

APPLICATION FOR MATERIALS LICENSE — TELETHERAPY

INSTRUCTIONS — Complete Items 1 through 22 if this is an initial application or an application for renewal of a license. Use supplemental sheets where necessary. Item 22 must be completed on all applications and signed. Retain one copy. Submit original and one copy of entire application to: Director, Office of Nuclear Materials Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. Upon approval of this application, the applicant will receive a Materials License. An NRC Materials License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Parts 19, 20, 21, and 35 and the license fee provision of Title 10, Code of Federal Regulations, Part 170. The license fee category should be stated in Item 22 and the appropriate fee enclosed.

<p>1.a. NAME AND MAILING ADDRESS OF APPLICANT (institution, firm, clinic, physician, etc.) INCLUDE ZIP CODE</p> <p style="text-align: center;">Southeast Missouri Hospital 1701 Lacey Street Cape Girardeau, MO 63701</p>	<p>1.b. STREET ADDRESS(ES), ACTUAL LOCATION OF TELETHERAPY SOURCE, INCLUDING BUILDING NAME, ROOM NUMBER, ETC.</p>
<p>2. PERSON TO CONTACT REGARDING THIS APPLICATION</p> <p style="text-align: center;">W. Donald Agnew</p>	<p>3. THIS IS AN APPLICATION FOR: (Check appropriate item)</p> <p><input type="checkbox"/> a. NEW LICENSE</p> <p><input checked="" type="checkbox"/> b. AMENDMENT TO LICENSE NO. <u>24-00128-05</u></p> <p><input type="checkbox"/> c. RENEWAL OF LICENSE NO. _____</p>
<p>4. INDIVIDUAL USERS (Name individuals who will use or directly supervise use of radioactive material. Complete Supplements A and B for each individual.)</p>	<p>5. RADIATION SAFETY OFFICER (RSO) (Name of person designated as radiation safety officer. If other than individual user, complete resume of training and experience as in Supplement A.)</p> <p>Change to:</p> <p style="text-align: center;">W. Donald Agnew, M.S.</p>

6. SEALED SOURCES TO BE USED IN TELETHERAPY UNITS (Attach supplemental pages if necessary)

	BYPRODUCT MATERIAL (Element and Mass No.)	NAME OF SOURCE MANUFACTURER	SOURCE MODEL NUMBER	MAXIMUM ACTIVITY PER SOURCE	NUMBER OF SOURCES
A.					
B.					
C.					

7. TELETHERAPY UNITS (Attach supplemental pages, if necessary)

	NAME OF MANUFACTURER (include description, if unit is custom made)	MODEL NUMBER
A.		
B.		
C.		

8. USE (Attach supplementary pages, if necessary)

A	B	C

HUMAN USE ONLY
HUMAN AND OTHER USE
(Specify on separate sheet)

RECEIVED BY LFMB

Date: 7/6/84

Log: July 9, 1984

By: [Signature]

Orig. To: [Signature]

Action Compl. [Signature]

Applicant: 57815

Check No. 62307H

Amend: Amend

Date Check Rec'd: 7/6/84

Received By: [Signature]

9. PERSONNEL MONITORING DEVICES

TYPE (Check and/or complete as appropriate)	SUPPLIER (Service Company)	EXCHANGE FREQUENCY
(1) FILM BADGE — WHOLE BODY		
(2) THERMOLUMINESCENT DOSIMETER (TLD) — WHOLE BODY		
(3) OTHER (Specify):		

8509130037 850829
REQ3 LIC30
24-00128-05 PDR

INFORMATION REQUIRED FOR ITEMS 10 THROUGH 21

For Items 10 through 21, check the appropriate box(es) and submit a detailed description of all the requested information. Begin each item on a separate sheet. Identify the item number and the date of the application in the lower right corner of each page. If you indicate that an appendix to the teletherapy licensing guide will be followed, do not submit the pages, but specify the revision number and date of the referenced guide. Regulatory Guide 10. Rev. _____ Date: _____

