

---

# PO-RT-23 The Monte Carlo validation of Varian 10 MV and 10 MV flattening filter free phase-spaces files for clinical quality assurance program

Junior Akunzi\*<sup>1</sup>, P-E Leni<sup>2</sup>, and R. Gschwind<sup>2</sup>

<sup>1</sup>Centre Antoine Lacassagne, Nice – CRLCC Antoine Lacassagne – 33, avenue de Valombrose, 06189  
Nice cedex 2, France

<sup>2</sup>UMR 6249 - Laboratoire Chrono-environnement, Montbéliard (UMR 6249 - Laboratoire  
Chrono-environnement) – Université de Franche-Comté – Pôle Universitaire BP 71427 25211  
Montbéliard cedex, France

## Résumé

### Introduction :

In order to safely administrated highly complexes radiotherapy technics like VMAT or IMRT, the implementation of a quality assurance software is in progress at Chrono-environnement UMR CNRS 6249 laboratory based in Montbéliard (France). The Monte Carlo modeling of the TrueBeam Novalis STx used in Montbéliard hospital was performed. The simulation of particles transport through jaws, MLC and water phantom was performed using the Varian generic phase-space files for the 10MV beams in both fattened and unflattened (flattening filter free) mode. Hereafter, the validation of the modeling for clinical quality assurance program is presented.

### Methods :

The modeling of TrueBeam Novalis STX of Varian was implemented using the Monte Carlo code BEAMnrc/DOSXYZnrc. BEAMnrc was used to create field specific phase spaces under the jaws for field ranging from 3cm\*3cm to 20cm \* 20cm. DOSXYZnrc was used to calculate doses in water phantom. Calculated cross-lines profiles at various depths, percent depth doses and output factors were compared with gold standard measurements provided by Varian. The simulation and measurement were compared using the gamma-index analyses method.

### Results :

For cross-line profiles, agreements in the penumbra region (80%-20% width) and in the field size defined at 50% were better than 2mm for all fields sizes. Moreover agreement better than 1,5%, 1mm and 2%, 2mm were found for 10MV-FFF and 10MV, respectively. Calculated and measured percent depth doses beyond the buildup region agreed within 1,5%, 1mm for 10MV-FFF beams and within 2%, 2mm for 10MV beams. The agreement between calculate and measured output factors for all field were within 1%. Furthermore the 10MV-FFF results show less noise compare to the 10 MV's.

---

\*Intervenant

Conclusions :

The X10 and X10-FFF Varian phase-spaces files have been validated in homogeneous medium. The perspectives of this study include the validation of the modeling in a heterogeneous medium. And afterward, the validation of a treatment plan through a comparison between a Monte Carlo VMAT simulating plan and a TPS one.

**Mots-Clés:** BEAMnrc, DOSXYZnrc, gamma, index, phase, space, TrueBeam Novalis STX, X10, FFF