FIRST | ESA | M | 0034.10

Agenda for AO clarification meeting
3 Dec. 1997 Newton 1

09.00 - 09.10	Welcome and introduction	FF	Felici
09.10 - 10.00	Briefing on Industrial studies	FV	
10.00 - 10.15	Coffee		
10.15 - 10.45	Model Philosophy, Deliverables, Alignment	MA	
10.45 - 11.15	FIRST/Planck schedule	FF	
11.15 - 11.45	Development and Qualification (Cold vibration)	TP	
11.45 - 12.15	Telescopes and cryo coolers	TP	
12.15 - 12.45	Commonality	PE,HS	
12.45 - 13.45	Lunch		
13.45 - 14.15	Public Relations	FF	
14.15 - 14.45	Parts Procurement, Microprocessors	MvH,HS	
14.45 - 17.00	Question/Answer session/Coffee		

BOL QUESTIONS FOR CLARIFICATION MEETING

1. INSTRUMENT HARDWARE

1.1 INSTRUMENT MODELS

Q.BOL-01 In what form are the mathematical instrument models required?

The IID Part A specifies delivery of:
- an instrument Straylight Mathematical Model
- an instrument Thermal Mathematical Model
- an Structural Mathematical Model;

Can any modelling software/environment be used, or will one be imposed? ESA will have to provide inputs to some of these models: will they accept to provide them in the format we require?

A.BOL-01 **Instrument Straylight Model:**

There is no final definition yet of what shall be the instrument straylight model.
For the FIRST instruments the model to be delivered could be in a CODE V or ASAP format with as a minimum the geometrical definition of the instrument (nodes with X, Y, Z coordinates and angles) and the optical properties of the nodes (radius of curvatures, conical constants, thickness, distance of next path, optical path length ...).
For the PLANCK instruments the detailed definition is still TDB, but expected to be similar to the inputs provided for the Straylight Evaluation Document.

Instrument Thermal Mathematical Model:

- FIRST FPU's Units:
A thermal Mathematical Model with a few nodes shall be provided with the definition of the geometry and of the thermal interfaces with the FIRST optical bench. In addition the following thermal properties shall be included in the thermal model:

temperature	capacitance	dissipation
provide either: - temperature of the node as boundary condition, or - conductive (temperature dependant) and radiative links between nodes and to the thermal interface	provide either: - capacitance or - mass and specific heat (with temperature dependance)	provide: - average value and - time dependant

- *FIRST Cryo Vacuum Vessel's (CVV) Units:*

A thermal Mathematical Model with a few nodes shall be provided with the definition of the geometry and of the thermal interfaces with the CVV. In addition the following thermal properties shall be included in the thermal model:

temperature	capacitance	dissipation
provide either: - temperature of the node as boundary condition, or - conductive (temperature dependant) and radiative links between nodes and to the thermal interface	provide either: - capacitance or - mass and specific heat (with temperature dependance)	provide: - average value and - time dependant

- *Instrument Units in SVM:*

A thermal Mathematical Model with a few nodes shall be provided with the definition of the geometry and of the thermal interfaces with the SVM. In addition the following thermal properties shall be included in the thermal model:

temperature	capacitance	dissipation
provide either: - temperature of the node as boundary condition, or - conductive (temperature dependant) and radiative links between nodes and to the thermal interface	provide either: - capacitance or - mass and specific heat (with temperature dependance)	provide: - average value and - time dependant

- *PPLM Units:*

A thermal Mathematical Model with a few nodes shall be provided with the definition of the geometry and the thermal interfaces with the PPLM. Thermal model of coolers shall be provided with heat dissipation and heat lift at all levels of the coolers. In addition the following thermal properties shall be included in the thermal model:

temperature	capacitance	dissipation
provide either: - temperature of the node as boundary condition, or - conductive (temperature dependant) and radiative links between nodes and to the thermal interface	provide either: - capacitance or - mass and specific heat (with temperature dependance)	provide: average value and - time dependant

<u>Structural Mathematical Model</u>:

A structural mathematical Model with a few nodes is sufficient to be delivered for each instrument. The nodes shall include:

- the mass in kg,
- the stiffness in all 3 axes in Si units (N/m or rad/m).

Q.BOL-02 Is an EMC mathematical model required?

This was required for ISO.

A.BOL-02 The type of EMC model that will be required is the definition of particular interfaces as far as impedance, grounding, cable types, signal levels, bandwidth, common-mode rejection, etc. In due time a questionnaire will be prepared.

Q.BOL-03 Structural/Thermal Model?

The IID Part A indicates that the Instrument Baseline Design Review objectives include 'release for manufacture of the instrument Structural/Thermal Model' but this model is not required.

A.BOL-03 This is correct, the IID-A will be updated.

Q.BOL-04 Alignment model?

The FIRST alignment plan assumes that the BOL pupil plane is oversized compared to M2 and that it is visible on the EQM when viewed through the FIRST telescope.

This will not be compatible with our proposed design because a) we will want to undersize our system stop in order to prevent diffracted straylight entering our instrument and b) in order to maintain the thermal balance of our instrument and to reject out of band emission from the telescope, we want to place a long pass filter at the entrance to our instrument - this will be opaque to visible light.
As an alternative alignment strategy, we would like to propose the provision of a simple alignment model that has M3 and M4 with fiducial marks and some of the instrument baffles but no filters. The telescope can be aligned against this and we can use it, or a copy, as our alignment reference.

Is this acceptable?

A.BOL-04 Probably acceptable. To be discussed in the Alignment Working Group.

Q.BOL-05 What is the environment of M2?

With our current optical design we will be able to see the edge of the secondary mirror and any baffling surrounding it. What is the current design for this?

A.BOL-05 No baffle around M2. Only a tripod.

Q.BOL-06 Do we need separate EM and QM?

The AO (section 1.3.4.4) and IID Part A (section 10.11.2.1) identify the delivery of an EM/QM model. Section 1.6 of the AO (the Project Schedule) requires delivery of separate Engineering and Qualification models.

Our current baseline is to deliver an EQM.

A.BOL-06 We require both an EM and a QM.

Q.BOL-07 What is the EM?

What facilities must the EM provide? What system level tests will it be used for?

A.BOL-07 See MA presentation and Chapter 9 of IID part A.

Q.BOL-08 What is the QM?

What facilities must the QM provide? What system level tests will it be used for? Presentations in the past have said that the QM will only be used in the ISO spare cryostat for checking instrument compatibility - is this correct?

A.BOL-08 See MA presentation and Chapter 9 of IID part A.

Q.BOL-09 What is the delivery date for the QM?

The AO gives the QM delivery date as Jan 2002, the SIRD gives it as May 2002.

A.BOL-09 Referred to presentation on "Schedule"

Q.BOL-10 Will the QM FPU be returned to the instrument groups in time for refurbishment as the Flight Spare?

The IID Part A (section 10.11.2.1) says the EM/QM will stay with the PFM for immediate replacement in the case of a failure of a PFM unit for which only spare subassemblies are available. This therefore does not apply to the EM/QM FPU which could be returned upon delivery of the PFM.

Note: it is also not likely to be possible to repair and retest the PFM FPU within 30 calendar days (AO section 1.3.4.4)
Our estimated latest date for return of the EQM is June 2003.

A.BOL-10 See MA presentation and Chapter 9 of IID part A.

1.2 REQUIREMENTS

Q.BOL-11 Sections 5.15 in IID Parts A and B do not match

Which is correct?

A.BOL-11 IID-B is correct. IID-A will be amended.

Q.BOL-12 What is the spacecraft power supply philosophy?

A.BOL-12 According to present planning we will have a recommendation mid Febr. 1998. Final definition of design will be made in Project phase B which at current planning is early 2000.

Q.BOL-13 Can you clarify the baseline mechanical interface to the instrument?

A recent presentation said instruments are fixed to Optical bench with no adjustment. IID Part A (section 5.6.1.1) indicates adjustment is available.

A.BOL-13 The definition of the nominal position of the focal plane unit on the optical is provided by the alignment reference on the upper side of the unit (as defined in the Alignment Plan), together with the alignment reference on the optical bench. In order to provide tolerances for the mechanical interfaces of the unit to the optical bench, this interface is defined such, that it allows a movement of the unit in the y-z plane by tbd mm.

Q.BOL-14 What is the expected temperature of the Optical Bench?

A.BOL-14 The calculated optical bench temperature in orbit is practically identical to the temperature of the '15 K' level. The latest mathematical model calculations show differences of less than 0.2 K. A similar difference occurs to the instrument shield around the focal plane units, with once again slightly higher temperature of the order of 0.2 K.
During Ground testing the behavior is expected to be different, i.e. the optical bench and the instrument shield are calculated to show an about 20 K temperature than the optical bench, being around 10 K.

At certain periods during tests (after filling cryostat) Temp will be similar to in-orbit temps.

Q.BOL-15 What temperature does the (15K) cooling strap provide? Also, how stable is it?

A.BOL-15 The calculated temperature of the 15 K interface is given at a value of around 12 K at present. The design of the interfaces, however, is such that there will be practically a common 4 K temperature level and slightly different 15 K level for the instruments. The heat load distribution on the 15 K level has recently been evaluated from the mathematical model to 24 % of a total of about 40 mW from constant contributors (heat shields, optical bench, harness conduction), 32 % from harness dissipation (cryostat part, i.e. 15 K to CVV) and 44 % instrument internal dissipation. The dissipative part is driven by the instrument power profile and will dictate the temperature stability of this temperature level.

Q.BOL-16 What is the temperature gradient across the primary mirror?

Also, what fluctuations in temperature can be expected?

A.BOL-16 The temperature on the primary mirror with the expected material as proposed by NASA/JPL has only be calculated for the high elliptic (ISO type) orbit. The resulting gradient along the z-axis of around 1 K is expected to be similar in the L_2 orbit. The gradient across the tripod is expected to be above this value, in the order of several K, depending on the selected design. The fluctuations of the telescope temperature are driven only by the extremes of the allowed sun aspect angles, i.e. from +30° to -15°. The actual fluctuation has not been calculated with the present telescope configuration but is expected to be extremely low.

Q.BOL-17 Optical Ground Support Equipment?

The IID Part A (section 6) does not include a subsection for OGSE. This may be needed for alignment purposes - see earlier.

A.BOL-17 IID to be updated after Alignment Working Group.

Q.BOL-18 Is the instrument envelope fixed?

The assumed instrument envelope was determined a long time ago. Is it possible that the current cryostat design would allow the use of (part of) the corner of the instrument that is currently cut off?

A.BOL-18 The allowed instrument envelope is definitily not fully frozen. The design of the instrument shield and the structure above in the cryostat have been selected such to achieve a structural design with reasonable total mass. It is recommended to make maximum use of the available volume below the instrument shield, where the height of the shield is defined by the maximum required height of one of the FPU's.

Q.BOL-19 What is a Frequency Plan?

A.BOL-19 A Frequency Plan is a list of frequencies generated or used by a particular subsytem. It is used for the purpose of EMC calculations. See example below:

Frequency range		Maximum power level	Interference limit	Notes
Lower limit (GHz)	Upper limit (GHz)	(dBW)	(dBW)	
1600	1800	n/a	-173	Astronomical signal
490	1250	n/a	-183	Astronomical signal
8.0	12.0	-64	-193	SIS IF
2.0	6.0	-64	-193	HEB IF

Q.BOL-20 Shall Rad-Hard/Rad-Tolerant components be used?

The total dose, beginning of mission 2007 and 6 years exposure is about 20 times less than the ISO level. Do we need Rad-Hard/Tolerant components?
If so, can we still use an 80Cx86 CPU? And can we buy them from the Common Parts Procurement exercise?

In general what kind of LSI chips can we rely on if Rad-Hard/Tolerant technology is required?
If we must use the Marconi microprocessor, what kind of S/W tools are available?
Is there any possibility of ESA qualifying a mil-spec microprocessor?

A.BOL-20 This is a partial answer only! The unanswered questions will be covered in the meeting.
Software tools available are a compilation system that supports the MIL-STD-1750. This includes: Compiler, Linker, Assembler, Archiver, Standalone C library, Debugger with 1750 assembler, Graphical user interface. Binary versions are available that run on Solaris 2.5, Linux 2.0 and Windows 95/NT operating systems. These are sort of free and include on-line documentation. A more luxurious version is available from the developer.

