

**Final Report on the
University of Florida
U.S. Department of Energy
1991-1992 Reactor Sharing Program**

Grant No. DE-FG07-83ER75103

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**NUCLEAR REACTOR FACILITY
NUCLEAR ENGINEERING SCIENCES DEPARTMENT
COLLEGE OF ENGINEERING**

GAINESVILLE, FLORIDA

January, 1993

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FINAL REPORT ON 1991-1992

UNIVERSITY OF FLORIDA REACTOR SHARING GRANT

Department of Energy Grant Number DE-FG07-83ER75103 was supplied to the University of Florida Training Reactor(UFTR) facility through the U.S. Department of Energy's University Reactor Sharing Program. The original renewal proposal submitted in March, 1991 requested \$63,740 to support various educational institutions using the UFTR facilities. The actual grant support was only in the amount of \$27,000, all of which has been well-used by the University of Florida as host institution to support various educational institutions in the use of our reactor and associated facilities as indicated in the proposal. These various educational institutions are located primarily within the State of Florida. However, when the 600 mile distance from Pensacola to Miami is considered, it is obvious that this Grant provides access to reactor utilization for a broad geographical region and a diverse set of user institutions.

All users and uses were carefully screened to assure the usage was for educational institutions eligible for participation in the Reactor Sharing Program; where research activities were involved, care was taken to assure the research activities were not funded by grants or contract funding from outside sources. In some cases external grant funding is limited or is used up in which case the Reactor Sharing Grant and frequent cost sharing by the UFTR facility and the University of Florida provide the necessary support to complete a project or to provide more results to make a complete project even better. In some cases

this latter usage has aided renewal of external funding.

Over its nearly ten(10) years implementation at the University of Florida, the DOE University Reactor Sharing Program has been a key catalyst for renewing utilization of the UFTR both by external users around the State of Florida and the Southeast and by various faculty members within the University of Florida to support the educational mission of dozens of different courses in over twenty departments and to support a number of unfunded as well as funded research projects. With a decline in usage in the early 1980s, the UFTR was in danger of going the way of so many university reactor facilities. Fortunately the Reactor Sharing Program advertisements resulted in significant external use of the UFTR. Subsequently, potential internal users for courses and research noted that there was value in using the facility and their usage has grown synergistically. In the latter case of funded research, charges allow the UFTR to expand various programs still further. Therefore, the role of the Reactor Sharing Program, though relatively small in dollars, has been the single most important occurrence in assuring the rebirth and continued high utilization of the UFTR in a time when many better equipped and better placed facilities have ceased operations. Through dedicated and effective advertising efforts, the UFTR has seen nearly every four-year college and university in the State of Florida make substantive use of the facility under the Reactor Sharing Program with many now regular users. Some have even been able to support usage from outside grants where the Reactor Sharing Grant has served as seed money; still others have been assisted when external grants were depleted.

Though much more funding could be easily justified, much has been accomplished with the Grant received. In these times of concern about effective delivery of educational programs, the UFTR Reactor Sharing Program is a leader in this area. Only by having excellent programs and effective learning tools could one have schools bring classes of students from their campuses to the University of Florida, sometimes over 100 miles for one way travel. With every good experience by a user, we are assured not only of a return by that user group but, through communication with other schools at meetings to interchange ideas, we are assured of a continued increase in new users. The letter to Mr. Harold Young in Appendix I documents just one example from this past year of how well regarded our program is and how much it is valued by the components of the educational community we have been able to reach. It clearly indicates the efficiency of our program at the grass roots level. Indeed, the fact that several groups of advanced and/or honors program students collected from various high schools visited our facility for substantive usage during the past year again shows the high regard the facility enjoys among secondary school educators throughout the state of Florida.

The three tables that follow provide basic information about the 1991-1992 program and utilization of reactor facilities by user institutions under the Reactor Sharing Grant. Table 1 (Summary Information/Data For the University of Florida University Reactor Sharing Program) delineates the basic information and data about the UFTR facility and the Reactor Sharing Grant needed to document its implementation through the University of Florida Training Reactor at the University of Florida as the host institution. Table 2

(Reactor Sharing Program Summary of Usage of UFTR Facilities) lists users, numbers of usages and numbers of student and faculty participants. As is shown in Table 2, last year's grant(1991-1992) saw a broad spectrum of users, with the largest numbers of participants ever as we continue to expand delivery of services especially for high school classes. The three different groups of honors-type high school students that made substantive use of the facility during this year are particularly encouraging for expanding the user community in the future. This expectation is based on past experience where first time visiting high school students and educators are our best means of advertising the UFTR facilities and their availability. Finally, Table 3 (Summary of Facility Utilization) summarizes the activities supported under the 1991-1992 grant with costs of consumable supplies and NAA Laboratory usage(mostly cost shared at \$35/hour) not included in the \$85/hour charge for reactor usage.

