ENGINEERING AND INDUSTRIAL EXPERIMENT STATION

College of Engineering

University of Florida

Gainesville

Contract #EY-76-S-05-4014
Report #ORO-4014-9

ANNUAL PROGRESS REPORT OF THE

UNIVERSITY OF FLORIDA TRAINING REACTOR

September 1, 1977 - August 31, 1978

Submitted to the

Department of Energy

Nuclear Regulatory Commission

and

University of Florida

By

Nils J. Diaz

Associate Professor and Director of Nuclear Facilities

Department of Nuclear Engineering Sciences
College of Engineering
University of Florida
Gainesville, Florida
October, 1978

TABLE OF CONTENTS

I. INTRODUCTION

During this reporting period (Sept. 1, 1977 through August 31, 1978), the facility utilization experienced a 30% increase; essentially all the additional use was for nuclear utility "cold licensing" reactor operations training. The utilization for University teaching and research was unchanged, maintaining the large teaching use with two reactor operations courses per year.

Fourteen research projects were conducted this year, again mainly for vacuum UV spectroscopy for the U.S. Army, BMD-ATC-O and activation analysis studies.

The complexity and time demand for administration continues to spiral upwards, keeping pace with the national trend. The number of regulatory inspections has doubled with the further separation of responsibilities within the Nuclear Regulatory Commission; the increase in security regulations (and emergency preparedness) created a new demand for manpower and funds.

Service-wise, the UFTR maintained high state-wide visibility with 49 tours and demonstrations conducted this year and national visibility with the research projects and the utility reactor operations training programs.

The re-licensing process continues, with upgrading of most components of the Safety Analysis Report and the Technical Specifications requested by NRC. The UFTR is accelerating, with DOE support, the effort to change to the 4.8% UO_2 fuel from the 93% enriched UAl fuel. Power upgrading to 500 kw thermal is expected to be done concurrently with the fuel change-over.

II. UNIVERSITY OF FLORIDA PERSONNEL ASSOCIATED WITH THE REACTOR

A. Personnel Employed by the UFTR

N.J. Diaz	-	Associate Professor and Director of Nuclear Facilities, Reactor Supervisor (1/3 time).
† W.S. Delk	-	Senior Reactor Operator and Assistant Reactor Supervisor (full time)
H. Gogun	-	Senior Reactor Operator (full time)
G.W. Fogle	-	Reactor Operator (full time)
† L.F. Donatell	-	Senior Reactor Operator (1/4 time)
C.B. Fountain	-	Senior Reactor Operator (1/2 time)

B. Other Licensed Operators

G.R. Dalton	-	Professor and Senior Reactor Operator, Nuclear Engineering Sciences Department
B.D. Carter	-	Reactor Operator and Senior Experimentor

C. Radiation Control Office

T.J. Bauer		Radiation Control Officer
H.G. Norton	-	Radiological Safety Officer
G.R. Renshaw	-	Radiological Safety Officer
D.L. Monroe	-	Radiological Safety Officer
T.R. LaVoy	-	Nuclear Technician (1/2 time)

D. UFTR Subcommittee of University Radiation Control Committee

G.R. Dalton	-	Chairman
N.J. Diaz	-	Member
M.J. Ohanian	-	"
T.J. Bauer	-	"
W.E. Bolch	-	"

† No longer employed by UFTR effective Aug. 31, 1978.

E. Line Responsibility for the UFTR Administrative Control

R.Q. Marston, President, University of Florida

W.H. Chen, Dean, College of Engineering

M.J. Ohanian, Chairman, Department of Nuclear Engineering Sciences

N.J. Diaz, Director of Nuclear Facilities and Reactor Supervisor

F. Line Responsibility for the Radiation Control Office

R.Q. Marston, President, University of Florida

W.E. Elmore, Vice-President, Administrative Affairs

B.G. Dunavant, Director, Occupational Health and Safety

T.J. Bauer, Radiation Control Officer

III. FACILITY OPERATION

The UFTR, although still limited by neutron flux (at present power level) remains the most utilized teaching, training and research tool of the Nuclear Engineering Sciences Department.

