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OAK RIDGE NATIONAL LABORATORY

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High Flux Isotope Reactor Quarterly Report July, August, and September of 1981

B. L. Corbett
K. H. Poteet

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DEPARTMENT OF ENERGY

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HIGH FLUX ISOTOPE REACTOR QUARTERLY REPORT JULY, AUGUST, AND SEPTEMBER OF 1981

B. L. Corbett and K. H. Poteet

Sponsor: J. H. Swanks, Director
Operations Division

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HIGH FLUX ISOTOPE REACTOR QUARTERLY REPORT JULY, AUGUST, AND SEPTEMBER OF 1981

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SUMMARY

Routine reactor operation with four end-of-cycle shutdowns and two unscheduled shutdowns resulted in an on-stream time of 91.3% for the quarter. The outer control plates and the inner control cylinder were changed and a semi-annual core component inspection was made.

OPERATIONS

Basic operating data for the quarter are listed in Table 1.

Table 1. HFIR basic operating data
(July 1 through September 30, 1981)

	This Quarter	Last Quarter	Year to date
Total energy, MWd	8381	8373	25,291
Average power, MW/operating hr	99.8	99.7	99.8
Time operating, %	91.3	92.3	92.8
Reactor availability, %	91.3	92.7	93.1
Reactor water radioactivity, $\frac{c/min}{ml}$ (av)	293,000	237,000	
Pool water radioactivity $\frac{c/min}{ml}$ (av)	58	52	

The starting and ending dates for Cycles 210, 211, 212, 213, and 214 are presented in Table 2.

Table 2. Cycles of operation

Cycle No.	Date started	Date ended	Accumulated Power (MWd)
210	6-21-81	7-12-81	2151
211	7-15-81	8-6-81	2158
212	8-7-81	8-29-81	2120
213	8-30-81	9-20-81	2076
214	9-22-81	In progress	854

The status of the HFIR fuel and control-plate inventory is indicated in Table 3.

Table 3. HFIR material inventory

Item	This Quarter	Last Quarter
New fuel elements placed in service	4	4
New fuel elements available for use	37	37
Spent fuel elements on hand	12	14
Spent fuel elements shipped	6	4
New sets of shim plates placed in service	1	0
New sets of shim plates available for use	4	5

SHUTDOWNS

There were four end-of-cycle shutdowns and two unscheduled shutdowns for a total downtime of 191.950 hours. Table 4 gives further details.

Table 4. Description of HFIR shutdowns

Date	Downtime (h)	Remarks
		Scheduled
7-12-81	74.050	Fuel cycle 210 was completed at 6:33 PM. A total power generation of 2151 MWd was obtained on fuel element 211 O&I. The shutdown was extended to replace the outer control plates (see Unusual Occurrence Report OP-81-15).
8-6-81	31.667	Fuel cycle 211 was completed at 12:20 PM. A total power generation of 2158 MWd was obtained on fuel element 212 O&I.
8-29-81	38.183	Fuel cycle 212 was completed at 1:06 AM. A total power generation of 2120 MWd was obtained on fuel element 213 O&I.
9-20-81	36.133	Fuel cycle 213 was completed at 9:42 AM. A total power generation of 2076 MWd was obtained on fuel element 214 O&I.
		Unscheduled
9-21-81	0.100	The No. 3 control plate dropped while performing post-startup safety tests (see Unusual Occurrence Report OP-81-20).
9-21-81	11.817	The No. 3 control plate dropped again after resuming the safety tests upon restart of the reactor (see Unusual Occurrence Report OP-81-20). The No. 3 control plate magnet was replaced before restart.

PLANT MAINTENANCE

Maintenance and changes in the various process systems are listed in Table 5.

Table 5. Process systems — maintenance and changes

Date	Component	Remarks
		Primary system
7-15-81	Prefilter	A sizeable water leak developed on the west primary cleanup system prefilter. The leak was repaired by in-place welding.
7-16-81	Resin	The anion and cation resin in the west primary cleanup system demineralizer was replaced due to deterioration from age and radiation damage.
		Miscellaneous
9-11-81	Relay	The charger failure relay on PU-1E pony motor battery charger failed and was replaced.
9-22-81	Magnet	The No. 3 control rod drive rod magnet was replaced because of its decreased holding force.

