COS
Monthly Status Review
January 31, 2001
Ball

Cosmic Origins Spectrograph
Hubble Space Telescope

John Andrews
January 31, 2001

COS
Monthly Status Review

Center for Astrophysics and Space Astronomy

Agenda

Progress Summary Since Last Monthly	J. Andrews
Optics Development Status	J. Andrews
Optics Test Status	J. Andrews
UCB FUV Detector Programmatic Status	J. Andrews
UCB FUV Detector Technical Status	O. Siegmund
CU Software Activities Status	K. Brownsberger
Cal/FF Subsystem Activities at CU	J. Andrews
Calibration & Verification Test Planning	J. Andrews
Schedules	J. Andrews
Descope Report	J. Andrews
Upcoming Events/Activities	J. Andrews
CU Issues & Resolution Plan	J. Andrews
STScI Presentation	T. Keyes
Structure Test Report	Smith/Dame
BATC Presentation	P. Volmer
Financial Splinter	GSFC/Ball/CU

Progress Summary Since Last Monthly

- Received flight G160M and G225M gratings from JY.
- Continued FUV detector T-V test preparations at CU.
- Completed and integrated all flight unit DEB electronics at UCB.
- Deposited photocathode on flight detector's MCPs and completed QE testing.
- Completed flight boot and operate software.
- Completed EMI/EMC testing on flight detector.

Optics Development Status - NUV Mirrors

- All NUV optics have been or are about to be coated
  - Coating complete:
    - NCM1-A, B
    - G185M-1, 2
    - NCM2-1
    - NCM3a, b, c-1
  - Awaiting coating:
    - G225M-1, 2
    - G285M-1, 2
    - NCM2-2
    - NCM3a, b, c-2

Optics Development Status - Gratings

- Present grating delivery plan (changes since last month in red/bold):

Item	Delivery Date	Coating Dates at GSFC	Test Dates	Planned Test Location
G140L	Done	Done	Done	CU
G160M	**Done**	**Done**	**2/01-4/01**	CU
G140L-Blazed	TBD	TBD	TBD	CU
G185M	Done	**Done**	**In Process**	GSFC
G225M	**Done**	**In Process**	**2/01**	GSFC
G285M	**Done**	**In Process**	**3/01**	GSFC
G230L	**3/01**	**4/01**	**4/01**	GSFC

- CU & GSFC visited JY on 12/11/00.
  - Took delivery of 2 each G225M and G285M gratings.
  - Gave JY an award for their contributions to COS.
- G140L - blazed effort at JY is still a research project.
  - Phase 1 complete with questionable results.
  - CU is awaiting Phase 1 report form JY before making final decision on Phase 2.

COS FUV Grating Test Status

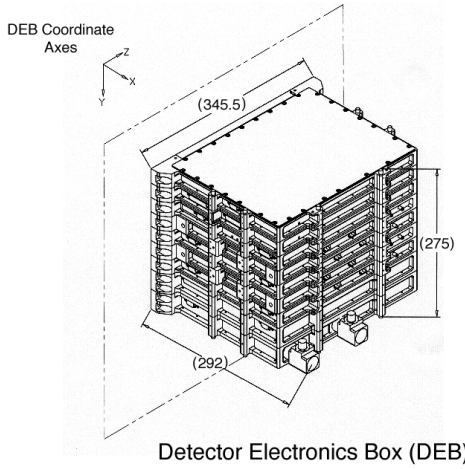
- G130M Gratings
  - Testing and data analysis have been completed for both gratings. Calibration reports have been released for both gratings.
  - Both gratings are satisfactory in all respects.
  - G130M-B appears to have slightly better performance.
- G140L Gratings
  - Testing and data analysis have been completed for both gratings.
  - G140L-B is satisfactory in all respects. G140L-C has slightly lower efficiency, but is otherwise acceptable.
- G160M Gratings
  - Expect to receive mounted grating by 2/5/01 and immediately start tests.

NUV Grating Test Status & Issues

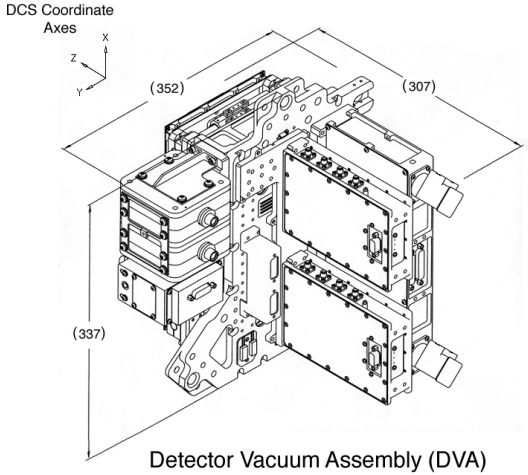
- Efficiency testing of the first G185M grating began 1/18/01.
- Initial results found an unacceptably low efficiency across the bandpass, in disagreement with measurements and predictions done by the vendor.
- GFSC personnel are conducting a series of investigations to help determine the cause of the low efficiency. Potential causes under investigation include instrumental, measurement error, contamination, and issues with the groove depth after coating.
- Currently it appears that the grating under test has NOT been contaminated.
- Measurements of n=0 off of the grating will provide crucial insight into the efficiency of the groove profile and guide further actions.
- Coating of the remaining NUV gratings (G225M & G285M) is on hold until this issue is resolved.

Overview of FUV Detector Assemblies

- **DEB -** (**D**etector **E**lectronics **B**ox)
  - **DCE** (**D**etector **C**ontrol **E**lectronics**)**)
  - **TDCs** (**T**ime-**to**-**D**igital **C**onverters)
  - **HVPS** (**H**igh **V**oltage **P**ower **S**upply)
  - **LVPC**(**L**ow **V**oltage **P**ower **C**onverter)
- **DVA -** (**D**etector **V**acuum **A**ssembly)
  - **VHA** (**V**acuum **H**ousing **A**ssembly)
    - Detector Door Mechanism
    - Ion Pump Assembly
  - **DBA** (**D**etector **B**ackplate **A**ssembly)
    - **Amplifiers**
    - **HVFM (H**igh **V**oltage **F**ilter **M**odule)



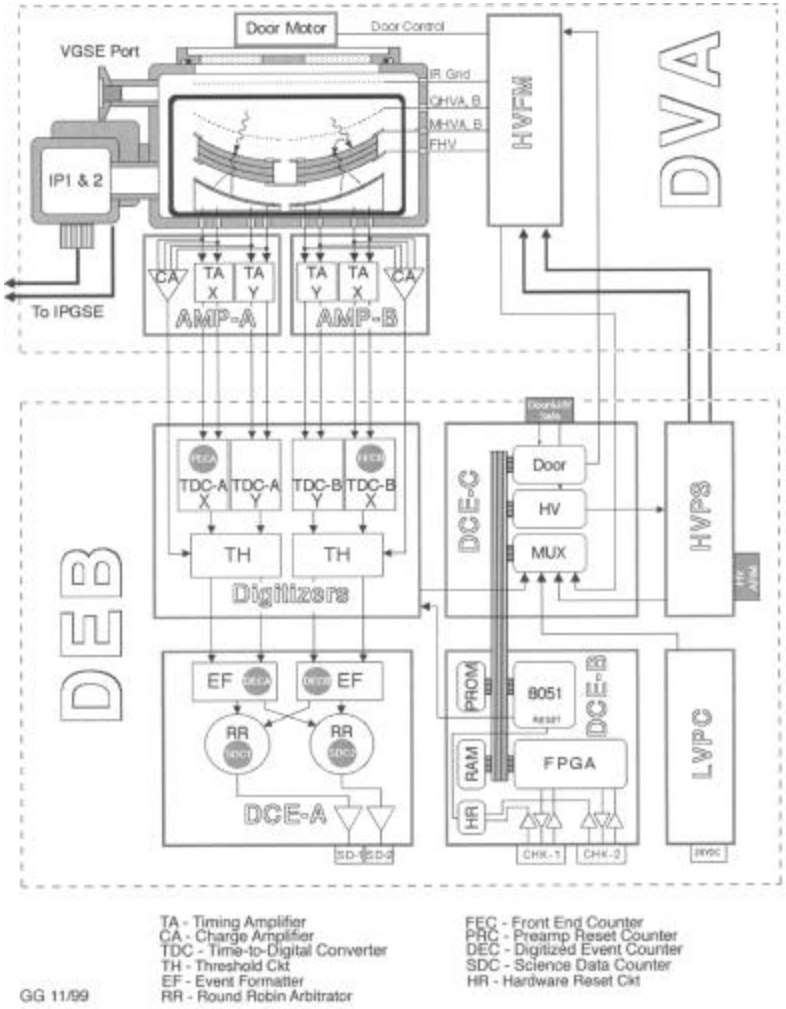
Detector Electronics Box (DEB)



Detector Vacuum Assembly (DVA)

FUV Detector Subsystem Block Diagram

- UCB is under contract to deliver 1 flight FUV detector subsystem and 1 flight-spare detector subsystem.



UCB FUV Detector Status - Electronics Summary

ACTIVITY	Electronic Board								
	Amps	HVFM	HVPS	LVPC	DCE-A	DCE-B	DCE-C	TDC-X	TDC-Y
Parts List	C	C	C	C	C	C	C	C	C
Schematic	C	C	C	C	C	C	C	C	C
Parts Stress Analysis	C	NA	NA	NA	NA	C	C	C	C
Worst Case Analysis	NA	NA	NA	C	NA	C	C	C	C
Board Thermal Analysis	C	**NS**	**NS**	**NS**	C	C	C	C	C
Release Layout	C	C	C	C	C	C	C	C	C
Board Fabrication	C	C	C	C	C	C	C	C	C
Kit Parts	C	C	C	C	C	C	C	C	C
Board Coupon Testing	C	C	C	C	C	C	C	C	C
Stuff Boards	C	C	C	C	C	C	C	C	C
Board Workmanship Acceptance	C	C	C	C	C	C	C	C	C
Board Engineering Acceptance	C	C	C	C	C	C	C	C	C
Engineering Test & Acceptance	C	C	C	C	C	C	C	C	C
Temperature Cycle Test	C	C	C	C	C	C	C	C	C
Voltage Margin Test	C	NA	NA	NA	C	C	C	C	C
Final Acceptance Test	C	C	C	C	C	C	C	C	C
Staked/Conformal Coated	C	C	C	C	**C**	**C**	**C**	**C**	**C**
Legend	*C = Complete*		*NA = Not Applicable*		*S = Started*		*NS= not started*		

Changes since last MSR in red/bold

UCB FUV Detector Status - Systems

- Documentation Update:
  - No changes to report this month
- Mass and Power Updates (changes in red/bold):

