Short Comments about present HFI Schedule

This schedule incorporates HFI and ESA updated model philosophy.

A number of Bred Boards/Prototypes shall be procured/assembled in order to perform specific preliminary tests:
- Bolometer/HEMTs EMI and horns coupling interaction (at Caltech)
- Selection of final Readout Electronics scheme (with SYMBOL)
- On-board central electronics bred board and software tests (at LAL)
- Effect of thermal noise on detection (SYMBOL)
- SRT tests (at Caltech)
- Horns and Filters tests (at QMW)
- Energetic particles sensitivity test
- Coolers individual performance tests and so on,...
- Cooling chain end-to-end functional test. This test could associate for a short period of time: at IAS a prototype of the 0.1K dilution cooler "cryostat", the full prototype of the Sorption cooler, and the refurbished 4K cooler of the "0.1K demonstrator".

HFI photometric calibration IAS facility performance early testing could be performed using absolute calorimeters.

It is no longer planned to built an early Thermo-Optical Model (TOM) of HFI Focal Plane Unit.

An AVionics Model (AVM) of the instrument representative of HFI electrical interfaces (including power interface) and on-board software interactions. This model shall not be returned to the PI teams before launch.

A full Cryogenic-Qualification Model (CQM) of HFI instrument shall be procured, tested to qualification levels and delivered for integration on Planck specific CQM Payload Module, but for the following exceptions:
- HFI Focal Plane Unit shall be populated by only 10 detection pixels (TBC), only the appropriate number of associated JFETs and Readout Electronics shall be included,
- Only one helium 4 storage tank shall be delivered (instead of 3),
- No redundant Sorption Cooler shall be included.

It is foreseen an early development of the instrument CQM in order to allow enough time for photometric calibration facility debugging/validation now that we have no longer a TOM.
After Payload Module level testing the instruments CQM shall be returned to the PI teams. It is foreseen to refurbish/upgrade CQM units into Flight Spares.

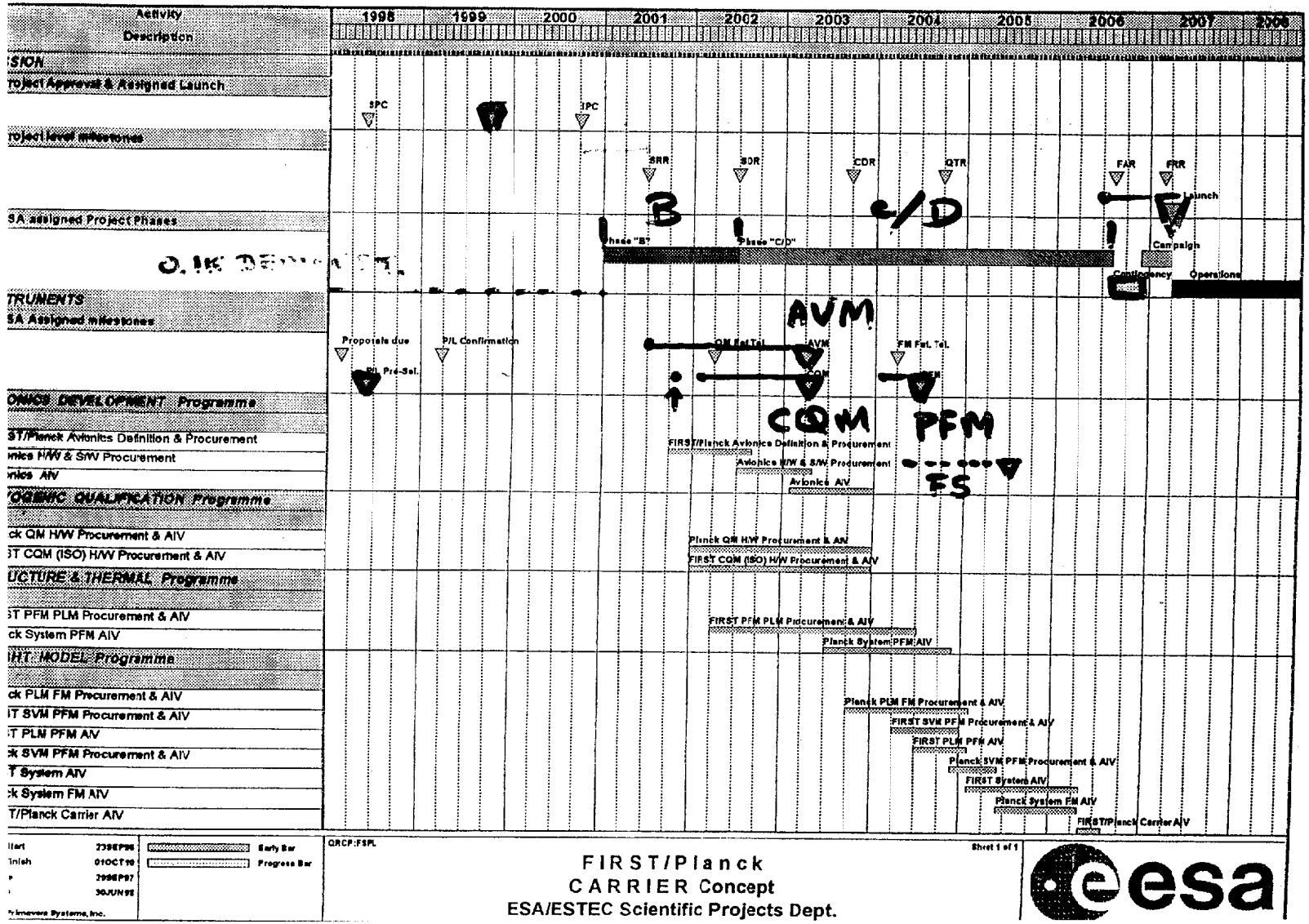
A full Proto-Flight Model (PFM) shall be procured, tested to acceptance levels and delivered for integration on Planck PFM Payload Module.

CQM and PFM model deliveries to ESA are earlier than required in order to allow for integration of HFI PFU into LFI Front End Unit.

