



BHPA 2021 Abstract submission form

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II. Abstract information

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Remote auditing
SBRT
Dose verification
Film dosimetry
EPR dosimetry

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Results of the national remote lung SBRT audits after 1 year

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I. Introduction and purpose

NuTec has started its national remote auditing program for lung SBRT based on the combination of alanine/EPR and radiochromic film dosimetry. The goal is to provide an independent assessment of the dosimetric accuracy for the SBRT practice of the participating hospitals.

II. Material and methods

Initially the first audits were planned visited but due to the covid-19 pandemic most of the audits were performed remotely. The audit consists of a series of basic tests and an E2E test for a lung SBRT case on a commercial lung phantom that is preloaded with film/alanine detectors. The tumour volume is simulated using a 3D printed mould filled with a silicone mixture. An alanine pellet is placed in the centre of this volume. Large film detectors are placed through the target and also on top of the lungs. The films were analysed using gamma analysis [1, 2]. The centres that used Acuros with dose to medium (Dm) for the dose calculations were also asked to recalculate with dose to water (Dw) for the SBRT plan. Our alanine/EPR dosimetry was also validated against the IC chamber of another hospital. Both detectors were irradiated simultaneously at 10 cm depth with a 10 x 10 cm² field with 6 MV beams. 4 Gy was delivered. Both detectors had an uncertainty of 1 % (k=1).

III. Results and discussion

8 audits are performed up to now. Figure 1 shows the results of the basic tests. 7/8 beams are within 2 % for beam output with 5/8 beams being within 1 %. For 1 centre the difference between measurement and calculation was higher than 3 % which is under investigation. For the other tests all the differences are within 3 %.

Figure 2 and Figure 3 show the alanine and film results for the E2E tests. The alanine results for 5/8 beams are within 3 % of the calculated doses. For the other 3 beams the measured dose with the alanine detectors was 3 % higher than the calculated doses. Acuros Dm was used for the calculation. When these centres recalculated the same plans using Acuros Dw, the alanine results were within 3 % of the calculated doses.

For 6/8 beams the passing rate was higher than 95 % for the film through target (5%/1mm criteria) and 7/8 beams had a passing rate higher than 95 % for the film on top of the lungs (3%/2mm criteria). For the centres that recalculated using Acuros Dw, no trend was observed.

The comparison of the alanine/EPR dosimetry with the IC dosimetry of the hospital was within 1 %.

IV. Conclusions

The results of the basic dosimetry and the complex dosimetry for the SBRT delivery are good. Dose to water must be used as dose report mode when Acuros is used for the dose calculation as alanine is calibrated in dose -to-water.

V. Acknowledgements and potential conflicts of interest

We would like to thank the Cancer Plan, FOD Healthcare and the Belgian College of Radiation Oncology for the financial and scientific support. We would also like to thank the members from the steering committee and the participating centres for their support. We have no conflict of interest.

VI. References

- [1] D. A. Low and J. F. Dempsey, "Evaluation of the gamma dose distribution comparison method," *Med Phys*, vol. 30, no. 9, pp. 2455-64, Sep 2003, doi: 10.1118/1.1598711.
- [2] D. A. Low, W. B. Harms, S. Mutic, and J. A. Purdy, "A technique for the quantitative evaluation of dose distributions," *Med Phys*, vol. 25, no. 5, pp. 656-61, May 1998, doi: 10.1118/1.598248.

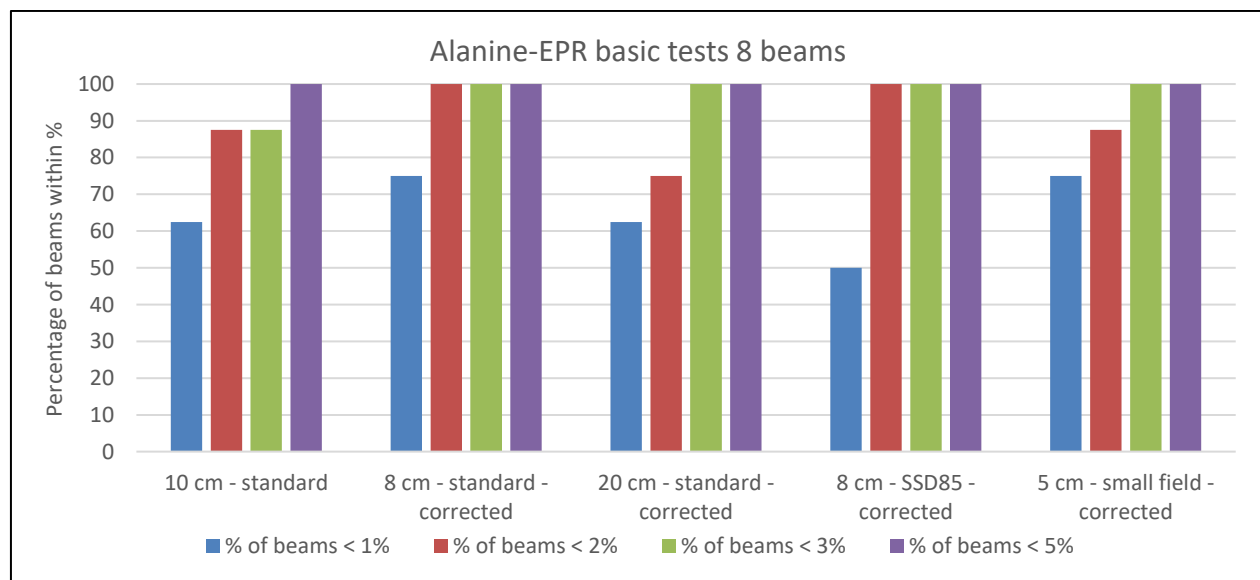


Figure 1: Results basic tests for 8 audits. The utter left column is the measured output by NuTeC. The other results are corrected with the output measurement.

