



HERSCHEL / Planck Project

date	13.11.2002	reference	SCI-PT/15287	page	1/3
meeting date	13.11.2002	meeting place	LAL, Orsay		
chairman	P. Olivier				
participants	Annex 1	copy	Participants		

subject **Herschel/Planck 4th Quarterly Instrument PA meeting**

Description	action	due date
Agenda, Annex 2		
PACS Presentation by Georg Igl (teleconference) Annex 3		
List of Critical Items, CIL, to be provided to ESA	AI 1 PACS	Nov. 2002
List of NCRs to be provided to ESA, plus Major NCRs (on FEE, tested at MPIA) and others if not provided already No input from some sub-systems – to be discussed at the next PACS consortium meeting CM#18	AI 2 PACS	Nov. 2002
Signed copies of PACS RFW-0001 and -0003 to be provided to ESA for formal processing	AI 3 PACS	Nov. 2002
PACS to discuss internally with PM and PI how to get FMECA / HSIA in the required time and to take this up to discussion at the next PACS Consortium Meeting CM#18	AI 4 PACS	Nov. 2002
SPIRE presentation by Eric Clark (teleconference) Annex 4		
ESA to provide an example of a CIL to SPIRE, for the updating of their CIL	AI 5 ESA	Nov. 2002
The CIL status shall be reported at each Quarterly Instrument PA meeting	AI 6 ALL	Next PA meeting
SPIRE to provide list of NCRs to ESA	AI 7 SPIRE	Nov. 2002
RFWs with original signatures shall be sent by mail to ESA for obtaining formal agreement	AI 8 SPIRE	
Verify if the two PADs produced by IFSI have been submitted to ESA , and their approval status	AI 9 ESA	Nov. 2002

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ESTEC



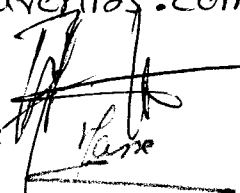
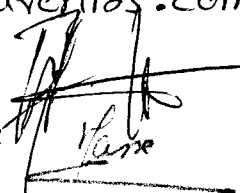
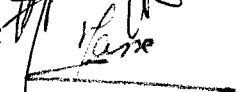

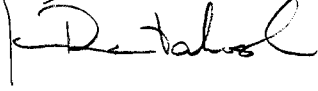
Keplerlaan 1 - NL 2201 AZ Noordwijk ZH - The Netherlands
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Description	action	due date
SPIRE to provide the updated FMECA to ESA	AI 10 SPIRE	Nov. 2002
All electronic parts, including wires, cables and connectors, shall be derated in accordance with ESA PSS-01-301		
SPIRE to verify with all subsystems that all EEE parts are derated as appropriate	AI 11 SPIRE	Nov. 2002
LFI no presentation, refer to status from previous meeting		
HIFI presentation by Herman Jacobs, Annex 5		
HIFI to provide e-mail addresses of their internal CCB	AI 12 HIFI	Nov. 2002
HIFI plan to provide their PAD sheets to ESA in November – December 2002. These PADs contain proprietary information, as data of evaluation results of cryo applications, and are not to be presented to industry		
ESA to make sure that HIFI PADs are not distributed to industry, since they contain proprietary information, or to inform HIFI that they will be handed over to industry. HIFI will then restrict the information removing proprietary details	AI 13 ESA	Nov. 2002
Presentation by Tim Larson, JPL, Annex 6		
JPL to provide documentation for SWB and PSB when completed to HFI	AI 14 JPL	
JPL to provide handling manual for the bolometers before the delivery	AI 15 JPL	
JPL to provide the FMECA for the bolometer modulus and set tests to IAS	AI 16 JPL	
JPL send a copy of TMV safety documents for S/C to IAS	AI 17 JPL	
HFI presentation by Alain Heurtel, Annex 7		
HFI to present the actual status of their Critical Items to ESA	AI 18 HFI	Week 49, 2002
Comment on page 11 of the HFI presentation on cleanliness. The objective is to discuss means to meeting the agreed delivery budget, not to change agreed requirements		
HFI to require the FMECA from Air Liquide for the CDR that is to be held on the 26.11.2002, to verify that the FMECA has been used as a tool for the design phase	AI 19 HFI	Mid. Nov. 2002
Action Items from previous meetings		
LA-GE-DQ-MN-0006-02, AI 2 is closed. It is confirmed that		

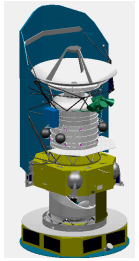
Description	action	due date
the SW PA plan from ISN is not applicable to LFI		
Derating presentation Annex 8		
HSIA presentation Annex 9		
HSIA example Annex 10		
Annex 11, handwritten minutes		

November 13th meeting in LAL
 PA quarterly meeting Heschel - Claude

Name	Institut	address	signature
Alain HEURTEL	HFI LAL/IAS	heurte@lal.m2p3.fr	
Tim Larson	JPL	timothy.larson@jpl.nasa.gov	Timothy W. Larson
Stéphane Rideau	Bureau Veritas/IAS	stephane.rideau@ias.u-psud.fr	
Didier WADEL	Bureau Veritas/IAS	didier.wadel@fr.bureauveritas.com	
Herman JACOBS	SRON	H.M.Jacobs@SRON.NL	
Christian Masse	Alcatel	christian.masse@space.alcatel.fr	
Pierre OLIVIER	ESA	pierre.olivier@esa.int	
Jan Rautakoski	ESA	jan.rautakoski@esa.int	

Agenda for Hershel/Planck Instrument Quarterly PA meeting 13.11.2002, LAL, Orsay

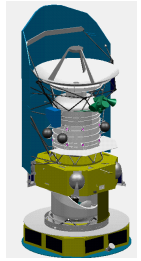
- Instrument PA status and outlook including the following items
 - Problem areas and solutions
 - Critical items status
 - NCR status
 - RFW status
 - Parts materials and processes activities, PADs
 - Cleanliness activities
 - System FMECA and effect on S/C (propagation of failures)/HSIA
 - Results on derating, WCA status
 - Status on VCD
 - Configuration status
 - Software PA
 - MIP planning
 - AIT procedure preparation
 - Hardware status and qualification planning
 - Future planning
- Derating
- Components and PADs
- HSIA
- Safety
- Action Items from previous meeting
- AOB



