COS
Monthly Status Review
August 24, 2000
Ball

Cosmic Origins Spectrograph
Hubble Space Telescope

John Andrews
August 24, 2000

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	J. Andrews
Schedules	J. Andrews
Upcoming Events/Activities	J. Andrews
CU Issues & Resolution Plan	J. Andrews
STScI Presentation	M. McGrath
BATC Presentation	D. Hood
Financial Splinter	GSFC/Ball/CU

Progress Summary Since Last Monthly

- Completed preparations for G140L grating testing.
- Placed OP-01 under “quasi” CM.
- Met with Tinsley to assess NUV optics status.
- Discussed grating status with J-Y.
- UCB received stuffed digitizers from J&T.
- UCB/GSFC commenced Actel reviews.
- UCB completed metrology on all 3 backplates.
- VHA No. 1 has completed assembly.

Optics Development Status - NUV Mirrors

- Tinsley:
  - Current delivery Plan for flight optics (recent changes in bold):

Item	Previous Due Date	New Date	Slip	New Date for Spares
NCM1	8/7/00	**9/1/00**	**4 weeks**	**10/15/00**
NCM2	8/7/00	**8/25/00**	**3 weeks**	**10/15/00**
NCM3a,b,c	8/7/00	**9/8/00**	**5 weeks**	**10/15/00**

  - We met with Tinsley on 8/21/00.
  - Continued delays due to technical challenge in meeting figure requirements across full clear aperture, and access to best resources within Tinsley.
- TA-1 mirrors have been coated at GSFC and are delivered to Ball.

Optics Development Status - Gratings

- JY has restored their efficiency test system and can now test in-house.
- G140L gratings (qty=2) picked-up by CU on Friday, June 30.
- Present grating delivery plan (changes since last month in bold):

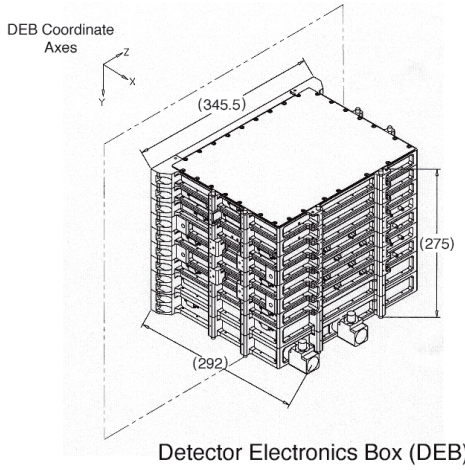
Item	Delivery Date	Coating Dates at GSFC	Test Dates	Planned Test Location
G140L	Done	In process	8/00-10/00	CU
G160M	11/00	12/00	12/00-3/01	CU
G140L-Blazed	11/00	11/00	10/01	CU
G185M	9/00	9/00	10/00	GSFC
G225M	11/00	11/00	12/00	GSFC
G285M	12/00	12/00	1/01	GSFC
G230L	1/01	1/01	2/01	GSFC

COS FUV Grating Test Status

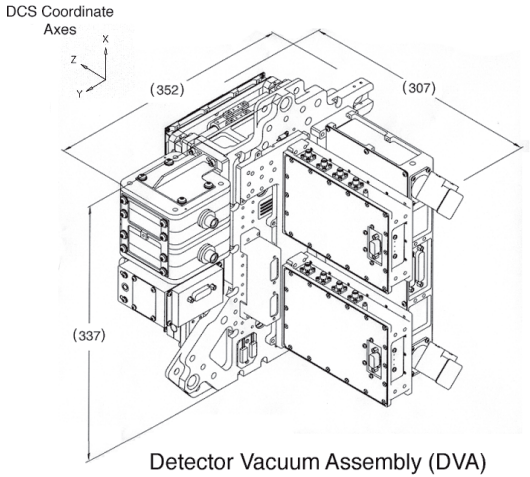
- Test report for G130M b & c is being routed for signatures.
- First G140L has been coated, mounted, and is ready for testing.
- CASA test facility has been cleaned, re-certified, and is ready.
- Testing to resume Monday, August 28th.

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)



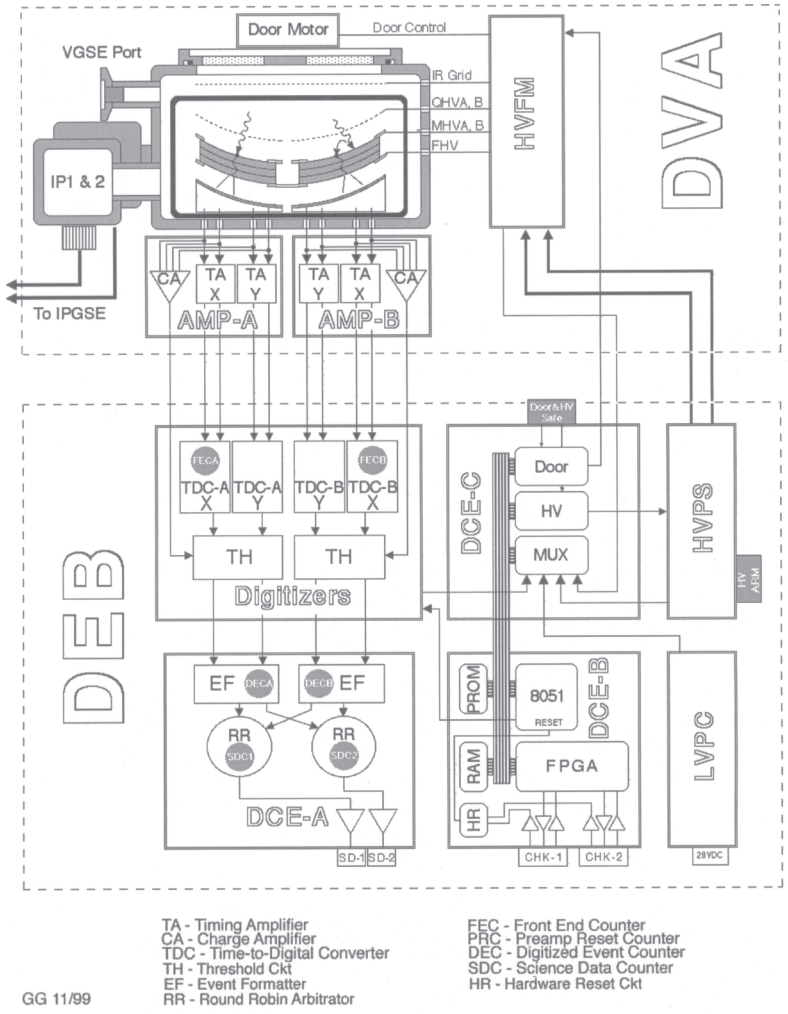
Detector Electronics Box (DEB)



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 - Personnel Issues

- Raffanti still supporting UCB ~ 2 day/week plus consulting via daily phone conversations.
- Baja Technologies is still supporting electrical systems test and integration preparations at ~1 FTE level.
- MAG Systems has temporarily completed COS activities and will pick-up spare detector assembly and test in October.
- The UCB FSW development effort has recently been augmented by the HST program's assistance in making available W. Clement to assist in DCE boot code development.

