

**OFFICIAL RECORD COPY**  
**MATERIALS LICENSE**

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 18.3 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee		In accordance with letter dated November 25, 1996	
1. West Virginia University		3. License Number	47-23035-01
		is amended in its entirety to read as follows:	
2. Morgantown, West Virginia 26506		4. Expiration Date	August 31, 2001 (extended)
		5. Docket or Reference No.	030-20199
6. Byproduct, Source, and/or Special Nuclear Material		7. Chemical and/or Physical Form	8. Maximum Amount that Licensee May Possess at Any One Time Under This License
A. Any byproduct material with atomic numbers 3 through 83, inclusive with a half life of less than 120 days	A. Any	A. Not to exceed 10 millicuries per nuclide	
B. Hydrogen 3	B. Any	B. 2000 millicuries	
C. Carbon 14	C. Any	C. 300 millicuries	
D. Phosphorus 32	D. Any	D. 500 millicuries	
E. Sulfur 35	E. Any	E. 500 millicuries	
F. Chlorine 36	F. Any	F. 10 millicuries	
G. Calcium 45	G. Any	G. 10 millicuries	
H. Chromium 51	H. Any	H. 300 millicuries	
I. Iron 55	I. Any	I. 10 millicuries	
J. Zinc 65	J. Any	J. 10 millicuries	
K. Technetium-99m	K. Any	K. 100 millicuries	
L. Tin 125	L. Any	L. 50 millicuries	
M. Iodine 125	M. Any	M. 500 millicuries	
N. Iodine 131	N. Any	N. 100 millicuries	
O. Tellurium 129	O. Any	O. 60 millicuries	

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6. Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
P. Barium 133	P. Any	P. 9 millicuries
Q. Cadmium 109	Q. Any	Q. 10 millicuries
R. Nickel 63	R. Foils contained in detector cells registered pursuant to 10 CFR 32.210	R. Ten cells of no more than 12 millicuries each
S. Americium 241	S. Sealed neutron source registered pursuant to 10 CFR 32.210 or an equivalent Agreement State Regulation	S. Not to exceed 100 millicuries per source
T. Cesium 137/Americium 241	T. Combined sealed source registered pursuant to 10 CFR 32.210 or an equivalent Agreement State Regulation	T. No single source to exceed 10 millicuries of cesium 137 and 50 millicuries of americium 241
U. Cesium 137	U. Sealed source registered pursuant to 10 CFR 32.210 or an equivalent Agreement State Regulation	U. No single source to exceed 10 millicuries
V. Cesium 137	V. Sealed source registered pursuant to 10 CFR 32.210	V. 132 curies
W. Cobalt 60	W. Sealed source (Tech/Ops Model No. 57)	W. 15 millicuries
X. Iodine 125	X. Sealed sources registered pursuant to 10 CFR 32.210 or an equivalent Agreement State Regulation	X. No single source to exceed 200 millicuries
Y. Cesium 137	Y. Sealed source registered pursuant to 10 CFR 32.210 or an equivalent Agreement State Regulation	Y. 1 millicurie
Z. Cobalt 60	Z. Sealed source registered pursuant to 10 CFR 32.210 or an equivalent Agreement State Regulation	Z. 1 millicurie

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## 9. Authorized Use:

- A. through R. Research and development as defined in 10 CFR 30.4. In vitro laboratory studies. Teaching and training of students. Laboratory tracer studies in farm animals.
- S., T., and U. For use in compatible Troxler portable gauges (registered pursuant to 10 CFR 32.210 or an equivalent Agreement State Regulation) to measure properties of materials.
- V. For use in J.L. Shepherd Model 78 Series source projector for instrument calibration.
- W. Instrument calibration.
- X. For use in bone mineral analyzers registered pursuant to 10 CFR 32.210 for laboratory research on animals.
- Y. and Z. For use in dose calibrator checks.

## CONDITIONS

10. Licensed material shall be used only at the licensee's facilities located at:
- A. The Morgantown Campus, Morgantown, West Virginia, to include all facilities as described in Item 30.B.(11).
  - B. The Charleston Division, 3110 MacCorkle Avenue, S. E., Charleston, West Virginia for only those radioisotopes and quantities identified in the licensee's letter dated April 16, 1991, and in accordance with commitments in letter dated August 7, 1991; and,
  - C. In addition, portable moisture/density gauges containing licensed material may also be used at temporary job sites of the licensee anywhere in the state of West Virginia.
11. Licensed material shall be used by, or under the supervision of, individuals designated by the West Virginia University Radiation Safety Committee. The licensee shall maintain records of individuals designated as authorized users.
12. The Radiation Safety Officer for this license is **Kenneth H. Douglass, Ph.D.**
- 13.
- A. Sealed sources and detector cells shall be tested for leakage and/or contamination at intervals not to exceed 6 months or at such other intervals as specified by the certificate of registration referred to in 10 CFR 32.210.
  - B. Notwithstanding Paragraph A of this Condition, sealed sources designed to emit alpha particles shall be tested for leakage and/or contamination at intervals not to exceed 3 months.
  - C. In the absence of a certificate from a transferor indicating that a leak test has been made within six months

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(continued)

## CONDITIONS

13. D. Each sealed source fabricated by the licensee shall be inspected and tested for construction defects, leakage, and contamination prior to any use or transfer as a sealed source.
- E. Sealed sources need not be leak tested if:
- (i) they contain only hydrogen-3; or
  - (ii) they contain only a radioactive gas; or
  - (iii) the half-life of the isotope is 30 days or less; or
  - (iv) they contain not more than 100 microcuries of beta and/or gamma emitting material or not more than 10 microcuries of alpha emitting material; or
  - (v) they are not designed to emit alpha particles, are in storage, and are not being used. However, when they are removed from storage for use or transferred to another person, and have not been tested within the required leak test interval, they shall be tested before use or transfer. No sealed source or detector cell shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.
- F. The leak test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. Records of leak test results shall be kept in units of microcuries and shall be maintained for inspection by the Commission. If the test reveals the presence of 0.005 microcurie or more of removable contamination, a report shall be filed with the U.S. Nuclear Regulatory Commission and the source shall be removed immediately from service and decontaminated, repaired, or disposed of in accordance with Commission regulations. The report shall be filed within 5 days of the date the leak test result is known with the U.S. Nuclear Regulatory Commission, Region II, Division of Nuclear Materials Safety, Materials Licensing/Inspection Branch, 101 Marietta Street, N.W., Suite 2900, Atlanta, Georgia 30323-0199. The report shall specify the source involved, the test results, and corrective action taken. Records of leak test results shall be kept in units of microcuries and shall be maintained for inspection by the Commission. Records may be disposed of following Commission inspection.
- G. Tests for leakage and/or contamination shall be performed by the licensee or by other persons specifically licensed by the Commission or an Agreement State to Perform such services.
14. In lieu of using the conventional radiation caution colors (magenta or purple on yellow background) as provided in 10 CFR 20.203(a)(1), the licensee is hereby authorized to label detector cells, containing licensed material and used in gas chromatography devices, with conspicuously etched or stamped radiation caution symbols.
15. Maintenance, repair, cleaning, replacement and disposal of foils contained in detector cells shall be performed only by the device manufacturer or other persons specifically authorized by the Commission or an Agreement State to perform such services.

