EADS ASTRIUM

SPIRE-AST-MOM-002177

Minutes of Meeting

Herschel

Date:	09.09.04		
Doc.-No.:	HP-2-ASED-MN-0753		
Meeting place:	ASED, Ottobrunn	Chairman:	C.Schlosser / S. Idler
Date/Time:	09.09.04/09h00	Secretary	H. Faas
Agenda dated:	See HP-ASED-EM-644-04	Close of Meeting:	Close of Meeting

Subject: SPIRE AIT and EMC Meeting

Participants:	C.Scharmberg, N. Nikolaizig, f. Marliani (ESTEC), G. Doubrovik, D. Montet, B. Collaudin, J. Gallagher (ASP), C.Schlosser, S. Idler, C. Kalde, H. Faas (EADS Astrium), B. Swinyard, D. Griffin (RAL)	Additional Distribution:	ESA, ASP, ASED (internal distribution list)

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☐ Brief-Minutes (except following sheets)

☐ Summary of Results of Sheets 2 till

Reference	Results	Remarks
	Draft Agenda AIT Meeting (Updated): 1. Introduction 1. ASED Instrument Test Plan: Instrument Testing on PLM EQM Level (HP-2-ASED-PL-0021), Issue 3.0 • Review of comments on Issue 3.0 (released end of July) 1. Status of AIT Documentation (see Annex 1) 1. Detailed review and clarification of: • Pre-integration Tests, e.g. Compatibility with CR100 conditions • Mechanical Integration Procedures • Electrical Integration Procedures • Test Duration • Test Constraints • Thermal environment during on-ground testing 1. Test Logistics - Required Support from SPIRE - Planning of EQM Tests (ASED) 1. EMC Splinter (see separate Agenda) 1. Task plan for the implementation of the Instrument Test Procedures 1. SPIRE CQM Delivery Schedule (FPU, JFETs and Warm Units) 1. AOB • ASED IDAS database validation at RAL • Cryo cover temperature calibration **Draft Agenda for EMC Splinter:** 1. Review of H-EPLM EMC Test Plan (HP-2-ASED-PL-0037) • Presentation of PLM EQM RS Test Planning (ASED) • Clarifications of Open Points, tbd's and tbc's 1. Presentation of Instrument Level EMC Test results and Problem Areas (if any) (SPIRE) 1. Detailed Definition of: • Test Modes, Fail/Pass Criteria, Test Duration, Frequencies 1. Task Plan for Implementation of PLM EMC Test Procedures 1. AOB **Agenda Item 1:** Introduction	

Reference	Results	Remarks
	Agenda Item 2: Instrument Test Plan: Instrument Testing on PLM EQM Level **RAL/SPIRE presented comments** to the PL-0021, Issue 3 (see Annex 1, page 1 to 8), which were discussed. ASED will provide a response to the RAL comments **(AI#1)**. Within this AI ASED will check: • if all instrument can be switched on at the same time. • If saver plugs (EMI caps) can be provided for the FPU and JFET connectors (not used by the EQM harness). ASED will check if an ECP will be raised. • Which is the preferred option for the implementation of the BOB, depending on the response to AI#2 (SPIRE) • That Ready Mode is used (now Stand-by mode) in the plan ASED clarified that: • the SPT is part of the IMT • AVM DPU power will be provided by the PLM EGSE • TN Making SPIRE ESD safe: For type 7 ASED will use EMC caps. This was agreed by SPIRE. Note: ESA stated: Simplification of EQM cryoharness has been implemented on industry request (Ref. Hp-ASED-EM-0311-04). SPIRE accepted the simplification approach, but at the same time clarified, that EMI caps would be needed on ' unused' connectors of FPU/JFETs (Ref. Email from Doug Griffin to Horst Faas, 29/03/04). --> ASED shall procure the requested EMI caps WITHOUT ECP raised by SPIRE. SPIRE clarified that: • no cryoharness cross talk test is required. • A break-out-box is required by the cryoharness and the SPIRE WUs to drive SMEC and BSM (STM). It only be connected during thermal balance test. ASED suggested that a solution with a T-connector. RAL will provide a sketch of the proposed design of the BOB. **(AI#2)** • RD-11 has been updated and will be issued at Version 4 **(AI#3)** • SPIRE will define its GSE deliverables for EQM testing **(AI#4)**	**AI#1, ASED** will response to the RAL comments **AI#2, SPIRE:** RAL will provide a sketch of the proposed design of the BOB. **AI#3, SPIRE:** RD-11 has been updated and will be issued at Version 4**)** **AI#4, SPIRE:**SPIRE will define its GSE deliverables for EQM testing

Reference	Results	Remarks
	The <u>ESA comments and the ASED responses</u> were discussed (see Annex 2). SPIRE clarified that the SPIRE FPU CQM has been baked out once, but a further bake is not planned before delivery to ASED. SPIRE requests that no further bake-out will be performed in order not to invalidate the calibration of the Cernox thermistors. The upper limit for the Cernox is 50°C. ASED does not plan to perform a bake-out of the EQM, but a flushing with nitrogen will be performed. SPIRE will send a PACS/SPIRE Parallel Mode Procedure for EQM testing. The cooler recycling for both instrument need to be resolved. **(AI#5)**. ASED clarified that the parallel test will be performed directly after the SPIRE single test and prior to the PACS single test. The delivery format and date need to be clarified and will be discussed at a EGSE Working Group Meeting on Monday, 13/09/04. ASED proposed that the tilting angle for PACS and SPIRE cooler recycling in the EQM will be 30 to 35 degrees (reqt. >20 deg). 90 degree would be even better, but may not be possible due to Cryostat constraints. Item 15 - Microvibration Constraints: In the test facility pumps may generate microvibration (experience from ISO). When the pumps are stopped the mass flow will be stopped (OBA ventline L1, L3). The temperature will drift up consequently. On the EQM no accelerometers are installed in the cryostat. Item 16 - mass flow rate: On the EQM two separate mass flows are available. The main tank mass flow rate is in the order of 100mg/sec. The auxiliary tank flow rate can be adjusted. But this is not possible for steady state, only for transient. **<u>Alcatel Comments from B. Collaudin (email, 20/08/04) (see Annex 3)</u>**: Item 1: ASED will include the VPP reference, for the test activity sheet. Item 2: see Item 1 Item 3: Functional check of WU is planned to be performed as part of the electrical integration (Pre-integration test done be Instrument Teams)	**AI#5, SPIRE:**.SPIRE will send a PACS/SPIRE Parallel Mode Procedure for EQM testing.. **AI#6,** SPIRE will provide the EQM thermal interface requirements and mass flow rate for the EQM testing

Reference	Results	Remarks
	Item 4: ASED clarified that the SFT is a very short test without evaluation of scientific data. Item 5: It was agreed to have only one Test Activity sheet covering both tests. Item 6: already discussed Item 7: SPIRE should update the test sheets to be consistent with thermal environment defined in Table 9-4. SPIRE will provide the EQM thermal interface requirements and mass flow rate for the EQM testing **(AI#6)** SPIRE will provide update test activity sheets to cover resolution of the TBD or empty fields **(AI#7)** **Agenda Item 3:** Status of AIT Documentation The list of SPIRE AIT documents, with comments made to the list, is covered in Annex 4. A separate WU integration procedure will be provided by RAL. This will cover the WU interconnection harness (**AI#8, SPIRE**). SPIRE will provide a dedicated integration procedure for the AVMs **(AI#9, SPIRE)**. **ASP will provide the** AVM test plan **(AI#19**). Document: SPIRE FPU Handling and Integration Procedure : Update (mainly as regards harness integration) will be provided by SPIRE **(AI#10)**. Document: "Operating the SPIRE Instrument" needs to be updated **(AI#11, SPIRE)**. Document: SPIRE Functional Test Specification, Current version: 1.2. To be distributed **(AI#12)**. Document: Definition of the SPIRE CQM Delivered for system level testing; Has been updated to issue 4. Will be sent within CW 38 **(AI#13)** **Agenda Item 4:** Detailed review and clarification of test and procedures Pre-integration tests FPU (incl. JFETs) tests performed in CR 100 (see IID-B, 5.15.2.2: RAL-PRC-001923). No specific test equipment needed. Test equipment will be provided by SPIRE and is compatible to CR 100. WU pre-integration tests will be performed in CR 100000.	**AI#7,** SPIRE will provide update test activity sheets to cover resolution of the TBD or empty fields **AI#8, SPIRE** A separate WU integration procedure will be provided by RAL. This will cover the WU interconnection harness **AI#9, SPIRE:** SPIRE will provide a dedicated integration procedure for the AVMs **AI#19,** ASP will provide the AVM test plan. **AI#10, SPIRE:** Update of the FPU Handling and Integration Procedure will be provided by SPIRE. **AI#11, SPIRE** will update the document Operating the SPIRE Instrument. **AI#12, SPIRE** Functional Test Specification, Current

Reference	Results	Remarks
	Test done by SPIRE personnel with SPIRE provided test equipment. <u>Mechanical Integration procedures</u> Procedure for WU mech. and el. integration is still to be provided (see AI#8 above). • Mechanical Integration Procedures / Electrical Integration Procedures When and how long can ESD safing plugs be removed during mech. and/or electr. Integration of FPU and JFET? SPIRE confirms that the ESD safing plugs on the JFET have a depth of 25mm (1inch). The JFET can be rotated and pushed towards the FPU by 15 to 25mm. Consequently, no clash is expected. The EQM SVM Simulator is shown in Annex 8. ASED will provide I/F drawings **(AI#18, ASED)** <u>Electrical Integration procedures</u> The Instrument Integration Sequence together with the cryo-harness integration was presented by ASED / CS (see Annex 5). A potential risk was identified, when no warm test of the FPU can be performed with the complete cryoharness installed. Note: According to the current harness schedule, the external cryoharness will not be available before closing the cryostat. It was agreed that SPIRE performs the following tests at ASED: • A bench test with the SPIRE WU using FPU simulator and Instrument EGSE (part of pre-integration check) • A bench test with the SPIRE WU using FPU simulator and PLM EGSE (test performed together with ASED) • A bench test with the integrated FPU via break-out-box connected to CVV feedthrought connector (i.e. resistance measurements) ASED will check the connection between DPU and CDMU frontend (FEE), as regards to dedicated connector bracket, as part of normal work. Note: For PFM a dedicated connector bracket is foreseen for SVM. The cable is part of the SVM PFM delivery.	version: 1.2. To be distributed **AI#13, SPIRE:** Definition of the SPIRE CQM Delivered for system level testing; Has been updated to issue 4. Will be sent within CW 38 **AI#18, ASED:** The EQM SVM Simulator is shown in Annex 8. ASED will provide I/F drawings

Reference	Results	Remarks
	Test Duration SPIRE confirmed the following test duration: The SPIRE bench test (SPIRE Full Warm Functional Test) will take approx.4 hours. SPIRE SFT Warm or Cold: 1 hour SPIRE S/C level test duration are summarised in Table 9-3 of PL-0021. Test Constraints: None identified for functional tests. Tilting and microvibration constraints are covered above Thermal environment during on-ground testing Covered by earlier discussion and an SPIRE AI. The list of procedures with input required by SPIRE and the associated due dates are covered in Annex 9. **Agenda Item 5:** Test Logistics ASED Questions: • Required office space: SPIRE will have not more then 4 people at the ASED site. Most of the time there will be 2. SPIRE asked concerning installation of Laptops and the connectivity to the out-side world. ASED will clarify the connectivity to the out-side world. **AI#14** • Clean Room tables, space required for testing in Clean Rooms? Only CR table required for FPU. The FPU simulator is cabinet (19 inch) to placed in the CR100000. The Common Instrument EGSE will not be in the CR100000. • Power supply? ASED will provide the DPU power supply (part of PLM EGSE). • List of required tools, test adapters and measurement equipment? SPIRE will provide the packing list and may request some additional tools, if available at ASED **(AI#15)** SPIRE will bring imperial tools (spanners), as only metric ones are available at ASED. • Use of nitrogen (gaseous, quality (FN: 5.6, 5.9; OTN:)?	**AI#14,ASED** will clarify the connectivity to the out-side world. **(AI#15) SPIRE** will provide the packing list and may request some additional tools, if available at ASED

