

Dosimetric Analysis Report

SAMPLE, for demonstration purposes only

Date of report: -----
Date of irradiation: -----
Irradiation system: -----
Treatment Planning System: -----
Number of target volumes (PTVs): 1
Number of Organs-at-risk: 1
Institution: -----

Short description of procedure: A 3D-printer is used to construct a hollow phantom that duplicates the selected patient anatomical geometry using the patients' planning-CT DICOM images. The hollow phantom is subsequently filled with a polymer gel dosimeter. The phantom then is irradiated using the specific patient's irradiation protocol. This process is followed by a magnetic resonance imaging (MRI-T2 maps) scan of the irradiated phantom, which provides a complete set of high spatial resolution 3D-dose distribution measurements. These MR-images (T2-maps that include the measured dose distributions information) are then co-registered with the real patient planning -CT images and the corresponding DICOM-RT Structure set and treatment planning system (TPS) calculated Dose data. The dosimetric analysis report consists of a detailed 3D qualitative and quantitative comparison between TPS-calculations and corresponding patient specific derived measurements of the 3D-dose cloud, the spatial location of dose delivery and DVHs.

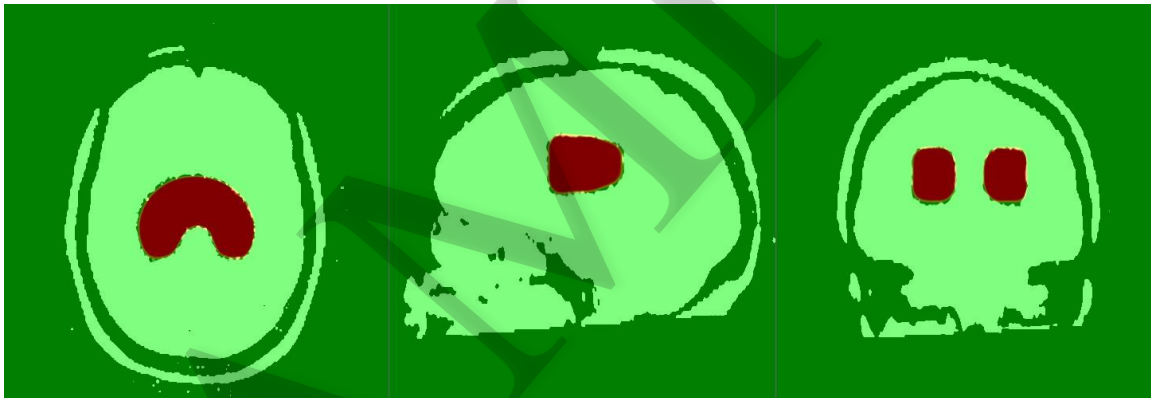
PART I: Qualitative comparison

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.

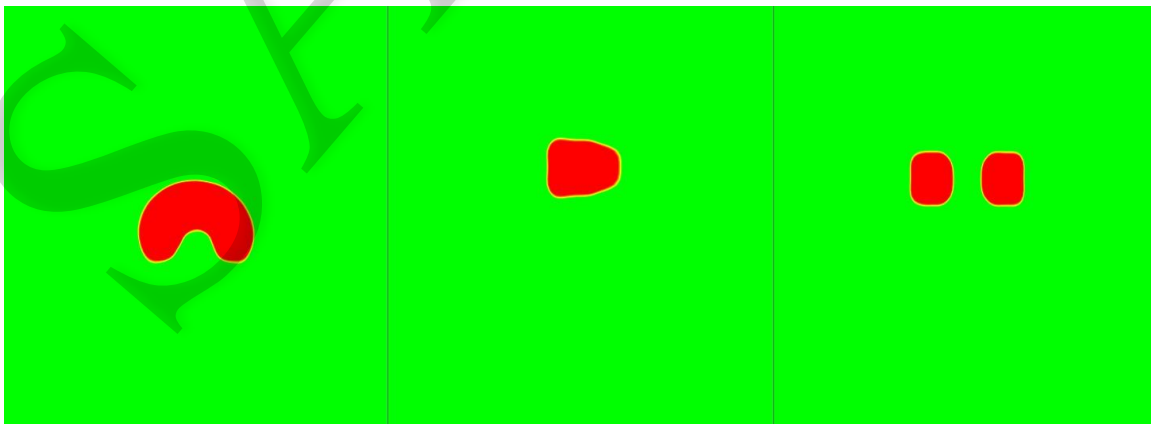
MRI (measured dose) blended with TPS (calculated dose)



