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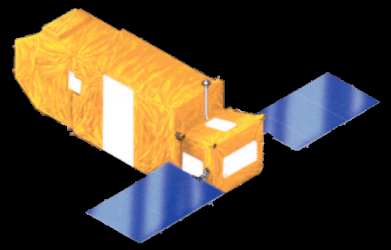
FOAC Meeting-April 2, 2004



FUSE Mission Status

Bill Blair
FUSE Deputy PI
Chief of Observatory Operations

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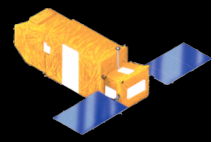
Recent Performance



- Preliminary Statistics for Cycle 4 (Apr.2003 - Mar. 2004):
  - Total science time: 11.83 Msec (37.4% efficiency)
  - Primary science time: 6.98 Msec (22.1% efficiency)
  - Secondary science: 4.84 Msec (15.3% efficiency)
    - Survey/Observ. Progs: 2.82/0.94 Msec (11.9%)
    - Background Program: 1.09 Msec (3.4%)
  - Prime and total %s are both considerably higher than last 6 month period of Primary mission.
  - Due largely to systematic scheduling of higher declination targets with smaller occultations and longer visibility periods.
- Flux Calibration status:
  - Will be addressed this afternoon (Sahnow presentation).

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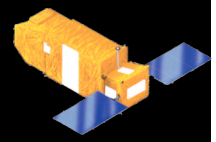
Overall Performance to Date



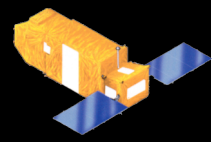
Summary of All Science, Cycles 1-4

Cycle	N(obj)	N(obsid)	N(obs)	Total Time (ks)
1	623	634	884	8914.584
2	530	592	736	9781.739
3*	522	629	868	13387.297
4	406	513	677	11827.007
TOTAL	2081	2368	3165	43910.627 ks

*Cycle 3 was 16 months including 2 months of down time.

(Info thanks to Alex Fullerton.)

Carry-over to Cycle 5

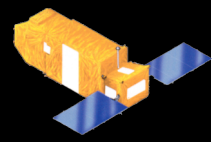


Programs carried over from Cycles 1-4 into the Cycle 5 time period (April, 2004 - April, 2005).

	Observations	Exp. Time (ks)
A programs:	0	0
B programs:	11	104
C programs:	63	564
D prime:	99	1583
D survey:*	35	290
P programs:	51	391
Q programs:	5	47
TOTALS:	264	2979 ks

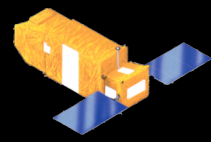
*** Survey carry-over TBD.**

Observations On HOLD



	No. Obs	Exp. Time (ks)	Comments
A programs:	0	0	No pending obs.
B programs:	3	49	All unschedulable w/current constraints
C programs:	13	142	Bright & unschedulable targets
D programs:	41	202	Bright targets
P programs:	42	257	Bright & unschedulable targets; Jupiter (5 obs)
Q programs:	0	0	
Z programs:	1	33	Z007 - FUSE/COS Cross Calibration (!)
TOTALS:	100	683	Includes 5 Moving Target obs.

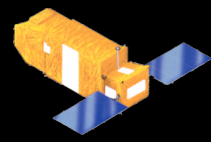
Total Carry-Over to Cy5



	Observations	Exp. Time
A programs:	0	0 ks
B programs:	14	153 ks
C programs:	76	706 ks
D programs:	175	2075 ks
P programs:	93	648 ks
Q programs:	5	47 ks
Z programs:	1	33 ks
TOTAL:	364	3662 ks

(Information courtesy of Alice Berman, FUSE MP.)

