Some Scheduling Constraints Introduced by the New Battery Discharge Policy

The primary function of the two batteries on board IUE is to provide spacecraft power during the semi-annual earth shadow seasons. In the past, the batteries have been used to supplement solar array power to meet spacecraft needs while observing at high and low beta angles. As the IUE solar array output decreases with age (6%/year) the demand increases for use of the satellite's batteries to support GO observations. The IUE Project has adopted a new battery policy which greatly restricts battery usage with the goal of prolonging IUE's useful life. This policy, described in an article by Keith Kalinowski in this Newsletter, and the decreasing solar array output combine to have important implications for the scheduling of current and future IUE observing programs.

The most important change for GO programs is the restriction on the number of times (24 for GSFC) the new 22.5 volt threshold may be crossed in a 12-month period. GO observing programs are therefore affected by having to make observations at beta angles where the batteries will not discharge.

Recent spacecraft data indicate that the 22.5 volt limit will be reached very quickly at extreme beta angles (20-60 minutes at beta>120° or beta<20°). The length of time spent at these beta will also depend on spacecraft power requirements (exposure time, read-prep frequency, science heater configuration, maneuvering, unloads, etc). While it is difficult to precisely define the limiting beta angles which satisfy the battery usage restrictions, recent observations indicate that the region with no power restrictions is now 25° < beta < 115°.

Figure 1 shows the predicted solar array power output as a function of beta angle. The power output expected in January of each year is shown by different symbols: plus, asterisk, diamond, and triangle represent 175, 180, 185, and 190 watts, respectively. Since spacecraft power requirements vary between 185 and 190 watts for normal science operations, actual beta angle limits are very close to the predictions. Note that as the high-beta power limits decrease (about 3 degrees over the next year) the "cool beta" region between power-constrained and OBC heating betas gets narrower.

The most significant scheduling constraint introduced by the battery discharge policy is the fact that an object within 30° of the ecliptic crosses the 95°-115° cool beta zone in three weeks or less. It is therefore particularly important that observing dates for long exposures be carefully chosen to ensure that priority targets are at good beta angles.

George Sonneborn

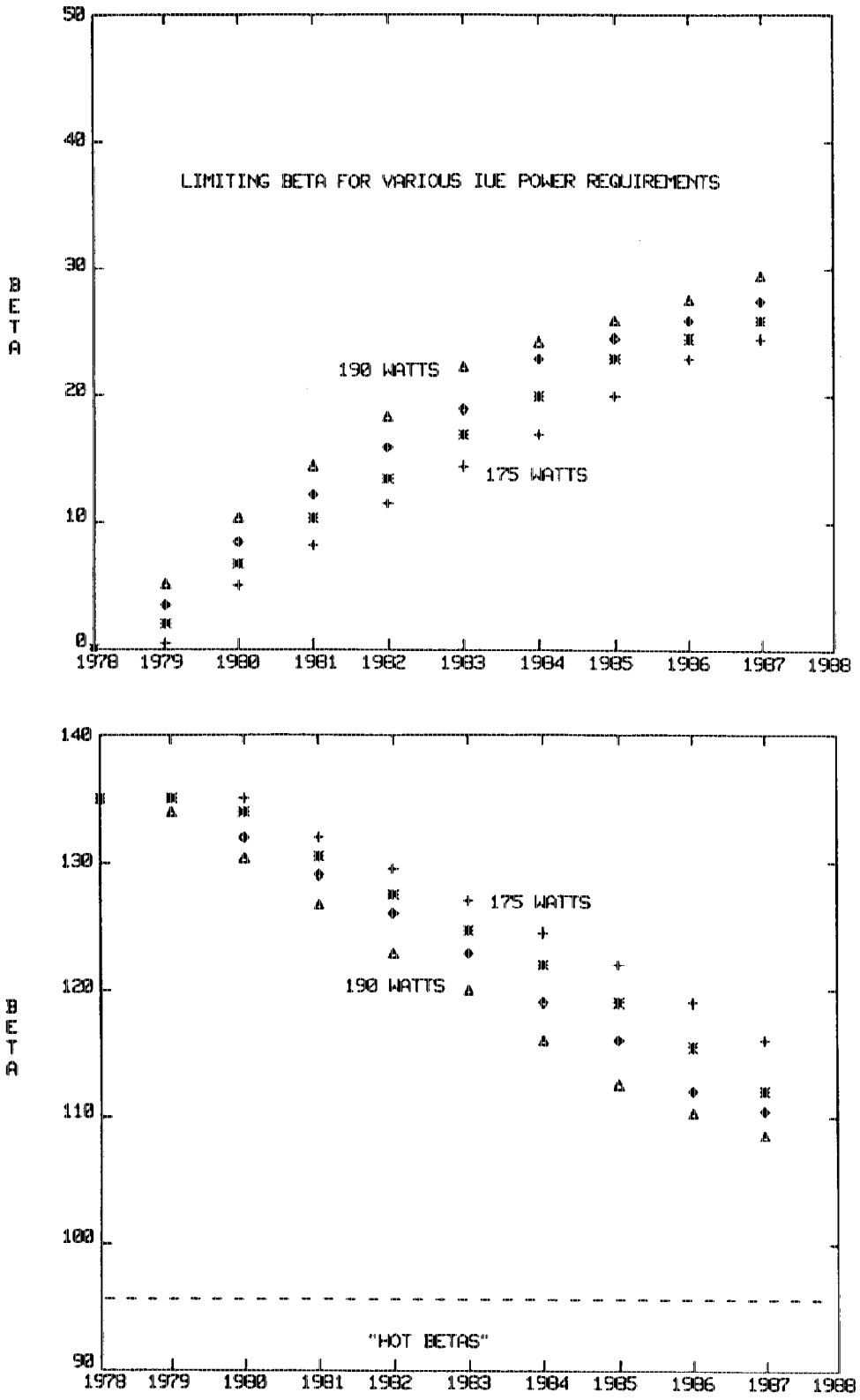
LIMITING BETA FOR VARIOUS IUE POWER REQUIREMENTS
BETA
50
40
30
20
10
0
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
190 WATTS
175 WATTS
BETA
140
130
120
110
100
90
175 WATTS
190 WATTS
"HOT BETAS"

FIG. 1.