



**FIRST
PLANCK**

Document No. : PT-04829
 Issue/Rev. No. : Draft 1
 Date : 15 08 1997
 Page : 1

FIRST / PLANCK
GROUND SEGMENT
INTERFACE DOCUMENT
(GSID)

PT - 04829 (DRAFT # 1)

15 August 1997

	Name	Signature
Prepared by	P. Estaria Mission Operations Engineer	
Agreed by	G. Pilbratt FIRST Project Scientist	
Agreed by	J. Tauber PLANCK Project Scientist	
Agreed by	J. Dodsworth Ground Segment Manager ESOC	
Approved by	F. Felici / J.A. Steinz Project Managers (Acting)	



**FIRST
PLANCK**

Document No. : PT-04829
Issue/Rev. No. : Draft 1
Date : 15.08.1997
Page : 3

DOCUMENT REVISION STATUS

Revision	Revision Date
Draft #0	24 June 1997
1st Draft	15 August 1997

ACRONYM LIST

*It is assumed that an overall **FIRST/PLANCK** acronym list will be available at a later time. The present list therefore only contains the acronyms which are used in the context of this document.*

AIV	Assembly Integration Verification
AO	Announcement of Opportunity
CC	Configuration Control
CCE	Central Check-out Equipment
CCS	Central Command Schedule
C/O	Check-Out
DPC	Data Processing Centre
DSOP	Daily Science Period
DTCP	Daily Telecommunication Period
EGSE	Electrical Ground Support Equipment
EM	Engineering Model
ESA	European Space Agency
ESOC	(ESA) Space Operations Centre
FCS	Flight Control System
FD	Flight Dynamics
FINDAS	FIRST Integrated Network & Data Archive System
FIRST	Far Infrared & Submillimetre Telescope
FM	Flight Model
FOM	FSC Operations Manager
FOP	Flight Operations Plan
FOT	FSC Operations Team
FSC	FIRST Science Centre
FTP	File Transfer Protocol
GSID	Ground Segment Interface Document
GTO	Geostationary Transfer Orbit
Gb	GigaBit
HFI	High Frequency Instrument
HK	Housekeeping
H/W	Hardware
ICC	Instrument Control Centre
ICD	Interface Control Document
IID	Instrument Interface Document

1.0 INTRODUCTION

1.1 Objective

The purpose of this document is to identify the major FIRST/PLANCK Ground Segment Interfaces (internal and external) and to list the corresponding Interface Control Documents (ICDs) to be generated by ESOC, ESTEC, the ICCs, the FSC (FIRST) and the DPCs (PLANCK) for the implementation, management and maintenance of these interfaces.

1.2 Scope

The current version of this document only provides the information which is required by the potential PIs who intend to bid for the provision of a FIRST Instrument (and corresponding ICC) or for a PLANCK Instrument (and corresponding DPC). At this stage of definition this information can only be very *preliminary*. The document is part of the AO

It will be maintained throughout the development cycle of the Ground Segment for the FIRST/PLANK combined mission.

1.4 ICD Definition

Each major Ground Segment Interface will be described in a high level ICD. Depending on the characteristics of the interface, lower-level related ICDs may describe, if necessary, specific items within the framework of the high level interface.

Each ICD defines in detail the hardware (as far as needed for software implementation) and software interface between two or more software systems. When applicable, the managerial and/or operational interfaces will be covered in the ICD. An ICD must be prepared each time that two systems having a mutual interface have to be developed, integrated or maintained by different entities (i.e. different organisations or functionally independent parts of an organisation)

The purpose of the ICD is as follows:

- provide accurate, adequate and binding information that will permit software development and maintenance of the separate systems as separate activities.
 - serve as a vehicle for interface design, negotiation and change control.
 - document the total detailed system design when viewed together with documentation of the individual connected software systems.
-

3.0 MAJOR ASSUMPTIONS

(to be expanded/updated)

AD-3 and AD-4 list the major assumptions underlying the overall Ground Segment concept. The most important ones are summarized here.

- FIRST and PLANCK will be launched end-2005, to the L2 point, as a combined mission by an Ariane 5.
 - Duration of orbital operations: 4.5 years
 - Duration of post-operational Phase: 3.25 years followed by a "Historical Archive" phase lasting up to 10 years (TBC)
 - Two mutually exclusive modes of operations: PLANCK mode and FIRST mode. The current scenario is
 - PLANCK first survey (6+ months) + FIRST survey (> 6 months) + PLANCK second survey (6+ months) + (rest) of FIRST mission
 - Ground stations: Kourou (LEOP+Commissioning), Perth (all phases), VILSPA (LEOP+emergency)
 - TC uplink data rate: 2 kbps (TBC)
 - TM (on-board generation) data rate: 68 kbps (TBC)
 - On board compression of science data (compression factor varies with instrument and mode)
 - The MOC processes the science-housekeeping data packets in order to ensure instrument health and safety. It does not process the science packets.
 - A single FIRST/PLANCK Ground Segment will support the two missions.
 - Operations (in both modes) are carried out according to the following scheme:
 - autonomously via on-board schedule
 - each 24-hour period is divided into two sub-periods: 22 hours Daily Science Operations Period (DSOP), 2 hours Daily Telecommunication Period (DTCP).
 - data (Science + HK -spacecraft & instrument-) is stored into on-board mass memory during the DSOP.
-

