

DEPARTMENT OF THE AIR FORCE DAVID GRANT USAF MEDICAL CENTER (MAC) TRAVIS AIR FORCE BASE, CALIFORNIA 94535

31 May 1984

Reply to Attn of: SGHRT

Subject: RadiationSurvey Report after Installation of new Cobalt Source David Grant Medical Center NRC License 04-07840-02

To: United States Nuclear Regulatory Commission, Region V Office of Inspection and Enforcement 1450 Maria Lane Suite 210 Walnut Creek, CA 94596-5368

1. A radiation survey was performed on the cobalt 60 radiation cherapy facility on 4 May 1984 after the installation of a new cobalt source.

2. A new cobalt source of 5786 curies (16 March 1984) of a C-146 design with a source serial number of S-3600 was installed in the Theratron 80 unit serial number 312 on 4May 1984.

3.A leak test was performed on the new source prior to shipment and certificate was given stating the source was leak free as determined by wipe tests.

4. The survey was performed using a Victoreen 666 survey meter which was calibrated by the USAF DMFL calibration facility at McClellan AFB. Copy of the calibration procedure is attached. (Atchl)

5. The soucehead leakage radiation was checked with the source in the off position. The leakage was within limits and a copy of leakage survey is attached. (Atch 2)

6. The adjacent areas were surveyed by placing the therapy unit in an off beam stopper mode as if a whole body irradiation was being performed. This will produce the largest dose in occupied areas using techniques permitted by our license. A maximum reading in the simulator room of 8 mr/hr was measured and this was next to the wall. The area where personnel normally stand was less than 2mr/hr and when using the unit in normal mode with beam stopper in place readings were less than 0.1mr/hr. Copy of the survey and gantry positions is attached. (Atch 3)

7. The radiation output of the source was measured using a Victoreen Model 570 electrometer and Model 621 Ionization chamber. This system was calibrated by K&S Associates on 24May 1983. The output was measured and found to be 103.6 R/min for a 12.5 x 12.5 cm field at 1 meter. This compares within one percent of measurment performed by AECL.

8408290242 840816 NMS LIC30 04-07840-02 PDR 8. The interlocks were checked and the following results were obtained a. The door interlocks would shut off unit and unit had to

be reset at the control panel b. The table interlocks would shut off unit and unit had to be reset at the control panel.

c. The console interlock would turn unit off and unit would have to be reset at control panel.

a. Emergency off switches turned off power to unit and need to be turned on at emergency off switch prior to having power to use the unit.

e. The beam limit switch on the sourcehead swivel was checked and found to allow the unit to irradiate against the simulator wall and floor. These areas have dirt fill on the other side of the wall and floor.

f.The warning lights on the door, source arm and console were found to be operating satisfactorily with red for source out, red-green when source is in transit and green when source has returned to safe position.When source is out Primalert indicates red. g. Beam stopper interlock prevents rotation when beam stopper is rotated from primary position

h. The closed circuit TV System was used to check the mechanical indicator at the end of the source when the source is out.i. The timer was checked and found to be accurate and that the timer had to be reset between each irradiation.

9. If there is any additional information required please contact me.

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Bernard S. Tatera, PhD Medical Physicist

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RADIAC TEST EQUIPMENT (HIGH RANGE)

This procedure describes the calibration process of Radiac Test Equipment, listed in Appendix A, while utilizing the Radiac Calibrator Set AN/UDM-1A.

1.0 CALIBRATION DESCRIPTION:

TABLE I

Test Instrument Characteristics	Performance Specifications	Test Method
Gamma Radiation Indication	Range: 0 - 450 r/hr	Test Instrument compared
	Accuracy: $\pm 5^{\circ}$ to 30°	the Radiac Calibrator

	Noun	Minimum Use Specifications	Calibration Equipment	Sub Item
2.1	RADIAC CALIBRATOR	Range: 2 mr/hr to 250 r/hr Accuracy: ± 5%	AN/UDM-1A	
2.2	ETHYL ALCOHOL	99 proof	FSN 6810-242-3645	
2.3	MANOMETER	Range: 500 to 790 mm/Hg Accuracy: ± 0.3 mm/Hg	Hass Al	
2.4	THERMOMETER	Range: 35 to 135 degrees F Accuracy: ± 0.2 degrees F	Princo 77	
2.5	RADIAC DETECTOR CHARGER	Range: N/A Accuracy: N/A	CDV-750	

2.0 EQUIPMENT REQUIREMENTS:

3.0 PRELIMINARY OPERATIONS:

3.1 Read the entire procedure before beginning calibration.

3.2 Check Test Instrument meter for mechanical zero.

3.3 Allow Test Instrument to stabilize at room temperature prior to calibration.

3.4 Check batteries before beginning calibration. This may be done by either checking the batteries with a voltmeter or by setting Test Instrument FUNCTION switch to BATT position and observing the meter indication.

CAUTION

Ethyl Alcohol emits flammable vapors and will be placed in an approved self closing or stoppered containers (bottles, 8 oz. or less) where applications are made with cotton swabs or small brushes.