The teaching utilization remained high, with most of the time being taken by the two reactor operations courses, which use individualized "hands-on" training at the reactor controls. Laboratory use was essentially unchanged.

The research utilization was essentially unchanged. Two three-weeks reactor operations training programs were conducted during the summer of 1978 for the Louisiana Power and Light "cold-licensing" operators. These programs, using "hands-on" reactor operations training increased the reactor utilization some 30% from last year.

Changes in the reactor operations and associated procedures have been made to increase efficiency, safety and security.

Shown in Table I is a summary of the reacto utilization for this report period. The list categorizes the twenty-eight (ferent research projects and the teaching and training activities. The tota reactor on-time was about 900 hours, with 542 man-hours employed on establishing the experiments, conducting the teaching and services, running and maintaining the reactor.

Table II summarizes the different categories of reactor utilization, irradiation time, teaching and training, checkouts, calibration and experimental set-up services.

Detailed in Table III are the monthly and total energy generation. The UFTR generated 26.376 Mw-hr of energy during this reporting period, essentially unchanged from last year's. Table IV shows the reactor full power

running by month and total.

Described in Table V are the reasons and dates of unscheduled shut downs and reportable incidents. A release of gaseous tritium into the reactor cell, which exceeded MPC in the cell environment for a few hours was reported during this period. No significant amount of tritium intake was detected in any workers and no hazards were created for the general public.

A significant amount of activities were conducted during this year to increase the effectiveness of response at the University, city, county and state levels associated with emergency situations (fire, radiological and security related).

TABLE I

SUMMARY OF REACTOR USAGE

(September, 1977 - August, 1978)

NOTE: The projects marked with a † indicate those experiments considered to be "IRRADIATION" experiments. The projects marked with a †† indicate an operating reactor demonstration run.

Project or User	Experiment Time*
† Archaeological Trace Metal Detection: Dr. G.S. Roessler, Nuclear Engineering Sciences Department	14.37 hrs.
† He^3-Ne Laser Gas Experiment:** Dr. R.T. Schneider, Nuclear Engineering Sciences Department	42.03 hrs.
† NAA of Pottery Samples from Florida: Dr. G.S. Roessler, Nuclear Engineering Sciences Department	27.70 hrs.
† NAA of Hair Samples: Dr. G.S. Roessler, Nuclear Engineering Sciences Department	22.16 hrs.
† NAA of Hair of Cancer Patients:** Dr. G.S. Roessler, Nuclear Engineering Sciences Department	14.90 hrs.
† Irradiations of Organic Dye:** Dr. R.T. Schneider, Nuclear Engineering Sciences Department	16.44 hrs.
† Irradiation of Organic Dye:** Dr. R.A. Walters, Nuclear Engineering Sciences Department	6.96 hrs.
† Measuring the Activity of Hg-197 Samples: Dr. W.H. Ellis, Nuclear Engineering Sciences Department	31.55 hrs.
† He^3 Gas Irradiation Study:** Dr. R.T. Schneider, Nuclear Engineering Sciences Department	46.33 hrs.
† Irradiatio of Quartz Sample: Dr. R.T. Schneider, Nuclear Engineering Sciences Department	1.28 hrs.
† Irradiation of Inorganic Liquid:** Dr. R.A. Walters, Nuclear Engineering Sciences Department	4.60 hrs.
† Testing of Conductivity Gap in UFTR at Power: Dr. R.T. Schneider, Nuclear Engineering Sciences Department	7.22 hrs.
† Fossil Fuel Characterization Via Neutron Activation Analysis: Dr. G.S. Roessler, Nuclear Engineering Sciences Department	17.16 hrs.

*Experiment Time: reactor key on time for described experiments. Does not include time for checkouts, testing, set-up, etc.

