BNL-61330
INFORMAL

REACTOR OPERATIONS

BROOKHAVEN MEDICAL RESEARCH REACTOR

BROOKHAVEN HIGH FLUX BEAM REACTOR

H. M. Hauptman, Group Leader, Medical Reactor
J. N. Petro, Group Leader, Instrumentation
O. Jacobi, Group Leader, Maintenance
V. Lettieri, Group Leader, Cold Neutron Facility
N. Holden, Research Coordinator
D. Ports, Group Leader, Operations
R. Petricek, Group Leader, Compliance
Approved: Lance L. Junker, Manager, Reactor Division

October 1994

INFORMAL REPORT

BROOKHAVEN NATIONAL LABORATORY

ASSOCIATED UNIVERSITIES, INC.

UPTON, NEW YORK 11973-5000

under contract No. DE-AC02-76CH00016 with the
United States Department of Energy

DISCLAIMER

Part I

Brookhaven Medical Research Reactor

1. Reactor

The reactor ran for 18 days with 24 startups during the month of October. A total of 144.9 Mwhrs of thermal energy were produced bringing the total to date to 21,379.84 Mwhrs.

2. Instrumentation

After successfully completing the monthly testing of the Nuclear Safety System (Channel 1), the scram setpoint of the safety amplifier was unable to be reset to the normal value. Details of this event are in OR-CH-BH-BNL-BMRR-1994-0002. The low alarm for the reactor vessel level instrument was set to 31". This was to comply with a new yellow page change.

3. Mechanical Maintenance

All scheduled tickler card maintenance was performed.

4. Occurrence Reports

There was one occurrence at the Brookhaven Medical Research Reactor for the month of October 1994.

CH-BH-BNL-BMRR-1994-0002, Failure of One Channel of the Nuclear Safety System to Generate a Scram Signal.- 10/17/94.

5. Safety

There were no reportable first aid cases at the Brookhaven Medical Research Reactor for the month of October, 1994.

BMRR TECHNICAL SPECIFICATION SURVEILLANCE REQUIREMENTS RECORD

MONTH October **YEAR** 1994

Requirement	Period	Previous Completion Date	Scheduled Date	Completion Date	Deadline if Not Completed
Operations					
Confinement System					
a. Nuclear Incident System (M-4.2.4)	M	09/19/94	10/94	10/10/94	
b. Bldg. Relief Valves (M-4.2.2)	M	10/03/94	10/94	10/17/94	
c. Safety Circuit Test (Q-4.8.1)	Q	07/20/94	10/94	11/01/94	
d. Control Rod Seating (M-4.3.4)	M	08/01/94	10/94	10/03/94	
e. Reactor Shutdown Margin Test (A-4.3.1)	A	10/18/93	10/94	10/17/94	

[TSSRR/octtechs]

M = Monthly A/2 = Semi-Annually
Q = Quarterly A = Annually
( ) = Date of the month in which card is issued

