

#226

APOLLO 14 ALSEP  
COUNT RATE DATA AND SOLAR  
FLARE COUNT RATE DATA  
71-008C-08A

53 frames

APOLLO 14 LM/ALSEP

COUNT RATE DATA ON MAG TAPE

71-008C-08A

This data set has been restored. There were originally 53 7-track, 556 BPI tapes written in Binary. There are five restored tapes. The DR tapes are 3480 cartridges and the DS tapes are 9-track, 6250 BPI. The original tapes were created on a 930 computer and the restored tapes were created on an IBM 9021 computer. The DR and DS numbers along with the corresponding D numbers are as follows:

DR#	DS#	DD#	FILES	TIME SPAN	
-----	-----	-----	-----	-----	
DR004786	DS004786	D010822	1	02/05/71 - 02/09/71	
		D011638	2	02/09/71 - 02/13/71	(a)
		D011639	3	02/13/71 - 02/17/71	
		D011640	4	02/17/71 - 02/21/71	
		D011641	5	02/21/71 - 02/25/71	
		D011642	6	02/25/71 - 03/01/71	
		D011634	7	03/01/71 - 03/05/71	
		D011635	8	03/05/71 - 03/09/71	(b)
		D011636	9	03/09/71 - 03/12/71	
		D011637	10	03/13/71 - 03/17/71	(c)
		D011890	11	03/19/71 - 03/21/71	
DR004787	DS004787	D011891	1	03/21/71 - 03/25/71	
		D011892	2	03/25/71 - 03/29/71	(d)
		D011893	3	03/29/71 - 04/02/71	
		D011894	4	04/02/71 - 04/06/71	
		D011895	5	04/06/71 - 04/10/71	
		D011896	6	04/16/71 - 04/20/71	
		D011897	7	04/20/71 - 04/24/71	
		D011898	8	04/24/71 - 04/28/71	
		D011899	9	04/28/71 - 05/02/71	
		D012117	10	05/02/71 - 05/06/71	
		D012118	11	05/06/71 - 05/10/71	
DR004788	DS004788	D012119	1	05/10/71 - 05/14/71	
		D012120	2	05/14/71 - 05/18/71	
		D012121	3	05/18/71 - 05/22/71	
		D012122	4	05/22/71 - 05/26/71	(e)
		D012123	5	05/26/71 - 05/30/71	(f)
		D012124	6	05/30/71 - 06/03/71	
		D012125	7	06/03/71 - 06/07/71	
		D016608	8	07/31/72 - 08/04/72	(g)
		D012593	9	08/03/72 - 08/06/72	
		D016604	10	08/04/72 - 08/08/72	
		D012591	11	08/07/72 - 08/10/72	

DR#	DS#	DD#	FILES	TIME SPAN
-----	-----	-----	-----	-----
DR004789	DS004789	D016603	1	08/08/72 - 08/12/72 (h)
		D016601	2	12/06/72 - 12/10/72 (i)
		D016606	3	12/18/72 - 12/22/72
		D016607	4	12/22/72 - 12/26/72 (j)
		D016605	5	12/26/72 - 12/30/72
		D016610	6	12/30/72 - 01/01/73
		D016609	7	01/01/73 - 01/05/73
		D016611	8	01/05/73 - 01/09/73
		D016612	9	01/09/73 - 01/13/73
		D016598	10	01/13/73 - 01/17/73 (k)
DR004790	DS004790	D016622	1	01/17/73 - 01/21/73
		D016621	2	01/21/73 - 01/25/73
		D016620	3	01/25/73 - 01/29/73 (l)
		D016619	4	01/29/73 - 02/02/73
		D016618	5	02/02/73 - 02/06/73
		D016617	6	02/06/73 - 02/10/73 (m)
		D016616	7	02/10/73 - 02/14/73
		D016615	8	02/14/73 - 02/18/73
		D016613	9	02/20/73 - 02/22/73 (n)
		D016614	10	02/28/73 - 03/02/73 (o)

- (a) D011638: Read error occurred in record 490 of file 1.
- (b) D011635: Read error occurred in record 14 of file 1.
- (c) D011637: Read error occurred in record 206 of file 1.
- (d) D011892: Read error occurred in record 93 of file 1.
- (e) D012122: Read error occurred in record 5 of file 1.
- (f) D012123: Read error occurred in record 4 of file 1.
- (g) D016608: Read error occurred in record 1702 of file 1.
- (h) D016603: Read errors occurred in records 1743 & 1769 of file 1.
- (i) D016601: Read error occurred in record 85 of file 1.
- (j) D016607: Read errors occurred in records 1284 & 1285 of file 1.
- (k) D016598: Read errors occurred in records 28, 41, 44, 48, 62 of file 1.
- (l) D016620: Read error occurred in record 395 of file 1.
- (m) D016617: Read error occurred in record 65 of file 1.
- (n) D016613: Read error occurred in record 182 of file 1.
- (o) D016614: Read error occurred in record 47 of file 1.

APOLLO 14 ALSEP

COUNT RATE DATA AND SOLAR FLARE COUNT RATE DATA

71-008C-08A

This data set catalog consisting of 53 tapes contains Apollo 14 ALSEP Charged Particle Lunar Environment Experiment data. The tapes are 556 BPI, 7-track, Binary, 1 file. They were created on an XDS 920 computer.