**Funded by Federal grant or contract

Project or User	Experiment Time*
† NAA of Florida Rock Chart: Dr. G.S. Roessler, Nuclear Engineering Sciences Department	16.85 hrs.
† Determination of Pt. Levels in Glass: Dr. G.S. Roessler, Nuclear Engineering Sciences Department	16.76 hrs.
† Phosphate Ore Irradiation: Mr. Reed Rogers, North Carolina State University	4.96 hrs.
† ^{3}He-Ne Gas Irradiation Study:** Dr. R.T. Schneider, Nuclear Engineering Sciences Department	22.22 hrs.
† Neutron Activation of ^{23}Na to Produce ^{24}Na: Dr. G.S. Roessler, Nuclear Engineering Sciences Department	0.72 hrs.
† NAA for Chert Samples: Dr. G.S. Roessler, Nuclear Engineering Sciences Department	5.32 hrs.
† Nuclear Engineering Laboratory I; NES 404: Dr. W.H. Ellis, Mr. G.Seguin, Mr. K. Shacter, Nuclear Engineering Sciences Department	22.54 hrs.
† Nuclear Engineering Laboratory II; NES 600: Dr. C.D. Kylstra, Mr. C. Hoxie, Nuclear Engineering Sciences Department	12.62 hrs.
UFTR Reactor Operator Training UFTR Licensed Staff	15.84 hrs.
Nuclear Regulatory Commission Reactor Operator Examination: Mr. J. Buzy (NRC), Mr. E. Gogun (UFTR)	2.57 hrs.
Reactor Operator Training; Louisiana Power and Light Co.: UFTR Staff	299.52 hrs.
††Principles of Nuclear Reactors; NES 400: Dr. J.A. Wethington, Nuclear Engineering Sciences Department	1.77 hrs.
Principles of Nuclear Reactor Operations; NES 570: Dr. N.J. Diaz and W.S. Delk, Nuclear Engineering Sciences Department	85.18 hrs.
UFTR Instrument Alignments and Calibrations: UFTR Staff	40.23 hrs.
TOTAL TIME	800.44 hrs.

*Experiment time: reactor key on time for described experiments. Does not include time for checkouts, testing, set-up, etc.

**Funded by Federal grant or contract

TABLE II

COMMERCIAL, IRRADIATION AND MISCELLANEOUS REACTOR
UTILIZATION SUMMARY

Commercial Usage: Louisiana Power and Light Reactor Operator Training	299.5	hrs.
University Related Irradiations	328.8	hrs.
Student Operator Training	85.2	hrs.
Reactor Calibrations, Reactor Operation Demonstrations and Nuclear Engineering Laboratories (less foil irradiations) and Ar-41 Measurements.	85.7	hrs.
N.R.C. Reactor Operator Examination	8.2	hrs.
Reactor Tours (49 tours conducted for some 611 persons representing various high school, junior college and university students and teachers as well as some interested persons from the general public.)		
Experimental Services - Estimated reactor time for experimental systems checkouts, set-ups and removal.	213.6	man-hrs.
Reactor Checkouts - Estimated reactor time used for routine reactor checkouts.	266.0	man-hrs.
TOTAL REACTOR KEY RUN ON TIME	741.7	hrs.
ESTIMATED TOTAL REACTOR KEY ON TIME	919.0	hrs.

TABLE III

MONTHLY REACTOR ENERGY GENERATION

Monthly Totals	Kw-hr of Energy Produced
September, 1977	2,710.3
October, 1977	3,080.0
November, 1977	1,370.8
December, 1977	3,193.7
January, 1978	2,388.6
February, 1978	244.4
March, 1978	1,075.2
April, 1978	2,422.9
May, 1978	2,833.1
June, 1978	3,744.7
July, 1978	2,272.2
August, 1978	1,039.9
TOTAL FOR PERIOD	26,375.3

NUMBER OF Mw-hr PRODUCED = 26.376

TABLE IV

MONTHLY FULL-POWER-HOURS SUMMARY

Monthly Totals	Hours At Full Power
September, 1977	26.32
October, 1977	30.62
November, 1977	12.33
December, 1977	31.88
January, 1978	23.80
February, 1978	2.33
March, 1978	10.65
April, 1978	24.17
May, 1978	24.67
June, 1978	32.63
July, 1978	17.70
August, 1978	10.92
TOTAL FOR PERIOD	248.02

TOTAL HOURS OF OPERATION AT FULL POWER = 248.0 hrs.