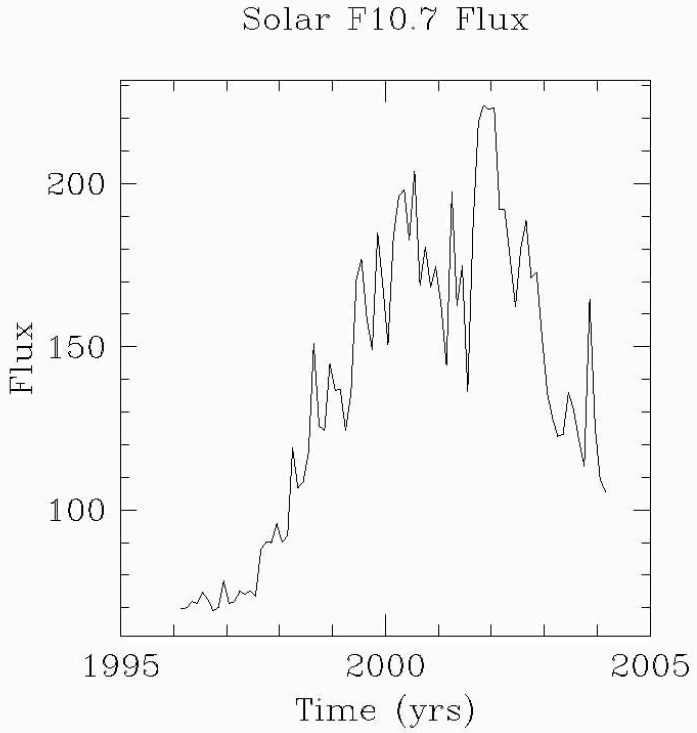
Progress on Pending Observations



Program	10/26/03 LRP # obs	10/26/03 LRP Time (ks)	03/26/04 LRP # obs	03/26/04 LRP Time (ks)
A	3	14	0	0
B	42	240	11	104
C	105	1123	63	564
D prime	156	3141	99	1583
D survey	137	1372	35	290
M	86	493	97	570
P	83	691	51	391
Q	13	110	5	47
S	0	0	1	2
Z0xx	2	66	0	0
Z9xx	77	630	56	412
	704	7880	418	3963

Ram Avoidance Zone Decrease

- Atmospheric heating is driven mainly by average solar output, not flare activity.
- Average activity (as tracked by 10.7 cm flux) is <1/2 max.
- We feel comfortable scheduling a few test observations, with calibration observations before and after, later this year.
- Assuming analysis is positive, we may significantly reduce the Ram avoidance zone, at least for problem targets, late this year.
- But…



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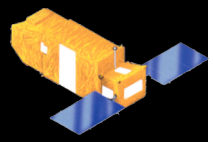
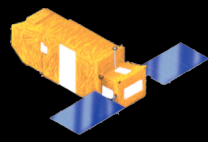
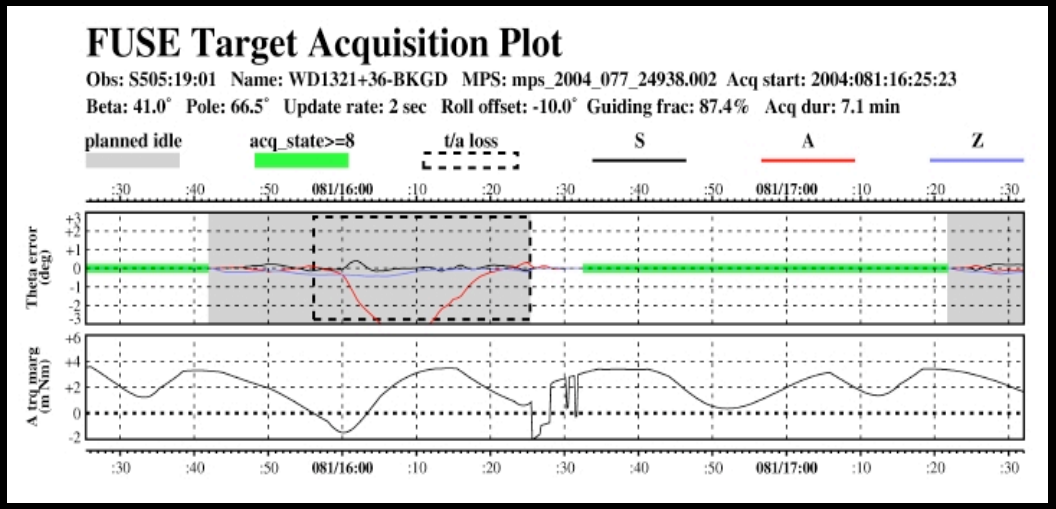
Operations Enhancements

