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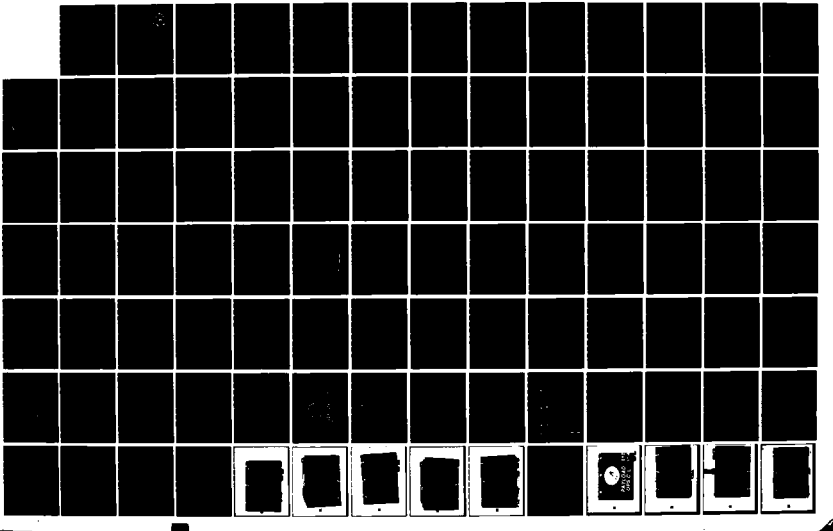

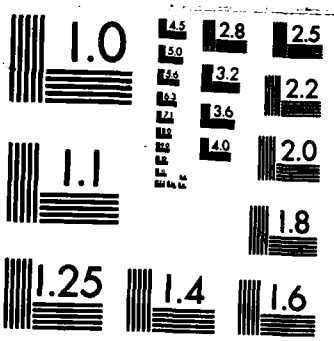

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RESULTS FROM RADIATION MONITORING EQUIPMENT EXPERIMENTS ON STS-41C, 41D, 41G, AND 51A

STEVEN E. CASH, RICHARD G. MADONNA,
MICHAEL R. MCCLELLAN, AND MARK E. FIELDS

18 APRIL 1985

FINAL REPORT.

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The results from the Radiation Monitoring Equipment (RME) experiments, flown onboard STS-41C, 41D, 41G, and 51A are presented and discussed. The RME consists of the HRM-III gamma-ray counter and PRM neutron/proton dosimeter. The gamma-ray data agree with data from previous flights with somewhat higher readings on STS-41G. Large increases in count rates are observed when the Orbiter is in the South Atlantic and Southeast Asian Anomalies. Increases in count rate are also observed at higher latitudes. Neutron/proton dosage is consistent with NASA predictions. → cont keywords include:

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SUMMARY

The Radiation Monitoring Equipment (RME) was flown on Space Shuttle Missions STS-41C, 41D, 41G, and 51A to provide in-cabin, real-time crew dosimetry, and to obtain time resolved gamma-ray background data and neutron/proton background data. The RME consists of two instruments, EG&G HRM-III gamma-ray counter and EG&G Pocket REM Meter (PRM) neutron/proton dosimeter. The HRM-III was operated by the astronaut crews 18 times during the four missions, with each operation lasting 52.5 minutes. The PRM was operated nine times with each operation lasting a minimum of approximately eight hours.

The results from the HRM-III operations are plotted as a function of time and as a function of ground position. The data show large increases in count rate during the periods when the Orbiter was in the South Atlantic and Southeast Asian Anomalies. Also, increases in count rate were observed as the orbit brought the Shuttle nearer the north or south poles. These data are consistent with data obtained from other missions.

The PRM results are displayed in tabular form. The average dose rate from these operations is .484 millirem per hour (mrem/hr) (.044 millirad per hour (mrad/hr)). The total mission neutron/proton dosages predicted by these readings are: STS-41C, 151.571 mrem (12.407 mrad); STS-41D, 33.914 mrem (3.333 mrad); STS-41G, 111.324 mrem (10.461 mrad); STS-51A, 44.9654 mrem (4.6979 mrad).

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SECTION I

INTRODUCTION

This report presents the results of the Radiation Monitoring Equipment (RME) experiments flown on STS-41C, 41D, 41G, and 51A. The objectives of the RME experiments are to provide in-cabin, real-time crew dosimetry and to obtain time resolved gamma-ray background data and neutron/proton background data.

The first objective was partially met during the flight of STS-6 (ref 1). The RME was flown for the first time on STS-6, and a limited amount of data was taken. The quality of the data was sufficient to convince us that the instruments will work in space, and, more importantly, that the crew can operate them and obtain meaningful data. Longer operations were required to fully meet the first objective since the instruments were not utilized to their fullest extent during the STS-6 mission.

The second objective was also achieved, in part, during the STS-6 mission. The neutron/proton dosimeter, EG&G's Pocket REM Meter (PRM), was operated for sufficiently long periods of time and gathered meaningful background data. The gamma-ray counter, EG&G's HRM III, was only operated for 10 seconds each time it was activated and did not yield enough background data to meet the second objective.

The STS-8 and STS-11 flights (ref 2 and 3) provided opportunities to meet both objectives of the RME experiments. During these flights, the HRM-III was operated a total of 11 times with each operation lasting 52.5 minutes. The PRM was operated four times with each operation lasting a minimum of 10 hours.

During the STS-6, 8, and 11 flights, the RME data convinced us that the crew can operate the RME to obtain valuable data. During STS-41C, 41D, 41G, and 51A, the RME provided real-time crew dosimetry capability and obtained time resolved gamma-ray background data and neutron/proton background data. During these flights, the HRM III was operated for a total of 15.75 hours and the PRM was operated for a total of 116.5 hours.

SECTION II

EQUIPMENT

HRM-III.

The HRM-III (Figure 1) (ref 4) is a hand-held gamma-ray counter. It weighs approximately 1 kilogram (2.2 pounds) and is about the size of a small cassette recorder. The circuitry is all solid state and microprocessor controlled. The detector is a mecuric iodide (HgI_2) crystal with a detection threshold of 100 kiloelectronvolts (keV).

The HRM-III has 105 internal memories that can store counting data for playback at a later time. These memories are filled with the average counts obtained during a user determined time interval. The interval can vary from 1/3 of a second to 33 seconds. Playback of the stored data is accomplished through a liquid crystal display (LCD) on the HRM-III. This record-playback feature allows for a time-history of the gamma-ray counts without having a user continually monitoring the instrument. (For a more complete description of the HRM-III, see reference 4).

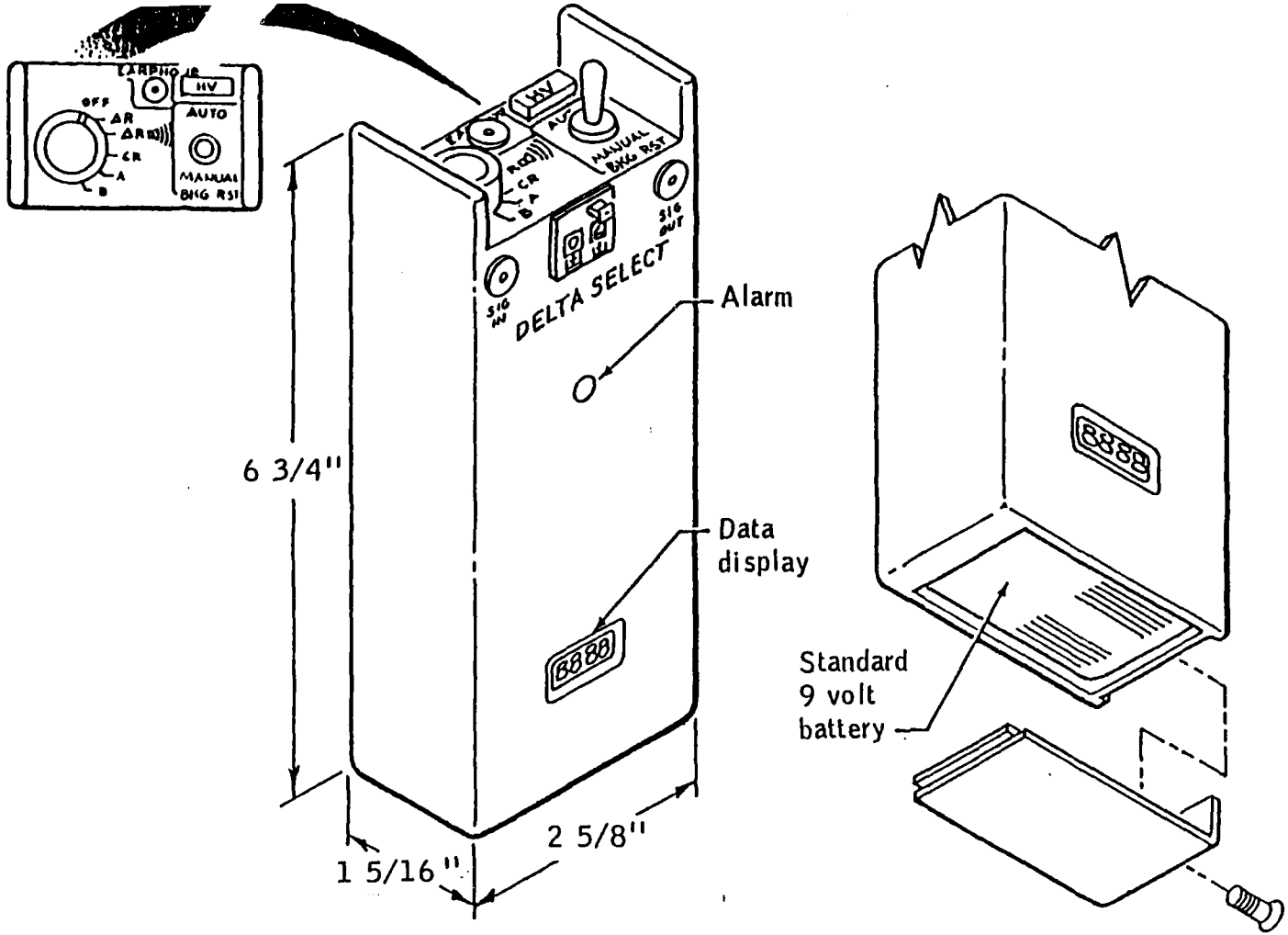
PRM.

The PRM (Figure 2) (ref 5) is a hand-held neutron/proton dosimeter. It weighs approximately 1 kilogram (2.2 pounds) and is slightly larger than the HRM-III. The PRM has microprocessor controlled solid state circuitry. It uses three ionization tubes as detectors. These tubes are surrounded by a tissue equivalent plastic. The associated electronics then produce data in the form of counts, rads and rems in real time.

Data are obtained via a LCD. The PRM will read out either hours (elapsed time since turn-on), counts, rads, or rems by changing the position of a rotary switch. The LCD displays the current value of the function (hours, counts, rads, rems) chosen and the LCD readout is updated as the value changes. Thus the PRM is a real time dosimeter. (For a more complete description, see reference 5).

Crew Training.

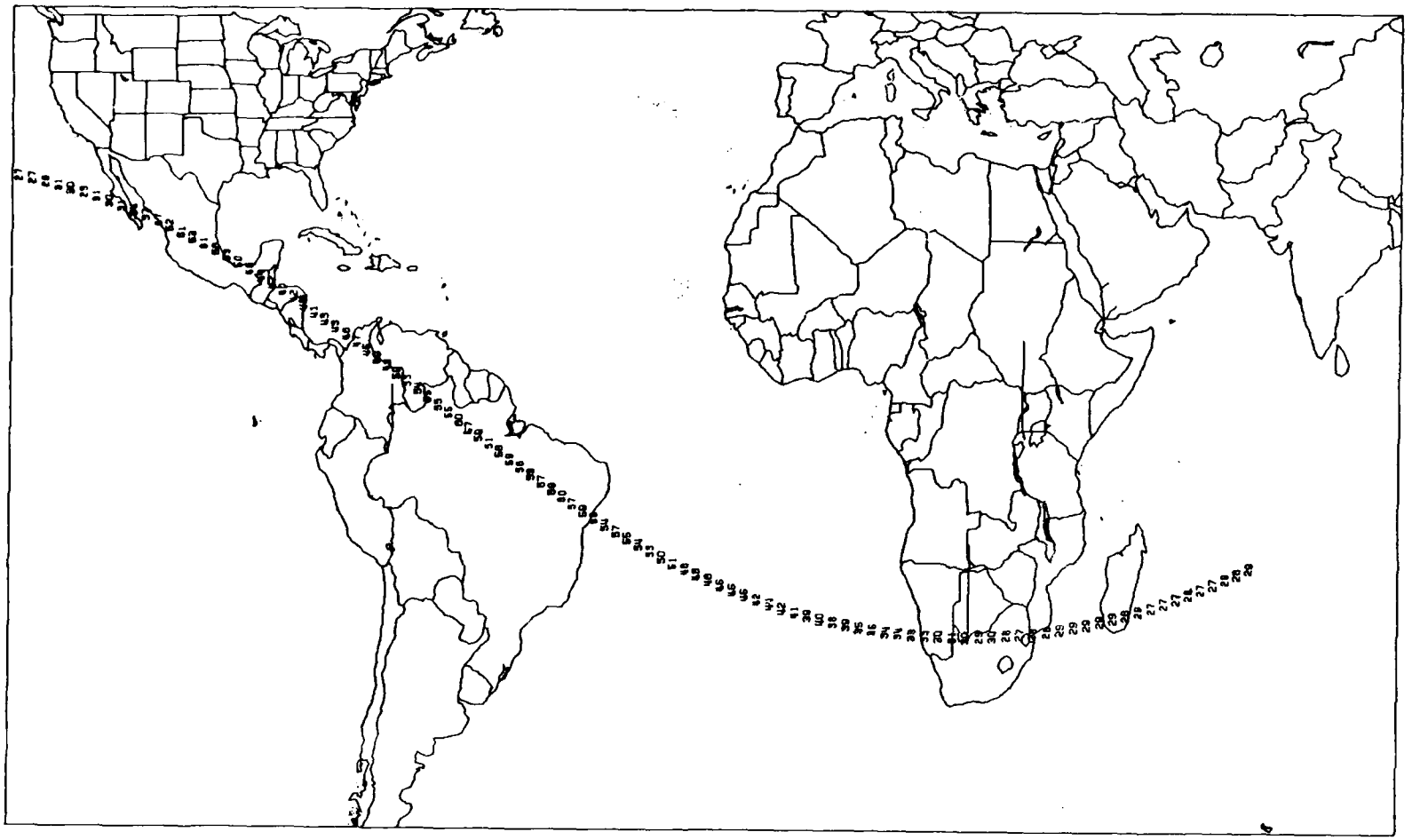
Crew training on the RME was accomplished at Johnson Space Center. The crews received a briefing on the instruments and were allowed to operate them. During this training briefing, questions that the crews had on the operation of the instruments were answered. The crews then practiced with two training units at Johnson Space Center.



Handheld Radiation Monitor (HRM-III)

Figure 1.

OPERATION NO. 2



STS41-D

Figure 14

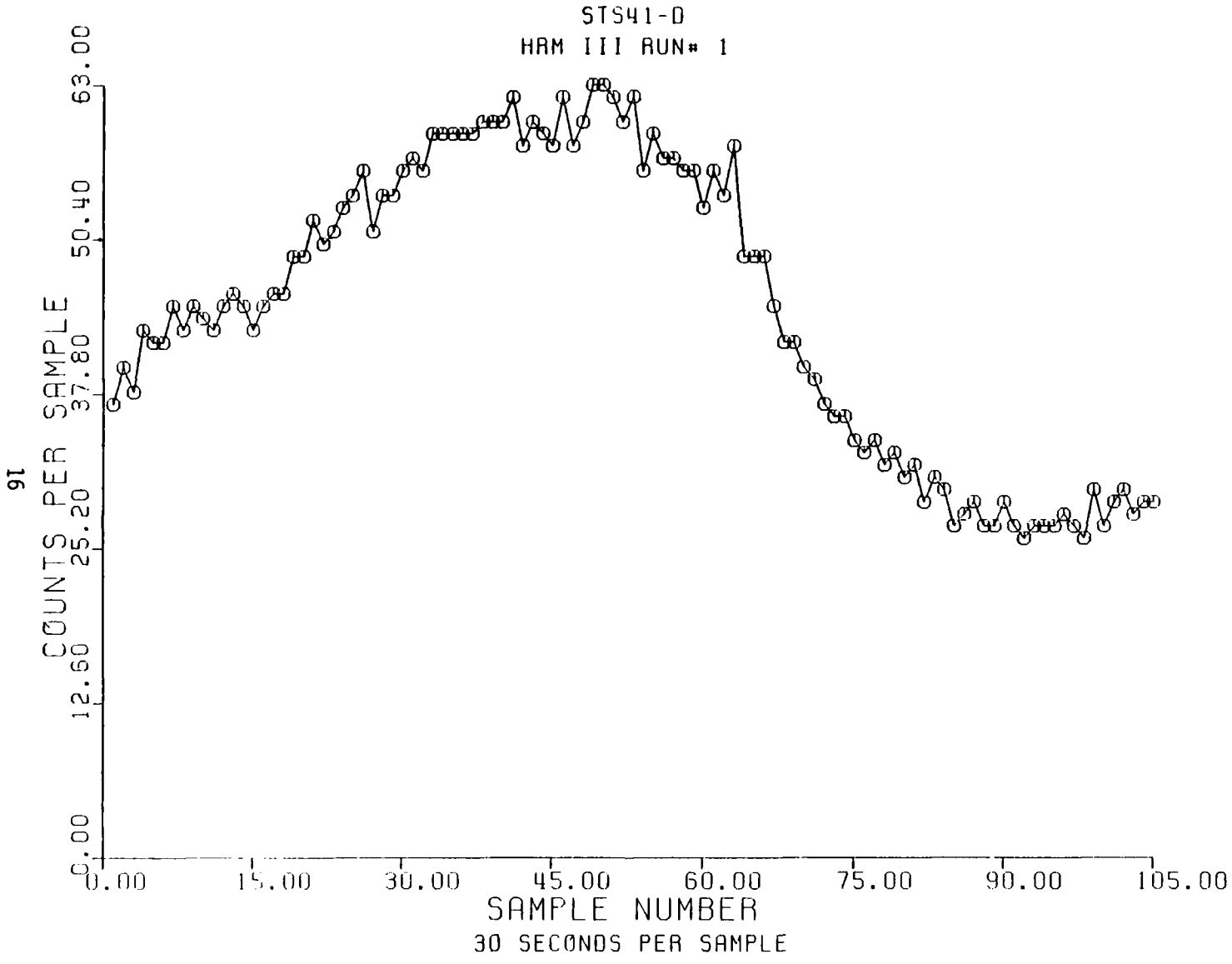
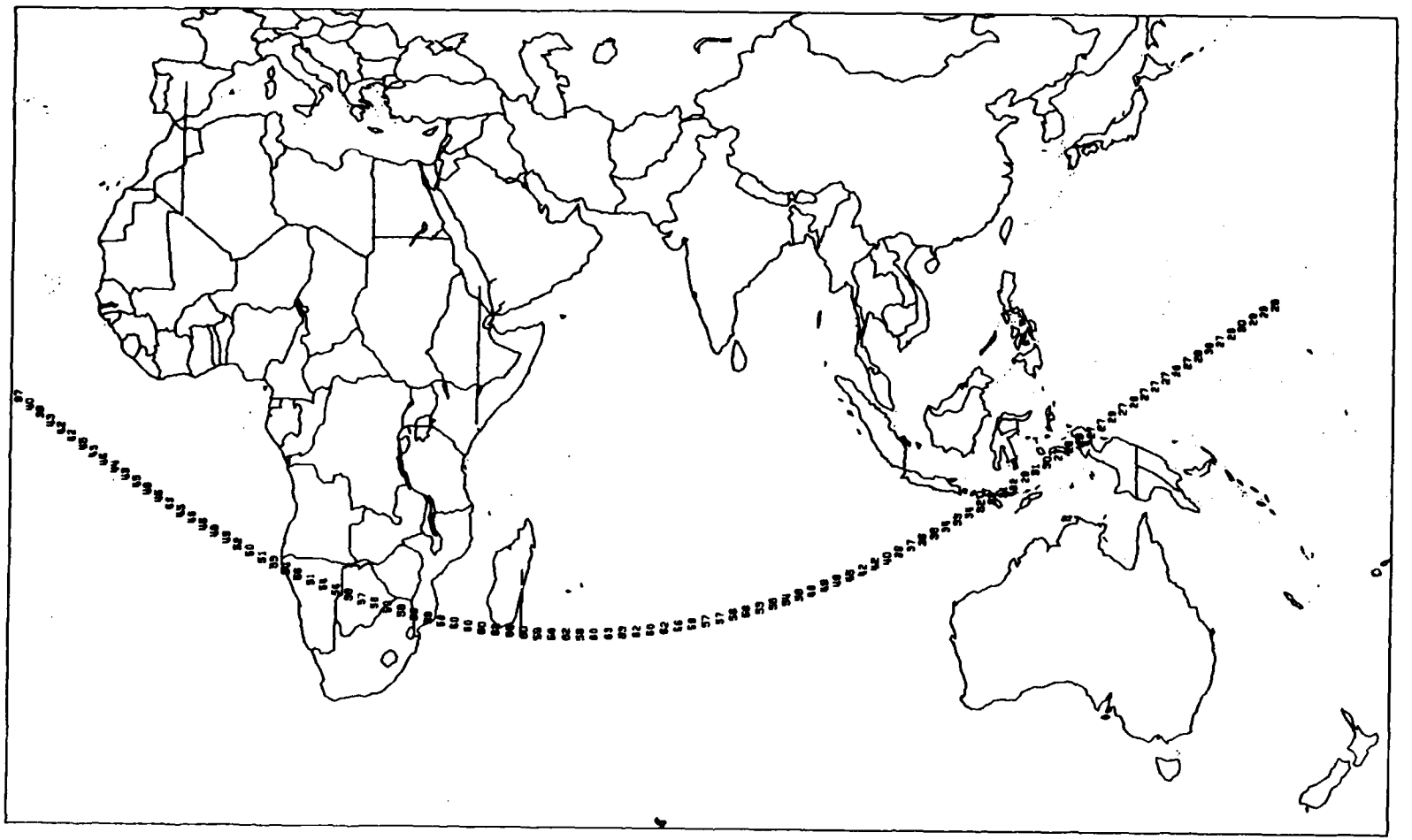

STS41-D
HAM III RUN# 1
COUNTS PER SAMPLE
0.00
12.60
25.20
37.80
50.40
63.00
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 13

HAM-III

OPERATION NO. 1



STS41-D

Figure 12

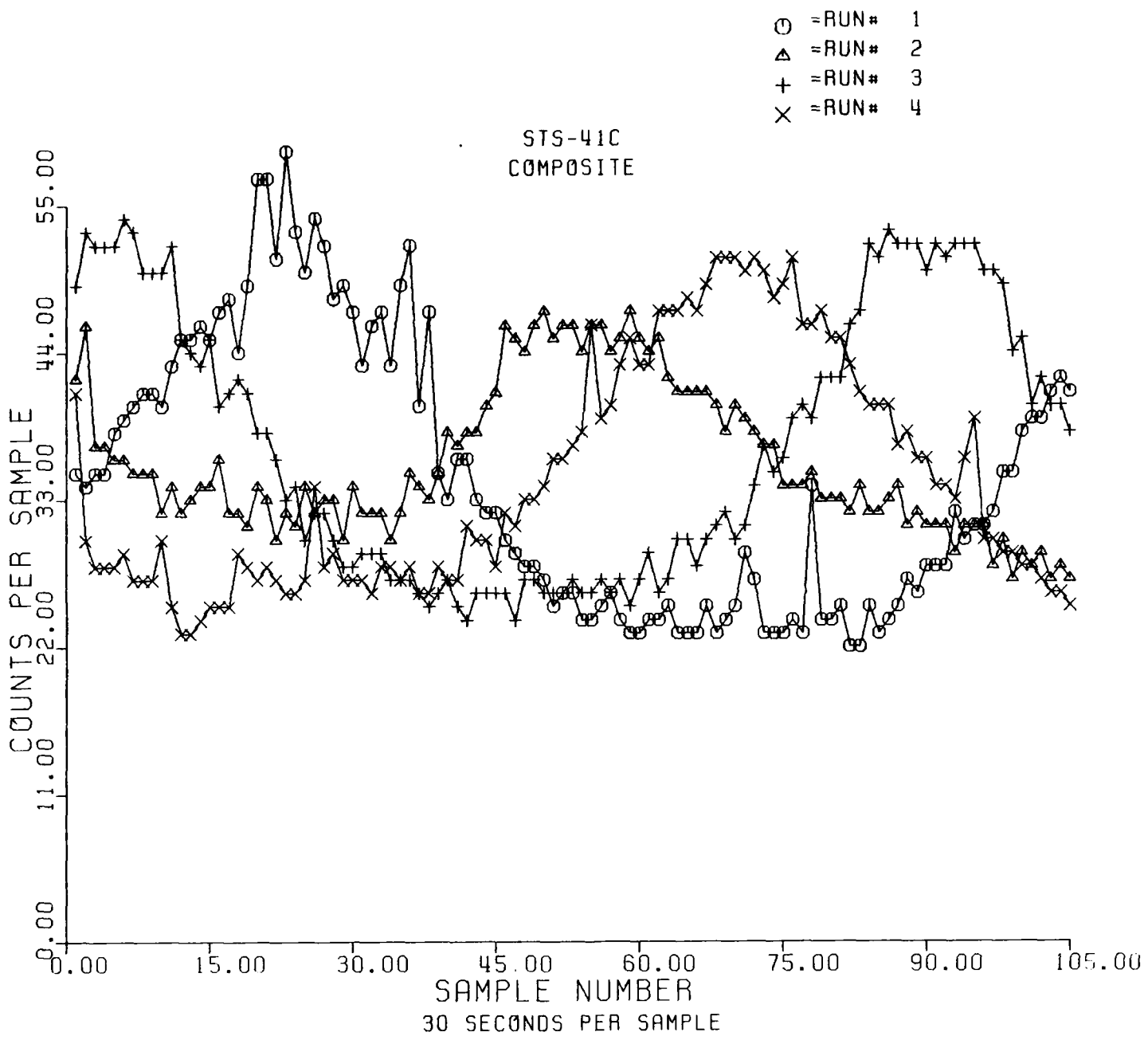

=RUN# 1
=RUN# 2
=RUN# 3
=RUN# 4
STS-41C
COMPOSITE
COUNTS PER SAMPLE
0.00
11.00
22.00
33.00
44.00
55.00
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 11

