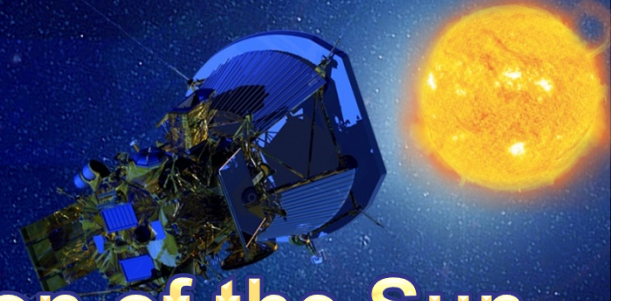


Solar Probe Plus

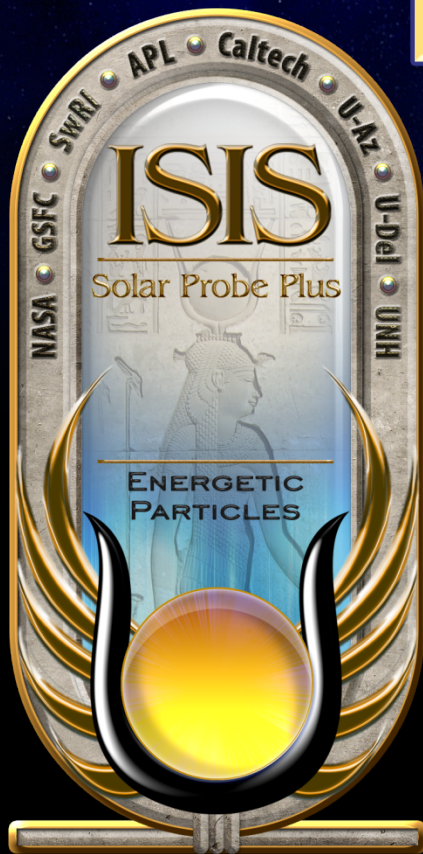
A NASA Mission to Touch the Sun



Integrated Science Investigation of the Sun Energetic Particles

Preliminary Design Review

05 – 06 NOV 2013

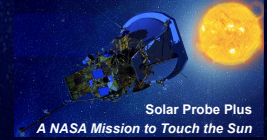


EPI-Hi Electronics

Branislav Kecman / Rick Cook



EPI-Hi Electronics

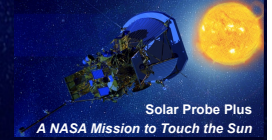


Implementation and Status

Branislav Kecman
Cognizant Electrical Engineer



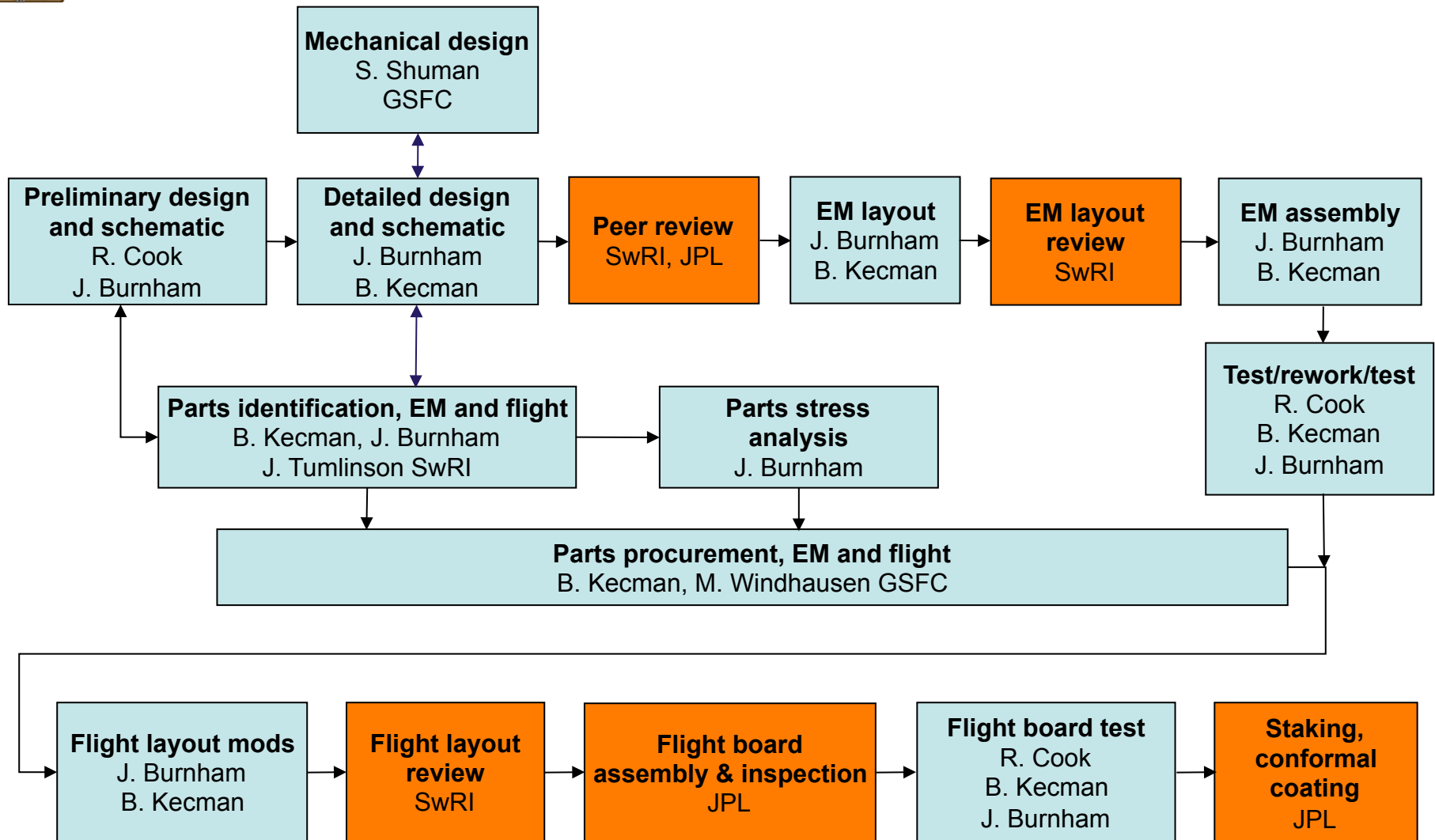
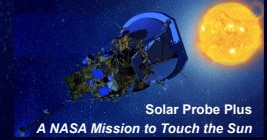
Outline



- Design/Assembly/Test Flow
- Board Status
 - DPU Board Layout
 - Bias Supply Board Layout
- EEE Parts Program and Status
 - Significant Parts
 - ASICs: PHASIC and HKchip
- Resources
 - Power
 - Mass
- Harness Diagram
 - Thermal Harness

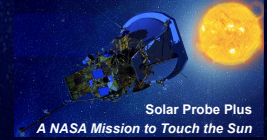


Design/Assembly/Test Flow





Board Status

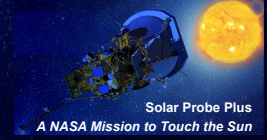


Board	Spec	Schem	Peer review	EM layout	EM fab began	EM parts procured	EM test starts at Caltech
Telescope x3	N/A	80%	√	20%	No	60%	Jan-Jun '14
DPU	N/A	√	√	√	No	80%	2/28/14
LVPS	√	√	√	√	Yes	√	1/27/14
Bias Supply	√	√	√	60%	No	70%	4/7/14

