

MATERIALS LICENSE

Amendment No. 22

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.

301754

Licensee

1. National Aeronautics and
Space Administration
Lewis Research Center
21000 Brookpark Road
Cleveland, OH 44135

In accordance with letter dated
August 14, 1996

3. License Number 34-00507-16 is amended in
its entirety to read as follows:

4. Expiration Date June 30, 2004

5. Docket or
Reference No. 030-05626

6. Byproduct, Source, and/or
Special Nuclear Material7. Chemical and/or Physical
Form8. Maximum Amount that Licensee
May Possess at Any One Time
Under This License

A. Americium-241

A. Sealed sources
(Amersham Corporation
Model AMC 17)

A. 3 sources not to exceed
300 millicuries each

B. Americium-
241/Beryllium

B. Custom sealed
source (General Electric
Co., Vallecitos Atomic
Lab)

B. One source not to exceed
54 curies

C. Americium-241/
Beryllium

C. Sealed source (General
Nuclear, Inc.)

C. One source not to exceed
1 curie

D. Californium-252

D. Sealed source (Battelle
Laboratories Model
No. GI-Cf-Cs-1)

D. One source not to exceed
59 millicuries

E. Carbon-14

E. Foil source (Amersham
Corp. Model No. T077)

E. One source not to exceed
1 microcurie

F. Cesium-137

F. Sealed source (ORNL)

F. One source not to exceed
24 curies

G. Cesium-137

G. Sealed sources
(NBS or Isotope Products
Laboratory)

G. 2 sources not to exceed
15 microcuries each

H. Cesium-137

H. Sealed source
(Berthold Systems,
Inc. Dwg.
No. P-2623-100)

H. One source not to exceed
150 millicuries and one
source not to exceed
20 millicuries

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PDR ADOCK 03005626
C PDR

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2 ML
30
SD

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number

34-00507-16

Docket or Reference Number

030-05626

Amendment No. 22

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

I. Strontium-90

I. Sealed source
(Isotope Products,
Inc.)

I. One source not
to exceed 1
microcurie

J. Cesium-137

J. Sealed sources
(Texas Nuclear Model
No. 5202 or 5203)

J. 2 sources not
to exceed 1
curie each

K. Cesium-137

K. Contaminated
cyclotron
components/equipment

K. 1 microcurie total

L. Promethium-174

L. Sealed Source
(Ameresham
Corporation Model
PHC.C1, Dwg.
No. VZ-376)

L. One source not
to exceed 10
millicuries

9. Authorized Use:

A., B., D., H., and J. For storage only.

C., E., F., G., and I. For instrument calibration/standardization.

K. Possession incident to storage and disposal of decommissioned cyclotron.

L. Research as described in letter dated August 14, 1996.

CONDITIONS

10. Licensed material may be used and stored at NASA Lewis Research Center, 21000 Brookpark Road, Cleveland, Ohio and may also be stored at Plum Brook Station, 6100 Columbus Avenue, Sandusky, Ohio.

11. A. Licensed material shall be used by, or under the supervision of, John Cooper, Dale Krismanth, Gayle Reid, or George Saturnino.

B. Licensed material in subitem L may be used by George Rybicki.

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**MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License Number

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12. The Radiation Safety Officer for this license is Gayle Reid.
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 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
 - (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. 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 in accordance with 10 CFR 30.50(b)(2), 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, ATTN: Chief, Nuclear Materials Safety Branch, 801 Warrenville Road, Lisle, Illinois 60532-4351. The report shall specify the source involved, the test results, and corrective action taken.