TABLE V

UNSCHEDULED SCRAMS

Date	Occurrence
9 September, 1977	Electrical Transient
13 January, 1978	Electrical Transient
15 February, 1978	Electrical Transient
20 April, 1978	Electrical Transient
7 July, 1978	Electrical Transient
18 July, 1978	Electrical Transient
26 July, 1978	Electrical Transient

NOTE: None of these scrams were reportable as an abnormal occurrence.

IV. MODIFICATIONS TO THE OPERATING CHARACTERISTICS OR CAPABILITIES OF THE UFTR

Effective January 19, 1978, the backup secondary cooling water supply from the city water is equipped with a low flow sensor. The low flow sensor initiates a reactor trip and is more indicative of system performance than the pressure switch which the low flow sensor replaced.

Effective June 2, 1978, a Watts Series 900 reduced pressure principle backflow preventer was installed in the city water supply line used for UFTR demineralized make-up water and as auxillary secondary cooling water. The installation of the backflow preventer will insure that the city water system cannot become contaminated through either backflow or back siphonage.

V. SIGNIFICANT MAINTENANCE AND TESTS OF REACTOR SYSTEMS

Date	Description
14 Sept., 77	Conducted Reactivity Measurements
27 Sept., 77	Replaced belts to Dilution Fan
6 Oct., 77	Conducted Quarterly Evacuation Drill (Q-3)
6 Oct., 77	Repaired Motor Commutator on UFTR Annex Siren
12 Oct., 77	Repaired P.C. Tank Sight Glass
14 Oct., 77	Completed Quarterly Scram Checks (Q-1)
17 Nov., 77	Replaced broken rupture disc
7 Dec., 77	Conducted Area Monitor Calibration (Q-2)
12 Dec., 77	Conducted Quarterly Evacuation Drill (Q-3)
12 Dec., 77	Replaced magnetic clutch current "ON" lamps
21 Dec., 77	Conducted Argon-41 Measurements (S-4)
19 Jan., 78	Placed city water flow switch in service
20 Jan., 78	Completed Quarterly scram checks (Q-1)
1 Mar., 78	Conducted Area Monitor Calibration (Q-2)
10 Mar., 78	Conducted N.I. Alignment (A-2)
21-23 Mar., 78	Held Fuel inspection
23 Mar., 78	Conducted reactivity measurements
24 Mar., 78	Conducted Quarterly Evacuation Drill (Q-3)
4 Apr., 78	Repaired APD chart recorder
10 Apr., 78	Replaced filter in Shield Tank Recirculation System
12 Apr., 78	Material Status Report Completed
17 Apr., 78	Conducted Quarterly Evacuation Drill (Q-3)
8 May, 78	Completed Quarterly Scram Checks (Q-1)
8 May, 78	Completed Area Monitor Calibrations (Q-2)
2 June, 78	Completed installation of backflow preventer on city water supply line.

Date	Description
5 June, 78	Replace absolute filter in core vent system
14 June, 78	Replaced magnetic clutch current "ON" lamps
16 June, 78	Replace safety-one blade drive motor
25 July, 78	Replaced resins in makeup demineralizer
2 Aug., 78	Replaced North Area Monitor Recorder
3 Aug., 78	Replaced magnetic clutch current "ON" lamps
14 Aug., 78	Conducted quarterly Evacuation Drill (Q-3)
16 Aug., 78	Measured Core Vent and dilution fan flow rates (A-1)
23 Aug., 78	Performed Area Monitor Calibrations (Q-2)
23 Aug., 78	Completed security system modifications as required by NRC
24 Aug., 78	Timed Blade free fall drop times (S-1)
29 Aug., 78	Replaced both bearings in vent fan motor

VI. CHANGES TO TECHNICAL SPECIFICATIONS AND STANDARD OPERATING PROCEDURES

A. There were no changes to the Technical Specifications during this reporting period.

B. Revisions to Standard Operating Procedures

1. UFTR-SOP-A.1 Part I, Weekly Pre-Operational Checks

a.	Cover Sheet	Rev. 7, 1/78	
b.	Page 16	Rev. 7, 1/78	Item A.9.f. deletion
c.	Page 18	Rev. 7, 1/78	Item E.1.b. clarification
d.	Page 22	Rev. 7, 1/78	Item B.3.b. correction

