DAILY IUE PEAK RADIATION LEVELS

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Each day the IUE satellite passes through the outer Van Allen radiation belts during the US 2 shift. The particles trapped in the radiation belts cause increased fogging on the cameras during the time of this passage. The radiation background thus limits the length of the exposures that can be obtained during the second US shift. This communication is a continuation of the work reported by Walter and Imhoff (1983, NASA IUE Newsletter, No. 20, p. 9).

The IUE Observatory monitors the peak radiation levels which are encountered each day. These are recorded as a voltage on the Flux Particle Monitor (FPM). The readings may be converted to an equivalent exposure rate for the most sensitive portions of the cameras by:

$$\text{fogging rate (DN/hour)} = 10^{FPM}$$

This estimate is appropriate for the LWR and SWP cameras. The LWP camera is about 40% more sensitive to radiation. Thus when the FPM reaches 2 volts, the fogging occurs at a rate of 100 DN/hr for the LWR and SWP cameras and 140 DN/hr for the LWP camera. The LWR low dispersion spectrum falls on a less sensitive portion of the camera; the fogging rate is about half of the nominal rate of 10^{FPM} in the region of the camera near the spectrum.

Figure 1 depicts the variation of the daily peak radiation values during the first three months of 1984. Please note that these are maximum values only. Maximum FPM values encountered during this period ranged from 0.4 to 3.0 volts.

The radiation background typically varies during the US 2 shift, often reaching two unequal maximum values. Figure 2 depicts the variations of the FPM for a few recent shifts. Perigee occurs roughly five hours after the beginning of the US 2 shift, depending somewhat on the time of the month. Note that the radiation often starts to rise near the end of the previous US 1 shift. The change in the shift times implemented in January, thanks to the cooperation of our Vilspa colleagues, has helped to reduce the impact of such radiation on the US 1 Guest Observer programs.

Finally, the trend toward somewhat higher radiation levels noted in early 1983 has stopped. As the Sun nears the minimum of its activity cycle, the radiation levels appear to be declining slightly. However sporadic bursts of activity, such as the large proton event of May 1984, are to be expected. Thus IUE can be expected to experience the usual wide range in radiation levels for the foreseeable future. The typical

radiation levels, summarized in Table 1, are comparable to those experienced in 1978 (see previous report). Table 2 indicates monthly summaries of the radiation values for the last 18 months. The median value of the peak radiation level during US 2 is about 2.0 volts, thus limiting the exposure times to roughly one hour during the middle of the shift.

Table 1

Statistical Summary of Peak Radiation Levels in 1983

Radiation	Per Cent of Year	Fogging Rate	Longest Exposure
FPM < 1.0 volts	3.0 %	< 10 DN/hr	> 10 hrs
1.0<FPM<1.7	27.7	10 - 50	2 - 10
1.7<FPM<2.0	22.2	50 - 100	1 - 2
2.0<FPM<2.4	21.9	100 - 250	30 - 60 min
2.4<FPM<2.8	18.9	250 - 500	15 - 30
2.8<FPM<3.0	4.4	500 - 1000	7 - 15
FPM < 3.0	1.9	> 1000	< 7

Table 2

NUMBER OF DAYS REACHING PEAK RADIATION LEVELS

PEAK MONITOR READING	NOV	1983 DEC	/ JAN	FEB	1984 MAR	APR	TOTAL	MAXIMUM FOGGING RATE (DN/HOUR)
FPMK1.0	0	1	3	0	0	1	5	< 10
1.0K=FPMK1.7	7	6	10	5	8	3	39	10-50
1.7K=FPMK2.0	4	7	6	5	4	2	28	50-100
2.0K=FPMK2.4	9	9	5	10	6	5	44	100-250
2.4K=FPMK2.8	9	8	7	8	9	10	51	250-500
2.8K=FPMK3.0	1	0	0	0	3	6	10	500-1000
FPM>=3.0	0	0	0	1	1	3	5	>1000

PEAK MONITOR READING	MAY	JUN	JUL	1983 AUG	SEP	OCT	TOTAL	MAXIMUM FOGGING RATE (DN/HOUR)
FPMK1.0	0	0	0	0	0	0	0	< 10
1.0K=FPMK1.7	5	5	4	11	4	4	33	10-50
1.7K=FPMK2.0	3	8	7	5	2	5	30	50-100
2.0K=FPMK2.4	10	5	12	7	5	13	52	100-250
2.4K=FPMK2.8	8	9	7	3	11	9	47	250-500
2.8K=FPMK3.0	2	3	1	4	5	0	15	500-1000
FPM>=3.0	3	0	0	1	3	0	7	>1000