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SUPPLEMENTARY SHEET**

License Number 47-23035-01

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(continued)

**CONDITIONS**

16. Each portable nuclear gauge shall have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. The gauge or its container must be locked when in transport, storage or when not under the direct surveillance of an authorized user.
17. Any cleaning, maintenance, or repair of the gauge(s) that requires removal of the source rod shall be performed only by the manufacturer or by other persons specifically licensed by the Commission or an Agreement State to perform such services.
18. The licensee is authorized to hold radioactive material with a physical half-life of less than 65 days and sulfur 35 for decay-in-storage before disposal in ordinary trash provided:
  - A. Radioactive waste to be disposed of in this manner shall be held for decay a minimum of 10 half-lives.
  - B. Before disposal as ordinary trash, byproduct material shall be surveyed at the container surface with the appropriate meter set on its most sensitive scale and with no interposed shielding to determine that its radioactivity cannot be distinguished from background. All radiation labels shall be removed or obliterated.
19. Radioactive waste possessed under this license shall be stored in accordance with the statements, representations, and procedures included with the licensee's waste storage plan described in the licensee's letters dated September 9, 1992, December 8, 1992, and February 25, 1997.
20. Licensed material shall not be used in or on human beings.
21. This license does not authorize commercial distribution of licensed material.
22. The licensee shall not use licensed material in field applications where activity is released except as provided otherwise by specific condition of this license.
23. A copy of the licensee's Radiation Safety Manual dated January 1994 shall be made available to all personnel using or having responsibility for use of licensed material.
24. Experimental animals administered licensed material or their products shall not be used for human consumption.
25. Sealed sources or detector cells containing licensed material shall not be opened by the licensee.
26.
  - A. Individuals involved in operations which utilize, at any one time, more than 100 millicuries of hydrogen 3 in a non-contained form, other than metallic foil shall have bioassays performed within one week following a single operation and at weekly intervals for continuing operations.
  - B.
    - (1) Hydrogen 3 shall not be used in such a manner as to cause any individual to receive a radiation exposure such that urinary excretion rates exceed 28 microcuries per liter when averaged over a calendar quarter.



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## CONDITIONS

26. B. (2) Urinalysis shall be performed at weekly intervals on all individuals who work in the restricted areas of facilities in which hydrogen 3 is used. If the average concentration of hydrogen 3 in urine for any single individual during a calendar quarter is less than 10 microcuries per liter, urinalysis may be performed on that individual at monthly intervals for the following quarter and may continue at monthly intervals so long as the average concentration in the calendar quarter remains below 10 microcuries per liter. The urine specimen shall be collected on the same day of the week insofar as possible.
- (3) A report of an average concentration in excess of the limit specified in B.(2) above for any individual shall be filed, in writing, within thirty days of the end of the quarter with the U.S. Nuclear Regulatory Commission, Region II, Division of Nuclear Materials Safety, Materials Licensing/Inspection Branch, 101 Marietta Street, N.W., Suite 2900, Atlanta, Georgia 30323-0199. The report shall contain the results of all urinalyses for the individual during the quarter, the causes of excessive concentration, and corrective steps taken or planned to prevent a recurrence.
- (4) Any single urinalysis which discloses a concentration of greater than 50 microcuries per liter shall be reported, in writing, within seven days of the licensee's receipt of the report, to the address stated in paragraph B.(3) above.
27. The licensee shall conduct a physical inventory every 6 months to account for all licensed material received, possessed, and/or transferred under this license. Records of inventories shall be maintained for 2 years from the date of each inventory and shall identify each source, its initial activity and activity at the time of inventory and location.
28. The licensee shall maintain records of information important to safe and effective decommissioning at the licensee's Morgantown Campus, Morgantown, West Virginia in accordance with the provisions of 10 CFR 30.35(g) until this license is terminated by the Commission.
29. In addition to the possession limits in item 8, the licensee shall further restrict the possession of licensed material as follows:
- A. For unsealed sources to quantities less than  $10^4$  times the applicable limits in Appendix B, 10 CFR 30 as specified in 10 CFR 30.35(d), and
- B. For sealed sources, to quantities less than  $10^{10}$  times the applicable limits in Appendix B, 10 CFR 30 as specified in 10 CFR 30.35(d), and
- C. For iodine 131, the total possession limit shall not exceed 10 curies. (Note: Applications for permission to exceed this quantity shall contain information specified in 10 CFR 30.32(i)(1))

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(continued)

## CONDITIONS

30. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents including any enclosures, listed below. The Nuclear Regulatory Commission's regulations shall govern unless the statements, representations and procedures in the licensee's application and correspondence are more restrictive than the regulations.

A. Application dated February 20, 1990

B. Letters dated:

- (1) May 2, 1985 (Memorandum of Understanding between West Virginia University Hospitals, Inc. and West Virginia University)
- (2) February 23, 1990
- (3) September 12, 1990
- (4) October 17, 1990
- (5) April 16, 1991
- (6) August 7, 1991
- (7) January 10, 1992
- (8) September 9, 1992 (letter requesting decay in storage of sulfur 35)
- (9) December 8, 1992 (response to NRC letter of November 4, 1992)
- (10) Letter dated July 26, 1993 (changes to Radiation Safety Committee)
- (11) March 21, 1994 (add and delete radionuclides, revise Radiation Safety Manual, Radiation Safety Committee and locations of use)
- (12) June 20, 1994 (decrease carbon 14 activity)
- (13) September 15, 1994 (decrease barium 133 activity)
- (14) September 22, 1994 (change RSO)
- (15) January 6, 1995 (add location of use)
- (16) October 12, 1995 (add use of Cobalt 60 and Cesium 137 for dose calibrator check sources)
- (17) November 25, 1996 (change RSO)
- (18) February 25, 1997 (change waste storage location)

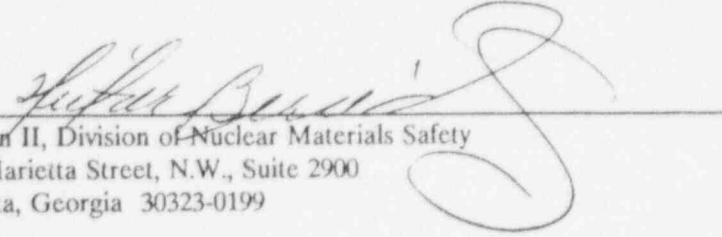
C. West Virginia University Radiation Safety Manual dated January 1, 1994

D. Reference: NRC license expiration date extension letter dated March 1, 1996


FOR THE U.S. NUCLEAR REGULATORY COMMISSION

HECTOR BERMUDEZ

Date **MAR 18 1997**

By   
Region II, Division of Nuclear Materials Safety  
101 Marietta Street, N.W., Suite 2900  
Atlanta, Georgia 30323-0199

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 3/18/97



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION II  
101 MARIETTA STREET, N.W., SUITE 2900  
ATLANTA, GEORGIA 30323-0199  
**MAR 18 1997**

INFORMATION FOR NRC MATERIAL LICENSEES

Please find enclosed:

- ☒ Your NRC material license
- ☐ Amendment to your NRC material license
- ☐ Amendment renewing your NRC material license
- ☐ Amendment terminating your NRC material license
- ☐ Notice for Radiographer Quality Assurance Approval Program

Please review the enclosed document carefully and be sure that you understand all conditions. If there are any errors or questions, please notify this office (ATTN: Ms. Diane Heim at (404) 331-4673) so that we can provide appropriate corrections and answers.

