes lower or equal to 15 mm diameter defined by specially designed collimators, multi-leaves and jaws will be investigated, as well as the transfer of the DAP national dosimetry reference of the LNHB towards the clinical user thanks to a large-area plane-parallel chamber specially designed by the LNHB and its use for the commissioning of medical linear accelerators (LINAC).

Results: Once this transfer dosimeter manufactured and tested, it will be used to characterize the radiations fields, in particular through parameters such as tissue phantom ratios and output factors (OF), whose accuracy is essential for the calculation of the treatment planning systems (TPS). For the OF, a comparison will be made between the obtained values if one consider the absorbed dose to water at a point (IAEA 483 protocol) or the DAP, the latter being considered to provide more accurate values because intrinsically not influenced by the electronic equilibrium problems inherent in stereotaxy. The comparison will allow validating or not the results based on the point dose used until now.

Conclusion: This project is aimed at promoting the use of DAP for small field sizes to, in fine, improve the dosimetric accuracy of treatments. One of the objectives, as long as TPS algorithms don't accept DAP as input data, is to propose to the clinical user a conversion protocol between the two quantities leading to more reliable traceability of the absorbed dose for the LINAC commissioning.

References

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