HERSCHEL / PLANCK

Planck RFQM AIT Plan

H-P-3-ASP-PL-0669

Product Code : 200000

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1. INTRODUCTION

1.1 FOREWORD

This document describes the assembly, integration and test activities to be performed by ALCATEL as AIT Contractor on Planck RFQM.

All the Planck activities planned before the satellite launch can be splinted in five major parts:

1.1.1 CQM (Cryo Qualification Model) activities:

Refer to [RD2]

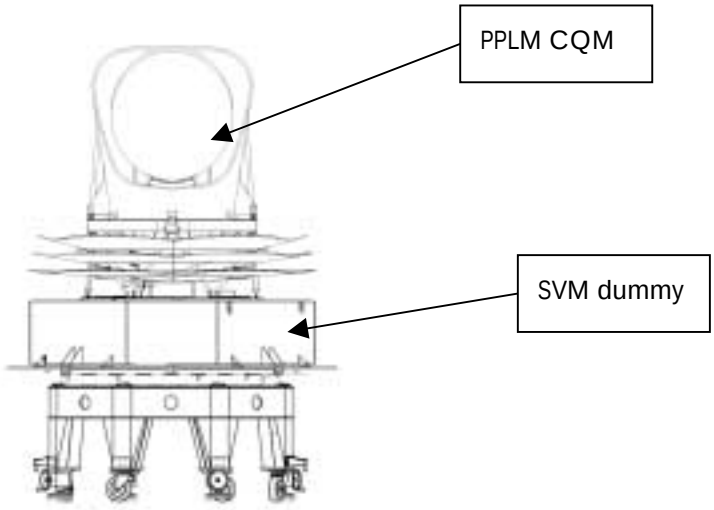


Figure 1: Satellite CQM configuration

→ perform an early acoustic testing of the Planck PLM so as to obtain advanced and reliable data supporting the validation of some instruments –mainly the FPU's- specified mechanical environment before FPU FM test campaign.

→ Perform a PPLM thermal balance to :

- ✓ validate the passive cooling
- ✓ validate the active cooling (0.1K, 4K, 20K)
- ✓ validate the HFI detection chain
- ✓ validate the non-impact of the μ-vibration environment
- ✓ measure conducted EMC at HFI instrument level

1.1.2 STM (Structural and Thermal Model) activities:

refer to [RD3]

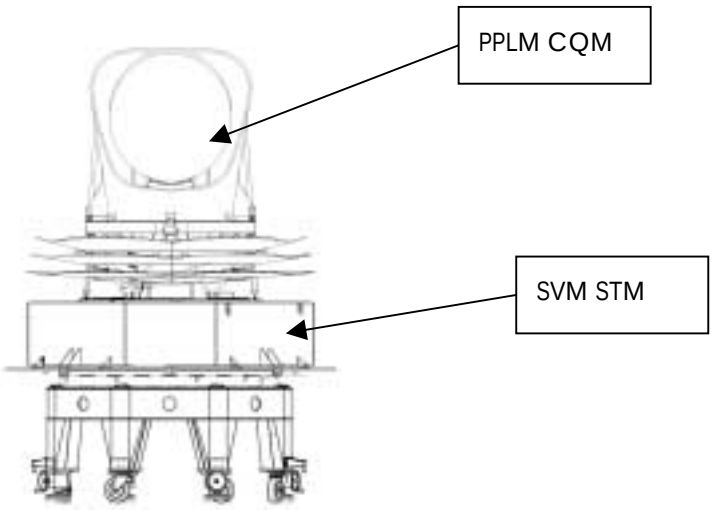


Figure 2 : Satellite STM configuration

→ Perform mechanical qualification test: acoustic and sine vibrations measurements , shogun test, MCI, balancing,

1.1.3 RFQM (Radio Frequency Qualification Model) activities:

Deal in this document

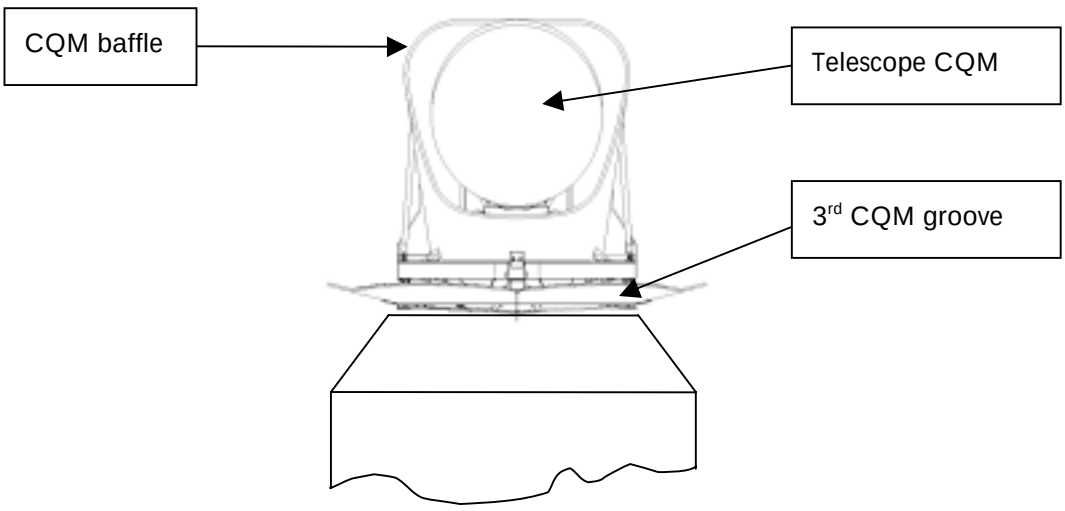


Figure 3: PPLM RF QM configuration

→ The aim of the RFQM is the validation at PLM level of RF performances and of the associated mathematical models. The model is representative of all the elements active in the RF performances (i.e. telescope/baffle and the third groove of the cryo structure

1.1.4 AVM (Avionique Model) activities:

refer to [RD4]

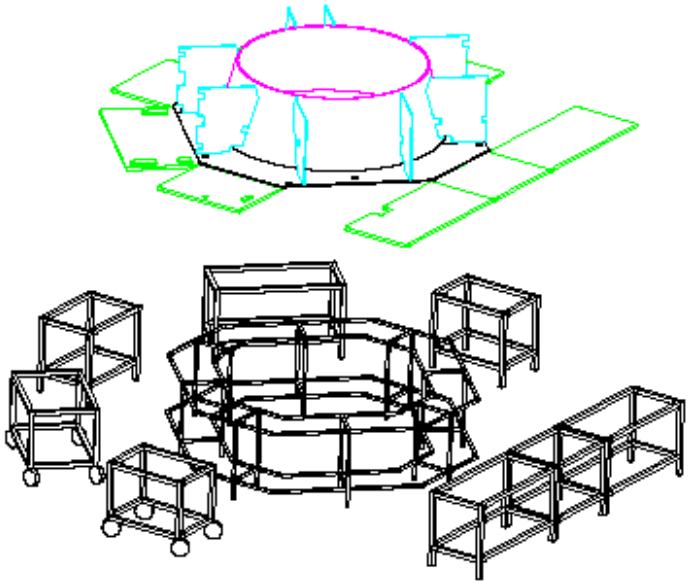


Figure 4: AVM configuration

The AVM model will be made with fixed table + two wheels table (to ease the swap between Herschel and Planck). The different panels as well as the harness will be set on these table.

→ The aim of the AVM is the validation of the functional chains at system level

1.1.5 Satellite PFM (Proto Flight Model) activities:

Refer to [RD1]

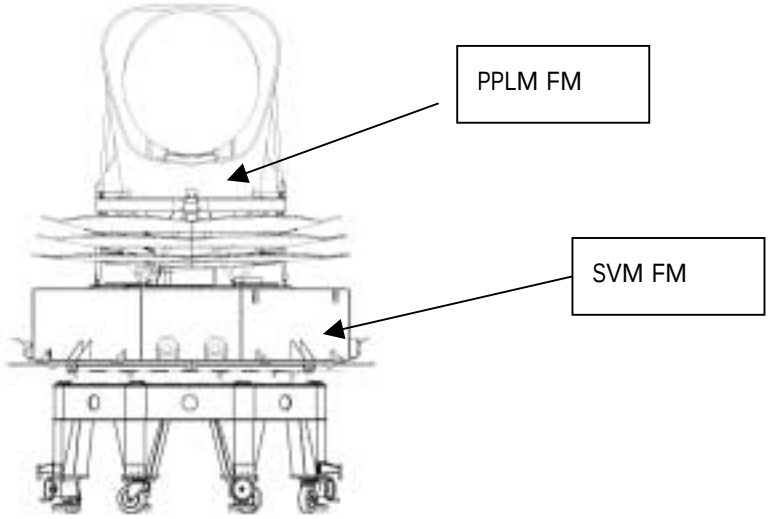


Figure 5: Planck satellite configuration

→ The aim of the satellite is the verification of the overall satellite functioning and performances. The PFM is submitted to qualification levels during acceptance tests.

1.1.6 Top overview of the five main parts:

1.1.6.1 PPLM CQM / STM / RFQM logic

This logic diagram is simplified. This document will deal with the detailed CQM activities in next chapter. [RD9] will deal with the detailed STM activities. [RD8] will deal with the detailed RFQM activities.

