

ON-ORBIT DISCRIMINATOR SETTINGS

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Abstract

Pulse height discriminator settings and measurements were made for each of the 512 channels on both the FOS Red and Blue sides. These initial on-orbit measurements show noise spikes in the first few discriminator settings of most channels on the Red side only, for which a cause has yet to be determined. The discriminator settings determined here are similar to those measured on the ground.

I. Introduction

Preflight discriminator measurements were performed at Lockheed Missile and Space Company (LMSC) on 23-26 February 1988, as described in CAL/FOS-050. Similar measurements were performed on-orbit as part of OV 2774 on 6 August and 16 October 1990 for the Red and Blue detectors, respectively; the data log is given in Table 1. The high voltage was set at 12.75 kV, and the flat field LED was used for all observations. Theory and practice are as described in CAL/FOS-050, with the following exceptions:

1. Measurements of the count rate with odd and even discriminator settings were performed on different days in order to minimize the command load.
2. In the analysis of the Red side data, a minimum discriminator setting of 124 or 125 was used (on the flat portion of the pulse height distribution), because of noise in the data at low discriminator settings, as described below.

Except as described below, results from OV 2774 were the same as from tests at LMSC.

Table 1
On-Orbit Discriminator Tests

Detector	Disc Dac Beg-End	Integration Time (Seconds)	Date
Red	101-255	10	6 August 1990
Red	100-254	10	7 August 1990
Blue	101-255	60	16 October 1990
Blue	100-254	60	17 October 1990

As part of this analysis, the CDBS routine PHAY as used to perform the identical analysis to that used here. It was found to yield effectively the same results. The changes discussed below have in some cases been superseded by results of more recent tests.

II. Red Discriminator Settings

The most prominent difference between the OV and LMSC tests was the appearance of noise in the first few discriminator settings of most channels. The appearance of this noise is shown in Figure 1. Most channels showed this noise at some level. No evidence was found for any special pattern in either the discriminator DAC setting or channel where this noise occurred, although there is some evidence that lack of this noise is related to the card and/or hybrid of the preamp. It was initially thought that this noise might be related to the rapid drop in voltage from operational levels to 12.75 kV just prior to the start of this test; in tests at LMSC the voltage had been slowly raised to 12.75 kV. However, a recent on-orbit discriminator test where the voltage *was* slowly raised to 12.75 kV shows the same effect (G. Hartig, private communication).

Odd and even data were examined separately; since the results were indistinguishable, the data were combined prior to final analysis. Changes from the PROM values for the discriminator DACS and diode status prior to launch are shown in Appendix 1. As a result of OV 2774 and the initial portion of the dark count test (OV 1533) the following changes were made:

1. The reference DAC (refdac) was set to the optimal value of 213 (as described in CAL/FOS-050).
2. Channel 110 was disabled.
3. Channel 380 has had the discriminator changed to 230.
4. Channels 233, 261, 344, and 381 have been enabled.
5. Channel 285 is reclassified as noisy rather than dead.