INSTRUMENTATION AND CONTROLS

Maintenance and changes in the various instrumentation systems are listed in Table 6.

Table 6. Instrumentation — maintenance and changes

Date	Component	Remarks
8-7-81	Current repeater	The No. 1 safety channel outlet temperature current repeater, TX-100-1, failed and was replaced.

SYSTEM SURVEILLANCE TESTS AND RESULTS

Vessel Head Studs

The accumulated number of tensioning cycles on the reactor vessel head studs is presented in Table 7. These studs were designed for a fatigue life of 40 cycles loading due to tensioning of the bolts and 730 full-pressure 6.9 MPa (1000 psig) cycles. Installation of new reactor vessel head studs was completed in June 1972. The numbers in Table 7 represent the maximum cycles to which any new stud has been exposed.

Table 7. Vessel head stud-tensioning cycles

	This Quarter	Last Quarter	Total to Date
Head bolts tensioned	0	0	6
10.3 MPa (1500 psig)			0
6.5 MPa (950 psig)	0	0	7
5.2 MPa (750 psig)	7	4	95
4.5 MPa (650 psig)	0	0	117

Stack Filters

Stack filtering systems in the special building hot exhaust (SBHE) and hot off-gas (HOG) systems were tested for particulate and iodine removal efficiency. Results of the most recent tests are tabulated in Table 8.

Summary of Surveillance Tests

Table 9 is a tabulation of the completion dates of the surveillance tests required by the Technical Specifications. This table contains all the surveillance tests scheduled for frequencies of one month or longer. Other surveillance requirements which will not be reported are satisfied by the routine completion of daily and weekly check sheets, startup checklists, hourly data sheets, the operating logbooks, and miscellaneous quality assurance tests.

REVISIONS TO THE HFIR OPERATING MANUAL

There were no revisions or additions to the HFIR operating manual during this quarter.

UNUSUAL OCCURRENCES

Two unusual occurrences (OP-81-15 and OP-81-20) were issued in final form at the HFIR during this quarter. All outstanding Unusual Occurrence Reports have been completed in final form.

REACTOR EXPERIMENTS

Experiment Facilities

Assignment of the various HFIR experiment facilities is tabulated in Table 10.

HFIR Target Loading

A description of the HFIR target loading for each of the operating cycles this quarter is presented in Figs. 1, 2, 3, 4, and 5.

Table 8. Particulate and iodine removal efficiency

Filter bank	Methyl iodide				Elemental iodine				Filter Position	Particulate retention			
	Last test		Previous test		Last test		Previous test			Last test		Previous test	
	Date	Eff.,%	Date	Eff.,%	Date	Eff.,%	Date	Eff.,%		Date	Eff.,%	Date	Eff.,%
SBHE, west	11-03-81	90.96	4-28-81	93.3	10-8-81	99.99	3-31-81	99.99	South	9-23-81	99.994	3-3-81	99.995
									North	9-23-81	99.997	3-3-81	99.97
SBHE, center	11-05-81	36.7	5-5-81	15	10-14-81	99.9	4-2-81	99.9	South	9-23-81	99.993	3-3-81	99.996
									North	9-23-81	99.996	3-3-81	99.996
SBHE, east	11-12-81	86.7	4-5-81	84	10-13-81	99.97	4-7-81	99.98	South	9-23-81	99.990	3-3-81	99.995
									North	9-23-81	99.994	3-3-81	99.994
HOG, west	11-11-81	99.9	4-9-81	99.9	10-15-81	99.99	3-19-81	99.95					
HOG, center	4-21-81	99.99	4-21-81	99.9	10-27-81	99.99	3-17-81	99.99					
HOG, east	4-14-81	99.9	4-14-81	99.9	10-29-81	99.99	3-26-81	99.99					

