Code of practice: Create a verification plan for OCTAVIUS in CMS XiO®

1. Before starting with IMRT plan QA

A first hint is to keep a good CT scan of the PTW 2D-ARRAY inside the relevant measuring phantom (PTW OCTAVIUS, PTW RW3 slab phantom, ...) inside XiO patient database, already with the external contour and an interest point exactly placed in the effective measurement point of the PTW 2D-ARRAY (helpful for isocenter placement), that is the middle of the central chamber (7.5 mm below the surface). Everything could be saved like a real patient record, using intuitive patient ID and name, like shown here below as example:

Figure 1 - XiO main screen - "Patient File Maintenance"

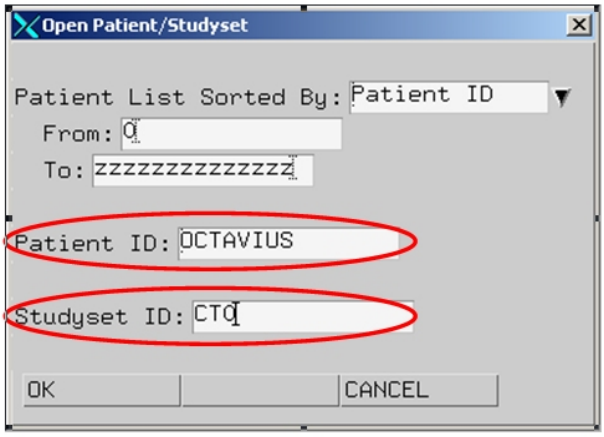

Figure 2 - Inside "Patient File Maintenance", this is the "File Open" dialog box (middle click to open the drop-down list in all fields like “Patient ID” and “Studyset ID”, for example)

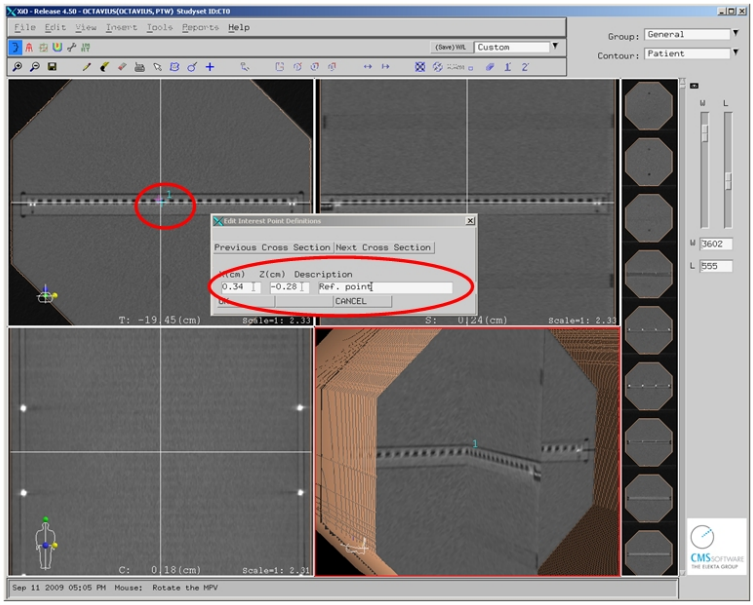

Figure 3 - Example of CT scan with external contour and interest point

2. Creation of IMRT plan QA

Every time one or more IMRT plans are calculated and saved inside XiO patient database, it's possible to recalculate these plans on a different CT image set, that is typically a detector plus phantom setup CT image set (or an ideal rectangular box not CT-based, or another CT image set):

Figure 4 - XiO main screen - "Teletherapy"

The user has to left click on "Teletherapy" and follow the steps here below described:

- load the CT image set of the detector + phantom setup (Figure 5);

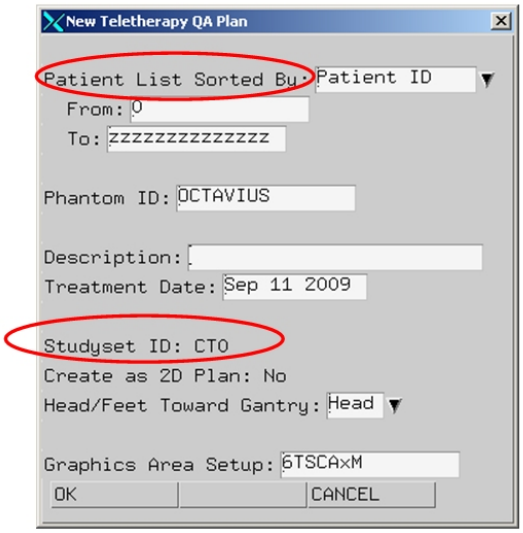

Figure 5 - Inside "Teletherapy", this is the "File | New QA Plan" dialog box (middle click to open the drop-down list in all fields like "Phantom ID", for example)

