



Update on the ACIS Contamination Issue and a Possible Bakeout

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Contributors to the Analysis Effort

There is a large group working on these issues. Those groups contributing directly to the effort:

**Northrup Grumman Space Technologies, MSFC Project Science, ACIS
MIT and PSU instrument teams, Neil Tice and Scot Anderson at
Lockheed-Martin, and the CXC**



Update on the Decrease in the Low Energy Efficiency

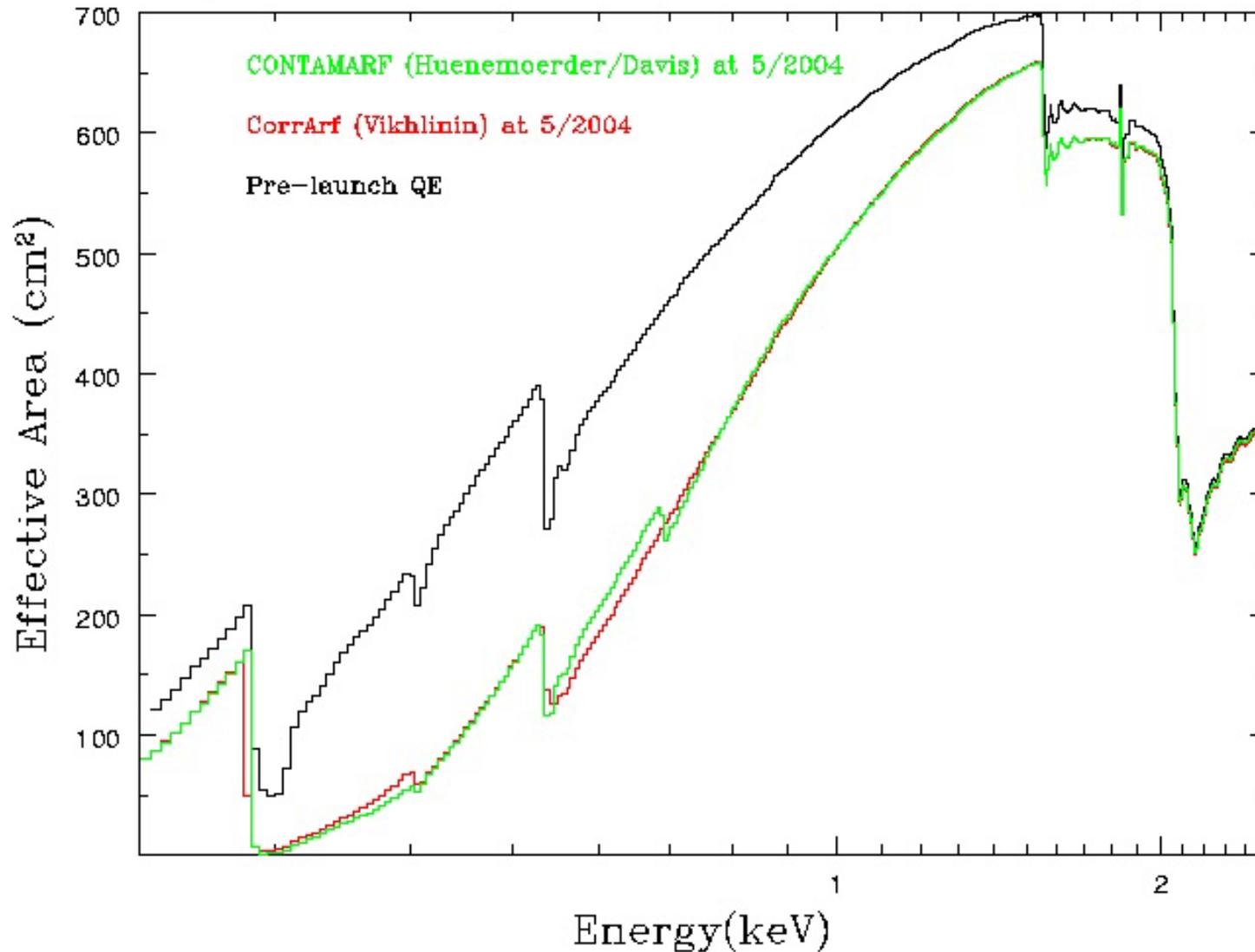
- The decrease in the low-energy QE is continuing
- Grant's analysis of the external cal source continues to indicate a decrease in the accumulation rate of the contaminant; Marshall's analysis of the C-K edge **NOW** shows a decrease in the accumulation rate
- Marshall's analysis still shows C, O, and F edges in the ratio of 14:1:1.2
- Marshall's analysis indicates a thickness of $\approx 60 \mu\text{gm cm}^{-2}$
- "contamarf" tool, which incorporates the above model, is available on the contributed SW page
- Vikhilin's analysis shows that the contaminant is not uniform and follows the temperature gradient on the filter
- Vikhilin's model for the spatial dependence and time dependence of the contaminant is now available on the contributed SW page, CIAO implementation is in progress