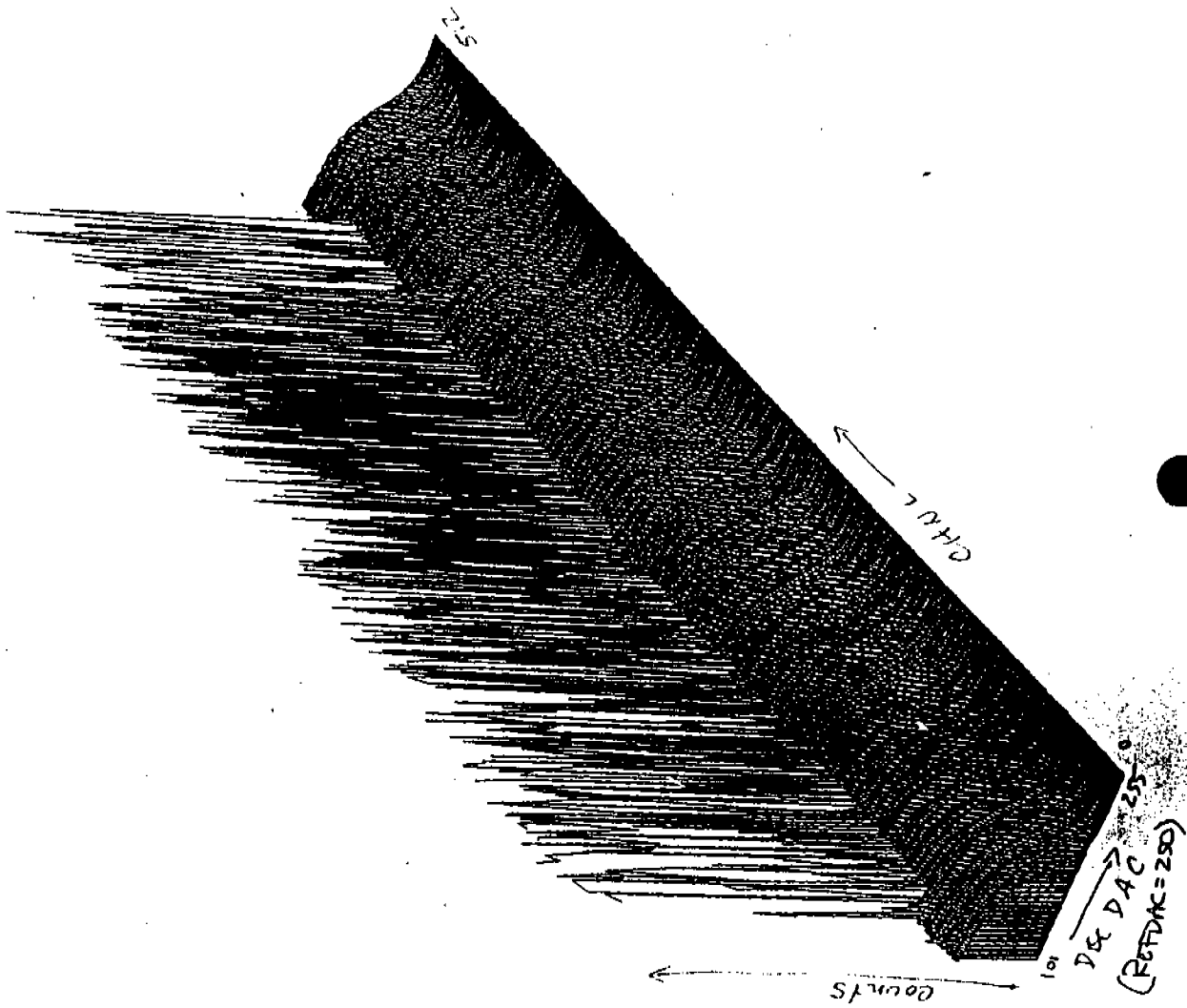
III. Blue Discriminator Settings

The noise seen at low discriminator DAC values in the Red side tests was not seen in the Blue side tests. As the count rates were somewhat different for the odd and even data, they could not be combined prior to analysis. The results were similar and were averaged. As a result of OV 2774 and the initial portion of the dark count test (OV 1533), as well as the high voltage turnon and SAA test, the following changes were made (see also Appendix 2):

1. The refdac was set to the optimal value of 219 (as described in CAL/FOS-050).
2. Channel 73, 225, 235, 241, and 497 were disabled.
3. Channel 22 has had the discriminator changed to 208; it was very far from optimal. Channel 431 has had the discriminator changed to 225; it was very far from optimal.

4. Channel 305 had the discriminator changed to 208 in an attempt to decrease noise. Channel 306 had the discriminator changed to 216 in an attempt to decrease noise. Channel 398 had the discriminator changed to 218 in an attempt to decrease noise.
5. Channel 219 had the discriminator changed to 226. This change was considered a test and the channel was left disabled.

FIGURE 1
TEST OF RED SIDE ODD DISCRIMINATOR SETTINGS



Appendix 1

E-MAIL Memorandum

TO: Vicki Balzano
 FROM: George Hartig
 SUBJECT: FOS Discriminator Settings

23 May 1990

Recent communications with the FOS IDT personnel most familiar with the setting of the Digicon discriminator levels have indicated that the current values in the IMDB are not ideal. In particular, the reference DAC values should be as given below (decimal) for both detectors, and discriminator levels should be set even for those channels which we are currently disabling. Since background rate data will be obtained with all channels enabled, and since it is possible that channels which have appeared noisy in ground-based tests will exhibit lower dark rates in the space environment, it is useful to set the discriminators for the nominally disabled channels. Following is a list of the optimal discriminator values, as communicated by Dr. Ross Cohen (UCSD). Please update the instructions to correspond to this list.

