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SHEARON HARRIS NUCLEAR POWER PLANT
DOCKET NO. 50-400/LICENSE NO. NPF-63
STARTUP TEST REPORT

Gentlemen:

In accordance with the reporting requirements for the Shearon Harris Nuclear Power Plant (SHNPP) Technical Specifications, Section 6.9.1.1,Carolina Power & Light Company herein submits the Startup Test Report for Cycle 6 operation. The report is required because the SHNPP core for Cycle 6 contains fuel purchased from a different supplier, Siemens Power Corporation.

Questions regarding this matter may be referred to Mr. R. W. Prunty at (919) 362-2030.

Sincerely,

W. R. Robinson

SDC/sdc

c: Mr. S. D. Ebneter
Mr. N. B. Le
Mr. J. E. Tedrow

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Serial: NF-94A-0597

Harris Nuclear Plant Unit 1, Cycle 6
Startup Test Report

The First Reload of a Transition from Westinghouse to Siemens Supplied Fuel

NFM&SA File: 908.04

Startup Test Report

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1.0 Introduction and Cycle Description

This report documents the startup test results for Harris Nuclear Plant Unit 1, Cycle 6. This report will focus primarily on the results obtained from the various startup physics tests and on a comparison between measured and predicted data supplied by Siemens Power Corporation (SPC). Note that this report is not intended to be a detailed description of the startup tests; for detailed documentation of the tests, refer to the following procedures:

EPT-069	Initial Criticality
EPT-026	Reactivity Computer Initial Setup and Calibration Using the Reactivity Computer Detector
EPT-070	Reactivity Computer Initial Setup and Calibration
EPT-067	Boron Endpoint Measurement - All Rods Out
EST-707	Special Test Exceptions
EST-703	Moderator Temperature Coefficient Measurement BOL After Each Refueling
EST-701	Shutdown Margin Calculation Mode 2
EPT-068	Reactivity Worth of the Control and Shutdown Banks Utilizing the Rod Swap Technique
EST-724	Shutdown and Control Rod Drop Test Using Computer
FMP-101	Incore Thermocouple and Flux Mapping
EST-710	Hot Channel Factor Tests
EPT-009	Intermediate Range Detector Setpoint Verification

Specifically, the following items are addressed:

- Control Rod Drop Times
- Control and Shutdown Bank Worth Measurements
- Endpoint Measurements
- Isothermal Temperature Coefficients
- Power Distributions
- Intermediate Range Detector Setpoint Verification
- Conclusions

1.0 Introduction and Cycle Description (Continued)

Among the items discussed for each of the topics above will be measured data, comparisons to predicted data, and applicable acceptance criteria which must be satisfied for the successful completion of the tests.

Harris Unit 1 is a three-loop Westinghouse PWR reactor currently in its sixth cycle of operation. The rated thermal power is 2775 MWt. The reactor core consists of 157 assemblies grouped into four regions for Cycle 6; with 52 fresh Siemens High Thermal Performance (HTP) assemblies, 96 carryover Westinghouse Vantage-5 assemblies and 9 Westinghouse reinserted LOPAR assemblies. The 9 reinserted assemblies were used because of the potential to exceed the peak pin burnup limits in the assemblies that they replaced. Tables 1.1, 1.2, 1.3 and 1.4 provide a review of the Cycle 6 core design parameters and a description of each fuel type. Figures 1.1 and 1.2 provide the core loading pattern and the thimble and control rod locations, respectively. Figure 1.3 provides the gadolinia loading in the fresh fuel assemblies.

There are several new features in Cycle 6. The fresh fuel is now supplied by Siemens Power Corporation (SPC) and the burnable poison in the fresh fuel is gadolinium oxide (Gd_2O_3). Additional changes to the Harris Plant include the elimination of the RTD bypass manifold, a T_{HOT} reduction of 8°F and the removal of the neutron source assemblies from use in the Cycle 6 core.

The predicted full power Cycle 6 length is 420 EFPDs based on a 463 EFPD Cycle 5.

Cycle 6 initial criticality was achieved on May 10, 1994; the unit synchronized to the grid on 5/12/94. Following criticality, checkouts of the reactivity computers (connected to NI-41 and Reactivity Computer Detector) were performed by comparing period measurements to the startup rate indicated by the computer. The six-group constants input to the reactivity computers were provided by SPC and are listed in Table 1.5. After confirming correct operation of the reactivity computers, startup physics testing continued in accordance with the established schedule. The reactivity computer connected to NI-41 was disconnected since the reactivity computer connected to the Reactivity Computer Detector was performing satisfactorily. The results of the Low Power Physics tests and the applicable acceptance criteria are provided in Tables 1.6 and 1.7.

[illegible]
[illegible]

2.0 Control and Shutdown Rod Drop Times

Rod drop tests were performed in accordance with procedure EST-724 at hot full flow coolant conditions. Briefly, a bank was selected and pulled to the fully withdrawn position. Rods were then dropped by opening the reactor trip breakers, thus interrupting the circuit.

Technical Specifications require that the rod drop time from the beginning of the drop to dashpot entry be no greater than 2.7 seconds at full core flow and $T_{avg} \geq 551°F$

In Cycle 6, all rods met the rod drop acceptance criteria.

The summarized results of the rod drop test are presented in Table 2.1. The data for the rods going into the SPC fuel has been italicized.

3.0 Control and Shutdown Rod Bank Worth Measurements

Rod worth measurements were performed in accordance with plant procedure EPT-068. This procedure uses the rod swap technique to measure all banks except for the reference bank; this bank is measured through boron dilution. The purposes of this procedure are as follows:

1. To verify that the reactivity worth of the reference RCC bank, as determined through reactivity computer measurement, is consistent with design predictions. The reference RCC bank is the bank that has the highest predicted reactivity worth of all control and shutdown banks when inserted into an otherwise unrodded core. In Cycle 6 the Reference Bank is Control Bank B.

2. To verify that the reactivity worth of each control and shutdown bank (except for the Reference Bank), as measured in the presence of the Reference Bank in a critical configuration, is consistent with design predictions.

3. To verify by analysis that shutdown margin is consistent with accident analysis assumptions.

4. To determine the critical RCS boron concentration and associated reactivity worth appropriate to an endpoint configuration. The boron endpoints of interest in this procedure are those with ARO and the reference bank fully inserted. The method used to obtain this data is similar to that used in EPT-067, except that the Reference Bank is manipulated instead of Control Bank D.

3.0 Control and Shutdown Rod Bank Worth Measurements (Continued)

The review criteria for the rod worths is as follows:

1. The absolute value of the percent difference between measured and predicted integral worth of the Reference Bank is (10%.

2. For all banks other than the Reference Bank; either

   a. The absolute value of the percent difference between measured and predicted worths is (15%, or

   b. The absolute value of the reactivity difference between measured and predicted worths is (100 pcm, whichever is greater.

The acceptance criteria requires that the sum of the measured worths be greater than 90% and less than 110% of the sum of the predicted worths.

Table 3.1 presents the integral and differential worth of Control Bank B (Reference Bank). Table 1.6 presents the measured and predicted endpoint data and measured integral worth for all banks. Figures 3.1 and 3.2 graphically compare the predicted and measured integral and differential rod worths for Control Bank B.

The review and acceptance criteria on bank worths were met.

4.0 Endpoint Measurements

The ARO boron endpoint measurement was performed in accordance with the procedure EPT-067. The acceptance criterion for the boron endpoint measurement requires that the ARO critical boron concentration be within 500 pcm (71 ppm at Cycle 6 BOC boron worth) of the measured value.

For Cycle 6, the ARO endpoint was 16 ppm more than the predicted value (1826 ppm predicted, 1842 ppm measured). The acceptance criterion for the endpoint was met.

5.0 Isothermal Temperature Coefficient

Isothermal Temperature Coefficient (ITC) measurements were taken, in accordance with EST-703, to insure that Technical Specification requirements limiting the moderator temperature coefficient to less than or equal to +5 pcm/°F at HZP and 0.0 pcm/°F at HFP are met. Should the MTC exceed +5 pcm/°F at HZP, ARO conditions, rod withdrawal limits for startup and power ascension must be established. The ITC is measured at HZP and operating pressure with rods close to ARO.

The ITC is obtained by a uniform cooldown and heatup of the primary system with the resultant reactivity changes monitored by the reactivity computer and recorded on an X-Y plotter. All measurements are made below the nuclear heating range to minimize Doppler feedback effects. Over the temperature range used (558-553°F) the reactivity versus temperature relationship is approximately linear. As such, the coefficients were measured as the slope of the reactivity change versus the temperature change provided on the X-Y plotter. Note that the ITC measurements were taken for two cooldowns and heatups (one cooldown was discarded because of reactivity computer problems during the process) and the results averaged in order to calculate the MTC. The averaging was done to minimize the effect of boron additions to the system during the cooldown (boron additions are caused by concentration mismatches between the RCS and pressurizer). Calculation of the MTC from the measured ITC is done using the equation below and the SPC predicted HZP Doppler coefficient of -1.60 pcm/°F:

$$\alpha_{iso} = \alpha_{mod} + \alpha_{Dopp}$$

Results of the ITC/MTC measurements are presented in Tables 5.1 and 5.2 and the actual test data is provided graphically (obtained from Cycle 6 EST-703) as Figures 5.1, 5.2 and 5.3.

The results indicate a negative MTC of -2.2 pcm/°F at HZP, ARO conditions indicating that no rod withdrawal limits would be necessary.

6.0 Power Distributions

The core power distribution measurements are taken to insure correct core loading and to verify compliance with Technical Specification requirements and limits on hot channel factors, quadrant power tilts, power density and allowed power limits. Core power distribution is measured by processing moveable detector data using the INCORE code which evaluates the map quality, flux trace validity, hot channel factors and locations, and allowed power limits.

Tables 6.1 and 6.2 provide pertinent statistics for evaluating map quality and core parameters which must be monitored. Flux maps were taken at power levels of 27.5, 72.6, 93.8 and 99.8% power (Maps 211, 212, 214 and 215, respectively). Map 213 was not valid because of detector drift due to axial and radial xenon oscillations induced by rod movement immediately prior to the start of taking thimble data.

Figures 6.1 through 6.8 provide pertinent INCORE results for the four flux maps. All Technical Specification limits were met.

7.0 Intermediate Range Detector Setpoint Verification

SPC introduced a new methodology for the adjustment of the Power and Intermediate Range Detectors to account for the flux leakage changes between the end of Cycle 5 and the beginning of Cycle 6. During the power ascension phase of the startup physics testing, the procedure EPT-009 is used to verify that the Intermediate Range Rod Withdrawal Stop and Trip Setpoints are within acceptance limits. Although EPT-009 is not specifically required by Technical Specifications, it is generally performed for each startup to monitor, verify and determine the Intermediate Range Detector Setpoints. During a reactor startup, the Intermediate Range Rod Withdrawal Stop and Trip Setpoints are verified to be as follows for both N35 and N36:

a. Current equivalent to 15% power $\leq P_{Trip} \leq$ current equivalent to 27% power for N35.

b. Current equivalent to 15% power $\leq P_{Trip} \leq$ current equivalent to 27% power for N36.

The highest Power Range indicated power at which the bistables engaged for the Intermediate Range Trip was 18.5 and 22.4, for N35 and N36 respectively.

The Technical Specification allowed value for the trip setpoint is 30.9% RTP.

8.0 Conclusions

The data obtained during the Cycle 6 startup physics testing show acceptable agreement between measured and predicted rod worths, boron endpoints, temperature coefficients. The flux maps allowed power ascension and then full power operation based on meeting the acceptance criteria as presented in Table 1.7.

