



**COS**  
*Monthly Status Review*



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**Monthly Status Review**  
**June 28, 2000**  
**BATC**

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*Cosmic Origins Spectrograph*  
*Hubble Space Telescope*

John Andrews  
June 28, 2000



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### Agenda

Progress Summary Since Last Monthly	J. Andrews
Program Overview	J. Andrews
Optics Development Status	J. Andrews
Optics Test Status	J. Andrews
UCB FUV Detector Status	J. Andrews
CU Software Activities Status	K. Brownsberger
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



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### **Progress Summary Since Last Monthly**

- Held DCE FSW code walk through.
- Held TDC tiger team review at UCB.
- Modified and improved TDC rate vs. resolution performance.
- Commenced some facility moves at UCB.
- Completed TAACOS build 1 and issued draft report.
- Continued system build-up and test at UCB.
- Continued preparations for G140L grating tests.
- Held site visits with UCB and Tinsley.



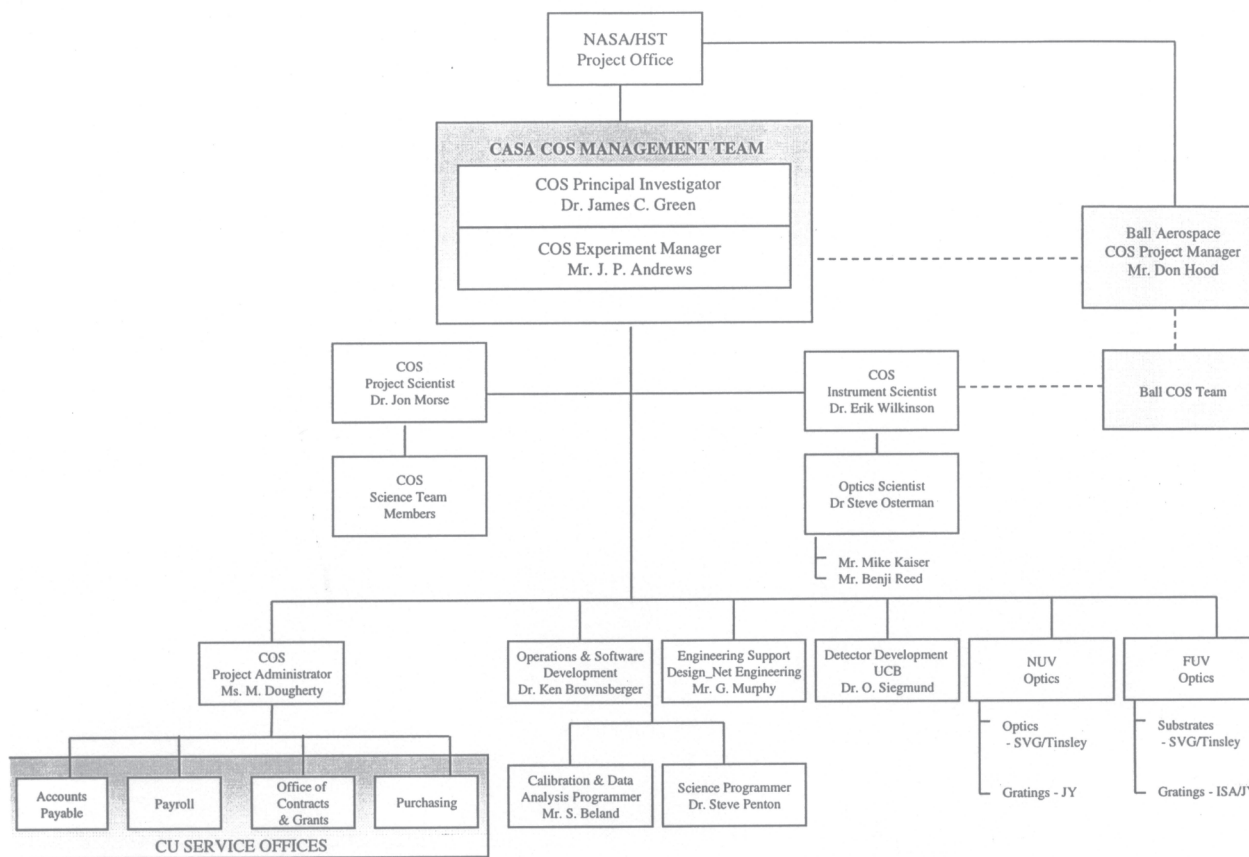
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CU/CASA HST/COS Organization Chart



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*Hubble Space Telescope*

John Andrews  
June 28, 2000



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### Optics Development Status - NUV Mirrors