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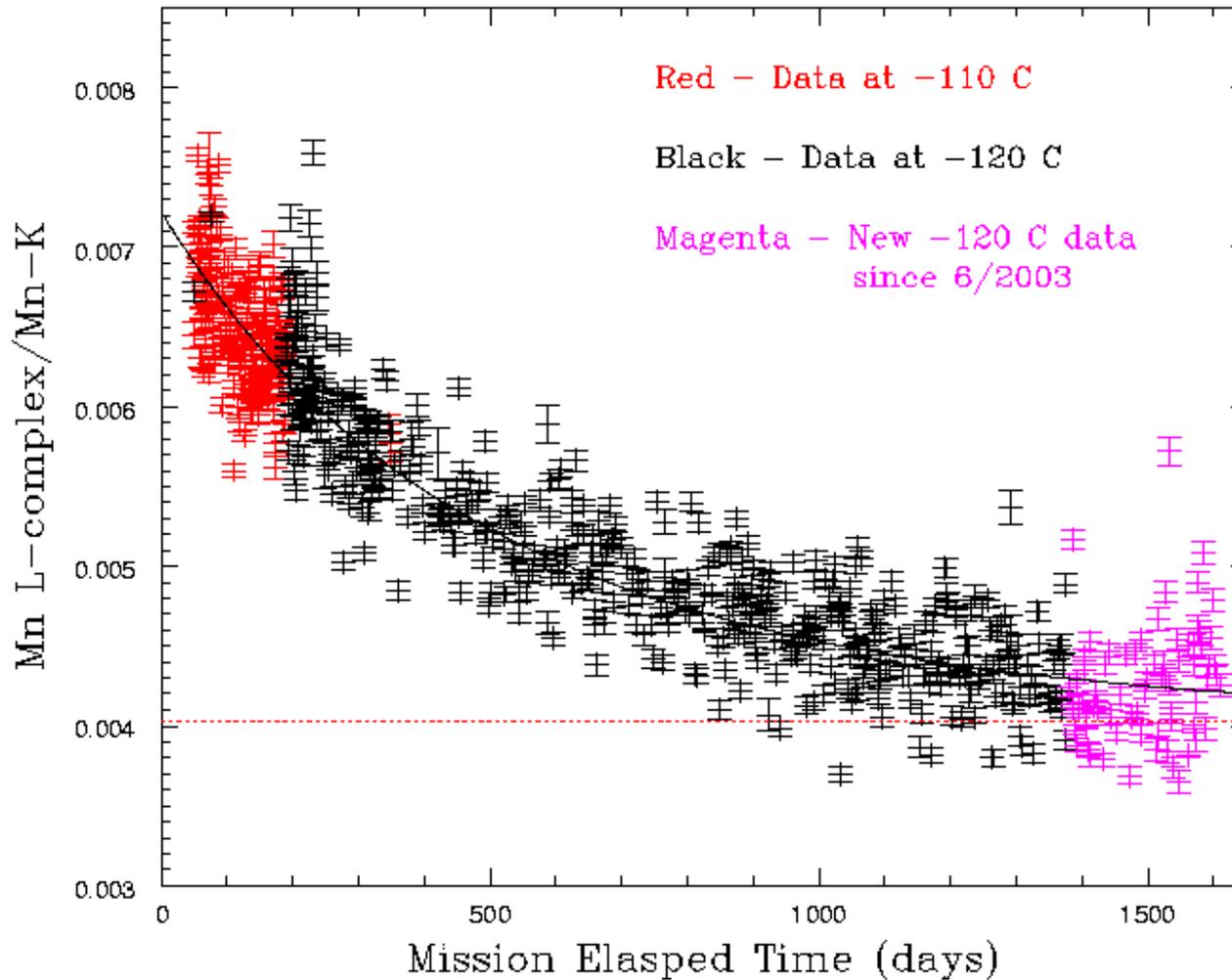
CXC

Comparison of Effective Area at Launch and 5/2004





Mn-L complex/Mn-K vs Time



Grant (MIT)