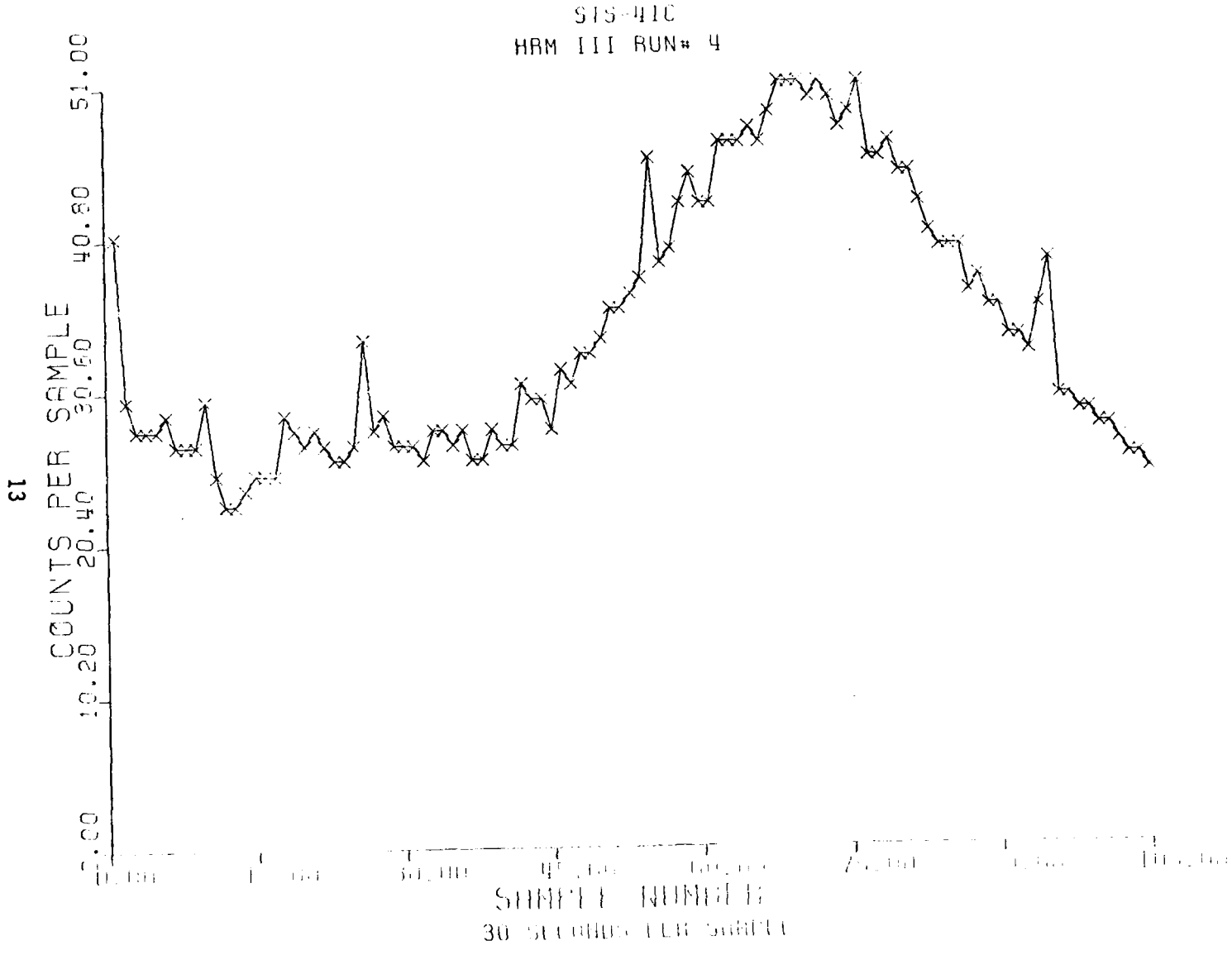
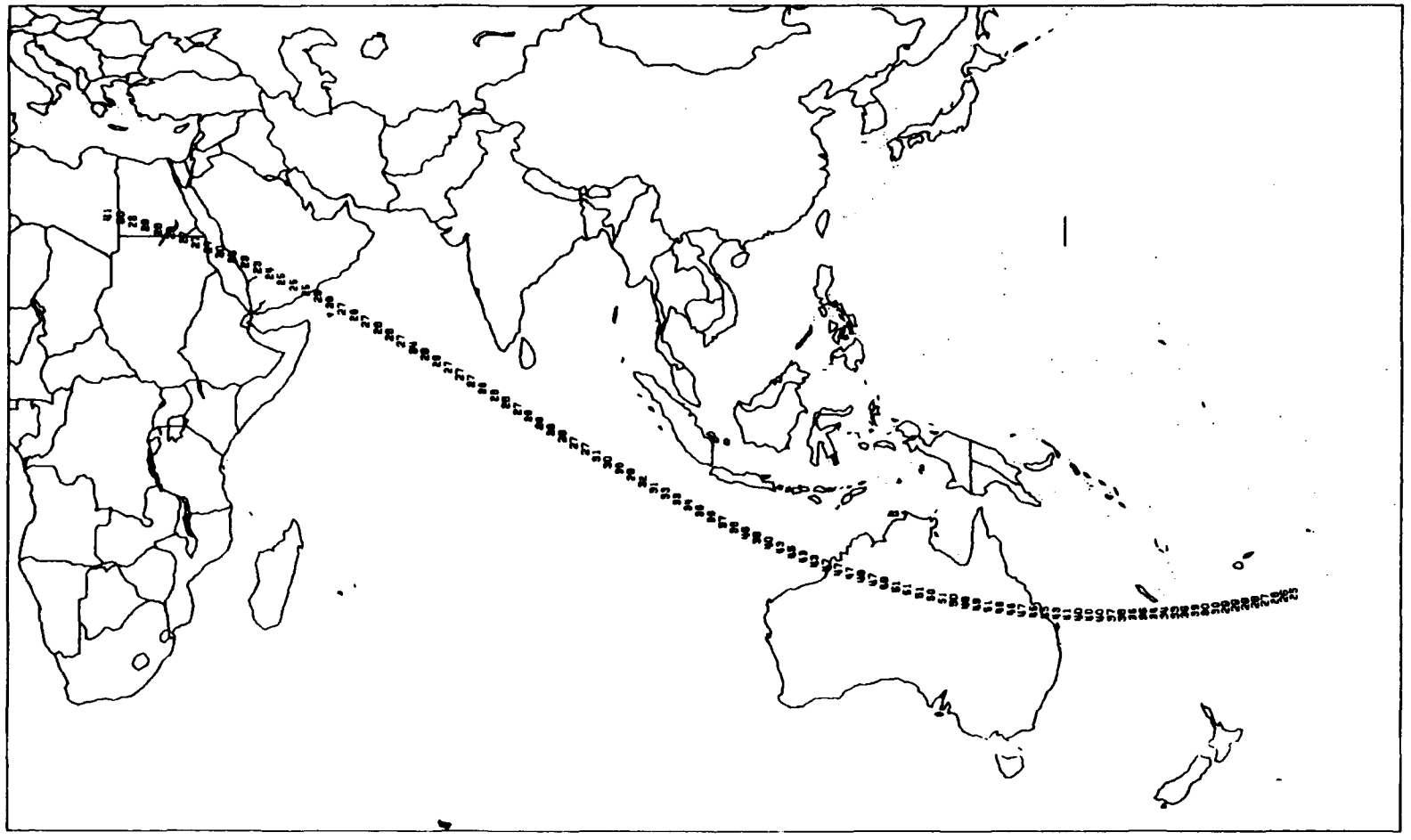

STS-41C
HRM III RUN# 4
COUNTS PER SAMPLE
0.00
10.20
20.40
30.60
40.80
51.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 10

MISSION 41C STS13
HRM III RUN #4



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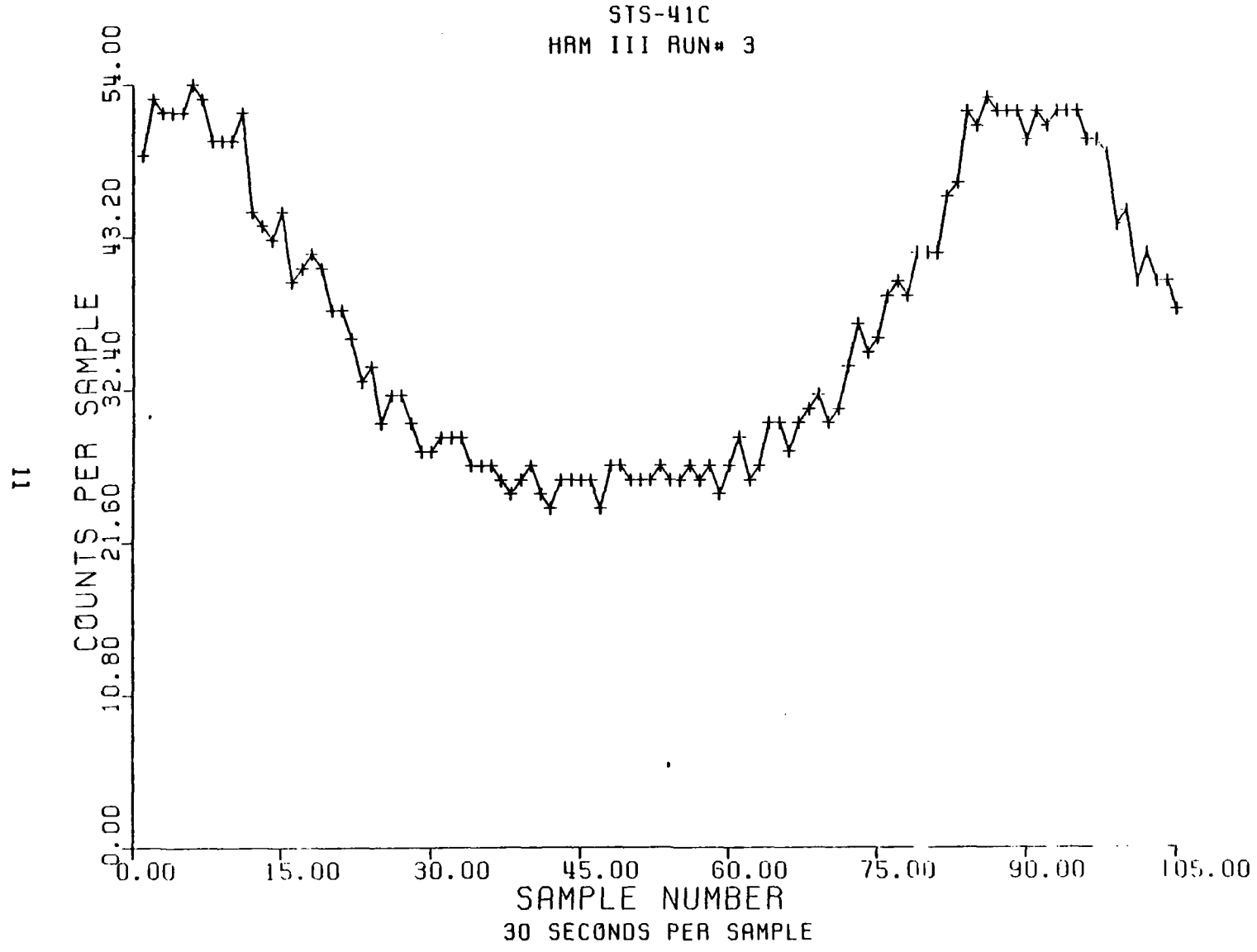
STS-41C
HAM III RUN# 3
COUNTS PER SAMPLE
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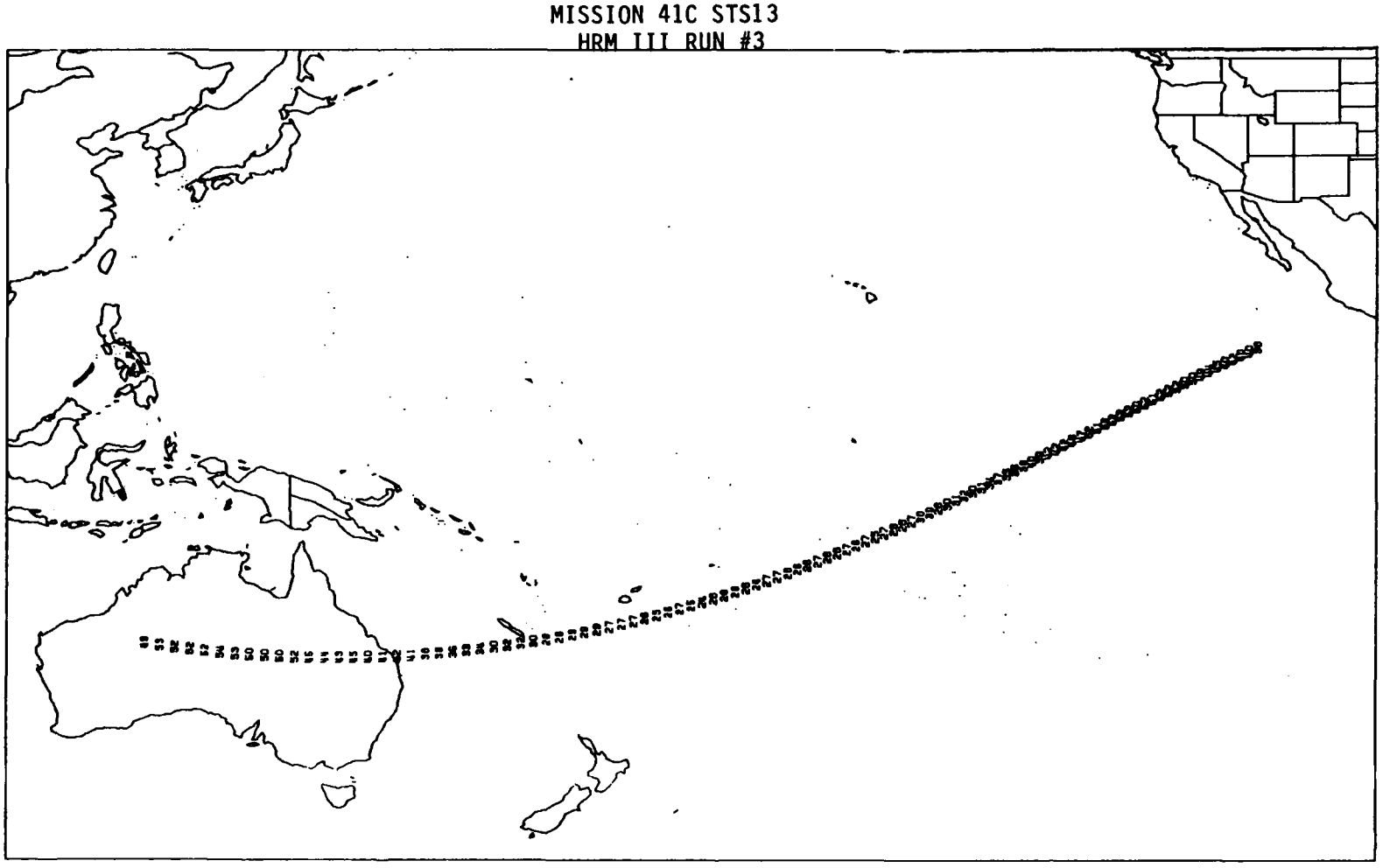
10.80
21.60
32.40
43.20
54.00
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 8



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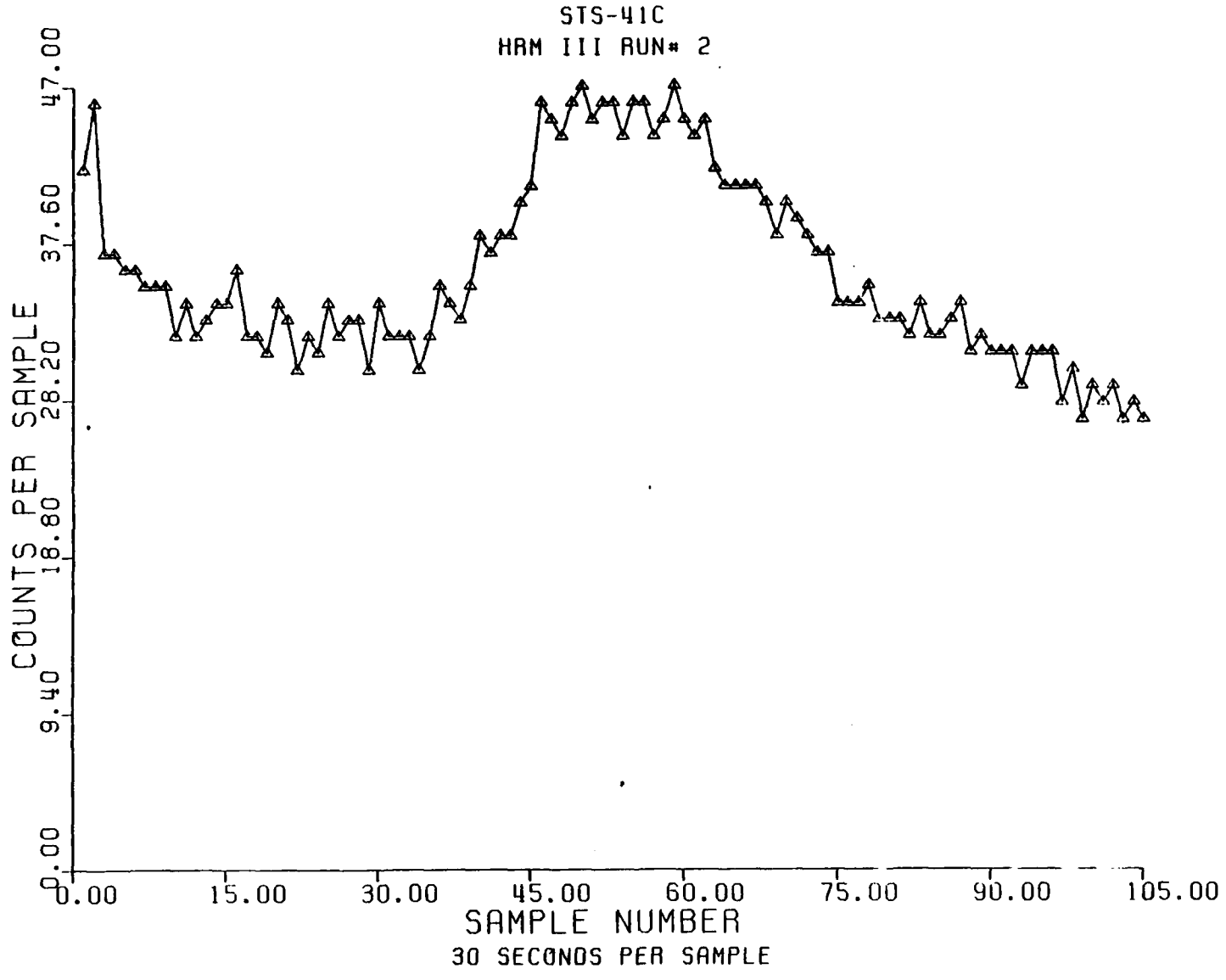

STS-41C
HRM III RUN# 2
COUNTS PER SAMPLE
0.00
9.40
18.80
28.20
37.60
47.00
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 6

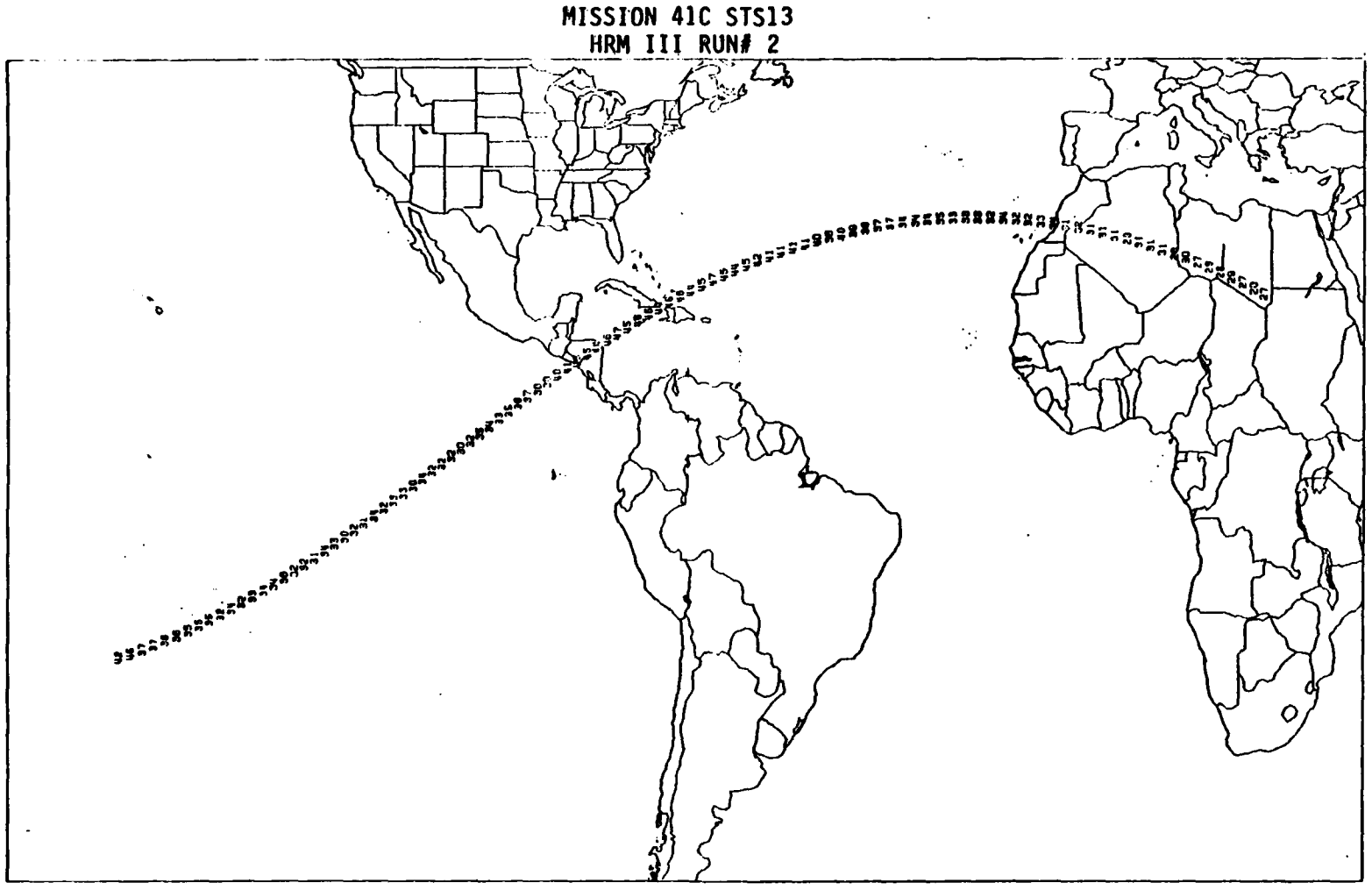


Figure 5

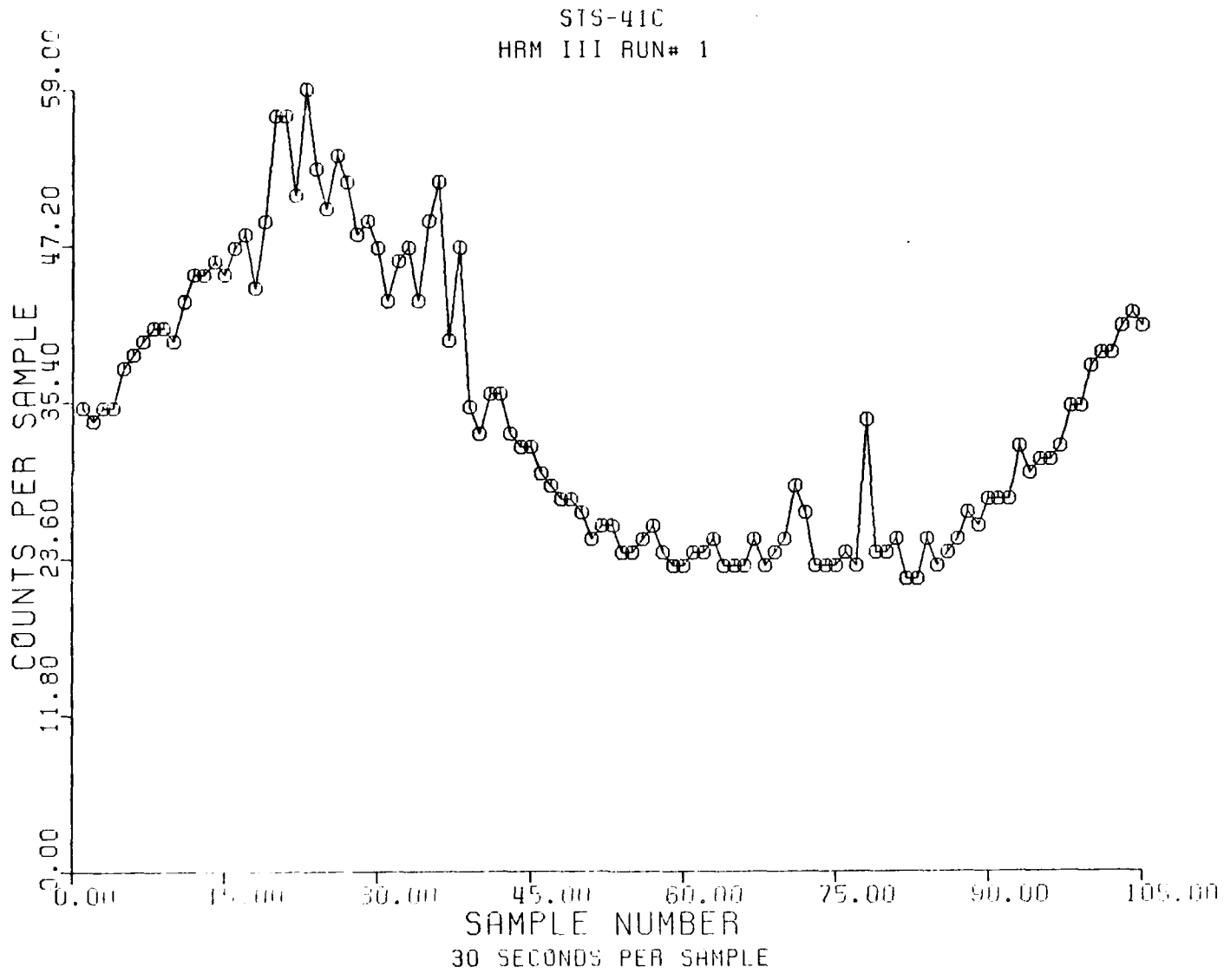

STS-41C
HRM III RUN# 1
COUNTS PER SAMPLE
0.00
11.80
23.60
35.40
47.20
59.00
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 4

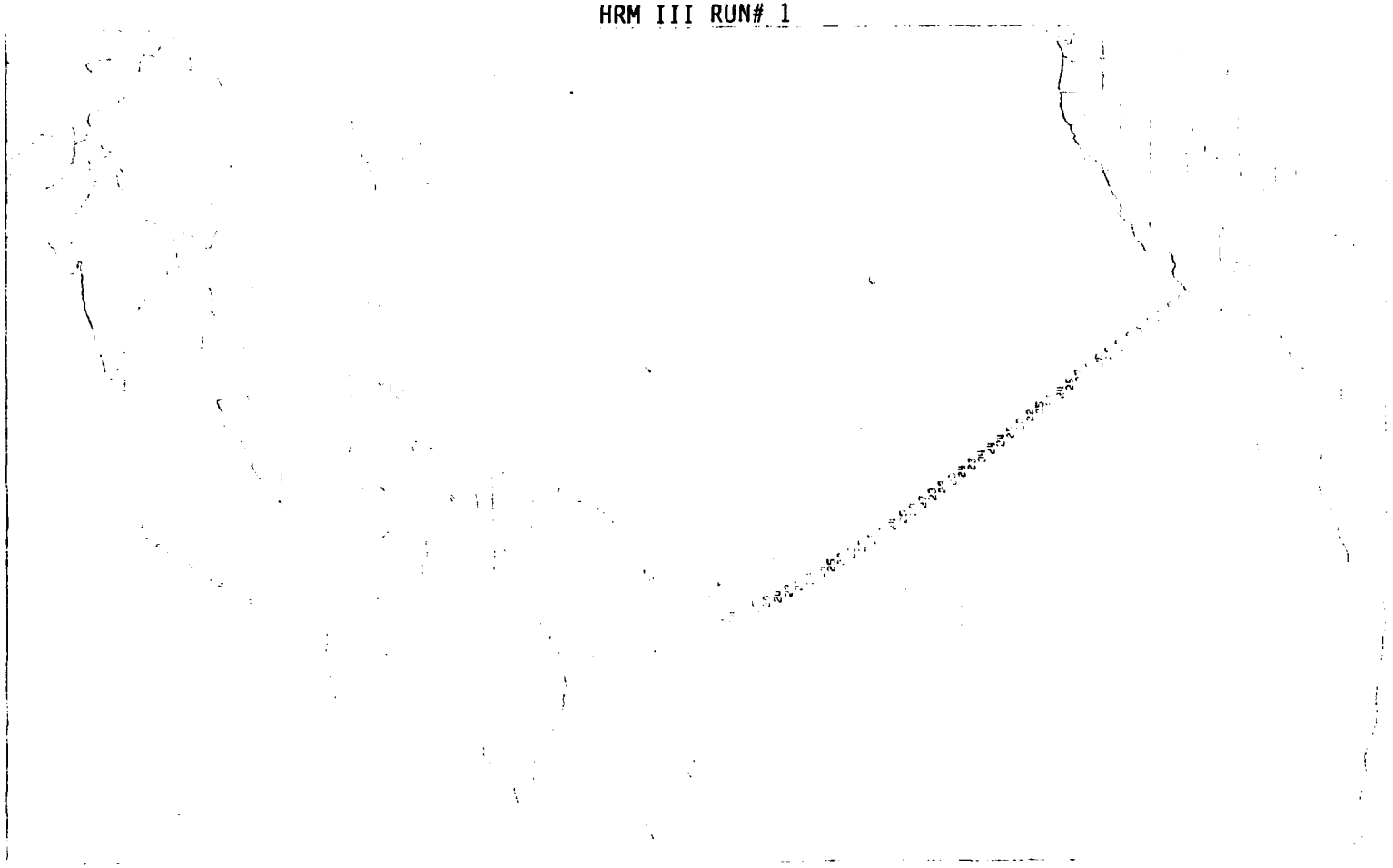


Figure 3

SECTION III

RESULTS

HRM-III.