- Tinsley:
  - CU visited Tinsley on 6/19/00 to assess status.
  - Tinsley informed CU they are not going to make their current delivery schedule:
    - This makes the 4th time they have requested a slip.
  - New delays caused by competing work volume at Tinsley.
  - New delivery Plan for flight optics:

Item	Previous Due Date	New Date	Slip	New Date for Spares
NCM1	6/28/00	7/21/00	3 weeks	8/14/00
NCM2	6/28/00	7/14/00	2 weeks	8/4/00
NCM3a,b,c	6/28/00	7/24-31/00	3-4 weeks	9/1/00

- We are now speaking with Tinsley weekly to monitor their progress.
- TA-1 mirrors have been coated at GSFC and are ready for delivery to Ball.



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### Optics Development Status - Gratings

- JY has restored their efficiency test system and can now test in-house.
- G140L gratings (qty=2) planned for pick-up by CU on Friday, June 30.
- Present grating delivery plan:

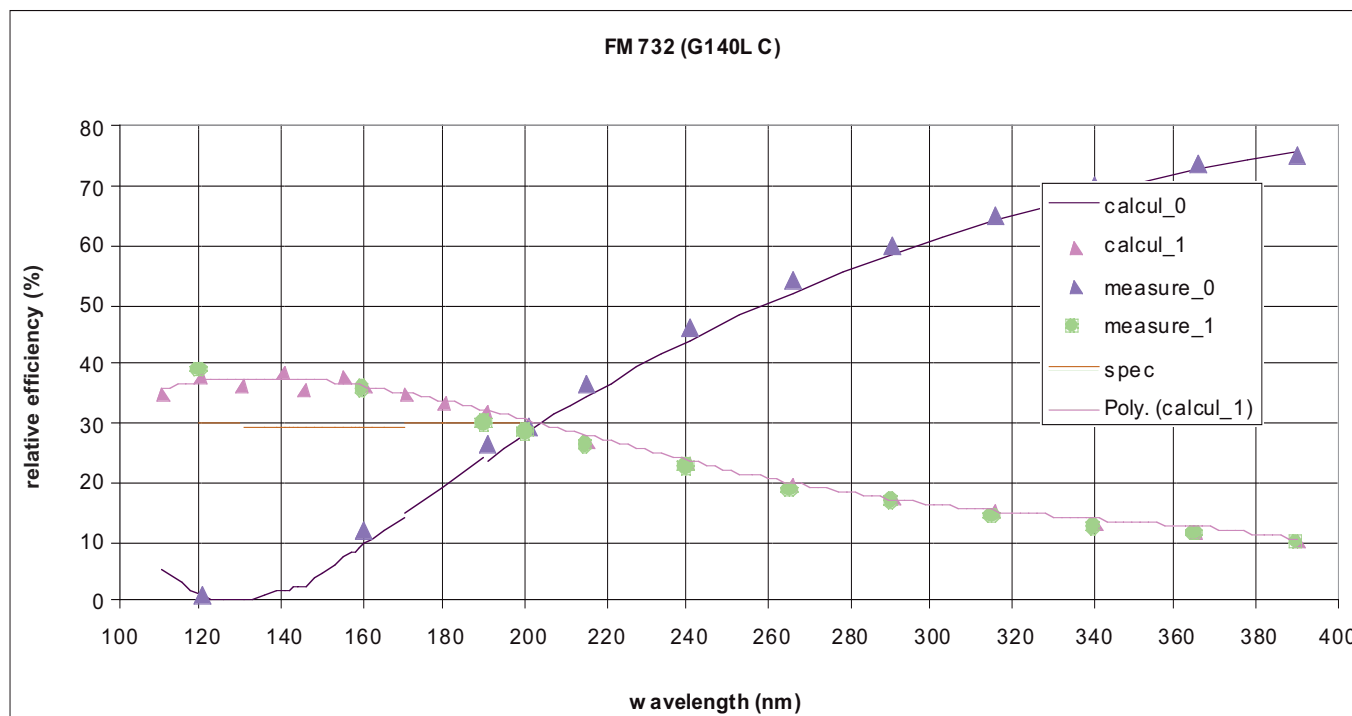
Item	Delivery Date	Coating Dates at GSFC	Test Dates	Planned Test Location
G140L	7/00	7/00	8/00-10/00	CU
G160M	11/00	11/00	12/00-3/01	CU
G140L-Blazed	11/00	11/00	1/01	CU
G185M	8/00	8/00	9/00	GSFC
G225M	11/00	11/00	12/00	GSFC
G285M	12/00	12/00	1/01	GSFC
G230L	1/01	1/01	2/01	GSFC