Q.BOL-21 Does the DC/DC converter need to be synchronised?

A.BOL-21 This will be determined as soon as all relevant information is available. The information required is: Instrument/subsystem susceptibility, bandwidth, frequency range of interest, allowed level of interference, i.e. in general EMC related parameters. Preliminary guidelines in the IID-A para 5.14 assume converter synchronisation to reduce frequency beating affects.

Q.BOL-22 Are any S/C - Instrument interfaces definitions available?

A.BOL-22 See BOL12

1.3 AIV

Q.BOL-23 What are the vibration Qualification and Acceptance levels?

We need to know these levels for subsystem, instrument and system tests.

A.BOL-23 The definition of the levels is not yet available at the present stage. However, as a starting point we propose the following values to be considered for the FPU's:

- Sine vibration qualification tests:
5 - 100 Hz: 15 g

all axes - 2 oct/min

- Sine vibration acceptance tests:
5 - 100 Hz: 10 g
all axes - 2 oct/min

- Random vibration tests as workmanship tests:

30 - 150 Hz:	+6dB/Oct	
150 - 700 Hz:	0.018 g^2/Hz	} 5 g RMS (TBC)
700 - 2000 Hz:	-3dB/Oct	

Q.BOL-24 What is the maximum temperature at which the experiment must be vibrated to declare it qualified?

Our baseline is to vibrate the instrument at 77K with selected key parts being tested at 4K. Is this acceptable?

A.BOL-24 During mechanical testing of the satellite and during launch the temperature of the instrument is expected to be at about 10 K to 20 K. It is therefore required that the integrated instrument mechanical qualification testing be carried out with this temperature range. Vibration testing at instrument level at 77 K is not sufficient.

Q.BOL-25 What temperature will the instrument be viewing during ground testing?

A 15-K black body would impose a large background on the detectors. Is it possible to flush the cryostat lid to reduce this temperature?

A.BOL-25 The present design of the cryostat cover does not allow for flushing with helium to achieve a low temperature background. It is envisaged that a low background temperature could be achieved by placing a special GSE on top of the cryostat that carries a helium shroud and to open the cover. It should be noted that during nominal ground testing the instrument shield temperature is at around 35 K and the upper parts of the baffle(s) at the cryostat shields even at higher temperatures. Instrument shutters should be implemented to block the radiation from the outside of the instrument.

Q.BOL-26 Is attendance at System Level Tests required/necessary?

The IID Part A (section 6.3) implies instrument monitoring of system level tests will take place at the ICCs through a dedicated communication link. Is this the expected method of working? Will this method also be used for tests carried out at the launch site? How will test reviews be carried out? Does this imply video/teleconferences? Will the contractors be happy to allow outside access to their network?

A.BOL-26 Section 6-3 (page 6-2, bullet before last) IID Part A will be re-phrased as: " During the Instrument -Level activities the RTA/QLA Instrument Stations will be located at the ICCs(FIRST) and DPCs(PLANCK).

For Module and System level Tests they will be connected to and in the vicinity of the CCE and the spacecraft. An ICD....

Q.BOL-27 What is the maximum cryostat pump-down rate during system testing?

We need to design a venting system for the instrument that will eliminate straylight - the pump-down rate will determine the size of vents.

A.BOL-27 The pump down rate of the cryostat can to a certain extent be adjusted to the capabilities of the focal plane units. As a first assumption pump down rates of 50 mbar/min appear reasonable. It should be noted that the units outside the cryostat have to comply with the evacuation speed defined with the AR 5 users manual.

Q.BOL-28 What level of ESD/EMC test verification is required at instrument level for the FPU?

A.BOL-28 For ESD the following has been defined for the spacecraft:

For Conducted Electrostatic Discharge (current injected anywhere in the structure):

- Imax	50 A (TBC)
- Rise time	< 5 ns (10-90 %)
- Duration	30 ns (at half amplitude)
- Rate	10 Hz

For Radiated Electrostatic Discharge (spark gap at 30 cm.)

- Energy	15 mJ
- Voltage	> 10 Kv
- Rate	10 Hz

Testing is desirable, if however harmful to detectors this test might be waived.

EMC test verification is presently TBD. However as a minimum CE and CS tests will have to be performed on the whole of the FPU or on one or two typical circuits with adequate simulation of the remainder of the FPU. In addition our Contractor will perform a computer simulation of the sensitive parts of the instrument based on inputs provided by the instrument teams. See BOL-02

2. INSTRUMENT CONTROL CENTRE

2.1 MISSION PHASES

Q.BOL-29 Is there a Cruise Phase?

According to the SIRD, the Commissioning Phase starts 3 weeks after launch and lasts for 1 month. This is then followed by the Performance Verification Phase which will require observations of astronomical sources. Can observations be made while travelling to L2? If not at what time can observations (and the PV Phase) begin?

A.BOL-29 There is no cruise phase in the sense of a "dormant" ("waiting") phase. During the transfer towards L2, astronomical observations may start. However restrictions (handled by the Mission Planning System) will apply. Observations will start no later than if FIRST was in a 24 or 48 hour Earth orbit. It is anticipated here that there will only be FIRST operations.

2.2 INSTRUMENT SIMULATOR

Q.BOL-30 What is the interface to the instrument simulator?

For integration and testing of our instrument AIV facilities we will use a simulator of the analogue electronics and FPU with a copy of the instrument Digital Electronics. This provides the ability to simulate the important aspects of the instrument (analogue parameters, operations and possibly realistic scientific data) with the ability to load and execute on-board software with accurate timing. We would prefer to deliver such a system to ESA as the instrument simulator, but it would interface through the satellite hardware interfaces. Would this be acceptable?

A.BOL-30 This is not what we expect as a simulator but rather as the EM. The simulator is a software simulator to be integrated with the satellite simulator for operators' training, procedures development, ground segment testing, etc.

2.3 FINDAS

Q.BOL-31 When is FINDAS available?

There is no indication in the SIRD when a version of FINDAS would be available that would allow its use for development of software and instrument level testing.

A.BOL-31 The FINDAS prototype will be delivered to the FSC in January 99. Version 0 (Vo) shall be available in Jan. 2000, V1 in Nov. 2000, V2 in Nov. 2001, etc. The intention is to follow an "incremental" development approach starting from a basic kernel and adding functionality with successive versions. It is expected that an agreed URD for implementation of the full FINDAS will be available in Jun. 99. Contents of the various versions will be defined taking into account instrument needs, i.e. the first "operational version" will be tailored to the support of instrument level testing.

Q.BOL-32 Will there be full FINDAS access for instrument developers?

The testing of instrument models, development of software and operation of the ICC all will require access to FINDAS data and capabilities. However these activities will take place at several different sites. Is it envisaged that access from these sites to FINDAS will be available (not necessarily through dedicated lines)?

A.BOL-32 FINDAS access will be subjected to specific "access rights" (instrument developers will have the "rights" necessary to fulfill their tasks. I would not expect much limitation in the pre-launch phase anyway -TBD-). Access to FINDAS data and capabilities will be possible from the different sites. The exact means need to be defined: (i) data replication by maintaining local copies of some data, (ii) remote access via network (Internet) through a Web-type inteface, (iii) mixture of (i) and (ii), etc..
These options will be explored in the FINDAS prototype.

2.4 SOFTWARE

Q.BOL-33 What is the Instrument Command Translator?

As defined in the SIRD this software translates Mnemonics plus Parameters into a satellite command stream. This function has to be done for all instruments and requires a knowledge of the satellite command structure and the addressing scheme for units on the satellite. In ISO this function was carried out by a common piece of software developed by the (equivalent of) the MOC with the instrument specific information held in a database. This would be the best way to implement this function for FIRST, and so should not be an instrument responsibility.

There is no facility required in the SIRD for the translation of high level scripts, used for the definition of tests and AOTs (using Instrument Command Sequences), into a command stream. This is the equivalent of the Calibration Uplink System (CUS) of ISO. Again this is a common facility, which is required during all phases of the instrument development and operations (it will be required by the instrument teams during instrument level tests, the CCE during system level tests and the ICCs and FSC during operations). This should also be developed by ESA with input from the instruments. Is this the Instrument Command Translator?

A.BOL-33 - Command Translator (1st paragraph of question). It is agreed that the best way would be, as for ISO, a CT (in the ISO-sense) implemented by the MOC, with inputs from the instrument teams. This has not, however, been included as a specific MOC deliverable. Alternatives could also be considered where the work would be split between the ICCs (possibly a common development) and MOC. This needs to be discussed.

- Translation of high level scripts: (2nd paragraph). The FIRST/Planck baseline is to define a Common "Command Language" between check-out and operations and have the CCE contractor implement the language together with the associated tools. This is the ROSETTA baseline and FIRST/Planck plans to re-use, to the maximum extent possible, elements of the ROSETTA system (or at least to take advantage of the experience gained with ROSETTA). This system (which is not the CT mentionned above) would then be an ESA development. It is however conceivable that instrument-specific modules might have to be implemented. In this case ESA would require the instrument teams to provide these modules (according to specs to be commonly agreed). This needs to be discussed.

Q.BOL-34 Requirements on the Science Data Processing software?

It is likely that the Science Processing Software cannot be run as a pipeline (at least in the initial stages) but will require interaction by the observer at some stage in the processing.

Is it true that only processed data will be available to the observer? If so, there will need to be 'pipeline' software producing these products as well as 'interactive' software to allow optimal processing of the data.

Otherwise, the implication is that users may download S/W as well as their data from the FSC.

If so, what requirements are there on this software to enable it to be usable by observers in their own establishments?

A.BOL-34 The raw data, and all associated data needed to process observations, i.e. calibration data, auxilliary spacecraft data, ancilliary data, etc, as well as the 'Science Data Processing' software delivered by the ICCs, will be available in FINDAS. The FSC will have to put together some sort of 'pipeline' based on the ICC software in order to carry out the required level of "Quality Control" (extent TBD) on data and software. The resulting 'processed' data, rather than be thrown away would probably be kept in FINDAS, and could therefore be accessible to observers. The baseline, however, is that the observers access all the elements (raw, calibration, auxiliary data + S/W) required to process their observations -FINDAS will nicely package all that for them- . They then carry out the processing themselves, either by downloading the lot and running on their own machines, or by directly accessing the FSC/FINDAS processors. (mechanism TBD). The ICCs would however only be requested to deliver S/W which can run on ONE AGREED platform (e.g. SUN Unix -tbd-) most probably the FSC platform.

Q.BOL-35 Who is responsible for addressing commonality issues for the ICC software?

A.BOL-35 The assumption is that in the framework of the Commonality WG (CWG), ESA and the ICCs/DPCs/Instrument_teams will discuss the software commonality issues (languages, software standards -e.g. BSSC 'Lite'-, structure/contents of URDs/SRDs/ADDs, level of testing, naming conventions, error handling, data definition, calling sequences, etc, etc.) relevant to the ICC, DPC and FSC software. Upon agreement the ICC/DPC/FSC managers will be responsible for enforcing these standards within their Centres.

2.5 INSTRUMENT OPERATIONS

Q.BOL-36 Will instrument operations be allowed during the Daily Telecommunications Phase?

BOL requires to be able to recycle the cooler every 48 hrs (TBC). This could be carried out during the DTCP, reducing the interference with scientific observations. Is this possible?

A.BOL-36 The baseline is that instrument operations (scientific observations) are carried out during the DTCP. Restrictions w.r.t. area of the sky observable may apply depending on the requirement to point the S/C antenna towards the Earth for the DTCP. Recycling BOL cooler during the DTCP can be implemeted as a standard procedure, being one of the restrictions defined above. Priority will however be given to spacecraft activities.

Q.BOL-37 Is bi-directional exchange of data between spacecraft and instrument available?

The IID Part A (section 5.12.5) says that the instrument may pass positional information to the spacecraft during peak-up activities. Full autonomy of the instrument requires communication between the instrument and the Central Data Management Unit (to provide watchdog facilities). Is this possible?

A.BOL-37 Yes this is possible. A (limited) set of instrument health and safety parameters can be monitored against predefined limits and appropriate action be taken as to be defined for these parameters if exceeding limits.

Q.BOL-38 What does the phrase "without interrupting the planned operations" mean?