Because of the success of this program, the limitations in funding are really the only factor limiting a 2-3 fold increase in reactor sharing usage. Indeed, it is no longer necessary for the UFTR to advertise reactor sharing. Even with minimal advertising, the facility provided usage and other services easily valued at 2-3 times the Grant value of \$27,000 in 1991-1992. Similar results will apply in an even more diverse set of usages to justify 2-3 times the \$30,000 in the current 1992-1993 Grant.

In conclusion, the DOE Reactor Sharing Program is a rousing success and should be continued as one of the most cost effective and best returns on invested dollars that are possible in assisting the United States in meeting the technological challenges of the twenty-

first century. The only request for the UFTR facility is to expand the support so that facilities such as the UFTR can further advertise and expand delivery of reactor usage and related services. Those reached still represent only a small fraction of all the students and faculty who could reasonably be expected to make valuable use of reactor facilities for their educational programs, though again this year several new schools are included among the users. This is particularly true for pre-college institutions and users - the source of our nuclear-trained leaders in the next century. Once they become a user, they continue to return; now we are beginning to see students majoring in Nuclear Engineering and Health Physics as well as and other branches of engineering whose first contact with the subject was at the UFTR. Indeed this year's senior class in nuclear engineering contains two students whose high school teacher (Mrs. R. Allen) in Lake Butler first brought them to our facility about five(5) years ago. One of these students is the leading student in the senior class! Mrs. Allen uses our facility every year despite being located some 40 miles from Gainesville. She has also encouraged her students to do research for science fair projects at the UFTR. Several of these projects have won regional and statewide honors. Needless to say this is a strong statement on behalf of continuing and expanding the educational and research activities supported by the University Reactor Sharing Program.

TABLE 1
Summary Information/Data
For the University of Florida
University Reactor Sharing Program

Host Institution:	University of Florida
Location:	Gainesville, Florida
Program Director:	Dr. William G. Vernetson Director of Nuclear Facilities and Associate Engineer Nuclear Engineering and Sciences Department University of Florida
Contact Numbers:	Telephone Number: (904) 392-1429/1408 Fax Number: (904) 392-3380
Grant Number:	DE-FG07-83ER75103
Reactor Description:	University of Florida Training Reactor(UFTR) License Number: R-56 Docket Number: 50-83
Reactor Type:	Modified\Argonaut Two-Slab Flux Trap Light Water Cooled Graphite/Light Water Moderated
Special Features:	Pneumatic Sample Delivery(Rabbit) System Neutron Radiography Capability

TABLE 2

**REACTOR SHARING PROGRAM
SUMMARY OF USAGE OF UFTR FACILITIES
(September, 1991 - September, 1992)**

School ¹	Usages ²	Users	
		Faculty	Students
Bolles High School (BHS)	1	2	7
Chamberlain High School (CHS)	1	2	17
Central Florida Community College (CFCC)	12	2	15
Crystal River High School (CRHS)	1	2	37
Dunnellon High School (DHS)	1	1	64
Eastside High School (EHS)	2	2	12
FFFS Science Engineering & Humanities Symp.(High School)	1	1	18
Florida Accelerated Initiatives Seminar(High School)	1	2	45
Florida A&M University (FAMU)	12	1	1
Florida Community College At Jacksonville North Campus (FCCJ)	1	2	19
Florida State University (FSU)	44	6	3
Heritage Christian School (HCS)	3	4	44
High School Scholar Group	1	1	31
Hillsborough Community College (HCC)	1	1	11
Jacksonville University (JU)	1	2	6
Mainland High School (MHS)	5	2	5
Piper High School (PHS)	3	1	4
Ridgewood High School (RHS)	1	1	2
Santa Fe Community College - Gainesville (SFCC-G)	2	3	38
Santa Fe Community College - Starke (SFCC-S)	1	1	18
Southeast Missouri State University (SEMSU)	4	1	1
Union County High School (UCHS)	4	1	22
University of Wisconsin, Eau Claire (UWEC)	3	2	1
TOTAL	106	43	421

1. School abbreviations in parenthesis can be used elsewhere in this report to determine appropriate user designations in the details of usage delineated in Table 3.
2. Usage is defined as utilization of the University of Florida Training Reactor facilities for all or any part of a day with the average being about four(4) hours. In many cases, a school can have multiple usages but all related to the same research project or training program such as one project for Florida State University that involved long term irradiations as did others such as for the Union County High School or the multiple usage training programs conducted for Central Florida Community College students and Union County High School students.