Please be advised that your license expires at the end of the day in the month and year stated in the license. Unless your license has been terminated, you must conduct your program involving byproduct materials in accordance with the conditions of your NRC license, representations made in your license application, and NRC regulations. In particular, note that you must:

1. Operate in accordance with NRC regulations 10 CFR 19, "Notice, Instructions and Reports to Workers; Inspections," 10 CFR Part 20, "Standards for Protection Against Radiation," and other applicable regulations.
2. Not possess and use materials authorized in Items 6, 7, and 8, on the license until:
  - a. you have constructed the facilities and obtained the equipment described in the license application and supporting documentation; and
  - b. you have notified the U. S. Nuclear Regulatory Commission, Region II, ATTN: Materials Licensing/Inspection Branch, in writing, that activities authorized by the license will be initiated.
  - c. you have submitted and certified implementation of a Quality Management Program (10 CFR 35.32) for radiotherapy, or for administering  $> 30$  uCi of I-125 or I-131.
3. Notify NRC, in writing, within 30 days:
  - a. when an authorized user, Radiation Safety Officer, or Teletherapy Physicist permanently discontinues performance of duties under the license or has a name change; or
  - b. when the licensee's mailing address changes (no fee is required if the location of byproduct material remains the same).
4. In accordance with 10 CFR 30.36(b) and/or license condition, notify NRC, promptly, in writing, and request termination of the license:
  - a. when you decide to terminate all activities involving materials authorized under the license; or
  - b. if you decide not to complete the facility, acquire equipment, or possess and use authorized material.



5. Request and obtain a license amendment before you:
  - a. receive or use byproduct material for a clinical procedure permitted under Part 35 but not permitted by your license issued pursuant to this part.
  - b. permit anyone, not authorized under 10 CFR 35, Subpart J, to work as an authorized user under a license for medical use of byproduct material.
  - c. permit anyone, not authorized under 10 CFR 35, Subpart J, to work as a Radiation Safety Officer, Teletherapy Physicist, or Nuclear Pharmacist, under a license for medical use of byproduct material.
  - d. order byproduct material in excess of the amount, or a different radionuclide or form, other than authorized on the license;
  - e. add or change the areas of use or address (or addresses) of use identified in the license application or on the license; or
  - f. change ownership of your organization.
6. Submit a complete renewal application with proper fee or termination request at least 30 days before the expiration date of your license. You will receive a reminder notice approximately 90 days before the expiration date. Possession of byproduct material after your license expires is a violation of NRC regulations. Transfer of licensed materials must be consistent with 10 CFR 30.41, 40.51 or 70.42, as applicable. A license will not normally be renewed, except on a case-by-case basis, in instances where licensed material has never been possessed or used.

In addition, please note that NRC Form 313 requires the applicant, by his/her signature, to verify that the applicant understands that all statements contained in the application are true and correct to the best of the applicant's knowledge. The signatory for the application should be the licensee or certifying official rather than a consultant.

You will be periodically inspected by NRC. Failure to conduct your program in accordance with NRC regulations, license conditions, and representations made in your license application and supplemental correspondence with NRC will result in enforcement action against you. This could include issuance of a Notice of Violation, or imposition of a Civil Penalty, or an order suspending, modifying or revoking your license as specified in the "General Statement of Policy and Procedures for NRC Enforcement Actions," NUREG-1600, (7/95). Since serious consequences to employees and the public can result from failure to comply with NRC requirements, prompt and vigorous enforcement action will be taken against those who do not achieve the necessary attention to detail and standard of compliance expected of licensees.

Thank you for your cooperation.

Enclosures:

1. NRC License
2. Category Marked Below for:
  - ☐ New licenses: NUREG-1600 (7/95); 19; 20; 30; 40 or 70, as appropriate; 71; 170; NRC Form 3; Agreement State list; and NRC Form 313.
  - ☐ New radiography licenses: Parts 34; 150.
  - ☐ New medical and teletherapy licenses: Part 35.
  - ☐ Amendments and renewals: NRC Form 313.

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February 25, 1997

ROBERT C. BYRD  
HEALTH SCIENCES CENTER  
OF WEST VIRGINIA UNIVERSITY  
Radiation Safety

February 25, 1997

US Nuclear Regulatory Commission  
101 Marietta St, N.W. Suite 200  
Atlanta, GA 30323-0199  
Attn: Earl Wright

Dear Mr. Wright:

West Virginia University would like to amend license 47-23035-01 to reflect a change of location for radioactive waste storage. We plan to move the material presently stored on the 8<sup>th</sup> floor to the 5<sup>th</sup> floor of the Health Sciences Center. The 5<sup>th</sup> floor is an unoccupied area and access will be limited to Radiation Safety staff. We understand that West Virginia University is exempt from amendment fees under 19 CFR 170.11 (a)(4).

Please contact our office if you need additional information.

Sincerely,

Eric Raudenbush, RSO  
West Virginia University

ER/ks

BETWEEN:

License Fee Management Branch, ARM  
and  
Regional Licensing Sections

: (FOR LFMS USE)  
: INFORMATION FROM LTS  
: -----  
:   
: Program Code: 01100  
: Status Code: 0  
: Fee Category: EX 3L  
: Exp. Date: 20010831  
: Fee Comments: 170.11(A)(4)  
: Decom Fin Assur Req'd: Y  
: .....

LICENSE FEE TRANSMITTAL

A. REGION II

1. APPLICATION ATTACHED

Applicant/Licensee: WEST VIRGINIA UNIVERSITY  
Received Date: 970203  
Docket No: 3020199  
Control No.: 257372  
License No.: 47-23035-01  
Action Type: Amendment

2. FEE ATTACHED

Amount: \_\_\_\_\_  
Check No.: \_\_\_\_\_

3. COMMENTS

Signed NWitt  
Date 2/6/97

B. LICENSE FEE MANAGEMENT BRANCH (Check when milestone 03 is entered ☒)

1. Fee Category and Amount: EX 3L

**FEE EXEMPT**

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

Amendment ☒  
Renewal \_\_\_\_\_  
License \_\_\_\_\_

170.11(A)(4)

3. OTHER

Signed Rita Messier  
Date 2/14/97

RECEIVED BY LFMS	
Date	2/13/97
Log	Feb 2 II
By	Rem
Date Completed	2/14/97



ROBERT C. BYRD  
HEALTH SCIENCES CENTER  
OF WEST VIRGINIA UNIVERSITY

Radiation Safety

November 25, 1996

Mr. Earl Wright  
US Nuclear Regulatory Commission  
101 Marietta Street, NW  
Suite 200  
Atlanta GA 30323-0199

Dear Mr. Wright:

At its meeting on November 19, 1996, the Radiological Safety Committee of West Virginia University voted to change the Radiation Safety Officer listed on the radioactive materials license, # 47-23035-01. The new RSO is Kenneth H. Douglass, Ph.D. and paragraph 12 of the license should be changed to read:

12. The Radiation Safety Officer for this license is Kenneth H. Douglass, Ph.D..

A copy of his curriculum vitae is enclosed.

We intend to submit a revised Radiation Safety Manual in the near future, but request that this change to our license be made immediately. It is our understanding that there is no amendment fee for the university license.