Since the startup physics predictions were acceptable overall, confidence in both the SPC data and the NFM&SA Section's ability to predict future Cycle 6 core behavior is reasonable.

9.0 References

1. "Shearon Harris Unit 1, Cycle 6 Startup and Operations Report", EMF-94-025(P), April 1994.
2. Shearon Harris Engineering Periodic Test Procedure EPT-069, "Initial Criticality", Revision 4, May 3,1994, Revision 4, May 3, 1994.
3. Shearon Harris Engineering Periodic Test Procedure EPT-070, "Reactivity Computer Initial Setup and Calibration", Revision 3, March 14, 1994.
4. Shearon Harris Engineering Periodic Test Procedure EPT-026, "Reactivity Computer Initial Setup and Calibration Using the Reactivity Computer Detector", Revision 3, April 20, 1994.
5. Shearon Harris Engineering Periodic Test Procedure EPT-067, "Boron Endpoint Measurement - All Rods Out", Revision 5, May 2, 1994.
6. Shearon Harris Engineering Surveillance Test Procedure EST-707, "Special Test Exceptions", Revision 4, October 14, 1993.
7. Shearon Harris Engineering Surveillance Test Procedure EST-703, "Moderator Temperature Coefficient Measurement BOL After Each Refueling", Revision 8, May 2, 1994.
8. Shearon Harris Engineering Surveillance Test Procedure EST-701, "Shutdown Margin Calculation Mode 2", Revision 6, November 22, 1993.
9. Shearon Harris Engineering Periodic Test Procedure EPT-068, "Reactivity Worth of the Control and Shutdown Banks Utilizing the Rod Swap Technique", Revision 5, May 2, 1994.
10. Shearon Harris Engineering Surveillance Test Procedure EST-724, "Shutdown and Control Rod Drop Test Using Computer", Revision 0, March 6, 1994.
11. Shearon Harris Fuel Management Procedure FMP-101, "Incore Thermocouple and Flux Mapping", Revision 7, May 13,1994.
12. Shearon Harris Engineering Surveillance Test Procedure EST-710, "Hot Channel Factor Tests", Revision 10, May 13, 1994.
13. Shearon Harris Engineering Periodic Test Procedure EPT-009, "Intermediate Range Detector Setpoint Verification", Revision 4, March 3, 1994.

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Figure 6.6 Cycle 6 $F_Q^T * V(z)/K(z)$ versus Core Elevation, Map 212
Figure 6.7 Cycle 6 $F_Q^T * V(z)/K(z)$ versus Core Elevation, Map 214
Figure 6.8 Cycle 6 $F_Q^T * V(z)/K(z)$ versus Core Elevation, Map 215

Note: $F_Q^T = F_Q^M * 1.05 * 1.03$

Table 1.1
Comparison of Cycles 5 and 6 Fuel Loading

	Cycle 5	Cycle 6
As-built Zero Burnup Loading (MTU)		
Region 1	4 Assy - 1.847	9 Assy - 4.161
Region 5A	13 Assy - 5.533	-
Region 5B	20 Assy - 8.495	-
Region 6A	32 Assy - 13.602	12 Assy - 5.098
Region 6B	28 Assy - 11.917	24 Assy - 10.213
Region 7A	32 Assy - 13.580	32 Assy - 13.580
Region 7B	28 Assy - 11.896	28 Assy - 11.896
Region 8 LFA	-	8 Assy - 3.663
Remainder Region 8	-	44 Assy - 20.046
Total (MTU)	66.870	68.657408
Power Rating (MWt)	2775	2775
Rod Out Park Position (steps)	228	231
System Pressure (psig)	2250	2250
Core Average Moderator Temperature (HZP/HFP °F)	557/588.8	557/580.8
Number of Poison Rod/Pins	4096 IFBAs 96 WABAs	40@2 w/o Gd_2O_3 632@6 w/o Gd_2O_3 160@8 w/o Gd_2O_3

Table 1.2

Comparison of Cycles 5 and 6 Peaking Factor Limits

	Cycle 5	Cycle 6
F_Q Limit	2.45 - LOPAR, V5	2.45 - LOPAR, V5 2.52 SPC HTP
$F_{\Delta H}$ Limit	1.62- LOPAR 1.65 - V5	1.62- LOPAR 1.65 - V5 1.73- SPC HTP

Table 1.3

Fuel Inventory Dimensions

Region	1	6A	6B	7A	7B	8
Number of Assemblies	9	12	24	32	28	52
Fuel Design	LOPAR	V5	V5	V5	V5	HTP
Pellet Density (% TD)	95.1[1]	95.4[1]	95.6[1]	95.5[1]	95.6[1]	95.0
Pellet O.D., inches	.3225	.3088	.3088	.3088	.3088	.3215
Clad I.D., inches	.329	.315	.315	.315	.315	.328
Clad O.D., inches	.374	.360	.360	.360	.360	.376
Fill Gas Pressure, psig	-	-	-	-	-	355
Region-wise loading, MTU	4.161	5.098	10.213	13.580	11.896	23.709

(1) Region 1, 6A, 6B, 7A and 7B pellet densities are as built

Table 1.4

Fuel Inventory Enrichment

Nominal Initial Enrichment, w/o U235

Region	1	6A	6B	7A	7B	8
Top 3 inches	2.10	0.72	0.72	0.74	0.74	0.71
Next 3 inches	2.10	0.72	0.72	0.74	0.74	4.95
Next 6 inches	2.10	4.40	4.80	4.40	4.80	4.95
Central 120 inches:						
0 w/o Gd_2O_3	2.10	4.40	4.80	4.40	4.80	4.95(1)
2 w/o Gd_2O_3	–	–	–	–	–	4.85(2)
6 w/o Gd_2O_3	–	–	–	–	–	4.65(3)
8 w/o Gd_2O_3	–	–	–	–	–	4.55(4)
Next 3 inches	2.10	4.40	4.80	4.40	4.80	4.95
Next 3 inches	2.10	0.72	0.72	0.74	0.74	4.95
Bottom 3 inches	2.10	0.72	0.72	0.74	0.74	0.71

(1) 12,896 rods contain 0 w/o Gd_2O_3

(2) 40 rods contain 2 w/o Gd_2O_3

(3) 632 rods contain 6 w/o Gd_2O_3

(4) 160 rods contain 8 w/o Gd_2O_3

Table 1.5 Input Parameters to the Reactivity Computer		
Group	βi	λi (sec^{-1})
1	.000207	.0128
2	.001293	.0316
3	.001163	.1203
4	.002497	.3211
5	.000904	1.4045
6	.000216	3.8696

$$\sum_{i=1}^{6} \beta i = 0.00628$$

$$l^{*} = 17.39$$

$$l = 0.965$$

$$\beta_{eff} = 0.006060$$

Table 1.6 Startup Test Summary				
Boron Endpoint (ppm)				
Configuration		Measured	Predicted	Difference (M-P)
ARO		1842	1826	16
B-IN		1665	1637	28
Control Rod Worths (pcm)				
Bank	Measured	Predicted	Wm-Wp	Percent Difference
CBB	1281	1342	-61	-4.5%
CBA	346	371	-25	-6.7%
SBC	433	480	-47	-9.8%
SBB	746	811	-65	-8.0%
SBA	956	1040	-84	-8.1%
CBC	1081	1150	-69	-6.0%
CBD	901	948	-47	-5.0%
Sum of the Measured Worths	Sum of the Predicted Worths	0.9*Predicted Worth	1.10* Predicted Worth	
5744	6142	5528	6756	

Table 1.6 Continued

Startup Test Summary

Moderator Temperature Coefficient (pcm/°F)			
Configuration	Measured	Predicted	Difference
CBD-212	-2.2	-3.37	+1.2
Differential Boron Worth (pcm/ppm)			
Configuration	Measured	Predicted	Percent Difference
CBB going in	-7.24	-7.09	-2.1

Table 1.7

Startup Physics Test Procedures Acceptance Criteria

Test	Criteria
Boron Endpoint	The ARO critical boron concentration should be within 500 pcm (71 ppm) of the measured value.
Moderator Temperature Coefficient	The moderator temperature coefficient during power escalation is less than or equal to +5.0 pcm/°F at HZP.
Control Rod Worth	<u>Review Criteria:</u> a. The reference bank must be within ±10% of the predicted worth. b. The absolute value of the percent difference between measured and predicted worths is ⟨15%, or c. The absolute value of the reactivity difference between measured and predicted worths is ⟨100 pcm, whichever is greater. <u>Acceptance Criteria:</u> The sum of the measured worths are within ±10% of the sum of the predicted worths.

Table 1.7
Startup Physics Test Procedures Acceptance Criteria

Test	Criteria
Power Distribution Maps	a. $$F_Q(z) \le \frac{F_Q^{RTP} * K(z)}{P}, \quad P > 0.5$$ $$F_Q(z) \le \frac{F_Q^{RTP} * K(z)}{0.5}, \quad P \le 0.5$$ Where: P is a fraction of HFP F_Q^{RTP} = 2.45 for LOPAR and Vantage 5 fuel F_Q^{RTP} = 2.52 for SPC HTP fuel b. $F_{\Delta H} \le 1.62[1 + 0.30(1-P)]$ *(LOPAR Fuel)* $F_{\Delta H} \le 1.65[1 + 0.35(1-P)]$ *(Vantage 5 Fuel)* $F_{\Delta H} \le 1.73[1 + 0.35(1-P)]$ *(SPC HTP Fuel)* c. Quadrant tilts ≤ 1.02
Control Rod Drop	The drop time to dashpot under hot conditions ≤ 2.7 seconds.

Figure 1.1

Loading Pattern

	R	P	N	M	L	K	J	H	G	F	E	D	C	B	A	
01							F48 40472 6B	F06 41851 6A	F44 44639 6B							01
02					F57 45521 6B	F30 38305 6A	H03 0 5A	G34 21795 7B	H02 0 5A	F10 37123 6A	F45 44911 6B					02
03				F33 44038 6B	H11 0 5B	H27 0 5B	G08 24691 7A	H33 0 5B	G14 24614 7A	H26 0 5B	H10 0 5B	F39 44012 6B				03
04			F35 44188 6B	H18 0 5B	H47 0 5B	G25 26091 7A	G35 22668 7B	G26 24907 7A	G42 22455 7B	G21 26018 7A	H46 0 5B	H17 0 5B	F40 43581 6B			04
05		F51 45715 6B	H12 0 5B	H48 0 5B	A15 15917 1R	G11 25539 7A	H39 0 5B	G23 25206 7A	H38 0 5B	G12 25083 7A	A27 15916 1R	H45 0 5B	H09 0 5B	F53 45423 6B		05
06		F01 38076 6A	H28 0 5B	G22 25861 7A	G06 25137 7A	G38 21637 7B	G58 26009 7B	G51 23961 7B	G57 26068 7B	G41 21664 7B	G03 25460 7A	G19 26074 7A	H25 0 5B	F26 38458 6A		06
07	F43 45143 6B	H04 0 5A	G15 24757 7A	G36 22367 7B	H40 0 5B	G60 25835 7B	A12 16234 1R	H21 0 5B	A24 16217 1R	G55 26118 7B	H37 0 5B	G45 22673 7B	G02 24805 7A	H01 0 5A	F49 40947 6B	07
08	F09 42289 6A	G47 21260 7B	H34 0 5B	G27 24857 7A	G28 25011 7A	G43 23874 7B	H22 0 5B	A39 13475 1R	H24 0 5B	G46 23580 7B	G32 25321 7A	G20 24976 7A	H36 0 5B	G49 21358 7B	F05 41905 6A	08
09	F58 40718 6B	H05 0 5A	G09 24693 7A	G44 22474 7B	H41 0 5B	G54 26134 7B	A06 15685 1R	H23 0 5B	A51 16522 1R	G56 26047 7B	H44 0 5B	G39 22490 7B	G10 24645 7A	H08 .0 5A	F42 44395 6B	09
10		F23 38395 6A	H29 0 5B	G29 26262 7A	G13 25629 7A	G52 21562 7B	G53 26042 7B	G40 23804 7B	G59 25912 7B	G48 21556 7B	G01 24915 7A	G17 25854 7A	H32 0 5B	F12 37397 6A		10
11		F46 45462 6B	H13 0 5B	H49 0 5B	A35 16651 1R	G16 25438 7A	H42 0 5B	G24 25121 7A	H43 0 5B	G04 25310 7A	A21 16240 1R	H52 0 5B	H16 0 5B	F52 45315 6B		11
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13				F38 43926 6B	H14 0 5B	H30 0 5B	G05 24401 7A	H35 0 5B	G07 24644 7A	H31 0 5B	H15 0 5B	F37 43870 6B	ASSEMBLY ID BOC EXPOSURE FUEL REGION			13
14					F50 45141 6B	F08 37537 6A	H06 0 5A	G33 21438 7B	H07 0 5A	F15 38322 6A	F47 45650 6B					14
15							F41 44746 6B	F07 42435 6A	F55 41084 6B							15
	R	P	N	M	L	K	J	H	G	F	E	D	C	B	A	