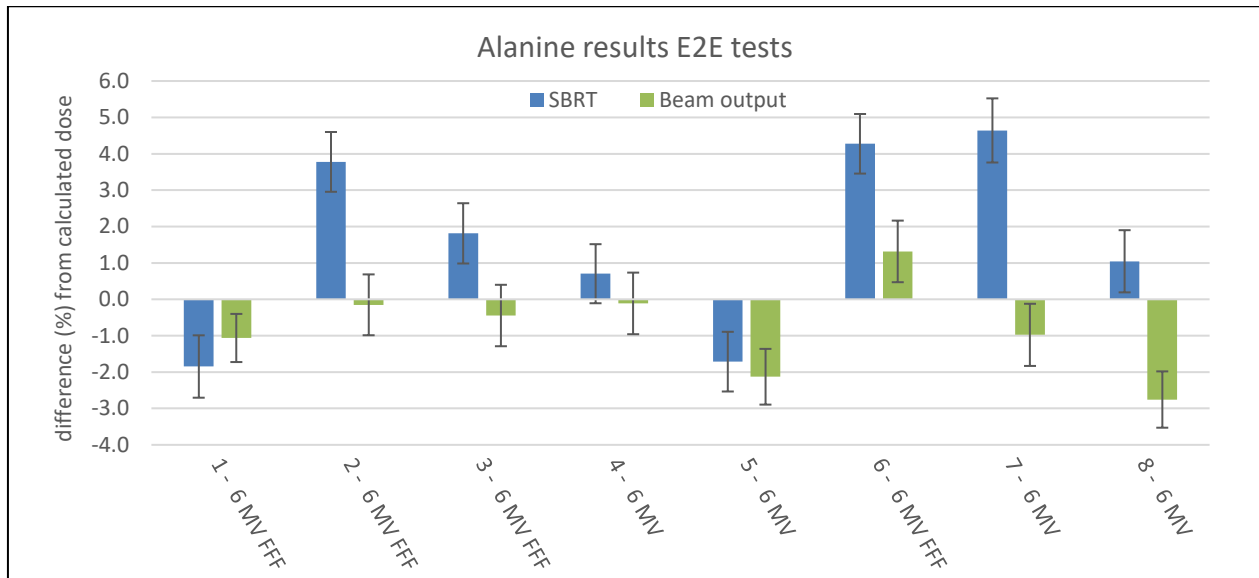


Figure 2: Alanine/EPR results for the E2E test for the SBRT delivery of each participating centre. The measured beam output on the same day as the SBRT delivery is plotted together.

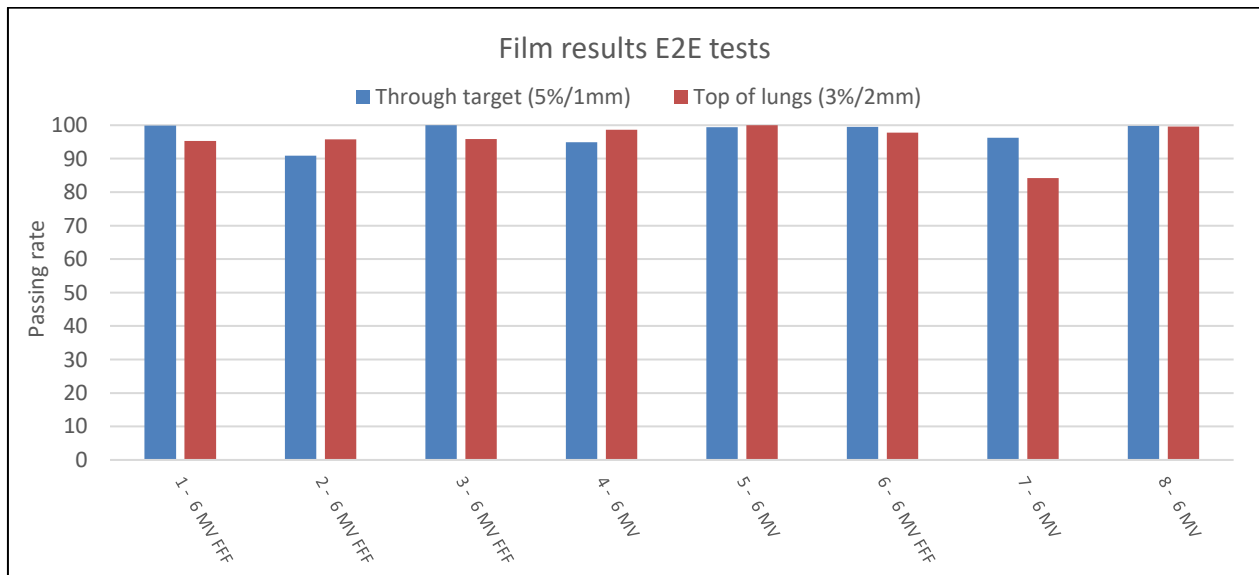


Figure 3: Film results of the E2E test of the SBRT delivery of each participating centre.