- Select the patient and the IMRT plan to QA (Figure 6);
  HINT: if the aim of the IMRT plan QA is to check independently each single field at nominal gantry angle (0°, using the PTW 2D-ARRAY inside the PTW RW3 slab phantom, for example), then the user has to select "Yes" in the field named "Set Non-Rotational Gantry Angle to Nominal"
  HINT: if the aim of the IMRT plan QA is to check the full plan at once (composite), with a single measurement, keeping the original gantry angles (using the PTW 2D-ARRAY inside the PTW OCTAVIUS phantom, for example), then the user has to set "No" in the field named ""Set Non-Rotational Gantry Angle to Nominal"

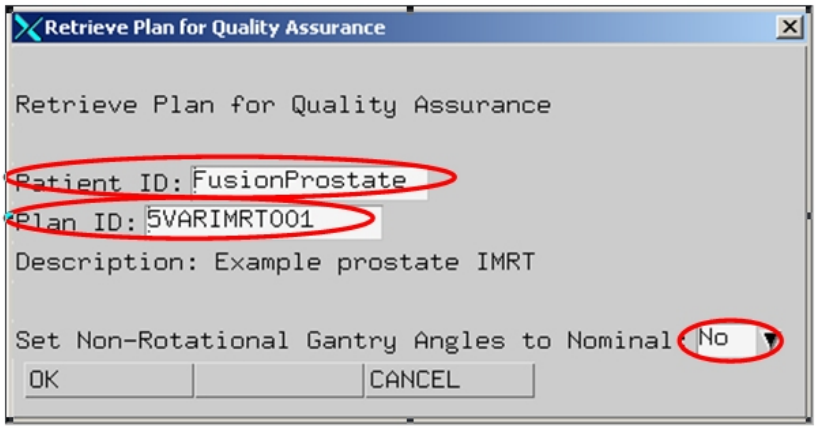

Figure 6 - Patient and plan selection

- Set the isocenter location of the plan being recalculated for QA aims (Figure 7);
  HINT: here the user can take advantage of having saved the detector plus phantom setup CT image set with an interest point exactly placed in the effective point of measurement

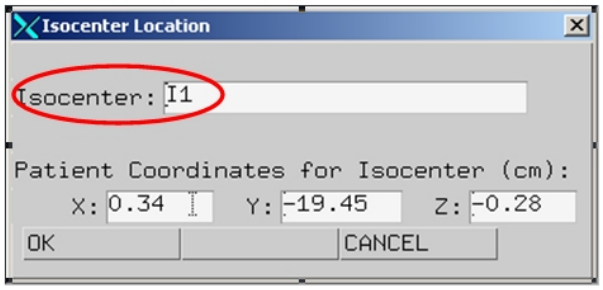

Figure 7 - Setting the right isocenter location

- Set the "Calculation Region Center" (Figure 8) according to the coordinates of the above isocenter point (Figure 7). Doing so, also the geometric center of the calculated matrix will be exactly in the same place of all the field isocenters, already positioned in the effective measurement point of the detector, for instance the PTW 2D-ARRAY. In this way, the user is sure to avoid misplacements during the following comparison inside PTW VeriSoft between calculated and measured matrix.