For your information, the Radiation Safety office may be reached at the following address:

West Virginia University  
Radiation Safety  
PO Box 9006  
Morgantown WV 26506  
(304) 293-3413  
(304) 293-4529 (Fax)

Sincerely,

*Larry E. Halliburton*

Larry Halliburton, Ph.D.,  
Chairman,  
Radiological Safety Committee  
West Virginia University  
PO Box 6315  
Morgantown WV 26506

257372

## CURRICULUM VITAE

**Kenneth H. Douglass, Ph.D.**

Home address: 205 Poplar Drive  
Morgantown, West Virginia 26505

Home phone: (304) 599-2628

Social Security #: 114-34-5159

Born: October 27, 1927; Rochester, New York

Family: Nancy (wife); Melanie (daughter)

Present Position: Director, Radiation Safety, WVUH and WVU (since July 1996)  
Adjunct Professor of Radiology, WVU School of Medicine (since July 1996)  
Robert C. Byrd Health Sciences Center of West Virginia University  
PO Box 9006  
Morgantown WV 26506-9006

Office phone: (304) 293-1549  
(304) 293-4529 (Fax)

email: kdouglas@wvu.edu

Certification: American Board of Science in Nuclear Medicine (1994)  
American Board of Radiology (1995)

### Current Responsibilities:

- Radiation Safety Officer for West Virginia University Hospitals, Inc. and alternate interim RSO for West Virginia University (since September 1994).
- Development of PC based database software for radiation safety.
- Teaching physics and radiation safety to technology students and radiology residents.

### Previous Positions:

(1994 - July 1996): Interim Radiation Safety Officer, West Virginia University Hospitals, Inc. and West Virginia University (alternate).

Responsibilities: Managed radiation safety program for WVU and WVUH.

(1988 - 1996): Associate Professor of Radiology; Senior Medical Physicist, Department of Radiology, West Virginia University School of Medicine, Morgantown WV, 26506.



Responsibilities: Medical physics support for nuclear medicine and diagnostic radiology. Developed and implemented quality assurance programs for instrument and image quality. Developed and maintained PC based database programs for radiation safety and nuclear medicine. Taught physics for radiology residents and technologist training programs.

(1974 - 1988): Instructor (1974 - 1984), Assistant Professor (1984 - 1988), Division of Nuclear Medicine, The Johns Hopkins University School of Medicine; and Department of Environmental Health Sciences, The Johns Hopkins University School of Hygiene and Public Health, 615 North Wolfe Street, Baltimore, Maryland 21205.

Responsibilities: Research into improved methods of computerized data processing in a nuclear medicine clinical setting. Use of data processing techniques in clinical research. Program development and support for routine clinical computer operation. Training of physicians and technologists in computer usage.

Research projects: The use of nonlinear least squares techniques for fitting mathematical models to positron emission tomographic data on the concentration of neuroreceptors and amino acids in the living human brain. The use of cinematic display for improved visualization of regional function in dynamic radionuclide studies, characterization of high temporal resolution left ventricular time-activity curves in patients and normal subjects, improved methods of quantification of left-to-right intracardiac shunts, and development of a fully automated program for measurement of global and regional cardiac function from equilibrium gated radionuclide images.

(1974-1975): Investigations of rapid diagnosis of viral infections and changes in leukocyte metabolism during phagocytosis.

(1971-1974): Postdoctoral Fellow, Department of Biophysics, The Johns Hopkins University. Research on heavy ion labels for high resolution electron microscopy studies of DNA. This included both binding constant measurements and dark field electron microscopy of single and double stranded DNA.

(summer 1970, 1971): Research Associate, Department of Physics, Case Western Reserve University, Cleveland, Ohio. Research on the theory of dielectric loss in semiconductors due to small polarons.

(1969-1971): Assistant Professor of Physics, Pennsylvania State University, Schuylkill Campus. Teaching introductory physics courses and labs.

(1964-1968): Teaching Assistant, Department of Physics, Carnegie-Mellon University, Pittsburgh, Pennsylvania. Teaching recitation section of first year physics course.

Previous summer jobs in industry (Bausch and Lomb, Xerox) involved experimental work with spectrophotometry, thin films and luminescence.

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Certification:

American Board of Science in Nuclear Medicine (Physics and Instrumentation); 1994  
American Board of Radiology (Diagnostic Radiological Physics and Medical Nuclear Physics); 1995

Teaching Responsibilities (1996):

Radiology Residents Physics Conferences:	May, Jun, Aug; 1 class hour /week
Nuclear Medicine Technology Physics	Jan - May; 3 class hours/week

Committees:

Radiological Safety Committee  
Human Use of Radiation and Radionuclides (WVUH)  
Nonhuman Use of Radiation and Radionuclides (WVU)  
Animal Use of Radiation and Radionuclides (WVU)  
Radiation Research Committee (WVU)  
Hospital Safety Committee (WVUH)  
Radioactive Drug Research Committee  
Promotion and Tenure Committee (Radiology Department)  
Admissions Committee for Nuclear Medicine Technology program

Director, Radiation Safety (since July 1996)

Radiation Safety Officer for WVUH (since July)

Radiation Safety Officer for WVU (since Nov)

Alternate Radiation Safety Officer for WVU (July - Nov)

Interim Radiation Safety Officer for WVUH (Jan - June)

Interim Radiation Safety Officer for WVU (alternate, Jan - Nov)

- oversaw compliance with applicable state and federal regulations concerning the use of radiation and radioactive materials
- chaired quarterly meetings of the five hospital and university radiation safety committees
- delivered inservice presentations on radiation safety to hospital and university personnel
- reviewed radiation safety aspects of research proposals involving the use of radiation for the Institutional Review Board

Nuclear Medicine Quality Assurance (Jan - June):

- Regular review of daily quality control measurements, supplemented by more specialized measurements of scintillation camera performance.
- QC review and measurements for dose calibrators and thyroid probe.
- quarterly review of the quality management program.

Radiology Quality Assurance (Jan - June)

Computer support:

- maintenance of radionuclide ordering and inventory programs for Nuclear Medicine and Radiation Safety.

## Annual Report — 1995

### Certification:

American Board of Science in Nuclear Medicine (Physics and Instrumentation); 1994  
American Board of Radiology (Diagnostic Radiological Physics and Medical Nuclear Physics); 1995

### Teaching Responsibilities (1995):

Radiology Residents Physics Conferences:	Jan - Jun; 1 class hour /week
Radiologic Technology Advanced Physics:	Jan - Jun; Jul - Dec; 3 class hours/week
Nuclear Medicine Technology Physics	Jan - Jun; 3 class hours/week
Computer Literacy for Technologists:	Jan - May; 1.5 class hour/week
Ultrasound Technology Physics	Sep - Dec; 3 class hours/week

### Committees:

Promotion and Tenure Committee (Radiology Department)  
Admissions Committee for Nuclear Medicine Technology program  
Radiological Safety Committee  
Human Use of Radiation and Radionuclides (WVUH)  
Nonhuman Use of Radiation and Radionuclides (WVU)  
Animal Use of Radiation and Radionuclides (WVU)  
Radiation Research Committee (WVU)  
Hospital Safety Committee (WVUH)  
Radioactive Drug Research Committee

### Interim Radiation Safety Officer for WVUH

#### Interim Radiation Safety Officer for WVU (alternate)

- oversaw compliance with applicable state and federal regulations concerning the use of radiation and radioactive materials
- coordinated application for license amendment for possession of a high dose rate afterloader in radiation oncology
- chaired quarterly meetings of the five hospital and university radiation safety committees
- delivered 30 inservice presentations on radiation safety to hospital and university personnel
- coordinated development of radiation safety program for PET center
- reviewed radiation safety aspects of research proposals involving the use of radiation for the Institutional Review Board

### Nuclear Medicine Quality Assurance:

- Regular review of daily quality control measurements, supplemented by more specialized measurements of scintillation camera performance.
- QC review and measurements for dose calibrators and thyroid probe.
- quarterly review of the quality management program.
- acceptance testing of GE Maxxus dual head scintillation camera.
- participated in 1995 Nuclear Medicine Imaging Proficiency Testing Program of the American College of Nuclear Physicians (SPECT)

### Radiology Quality Assurance:

- review of daily and monthly quality control data for the CT scanners.
- acceptance testing of biplane digital fluoroscopy unit

### Computer support:

- maintenance of radionuclide ordering and inventory programs for Nuclear Medicine and Radiation Safety.