ESA requires that HFI Flight Spares include a Focal Plane Unit fully detectors populated.

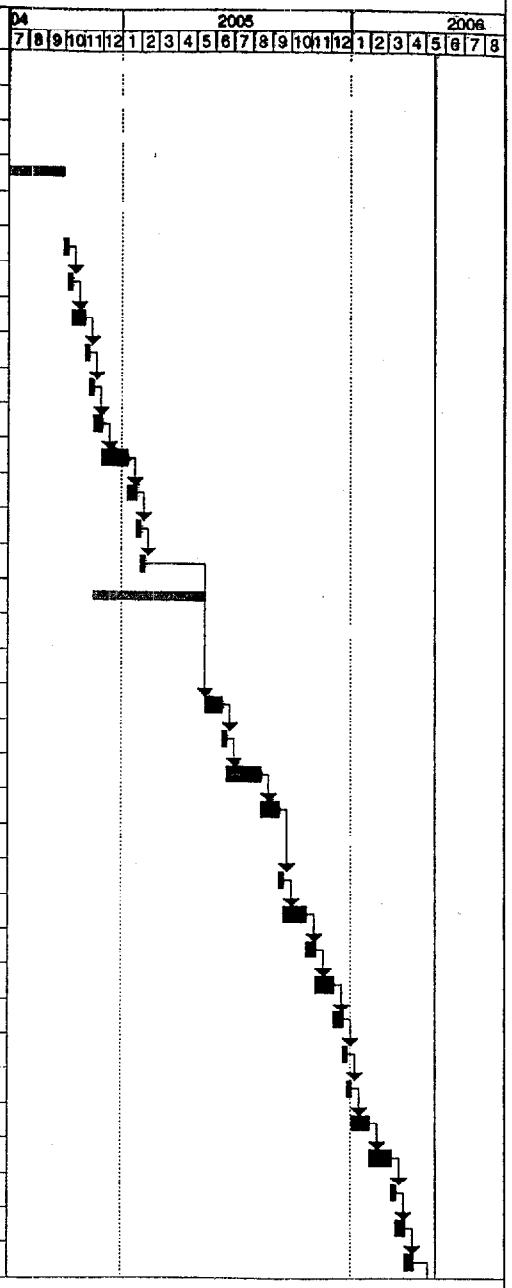
HFI Models Procurement Matrix (to be issued) summarises each model composition and identifies procurement responsibles.

Present schedule includes no system level contingency margins.


Activity Description
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
SION
roject Approval & Assigned Launch
SPC
SPC
roject level milestones
SRR
SDR
CDR
QTR
FAR
FRR
Launch
SA assigned Project Phases
B
C/D
Phase "B"
Phase "C/D"
Campaign
Contingency
Operations
TRUMENTS
SA Assigned milestones
AVM
Propoisals due
P/L Confirmation
P/L Pre-Sel.
QM Sel.Tel.
AVM
FM Sel. Tel.
ONICS DEVELOPMENT Programme
ST/Planck Avionics Definition & Procurement
nics H/W & S/W Procurement
nics AIV
QM
PFM
FS
FIRST/Planck Avionics Definition & Procurement
Avionics H/W & S/W Procurement
Avionics AIV
OGENIC QUALIFICATION Programme
ck QM H/W Procurement & AIV
T CQM (ISO) H/W Procurement & AIV
Planck QM H/W Procurement & AIV
FIRST CQM (ISO) H/W Procurement & AIV
UCTURE & THERMAL Programme
T PFM PLM Procurement & AIV
ck System PFM AIV
FIRST PFM PLM Procurement & AIV
Planck System PFM AIV
HT MODEL Programme
ck PLM FM Procurement & AIV
T SVM PFM Procurement & AIV
T PLM PFM AIV
k SVM PFM Procurement & AIV
T System AIV
k System FM AIV
T/Planck Carrier AIV
Planck PLM FM Procurement & AIV
FIRST SVM PFM Procurement & AIV
FIRST PLM PFM AIV
Planck SVM PFM Procurement & AIV
FIRST System AIV
Planck System FM AIV
FIRST/Planck Carrier AIV
Early Bar
Progress Bar
QRCP:FSPL
Sheet 1 of 1
FIRST/Planck
CARRIER Concept
ESA/ESTEC Scientific Projects Dept.
esa