During the STS-41C, 41D, 41G, and 51A flights, each HRM-III operation lasted 52.5 minutes with the device configured to fill one menory location every 30 seconds. For each flight, the data are presented in two ways. First, average counts per second are plotted on a map of the world, based on the Orbiter's subpoint. Second, average counts per second are plotted against elapsed time since device activation.

STS-41C.

The HRM-III was operated four times during STS-41C. The device performed well with no anomalies experienced.

Figures 3, 5, 7, and 9 show average counts per second plotted on a world map. Figures 4, 6, 8, 10, and 11 show average counts per second plotted against elapsed time.

The four operations produced very similar data. Low count rates are all experienced around the equator and fall between 22 and 27 counts per second. High count rates occur at the higher latitudes and fall between 47 and 59 counts per second.

STS-41D.

The HRM-III was operated six times during STS-41D with no anomalies experienced.

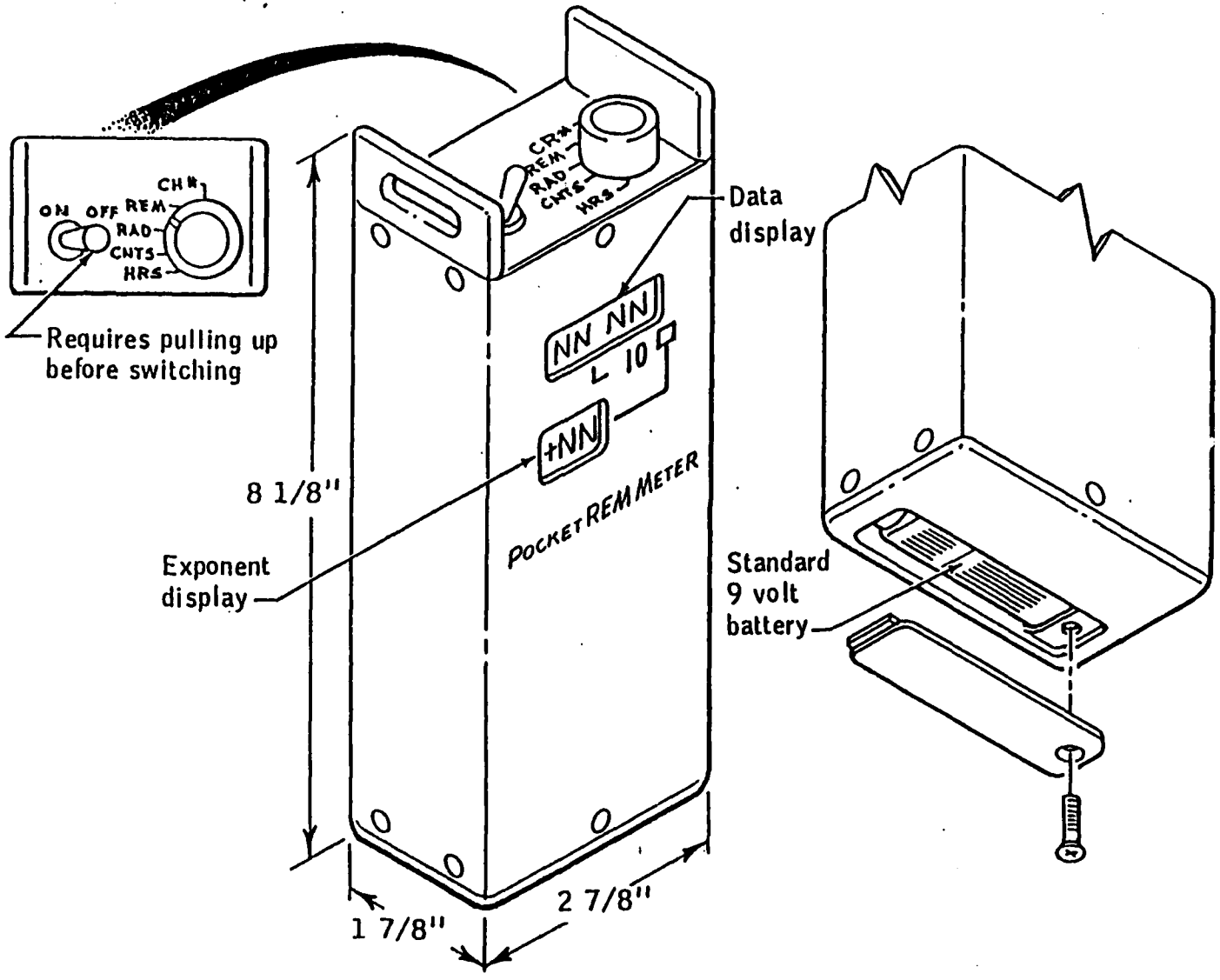
Figures 12, 14, 16, 18, 20, and 22 show average counts per second plotted on a world map. Figures 13, 15, 17, 19, 21, 23, and 24 show average counts per second plotted against elapsed time.

The most significant aspect of the data was seen in run #5 (Figures 20 and 21) when the Orbiter passed through the Southeast Asian Anomaly. Approximately midway through this data take, average count rate rose from 38 counts per second to a high of 117 counts per second and dropped back down to 59 counts per second during a period of 12.5 minutes.

Data from runs 1, 2, 3, 4, and 6 are unremarkable with average count rates ranging from a low of 21 counts per second to a high of 68 counts per second.

STS-41G.

The HRM-III was operated four times during STS-41G. Once again, the device performed well with no anomalies experienced.



Pocket REM Meter (PRM)

Figure 2.

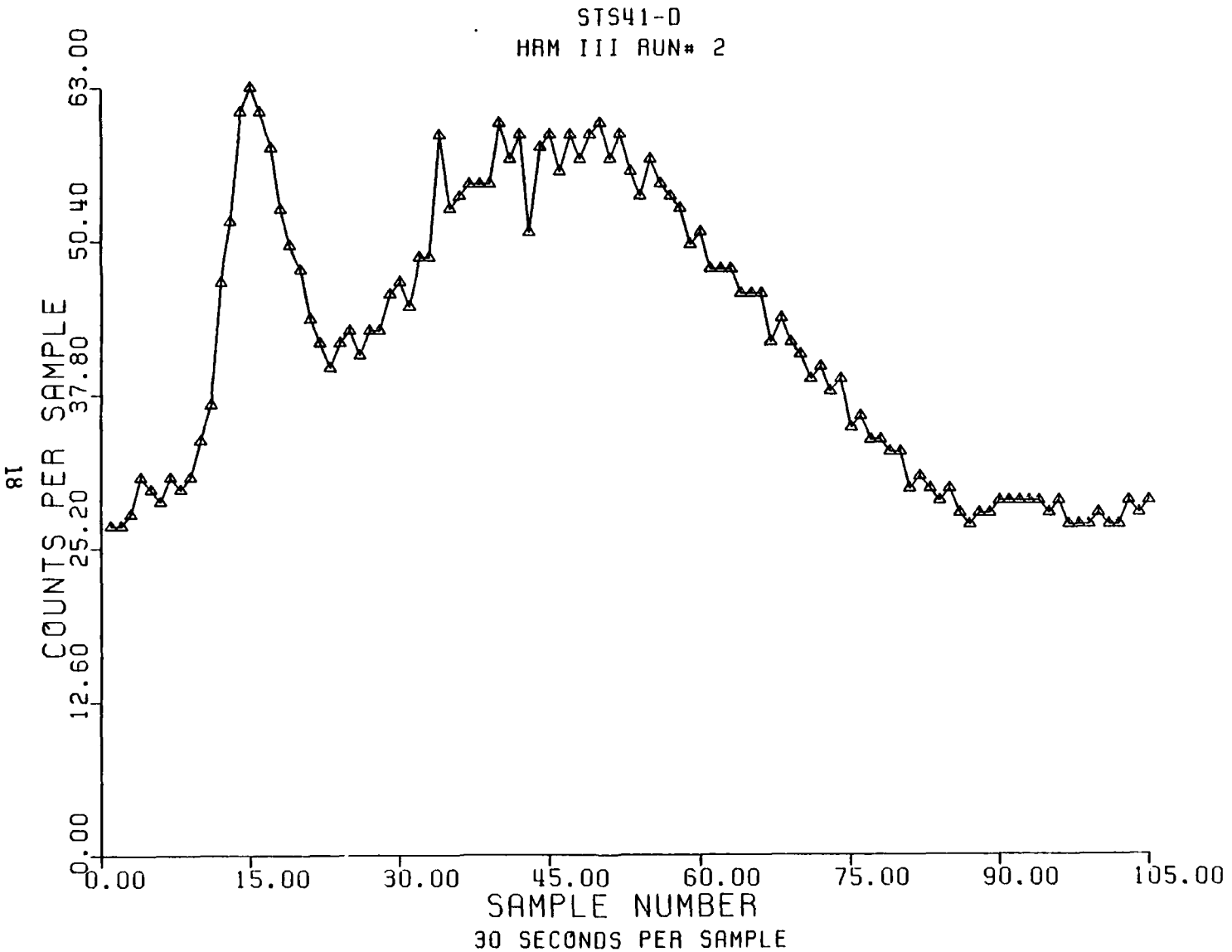
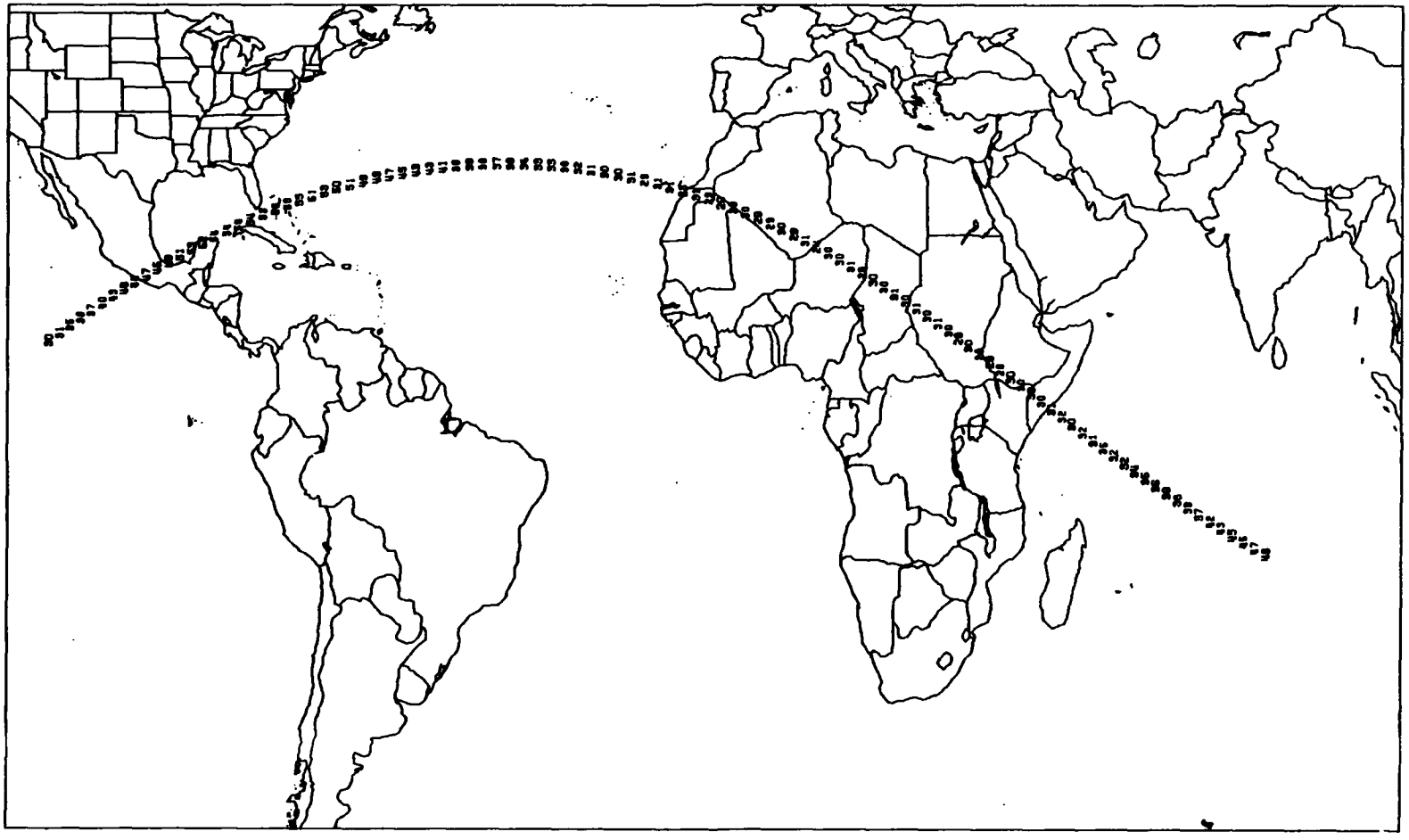

STS41-D
HRM III RUN# 2
COUNTS PER SAMPLE
0.00
12.60
25.20
37.80
50.40
63.00
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 15

HRM-III

OPERATION NO. 3



STS41-D

Figure 16

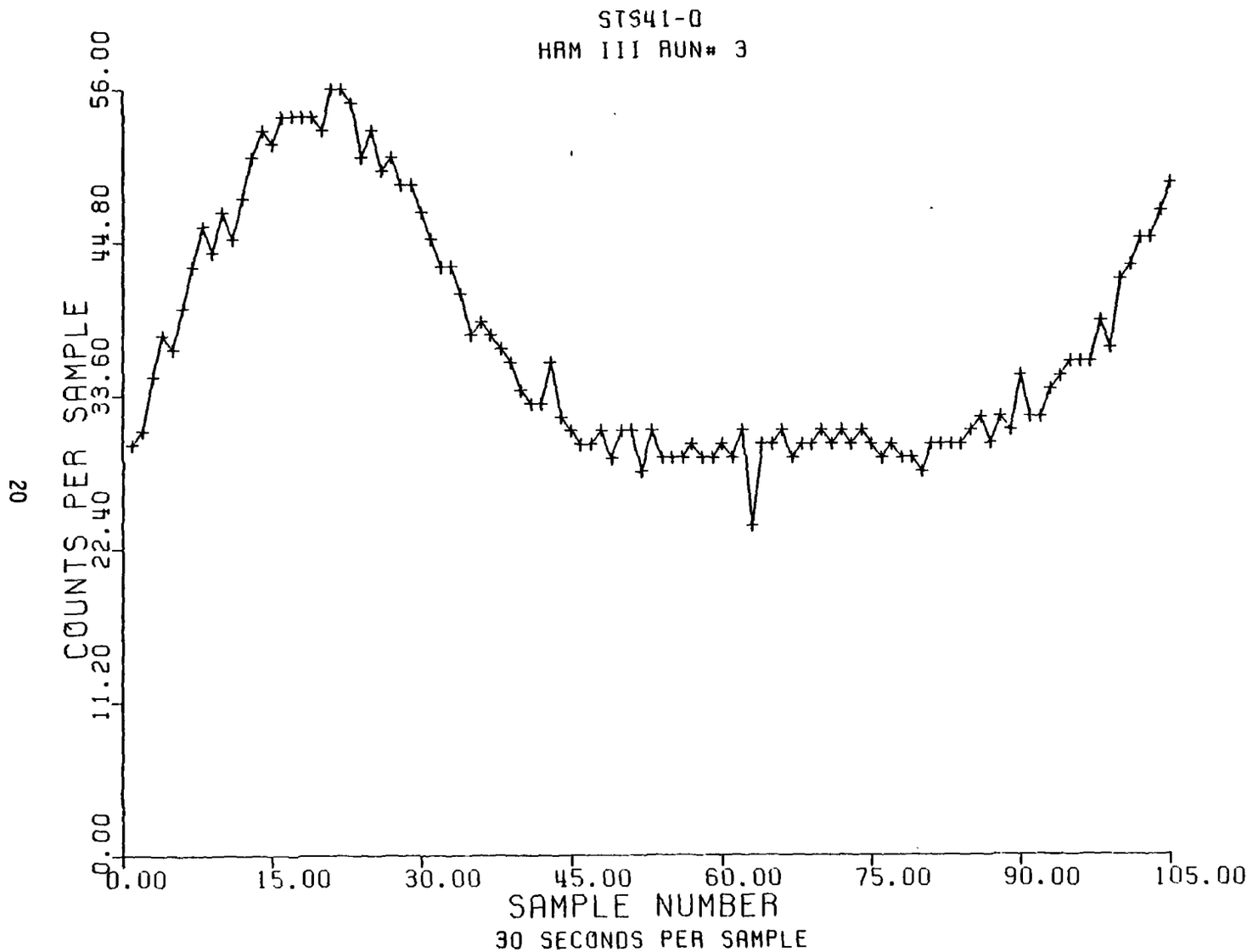
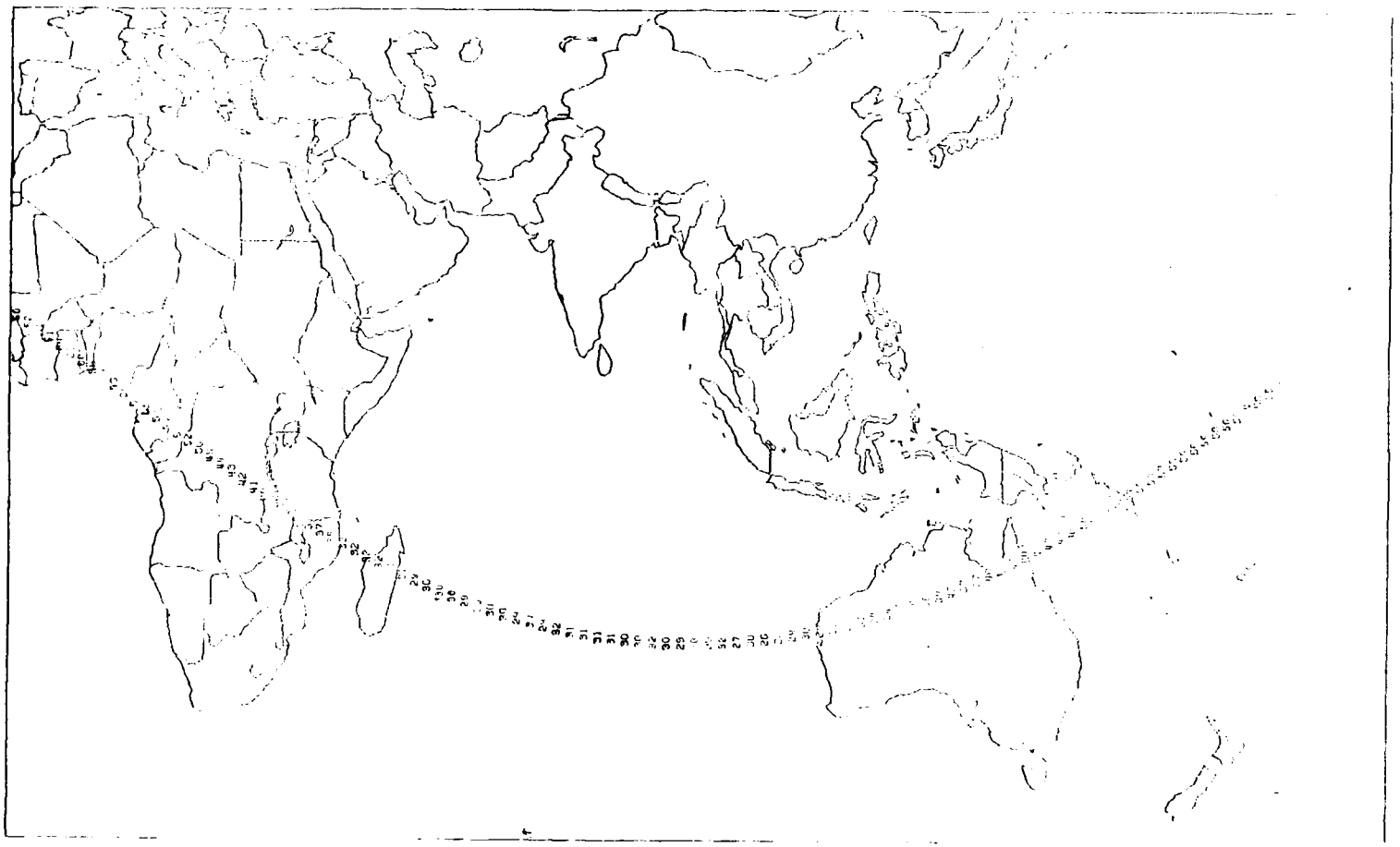

STS41-D
HRM III RUN# 3
COUNTS PER SAMPLE
0.00
11.20
22.40
33.60
44.80
56.00
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 17

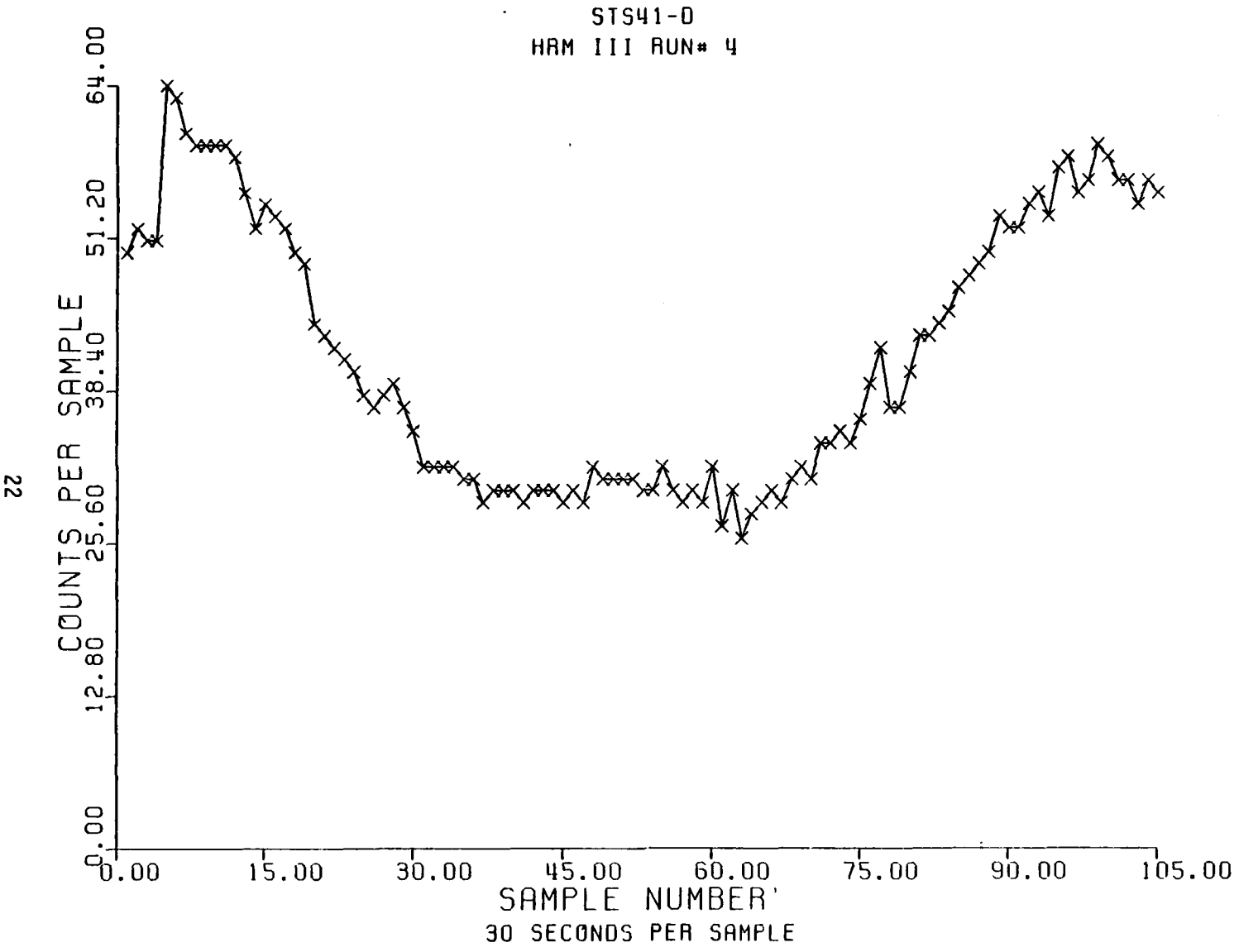
HRM-III

OPERATION NO. 4



STSPT-D

Figure 18


STS41-D
HRM III RUN# 4
COUNTS PER SAMPLE
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12.80
25.60
38.40
51.20
64.00
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 19