Annual Report — 1994

Certification:

American Board of Science in Nuclear Medicine (Physics and Instrumentation);  
passed June 1994  
American Board of Radiology (Diagnostic Radiological Physics and Medical  
Nuclear Physics): passed written examination; eligible for oral examination

Teaching Responsibilities (1994):

Radiologic Technology Advanced Physics:	Jan - Jun; Sep - Dec; 3 class hours/week
Computer Literacy for Technologists:	Jan - May; 1.5 class hour/week
Radiology Residents Physics Conferences:	Jan - Mar; Sep - Dec; 1 class hour /week
Ultrasound Technology Physics	Sep - Dec; 3 class hours/week

Committees:

Admissions committee for Nuclear Medicine Technology program  
Human Use of Radiation and Radionuclides; Sept - present  
Radiological Safety Committee; Sept - present  
Nonhuman Use of Radiation and Radionuclides; Sept - present  
Animal Use of Radiation and Radionuclides (WVU) ; Sept - present  
Radiation Research Committee (WVU) ; Sept - present  
Hospital Safety Committee (WVU) ; Sept - present

Interim Radiation Safety Officer for WVUH: Sept -present

Interim Radiation Safety Officer for WVU (alternate): Sept - present

- participated in three Nuclear Regulatory Commission inspections
- prepared WVUH response to NRC inspection reports and notice of violation
- directed revision of Quality Management Programs in Nuclear Medicine and Radiation Oncology
- developed improved radioactivity assays for P-32 and Sr-89
- delivered 10 inservice presentations on radiation safety to hospital personnel and one to university personnel

Research:

National Institutes of Health Special Review Committee, Applicant Interview  
Review Team for two program project grant renewal applications

Nuclear Medicine Quality Assurance:

- Regular review of daily quality control measurements, supplemented by more specialized measurements of scintillation camera performance.
- QC review and measurements for dose calibrators and thyroid probe.
- quarterly review of the quality management program.

Radiology Quality Assurance:

- regular review of daily and monthly quality control data for the CT scanners.
- surveyed 8 of 12 fluoroscopy units in the hospital, including acceptance test of both new digital fluoro units.

Computer support:

- maintenance of radionuclide inventory program for the Radiation Safety Office.
- maintenance of programs for tracking radionuclide purchase, use and quality control in Nuclear Medicine.

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## Annual Report —1993

### Teaching Responsibilities (1993):

Radiologic Technology Advanced Physics:	Jan - Dec; 3 class hours/week
Nuclear Physics (NM & Therapy):	Sept - Dec; 3 class hours/week
Computer Literacy for Technologists:	Mar - May; 1 class hour/week
Radiology Residents Physics Conferences:	Jan - Mar; Oct - Dec; 1 class hour /week

### Committees:

Internal Advisory Committee for PET Research  
Admissions committee for Nuclear Medicine Technology program

### Nuclear Medicine Quality Assurance:

- Regular review of daily quality control measurements, supplemented by more specialized measurements of scintillation camera performance.
- QC review and measurements for dose calibrators and thyroid probe.
- performed quarterly review of the quality management program.
- Reported quarterly to Susan Keener, CNMT.

### Radiology Quality Assurance:

- regular review of daily and monthly quality control data for the CT scanners.
- began development of quality assurance program for Computed Radiography.
- developed quality assurance program for fluoroscopy; surveyed all fluoroscopy units in the hospital.

### Computer support:

- Further developed radionuclide inventory program for the Radiation Safety Office.
- Further developed programs for tracking radionuclide purchase, use and quality control in Nuclear Medicine. Added programs for listing patient studies for quality management review and quarterly reports.
- configured nuclear medicine computers to use the radiology department network.

### Research:

- consulted with Dr. Hurst on application for PULMO CT grant.
- consulted with Dr. Blaha of the Orthopedics department on image processing of digitized radiographs.
- consulted with Dr. Odom of the Ophthalmology Department on grant application.
- consulted with Dr. Hoeldtke of the Department of Medicine on a grant application for PET research.

### Presentation:

- K.H.Douglass, "Database design for nuclear medicine and radiation safety." The Society of Nuclear Medicine, Computer and Instrumentation Symposium: Desktop Computing in Nuclear Medicine, Atlanta GA, Feb 8, 1993.



## Annual Report — 1992

### Teaching Responsibilities (1992):

Radiologic Technology Advanced Physics:

Jan - Sept, 3 class hours/week

Computer Literacy for Technologists:

Jan - Mar, 2 class hours/week

Radiology Residents Physics Conferences:

Apr - Jun, 1 class hour /week

### Committee Membership:

Internal Advisory Committee for PET Research

### Nuclear Medicine Quality Assurance:

- Regular review of daily quality control measurements, supplemented by more specialized measurements of scintillation camera performance.
- QC review and measurements for dose calibrators and thyroid probe.
- Reported quarterly to Susan Keener, CNMT.

### Radiology Quality Assurance:

- Helped start daily quality control program for CT scanners; these will be reviewed quarterly.
- In compliance with JCAHO requirements, helped develop program for calculating and reporting radiation exposures for specific procedures and x-ray generators.

### Computer support:

- Further developed radionuclide inventory program for the Radiation Safety Office.
- Developed programs for tracking radionuclide purchase, use and quality control in Nuclear Medicine.

### Research:

- Consulted with Dr. Blaha of the Orthopedics department on image processing of digitized radiographs.
- Obtained grant from the Biomedical Research Support Committee for work on compartmental modeling of PET data.
- Am preparing a talk on database system design for the 1993 midwinter meeting of the Society of Nuclear Medicine.

### Presentations:

- "Compartmental modeling of PET data", poster for the WVU HSC Research Day, March 14, 1992.
- "Mathematical Analysis of PET Scans", talk for the Northern West Virginia chapter of the Society for Neuroscience, May 2, 1992.

Education:

University of Rochester, B.S. Physics 1964

Carnegie-Mellon University, M.S. Physics 1966

Carnegie-Mellon University, Ph.D. Physics 1969

Doctoral Thesis: Applications of the Coherent State Representation in the Theory of Magnetism

Advisor: Dr. James S. Langer, Ph.D.

