HST Status

HST Mission Office

STUC Presentation

November 12, 2009

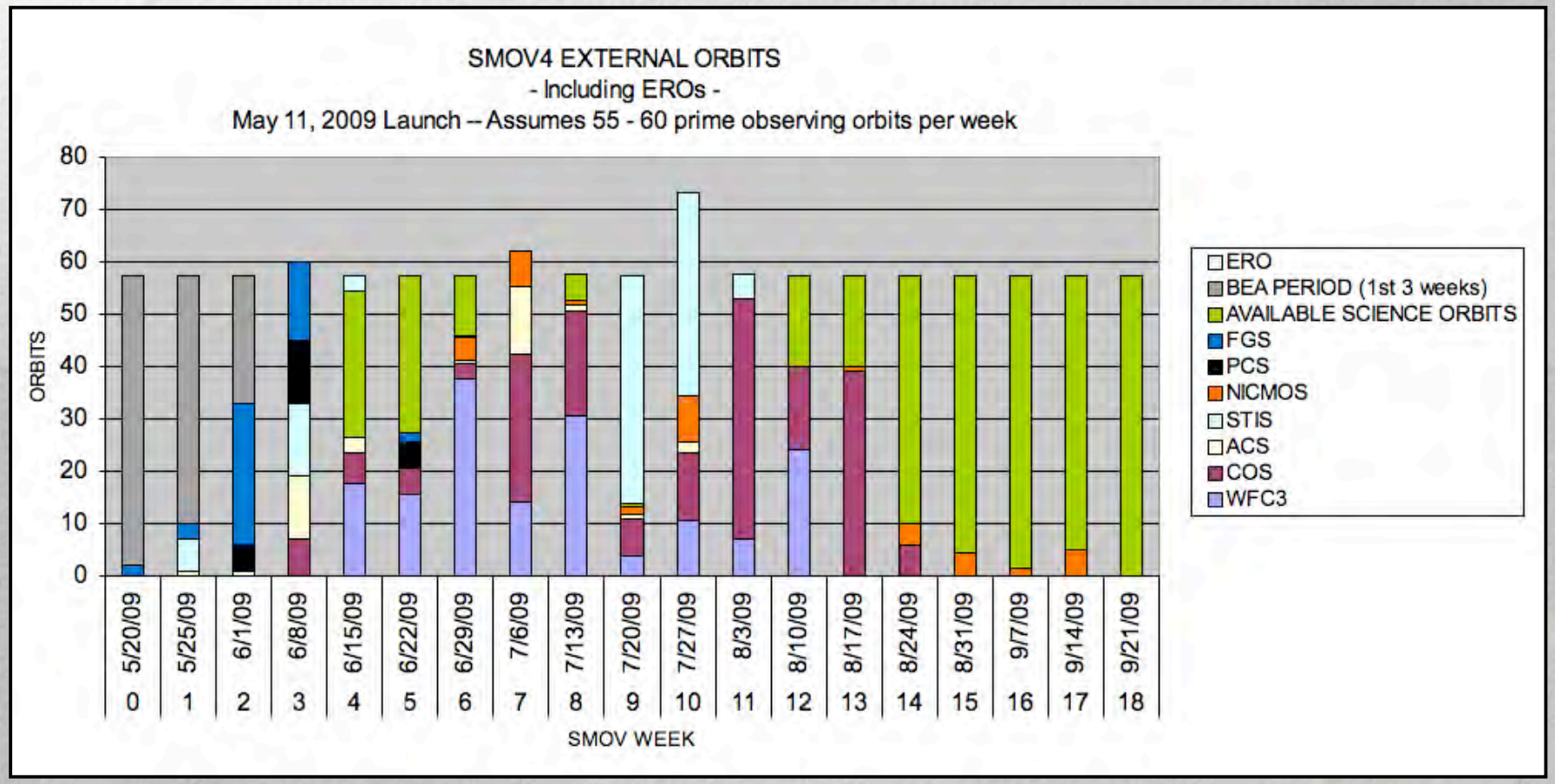
Last presentation: June 15, 2009

Agenda

- This Presentation:
  - Servicing Mission Observatory Verification (SMOV) and Early Release Observations (EROs)
  - SI C&DH Upsets
  - Cycle 17 Long Range Plan
  - Data Reprocessing
  - Handbook Updates
  - Exposure Time Calculators
- Separate Presentations:
  - Science Instrument Reports
  - Hubble Legacy Archive
  - Cycle 18 Preparations
  - Multi-Cycle Treasury Program

General SMOV Flow

- Pre-launch estimate of general SMOV timeline
  - Changing details as SMOV progressed



Science Enabling Dates	
FGS1R	June 10
ACS SBC	June 15
STIS CCD	June 15
ACS WFC	July 13
WFC3 UVIS	July 20
WFC3 IR	July 27
STIS NUV/FUV	August 10
COS NUV/FUV	September 14
NICMOS	TBD