The physical and logical record size can be found in the data tape format.

The time spans for the tapes are:

<u>D#</u>	<u>C#</u>	<u>TIME SPAN</u>
D-10822	C-08176	2/05/71 - 2/09/71
D-11638	C-08938	2/09/71 - 2/13/71
D-11639	C-08939	2/13/71 - 2/17/71
D-11640	C-08940	2/17/71 - 2/21/71
D-11641	C-08941	2/21/71 - 2/25/71
D-11642	C-08942	2/25/71 - 3/01/71
D-11634	C-08934	3/01/71 - 3/05/71
D-11635	C-08935	3/05/71 - 3/09/71
D-11636	C-08936	3/09/71 - 3/12/71
D-11637	C-08937	3/13/71 - 3/17/71
D-11890	C-09194	3/19/71 - 3/21/71
D-11891	C-09195	3/21/71 - 3/25/71
D-11892	C-09196	3/25/71 - 3/29/71
D-11893	C-09197	3/29/71 - 4/02/71
D-11894	C-09198	4/02/71 - 4/06/71
D-11895	C-09199	4/06/71 - 4/10/71
D-11896	C-09200	4/16/71 - 4/20/71
D-11897	C-09201	4/20/71 - 4/24/71
D-11898	C-09202	4/24/71 - 4/28/71

<u>D#</u>	<u>C#</u>	<u>TIME SPAN</u>
D-11899	C-09203	4/28/71 - 5/02/71
D-12117	C-09401	5/02/71 - 5/06/71
D-12118	C-09402	5/06/71 - 5/10/71
D-12119	C-09403	5/10/71 - 5/14/71
D-12120	C-09404	5/14/71 - 5/18/71
D-12121	C-09405	5/18/71 - 5/22/71
D-12122	C-09406	5/22/71 - 5/26/71
D-12123	C-09407	5/26/71 - 5/30/71
D-12124	C-09408	5/30/71 - 6/03/71
D-12125	C-09409	6/03/71 - 6/07/71
<i>SOLAR FLARE</i> * D-12591	C-09583	8/03/72 - 8/06/72
* D-12593	C-09584	8/07/72 - 8/10/72

\* These two tapes are the Solar Flare tapes.

<u>D#</u>	<u>C#</u>	<u>TIME SPAN</u>
D-16598	C-12689	1/13/73 - 1/17/73
D-16601	C-12690	12/06/72 - 12/10/72
D-16603	C-12691	8/08/72 - 8/12/72
D-16604	C-12692	8/04/72 - 8/08/72
D-16605	C-12693	12/26/72 - 12/30/72
D-16606	C-12694	12/18/72 - 12/22/72
D-16607	C-12695	12/22/72 - 12/26/72
D-16608	C-12696	7/31/72 - 8/04/72
D-16609	C-12697	1/01/73 - 1/05/73
D-16610	C-12698	12/30/72 - 1/01/73
D-16611	C-12699	1/05/73 - 1/06/73
D-16612	C-12700	1/09/73 - 1/13/73
D-16613	C-12701	2/20/73 - 2/22/73
D-16614	C-12702	2/28/73 - 3/02/73
D-16615	C-12703	2/14/73 - 2/18/73
D-16616	C-12704	2/10/73 - 2/14/73
D-16617	C-12705	2/06/73 - 2/10/73
D-16618	C-12706	2/02/73 - 2/06/73
D-16619	C-12707	1/29/73 - 2/02/73
D-16620	C-12708	1/25/73 - 1/29/73
D-16621	C-12709	1/21/73 - 1/25/73
D-16622	C-12710	1/17/73 - 1/21/73

Three tapes - D-16599, D-16600, and D-16602 each had over 30 parity errors.

CPLEE DATA TAPE FORMAT

The data tape records are organized around the CPLEE deflection voltage cycles. The tapes are 7-track, 556 B.P.I., binary, odd parity with 1110 word physical records. A logical record contains timing and housekeeping information, and 96 data words. The 96 data words represent either 1 CPLEE cycle in the automatic mode (19.2 seconds) or 8 CPLEE cycles (2.4 seconds/cycle) in the manual mode. Also included are words to identify the deflection voltage step and polarity.

Each data tape begins with a 4-word header record written in odd parity and SDS-92 internal code. The label is "CPLEE ALSEP APOLLO 14".

Each logical record is constructed as follows, with ten (10) logical records per physical record.

WORD NUMBERFUNCTION

1	Days (Day 1 = Jan.1.)
2	Hours
3	Minutes
4	Milliseconds
5-100	Data Array
101	Mode and Step Indicator
102	Last Valid Line (Manual)
103	N/A
104	N/A
105	Year
106	N/A
107	Analyzer B Channeltron Power Supply Voltage
108	Analyzer A Channeltron Power Supply Voltage
109	DC/DC Convertor Voltage
110	Physical Analyzer Temp. (°C)
111	Electronics Temp. (°C)



DATA ARRAY (Words 5-100)

A. AUTOMATIC MODE

<u>WORD</u>	<u>FUNCTION</u>
5-10	Analyzer A, + 3500, Ch. 1-6
11-16	Analyzer B, + 3500, Ch. 1-6
17-22	Analyzer A, + 350, Ch. 1-6
23-28	Analyzer B, + 350, Ch. 1-6
29-34	Analyzer A, + 35, Ch. 1-6
35-40	Analyzer B, + 35, Ch. 1-6
41-46	Analyzer A, + 0, Ch. 1-6
47-52	Analyzer B, + 0, Ch. 1-6
53-58	Analyzer A, - 3500, Ch. 1-6
59-64	Analyzer B, -3500, Ch. 1-6
65-70	Analyzer A, -350, Ch. 1-6
71-76	Analyzer B, -350, Ch. 1-6
77-82	Analyzer A, -35, Ch. 1-6
83-88	Analyzer B, -35, Ch. 1-6
89-94	Analyzer A, -0, Ch. 1-6
95-100	Analyzer B, -0, Ch. 1-6.

