Code of practice: Create a verification plan for OCTAVIUS Detector 729 in Philips Pinnacle³

There are basically three ways to carry out verification of IMRT fluences.

For all options, it is important that the IMRT plan is calculated as sum total plan or single fraction plan.

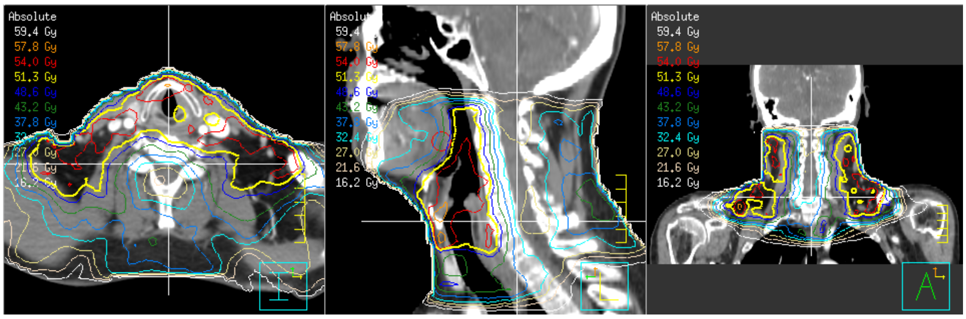

Fig. 1: 3D Isodose image

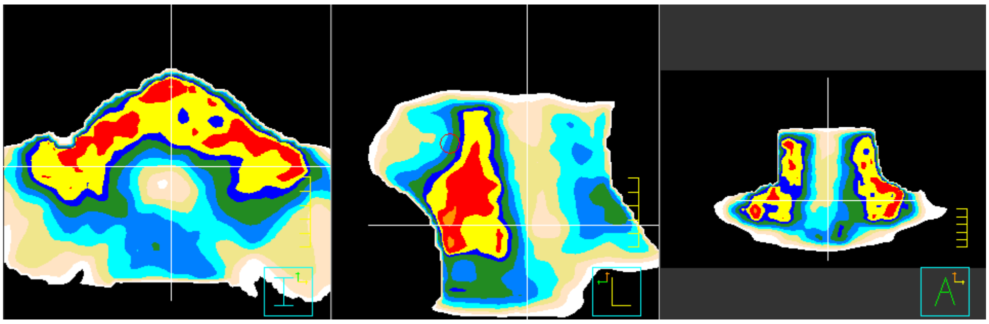

Fig. 2: 3D Isodose image in the calculation matrix

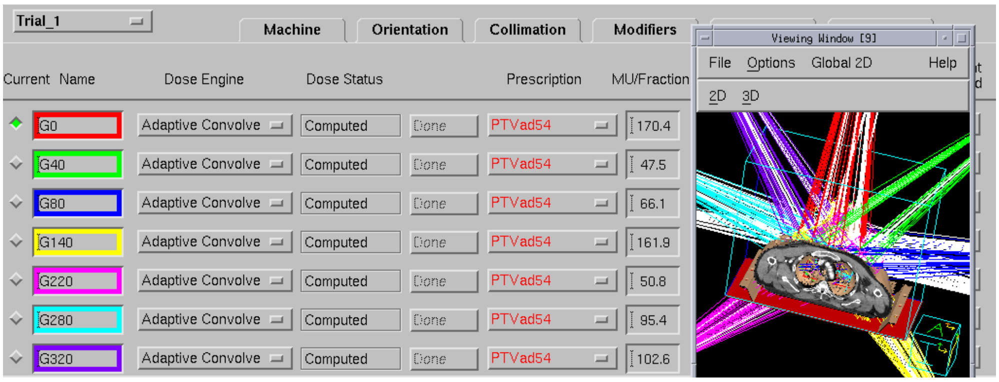

Fig. 3: e.g., 7-Field HNO Technique (here: Adaptive Convolve Dose-engine)

1. Single field fluence verification.

The planar dose module is selected from the planning window of the current patient:

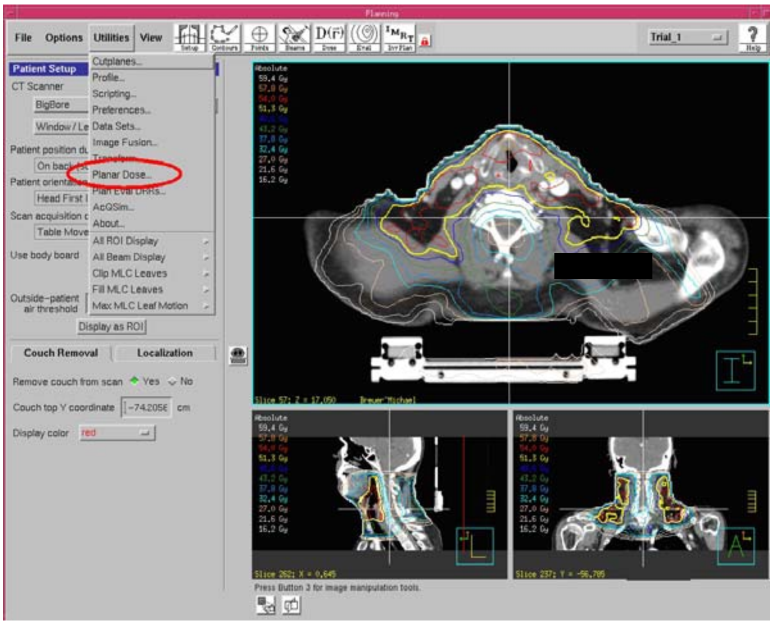

Fig. 4: Planning Window (locating the planar dose module)

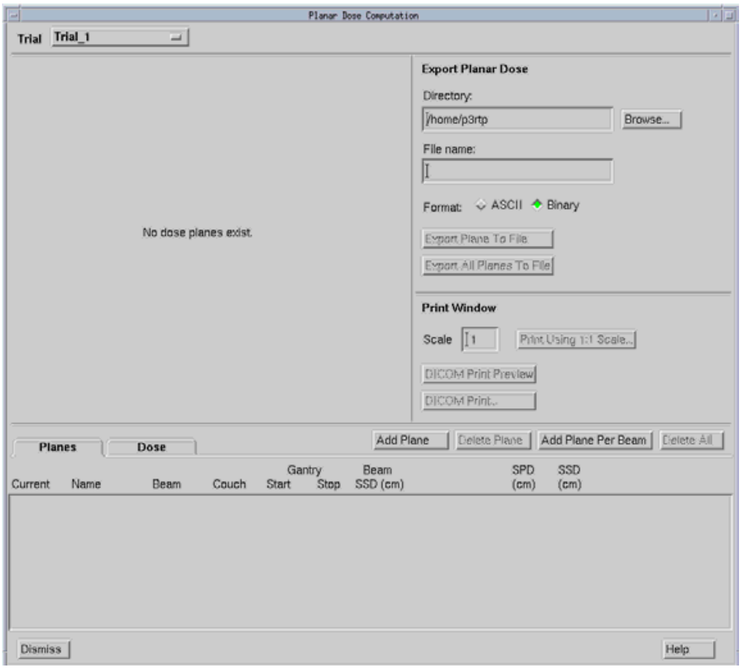

Fig. 5 Planar Dose Module

When you select "Add Plane per Beam", a 2D calculation plane is created at a distance (SourcePhantomDistance=SPD). This is orthogonal to the gantry angle of the respective field.

