

## STIS CCD Hot Pixel Annealing

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### 1. Introduction

In an effort to reduce the number of “hot” pixels in the CCD array, an annealing process was used that allowed the CCD to warm up to about 0C for approximately 12 hours. The effectiveness of the procedure was tested by measuring the dark current behavior before and after annealing.

### 2. Observations

Data for this test (SMOV proposal 7107) was taken on May 17-18, 1997 and again on June 19-20, 1997 and consist of five 1200-second dark frames taken before and after each annealing cycle. All observations were executed using CCD amplifier “D” at GAIN=1.

### 3. Data Reduction

For each group of 5 dark frames, the STIS IDL procedure `CALSTIS_OVERSCAN` was used to remove the overscan and trim each dark frame. Routine `iraf$darkcombine` was used to create a cosmic-ray rejected combined dark.

### 4. Analysis

For each combined dark frame, pixels above three different threshold rates (1.0, 0.5, and 0.1 electrons/sec) were counted using the IDL `WHERE` function. The ratio of the values of these pixels was then computed (post/pre). A ratio of less than 1.0 indicates that the pixel had annealed. Table 1 summarizes the results for the May 17/18 test. Table 2 shows the results for the June 19/20 annealing.

Table 1. Annealing Cycle for 17-18 May 1997.

Count Rate e-/sec	Hot Pixels				Percent of pre-annealing hot pixels with a ratio of			
	pre	post	common	new	< 1.0	< 0.5	< 0.1	< 0.01
1.0	720	427	362	65	80.9	52.6	24.9	5.8
0.5	1084	684	600	84	79.7	51.9	22.6	5.0
0.1	3222	1811	1620	191	84.2	59.6	17.0	2.4

Table 2. Annealing Cycle for 19-20 June 1997.

Count Rate e-/sec	Hot Pixels				Percent of pre-annealing hot pixels with a ratio of			
	pre	post	common	new	< 1.0	< 0.5	< 0.1	< 0.01
1.0	758	476	405	71	80.2	54.1	26.9	8.0
0.5	1211	782	642	140	80.6	55.1	27.3	8.1
0.1	4594	3482	1846	1636	86.1	66.4	36.0	18.2

Note that in each case approximately 80% of the hot pixels identified in the pre-annealing combined darks annealed to some degree. The three panels of Figures 1 and 2 show the histograms of the pixel value ratios at each threshold rate.

