COMMUNITY HEALTHCARE NETWORK
MEDCENTER HOSPITAL

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U.S. N.R.C.
MC. FEE MGMT. BRANCH

July 19, 1985

Material Licensing Section
U. S. Nuc. Reg. Commission
Region III
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Attention: Ms. Patricia J. Whiston Mat. License # 34=00179-03

Madam:

A neutron Products, Inc. Model NPI-20-3600W, 3710 Curie telecobalt source was installed in our Picker C-9 on June 28, 1985, replacing the NPI-20-2800 source. On completion of the source replacement, a full calibration, leak tests and area radiation survey were performed by our Medical Physics Consultant. Two sets of reports of full calibration, source leak test, head leakage measurements, and area radiation survey from the Medical Physicist, along with the source change and five (5) year telecobalt service reports from Neutron Products are enclosed.

I hope you will find these documents in order.

Sincerely,

Robert R. Tracht

Robert R. Tracht
Administrator

RECEIVED BY LFMB
Date 8/1/85
Log
By
Orig. To 8/1/85
Action Comp

RRT:jo

enclosure: Calibration Report, Source Leak Test Report, Cobalt Head Leakage Report, Area Radiation Survey Report, Source change Report, Five Year Service Report

Cobalt Survey

FEE EXEMPT

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JUL 22 1985
REGION III
JUL 22 1985

CONTROL NO. 79375

1050 Delaware Avenue
Marion, Ohio 43302
614/387-8604

a caring team in our community

TELETHERAPY SOURCE TRANSFER

This is to certify that a cobalt-60 source:

Model Number: NPI-20-3600W
Serial Number: T-774
Containing 3710 curies as of 7-1-85

and which has been determined by helium pressure test and by wipe test to be leak free, has been installed in a teletherapy unit described as follows:

Manufacturer: Picker
Model Number: C9
Serial Number: 130

This source is hereby transferred from Neutron Products' Radioactive Materials License MD-31-025-03 to Community MedCenter Hospital's Radioactive Materials License 34-00179-03.

This will also certify that a cobalt-60 source described as follows:

Model Number: NPI-20-2800
Serial Number: RT-70
Containing 1254 curies as of 6-1-85

has been determined by a wipe test to be leak free and has been removed from the above teletherapy unit and transferred from Community MedCenter Hospital's Radioactive Materials License 34-00179-03 to Neutron Products' License MD-31-025-03.

We have witnessed the inspection and operation of the above teletherapy unit after completion of the installation by Neutron Products, Inc. and have found the unit to be operating properly and safely.

Neutron Products, Inc.

Date _____ Date 6-29-85

NEUTRON PRODUCTS INC
CONTROL NO. 7 9 3 7 5

TELETHERAPY SOURCE TRANSFER

This is to certify that a cobalt-60 source:

Model Number: **NPI-20-3600W**
Serial Number: **T-774**
Containing **3710** curies as of **7-1-85**

and which has been determined by helium pressure test and by wipe test to be leak free, has been installed in a teletherapy unit described as follows:

Manufacturer: **Picker**
Model Number: **C9**
Serial Number: **130**

This source is hereby transferred from Neutron Products' Radioactive Materials License MD-31-025-03 to **Community MedCenter Hospital's Radioactive Materials License 34-00179-03/**

This will also certify that a cobalt-60 source described as follows:

Model Number: **NPI-20-2800**
Serial Number: **RT-70**
Containing **1254** curies as of **6-1-85**

has been determined by a wipe test to be leak free and has been removed from the above teletherapy unit and transferred from **Community MedCenter Hospital's Radioactive Materials License 34-00179-03** to Neutron Products' License MD-31-025-03.

We have witnessed the inspection and operation of the above teletherapy unit after completion of the installation by Neutron Products, Inc. and have found the unit to be operating properly and safely.

Robert [illegible]
Date _____

[signature]
Neutron Products, Inc.
Date 6-29-85

NEUTRON PRODUCTS INC
CONTROL NO. 79375

TELETHERAPY SOURCE CERTIFICATION

This certifies that the cobalt-60 source:

Model Number: **NPI-20-3600W**

Serial Number: **T-774**

Containing **3710** curies as of: **7-1-85**

was fabricated by Neutron Products, Inc. in accordance with NPI specification P-4 per Drawing Number A20005 and was leak tested by the helium pressure test and found to be leak free on June 25, 1985. The source was wipe tested and the removable activity was .013, and .0008 microcuries from the inner and outer encapsulations, respectively.

Performed by and certified to by:

Brent R. Albert for JWC

Jeffrey W. Corun, Manager
Hot Cell Operations

Reviewed and approved by:

Marvin M. Turkanis
Vice President

6/26/85
Date

NEUTRON PRODUCTS INC

CONTROL NO. 79375

REPORT OF INSPECTION AND SERVICING
("FIVE YEAR INSPECTION" REPORT)

This is to certify that the Picker teletherapy unit, Model C9, Serial Number 130 located at Community MedCenter Hospital, 1040 Delaware Ave., Marion, Ohio, 43302 was inspected and serviced on 6-28-85. by Russ Brown. to assure the proper function of the source exposure mechanism as authorized by Maryland License MD-31-025-03.

