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Dose Distributions and Treatment Planning System Verification of Synchrotron Beams on the IMBL

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Radiation therapy requires vigorous validation of the treatment planning system (TPS) before patient treatments can be accurately performed. Typically this is done by comparing dose calculations of the TPS with ionisation chamber or film measurements in various phantoms. Researchers from RMIT University and the Australian Synchrotron's IMBL have developed a TPS based on the Eclipse TPS (Varian Medical Systems of Palo Alto, California, USA). The Eclipse algorithms which calculate the dose distributions for megavoltage (MV) radiation therapy have been substituted for Monte Carlo algorithms that model the dose distribution generated by the kilovoltage (kV) synchrotron beams on the IMBL.

The major difficulty in validating the dose distributions calculated with the new TPS is the dynamical nature of the IMBL treatments. Only a single ionisation chamber measurement or a 2D representation with film may be performed at a time.

Dosimetric properties of synchrotron beams on the IMBL have been measured in 3D with water equivalent radiosensitive dosimeters and optical CT scanning. The results have been compared with ion chamber measurements performed on the IMBL and calculations with the new TPS.

Keywords

IMBL Dose Distributions, Optical CT Scanning.

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