Table 9. Summary of surveillance tests

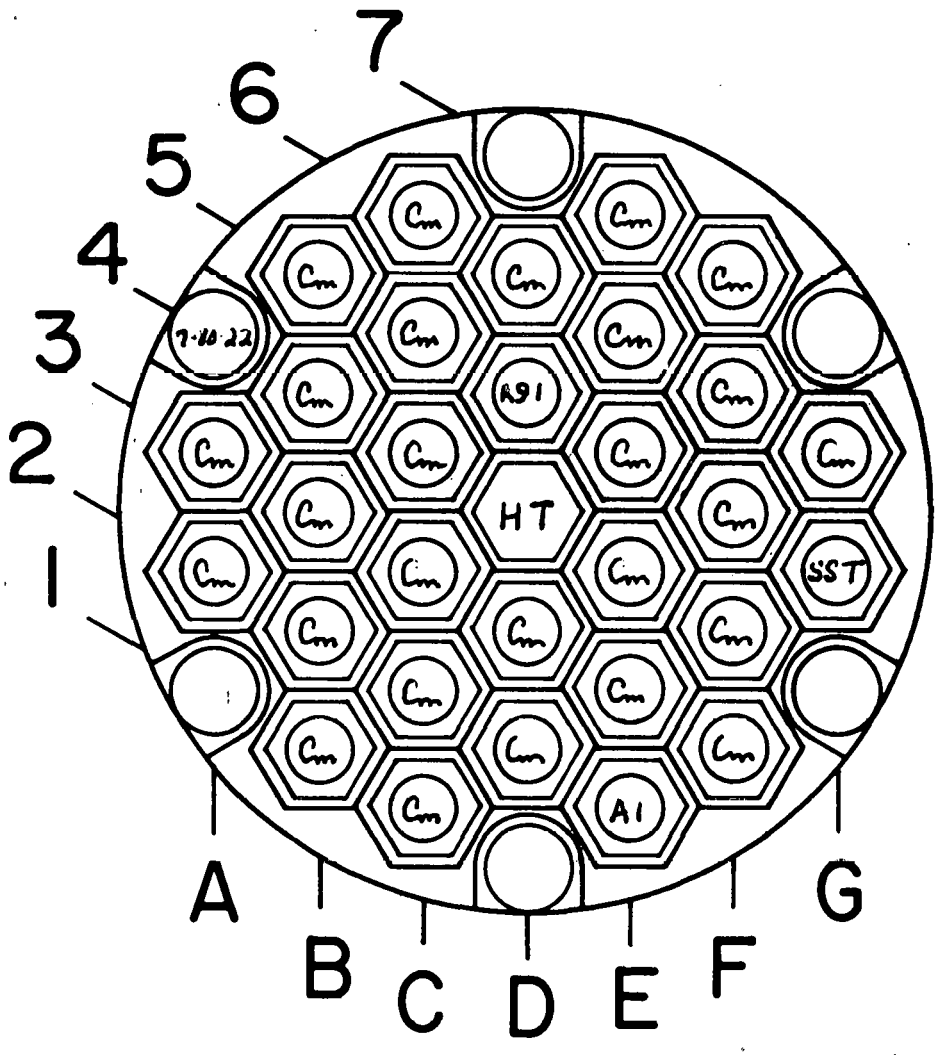
Test	Most Recent Test	Previous Test	Previous Test
Annual Tests			
Count rate channel A calibration	9-3-81	1-8-81	6-3-80
Count rate channel B calibration	9-4-81	1-8-81	6-19-80
Count rate channel C calibration	9-10-81	1-9-81	6-17-80
Normal-emergency systems	10-15-81	5-25-81	12-15-80
Poison injection system	11-30-81	12-15-80	12-18-79
Pressurizer pump high pressure cutoff	10-15-81	10-6-80	9-27-79
Pressure relief valves	5-21-81	5-14-80	4-6-79
Pressure vessel head studs	5-21-81	7-23-80	9-4-79
Radiation block valve test	11-30-81	12-15-80	12-18-79
Reactor bay in-leakage test	11-30-81	12-15-80	12-18-79
Reactor components	10-14-81	5-25-81	12-15-80
Safety channel A calibration	5-27-81	12-16-80	6-9-80
Safety channel B calibration	5-27-81	12-16-80	6-10-80
Safety channel C calibration	5-27-81	12-16-80	6-12-80
Servo channel A calibration	4-24-81	12-2-80	5-20-80
Servo channel B calibration	4-24-81	12-2-80	5-20-80
Servo channel C calibration	4-24-81	12-2-80	5-20-80
Speed of shim and regulating drives	5-21-81	7-23-80	9-4-79
Switchgear battery load test	9-17-81	12-15-80	12-18-79
Semiannual Tests			
Main pump low pressure cutoff	11-30-81	5-15-81	12-15-80
Pony motor battery E	7-12-81	3-16-81	11-19-80
Pony motor battery F	8-6-81	5-3-81	12-12-80
Pony motor battery G	8-29-81	5-26-81	10-1-80
Pony motor battery H	9-20-81	6-19-81	4-9-81
Radiation monitoring equipment	9-10-81	7-13-81	1-4-81
SBHE filter efficiency	10-14-81	3-16-81	10-16-80
Monthly Tests			
Cadmium nitrate tests	9-12-81	8-15-81	7-11-81
Diesel run test, No. 1	9-14-81	8-17-81	7-13-81
Diesel run test, No. 2	9-14-81	8-17-81	7-13-81