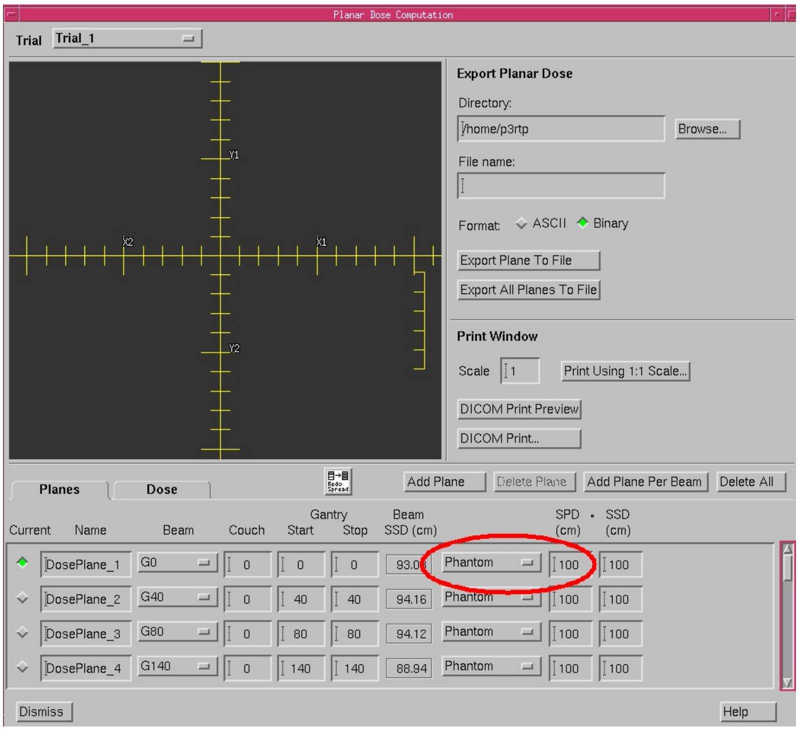

Fig. 6: after "Add Plane per Beam"; practicable: Phantom Data Set and SPD=100 cm

The resolution of the planar dose can be set in the "Dose" tab.
A good value from past experience is half the grid resolution of the patient calculation (e.g., grid size = 4 mm -> resolution selected = 2 mm). The number of calculation points should be considered in this, and it is oriented to the type of further processing.

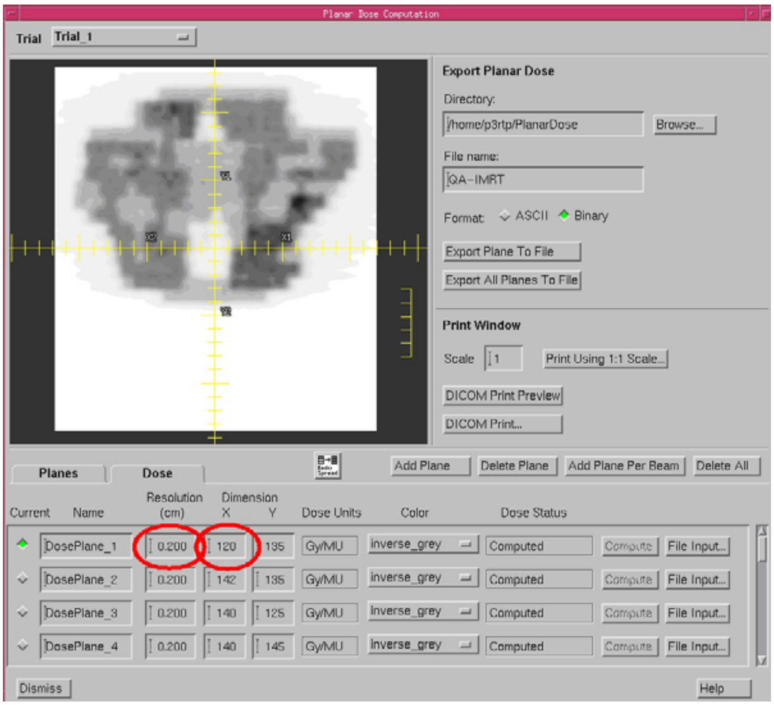

Fig. 7: Calculated Planar Dose

Then this can be written in ASCII or binary format in a suitable directory. Use of an FTP server is recommended for a more efficient workflow.
The generation of the plan dose information represents the fastest way to generate absolute dose fluences for a single-field QA. These can be compared relatively using the VeriSoft software after measurement with the 2D-Array in the gantry head bracket (cf. Fig. 8).
The quantitative statement with respect to the absolute dose of the respective single field is rather poor due to the calculation of a virtual water phantom, but sometimes it can be useful.