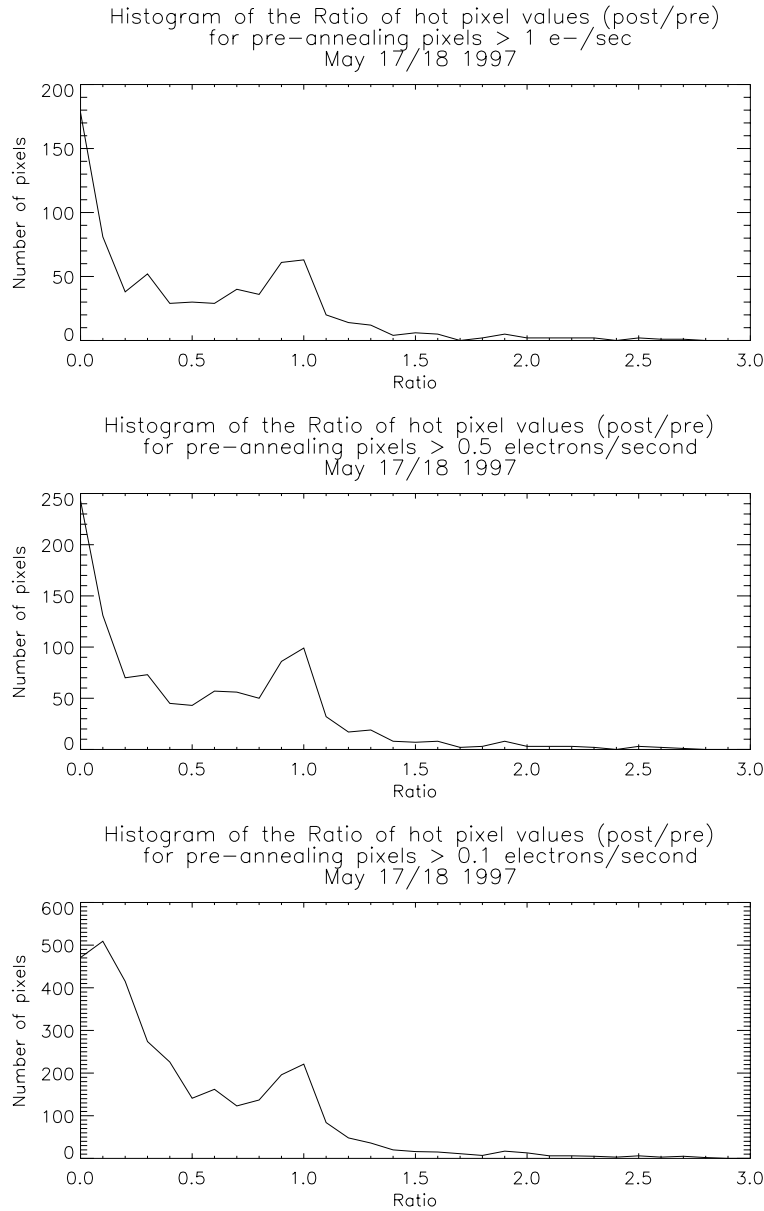


Figure 1. Ratio Histograms for May 17/18

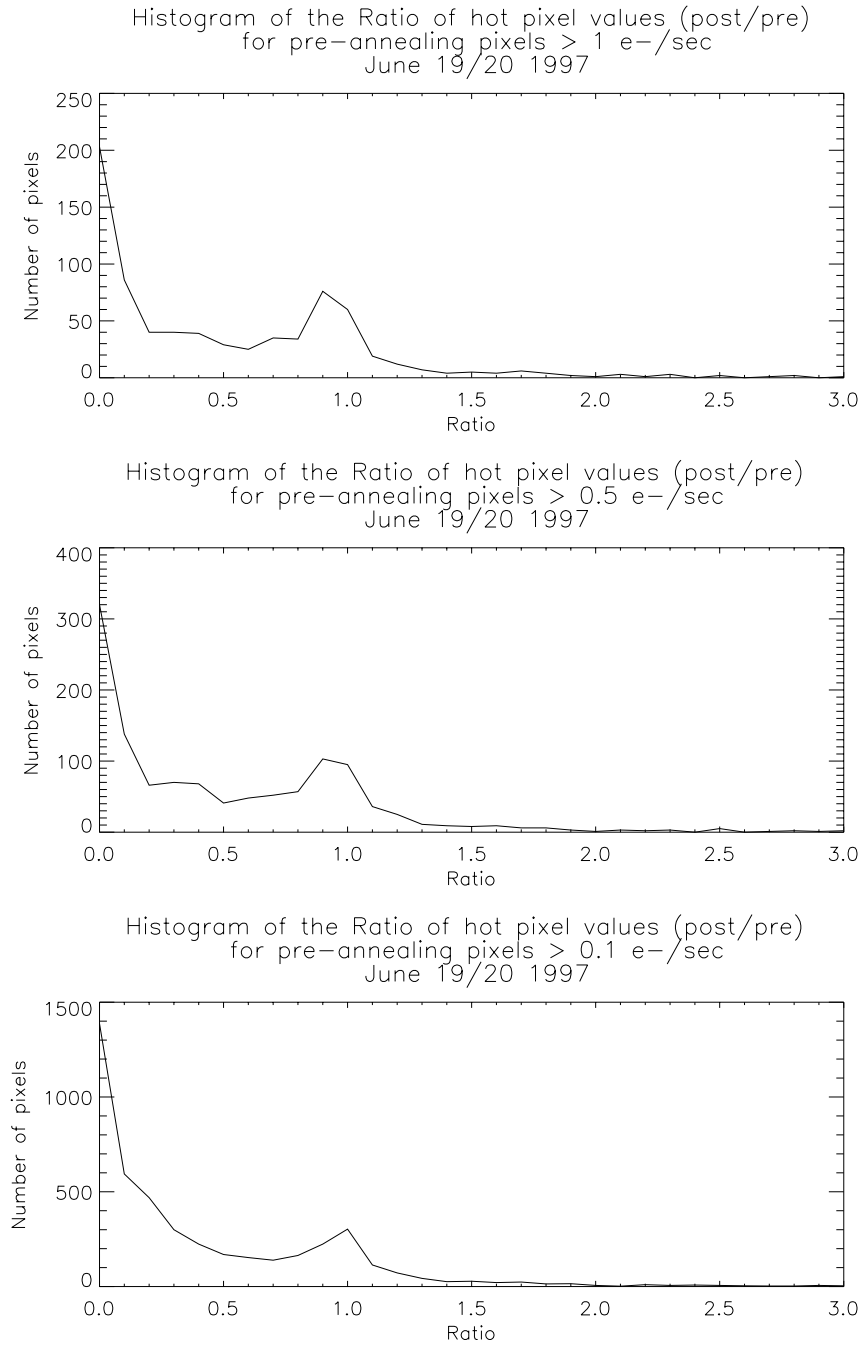


Figure 2. Ratio Histograms for June 19/20

Cumulative histograms of each combined dark frame (overplotted) show the drop in the number of hot pixels at low count rates. See Figure 3.