B. MANUAL MODE.

WORD

FUNCTION.

5-10

Analyzer A, Ch. 1-6

11-16

Analyzer B, Ch. 1-6

This sequence is repeated 7 times to fill the data array. In the event that the instrument returns to automatic mode or changes deflection voltage before the 8 cycles are complete, the remainder of the array will be filled with zeroes.

MODE AND ID BITS (Word 101)

- A. Automatic Mode - If the instrument is in automatic mode the 24th bit ( $2^{23}$ ) will be set to "1" and all other bits zero.
- B. Manual Mode - If the instrument is in manual mode the 24th bit will be "0" and the lowest-order four bits will indicate the deflection voltage step according to the following:

<u>OCTAL</u>	<u>DECIMAL</u>	<u>BINARY</u>	<u>DEFLECTION VOLTAGE</u>
16	14	1110	+ 3500
14	12	1100	+ 350
12	10	1010	+ 35
10	8	1000	+ 0
06	6	0110	- 3500
04	4	0100	- 350
02	2	0010	- 35
00	0	0000	- 0

LAST VALID LINE (Word 102)

The last valid line word (word 102) is an integer from 1 to 8 which is the number of the last valid line in the data array. Since all lines are valid in Automatic, this value is significant only in Manual mode. Normally 8 manual cycles are packed into a logical unit, but a data gap or a change in mode or deflection voltage will abort the packaging process. Therefore, some logical units will have fewer than 8 lines of good, time-consecutive data in them, and this parameter tells how many lines are good.

YEAR (Word 105)

The year word is a binary integer for the data year; i.e., 1971.

HOUSEKEEPING (Words 107-111)

The housekeeping data has all been multiplied by 100 to preserve two decimal places in the binary integer form.

TAPE TERMINATION - Tapes are terminated with two (2) IBM end-of-file marks.

NOTE:

- a) All periods when the instrument was off are deleted from the tape.
- b) Each tape contains 4 days of data beginning at Day n, 17/44/00 and ending at Day n + 4, 17/43/59.
- c) When checking to see if instrument is in manual or auto (word 101), simply check if word 101 is greater than or less than 100.

CHARGED PARTICLE LUNAR ENVIRONMENT EXPERIMENT

(CPLEE)

Description of the instrument, calibration factors, operational history, and data tape format prepared for the National Space Science Data Center.

For further information contact:

Prof. David L. Reasoner  
Department of Space Science  
Rice University  
Houston, Texas 77001  
713-528-4141 X1135

## DESCRIPTION OF THE INSTRUMENT

The CPLEE consists of a box supported by four legs. The box contains two similar physical charged-particle analyzers, two different programable high-voltage supplies, twelve 20-bit accumulators, and appropriate conditioning and shifting circuitry.

Each physical analyzer contains five C-shaped channel electron multipliers with a nominal aperture of 1 mm each and one helical channel electron multiplier with a nominal aperture of 8 mm. These are shown schematically in figure 1.

The channel electron multiplier is a hollow glass tube, the inside surface of which, when bombarded by charged particles, ultraviolet light, etc., is an emitter of secondary electrons. In the CPLEE, the aperture of each electron multiplier is operated nominally at ground potential (actually at 16 V), while a voltage of 2800 or 3200 V (selected by ground command) is placed on the other (i.e., anode) end. Thus, if an incident particle enters the aperture and secondary electrons are produced, these are accelerated and hit the walls to generate more secondary electrons, so that a multiplication to an order of  $10^7$  is achieved by the time the pulse arrives at the anode. After conditioning, pulses from each electron multiplier are accumulated in a register for later readout as described in the following paragraphs.

As shown in figure 1, incident particles enter an analyzer through a series of slits and then pass between two deflection plates across which a voltage can be applied. Thus, at a given deflection voltage, the five small-aperture electron multipliers make a five-point measurement of the energy spectrum of charged particles of a given polarity (e.g., electrons), while, sim-

ultaneously, the large-aperture electron multiplier makes a single wideband measurement of particles with the opposite polarity and of simultaneous multiple-spectral samples are considerable in studies of rapidly varying particle fluxes.

In the CPLEE, the deflection-plate voltage, in the normal mode, is stepped in the sequence shown in figure 2. As a consequence, the energy passbands shown in figures 4 and 5 are sampled. Although data acquired by the six sensors are not transmitted simultaneously, the six sensors are connected to six accumulators for exactly the same time (viz, 1.2 sec) and the contents transferred to shift registers for later sequential transmission.