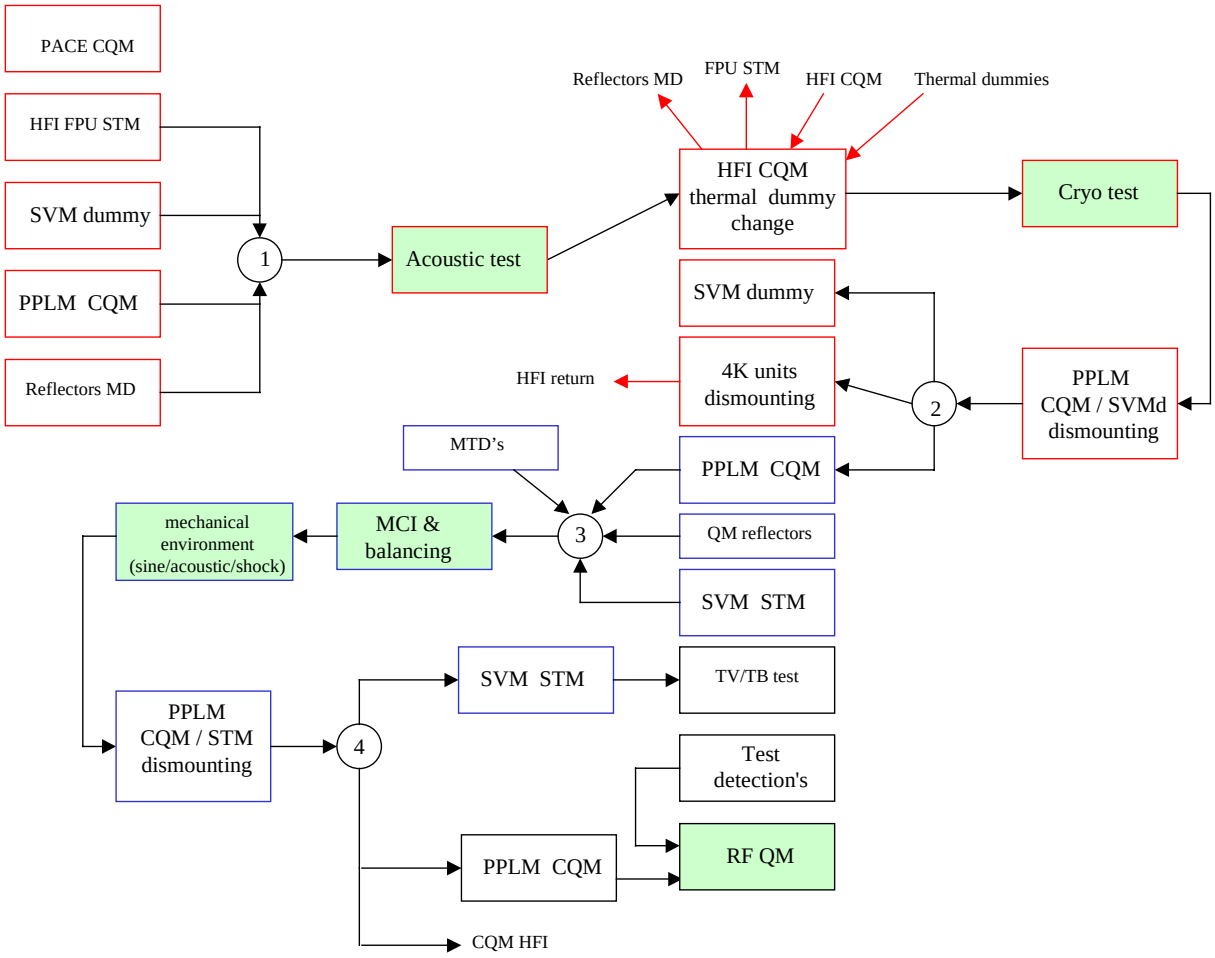


Figure 6: CQM / STM / RF QM logic

1.1.6.2 AVM logic

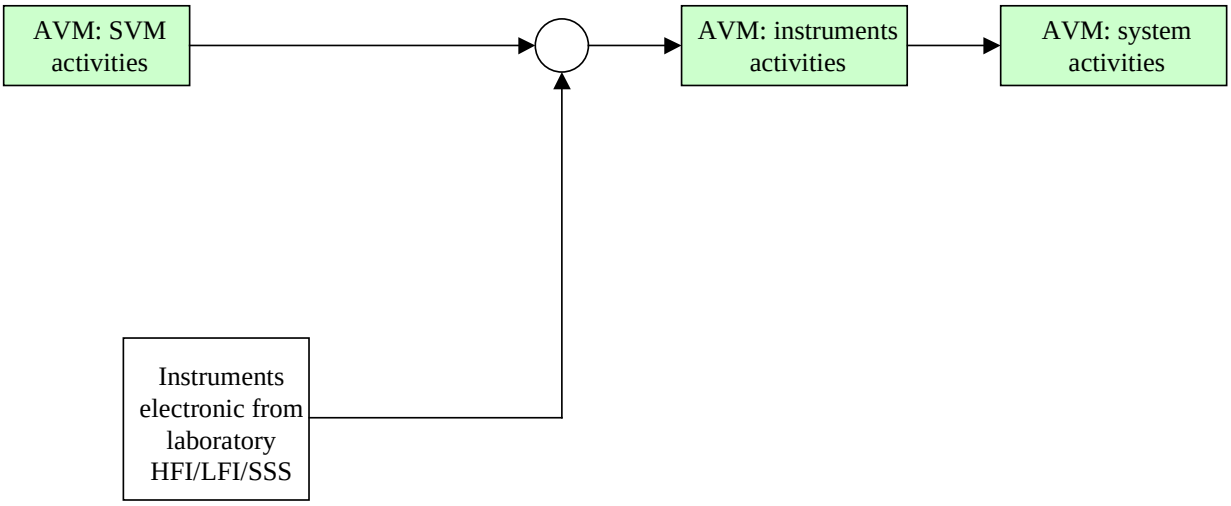
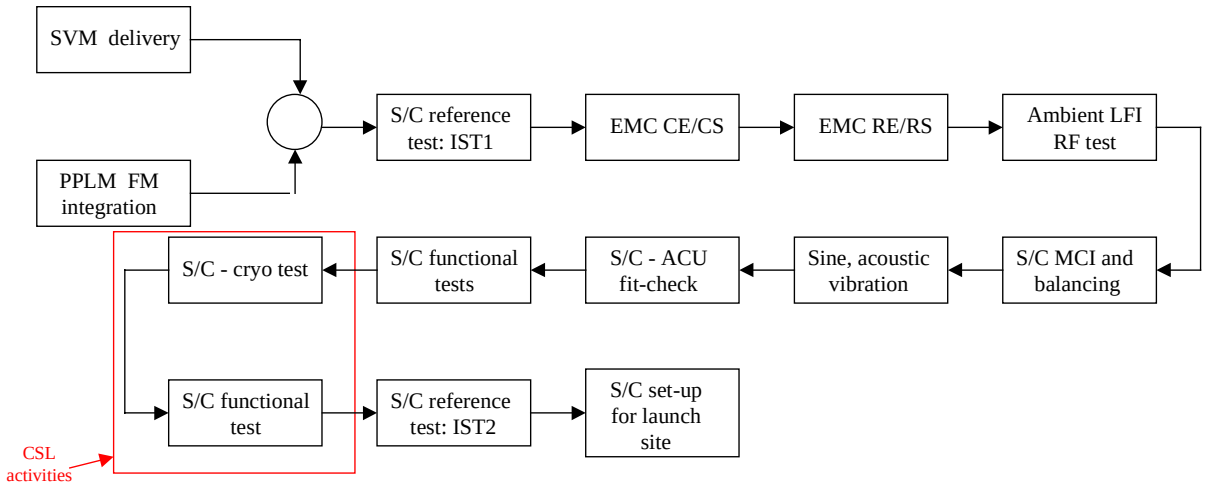


Figure 7: AVM logic

1.1.6.3 PFM logic



Note: SVT1 can be planned at any moment until the first S/C reference test and the second reference test

Doc H-P-3-ASPI-PL-0208

Figure 8: satellite logic

1.2 SCOPE

The objective of this plan is to define :

- an AIT programme in accordance with the system level AIV requirements (only RFQM part in this document)
- the relevant organisation, necessary to carry out all tasks identified in the AIT programme
- the required test documentation and test software
- 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 operations
- the AIT programme schedule and the major milestones
- the integration and test sequences.

This document deals only with the RFQM activities.

2. APPLICABLE AND REFERENCE DOCUMENTS

2.1 APPLICABLE DOCUMENTS

AD 1	System Verification Performance Plan Document n° H-P-1-ASPI-PL-0225
AD 2	Herschel/Planck system requirement specification Document n° SCI-PT-RS-05991
AD 3	Herschel/Planck Product Assurance Requirement Document n° SCI-PT-RS-04683
AD 4	Cleanliness Requirements Specification Document n° H-P-1-ASPI-SP-0035
AD 5	General Design & Interface Requirement Document n° H-P-1-ASPI-SP-0027
AD 6	PA Plan Document n° H-P-1-ASPI-PL-0055
AD 7	Design and Development Plan Document n° H-P-1-ASPI-PL-0009
AD 8	Planck Alignment Plan Document n° H-P-3-ASPI-PL-0078
AD 9	Planck Cleanliness Control Plan Document n° H-P-3-ASPI-PL-0253
AD 10	Planck RFQM test requirements Document n° H-P-3-ASP-SP-0561
AD 11	Design and Development Plan Document n° H-P-1-ASPI-PL-0055

2.2 REFERENCE DOCUMENTS

RD1	Planck PFM AIT plan Document n° H-P-3-ASPI-PL-0208
RD2	Planck CQM AIT plan Document n° H-P-3-ASP-PL-0668

RD3	Planck Satellite STM AIT plan (Mechanical test) Document n° H-P-3-ASP-PL-0670
RD 4	Herschel / Planck Service Module AIT plan Document n° H-P-PL-AI-0012
RD 5	Planck deployment in clean room Doc n° H-P-3-ASPI-TN-0442
RD 6	EGSE General Requirements Specification Document n° H-P-1-ASPI-SP-0048
RD 7	MGSE General Requirements Specification Document n° H-P-1-ASPI-IS-0044
RD 8	EGSE General Requirements Specification Document n° H-P-1-ASPI-IS-0121
RD 9	MGSE Interface Requirements Document n° H-P-1-ASPI-IS-0120
RD 10	EGSE Deployment Plan Document n° H-P-1-ASPI-PL-0220
RD 11	MGSE Deployment Plan Document n° H-P-1-ASPI-LI-0119
RD 12	Planck SVM dummy structure specification Document n° H-P-3-ASP-SP-0545
RD 13	Specification of facilities for Planck Cryogenic Test Sequence Document n° H-P-3-ASPI-TS-0051
RD 14	Satellite AIT software management plan Document n° H-P-1-ASP-PL-0420
RD 15	Planck Cryogenic Test Operation Plan Document n° H-P-3-ASP-PL-0502
RD 16	CQM technical description Document n° H-P-3-ASP-TN-0671
RD 17	Common ground support equipment maintenance Document n° H-P-1-ASP-PL-0544
RD 18	Planck Assembly Sequence Doc n° H-P-3-ASP-TN-0521
RD 19	Planck Electrical Integration Sequence Doc n° H-P-3-ASP-TN-0611

2.3 ACRONYMS

AC	Alternating Current
ACC	Attitude Control Computer
ACME	Attitude Control and Measurement Electronic
ACMS	Attitude Control and Measurement Subsystem
ACR	AIT Change Request
ACU	Adaptateur Charge Utile
ADP	Acceptance Data Package
AIT	Assembly, Integration and Test
AIV	Assembly, Integration and Verification
AVM	Avionics Verification Model
BEU	Back End Unit (LFI)
C/O	Check Out
CATR	Compact Antenna Test Range
CAU	Cooler Ancillary Unit
CCS	Control Check-out System
CCU	Cryostat Control Unit
CDMS	Command and Data Management Subsystem
CDMU	Central Data Management Unit
CE	Conducted Emission
CEU	Cryo Electronics Unit
CFRP	Carbon Fibre Reinforced Plastic
CLCW	Command List Control Word
CLTU	Command Link Transfer Unit
CoG	Centre of Gravity
CQM	Cryogenic Qualification Model
CS	Conducted Susceptibility
CSL	Centre Spatial de Liège
DAE	Data Acquisition Electronics (LFI)
DBS	Data Base System
DBMS	Data Base Management System
DC	Direct Current
DCCE	Dilution Cooler Control Equipment
DCCU	Dilution Cooler Control Unit
DCE	Dilution Cooler Equipment
DFE	Data Front End
DPU	Digital Processing Unit
EED	ElectroExplosive Device
EGSE	Electrical Ground Support Equipment
ELD	Equipment panel Lifting Device
EMC	ElectroMagnetic Compatibility
ENV	ENVironment
EPS	Electrical Power System
EPT	Equipment Panel Trolley
EQM	Engineering Qualification Model (of spacecraft)
ESA	European Space Agency
ESD	ElectroStatic Discharge