- Man Machine Interfaces
- Data Archiving and Distribution
- On-board Software Management
- On-board Software Maintenance (e.g. Software Development Environment, Software Validation Facility)
- Common User Language (for Test procedures and in-orbit operations)

The WG has produced the corresponding high level requirements.

The ROSETTA Project is currently following a similar route, and synergy between the two Projects is expected.

These high level Commonality requirements will be elaborated and detailed interfaces (hardware and software) defined when the CCE Contractor will have been selected.

For the FIRST/PLANCK mission commonality will largely be enforced through FINDAS. FINDAS shall provide continuity between instrument development, check-out/AIV, and operations.

For the purpose of the FIRST/PLANCK Ground Segment and in particular for the corresponding hardware and software ICC and DPC facilities it shall be assumed that:

- The same hardware -or compatible hardware- (e.g. Instrument Stations for RTA/QLA) can be used throughout all phases of the programme.
- During the Instrument Level Tests (ILTs) and AIV activities, the RTA/QLA Instrument Stations will be located at the ICCs (FIRST) and DPC (PLANCK). For the Module and System-level tests they will be connected to the CCE (location TBD) via dedicated (capacity TBD) communication lines. An ICD between ICCs/DPCs and the CCE will specify hardware, software and operational interfaces.
- The RTA/QLA Instrument Stations used at the ICCs and DPCs during the check-out/AIV activities will be transported and connected to the MOC for the Commissioning and Performance Verification phases. The FIRST/PLANCK Project will ensure that the hardware and data interfaces will be identical in both environments.

The Interface Control Documents (ICDs) between MOC, FSC, ICCs and DPCs will reflect these commonality requirements.



FSC (by the FSC Operations Manager). In keeping with the overall FIRST/PLANCK "commonality" requirements, all ICDs will be identical in contents and format. Exceptions to the general ICD would be discussed and agreed on a case by case basis.

The ICC - FSC ICDs will call upon the FINDAS Interface Document mentioned in 5.0. The exact relationship is TBD.

The FSC will be the custodian of the ICDs.

5.1.1 Preliminary Definition

The *preliminary* information provided herein, should be sufficient for potential PIs to scope the effort required to maintain the ICC-FSC interface. The "formal" "ICC to FSC ICDs" will be negotiated between ESA and the ICCs and generated according to the format described in Appendix A.

5.1.2 Physical and Operational Interface

- one dedicated 128-Kbs line and one back-up (same capacity). To be provided, maintained and operated by the MOC (TBC).
- WWW, Internet, E-mail
- Fax and phone, surface mail
- operational interface through agreed procedures (custodian: FSC)

5.1.3 Data Interface

The data exchanged across this interface are listed below. Detailed definition will be provided via a series of individual (lower level) ICDs. Note that most of the data exchanges take place via FINDAS.

Data type	Route	Custodian	Notes
- Science Processing Software	ICC- FSC	FSC	delivered to FINDAS
- "Time" estimator	ICC - FSC	FSC	available on FINDAS
- AOT definitions	ICC - FSC	FSC	available on FINDAS
-Calibration Proposals	ICC - FSC	FSC	via FINDAS
-Engineering Proposals	ICC - FSC	FSC	via FINDAS

- operational interface through agreed procedures (custodian: MOC)

5.2.3 Data Interface

The data exchanged across this interface are listed below. Detailed definition will be provided via a series of ICDs. In most cases the exchange of data takes place via FINDAS. The resulting data bases and all "definitions" are kept and maintained on FINDAS.

Data type	Route	Custodian	Notes
- (near) real-time TM	MOC - ICC	MOC	"cleaned" TM packets delivered to FINDAS
- auxiliary TM data	MOC - ICC	MOC	delivered to FINDAS
- Sc-HK TM & TC Packet definition	ICC - MOC	MOC	
- Instrument Data Base (TM & TC)	ICC - MOC	MOC	
- Definition Health & Safety parameters	ICC - MOC	MOC	
- PCSs & ICSSs	ICC - MOC	MOC	
- Instrument on-board software Images	ICC - MOC	MOC	format specified by MOC
- on-board memory dump Images	MOC - ICC		extracted by MOC from TM
- Instrument Command Translator	ICC - MOC	MOC	
- IFOPs & ICRPs	ICC - MOC	MOC	format specified by MOC
- Instrument S/W Simulator	ICC - MOC	TBD	Interface specified by MOC

5.3 MOC TO FSC INTERFACE (FIRST AND PLANCK)

The physical, operational and formal (managerial) interfaces between the FSC and the MOC will be described in a *top-level* "MOC to FSC ICD".