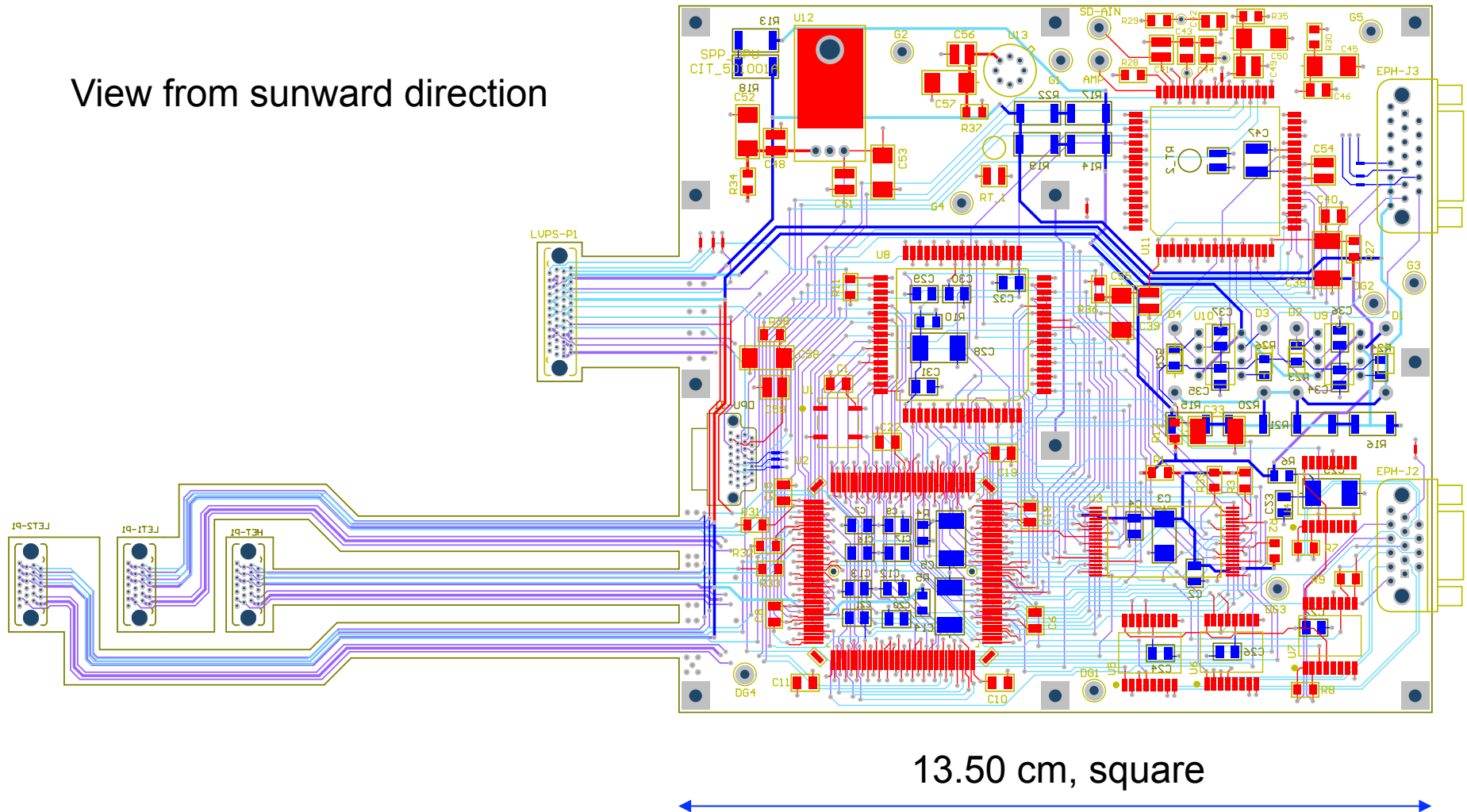
Breadboard	Spec	Schem	Peer	Layout	Fab	Parts	Test
Bias Supply	√	√	N/A	√	√	90%	In progress