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## Optics Development Status - G140L Efficiency





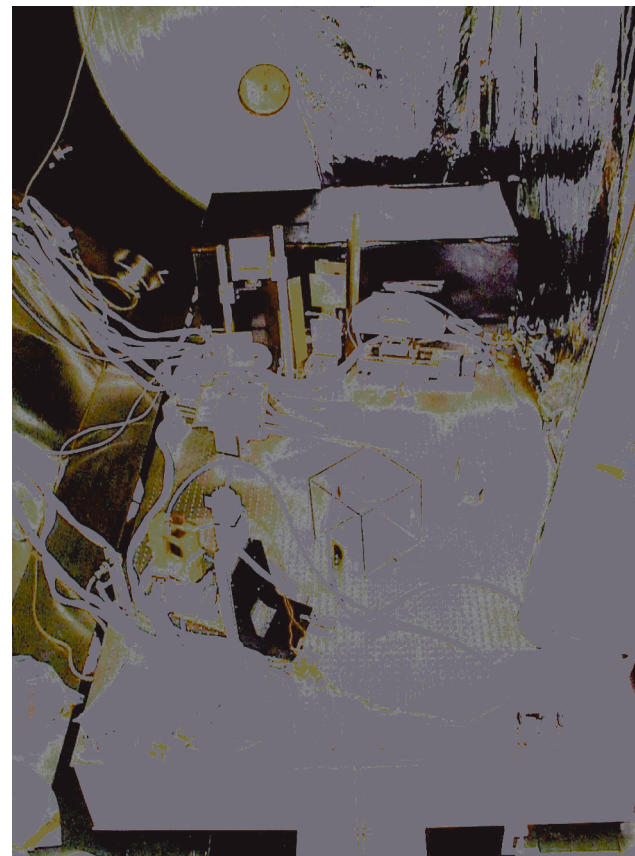
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### Optics Test Status

- Both G130M-b and G130M-c have been tested.
- G130M test data is in final reduction now. Final test reports to be issued in late July.
- G140L test preparations are ongoing.
- Expect to start G140L testing in August.





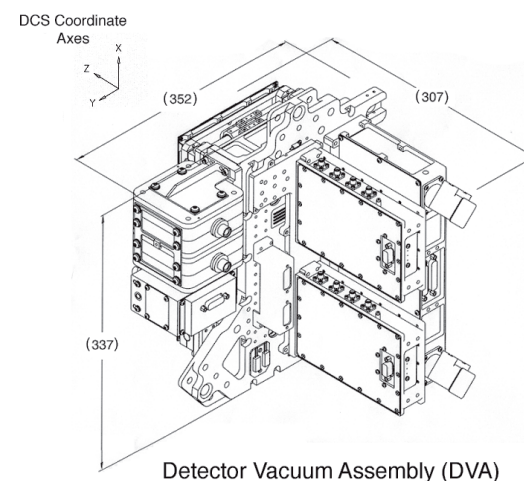
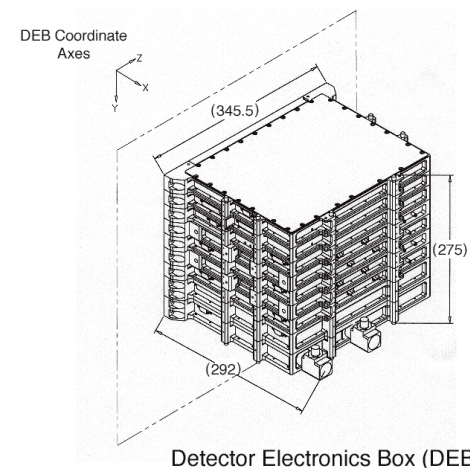


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## Overview of FUV Detector Assemblies

- **DEB - (Detector Electronics Box)**
  - DCE (Detector Control Electronics))
  - TDCs (Time-to-Digital Converters)
  - HVPS (High Voltage Power Supply)
  - LVPC (Low Voltage Power Converter)
- **DVA - (Detector Vacuum Assembly)**
  - VHA (Vacuum Housing Assembly)
    - Detector Door Mechanism
    - Ion Pump Assembly
  - DBA (Detector Backplate Assembly)
    - Amplifiers
    - HVFM (High Voltage Filter Module)





