HSP - 007

MEMORANDUM

To: Larry Petro, Claus Leitherer, Chris Blades
From: Lisa E. Walter, Rick White
Subject: Bright Object Limits for HSP
Date: 25 Sept 1989

The following table is a list of the HSP limiting magnitudes for the broadest filters and various spectral types. It was compiled by running the HSP simulator on each spectrum in the FOS simulator spectrum library and determining the magnitude that would be required for each spectrum to produce a count rate of 5e+7 counts/sec. This magnitude then becomes the limiting magnitude for that filter at a certain reddening. Only stars with the faintest limiting magnitudes are listed.

The limiting count rate of 5e+7 counts/sec was determined by the following equation. The maximum desired current was chosen to be 80% of full scale current for the analog monitor. The gain is an median value of the normal amplification that will be used.

$$\text{Limiting Count Rate} == \frac{\text{Maximum Desired Current} * \frac{1}{\text{Electron Charge}}}{\text{Gain}}$$

$$== \frac{8\text{uA} * 6\text{e+18 electrons/Coulomb}}{1\text{e+06 electrons/count}}$$

$$== \sim 5\text{e+07 counts/sec}$$

TABLE 1

Limiting Magnitudes for the High Speed Photometer

Det	Filter	Spectrum	Limiting V Magnitude for E(B-V) = 0.0	0.1	0.5
	F140LP	O7V	6.1	5.6	3.8
UV1	F140LP	O8V	5.9	5.5	3.7
&	F140LP	B0V	5.9	5.4	3.6
UV2	F140LP	O9V	5.9	5.4	3.6
	F140LP	B1.5V	5.7	5.2	3.4
	F160LP	O7V	6.7	6.4	5.5
VIS	F160LP	O8V	6.6	6.3	5.4
&	F160LP	O9V	6.6	6.3	5.5
POL	F160LP	B0V	6.5	6.2	5.4
	F160LP	B1.5V	6.4	6.1	5.3
	IDTPMT	M2I	3.8	3.9	4.3
PMT	IDTPMT	K4III	3.7	3.8	4.2
	IDTPMT	K5V	3.6	3.7	4.0
	IDTPMT	K2III	3.5	3.6	3.9

The table indicates that adding reddening to the blue stars in the bluer detectors allows brighter stars to be observed. Con-

versely, as reddening is added to the red stars in the PMT detector, dimmer stars must be observed.

We recommend the following Macro Aperture Bright Object Alert Thresholds (MABOAT) for the HSP:

UV1: 6.1
UV2: 6.1
VIS: 6.7
POL: 6.7
PMT: 4.3

These thresholds do not indicate brightnesses which are necessarily unsafe for the HSP, but rather flag objects which should be investigated in detail using the actual instrument configuration. The first concern during a Bright Object (B/O) Alert should be whether the bright object is near the aperture in which the observation will occur. If the bright object is NOT near the observation aperture, then its light does not contribute to the current being read out, and therefore the specific object in question does not propose a threat to the instrument. If the object IS near the observing aperture, then the expected current generated by the bright object in that filter can be determined to see if the object is a threat to the safety of the instrument.

Serious B/O Alerts for the HSP are not expected to occur often for two reasons:

1) the magnitude limits for most stars will be much brighter than those for the extremely blue (or red, for the PMT) stars given in the table,
2) the magnitude limits for most stars observed through the non-clear filters will be much brighter than those in the table due to the reduced transmission and narrow bandpass of those filters.

Consequently, the most likely time for a B/O Alert to occur is during target acquisition using the large (6 or 10 arcsec) target acquisition aperture and longpass filters.

To: STSCIC::BLADES
CC: WALTER,WHITE
Subj: RE: HSP B/O alert

>From: STSCIC::BLADES 25-SEP-1989 18:29:09.24
>To: WHITE,WALTER
>Subj: HSP B/O alert
>
>Thanks for your memo. But does the CARD have to be updated with these figures?
>If not, are Larry and Claus happy to use the table you generated? Cheers, Chris

I don't believe that the CARD should be changed to use these figures. Stars at the brightness limits we give will not hurt the HSP (no damage), they will instead cause the instrument to safe if observed through the wrong filters with the wrong gain. Even the brightest stars can be observed with the HSP (giving useful scientific data) if the gain is turned down and/or a narrower filter is used. I don't think this is the sort of restriction which belongs in the CARD.

I talked with Larry about this last week; he said that so far they are just implementing the CARD limits for the other instruments, but that we can talk about what to do after writing this memo. I'll keep working with Larry on this, and I assume that the limits we suggest will be adopted for use in SPB's bright object alerts. If we run into any problems I'll let you know.

Rick

From: STSCIC::WHITE "Rick" 26-SEP-1989 09:54:44.42
To: STSCIC::LEITHERER
CC: WALTER,WHITE
Subj: RE: your memo

>From: STSCIC::LEITHERER 26-SEP-1989 09:38:16.14
>To: WHITE
>CC: LEITHERER
>Subj: your memo
>
>Rick,
>I got your memo on the B/O limits for HSP.
>Could you explain the quantity "Maximum Desired Current"? What
>happens if it is larger than the full scale current for the analog
>monitor? Will damage to the instrument result or does the instrument
>enter a safing mode in this case? If the latter is true, can you
>estimate the operational impact of the safing mode on the observations?
> Thanks, Claus

Claus,
If the current out of the HSP exceeds 80% of the full scale current for the analog monitor, the Bright Object Protection Application Processor (running in the NSSC-1 onboard ST) will safe the HSP. No instrument damage will result even if these current levels are substantially exceeded, which is why the CARD brightness limits are much higher than those we give.

However, with the current ground system, safing will have a huge effect on the observations which are underway and on all HSP observations downstream from the time of safing. As you know very well, recovering from safing and getting the instrument back onto the timeline schedule will take a very long time. I don't know what the latest estimates are for the recovery time from safing, but I've heard estimates ranging from several weeks to a month. Obviously this is something we want to avoid.

Rick