

Purpose:

A concept for quality assurance and IMRT plan verifications with 2D-ARRAYs and the DAVID- System is presented.

Methods and Materials:

A 2D-ARRAY (PTW-Freiburg) and a multi-wire ionization chamber (DAVID-system, PTW Freiburg) are used in this work. The DAVID-system is a translucent, multiwire transmission-type ionisation chamber, placed in the accessory holder of the accelerator. Each detection wire is positioned in the projection line of a MLC leaf pair. The signal of each wire is proportional to the line integral of the ionisation density along this wire.

The 2D-ARRAY is used for daily dosimetrical checks (dose on central axis, MLC calibration, symmetry, flatness, energy) and for pre-treatment IMRT plan verification. During the dosimetric verification of an IMRT plan reference values are measured with the DAVID-system and stored in a patient specific database. During daily treatment the signals are re-measured and compared to the reference values. Thus a direct connection to the IMRT plan verification is possible. A warning occurs if a deviation beyond a chosen threshold is detected. In an "expert" mode the physicist can analyse each single segment of the plan and detected errors are related to MLC pair. If necessary a re-verification with 2D-ARRAYs can be performed.

Results

The application of the concept for standard IMRT cases and examples for error detection capabilities (e.g. de-calibrated MLCs, neglected segments) are shown. For typical IMRT plans with field sizes beyond 10 cm x 10 cm the DAVID-system is able to detect positioning errors of MLC pairs in the sub-millimeter region.

Conclusions:

The procedures can be used during daily routine with a minimum of additional time and are assuring a closed dosimetrical QA loop for IMRT.