C. Additions to Standard Operating Procedures

1. UFTR-SOP-D.4, UFTR Radiation Protection Weekly Survey

a.	Cover Sheet	Orig., 1/78
b.	Page 1	Orig., 1/78
c.	Page 2	Orig., 1/78
d.	Page 3	Orig., 1/78

2. UFTR-SOP-D.5, Primary Equipment Pit Entry

a.	Cover Sheet	Orig., 1/78
b.	Page 1	Orig., 1/78

3. UFTR-SOP-D.6, Removing Irradiated Samples From UFTR Experimental Ports

a.	Cover Sheet	Orig., 1/78
b.	Page 1	Orig., 1/78

4. UFTR SOP-D.7, Primary Resin Change

a.	Cover Sheet	Orig., 1/78
b.	Page 1	Orig., 1/78

5. UFTR SOP-E.2A, Changing Primary Purification Demineralizer Resins

a.	Cover Sheet	Orig., 1/78
b.	Page 1	Orig., 1/78
c.	Page 2	Orig., 1/78

VII. RADIOACTIVE RELEASES AND ENVIRONMENTAL SURVEILLANCE

The following is a summary of radioactive effluents released to the environment from the reactor complex.

A.1. Gaseous (Argon-41)

Month	μCi Released	μCi/ml	μCi/ml*
September 77	1.21×10^{7}	9.22×10^{-7}	4.61×10^{-9}
October 77	2.58×10^{7}	1.97×10^{-6}	9.84×10^{-9}
November 77	6.11×10^{6}	4.66×10^{-7}	2.33×10^{-9}
December 77	1.42×10^{7}	1.09×10^{-6}	5.43×10^{-9}
January 78	1.06×10^{7}	8.12×10^{-7}	4.06×10^{-9}
February 78	1.09×10^{6}	8.30×10^{-8}	4.15×10^{-10}
March 78	4.79×10^{6}	3.72×10^{-7}	1.83×10^{-9}
April 78	1.08×10^{7}	8.24×10^{-7}	4.12×10^{-9}
May 78	1.26×10^{7}	9.78×10^{-7}	4.89×10^{-9}
June 78	1.67×10^{7}	1.27×10^{-7}	6.36×10^{-9}
July 78	1.01×10^{7}	7.72×10^{-7}	3.86×10^{-9}
August 78	4.64×10^{6}	3.54×10^{-9}	1.77×10^{-9}

Total Argon-41 Released = 129.53 Ci

The MPC for an uncontrolled area is 4×10^{-8} μCi/ml

*Reflects the authorized dilution rate of 200

A.2. Gaseous (Others)*

On July 31, 1978, the release of vacuum on one end of the UFTR horizontal through-port resulted in the rapid movement of the improperly secured McFig capsule with breakage of the window and release of activated gas, principally Xe^{133} and tritium into the UFTR cell. Even though the MPC for tritium was probably exceeded during the incident inside the UFTR cell, there was no hazard to the health and safety of the general public and no person received

*Reference: Report of Incident/Radioactivity Release to Nuclear Regulatory Commission, August 15, 1978.

more than 10% Maximum Allowable Body Burden of tritium. New safety-related requirements are being established to prevent recurrence and/or minimize hazards.

Total Release: 64.2 mCi of tritium

10 mCi of Xe^{133}

Released averaged over reporting period

Tritium: 3.8×10^{-10} µCi/mℓ (.19% MPC)

Xe^{133}: 5.9×10^{-11} µCi/mℓ (.02% MPC)

B. Liquid Waste From the UFTR/Nuclear Sciences Complex

There are 340,000 liters* discharged to the campus sanitary sewage system during this report period.

	µCi/mlβ		µCi/mlβ
September '77	5×10^{-9}	March '78	NR*
October '77	NR*	April '78	NR*
November '77	NR*	May '78	8×10^{-9}
December '77	4×10^{-9}	June '78	NR*
January '78	NR*	July '78	NMA**
February '78	8×10^{-9}	August '78	2×10^{-8}

*NR - No Release

**NMA - No Measurable Activity
(Minimum Detectable Activity, 2.4×10^{-9} µCi/ml)

The UFTR normally releases to the holding tanks approximately 1500 milliliters of primary coolant per week due to waste from primary sampling. The average activity being 2.1×10^{-6} µCi/ml for the reporting period. There was one release on November 17, 1977 of less than 210 liters at less than 3×10^{-6} µCi/ml. The total release of primary coolant to the holding tanks from the UFTR was approximately 288 liters and less than one microcurie of beta-gamma activity.