Figure 1.2

Control Rod and Flux Thimble Locations

	R	P	N	M	L	K	J	H	G	F	E	D	C	B	A	
01								18								01
02						A		D		A 31						02
03				1			SA 9		SA		SC	10				03
04				C	13	B		37		B 3		C				04
05			SC 22		SB		24				SB 49	39		7		05
06		A		B	40	D		C 8		D 15		B		A		06
07			SA 33				SB 28		SB 20			29	SA	17		07
08	36	D	46		4	C				C 5			44	D 25		08
09			SA		11		SB		SB 19	32			SA		34	09
10		A	26	B		D	23	C		D		B 41		A 12		10
11					SB 48			38		21	SB 47		SC			11
12			35	C		B	16			B		C 6	27			12
13					SC		SA	43	SA	14						13
14					30	A		D	42	A						14
15							2									15
	R	P	N	M	L	K	J	H	G	F	E	D	C	B	A	

ROD BANK
FLUX THIMBLES

Figure 1.3

Gadolinia Loading

(ASM and AS represent Asymmetric gadolinia loadings)

	R	P	N	M	L	K	J	H	G	F	E	D	C	B	A
01							F48	F06	F44						
02					F57	F30	H03 4@2 ASM	G34	H02 4@2 ASM	F10	F45				
03				F33	H11 1@2AS 4@6AS	H27 20@6	G08	H33 28@6	G14	H26 20@6	H10 1@2AS 4@6AS	F39			
04			F35	H18 6@6 ASM	H47 20@8	G25	G35	G26	G42	G21	H46 20@8	H17 6@6 ASM	F40		
05		F51	H12 1@2AS 4@6AS	H48 20@8	A15	G11	H39 28@6	G23	H38 28@6	G12	A27	H45 20@8	H09 1@2AS 4@6AS	F53	
06		F01	H28 20@6	G22	G06	G38	G58	G51	G57	G41	G03	G19	H25 20@6	F26	
07	F43	H04 4@2 ASM	G15	G36	H40 28@6	G60	A12	H21 20@6	A24	G55	H37 28@6	G45	G02	H01 4@2 ASM	F49
08	F09	G47	H34 28@6	G27	G28	G43	H22 20@6	A39	H24 20@6	G46	G32	G20	H36 28@6	G49	F05
09	F58	H05 4@2 ASM	G09	G44	H41 28@6	G54	A06	H23 20@6	A51	G56	H44 28@6	G39	G10	H08 4@2* ASM	F42
10		F23	H29 20@6	G29	G13	G52	G53	G40	G59	G48	G01	G17	H32 20@6	F12	
11		F46	H13 1@2AS 4@6AS	H49 20@8	A35	G16	H42 28@6	G24	H43 28@6	G04	A21	H52 20@8	H16 1@2AS 4@6AS	F52	
12			F36	H19 6@6 ASM	H50 20@8	G30	G37	G31	G50	G18	H51 20@8	H20 6@6 ASM	F34		
13				F38	H14 1@2AS 4@6AS	H30 20@6	G05	H35 28@6	G07	H31 20@6	H15 1@2AS 4@6AS	F37			
14					F50	F08	H06 4@2AS	G33	H07 4@2AS	F15	F47				
15							F41	F07	F55						

ASSEMBLY ID
*GAD PINS
*GAD PINS

Table 2.1
Hot Rod Drop Times

RCCA Bank and Group	RCCA Grid Location	Time from Initiation of Drop to Dashpot Entry (Seconds)	Time from Initiation of Drop to Bottom of Dashpot (Seconds)	RCS Tavg (°F)	RCS Flow (%)	RCS Press (psig)
CBA	F2	1.485	1.937	557	100	2292
	B10	1.534	2.043	557	100	2292
	K14	1.613	2.105	557	100	2292
	P6	1.484	1.934	557	100	2292
CBA	K2	1.485	1.934	557	100	2292
	B6	1.713	2.178	557	100	2292
	F14	1.479	1.888	557	100	2292
	P10	1.471	1.904	557	100	2292
CBB	F4	1.512	1.928	556.8	101	2221
	D10	1.488	1.915	556.8	101	2221
	K12	1.439	1.896	556.8	101	2221
	M6	1.457	1.897	556.8	101	2221
CBB	K4	1.482	1.971	556.8	101	2221
	D6	1.469	1.906	556.8	101	2221
	F12	1.476	1.900	556.8	101	2221
	M10	1.504	1.944	556.8	101	2221

Table 2.1 (Continued)
Hot Rod Drop Times

RCCA Bank and Group	RCCA Grid Location	Time from Initiation of Drop to Dashpot Entry (Seconds)	Time from Initiation of Drop to Bottom of Dashpot (Seconds)	RCS Tavg (°F)	RCS Flow (%)	RCS Press (psig)
CBC	*D4*	*1.438*	*1.865*	*557*	*100*	*2292*
	D12	*1.431*	*1.864*	*557*	*100*	*2292*
	M12	*1.445*	*1.880*	*557*	*100*	*2292*
	M4	*1.492*	*1.908*	*557*	*100*	*2292*
CBC	H6	1.473	1.925	557	100	2292
	F8	1.424	1.878	557	100	2292
	H10	1.450	1.954	557	100	2292
	K8	1.472	1.965	557	100	2292
CBD	H2	1.482	1.947	556.8	101	2221
	B8	1.574	2.094	556.8	101	2221
	H14	1.484	1.970	556.8	101	2221
	P8	1.448	1.927	556.8	101	2221
CBD	F6	1.484	1.958	556.8	101	2221
	F10	1.501	1.970	556.8	101	2221
	K10	1.484	1.927	556.8	101	2221
	K6	1.498	1.958	556.8	101	2221

Table 2.1 (Continued)
Hot Rod Drop Times

RCCA Bank and Group	RCCA Grid Location	Time from Initiation of Drop to Dashpot Entry (Seconds)	Time from Initiation of Drop to Bottom of Dashpot (Seconds)	RCS Tavg (°F)	RCS Flow (%)	RCS Press (psig)
SBA	G3	1.482	1.903	556.7	101	2291
	C9	1.468	1.883	556.7	101	2291
	J13	1.455	1.889	556.7	101	2291
	N7	1.461	1.901	556.7	101	2291
SBA	J3	1.473	1.904	556.7	101	2291
	C7	1.484	1.901	556.7	101	2291
	G13	1.478	1.900	556.7	101	2291
	N9	1.464	1.895	556.7	101	2291
SBB	E5	1.481	1.926	556.8	101	2291
	E11	1.465	1.895	556.8	101	2291
	L11	1.473	1.958	556.8	101	2291
	L5	1.458	1.886	556.8	101	2291
SBB	G7	1.485	1.964	556.8	101	2291
	G9	1.481	1.920	556.8	101	2291
	J9	1.471	1.917	556.8	101	2291
	J7	1.464	1.914	556.8	101	2291

Table 2.1 (Continued)

Hot Rod Drop Times

RCCA Bank and Group	RCCA Grid Location	Time from Initiation of Drop to Dashpot Entry (Seconds)	Time from Initiation of Drop to Bottom of Dashpot (Seconds)	RCS Tavg (°F)	RCS Flow (%)	RCS Press (psig)
SBC	*E3*	*1.429*	*1.865*	*556.9*	*100*	*2291*
	C11	*1.496*	*1.940*	*556.9*	*100*	*2291*
	L13	*1.537*	*1.990*	*556.9*	*100*	*2291*
	N5	*1.475*	*1.922*	*556.9*	*100*	*2291*

Table 3.1

Rod Worth Measurement: Control Bank B

RCCA Position (Steps Withdrawn)					
RCC Position (Steps Withdrawn)			Reactivity (pcm)		
Initial	Final	Average	$\Delta\rho$	$\Sigma\Delta\rho$	$\Delta\rho/\Delta h$
231	217	223.5	19	19	1.3
217	209	213	69	88	8.6
209	206	207.5	31	119	10.3
206	202	204	47	166	11.8
202	199	200.5	32	198	10.7
199	196	197.5	33	231	11.0
196	193	194.5	33	264	11.0
193	189	191	42	306	10.5
189	185	187	40	346	10.0
185	180	182.5	47	393	9.4
180	175	177.5	44	437	8.8
175	170	172.5	42	479	8.4
170	165	167.5	42	521	8.4
165	160	162.5	40	561	8.0
160	155	157.5	37	598	7.4
155	149	152	43	641	7.2
149	143	146	41	682	6.8
143	137	140	42	724	7.0
137	131	134	38	762	6.3

Table 3.1
Rod Worth Measurement: Control Bank B

RCCA Position (Steps Withdrawn)					
RCC Position (Steps Withdrawn)			Reactivity (pcm)		
Initial	Final	Average	$\Delta\rho$	$\Sigma\Delta\rho$	$\Delta\rho/\Delta h$
131	125	128	37	799	6.2
125	119	122	38	837	6.3
119	113	116	37	874	6.2
113	107	110	40	914	6.7
107	101	104	39	953	6.5
101	95	98	40	993	6.7
95	89	92	42	1035	7.0
89	83	86	39	1074	6.5
83	77	80	38	1112	6.3
77	71	74	34	1146	5.7
71	62	66.5	48	1194	5.3
62	52	57	38	1232	3.8
52	45	48.5	17	1249	2.4
45	0	22.5	32	1281	0.7