Reference	Results	Remarks
	None. • Use of cleaning material, IPA, etc. None. There is a restriction on the use of UV lamps. It has to be operated in low power in order not to damage the PDFE filters. ASED will sent the UV lamp spec to SPIRE for check. **(AI#16).** • CR-100 clothing, number of people? SPIRE will not bring any clothing. For 4 people max., more likely 2 people. RAL proposes to have at least one representative present during integration. This is appreciated by ASED. ASED proposes to inform RAL about 2 week prior to the integration and testing. ASED will provide the warm up curves of the instruments. **(AI#17)** The concern is that no instrument would like to be the coldest point during warm up. Industry (ASP) stated that there are no simple ways to control the warm-up the 3x50 kg FPU's structures from the PLM side. Solutions can be the following: • to use Instruments internal heaters (check if sufficient, to be agreed on a case by case basis) • to use the cover shield as cold trap (by flushing He or N2 during warm up) is probably the simplest way. (better to do it horizontally) **Agenda Item 6:** EMC Splinter (see separate Agenda) The EMC Splinter MOM is covered in Annex 7 . The ASED EMC presentation is covered in Annex 6. The RAL/SPIRE EMC presentation is covered in Annex 1 (Note: from page 9 to 21). Page 5 of ASED Presentation - SPIRE Test times: SPIRE will perform the instrument setup out of office hours to ensure a maximum EMC test time available for ASED and to reduce the overall EMC test duration to the planned duration of 5 days. Total EMC test time is 20 days (4 weeks). This includes re-filling activities, when required. With respect to the EMC test duration (20 days), Industry can guarantee that the cryostat QM can provide	ASED will sent the UV lamp spec to SPIRE for check. **(AI#16).** ASED will provide the warm up curves of the instruments. **(AI#17)**

Reference	Results	Remarks
	stable environment thermal without re-filling between each instruments (as 1.7K is provided by the AXT). in that case this should be taken into acount in the schedule SPIRE proposes to perform frequencies sweep in order to sharp and high Q in the most relevant frequency ranges. Thereafter, spot frequencies will be checked (60 proposed by SPIRE). In order to have a clean RS test it is proposed to switch off the instruments not under test. Current baseline is that the other instruments are in Standby Mode, to be clarified as regards stabilisation time of instrument from Off to operating with full performance. SPIRE clarified that if takes approx. 10 minutes from OFF to Ready, plus 2 hours for cooler recycling and 2 tbc hours to full performance. The SPIRE EMC tests cover only the detector chains (no housekeeping and mechanisms data). Review of H-EPLM EMC Test Plan (HP-2-ASED-PL-0037) **Agenda Item 7:** Task plan for the implementation of the Instrument Test Procedures This item is covered by the AIT document list and the related Action Items. The delivery of the SPIRE instrument database will be covered in the EGSE Working Group Mtg., scheduled for 13/09/04. **Agenda Item 8:** SPIRE CQM Delivery Schedule SPIRE confirmed the availability of the SPIRE CQM on 15 November 2004. Details concerning the Warm Unit delivery/availability will be discussed at the DRB. The full availability of the Warm Units (QM1) to ASED is in March 2005. "SPIRE confirmed the availability of SPIRE CQM FPU/JFETs and the QM WU on 15 November 2004. SPIRE will be prepared to hold the DRB at that time. However, due to late availability of DRCU QM2 (needed at RAL for SPIRE PFM program) in March 2005, SPIRE would need occasionally DRCU QM1, which is part of QM WU delivery, to support their PFM program between 15/11/04 and March 2005. Details of DRCU QM1 shipment to be agreed with ASED/ESA."	

Reference	Results	Remarks
	Agenda Item 9: AOB • ASED IDAS harness database validation at RAL Most likely period is 2nd or 3rd week in October according to SPIRE "SED clarified, that IDAS can verify pin-to-pin connections and resistances, but IDAS cannot verify capacitance between signals and grounds. • Cryo cover temperature calibration SPIRE will provide the detailed breakdown of the SPT, including the cyrocover temperature calibration **(AI#20)**.	**AI#20**: SPIRE will provide the detailed breakdown of the SPT, including the cyrocover temperature calibration

Meeting: HP-2-ASED-MN-0753
Title: SPIRE AIT and EMC Meeting
Date: 09/09/04

Action Item List **Herschel**

No.:	Description:	Due Date	Originator Comp./Pers.	Actionee Comp./Pers.	Source	Completion
AI#1	**AI#1, ASED** will response to the RAL comments	21/09/04	B. Collaudin	H: Faas		
AI#2	**AI#2, SPIRE:** RAL will provide a sketch of the proposed design of the BOB. Preferred solution is a T-Adapter	20/09/04	H: Faas	E.C. Sawyer		
AI#3	**AI#3, SPIRE:** RD-11 has been updated and will be issued at Version 4**)**	13/09/04	H: Faas	E.C. Sawyer		
AI#4	**AI#4, SPIRE:**SPIRE will define its GSE deliverables for EQM testing	07/10/04	H: Faas	E.C. Sawyer		
AI#5	**AI#5, SPIRE:**.SPIRE will send a PACS/SPIRE Parallel Mode Procedure for EQM testing..	30/09/04	H: Faas	E.C. Sawyer		
AI#6	**AI#6,** SPIRE will provide the EQM thermal interface requirements and mass flow rate for the EQM testing**)**	30/09/04	H: Faas	E.C. Sawyer		
AI#7	**AI#7,** SPIRE will provide update test activity sheets to cover resolution of the TBD or empty fields	30/09/04	H: Faas	E.C. Sawyer		
AI#8	**AI#8, SPIRE** A separate WU integration procedure will be provided by RAL. This will cover the WU interconnection harness.	15/10/04	H: Faas	E.C. Sawyer		
AI#9	**AI#9, SPIRE:** SPIRE will provide a dedicated integration procedure for the AVMs, based AVM test plan to be provided by ASP.	15/10/04	G. Doubrovik	E.C. Sawyer		
AI#10	**AI#10, SPIRE:** Update of the FPU Handling and Integration Procedure will be provided by SPIRE.	15/10/04	H: Faas	E.C. Sawyer		
AI#11	**AI#11, SPIRE**: will update the document Operating the SPIRE Instrument.	15/10/04	H: Faas	E.C. Sawyer		

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Action Item List **Herschel**

No.:	Description:	Due Date	Originator Comp./Pers.	Actionee Comp./Pers.	Source	Completion
AI#12	**AI#12, SPIRE** Functional Test Specification, Current version: 1.2. To be distributed	13/09/04	H: Faas	E.C. Sawyer		
AI#13	**AI#13, SPIRE:** Definition of the SPIRE CQM Delivered for system level testing; Has been updated to issue 4. Will be sent within CW 38	13/09/04	H: Faas	E.C. Sawyer		
AI#14	**AI#14,ASED** will clarify the connectivity to the out-side world in OTN for PCs.	7/10/04	E.C. Sawyer	C. Schlosser		
AI#15	**(AI#15) SPIRE** will provide the packing list and may request some additional tools, if available at ASED	7/10/04	H: Faas	E.C. Sawyer		
AI#16	ASED will sent the UV lamp spec to SPIRE for check. **(AI#16).**	17/09/04	E.C. Sawyer	C. Schlosser		
AI#17	ASED will provide the warm up curves of the instruments. **(AI#17)**	30/10/04	E.C. Sawyer	A. Hauser		
AI#18	**, ASED:** The EQM SVM Simulator is shown in Annex 8. ASED will provide I/F drawings.	17/09/04	E.C. Sawyer	H. Faas		
AI#19	ASP will provide the AVM test plan ()..	13/09/04	E.C. Sawyer	D. Montet		Closed. Doc. Provided to SPIRE during Mtg.
AI#20	: SPIRE will provide the detailed breakdown of the SPT, including the cyrocover temperature calibration	15/10/04	H: Faas	E.C. Sawyer		

SPIRE EQM AIT Meeting

EADS Ottobrunn, 9 September 2004

DKG Overheads

Comments on ASED PLM EQM Test Plan
HP-2-ASED-PL-0021, Issue 3.0

Reference Document Status (cont.)

- RD-6 Suggest that it is substituted by: *FPU Handling and Integration Procedure*, SPIRE-RAL-PRC-001923, Issue 1, 20/05/04
  - Worked OK at CSL
  - But, needs to be updated:
    - Delete reference to harness cross-talk-tests
    - The electrical connection sequence needs to be updated to comply with *Making SPIRE ESD Safe*, SPIRE-RAL-NOT-002028, Draft 1.0, September 6, 2004.
- RD-7 *SPIRE EQM Test Plan* SPIRE-RAL-DOC-001905 Issue 1.0, 19.12.03
  - Generally OK, but will be updated to incorporate outcome of this meeting

Comments on ASED PLM EQM Test Plan
HP-2-ASED-PL-0021, Issue 3.0

Reference Document Status (cont.)

- RD-8 *Operating the SPIRE Instrument*, SPIRE-RAL-DOC-000768, Issue Draft 3, 1.05.2003
  - To be updated (IQR ?)
- RD-9 *SPIRE Functional Test Specification,* SPIRE-RAL-DOC-001652
  - Latest Issue: 1, 2 August 2004
- RD-10 *SPIRE DRCU Integration Test Specification*, Issue 1.0, 05.09.2003
  - Currently under review
- RD-11 *Definition of the SPIRE CQM Delivered for system level testing*,
  - New Issue 4.0 draft exists
- RD – 12 *SPIRE Warm Electronics Integration Plan*, Issue 0.1, 10.01.02
  - Superseded
- RD-15 SPIRE-RAL-DOC-001123 SPIRE CQM Performance Test Specification, Issue 0.4 Draft, 29.05.02
  - Out of date - no current plan to update it
  - Effectively superseded by SPIRE-RAL-001920 and SPIRE-RAL-NOT-001850

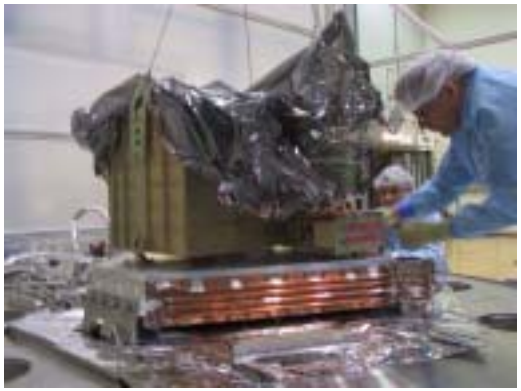
Comments on ASED PLM EQM Test Plan
HP-2-ASED-PL-0021, Issue 3.0

Reference Document Status (cont.)