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MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number

34-00507-16

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Amendment No. 22

- 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.
14. Sealed sources or detector cells containing licensed material shall not be opened or sources removed from source holders by the licensee.
15. The licensee shall conduct a physical inventory every 6 months to account for all sources and/or devices received and possessed under the license.
16. 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 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 8, 1994; and
- B. Letters dated June 29, 1994, October 19, 1994, and February 13, 1995 (with attachments), June 15, 1995, August 14, 1996, and October 2, 1996.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Date 21 October 1996

By

William P. Kneiff
Nuclear Materials Licensing Branch, Region III

COPY

(FOR LPMS USE)
INFORMATION FROM LTS

BETWEEN:

License Fee Management Branch, ARM
and
Regional Licensing Sections

Program Code: 03122
Status Code: 0
Fee Category: EX 3P
Exp. Date: 20040630
Fee Comments: 3P EFF 1/4/95
Decom Fin Assur Req'd: N

LICENSE FEE TRANSMITTAL

A. REGION

1. APPLICATION ATTACHED

Applicant/Licensee: NATIONAL AERONAUTICS & SPACE ADM.
Received Date: 960821
Docket No: 3005626
Control No.: 301754
License No.: 34-00507-16
Action Type: Amendment

2. FEE ATTACHED

Amount: 0

Check No.: 0

3. COMMENTS

Signed D. Hersey
Date 8-23-96

FEE EXEMPT

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 _____



Reply to Attn of:

0540

August 14, 1996

U.S. Nuclear Regulatory Commission
Region III
Regional Licensing Branch
801 Warrenville Road
Lisle, IL 60532-4351

Subject: Amendment License #34-00507-16
Docket #030-05626

The Lewis Research Center is submitting a request to amend NRC license no. 34-00507-16 to add a plated source and an additional authorized user. This request voids the amendment application dated October 24, 1995, Docket #030-05626. We are requesting the following radioactive source, which is included in the approved source and device registry:

Promethium 147
10 millicuries
Amersham Corp. Model No. PHC-C1

Authorized use:

The source will be used for research in space power applications. Specifically, it will be used to irradiate a diode array to generate an electric current. A drawing of experimental setup is enclosed. The source will be placed in a chamber and a diode array will be placed next to the source, not in contact with it. The chamber will be sealed, a vacuum pulled with a laboratory vacuum pump, and the test begun. The diode array is connected to measuring equipment and to a computer so the chamber does not have to be opened until a test is completed. There is no manipulation of the source beyond placing it in the chamber. When the source is not in use it will be stored in a container in the Health Physics section. The test setup with the source will be performed in the health physics area and will be conducted with the assistance of the health physics staff. The health physics area is a secure area so only the user and the health physics staff will have access to the area. The area is also posted in accordance with 10 CFR Part 20 requirements.

FREE EXEMPT

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AUG 21 1996

AUG 21 1996

REGION III

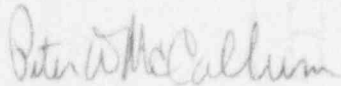
Pm: 8-15-96

301254

The radioactive source, the chamber, diodes and connections and ports will be checked for leakage or contamination whenever a test is completed and the chamber is opened. Wipe samples will be analyzed using a gas flow proportional counter according to the procedures described in license no. 34-00507-16.


The authorized user of the Promethium-147 source will be Dr. George Rybicki. A summary of Dr. Rybicki's training and experience is enclosed.

