

## MATERIALS LICENSE

Amendment No. 87  
CORRECTED COPY

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 183 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 March 12, 1997	
1. The Curators of the University of Missouri		3. License Number 24-00513-32 is amended in its entirety to read as follows:	
2. 311 Jesse Hall Columbia, MO 65211		4. Expiration Date July 31, 2003	
		5. Docket or Reference No. 030-02278	
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 identified in 10 CFR 35.100	A. Any radiopharmaceutical identified in 10 CFR 35.100	A. As needed	
B. Any byproduct material identified in 10 CFR 35.200	B. Any radiopharmaceutical identified in 10 CFR 35.200	B. As needed	
C. Any byproduct material identified in 10 CFR 35.300	C. Any radiopharmaceutical identified in 10 CFR 35.300	C. As needed	
D. Any byproduct material identified in 10 CFR 35.400	D. Any brachytherapy source identified in 10 CFR 35.400	D. 5 curies	
E. Any byproduct material identified in 10 CFR 35.500	E. Any diagnostic source identified in 10 CFR 35.500	E. 5 curies	
F. Any byproduct material with Atomic Numbers between 3 through 83 except as specified below	F. Any	F. 3 curies of each radionuclide with total possession limit of 30 curies	



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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   |
| G. Hydrogen-3   | G. Any  | G. 15 curies   |
| H. Molybdenum-99                                      | H. Mo-99-Tc99m Generators   | H. 12 curies   |
| I. Technetium-99m                                     | I. Any  | I. 6 curies  |
| J. Gold-198   | J. Any  | J. 1 curie   |
| K. Polonium-210                                       | K. Any  | K. 5 millicuries   |
| L. Neptunium-237                                      | L. Any  | L. 2 millicuries   |
| M. Americium-241                                      | M. Any  | M. 5 millicuries   |
| N. Phosphorus-32                                      | N. Any  | N. 5 curies  |
| O. Cesium-137   | O. Sealed sources (registered pursuant to Section 32.210 of 10 CFR Part 32 or an Agreement State) | O. 5 curies  |
| P. Americium-241                                      | P. Sealed source  | P. 10 sources not to exceed 100 millicuries each, total not to exceed 600 millicuries  |
| Q. Americium-241                                      | Q. Sealed source  | Q. 4 sources not to exceed 50 millicuries each, total of 200 millicuries   |
| R. Americium-241/Cesium-137                           | R. Sealed source  | R. 4 sources not to exceed 50 millicuries Am-241 and 10 millicuries Cs-137 each, total of 200 millicuries Am-241 and 40 millicuries Cs-137 |
| S. Americium-241                                      | S. Sealed source  | S. 300 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
T. Curium-244	T. Calibration sources	T. 2 sources not to exceed 0.001 millicuries, total not to exceed 0.002 millicuries
U. Americium-241	U. Sealed sources	U. 12 sources not to exceed 50 millicuries each, total not to exceed 600 millicuries
V. Americium-241	V. Sealed sources	V. 5 sources not to exceed 10 millicuries each, total not to exceed 50 millicuries
W. Americium-241	W. Sealed source	W. 15 millicuries
X. Americium-241	X. Sealed source	X. 14 millicuries
Y. Americium-241	Y. Sealed source	Y. 200 millicuries
Z. Uranium (Nat.)	Z. Sub-Critical Assembly Slugs in Aluminum Cans	Z. 2500 kilograms
AA. Uranium (Nat.)	AA. Any	AA. 250 kilograms
BB. Thorium (Nat.)	BB. Any	BB. 250 kilograms
CC. Plutonium-239	CC. Sealed sources (Mound Laboratory)	CC. 5 sources not to exceed 80 grams total
DD. Uranium (Depleted)	DD. Any	DD. 250 kilograms
EE. Californium-252	EE. Sealed sources	EE. Total not to exceed 19.0 micrograms
FF. Strontium-90	FF. Sealed source	FF. 500 millicuries
GG. Hydrogen-3	GG. Waste Storage/Processing	GG. 3 curies

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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 |
| HH. Any byproduct material with Atomic Numbers between 3 through 83, inclusive | HH. Waste Storage/Processing  | HH. 1 curie each isotope, total possession limit 10 curies                     |
| II. Gadolinium-153   | II. Sealed sources (North American Scientific, Inc. Model MED 3601) | II. 12 sources, not to exceed 250 millicuries each, 3 curies total             |