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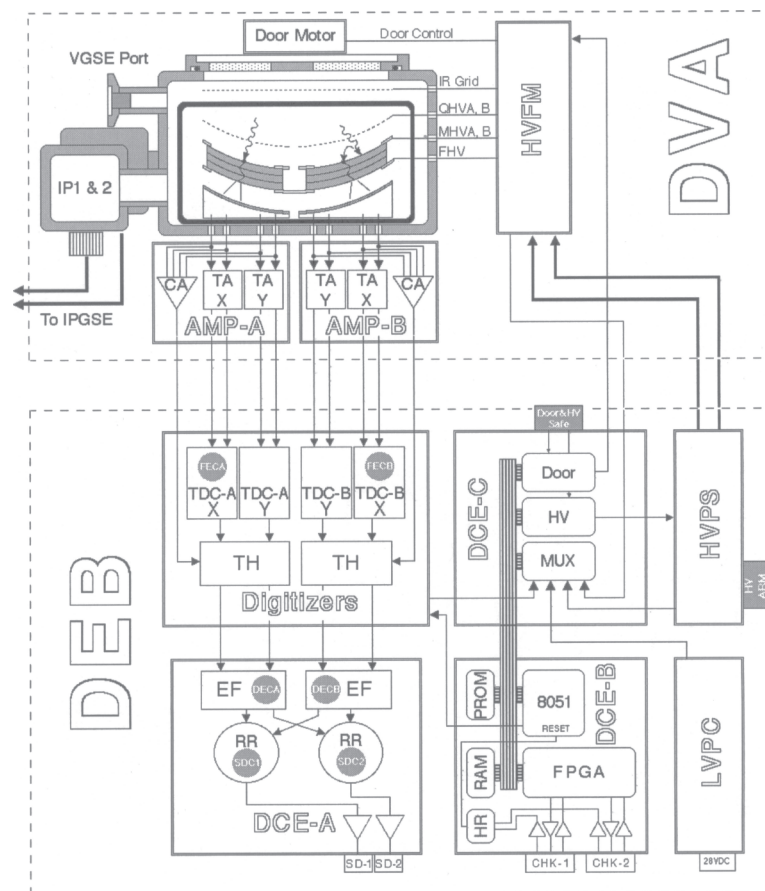
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### FUV Detector Subsystem Block Diagram

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



TA - Timing Amplifier  
CA - Charge Amplifier  
TDC - Time-to-Digital Converter  
TH - Threshold Ckt  
EF - Event Formatter  
RR - Round Robin Arbitrator

FEC - Front End Counter  
PRC - Preamp Reset Counter  
DEC - Digitized Event Counter  
SDC - Science Data Counter  
HR - Hardware Reset Ckt

GG 11/99



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### **UCB FUV Detector Status - Personnel Issues**

- One part-time COS M.E. announced he is departing at the end of July.
- J&T has completed DCE functional testing.
- Raffanti still supporting UCB ~ 1 day/week plus consulting via daily phone conversations.
- Baja Technologies is still supporting electrical systems test and integration preparations. Their contract is being modified to extend through 12/00.
- MAG Systems has temporarily completed COS activities and will pick-up spare detector assembly and test starting August.



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## **UCB FUV Detector Status - Facilities**

- Building renovations have started.
- All UCB COS personnel and most facilities are being moved to the new Space Sciences Building.
- Personnel are now moving and should be finished by mid-July.
- Cleanroom operations are expected to transition after new temporary cleanroom arrives in next few weeks.



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## **UCB FUV Detector Status - Detector Vacuum Assembly**

- DVA door assembly build-up was started in June and will continue into July.
- Flight door motor/gear-box assembly will be TQCM contamination certified at CU 1st week of July.
- Vacuum Box, door assemblies, etc. will be assembled, leak checked, and operationally tested in July.