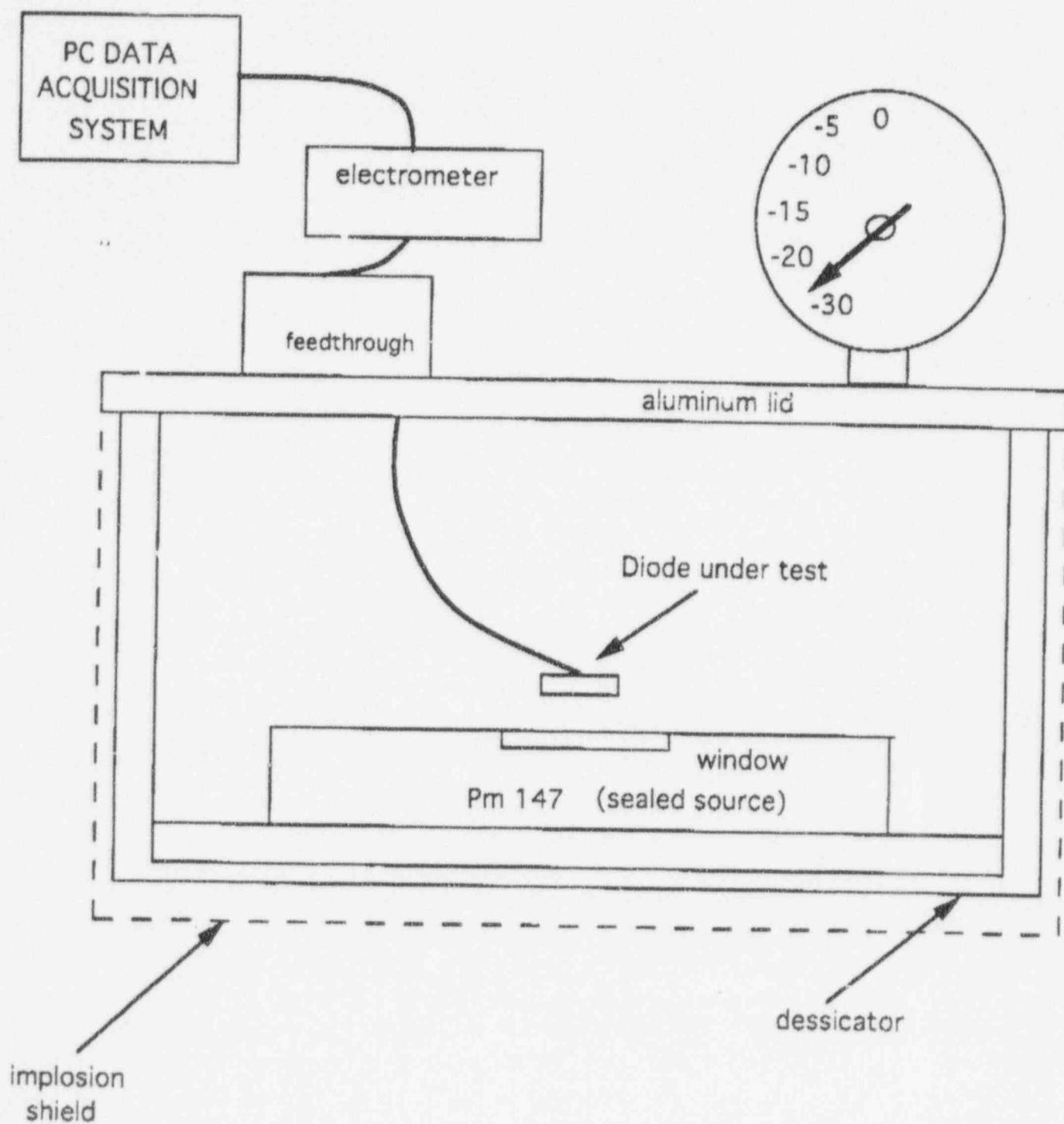
Please contact Gayle Reid, Lewis Research Center's RSO, at (216) 433-3173, if you have any questions or require any further information.



Peter W. McCallum, Chief
Office of Environmental Programs

Enclosure





Dr. George C. Rybicki

Photovoltaics Branch NASA Lewis Research Center
21000 Brookpark Rd.
Cleveland, Ohio MS 302-1
44135
216-433-8473

EDUCATION Ph.D. Materials Science and Engineering, Case Western Reserve University, Cleveland, OH, 5/93. Dissertation title "Proton Irradiation Damage in Zn and Cd Doped InP".

MSc. Materials Science and Engineering, Case Western Reserve University, Cleveland, OH, 5/88. Thesis title "Indentation Plasticity and Fracture in Silicon".

BSc. Materials Science and Engineering, Case Western Reserve University, Cleveland, OH, 1/83.

