Agenda

8:30-12:00 Status reports
- STEREO Project Status- Project (20 min)
- IMPACT Overall Status- Luhmann (10 min)
- BOOM Package:
  - MAG- Acuna (15 min)
  - SWEA- Aoustin/Sauvaud (15 min)
  - STE- McBride (15 min)
  - Boom- Ullrich (15 min)

Break (10 min)
- SEP Package:
  - SEPT- Mueller-Mellin (15 min)
  - LET/Central- Mewaldt (15 min)
  - HET/Mechanical- von Rosenvinge (15 min)
  - SIT- von Rosenvinge (15 min)
- IDPU/GSE - Curtis (15 min)
- LVPS/SIT HVPS - Berg (15 min)

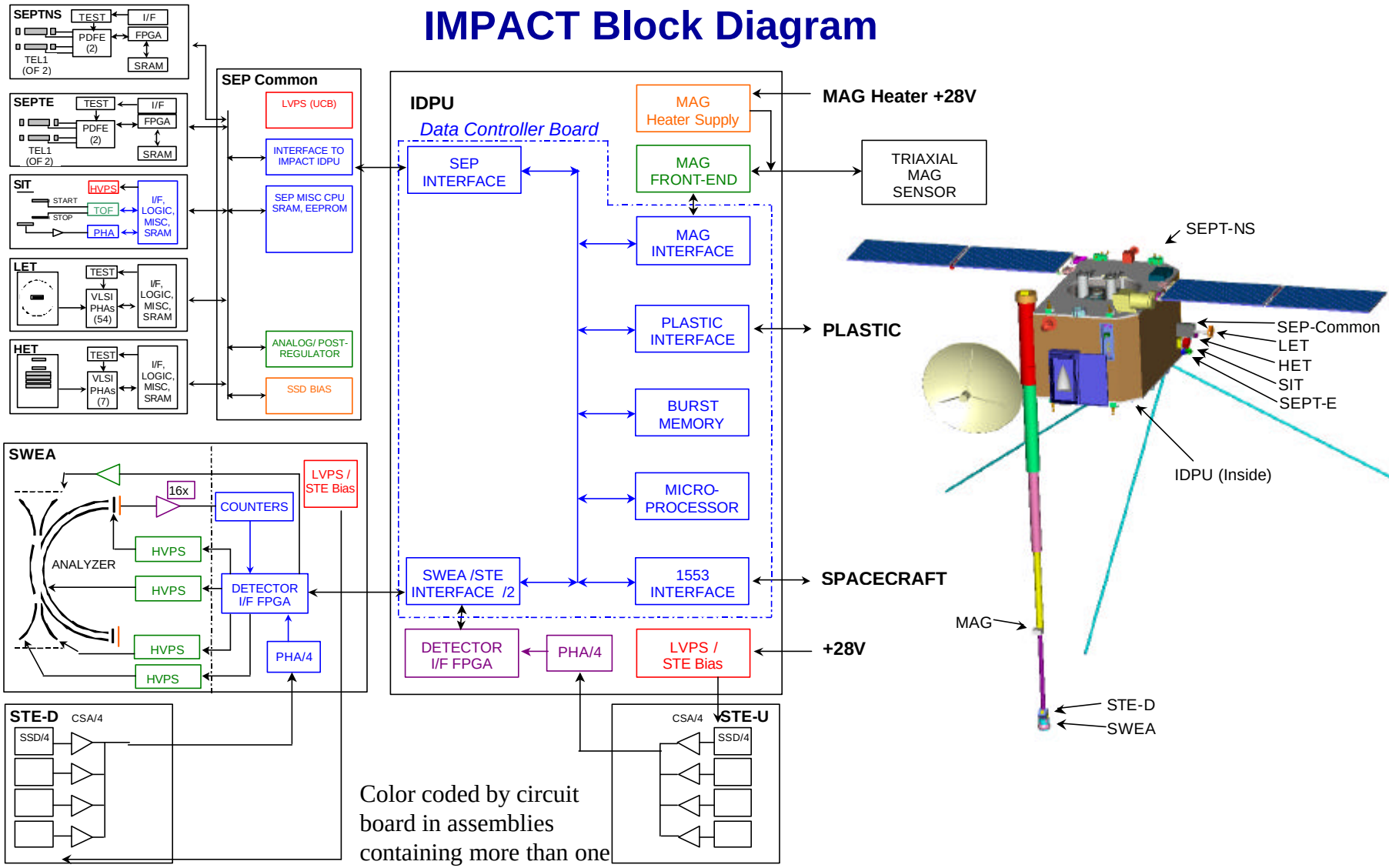
12:00-1:00 Lunch, Discussion

1:00-3:00
- IDPU Software Requirements / Design review- Curtis (2 hours)
- Break (10 min)

3:10-6:00
- Issues: Curtis/all
  - PAIP- (20 min)
  - ICD- (10 min)
  - EMC/Grounding- (20 min)
  - Telemetry/Beacon- (20 min)
  - Contamination Control- (20 min)
  - Environmental Requirements- (20 min)
  - Schedule- (20 min)

