

Dosimetric Analysis Report

Date of report:	-
Phantom Type	Prime
Phantom S/N:	-
Gel Inset Kit S/N:	-
Treatment Planning System:	MR-Linac
Number of target volumes (PTVs):	1
Institution:	-

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3D Relative Dosimetry (Gel)

PART I: *Qualitative comparison*

Image registration between post-irradiation MRI and planning RTDose TPS data with structures of the Gel phantom. This is to demonstrate the coincidence of each treated target to its planned location.

MRI (actually delivered dose) blended with TPS (calculated dose)

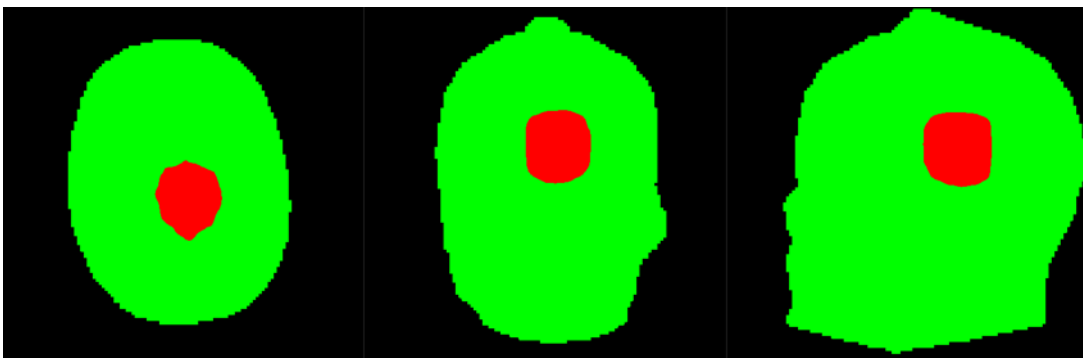
MRI 100% - RTDOSE TPS 0%



MRI 50% - RTDOSE TPS 50%



MRI 0% - RTDOSE TPS 100%



(Brightness and contrast adjusted so that only high dose areas are depicted)

MRI (actually delivered dose) blended with TPS (calculated dose)

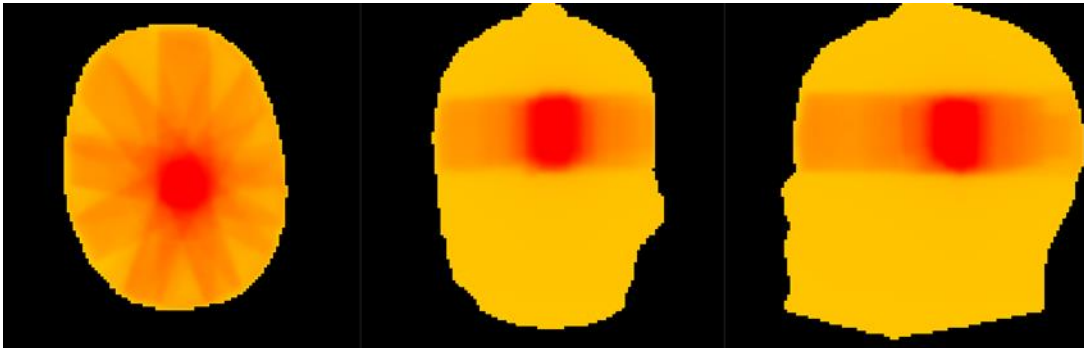
MRI 100% - RTDOSE TPS 0%



MRI 50% - RTDOSE TPS 50%



MRI 0% - RTDOSE TPS 100%



(Brightness and contrast adjusted so that also low dose areas are depicted)

PART II: Profiles comparison

Indicatively, a number of relative dose profiles for both the measured and TPS-calculated datasets are presented in the following figures. In order to quantitatively assess agreement between the two datasets, 1D gamma index calculations are also included. Passing criteria were 2 mm distance-to-agreement and 5% dose difference.