---

*The liquid effluent discharged into the holding tanks comes from twenty laboratories within the Nuclear Sciences Center as well as from the UFTR complex.

There was no detectable alpha activity released. Allowing for decay in the holding tanks, characteristic half-life of 15 hours, the activity was reduced to less than 1×10^{-2} microcurie total beta-gamma activity diluted to an average concentration of less than 3×10^{-11} µCi/ml released to the environment.

C. The UFTR maintains continuous film badge monitoring in areas adjacent to the UFTR complex. All exposures have indicated less than 10 milli-Roentgens per month.

During the reporting period, there were only two film badge readings of radiation workers greater than 10 mRem for a one month period.

1. March, 1978 - One SRO received 40 mRem gamma whole body dose principally during fuel inspection activities.

2. December, 1977 - One experimenter received 30 mRem gamma whole body dose principally due to the handling of irradiated experiments.

Dosimeter exposure measurements for visitors to the UFTR were all less than 5 milli-Roentgen each for this reporting period.

VIII. EDUCATION, RESEARCH AND TRAINING UTILIZATION

NOTE: The participating students are indicated by an *. Other participants are faculty or staff members of the University of Florida, unless specifically designated otherwise. An ** indicates those students working on theses or dissertations.

1. He^3-Ne Laser Gas Experiment - Dr. R.T. Schneider, D.B. Carter** (Nuclear Engineering Sciences)

Gain measurements were made on a nuclear pumped laser amplifier. The UFTR was used as a neutron source to study the effects of He^3 (n,p)T reaction as a pumping source for a nuclear pumped laser.

2. Neutron Activation Analysis of Pottery Samples from Florida - Dr. P. Rice (Anthropology) and Dr. G.S. Roessler, J. Lanza* (Nuclear Engineering Sciences)

An experiment designed to determine the elemental concentration of various pottery samples found at different archeological sites in Florida. It is hoped that a correlation between Florida pottery and materials from other Southeastern United States areas can be made.

3. Neutron Activation of Hair Samples (Crime Lab) - Dr. G.S. Roessler, Mike Reynolds*, John Lanza* (Nuclear Engineering Sciences)

The intent is to do research on the feasibility of using the UFTR and sophisticated analysing equipment at the University of Florida in conjunction with the State Crime Lab in the use of activation analysis for crime detection.

4. Neutron Activation Analysis of Hair of Cancer Patients - Dr. G.S. Roessler, Mike Reynolds**, J. Lanza* (Nuclear Engineering Sciences)

An experiment designed to determine if differences exist in trace elements of hair samples between control groups and cancer patients at Shands Teaching Hospital.

5. Irradiations of Organic Dye - Dr. R.T. Schneider, Bob Hansen*, Nancy Slater* (Nuclear Engineering Sciences)

This experiment was conducted to study the effects of irradiation upon the lasing ability of Rhodamine 6G in Ethanol.

6. Nuclear Pumped He-Ne Laser - Dr. R. T. Schneider, B.D. Carter** (Nuclear Engineering Sciences)

The reactor will be used as a neutron source to produce the He^3 (n,p)T^3 reaction in the He-Ne Laser. The resulting proton and triton will excite the gas and pump the laser levels producing a CW He-Ne nuclear pumped laser.

7. Irradiation of Organic Dye - Dr. R.A. Walters, R. Hansen*, Nancy Slater*, B. Carter* (Nuclear Engineering Sciences)

This experiment was conducted to study the effects of irradiation upon the lasing ability of Rhodamine B in Ethanol.

8. Measuring the Activity of ^{197}Hg Samples - Dr. W.H. Ellis, Muen Alkowni* (Nuclear Engineering Sciences)

Mercury Spectrum analysis of irradiated mercury oxide for use in NAA of biological samples.

