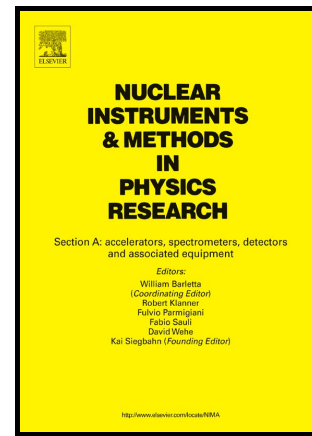


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Design, construction and performance evaluation of the target tissue thickness measurement system in intraoperative radiotherapy for breast cancer

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Abstract

Intraoperative electron radiation therapy (IOERT), which uses electron beams for irradiating the target directly during the surgery, has the advantage of delivering a homogeneous dose to a controlled layer of tissue. Since the dose falls off quickly below the target thickness, the underlying normal tissues are spared. In selecting the appropriate electron energy, the accuracy of the target tissue thickness measurement is critical. In contrast to other procedures applied in IOERT, the routine measurement method is considered to be completely traditional and approximate. In this work, a novel mechanism is proposed for measuring the target tissue thickness with an acceptable level of accuracy. An electronic system has been designed and manufactured with the capability of measuring the tissue thickness based on the recorded electron density under the target. The results indicated the possibility of thickness measurement with a maximum error of 2 mm for 91.35 percent of data. Aside from system limitation in estimating the thickness of 5 mm phantom, for 88.94 percent of data, maximum error is 1 mm.

Keywords: Breast cancer; Intraoperative electron radiotherapy; Target tissue thickness; Measurement system.

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