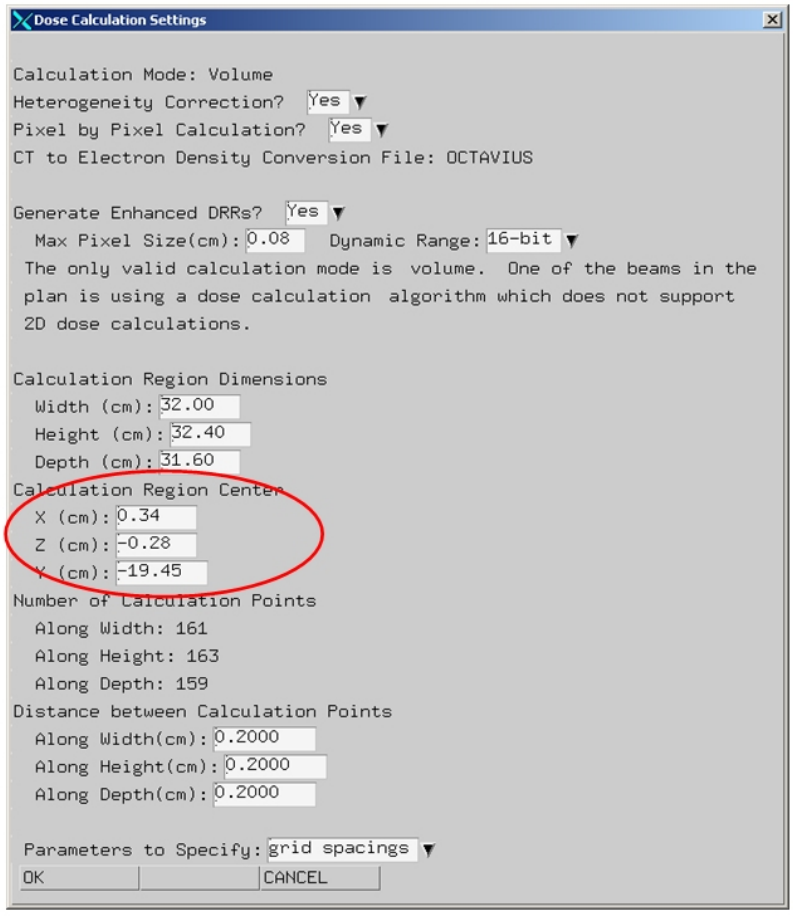

Figure 8 - Setting the "Calculation Region Center" in the "Dose | Calculation | Settings" dialog box

3. Exporting the 2D / 3D dose matrices for comparison between calculation and measurement
Before considering each single scenario, the user may be interested in the following considerations, arising from the different opportunities offered by VeriSoft version 4.x, in particular Gamma 3D feature that requires a 3D calculated dose matrix exported by the TPS:

	VeriSoft "Gamma 2D" method	**VeriSoft "Gamma 3D" method**
To check independently each single field at nominal gantry angle (0°), using the PTW 2D-ARRAY inside the PTW RW3 slab phantom, for example	In this case, the user can export the 2D calculated dose matrix in ASCII text file format (suggested method for "Gamma 2D", see 3.1 section) or the 3D calculated dose matrix in DICOM RT (see 3.2 section)	In this case, the user must export the 3D calculated dose matrix in DICOM RT, see 3.2 section
To check the full plan at once, with a single measurement and keeping the original gantry angles, using the PTW 2D-ARRAY inside the PTW OCTAVIUS phantom, for example	In this case, the user can export the 2D calculated dose matrix in ASCII text file format (suggested method for "Gamma 2D", see 3.1 section) or the 3D calculated dose matrix in DICOM RT (see 3.2 section)	In this case, the user must export the 3D calculated dose matrix in DICOM RT, see 3.2 section

3.1 Exporting the 2D dose matrices from CMS SOFTWARE, XiO® in ASCII text file format
The users should follow the following steps:

- Select "ON" (see figure 9) for each single field if the aim is to check independently each single field at nominal gantry angle (0°), repeating this procedure for each field of the plan, or select "ON all available fields of the plan", if the aim is to check the full plan at once, with a single measurement and keeping the original gantry angles (figure 9);