<p>10. MEDICAL ISOTOPE COMMITTEE</p> <p><input checked="" type="checkbox"/> Names and specialties attached; and <i>(check one)</i> (additions only)</p> <p><input checked="" type="checkbox"/> a. Duties as in Appendix A, or</p> <p>b. Equivalent duties attached.</p> <p>11. TRAINING AND EXPERIENCE</p> <p>a. Supplements A & B attached for each individual user; and</p> <p><input checked="" type="checkbox"/> b. Supplement A attached for RSO.</p> <p>12. INSTRUMENTATION <i>(check one)</i></p> <p>a. Appendix C form attached, or</p> <p>b. List manufacturer's name and model number.</p> <p>13. CALIBRATION OF INSTRUMENTS <i>(check one)</i></p> <p>a. Appendix D, Part 2 procedures followed for instrumentation calibration; or</p> <p>b. Description of sources, calibration frequency and equivalent procedures attached.</p> <p>14. FACILITIES AND EQUIPMENT</p> <p>a. Description and drawing of facilities attached; and</p> <p>b. Description of patient viewing and communicating systems attached; and</p> <p>c. Description of area safeguards attached.</p>	<p>15. BEAM STOPS</p> <p>Description of stops used to restrict beam orientation attached.</p> <p>16. SHIELDING EVALUATION</p> <p>Evaluation of proposed shielding attached.</p> <p>17. OPERATING AND EMERGENCY PROCEDURES</p> <p>a. Description of operating procedures attached; and</p> <p>b. Copy of emergency procedures attached.</p> <p>18. INSTRUCTION OF PERSONNEL <i>(check one)</i></p> <p>a. Training program and schedule in Appendix H followed; or</p> <p>b. Description of instruction program for employees attached.</p> <p>19. LEAK TESTS OF SEALED SOURCES</p> <p>Description of leak test procedures attached.</p> <p>20. QUALIFIED EXPERT <i>(Use only if the individual fails to meet 10 CFR 35.24 requirements.)</i></p> <p><input checked="" type="checkbox"/> Statement of qualifications of the expert who will perform teletherapy calibrations attached.</p> <p>21. ALARA PROGRAM <i>(check one)</i></p> <p>ALARA Program as in Appendix I, or</p> <p>Equivalent ALARA Program attached.</p>
<p>22. CERTIFICATE</p> <p><i>(This item must be completed by the applicant)</i></p>	
<p>The applicant and any official executing this certificate on behalf of the applicant named in Item 1a certifies that this application is prepared in conformity with Title 10, Code of Federal Regulations, Parts 30 and 35, and that all information contained herein, including supplements attached hereto, is true and correct to the best of our knowledge and belief.</p>	
<p>a. LICENSE FEE REQUIRED <i>(See section 170.31, 10 CFR 170)</i></p> <p>(1) LICENSE FEE CATEGORY 7.A Amendment</p> <p>(2) LICENSE FEE ENCLOSED \$40.00</p>	<p>b. APPLICANT OR CERTIFYING OFFICIAL <i>(Signature)</i></p> <p>(1) NAME <i>(Type or print)</i> O. David Niswonger</p> <p>(2) TITLE Administrator</p> <p>c. DATE</p>
<p>WARNING: 18 U.S.C. Section 1001; Act of June 25, 1948, 62 Stat. 749, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.</p>	

TRAINING AND EXPERIENCE PROPOSED AUTHORIZED USER OR RADIATION SAFETY OFFICER

1. NAME OF PROPOSED AUTHORIZED USER OR RADIATION SAFETY OFFICER		2. STATE OR TERRITORY IN WHICH LICENSED TO PRACTICE MEDICINE (if physician)		
Willis Donald Agnew, M.S.		N.A.		
3. CERTIFICATION				
SPECIALTY BOARD	CATEGORY	MONTH AND YEAR CERTIFIED		
None				
4. TRAINING RECEIVED IN BASIC RADIOISOTOPE HANDLING TECHNIQUES (To be completed by institution providing training)				
FIELD OF TRAINING	LOCATION AND DATE(S) OF TRAINING	TYPE AND LENGTH OF TRAINING		
		LECTURE/LABORATORY COURSE (Hours)	FORMAL SUPERVISED OUT/LABORATORY EXPERIENCE (Hours)	
RADIATION PHYSICS AND INSTRUMENTATION	Location in all cases: Univ. of Ark. for Med. Sci. Little Rock, AR 72203 8/79 - 12/79	(contact hours) Rad. Iso. Tracer — Lab: 18 hrs. Lecture: 54 hrs. Rad. Chem. — Lab: 18 hrs. Lecture: 54 hrs.		
RADIATION PROTECTION	1/80 - 5/80	(Health Physics Lecture: 54 hrs.	Lab: 36 hrs.	
MATHEMATICS PERTAINING TO THE USE, MEASUREMENT, AND SHIELDING OF RADIOACTIVE SOURCES	8/79 - 12/79 1/80 - 5/80	Biom. I 54 hrs. Bio. Comp. 54 hrs.		
RADIATION BIOLOGY	8/79 - 12/79	Rad. Biol. Lecture: 54 hrs.		
5. EXPERIENCE WITH RADIOACTIVE MATERIALS* (Actual use of radioisotopes or equivalent experience)				
ISOTOPE	MAXIMUM AMOUNT FOR ANY SINGLE APPLICATION	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
Cs-137	100 mCi	Health Physics lab	one semester	calibration
Co-60	10 mCi	" " "	" "	"
P-32, I-131, Pb-210, C-14, H-3	1-10 uCi	Radioisotopes lab	" "	radiochemistry
Tritium Labels	1 uCi	Thesis research	one year	cell labeling
*Experience with sealed radioactive sources under the supervision of qualified instructors should include:				
1. Review of initial source calibration and periodic spot check measurements of teletherapy units.		4. Preparation of treatment plans and treatment times for teletherapy and brachytherapy.		
2. Initial source calibration of sealed sources other than teletherapy sources that are used for treatment purposes.		5. Knowledge of appropriate radiation safety, quality control, and emergency procedures for handling and using sealed sources.		
3. Calibration of ion chambers and survey meters.				
6. I CERTIFY THAT THE INFORMATION PRESENTED ABOVE IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF (Signature of program supervisor)				
Charles E. Breckinridge, Ph.D.				6-12-84
TYPED OR PRINTED NAME				DATE
Charles E. Breckinridge, Ph.D.				6-12-84
NAME OF INSTITUTION				
University of Arkansas for Medical Sciences College of Pharmacy				
MAILING ADDRESS				
4301 West Markham Street				
CITY	STATE	ZIP CODE	RADIOACTIVE MATERIALS LICENSE NUMBER	
Little Rock	AR	72205	ARK-001-INC 7/86 17772	
WARNING: 18 U.S.C. Section 1001, Act of June 25, 1948, 62 Stat. 749, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.				