Scholarships:	NIH Post doctoral Fellowship	1972-1973
	NSF Graduate Traineeship	1968-1969
	NASA Predoctoral Traineeship	1964-1967
	National Merit Scholarship	1960-1964

Publications:

1. K.H. Douglass: Applications of the coherent state representation in the theory of magnetism. I. The Heisenberg Model. *Annals of Physics* 62:383-421, 1971.
2. K.H. Douglass: Applications of the coherent state representation in the theory of magnetism: II. Helical spin configurations. *Annals of Physics* 64:396-423, 1971.
3. M.F. Tsan, K.H. Douglass, P.A. McIntyre: Hydrogen peroxide production and killing of staphylococcus aureus by human polymorphonuclear leukocytes. *Blood* 49:437-444, 1977.
4. S. Qureshi, H.N. Wagner Jr., P.O. Alderson, D.F. Housholder, K.H. Douglass, M.G. Lotter, E.L. Nickoloff, M. Tanabe, L.G. Knowles: Evaluation of left-ventricular function in normal persons and patients with heart disease. *J Nucl Med* 19: 135-141, 1978.
5. H.N. Wagner Jr., M.G. Lotter, K.H. Douglass, P.O. Alderson, L.G. Knowles: Cinematic display of regional function in nuclear imaging. *The Johns Hopkins Med J* 142:61-66, 1978.
6. P.O. Alderson, H.N. Wagner Jr., J.G. Gomez-Moieras, T.G. Rehn, L.C. Becker, K.H. Douglass, H.F. Manspeaker, J.G. Schindedecker: Simultaneous detection of myocardial perfusion and wall motion abnormalities by cinematic Tl-201 imaging. *Radiology* 127:531-533, 1978.
7. K.H. Douglass, H.N. Wagner Jr., J.G. Schindedecker: Use of color display for selection of left ventricular regions of interest. *Radiology* 131:249-250, 1979.
8. H.N. Wagner Jr., P. Rigo, R.H. Baxter, P.O. Alderson, K.H. Douglass, D.F. Housholder: Monitoring ventricular function at rest and during exercise with a nonimaging nuclear detector. *Am J Cardiol* 43:975-979, 1979.
9. P.O. Alderson, K.H. Douglass, K.G. Mendenhall, V.A. Guadiani, D.C. Watson, J.M. Links, H.N. Wagner Jr: Deconvolution analysis in radionuclide quantitation of left-to right cardiac shunts. *J Nucl Med* 20:502-506, 1979.
10. J.M. Links, K.H. Douglass, and H.N. Wagner Jr.: Patterns of ventricular emptying by Fourier analysis of gated blood pool studies. *J Nucl Med* 21:978-982, 1980.

11. K.H. Douglass, J.M. Links, P.O. Alderson, H.N. Wagner Jr.: Temporal fourier analysis in the selection of right ventricular regions of interest. In: Single Photon Emission Computed Tomography and Other Selected Computer Topics. Society of Nuclear Medicine, New York, 1980, p. 198.
12. M.H. Bourguignon, K.H. Douglass, J.M. Links, and H.N. Wagner, Jr.: Fully automated data acquisition, processing and display in equilibrium radio-ventriculography. *Eur J Nucl Med* 6: 343-347, 1981.
13. M.H. Bourguignon, J.G. Schindldecker, G.A. Carey, K.H. Douglass, R.D. Burow, E.E. Camargo, L.C. Becker and H.N. Wagner, Jr.: Quantification of left ventricular volume in gated equilibrium radioventriculography. *Eur J Nucl Med* 6: 349, 1981.
14. K.H. Douglass, J.M. Links, T. Gedra, H.N. Wagner, Jr.: A comparison of interpolative background subtraction algorithms using analytical surfaces. In: Functional Mapping of Organ Systems and Other Computer Topics. Peter D. Esser, Ed., Society of Nuclear Medicine, New York, 1981, p. 83.
15. M.H. Bourguignon, J.M. Links, K.H. Douglass, P.O. Alderson, J.M. Roland and H.N. Wagner, Jr.: Quantification of left to right cardiac shunts by multiple deconvolution analysis. *Am J Cardiol* 48: 1086, 1981.
16. K.H. Douglass, P. Tibbits, W. Kasecamp, S-T Han, D. Koller, J.M. Links, H.N. Wagner, Jr.: Performance of a fully automated program for measurement of left ventricular ejection fraction. *Eur J Nucl Med* 7:564-566, 1982.
17. W.H. Meyer, J. Levin, P.M. Ness, W.R. Bell, K.H. Douglass, E.E. Camargo, W.H. Kinkham. Abnormalities of the spleen and liver in patients with hemophilia. *Am J Hematology* 14:235-246, 1983.
18. D.F. Wong, D. Espinola, E.E. Camargo, K.H. Douglass, D.W. Koller, H.N. Wagner, Jr.: Sequential computer- assisted hepatobiliary scintigraphy in the evaluation of conjoint twins. *Am J Roentgenology* 142:479-481, 1984.
19. D.F. Wong, H.N. Wagner, Jr., R.F. Dannals, J.M. Links, J.J. Frost, H.T. Ravert, A.A. Wilson, A.E. Rosenbaum, A. Gjedde, K.H. Douglass, J.D. Petronis, M.F. Folstein, J.K. Toung, H.D. Burns, M.J. Kuhar: Effects of age on dopamine and serotonin receptors measured by positron tomography in the living human brain. *Science* 226:1393-1396, 1984.
20. D.F. Wong, A. Gjedde, H.N. Wagner, Jr., R.F. Dannals, K.H. Douglass, J.M. Links and M.J. Kuhar: Quantification of neuroreceptors in the living human brain. II. Inhibition studies of receptor density and affinity. *J Cereb Blood Flow and Metabolism* 6:147-153, 1986.
21. K.H. Douglass, J.M. Links, D.C.P. Chen, D.F. Wong and H.N. Wagner, Jr.: Linear discriminant analysis of regional ejection fractions in the diagnosis of coronary artery disease. *Eur J Nucl Med* 12:602-604, 1987.
22. J.J. Frost, H.S. Mayberg, R. Fisher, K.H. Douglass, R.F. Dannals, J.M. Links, A.A. Wilson, H.T. Ravert, A.E. Rosenbaum, S.H. Snyder and H.N. Wagner Jr.: Mu-Opiate receptors measured by positron emission tomography are increased in temporal lobe epilepsy. *Ann Neuro* 23:231-237, 1988.

23. H.Valette, M.Bourguignon, K.Douglass, A.del Buono, P.Merlet, J.Buchanan, C.Raynaud, A.Syrota, H.N.Wagner Jr.: Automatic drawing of the left epicardial region of interest on Thallium 201 scintigraphic images. *Eur J Nucl Med* 14:485-488, 1988.
24. L.A. O'Tuama, T.R. Guilarte, K.H. Douglass, H.N. Wagner Jr., D.F. Wong, R.F. Dannals, N.D. LaFrance, A.N. Bice, J.M. Links: Assessment of  $^{11}\text{C}$ -L-methionine transport into the human brain. *J Cere Blood Flow Metab* 8:341-345, 1988.
25. T.Mukai, J.M.Links, K.H.Douglass, H.N.Wagner Jr: Scatter correction in SPECT using non-uniform attenuation data. *Phys Med Biol.* 33:1129-1140, 1988.
26. J.J. Frost, K.H. Douglass, H.S. Mayberg, R.F. Dannals, J.M. Links, A.A. Wilson, H.T. Ravert, W.C. Crozier, H.N. Wagner Jr.: Multi-compartmental analysis of  $^{11}\text{C}$ -carfentanil binding to opiate receptors in humans measured by positron emission tomography. *J Cere Blood Flow Metab* 9:398-406, 1989.