9. ^3He Gas Irradiation Study - Dr. R.T. Schneider, L.D. Luker*, J.W. Griffin* (Nuclear Engineering Sciences)

The spectral output of ^3He was analyzed and determination made of the various relative excited state populations.

10. Irradiation of Quartz Sample - Dr. R.T. Schneider, R. Hansen* (Nuclear Engineering Sciences)

A quartz laser window was irradiated to determine suitability for this type of window in a reactor-laser system.

11. Irradiation of Inorganic Liquid - Dr. R.A. Walters, R. Hansen*, N. Slater* (Nuclear Engineering Sciences)

A feasibility study in the techniques for irradiating liquids such as $POCl_3$ with Nd and Zr for potential use in liquid laser systems.

12. Testing of Conductivity Gap in UFTR - Dr. R.T. Schneider, R. Hansen* (Nuclear Engineering Sciences)

A test of a prototype conductivity gap for eventual use as a leak detector for irradiated liquids used in liquid laser research.

13. Fossil Fuel Characterization Via Neutron Activation Analysis - Dr. G.S. Roessler, J. Lanza* (Nuclear Engineering Sciences), Jesse Buskerville (Environmental Engineering) -

The accumulation of data via NAA of the trace elemental constituency of fossil fuels will aid in the evaluation of possible detrimental environmental contaminants.

14. Neutron Activation of Florida Rock Chert - Dr. G.S. Roessler, Sun Tae Hwang* (Nuclear Engineering Sciences)

NAA of Florida rock was compared to results obtained from Proton induced gamma-ray emissions.

15. Determination of Platinum Levels in Glass - Dr. J. Goldfard (Chemistry) and Dr. G.S. Roessler, J. Lanza* (Nuclear Engineering Sciences)

A thin layer of platinum was applied to a small glass planchet. The platinum level was to be determined by NAA techniques.

16. Phosphate Ore Irradiation - R. Rogers (North Carolina State University)

Irradiation of large quantities of phosphate ore samples for tracer work at W.R. Grace in Bartow, Florida.

17. Neutron Activation of ^{23}Na to Produce ^{24}Na - Dr. G.S. Roessler, W. Duncan*, K. Shacter* (Nuclear Engineering Sciences)

One gram of Reagent Grade Sodium Bicarbonate was activated, processed and analyzed on a GeLi detector.

18. Nuclear Engineering Laboratory I, NES 404 - Dr. W.H. Ellis, G. Seguin*, K. Shacter* and 29 undergraduate students* (Nuclear Engineering Sciences)

This Nuclear Engineering Laboratory for undergraduate students used the UFTR for a series of experiments and exercises that included: radiation field surveys and radiation protection, measurement of the diffusion length of neutrons in graphite, low and high power reactor operations, 1/m approach to critical by control blade, temperature coefficient measurements, and blade reactivity measurements by blade drop and positive period techniques.

19. Nuclear Engineering Laboratory II, NES 600 - Drs. C.D. Kylstra and N.J. Diaz and 12 graduate students* (Nuclear Engineering Sciences)

This Nuclear Engineering Laboratory for graduate students used the UFTR for a series of experiments that included: activation for coincidence counting and NAA, statistical weights, importance function and danger coefficient.

20. Principles of Nuclear Reactor Operations, NES 570 - Dr. N.J. Diaz, UFTR Staff and 21 students* (Nuclear Engineering Sciences)

For this course, students are assigned in pairs to spend two hours weekly in the UFTR cell performing reactor startups, shutdowns, operations at power, as well as tests and calibrations of reactor systems and nuclear instruments normally done as routine checkouts. This course is recommended for senior undergraduate and graduate students in Nuclear Engineering. All student activities in the UFTR are performed under the direction of a licensed Reactor Operator or Senior Reactor Operator.

21. Principles of Nuclear Reactors, NES 400 - Dr. J.A. Wethington and 24 students* (Nuclear Engineering Sciences)

This introductory course for non-nuclear majors utilized the reactor for a reactor power demonstration.