PRECEPTOR STATEMENT

Supplement B must be completed by the applicant physician's preceptor. If more than one preceptor is necessary to document experience, obtain a separate statement from each.

1. APPLICANT PHYSICIAN'S NAME AND ADDRESS

FULL NAME

STREET ADDRESS

CITY

STATE

ZIP CODE

KEY TO COLUMN C
PERSONAL PARTICIPATION SHOULD CONSIST OF:

1. Supervised examination of patients to determine the suitability for radioisotope therapy and recommendations on dosage to be prescribed.
2. Collaboration in calculation of radiation dose, related measurement, and modification of the originally prescribed dose as warranted by patient reaction to the radiation.
3. Followup of patients when required.
4. Study and discussion with preceptor of case histories to establish the most appropriate therapy procedures, limitations, contraindications, etc.

2. CLINICAL TRAINING AND EXPERIENCE OF PHYSICIAN CITED ABOVE IN USING SOURCES OR DEVICES FOR THERAPY

ISOTOPE	TYPES OF TREATMENT	NUMBER OF CASES INVOLVING PERSONAL PARTICIPATION	COMMENTS (Append additional information, if necessary)
A	B	C	D
Co-60	COURSES OF TELETHERAPY TREATMENT		
OR	INTERSTITIAL		
Cs-137	INTRACAVITARY		
I-125 or-192 OR Au-198 SEEDS	INTERSTITIAL		
Ra-226	INTRACAVITARY		
X-RAY AND ACCELERATOR THERAPY	COURSES OF THERAPY TREATMENT		
Si-90	SUPERFICIAL EYE CONDITIONS		
OTHER			

DATES AND TOTAL NUMBER OF HOURS IN CLINICAL TRAINING USING SEALED SOURCES FOR THERAPY

3. PRECEPTOR'S CERTIFICATION

NAME OF SUPERVISOR	NAME OF INSTITUTION	RADIOACTIVE MATERIALS LICENSE NUMBER
MAILING ADDRESS	CITY	STATE ZIP CODE
I CERTIFY THAT (a) THE INFORMATION PRESENTED ABOVE IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND (b) I WAS AUTHORIZED BY THE REFERENCED RADIOACTIVE MATERIALS LICENSE(S) TO PERFORM THE PROCEDURES SPECIFIED ABOVE. I FURTHER BELIEVE THAT THE APPLICANT PHYSICIAN IS COMPETENT TO PERFORM THESE PROCEDURES INDEPENDENTLY. (Signature)		DATE

WARNING: 18 U.S.C. Section 1001, Act of June 25, 1948, 62 Stat. 749, makes it a criminal offense to make a willfully false statement of representation to any department or agency of the United States as to any matter within its jurisdiction.



The University of Texas System Cancer Center

M. D. Anderson Hospital and Tumor Institute

Texas Medical Center • 6723 Bertner Avenue • Houston, Texas 77030

Department of Physics

May 1, 1984

TO WHOM IT MAY CONCERN:

Willis Donald Agnew attended a course entitled "External Beam Dosimetry - Principles and Calibrations" during the first two weeks in January 1984. He was instructed in this course, and I can give assurance that Agnew is experienced in the calibration and checking of Co-60 radiation therapy units.