MRI 100% - RTDOSE TPS 0%



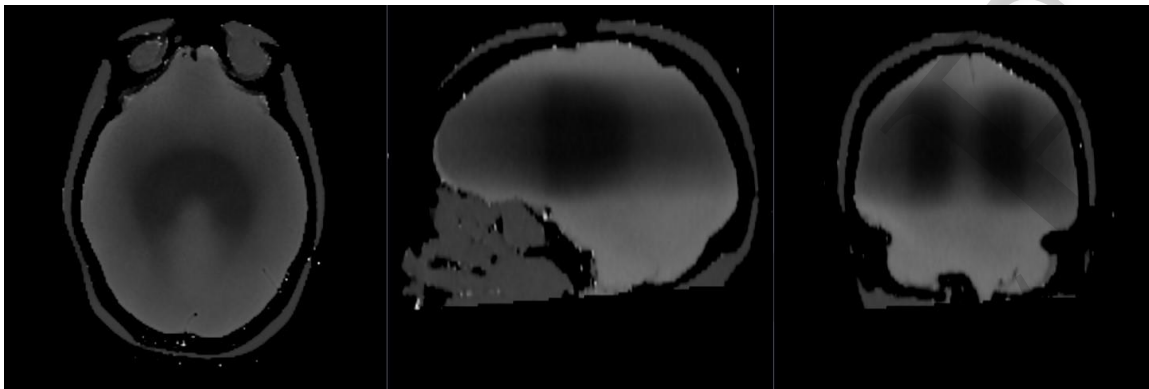
MRI 50% - RTDOSE TPS 50%



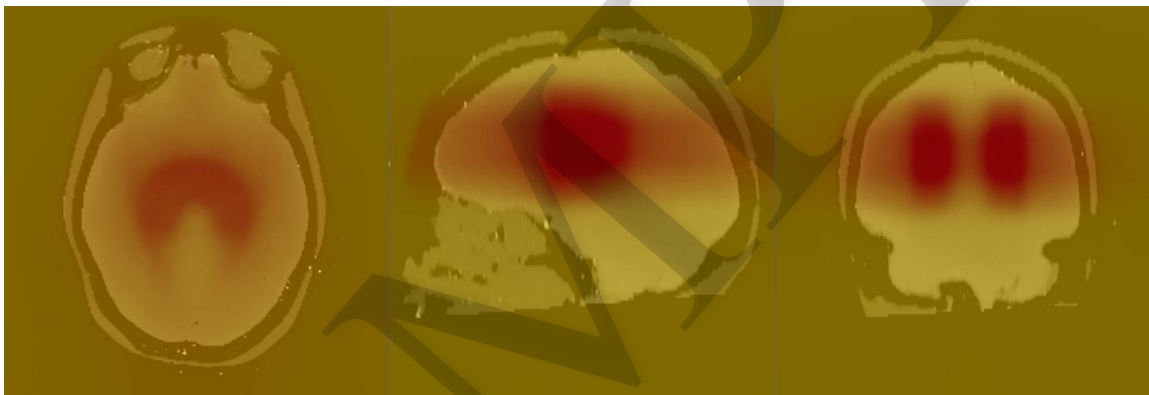
MRI 0% - RTDOSE TPS 100%

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

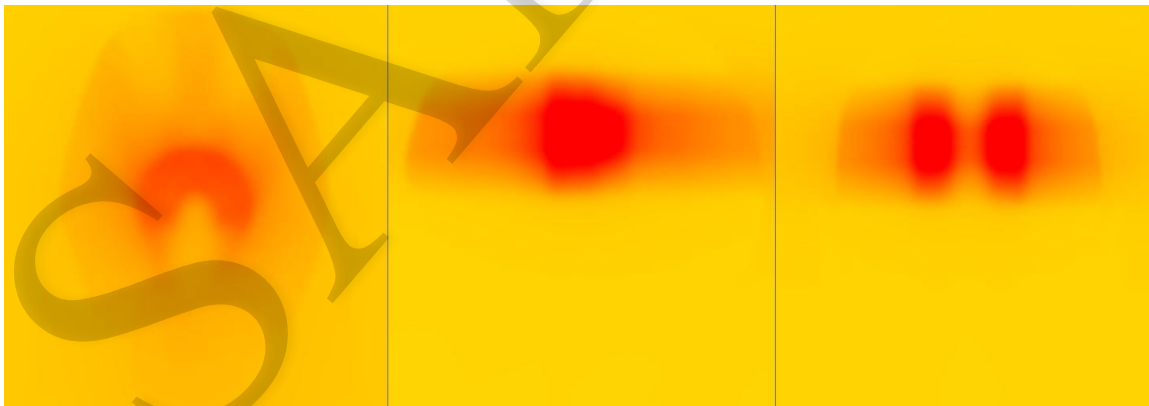
MRI (measured dose) blended with TPS (calculated dose)



MRI 100% - RTDOSE TPS 0%



MRI 50% - RTDOSE TPS 50%

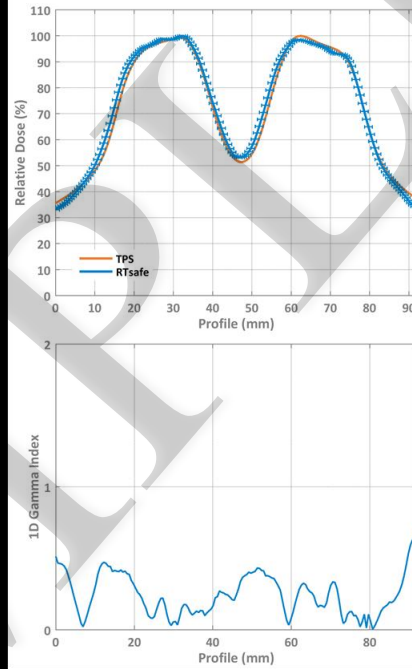
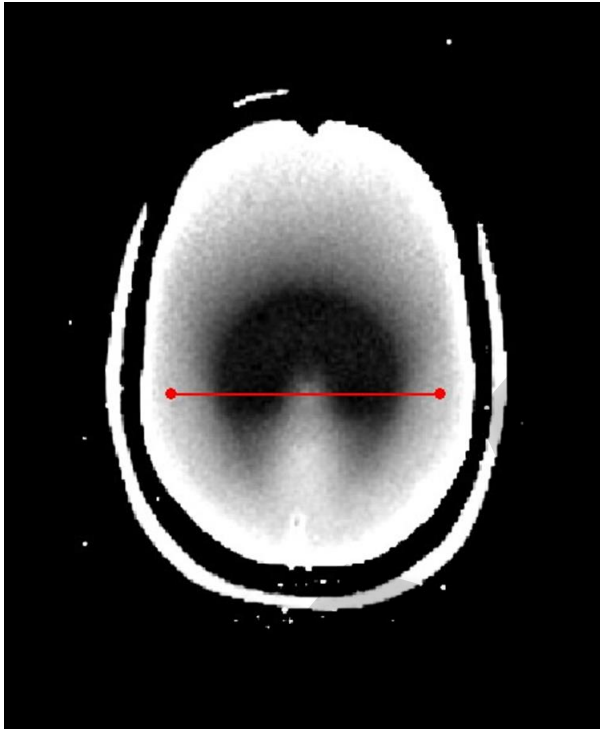