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	NS	NA	NA	NA	NA	C	C	C	C
Worst Case Analysis	NA	NA	NA	NS	NA	C	C	C	C
Board Thermal Analysis	C	NS	NS	NS	C	C	C	NS	NS
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	S	S
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	**S**	**S**
Board Engineering Acceptance	C	C	C	C	C	C	C	NS	NS
Engineering Test & Acceptance	C	C	C	C	C	C	C	NS	NS
Temperature Cycle Test	**C**	C	C	C	NS	NS	NS	NS	NS
Voltage Margin Test	**C**	NA	NA	NA	NS	NS	NS	NS	NS
Final Acceptance Test	S	C	C	C	NS	NS	NS	NS	NS
Legend	C = Complete		NA = Not Applicable		S = Started		NS= not started		

Changes since last MSR in Bold

UCB FUV Detector Status - Actels

ACTIVITY	DCE A		DCE-B	TDC-X	TDC-Y
	Counter	Round Robin	CPU	X	Y
Initial ACTEL Design	C	C	C	C	C
ACTEL Peer Review	C	C	C	C	C
End-to-end System Simulation	C	C	C	S	S
GSFC Review	C	S	C	NS	NS
FPGA tests with ETU electronics	C	C	C	C	C
Release ACTEL schematic/burn	NS	NS	NS	NS	NS
Legend	C = Complete	NA = Not Applicable	S = Started	NS = Not Started	

Changes since last MSR in bold

UCB FUV Detector Status - Systems

- Documentation Update:
  - ICD Revision A - released 6/24/00.
  - Environmental Verification Plan - released 6/20/00.
  - ECO for Revision A QA Plan - in process.
- Mass and Power Updates (no change since last month):

	Mass (Kg)			Power (W)		
	Current Estimate	SoR Allocation (1)	Margin	Current Estimate	SoR Allocation (1)	Margin
DVA	19.43	21.5	9.6%	5.68	-	-
DEB	13.46	15.3	12%	46.46	-	-
Harness	2.7	3.4	20.5%	-	-	-
Total	35.59	40.2	11.5%	52.14	53.0	1.6%

Notes: (1) SoR Revision B allocations

UCB FUV Detector Status - Schedule Overview

August Tracking Milestones	Status
Finish metrology on 3 backplates	Complete
Fully assemble DVA #1	Slipped into early September
Stuff all 8 TDC boards	Complete
BBA No. 1 to DBA No. 1 conversion	Complete
DCE Actel Reviews	2 of 3 complete. Awaiting feedback from GSFC on round robin.

September Planned Milestones
Complete DVA No. 2 assembly
Complete DCE qualification
Complete TDC No. 1 qualification
Complete BBA No. 2 to DBA No. 2 conversion
Commence DBA No. 1/electronics testing

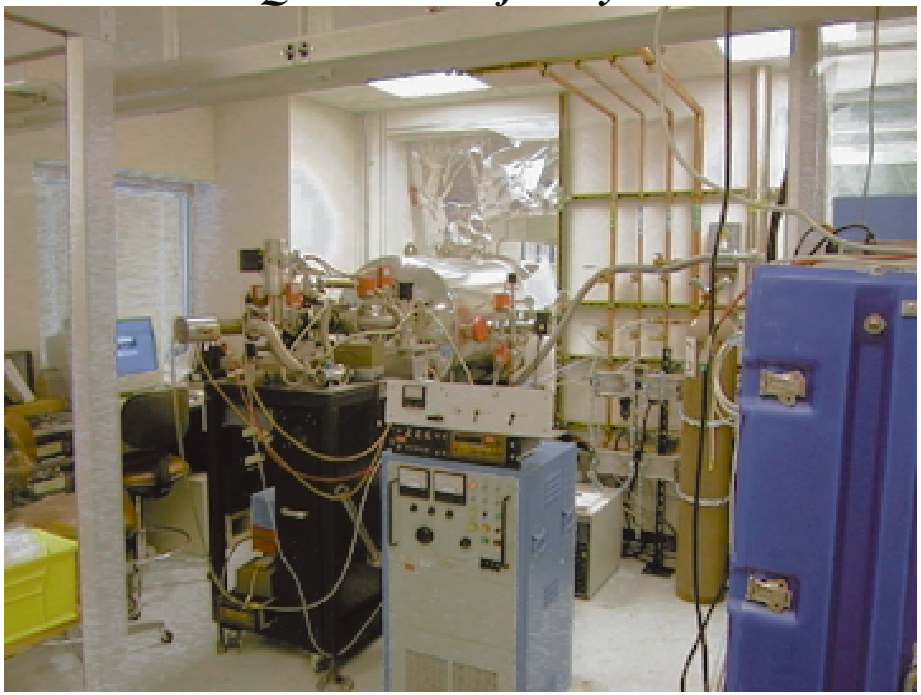
Forecast flight system delivery to Ball:

This month = 2/28/00

Last month = 2/23/00

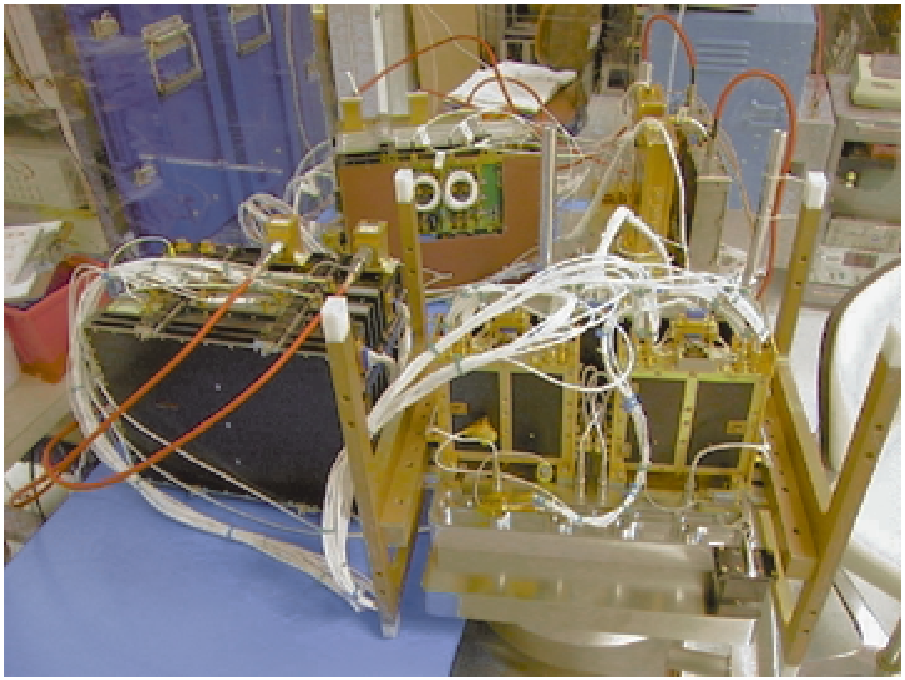
UCB FUV Detector Status - Facilities

- Detector facilities in new building fully commissioned
- Started detector work in these beginning of August
- ***Detector QE Test tank facility***



- ***Detector system test cleanroom***
- Patty Hansen (GSFC) has reviewed clean-room facilities this week

UCB FUV Detector Status - Facilities (cont.)