Two analyzers, A and B, point in the directions shown in figure 3. The same deflection voltage is applied to each analyzer simultaneously, with counts from 1.2-sec accumulation time of analyzer A being transmitted while counts from analyzer B are accumulating. Thus, each voltage is normally on for 2.4 sec with the result that the total cycle time is 19.2 sec (fig. 2), when allowance is made for two sample times when the deflection voltage is zero. On one of those two occasions, counts are accumulated as usual to measure background or contaminating radiation. On the other occasion, a pulse generator of about 375 kHz is connected to the accumulators to verify operation.

The command link with the ALSEP provides a variety of options for CPLEE operation. Aside from the usual power commands common to all ALSEP experiments, three commands are provided that allow the normal automatic stepping sequence to be modified. The sequence can be stopped and then the deflection plate supply can be manually stepped to any one of the eight possible levels.

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This is done to study a particular phenomenon (e.g., low-energy electrons) with higher time resolution (2.4 sec). A second set of commands allows the electron-multiplier high-voltage supply to be set at either 2800 or 3200 V. The higher voltage is used in the event the electron-multiplier gains decrease during lunar operations. A third pair of commands allows the normal thermal-control mode to be bypassed in the event of failure of the thermostat, thus offering manual control of the heaters.

The CPLEE apertures are covered with a dust cover to avoid contamination during deployment and, particularly, during LM ascent. The dust cover was made doubly useful because a  $^{63}\text{Ni}$  radioactive source was placed on the underside over each aperture. Thus, the sensors were proof calibrated on the Moon, and the data compared with measurements made in the same way with the same system when the unit was last calibrated on Earth.

CPLEE was deployed on the lunar surface at lunar coordinates  $3^{\circ} 40'$  south latitude and  $17^{\circ} 27'$  west longitude on February 5, 1971. Leveling and east-west orientation to within  $\pm 1^{\circ}$  were accomplished by means of a bubble level and sun compass. Analyzer A, therefore, points toward the local lunar vertical and Analyzer B points  $60^{\circ}$  from vertical toward lunar west. For a first approximation, the detectors may be considered to be pointing in the plane of the ecliptic.

# CPLEE PHYSICAL ANALYZER

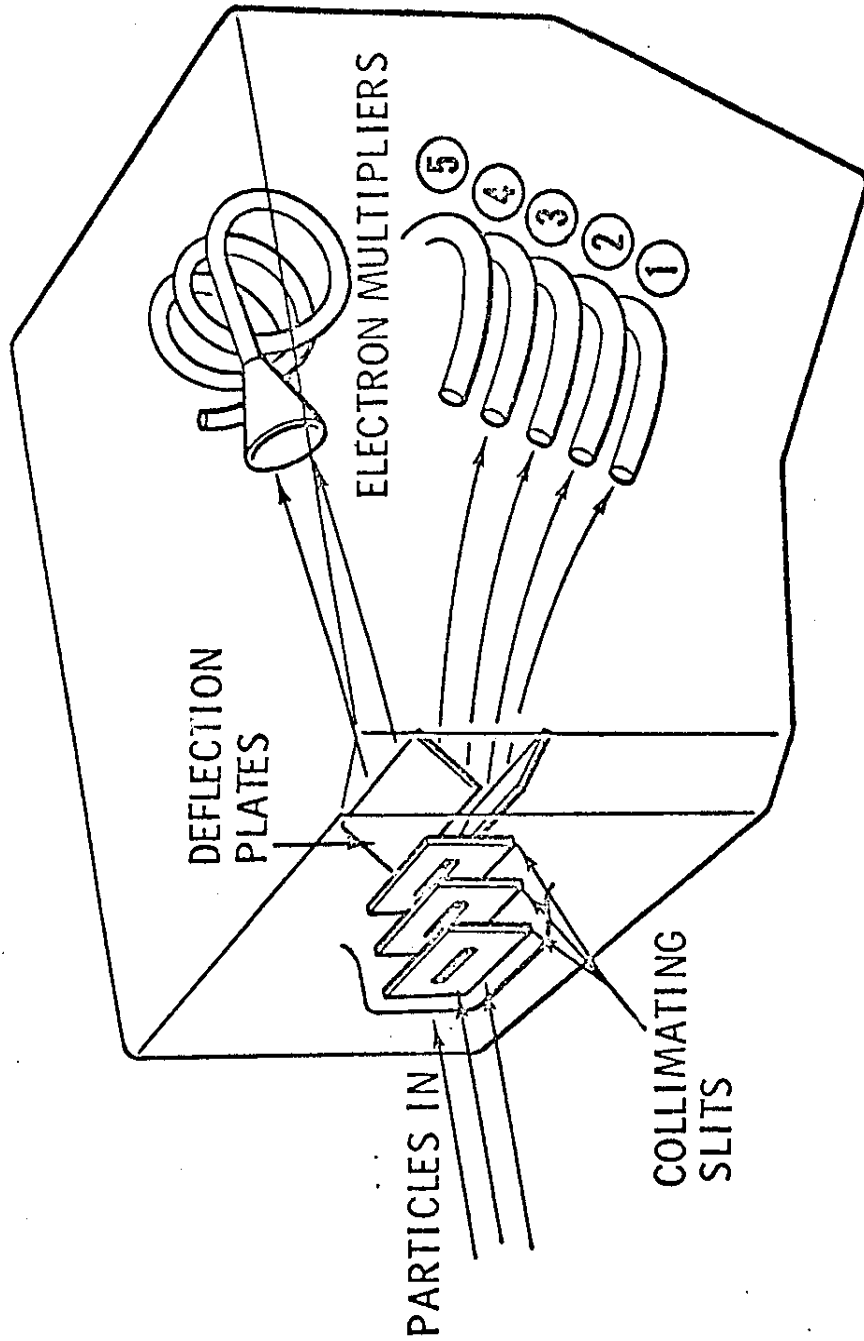
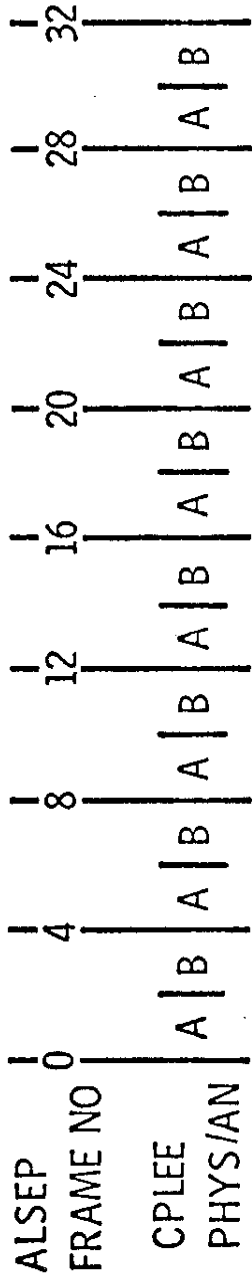