Fig. 8: Gantry head bracket with 2D-Array (aligned on the measurement level = SSD = 100 cm; Approx. 4cm of setup material is missing)

After evaluation of the relative IMRT method using single-field QA, the two other methods "Sum Total Plan Verification" are the means of choice.

2. Sum Total Plan Verification
We look at the planar sum-total-plan verification in the CT scanned phantom data set. (2D-ARRAY *seven29* in a slab phantom or in the OCTAVIUS phantom).

In the "Patient Select" tab copy the calculated IMRT plan onto the phantom.

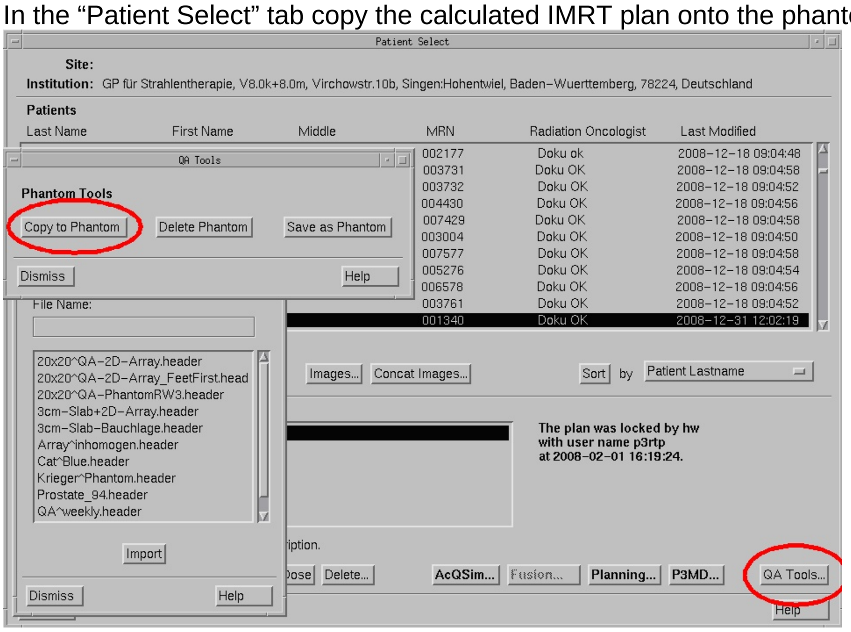

Fig. 9: Copy to Phantom ….

The phantom data set should be generated beforehand with the CT scanner (incl. setting the isocenter to the volume middle of the chamber 14/14, (7.5 mm from the surface of the array).
When the plan is accessed for the first time, the plan isocenter is synchronized to the phantom data record isocenter.