Measured Integral Worth = 1281 pcm

Predicted Integral Worth = 1342 pcm

Percent Difference = -4.5%

Figure 3.1

Integral Worth of the Reference Bank

(Control Bank B) BOL, HZP, No Xenon

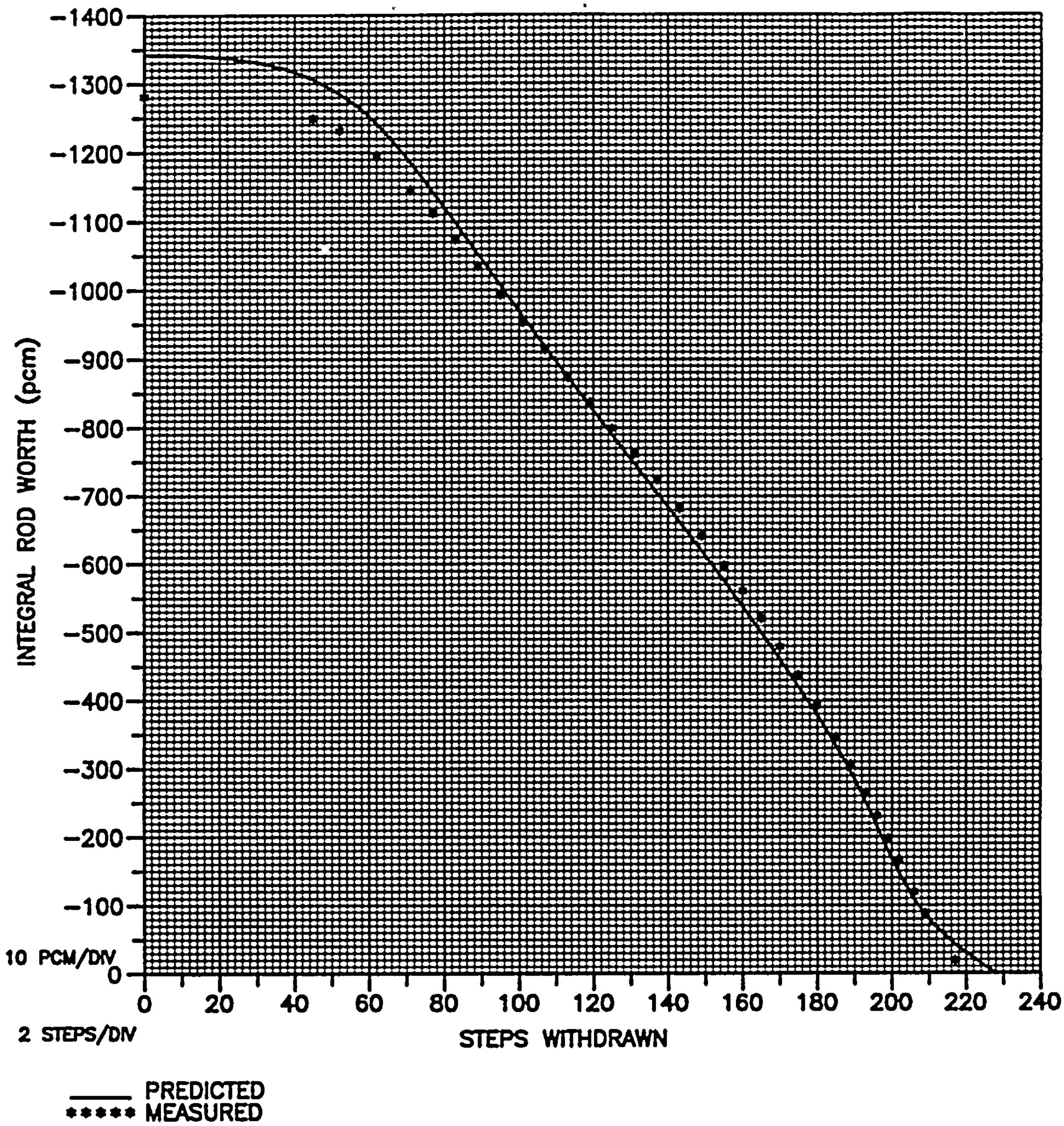


Figure 3.2

Differential Worth of the Reference Bank

(Control Bank B) BOL, HZP, No Xenon

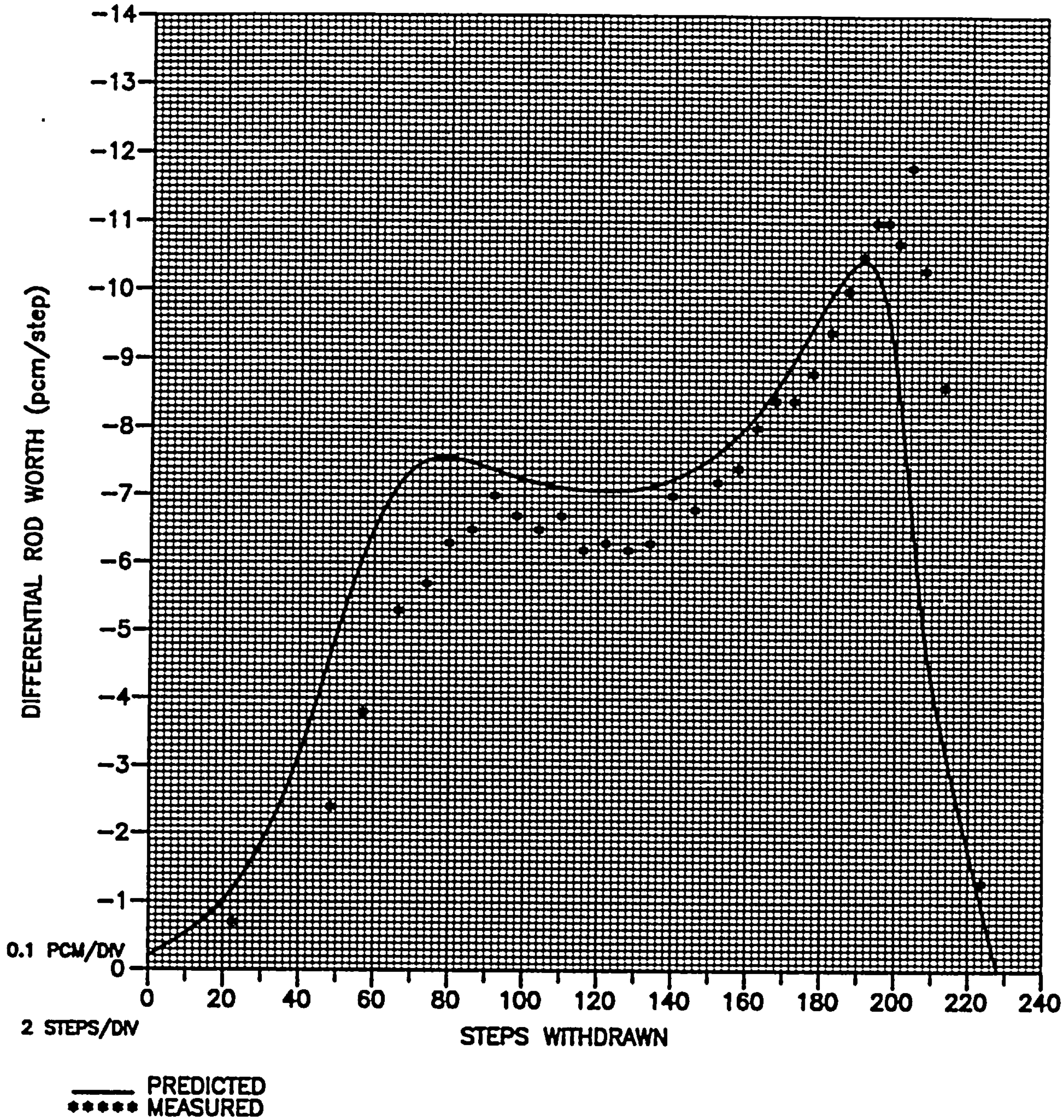


Table 5.1
Isothermal Temperature Coefficient

Configuration	Measured ITC (pcm/°F)			Predicted (pcm/°F)	Difference (pcm/°F)
	Cooldown	Heatup	Average		
CBD-212	-3.7	-3.9	-3.8	-4.97	+1.2
		-3.7			

Table 5.2
Isothermal Temperature Coefficient

Temperature Coefficients, HZP, BOL						
Cycle	Configuration	Boron (ppm)	Measured ITC (pcm/°F)	Predicted ITC (pcm/°F)	Difference (pcm/°F)	Doppler (pcm/°F)
1	ARO	1353	-1.50	-2.28	0.78	-1.9
2	D-216/217	1764	-0.82	-0.06	-0.76	-1.6
3	D-206	1839	-0.528	-0.79	0.262	-1.6
4	D-214	1718	-1.615	-1.39	-0.225	-1.69
5	D-206	1940	+1.17	+1.43	-0.260	-1.86
6	D-212	1835	-3.8	-4.97	+1.2	-1.6

