Using the BEAMSCAN® MR T93002 with a Varian Halcyon® Linac

Technical Note

PTW THE DOSIMETRY COMPANY

Introduction

The Varian Halcyon® linear accelerator (linac) is a radiotherapy device offering a beam quality of 6MV photons and a maximum field size at the isocenter of 28 cm x 28 cm. Its design is similar to e.g. the Viewray MRIdian MR-linac, less the magnetic fields.

The use of the BEAMSCAN® MR T93002 water phantom system at the Halcyon® has been tested by PTW and is described in this technical note.

Set-up of the BEAMSCAN® MR at the Halcyon®

The workflow is initially identical to the set-up at a Viewray MRIdian (see BEAMSCAN® MR manual chapter 8). In fact it is even simpler since the Halcyon® bore has a larger diameter (100cm vs 70cm) and there is no magnetic field that would have to be taken into account (e.g. safety considerations).
The set-up should take place on the Halcyon® service plate to protect the patient couch (Fig. 1).

Follow all set-up steps described in the BEAMSCAN® MR T93002 manual up to and including chapter 8.4. (Fig. 2)
For setting up the reference chamber you can use the positioning device provided (Fig. 3), even though the projections given will be slightly too small since they were calculated for the 90cm SID of the MRIdian system and not the 100cm SID of the Halcyon®.