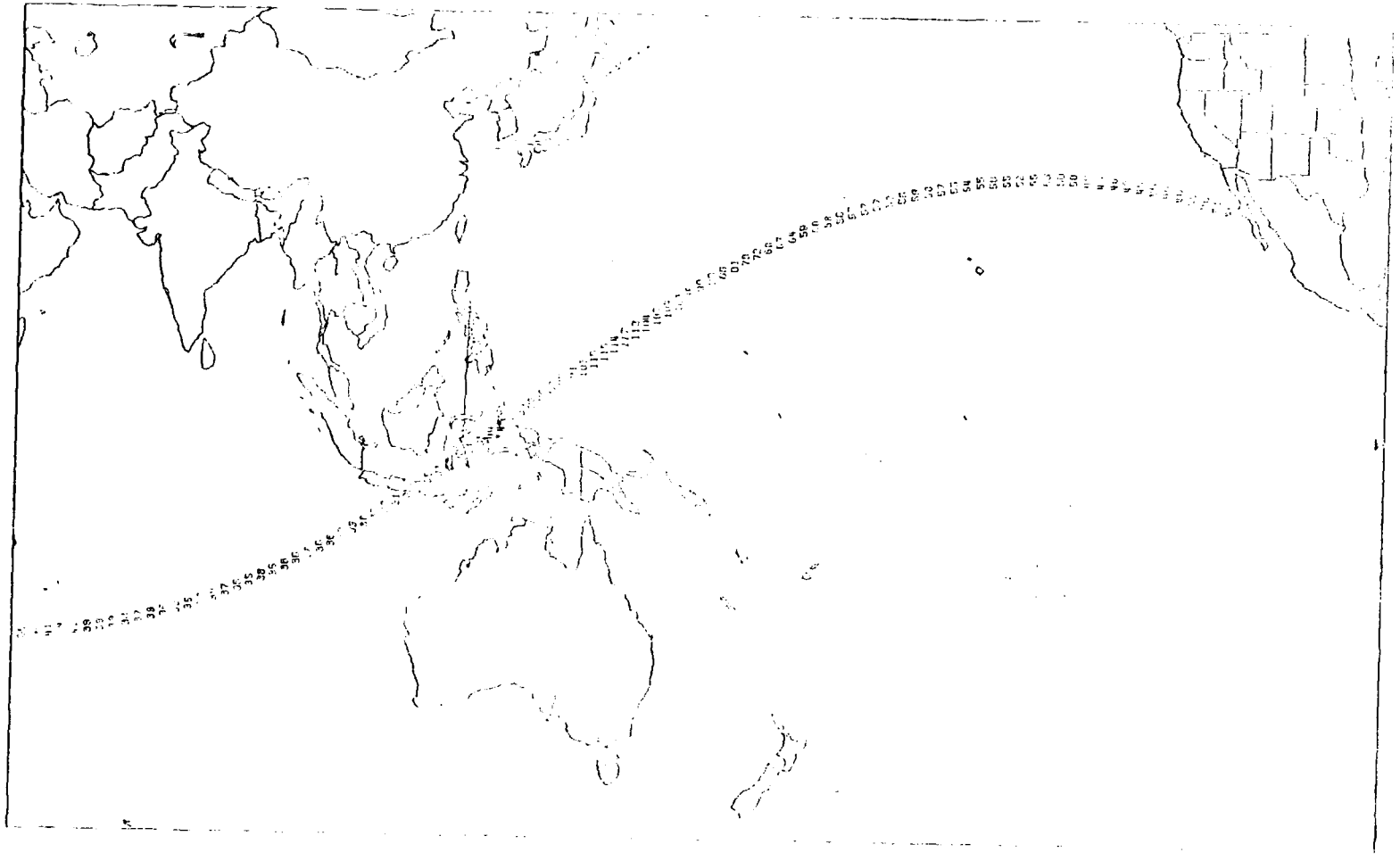


Figure 20

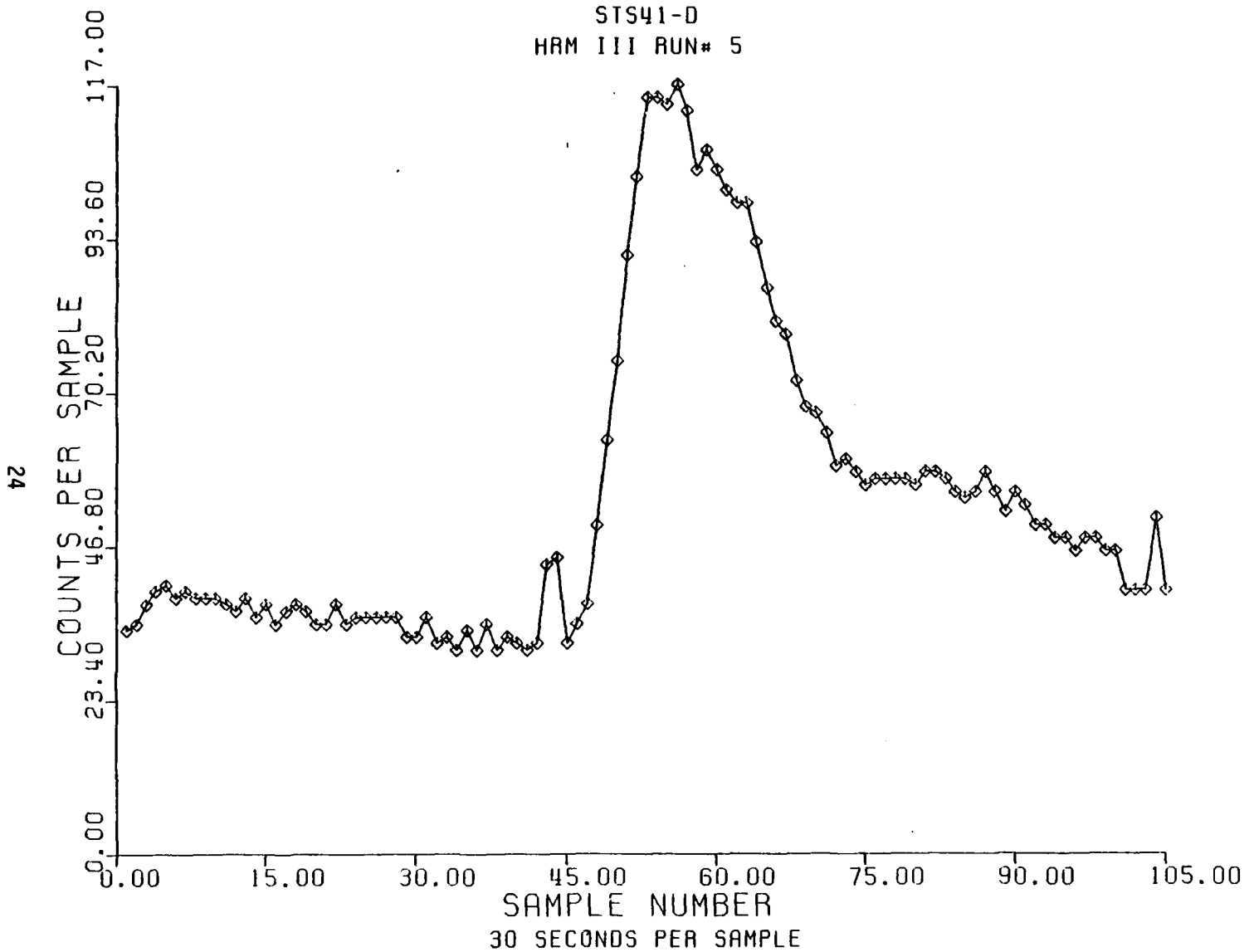
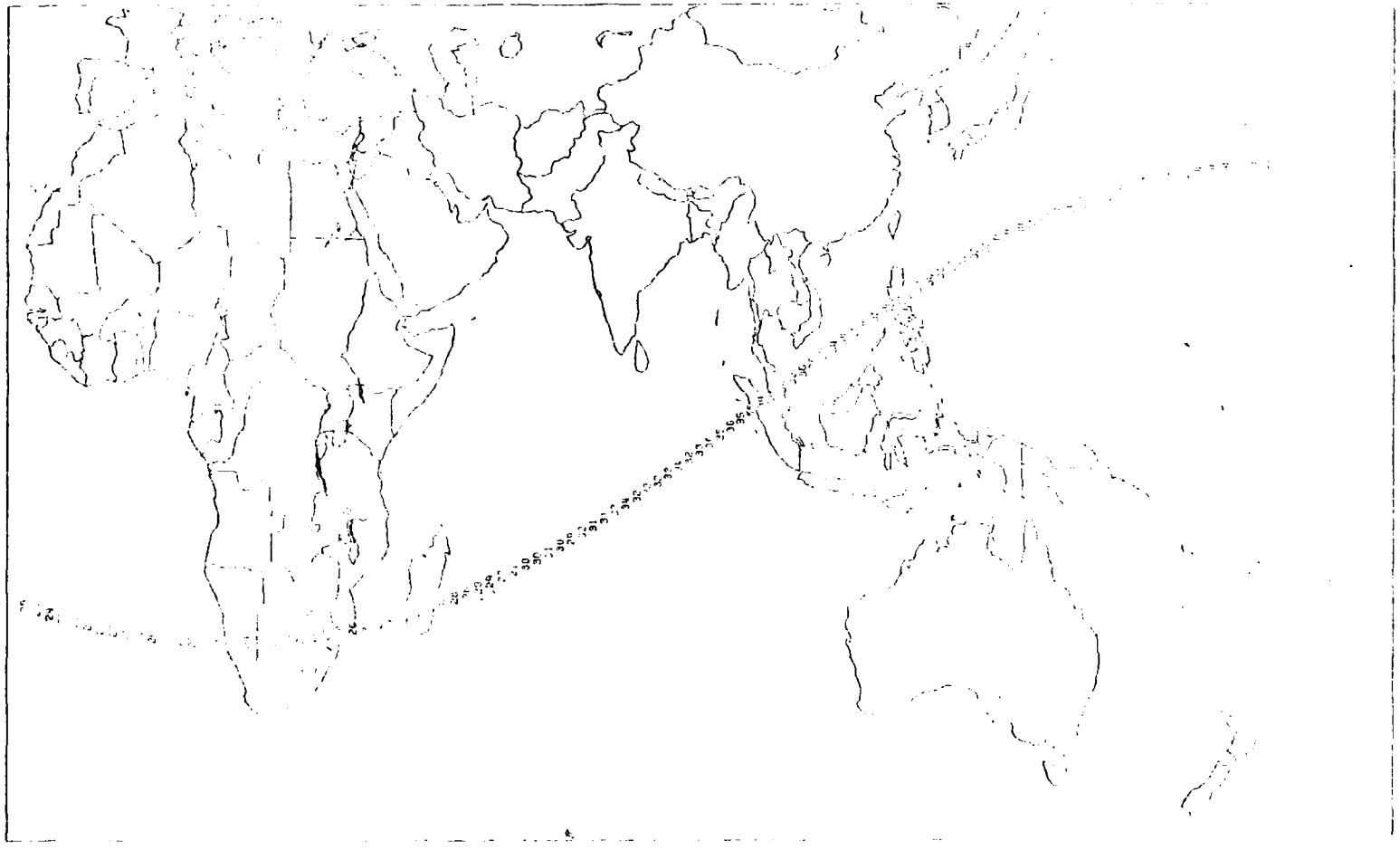

STS41-D
HRM III RUN# 5
COUNTS PER SAMPLE
0.00
23.40
46.80
70.20
93.60
117.00
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 21



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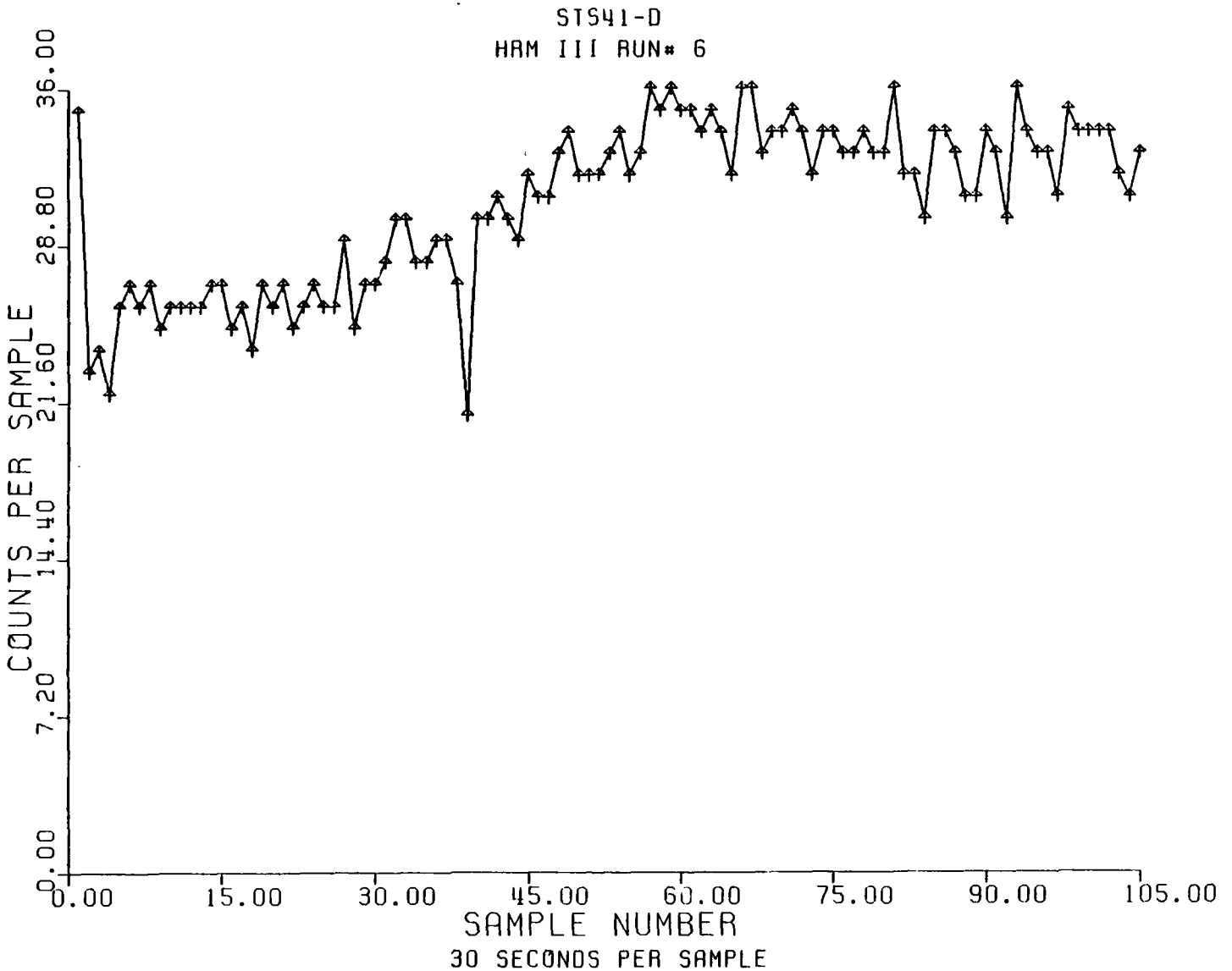
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HAM III RUN# 6
COUNTS PER SAMPLE
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21.60
28.80
36.00
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30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 23

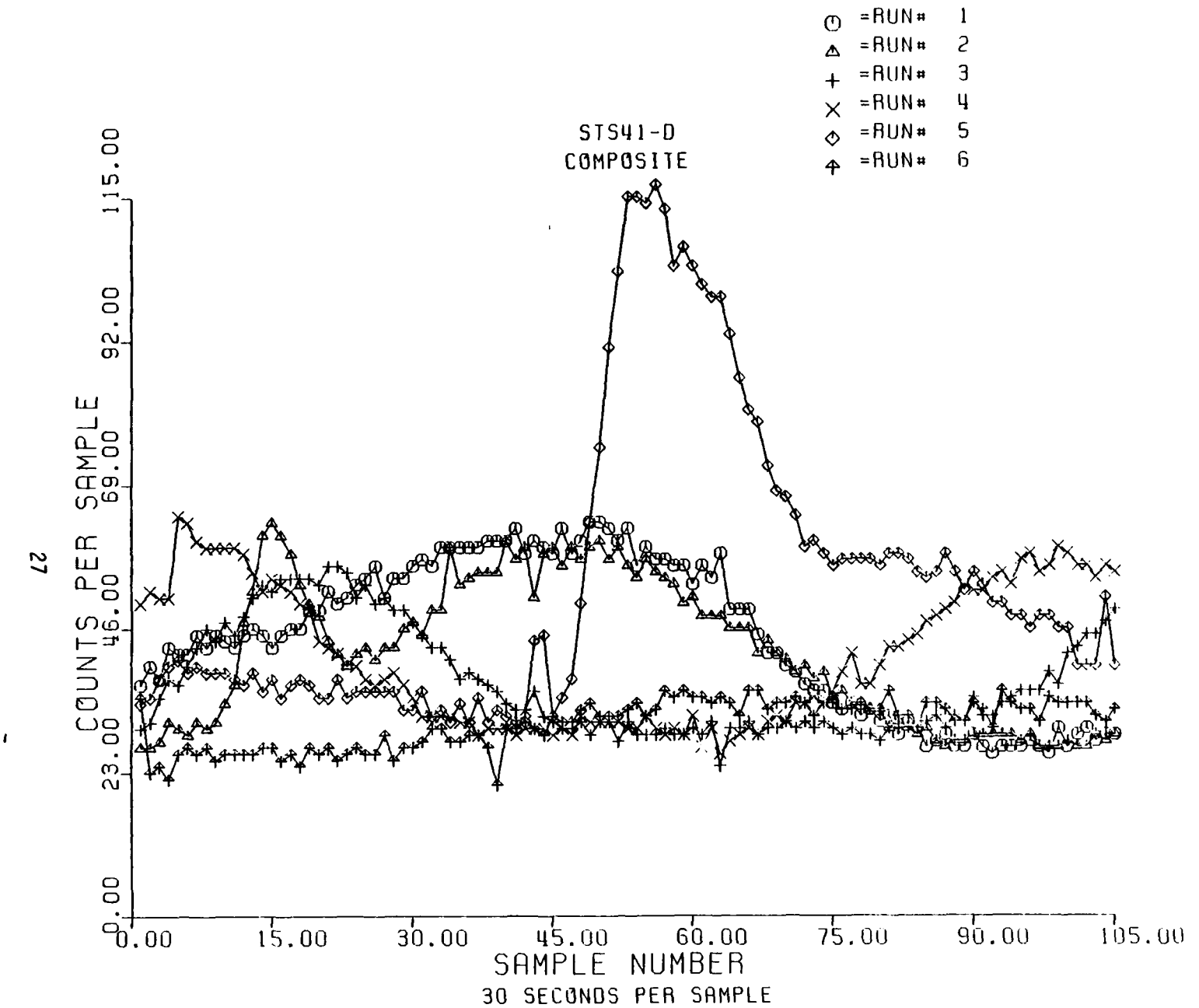

=RUN# 1
=RUN# 2
=RUN# 3
=RUN# 4
=RUN# 5
=RUN# 6
STS41-D
COMPOSITE
COUNTS PER SAMPLE
0.00
23.00
46.00
69.00
92.00
115.00
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 24

Figures 25, 27, 29, and 31 show average counts per second plotted on a world map. Figures 26, 28, 30, 32, and 33 show average counts per second plotted against elapsed time.

The inclination of the STS-41G orbit was 57°, whereas the inclinations of STS-41C, 41D, and 51A were 28.5°. Data taken at the higher latitudes covered by STS-41G show significantly higher count rates than those of the lower inclination orbits. There is a greater population of trapped particles at higher latitudes and the increased interaction of the particles with the Orbiter results in higher levels of nuclear radiation.

Another interesting characteristic of the data was seen during operation #1. Near the end of the data take, the average count rate increases dramatically to a high of 2518 counts per second. These readings, the highest of any of the RME Shuttle experiments are clearly the result of passing through the South Atlantic Anomaly.

During operation #3 (refer to figures 29 and 30), a severe spike in count rate occurred near the beginning of the run. The readings for four consecutive sampling periods were 324, 2227, 761, and 146 counts per second. The unusual appearance, that is the narrow width of the spike, is attributed to the effect of the 30 second sampling period of the HRM-III as configured for these experiments. Better resolution of this data would have required a finer sampling rate.

STS-51A.

The STS-51A crew performed four HRM-III operations. No anomalies were experienced.

Figures 34, 36, 38, and 40 show average counts per second plotted on a world map. Figures 35, 37, 39, 41, and 42 show average counts per second plotted against elapsed time.

For the most part, HRM-III data from this flight are unremarkable. Average count rates for the four operations range from a low of 23 counts per second to a high of 63 counts per second. A pass through the Southeast Asian Anomaly is evident in operation number one where average count rate climbs gradually from 27 counts per second over Australia to a high of 58 counts per second and then falls down to 31 counts per second near the Pacific coast of Mexico (see figure 34).

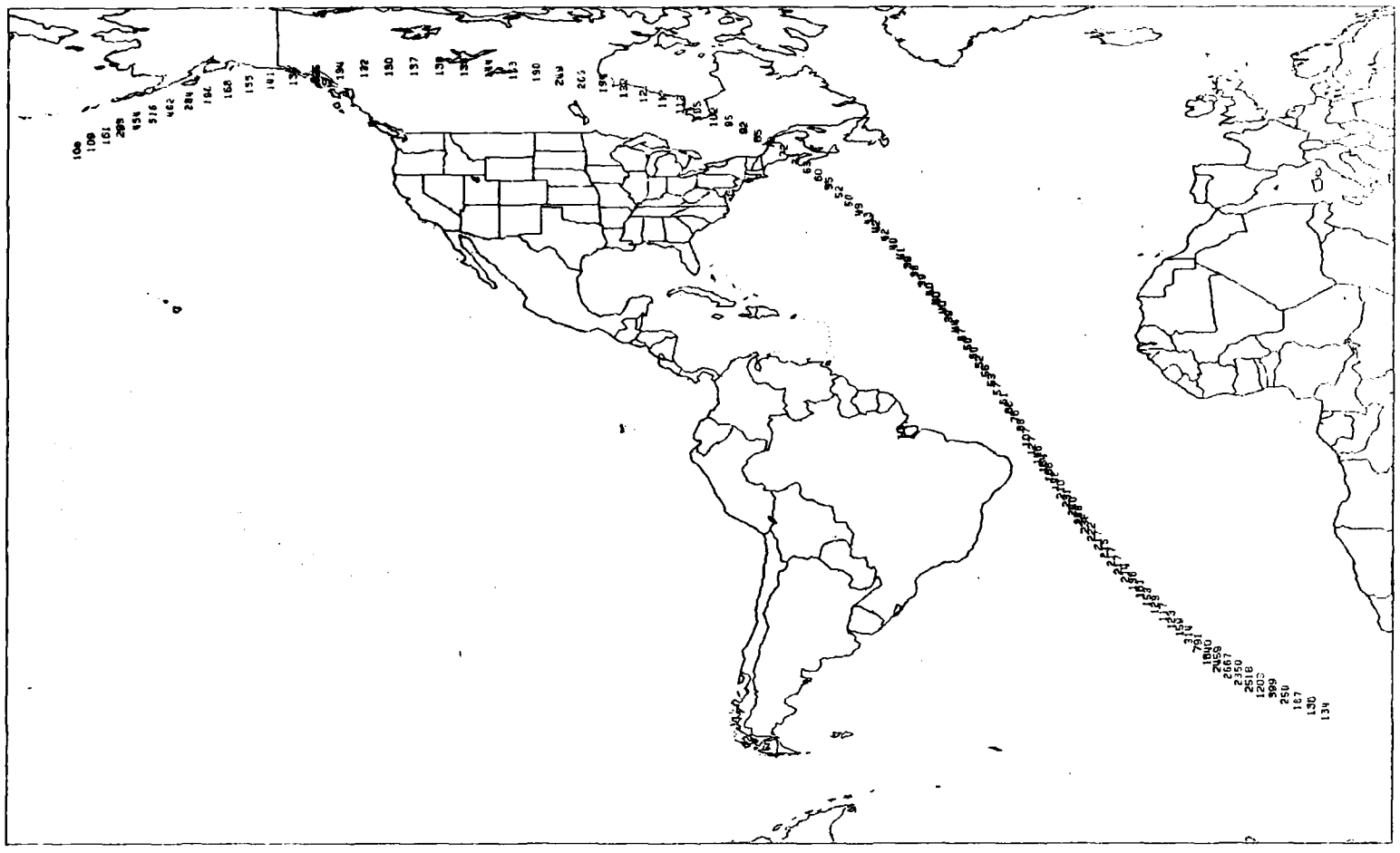
PRM.

During the STS-41C, 41D, 41G, and 51A flights, ten PRM operations were attempted. The first operation during STS-41C failed, presumably due to a low battery. All other data takes were successful. PRM data are presented in tables 1 through 8.