RJS:ff

Robert J. Shalek, Ph.D.
Chairman, Department of Physics
Certified in Radiological
Physics
American Board of Radiology



1836-1986

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CURRICULUM VITAE

PERSONAL DATA

Name: Willis Donald Agnew, Jr.
Date of Birth: October 31, 1953
Citizenship: United States
Marital Status: Married, one child
Social Security: 488-60-0431

EDUCATION

1981 Master of Science - Radiological Health
University of Arkansas, Medical Sciences Campus
Little Rock, Arkansas
Thesis: Alkaline Elution in Radiation-Induced
DNA Damage Analysis

1977 Bachelor of Science - Nuclear Medicine Technology
University of Arkansas, School of Health
Related Professions, Little Rock, Arkansas

1976 University of Arkansas at Little Rock
Little Rock, Arkansas (74-76)

1974 Southeast Missouri State University
Cape Girardeau, Missouri (72-74)

1971 University of Missouri - Rolla
Rolla, Missouri

EMPLOYMENT

1983-present Regional Radiation Oncology Center
Southeast Missouri Hospital
Cape Girardeau, Missouri
Medical Radiation Physicist

1981-1983 Monsanto Research Corporation
Mound Facility - D.O.E.
Miamisburg, Ohio
Health Physicist

Continued:

1978-1979	Doctors Hospital Little Rock, Arkansas Nuclear Medicine Department Director
1975-1978	Doctors Hospital Little Rock, Arkansas Nuclear Medicine Technologist
1972-1974	Missouri Delta Community Hospital Sikeston, Missouri X-ray Technician

Request for exception from the requirements of 10 CFR 35.24 in accordance with Footnote 2 of 35.24.

- 1). Name of proposed qualified expert:

Willis Donald Agnew, M. S.

- 2). Description of training and experience of individual above:

See enclosed Supplement A. Form 313T and curriculum vitae.

- 3). Reports of calibration and spot check program at Southeast Missouri Hospital, performed by proposed expert, are attached.
- 4). Endorsement of technical qualifications of proposed expert by ABR - certified physicist is enclosed.

Calibration and Spot Check Program

Instrument: AECL Theratron 80

Source: Cobalt-60, 5155 Curies on 2/15/82

Location: Southeast Missouri Hospital
Cape Girardeau, Missouri

Person performing measurements: Willis Donald Agnew, M.S.

Tests Performed Monthly:

1. Gantry Angle checked with level
2. Light Field vs Radiation Field
3. SSD Check at 80 cm
4. Crosswire travel with collimator rotation and table height adjustment
5. Backpointer Check at 80 cm
6. Field Size Indicators
7. Security of Blocking Tray and Wedge Filters
8. Beam Flatness & Symmetry Film with scan by isodensitometer
9. Timer Accuracy
10. Dose Rate Determination vs Rate expected from annual calibration (by decay)
11. Emergency Off Check of Interlocks

Tests Performed at Annual Calibration: (in addition to those above)

12. Dose Rate Determination for a full range of field sizes
13. Depth Dose Check
14. Wedge Filter Transmission Factors
15. Blocking Tray Transmission Factors.

7/21/83 Output Check

Poly Phantom no Tray Keithley System

2': 43.8, 43.8

2x 1': 43.1, 43.1

$$\frac{43.8}{2-\pi} = \frac{43.1}{2-2\pi}$$

$$87.6 - 87.6\pi = 86.2 - 43.1\pi$$

$$44.5\pi = 1.4$$

$$\pi = 0.03 \text{ shutter correction}$$

T = 25 P = 755 CTP = 1.017

%DD: 81.0 80SSD 4.5cm depth no Lucite

$$\dot{D} = 43.8 \times 1.017 \times 4.64 \times \underbrace{0.991}_{4.64 \times 0.991} \times 0.95 \times (0.81 \times 1.97) = \frac{121.94}{123.04}$$

$$\text{Correct for Lucite: } 121.94 / 1.03 = 118.4 \quad 119.4$$

Reading on 7-10-83 is 118.2

$$\text{corrected 11 days: } 118.2 \times 0.996 = 117.73$$

$$\% \text{ difference} = \frac{118.2 - 117.73}{117.73} \times 100 = 0.4\%$$

Remind 7/25 Lymphosinh

$$8/10 - 9/10 \quad 10 \times 10 \quad \frac{100 \text{ rats}}{115.6} = .865$$

7/27/83

Monitrex Check

1.03 min

upper: .353

lower: .127

ratio: 1.329

8-29-83

- ① Gantry angle @ 0° OK
- ② Light field vs x-ray field 0/180 OK
- ③ SSD 79.5 cm to 80 mech. 80 optical OK
- ④ crosswire travel 70-790 ± 2 mm OK
- ⑤ crosswire travel coll. rot. ± 2 mm OK
- ⑥ Backpointers @ 80 cm ± 2 mm OK
- ⑦ Field Size indicator check

5x5	5x5
10x10	10x10.1
15x15	15x15
20x20	19.9x20

- ⑧ Security of tray & wedges OK
- ⑨ Beam Flatness & Symmetry OK
- ⑩ Output (No Lucite) $C_{TP} = 2.576 \left(\frac{T+273}{P} \right)^K$ OK

