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Title: **Herschel PLM/ EQM AIT Plan**

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Prepared by:	P. Mack <i>P. Mack</i>	Date:	<u>27.03.02</u>
Checked by:	Chr. Schlosser <i>Chr. Schlosser</i>		<u>02.04.02</u>
Product Assurance:	R. Stritter <i>R. Stritter</i>		<u>03.04.02</u>
Configuration Control:	A. v. Ivady <i>A. v. Ivady</i>		<u>11.04.02.</u>
Project Management:	W. Rühle <i>W. Rühle</i>		<u>11.4.02</u>

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1 INTRODUCTION

In order to verify the performance of the instruments in an early phase of the Herschel program an electrical/engineering qualification model the EQM will be used and is based on the refurbished and modified ISO-Cryostat (QM). The ISO QM has to be seen as a test cryostat to provide the cryogenic in flight environment condition for the instruments.

The purpose of using the Herschel EQM is to perform the following tests prior to the PFM program:

- Functional test of the scientific instruments
- EMC test
- Dark background test
- Validation of the alignment procedure
- Pre-validation of Payload thermal design w.r.t. instrument thermal interfaces
- Verification of the payload integration procedure
- First functional check of the EGSE (H/W and S/W) and EGSE Test Procedure preparation/evaluation

1.1 OBJECTIVE

This Assembly, Integration and Test Plan (AIT Plan) describes all integration and test activities for the Herschel PLM/EQM program performed by Astrium GmbH.

The major objectives of this AIT Plan are to define the technical basis for the following activities:

- An AIT programme in accordance with the system level AIV requirements
- The relevant organisation, necessary to carry out all tasks of the AIT programme
- The definition and utilisation of GSE and facilities dedicated to this programme
- The required integration/test documentation
- All tests and operations to be performed within the identified tasks
- The general company rules, PA and safety procedures to be followed throughout the AIT activities
- The AIT programme schedule and the major milestones
- The integration and test sequences
- Transports

2 DOKUMENTSDOCUMENTS

2.1 APPLICABLE DOCUMENTS (AD)

Applicable documents (AD) are defined as being documents which are needed to complete the work, they are considered as being integral part of this document, as far as specifically called-up.

The following documents in their latest issue are applicable to the specification :

AD #	Document Title	Document Identifier
AD 01	Instrument Interface Document IID – part A	SCI-PT-IIDA-04624
AD 02	Instrument Interface Document IID – part B, HIFI	SCI-PT-IIDB/HIFI-02125
AD 03	Instrument Interface Document IID – part B, PACS	SCI-PT-IIDB/PACS-02126
AD 04	Instrument Interface Document IID – part B, SPIRE	SCI-PT-IIDB/SPIRE-02124
AD 05	HERSCHEL EPLM AIV and HERSCHEL Satellite AIT Requirements Specification	HP-1-ASPI-SP-0008
AD 06	H-EPLM Requirements Specification	HP-2-ASED-SP-0003
AD 07	EMC Requirements Specification	H-P-1-ASPI-SP-0037
AD 08	Contamination Control Plan	HP-2-ASED-PL-0023
AD 09	PA Plan	HP-2-ASED-PL-0007
AD 10	EGSE General Requirement Specification	HP-1-ASPI-SP-0045
AD 11	Herschel/Plank DDP	H-P-1-ASPI-PL-0009

2.2 REFERENCE DOCUMENTS

RD 01	Facility and Transportation Plan	HP-2-ASED-PL-0014
RD 02	EQM Test Program Definition	HP-2-ASED-TN-0004
RD 03	List of Acronyms	H-P-1-ASPI-LI-0077
RD 04	Instrument Testing on PLM EQM Level	HP-2-ASED-PL-0021
RD 05	Herschel EQM Design Description	TBD
RD 06	ISO PLM/QM Inspection and Status Verification before Deintegration	HP-2-ASED-PR-0005
RD 07	Herschel Alignment Concept	HP-2-ASED-TN-0002

3 EQM MODEL PHILOSOPHY

The Herschel design and development planning is based on a two model philosophy:

- The PLM/EQM, as electrical/engineering qualification model with flight representative instrument components (CQM's), based on the refurbished and modified ISO cryostat (QM). This is described within this AIT plan.
- The PLM/PFM, used for qualification and acceptance testing, which will be subject of the Herschel Satellite AIT plan.

The purpose of using the Herschel EQM is to perform the following tests prior to the PFM program:

- Functional test of the scientific instruments under orbit representative cryogenic conditions (Integrated Module Test)
- EMC test
- Dark background test
- Validation of the alignment procedure
- Verification of the payload integration procedure
- EGSE Test Software validation
- Pre-validation of the payload thermal design w.r.t. OB and instrument I/F

4 EQM DESIGN DESCRIPTION

4.1 MAIN MODIFICATION OF ISO/QM TO EQM

The main components of the EQM are (see figure on next pages):

- Test cryostat based on ISO/QM cryostat with the following major changes:
 - Main tank (torus) used as He I reservoir for the ventline-cooling of the heatshields only
 - New auxiliary tank as He II reservoir instead of the ISO auxiliary tank for ventline-cooling of payloads as well as for cooling of the instrument LO-interfaces
 - Internal harness/sensors electrically representative to PFM (as far as useful)
 - ISO Baffle dismounted
 - ISO OSS dismounted
- Optical bench and instrument shield in Herschel FM design with HIFI-, PACS-, and SPIRE Focal Plane Units mounted on the optical bench and the HIFI LOU and PACS BOLA mounted on the outside of the CVV, all these instrument units with cryogenic qualification status
- Instrument cryo harness plus LOU waveguide assembly, both flight representative
- CVV upper part identical to Herschel FM (including shields and MLI)
- Additional connector ring for scientific instrument harness vacuum feedthroughs
- Additional He S/S components for new EQM design (e.g. burst disc for aux. tank)
- Additional ventline for auxiliary tank
- He S/S internal tubing adapted to new EQM design
- PLM Test Cavity to simulate orbital representative background conditions, ventline-cooled by a separate external LHe dewar
- SVM platform with support frame, equipped with warm units AVM's. Arrangement of SVM platform representative to PFM in position and size (wave guide configuration and external instrument harness routing identical to PFM) see Fig.: 3
- Cryostat harness shall be electrically representative to PFM

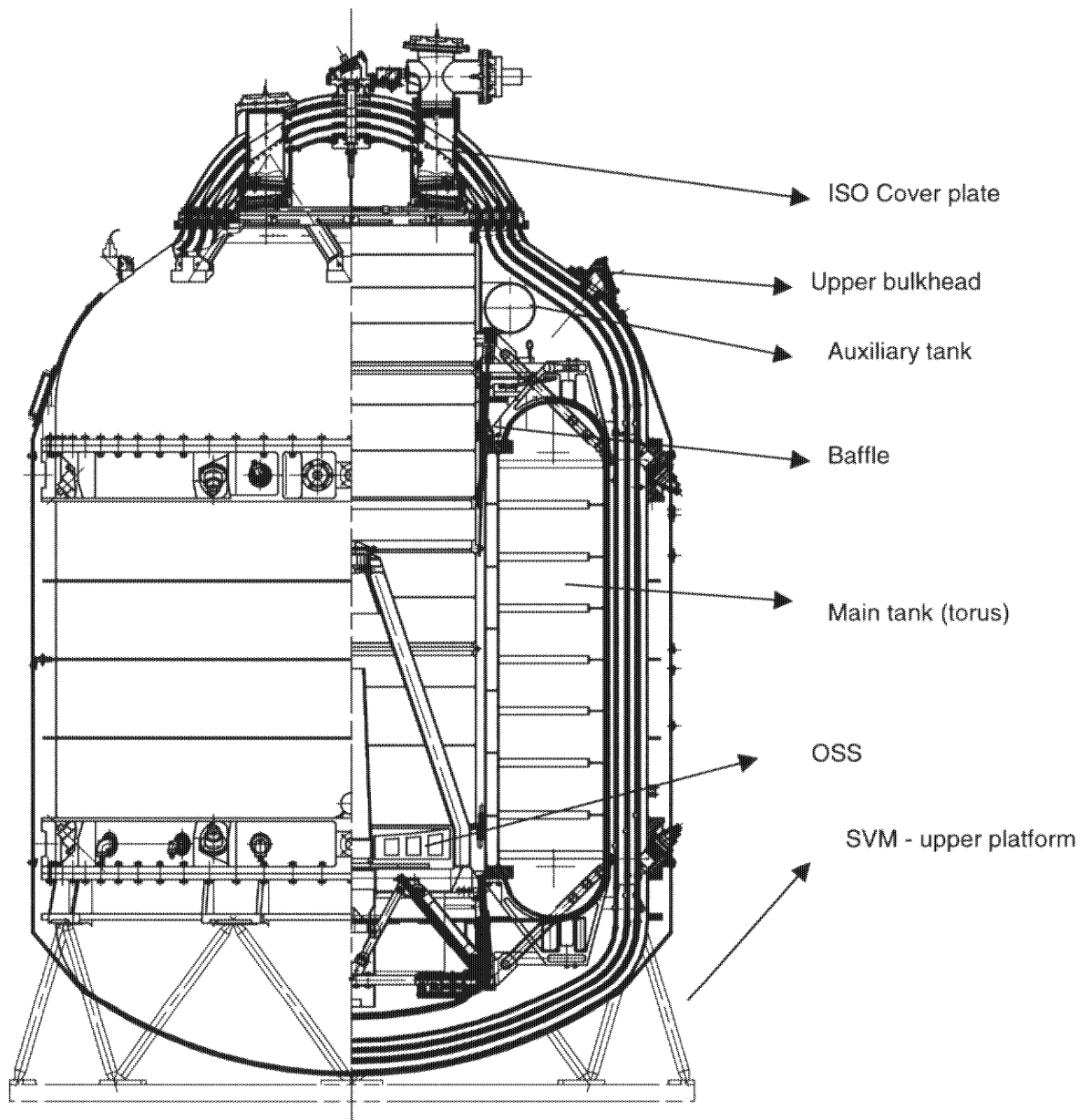


Fig.: 1 ISO PLM/QM – Parts to be disassembled

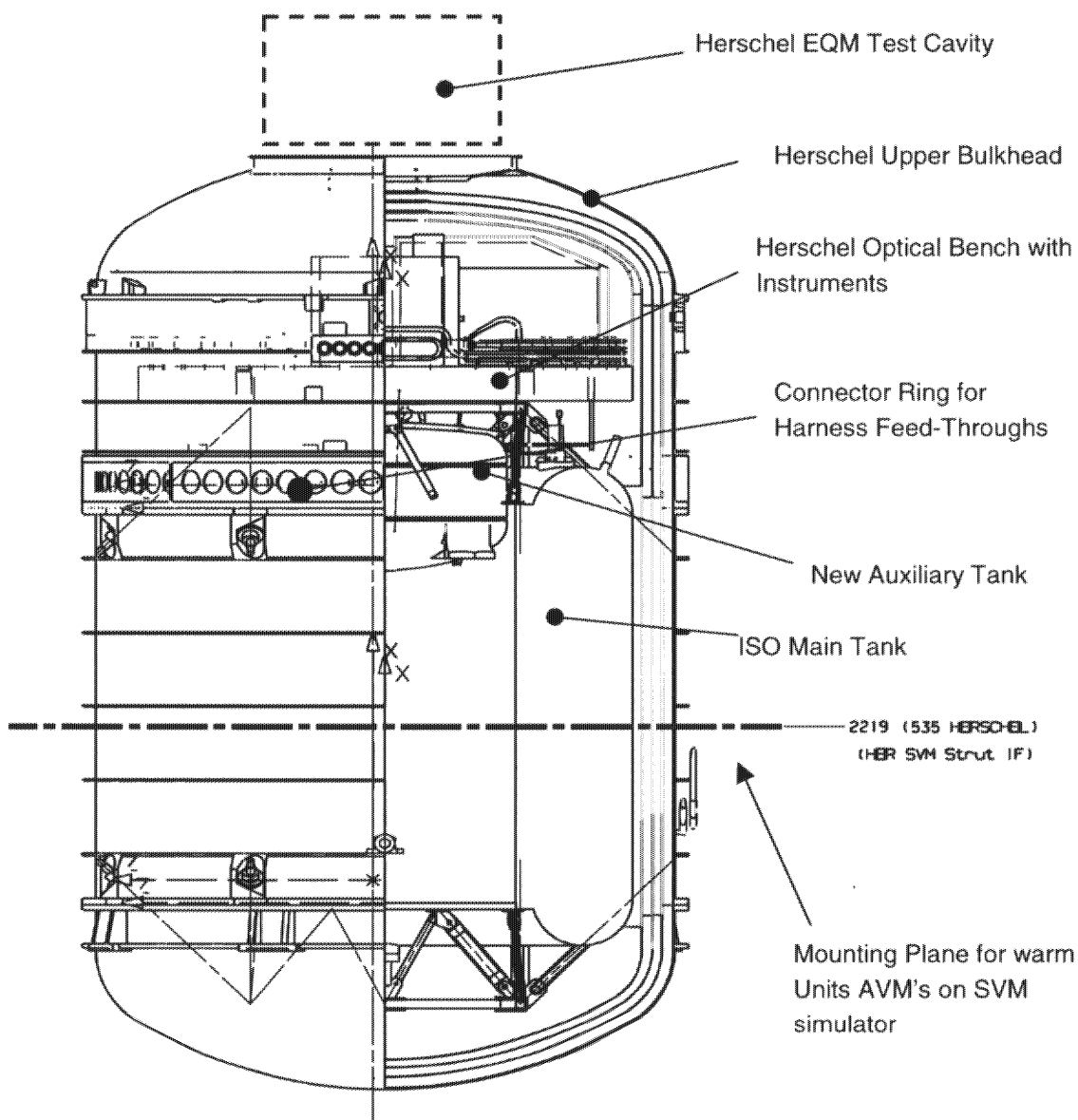


Fig.: 2 Main components to be integrated to Herschel EQM

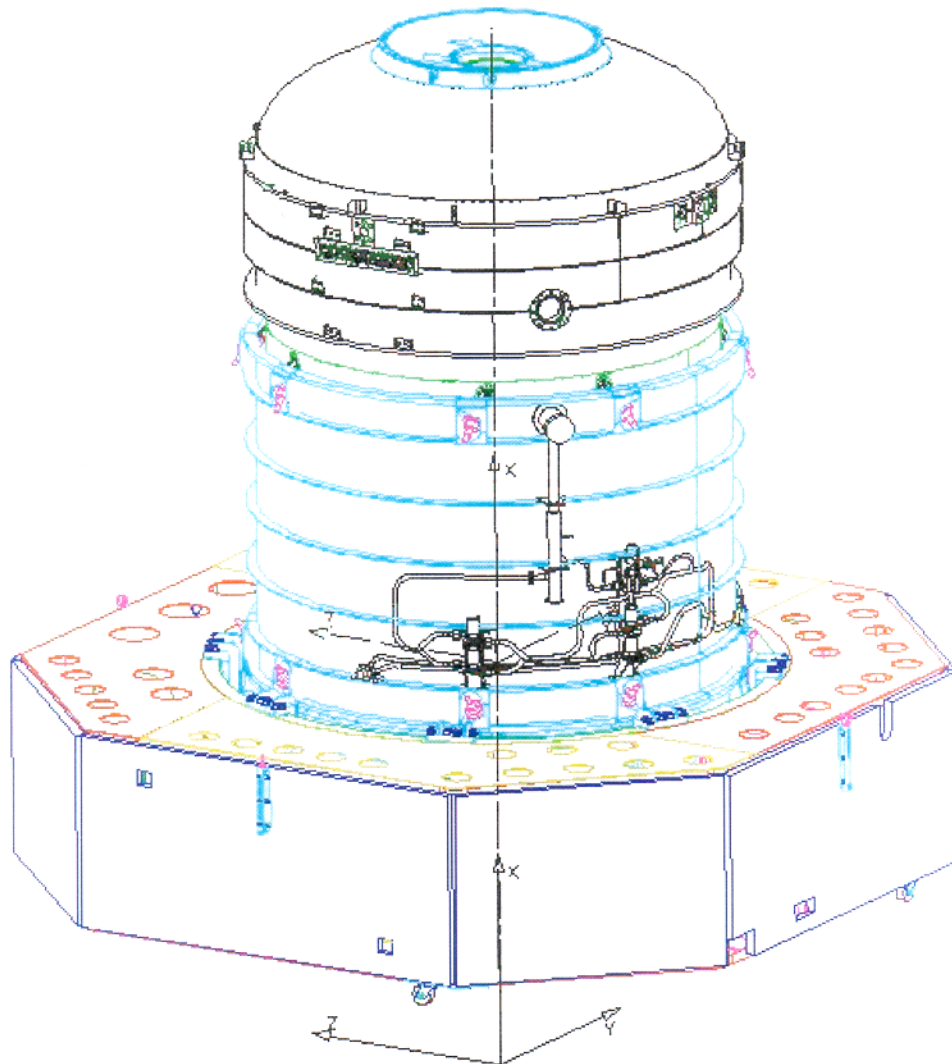


Fig.: 3 3D view of PLM/EQM with SVM simulator (CTA not shown)

4.2 EQM THERMAL REQUIREMENTS

The thermal requirements for the three different levels are as specified in AD2, AD3 and AD4.

	HIFI	PACS	SPIRE
Level 0	0 K ... 2 K stability: 6 mK/100s	1.6 K ... 1.75 K 1.6 K ... 2.2 K 1.6 K ... 3.5 K	N/A ... 2 K
Level 1	TBD ... 6 K stability: 6 mK/100s	3 K ... 5 K	N/A ... 6 K
Level 2	TBD ... 20 K stability: 15 mK/100s	N/A	N/A ... 15 K

Table 1: Summary of thermal requirements

4.3 EQM HELIUM SUBSYSTEM

In order to fulfil the above given requirements for instrument testing the EQM He subsystem will be realised as given in figure below.

Main characteristics of this concept are as follows:

- The main tank will be filled with He-I at 4.2 K. For instrument testing it will be used to cool down the shields only (bypassing the optical bench) to nearly orbital temperature, i. e. approx. 30 K at the innermost shield. This temperature condition will be achieved by heating the main tank accordingly. The main tank is venting via V502 to ambient environment
- The aux. tank will be located within the upper part of the torus main tank. The shape of the upper part of the aux. tank will be similar to the shape of the Herschel EPLM main tank which will support a EPLM representative thermal coupling by Cu straps of the instruments
- The fixation of the aux. tank to the main tank will be realised by isolated CFK blades (shortened ISO baffle suspension)
- The auxiliary tank will be used as a He-II tank, to cool down the optical bench with the required flight representative mass flow of approx. 2.2 mg/sec. This will be realised by pumping at the new additional aux. tank ventline that is connected with the Herschel payload ventline. The adjustment of the required mass flow will be done by heating of the aux. tank and throttling the pumping capacity

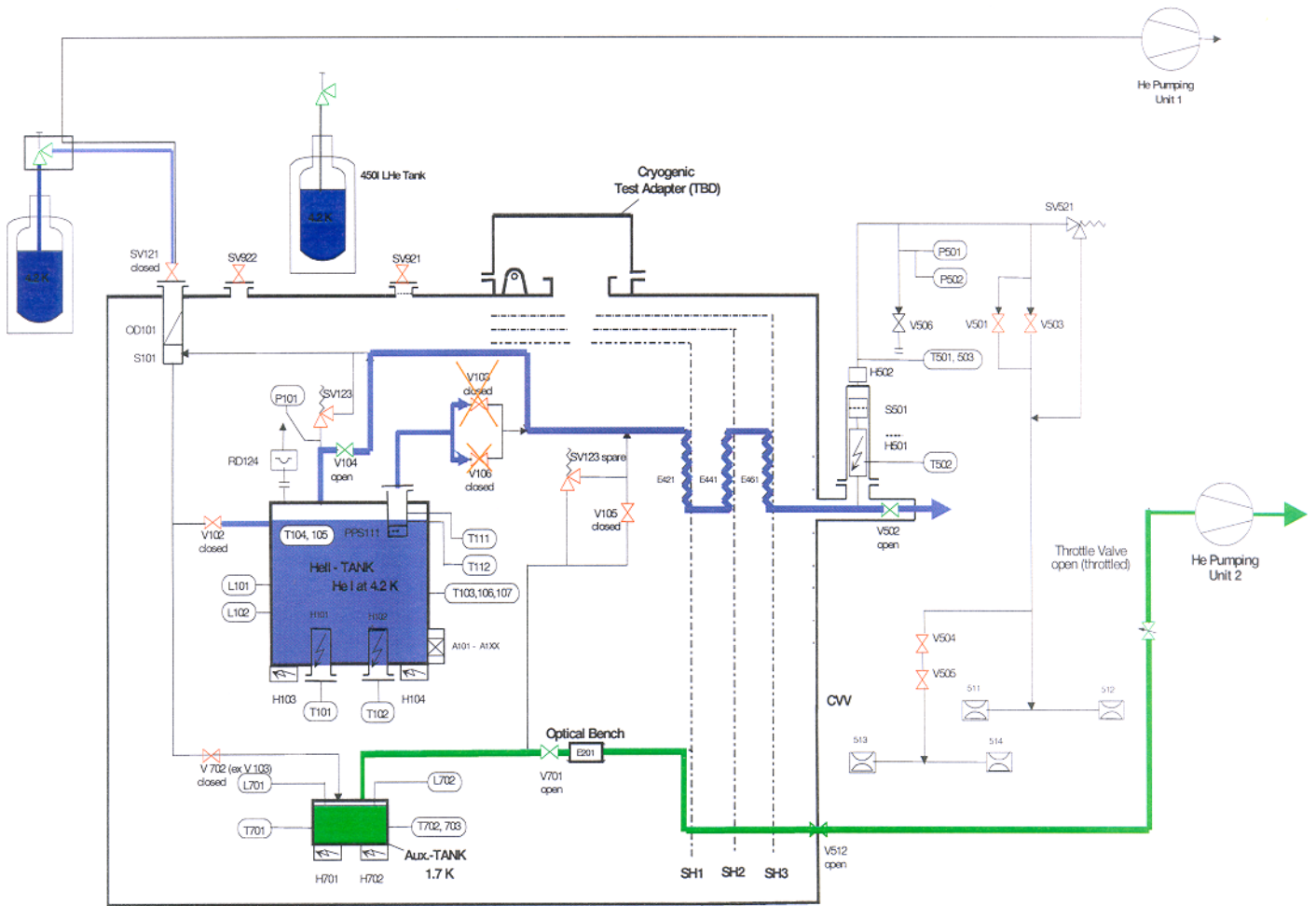


Fig.: 4 EQM Helium Subsystem Flow Schema

4.4 CRYOGENIC TEST ADAPTER (CTA)

The cryogenic test adapter (CTA) is a non-flight item, which is used to provide the flight representative thermal test environment during the EQM test programme and covers the following:

- Performance of functional tests of HIFI, PACS and SPIRE instrument by replicating the correct thermal background (i.e. dark background)
- Performance of radiated susceptibility tests under flight representative conditions (i.e. thermal background and aperture geometry) (TBC)
- Performance of conducted susceptibility tests under flight representative conditions (i.e. thermal background)
- Performance of H-Field test under flight representative conditions (TBC)

It is not required that the CTA is designed to test the imaging properties of the system.

The CTA will be mounted on top of the Herschel EQM CVV.

Based on the preliminary concept, proposed by the Instrument Teams (see Figure below), the following CTA subsystems and components can be identified:

- CTA Cryo-Subsystem
- CTA Optical System
- EMC Components

Mechanical Support Structure

The final design of the CTA is actually under preparation.



Fig.: 5 Cryogenic Test Adapter (CTA) – Preliminary Concept (not to scale)

5 INTEGRATION AND TEST PHILOSOPHY

5.1 INTEGRATION

5.1.1 PRE- INTEGRATION INSPECTION AND H/W RELEASE

Before starting the integration an incoming inspection will be performed on each delivered equipment to control the quality of the hardware to be integrated.

As a minimum, the following controls/measurements will be performed:

- control of data package according to the shipping list
- visual inspection
- cleanliness inspection
- conformity of identification markings and serial numbers to the configuration status
- fit check (if possible) dimensional check and planarity
- mass
- instrument health check after shipment

Release of hardware for integration will be controlled. Parts required for a particular integration activity will be kited to reflect the requirements of the governing procedure prior to the need date. This kiting operation shall include an inspection according to the system/module assembly drawing and subsystem manufacturing drawings to ensure that all parts materials are available and that obvious anomalies are found prior to the beginning of integration activities.

5.1.2 MECHANICAL INTEGRATION/DISASSEMBLY

Mechanical integration/deintegration will be performed according integration/deintegration procedures in step by step format. All activities will be given in correct timely order.

All de-integration and re-integration activities of the EQM cryostat will be performed in cleanroom class 100 environment.

The handling- and integration activities of EQM hardware will be carried out using the ISO refurbished MGSE. It will be done by trained authorised personnel with the necessary experience (ISO heritage).

The deintegration and storage of Herschel relevant H/W from ISO must be performed such that they can be reused for Herschel PLM/EQM (protection of flange I/F's is mandatory). Generally all parts which shows anomalies (e.g. helicoil inserts, gaskets) have to be replaced. Clear marking of dismantled parts is requested for precise identification during reintegration phase.