PRM operations on all four flights lasted between 7.95 and 17.65 hours. Average dose rates for these operations ranged between .211 mrem/hr (.0217 mrad/hr) and 1.2421 mrem/hr (.1025 mrad/hr), and estimated total mission

HRM-III

OPERATION NO. I



STS41-G

Figure 25

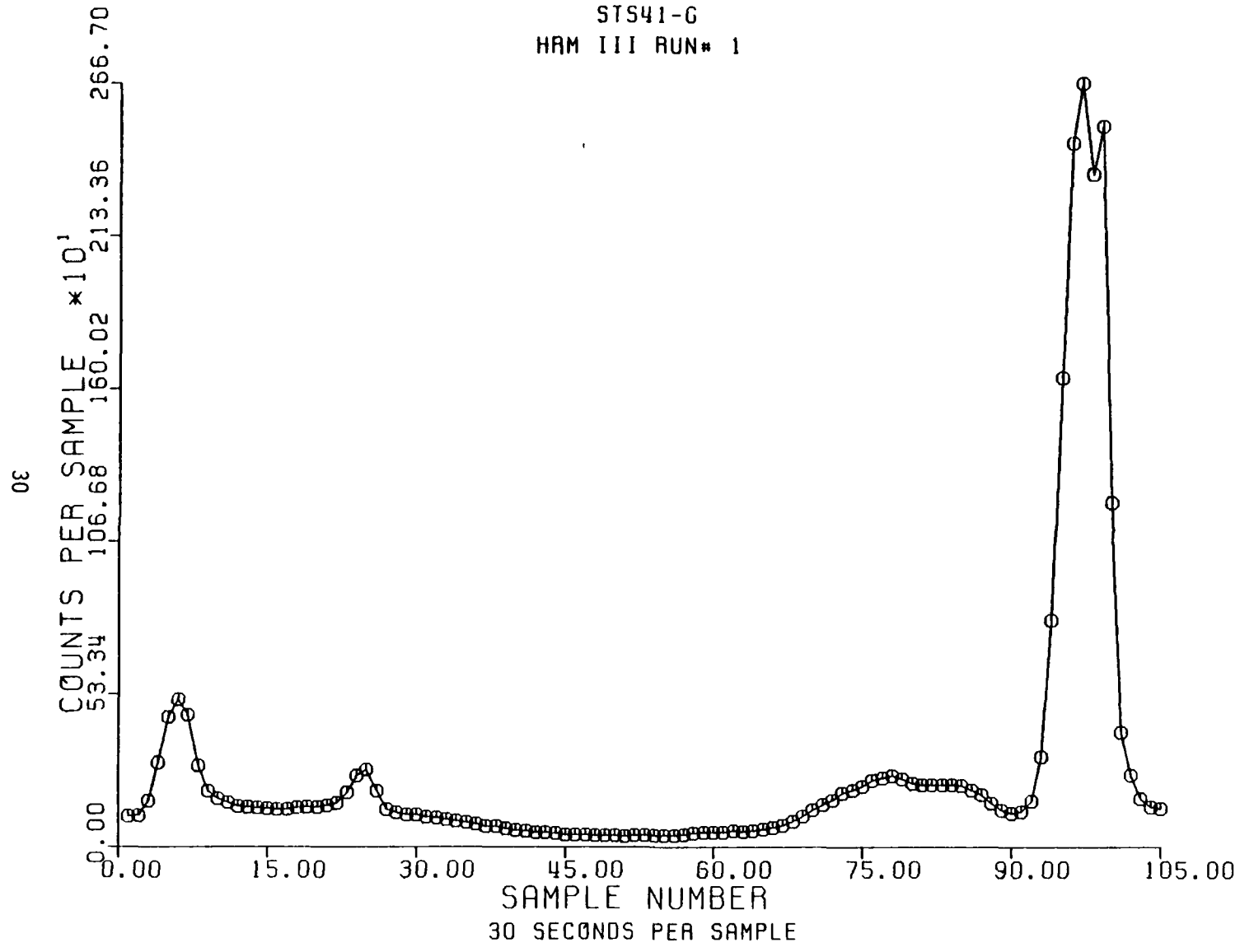
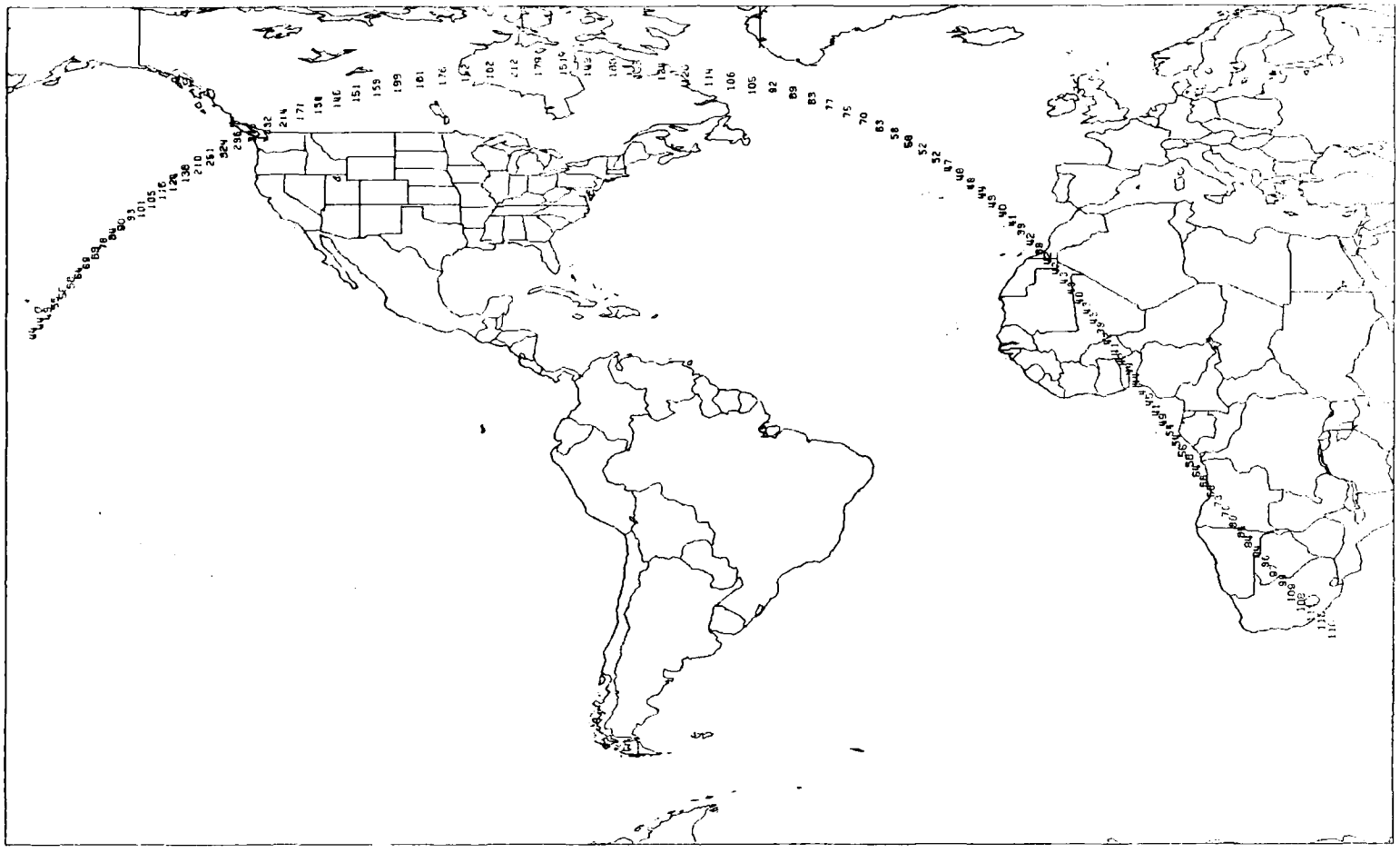

STS41-G
HAM III RUN# 1
COUNTS PER SAMPLE *10¹
0.00
53.34
106.68
160.02
213.36
266.70
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 26

OPERATION NO. 2



STS41-G

Figure 27

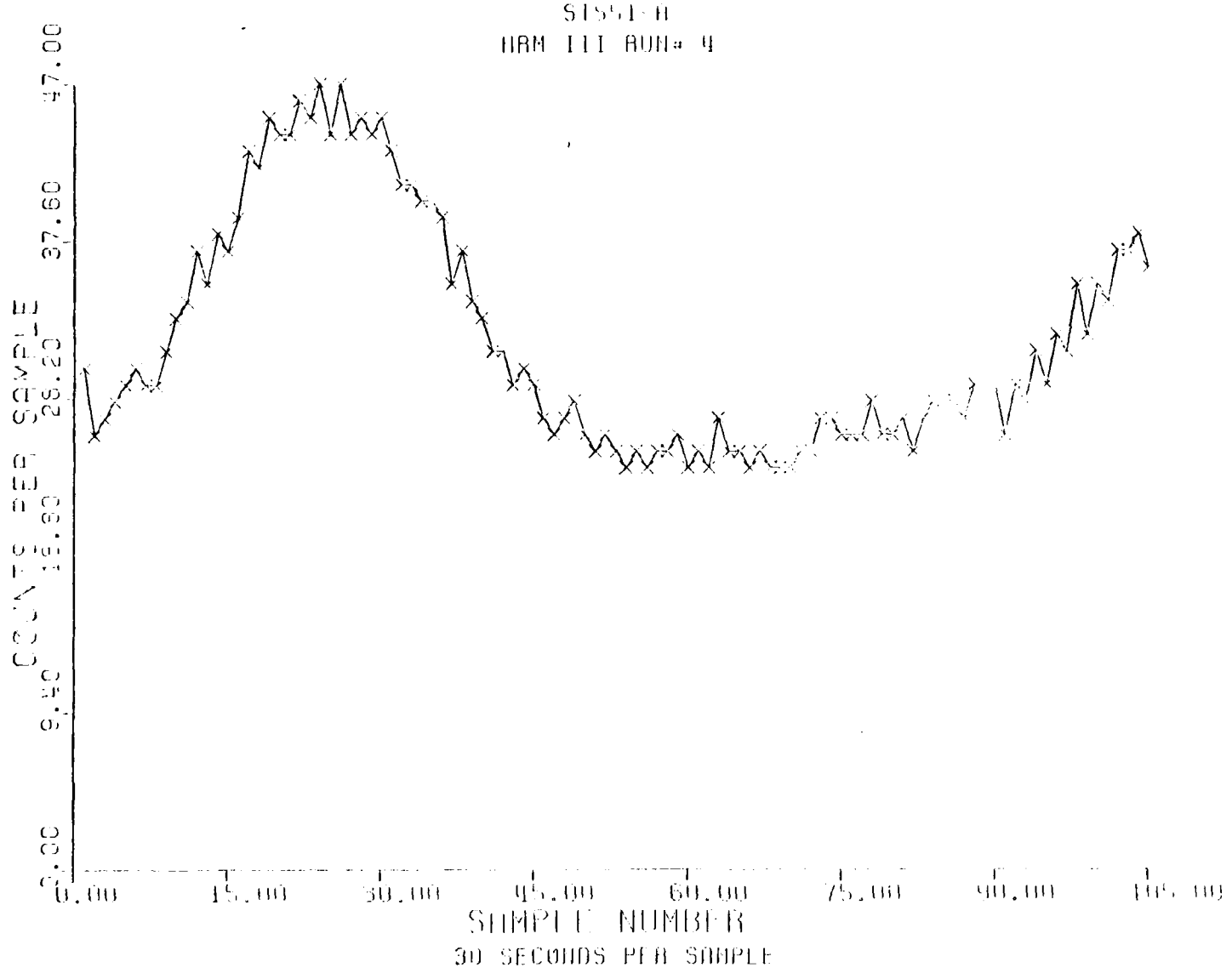

HRM III RUN= 4
47.00
37.60
28.20
18.80
9.40
0.00
COUNTS PER SAMPLE
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 41

HRM-III

OPERATION NO. 4

STS-51A

Figure 40

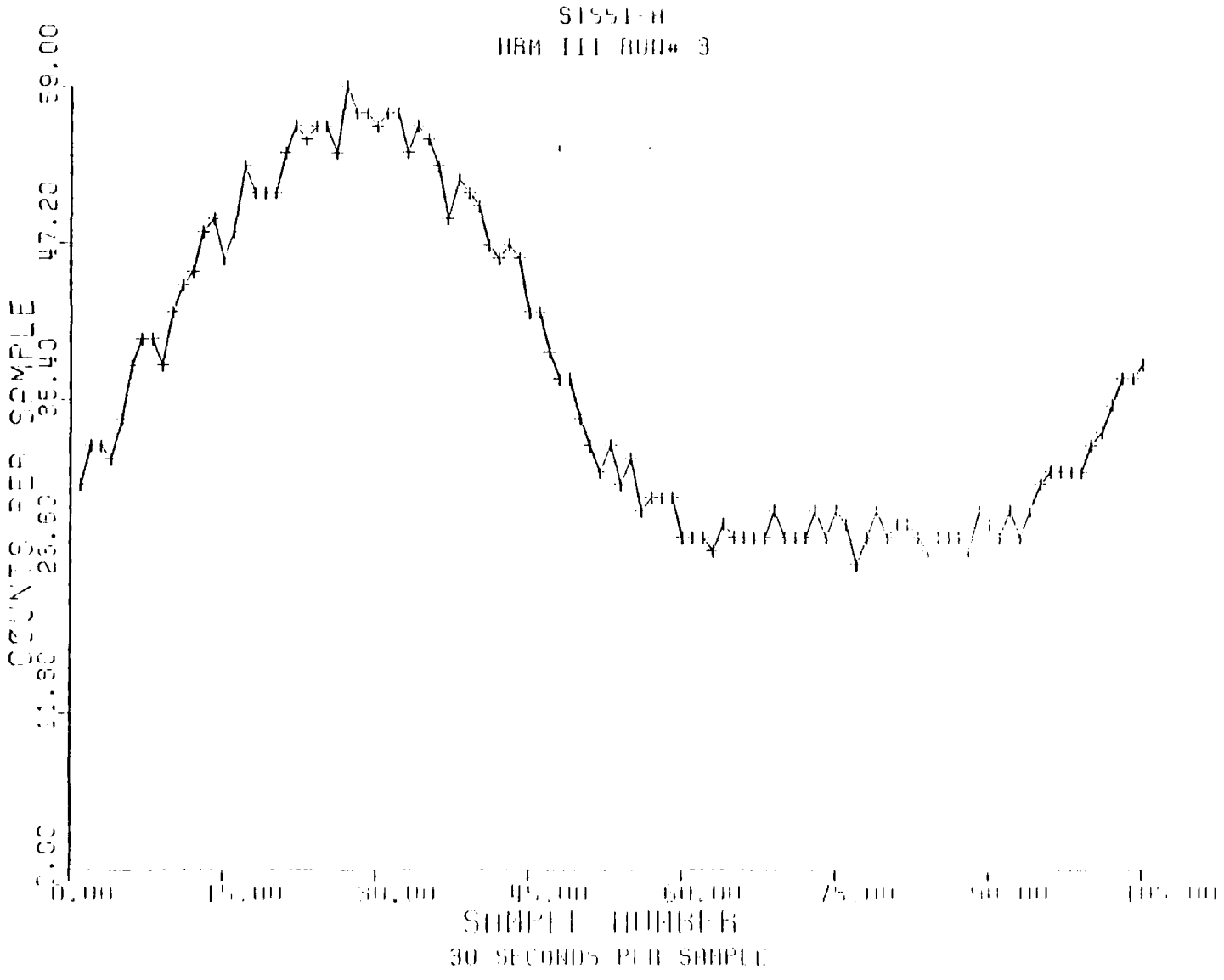
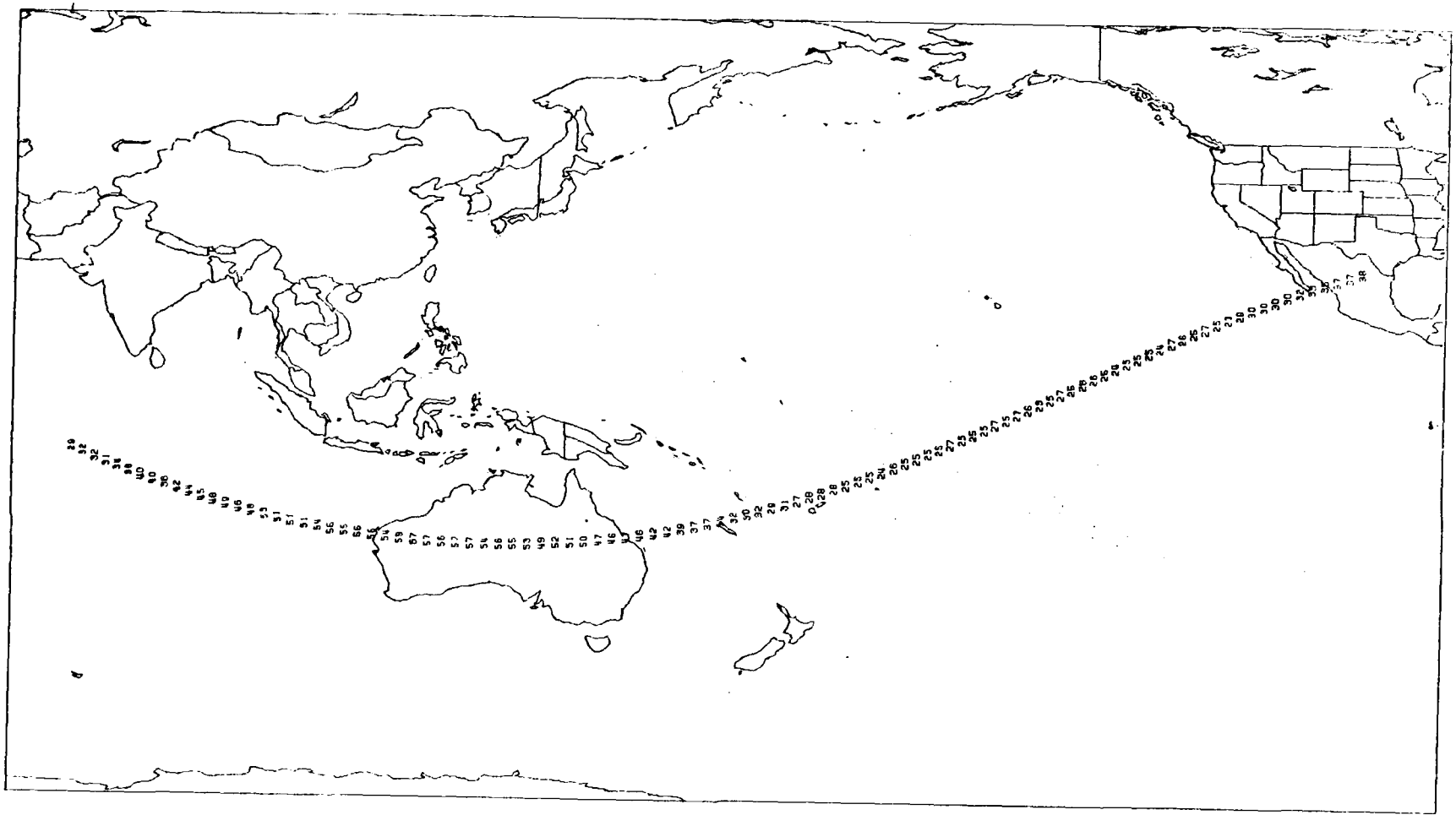

S1551-H
HRM III RUN# 3
59.00
47.20
35.40
23.60
11.80
0.00
COUNTS PER SAMPLE
0.000
30.000
60.000
90.000
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 39

HRM-III

OPERATION NO. 3



STS-51A

Figure 38

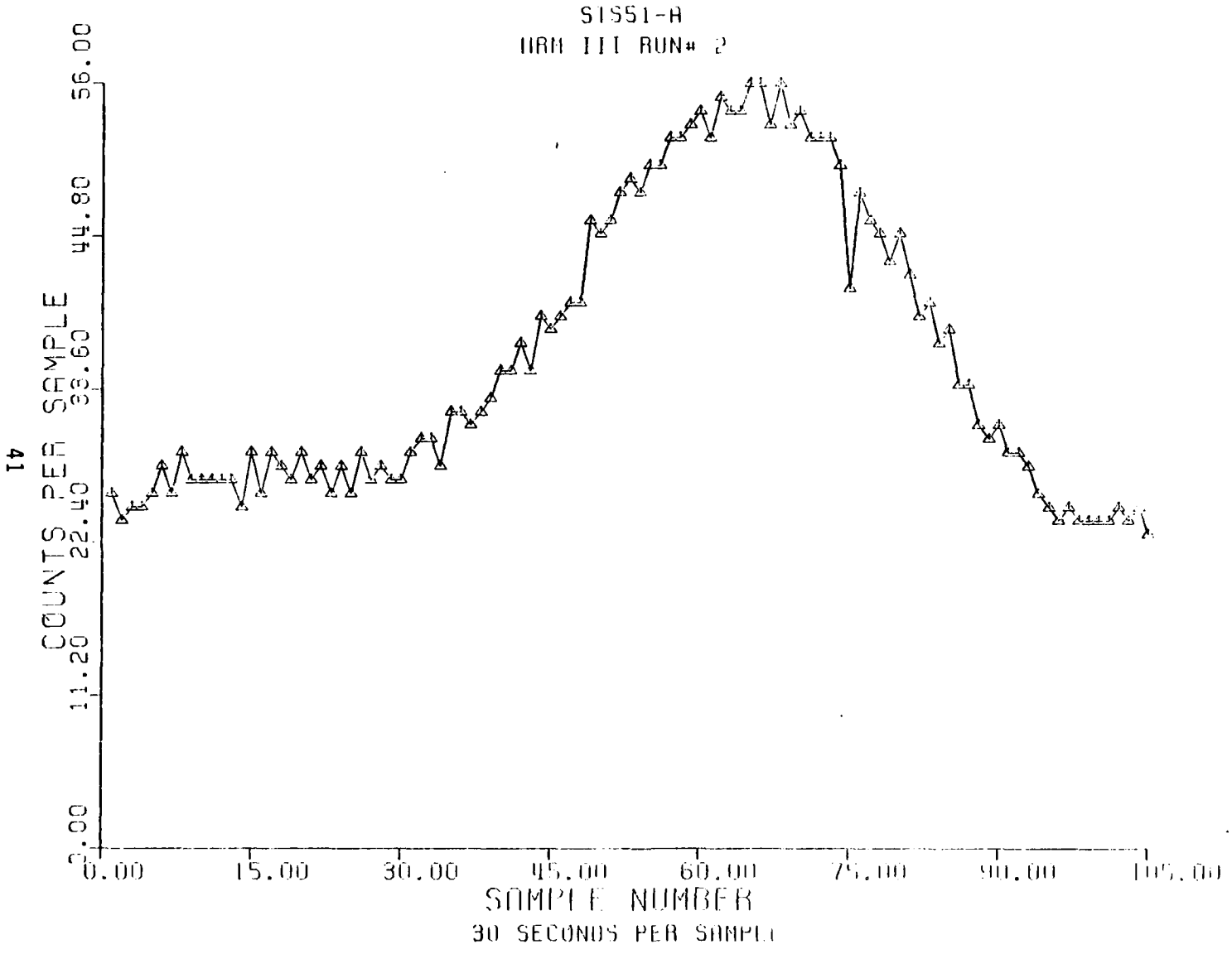
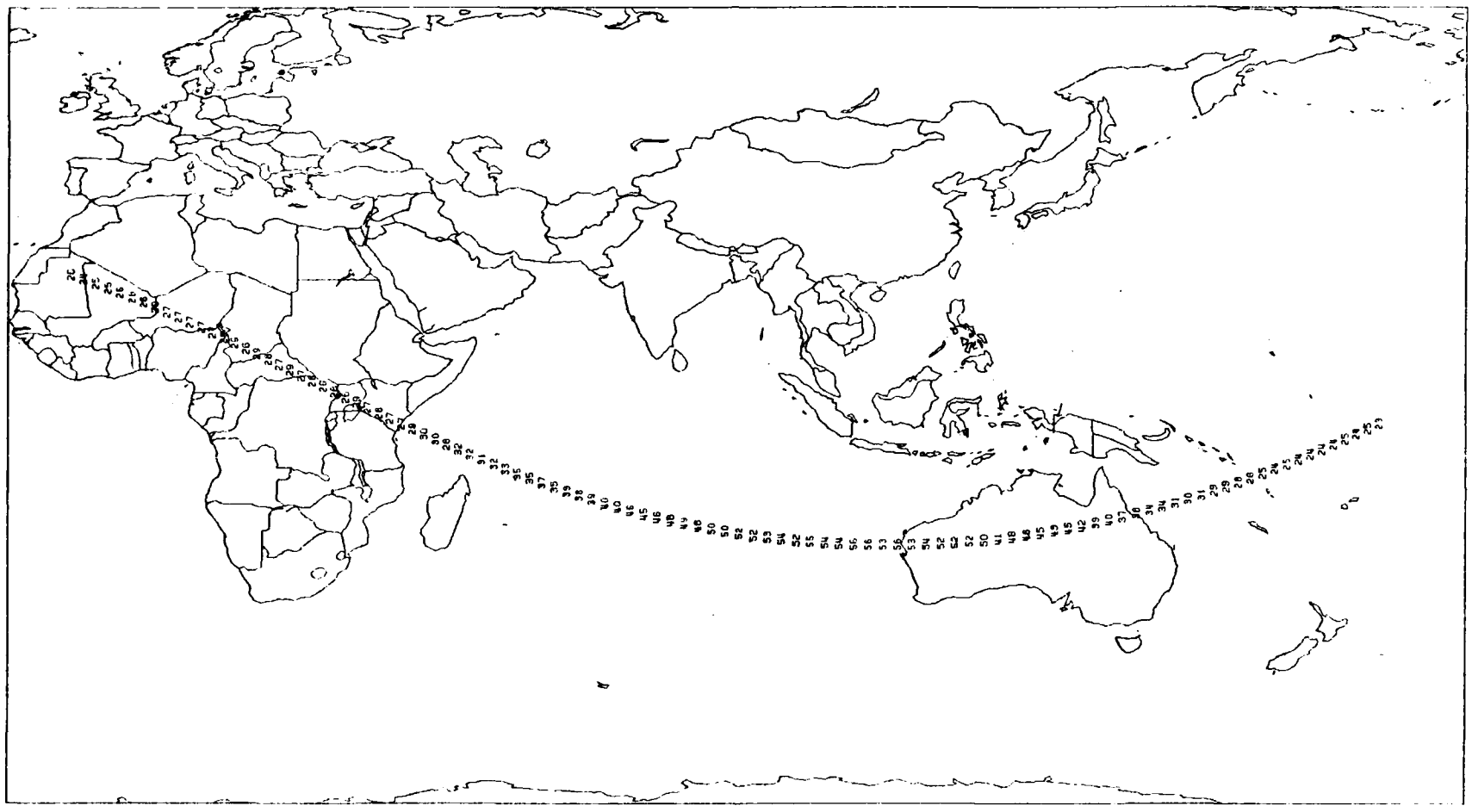

S1S51-A
HRM III RUN# 2
COUNTS PER SAMPLE
0.00
11.20
22.40
33.60
44.80
56.00
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 37