Table 10. Experiment facility usage

Facility	Description	Division
PTP-A1	Materials studies	Fusion Energy
PTP-A4	Materials studies	Fusion Energy
PTP-D1	Materials studies	Fusion Energy
PTP-D7	Materials studies	Fusion Energy
PTP-G4	Materials studies	Fusion Energy
PTP-G7	Materials studies	Fusion Energy
RB-1	Isotope production	Operations
RB-2	Isotope production	Operations
RB-3	Isotope production	Operations
RB-4	Isotope production	Operations
RB-5	Isotope production	Operations
RB-6	Isotope production	Operations
RB-7	HTGR fuel irradiations	Engineering Technology
RB-8	Isotope production	Operations
CR-1	Isotope production	Operations
CR-2	Isotope production	Operations
CR-3	Isotope production	Operations
CR-4	Isotope production	Operations
CR-5	Isotope production	Operations
CR-6	Isotope production	Operations
CR-7	Isotope production	Operations
CR-8	Isotope production	Operations
VXF-1	Isotope production	Operations
VXF-3	HFIR corrosion specimen	Operations
VXF-7	Pneumatic tube	Analytical Chemistry
VXF-9	Isotope production	Operations
VXF-13	Isotope production	Operations
VXF-18	Isotope production	Operations
VXF-22	Isotope production	Operations
HB-1	Neutron diffractometer	Solid State
HB-2	Neutron diffractometer	Chemistry
HB-3	Neutron diffractometer	Solid State
HB-4	Neutron diffractometer	Solid State

HFIR TARGET LOADING

CYCLE NO. 214 DATE 9-22-81



TARGET TYPE	NUMBER
PLUTONIUM (Pu)	
CURIUM (Cm)	27
STAINLESS STEEL (SST)	1
GRAPHITE (C)	
ALUMINUM (Al)	1
HYDRAULIC TUBE (HT)	1

