PARTNER
Rigshospitalet,
Copenhagen, Denmark

CHALLENGE
Efficient commissioning of two new Varian Medical Systems® TrueBeam™ Systems

SOLUTION
3D SCANNER

Owned and operated by The Capital Region of Denmark, Copenhagen's Rigshospitalet is the country's largest radiotherapy center. It recently embarked on a multi-year project to replace aging linacs with a mix of Varian Medical Systems® and ViewRay delivery systems.

Commissioning of the first two systems (Varian Medical Systems® TrueBeam™ Systems) was handled by a team of six Medical Physicists in **only eight days per system**. Their goal was to establish best practices to apply throughout the multi-year project. Their water tank choice: Sun Nuclear's 3D SCANNER™.

WHY THE 3D SCANNER

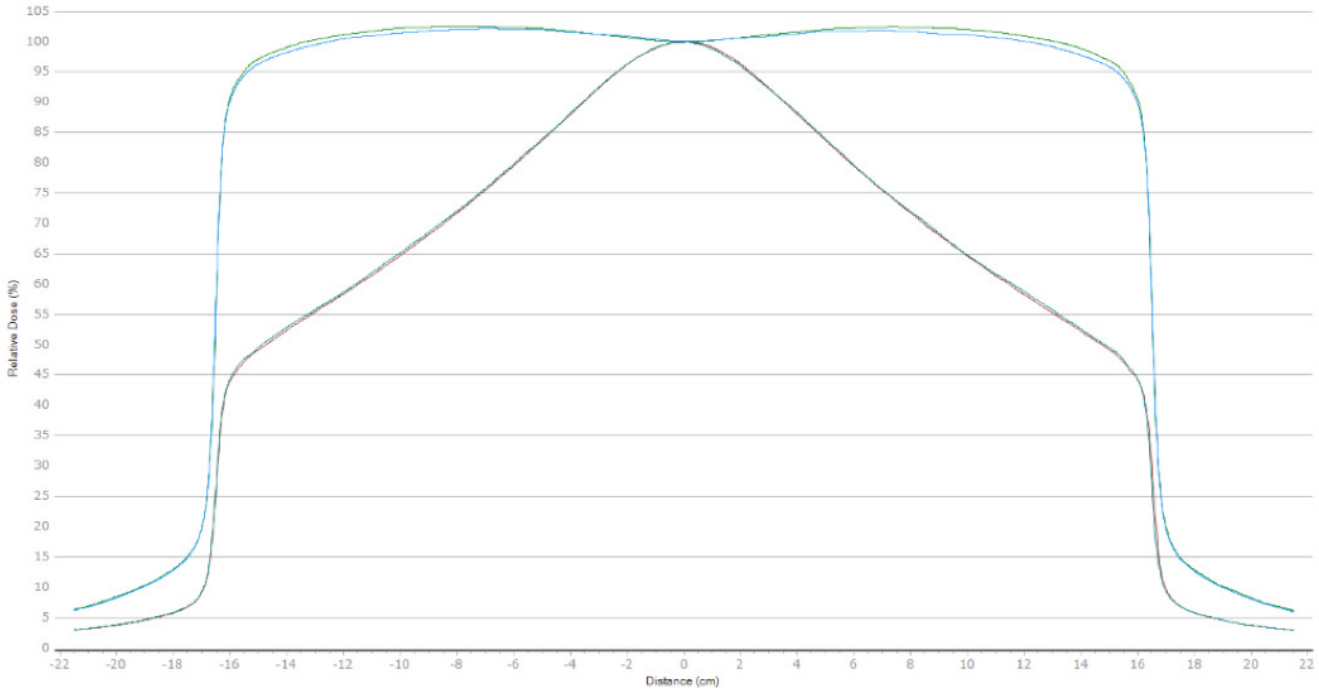
The Rigshospitalet team commissioned each system with five photon and five electron energy modes. They chose the 3D SCANNER over conventional square water tank options because they understood critical efficiency advantages could be gained, both from its unique cylindrical design and AutoSetup™ capabilities.

For Rigshospitalet, the 3D SCANNER allowed measurement of crossline, inline and diagonal profiles along the same axis of motion, which helped ensure identical scatter conditions and mechanical accuracy for all profile measurements.

For diagonal scans, Rigshospitalet avoided having to set up the phantom off-axis, which provided time-savings from at least three hours of measurement time, to a full day, including post-processing required to combine partial scans into a usable profile.

"The automatic setup feature allowed us to achieve a high degree of reproducibility during setup, giving us reassurance in the consistency of results among our physicists."

Nikolaj KG Jensen, Ph.D.,
Rigshospitalet Medical Physics Department



Crossline profiles for 30 x 30 cm² field in 10 MV and 10 MV flattening-filter-free beams for both systems. There is a difference of less than 1% in dose between the machines.

ACCURACY HINGES ON REPRODUCIBILITY

Conducting water tank scans by different physicists can potentially introduce errors into this process, resulting in data variances. As described in AAPM Task Group 106, "Beam data commissioning should be performed with appropriate knowledge and proper tools and should be independent of the person collecting data."

With the 3D SCANNER, Rigshospitalet uncovered a minute difference in the 10 MV photon beams between the machines, which may have been missed without the mechanical accuracy and setup reproducibility features of the water tank.

"I think reproducing the same scatter conditions is really where square water phantoms have a limitation. If you're doing an inline profile as compared to a crossline profile, you have different scattering conditions for your detector, and you're using two different motion axes. If they're not reproducible between each other, you're going to get slightly different results. When you're doing a diagonal profile, moving along two axes at once, that may compound some uncertainty," notes Jensen.

INITIAL EXPERIENCE

The 3D SCANNER performed diagonal and crossline profiles of fully open fields, without changes to SSD or being aligned off-axes at maximum dose depth. Not having to adjust the tank made measurements easier and reduced the potential for incorrect measurements. Less experienced users in the clinic experienced a time-savings of approximately one hour due to the automated features of the 3D SCANNER.

All measurements were made with the tank aligned to the beam central axis and SSD 100 cm, except for air profiles required for Monte Carlo calculation for electron planning (made at SSD 95 cm). In summary, Jensen states:

"I have never worked with another water phantom that is so easy to set up and use."

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