## 9. Authorized Use:

- A. Any uptake, dilution and excretion procedure approved in 10 CFR 35.100.
- B. Any imaging and localization procedure approved in 10 CFR 35.200.
- C. Any radiopharmaceutical therapy procedure approved in 10 CFR 35.300.
- D. Any brachytherapy procedure approved in 10 CFR 35.400.
- E. Medical use of sealed sources included in 10 CFR 35.500 in compatible devices registered pursuant to 10 CFR 30.32(g).
- F. through N., AA., BB., DD., and EE. Research and development as defined in Section 30.4 of 10 CFR Part 30, Instrument calibration and Student Instruction.
- O. Sealed sources to be used in J.L. Shepherd 28-GA 5671; Amersham X2016 40666F; EON Corp. 64-761 177 for calibration and density measurements and for medical and veterinary medical brachytherapy use.
- P. To be used in Troxler Electronics Labs, Inc., Model 1257 soil moisture/density gauge.
- Q. To be used in Troxler Electronics Labs, Inc., Model 1257 soil moisture/density gauge.
- R. To be used in Troxler Electronics Labs, Inc., Model 1403 soil moisture/density gauge.

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- S. To be used for laboratory moisture/density measurement of soil samples Amersham/Searly in a type X-92 capsule.
- T. Electroplated calibration sources to be used in an E G & G Model Let-SE 1/2 counter.
- U. To be used in Campbell Pacific Nuclear Model MC-M moisture gauges (CPN-131).
- V. To be used in Troxler Electronics 3220 series moisture gauges, Troxler Drawing No. A-102700.
- W. To be used in a Siemens Model SS10244 anatomical marker Amersham Model AMC24, also for calibration and research.
- X. To be used in a Siemens Model 035-423000 Dual Isotopic Motion Correction Point Source Holder, Amersham Model AMC24, also for calibration and research.
- Y. To be used for research, development and evaluation of a prototype device for testing utility poles at temporary job sites throughout the State of Missouri and outside of Missouri in NRC-regulated states; Amersham/Searle in a type X-92 capsule, AMC-26X108-3675LV.
- Z. To be used in a sub-critical light-water-moderated assembly for student instruction and research.
- CC. To be used for laboratory research, student instruction and instrument calibration.
- FF. To be used in Tracer Lam model 772 for veterinary medical therapy.
- GG. and HH. Short term waste inventory for including waste materials transferred from other licenses issued to the Curators of the University of Missouri.
- II. Six sources to be used in Adac Laboratories Transmission Line Source Housing VANTAGE devices for medical radiography in humans. Six sources in shipping containers for replacement of the sources.

CONDITIONS

- 10. Licensed material may be used at the licensee's facilities located at The University of Missouri-Columbia, Missouri Columbia campus and facilities throughout the State of Missouri and at temporary job sites of the licensee anywhere in the United States where the U.S. Nuclear Regulatory Commission maintains jurisdiction for regulating the use of licensed material.
- 11. The Radiation Safety Officer for this license is Susan M. Langhorst, Ph.D.

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12. A. The use of licensed material in or on humans shall be by a physician, dentist, or podiatrist as defined in 10 CFR 35.2.
- B. Physicians, dentists, or podiatrists designated to use licensed material in or on humans shall meet the training criteria established in 10 CFR 35, Subpart J and shall be designated by the licensee's Radiation Safety Committee. The licensee shall maintain records of individuals designated as users for three years after the individual's last use of licensed material.
- C. Licensed material for other than human use shall be used by or under the supervision of individuals designated by the Radiation Safety Committee. The licensee shall maintain records of individuals designated as users for three years after the individual's last use of licensed material.
13. In addition to the possession limits in Item 8, the licensee shall further restrict the possession of licensed material, except for licensed material included in Attachment C of application dated February 28, 1992, to quantities below the limits specified in 10 CFR 30.72 which require consideration of the need for an emergency plan for responding to a release of licensed material.
14. 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 6 months prior to the transfer, a sealed source or detector cell received from another person shall not be put into use until tested.
- D. 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

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(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.

E. 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 III, 801 Warrenville Road, Lisle, Illinois 60532-4351, ATTN: Chief, Nuclear Materials Safety Branch. 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.

F. 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.

15. Pursuant to 10 CFR Part 40, "Domestic Licensing of Source Material," the licensee is authorized to possess, use, transfer, and import up to 999 kilograms of depleted uranium contained as shielding material.

