

Example worksheets for TPS QA purposes

1. Peripheral devices

1.1 CT Interface

1.1.1 Correct implementation of CT scanner in software

1.1.1.1 Check the name of the CT interface installed in the treatment planning software :

CT Interface : _____

1.1.1.2 Check the type or model of the installed CT scanner :

CT Type/Model : _____

1.1.1.3 Check that all menu items are working correctly :

YES or NO

1.1.2 Correct display of different types of CT images

1.1.2.1 Check that all images read with the CT interface are displayed correctly on the screen. Check both transversal and scout view images

YES or NO

1.1.2.2 Check that all scout view images are labelled correctly

YES or NO

1.1.2.3 Check that all image orientations are correct after reading the images to the treatment planning system

YES or NO

1.1.3.1 Correct conversion of Hounsfield numbers to electron density values

Material / Ref.CT-value	CT-value (TPS)	Ref. e ⁻ density	TPS e ⁻ dens
Ln300 Lung / -561		0.438	
CT Solid water / -8.2		1.000	
LV 1 Liver / 68.9		1.050	
CB2-30% CaCO ₃ / 458.2		1.285	
SB3 Cortical Bone/ 1273.2		1.707	

1.1.3.2 Hounsfield versus electron density is correct :

YES or NO

1.1.4 Correct transfer of pixel size

1.1.4.1 Measure at least four distances on X-ray film or at the CT unit and compare with distances measured between identical points inside the treatment planning system :

Axis (X/Y)	Distance measured outside TPS	Distance measured in TPS
X		
X		
Y		
Y		

1.1.4.2 Pixel size is correct :

YES or NO

1.2 Digitizer

1.2.1 Accurate transfer of geometric figures

Digitize at least three (3) geometric figures (e.g. circle, square, triangle)

1.2.1.1 Measure and compare the following dimensions on paper and with calipers within the TPS :

	Circle		Square		Triangle	
Dimension	Orig	TPS	Orig	TPS	Orig	TPS
D ₁						
D ₂						
D ₃						

1.2.1.2 Dimensions correct : YES or NO

1.3 Plotter

1.3.1 Accurate transfer of geometric figures

Plot at least three (3) geometric figures (e.g. circle, square, triangle)

1.3.1.1 Measure and compare the following dimensions on the TPS screen and the paper plot :

	Circle		Square		Triangle	
Dimension	TPS	Plot	TPS	Plot	TPS	Plot
D ₁						
D ₂						
D ₃						

1.3.1.2 Dimensions correct : YES or NO

1.4 Block/compensator cutting device

1.4.1 Cutting precision correct YES or NO

1.4.2 Block filter – center position correct YES or NO

1.4.3 System precision correct YES or NO

1.4.4 Compensator filter cut correct YES or NO

Implementation of peripheral devices correct : Yes or NO

SIGNATURE : _____

DATE : _____

2 Treatment planning software : Configuration and algorithms

2.1 Photon beam point dose calculations

5 x 20 field on square water phantom. Calculation matrix = 0.5cm Obtain %DD utilising a profile measurement along beam central axis.

Treatment unit 1 : _____

Energy	D _{max}	D ₅₀	0.5cm	10 cm	20cm

Photon beam point dose calculation correct : YES or NO

2.2 Electron beam point dose calculations

10 x 10 field on square water phantom. Calculation matrix = 0.5cm Obtain %DD utilising a profile measurement along beam central axis.

Treatment unit 1 : _____

Energy	D _{max}	D ₉₀	D ₈₅	D ₈₀	D ₅₀

Electron beam point dose calculation correct : YES or NO

2.3 Photon beam dose distributions and MU checks

2.3.1 Open fields

Plan a 10 x 10 field on a square water phantom. Calculation matrix = 0.5cm. No normalization. Plot the resulting dose distribution for each photon beam energy. Calculate the MUs required to deliver 2 Gy at d_{max}.

2.3.2 Wedged fields

Plan a 10 x 10 field on a square water phantom. Calculation matrix = 0.5cm. No normalization. Use a 45° physical wedge or a 50% motorised/dynamic wedge in the field. Plot the resulting dose distribution for each photon beam energy. Calculate the MUs required to deliver 2 Gy at d_{max} .

2.3.3 Asymmetric fields

Plan a 5:5 x 0:10 field on a square water phantom. Calculation matrix = 0.5cm. No normalization. Plot the resulting dose distribution for each photon beam energy. Calculate the MUs required to deliver 2 Gy at d_{max} .

2.3.4 Parallel opposed fields

Plan two parallel opposed 15x5 fields on a square water phantom. Calculation matrix = 0.5cm. No normalization. Plot the resulting dose distribution for each photon beam energy. Calculate the MUs required to deliver 2 Gy at the midplane.