DPU Board Layout

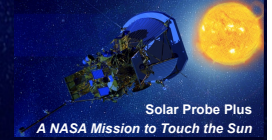


View from sunward direction

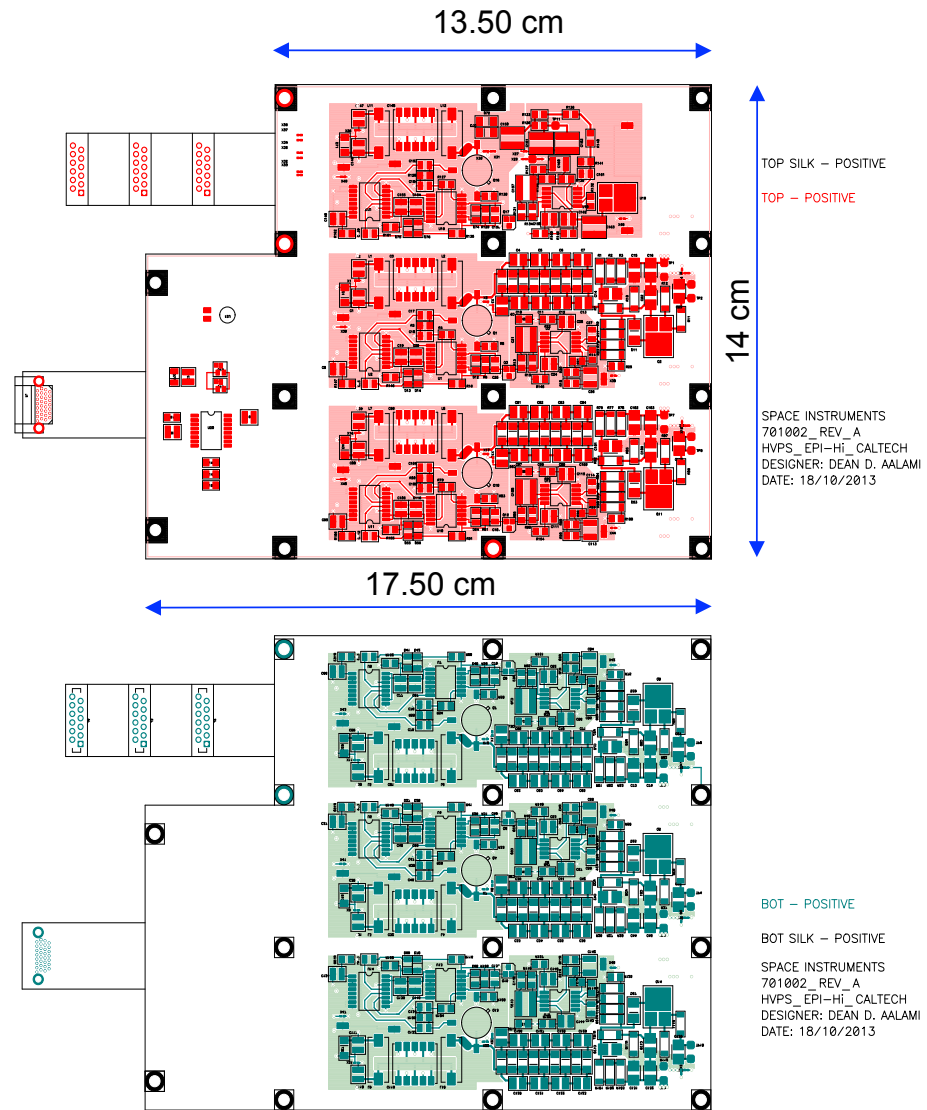




Bias Supply Board Layout

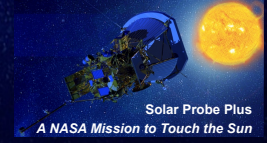


View from sunward direction





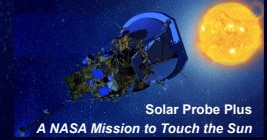
EEE Parts Program and Status



- All parts required to meet EEE-INST-002, Level 2
 - PCB approval required for all parts
 - PCB review in process for all parts
- Existing Caltech custom databases used to track inventory and kit history for all parts
- Procurement in process now for prototype/EM parts
- Where possible, flight parts will come from Caltech, GSFC, SwRI and JPL inventory
 - Parts more than 5 years old will have additional testing performed as required by the PCB



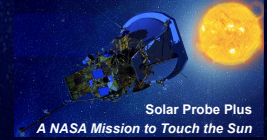
Significant Parts



Part Number Part Type	Manufacturer	Heritage	Notes
RTAX250SL-CQ208B FPGA	Microsemi SoC (Actel)	NuSTAR	Existing stock at Caltech
5962R0323601QXC SRAM, 4Mb (128k x 32)	Aeroflex	NuSTAR	Existing stock at Caltech
5962R0422701QXC SRAM, 16Mb (512k x 32)	Aeroflex		
5962R1222201VXC MRAM, 16Mb (2M x 8)	Aeroflex		Common buy with S/C
10229545 PHASIC, Hybrid ASIC	JPL	STEREO	Existing stock at Caltech Modification required
TBD HKchip, ASIC	JPL		Will follow similar process as PHASIC



ASICs: PHASIC and HKchip

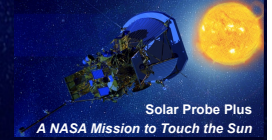


- PHASIC: Hybrid ASIC developed for STEREO
 - Using existing stock with modifications
 - New rad-hard wafers will be produced
 - TID and SEL testing planned
 - Heritage die will be removed and replaced
 - Packaging will be performed by JPL Hybrid Lab
 - Assembled part will undergo full screening and qualification performed by JPL and Caltech
- HKchip: New part, monolithic ASIC
 - Will follow the same wafer procurement, packaging and test plan as the PHASIC





Resources - Power

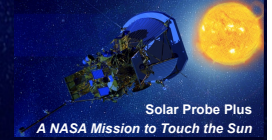


Subsystem	Power [W]
LET1 board	1.06
LET2 board	0.76
HET board	0.95
DPU board	0.62
Bias Supply @ Beginning Of Life	0.12
LVPS @ BOL (70% efficiency)	1.50
Total @ BOL	5.0

End Of Life	
Bias Supply @ End Of Life	0.68
LVPS @ EOL (70% efficiency)	1.74
Total @ EOL	5.8



