

MAINE RADIATION PHYSICS, INC.
P.O. Box 664
Portland, Maine 04104

REPORT OF COBALT-60 CALIBRATION
THE AROOSTOOK MEDICAL CENTER
151 ACADEMY STREET
PRESQUE ISLE, MAINE 04769

LICENSE: 18-07032-01

I. Date of Calibration

April 20, 1985

II. Reason for Calibration

Installation of new Cobalt-60 unit

III. Name and Address of Institution

The Aroostook Medical Center
151 Academy Street
Presque Isle, Maine 04769

IV. Name and Address of Person doing Calibration

Joseph S. Blinick, Ph.D.
Maine Radiation Physics, Inc.
P.O. Box 664
Portland, Maine 04104

V. Therapy Equipment

Therapy unit: AECL Model GS2200C (Theratron 780),
S/N 431
Source: AECL Type C-146 Co-60 source, S/N S3716.
This source is 1.5 cm diameter, and is
certified by AECL to have had an
activity of 5590 Ci on 2/20/85.

VI. Measuring Equipment

Output measurements were made with a Baldwin Farmer
Model 2570 secondary standard dosimeter, S/N 326,
equipped with a Model 2571 0.6 cc chamber, S/N 546. A
delrin buildup cap was used to produce a total wall
thickness of 0.5 cm. The system was last calibrated at
the AAPM Accredited Dosimetry Calibration Laboratory at
K & S Associates, Nashville, TN, on August 23, 1984.

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VII. Isocenter Alignment

The mechanical center of rotation of the unit was found to be 35.0 cm from the bottom of the trimmers (for a 10x10 cm field @ 80 cm SAD). This point is specified by AECL to be 45.0 cm from the source. A mark on an upright film was made at this point, and the film exposed to a series of narrow beam exposures at various angles of gantry rotation. The resultant pattern indicates that the radiation center of rotation is within 2 mm of the mechanical center. The regular appearance of the pattern indicates that there is no offset rotation of the head and no significant bearing sag. (Film to be kept by TAMC for their records).

VIII. Verification of Optical Distance Indicator

Using the mechanical center of rotation as a reference point, the optical distance indicator was found to read as follows:

OPTICAL INDICATOR	ACTUAL DISTANCE FROM SOURCE
55 cm	54.7 cm
60	59.8
65	64.8
70	69.8
75	75.0
80	80.0
85	85.2
90	90.4
95	95.4
100	100.5

IX. Mechanical Alignment

The cross hairs were projected on a piece of graph paper taped to the table top. The variation of the intersection of the cross hairs was noted as:

- The collimator was rotated through its full range.
- The table was raised from its lower to upper limit.
- The table was rotated from -90° to $+30^\circ$ (compared to its normal position).

In all cases, the variation was less than 1 mm.

X. Verification of the Gantry Angle Indicator

A spirit level was used to set the gantry angle to four cardinal values, and the readings of the mechanical indicator in the room, and the electronic indicator on the control panel were noted.

ACTUAL ANGLE	MECHANICAL INDICATOR	ELECTRONIC INDICATOR
00	0	000
90	90	091
180	180	180
270	270	270

XI. Verification of Field Size Indicators

At a true SSD of 80.0 cm, indicated field sizes were compared to measured values.

ACTUAL FIELD SIZE	INDICATED FIELD SIZE
5.0 x 5.0 cm	4.9 x 5.0 cm
10.0 x 10.0	9.9 x 10.0
15.0 x 15.0	14.9 x 15.1
20.0 x 20.0	19.9 x 20.0
35.0 x 35.0	34.9 x 35.0

XII. Verification of Light and Radiation Field Congruence

Films were taken at 80.0 cm SSD using RP/TL films for 5x5, 10x10, 20x20, and 35x35 cm field sizes. These films show the light and radiation field congruence to be within 2 mm in all cases. (Films to be kept by TAMC for their records).

XIII. Timer and Shutter Error

The timer was checked with a stop watch, and was found to be accurate to better than one second during a period of one minute. The shutter error was determined by making one exposure of four minutes, and four consecutive exposures of one minute, and comparing the output readings. The shutter error was found to be -0.5 sec. The negative sign indicates that the beam is effectively on for 0.5 second less than the setting on the timer. For treatment times of one minute or longer, the shutter error may be neglected.