ESOC	European Space Operations Centre
FAR	Flight Acceptance Review
FIP	Failure Investigation Procedure
FOP	Flight Operations Plan
FPA	Focal Plane Assembly
FPU	Focal Plane Unit
GN2	Gaseous Nitrogen
GSE	Ground Support Equipment
H/W	HardWare
He	Helium
HFI	High Frequency Instrument (Planck)
HHD	Horizontal Hoisting device
HK	House Keeping
HPSDB	Herschel Planck System Data Base
HLC	High Level Command
HW	Hard Ware
ICD	Interface Control Document
I/F	Inter Face
IS	InStrument
ISDN	Integrated Service Digital Network
IST	Integrated Satellite Test
ITT	Invitation To Tender
JFET	Junction Field Effect Transistor
KIP	Key Inspection Point
LAN	Local Area Network
LFI	Low Frequency Instrument
LGA	Low Gain Antenna
LHe	Liquid Helium
LN2	Liquid Nitrogen
MCI	Masse, centring, Inertia
MGA	Medium Gain Antenna
MGSE	Mechanical Ground Support Equipment
MIP	Mandatory Inspection Point
MLI	MultiLayer Insulation
MOC	Mission Operations Centre
MPI	Masse, Product Inertia
MPT	Multi Propose Trolley
MTD	Mechanical & Thermal Dummy
MTL	Mission Time Line
N/A	Not Applicable
NA	Not Applicable
NCR	Non Conformance Report
NDIU	Network Data Interface Unit
OBCP	On-Board Control Procedure
OBSW	On-Board SoftWare
OBT	On-Board Time
PA	Product Assurance
PAD	PPLM Adaptet Device
PAP	PLM Access Platform
PAU	Power Amplifier Unit

PCDU	Power Conditioning & Distribution Unit
PFM	Proto-Flight Model
PGSE	Pneumatic Ground Support Equipment (HFI dilution)
PLM	Payload Module
PPLM	Planck Payload Module
PTR	Post Test Review
PTT	Panel Tilting Trolley
PVHD	PLM Vertical Hoisting Device
QA	Quality Assurance
QC	Quality Controller
QM	Qualification Model
QRS	Quarts Rate Sensor
RAA	Radiometry Array Assembly (LFI)
RAIT	Responsible AIT
RCS	Reaction Control System
RE	Radiated Emission
REBA	Radiometer Electronics Box Assembly (LFI)
REU	Read out Electronics Unit
RF	Radio Frequency
RFDM	Radio Frequency Development Model
RFQM	Radio Frequency Qualification Model
RFW	Request For Waiver
RMS	Root Mean Square
RS	Radiated Susceptibility
RSAIT	Responsible System AIT
S/C	SpaceCraft
SA	Solar Array
SC	SpaceCraft
SCC	Sorption Cooler Compressor (LFI)
SCE	Sorption Cooler Electronics (LFI)
SCOE	Special Check Out Equipment
SCS	Sorption Cooler Subsystem (LFI)
SFT	Short Functional Test
SID	SCC Integration Device
SIT	System Integration Test
SLI	Single Layer Insulation
SOW	Statement Of Work
SPF	Single Point Failure
SPSD	SCC Panels Stiffener Device
SPT	Specific Performance Test
SS	Subsystem
SREM	Standard Radiation Environment Monitor
STM	Structural/Thermal Model
STR	Star Tracker
SVM	SerVice Module
SVT	System Validation Test
SW	SoftWare
TBC	To Be Confirmed
TBD	To Be Defined
TC	TeleCommand

TFPU	Test Focal Plane Unit
TGSE	Tanking Ground Support Equipment
THA	Transport and Handling Adapter
TRR	Test Readiness Review
TRS	Test Requirement Sheet
TTC	Telemetry, Tracking & Command
TV	Thermal Vacuum
UFT	Unit Function Test
UIT	Unit Integration Test
UP	Umbilical Plug
US	United States
VHD	Vertical Hoisting Device
VIS	Vertical Integration Stand
VMC	Video Monitoring Camera
WU	Warm Unit

3. MODEL PHILOSOPHY

3.1 GENERAL

The PLANCK design and development plan deals with the following model philosophy :

- RFQM: RF Demonstration Model and RF Qualification Model ; PLANCK RF qualification done at subsystem level
- CQM [RD2]: Cryo. Qualification Model ; PLANCK satellite thermal and cryo. qualification
- STM [RD3]: Structure Thermal Model; PLANCK satellite mechanical qualification
- AVM [RD4]: AVionic Model ; PLANCK functional and performances qualification (done by ALENIA at SVM level, by Alcatel at Satellite level)
- PFM [RD1] : Proto Fligth Model ; PLANCK satellite

This document describes the RFQM Assembly, integration & test.

The respective start of integration & test campaign of CQM, STM, AVM, RFQM, PFM models will follow System Design & Development plan [AD11], reflected in the reference baseline schedule included in the AIT plan.

In this document, the contractor is the company that will be in charge of the RF measurements.

3.2 MODELS DEFINITION

3.2.1 Satellite CQM (Structural Cryo. Qualification Model)

The aim of the CQM is the validation at system level of thermal and cryogenic concepts and of the associated mathematical models. Before the cryo test, an early acoustic testing shall be performed so as to obtain advanced and reliable data supporting the validation of some instruments –mainly the FPU's- specified mechanical environment before FPU FM test campaign.

3.2.1.1 Acoustic test

The model has been designed to be representative of the satellite for acoustic test.

It can be splited in two main parts:

- PPLM CQM: incluing the following functionality's:
  - FPU structural model (HFI STM+ LFI MTD)
  - Mass dummies to simulate the missing units
  - Telescope CQM with reflectors mass dummies

- Cryo structure CQM
- PACE CQM

- SVM dummy
  - Design to support the PPLM
  - No others functionality needs for the acoustic test

3.2.1.2 Cryo test

The model has been designed to be representative of the satellite for cryo tests. For the power simulated dissipation of the missing units, heaters have been installed; SVM dummy is not fully representative of the thermal aspect, only the interface with the PPLM is representative in order to not disturb the performances of the cryo subsystem.

It can be splited in two main parts:

- PPLM CQM: incluing the following functionality's:
  - complete HFI detection chain
  - 0.1K, 4K and PACE cooler chains
  - cryo sensors acquisition (test sensors + flight sensors)
  - heaters for power simulated dissipation
  - telescope CQM without reflectors QM
  - cryo structure CQM
- SVM dummy: incluing the following functionality's:
  - Structural aspect to support the PPLM
  - Thermal representive aspect on the PPLM / SVM dummy interface area.
  - Complete HFI detection chain (electronic units: WU)
  - 4K cooler chains
  - 0.1K and 20K cooler chains are not representative ; PGSE have been designed to simulate them

3.2.2 Satellite STM (Structural Thermal Model)

The aim of the STM is the validation at system level of mechanical, shocks, MCI, balancing and of the associated mathematical models.

The satellite STM is fully representative of structural aspects . The SVM is built up with equipment structural and thermal dummies, it includes a flight representative propulsion subsystem .

It can be splited in two main parts:

- PPLM CQM: incluing the following functionality's:
  - complete HFI detection chain

- 0.1K and 20K cooler chains (4K replaced by MD)
- cryo sensors acquisition (flight sensors)
- telescope CQM with reflectors QM
- cryo structure CQM

- SVM STM: incluing the following functionalities:
  - Complete HFI detection chain (electronic units: WU)
  - Mass dummies for the others units (except 0.1K DCCU CQM)
  - Propulsion tanks CQM

3.2.3 RFQM (RF Qualification Model)

The aim of the RFQM is the validation at PLM level of RF performances and of the associated mathematical models.

The model is representative of all the elements active in the RF performances (i.e telescope / baffle and the third groove of the cryo. structure) .

The telescope the baffle and the third groove are the CQM model ones.

3.2.4 AVM(Avionic Model)

The aim of the AVM is the validation at system of functional chains.

The model is fully representative of electronics/software aspects, it includes flight representative units / bread board / simulator. Refer to [RD4]

3.2.5 Satellite PFM (Proto Flight Model)

The aim of the satellite is the verification of the overall satellite functioning and performances.

The PFM is submitted to qualification levels during acceptance tests. The levels and the duration of the tests will be defined later in the “tests specifications” documents.

3.3 INCOMING

Before integration, verification is performed on each delivered unit to control the quality of the hardware to be integrated.

As minimum, the following controls are performed :

- verification of data package according to the shipping list

- visual inspection
- conformity of identification markings and serial numbers to the configuration status
- planarity
- mass.

3.4 ASSEMBLY

The S/C and other model will be assembled in a class 100000 (US fed. Std) clean room.

Assembly methods and hardware will conform to the latest satellite design, drawings and procedures.

Afterwards it will be prepared on the table if required and then mounted on the structure in accordance with the respective procedure.

Bonding and grounding measurements will terminate the assembly.

A well-trained team with adequate QA coverage will perform all these activities. Only members of this group will be authorised to perform mechanical operations on the satellites or part of them.

3.5 MECHANICAL INTEGRATION

3.5.1 Hardware release

Hardware release 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.

3.5.2 Hardware "as built status" report

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

- integrated hardware part and serial number
- ADP reference
- integration date
- integration location when applicable
- module status
- subsystem
- mass of unit
- integration procedure reference (with issue/rev) with the record of:
    - ➢ torquing of fixing screws

- marking (or eventually sticking) of fixing screws

3.5.3 Handling

The handling activities of module and system hardware, in the various integration and testing facilities shall only be carried out using the dedicated MGSE and by trained personnel having the necessary experience.

Only authorised crane operators will operate in particular, overhead crane.

3.6 Specific Performance Test

The RFQM test is a specific test performed with specific horns, test horns (TBC) and CQM complete telescope. The objective of this activity is to perform the RF characterisation of the Planck telescope and FPU.

As the ITT results is not known up to now, this AIT plan has been written with the test specifications [AD10]. Some arrangements may be necessary after the kick-off.

4. SPECIFIC CONSTRAINTS

4.1 CLEANLINESS

The requirements on cleanliness are recalled in [AD4].