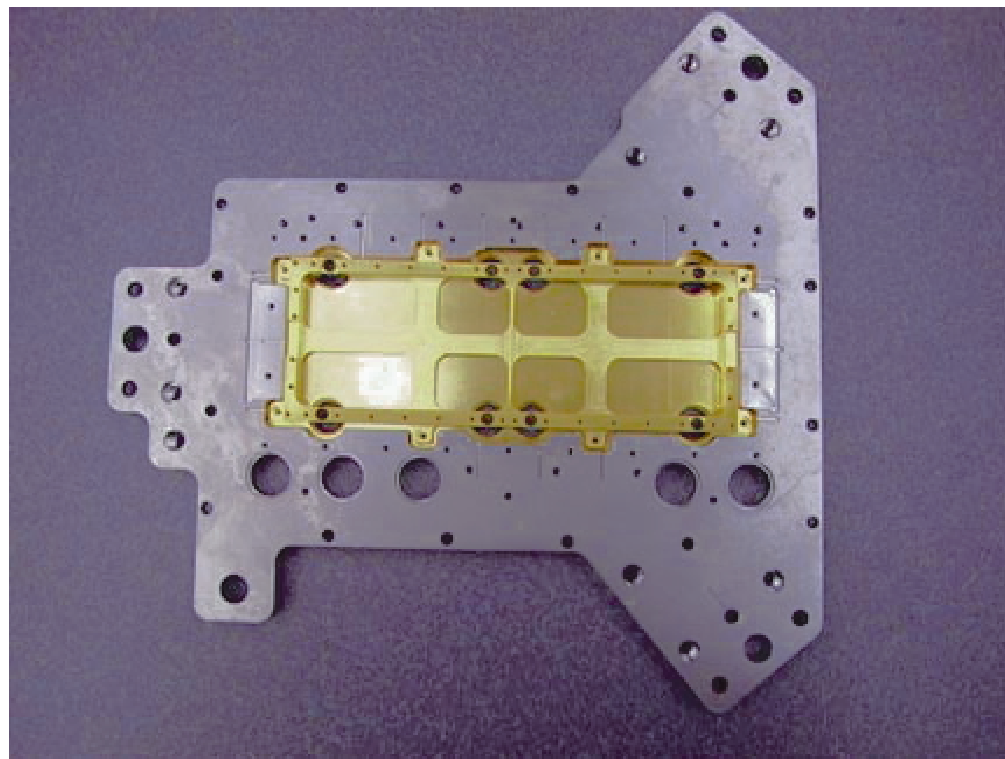
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### UCB FUV Detector Status - DVA Continued

- 4 backplates have now been fabricated and are in-house at UCB.
- Backplate No. 1 has had feedthroughs welded and leak-checked and is out for CMM.
- Backplate No. 1 ready for metrology at GSFC (K. Redman) by 7/5/00.
- Backpates 2 & 3 waiting to be lapped at local UCB subcontractor prior to feedthrough installation.
- Backplates 2 & 3 should be ready for metrology at GSFC ~8/1/00.





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### 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	NS	NS
Stuff Boards	C	C	C	C	C	C	C	NS	NS
Board Workmanship Acceptance	C	C	C	C	C	C	C	NS	NS
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	S	C	C	C	NS	NS	NS	NS	NS
Voltage Margin Test	S	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		



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### UCB FUV Detector Status - Actels

ACTIVITY	ACTEL FPGA's								
	Amps	HVFM	HVPS	LVPC	DCE-A	DCE-B	DCE-C	TDC-X	TDC-Y
Initial ACTEL Design	NA	NA	NA	NA	C	C	NA	C	C
ACTEL Peer Review	NA	NA	NA	NA	C	C	NA	C	C
End-to-end System Simulation	NA	NA	NA	NA	S	S	NA	NS	NS
FPGA tests with ETU electronics	NA	NA	NA	NA	C	C	NA	S	S
Release ACTEL schematic/burn	NA	NA	NA	NA	NS	NS	NA	NS	NS
Legend	C = Complete		NA = Not Applicable		S = Started		NS= not started		

- UCB, CU, DN are now working to plan an Actel acceptance review with GSFC with a target date of July 6.





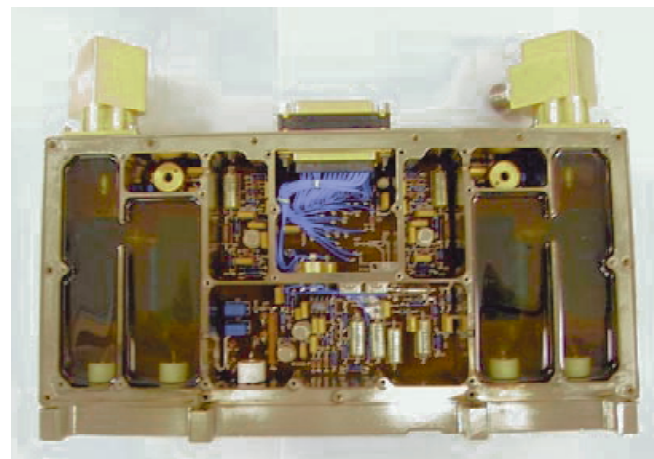
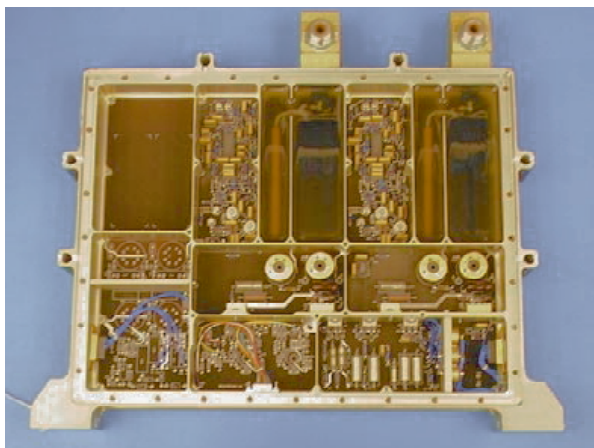
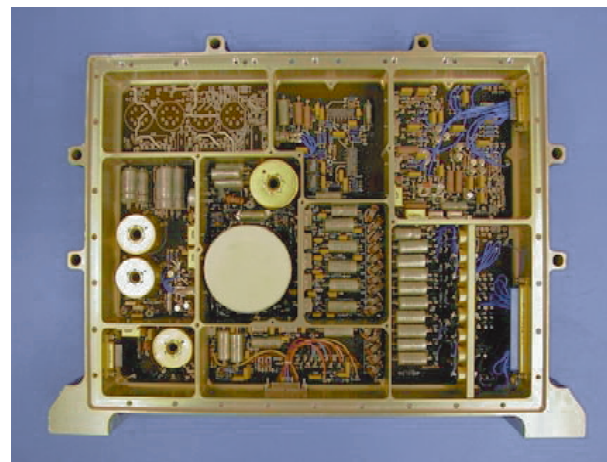
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### UCB FUV Detector Status - Power Systems

