



## ACIS Report

- 1. Overall Status of the Instrument**
- 2. Update on Controlling the FP Temperature**

**ACIS Ops Team**



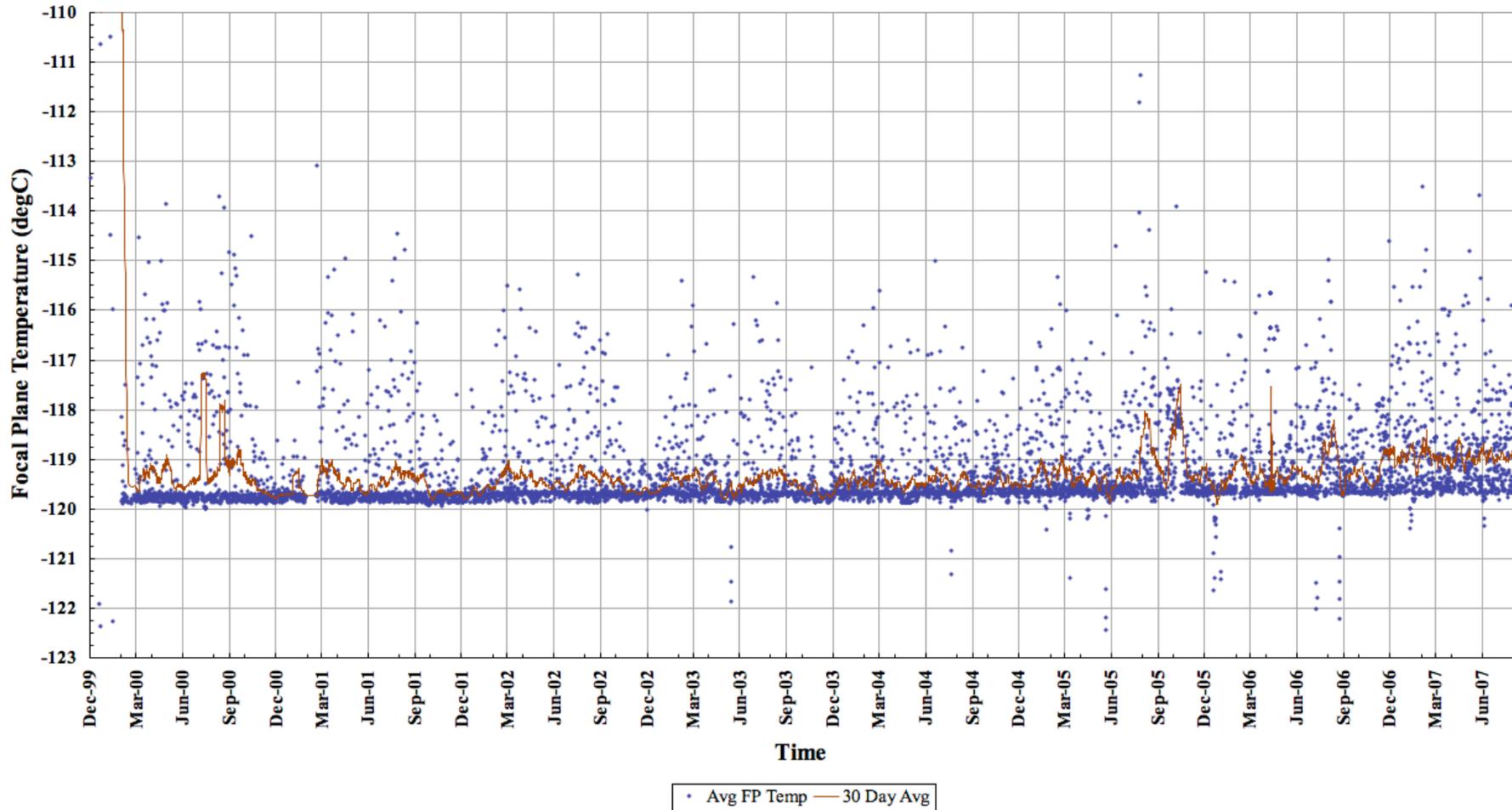
## 1. Overall Status of the Instrument

- Instrument continues to work well, no failures to report, no new degradations to report
- No anomalies since the last meeting of the CUC (Yeah !!)
- CTI increasing consistent with expectations, FI CCDs 2.3%/yr, BI CCDs 1.0%/yr
- Contaminant continues to accumulate slowly, recent work by Herman Marshall on the C, O, F edges vs. time included in the calibration report
- Use of Optional CCDs for observations at forward-Sun pitch angles - only three 6-CCD observations have been reduced to 5-CCD observations, so proactive scheduling is minimizing the science impact
- Thermal issues are still the most challenging, observations with pitch angles between 135-180 lead to heating of the ACIS detector housing and hence the focal plane



