



DOCUMENT: SAMPS9401ENG

CODE OF PRACTICE FOR TELETHERAPY COBALT UNITS

This code of practice is divided into three parts, the first two of which have four sections, encompassing those items which require to be performed daily, weekly, monthly, biannually and a further fifth section which should be performed at installation or subsequent to a source change, and the third part consisting of appendices addressing methods to achieve these goals.

The requirements are gleaned from Official Publications viz. I.A.E.A., I.C.R.U., I.C.R.P. and Government Gazettes, Professional Publications of H.P.A. and A.A.P.M. and manufacturer's specifications as contained in their various manuals.

The fifth section of the first part will include the range of values and tolerances that are specified in the Initial Customer Acceptance Document and could vary from manufacturer to manufacturer. At the time of initial acceptance, these values and tolerances (deliberately left blank in the document) should be recorded and variations from these values noted subsequently. The tables list the equipment/analysis and typical tolerances of older machines and various appendices give the relevant protocols and suggested methods.

It is automatically assumed that the "WEEKLY" checks will encompass the "DAILY" checks as those in each succeeding section are in addition to the sections that precede it.

I. DAILY

A. Mechanical Accuracy

1. Gantry Angle
2. Collimator Angle
3. Optical Distance Indicator (ODI) at Treatment Distance
4. Light Field Size
 - a. 10 x 10 cm Symmetric Field.
5. Laser Alignment

B. Safety System Feature

1. Collision Avoidance
2. Deadman Emergency Switches
3. Source Drawer Emergency Retraction Rod
4. Patient Monitoring System
5. Key Switch Operations
6. Beam On / Beam Off Light on Console etc.
7. Door Interlocks
8. Low Pressure Pneumatic Safety Switches.

II. WEEKLY

- A. Mechanical Accuracy
 - 1. Gantry Angles
 - 2. Collimator Angles
 - 3. Optical Distance Indicator (ODI) at 2 distances.
 - 4. Light Field Size
 - a. 10 x 10 cm Symmetric Field
 - b. 20 x 20 cm Symmetric Field
 - c. Asymmetric Fields
 - 5. Couch Height
 - 6. Rotation Indicators
 - 7. Cross Hair Stability with Collimator Rotation (2 gantry angles)
 - 8. Laser Alignment with Isocentre
 - 9. Wedges – one per week
 - a. Mechanical Interlocks
 - b. Maximum Field Size Interlock
- B. Radiation Accuracy
 - 1. Proper function of Arc Therapy Feature

III MONTHLY

- A. Mechanical Accuracy and Maintenance
 - 1. Gantry Angles
 - 2. Collimator Angles over complete range
 - 3. Drain the pneumatic system
 - 4. Optical Distance Indicator (ODI) over useful range
 - 5. Cross Hair Stability with Collimator Rotation (2 gantry angles)
 - 6. Backpointer accuracy
 - 7. Light Field Size
 - a. 5 x 5 cm Symmetric Field
 - b. 10 x 10 cm Symmetric Field
 - c. 15 x 15 cm Symmetric Field
 - d. 20 x 20 cm Symmetric Field
 - e. Maximum Field Sizes
 - f. Asymmetric Fields
 - 8. Couch Height
 - 9. Rotation Indicators
 - 10. Laser Alignment with Isocentre
 - 11. Wedges
 - a. Mechanical Interlocks
 - b. Maximum Field Size Interlock
- B. Radiation Accuracy
 - 1. Output Calibration
 - 2. Source Transit time
 - 3. Radiation Beam and Light beam coincidence
 - 4. Proper function of Arc Therapy Feature