3.5 When calibrating Ion Chamber Dosimeters, clean exterior with Ethyl Alcohol and allow them to dry for approximately 2 hours. Charge the Ion Chamber Dosimeter and allow it to set for a minimum of 8 hours, then check for leakage.

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3.6 If the Test Instrument PROBE has a beta discriminating shield, a screen or filter, ensure that it is closed so that the Test Instrument will respond to Gamma Radiation only.

3.7 When calibrating the 666 Portable Radiographic Health Survey System, the Background Chamber Probe may be connected to Test Instrument by using either a 2 foot or 20 foot cable. During the measurement cycle the cables should be kept as motionless as possible, particularly while using the more sensitive ranges of the Test Instrument.

3.8 Set Test Instrument FUNCTION SELECTOR switch to ON and allow a five minute warm-up period.

3.9 For Model IM-174/PD (), hold CHECK switch in the ZERO position and adjust ZERO control until Test Instrument meter pointer indicates zero. Then set CHECK switch to ELEC CAL position and adjust CALIBRATION control for a 500 r/hr indication. Set CHECK switch to LINEARITY position. The meter pointer must indicate within the red mark if batteries are good.

3.10 On some occasions, a meter indication will be noted without a radiation field present. This may be due to static electricity induced on the Test Instrument dial glass. This can be removed by cleaning with antistatic and cleaner compound. FSN 6850-346-5707 (or equivalent).

3.11 For Model 666, using the 0.3 to 30 INT/mr ranges, the radiation is accumulative. If the Radiac Calibrator is set for 25 mr/hr and the Test Instrument is exposed for 60 minutes the meter must indicate within 22 to 28 mr. When using the Diagnostic Probe the sensitivity will be 1/100 of the Background Probe.

3.12 Air density corrections are required for Models ERJ 8, SRJ 7, CP-3, CP-3A, 471RF, 740,740A. 740B,740G, 2592. The correction factor may be found by using the following formula:

Correction Factor = $\frac{459.7 + T^{\circ}F}{531.3}$ X $\frac{760}{Pmm}$ Hg

The Test Instrument meter indication times the Correction Factor must be within the values listed in limits column of Appendix B for the appropriate Test Instrument.

3.13 If the Test Instrument has a Radioactive Check Source perform the following steps when making a Leak Test.

NOTE

A Leak Test is not required for tritium or Krypton-85 sources.

WARNING

Personnel involved in the performance of a leak test will wash their hands upon completion of the test.

3.13.1 Remove Test Instrument from its case, if necessary, to expose the cneck source.

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CAUTION

Extreme care must be exercised to avoid damage to the check source.

- 3.13.2 Turn case so that the active surface of the Check Source is exposed.
- 3.13.3 Moisten the filter paper disc with water.

3.13.4 Thoroughly wipe the radioactive side of the Check Source with one side of the filter paper disc. Avoid hand contact with the radioactive side of the Check Source and the wiped side of the filter paper disc.

3.13.5 Using the 0 - 0.5 mr/hr scale of the AN/PDR-27 () Radiac Set (probe shield opened), read and record the radiation background. This reading shall be taken at the same location where the wipe sample is monitored but not less than ten feet from the Check Source.

3.13.6 Hold the wiped side of the filter paper disc at the open end of the probe. Do not permit the filter paper disc to come into direct contact with the probe.

3.13.7 Read and record the indicated radiation level and subtract from it the background obtained in step 3.13.5. Record the date the leak test was performed on the AFTO Form 140 for the Test Instrument being checked. The swipe sample will be forwarded to USAF OEIIL/RZA BROOKS AFB. TX 78235.

3.13.8 The net reading must be less than 0.1 mr/hr. If not, the radioactive Uneck Source should be replaced. Reference TO 00-110N-2 for radioactive material disposition instructions.

3.13.9 Replace Test Instrument in its case and secure.

WARNING

Personnel performing the following steps shall wear a USAF APPROVED FILM or THD BADGE. In addition, a LOW RANGE POCKET DOSIMETER may be worn.

4.0 CALIBRATION PROCESS:

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NOTE

Unless otherwise specified, verify the results of each test and take corrective action whenever the test requirement is not met. before proceeding.

4.1 METER CALIBRATION:

4.1.1 While standing behind the Radiac Calibrator radiation source housing stand, check operation of alarm circuits for alerting personnel when Radiac Calibrator is in operation.

4.1.2 Electrically zero Test Instrument meter if Test Instrument has a zero adjust

control.

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4.1.3 Set Test Instrument FUNCTION switch to the desired range as listed in

Appendix B.

4.1.4 Place Test Instrument on the Radiac Calibrator alignment table. Arrange so that the center portion of the chamber (detecting element) will be placed directly on the desired calibrated distance point and in line with the opening of the radiation source chamber.

4.1.5 Move the positioning platform to the correct distance according to the Calibration Chart to obtain a radiation intensity that will produce approximately 1/3 and 2/3 full scale deflection on Test Instrument meter for each range listed in Appendix B.