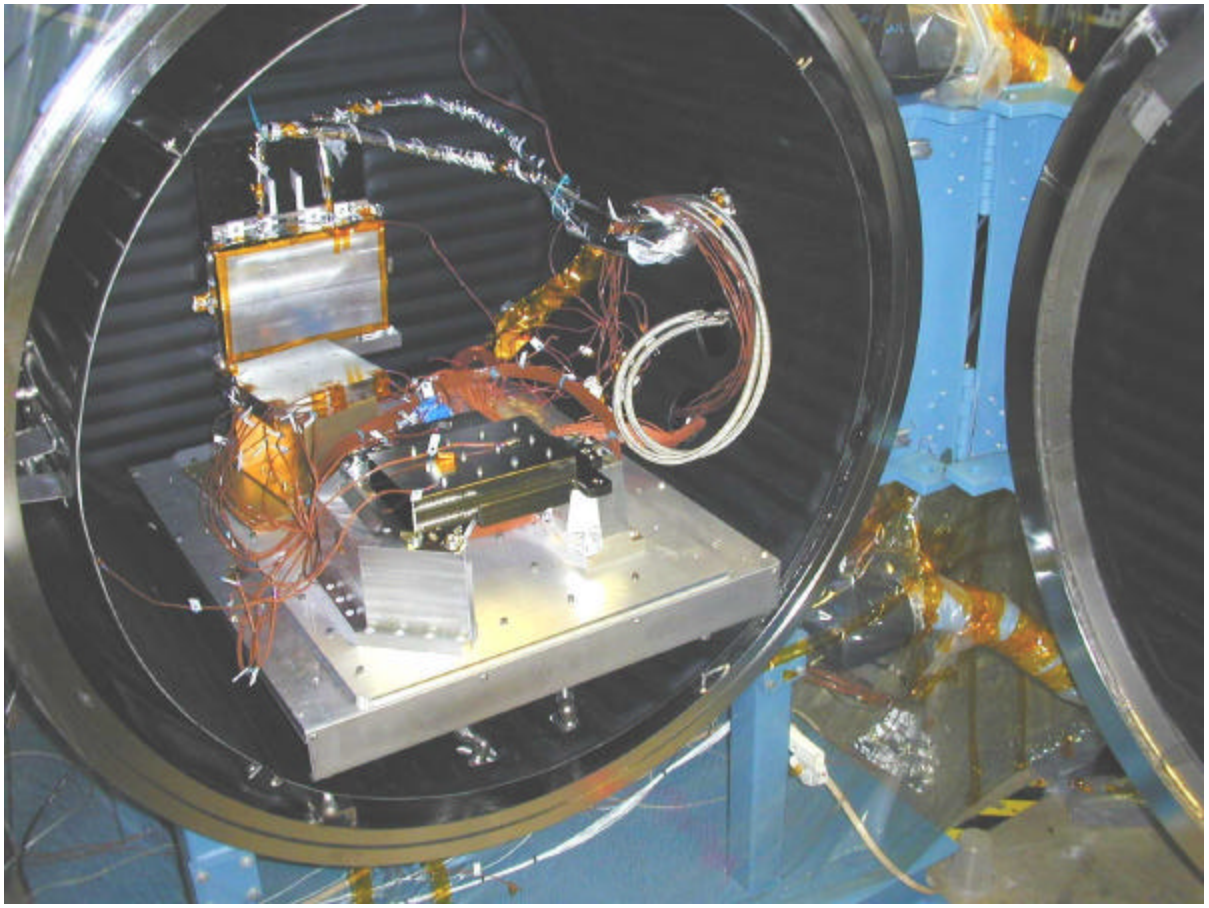
	Mass (Kg)			Power (W)		
	Actuals	SoR Allocation (1)	Margin	Actuals	SoR Allocation (1)	Margin
DVA	**20.43**	21.5	**5%**	4.59	-	-
DEB	**14.44**	15.3	**5.6%**	47.42	-	-
Harness (est.)	2.7	3.4	20.5%	-	-	-
Total	**37.57**	40.2	**6.5%**	52.01	53.0	**1.73%**

Notes: (1) SoR Revision B allocations

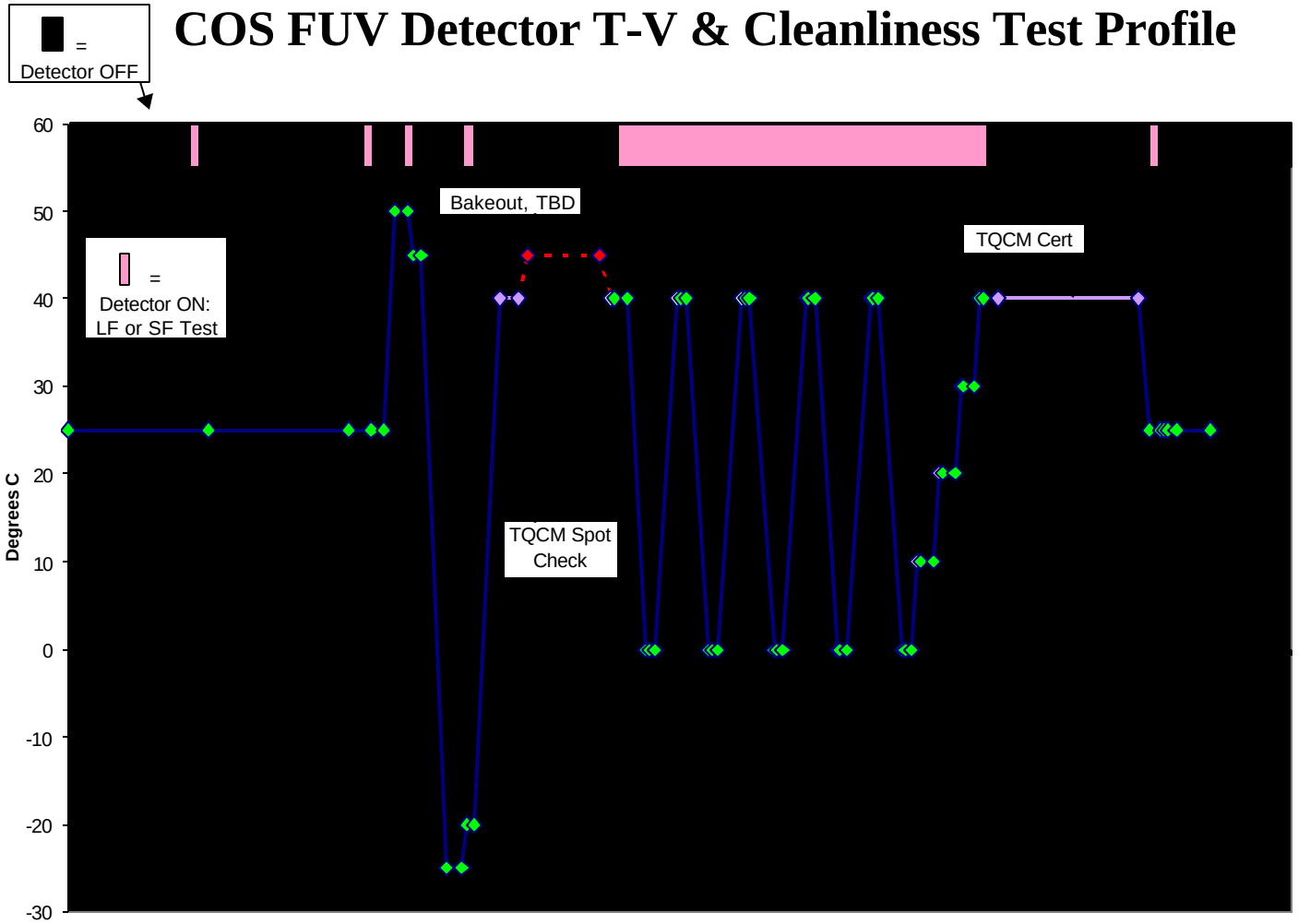
- Latest UCB masss & power numbers are actuals measured on the flight system. The numbers come from Revision D of the UCB Mass & Power Budget Report (UCB-COS-RPT-1015, UCB-COS-RPT-1004).

UCB FUV Detector Status - Thermal-Vac Test Preparation

- Thermal-vacuum testing of the flight FUV detector has been baselined to occur at CU.
- CU is working with UCB to define and develop test cabling and UV light source.
- Per GSFC's request (PER RFA no. 12) a test readiness review will be held.
  - Today a facility walk-through.
  - Mid-February a procedure review.



COS FUV Detector T-V & Cleanliness Test Profile



UCB FUV Detector Status - Schedule Overview

October Tracking Milestones	**Status**
DBA/DEB system characterization started	Complete

November Tracking Milestones	**Status**
Complete Flight Detector Photocathode deposition & QE test	Completed 1/01
Complete DBA/DEB system characterization	Complete
Complete staking and conformal coating of all DEB No. 1 PWAS	Completed 12/00

December/January Tracking Milestones	**Status**
FUV #1 system vibration test	Slipped to 2/1/01 start
FUV #1 EMI/EMC test	Complete

February Tracking Milestones	**Status**
MCP Scrub	
Start T-V Tests at CU	

Forecast flight system delivery to Ball:

This month = 3/30/01

Last month = 3/22/01

Latest Detector Delivery Plan

- Because of schedule delays introduced by the added optics bench testing and Ras/Cal's availability, the need for a surrogate detector and the need date for the flight detector have changed. In order to streamline activities at UCB the following changes are being made:
  - We have dropped the plan to deliver the surrogate detector to Ball prior to delivery of the flight detector.
  - Delivery of flight detector to Ball anticipated 3/30/01.
  - UCB has been instructed to proceed with completion of spare detector system and not to deliver a surrogate detector to Ball.
  - At present, spare detector delivery is scheduled for mid June 01.

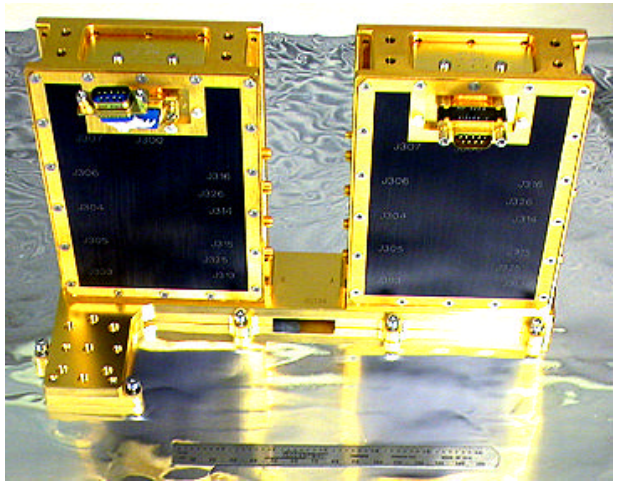
UCB FUV Detector Status -Accomplishments

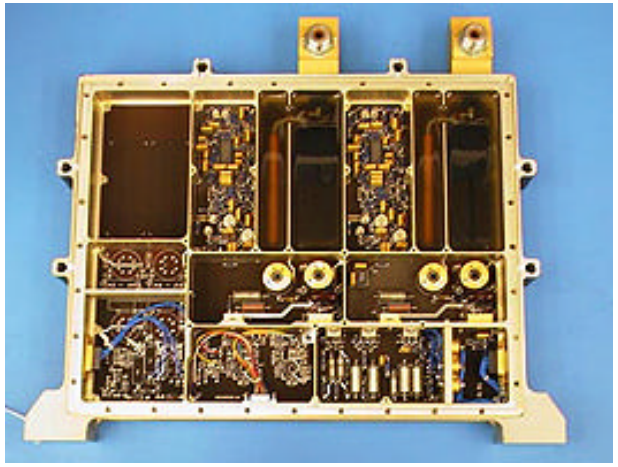
- Tested flat field & flat stability with flight electronics
- Measured system livetime vs rate with flight electronics
- Coated cathodes (CsI) onto flight detector
- QE vs wavelength, angle, and position,
- Functional test of coated flight BBA, including background.
- Performed vacuum deflection tests on DBA/DVA.
- Successfully completed flight detector EMI/EMC test
- Review of preparations for thermal vacuum later today.
- Flight spare system being configured for full flight processing since the system is now not required at Ball in Feb-01

UCB FUV Detector Status - Electronics

- Power systems (HVPS, LVPC, HVFM)
  - All coated, staked, vac baked & certified.
- Amplifiers
  - All 4 amps tested, coated & staked, vac baked and certified.
- Flight Harnesses
  - 2 sets complete, vac baked & certified.
  - Wrapping completed this week