- RD -13 *SPIRE CQM Instrument Level Test Plan,*
  - Latest version is Issue 2.0, July 2004
- RD -14 *SPIRE EQM Test Program Definition Test Case Forms*
  - Superseded by *SPIRE EQM Test Plan* SPIRE-RAL-DOC-001905
- RD-15 SPIRE-RAL-DOC-001123 SPIRE CQM Performance Test Specification, Issue 0.4 Draft, 29.05.02
  - Out of date - no current plan to update it
  - Effectively superseded by SPIRE-RAL-001920 and SPIRE-RAL-NOT-001850

Mechanical / Electrical Integration

- As per *FPU Handling and Integration Procedure*, SPIRE-RAL-PRC-001923, Issue 1, 20/05/04 and *Making SPIRE ESD Safe*, SPIRE-RAL-NOT-002028, Draft 1.0, September 6, 2004.
- Assumes that Cryoharness database has been cross-checked against RAL Instrument Cryoharness with automated harness test bed
- Electrical checkout of critical FPU and JFP functions



Comments on HP-2-ASED-PL-0021, Issue 3

§3.2 During cool-down, after the Warm Functional Test, the instrument is to be left in the REDY Mode “DPU+DRCU-ON Thermometers ON mode” to allow us to monitor instrument temperatures.

§ 4.1 SPT not indicated in flow diagram

§5.4.4 SPIRE requires that exposed connectors are EMI sealed by ASED

§5.4.4 Cryoharness cross-talk test at System Level to be deleted. Replaced by cross-checking ASED harness database with SPIRE Test Cryoharness

§6.3.3.1 AVM DPU will not be delivered with an EGSE 28V power supply as it will be powered by the bus on the EQM-SVM

Comments on HP-2-ASED-PL-0021, Issue 3

§6.4.3 Need to use BOB to drive SMEC and BSM during chop test

§6.5, Figure 6-1, We are in Ready mode not Standby.

§7.2.3

- Two Phot LIA cards
- Three Spect. LIA cards
- Note EGSE WIH harness for secondary power supply
- Description of MCU wrong
- Refer to the to-be-issued SPIRE-RAL-NOT-000983

§ 9.8 See Making SPIRE ESD Safe SPIRE-RAL-NOT-002028

§10.1 TBDs need to be closed out regarding Thermal conditions

§2.2 Correct name of RD 11. s.b. “Definition of the SPIRE CQM Delivered for system level testing”

Thermal Comments

- Off case (no SPIRE dissipation on OBA)
  - Possibly could be carried out at the same time as other instruments are carrying out tests
- First test: Phot mode thermal balance (Chop) and cooler hold time
  - Estimated 2 hours recycle and 32 hour hold time
  - Wait for cooler to run out of 3He
- Second test: Spect mode thermal balance
  - Estimated 2 hours recycle and 4 hours to reach thermal equilibrium

Issue of He flow rate and interface temperatures needs to be resolved.

Facility heaters on FPUs/HOB ???

SPIRE EPLM EMC RS Testing

Instrument HW Configuration Summary

SPIRE-RAL-NOT-000983 to be updated to Issue 4.0

- ***FPU***
  - PLW (flight-like array), PSW, PMW, SSW and SLW (Mass dummies)
  - Mechanisms (mass dummies with heaters for thermal dissipation)
  - Structure (flight-like)
  - Optics
    - Photometer - flight-like except non-moving BSM,
    - Spectrometer – varied build standard
- ***JFETs***
  - JFP – PLW module flight-like, all other modules mass, thermal dummies
  - JFS – mass thermal dummies
- ***Cryoharness***
  - C1, C3, C6, C10 and C11 – flight-like
  - Rest – not present

SPIRE EPLM EMC RS Testing

Instrument HW Configuration Summary (cont.)

- DCU (See IID-B ICD pack for QM1)
  - Two LIA-P and Three LIA-S functionally flight-like
  - Phot. and Spect bias functionally Flight-like Prime, no Red.
  - Mechanical I/F of cryoharness not flight-like (Discussion required)
  - Not EMC tight structure – Aluminium tape used to seal apertures
- FCU (See IID-B ICD pack for QM1)
  - Functionally flight-like Prime, no Red.
  - Mechanical I/F of cryoharness not flight-like (Discussion required)
  - Not EMC tight structure – Aluminium tape used to seal apertures
- DRCU PSU
  - EGSE bespoke supply
  - Shielded Secondary power supply harnesses (~5000mm)
  - Mains operated

SPIRE EPLM EMC RS Testing

Instrument HW Configuration Summary (cont.)

- DPU
  - Functional flight-like prime, no red
  - Mechanically flight-like
  - S/C 1553 and 28V Prime I/F Flight-like, no red.
- WIH
  - Prime: Flight-like with exception of Secondary DRCU power (EGSE Power supply)
- Instrument Grounding
  - Topologically identical to flight with the possible exception of the EGSE Power supply (TBC)
- Savers / Backshells / No BOBs
  - No savers
  - For SPIRE cryoharness I/Fs (DRCU, FPU, JFP and JFS) to C2, C4, C5, C7, C8, C9, C12 and C13, ASED to supply EMI tight backshells

SPIRE EPLM EMC RS Testing

General comments (1)

EUT

- Test of **detection system** only (BDA, FPU Grounding scheme, JFETs, Cryoharness and DCU Readout)
- Other tests required at subsystem level.

Susceptibility Levels

- Susceptibility levels defined in the detector chain noise budget (~5nV/rt(Hz) referred to detector)
- In general the signal needs to be integrated for ~180 (1σ) seconds integration time to detect this level of noise
- This means that a comprehensive (i.e. all frequencies, polarisations, antenna positions etc.) RS test would be **very** long

SPIRE EPLM EMC RS Testing

General comments (2)

Signal Monitoring

- RS can manifest itself as either:
  - Excess noise on the output from the Analogue signal amplifiers, or
  - Ohmic heating of the detectors.
- In either case, EMI in the detection chain can be monitored in quasi-real time with the SPIRE QLA (Quick Look Analysis)
- Results from early part of test will possibly be used to set levels and frequencies later on in the test

Instrument Mode

- The instrument is to be placed in it's most sensitive mode: Photometer Mode
- Requires that the JFET DC Bias, Detector AC Bias Levels and Bias Frequency be set to optimised values found during SPT
- The detector sampling frequency is set to the maximum (approx. 80Hz)
- Subsystems turned off: BSM, S-Cal, P-Cal, SMEC, JFS and any non functional JFP modules

SPIRE EPLM EMC RS Testing

General comments (3)

Instrument Mode (cont.)

- At the start of any test, the cooler needs to be recycled (approx 2 hour)
- IID-B specifies the cooler hold time at > 48 hours which would imply recycle after two days of EMC testing
- It is highly unlikely that this will be achieved as the SPIRE thermal architecture is currently under ECR
- PFM thermal architecture should achieve 48 hour
- The estimated cooler hold time is ~32 hour (TBD)
- Hence for the sake of planning, assume ~ 24 hour hold time: need to recycle every morning prior to the start of testing

SPIRE EPLM EMC RS Testing

General comments (4)

Reference Condition

- Instrument thermal transients will manifest themselves as 1/f noise hence after cooler recycle, need to wait for the bulk of the transients to settle before commencing testing
- Dark noise measurements provide the reference noise levels for comparison with noise levels under test
- The reference test will have to be repeated at TBD intervals to remove thermal instability “noise”

SPIRE EPLM EMC RS Testing

General comments (5)

Test Conditions

- RS E-Field
  - 14kHz to 18GHz
  - 2 V/m as per IID-A
    - Sweep
      - Used to find any **very sharp and high** Q susceptibility frequencies
      - Test does not identify all possible susceptibilities as integration time insufficient to detect “marginal” susceptibilities
      - Sweep Rates as per Mil-STD-461E (Approx test time 3 hours neglecting set up time)
    - Spot Frequencies
      - Mil-STD-461E maximum steps would imply ~4155 spot frequencies with 180 sec dwell = 8.6 days for each condition
      - Not practical
      - Need to determine spot frequencies to test

SPIRE EPLM EMC RS Testing

General comments (6)

Test Conditions (cont.)

- RS E-Field
  - Vertical and Horizontal polarizations for > 30MHz
    - What is worst case for < 30 MHz?
  - TBD Antenna numbers and locations (IID-A says three)
    - Tx and Rx for calibration
    - Should the cryoharness be the main illuminated location?
    - Field uniformity
  - TBD Antenna bands
    - How many times test facility needs to be reconfigured)
  - Absorber materials on walls?

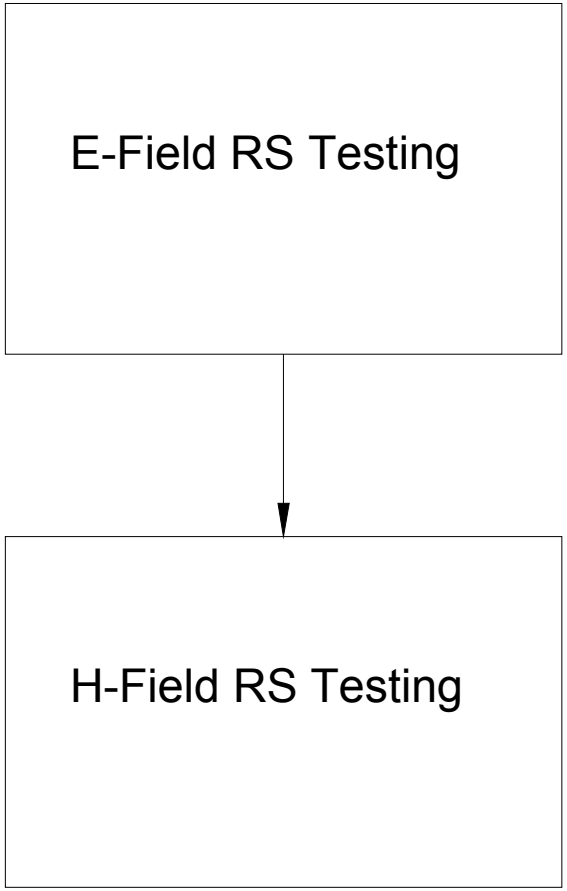
SPIRE EPLM EMC RS Testing

General comments (7)

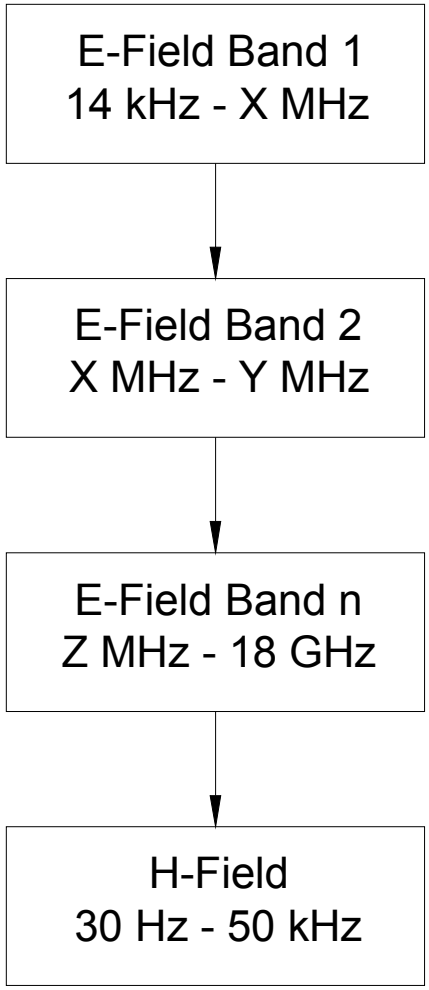
Test Conditions (cont.)