Signed [signature] Date 6-29-85.

Parts: Source Wheel Bearings.
Drive Belt.
Return Spring
Threaded Taper Pin - Variant' Elapsed Treatment Timer.

Nonstandard Service:

Facility Address:

Community MedCenter Hospital
1040 Delaware Ave.
Marion, Ohio 43302

Revision Date
July 25, 1983

INSPECTION CHECK LIST

Unit: Picker C9 Serial Number: 130

Operation	Prior to Transfer*		Subsequent to Transfer**
1. Determine Operating History	X		
2. Head Movement	(X)		(X) Head rotation gearbox faulty.
3. Electrical and Mechanical Source Condition-Indicator Check	X		X
4. Manual Source/Shutter Return	X		X
5. Timer	X		X REPLACED ELAPSED TREATMENT TIMER.
6. Source Holder/Shutter Movement Check	X		X
7. Pneumatic Activating System	X	N/A	X
8. Mercury Shutter System	X	N/A	X
9. Stand and Stretcher			X
10. Protective Source Housing, Beam-Off Leakage (Confirm Measured by Medical Physicist)			X
11. Source-Surface Distance (SSD)			X
12. Beam Orientation	X		X
13. Congruence of Light and Radiation Fields			X
14. Full Calibration (Confirm Performed by Medical Physicist)			X
15. Facility Door Interlock	X		X
16. Teletherapy Units with Moving Source Drawer	X	N/A	X
17. Teletherapy Units with Moving Shutter Blocks	X	N/A	X
18. Teletherapy Units with Rotating Shutter	X		X
19. Indicator Light	X		X
20. Emergency Shutoffs	X		X
21. Collimator	X		X

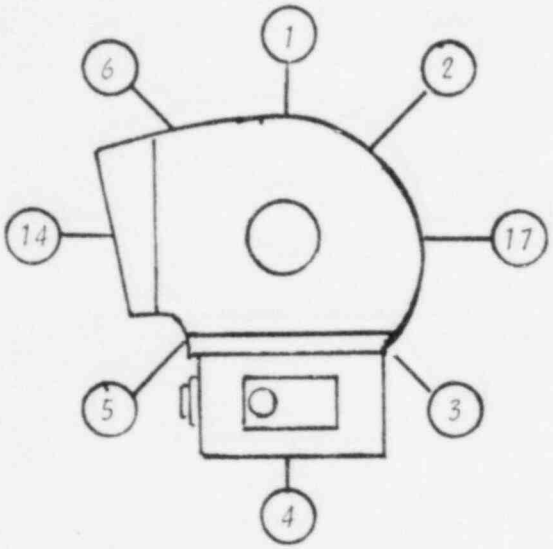
Note: *Circle all items not meeting attached criteria.
**Circle all items not meeting attached criteria after servicing.

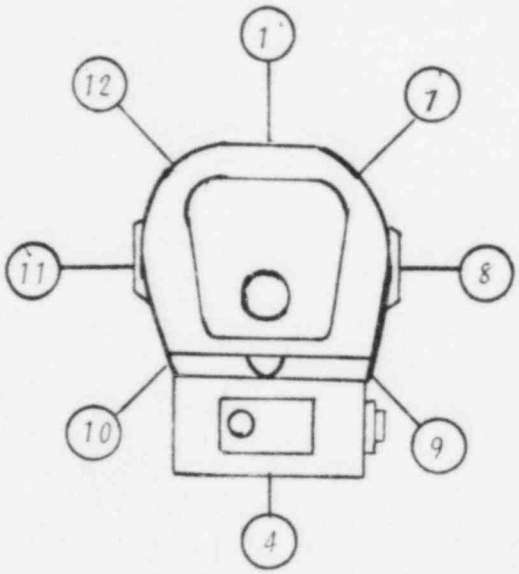
Signed: [signature] Date: 6-29-85

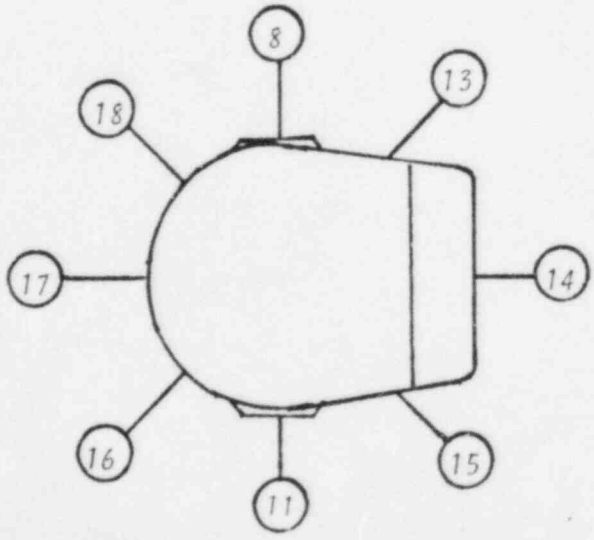
NEUTRON PRODUCTS INC

BEAM OFF SURVEY OF COBALT-60 TELETHERAPY SOURCE

TABLE I







DATE OF SURVEY: July 6, 1985

UNIT LOCATION: Radiology Department, Smith Clinic
Community Hospital, 1040 Delaware Ave.
Marion, Ohio 43302

