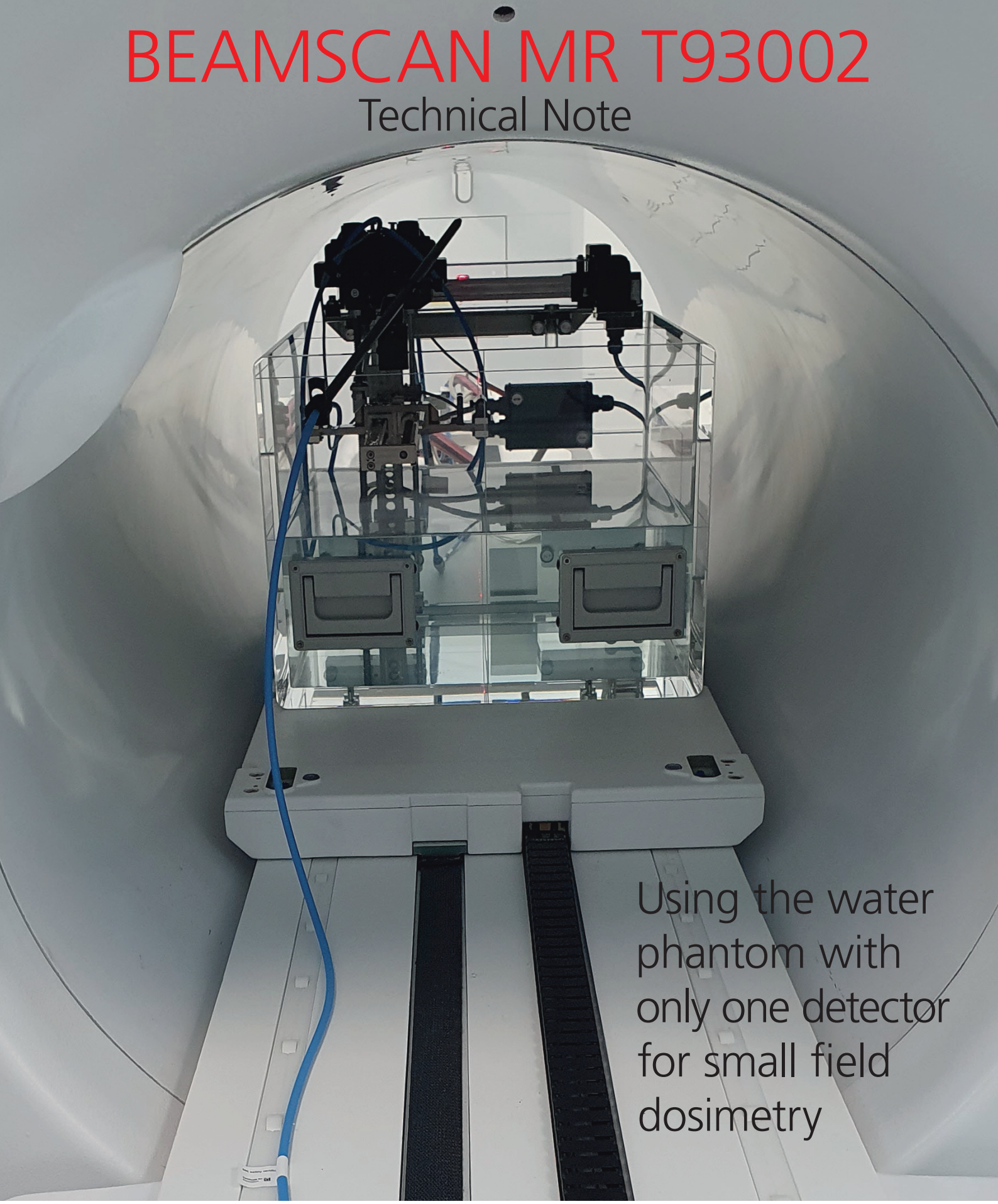
BEAMSCAN MR T93002

Technical Note



Using the water phantom with only one detector for small field dosimetry

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Introduction

Recently there have been several requests for information on if and how the BEAMSCAN MR water phantom can be used to measure PDDs and profiles of small fields with just one detector at a Viewray MRIdian.
This technical note describes the necessary steps for field sizes up to 5 x 5 cm^2

General Situation

The BEAMSCAN MR is using a double detector setup to achieve optimal scanning depth and width within the confinements of the linac bore. Due to these confinements, there is hardly any overtravel in X-direction between the two detectors. X-profiles are scanned by combining the scans of both field detectors to measure a full X-profile.