Hardware Software Interaction Analysis - HSIA

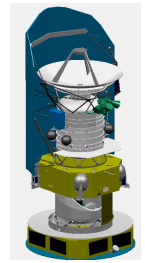
ESA-ESTEC

J. Rautakoski



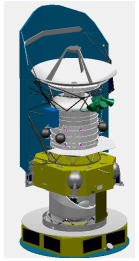
HSIA

- Performed according to ECSS-Q-30-02A, in conjunction with the FMECA, which is used as an input to the HSIA
 - Improve the efficiency of the development approach
 - Optimise the treatment of faults
 - Clarify the functionality of the HW and to avoid its misuse
- To verify that SW is specified to react to hardware failures as required
 - HW failure modes are taken into account in the SW requirements definition
 - Validation of the SW requirements and definition of new requirements
 - Define SW countermeasures to the problems found
 - Increases SW complexity with impacts on its development and validation phases
 - Design characteristics will not cause the SW to overstress the HW, or adversely change failure severity consequences on failure occurrence



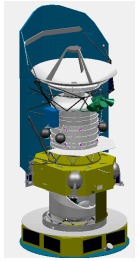
HSIA – how, pros and cons

- Conducted through checklists, according to which answers shall be produced for each identified failure case
 - Specific to each analysis and have to take into account the specific safety requirements of the system
- Disadvantage:
 - The effectiveness of the HSIA is largely dependent on the appropriateness of the checklist
- Advantages:
 - Systematic
 - Identifies and manages all possible causes of malfunction of the SW due to HW failure and vice versa
 - HW and SW designers co-operate to discuss specific problems in order to identify the constraints of each part
 - Making HW people sensitive to SW constraints and vice versa



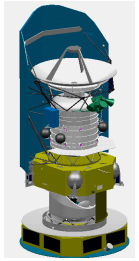
HSIA and its place in the design analysis process

- The whole process is an iterative process where
 - The FMECA is used as input to the HSIA (concurrently performed)
 - The HSIA is used as an input to the FDIR
 - The FDIR is used as an input to the User Manual
- Considers all SW which interacts with the HW analysed in relevant FMEA/FMECA
 - Particular attention shall be paid to failure modes of HW which are:
 - Involved in compensatory provisions (redundancy, protection)
 - Controlled by software



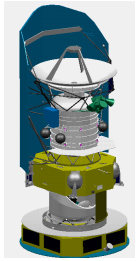
HSIA and its place in the design analysis process

- The process is repeated several times during a programme to correct problems discovered in the design and then to analyse the new design and verify its conformance to the requirements, and to validate the new SW requirements identified by the HSIA
 - It shall be performed sufficiently early in the programme to influence the hardware design and the software requirements
 - It is also useful for SW patches
- Used to verify that the SW specifications cover the hardware failures according to the applicable FDIR requirements



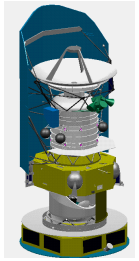
HSIA analysis and outputs

- To be considered for each failure mode:
 - Symptoms triggering the SW action (parameters accounting for the failure mode)
 - Action of the SW (failure isolation and recovery).
 - Effect of the SW action on the product functionality (through induced possible sequence software-hardware effects)
- Performed to provide the following results:
 - Inputs to the list of critical items (e.g. no or nonconforming SW action and SW action having adverse effects on HW)
 - Recommendations as HW or SW to be added or modified
- Nonconforming cases shall be identified and formally dispositioned



HSIA documentation

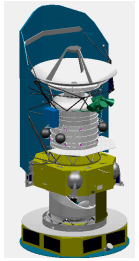
- The HSIA can be documented in:
 - Tabular form according to figure 6 in ECSS-Q-30-02A, where each hardware failure mode is documented on a single table
 - The standard FMEA/FMECA worksheet completed with the HSIA information in the columns for:
 - effects,
 - failure detection,
 - recovery or compensation,
 - severity or criticality
 - * Enter SW to each completed column for each failure mode where software is involved
 - * For more details on what information to enter refer to ECSS-Q-30-02A
 - Findings and recommendations arising from the HSIA shall be referenced in the applicable part of the FMEA/FMECA to maintain traceability



D e r a t i n g

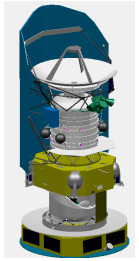
ESA-ESTEC

J. Rautakoski



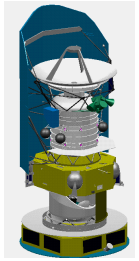
Derating definition, objectives and applicability

- According to ECSS-P-001A, Rev. 1 derating is:
 - Process of designing a product such that its components operate at a significantly reduced level of stress to increase reliability
- According to ESA PSS-01-301 Issue 2 derating is:
 - The intentional reduction of electrical and thermal stress in order to increase the useful lifetime of a component
- Applicable to all EEE components including wires, cables and connectors
- Performed according to the requirements in ESA PSS-01-301 Issue 2



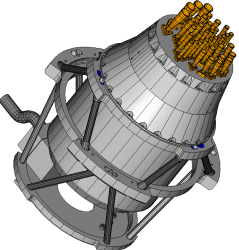
Derating – minimum requirements

- All flight EEE components shall be derated
- Acceptance temperature to be taken into account when performing the derating analysis, if actual temperature is not known
- For any non-compliances to derating requirements an RFW shall be raised
- Reporting
 - For each type of component it shall be described how the derating analysis is performed, including the calculations for one component of that type as an example
 - All components shall be listed in a table identifying the component, location, rated and actual value, derating requirement, compliance status, and justification for non-compliance.



Derating table example

Component	Location	Rated value	Derating requirement, (derate to)	Actual value	Compliance Y/N	Remarks justification, RFW
Cap. Ceramic	PCB 1, C1	50 V Max 85 C	50% -	10 V 60 C	Y Y	- -
Cap solid tantalum	PCB 3, C25	100 V Max 50 C	60% -	70 V 60 C	N N	RFW 1
Resistor chip	PCB 2, R12	50 V 0.5 W	Voltage 80% Power 50%	30 V 0,2 W	Y Y	
Op Amp	PCB 3, Op3		Supply V 80% P diss. 75% Max f 90% Output I 80% Input V 70%			
etc...						