The ICD covers all data exchanged between the MOC and the FSC for FIRST and PLANCK.

The ICD will be negotiated between the MOC, and the FSC after establishment of the FSC.

The MOC - FSC ICD will call upon the FINDAS Interface Document mentioned in 5.0. The exact relationship is TBD.

Most of the data delivered by the MOC to the FSC will be used (in the FIRST mode of operations) by the FSC Operations Team to carry out its functional tasks (e.g. Proposal Handling, Mission Planning). The data, once stored in FINDAS, are also available to the ICCs and DPCs (subject to relevant access rights).

The MOC will be the custodian of the ICD.

5.3.1 Preliminary Definition

The "formal" "MOC to FSC ICD" will be generated according to the format described in Appendix A.

5.3.2 Physical and Operational interface

- one dedicated 128-Kb line and one back-up (same capacity). To be provided, maintained and operated by the MOC.
- WWW, Internet, E-mail
- Fax and phone, surface mail
- operational interface through agreed procedures (custodian: MOC)

5.3.3 Data Interface

The data exchanged across this interface are listed below. Detailed definition will be provided via a series of ICDs. Note that in all cases the exchange of data takes place via FINDAS. Additional data sets will be identified as the definition of the FIRST/PLANCK Ground Segment will progress. Chapter 6.1 provides a preliminary list of items delivered by Flight Dynamics (MOC) to FINDAS (FSC)

Data Type	Route	Custodian	Notes
- Observations Log	MOC-FSC	MOC	via FINDAS (FIRST only)
- TC History	MOC-FSC	MOC	via FINDAS (FIRST and PLANCK)

5.4.2 Physical and Operational Interface

- one dedicated 128-Kb line and one back-up (same capacity). To be provided, maintained and operated by the MOC.
- WWW, Internet, E-mail
- Fax and phone, surface mail
- operational interface through agreed procedures (custodian: MOC)

5.4.3 Data Interface

The type of data exchanged across this interface (for PLANCK) is practically identical to the data exchanged (for FIRST) between the ICCs and the MOC. As for FIRST most of the data are exchanged via FINDAS.

Data type	Route	Custodian	Notes
- raw TM (24-hours)	MOC -DPC	MOC	"cleaned" TM packets delivered to FINDAS
- Payload Operations Plan	DPC- MOC	MOC	
- Mission Planning Skeleton Plan	MOC-DPC	MOC	
- Planned Observation Sequence	DPC-MOC	MOC	
- spin axis pointing update	DPC- MOC	MOC	delivered to FINDAS
- auxiliary TM data	MOC -DPC	MOC	dclivered to FINDAS
- Orbit data	MOC-DPC	MOC	
- Attitude data	MOC-DPC	MOC	
- Sc-HK TM & TC Packet definition	DPC -MOC	MOC	
- Instrument Data Base (TM & TC)	DPC- MOC	MOC	
- Definition Health & Safety parameters	DPC- MOC	MOC	
- PCSs & ICSSs	DPC- MOC	MOC	
- Instrument on-board software Images	DPC- MOC	MOC	format specified by MOC

For categories (i) - (iii) the FIRST and PLANCK Project Scientists will define the products and/or services which shall be made available to the corresponding external users. Products and/or services will be accessible through FINDAS. They will be identified and described in the relevant top-level and/or lower level FINDAS-related ICDs. The FSC will be responsible for the generation and maintenance (as custodian) of these ICDs.

6.0 LOWER LEVEL INTERFACES

The following lower-level interfaces are identified. The list will be expanded, and the corresponding ICDs will be defined as the Ground Segment definition work progresses.

Note that a for the sake of efficiency and to simplify Configuration Control a single ICD may describe several interfaces.