T = 24.5 P = 756 $C_{TP} = 1.014$
 4.5 cm depth, 80 SSD

2' 42.6, 42.3, 42.2, 42.2 $\frac{42.45}{2-\pi} = \frac{41.8}{2-2\pi}$
 2x1' 41.8, 41.8 $\frac{84.9-84.9\pi}{-43.1\pi} = \frac{83.6-41.8\pi}{-10.3}$

⑪

$$\begin{aligned} \dot{D} &= \frac{R}{42.45} \times 1.014 \times 4.64 \times 0.95 / (.81)(1.97) = \\ &= R(2.801) \\ &= (42.2)(2.801) \\ &= 118.21 \end{aligned}$$

Expected $\dot{D} = 115.6 \times 1.03 = 119.07$

0.7% diff. OK

- ⑫ Emergency Off OK

⑬ Monitor 1.03 min upper .376 ratio .316
 lower .119 OK

[Signature] 131

9-30-83

- ① Gravity Angle 0° OK
- ② Light Field vs X-Ray Field 90/270 OK
- ③ SSD optical vs measured - adjusted to 80 OK
- ④ crosswise travel 70-90 $\pm 2\text{mm}$ OK
- ⑤ crosswise travel collimator rot. $\pm 2\text{mm}$ OK
- ⑥ Backpointer @ 80cm $\pm 2\text{mm}$ OK
- ⑦ Field Size Indicator Check @ 80SSD

5x5 5.1x5

10x10 10.1x10

15x15 15x14.9

20x20 20x20 OK

⑧ security of Tray & Wedges OK

⑨ Beam Flatness & Symmetry OK

⑩ Output $T = 25$ $P = 758$ $C_{TP} = 2.576 \left(\frac{273 + 25}{758} \right)$ OK

No Lucite 80cm SSD $d = 4.5\text{cm}$ $C_{TP} = 1.013$

2 min: 42.7, 42.5, 42.5, 42.5

2x1 min: 41.9, 42.0, 41.9, 42.0

⑪ Shutter Correction: $\frac{42.5}{2-x} = \frac{41.95}{2-2x}$

$$85 - 85x = 83.9 - 41.95x$$

$$43.05x = 1.1$$

$$x = 0.0255$$

$$\boxed{-0.03} \text{ OK}$$

$$\dot{D} = R(1.013)(4.64)(0.95)(1.97)(0.81)$$

$$= R(2.798)$$

$$= 42.5 \times 2.798$$

$$= 118.93 \text{ rad/min}$$

$$\text{Expected } \dot{D} = 114.4 \times 103 = 117.83$$

$$\% \text{ Difference} = 0.93\%$$

OK

⑫ Emergency Ore OK

⑬ Monitor Check 103 min

upper: 366 lower: 113 ratio: 306 OK

10-26-83

OK
OK
OK
OK
OK
OK

- ① Entry angle 0° OK
- ② Light Field vs X-Ray Field $0/180$ OK
- ③ SSD optical vs measured $80/80$ OK
- ④ crosswire travel $70-90 \pm 2 \text{ mm}$ OK
- ⑤ crosswire travel coll. rot. $\pm 2 \text{ mm}$ OK
- ⑥ Backpointer @ 8cm $\pm 2 \text{ mm}$ OK
- ⑦ Field Size @ 80 SSD

5x5	5.1x5
10x10	10.1x10
15x15	15x15
20x20	20x20

OK
OK
OK

- ⑧ Security of Tray & wedges
- ⑨ Beam Flatness & Symmetry
- ⑩ Shutter Correction &
- ⑪ Output: 80 cm SSD, d: 4.5 cm NO LUCITE

$T=24 \quad P=757 \quad C_{TP} = 2.576 \left(\frac{277+24}{757} \right) = 1.011$

$2' : 41.8, 41.9$

$\frac{41.85}{2-x} = \frac{41.4}{2-2x}$

$2 \times 1' : 41.4, 41.4$

$83.7 - 83.7x = 82.8 - 41.4x$

$42.3x = .9$

$x = 0.02 \text{ min}$

OK

$\dot{D} = R(1.011)(4.64)(0.95)/(4.98)(0.81)$

$= R(1.104) \text{ rad/min}$

$= (105.4)(1.104)$

$\dot{D} = 116.4 \text{ rad/min}$

Expected $\dot{D} = 113.1 \times 1.03 = 116.5$

% Difference $< 0.1\%$ OK

⑫ Emergency Off OK

⑬ Monitor Check:

upper	362	363	364
lower	113	116	117
ratio	311	318	320

[Signature]

11-29-83

- 1 Gantry Angle 0° OK
- 2 Light Field vs X-Ray Field 90/270 DONE OK
- 3 SSD optical vs measured OK
- 4 cross wire travel 70-90 ± 2 mm OK
- 5 cross wire travel collimator rotation ± 1 mm OK
- 6 Backpointer @ 80cm ± 2 mm OK
- 7 Field Size Indicator Check @ 80cm

indicated	5 x 5	measured	5.2 x 5	} OK
	10 x 10		10.2 x 10	
	15 x 15		15.2 x 15	
	20 x 20		20 x 20	

