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To: Distribution

From: David Do

Subject: EPI-Hi LVPS Board Peer Review Action Items

Description: On May 22nd, 2013 the EPI-Hi team held a peer review for the LVPS Board. This memo lists all recorded action items and action responses.

Action Item List:

ID Number	Reviewer	Actionee	Area of Concern	Concern	Recommended Action	Date Opened	Due Date	Action Response
1	Steve Jaskulek	John Dickinson	Redundancies	Can the redundant primary side power signals from the spacecraft be tied together on the LVPS? Where is the isolation protection between side A and B maintained: S/C or instrument?		5/22/2013	7/4/2013	There are not primary/redundant power services supplied from the S/C. They are entirely single string, so there is nothing to tie together either on the LVPS or the S/C side.
2	Steve Jaskulek	John Dickinson	Op Heater Power	Is Op heater power along with instr. primary power, or is it a separate service?	Work with Project to determine how Op Heater power is received by instrument	5/22/2013	7/4/2013	EPI-Hi operational power is provided on a separate S/C power service than instrument power
3	Jim Johnson	David Do	EMI		Look into freewheeling diodes around the normal mode inductors; Can reduce conducted emissions in EMI	5/22/2013	7/4/2013	Added diodes as option to install
4	Samuel Kerem	David Do	SPF		Consider fuses or series diodes across D8/D9 diodes to reduce single point failures	5/22/2013	7/4/2013	Added diode in series
5	Jim Johnson	David Do	Thermal	TO-205 might not conduct heat adequately compared to the amount dissipated in the component	Consider thermal analysis and part packaging for Q20.	5/22/2013	7/4/2013	Thermal analysis will be done after board layout is completed
6	Jim Johnson	David Do	Switching FET		Suggestion: Use a fast and soft diode or Schottky diode across the switching FET (Q20). As RC snubber is another option, but is lossy.	5/22/2013	7/4/2013	Not implemented

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7	Jim Johnson	David Do			Suggestion: Ferrite bead/small inductor for differential mode noise rejection on low voltage outputs. Differential inductance for the LC filter on the output. Add freewheeling diodes across the differential inductors.	5/22/2013	7/4/2013	Will consider if the noise is still high. Board layout accommodate as option.
8	Uno Carlsson	David Do	Safety		Safety -Perform a short-circuit analysis for safety purposes on low-voltage outputs. Based on analysis results, possible design implications may be appropriate	5/22/2013	7/4/2013	Short circuit is hard to analyzed on the on multiple outputs. Tested on breadboard and critical waveform was observed for over stressed.
9	Steve Jaskulek	David Do	EMI		Verify that the resistance/capacitance between primary to secondary is within SPP EMI Spec	5/22/2013	7/4/2013	The spec does not have any resistance or capacitance isolation requirement. 1 Meg resistance isolation is common practice for grounding purpose.
10	Samuel Kerem	David Do	Notes		Fix note "GNDP is tied to GND at U1-18"	5/22/2013	7/4/2013	Fixed
11	Samuel Kerem/ Branislav Kecman	David Do	Grounding		Add a page/key that indicates how grounds are connected	5/22/2013	7/4/2013	Added notes to page 1 on schematics.
12	All	David Do			Linear Regulator (U4) is positive feedback; should be negative	5/22/2013	7/4/2013	Fixed

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13	Steve Jaskulek	David Do	Safety		Safety -what happens to other voltages when the a voltage rail is shorted? Part of short-circuit analysis	5/22/2013	7/4/2013	Most voltages fold back. 12V will overvoltage if 1.5V or 1.8V is shorted. It is protected by 5W 15V zener. 3.5V goes to 8V if -6V is shorted but the linear regulator can handle in a short period.
14	Jim Johnson	David Do	Linear Regulators		Consider Active current limiting on the output of the linear regulators to prevent going to cycle-by-cycle limiting on the switcher	5/22/2013	7/4/2013	For high efficiency, the over voltage is very low on these linear regulators. Simple current limit does not work.
15	John Dickinson	David Do	Output Loads		Refine the output loads and provide capability table to EPI-Hi for review	5/22/2013	7/4/2013	Working in progress with Epi Hi team
16	Rich Cook	EPI-Hi	Voltages		Review min/max voltage and determine where error budget is bookept. Shouldn't all be kept at the LVPS	5/22/2013	7/4/2013	Closed.
17	Steve Jaskulek	David Do	Heater power		If operational heater is added to primary power bus, do not include heater power in primary current sense circuit	5/22/2013	7/4/2013	Primary current sense does not include heater
18	Branislav Kecman	David Do	Thermistors		EPI-Hi will supply the a thermistor (made to GSFC spec)	5/22/2013	7/4/2013	EPI-Hi have not sent spec. There is place holder on the board.

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19		EPI-Hi	Thermistors		Send thermistor datasheet/spec; Do will test the thermistor in board checkout. EPI-Hi will provide the component; Do will fabricate it (install on board)	5/22/2013	7/4/2013	Long term action, will be tracked by SwRI.
20	EPI-Hi	David Do	EMI		Requests to do a quick EMI test on EM board. Conducted emissions is the only practical test. To be determined whether this is done at APL's or Caltech's facility	5/22/2013	7/4/2013	Will be done after EM board is completed
21	Steve Jaskulek	EPI-Hi	Mechanical		Provide mechanical information on LVPS EMI shield	5/22/2013	7/4/2013	Ongoing work between SwRI and APL.
22	Steve Jaskulek	John Dickinson	Thermal		Ensure Do has a contact for the thermal analysis.	5/22/2013	7/4/2013	Greg Dirks at SwRI
23	EPI-Hi	David Do	Reviews		Perform a follow-up layout review. Layout will be done in Expedition.	5/22/2013	7/4/2013	Layout is in progress to accommodate shields
24		John Dickinson	Schedule		When does EPI-Hi need the LVPS in the schedule?	5/22/2013	7/4/2013	From the LVPS spec: Jan 23, 2014

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25	EPI-Hi	David Do	Parts placement		Indicate on schematic which portions should have primary vs. secondary side EMI shielding to leave room on parts placement for gold-plated footprint (to be incorporated by EPI-Hi mechanical engineering)	5/22/2013	7/4/2013	Preliminary shield information has sent to GFSC for review. Work in progress.
26	EPI-Hi/ Dean	David Do	Ripple		Suggestion: put electrostatic isolation between the primary and secondary transformer windings. Determine how/if it should be done. Meant to clean-up switching noise. Otherwise, you'll have a hard time meeting the spec for ripple.	5/22/2013	7/4/2013	Option will be tested on EM board. Layout includes option for faraday shield.
27	Jim Johnson	David Do			Look at using a reset winding	5/22/2013	7/4/2013	Not implemented.

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