SUMMARY OF BMRR IRRADIATIONS

10/01/94 TO 10/31/94

DATE	PROJECT	HOURS	FACILITY	DESCRIPTION OF SAMPLE
10/03/94	S&EP	0.250	Pn-TUBE	I-127
10/04/94	MEDICAL	0.083	Pn-TUBE	In-115
10/04/94	MEDICAL	0.167	Pn-TUBE	Gd-158
10/04/94	MEDICAL	0.700	TREATMENT ROOM #2	ION CHAMBERS
10/04/94	MEDICAL	2.650	RADIAL	CELLS w/B-10
10/05/94	MEDICAL	6.283	RADIAL	CELLS w/B-10
10/06/94	DAT	2.500	Pn-TUBE	SiO2 SLIDES
10/06/94	MEDICAL	6.383	RADIAL	CELLS w/B-10
10/06/94	CHEMISTRY	217.417	Pn-TUBE	SOIL w/Th-232
10/12/94	MEDICAL	0.083	Pn-TUBE	In-115 STDS
10/12/94	MEDICAL	0.167	Pn-TUBE	Gd-158
10/12/94	MEDICAL	5.833	TREATMENT ROOM #1	RATS
10/13/94	MEDICAL	3.500	TREATMENT ROOM #1	RATS
10/14/94	DAT	3.750	Pn-TUBE	SiO2 SLIDES
10/14/94	MEDICAL	6.517	RADIAL	CELLS w/B-10
10/18/94	MEDICAL	0.083	Pn-TUBE	In-115 STDS
10/18/94	MEDICAL	0.167	Pn-TUBE	GdCl3 (Gd-158)
10/18/94	MEDICAL	4.983	TREATMENT ROOM #2	TLD's, Au FOILS
10/19/94	MEDICAL	5.333	TREATMENT ROOM #1	RATS
10/20/94	DAT	2.500	Pn-TUBE	SiO2 SLIDES
10/21/94	MEDICAL	5.417	TREATMENT ROOM #1	RATS
10/24/94	MEDICAL	6.833	TREATMENT ROOM #1	RATS
10/26/94	MEDICAL	6.667	TREATMENT ROOM #1	RATS
10/27/94	MEDICAL	6.400	TREATMENT ROOM #2	TLD's, Au FOILS
10/27/94	MEDICAL	0.083	Pn-TUBE	Gd-158 IN TISSUE
10/28/94	MEDICAL	6.000	RADIAL	CELLS w/B-10
10/28/94	DAT	3.750	Pn-TUBE	SiO2 SLIDES