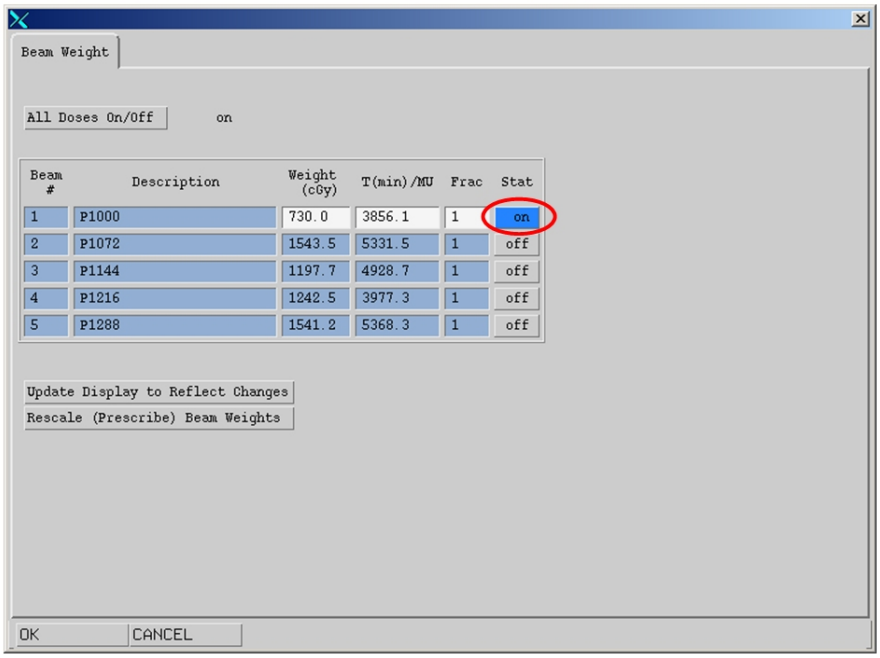

Figure 9 - Setting ON / OFF the treatment fields in the "Dose Weight" dialog box

- Using XiO "Plane Icon" tools, select the right 2D section (in general it's a coronal slice) passing through the effective point of measurement of the detector.

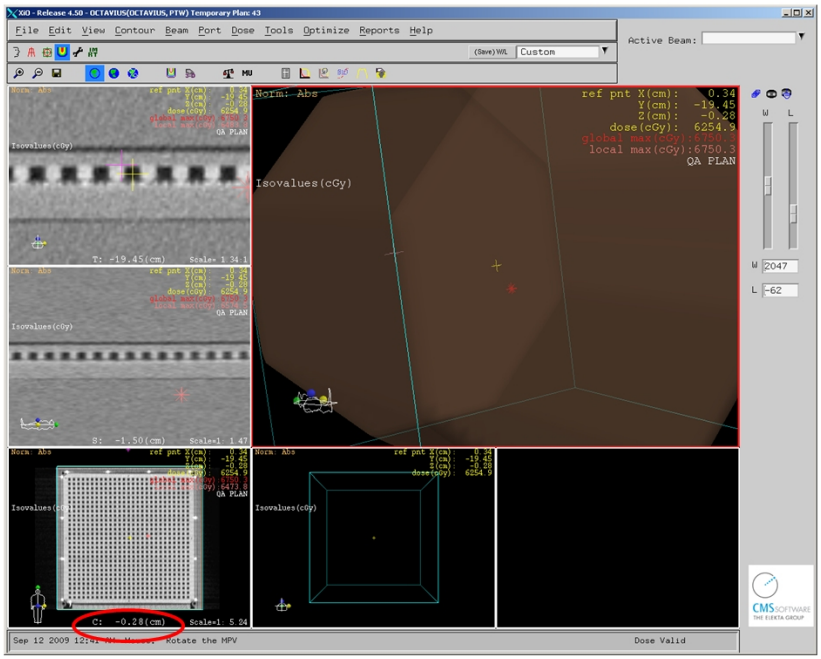

Figure 10 - Selection of the dose plane to be exported

- Setting absolute dose values in the dose matrix to be exported (Figure 11);

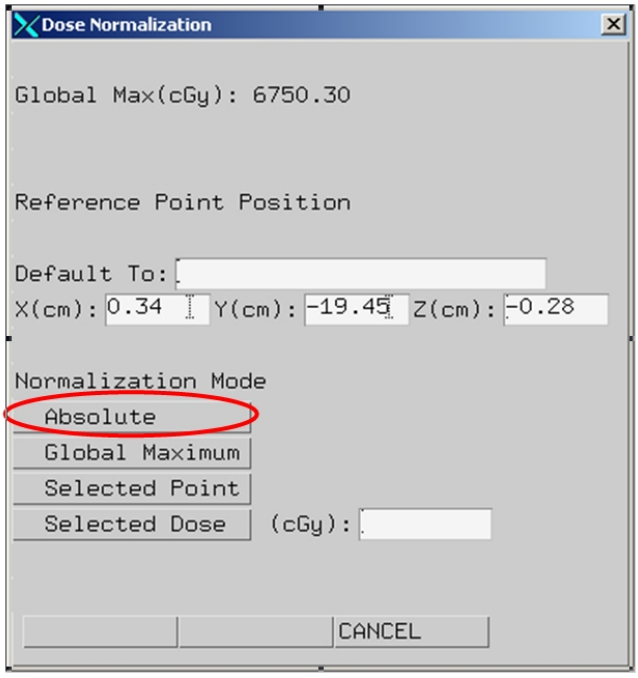

Figure 11 - Setting absolute dose values in the "Dose | Normalization" dialog box