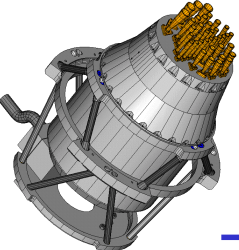
HFI Product Assurance : Status and outlook

Alain Heurtel, HFI PAM

CNRS/IN2P3/LAL and IAS (France)

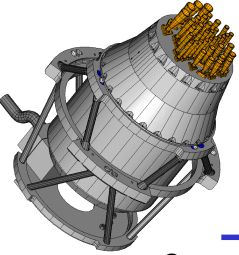
heurtel@lal.in2p3.fr

with Didier Wadel and Stéphane Rideau



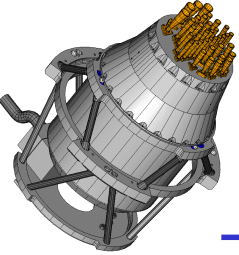
Plan

- PA structure management
- PAP situation
- Software PA : situation
- FMECA and HSIA
- Derating analysis
- Summary FDIR
- Calibration
- Other PA activities
- AIT procedure preparation



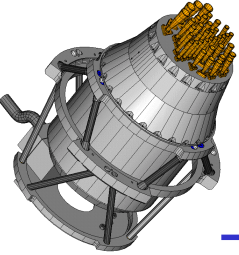
PA structure management (1/2)

- PA support :
 - Stephane Rideau from Bureau Veritas Paris joined us mid of September in IAS, up to the end of the Project.
- PA local managers appointed :
 - Gianfranco Morelli from Officine Galileo for the JFET's box,
 - Ian Walker at Cardiff for the cold optics.
- Activities :
 - Are developed along 4 axis through one Action Plan relative to :
 1. Management of the documentation :
 - An approval process is now the subject of a procedure approved by the project.
Document PR-PH 111-200180-IAS 1/1
 - Validation of the IAS HFI data base is on-going starting with PA and system documents .
 - Modifications will be reported into the CMP



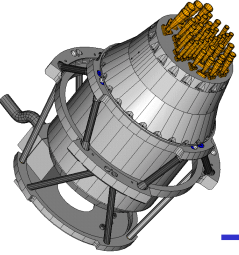
PA structure management (2/2)

2. Management of PA at system and S/S level :
 - Sharing of PA tasks at IAS level between PA team,
 - Actions towards each the local PA Manager in Institutes.
3. Analysis and risks management for the calibration facilities in IAS (see later-on).
4. Technical PA documents : Production and up-grading of PA documents asked by ESA in relationship with the involved actors (PA managers, AIT Manager, System Engineer, PM)



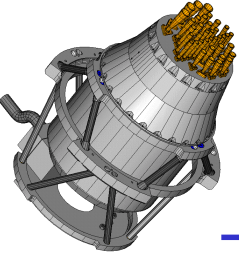
PAP

- PAP is through the formal internal process leading to validation and signature by the Project. Last issue, 3/1, August 26, takes into account all ESA comments and remarks. It includes recently issued ECSS standards, instead of PSS.
- This Plan is now the reference in matter of PA for sub-contractors. It points out the control and the management methods to be used and the documentation to be provided with the deliverables.



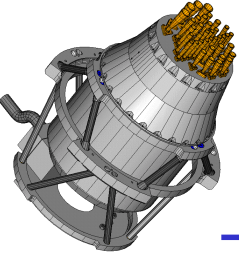
Software PA : Situation

- Last January, F. Montero from ESA proposed a way to compose the SWMP and he defined its content (January, 29 meeting at LAL).
- A draft of the SWMP for the 3 teams in charge of electronics written by B. Mansoux this summer.
- Addition of information on Software Plan sent by e-mail to the PM by ESA (J. M. Canales on Oct, 22). Necessity of a SVVP.
- Other meeting to day in LAL to finalize with ESA content of this (these) Plan(s).
- Due to lack of resources, a cognizant external support asked by the Project to achieve writing of PA Software Plan(s).



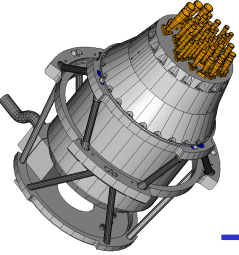
FMECA and HSIA

- Documentation for HSIA :
 - An example of HSIA received from ESA
 - Evaluation of this document made by the LAL : Rubrics and methodology are FMECA's at system level
- FMECA will be reconsidered for DPU by LAL and REU by CESR and DCE by ISN to include consequences of failure of parts of software and recovery methods.
- Actions are on-going for this purpose in these Labs.
- Missing Air Liquide FMECA will be delivered this month with the mock-up, as a part of the ADP.



Derating analysis

- Derating analysis is a priority for the Project according to ESA demand. N. Briand is in charge of it in IAS.
- Done for analogical modules of PAU, DPU, REU (except for DAC and its servo-control).
- For DCE, derating will be made directly by ISN as soon as design will be frozen (includes He lines command and control).
- Derating of digital modules and especially interfaces remains to be done. Waiting for guidelines from CNES.
- Dead line foreseen mid of December.

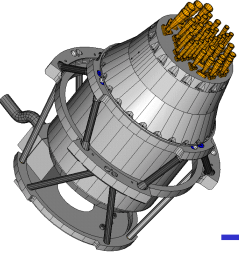


Summary FDIR

- The FDIR procedures are configured by the S/C FDIR mode.
- FDIR analysis is covered by the Data Management (and Cryogenic) Working Groups involving all partners (Alcatel, IAS, LAL and the 3 cooler's teams).
- Necessity :
 1. To collect and to bring closer the functioning modes of the 3 coolers,
 2. To determine the reaction of each cooler if one of them stops.
- Operating rules and 2 procedures have just been proposed by the LAL, for discussion during the Data Management Working Group last week in Alcatel:

Ref TS-PHBC-100006-LAL 01/03 (draft)

 - For hardware or soft failure : How to restore the electronics,
 - For cooling failure : How to limit the FPU warm-up.

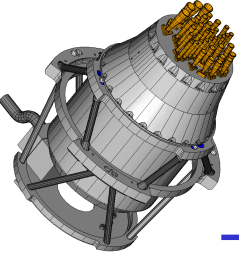


Calibration

- For the optical set-up into the Saturne tank :
 - Up-dating of the Cleanliness Control Plan
PL-PHZW190-100024-CDF Sept 25, 02
 - Procedures on-going to be written by CdF for :
 - Immersion –rinse cleaning,
 - Ultrasonic cleanliness,
 - Vacuum bake drying.
- Facilities :

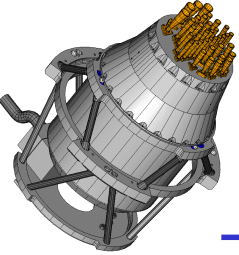
Implementation of a Working Group for evaluation of reliability and availability. Covered domains :

 - Evaluation of potential risks for the instrument and for the people (electrical supply, clean room, safety, grounding, building, cranes etc...). Quite already completed.
 - Definition of protective and preventive measures according to the legislation in effect . Ex : formation for people ability into facilities.
 - Assurance that all will be in phase with the instrument master planning.