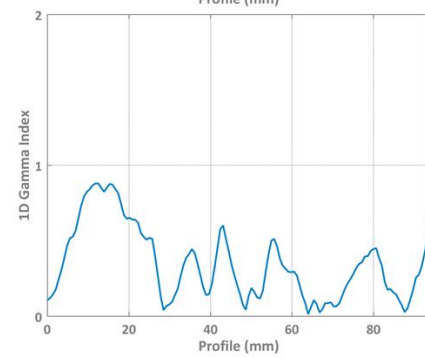
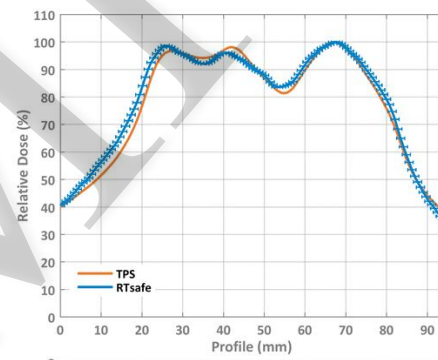
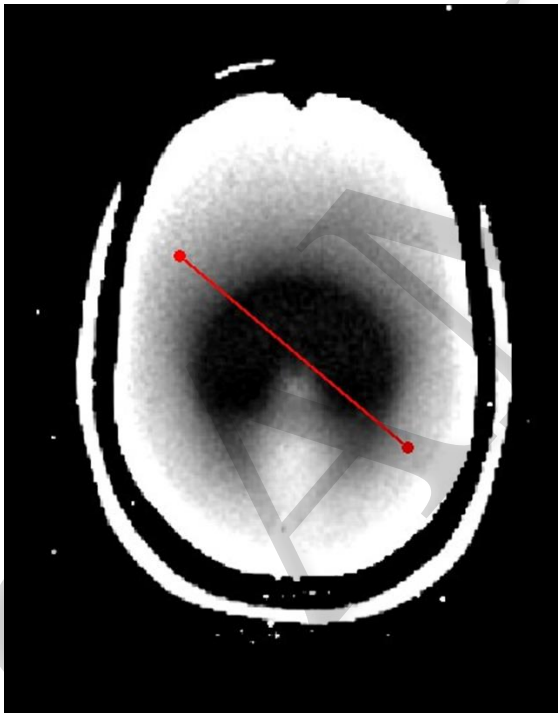
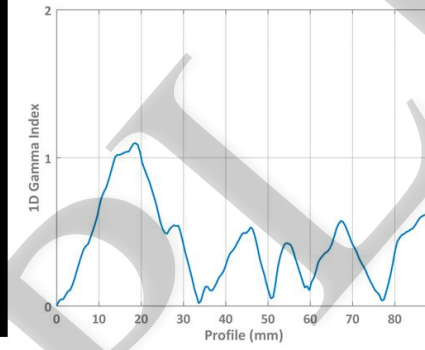
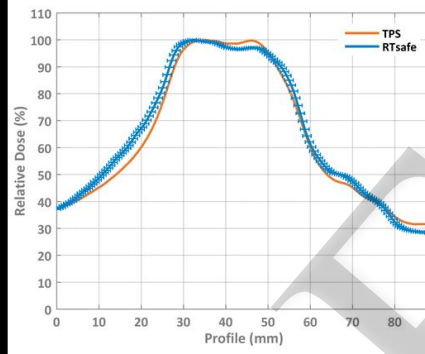
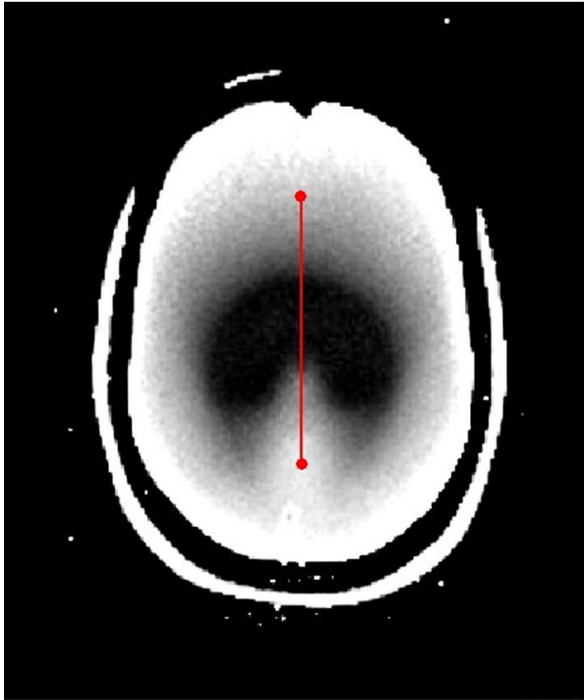
MRI 0% - RTDOSE TPS 100%

