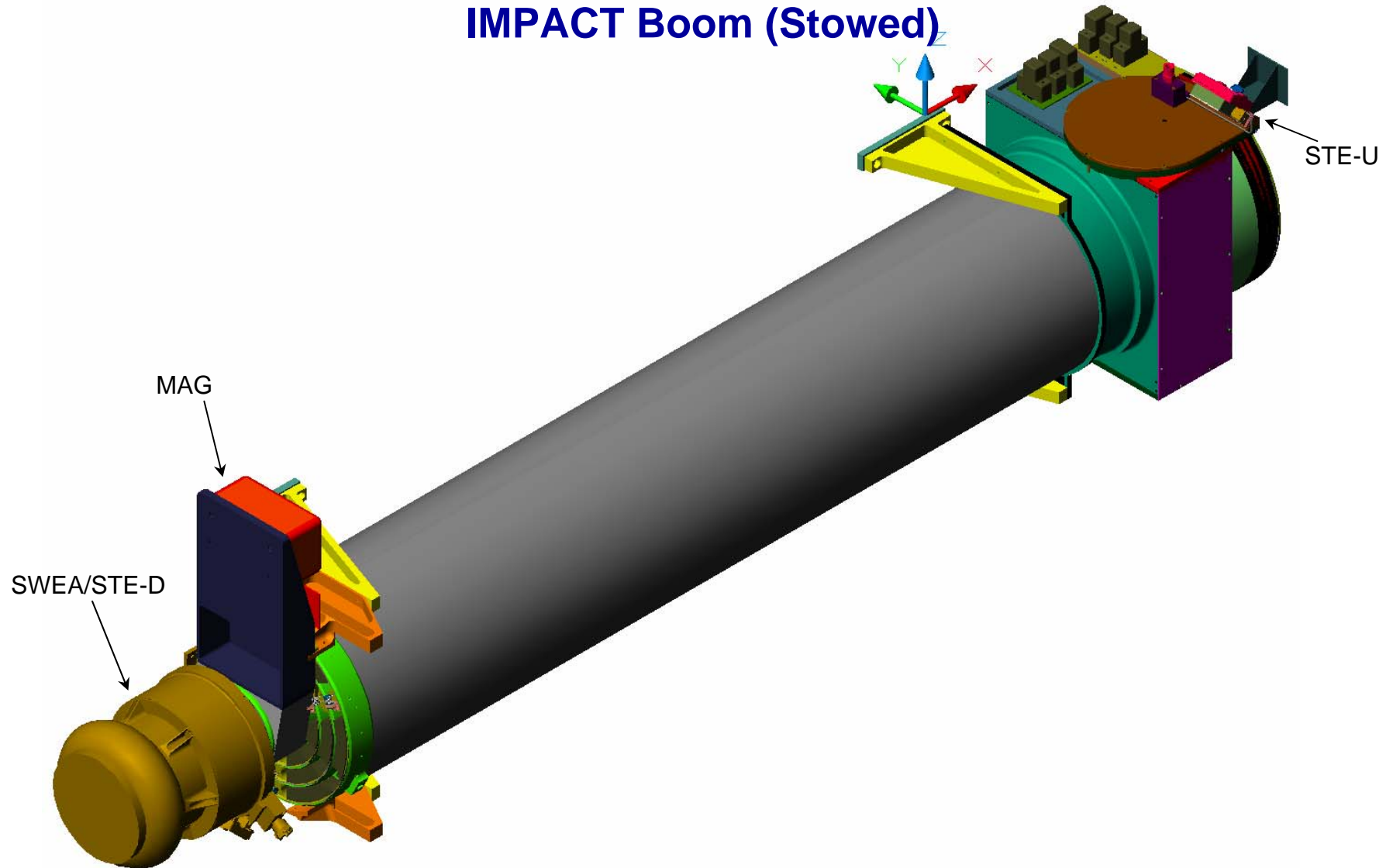




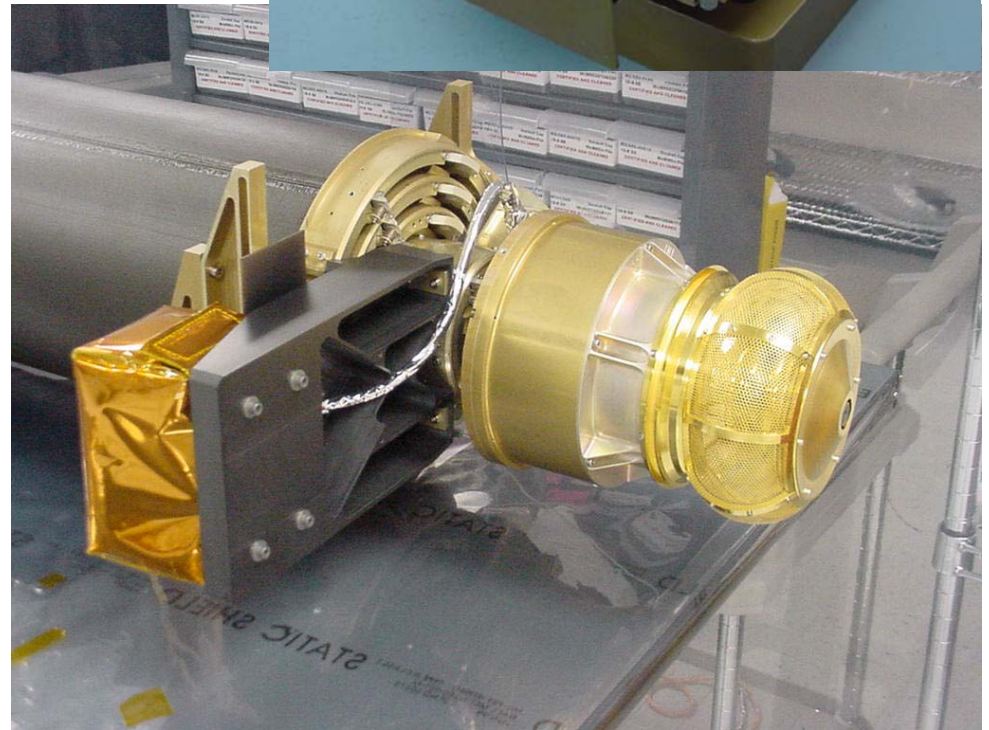
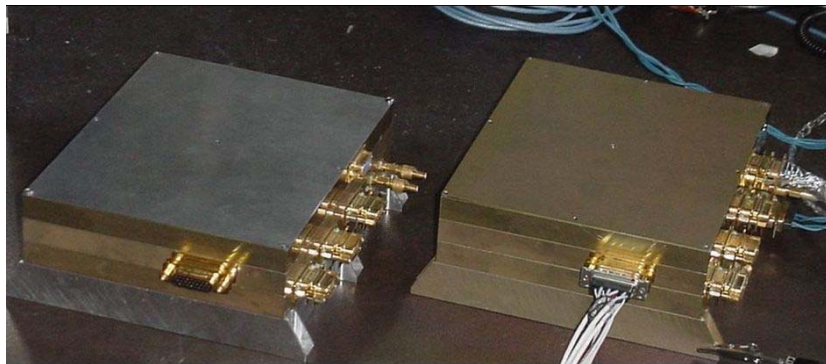
Team Member Institutions and Primary Roles

- **University of California, Berkeley-Space Sciences Laboratory (IMPACT Management, SWEA, STE, IDPU)**
- **NASA Goddard Space Flight Center (MAG, SEP-LET, HET)**
- **California Institute of Technology (SEP-LET, HET)**
- **University of Maryland (SEP-SIT)**
- ***University of Kiel (SEP-SEPT)***
- ***Centre d'Etude Spatiale des Rayonnements CESR (SWEA)***
- **Los Alamos National Laboratory (Science Integration, SEP-SIT)**
- ***Max Planck Institut fur Aeronomie (SEP-SIT)***
- **Jet Propulsion Laboratory (SEP-LET, HET)**
- ***ESTEC-European Space Agency (SEP-SEPT)***
- ***DESPA Observatoire de Paris-Meudon (SWAVES/IMPACT coordination)***
- **University of California, Los Angeles (MAG, IMPACT Data Web)**
- **SAIC-Science Applications International Corporation (IMPACT Modeling)**
- **NOAA Space Environment Center (IMPACT Modeling, Space Weather Applications)**
- **University of Michigan (IMPACT Modeling)**
- ***KFKI-Hungarian Research Institute for Particle and Nuclear Physics (SEP Modeling)***

IMPACT Boom (Stowed)