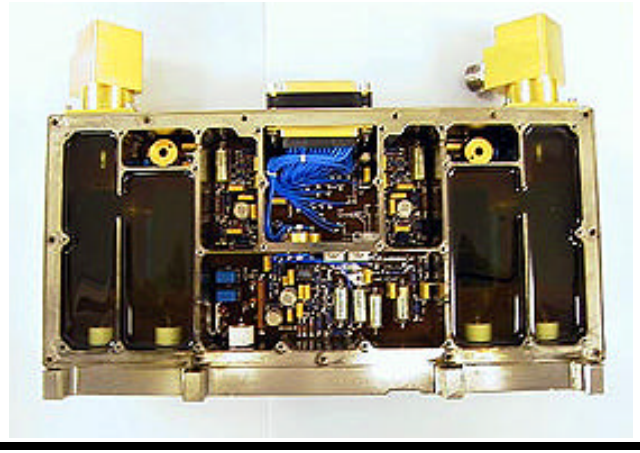
Amplifiers





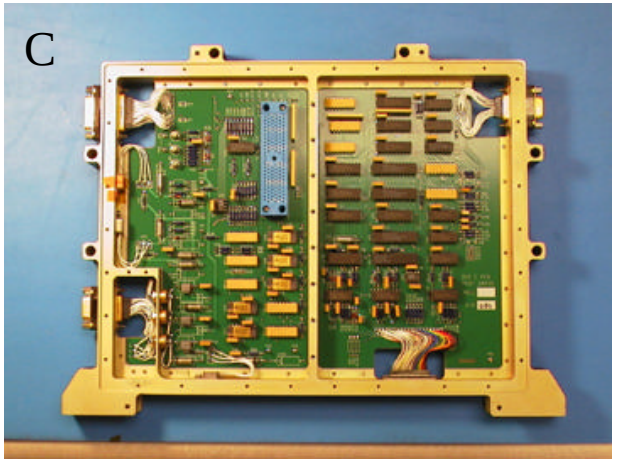
HVPS

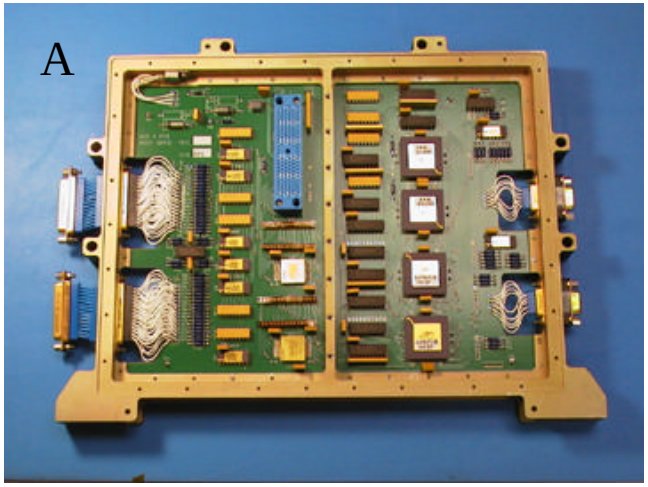
HVFM

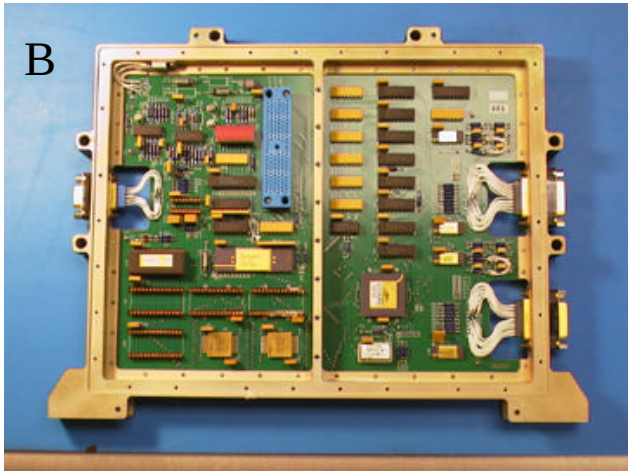


UCB FUV Detector Status - Electronics ctd

- DCE - A,B,C, 2 sets, in house
  - Voltage & frequency margins done, thermal soak & cycle tested, POR tests done
  - Flight set , coated, staked, vac baked & certified.
  - #1 DCE has 950+ Hrs burn-in and #2 DCE has 850+ hours.
  - Final PROMS/new boot code due Jan 29

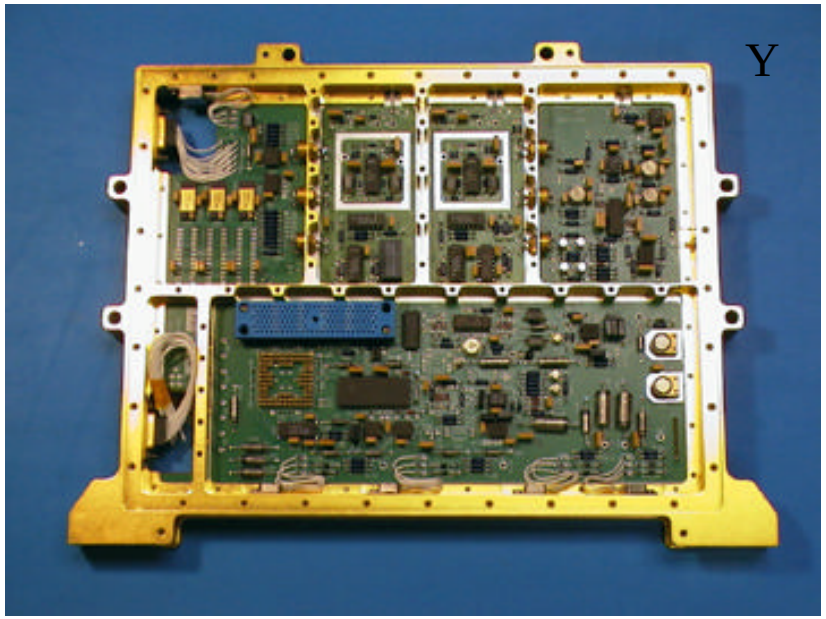


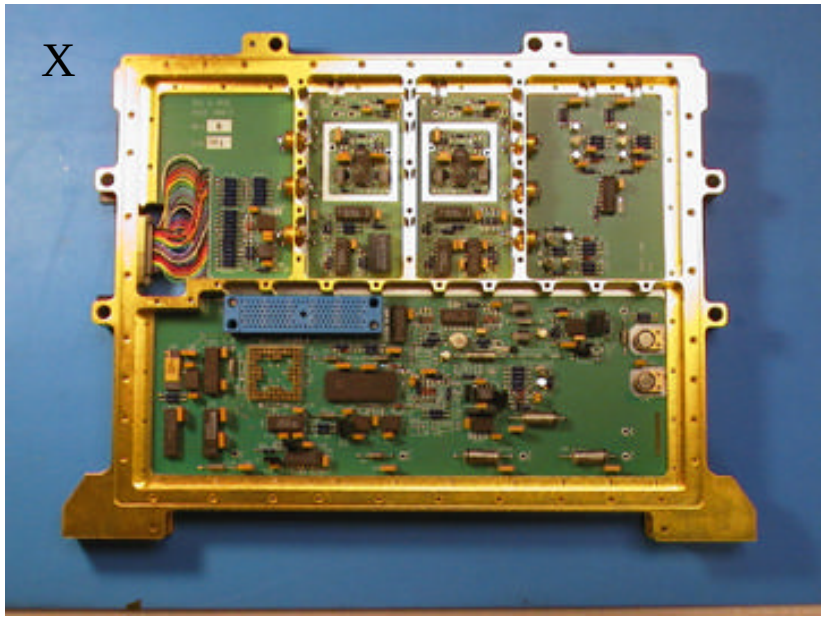




UCB FUV Detector Status - Electronics ctd

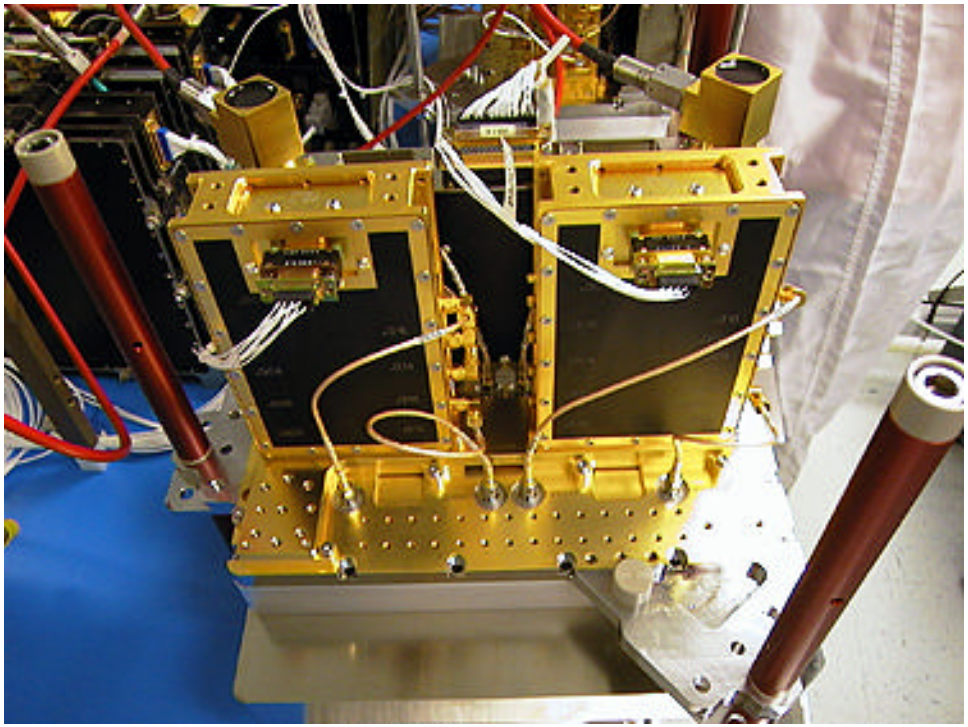
- 4 X and 4 Y flight TDC's fully functional
  - Voltage margin & frequency margin tests done
  - Thermal cycle and acceptance tests done.
  - Flight sets coated & staked, vac baked and certified, heat sinks added.





UCB FUV Detector Test Status

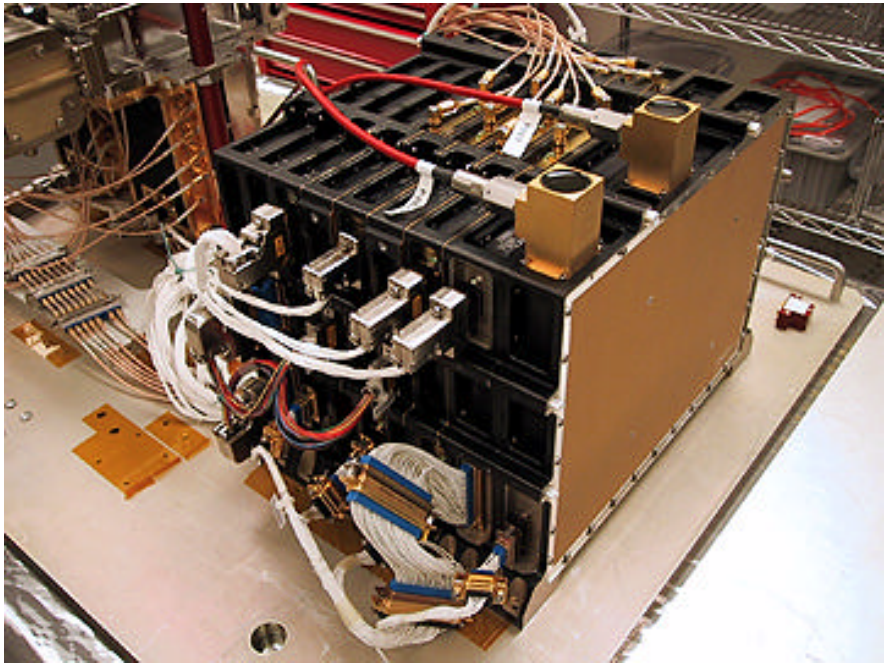
- FUV02 Flight spare final metrology done. About to do tests with completed DEB for verification prior to cathode coating.
- FUV01 Flight detector & flight DEB being re-integrated and functionally tested prior to the vibration test this week.