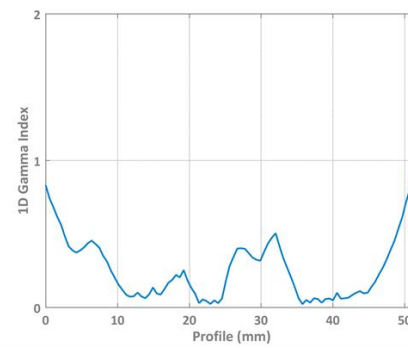
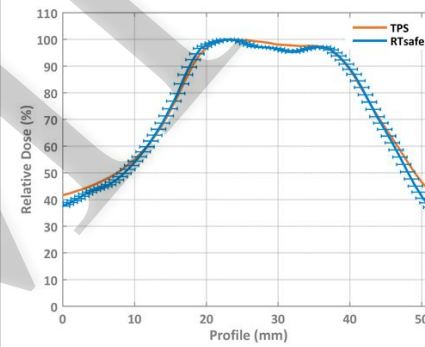
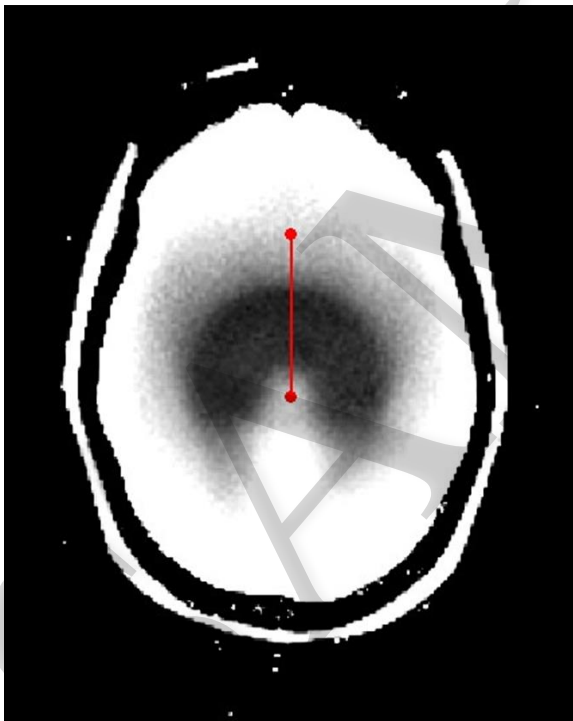
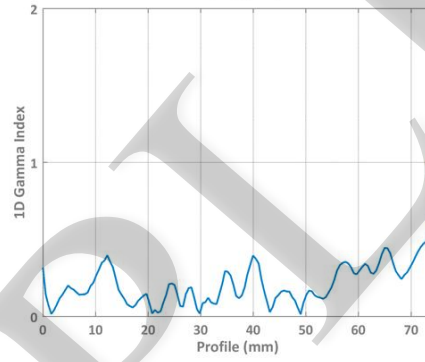
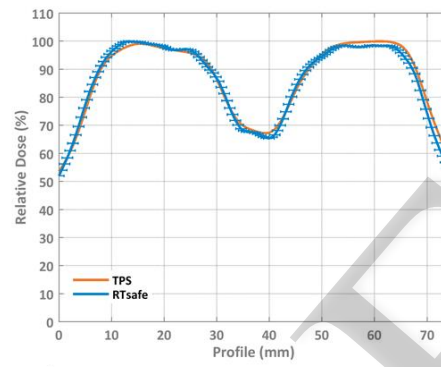
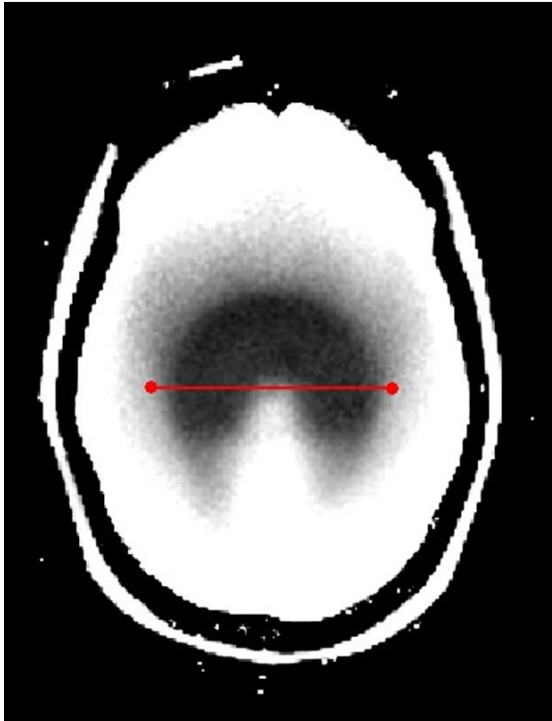
(Brightness and contrast adjusted so that also low dose areas are depicted)

