



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  $\gamma/\sqrt{\text{Hz}}$  ( $= \text{nT} \cdot \sqrt{\text{sec}}$ ) one has to apply a conversion factor  $\text{conv}(f)$  and the amplification factor  $\text{Amp}$  to each channel.

$\text{Amp}$  is 10. throughout the missions of He1 and 2.

$\text{conv}(f)$	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  $[\gamma/\sqrt{\text{Hz}}] = \text{real}(\text{word } 87,88) \times \text{conv}(8)/\text{Amp}$

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 occurrence 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.

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E4ADR TAPE RECORDS FILE: "E4FORMAT.GBEIN"  
05.03.81

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1. TAPE HEADER

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WORDNUMBER	TYPE	CONTENT
1	INTEGER	100 LABEL
2	INTEGER	LENGTH OF RECORD IN WORDS
3	CHARACTER	***** E4ADR TAPE HEADER/HELIOS A *****
		***** E4ADR TAPE HEADER/HELIOS B *****
21	INTEGER	NUMBER OF TAPE
22	INTEGER	NUMBER OF SERIES
23	INTEGER	YEAR OF GENERATION
24	INTEGER	MONTH "
25	INTEGER	DAY "
26	INTEGER	HOUR "
27	INTEGER	MINUTE "
28	INTEGER	MAX. LENGTH OF DATA RECORD IN WORDS
29	INTEGER	OUTPUT DEVICE
30	INTEGER	RPI
31	INTEGER	AVERAGE TIME OF TAPE IN SECONDS
32-60		FREE

2. DAY LABEL

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1	INTEGER	99 LABEL
2	INTEGER	12 - LENGTH OF RECORD IN WORDS
3	INTEGER	NUMBER OF DAYS SINCE LAUNCH
4	CHARACTER	*****DAY LABEL*****

3. SCIENCE DATA

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1	INTEGER	11 - MEANVALUES
		12 - MAXIMALVALUES
		13 - WAVEFORMVALUES
2	INTEGER	LENGTH OF RECORDS IN WORDS
3	INTEGER	NUMBER OF DAYS SINCE LAUNCH
4-7	LONG	FRACTION OF DAY (DECIMAL)
8-9		FREE
10	INTEGER	NUMBER OF VECTORS IN RECORD
11		FREE
12	INTEGER	FORMAT
13	INTEGER	BIT RATE
14	INTEGER	DISTRIBUTION MODE
15-18	LONG	VECTOR STEP TIME IN FRACTION OF DAY
19-21		FREE

58	22	INTEGER	90	- HELIOS 1
59			91	- HELIOS 2
60	23-24	REAL		ECLIPT. LAT. OF SPIN AXIS (RAD)
61	25,26	REAL		ECLIPT. LONG. OF SPIN AXIS (RAD)
62	27,28			FREE
63	29-30	REAL		ECLIPT. LONG. OF HELIOS POS. (RAD)
64	31-32	REAL		DISTANCE FROM SUN (AU)
65	33-34	REAL		FREE
66	35,36			HELIOGRAPH. LAT. OF HEL. POS. (RAD)
67	37,38	REAL		ANGLE HELIOS-SUN-EARTH (RAD)
68	39,40			FREE
69	41,42	REAL		SAMPLING RATE IN ORIG. DATA
70				(ONLY AVERAGE TAPES)
71	43-46	LONG		VECTOR STEP TIME " "
72				(ONLY AVERAGE TAPES)
73	47-66			FREE
74	67-70	LONG		TRIP LIGHT TIME IN FRACTION OF DAY
75	71-74	LONG		SPIN PERIOD IN FRACTION OF DAY
76	74-80			FREE

DATA PART OF REC

81	81	INTEGER	0	- GOOD QUALITY
82			1-7	- BAD QUALITY
83	82	INTEGER	0	- Y - SENSOR
84			1	- X - SENSOR
85	83	INTEGER		AMPLIFICATION FACTOR
86				( 0 - .4, 1 - .08
87				2 - 10., 3 - 2. )
88	84	INTEGER		FACTOR, ONLY IN AVERAGE TAPES
89	85-86	REAL		SAMPLING RATE (IN AVERAGE TAPES
90				NUMBER OF GOOD VECTORS FOUND
91				IN THIS AVERAGE INTERVALL,
92				SEE WORD 41,42 )
93	87-118	REAL		16 WORDS, 8X,8Z,7X,7Z,....,1X,1Z
94				FOR MEAN VALUES
95	87-102	INTEGER		16 WORDS, 8X,8Z,7X,7Z,....,1X,1Z
96				FOR MAXIMAL VALUES

REPETITIONS FOR N MORE VECTORS AS SPECIFIED IN WORD 10

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LINES = 60  
POLLI = TRUE (I.E. BATCH = FALSE)  
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)  
TIME1 = 50  
TOTAL NUMBER OF CURRENT LINES = 100  
FROM = 1  
LEFT = 1  
FIXED = TRUE (I.E. VARIABLE = FALSE)  
SIZE1 = 0  
DISPLAY = TRUE (I.E. QUIET = FALSE)  
FORMAT=DEFAULT  
NO TABS USED  
FILES:

WORK: K0641640  
KEEP:  
TEXT: E4FORMAT.GBEIN.E4  
JOIN:

THU, MAR 5, 1981, 4:40 PM