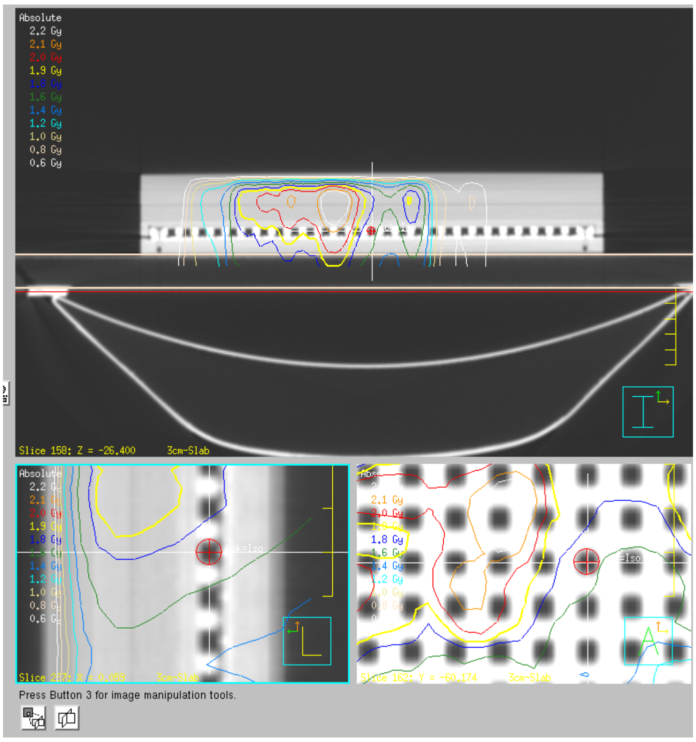

Fig. 10: Iso placement on the desired (meaningful) position

In addition, you should set the calculation grid and couch-removal plane. All the gantry angles are to be set to 0°(not for composite plan). We recommend formulating the prescription in the overall MUs and for only one fraction.

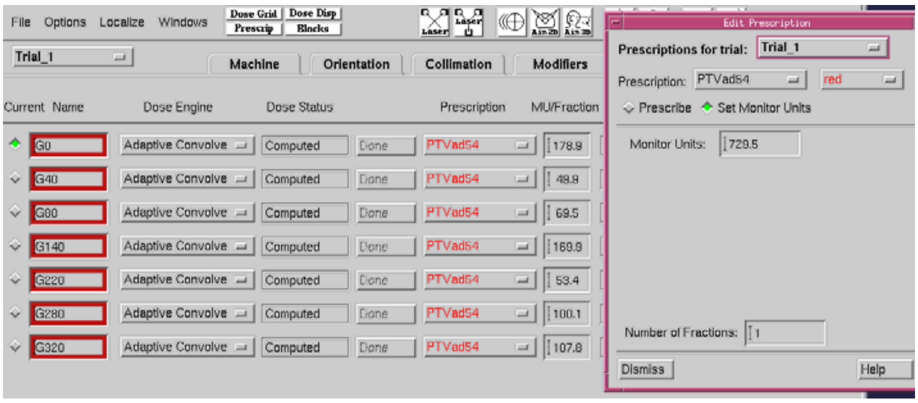

Fig. 11: Pay attention to the agreement of the Monitor Units with the R&V system.

The planar dose function is accessed analog to Fig. 4-5.
Contrary to Fig. 6, "Add plane" is used this time. Set "Primary Data" and "Sample Trial" in SPD=100 cm.