- RS H-Field,
  - 30Hz to 50kHz.
  - 140 dBpT
- The approach is similar to the E-Field tests
  - Location of current ring needs to be defined?
    - Should we try and generate loop currents in cryoharness shield?
    - Main RE source: solar panels?

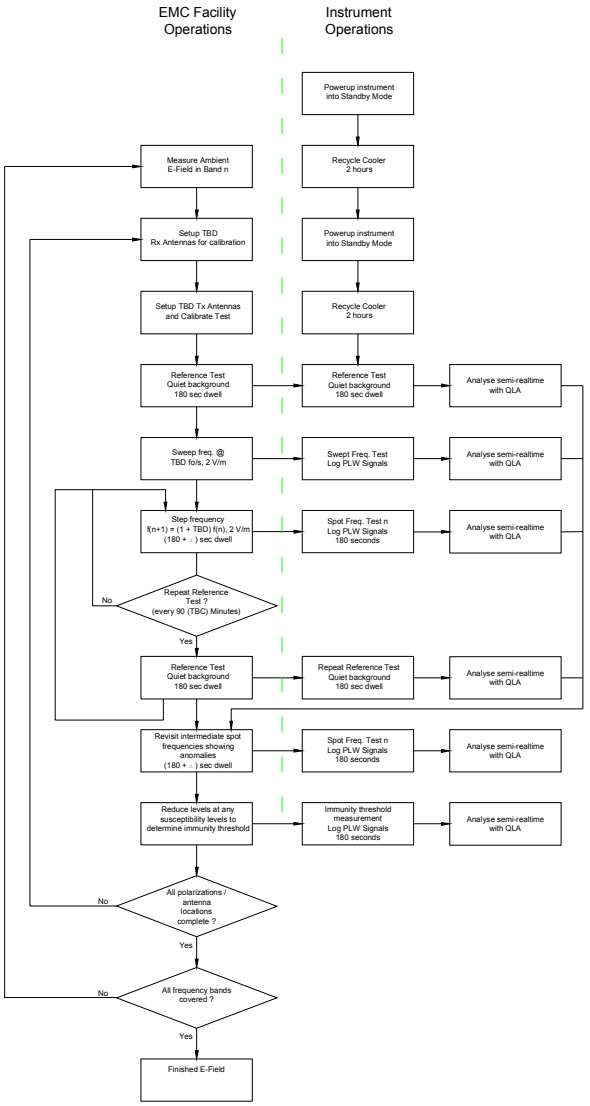
EMC Test Flow (Level 1)



EMC Test Flow (Level 2)



EMC Test Flow (Level 3)



ASED response to ESA Comments on HP-2-ASED-PL-0021, Issue 3
(email Flemming Petersen to S. Idler, 23/08/04)

No	Section Ref.	ESA Comment	ASED Response
1	3.1 General Objectives	PLM EQM Test Programme General Objectives • Please include as a general objective a check of the straylight design. (ref Entrance baffle and LOU baffle design). • We also recommend that validation of the operational procedures for the cryo-cover flushing are included as a general objective.	• Check of straylight design is not an objective of the EQM test programme. • It is not a general objective of the EQM programme to validate the cryo-cover flushing procedures, because this validation can already be done with the PFM.
2	3.2 Definitions:	• The electrical interfaces between the Warm Units and the CDMU FEE / PLM SCOE are new interfaces which cannot be done initially as plug-and-play, they must first be verified properly. (grounding/isolation/ continuity, for power lines: polarity, level, inrush current, ripple, etc., for data lines: levels, rise/fall time, pulse duration, timing, etc.). • Database validation to be added as an objective.	• The verification of these I/F is covered in the plan (see § 5.4.1). Details still need to be discussed with the instruments. • Ok.
3	4.1 Activities Overview	• We assume that a bake-out will be part of the initial evacuation of the cryostat. The details of this should be visible to the instruments. • Same comment for cryo-cover flushing.	• There is no specific bake-out planned, however evacuation will be supported by flushing steps with dry nitrogen (grade 6.), if it is required. • This is a parallel activity during IMT to achieve the thermal requirements and will be performed on demand.
4	Section 5 and 7, general comment:	• It will be an important task during the next round of meetings to establish the exact build standard for each EQM instrument. Significant developments in the build standards and associated operational capabilities can be expected.	• Noted.

No	Section Ref.	ESA Comment	ASED Response
5	5.1 Incoming Inspection:	• A number of the activities listed under Incoming Inspection should be moved to the Consent To Ship Review, thereby giving a bit of time to get any missing items sorted out prior to hardware arrival in Ottobrun. The Incoming Inspection could then focus upon detection of any shipment damage and closeout of open work identified during the Consent To Ship Review.	• The tasks of the incoming inspections are well defined by PA. They will not be relaxed for the instruments. However, activities to be performed for the DRB (may be repeated for the incoming inspection) to be discussed with instruments.
6	5.4.2 Note 2:	• See comment under 3.2 for electrical interface validation.	• Details to be discussed with instruments.
7	6.2 Alignment Check:	• The alignment activities should be described as three steps: first an initial alignment measurement at ambient, then the check after evacuation and finally the check/adjustment after cool-down. • It is assumed that the initial alignment measurements will include measurements of all three FPU's. • The mis-alignment that we will have with the FPU when the CVV and LOU are at ambient temperature may not be fully understood by HIFI. On page 64 it seems that HIFI want to perform standing wave measurements in a flight representative condition. On the EQM we do not have flight representative conditions wrt alignment. See also page 30 which confirms the mis-alignment we will have on ground.	• Covered in the alignment plan. • Details of the alignment are covered in the alignment plan. • To be clarified with HIFI.
8	6.4.2 PACS SPT	• The PACS/SPIRE parallel mode included in the PACS SPT will lead to not getting inputs from SPIRE. We recommend to create a separate SPT for the PACS / SPIRE parallel operations.	• ASED will request information from SPIRE and PACS for input to the parallel mode operations. It is assumed that a consolidated test procedure is provided to ASED.
9	6.5 IMT	• There will be a period of time to re-gain the required thermal stability when switching between instruments. The EQM is an ideal facility for checking this out. Therefore the instruments should confirm the starting conditions at switch ON of their instruments.	• Starting point will be Thermal Analysis results. Thermal boundary conditions for instrument operations are already known. Validation of TMM is objective of STM programme.

No	Section Ref.	ESA Comment	ASED Response
10	6.6 EMC Test:	• Ensure that permission from RRC will be formally requested in time (at least 6 months prior to the test.) • Clearly the most sensitive mode for the instruments is with the bolometers operating at 300mK. Therefore ASED will need to perform EMC testing with the 3HE cooler operating and with enough hold time to complete the EMC test.	• Noted. • Most sensitive mode for SPIRE and PACS has been received. Details to be clarified by Instrument during EMC Mtg. and in Procedures. Cooler recycle is planned (see fig. 6-2).
11	7.4.2 Integration and Test Procedures:	• The section should also identify the new procedures to be written by Astrium and how the instrument information will be fitted into these procedures, the section only identifies instrument provided documents or information at the moment. • Early delivery of the database for each instrument is needed. • For instruments to provide sensible inputs, first drafts of the Mechanical and Electrical Integration Procedures based on this document, the IID's and the Electrical ICD should be distributed as soon as possible. • The HPSDB inputs should be added as an early deliverable.	• Table 7-5 lists the instrument related S/C test procedures to be written by ASED which require inputs from the instruments. • Ok. Delivery date to be agreed with Instruments. • Noted. • Ok. Delivery date to be agreed with Instruments.
12	9.2 FPU/LOU Operational Constraints	• Operational constraints on cryostat fillings and cryocover flushing need to be defined together with the instruments.	• The operational constraints will be identified in the corresponding ASED procedures: o EQM Filling and Cool Down of He II tank o EQM Cover Flushing Procedure Note that these procedures are not instrument related (not covered in PL-0021).
13	9.3 Spacecraft Orientation:	• Clarify tilting angle for PACS/SPIRE cooler recycling. Second bullet gives 20deg, however, figure 6-1 on page 26 requires between 23deg and 30deg as EPLM Position.	• Tilting angles are as defined by the instruments. There is a discrepancy between PACS and SPIRE. This will be discussed with the instruments. Tilting angles in Document will be updated to be consistent.
14	9.4 Sensor Background.	• The assumption that the on line signals of PACS and SPIRE are absolutely calibrated for the cryo-cover temperature selection need to be highlighted to the instruments.	• Section to be updated. To be discussed with instruments.

No	Section Ref.	ESA Comment	ASED Response
15	9.9 Micro vibration.	• Operational constraints on whether the pumps can be run when the flexible lines are hard mounted to the CVV need to be defined together with the instruments. Note that bolometers are phonon detectors and will pick up vibrations in their bandwidth extremely well.	• Section to be updated. To be discussed with instruments.
16	10 Activity Sheets:	• Sheets to be added for the mechanical and electrical integration activities for each instrument. • We recommend to avoid defining a mass flow rate of 2.2 mg/sec as an environmental constraint, the temperature I/F's are the environmental constraints. The ASED design indicates that they can fulfil the temperature I/F constraints with a mass flow of 2.2 mg/sec but if we fail to do this with 2.2 mg/sec then we can still fulfil most of the objectives of the EQM tests with a different mass flow rate. There is then likely a lifetime problem to solve on the PFM .	• Mechanical and electrical integration of the instrument is covered in the relevant Instrument Procedures (e.g. already available for SPIRE). Reference should be sufficient to avoid duplication. • Accepted. Section will be updated.
17	2.2 Reference Documents:	Editorial comments: • Entries for RD1, RD16, RD17 to be removed.	• Ok
18	5.4.2 Note 3:	• Typo, replace "step 13" by "step 10"	• Ok

HP-2-ASED-MN-0753 Annex 3

-----Original Message-----
From: Bernard.Collaudin@space.alcatel.fr [mailto:Bernard.Collaudin@space.alcatel.fr]
Sent: Freitag, 20. August 2004 10:29
To: Siegmund.Idler@astrium.eads.net
Cc: Christian.Schlosser@astrium.eads.net; Denis.Montet@space.alcatel.fr; Guy.Doubrovik@space.alcatel.fr; Ivan.Benilan@space.alcatel.fr
Subject: comments on Instruments TRS for Herschel, in preparation on next AIT meetings
Importance: Low

ref:
[1] HP-2-ASED-PL-0021_2_0 - Instrument testing at HPLM EQM level [2] HP-2-ASED-PL-0031_1_0 - Instrument testing at HPLM FM level

I've the following remarks wrt the Herschel test requirement sheets (from ref [1] & [2] QM & FM's) (with respect to current scheduled activities, ref Herschel schedule from CDR data pack)

1: TRS's should have reference numbers.
2: Consistancy to be cheked with the system verification program plan (H-P-1-ASP-PL-0225) in term of TRS and numbering (see attached exel file)
3: There should be an additional TRS "functional check of warm units", following integration of warm units on SVM, as it is not covered by the sheets "Electrical integration test" nor "Instrument EGSE validation" 4 : TRS "Short functional test Warm" should be perfomed 2 times: When the FPU are just integrated on the OBA and connected (cryostat Open), and when the cryostat is closed & pumped down, before cooldown.
5: What is the difference between TRS "Short Functional Test Cold He 1" and "Short Functional Test Cold He 2". I believe we should aim to have them as similar as possible (ie with the similar test sequence/procedure, & only a few parameter different (temperatures)
6: Specific requirements on PLM for cooler recycling in TRS's requiring cooler recycling should be similar for Planck and Herschel. The 17° is out of date, prefered tilt is now >30° for recycling, except in TV test where this cannot be reached (with the drawback of lower cooler recycling efficiency).
7: Particular environmental constraints: By now, the Interface temperatures should be known. We should propose a temperature range. How to define the sensors background ?
8: Success criteria should also be defined more precisely.