- 8 Security of Tray & Wedges OK
- 9 Beam Flatness & Symmetry Film DONE OK
- 10 Shutter Correction

2 min exposure: 41.4, 41.4
 2 x 1 min exposures: 41.0, 41.0

$$\frac{41.4 - 41.0}{2 - x} = \frac{41.0 - 82.8}{2.2 - x}$$

$$41.8x = 0.8$$

$$x = .019 = 0.02 \text{ OK}$$

11 Output T: 23 P: 756 $C_p = 2.576 \left(\frac{273 + 23}{756} \right) = 1.0086$
 NO TRAY

$$\dot{D} = R(4.64)(0.95)(1.0086) / (1.98)(0.81)$$

$$= R(\cancel{2.786})$$

$$= R(2.772)$$

$$= (41.4)(2.772)$$

$$= 114.8 \text{ rad/min}$$

Expected: $111.9 \times 1.03 = 115.3$

% Difference = 0.4% OK

12 Emergency Off OK

13 Monitrex Check: upper .358
 lower .106
 ratio .293

[Signature]

12-27-83

Gantry Angle @ 0°

OK

Light Field vs X-Ray Field 0/180

OK

SSD optical: 80 measured: 80

OK

crosswise travel 70-90 ± 2mm

OK

crosswise travel collimator rotation ± 2mm

OK

Backpointer @ 80 cm ± 2mm

OK

Field Size @ 80 cm

indicator	5x5	measured	5.1x5
	10x10		10.1x10
	15x15		15x15
	20x20		20x20

OK

Security of tray & wedges

OK

Beam Flatness & Symmetry DONE

OK

Shutter Correction:

$$\frac{40.7}{2-x} = \frac{40.4}{2-2x}$$
$$81.4 - 81.4x = 80.8 - 40.4x$$
$$0.6 = 41x$$

2min: 40.7, 40.7

2x1min: 40.4, 40.4

x = .015 ⇒ use 0.02 min

OK

Output T=23 P=756 C_{TP}: 2576 ($\frac{273+23}{756}$): 1.0086

No Tray, 80cm SSD, d: 4.5 cm, 10x10 Keithley

D = R(4.64)(0.95)(1.0086)(0.81)(4.98)

= R(1.102)

= (102.7)(1.102)

= 113.2 rad/s/min

Expected: 110.7 x 1.03 = 114.0

% Difference: 0.7%

OK

Emergency Off: OK

Monitors Check: upper 351

lower 110

ratio 311

OK

135

1-30-84

1. Gravity Angle @ 0° OK
2. Light Field vs X-Ray Field 90/270 OK
3. SSD optical: 80 measured: 80.5 Adj to 80 OK
4. crosswise travel 70-90 ± 2 mm OK
5. crosswise travel collimator rotation ± 2 mm OK
6. Backpointer @ 80 mm ± 2 mm OK
7. Field Size Indicator Check

5x5	5.1x5	
10x10	10.1x10	
15x15	15.1x15	
20x20	20x20	OK

8. Security & Tray & Wedges OK
9. Beam Flatness & Symmetry Done OK
10. Shutter Correction

2 min exp: 40.8, 40.7, 40.8, 40.8 $\frac{40.8}{2-x} = \frac{40.4}{2-2x}$

2X 1min exp: 40.4, 40.4, 40.5 $81.6 - 81.6x = 80.8 - 40.4x$

$0.8 = 41.2x$ OK

$x = 0.019 \Rightarrow 0.02$

11 Output $T=22^\circ$ $P=758$ $\left(\frac{273+22}{758}\right)(2.576) = 1.0025$

NO TRAY

$\dot{D} = (40.8)(1.0025)(4.64)(0.95) / (1.98)(0.81) =$

$\dot{D} = 112.42 \text{ rad/min}$

Expected: $109.5 \times 1.03 = 112.8 \text{ rad/min}$

Difference = 0.3%
 Tray factor

12. Emergency Off: OK

13. Monitor Check upper: 343
- lower: 105
- ratio: 303 OK

T = 21
P = 758

$$C_{TP} = \left(\frac{273.15 + 21}{295.15} \right) \left(\frac{760}{758} \right) = 0.999$$

2-29-84

Grantry Angle @ 0°

OK

Light Field vs X-Ray Field 0/180

OK

SSD optical: 80 measured: 79 3/4 adj to 80 OK

crosswise travel 70-90 SSD: ± 2 mm OK

crosswise travel & collimator rotation: ± 1 mm OK

Backpointer @ 80 cm SSD ± 2 mm OK

Field Size Indicator Check

	5x5	measured	5x5.1	} OK
optical	10x10		10x10.1	
	15x15		15x15.1	
	20x20		20.1x20.1	

security of tray & wedges:

OK

Beam Flatness & Symmetry Film: Done

Shutter Correction 2min exp: 40.4, 40.4, 40.5, 40.5

2X/min exp: 40.2, 40.2, 40.2, 40.2

$$\frac{40.45}{2-x} = \frac{40.2}{2-2x}$$

$$80.9 - 80.9x = 80.4 - 40.2x$$

$$40.7x = .5$$

$$x = 0.012 \text{ min}$$

OK

Output 10x10 80SSD 4.5cm depth

$$\dot{D} = (40.45)(0.999)(4.64)(0.95)(1.98)(0.81)$$

$$\dot{D} = 111.06 \text{ rad/min}$$

OK

$$\text{Expected: } 108.2 \times 1.03 \left(\frac{\text{Tray Factor}}{\text{Factor}} \right) = 111.4$$

$$\text{Difference: } 0.3\%$$

OK

Emergency OFF: OK

Montrex Check: upper 341 lower 106 ratio 308 OK

T = 23 22.0

P = 744.5

CTP = 1.0208

3-28-84

Grantry Angle @ 0°

OK

Light Field vs Beam Field 90/270

OK

SSD optical 80 measured 80

OK

crosswire travel 70-90 ± 2 mm

OK

crosswire travel coll. rot. ± 2 mm

OK

Backpointer @ 80 cm ± 1 mm

OK

Field Size Indicator Check @ 80 cm

5 x 5 5.2 x 5

10 x 10 10.2 x 10

15 x 15 15.2 x 15

20 x 20 20.2 x 20

OK

Security of Tray & Wedges

OK

Beam Flatness & Symmetry Film DONE

OK

Shutter Correction

$$\frac{38.6}{2-x} = \frac{38.3}{2-2x}$$

2 min exp: 38.6, 38.6

$$77.2 - 77.2x = 76.6 - 38.3x$$

2 x 1 min exp: 38.3, 38.3

$$38.9x = 0.6$$

$$x = 0.015 \checkmark$$

OK

Output 80 cm SSD 10 x 10 $d = 4.5$ cm NO TRAY

Koithley

$$\dot{D} = (38.6)(1.0208)(4.64)(0.95) / (1.985)(.81)$$

$$\dot{D} = 108.0 \text{ rad/min}$$

*

Expected: $107.0 \times 1.03 = 110.2$

Montrex Check: upper 334

lower 100

Emergency

ratio 296

OFF: OK

3-30-84 OUTPUT RECHECK

T=21

P=757

$$C_{TP} = \left(\frac{273+21}{295} \right) \left(\frac{760}{757} \right) = 1.0006$$

2 min: 40.0, 40.0, 40.0

2x 1 min 39.6 39.7 39.7 39.7

$$\frac{40}{2-7} = \frac{39.7}{2-2x}$$

$$80-80x = 79.4 - 39.7x$$

$$0.6 = 40.3x$$

$$x = 0.015 \text{ min.}$$

$$\dot{D} = (40.0)(1.0006)(4.64)(0.95)(1.985)(0.81)$$

$$\dot{D} = 109.7 \text{ rad/min}^*$$

$$\text{Expected: } 107.0 \times \underset{\substack{\text{trap} \\ \text{factor}}}{1.03} = 110.2$$

$$\text{Difference: } \frac{109.7 - 110.2}{110.2} = -0.5\%$$

* Difference of readings on 3-28-84 & 3-30-84 was due to buildup cap not being screwed down fully tight on 3-28-84. *BSA*

T: 23

P: 752

4-27-84

Gantry Angle @ 0°

OK

Light Field vs Beam Field

0/180

Done

OK

SSD

optical: 80

measured: 80

OK

crosswise travel 70-90

± 2 mm

OK

crosswise travel coll. rot.

± 1 mm

OK

Backpointer @ 80 cm

OK

Field Size Indicator Check

5x5

5

52x5

10x10

10

10.1x10

15x15

15

15.1x15

20x20

20

20x20

OK

Security of Tray & Wedges

OK

Beam Flatness & Symmetry Film

Done

OK

Shutter Correction:

2 min exp: 38.6, 38.6

2x 1 min exp: 38.3, 38.3

$$\frac{38.6}{2-x} = \frac{38.3}{2-2x}$$

$$77.2 - 77.2x = 76.6 - 76.6x$$

$$.6 = 38.9x$$

$$x = 0.015$$

Output 80 SSD, 10x10, d=4.5

NO TRAY

Keithley

C_{TP} = 1.0141

$$D = (38.6 \times 1.0141)(4.64)(0.95) / (0.81)(1.985)$$

$$D = 107.3 \text{ rad/min}$$

$$\text{Expected: } 105.9 \times 1.03 = 109.1$$

$$\text{Difference} = \frac{107.3 - 109.1}{109.1} = 1.6\%$$

Emergency Off: OK

Monitor Check: upper 333

lower 093

276

5-21-84

ANNUAL CALIBRATION

1. Gantry angle @ 0° OK
2. Light Field vs. Beam Field 90°/270°
3. SSD optical: 80 measured: 80 OK
4. Crosswire travel SSD: 70-90 $\pm 3\text{mm}$ OK
5. Crosswire travel & Collimator Rotation @ 80 SSD $\pm 2\text{mm}$ OK
6. Backpointer @ 80^{SSD} $\pm 3\text{mm}$ OK
7. Field Size Indicator Check