IV BIANNUALLY or AFTER A MAJOR SERVICE

- A. Mechanical Accuracy over complete manufacturer's specification range
 - 1. Pneumatic pressures
 - 2. Vertical Travel
 - 3. Head Swivel
 - 4. Collimator Rotation
 - 5. Collimator Field Sizes
 - 6. Gantry Angles
 - 7. Collimator Angles
 - 8. Optical Distance Indicator (ODI)
 - 9. Cross Hair Stability with Collimator Rotation
 - 10. Backpointer accuracy
 - 11. Light Field Size
 - a. 5 x 5 cm Symmetric Field
 - b. 10 x 10 cm Symmetric Field
 - c. 15 x 15 cm Symmetric Field
 - d. 20 x 20 cm Symmetric Field
 - e. Maximum Field Sizes
 - f. Asymmetric Fields
 - 12. Couch Height
 - 13. Rotation Indicators
 - 14. Laser Alignment with Isocentre
 - 15. Wedges
 - a. Mechanical Interlocks
 - b. Maximum Field Size Interlock
- B. Radiation Accuracy
 - 1. Output Calibration
 - 2. Source Transit time
 - 3. Radiation Beam and Light beam coincidence
 - 4. Proper function of Arc Therapy Feature
- C. Safety System Feature
 - 1. Collision Avoidance
 - 2. Deadman Switches
 - 3. Patient Monitoring System
 - 4. Key Switch Operations
 - 5. Beam On / Beam Off Light on Console etc.
- D. Radiation Protection
 - 1. Contamination of Collimators and Source Drawer

V INSTALLATION OR SOURCE CHANGE OR MAJOR REPAIR

- A. Radiation Protection
 - 1. Verification of adequate protection of site

2. Contamination of Collimators and Source Drawer
- B. System Performance Checks
1. Gantry Motion
 - a. Rotation
 - b. Rotation Control
 - c. Console
 - d. Speed Regulation
 2. Head Motions
 - a. Rotation
 - b. Headlock
 3. Collimator Motions
 - a. Rotation
 - b. Field Size
 4. Table Motions
 - a. Manual
 - (1) Vertical Travel
 - (2) Longitudinal Travel
 - (3) Lateral Travel
 - (4) Brakes
 - (5) Free Float
 - b. Motorised
 - (1) Vertical Travel
 - (2) Longitudinal Travel
 - (3) Lateral Travel
 - (4) Isocentric Rotation
 - (5) Table Top Rotation
 5. Distance Indicators
 - a. Mechanical
 - b. Optical
- C. Alignment Checks
1. Table Alignment
 - a. Vertical
 - b. Isocentric
 2. Unit Alignment
 - a. Collimator Alignment
 - b. Field Light Alignment
 - c. Isocentric Alignment
 3. Interlocks
 - a. Source Drawer
 - b. Treatment Angle
 - c. Headlock
 - d. Off shield
 - e. Pneumatic pressures
 - f. Gantry Angle Limit Switches
 - g. Door Interlock
 - h. Wedge Mechanical Interlocks
 4. Laser Alignment with Isocentre
 5. Wedges

- a. Mechanical Interlocks
 - b. Maximum Field Size Interlock
- D. Safety System Feature
- 1. Collision Avoidance
 - 2. Deadman Switches
 - 3. Patient Monitoring System
 - 4. Key Switch Operations
 - 5. Indicator Lights
 - a. Beam On / Beam Off Light on Console etc.
 - b. Head Display Panel
- E. Radiation Accuracy
- 1. Source Symmetry Verification
 - 2. Treatment Timer
 - 3. Output Calibration
 - 4. Source Transit time
 - 5. Radiation Beam and Light beam coincidence
 - 6. Proper function of Arc Therapy Feature
 - 7. Output Field Factors
 - 8. Beam Profiles

TELE THERAPY COBALT / DAILY		
MEASURE	EQUIPMENT/ANALYSIS	TOLERANCE
A Mechanical Accuracy		
1 Gantry Angle (Select one angle)	Level/visual	1 degree
2 Collimator Angle (Select one angle)	Level/visual	1 degree
3 Optical Distance Indicator (Standard treatment distance)	Front pointer/distance rod	2mm
4 Light Field Size (a) 10x10 cm Symmetric Field	Visual	2mm each edge
5 Laser Alignment	Test device/visual	2mm
B Safety System Feature		
1 Collision Avoidance	Hand/visual	Functioning
2 Deadman Emergency Switches	Hand/visual	Functioning
3 Source Drawer Emergency Retraction Rod	Hand/visual	Available
4 Patient Monitoring System	Hand/visual	Functioning
5 Key Switch Operations	Key/visual	Functioning
6 Beam On/Beam Off Light on Console etc. and audible alarms	Visual/aural	Functioning
7 Door Interlocks	Hand/visual	Functioning
8 Low Pressure Pneumatic Safety Switches	Hand/visual	functioning