FIGURE 1



# CPLLEE TIMING SEQUENCE



READOUT OF A DURING B MEAS , ETC.

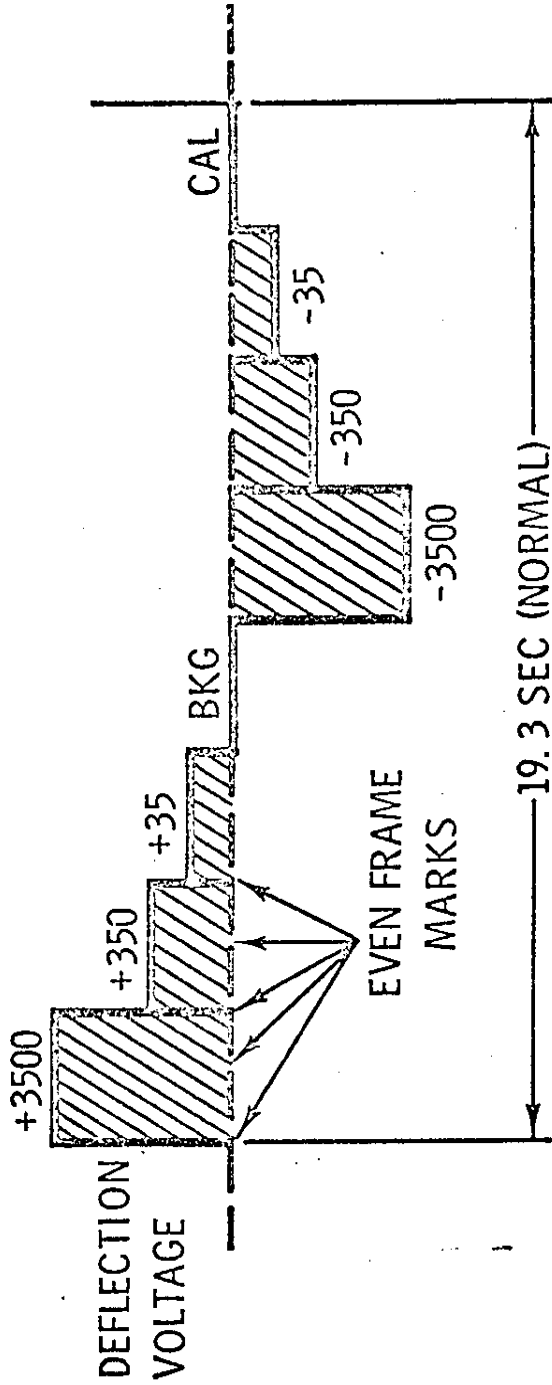


FIGURE 2

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# CHARGED-PARTICLE LUNAR ENVIRONMENT EXPERIMENT SUBSYSTEM

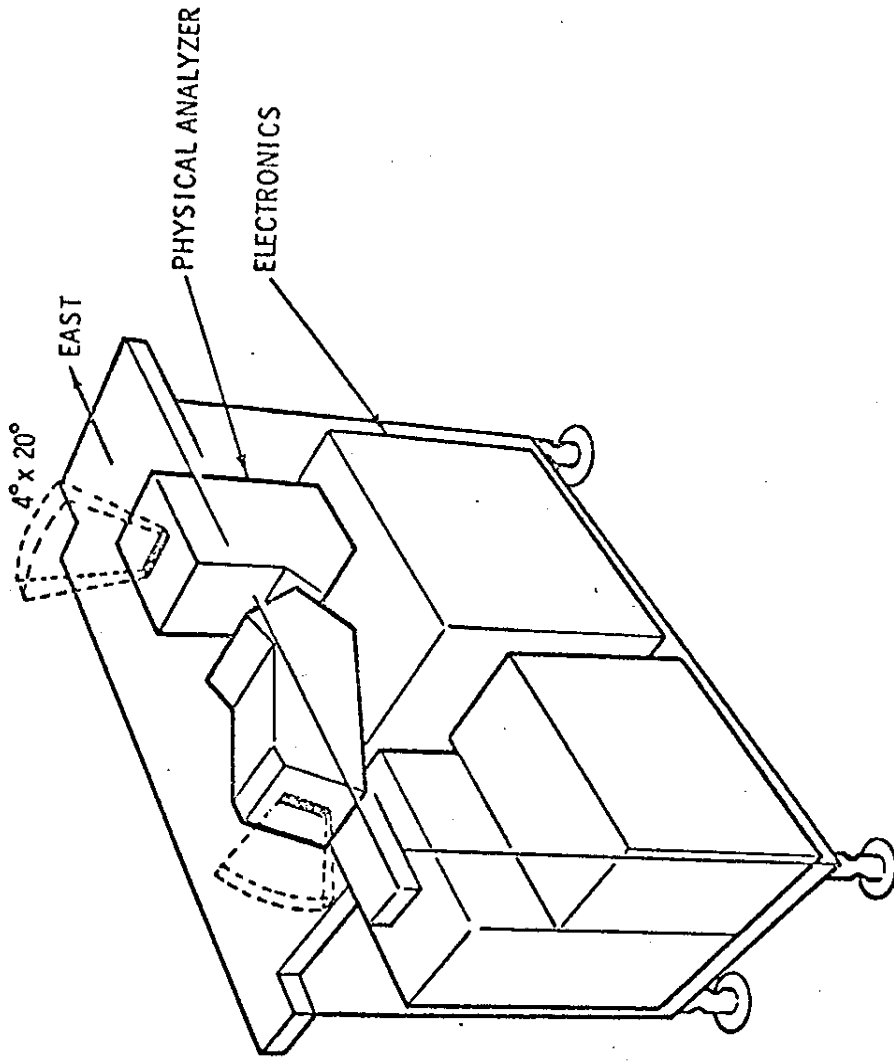


FIGURE 3

CPLEE CALIBRATION

In the following table (Table 1) the center energies of the various channels and the numbers to convert from counts/cycle (1 cycle = 1.2 seconds) to flux in particles/cm<sup>2</sup> sec-ster-eV are given. Negative deflection voltages (-35, -350, -3500) for channels 1-5 are electron channels, while positive deflection voltages for channel 6 are electron channels. Conversely, positive deflection voltages for channels 1-5 and negative deflection voltages for channel 6 are ion channels. The calibrations for the lowest energy ion channels ( +35 volts, channels 1-5) are estimated as there was no low-energy ion source available for calibration.

The deflection voltage step labeled + 0 is a background measurement. At the -0 deflection voltage step, a test oscillator with frequency of about 375 kHz is connected to the amplifiers to verify operation of the entire data link.