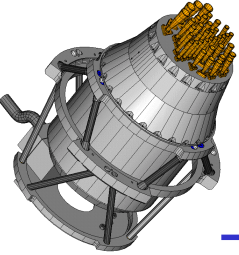
PA status (1/3)

- CIL status :
 - No new issue since the IBDR
 - Project to review the list with each PA local Manager for the next review.
- Cleanliness activities :
 - General : No new information. J M. Lamarre proposes to discuss with Alcatel to harmonize budgets with real needs.
 - Sub-systems : Waiting for contamination figures from Cardiff and JPL, to insert into the « HFI Detailed Contamination Budget Document » already issued.



PA status (2/3)

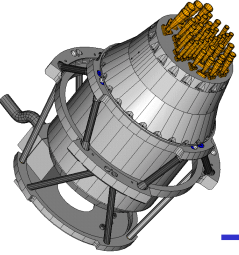
- VCD and Qualification Matrix
 - All sub-systems have developed programs of functional tests to check performances. ICD have also been issued. They are covered by internal procedures and local matrix of application.
 - Particularly important tests are planned for :
 - EMI/EMC pass/fail criteria with the whole detection chain,
 - Cold optics chain,
 - HSL line communication between DPU and REU?
 - Cold alignment tests on the Air Liquide cryostat mock-up.
 - No documents still received in the VCD format (previously sent by IAS to the sub-contractors) for this purpose
 - A balance of interfaces documents foreseen in IAS.
 - Qualification Matrix not written at system level in IAS.
- RFW and RFD
 - Implemented at IAS PA team level with the PM
- NCR
 - No documents still received



PA status (3/3)

- Configuration status
 - CIDL is managed by the PC (B. Cougrand)
 - New version of Baghera DMS is installed in IAS under CNES licence. Baghera is connected to Agile in configuration mode via the HFI Product Tree.
- MIP planning
 - For manufacture : Key points defined in each institute with selected sub-contractors.
 - For AIT/AIV : Will be integrated into the new version to be written of the AIT Plan.
- Future planning

HFI schedule key points defined on the 12 of June is valid.



AIT procedure preparation

Approach is being performed along this axis :

1. Implementation of clear rules with sub-contractors by the way of delivery procedures :

Need of realistic ADP documents from sub-contractors :

See « Incoming Material Inspection Procedure »

« Internal Historical Record form »

Ref: PR-PH195-200184-IAS

2. Formalisation of tests to perform versus master planning :
 - Sharing into tasks from AIT/AIV plan
 - Assignment of resources
 - Identification of the important and critical tasks.
3. Policy of sensitisation of this approach.
4. Implementation of meeting to validate the documents.

Performed by S. Rideau in IAS with the AIT manager.



JPL



Herschel/Planck Project

JPL PA Status

Tim Larson

JPL H/P Mission Assurance Manager

4th Quarterly PA Managers Meeting

13 November 2002

Orsay, France

- **JPL contributions:**

- **Herschel**

- SPIRE: Bolometer Detector Assemblies, JFET Modules, RF Filter Modules, cryo harnesses
- HIFI: High power amps, high and low frequency diodes, Band 5 mixers and LO chains, Band 6 Mixer blocks, Band 6 LO Chains

- **Planck**

- HFI: Bolometer modules (100GHz to 853GHz)
- LFI: Sorption cryo cooler subsystem (cold end interfaces with LFI and HFI instruments, mechanical and thermal attachment to the S/C structure and radiators)

- **PA Approach**

- **JPL Mission Assurance process applied to all project elements**
- **One Mission Assurance Manager and support team for consistent application across the project**
 - Contact info: timothy.larson@jpl.nasa.gov
 - Phone: (818) 354-0100

- **HIFI Band 6 Mixer**

- HEB mixer chip did not meet noise temperature requirements
- Current plan is for Chalmers University in Sweden to provide phonon cooler mixer chips. JPL will fabricate the mixer block with the Chalmers IF board design and provide to Chalmers for final assembly.
- Will use as much similarity as possible with Band 5 mixer to facilitate qualification. Most MA processes will remain the same as planned.

- **HIFI Band 6 multiplier**

- Band 6 High is technologically challenging, leading to schedule and cost pressures
- Will streamline the MA processes to support delivery of this challenging band. Will concentrate on MA activities that are most vital (e.g. use of approved materials and processes developed for Band 5, use of parts qualified for Band 5, QA assistance in the assembly process, etc.).

- **LFI**

- Are pursuing funding for a effort to provide 12 100 GHz radiometer chains
- Will propose an effort starting in January 03 to deliver by June 04
- Due to the time and cost limitations of this effort, the MA activities will be limited to those essential to reduce highest risks
 - **Will use materials and processes already approved for similar assemblies**
 - **Will use an early EM for qualification**
 - **Interface FMECA to ensure no FEM/BEM failures propagate to the instrument**
 - **Utilize experienced QA engineer during assembly**
- Stay tuned ...

-
- **SPIRE**
 - Approved by RAL
 - **HIFI**
 - Approved by SRON
 - **LFI (Cooler)**
 - Verbal approval by LFI, need to finalize
 - **HFI**
 - No formal requirement flowed down from Cardiff
 - Business Agreement references JPL Herschel Planck Project Mission Assurance Requirements document
 - Same MA processes/requirements as rest of project are applied to HFI element

-
- **HIFI**
 - Qualification plans are in place
 - Some component qualification has been done
 - Assembly qualification tests for multipliers and mixers coming soon
 - **SPIRE**
 - BDA – qualification in progress
 - JFET Modules – qualification model is being assembled
 - RFF Modules – qualification model to be delivered by vendor by end of November
 - **Cooler**
 - Weld schedules being developed and qualified
 - Joint Controller/TMU EM test was successful the first time!
 - **HFI**
 - SWB qualification is complete
 - PSB qualification is in progress