Detector Test tank facility in clean tent accommodates two full COS detector systems

Detector cleaning and assembly clean room

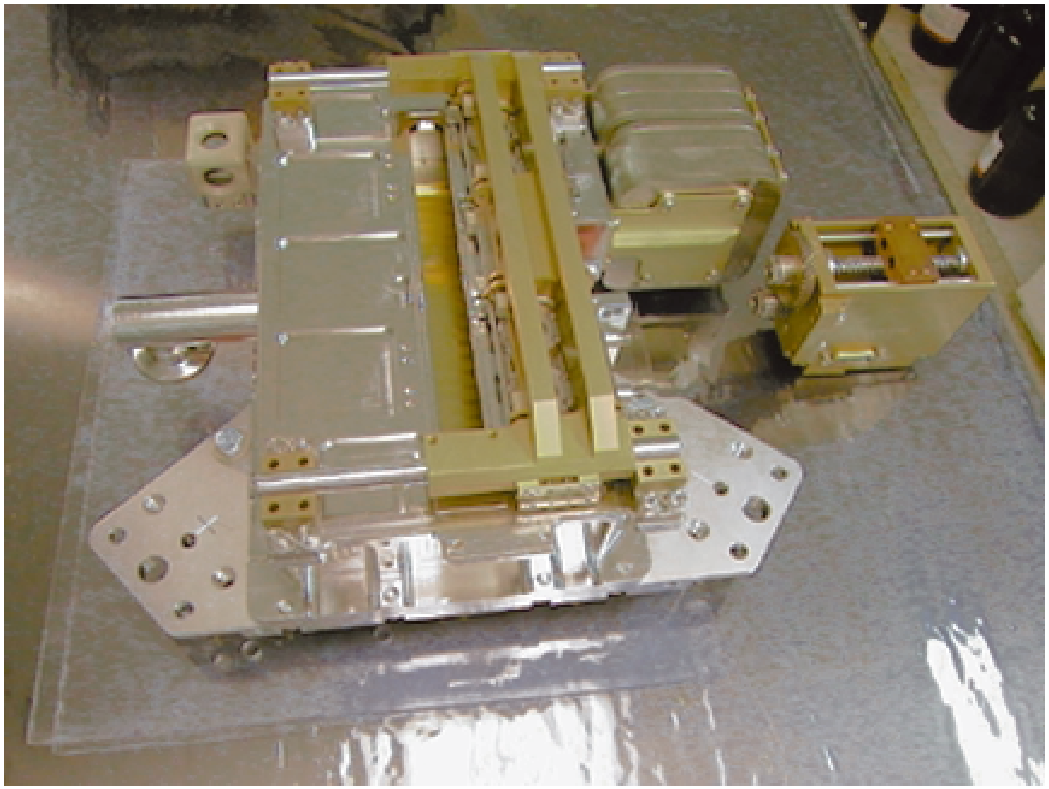
UCB FUV Detector Status - Detector Vacuum Assembly

Two DVA door assemblies completed

2 sets of ion pump assemblies completed

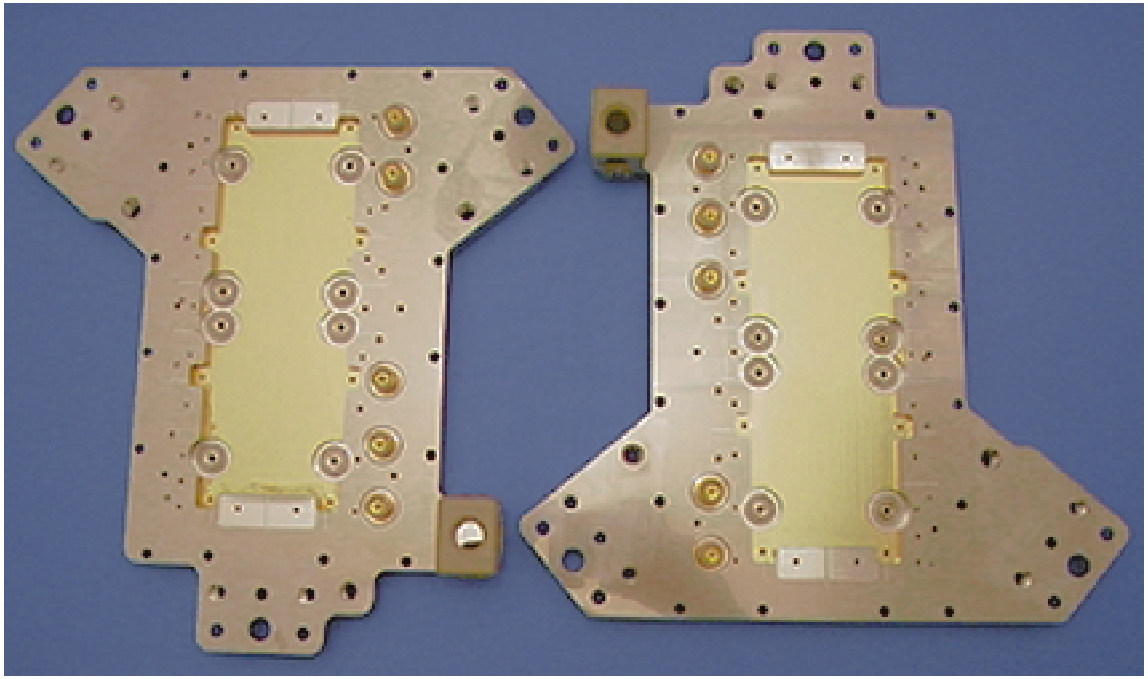
2 flight drive units completed and test driven