IDPU Status

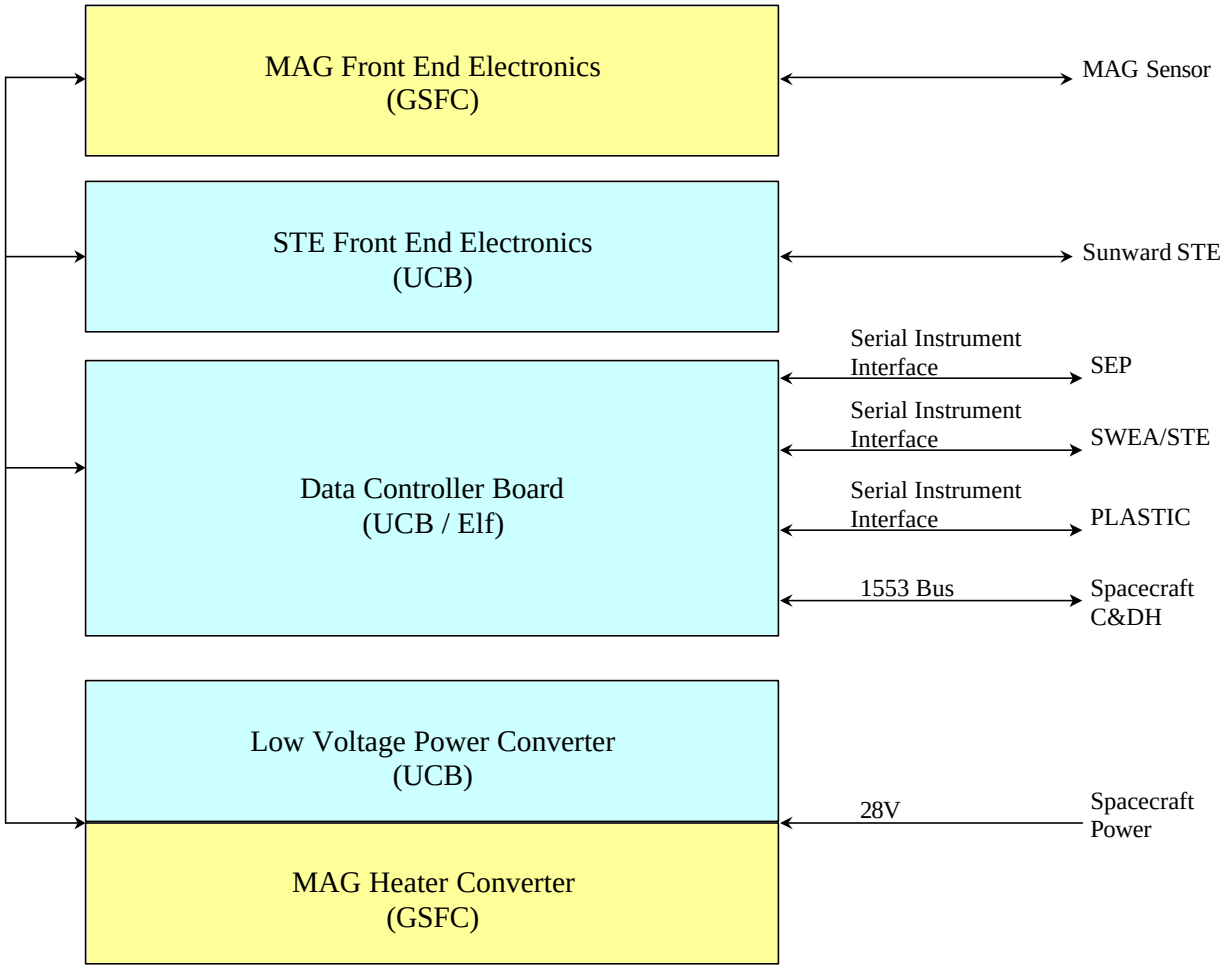
IMPACT Block Diagram



Color coded by circuit board in assemblies containing more than one board.

"Stackable Connector" Interconnect:
+/-12V, +/-5, +5V, +2.5V
MAG Serial Instrument Interface
MAG Heater Control
STE Serial Instrument Interface

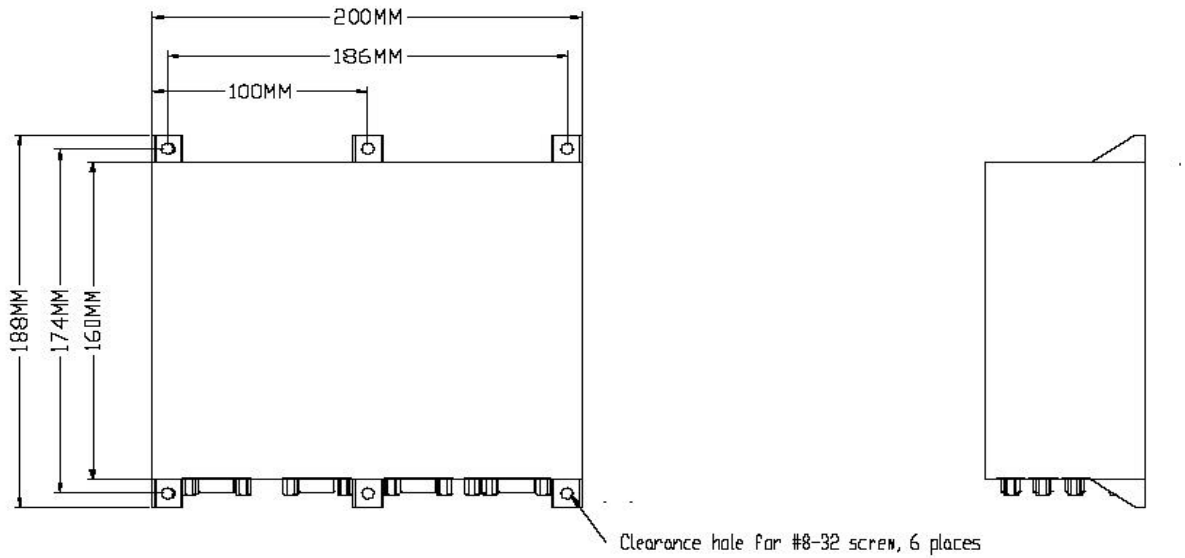
STEREO IMPACT
IDPU Block Diagram
D. Curtis Rev B 2001-7-17

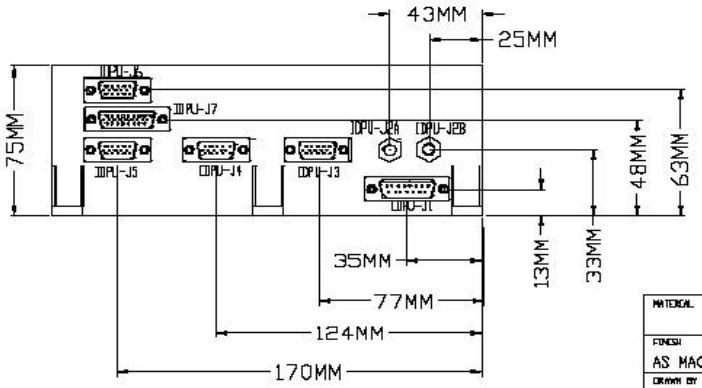


IDPU Responsibilities

- System Design – Dave Curtis
- MAG Analog – GSFC / Mario Acuna
- MAG Heater – GSFC / Mario Acuna
- LVPS – Peter Berg
- Data Controller Board, FPGAs – Elf / Dorothy Gordon
- STE Detector Interface Board – Steve McBride
- Mechanical Design – Heath Bersch
- Flight Software – Dave Curtis
- EGSE:
  - IDPU Simulator Hardware – Elf / Dorothy Gordon
  - IDPU Simulator Top Level Software – Mike Hashii
  - IDPU Simulator SWEA, STE, MAG Software – Mike Hashii
  - IDPU Simulator PLASTIC Software – UNH
  - IDPU Simulator SEP Software - Caltech
  - Command & Display GSE – Mike Hashii
  - SWEA, STE, MAG Science Displays – Mike Hashii
  - SEP Science Displays – Caltech
  - PLASTIC Science Displays - UNH

