



**ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE**  
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March 25, 2015

U.S. Nuclear Regulatory Commission  
Document Control Desk  
11555 Rockville Pike  
Rockville, MD 20852

Sir or Madam:

Enclosed is the 2014 Annual Operating Report required by the Technical Specifications for the Armed Forces Radiobiology Research Institute reactor (license R-84, docket 50-170).

Should you need any further information, please contact me at (301) 295-9245.

STEPHEN I. MILLER  
Reactor Facility Director

A020  
NRC

**Armed Forces Radiobiology Research Institute  
AFRRI TRIGA Reactor Facility**

01 January 2014 - 31 December 2014

To satisfy the requirements of  
U.S. Nuclear Regulatory Commission License No. R-84 (Docket No. 50-170),  
Technical Specification 6.6.b.

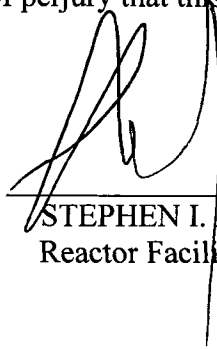
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Reactor Facility Director

Armed Forces Radiobiology Research Institute  
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Telephone: (301) 295-1290

## Submission of 2014 Annual Report

I declare under penalty of perjury that this report is true and correct.



A handwritten signature in black ink, appearing to be 'S. I. Miller', is written over a horizontal line. The signature is stylized and cursive.

STEPHEN I. MILLER  
Reactor Facility Director

**MAR 25 2015**

Date

## 2014 ANNUAL REPORT

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# 2014 ANNUAL REPORT

## INTRODUCTION

The Armed Forces Radiobiology Research Institute (AFRRI) reactor facility was available for irradiation services only a part of the year due to renovation work in Exposure Room #1 and several maintenance and calibration issues. The reactor was unavailable for operations from 20 November until the end of the calendar year due to the pending repair of the control console. Pulsing operations remain unavailable awaiting installation of a new pulse ion chamber and calibration of the pulsing circuits.

There were three reactor modifications during the year discussed in Section I. There were no unscheduled shutdowns during 2014.

The 2014 annual reactor audit required by the reactor Technical Specifications was conducted by Mr. Thomas Myers in December 2014. Mr. Myers is a member of the reactor staff at the National Institute of Standards and Technology (NIST). The auditor found reactor operations, training, maintenance activities, radiation protection, emergency planning, and physical security met the requirements set forth in the AFRRI licensing documents.

A comprehensive NRC inspection of procedures, experiments, health physics, design changes, transportation, committees, audits, and reviews was conducted by Mr. Johnny Eads in February 2014. No safety concerns or noncompliance with NRC requirements were identified. The reactor program met the requirements of regulations, Technical Specifications, and facility procedures.

Reactor and Radiation Facilities Safety Subcommittee (RRFSS) membership changes during the year are discussed in the General Information section. There were no reactor staff departures or additions during the year.

The remainder of this report is written in the format designated in the Technical Specifications for the AFRRI TRIGA Reactor Facility. Items not specifically required are presented in the General Information section. The following sections correspond to the required items listed in Section 6.6.b. of the Technical Specifications.

## GENERAL INFORMATION

All personnel held the listed positions throughout the year unless otherwise specified.

Key AFRRI personnel (as of 31 December 2014) are as follows:

1. AFRRI Director – L. Andrew Huff, Col, USAF  
Radiation Sciences Department (RSD) Head - Stephen Miller (SRO)  
Radiation Safety Officer – Brian Livingston
2. Reactor Facility Director and Facility Radiation Manager - Stephen Miller (SRO)
3. Reactor operations personnel:  
Reactor Operations Supervisor – Ian Gifford (SRO)  
SRO Training Coordinator – Ian Gifford (SRO)  
Maintenance Specialist - Walter Tomlinson (SRO)  
Records Administration Specialist – Ian Gifford (SRO)
4. Other Senior Reactor Operators:  
Jason Jacot, SFC, USA (effective 06 August)
5. Operator candidates:  
Robert McMahan, MAJ, USA  
David Manzanares, SSG, USA
6. Additions to staff during 2014:  
None
7. Departures during 2014:  
None
8. There were a few changes to the RRFSS membership during 2014. Dr. Seymour Weiss was replaced by Mr. Vincent Adams as a Reactor Operations Specialist. Following the retirement of Ms. Anna Teachout, Mr. Charles Woodruff and Mr. Brian Livingston were appointed to the role of Radiation Safety Officer.