TELE THERAPY COBALT / WEEKLY		
MEASURE	EQUIPMENT/ANALYSIS	TOLERANCE
A Mechanical Accuracy		
1 Gantry Angle (Select multiple angle)	Level/visual	1 degree
2 Collimator Angle (Select multiple angle)	Level/visual	1 degree
3 Optical Distance Indicator (ODI) at 2 distances	Pointer/distance rod	2mm
4 Light Field Size (a) 10x10 cm Symmetric Field	ruler/visual	2mm each edge
(b) 20x20 cm Symmetric Field	ruler/visual	2mm each edge

(c) Asymmetric Fields	ruler/visual	2mm each edge
5 Couch Height	visual	2mm
6 Rotation Indicators	visual	1 degree
7 Cross Hair Stability with Collimator Rotation (2 gantry angles)	ruler/visual	2mm
8 Laser Alignment with Isocentre	test device/visual	2mm
9 Wedges – one per week		
(a) Mechanical Interlocks	visual	correct functioning
(b) Maximum Field Size Interlock	visual	correct functioning
B Radiation Accuracy		
1 Proper function of Arc Feature	visual	Correct functioning

TELETERAPY COBALT / MONTHLY

MEASURE	EQUIPMENT/ANALYSIS	TOLERANCE
A Mechanical Accuracy and Maintenance		
1 Gantry Angle	visual	1 degree
2 Collimator Angle over complete range	visual	1 degree
3 Drain the pneumatic system	mechanical	N/A
4 Optical Distance Indicator (ODI) over useful range	front pointer/distance rods(s)	2mm
5 Cross Hair Stability with Collimator Rotation (for 2 gantry angles)	visual	2mm
6 Backpointer accuracy	visual	2mm
7 Light Field Size		
(a) 5x5 cm Symmetric Field	visual	2mm each edge
(b) 10x10 cm Symmetric Field	visual	2mm each edge
(c) 15x15 cm Symmetric Field	visual	2mm each edge
(d) 20x20 cm Symmetric Field	visual	2mm each edge
(e) Maximum Field Sizes	visual	2mm each edge
(f) Asymmetric Fields	visual	2mm each edge
8 Couch Height	mechanical/visual	2mm
9 Rotation Indicators	visual	1 degree
10 Laser Alignment with Isocentre	test device/visual	2mm
11 Wedges		
(a) Mechanical Interlocks	mechanical/visual	
(b) Maximum Field Size Interlock	mechanical/visual	
B Radiation Accuracy		
1 Output Calibration	Chamber + electrometer	± 3%
2 Source Transit time	Film or isodose plotter	
3 Radiation Beam and Light beam coincidence		2mm each edge

TELETERAPY COBALT / BIANNUALLY OR AT A MAJOR SERVICE

MEASURE	EQUIPMENT/ANALYSIS	TOLERANCE
A Mechanical Accuracy over Manufacturer's specification range		
1 Pneumatic Pressure	visual	N/A
2 Vertical Travel	visual	2mm
3 Head Swivel	visual	1 degree
4 Collimator Rotation	visual	1 degree
5 Collimator Field Size	visual	2mm
6 Gantry Angles	visual	1 degree
7 Collimator Angles	visual	1 degree
8 Optical distance Indicator	visual	2mm