IDPU





MATERIAL FINISH AS MACHINED DRAWN BY HEATH BERSCH 8-30-01 APPROVED	LOC. STD. THIRD ANGLE PROJECTIONS STANDARD BILATERAL TOLERANCES SCALE NOT TO SCALE	SPACE SCIENCES LABORATORY UNIVERSITY OF CALIFORNIA, BERKELEY 94720 (510) 642-7297 FAX: (510) 643-8302 TITLE STEREO IMPACT IDPU DRAWING NO ICD DRAWING REVISION B SHEET

IDPU Status

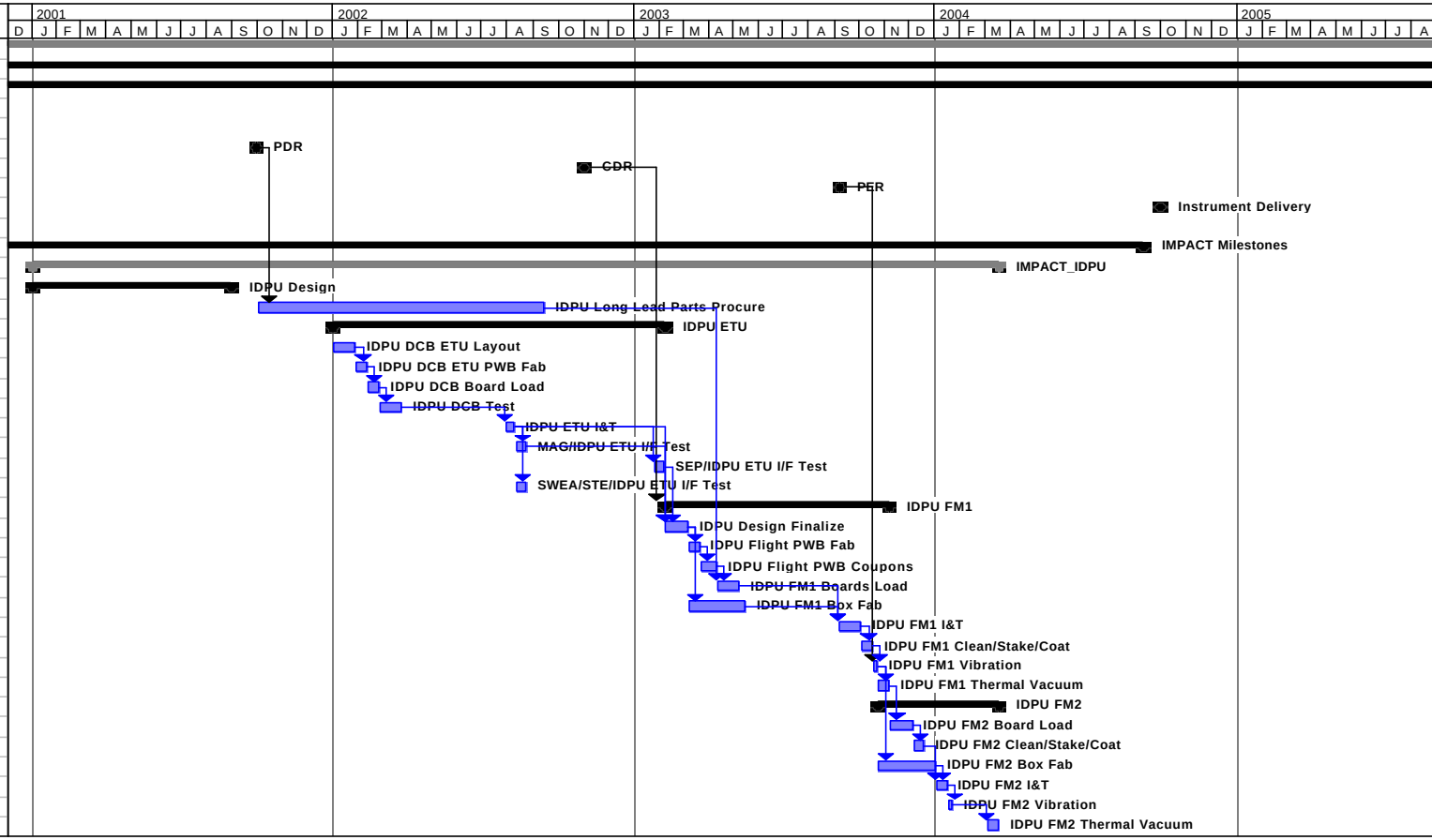
- IDPU Specification on line at:
  - http://sprg.ssl.berkeley.edu/impact/dwc/Specifications/IDPUSpec_C.pdf
- IDPU Flight Software Requirements are on-line at:
  - http://sprg.ssl.berkeley.edu/impact/dwc/Specifications/IDPUSoftwareRequirements_B.pdf
  - http://sprg.ssl.berkeley.edu/impact/dwc/Specifications/PLASTIC_Software_rec.pdf
- Serial Interface Breadboard to verify interface tested
- IDPU Simulator GSE is very similar to the IDPU Data Controller Board (DCB), giving us some early experience with the processor and serial interfaces
- Work on ETU DCB to start in January, after the IDPU Simulator is completed
- Recent changes to IDPU Memory
  - Changed addressing to increase maximum code size from 32K to 64K
  - Increased RAM from 2M to 3M due to increased PLASTIC buffering requirements and to allow burst system to make better use of enhanced bitrate
- Flight Software Requirements / Design to be presented later today
- Flight Software coding has started
  - low level routines to aid in design trades

Non-Standard Parts

- UCB is working on up-screening a number of non-standard parts, including:
  - LT1353C quad opamp
  - AD8005A current feedback opamp
  - CA3080A transconductance opamp
  - MAX987 comparator
  - AD7664 16-bit ADC
  - LT1599 16-bit DAC
  - LT1877 regulator
  - MMBT3904, MMBT3906, MMBTH81 surface mount transistors
  - LM2672N-ADJ adjustable zener
- SCD/Travelers for screening these parts are approved by Project Parts:
  - LT1353C, JANTXV1N6642, JANTXV2N2222A, JANTXV2N2907, 54AC14DMQB, 54AC74DMQB and LM193AH/883
  - Some only require PIND, some require more extensive testing
  - More SCD/Travelers are in the works
  - Screening will start shortly to provide time to recover from problems
  - LT1024 being up-screened by CESR
- Screening costs are very high (up to $30K a part type)
- Some of these parts will be used by other IMPACT team members and non-IMPACT STEREO instrumenters
  - Method of sharing screening costs has not been fully worked out