In accordance with the requirements set forth in Section 6.2.1.1. of the Technical Specifications for the AFRRRI TRIGA Reactor Facility, the RRFSS consisted of the following members as of 31 December 2014.

Regular members are:

Radiation Safety Officer – Brian Livingston

Reactor Facility Director and Facility Radiation Manager – Stephen Miller

Reactor Operations Specialist – Harry Spence

Reactor Operations Specialist – Vincent Adams

Health Physics Specialist - Joe Pawlovich

Chairman and Director's Representative – CAPT David Lesser, USN

Special nonvoting member - David Lake, Montgomery County Government (Department of Environmental Protection)

Recorder – Ian Gifford

Two meetings were held in 2014:

19 June 2014

09 December 2014

# SECTION I

## **Changes in the Facility Design, Performance Characteristics, Administrative Procedures, Operational Procedures, Results of Surveillance Tests and Inspections**

A summary of changes to the facility design, performance characteristics, administrative procedures, and operational procedures as well as the results of surveillance testing are provided in this section.

### **A. DESIGN CHANGES**

In April 2014, the poison-followed transient control rod was replaced with an aluminum-followed transient control rod. As described in the AFRRRI Technical Specifications Section 5.2.3(b), “the transient control rod shall have scram capability, and shall contain borated graphite, B<sub>4</sub>C powder, or boron and its compounds in solid form as a poison in aluminum or stainless-steel cladding. This rod may incorporate an aluminum, poison, or air follower.” The replacement aluminum-followed transient control rod satisfies the requirements outlined in the Technical Specifications. The RRFSS was notified of the change during the June 2014 meeting. The design change did not require a change to the Technical Specifications nor did it meet any of the criteria described in Section 50.59(c)(2) of 10 CFR Part 50.

### **B. PERFORMANCE CHARACTERISTICS**

There were no changes to the performance characteristics of the core during 2014.

### **C. ADMINISTRATIVE PROCEDURES**

There were no changes to the Administrative Procedures during 2014.

### **D. OPERATIONAL PROCEDURES**

There were two changes to the Operational Procedures during 2014. The RRFSS was notified of the changes during the June 2014 meeting.

Operational Procedure 8, Tab D “k-Excess” was modified on 30 January to clarify permissible control rod positions used to achieve cold critical during excess reactivity measurements. The purpose of excess reactivity measurements, as defined in Section 4.1 of the Technical Specifications, is met with the modified procedure. The procedural change did not require a change to the Technical Specifications nor did it meet any of the criteria described in Section 50.59(c)(2) of 10 CFR Part 50.

Operational Procedure 8, Tab H “Weekly Operational Instrument Checklist” was modified on 24 February to add a check of container seals on a new storage cabinet. The change does not



impact reactor safety. The procedural change did not require a change to the Technical Specifications nor did it meet any of the criteria described in Section 50.59(c)(2) of 10 CFR Part 50.

## E. RESULTS OF SURVEILLANCE TESTS AND INSPECTIONS

Surveillance tests required by Technical Specifications were accomplished as normally scheduled during 2014, with the exception of several pulse related calibration tasks normally completed during the annual reactor maintenance shutdown. These tasks were postponed until a new pulse ion chamber is installed. The replacement pulse ion chamber has arrived and is scheduled to be installed and tested in 2015. No pulse operations shall be conducted until all required calibrations have been performed

The 2014 annual reactor audit required by the reactor Technical Specifications was conducted by Mr. Thomas Myers in December 2014. Mr. Myers is a member of the reactor staff at the National Institute of Standards and Technology (NIST). The auditor found reactor operations, training, maintenance activities, radiation protection, emergency planning, and physical security met the requirements set forth in the AFRRI licensing documents.

A comprehensive NRC inspection of procedures, experiments, health physics, design changes, transportation, committees, audits, and reviews was conducted by Mr. Johnny Eads in February 2014. No safety concerns or noncompliance with NRC requirements were identified. The reactor program met the requirements of regulations, Technical Specifications, and facility procedures.