Planck AIT is performed in a clean room class 100.000 of US Federal Std n° 209B. The clean rooms are in accordance with the following conditions:

- Temperature: 22°C +/- 3°C
- Relative humidity: 55% +/- 10%

4.2 SPECIFIC PROTECTIONS

To limit particulate contamination during AIT, several types of covers are necessary . These covers will be dismounted for some RF performances measurements.

The reflectors protections will be provided by CONTRAVES, the optical cavity protection will be provided by ASP.

In order to characterise the optical cavity protections, ASP proposes to perform RF measurements with and without the protections. The results can ease the choice of the set-up for the flight model.

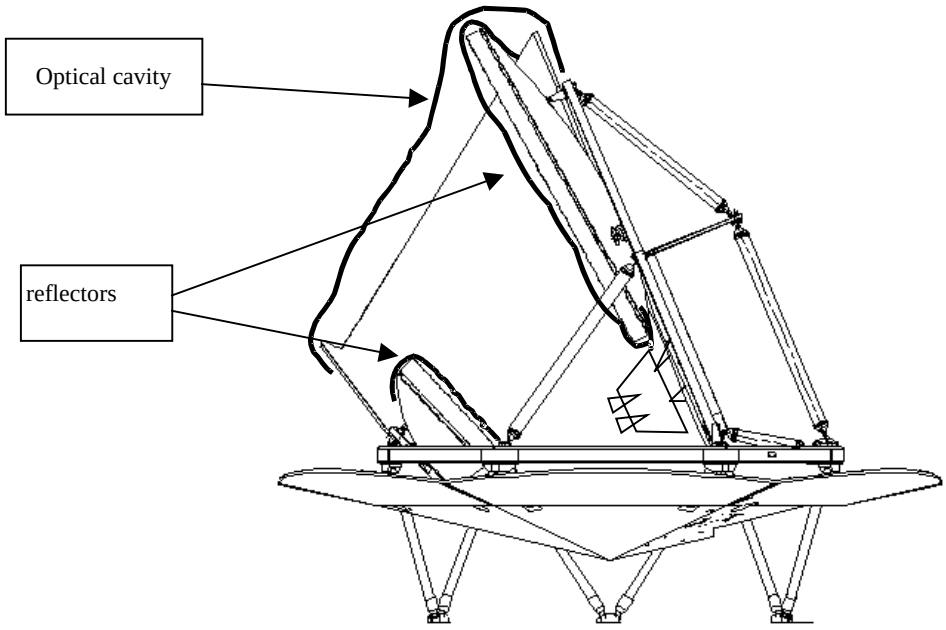


Figure 9: PPLM protections set

5. AIT SEQUENCES

This chapter describes the AIT activities at RFQM level, from unit/subsystem assembly

to the end of the RFQM test campaign.

The sequences logic may be arranged in order to improve the schedule and reduce the costs without jeopardising the qualification or the health of the hardware. This point will be closely examined during early phase of the programme and the rearrangements will be proposed and discussed thoroughly.

The following flow charts describe the main activities of the system level satellite AIT plan.

As the RFQM performance measurements is under evaluation (up to now, company which will be in charge of these measurement is not chosen), ASP AIT team doesn't know today the exact sequence. Some improvements in the activity logic will be done after the kick off, when all the hypothesis will be known.

In this AIT plan, ASP takes the assumption that:

- the six RF modules are integrated together in the main frame and that all the measurements will be done with only one main frame dismounting for changing the horns polarisation's.
- the telescope is aligned

5.1 Tests list

The tests to be performed are:

- Main lobe measurements
- Intermediate area measurements
- Straylight zone measurements
- Spill over lobe zone measurements
- High resolution measurements.

All these measurements will be performed in two polarisation's.

5.2 RFQM assembly, integration and tests

5.2.1 Assembly, Integration and Test logic

- For RFQM test, the main part of the model will be:
  - → Partial CQM cryo structure (only the struts and the 3rd groove)
  - → CQM telescope

- → CQM reflectors
- → CQM baffle
- → 5 horns (2 in LFI frequency, 3 in HFI frequency) + 1 test horn (TBC) included in a main frame

The 5 horns + 1 test horn with theirs own RF modules will be integrated in the main frame. This integrated part is called TFPU.

The integration logic of the RFQM is the following:

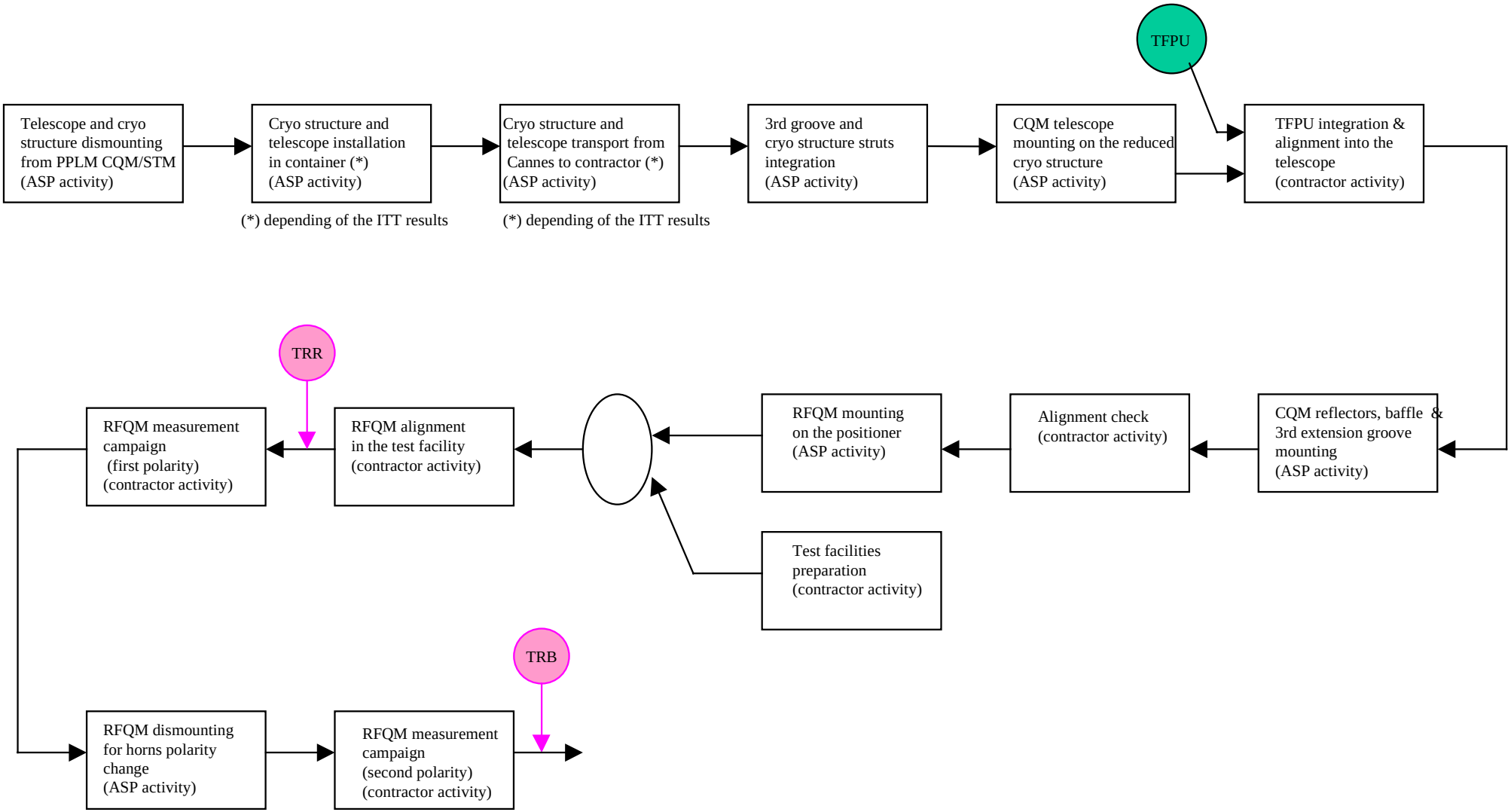
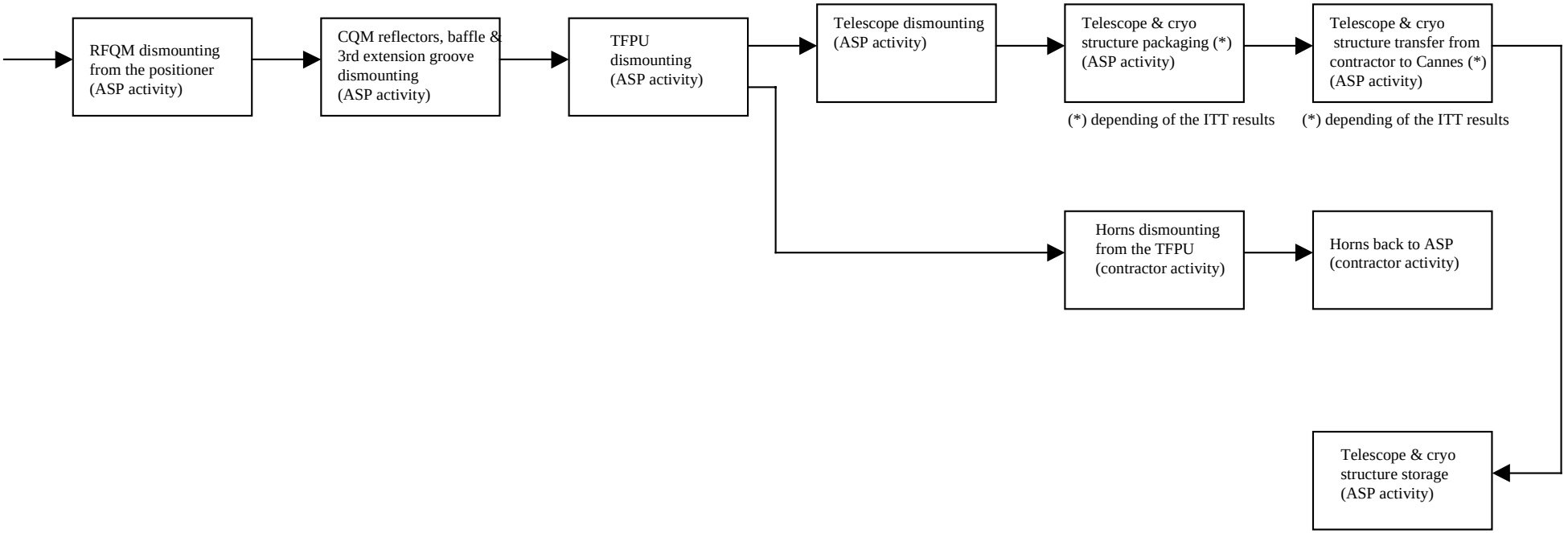


Figure 10: RFQM detailed logic



5.2.2 RFQM GSE configuration

- No specific EGSE will be used for the RFQM performance measurements campaign. The equipment's used will be the ones setting in the test facilities + RF measurements equipment's connected to the RF modules (network analyser, synthesiser…..).
- Stands and handling devices will be used for the RFQM set-up. Planck MGSE as MPT, telescope stand, cryo-structure stand already exist. This test will require some specific MGSE (positioner adaptor (contractor responsibility), MPT/RFQM adaptor, RFQM hoisting device, MGSE for TFPU dismounting (TBC)…
- Telescope and cryo-structure container.