Source strength: 3710 Curies as of 7-1-1985

Serial No.: T-774 of Model NPI-20-3600W

Points indicated on the sketches on the left are all one (1) meter from the source in the beam "OFF" condition. Survey measurements were taken in these conditions only.

Location	mR/hr.
1	1.3
2	0.7
3	1.6
4	2.1
5	2.8
6	1.3
7	1.4
8	1.5
9	2.3
10	2.4
11	3.0
12	0.8
13	2.1
14	0.5
15	1.9
16	1.8
17	1.0
18	1.7
AVERAGE	1.7 ± 0.7 mR/hour
MAXIMUM	3.0 mR/hour

SURVEY INSTRUMENT USED: Victoreen PANORAMIC Model 470A ionization survey meter, last calibrated in October 1984.

SURVEY CONDUCTED BY

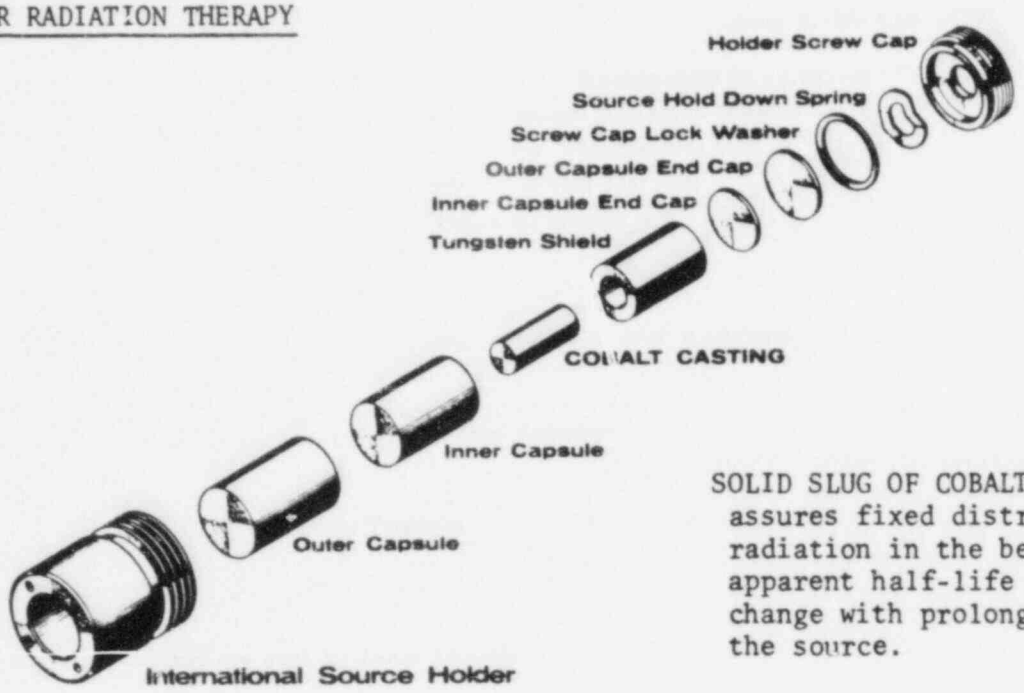
Mukund K Kartha PhD

Mukund K. Kartha, Ph.D., DABR
Consulting Radiological Physicist
4260 Reedbury Lane
Columbus, Ohio 43220
(614)457-0275/(304)424-2744

CONTROL NO. 79375

July 8, 1985

COBALT-60 SOURCES FOR RADIATION THERAPY



SOLID SLUG OF COBALT-60 assures fixed distribution of radiation in the beam; the apparent half-life will not change with prolonged use of the source.

DOUBLE ENCAPSULATION, with or without internal heavy metal shield, is fabricated, seal-welded, leak-tested, and checked for external contamination to highest standards.

Source capsule holder is provided for any teletherapy machine, including INTERNATIONAL CAPSULE (as shown), SHIELDED DRAWER, or other holder as appropriate.

NEUTRON PRODUCTS sources and fabrication procedures have been approved for standard applications in beam therapy units. Licensed personnel provide installation and radiation surveys.