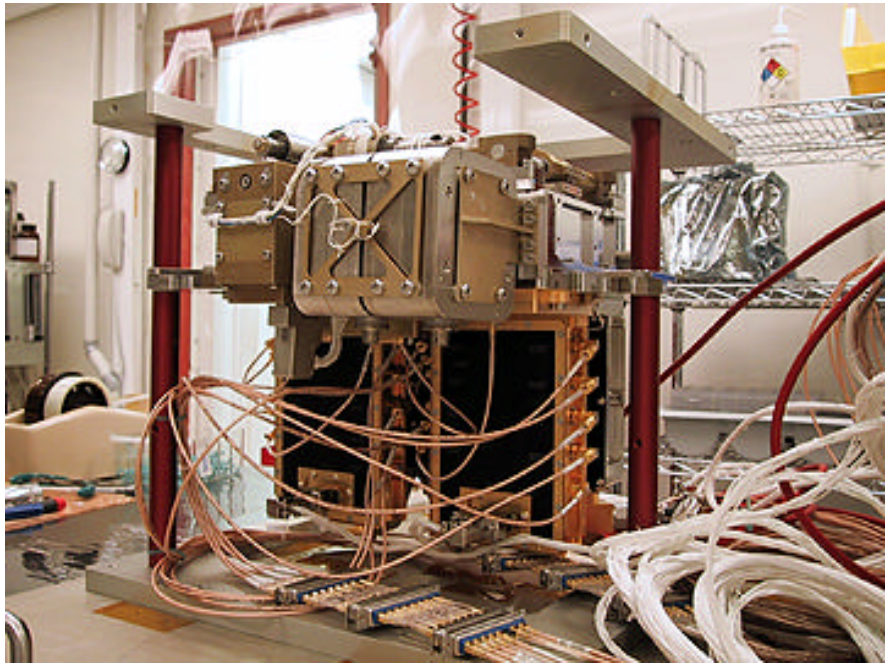
FUV02

COS FUV01 Detector System

- Detector DEB

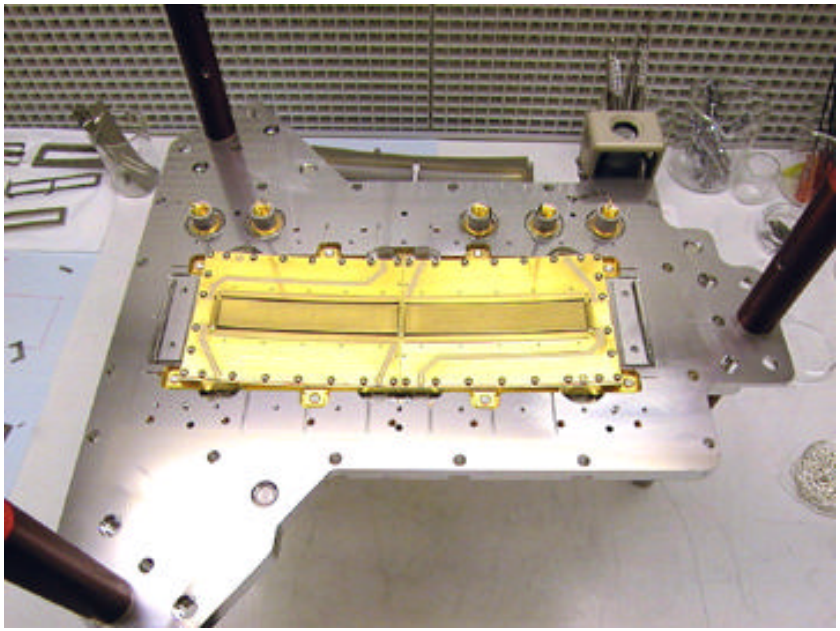


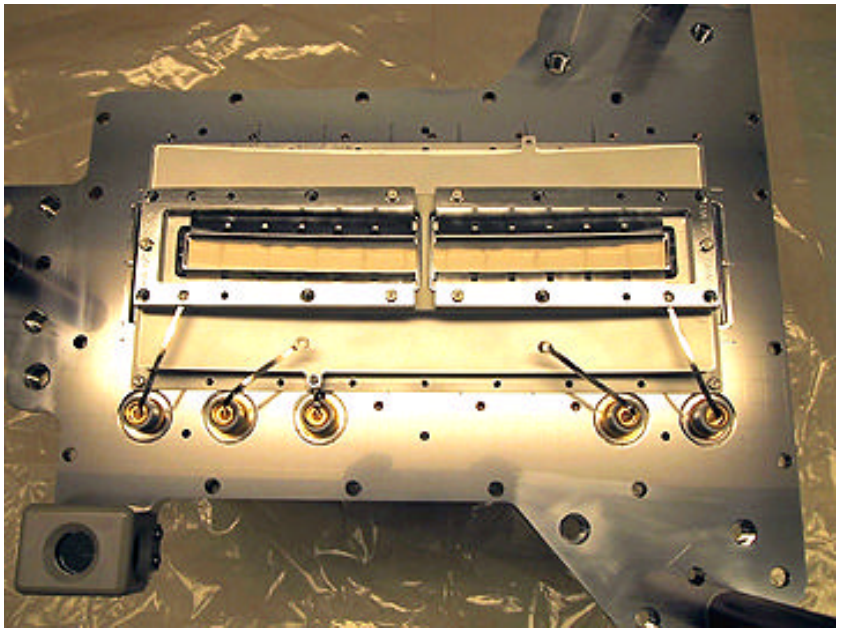
- Detector Head



- Note: MEB- DEB ETU tests ongoing @ Ball

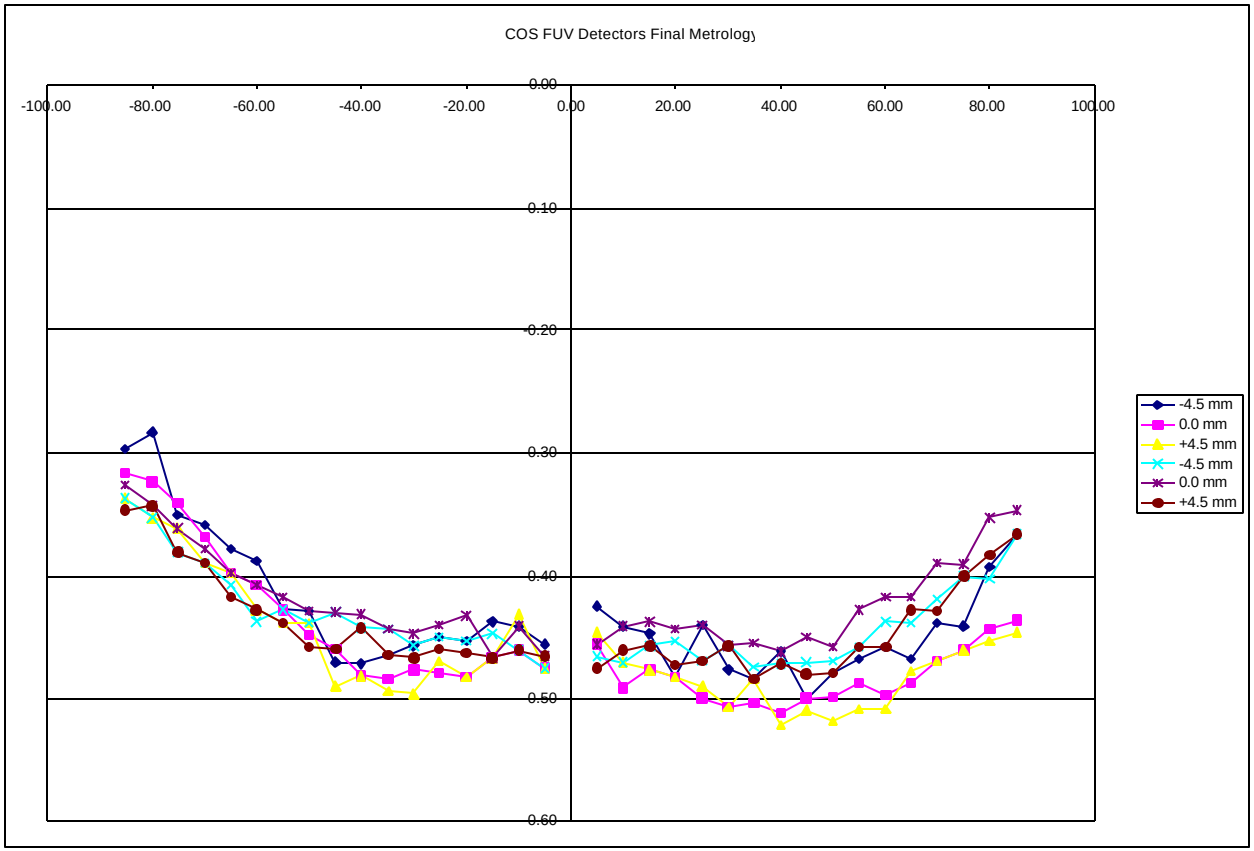
UCB FUV Detector Status - Metrology





- FUV#01 and #2 initial and final metrology done
- About 0.4mm displacement from ideal, also curved displacement
- FUV#02 about 17µm different than FUV#01 after shimming

Final FUV01 & FUV02 displacements from ideal surface

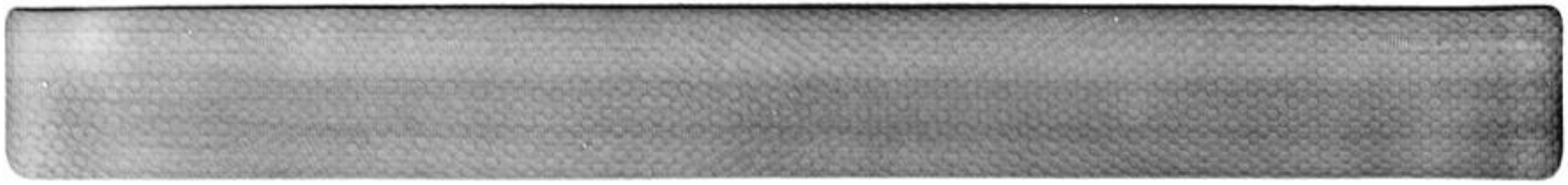


FUV Detector Test Status

- UCB FUV Detector Status - Pre-Environmental Review
- 16 RFA's in process of being closed out [12 written up, 4 in process]
- No Mission-critical items identified

- Performed vacuum deflection tests on DBA/DVA
  - 36 arcsec in one axis, 14 arcsec in the other
  - Calculated defocus is ~12 microns which is a factor of 10 better than the insertion tolerance

Flight BBA#1 MCP Stack Fixed Pattern Noise
Pre Cathode coat data on flight electronics

