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September 22, 2005

Document Control Desk  
U.S. Nuclear Regulatory Commission  
One White Flint North  
11555 Rockville Pike  
Rockville, MD 20852-2738

SUBJECT: Annual Report for The Ohio State University Research Reactor, License R-75, Docket 50-150

Please find enclosed the annual report for The Ohio State University Research Reactor, Docket No. 50-150. This report is being submitted as required by our Technical Specifications, Section 6.6.1. If you have questions on the content of this report, please contact Mr. Andrew Kauffman, Associate Director of the Nuclear Reactor Laboratory, at 614-688-8220.

I declare under penalty of perjury that the foregoing is true and correct.  
Executed on September 22, 2005.

Sincerely,

W. A. "Bud" Baeslack III  
Dean, College of Engineering

c: A. Fentiman, OSUNE  
D. Hughes, USNRC  
A. Kauffman, OSURR

JADA DeANNE HARMON  
NOTARY PUBLIC, STATE OF OHIO  
My Commission Expires 04-25-09

A020

THE OHIO STATE UNIVERSITY  
RESEARCH REACTOR

ANNUAL REPORT FOR FY 2004/2005

SEPTEMBER 2005

## **Introduction**

As stated in The Ohio State University Research Reactor (OSURR) Technical Specifications, Section 6.6.1 Operating Reports, an annual report shall be made to the NRC by September 30 of each year. This report is to include the following seven sections.

1. A narrative summary of operating experience (including experiments performed) and of changes in facility design, performance characteristics, and operating procedures related to reactor safety occurring during the reporting period.
2. A tabulation showing the energy generated by the reactor (in kilowatt hours) and the number of hours the reactor was in use.
3. The results of safety-related maintenance and inspection. The reasons for corrective maintenance of safety-related items shall be included.
4. A table of unscheduled shutdowns and inadvertent scrams, including their reasons and the corrective actions taken.
5. A summary of changes to the facility or procedures, which affect reactor safety and performance of tests or experiments carried out under the conditions of sections 50.59 of 10CRF50.
6. A summary of the nature and amount of radioactive gaseous, liquids, and solid effluents released or discharged to the environs beyond the effective control of the licensee as measured or calculated at or prior to the point of such release or discharge.
7. A summary of radiation exposures received by facility personnel and visitors, including the dates and times of significant exposures.

These seven sections are discussed below. These are all for the period July 1, 2004 through June 30, 2005, except as noted for exposure records.

### **1. Summary of Operating Experience and Changes**

#### **1.A. Experiments Performed**

The staff of The OSU Research Reactor is generally involved in four types of experiments at the Nuclear Reactor Laboratory. Included are introductions to nuclear research, neutron activation analysis, material irradiations, and classes that measure various reactor parameters. Typically when we introduce students, faculty or other experimenters to nuclear research, we do the following:

- a. Discuss nuclear reactions and radiological safety.
- b. Operate the reactor at 10kW-100kW
- c. Have the individuals observe control room operations.
- d. Complete a tour and demonstrate irradiation techniques.

Neutron activation analysis experiments are routinely completed for students ranging from high school to graduate school. The facilities normally utilized are the "rabbit" (pneumatic tube) and the "CIF" (Central Irradiation Facility). Much of the NAA work is geological samples.

Material irradiations, other than for NAA, are in four basic areas: isotope production; detector, electronic component and fiber optic testing; boron neutron capture therapy (BNCT); and irradiation of biological samples. Isotope production has been done often for medical research. Detector and electronic component

testing is done routinely. This testing is usually completed in the thermal column, or one of the beam ports, while fission chamber testing is in the Central Irradiation Facility. The reactor thermal column is also utilized for other BNCT studies. Typically it is the location for cell samples to determine their boron content.

Various nuclear engineering or physics classes throughout Ohio utilize the reactor for the following basic experiments:

- a. Approach to critical (using banked control rods rather than fuel loading).
- b. Control rod calibration by rod drop, positive period, and subcritical multiplication.
- c. Measurement of the reactor transfer function by noise analysis.
- d. Temperature coefficient measurements.
- e. Radiological surveys.

The reactor utilization for July 1, 2004 through June 30, 2005 is summarized in the following reports.

Funding for colleges and universities that utilize the OSU Research Reactor is provided in part by the DOE-funded Reactor Sharing Program.

**The Ohio State University Nuclear Reactor Lab Reactor Utilization Report:  
July 1 - December 31, 2004**

<u>User / Activity</u>	<u>Hours</u>
Irradiations for AFIT – semiconductor damage	23.0
Hf-181 production for Miami	1.0
NAA for OSU Students	3.0
UC / Tuskegee tour/lab	2.5
NAA for Scintiprox	5.0
NAA for OK State	4.5
Detectors for GE Reuter-Stokes	60.5
NE 505, 742, 744 labs	32.5
Misc. OSU tours	7.0
Misc. high school / middle school tours	2.5
Misc. Ohio college tours	10.5
NASA testing	30.5
Irradiation of Si disks for U.C.	5.0
Irradiation of rare-earth magnets for Electron Energy Corp.	5.5
NERI scintillator irradiations	30.0
BNCT irradiations	2.5
SiC detector irradiations	26.5
Isotope production for U.C.	1.0
Total Reactor Operation Time	253.0

**The Ohio State University Nuclear Reactor Lab Reactor Utilization Report:  
January 1 - June 30, 2005**

User / Activity	Hours
AFIT - Electronics damage	19.7
Tours	51.9
Bucky ball irradiations	1.5
GE-RS FC testing	46.3
Luna Innovations - fiber optic testing	19.9
NASA - electronics damage	51.2
NE 505, NE 742, NE 744	28.5
OK State Geology - NAA	3.0
OSU Mat. Science - Resin composition NAA	25.7
OSU-NE / Blue - BNCT	12.1
OSU-NE / Blue - SiC detectors	26.1
OSU-NE / Miller - Scint. Detectors	10.2
OSU-NE / Miller - SSFM Detectors	1.5
Scintiprox - source production	1.4
U Cincinnati - neutron irradi. Of quartz disks	7.9
U Miami - source production	4.2
Westinghouse - dosimeter irradiation	6.2
	<hr/> 317.3

**1.B. Changes in Facility Design**

There were no facility design changes that required a change to the Technical Specifications. 10CFR50.59 changes are described in Section 5.A of this report.