TOTAL NO. OF HOURS: 304.5

TOTAL NO. OF SAMPLE CAPSULES LOADED: 13

End of Report

Treatment Room #1 formerly reported as Patient Facility

Treatment Room #2 formerly reported as Animal Facility

PART II

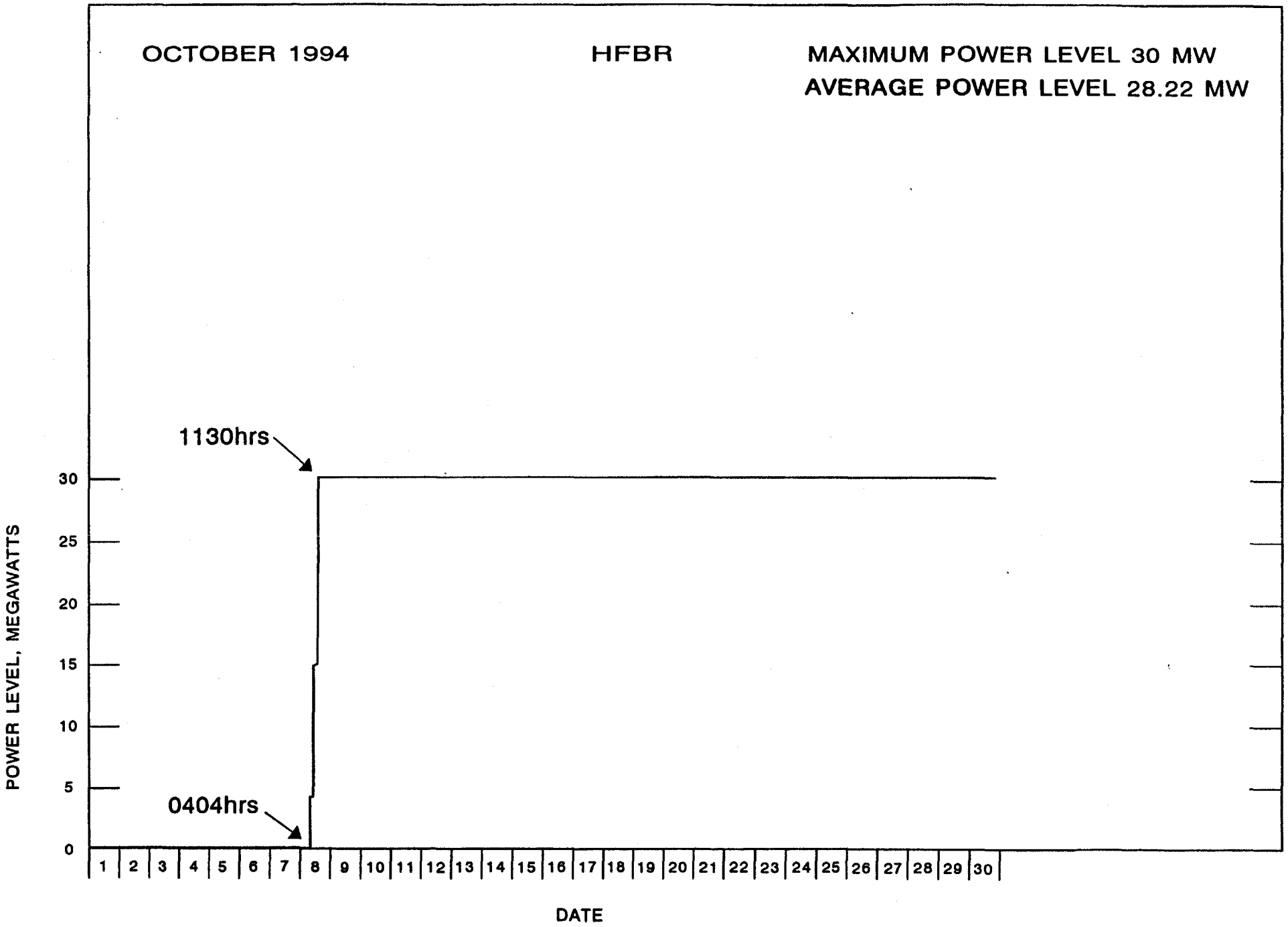
Brookhaven High Flux Beam Reactor

October

31 Days

10564 - 10594

Reactor Operation to Date	272,907.20	MWD
Reactor Operation for Month	678.57	MWD
Hours of Operation	577.00	HRS
Average Power Level ((MWDx24) / Hours of Operation)	28.22	MW
Maximum Power Level	30.00	MW
Downtime	22.44	%
Electrical Energy Consumed within HFBR Bldg.	966,000.	KWH
Electrical Energy Consumed by Sec. Water Pumps	230,900.	KWH
Electrical Energy Consumed in Pumphouse 440V System	4,400.	KWH
Total Electrical Energy Consumed within HFBR Complex	1,201,300.	KWH
Electrical Energy Consumed by CNF Compressor	208,800.	KWH
Elements Charged this Month	7	
Elements Discharged this Month	7	
Reactor D_2O Inventory (within 200 pounds)	102,977.00 (46,710.36	LBS KG)
Reactor D_2O Isotopic Purity (Average All Systems)	99.53	%
Helium Consumed (NTP)	13,000. (367.	CF CM)
CO2 Consumed	12,000. (5,443.	LBS KG)


OCTOBER 1994
HFBR
MAXIMUM POWER LEVEL 30 MW
AVERAGE POWER LEVEL 28.22 MW
1130hrs
0404hrs
POWER LEVEL, MEGAWATTS
0
5
10
15
20
25
30
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
DATE

2. Explanation of Histogram

On October 8, 1994 the reactor was restarted in accordance with the "HFBR Restart Procedure Following Shutdown No. 274." This procedure specified the actions taken following the "Investigation of Possible Heavy Water Leak" and actions taken to correct deficiencies noticed in Conduct Of Operations. At 0404 hours the reactor was started up to verify the Estimated Critical Position (ECP) for Operating Cycle No. 275. Throughout the next several hours, power was raised to 4MW for a Health Physics Shield Check, 15MW for completion of Tri-monthly Safety Circuit Testing and at 1130 hours was raised to 30MW for Operating Cycle No. 275.

3. Operating Difficulties

Operations reported that the Area Gamma Radiation Monitor chassis failed with all alarms locked in. The Reactor Instrument Group (RIG) replaced a blown fuse and tested all channels. The unit was placed back in service by Operations on October 4, 1994.

On October 1, 1994, during routine testing of the Criticality Alarm system, one of the local indicators on the Equipment Level failed to produce an audible alarm. The channel was placed in the tripped conditions which had no impact on Operations, since fuel handling was not in progress. The indicator was replaced with a spare and tested satisfactorily by the Reactor Instrument Group (RIG) and Operations personnel at 1230 hours on October 4, 1994. This failure was categorized as "Off-normal" and further details may be found in Reactor Division Occurrence Report CH-BH-BNL-HFBR-1994-0013.