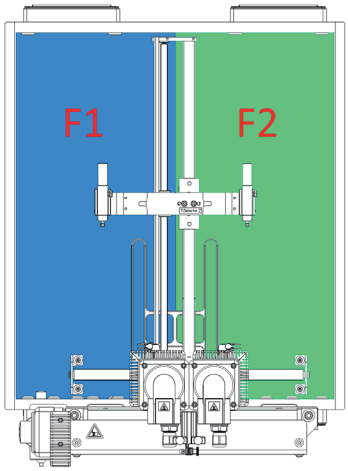


Figure 1: Measurement volumes per detector for the standard setup.

Measuring X-profiles with only one detector

If you prefer to measure X-profiles with only one detector, it is possible to do so for small fields (up to 5 x 5 cm^2) using the following steps in addition to the standard set-up:

Prerequisites:
- Set-up and align BEAMSCAN MR phantom in the linac bore at isocenter position following all steps as described in the manual. Make sure that the PMMA tank has been aligned as well as possible with the room lasers before moving it into the bore and doing the isocenter alignment procedure.
- Set the origin to the water surface above the isocenter.

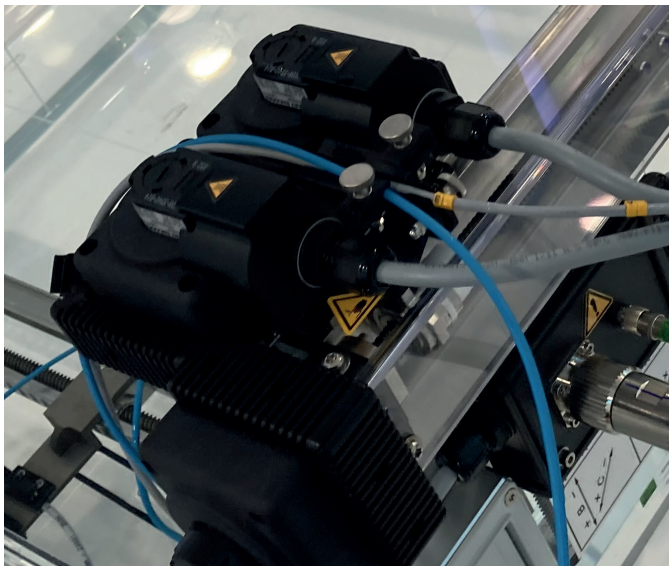


Figure 2: X-axis at the leftmost position (-X-direction)

Steps:
1. Set the water level either to 60 % or 210 mm to avoid splashing.
2. Go to the "Detector Selection" menu. Enable (green) only the F2 detector and if required the reference detector.
3. In the remote access software (not on the trolley touch-screen) go into the 'Positioning' menu and move the detector to the minimum X-position.
4. Move the tank out of the bore by moving the patient couch in -Y-direction.
5. Mount the required detector on the F2 holder.
6. Outside the bore, move the phantom by moving the patient couch 12.5 mm in +Z-direction and 30 mm in -X-direction
7. Move the phantom carefully back into the bore to the Y-coordinate of the isocenter position by moving the patient couch in +Y-direction. Carefully check that the phantom/ motors and the reference chamber set-up do not collide with the bore!
8. Fill the water back to the previous level minus 12.5 mm. Example: If the water level after alignment was 210.7 mm fill it now to 198.2 mm.
9. Use the positioning menu to
   a. go to isocenter
   b. go to water surface
   c. move the detector to +30mm using individual steps in 'fast' mode (do not push the '+'-button continuously)
   d. set origin.

You are now ready to measure PDDs and profiles up to 5 x 5 cm^2 with only one detector.

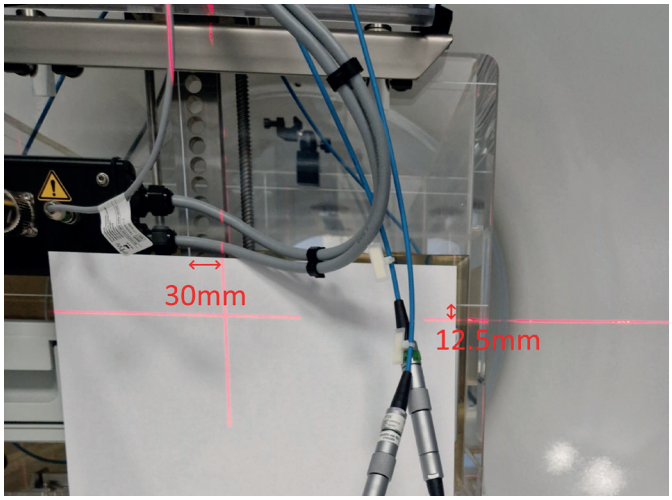


Figure 3: Offset of the phantom tank relative to the room lasers after couch movement