The IID part A (section 5.13.3) says the instrument must operate nominally for 4 days without interrupting the planned operations. Does this mean that the instrument must be able to reset itself to some functioning configuration and continue with whatever planned observations it can do, or does this just mean that the instrument should not interfere with satellite operations during this time?

A.BOL-38 It means that in case of problems, the instruments must go to a safe configuration and shall not interfere with satellite operations.

Q.BOL-39 What FSC effort is available for support to the ICCs activities?

The Ground Segment Concept Document envisages training of the FSC staff to be largely accomplished by them taking part in ICC integration, testing and calibration activities. What effort will be allocated to this?

A.BOL-39 The purpose of this on-the-job training is to allow the FSC staff to run the Help-desk efficiently (i.e. to answer community queries acurately relaying only a 'minimum' number of requests for clarification to the ICCs). The extent of the training necessary will thus depend on the level of support required (which is TBD) and also on the complexity of the instruments (hoped to be minimum but also TBD). In the absence of a better definition it seems reasonable to assume that the cost/benefit for the ICCs will be neutral, i.e. the amount of time/effort spent by the ICCs to train the FSC staff will be compensated by work this staff will do to help ICC integration, testing and calibration activities. This of course needs discussion.

3. MANAGEMENT

3.1 FUNDING PROPOSAL

Q.BOL-40 Col funding?

The funding proposal asked for detailed funding information on a Col basis. We intend to provide this on an Institute/Country basis. Is this acceptable?

A.BOL-40 Yes this is acceptable provided that Col resposibility is clearly defined.

Q.BOL-41 When does the Instrument Implementation Agreement need to be signed?

A.BOL-41 After SPC final confirmation of payload complement for First/Planck i.e. Feb. 1999

3.2. RESOURCES

Q.BOL-42 Will ESA assist member states with the additional resources necessary to implement the ICCs?

A.BOL-42 No

Q.BOL-43 Will ESA provide communication links to sites other than the prime ICC node?

A.BOL-43 No. ESA will provide links to one ICC/DPC per instrument.

3.3 PRODUCT ASSURANCE

Q.BOL-44 When will IID Part A Chapter 9 be available?

A.BOL-44 An updated version of the IID-A has been put on the WEB server on 12 nov. '97

Q.BOL-45 Implementation of PSS and ECSS?

As an AO instrument being constructed by Universities and research labs we do not have the resources to implement PSS and ECSS to the letter; the PA Plan produced will describe the systems to be followed and the level of compliance with the various requirements. Is this acceptable?

A.BOL-45 This is acceptable by ESA, but please note that instrument specific PA plans need to be formally agreed with ESA

Q.BOL-46 Fracture Mechanics?

We rarely do this as it has normally been restricted to Manned Spacecraft, therefore only being a requirement on Shuttle launches.
Please clarify whether this is required.

A.BOL-46 It is not required, but materials shall be selected from PSS-01-736 which are resistant to stress corrosion.

Q.BOL-47 Preferred Components

As an AO instrument we reserve the right to use components, from whatever source, provided they satisfy the project quality requirements. For example, NASA Standard Parts List MIL-STD-975 and GSFC PPL will be treated as equivalent to the ESA documents. Is this acceptable?

A.BOL-47 Yes, however commonality with S/C selected componants provides maximum benefit (cost, technical, etc) to instruments and satisfies project quality criteria.

Q.BOL-48 Component Quality?

For an AO instrument the general level we intend to use is ESA/SCC level C or NASA Grade 2 or 3, we expect to use ESA/SCC Level B or NASA Grade 1 for interface components on an unprotected interface with the Spacecraft. For a protected interface we would treat that as a general case.
LAT testing would only be carried out for ESA/SCC parts as it is part of the normal procurement, extra LAT testing would not be carried out on US procured parts.
Please clarify the quality level expected.

A.BOL-48 Grade 3 is not known to us. It is however suggested to join a central coordinated parts procurement scheme for the S/C and all LAT related testing will be done as one batch to the complete satellite need, which provides cost benefits.

Q.BOL-49 What is the minimum number of copies of the ADP required?

Producing 5 copies of the ADP is a large task we would wish to reduce this.

A.BOL-49 Distribution of ADP is as follows: Prime Contractor, Project, One copy with the S/C, One in the Document Management System. It is not possible to reduce.

Q.BOL-50 Do we need a separate Configuration Control Requirements Document?

We would expect to include the configuration control requirements in the PA Plan and not write a separate plan.

A.BOL-50 This is accepted.

HET QUESTIONS FOR CLARIFICATION MEETING

Questions for clarification meeting of FIRST, 3 Dec 1997 -- HvdS, 31 October, 1997.

AO

Q.HET-01 Instrument Model Philosophy.

. Why a PFM instead of a FM?
. Why no STAM (structural, thermal, alignment model)?
. No FS for LOU and backends?

A.HET-01 There is no STAM for financial reasons.

IID-A

Q.HET-02 Page 4-7: Telescope

. Secondary mirror diameter: 301 mm?
. Height of secondary above primary vertex: 1592 mm?
. Distance Primary vertex to best focus: 975 mm
. System f/D: 8.68?
. Effective aperture D: 3.28 m?
. What is the WFE budget?

A.HET-02 System f/D of 8.68 (where D is effective diameter), system focal length of 28.5 m, and "back focal distance" of 975 mm are requirements of the telescope together with the diameter of 3.5m. Design parameters resulting from these requirements are in line with the parameters given in your question. The WFE is specified to 10 μm rms with a goal of 6 μm rms.

Q.HET-03 Page 5-5: Sizes and mass properties:

No STAM?

A.HET-03 See HET-01. No STM but the Alignment Working Group could introduce an alignment dummy.

Q.HET-04 Page 5-9: LOU

The LOU alignment should be added to the alignment plan document.

A.HET-04 Yes it will be added.

Q.HET-05 Page 5-21: See remarks about page 4-7.

A.HET-05 See HET-02 and the Alignment Plan.

Q.HET-06 Page 5-33: Error table

Columns 3 and 5: arcmin or arcsec?

A.HET-06 Arcmin.

ALIGNMENT PLAN

This report is of great importance to the whole project. It is worth while to devote a lot of attention to it and for that reason we have many detailed questions. General remark: the alignment plan does not take into consideration the HET instrument. There is no internal instrument pupil and the alignment of the LO unit is not mentioned.

A. by ESA Plan to be updated because of: new telescope, new configuration, new model philosophy.

Q.HET-07 Page 3/23, Configuration and interfaces figure.

. Will the Telescope focus be located on the optical bench surface as indicated?
. Is the Instrument/PLM I/F located inside or outside the dewar?
. Two interfaces: do they have lateral and tilt adjustment mechanisms built in?
. Where are the adjustment ranges (tilt and shift) of these interfaces specified?

A.HET-07 Will be dealt with in the Alignment Plan

Q.HET-08 Page 4/23

. Where is the reference mark on the telescope located?
. What is the "theoretical" centre of the field of view given by the telescope?

A.HET-08 Will be dealt with in the Alignment Plan

Q.HET-09 Page 5/23

. What is WFE budget? (10.4 :m at edge gives 6.3 mm defocus, not 11 mm)
. 12 arcmin tilt correspond to 7.1 mm lateral shift at 2023 mm? (not 16 mm)
. How is the "telescope reference frame" defined?

A.HET-09 Will be dealt with in the Alignment Plan

Q.HET-10 Page 5/23 and 6/23

. How are the "particulars" from the table taken from the table?

A.HET-10 Will be dealt with in the Alignment Plan

Q.HET-11 Page 6/23

. To what should the "Capability of the PLM/Telescope adjustment along the X axis" be kept?

A.HET-11 Will be dealt with in the Alignment Plan

Q.HET-12 Page 7/23

. The distance between secondary and focal plane is 2043 mm, not 2288 mm.
. What is the meaning of the 13 mm margin between the U.F.O.V provided by the telescope and the F.O.V used by the intruments?
. Is the the "telescope/IF adjustment" to be read as "telescope/PLM adjustment accuracy"?

A.HET-12 Will be dealt with in the Alignment Plan

Q.HET-13 Page 8/23

. Should the third and fourth sentences read: The measurement of the secondary mirror and the focus lateral locations and the telescope defocus will be used later on for the correct adjustment of the Telescope/PLM interface?
. Second sentence under PLM: replace "PLM/telescope interface" by "Instrument/PLM interface"?
. First sentence under Satellite should read: ...to take into account the measured lateral positions of the focus and the secondary mirror and the telescope axial defocus?
. Second sentence under Satellite: is the optical reference located
on the PLM or on the telescope or on the interface? What is the optical reference?

A.HET-13 Will be dealt with in the Alignment Plan

Q.HET-14 Page 9/23

Is the last sentence under 4.1 refering to the two interfaces? If so, are the last sentence under 4.1 and the second sentence under 4.3 contradictory?

A.HET-14 Will be dealt with in the Alignment Plan

Q.HET-15 Page 10/23

Replace "PLM optical bench" by "Instrument/PLM interface"?

A.HET-15 Will be dealt with in the Alignment Plan

Q.HET-16 Page 11/23

Is the PLM I/F the same as the Instrument/PLM interface?

A.HET-16 Will be dealt with in the Alignment Plan

Q.HET-17 Page 12/23

. How can the Instrument optical reference be used to adjust the optical bench with respect to the PLM/telescope mechanical interface? (second sentence)
. Is the PLM mechanical I/F the same as the Instrument/PLM interface? (3rd sentence)
. Are the alignment cube and optical ball part of the optical bench or the Instrument optical reference or the visualization of the PLM (actually the Instrument/PLM) I/F?
. What are the principle functions of the OGSE, the SIMON collimator and the optical ball?

A.HET-17 Will be dealt with in the Alignment Plan

Q.HET-18 Page 13/23

. The end to end test should include also a focal plane test, if possible.
. The end to end test must include the LO unit for HET.

A.HET-18 Will be dealt with in the Alignment Plan

Q.HET-19 Page 19/23

Please give a literature reference to the working principle of the Simon collimator.

A.HET-19 Will be dealt with in the Alignment Plan

HET Consortium
Questions for FIRST AO Clarification Meeting

PROGRAMMATIC

Q.HET-20 Should we assume the schedule proposed by ESA leading to a launch at the end of 2005, or a schedule compatible with most funding agencies and leading to a launch in 2007?

A.HET-20 Reference launch date now is mid 2006.

Q.HET-21 Will ESA be providing funding to the instrument groups for development work during phase B, i.e. between preselection and the start of the funding by national agencies?

A.HET-21 From preselection onwards the National Agencies will pay, however PI's can propose specific technological developments for their instrument, which will be considered for funding by ESA/SSD.

GENERAL/SYSTEM

Q.HET-22 What will the qualification radiation dose be?

A.HET-22 See IID-A para 9.7

Q.HET-23 What will be the repointing speed for nodding and position switching with throws of 3', 30' and 1 degree? What is the maximum angular acceleration and the repointing dead time?

A.HET-23 We have specified that a slew of 5 arcmin shall take 18 seconds. To estimate time taken for other small slew use as rule of thumb: slew duration is proportional to [the square root of] slew length.

Q.HET-24 Can the range of solar elongation angles be increased to reduce restrictions of observations of solar system objects, e.g. comets?

A.HET-24 This will not be possible.

Q.HET-25 Regarding the Instrument Model Philosophy. What is the difference between PFM and FM for the instruments? Why no ASTM (alignment, structural, thermal model)? Is it correct that no FS is required for LOU and SVM units? Please specify EM of the instruments. What is the plan for the ISO cryostat tests? Are you planning to have a LO window and microwave harness?

A.HET-25 See MA presentation.

LOCAL OSCILLATOR RELATED

Q.HET-26 What will the mounting structure for the LOU (HET2) look like? Currently, we estimate a weight of 32 kg which leads to the need of 12 M8 bolts for fixation of the LOU. This is a worst case. We are working on weight and size reduction.

A.HET-26 The mass as given in the present IID-B and used in the system definition study for the local oscillator unit is 17 kg. This does not include the mounting structure, what might explain the difference to the above quoted 32 kg. A update of the design from the one used in the earlier FIRST system definition study is expected to be available by end of the system definition study, taking into account also the results of the alignment and alignment stability assessment.

Q.HET-27 Do we have to take care of reduced heat flow or is the LOU mounting structure made of low heat conductivity material provided by ESA? Which surfaces can we use to radiate heat from the LOU?

