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Description of Average Tapes of Experiment-4 Data of He-1 and -2 (Search-Coil Magnetometer Experiment)

- A) Structure of Tapes
 - 1) 9 track, 1600 BPI, binary
 - 2) Files: one tape includes one file
 - 3) Records: they have variable length. The maximal length is 800 words. The first record in a tape is a header-record. The next record is a day label. Additional day labels praced every change of day in a tape. The other records are science data records. In average tapes two types of science data records are possible:

Mean value records (Mean) peak value records (Max)

The time sequence is as follows:

Mean (T1), Max (T1), Mean (T1 + 0.5 \times Tstep),

Mean (T1 + 2 \times Tstep), Max (T1 + 2 \times Tstep),

Mean (T1 + 1.5 \times Tstep),

a.s.o.

with: T1 - any start time

Tstep - time intervall for one Max

4) words:

The wordlength is 16 bits.

The content of records is counted in words.

For detailed description of words in a record see

'E4 adr Tape Records' (enc.)

character representation: 8-bit Ascii code

bits 1-8 first character

bits 9-16 second character

integer representation: 1 word, two's complement

real representation: 2 words

bit 1: sign

bits 2-10: exponent (biased+256)

bits 11-32: positive fraction

long representation: 4 words

bits 1-10: same as real

bits 11-64: positive fraction

B) Science Data Records:

1) Data processing: For detailed description of the search-coil magnetometer experiment (E4) see Neubauer et al. (1977), Dehmel et al. (1975).

The experiment consists of 3 orthogonal search-coil sensors with Z-axis parallel to the spin-axis and the X- and Y-axis in the equatorial plane.

The Z-component and one of the X- or Y-component is processed by a spectrum analyser. It consists of 8 band-pass filters spaced logarithmically in frequency.

frequency range [Hz]		center freq. [Hz]	channels
4.	7 - 10	6.8	X1, Z1
10	- 22	14.7	X2, Z2
22	- 47	31.6	X3, Z3
47	- 100	68	X4, Z4
100	- 220	147	X5, Z5
220	- 470	316	X6, Z6
470	- 1000	681	X7, Z7
1000	- 2200	1470	X8, Z8
			(or instead of X · Y)

A set of X1, Z1,, X8, Z8 is called a vector.

Mean vaules:

The filter outputs are squared and averaged by a digital mean-value-computer on board of Helios. The time intervalls are:

1.125, 2.25, 4.5, 18, 36, 72, 144, 288, 576, 1152 seconds depending on the operational mode of the S/C telemetry system.

Peak values:

For the same time interval the peak reading from each filter output is transmitted in addition to the mean values. The peak values are scaled such that for a monochromatic signal they are above the mean values by a factor of $\sqrt{2}$. No peak values exist for distribution mode 0.

8sec average tapes:

The data records consist of experimental output voltages with respect to an amplification factor. For average intervals less than 4.5 seconds the mean values are compressed to 8-sec-averages.

2) Time information:

The number of days is counted from the day of year at launch.

He 1: launched December 10, 1974 number of day: 344

He 2: launched January 15, 1976 number of day: 15

Attention: No reset of day number was made when the year changes.

The fraction of day is the current time of that day.

e.g.: He-1, February 1, 1975 at 12.00 number of days: 397 fraction of days: 0.5

The number and fraction of day provide the event time of the first vector in a data record. The vector step time is the time between two vectors in fraction of day.

3) Conversion of data:

To convert the sensor output voltages into spectral densities measured in $\gamma/\sqrt{\text{Hz}}$ (= nT · $\sqrt{\text{sec}}$) one has to apply a conversion factor conv(f) and the amplification factor Amp to each channel.

Amp is 10. throughout the missions of He1 and 2.

conv(f)	channel X,Y,Z	
$2.07 \cdot 10^{-6}$	8	
$6.58 \cdot 10^{-6}$	7	
$2.11 \cdot 10^{-5}$	6	
$6.65 \cdot 10^{-5}$	5	
$2.11 \cdot 10^{-4}$	4	
$6.60 \cdot 10^{-4}$	3	
$2.09 \cdot 10^{-3}$	2	
$6.59 \cdot 10^{-3}$	1	

e.g.: Value of sensor 2, 1st vector, channel 8 value $[\gamma/\sqrt{\text{Hz}}]$ = real (word 87,88) × conv(8)/Amp

4) Noise:

There are some rare cases showing only background noise in all frequency channels. But in most of the time channel 1 and 2 (frequency 4.7 - 22 Hz) show signals well above the noise levels.

The occurence of signals above the noise decrease with increasing frequency and increase with approach to the sun.

Lit.: Neubauer, F.M., Beinroth, H.J., Barnstorf, H., Dehmel, G.: Initial results from the Helios-1 search-coil magnetometer experiment. J.Geophys.Res., 42, 599-614, 1977.

Dehmel, G., Neubauer, F.M., Lukoschus, D., Wawretzko, J., Lammers, E.: Das Induktionsspulen-Magnetometer-Experiment (E4). Raumfahrtforschung, 19, 241-244, 1975.