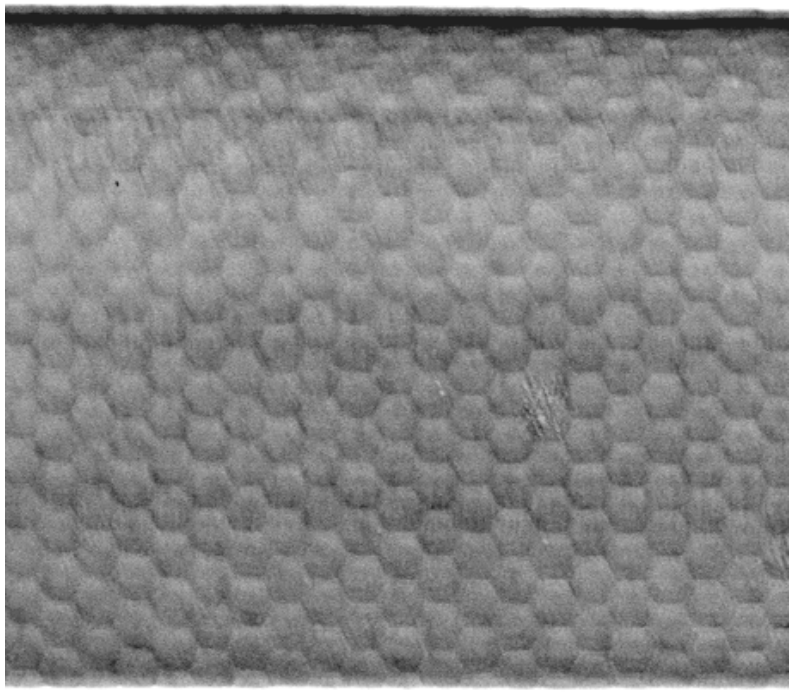


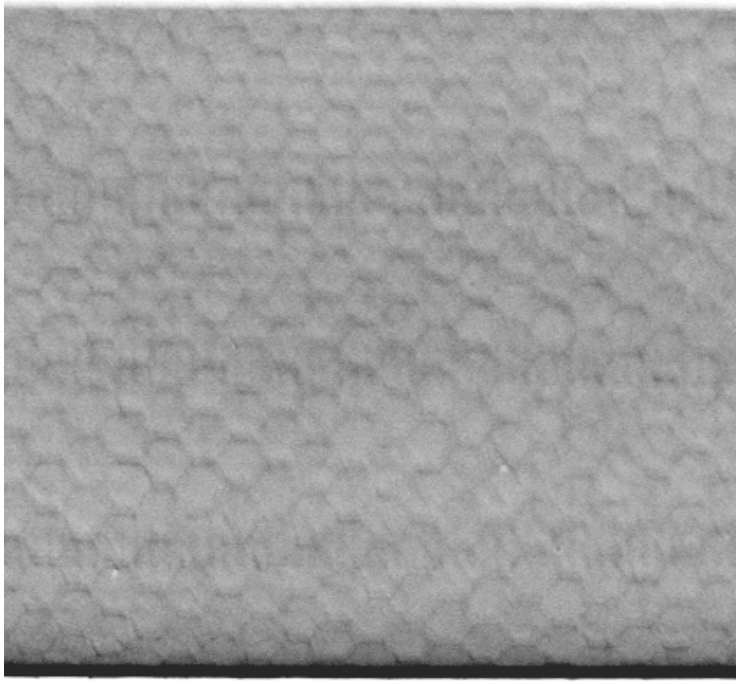
Segment A

Segment B

- Multifiber modulation dominates
- 10^9 counts in image at about 50kHz

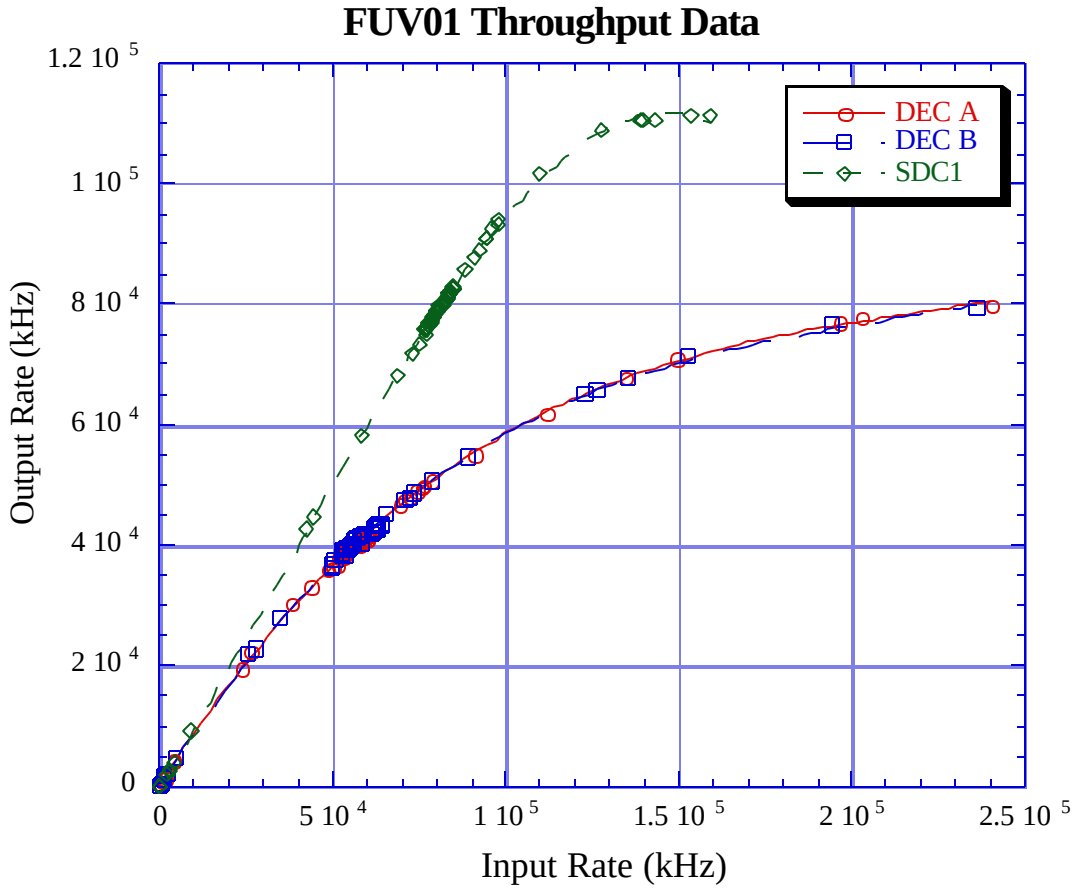
Flight BBA#1 MCP Stack Fixed Pattern Noise



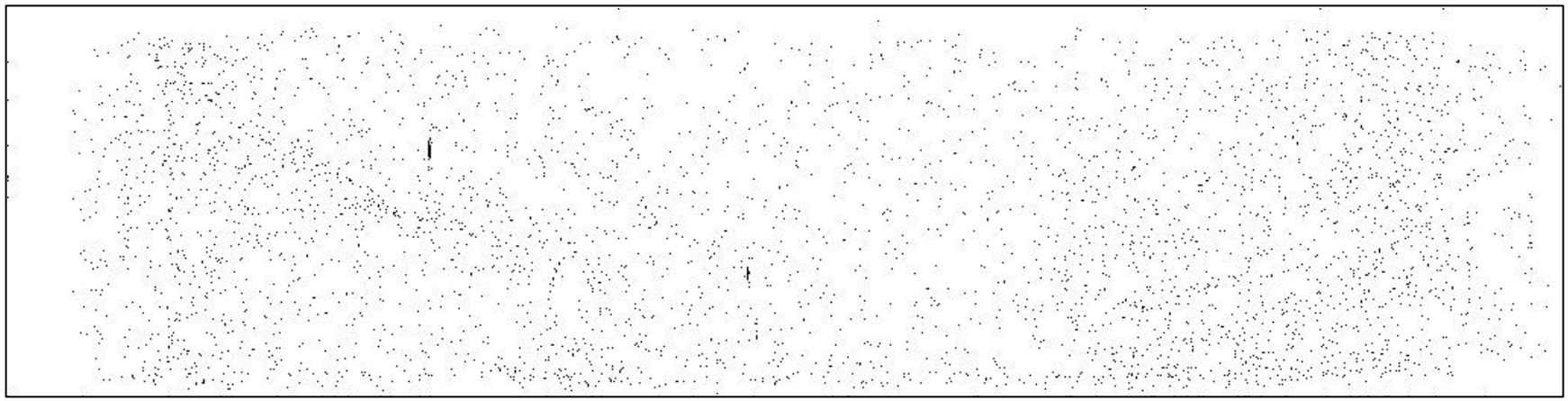


- Segment A Segment B
- Flat field stability tests done with 10°C delta on DVA and 5°C on TDC's, results being examined by CU.

Flight system livetime throughput measurements on FUV01

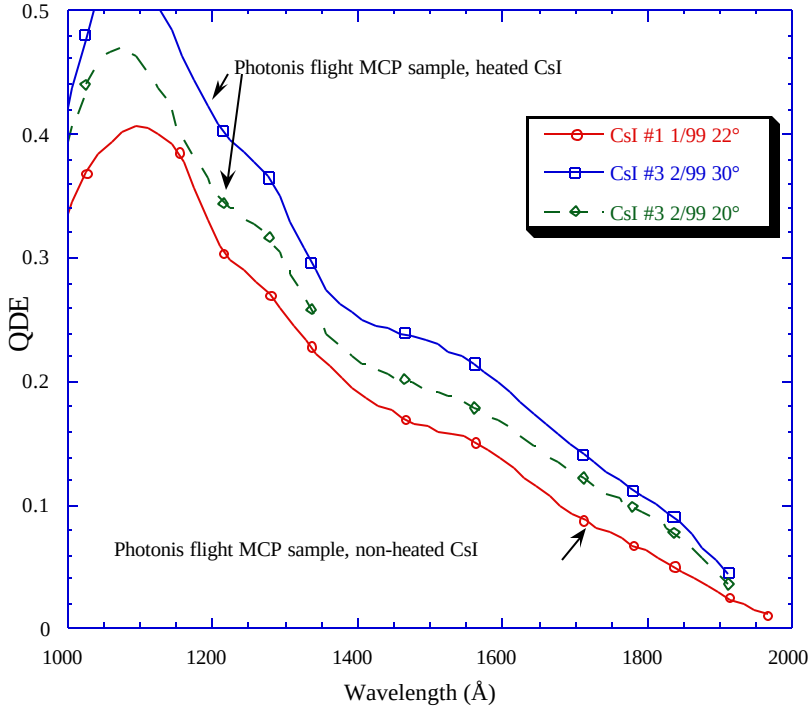


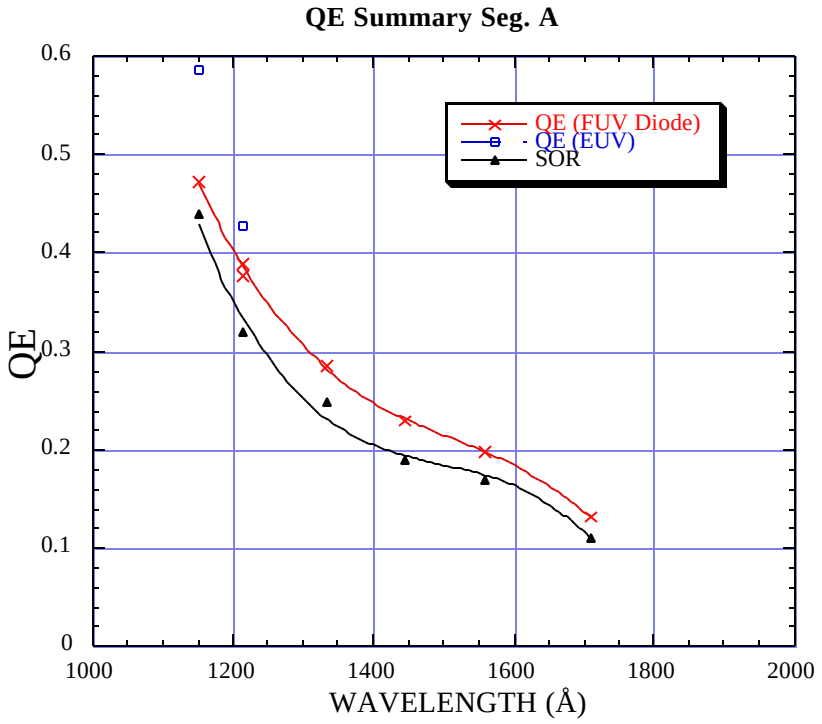
Background image after cathode coating on segment A:- two low level hotspots, background dominated by tank ions (no ion rejection grid present). Segment B has no hotspots.