## SECTION II

### Energy Generated by the Reactor Core and the Number of Pulses \$2.00 or Larger

Month	Kilowatt Hours
JAN	5.0
FEB	0.0
MAR	37.9
APR	0.0
MAY	0.0
JUN	3418.9
JUL	0.0
AUG	6.6
SEP	752.0
OCT	119.6
NOV	156.6
DEC	<u>0.0</u>
TOTAL	4496.6

Total energy generated in 2014: 4,496.6 kWh

Total energy on fuel elements: 1,153,063.6 kWh

Total energy on FFCRs\*: 420,265.9 kWh

Total pulses this year  $\geq$  \$2.00: 0

Total pulses on fuel elements  $\geq$  \$2.00: 4,219

Total pulses on FFCRs\*  $\geq$  \$2.00: 107

Total pulses this year: 0

Total pulses on fuel elements: 12,171

Total pulses on FFCRs\*: 2,406

\*Fuel-followed control rods

## SECTION III

### **Unscheduled Shutdowns**

There were no unscheduled shutdowns during 2014.

## SECTION IV

### **Safety-Related Corrective Maintenance**

The following is a summary of malfunctions during the reporting period:

20 November 2014 – While performing a Weekly Operational Startup Checklist, the reactor operator was unable to observe the proper data display on the reactor control console. Upon further examination, it was determined that communication between the control system computer and digital acquisition computer was interrupted. The RFD was notified and all reactor operations were suspended. As of the end of the calendar year, repair of this system was still ongoing.

## SECTION V

### **Facility and Procedure Changes as Described in the Final Safety Analysis Report (FSAR), New Experiments or Tests Performed During the Year**

#### **A. FACILITY CHANGES AS DESCRIBED IN THE FSAR**

There were no facility changes as described in the FSAR during the year.

#### **B. PROCEDURE CHANGES AS DESCRIBED IN THE FSAR**

There were no changes to procedures as described in the FSAR during the year.

#### **C. NEW EXPERIMENTS OR TESTS**

No new experiments or tests were performed during the reporting period that were not encompassed by the FSAR.

## SECTION VI

### Summary of Radioactive Effluent Released

- A. Liquid Waste: The reactor produced no liquid waste during 2014.
- B. Gaseous Waste: There were no particulate discharges in 2014.

The total activity of Argon-41 discharged in 2014 was 0.47 curies. The estimated effluent concentration from the release of Argon-41 represents less than 1% of the constraint limit for unrestricted areas (10 CFR 20.1101(d) and Table 2, Appendix B, 10 CFR 20).

Quarterly:	Jan - Mar 2014	0.009 Ci
	Apr - Jun 2014	0.008 Ci
	Jul - Sep 2014	0.364 Ci
	Oct - Dec 2014	0.091 Ci

- C. Solid Waste: All solid radioactive waste material was transferred to the AFRRRI byproduct license; none was disposed of under the R-84 reactor license.

## SECTION VII

### Environmental Radiological Surveys

All environmental sampling of soil and vegetation yielded radionuclide levels within the background range. The radionuclides that were detected were those expected from natural background and from long-term fallout from nuclear weapons testing.

The calculated annual dose, due to Argon-41 release to the environment for 2014, was 0.015 mrem at the location of maximum public exposure. The maximum exposure is calculated at a location 91 meters from the release point as described in the FSAR. Exposure to the general population at the boundary of the Naval Support Activity Bethesda is significantly less due to the diffusion of Argon-41 in the atmosphere. The constraint limit for exposure to the public established under 10 CFR 20.1101(d) is 10 mrem per year. The exposure dose was calculated using COMPLY code, level 2, which is the most conservative level of COMPLY. Emissions due to reactor operations were 0.015 mrem, or less than 1% of the 10 mrem constraint limit, for the entire year.

The reactor in-plant surveys, specified in Health Physics Procedure (HPP) 3-2, all resulted in readings that were less than the action levels specified in HPP 0-2.

## SECTION VIII

### **Exposures Greater than 25% of 10 CFR 20 Limits**

There were no doses to reactor staff personnel or reactor visitors greater than 25% of 10 CFR 20 occupational and public radiation dose limits.