Treatment unit 1 : _____

Energy	Type of field	Dose distr. Plot	MU for 2 Gy
1)	Open	Y / N	(d_{max})
	Wedged	Y / N	(d_{max})
	Asymmetric	Y / N	(d_{max})
	Parallel opposed	Y / N	(midplane)
2)	Open	Y / N	(d_{max})
	Wedged	Y / N	(d_{max})
	Asymmetric	Y / N	(d_{max})
	Parallel opposed	Y / N	(midplane)

Photon beam MU calculation correct : YES or NO

Photon beam dose distributions identical to previous results: YES or NO

2.4 Electron beam dose distributions and MU checks

2.4.1 Open fields

Plan a 9 x 5 field on a square water phantom. Calculation matrix = 0.5cm. No normalization. Plot the resulting dose distribution for each electron beam energy. Calculate the MUs required to deliver 2 Gy at the 90% isodose level.

2.4.2 Irregular electron cutout field

Plan a 10 x 10 field on a square water phantom. Insert an irregular cutout that will give a triangular field with a base and height of 10cm.

Calculation matrix = 0.5cm. No normalization. Plot the resulting dose distribution for each electron beam energy. Calculate the MUs required to deliver 2 Gy at the 90% isodose level.

2.4.3 Circular electron cutout field

Plan a 10 x 10 field on a square water phantom. Insert a circular cutout with a diameter of 5cm.

Calculation matrix = 0.5cm. No normalization. Plot the resulting dose distribution for each electron beam energy. Calculate the MUs required to deliver 2 Gy at the 90% isodose level.

Treatment unit : _____

Energy	Type of field	Dose distr. Plot	MU for 2 Gy at 90%
1)	Open	Y / N	
	Irregular cutout	Y / N	
	Circular cutout	Y / N	
2)	Open	Y / N	
	Irregular cutout	Y / N	
	Circular cutout	Y / N	
3)	Open	Y / N	
	Irregular cutout	Y / N	
	Circular cutout	Y / N	
4)	Open	Y / N	
	Irregular cutout	Y / N	
	Circular cutout	Y / N	

5)	Open	Y / N	
	Irregular cutout	Y / N	
	Circular cutout	Y / N	
6)	Open	Y / N	
	Irregular cutout	Y / N	
	Circular cutout	Y / N	

Electron beam MU calculation correct : YES or NO

Electron dose distributions are identical when compared to previous results :
YES or NO

Configuration and calculation algorithms of the external beam treatment planning software give identical results for an identical test set of treatment plans previously calculated with this TPS software : YES or NO

SIGNATURE : _____

DATE : _____

3 External beam treatment planning software : Standard patient treatment files

Plan at least five (5) patients that are representative of the different types of cancer patients being treated in the hospital. Use a calculation grid of 0.5 cm and normalize the treatment plan according to the ICRU specifications. Calculate the coronal and sagittal views in the plane that passes through the isocentre. Determine the MU required per field to deliver 2 Gy per fraction to the 100% isodose volume. Calculate DVH's for each of the areas of interest in the treatment volume.

3.1 Dose distribution check

Compared to previous results obtained with this treatment planning software,

3.1.1 The dose distributions on the axial view through the isocentre are identical :

YES or NO

3.1.2 The dose distributions on the coronal view through the isocentre are identical :

YES or NO

3.1.3 The dose distributions on the saggital view through the isocentre are identical :

YES or NO

3.2 Shielding block transmission factor check

Compared to previous results obtained with this treatment planning software,

3.2.1 The printed shielding block transmission factors are identical :

YES or NO

3.3 Tray transmission factor check

Compared to previous results obtained with this treatment planning software,

3.3.1 The printed tray transmission factors are identical :

YES or NO

3.4 Wedge transmission factor check

Compared to previous results obtained with this treatment planning software,

3.4.1 The printed wedge transmission factors are identical :

YES or NO

3.5 Entrance dose check

Compared to previous results obtained with this treatment planning software,

3.5.1 The printed entrance dose for all fields are identical :

YES or NO

3.6 Equivalent field size check

Compared to previous results obtained with this treatment planning software,

3.6.1 The printed equivalent field sizes are identical :

YES or NO

3.7 Calculated monitor unit check

Compared to previous results obtained with this treatment planning software,

3.7.1 The printed MUs for each field are identical :

YES or NO

3.8 Dose-Volume histogram check

Compared to previous results obtained with this treatment planning software,

3.8.1 The DVH plots are identical : YES or NO

3.8.2 The calculated maximum doses are identical : YES or NO

3.8.3 The calculated mean doses are identical : YES or NO

3.8.4 The calculated median doses are identical : YES or NO

3.8.5 The calculated minimum doses are identical : YES or NO

An identical set of patient input data gives identical dosimetry results when compared to previous results obtained with this external beam treatment planning software :

YES or NO

SIGNATURE : _____

DATE : _____

THE EXTERNAL BEAM TREATMENT PLANNING SOFTWARE IS APPROVED FOR CONTINUING CLINICAL USE :

YES or NO

SIGNATURE : _____

DATE : _____