Materials And Processes Status

- **All elements – generating final declared materials and processes lists with final design information**
 - **SPIRE – all materials have been reviewed and approved. Will finalize materials list and forward to RAL in December 02.**
 - **HIFI – materials are being reviewed, design in progress. Final list when design is finalized. Expect completion in December 02.**
 - **Cooler – materials review is up to date with current design status. One material to be qualified. Final list once PACE design is settled. Expected in Feb/March 03.**
 - **HFI – all materials have been reviewed and approved.**

- **Putting material and process information in ESA format is significant extra effort.**

- **All electronic parts are used outside of standard temperature ranges (from 100mK to 120K)**
 - Custom made parts (HIFI diodes) are qualified at the part level (some are used in JPL HIFI hw, some are shipped to other HIFI consortium members)
 - Procured parts – DPAs and component evaluation performed where necessary
 - Parts will undergo rigorous assembly level qualification and acceptance test programs
- **Part lists are being finalized**
- **Will be available by end of year**
- **PAD sheets: Information is available, and parts engineer is available for consultation if needed**
 - donald.franzen@jpl.nasa.gov
 - 1 818 354 1781

-
- **All facilities handling flight hardware have been evaluated and certified to appropriate levels (most labs and assembly areas must meet class 100.000 level)**
 - **When environmental tests are performed in areas not meeting the class 100.000 requirement, hardware is placed inside special fixtures for protection**

- **Following FMECAs completed:**
 - **SPIRE: BDA & JFET FMECA updated, GSE FMECA for BDA test cryostat completed, GSE for BDA and JFET test boxes to be complete by end of November**
 - **HIFI: Band 5 multiplier and mixer FMECAs done, test equipment FMECAs are in work, multiplier part stress analysis has been done with final document in work**
 - **HFI: Bolometer module and test set FMECAs done**
 - **Cooler: TMU FMECA has been updated, joint SCE/TMU HSIA completed**

- **Problem/Failure Reporting System**

- **P/FR system used to track all problems, anomalies, and failures on the flight hardware after completion of assembly fabrication**
- **Requires description of problem, analysis of root cause, identification of corrective action, and verification of fix**
- **Requires review by CogE, project element management, reliability, safety, and MAM is final closure signature**
- **Problems with serious impact and/or uncertain corrective action result in a ‘red flag P/FR’ requiring project manager approval for closure**

-
- **Safety engineer reviews all facilities, tests and processes that could threaten the hardware**
 - **Operational Safety Reviews**
 - **Pre-test Reviews**
 - **Facility Safety Reviews**
 - **Safety Data Package will be updated for the Sorption Cooler TMU (expect completion by end of November)**
 - **Will include recent hazard analysis on pressurized systems**
 - **Approval of this document is time critical, since it directly affects the TMU structural design**

- **Quality Assurance reviews and approves all AIDS (Assembly and Inspection Data Sheets) that control all assembly, handling, test and other activities on the flight hardware**
 - These AIDS define the inspection points
 - AIDS are maintained under configuration control
- **PA/QA personnel review all qualification and acceptance test plans and procedures**
- **QA personnel witness all test setups**
- **Vendors are surveyed and approved by QA**
- **PA requirements are passed on to subcontracts**

- **All inspection findings are documented in Inspection Reports (IRs) – these require disposition by the Cognizant Engineer, concurrence by the QA engineer, and verification of follow-up**
- **All assembly, testing, and other activity involving hardware handling is controlled by written procedures – AIDS (Assembly Inspection Data Sheets) – that also call out all inspection points. The AIDS are approved by QA prior to use, and reviewed by QA and closed out prior to the next hardware activity. The AIDS, as built lists, and associated closed IRs constitute the Build Book for all flight hardware.**
- **All personnel handling the flight hardware have been identified, training is performed as needed, and QA verifies necessary certifications are in place (ESD, flight hardware handling, soldering, clean room protocol, mate/demate, torqueing, etc.)**
- **Device processing in the Micro Devices Lab follows documentation and traceability agreed to by QA and electronic parts engineers**
- **QA personnel are identified and in place to support the flight build**

- **Inspection Reports**

- Total IRs: 713
- Total open: 299
 - 183 over 120 days

- **Problem/Failure Reports**

- Total P/FRs: 36
- Closed: 11
- Potential Red Flag: 0

- **Waivers (Class B:internal, but included in EIDP)**

- Total Waivers: 1 (number of thermal cycles on CQM)

- **Request for deviation (external approval needed)**

- 3 RFDs (Cooler cold end temperature stability, Cooler 140 Hz first mode frequency, SPIRE JFET Module heat load)



Software Quality Assurance



-
- **No deliverable software**

- **All controlling documents are listed in the Business Agreements and Specification Documents**
- **Drawing Trees list all drawings that define the hardware**
- **All test and engineering procedures, plans, AIDS, other documents, and drawings are placed in JPL PDMS (Project Data Management System) database**
- **This system is used to store and track release status of drawings and documents**
- **ECRs are part of this system, and are used to track changes to controlled documents and drawings**
- **All IRs (Inspection Reports) are also tracked in this database for CogEngineer disposition and QAE concurrence**

HIFI PA stutus

November 13, 2002

Problems areas:

LO subsystem product assurance not available:

Will be included in Project management meeting (15-11-2002).

To be resolved Prior CDR.

Quality levels HRS IF:

PAD's and procurement specs of HRS IF contract with Miteq is under discussion.

Critical items:**Generic:**

There are many items open, or items partly visible but with not sufficient visible or documented information that allows implementation in a Critical Items List.

Reference or base line for observations:

All EEE components procured through the CPPA are for the purpose of the critical items control not considered as critical items unless they are applied outside qual. range.

FMECA

FMECA status: SRON-U/HIFI/RP/2000-001. (under update as per CDR's)

FMECA related items:

- Chopper: Containes pivots,
- Calibration source: PID for assembly is beeing developed.
- Diplexer mechanism: Containes pivots.

-
- Local Oscillator Source Unit: The LSU has been redesigned, impact on the FMECA is unknown.

Reliability or Qualification Status Items, self manufactured or self procured

Focal Plane Unit:

Mixers:

A CDR has been performed recently to assess the PID status and the PID qualification status of the mixer designs.

For all the mixer units prequalification items concerning parts, materials and processes has been identified. For some mixer groups controls has to be implemented as required by the PA plan (See also CDR report).

The PID status varied from group to group.

Some items such as the evaluation and application of components and interconnection technology versus substrate and clamping approach is coordinated by the Focal plane S/S.