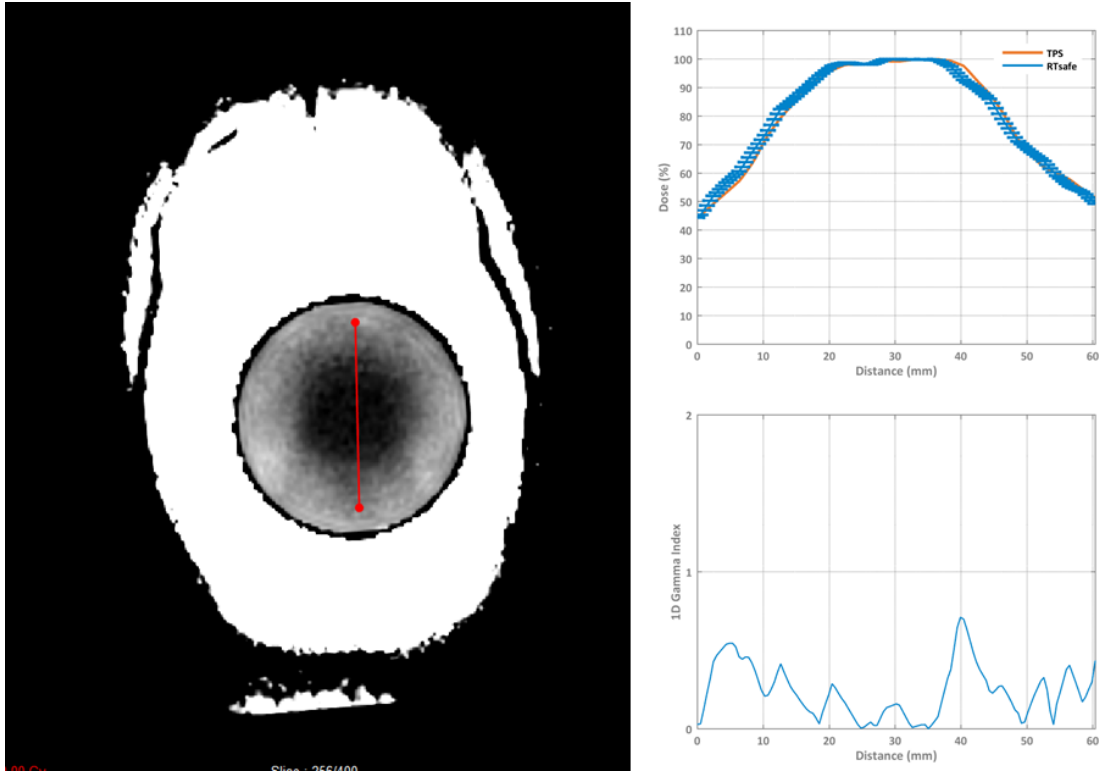
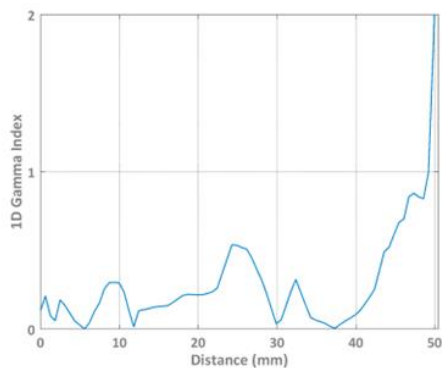
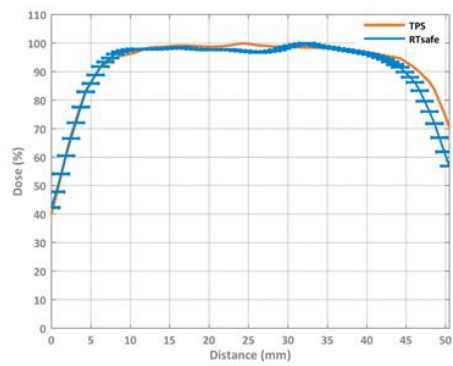
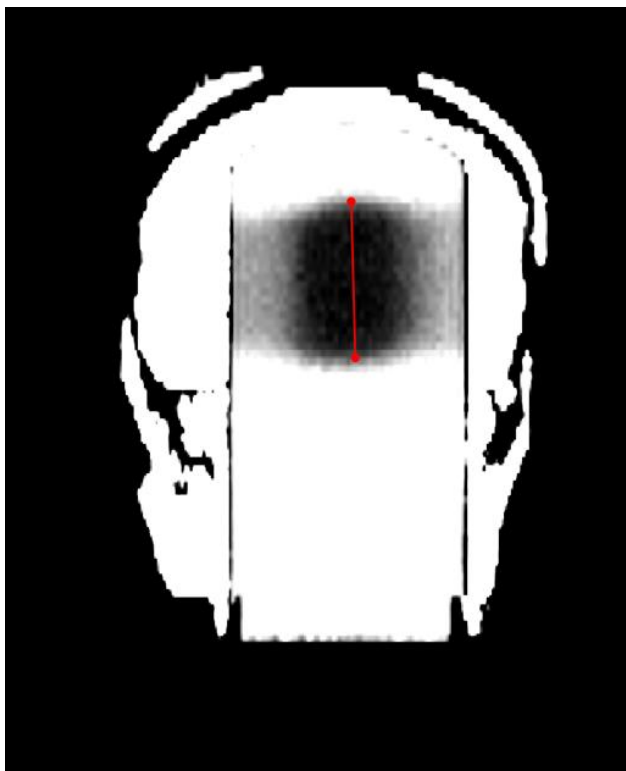
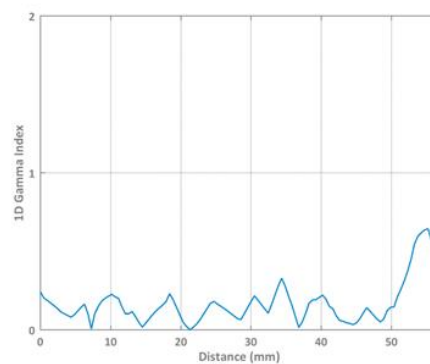