TABLE 3

SUMMARY OF FACILITY UTILIZATION

For Reactor Sharing

(September, 1991 - September, 1992)

NOTE: The projects marked with one asterisk (*) indicate irradiations or neutron activations. The projects marked with two asterisks (**) indicate training/educational use. The projects marked with three asterisks (***) indicate demonstrations of reactor operations. "Experiment Time" as total time that the facility dedicates to a particular use; it includes "Run Time". "Run Time" is inclusive time commencing with reactor startup and ending with shutdown and securing of the reactor.

PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**CFCC Radiation Protection Technology Co-op Work Program - Mrs. R. Rawls/Mr. S. MacKenzie - Reactor Sharing	Two Semester Long Reactor Operations-Based Radiological Control and Protection Training Programs of Cooperative Work Exercises	4.57 (1.82)	45.75 (3.50)
*NAA Research For Biogeochemical Assessment of Pollard, AL Oil Field - Dr. Gary Cwick, S.E. Missouri State University and Dr. Michael Bishop, University of Wisconsin, Eau Claire - Reactor Sharing	NAA to Evaluate and Identify Elemental Constituents In Second Large Set of Vegetation and Soil Samples Taken From the Pollard, Alabama Oil Field for Geochemical Analysis and Correlation with Satellite Imaging for Geochemical Analysis and Hydrocarbon Exploration Systematics	25.91 (12.35)	32.91 (15.08)
**Jacksonville Bolles High School Physics Class - Mr. Ellis Lanquist, Mrs. J. Luepke - Reactor Sharing	Lecture, Tour and Demonstration of Reactor Operations and Power Maneuvering Plus Discussion of Research Usage and Projects Using Research Reactors	0.00	1.50

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PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
*NAA Research of Sedimentary Mineral Deposits, Dr. A. Dabous, Florida State University Chemistry Department - Reactor Sharing	NAA To Evaluate and Quantify Rare Earth Elemental Content of Egyptian Sedimentary Mineral Deposits	25.18 (4.83)	30.42 (7.00)
** Hillsborough Community College Nuclear Medicine and Radiation Therapy Technology Program - Dr. M. Lombardi/Ms. Camille Vernesse - Reactor Sharing	Lecture, Tour and Demonstration of Facility Operations with Radiation Surveys and Exercise in Use of Rabbit System for Trace Element Analysis of Hair Samples Using NAA Techniques and Demonstration of Neutron Radiographic Techniques	0.78	3.83
**Union County High School Physics Class - Mrs. Renae Allen Reactor Sharing	Lecture, Tour and Demonstration of UFTR Operations with Radiation Surveys and NAA Training Exercises Demonstrating Trace Element Analysis Technique Using the Rabbit System and PC Based Analyzers	1.32	4.58 (1.00)
**Sante Fe Community College Medical Radiological Technology Program - Mr. S. Marchionno/Ms. Rochelle Sturm - Reactor Sharing	Lecture, Tour and Demonstration of UFTR Operations with Radiation Surveys and NAA Training Exercises Demonstrating Trace Element Analysis Technique Using the Rabbit System and PC Based Analyzers Plus Neutron Radiography Demonstration	0.73	4.42
**Crystal River High School Chemistry Classes - Mrs. A. Butler/Mr. Steve Richardson - Reactor Sharing	Lecture, our and Demonstration of UFTR Operations with Radiation Surveys and NAA Training Exercises Demonstrating Trace Element Analysis Technique Using the Rabbit System and PC Based Analyzers	1.87	7.25 (1.00)