5.3 RFQM task sheets

TS RFQM AI1: cryo structure & telescope installation in the container, transfer to the contractor.	RFQM model
Duration	8 days
Ambience	Class 100000

Goal :

To package all the RFQM part into the container.

To transfer the RFQM to the contractor

Note: this task depends of the ITT results.

Specimen configuration :

- Mechanical configuration / MGSE required :
  - Satellite STM completely dismounted.
  - MGSE needs: telescope stand, cryo structure support MGSE, cryo structure container, telescope container.

- Electrical configuration / EGSE required :
  - N/A

Activity :

- Integration of the telescope on the telescope stand (telescope structure, reflectors, baffle).
- Cleanliness protection covers installation, if it's not already done.
- Set the telescope in its container.
- Integration of the 3rd groove and the struts in the cryo structure support.
- Set the cryo structure in its container.
- Containers transportation from Cannes to contractor premises.

TS RFQM AI2: cryo structure and telescope mounting (first part)	RFQM model
Duration	5 days
Ambience	Class 100000

Goal :

To mount the cryo structure and the telescope structure on the cryo structure support.

Specimen configuration :

- Mechanical configuration / MGSE required :
  - Cryo structure and telescope into theirs containers in the contractor premises.
  - MGSE needs: telescope stand, cryo structure support MGSE, cryo structure container, telescope container, MPT, cryo structure/MPT adaptor.

- Electrical configuration / EGSE required :
  - N/A

Activity :

- Telescope container opening .
- Telescope mounting on its stand.
- Cryo structure container opening.
- Cryo structure mounting on the MPT.
- Telescope mounting in the cryo structure.
- MLI installation.

TS RFQM AI3: RFQM model completion & moving to the positioner	RFQM model
Duration	8 days
Ambience	Class 100000

Goal :

To complete the RFQM model.

To mount the RFQM model on the positioner.

Specimen configuration :

- Mechanical configuration / MGSE required :
  - Telescope mounting on the cryo structure (without the TFPU)
  - MGSE needs:
    - → Under ASP responsibility: MPT, cryo structure/MPT adaptor, Telescope hoisting device
    - → Under contractor responsibility: positioner / RFQM adaptor.
  - TFPU completely mounted with the horns, alignment between the horns phase centre and the bipods plan done on the table (under contractor responsibility).
  - Shims to be mounted on the bipods plan already manufactured (under contractor responsibility).

- Electrical configuration / EGSE required :
  - N/A

Activity :

- Optical cavity cleanliness protection dismounting.
- Baffle dismounting.
- TFPU integration on the telescope (with the shims between the bipods and the primary panels) .
- Telescope/TFPU alignment check.
- Baffle mounting.
- MLI installation.
- 3rd extension groove installation.
- Test cables (coax + wires) connected to the RF modules and routing through the telescope
- Positioner adaptor mounting on the positioner.
- RFQM mounting on the positioner adapter with X satellite perpendicular to the ground.
- Rotation of the positioner adapter in order to have the X satellite parallel to the ground.
- In parallel with these activities, the contractor prepares the compact range facilities.

TS RFQM T4.1: RFQM measurements	RFQM model
Duration	55 days
Ambience	Class 100000

Goal :

To perform optical measurement of the RFQM with regards to the test facility

To perform the RF performances measurement of the RFQM

Specimen configuration :

- Mechanical configuration / MGSE required :
  - RFQM completely integrated, mounted on the positioner.
  - MGSE needs: RFQM / positioner adaptor.

- Electrical configuration / EGSE required :
  - RF measurement unit's

Activity :

- Coaxes and wires connection to the test units (closed to the positioner).
- Perform optical measurements of the RFQM with regards to the test facility.
- TRR
- Perform RF performances measurement (refer to [AD10]) with linear polarisation aligned along the X_axis.

TS RFQM T4.2: RFQM measurements – configuration change	RFQM model
Duration	10 days
Ambience	Class 100000

Goal :

To change the RFQM set-up (horns polarisation)

Specimen configuration :

- Mechanical configuration / MGSE required :
  - RFQM completely integrated, mounted on the positioner.
  - MGSE needs:
    - → Under contractor responsibility: RFQM / positioner adaptor
    - → Under ASP responsibility: MPT, cryo structure/MPT adaptor, telescope hoisting device.

- Electrical configuration / EGSE required :
  - N/A

Activity :

- Coaxes and wires disconnection to the test units (closed to the positioner).
- Rotation of the positioner adapter in order to have the X satellite perpendicular to the ground.
- RFQM moving from the positioner to the MPT.
- Baffle dismounting.
- Main frame dismounting.
- Horns set-up change.
- Main frame mounting on the telescope.
- Baffle mounting.
- RFQM moving from the MPT to the positioner.
- Rotation of the positioner adapter in order to have the X satellite parallel to the ground.
- Coaxes and wires connection to the test units (closed to the positioner).

TS RFQM T4.3: RFQM measurements	RFQM model
Duration	55 days
Ambience	Class 100000

Goal :

To perform the RF performances measurement of the RFQM

Specimen configuration :

- Mechanical configuration / MGSE required :
  - RFQM completely integrated, mounted on the positioner.
  - MGSE needs: RFQM / positioner adaptor.

- Electrical configuration / EGSE required :
  - RF measurement unit's

Activity :

- Perform RF performances measurement (refer to [AD10]) with linear polarisation aligned along the Y_axis.
- PTR

TS RFQM AI5: RFQM moving from the positioner & dismounting	RFQM model
Duration	8 days
Ambience	Class 100000

Goal :

To transfer the RFQM from the positioner to cryo structure support

Specimen configuration :

- Mechanical configuration / MGSE required :
  - RFQM mounted on the positioner.
  - MGSE needs: positioner adaptor, cryo structure support, telescope hoisting device, MPT, cryo structure/MPT adaptor.

- Electrical configuration / EGSE required :
  - N/A

Activity :

- Measurement unit's disconnection.
- Rotation of the positioner adapter in order to have the X satellite perpendicular to the ground.
- RFQM dismounting from the positioner to the MPT.
- Cleanliness protectives covers installation on the reflectors.
- CQM baffle dismounting.
- 3rd extension groove dismounting.
- TFPU dismounting.
- CQM baffle mounting.
- Telescope dismounting and transfer to the telescope stand.
- Cryo structure transfer to its stand.

TS RFQM AI6: RFQM packaging & transfer to Cannes	RFQM model
Duration	8 days
Ambience	Class 100000

Goal :

To package all the RFQM part into the container.

To transfer the RFQM to the contractor

Note: this task depends of the ITT results.

Specimen configuration :

- Mechanical configuration / MGSE required :
  - RFQM dismounted: cryo structure on its stand, telescope on its stand.
  - MGSE needs: telescope stand, cryo structure support MGSE, cryo structure container, telescope container.

- Electrical configuration / EGSE required :
  - N/A

Activity :

- Set the telescope in its container.
- Set the cryo structure in its container.
- Containers transportation from contractor premises to Cannes.

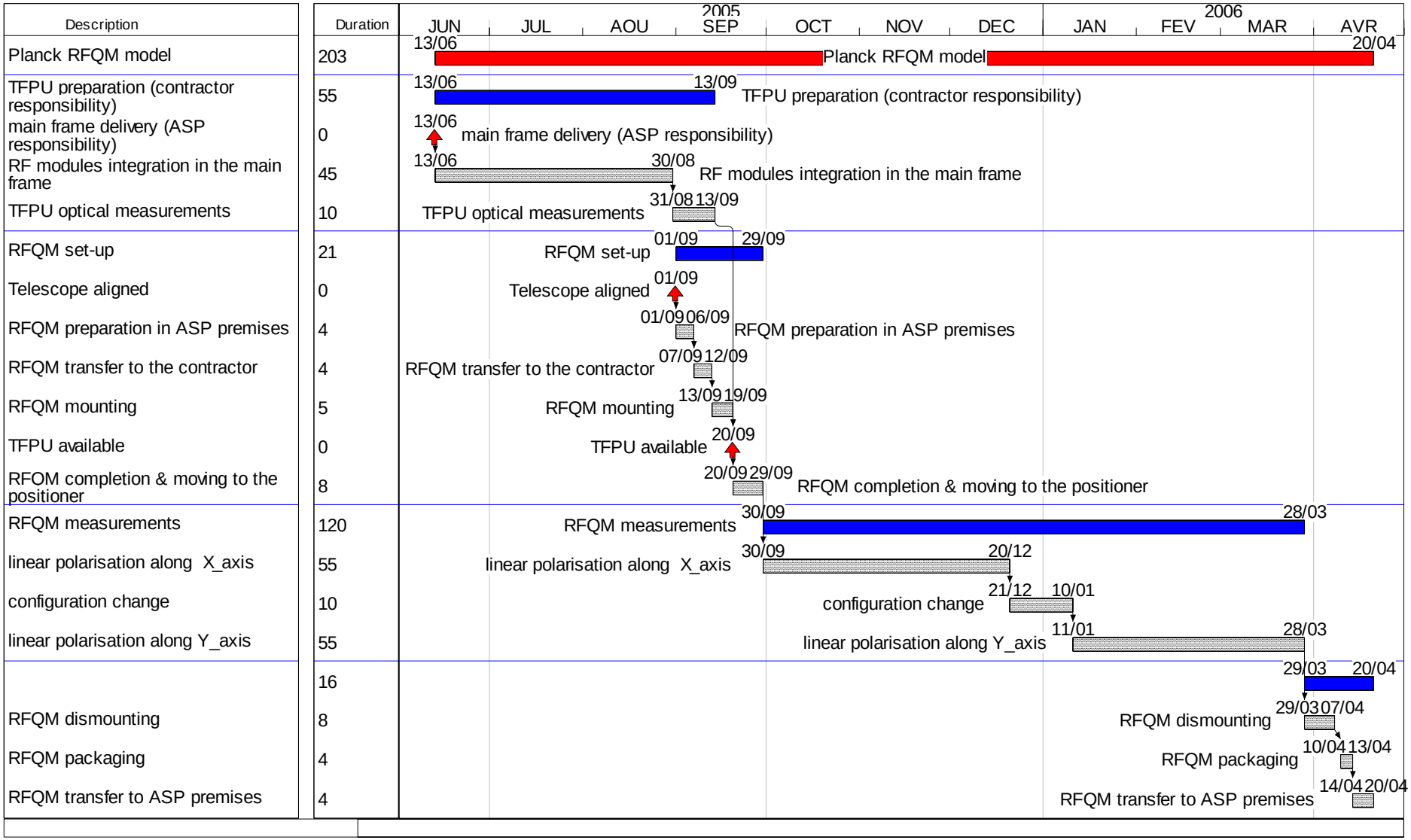
5.4 Schedule

The main assumption for the schedule is that nominally, the RF performances measurements duration is 4 months, with only one main frame change between measurements (to change horns polarisation).