Analysis

Tennant,

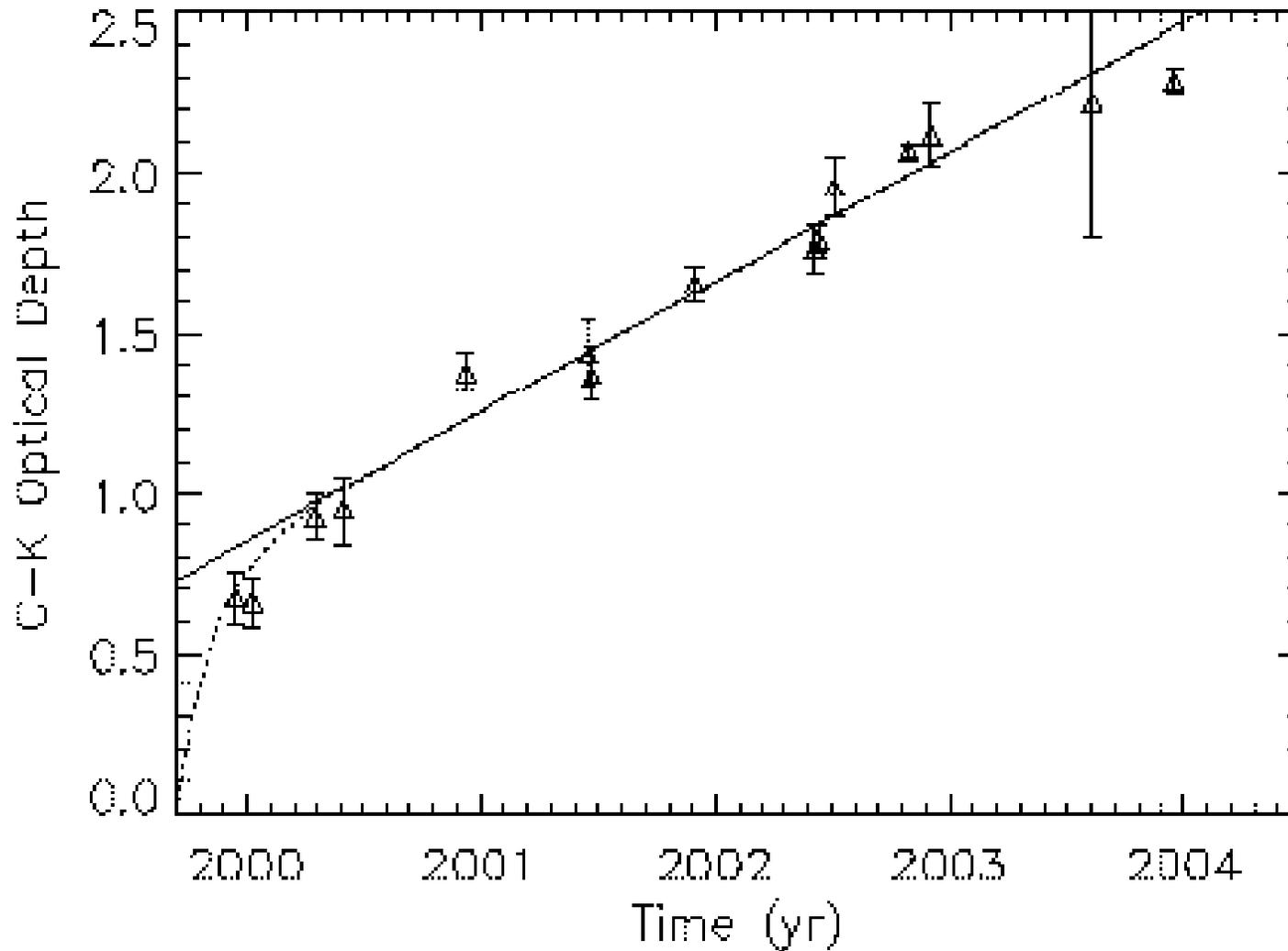
O'Dell
(MSFC)

Functional

Form



Depth of C-K Edge vs. Time



Marshall
(MIT)