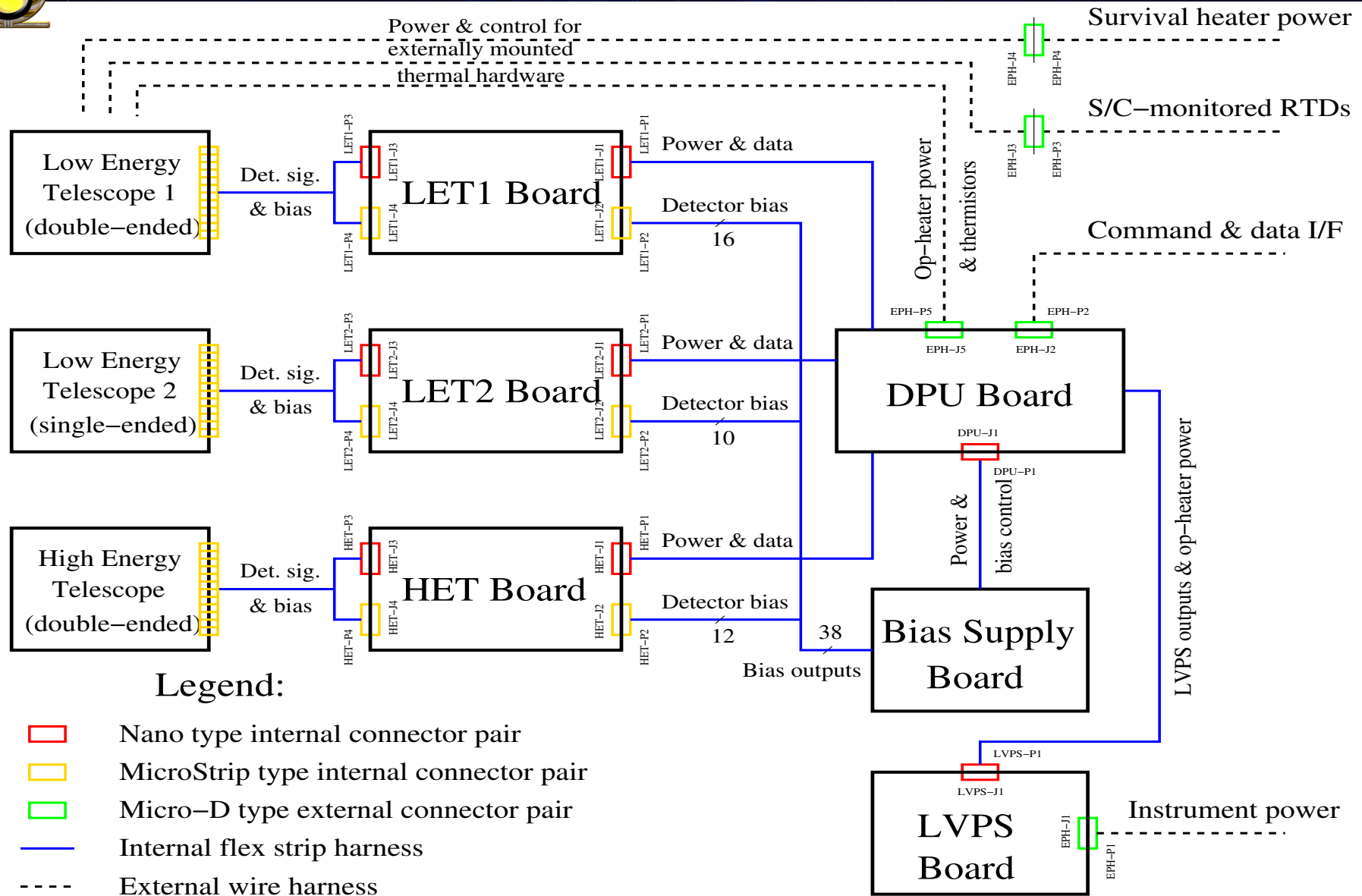
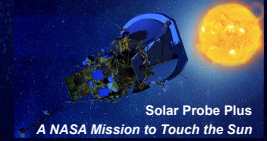
Resources - Mass



Subsystem	Mass [g]
LET1 telescope	225
LET1 board	258
LET2 telescope	145
LET2 board	233
HET telescope	120
HET board	250
DPU board	197
Bias Supply & RF shields	225 + 130
LVPS & RF shields	160 + 100
Elec. box, hardware & shielding	925 + 250 + 100
Telescope brackets	160
Thermal hardware	50
MLI blankets	100
Total	3,628



Harness Diagram





Thermal Harness Diagram