IDPU Schedule

D	Task Name
1	**IMPACT_Milestones**
1	**Project Phases**
7	**Project Milestones**
8	IMPACT Phase A Contract
9	SRR
11	PDR
18	CDR
25	PER
32	Instrument Delivery
33	Launch
34	**IMPACT Milestones**
2	**IMPACT_IDPU**
1	**IDPU Design**
8	IDPU Long Lead Parts Procure
9	**IDPU ETU**
11	IDPU DCB ETU Layout
12	IDPU DCB ETU PWB Fab
13	IDPU DCB Board Load
14	IDPU DCB Test
15	IDPU ETU I&T
17	MAG/IDPU ETU I/F Test
20	SEP/IDPU ETU I/F Test
23	SWEA/STE/IDPU ETU I/F Test
26	**IDPU FM1**
27	IDPU Design Finalize
28	IDPU Flight PWB Fab
29	IDPU Flight PWB Coupons
30	IDPU FM1 Boards Load
31	IDPU FM1 Box Fab
35	IDPU FM1 I&T
36	IDPU FM1 Clean/Stake/Coat
38	IDPU FM1 Vibration
39	IDPU FM1 Thermal Vacuum
41	**IDPU FM2**
42	IDPU FM2 Board Load
43	IDPU FM2 Clean/Stake/Coat
44	IDPU FM2 Box Fab
47	IDPU FM2 I&T
48	IDPU FM2 Vibration
49	IDPU FM2 Thermal Vacuum



Ground Support Equipment

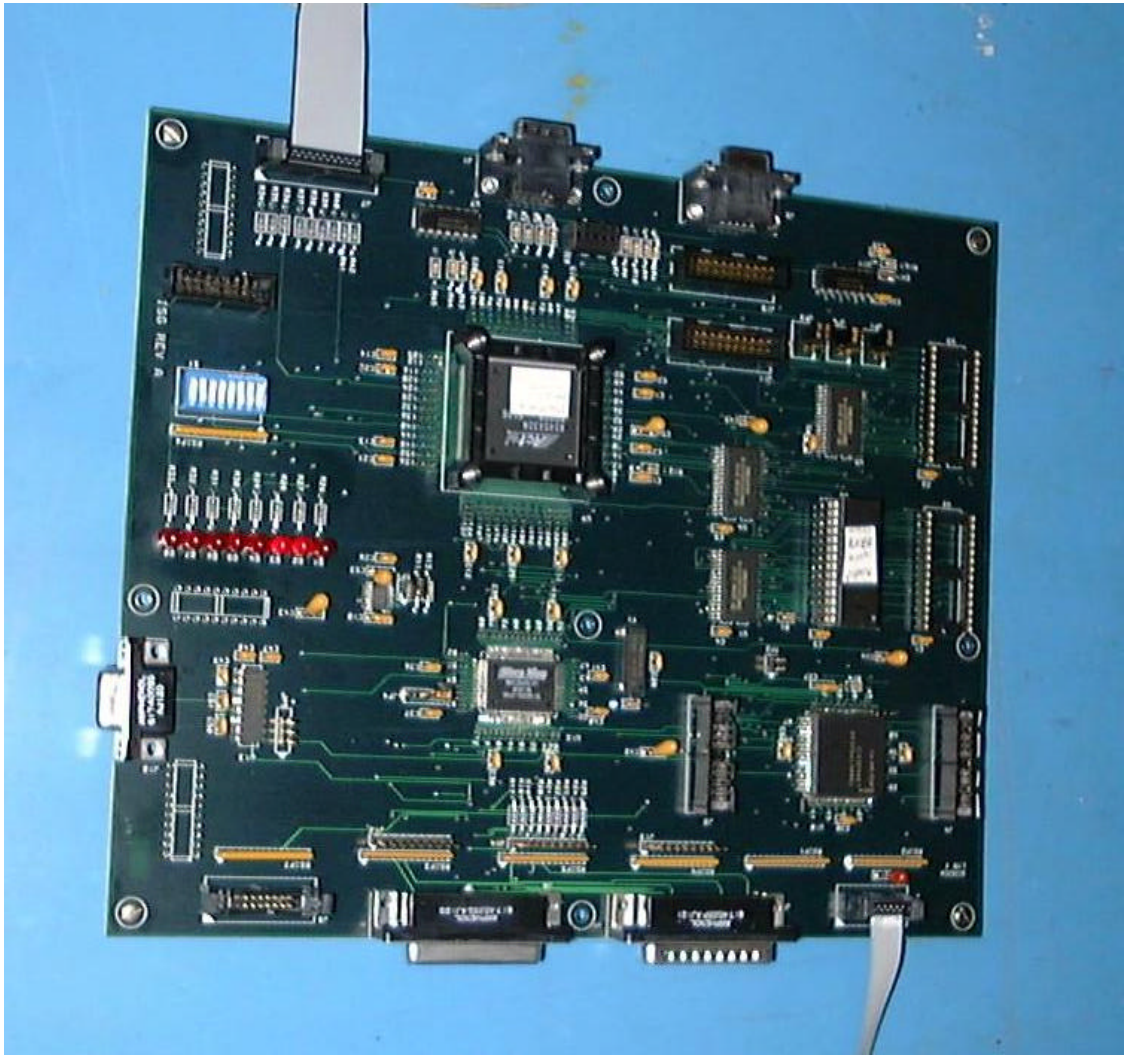
IDPU Simulator GSE

- Developed at UCB (with Elf)
- Provides ability to test instruments in the absence of the IDPU and verify the instrument / IDPU interface
- Consists of a black box (IDPU Simulator GSE, ISG) plus a PC
- ISG includes most of the functionality of the Data Controller Board, minus the 1553 interface
  - Includes a commercial 80C196 processor, FPGA with an early version of the flight DCB FPGA
  - Interfaces with PC via the printer port
  - Designed to IDPU Simulator Specification Document by Elf (who also designs the DCB)
  - Can be used as a test bed for IDPU software
  - Has an added Instrument Simulator feature which works the serial instrument interface in the reverse direction for IDPU testing
- PC software shall be developed at UCB
  - Based on LabWindows CVI development system
  - HESSI GSE heritage; STOL-like scripted command system
  - Science display modules written at the instrument home institution

IDPU Simulator Status

- IDPU Simulator Hardware in test
- IDPU Simulator Software in work at SSL
  - Essential features have been extracted from HESSI GSE
  - Interface to hardware in test
- Simulator needs to be adapted to the requirements of the Instrument
  - Display & Command requirements
  - UCB to write the MAG and SWEA/STE versions
  - Caltech to write the SEP version, UNH to write the PLASTIC version
    - UCB can provide MAG version as a template
    - Since the IDPU is a bent pipe for SEP, SEP display requirements will be similar for the IDPU Simulator GSE and the later SEP Science displays;
    - We should look into making a version of the IDPU Simulator GSE that connects to the SEP Science Display GSE used at the Suite level
  - Simulators should be available early next year

