



Design of experiments in medical physics: Application to the AAA beam model validation

Submitted by Téodor Tiplica on Tue, 09/19/2017 - 08:57

Titre Design of experiments in medical physics: Application to the AAA beam model validation

Type de publication Article de revue

Auteur Dufreneix, S. [1], Legrand, C. [2], Di Bartolo, C. [3], Bremaud, M. [4], Mesgouez, J. [5], Tiplica, Téodor [6], Autret, Damien [7]

Editeur Elsevier

Type Article scientifique dans une revue à comité de lecture

Année 2017

Langue Anglais

Date Septembre 2017

Pagination 26-32

Volume 41

Titre de la revue Physica Medica

ISSN 1120-1797

Mots-clés Beam model [8], Experimental designs [9], Quality assurance [10]

Résumé en anglais

Purpose
The purpose of this study is to evaluate the usefulness of the design of experiments in the analysis of multiparametric problems related to the quality assurance in radiotherapy. The main motivation is to use this statistical method to optimize the quality assurance processes in the validation of beam models.

Method
Considering the Varian Eclipse system, eight parameters with several levels were selected: energy, MLC, depth, X, Y1 and Y2 jaw dimensions, wedge and wedge jaw. A Taguchi table was used to define 72 validation tests. Measurements were conducted in water using a CC04 on a TrueBeam STx, a TrueBeam Tx, a Trilogy and a 2300IX accelerator matched by the vendor. Dose was computed using the AAA algorithm. The same raw data was used for all accelerators during the beam modelling.

Results
The mean difference between computed and measured doses was $0.1 \pm 0.5\%$ for all beams and all accelerators with a maximum difference of 2.4% (under the 3% tolerance level). For all beams, the measured doses were within 0.6% for all accelerators. The energy was found to be an influencing parameter but the deviations observed were smaller than 1% and not considered clinically significant.

Conclusion
Designs of experiment can help define the optimal measurement set to validate a beam model. The proposed method can be used to identify the prognostic factors of dose accuracy. The beam models were validated for the 4 accelerators which were found dosimetrically equivalent even though the accelerator characteristics differ.

URL de la notice <http://okina.univ-angers.fr/publications/ua16230> [11]

DOI 10.1016/j.ejmp.2017.05.068 [12]

Lien vers le document <http://www.physicamedica.com/article/S1120-1797%2817%2930185-0/addons> [13]

Liens

- [1] <http://okina.univ-angers.fr/publications?f%5Bauthor%5D=25049>
- [2] <http://okina.univ-angers.fr/publications?f%5Bauthor%5D=25052>
- [3] <http://okina.univ-angers.fr/publications?f%5Bauthor%5D=25051>
- [4] <http://okina.univ-angers.fr/publications?f%5Bauthor%5D=25053>
- [5] <http://okina.univ-angers.fr/publications?f%5Bauthor%5D=25054>
- [6] <http://okina.univ-angers.fr/teodor.tiplica/publications>
- [7] <http://okina.univ-angers.fr/publications?f%5Bauthor%5D=20484>
- [8] <http://okina.univ-angers.fr/publications?f%5Bkeyword%5D=23472>
- [9] <http://okina.univ-angers.fr/publications?f%5Bkeyword%5D=23471>
- [10] <http://okina.univ-angers.fr/publications?f%5Bkeyword%5D=14838>
- [11] <http://okina.univ-angers.fr/publications/ua16230>
- [12] <http://dx.doi.org/10.1016/j.ejmp.2017.05.068>
- [13] <http://www.physicamedica.com/article/S1120-1797%2817%2930185-0/addons>

Publié sur *Okina* (<http://okina.univ-angers.fr>)