EXPERIENCE **Photovoltaics Branch, Power Technology Division, NASA Lewis Research Center, Cleveland, OH**

5/88-Present. Study of radiation effects in materials. Development of new long life, high power output radioisotope battery. Fundamental and engineering studies of radiation damage in semiconductor materials using particle accelerator and radioisotope sources.

Environmental Durability Branch, NASA Lewis Research Center, Cleveland, OH.

1/83-5/88. Fundamental research on oxidation and corrosion of superalloys and high temperature metal and ceramic materials.

AREAS OF KNOWLEDGE AND EXPERTISE radiation physics, radiation effects and radiation safety
solar cell and semiconductor device physics
electrical analysis and characterization of materials
electron microscopy and SIMS
vacuum science and technology
thermal electrical and optical properties and processing of ceramics

SPECIALIZED TRAINING AND EXPERIENCE Nuclear Physics, Case Western Reserve University, 65 hours
Solid State Physics, Case Western Reserve University, 65 hours
Radiation Safety Training: General Physics Corporation-16 Hours.
Radiation Safety Training: Radiology Dept., School of Medicine, Case Western Reserve University 16 Hours
Radiation Safety Training, Health Physics Branch NASA Lewis Research Center 20 hours
X-Ray diffraction, Case Western Reserve University - 100 hours practical experience and training
Radioisotope Irradiation of Semiconductors, using 1.5 mCi Am-241 foil source - 600 hours practical experience and training
Accelerator irradiations of semiconductor materials- 1000 hours practical experience and training

OCT 21 1996

Peter W. McCallum, Chief
Office of Environmental Programs
National Aeronautics and Space
Administration Lewis Research Center
2100 Brookpark Road
Cleveland, OH 44135

Dear Mr. McCallum:

Enclosed is Amendment No. 22 to your NRC Material License No. 34-00507-16 in accordance with your request.

Please review the enclosed document carefully and be sure that you understand all conditions. If there are any errors or questions, please notify the U.S. Nuclear Regulatory Commission, Region III office at (630) 829-9887 so that we can provide appropriate corrections and answers.

Please note we have extended the expiration date of the license for five years in accordance with the regulations (10 CFR 30.36).

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 Part 19, "Notices, Instructions and Reports to Workers; Inspections," 10 CFR Part 20, "Standards for Protection Against Radiation," and other applicable regulations.
2. Notify NRC, in writing, within 30 days:
 - a. When the Radiation Safety Officer 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).
3. In accordance with 10 CFR 30.36(b) and/or license condition, notify NRC, promptly, in writing, and request termination of the license when you decide to terminate all activities involving materials authorized under the license.
4. Request and obtain a license amendment before you:
 - a. Change Radiation Safety Officers;

301754

- b. Order byproduct material in excess of the amount, or radionuclide, or form different than authorized on the license;
 - c. Add or change the areas of use or address or addresses of use identified in the license application or on the license; or
 - d. Change ownership of your organization.
5. 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. 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 Policy and Procedures for NRC Enforcement Actions. 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 when dealing with licensees who do not achieve the necessary meticulous attention to detail and the high standard of compliance which NRC expects of its licensees.

Sincerely,

Original Signed By
W. P. Reichhold
Nuclear Materials Licensing Branch

License No.: 34-00507-16
Docket No.: 030-05626

Enclosure: Amendment No. 22

DOCUMENT NAME: M:\03005626.CL6

To receive a copy of this document, indicate in the box: "C" = Copy without attachment/enclosure "E" = Copy with attachment/enclosure "N" = No copy

OFFICE	DNMS/RIII <i>MR</i>	DNMS/RIII							
NAME	WREICHOLD:jaw	KGNULD							
DATE	10/1/96	10/ /96							

OFFICIAL RECORD COPY



October 2, 1996

Reply to Attn of:

U.S. Nuclear Regulatory Commission
Region III
801 Warrenville Road
Lisle, IL 60532-4351

Attention: Bill Reichhold

Reference: License #3400507-16
Control #301754

The following are answers to the additional questions related to our license amendment request, dated 8/14/96, which we discussed in our telecon on 9/30/96.