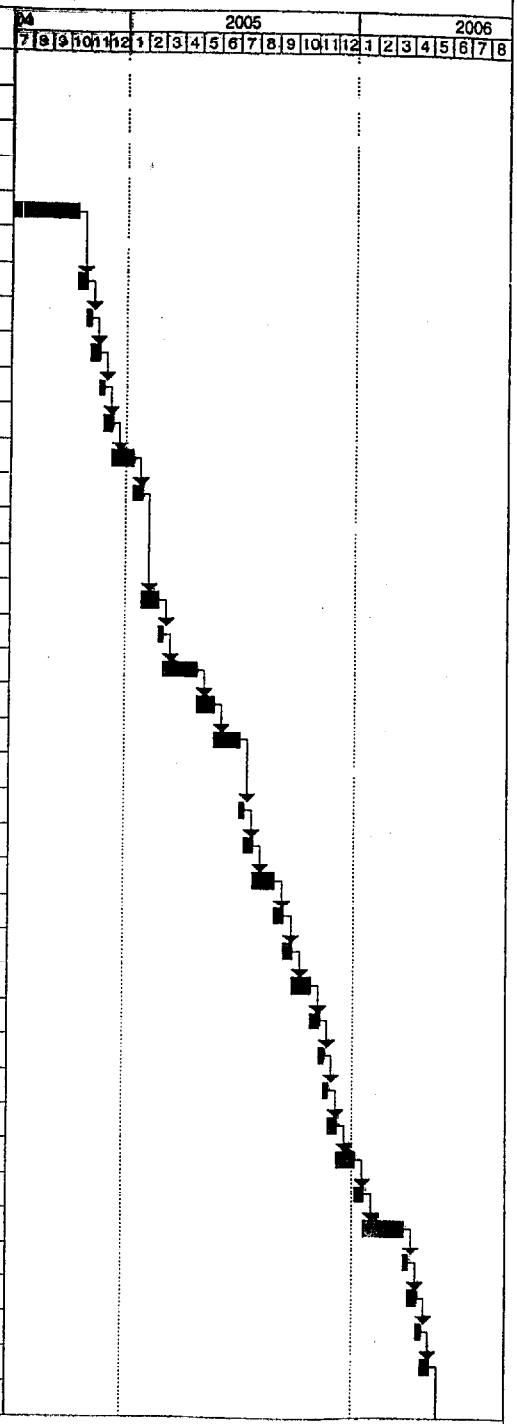
FIRST/Planck Programme
Carrier Concept

ID	Task Name
40	**Planck S/C DEVELOPMENT**
41	**Planck PFM Programme**
42	**Planck Payload Module PFM**
43	**Integration**
61	**Test**
62	Telescope alignment check
63	Function test instruments
64	Vibration test
65	Telescope alignment check
66	Functional test
67	Cryogenic Test Preparation
68	Cryogenic Test
69	Post cryogenic test activities
70	Alignment check
71	Functional Test
72	**Planck SVM Structure PFM (II)**
75	**Planck Spacecraft AIV PFM**
76	**Integration**
77	Integration SVM to PLM
78	Alignment Check/Reference
79	Integration external structures
80	Integration Sunshield
81	**Test**
82	Alignment check
83	Inegrated System Test
84	ESOC Compatibility Test
85	Vibration Test
86	Acoustic Noise Test
87	Alignment check telescope
88	Alignment check s/c
89	EMC test
90	TV test
91	Alignment check
92	ESOC Compatibility test
93	Delivery to Carrier programme



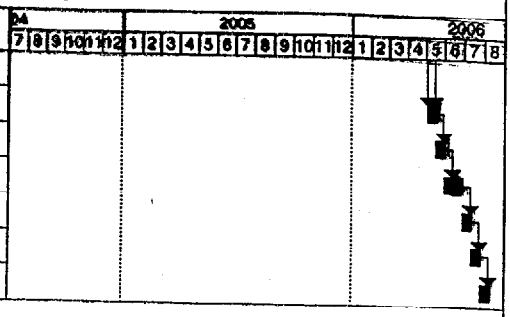
FIRST/Planck Programme
Carrier Concept

ID	Task Name
1	**FIRST/Planck Carrier**
2	**FIRST S/C DEVELOPMENT**
3	**FIRST PFM Programme**
4	**FIRST Cryostat PFM (II)**
5	Integration
6	**Test**
7	Evacuation and Bake Out
8	Alignment check FPU's
9	Cooldown and filling
10	Alignment check cryogenic
11	He II production and top up
12	Integrated Module Test
13	Delivery to System AIT
14	**Spacecraft AIV**
15	**Integration**
16	Integration FM Telescope
17	Alignment Check/Reference
18	Integration external structures
19	Integration Sunshield/sunshade STM
20	Integration SVM
21	**Test**
22	Alignment check
23	Cryostat refilling, He II production
24	Inegrated System Test
25	ESOC Compatibility Test
26	Cryostat refilling, He I
27	Vibration Test
28	Acoustic Noise Test
29	Alignment check telescope
30	Alignment check s/c
31	Cryostat refilling and He II production
32	EMC test
33	Cryostat top up/launch autonomy
34	TV test
35	Alignment check
36	ESOC Compatibility test
37	Conversion to He I
38	Delivery to Carrier programme
39	