- Exporting the desired 2D dose matrix, after selecting the right "SPV Subwindow Number" and left clicking on the button "Dose Plane Output";

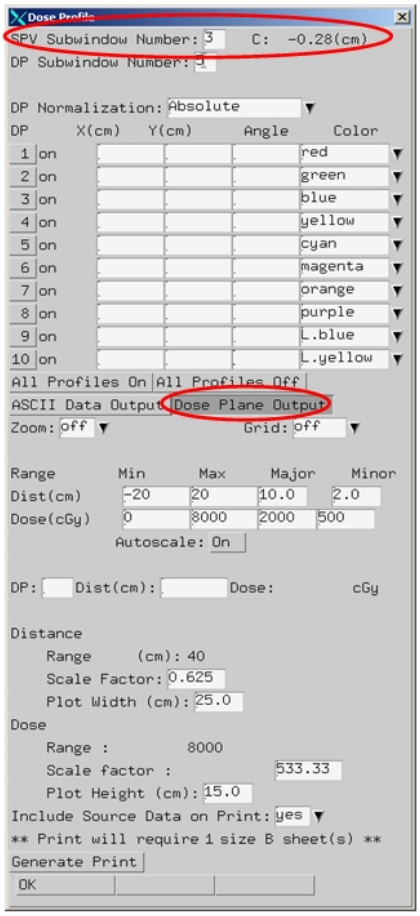

Figure 12 - Exporting a 2D dose matrix in ASCII text file format in the "Dose Profile" dialog box

- After typing in the desired file name, this file will be available inside an XiO folder already shared on the network with a path like: \\<IP address of XiO workstation>\network\QA

3.2 Exporting the 3D dose matrices from CMS SOFTWARE, XiO® in DICOM RT format

The user should follow the following steps:

- Select “ON each single field” if the aim is to check independently each single field at nominal gantry angle (0°), repeating this procedure for each field of the plan, or select “ON all available fields of the plan”, if the aim is to check the full plan at once, with a single measurement and keeping the original gantry angles (in the "Dose / Weight" dialog box);

- Save the QA plan when the flag "Dose Valid" is present in the status line of XiO;

- Export the DICOM RT DOSE (and RT PLAN when necessary) using the "File | Export DICOM" dialog box, choosing the desired destination;

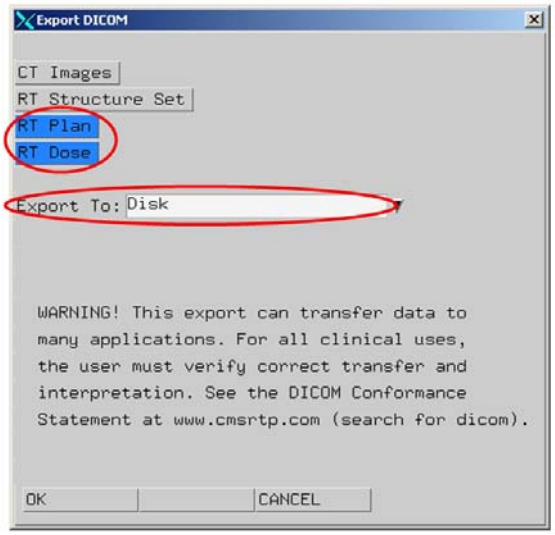

Figure 13: Selection of DICOM / DICOM RT objects to be exported and selection of destination ("Export To:" can be "Disk" or any DICOM SCP destination configured and then available in the drop-down list. In case of "Disk", the files are saved inside an XiO folder already shared on the network with a path like: \\<IP address of XiO work-station>\network\dicom\focus_out

Thank you to Gabriele Rinaldi from Tema Sinergie, Italy, who provided this information.

Disclaimer

Although the information in this document has been carefully assembled, PTW-Freiburg does not guarantee that this document is free of errors. PTW-Freiburg shall not be liable in any way for any consequence of using this document.

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