On October 8, 1994 following reactor startup, thermopile nuclear power channel 5 was not responding to power escalation. Reactor Instrument Group (RIG) personnel indicated that the failure may be due to a faulty detector. Operations personnel decided to continue reactor operations since two alternate emergency power indicators were available. Further troubleshooting was scheduled for the next reactor shutdown.

4. Reactivity Comments

The excess reactivity at the start of Operating Cycle No. 275 was 20.95$.

5. Building Confinement Test and Changes

Building Confinement was considered broken until completion of the surveillance test on the Exit Air Bypass Facility Charcoal filters. Results of the iodine absorption collection efficiency test on October 3, 1994 on the charcoal filters was 99.638%. Based upon these results and the collection efficiency test performed on the HEPA filters on September 28, 1994, the overall decontamination efficiency of the Exit Air Bypass Filter Facility was calculated to be 95.67%, which meets the Technical Safety Requirement of greater than or equal to 95%. Confinement was restored on October 4, 1994 at 1000 hours.

6. Changes to Reactor or Process Systems

A new auxiliary remote fire alarm annunciator panel was installed in the control room to alert the operating crew when a fire alarm signal originates in the fanhouse (Bldg. 704), pumphouse (Bldg. 707) or office annex (Bldg. 750). Installation and testing of the annunciator panel was completed satisfactorily by Fire Alarm Electricians and Operations Personnel on October 19, 1994.

The temperature indicator which monitors the primary pump bearing oil was replaced with a new upgraded unit. The Reactor Instrument Group (RIG) completed installation and testing of the new unit on October 17, 1994. Additional details may be found in Reactor Division Maintenance Replacement Approval No. 94-19.

7. Instrumentation

During routine testing of the Criticality Alarm System on the Equipment Level, one of the local indicators failed to produce an audible alarm. Details of this event are in OR-CH-BH-BNL-HFBR-1994-13. When the reactor was being started up, it was observed that the thermopile (channel 5) was not responding to the power escalation. It was determined that the thermopile was not outputting a signal. Investigation will continue when the reactor is shut down.

8. Mechanical Maintenance

All scheduled tickler card maintenance was performed.

9. Occurrence Reports

There were two reportable occurrences at the High Flux Beam Reactor for the month of October 1994.

CH-BH-BNL-HFBR-1994-0013, Failure of Audible Alarm During Technical Safety Requirement (TSR) Surveillance Test of Criticality Alarm - 10/1/94.

CH-BH-BNL-HFBR-1994-0014, Fission Chamber Containing 1.7 Grams of Uranium-235 was Discovered Not to be in its Designated Area During Physical Inventory - 10/19/94.

10. Experimental Facilities

Experimental work was in progress on the following beam lines from October 8 - 31, 1994.

H-1B Physics Department - Nuclear Structure Group - work in progress.
H-1A Powder diffractometer in service.

H-2 Physics Department - NO EXERPERIMENTAL WORK IN PROGRESS

H-3 Biology Department - Structural Biology Group.

H-3A Experimental work in progress.

H-3B Experimental work in progress.

H-4 Physics Department - Neutron Scattering Group.

H-4M Experimental work in progress.

H-4S Experimental work in progress.

H-5 Chemistry Department - Chemistry Department Neutron Scattering Group.

Experimental work in progress.

H-6 Chemistry Department - Chemical Crystallography Group.

H-6M & H-6S - Experimental work in progress.

H-7 Physics Department - Neutron Scattering Group.

Experimental work in progress.

H-8 Physics Department - Neutron Scattering Group.

Experimental work in progress.

H-9 Reactor Division - Cold Neutron Facility.

H-9A Physics - Experimental work in progress.
H-9B Biology - Experimental work in progress.
H-9R Physics - Neutron Reflectometer in-service.

11. Cold Neutron Facility

Operating History

The CNF was shutdown at the beginning of the report period. The CNF started up with the reactor on October 8, 1994. The CNF operated from 1507 hours on the 8th until 1256 hours on 10/17/94. The CNF was manually vented and purged on 10/17/94 at 1256 hours due to a leak of hydrogen into the vent line. The CNF was restarted on 10/18/94 at 1520 hours and operated until the end of the reporting period.

The CNF operated 534.7 hours during October. Lost time was caused by a hydrogen leak through relief valve H303R. The CNF produced cold neutrons 95% of the time the reactor was at full power.