Evaluation of a Possible Bakeout

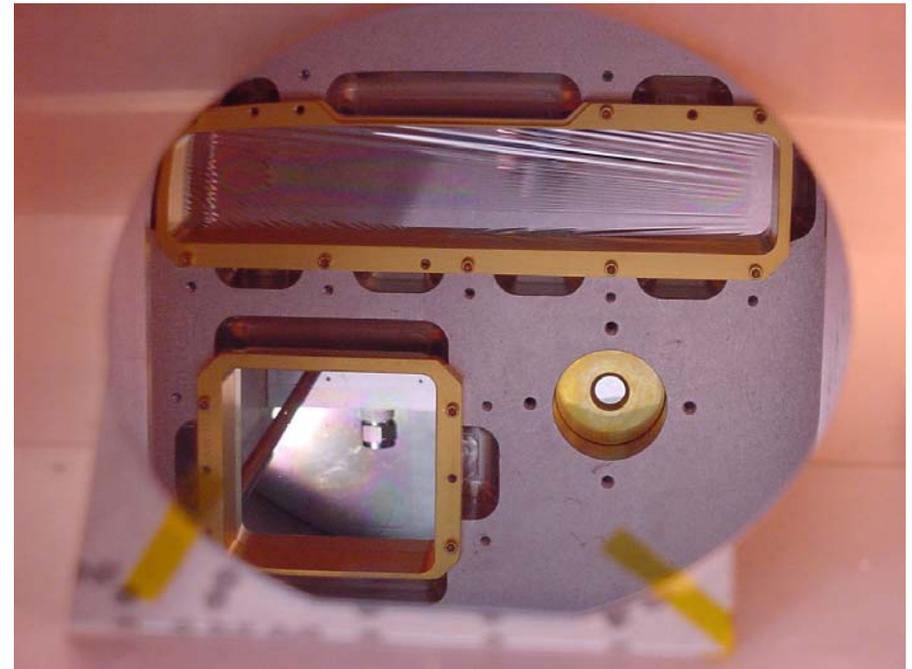
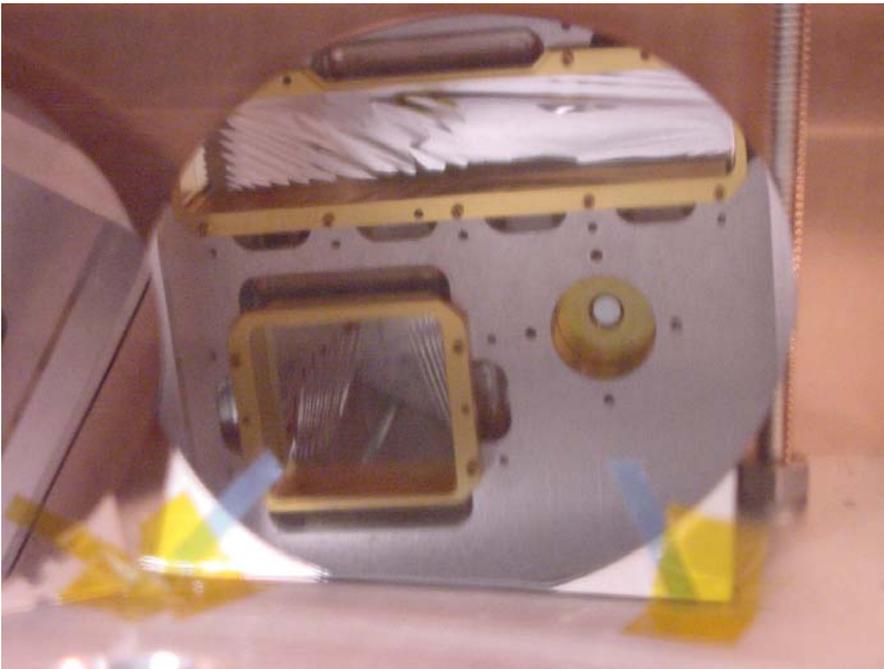
- The project decided to postpone the bakeout in November 2003, the project wants to consider additional tests on the spare filters
- Tests at NGST on the spare filter were conducted in October 2003. A thick layer of a hydrocarbon-based material was deposited on the spare filter. The filter was then warmed up and cooled back down again. No damage to the filter was observed.
- The filter was isothermal at -60 C during the NGST test. We are considering a test which would reproduce the temperature gradients expected in the flight bakeout.
- An independent review of the contamination effort at NGST was organized by NGST and included personnel from Swales Aerospace and GSFC. The review was optimistic that a bakeout to 0 C would liberate the contaminate from the filter but suggested that a simplified venting analysis be conducted to determine what fraction of the contaminant would exit the ACIS collimator and eventually vent overboard. The review panel did not feel competent to comment on the risk to the filter.



OBF Tests at NGST

BEFORE

AFTER



Yes, the filter survived !!!!