6.1 Flight Dynamics Interfaces

Data type	Route	Custodian	Notes
- Orbit Data File	FD to FSC	FD	
- Attitude History File	FD to FSC	FD	
- Attitude Constraint Checker	FD to FSC	FD	Sc. Mission Planning
- Slew Time Predictor	FD to FSC	FD	Sc. Mission Planning
- Focal Plane Geometry Calibration offsets	FSC to FD	FSC	Commissioning Phase
- Sky Visibility Constraints	FD to FSC	FD	
- Planning Files	FD to FSC FSC to FD	-	

6.2 Other Low Level Interfaces

TBW

Synchronisation Requirements

- Timing and Sequencing Characteristics
- Effective Duration
- Priority

Error Handling

- e.g. Transport / Network layer
- e.g. Application Layer

Detailed Interface Specifications

- Data Structure
- Generation Method
- Data passed across the interface - direction of transfer
- Size and Frequency of Transfers

Data Definition (for example a file)

- File Characteristics
- Header Records
- Data Records
- File example

Data Definition (for example a software routine)

- Routine name and description
- Calling sequence
- Input parameters
- Output parameters
- Return code
- Restrictions of use
- Running environment

Figures**Tables**

Note: Upon approval this List of Contents will be used for all ICDs produced for the FIRST/PLANCK Ground Segment.

Note: Depending on the level of the ICD in the hierarchy and on the characteristics of each interface, some items in the List of Contents might not be applicable. In this case, the heading must still be present, the corresponding text will be: " N/A ".

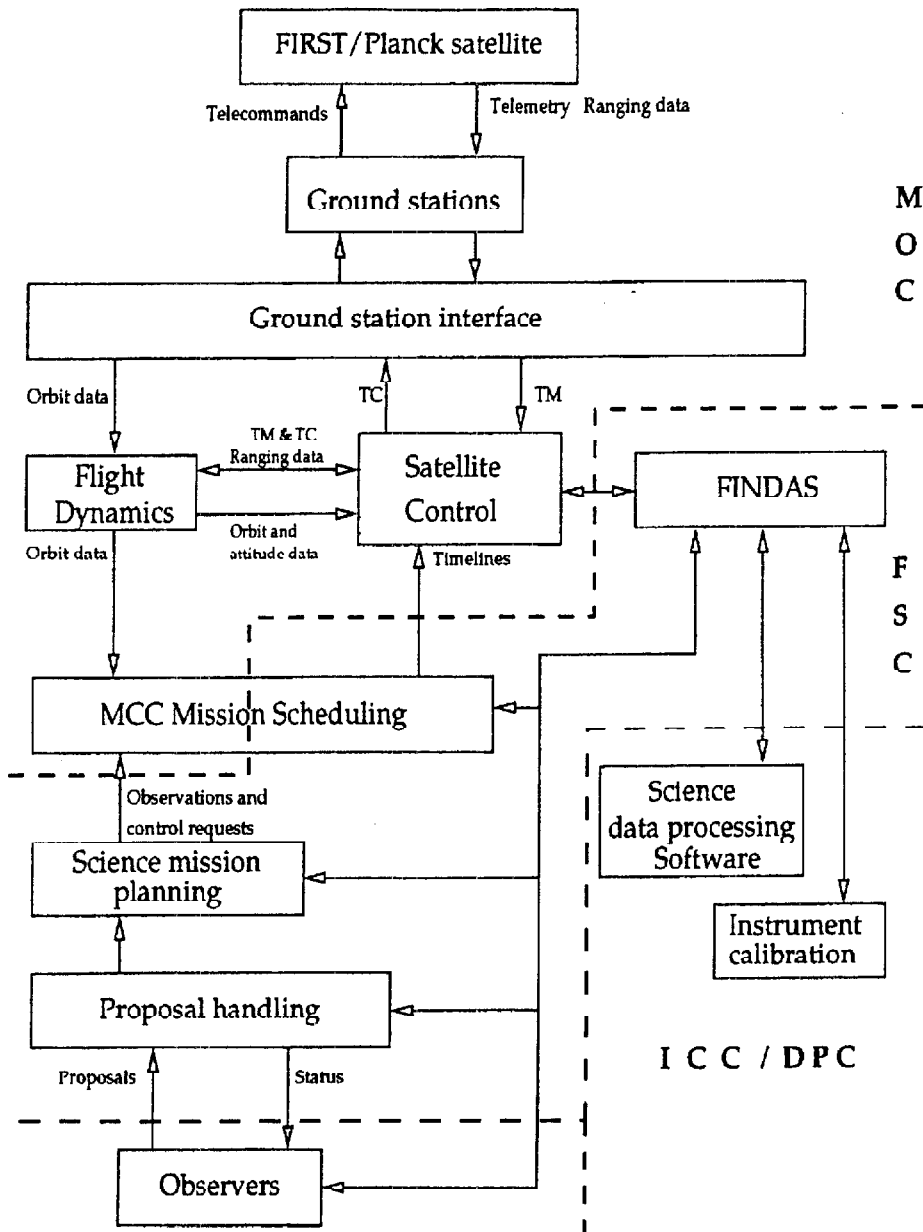


Figure 2: FIRST/PLANCK ground segment during mission operations