SMOV Completion Dates	
FGS2R2 (guiding)	July 1
ACS	July 14
STIS	September 6
WFC3	September 11
COS	October 2
NICMOS	TBD

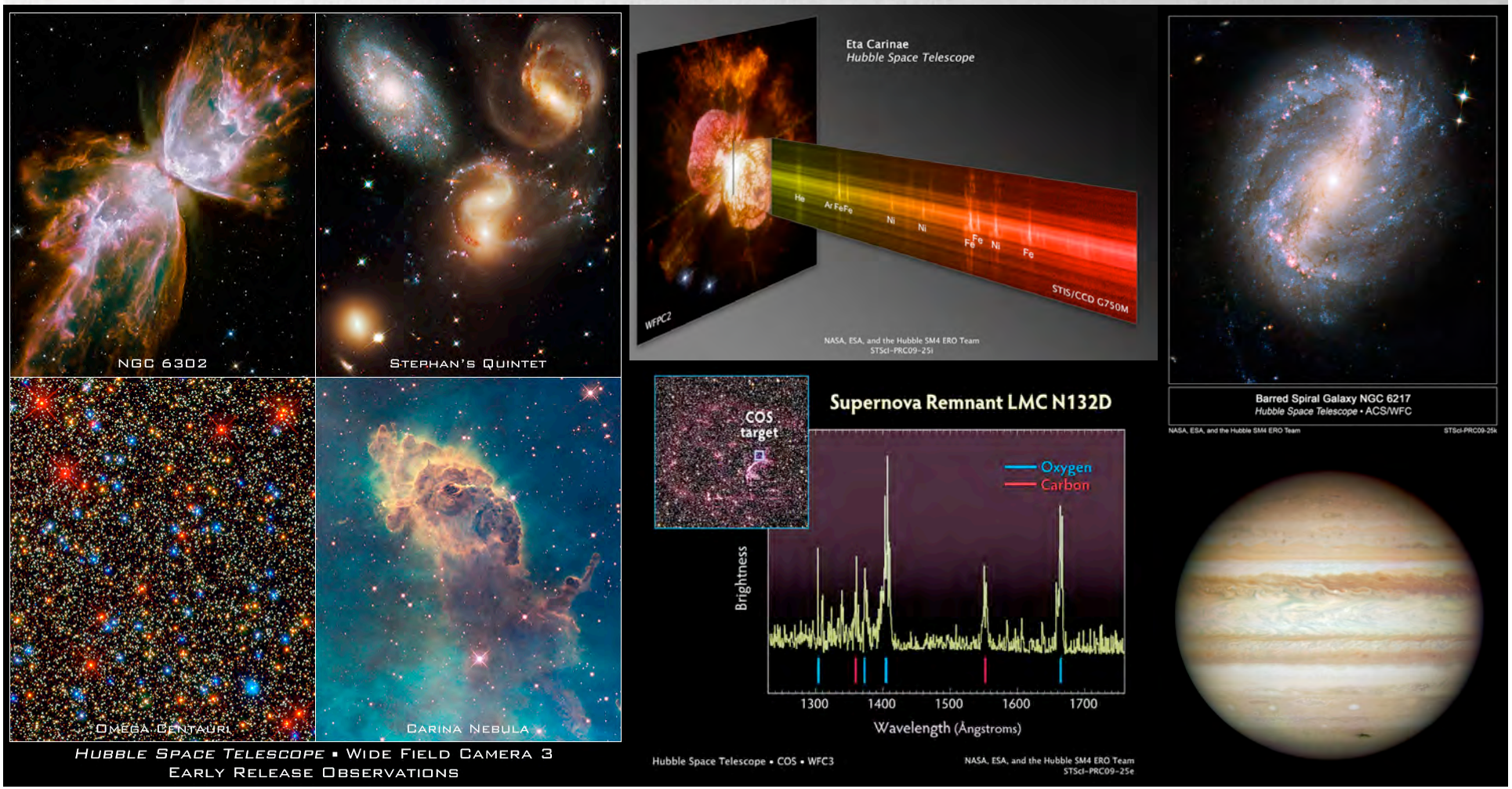
HST Instrument Status Summary

- ACS (repaired)
  - Restored WFC read noise is only ~ 4e$^-$
  - SBC continues to function nominally
- COS (new)
  - Far-UV throughput is exceptional (>10x STIS)
- STIS (repaired)
  - All modes (CCD, MAMA) operating well
  - NUV MAMA channel has elevated dark current
- WFC3 (new)
  - UVIS channel read noise is ~ 3e$^-$
  - IR FOV x Sensitivity ~ 50-100 times NICMOS
- FGS (new)
  - New FGS2 is enabled as guider
- NICMOS
  - Recommissioning interrupted by SI C&DH anomaly
- **SMOV Closure Review on November 18**