Figures 4 and 5 show the actual CPLEE energy passbands for electrons. Here are plotted GF(E) vs. E. The area under a curve is GF<sub>0</sub> x ΔE, or the effective geometric factor in units of cm<sup>2</sup>-ster-eV-counts/particle. The conversion numbers in Table 1 were obtained by the formula  $N = \frac{1}{GF_0 \times \Delta E} \cdot \frac{1}{1.2}$ . (The factor of 1.2 accounts for the 1.2 second accumulation time.)

Table 1  
 CPLEE Counts to Differential Flux  
 (Counts/1.2 sec to #/cm<sup>2</sup>sec ster eV)

Step, Detector	Center Energy (eV)		Flux units/count	
	Analyzer A	Analyzer B	Analyzer A	Analyzer B
-35,1	40	45	5900	4350
-35,2	50	54	2780	2560
-35,3	65	70	1410	1430
-35,4	94	100	530	532
-35,5	200	200	100	74
-35,6				
-350,1	500	500	313	351
-350,2	600	600	210	266
-350,3	750	750	118	143
-350,4	1100	1100	65	81
-350,5	2000	2300	15	15
-350,6				
-3500,1	4800	5000	68	70
-3500,2	5800	6000	31	33
-3500,3	7200	7500	18	24
-3500,4	10000	10000	9.5	11.5
-3500,5	20000	23000	6.5	6.5
-3500,6				
+35,1	(60)	(55)	(2 x 10 <sup>5</sup> )	(1.2 x 10 <sup>5</sup> )
+35,2	(70)	(65)	(50000)	(50000)
+35,3	(84)	(85)	(19000)	(20000)
+35,4	170	(100)	2000	(4000)
+35,5	300	220	230	240
+35,6	75	85	4.8	4.5

Table 1 (continued)

+350,1	500	500	630	615
+350,2	600	600	380	475
+350,3	750	750	170	242
+350,4	1100	1100	70	105
+350,5	2000	2200	12	11
+350,6	750	800	0.74	0.83
+3500,1	4800	5000	35	35
+3500,2	5800	6000	13.4	14.3
+3500,3	7200	7500	6.9	8.0
+3500,4	10000	10000	2.7	3.3
+3500,5	20000	22000	1.5	1.5
+3500,6	9000	8000	0.31	0.60