## 2. Controlling the ACIS FP Temperature

Bissell (NGST), blue points 8 hr averages, red line 30 day running average

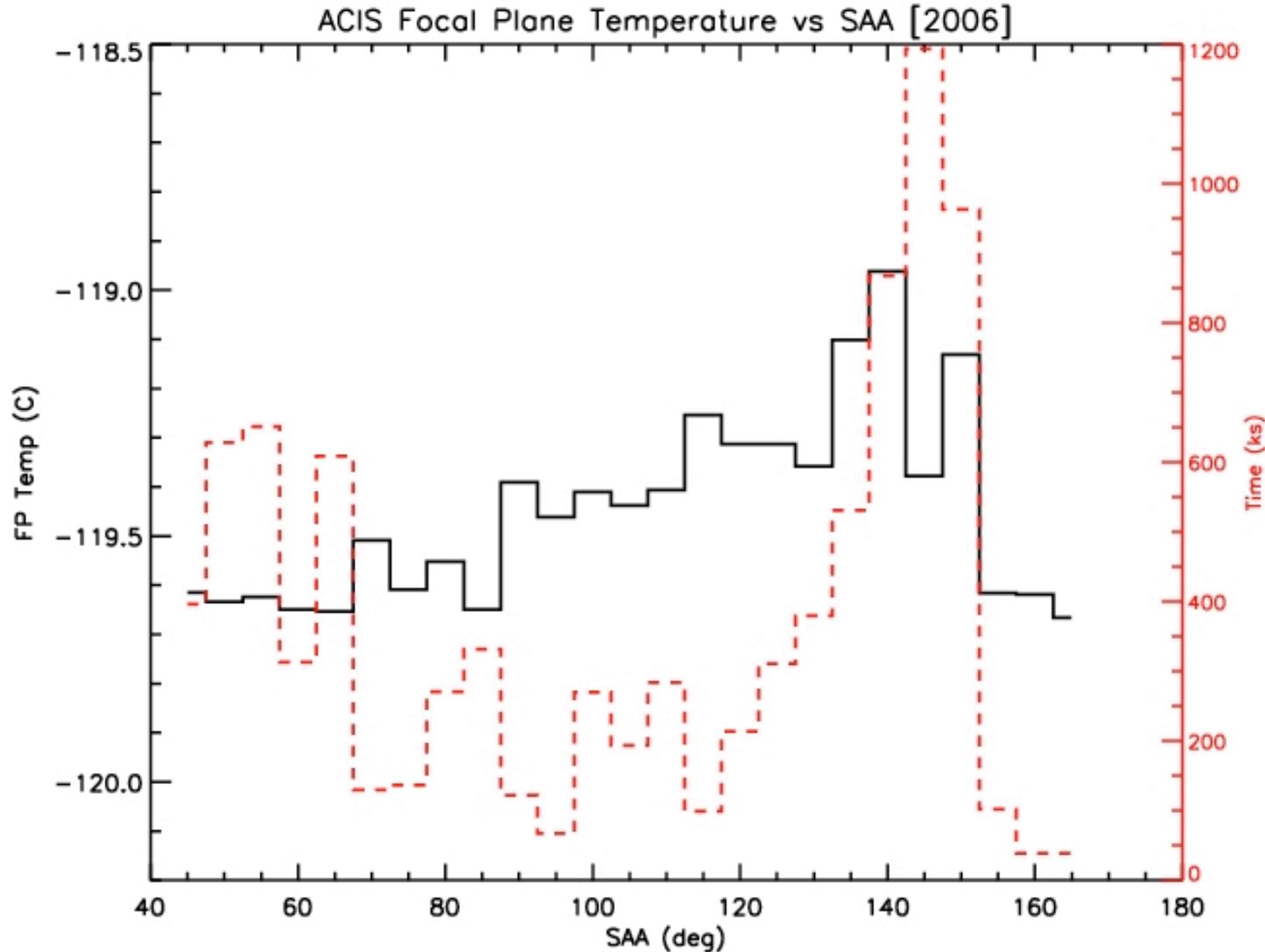




# Chandra X-Ray Observatory

CXC

## Average FP Temperature vs. Pitch Angle



DePasquale (SAO),  