HRM-III

OPERATION NO. 2



STS-51A

Figure 36

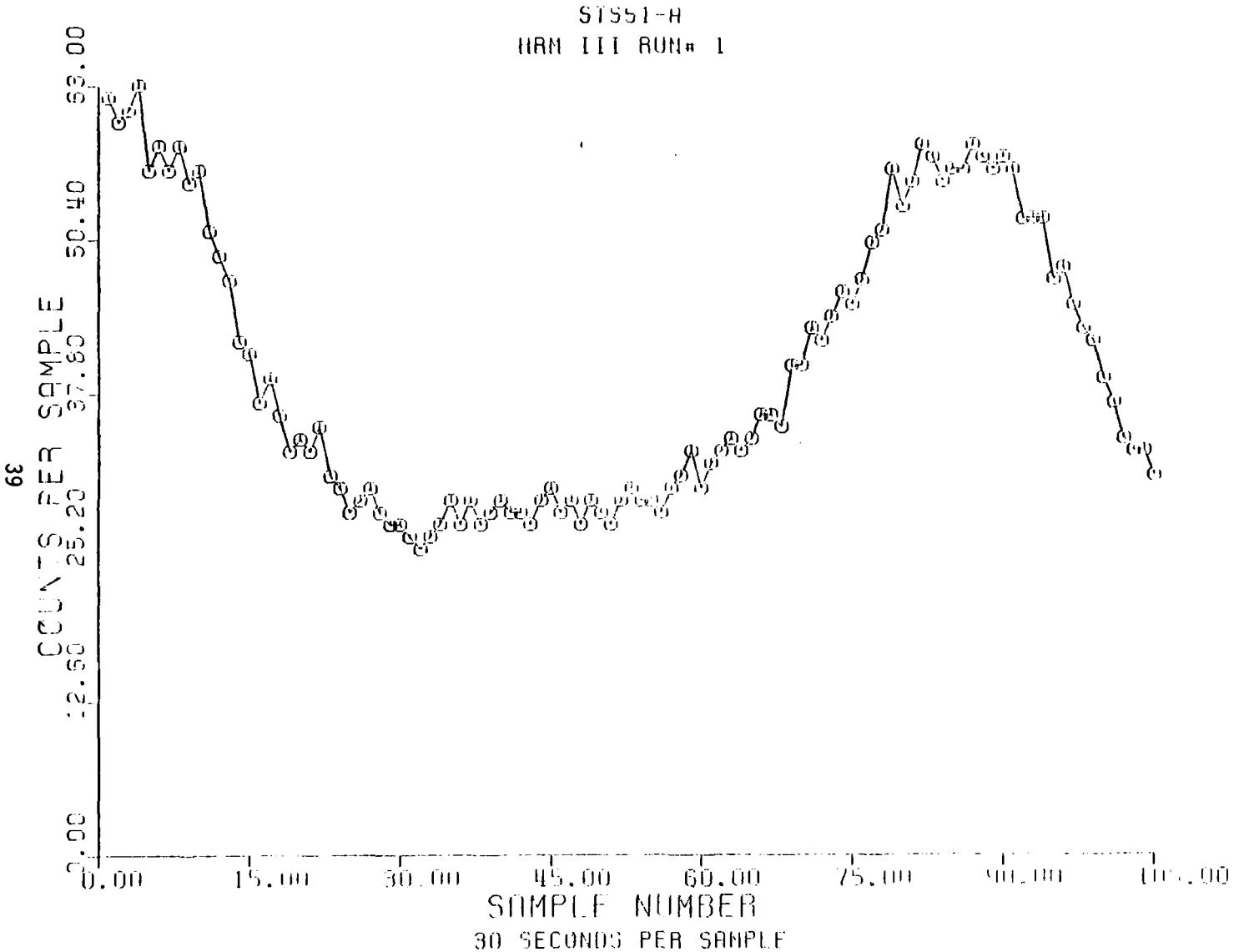
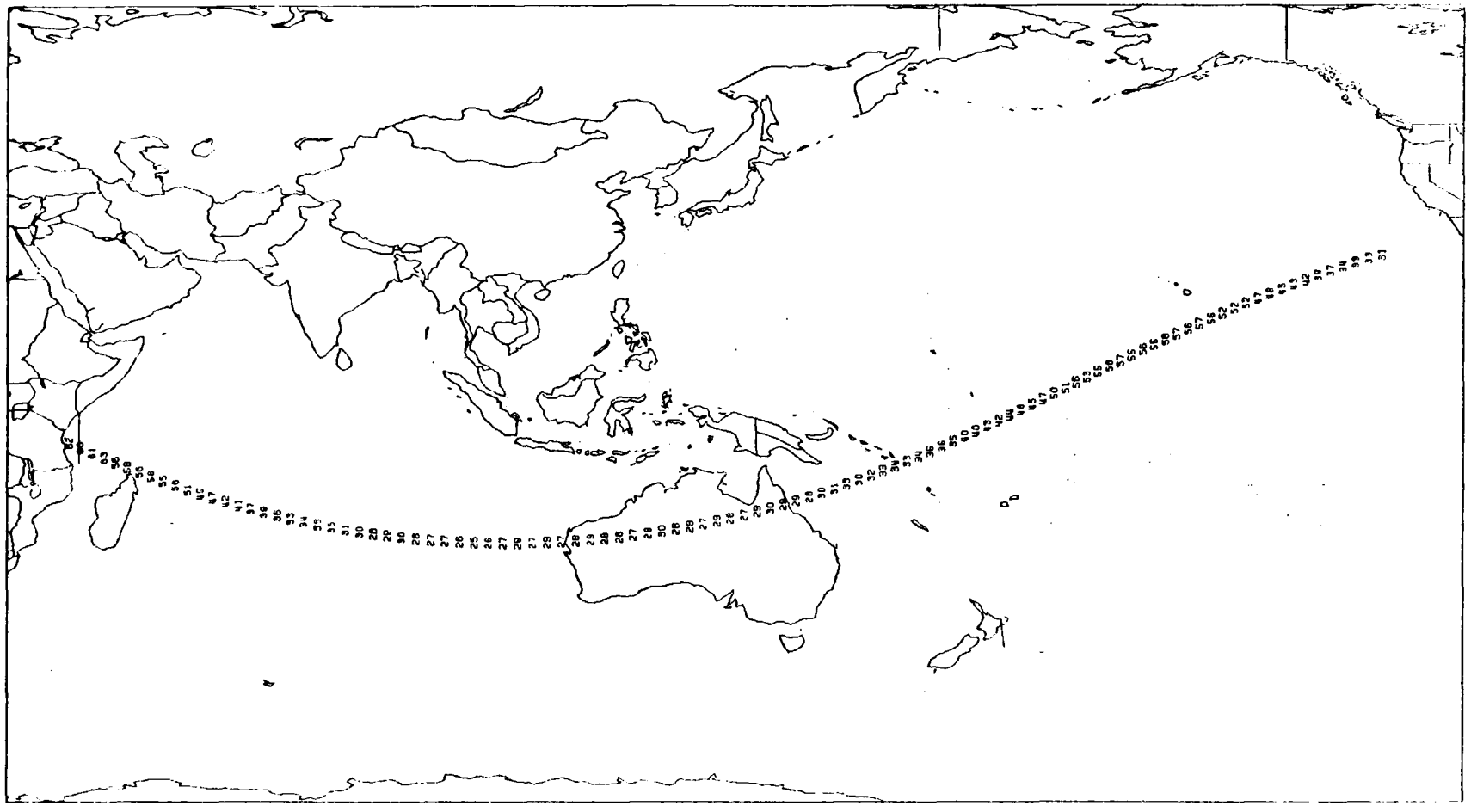

STS51-H
HRM III RUN= 1
COUNTS PER SAMPLE
39
0.00
12.60
25.20
37.80
50.40
63.00
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 35

HRM-III

OPERATION NO. 1



STS-51A

Figure 34

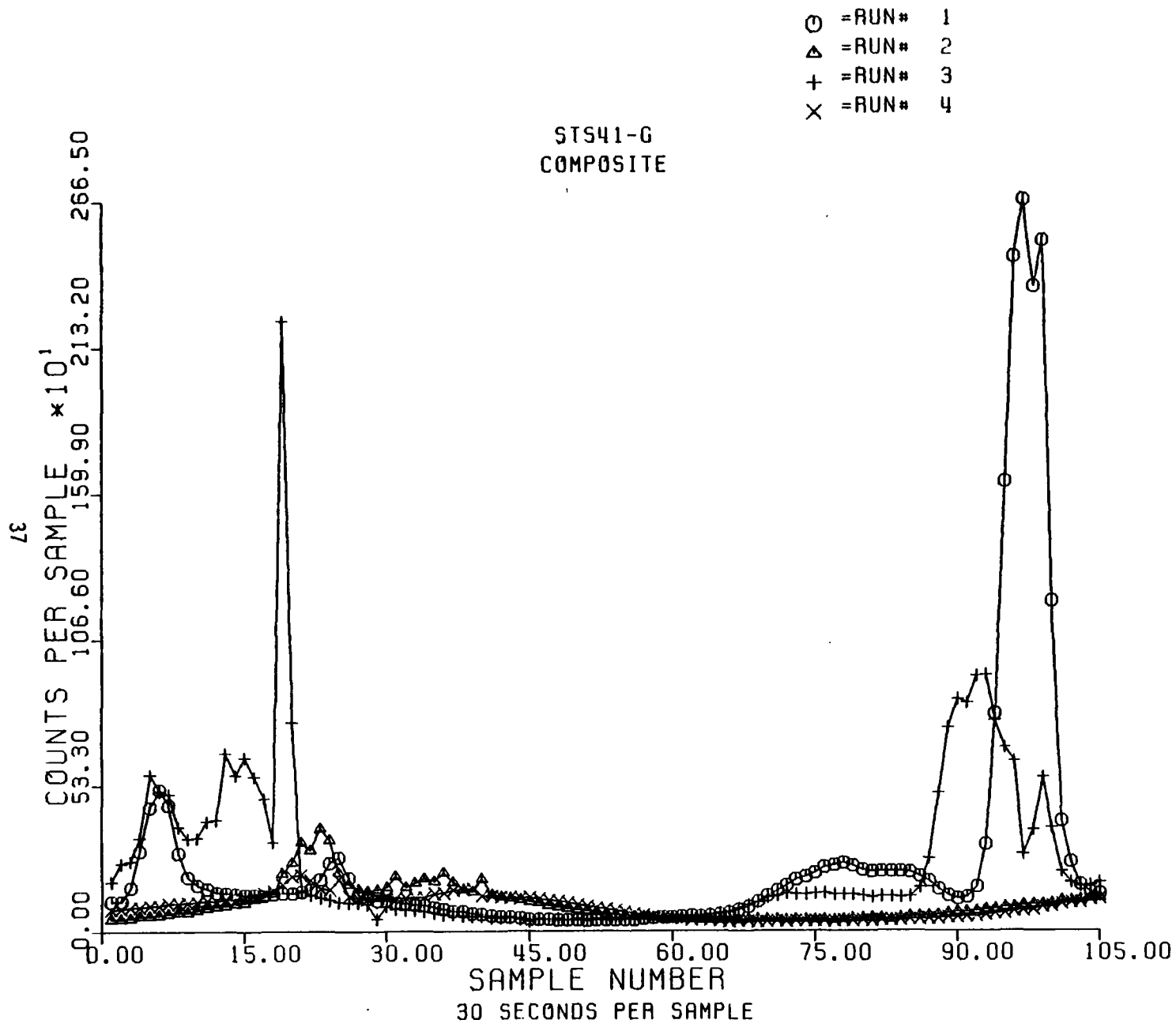

O =RUN# 1
Δ =RUN# 2
+ =RUN# 3
× =RUN# 4
STS41-G
COMPOSITE
COUNTS PER SAMPLE *10¹
0.00
53.30
106.60
159.90
213.20
266.50
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 33

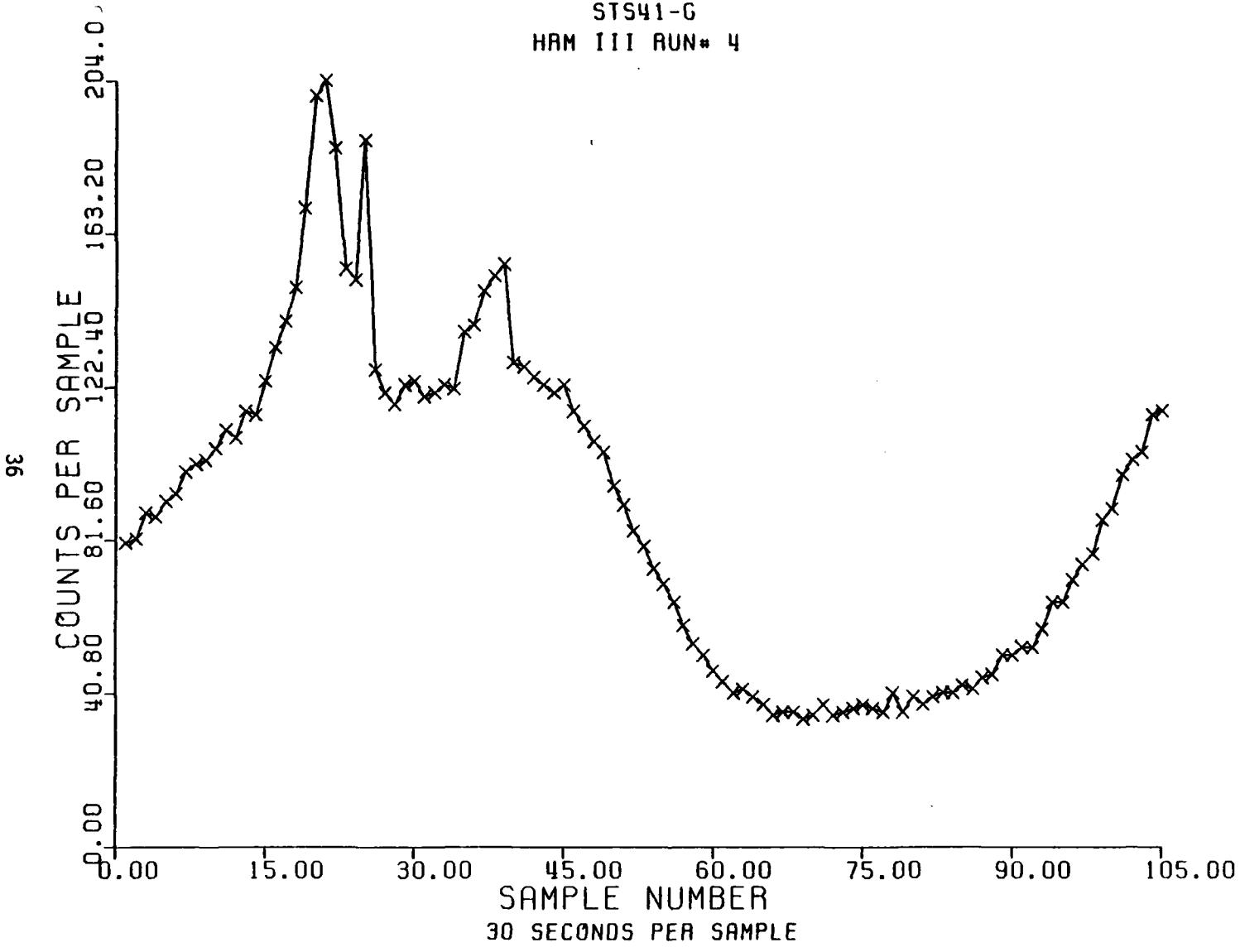
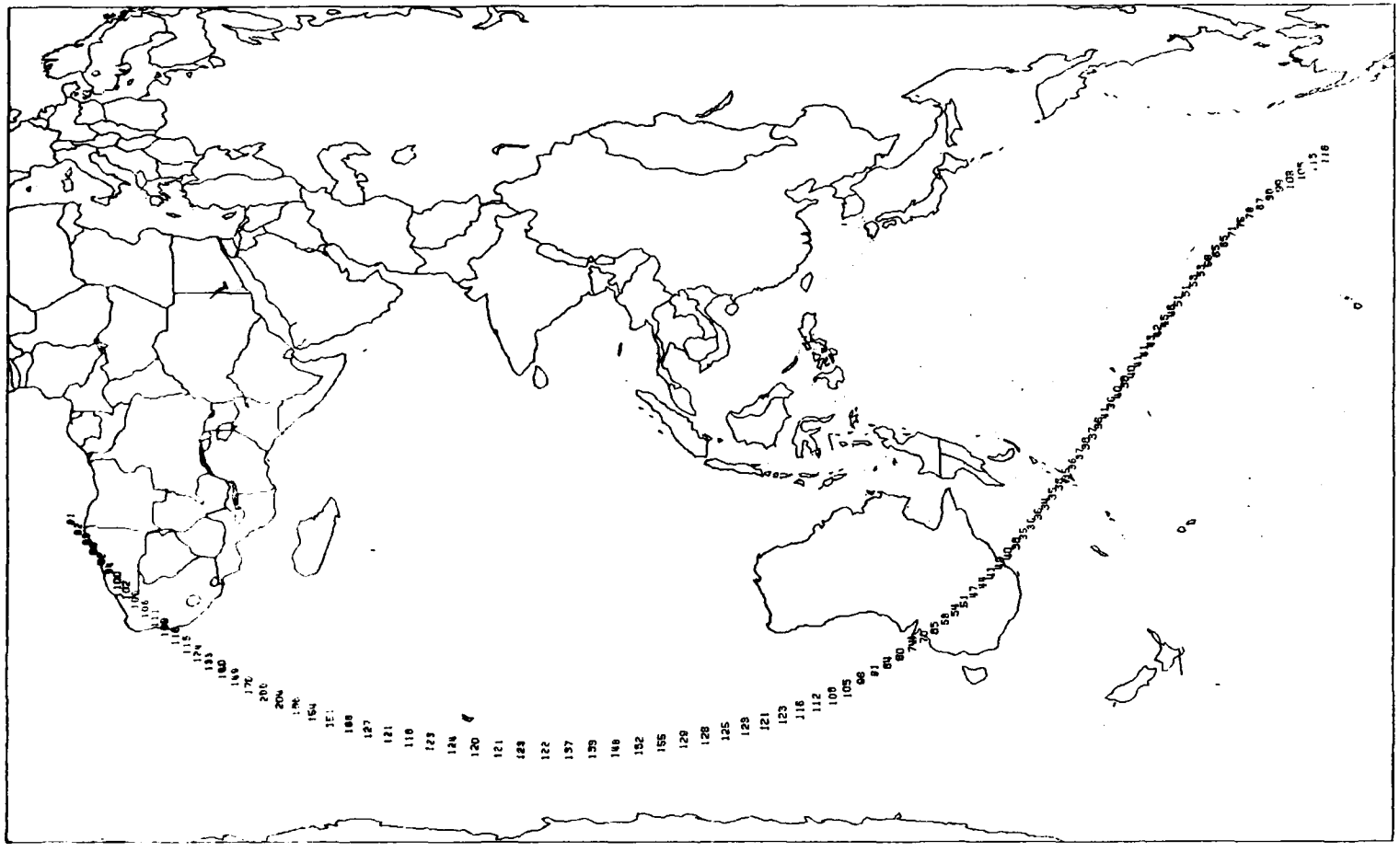

STS41-G
HRM III RUN# 4
COUNTS PER SAMPLE
0.00
40.80
81.60
122.40
163.20
204.0
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 32

HRM-III

OPERATION NO. 4



STS41-G

Figure 31

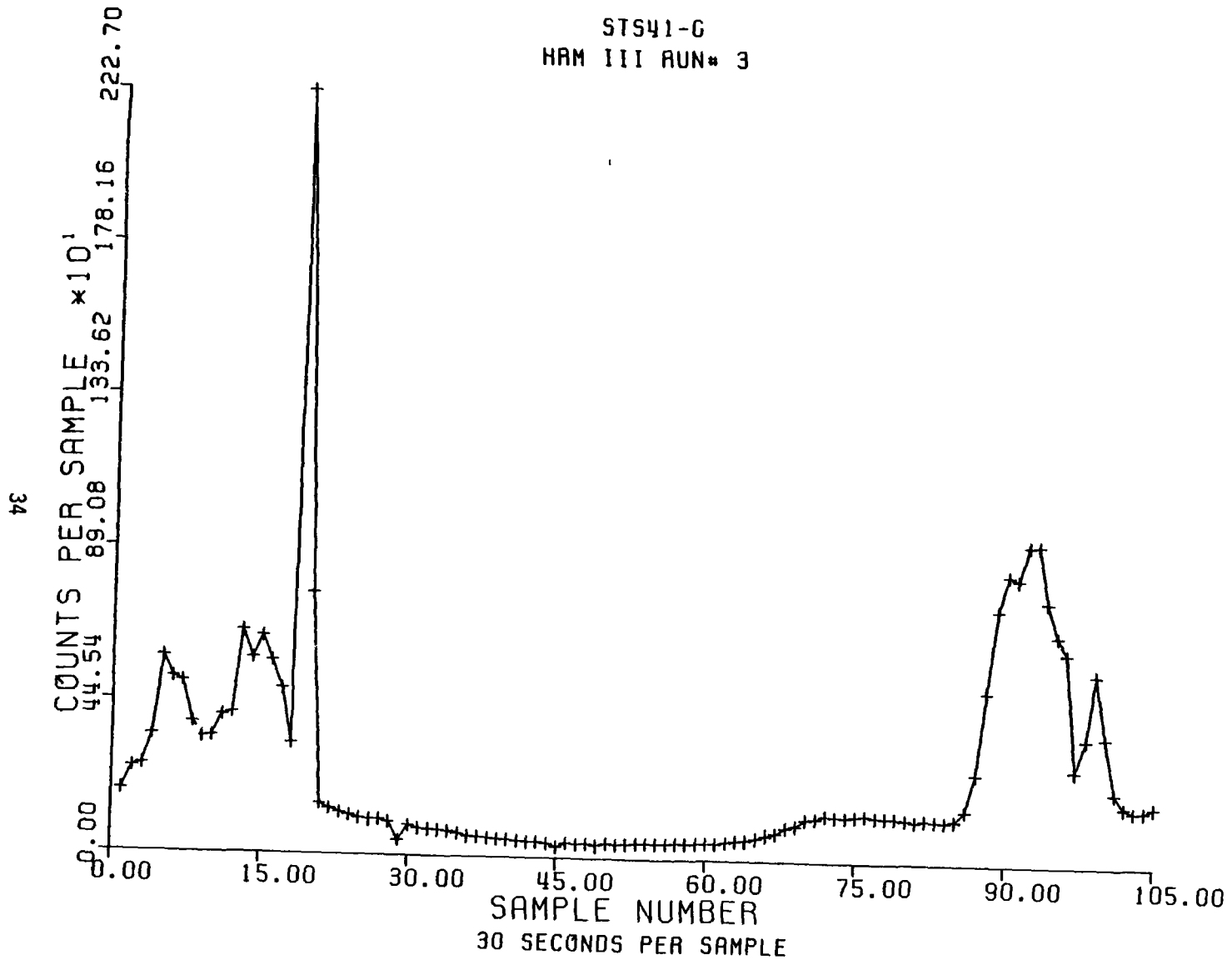
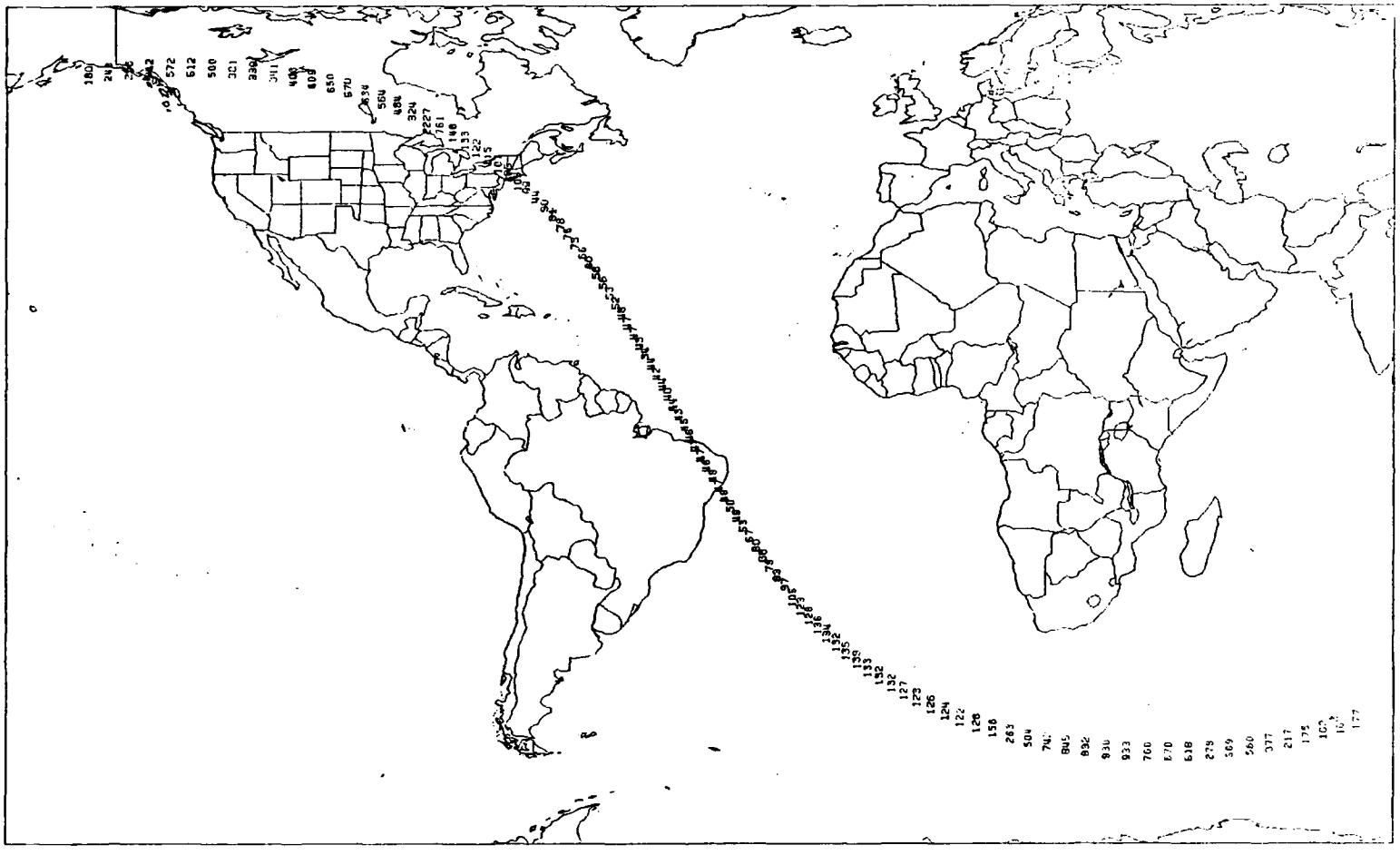

STS41-G
HAM III RUN# 3
COUNTS PER SAMPLE *10¹
0.00
44.54
89.08
133.62
178.16
222.70
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 30