- Flight HVPS, LVPC, and HVFM are in-house and awaiting build-up into system.





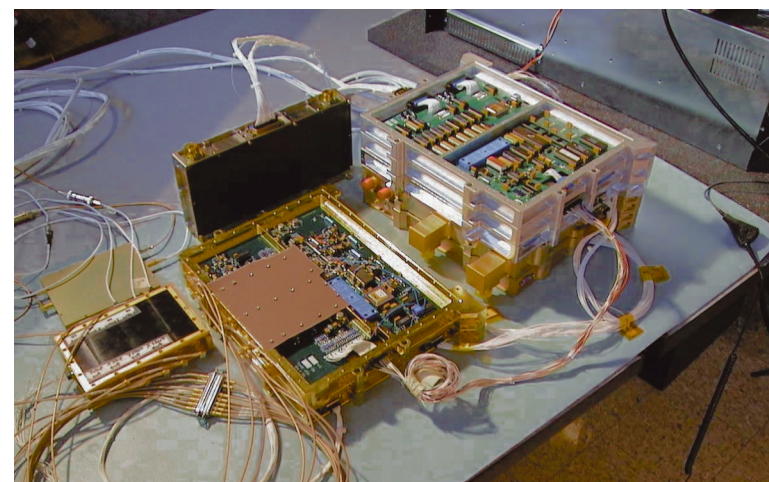
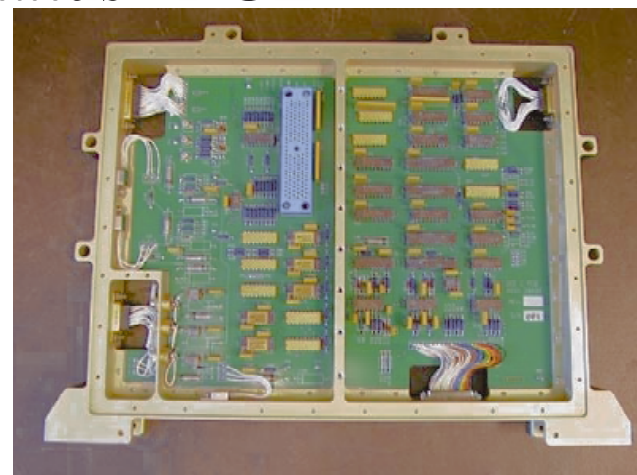
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### UCB FUV Detector Status - DCE

- Flight DCE boards have completed engineering acceptance and functional tests.
- Awaiting DCE Actel design review in early July before burning and installing flight Actels.
- Thermal cycling and additional functional testing scheduled through July.