FUV01 background image for segment A

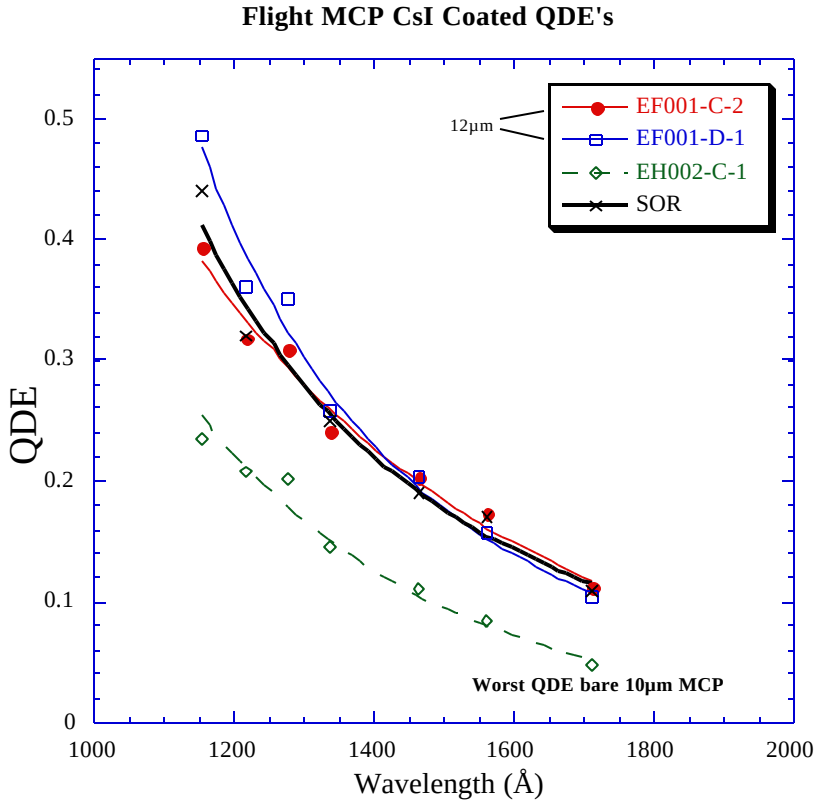
Flight Detector Segment A QE compared with MCP samples

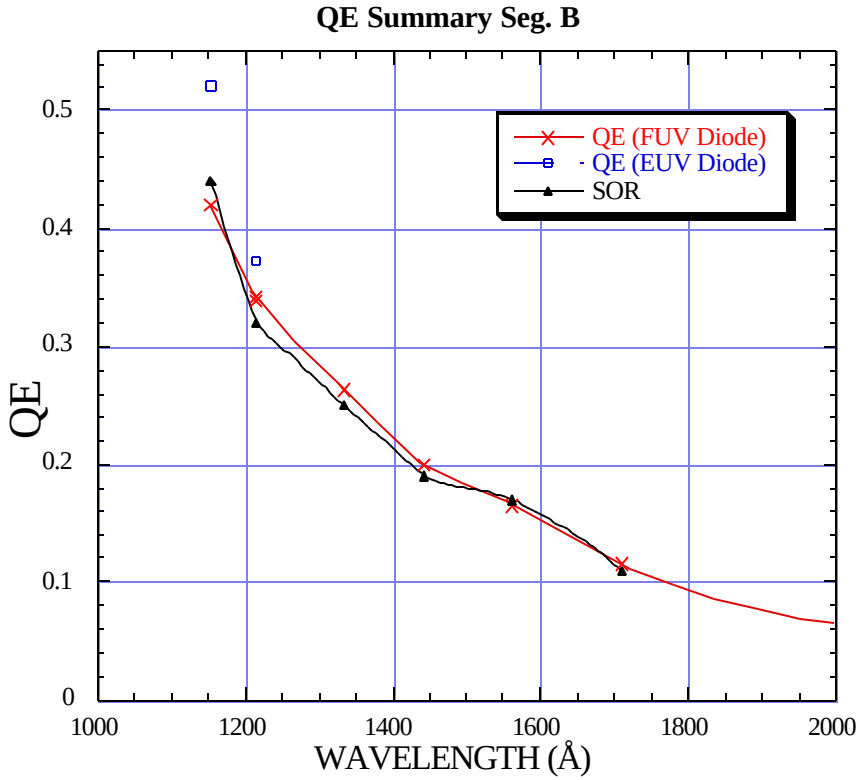




- QE varies by less than 3.6% relative, for ±6° angular variation

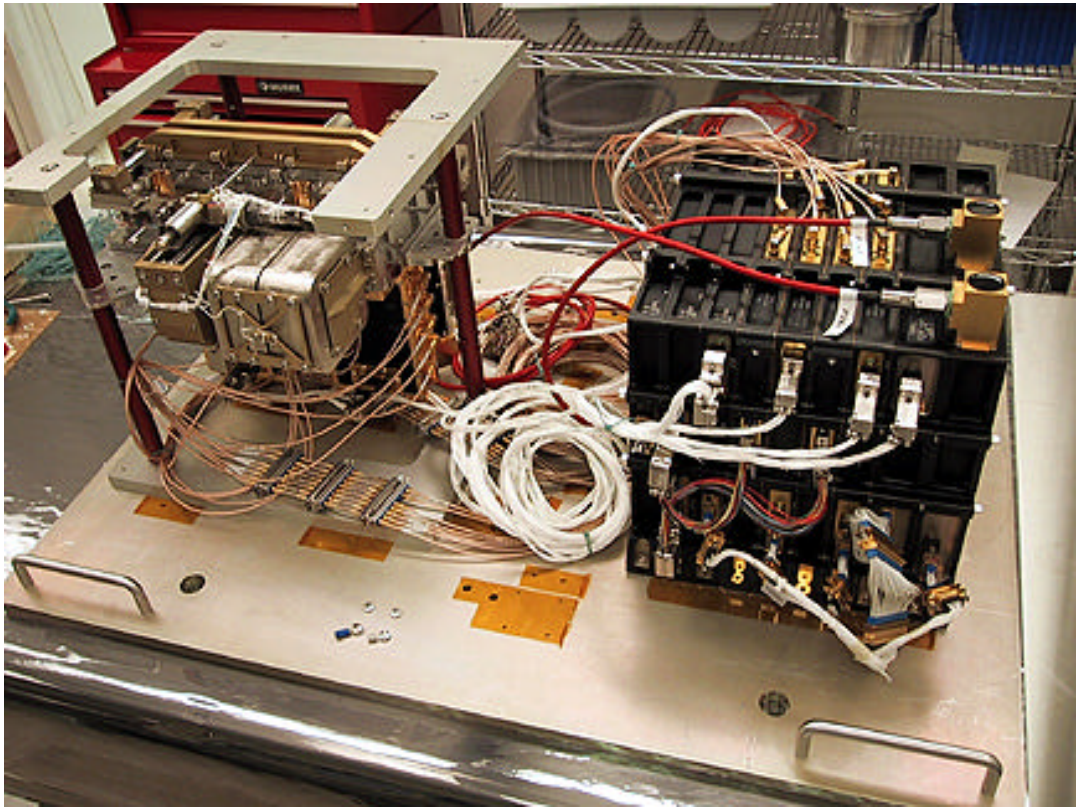
Flight Detector Segment B QE compared to previous CsI





- QE uniformity is better than 10% over the detector area

Flight FUV Detector System Prior to EMI/EMC Test



Flight Detector FUV01 EMI/EMC TEST

FLIGHT DETECTOR SYSTEM (DVA + DEB) EMI/EMC TESTING PERFORMED AT EMCE Engineering (Fremont) 1/18 - 1/19

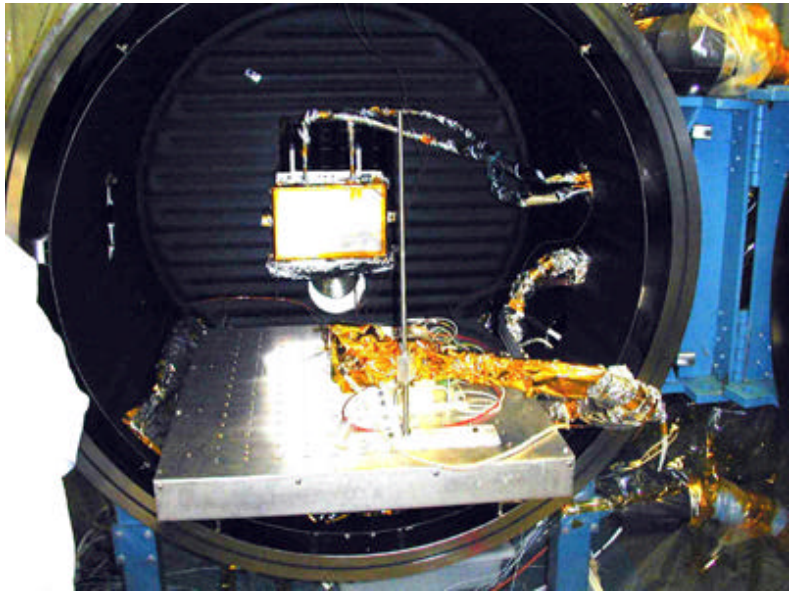
- Flight MCPs removed, stims pulsed through flight anode, HV ON
- LISN circuit complies with BATC design for HST project
- Data recorded through COS detector EGSE
- Attended by 3 UCB personnel with oversight from Design Net Engineering and Dale Phelps (HST QA)

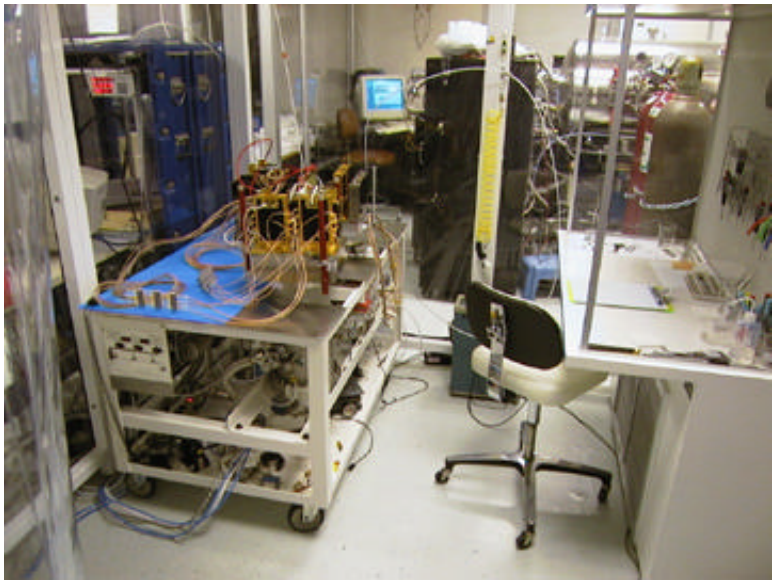
CONDUCTED EMISSION (CE01, CE03, CE07) and CONDUCTED SUSCEPTIBILITY (CS01, CS02, CS06) TESTS ALL COMPLETED SUCCESSFULLY

- Test reports (conducted emission results from EMCE, susceptibility results from UCB) ready very soon
- Radiated emissions & susceptibility to be performed at the COS Instrument level

UCB FUV Detector Status - Facilities

- FUV detector system TV will be done in Colorado tank. TV procedures and plans being reviewed later today.





Detector system test cleanroom

- Detector test tank facility in clean tent accommodates two full COS detector systems, currently FUV02 flight detector tests

CU Software/Operations Effort
GSE Software Development

COS Science Data Index and Analysis Software - a.k.a. "CEDAR"

Website gives full details for CEDAR: http://cos-arl.colorado.edu/CEDAR/

- CEDAR Build III development near completion. Final versions of the Science Header Keywords will be the last piece necessary for the 'complete' FITS file generator portion of the software.
- Two new 'FSW' analysis tools to be added to CEDAR – based on needs uncovered during MEB-DEC "OPERATE" Interface Testing. Both tools are for quick-look inspection of DCE Memory Dump data: New Tool #1: PHA "Exposure" Data, and Tool #2: FUV "current monitor" buffer and histogram data areas. Both tools will take less than 1-week development time – and will aid in FSW component testing, and in possible anomaly investigation during instrument I&T.
- The CEDAR lead developer, Stéphane Béland, is currently working on both CEDAR and on the CALCOS-GSE software effort. During the month of March, he will be supporting FUV Detector Thermal-Vac at CU.

CU Software/Operations Efforts

COS Science Data "Ground Support" Calibration Software - a.k.a. "CALCOS-GSE"

Website (to be developed) will give full details of CALCOS-GSE efforts:

http://cos-arl.colorado.edu/CALCOS/

- AV-03 algorithms being verified for feasibility, accuracy and "programmability" by Penton and Béland.
- CALCOS-GSE Development Plan - prepared by Béland – is in draft form.
- Changes to the COS Instrument I&T schedule, simplifications to calibration algorithms in AV-03, and increased support needs for ongoing TAACOS simulations and the upcoming FUV Detector Thermal-Vac testing at CU – have resulted in a modified CALCOS-GSE development profile. In short, full-scale startup of CALCOS-GSE development will be slipped to April – with NO anticipated impact on it's availability for Instrument Thermal-Vac.