Figure 5.1

ITC, D-212, Cooldown Measured Value

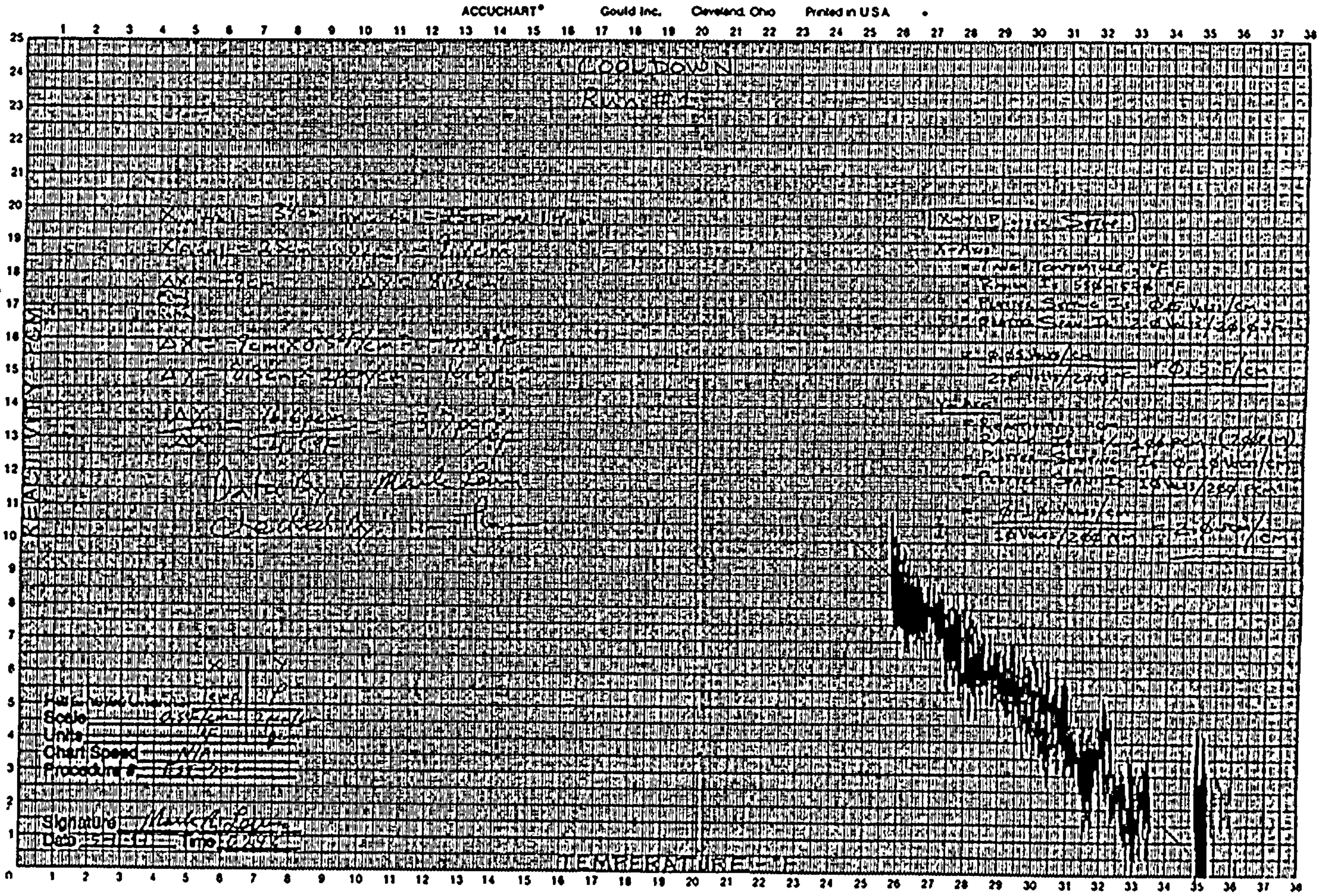


Figure 5.2

ITC, D-212, Heatup #1 Measured Value

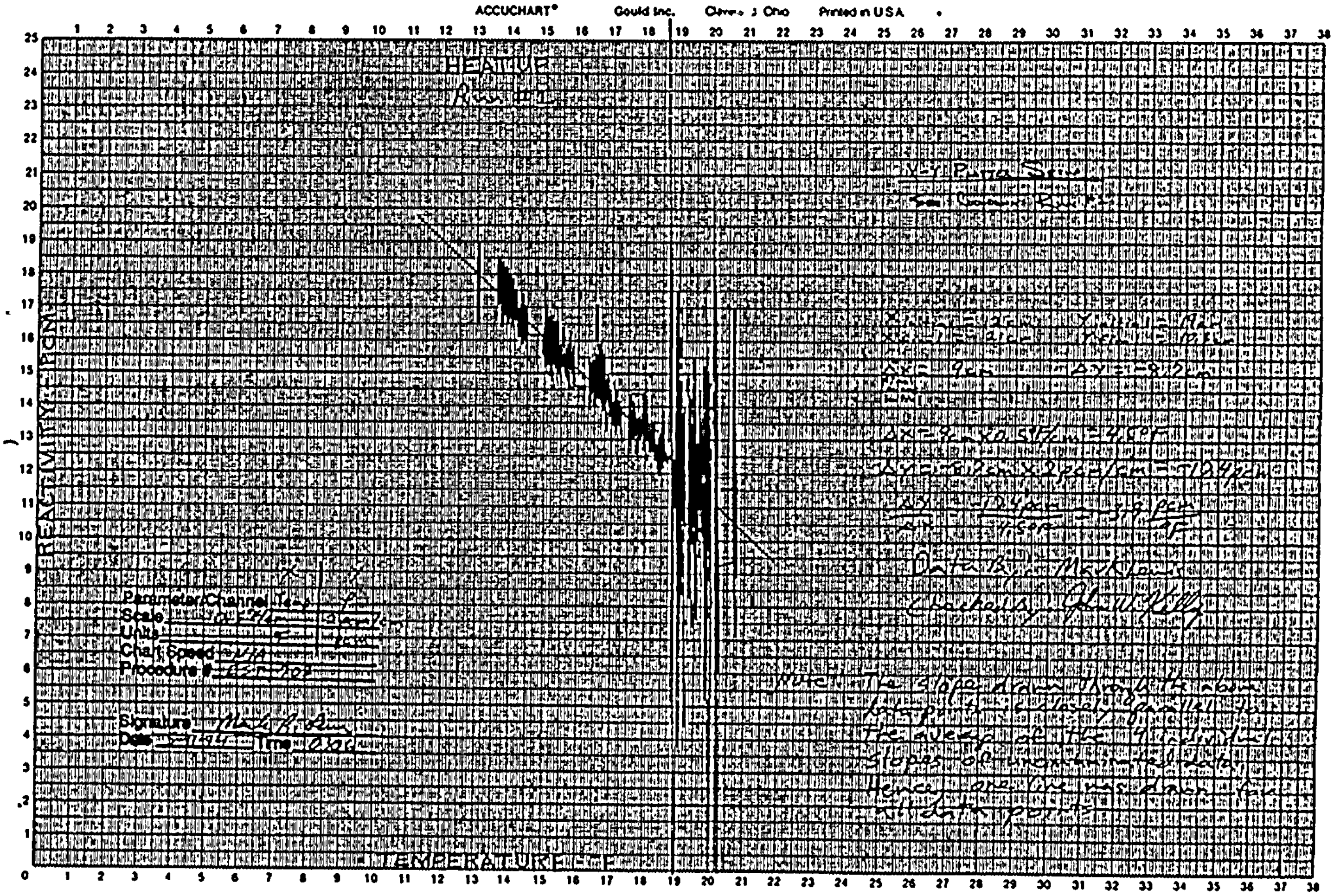


Figure 5.3

ITC, D-212, Heatup #2 Measured Value

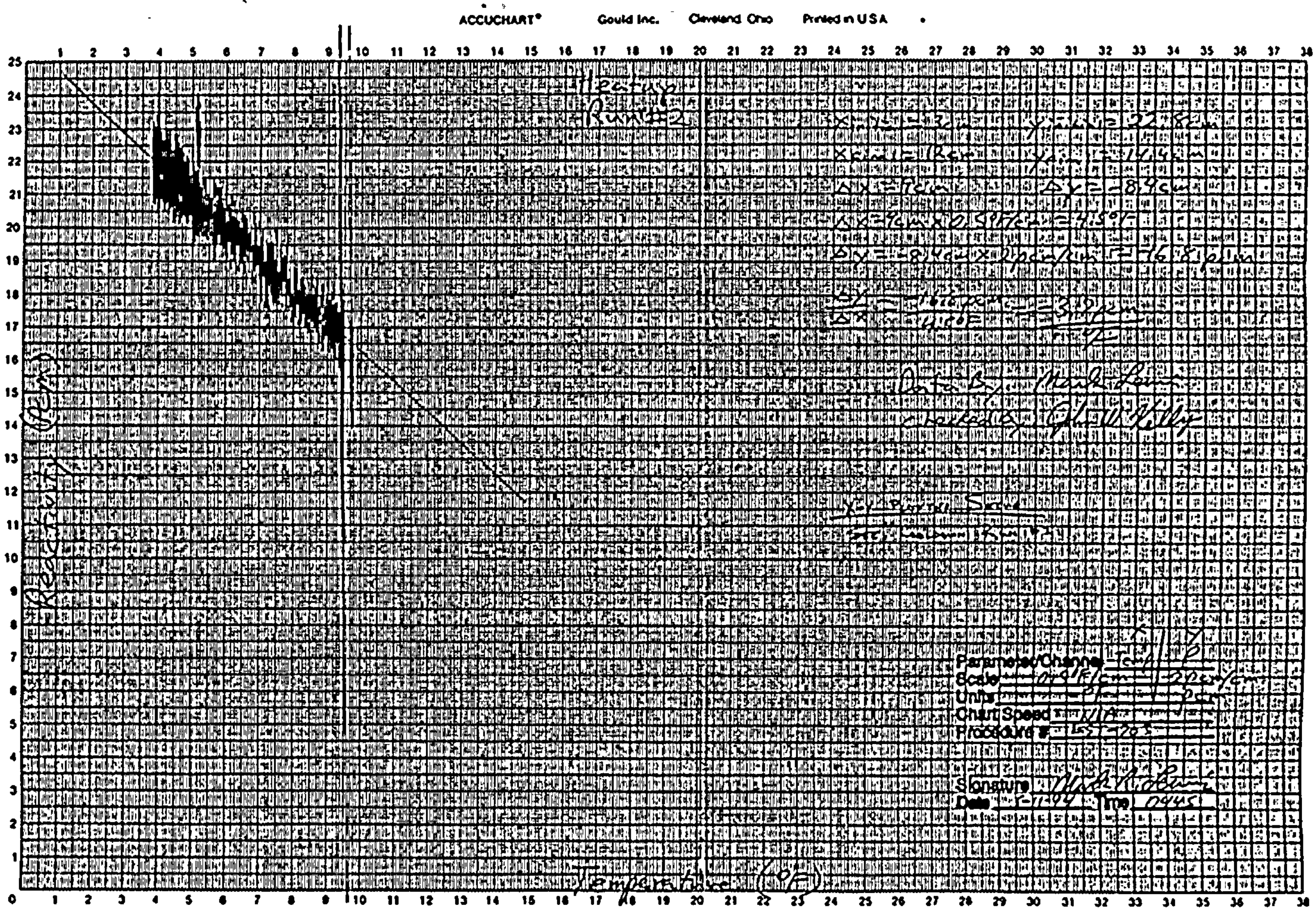


Table 6.1

Flux Map Summary

Map	MWd/ MTU	Date	PWR %	D Bank	Core AO	Core Avg FZ	$F_{\Delta H}$	Loc $F_{\Delta H}$
211	20	5/13/94	28	181	8.73	1.269	1.857	D12
212	61	5/16/94	73	190	4.66	1.217	1.796	M12
214	161	5/18/94	94	219	5.35	1.175	1.740	M12
215	344	5/24/94	100	219	3.87	1.154	1.651	D12

Table 6.1 (Continued)

Flux Map Summary

Map	MWd/ MTU	Max. KW/FT	Lim $F_Q/K(z)$	F_Q	Loc F_Q	F_R	PDC3 APL	F_Z	LOC F_Z
211	20	3.65	2.444	2.372	D12	1.510	89.68	1.416	F6
212	61	8.94	2.281	2.201	M12	1.472	96.08	1.345	F10
214	161	11.03	2.176	2.101	M12	1.433	100.69	1.293	G11
215	344	11.52	2.129	2.004	H7	1.359	102.93	1.227	J7

F_Q includes a 1.03 engineering factor and a 1.05 measurement uncertainty

$F_{\Delta H}$ includes a 1.04 measurement uncertainty

KW/FT includes a 1.03 engineering uncertainty and a 1.05 measurement uncertainty

Table 6.1 (Continued)
Flux Map Summary

	Quadrant Tilt				Power Fraction, Fuel Region			
Map	NW	NE	SW	SE	1	2	3	4
211	0.994	1.000	0.998	1.008	0.805	0.413	1.109	1.314
212	0.993	1.001	1.002	1.004	0.829	0.407	1.122	1.299
214	0.991	1.004	1.002	1.003	0.840	0.402	1.136	1.285
215	0.990	1.002	1.005	1.003	0.847	0.400	1.138	1.282

Table 6.2
Flux Map Statistics

		Standard Deviation, Fuel Region				No. of Useable Thimble Traces	Central Region Reaction Rate Percent Differences
Map	PWR %	1	2	3	4		
211	28	6.334	5.406	3.836	4.457	61	5.60
212	73	1.886	4.314	1.691	1.983	58	3.02
214	94	1.135	4.044	1.330	1.698	74	2.38
215	100	1.629	4.000	1.325	1.827	58	2.45