A.HET-27 The mounting structure of the LOU is made from low conductivity material and provided by ESA. In addition the unit should to a maximum extent radiate its disspated power to space. The detailed layout will depend on the sharing of radiator and protection parts of the LOU housing. A first iteration is expected by end of the system definition study.

Q.HET-28 What will be the alignment stability of the LOU relative to the FPU? On what basis has this been estimated? How will it be achieved and verified (e.g. cooling, zero g)? What is the expected shift of the LOU relative to the FPU during cooldown?

A.HET-28 An alignment and alignment stability assessment for the local oscillator is underway as part of the system definition study including the measurement method and verification approach.

Q.HET-29 What will be the stress level of Ariane V compared to Ariane 4 for instrument qualification? Will the location of the instrument at the outside of the dewar lead to higher stress levels?

A.HET-29

1. For Instrument sine vibration qualification see BOL-23

2. The comparison of environment ARIANE 4 vs ARIANE 5 are given here below for information. However, it is not considered to be of importance since these are loads applicable to the whole spacecraft.

2.a Quasi Static Loads:

ARIANE 4			ARIANE 5			
Flight event	Longi (g)	Lateral (g)	Flight event	Longitudinal (g)		Lateral (g)
				Static	Dynamic	Static + Dynamic
Max Dyn Pressure	-3.0	±1.5	Lift-off	-1.7	±1.5	±1.5
Before Thrust termination	-5.5	±1.0	Max Dyn Pressure	-2.7	±0.5	±2

ARIANE 4			ARIANE 5			
During Thrust Tail-off	+2.5	±1.0	P230 Thrust Oscillations	-4.25	±1.75	±1
			H 155 Thrust tail-off	-0.2	±1.4	±0.25

2.b Sine Vibrations Loads:

	ARIANE 4			ARIANE 5		
	Frequency range (Hz)	Qualif levels	Acceptance levels	Frequency range (Hz)	Qualif levels	Acceptanc e levels
Longitudinal	5 - 6 6 - 100	8.6 mm 1.25 g	1 g 1 g	4 - 5 5 - 100	12.4 mm 1.25 g	9.9 mm 1 g
Lateral	5 - 18 18 - 100	1 g 0.8 g	0.8 g 0.6 g	2 - 5 5 - 25 25 - 100	9.9 mm 1 g 0.8 g	8.0 mm 0.8 g 0.6 g
Sweep rate		2 oct / min	4 oct / min		2 oct / min	4 oct / min

2.c Acoustic Vibrations Loads:

	ARIANE 4		ARIANE 5		
Octave band (Hz)	Qualif levels (dB)	Acceptance levels (dB)	Qualif levels (dB)	Acceptance levels (dB)	Test Tolerance
31.5	124	120	128	124	-2, +4
63	131	127	134	130	-1, +3
125	139	135	139	135	-1, +3
250	143	139	143	139	-1, +3
500	138	134	138	134	-1, +3
1000	132	128	132	128	-1, +3
2000	128	124	128	124	-1, +3
4000	124	120	-	-	-4, +4
8000	120	116	-	-	-4, +4
overall	146	142	146	146	-1, +3
test duration	2 min	1 min	2 min	1 min	

3. Limit Loads for the Instruments:

The definition of the limit loads to be applied for the structural design of the instruments is not yet available at the present stage. However, we propose the following values to be considered at present for the design of the instruments:

Location	Case	longitudinal (g)	Lateral (g)
FIRST Optical Bench (*)	1	15	2
	2	-	4
FIRST CVV (*)	1	25	10
	2	-	20/10
	3	8	8/20
SVM	1	10	1.5
	2	0	4
PPLM Optical Bench (similar to SVM)	1	10	1.5
	2	0	4

(*) Design Limit Loads coming from ISO experience

Q.HET-30 Have the microwave and DC cables between the LO control unit and the LOU to be redundant?
What experience does ESA have with low loss microwave cables up to 50 GHz? Can we get detailed data sheets? What is the temperature stability of the microwave cables outside the cryostat?

A.HET-30 Redundancy is something that needs to be analysed on a case by case basis. Once the concept is available a trade-off can be made. ESA does not have direct experience with low loss microwave cables. Another attempt has been made again to obtain data and samples of cables to perform some tests. What is the experience of people that have flown or are about to fly similar instrumentation?

Q.HET-31 Are there any updated restrictions concerning size, mass, power consumption and location for the different parts of the instrument? What are the present restrictions on the warm part of the instrument?

A.HET-31 As defined in the IID-B. In addition IID-A lists the allocations.

IID-A

Q.HET-32 Page 4-7: Will the telescope secondary mirror diameter be 301 mm? Height of secondary above primary vertex: 1592 mm? Distance Primary vertex to best focus: 975 mm. System f/D: 8.68?
Effective aperture D: 3.28 m? What is the WFE budget?

A.HET-32 See HET-02.

Q.HET-33 Page 5-5: Sizes and mass properties: No ASTM?

A.HET-33 See HET-01.

Q.HET-34 Page 5-9: LOU. The LOU alignment should be added to the alignment plan document.

A.HET-34 Yes.

Q.HET-35 Page 5-21: See remarks about page 4-7.

A.HET-35 See HET-32

Q.HET-36 Page 5-33: Error table, Columns 3 and 5: arcmin or arcsec?

A.HET-36 See HET-06.

EMC & GROUNDING

Q.HET-37 What will the grounding philosophy be for the instruments in the focal plane and the LOU?

A.HET-37 The grounding philosophy will be determined after analysis of the various instrument/subsystem requirements and constraints and is an overall system task. Preliminary guidelines can be found in IID-A para 5.14.

ALIGNMENT PLAN

This report is of great importance to the whole project. It is worth while to devote a lot of attention to it and for that reason we have many detailed questions. General remark: the alignment plan does not take into consideration the HET instrument. There is no internal instrument pupil and the alignment of the LO unit is not mentioned. Maybe we need a dedicated meeting on this topic.

Q.HET-38 Page 3/23, Configuration and Interfaces figure: Will the Telescope focus be located on the optical bench surface as indicated?

A.HET-38 See HET-07

Q.HET-39 Is the Instrument/PLM I/F located inside or outside the dewar?

A.HET-39 See HET-07

Q.HET-40 Two interfaces: do they have lateral and tilt adjustment mechanisms built in? Where are the adjustment ranges (tilt and shift) of these interfaces specified?

A.HET-40 See HET-07

Q.HET-41 Page 4/23 Where is the reference mark on the telescope located?

A.HET-41 See HET-01

Q.HET-42 What is the "theoretical" centre of the field of view given by the telescope?

A.HET-42 See HET-08

Q.HET-43 Page 5/23 What is WFE budget? (70,4 :m at edge gives 6.3 mm defocus, not 11 mm) 12 arcmin tilt correspond to 7.1 mm lateral shift at 2023 mm? (not 16 mm)

A.HET-43 See HET-09

Q.HET-44 How is the "telescope reference frame" defined?

A.HET-44 The telescope refence frame is defined in the FIRST telescope specification PT-RQ-04671 in paragraph 3.3:
The following axis system shall be used for the telescope: the basic coordinate system shall be a right handed Cartesian system with its origin located at the point of the centre of the interface triangle of the telescope, within the plane defined by the interface triangle lower interface. The X-axis is perpendicular to this interface plane, positive towards the target source. The Z-axis is in the plane normal to the X-axis such that nominally the Sun will lie in the XZ-plane (zero roll axis with respect to the Sun), positive towards the Sun. The Y- axis completes the right-handed orthogonal reference frame.

Q.HET-45 Page 5/23 and 6/23 How are the "particulars" from the table taken from the table?

A.HET-45 See HET-10

Q.HET-46 Page 6/23 To what should the "Capability of the PLM/Telescope adjustment along the X axis" be kept?

A.HET-46 See HET-11

Q.HET-47 Page 7/23 The distance between secondary and focal plane is 2043 mm, not 2288 mm. What is the meaning of the 13 mm margin between the U.

F.O.V provided by the telescope and the F.O.V used by the instruments?

A.HET-47 See HET-12

Q.HET-48 Is the "telescope/IF adjustment" to be read as "telescope/PLM adjustment accuracy"?

A.HET-48 See HET-12

Q.HET-49 Page 8/23 Should the third and fourth sentences read: The measurement of the secondary mirror and the focus lateral locations and the telescope defocus will be used later on for the correct adjustment of the Telescope/PLM interface?

A.HET-49 See HET-13

Q.HET-50 Second sentence under PLM: replace "PLM/telescope interface" by "instrument/PLM interface"?

A.HET-50 See HET-13

Q.HET-51 First sentence under Satellite should read: . . ..to take into account the measured lateral positions of the focus and the secondary mirror and the telescope axial defocus?

A.HET-51 See HET-13

Q.HET-52 Second sentence under Satellite: is the optical reference located on the PLM or on the telescope or on the interface? What is the optical reference?

A.HET-52 See HET-13

Q.HET-53 Page 9/23 Is the last sentence under 4.1 referring to the two interfaces? If so, are the last sentence under 4.1 and the second sentence under 4.3 contradictory?

A.HET-53 See HET-14

Q.HET-54 Page 10/23 Replace "PLM optical bench" by "Instrument/PLM interface"?

A.HET-54 See HET-15

Q.HET-55 Page 11/23 Is the PLM I/F the same as the instrument/PLM interface?

A.HET-55 See HET-16

Q.HET-56 Page 12/23 How can the Instrument optical reference be used to adjust the optical bench with respect to the PLM/telescope mechanical interface?

A.HET-56 See HET-17

Q.HET-57 Is the PLM mechanical I/F the same as the Instrument/PLM interface?

A.HET-57 See HET-17

Q.HET-58 Are the alignment cube and optical ball part of the optical bench or the Instrument optical reference or the visualization of the PLM (actually the instrument/PLM) I/F?

A.HET-58 See HET-17

Q.HET-59 What are the principle functions of the OGSE, the SIMON collimator and the optical ball?

A.HET-59 See HET-17

Q.HET-60 The end to end test must include the LO unit for HET.

A.HET-60 See HET-18

PHC QUESTIONS FOR CLARIFICATION MEETING

Q.PHC-01 Commonality / Parts Procurement: When will ESA release the specs for microprocessors, memory etc., or what assumptions can one make on the capability particularly of the processor for the purpose of the proposal?

For circuits that aren't covered by the commonality approach, can components be used that are qualified to equivalent NASA specs, e.g. by the radiation hardening process of Space Electronics Inc.?

A.PHC-01 Will be covered in the meeting

Q.PHC-02 Model Philosophy: Which one is applicable, the one in the AO or the scheme presented more recently?

A.PHC-02 Refered to Model Philosophy presentation.

Q.PHC-03 PI: Is the concept of having a Co-PI still valid?

A.PHC-03 Yes.

Q.PHC-04 Test and Calibration Plans: What is the maximum temperature at which the experiment must be vibrated to be declared qualified?
What are the vibration levels to be applied to the instrument?

A.PHC-04 See BOL-23 and BOL-24.

Q.PHC-05 Schedule: Shall we assume a launch in late 2005 or early 2006? In either case, while such a schedule is technically feasible, it poses severe budgetary problems with several national funding agencies. Does ESA see any way to provide some initial funding for the year of 1998 to those instrument teams whose national funding can only start in 1999?

A.PHC-05 Reference launch date is now mid 2006.

Q.PHC-06 Which telescope specs should be adopted for the proposal, the updated version or the one quoted in the AO?

A.PHC-06 See HET-02.

Warning: ***This list of questions is not complete; more questions will follow in the near future.***
Answer: ***For the AO clarification it better be complete.***

HFI QUESTIONS FOR CLARIFICATION MEETING

Q.HFI-01 FIRST/Planck applicable radiation level

As a first approximation, can we suppose that levels / doses specified for SOHO at L1, shall apply to FIRST/Planck, at L2, which launch should also occur close to solar activity minimum ?

A.HFI-01 See HET-22

Q.HFI-02 Planck telescope and optical bench temperature monitoring and heaters powering

As any of HFI and LFI, or even both, instrument(s) may not be powered at some stage of the flight, it seems reasonable that Planck telescope, optical bench and PLM thermal control should be directly performed by the SVM. However, for safety reasons HFI on-board systems may need to receive sufficiently accurate temperature measurements of these systems. How do you think this need shall be addressed ?