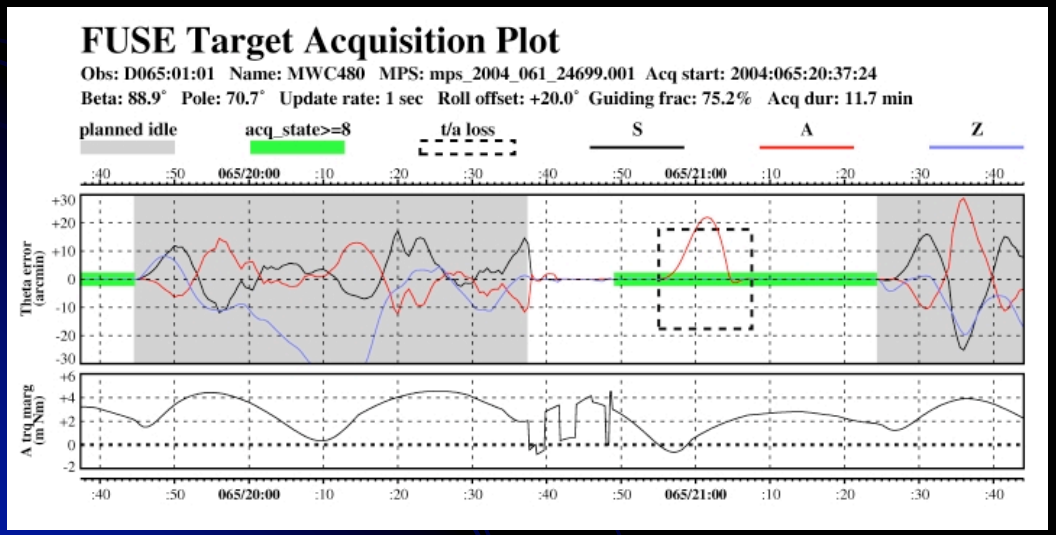


- We are pursuing two enhancements that may largely negate the need to operate very close to the orbital plane.
  - Careful use of marginally stable orbits.
    - Our ability to predict small torque losses is now fairly robust.
    - Testing shows that small torque losses during occultations, or even during visibility in certain cases, can be tolerated.
  - Use of positive roll offsets (up to 20 degrees).
- These two enhancements, in combination, hold significant promise for
  - Increasing sky coverage significantly, reducing or possibly even eliminating the “black hole” in sky coverage.
  - Increasing schedulability of targets with otherwise marginal visibility.
- Thermal effects or other problems may crop up in testing, but at present these enhancements look attractive.

Partially Stable Orbits







- Torque Authority (TA) loss during occultation.
  - Pointing recovers in time for acquisition and observation.

- Minor TA loss during visibility.
  - Pointing disrupted but track is maintained.
  - Extra time planned to make up for time lost.

[Dashed boxes = predicted TA losses]

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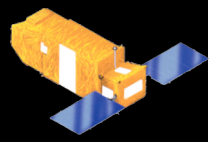
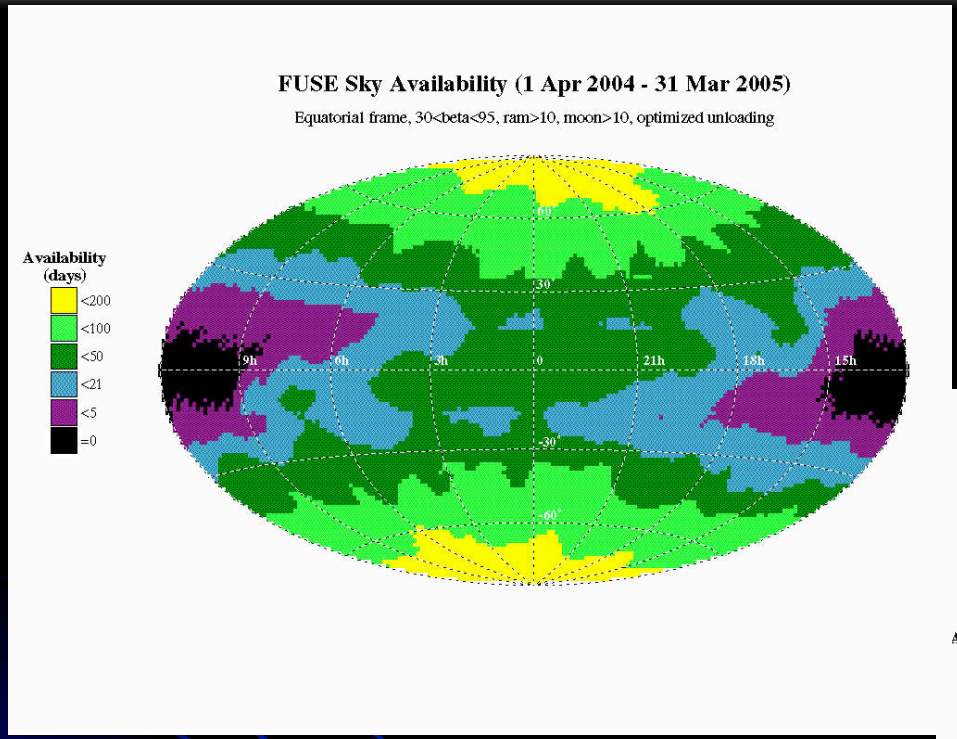
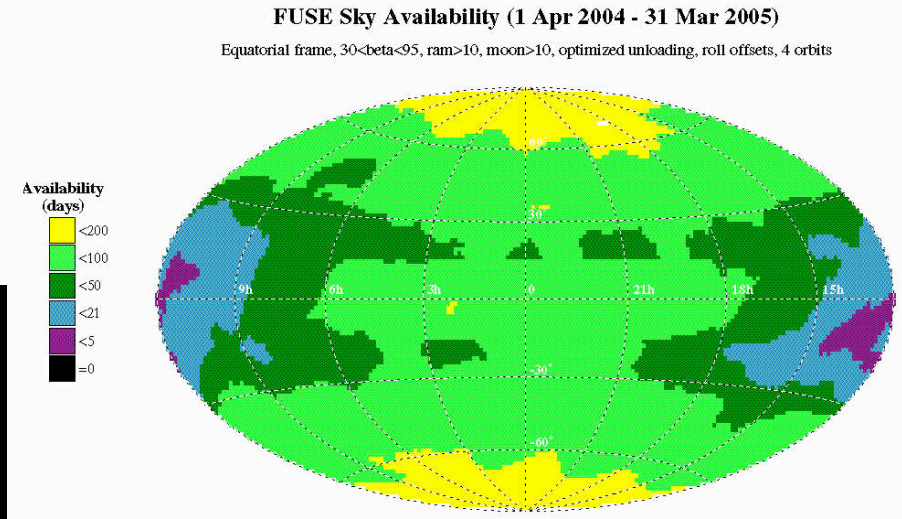
Sky Coverage