The major steps of the disassembly/re-integration is:

- Disassemble non used ISO components
- Integration of new auxiliary tank and L0 cooling straps
- He S/S tubing re-routing/completion
- Re-routing of CCH
- Closure lower part
- Integration of optical bench with pre-integrated thermal foil on lower side

- Connection of optical bench ventline
- Integration of connector ring and instrument harness (up to optical bench)
- Integration of FPU's and connecting of L0 and L1 cooling straps
- Final integration of instrument harness
- Integration of Instrument shields
- Integration of Instrument MLI
- Closure of upper part of CVV including shields & MLI
- Installation of CTA

The re-integration will be completed after closure of the cryostat with a successfully performed leak tightness test. The final integration activities will be continued in cleanroom class 100.000 (e.g. BOLA, LOU integration, external harness integration ...).

5.1.3 HARDWARE "AS BUILT STATUS" LIST

Through an official record the hardware "as built status" shall be traced during the AIT activities. The record shall state:

- drawings
- integrated hardware part and serial number
- integration date
- module
- subsystems
- integration location, if applicable
- grounding measurement result

5.1.4 CRITICAL INTERFACES

All sensitive interfaces (flange- or optical I/F's.) must be adequate protected e.g. by foil or protection covers

5.1.5 ELECTRICAL INTEGRATION/DEINTEGRATION

The general approach is a sequential assembling and testing. Each unit shall be reasonable functionally tested within existing constraints as far as possible before further units are added. The philosophy shall allow the identification of problems as clear and early as possible.

5.1.5.1 HARNESS AND WAVEGUIDES

Harness and waveguides will be handled and installed only by adequate and authorised personnel. All harness interfaces have to be protected by connector savers during integration. Mating/demating during ground handling will be made by separating “non flight” hardware interfaces. Electrical integration of harness will be completed by execution of detailed functional checks/tests. Open ends of the waveguides will be protected by adequate caps.

Integrated ISO harness no longer required for Herschel, it will be preferable to detach a suitable harness I/F before cutting of harness cables.

5.1.5.2 INSTRUMENT COLD UNITS INTEGRATION

Grounding and precaution of static discharge requirements will be verified before any activity. Electronic unit/box connectors will be protected by connector savers during integration.

The instrument cold units integration will be supported by short electrical interface checks performed with adequate instrument unit tester.

5.1.5.3 INSTRUMENT WARM UNITS INTEGRATION

Grounding and precaution of static discharge requirements will be verified before any activity. Electronic unit/box connectors will be protected by connector savers during integration. Mating/demating during ground handling will be made by disconnecting “non flight” hardware interfaces.

Electrical integration of units and subsystems will be completed by execution of detailed functional checks/tests.

The instrument warm-units will be integrated onto the SVM platforms in parallel to the cryostat integration as offline activity in cleanroom class 100.000. The warm-unit integration will be completed by a test sequence debugging, using the FPU simulators and the PLM EGSE together with the CCS light.

These pre-integrated SVM platforms will be finally installed to the cryostat prior instrument testing.

5.2 CRYO OPERATIONS

In order to allow instrument testing in the required thermal environment, the cryostat has to be cooled down and the tanks filled with LHe. Instrument cool down requirements will be respected.

5.2.1 COOLDOWN & FILLING

The cooldown and filling will be performed according procedures, based on the verified ISO documents and using the refurbished ISO CVSE.

Cooldown and filling will start after successfully performed leaktest of the internal Helium S/S to the cryostat isolation vacuum and isolation vacuum to ambient. After filling of the main tank with LHe I, a cold leaktest will be performed.

Similar procedures will be used for filling the auxiliary tank with LHe I.

Cooldown and filling will be performed in vertical position only.

5.2.2 HELIUM II PRODUCTION & TOP UP

The Helium II production and top up will be performed according procedures based, on the verified ISO documents and using the refurbished ISO CVSE.

According our EQM design concept of the cryostat, the auxiliary tank will be used as He II reservoir for instrument testing, venting through the optical bench directly out of the CVV to the Helium pumping units. It provides the required level 0 temperatures as well as the level 1 and level 2 temperatures, by adjusting the required flight representative massflow of approximately 2.2 mg/s.

These conditions have to be maintained during the complete test sequence. Refilling of the auxiliary tank will start latest at an liquid level of 10 %.

He II production and top up will be performed in vertical position only.

5.2.3 CTA OPERATION

To provide a cold background for the instruments in order to perform their instrument testing, the CTA components have to be cooled during test. According to the conceptual design of the CTA the cavity will be equipped with shrouds cooled by ventlines below 5K. The required temperatures will be obtained by active cooling of the internal components with LHe, delivered by an external dewar. Other components within the CTA will be controlled at higher temperatures by electrical heaters.

All testing with the EQM cryostat will be performed with x-axis in horizontal position.

The necessary procedures will be defined after final design of the CTA.

5.2.4 DEPLETION & WARM-UP

The depletion and warm-up will be performed according procedures based, on the verified ISO documents and using the refurbished ISO CVSE.

It will start after finalising the instrument testing. It will be performed using the internal heaters of the main tank and auxiliary tank.

5.3 EQM TESTS

5.3.1 INSTRUMENT TESTS

Specific tests/verifications with the PLM EQM will be performed according to test procedures (definition of test and documentation of test process). All steps will be given in correct timely order. The release for starting the test will be given by aTRR.

According PLM EQM activity flow see Fig. 5 the following instrument specific tests are foreseen as follows:

1. Short cold functional tests (SFT) in He I conditions
2. Integrated module test (IMT) with a dark background test in He II condition
3. EMC test in He II condition
4. Validation of alignment procedure
5. Validation of EGSE test software

Objective and definition of each test is given in the Instrument Testing on PLM EQM Level (RD). The SFT will include sequential short tests of the instruments in order to check the instrument health after cooldown and filling. Each instrument will define adequate test sequences to limit testing time.

The IMT will be performed in orbit representative conditions in order to verify the instrument function in all modes. It will start with a test sequence debugging. The IMT will include

- Functional tests of each instrument separate, in all modes
- Functional tests of PACS and SPIRE in parallel mode
- Check of the instrument sensitivity w.r.t. background conditions, simulated by CTA

The EMC test will be performed after the IMT. The CTA will be used to reach the required thermal background. It will include:

- CE and CS test
- Radiated susceptibility test (in cleanroom class 100.000) using antennas inside the CTA (TBC)
- H-field test (TBC)

Some of these tests will be supported by tilting the cryostat around z-axis according instrument or cryostat needs.

A test report will be issued after test.

In detail, the following tests are proposed by each instrument:

HIFI:

- Alignment check
- Thermal test
- Functional test
- IF properties
- Receiver tuning
- Radiometry
- EMC test

PACS:

- Full functional test
- Short performance test
- AOT tests
- PACS/SPIRE parallel mode
- EMC test

SPIRE:

- Flight operations thermal balance tests:
 - Cooler recycle test
 - Photometer chopper mode
 - Ambient background verification
 - Spectrometer mode
- EQM EMC Test

5.3.2 ALIGNMENT PROCEDURE VERIFICATION

5.3.2.1 ALIGNMENT PLAN

This chapter defines the alignment philosophy and the measurements which will be performed with the individual models. During the on-ground alignment two constraints must be taken into account:

1. The alignment requirements are valid for in-orbit conditions
2. The alignment requirements are specified for operational conditions, whereas the alignment can only be performed at ambient conditions.

The following environmental conditions will change between on-ground alignment and in-orbit operation:

- Gravity from 1g to zero g
- Atmospheric pressure from 1bar to 0bar
- Outer CVV temperature

These effects must be determined and have to be pre-compensated by a corresponding offset on-ground.

For the initial alignment performed with the EQM this offset must be determined theoretically and confirmed during testing.

Effects due to internal temperature and pressure change can be confirmed during on-ground testing, however, outer CVV temperature and the gravity release effect can only be determined theoretically. Restrictions must also be made for the testing of the temperature change.

Alignment of the Herschel PLM has to be performed in various steps.

5.3.2.2 EQM ALIGNMENT

With the EQM the alignment procedure shall be verified at an early stage of the AIV programme. The effect on alignment due to pressure change and cool down will also be determined. The effect on alignment due to outer CVV temperature change can only be verified with the STM inside the TV chamber. For the EQM the following alignment steps will be performed:

- OB wrt. CVV after OB integration
- Instrument FPU wrt. OB after FPU integration
- LOU wrt. OB after LOU integration and completion of CVV integration (before CVV closure)
- OB wrt. CVV and LOU before cooldown (CVV evacuated and in warm condition)
- OB wrt. CVV during cooldown and final adjustment of strap pretensions
- OB wrt. CVV and LOU in cold condition (check of alignment after filling)

The complete alignment plan is shown in the relevant AIV documentation.
The main tasks are the following:

- Early verification of the alignment
- Verification of pressure and temperature change effects on alignment (with an outer CVV temperature at 300K)
- Lessons learned with the EQM can already be applied for the STM
- No end to end test seems possible but: switching on the LOU and determine the signal strength at HIFI will verify correct alignment of LOU w.r.t. HIFI (this is only possible if the LOU can be sub-cooled to orbit representative temperatures)
- Risk reduction for the STM and FM programme

Monitoring the shift and angular deviation of the OB after cryostat evacuation and cool down will be performed using the dedicated alignment cameras proposed by HIFI TBC.

Two alignment cameras are mounted temporarily on the LOU allowing to monitor simultaneously tilt and offsets (two cameras are needed to determine the rotation about the y axis). A distance measurement in y direction is not possible, however, the distance requirement w.r.t. this axis is very comfortable ($\pm 15\text{mm}$ for LOU w.r.t. HIFI FPU), so that we can rely on the mathematical model for this direction TBC. For the lateral instrument alignment w.r.t. the telescope focus this will be checked in the course of phase B.

The advantage to use the HIFI dedicated camera system would be, that it can also be used for the STM programme inside the TV chamber and no additional alignment window is needed.

5.4 TEST SET UP

On the following pages major PLM /EQM test set up's are shown:

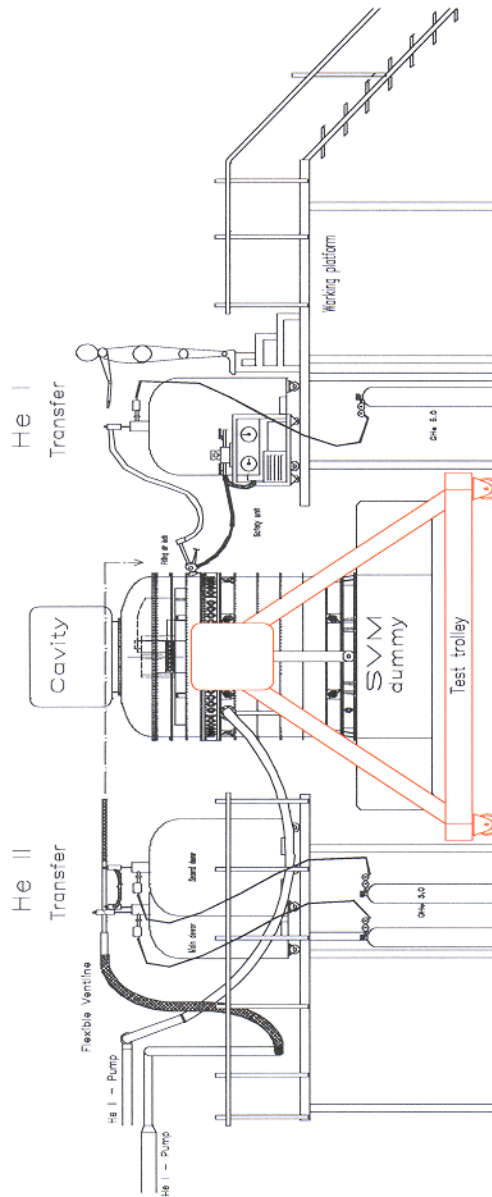


Fig.: 6 PLM set up for cool down and filling and cold instrument testing with PLM in vertical configuration

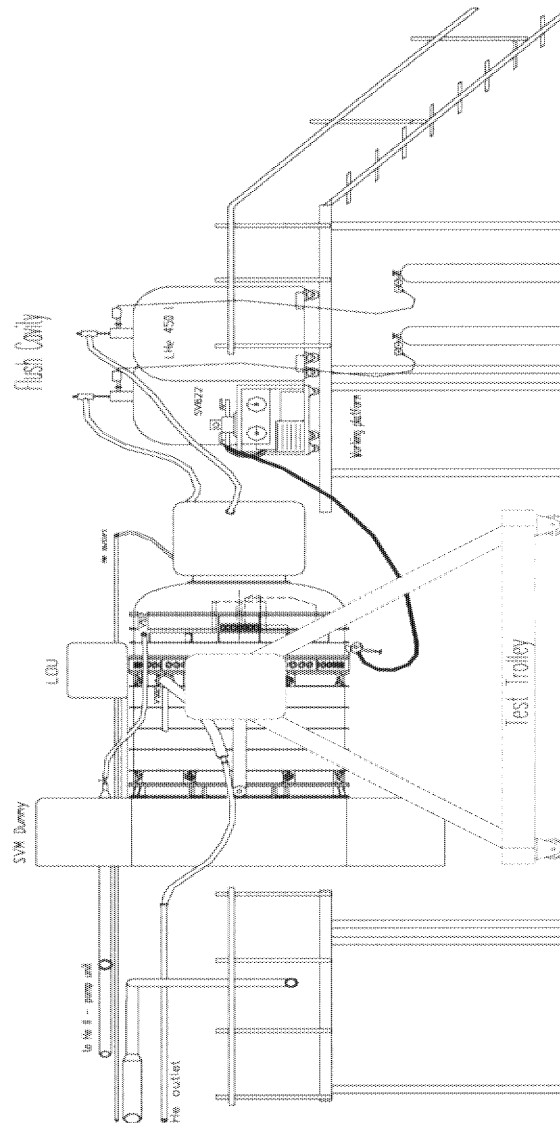


Fig.: 7 PLM set up for cold instrument testing with PLM in horizontal configuration

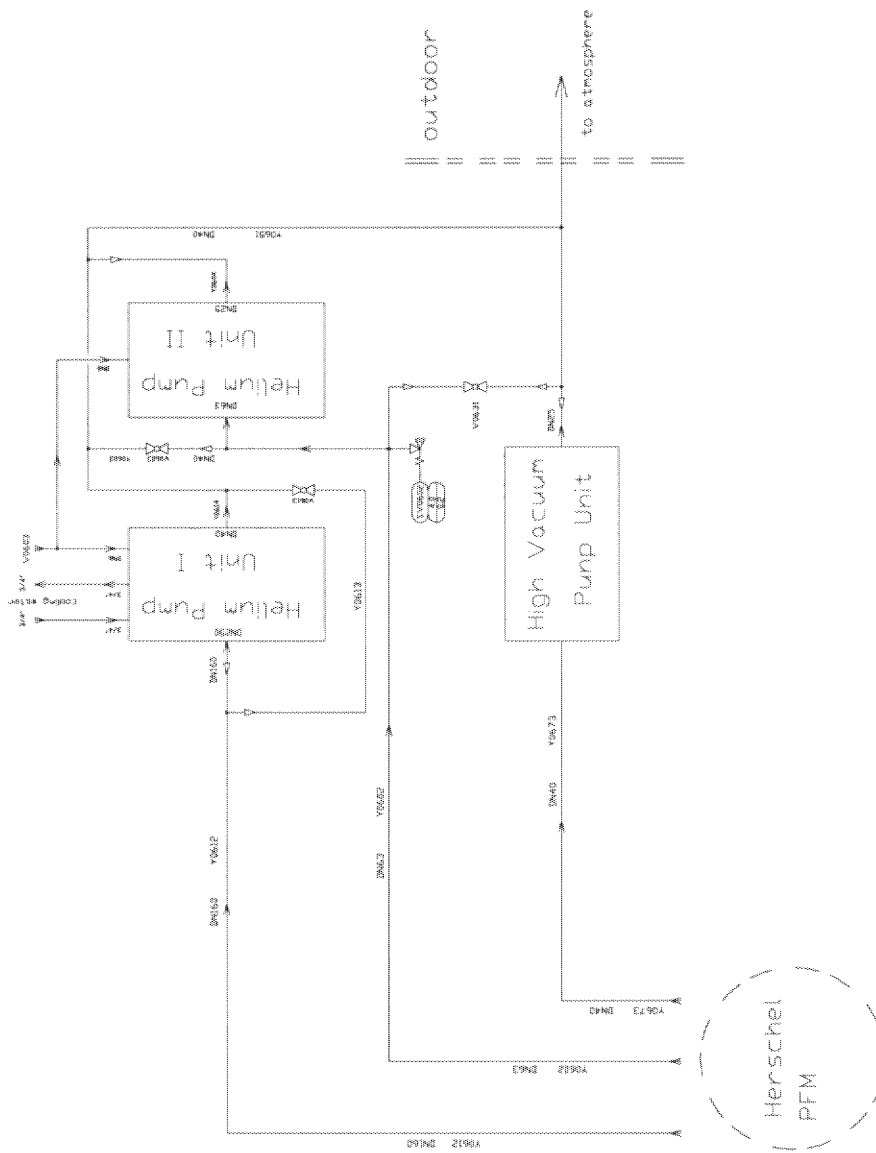


Fig.: 8 Arrangement of Cryogenic servicing equipment

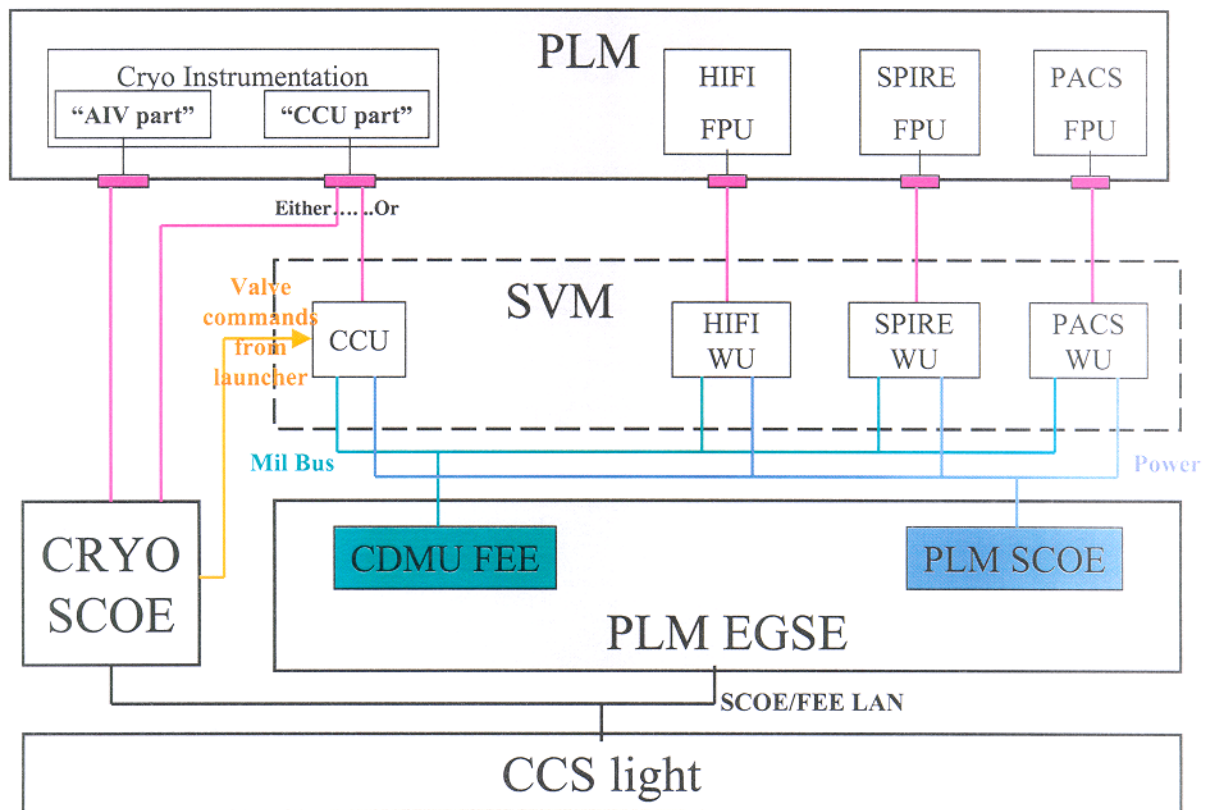


Fig.: 9 EGSE set up for instrument testing

5.5 AIT LOGIC FLOW

Logic flow for Herschel PLM/EQM AIT activities

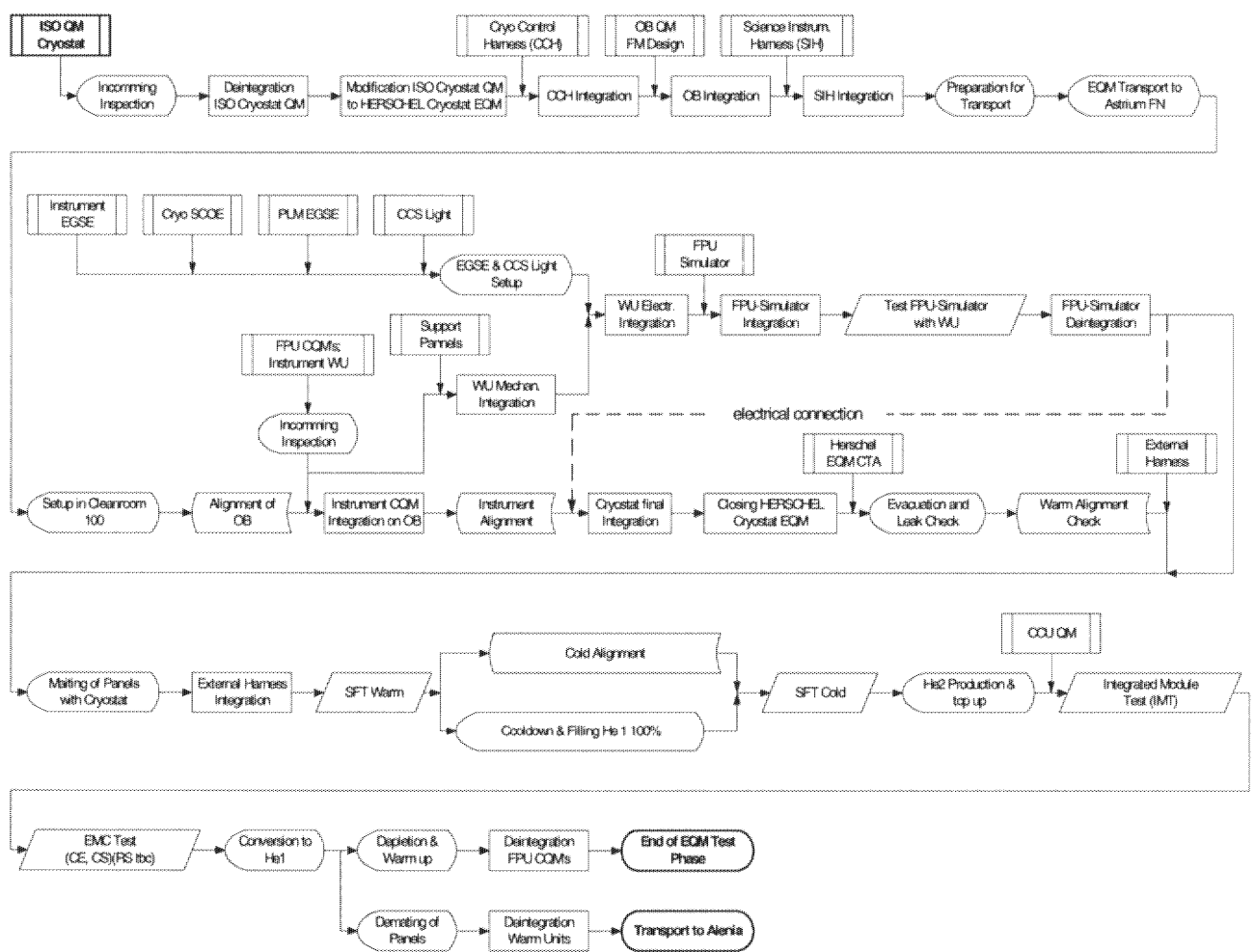


Fig.: 10 EQM AIT Logic flow

6 ORGANISATION AND MANAGEMENT

6.1 AIT TASKS

The main tasks to be performed under the AIT organisation are the following:

- detailed planning of AIT activities
- definition and sequencing of tests
- preparation of integration and test
- co-ordination and preparation of test facilities
- preparation of test set-up
- organisation of test reviews
- execution of AIT operations
- reporting of AIT operations
- determination and on site management of AIT team and technical support.

In order to fulfil these tasks, the following general rules have to be respected:

Prior to the start of any integration or test activity:

- KIP/MIP or TRR has to be held
- relevant procedures are available, reviewed and approved
- test configuration is defined, established and verified by Product Assurance
- necessary GSE, test instrumentation and facility is available and accepted for use
- safe working conditions for personnel and hardware have been established and verified by safety
- designated personnel is specially distinguished in the integration and test area

During any integration and test activity:

- all activities proceed according to approved procedures only
- anomalies or discrepancies with the procedure shall be reflected in a non-conformance report immediately raised

Conclusion of integration or test activity:

- all activities are successfully completed
- declaration sheets to verify completion are signed by the responsible engineers
- appropriate action is taken on all non-conformance reports raised during the activity
- an integration or test report is issued within an adequate time interval

6.2 AIT PERSONNEL

The AIT team will be recruited of a member of people from different disciplines. The team will be sized according to the manpower required during the various integration and test steps.

An AIT manager will be responsible for the overall co-ordination of the team. A second team member is responsible for all payload (instrument) relevant interfaces/aspects. The team will be completed by mechanics, responsible for all mechanical activities.