F.S. Indicator

Measured

5 x 5

5.2 x 5

10 x 10

10.2 x 10

15 x 15

15.2 x 15

20 x 20

20.2 x 20.2

8 Security of Tray & Wedges OK

9 Beam Flatness & Symmetry Film Done OK

10 Isocentric Rotation Film OK

11. Collimator Rotation Film OK

12 Emergency Off OK

Monitrex Check

upper 325

lower .093

ratio 293

KEITHLEY SYSTEM Calibrated May 8, 1984
by ADCL, U. of Wisconsin, Madison

Ion Chamber: Nuclear Enterprises Ltd.

Model 2505/3A SN 1857

Electrometer: Keithley Model 616 SN 42481A

Interface: Keithley Model 6169 SN 42389A

5-22-84

Field Size Effect in A:5 80 SSD 0.5cm Buildup Cap

size	reading @ 1min
5x5	21.5
10x10	22.3
15x15	23.0
20x20	23.6
30x30	24.0

Blocking Tray Transmission 10x10

readings: 21.3, 21.3, 21.0, 20.9, 21.3
(tray moved 0.5cm \pm each edg.) $\frac{\text{tray}}{\text{no tray}} = \underline{0.95}$

Wedge Factors 80 SSD, 10x10

2min readings

no tray, no wedge: 45.1, 45.1

		Factor
30°	32.7, 32.5	0.723
45°	28.6, 28.2	0.630
60°	19.22, 18.61	0.419

Isocentric Readings center of chamber @ 80cm, 5cm Buildup Cap

0°: ~~22.3~~ 45.9 (2min) 10x10

90°: 45.3

270° ~~180°~~: 46.0

[Signature]

5-22-84

5-22-

Field Size Effect @ 80 SSD $d = 4.5 \text{ mm}$

5x5	readings:	17.55
10x10	(1 min)	19.15
15x15		20.4
20x20		21.2

Times Error / Shutter Correction

2 min edgs: 38.8, 38.8, 38.7

2x/min edgs: 38.5, 38.4, 38.4

$$\frac{38.7}{2-x} = \frac{38.43}{2-2x}$$

$$77.54 - 77.54x = 76.86 - 38.43x$$

$$.68 = 39.11x$$

$$x = 0.017 \text{ min}$$

$$T = 23$$

$$P = 754.5$$

$$C_{TP} = \left(\frac{273.15 + 23}{295.15} \right) \left(\frac{760}{754.5} \right) = 1.0107$$

$$\dot{D} = (38.77)(1.0107)(0.95)(4.66 \times 10^4)(0.987 \times 10^{-9}) / (6.31)(1.983)$$

$$\dot{D} = 106.6 \text{ rad/min @ } d_{\text{max}} \text{ } 10 \times 10, 80 \text{ SSD}$$

Field Size Effect @ 80 SSD, $d = 14.5 \text{ cm}$

size	readings @ 1 min
5x5	8.08
10x10	9.76
15x15	10.89
20x20	11.64

5-22-84

Field Size Effect in A:5 80 SSD 0.5cm Buildup Co

size	ading @ 1min
5x5	21.5
10x10	22.3
15x15	23.0
20x20	23.6
30x30	24.0

Blocking Tray Transmission 10x10

readings: 21.3, 21.3, 21.0, 20.9, 21.3
(tray moved 0.5cm \pm each edg.) $\frac{\text{tray}}{\text{no tray}} = 0.95$

Wedge Factors 80 SSD, 10x10

2min readings

no tray, no wedge: 45.1, 45.1

		Factor
30°	32.7, 32.5	0.723
45°	28.6, 28.2	0.630
60°	19.22, 18.61	0.419

Isocentric Readings center of chamber @ 80cm, .5cm Buildup

0°: ~~22.3~~ 45.9 (2min) 10x10
90°: 45.3
270°/180°: 46.0

[Signature]

17773

NOTE TO: License Fee Management Branch, ADM

FROM: Region III

SUBJECT: VOIDED APPLICATION

Control Number 17773

Applicant Southwest Missouri Hospital

Date Voided 8/29/85

Reason for Void Authorization to add user

not approved

Signature S. Schnalle

Attachment:
Application

Voided 8/29/85
Withdrawn after
review
no refund due

July 3
27773
* Voided after
review
9/9/85