

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"

Copen Patient/Studyset	×
Patient List Sorted By: Patient ID From: 0 To: ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ	Y
Patient ID: DCTAVIUS	
Studyset ID: CTQ	
OK CANCEL	

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)

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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 dropdown 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"

Retrieve Plan for Quality Assurance
Retrieve Plan for Quality Assurance
Patient ID: FusionProstate
Plan ID: SVARIMRTOO1
Set Non-Rotational Gantry Angles 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.

Cose Calculation Settings	×
Calculation Mode: Volume Heterogeneity Correction? Yes ▼ Pixel by Pixel Calculation? Yes ▼ CT to Electron Density Conversion File: OCTAVIUS	
Generate Enhanced DRRs? Yes ▼ Max Pixel Size(cm): 0.08 Dynamic Range: 16-bit ▼ The only valid calculation mode is volume. One of the beams in the plan is using a dose calculation algorithm which does not support 2D dose calculations.	
Calculation Region Dimensions Width (cm): 32.00 Height (cm): 32.40 Depth (cm): 31.60 Calculation Region Center X (cm): 0.34 Z (cm): -0.28 Y (cm): -19.45 Number of State Points	
Along Width: 161 Along Height: 163 Along Depth: 159 Distance between Calculation Points Along Width(cm): 0.2000 Along Height(cm): 0.2000 Along Depth(cm): 0.2000	
Parameters to Specify: grid spacings V OK CANCEL	

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

eam We	eight										
AII DO	JSes on/orr on										
Beam. #	Description	Weight (cGy)	T(min)/MU	Frac	Stat						
L	P1000	730.0	3856.1	1 (on)					
2	P1072	1543.5	5331.5	1	off						
;	P1144	1197.7	4928.7	1	off						
ł	P1216	1242.5	3977.3	1	off						
5	P1288	1541.2	5368.3	1	off						
pdate	e Display to Reflect Cha	nges									
escal	Le (Prescribe) Beam Weigi	hts									
<	CANCEL										

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";

Dose Profile					×
SPV Subwind	ow Number	·: 3	C: -	0.28(cm)	>
DP Subwindo	w Number:	्र			
DP Normaliz	ation: Ab	solute		y	
DP X(cm) Y(cm) A	angle	Color	
1 on .				red	y.
2 on				green	Υ.
3 on		-		blue	y
4 on .				yellow	y.
5 on .				cyan	y.
6 on				magenta	Υ.
7 on				orange	¥.
8 on		-		purple	Υ.
9 on		-		L.blue	¥.
10 on .		[L.yellow	y.
All Profile	s On All	Profile	es Off		
ASCII Data	Output	ose Plar	ne Out	put	
Zoom: off V		0	Grid:	off 🔻	
Range	Min	Max	Maj	or Min	or
Dist(cm)	-20	20	20.0	2.0	
Dose(CGy)		0000	2000	500	
	Autoscal	e: Un			
DP: Dist	(cm):	Do	se:	cGy	
Distance					
Range	(cm):	40			
Scale F	actor: 0.	625			
Plot Wi	dth (cm):	25.0			
Dose					
Range :		8000			
Scale f	actor :		533	3.33	
Plot He	ight (cm)	: 15.0			
Include Sou	rce Data	on Prin	nt: yes	T T	
** Print wi	ll requir	e 1 size	e B sh	eet(s) **	ĸ
Generate Pr	int				
OK				1	

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;

KExport DIC	M			×
CT Images]			
RT Struct	ure Set			
RT Plan RT Dose				
Export To	:Disk		\rightarrow	
WARNING	! This exp	ort can tra	nsfer dat	a to
many ap	plications	. For all c	linical u	ses,
the use	r must ver	ify correct	transfer	and
interpr	etation. Se	ee the DICO	M Conform	ance
Stateme	nt at www.u	cmsrtp.com	(search f	or dicom).
OK	2	CONCEL		

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

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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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