<-- Current Sky Coverage



Sky Coverage --> including roll offsets and partially stable orbits

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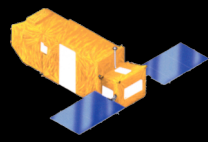
Bright Target Techniques



- **SiC only technique:** has been used several times. Targets needing this technique have been released from hold. It is not quite a "standardized" procedure, but can be utilized when needed (within human resource limitations).
- **Defocus technique:** Testing has uncovered some unexpected effects in how the images move with defocus. No science assessment data have yet been obtained, so calibration issues are still open. Next test is scheduled for late-April.
- **Lowered HV method:** Tests to date have shown both promise and potential complications. May possibly provide a safer, multi-channel method of observing bright targets, but repeatability and calibration issues remain to be tested.
- **Scattered light technique:** May be usable in certain cases but will require new development to use safely (human resource issue).

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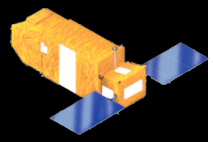
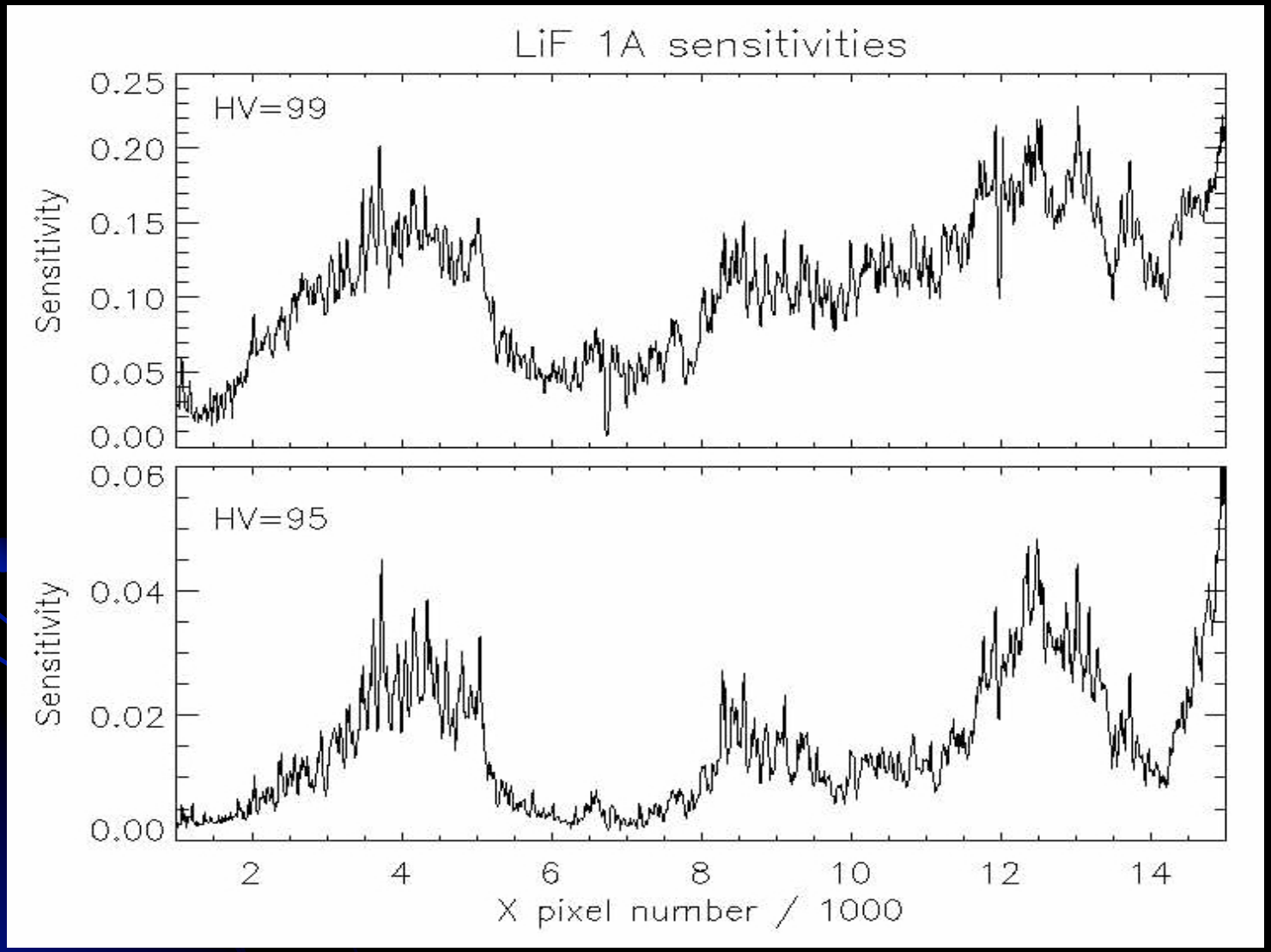
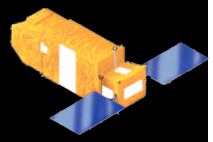
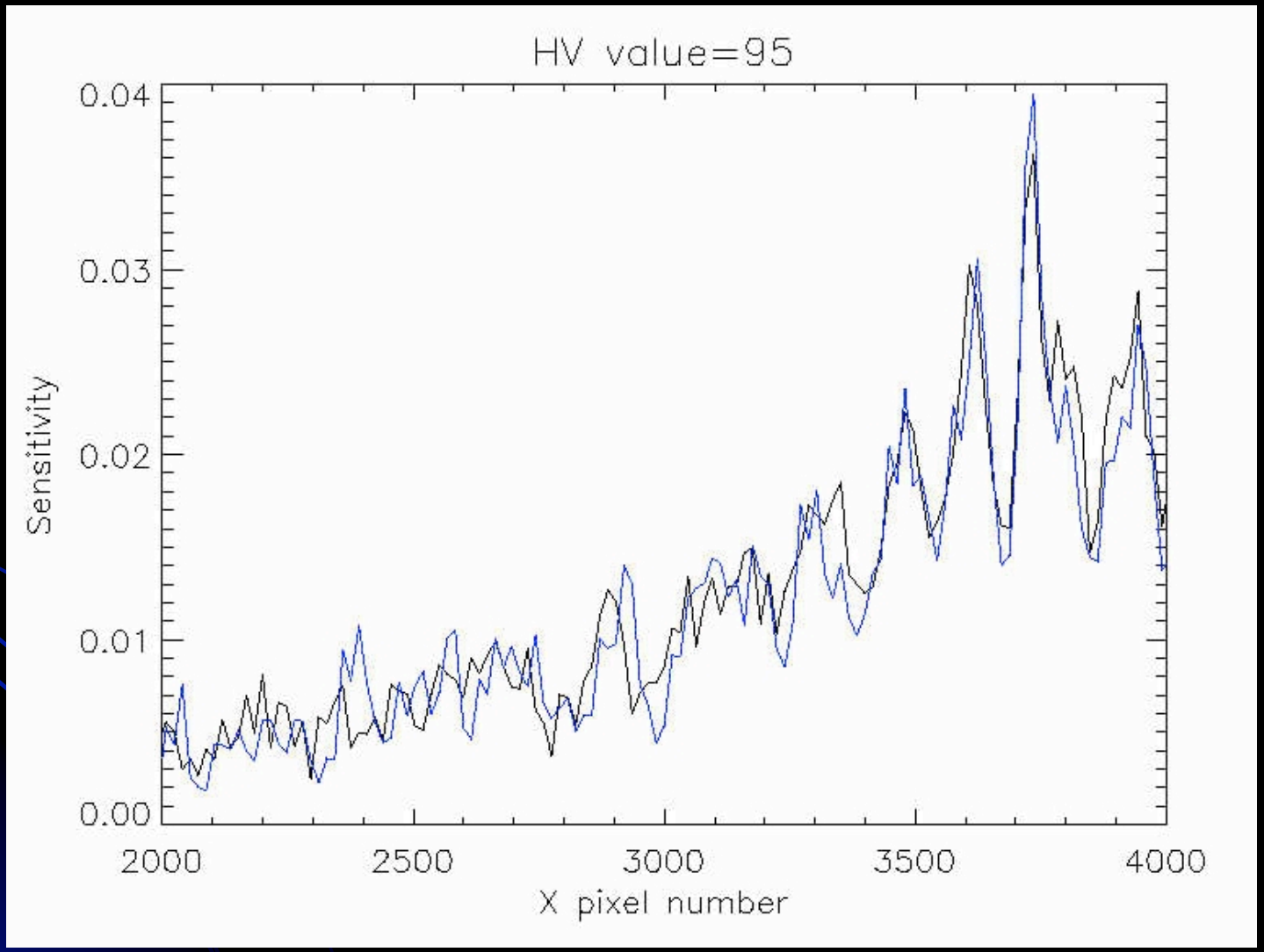
Lowered HV Technique