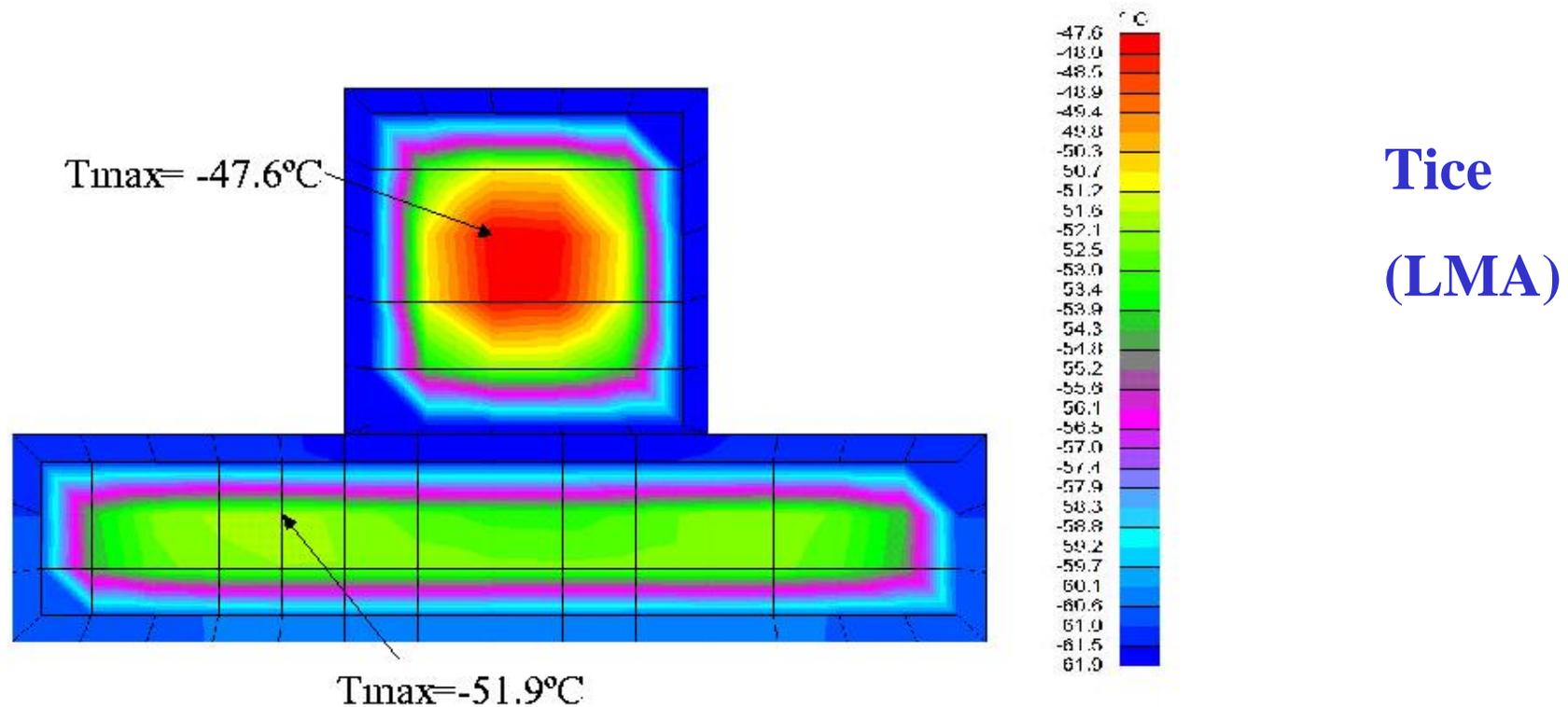


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ACIS Filter Temperatures for Standard Conditions