HRM-III

OPERATION NO. 3



STS41-G

Figure 29

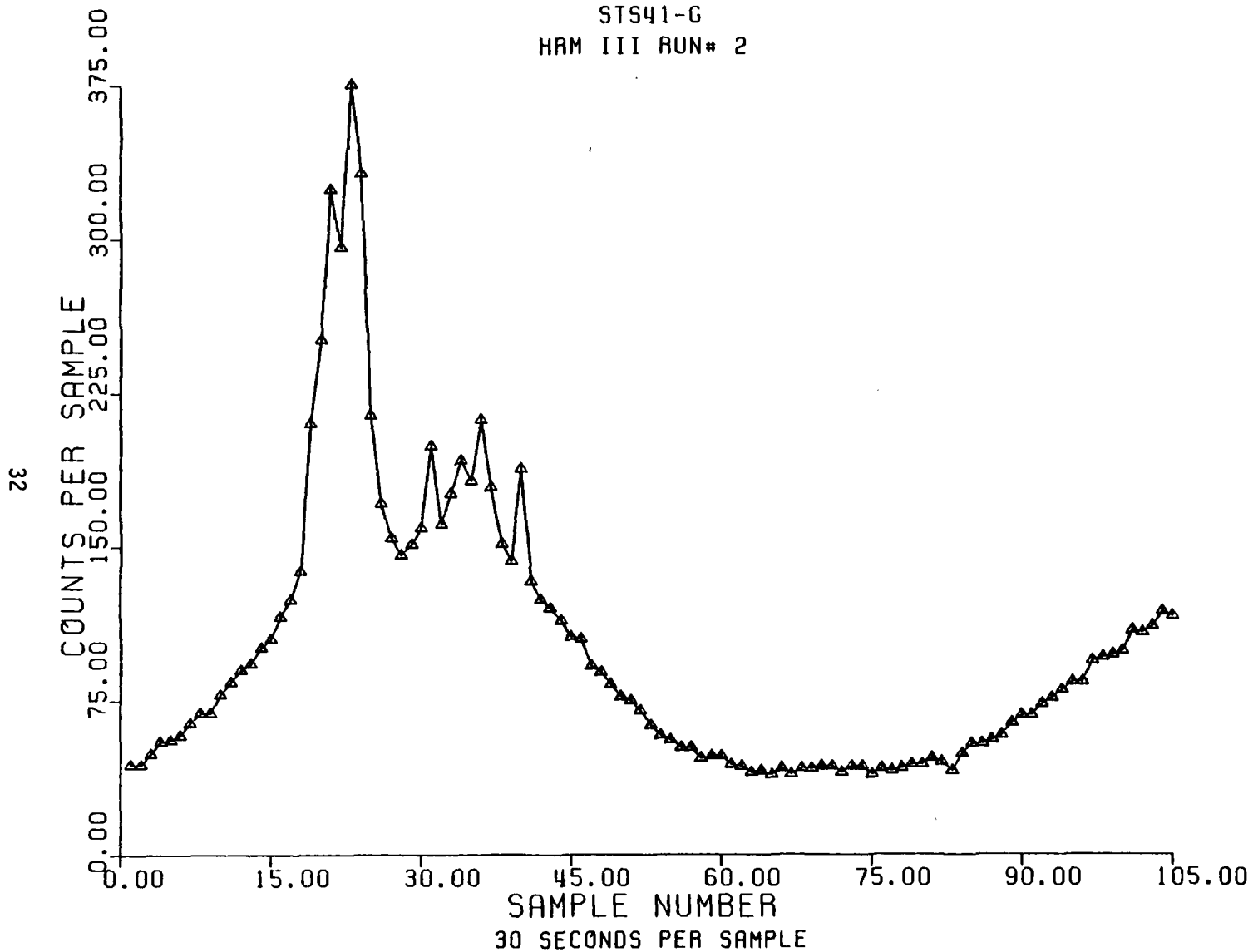

STS41-G
HAM III RUN# 2
COUNTS PER SAMPLE
0.00
75.00
150.00
225.00
300.00
375.00
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 28

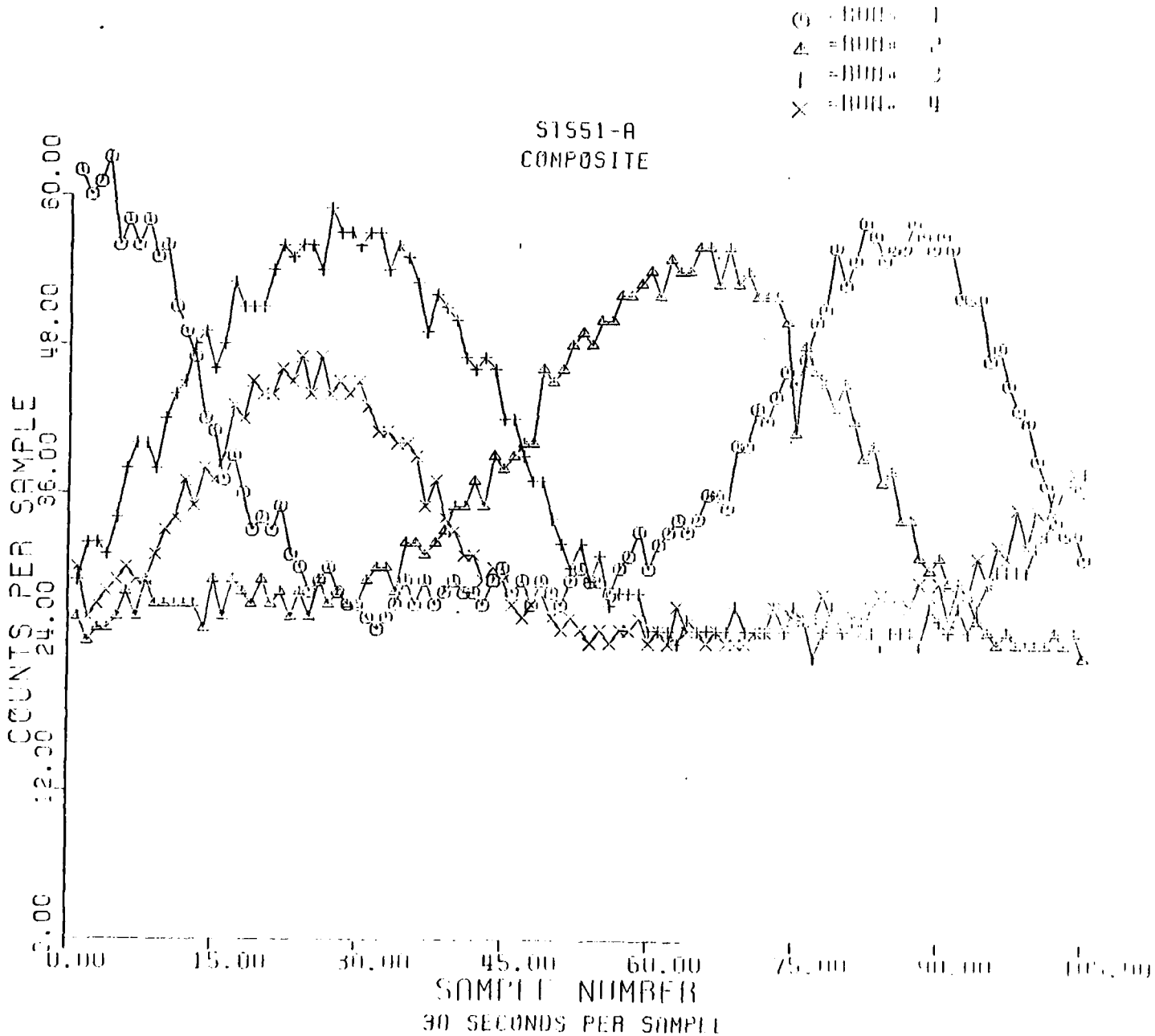

S1551-A
COMPOSITE
COUNTS PER SAMPLE
0.00
12.00
24.00
36.00
48.00
60.00
0.00
15.00
30.00
45.00
60.00
75.00
90.00
105.00
SAMPLE NUMBER
30 SECONDS PER SAMPLE

Figure 42

TABLE 1

PRM DATA FROM STS-41C

RAW DATA

MET	0/06:08:58	5/16:15:XX
Counts	5304	1658
Average Count Rate	372.21/hr	146.34/hr
Stdr Dev	±19.29/hr	±12.10/hr
rem	17.7 mrem	6.41 mrem
rad	1.46 mrad	.508 mrad
Hours	14.25 hrs	11.33 hrs

TABLE 2

PRM DATA FROM STS-41C

AVERAGE DOSE RATES

MET	0/06:08:58	5/16:15:XX
Dose Rate (mrem/hr)	1.2421	.5658
Dose Rate (mrad/hr)	.1025	.0448

Average dose rate for both operations:

(mrem/hr) .904

(mrad/hr) .074

Mission Duration: 6 days 23 hours 40 minutes.

Estimated Total Mission Dosage: 151.571 mrem

12.407 mrad

TABLE 3

PRM DATA FROM STS-41D

RAW DATA

MET	03/23:41:00	04/19:15:00	05/17:36:XX
Counts	2217	2110	2489
Average Count Rate	278.87/hr	225.67/hr	192.80/hr
Stdr Dev	16.70/hr	15.02/hr	13.89/hr
rem	2.26 mrem	2.35 mrem	2.80 mrem
rad	.234 mrad	.233 mrad	.276 mrad
Hours	7.95	9.35	12.91

TABLE 4

PRM DATA FROM STS-41D

AVERAGE DOSE RATES

MET	03/23:41:00	04/19:15:00	05/17:36:XX
Dose Rate (mrem/hr)	.284	.251	.217
Dose Rate (mrad/hr)	.029	.025	.021

Average dose rate for both operations:

(mrem/hr) .234

(mrad/hr) .023

Mission Duration: 6 days 56 minutes.

Estimated Total Mission Dosage: 33.914 mrem

3.333 mrad

TABLE 5

PRM DATA FROM STS-41G

RAW DATA

MET	1/09:48:00	6/10:01:00
Counts	3869	3166
Average Count Rate	219.21/hr	204.79/hr
Stdr Dev	14.81/hr	14.31/hr
rem	10.4 mrem	8.33 mrem
rad	.970 mrad	.790 mrad
Hours	17.65 hrs	15.46 hrs

TABLE 6

PRM DATA FROM STS-41G

AVERAGE DOSE RATES

MET	1/09:48:00	6/10:01:00
Dose Rate (mrem/hr)	.589	.539
Dose Rate (mrad/hr)	.055	.051

Average dose rate for both operations:

(mrem/hr) .564

(mrad/hr) .053

Mission Duration: 8 days 5 hours 23 minutes.

Estimated Total Mission Dosage: 111.324 mrem

10.461 mrad

TABLE 7

PRM DATA FROM STS-51A

RAW DATA

MET	0/23:16:00	2/08:04:43
Counts	2874	3367
Average Count Rate	203.40/hr	249.96/hr
Stdr Dev	14.26/hr	15.81/hr
rem	2.98 mrem	3.47 mrem
rad	.307 mrad	.368 mrad
Hours	14.13 hrs	13.47 hrs

TABLE 8

PRM DATA FROM STS-51A

AVERAGE DOSE RATES

MET	0/23:16:00	2/08:04:43
Dose Rate (mrem/hr)	.211	.258
Dose Rate (mrad/hr)	.0217	.0273

Average dose rate for both operations:

(mrem/hr) .2345

(mrad/hr) .0245

Mission Duration: 7 days 23 hours 45 minutes.

Estimated Total Mission Dosage: 44.9654 mrem

4.6979 mrad

dosage was greatest on STS-41C at 151.571 mrem (12.407 mrad) (see table 2).

The operation which yielded the highest dose rate was the STS-41C data take at a mission elapsed time (MET) of 0/06:08:58. The PRM data from this operation is surprisingly high and cannot be correlated to HRM-III (gamma-ray) data from approximately the same time frame.

SECTION IV

CONCLUSIONS

For the most part, RME data from the STS-41C, 41D, 41G, and 51A flights are consistent with data taken on previous missions. The higher gamma-ray count rates (HRM-III) from STS-41G are attributed to the higher orbital inclination of that flight. The unusually high neutron/proton data (PRM) from the first STS-41C operation remains unexplained. All other variations in the data correspond to natural external sources of radiation (e.g. the South Atlantic Anomaly, and the Southeast Asian Anomaly).

The RME equipment performed very well with only one anomaly experienced in 28 total operations. This failure of the PRM was due to a low battery, and after a battery change, two successful operations were accomplished.

Future flights of the RME will contribute to the data base of background radiation. Different mission profiles will yield data from different altitudes and orbital inclinations. Such a data base will prove useful for planning future space systems, including crew health and safety requirements, as may exist in permanently inhabited stations and platforms.

REFERENCES

1. STS-6 Report, (In publishing), AFTAC, Caplan, et al.

2. Results From Radiation Monitoring Equipment Experiment on STS-8, AFTAC-TR-84-4, 9 July 1984, Madonna, et al.

3. Results From Radiation Monitoring Equipment Experiment on STS-11, AFTAC-TR-85-2, 14 March 1985, Madonna, et al.

4. HRM-III Handheld Radiation Monitor User's Handbook, EG&G Report No. EG&GH83-2424 S-347-MN.

5. Pocket Neutron REM Meter, W. Quam, T. DelDuca, et al., preprint.

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APPENDIX A

RAW DATA FROM STS-41C

X = 02660
Y = -2329.1
Z = -6067.13

STUDENT EXP/RME/GAS

RME STUDENT EXP

INIT MET 05:04:40:00 HRM DATA PADS EXTRA PAIR

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0__1	25	0_22	25	0_43	30	0_64	34	0_85	34
0__2	23	0_23	26	0_44	29	0_65	32	0_86	34
0__3	24	0_24	27	0_45	32	0_66	36	0_87	33
0__4	22	0_25	28	0_46	31	0_67	36	0_88	31
0__5	26	0_26	26	0_47	31	0_68	33	0_89	31
0__6	27	0_27	27	0_48	33	0_69	34	0_90	34
0__7	26	0_28	25	0_49	34	0_70	34	0_91	33
0__8	27	0_29	27	0_50	32	0_71	35	0_92	30
0__9	25	0_30	27	0_51	32	0_72	34	0_93	36
0_10	26	0_31	28	0_52	32	0_73	32	0_94	34
0_11	26	0_32	30	0_53	33	0_74	34	0_95	33
0_12	26	0_33	30	0_54	34	0_75	34	0_96	33
0_13	25	0_34	28	0_55	32	0_76	33	0_97	31
0_14	27	0_35	28	0_56	33	0_77	33	0_98	35
0_15	27	0_36	29	0_57	36	0_78	34	0_99	34
0_16	25	0_37	29	0_58	35	0_79	33	0100	32
0_17	26	0_38	27	0_59	36	0_80	35	0101	34
0_18	24	0_39	27	0_60	35	0_81	36	0102	34
0_19	27	0_40	30	0_61	35	0_82	32	0103	32
0_20	26	0_41	30	0_62	34	0_83	37	0104	31
0_21	27	0_42	27	0_63	35	0_84	30	0105	33

12-6

41-D/GAS

SHIFT NET (?) 04:03:36 HAM (?) A PADS EXTRA (?) (?)

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0_1	34	0_22	38	0_43	44	0_64	93	0_85	54
0_2	35	0_23	35	0_44	45	0_65	86	0_86	55
0_3	38	0_24	36	0_45	32	0_66	81	0_87	58
0_4	40	0_25	36	0_46	35	0_67	79	0_88	55
0_5	41	0_26	36	0_47	39	0_68	72	0_89	52
0_6	39	0_27	36	0_48	50	0_69	68	0_90	55
0_7	40	0_28	36	0_49	63	0_70	67	0_91	53
0_8	39	0_29	33	0_50	76	0_71	64	0_92	50
0_9	39	0_30	33	0_51	91	0_72	59	0_93	50
0_10	39	0_31	36	0_52	103	0_73	60	0_94	47
0_11	38	0_32	32	0_53	115	0_74	58	0_95	[illegible]
0_12	37	0_33	33	0_54	115	0_75	56	0_96	46
0_13	39	0_34	31	0_55	114	0_76	67	0_97	48
0_14	36	0_35	34	0_56	117	0_77	57	0_98	48
0_15	39	0_36	31	0_57	113	0_78	57	0_99	46
0_16	35	0_37	35	0_58	104	0_79	58	0_100	4[illegible]
0_17	37	0_38	31	0_59	107	0_80	56	0_101	40
0_18	36	0_39	33	0_60	114	0_81	58	0_102	40
0_19	37	0_40	32	0_61	101	0_82	58	0_103	4[illegible]
0_20	35	0_41	31	0_62	99	0_83	57	0_104	51
0_21	35	0_42	32	0_63	91	0_84	55	0_105	40

12-5

41-C/FIN

GAS

247/13:57:40 1 @ wt
04/01 [illegible]
x = 9642423
y = 16686020
z = 10400491
x [illegible] 2000 [illegible]
y [illegible]
r [illegible] -155.86

STUDENT EXPERIMENT

INIT MET 3/23 :46:

HRM DATA PADS

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0_1	50	0_22	42	0_43	30	0_64	27	0_85	47
0_2	52	0_23	41	0_44	30	0_65	29	0_86	48
0_3	51	0_24	40	0_45	29	0_66	30	0_87	49
0_4	52	0_25	39	0_46	30	0_67	29	0_88	50
0_5	54	0_26	37	0_47	29	0_68	31	0_89	53
0_6	53	0_27	29	0_48	32	0_69	32	0_90	52
0_7	50	0_28	29	0_49	31	0_70	31	0_91	52
0_8	59	0_29	37	0_50	31	0_71	34	0_92	54
0_9	49	0_30	35	0_51	31	0_72	34	0_93	55
0_10	59	0_31	32	0_52	31	0_73	35	0_94	53
0_11	59	0_32	32	0_53	30	0_74	34	0_95	57
0_12	58	0_33	32	0_54	30	0_75	36	0_96	57
0_13	55	0_34	32	0_55	32	0_76	39	0_97	55
0_14	52	0_35	31	0_56	30	0_77	42	0_98	56
0_15	54	0_36	31	0_57	29	0_78	37	0_99	59
0_16	53	0_37	29	0_58	30	0_79	37	0100	58
0_17	52	0_38	30	0_59	29	0_80	40	0101	56
0_18	50	0_39	30	0_60	32	0_81	43	0102	56
0_19	49	0_40	30	0_61	27	0_82	43	0103	54
0_20	144	0_41	29	0_62	30	0_83	44	0104	56
0_21	43	0_42	30	0_63	26	0_84	45	0105	55

12-8

41-0/FIN

247:10:38:54.1 GMT

03/21 47:041

X = 14196055

Y = [illegible]

Z = 1092319

$\dot{X}$ = -8466

$\dot{Y}$ = -3396.1

$\dot{Z}$ = -1085.4

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0_1	27	0_22	42	0_43	51	0_64	46	0_85	30
0_2	27	0_23	40	0_44	58	0_65	45	0_86	28
0_3	28	0_24	42	0_45	59	0_66	45	0_87	27
0_4	31	0_25	43	0_46	56	0_67	42	0_88	27
0_5	30	0_26	41	0_47	59	0_68	44	0_89	28
0_6	29	0_27	43	0_48	57	0_69	42	0_90	29
0_7	31	0_28	43	0_49	59	0_70	41	0_91	29
0_8	30	0_29	46	0_50	60	0_71	39	0_92	29
0_9	31	0_30	47	0_51	57	0_72	40	0_93	29
0_10	34	0_31	45	0_52	59	0_73	38	0_94	29
0_11	37	0_32	49	0_53	56	0_74	39	0_95	28
0_12	47	0_33	49	0_54	54	0_75	35	0_96	29
0_13	52	0_34	52	0_55	57	0_76	36	0_97	27
0_14	61	0_35	53	0_56	55	0_77	34	0_98	27
0_15	63	0_36	54	0_57	54	0_78	34	0_99	27
0_16	61	0_37	55	0_58	53	0_79	33	0100	28
0_17	58	0_38	55	0_59	50	0_80	33	0101	26
0_18	53	0_39	55	0_60	51	0_81	30	0102	27
0_19	50	0_40	60	0_61	48	0_82	31	0103	28
0_20	48	0_41	57	0_62	48	0_83	30	0104	28
0_21	44	0_42	59	0_63	48	0_84	29	0105	27

245/16 07 31 gmt
2/03:19 41
x = 8359026 ẋ = -3243.7
y = 17423905 ẏ = 9966.10
z = 10468538 ż = 2001.74

246/08:21:25 gmt
02/19:35:31
X = -427.1413 Ẋ = 4537.3
y = 18820787 ẏ = -6275.9
z = 10350898 ż = 1293.8

SET SET 7/19:38:

NRH DATA PADS

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0_1	30	0_22	56	0_43	36	0_64	30	0_85	31
0_2	31	0_23	55	0_44	32	0_65	30	0_86	32
0_3	35	0_24	51	0_45	31	0_66	31	0_87	30
0_4	38	0_25	53	0_46	30	0_67	29	0_88	32
0_5	38	0_26	50	0_47	30	0_68	30	0_89	31
0_6	40	0_27	51	0_48	31	0_69	30	0_90	35
0_7	43	0_28	49	0_49	29	0_70	31	0_91	32
0_8	46	0_29	49	0_50	31	0_71	30	0_92	32
0_9	44	0_30	47	0_51	31	0_72	31	0_93	34
0_10	47	0_31	45	0_52	29	0_73	30	0_94	35
0_11	45	0_32	43	0_53	31	0_74	31	0_95	36
0_12	48	0_33	43	0_54	29	0_75	30	0_96	36
0_13	51	0_34	41	0_55	29	0_76	29	0_97	36
0_14	53	0_35	38	0_56	29	0_77	30	0_98	39
0_15	52	0_36	39	0_57	30	0_78	29	0_99	37
0_16	54	0_37	38	0_58	29	0_79	29	0100	42
0_17	54	0_38	37	0_59	29	0_80	29	0101	43
0_18	54	0_39	36	0_60	30	0_81	30	0102	45
0_19	54	0_40	34	70 1	29	0_82	30	0103	45
0_20	52	0_41	33	2	31	0_83	30	0104	47
0_21	52		33		29	0_84	30	0105	49

99)
eqd
se

c or as

after
shows next

nnels

~~......~~ ...0130074
~~......~~ ...4198295
~~...+FS~~ x ...2541.6
... = 0118 ...FS y = -9042...
... 13.93 ... z ...1069.4

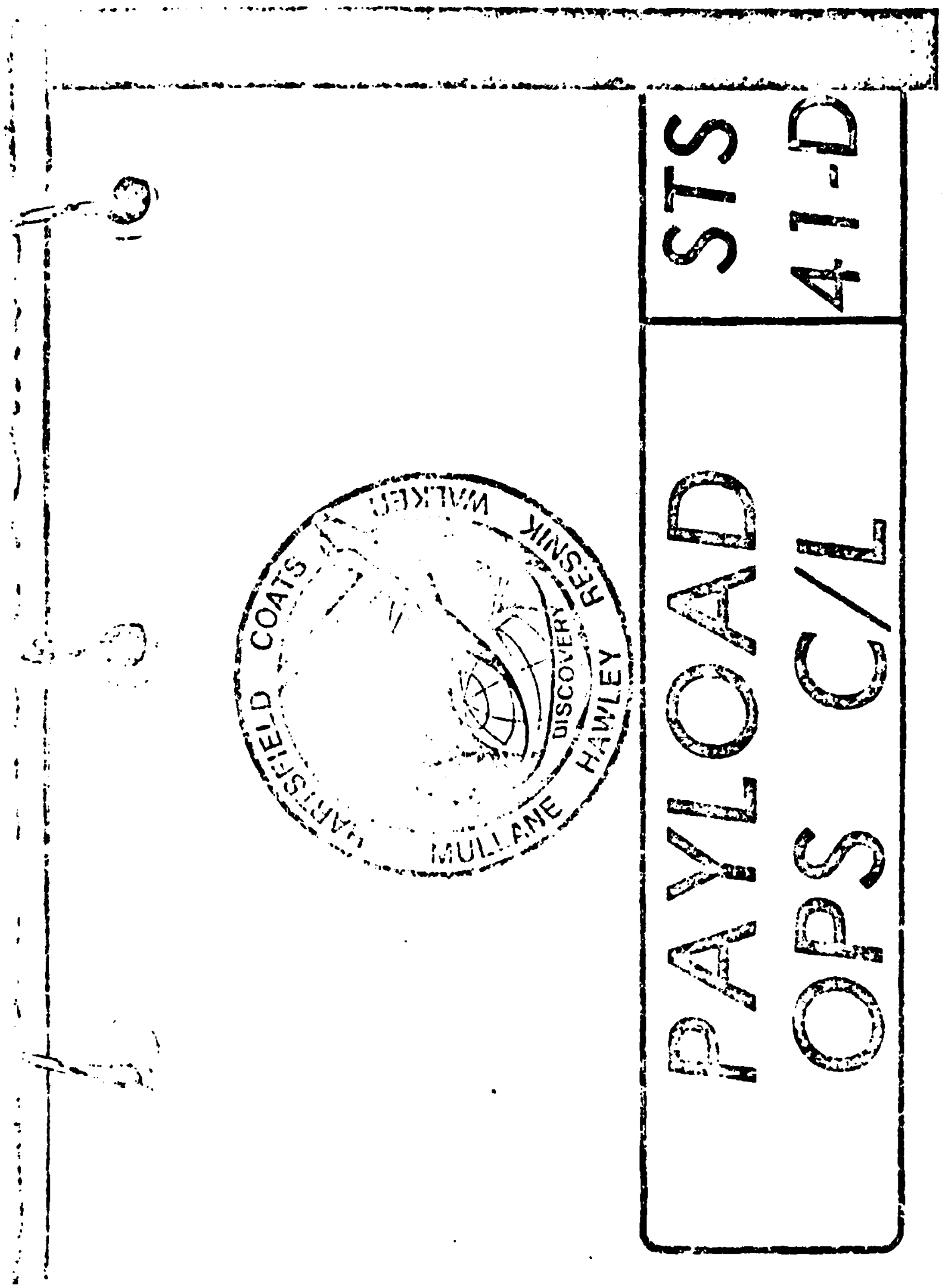
...14:40:39.1
01/01:58:49.1

01/02:03:45

INIT MET ... HRM ... A PADS

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0__1	37	0_22	50	0_43	60	0_64	49	0_85	27
0__2	40	0_23	51	0_44	59	0_65	46	0_86	29
0__3	38	0_24	53	0_45	58	0_66	49	0_87	29
0__4	43	0_25	54	0_46	62	0_67	45	0_88	27
0__5	42	0_26	56	0_47	58	0_68	42	0_89	27
0__6	42	0_27	51	0_48	60	0_69	42	0_90	29
0__7	45	0_28	54	0_49	63	0_70	40	0_91	27
0__8	43	0_29	54	0_50	63	0_71	39	0_92	26
0__9	45	0_30	56	0_51	62	0_72	37	0_93	27
0_10	44	0_31	57	0_52	60	0_73	36	0_94	27
0_11	43	0_32	56	0_53	62	0_74	36	0_95	27
0_12	45	0_33	59	0_54	56	0_75	34	0_96	28
0_13	46	0_34	59	0_55	59	0_76	33	0_97	27
0_14	45	0_35	59	0_56	57	0_77	34	0_98	26
0_15	43	0_36	59	0_57	57	0_78	32	0_99	30
0_16	45	0_37	59	0_58	54	0_79	33	0100	27
0_17	46	0_38	60	0_59	56	0_80	31	0101	29
0_18	46	0_39	60	0_60	53	0_81	32	0102	30
0_19	49	0_40	60	0_61	56	0_82	29	0103	28
0_20	49	0_41	62	0_62	54	0_83	31	0104	29
0_21	52	0_42	58	0_63	55	0_84	30	0105	29