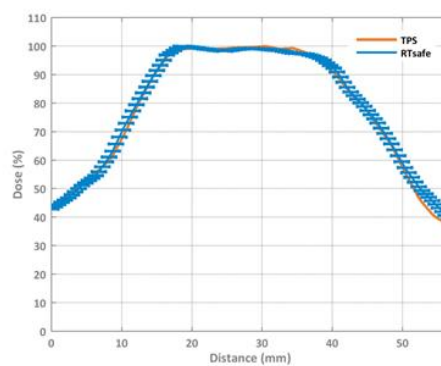
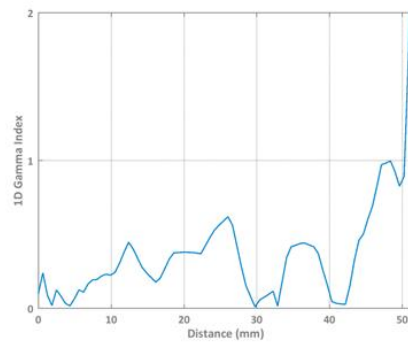
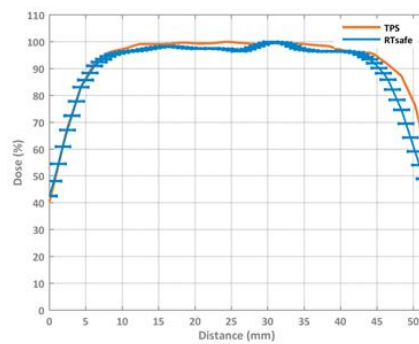
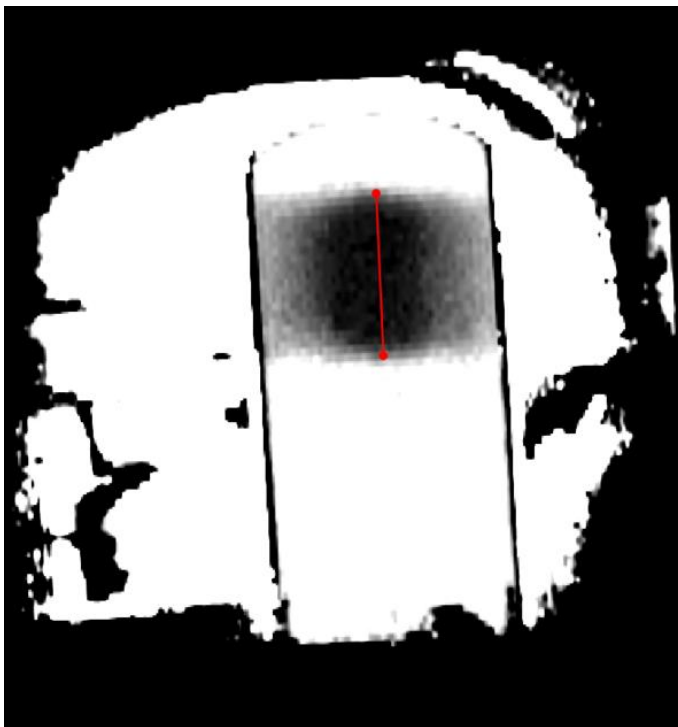
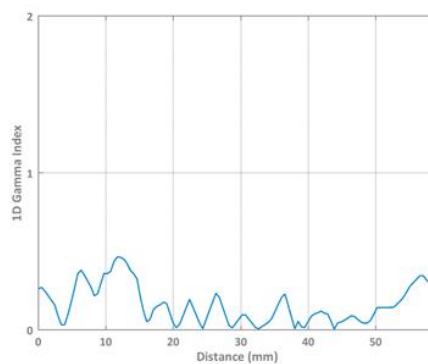