ACIS Housing -60°C, FP -120°C

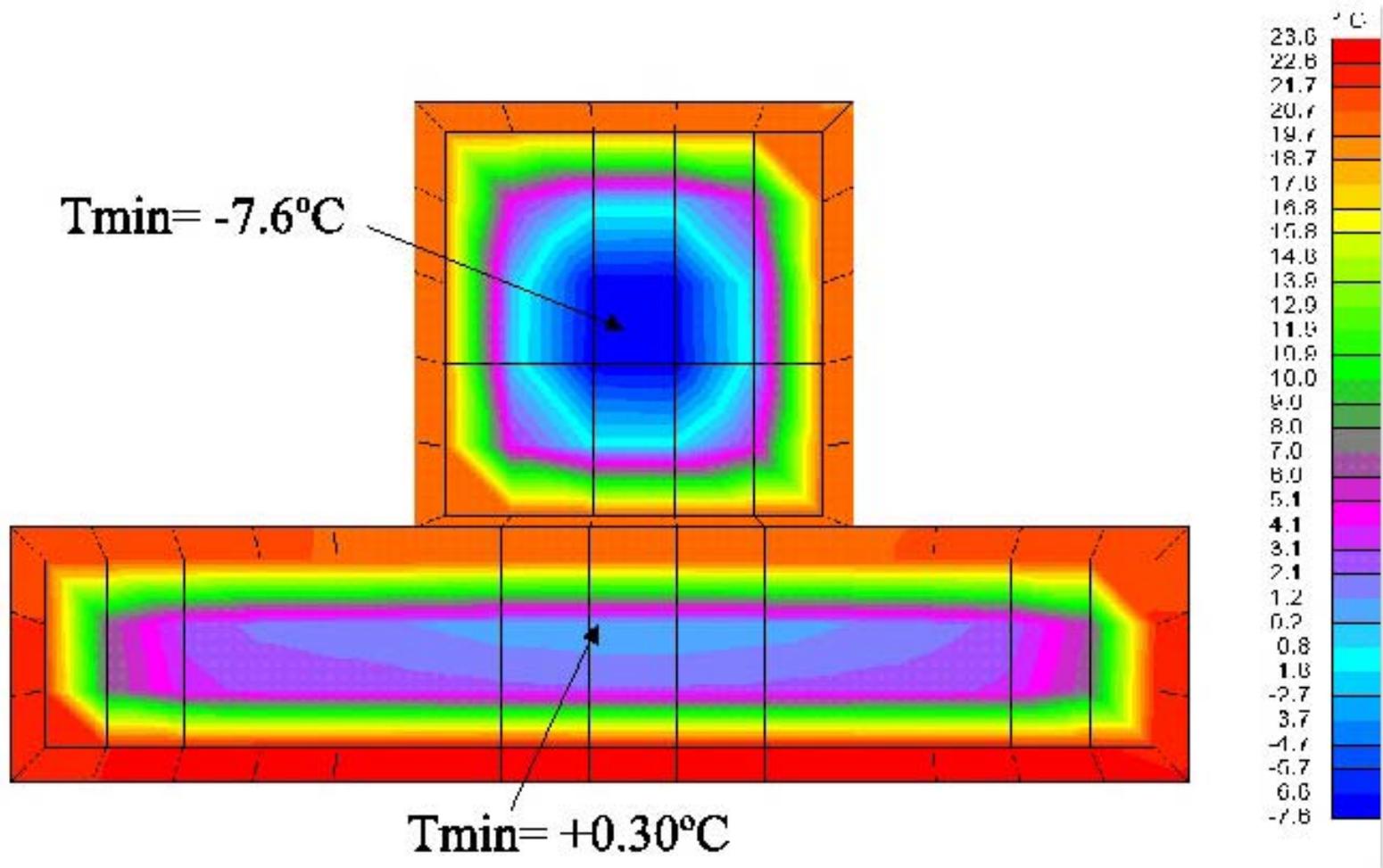




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ACIS Housing 25°C, FP -60°C

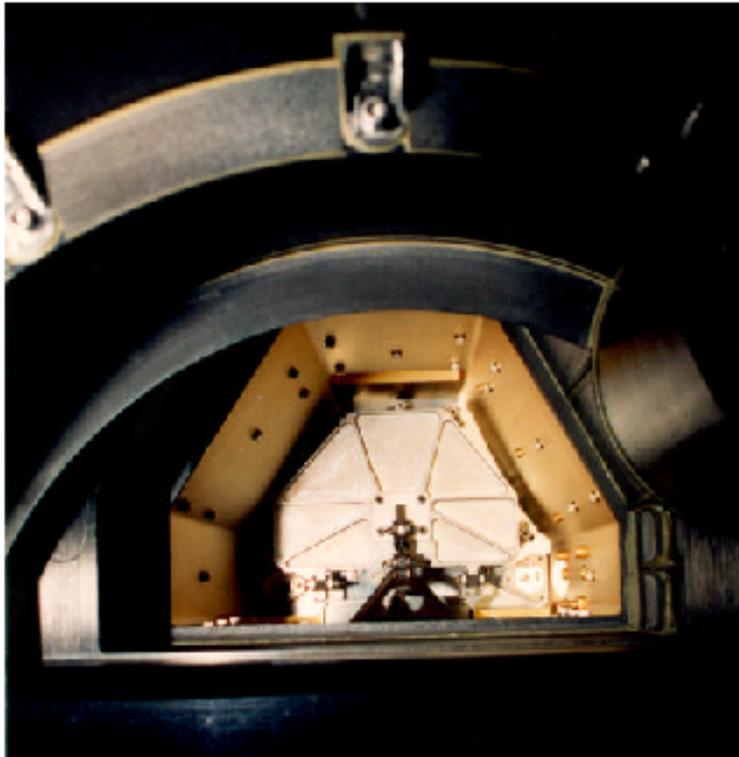




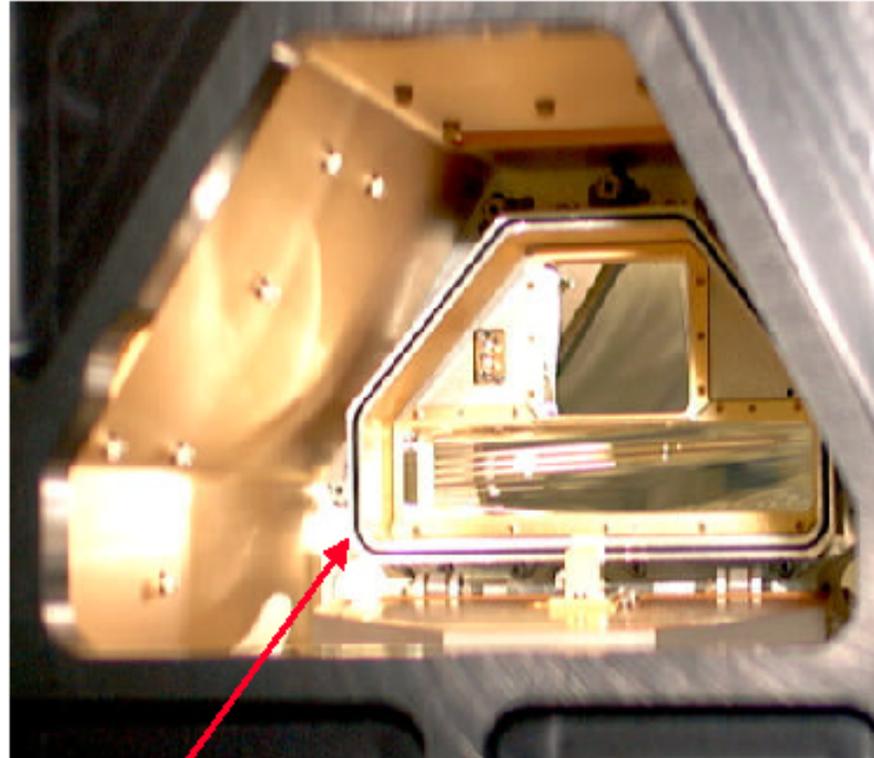
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X-Ray View of ACIS Door and Detector



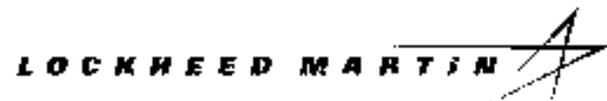
Door Closed while Mounted to ISIM



Door Open at LMA

Viton O-ring

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Key Tasks for a Bakeout Decision

1. Identify Possible Contaminants (CXC CAL/NGST) ✓
2. Determine Release Temperature of the Contaminant (NGST) ✓
3. Determine ACIS FP and DH Temperature to Achieve Desired Bakeout Temperature (LMA/ACIS Team) ✓
4. Perform Venting Analysis of Release and Redeposition (NGST) ✗
5. Conduct Engineering Assessment of Risk to ACIS (ACIS Team/LMA) ✓
6. Develop Flight Procedure (SOT & FOT) ✗
7. Develop Calibration Plan Before and After Bakeout (CXC CAL) ✓
8. Evaluate the impact to the Science Observation Plan (CDO) ✓
9. Obtain Final Approval from Project to Execute Bakeout ✗



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New Tasks for a Bakeout Decision

1. **Perform Simplified Venting Analysis (MIT,LMA)**
2. **Consider Additional Tests on the Spare OBF (ACIS instrument team,NGST)**
3. **Develop an Objective Measure of the Impact on *Chandra* Science (CXC & GTO teams)**
4. **Make a quantitative determination of ACIS capabilities if the filter were lost (CXC CAL and DOSS, ACIS instrument team)**
5. **Obtain Final Approval from Project to Execute Bakeout**



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Impact on GTO AO-5 Proposals

Question 1: Were there any targets for which you wanted to propose but did not because the observation was no longer feasible ?