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PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**Chamberlain High School (Tampa) Advanced Physics Class - Mr. T. Jordan - Reactor Sharing	Lecture, Tour and Demonstration of UFTR Operations with Radiation Surveys and NAA Training Exercises Demonstrating Trace Element Analysis Technique Using the Rabbit System and PC Based Analyzers	0.63	5.75 (0.75)
*** Florida Foundation of Future Scientists Junior Science, Engineering and Humanities Symposium - Dr. B. Abbott - Reactor Sharing	Lecture, Tour and Demonstration of Reactor and NAA Laboratory Facility Capabilities and Applications For Honors Group of High School Junior Level Students	0.00	1.75
*NAA Research To Perform Trace Element Analysis of Fertilizer Samples - Mrs. Renae Allen, Union County High School - Reactor Sharing	NAA Evaluation For Trace Element Analysis of Fertilizer Samples for Quantification of Heavy Metal Content and Buildup From Continued Application of Synthetic Fertilizers To Crop and Pasture Lands For Science Fair Project - to include some time inadvertently omitted from last report	9.37 (1.52)	15.41 (5.42)
***Florida Foundation of Future Scientists - Dr. W.G. Vernetson, Mr. A. Arico(Piper High School), Mr. C. Caldwell, L. Chapman and E. Leonard (Mainland High School) - Reactor Sharing	Lecture, Tour and Demonstration of Reactor Facility Operations and Experimental Capabilities For Seven(7) Honors High School Students Plus Summer Research Project Selection for Two FFFS High School Students (Frank Ayoung-Chee of Piper High School and Bruce Morehouse of Mainland High School)	2.00 (1.50)	9.50 (3.58)

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PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**Florida Community College At Jacksonville (North Campus) - Physics Classes -Dr. C. Lee, Dr. O Lee - Reactor Sharing	Lecture, Tour and Demonstrations of Reactor Facility Operations and Use of Rabbit System and PC Based Analyzers For Trace Element Analysis Using Previously Irradiated Samples	0.00	3.50
**Central Florida Community Radiation Protection Technology Program - Mr. S. MacKenzie - Reactor Sharing	Lecture, Tour and Demonstration of UFTR Operations with Radiation Surveys and NAA Training Exercises Demonstrating Trace Element Analysis Technique Using the Rabbit System and PC Based Analyzers Using Previously Irradiated Samples	0.00	3.75
**Heritage Christian High School Science Department (Gainesville) - Dr. G. Featherston, Dr. B. Tucker, Mr. B. Jones, Ms. Juanita DeLott - Reactor Sharing	Various Lectures, Tours and Demonstrations of UFTR Operations with Radiation Surveys and NAA Training Exercises Demonstrating Methodology of Trace Element Analysis Technique Using the Rabbit System and PC Based Analyzers As Well As Radiation Survey and Contamination Control Exercises	0.53	18.00 (0.50)
**P.K. Yonge High School Government Class - Mr. D. Anderson - Reactor Sharing	Lecture, and Demonstration of Reactor Operations and Capabilities Including Surveys and NAA Laboratory Facility Operations For Understanding of Nuclear Energy Usage	0.00	3.00

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PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**Jacksonville University Physics and Chemistry Departments - Dr. Paul Simony(Physics) and Dr. JohnPelphry(Chemistry) - Reactor Sharing	Lecture, Tour and Demonstration of UFTR Operations with Radiation Surveys and NAA Laboratory Facility Operations Using Rabbit System and PC Based Analyzers For Trace Element Analysis of Several Samples and Demonstration of Basic Radiation Detection and Mitigation Techniques As Well As Possible Research Applications	0.53	3.67
*Physics of Materials Properties Research - Dr. Hans Plendl, Physics Dept., Florida State University and Dr. Peter Gielisse - Mechanical Engineering Dept., FAMU/FSU - Reactor Sharing	Fast and Thermal Neutron Irradiations of Dielectric Materials Including Topaz and Beryl To Determine Optical Effects of Trace Elements on Rate and Types of Color Center Development For Basic Physics Understanding	73.99 (13.34)	94.50 (17.92)
**P.K. Yonge High School Science Department(Gainesville) - Dr. Paul Becht(Chemistry), Mr. G. Jones(Physics), Mr. D. Dodge(Science) - Reactor Sharing	Various Lectures, Tours and Demonstrations of Reactor Operations and Capabilities Including Surveys and NAA Laboratory Facility Operations Using the Rabbit System for Trace Element Analysis	1.30	14.50 (2.50)
*** Tau Beta Pi Honor Society-Sponsored High School Scholars/Parents Program - W.G. Vernetson/Reactor Staff - Reactor Sharing	Lecture and Tour of Reactor and NAA Laboratory Facilities For High School Scholars and Parents Visiting the UF College of Engineering to Learn About Advanced Technologies and Research	0.00	1.50