16. The licensee shall conduct a physical inventory every 3-months to account for all sources and/or devices received and possessed pursuant to 10 CFR 35.59, 10 CFR 35.400 and 10 CFR 35.500 and every 6 months for all other sources and/or devices. Records of inventories shall be maintained for 5 years from the date of each inventory, and shall include the information required in 10 CFR 35.59(g).

17. A. Detector cells containing a titanium tritide foil or a scandium tritide foil shall only be used in conjunction with a properly operating temperature control mechanism which prevents the foil temperature from exceeding that specified by the manufacturer and approved by U.S. Nuclear Regulatory Commission.

B. When in use, detector cells containing a titanium tritide foil or a scandium tritide foil shall be vented to the outside.

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18. 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.
19. Sealed sources or detector cells containing licensed material shall not be opened or sources removed from source holders by the licensee.
20. The licensee is authorized to hold radioactive material with a physical half-life of less than 65 days, and those isotopes listed in Table 11-A1 application dated February 28, 1992, 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.
  - C. Generator columns shall be segregated so that they may be monitored separately to ensure decay to background levels prior to disposal.
  - D. A record of each disposal permitted under this License Condition shall be retained for 3 years. The record must include the date of disposal, the date on which the byproduct material was placed in storage, the radionuclides disposed, the survey instrument used, the background dose rate, the dose rate measured at the surface of each waste container, and the name of the individual who performed the disposal.
  - E. Radioactive waste being held for decay shall not be stored for a period greater than 4 years.
21. Radioactive waste other than that specified in Condition 20. shall not be stored for a period greater than 2 years.
22. Radioactive waste currently possessed exceeding the storage provisions of Condition 20.E., and 21. shall be disposed of within one year of the issuance of this license.
23. Notwithstanding Conditions 20. and 21., radioactive waste transferred from other University of Missouri Licenses shall be disposed of within one year of receipt.

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24. Pursuant to 10 CFR 20.1302 and 10 CFR 20.2002, the licensee is authorized to dispose of licensed material by incineration provided the gaseous effluent from incineration does not exceed the limits specified for air in Appendix B, Table II, 10 CFR Part 20.
25. The licensee shall not use licensed material in or on human beings except as provided otherwise by specific condition of this license.
26. Experimental animals, or the products from experimental animals, that have been administered licensed materials shall not be used for human consumption.
27. The licensee shall not acquire licensed material in a sealed source or device that contains a sealed source unless the source or device has been registered with the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or with an Agreement State.
28. The licensee is authorized to transport licensed material only in accordance with the provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."
29. The licensee shall maintain records of information related to decommissioning at 311 Jesse Hall, Columbia, Missouri as specified in 10 CFR 30.35(g) until this license is terminated by the Commission.
30. Pursuant to 10 CFR 20.2002, the licensee may dispose of incinerator ash containing radioactive materials with Atomic Nos. 1-83, other than those isotopes listed below, as ordinary waste in a landfill, provided the concentrations of the isotopes, expressed in  $\mu\text{Ci}$  per gram of ash, at the time of disposal, do not exceed the numerical values listed in Table II, Column 2, 10 CFR 20, Appendix B. Isotopes not included are hydrogen-3, carbon-14, aluminum-26, chlorine-36, silver-108m, niobium-94, iodine-129, technetium-99, and thallium-204, for which the concentrations must not exceed 10 percent of the values listed in Table II, Column 2, 10 CFR Part 20, Appendix B.
31. 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, except for minor changes in the medical use radiation safety procedures as provided in 10 CFR 35.31. The U.S. 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 28, 1992; and

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31. (Continued)

- B. Letters dated June 5, 1992 (except reference to disposal of ash residue), June 30, 1992, June 27, 1995, December 6, 1995, March 7, 1996, October 23, 1996 and March 12, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Date

6/11/97

By

Kevin A. Nee

Nuclear Materials Licensing Branch, Region III

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JUN 13 1997

Susan M. Langhorst, Ph.D.  
Radiation Safety Officer  
Curators of the University  
Missouri  
311 Jesse Hall  
Columbia, MO 65211

Dear Dr. Langhorst:

It has come to our attention that Amendment Number 87 to License  
Number 24-00153-32 issued on May 23, 1997 contained an error.

Enclosed is a corrected copy reflecting a corrected License Condition  
No. 24. We apologize for any inconvenience this may have caused you.

Sincerely,

Original Signed By  
Charles F. Gill  
Nuclear Materials Licensing Branch

License No.: 24-00153-32  
Docket No.: 030-02278

Enclosure: Corrected Copy of  
Amendment No. 87

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