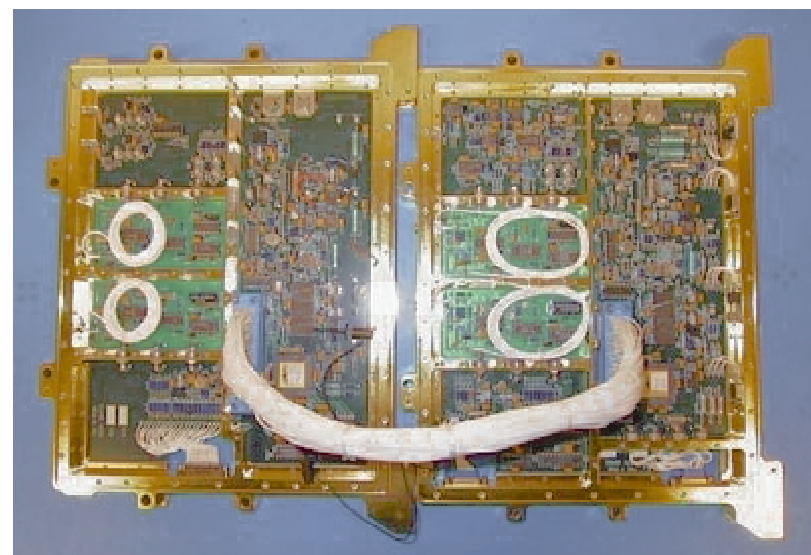
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### UCB FUV Detector Status TDC

- TDC Tiger Team met at UCB on May 24 to evaluate TDC resolution and resolution vs. rate performance.
- Several circuit modifications were proposed, some were implemented and improved performance, others had no affect.
- Upon further testing and tweaking through June, the performance reached a threshold were the team agreed to proceed with board layout, fabrication, and assembly.,
- Further assessments of resolution and rate performance can only be made after the system starts integration in August/September.
- Stuffing of the 8 PWAs will occur at J&T in July.



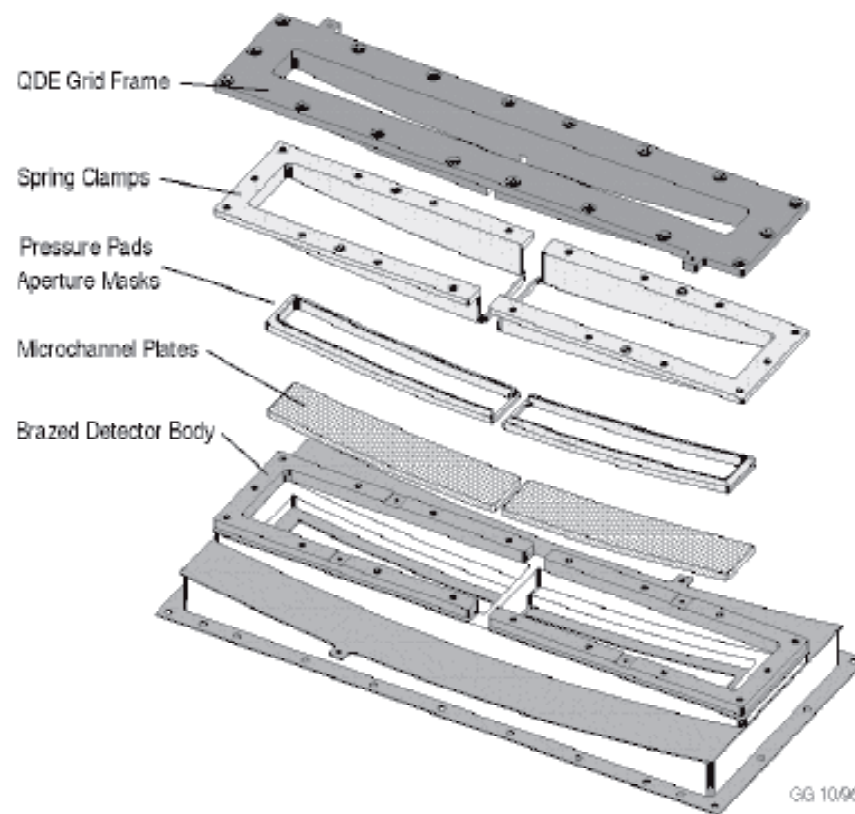
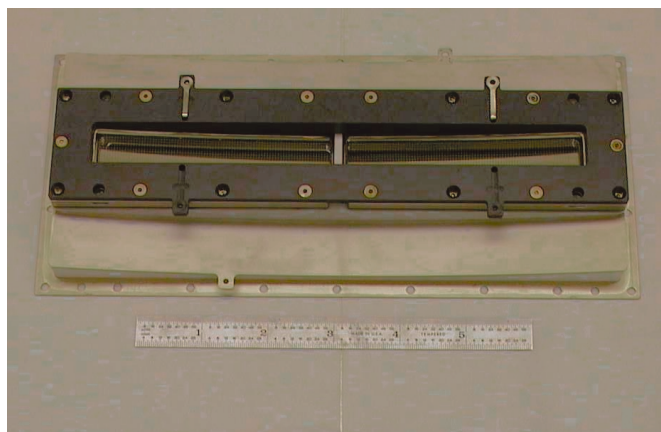


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## UCB FUV Detector Status - BBA

- All brazed body assembly (BBA) hardware is in-house and ready to start BBA #1 assembly and MCP optimization process.
- Optimization for BBA #1 and BBA #2 scheduled for all of July.