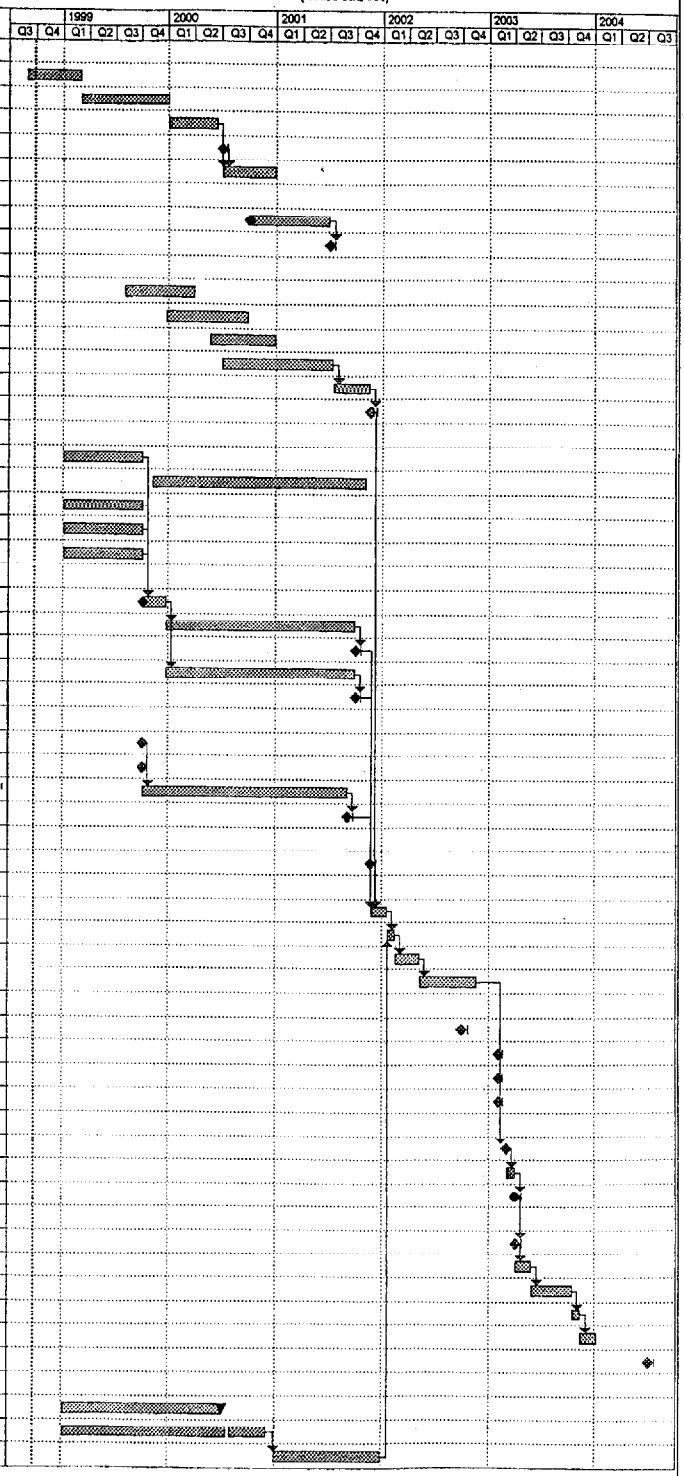
Carrier Concept

ID	Task Name
94	**FIRST/Planck Programme**
95	**Mechanical integration FIRST/Planck**
96	**FIRST Cryostat He filling**
97	Vibration test
98	Acoustic noise test
99	FIRST/Planck Clampband test and deintegration
100	Preparation for Transport



PLANCK HFI SCHEDULE FOR CQM and more (Issued 09/24/98)

ID	Task Name
1	
2	0.1K Demonstrator Contract
3	0.1K Demonstrator Follow-up
4	Demonstrator 4K Cooler Refurbishment
5	Dilution Proto Delivery (AL)
6	Cryogenic Chain Testing (end to end)
7	
8	Proto 20K Cooler delivery to IAS and use
9	Proto 20K Cooler return to LFI
10	
11	CalTech Detector Manufacture
12	CalTech Testing
13	CalTech Delivery of bolometers
14	QMW AIV & test of pixels
15	QMW AIV & Test of Focal Plane
16	QMW Delivery of CQM cold optics to IAS
17	
18	Bolometers + Readout Electronics Testing with Symbol
19	Bolometers Testing with Symbol Follow-up
20	Thermal Stability Test with Symbol
21	STR Tests
22	Particule Sensitivity Testing
23	
24	JFETs Box + Readout Electronics Confirmed Design
25	CQM JFETs Box Procurement (manufacture and testing)
26	JFETs Box Delivery to IAS
27	CQM Readout Electronics manufacture and testing
28	CQM Readout Electronics Delivery to IAS
29	
30	0.1K-1.6K Subsystem Prototype Study Outputs
31	Payload Definition with Architect/constraint outpouts
32	CQM 0.1K-4K Structures and Suspensions Design and Manufactur
33	CQM 0.1K cooler Delivery to IAS
34	
35	CQM DPU+PSU Delivery to IAS
36	
37	Integration of FPU
38	Functional Testing under Vacuum
39	HFI CQM Environment Qualification
40	Photometric Tests/Calibration
41	
42	20K Cooler CQM Delivery to LFI
43	4K Cooler Delivery to ESA Contractor
44	CQM 4K Ancillary Electronics Delivery to ESA Contractor
45	0.1K Cooler Delivery to ESA Contractor
46	
47	Focal Plan Unit Delivery to ESA Contractor
48	HFI FPU integration with LFI FPU
49	**Instrument Delivery To ESA**
50	
51	20K Cooler delivery to ESA Contractor
52	Cryogenic System Integration
53	Integration with Payload Structure and Telescope
54	Cryogenic Testing
55	ESA Environment Testing
56	**CQM Return to PI**
57	
58	Absolute Calorimeter Development
59	Calibration Facility Development
60	Calibration Facility Testing



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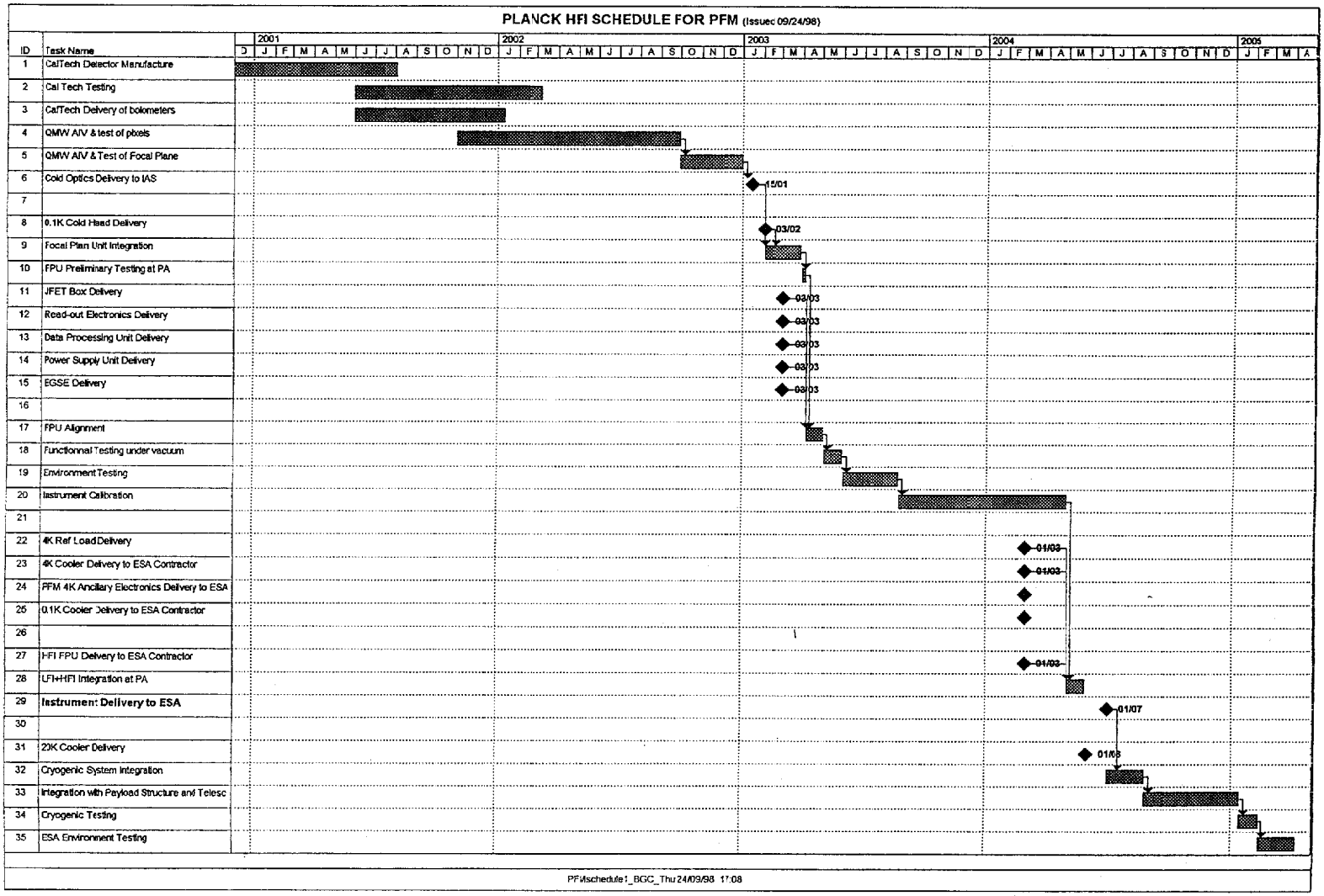