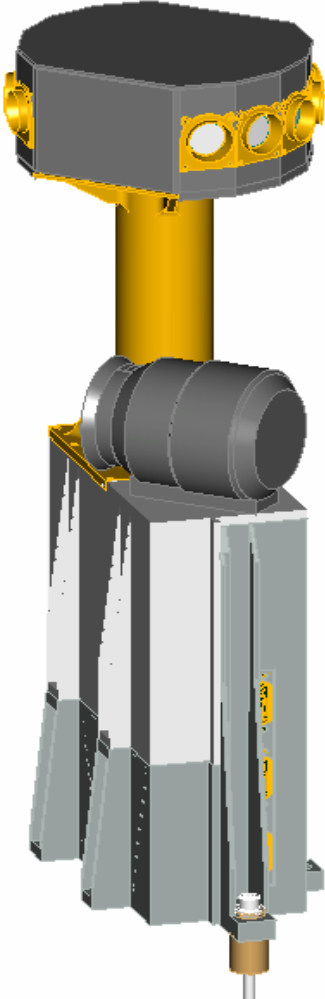


Boom Suite



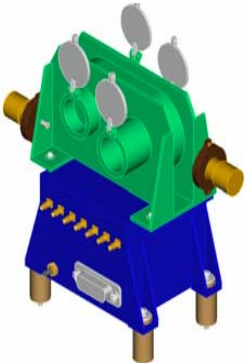
STEREO IMPACT

SWG 2005 May 2-4,
Hamburg

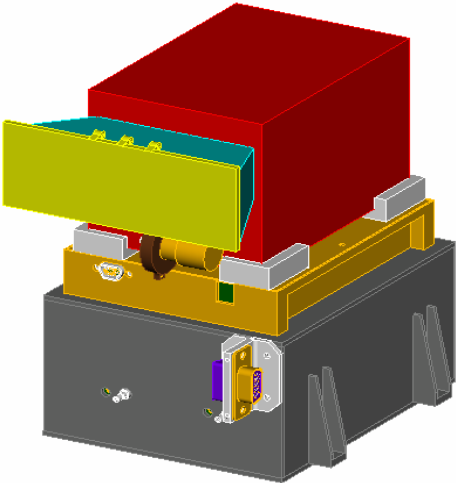


SEP Central/HET/LET

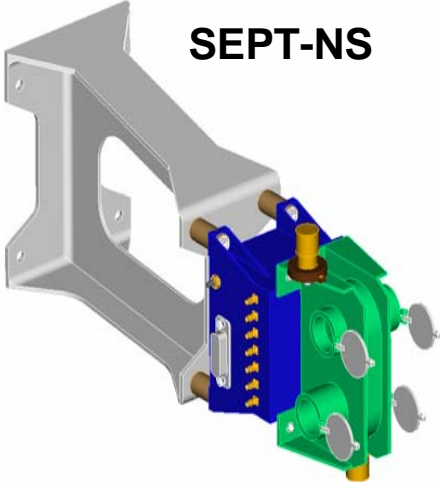
SEP



SEPT-E



SIT

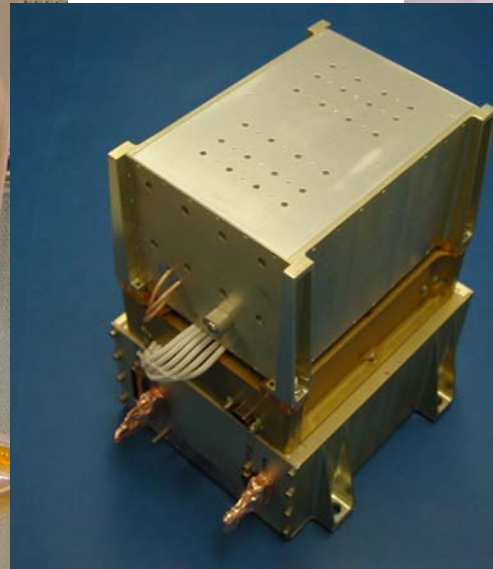
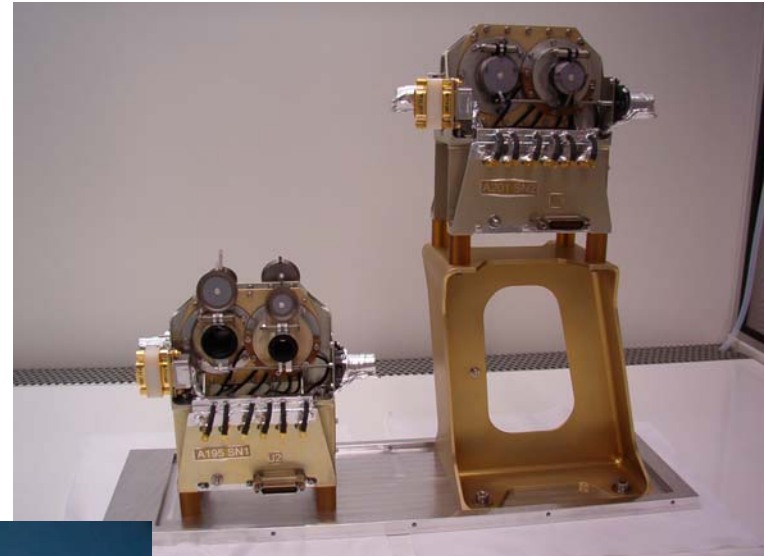