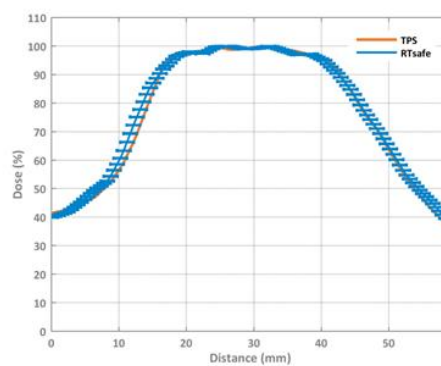
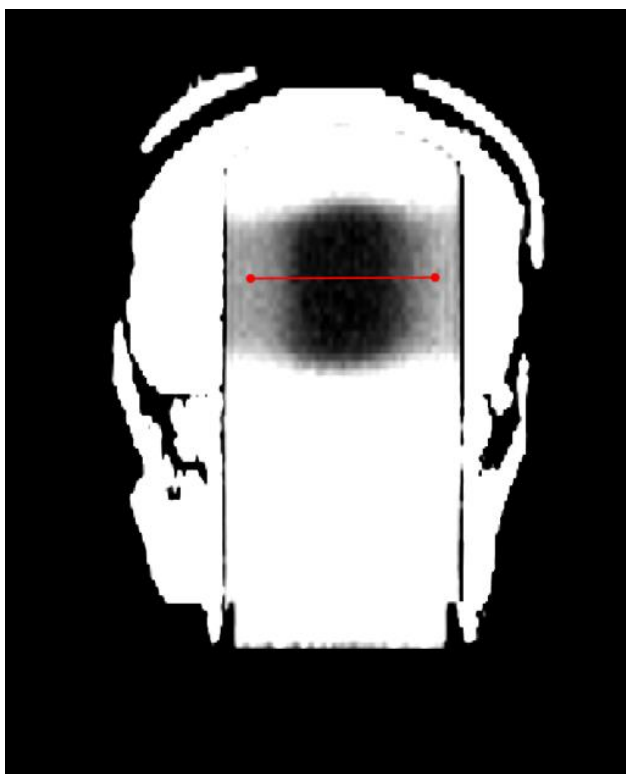
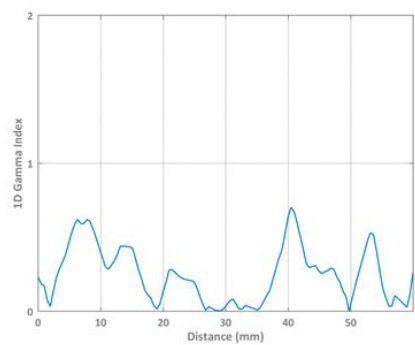
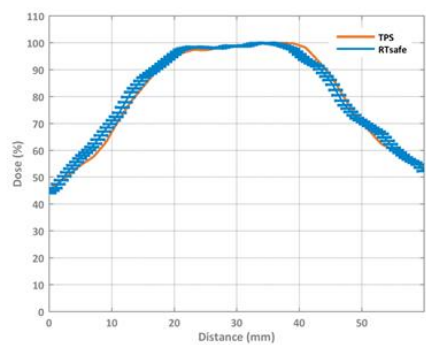
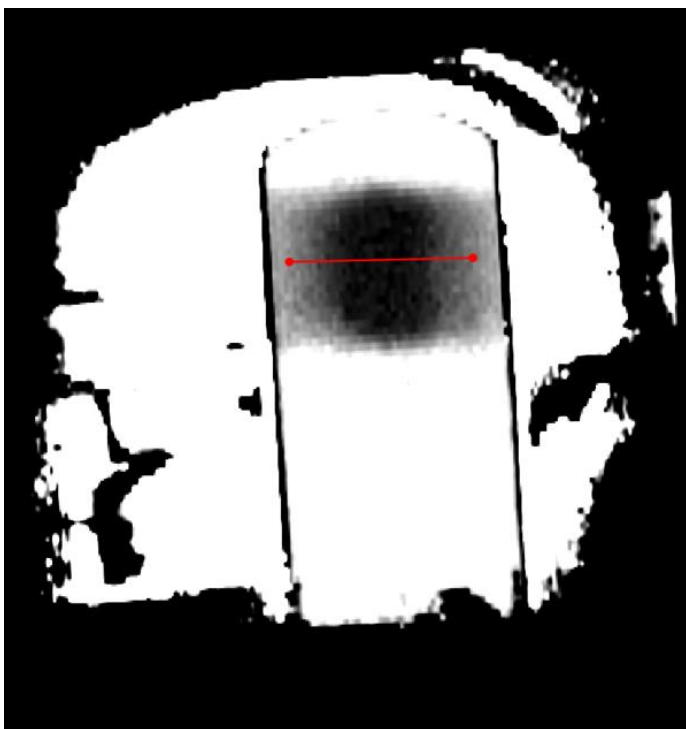