In this schedule, it is not planned to dismount/mount the reflectors protections each day. If it's necessary, ASP estimates that these activities take 2hours per day, i.e. 30 days for a 120days-measurement campaign.

Planck - RFQM model
RF performances tests

01AVR04



6. MANAGEMENT AND ORGANISATION

6.1 AIT TASKS

ALCATEL is in charge of the RFQM.

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

- definition and sequencing of system tests and operations, except the RF performances measurements them-self organised by the contractor.
- detailed planning of AIT activities
- daily event scheduling and briefing
- preparation of handling procedures
- installation, validation, verification and maintenance of system level GSE
- execution of AIT operations
- reporting of AIT operations
- preparation and issue of test reports
- determination and on site management of AIT team and technical support.

6.2 AIT ORGANISATION

6.2.1 AIT team

For all these activities ALCATEL will use an AIT team raising specialists of different engineering specialities already involved to the maximum extent in subsystem or module level testing in ALCATEL and other companies. That means that the composition of AIT team will be modified according to the AIT phase in order to be always adequate to the task. A close attention will be paid to management and technical supervision tasks of GSE and Check-out software which will be carried-out by the EGSE and the MGSE Managers belonging from the beginning to the system AIT team.

The AIT team will be directed by the ALCATEL AIT responsible supported by Test engineers.

6.2.1.1 Preliminary phase

This concerns the AIT activities to be performed early in the AIT programme, before starting the module or system level operations:

- definition and sequencing of system tests and operations
- preparation of AIT plans and subsystem test plans
- supervision of GSE design and development
- interfaces.

During this phase, as the AIT team does not include any test engineer specifically responsible for each subsystem, the AIT manager will be able to call upon technical support of specialists in AIT Department on one side and PLANCK engineering team on the other side. So the AIT organised as described in Figure here under will be mainly restricted to MGSE engineers as permanent members.

6.2.1.2 Operational phase

The AIT team, will be charged with doing all preparation and adaptation tasks from module level to system level. So the AIT team constituted as defined previously for preliminary phase will be progressively increased by addition of operation personnel (operators, technicians, test engineers...) from ALCATEL (and by incorporation of personnel coming from other Contractors in PLANCK system test activities). This integrated team will be under the authority of the ALCATEL AIT Manager (RAIT / RSAIT)

6.2.1.3 Operational AIT team

The baseline hypothesis for the scheduled activities is that the work will be organised in one shift operation; some activities will be performed in double or triple shift (as thermal tests for example). This kind of organisation may be used for mechanical and electrical integration tasks, mechanical electrical or thermal preparation operations, functional and performance test phases, provided that no test engineers and operators other than the AIT team specialists are required. Of course, all the AIT team members are properly trained and authorise to do their works.

The team is managed by the RAIT / RSAIT with the helps of mechanical responsible's. The team comprises mainly the mechanical operators required for performing general mechanical tasks . This team will be able to :

- hoist and handle the flight hardware
- assemble/disassemble the modules and mechanical items.

According to the task to be performed the technical support of other test engineers could further increase the teams for the duration of the dedicated operation .

A typical operational team function included:

- test conductor (in charge of the handling procedure execution).
- mechanical engineer with the help of mechanical operators.
- quality controller.

During the nominal working timetable the complete management and technical AIT team is available, to support the operational team who is in charge of the satellite:

- AIT manager/test managers
- responsible for procedures
- AIT QA engineer

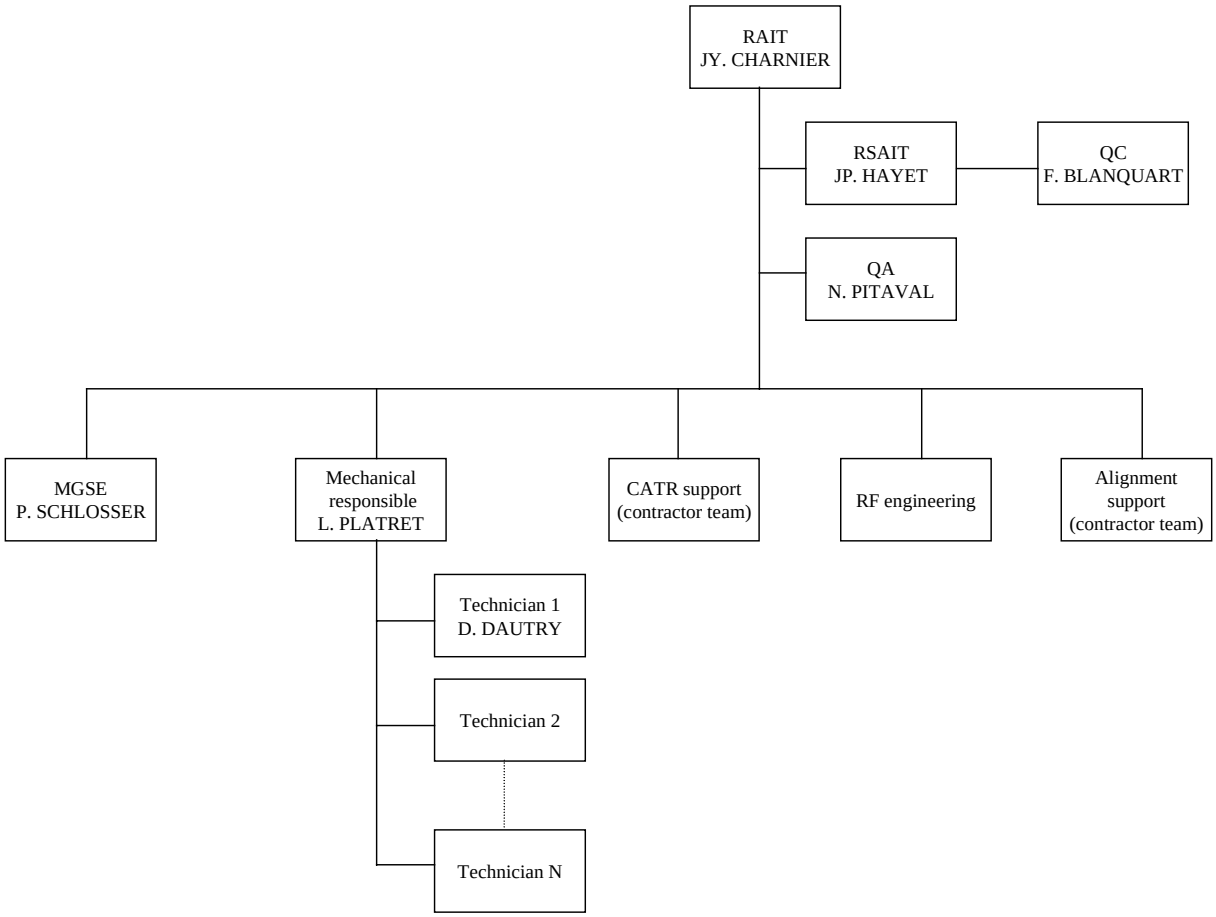


Figure 11: ALCATEL AIT core team for RFQM tests

6.2.2 AIT responsibility

The ALCATEL AIT Manager is responsible for definition, organisation, preparation, execution and reporting of all RFQM AIT activities and associated tasks including GSE and C/O software management. The ALCATEL AIT responsible directly reports to the ALCATEL Project Manager.

He has to organise and co-ordinate the necessary manpower effort such as the engineering support of ALCATEL and other companies. He co-ordinates the selection and use of test facilities. He participates in planning, co-ordination and progress meetings as responsible for co-ordination and planning for system level AIT activities, related documentation and GSE.

He is supported for conduction of operational tasks (mechanical, and alignment operations) by Test Manager more specially in charge of technical aspects of testing.

He is assisted by an MGSE Manager for MGSE and test facilities management.

They are responsible for maintenance, availability, readiness and verification of GSE and test facilities for all planned activation within the domain of: mechanical operations.

For each specific test, a Test Conductor will be selected amongst the different test engineers, according to the test to be performed and taking into account their competences and technical specialities.. It will be necessary to nominate several test conductors for double shift (2 x 8) or triple shift (3 x 8) work. The test conductor will be responsible for operational test team management (other test engineers and operators) and for test execution, he will be answerable to the test manager and the AIT manager.

The test engineers and operators coming from other companies are considered as members of AIT team and are under complete supervision of ALCATEL AIT manager. They have to execute any committed task (in the framework of their competency), to report results and incidents to the AIT manager/Test manager, to enforce all AIT rules, instructions and practices. They could be appointed test conductor for specific tasks, considered in certain cases as technical support, or integrated if necessary into operational teams.

6.2.3 Interfaces with the ESA project team

As responsible for system level AIT the ALCATEL AIT Manager is in close communication with the ESA project representatives and is the only official authorised interface between them and the AIT team. In particular he maintains close contacts with the ESA AIT Manager, informs him of AIT schedules, activity flow and any deviation w.r.t. the planned operations.

The Test manager is in charge of the satellite during a delimited test phase (Electrical integration, Mechanical tests...) He acts on the authority of the AIT/manager for all technical aspects of the test phase which he is entrusted with. The test manager is responsible for supervision of tests performed under the direct responsibility of the test conductors, in particular he has to take steps to ensure that all AIT requirements are fulfilled and all quality requirements enforced.

He has to report during the daily meeting all technical aspects of the tests, the day by day organisation and all practical problems or unexpected events that could occur. He fills in the daily logsheets and the working copy of the Master test procedure.

6.2.4 QA responsibility

The QA engineer assures the compliance between the satellite and the definition files, the AIT plan, the test matrix. He is in charge of the Assurance Product of the GSE, he is in charge of the Assurance Quality of all the process's and all the test equipments used during the AIT phase.

His main functions are:

- to verify that AIT team is working following the quality rules defined by Alcatel
- to check the coherency between the definition files and the AIT procedure. He approves the procedures.
- to participate to the "risk analysis " meetings
- to manage the MIP, the KIP
- to check the compliance of the test results versus the expected results defined in the procedure
- to manage the satellite configuration
- to manage the NCR's, the open work's status

Note: for this specific tests, as it is under contractor responsibility; the contractor will be in charge of initiate and organise the TRR/PTR.

6.3 MANAGEMENT OF AIT TASKS

6.3.1 General AIT rules

The following is an outline of general rules, standard practices, procedures adopted throughout the whole integration and test activities to ensure a controlled and safe conduction of all tasks to be performed before, during and at the conclusion of AIT operations.