Operating Difficulties

The CNF developed a hydrogen leak through relief valve H303R sometime between 10/8/94 and 10/17/94. Though the CNF was shutdown, relief valve H303R could not be repaired during reactor operation. A continuous helium purge of the CNF vent line was initiated on 10/18/94. A safety review was performed to determine the minimum required helium flow through the vent line to maintain hydrogen concentration below the flammable limit. The required helium flow was maintained and recorded daily by CNF personnel during the remainder of the operating cycle.

A safety review was completed regarding the possibility of adding hydrogen to a partially filled CNF moderator. A yellow page T.O.P. was issued to perform the addition. After discussions with the experimenter's the CNF added approximately 22 SCF of hydrogen to a partially full CNF moderator at 1117 hours on 10/28/94.

As a result of this addition of hydrogen to the moderator the experimenter's measured a higher neutron flux than was normal for the CNF. It is believed that this increased flux is due to the liquid hydrogen level being higher than normal, after the additional charge of hydrogen was made. Discussions are taking place with the experimenter's regarding what studies should be conducted to determine the optimum level to which the CNF moderator should be filled in the future.

Maintenance Activities

All required maintenance and surveillance testing was completed. Work continued on MRA #94-13, New Helium Refrigerator Temperature Diodes and Indicator.

12. Safety

There were 2 first aid cases reported for the month of October, 1994. The highest quarterly average exposure to radiation was 45.4 mrem gamma tritium.

13. Fuel Element Inventory

Elements in Use as of October 31, 1994

In Reactor(s)	HFBR 28	BMRR 35	63

Element Movement during the Month

Charged to reactor	0
Discharged from reactor	0

HFBR TECHNICAL SPECIFICATION
SURVEILLANCE REQUIREMENTS RECORD

October 1994.

Requirement	Tech Spec Period	Previous Completion Date	Current Completion Date	Tech Spec Deadline
AA 2.1.exp *Chloride Content in Experimental System* BIMONTHLY	M	10/17/94	10/24/94	12/01/94
AA 2.1.pri *Chloride Content in Primary System* BIMONTHLY	M	10/17/94	10/24/94	12/01/94
IR 2.exp *Isotopic Purity of Experimental System* WEEKLY	M	10/24/94	10/31/94	12/08/94
IR 2.pri *Isotopic Purity of Primary System* WEEKLY	M	10/24/94	10/31/94	12/08/94
MIS 1.1 *Determination of pD with Orion pH meter (Primary System)* WEEKLY	M	10/24/94	10/31/94	12/08/94
TC 302 *Criticality Alarm System Operability Test* MONTHLY	M	09/02/94	10/01/94	11/08/94
TC 310 *SPAM Station Checks* MONTHLY	M	09/17/94	10/15/94	11/22/94
TC 116A *Control Rod Interlock* JAN/APR/JUL/OCT	3M **DUE**	06/08/94	08/18/94	12/08/94
TC 116B *SCRAM Logic Action Tests* JAN/APR/JUL/OCT	3M **DUE**	06/04/94	08/18/94	12/08/94
TC 116C *SETBACK Logic Action* JAN/APR/JUL/OCT	3M **DUE**	06/04/94	08/18/94	12/08/94

Requirement	Tech Spec Period	Previous Completion Date	Current Completion Date	Tech Spec Deadline
TC 116D *SCRAM & SETBACK Trip Point & Channel Independency* JAN/APR/JUL/OCT	3M **DUE**	06/04/94	08/18/94	12/08/94
TC 116E *Nuclear Instrumentation Performance* JAN/APR/JUL/OCT	3M	06/08/94	10/08/94	01/28/95
TC 116F *LOLOLOW AND LOLOW Logic Action & Channel Independency* JAN/APR/JUL/OCT	3M **DUE**	06/04/94	09/13/94	01/03/95
TC 175 *Main Control Rod SCRAM Times (Digital System)* JAN/APR/JUL/OCT	3M	08/18/94	10/07/94	01/27/95
TC 291 *Low-Low-Low Level Pony Motor Trip Relay Test* JAN/APR/JUL/OCT	3M **DUE**	06/07/94	09/12/94	01/02/95
TC 296 *LI-107 / LI-109 Operability Check* JAN/APR/JUL/OCT	3M	07/08/94	10/06/94	01/26/95
TC 324 *Review of HFBR Management Technical and Rad Safety Support* JAN/APR/JUL/OCT	3M **DUE**	07/11/94	09/30/94	01/20/95
TC 160 *HFBR Main Control Rod Shutdown Margin Test* AUG	A	09/03/93	10/08/94	01/08/96
HE 3&11(A) *24 VDC Battery Float Voltage* MONTHLY	M	08/31/94	10/03/94	11/10/94
HG 8(A) *LI-109 24 VDC Float Voltage and Battery Operability Check* JAN/APR/JUL/OCT	3M	07/11/94	10/07/94	01/27/95