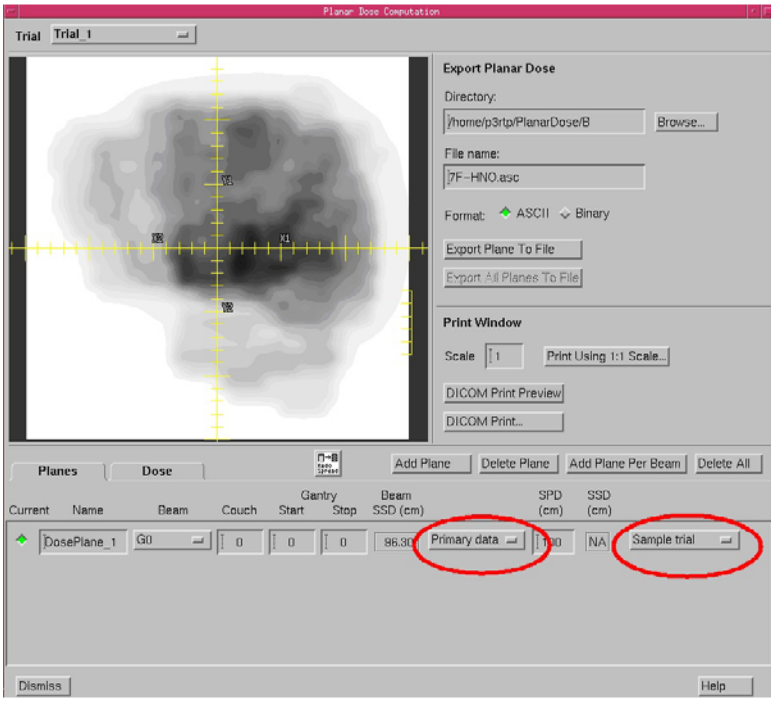

Fig. 12: Locating the "Primary data" and "Sample trial" parameters

As a result, a sum total matrix fluence is generated at a distance of 100 cm. Then this can be validated by radiating all IMRT fields on the "head-mounted" 2D-Array using the VeriSoft software. (Instead of the head mounted 2D-Array you can deliver the plan also to the OCTAVIUS phantom)

(Note: If you want fluence for validation with film in an axial direction, the angle of view of the dose matrix is attained using a gantry= table-iso=90° field)
Otherwise, proceed analog to the description above.

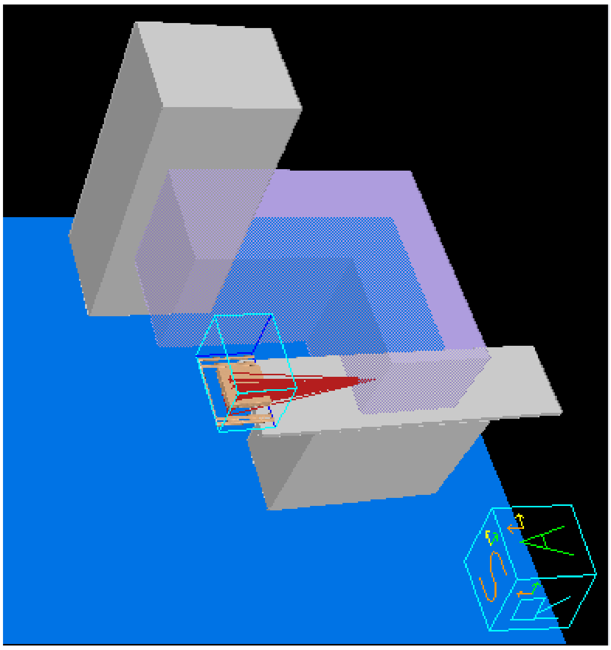

Fig. 13: RoomsEyeView virtual beam

Then this can be written in ASCII or binary format in a suitable directory. Use of an FTP server is recommended for a more efficient workflow.

3. Data Analysis in VeriSoft

Load the ".header" file in VeriSoft. The ".header" file must be in the same directory as the ".image" file. Depending on the Pinnacle version it might be necessary to rotate the file 180°. For absolute dose comparison you have to change the unit from "unknown" into "Gy"
In VeriSoft 4.0 or higher you can program a batch for these two steps.

