

Theory, simulation and experiments for precise deflection control of radiotherapy electron beams

R. Figueroa^{1,2*}, J. Leiva¹, R. Moncada^{1,3}, L. Rojas^{1,2}, M. Santibáñez^{1,2}, M. Valente^{1,2,4}, J. Velásquez⁵,
H. Young^{1,3}, G. Zelada⁶, R. Yáñez⁷, Y. Guillen⁷

*rodolfo.figueroa@ufrontera.cl

¹ Centro de Física e Ingeniería en Medicina - CFIM, Universidad de La Frontera. (Av. Francisco Salazar 1145, Casilla 54-D, Temuco, Chile)

² Departamento de Ciencias. Físicas, Universidad de la Frontera, Temuco, Chile.

³ Departamento de Ingeniería Eléctrica, Universidad de La Frontera, Temuco, Chile.

⁴ Instituto de Física Enrique Gaviola – CONICET & LIIFAMIRX, Universidad Nacional de Córdoba. (Av. M. Allende s/n, 5000, Córdoba, Argentina).

⁵ Instituto Oncológico del Sur- ICOS- Inmunomédica, Lago Puyehue 01745, Temuco, Chile.

⁶ Clínica Alemana de Santiago, Santiago de Chile, Av. Vitacura 5951, Vitacura, Santiago de Chile.

⁷ Hospital Base de Valdivia, Calle Simpson 850, Valdivia Chile.

Abstract

Conventional radiotherapy is mainly applied by linear accelerators. Although linear accelerators provide dual (electron/photon) radiation beam modalities, both of them are intrinsically produced by a megavoltage electron current. Modern radiotherapy treatment techniques are based on suitable devices inserted or attached to conventional linear accelerators. Thus, precise control of delivered beam becomes a main key issue. This work presents an integral description of electron beam deflection control as required for novel radiotherapy technique based on convergent photon beam production. Theoretical and Monte Carlo approaches were initially used for designing and optimizing device's components. Then, dedicated instrumentation was developed for experimental verification of electron beam deflection due to the designed magnets. Both Monte Carlo simulations and experimental results support the reliability of electrodynamic models used to predict megavoltage electron beam control.

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