- Preparation activities

Before starting any AIT activity the following status shall be verified:

- availability of all required test documentation of the last approved issue and distribution to all team members who have to make use of it
- control of GSE installation and validation results, instruments calibration status, compliance with all required test configurations

- preparation of daily activity planning, based on a master AIT procedure, with the identification of required personnel, task duration, data analysis
- clear definition of task assignments to each member to the team with identification of responsibilities, autonomy and where decisions have to be deferred to higher level
- availability and good knowledge of any applicable emergency procedure to be applied in case of hazardous situations for either personnel or flight hardware.
- NCR's / open work status

- During test operations

Any AIT operation shall be performed in conformity with the following rules and practices:

- all test operations are conducted only according to approved procedures and in the presence of a QC representative
- operations to be performed are confirmed at a daily briefing, normally held each morning before starting the daily activities
- access to test areas is restricted only to a limited number of authorised personnel
- tests and operations are supervised by a Test Manager and performed by a Test Conductor appointed by the AIT Manager and nobody else is allowed to operate the satellite or ask deviations from the test sequence that have not been requested and approved during daily reviews
- any non conformance has to be immediately raised and analysed before authorising proceeding with testing
- any approved deviation from a baseline procedure is recorded on the daily activity log together with the justification for the change using the AIT change request (ACR).

- Conclusion of test operations

At the end of any AIT activity the following verifications and operations will be performed:

- verification that all required tasks have been performed and that results are approved and signed by the responsible engineer
- collection and archiving of all test results
- analysis of deviations, schedule impacts, work around solutions to be presented at the next daily briefing
- at the end of the working day, the EGSE and flight hardware are set in a known and safe configuration, unattended operation is not allowed on the flight hardware.

6.3.2 Supervision of AIT tasks through the AIT documents

Planning and supervision of AIT activities are done through a number of official documents sent to the customer or which can be examined on the site by his representative. The documents under AIT

responsibility and those under QA responsibility are interdependent, therefore we will refer here to the two types of documentation.

- The control of AIT activities is done from documents under AIT responsibility:
  - AIT weekly planning and report
  - AIT log sheet
  - Test procedures (Red line working copy As run procedure)
  - All AIT forms used for change recording during tests
  - Test reports.

- The configuration is normally followed up by means of documents under QA responsibility:
  - "As built" register
  - Electrical connection register
  - Non conformance forms when issued.

The diagram of operational utilisation of different AIT forms :

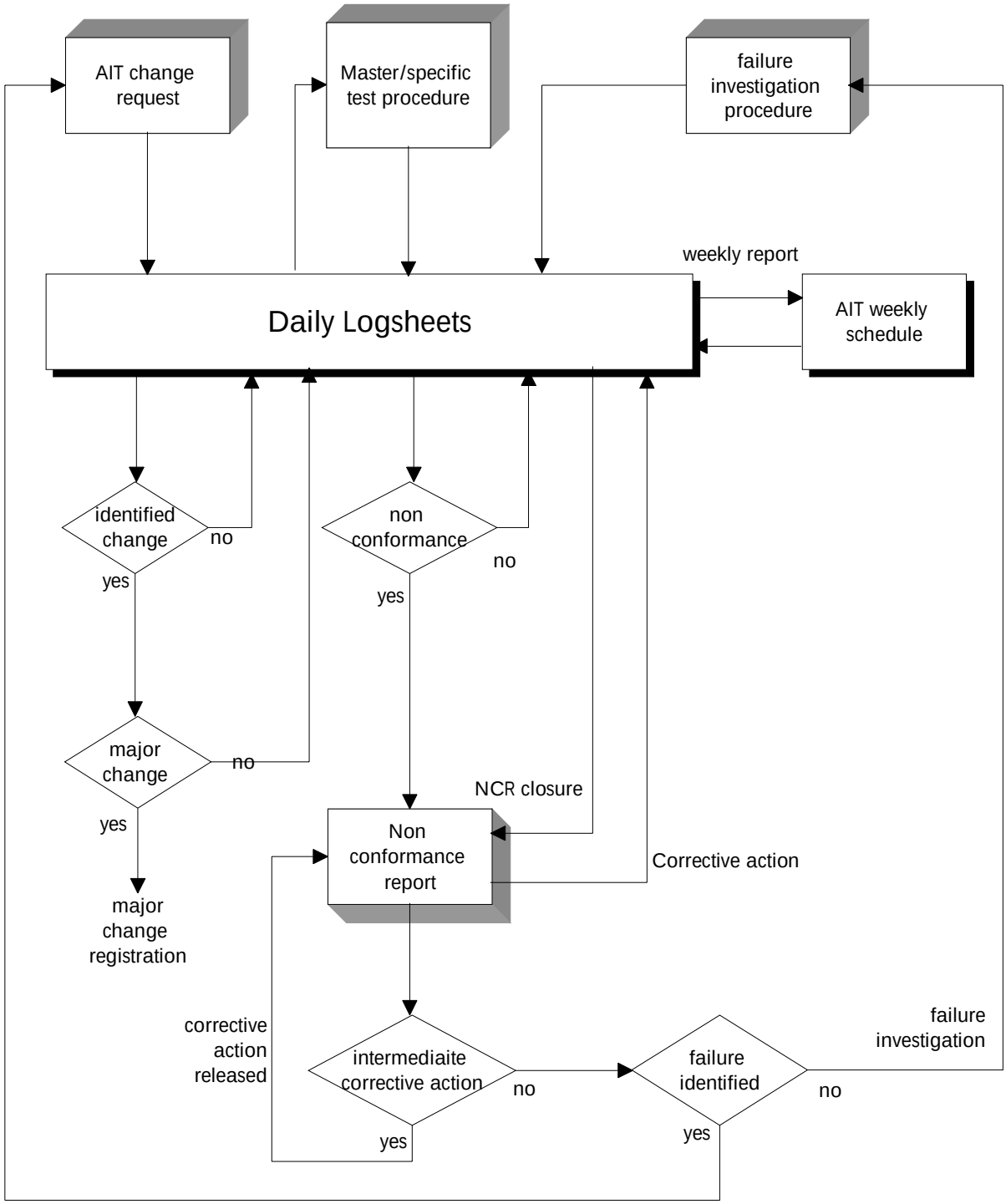


Figure 12: operational diagram - use of different AIT forms

- all AIT tasks are planned in the Log sheets from the AIT weekly planning and their execution is reported in the AIT weekly report. They are always referenced to a test procedure or classed as document.

- To plan the daily activities, a daily planning is introduced each daily meeting. Its takes into account the n-1 day activities and all the new discrepancy's if any.

- when the task is performed as planned without any non conformance nor modification, the task completion is recorded in the log sheet and the next task starts as foreseen.

- if the task cannot be performed nominally or the test procedure has to be modified, a NCR is opened and discussed (QA is in charge of the classification of the NCR's: major or minor). An AIT Change Request is issued and this is recorded in the log sheet. When accepted this ACR supersedes the corresponding steps of the current procedure and the task is performed accordingly.

- the minor changes to an approved (but not yet validated) procedure are red lined in the working copy and immediately applied, nevertheless these changes are recorded in a recapitulative sheet and submitted to approval immediately or at least at the daily meeting. These recapitulative sheets will constitute a global ACR, which will be formally reviewed to update the procedure

- if an unexpected event occurs, or if something seems wrong or suspicious, before, during or after the task execution, a NCR is issued under the test conductor responsibility.

- This NCR will be documented and analysed to define if possible the following points:

  - proposed immediate corrective action

  - elements of decision for the current test

  - failure investigation.

- This NCR is examined jointly by the AIT manager, the ESA AIT manager or his representative, the test manager and AIT QA engineer in order to determine if the current test must be continued, hold for complementary investigations or delayed according to the NCR importance. Whatever the decision is, the corresponding operations shall be recorded in the log sheet.

- The log sheet shall be always the reliable record file of any event occurred during the tests and will be incorporated into the module or system Logbook. This sheet has to be at the same time an execution order of planned activities and a record file of actual performed operations.

- The logsheets allow to keep track day by day all operations performed on the model. The necessary cross coupling between the logsheets and the others documents is made by means of the AIT record lists where are registered the AIT events through the dedicated documents (Non conformances - Change request - Failure investigation - Test reports - Open works...). Another verification is also possible through the AIT weekly plannings and reports.

6.3.3 Time and task execution management

6.3.3.1 AIT weekly planning and report

The report is done each week, it briefly analyses the last events and gives out a notice of work planned for next weeks, showing the modification of actual performed activities w.r.t. expected ones.

Several sheets of AIT weekly planning can be joined to this short comment: the previous week planning with comparison between planned and actual performed activities, and the next weeks actualised planning to take into account the evolutions (if any) from the last edition.

6.3.3.2 Daily progress meeting

A progress meeting will be held each day at suitable time taking into account the availability of the personnel, the nature of the tasks in progress, and the work organisation.

The objectives of this meeting are as follows:

- to report from the daily logsheet, the activities of the day before: actual performed, ACR's and red line summary of test procedure, problems and non conformances, open works, status of NCR's, ACR's,...
- to confirm the task planned for the current day and take if necessary all specific dispositions in case of unexpected event. This part of the meeting can be considered as a preliminary report, as the progress status of the current day will be reported during the next meeting
- to anticipate the activities which will be planned for the next day (verify procedure availability and approval, compatibility of tasks planned in parallel...).
- In order not to disturb the progress of the work, the number of participants will be restricted to necessary personnel.
- The planned activities are displayed on a board and a short briefing of the whole AIT team is held to inform everybody and to listen to their comments, answer their questions or record their problems.

6.3.3.3 AIT logsheets

- Definition

As already explained before, the daily logsheet allows to record on a daily basis the AIT operation as they proceed. This sheet is filled out under control of the Test manager:

- Emission

The AIT daily logsheets are filled out during the daily meeting, which convenes the AIT management team. It is established from the AIT weekly planning, the Master Test Procedure and the progress status of the previous day (through the corresponding log sheet).

The planned operations will be always referenced to a test procedure or classed as document (ACR-NCR-FIP...)

The column "remarks" will give complementary informations as for example: potential risks and precautions, attendance of QA when mandatory, identification of unit to be integrated SPF and critical points...

- Execution

The systematic recording of work progress and all events occurred during the task execution (non-conformances, changes, repairs...) is mandatory. The AIT QA engineer verifies the filled out logsheet and attests in particular the closure of all NCR's issued in the framework of this logsheet and the configuration status when concerned.

When filled out, the logsheet shall contain the following informations:

- task definition
- test procedure (Nr, Issue, Rev.) or classed as document (ACR, FIP)
- test conductor and operators identification
- starting and ending time
- identification of units to be integrated if any (type, serial number)
- status of RCS/coolers if concerned (pressure, gas...)
- clear identification of hazardous operations
- mention of tasks for which a special care has to be paid (QA attendance, special process, critical points, SPF...)
- non conformances (NCR's)
- open works
- AIT change requests
- informations on the progress status of planned tasks (completed, to be continued, interrupted...).