A.HFI-02 A limited number of S/C powered temperature sensors will be allocated to each of the FIRST/Planck instruments. The IID-B's will (have been) amended to this extent.

Q.HFI-03 Experiment(s) model philosophy

A "preliminary" philosophy has been explained by F. Felici at 03-04 september 97 meeting. The AO different documents provide even less information. This information is needed to establish experiment overall model philosophy and cost. Is it specified that a Planck PLM Qualification Structure shall be provided under S/C Prime Contractor responsibility ?
On the other hand HFI is composed of a larger number of units than the classical 3 units experiments (Sensor, DPU, PSU), some of which like Helium tanks are fairly "passive" during the system level AIV program.
We would like to suggest to define, and agree on, different model philosophies for the instrument different units. Could this be addressed at next clarification meeting or even at an earlier stage ?

A.HFI-03 Yes, the model philosophy could be different for the various units. The objectives of the planned PPLM qualification and flight model testing must not be compromised.

Q.HFI-04 Components level of reliability

Does the "higher risk" approach mentioned in the "Pilot Project" documents drive to a relaxation of reliability requirements that shall be included into IID-A ?

A.HFI-04 FIRST/Planck is not a "Pilot Project". Componant levels are applicable as specified.

Q.HFI-05: Question about 1.3.2 of the announcement of opportunity.

We are going to propose to take part of the payload module responsibilities which were initially foreseen in phase A to be under ESA's responsibility.
Are we expected to explain what we consider as the necessary support from ESA for the proposed scheme to be possible?
The integration of the payload module includes the telescope. We intend to discuss with the telescope team (and LFI team) possible schemes for the integration.
Does that raise any problem?

A.HFI-05 Any support expected in such case should be identified and discussed as soon as possible.

Your discussion on the scheme does not raise a problem.

Q.HFI-06 Can ESA be expected to deliver the data at a common Quick Look center (HFI,LFI) and Orsay for the DPC?

A.HFI-06 It is assumed that the question refers to both pre-launch (e.g. Module and System Tests) and post-launch (operations) phase. Post-launch data will be accessible to the DPCs , as for the FIRST ICCs, via FINDAS. For pre-launch data see answer to BOL-26. Requirements for specific data delivery to QLA centre (HFI, LFI) and HFI-DPC would have to be discussed with ESA.

Note: The intention is to discuss all these issues with the ICCs/DPCs/Instrument Teams, come to an agreement, and, then, jointly, enforce this agreement. The intention is NOT to impose ESA solutions without discussion.

LFI QUESTIONS FOR CLARIFICATION MEETING

The Planck Consortium wishes some clarifications on the following points of the AO:

Q.LFI-01 Overall Program Schedule for FIRST/Planck (page 19 of PT/AO-03114)

It seemed to us that a two years period between the Instrument QM delivery (January 2002) and the Instrument PFM delivery (January 2004) is quite large. Could you explain this scheme? What are the definitions of the various models?

A.LFI-01 Refered to Schedule presentation.

Q.LFI-02 IID-B

Until now the IID-B of Planck LFI has been written at ESTEC by ESA staff on the basis of inputs from the Instrument teams. Since this document is part of the proposal, how do we proceed?

A.LFI-02 At your request a file transfer can be made for the present version of the IID-B (WP format). You are then to update this file as required for the AO response, for which I hope that the present structure can be maintained!! The agreed contents of your IID-B will then be transfered into an official ESA version, which will be issued as per its distribution list.

Q.LFI-03 Public Relations Plan

Is it part of the proposal? Who writes it? Does ESA already need some material from us?

A.LFI-03 Refered to presentation

Q.LFI-04 Scientific & Technical Plan

There are two chapters devoted to Test, Calibration, Verification (Assembly, Integration). Could you clarify these issues? We understand that:

- under Test & Calibration Plans, ESA needs to know if the Consortia have all the facilities required for their functional tests.

To which level of decomposition(Set, Equipment, Assembly, Parts) does the Verification Plan need to be detailed?

- under System Level (see below) AIV, ESA needs to know what are the procedures for the Integration and Certification (that everything works after) of the instrument.

How could we comply with a pre-launch AIV programme that is mostly TBD? (IID-A)

A.LFI-04 See MA presentation.

Q.LFI-05 Planck at System Level

Who is responsible of the AIV of the two instruments (LFI and HFI) into the FPU?

A.LFI-05 LFI and HFI PI's

FIRST/ESA/M/0034.10

FIRST/PLANCK
AO CLARIFICATIONS
BRIEFING ON INDUSTRIAL STUDIES

ESTEC, Newton 1
3 December 1997

F.C. Vandenbussche

1. ***INDUSTRIAL STUDIES***

2. ***JPL SUPPORT***

1. INDUSTRIAL STUDIES

ORGANISATION OF THE INDUSTRIAL STUDIES

- Studies performed by Aerospatiale (AS) and MATRA/MARCONI Space/F under ESA contract
- Divided into three phases

	MERGED	PLANCK "ALONE"	FIRST "ALONE"
Phase 1 1/09-97 till 31/10-97 System Definition/Trade-off/Alternative	X		
Phase 2 1/11-97 till mid Feb-98 Detailed Design	X	X	
Phase 3 to be completed mid-March 98 - Cost and schedule analysis	X	X	X

MERGED FIRST/PLANCK STUDIES STATUS

- Phase 1 : System definition and trade-off of alternative solutions
  - Presentation of the results to all parties on 16 October 97 at Estec
- Phase 2 : Detailed design phase
  - Merged FIRST/PLANCK concept has been retained by ESA for Phase 2
  - The retained solution is challenging technically (AOCS) and still likely to be the cheapest

MERGED FIRST/PLANCK STUDIES STATUS

- included in the Phase 2, review by Industries of IIDs A/B (Mechanical, Thermal, Alignment, etc.) for completion and updates
- included in the Phase 2, the identification of power, Data handling hardware instrument interfaces and grounding scheme which could be used on FIRST/PLANCK Project. Recommendation based on technical/cost criteria will be done after preseletion (mid'98).

The ITT to Industry will contain these interfaces

MERGED FIRST/PLANCK STUDIES STATUS

- Option of baffle of 20 cm (approx. 1.50 m) the PLANCK Telescope primary mirror is being studied by Industry

Phase 3 : Cost and schedule analysis

- To be completed mid March 1998

PLANCK "ALONE"

Phase 1

- Feasibility assessment of PLANCK "Alone" launched by a SOYUZ-FREGAT performed by Estec, presentation to all parties on 16 October 1997.

PLANCK "ALONE"

Phase 2 Detailed design phase

- Similar objectives that the merged FIRST/PLANCK
- Baseline as the presentation of 16 October 1997
- Baffle on PLANCK Telescope being studied
- Has been contracted to AS and MMS-F
- Started early November 1997
- To be completed by Mid-February 1998

PLANCK "ALONE"

Phase 3 Cost and Schedule Analysis

- To be completed Mid-March 1998

FIRST "ALONE"

Phase 3 Cost and Schedule Analysis

- Cost and schedule analysis
- Only Phase 3 will be performed.
- To be completed Mid-March 1998

Industrial Studies

- To be completed Mid-March 1998
- ESA Paper to SPC ready mid-April 1998
- Presentation of results to SPC of 28-29 May 1998

Meetings with Potential Launcher Suppliers

Meetings with Arianespace (Ariane V) and Starsem (SOYUZ-FREGAT) took place on 13 November 1997 with the participation of AS and MMS-F.

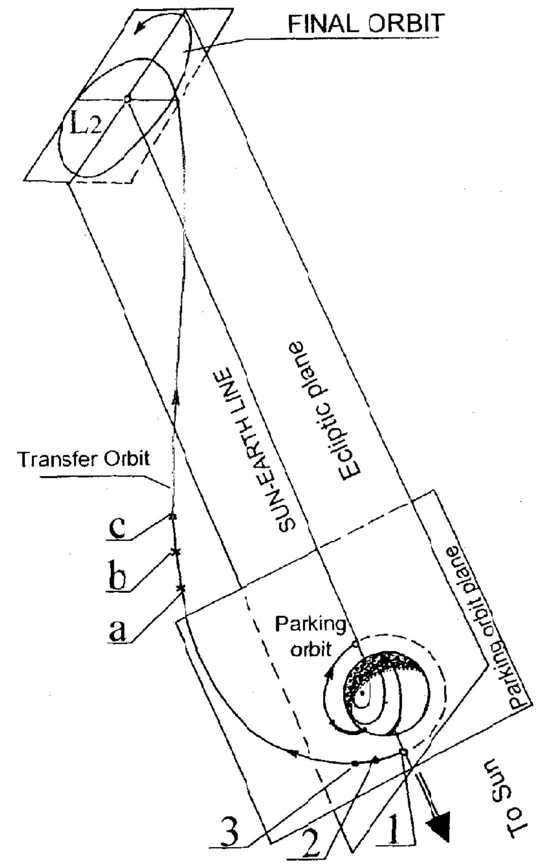
ARIANESPACE

- Launcher performance taken for the studies are confirmed mainly on mass, envelope and delayed ignition.
- Situation will be reviewed before release of ITT

STARSEM

- STARSEM was incorporated in August 1996 and is owned by
  - RKA (Russian Space Agency) and SAMARA Space Center (25% each)
  - Aerospatiale (35%) and Arianespace (15%)
- Launch mass (incl. Adaptor) of 1490 kg with SOYUZ-FREGAT from Baikonur is confirmed
- Mission analysis and spacecraft attitude during launch have to be reviewed.

SCHEME OF FLIGHT



1 - Injection to Transfer Orbit
2 - Orientation of the PLANCK S/C
by US FREGAT, spinning-up
3 - separation of S/C from FREGAT

Possible additional service by FREGAT:
a - midcourse orbital correction
b - orientation&spinning-up
c - separation of S/C from FREGAT

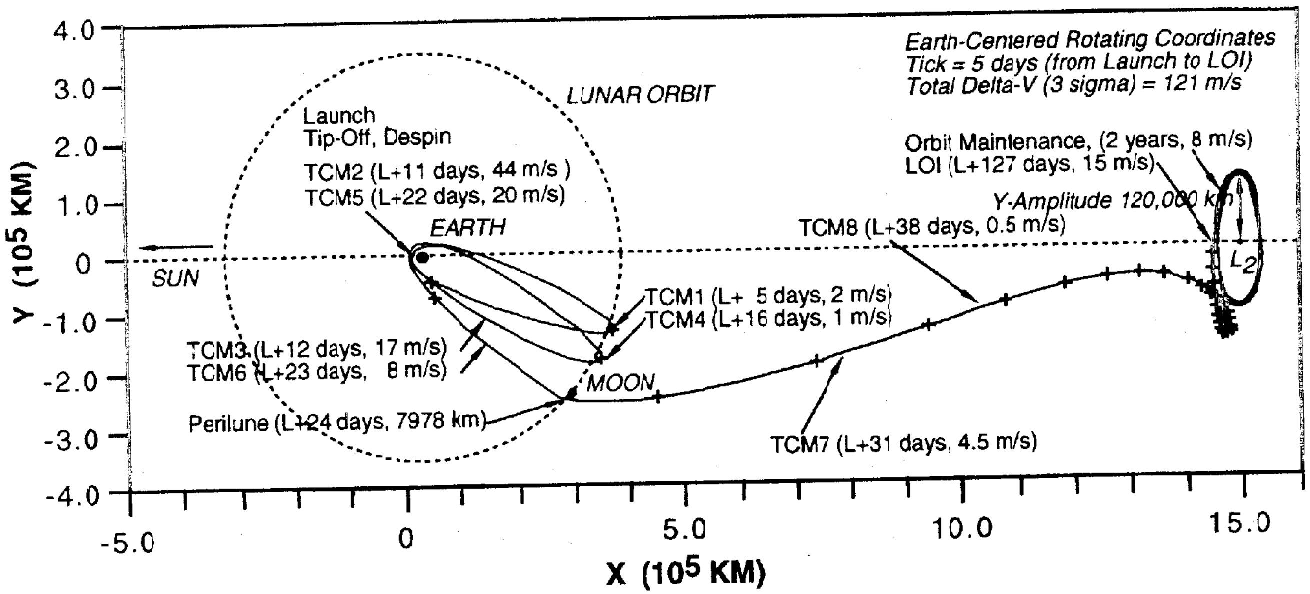
2. *JPL SUPPORT*

- L2 Orbit Insertion
- FIRST Cryostat Thermal Optimisation
- PLANCK Telescope Configuration
- US Launch Vehicle Survey for PLANCK “Alone”

JPL SUPPORT L2 orbit insertion

- JPL propose alternative solution Lunar Swingby and insertion to 4.5 deg. L2 Lissajous which enables less mass than is required for direct insertion into large Lissajous
- Launch Window :
  - Non-contiguous 10-15 Day Launch Period Over 1.5 months
  - Assuming 4.5 Loops in Lunar Phasing Orbit
- Daily Launch Window like Planetary Missions: Few Min.
- Eclipse in Lunar Phasing orbit extremely likely due to low inclination orbit from Kourou
  - Best launch seasons near solstices

LUNAR SWINGBY ORBIT INSERTION STRATEGY FOR SMALL L_2 LISSAJOUS



JPL SUPPORT L2 ORBIT INSERTION (Cont'd)

- Full launch window analysis will require several months and will not be performed by JPL
- JPL will continue analysis limited to several orbit insertion stategies
- Other options have been identified by JPL and are kept in mind
- ESA will perform a full analysis for lunar swingby

JPL SUPPORT FIRST CRYOSTAT THERMAL OPTIMISATION

- Several solutions for the thermal shielding of the cryostat and increase of the FIRST Telescope size are currently analyzed by JPL.
  Completion of the work : mid-December 1997.