Black points are average FP temperature,  
Dashed red line is amount of time at that pitch angle

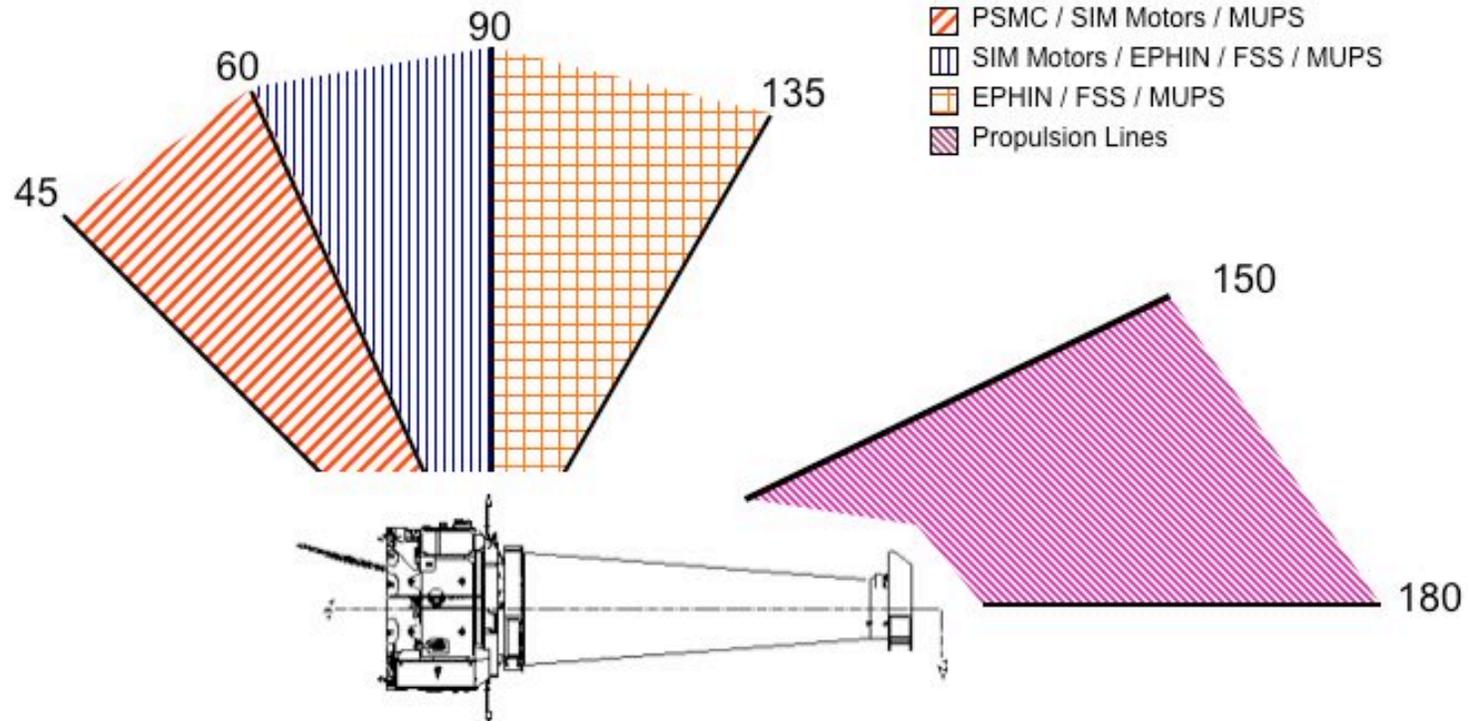


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## Current Temperature Dependencies vs Sun Pitch