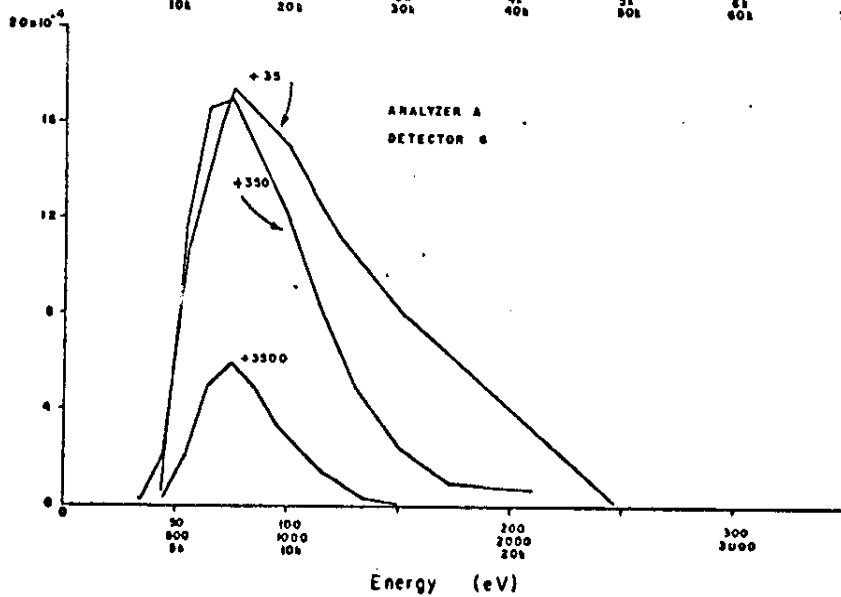
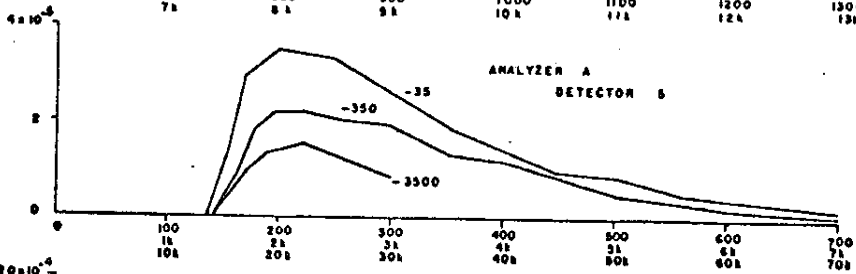
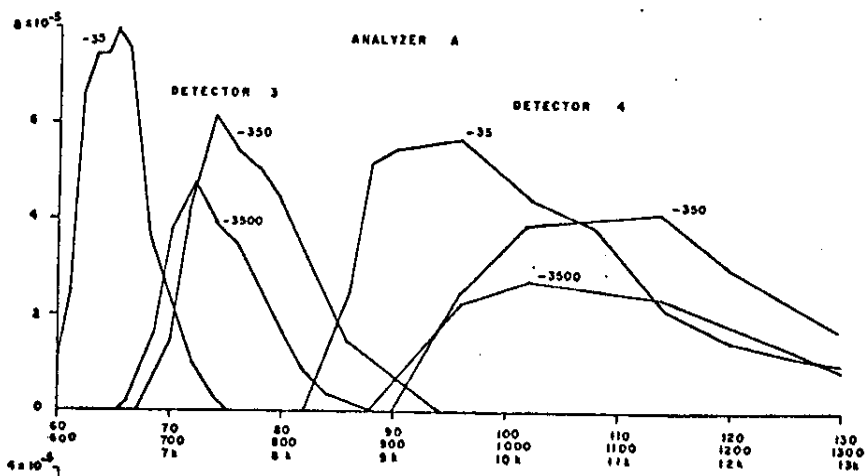
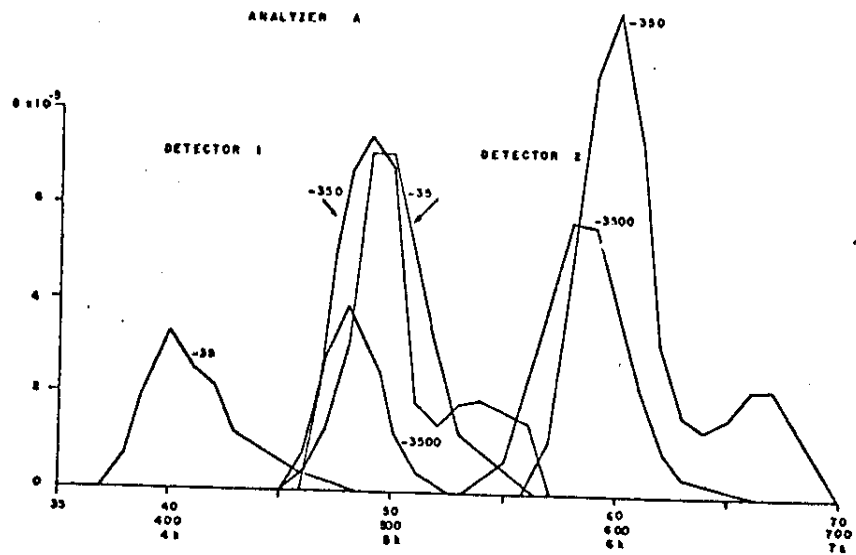