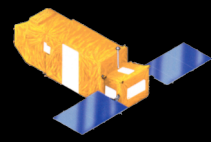


Lowered HV-Detail





FUSE Detector Usage



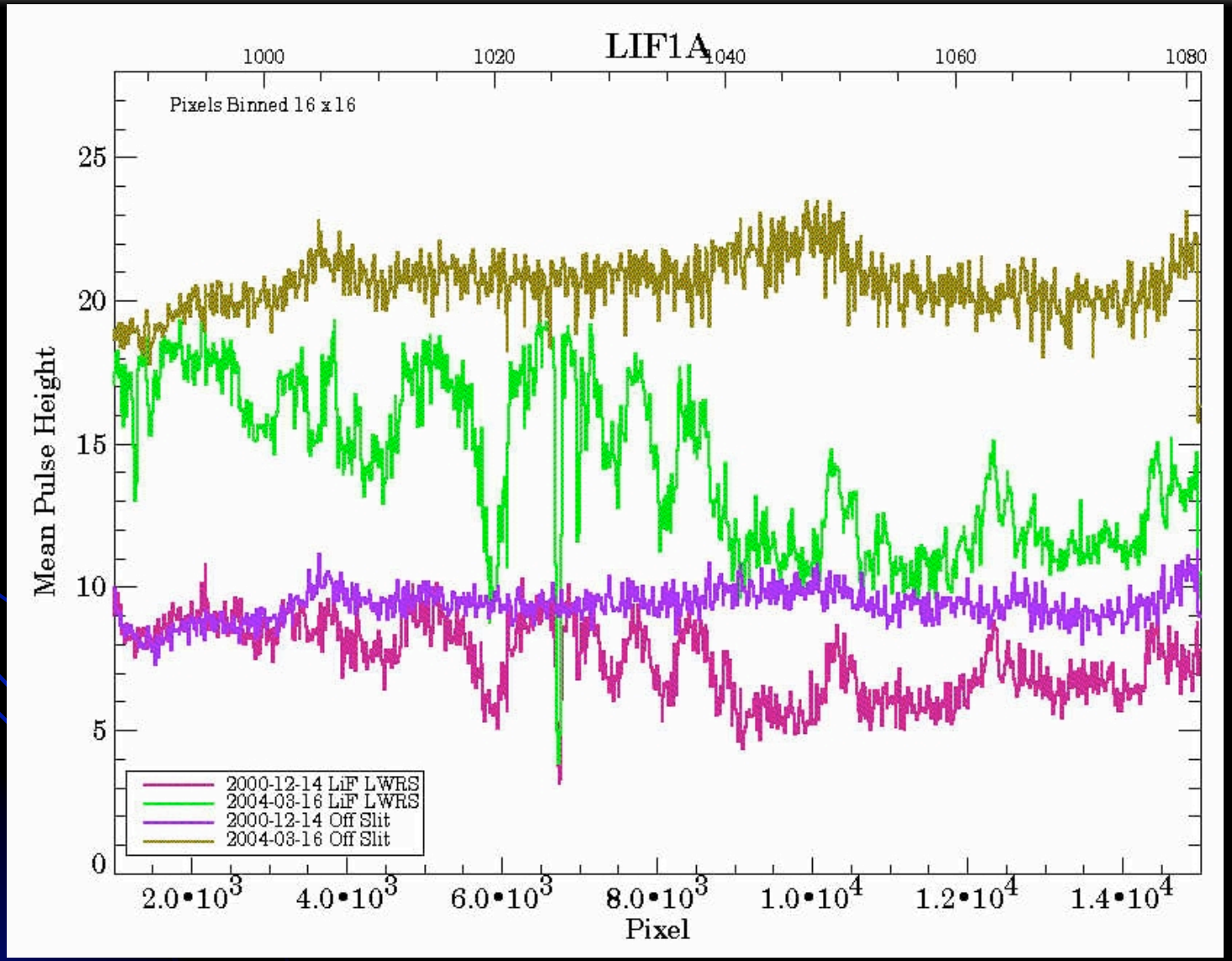
- Limited charge can be extracted per unit area from MCP detectors.
  - We are seeing significant gain loss from the detectors in the region of our workhorse (LWRS) apertures.
- Nominally, increases in high voltage can be used to keep pulse heights in the good range.
  - We have raised HV every 8 months or so (past few years).
  - We no longer raise HV in segment 2A.
- Two effects impact this process:
  - Differential gain loss (LWRS detector real estate compared with other apertures).
  - "Walk" corrections needed for pulse heights <8-10. (TTAG data can be corrected, but HIST data cannot.)
- For the long term health of the detectors, we are considering offloading bright targets to the MDRS.