Prices quoted on request will cover FULL SERVICE --- shipping, rigging, installation, routine maintenance, removal and disposal of turn-in source. Special maintenance, calibration, leakage field surveys, reports to regulatory agency, and other services may be ordered.

For further information please write or call:

NEUTRON PRODUCTS INC
22301 Mt. Ephraim Rd
P. O. Box 68
Dickerson, MD 20842
(301) 349-5001

DEPARTMENT OF RADIATION ONCOLOGY

CAMDEN-CLARK MEMORIAL HOSPITAL
800 GARFIELD AVENUE
P.O. BOX 718
PARKERSBURG, WEST VIRGINIA 26102
TELEPHONE 304/424-2744

CHANDRA S. SEKAR, M.D.
Radiation Oncologist

SRINI VASAN, M.D.
Radiation Oncologist

MUKUND K. KARTHA, Ph.D.
Medical Physicist

COBALT-60 TELETHERAPY MACHINE CALIBRATION REPORT

LOCATION:	Radiology Department Frederick C. Smith Clinic Community Hospital 1040 Delaware Avenue Marion, Ohio 43302
MACHINE:	PICKER C-9, Model 590-E Serial number 130
SOURCE:	Neutron Products, Inc. NPI-20-3600W, Ser.No. T-774 3710 Curies as of 7-1-1985 Installed June 28, 1985
Calibration date:	June 29, 1985 July 6, 1985
Physicist:	Mukund K. Kartha, Ph.D., DABR 4260 Reedbury Lane Columbus, Ohio 43220 (614) 457-0275 (residence)

DETAILS AND RESULTS OF CALIBRATION MEASUREMENTS AND PHYSICS CHECK

1. Dosimetric Instrumentation used in the full calibration of this telecobalt unit include Capintec 192X electrometer, sr.No.46301431, with Capintec Model CII.6 Farmer ionization chamber, sr.No.3252 and Capintec Model CII G guarded ionization chamber, sr.No.CII G.65555(used for in-phantom measurements). The system was last calibrated at the ADCL at Allegheny Singer Research Foundation, Pittsburg, Pennsylvania, in August 1983.

   Calibration was performed following the AAPM TG21 protocol, with the in-air measurements taken with the Farmerchamber and cobalt build-up cap, centered at 80cm SAD. The in-phantom measurements, according to the TG-21 protocol were performed in a 35cm x 35cm x 50cm water phantom, using the air equivalent plastic gaurded chamber. The surface of the phantom was set at 80cm and the depth of measurements in water was 5cm.

2. Isocenter and Optical Distance Indicator: The mechanical center about which the c-arm of the telecobalt unit rotates was first determined, and the ODI was set to read 80cm at this isocenter. The distance from the distal surface of the collimator assembly to this isocenter was measured to be 35.7cm. This is consistant with the distance previously measured.

The ODI readings at the isocenter for various c-arm angle were taken:

C-arm angle:	0^o	45^o	90^o	135^o	180^o	215^o	270^o	315^o
ODI reading:	80.0	80.0	80.1	80.1	80.1	80.0	79.8	79.9

From tese measuerments, the agreement between the mechanical isocenter and the ODI was established to be ±1mm. The back pointer was found to be in good agreement with the cross hairs defining the field center.

3. Congruence between the Dial size, Light Field and Radiation Field were determined, first by comparing the dial size and the light field size projected at isocenter:

Dial size (cm)	TRIMMERS UP - Light field size at 80cm SAD - Upper Coll.	Lower Coll.	TRIMMERS DOWN Upper Coll.	Lower Coll.
4	41mm	40mm	40mm	40mm
5	51mm	50mm	50mm	50mm
6	60mm	59mm	60mm	60mm
7	70mm	70mm	70mm	70mm
8	81mm	80mm	80mm	80mm
9	91mm	90mm	90mm	90mm
10	101mm	100mm	100mm	100mm
12	120mm	120mm	121mm	121mm
14	140mm	140mm	141mm	141mm
15	150mm	150mm	151mm	151mm
16	160mm	160mm	160mm	161mm
18	180mm	180mm	180mm	181mm
20	200mm	200mm	200mm	201mm
22	221mm	220mm	220mm	221mm
24	242mm	241mm	241mm	241mm
25	251mm	251mm	251mm	252mm
26	260mm	262mm	261mm	262mm
28	283mm	282mm	281mm	282mm
30	303mm	303mm	301mm	302mm
32	323mm	323mm	321mm	322mm
35	350mm	354mm		

The light field and dial size for the full range of field sizes agree within ±1mm.

The congruence between the light and radiation fields were determined by exposing films for the full range of fields sizes, with the light field edges marked with radioopaque wires. The processed films were densitometered to determine the 50% density location in both direction. From these tests the light field and radiation field for the trimmers UP (45cm SDD) were found to agree within ±3mm, where as the agreement was better at ±1mm when the trimmers were at 65cmSDD. The combined effect resulted in a dial size to radiation field congruence of ±2mm for 45cm SDD and ±1.5mm for 65cm SDD.

