Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **421** Type: **Invited Speaker / Conférencier(ère) invité(e)**

The Aurora-RT –the Canadian Home-Grown Linac-MR Treatment Platform at the Cross Cancer Institute

Tuesday 10 June 2025 15:00 (45 minutes)

Invented and developed at the Cross Cancer Institute in Edmonton, Alberta, the MagnetTx Aurora-RT is a made in Canada solution that combines a 6 MV linac producing therapeutic radiation and a biplanar 0.5 T MRI. This treatment platform received FDA clearance and treated its first patients recently. The primary benefit of such a device is to provide 3D MRI with excellent soft tissue contrast at start of treatment to manage inter-fractional organ motion, and real time 2D MRI to monitor intra-fractional organ motion during radiation delivery. Compared to other MR-Linac systems, the Aurora RT has a wide bore (60 cm x 110 cm) and a geometry that ensures the main magnetic field of the system is always parallel with the radiation field, which is unique to other commercials MR-Linac systems which are perpendicular. Secondary electrons generated by X-ray beams are highly forwarded peaked, thus a perpendicular magnetic field perturbs the dose more strongly via Lorentz force which leads to shifting of depth dose curves, crossplane beam profiles and Electron Return Effects, which is largely avoided in our parallel field. Our initial commissioning work confirms the minimal influence of the parallel magnetic field in beam modeling in water phantom, reference dose calibration, and IMRT dose accuracy, thus allowing initial patient treatments with off-the-shelve treatment planning systems that do not explicitly model magnetic field effects. However, clinicians should be aware that parallel magnetic field can still act on lateral electrons to cause dose perturbations in certain situations, such as at the patient's surface, in lung, and orthogonal interfaces. These situations are investigated with Monte Carlo simulations. Finally, a collaboration is underway with a commercial partner for a treatment planning system that accounts for these parallel magnetic field effects of our Linac-MR system and initial results are promising.

Keyword-1

Keyword-2

Keyword-3

Author: YIP, Eugene (Dept. of Oncology, University of Alberta)

Presenter: YIP, Eugene (Dept. of Oncology, University of Alberta)

Session Classification: (DPMB) T2-11 | (DPMB)

Track Classification: Technical Sessions / Sessions techniques: Physics in Medicine and Biology / Physique en médecine et en biologie (DPMB-DPMB)