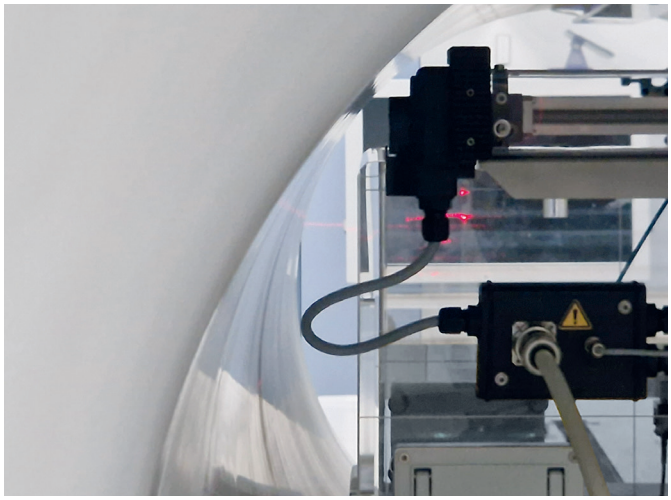
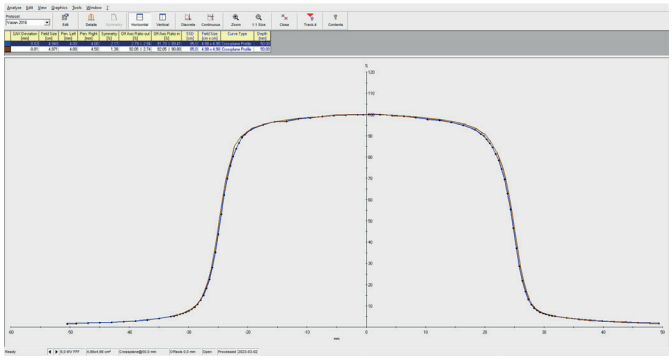
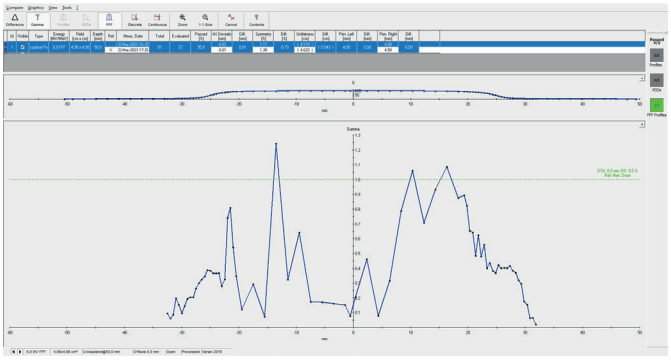


Figure 4: Remaining space between bore and phantom

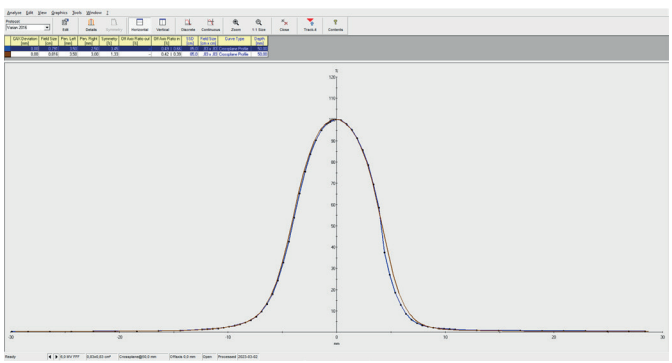
Example Scans

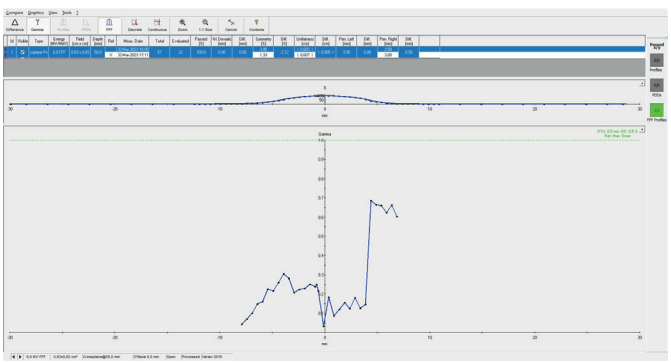
1. 4.98 x 4.98 cm², auto-stitch compared to single detector scan (microdiamond; no reference chamber); 1D-Gamma-criterion 0.5 mm and 0.5 %, local dose





2. 0.83 x 0.83 cm², auto-stitch compared to single detector scan (microdiamond, no reference chamber); 1D-Gamma-criterion 0.5 mm and 0.5 %; stitching effect visible on the right (< 0.3 mm offset), local dose





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For PTW, making medical radiation safer is both a passion and lifetime commitment. The family-run high-tech company operates the oldest and largest accredited calibration laboratory in the field of ionizing radiation and established THE DOSIMETRY SCHOOL to globally promote the exchange of knowledge in clinical dosimetry.

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