RED REFDAC=208 COUNTS			BLUE REFDAC=213 COUNTS			
RED:	CHNNL	CHNNL	:	BLUE:	CHNNL	CHNNL
PYINHCHL*	2	405	:	PYINHCHL*	47	415
	6	409	:		55	427
	212	233	:		49	451
	285	261	:		223	472
	486	344	:		284	31
	381		:		409	218
			:		201	219
			:		268	465
	CHNNL	DISCR	:	CHNNL	DISCR	
PYDAC@	182	232	:	PYDAC@	22	212
	261	213	:		31	225
	263	222	:		73	226
	280	211	:		170	219
			:		222	210
			:		225	206
			:		256	231
			:		273	200
			:		415	214
			:		422	221
			:		427	203
			:		465	207
			:		472	222
			:		497	211

* From Dead and Noisy Channel Summary CAL/FOS-051

@ From Discriminator Setting CAL/FOS-050

Copies:

STSTI:	Others:	
Chance, D.	Baity, W.	UCSD
Doxsey, R.	Gasaway, T.	UCSD
	Cohen R.	UCSD
	Harms, R.	ARC
	Thienel, L.	J&T

Appendix 2

E-Mail Communication

FROM: R. COHEN
TO: @DISCS
SUBJECT: BLAB
DATE: 7 NOV 1990

The Blue discriminator test do not show the noise problem shown by the Red test. The dac settings determined from the odd and even tests are almost identical despite the fact that the curves cannot be merged because of some (not simply explained) systematic differences between the levels of the odd and even data. Changes to the IMDB based on the results of the disc test, and the darks from the high voltage turnon and SAA tests (analyzed by Ron Lyons) are as follows. IMDB updates will follow to Ian Evans for official entry.

REFDAC = 219

This is a minor change, but why not do it to keep everything consistent with our system. Based on the eqn $REFDAC = \text{truncation}(5.08X + 0.48)$ which I got from somewhere, 43.02 seems right.

Noisy channels -

Disabled channels were not on for these darks, so no further information is available for them. All channels were enabled for the discriminator tests, and most appeared normal. This is not unexpected, however. "New" information from all tests is as follows.

73 - noisy in hv turn-on. This channel has already had its disc. dac tweaked up to no effect. OFF

225 - noisy in disc test and some SAA darks. (at a lower level than 73). This channel has already had its disc dac tweaked up to no effect. OFF

235 - noisy or dead in disc test, hv turn-on, and all SAA darks. Hopeless. OFF

241 - noisy or dead in disc test and some SAA darks. Hopeless. OFF

497 - noisy in hv turn-on and some SAA darks. This channel has already had its disc. dac tweaked up to no effect. OFF

All of these were disabled "via phone call" prior to 1068 Blue attempt.

305 - In last run of SAA darks (T) this channel ran continuously at 5 times the background.

306 - In last run of SAA darks (T) this channel ran continuously at 5 times the background. Try BOOSTing THE DISCrminator slightly.

398 - In one run of SAA darks (P) this channel had a few spurts of 20 or so. Try BOOSTing THE DISCRiminator slightly, although experience has shown little hope for fixing this type of behavior.

Deranged Dac settings

22 - PROM off by 50 dac units from optimal. SET TO OPTIMAL (a slight change from what is in the IMDB)

431 - This is the next worst of all the mis-settings (25 units). This is only at most a 5% QE variation, (excess), but this channel was noted in the past as marginally noisy. SET TO OPTIMAL.

OTHER VAGUE HOPES

219 - This channel is disabled and noisy. However, it is the least bad of the large number in the range 218-225 which are disabled, and I'd like to try tweaking the discriminator to see if it looks OK in the darks in the hope of turning it on later. I doubt this will work, but it's worth a try. Try BOOSTing THE DISCRiminator slightly.

We could play with several other channels as noted as very marginally noisy at Lockheed, but they are probably OK, so I will just LEAVE THEM ALONE.

Six channels burped unpleasantly a few times at the Cape and nowhere else and I'm gonna continue to LEAVE THEM ALONE, and assume it was some problem with the system down there (always the optimist).

We will continue to leave in any discriminator changes made in disabled channels (those disabled before launch and the above) to see how they behave in the long series of darks upcoming. I don't know whether the new disc. changes I am suggesting will get in in time for any of the darks, and if they do, I don't know if we will have time to act on them before they are set in stone by being included in the flat fields.