CU Software/Operations Efforts

COS Target Acquisition Simulation Software - a.k.a. "TAACOS"

Website gives full details for TAACOS: http://cos-arl.colorado.edu/TAACOS/

TA-1 Imaging Target Acquisition – Explanation and History

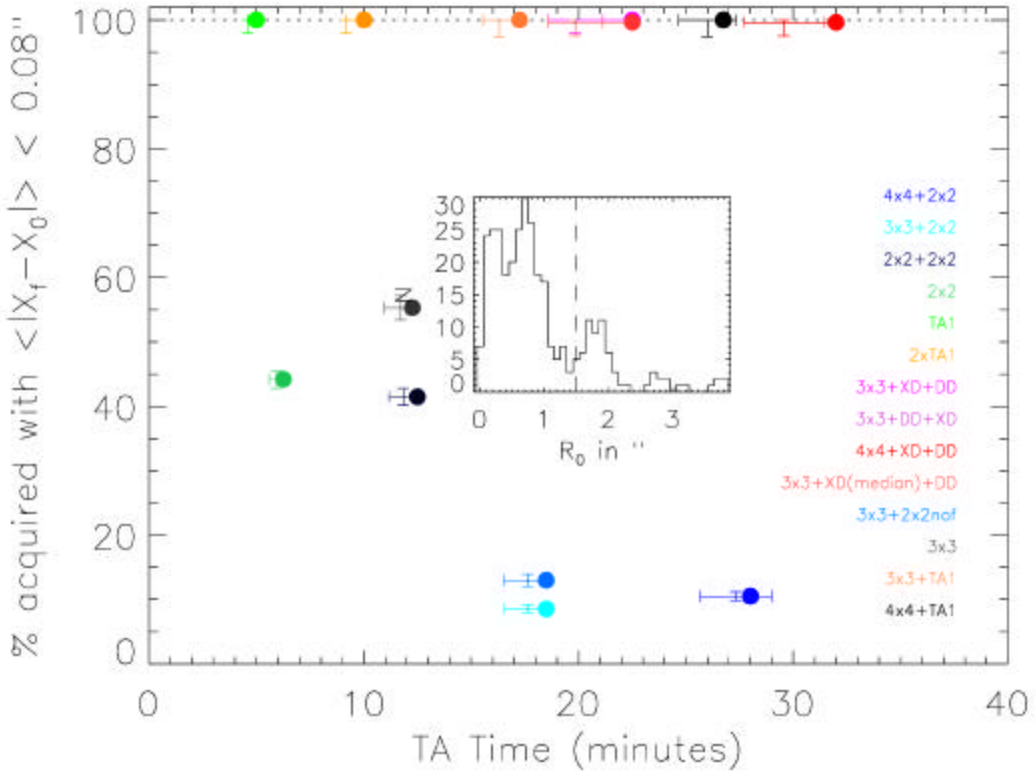
Background:

In an effort to maximize the HST Science/Dollar Ratio – attempts have been made to see how we can reduce the time needed for Target Acquisition, yet maintain the high degree of precision required to place a target in the aperture, which impacts both the S/N and wavelength accuracy of an observation.

Original use of the TA1 mirror on the NUV channel was envisioned so that a user could take a 'snapshot' of their target – to allow them to precisely compute the position of the target in the aperture, so that they could determine wavelength accuracy to the values documented in the CEI specification.

However, it has been found through detailed TAACOS simulations, that performing Target Acquisition with the TA1 mirror, in a fashion similar to a TA mode used on STIS, that highly accurate Target Acquisitions on faint targets can be achieved in significantly less time than using the existing techniques planned for COS. This would dramatically increase the time available for Science Exposures with COS.

CU Software/Operations Efforts



CU Software/Operations Efforts

TA-1 Imaging Target Acquisition – Explanation and History (cont.)

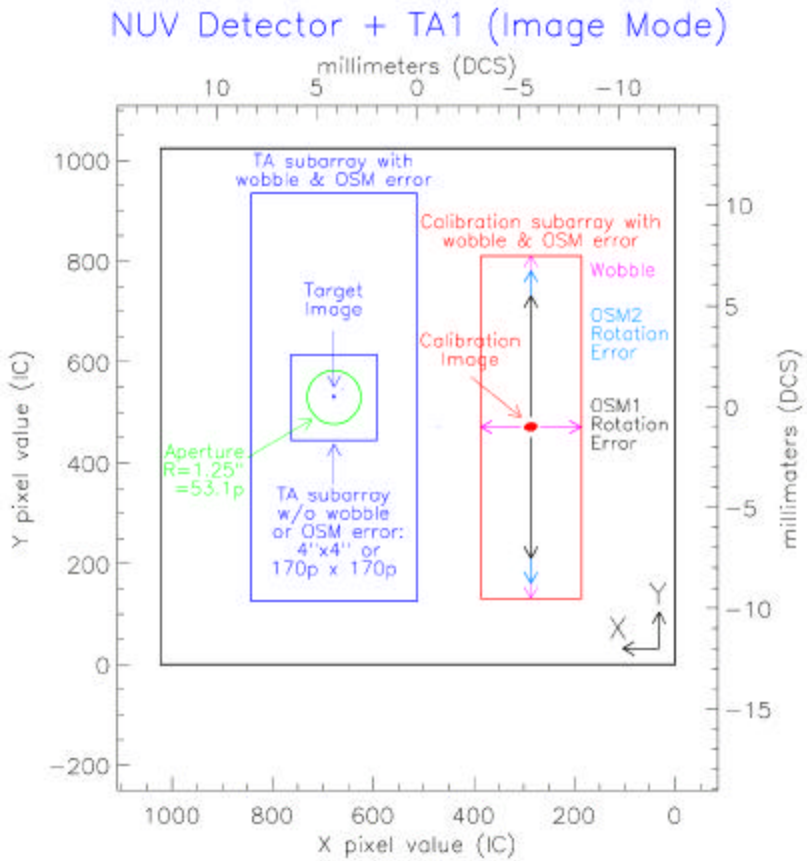
With the anticipated accuracy of both target coordinates (with GSC II) and HST pointing – it is expected that many COS targets will fall within the COS aperture on the initial pointing, meaning that a time consuming 'spiral search' phase will not be required.

However, anticipated optical element 'wobble' and rotational inaccuracies of the OSM mechanisms (which are fully expected to be within CEI specifications) require that the detector location corresponding to the center of the COS aperture be determined for each individual Target Acquisition with the TA1 mirror. This 'aperture location' step for TA1 Target Acquisition is similar in function to the CAL-APERTURE phase used for Target Acquisition with dispersed light. (Recall, the CAL-APERTURE Phase of Target Acquisition computes the cross-dispersion location of the calibration lamp spectrum, and uses this information to compute where the PSA (or BOA) spectrum should fall on the detector.)

As such, a new Target Acquisition phase (tentatively called LTAIMCAL) needs to be created to determine the NUV detector location of the spatial centroid of an image of the calibration lamp shown through the calibration aperture. This mode would be performed in TIME-TAG data acquisition mode.

A second new phase of TA1 Target Acquisition (tentatively called LTAIMAGE) determines the location of the target in the aperture by obtaining an ACCUM image of the sky, determining the centroid of the target image, and computing (via the plate scales and the LTAIMCAL calibration image centroid coordinates) and requesting a slew which will place the target in the center of the aperture.

CU Software/Operations Efforts



CU Software/Operations Efforts

TA-1 Imaging Target Acquisition – Explanation and History (cont.)

These issues are currently being discussed by the COWG – and the results of the TAACOS simulations are summarized in the documents listed below.

Tony Keyes (STScI) and Grant Blue (BATC) will cover Science and Cost impacts of these TA1 Target Acquisition issues separately in today's MSR.

Recent and Upcoming TAACOS Documentation:

- TER: "Recommended TA FSW and Operations Changes", ECO and RevA, pending COWG approval.
- TER: "TAACOS: Phase I NUV Report", ECO and RevA, released for signature on 1/31/2001.
- TER: "Target Acquisition with the TA1 Mirror", released for signature on 1/31/2001.
- TER: "TA Subarrays and Simulated Detector Summaries", to be released the week of 2/5/2001.
- TER: "Recommendations for the Flux-Centroiding Algorithm", to be released the week of 2/5/2001.
- TER: "Recommended initial values for TA FSW Parameters", In Development.
- The TAACOS lead developer, Dr. Steven Penton, is currently finishing the remaining TAACOS reports – and beginning work on the CALCOS-GSE software. During the month of March, he will be supporting FUV Detector Thermal-Vac at CU.

FUV Detector FSW Development Efforts

DCE FSW Development and Test

Website gives full details of DCE development efforts: http://cos-arl.colorado.edu/DCE/

DCE BOOT FSW:

- One minor bug was found in DCE BOOT v1.09 – which caused intermittent background CRC errors being generated during code uploads. A fix was implemented – and because the schedule allowed it – the opportunity was taken to add several other requested features to the DCE BOOT FSW. Flight DCE BOOT v1.13 was sent to UTMC for burning into a flight PROM on 1/11/2001.
- DCE BOOT v1.13 passed a suite of Component and Unit Level Tests on 1/18/2001. "As-Run" Test procedures from this run are to be released as controlled documents ASAP.
- Two DCE Flight PROM's – burned with v1.13 – due from UTMC on 1/29/2001.

FUV Detector FSW Development Efforts

DCE OPERATE FSW:

- Bi-Weekly DCE OPERATE Code telecons were held during the month of December and January, and will culminate in a two-day code review at Ball on February 1st – 2nd.
- A full week of DCE OPERATE Code testing was held Dec. 11th – 15th at UCB, using FUV ETU hardware and UCB EGSE. Testing focused on implementation and verification of HV Ramping and background 'HV Current-Limit' Protection Tasks.
- A second week of DCE OPERATE Code testing was held Jan. 8th – 12th at UCB, using FUV ETU hardware and UCB EGSE. Testing focused on verification of Count Rate Protection and Door Operations. At the end of this second week of testing – UCB systems engineer Geoff Gaines agreed that the DCE OPERATE Code contained the proper functional and safety features to be used on flight hardware.

FUV Detector FSW Development Efforts

DCE OPERATE FSW (cont.):

- A week of DCE-MEB Interface Testing was held Jan. 22nd – 26th at Ball, using FUV ETU hardware and the COS SW Bench. Testing focused on proper command and telemetry protocols between the CS and DCE FSW. All major components of CS-DCE commanding were tested – including FUV Detector Power-ON; Loading the DCE OPERATE FSW; Jumping to DCE OPERATE Mode; Initial configuration of DCE hardware (i.e., Digitizer settings, HV presets, etc…), FUV HV Turn-ON and HV Ramping to LOW, NOMAB, NOMA and NOMB States; Current Limit and Count Rate Protection verification and anomaly investigation; and Primary and Contingency FUV DOOR Operations.
- During the course of the Interface Testing - several bug fixes and enhancements were made to both the CS-DCE FSW and the DCE OPERATE FSW.

In summary, the very aggressive development, review and test schedule that has been maintained for the DCE FSW since last October has enabled us to be ready to support FUV Detector environmentals. Congratulations to all those who've worked very hard to pull this off.

Calibration/Flat-Field Subsystem Activities at CU

- CU and Ball have worked out a plan where CU will assemble, align, and optically test the COS calibration/flat-field subsystem.
- This effort will be lead by Dr. Steve Osterman.
- The effort will take place in CASA's cleanroom where the FUV grating tests were done.
- The activities will start this summer (after completion of G160M grating test) with a Cal/FF platform delivery to Ball in August '01.