LiF1A--Current vs. Early Mission

LWRS Aperture Comparison

(Now)

(Early in Mission)



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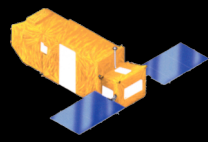
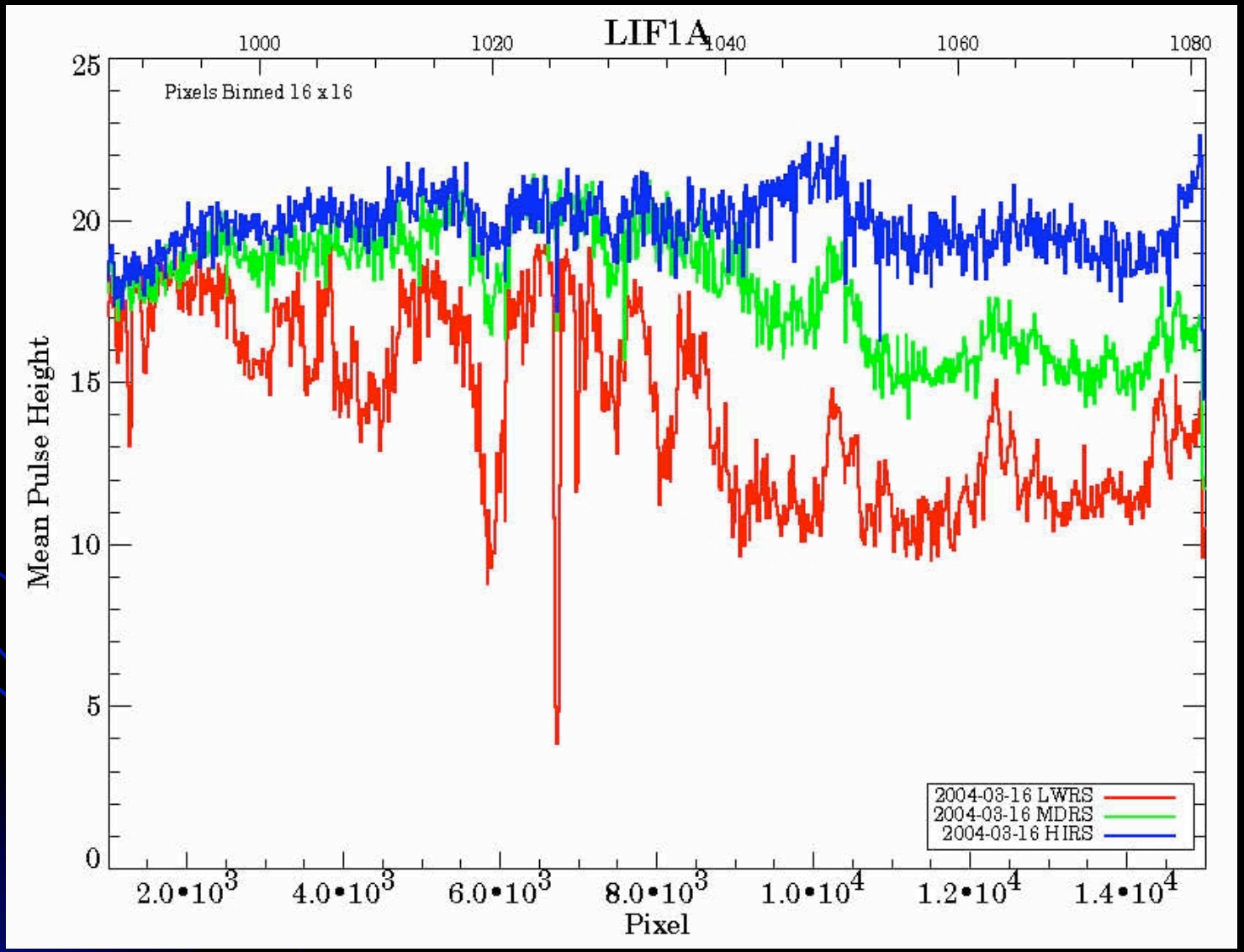
LiF1A Segment (Current)