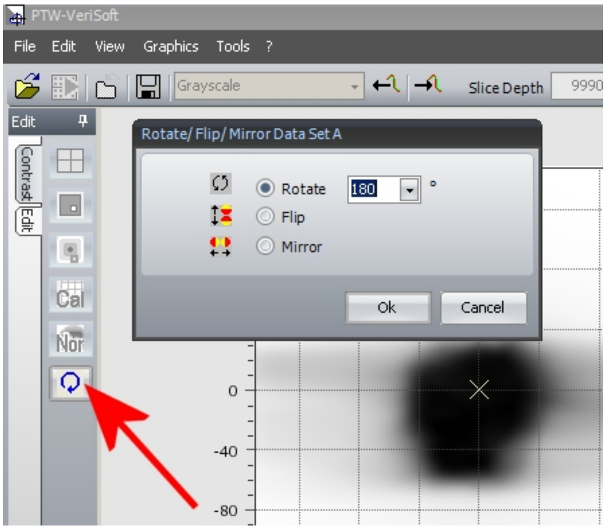

Fig. 14: Rotate in the TPS data

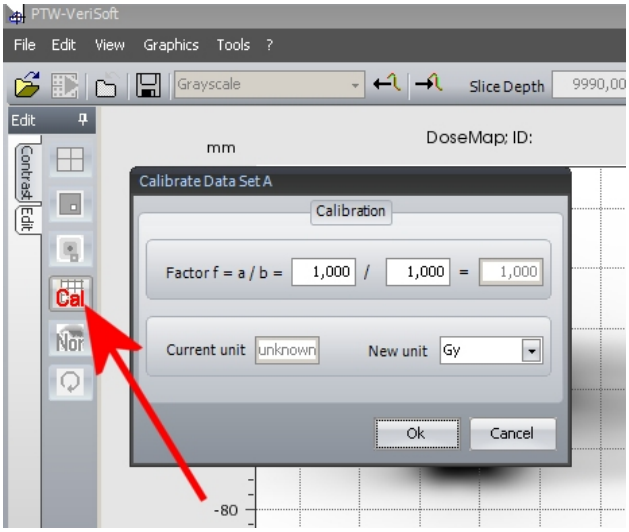

Fig. 15: Calibrate the TPS data
Now you can analyze the data in VeriSoft.

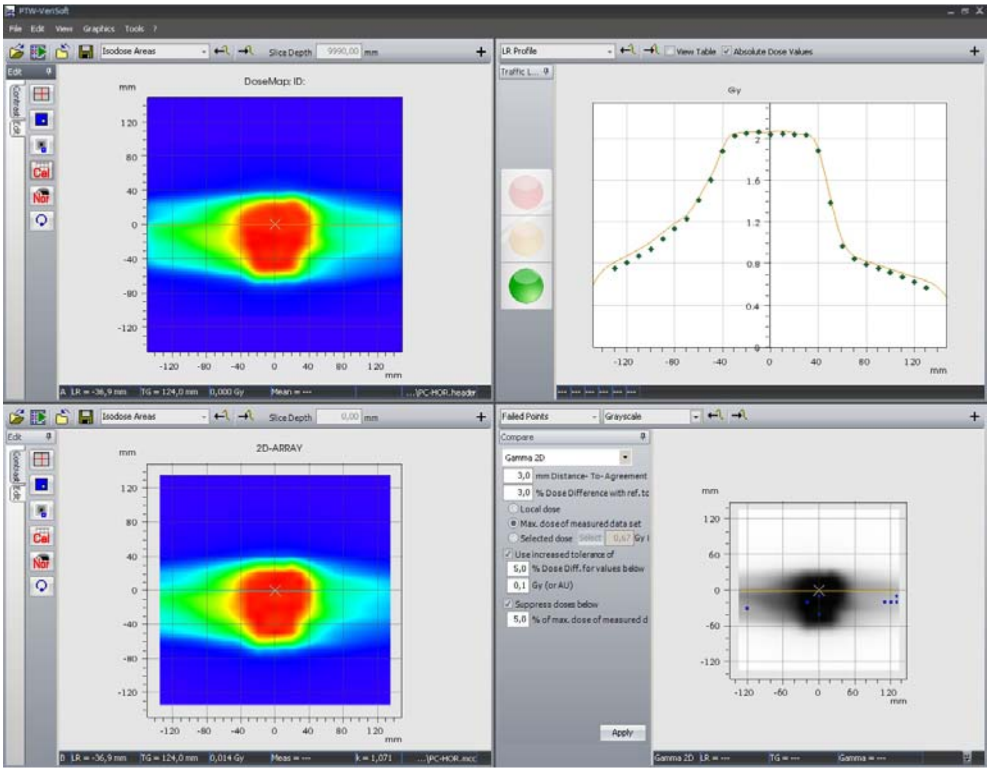

Fig. 16: Analyze the data in VeriSoft

Thank you to Holger Wirtz, STZ Singen, Germany, who provided this information.

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