# COSPIN / HET - User Notes

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**Rates Data**

**SPIN-AVERAGED RATES DATA**

RECORD FORMAT:

```
C FREE FORMAT
      READ(1,*)IYEAR,IDOY,IHOUR,IMIN,
     .        H1,H2,H3,H4,H5,
     .        H6,H7,H8,
     .        H9,H10,H11,H12,H13,
     .        YEAR,DOY
C FIXED FORMAT
      READ(1,100)IYEAR,IDOY,IHOUR,IMIN,
     .        H1,H2,H3,H4,H5,
     .        H6,H7,H8,
     .        H9,H10,H11,H12,H13,
     .        YEAR,DOY
100   FORMAT(3X,I2,X,I3,2(X,I2),13(X,E10.3),X,F12.8,X,F9.5)
```

PARAMETER LIST:

IYEAR: year

IDOY: day of year
IHOUR: hour
IMIN: minute
H1: protons (5-14 MeV)
H2: " (14-19 MeV)
H3: " (24-31 MeV)
H4: " (34-68 MeV)
H5: " (68-92 MeV)
H6: electrons (1-3 MeV)
H7: " (5-10 MeV)
H8: " (3-5 MeV)
H9: protons (>92 MeV)
H10: Z>=3 (26-36 MeV)
H11: Z>=3 (44-127 MeV)
H12: Z>=3 (127-173 MeV)
H13: Z>=3 (>173 MeV)
YEAR: decimal year
DOY: decimal day of year

COUNT RATE UNITS: (/s)

TIME RESOLUTION: 10 minutes

NOTES: Geometric factors can be found in the reference
Simpson et al., Astrophys. Sp. Sci., v92, pp365-399, 1992.

The energy ranges for the Z>=3 channels are for carbon 12.

All rates listed as counting protons are also sensitive
to nuclei with Z>1 having the same penetrating power as
protons in the energy range counted by the rate

The following channels may also be sensitive to electrons:

H1: electrons (0.35-1.0 MeV)
H3: " (3-5 MeV)
H4: " (5-10 MeV)
H5: " (10-16 MeV)
H9: " (>16 MeV)

Bad or missing data are flagged by a negative value

**8-SECTORED RATES DATA**

RECORD FORMAT:

```
C FREE FORMAT
     READ(1,*)IYEAR,IDOY,IHOUR,IMIN,
    .        H45S1,H45S2,H45S3,H45S4,
    .        H45S5,HRTS6,H45S7,H45S8,
    .        H7S1,H7S2,H7S3,H7S4,
    .        H7S5,H7S6,H7S7,H7S8,
    .        YEAR,DOY
C FIXED FORMAT
     READ(1,100)IYEAR,IDOY,IHOUR,IMIN,
    .        H45S1,H45S2,H45S3,H45S4,
    .        H45S5,HRTS6,H45S7,H45S8,
    .        H7S1,H7S2,H7S3,H7S4,
    .        H7S5,H7S6,H7S7,H7S8,
    .        YEAR,DOY
100   FORMAT(3X,I2,X,I3,2(X,I2),16(X,E10.3),X,F12.8,X,F9.5)
```

PARAMETER LIST:

IYEAR: year
IDOY: day of year
IHOUR: hour
IMIN: minute
H45S1-F45S8: protons (34-92 MEV) IN 8 45 degree sectors
H7S1-H7S8: electrons (5-10 MeV) IN 8 45 degree sectors
YEAR: decimal year
DOY: decimal day of year

COUNT RATE UNITS: (/s)

TIME RESOLUTION: 10 minutes

NOTES: geometric factors can be found in the reference
Simpson et al., Astrophys. Sp. Sci., v92, pp365-399, 1992.

The channels H45S1-H45S8 may also be sensitive to nuclei with Z>1 having the same penetrating power as protons in the range 34-92 MeV, as well as to electrons in the approximate energy range 5-16 MeV.

Bad or missing data are flagged by a negative value.

**PHA Derived Data**

Description of Daily Flux Data for the COSPIN High Energy Telescope (HET)

This file contains daily average fluxes (cm^2 s sr MeV/n)^-1 of protons and helium nuclei stopping in the detectors K1-K6 of the Ulysses COSPIN High Energy Telescope (HET). The HET is described in detail by Simpson et al. (Astron. & Astrophys., vol 92, pp. 365-399, 1992).

The particles contributing to these fluxes have been identified by pulse height analysis. Therefore even in quiet times, when backgrounds dominate the counting rates, it is possible to separate the very low fluxes of protons and helium from the backgrounds in the telescope.

The energy intervals are as shown in the titles and correspond to particles which trigger exactly the same detectors in the telescope that are required to produce counts in the counting rates H4 (no penetration beyond K3) and H5 (no penetration beyond K6). By comparison of A) the total PHA events with detector triggers identical to those required for the H4 and H5 counting rates to B) the measured H4 and H5 counting rates, fluxes can be derived even though the PHA information is returned for only a small fraction of the incident events.

The errors shown, also in units of (cm^2 s sr MeV/n)^-1, correspond to 1 sigma counting errors, assuming Poisson statistics. Additional systematic uncertainties due to such effects as the variation of effective geometric factor with energy, or the variation in the minimum and maximum energies contributing to the counting rates as a function of angle of incidence, are difficult to estimate precisely but are probably of the order of 10-20 percent.

Missing or invalid data are represented by values of -1, as are meaningless fields such as the error on a measured flux of zero (no events registered during the accumulation interval). In some cases, particularly during solar particle events when the overwhelming majority of incident particles are low energy protons, competition for telemetry may lead to no events being registered in the higher energy proton or helium energy bins even though their true fluxes may be significantly elevated above quiet time levels.

The times, given as fractional year after 1900.0 and as fractional day of year (noon Jan. 1 = 1.5) correspond to the midpoints of the accumulation intervals.

The quantity "seconds of coverage" shown in the last column is derived from the HET Full Resolution Data Set omni1 files, and corresponds to the total number of seconds included in the daily averages of the H4 and H5 counting rates. These rates are used, together with the H4 and H5 PHA data, to determine the fraction of incident events included in PHA telemetry, and thus to determine the absolute value of the H4 and H5 proton and helium fluxes derived from the PHA data. On days with less than approximately 1000 seconds of coverage, there are frequently too few PHA events collected to support computation of fluxes for some or all of the proton and helium energy ranges included in this data set.

During the first Jupiter flyby, days 33-43 of 1992, the HET instrument logic was swamped by the extremely high levels of radiation encountered in the Jovian magnetosphere. While counting rates and PHA events were returned in telemetry, the level of corruption due to the overdriven logic made it impossible to compute reliable fluxes from the PHA events, and much of the time even the counting rates could be used only as qualitative indicators of lower or higher levels of radiation. Therefore in this data set all fluxes during this period have been set to the fill value, -1.

| Column | Contents |
|---|---|
| 1 | Fractional year - 1900 |
| 2 | day of year |
| 3 | H4 proton flux (39-70 MeV) |
| 4 | Error for H4 protons |
| 5 | H5 proton flux (71-94 MeV) |
| 6 | Error for H5 protons |
| 7 | H4 helium flux (39-71 MeV/n) |
| 8 | Error for H4 helium |
| 9 | H5 helium flux (72-95 MeV/n) |
| 10 | Error on H5 helium |
| 11 | Seconds of coverage during the day |