(See attached file: Herschel instruments TRS.xls)

Bernard COLLAUDIN- Herschel Planck Instruments interfaces
- Alcatel Space - Space Camp - Y04-113 - 100, Bd du midi, BP 99 - 06156 Cannes la Bocca Cedex- France
Tel:+(33)(0) 4 92 92 30 21 Fax: +(33)(0) 4 92 92 30 10 Mob: +(33)(0)6 18 42 78 35
email: bernard.collaudin@space.alcatel.fr

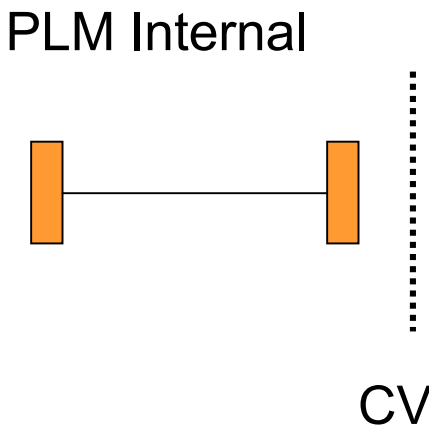
ALCATEL SPACE

No	Title	Reference No.	Issue	Date	ASED Comments /Mtg. Comments	RAL Comments
	Plans					
1.	SPIRE Warm Electronics Integration Plan	SPIRE-RAL-DOC-001132	0.1	10/01/02	Provided at SPIRE IHDR, July 2003 For info only. A separate WU integration procedure will be provided by RAL. This will cover the WU interconnection harness (AI#8, SPIRE)	LV, but applies to instrument level only
2.	SPIRE CQM Instrument Level Test Plan	SPIRE-RAL-DOC-001049	1.0	15/05/02	Provided at SPIRE IHDR, July 2003 Instrument Level plan only. Now: Issue 2.0, 8/07/04 (not available at ASED)	LV, but needs updating
3.	SPIRE Cryostat Integration and Test Plan	SPIRE-RAL-DOC-001701	1.1	6/06/03	Provided at SPIRE IHDR, July 2003, partly relevant Is not relevant for S/C level AIT.	LV, but applies to our test equipment only
4.	SPIRE EQM Test Plan	SPIRE-RAL-DOC-001905	1.0	19/12/03	Is reference document only. Relevant information will be provided as input to -ASED-PL-0021.	LV, still valid but flowchart is nonsense in pdf version.
	Procedures					
5.	SPIRE FPU Handling and Integration Procedure	SPIRE-RAL-PRC-001923	1	20/05/04	Update (mainly as regards harness integration) will be provided by SPIRE (AI#10).	LV, still valid
6.	Operating the SPIRE Instrument	SPIRE-RAL-DOC-00768	0.5 Draft	31/05/03	Needs to be updated (AI#11).	
	Test Specifications					
7.	SPIRE Functional Test Specification	SPIRE-RAL-DOC-001652	1.0 Draft 2	5/12/03	Current version: 1.2. To be distributed (AI#12).	LV, still valid.
8.	SPIRE EQM Test Program Definition Test Case Forms	SPIRE-RAL-NOT-000982	0.2	19/02/02	This note contains the test sheets defined by Astrium for the EQM testing for Herschel/SPIRE (see **Error! Unknown document property name.**). Document to be deleted from list (covered by item 4).	LV still valid
9.	Definition of the SPIRE CQM Delivered for system level testing	SPIRE-RAL-NOT-000983	3.0	19/12/03	Has been updated to issue 4. Will be sent within CW 38 (AI#13).	LV, but needs updating
1.	SPIRE CQM Performance Test Specification	SPIRE-RAL-DOC-001123	Draft 0.4	29/05/02	Provided at SPIRE IHDR, July 2003 Is reference document only (ILT related). A separate document will be provided to cover the S/C level	LV, but needs updating

No	Title	Reference No.	Issue	Date	ASED Comments /Mtg. Comments	RAL Comments
					SPTs (AI#14).	
11.	SPIRE DRCU Integration Test Specification	SPIRE-RAL-DOC-001799	1.0 Draft 1	5/09/03	Only ILT related. To be deleted from list.	LV, but needs updating
	ASED Instrument AIT Documents					
	Instrument Testing on PLM EQM Level	HP-2-ASED-PL-0021	3.0	23/07/04	To be distributed by ASED end of July 2004	
	Instrument Testing on PLM PFM and Satellite Level	HP-2-ASED-PL-0031	1.0	10/06/02	To be updated and released after the holiday period	

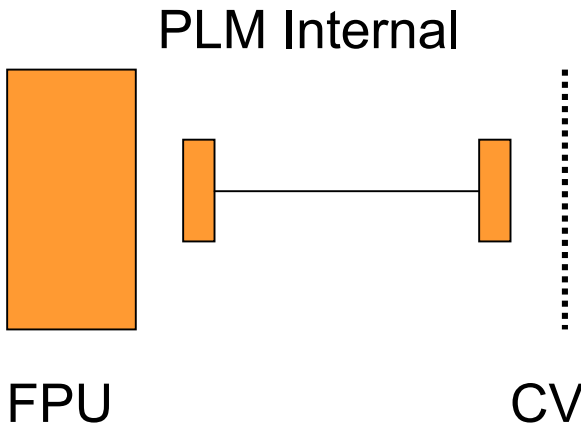
Notes.
LV = latest version
Most of these documents require updating, there are generally correct except for the build standard of the CQM

Instrument Integration Sequence



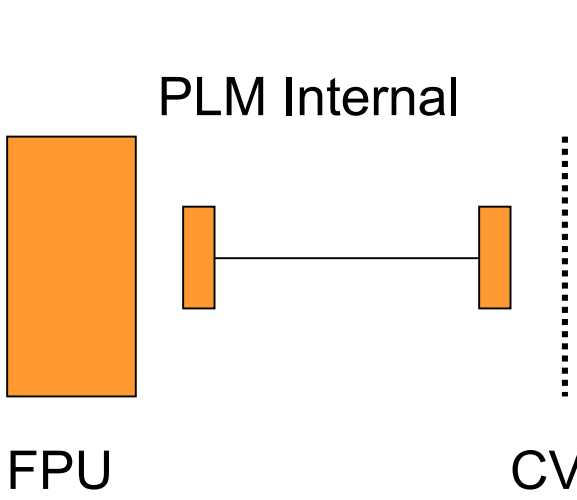
- Internal SIH integration
- Internal SIH verification by test against EICD

Instrument Integration Sequence

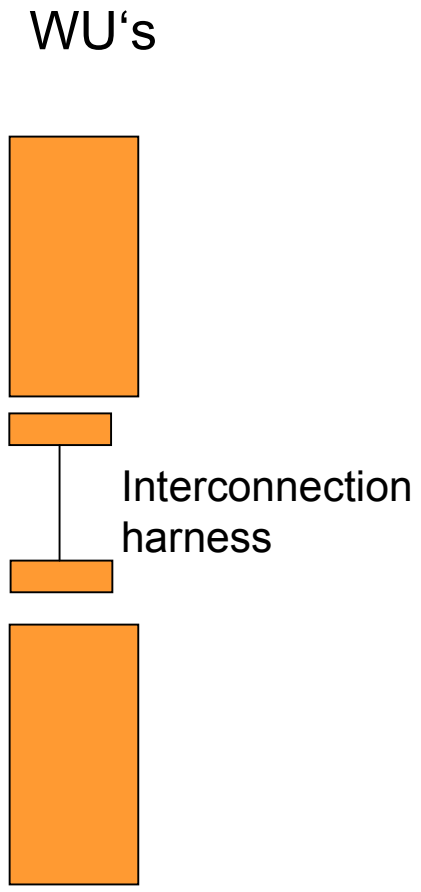


- FPU mechanical integration
- FPU connection to internal SIH (no test)

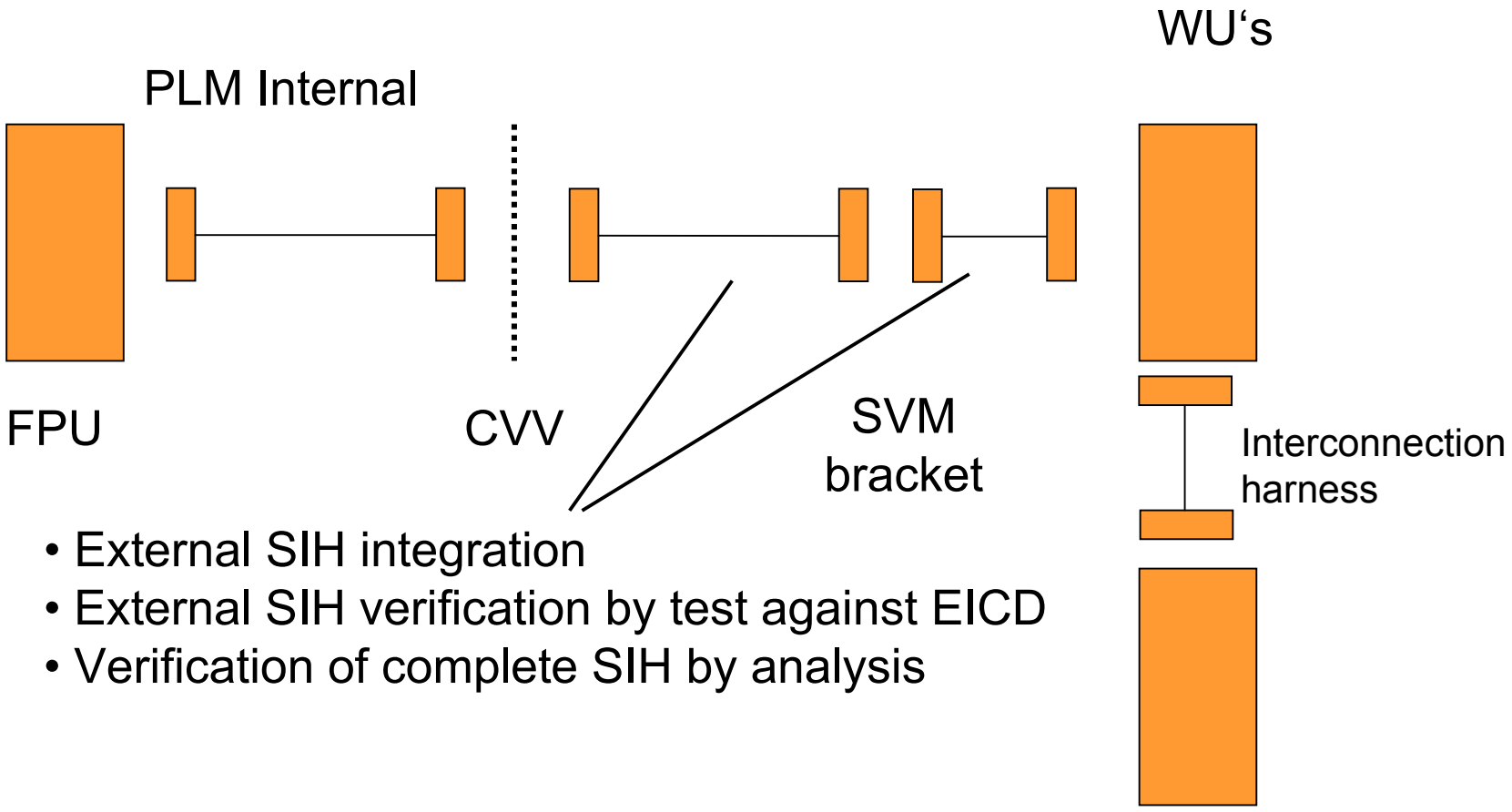
Instrument Integration Sequence



- WU mechanical integration
- WU electrical integration (S/C interfaces)