SEPT-NS

STEREO IMPACT

SWG 2005 May 2-4,
Hamburg

SEP



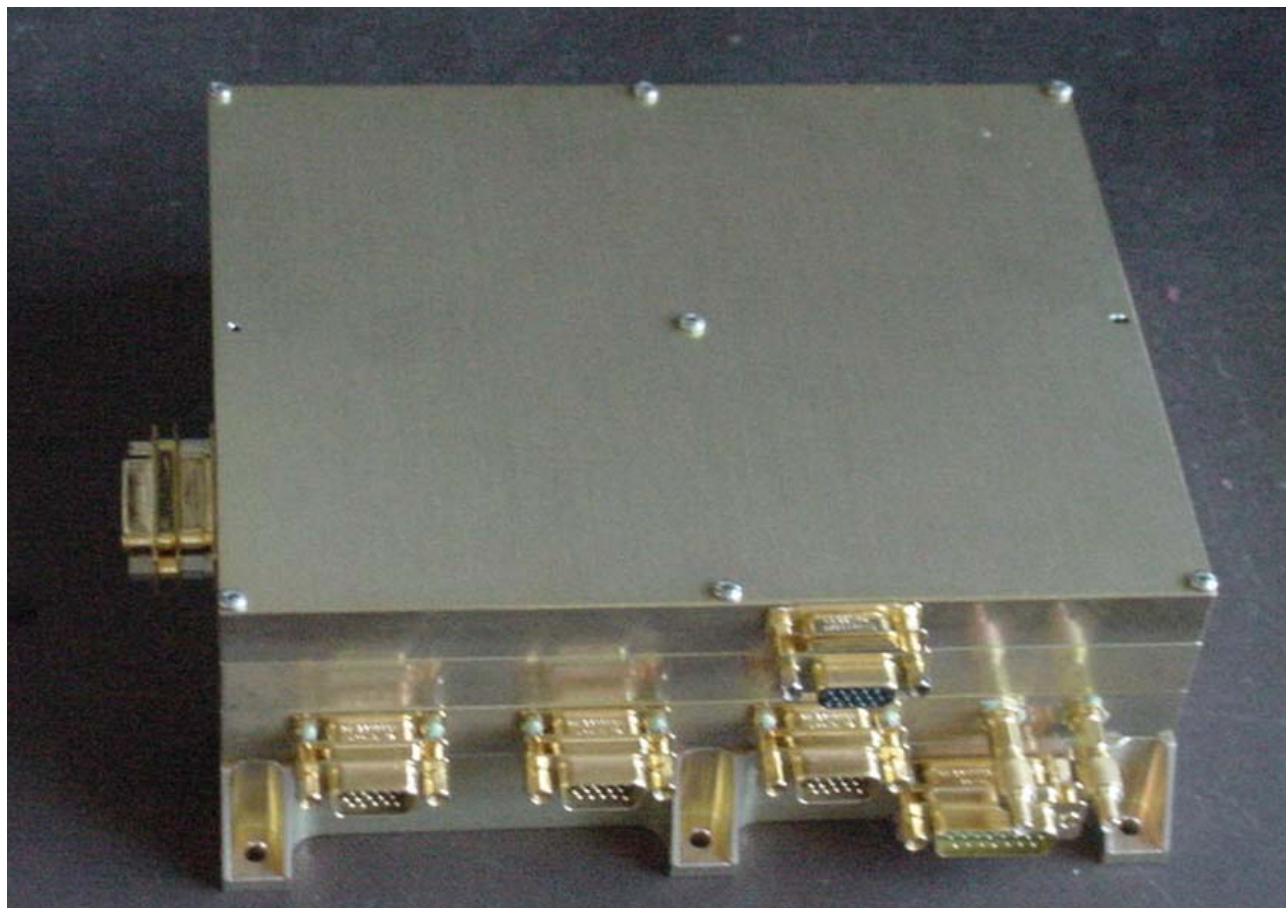
Testing



FM1 IDPU
Pre-ship review
March 2, 2005
Highlights



IMPACT FM1 IDPU



IDPU Verification Matrix

		Verification Matrix for STEREO/IMPACT/IDPU																		
Hardware Description		Test																		
Level of Assembly	Item	Elect. test, rm. Temp	Elect. Test, hot	Elect. Test, cold	Vibration, Sinusoidal	Vibration, Random	Shock	Acoustics	Pressure change	Voltage margins	Thermal Vacuum	Thermal balance	>100 hours Operation	EMC/EMI	Magnetics	Leak	Bakeout	Mass Properties	Outgassing	Contamination
C	PWB, EM	C	C	C						C			C							
I	IDPU EM	C								C			C	C						
C	PWB, F	C	C	C						C			C							
I	IDPU, FM1	C	C	C	C	C			A	C	C		C	C	C		C	X	C	X
I	IDPU, FM2	C	C	C	C	C			A	C	C		C	X	X		C	X	C	X
Legend:																				
Level of Assembly		Unit Type										X = Test required								
C = Component		BB = Breadboard										A = Analysis								
I = Instrument		EM = Engineering Model										H = at higher level of assembly								
		PT = Prototype										C = Test Completed								
		PF = Protoflight																		
		F = Flight																		

Full IMPACT Verification Matrix at:

http://sprg.ssl.berkeley.edu/impact/dwc/Verification/IMPACTVerificationMatrix_2005-3-1.pdf

Performance Data

- **Mag, STE-U and Power Supply measurements were trended throughout testing**
 - **MAG and STE-U analog interfaces included In the IDPU**
 - **No significant trends were found**
- **All performance measurements met or exceeded the requirements**
 - **Current processor load is 58%, code space is 54% of available memory**
 - **Anticipate no problems accommodating remaining PLASTIC software tasks**
- **MAG and STE-U performance details to be reported at the boom Pre-Ship review**

Operating Hours

- **Most of the FM1 IDPU has operated for over 1,000 hours trouble free**
- **Since the last change (reverse biased capacitor, PFR1032)**
 - **Thermal Vac #2: 135.6 Hours**
 - **Post Vib CPT: 2.4 Hours**
 - **Software Load, Test: 34.5 Hours**
 - **Boom Suite I&T: ~48 hours so far, expect ~200 before shipping**