Only trained personnel, familiar with special requirements of class 100000/100 clean-rooms will work with the various H/W.

The AIT team will be supported as appropriate by optical engineering, mechanical engineering, thermal engineering and various support from manufacturing departments. The necessary engineering support from the different disciplines will be provided according to the AIT program requirements.

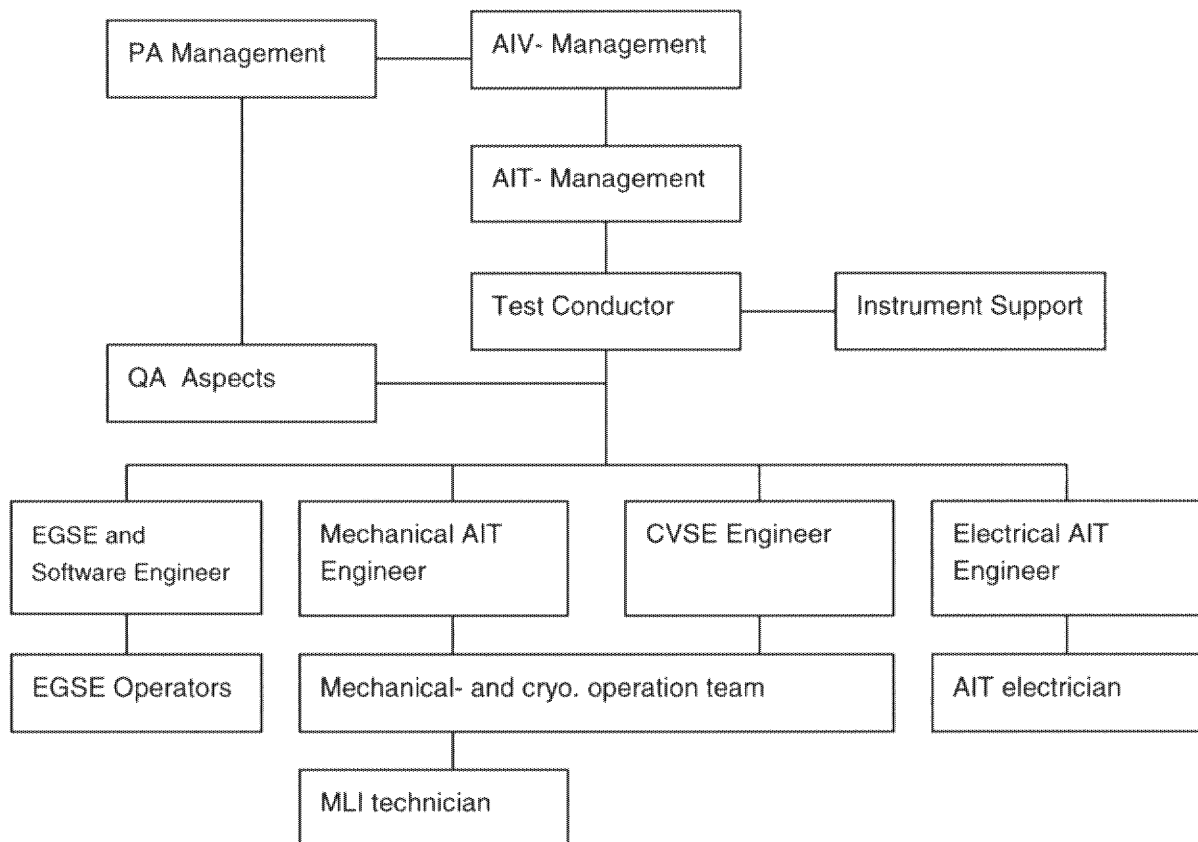


Fig.: 11 AIT Team Organisation

6.3 AIT MEETINGS AND REVIEWS

In the following a short overview of meetings and their objectives is provided:

6.3.1 AIT INTERNAL MEETINGS

Regular internal meetings will accompany the AIT process at the contractor. The meetings are used to discuss the status of AIT, further AIT activities with the corresponding members of the engineering team and PA.

6.3.2 TEST READINESS REVIEW (TRR)

The test readiness reviews have to be held in order to confirm that all documentation, hardware and facility requirements are fulfilled for a specific test. This will ensure a successful performance of the envisaged test. Test readiness reviews are announced at a suitable period prior to begin of all tests as defined in chapter 5.3.1

6.3.3 POST TEST REVIEW (PTR)

This review is to confirm that the corresponding test was performed according to the applicable test procedure, to review the result and to release the hardware configuration for the next step.

6.3.4 NON CONFORMANCE REVIEW BOARD

A review board will be established if non-conformances within integration or test program are encountered. This board has to decide upon corrective actions to be taken and therefore defines how to proceed in the program.

Further reviews, as the Qualification Review and Delivery Review Board (DRB) are no AIT specific reviews, however corresponding inputs will be delivered from AIT.

6.3.5 TEST SPECIFICATION

For the Integrated Module Test and the EMC-Test test specifications will be issued.

6.3.6 KIP/MIP

KIP/MIP's will be implemented in accordance with the PA plan (AD 09). The following KIP's and MIP's are planned:

- KIP 1: before preparation for transport (E.060.030)
- KIP 2: before instrument alignment (E.120.020)
- KIP 3: before integration of cryogenic test adapter (E.150.060)
- KIP 4: before mating of SVM panels with cryostat (E.170.020)
- KIP 5: before He II production and top up (E.220.030)

- MIP 1: before modification of ISO Cryostat QM to Herschel cryostat EQM (E.020.060)
- MIP 2: before integration of aux. tank (E.030.060)
- MIP 3: before instrument CQM integration on OB (E.100.020)
- MIP 4: before cryostat final integration (E.130.020)
- MIP 5: before cooldown and filling/ cold alignment (E.200.020)
- MIP 6: before demating of SVM panels (E.270.020)
- MIP 7: before warm unit integration (E.330.050)

6.4 INTEGRATION/TEST PROCEDURES

The integration and test documentation comprises different types of documents:

- documents used for definition of AIT activities:
AIT plan and other applicable documents called therein
- documents used for performing the AIT activities defined above:
instructions, integration/test procedures
- documents used for reporting AIT activities:
test reports
- documents for controlling the AIT:
log books and AIT forms

6.4.1 INSTRUCTION-/INTEGRATION-/TEST PROCEDURE

To be in compliance with required degree of quality, only units and assemblies will be assembled and integrated which have successfully passed a formal qualification or acceptance test/inspection program. A certificate of compliance duly accepted and contained within the data package is required.

Integration- and Test Procedures will be written for major AIT activities. This documentation will provide detailed step-by-step instructions to the dedicated teams conducting these activities.

This documentation shall contain the following information:

General view:

- Describing the activity objective, item to be handled, references, methods and success criteria.
- List of applicable and reference documents.
- Facilities description, listing of GSE items, tooling required personnel functions and other equipment.

Instructions:

- Provision of general set-up instructions including cleanliness and safety, environmental conditions, hazards and precautions.
- Step-by-step operation sequences, including an operational flow diagram where required:
In this section all measurements will be recorded against the required schedule, including check out sequences to be executed in case of test configurations (description of activity set-up) and pass/fail criteria.

Documentation and data sheets:

Identification of test result data delivered by the corresponding GSE. Data sheets to be prepared by the operator.

6.4.2 TEST REPORT

For each test, a test report containing the actually performed operations and the detailed test results shall be generated.

The test report starts as soon as the test itself is running. As the test proceeds the information, documents, lists, data sheets, records etc. are incorporated in the corresponding sections up to the test completion. Finalising the test report require to analyse the results with respect to success criteria and to draw the test conclusion.

The major sections of the test report are as follows:

- Filled in/as run procedure including performed operations, test date, applicable documents, test conclusion
- Test results including detailed results and analysis where applicable
- Configuration status w.r.t. specimen configuration during operation, GSE configuration, test set-up
- NCR status including a list of non-conformances issued during operations

- Time record, which lists the actual operation sequence. Raw data sheets if applicable like log sheets, minutes, data recording
- Procedure Variation Sheet

6.4.3 AIT FORMS

Log documentation:

A logbook will be established at the beginning of AIT activities and will be maintained up to date until delivery. Log sheets will be used to document all planned and unplanned events, supporting documentation will be added as necessary. In addition, a configuration list will be kept current to reflect the as-built status at any point of time.

The logbook will provide a complete traceability for the instrument. The logbook will finally be incorporated into the Acceptance Data Package.

AIT change request (CR)

The CR is the only authorised way to improve or modify an integration/test procedure when competent authority has already approved this one and there is not enough time to prepare a new issue. All changes will be justified and agreed prior to the event. CR's will be approved at the same authority level in the organisation as it is the case for the integration/test procedure.

The CR has to identify following issues:

- adding a new task
The corresponding test sequence (step-by-step section) shall be included into the CR file with clear definition sequencing
- suppressing a planned task
The CR shall clearly identify the test sequence of the current procedure to be cancelled.
- modifying a task already clearly defined

The CR shall include the new issue of the test sequence to be updated.

The CR can be the consequence of:

- change in test specification/plan
- calculation, prediction analysis, thermal or mechanical models processing etc.
- analysis of preliminary result (coming from another test or processed during the test itself)
- unavailability of unit, test equipment, facility etc.
- unexpected limitation in capability of test equipment or test facilities
- non conformance and failure.

The CR modifies an integration/test procedure and after agreement it becomes a part of this one, so the CR does not justify to issue a specific test report, but it will be automatically included in the test report of the corresponding procedure.

Non-conformance reporting and control will be performed on any article or material which fails to meet the requirements of the contract as interpreted through drawings, technical specifications and integration/test procedures.

6.5 QUALITY ASSURANCE

Quality assurance will be actively involved during assembly, integration and test to ensure that all activities are performed in a controlled manner and documented in accordance with corresponding PA plan (AD 09) .

The main AIT QA tasks will comprise:

- assurance that all activities are performed in accordance with released procedures
- surveillance of activities
- recording of the ASBL
- surveillance of environmental conditions (temperature, humidity, cleanliness)
- verification of calibration validity of measurement equipment
- correct application of the non-conformance reporting system
- performance of inspections
- perform MIP/KIP
- For more details concerning the QA tasks reference is made to the PA plan

7 CLEANLINESS AND CONTAMINATION CONTROL

7.1 SCOPE

The detailed requirements on cleanliness and contamination control for Herschel E-PLM AIT are comprised in the Contamination Control Plan.

This chapter of the document describes only the major relevant requirements to be respected during Herschel E-PLM AIT. Details are included in a.m. document which is a subdocument to this document refer to AD 08.

7.2 CLEANLINESS REQUIREMENTS

Cleaning/Cleanliness inspection for any H/W entering the clean cabin cl. 100 is **mandatory**

7.3 CLEANLINESS MONITORING ACTIVITIES

The following paragraphs list some of the cleanliness control measurements which are suitable and shall be implemented in an appropriate manner.

Standard-Cleanliness Monitoring

Particulate and molecular cleanliness monitoring shall be performed during all phases of AIT, starting from the point of arrival of the hardware at the instrument contractors AIT site until launch.

Witness Samples

Witness samples have to accompany cleanliness sensitive surfaces and components. Samples have to be located close to critical surfaces or surfaces which are representative w.r.t. overall contamination.

The witness samples have to be exchanged periodically in certain time intervals according to CCP (AD 08).The samples will be tested by special laboratories w.r.t. particular and molecular contamination.

7.4 SPECIAL PROTECTIONS TO PREVENT CONTAMINATION

If special protections are foreseen to prevent contamination on the sensitive Optic and components they shall be respected and implemented for the detailed planning of AIT procedures with high priority.

8 FACILITIES AND TRANSPORT

8.1 MAJOR FACILITIES USED FOR HERSCHEL PLM EQM AIT

The Herschel PLM EQM specific requirements on facilities will be specified by the AIV management. Product Assurance will be involved in the acceptance of new facilities. The main facilities used within the Herschel PLM EQM AIT program are:

- class 100 clean room used for alignment and mechanical integration of the PLM
- Clean room class 100.000 used for preintegration of H/W (functional testing), incoming inspection of components, provision and cleanliness inspection of PLM H/W.

The facilities are standard for AIT of optical space instruments. All facilities have to be accepted for use by PA.

8.2 INTEGRATION FACILITIES

The EQM integration will be performed in a class 100 clean-cabin, respectively a class 100.000 cleanroom in Astrium OTN/FN. The instrument EGSE, used for functional checks during the instrument integration, will be installed in a checkout room near the integration room.

The main dimensions and capabilities for the integration facility at Astrium OTN are as follows:

clean-room class 100.000 (acc. To US-Fed. Stand.209D)

- length 14 m
- width 20 m
- height 12 m
- door width 6 m/height 7.2 m
- max. crane load 4000 kg
- max. hook height 9.4 m
- max. floor load 1000 kg/m²

clean-cabin class 100 (acc. to US-Fed. Stand.209D)

- length 10 m
- width 8 m
- height 7 m
- max. crane load 4000 kg
- max. hook height 6 m
- max. floor load ca. 10000 kg/m² (within the concrete foundation)

checkout-room (lab conditions)

- min. useable area 25 m²

The cable length between the checkout-room and Telescope Electronics in the class 100.000 is ≤ 30 m.

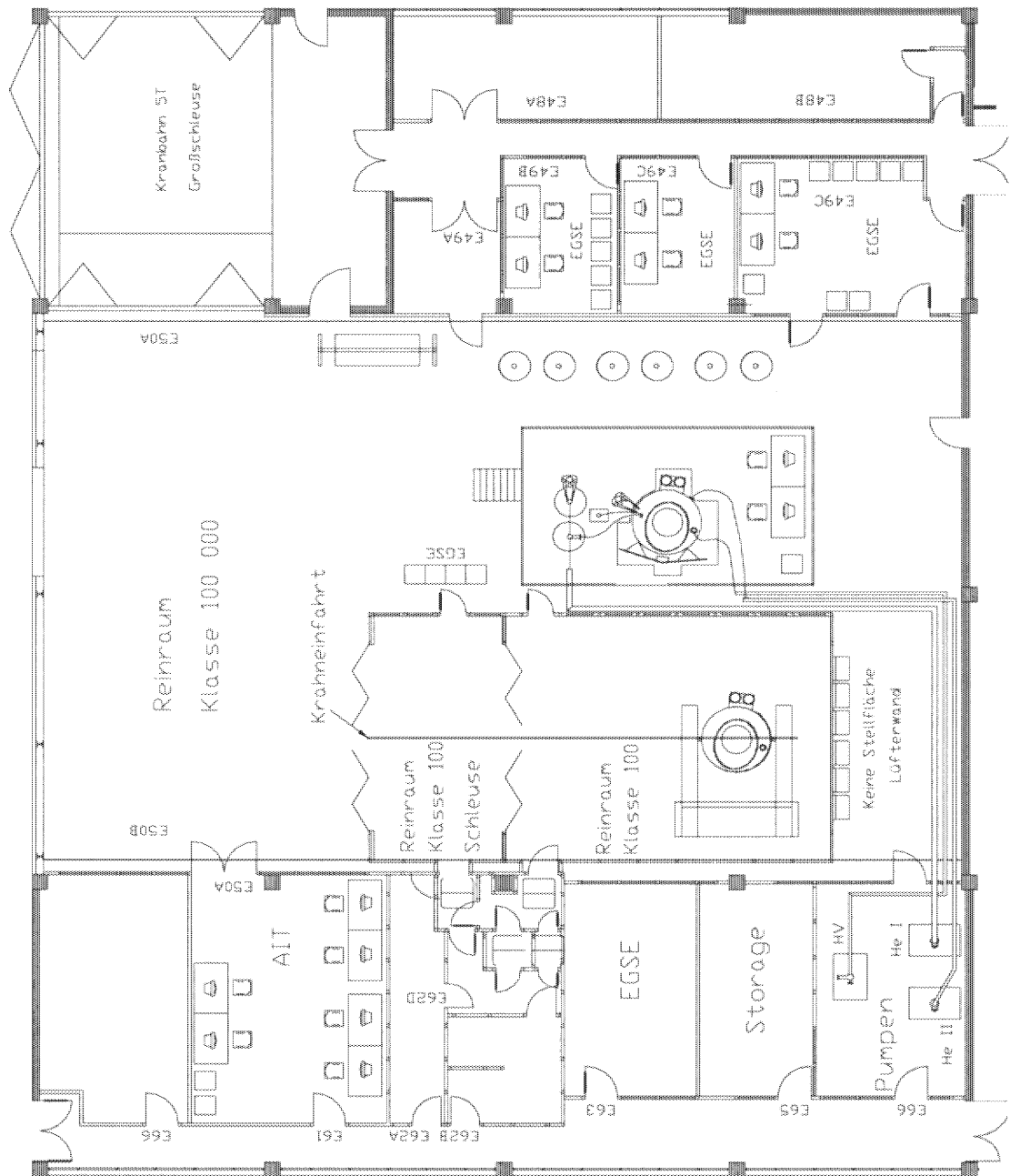


Fig.: 12 Integration facility at Astrium OTN

The main dimensions and capabilities for the integration facility at Astrium FN are as follows:

Facility FN	Data	Remarks
Cleanroom class 100	17.5 x 10 x 12 m (LxWxH)	
Cleanroom Class 100 000	36.5x17.5x12 m (LxWxH)	
Crane capacity	Two cranes : 50 000 N 100 000 N	Enables the handling with two cranes
Crane height (under hook)	10 m	In class 100 and In class 100 000
Seismic mass	5 000 kg Size 2.6 x 3.6 m	For optical alignment
Cleanliness	Particle: class 100 Molecular : activated charcoal filter	System specially designed for the integration of highly sensitive optical systems
Illumination	Additional halogen floodlight	Prevents electro magnetic disturbances and ionisation of dust particles

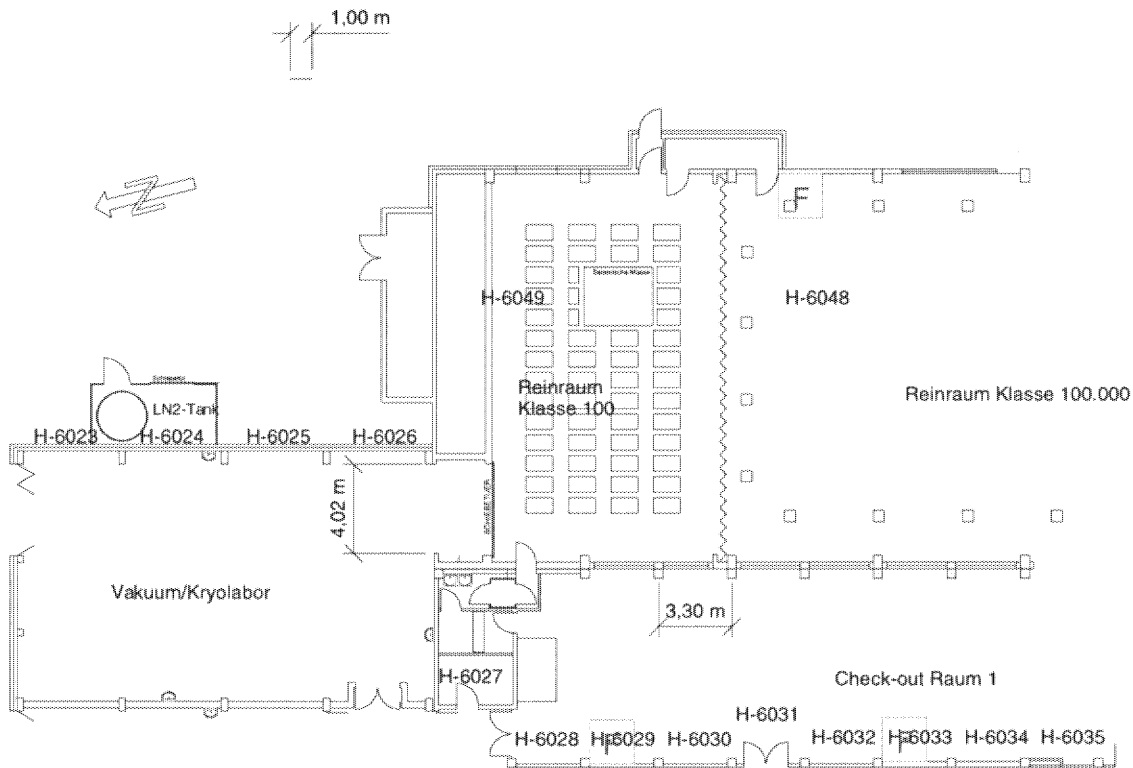


Fig.: 13 Integration facility at Astrium FN

9 GROUND SUPPORT EQUIPMENT (GSE) IDENTIFICATION

The purpose of GSE is to support the Herschel PLM/EQM AIT activities as non flight equipment's. The GSE ensures that the function of

- integration and handling
- transportation
- optical alignment
- testing and verification

of the Herschel PLM/EQM H/W in their intended environment are fully supported and carried out easily and safely (refer also to § 13 of the PA Plan AD 09).

9.1 MECHANICAL GROUND SUPPORT EQUIPMENT (MGSE)

The following MGSE, mainly refurbished ISO MGSE, will be used:

Equipment	No.	Reference
PLM Integration dolly	1	ISO-VV-ZYYR-SP-0043
Hoisting equipment SN02	1	ISO-VV-ZYYY-SP-0048
Test dolly SN02	1	ISO-VV-ZYYX-SP-0473
Transport container	1	
Test dolly (enlarged) SN03	1	-
Heavy duty working platform	1	-
Load cells with strap pretension gauge	16	-
ISO/SVM Support Trolley	1	-
Mobile Access Platform MAP	1	-
Set of integration tooling	1	-
Instrument MGSE (e.g. instrument lifting device)	-	-

9.2 ELECTRICAL GROUND SUPPORT EQUIPMENT (EGSE)

The following Herschel PLM EQM specific electrical ground support equipment is required:

Equipment	No.	Reference
HIFI Instrument EGSE	1	PTI No. 111520
SPIRE Instrument EGSE	1	PTI No. 1125...
PACS Instrument EGSE	1	PTI No. 1135...
Central Checkout System (CCS) light	1	PTI No. 142210 (EPLM)
Cryo SCOE	1	PTI No. 142220 (EPLM)
CDMU Front End	1	PTI No. 142230 (EPLM)
PLM SCOE	1	PTI No. 142240 (EPLM)
Test cabling	1	PTI No. 142250 (EPLM)

9.3 CRYO VACUUM SERVICE EQUIPMENT (CVSE)

The following CVSE, mainly refurbished ISO CVSE, will be used:

Equipment	No.	Reference
Helium pumping unit 1	1	
Helium pumping unit 2	1	
Set of LHe I and LHe II transfer lines	1	
High vacuum pumping unit	1	
Turbo pump	2	
Helium supply dewars 450 l	8	
Nitrogen supply dewars	2	
Leaktest equipment	1	
Cryogenic test adapter	1	
Pirani/Penning gauge, Manometer.		
Evacuation line		
GN ₂ quality 5.6		
GHe quality 5.0		

9.4 OPTICAL GROUND SUPPORT EQUIPMENT (OGSE)

The following OGSE will be used:

Equipment	No.	Reference
Theodolite		
Linear Measurement Device (LMD)		
Angular Transfer Prism		
Lou Alignment Camera TBC		
Alignment References		
Support Structure for LMD		
Tripod for Theodolite		

9.5 SPECIAL EQUIPMENT

Equipment	No.	Reference
Set of CTA Test instrumentation	1	-
He I dewar for CTA cooling	1	-

10 CONSTRAINTS; LIMITATIONS AND RESTRICTIONS

According instrument needs tilting of cryostat around z-axis is required.

- In order to perform PACS and SPIRE instrument tests cooler recycling (evaporator below the sorption pump) has to be performed for a period of up to 3 hours prior to a 24 - 48 hour test period. Some of these tests will be supported by tilting the cryostat around Z-axis according instrument or cryostat needs. In the instrument, the sorption cooler is horizontally mounted. The recycling has to be performed by tilting the Z-spacecraft axis in the direction, as shown in the figure below.
- PACS will be operated by tilting the cryostat around the +z-axis by -90 degrees (i.e. -y-axis pointing downwards). A short test sequence during the EQM- and PFM- tests (approximately 1 hour) will be performed with the cryostat left tilted to +20 degree, to gather correlated data referenced to the PACS ILT (Instrument Level Test) test conditions.
- SPIRE Spectrometer test to be performed for a period of 3 hours in -90 degrees round + z-axis.

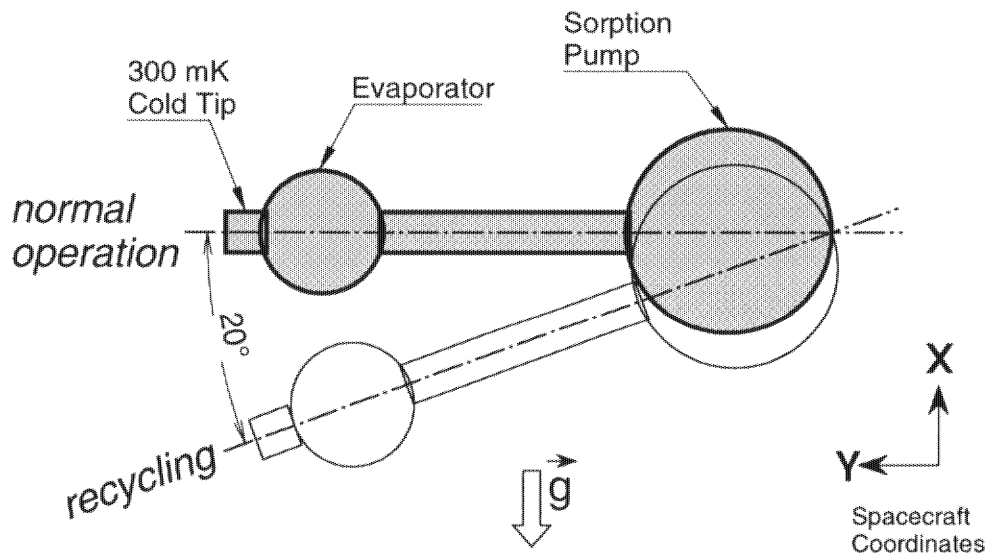


Fig.: 14 Cryostat tilting requirements for SPIRE/PACS cooler recycling

11 SHIPMENT

For more details refer also to Facility and Transportation Plan RF02

11.1 HANDLING

For handling of units and components of Herschel PLM EQM, the following points have to be respected:

- the units/components may only be touched with clean powder- and lintfree gloves
- the tables have to be clean and flat
- mounting planes have to be checked for cleanliness and damages
- before and after each plug operation, pins and sockets as well as the plugs have to be checked for cleanliness and damages
- all open plugs have to be covered with protective caps.