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PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
**Santa Fe Community College(Gainesville) Physics Students(PHY-2054) - Dr. A. Ferrari - Reactor Sharing	Lecture, Tour and Demonstration of Reactor Operations with Radiation Surveys and NAA Training Exercises, with Demonstrations of Trace Element Analysis Techniques Using the Rabbit System and PC Based Analyzers	1.35	4.00
**Santa Fe Community College(Starke) Science Students(ISC-1001) - Dr. A. Ferrari - Reactor Sharing	Lecture, Tour and Demonstration of Reactor Operations with Radiation Surveys and NAA Training Exercises, with Demonstrations of Trace Element Analysis Techniques Using the Rabbit System and PC Based Analyzers	0.77	3.58
*Florida Foundation of Future Scientists - NAA Research On Elemental Aluminum Content In Canned Carbonated Beverages - Mr. Anthony Arico, Piper High School, Dr. W.G. Vernetson, University of Florida - Reactor Sharing	Summer 1992 Student Research Program: Evaluation of Carbonated Beverages For Aluminum Content Under Different Storage Conditions Prior To Opening the Beverage Can and After Opening the Can	4.85 (2.00)	6.00 (2.33)
*NAA Research For Determination of Trace Elements In Hair Samples - Mrs. Renae Allen, Union County High School - Reactor Sharing	NAA Evaluative Research For Trace Element Analysis of Several Hair Samples For Possible Identification and Quantification of Anomalous Heavy Element Concentrations	2.60 (1.30)	3.00 (1.75)

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PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
*Florida Foundation of Future Scientists - NAA Research on Mercury Content of Canned Tuna -Mr. C. Coldwell, L. Chapman and E. Leonard, Mainland High School, Dr. W.G. Vernetson, University of Florida - Reactor Sharing	Summer 1992 Student Research Program: Evaluation and Quantification of the Elemental Mercury Content In Canned Tuna Fish	4.85	13.83 (3.17)
*Physics of Superconducting Materials Properties Research - Dr. Haliaea Niculescu, Physics Dept., Florida State University and Dr. Peter Gielisse Mechanical Engineering Dept., FAMU/FSU - Reactor Sharing	Neutron Irradiation of Polycrystalline High Temperature Superconductor Material(YBaCuO: 1:2:3;7) To Increase Pinning Site Density of Fluxoids To Increase Critical Current Density To Determine Possible Improvements In Shielding Characteristics of the Superconducting Material	83.37 (39.88)	100.84 (46.50)
*** Second Annual Florida Accelerated Initiatives Student Seminar On Energy Issues For Outstanding High School Students - Mr. David Murray - Cocoa Beach High School - Reactor Sharing	Lecture, Tour and Demonstration of Reactor and NAA Laboratory Facility Capabilities and Applications For Group of Outstanding High School Students Examining Energy and Other Political Issues	0.00	2.00

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PROJECT AND USER	TYPE OF ACTIVITY	RUN TIME (hours)	EXPERIMENT TIME (hours)
*** Demonstration of Reactor Facility Operations - Mr. Spencer Reeder, Dunnellon High School - Reactor Sharing	Series of Lectures, Tours and Demonstrations of UFTR Operations and Capabilities For Trace Element Analysis Using the Rabbit System and PC Based Analyzers	0.23	1.75 (0.33)
*** Demonstration of Reactor Facility Capabilities and Usage For Industrial Arts Program - Mr. Jim McMullen, Mrs. Ann Marie Heller, Eastside High School - Reactor Sharing	Lecture, Tours and Demonstration of Reactor and NAA Laboratory Facility Operational Capabilities For Innovative Industrial Arts Industry - Oriented High School Technology Program	0.00	3.25 (0.08)
*** Demonstration of Reactor and NAA Laboratory Facility Capabilities and Usage - Mr. S. Torecki, Ridgewood High School - Reactor Sharing	Lecture, Tour and Demonstration of Reactor and NAA Laboratory Facility Operational Capabilities To Support Potential Science Fair Projects	0.00	2.50

1. Values in parentheses represent multiple or concurrent facility utilization (Run or Experiment time); that is the reactor was already being utilized in a primary run or activity for a project so a reactor training or demonstration utilization could be conducted concurrently with a scheduled NAA irradiation, course experiment, or other reactor run.
2. Exp. Time is run time (total key on time minus checkout time) plus set-up time for experiments or other reactor or facility usage including checkouts, tests and maintenance involving the reactor facility.
3. In general, charges are made only for time used and not for preparation time.
4. These hours do not reflect the hundreds of hours of NAA Laboratory usage for analysis of irradiated samples, only a small part of which is charged to the Reactor Sharing Grant.

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