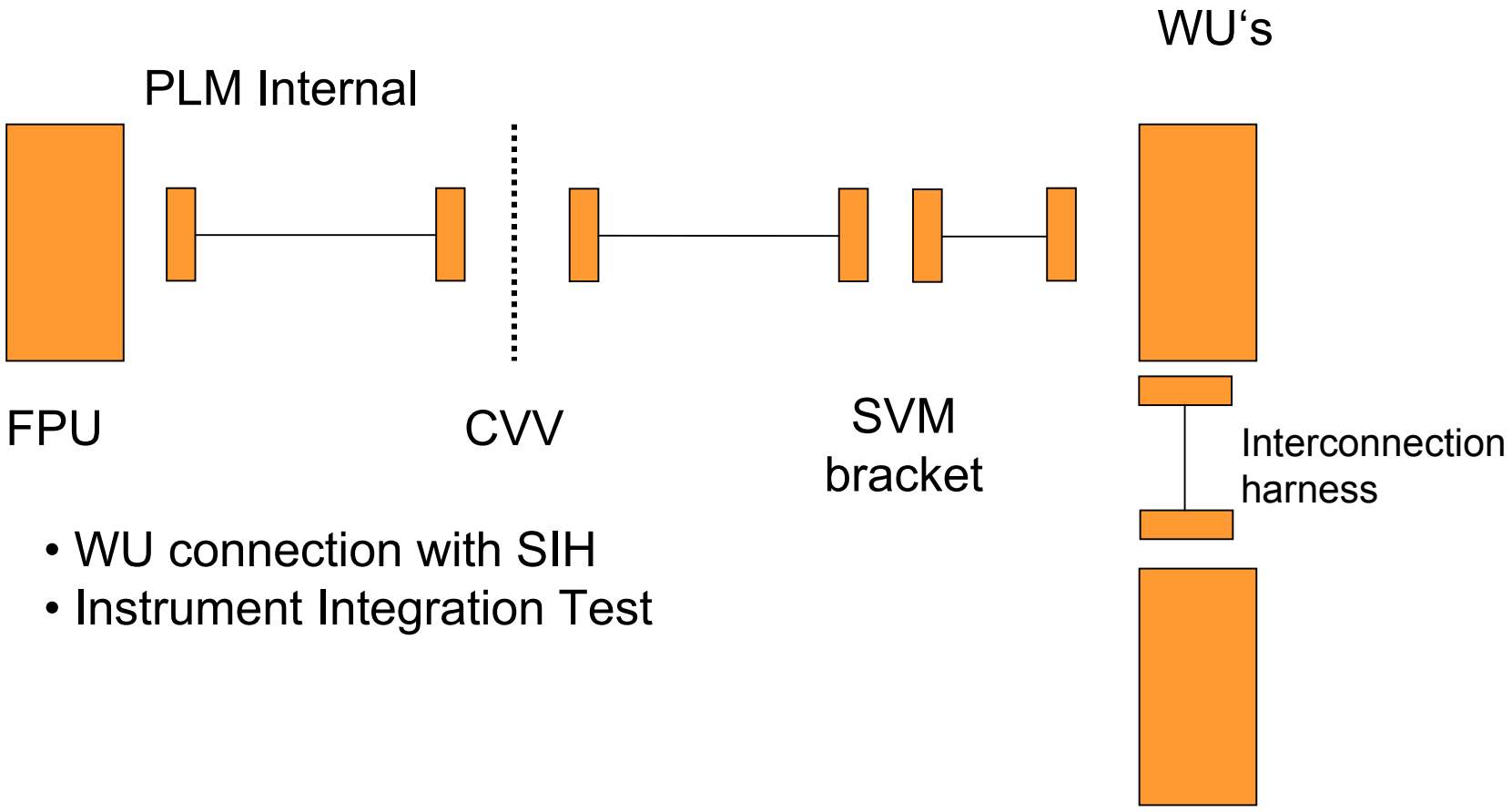


Instrument Integration Sequence



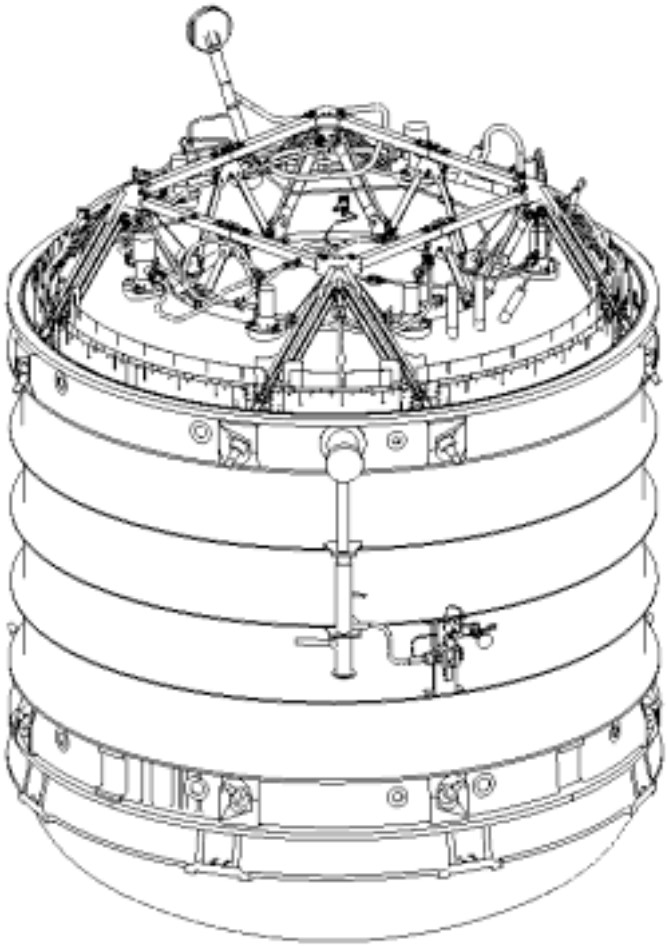
- External SIH integration
- External SIH verification by test against EICD
- Verification of complete SIH by analysis

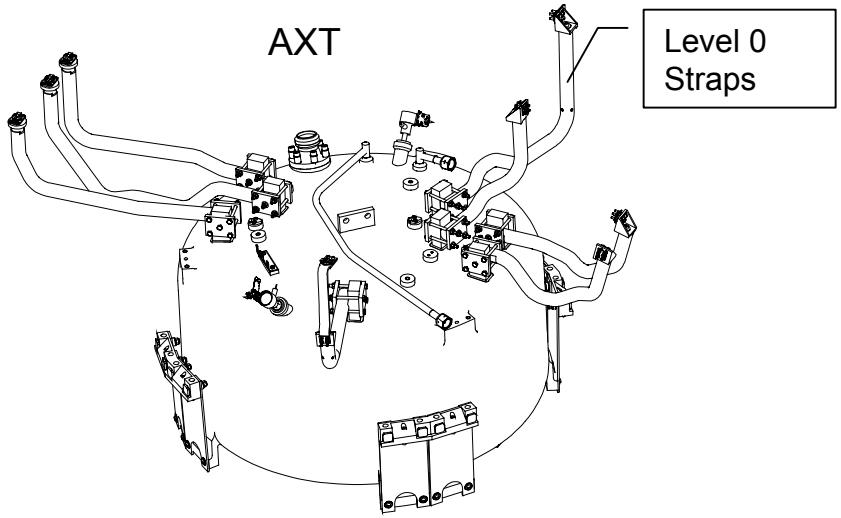
Instrument Integration Sequence



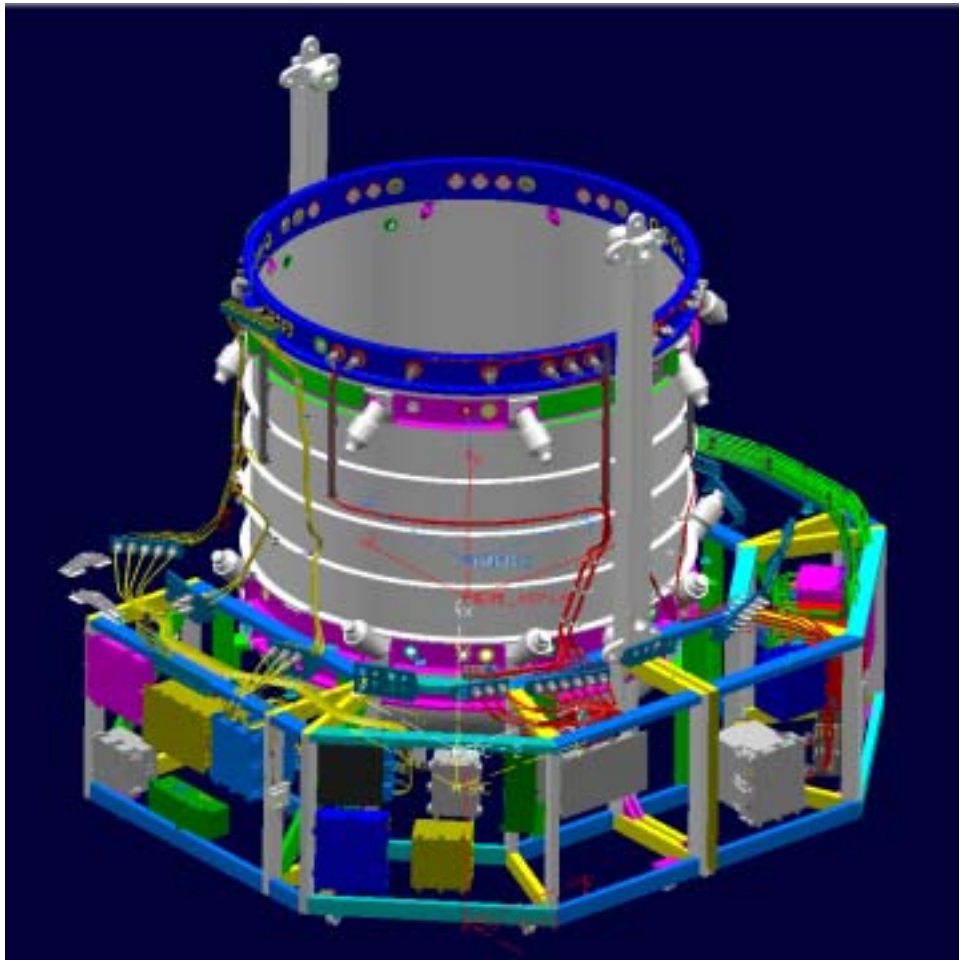
- WU connection with SIH
- Instrument Integration Test

EQM AIT Status





EQM AIT Status



HP-2-ASED-MN-0753,
Annex 6

HERSCHEL AIV Meeting

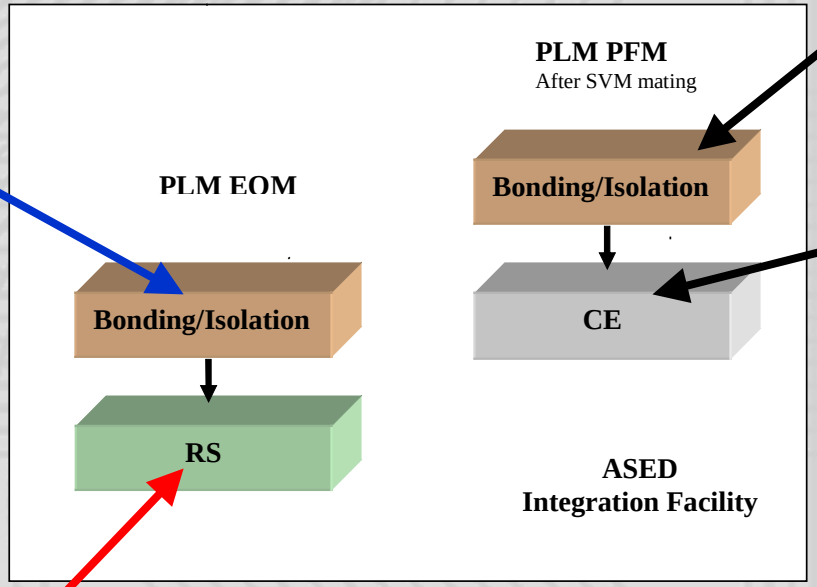
PLM EQM RS Test Planning

AGENDA

- **Overall EMC Test Plan**
  - **EMC Test Blocks**
  - **EMC Test Sequence**
  - **Antenna Possitions**
- **SPIRE Test Sequence**
  - **Definitions**
  - **Timings**
- **Open Points**

PLM EMC Test Blocks

Part of electrical Integration



Part of electrical Integration

Common Mode CE on power lines

- Test will be done on satellite level

To be defined in detail w.r.t. e.g.