11.2 PACKING

For packing the original transport containers of the S/C HW should be used as far as possible.

In other cases, it has to be assured that the components are protected against dirt, humidity, shock and vibration.

The packing has to be controlled by Quality Assurance and documented in the Log Sheet.

Clear identification and designation of the project of the container content has to be assured. Stickers like "Handle Carefully" or "Protect against Humidity", "Cleanliness sensitive – only to open in class 100" as well as indication of the external dimensions and of weight (brutto and net) have to be provided.

The original log sheets (historical record) have to be included. A copy of the log sheet remains at AIT-QA before each shipment.

11.3 STORAGE

Requirements for Storage:

- Containers must clearly indicated on 3 faces, S/C model, module, box code, or any other for identification necessary remarks.
- Storage under lock
- Storage under QA surveillance
- Items which will be stored in common storage areas have to be identified by red identification labels.

11.4 DELIVERY TO ASTRIUM GMBH

Generally, all components delivered for Herschel PLM/EQM have to be routed formally through "Wareneingang" (WE) of Astrium GmbH.

Here the transport papers and customs documents are controlled, provided with a WE-No. (incoming number) and stamped.

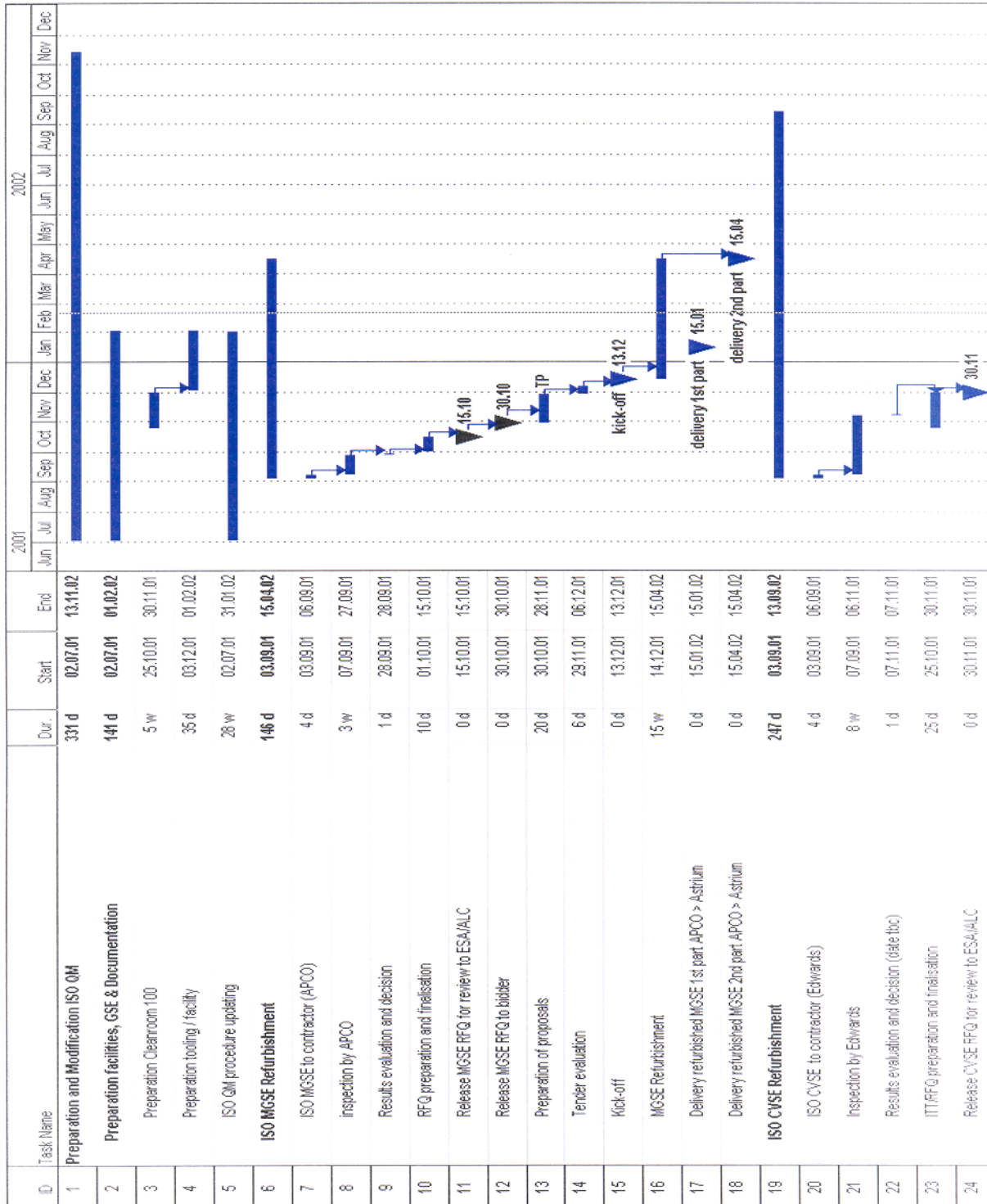
12 DETAILED ACTIVITY SHEETS

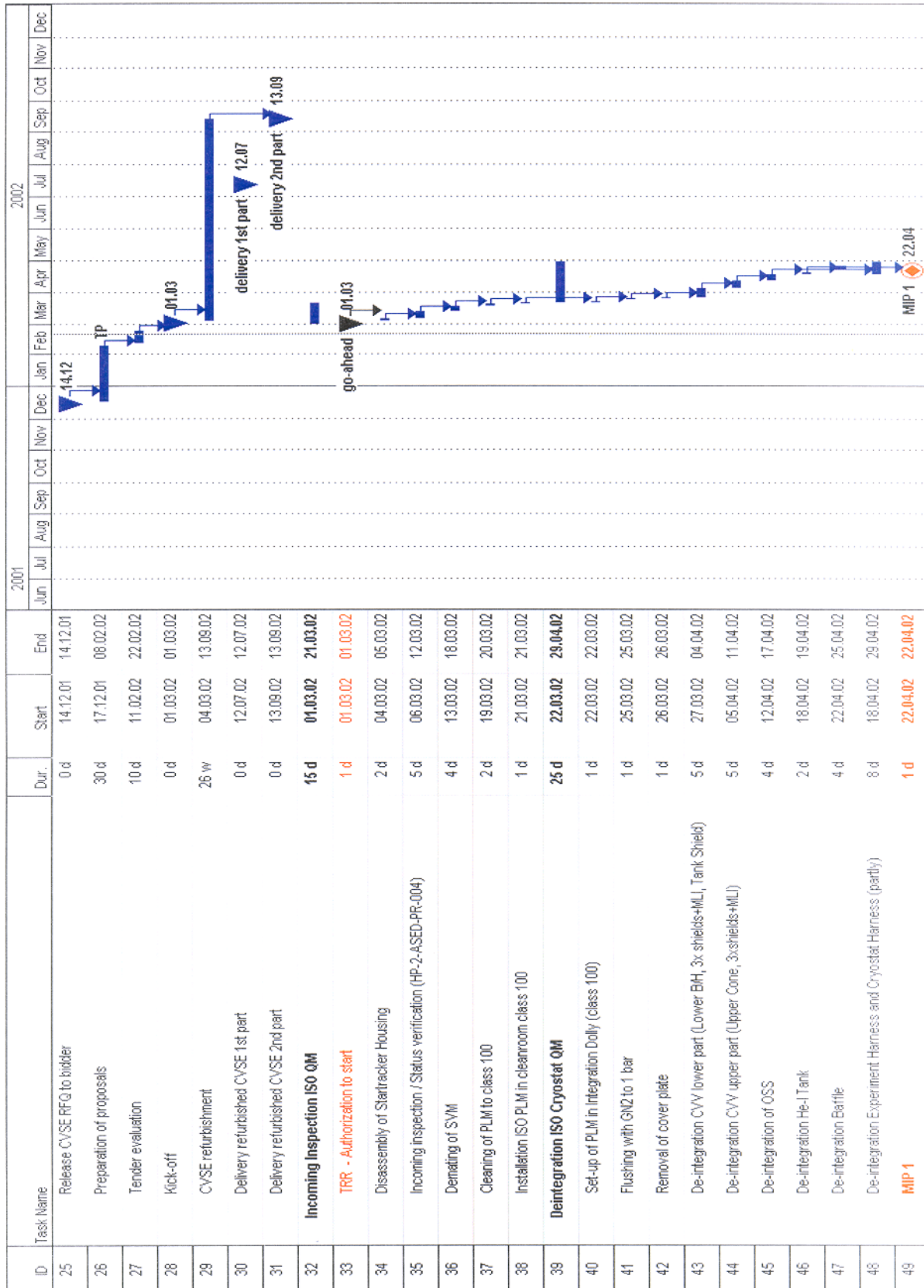
The individual activities presented in the detailed AIT flow (see chapter 12) are described in the AIT activity sheets. These sheets presents the following information:

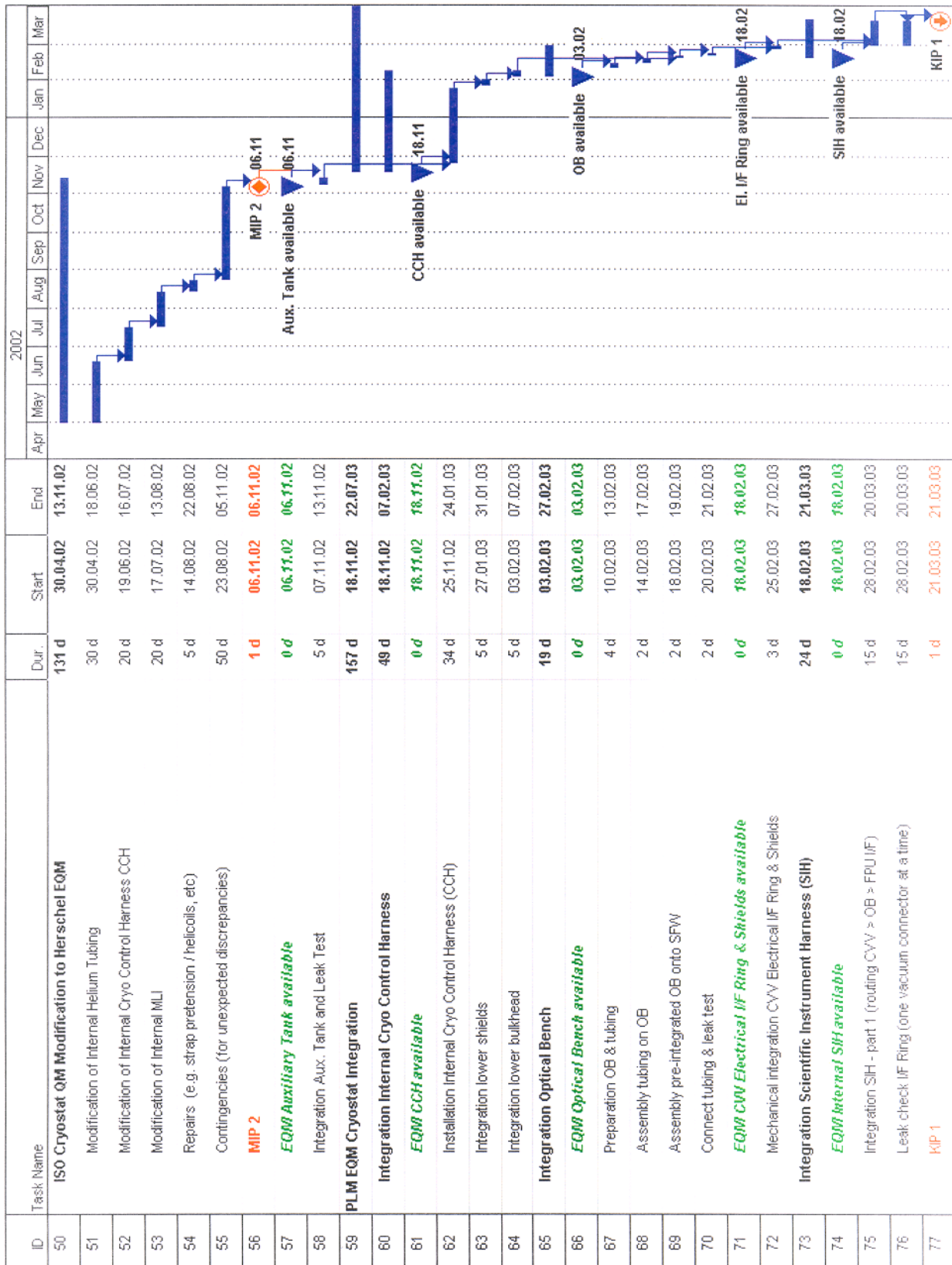
- Activity identification (ID)
- Duration (in working days)
- Activity Name (accordance to AIT sequence)
- Objective
- Requirements to be verified
- Environment
- Specimen configuration (at the beginning of the task)
- Activity breakdown
- Applicable documents
- GSE required
- Facility/Instrumentation
- Personnel (AIT and QA)
- Safety precautions
- Special notes

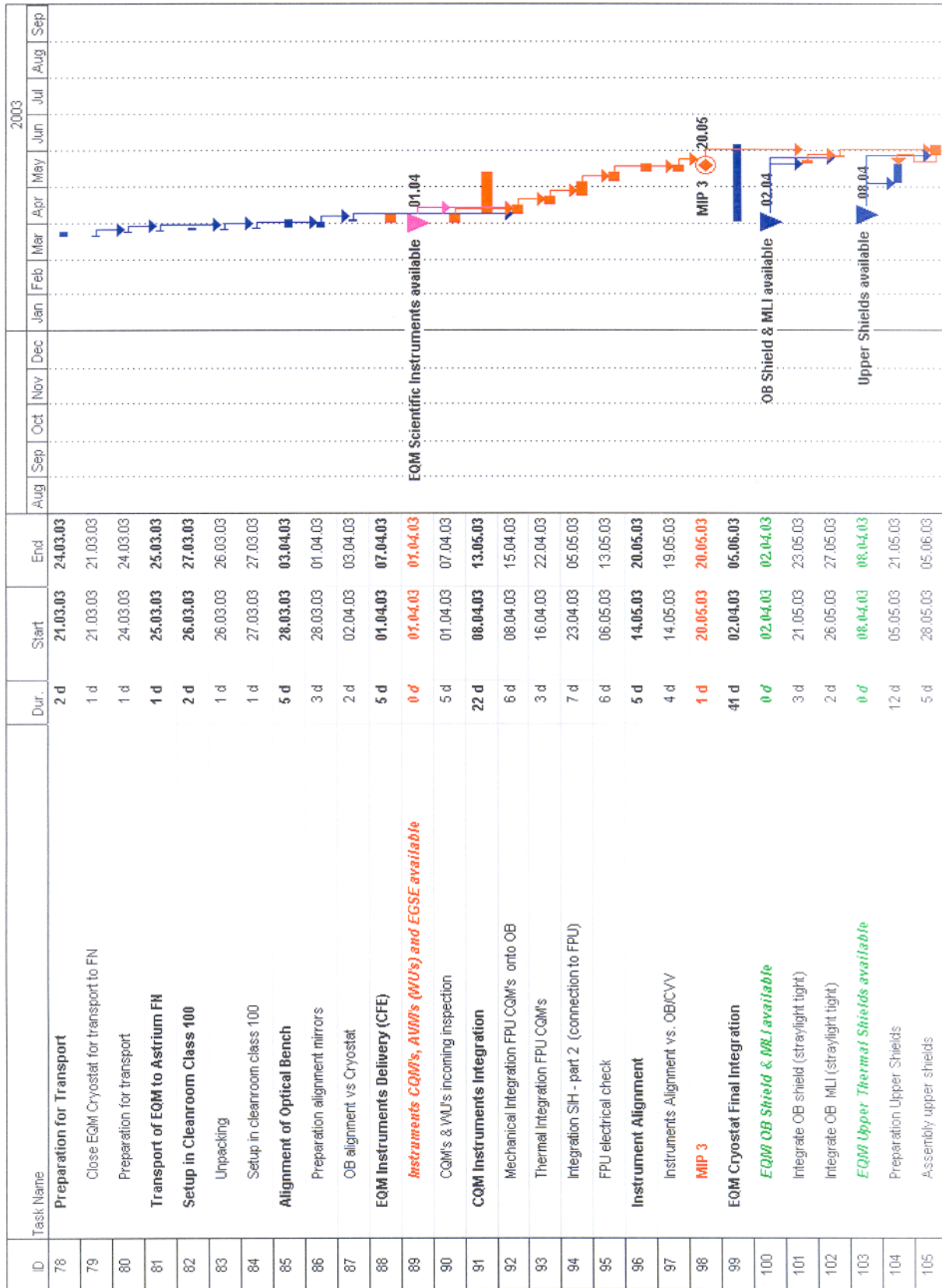
12.1 SCHEDULE (FOR INFIRMATION ONLY)

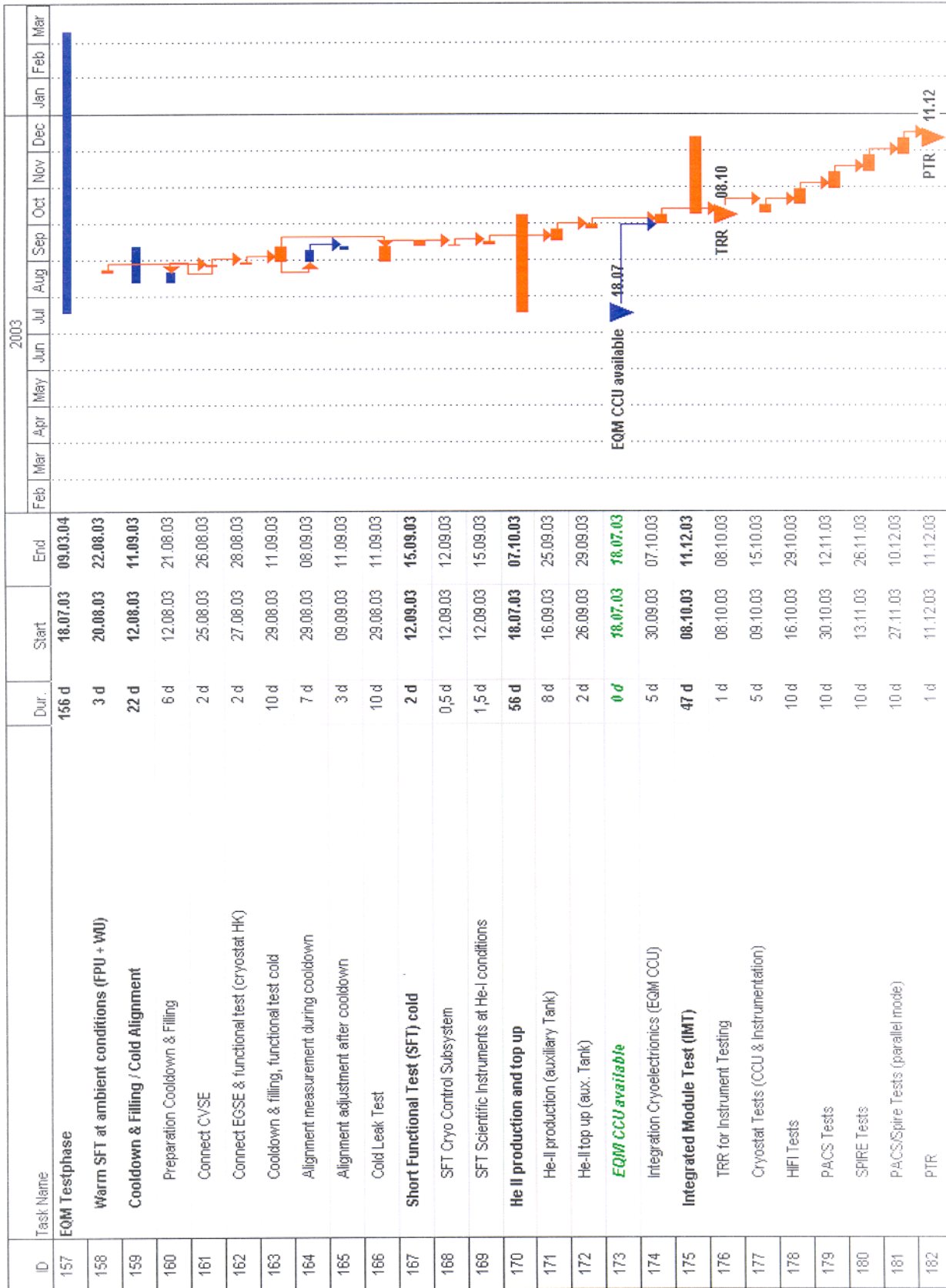
Not any change in schedule will result in a update of this AIT plan.











12.2 LIST OF ACTIVITY SHEETS

Number	Activity/Definition	No. according schedule
E.010.000	Incoming Inspection	
E.010.010	Incoming Inspection/Status Verification	
E.010.020	Demaiting ISO SVM	
E.010.030	Installation ISO PLM in clean cabin class 100	
E.020.000	Deintegration ISO cryostat QM	
E.020.010	Pressurization of PLM to ambient pressure	
E.020.020	Deintegration of CVV lower part	
E.020.030	Deintegration of CVV upper part	
E.020.040	Deintegration OSS, baffle. Aux. Tank	
E.020.050	Deintegration of ISO experiment Harness	
E.020.060	MIP 1	
E.030.000	Modification ISO Cryostat QM to Herschel cryostat EQM	
E.030.010	Modification of internal He tubing	
E.030.020	Modification of internal Cryo Control Harness CCH	
E.030.030	Modification of internal MLI	
E.030.040	Repairs	
E.030.050	Contingencies	
E.030.060	MIP 2	
E.030.070	Integration of aux. tank and leaktest	
E.040.000	Integration Cryo Control Harness (CCH)	
E.040.010	Installation of internal CCH (cylindrical part of CVV)	
E.040.020	Integration of lower shield and lower bulkhead	
E.050.000	Optical Bench Integration	
E.050.010	Preparation of optical bench (OB)	
E.050.020	Mechanical integration of OB	
E.050.030	Mechanical integration of CVV electrical ring and shields	

Number	Activity/Definition	No. according schedule
E.060.000	Science Instrument Harness (SIH) Integration	
E.060.010	Mechanical installation of SIH	
E.060.020	Installation of SIH part 1 (routing onto OB up to FPU I/F)	
E.060.030	KIP 1	
E.070.000	Preparation for Transport	
E.070.010	Preparation for transport of EQM	
E.080.000	Transport of EQM to Astrium FN	
E.080.010	Transport of EQM to Astrium FN	
E.090.000	Set-up in Cleanroom 100	
E.090.010	Set-up in Cleanroom 100	
E.100.000	Alignment of OB	
E.100.010	Alignment of OB	
E.100.020	MIP 3	
E.110.000	Instrument CQM Integration on OB	
E.110.010	CQM & WU incoming inspection	
E.110.020	Mech. Integration of FPU CQM's onto OB	
E.110.030	Thermal integration of FPU CQM's	
E.110.040	Installation of SIH part 2 (connection to FPU)	
E.120.000	FPU electrical check	
E.120.010	FPU electrical check	
E.120.020	KIP 2	
E.130.000	Instrument Alignment	
E.130.010	Instrument Alignment	
E.130.020	MIP 4	
E.140.000	Cryostat final integration	
E.140.010	Integrate OB shield & OB MLI	
E.140.020	Integrate cryostat upper shields	
E.150.000	Closing Herschel EQM Cryostat	
E.150.010	Integrate Cryostat upper bulkhead	
E.150.020	Integrate LOU	

Number	Activity/Definition	No. according schedule
E.150.030	Integrate waveguides upper part	
E.150.040	Alignment LOU/OB (HIFI)	
E.150.050	KIP 3	
E.150.060	Integrate cryogenic test adapter	
E.160.000	Evacuation and Leaktest	
E.160.010	PLM evacuation and leaktest	
E.160.020	Move PLM in cleanroom class 100 000	
E.160.030	Integrate BOLA	
E.170.000	Warm alignment check	
E.170.010	Warm alignment check	
E.170.020	KIP 4	
E.180.000	Mating of SVM panels with cryostat (including WU)	
E.180.010	Integration of pre-integrated SVM pannels	
E.180.020	Integrate waveguide assembly lower part	
E.190.000	External Harness Integration	
E.190.010	Integration of external harness (CCH and SIH)	
E.190.020	FPU electrical check (with instrument unit tester)	
E.190.030	Connection of external harness to WU	
E.200.000	Warm SFT at ambient conditions (FPU + WU)	
E.200.010	Warm SFT at ambient conditions (FPU + WU)	
E.200.020	MIP 5	
E.210.000	Cooldown & Filling / Cold Alignment	
E.210.010	Connect CVSE – continue evacuation	
E.210.020	Connect EGSE & functional test	
E.210.030	Cooldown and filling	
E.210.040	Alignment measurement (adjustment in parallel with cooldown)	
E.210.050	Cold leak test	
E.220.000	Short Functional Test Cold	
E.220.010	SFT cryostat control subsystem in He I conditions	
E.220.020	SFT instruments in He I conditions	