4. Timer Accuracy: The timer on the operator console which controls the exposure was first compared with a accurate digital clock and was found to be correct within 0.5%. The timer accuracy, which results from the timer controlling the operation of the source drive mechanism, was determined by comparing the exposures measured at one (1) minute single exposure to the cumulative exposure of three (3) 20seconds exposures. From these measurements the timer error was calculated to be -0.06 second.

5. Central Axis Dose Rates in-air was calculated from measurements of exposure with the Farmer chamber and the cobalt build-up cap centered along the central ray at 80cm SAD. At the time of measurements the uncorrected barometric pressure was 741mm Hg and the room temperature was 21°C, giving a air density correction factor of 1.022. The chamber calibration factor for cobalt-60 is 4.829 R/nCoulomb and the TG-21 correction factor for this chamber and cobalt-60 was 4.575 muscle rad per nanoCoulomb. Including the air density correction factor, the total conversion factor was 4.666 rad per nanoCoulomb.

Field size cm x cm	Central axis D_{max} in rad in a minimuscle phantom measured June 29, 1985
4 x 4	86.46
5 x 5	87.84
6 x 6	89.21
8 x 8	90.58
10 x 10	91.65
12 x 12	93.33
15 x 15	95.61
20 x 20	98.05
25 x 25	99.58
30 x 30	100.65
33 x 33*	100.95

* the largest field size before the zonegard light goes off, prohibiting the source operation.

Exposure rates at 5cm depth in the large water phantom were measured for the SSD setup, using the guarded chamber. Following the TG-21 protocol, for the chamber calibration factor fo 5.029 R/nCoul for Co-60, the TG-21 conversion factor was 4.934 rad per nanoCoulomb. The temperature at measurement was 21°C and the uncorrected barometric pressure was 742 mm Hg, giving an air density correction factor of 1.021. The total conversion factor for in-phantom measurements was 5.037 rad per nanoCoulomb for the guarded chamber. These measurements were taken on July 6, 1985

Field size cm x cm	Centarl axis D_{max} at 80cm SSD measured June 29, 1985
4 x 4	89.23
5 x 5	91.05
6 x 6	92.27
7 x 7	93.63
8 x 8	94.44
9 x 9	95.22
10 x 10	96.31
12 x 12	98.45
15 x 15	100.91
17 x 17	102.24
20 x 20	104.47
22 x 22	105.48
25 x 25	106.99
27 x 27	107.62
30 x 30	108.70
33 x 33*	109.04

From the in-air exposure emasurements in the 20cm x 20cm field at 80cm SAD, the source strength was calculated to be 3978 RHM.

6. Dose Rate Dependence on C-arm Angle was determined from measurements at various stationary C-arm angular positions, with the ionization chamber centered along the central ray in a 10cm x 10cm field at 80cm SAD. All exposure rates were normalized to that at 0^o C-arm position:

C-arm angle:	0^o	45^o	90^o	135^o	180^o	225^o	270^o	315^o
Relative dose:	1.000	1.002	1.003	1.007	1.005	1.005	1.008	1.004

From these measurements the angular dependence output was determined to be ± 0.5%.

Dependence of dose rate at c-arm rotation was determined by comparing the exposure for stationary 0^o position to various rotaional speed.

Rotational speed:	120^o/min.	60^o/min.	40^o/min.
Relative output :	0.961	0.968	0.972

The lower output is primarily due to the attenuation by the treatment table and not the dose rate instability.However, the rotational speed of the C-arm was found to be nonlinear with reference to the meter on the controls to set the rotational speed.

Rotational speed set:	120^o/min	60^o/min	40^o/min
Actual rotational speed:	117^o/min	49^o/min	25^o/min
Correction factor :	1.021	1.220	1.586

7. Trimmer Doserate Factors: Dose rates with trimmers at 45cm SDD and at 65cm SDD wer measured to determine the trimmer factors:

65cm SDD field size:	5 x 5	6 x 6	8 x 8	10x10	12x12	15x15	20x20	25x25	30x30
Trimmer Factor:	1.031	1.027	1.023	1,020	1.018	1.017	1.015	1.014	1.009

From these values the average trimmer factor is 1.019 ± 0.009, in excellent agreement with previously measured trimmer factors.