PEAK MONITOR READING	NOV	1982 DEC	/ JAN	FEB	1983 MAR	APR	TOTAL	MAXIMUM FOGGING RATE (DN/HOUR)
FPMK1.0	5	8	3	3	3	1	23	< 10
1.0K=FPMK1.7	5	9	14	13	13	15	69	10-50
1.7K=FPMK2.0	9	9	12	7	15	6	58	50-100
2.0K=FPMK2.4	7	4	2	4	0	4	21	100-250
2.4K=FPMK2.8	3	1	0	1	0	4	9	250-500
2.8K=FPMK3.0	1	0	0	0	0	0	1	500-1000
FPM>=3.0	0	0	0	0	0	0	0	>1000

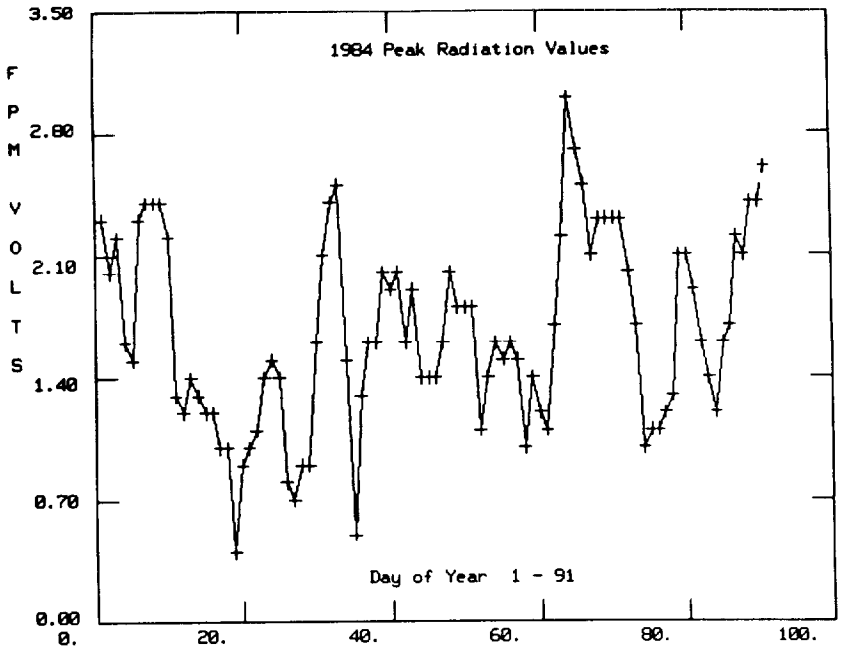

Figure 1. Daily peak FPM values for the first three months of 1984.

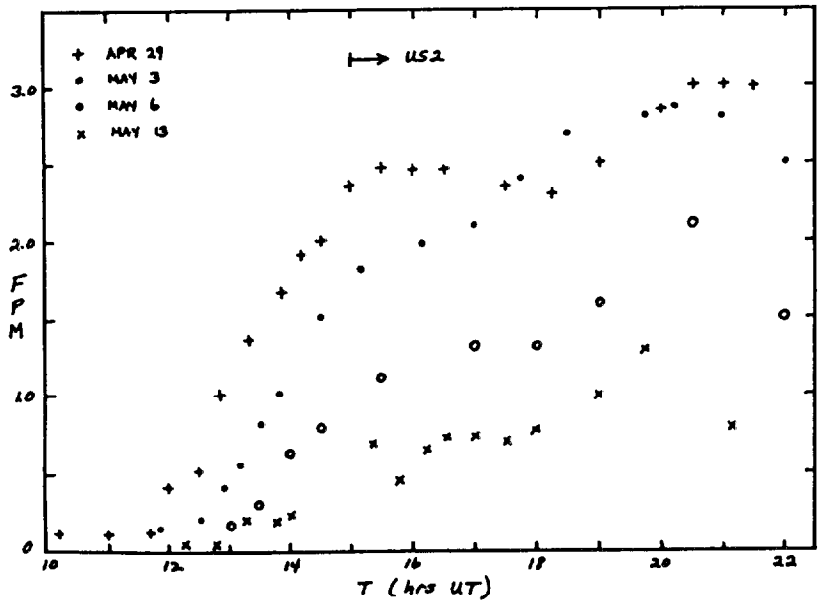

Figure 2. Variation of FPM during four recent days. The radiation typically rises at the end of US 1 and peaks about 5-6 hours into the US 2 shift.