Number	Activity/Definition	No. according schedule
E.220.030	KIP 5	
E.230.000	He II production and top up	
E.230.010	He II production (aux. Tank)	
E.230.020	He II top up (aux. Tank)	
E.230.030	CCU integration (TBC)	
E.240.000	Integrated Module Test	
E.240.010	TRR for instrument testing	
E.240.020	HIFI tests	
E.240.030	PACS tests	
E.240.040	SPIRE tests	
E.240.050	PACS/SPIRE tests (parallel mode)	
E.240.060	Cryostat tests (CCU & instrumentation)	
E.240.070	PTR	
E.250.000	EMC test	
E.250.010	TRR for instrument EMC testing	
E.250.020	HIFI tests	
E.250.030	PACS tests	
E.250.040	SPIRE tests	
E.250.050	PACS/SPIRE tests (parallel mode)	
E.250.060	PTR	
E.260.000	Conversion to He 1	
E.260.010	Conversion to He 1	
E.270.000	Depletion and warm up	
E.270.010	Depletion and warm up	
E.270.020	MIP 6	
E.280.000	Demating of SVM panels	
E.280.010	Demating SVM panels	
E.290.000	De-integration warm units	
E.290.010	De-integration warm units	
E.300.000	Transport of WU to Alenia	

Number	Activity/Definition	No. according schedule
E.300.010	Transport of WU to Alenia	
E.310.000	Deintegration FPU CQM's	
E.310.010	Dismounting LOU / BOLA (incl. waveguides)	
E.310.020	Transport into cleanroom class 100	
E.310.030	Dismounting CTA	
E.310.040	Deintegration of upper cone and upper shields	
E.310.050	Deintegration of CQM instruments	
E.320.000	END OF EQM TESTPHASE	
E.320.010	Storage PLM EQM	
E.320.020	Return CQM instruments for refurbishment	
	Parallel Activities	
E.330.000	EGSE & CCS light Set-Up	
E.330.010	CCS set-up	
E.330.020	CryoSCOE set-up	
E.330.030	PLM EGSE set-up	
E.330.040	Instrument EGSE connection	
E.330.050	MIP 7	
E.340.000	Warm unit integration (mech.)	
E.340.010	Mechanical integration of instrument warm units	
E.350.000	Warm unit electrical integration	
E.350.010	Interface verification (SVM interfaces provided by PLM EGSE)	
E.350.020	EGSE harness connection	
E.360.000	FPU Simulator Integration	
E.360.010	FPU Simulator Integration	
E.360.020	Test Readiness Review TRR	
E.370.000	Test FPU-Simulator with WU	
E.370.010	HIFI test sequence debugging	
E.370.020	PACS test sequence debugging	
E.370.030	SPIRE test sequence debugging	

Number	Activity/Definition	No. according schedule
E.370.040	PACS/SPIRE test sequence debuggig (parallel mode)	
E.380.000	FPU Simulator De-Integration	
E.380.010	FPU Simulator De-Integration	

Activity Number: E.010.010

Duration: 5 days

Activity Name: Incoming Inspection/Status Verification

Objective: Incoming inspection after transport and verification of actual status of the PLM He subsystem

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- ISO PLM/QM mounted in transport container. X-axis horizontal
- PLM cover not mounted (cover evacuation plate mounted)
- Outer MLI not mounted

Activity Breakdown:

- Perform cleaning of transport container after transport.
- Move container in airlock of clean room cl. 100 000.
- Opening of transport container
- Incoming inspection
- Cleanliness inspection/cleaning of PLM
- Installation of PLM in test dolly
- Perform ISO PLM/QM Inspection and Status Verification

Activity Number: E.010.010

Duration: 5 days

Applicable Documents:

- Test dolly handling manual
- Lifting device handling manual
- ISO PLM/QM Inspection and Status Verification before Deintegration HP-2-ASED-PR-0005

GSE required:

- Transport Container
- PLM Test dolly
- PLM Hoisting device

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100
- Facility crane, standard hoisting slings
- Cleaning equipment

Personnel:

- 1 crane operator
- 1 AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

- Standard safety precautions for crane operations are applicable.

Special Notes:

n. a.

Activity Number: E.010.020

Duration: 4 days

Activity Name: Demating ISO SVM

Objective: Dismounting of PLM H/W components not needed for Herschel EQM

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- ISO PLM/QM mounted in test dolly

Activity Breakdown:

- Prepare support stand for ISO SVM
- Connect hoisting device to ISO PLM
- Dismount ISO PLM from test dolly
- Move ISO PLM upon SVM support stand and couple SVM with support stand
- Dismount SVM from PLM
- Remount PLM in test dolly
- Dismount star tracker housing
- Dismount PLM external cryo. harness
- Check/Adjust strap pretension to nom. Value of approx. 5 KN

Activity Number: E.010.020

Duration: 4 days

Applicable Documents:

- Test dolly handling manual
- Lifting device handling manual
- ISO PLM/QM Inspection and status verification before deintegration HP-2-ASED-PR-0005

GSE required:

- Adequate PLM SVM support stand
- PLM Test dolly
- PLM Hoisting device
- 16 Strap pretension measurement devices

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100
- Facility crane, standard hoisting slings
- Cleaning equipment

Personnel:

- 1 crane operator
- 1 AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

- Standard safety precautions for crane operations are applicable.

Special Notes:

n. a

Activity Number: E.010.030

Duration: 2 days

Activity Name: Installation ISO PLM in clean cabin class 100

Objective: provision of ISO PLM in clean cabin cl. 100 mounted in integration dolly

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000/100

Configuration:

- Integration dolly finally placed in clean cabin cl. 100
- PLM partly dismantled, mounted in test dolly, placed in clean room cl.100 000 in front of clean cabin cl. 100

Activity Breakdown:

- Perform cleaning of PLM. According cl. 100 requirements
- Perform cleaning of PLM hoisting device. According cl. 100 requirements
- Install hoisting device to PLM.
- Disconnect PLM from test dolly
- Move PLM in clean cabin cl. 100 and install PLM in integration dolly. PLM Z-axis adapted to integration dolly

Activity Number: E.010.030

Duration: 2 days

Applicable Documents:

- Test dolly handling manual
- Integration dolly handling manual
- Lifting device handling manual
- ISO PLM deintegration procedure

GSE required:

- PLM Test dolly
- PLM Integration dolly
- PLM Hoisting device

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100
- Facility crane, standard hoisting slings
- Cleaning equipment

Personnel:

- 1 crane operator
- 1 AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

- Standard safety precautions for crane operations are applicable.

Special Notes:

n. a.

Activity Number: E.020.010

Duration: 1 day

Activity Name: Pressurization of PLM to ambient pressure

Objective: to obtain ambient pressure inside PLM

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly
- CVV under vacuum

Activity Breakdown:

- Install ISO vacuum lock (SV 922) to PLM upper cone
- Install pressurization equipment
- Pressurize PLM with GN2 to approx. 1bar
- Remove cover evacuation plate

Activity Number: E.020.010

Duration: 1 day

Applicable Documents:

- ISO PLM deintegration procedure

GSE required:

- GN2 pressurization equipment
- ISO vacuum lock (SV 922)

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100
- Facility crane, standard hoisting slings
- Cleaning equipment

Personnel:

- 1 AIT engineer
- 1 AIT technician
- 1 QA representative

Safety Precautions:

- Standard safety precautions for crane operations are applicable.

Special Notes:

n. a.

Activity Number: E.020.020

Duration: 5 days

Activity Name: Deintegration of CVV lower part

Objective: dismounting of CVV lower part to obtain access to PLM inside

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- ISO PLM mounted in integration dolly
- Cover evacuation plate dismantled

Activity Breakdown:

- Tilt PLM with integration dolly. PLM –X-axis top
- Install lower bulkhead lifting device
- Dismount lower bulkhead
- Dismounting of, one after another, lower conical shield 1, 2, and 3
 - disconnect electrical connectors in between shield 1, 2 and 3
 - MLI dismounting/opening (shield to shield)
- Storage of lower bulkhead and lower shields

Activity Number: E.020.020

Duration: 5 days

Applicable Documents:

- ISO PLM Deintegration procedure

GSE required:

- Facility crane
- Lower bulkhead lifting device

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100
- Facility crane, standard hoisting slings
- Facility crane

Personnel:

- 1 AIT engineer
- 2 AIT technician
- 1 electrical technician
- 1 MLI technician
- 1 QA

Safety Precautions:

- Standard safety precautions for crane operations are applicable.

Special Notes:

n. a.

Activity Number: E.020.030

Duration: 5 days

Activity Name: Deintegration of CVV upper part

Objective: dismounting of CVV upper part to obtain access to PLM inside

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100

Configuration:

- ISO PLM mounted in integration dolly
- CVV lower part dismantled

Activity Breakdown:

- Tilt PLM with integration dolly +X-axis top
- Install upper cone lifting device
- Dismount upper cone
 - Dismount He filling tube from upper cone
- Dismounting of, one after another, upper conical shield 1, 2, and 3
 - disconnect electrical connectors in between shield 1, 2, and 3
 - MLI dismantling/opening (shield to shield)
- Storage of upper and upper shields

Activity Number: E.020.030

Duration: 5 days

Applicable Documents:

- ISO PLM Deintegration procedure

GSE required:

- Upper cone lifting device

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100
- Facility crane, standard hoisting slings
- Cleaning equipment

Personnel:

- 1 crane operator
- 1 AIT engineer
- 2 AIT technician
- 1 electrical technician
- 1 MLI assistant
- 1 QA

Safety Precautions:

- Standard safety precautions for crane operations are applicable.

Special Notes:

n. a.

Activity Number: E.020.040

Duration: 10 days

Activity Name: Dismounting of OSS, Baffle and Auxiliary tank

Objective: to obtain the initial H/W status for Herschel PLM/EQM integration

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- ISO PLM mounted in integration dolly; X-axis vertical, +X-axis top
- CVV lower part dismounted
- CVV upper part dismounted

Activity Breakdown:

- Dismounting of ISO aux. Tank
 - disconnect aux. tank tubing
 - electrical disconnection of aux. tank instrumentation
 - dismount aux. Tank
 - storage of aux. tank
- Dismounting of ISO OSS
 - dismount OSS shield
 - electrical disconnection of OSS instrumentation
 - disconnect OSS tubing
 - disconnect cooling straps
 - Tilt PLM with integration dolly –X-axis top
 - dismount OSS
 - storage of OSS
- Dismounting of ISO baffle
 - Tilt PLM with integration dolly +X-axis top
 - dismount baffle MLI
 - disconnect baffle instrumentation
 - disconnect baffle tubing
 - dismount baffle
 - storage of baffle

Activity Number: E.020.040

Duration: 10 days

Applicable Documents:

- ISO PLM Deintegration procedure

GSE required:

- OSS lifting device
- Baffle lifting device

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100
- Facility crane, standard hoisting slings
- Cleaning equipment

Personnel:

- 1 crane operator
- 1 AIT engineer
- 2 AIT technician
- 1 electrical technician
- 1 MLI technician
- 1 QA representative

Safety Precautions:

- Standard safety precautions for crane operations are applicable.

Special Notes:

n. a.

Activity Number: E.020.050

Duration: 8 days

Activity Name: Dismounting of ISO experiment harness

Objective: to obtain the initial H/W status for Herschel PLM/EQM integration

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- ISO PLM in integration dolly
 - Baffle dismounted
 - OSS dismounted
 - aux. tank dismounted

Activity Breakdown:

- disconnect ISO experiment harness from lower spatial framework I/F
- dismount ISO experiment Harness

Activity Number: E.020.050

Duration: 8 days

Applicable Documents:

- ISO PLM Deintegration procedure

GSE required:

-

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100

Personnel:

- 1AIT engineer
- 2 harness technician
- 1 QA

Safety Precautions:

- Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.020.060

Duration: 1 day

Activity Name: MIP 1

Objective: to review the status of H/W and corresponding documentation

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM in integration dolly

Activity Breakdown:

- Review documentation status
- Review status of relevant NCR's
- H/W inspection
- Review of open work list TBC
- Take Photos for documentation TBC
- Release for further integration

Activity Number: E.020.060

Duration: 1 day

Applicable Documents:

- ISO PLM Deintegration procedure

GSE required:

-

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100

Personnel:

- 1 AIT engineer
- PLM S/S representative
- customer representatives
- 1 PA
- 1 QA

Safety Precautions:

- Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.030.010

Duration: 30 days

Activity Name: Modification of internal He tubing

Objective: Herschel PLM/EQM integration

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly

Activity Breakdown:

- Arrange PLM position for optimal access
- Perform adaptation of internal He tubing wrt. to the following I/F's
 - baffle
 - OSS
 - aux. tank
 - aux. tank ventline
 - filling port
- For welded I/F adaptations install adequate protections
- Perform X-ray analysis of welded tubing I/F's
- perform leak check of internal He tubing adaptations
- Perform cleanliness verification of internal He tubing

Activity Number: E.030.010

Duration: 30 days

Applicable Documents:

- ISO PLM Deintegration procedure

GSE required:

- Integration dolly
- Working platform
- Leaktest equipment
- Tube welding machine
- X-ray analysis equipment
- Standard cleaning equipment

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100

Personnel:

- 1AIT engineer
- 2 AIT technician
- 1 welding expert
- X-ray analysis personal
- 1 QA

Safety Precautions:

- Standard safety precautions are applicable
- X-ray analysis safety precautions
- Welding safety precautions

Special Notes:

n. a.

Activity Number: E.030.020

Duration: 20 days

Activity Name: Modification of internal Cryo Control Harness CCH

Objective: Herschel PLM/EQM integration

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly
- Pre-assembled and released CCH adaptations available

Activity Breakdown:

- Preparation of existing harness for modification
- Preparation of the new harness fixation areas
- Integration of internal Cryo Control Harness CCH
- Electrical test of modified CCH

Activity Number: E.030.020

Duration: 20 days

Applicable Documents:

- ISO PLM Deintegration procedure
- CCH Integration procedure

GSE required:

-

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100

Personnel:

- 2 harness technicians
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.030.030

Duration: 20 days

Activity Name: Modification of internal MLI

Objective: Herschel PLM/EQM integration

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly

Activity Breakdown:

- Perform adaptation of PLM internal MLI
 - Manufacturing of templates
 - Fit check of templates
 - Manufacturing of MLI layers
 - Cleaning of MLI layers

Activity Number: E.030.030

Duration: 20 days

Applicable Documents:

- ISO PLM Deintegration procedure
- MLI integration procedure

GSE required:

-

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100

Personnel:

- 4 MLI specialists
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.030.040

Duration: 5 days

Activity Name: Repairs of PLM H/W

Objective: Herschel PLM/EQM integration

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly

Activity Breakdown:

- Perform repair of strap tensioning device No. 02
 - Dismounting of strap tensioning device No. 02
 - Integration of spare strap tensioning device
 - perform leak check of exchanged strap tensioning device
 - reinstallation of strap pretension measurement device

Activity Number: E.030.040

Duration: 5 days

Applicable Documents:

- ISO PLM Deintegration procedure
- Herschel PLM logsheet

GSE required:

- Leaktest equipment
- Strap pretension measurement device

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100

Personnel:

- 1 AIT engineer
- 1 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.030.050

Duration: 50 days

Activity Name: Contingencies

Objective: repair of unexpected H/W deviations

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly

Activity Breakdown:

- Defined repair activities resulting from findings during deintegration, e. g. MLI repairs, exchange of helicoils etc.

Activity Number: E.030.050

Duration: 50 days

Applicable Documents:

Tbd.

GSE required:

Tbd.

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100

Personnel:

Tbd.

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.030.060

Duration: 1 day

Activity Name: MIP 2

Objective: to review the status of H/W and corresponding documentation

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly

Activity Breakdown:

- Review of documentation status
- Review status of relevant NCR's
- H/W inspection
- Review status of open work list TBC
- Take Photos for documentation TBC
- Release for further integration

Activity Number: E.030.060

Duration: 1 day

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

-

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100

Personnel:

- 1 AIT engineer
- PLM S/S representative
- customer representatives
- 1 PA
- 1 QA

Safety Precautions:

- Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.030.070

Duration: 5 days

Activity Name: Integration of aux. tank and leaktest

Objective: integration of aux. tank to upper spatial framework

Requirements to be verified:

- Leakrate of aux. tank He tubing I/F's $\leq 1 \times 10^{-8}$ mbarls⁻¹

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly
- Aux. tank released for integration

Activity Breakdown:

- Installation of EQM auxiliary He tank to upper spatial framework I/F
 - Final cleaning and final inspection of aux. tank
 - Measurement of mass of aux. tank and documentation of weight
 - Mechanical installation of aux. tank to PLM upper spatial framework
 - Mech. check: dimensions, screw torque, screw locking etc.
 - connect aux. tank tubing
 - Connect leaktester and perform leak check of aux. tank tubing I/F
 - Perform routing of aux. tank instrumentation harness
 - Connect aux. tank instrumentation to internal CCH I/F
 - Perform electrical check of aux. tank instrumentation and harness
 - Install aux. tank MLI tbc.

Activity Number: E.030.070

Duration: 5 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

- Aux. tank lifting device
- PLM integration dolly
- Electrical check out equipment
- Working platform

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100
- Facility crane, standard hoisting slings

Personnel:

- 1 crane operator
- 2 AIT technician
- 1 harness technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.040.010

Duration: 34 days

Activity Name: Installation of internal Cryo Control Harness CCH

Objective: installation, routing and verification of PLM internal CCH upper and lower part

Requirements to be verified:

n.a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly

Activity Breakdown:

- Preparation of harness fixation areas
- Integration of harness
- Electrical check out of harness and connectors

Activity Number: E.040.010

Duration: 34 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet
- CCH integration procedure

GSE required:

- Electrical check out equipment

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100
- Cleaning-/Cleanliness inspection equipment

Personnel:

- 1 AIT engineer
- 1 AIT technician
- 2 harness technicians

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.040.020

Duration: 10 days

Activity Name: Integration lower shields and lower bulkhead

Objective: integration of lower shield and lower bulkhead to PLM CVV lower I/F

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly
- Lower shields preinstalled with cryo. Components, cryo. Instrumentation, MLI and released for integration

Activity Breakdown:

- Final inspection of PLM lower part
- Closure of PLM MLI lower part
- Measurement of mass of lower shield 1, 2, 3; and lower bulkhead. Documentation of weight
- Final cleaning and final inspection of lower shield 1, 2, 3 before integration
- Successive mechanical installation of lower shield 1, 2, 3
 - Connect electrical connectors in between shield 1, 2, and 3
 - Perform electrical check of shield sensor after each plug connection
 - MLI closure (shield to shield)
- Installation of lower bulkhead
 - Final cleaning and final inspection of lower bulkhead
 - Final cleaning and final inspection O-ring seal
 - Installation of O-ring seal to CVV cyl. I/F
 - Mechanical installation of lower bulkhead to CVV
 - Mech. check: dimensions, screw torque, screw locking etc.

Activity Number: E.040.020

Duration: 10 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

- PLM integration dolly
- Electrical check out equipment
- Lower bulkhead lifting device

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100
- Facility crane, standard hoisting slings

Personnel:

- 1 crane operator
- 2 AIT technicians
- 1 harness technician
- 2 MLI specialists
- 1QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n. a.

Activity Number: E.050.010

Duration: 6 days

Activity Name: Preparation of Optical Bench (OB)

Objective: preparation of OB for integration at PLM

Requirements to be verified:

n.a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- incoming inspection of OB performed and released for further activities
- OB without cryo. instrumentation, tubing and scientific instruments

Activity Breakdown:

- Integration of OB tubing and leaktest of relevant tubing I/F's
- Integration of cryo. instrumentation to OB
- Integration of OB alignment reference cube
- Measurement of mass and documentation of weight
- Cleaning according requirements cl. 100
- Provision for integration

Activity Number: E.050.010

Duration: 6 days

Applicable Documents:

- PLM/EQM integration procedure

GSE required:

- Optical bench lifting device

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100
- Facility crane, standard hoisting slings

Personnel:

- 1 crane operator
- 1 AIT engineer
- 1 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n. a.

Activity Number: E.050.020

Duration: 4 days

Activity Name: Mechanical Integration of OB

Objective: mechanical integration of optical bench at PLM structure

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly
- OB tubing and cryo. instrumentation mounted without scientific instruments
- Optical bench cleaned according class 100 requirements and released for integration

Activity Breakdown:

- Final cleaning and final inspection of OB before integration
- Mechanical installation of OB to PLM upper spatial framework
- Mech. check: dimensions, screw torque, screw locking etc.
- connect OB tubing
- Perform leak check of OB tubing I/F
- Integrate OB cooling straps
- Connect OB cryo. instrumentation to CCH I/F
- Perform electrical check of OB instrumentation and harness

Activity Number: E.050.020

Duration: 4 days

Applicable Documents:

- PLM/EQM integration procedure
- Herschel EQM PLM logsheet

GSE required:

- PLM integration dolly
- Electrical check out equipment
- OB hoisting equipment
- Leaktest equipment

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100
- Facility crane, standard hoisting slings

Personnel:

- 1 AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n. a.

Activity Number: E.050.030

Duration: 3 days

Activity Name: Mechanical integration of CVV electrical ring and shields

Objective: mechanical integration of CVV electrical ring to CVV I/F

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly
- Electrical I/F ring released for integration.

Activity Breakdown:

- Measurement of mass of electrical I/F ring and upper cyl. shields. Documentation of weight
- Final cleaning and final inspection of electrical I/F ring
- Final cleaning and final inspection O-ring seal
- Installation of O-ring seal at CVV cyl. I/F
- Mechanical integration of electrical I/F ring to CVV cylindrical part
- Mech. check: dimensions, screw torque, screw locking etc.
- Successive mechanical installation of upper cylindrical shield 1, 2, 3
 - Connect electrical connectors in between shield 1, 2, and 3
 - Perform functional check of shield sensor after each plug connection
 - MLI closure (shield to shield)
- Mech. check: dimensions, screw torque, screw locking etc.

Activity Number: E.050.030

Duration: 3 days

Applicable Documents:

- PLM/EQM integration procedure
- Herschel EQM PLM logsheet

GSE required:

- PLM integration dolly
- I/F ring lifting device

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100
- Facility crane, standard hoisting slings
- Standard cleaning equipment

Personnel:

- 1 crane operator
- 2 AIT technicians

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n. a.

Activity Number: E.060.010

Duration: 15 days

Activity Name: Mechanical installation of SIH

Objective: integration SIH vacuum-feedthroughs to CVV electrical ring and leaktest

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly
- SIH released for integration

Activity Breakdown:

- Final cleaning and final inspection of vacuum feedthrough I/F at the CVV structure
- Installation of SI-harness vacuum feedthroughs to electrical ring
- Leaktest of vacuum feedthroughs. Documentation of results

Activity Number: E.060.010

Duration: 15 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet
- SIH integration procedure

GSE required:

- Leaktest equipment
- Standard cleaning equipment

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100
- Cleanliness inspection equipment

Personnel:

- 1 electrical engineer
- 2 electrical technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.060.020

Duration: 15 days

Activity Name: Installation of SIH part 1

Objective: Installation and routing of SIH onto OB up to FPU I/F and electrical verification test

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly
- SIH vacuum feedthroughs integrated to CVV

Activity Breakdown:

- Preparation of SIH fixation areas
- Routing of SI-harness up to OB
- Electrical check out of harness and connectors

Activity Number: E.060.020

Duration: 15 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet
- SIH integration procedure

GSE required:

- PLM integration dolly
- Working platform
- Electrical check out equipment

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100
- Cleanliness inspection equipment

Personnel:

- 1 electrical engineer
- 2 electrical technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

ESD precautions applicable

Special Notes:

n. a.

Activity Number: E.060.030

Duration: 1 day

Activity Name: KIP 1

Objective: to review the status of H/W and corresponding documentation

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly.

Activity Breakdown:

Agenda:

- Review of documentation status
- CIDL/ CSL available
- As- built status documented
- Deviations to CIDL/ CSL documented and approved
- NCR Status review, related to the integration status
- Cleanliness status
- Previous steps (manufacturing, inspection, integration, in- process tests) performed and documented in relevant procedures/ logsheets
- Defined open works are closed
- Hardware inspection
- Calibration status of used facilities and tools
- Mating/ dismating list available and up to date
- Conclusion

Activity Number: E.060.030

Duration: 1 day

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

n.a.

Facility instrumentation:

- Astrium FN; cleanroom class 100

Personnel:

- 1AIT engineer
- PLM S/S representative
- customer representatives
- 1 PA
- 1 QA

Safety Precautions:

- Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.070.010

Duration: 1 day

Activity Name: Preparation for Transport

Objective: integration of PLM in transport container

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100/100 000

Configuration:

- PLM mounted in integration dolly
- CVV lower part finally mounted. CVV upper part without upper cone
- Transport container placed in air lock of clean room cl. 100 000. Cover dismantled.