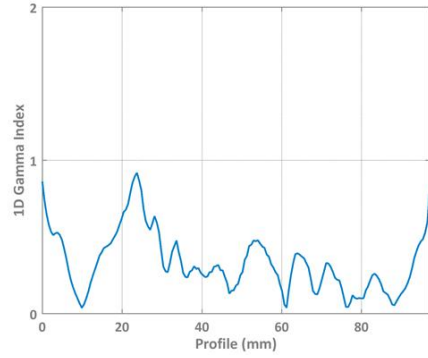
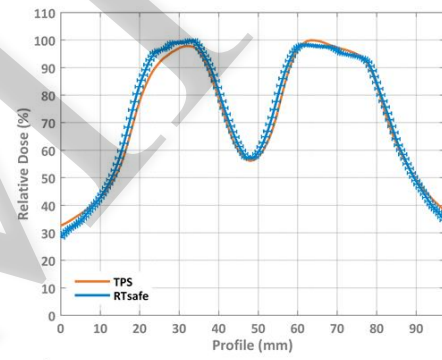
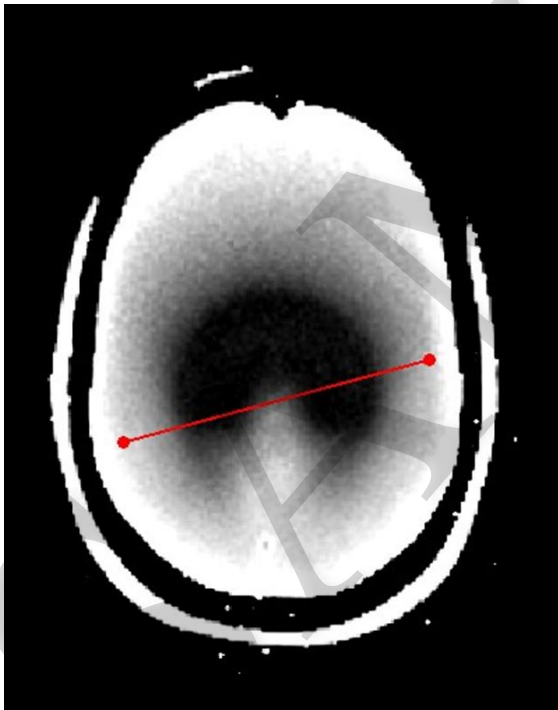
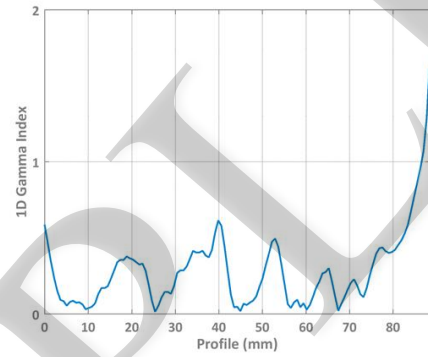
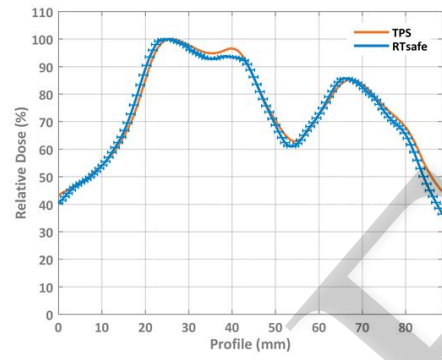
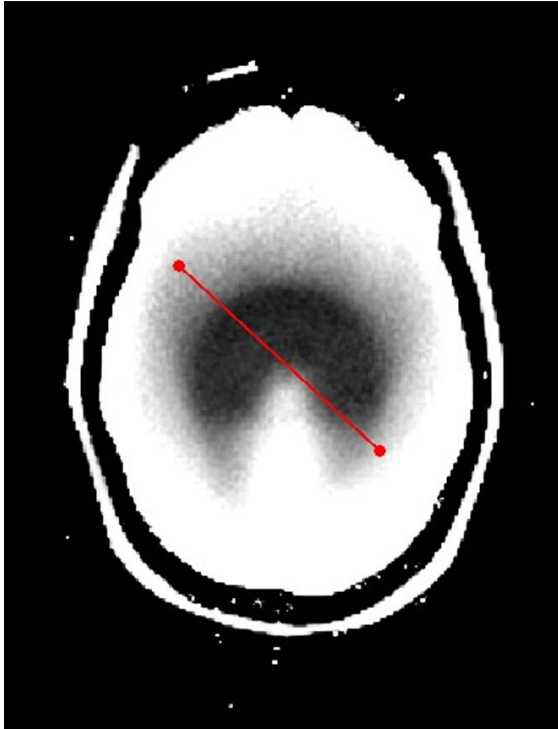
PART II: Profiles comparison

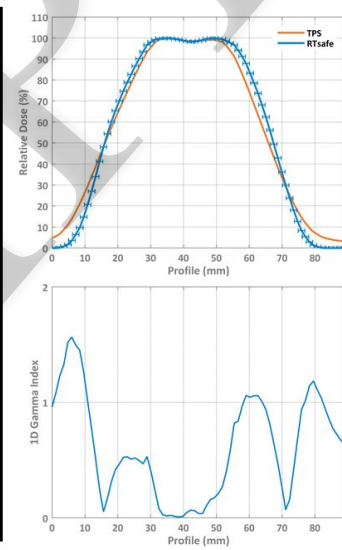
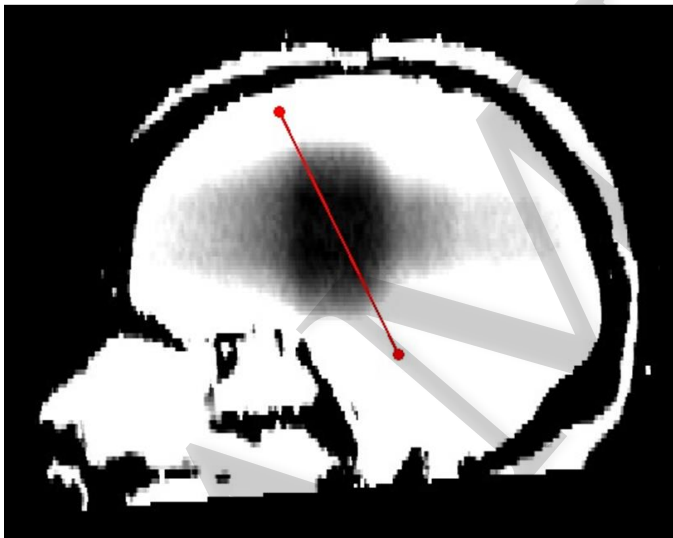
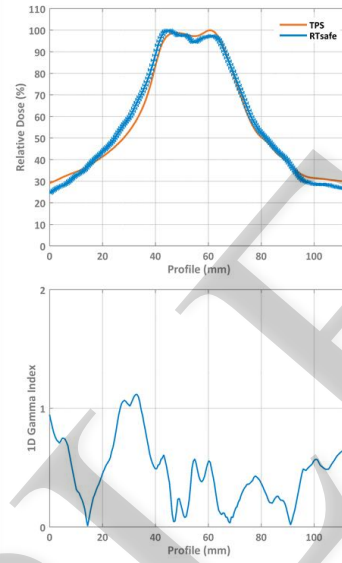
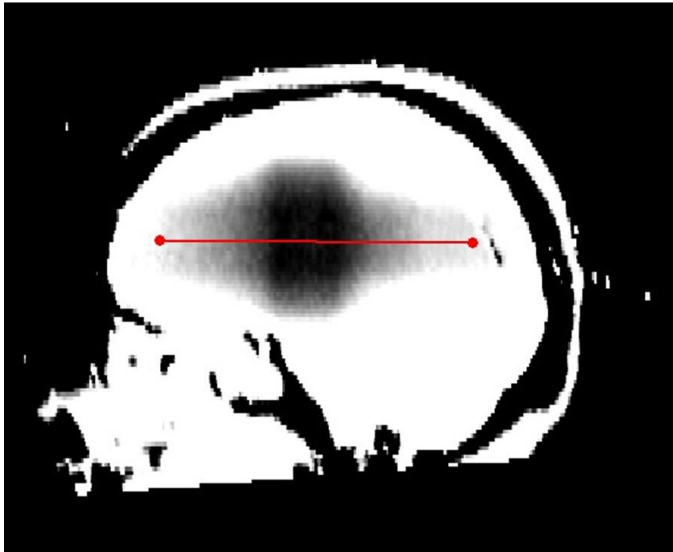
Indicatively, a number of relative dose profiles for both the measured and TPS-calculated datasets are presented in the following figures. In order to quantitatively assess agreement between the two datasets, 1D gamma index calculations are also included. Passing criteria were 2 mm distance-to-agreement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