Requirement	Tech Spec Period	Previous Completion Date	Current Completion Date	Tech Spec Deadline
HB 54 *TRa-101 & TR 102 Calibration* FEB/JUN/OCT	A	06/13/94	10/21/94	01/21/96
HK 1&2 *LA-307 Test and Calibration* OCT	A	09/27/93	10/18/94	01/18/96
HP 22 *NSS CH1 Chamber Characteristics Curve* MAR/JUN/SEP/DEC	A	06/14/94	10/12/94	01/12/96
HP 25 *NSS CH2 Chamber Characteristics Curve* MAR/JUN/SEP/DEC	A	06/16/94	10/12/94	01/12/96
HP 28 *NSS CH3 Chamber Characteristics Curve* MAR/JUN/SEP/DEC	A	06/14/94	10/12/94	01/12/96
HR 12...82(A) *Main Rod Reactivity Measurement* MAR/SEP	A **DUE**	06/14/93	07/11/94	10/11/95
HT 15&19 *PIa-101A and PI-301A Calibration* OCT	A **DUE**	10/12/92	10/14/93	01/14/95
HT 16&20 *PIa-101B and PI-301B Calibration* OCT	A **DUE**	10/13/92	10/14/93	01/14/95
HT 65&66 *PIa-106 and PIa-306 Calibration* OCT	A **DUE**	10/13/92	10/14/93	01/14/95
HT 67-70 *FCF Chambers (RRa-101, 102, 103 and Spare) Calibration* MAR/JUN/SEP/DEC	A	06/16/94	10/12/94	01/12/96
HE 3&11(D) *24 VDC Battery Discharge* Sep 1994	5Y **DUE**		11/27/89	05/27/95

Requirement	Tech Spec Period	Previous Completion Date	Current Completion Date	Tech Spec Deadline
TC 627E *250V Monthly Battery Inspection* MONTHLY	M	09/01/94	10/03/94	11/10/94
TC 632E *Monthly Pony Motor Battery Inspection* MONTHLY	M	09/01/94	10/03/94	11/10/94

...end...

SUMMARY OF HFBR IRRADIATIONS

10/01/94 TO 10/31/94

DATE	PROJECT	HOURS	FACILITY	DESCRIPTION OF SAMPLE
10/08/94	OAK RIDGE	1.000	V-14	STEEL
10/11/94	OAK RIDGE	18.500	V-14	STEEL
10/11/94	CHEMISTRY	26.033	V-10	LIMESTONE
10/12/94	OAK RIDGE	8.000	V-14	Al, Co, Fe, Ni
10/13/94	MEDICAL	117.217	V-15	TiO2 (Ti-47)
10/14/94	TENN TECH	141.050	V-16	PURE CALCIUM
10/14/94	MEDICAL	5.000	V-10	Au-197
10/18/94	CHEMISTRY	26.083	V-10	LIMESTONE
10/19/94	PHYSICS	45.833	V-14	Cu-63
10/21/94	OAK RIDGE	8.000	V-10	Al, Fe, Ni
10/24/94	PHYSICS	71.833	V-14	Cu-63
10/25/94	CHEMISTRY	26.017	V-10	LIMESTONE
10/26/94	CHEMISTRY	16.617	V-12	LIMESTONE
10/27/94	PHYSICS	70.500	V-14	Cu-63
10/31/94	PHYSICS	67.500	V-14	Cu-63

TOTAL NO. OF HOURS: 649.1833

TOTAL NO. OF SAMPLE CAPSULES LOADED: 15

End of Report