Pivots:

Procurement spec. needs update, procurement and evaluation program is visible.

Visit planned to C-Flex for product improvement is planned for 18-22 Nov. 2002

Calibration source:

- PID under development, semiconductor temperature sensor will be evaluated also for radiation and PAD for temp. sensor is issued.

Isolator/circulator PAMTECH: PAD/PID under development.

Intermediate Frequency Amplifier 1:

- InP HEMT transistors from TRW: Status is available concerning evaluation and qualification. PAD is under construction.
- The combination substrate/components/interconnection technology to be defined and evaluated/qualified, also versus the substrate clamping technology.
- PAD for passive components to be applied outside their qual. temperature range has been issued, see further the interconnection technology evaluation.

Intermediate Frequency Amplifier 2:

- Design status is under definition.
- PAD for GaAs transistor has been rejected (power consumption). TRW HEMT is back-up.

Local Oscillator unit:

- Varactor dice: Applied in frequency multipliers assembled, either by JPL or RPG. JPL PID under final development and qualification approach is visible.
- Varactor, discrete: Applied by MILLITECH for a frequency multiplier. Screening and qualification approach is visible. PAD to be issued.
- Frequency Multipliers: Assembled by JPL, PID under development and qualification approach is visible. PAD is under construction.
- Frequency Multipliers: Assembled by RPG, PID and qualification approach is under definition.
- Frequency Multiplier: Assembled by MILLITECH. PID under development and qualification approach is visible
- High Frequency Amplifiers: Manufactured by TRW. Procurement specification, including qualification approach and PID base line from JPL, is visible.
- Isolators, designed by JPL/MILLITECH and manufactured by MILLITECH, presently under development.
- Isolator designed and manufactured by MILLITECH, presently under development.

Local Oscillator Source Unit:

- The unit contains mainly electronic components and some of them are not available from qualified sources but have a successful application history. Some components require further development. Further development of the component list will be undertaken and is discussed at CSA (Canada). At present, a preliminary list is available.
- A number of components will be procured through the project CPPA, the remainder will be self procured by COMDEV. PAD have been requested

Wide Band Spectrometer:

- Bragg cell: Procurement specification and qualification approach is visible.
- CCD: PAD covering procurement evaluation, assembly PID and qualification is visible. Sensitivity to radiation is high, 2 KRad Si, and requires further confirmation and requires evaluation of shielding.
- Solid State Laser: PAD covering screening and qualification is visible.
- ASIC, digital, CMOS: PAD is under development. Open items concerning qualification to be closed and implemented at 12 november 2002.
- Intermediate Frequency Modules: The PAD summarising the acceptance approach for the components is under development. The PID for the module assembly is being developed.
- Power supply modules (hybrids): The WBE procurement approach is at present open but procurement through the CPPA is being considered. PAD has been requested by HIFI to cover the procurement approach. Meeting planned 12 november 2002.

High Resolution Spectrometer:

- Redesign (descoping), impact on components list is included in latest issue.
- Intermediate frequency Modules: PAD are under construction.
- ACS: PAD sheets of a GaAs ASI and a CMOS ASIC has been made available and are processed and agreed.

NCR status:

One wafer lot of HRS ASIC's is rejected by the Manufacturer (Temec).
Re-manufacturing within the time-frame of QM/FM.

RFW status:

Available on HIFI web-site.

Are agenda item of interface meeting 13-14 Nov. 2002 at Estec

REMARK: RFW should nor be processed by Spacecraft PA but by
ESA/Spacecraft CCB (engineering/PA/management).

PMP status:

PMP lists and are available HIFI web-site.
EEE component list issue 15 is under construction.

PAD sheets:

Pad status is available HIFI web-site.

Activities: -see also critical items.

-A lot of PAD sheets are approaching final status and will be sent for approval.

There will be a PAD burst end of November/December!!!!!!!!!!

Contact points will be Jan Rautakoski and Jan Minee.

Remark: In case PAD's are sent to industry, no propriety data and evaluation results of cryo applications will be included.

Cleanliness:

No major activities other than arguing with ESA/Industry of implementing Purging/flushing of FPU and LOU.

See also agenda Interface meeting Estec 13-14 Nov. 2002.

HIFI design analysis:

FMECA/WCA partstress are part of S/S CDR and will be built-up from S/S level to system.

Conditions are visible to S/S.

HIFI VCD:

Is available on IID- and instrument spec level.

Remark: ESA is frequently changing the chapter numbers of the IID's resulting in a change of the HIFI VCM.

S/S level will be available at S/S CDR to major sub-contractor level.

Configuration status:

Is available on HIFI web-site.

S/S level conf. Control will be ready at each S/S CDR.

Software PA:

There is a PA baseline within HIFI.

OBS is covered by IFSI OBS PA plan and monitored by system ICC representative.

ICC software is covered within the ICC team

Remark: There is a back log in design status at IFSI.

MIP planning:

Is under inclusion at S/S planning.

INTRODUCTION

Product Assurance

Eric Clark

RAL

Apology

Sorry I can't join you at the meeting in person, but due to Funding problems, restrictions on foreign travel are currently being imposed on SPIRE.

AGENDA

- **Problems & Solutions**
- **Critical Items Status**
- **NCR & RFW Status**
- **Parts, Materials, Processes & Pad's**
- **Cleanliness**
- **FMECA & HSIA**
- **WCA & Derating**
- **VCD**
- **CIDL & Configuration**
- **Software PA**
- **AIT, MIP's & KIP's**
- **Hardware Status & Qualification Planning**
- **Future Planning**
- **AOB & Actions from previous meeting**

PROBLEMS & SOLUTIONS

- ❖ **The Main problem area is still resource, Money & person power. (Spire is already Overspent).**

There is not enough of either available to meet the requirements for Hardware, Software or Documentation.

Solutions:-

1. To obtain more money from somewhere. This is being actively pursued.
2. To restrict spending to essentials. (this is current practice, hence my none attendance).

- ❖ **The Usual problems of delayed / late delivery.**

Typical problem of too much to do by too few people.

Solution:- Keep chasing subsystems as required until first item above is resolved.

CIL,

- ❖ **CIL** Update will be available for the **IHDR**.
Points raised at the meeting with Jan SCI-PT/14768
Action A1 – 4 have not as yet been implemented, requires the requested example (see note).

Note.

- At the IBDR, Matt requested that “ESA provide an example from a recent astronomy satellite instrument (e.g., one of the XMM instruments). If we had this as a guide to what ESA want in the CIL and in what form, then we could use it to update the SPIRE CIL.”