Activity Breakdown:

- Provide transport container in air lock of clean room class 100 000
- Install cleanliness protection to PLM
- Tilt PLM with integration dolly. PLM X-axis horizontal
- Install hoisting device to PLM.
- Dismount PLM from integration dolly
- Move PLM in airlock of clean room cl. 100 000 and install PLM in transport container.
- Mech. check: screw torque, screw locking etc.

Activity Number: E.070.010

Duration: 1 day

Applicable Documents:

- Herschel EQM PLM Transport procedure
- Herschel EQM PLM logsheet

GSE required:

- PLM integration dolly
- Working platform
- PLM hoisting device
- PLM Transport Container

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100, clean room cl. 100 000
- Cleanliness inspection equipment

Personnel:

- 1 crane operator
- 1 AIT engineer
- 1 electrical engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n.a.

Activity Number: E.080.010

Duration: 1 day

Activity Name: Transport of EQM to Astrium FN

Objective: opening of container after transport

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: 100 000

Configuration:

- PLM mounted in transport container; PLM X-axis horizontal
- CVV lower part finally mounted. CVV upper part without upper cone

Activity Breakdown:

- Final inspection before container closure
- Close transport container
- Transport of PLM/EQM to Astrium FN
- Cleaning of container after transport
- Placing of container in airlock of clean room cl. 100 000
- Opening of container
- Incoming inspection

Activity Number: E.080.010

Duration: 1 day

Applicable Documents:

- Herschel EQM PLM Transport procedure
- Herschel EQM PLM logsheet

GSE required:

- PLM Transport Container

Facility instrumentation:

- Astrium FN; cleanroom class 100 000
- Facility crane
- Cleanliness inspection equipment

Personnel:

- 1 crane operator
- 1 AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n.a.

Activity Number: E.090.010

Duration: 1 day

Activity Name: Set-up in Cleanroom 100

Objective: placing of PLM in cleanroom cl. 100 to continue with integration

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: 100 000

Configuration:

- PLM mounted in transport container; PLM X-axis horizontal
- Transport container cover dismantled. Incoming inspection performed

Activity Breakdown:

- Install hoisting device to PLM.
- Disconnect PLM from container
- Cleaning of PLM according cl. 100 requirements
- Move PLM in clean cabin cl. 100 and install PLM in integration dolly. PLM Z-axis adapted to integration dolly
- Remove cleanliness protection from PLM
- Continue EQM integration

Activity Number: E.090.010

Duration: 1 day

Applicable Documents:

- Herschel EQM PLM Transport procedure
- Herschel EQM PLM logsheet

GSE required:

- PLM Transport Container
- PLM hoisting device
- PLM Integration Dolly

Facility instrumentation:

- Astrium FN; airlock of cleanroom class 100 000, cleanroom class 100
- Facility crane
- Cleanliness inspection equipment

Personnel:

- 1 crane operator
- 1 AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n.a.

Activity Number: E.100.010

Duration: 5 days

Activity Name: Alignment of OB

Objective: Determination of OB position wrt CVV alignment I/F as alignment reference for following integration of optical components

Requirements to be verified:

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly. PLM X-axis vertical; +X-axis top

Activity Breakdown:

- Install alignment equipment
- Perform alignment OB wrt. to CVV

Activity Number: E.100.010

Duration: 5 days

Applicable Documents:

- PLM EQM Integration procedure
- Alignment Procedure

GSE required:

- PLM integration dolly
- PLM alignment equipment

Facility instrumentation:

- Astrium FN; cleanroom class 100

Personnel:

- 1 Optical subsystem representative
- 2 alignment technicians
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.100.020

Duration: 1 day

Activity Name: MIP 3

Objective: to review the status of H/W and corresponding documentation

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly

Activity Breakdown:

- Review of documentation status
- Review status of relevant NCR's
- H/W inspection
- Review status of open work list TBC
- Take Photos for documentation TBC
- Release for further integration

Activity Number: E.100.020

Duration: 1 day

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

-

Facility instrumentation:

- Astrium OTN building 5.0; clean cabin class 100

Personnel:

- 1AIT engineer
- PLM S/S representative
- customer representatives
- 1 PA
- 1 QA

Safety Precautions:

- Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.110.010

Duration: 5 days

Activity Name: CQM & Warm Unit (WU) incoming inspection

Objective: incoming Inspection and health check of CQM's & WU's after transport

Requirements to be verified:

- H/W integrity
- completeness

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100
- ESD: personnel ESD to be avoided

Configuration:

- CQM's clean according class 100 requirements and packed in transport container
- WU's clean according class 100 000 requirements and packed in transport container

Activity Breakdown:

- Incoming inspection CQM's
 - + unpacking of H/W in airlock of clean room cl. 100
 - + measurement of mass of H/W and documentation of weight (tbc)
 - + visual inspection
 - + mechanical I/F fit check tbc.
 - + cleanliness inspection
- Incoming inspection WU's
 - + unpacking of H/W in clean room cl. 100 000
 - + measurement of mass of H/W and documentation of weight (tbc)
 - + visual inspection
 - + mechanical I/F fit check tbc.
 - + cleanliness inspection
- Health check of instruments and warm units
- Provision for integration

Activity Number: E.110.010

Duration: 5 days

Applicable Documents:

- CQM & WU ADP/Handling manual

GSE required:

- CQM & WU electrical test equipment (unit tester tbc.)
- Equipment lifting device

Facility instrumentation:

- Astrium FN; cleanroom class 100
- Facility crane, standard hoisting slings

Personnel:

- 2 Electrical operation engineer
- Instrument representative
- 1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable
ESD precautions

Special Notes:

- ESD precautions

Activity Number: E.110.020

Duration: 6 days

Activity Name: Mechanical Integration of FPU QM's onto OB

Objective: mechanical integration of FPU QM's onto OB

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100
- **ESD:** **personal ESD to be avoided**

Configuration:

- PLM mounted in integration dolly
- FPU QM's released for integration

Activity Breakdown:

- Final cleaning and final inspection of QM FPU
- Preparation of QM FPU fixation areas on OB
- Mechanical installation of FPU QM's to OB
- Mech. check: dimensions, screw torque, screw locking etc.
- Check grounding of FPU QM's

Activity Number: E.110.020

Duration: 6 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet
- FPU CQM integration procedure

GSE required:

- PLM integration dolly
- Instrument lifting device
- Working platform

Facility instrumentation:

- Astrium FN; cleanroom class 100
- Cleanliness inspection equipment

Personnel:

- Instruments representatives tbc.
- 1 AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

- ESD precautions are applicable

Activity Number: E.110.030

Duration: 3 days

Activity Name: Thermal Integration of FPU CQM's onto OB

Objective: thermal integration of FPU QM's onto OB

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100
- **ESD:** **personal ESD to be avoided**

Configuration:

- PLM mounted in integration dolly
- FPU QM's mechanically mounted to OB

Activity Breakdown:

- Preparation of cooling strap fixation areas
- Integration of instrument cooling straps
- Mech. check: dimensions, screw torque, screw locking etc.

Activity Number: E.110.030

Duration: 3 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet
- FPU CQM integration procedure

GSE required:

- PLM integration dolly
- Instrument lifting device
- Working platform

Facility instrumentation:

- Astrium FN; cleanroom class 100
- Cleanliness inspection equipment

Personnel:

- Instruments representatives tbc.
- 1 AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

- **ESD precautions are applicable**

Activity Number: E.110.040

Duration: 7 days

Activity Name: Integration of SIH part 2 (connection to FPU)

Objective: completion of OB harness integration onto OB structure

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100
- **ESD:** **personal ESD to be avoided**

Configuration:

- PLM mounted in integration dolly.
- FPU QM's mechanical and thermal finally mounted onto OB.
- SIH not connected to FPU QM's

Activity Breakdown:

- Connection of SIH I/F's at corresponding FPU QM's I/F's
- Finalize SIH routing/integration onto OB

Activity Number: E.110.040

Duration: 7 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet
- SIH integration procedure

GSE required:

- PLM integration dolly
- Working platform
- Electrical check out equipment

Facility instrumentation:

- Astrium FN; cleanroom class 100
- Cleanliness inspection equipment

Personnel:

- 1 scientific instruments representatives
- 1 electrical engineer
- 2 electrical technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

- ESD precautions are applicable

Activity Number: E.120.010

Duration: 6 days

Activity Name: FPU Electrical Check

Objective: electrical check of instruments after final integration on OB

Requirements to be verified:

- Functionality (warm condition) of PACS instrument controlled via SIH vacuum feedthrough connector I/F's
- Functionality (warm condition) of SPIRE instrument controlled via SIH vacuum feedthrough connector I/F's
- Functionality (warm condition) of HIFI instrument controlled via SIH vacuum feedthrough connector I/F's

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100
- **ESD:** **personal ESD to be avoided**

Configuration:

- PLM mounted in integration dolly.
- FPU QM's finally mounted onto OB

Activity Breakdown:

- Connection of instrument test equipment via vacuum feedthrough connectors
- Electrical check out of instruments and CVV internal SIH

Activity Number: E.120.010

Duration: 6 days

Applicable Documents:

- PACS electrical test (warm condition) procedure
- SPIRE electrical test (warm condition) procedure
- HIFI electrical test (warm condition) procedure

GSE required:

- PLM integration dolly
- Electrical check out equipment of instruments (unit tester tbc)

Facility instrumentation:

- Astrium FN; cleanroom class 100
- Cleanliness inspection equipment

Personnel:

- 1 scientific instruments representatives
- 1 electrical operation engineer
- 2 electrical technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

- ESD precautions are applicable

Activity Number: E.120.020

Duration: 1 day

Activity Name: KIP 2

Objective: to review the status of H/W and corresponding documentation

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly.

Activity Breakdown:

Agenda:

- Review of documentation status
- CIDL/ CSL available
- As- built status documented
- Deviations to CIDL/ CSL documented and approved
- NCR Status review, related to the integration status
- Cleanliness status
- Previous steps (manufacturing, inspection, integration, in- process tests) performed and documented in relevant procedures/ logsheets
- Defined open works are closed
- Hardware inspection
- Calibration status of used facilities and tools
- Mating/ dismating list available and up to date
- Conclusion

Activity Number: E.120.020

Duration: 1 day

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

n.a.

Facility instrumentation:

- Astrium FN; cleanroom class 100

Personnel:

- 1AIT engineer
- PLM S/S representative
- customer representatives
- 1 PA
- 1 QA

Safety Precautions:

- Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.130.010

Duration: 4 days

Activity Name: Instrument Alignment

Objective: alignment of instruments in correlation together

Requirements to be verified:

Tbd.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly. X-axis vertical. PLM +X-axis top

Activity Breakdown:

- install alignment equipment
- alignment (shimming/adjustment) of instruments

Activity Number: E.130.010

Duration: 4 days

Applicable Documents:

- Instrument Alignment Procedure

GSE required:

- PLM integration dolly
- PLM alignment equipment

Facility instrumentation:

- Astrium FN; cleanroom class 100

Personnel:

- Optical subsystem representative
- alignment technicians
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.130.020

Duration: 1 day

Activity Name: MIP 4

Objective: to review the status of H/W and corresponding documentation

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly.

Activity Breakdown:

- Review of documentation status
- Review status of relevant NCR's
- H/W inspection
- Review status of open work list TBC
- Take Photos for documentation TBC
- Release for further integration

Activity Number: E.130.020

Duration: 1 day

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

n.a.

Facility instrumentation:

- Astrium FN; cleanroom class 100

Personnel:

- 1 AIT engineer
- PLM S/S representative
- customer representatives
- 1 PA
- 1 QA

Safety Precautions:

- Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.140.010

Duration: 5 days

Activity Name: Integration of OB shield and OB MLI

Objective: integration of OB shield onto OB and fixation/closure of OB shield MLI

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly
- MIP 3 successfully passed
- OB shield released for integration

Activity Breakdown:

- Final inspection and final cleaning of OB
- Perform mass measurement of OB shield. Documentation of weight
- Final cleaning and final inspection of OB shield
- Mechanical installation of OB shield
- Mech. check: dimensions, screw torque, screw locking etc.
- Check grounding of OB shield
- Installation and closing of OB shield MLI
- Check MLI bonding

Activity Number: E.140.010

Duration: 5 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet
- MLI integration procedure

GSE required:

- PLM integration dolly
- Working platform
- OB shield lifting device

Facility instrumentation:

- Astrium FN; cleanroom class 100
- Cleanliness inspection equipment

Personnel:

- Herschel Project straylight representative
- 2 AIT technician
- 2 MLI technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n.a.

Activity Number: E.140.020

Duration: 17 days

Activity Name: Integrate Cryostat upper shields

Objective: integration of upper conical shields

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly. X-axis vertical. PLM +X-axis top
- upper shields without cryo. Components/instrumentation and MLI. H/W cleaned according cl. 100 000 requirements and released for integration

Activity Breakdown:

- Final cleaning/inspection of upper shields (conical and cylindrical) according cl. 100 requirements
- Pre integration of upper shields (conical and cylindrical) with cryo. instrumentation and MLI
- Measurement of mass of upper shields (conical and cylindrical). Documentation of weight
- Final inspection of CVV upper part
- Successive mechanical installation of upper conical shield 1, 2, 3
 - Connect electrical connectors in between shield 1, 2, and 3
 - Perform functional check of shield sensor after each plug connection
 - MLI closure (shield to shield)
- Mech. check: dimensions, screw torque, screw locking etc.

Activity Number: E.140.020

Duration: 17 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

- PLM integration dolly
- Shield lifting device
- Electrical check out equipment

Facility instrumentation:

- Astrium FN; clean room class 100
- Standard cleaning equipment

Personnel:

- 1 AIT engineer
- 2 AIT technicians
- 1 harness technician
- 2 MLI specialists
- 1QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.150.010

Duration: 17 days

Activity Name: Integrate Cryostat upper bulkhead

Objective: integration of upper shields and upper cone to PLM structure

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly. X-axis vertical. PLM +X-axis top
- Upper bulkhead cleaned according cl. 100 000 requirements and released for integration

Activity Breakdown:

- Measurement of mass of upper cone. Documentation of weight
- Final cleaning according class 100 cleanliness requirements and final inspection of upper cone
- Installation of "cold seal" to filling port I/F
- Installation of "cold seal" to aux. tank ventline I/F
- Installation of O-ring seal to CVV cyl. I/F
- Mounting of filling port tube to CVV upper cone
- Mech. check: dimensions, screw torque, screw locking etc.
- Perform leaktest of filling port tube I/F to CVV. Documentation of result
- Mounting of aux. tank ventline I/F at CVV upper cone
- Mech. check: dimensions, screw torque, screw locking etc.
- Perform leaktest of aux. tank ventline I/F to CVV. Documentation of result
- Mounting of upper cone to CVV cylindrical part
- Mech. check: dimensions, screw torque, screw locking etc.
- Protect upper cone inlet aperture with foil
- Install safety valve to upper cone
- Install filling port I/F (plug) to upper cone
- Install aux. tank ventline valve V512 to upper cone

Activity Number: E.150.010

Duration: 17 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

- PLM integration dolly
- Upper cone lifting device
- Leak test equipment

Facility instrumentation:

- Astrium FN; clean room class 100
- Standard cleaning equipment

Personnel:

- 1 AIT engineer
- 2 AIT/CVSE technicians
- 1QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.150.020

Duration: 3 days

Activity Name: Integrate LOU

Objective: integration of LOU to CVV outer wall

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly
- LOU released for integration

Activity Breakdown:

- Final inspection and final cleaning of LOU
- Preparation of fixation areas
- Mass measurement of LOU. Documentation of weight
- Mechanical mounting of LOU
- Mech. check: dimensions, screw torque, screw locking etc.
- Check grounding

Activity Number: E.150.020

Duration: 3 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet
- LOU handling manual

GSE required:

- PLM integration dolly
- Working platform
- LOU lifting device

Facility instrumentation:

- Astrium FN; clean room class 100
- Cleanliness inspection equipment

Personnel:

- Optical subsystem representative
- 1 AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n.a.

Activity Number: E.150.030

Duration: 2 days

Activity Name: Integrate waveguides upper part

Objective: integration of waveguides to CVV outer wall

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly
- LOU installed to CVV
- Waveguides released for integration

Activity Breakdown:

- Final inspection and final cleaning of waveguides
- Mass measurement of waveguides. Documentation of weight
- Mounting of waveguides
- Mech. check: dimensions, screw torque, screw locking etc.

Activity Number: E.150.030

Duration: 2 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet
- Waveguide handling manual

GSE required:

- PLM integration dolly
- Working platform

Facility instrumentation:

- Astrium FN; clean room class 100
- Cleanliness inspection equipment

Personnel:

- Optical subsystem representative
- 1 AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n.a.

Activity Number: E.150.040

Duration: 2 days

Activity Name: Alignment LOU/OB (HIFI)

Objective: alignment of LOU wrt. OB alignment I/F

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly

Activity Breakdown:

- Install alignment equipment
- Perform alignment

Activity Number: E.150.040

Duration: 2 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet
- Alignment procedure

GSE required:

- PLM integration dolly
- Working platform
- Alignment equipment

Facility instrumentation:

- Astrium FN; clean room class 100
- Cleanliness inspection equipment

Personnel:

- Herschel Project straylight representative
- 2 alignment technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n.a.

Activity Number: E.150.050

Duration: 1 day

Activity Name: KIP 3

Objective: to review the status of H/W and corresponding documentation

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly.

Activity Breakdown:

Agenda:

- Review of documentation status
- CIDL/ CSL available
- As- built status documented
- Deviations to CIDL/ CSL documented and approved
- NCR Status review, related to the integration status
- Cleanliness status
- Previous steps (manufacturing, inspection, integration, in- process tests) performed and documented in relevant procedures/ logsheets
- Defined open works are closed
- Hardware inspection
- Calibration status of used facilities and tools
- Mating/ dismating list available and up to date
- Conclusion

Activity Number: E.150.050

Duration: 1 day

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

n.a.

Facility instrumentation:

- Astrium FN; cleanroom class 100

Personnel:

- 1AIT engineer
- PLM S/S representative
- customer representatives
- 1 PA
- 1 QA

Safety Precautions:

- Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.150.060

Duration: 5 days

Activity Name: Integration of Cryogenic Test Adapter (CTA)

Objective: Mounting of cryogenic test adapter to PLM upper cone I/F

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly. X-axis vertical. PLM + X-axis top
- Upper cone aperture protected by foil
- Test cavity released for integration

Activity Breakdown:

- Perform mass measurement of test cavity. Documentation of weight
- Final cleaning and final inspection of test cavity I/F
- Installation of O-ring seal to upper cone I/F
- Mechanical installation of test cavity to upper cone
- Mech. check: dimensions, screw torque, screw locking etc.

Activity Number: E.150.060

Duration: 5 days

Applicable Documents:

- PLM/EQM integration procedure

GSE required:

- PLM integration dolly
- Cryogenic Test Adapter lifting device

Facility instrumentation:

- Astrium FN; clean room class 100
- Facility crane, standard hoisting slings
- Standard cleaning equipment

Personnel:

- 1 AIT engineer
- 2 AIT technicians
- 1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n. a.

Activity Number: E.160.010

Duration: 11 days

Activity Name: PLM evacuation and leaktest

Objective: evacuation of PLM and verification of CVV tightness against ambient

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM/EQM mounted in integration dolly.
- CVV finally closed

Activity Breakdown:

- Preparation of CVV evacuation line and evacuation pumps
- Integration of CVV evacuation port
- Connect evacuation line to evacuation port (leaktester connected parallel behind turbo pump)
- Leak check of evacuation line
- Evacuate PLM vacuum vessel (controlled evacuation, to avoid MLI damage)
- Perform integral leak check He-subsystem against inner vessel. Documentation of result
- Perform local leak check of CVV O-ring seals
 - lower bulkhead
 - upper cone
 - CTA I/F to CVVagainst ambient. Documentation of result
- Perform local leak check of filling port I/F to upper cone. Documentation of result
- Perform local leak check of upper cone safety valve I/F to upper cone. Documentation of result
- Perform local leak check of V 512 I/F to upper cone. Documentation of result

Activity Number: E.160.010

Duration: 11 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

- PLM integration dolly
- Leaktest equipment
- PLM evacuation lines
- PLM evacuation equipment (Turbo pump and High vacuum pumping unit)

Facility instrumentation:

- Astrium FN; clean room class 100
- Standard cleaning equipment

Personnel:

- 1 AIT engineer
- 2 CVSE technicians
- 1QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.160.020

Duration: 2 days

Activity Name: Move PLM in clean room class 100 000

Objective: Dismounting of PLM from Integration dolly, movement in clean room class 100 000 and reinstallation in test dolly

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 and class 100 000

Configuration:

- PLM mounted in integration dolly.
- PLM under vacuum and successfully leak tested
- Test dolly prepared in clean room class 100 000

Activity Breakdown:

- Disconnect evacuation lines from PLM
- Connect PLM hoisting equipment
- Dismount PLM from Integration dolly
- Move PLM with crane in cleanroom class 100 000
- Install PLM in Test dolly. Z-axis mounted to test dolly!

Activity Number: E.160.020

Duration: 2 days

Applicable Documents:

- PLM/EQM integration procedure
- PLM hoisting equipment handling manual
- PLM Test dolly handling manual

GSE required:

- PLM integration dolly
- PLM hoisting equipment
- PLM test dolly (SN03, expanded in width)
- Working Platform

Facility instrumentation:

- Astrium FN; clean room class 100 and clean room class 100 000
- Facility crane

Personnel:

- 1 Crane operator
- 1 AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n. a.

Activity Number: E.160.030

Duration: 1 day

Activity Name: Integration of BOLA

Objective: Integration of BOLA to PLM structure

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000
- ESD: personal ESD to be avoided tbc.

Configuration:

- PLM mounted in integration dolly
- BOLA released for integration

Activity Breakdown:

- Perform mass measurement of LOU/BOLA
- Preparation of LOU BOLA fixation areas
- Installation of LOU BOLA to PLM support structure
- Mech. check: dimensions, screw torque, screw locking etc

Activity Number: E.160.030

Duration: 1 day

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

- PLM integration dolly
- BOLA check out equipment tbc

Facility instrumentation:

- Astrium FN; clean room class 100
- Cleanliness inspection equipment

Personnel:

- 1 AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

- ESD precautions applicable tbc.

Activity Number: E.170.010

Duration: 1 day

Activity Name: Warm Alignment check

Objective: determination of OB position wrt CVV alignment I/F if CVV is under vacuum

Requirements to be verified:

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly. PLM X-axis vertical; +X-axis top

Activity Breakdown:

- Install alignment equipment
- Alignment check OB wrt. to CVV

Activity Number: E.170.010

Duration: 1 day

Applicable Documents:

- PLM EQM Integration procedure
- Alignment Procedure

GSE required:

- PLM integration dolly
- PLM alignment equipment

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- 1 Optical subsystem representative
- 2 alignment technicians
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.170.020

Duration: 1 day

Activity Name: KIP 4

Objective: to review the status of H/W and corresponding documentation

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in integration dolly.

Activity Breakdown:

Agenda:

- Review of documentation status
- CIDL/ CSL available
- As- built status documented
- Deviations to CIDL/ CSL documented and approved
- NCR Status review, related to the integration status
- Cleanliness status
- Previous steps (manufacturing, inspection, integration, in- process tests) performed and documented in relevant procedures/ logsheets
- Defined open works are closed
- Hardware inspection
- Calibration status of used facilities and tools
- Mating/ dismating list available and up to date
- Conclusion

Activity Number: E.170.020

Duration: 1 day

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

n.a.

Facility instrumentation:

- Astrium FN; cleanroom class 100 000

Personnel:

- 1AIT engineer
- PLM S/S representative
- customer representatives
- 1 PA
- 1 QA

Safety Precautions:

- Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.180.010

Duration: 3 days

Activity Name: Integration of pre-integrated SVM panels

Objective: Installation of SVM dummy platform (preintegrated with AVM's) to PLM structure

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly; X-axis vertical. PLM +X-axis top
- AVM's mounted to SVM dummy platform and released for integration

Activity Breakdown:

- Mass measurement of pre-integrated dummy platform and dummy platform support structure
- Integration of SVM dummy platform support structure to CVV
- Preparation of SVM dummy platform mounting I/F's
- Integration of SVM dummy platform to CVV support structure
- Mech. check: dimensions, screw torque, screw locking etc.
- Check grounding conductivity

Activity Number: E.180.010

Duration: 3 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

- PLM test dolly
- SVM dummy platform lifting device

Facility instrumentation:

- Astrium FN; cleanroom class 100 000
- Facility crane, standard hoisting slings
- Cleanliness inspection equipment

Personnel:

- 1 crane operator
- 1 AIT engineer
- 2 AIT technician
- 1 electrical technician
- 1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n.a.

Activity Number: E.180.020

Duration: 2 days

Activity Name: Integrate waveguide assembly lower part

Objective: completion of waveguides assembly

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly
- Waveguides assembly upper part mounted to PLM
- Waveguides assembly lower part released for integration

Activity Breakdown:

- Mass measurement of waveguides. Documentation of weight
- Mounting/Adjustment of waveguides
- Mech. check: dimensions, screw torque, screw locking etc.

Activity Number: E.180.020

Duration: 2 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet
- Waveguide handling manual

GSE required:

- PLM integration dolly
- Working platform

Facility instrumentation:

- Astrium FN; clean room class 100
- Cleanliness inspection equipment

Personnel:

- Optical subsystem representative
- 1 AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n.a.