FIGURE 4

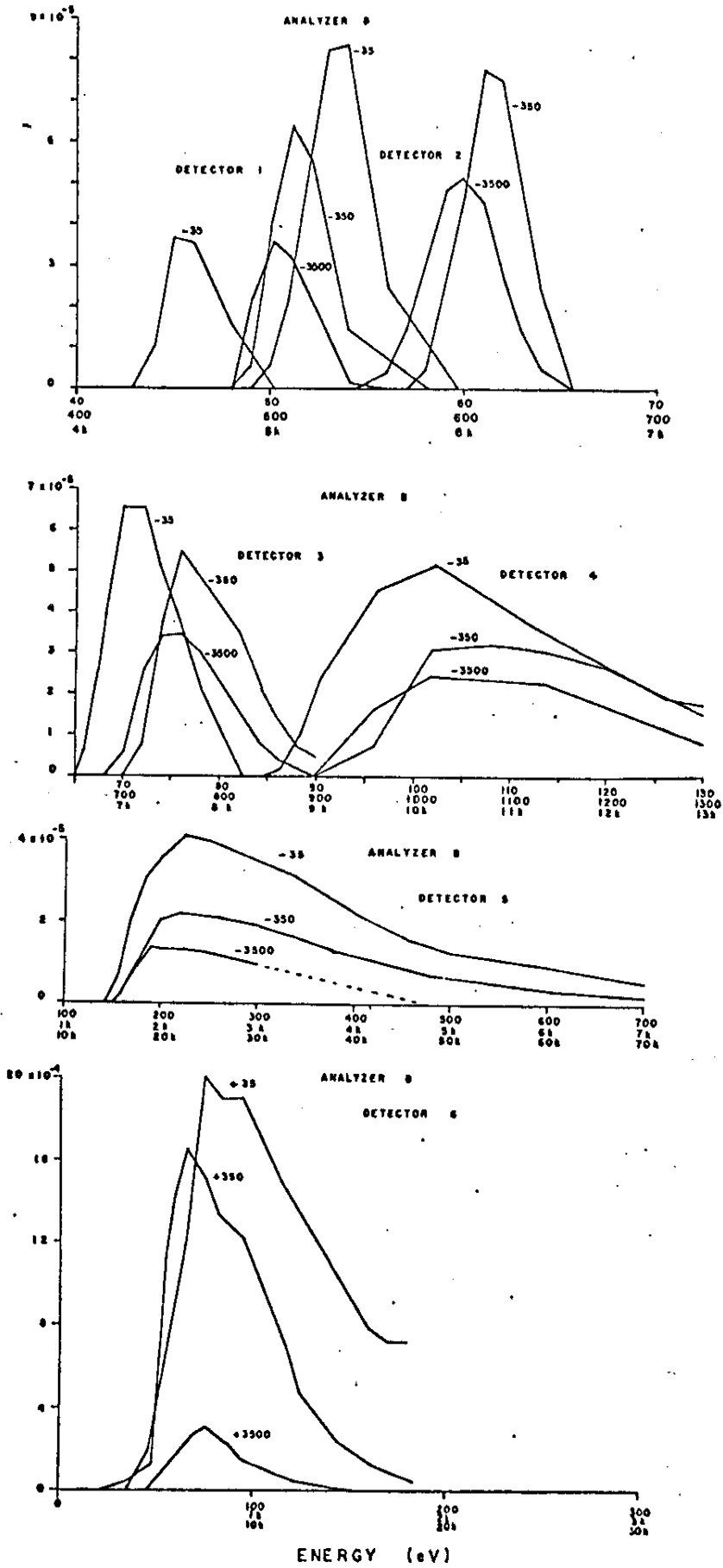


FIGURE 5

CPLEE OPERATIONAL HISTORY

<u>TIME</u> (Day/Hours/Min./Sec.)	<u>EVENT</u>
036/10/00/00	CPLEE on-Functional Test
036/19/10/00	CPLEE off
036/21/58/40	CPLEE on
036/22/03/10	CPLEE off
037/04/00/00	CPLEE on -Full Functional Test w/all command Functions Tested-Counts are due to dust cover beta sources
037/06/09/40	CPLEE off
037/15/28/20	CPLEE on
037/15/39/50	CPLEE off
037/19/10/01	CPLEE on-Post LM Liftoff
037/19/30/13	Dust Cover Removed
044/02/22/00	Sequence of 10 minutes automatic operation alternating with 50 minutes manual + 350 operation begun.
044/21/00/00	Sequence Terminated.



045/02/00/00 Sequence of alternates  
1-hour periods of automatic  
and manual + 350 operation begun.

048/21/00/00 Sequence Terminated - Instrument  
to automatic.

065/08/00/00 Sequence of alternate 1-hour  
periods of automatic and manual  
-35 operation begun.

069/21/45/00 Sequence Terminated - Instrument  
to automatic mode/

072/00/00/00 CPLEE off due to Analyzer A  
solar U.V. contamination.

072/18/00/00 CPLEE on.

076/08/03/00 CPLEE off due to Analyzer B  
solar U.V. contamination.

078/04/00/00 CPLEE on.

098/21/55/35

CPLEE Channeltron power supply for Analyzer B failed, terminating data from this Analyzer.

099/14/30/00

CPLEE off.

106/14/29/00

CPLEE on - Analyzer A only.

130/20/50/00

CPLEE off due to Analyzer A solar U.V. contamination.

131/18/58/00

CPLEE on.

157/17/15/00

CPLEE channeltron power supply for Analyzer A partically failed (low voltage condition).

157/18/11/00

CPLEE off.



