



# UNIVERSITY OF MARYLAND

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U.S. Nuclear Regulatory Commission  
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SUBJECT: ANNUAL REPORT

Enclosed is the Annual Report for the University of Maryland Training Reactor (MUTR) in accordance with the requirements set forth in the Technical Specifications. This report covers the period from July 1, 1999 to June 30, 2000.

Sincerely,

A handwritten signature in black ink, appearing to read "Alsheikhly".

Dr. Mohamad Al-Sheikhly  
Reactor Director

Cc: Dr. Aris Christou, Chairperson  
Department of Materials and Nuclear Engineering

U.S. Nuclear Regulatory Commission  
Region 1  
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King of Prussia, PA 19406

Reactor Files

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**ANNUAL REPORT:**  
July 1, 1999 – June 30, 2000

**FOR THE**

**MARYLAND UNIVERSITY TRAINING REACTOR**

License No. R-70

Docket No. 50-166



Department of Materials and Nuclear Engineering  
A. James Clark School of Engineering  
University of Maryland, College Park  
College Park, MD 20742-2115

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## I. INTRODUCTION

The University of Maryland Training Reactor (MUTR) is an open-pool type, TRIGA fueled reactor licensed for operation at 250 kW thermal power. The core is cooled by natural convection of the pool water with auxiliary cooling provided for protection of the filters and ion exchange equipment associated with reactor support piping.

The MUTR is used for academic instructions and operator training, performance of neutron and gamma irradiations, neutron activation analysis experiments, and tours and demonstrations for groups internal and external to the campus as well as for visiting nuclear power plant trainees.

## REACTOR USEAGE

During the past year the MUTR operated for a total of 50 runs (Run Numbers 3536 - 3586), which are categorized below:

Operator Training/Requalification	10 runs
Tours, Labs & Demonstrations	7 runs
Calibration, Maintenance, and Surveillance	12 runs
Nuclear Engineering Classes	17 runs
Irradiations and Activations*	4 runs

\*Note: Some of the runs in the Classes category consisted of irradiations. They are not included in the Irradiations category.

To perform these runs the core produced 8.083 MWh (kWh meter change from 168509 kWh to 176592 kWh), with a corresponding burnup of 0.41 Grams of U-235.

### III. SURVEILLANCE TESTS AND INSPECTIONS

All required surveillance tests and inspections were performed at the specified intervals. The required surveillance items for this reporting period include:

WATER SAMPLE TESTS

AIR SAMPLE TESTS

SUMP SAMPLE TESTS

RADIATION SURVEYS

CONTROL ROD DROP TEST

RAM CALIBRATION

SNM INVENTORIES

ALARA REVIEW

In addition to the above surveillance items, the following maintenance operations were performed on the indicated dates:

- 8/17/99 Detector heights adjusted during power calibration.
- 8/23/99 Replaced coarse filter on primary system.
- 9/12/99 Replaced redundant fuel temp meter with identical unit.
- 10/15/99 Replaced make-up water column.
- 11/18/99 New CRDM delivered from General Atomics. Shim II CRDM removed from service.
- 12/06/99 New rod position indicator circuits installed.
- 1/27/00 Dri-rite replaced
- 3/17/00 Replaced high voltage and signal cables on fission chamber.
- 3/18/00 Calibrated Safety Channel I
- 3/23/00 Replaced DC power supply on Radiation Area monitors.
- 3/17/00 Replaced Safety II "Trip Test" potentiometer.
- 3/27/00 Replaced start-up source withdraw tether.
- 4/3/00 Dri-rite replaced
- 4/28/00 Replaced Shim I and Regulating Rod drives with refurbished drives.

Additional minor maintenance was performed such as light bulb replacement and fine-tuning of equipment was performed as necessary. Additional descriptions of some items from above can be found in Section IV.

#### IV. CHANGES TO FACILITY

There were no significant changes to the Facility during this reporting period.

V. ENVIRONMENTAL SURVEYS OF SURROUNDING AREAS

All continuous monitoring for this year was accomplished using fixed-mounted film badges throughout the interior of the reactor building itself. These badges recorded the following exposures:

<u>Monitor</u>	<u>Location</u>	<u>Dose (mrem)</u>
1	Control Room	18
2	Pool Surface	321
3	Hot Room	241
4	Prep Room	59
5	S. Wall Upper	12
6	S. Wall Lower	35
7	E. Wall Lower	73
8	Pump Room	188
9	N. Wall Lower	870
10	W. Wall Lower	100

## VI. RADIOACTIVE RELEASE AND DISCHARGE TO THE ENVIRONMENT

The Reactor Storage Sump was not discharged during this reporting period.