1.) Q. Confirm that you will not subject the source to environmental or other conditions of use which exceed the ANSI N542 classification of 77C3322.

A. The ANSI in New York has informed us that the N542 standard is obsolete. They are checking for the standard that supersedes N542 or a current version and will contact us with the appropriate information. NASA Lewis agrees to comply with the conditions of the N542 for any terms preventing damage or alteration of the sealed source's original physical state, to prevent unanticipated exposure to or release of radioactive material.

2.) Q. Please describe how you will shield and what type of shielding you will use to shield the radioactive source during the experiment.

A. The source will be used in a Plexiglas chamber with aluminum shielding for the beta energy characteristic of this source.

3.) Q. Please describe what type of personnel monitoring the researcher will use when handling the radioactive source.

A. The user will be issued a finger dosimeter.

4.) Q. Please describe what type of remote handling device will be used to handle the radioactive source.

A. The sealed source will be positioned with the hand wearing the dosimeter. The physical size of the source is too small for manipulators or other source handling devices. The source will be handled by the user twice, for a matter of seconds. Once to place it in the chamber and again to remove it from the chamber when the test has been completed.

If you require additional information, you may contact me at :

Telephone: (216) 433-3173

FAX: (216) 433-8719

Gayle M. Reid
Gayle Reid
Health Physicist/RSO

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OCT 10 1996
REGION III

pm, 10-7-96

OCT 10 1996

TRANSMIT CONFIRMATION REPORT

NO.	:	005	
RECEIVER	:		216 433 8719
TRANSMITTER	:	US NRC REGION III	
DATE	:	SEP 30'96	10:38
DURATION	:	00'39	
MODE	:	STD	
PAGES	:	01	
RESULT	:	OK	

FAX TRANSMITTAL

of pages 1

To GALE REID	From Bill REICHHOLD
Dept./Agency NASA	Phone # 630-829-9839
Fax # 216-433-8719	Fax # 630-515-1259
NSN 7540-01-317-7368	5099-101 GENERAL SERVICES ADMINISTRATION

UNITED STATES NUCLEAR REGULATORY COMMISSION
REGION 3
801 WARRENVILLE ROAD
LISLE, ILLINOIS 60532-4351

PHONE CONVERSATION RECORD

30 September 1996
Gayle Reid
Radiation Safety Officer
National Aeronautics and Space Administration
Cleveland, Ohio

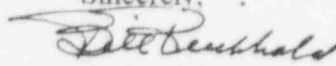
Dear Mr. Reid,

The following additional information is needed to complete the review of your license amendment.

1. Please confirm that you will not subject the source to environmental or other conditions of use which exceed the ANSI N542 classification of 77C33222.
2. Please describe how you will shield and what type of shielding you will use to shield the radioactive source during the experiment.
3. Please describe what type of personnel monitoring the researcher will use when handling the radioactive source.
4. Please describe what type of remote handling device will be used to handle the radioactive source.

Please respond to the above within 15 days and refer to mail control 301754. Please call me at 630-829-9839 if you have any questions.

Sincerely,


Bill Reichhold

FAX TRANSMITTAL

of pages 1

To: <u>GALE REID</u>	From: <u>Bill REICHOLD</u>
Dept./Agency: <u>NASA</u>	Phone: <u>630-829-9839</u>
Fax: <u>216-433-8719</u>	Fax: <u>630-515-1259</u>
NSN 7540-01-917-7368	5099-101 GENERAL SERVICES ADMINISTRATION

UNITED STATES NUCLEAR REGULATORY COMMISSION
REGION 3
801 WARRENVILLE ROAD
LISLE, ILLINOIS 60532-4351

PHONE CONVERSATION RECORD

30 September 1996
 Gayle Reid
 Radiation Safety Officer
 National Aeronautics and Space Administration
 Cleveland, Ohio

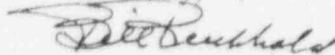
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