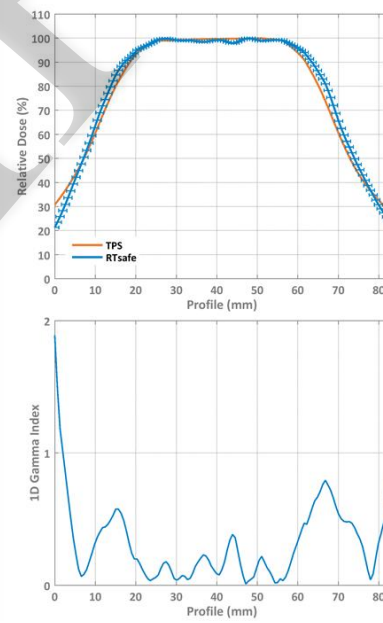
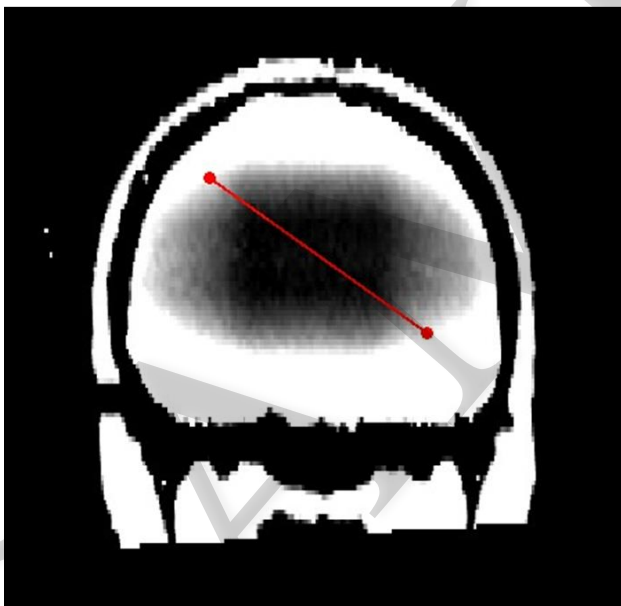
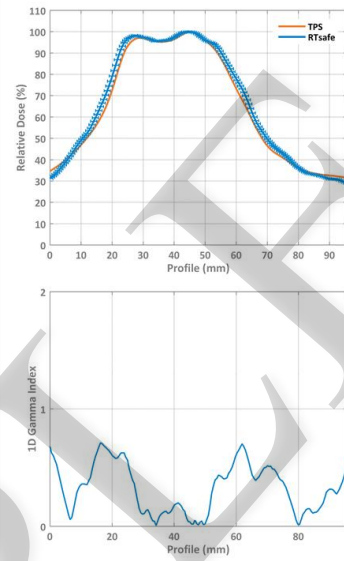
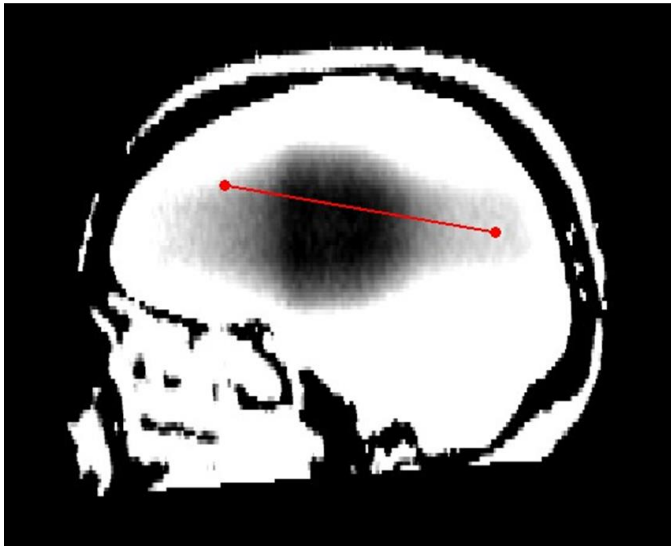