- **Number and range of frequencies**
- **Positions of antennas**
- **Polarisations**
- **Instrument mode**
- **Data processing and fail/pass criteria**
- **Exposure time per frequency**
- **Reference test definition**
- **anything else?**

Overall Test Sequence

(as copied from PLM EQM Test Plan, HP2-ASED-PL-0021)

Step	Test Type	HIFI	PACS	SPIRE	EPLM Position	Duration
1	-	Off	Off	Off	No requirement	-
2	Reference test	Measurement Mode (Band 3 H)	Stand-By	Stand-By	No requirement	1 day (TBC)
3	Reference test	Measurement Mode (Band 3 V)	Stand-By	Stand-By	No requirement	
4	RS	Measurement Mode (Band 3 H)	Stand-By	Stand-By	No requirement	
5	RS	Measurement Mode (Band 3 V)	Stand-By	Stand-By	No requirement	
6	-	Stand-By	Cooler Recycle	Stand-By	23° to 30° to +y	1 day (TBC)
7	Reference test	Stand-By	TBD (most sensitive mode)	Stand-By	No requirement	
8	RS	Stand-By	TBD (most sensitive mode)	Stand-By	No requirement	
9	-	Stand-By	Stand-By	Cooler Recycle	23° to 30° to +y	1 day (TBC)
10	Reference test	Stand-By	Stand-By	TBD (most sensitive mode)	No requirement	
11	RS	Stand-By	Stand-By	TBD (most sensitive mode)	No requirement	
12	-	Off	Off	Off	No requirement	-

SPIRE Test Definition

- **Cooler recycle (2h) every 24 h**
- **Reference test , MODE TBD by SPIRE**
- **RS, sensitive MODE TBD by SPIRE, EMI detection by SPIRE Quick-Look-Analysis (QLA), Performance data storage with reference to RS injection event/frequency: Capability to be checked: TBD by SPIRE**
- **Detector sampling frequency to be set to the maximum (around 80 Hz).**

Antenna Positions

Directed to the right side

Directed to the left side

Directed to the front

Remark: Telescope and SA only for completeness

SPIRE Test Timings

Reference	**Power/EMC WG #17**	
SPOT Frequencies for RS E-Field	60	
E-Field Antenna Positions	6	
SPOT Frequencies for RS H-Field	30	
H-Field Antenna Positions	3	
Integration Time per SPOT [min]	3	min
SPOT Set-up Time [min]	0,6	min
Dark Noise Measurement [min]	4	min
Dark Noise Measurements (1 after 6 SPOTs)	75	
Switch-on [min]	10	
Cooler Recycling Time [h]	2	h
Recycling per Day	1	
Upset Instrument per 24 h [min]/day	10	min
Decay Time Thermal Transients [min]/day	30	min
Test Revisit and Post Test Data Analysis [h]/day	80	min
==> Effective test time /day [h] (8 hours per day)	3,833333	h
Total test time [d]	**8,347826**	**days**
EMC Set-up changes, each 10 minutes (not included)	90	

OPEN POINTS

- Test to be reduced in order to fit in 1 week (5 days):
  - Reduction of number of SPOTS (21 min.)
  - Reduction of antenna positions/polarisations
- Test frequencies/frequency range to be designated
- SPIRE measuring mode to be precised
- Fail / Pass criteria
- Data offline evaluation to be defined

  Clear correlation betw. SPOT freq. – Data packet necessary

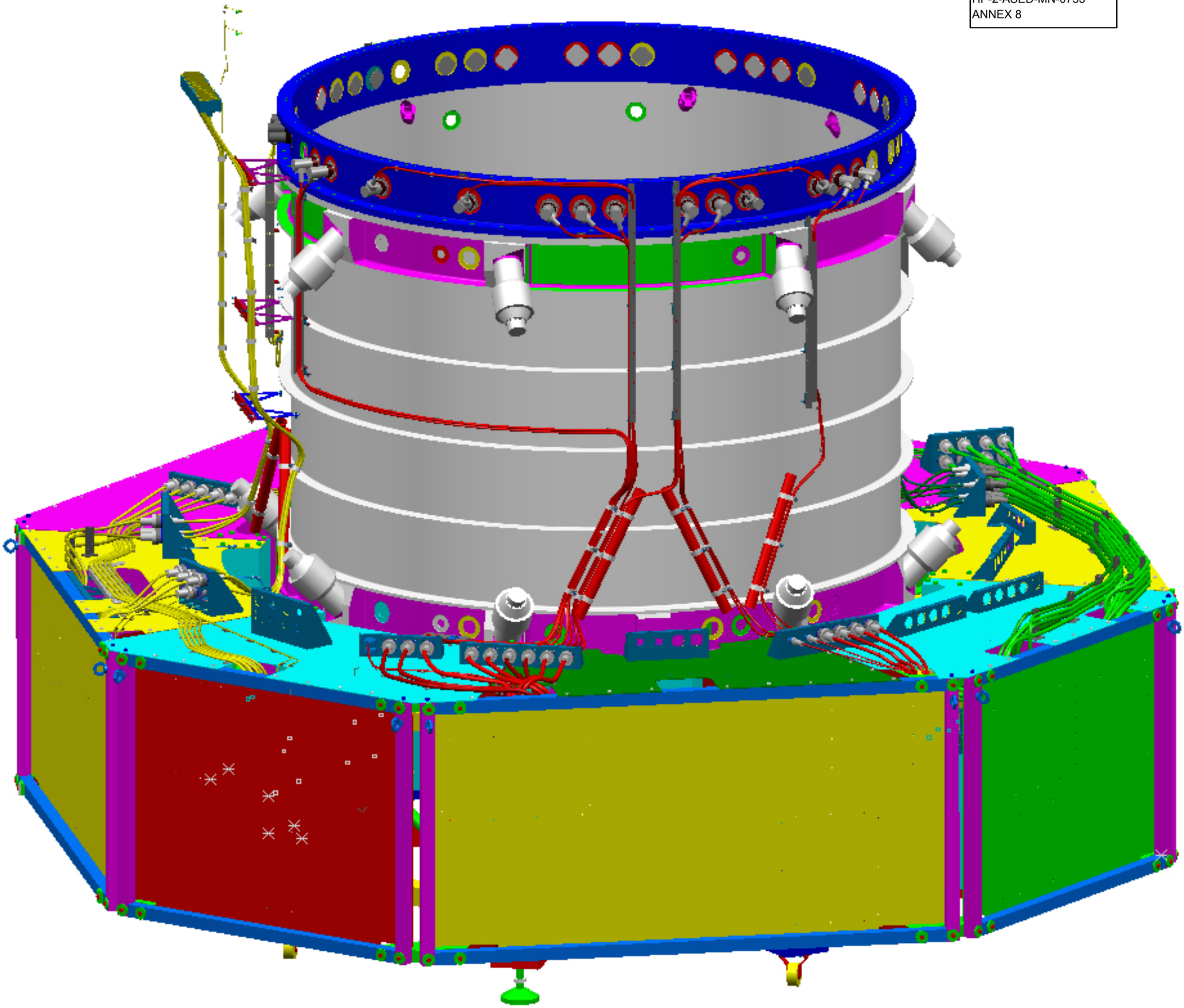
End of Presentation

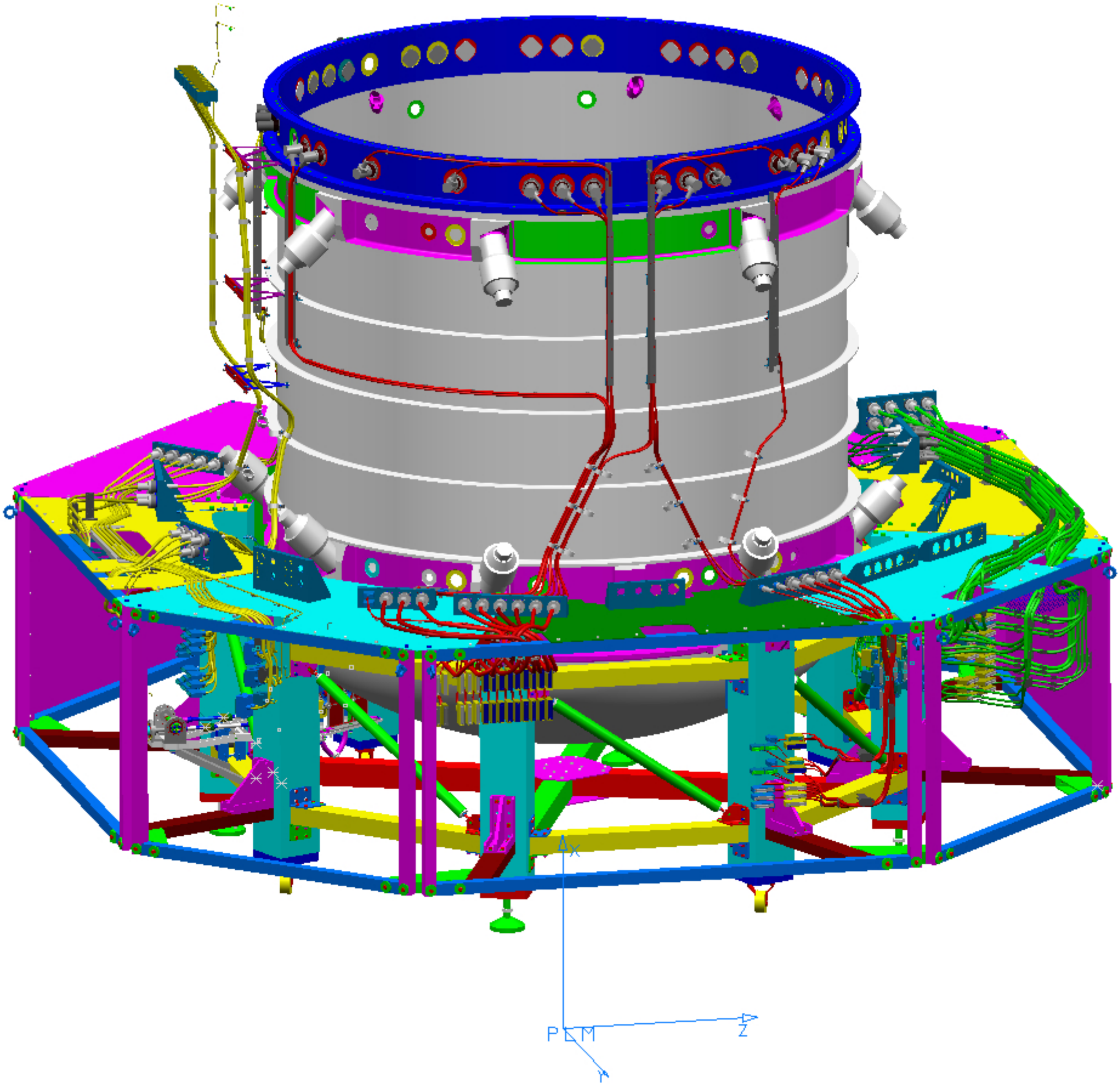
- As we do not have sufficient time available to carry out exhaustive testing, we need to optimise the testing within these constraints