NCR'S & RFW Status

❖ Non-Conformance Report

NCR

No Major or Flight NCR's

Any NCR's concerning Safety are Classed as Major.

❖ Request for Waiver

RFW

HR-SP-CEA-RFW-001 Open

HR-SP-CEA-RFW-002 Open

HR-SP-JPL-RFW-001 Open

Parts Materials & Processes. PAD's

❖ Parts, Materials & Processes

Currently no changes to the combined lists however:

Ref to meeting with Jan SCI-PT/14768

Action A1-1 completed.

All subsystems have been asked to provide updates.

Action A1-2 still Open (not due until Dec 02)

Some subsystems have promised the updates but not all have replied.

❖ PAD's

Two PAD's from IFSE on the DPU Submitted

DPU-PA-CGS-001 Is.1 & DPU-PA-CGS-002 Is.1

Two PAD's from RAL in preparation, will be Submitted by Dec.

HR-SP-RAL- PAD-001. & HR-SP-RAL- PAD-002.

CLEANLINESS

- ❖ **The Cleanliness Plan has defined the cleanliness for the instrument, However The comments on the cleanliness plan SPIRE-RAL-PRJ-1070 ref Meeting SCI-PT/14768 are accepted and will be implemented.**
- ❖ **Cryostat Clean room progressing**
- ❖ **Cryostat currently under test at manufacturers**
- ❖ **SPIRE Support frame (Structure) & trolley Delivered and Checked. Some minor problems now corrected.**

FMECA - HSIA

- ❖ **FMECA and effect on short circuit (propagation of failures).**

Now on Live Link Configured items.

SPIRE-RAL-PRJ-001260

The System FMECA including interfaces for Launch and Flight, has been supplied, comments raised by Jan have been addressed.

- ❖ **Hardware/Software Interaction Analysis (HSIA).**

Bruce Swinyard has stated that he will be supplying this by December 2002!

WCA, & DERATING

❖ Worst case analysis and Derating analysis

Have been requested from IFSE & CEA/Sap.

Who I believe are the only subsystems required to produce them for SPIRE.

Currently I have:-

- **IFSI Derating-WCA_Issue11.pdf** (Jan sent copy Jul 02)
- **Nothing from CEA/Sap.** (Will send a reminder).

VCD.

❖ Verification Control Document. (VCD)

- The Test Plan is completed
- The Database is Progressing but not completed.

CIDL & CONFIGURATION STATUS

❖ CONFIGURATION ITEM DATA LIST CIDL

SPIRE-RAL-PRJ-001134. Still at draft issue 2.
Configuration Management Plan Issued

❖ No new subsystems CIDL's added.

Some still require updating and putting into document format.

Additions Suggested by Jan Ref SCI-PT/14768 incorporated

❖ Configuration Status.

SPIRE still has to many documents not signed, however all the documents that would come under configuration control are being controlled accordingly.

Still require authorisation (by ESA etc) of top level documents before the lower ones can be authorised

Software PA

- **Most of the Software is still in development or Draft form, with hardware needed (in some cases) before it can be tested etc. However the software is being controlled as stated in the:-
SPIRE Configuration Management Plan 1.3.**

AIT, MIP's & KIP's

❖ AIT Procedure Preparation.

- AIT Plan for STM and CQM is completed, with all the Test plans, issue, date, etc included.
Awaiting approval signatures.

❖ Mandatory & Inspection Points (MIP's)

❖ Key Inspection Points (KIP's)

- Are detailed in the AIT plan above
ESA will be informed of the place, time and date of a MIP
Typically Four weeks before, by fax or Email, and reminded two days before, by Email or Telephone.

Hardware Status & Qualification Planning

- ❖ **Cryostat currently under test at manufacturers**
- ❖ **SPIRE Support frame (Structure), trolley & Hob plate Simulator Delivered and Checked. Some minor problems but now corrected.**
- ❖ **BSM EIDP reviewed awaiting update and Delivery of EIDP and BSM.**
- ❖ **Qualification Planning**
Isn't this covered by VCD and AIT plans etc, Please clarify what the requirements are.

FUTURE PLANNING

- *Inspection of some subsystem deliverables have taken place, with more expected over the coming months, requiring incoming/outgoing inspections and EIDP(ADP) reviews etc.*
- *TRR's (Test Readiness Review) will be require for the Qualification testing etc.*
- *Cryostat clean room has been checked, the ESD protective equipment has arrived, to be installed once Cryostat is in place.*
- *Complete the actions I set for myself at the last PA Managers meeting and at the meeting with Jan SCI-PT/14768*

AOB & ACTIONS

- **AOB**

- ❖ **SPIRE Product Assurance Plan**

SPIRE-RAL-PRJ-000017 Issue 1

Changes To the Plan Now at Issue 1.1

Most of the comments from Pierre have been incorporated Due to be completed by Dec 02.

- **ACTIONS**

- ❖ **All Actions on Spire from the meeting at MPE have been completed.**

PACS PA/QA-STATUS

- Critical items
- NCR, RFW,
- Parts, Materials, SPP,
- Cleanliness
- FMECA, HSIA
- Derating, WCA
- VCD status
- Configuration status
- Software PA
- MIP - planning
- AIT preparation
- Hardware qualification
- Safety
- Comments, problems

Critical item list

PACS-ME-LI-007 (1) 07 Feb 2002

NCR status updated 10/02

ANTEC 9 open

CEA nothing reported

CSL 0 open

IAC nothing reported

IMEC 0 open

KT 4 open

MPE 0 open

MPIA 5 open

IFSI 1 open

Request for Waiver

PACS-RFW-0001: change of qualification level of AD590MF chips
0002: change of cryo-vibration procedure
0003: change of outgassing requirements

ESA decision requested for all RFW

DCL, DML, DPL Self procured parts list

All lists (without self procured parts) confirmed by all (as stored in PACS central file)

Self procured parts list available from IAC, KT, IMEC.

Self procured parts lists were requested several times from all !!!

Some self procured parts lists are included in EEE or DML parts lists and not completed.

Cleanliness: Plan Issue 1 26.04.02 is submitted for signature

Some requirements as procedures and inspection methods are under discussion. Final version till 12/02 expected.