1 VHA integrated with DBA and ion pumps for door rail shimming and limit switch adjustment



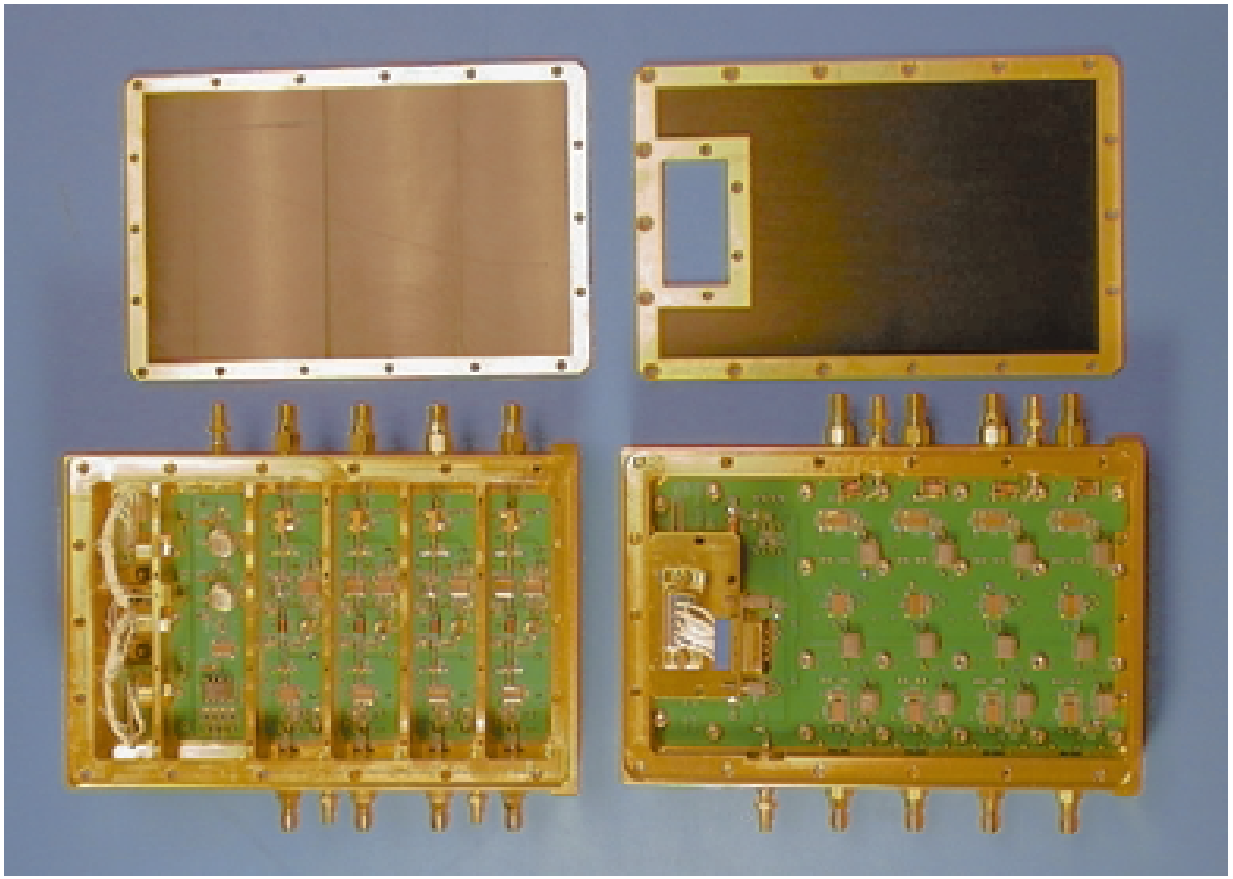
UCB FUV Detector Status - Detector Vacuum Assembly (cont.)

- Backplates #2 & #3 were received back from metrology last week.
- Now being laser etched and pinned before integration with BBA#1 & BBA#2



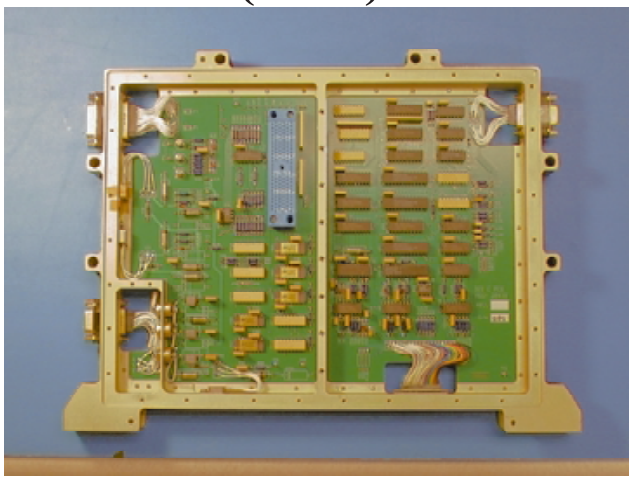
UCB FUV Detector Status - Electronics

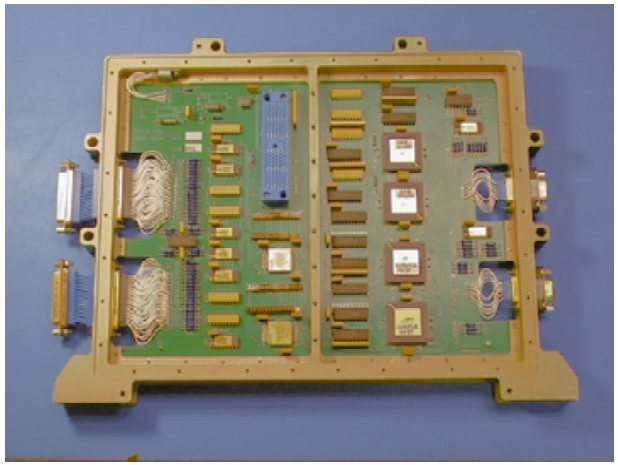
- Power systems (HVPS, LVPC, HVFM)
  - All ready for integration
- Amplifiers
  - 6 amps adjusted for linearity
  - Thermal cycles and soaks done
- Flight Harnesses
  - 1 set complete
  - 2nd set almost done

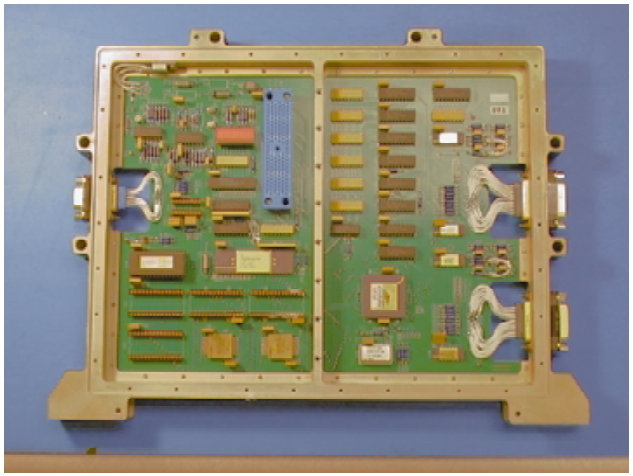


UCB FUV Detector Status - Electronics (cont.)