9	Cross Hair Stability with Collimator Rotation	visual	2mm
10	Backpointer Accuracy	visual	2mm
11	Light Field Size		
	(a) 5x5cm field	visual	2mm
	(b) 10x10cm field	visual	2mm
	(c) 15x15cm field	visual	2mm
	(d) 20x20cm field	visual	2mm
	(e) Maximum field	visual	2mm
	(f) Asymmetric field	visual	2mm
12	Couch Height	visual	2mm
13	Rotation Indicators	visual	1 degree
14	Laser Alignment with Isocentre	test device/visual	2mm
15	Wedges		
	(d) Mechanical Interlocks	test device/visual	functioning
	(e) Maximum field size locks	test device/visual	functioning
B Radiation Accuracy			
1	Output Calibration	Chamber + electrometer	1%
2	Source Transit time	Film or isodose plotter	0,01min
3	Radiation Beam and Light beam coincidence		2mm
4	Proper functioning of Arc Therapy Feature		
C Safety System Features			
1	Collision Avoidance	Visual	Functional
2	Deadman Switches	Visual/hand	Functional
3	Patient Monitoring System	Visual/test	Functional
4	Key Switch Operations	Hand/visual	Functional
5	Lights / alarms	Visual	Functional
D Radiation Protection			
1	Contamination of Source Drawer and collimators	Contamination meter	< 100cpm for γ < 185 for α particles

TELE THERAPY COBALT/INSTALLATION OR SOURCE CHANGE OR MAJOR REPAIR			
MEASURE	EQUIPMENT/ ANALYSIS	RANGE	TOLERANCE
A Mechanical Accuracy and Maintenance			
1	Gantry Motions		
	(a) Rotation	Visual	1 degree
	(b) Rotation Control	Visual	1 degree
	(c) Console	Visual	N/A
	(d) Speed	Visual	3%
2	Head motions		
	(a) Rotation	Mechanical	1 degree
	(b) Headlock	Mechanical	0,5 degree
3	Collimator motions		
	(a) Rotation	Visual	1 degree
	(b) Field Size	Visual	2mm
4	Table Motions		
	(a) Manual		
	(i) Vertical	Visual	2mm
	(ii) Longitudinal	Visual	2mm
	(iii) Lateral	Visual	2mm
	(iv) Brakesons	Visual	functioning

<ul style="list-style-type: none"> (v) Free Float (b) Motorised <ul style="list-style-type: none"> (i) Vertical (ii) Longitudinal (iii) Lateral (iv) Isocentric Rotation (v) Table Top Rotation 5 Distance Indicators <ul style="list-style-type: none"> (a) Mechanical (b) Optical 	<ul style="list-style-type: none"> Visual Visual Visual Visual Visual Front pointer/ Distance rod(s) 		<ul style="list-style-type: none"> functioning 2mm 2mm 2mm 2mm 2mm 2mm 2mm
<ul style="list-style-type: none"> B Alignment Checks <ul style="list-style-type: none"> 1 Table Alignment <ul style="list-style-type: none"> (a) Vertical (b) Isocentric 2 Unit Alignment <ul style="list-style-type: none"> (a) Collimator Alignment (b) Field Light Alignment (c) Isocentric Alignment 3 Interlocks <ul style="list-style-type: none"> (a) Source Drawer (b) Treatment Angle (c) Headlock (d) Off Shield (e) Pneumatic Pressures (f) Gantry Angle Limit Switches (g) Door Interlocks (h) Wedge Mechanical Interlocks 	<ul style="list-style-type: none"> Visual Visual Visual Visual Visual Visual Visual Visual Visual Visual Visual Visual Visual 		<ul style="list-style-type: none"> 2mm 2,5mm 1mm radius 2mm radius 2mm radius functioning functioning functioning functioning functioning functioning functioning functioning
<ul style="list-style-type: none"> C Radiation Accuracy <ul style="list-style-type: none"> 1 Output Calibration 2 Source Transit time 3 Radiation Beam and Light Beam coincidence 	<ul style="list-style-type: none"> Chamber + electro- meter Chamber + electro- meter Film or isodose plotter 		<ul style="list-style-type: none"> 3% 0,01min 2mm