Activity Number: E.190.010

Duration: 5 days

Activity Name: Integration of external Harness (CCH and SIH)

Objective: Integration of external CCH and external SIH to PLM structure

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000
- ESD: personal ESD to be avoided

Configuration:

- PLM mounted in test dolly,
- External CCH and SIH released for integration

Activity Breakdown:

- Preparation of CCH and SIH fixation areas
- Installation and routing of CCH and SIH at PLM outer structure
- Connection of CCH to corresponding I/F vacuum feedthrough I/F's
- Electrical check out of cryo. instrumentation after final external CCH integration
- Connection of SIH to corresponding I/F vacuum feedthrough I/F's

Activity Number: E.190.010

Duration: 5 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet
- External CCH integration and test procedure
- External SIH integration procedure

GSE required:

- PLM test dolly
- Electrical check out equipment

Facility instrumentation:

- Astrium FN; clean room class 100 000
- Cleanliness inspection equipment

Personnel:

- 1 electrical operation engineer
- 2 electrical technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

ESD precautions applicable

Activity Number: E.190.020

Duration: 6 days

Activity Name: FPU electrical check (with instrument unit tester)

Objective: electrical check of instrument FPU's after final external SIH integration and connection to PLM vacuum feedthrough's

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000
- ESD: personal ESD to be avoided

Configuration:

- PLM mounted in test dolly,
- External SIH finally integrated and with PLM vacuumfeethrough's connected

Activity Breakdown:

- Connection of instrument unit tester to SIH I/F (opposite side of SIH vacuum feedthrough I/F)
- Electrical check out of FPU after final external CCH integration

Activity Number: E.190.020

Duration: 6 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet
- External SIH Test Procedure

GSE required:

- PLM test dolly
- Electrical check out equipment

Facility instrumentation:

- Astrium FN; clean room class 100 000
- Cleanliness inspection equipment

Personnel:

- scientific instruments representatives
- 1 electrical operation engineer
- 2 electrical technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

ESD precautions applicable

Activity Number: E.190.030

Duration: 3 days

Activity Name: Connection of external harness to warm units (WU)

Objective: electrical connection of FPU's via external SIH with WU

Requirements to be verified:

n.a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100
- **ESD:** **personal ESD to be avoided**

Configuration:

- PLM mounted in integration dolly.
- WU mounted on SVM dummy plate
- SIH integrated to PLM, connected to FPU's and tested

Activity Breakdown:

- Connection of SIH I/F's to corresponding WU I/F's
- Complete SIH routing/integration

Activity Number: E.190.030

Duration: 3 days

Applicable Documents:

- External SIH integration procedure

GSE required:

- PLM integration dolly

Facility instrumentation:

- Astrium FN; clean room class 100
- Cleanliness inspection equipment

Personnel:

- scientific instruments representatives
- 1 electrical operation engineer
- 2 electrical technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

- ESD precautions are applicable

Activity Number: E.200.010

Duration: 3 days

Activity Name: Warm SFT at ambient conditions (FPU +WU)

Objective: SFT of instruments in conditions

Requirements to be verified:

- Functionality (warm condition) of PACS instrument
- Functionality (warm condition) of SPIRE instrument
- Functionality (warm condition) of HIFI instrument

Environment:

- temperature: $(22 \pm 3) \text{ }^\circ\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100
- **ESD:** **personal ESD to be avoided**

Configuration:

- PLM mounted in integration dolly.
- WU connected with FPU'S
- WU connected with corresponding EGSE

Activity Breakdown:

- TRR
- Start test
- PTR

Activity Number: E.200.010

Duration: 3 days

Applicable Documents:

- PACS electrical test (warm condition) procedure
- SPIRE electrical test (warm condition) procedure
- HIFI electrical test (warm condition) procedure

GSE required:

- PLM integration dolly
- Electrical check out equipment of instruments (unit tester tbc)

Facility instrumentation:

- Astrium FN; cleanroom class 100
- Cleanliness inspection equipment

Personnel:

- 1 scientific instruments representatives
- 1 electrical operation engineer
- 2 electrical technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

- ESD precautions are applicable

Activity Number: E.200.020

Duration: 1 day

Activity Name: MIP 5

Objective: to review the status of H/W and corresponding documentation

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in integration dolly.

Activity Breakdown:

- Review of documentation status
- Review status of relevant NCR's
- H/W inspection
- Review status of open work list TBC
- Take Photos for documentation TBC
- Release for further integration

Activity Number: E.200.020

Duration: 1 day

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

n.a.

Facility instrumentation:

- Astrium FN; cleanroom class 100 000

Personnel:

- 1 AIT engineer
- PLM S/S representative
- customer representatives
- 1 PA
- 1 QA

Safety Precautions:

- Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.210.010

Duration: 2 days

Activity Name: Connect CVSE – continue evacuation

Objective: Reinstallation of CVSE equipment to CVV and continue evacuation

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly. X-axis vertical. PLM +X-axis top
- PLM evacuation I/F already mounted and leaktested, evacuation lines preinstalled and leaktested
- CVV preevacuated

Activity Breakdown:

- Connect evacuation line to evacuation port
- Perform leak check of evacuation line and evacuation port
- Continue PLM evacuation

Activity Number: E.210.010

Duration: 2 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

- PLM test dolly
- Leaktest equipment
- PLM evacuation lines
- PLM evacuation equipment (Turbo pump and High vacuum pumping unit)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

1 mechanical AIT engineer
2 CVSE technician
1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n. a.

Activity Number: E.210.020

Duration: 2 days

Activity Name: Connect EGSE & functional test

Objective: to connect the flight HW (incl. instruments, TBC) resp. the Cryostat instrumentation to the EGSE and check the functionality

Requirements to be verified:

- Check out/validation of PLM EGSE

Environment:

- temperature: $(22 \pm 3) ^\circ\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 00

Configuration:

- PLM mounted in test dolly

Activity Breakdown:

- Connect CryoStat instrumentation (AIV part) to the Cryo SCOE
- Connect CryoStat instrumentation (CCU part) to the CCU
- Connect CCU to the PLM SCOE and CDMU DFE, and perform SFT
- Check CryoStat I/F (data stream HK)
- If no CCU available: connect CryoStat instrumentation (CCU part) also to the Cryo SCOE and check I/F
- Connect warm units of instruments to the PLM SCOE (TBC)
- Check instrument I/F, TBC (data stream HK science)
- Perform first SFT with integrated instruments (at warm)

Activity Number: E.210.020

Duration: 2 days

Applicable Documents:

- EGSE installation and test procedure

GSE required:

- PLM test dolly
- EGSE check out equipment
 - CCS
 - PLM SCOE
 - Cryo SCOE
 - CDMU DFE
 - Instrument EGSE (TBC)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- 2 Electrical operation and software engineer
- 2 EGSE operators
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.210.030

Duration: 10 days (triple shift)

Activity Name: Cooldown and filling, functional test cold

Objective: Cooldown and filling of cryostat with He I

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM in test dolly
- CVV finally evacuated, turbo pumps in operation
- EGSE connected and operational

Activity Breakdown:

- Install heavy duty access working platform
- Connect ventline
- Installation and leaktest of filling port
- Prepare LHe transferline
- Provide LHe supply dewars
- Installation of transferline in supply dewar and PLM filling port
- Start cooldown of main tank. Respect cooling requirements of instruments.
- During cooldown increase strap pretension to 100% under respect of OB alignment requirements
- If main tank is at 4.2 K start filling of main tank with LHe
- After completion of main tank filling prepare final configuration (CVV evacuation, oscillation damper, valve status, filling port, transferlines, etc.)
- Perform cold functional test

Activity Number: E.210.030

Duration: 10 days (triple shift)

Applicable Documents:

- PLM EQM Integration procedure
- Procedure for Cooldown and filling with He I
- Procedure for preparation of transferlines
- Procedure for mounting and dismounting of oscillation damper
- Functional Test Procedure

GSE required:

- Cryo SCOE
- CVSE for filling operations (Transferlines, ventline, LHe supply dewars, safety line to filling port etc.)
- Heavy duty access platform
- Leak tester
- PLM test dolly
- Evacuation equipment
- Strap pretension measurement equipment

Facility instrumentation:

- Astrium FN; cleanroom class 100 000
- Facility crane, standard hoisting slings

Personnel:

- 1 Cryo operation manager
- 1 Electrical operation and software engineer
- 1 Test conductor & engineer
- 2 CVSE technician
- 1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n. a.

Activity Number: E.210.040

Duration: 7 days

Activity Name: Alignment measurements (adjustment parallel with cooldown)

Objective: instrument measurements/adjustment during cooldown

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly. X-axis vertical. PLM +X-axis top
- PLM cooldown running

Activity Breakdown:

- Install alignment equipment
- Increase CVV strap pretension to 100% under respect of OB alignment requirements

Activity Number: E.210.040

Duration: 7 days

Applicable Documents:

- PLM EQM Integration procedure
- Instruments Alignment Procedure

GSE required:

- PLM test dolly
- Instruments alignment equipment
- Strap pretension measurement equipment

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- 1 Test conductor & engineer
- 1 Optical subsystem representative
- 2 alignment technicians
- 2 CVSE technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.210.050

Duration: 10 days

Activity Name: Cold Leaktest

Objective: global leaktest of CVV internal He subsystem in cold condition versus CVV inner vessel

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly. X-axis vertical. PLM +X-axis top
- PLM cooldown running

Activity Breakdown:

- Preparation of leaktest equipment
- Connect leaktester parallel to PLM evacuation line behind turbo pumps
- Perform integral leak check of He-subsystem against CVV inner vessel. Documentation of results (Leaktester permanent in operation during colldown)

Activity Number: E.210.050

Duration: 10 days

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

- PLM integration dolly
- Leaktest equipment
- PLM evacuation lines
- PLM evacuation equipment (Turbo pump and High vacuum pumping unit)

Facility instrumentation:

- Astrium FN; clean room class 100 000
- Standard cleaning equipment

Personnel:

- 1 AIT engineer
- 2 CVSE technicians
- 1QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.220.010

Duration: 0.5 days

Activity Name: SFT cryostat control subsystem in He I conditions

Objective: SFT of PLM cryo. instrumentation instruments in Hel conditions

Requirements to be verified:

- Functionality (He I condition) of cryo instrumentation

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly.
- Corresponding EGSE connected

Activity Breakdown:

- TRR
- Start test
- PTR

Activity Number: E.220.010

Duration: 0.5 days

Applicable Documents:

- SFT procedure of cryostat control subsystem (He I condition)

GSE required:

- PLM integration dolly
- Cryo. SCOE

Facility instrumentation:

- Astrium FN; clean room class 100 000
- Cleanliness inspection equipment

Personnel:

- Test conductor & engineer
- 1 Cryo operation manager
- 1 Electrical operation and software engineer
- Electrical operation engineer
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

Activity Number: E.220.020

Duration: 1.5 days

Activity Name: SFT instruments in He I conditions

Objective: SFT of instruments in He I conditions

Requirements to be verified:

- Functionality (HeI condition) of PACS instrument
- Functionality (HeI condition) of SPIRE instrument
- Functionality (HeI condition) of HIFI instrument

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly. Tilting of PLM required
- Corresponding EGSE connected

Activity Breakdown:

- TRR
- Start test
- PTR

Activity Number: E.220.020

Duration: 1.5 days

Applicable Documents:

- PACS electrical test (Hel condition) procedure
- SPIRE electrical test (Hel condition) procedure
- HIFI electrical test (Hel condition) procedure

GSE required:

- PLM integration dolly
- EGSE

Facility instrumentation:

- Astrium FN; clean room class 100 000
- Cleanliness inspection equipment

Personnel:

- scientific instruments representatives
- 1 Test conductor & engineer
- 1 Cryo operation manager
- Electrical operation and software engineer
- Electrical operation engineer
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n.a.

Activity Number: E.220.030

Duration: 1 day

Activity Name: KIP 5

Objective: to review the status of H/W and corresponding documentation

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: 45% < RH < 70%
- cleanliness: class 100 000

Configuration:

- PLM mounted in integration dolly.

Activity Breakdown:

Agenda:

- Review of documentation status
- CIDL/ CSL available
- As- built status documented
- Deviations to CIDL/ CSL documented and approved
- NCR Status review, related to the integration status
- Cleanliness status
- Previous steps (manufacturing, inspection, integration, in- process tests) performed and documented in relevant procedures/ logsheets
- Defined open works are closed
- Hardware inspection
- Calibration status of used facilities and tools
- Mating/ dismating list available and up to date
- Conclusion

Activity Number: E.220.030

Duration: 1 day

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

n.a.

Facility instrumentation:

- Astrium FN; cleanroom class 100 000

Personnel:

- 1AIT engineer
- PLM S/S representative
- customer representatives
- 1 PA
- 1 QA

Safety Precautions:

- Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.230.010

Duration: 8 days (triple shift)

Activity Name: He II production

Objective: He II production in aux. tank

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted test dolly
- Heavy duty access platform installed
- PLM main tank in He I condition (4,2 K)
- Ventline mounted
- Filling port mounted

Activity Breakdown:

- Check PLM status (liquid level of main tank, valve status, Cryo EGSE)
- Preparation activities (if mounted remove oscillation damper; prepare MGSE, install aux. lines, prepare and install transferlines, install supply- and transport dewar)
- Prepare He I and He II pumping units
- Filling of aux. tank with He I
- Connect He I and He II pumping units
- Start He II production in aux. tank
- After completion of He II production in aux. tank prepare final configuration (check valve status, retract transferline and close filling port, stop He pumping unit I, remove supply- and transport dewar, continue pumping with He pumping unit II)

Activity Number: E.230.010

Duration: 8 days (triple shift)

Applicable Documents:

- PLM EQM Integration procedure
- He I filling procedure
- He II production and top up procedure
- Procedure for preparation of transferlines

GSE required:

- Cryo SCOE
- CVSE for filling operations (He vacuum pumping unit I and II, Transferlines, LHe supply dewars)
- Heavy duty working platform
- Leak tester
- PLM test dolly
- Safety line to filling port

Facility instrumentation:

- Astrium FN; cleanroom class 100 000
- Facility crane, standard hoisting slings

Personnel:

- 1 Cryo operation manager
- 1 Electrical operation and software engineer
- 1 Test conductor & engineer
- 2 CVSE technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.230.020

Duration: 2 days (triple shift)

Activity Name: He II top up

Objective: He II top of aux. tank

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted test dolly
- Heavy duty access platform installed
- PLM main tank in He I condition (4,2 K)
- PLM aux. tank partly filled with He II
- Ventline mounted
- Filling port mounted

Activity Breakdown:

- Check PLM status (liquid level of main tank, valve status, Cryo EGSE)
- Preparation activities (if mounted remove oscillation damper; prepare MGSE, install aux. lines, prepare and install transferlines, install supply- and transport dewar)
- Prepare He I and He II pumping units
- Connect He I and He II pumping units
- Start He II top up of aux. tank
- After completion of aux. tank top up with He II prepare final configuration (check valve status, retract transferline and close filling port, stop He pumping unit I, remove supply- and transport dewar, continue pumping with He pumping unit II)

Activity Number: E.230.020

Duration: 2 days (triple shift)

Applicable Documents:

- PLM EQM Integration procedure
- He II production and top up procedure
- Procedure for preparation of transferlines
- Procedure for mounting and dismounting of oscillation damper

GSE required:

- Cryo SCOE
- CVSE for filling operations (He vacuum pumping unit I and II, Transferlines, LHe supply dewars)
- Heavy duty working platform
- Leak tester
- PLM test dolly
- Safety line to filling port

Facility instrumentation:

- Astrium FN; cleanroom class 100 000
- Facility crane, standard hoisting slings

Personnel:

- 1 Cryo operation manager
- 1 Electrical operation and software engineer
- 1 Test conductor & engineer
- 2 CVSE technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.230.030

Duration: 5 days

Activity Name: CCU integration (TBC)

Objective: integration of CCU to SVM dummy plate

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000
- ESD: personal ESD to avoided

Configuration:

- PLM with SVM dummy plate mounted in test dolly
- CCU released for integration

Activity Breakdown:

- Preparation of CCU fixation area
- Mechanical integration of CCU to SVM dummy plate
- Mechanical check: dimensions, screw torque, screw locking, etc.
- Electrical connection of CCU
- Electrical check out of CCU

Activity Number: E.230.030

Duration: 5 days

Applicable Documents:

- Herschel EQM integration Procedure
- CCU integration and test procedure

GSE required:

- PLM test dolly
- Electrical check out equipment

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- AIT engineer
- 2 AIT technicians
- 2 electrical technicians
- 1QA

Safety Precautions:

- Standard safety precautions are applicable

Special Notes:

- ESD precautions are applicable

Activity Number: E.240.010

Duration: 1 day

Activity Name: TRR for instrument testing

Objective: official release to start with IMT of instruments

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly
- PLM main tank filled with He I and venting via V502
- PLM aux. tank filled with He II and venting via V512
- He II pumping unit running

Activity Breakdown:

- Review of configuration status
- Review of documentation status
- Review of test procedures
- Review of NCR status
- Inspection status and reports
- Conclusion

Activity Number: E.240.010

Duration: 1 day

Applicable Documents:

- IMT test specifications
- IMT test procedures

GSE required:

- PLM test dolly
- CCS (Central Check-out system)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- Project management representative
- 1 IMT operation manager
- PA
- Scientific instrument representatives

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.240.020

Duration: 10 days

Activity Name: HIFI tests

Objective: HIFI IMT

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly
- PLM main tank filled with He I and venting via V502
- PLM aux. tank filled with He II and venting via V512
- He II pumping unit running

Activity Breakdown:

- Prepare HIFI IMT test configuration
- Perform IMT test;
- Tilt Cryostat according instrument needs

Specific Constraints:

- Tilting and thermal requirements tbd.
- CTA requirements tbd.
- Environmental requirements tbd.

Activity Number: E.240.020

Duration: 10 days

Applicable Documents:

- HIFI Integrated Module Test Specification
- HIFI Integrated Module Test procedure

GSE required:

- PLM test dolly
- CCS (Central Check-out system)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- IMT operation manager
- Scientific instrument representative
- Electrical operation and software engineer
- EGSE operators
- Test conductor & engineer
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.240.030

Duration: 10 days

Activity Name: PACS tests

Objective: PACS IMT

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly
- PLM main tank filled with He I and venting via V502
- PLM aux. tank filled with He II and venting via V512
- He II pumping unit running

Activity Breakdown:

- Prepare PACS IMT test configuration
- Perform PACS IMT test;
- Tilt Cryostat according instrument needs

Specific Constraints:

- Tilting and thermal requirements tbd.
- CTA requirements tbd.
- Environmental requirements tbd.

Activity Number: E.240.030

Duration: 10 days

Applicable Documents:

- PACS Integrated Module Test Specification
- PACS Integrated Module Test procedure

GSE required:

- PLM test dolly
- CCS (Central Check-out system)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- IMT operation manager
- Scientific instrument representative
- Electrical operation and software engineer
- EGSE operators
- Test conductor & engineer
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.240.040

Duration: 10 days

Activity Name: SPIRE tests

Objective: SPIRE IMT

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly
- PLM main tank filled with He I and venting via V502
- PLM aux. tank filled with He II and venting via V512
- He II pumping unit running

Activity Breakdown:

- Prepare SPIRE IMT test configuration
- Perform SPIRE IMT test;
- Tilt Cryostat according instrument needs

Specific Constraints:

- Tilting and thermal requirements tbd.
- CTA requirements tbd.
- Environmental requirements tbd.

Activity Number: E.240.040

Duration: 10 days

Applicable Documents:

- SPIRE Integrated Module Test Specification
- SPIRE Integrated Module Test procedure

GSE required:

- PLM test dolly
- CCS (Central Check-out system)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- IMT operation manager
- Scientific instrument representative
- Electrical operation and software engineer
- EGSE operators
- Test conductor & engineer
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.240.050

Duration: 10 days

Activity Name: PACS/SPIRE tests (parallel mode)

Objective: PACS/SPIRE IMT in parallel mode

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly
- PLM main tank filled with He I and venting via V502
- PLM aux. tank filled with He II and venting via V512
- He II pumping unit running

Activity Breakdown:

- Prepare PACS/SPIRE (parallel mode) IMT test configuration
- Perform PACS/SPIRE IMT test;
- Tilt Cryostat according instrument needs

Specific Constraints:

- Tilting and thermal requirements tbd.
- CTA requirements tbd.
- Environmental requirements tbd.

Activity Number: E.240.050

Duration: 10 days

Applicable Documents:

- PACS/SPIRE (parallel mode) Integrated Module Test Specification
- PACS/SPIRE (parallel mode) Integrated Module Test procedure

GSE required:

- PLM test dolly
- CCS (Central Check-out system)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- IMT operation manager
- Scientific instruments representatives
- Electrical operation and software engineer
- EGSE operators
- Test conductor & engineer
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.240.060

Duration: 10 days

Activity Name: Cryostat tests (TBC)

Objective: test of cryostat CCU with cryo. instrumentation

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly
- PLM main tank filled with He I and venting via V502
- PLM aux. tank filled with He II and venting via V512
- He II pumping unit running

Activity Breakdown:

- Prepare cryostat test configuration
- Perform cryostat tests with CCU and cryo. instrumentaion
- Tilt Cryostat according instrument needs

Specific Constraints:

- Thermal requirements tbd.
- CTA requirements tbd.
- Environmental requirements tbd.

Activity Number: E.240.060

Duration: 10 days

Applicable Documents:

- CCU Test specification
- CCU Test procedure

GSE required:

- PLM test dolly
- CCS (Central Check-out system)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- Cryo. operation manager
- Electrical operation and software engineer
- EGSE operators
- Test conductor & engineer
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.240.070

Duration: 1 day

Activity Name: PTR

Objective: official close of PLM/EQM IMT sequence

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly
- PLM main tank filled with He I and venting via V502
- PLM aux. tank filled with He II and venting via V512
- He II pumping unit running

Activity Breakdown:

- Review of execution of test
- Review of required test data
- Review of procedure deviations
- Review of test procedures
- Review of NCR status
- Conclusion

Activity Number: E.240.070

Duration: 1 day

Applicable Documents:

- Relevant test procedures

GSE required:

- PLM test dolly
- CCS (Central Check-out system)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- Project management representative
- test operation manager
- PA
- Scientific instrument representatives

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.250.010

Duration: 1 day

Activity Name: TRR for EMC testing

Objective: official release to start with instrument EMC testing

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly
- PLM main tank filled with He I and venting via V502
- PLM aux. tank filled with He II and venting via V512
- He II pumping unit running

Activity Breakdown:

- Review of configuration status
- Review of documentation status
- Review of test procedures
- Review of NCR status
- Inspection status and reports
- Conclusion

Activity Number: E.250.010

Duration: 1 day

Applicable Documents:

- EMC test Specifications
- EMC test procedures

GSE required:

- PLM test dolly
- CCS (Central Check-out system)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- Project management representative
- 1 EMC operation manager
- PA
- Scientific instrument representatives

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.250.020

Duration: 5 days

Activity Name: HIFI tests

Objective: HIFI EMC test

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly
- PLM main tank filled with He I and venting via V502
- PLM aux. tank filled with He II and venting via V512
- He II pumping unit running

Activity Breakdown:

- Prepare HIFI EMC test configuration
- Perform EMC test;
- Tilt Cryostat according instrument needs

Specific Constraints:

- Tilting and thermal requirements tbd.
- CTA requirements tbd.
- Environmental requirements tbd.

Activity Number: E.250.020

Duration: 5 days

Applicable Documents:

- HIFI EMC Test Specification
- HIFI EMC Test procedure

GSE required:

- PLM test dolly
- CCS (Central Check-out system)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- EMC operation manager
- Scientific instrument representative
- Electrical operation and software engineer
- EGSE operators
- Test conductor & engineer
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.250.030

Duration: 5 days

Activity Name: PACS tests

Objective: PACS EMC test

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly
- PLM main tank filled with He I and venting via V502
- PLM aux. tank filled with He II and venting via V512
- He II pumping unit running

Activity Breakdown:

- Prepare PACS EMC test configuration
- Perform PACS EMC test;
- Tilt Cryostat according instrument needs

Specific Constraints:

- Tilting and thermal requirements tbd.
- CTA requirements tbd.
- Environmental requirements tbd.

Activity Number: E.250.030

Duration: 5 days

Applicable Documents:

- PACS EMC Test Specification
- PACS EMC Test procedure

GSE required:

- PLM test dolly
- CCS (Central Check-out system)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- EMC operation manager
- Scientific instrument representative
- Electrical operation and software engineer
- EGSE operators
- Test conductor & engineer
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.250.040

Duration: 5 days

Activity Name: SPIRE tests

Objective: SPIRE EMC test

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly
- PLM main tank filled with He I and venting via V502
- PLM aux. tank filled with He II and venting via V512
- He II pumping unit running

Activity Breakdown:

- Prepare SPIRE EMC test configuration
- Perform SPIRE EMC test
- Tilt Cryostat according instrument needs

Specific Constraints:

- Tilting and thermal requirements tbd.
- CTA requirements tbd.
- Environmental requirements tbd.

Activity Number: E.250.040

Duration: 5 days

Applicable Documents:

- SPIRE EMC Test Specification
- SPIRE EMC Test procedure

GSE required:

- PLM test dolly
- CCS (Central Check-out system)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- EMC operation manager
- Scientific instrument representative
- Electrical operation and software engineer
- EGSE operators
- Test conductor & engineer
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.250.050

Duration: 5 days

Activity Name: PACS/SPIRE tests (parallel mode)

Objective: PACS/SPIRE EMC test in parallel mode

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly
- PLM main tank filled with He I and venting via V502
- PLM aux. tank filled with He II and venting via V512
- He II pumping unit running

Activity Breakdown:

- Prepare PACS/SPIRE (parallel mode) EMC test configuration
- Perform PACS/SPIRE EMC test;
- Tilt Cryostat according instrument needs

Specific Constraints:

- Tilting and thermal requirements tbd.
- CTA requirements tbd.
- Environmental requirements tbd.