PLANCK HFI SCHEDULE FOR PFM (Issuec 09/24/98)
ID
Task Name
2001
2002
2003
2004
2005
1 CalTech Delector Manufacture
2 Cal Tech Testing
3 CalTech Delivery of bolometers
4 QMW AIV & test of pixels
5 QMW AIV & Test of Focal Plane
6 Cold Optics Delivery to IAS
7
8 0.1K Cold Head Delivery
9 Focal Plan Unit Integration
10 FPU Preliminary Testing at PA
11 JFET Box Delivery
12 Read-out Electronics Delivery
13 Data Processing Unit Delivery
14 Power Supply Unit Delivery
15 EGSE Delivery
16
17 FPU Alignment
18 Functionnal Testing under vacuum
19 Environment Testing
20 Instrument Calibration
21
22 4K Ref Load Delivery
23 4K Cooler Delivery to ESA Contractor
24 PFM 4K Ancillary Electronics Delivery to ESA
25 0.1K Cooler Delivery to ESA Contractor
26
27 HFI FPU Delivery to ESA Contractor
28 LFI+HFI Integration at PA
29 Instrumen: Delivery to ESA
30
31 20K Cooler Delivery
32 Cryogenic System Integration
33 Integration with Payload Structure and Telesc
34 Cryogenic Testing
35 ESA Environment Testing
01/01
03/02
03/03
03/03
03/03
03/03
03/03
01/03
01/03
01/03
01/07
01/08
PFM\schedule1_BGC_Thu 24/09/98 17:08

HFI FUNDING

IN ORDER TO PREPARE FEBRUARY 1999 SPC CONFIRMATION OF PLANCK MISSION

FOR EACH NATIONAL FUNDING AGENCY WE HAVE TO DELIVER ON DECEMBER 14TH

- REQUIRED MANPOWER STATUS
- TOTAL REQUESTED AMOUNT
- REQUESTED FUNDING PROFILE

- AGENCIES PROPOSED AMOUNT AND PROFILE (THIS INFORMATION MUST HAVE AGENCIES AGREEMENT)
- IMPACT OF THAT ON INSTRUMENT SCHEDULE, AND SPECIFICALY THAT OF SHORT TERM FUNDING SHORTAGE
- POSSIBLE REMEDIAL ACTION IF ANY

HFI Models Procurement MATRIX

	Breadboards (to be identified)	AVM	CQM	PFM	FS
HFI Focal Plane Unit					
Back to back Feed Horns	QMW (TBD #)		QMW (10)	QMW (48)	QMW (48)
Coupling Horns	QMW (TBD #)		QMW (10)	QMW (48)	QMW (48)
Bandpass filters	QMW (TBD #)		QMW (10)	QMW (48)	QMW (48)
Bolometers	Caltech (TBD #)		Caltech (10)	Caltech (48)	Caltech(48)
Cryo thermometers	Caltech (0.1, 1.6 & 4K)		Caltech (10)	Caltech (10)	Caltech (10)
Heaters	QMW		QMW	QMW	QMW
Base plates	IAS		IAS	IAS	IAS
0.1K Structure	AL		AL	AL	CQM
0.1K Suspension	AL		AL	AL	CQM
1.6K Structure	AL		AL	AL	CQM
1.6K Suspension	AL + IAS		AL	AL	CQM
4K Structure	IAS		AL	AL	CQM
4K Suspension	IAS		IAS	IAS	CQM
4K Reference Load for LFI & Dampers	LFI		LFI	LFI	LFI (CQM ?)
18K Structure			IAS	IAS	IAS (CQM ?)
JFETs					
JFET Box	CESR		Roma	Roma	Roma
4K Connection Box	CESR		Roma	Roma	Roma
4-20K Bellow			Roma	Roma	Roma
4-50K Harness			Roma	Roma	Roma
Capacitors			Roma	Roma	Roma
JFET Boards			Roma	Roma	Roma / CQM
Readout system					
Readout Electronics	CESR		CESR (18 channels)	CESR (66 channels)	CESR (18 channels)