15-18

19-21

INTEGER

INTEGER

LONG

E4ADR TAPE RECORDS FILE: "E4FORMAT.GBEIN" 05.03.81

1. TAPE HEADER

THESE STATE Note When the court space that the court state that the court of the co		
WORDNUMBER	TYPE	CONTENT
1	INTEGER	100 LAREL
	INTEGER	LENGTH OF RECORD IN WORDS
3	CHARACTER	"**** E4ADR TAPE HEADER/HELIOS A ****" "**** E4ADR TAPE HEADER/HELIOS B ****"
51	INTEGER	NUMBER OF TAPE
55	INTEGER	NUMBER OF SERIES
23	INTEGER	YEAR OF GENERATION
24	INTEGER	- MONTH
25	INTEGER	DAY
26	INTEGER	HOUR "
27	INTEGEP	MINUTE
28	INTEGER	MAX. LENGTH OF DATA RECORD IN WORL
29 30	INTEGER	OUTPUT DEVICE
31	INTEGER INTEGER	RPI
32-60	INICOCK	AVERAGE TIME OF TAPE IN SECONDS Free
2. DAY LABEL		
MINE PART NAME TO BE AGAIN AND WHITE BASE MAY ARREST SALES SALES AND ARREST SALES ARREST ARRE	- Mary - Arms	
1	INTEGER	99 LABEL
S	INTEGER	12 - LENGTH OF RECORD IN WORDS
3	INTEGER	NUMBER OF DAYS SINCE LAUNCH
4	CHARACTER	"****DAY LAREL****
3. SCIENCE D	ΑΤΔ	
Species where which have related subject deliver have deliver have subject to the subject of the	400	
1	INTEGER	11 - MEANVALUES
		12 - MAXIMALVALUES
***	The state of the s	13 - WAVEFORMVALUES
5	INTEGER	LENGTH OF RECORDS IN WORDS
3	INTEGER	NUMBER OF DAYS SINCE LAUNCH
4-7 8-9	LONG	FRACTION OF DAY (DECIMAL)
10	INTEGER	FREE
11	INICUEK	NUMBER OF VECTORS IN RECORD
12	INTEGER	FREE Format
	INICOER	P UK TH I

BIT RATE

FREE

DISTRIBUTION MODE

VECTOR STEP TIME IN FRACTION OF DAY

	58	55	INTEGER	90	Single	HELIOS 1
į	59			91	- H	HELIOS 2
	50 61	23-24	REAL			ECLIPT. LAT. OF SPIN AXIS (RAD)
	62	25,26 27,28	REAL			ECLIPT. LONG. OF SPIN AXIS (RAD)
	53	29-30	REAL			FREE ECLIPT. LONG. OF HELIOS POS. (RAD)
	54	31-32	REAL			DISTANCE FROM SUN (AU)
	5 5	33-34	REAL			FREE
	56 57	35,36	D. ~ A :			HELIOGRAPH. LAT. OF HEL. POS. (RAD)
	5 8	37,38 39,40	REAL			ANGLE HELIOS-SUN-EARTH (RAD) FREE
	69	41,42	REAL			SAMPLING RATE IN ORIG. DATA (ONLY AVERAGE TAPES) VECTOR STEP TIME " "
	70					
	71	43-46	LONG			
	72 73	47-66				(ONLY AVERAGE TAPES)
	74		LONG			FREE
	75		LONG			TRIP LIGHT TIME IN FRACTION OF DAY SPIN PERIOD IN FRACTION OF DAY
	76	74-80				FREE
	77					
	7 8		5171 5.57 65 55			
	80		DATA PART OF REC			
	81	81	INTEGER	0	960A	GOOD QUALITY
	82		We to the state of			BAD QUALITY
	83	82	INTEGER	0 -	S pan	Y - SENSOR
	84 85	83			550-0	X - SENSOR
	86	0.7	INTEGER			AMPLIFICATION FACTOR (04, 108
	87					2 - 10., 3 - 2.)
	88		INTEGER			FACTOR, ONLY IN AVERAGE TAPES
	89	85-86	REAL			SAMPLING RATE (IN AVERAGE TAPES
À	90					NUMBER OF GOOD VECTORS FOUND
9	95					IN THIS AVERAGE INTERVALL, SEE WORD 41,42)
	93	87-118	REAL			16 WORDS, 8X,8Z,7X,7Z,,1X,17
	94		* * * * * * * * * * * * * * * * * * *			FOR MEAN VALUES
	95	87-102	INTEGER			16 WORDS, 8X,8Z,7X,7Z,,1X,1Z
	96 97					FOR MAXIMALI VALUES
	98	PEPETT	TIONS FOR M MORE W	こんてん	rs e	S AS SPECIFIED IN WORD 10
	20	NEFERI	TIVAS FUR N MURE V	LUIU	T 3	HO OLECTIFIED IN MORY IN

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100
     LINES = 60
      POLLI = TRUE (I.E. BATCH = FALSE)
0
      REAR = TRUE (I.E. FRONT = FALSE)
      DELTA =
                  1
     CURRENT DEPTH = 0. THE DEPTH LIMIT = 10
      RIGHT =72
      LENGTH = 72
      LONG = TRUE (I.E. SHORT = FALSE)
. 0
      TIME = 50
      TOTAL NUMBER OF CURRENT LINES = 100
      FROM = 1
.0
      LEFI = 1
      FIXED = TRUE (I.E. VARIABLE = FALSE)
      SIZEI = 0
      DISPLAY = TRUE (I.E. QUIET = FALSE)
0
      FORMAT=DEFAULT
      NO TABS USED
0
      FILES:
          WORK: K0641640
          KEEP:
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                                           THU, MAR 5, 1981, 4:40 PM
          TEXT: E4FORMAT.GBEIN.E4
          JOIN:
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