

Purpose: Volumetric modulated arc therapy (VMAT) has been introduced in many clinics. The need for patient specific quality assurance tests for VMAT was reflected in a large number of publications on this subject. Many centers have used the Sun Nuclear Mapcheck diode array for IMRT patient specific QA, and thus the retrofitted MAPPHAN/Mapcheck may appear an economical and trustworthy solution for VMAT. Implementing this phantom was not straightforward. Following manufacturer's guidelines for comparing measured and calculated dose distributions, the pass rates were considerably lower than with other volumetric dosimeters. We present a simple method to improve these results to clinically acceptable values.

Methods: We commissioned VMAT for two Elekta Infinity accelerators with the Pinnacle3(v9) treatment planning system. For MAPPHAN dose calculation, we used a CT scan of the phantom directly or assigned a density of 1.05 g/cm³ to the whole phantom, as recommended by the manufacturer and tested these on 5 prostate plans. To improve plan/measurement agreement we created an artificial CT scan using two density configurations as possible estimates of the actual phantom. To minimize couch effects, we placed the phantom on 7cm of Styrofoam. Validity of the plans was also verified with the Delta4 phantom (Scandidos) which gave 100% agreement under TG119 criteria.

Results: Using MAPPHAN as suggested by the manufacturer gave suboptimal results. A literature search revealed that this problem was also identified by others (1). Using an artificial CT representation and raising the phantom improves agreement with plans from (93+/-6)% to (98+/-3)% (TG119), approaching Delta4 results.

Conclusions: Problems with using the MAPPHAN phantom can stem from insufficient knowledge of the phantom composition and treatment couch attenuation. A simple method was developed to improve the results of VMAT patient specific QA.

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None