XIV. Output (Dose) Measurements

All measurements were made in air at 80.0 cm source-to-chamber distance. Field sizes were determined by the collimator readings. The dose rates at a depth of 0.5 cm in tissue at an SSD of 80.0 cm were determined from the expression:

$$D = \frac{R \times N \times C_{tp} \times A \times f \times B \times I}{t}$$

where

- D is the dose rate in rads/min,
- R is the instrument reading,
- N is the cobalt-60 calibration factor for the instrument (0.992),
- C_{tp} is the temperature/pressure correction factor, (at the time of measurement, T was 22.2°C, P was 746 mm Hg, and $C_{tp} = 1.019$)
- A is the attenuation factor for the build-up cap (0.985),
- f is the Roentgen to Rad conversion factor (0.957 for water),
- B is the backscatter factor,
- I is the inverse square correction to 80.5 cm (0.988), and
- t is the actual beam-on time (corrected for shutter error).

The dose values obtained were then fitted to a logarithmic curve to obtain a smoothed output curve.

The output values may be used in conjunction with standard depth dose tables to obtain the dose at depth in tissue.

TABLE I
OUTPUT VS FIELD SIZE

FIELD SIZE (cm x cm)	TIME (min)	AVERAGE READING	B	DOSE RATE IN TISSUE (rad/min)	
				(1)	(2)
4.3 x 4.3	0.991	140.0	1.014	134.9	133.6
5 x 5		140.7	1.017	135.9	135.6
6 x 6		142.0	1.021	137.7	137.9
7 x 7		143.0	1.025	139.2	139.8
8 x 8		144.0	1.029	140.8	141.5
10 x 10		145.7	1.036	143.4	144.3
12 x 12		147.5	1.043	146.1	146.6
15 x 15		149.7	1.052	149.6	149.5
18 x 18		151.5	1.057	152.1	151.8
20 x 20		152.5	1.061	153.7	153.1
25 x 25		154.1	1.067	156.2	155.9
30 x 30		154.7	1.074	157.8	158.2
35 x 35		154.5	1.081	158.7	160.2

(1) - Raw data

(2) - Data fitted to a logarithmic curve

XV. Tray and Wedge Transmission Factors


Measurements were made in air at 80.0 cm SSD for a 10x10 cm field with and without the various trays and wedges in the beam. The ratio of these measurements gives the transmission factors for these devices.

DEVICE	TRANSMISSION FACTOR
Solid Plastic Tray	0.92
Slotted Plastic Tray	0.96
Aluminum Tray (w/holes)	0.96
30° wedge	0.72
45° wedge	0.59
60° wedge	0.42

Note: Wedge factors varied less than 1% when the collimator was rotated from 0° to 90°.

XVI. Recommendations

NONE


Joseph S. Blinick, Ph.D.
Certified Radiological Physicist

BEETEN: William O. Miller, Chief
License Fee Management Branch
Office of Administration -

John E. Glenn, Chief
Nuclear Materials Section B
Division of Engineering and
Technical Programs

LICENSE FEE TRANSMITTAL

A. REGION I

No Fee - Cobalt 60 Survey
Needed

1. APPLICATION ATTACHED

Applicant/Licensee: The Arcostock Medical Center

Application Dated: 4/20/85

Control No.: 03822

License No.: 18-07032-01

2. FEE ATTACHED

Amount: 0

Check No.: 0

3. COMMENTS

Signed Brandi Platchek

Date 5/20/85

B. LICENSE FEE MANAGEMENT BRANCH

1. Fee Category and Amount: 7A

8/85
FEE EXEMPT

at survey report

2. Correct Fee Paid. Application may be processed for:

Amendment ✓

Renewal

License

Signed Frances Brown

Date 5/28/85

6/29/85

NOTE TO: License Fee Management Branch, ADM

FROM: Region I

SUBJECT: VOIDED APPLICATION

Control Number

103822

Applicant

Arastook Medical Center

Date Voided

6-4-85

Reason for Void

18-07032-02 is NOT

teletherapy license.

See CN 018984.

Signature

SL-J

Attachment:
Application

Should be -01 license

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