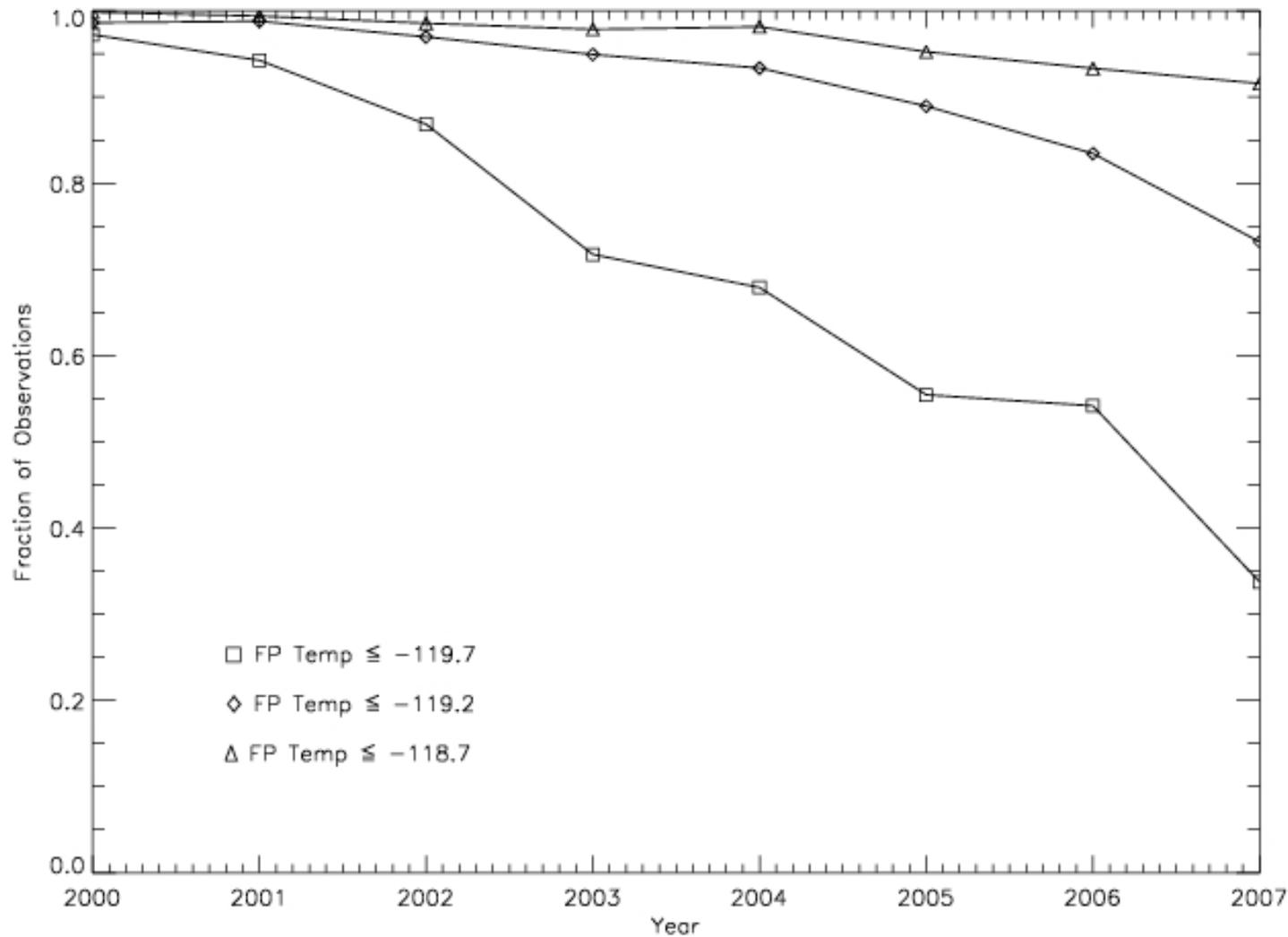




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## ACIS FP Temperature over the Mission