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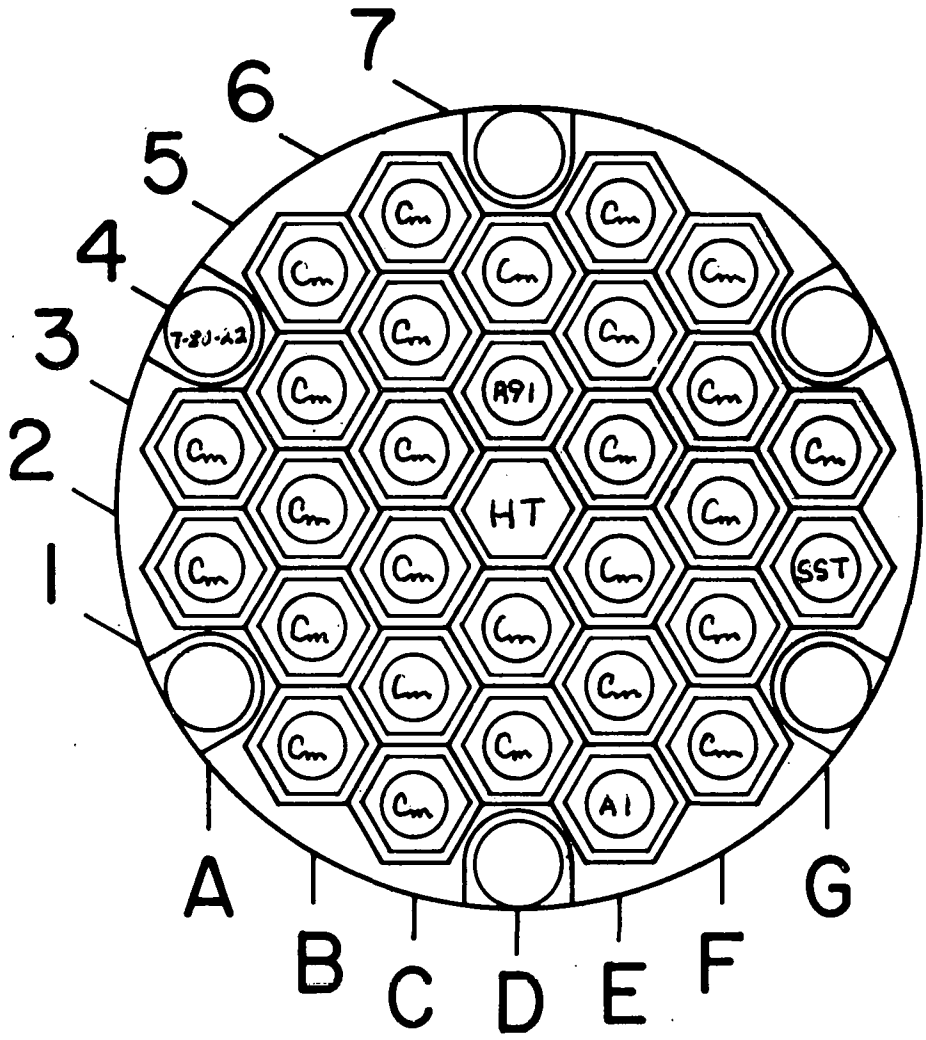
HFIR TARGET LOADING

CYCLE NO. 213 DATE 8-30-81



TARGET TYPE	NUMBER
PLUTONIUM (Pu)	
CURIUM (Cm)	27
STAINLESS STEEL (SST)	1
GRAPHITE (C)	
ALUMINUM (Al)	1
HYDRAULIC TUBE (HT)	1

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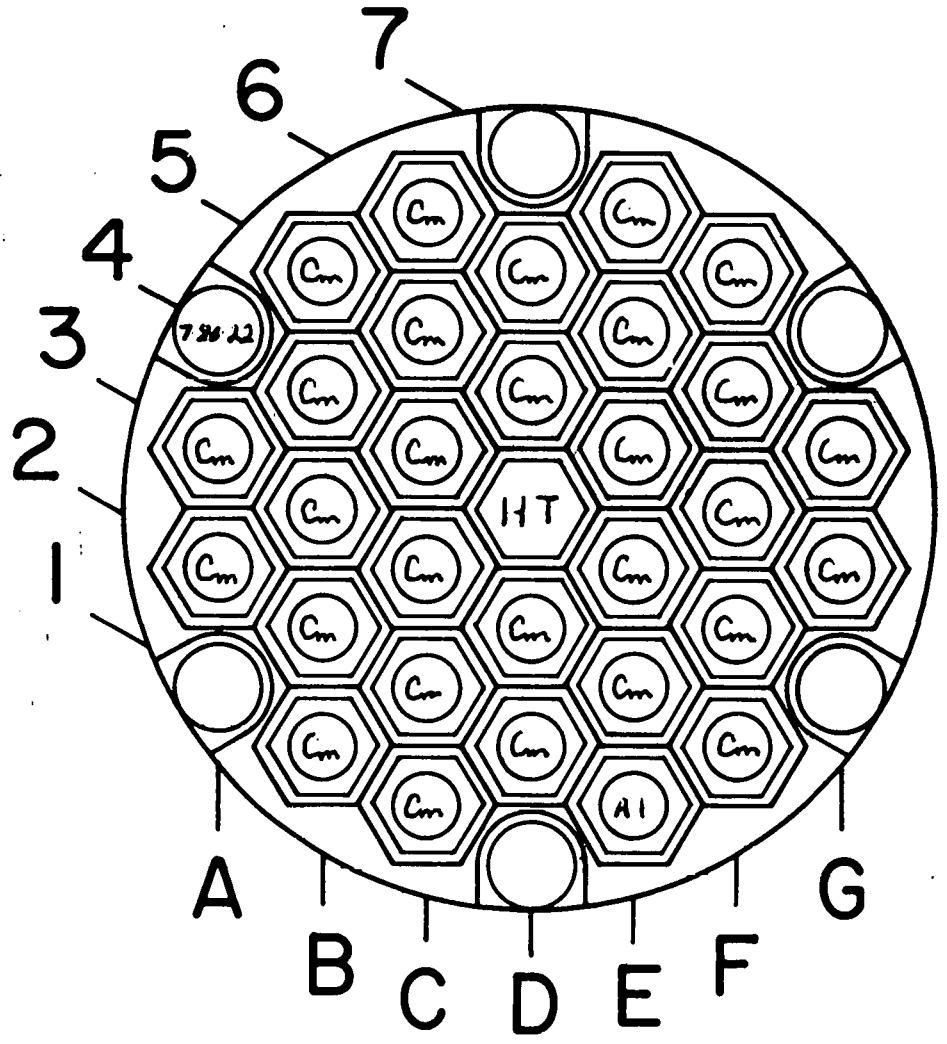
HFIR TARGET LOADING

