STEREO Peer Review Summary of Findings & Recommendations
April 19th IMPACT SEP Instruments and MAG

The Reviewer's comments have been compiled below and the response required has been classified into three categories as follows:

1. **Risk- A Risk shall be entered by the subsystem lead. It will be tracked via the STEREO Risk Management Database.**
2. **Action Item - An action has been assigned. It will be tracked via the STEREO Action Item Database.**
3. **Recommendation / Comment – No official response is required.**

#	*REGARDING*	*REVIEWER WRITE-UP*	*DISPOSITION*
1	**Overall**	For PDR, everyone will need to do a better job of: Stating the subsystem requirements, in particular the requirements flow down. Summarizing the trade studies that lead to the current design	**Recommendation /Comment**
2	**IMPACT Software**	A tight system of Configuration Management and Configuration Control Boards needs to be put in place for the Software Development. The action is to establish a software configuration control process by PDR. At a minimum, the process should include (1) a record of the change, (2) a reason for the change, (3) approval signature of the SEP Lead Engineer/Scientist.	**Action Item**
3	**IMPACT SEP**	Is there a plan for radiation testing of the Actel 54sx72a? Similarly, have Radiation Effects engineers and persons familiar with part availability looked over the entire parts list? The action is to consult a parts engineer before PDR, in particular about the Actel.	**Action Item**
4	**IMPACT**	At some point in the near future, a decision as to what are "requirements" and what are "goals" needs to be made. In the SEP section of the IMPACT Instrument Requirements Document, the requirements for all SEP subsystems should be clearly stated. The action is to produce a requirements matrix by PDR.	**Action Item**
5	**IMPACT**	It wasn't apparent how many engineers are pursuing MISC computer development and L1 detector development. Overcoming or circumventing the problems seen in L1 detector development seems to be highly important in LET Instrument development. Are sufficient resources being allocated to solving this problem?	**Recommendation /Comment**
6	**IMPACT Software**	The top down / bottom up software design methodology and the Cal Tech software quality assurance plan as presented provide a solid foundation for successful SEP/SIT/HET/LET software development. However, a visit to Cal Tech to have a working meeting regarding their software development plans (a deliverable at PDR) is desired. The action is to schedule a meeting at CalTech to discuss further the software development efforts.	**Action Item**
7	**IMPACT Software**	There are potentially four different MISC Actel designs for SEP, SIT, HET, and LET. We need to understand how each MISC implementation will be tested. Action item to Cal Tech and GSFC (Don Reames) to define how MISC computers and software will be tested and qualified for flight.	**Action Item**

8	**IMPACT**	If the new Actel part isn't available as scheduled, a backup plan is to split the MISC between two smaller Actels. This plan is technically risky. Action item for Cal Tech to define less risky or alternate fallback plan.	**Action Item**
9	**IMPACT Software**	The Stereo project needs to assess the impact of fixed length telemetry packets on the IMPACT instrument design. Action item for the IMPACT team to provide a preliminary concept for telemetry data packaging and downlink (i.e. output to S/C).	**Action Item**
10	**IMPACT**	Is the magnetometer requirement to be > 6 in accounted for in the IMPACT boom design. Are there any boom harness shielding requirements that could further increase boom harness friction. The action is to ensure that a requirement of 6 inch separation between magnetometer and the boom is levied.	**Action Item**
11	**IMPACT**	Their needs to be an overall (STEREO) schedule that coordinate all the various subsystems efforts. There doesn't seem to be any milestones presented at all the STEREO peer reviews including this one. The Action is to put together an integrated IMPACT schedule.	**Action Item**
12	**IMPACT**	What are the budgetary constraints and are they on track?	**Action Item**
13	**IMPACT**	Need to finalize SEPT cover design and address issues related to contamination for instrument protection.	**Action Item**
14	**IMPACT Contamination**	Purging was identified for the SEPT instrument; however, the detailed specifications were not discussed. Need to specify the purge gas requirements including gas type, impurities that SEPT is sensitive to, flow rate, duration, purge outage tolerance, purge connection design, etc.	**Action Item**
15	**IMPACT Contamination**	Either surface barrier or ion will become part of the Sit detector. Contamination concern and solution may be quite different in either design. Need to finalize the design and deal with potential contamination issues.	**Action Item**
16	**IMPACT Contamination**	SIT will use a high voltage power supply. Need to define hardware bakeout requirements and thermal vacuum test procedures to protect sensitive surface from contamination buildup and instrument when turning on high voltage power.	**Action Item**
17	**IMPACT Contamination**	Surface treatment on the LET mast has not been presented. Moly-disulfide was briefly mentioned. Need to clarify the coatings used and identify their potential contamination problems.	**Action Item**
18	**IMPACT Contamination**	Materials applied in sensitive areas, such as a conductive epoxy for LET detector, are not thoroughly discussed. A complete list of materials should be completed and a review process should be established.	**Action Item**