Grant  
(MIT),  
Average FP  
temperature  
during  
observations

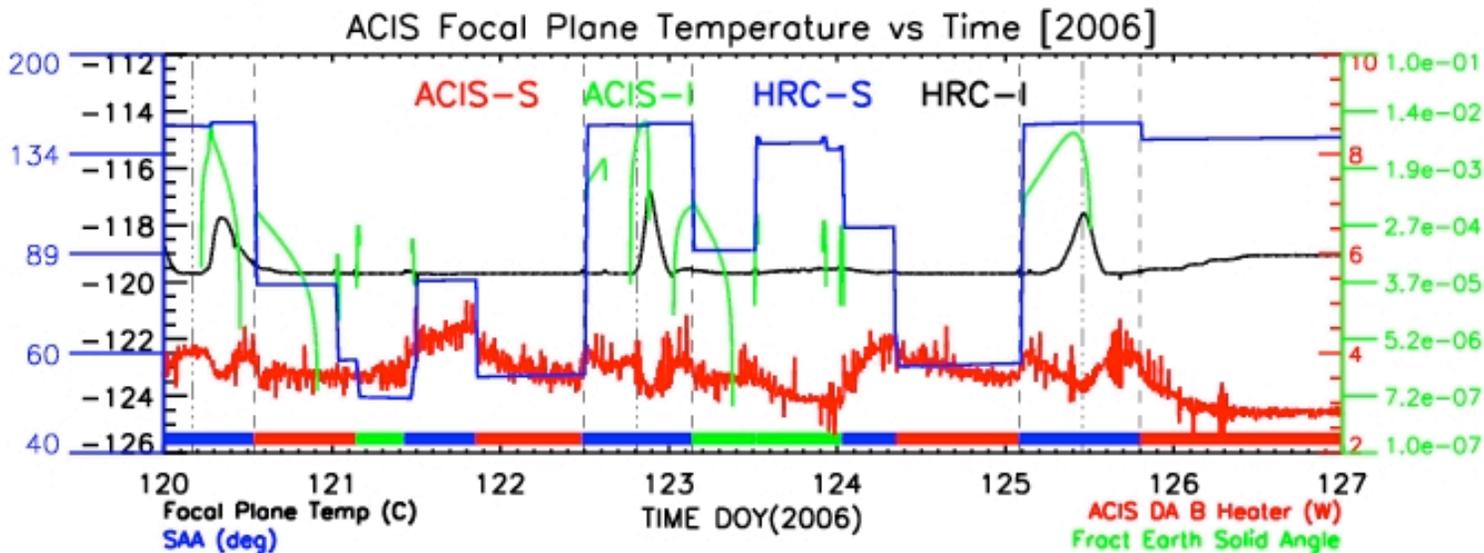
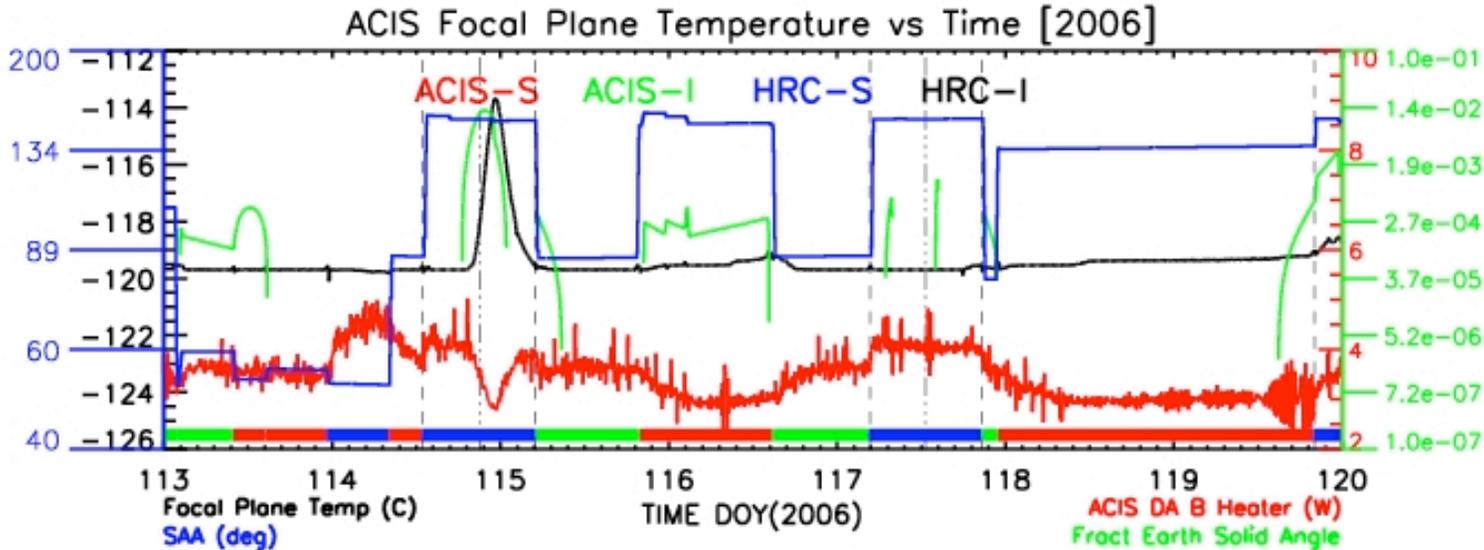