- ESA will not ask at this stage industries for incorporation of the results in the study and the baseline telescope size is 3.5 m.

JPL SUPPORT
PLANCK TELESCOPE CONFIGURATION (Cont'd)

- Different geometrical configurations of the PLANCK Payload Module for the merged FIRST/PLANCK have been investigated by JPL.
- JPL structural and thermal analysis are expected mid-December 1997.
- ESA contractors will be kept informed on these studies.

JPL SUPPORT (Cont'd)

US LAUNCH VEHICLE SURVEY RESULTS FOR PLANCK "ALONE"

- TWO VERSIONS OF DELTA II ONLY VIABLE MODERATE COST LAUNCH VEHICLES FOR LIFTING THE PLANCK PAYLOAD TO L2
  -COST IS IN $60 M RANGE
- REGULAR DELTA II 7925 HAS 1300 TO 1350 kg PAYLOAD TO L_2
  -(C3 OF –0.6 TO –1.8)
- DELTA II 7925H HAS 1450 TO 1500 kg PAYLOAD TO L_2
  -FIRST LAUNCH IN 2000

Delta II (all): SIZE OF DYNAMIC ENVELOP (m)

MAJOR DIA.	FULL DIA. LENGTH	TAPERED LENGTH	MINOR DIA.
2.54 (4)	4.19 (3)	2.15	0.73
2.74	4.94 (3)(5)	2.28	0.61

(3) Reduce L by 1.89 m for 3-stage versions (PAM-D upper stage).
(4) Lower 2.2 m of L has only 2.18 m D (adapter/PAM-D region)
(5) 3 ft extension is under development (will cause slight decrease in L')

FIRST/PLANCK

AO CLARIFICATIONS

TELESCOPES & CRYOCOOLERS

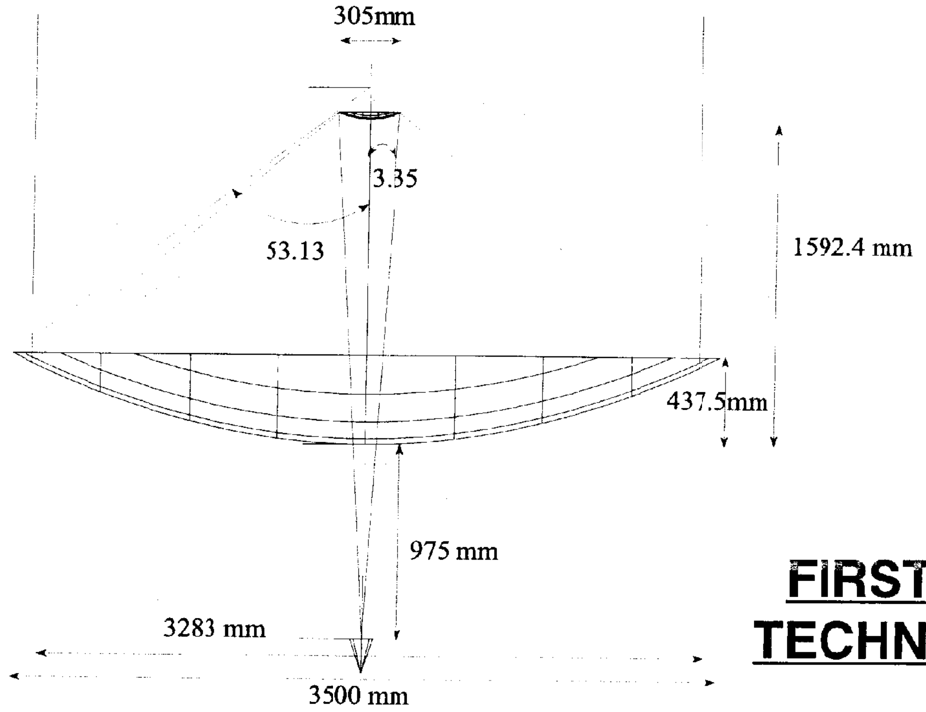
ESTEC - Newton 1

3rd December 1997 **T. Passvogel**

FIRST TELESCOPE - TECHNICAL BASELINE

Basic Telescope Parameters

Diameter	3.5 m
System focal length	f = 28.5
System f/D	f/D = 8.68
Field of view	15 arcmin
Back focal length	975 mm
Temperature range	70 - 90 K
WFE	10μm rms (goal 6μm rms)



FIRST TELESCOPE - TECHNICAL BASELINE

FIRST TELESCOPE - DEVELOPMENT STATUS

Baseline :	NASA/JPL (Carbon Fibre)
Alternatives :	Silicon Carbide Aluminium

FIRST TELESCOPE - DEVELOPMENT STATUS

Baseline - NASA/JPL

- Draft Project Plan on ESA/NASA Cooperation discussed
- Development planned in three major steps :

  - 2.2 m reflector as predevelopment (Demonstrator)
    - mould under grinding/polishing - available Jan '98
    - contract to Manufacturer of Reflector Jan '98
    - cryogenic test (WFE) - June to Sept. '98
  - 3.5 m Qualification Model (Jan. '98 to June 2000)
  - 3.5 m Flight Model (Oct. 2000 to Dec. 2003)

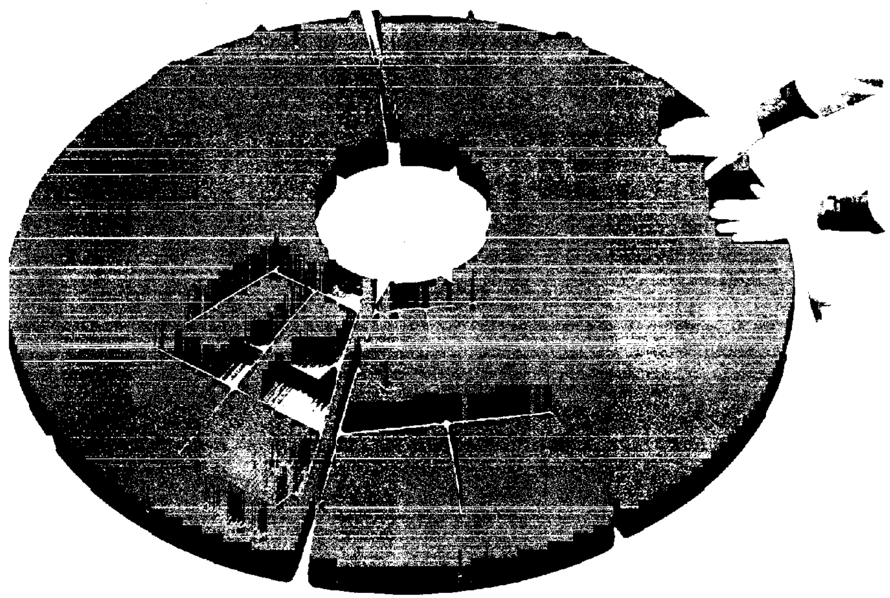
FIRST TELESCOPE - DEVELOPMENT STATUS

Alternatives - Silicon Carbide (SiC)Telescope

- 1.35 m segmented reflector produced
- Completion by Mid 1998 (brazing-grinding-polishing)
- Cryogenic testing - July to September 1998
- 3.5 m Telescope in SiC is compatible with mass requirement

FIRST TELESCOPE - DEVELOPMENT STATUS

Alternatives - Silicon Carbide 1.35 m Demonstrator



FIRST TELESCOPE - DEVELOPMENT STATUS

Alternatives - Aluminium Telescope

- 3 m flat demonstrator plate produced

Main result:
Reflector has to be polished, machining alone with diamond tool not sufficient

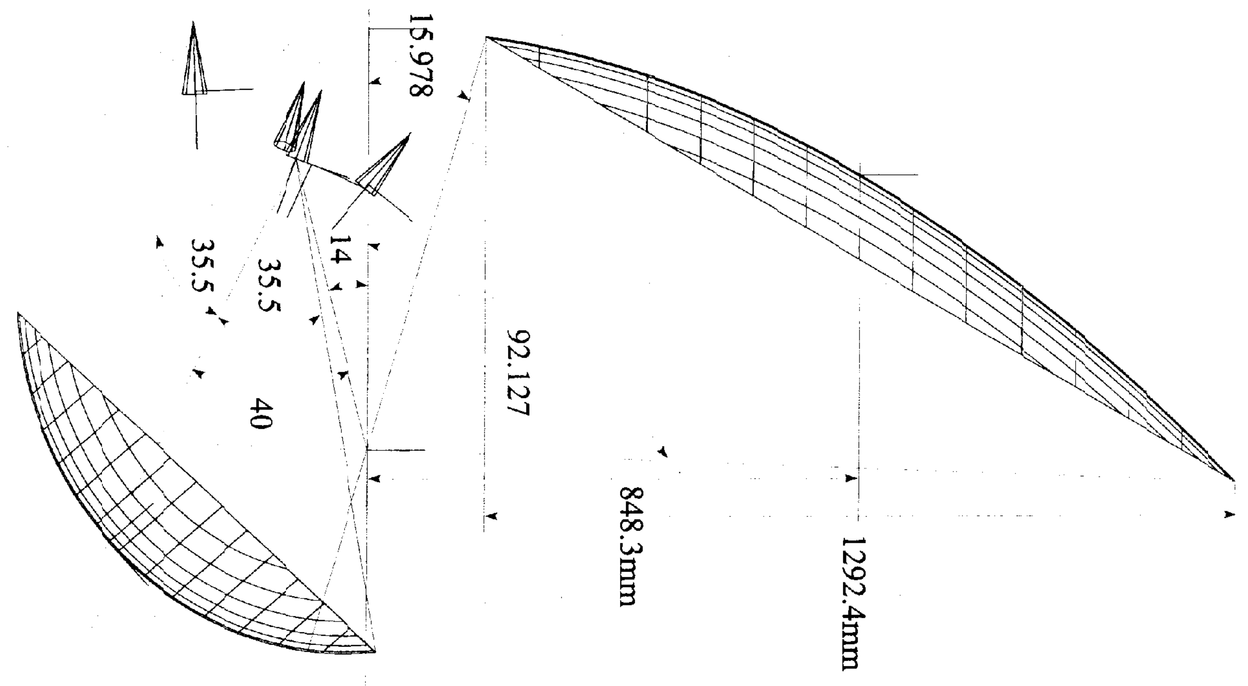
Presently no further development step

- Higher mass of Al (mass critical on FIRST/PLANCK merger)
- Problem of availability of 3.5 m blanck