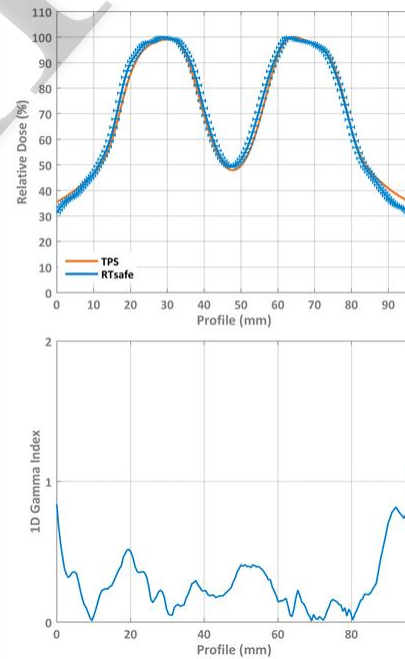
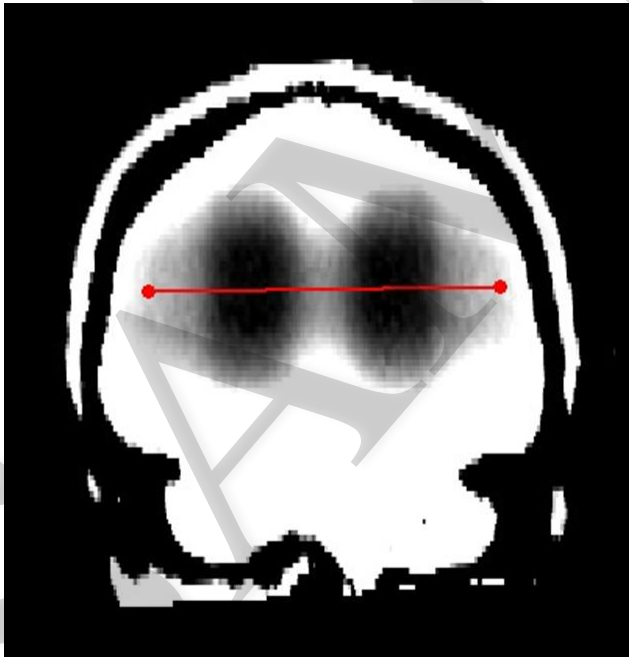
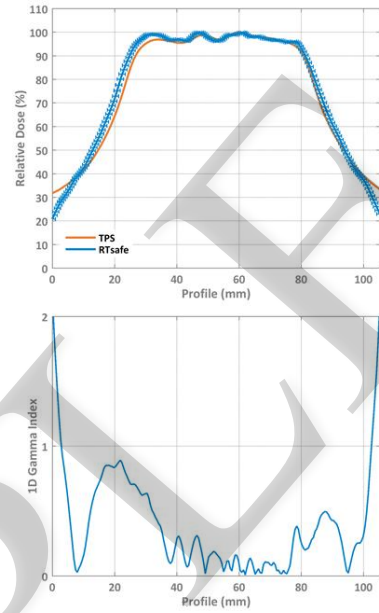
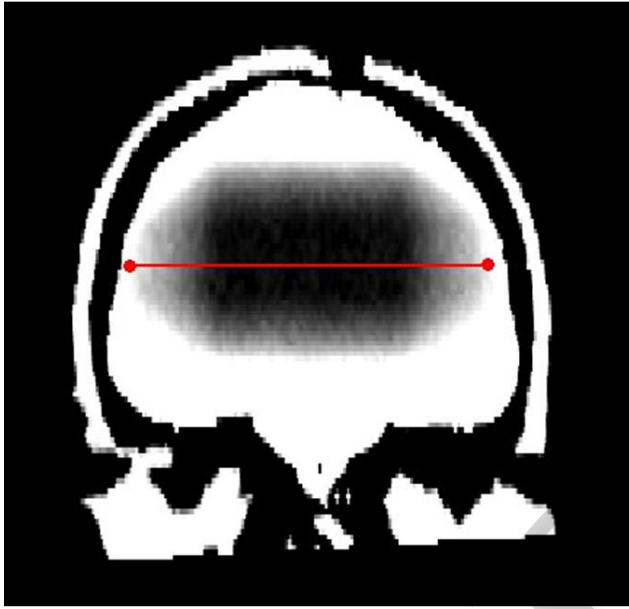








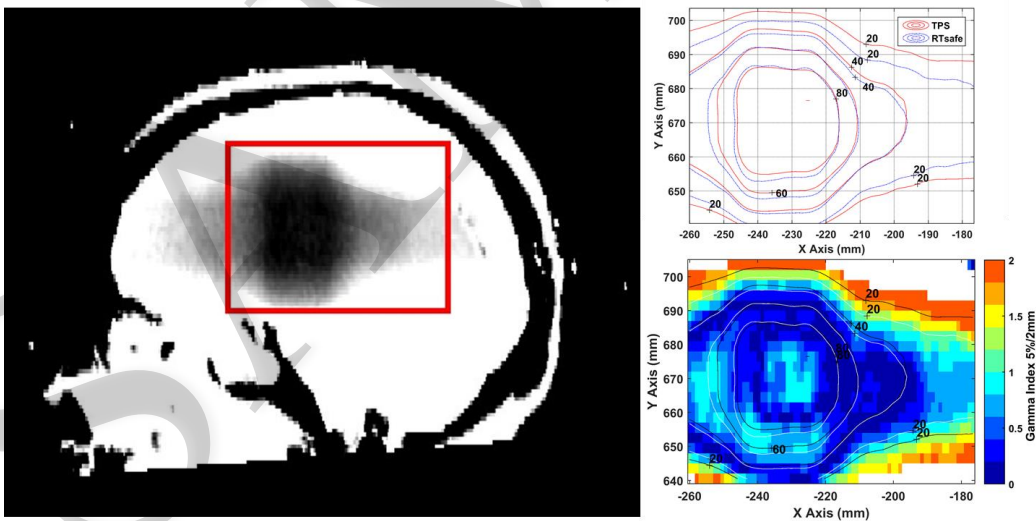
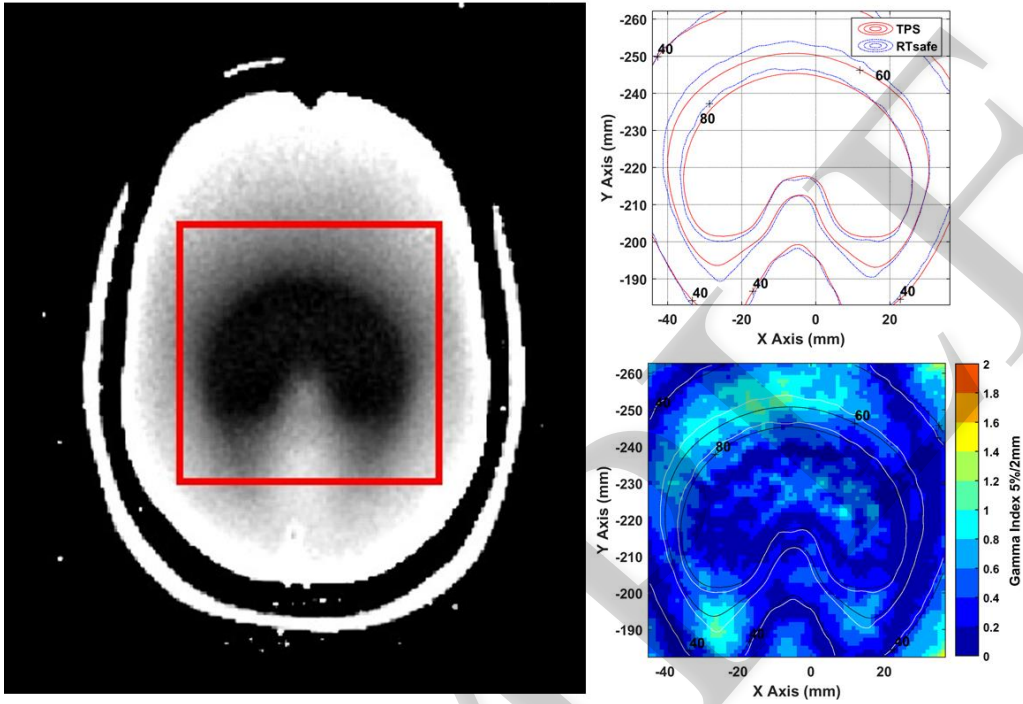