Outstanding Issues

- **IMPACT FM1 EMC Waiver not signed off**
 - Official waiver should be into approval cycle shortly
- **IDPU Flight Software is not complete**
 - Will be loaded from the POC via the commanding system when it is complete and passed acceptance tests
 - Should be in place prior to PLASTIC integration on the spacecraft
- **IDPU does not currently have the required connector identifiers attached**
 - Will be kapton-taped to the box to avoid violating outgassing certification
- **Final mass properties and surface contamination screening still to be performed.**

GSE Status

- **IDPU GSE includes:**
 - **APL Spacecraft Emulator computer and software, used during bench tests**
 - **POC Command and Telemetry GSE and Science GSE computer and software**
 - **Includes Command and Telemetry Database**
 - **Displays all housekeeping, sends all commands**
 - **Has been in use for more than a year**
 - **Software & Database passed acceptance tests and under configuration control**
 - **Data Logger, power switching for bench testing**
 - **Simulates spacecraft functions**
 - **ETU MAG sensor and cable**
 - **Must be connected to IDPU when IDPU is powered until flight MAG is attached.**
- **All this GSE will be shipped to APL prior to delivery**
 - **Use in bench tests**
 - **Use POC (connected to Spacecraft ground system) after integration**

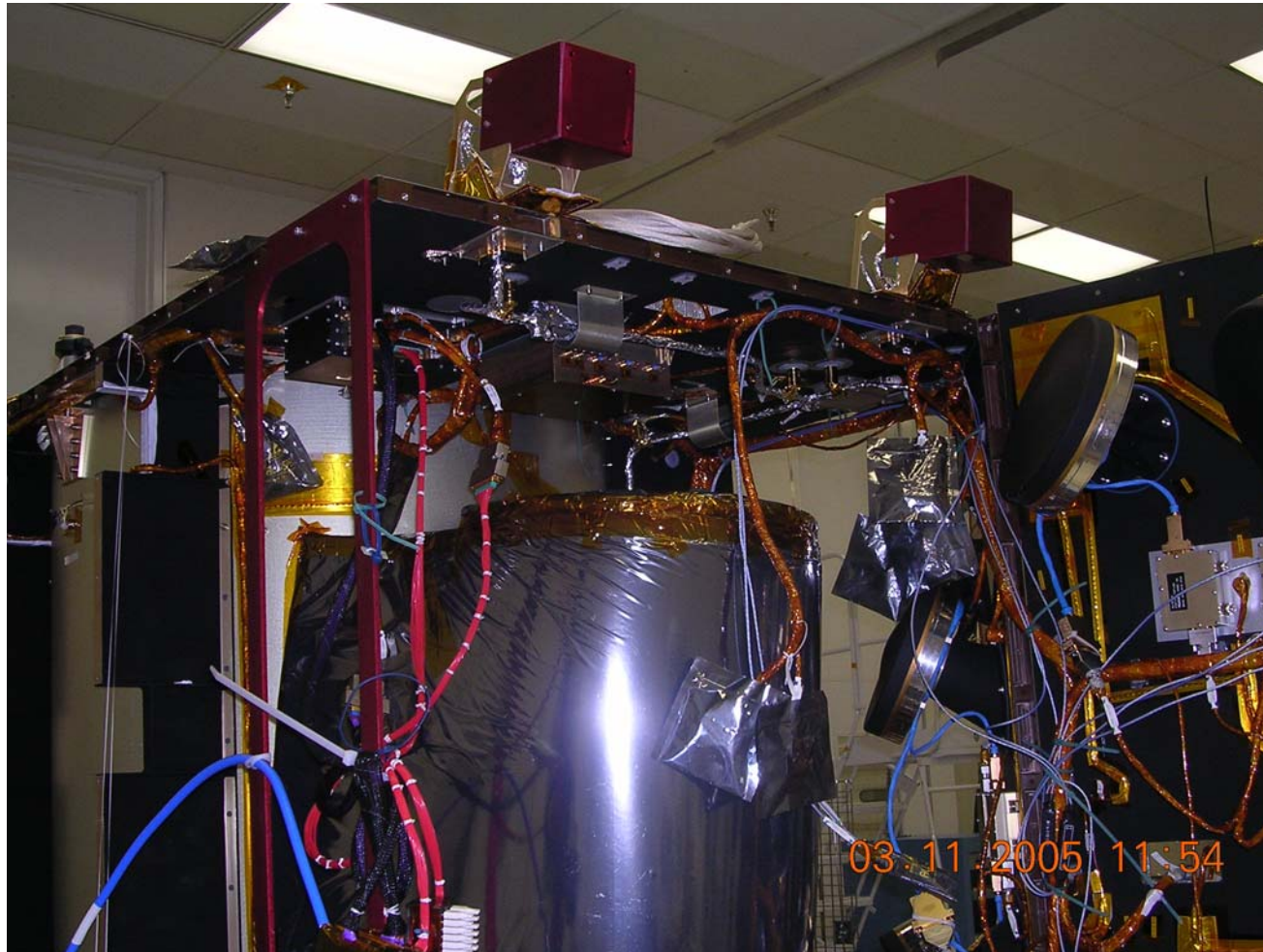
Immediate Plans

- **FM1 Boom Suite is currently integrated and collecting operating hours**
- **Kelly Henderson will come to UCB March 8 to do final contamination inspection**
- **While the instrument is de-bagged we will do final FM1 IDPU Mass Properties**
 - **Measured Mass is 1.90kg, Not to Exceed = 2.25kg**
 - **Still need CG**
- **Deliver to APL March 10**
 - **Hand-carried**
 - **Triple-bagged in lumalloy**
 - **Connector savers extend through inner bag**
 - **Outer bags are sealed, dry N2 back-filled.**
 - **All inside an Aluminum briefcase packed with bubble-wrap**
 - **Shock and humidity monitors will be included**
 - **Project to provide paperwork and advance warning to TSA, Airlines**