8. Treatment Accessories were checked for its physical conditions and found to be good. Transmission factorsfor all accessories were determined from measureemnts for various field sizes and all possible orientations. For wedge transmission factor measurements, the wedge directions were reversed and average transmission was determined. All values were normalized to the corresponding open field output:

Treatment accessory	Field size cm x cm	Transmission factor
Large shadow block table	5 x 5	0.953
	10 x 10	0.955
	15 x 15	0.957
	20 x 20	0.958
	30 x 30	0.968
	AVERAGE	0.958 ± 0.005
Small 45° Wedge	5 x 5	0.495
	10 x 10	0.498
	15 x 15	0.502
	AVERAGE	0.498 ± 0.028

Treatment accessory	Field size cm x cm	Transmission factor
continued		
Large 45° Wedge	5 x 5	0.494
	10 x 10	0.497
	15 x 15	0.502
	20 x 20	0.511
	AVERAGE	0.501 ± 0.007

The shadow table transmission factor measured, 0.958 compares well with the last calibration value of 0.960. Wedge transmission factors are 2.5% and 1.2% lower (i.e. 0.498 vs 0.511 and 0.501 vs 0.507) for the small and large wedge respectively.

9. Off-Axis Dose Rate Factors or the beam flatness was measured in a 30cm x 30cm field, with the ionization chamber with build-up cap in air. All measuerd values were normalized to that along the central ray:

Location of dose measurement	Off-axis dose factor for a 30cm x 30cm field
CENTRAL AXIS	1.000
5cm right	0.982
10cm right	0.956
14cm right	0.899
15cm right	0.480
16cm right	0.298
5cm left	0.981
10cm left	0.949
14cm left	0.881
15cm left	0.428
16cm left	0.197
5cm head	0.994
10cm head	0.950
14cm head	0.861
15cm head	0.508
16cm head	0.211
5cm foot	0.978
10cm foot	0.947
14cm foot	0.862
15cm foot	0.464
16cm foot	0.179

This beam flatness shows excellent agreement with those measured at previous calibrations and is as expected for the unit with 2cm diameter source.

10. Mechanical and Electrical Operations of the telecobalt head, the treatment table, collimator assembly, telecobalt source mechanism and all safety features were checked out for prompt and accurate performance. The C-arm rotation and the head tilt motorized oprational were functional, but the head angulation drive was found to malfunction. This was brought to the attention of Mr. Russ Brown of the Neutron Products, and in consultation with Dr. Wilson, it was decided that the broken gear mechanism would be replaced as soon as possible. The Collimators were fully functional and the table drives were satisfactory. The maximum allowed field size was 33cm x 33cm, beyond which the ZONEGARD light went off prhibiting the source drive motor from operating.

With the ionization chamber set along the central aixs at the isocenter in the primary field, the source operation and safety mechanisms of the teletherapy unit was monitored.It was observed that the radiation warning lights on the console, at the door and the ZONEGARD were functioning normally as indicated by the manitor chamber. The zonegard light changed to red when the source drive started and stayed red until the source moved back to storage position. The red light on the operators console and the amber light at the door came on as soon as the motor got strated and stayed on along with the green lights during the time the source was in motion. When the source moved in to fully ON position the green lights turned OFF. Similarly, at the termination of the exposure, both light stayed on and the red lights went OFF as the source was moved fully into the OFF position.

The source drive could not be activated, without the door completely closed, some time set on the clock, the clock swith turned on and the key switch activated, in that sequence. As indicated by the monitor chamber, the exposure was terminated by opening the door, or by activating the EMERGENCY OFF switch or when the time on the clock ran out. In order for the source drive to be reactivated the proper steps described above were followed in that sequence.

The area radiation monitor was found to be fully operational, with the monitor coming on with about 2 seconds delay after the source came ON and went off with the same time delay when the source turned OFF, as monitored by the ionization chamber. The area radiation monitor was functional off the battery alone as well off the city power, meaning that the backup battery pack is fully functional.

The CCTV and the direct view morror system to monitor the patients were found in good shape. Wet wipes were taken from collimator surface area closest accessible to the telecobalt source and assayed in a multichannel analyzer for any possible leak. No detectable leak was found. A complete radiation survey of all areas around the telecobalt room and telecobalt head leakage was performed, and the results are attached as separate document.

With the completion of the calibration and radiation survey, the telecobalt unit was judged fully acceptable for clinical use.

Calibration measurements taken, data analyzed and reports prepared by

Mukund K Kartha PhD

Mukund K. Kartha, Ph.D.
Consulting Medical Physiicst

Encl.: Clinical output tables
Cobalt leak test report
Radiation survey report
Cobalt head leakage report

TELETHERAPY SOURCE LEAK TEST

LOCATION OF SOURCE LEAK TESTED:

Picker C-9, Sr. No. 130
Radiology Department
F. C. Smith Clinic
1040 Delaware Avenue
Marion, Ohio 43302

This is to certify that the above listed sealed teletherapy source was leak tested on June 29, 1985 *by obtaining wet wipes from collimator surface areas closest approchable and assayed in:* CANBERRA Series 30 mutichannel analyzer, Model 3100, serial number 1811301, with scintillation welldetector, and compared to the standard ^{60}Co source assay.

RESULTS OF ASSAY:

Sample counts per minute:	571	uncorrected for background
Background counts per minute:	563	
Net sample counts per minute:	7	

EXPECTED sample count per minute on calibration of the assay instrument for a 0.005 µCi 3000 OR 18 cpm per dps

Calculated removable activity from the source tested: less than 100 dps.