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## ACIS FP Temp vs Pitch Angle, DH Heater Power, Earth Solid Angle

DePasquale  
(SAO)





## Possible Responses to a Warmer FP Temperature

1) Turn off the ACIS DH heater and the SIM FA6 heater

**PRO:** maintains calibration and best performance of the CCDs

**CON:** DH temperature is unregulated

2) Impose new MP constraints on duration of time spent at pitch angles  $>120$

**PRO:** stable DH temperature for Fid Lights

**CON:** adds yet another constraint to an already tightly constrained schedule

3) Operate at a higher FP temperature

**PRO:** easy for operations and MP

**CON:** degrades CCD performance, requires a lengthy recalibration

**Option #1 is the preferred option**

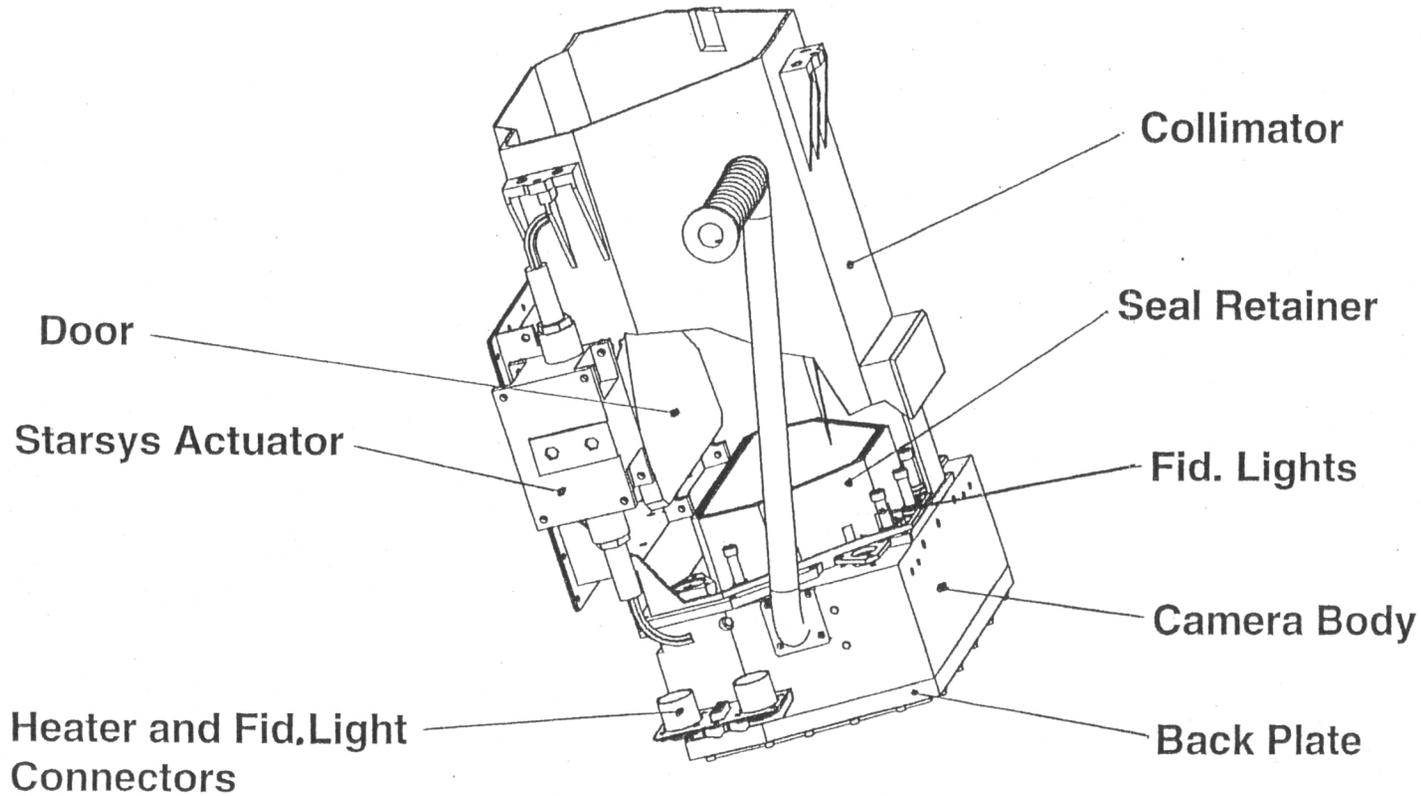
**NOTE \*\* ACIS FP temperature set point will remain at -119.7 C \*\***