IDPU Post-Delivery at APL

- **On arrival at APL, FM1 IDPU went through a bench CPT and contamination inspection prior to mating with the spacecraft**
- **An APL procedure was used for spacecraft mating**
- **A safe-to-mate was performed prior to electrical mating**
- **A post-mating functional was run using the POC/MOC/Spacecraft/IDPU**
- **The SEP and Boom instruments are being shipped and integrated separately**
 - **SEP Suite is still in environmental tests**
 - **The FM1 Boom shipped, installed on the spacecraft, uninstalled**
- **Other than loading software, there are no other post-delivery operations required on this unit and no safety issues.**

IMPACT IDPU on the spacecraft@APL



Boom Suite
FM1 PSR
March 31 '05
Highlights



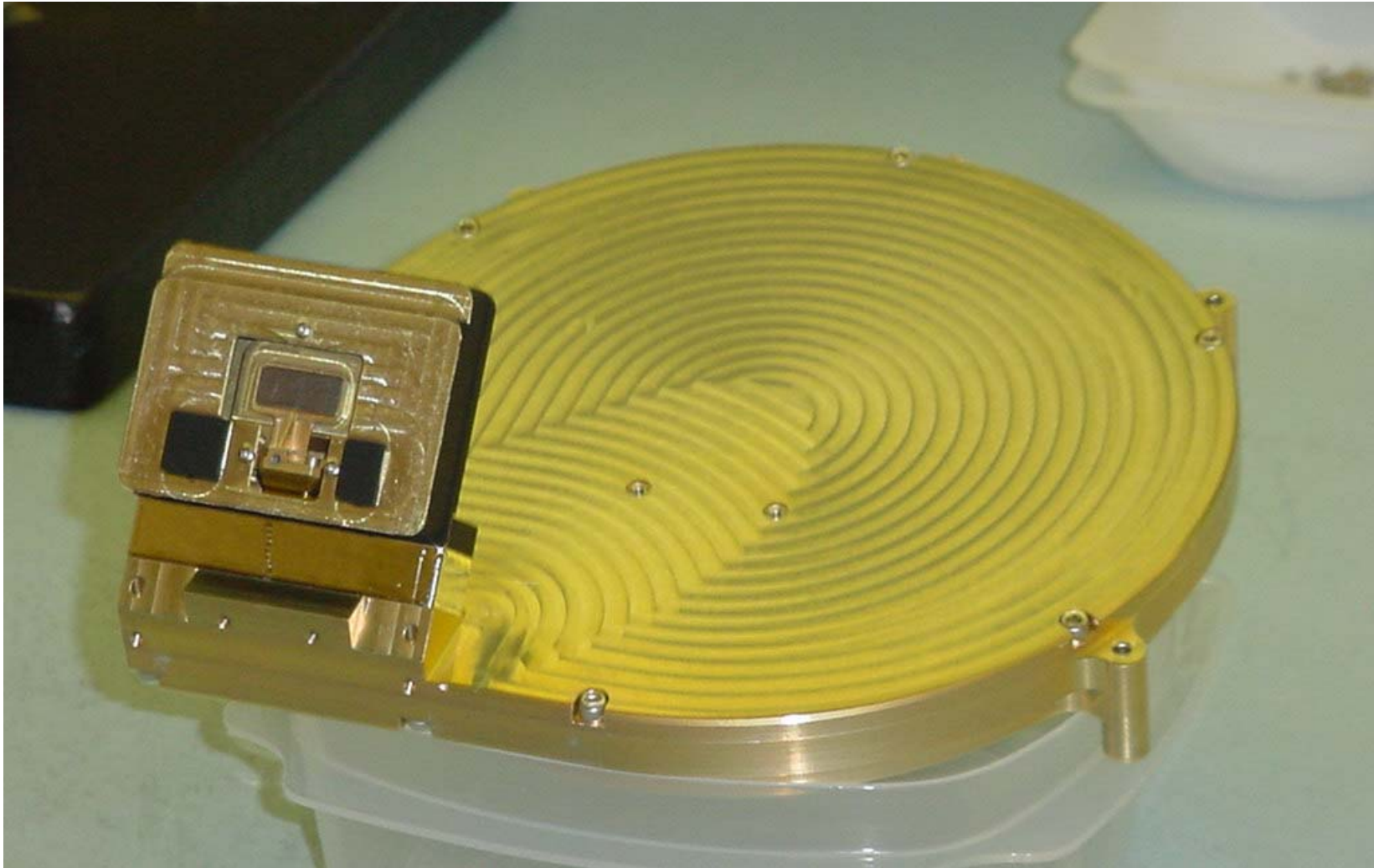
IMPACT FM1 BOOM



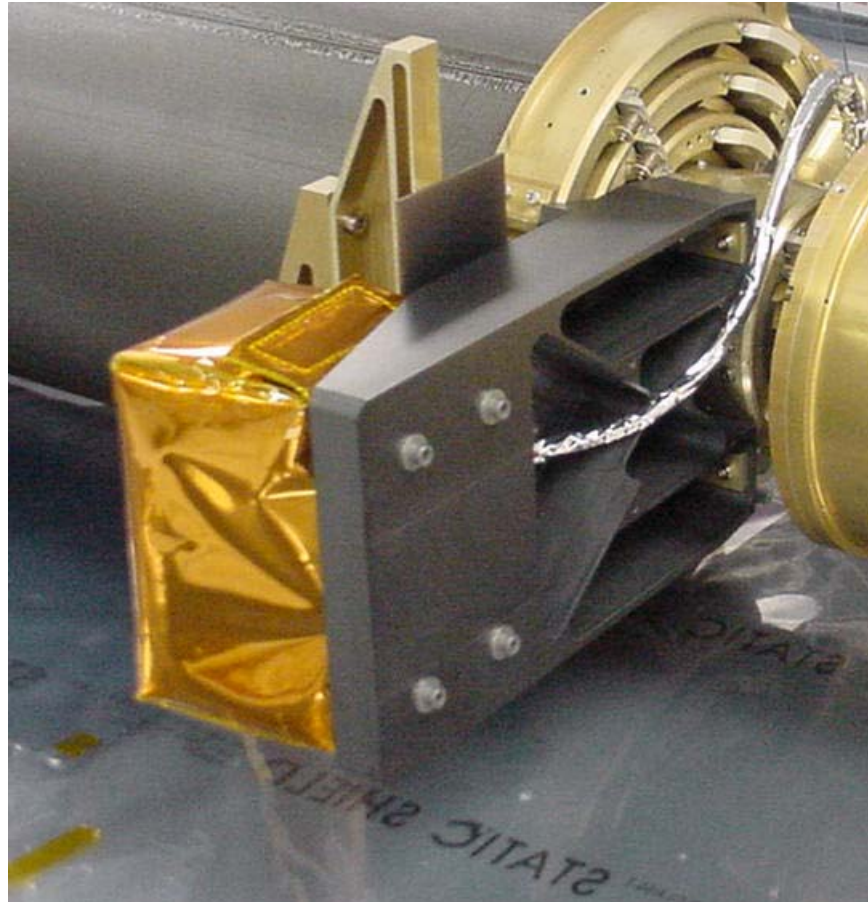
IMPACT FM1 SWEA/STE-D



IMPACT FM1 STE-U



IMPACT FM1 MAG Sensor



FM1 Boom Test History

- **09 Jan 2004 Assembly Begins.**
- **14 Jun 2004 Assembly Completed.**
- **June 2004 Magnetometer and STE-U Installed.**
- **28 Jun 2004 Vibration Test. Completed. Loose Pin found (PFR-1010)**
- **30 Jun 2004 STE-U Uninstalled.**
- **1-16 Jul 2004 Thermal Vacuum Test. Completed.**
- **16 Jul 2004 Bakeout Qualification. Completed.**
- **Oct 2004 STE-U Installed.**
- **18 Oct 2004 – 1 Nov 2004**
 - **EMC test with the full IMPACT Suite. Completed.**