22. UFTR Reactor Operator Training - UFTR Licensed Staff

To supplement the UFTR operating staff and increase the operating capability of the reactor, student personnel with prior military nuclear experience are given qualification operational training under the direct supervision of licensed operators. This training encompasses routine operations, routine checkouts, scheduled repetitive calibration checks, participation in drills, participation in maintenance activities, testing on understanding and proficiency of items such as operating procedures, technical specifications, routine administrative matters, and applicable rules and regulations.

The personnel chosen to receive this qualification training are selected

with a view toward the UFTR receiving a maximum length of service from them after they have received their operating licenses.

This past year D.B. Carter was given consideration for his long and continuous association with and utilization of the UFTR for research and was examined by the N.R.C. for his Reactor Operator license on August 3, 1978.

23. Nuclear Regulatory Commission Reactor Operator Examination - J. Buzy (NRC) H. Gogun (UFTR) B.D. Carter* (R.O. Candidate).

24. Reactor Operator Training: Louisiana Power and Light Company - Training Staff: Dr. N.J. Diaz, UFTR Staff, Dr. E. Dugan, W. Vernetson**, W. Kerrick*, T. Kanellopoulos*, H. Norton (Radiological Safety Officer), T. Bauer (Radiation Control Officer)

Twenty-four (potential reactor operators and supervisors) of Louisiana Power and Light Company received intensive training at the UFTR in reactor physics, instrumentation, operations, and radiological safety. The program consisted of two duplicate three week sessions with approximately half of the trainees on campus at one time to maximize time spent on a one-to-one basis between the UFTR staff and LP&L staff. Reactor operations labs gave each trainee extensive hands-on training through all phases of reactor operation from subcritical to power with emphasis on the ability to interrelate reactor systems during both normal and abnormal conditions to insure reactor safety.

25. UFTR Instrument Alignments and Calibrations - UFTR Staff

Performed calibration of primary coolant flow meter and temperature recorder and calorimetric run made to calibrate and align the nuclear instruments. Blade worth determinations were made using both blade drop and positive period techniques.

IX. THESES, PUBLICATIONS, REPORTS AND ORAL PRESENTATIONS OF WORK RELATED TO THE USE AND OPERATION OF THE UFTR

1. "Neutron Activation Analysis of Biological Tissue Samples for Use in Monitoring Mercury Exposure of Dental Workers", Drs. W.H. Ellis and G.S. Roessler, J.J. Lanza and M. Alkowni, presented at the 29th Am. Chem. Soc. SE Regional Meeting, Tampa, Florida, Nov. 9-11, 1977.

2. "Application of Instrumental Neutron Activation Analysis to Forensic Sciences", Drs. W.H. Ellis and G.S. Roessler, F.H. Dietrich and J.J. Lanza, presented at the 29th Am. Chem. Soc., SE Regional Meeting, Tampa, Florida, Nov. 9-11, 1977.

3. "Multielement Analysis of Human Tissue Samples by Computer Based Instrumental Neutron Activation Analysis", K.B. Shacter, presented at the 1978 SE Regional Nuclear Sciences and Engineering Student Conference, University of Florida, Gainesville, Florida, March 30 and April 1, 1978.

4. "Mercury Level Monitoring of Alachua County Dentists and Their Assistants Using Instrumental Neutron Activation Analysis", M.R. Alkowni, presented at the 1978 SE Regional Nuclear Sciences and Engineering Student Conference, University of Florida, Gainesville, Florida, March 30 and April 1, 1978.

5. Oral Presentation given for the BMD-ATC-OD, Dr. R.T. Schneider, Dr. Roy Walters, B.D. Carter, et.al., University of Florida, May, 1978.

6. Oral Presentation given to Frank Hohl, National Aeronautics and Space Administration, Dr. R.T. Schneider and Dr. Roy Walters, University of Florida, July, 1978.

7. Inorganic Liquid Nuclear Pumped Laser Manual, Dr. R.T. Schneider, Dr. Roy Walters, Nuclear Engineering Sciences Department, University of Florida, June, 1978.

8. Oral Presentation given at the BMD-ATC, Drs. R.T. Schneider and Roy Walters, Huntsville, Alabama, October, 1977.

9. "Liquid Reactor Laser Research", Robert Hansen, Master of Engineering Theses, June, 1978.