Question 2: Were there any targets for which you increased the exposure time due to the contamination layer ? If yes, how many and by how much ?

Question 3: How many targets were unaffected ?

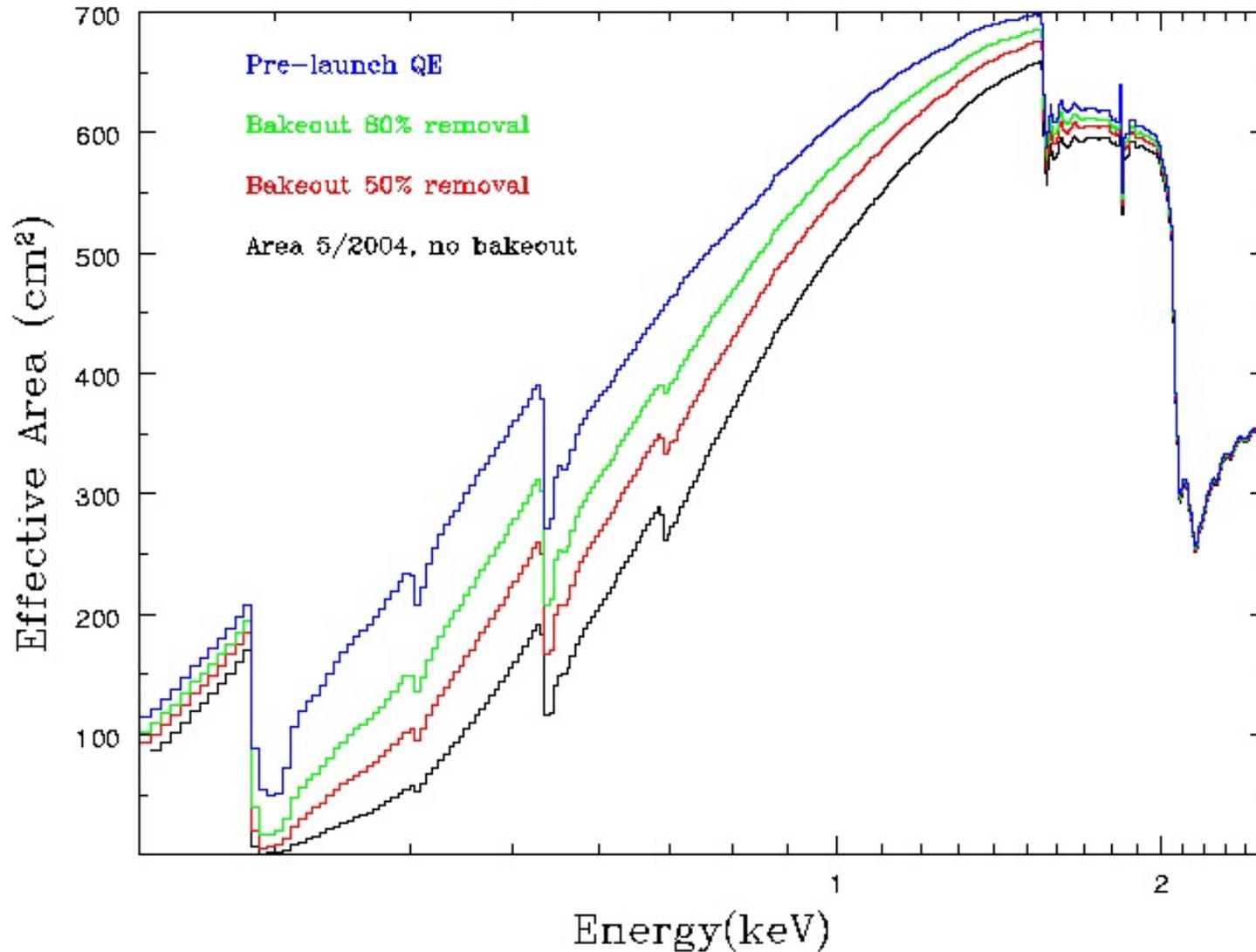
	<u>#1</u>	<u>#2</u>	<u>#3</u>
ACIS GTO Team	5 targets	13 targets, 16% of total	24 targets,
HRC GTO Team	0 targets	0 targets	All
HETG GTO Team	0 targets	2 targets, 18% of total	2 targets



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Predicted Improvement after Bakeout





Summary of a Possible Bakeout

- We are still working on the Bakeout
- Given the slow accumulation rate of the contaminant there is no reason to rush into a decision
- Real debate within the project as to whether the potential benefit of the bakeout is worth the risk.
- No firm timetable for a decision