Engineering Checkout	ACS	✓
	COS	✓
	STIS	✓
	WFC3	✓
Detector Checkout	ACS	✓
	COS	✓
	STIS	✓
	WFC3	✓
Alignment & Focus	ACS	✓
	COS	✓
	STIS	✓
	WFC3	✓
Science Enabled	ACS	✓
	COS	✓
	STIS	✓
	WFC3	✓

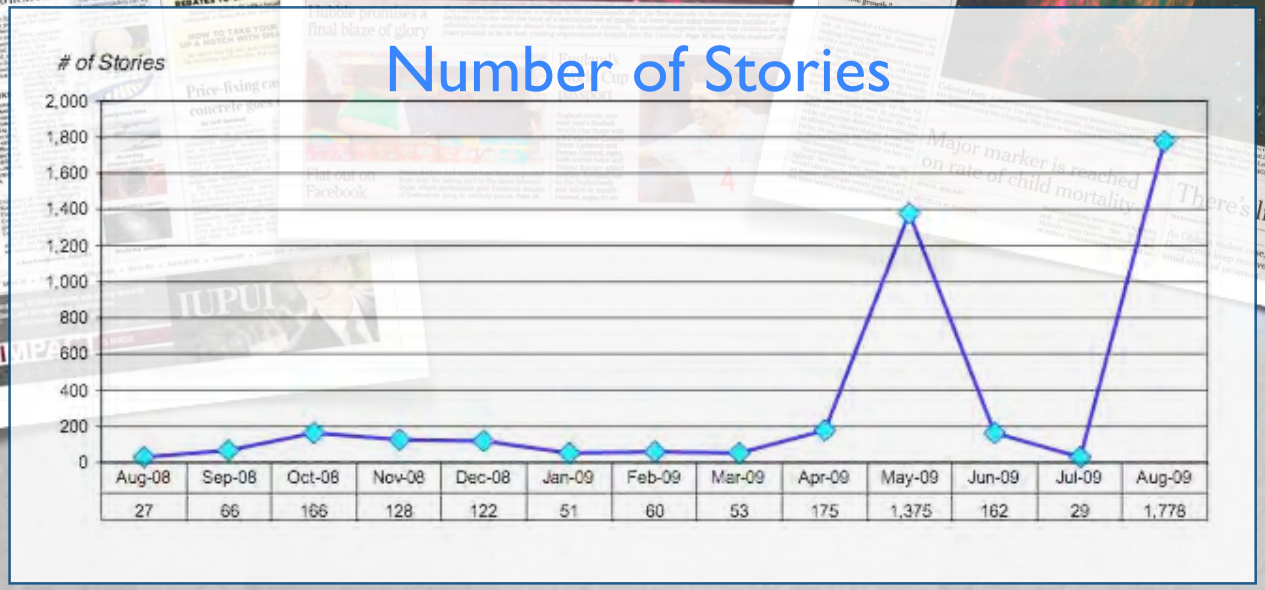
Early Release Observations

- EROs were presented in a press release on September 9, 2009



ERO Media Impact

Number of Stories

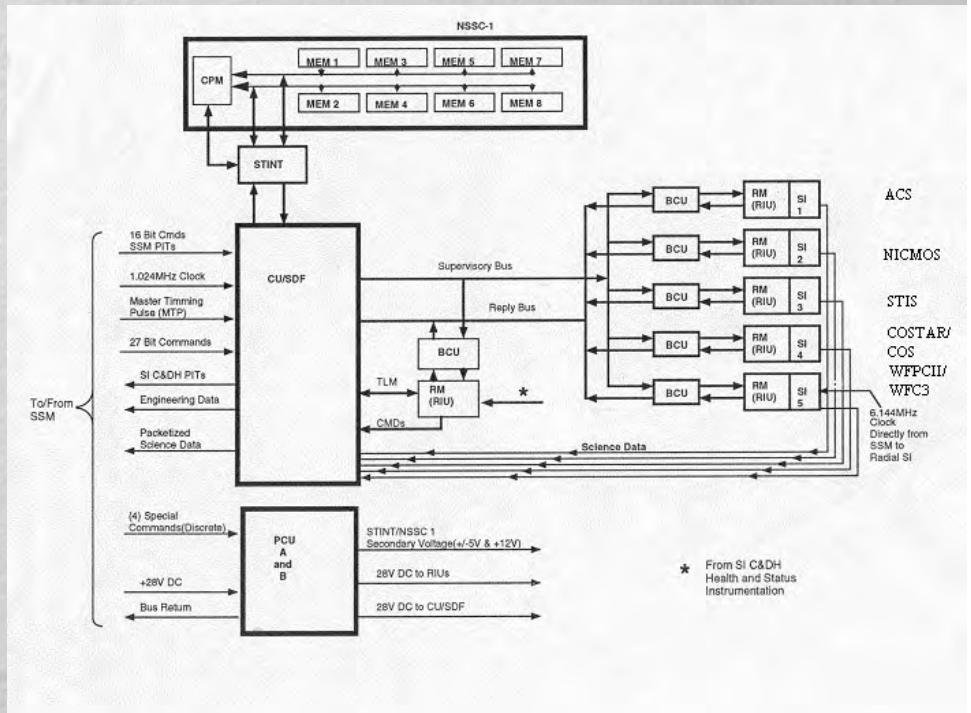


ERO Reach

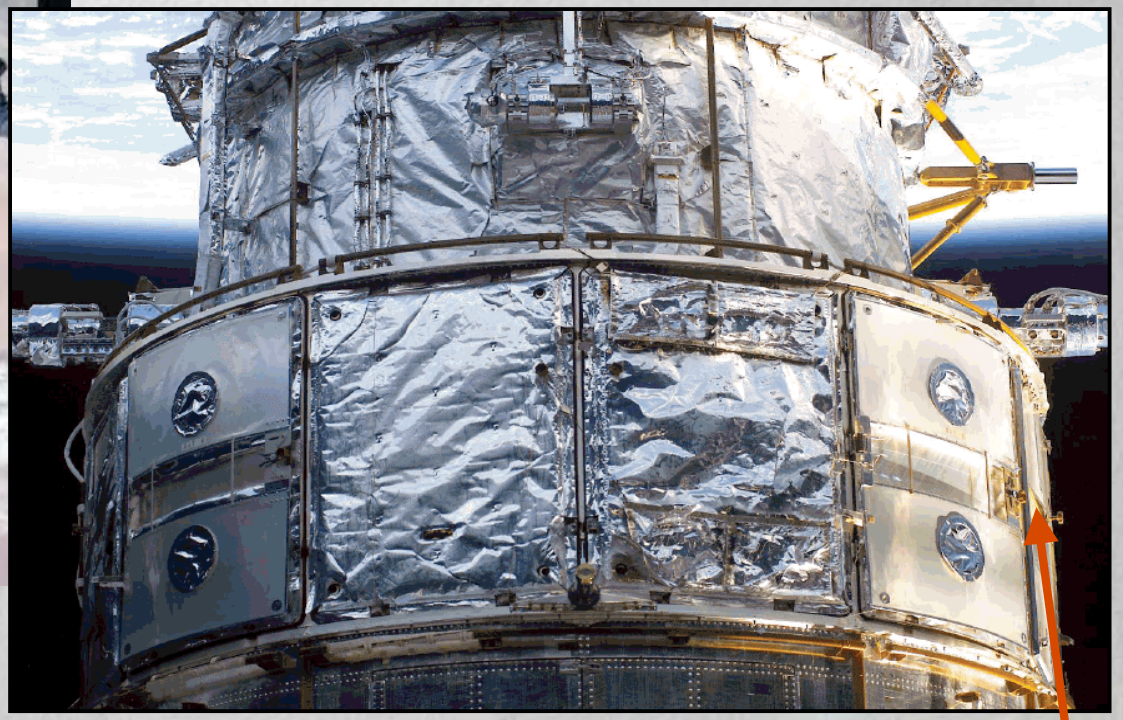
SM4 and EROs reached >1 billion readers among internet articles and newspapers

Science Instrument Control & Data Handling (SI C&DH)

- Both the NASA Standard Spacecraft Computer (NSSC-1) and the Control Unit / Science Data Formatter (CU/SDF) are part of the Science Instrument Control & Data Handling (SI C&DH) hardware.
- The SI C&DH has two redundant sides (Side A and Side B).
- Failure of SI C&DH in the fall of 2008 led to postponement of SM4.
- Spare unit installed during SM4, operating on Side B.