- DCE - A,B,C in house
  - Minor revision of Actel 1 & 2 done
  - Mod of #3 Actel imminent (Round Robin)
  - Voltage margin & thermal tests next

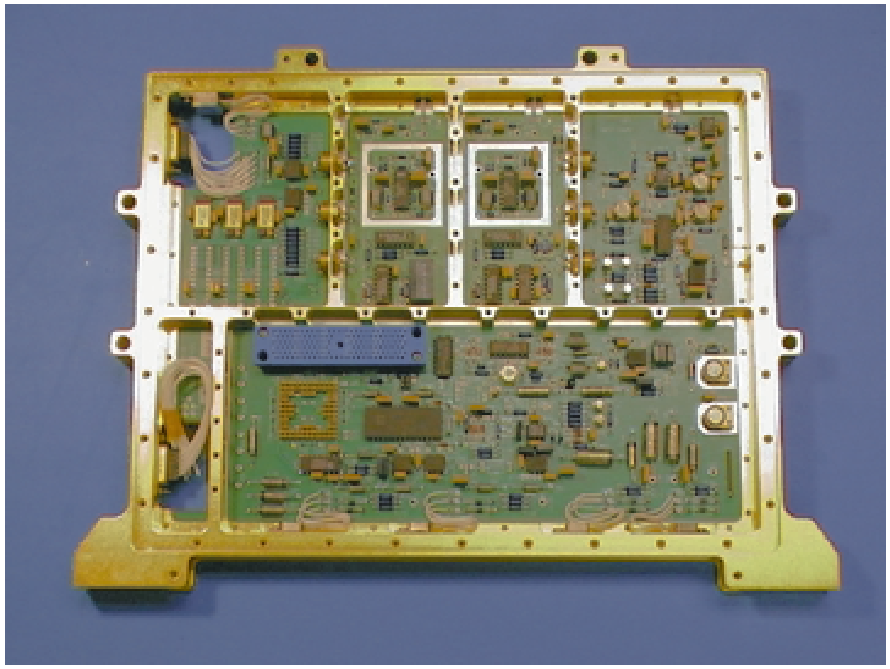


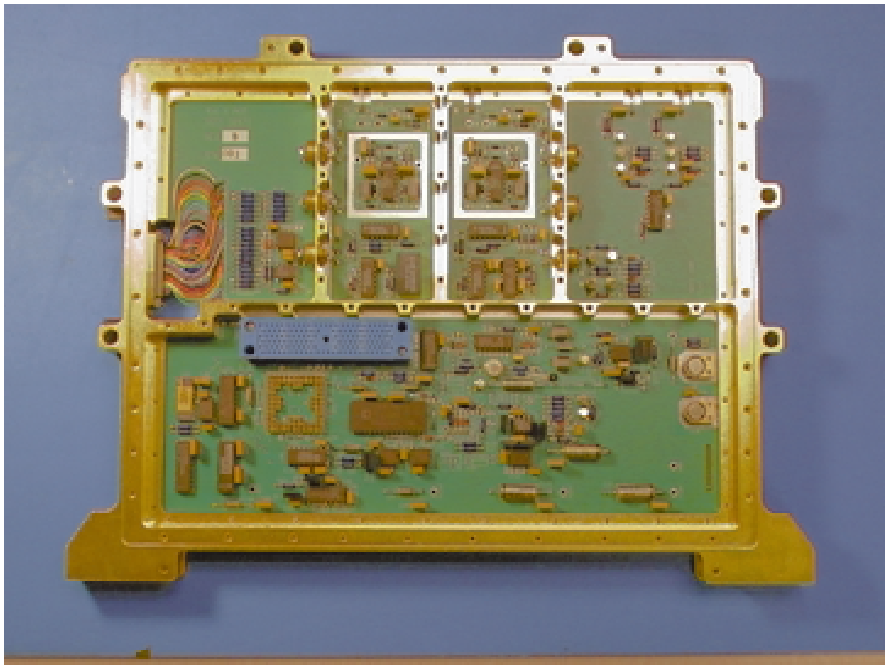




UCB FUV Detector Status - Electronics (cont.)

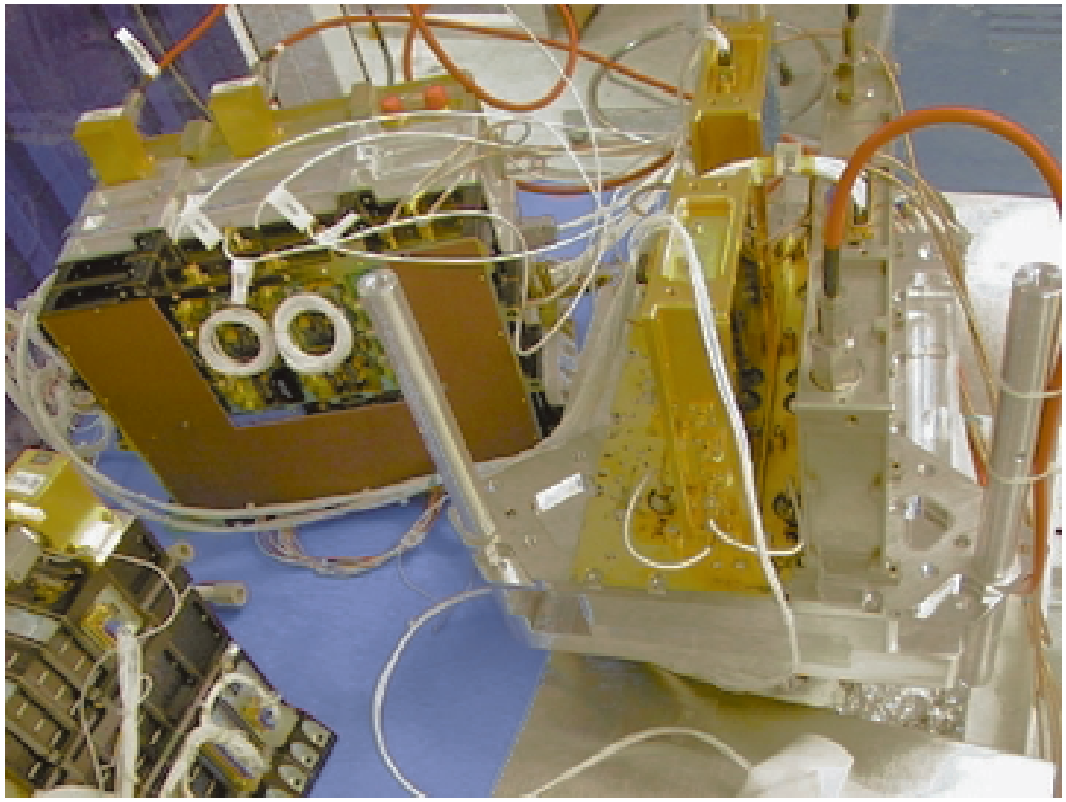
- 2 X and 2 Y TDC's arrived at UCB from J&T, in final hookup/inspection
- 2 X & 2 Y spare units to be ready at J&T end of this week