Figure: (left) Slice of the derived T2 maps of the irradiated phantom. High dose regions correspond to darker areas. (right) 1D profile comparison between calculated (TPS) and measured (RTsafe) dose distributions at the location depicted by the red line. Error bars correspond to $\pm 1\text{mm}$ spatial uncertainty. 1D gamma index calculations are also given using passing criteria 5%/2mm.

The same figure caption applies to all following figures in Part II.







PART III: 2D Gamma Index comparison

For selected slices of the irradiated phantom, 2D gamma index calculations are presented in the following figures. Again, passing criteria were 2 mm distance-to-agreement and 5% dose difference. However, a dose threshold of 1% has been applied to exclude corresponding voxels from the gamma index calculations. Isodose lines are also plotted to assist comparison.

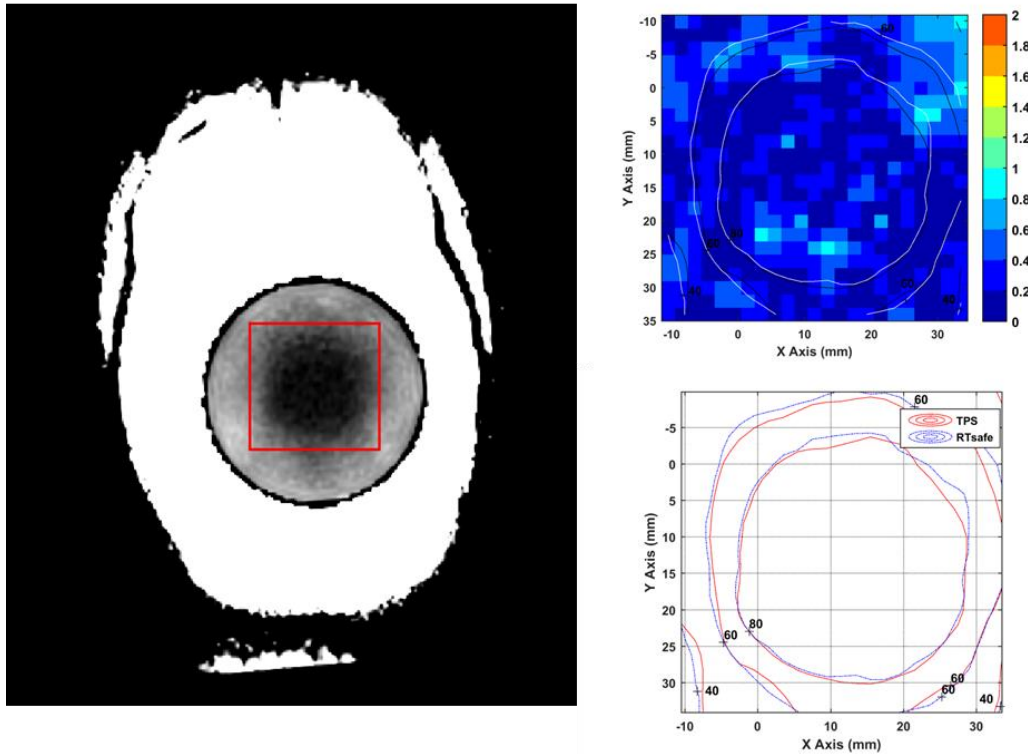
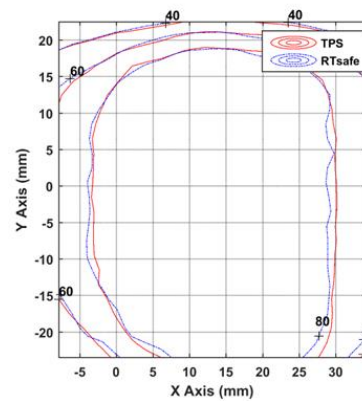
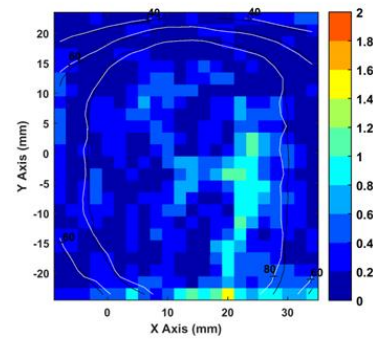
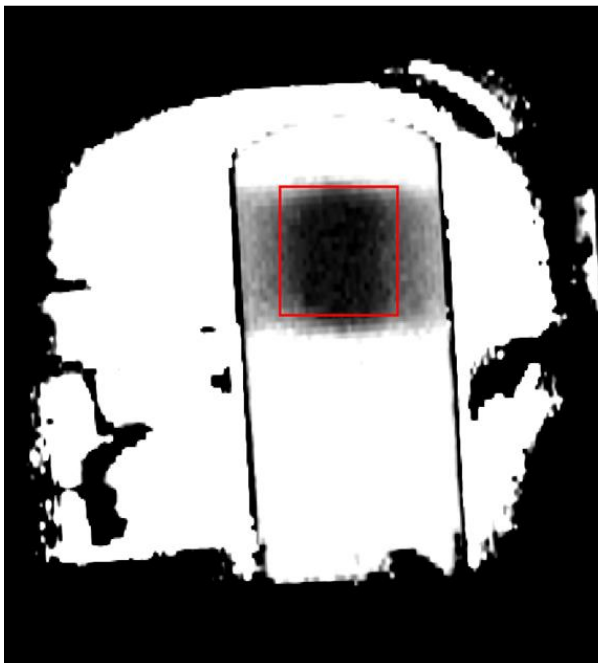
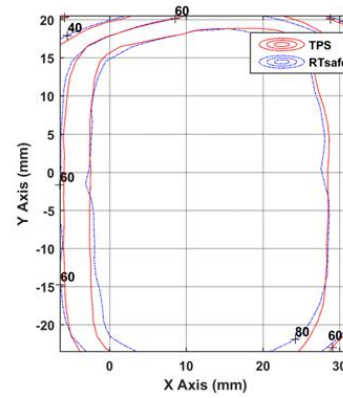
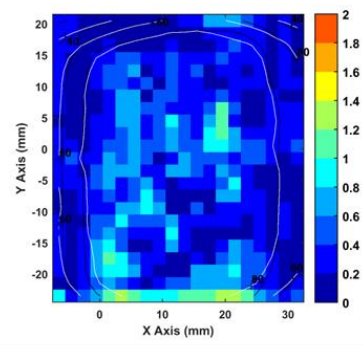
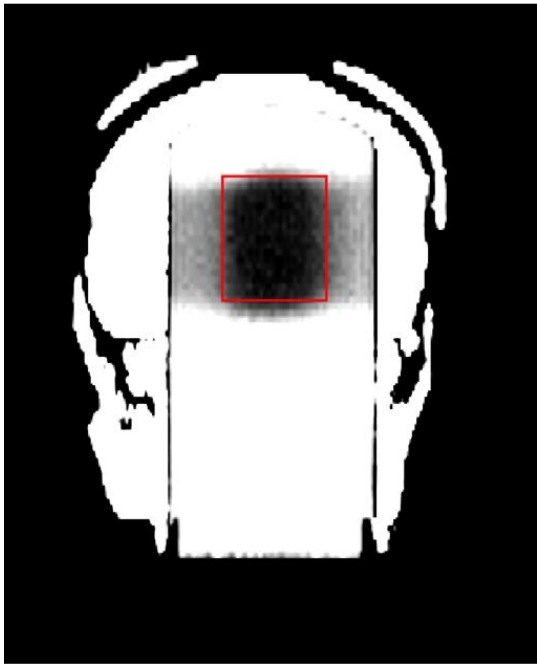