## Abstracts:

1. M. Beer, W. Wiggins, K.M. Douglass, et al: Electron microscopic study of nucleic acids and nucleoproteins. IV International Biophysics Congress, Moscow, August, 1972.
2. M. Beer, K. Douglass, A. Kosiara, W. Wiggins: Biological structure determination with energy analyzing electron microscopes and selective staining. 168th ACS National Meeting, Atlantic City, New Jersey, September, 1974.
3. A. Kosiara, K. Douglass, M. Beer: Trimethyllead acetate as a DNA backbone stain for electron microscopy. Electron Microscopy Society of America, Las Vegas, Nevada, August, 1975. *Proc Electron Microscopy Soc Amer* 33:624, 1975 (abstract).
4. M.F. Tsan, B. Newman, M. Chen, K. Douglass, P. McIntyre: A study of surface functional groups in relationship to the oxidative metabolic changes which occur during phagocytosis in human polymorphonuclear leukocytes. Society of Nuclear Medicine 23rd Annual Meeting, Dallas, Texas, June, 1976. *J Nucl Med* 17: 561, 1976 (abstract).
5. S. Qureshi, H.N. Wagner, Jr., P.O. Alderson, M.G. Lotter, K.H. Douglass, L.G. Knowles: Characteristics of left ventricular time-activity curves in patients with heart disease. Society of Nuclear Medicine 24th Annual Meeting, Chicago, Illinois, June, 1977. *J Nucl Med* 18:601, 1977 (abstract).
6. H.N. Wagner, Jr., M.G. Lotter, L.G. Knowles, T.K. Natarajan, K.H. Douglass: Computer-assisted cinematic displays in nuclear medicine. Society of Nuclear Medicine 24th Annual Meeting, Chicago, Illinois, June, 1977. *J Nucl Med* 18:615, 1977 (abstract).
7. K.H. Douglass, H.N. Wagner, Jr., P.O. Alderson, P. Rigo: Characteristics of left ventricular time-activity curves in normal volunteers. Society of Nuclear Medicine 25th Annual Meeting, Anaheim, California, June, 1978. *J Nucl Med* 19:670, 1978 (abstract).
8. H. Ito, G.C. Smaldone, D.L. Swift, D.F. Proctor, K.H. Douglass, P.O. Alderson, H.N. Wagner, Jr.: Effect of carrier gas on the distribution of inhaled aerosols. Society of Nuclear Medicine 25th Annual Meeting, Anaheim, California, June, 1978. *J Nucl Med* 19:676, 1978 (abstract).

9. P.O. Alderson, K.H. Douglass, K.G. Mendenhall, R.C. Donovan, H.N. Wagner, Jr.: Quantitation of left-to-right shunts after deconvolution analysis of pulmonary time-activity curves. Society of Nuclear Medicine 25th Annual Meeting, Anaheim, California, June, 1978. *J Nucl Med* 19:697, 1978 (abstract).
10. D.S. Gawles, K.H. Douglass, P.O. Alderson, H.N. Wagner, Jr.: First-pass determination of biventricular function from a single injection in the RAO projection. Society of Nuclear Medicine 25th Annual Meeting, Anaheim, California June, 1978.
11. H.N. Wagner, Jr., P.O. Alderson, P. Rigo, R.H. Baxter, K.H. Douglass, D.F. Housholder: Temporal imaging of ventricular function during rest and exercise with the nuclear stethoscope. World Federation of Nuclear Medicine and Biology, 2nd International Congress. Washington, D.C., September, 1978.
12. D.S. Gawles, K.H. Douglass, P.O. Alderson, H.N. Wagner, Jr.: First pass determination of biventricular function from a single injection in the RAO projection. World Federation of Nuclear Medicine and Biology, 2nd International Congress, Washington, D.C., September, 1978.
13. K.H. Douglass, H.N. Wagner, Jr., P.O. Alderson, P. Rigo: Characteristics of left ventricular time-activity curves obtained at rest and stress in normal volunteers. World Federation of Nuclear Medicine and Biology, 2nd International Congress, Washington, D.C., September, 1978.
14. P.O. Alderson, K.H. Douglass, K.L. Mendenhall, R.C. Donovan, H.N. Wagner, Jr.: The utility of deconvolution techniques in gamma function quantitation of left-to-right cardiac shunts. World Federation of Nuclear Medicine and Biology. 2nd International Congress, Washington, D.C., September, 1978.
15. S.L. Yang, T.H. Hsu, H.N. Wagner, Jr., K.H. Douglass, J.G. Schindldecker, E.L. Nickoloff: Left ventricular function in hypothyroid patients: effects of exercise. *Clinical Research* 25:559A, 1977 (Abstract).
16. R. Shakir, P.O. Alderson, P. Rigo, K.H. Douglass, H.N. Wagner, Jr.: Left ventricular function curves in patients with hypertension. American Heart Association, Dallas, Texas. *Circulation* 58:II-62, 1978 (abstract).
17. J.M. Links, K.H. Douglass, H.N. Wagner, Jr.: Visualization of the pattern of ventricular contraction in patients with conduction abnormalities. Tenth Symposium on the Sharing of Computer Programs and Technology in Nuclear Medicine. Miami Beach, Florida, January, 1980.
18. K.H. Douglass, J.M. Links, P.O. Alderson, H.N. Wagner, Jr.: Temporal fourier analysis in the selection of right ventricular regions of interest. Tenth Symposium on the Sharing of Computer Programs and Technology in Nuclear Medicine, Miami Beach, Florida, January 1980.
19. K.H. Douglass, J.M. Links, T. Gedra, and H.N. Wagner, Jr.: A comparison of interpolative background subtraction algorithms using analytical surfaces. Eleventh Symposium on the Sharing of Computer Programs and Technology in Nuclear Medicine. New Orleans, Louisiana, February 6-8, 1981.