NOTE

Use the main cardinal points that are nearest to the 1/3 and 2/3 full scale deflection positions if the Test Instrument range is greater than the maximum intensity of the Radiac Calibrator, set Radiac Calibrator for maximum intensity and calibrate Test Instrument at one point only.

4.1.6 Adjust the optical system of the Radiac Calibrator for remote observation f the Test Instrument.

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4.1.7 If the Test Instrument being calibrated requires a correction Factor bas the air temperature and barometric pressure, measure same and record these values.

4.1.8 Set Radiac Calibrator APERTURE PLUG control arm and the RADIOAC SOURCE control lever to the positions indicated on the Calibration Chart to obtain a meter indication : in step 4.1.5.

4.1.9 The Test Instrument must indicate within the values listed in Appendix 1

4.1.10 Set Radiac Calibrator POSiTIONING lever so the radioactive source con is locked in the ATTENUATION position and APERTURE has been tightly plugged.

NOTE

If the Test instrument has a check source, complete the following steps:

4.1.11 Measure the Test Instrument check source with the Test Instrument. N indication obtained on the meter and record it as "Check Source" in the special block on the AFTO Fo and on AFTO Form 140 accompanying Test Instrument.

NOTE

If the Check Source did not accompany the Test Instrument, it will be the Users responsibility to perform the operational check and annotate the AFTO Form 140 accompanying Test Instrument.

4.1.12 Set Test Instrument FUNCTION switch to OFF and secure equipment.

CALIBRATION PERFORMANCE TABLE

No Calibration Performance Table is required.

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APPENDIX A "Continued"

Model Number	Manufacturer	Page Number		
RM-600	Nuclear Corp of America	30 - 7		
SRJ-6	Technical Associates	30 - 9		
SRJ-7 2592 444 27185 666	Technical Associates Texas Nuclear Div Victoreen Inst Victoreen Inst Victoreen Inst	30 - 9 30 - 10 30 - 8 30 - 8 30 - 8		
740	Victoreen Inst	30 - 10		
740A	Victoreen Inst	30 - 9		
740B 740D 740 F 740G	Victoreen Inst Victoreen Inst Victoreen Inst Victoreen Inst	30 - 8 30 - 8 30 - 8 30 - 10 30 - 10		
904-416	Baird-Atomic	30 10		

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APPENDIX B "Continued"

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Range 0 - 25 r/hr

CP-3A

 $\pm 10\%$ of indication when air density corrections are made

740B, 740D, 740F

± 10% of FS when air density corrections are made.

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Range (mr/hr)	Applied (mr/hr)	Limits (mr/hr)
0 - 25	20	17.5 - 22.5
0 - 250	200	175 - 225
0 - 2500 0 - 25600	2000 20000	1750 - 2250 17500 - 22500

Range 0 - 300 r/hr

444 471RF 666

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4	4	na		
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 $\pm 10\%$ with background Probe

± 20% with Diagnostic Probe

Range (mr/hr)	Applied (mr/hr)	Limits (mr/hr) ±10%
0 - 3	2.5	2.2 - 2.8
0 - 3	1	0.7 - 1.3
0 - 10	8	7 - 9
0 - 10	4	3 - 5
0 = 30	25	22 - 28
0 - 30	10	7 - 13
0 = 100	80	70 - 90
0 - 100	40	30 - 50
0 - 300	250	220 - 280
0 - 300	100	70 - 130
0 - 3 r/hr	2.5 r/hr	2.2 - 2.8 r/hr
0 - 3 r/hr	l r/hr	0.7 - 1.3 r/hr
0 - 10 r/hr	8 r/hr	7 - 9 r/hr

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Range (nur. hr)	Applied (mr/hr)	Limits (mr/hr) ±10'c	
0 - 10 r hr	4 r/hr	3 - 5 r/hr	
0 - 30 r hr	25 r/hr	22 - 28 r/hr	
0 - 30 r hr	10 r/hr	7 - 13 r/hr	
0 - 100 r hr	80 r/hr	70 - 90 r/hr	
0 - 100 r hr	40 r/hr	30 - 50 r/hr	
0 - 300 r hr	. 250 r/hr	220 - 280 r/hr	
0 - 300 r hr	100 r/hr	70 - 130 r/hr	
Diagnostic Probe			
0 - 3 mr hr	240 mr hr	1.80 to 3.00 mr/hr	

APPENDIX B "Continued"

Range 0 - 500 r/hr

AGB-50B-SR	± 15 ^c c	
AGB-500-SR	± 15'c	
CDV710 All Models	± 20'c	
CDV715	± 20'î	
CDV7I7	± 20'č	
CDV720	± 20' c	
CH720	± 15' c	
CP-3	- 10%5% of indication when air density corrections are made	
CS40A	± 10'	
SRI-7	- 10 /5 / of indication when air density co: rections are made	
ERJ-8	- 10 5% of indications when air density corrections are made	
IM174/PD, IM174A PD	= 15 ⁷⁷	
SR1-6	- 10'5' of indications when air density corrections are made	
740A	z 10 of FS when air density corrections are	

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