Figure 6.1

Assembly Relative Power Map 211

Predicted
Measured
% Difference

						0.269	0.294	0.259						
						0.275	0.302	0.267						
						2.43	2.85	2.95						
				0.334	0.535	1.119	0.869	1.118	0.536	0.334				
				0.364	0.538	1.133	0.888	1.143	0.553	0.346				
				9.20	0.48	1.25	2.08	2.21	3.07	3.43				
			0.497	1.312	1.305	1.117	1.243	1.117	1.306	1.313	0.497			
			0.531	1.396	1.331	1.100	1.221	1.116	1.336	1.348	0.516			
			6.82	6.38	2.04	-1.50	-1.76	-0.06	2.28	2.66	3.82			
		0.497	1.420	1.439	1.161	1.259	1.158	1.261	1.162	1.440	1.420	0.497		
		0.535	1.482	1.494	1.160	1.229	1.129	1.245	1.174	1.478	1.462	0.519		
		7.52	4.31	3.83	-0.07	-2.39	-2.54	-1.20	0.99	2.57	2.94	4.52		
	0.334	1.313	1.440	0.862	1.078	1.289	1.143	1.290	1.080	0.862	1.439	1.312	0.334	
	0.355	1.390	1.459	0.860	1.068	1.207	1.070	1.234	1.091	0.882	1.481	1.374	0.346	
	6.28	5.81	1.25	-0.18	-0.97	-6.36	-6.42	-4.36	1.05	2.33	2.88	4.72	3.83	
	0.536	1.306	1.162	1.080	1.099	1.127	1.178	1.128	1.099	1.078	1.161	1.305	0.535	
	0.552	1.341	1.166	1.056	1.054	1.048	1.093	1.036	1.054	1.093	1.174	1.350	0.565	
	2.99	2.63	0.30	-2.18	-4.17	-7.02	-7.27	-8.16	-4.16	1.34	1.14	3.44	5.62	
0.259	1.118	1.117	1.261	1.290	1.128	0.811	1.280	0.811	1.127	1.289	1.259	1.117	1.119	0.269
0.260	1.123	1.121	1.239	1.239	1.067	0.742	1.176	0.746	1.037	1.254	1.256	1.144	1.178	0.290
0.03	0.43	0.37	-1.70	-3.95	-5.40	-8.45	-8.12	-7.98	-7.94	-2.71	-0.27	2.44	5.25	7.70
0 294	0.869	1.243	1.158	1.143	1.178	1.280	0.838	1.280	1.178	1.143	1.158	1.243	0.869	0.294
0.298	0.879	1.247	1.141	1.103	1.119	1.172	0.770	1.184	1.089	1.095	1.158	1.271	0.918	0.312
1.51	1.15	0.36	-1.49	-3.46	-5.02	-8.41	-8.19	-7.51	-7.59	-4.20	0.01	2.28	5.62	6.44
0.269	1.119	1.117	1.259	1.289	1.127	0.811	1.280	0.811	1.128	1.290	1.261	1.117	1.118	0.259
0.273	1.160	1.157	1.260	1.244	1.076	0.752	1.177	0.750	1.044	1.253	1.279	1.150	1.168	0.274
1.43	3.62	3.63	0.07	-3.44	-4.51	-7.29	-8.04	-7.54	-7.40	-2.86	1.49	2.98	4.45	5.51
	0.535	1.305	1.161	1.078	1.099	1.128	1.178	1.127	1.099	1.080	1.162	1.306	0.536	
	0.567	1.378	1.179	1.072	1.070	1.054	1.092	1.054	1.050	1.059	1.174	1.343	0.564	
	5.94	5.58	1.56	-0.60	-2.70	-6.50	-7.29	-6.41	-4.48	-1.93	1.03	2.82	5.23	
	0.334	1.312	1.439	0.862	1.080	1.290	1.143	1.289	1.078	0.862	1.440	1.313	0.334	
	0.357	1.399	1.507	0.872	1.052	1.224	1.085	1.218	1.061	0.875	1.508	1.387	0.357	
	6.98	6.64	4.70	1.16	-2.54	-5.12	-5.07	-5.48	-1.66	1.46	4.66	5.61	6.99	
		0.497	1.420	1.440	1.162	1.261	1.158	1.259	1.161	1.439	1.420	0.497		
		0.537	1.483	1.455	1.156	1.244	1.144	1.258	1.171	1.478	1.510	0.540		
		8.05	4.39	0.98	-0.58	-1.28	-1.21	-0.11	0.87	2.70	6.32	8.54		
			0.497	1.313	1.306	1.117	1.243	1.117	1.305	1.312	0.497			
			0.537	1.324	1.276	1.130	1.270	1.171	1.365	1.403	0.539			
			8.05	0.84	-2.31	1.16	2.17	4.85	4.65	6.91	8.56			
				0.334	0.536	1.118	0.869	1.119	0.535	0.334				
				0.327	0.525	1.131	0.895	1.173	0.562	0.352				
				-2.27	-2.12	1.11	2.93	4.83	4.97	5.52				
						0.259	0.294	0.269						
						0.255	0.298	0.281						
						-1.77	1.38	4.46						

Figure 6.2

Assembly Relative Power Map 212

Predicted
Measured
% Difference

						0.271	0.298	0.262						
						0.288	0.317	0.274						
						6.42	6.51	4.85						
				0.331	0.534	1.126	0.888	1.125	0.535	0.332				
				0.347	0.528	1.145	0.909	1.159	0.550	0.343				
				4.58	-1.15	1.69	2.36	3.05	2.79	3.38				
			0.492	1.303	1.300	1.116	1.248	1.116	1.302	1.305	0.493			
			0.502	1.322	1.283	1.097	1.225	1.106	1.300	1.319	0.513			
			1.91	1.45	-1.34	-1.69	-1.82	-0.91	-0.14	1.12	3.99			
		0.493	1.410	1.432	1.156	1.256	1.156	1.257	1.157	1.433	1.410	0.492		
		0.501	1.416	1.444	1.142	1.229	1.130	1.229	1.147	1.440	1.432	0.504		
		1.66	0.44	0.86	-1.26	-2.18	-2.23	-2.26	-0.86	0.49	1.57	2.28		
	0.332	1.305	1.433	0.860	1.081	1.291	1.142	1.292	1.082	0.860	1.432	1.303	0.331	
	0.329	1.291	1.417	0.852	1.067	1.241	1.099	1.246	1.078	0.858	1.440	1.320	0.340	
	-0.77	-1.02	-1.13	-0.97	-1.24	-3.85	-3.78	-3.56	-0.40	-0.27	0.57	1.31	2.68	
	0.535	1.302	1.157	1.082	1.121	1.132	1.179	1.133	1.121	1.081	1.156	1.300	0.534	
	0.531	1.289	1.148	1.073	1.109	1.104	1.156	1.110	1.127	1.083	1.154	1.312	0.551	
	-0.66	-0.97	-0.83	-0.79	-1.10	-2.50	-2.02	-2.06	0.48	0.21	-0.17	0.89	3.25	
0.262	1.125	1.116	1.257	1.292	1.133	0.813	1.282	0.813	1.132	1.291	1.256	1.116	1.126	0.271
0.281	1.145	1.107	1.237	1.261	1.115	0.796	1.263	0.799	1.129	1.260	1.242	1.131	1.157	0.282
7.41	1.79	-0.83	-1.57	-2.40	-1.61	-2.07	-1.44	-1.73	-0.31	-2.37	-1.10	1.36	2.73	4.21
0.298	0.888	1.248	1.156	1.142	1.179	1.282	0.839	1.282	1.179	1.142	1.156	1.248	0.888	0.298
0.320	0.911	1.236	1.138	1.117	1.161	1.276	0.836	1.266	1.163	1.116	1.144	1.262	0.927	0.314
7.53	2.54	-0.95	-1.51	-2.17	-1.59	-0.50	-0.40	-1.21	-1.36	-2.31	-0.98	1.10	4.41	5.42
0.271	1.126	1.116	1.256	1.291	1.132	0.813	1.282	0.813	1.133	1.292	1.257	1.116	1.125	0.262
0.291	1.157	1.122	1.245	1.262	1.105	0.784	1.253	0.798	1.111	1.268	1.252	1.141	1.172	0.277
7.42	2.80	0.56	-0.84	-2.26	-2.40	-3.57	-2.26	-1.83	-1.99	-1.83	-0.38	2.17	4.25	5.95
	0.534	1.300	1.156	1.081	1.121	1.133	1.179	1.132	1.121	1.082	1.157	1.302	0.535	
	0.544	1.319	1.164	1.083	1.113	1.104	1.154	1.112	1.116	1.079	1.167	1.328	0.568	
	1.86	1.48	0.67	0.25	-0.72	-2.60	-2.17	-1.74	-0.42	-0.32	0.83	2.05	6.23	
	0.331	1.303	1.432	0.860	1.082	1.292	1.142	1.291	1.081	0.860	1.433	1.305	0.332	
	0.343	1.347	1.472	0.877	1.071	1.258	1.114	1.267	1.089	0.862	1.454	1.332	0.340	
	3.65	3.39	2.84	1.98	-1.01	-2.65	-2.43	-1.87	0.73	0.25	1.45	2.11	5.06	
		0.492	1.410	1.433	1.157	1.257	1.156	1.256	1.156	1.432	1.410	0.493		
		0.520	1.460	1.458	1.155	1.233	1.134	1.241	1.161	1.433	1.441	0.506		
		5.54	3.55	1.77	-0.22	-1.94	-1.91	-1.20	0.46	0.09	2.22	2.57		
			0.493	1.305	1.302	1.116	1.248	1.116	1.300	1.303	0.492			
			0.520	1.326	1.268	1.096	1.239	1.120	1.307	1.301	0.504			
			5.54	1.67	-2.57	-1.85	-0.74	0.35	0.55	-0.20	2.34			
				0.332	0.535	1.125	0.888	1.126	0.534	0.331				
				0.342	0.552	1.136	0.907	1.132	0.540	0.331				
				3.15	3.28	1.01	2.05	0.52	1.17	-0.08				
						0.262	0.298	0.271						
						0.271	0.307	0.278						
						3.61	3.27	2.58						

Figure 6.3

Assembly Relative Power Map 214

Predicted
Measured
% Difference

						0.279	0.313	0.269						
						0.296	0.332	0.282						
						5.98	5.96	4.61						
				0.323	0.529	1.146	0.953	1.144	0.530	0.324				
				0.335	0.523	1.157	0.966	1.172	0.547	0.335				
				3.45	-1.17	0.96	1.31	2.40	3.05	3.51				
			0.477	1.270	1.282	1.115	1.263	1.115	1.283	1.272	0.478			
			0.480	1.268	1.250	1.094	1.236	1.105	1.286	1.289	0.497			
			0.48	-0.21	-2.45	-1.83	-2.17	-0.87	0.21	1.35	3.96			
		0.478	1.370	1.402	1.140	1.246	1.149	1.247	1.141	1.403	1.370	0.477		
		0.479	1.364	1.405	1.125	1.219	1.124	1.220	1.147	1.410	1.390	0.485		
		0.25	-0.43	0.21	-1.27	-2.14	-2.20	-2.12	0.51	0.49	1.43	1.55		
	0.324	1.272	1.403	0.854	1.090	1.298	1.140	1.299	1.092	0.854	1.402	1.270	0.323	
	0.315	1.233	1.379	0.844	1.076	1.259	1.108	1.265	1.101	0.850	1.405	1.271	0.333	
	-2.63	-3.03	-1.69	-1.22	-1.31	-3.03	-2.78	-2.63	0.87	-0.44	0.20	0.05	2.86	
	0.530	1.283	1.141	1.092	1.198	1.153	1.185	1.154	1.198	1.090	1.140	1.282	0.529	
	0.518	1.248	1.129	1.093	1.196	1.140	1.180	1.154	1.231	1.094	1.141	1.281	0.541	
	-2.27	-2.69	-1.03	0.10	-0.22	-1.11	-0.41	-0.04	2.70	0.31	0.10	-0.03	2.16	
0.269	1.144	1.115	1.247	1.299	1.154	0.823	1.289	0.823	1.153	1.298	1.246	1.115	1.146	0.279
0.289	1.153	1.093	1.224	1.274	1.148	0.820	1.295	0.823	1.175	1.282	1.230	1.119	1.154	0.285
7.11	0.73	-1.94	-1.80	-1.95	-0.55	-0.38	0.40	-0.08	1.92	-1.24	-1.25	0.38	0.72	2.21
0.313	0.953	1.263	1.149	1.140	1.185	1.289	0.843	1.289	1.185	1.140	1.149	1.263	0.953	0.313
0.335	0.964	1.234	1.128	1.121	1.178	1.308	0.857	1.301	1.196	1.126	1.134	1.264	0.976	0.325
7.10	1.16	-2.30	-1.81	-1.70	-0.57	1.44	1.69	0.90	0.90	-1.18	-1.31	0.01	2.41	3.90
0.279	1.146	1.115	1.246	1.298	1.153	0.823	1.289	0.823	1.154	1.299	1.247	1.115	1.144	0.269
0.299	1.160	1.100	1.227	1.272	1.138	0.815	1.299	0.826	1.157	1.281	1.230	1.131	1.183	0.284
7.11	1.23	-1.30	-1.46	-1.98	-1.33	-1.02	0.73	0.29	0.27	-1.43	-1.32	1.46	3.36	5.47
	0.529	1.282	1.140	1.090	1.198	1.154	1.185	1.153	1.198	1.092	1.141	1.283	0.530	
	0.526	1.267	1.140	1.096	1.200	1.140	1.183	1.150	1.209	1.094	1.149	1.309	0.564	
	-0.70	-1.16	0.05	0.52	0.17	-1.25	-0.17	-0.26	0.93	0.19	0.74	2.05	6.42	
	0.323	1.270	1.402	0.854	1.092	1.299	1.140	1.298	1.090	0.854	1.403	1.272	0.324	
	0.330	1.290	1.425	0.872	1.094	1.277	1.123	1.280	1.106	0.851	1.416	1.295	0.342	
	1.96	1.57	1.69	2.09	0.22	-1.70	-1.46	-1.40	1.42	-0.34	0.94	1.85	5.70	
		0.477	1.370	1.403	1.141	1.247	1.149	1.246	1.140	1.402	1.370	0.478		
		0.499	1.414	1.433	1.146	1.223	1.127	1.229	1.146	1.396	1.393	0.488		
		4.62	3.20	2.12	0.43	-1.90	-1.97	-1.30	0.57	-0.43	1.65	2.15		
			0.478	1.272	1.283	1.115	1.263	1.115	1.282	1.270	0.477			
			0.500	1.299	1.258	1.093	1.241	1.103	1.268	1.249	0.486			
			4.62	2.14	-1.98	-1.94	-1.75	-1.08	-1.05	-1.71	1.77			
				0.324	0.530	1.144	0.953	1.146	0.529	0.323				
				0.339	0.555	1.155	0.960	1.131	0.526	0.320				
				4.62	4.60	0.99	0.75	-1.26	-0.57	-1.17				
						0.269	0.313	0.279						
						0.282	0.321	0.279						
						4.62	2.41	0.07						