IDPU Simulator Electronics



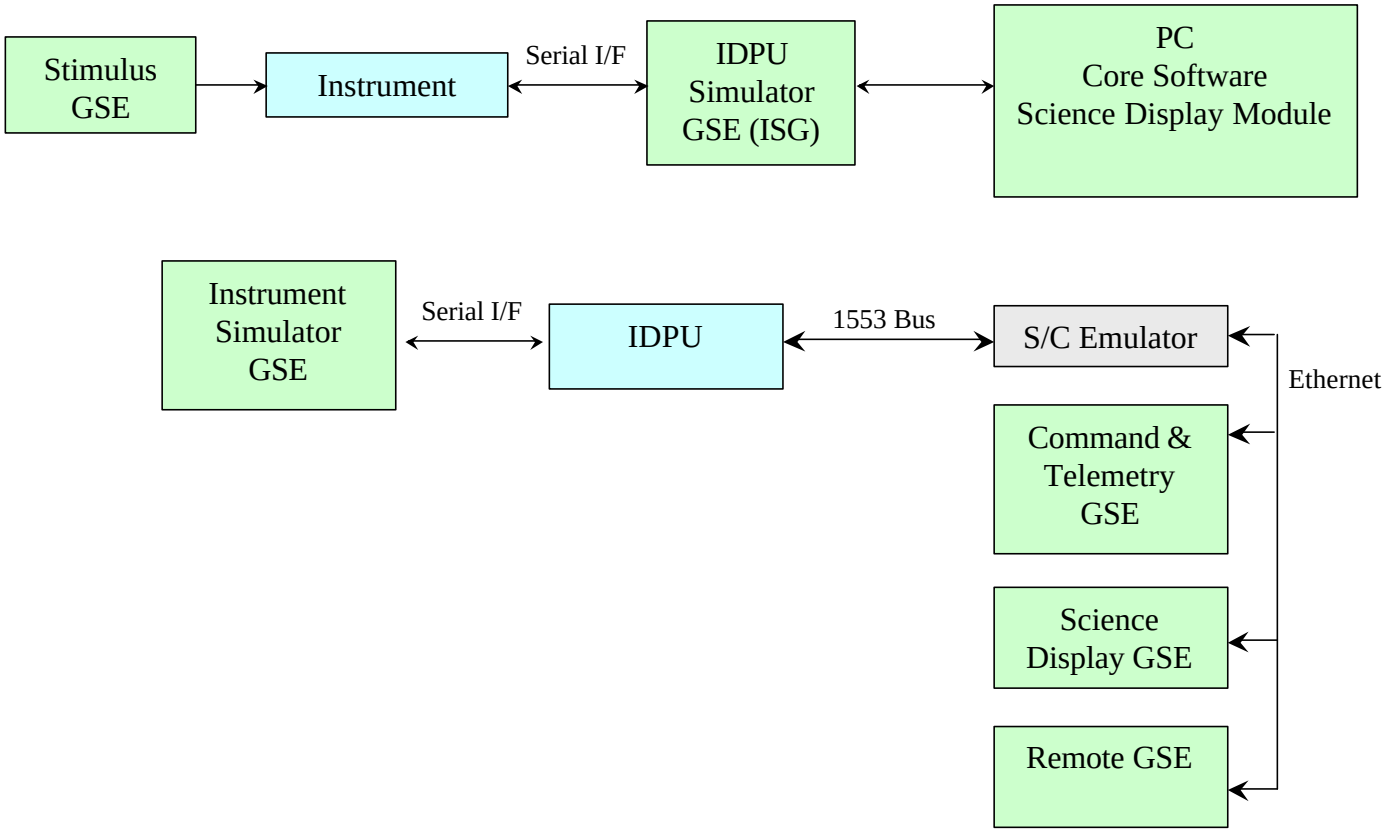
Command & Telemetry GSE

- Works with Spacecraft Emulator at suite I&T level
- Works with MOC at Spacecraft I&T level
- Runs commands and command scripts
  - STOL-like language
- Remote commanding & display via secure internet connection
- Displays housekeeping and instrument status information with limit-checking / alarms
- PLASTIC command scripts may be run on the IMPACT C&T GSE, or on a separate C&T GSE running the same software