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## ACIS Detector Housing Drawings



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## Thermal Modeling with the ACIS DH and SIM FA6 Off

Analysis by Joe Vogrin (NGST) and Neil Tice (LMA):

“Chandra ISIM Thermal Study to Lower ACIS Focal Plane Temperature”

- the ACIS and SIM temperatures were modeled for a range of pitch angles between 45 and 172 in 10 degree steps
- study indicates that the ACIS DH temperature side A/B will range from -71/-69 C at pitch=45 to -67/-66 C at pitch=145 (current temperatures are -62.4/-59.9 C)
- steady-state solution, these are equilibrium temperatures, whether they will be reached on-orbit depends on the time constants (which can be long) and the duration of time the heaters are off
- study indicates that the FP temperature will be up to 3.0 degrees colder at a pitch angle of 145. This is a large enough difference to significantly improve the performance of the CCDs.
- study indicates that ~2.5 degrees of the improvement comes from a lower DH temperature



## Two Proposed Tests Approved by the Flight Directors Board

*Tests scheduled for tail-Sun orientations in which the DH temperature should not drop below -67/-66 (-71/-69) C if the SIM is at the ACIS (HRC) observing position*

- 1) Turn off the ACIS DH heater during a perigee passage and HRC calibration observations just after perigee, turn on 2 hr before first outbound ACIS science observation starts, execute in the stored command load (~70 ks to cool), (17 September 2007)
- 2) Turn off the ACIS DH heater during an 48 ks observation (cool for 40 ks) of the CDF-South, (23 September 2007)
  - as the ACIS DH contracts/expands as it cools/warms the Fid Lights will move by an amount which may be large enough to affect the aspect
  - Tom Aldcroft believes that he can account for this apparent shift of the Fid Lights, Tom will analyze the results and attempt to reconstruct the aspect