COMMENTS: No detectable activity could be removed in this wet wipe test to determine any possible leak from the sealed telecobalt source. As a result it was concluded that the source is free of detectable leak.

Mukund K Kartha PhD

Test performed by:

Mukund K. Kartha, Ph.D., DABR
Consulting Medical Physicist
4260 Reedbury Lane
Columbus, Ohio 43220
(614) 457-0275 Home
(304) 424-2744 Work

MUKUNDA K. KARTHA, PH. D.
Radiological Physics Consultant
4260 Reedbury Lane
Columbus, Ohio 43220
(614)457-0275 : (304)424-2744

REPORT OF RADIATION SURVEY OF PICKER C-9 TELECOBALT INSTALLATION

Location:	Radiology Department F. C. Smith Clinic Community Hospital 1040 Delaware Avenue Marion, Ohio 43302
Machine:	Picker C-9 Head Model 590-E Serial No. 130
Source:	Neutron Products, Inc. Model NPI-20-3600W Serial No. T-774 3710 Curies as of 7-1-1985
NRC License	No. 34-00179-03

The new telecobalt source was installed in the Picker C-9 machine on June 28, 1985. Following the completion of installation, the unit was inpsected, radiation survey and full calibration performed on June 29 and July 6 of 1985 by the consulting Medical/Radiological Physicist.

The complete calibration was performed following the AAPM TG-21 protocol (Medical Physics 10(6), November/December 1983, pp.741-771), both in-air and in a large water phantom. The Capintec 192X electrometer and the Farmer chamber were calibrated at the ADCL at Allegheny Singer Research Corporation, Allegheny General Hospital, Pittasburg, Pennsylvania in August 1983. Capintec 192 has serial number 05C870, and the Farmer chamber Model CII.6 used was serial No. 3252. Complete report of the calibration is submitted as a separate document.

Telecobalt head leakage, when in OFF position was performed with Victoreen PANORAMIC survey meter, Model 470a, serial number 2234, last calibrated in October 1984. Complete area survey when the cobalt source is in ON position, with the largest possible beam size, in worst possible exposure conditions was performed with the same survey instrument on July 6, 1985. A telecobalt source leak test was performed by taking wet wipes off of collomator areas from nearest accessible locations to the telecobalt source and assaying in a CANBERRA multichannel analyzer with scintillation well detector on June 29, 1985.

TELECOBALT HEAD SURVEY

Telecobalt head leakage survey with source in OFF position by measuring exposure rates at eighteen (18) location around the at 1 meter distance from the source. The average exposure rate measured was 1.7 mR per hour, with the maximum exposure of 3.0 mR per hour.

AREA RADIATION SURVEY

The electrical and mechanical limits of the telecobalt head positions beyond which the source operation is not allowed were determined by checking the ZONEGARD light. Following limits were observed, beyond which the ZONEGARD light turned off and the source drive motor became inoperable:

Field size	C-arm angle	Head angulation	Head tilt
33cm x 33cm	0^o	21^o UP	16^o IN
		21^o DOWN	21^o OUT
	45^o	0^o UP	6^o IN
		0^o DOWN	6^o OUT
	90^o	0^o UP	6^o IN
		0^o DOWN	6^o OUT
	135^o	0 UP	6 IN
		0 DOWN	6 OUT
	180^o	0^o UP	6^o IN
		0^o DOWN	6^o OUT
	225^o	0^o UP	6^o IN
		0^o DOWN	6^o OUT
	270^o	0^o UP	6^o IN
		0^o DOWN	6^o OUT
	315^o	0^o UP	6^o IN
		0^o DOWN	6^o OUT

Radiation survey of all areas around the telecobalt room was performed with the largest possible field size (33cm x 33cm at 80cm SAD) and for all allowed head angulations and head tilts. All readings above the background measured in this survey are listed in the following, and those listed were background readings.

Location	C-arm angle	HEAD angle	TILT angle	Ave. Exp. rate
Control station	0^o	21^o UP	16^o IN	0.5 mR/hr
		21^o DOWN	21^o OUT	0.8 mR/hr
	90^o	0^o UP	6^o IN	0.1 mR/hr
		0^o DOWN	6^o OUT	0.3 mR/hr
	180^o	0^o UP	6^o IN	0.2 mR/hr
		0^o DOWN	6^o OUT	0.5 mR/hr
	270^o	0^o UP	6^o IN	0.1 mR/hr
		0^o DOWN	6^o OUT	0.2 mR/hr
Door	0^o	21^o UP	16^o IN	0.7 mR/hr
		21^o DOWN	21^o OUT	1.1 mR/hr
	90^o	0^o UP	6^o IN	0.3 mR/hr
		0^o DOWN	6^o OUT	0.2 mR/hr
	180^o	0^o UP	6^o IN	0.2 mR/hr
		0^o DOWN	6^o OUT	0.6 mR/hr
	270^o	0^o UP	6^o IN	0.1 mR/hr
		0^o DOWN	6^o OUT	0.1 mR/hr