- **EMC test exceedances have been accepted by the EMC committee; the official waiver is in process.**
- **03 Mar 2005 SWEA Harness Failure (PFR-1038).**
- **17 Mar 2005 SWEA Final Integration. Boom Complete.**

Boom Verification Matrix

		Verification Matrix for STEREO/IMPACT/Boom												Revision Date: 1/6/2004						
														Revision Number: 5						
Hardware Description		Test																		
Level of Assembly	Item	Deploy Test, Room Temperature	Deploy Test, Thermal Vac	Stiffness, Proof Load	Vibration, Sinusoidal	Vibration, Random	Self Shock	Acoustics	Alignment	Force Margin Deployment	Thermal Vacuum	Thermal Cycle	Thermal Balance	End-to-End Conductance Test	EMC/EMI	Magnetics	Bakeout	Deployment Contamination	Contamination Inspection	Comments
		C	Proto	P		P														
C	EM	P		P														P		Qual levels
C	PF/FS	P	P	P	P	P	P	P	P	P	P	P	P	P		P				Protoflight levels
C	FM1	P		P				P			P			P		P			P	Protoflight levels
C	FM2	P		P				P			P			P		P			X	Protoflight levels
S	FM1		P		P	P	S			P	P	P			P		P			Protoflight levels
S	FM2		P		P	P	S			P	P	P					P			Protoflight levels
Legend:																				
Level of Assembly		Unit Type								Status										
C = Component		PT =		Prototype						X = Test required										
S1 = with MAG, STE-U		PF/FS		Protoflight / Flight Spare						A = Analysis										
S = with all instruments		FM1 =		Flight unit #1						P = Performed										
		FM2 =		Flight unit #2																