**1.C. Changes in Performance Characteristics**

There have been no changes in performance characteristics related to reactor safety in the last year.

**1.D. Changes in Operating Procedures**

There were no changes in operating procedures related to reactor safety in the last year. 10CFR50.59 changes are described in Section 5.B of this report.

**2. Energy Generated and Hours of Use**

Kilowatt-Hours of Operation: 40,414

Hours of Utilization: 570.3

### 3. Safety Related Maintenance

None

### 4. Unscheduled Shutdowns

From July 1, 2004 to June 30, 2005 there were 15 unplanned shutdowns. These are summarized below.

Reason		Corrective Action
Noise on Period Safety Amplifier	(10)	Replaced Period Safety Amplifier
Low source counts	(2)	Discussed with operators
Linear Channel scale	(2)	Discussed with operators
Loss of magnet current	(1)	Repaired circuit

### 5. Changes in Facility and Procedures Accordance with 10CFR50.59

#### 5.A. Facility Modifications

During the period July 1, 2004 to June 30, 2005, three OSURR Modification Requests were completed by the reactor staff:

- Replacement of Level Safety Amplifier B
- Replacement of Magnet Current Amplifier (for Shim Safety 1)
- Replacement of Period Safety Amplifier

#### 5.B. Procedure changes

The following is a list of procedure changes made under 10CFR50.59 from July 1, 2004 to June 30, 2005 in accordance with Administrative Procedure AP-05, entitled Format for Writing, Revising, and Approving Procedures.

Procedure Number	Procedure Title	Revision Date
OM-01	Reactor Power Changes	7/12/04
OM-03	Experimental Facilities	7/12/04
OM-15	Process System Checks	7/12/04
RS-06	Annual Radiation Monitor Calibrations	7/14/04
RS-15	Radiation Safety Instruction	7/15/04
SP-01	Personnel Authorized Access to NRL	2/8/05
EP-02	Handling Precautions for Non-Radioactive Hazardous Materials	3/11/05

### 6. Radioactive Effluents

#### 6.A. Gaseous Effluent

The only effluent measured is the release of Ar-41. For the period July 1 - Dec. 31, 2004, Ar-41 releases measured 1.07 % of the annual average concentration limit. From Jan. 1 - June 30, 2005, releases measured 2.05 % of the annual average concentration limit.

In accordance with the requirements of 10CFR20.1101(d), the COMPLY code was run using the total Ar-41 release for the period July 1, 2004 - June 30, 2005 of 197.38 mCi. Using level 2 in the code, the effective dose

equivalent rate at the facility fence was computed to be 0.1 mrem/yr. This is well below the 10 mrem/yr constraint specified in the regulation.

#### **6.B. Liquid Releases**

Hot sink releases are recorded and reported through the OSU Office of Radiation Safety. No releases were made to the sanitary sewer system during the period July 1, 2004 to June 30, 2005.

#### **6.C. Solid Releases**

No releases of solid radioactive material were made to the uncontrolled environment.

### **7. Radiation Exposures**

Since the firm that maintains records for The Ohio State University keeps a year to date record, it is easier to report this by the nearest completed calendar year. Therefore film badge exposures in this report are for the period January 1, 2004 to December 31, 2004. Nine individuals were monitored as radiation workers for the entire year or a major part of it. These are tabulated below. They are consistent with the ALARA policy for The Ohio State University and represent a fraction of allowed limits. All doses are in rem.

Individual	DDE	SDE, WB	SDE, ME	TEDE
Visitors	0.000	0.000	0.000	0.000
1	0.019	0.057	N/A	0.019
2	0.095	0.128	0.480	0.095
3	0.035	0.039	0.190	0.035
4	0.047	0.154	0.030	0.047
5	0.015	0.017	N/A	0.015
6	0.047	0.057	N/A	0.047
7	0.264	0.604	0.970	0.264
8	0.055	0.126	0.240	0.055
9	0.029	0.030	N/A	0.029

COMPLY: V1.5d.

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40 CFR Part 61  
National Emission Standards  
for Hazardous Air Pollutants

REPORT ON COMPLIANCE WITH  
THE CLEAN AIR ACT LIMITS FOR RADIONUCLIDE EMISSIONS  
FROM THE COMPLY CODE, VERSION 1.5d

Prepared by:

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Prepared for:

U.S. Environmental Protection Agency  
Office of Radiation Programs  
Washington, D.C. 20460

COMPLY: V1.5d.

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NRL 2004-2005

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SCREENING LEVEL 2  
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DATA ENTERED:  
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Nuclide	Release Rate (curies/YEAR)
AR-41	1.974E-01

Release height 10 meters.

Building height 11 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 15 meters.

Building width 25 meters.

Default mean wind speed used (2.0 m/sec).

NOTES:  
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Input parameters outside the "normal" range:

None.

RESULTS:  
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Effective dose equivalent: 0.1 mrem/yr.

\*\*\* Comply at level 2.

This facility is in COMPLIANCE.

It may or may not be EXEMPT from reporting to the EPA.

You may contact your regional EPA office for more information.

\*\*\*\*\* END OF COMPLIANCE REPORT \*\*\*\*\*