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### 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:

	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



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**UCB FUV Detector Status - Schedule Overview**

<b>Activity/Task</b>	<b>Planned</b>	<b>Actual</b>	<b>Status</b>
Complete VHA	7/11/00 – 8/3/00		Prep work in progress
TDC Fab	7/5/00 – 8/7/00		Parts kitting started
DCE Thermal Tests	7/11/00 – 8/2/00		Awaiting Actel design review
MCP/BBA Optimization	6/26/00 – 8/1/00	6/26/00	BBA #1 work started
Start System Integration	9/6/00		
Deliver Flight No. 1 to Ball	3/28/00		Two months late



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**UCB FUV Detector Status - Candidate Schedule Descopes**

	<b>Descoped Activity</b>	<b>Time Saved</b>	<b>Risk Incurred</b>
1	UV QE detailed calibration	3 weeks	Lack of detailed QE knowledge prior to detector delivery.
2	Flat field detailed calibration	1 week	Lack of detailed flat-field knowledge & performance prior to detector delivery
3	Resolution detailed scan check	3 weeks	Lack of detailed resolution knowledge & performance prior to detector delivery



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## **UCB FUV Detector Status - Summary**

- With the exception of the X & Y TDCs, all major hardware elements are now in-house at UCB.
- TDC development is the critical path and board stuffing is slated to start next week.
- At present, without yet implementing any descopes, UCB's delivery date is forecast to be some 8 weeks after Ball's stated need date.
- As a team, we will continue to pursue other possible descopes and schedule work arounds to accommodate delays in the detector schedule.





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### 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 Demo/Testing held at BATC on June 22 & 23, 2000.
    - Build II tools and overall program functionality approx. 3 weeks ahead of schedule.
    - Build II release, w/ on-line documentation, slated for completion on July 17, 2000.
    - Start of Build III development requires release of DM-06 and DM-02 by BATC. CEDAR lead developer (Stéphane Béland) will move onto other COS programming tasks (i.e., CALCOS GSE software) until BATC documentation is released.
    - Build III development, test and documentation will take approx. 1 month from the time DM-06 and DM-02 are released.
    - Build III usage at BATC expected in the December, 2000 timeframe.



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### **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 TAACOS Report for FUV Channel issued in draft form on 5/25/2000.
  - Report on Recommended Target Acquisition FSW Changes issued in draft form on 5/31/2000.
  - Comments on Phase I TAACOS Report incorporated, and document released for signatures on 6/27/2000.
  - Revised Report on Recommended Target Acquisition FSW and Operations Changes to be released in early July, 2000.
  - Phase I Software for NUV channel in development and slated for completion in late July, 2000.
  - Phase I TAACOS Report for NUV Channel to be completed in early August, 2000.
  - Phase II TAACOS software development contingent upon recommendations from COWG and COS FSW Team, and the schedule for CALCOS GSE software development. Phase II TAACOS development, if initiated, will begin no earlier than August, 2000.



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## **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/>
    - DCE Software Development is well underway, with current code supporting FUV Detector HW development and test.
    - DCE FSW Code Walk-Thru (Part 1 of 3) held on June 5 & 6, 2000. Generated 54 Action Items from the Review. Next Code Walk-Thru is scheduled for July 27 & 28, 2000 - but the review process and schedule are being re-examined, so this date may change.
    - DCE Software Test Procedures are in development, and all unit and component test procedures are expected to be complete by late August, 2000.



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### COS Schedule for CU

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

<b>Task</b>	<b>Status</b>
G160M/G140L-Blazed Grating Testing	G160M/G140L-Blazed tests completion will slip out 2 months due to delays in grating delivery
CEDAR Software Development	Ahead of schedule
TAACOS Software Development	On schedule
G140L Gratings & Testing	Grating pick-up 6/30/00. CU will be ready to start testing in 8/00.



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## Questions, Issues & Resolution Plan

- None



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### **Upcoming Events/Activities**

- Take delivery of NUV flight optics from Tinsley.
- Continue G140L test preparations.
- Incorporate NUV channel details into TAACOS.
- Work/plan descopes/work-arounds for FUV detector.
- Oversee TDC board fabrication efforts.
- Continue MCP/BBA optimization at UCB.
- Complete DCE thermal cycling and functional tests at UCB.