The only release from the MUTR consists of Ar-41. For one operation the West Beam Port was open during operation for a routine experiment, so the West Beam Port would represent one possible source of Ar-41. The reactor was operated at a maximum power level of 200 kW for 1.25 hours, which would result in a production of 0.104 Ci of Ar-41. For this Ar-41 to escape to the reactor building it would have to diffuse through the 2" diameter hole in the new beam port plugs. If it is assumed that 10% of the Ar-41 manages to diffuse before it decays, this would yield a total release of 10.4 mCi. to the reactor containment area. From Section 11 of the SER for the MUTR, a 5.5 MWh operation year would result in the generation of 21.9 mCi of Ar-41 for the entire year from the reactor pool tank. For this operation year, a combined 32.3 mCi of Ar-41 was released to the reactor building. This value was used in the EPA program COMPLY. The MUTR meets the EPA level 2 compliance for airborne release of radioactive materials. A copy of the output for the EPA computer program "COMPLY" is appended with this report.

VII. ALARA REVIEW FOR FACILITY PERSONNEL AND VISTOR EXPOSURE

A review of exposure records and all facility operations were performed by facility management as part of the annual ALARA audit. For this reporting period, all badged personnel and students received doses less than ten per-cent of their annual dose limit.

The Pocket Dosimeters recorded minimal exposure for all guests and service personnel. Calibrations of these self-reading dosimeters were performed on an annual basis by the University of Maryland's Radiation Safety Office.

### VIII. UNSCHEDULED SHUTDOWNS/REPORTABLE OCCURRENCES

Two unscheduled shutdowns took place during this reporting period. Both were due to momentary loss of electric contact on the signal cable for Safety Channel I. Reactor operations were resumed after replacement of both signal and high voltage cables. The return to power was approved and supervised by the Facility Director and two additional SROs as well as the Facility's Electronics Technician.

There were no reportable occurrences during this reporting period.

IX. SPECIAL EXPERIMENTS

There were no special experiments performed during this reporting period.

X. CHANGES IN FACILITY STAFF

There were no significant changes to staffing during this reporting period.

APPENDIX A: EPA COMPLIANCE

Below is the output from the EPA program COMPLY for the Ar-41 release from the MUTR:

COMPLY: V1.5d.

9/13/99 3:06

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:

Maryland University Training Reactor  
University of Maryland  
College Park, MD 20742

Dr. Mohamad Al-Sheikhly  
(301)405-5214

Prepared for:

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

COMPLY: V1.5d.

9/13/99 3:06

1998-1999 MUTR Annual Report Ar-41 Release

-----  
SCREENING LEVEL 1  
-----

DATA ENTERED:  
-----

Effluent concentration limits used.

DATA ENTERED FOR STACK 1:

Nuclide	CONCENTRATION (curies/cu m)
AR-41	3.11E-05

DATA ENTERED FOR STACK 2:

Nuclide	CONCENTRATION (curies/cu m)
AR-41	3.11E-05

NOTES:  
-----

Input parameters outside the "normal" range:

None.

RESULTS:  
-----

You are emitting 9150.0 times the allowable amount  
given in the concentration table.

\*\*\* Failed at level 1.

COMPLY: V1.5d.

9/13/99 3:06

1998-1999 MUTR Annual Report Ar-41 Release

-----  
SCREENING LEVEL 2  
-----

DATA ENTERED:  
-----

RELEASE RATES FOR STACK 1.

Nuclide	Release Rate (curies/YEAR)
AR-41	2.650E-02

RELEASE RATES FOR STACK 2.

Nuclide	Release Rate (curies/YEAR)
AR-41	2.650E-02

SITE DATA FOR STACK 1.

Release height 8 meters.

Building height 11 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 8 meters.

Building width 15 meters.

SITE DATA FOR STACK 2.

Release height 8 meters.

Building height 11 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 8 meters.

Building width 15 meters.

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

MARYLAND UNIVERSITY TRAINING REACTOR  
1999-2000 ANNUAL OPERATING REPORT

COMPLY: V1.5d.

9/13/99 3:06

NOTES:  
-----

Input parameters outside the "normal" range:

None.

RESULTS:  
-----

Effective dose equivalent: 3.6E-02 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 \*\*\*\*\*