FMECA: no progress

PACS-ME-GR-004 draft (2) 07 Feb 2002

FPL-AN-1214-03-CRS (1) 25 Jul 2001

HSIA : no progress

DERATING ANALYSIS :

Nothing to report,
No derating analysis available

WCA

Nothing to report
No WCA available

VCD status

PACS-ME-PL-019 (1) 07 Feb 2002

CONFIGURATION STATUS:

PACS-ME-LI-011 status 27.06.02

SOFTWARE PA:

DEC/MEC Software Product Assurance Plan
PACS-CL-PL-007

DPU/ICU On board Software Product Assurance Plan
IFSI/OBS/PL/2000-001

SOFTWARE QUALITY ASSURANCE PLAN for the
PACS Data Compression S/W PACS-JR-PL-001

MIP - PLANNING:

A review of qualification procedures, test processes, equipment, responsibilities and clearance procedures is planned at MPE. This might be a base of fixing MIPs.

This effort shall streamline existing test plans of subunits with instrument Test plan. PACS-ME-PL-012 (1)24 Jan 2002

AIV:

Plans available for

Detector Array, Sorption Cooler, PACS Instrument (draft)

DPU, FPU, SPU, Grating, Chopper

Safety:

Nothing to report

Comments, problems

- Although there are PA/QA responsables named in each organigram of all PACS Consortium members, in the reality some are not executive experts.
- Support from ESA experts on dedicated problems is requested (p.g. Qualification procedures etc.)
- Procurement and acceptance procedures should be reviewed to avoid following problems.

Example of an FMEA completed with HSIA information (in red)

Id number	Item/block	Function	Failure mode	Failure cause	Failure effects a. Local effects b. End effects	Severity	Failure detection method/ observable symptoms	Compensation provisions	Correction actions	Remarks
1	DC/DC converter		Not functional	Internal failure	a. Loss of DC/DC converter b. Loss of nominal side	2R	No TM	Switch to redundant side	None	
2	CPU		Not functional	Internal failure	a. Loss of CPU b. Loss of nominal side <i>S/W: SW not running</i>	2R	No TM <i>S/W: No TM</i>	Switch to redundant side <i>S/W: none</i>	None	
2.1	Data RAM 1		Not functional	Internal failure	a. Loss of Data RAM b. Likely loss of nominal side <i>S/W: Only partial data processing</i>	2R	No or incomplete TM <i>SW: No data TM in addresses xxxx</i>	Switch to redundant side or try remedial SW actions <i>S/W: Patch SW to run in a degraded mode using only Data RAM 2</i>	None <i>S/W: Patch SW to run instrument in a degraded mode using only Data RAM 2</i>	<i>SW: New SW requirement identified: Change SW during the design phase so that When this failure occurs during flight the SW takes automatic action to switch to degraded mode using only RAM 2</i>
2.2	Data RAM 2		Not functional	Internal failure	a. Loss of Data RAM b. Likely loss of nominal side <i>S/W: Only partial data processing</i>	2R	No or incomplete TM <i>SW: No data TM in addresses yyyy</i>	Switch to redundant side or try remedial SW actions <i>S/W: Patch SW to run in a degraded mode using only Data RAM 1</i>	None <i>S/W: Patch SW to run instrument in a degraded mode using only Data RAM 1</i>	<i>SW: New SW requirement identified: Change SW during the design phase so that When this failure occurs during flight the SW takes automatic action to switch to degraded mode using only RAM 1</i>
2.3	Data EEPROM		Not functional	Internal failure	a. Loss of Data EEPROM b. Loss of nominal side <i>S/W: No data processing</i>	2R	No data TM <i>SW: No data TM</i>	Switch to redundant side <i>S/W: none</i>	None	
2.4	Program PROM		Not functional	Internal failure	a. Loss of PROM b. Loss of nominal side <i>S/W: Application SW not running</i>	2R	No data TM <i>S/W: No TM</i>	Switch to redundant side <i>S/W: none</i>	None	
2.5	Program RAM		Not functional	Internal failure	a. Loss of p RAM b. Lss of nominal side <i>S/W: Application SW not running</i>	2R	No TM <i>S/W: No TM</i>	Switch to redundant side <i>S/W: none</i>	None	

November 13, 2002
4th quarterly meeting in LAL.

(1)

1 - Presentation of Georg Jell by phone (teleconf).

Action 1: List of CIL to provide to ESA.
PACS end Nov.

Action 2: Provide list of NCR (consortium meeting 9-10 Dec).
PACS end Nov.

Action 3: ESA demands copy of RFW to see the evolution of the
PACS end Nov.

Action 4: PACS to discuss internally with PM and PI
PACS end Nov. how to get IMECA / HSIH in due time and to
take it over at next consortium meeting

2 - Presentation of Eric Clark by phone (teleconf).

Action 1: ESA to provide to Spire an recent example of CIL to
ESA end Nov. up-date Spire CIL.

~~Action 2: Provide SPIRE with an example of a CIL~~

Action 2: ESA requires that the CIL status is reported at each
PACS SPIRE quarterly PA meeting

Action 3: Spire to provide list of NCR to ESA with original sign
SPIRE end Nov. by mail to get agreement to ESA

Action 4: Jan is going to check the situation of the PADs from IFSI
ESA end Nov.

Action 5: Spire to provide new version of FORCEA to Jan.
SPIRE end Nov.

Action 6: ESA reminds that all electronics parts must be
SPIRE deleted according to ESA PCS-01-301.

Action 7: To check if this is made by all spire parts suppliers
SPIRE and particularly for the 4K coolers. With Tom Boardman.

3 - Presentation of Antonio Dragoni

No presentation. Impossibility to have a teleconf with labes -

4 - Presentation of HIFI in LAL - by H. M. Jacobs.

Action 1 - HIFI provides address where people could find CCB information
HIFI end Nov.

Action 2 - ~~HIFI~~ is going to provide PAD sheets to ESA. These PAD sheets
are not providing data for the industry.
How to approach this with industry? question to ESA?
Before end of this month. PAD will be sent to ESA. by

5 Presentation of Tim Larson from JPL -

Action 1: JPL to provide documentation for SWB and PSB when completed to HFI.

JPL Action 2: JPL provide handling manual for bolometers delivery.

JPL Action 3: JPL provide POECA for bolometer modules and set forth to IAS

JPL Action 4: JPL sent a copy of TOR safety documents for S/C to IAS

6 HFI presentation

Action - give CIL situation for ~~end-Nov~~ first week december (W49)

Comment page 11 - Cleanliness the objective is to discuss means to meeting the agreed delivery budget.