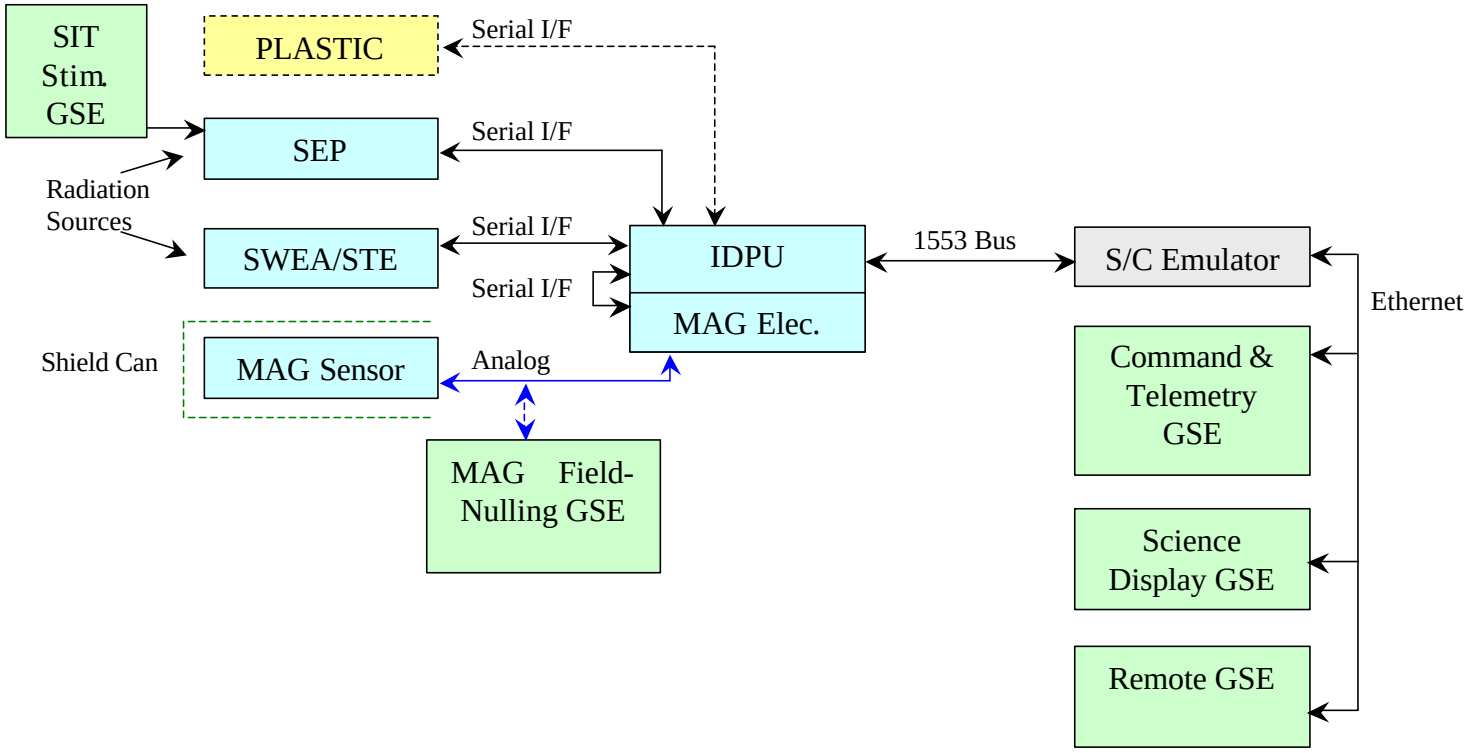
Science Display GSE

- Decodes and Displays science data from instruments
- Provides adequate information to determine the health and functionality of the instrument in the I&T, Commissioning, and mission environment
- Runs on a second workstation (PC) in order to provide more display space, separate science and engineering functions, and improve the reliability of the C&T system
- Science Display GSEs will get data from the MOC or Spacecraft Emulator
- Science displays shall be developed by the instrument teams:
  - MAG, SWEA, STE – UCB / Hashii
  - SEP – Caltech
  - PLASTIC – UNH

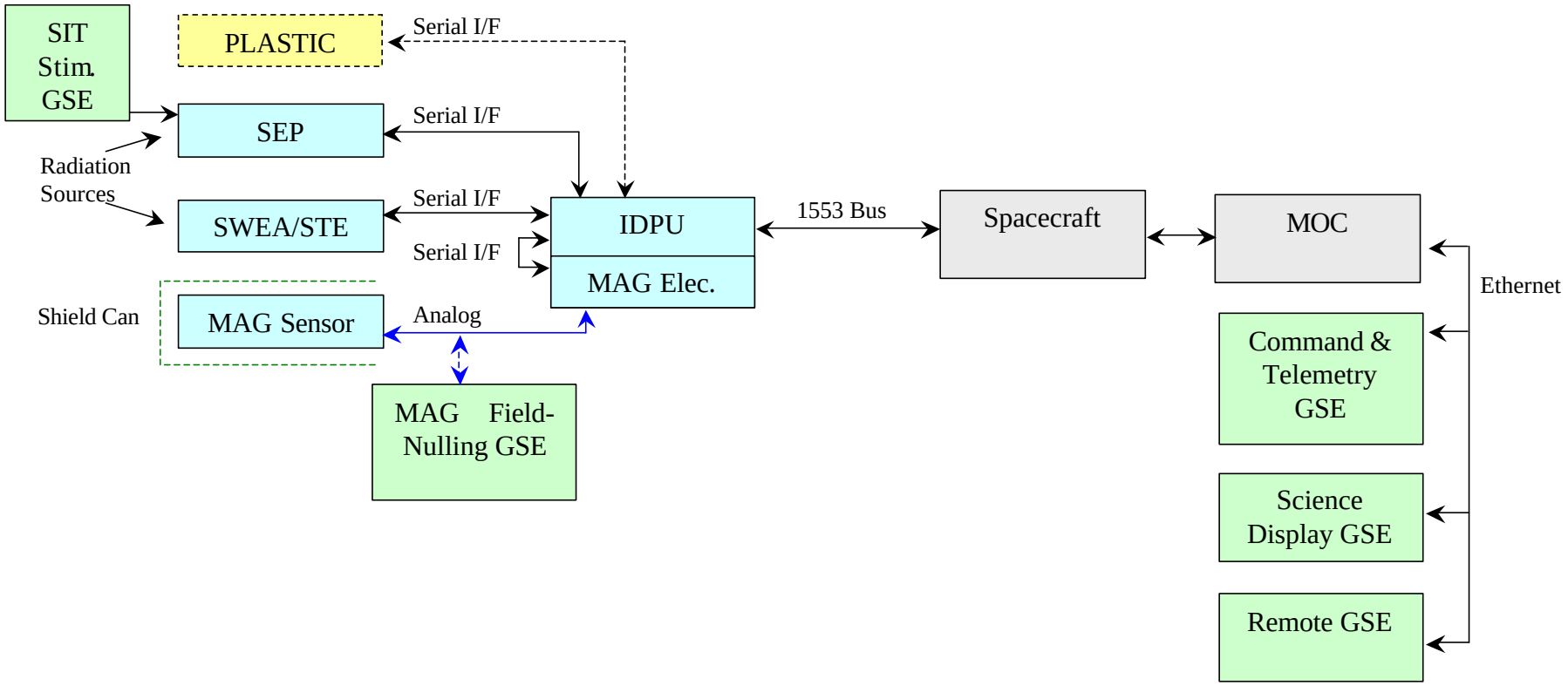
Instrument Bench Checkout Configuration



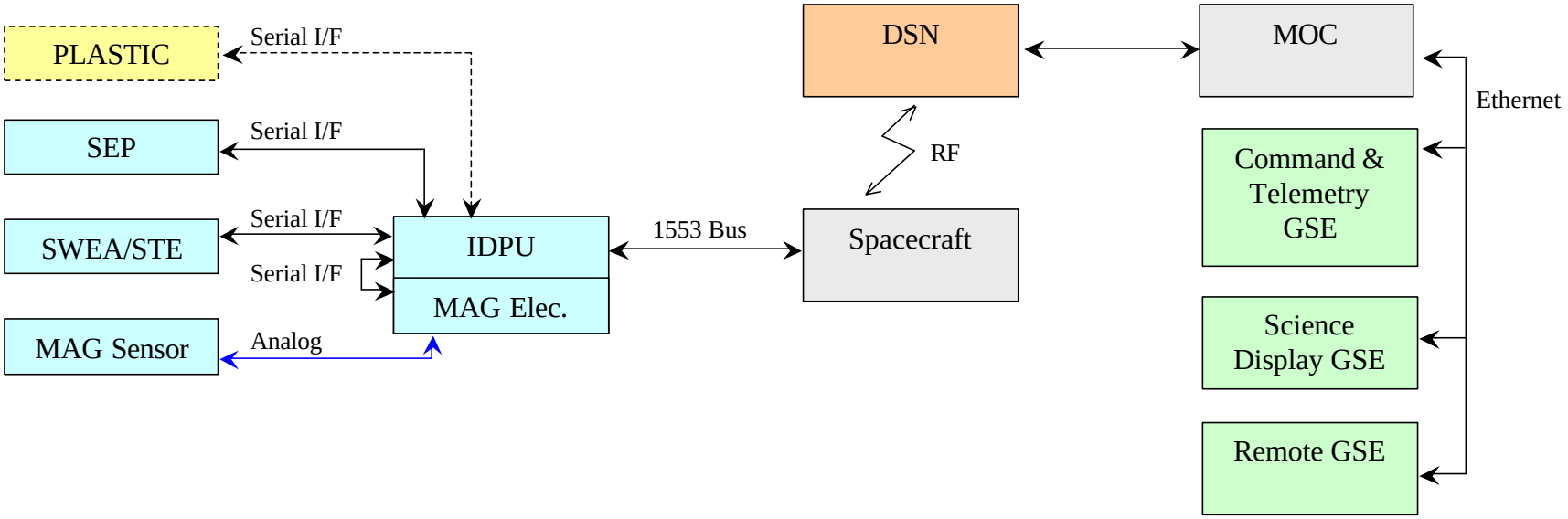
IMPACT Suite Integration GSE Configuration