Figure: (left) Slice of the derived T2 maps of the irradiated phantom. High dose regions correspond to darker areas. (right) 2D comparison between calculated (TPS) and measured (RTsafe) dose distributions at the location depicted by the red contour. 2D gamma index calculations are also given using passing criteria 5%/2mm.

The same figure caption applies to all following figures in Part III.



PART IV: 3D Gamma Index comparison

Gamma index calculations were also performed in 3D using a variety of passing criteria and a low-dose cut off threshold of 1%. For the indicative targets considered, gamma index comparison was performed within a volume of interest that includes the target(s) along with an extended region of surrounding soft tissue. Corresponding results are summarized in the following table. Moreover, histograms of the corresponding 3D gamma values are given in the following figures.

Table: Results for the 3D gamma index test, comparing gel-measured (reference) with the TPS-calculated (evaluated) dose distributions using a variety of passing criteria. Note that the volume of interest considered for each target includes the total contoured volume along with an extended area of surrounding soft tissue.

Structure	Passing criteria		Passing Rate
	DTA (mm)	DD (%)	GI ≤ 1 (%)
PTV	2	5	98.11
	1	5	94.73
	2	3	92.12

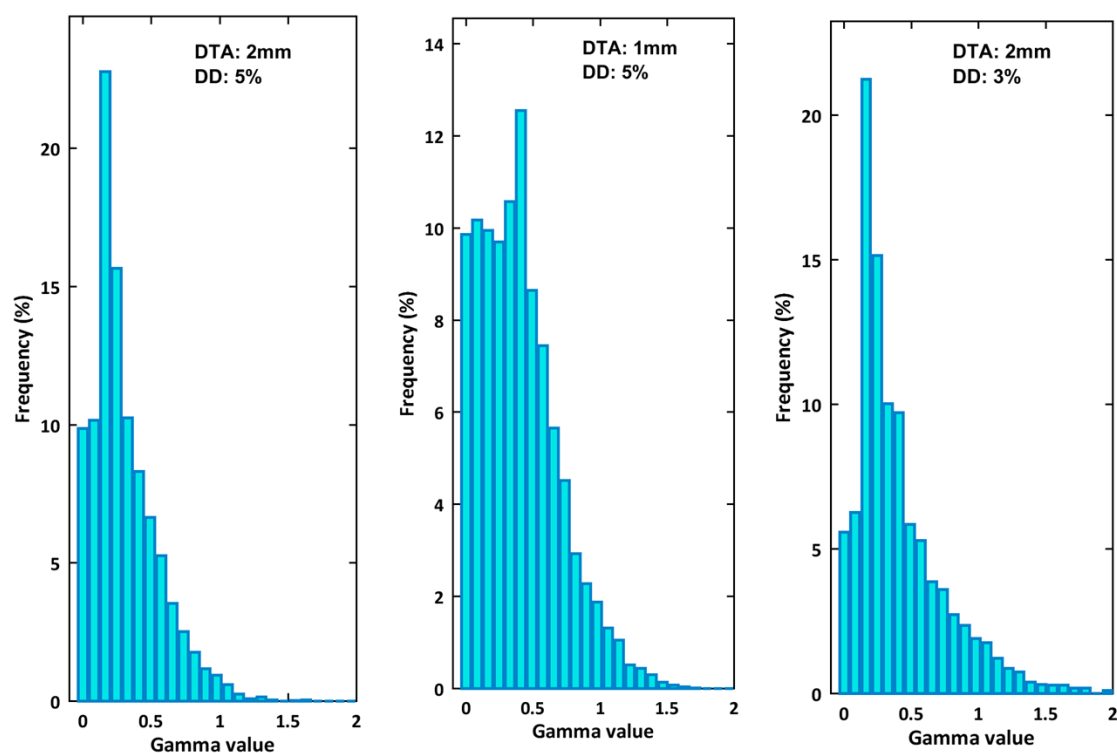
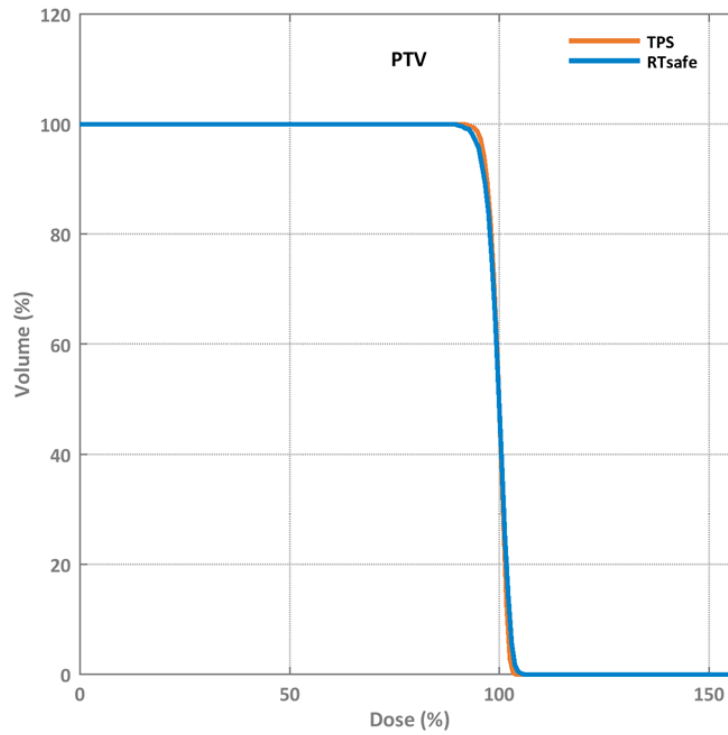