Figure 6.4

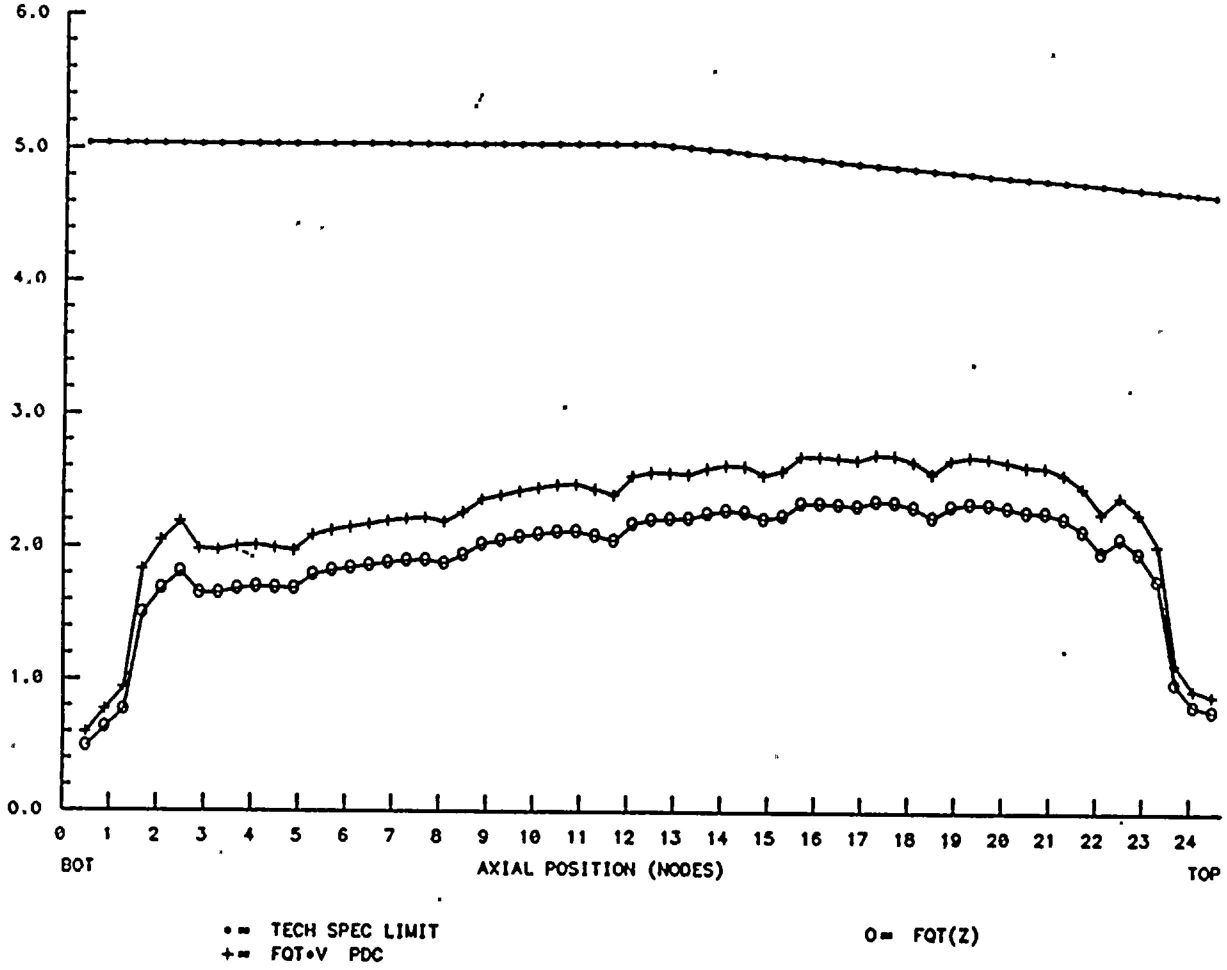
Assembly Relative Power Map 215

Predicted
Measured
% Difference

						0.280 0.298 6.44	0.315 0.335 6.42	0.271 0.284 5.04						
				0.324 0.333 2.82	0.529 0.525 -0.75	1.144 1.152 0.70	0.954 0.964 1.05	1.143 1.168 2.16	0.531 0.549 3.41	0.324 0.336 3.65				
			0.476 0.476 -0.04	1.265 1.255 -0.74	1.279 1.248 -2.44	1.114 1.092 -1.97	1.266 1.235 -2.44	1.114 1.104 -0.91	1.281 1.288 0.57	1.266 1.285 1.56	0.477 0.495 3.86			
		0.477 0.474 -0.60	1.363 1.348 -1.11	1.398 1.393 -0.38	1.139 1.123 -1.39	1.245 1.217 -2.23	1.150 1.123 -2.30	1.246 1.218 -2.25	1.140 1.147 0.67	1.399 1.402 0.22	1.363 1.375 0.92	0.476 0.482 1.18		
	0.324 0.312 -3.65	1.266 1.214 -4.09	1.399 1.365 -2.44	0.857 0.841 -1.80	1.092 1.074 -1.67	1.301 1.266 -2.71	1.141 1.114 -2.40	1.302 1.274 -2.14	1.093 1.104 1.00	0.857 0.850 -0.78	1.398 1.390 -0.56	1.265 1.259 -0.45	0.324 0.333 3.03	
	0.531 0.517 -2.61	1.281 1.242 -3.03	1.140 1.123 -1.49	1.093 1.088 -0.48	1.200 1.199 -0.09	1.156 1.151 -0.39	1.187 1.187 0.04	1.157 1.157 0.06	1.200 1.231 2.54	1.092 1.091 -0.11	1.139 1.135 -0.34	1.279 1.271 -0.65	0.529 0.538 1.57	
0.271 0.292 7.93	1.143 1.156 1.09	1.114 1.094 -1.82	1.246 1.222 -1.92	1.302 1.270 -2.42	1.157 1.154 -0.20	0.828 0.835 0.77	1.293 1.305 0.89	0.828 0.826 -0.28	1.156 1.174 1.57	1.301 1.284 -1.33	1.245 1.231 -1.14	1.114 1.117 0.30	1.144 1.150 0.54	0.280 0.285 1.91
0.315 0.340 7.90	0.954 0.968 1.48	1.266 1.238 -2.20	1.150 1.131 -1.66	1.141 1.124 -1.50	1.187 1.188 0.11	1.293 1.334 3.18	0.847 0.868 2.45	1.293 1.312 1.44	1.187 1.205 1.56	1.141 1.133 -0.71	1.150 1.136 -1.20	1.266 1.265 -0.01	0.954 0.949 -0.59	0.315 0.313 -0.64
0.280 0.302 7.92	1.144 1.158 1.20	1.114 1.094 -1.79	1.245 1.225 -1.59	1.301 1.278 -1.78	1.156 1.144 -0.98	0.828 0.825 -0.40	1.293 1.316 1.74	0.828 0.840 1.43	1.157 1.173 1.41	1.302 1.289 -1.02	1.246 1.231 -1.27	1.114 1.133 1.69	1.143 1.147 0.37	0.271 0.273 0.79
	0.529 0.521 -1.55	1.279 1.255 -1.93	1.139 1.141 0.16	1.092 1.104 1.12	1.200 1.209 0.74	1.157 1.148 -0.78	1.187 1.194 0.59	1.156 1.162 0.55	1.200 1.220 1.67	1.093 1.099 0.53	1.140 1.148 0.69	1.281 1.307 2.01	0.531 0.534 0.66	
	0.324 0.328 1.49	1.265 1.279 1.15	1.398 1.422 1.73	0.857 0.881 2.90	1.093 1.102 0.78	1.302 1.286 -1.25	1.141 1.129 -1.05	1.301 1.290 -0.86	1.092 1.111 1.73	0.857 0.854 -0.28	1.399 1.412 0.91	1.266 1.288 1.78	0.324 0.343 5.79	
		0.476 0.498 4.53	1.363 1.411 3.56	1.399 1.440 2.96	1.140 1.151 0.96	1.246 1.225 -1.67	1.150 1.130 -1.73	1.245 1.231 -1.14	1.139 1.147 0.70	1.398 1.393 -0.35	1.363 1.385 1.63	0.477 0.487 2.09		
			0.477 0.498 4.53	1.266 1.303 2.94	1.281 1.259 -1.70	1.114 1.094 -1.79	1.266 1.243 -1.80	1.114 1.099 -1.34	1.279 1.261 -1.41	1.265 1.239 -1.98	0.476 0.484 1.68			
				0.324 0.341 5.24	0.531 0.558 5.20	1.143 1.158 1.26	0.954 0.961 0.72	1.144 1.127 -1.54	0.529 0.524 -0.95	0.324 0.319 -1.37				
						0.271 0.285 5.20	0.315 0.322 2.45	0.280 0.279 -0.45						

Figure 6.5

F_Q^T*V(z)/K(z) versus Core Elevation Map 211



[illegible]