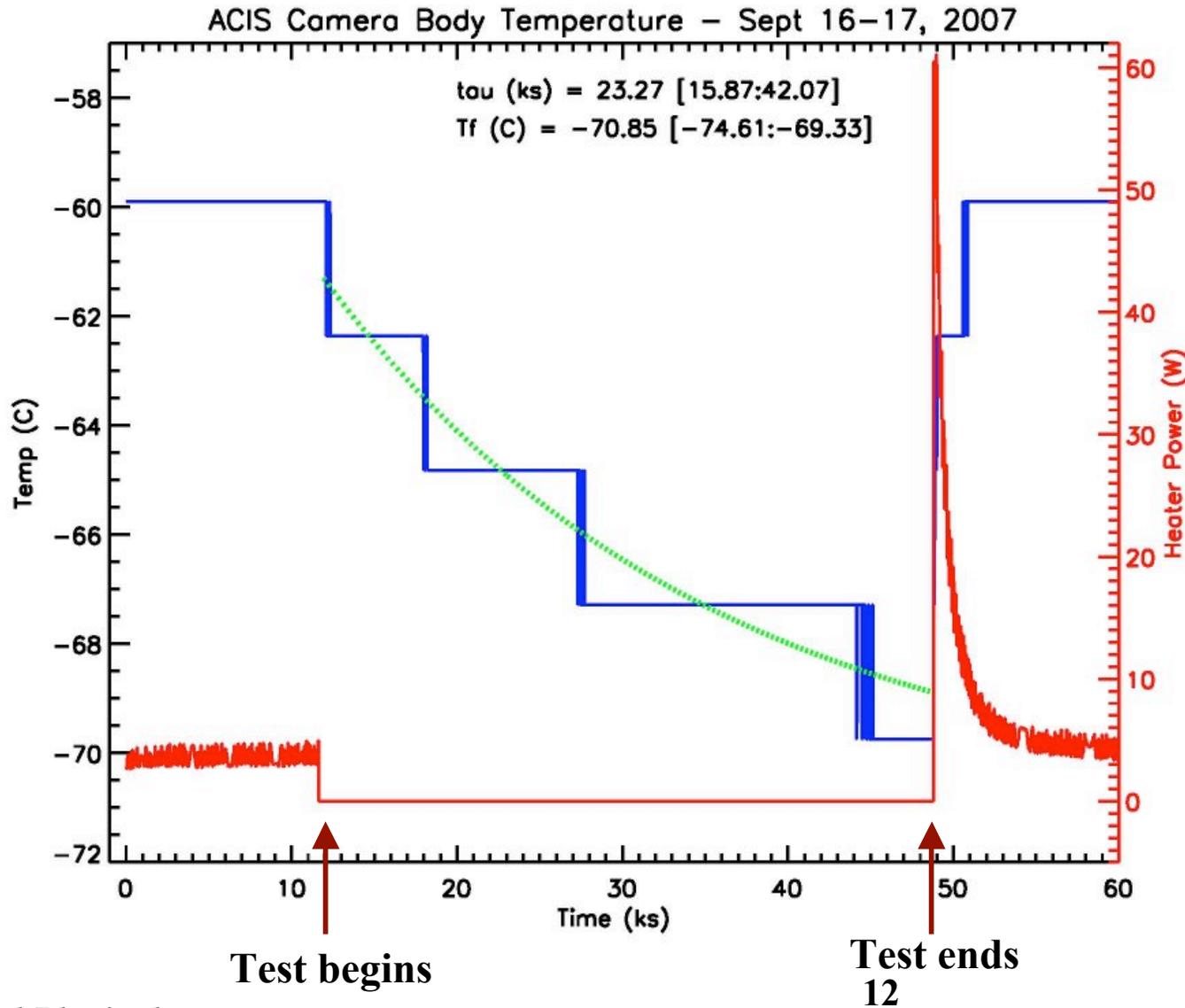
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## Test #1: Cooling During Perigee Passage

DePasquale  
(SAO)

SIM at the  
HRC  
position for  
perigee  
passages





## Implementation: Future Plans

-- ***If*** the verification test and the test during a perigee passage are successful, we would like to turn off the DH heater for all perigee passages, success criteria:

Verification test - receive expected TLM verifiers that heater turns off and on

Perigee test - DH cools below -60 C but not down to -72 C & warms to -60 C in 2 hr

-- ***If*** the test during the CDF-S test is successful, success criteria:

Absolute astrometry - 0.4 arcsec error

Image reconstruction - demonstrate that Enclosed Counts Fractions are statistically identical to previous observations

- 1) Schedule additional tests during remaining CDF-South observations
- 2) Proceed with implementation of DS SW to reconstruct aspect with a variable DH temperature
- 3) Schedule tests at different pitch angles and work gradually to more forward-Sun attitudes to characterize cooling rates in different attitudes
- 4) Return to the FDB to ask to turn off the DH heater for good once the SW is available

-- Continue to investigate the option of turning off the SIM FA6 heater to gain more control on the ACIS FP temperature