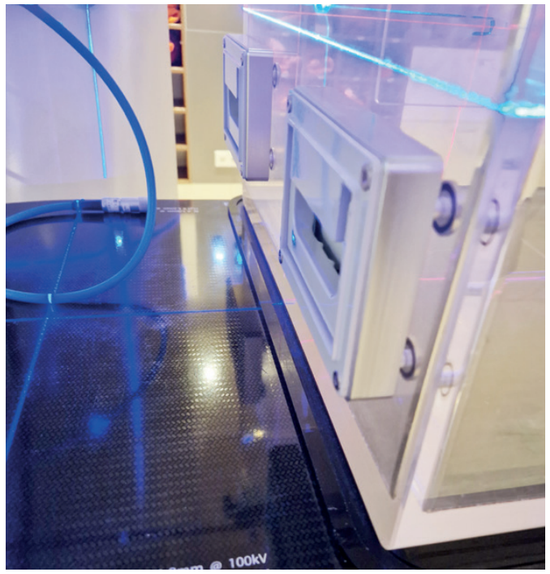

Figure 1: Halcyon® service plate with BEAMSCAN® MR

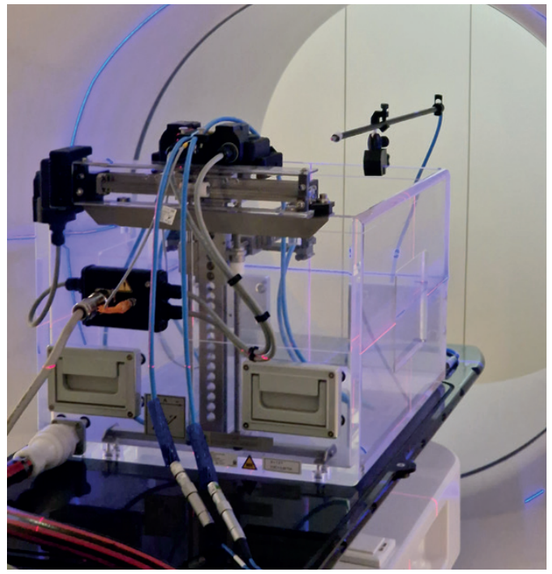

Figure 2: BEAMSCAN® MR aligned to the Halcyon® lasers

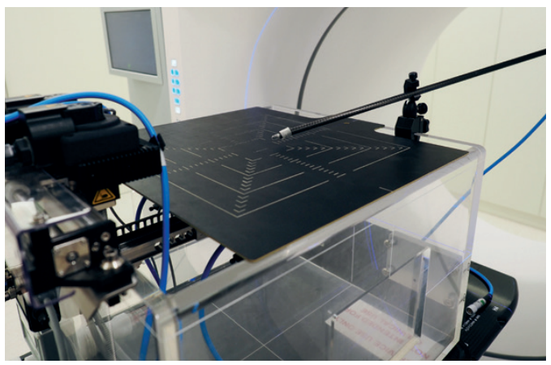

Figure 3: Positioning device with reference chamber

Set-up of the zero point

Chapter 8.5 of the T93002 manual describes setting the zero point on the water surface above the isocenter for gantry 0° beam incidence. If you simply follow the description in the manual, you can measure profiles up to a field size of 28 cm x 25 cm and PDDs at an SSD between 85 cm (24 cm maximum scanning depth) and 100 cm (9 cm maximum scanning depth) (Fig. 4).
Alternatively it is possible to use the patient couch to precisely reposition the phantom tank after alignment. This will allow full 28 cm x 28 cm profile scans as well as PDDs at SSDs between 85 cm and 100 cm with scanning depths up to 24 cm.
Make sure to reduce the water level to e.g. 60% before moving the couch and then return to the desired water level only after having done all intended couch movements to avoid water spillage!
In order to get maximum PDD scan depths for different SSDs move the couch down so that the maximum water level of the phantom (320mm nominal) corresponds to the preferred water level (See example for SSD 100 cm in Fig. 5):

In "Water level control":
- Fill to the maximum possible water level

In "Positioning":
- Move the system to the isocenter (should be at 0,0,0. If not click "Set origin")
- Move it to the water surface
- Note down the water level above the isocenter (Z-value)

In "Water level control":
- Go to 60%
- Move the patient couch down (-z direction) so that the required water level remains above the isocenter at maximum fill level
- Fill up to maximum level

To be able to scan a full 28 cm x 28 cm field you need to move the patient couch by -5 cm in Y-direction (at 60% water level, see above). After this you will have to set the zero point with the following steps in the "Positioning" menu of the water phantom:
- Move the system to the isocenter
- Move it to the water surface
- Move it +5cm in y-direction
- Set the zero point ("Set origin")

Continue with your measurements.

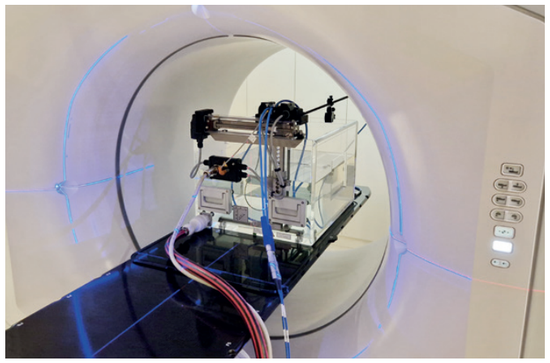

Figure 4: BEAMSCAN® MR positioned in the nominal isocenter

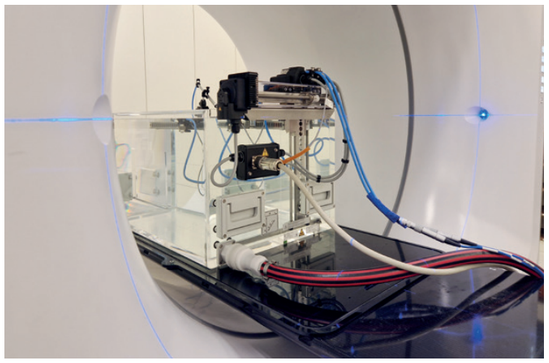

Figure 5: Patient couch lowered to 100cm SSD with maximum water level after completing the alignment process

Set-up for horizontal beam incidence

It is possible to use the BEAMSCAN® MR T93002 system for measurements with horizontal beam incidence through either of the built-in entrance windows (see ch. 8.5 of the BEAMSCAN® MR manual).
Please contact PTW if you intend to use the system to measure horizontal beams at a Halcyon® linac.

Using a BEAMSCAN® MR T93001 system at a Halcyon® linac

The BEAMSCAN® MR T93001 was developed for use with the Elekta Unity. Generally it can be set-up at a Halcyon® as well, but due to its geometry and different alignment steps used, it is more limited in its application to Halcyon® measurement tasks.
Please contact PTW if you intend to use the T93001 system to measure at a Halcyon® linac.

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PTW is a global market leader for dosimetry and quality control solutions in radiation medicine, serving the needs of medical radiation experts in more than 160 countries worldwide. Starting with the famous Hammer dosemeter in 1922, the German manufacturer is the pioneer in medical radiation measurement, known for its unparalleled quality and precision.

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.

For more information on BEAMSCAN® MR visit ptwbeamscan.com or contact your local PTW representative: ptwdosimetry.com/en/contact-us/local-contact

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