IMPACT Spacecraft Integration GSE Configuration



IMPACT Mission Operations GSE Configuration



Issues

Key Documents

- **IMPACT ICD, on APL Forum web site**
- **Environmental Requirements:**
  - http://sprg.ssl.berkeley.edu/impact/dwc/Project/EnvironmentalSpec7381-9003e.pdf
- **EMC Requirements:**
  - http://sprg.ssl.berkeley.edu/impact/dwc/Project/EMC_7381-9030d.pdf
- **Contamination Control Plan:**
  - http://sprg.ssl.berkeley.edu/impact/dwc/Project/ContaminationControlPlan_7381-9006-.pdf
- **Import / Export Plan:**
  - http://sprg.ssl.berkeley.edu/impact/dwc/Project/460-PLAN-0025ImportExport.pdf
- **IMPACT Performance Assurance Implementation Plan:**
  - http://sprg.ssl.berkeley.edu/impact/dwc/Plans/STEREO-IMPACT-PAIP_D.pdf
- **IMPACT Configuration Management Plan:**
  - http://sprg.ssl.berkeley.edu/impact/dwc/Plans/IMPACTCMPlan_B.pdf
- **IMPACT Environmental Test Plan:**
  - http://sprg.ssl.berkeley.edu/impact/dwc/Plans/IMPACTEnvTestPlan_A.pdf
- **IMPACT Performance Specification:**
  - http://sprg.ssl.berkeley.edu/impact/dwc/Specifications/IMPACTPerformanceSpec_F.pdf

IMPACT PAIP

- A new version of the IMPACT PAIP has been negotiated with Project
  - Some new requirements for PLASTIC parts qualification
- NASA-Funded Institutions need to verify that they can meet the PAIP requirements before we sign off on this PAIP
- Major concern with non-NASA Funded Institutions
  - PAIP has Appendices describing the PAIP for each institution (except Lindau)
  - Project is unhappy about the lack of specifics in these plans
    - Some of the referenced documents have a wide range of applications, and there is sometimes no reference to what level is to be used
  - Signed-off LOAs state that NASA will provide “Performance Assurance Requirements”
  - Can we use GGS Wind 3DP PAIPs for CESR, ESTEC?

IMPACT ICD

- IMPACT ICD has been signed off as of PDR
  - Under Project change control
- IMPACT Team needs to review the document, verify the document is correct, and help fill in any TBDs
  - Issues found late will be costly to fix
- We need to decide the refurbishment requirements for the instruments on a case by case basis
  - PLASTIC will be refurbished while the spacecraft is shipped to the Cape
  - Refurbishment can be argued if there is risk of damage to the instrument during I&T which cannot adequately be verified except by an internal inspection or a test that cannot be performed on the spacecraft
  - Instruments with MCPs are often refurbished after environmental tests to verify that the detectors were not contaminated, and are completely functional
  - This decision is independent of the need to remove an instrument if it has trouble during I&T.
- We need a time interval for how long instruments can safely look at the sun
  - Kiel has provided a number for SEPT

EMC / Grounding

- **STEREO has a severely constrained EMC due to the sensitivity of the SWAVES Instrument Radio receivers**
  - **Similar to Wind requirements**
  - **Sensitive to exposed conductors with millivolts of noise on them**
- **Highlights of the EMC control plan are:**
  - **Instrument chassis is bonded to spacecraft chassis with less than 5 milli-ohms impedance**
  - **No exposed harness – all will be over-wrapped continuously with shielding**
    - **Problem for externally-mounted components such as heaters**
  - **Strict conducted emissions requirements placed on converters**
    - **Must run at a multiple of 50KHz, crystal-controlled**
  - **Signal ground / Secondary Ground / Chassis Ground connected together in each box**
    - **Helps us keep differential chassis ground / signal ground noise out of our detector front-ends**
  - **Remotely powered units (such as SEPT) should have isolated converters, connected to signal ground only at the load end**
    - **Avoids current loops through chassis, which are primarily a concern to MAG**
    - **We are working on the resource requirements to meet this requirement for SEPT**
    - **We will probably submit a waiver request for STE-U and SIT**
      - **The current for STE-U is small**
      - **SIT is physically close to SEP Central, where the LVPS is**

Telemetry

- Our telemetry allocation has been raised from 2100bps to about 3300bps
- Agreed sample intervals: 1,2,10,30 sec, 1,5,15,30,60 minutes
- Proposed Allocations:
  - SEP Proposal from Rick Cook, using integral numbers of packets per minute
    - Need corresponding new data products & rates
  - MAG sample rate goes from 4Hz to 8Hz
  - STE goes to 8q x 16E @ 10 sec (was 16 sec)
  - SWEA goes to:
    - Moments: 13 @ 2 sec
    - PAD: 12q x 7E @ 10 sec (was 16 sec)
    - 3D: 80W x 16E @ 30 sec (was 60 sec)
  - Remainder goes into Burst playback
- There may be more bits available at CDR

	Was	Proposed
SEP:		
SEPT	120	70
SIT	240	418
LET	320	557
HET	120	209
Boom:		
MAG	192	384
SWEA	394	513
STE	64	102
Burst	486	845
Overhead	164	203
Total	2100	3300

Beacon Telemetry

- **No longer share a beacon packet with PLASTIC**
- **Allocated one packet per minute (272 bytes, 36bps)**
- **Proposed Allocation:**
  - **60 second resolution except MAG (10 sec)**
  - **Moments + PAD from SWEA**
  - **8E x 2 dir from STE**
  - **SEP details on next page**