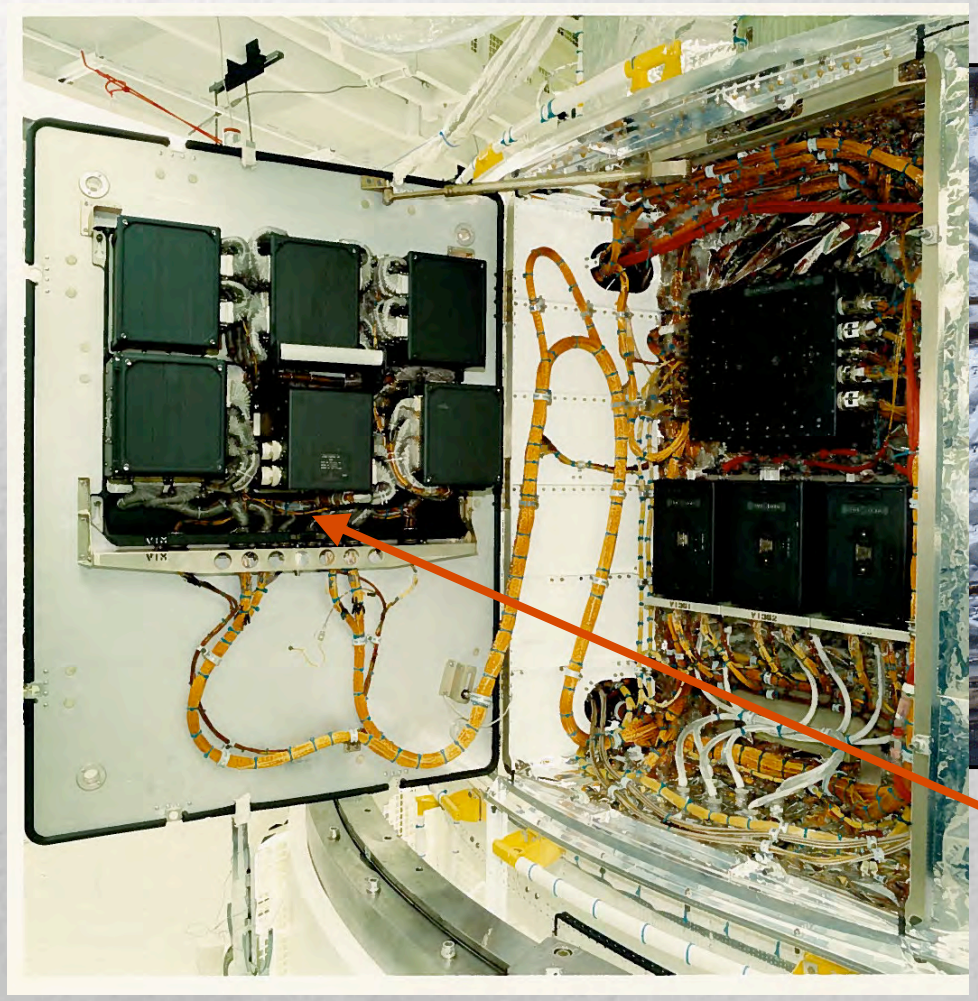


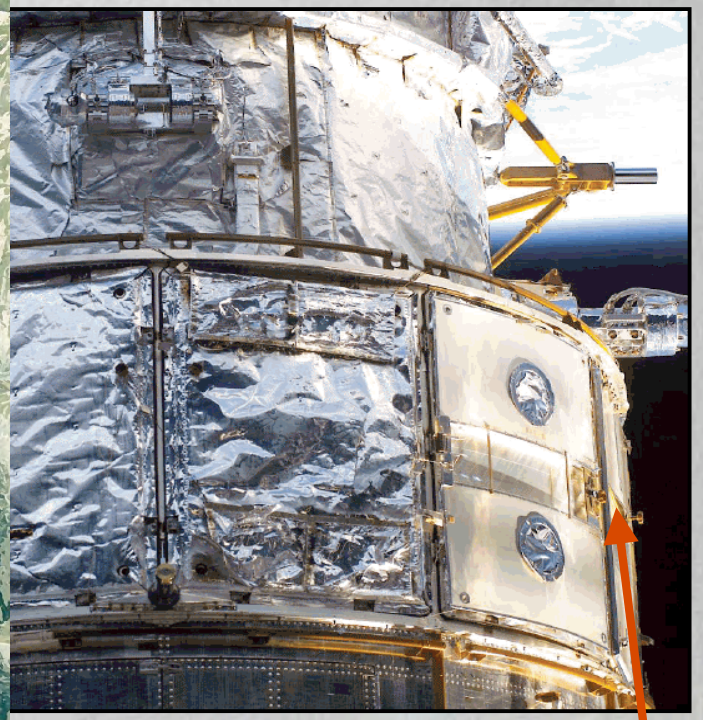
Where is the SIC&DH?



Bay 10

Where is the SIC&DH?





SI C&DH

Bay 10

SI C&DH Upsets

- On 15 June 2009, the HST spacecraft computer (HST486) commanded a safe of the payload computer (NSSC-1) after detecting a failure of the latter's keep-alive test with the CU/SDF in the SI C&DH.
  - Subsequent power-cycling of the SI C&DH cleared the problem.
  - Since similar behavior (on Side A) had been seen in tests prior to SM4, Contingency Operating Procedures were developed for quick power cycling to be able to safe the SIs and to keep interruption of science operations to a minimum.
- Similar upsets with identical signatures occurred:
  - 22 October 2009 (>40 hours interruption)
    - This event interrupted NICMOS commissioning, since the NICMOS Cooling System (NCS) also safed; currently warming up.
  - 3 November 2009 (~26 hours interruption)
- Further analysis into the root cause is difficult, but is beginning now.