20. M.H. Bourguignon, K.H. Douglass, J.M. Links, R.A. Wise, W. Ehrlich, and H.N. Wagner, Jr.: Fully automated processing in gated blood pool scintigraphy. *J Nucl Med* 22:59, 1981 (abstract).
21. M.H. Bourguignon, J.G. Schindeldecker, G.A. Carey, K.H. Douglass, R.D. Burow, E.E. Camargo, L.C. Becker, H.N. Wagner, Jr.: Quantification of left ventricular volume in gated equilibrium radioventriculography. *J Nucl Med* 22: 18, 1981 (abstract).
22. D.F. Wong, E.E. Camargo, P.O. Alderson, D. Biello, R.D. Katz, O. Malpica, K.H. Douglass, and H.N. Wagner, Jr.: Computer assisted interpretation of ventilation-perfusion imaging in pulmonary embolism. *J Nucl Med* 22:43, 1981 (abstract).
23. X.J. Liu, K.S. Harrison, K.H. Douglass, E.E. Camargo, and H.N. Wagner, Jr.: A simplified method for background correction in measurement of left ventricular ejection fraction. *J Nucl Med* 23:81, 1982 (abstract).
24. S. Watanabe, T. Suzuki, K. Douglass, M. Karam, D. Wong, J. Links, and H.N. Wagner, Jr.: Monitoring right ventricular function with nuclear stethoscope and Kr-81m. *J Nucl Med* 23:62, 1982 (abstract).
25. D.F. Wong, T.K. Natarajan, D. Koller, W. Summer, H. Rupani, X. Liu, K. Douglass, A. McCormack, J. Lamb, J. Olynyk, M. Philp, E. Camargo, and H.N. Wagner, Jr.: Automated V/Q imaging from gated Kr-81m scintigraphy in the diagnosis of pulmonary embolism. *J. Nucl Med* 23:42, 1982 (abstract).
26. K. Douglass, J. Links, and H.N. Wagner, Jr.: Fully automated measurement of regional left ventricular ejection fraction. *J Nucl Med* 23:24, 1982 (abstract).
27. W. Mitzner, K. Douglass, W. Ehrlich, G. Weinmann, H.N. Wagner, Jr.: Transient wash-in of Xe boluses during high frequency ventilation. *Fed Proc* 41:1747, 1982 (Abstr. #8635).
28. D.F. Wong, P.D. Wilson, J.M. Links, D.W. Koller, K.H. Douglass, H.N. Wagner, Jr.: Assessment of statistical errors in positron emission tomography. *J Nucl Med* 24:104, 1983 (abstract).
29. D. Espinola, P. Yang, S. Engin, K. Douglass, D. Loudenslager, H.N. Wagner, Jr.: A characteristic pattern of esophageal emptying in obstructive lesions of the esophagus. *J Nucl Med* 24:39, 1983 (abstract).
30. K.H. Douglass, D.C.P. Chen, D.F. Wong, J.M. Links, H.N. Wagner, Jr.: Relative accuracy of automated analysis of regional wall motion in diagnosis of CAD. *J Nucl Med* 24:91, 1983 (abstract).
31. R.A. Brooks, D.F. Wong, G. DiChiro, R.T. Wayner, K.H. Douglass, J.J. Frost, S.M. Larson, H.N. Wagner, Jr. Three compartment modeling of C-11 N-methylspiperone kinetics in the human brain. *J Nucl Med* 25:88, 1984 (abstract).
32. P.D. Wilson, J.M. Links, S.C. Huang, K.H. Douglass, D.F. Wong, J.J. Frost, H.N. Wagner, Jr. Cerebral metabolic rate of glucose computed by Bayes regression of deoxyglucose PET scans. *J Nucl Med* 25:92, 1984 (abstract).
33. D.F. Wong, A. Gjedde, H.N. Wagner, Jr., K.H. Douglass, R.F. Dannals, S.H. Snyder, M.J. Kuhar. Further development and validation of the model for in vivo quantification of human dopamine receptors. *J Nucl Med* 26:52, 1985 (abstract).

34. T. Mukai, K. Torizuka, K.H. Douglass, H.N. Wagner, Jr. Improvement of quantitation in SPECT: attenuation and scatter correction using non-uniform attenuation data. *J Nucl Med* 26:91, 1985 (abstract).
35. J.J. Frost, K.H. Douglass, H.S. Mayberg, R. Behal, R.F. Dannals, A.A. Wilson, H.T. Ravert, J.M. Links, H.N. Wagner, Jr.: Quantitative analysis of C-11 carfentanil binding to opiate receptors in man by graphical evaluation. *J Nucl Med* 27:955, 1986 (abstract).
36. J.J. Frost, K.H. Douglass, H.S. Mayberg, R.F. Dannals, J.M. Links, A.A. Wilson, H.T. Ravert, H.N. Wagner, Jr.: Multicompartmental analysis of C-11 carfentanil binding to opiate receptors in man by positron emission tomography. *J Nucl Med* 27:1027, 1986 (abstract).
37. N.D. LaFrance, L. O'Tuama, V. Villemagne, J. Williams, K. Douglass, R.F. Dannals, H.T. Ravert, A. Wilson, H. Drew, J. Links, D. Wong, B. Carson, H. Brem, L. Strauss and H.N. Wagner Jr.: Quantitative imaging and follow-up experience of C-11-L-methionine accumulation in brain tumors with positron emission tomography. *J Nucl Med* 28:645, 1987 (abstract).
38. J.J. Frost, H.S. Mayberg, R. Fisher, K.H. Douglass, R.F. Dannals, J.M. Links, A.A. Wilson, H.T. Ravert, S.H. Snyder and H.N. Wagner Jr.: Correlative measurement of regional opiate receptors and glucose utilization in temporal lobe epilepsy by positron emission tomography. *J Nucl Med* 28:699, 1987 (abstract).
39. L. O'Tuama, K. Douglass, P. Phillips, L. Strauss, J. Links, R. Dannals, H. Ravert, A. Wilson, B. Carson, H. Brem, D. Wong, N. LaFrance, H. Wagner Jr.: Maturation of cerebral neutral aminoacid accumulation from childhood to the adult: A C-11-L-methionine PET study. *J Nucl Med* 29:784, 1988 (abstract).
40. J.J. Frost, K.H. Douglass, B. Sadzot, H.S. Mayberg, R.F. Dannals, J. Lever, J.M. Links, H.T. Ravert, A.A. Wilson, H.N. Wagner Jr.: Multi-compartmental analysis of C-11-diprenorphine binding to opiate receptors in man by PET. *J Nucl Med* 29:796, 1988 (abstract).
41. J.J. Frost, B. Sadzot, J. Price, H.S. Mayberg, K.H. Douglass, R.F. Dannals, J. Lever, J.M. Links, A.A. Wilson, H. Ravert, H.N. Wagner, Jr. Measurement of opiate receptor density ( $B_{max}$ ) and ligand affinity ( $K_D$ ) in man using PET and C-11 diprenorphine at high and low specific activities. *J Nucl Med* 30:740, 1989 (abstract).
42. J.C. Price, B. Sadzot, K.H. Douglass, H.N. Wagner, Jr., J.J. Frost. Quantification of C-11 diprenorphine binding to opiate receptors: model validation. *J Nucl Med* 31:866, 1990 (abstract).
43. K. H. Douglass, "Database design for nuclear medicine and radiation safety." The Society of Nuclear Medicine, Computer and Instrumentation Symposium: Desktop Computing in Nuclear Medicine, Atlanta GA, Feb 8, 1993.

BETWEEN:

License Fee Management Branch, ARM  
and  
Regional Licensing Sections

: (FOR LFMS USE)  
: INFORMATION FROM LTS  
: -----  
:  
: Program Code: 02120  
: Status Code: 0  
: Fee Category: EX 7C  
: Exp. Date: 20051130  
: Fee Comments: \_\_\_\_\_  
: Decom Fin Assur Req'd: Y  
: :::::::::::::::::::::::::::: ::::::::::

LICENSE FEE TRANSMITTAL

A. REGION II

1. APPLICATION ATTACHED

Applicant/Licensee: V. A. MEDICAL CENTER  
Received Date: 970204  
Docket No: 3002261  
Control No.: 257373  
License No.: 23-08786-01  
Action Type: Amendment

2. FEE ATTACHED

Amount: ---  
Check No.: \_\_\_\_\_

3. COMMENTS

Signed NWitt  
Date 2/7/97

B. LICENSE FEE MANAGEMENT BRANCH (Check when milestone 03 is entered /\_/)

1. Fee Category and Amount: \_\_\_\_\_

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

Amendment \_\_\_\_\_  
Renewal \_\_\_\_\_  
License \_\_\_\_\_

3. OTHER \_\_\_\_\_  
\_\_\_\_\_

Signed \_\_\_\_\_  
Date \_\_\_\_\_