Time	5 days, 8 hours days
Regulatory	Specific frequency windows and levels
Reconfiguring facility and available antennas	Depends on the available antennas and feasible configurations

- Polarization, both polarizations need to be tested above 30MHz
- Proposed reduction in the number of test cases by illuminating in two directions 90° apart with two antennas driven by a single function generator and one or two drive amplifiers
    - In this case, we would monitor the field with E-Field probes around the CVV directly aligned with each Tx antennas to achieve good uniformity between the two probes
    - Each of the probes would have to measure at least 2V/m
    - Clemens to investigate with Mr Ripple at SERCO feasibility
- Use the five days at the end of the testing of the three Herschel instruments to revisit any problems areas
    - Strong resonances or susceptibilities found in PACS, SPIRE or HIFI could be tested in the others. This would be one possible action item from an MRB held after the instrument tests.
- Clemens to investigate the possibility of a survey of the the EMI background in the facility at Ottobrunn
- Outline SPIRE EMC testing
    - Subsystem level for DCRU and DPU
    - Instrument level (cryogenic test) for 28V CS
    - EQM level for RS

HP-2-ASED-MN-0753
ANNEX 8

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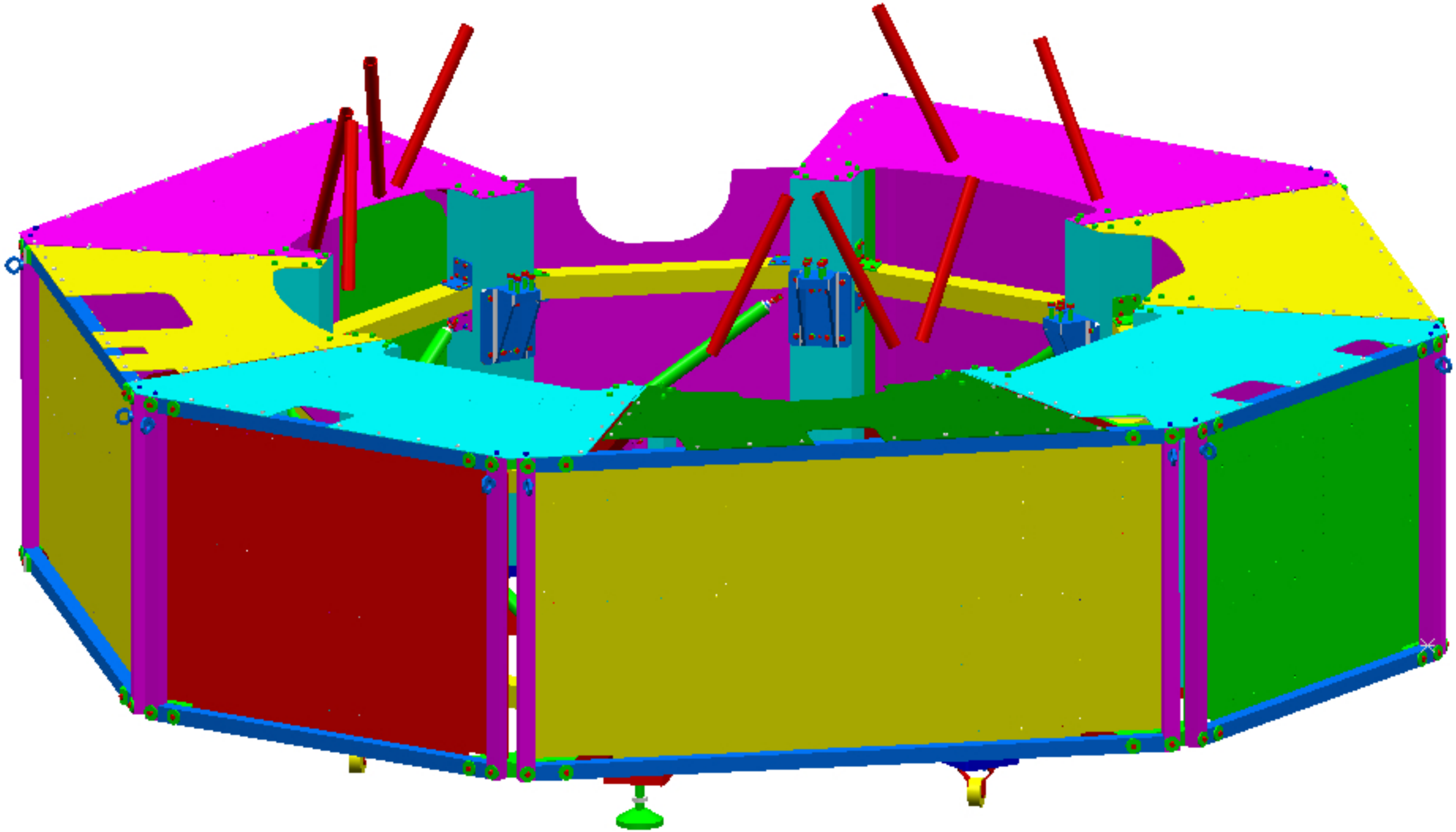

Annex 9: Summary - List of Required Instrument Spacecraft Level Integration and Test Procedures and Due Dates

Procedures	Applicable to CQM / FM	Instrument Input required by	First Issue	Comments relevant for SPIRE
Instrument Incoming Inspection Procedures	CQM / FM	Instrument Delivery - 2 months	Instrument Delivery - 1 month	Not available
Instrument Hoisting and Handling Procedures	CQM / FM	Instrument Delivery - 2 months	Instrument Delivery - 1 month	Covered by SPIRE-RAL-PRC-001923, Issue 1, 20/05/04
Instrument FPU/LOU Integration Procedures	CQM / FM	Instrument Delivery - 2 months	Instrument Delivery - 1 month	Covered by SPIRE-RAL-PRC-001923, Issue 1, 20/05/04
Instrument Warm Units Integration Procedures	CQM / FM	Instrument Delivery - 2 months	Instrument Delivery - 1 month	Not available
Instrument EGSE Setup and Verification Procedures	CQM / FM	Instrument Delivery - 2 months	Instrument Delivery - 1 month	Available ?
Instrument Electrical Integration Procedures	CQM / FM	Instrument Delivery - 2 months	Instrument Delivery - 1 month	Covered by SPIRE-RAL-PRC-001923, Issue 1, 20/05/04
Instrument SFT Procedures	CQM / FM	Instrument Delivery	Instrument Delivery + 1 month	Not available
Instrument IMT / IST Procedures	CQM / FM	Instrument Delivery	Instrument Delivery + 1 month	Not available
Instrument SPT Procedures (if any)	CQM / FM	Instrument Delivery	Instrument Delivery + 1 month	Not available
Instrument TV Test Procedure	FM	Instrument Delivery	Instrument Delivery + 1 month	Not available
Instrument EMC Test Procedures	EQM	Instrument Delivery	Instrument Delivery + 1 month	Not available

	Name	Dep./Comp.		Name	Dep./Comp.
	Alberti von Mathias Dr.	AOE22		Wagner Klaus	AOE23
	Alo Hakan	OTN/TP 45	x	Wietbrock, Walter	AET12
	Barlage Bernhard	AED11		Wöhler Hans	AOE22
X	Bayer Thomas	AET52			
X	Faas Horst	AEA65			
	Fehringer Alexander	AOE13			
X	Frey Albrecht	AED422			
	Gerner Willi	AED11			
	Grasl Andreas	OTN/AET52			
	Grasshoff Brigitte	AET12	x	Alcatel	ASP
X	Hauser Armin	AOE23	x	ESA/ESTEC	ESA
X	Hinger Jürgen	AOE23			
X	Hohn Rüdiger	AET52		**Instruments:**	
	Huber Johann	AOA4		MPE (PACS)	MPE
	Hund Walter	ASE4A	x	RAL (SPIRE)	RAL
X	Idler Siegmund	AED432		SRON (HIFI)	SRON
	Ivády von András	FAE22			
X	Jahn Gerd Dr.	AOE23		**Subcontractors:**	
X	Kalde Clemens	APE3		Air Liquide, Space Department	AIR
	Kameter Rudolf	OTN/AET52		Air Liquide, Space Department	AIRS
X	Kettner Bernhard	AOE22		Air Liquide, Orbital System	AIRT
X	Knoblauch August	AET32		Alcatel Bell Space	ABSP
X	Koelle Markus	AET22		Astrium Sub-Subsyst. & Equipment	ASSE
X	Kroeker Jürgen	AED65		Austrian Aerospace	AAE
	Kunz Oliver Dr.	AOE23		Austrian Aerospace	AAEM
	Lamprecht Ernst	OTN/ASI21		APCO Technologies S. A.	APCO
X	Lang Jürgen	ASE4A		Bieri Engineering B. V.	BIER
X	Langfermann Michael	AET52		BOC Edwards	BOCE
	Mack Paul	OTN/AET52		Dutch Space Solar Arrays	DSSA
X	Pastorino Michel	ASPI Resid.		EADS CASA Espacio	CASA
X	Peltz Heinz-Willi	AET42		EADS CASA Espacio	ECAS
	Pietroboni Karin	AED65		EADS Space Transportation	ASIP
	Platzer Wilhelm	AED22		Eurocopter	ECD
	Rebholz Reinhold	AET52		HTS AG Zürich	HTSZ
	Reuß Friedhelm	AED62		Linde	LIND
X	Rühe Wolfgang	AED65		Patria New Technologies Oy	PANT
	Runge Axel	OTN/AET52		Phoenix, Volkmarsen	PHOE
	Sachsse Bernt	AED21		Prototech AS	PROT
X	Schink Dietmar	AED422		QMC Instruments Ltd.	QMC
X	Schlosser Christian	OTN/AET52		Rembe, Brilon	REMB
	Schmidt Rudolf	FAE22		Rosemount Aerospace GmbH	ROSE
	Schweickert Gunn	AOE22		RYMSA, Radiación y Microondas S.A.	RYM
	Stauss Oliver	AOE13		SENER Ingenieria SA	SEN
	Steininger Eric	AED422		Stöhr, Königsbrunn	STOE
X	Stritter Rene	AED11		Terma A/S, Herlev	TER
	Tenhaeff Dieter	AOE22			
	Thörmer Klaus-Horst Dr.	OTN/AED65			