Figure 6.6

F_Q^T*V(z)/K(z) versus Core Elevation Map 212

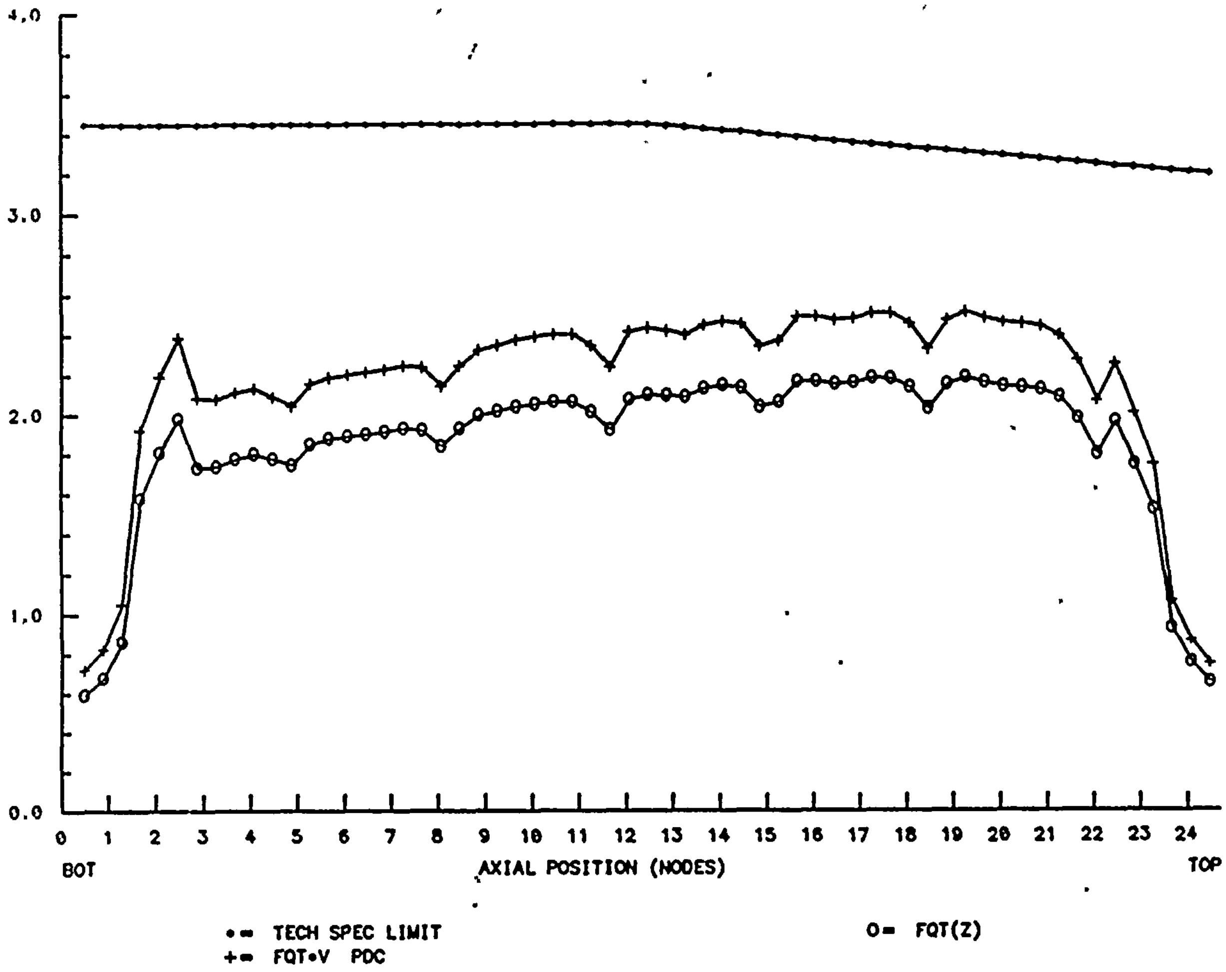


Figure 6.7

$F_Q^T * V(z)/K(z)$ versus Core Elevation Map 214

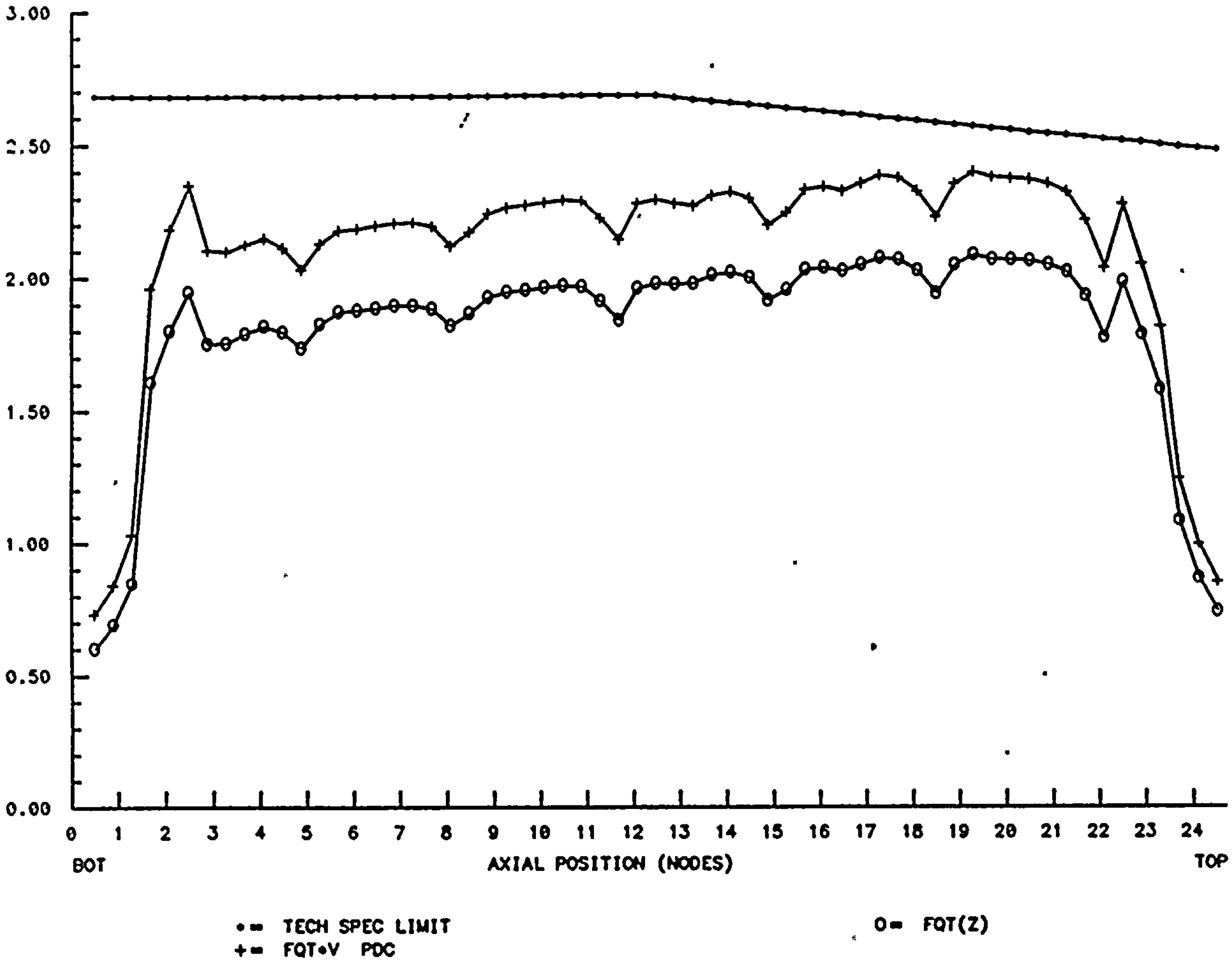
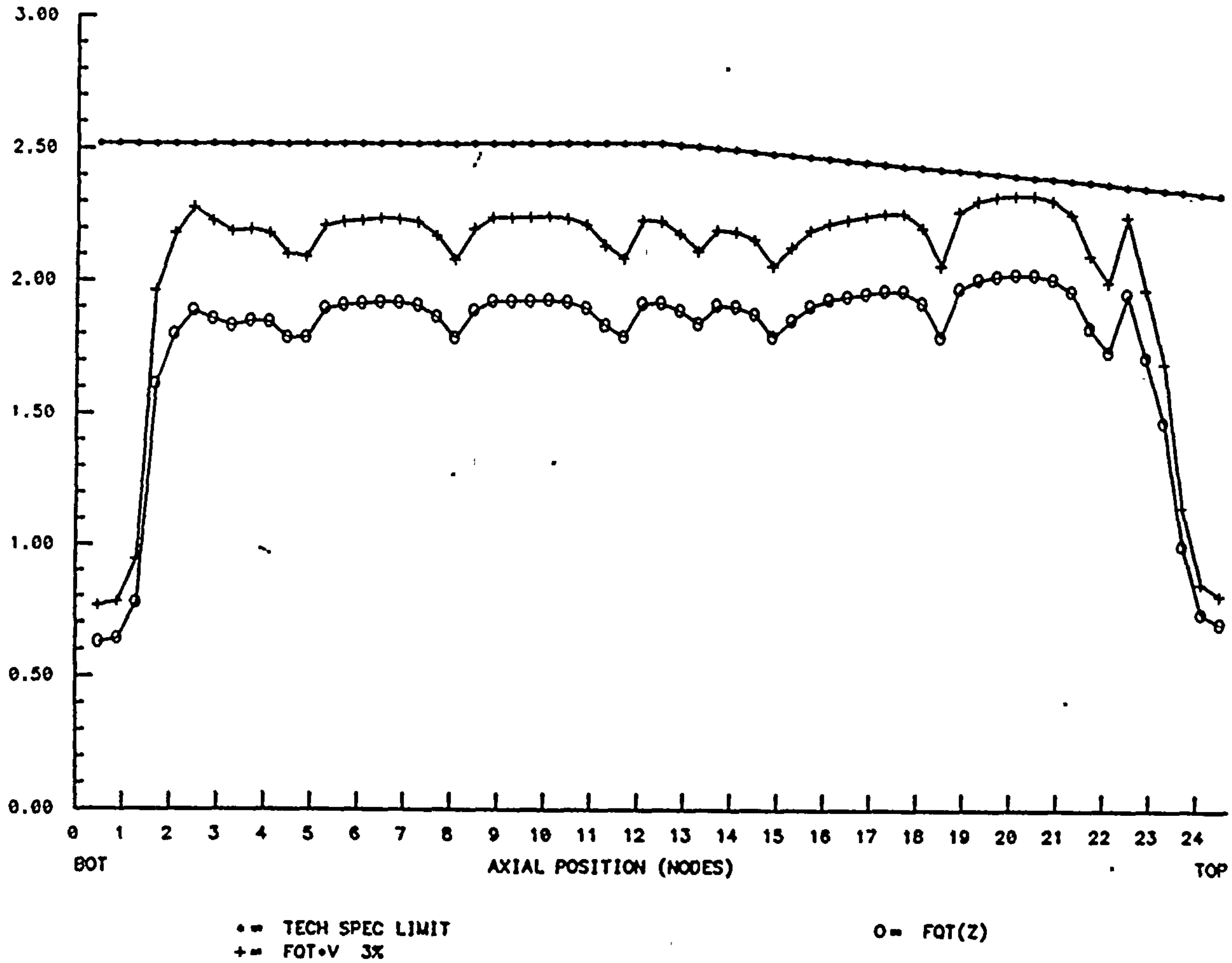


Figure 6.8

FQT*V(z)/K(z) versus Core Elevation Map 215



Distribution List

<u>NRC</u>

<u>Harris Plant</u>

Manager - NSSS

Manager - Technical Support

Manager - Regulatory Affairs

Power Ascension Coordinator - Cycle 6

<u>NFM&SA Section</u>

File: 908.04