Cycle 17 Long Range Plan

- Cycle 17 is now in full swing
  - Some Cycle 17 science obtained pre-SM4 with ACS/SBC and FGS when possible
  - Cycle 17 science was interwoven with SMOV to allow for early science results
- No program “favoritism”
  - Programs scheduled on an as-available basis from the Cycle 17 pool
  - Some large programs (e.g., Illingworth Treasury GO11563 and WFC3 ERS DD11359,11360) had constrained visibilities in Sep-Dec 2009 timeframe
    - Required careful planning and some programmatic decisions by the HST Mission Office

Current state of the LRP

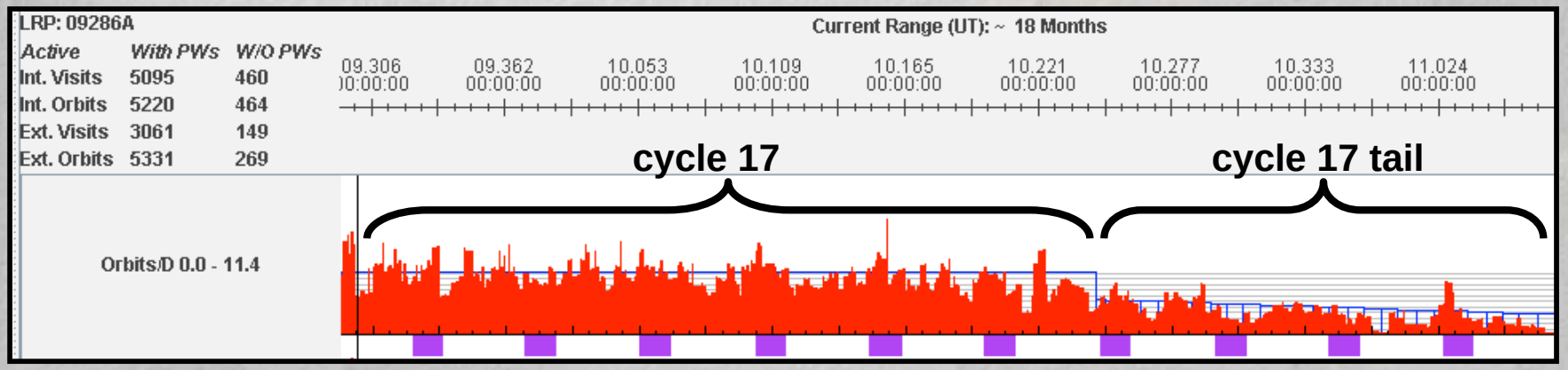
Cycle	Orbits
15/16	261
17	3582
Total	3843(1)

C16 snaps	45
C17 snaps	1263
Total snaps	1308

Instrument	Orbits
WFC3	1641
COS	1168
ACS	514
STIS	493
FGS	63
NIC	61
Total	3940(2)

Visits not in current plan	orbits
unschedulable	74
no plan windows	56
Miscellaneous (ToO, etc)	304
Total not in plan	434

1. SMOV not included in totals
2. Some programs have more than one SI prime



- Early results: weekly orbit counts are encouraging
  - LRP was built assuming 80 orbits/week (historical 3-Gyro average)

SMS week	SMOV orbits	Sci/Cal orbits	Total
Aug 31	32	63	95
Sep 7	13	76	89
Sep 14	28	63	91
Sep 21	18	70	88
Sep 28	0	78	78
Oct 5	7	79	86
Oct 12	0	78	78
Oct 19	3	83	86
Oct 26	0	89	89
Nov 2	0	80	80
Nov 9	0	83	83
Nov 16	0	83	83