COS Calibration and Verification Test Planning

- AV-03, COS Calibration Requirements and Procedures Document, is being written by Dr. Erik Wilkinson.
- AV-03 is now in signature cycle.

COS Schedule for CU

- The detailed CU schedule is available as a separate hand-out.

Task	Status
G160M/G140L – Blazed Grating Testing	G160M testing to start early February G140L-Blazed efforts TBD
CEDAR Software Development	Efforts renewed with Ball's release of DM-06 Build 3 completion in early February
TAACOS Software Development	Complete
G140L Gratings & Testing	Complete
JY Deliveries	Presented earlier
Tinsley	Effort completed
Calibration Planning & Implementation	AV-03 soon to be in signature cycle
Cal/FF SS Optical Integration	Summer '01

COS Descope Issues

- The COS IDT has been asked to develop and track a descope plan which, if implemented, can be used to control future cost growth and/or schedule difficulties.
- At the beginning of the COS development effort, late CY97 and early CY98, we prepared and presented several descope options.

DESCOPE HISTORY

- The following list summarizes the items we proposed as descopes at the April 1998 MSR
  - Reduce SRAM buffer memory in MEB - **IMPLEMENTED**
  - Develop single type of NUV gratings - NOT IMPLEMENTED
  - Procure fewer optics spares on both FUV and NUV channel - **IMPLEMENTED**
  - Procure NO NUV optics spares - NOT IMPLEMENTED
  - Reduce NUV camera mirrors from 3 to 1 - NOT IMPLEMENTED
  - Convert the NUV channel to an Echelle - NOT IMPLEMENTED
  - Remove the NUV channel - NOT IMPLEMENTED
  - Reduce number of spare EEE parts - NOT IMPLEMENTED
  - Eliminate the redundant MEB - NOT IMPLEMENTED
  - Implement only 1 science aperture - NOT IMPLEMENTED
  - Eliminate the aperture mechanism - NOT IMPLEMENTED
  - Go with no external shutter - NOT IMPLEMENTED
  - Eliminate calibration subsystem - NOT IMPLEMENTED
  - Make calibration subsystem single string - NOT IMPLEMENTED
  - Reduce the I&T/calibration effort - **IMPLEMENTED**
  - Reduce the number of Ball and CU CDRL's - PARTIALLY IMPLEMENTED
  - Change MSR to QSR - NOT IMPLEMENTED
  - Eliminate a major review - NOT IMPLEMENTED
  - Move environmentals from Ball - **IMPLEMENTED**
  - Hold all status meetings and reviews in Boulder - NOT IMPLEMENTED

Updated COS Descope Candidates

Candidate De-Scope	Trigger Date	Resource Saved*	Impacts
Eliminate FUV Detector detailed resolution tests	Implemented	2 weeks	Knowledge of detector
Eliminate FUV Detector detailed QE tests	Implemented	2 weeks	Knowledge of detector
Eliminate FUV Detector deep FF tests	Implemented	3 weeks	Knowledge of detector
Make DCE Op Code non-uploadable	Too late	---	Higher risk, Ops
Early transition of FSW to Code 582	TBD	$	Ops
Remove Redundant Cal/FF Elements	TBD	$,t	Higher risk, Ops
Remove/reduce memory	Too late	---	Ops
Remove NUV gratings from OSM2	TBD	$,t	Degraded science
Drop NUV channel	TBD	$,t	Degraded science
Remove NCM3 optics	TBD	$,t	Degraded science, Ops
Eliminate Aperture Mechanism	TBD	$,t	Ops, Obs. efficiency
Drop all Accum mode processing w/ Doppler	TBD	$,t	Degraded science
Drop spare FUV detector	TBD	$,t	Higher risk
Drop OSM1 capability (don't cover λ gap)	Too late	---	Degraded science
Reduce S/N requirement to 30 (no FF lamp)	TBD	$,t	Degraded science
Relax NUV resolution requirements below 20k	TBD	$,t	Degraded science
Remove on-orbit change-out capability	TBD	$,t	Higher risk
Drop dispersed light TA	TBD	$,t	Ops
No Ion Gauge	TBD	$,t	Higher risk, Ops
No external shutter	TBD	$,t	Ops
Change MSRs to QSRs	TBD	$	Unknown
Drop G. Hartig support activities	TBD	$	Unknown
Eliminate Mechanism Lifetime tests	TBD	$	Higher risk
Reduce CDRLs	TBD	$	Unknown
Drop G140L blazed effort	TBD	$,t	Possibly degraded science
Reduce G160M image testing	TBD	$,t	Higher risk

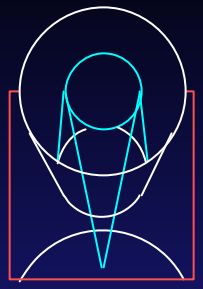
*The IPT has not yet done a detailed analysis to quantify $ or time saved.

Upcoming Events/Activities

- Flight detector vibration test.
- Scrub of flight MCPs.
- Ship flight detector to CU and start T-V test.
- Start G160M testing at CU.
- Release AV-03.
- Begin spare detector DEB/DVA characterization.

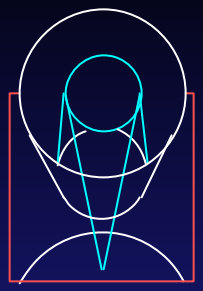
Questions, Issues & Resolution Plan

- None



COS Monthly Status Review - STScI

- **Pipeline Activities (Ground System "Back-end")**
  - PDR held 7 December 2000 at STScI
    - Very successful; excellent input from IDT and STScI systems
    - **`http://fluffy.stsci.edu/PDR/slides.htm`**
    - 18 RFAs; 13 closed; 5 presently open
      - **`http://fluffy.stsci.edu/PDR/RFA.htm`**
  - OPUS, Hubble Data Archive, calibration (**`calcos`**) design started



COS Monthly Status Review - STScI

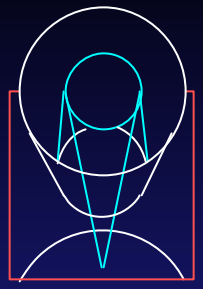
- **Thermal Vac Data-Processing MOU updated**
  - DM-06 internal header format deliverable from Ball to STScI
    - Scheduled for 1 Dec 2000; delivered week of 22 Jan 2001
      - Potential impact for STScI "back-end" development.
      - Workarounds were implemented to facilitate commencement of STScI design activity
  - Ops bench hardware-generated science test image deliverable from Ball with orientation indicated and internal headers populated
    - Originally scheduled for 1 Mar (NUV) and 15 April (FUV); now expected 15 June 2001
      - Workarounds to facilitate determination of image orientation
      - No workaround to test internal header ingest
      - Implies no testing prior to STScI delivery of beta-OPUS to team on 1 July 2001

COS Monthly Status Review - STScI

- **Thermal Vac Data-Processing MOU (continued)**
  - Integrated-instrument hardware-generated test data
    - Scheduled for 1 Sep 2001
    - SI functional tests presently scheduled to begin at Ball 8 Sep
    - Critical-path item for final OPUS and HDA-product delivery on 1 Oct 2001
      - Potential impact for STScI "back-end" development.
      - COS and WFC3 back-end (OPUS / HDA) development programs are serial processes

COS Monthly Status Review - STScI

- **STScI Integrated Scheduling System Development**
  - Phase 2: TIME-TAG (primary science mode) and dark exposures
    - FUV completed and tested at STScI
    - NUV completed previously
    - Ball testing per FSW availability timeline
  - Development Phase Review Team
    - Reviewed content and ordering of remaining phases considering internal and external deliverable and testing schedules
    - Revised Phase 3-7 development schedule approved



COS Phase Development Plan

(Rev 4, 1/17/01)

Phase 1 (1/1/00 – 6/30/00)

- Macro Development
- Reconfigurations

Phase 2 (7/1/00 – 12/31/00)

- NUV Timetag Mode + Darks
- FUV Timetag Mode + Darks

Phase 3 (1/1/01 – 6/30/01)

- FUV & NUV Accumulation Science Exposures
- FUV & NUV Target Acquisition Exposures
- FUV & NUV Target Peakup Exposures

Phase 4 (7/1/01 – 12/31/01)

- Aperture Alignment Exposures
- OSM1 Focus Alignment Exposures
- OSM1 Rotation Alignment Exposures
- OSM2 Rotation Alignment Exposures
- FUV & NUV Flat Field Lamp Calibration Exposures

Phase 5 (1/1/02 – 6/30/02)

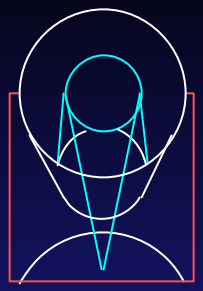
- FUV & NUV GO Wavelength Calibration Exposures
- FUV & NUV Automatic Wavelength Calibration Exposures
- FUV & NUV FP Split Exposures
- SAA Contours

Phase 6 (7/1/02 – 12/31/02)

- SMGT Preparations
- SMOV Special Commanding
- FUV & NUV Anomalous Recovery
- FUV & NUV Initial Turn-on
- FUV & NUV BOP Target Screening

Phase 7 (1/1/03 – 6/30/03)

- FUV & NUV Lifetime Adjustments



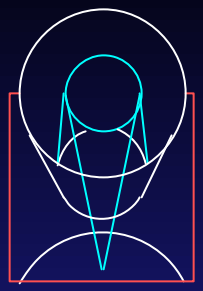
COS Team at STScI

Tony Keyes	Group lead, Instrument scientist
Melissa McGrath	Instrument scientist (operations)
Ralph Bohlin	Instrument scientist (calibration)
Matt McMaster	***Data Analyst*** **-** new team member
Vicki Balzano	Systems engineer (operations; commanding)
Marsha Allen	Systems engineer (operations; commanding)
Dean Zak	Systems engineer (operations; commanding)
Ron Henry	Systems engineer (operations)
Tom Wheeler	Engineer (operations)
Warren King	Systems Engineer (calibration)
Phil Hodge	Science software – calcos (calibration)
John Adams	TRANS developer – (scheduling)

COS Monthly Status Review - STScI

COS Target Acquisition:

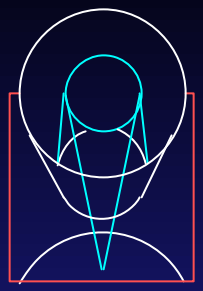
- STScI has extensive experience with target acquisition methods for spectrographs
- Valuable lessons learned from STIS experience
  - Utility, simplicity, efficiency, and robustness of imaging-based target acquisition methodologies
- Availability of GSC2 for COS observing epoch
  - Allows acceptable expectation of blind-pointing within COS aperture
  - Images in multiple passbands available for most target fields
    - Simplifies bright object checking procedures for MAMA images
- MAMA imaging target acquisition feasibility for COS
  - STScI brought forward utility and desirability of imaging methods to IDT and recommended inclusion in TAACOS studies



COS Monthly Status Review - STScI

COS Target Acquisition [TA] (continued):

- ~150 COS visits per year
  - ~80% (120 visits) will be faint object science - the primary COS science objective
  - ~ 30 minutes of savings per visit relative to present peakup algorithms
  - 10-20% gain in on-target observing time (science efficiency) per visit
- Imaging TA has substantial life cycle cost benefit
  - ~60 orbits of science gain per cycle for typical GO programs (~300 orbits in 5-year mission lifetime)
- Imaging TA also enables COS snapshot programs
  - For most targets, the duration of target acquisition performed with other methods is longer than typical snapshot opportunity
- Imaging TA provides robust failure-analysis methods
  - Analysis of actual image facilitates avoiding repeat failures



COS Monthly Status Review - STScI

COS Target Acquisition [TA] (continued):

- COS NUV TA1 imaging target acquisition summary:
  - Increases efficiency of target acquisition and spacecraft science
  - Increases target acquisition accuracy
  - Robust, proven centering algorithms
  - Robust methods of failure analysis
  - Enables snapshot science
  - Enables additional science
    - Improves on-target exposure time
    - Allows time for supporting or additional spectral regions
- STScI recommends implementation of NUV TA1 imaging target acquisition mode