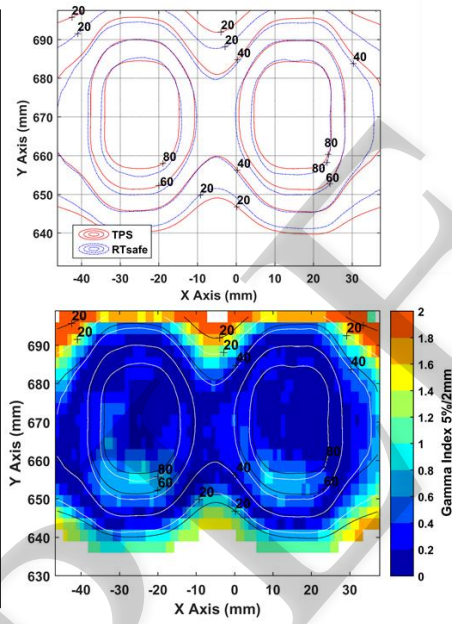
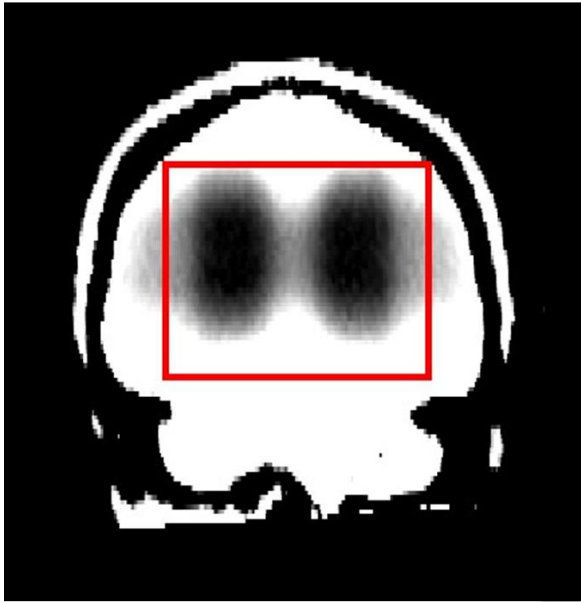


PART III: 2D Gamma Index comparison

For selected central axial slice 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 2% has been applied to exclude

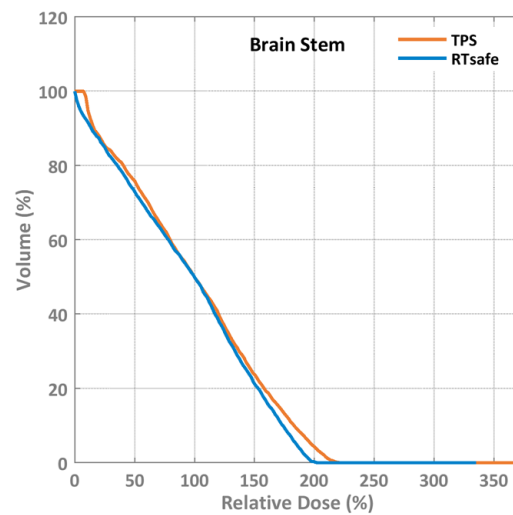
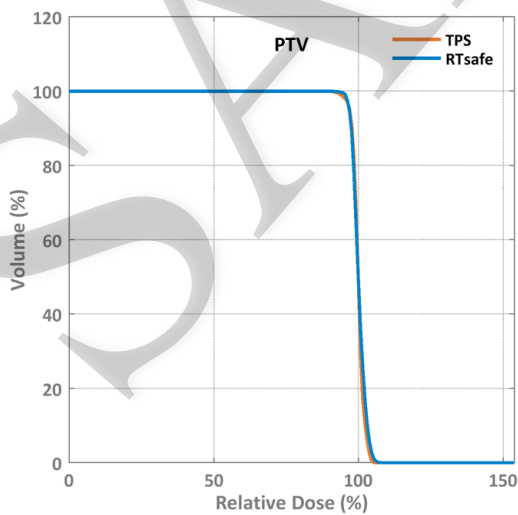
corresponding voxels from the gamma index calculations. Isodose lines are also plotted to assist comparison.





PART IV: 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 the PTV and OAR. 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.



PART V: DVH metrics comparison

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

Structure	Mean (%)		D95 (%)	
	TPS	Meas.	TPS	Meas.
PTV	100.0	100.2	97.0	96.9
Brain Stem	100.6	96.0	11.0	4.6