Introduction: MapCheck is a two-dimensional diode array. The detector measures the integrated dose at all detector locations, each of which has been corrected to the central detector sensitivity. This measured dose map can be normalized and compared to a normalized imported treatment plan dose map. Two commercially available MapCheck detector arrays were investigated for their use in clinical practice. The MapCheck has 445 n-type diodes in 22 x 22 cm² with 7.07 mm spacing, and the central detector sensitivity has been corrected to the central detector sensitivity. This map can be normalized and compared to a normalized imported treatment plan dose map. Two commercially available MapCheck detector arrays were investigated for their use in clinical practice.

Materials and methods: The treatment plan were calculated by two different commercially available (Philips ADAC Pinnacle3 and Varian Eclipse) treatment planning systems (TPSs) and were delivered using 6 MV and 18 MV photon beams and 6, 9, 12, 15, 18 MeV electron beams by two different types of linear accelerators, Siemens Primus and Varian Novalis. The energy, field-size, gantry orientation and dose rate dependence, short-term and long-term stability and the different kind of field matching were also examined to understand the stability and uncertainty of the systems. The planned and measured dose distributions were compared by gamma analysis.

Results: Setup and calibration of detector were fast and simple, its take about 30 minutes. The set-up error is approximately 1 mm. The short time stability was very impressive, less than 0.1 % (Table 1.). The linearity is also good until 350 cGy. During 2 hours continuous operation the measured dose was increased by 1% as the diodes were warming up. Increasing the dose rate from 100 MU/min to 1000 MU/min the measured dose was higher approximately 1%. At 1000 MU/min dose rate for 6 MV energy and smaller field sizes the measured dose increased additional 2%. Plotted and measured dose values show very good agreement for different field sizes. Wedge profiles of TPS and profiles measured by diode and ionisation chamber give the very similar shape. For electron beams could not be established any dose rate dependence for central-axis diode. For 9 MeV electron energy the dose measured a more accurate value. The MapCheck can used for QA/QC of electron and photon field matching. The dose of central-axis diode was measured with zero gantry angle.

Discussion: After the carefully calibration the 2D diode arrays is a very useful detector in a clinical practice. MapCheck is recommended for the regular quality control measurements. The MapCheck would be adequate device for per-plan quality assurance of IMRT, because it has larger, rectangular area with denser placed diodes. The 2D diode array has to use carefully for small field dosimetry and in high dose gradient region.

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