50-300K Harness	IN2P3		IN2P3	IN2P3	IN2P3
0.1K Dilution Cooler					
0.1K stage	AL		AL	AL	AL
0.1-1.6K exchanger	AL		AL	AL	AL
1.6-4K section	AL		AL	AL	AL
4-300K Piping	AL		AL	AL	AL
Dilution Control Unit	AL		AL	AL	AL
Control Unit Electronics	France		France	France	France
Storage to Control Unit piping	AL + IAS		AL	AL	CQM
He mixture Outlet system	AL		AL	AL	CQM
Helium3 storage system	IAS		AL	AL	AL (1)
Helium4 storage system	IAS		AL	AL	AL (1)
4K Cooler					
4-18k Cold end	RAL		RAL	RAL	CQM
18K to Ancillary Piping	RAL		RAL	RAL	CQM
Ancillary Unit	0.1K Demonstrator		RAL	RAL	CQM
Ancillary Interface Electronics	France		France	France	France
4K Compressor Unit	0.1K Demonstrator		MMS-Bristol	MMS-Bristol	CQM
4K Compressor to Ancillary piping	0.1K Demonstrator		RAL	RAL	CQM
4K Drive Electronics	0.1K Demonstrator		RAL	RAL	CQM
Drive Electronics to 4K Compressor Harness	0.1K Demonstrator		RAL	RAL	RAL (CQM ?)
Main (LFI) Sorption Cooler					
18 to 300K Main Sorption Cooler Piping	JPL		JPL	JPL	CQM
Main Sorption Cooler Compressor	JPL		JPL	JPL	CQM

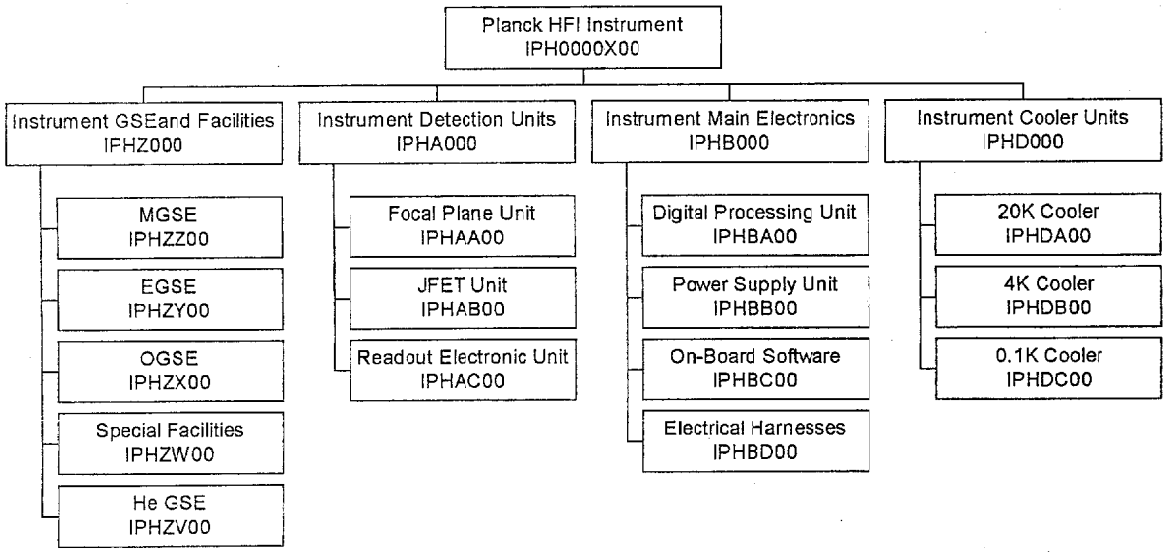
Main Sorption Cooler Electronic Box	France		France	France	France
Main SCEB to Compressor Harness	IAS		IAS	IAS	IAS
Redundant(HFI) SorptionCooler					
18-300K Red Piping				JPL	
Red Sorption Cooler Compressor				JPL	
Red Sorption Cooler Electronic Box				France	
Red SCEB to Compressor Harness				IAS	IAS
Central Electronics					
Data Processing Unit	IN2P3	IN2P3	IN2P3	IN2P3	IN2P3
Power Supply Unit	IN2P3	IN2P3	IN2P3	IN2P3	IN2P3
On-board Software	IN2P3	IN2P3	IN2P3	IN2P3	IN2P3
DPU to Readout Electronics Harness	IN2P3	IN2P3	IN2P3	IN2P3	IN2P3
DPU to 0.1K Electronics Harness	IN2P3	IN2P3	IN2P3	IN2P3	IN2P3
DPU to 4K Ancillary Electronics Harness					
LFI DPU to Main Sorption Cooler Electronics Harness	LFI		LFI	LFI (IAC)	LFI
HFI DPU to Main Sorption Cooler Electronics Harness	IN2P3		IN2P3	IN2P3	IN2P3
LFI DPU to Red Sorption Cooler Electronics Harness	LFI ?		LFI	LFI (IAC)	LFI

HFI DPU to Red Sorption Cooler Electronics Harness	IN2P3		IN2P3	IN2P3	IN2P3
PSU to DPU Harness	IN2P3	IN2P3	IN2P3	IN2P3	IN2P3
Planck to HFI Harness					
Bus to PSU Harness	IN2P3	ESA Contractor	ESA Contractor	ESA Contractor	ESA Contractor
Bus to 4K LVDE Harness	RAL	?	ESA Contractor	ESA Contractor	ESA Contractor
Bus to Main Sorption Cooler Electronics	France	?	ESA Contractor	ESA Contractor	ESA Contractor
Bus to Red Sorption Cooler Electronics		?	ESA Contractor	ESA Contractor	ESA Contractor
RTU to DPU Harness	IN2P3	ESA Contractor	ESA Contractor	ESA Contractor	ESA Contractor
HeliumFillingGSE			Air Liquide	Air Liquide	PFM
ElectricGSE					
Spacecraft Simulator	IN2P3		IN2P3	IN2P3	
DPU EGSE	IN2P3	IN2P3	IN2P3	IN2P3	CQM
HSK RTA	IN2P3	IN2P3	IN2P3	IN2P3	PFM
Raw Science Channel Data Acquisition Soft	IN2P3 + Geneva (1 Mbyte/min ?)	Geneva	Geneva	Geneva	PFM
QLA Hardware	Geneva		Geneva	Geneva	
Raw Science Channel Data Sorting Out		ESA Contract + Geneva	ESA Contract + Geneva	MOC	PFM
Level 0 Science Channel Data Recording Software	IN2P3	Geneva	Geneva	FINDAS +	PFM
Raw Science Channel Data De-commutation Software	IN2P3	Geneva	Avionics M	Geneva	PFM