Figure: Histograms for the calculated gamma values of the 3D gamma index comparison test using a variety of passing criteria. The volume of interest considered for each target includes the total contoured volume along with an extended area of surrounding soft tissue

PART V: DVH comparison

Comparison between planned and measured relative dose distributions is presented in the following figures, in terms of cumulative Dose Volume Histograms (DVHs) for all PTVs. All dose distributions were normalized to the corresponding $D_{50\%}$ metric (i.e., the minimum dose received by at least the 50% of the volume) of each structure.



Figures: cumulative Dose Volume Histograms derived from the calculated (TPS) and measured (RTsafe) dose distributions for all the structures considered.

PART VI: DVH metrics comparison

Using the aforementioned normalization (100% corresponds to $D_{50\%}$), metrics derived from the above DVHs are given in the following table.

Table: Indicative dose volume metrics for the structures considered.

Structure	Mean (%)		D95 (%)	
	TPS	Meas.	TPS	Meas.
PTV	99.74	99.75	96.22	95.33

PART VII: Geometry metric - Offset

Spatial offsets are measured independently for each target by comparing in 3D the center-of-mass of the polymerized area with the center-of-mass of the planned high-dose area. The center of mass of each distribution was calculated by averaging the center of masses of the distributions derived by applying a range of dose thresholds, taking into account the dose gradient of each target. Results are given in the following table.

Table: Distance between the center-of-masses of TPS and RTsafe 3D dose distributions (Geometry metric) for the structures considered.

Structure	Geometry metric - Offset (mm)
PTV	0.71

Disclaimer

Results presented in this report were deduced based on an experimental procedure performed by the end-user following the guidelines of RTsafe staff. Results are provided “as is”. No warranties, express or implied, that these results are free of error, or is consistent with any particular standard of merchantability, or that it will meet your requirements for any particular application, is made. No responsibility for any physical or technical limitations of the procedures and functions which make up this experimental methodology is accepted. The presented dosimetric report should not be relied on for solving a problem whose incorrect solution could result in injury to a person or loss of property. RTsafe shall not, in any event, be liable for any damages, whether direct or indirect, special or general, consequential or incidental, arising from the use of the results of this report. RTsafe does not suggest any specific actions for improving your radiotherapy treatment protocol. The interpretation of the presented results is entirely at your own risk.