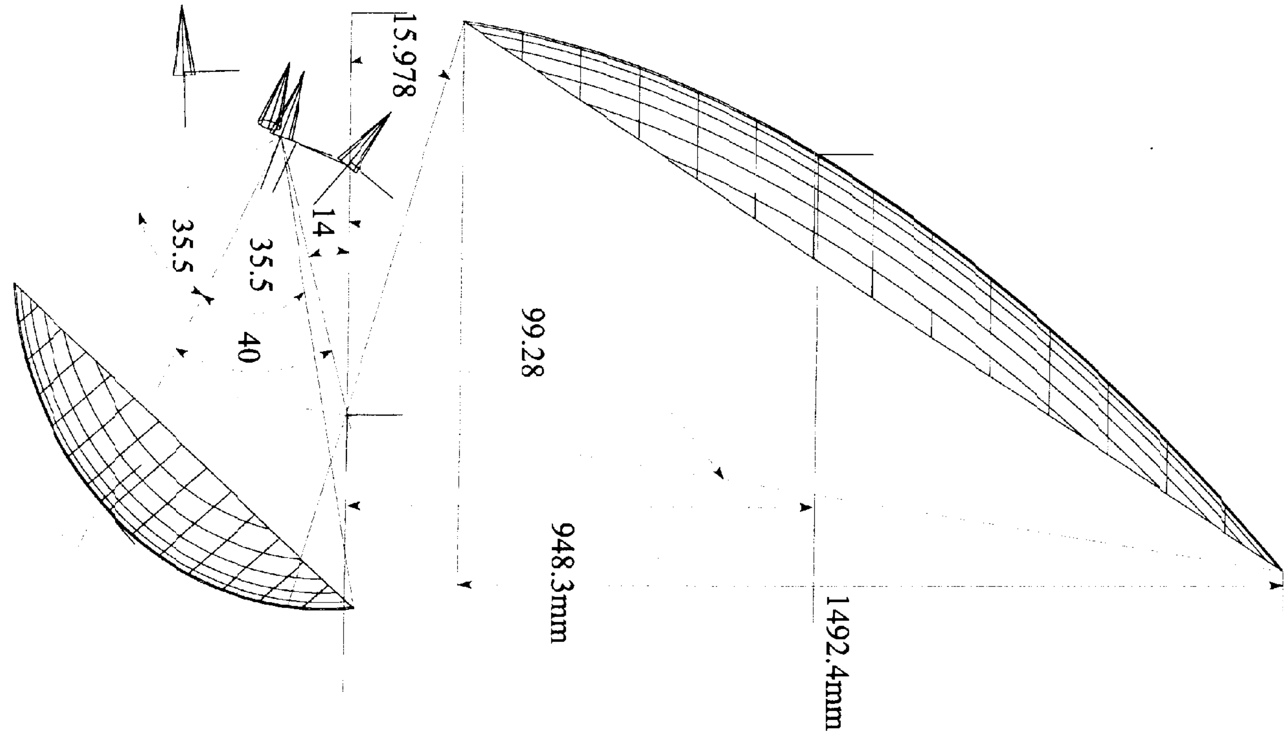
PLANCK TELESCOPE - TECHNICAL BASELINE

- Planck telescope definition as derived at completion of Phase A study is baseline
- Additional baffle around the primary mirror requested to improve straylight performance
- Possibility to implement such baffle up to maximum diameter increase of 20 cm investigated

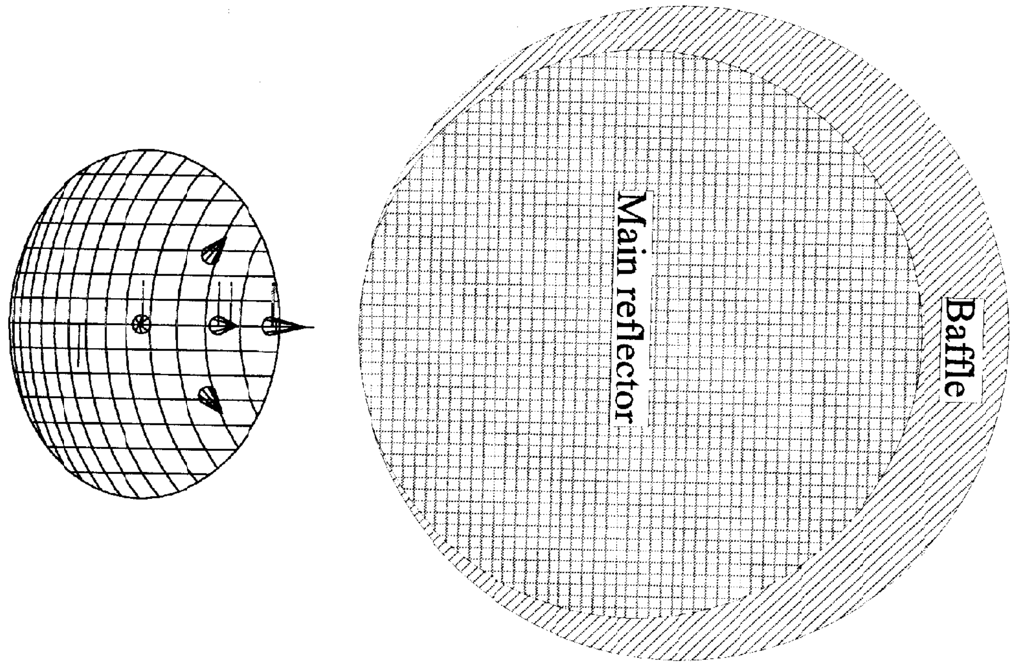
PLANCK TELESCOPE BASELINE



PLANCK TELESCOPE OPTION



PLANCK TELESCOPE TOP VIEW



PLANCK TELESCOPE - STATUS

- ESA/DSRI Cooperation discussed
- Telescope Definition - Activities
  - System Definition Studies
  - Alignment Working Group
  - Mirror Design

PLANCK TELESCOPE - DEVELOPMENT

- H/W Development - Key milestones
  - Technology Demonstrator (cryogenic test) - urgently needed
  - Qualification Model Mirrors - June 2001
  - Flight Model Mirrors - July 2003

PLANCK STRAYLIGHT - NEXT ACTIVITIES

- Instrument input available now
- Straylight Study by ESA up to mid 1998
- System definition study follows basic rules and covers primarily :
  - -- thermal stability aspects
  - -- time constants

CRYOCOOLERS - STATUS

- The 20 K and 4 K Stirling cryocoolers qualified under responsibility of the FIRST/PLANCK Project

- 20 K Cooler Status - 2 coolers under qualification
  - Qualification Review : Oct.' 97
  - Qualification Completion : Aug. '98

- 4 K Cooler Status - 2 coolers under qualification
  - Uses 20 K coolers as pre-coolers
  - Qualification Review : Feb. '98
  - Qualification Completion : May '99

FIRST/PLANCK

AO CLARIFICATIONS

DEVELOPMENT & QUALIFICATION

ESTEC - Newton 1

3rd December 1997

T. Passvogel

INSTRUMENTS DEVELOPMENT AND QUALIFICATION

Required instrument models and testing defined in IID-A, Chapter 9, Development and Verification

Instrument Test Plan - Electrical Model

EM	Electrical Functional	Flight SW	Random tests	Thermal tests	Limited EMC
FIRST FPU (Sims)	X				
FIRST FPU Warm Electronics	X	X	—	—	X
FIRST FPU LOU	X	X	—	—	X
PLANCK HFI/LFI (Sims)	X				
PLANCK Coolers (Sims)	X	X	—	—	X
PLANCK HFI/LFI Warm Electronics	X	X	—	—	X

INSTRUMENTS DEVELOPMENT AND QUALIFICATION

Instrument Test Plan - Qualification / Flight Model

QM/PFM*	Electrical functional	Flight SW	Sine/ Random Shock	Mech. functional	Thermal tests	EMC Cond.	EMC radiated
FIRST FPU	X		X	X	X	X	X
FIRST FPU Warm Electronics	X	X	X		X	X	X
FIRST FPU LOU	X	X	X		X	X	X
PLANCK HFI/LFI	X		X	X	X	X	X
PLANCK Coolers	X	X	X	X	X	X	X
PLANCK HFI/LFI Warm Electronics	X	X	X		X	X	X

INSTRUMENTS DEVELOPMENT AND QUALIFICATION

- Design Limit Loads as an initial input, (derived from ISO)

Location	Case	longitudinal (g)	Lateral (g)
FIRST Optical Bench (*)	1	15	2
	2	-	4
FIRST CVV (*)	1	25	10
	2	-	20 / 10
	3	8	8 / 20
SVM	1	10	1.5
	2	0	4
PPLM Optical Bench (similar to SVM)	1	10	1.5
	2	0	4

INSTRUMENTS DEVELOPMENT AND QUALIFICATION

Critical Verifications/Tests/Items

- Performance verification
- Straylight
- Function
- PLANCK Payload Integration and Test
- FIRST FPU Cold Vibration

INSTRUMENTS DEVELOPMENT AND QUALIFICATION

Performance Verification - Approach

- Instrument level - before delivery (incl. calibration)
  - definition by Instrument
- PLM level - after integration
  - ESA to define test configuration needs (based on above)
  - ESA to decide on implementation (technical/cost/schedule)
- System level
  - ESA to define test configuration needs (based on above)
  - ESA to decide on implementation (technical/schedule/cost)

INSTRUMENTS DEVELOPMENT AND QUALIFICATION

FIRST STRAYLIGHT - Approach

Analysis

- Instrument model(s) (Instrument Deliverable)
- Cryostat model] ↓
- Telescope (environment)] "System" Model

Test

- Possible test for Cryostat internal straylight (using ESA for Cryostat Cover)
  - ESA to define test configuration need
  - ESA to decide on implementation (technical/schedule/cost)

INSTRUMENTS DEVELOPMENT AND QUALIFICATION

PLANCK STRAYLIGHT - Approach

Analysis

- Instrument definition (instrument deliverable)

↓

- System configuration System Model

→ System Stray light Model → System Analysis

↓

- Instrument for detailed analysis

INSTRUMENTS DEVELOPMENT AND QUALIFICATION

INSTRUMENT FUNCTIONAL VERIFICATION

- Dedicated EM/QM models for instrument functional testing
- Full functional testing on PFM
- Functional tests defined in the IID A
  - Integrated System Test
  - Short Integrated System Test
  - Short Functional Test
- Tests to be adapted to environmental conditions

INSTRUMENTS DEVELOPMENT AND QUALIFICATION

PLANCK PAYLOAD MODULE (PPLM) INTEGRATION AND TEST

- Complex integration of the Instrument with PPLM
- "Extreme" cryogenic test
- Approach : - Input from Instruments (I/F, constraints)
  - Review of Integration Sequence
  - Definition of baseline
- Verified on the PPLM Qualification Model

INSTRUMENT DEVELOPMENT AND QUALIFICATION

FIRST FPU COLD VIBRATION

- FIRST (PLM + System) Vibration Test will be at representative launch temperature conditions
- Temperature of FPU's between 10 K and 20 K
- Representative Vibration testing required, i.e. max. temperature below 20 K !