CYCLE NO. 212 DATE 8-7-81



TARGET TYPE	NUMBER
PLUTONIUM (Pu)	
CURIUM (Cm)	29
STAINLESS STEEL (SST)	
GRAPHITE (C)	
ALUMINUM (Al)	1
HYDRAULIC TUBE (HT)	1

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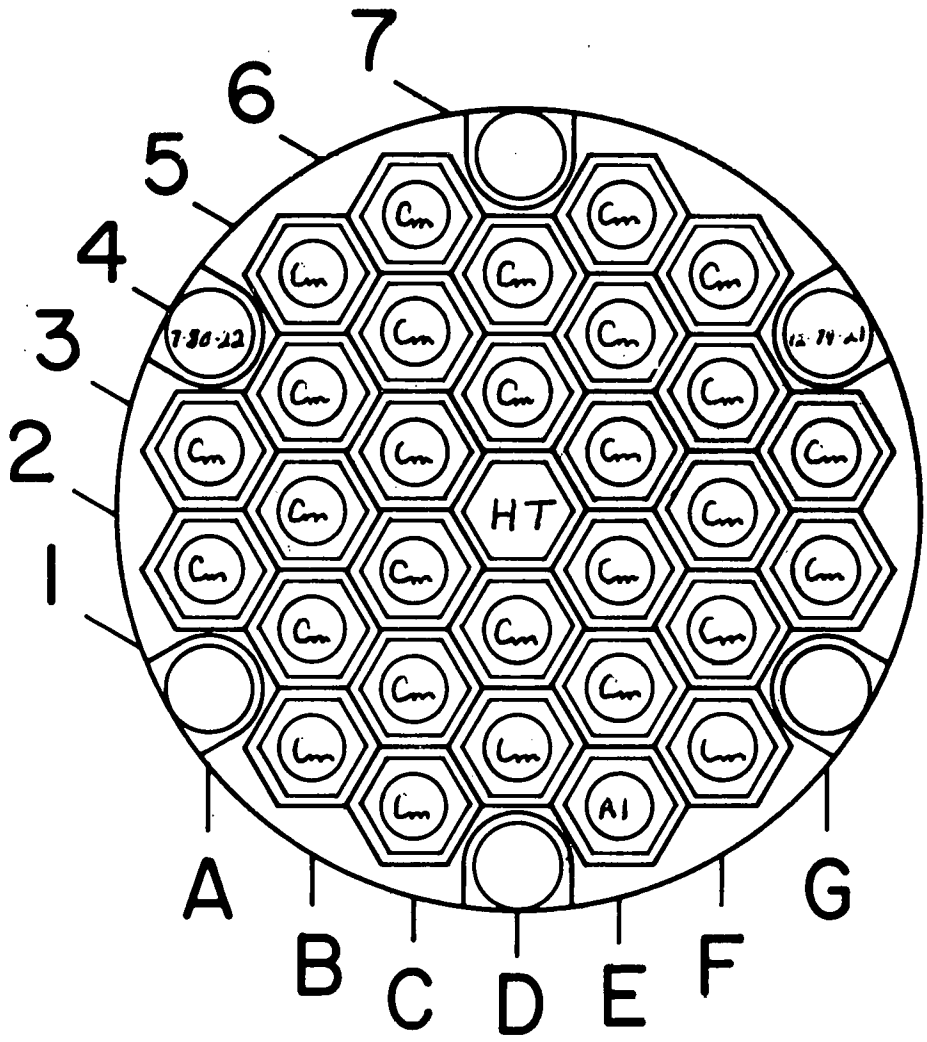
HFIR TARGET LOADING