northpoint

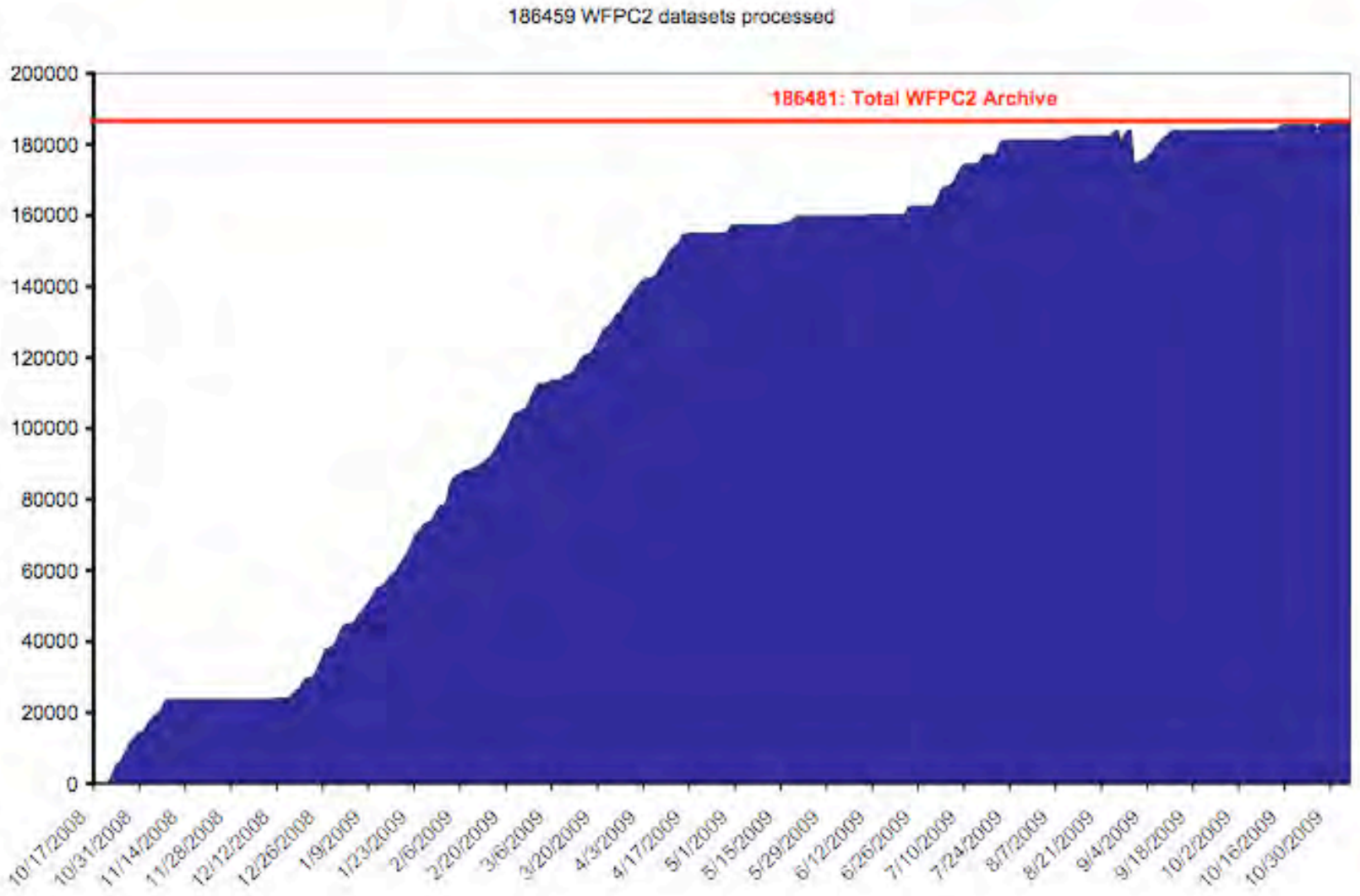
affected by SI C&DH suspends

- High subscription has allowed visits to be pulled from the tail (>Sept 1, 2010) into the current time frame
- Caution: Early-cycle subscription is always higher due to greater visit selection, availability of highly-flexible visits