Activity Number: E.250.050

Duration: 5 days

Applicable Documents:

- PACS/SPIRE (parallel mode) EMC Test Specification
- PACS/SPIRE (parallel mode) EMC Test procedure

GSE required:

- PLM test dolly
- CCS (Central Check-out system)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- EMC operation manager
- Scientific instruments representatives
- Electrical operation and software engineer
- EGSE operators
- Test conductor & engineer
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.250.060

Duration: 1 day

Activity Name: PTR

Objective: official close of PLM/EQM EMC test sequence

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly
- PLM main tank filled with He I and venting via V502
- PLM aux. tank filled with He II and venting via V512
- He II pumping unit running

Activity Breakdown:

- Review of execution of test
- Review of required test data
- Review of procedure deviations
- Review of test procedures
- Review of NCR status
- Conclusion

Activity Number: E.250.060

Duration: 1 day

Applicable Documents:

- Relevant test procedures

GSE required:

- PLM test dolly
- CCS (Central Check-out system)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- Project management representative
- test operation manager
- PA
- Scientific instrument representatives

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.260.010

Duration: 2 days

Activity Name: Conversion to He I

Objective: conversion of HeII to HeI in the aux. tank and depletion of aux. tank

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly. PLM X-axis vertical. PLM +X-axis top.
- PLM main tank in He I condition (~ 4.2 K)
- PLM aux. tank in He II condition (< 2.14 K)
- He pumping unit II connected and running

Activity Breakdown:

- Stop He pumping unit II and disconnect
- Connect ventline
- Start aux. tank heating
- Depletion of aux. tank

Activity Number: E.260.010

Duration: 2 days

Applicable Documents:

- PLM Depletion and warm up procedure

GSE required:

- Cryo SCOE
- PLM test dolly

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- 1 Cryo. operation manager
- 1 Electrical operation and software engineer
- 1 Test conductor & engineer
- 2 CVSE technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.270.010

Duration: 8 days

Activity Name: Depletion and warm up

Objective: warm up of cryostat

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly. PLM X-axis vertical. PLM +X-axis top.
- PLM main tank in He I condition ($\sim 4.2 \text{ K}$)
- PLM aux. tank empty
- Ventline installed
- Heavy duty access platform installed
- Strap pretension measurement devices mounted

Activity Breakdown:

- Install turbo pumps to PLM
- Start heating of main tank
- Start turbo pumps (if LHe level of main tank is $\leq 10 \%$) and check CVV isolation vacuum
- Start warm up of cryostat with GHe/GN2
- Decrease strap pretension during warm up phase to nom. value
- Disconnect ventline
- Dismount and store heavy duty platform
- After successful warm up disconnect EGSE cabling from PLM
- Packing of EGSE items in transport and storage containers/boxes

Activity Number: E.270.010

Duration: 8 days

Applicable Documents:

- PLM EQM Integration procedure
- PLM Depletion and warm up procedure

GSE required:

- Cryo SCOE
- PLM test dolly
- Strap pretension measurement instrument

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- 1 Cryo. operation manager
- 1 Electrical operation and software engineer
- 1 Test conductor & engineer
- 2 CVSE technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.270.020

Duration: 1 day

Activity Name: MIP 6

Objective: to review the status of H/W and corresponding documentation

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in integration dolly.

Activity Breakdown:

- Review of documentation status
- Review status of relevant NCR's
- H/W inspection
- Review status of open work list TBC
- Take Photos for documentation TBC
- Release for further integration

Activity Number: E.270.020

Duration: 1 day

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

n.a.

Facility instrumentation:

- Astrium FN; cleanroom class 100 000

Personnel:

- 1AIT engineer
- PLM S/S representative
- customer representatives
- 1 PA
- 1 QA

Safety Precautions:

- Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.280.010

Duration: 2 days

Activity Name: Demating of SVM panels

Objective: Dismounting and storage of SVM dummy structure from PLM

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000/class 100

Configuration:

- PLM mounted in test dolly
- SVM dummy structure mounted to PLM

Activity Breakdown:

- Separate all interconnections SVM dummy structure/PLM
- Preparation/provision of SVM dummy plate support frame
- Dismount dummy SVM plate from PLM
- Put SVM dummy structure on support frame

Activity Number: E.280.010

Duration: 2 days

Applicable Documents:

- PLM EQM Deintegration procedure

GSE required:

- SVM dummy structure support frame

Facility instrumentation:

- Astrium FN; clean room class 100 000
- Facility crane, standard hoisting slings

Personnel:

- 1 crane operator
- 1 mechanical AIT engineer
- 2 CVSE/AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n. a.

Activity Number: E.290.010

Duration: 2 days

Activity Name: De-integration of warm units

Objective: Dismounting and storage of warm units from SVM dummy structure

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- SVM dummy structure placed on support frame

Activity Breakdown:

- Separate all interconnections between WU and SVM dummy structure
- Preparation/provision of WU transport /storage boxes
- Dismount WU from SVM dummy structure
- Install WU's in transport containers

Activity Number: E.290.010

Duration: 2 days

Applicable Documents:

- PLM EQM Deintegration procedure

GSE required:

- PLM test dolly
- WU's transport /storage containers

Facility instrumentation:

- Astrium FN; clean room class 100 000
- Facility crane, standard hoisting slings

Personnel:

- 1 crane operator
- 1 mechanical AIT engineer
- 2 CVSE/AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

- ESD precautions applicable

Activity Number: E.300.010

Duration: 2 days

Activity Name: Transport of WU to Alenia

Objective: Packing of WU's and transport for refurbishment to Alenia

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) ^\circ\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100
- ESD: personal ESD to be avoided

Configuration:

- WU's dismantled from SVM dummy structure and pre-installed in transport containers

Activity Breakdown:

- Take photographs from scientific instruments (tbc)
- Final inspection of WU's
- Final inspection of transport containers
- Final packing of WU's in transport containers
- Organization of transport

Activity Number: E.300.010

Duration: 2 days

Applicable Documents:

- PLM EQM Deintegration procedure
- WU transport and storage procedure

GSE required:

- WU transport containers
- Standard cleanliness equipment

Facility instrumentation:

- Astrium FN; air lock of cleanroom class 100 000

Personnel:

- 1 AIT engineer
- 1 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

- ESD precautions applicable

Activity Number: E.310.010

Duration: 2 days

Activity Name: De-integration of LOU/BOLA (incl. waveguides)

Objective: Dismounting/storage of LOU/BOLA and waveguides from PLM

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$

- humidity: $45\% < \text{RH} < 70\%$

- cleanliness: class 100 000

Configuration:

- PLM mounted in test dolly

Activity Breakdown:

- Dismount waveguides
- Separate all interconnections between LOU/BOLA and PLM structure
- Preparation/provision of LOU/BOLA storage boxes
- Dismount LOU/BOLA from PLM structure
- Install LOU/BOLA in storage boxes

Activity Number: E.310.010

Duration: 2 days

Applicable Documents:

- PLM EQM Deintegration procedure

GSE required:

- PLM test dolly
- LOU/BOLA storage boxess

Facility instrumentation:

- Astrium FN; clean room class 100 000
- Facility crane, standard hoisting slings

Personnel:

- 1 crane operator
- 1 mechanical AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n.a.

Activity Number: E.310.020

Duration: 3 days

Activity Name: Transport into cleanroom class 100

Objective: mounting of PLM in test dolly in clean room class 100

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000/100

Configuration:

- PLM mounted in test dolly. PLM X-axis vertical. PLM +X-axis top

Activity Breakdown:

- Install PLM hoisting device
- Separate PLM from test dolly
- Cleaning of PLM and hoisting device according class 100 requirements
- Move PLM by crane in clean room cl. 100
- Install PLM in integration dolly
- Disconnect hoisting device

Activity Number: E.310.020

Duration: 3 days

Applicable Documents:

- PLM EQM Deintegration procedure

GSE required:

- PLM test dolly
- PLM integration dolly
- PLM hoisting device
- Cleaning equipment

Facility instrumentation:

- Astrium FN; clean room class 100 000
- Facility crane, standard hoisting slings

Personnel:

- 1 crane operator
- 1 mechanical AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n.a.

Activity Number: E.310.030

Duration: 3 days

Activity Name: Dismounting CTA

Objective: Dismounting and storage of CTA from PLM structure

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly, PLM X-axis vertical, PLM +X-axis top
- Evacuation port mounted to CVV
- CVV under vacuum

Activity Breakdown:

- Installation of PLM pressurization line
- Pressurization of CVV to ambient pressure
- Prepare CTA storage box
- Dismount CTA from PLM structure
- Install CTA in storage box

Activity Number: E.310.030

Duration: 3 days

Applicable Documents:

- PLM EQM Deintegration procedure

GSE required:

- PLM integration dolly
- CTA storage box

Facility instrumentation:

- Astrium FN; clean room class 100

Personnel:

- 1 AIT engineer
- 2 AIT technician
- 1 electrical technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n.a.

Activity Number: E.310.040

Duration: 2 days

Activity Name: Deintegration of upper cone and upper shields

Objective: Dismounting and storage of upper cone and upper shields

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100

Configuration:

- PLM mounted in integration dolly. PLM X-axis vertical. PLM +X-axis top
- CTA mounted to upper cone

Activity Breakdown:

- Separate all interconnections from upper cone (filling line I/F, aux. tank ventline ...)
- Connect hoisting equipment to upper cone and remove upper cone from PLM
- Dismount upper conical shields 1, 2, 3
 - Open MLI seams of shield 1, 2, 3
 - Disconnect shield instrumentation connectors in between shield 1, 2, 3
- Dismount upper cylindrical shields 1, 2, 3
 - Open MLI seams of shield 1, 2, 3
 - Disconnect shield instrumentation connectors in between shield 1, 2, 3
- Storage of upper cone, upper conical shields and upper cyl. shields

Activity Number: E.310.040

Duration: 2 days

Applicable Documents:

- PLM EQM Deintegration procedure

GSE required:

- PLM integration dolly
- Upper cone lifting device
- Upper shields lifting device

Facility instrumentation:

- Astrium FN; clean room class 100

Personnel:

- 1 AIT engineer
- 2 AIT technician
- 1 MLI technician
- 1 electrical technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n.a

Activity Number: E.310.050

Duration: 5 days

Activity Name: Deintegration of CQM instruments

Objective: Dismounting of scientific instruments from OB

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100
- **ESD:** **personal ESD to be avoided**

Configuration:

- PLM mounted in integration dolly. PLM X-axis vertical. PLM + X-axis top
- PLM upper part dismounted

Activity Breakdown:

- Prepare CQM transport containers
- Disconnect OB SIH from scientific instruments I/F's
- Dismount scientific instruments from OB
- Install connector savers to scientific instruments and SIH
- Install CQM's in transport containers

Activity Number: E.310.050

Duration: 5 days

Applicable Documents:

- PLM EQM Deintegration procedure
- CQM handling manual
- CQM transport and storage procedure

GSE required:

- PLM integration dolly
- CQM transport containers

Facility instrumentation:

- Astrium FN; clean cabin class 100

Personnel:

- Scientific instrument representative
- 1 AIT engineer
- 2 AIT technician
- 1 electrical technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

- ESD precautions applicable

Activity Number: E.320.010

Duration: 5 days

Activity Name: Storage of PLM/EQM

Objective: Mounting of PLM in transport container

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100/class 100 000

Configuration:

- PLM mounted in integration dolly. PLM X-axis vertical. PLM+ X-axis top
- Transport container available in airlock of clean room class 100 000

Activity Breakdown:

- Tilt PLM with integration dolly X-axis vertical
- Install hoisting equipment to PLM I/F
- Dismount PLM from integration dolly
- Move PLM with facility crane in airlock of clean room class 100 000
- Install PLM in transport container
- Final inspection of PLM
- Close transport container
- Pressurize transport container with GN2

Activity Number: E.320.010

Duration: 5 days

Applicable Documents:

- PLM/EQM Deintegration procedure
- Transport container handling manual

GSE required:

- PLM hoisting equipment
- PLM integration dolly
- PLM transport container with GN2 pressurization equipment

Facility instrumentation:

- Astrium FN; air lock of clean room class 100 000
- Facility crane, standard hoisting slings

Personnel:

- 1 crane operator
- 1 AIT engineer
- 2 AIT technician
- 1 QA

Safety Precautions:

Standard safety precautions for crane operations are applicable

Special Notes:

n. a.

Activity Number: E.320.020

Duration: tbd. days

Activity Name: Return QM instruments for refurbishment

Objective: Packing of scientific instruments and transport

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100
- ESD: personal ESD to be avoided

Configuration:

- CQM's dismantled from OB

Activity Breakdown:

- Take photographs from CQM's (tbc)
- Final inspection of CQM'S
- Final inspection of transport containers
- Packing of CQM's
- Organization of transport

Activity Number: E.320.020

Duration: tbd. days

Applicable Documents:

- PLM EQM Deintegration procedure
- CQM transport and storage procedure

GSE required:

- CQM lifting devices
- CQM transport containers
- Standard cleanliness equipment

Facility instrumentation:

- Astrium FN; air lock of clean room class 100
- Facility crane

Personnel:

- Scientific instrument representative
- 1 AIT engineer
- 1 electrical technician
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

- ESD precautions applicable

Activity Number: E.330.010

Duration: 3 days

Activity Name: CCS setup

Objective: To check the functionality of the CCS

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- CCS already acceptance tested
- See EGSE Requirement Spec

Activity Breakdown:

- Incoming inspection
- check CCS functionality
- Data base definition and management (import/export)
- Test Environment preparation and maintenance
- Configuration control
- Test execution
- Logging and archiving
- Test Software preparation and debugging
- Synoptic picture preparation and display
- Test results post-processing
- Connect Cryo SCOE and PLM EGSE to CCS and check I/F

Activity Number: E.330.010

Duration: 3 days

Applicable Documents:

- Incoming Inspection Procedure TBD
- CCS User Manual TBD

GSE required:

- CCS
- PLM EGSE
- Cryo SCOE
- Cables

Facility instrumentation:

- Astrium FN; cleanroom class 100 000

Personnel:

- 2 EGSE operators
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.330.020

Duration: 3 days

Activity Name: CryoSCOE set-up

Objective: To check the functionality of the Cryo SCOE

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- See EGSE Requirement Spec
- Cryo SCOE already acceptance tested

Activity Breakdown:

- Incoming inspection
- check Cryo SCOE local functionality
 - Selftest
 - Data base definition and management (import/export)
 - Test Environment preparation and maintenance
 - Configuration control
 - Logging and archiving
 - GUI preparation and display
- Connect Cryo SCOE to CCS and check I/F (remote control and data transfer)
- Connect Cryo SCOE to CVSE and check I/F (monitoring)

Activity Number: E.330.020

Duration: 3 days

Applicable Documents:

- Incoming Inspection Procedure TBD
- Cryo SCOE User Manual TBD

GSE required:

- CCS
- Cryo SCOE
- Cables
- IDAS (for Signal measurement)

Facility instrumentation:

- Astrium FN; cleanroom class 100 000

Personnel:

- 1 electrical engineer
- 2 EGSE operators
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.330.030

Duration: 3 days

Activity Name: PLM EGSE set-up

Objective: To check the functionality of the PLM EGSE

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- See EGSE Requirement Spec
- PLM EGSE already acceptance tested

Activity Breakdown:

- Incoming inspection
- check PLM EGSE functionality
 - Selftest
 - Test Environment preparation and maintenance
 - Configuration control
 - Logging and archiving
 - check CDMU DFE functionality
 - check PLM SCOE (Power) functionality
- Connect PLM EGSE to CCS and check I/F (remote control and data transfer)

Activity Number: E.330.030

Duration: 3 days

Applicable Documents:

- Incoming Inspection Procedure TBD
- PLM EGSE User Manual TBD

GSE required:

- CCS
- PLM EGSE
- Cables (SCOE LAN)
- IDAS (for Signal measurement)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- 1 electrical engineer
- 2 EGSE operators
- 1 QA

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.330.040

Duration: 3 days

Activity Name: Instrument EGSE connection

Objective: To check the connection of the Instrument EGSE(s)

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- See EGSE Requirement Spec
- Instrument EGSE(s) already acceptance tested

Activity Breakdown:

- Incoming inspection
- Connect Instrument EGSE to CCS and check I/F (data transfer)

Activity Number: E.330.040

Duration: 3 days

Applicable Documents:

- Incoming Inspection Procedure TBD
- Instrument EGSE User Manual TBD

GSE required:

- CCS
- Instrument EGSE(s)
- Cables (SCOE LAN)

Facility instrumentation:

- Astrium FN; cleanroom class 100 000

Personnel:

- 3 Instrumenters
- 1 EGSE operator

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.330.050

Duration: 1 day

Activity Name: MIP 7

Objective: to review the status of H/W and corresponding documentation

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

- PLM mounted in integration dolly.

Activity Breakdown:

- Review of documentation status
- Review status of relevant NCR's
- H/W inspection
- Review status of open work list TBC
- Take Photos for documentation TBC
- Release for further integration

Activity Number: E.330.050

Duration: 1 day

Applicable Documents:

- Herschel EQM PLM Integration procedure
- Herschel EQM PLM logsheet

GSE required:

n.a.

Facility instrumentation:

- Astrium FN; cleanroom class 100 000

Personnel:

- 1AIT engineer
- PLM S/S representative
- customer representatives
- 1 PA
- 1 QA

Safety Precautions:

- Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.340.010

Duration: 10 days

Activity Name: Mechanical integration of instrument warm units

Objective: mechanical fixation of AVM's to SVM dummy structure

Requirements to be verified:

n. a.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000
- ESD: personal ESD to avoided

Configuration:

- SVM dummy structure placed on suitable support in clean room cl. 100 000
- AVM's released for integration

Activity Breakdown:

- Preparation of AVM's fixation areas at SVM dummy structure
- Mechanical fixation of AVM's to SVM dummy plate
- Mechanical check: dimensions, screw torque, screw locking, etc.

Activity Number: E.340.010

Duration: 10 days

Applicable Documents:

- Herschel EQM integration Procedure
- AVM's Handling Manual

GSE required:

- SVM dummy structure support frame

Facility instrumentation:

- Astrium FN; cleanroom class 100 000

Personnel:

- 1 AIT engineer
- 1 AIT technicians
- 1 electrical technicians
- 1QA

Safety Precautions:

- Standard safety precautions are applicable

Special Notes:

- ESD precautions are applicable

Activity Number: E.350.010

Duration: 5 days

Activity Name: Interface verification (SVM interfaces provided by PLM EGSE)

Objective: Tbd.

Requirements to be verified:

Tbd.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

Tbd.

Activity Breakdown:

Tbd.

Activity Number: E.350.010

Duration: 5 days

Applicable Documents:

Tbd.

GSE required:

Tbd.

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

Tbd.

Safety Precautions:

Tbd.

Special Notes:

Tbd.

Activity Number: E.350.020

Duration: 1 day

Activity Name: EGSE harness connection

Objective: Tbd.

Requirements to be verified:
Tbd.

Environment:
- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:
Tbd.

Activity Breakdown:
Tbd.

Activity Number: E.350.020

Duration: 1 day

Applicable Documents:

Tbd.

GSE required:

Tbd.

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

Tbd.

Safety Precautions:

Tbd.

Special Notes:

Tbd.

Activity Number: E.360.010

Duration: 3 day

Activity Name: FPU Simulator Integration

Objective: Tbd.

Requirements to be verified:
Tbd.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

Tbd.

Activity Breakdown:

Tbd.

Activity Number: E.360.010

Duration: 3 day

Applicable Documents:

Tbd.

GSE required:

Tbd.

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

Tbd.

Safety Precautions:

Tbd.

Special Notes:

Tbd.

Activity Number: E.360.020

Duration: 1 day

Activity Name: Test Readiness Review TRR

Objective: official release to start with instrument WU testing

Requirements to be verified:

n. a.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

- WU mechanically and electrically mounted to SVM simulator

Activity Breakdown:

- Review of configuration status
- Review of documentation status
- Review of test procedures
- Review of NCR status
- Inspection status and reports
- Conclusion

Activity Number: E.360.020

Duration: 1 day

Applicable Documents:

- WU test Specifications
- WU test procedures

GSE required:

- SVM simulator for WU
- CCS (Central Check-out system)

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

- Project management representative
- 1 WU test operation manager
- PA
- Scientific instrument representatives

Safety Precautions:

Standard safety precautions are applicable

Special Notes:

n. a.

Activity Number: E.370.010

Duration: 8 day

Activity Name: HIFI test sequence debugging

Objective: Tbd.

Requirements to be verified:

Tbd.

Environment:

- temperature: $(22 \pm 3) \text{ }^{\circ}\text{C}$
- humidity: $45\% < \text{RH} < 70\%$
- cleanliness: class 100 000

Configuration:

Tbd.

Activity Breakdown:

Tbd.

Activity Number: E.370.010

Duration: 8 day

Applicable Documents:

Tbd.

GSE required:

Tbd.

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

Tbd.

Safety Precautions:

Tbd.

Special Notes:

Tbd.

Activity Number: E.370.020

Duration: 8 day

Activity Name: PACS test sequence debugging

Objective: Tbd.

Requirements to be verified:

Tbd.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

Tbd.

Activity Breakdown:

Tbd.

Activity Number: E.370.020

Duration: 8 day

Applicable Documents:

Tbd.

GSE required:

Tbd.

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

Tbd.

Safety Precautions:

Tbd.

Special Notes:

Tbd.

Activity Number: E.370.030

Duration: 8 day

Activity Name: SPIRE test sequence debugging

Objective: Tbd.

Requirements to be verified:
Tbd.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

Tbd.

Activity Breakdown:

Tbd.

Activity Number: E.370.030

Duration: 8 day

Applicable Documents:

Tbd.

GSE required:

Tbd.

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

Tbd.

Safety Precautions:

Tbd.

Special Notes:

Tbd.

Activity Number: E.370.040

Duration: 8 day

Activity Name: PACS/SPIRE test sequence debugging (parallel mode)

Objective: Tbd.

Requirements to be verified:

Tbd.

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

Tbd.

Activity Breakdown:

Tbd.

Activity Number: E.370.040

Duration: 8 day

Applicable Documents:

Tbd.

GSE required:

Tbd.

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

Tbd.

Safety Precautions:

Tbd.

Special Notes:

Tbd.

Activity Number: E.380.010

Duration: 3 day

Activity Name: FPU Simulator De-integration

Objective: Tbd.

Requirements to be verified:

Tbd..

Environment:

- temperature: (22 ± 3) °C
- humidity: $45\% < RH < 70\%$
- cleanliness: class 100 000

Configuration:

Tbd.

Activity Breakdown:

Tbd.

Activity Number: E.380.010

Duration: 3 day

Applicable Documents:

Tbd.

GSE required:

Tbd.

Facility instrumentation:

- Astrium FN; clean room class 100 000

Personnel:

Tbd.

Safety Precautions:

Tbd.

Special Notes:

Tbd.

Quantity	Name	Dep./Comp.	Quantity	Name	Dep./Comp.
X	Alberti von Mathias Dr.	ED 544	X	Tenhaeff Dieter	ED 544
X	Barlage Bernhard	ED 62		Thörmer Klaus-Horst Dr.	OTN/ED 37
X	Bayer Thomas	ED 532	X	Wagner Adalbert	OTN/IP 35
X	Faas Horst	ED 12	X	Wagner Klaus	ED 541
X	Grasl Andreas	OTN/TN 42		Wilz Eberhard	OTN/ED 37
	Hartmann Hans Dr.	ED 522	X	Wöhler Hans	ED 544
X	Hauser Armin	ED 541		Ziegler Fred	OTN/ED 522
X	Hohn Rüdiger	ED 531		Zipf Ludwig	EC 32
X	Hölzle Edgar	ED 12			
X	Huber Johann	ED 532	X	Wichtbrock	
X	Idler Siegmund	ED 521	X	Wack	
X	Ivány von András	EC 32	X	Schwabbauer	
X	Jahn Gerd Dr.	ED 541	X	Hinger	
X	Kalde Clemens	ED 513	X	Runge	
X	Kameter Rudolf	OTN/ED 37			
X	Knoblauch August	ED 51	X	Pastorius	
X	Koelle Markus				
X	Kroeker Jürgen	ED 515			
X	Lamprecht Ernst	OTN/TP82			
X	Lang Jürgen	ED 556	X	Mr. J. J. Juillet (FTP)	Alcatel
X	Langfermann Michael	ED 531	X	Mr. T. Passvogel (FTP)	ESTEC
X	Maier Hans-Ulrich	ED 61			
X	Moritz Konrad Dr.	ED 37			
X	Peitzker Helmut	ED 37			
X	Peltz Heinz-Willi	ED 515			
X	Peters, Gerhard	ED 533			
	Pietroboni Karin	ED 37			
X	Puttlitz Joachim	OTN/ED 37			
X	Raupp Helmut	ED 543			
X	Rebholz Reinhold	ED 531			
X	Reuß Friedhelm	ED 7			
X	Rühe Wolfgang	ED 3			
	Sachsse Bernt	EC 34			
X	Sagner Udo	OTN/TN 42			
X	Schink Dietmar	ED 522			
X	Schlosser Christian	OTN/TN 42			
X	Schweickert Gunn	ED 544			
X	Steininger Eric	ED 522			
X	Stritter Rene	ED 61			