	BPS
SEP:	
SEPT	5.87
SIT	3.20
LET	6.13
HET	3.73
Boom:	
MAG	4.80
SWEA	2.13
STE	6.67
Overhead	3.74
Total	36.27

SEP Beacon Data Detail

SEP Sensor	Species	(MeV or MeV/nuc) E1	E2	Geometry Factor (cm2sr)	Number of Directions	bps
SIT	He	0.02	0.04	0.3	1	0.27
		0.08	0.16	0.3	1	0.27
		0.32	0.64	0.3	1	0.27
		1.29	2.56	0.3	1	0.27
	CNO	0.02	0.04	0.3	1	0.27
		0.08	0.16	0.3	1	0.27
		0.32	0.64	0.3	1	0.27
		1.29	2.56	0.3	1	0.27
	Fe	0.02	0.04	0.3	1	0.27
		0.08	0.16	0.3	1	0.27
		0.32	0.64	0.3	1	0.27
		1.29	2.56	0.3	1	0.27
					Sum SIT	3.20
SEPT	Electrons	0.02	0.05	0.2	4 separate	1.07
		0.05	0.1	0.2	4 summed	0.27
		0.1	0.2	0.2	4 summed	0.27
		0.2	0.4	0.2	4 separate	1.07
	Ions	0.02	0.1	0.24	4 separate	1.07
	(mostly	0.1	0.5	0.24	4 summed	0.27
	protons)	0.5	2.5	0.24	4 summed	0.27
		2.5	7	0.24	4 separate	1.07
	SEPT Status (1 bit/channel; 20 channels)					0.53
					Sum SEPT	5.87

SEP Sensor	Species	(MeV or MeV/nuc) E1	E2	Geometry Factor (cm2sr)	Number of Directions	bps
LET	Protons	1.4	3	4.5	2	0.53
		3	6	4.5	1	0.27
	Helium	1.7	3	4.5	2	0.53
		3	6	4.5	1	0.27
		6	13	4.5	2	0.53
	3He	1.7	3.3	4.5	1	0.27
		3.3	13	4.5	1	0.27
	CNO	3	6	4.5	1	0.27
		6	13	4.5	1	0.27
		13	30	4.5	1	0.27
	Fe	3	6	4.5	1	0.27
		6	13	4.5	1	0.27
		13	30	4.5	1	0.27
		30	50	4.5	1	0.27
	Livetime					0.27
	H/He-Effic					0.27
	Z-Effic					0.27
	L1A-th					0.27
	L1B-th					0.27
	L2L2th					0.27
					Sum LET	6.13
HET	Electrons	1	4	0.5	1	0.27
	Protons	13	20	0.7	1	0.27
		20	40	0.7	1	0.27
		50	100	0.7	1	0.27
	He	13	20	0.7	1	0.27
		20	40	0.7	1	0.27
		50	100	0.7	1	0.27
	CNO	30	50	0.7	1	0.27
		50	100	0.7	1	0.27
	Fe	50	100	0.7	1	0.27
	Livetime					0.27
	Stop Effic.					0.27
	Pen. Effic.					0.27
	HET status					0.27
					Sum HET	3.73
	SEP Status					0.27
					SEP Total	19.20

Contamination Control

- **The spacecraft has strict contamination control requirements mostly due to the SECCHI instrument**
  - http://sprg.ssl.berkeley.edu/impact/dwc/Project/ContaminationControlPlan_7381-9006-.pdf
- **Dust and Non-volatile residue are carefully controlled; volatiles are of less concern to SECCHI; to the extent that we are concerned with volatiles killing our detectors, we need to continue to remind APL of our concerns**
  - **Tycho is doing a good job of pressing this issue**
  - **Quantitative requirements would be easier for the system to handle**
- **Instruments must be delivered to the spacecraft clean and baked out**
  - **External cleanliness will be verified at APL, probably class 300**
  - **Internal cleanliness must be imposed by the teams procedurally, or else the boxes must be sealed with a filtered vent to prevent dust from getting out**
  - **Bakeout must be verified by QCM measurement to ensure outgassing meets requirements**
  - **Failure to meet outgassing requirements will result in a long bakeout or possibly even dismantlement to remove the offending material**

Environmental Requirements

- Environmental Requirements (except EMC) are not very unusual
  - http://sprg.ssl.berkeley.edu/impact/dwc/Project/EnvironmentalSpec7381-9003e.pdf
  - Note that only Section 3 applies to instruments
- EMC Requirements are stringent as noted above
  - http://sprg.ssl.berkeley.edu/impact/dwc/Project/EMC_7381-9030d.pdf
- Parts must meet an 8KRad total dose and 80 MeVcm2/mg Latchup Level
- Instrument-level tests on BOTH flight units include:
  - Thermal Vacuum
  - Vibration: Shock, Sine Sweep, Random (Acoustic as required)
  - Mass Properties
  - EMC
  - Magnetics (Mario's test setup)
- We will be doing EMC as an integrated suite. The remaining tests are mostly at the box level
- The Electrostatic requirement is that exterior surfaces must be less that 10^8W/square
  - Any non-conducting exterior surfaces must be identified and tracked at the system level
- Magnetic Materials shall also be tracked at the system level

Schedule

- There is concern that there is insufficient slack in the system schedule
- Project has moved up our delivery date to improve the slack in I&T, and would like to move us up some more
- SEP is currently on the "Critical Path" for the mission
  - This is due primarily to key personnel issues at Caltech and GSFC
- We need to work to improve slack
  - There is probably some "hidden" slack buried in tasks with generous durations
  - It is human nature to use up all the available schedule, so the buried slack will get eaten up, leaving nothing for problems encountered late in the flow
  - Slack must be managed like mass, power, and dollars. Managers must maintain adequate margins. Like other resources, schedule margin must be guarded closely.
  - There is some resistance to divulging all our slack for fear that it will get taken away from us by Project (witness the 4 weeks we recently lost). This must be balanced by the danger that inadequate slack will be detrimental to getting the mission confirmed.
- One way to improve our schedule is to skip final integration at UCB, and have SEP deliver directly to APL. The team needs to consider this possibility.
- Project wants regular updates to our schedule so they can track progress
  - We first need to firm up our schedules so they match up and show adequate margin
  - We then need to report on schedule status compared to this baseline monthly

Miscellaneous Issues

- We need to maintain our Parts & Materials Lists, preferably on a common format
  - Do I have HET & SIT Digital parts lists?
  - Parts lists must be approved by Project
- We need to develop a more detailed data analysis plan
  - Data formats, data products, etc.
  - We should set up a committee of concerned parties and have a kick-off telecon early next year
- Project would like to know what our ETU plans are:
  - What their fidelity is, what interface testing is done, and where they are maintained.
- We need to complete our RFA responses. Project has some comments to our initial responses which team members need to respond to.