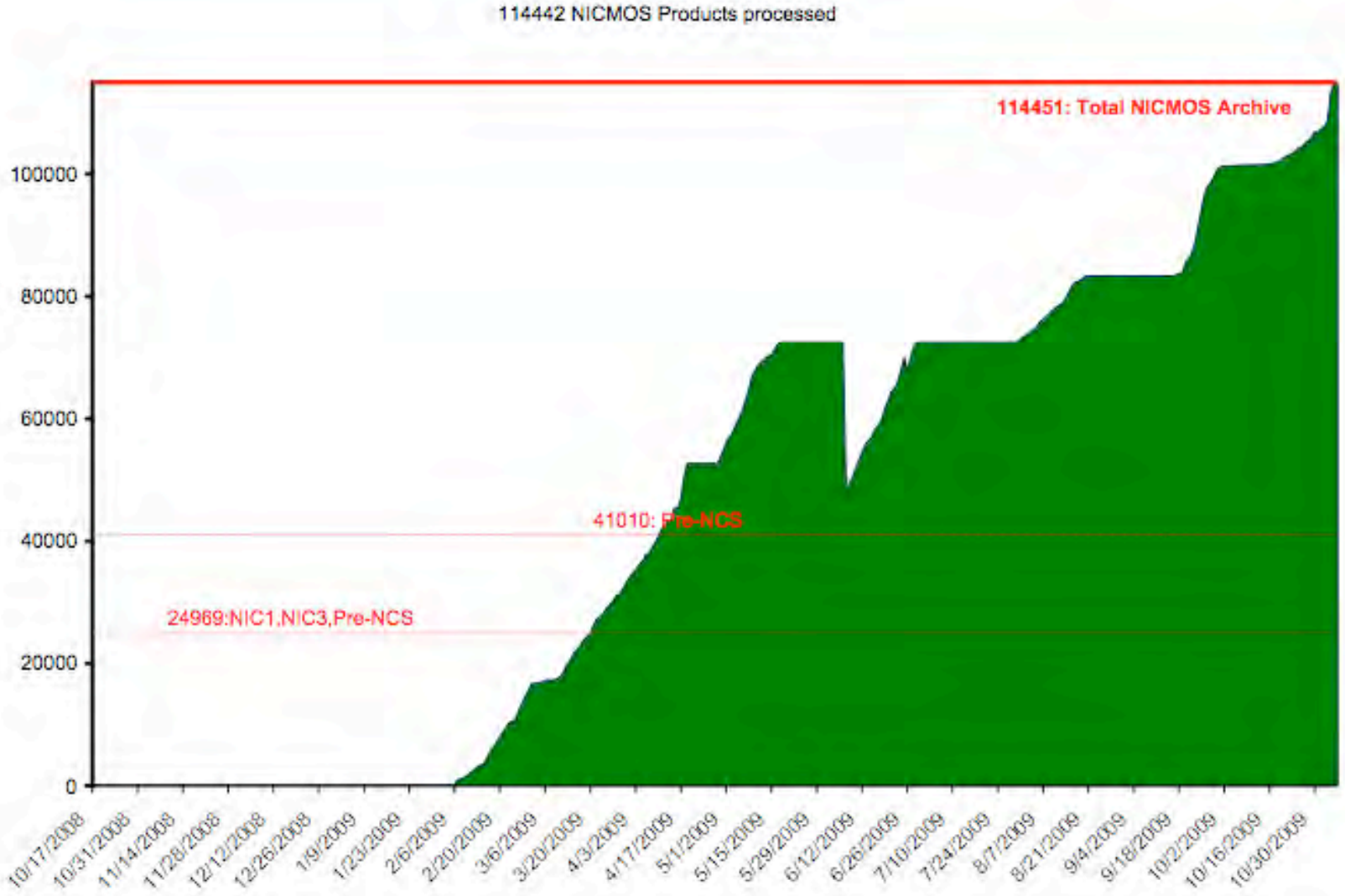
Archive Data Reprocessing

- Both WFPC2 and NICMOS reprocessing are virtually complete.
- WFPC2 status:
  - 186,481 datasets total
  - 303 datasets need reprocessing after OPUS 2009.3b is delivered
  - 366 datasets need reprocessing to populate special keyword
  - 22 datasets under investigation
- NICMOS status:
  - 114,451 datasets total
  - Only 9 datasets under investigation

WFPC2 Reprocessing



NICMOS Reprocessing



Archive Data Reprocessing

- STIS:
  - Reprocessing of pre-SM4 data was 100% complete last year
- ACS:
  - Similar efforts are being considered for pre-SM4 datasets

Cycle 18 Support

- Cycle 18 Call for Proposals (CP) to be issued on December 4, 2009
  - CP currently under review at GSFC
- Primer and all Instrument Handbooks available in draft form
  - In final review by instrument teams
  - Pending review and sign-off by HST Mission Office
  - On schedule for CP release

Exposure Time Calculators

- Problems encountered during the past 2 years indicate that significant overhaul is needed:
  - Server reliability issues
  - Difficulties with:
    - Testing
    - Installation
    - Understanding and maintaining configuration of instrument configuration
    - Making changes

Exposure Time Calculators

- Issues lead to extremely high maintenance costs and scheduling difficulties:
  - Code is complicated:
    - Many ad-hoc variations
    - Due to GUI (APT) heritage
  - Understanding code changes is difficult
  - Code base is unnecessarily large (130k LOC)
  - Code - install - test - review cycle is very lengthy

Exposure Time Calculators

- Decided to:
  - Implement only the most important changes for MCTP and Cycle 18
  - Embark on major overhaul to reduce future maintenance costs and improve reliability
    - Essentially a redesign and rewrite
    - Uses modern servers, languages and software components
    - To be available for Cycle 19
- Effort for Cycle 19 ETC is well underway

ETC 19 Progress To Date

Mode	Engine Tests		Web	
	Some	All	results	plots
COS spec	Done	Done	Done	Done
COS im	Done	Done	Done	Done
COS spec TA	Done	Done	Nov 15	Nov 15
COS im TA	Done	Done	Done	Done
COS G230L	Done	Done	Done	Done
ACS im	Done	Done	Done	Done
ACS spec	Done	Done	Done	Done
ACS ramp	Nov 15	Dec 1	Dec 8	Dec 8
ACS cor im & ramp modes	N/A	N/A	N/A	N/A
WFC3 UVIS im	Done	Done	Nov 15	Nov 15
WFC3 UVIS spec	Dec 22	Jan 22	Feb 1	Feb 8
WFC3 IR im	Dec 1	Dec 15	Jan 1	Jan 8
WFC3 IR spec	Jan 22	Feb 15	Feb 22	Mar 1
STIS spec	Jan 15	Feb 1	Feb 7	Feb 15
STIS im	Mar 1	Mar 15	Mar 22	Apr 1
STIS TA	Apr 8	Apr 15	Apr 22	Apr 22
NICMOS im	May 1	May 15	May 22	May 22
NICMOS spec	Jun 8	Jun 22	Jul 1	Jul 7