Boom FM1 Problem/Failures

- **PFR1010, FM1 Vibration – Loose Pin**
 - Locating Pin found in the bagging between vibration runs
 - Replaced Magnetometer Tray Locating Pin
 - Staked FM 1 and 2 pins
 - This PFR has been signed-off and closed
- **PFR1028, FM1 SWEA Harness Fault**
 - SWEA clocking intermittent following installation
 - Harness checked and fault localized
 - Harness opened and checked, wires fell apart at solder joint
 - New soldering procedure used to rejoin AWG 36 Coax to lead wire
 - This PFR has been signed-off and closed



FM1 Boom Test Results

- **The FM1 Boom has been deployed 4 times. 3 were full deployments (all subsystems were included)**
- **The structure has been shown repeatedly to have a first frequency of ~1.9 Hz.**
- **The structure is stable in thermal cycling.**
- **The actuation and deployment systems function at survival temperatures.**
- **The structure, actuation and deployment systems function after sinusoidal and random vibration.**
- **Vibration levels were determined for all attached instruments.**
- **The Boom has been found to align the Magnetometer to within 11.8 arcmin (root of sum of squares) in the XY and XZ spacecraft planes. (The requirement is 52.5 arcmin.)**
- **The deployment system functions with adequate force margin.**

FM1 Boom Outstanding Issues

- **IMPACT FM1 EMC Waiver not signed off**
 - Official waiver should be into approval cycle shortly
- **Thermal Blankets and Taping to be applied after Spacecraft EMC**
 - Including STE Silver-Teflon
- **PFR1038, SWEA Harness Fault awaiting signatures**
- **Cow Catcher ESC Closeout**



FM1 Boom Suite Limited Life Items

- **Boom Deployments:**
 - Qual boom deployments: 28
 - FM1 boom deployments to date: 4
 - Anticipated boom deployment in spacecraft I&T: 1
 - Anticipated boom deployments on orbit: 1
- **SWEA Door Actuations**
 - Actuator life (manufacturer): 100
 - FM1 door actuations to date: 14
 - Anticipated actuations in spacecraft I&T: 2
 - Anticipated actuations in orbit: 1
- **STE Door Actuations (count motions)**
 - ETU Life test, (ambient / cold vacuum): 18,000 / 1,100
 - STE-U FM1 door actuations to date: 520 / 119
 - STE-D FM1 door actuations to date: 128 / 46
 - Anticipated actuations in spacecraft I&T (2 per CPT): ~20
 - Anticipated actuations on-orbit: ~58
 - 2-year mission

Boom Suite Safety

- **Premature boom deployment**
 - Possible personnel hazard, probably damage to unit
 - APL actuation safeing plug
 - Deployment prevention pin will remain in place most of the time
- **Radiation sources**
 - STE units have very weak calibration radiation sources in their doors
 - Radiation Safety paperwork has been submitted
- **SWEA High Voltage**
 - No personnel hazard – completely contained, but can damage instrument if powered on except in vacuum
 - Enable plug will not be installed except for thermal vac and launch
 - Delivered with test plug installed in place of flight plug

FM1 Boom Suite Delivery

- **FM1 Boom Suite integrated, tested, shipped in “custom” box**
- **Delivered to APL April 16**
 - **Shipping preparations**
 - **Double-bagged in lumalloy**
 - **Bags sealed, dry N2 back-filled.**
 - **Shock-mounted inside the boom shipping coffin**
 - **Shock and humidity monitors will be included**
 - **Project provided paperwork and advance warning to TSA, Airlines**
 - **Picked up and driven directly from the airport to APL**
 - **Arrangements made for late arrival at APL**



FM1 Boom-Suite Delivery to APL

- **On arrival at APL, unit returned to purge**
- **Unit underwent a radiation safety wipe-test, bench test, and contamination inspection prior to mating with the spacecraft**
- **An APL procedure was used for spacecraft mating**
- **A safe-to-mate was performed prior to electrical mating**
- **A post-mating functional were run using the POC/MOC/Spacecraft/IDPU**
- **The SEP instruments will be shipped and integrated at a later date**
 - **SEP Suite is still in environmental tests**
- **The boom will be deployed for spacecraft-level EMC tests**
 - **UCB to provide off-load fixture**
 - **Verifies no interference to deployment from spacecraft**
 - **Boom will be removed for stowing after EMC**

IMPACT FM1 Boom on the Spacecraft@APL

What's next for IMPACT?

- **Boom Suite FM2 PSR on ~May 11**
- **SEP Suite instruments to finish environments and PSRs (May-June)**
 - *FM1 and FM2 SEP/HET/LET passed acoustics, FM1 vibrated, next FM2, then thermal balance, thermal vac
 - *SEPT completed tests but needs thermal blanket fix and retest
 - *SIT passed thermal balance but has detector issues
- **Integration and Test at APL**
- **Set up and test Data Access sites at UCB and UCLA (including browsers) and support SSC Beacon setup**