19	**IMPACT Contamination**	Because of the time constraint, a formal contamination control was not presented at the review. Contamination topics of purging, venting, bakeout were only briefly discussed. Following suggestions are proposed: - All involved groups need to identify the contamination sensitivities of their hardware. - All involved groups need to establish their contamination requirements related to materials, hardware, facilities, purging, venting, I&T, transportation, etc. - A project level contamination questionnaire was distributed recently. All involved groups need to respond. - A contamination working group need to established to deal with contamination, especially cross contamination (among instruments), issues.	**Recommendation /Comment**
20	**IMPACT Contamination**	The surface finish and cleanliness level of the boom antenna is a potential source of concern. The action is to review the proposed surface finishes of the SWAVES antennas.	**Action Item**
21	**IMPACT Contamination**	No mechanical drawings were presented so it was difficult to determine if there were other elements that might be sensitive to contamination. The action is that a meeting be scheduled with IMPACT to go through their mechanical design and make sure that all potentially sensitive surfaces are identified and that the instrument does not have materials that will be a potential source of contamination for other instruments or the spacecraft.	**Action Item**
22	**IMPACT Contamination**	An outline of IMPACT's plan to control contamination was not presented in the peer review. Suggest that a meeting be set-up to discuss how they plan to meet the spacecraft surface cleanliness requirement of 300A plus the outgassing requirements. Key points of discussion should be: 1. Bakeout plan and outgassing certification 2. Surface cleanliness budgets and verification 3. Overview of their I and T plan -- facilities and cleanliness verification checkpoints 4. Purge requirements	**Action Item**
23	**IMPACT Contamination**	A lengthy discussion ensued on purging and airborne chemicals and NVR. The exact nature and level of airborne chemical sensitivities need to be identified and quantified. The purge and venting (intentional and unintentional) design should be reviewed. It was recommended that the venting be minimized to permit a positive pressure inside the instrument thereby reducing the potential for airborne chemicals/contaminants to enter the instrument and reduce restrictions on observatory level operations. Bagging/GSE covers could be employed to seal off any leaks. Still to be specified are the total purge rates required for normal operations and any operation requiring removal of covers/ports/doors or other features that create an effective leak and the quality of gas (purity in ppm and particle levels). Water vapor sensitivities also need to be determined and specified.	**Action Item**
24	**IMPACT**	Need someone at APL for Magnetics.	**Action Item**

25	**IMPACT**	The front entrance filter isolates the instrument from the internal environment thereby providing an effective dust particle barrier. The entrance filter is relatively robust and will not easily be damaged by acoustic environments or light incidental contact, as would an EUV filter. The filter will act as an IR reflector to keep instrument temperature down. There is some concern about the thermal environment as previous versions of the instrument flew on spinning spacecraft. This spacecraft will be in continuous view of the sun.	**Recommendation /Comment**
26	**GSFC**	SIT has a 4.2 KW power supply in the μW range. This switching supply operates between 30 and 40 KHz and is not synchronized to a harmonic of 50 KHz. SWAVES has agreed that this is acceptable, regardless though a waiver type system is needed to track these items at the system level and to make sure we get the proper concurrence. The action is to develop a formal waiver process for STEREO.	**Action Item**
27	**IMPACT**	The mechanical design for SEP is immature for this stage in the program. Design has changed drastically since last iteration. The need for a bracket that supports all of SEP has been replaced with a bracket that supports just the LET telescopes. The electronics are now flush mounted to the spacecraft. It is unclear how SEP will be fabricated and integrated. New design should be provided to the spacecraft to assess for other FOV incursions. Note that on the surface, this design seems better than the previous one (where all of SEP was on a bracket). There was no formal presentation nor were drawings made available. Action is to provide new enveloped drawings and mass changes to GSFC.	**Action Item**
28	**IMPACT**	Recommend that early acoustic testing be done in additional to random vibe testing for Si Detectors.	**Recommendation /Comment**
29	**IMPACT**	SEP is base lining the use of four MISC processors to be implemented in Actel FPGAs. The baseline is a single 54sx72, which is the second part in the Actel pipeline behind the sx32, which has yet to be delivered. The risk mitigation for not getting the sx72 part is to fall back to two sx32s. How one divides the processor into two sx32s isn't clear. This can prove difficult (substantial I/O between parts) and could defeat the power advantage, which is the whole reason for going to the MISC design. Since the sx72 part is so far out, I would recommend that Rick Cook give some more thought as to the feasibility of using 2 sx32 parts.	**Recommendation /Comment**
30	**IMPACT**	SIT has an issue with their TOF amplifier; they have a need to go to a CFD amp. This will require another 500 mW. Impact will tie this in with a system level request for resources. The action is to include the new, requested power amount in the next monthly IMPACT resource report.	**Action Item**
31	**GSFC**	The EMC plan should be checked that it includes testing at the magnetometers sensitive frequency at 30 KHz.	**Action Item**
32	**GSFC**	The magnetometer uses an AC heater, which free runs at 50 KHz, but is not frequency controlled. This should be assessed for EMC impacts.	**Action Item**