6.3.4 Configuration management

6.3.4.1 Task identification

The configuration management allows to know exactly at any time what is the configuration of the specimen under test. So all assembly and integration operations have to be recorded and controlled by reference to the design and any change or deviation has to be identified. This task is mainly under the responsibility of AIT QA engineer. He shall manage on one side the specific documents as explained hereunder and on the other side the non-conformances since they have an impact on the

specimen definition. At last the AIT QA engineer will be responsible for System logbook management.

6.3.4.2 "as built" configuration register

The specimen configuration shall be precisely brought up to date by means of real time recording of all mounting/dismounting operations. The units or items installed on the model will be identified by their reference in a specific register.

This register will comprise a configuration summary sheet subsystem by subsystem where it will be easily possible to identify at any time what kind of equipment is installed (CQM, STM, and PFM) or what equipment is missing.

This register will be filled in by the Quality controller and so is set under QA responsibility.

6.3.5 Control and management of non conformances

- The level of the NCR determines the processing (if level 1 a major NCR shall be issued), this level will be decided during the weekly meeting involving all parties: ESA - ALCATEL AIT - QA - Engineering in order to streamline both the AIT schedule (minimise holds) and the NCR's treatment, the following rule applies:
- When a non-conformance (or supposed to be) is identified, a Non Conformance Report is filled in. When the AIT manager (or representative e.g. Test Manager) ESA AIT manager (or representative) and AIT QA engineer agree that there is no need to stop the activity, the work is continuing without waiting for the NCR treatment. In all other cases the current work is stopped either to immediately repair the defect (the corrective action is immediately defined, implemented and recorded on the logsheet) or to start another activity while the NCR is analysed.
- If there is no clear identification on the nature of the anomaly, its origin or its full consequences versus the system behaviour, a failure investigation can be decided.
- The NCR's are reviewed each day at the status meeting and final decision is made to issue or not a major NCR.
- The ESA AIT manager may have access to the testing area and participate to the activities with the AIT team when present on the spot, so he is immediately informed and consulted on the NCR treatment.

- A NCR status list will be issued, and at any time the NCR's themselves will be available on the spot.
- Anyhow an official major NCR shall be issued in all following cases:
  - when the stated event needs a failure analysis and/or a failure investigation (see corresponding form)
  - when the non conformance is considered as level 1 according to the criteria defined in PLANCK PA requirements [AD3].

- The internal "anomaly sheet" can be used as official NCR form (incoming inspection - EGSE incident...). The use of NCR form will be restricted to AIT sequence when any non-conformance, which is officially stated, has to be considered as major. In this case a formal MRB is requested.

6.3.6 Technical management of "as performed" operations

6.3.6.1 Test procedure change registration

To supervise the progress of a test, procedure is performed through its official working copy, which is filled in as the test proceeds by the test conductor or the test engineer and is verified and countersigned by the QA engineer.

This working copy will be taken as reference for the test report under the name of "as run procedure"

The test procedure can be run nominally, it can be improved (with approval) or modified (with approval) during the test, it can be also aborted whatever the reason is and the test be cancelled or postponed. All changes to test procedure are recorded on ACR forms. Nevertheless three cases can be identified:

1. **The minor changes**: (defined and agreed by the AIT manager or his representative) and AIT QA engineer, they will be directly red lined in the working copy of test procedure itself which will be included in test report (as run procedure). This kind of change does not require any interruption in the procedure running. Nevertheless these minor changes shall be summarised in a change record sheet, part of a recapitulative ACR, and reviewed each day
2. **The major changes**: they will be recorded using the AIT Change Request. This form can be initiated before starting the procedure or during its progress. In this case the procedure execution has to be interrupted until an agreement is reached on the ACR content.
3. **The procedure interruption for failure analysis**: this is considered as a specific major change which needs a Failure Investigation Procedure. The test continuation depends on the results of the FIP.

6.3.6.2 AIT Change Request (ACR)

The ACR is specially meant for changes concerning the test definition as for example:

- specimen configuration
- sequencing when significant
- test method
- test objective and success criteria
- addition, deleting, modification of test phase, verification phase or operation phase.

The ACR is the only authorised way to improve or modify a test procedure when it has been approved by competent authority and already been validated. All major changes will be justified and agreed prior to application. ACR's are subject to configuration control regardless of acceptance

or rejection. ACR's will be approved at the same authority level in the organisation as it was the case for the test procedure.

The ACR has to identify if it means::

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

An ACR can be the consequence of:

- change in test specification
- calculation, prediction analysis, thermal or mechanical models processing...
- analysis of preliminary result (coming from another test or processed during the test itself)
- rearrangement of schedule

- unavailability of unit test equipment, facility, personnel..
- unexpected limitation in capability of test equipment or test facilities
- non-conformance and failure.

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

6.3.6.3 Failure Investigation Procedure (FIP)

The FIP has the effect to hold the current procedure and to start another procedure with a completely different objective, so it can be considered as a major modification of test.

Such a decision requires, as for the ACR, the formal agreement of a board where engineering, AIT and QA have to be represented.

The FIP is issued after issuing a NCR when the failure needs complementary investigations to be characterised, located, explained, and sometimes corrected. So the FIP is referenced to the NCR and after a short identification of failure, and a definition of investigation objective (given in § failure analysis) has to be worded as a step by step procedure.

When the FIP has been run it becomes possible to take appropriate action concerning the test: restart - continue - hold - delete - delay...

A FIP gives rise to a specific test report, which could be included in the NCR file.

7. REVIEWS

7.1 KIP/MIP

Inspection points are implemented in the AIT sequence with the objectives to ensure that the activities are performed in compliance with the requirements, which are applicable on the programme. These inspection points are :

- KIP: Key Inspection Point
- MIP: Mandatory Inspection Point

During these inspection points attention will be placed on the compliance of the hardware to its design, on the status of non conformance or waiver, on the availability of approved documentation (procedures , specifications), on the status of the GSE.

7.2 AIT reviews

Such reviews are associated with milestones in the AIT sequence.

For the specific RFQM measurement tests:
The contractor is responsible to call the TRR or PTR, upon completion of the relevant prerequisite activities; the contractor is chairing the TRR/PTR, the contractor is responsible to authorise the test start (TRR) and to close-out the test (PTR)

7.3 Test Readiness Reviews and Test Review Boards

Such reviews are associated with major operations and tests (e.g. integration, dynamic environment tests, thermal environment tests, etc...).

PLANCK Project representative, Product Assurance manager, Quality Assurance manager, AIT System manager & Test manager are part of the board; as well as specialists and contractors as appropriate.

ESA will participate with management or expert personnel as required.

7.3.1 TRR objectives

The objectives of the TRR are to determine if the test may start. To this end must be declared / certified that:

- the hardware configuration is known, compliant and documented
- it is in a fit state to be tested
- the test facilities to be used are validated
- all the appropriate test objectives and the associated test procedures are agreed and approved

- supporting documentation is available
- all supporting equipment (hardware and software is available and validated
- the team exists and is clearly briefed, also in term of responsibilitie
- the schedule is available and agreed
- all safety aspects have been properly addressed
- RMR status allows the test

The form of this meeting is ideally that of completing a checklist and not a detailed review of individual items which should precede the review proper.

TRR CHECK LIST	REQUIRED
0. TEST REQUIREMENTS	Approval
1. TEST PROCEDURE	Approval
2. TEST SEQUENCE (CCS)	Approval
3. HPSDB STATUS	Approval
4. SPECIMEN CONFIGURATION	Adequate definition - QA certification
5. GSE	Availability - QA certification and validation report
6. FACILITIES	Availability – validation report
7. SUPPORTING DOCUMENTATION	Availability
8. PERSONNEL	Organisation, responsibilities, availability, information
9. SAFETY & HAZARD	Covered by procedure - QA certification
10. NCR STATUS	Open NCR's without impact on the test validity
11. RFW STATUS	No RFW impact on the test results
12. OPEN WORKS	Completeness of all steps necessary prior to test
13. SCHEDULE	Detailed and agreed

Figure 13: TRR check list

7.3.2 TRB objectives

The objectives of the Test Review Board is to confirm that the activities were carried out according to the procedure, to review the results and to release the hardware configuration for the next activity or to decide on the course of action where unacceptable anomalies occurred.

PTR CHECK LIST	REQUIRED
1. TEST RESULTS & DATA ANALYSIS	Available and approved
2. "AS RUN" TEST PROCEDURE	Deviations agreed
3. SPECIMEN CONFIGURATION	Adequate definition - QA certification
4. GSE	Current status
5. FACILITIES	Current status
6. DOCUMENTATION	Current status
7. NCR STATUS	List of NCR's open during the test
8. OPEN WORKS	List of Open works closed during the test
9. CORRECTIVE ACTIONS	Detailed list available and agreed
10. SCHEDULE	Real schedule of all performed activities

Figure 14: TRB check list

8. GSE

The GSE requirements specifications documents will be the guideline for GSE Design and Development plans .

8.1 Identification of GSE

The execution of the AIT programme at RFQM level will require the following groups of GSE:

- Mechanical Ground Support Equipment (MGSE) which includes all equipment's identified and described during phase B studies

8.2 MGSE

The MGSE shall be designed and developed for the AIT operations to be performed on all PLANCK models.. This includes assembly, integration, test activities and finally all tasks to be performed prior to launch. The MGSE will be used all along the different phases described in the development plan.

- The following groups of MGSE items are identified for RFQM tests:
  - handling and integration
  - transportation and storage

- MGSE are decomposed in several parts:
  - common Herschel and Planck MGSE for SVM purpose. Alenia is in charge of the manufacturing of these MGSE. Refer to Herschel/Planck SVM SOW: H-P-WS-AI-0006 for more information's.
  - Planck MGSE for satellite and CQM purpose. Alcatel is in charge of the manufacturing of these MGSE. Refer to Planck SOW: H-P-3-ASPI-SW-0168
  - Instruments MGSE. Each company is in charge of this own MGSE (LABEN for LFI…..)
  - Some MGSE will require to be manufactured: MPT/RFQM adapter, positioner adapter/RFQM (contractor responsibility), RFQM handling device (TBC), MGSE for TFPU dismounting…

8.3 EGSE

No EGSE needs for RFQM tests

9. FACILITIES AND TRANSPORTATION PLAN

9.1 FACILITY AND TRANSPORTATION PLAN

Transportation between Cannes and the contractor (if needed) will be done with the cryo structure in its container, the telescope in its container. The transports will be done by road.

The transportation will include all MGSE necessary for RFQM testing purpose.

9.2 RFQM TO TEST FACILITY INTERFACE SPECIFICATION

All the interfaces between PLANCK RFQM model and the CATR facilities are defined in [AD10]:

END OF DOCUMENT