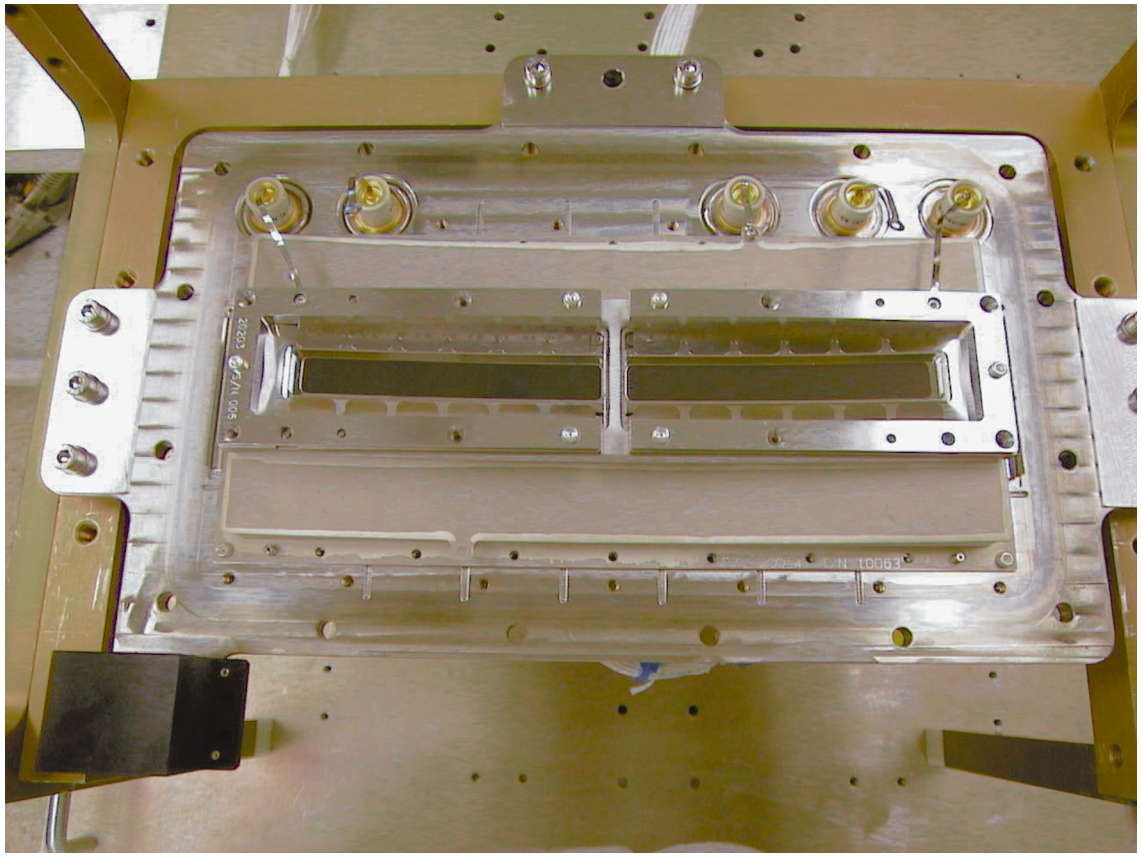
UCB FUV Detector Status - Electronics (cont.)

- One pair of flight board ETU TDC's now bench tested and in use to test DBA & anodes for flight & flight spare detectors, and establish flight TDC acceptance test procedures



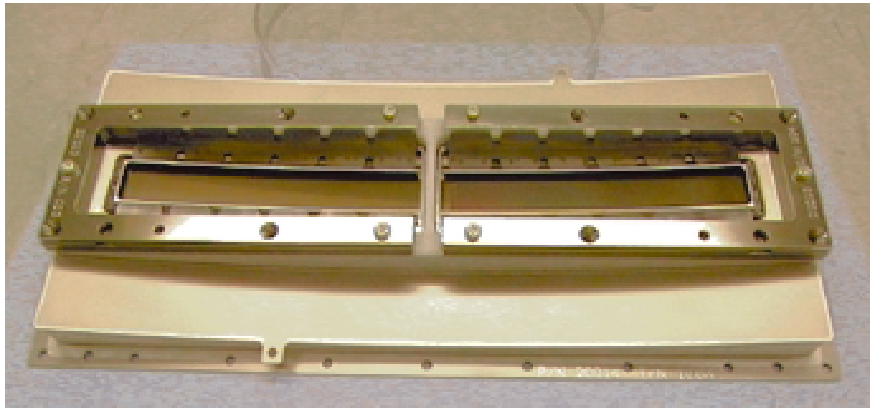
UCB FUV Detector Status - Electronics (cont.)

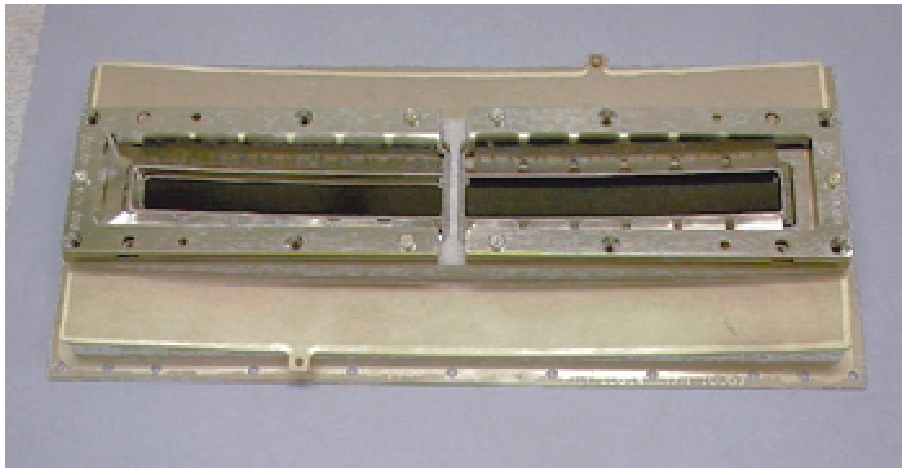
- BBA#1 is just finishing MCP scrub test,
- BBA #2 is about to be verified and then undergo its scrub tests