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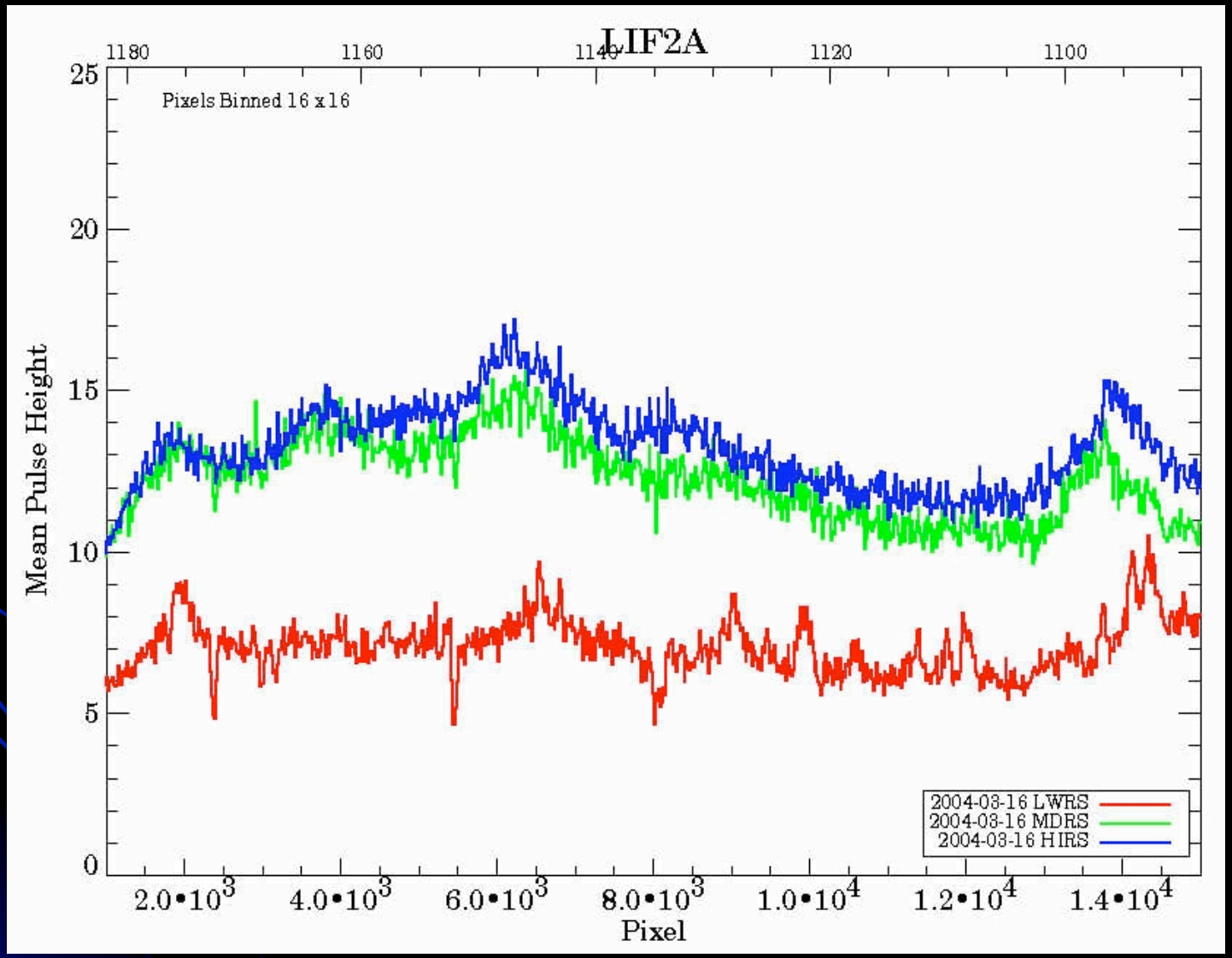
LiF2A Segment (Current)

HV no longer being raised on seg.2A!

(Note: Low PH's in LWRS.)



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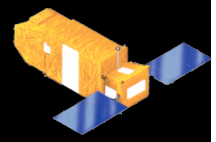
LWRS to MDRS Issue



- How soon should we impose this change?
  - Considering the long term health of the detector, and possible operations through FY08, we should implement this change soon, at least for the brightest HIST targets that drain charge faster per unit time of exposure.
- How many observations are (potentially) affected?
  - 24 LWRS science obs. (17 targets) w/F>1E-11 pending.
  - +10 LWRS (10 targets) w/F>5E-12 pending.
  - +60 other LWRS-HIST at lower flux levels.
  - Multiple observations of ~15 calibration targets (exempt these).
- What are the down sides?
  - More inefficient, heavier short term bulk memory impacts.
  - Users will have to deal with more exposures.
  - Poorer photometric properties. (Can be compensated for.)
  - Archival data quality issues?

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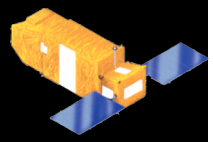
LWRS to MDRS Issue, con't.



- How might this be implemented?
  - Carefully review science requirements of any/all current observations moved from LWRS to MDRS.
    - May be valid reasons for LWRS usage.
  - Double requested time, use multiple Pkups per orbit (as per FUSE Observers Guide).
    - Compensates approximately for thermal channel motions.
    - If SiC data are not required, may not need to double time.
  - Exempt SAFTSNPs and SiC-only bright target observations.
    - Other brt-star techniques use smaller apertures anyway.
  - In Cycle 6 and beyond, be aggressive about recommending MDRS use (for more time) and require special reasons for new LWRS HIST observations.