Location	C-arm angle	HEAD angle	TILT angle	Ave. Exp. rate
continued from page 2...				
West corridor	0°	21° UP 21° DOWN	16° IN 21° OUT	BG BG
	90°	0° UP 0° DOWN	6° IN 6° OUT	BG BG
	180°	0° UP 0° DOWN	6° IN 6° OUT	BG BG
	270°	0° UP 0° DOWN	6° IN 6° OUT	0.6 mR/hr 1.0 mR/hr
Utility room entry	0°	21° UP 21° DOWN	16° IN 21° OUT	0.2 mR/hr 0.3 mR/hr
	90°	0° UP 0° DOWN	6° IN 6° OUT	BG BG
	180°	0° UP 0° DOWN	6° IN 6° OUT	0.1 mR/hr 0.2 mR/hr
	270°	0° UP 0° DOWN	6° IN 6° OUT	0.4 mR/hr 0.6 mR/hr
Maint. shop	0°	21° UP 21° DOWN	16° IN 21° OUT	BG BG
	90°	0° UP 0° DOWN	6° IN 6° OUT	BG BG
	180°	0° UP 0° DOWN	6° IN 6° OUT	BG BG
	270°	0° UP 0° DOWN	6° IN 6° OUT	BG BG
Radiology office*	0°	21° UP 21° DOWN	16° IN 21° OUT	BG BG
	90°	0° UP 0° DOWN	6° IN 6° OUT	1.0 mR/hr 1.8 mR/hr
	180°	0° UP 0° DOWN	6° IN 6° OUT	BG BG
	270°	0° UP 0° DOWN	6° IN 6° OUT	BG BG
Radiologist's office	0°	21° UP 21° DOWN	16° IN 21° OUT	BG BG
	90°	0° UP 0° DOWN	6° IN 6° OUT	0.5 mR/hr 0.2 mR/hr
	180°	0° UP 0° DOWN	6° IN 6° OUT	BG BG
	270°	0° UP 0° DOWN	6° IN 6° OUT	BG BG

Location	C-arm angle	HEAD angle	TILT angle	Ave. Exp. rate
continued from page 3.....				
Above in office	0°	21° UP	16° IN	BG
		21° DOWN	21° OUT	BG
	90°	0° UP	6° IN	BG
		0° DOWN	6° OUT	BG
	180°	0° UP	6° IN	0.2 mR/hr
		0° DOWN	6° OUT	0.5 mR/hr
	270°	0° UP	6° IN	BG
		0° DOWN	6° OUT	BG

* the area in the north side radiology office where the high exposure rates were measured is primarily storage area. Films area stored in this area in a large built-in shelf and the exposure rates reported were measured on top of the counter above the storage shelves. Additionally, measurable exposures were observed in this area ONLY when the C-arm is at 90° angle, which directs the primary beam towards this wall, with maximum filed openings. When the field size was reduced below 20cm x 20cm no measurable exposure was detected at this site. Since less than ¼ of the beam on time the beam is likely to be directed at this wall, and it would be very seldom, in a clinical situation the largest field size would be used for any lateral patient treatment, this exposure situation is likely to exist only in less than 10% of the total beam-on time. With an occupancy of ¼ and the 10% beam on time of 1 hour per week at this wall (i.e. 10% of a total of two hour beam on time per day, five days-a-week treatment), the weekly exposure rate at the counter top in the radiology office is estimated to be a maximum of two (2) mR.

The other area of concern is the office on the first floor above the telecobalt room. This offoce has an occupany of one (1), with uncontrolled access. Once again the maximum exposure rate of 0.5 mR/hr observed is in the worst of condition. Assuming this situation exists and considering that the beam is directed to the ceiling 40% of the time, the maximum weekly exposure rate estomated for this location is 2 mR.

In no location outside the telecobalt room, the exposure rate in worst of beam orientation was measured to be in excess of 2 mR/hr and at no location exposure rates significant enough to warrant caution was measured.

The backgorund reading in the general area was measured to be 0.05 mR/hour for the ionozation survey meter used. A room layout showing the location of surrounding areas on the basement floor on which the telecobalt unit is installed in attached.

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MEDICAL DEVICE AND LABORATORY PRODUCT PROBLEM REPORTING PROGRAM

ACCESS

DATE

1 TRADE NAME AND TYPE OF PRODUCT *(Attach labeling, if available)*

2 PRODUCT IDENTIFICATION
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3 NAME AND ADDRESS OF MANUFACTURER

4 EXPIRATION DATE *(If applicable)*

5 YOUR NAME

6 YOUR FACILITY'S NAME, ADDRESS, AND ZIP CODE

AREA CODE AND PHONE NUMBER OF YOUR FACILITY

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