Flight BBA Status

- BBA #2 prepared, cleaned & stacked with MCP's ready for verification and scrub

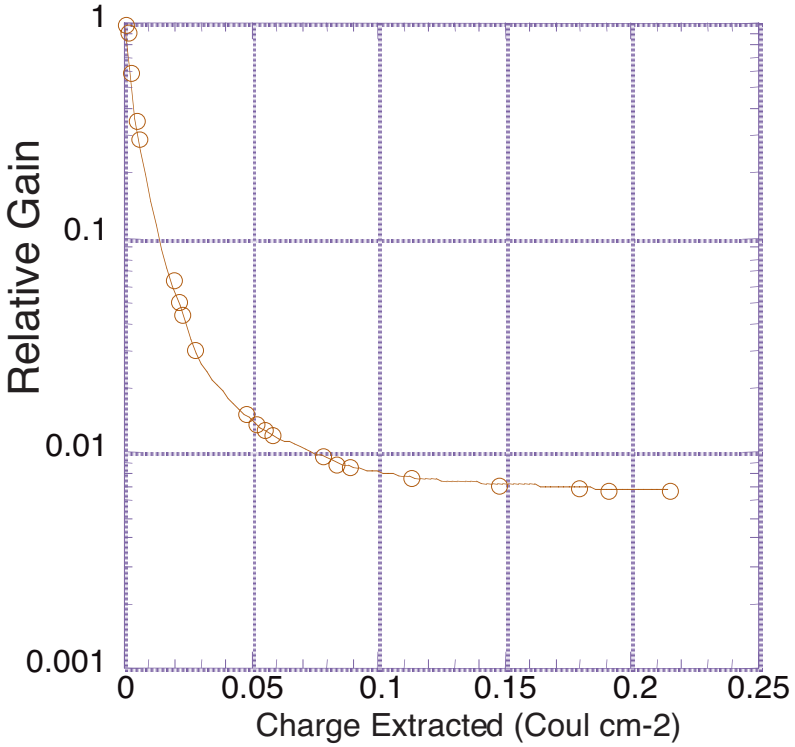




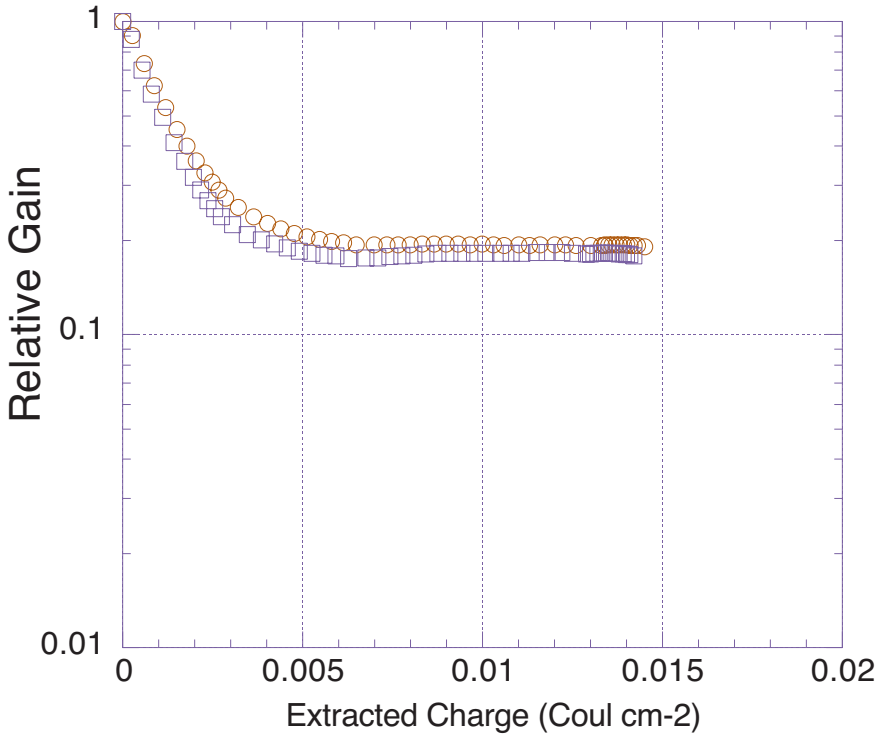
- BBA #1 with MCP's
- MCP's are just completing scrub.

BBA #1 Flight MCP Scrubbing

- COS sample MCP scrub

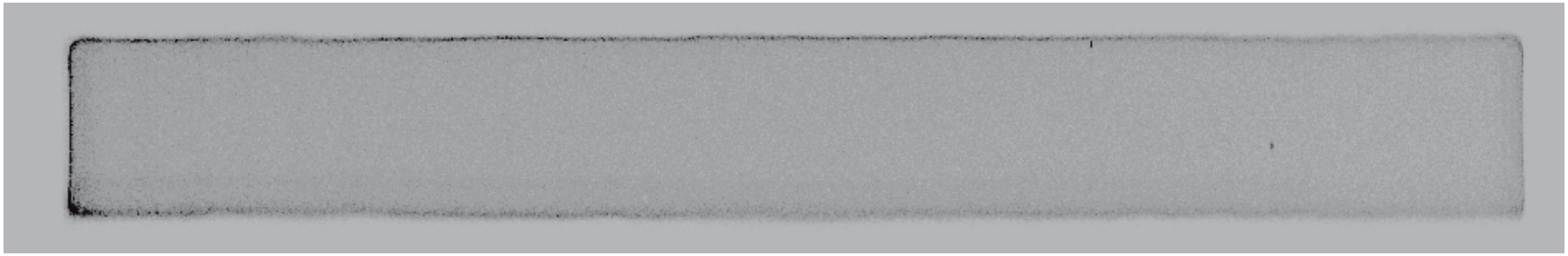


- COS BBA1 MCP scrub

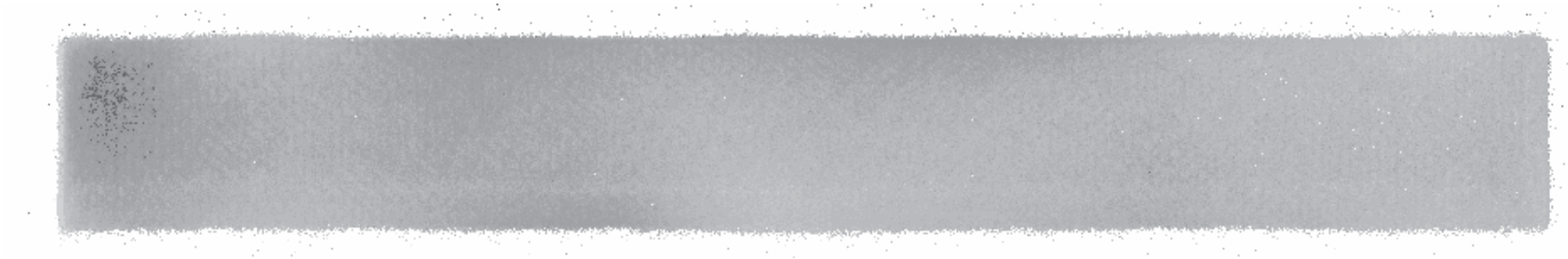


Flight MCP Stack Flat Field Data

- UV flat field

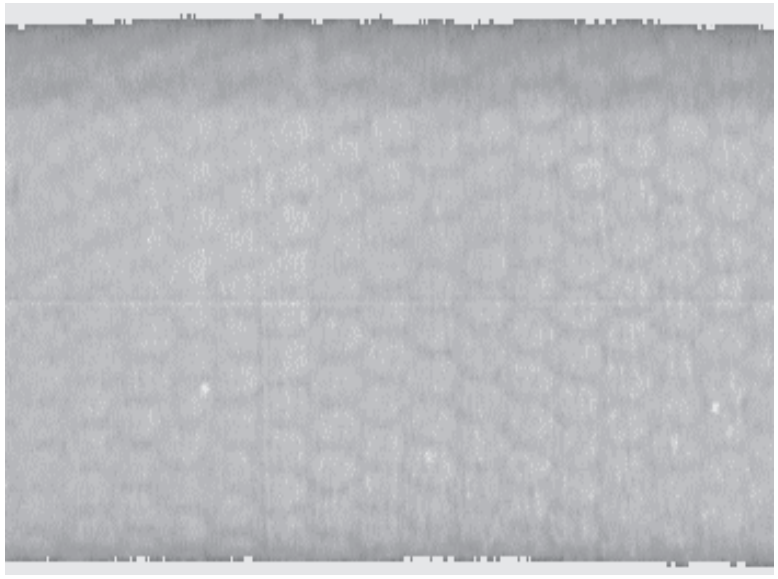


- Gain map:

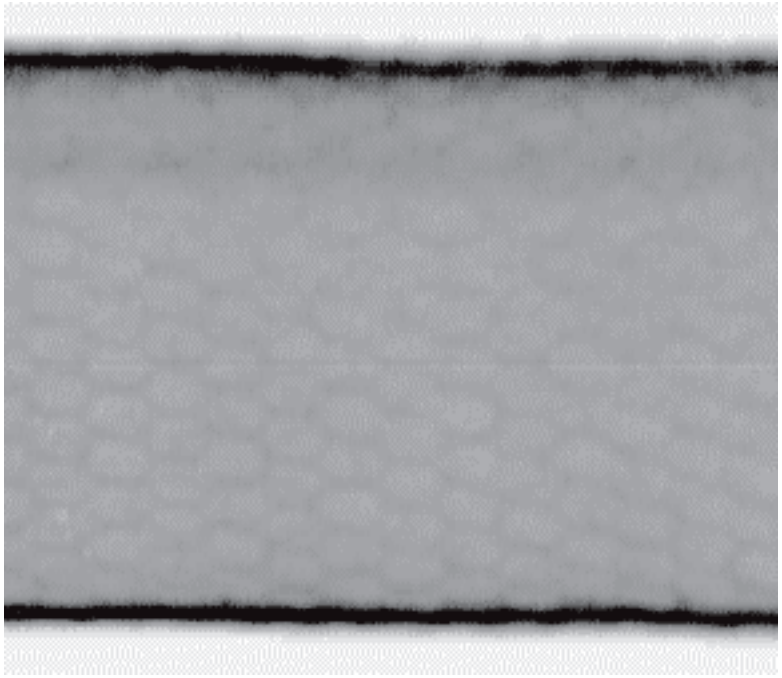


BBA #1 Flight MCP Moire Tests

Side A



Side B



Moire tests on BBA#1 show no visible Moire effects, clear multifiber MCP patterns only

UCB FUV Detector Status - Risk Mitigation Planning

- Current flight detector delivery schedule shows end Feb 01
- All flight/flight spare hardware currently in house
- Majority of tasks are performance verification & qualification
- Discussing with Ball ways to reduce possible schedule delivery/integration risks
- Propose Oct/Nov 00 fit check with flight design detector head & cables
- Propose to deliver flight spare system to Ball in mid Jan 01 for tests with MEB simulator and UV focus/alignment tests
- Plan results in mid April need date for flight detector at Ball

UCB FUV Detector Status - Milestones for Next Month

- Complete detector vacuum assembly #2.
- Complete BBA #2 to DBA #2 conversion.
- Start DBA #1 testing with system electronics.
- DCE's fully qualified.
- TDC #1 qualification - dependent on Actel review.

CU Software/Operations Efforts

- GSE Software Development at CASA-ARL
  - COS Science Data Index and Analysis Software - a.k.a. "CEDAR"
  - Website gives full details for CEDAR: http://cos-arl.colorado.edu/CEDAR/
    - Build II HEXView Tool enhanced to accommodate examining LARGE dump data files.
    - CEDAR lead developer, Stéphane Béland, is currently working on other tasks at BATC, primarily to assist with COS FSW Testing. As was reported last month, Stéphane is doing this because CEDAR Build III development is on hold until specific TLM, Science Data Header and Science Data Format are mature enough to allow further CEDAR development.
    - Build III completion will take approx. 1 month from the time these details become available.

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/
  - Phase I simulations for NUV channel are in progress, and slated for completion by the end of August, 2000.
  - TA1 "imaging" simulations completed. TA1 "imaging" of isolated point sources appears to be an excellent method for Target Acquisition.
  - Target Search algorithms for NUV "dispersed" light have been verified. Slightly modified flux-thresholding scheme in place and being tested.
  - Phase I TAACOS Report for NUV Channel to be completed by the first week of September, 2000.
  - A final, summary document - detailing all requested flight software and operational changes for Target Acquisition, based on Phase I TAACOS simulations for FUV and NUV channels - will be released in the second week of September, 2000.

Assistance with FSW Development Efforts at UCB

- DCE FSW Documentation Efforts
  - Website gives full details of DCE Documentation efforts:

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

    - After the second DCE Code Walk-Thru meeting in late July, 2000 - the review panel decided to switch to a twice-weekly telecon format. During the month of August, there have been four telecons, and all but a small portion of the existing DCE BOOT code has been reviewed. There are currently 70 open action items on the DCE Code, based on the Code Walk-Through meetings and telecons.
    - Partly as a result of the perceived quality, organization and content of the DCE software revealed at the Code Walk-Thru's, and partly as the result of the months of frustration the BATC FSW team has felt working on the DCE FSW effort, the BATC software team issued a memo which detailed their significant concerns about the DCE Flight Software. As a result of this memo, several small meetings where held to discuss the relevant issues. Participants at these small meetings included the primary FSW representatives from GSFC, BATC and CU. As an outcome of these meetings - two, high level meeting were held, wherein it was decided that Will Clement would be brought on-board to immediately begin developing an alternative BOOT code for the DCE FSW.

Assistance with FSW Development Efforts at UCB (cont.)

- As a follow-up to this decision, face-to-face meetings were held August 21-23 at UCB/SSL, where this plan was laid out and discussed with members of UCB's Team. Additionally, a draft "BOOT/OPERATE Code Interface Agreement" was written to help facilitate this new approach for DCE FSW development.
- Plans are in-progress to integrate this dual development process into the existing FUV development schedule, and to minimize the impact to the overall DCE FSW development and test effort.

COS Schedule for CU

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

Task	Status
G160M/G140L – Blazed Grating Testing	JY has slipped G160M deliveries 4 weeks. This has slipped final delivery to Ball by 4 weeks.
CEDAR Software Development	Ahead of schedule
TAACOS Software Development	On schedule
G140L Gratings & Testing	On schedule
JY Deliveries	Presented earlier
Tinsley	Presented earlier

Upcoming Events/Activities

- Take delivery of NUV flight optics from Tinsley.
- Pick-up G185M grating from JY.
- Start/continue G140L testing.
- Continue AV-03 development.
- Burn DCE Actels, qualify DCEs.
- Qualify TDC set No. 1.
- Begin DBA #1/electronics testing.
- Complete DVA #2 build-up.

Questions, Issues & Resolution Plan

- None