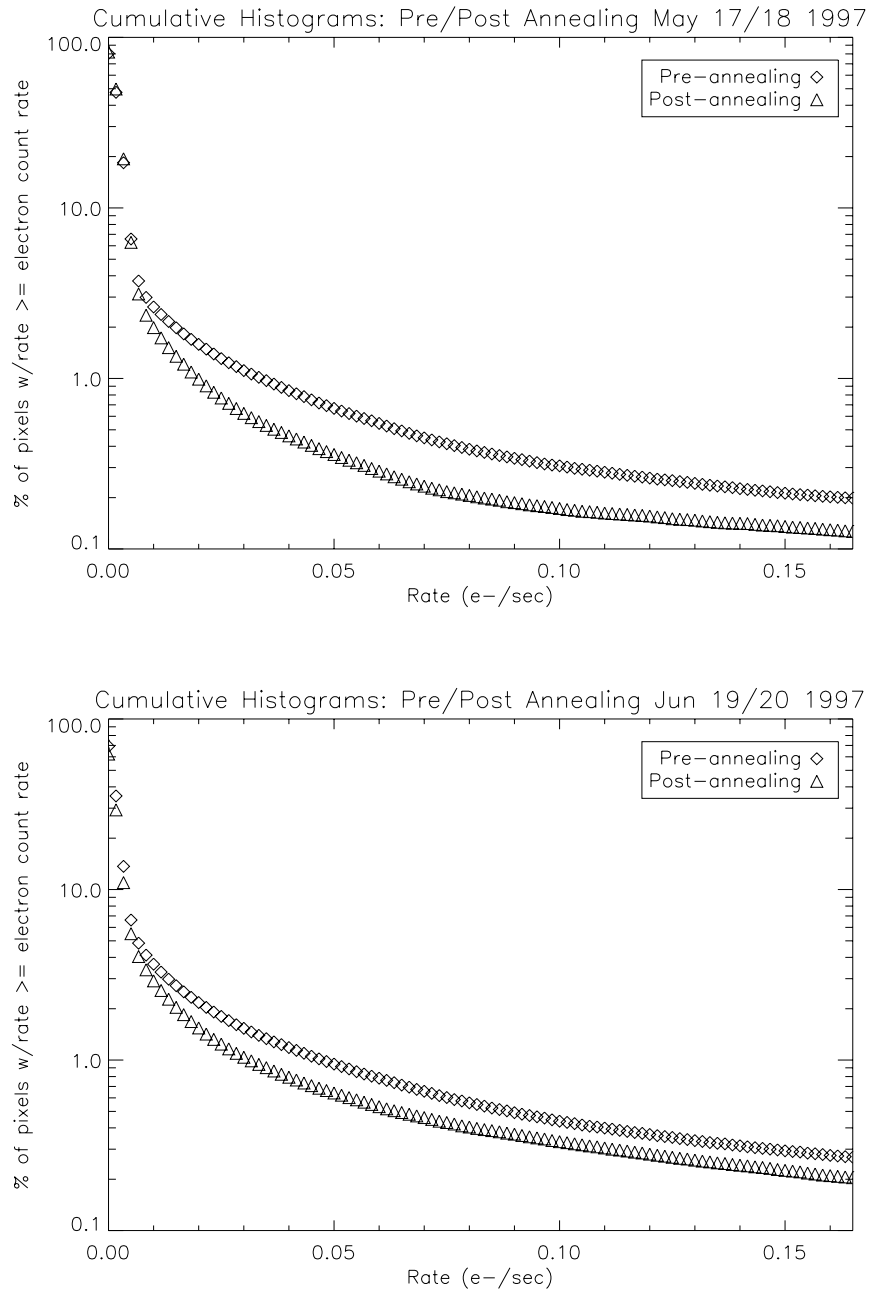


Figure 3. Cumulative Histograms

The hottest pixels in the sample ( $>25$  electrons/sec) appear to either anneal to a high degree (ratio  $<0.1$ ) or not all (ratio  $\approx 1.0$ ), with few pixels in between. See Histogram in Figure 4.

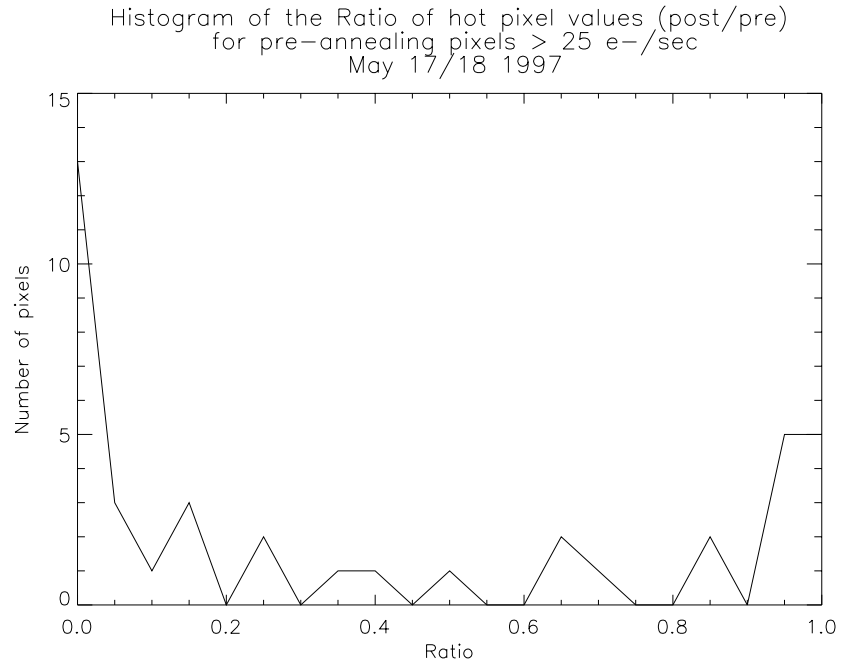


Figure 4.

## 5. Conclusion

In each annealing test approximately 80% of the hot pixels annealed to some degree. The ratio distribution of the hottest pixels appears to be somewhat polarized.