GAS


STS
41-D
PAYLOAD
OPS C/L
HARTSFIELD
COATS
WALKER
RESNIK
HAWLEY
MULLANE
DISCOVERY

APPENDIX B

RAW DATA FROM STS-41D

STUDENT EXP

1 Activation & Checkout

Unstow PRM
If second operation, replace, mark and stow used battery
Set Rotary sw - HRS
ON/OFF sw - ON
✓Display counts down from 9999 and record MET on PRM DATA PAD when Display = 0.00

* If display shows a colon or is blank, set ON/OFF sw - OFF; replace, mark, and stow used battery and repeat step 1 *

Report MET to MCC
Restow PRM (leave ON)

2 Data Recording

8-18 hrs after step 1, unstow PRM
Set rotary switch to appropriate positions and record display outputs on PRM DATA PAD

Set ON/OFF sw - OFF
Stow PRM

PRM DATA PAD

0.00 MET	01 06:08:58	_1_ _:_ _:_ _
HRS	14.25	_ _._ _
CNTS	5.304 E (+)03	._ _ _ E (_) _ _
RAD	1.46 E (−)03	_ _._ _ E (_) _ _
REM	1.72 E (−)02	_ _._ _ E (_) _ _

PAYLOAD OPS C/L

STS 41-C

RME | REF DATA | CSDU OPS | GAS OPS | SMM REF DATA | SMM RETURN | SMM OPS | FSS ACT

65

3-3

PRM

STUDENT EXP

1 Activation & Checkout

Unstow PRM
If second operation, replace, mark and stow used battery
Set Rotary sw - HRS
ON/OFF sw - ON
✓Display counts down from 9999 and record MET on PRM DATA PAD when Display = 0.00

* If display shows a colon or is blank, set ON/OFF sw - OFF; replace, mark, and stow used battery and repeat step 1 *

Report MET to MCC
Restow PRM (leave ON)

2 Data Recording

8-18 hrs after step 1, unstow PRM
Set rotary switch to appropriate positions and record display outputs on PRM DATA PAD

Set ON/OFF sw - OFF
Stow PRM

PRM DATA PAD 5/16:15→

0.00 MET 310/4:50:__	~~117:27:__~~
HRS −11.05	11.33
CNTS FAIL E (__) __ __	1.658 E (+) 3
RAD __.__ E (__) __ __	5.08 E (−) 4
REM __.__ E (__) __ __	6.41 E (−) 3

Blank 6/03:30

RME | C360 REF DATA | OPS | OPS | DATA | RETURN | CFS | ACT

INIT MET 5/16:2[illegible]

HRM DATA PADS 57/58/[illegible]

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0_1	41	0_22	27	0_43	30	0_64	47	0_85	40
0_2	30	0_23	26	0_44	30	0_65	48	0_86	40
0_3	28	0_24	26	0_45	28	0_66	47	0_87	37
0_4	28	0_25	27	0_46	32	0_67	49	0_88	38
0_5	26	0_26	24	0_47	31	0_68	51	0_89	36
0_6	29	0_27	28	0_48	33	0_69	51	0_90	36
0_7	27	0_28	29	0_49	33	0_70	51	0_91	34
0_8	27	0_29	27	0_50	34	0_71	50	0_92	34
0_9	27	0_30	27	0_51	36	0_72	51	0_93	33
0_10	30	0_31	27	0_52	36	0_73	50	0_94	31
0_11	25	0_32	26	0_53	37	0_74	48	0_95	30
0_12	23	0_33	28	0_54	38	0_75	49	0_96	30
0_13	23	0_34	28	0_55	46	0_76	51	0_97	30
0_14	24	0_35	27	0_56	39	0_77	46	0_98	29
0_15	25	0_36	28	0_57	40	0_78	46	0_99	29
0_16	25	0_37	26	0_58	43	0_79	47	0100	28
0_17	25	0_38	26	0_59	45	0_80	45	0101	28
0_18	29	0_39	28	0_60	43	0_81	45	0102	27
0_19	28	0_40	27	0_61	43	0_82	43	0103	26
0_20	27	0_41	27	0_62	47	0_83	41	0104	26
0_21	28	0_42	31	0_63	47	0_84	40	0105	25

8-8

41-C/III

63

This

UNIT MET 2/18:10:—

HRM DATA PADS Read at 2/7:30

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0__1	42	0_22	30	0_43	38	0_64	41	0_85	32
0__2	46	0_23	32	0_44	40	0_65	41	0_86	33
0__3	37	0_24	31	0_45	41	0_66	41	0_87	32
0__4	37	0_25	34	0_46	46	0_67	41	0_88	31
0__5	36	0_26	32	0_47	45	0_68	40	0_89	32
0__6	36	0_27	33	0_48	44	0_69	38	0_90	31
0__7	35	0_28	33	0_49	46	0_70	40	0_91	32
0__8	35	0_29	30	0_50	47	0_71	39	0_92	31
0__9	35	0_30	34	0_51	45	0_72	38	0_93	29
0_10	32	0_31	32	0_52	46	0_73	37	0_94	31
0_11	34	0_32	32	0_53	46	0_74	37	0_95	31
0_12	32	0_33	32	0_54	44	0_75	34	0_96	31
0_13	33	0_34	30	0_55	46	0_76	34	0_97	32
0_14	34	0_35	32	0_56	46	0_77		0_98	30
0_15	34	0_36	35	0_57	44	0_78	35	0_99	27
0_16	36	0_37	34	0_58	45	0_79	33	0100	29
0_17	32	0_38	33	0_59	47	0_80	33	0101	28
0_18	32	0_39	35	0_60	45	0_81	33	0102	29
0_19	31	0_40	38	0_61	44	0_82	32	0103	27
0_20	34	0_41	37	0_62	45	0_83	34	0104	28
0_21	33	0_42	38	0_63	42	0_84	32	0105	27

Ref 3/2 :54

UNIT MET 3/19:05:—

HRM DATA PADS

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0__1	49	0_22	36	0_43	26	0_64	30	0_85	51
0__2	53	0_23	33	0_44	26	0_65	30	0_86	53
0__3	52	0_24	34	0_45	26	0_66	27	0_87	52
0__4	52	0_25	30	0_46	26	0_67	30	0_88	52
0__5	52	0_26	32		24	0_68	31	0_89	52
0__6	54	0_27	32	0_48	27	0_69	32	0_90	50
0__7	53	0_28	30	0_49	27	0_70	30	0_91	52
0__8	50	0_29	28	0_50	26	0_71	31	0_92	51
0__9	50	0_30	28	0_51	26	0_72	32	0_93	52
0_10	50	0_31	29	0_52	26	0_73	30	0_94	52
0_11	52	0_32	29	0_53	27	0_74	31	0_95	52
0_12	45	0_33	29	0_54	26	0_75	36	0_96	50
0_13	44	0_34	27	0_55	26	0_76	31	0_97	53
0_14	43	0_35	27	0_56	27	0_77	40	0_98	49
0_15	45	0_36	27	0_57	26	0_78	39	0_99	44
0_16	40	0_37	26	0_58	27	0_79	42	0100	45
0_17	41	0_38	25	0_59	25	0_80	41	0101	41
0_18	42	0_39	26	0_60	27	0_81	41	0102	42
0_19	41	0_40	27	0_61	24	62 2	46	0103	40
0_20	38	0_41	25	0_62	24	3	41	0104	40
0_21	38	0_42	24	0_63	27	0_84	32	0105	33

8-6

8-7

Read at 2/07:40

INIT MET 0,20:20:

HRM DATA PADS

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0_1	35	0_22	51	0_43	33	0_64	23	0_85	23
0_2	34	0_23	59	0_44	32	0_65	23	0_86	24
0_3	35	0_24	53	0_45	32	0_66	23	0_87	25
0_4	35	0_25	50	0_46	32	0_67	25	0_88	27
0_5	36	0_26	54	0_47	30	0_68	23	0_89	26
0_6	41	0_27	52	0_48	29	0_69	24	0_90	28
0_7	40	0_28	48	0_49	28	0_70	25	0_91	28
0_8	41	0_29	49	0_50	27	0_71	29	0_92	28
0_9	41	0_30	47	0_51	27	0_72	27	0_93	30
0_10	40	0_31	43	0_52	25	0_73	27	0_94	30
0_11	43	0_32	46	0_53	26	0_74	23	0_95	31
0_12	45	0_33	47	0_54	26	0_75	23	0_96	31
0_13	45	0_34	45	0_55	24	0_76	24	0_97	32
0_14	46	0_35	49	0_56	25	0_77	23	0_98	35
0_15	45	0_36	52	0_57	26	0_78	34	0_99	35
0_16	47	0_37	40	0_58	24	0_79	24	0100	38
0_17	48	0_38	47	0_59	23	0_80	24	0101	39
0_18	44	0_39	35	0_60	27	0_81	25	0102	39
0_19	49	0_40	33	0_61	24	0_82	22	0103	41
0_20	57	0_41	36	0_62	24	0_83	22	0104	42
0_21	57	0_42	36	0_63	25	0_84	25	0105	41

8-5

41-C/FIN

STUDENT EXP

PAYLOAD OPS C/L

STS 41-C

RME	C360 REF DATA	C360 OPS	GAS OPS	SMM REF DATA	SMM RETURN	OPS	FSS ACT

PRM

1 Activation & Checkout

Unstow PRM
If second operation, replace, mark and stow used battery
Set Rotary sw - HRS
ON/OFF sw - ON
✓Display counts down from 9999 and record MET on PRM DATA PAD when Display = 0.00

* If displays shows a colon is blank, set ON/OFF sw - OFF; replace, mark, and stow used battery and repeat step 1 *

Report MET to MCC
Restow PRM (leave ON)

2 Data Recording

8-18 hrs after step 1, unstow PRM
Set Rotary sw to appropriate positions and record display outputs on PRM DATA PAD

Set ON/OFF sw - OFF
Stow PRM

PRM DATA PAD

0.00 MET	03/23:41:00	04/19:15:00
HRS	7.95	9.35
CNTS	2.217 E (+) 03	2.110 E (+) 03
RAD	2.34 E (−) 04	2.33 E (−) 04
REM	2.26 E (−) 03	2.35 E (−) 03

OFF 05/04:37 GMT

12-11 41-D/FIN

GAS

STUDENT EXP/RME/GAS

STUDENT EXP RME

05/04:42 activated PRM
05/17:36 deactivated PAM

12,91 HRS
2.489×10^{3} CNTS
$2,76 \times 10^{-4}$ RAD
2.80×10^{-3} REM

after run

This Page Intentionally Blank

12-12 41-D/FIN

12-10

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C

RAW DATA FROM STS-41G

INIT MET 1/06:41:26 HRM DATA PADS 1/9:49 Pad

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0_1	108	0_22	153	0_43	50	0_64	57	0_85	214
0_2	109	0_23	190	0_44	49	0_65	61	0_86	198
0_3	161	0_24	249	0_45	43	0_66	66	0_87	181
0_4	293	0_25	269	0_46	42	0_67	76	0_88	153
0_5	454	0_26	194	0_47	42	0_68	88	0_89	129
0_6	516	0_27	132	0_48	40	0_69	107	0_90	117
0_7	462	0_28	121	0_49	41	0_70	127	0_91	123
0_8	284	0_29	112	0_50	39	0_71	146	0_92	159
0_9	196	0_30	112	0_51	38	0_72	164	0_93	314
0_10	168	0_31	105	0_52	39	0_73	186	0_94	791
0_11	155	0_32	102	0_53	40	0_74	198	0_95	1640
0_12	141	0_33	95	0_54	40	0_75	210	0_96	2459
0_13	139	0_34	92	0_55	40	0_76	231	0_97	2667
0_14	135	0_35	85	0_56	37	0_77	240	0_98	2350
0_15	134	0_36	79	0_57	44	0_78	298	0_99	2518
0_16	132	0_37	72	0_58	47	0_79	238	0100	1203
0_17	130	0_38	71	0_59	50	0_80	222	0101	399
0_18	137	0_39	63	0_60	50	0_81	217	0102	250
0_19	138	0_40	60	0_61	52	0_82	215	0103	167
0_20	139	0_41	55	0_62	56	0_83	217	0104	136
0_21	144	0_42	52	0_63	53	0_84	217	0105	134

PL OPS

GAS TLD

RME/TLD/GAS

RME

INIT MET 2 0 3:3 0:0 0 Avail at 2/0604 HRM DATA PADS

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0__1	44	0_22	296	0_43	120	0_64	41	0_85	54
0__2	44	0_23	375	0_44	114	0_65	39	0_86	54
0__3	49	0_24	332	0_45	106	0_66	42	0_87	56
0__4	55	0_25	214	0_46	105	0_67	39	0_88	58
0__5	56	0_26	171	0_47	92	0_68	42	0_89	64
0__6	58	0_27	154	0_48	89	0_69	42	0_90	68
0__7	64	0_28	146	0_49	83	0_70	43	0_91	68
0__8	69	0_29	151	0_50	77	0_71	43	0_92	73
0__9	69	0_30	159	0_51	75	0_72	40	0_93	76
0_10	78	0_31	199	0_52	70	0_73	43	0_94	80
0_11	84	0_32	161	0_53	63	0_74	43	0_95	84
0_12	90	0_33	176	0_54	58	0_75	39	0_96	84
0_13	93	0_34	192	0_55	56	0_76	42	0_97	94
0_14	101	0_35	182	0_56	52	0_77	41	0_98	96
0_15	105	0_36	212	0_57	52	0_78	42	0_99	97
0_16	116	0_37	179	0_58	47	0_79	44	0100	99
0_17	124	0_38	151	0_59	48	0_80	44	0101	109
0_18	138	0_39	143	0_60	48	0_81	47	0102	108
0_19	210	0_40	188	0_61	44	0_82	45	0103	111
0_20	251	0_41	133	0_62	43	0_83	41	0104	118
0_21	324	0_42	124	0_63	40	0_84	49	0105	116

12-6

PL OPS/41-G/FIN

INIT MET 5/05:50:__ __

NRM DATA PADS

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0__1	180	0_22	133	0_43	47	0_64	60	0_85	126
0__2	248	0_23	122	0_44	43	0_65	66	0_86	156
0__3	252	0_24	115	0_45	34	0_66	73	0_87	263
0__4	342	0_25	107	0_46	44	0_67	83	0_88	504
0__5	572	0_26	105	0_47	42	0_68	97	0_89	742
0__6	512	0_27	105	0_48	44	0_69	105	0_90	845
0__7	500	0_28	99	0_49	40	0_70	123	0_91	832
0__8	381	0_29	44	0_50	44	0_71	128	0_92	930
0__9	339	0_30	90	0_51	43	0_72	136	0_93	933
0_10	341	0_31	89	0_52	45	0_73	134	0_94	768
0_11	403	0_32	78	0_53	46	0_74	132	0_95	670
0_12	409	0_33	76	0_54	47	0_75	135	0_96	618
0_13	650	0_34	73	0_55	47	0_76	139	0_97	279
0_14	510	0_35	66	0_56	46	0_77	133	0_98	369
0_15	634	0_36	60	0_57	49	0_78	132	0_99	520
0_16	564	0_37	58	0_58	47	0_79	132	0100	377
0_17	484	0_38	56	0_59	48	0_80	127	0101	217
0_18	324	0_39	53	0_60	50	0_81	123	0102	175
0_19	2227	0_40	52	0_61	49	0_82	126	0103	162
0_20	761	0_41	48	0_62	53	0_83	124	0104	165
0_21	1148	0_42	47	0_63	57	0_84	122	0105	177

12-7

PL OPS/41-G/FIN

RME/TLD/GAS

RME

INIT MET 7,02:50:00

HRM DATA PADS

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0_1	81	0_22	186	0_43	123	0_64	40	0_85	43
0_2	82	0_23	154	0_44	121	0_65	38	0_86	42
0_3	89	0_24	151	0_45	123	0_66	35	0_87	45
0_4	88	0_25	188	0_46	116	0_67	36	0_88	46
0_5	92	0_26	127	0_47	112	0_68	36	0_89	51
0_6	94	0_27	121	0_48	108	0_69	34	0_90	51
0_7	100	0_28	118	0_49	105	0_70	35	0_91	53
0_8	102	0_29	123	0_50	96	0_71	38	0_92	53
0_9	103	0_30	124	0_51	91	0_72	35	0_93	58
0_10	106	0_31	120	0_52	84	0_73	36	0_94	65
0_11	111	0_32	121	0_53	80	0_74	37	0_95	65
0_12	109	0_33	123	0_54	79	0_75	38	0_96	71
0_13	116	0_34	122	0_55	70	0_76	37	0_97	75
0_14	115	0_35	137	0_56	65	0_77	36	0_98	18
0_15	124	0_36	139	0_57	59	0_78	41	0_99	87
0_16	133	0_37	148	0_58	54	0_79	36	0100	90
0_17	140	0_38	152	0_59	51	0_80	40	0101	99
0_18	149	0_39	155	0_60	47	0_81	38	0102	103
0_19	170	0_40	139	0_61	44	0_82	40	0103	10?
0_20	203	0_41	128	0_62	41	0_83	41	0104	11?
0_21	204	0_42	125	0_63	42	0_84	41	0105	116

81

12-6

12-8

PL OPS/41-G/FIN

PRM

1 Activation & Checkout

Unstow PRM
If second operation, replace, mark and stow used battery
Set Rotary sw - HRS
ON/OFF sw - ON
✓Display counts down from 9999 and record MET on PRM DATA PAD when Display = 0.00

* If display shows a colon is blank, set ON/OFF sw - OFF; replace, mark, and stow used battery and repeat step 1 *

119:41

Report MET to MCC
Restow PRM (leave ON)

2 Data Recording

8-18 hrs after step 1, unstow PRM
Set rotary switch to appropriate positions and record display outputs on PRM DATA PAD

Set ON/OFF sw - OFF
Stow PRM

PRM DATA PAD

0.00 MET	1/09:48:00	6/10:01:00
HRS	17.65	15.46
CNTS	3.869 E (+) 03	3.166 E (+) 03
RAD	9.70 E (−) 04	7.90 E (−) 04
REM	1.04 E (−) 02	8.33 E (−) 03

TLD

GAS

APPENDIX D

RAW DATA FROM STS-51A

PAYLOAD OPS C/L

STS 51-A

INIT MET 0 / 23 : 27 : 00 HRM DATA PADS

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0__1	62	0_22	35	0_43	27	0_64	33	0_85	56
0__2	60	0_23	31	0_44	29	0_65	34	0_86	56
0__3	61	0_24	30	0_45	30	0_66	36	0_87	58
0__4	63	0_25	28	0_46	28	0_67	36	0_88	57
0__5	56	0_26	29	0_47	29	0_68	35	0_89	56
0__6	58	0_27	30	0_48	27	0_69	40	0_90	57
0__7	56	0_28	28	0_49	29	0_70	40	0_91	56
0__8	58	0_29	27	0_50	28	0_71	43	0_92	52
0__9	55	0_30	27	0_51	27	0_72	42	0_93	52
0_10	56	0_31	26	0_52	29	0_73	44	0_94	52
0_11	57	0_32	25	0_53	30	0_74	46	0_95	47
0_12	49	0_33	26	0_54	29	0_75	45	0_96	48
0_13	47	0_34	27	0_55	29	0_76	47	0_97	45
0_14	42	0_35	29	0_56	28	0_77	50	0_98	43
0_15	41	0_36	27	0_57	30	0_78	51	0_99	42
0_16	37	0_37	29	0_58	31	0_79	52	0100	39
0_17	39	0_38	27	0_59	33	0_80	53	0101	37
0_18	36	0_39	28	0_60	30	0_81	55	0102	34
0_19	33	0_40	29	0_61	32	0_82	58	0103	33
0_20	34	0_41	28	0_62	33	0_83	57	0104	33
0_21	33	0_42	28	0_63	34	0_84	55	0105	31

RME DMOS

INIT MET 2/21:39:30 HRM DATA PADS

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0_1	26	0_22	28	0_43	35	0_64	54	0_85	38
0_2	24	0_23	26	0_44	39	0_65	56	0_86	34
0_3	25	0_24	28	0_45	38	0_66	56	0_87	34
0_4	25	0_25	26	0_46	39	0_67	53	0_88	31
0_5	26	0_26	29	0_47	40	0_68	56	0_89	30
0_6	28	0_27	27	0_48	46	0_69	53	0_90	31
0_7	26	0_28	28	0_49	46	0_70	54	0_91	29
0_8	29	0_29	27	0_50	45	0_71	52	0_92	29
0_9	27	0_30	27	0_51	46	0_72	52	0_93	28
0_10	27	0_31	29	0_52	48	0_73	52	0_94	26
0_11	27	0_32	30	0_53	49	0_74	50	0_95	25
0_12	27	0_33	30	0_54	46	0_75	47	0_96	24
0_13	27	0_34	28	0_55	50	0_76	48	0_97	25
0_14	25	0_35	32	0_56	50	0_77	46	0_98	24
0_15	29	0_36	32	0_57	52	0_78	45	0_99	24
0_16	26	0_37	31	0_58	52	0_79	43	0100	24
0_17	29	0_38	32	0_59	53	0_80	45	0101	24
0_18	28	0_39	33	0_60	54	0_81	42	0102	25
0_19	27	0_40	35	0_61	52	0_82	39	0103	24
0_20	29	0_41	35	0_62	55	0_83	40	0104	25
0_21	27	0_42	37	0_63	54	0_84	37	0105	23

2-6
2-4

PL OPS/51-A/BAS

INIT MET 4/19:35:00

HRM DATA PADS

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0_1	29	0_22	56	0_43	47	0_64	26	0_85	25
0_2	32	0_23	55	0_44	46	0_65	25	0_86	25
0_3	32	0_24	56	0_45	42	0_66	25	0_87	25
0_4	31	0_25	56	0_46	42	0_67	25	0_88	24
0_5	34	0_26	54	0_47	39	0_68	25	0_89	27
0_6	38	0_27	57	0_48	37	0_69	27	0_90	26
0_7	40	0_28	57	0_49	37	0_70	25	0_91	25
0_8	40	0_29	57	0_50	34	0_71	25	0_92	27
0_9	38	0_30	56	0_51	32	0_72	25	0_93	25
0_10	42	0_31	57	0_52	30	0_73	27	0_94	27
0_11	44	0_32	57	0_53	32	0_74	25	0_95	29
0_12	45	0_33	54	0_54	29	0_75	27	0_96	30
0_13	48	0_34	56	0_55	31	0_76	26	0_97	30
0_14	49	0_35	55	0_56	27	0_77	23	0_98	30
0_15	46	0_36	53	0_57	28	0_78	25	0_99	30
0_16	48	0_37	49	0_58	28	0_79	27	0100	32
0_17	53	0_38	52	0_59	28	0_80	25	0101	33
0_18	51	0_39	51	0_60	25	0_81	26	0102	35
0_19	51	0_40	50	0_61	25	0_82	26	0103	37
0_20	51	0_41	47	0_62	25	0_83	25	0104	37
0_21	54	0_42	46	0_63	24	0_84	24	0105	38

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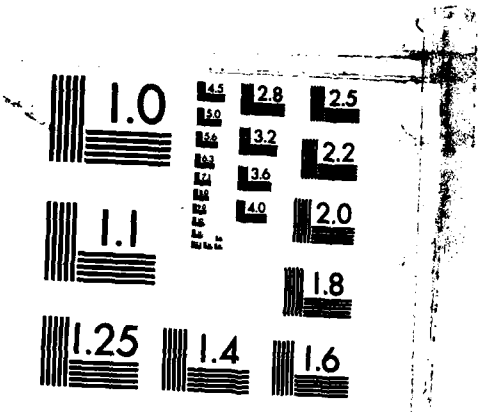
PL OPS/51-A/BAS

AD-A154 676 RESULTS FROM RADIATION MONITORING EQUIPMENT EXPERIMENTS 2/2
ON STS-41C 41D $!.. (U) AIR FORCE TECHNICAL APPLICATIONS
CENTER PATRICK AFB FL S E CASH ET AL. 18 APR 85
UNCLASSIFIED AFTAC-TR-85-4 F/G 18/4 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

INIT MET 6/ 18:03:00

HRM DATA PADS

CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC	CHANNEL	COUNTS/SEC
0_1	30	0_22	46	0_43	29	0_64	25	0_85	28
0_2	26	0_23	45	0_44	30	0_65	25	0_86	28
0_3	27	0_24	41	0_45	29	0_66	24	0_87	27
0_4	28	0_25	44	0_46	27	0_67	25	0_88	29
0_5	29	0_26	47	0_47	26	0_68	24	0_89	26
0_6	30	0_27	44	0_48	27	0_69	24	0_90	29
0_7	29	0_28	45	0_49	28	0_70	24	0_91	26
0_8	29	0_29	44	0_50	26	0_71	25	0_92	29
0_9	31	0_30	45	0_51	25	0_72	25	0_93	28
0_10	33	0_31	43	0_52	26	0_73	27	0_94	31
0_11	34	0_32	41	0_53	25	0_74	27	0_95	29
0_12	37	0_33	41	0_54	24	0_75	26	0_96	32
0_13	35	0_34	40	0_55	25	0_76	26	0_97	31
0_14	38	0_35	40	0_56	24	0_77	26	0_98	35
0_15	37	0_36	39	0_57	25	0_78	28	0_99	32
0_16	39	0_37	35	0_58	25	0_79	26	0100	35
0_17	43	0_38	37	0_59	26	0_80	26	0101	34
0_18	42	0_39	34	0_60	24	0_81	27	0102	37
0_19	45	0_40	33	0_61	25	0_82	25	0103	37
0_20	44	0_41	31	0_62	24	0_83	27	0104	38
0_21	44	0_42	31	0_63	27	0_84	28	0105	36

2-8

2-6

PL OPS/51-A/BAS

PL OPS/51-A/BAS

PRM

1 Activation & Checkout

Unstow PRM
If second operation, replace, mark and stow used battery
Set Rotary sw - HRS
ON/OFF sw - ON
√Display counts down from 9999 and record MET on PRM DATA PAD when Display = 0.00

* If display shows a colon is *
* blank, set ON/OFF sw - OFF; *
* replace, mark, and stow used *
* battery and repeat step 1 *

Report MET to MCC
Restow PRM (leave ON)

2 Data Recording

8-18 hrs after step 1, unstow PRM
Set rotary switch to appropriate positions and record display outputs on PRM DATA PAD

Set ON/OFF sw - OFF
Stow PRM

PRM DATA PAD

0.00 MET 0/23:16:00		208:04:43
HRS	14.13	13.42
CNTS	2.814 E (±) 3	3.367 E (±) 3
RAD	3.07 E (−) 4	3.68 E (−) 4
REM	2.98 E (−) 3	3.47 E (−) 3

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