FIRST/PLANCK
AO CLARIFICATIONS

Model Philosophy & Deliverables

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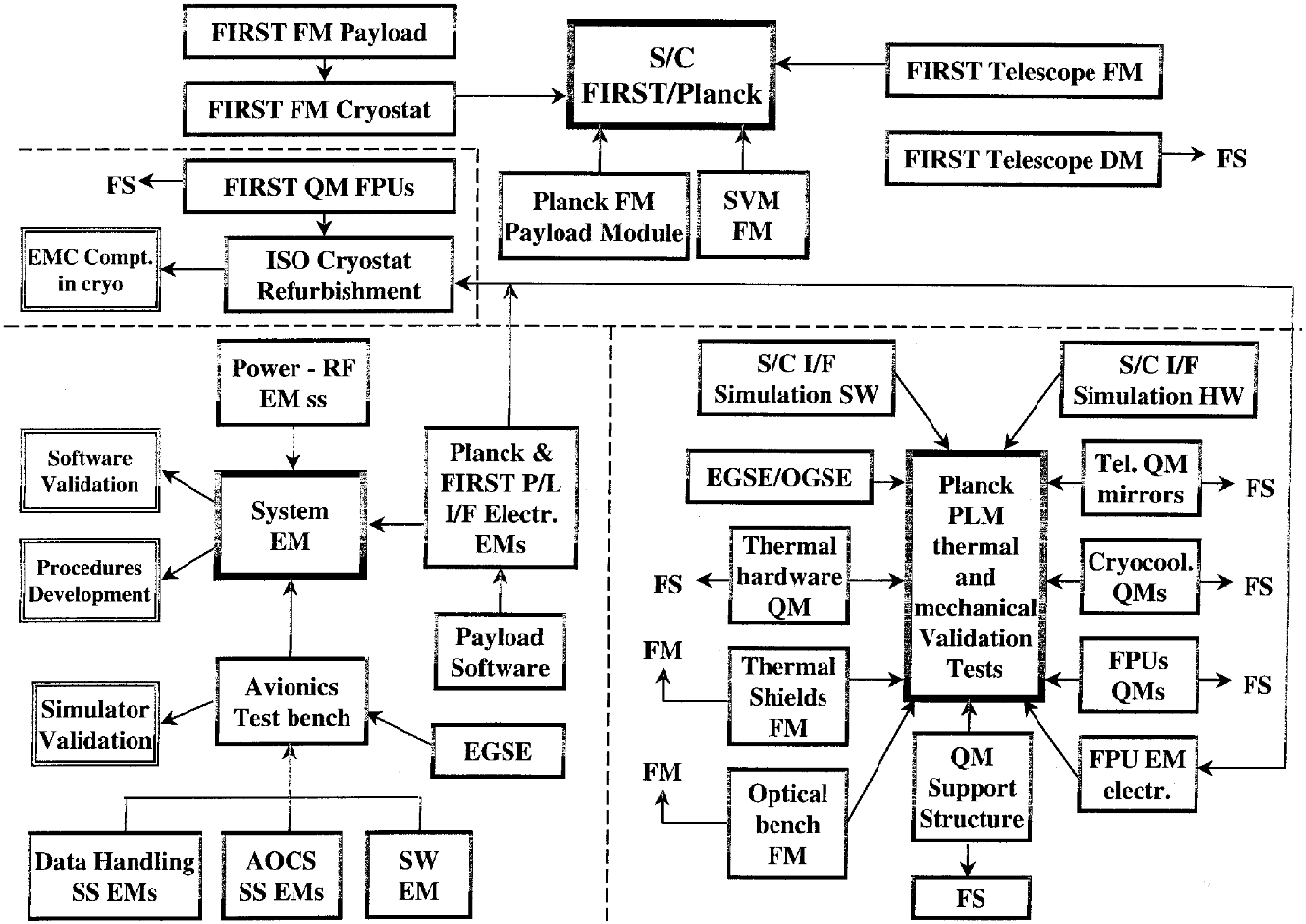
3rd December 1997

M. Anderegg

SATELLITE MODEL PHILOSOPHY



MODEL PHILOSOPHY & DELIVERABLES

ELECTRICAL MODEL 1

1) EM will be used throughout Development and Test Programme
2) OBS can be updated at times throughout development & test phase.

The EM system test objectives are :

- verification of all electrical and software interfaces
- verification of subsystem and instrument functional performance within system environment
- qualification of on-board software
- verification of system functional performance
- verification of operational procedures

MODEL PHILOSOPHY & DELIVERABLES

ELECTRICAL MODEL 2

- electronics flight standard except for parts. Commercial parts have to be of same technology, same supplier as FM parts
- mechanisms flight representative for electrical actuators
- software flight standard
- form, fit and function of the flight model
- software of flight quality must be able to be run

MODEL PHILOSOPHY & DELIVERABLES

ELECTRICAL MODEL 3

In order to save cost the EM hardware contents may be reduced by reducing redundancy :

- cold redundant units or channels may be deleted if no automatic switch-over function is involved
- multiple redundancy of hot redundant units or modules may be reduced by electrical dummies (to e.g. dual redundancy) if EM objectives
- simulators may be supplied of units not directly interfacing with spacecraft subsystems. The level of these simulators, to be agreed with ESA, will allow verification of the correct execution of the flight procedures.

MODEL PHILOSOPHY & DELIVERABLES

QUALIFICATION MODEL

Are required :

- FIRST focal plane units
- Planck focal plane unit (HFI and LFI)
- Planck coolers (HFI and LFI)
- Warm electronic boxes TBD on a case by case basis as proposed by the PI's in the Design and Development Plan (DDVP)

The qualification models standard will be the same as the flight models

MODEL PHILOSOPHY & DELIVERABLES

FLIGHT MODEL

The PFM system test objective is the qualification of spacecraft system by functional and environmental tests

(Protoflight tests: vibration for acceptance times at a level between qualification and acceptance levels.)

The FM units therefore shall have full flight standard verified by formal functional and environmental acceptance tests

MODEL PHILOSOPHY & DELIVERABLES

FLIGHT SPARES

The FS objectives are :

- replacement of failed or damaged equipment at integration and launch site

The FS units have to have the following built standard :

- full flight standard verified by formal acceptance tests.

In order to save cost the FS units :

- may be derived from refurbished qualification units if flight worthiness can be agreed
- may be reduced to repair kits for repair at manufacturer's site if predetermined turnaround time of one month is ensured for unit repair after failure.

This approach has to be agreed with the project office on a case by case basis.

MODEL PHILOSOPHY & DELIVERABLES

SUMMARY

	Development	EM	QM	FM/PFM	FS
FIRST FPUs	TBD	Sims	Yes	Yes	QMs
FIRST Warm Electronics	TBD	Yes	TBD	Yes	kits
FIRST FPU LOU	TBD	Yes	TBD	Yes	kits
PLANCK HFI/LFI FPUs	TBD	Sims	Yes	Yes	QMs
PLANCK HFI/LFI coolers	TBD	-	Yes	Yes	QMs
PLANCK HFI/LFI Warm electronics	TBD	Yes	TBD	Yes	kits

Note: Sims stands for Simulators
TBD's will be defined in the DDVP to be provided by the PI's

FIRST/PLANCK
AO CLARIFICATIONS

ALIGNMENT

ESTEC - Newton 1

3rd December 1997

M. Anderegg

MODEL PHILOSOPHY & DELIVERABLES

ALIGNMENT

- Planck Alignment Working Group has started
- FIRST Alignment Working to resume
  - FIRST Alignment Plan to be revised because of :
    - New telescope
    - New configuration
    - New model philosophy
- Presently no Alignment Dummies

FIRST/PLANCK
AO CLARIFICATIONS

COMMONALITY

ESTEC - Newton 1

3rd December 1997

P. Estaria

COMMONALITY

- Across the board commonality is one of the essential features of the overall FIRST/Planck cost reduction programme
- ESA should take the lead in commonality issues
- Proposed approach :
  - define
  - discuss and agree
  - enforce

COMMONALITY WORKING GROUP (CWG)

- Builds upon FIRST Science Operations Definition Group (FSODG) expertise
- Includes representatives of both FIRST and Planck
- Main objectives :
  - avoid unnecessary duplication of effort
  - ensure identical instruments to ground segment interfaces
- CWG NOT involved in instrument H/W or H/W simulator(s) commonality issues but maintain a link with corresponding WG
- CWG could merge into Ground Segment Advisory Group (GSAG)

COMMONALITY WORKING GROUP

CWG should address following issues (TBC) :

- Follow up on FINDAS activities
- On-board micro-processors
- On-board Programming Language(s)
- Software Development Environments (SDEs)
- Software Validation Facilities (SVFs)
- Instrument on-board Software
- Instrument EGSEs
- Instrument Software Simulators
- Test Sequence Language & Operations Language
- Instrument Stations and RTA/QLA Software
- Instrument Commanding scheme
- SPEVAL or equivalent

COMMONALITY WORKING GROUP

- Proposed composition (TBC)
  - ESOC : TBN
  - FIRST/Planck Project : P. Estaria, H. Schaap
  - BOL : TBN
  - HET : TBN
  - PHC : TBN
  - HFI : TBN
  - LFI : TBN
- FIRST and Planck Project Scientists as well as FIRST/Planck System Engineers will be regularly informed. They have a standing invitation to attend.
- CWG terms of reference to be issued soon.

PUBLIC RELATIONS
New Principles

AO Clarification Meeting
ESTEC -- Newton 1

3 December 1997

F. Felici

Introduction

The general public has never been a priority audience for ESA (in the way in which it is for NASA, for example). However, there is now an understanding that this will need to change, if ESA is to secure its future and hence provide maximum opportunities for the science community in Europe.

In the light of the environment described above, ESA is adopting a new approach to communications - one where the general public is considered an important audience.

Public Relations vs. Scientific Communications

- It must be extremely clear that the targets and scopes of the two activities are very different and therefore the level, aims, vehicles and skills necessary for each type communication are also very different

1) Scientific Communications

Target : the rest of the scientific community and other specialists in the specific field of the mission

Scope : to increase mankind's knowledge; to satisfy intellectual curiosity; to enhance one's scientific stature and career

Public Relations vs. Scientific Communications

2) Public relations

Target : general public, with emphasis on youth.

Scope : to enhance the visibility and the appeal of space science, ESA and European space exploration in an increasingly competitive funding environment

Public Relations vs. Scientific Communications

Vehicles, level

1) Scientific communications

- Typical vehicles are refereed scientific journals, scientific symposia and proceedings
- Level is very high, with emphasis on scientific solidity and certainty of the findings presented

2) Public relations

- Typical vehicles are the media (TV foremost, internet, radio, large circulation newspapers and magazines, popular scientific magazines)
- Level is low to very low (but not inaccurate!) with emphasis on synthesis, on shared excitement, and recognition by the public of (simplified) objectives which can be shared and participated in.

Public Relations vs. Scientific Communications

Skills

- The skills necessary to meet each type of objective are therefore widely different and are not necessarily present at the same level of excellence in all the members of the scientific community.

- This situation can be improved by :
  1) The definition and the agreement between ESA and the scientific teams of clear objectives for public relations at the beginning of the project.
  2) The definition and implementation of specific training as necessary and agreed.
  3) The supply of specialised resources for P.R. through the Agency.

PLANS

- Before X-mas '97 a Science Communication Plan will be defined for ESA's Scientific Directorate and approved by D/Science. A group of consultants is actively working on this plan since some weeks.
- Before mid-January this plan will be discussed in the appropriate coordination and consultation bodies of the Agency (PAG & PR SC).
- Before X-mas '97 a draft publicity agreement will be issued for FIRST/Planck in the frame of the Announcement of Opportunity.

  This will include a questionnaire to be answered in the proposals of the instruments.
- A PR plan for FIRST/Planck will be produced and discussed in the first half of 1998.

THE CORE PRINCIPLES OF THE FIRST/PLANCK COMMUNICATION PLAN

Communications concerning FIRST/Planck must :

- have broad public appeal
- create excitement about both space exploration and the project itself
- publicise ESA,scientists and industry's achievements
- promote benefits of the mission which can be widely appreciated
- emphasise international aspects of the mission
- highlight complementary role vis-à-vis NGST or other ground based telescopes of space astronomy and of FIRST/Planck in particular

SCIENTISTS' ROLE

To ensure the success of this approach, it is critical that all key scientists involved in the project - the principal investigators and the co-investigators - <u>actively support</u> the new communications principles.

For this reason, the scientists' role on the project will be expanded to include a significant contribution to the communications programme <u>in addition</u> to the purely scientific contribution.

Scientists' Role (cont'd)

Principal investigators will be expected to provide communication input on a number of levels.

- Working with co-investigators involved with their experiment, to provide instrument-specific material which fulfils the core communications principles.
- Working with other investigators from their own country to provide region- or-nation-specific socio-economic/general interest material to fulfil the core communications principles
- Working with other principal investigators to contribute to project-level communications activities, including promotion of FIRST/Planck at international events, etc., and other Agency wide initiatives.

Scientists' Role (cont'd)

- To help scientists to participate in the communications programme, and to fulfil their communications-related requirements, a dedicated communication advisor will be assigned to the project. This individual will have communications skills and experience and will work with the scientists throughout the project life-cycle to identify material for promotional/broad communications use.

This is a new approach in European Space

Scientists' Role (cont'd)

- Scientists, after appropriate specialist training if necessary, will be more exposed than in the past to media at the beginning of the mission (selection) during the development and build-up of the spacecraft and instruments, around launch and, finally, when the data start to be interpreted.

- Already at selection time an effort will be requested to publicise the mission to the general public (questions).

Publicity Agreement

- All participating scientists will be required to sign a publicity agreement which recognises the core principles and the specific requirements to provide input to the communications programme.