CYCLE NO. 211 DATE 7-15-81



TARGET TYPE	NUMBER
PLUTONIUM (Pu)	
CURIUM (Cm)	29
STAINLESS STEEL (SST)	
GRAPHITE (C)	
ALUMINUM (Al)	1
HYDRAULIC TUBE (HT)	1

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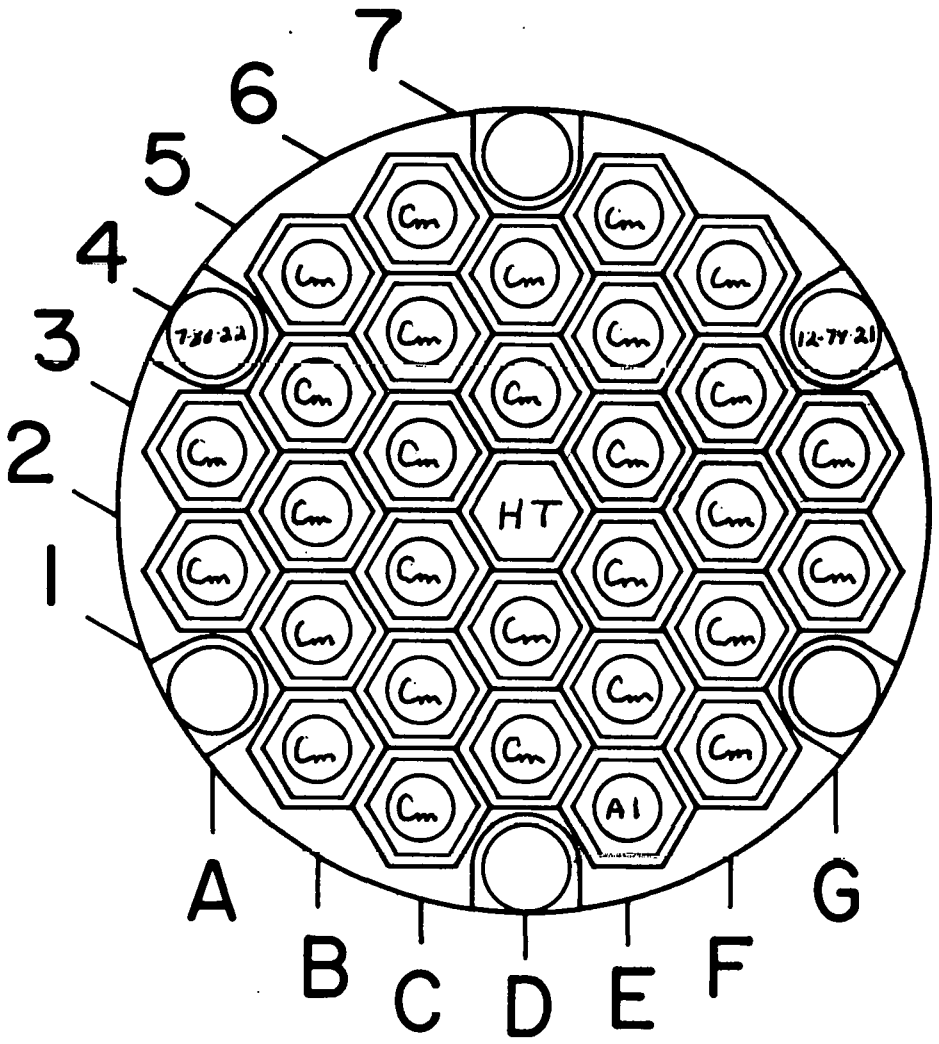
HFIR TARGET LOADING

CYCLE NO. 210 DATE 6-21-81



TARGET TYPE	NUMBER
PLUTONIUM (Pu)	
CURIUM (Cm)	29
STAINLESS STEEL (SST)	
GRAPHITE (C)	
ALUMINUM (Al)	1
HYDRAULIC TUBE (HT)	1

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