Raw Science Channel Data Decompression Software	IN2P3	IN2P3	Avionics M	IN2P3	PFM
Science Channel Decompressed Data Recording	Geneva	Geneva	Avionics M	Geneva	PFM
Science Channel Data Quick Look Analysis	IN2P3*	Geneva +	Avionics M	Geneva +	PFM

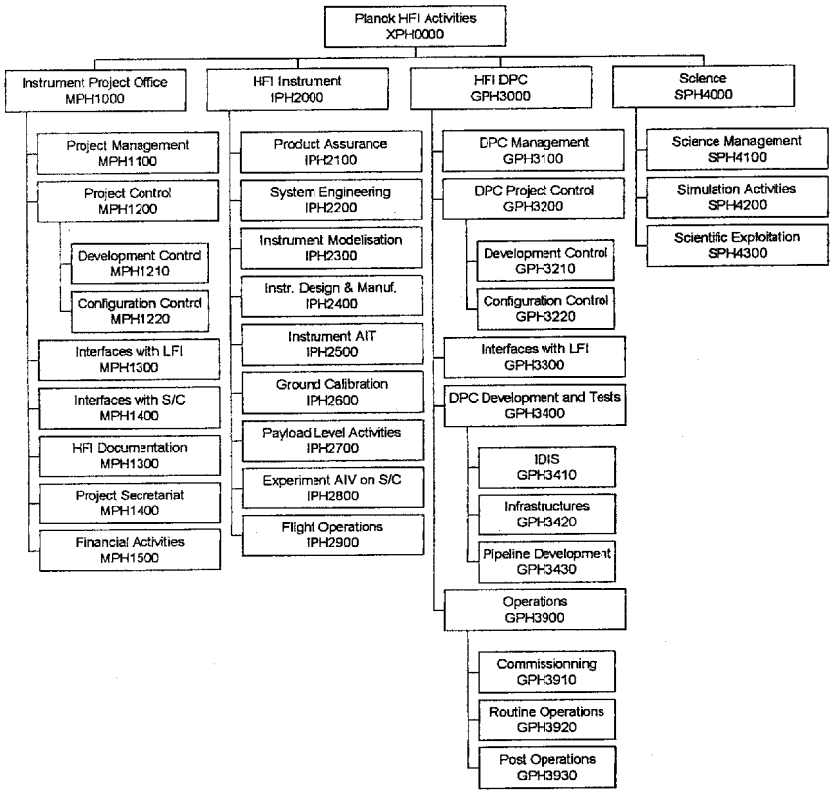
* Analysis : for Compression-Decompression process testing, EMC analysis ?

HFI Product Tree



Z: Level: I (Instrument), G (Ground segment), S (Science), M (Management)
X: S/C identification: P (Planck), F (FIRST)
Y: Instrument idenfication: H (HFI), L (LFI), C (Common)
NUM: 4 digits: subsystem code number
M: Model: A (AVM), C (CQM), P (PFM), F (FS), E (EM), X (not model related)
NUMB: 2 digits: lower level code number

HFI WBS 2



Z: Level: I (Instrument), G (Ground segment), S (Science), M (Management)
X: S/C identification: P (Planck), F (FIRST)
Y: Instrument idenfication: H (HFI), L (LFI), C (Common)
NUM: 4 digits: subsystem code number
M: Model: A (AVM), C (CQM), P (PFM), F (FS), E (EM), X (not model related)
NUMB: 2 digits: lower level code number

Preliminary HFI Product Tree is given below :

H24A00 DETECTOR ARRAY

- H24A10 FEED HORNS
  - H24A11 100GHz Feed Horns
    - H24A11a 100GHz Back-to-back Feed Horns
    - H24A11b 100GHz Coupling Horns
  - H24A12 143GHz Feed Horns
    - H24A12a 143GHz Back-to-back Feed Horns
    - H24A12b 143GHz Coupling Horns
  - H24A13 217GHz Feed Horns
    - H24A13a 217GHz Back-to-back Feed Horns
    - H24A13b 217GHz Coupling Horns
  - H24A14 353GHz Feed Horns
    - H24A14a 353GHz Back-to-back Feed Horns
    - H24A14b 353GHz Coupling Horns
  - H24A15 545GHz Feed Horns
    - H24A15a 545GHz Back-to-back Feed Horns
    - H24A15b 545GHz Coupling Horns
  - H24A16 857GHz Feed Horns
    - H24A16a 857GHz Back-to-back Feed Horns
    - H24A16b 857GHz Coupling Horns

- H24A20 FILTERS
  - H24A21 100GHz Filters
  - H24A22 143GHz Filters
  - H24A23 217GHz Filters
  - H24A24 353GHz Filters
  - H24A25 545GHz Filters
  - H24A26 857GHz Filters

MEMO. OF UNDERSTANDING WITH HARDWARE/SOFTWARE PROVIDING INSTITUTES

WE WANT TO HAVE SUCH MEMOs WITH ALL INSTITUTES FIRST VERSION READY IN DECEMBER

THEY SHALL INCLUDE

AGREEMENT ON DELIVERABLES AND SCHEDULE

- **AGREEMENT ON PERFORMED TEST**
- **AGREEMENT ON MANPOWER PROVIDED SUPPORT**

HFI MEETINGS AND TELECONFERENCES

WE PRESENTLY HAVE:

HFI MANAGEMENT EXECUTIVE MEETING AT IAS EACH Wednesday

HFI COORDINATION TELECONF. EACH OTHER Wednesday AT 17:00 PARIS TIME

HFI-LFI COORDINATION TELECONF. EACH OTHER Wednesday

HFI CALIBRATION MEETINGS EACH TWO WEEKS

0.1K COOLER PROGRESS MEETINGS EACH 4-6 WEEKS

THERMAL/MECHANICAL, OPTICAL, ELECTRONICS, STRAYLIGHT, INSTRUMENT MODELLING WORKING GROUPS MEETINGS/TELECONFERENCES

DPC MEETINGS

HFI INSTRUMENT WORKING GROUP MEETINGS

HFI CONSORIUM MEETINGS

PLUS AD HOC SPECIALISED MEETINGS

HFI MONTHLY PROGRESS REPORT

EACH HFI LOCAL MANAGER MONTHLY REPORT SHALL BE AT IAS ON THE 5TH OF EACH MONTH

HFI PROJECT MONTHLY REPORT IS TO BE AT ESTEC ON THE 10TH OF EACH MONTH

MONTHLY REPORT FORMAT

1. OVERALL SUMMARY

   1.1 INSTRUMENT PERFORMANCE CHARACTERISTICS
   - SCIENTIFIC
   - TECHNICAL

   1.2 INSTRUMENT RESOURCE REQUIREMENTS (ALLOCATED/REQUESTED)

   1.3 INSTRUMENT DESIGN CHANGES

   1.4 STATUS OF OPEN ECRs (ENGINEERING CHANGE REQUESTs)

2. HARDWARE DEVELOPMENT

   2.1 INSTRUMENT DEFINITION
   2.2 INTERFACE DEFINITION
   2.3 TEST AND CALIBRATION

WG #	ESA Chair	ESA Secretary	Planck HFI	Planck LFI	FIRST HIFI	FIRST PACS	FIRST SPIRE	Cross Instrument Support
SC	T. Passvogel	P. Estaria	J. Charra	C. Butler	H. Aarts	O. Bauer	K. King	
1/2	F. Vandenbussche	H. Schaap	R. Pons J.L. Beney	NN	D. Beintema R. Cerulli	E. Renotte	H. Dzitko or V. Mauguen M. Carter	R. Orfei J.H. Herrera
3	A. Heras	No permanent Secretary	B.Cougrand NN NN	C. Butler	P. Roelfsema A. di Giorgio	O. Bauer E. Wiezorrek	R. Warren-Smith R. Gastaud	P. Estaria
4	F. Vandenbussche	P. Estaria	J. Charra NN	C. Butler TBD (Laben)	P. Roelfsema R. Cerulli	H. Feuchtgruber	D. Pike NN	
5	P. Estaria	H. Schaap	NN	TBD (Laben)	P. Roelfsema S. Pezzuto	H. Feuchtgruber	NN	
6	P. Claes	NN (G. Pilbratt J. Tauber K. Bennet P. Estaria)	R. Gispert	F. Pasian	P. Roelfsema P. Andreani	O. Bauer R. Huygen	R. Warren-Smith	

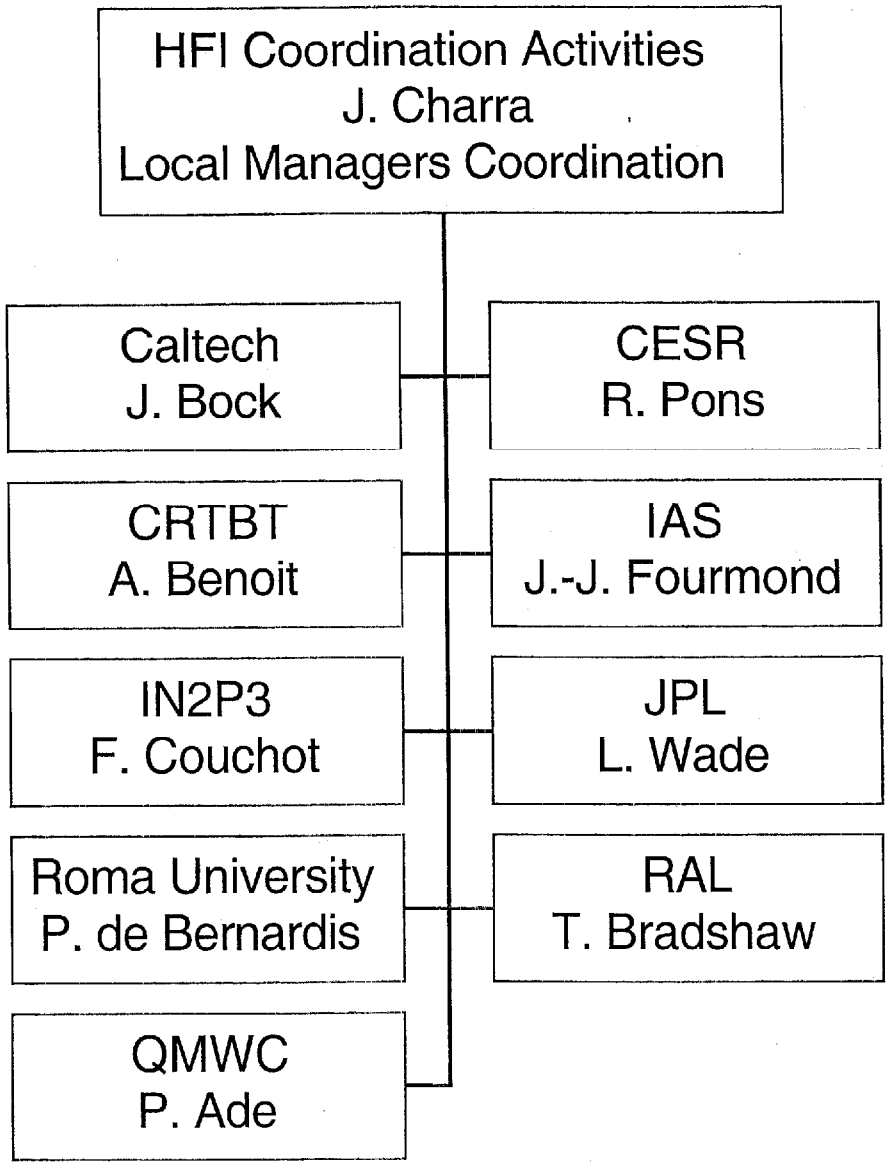
1/2 COMPONENTS

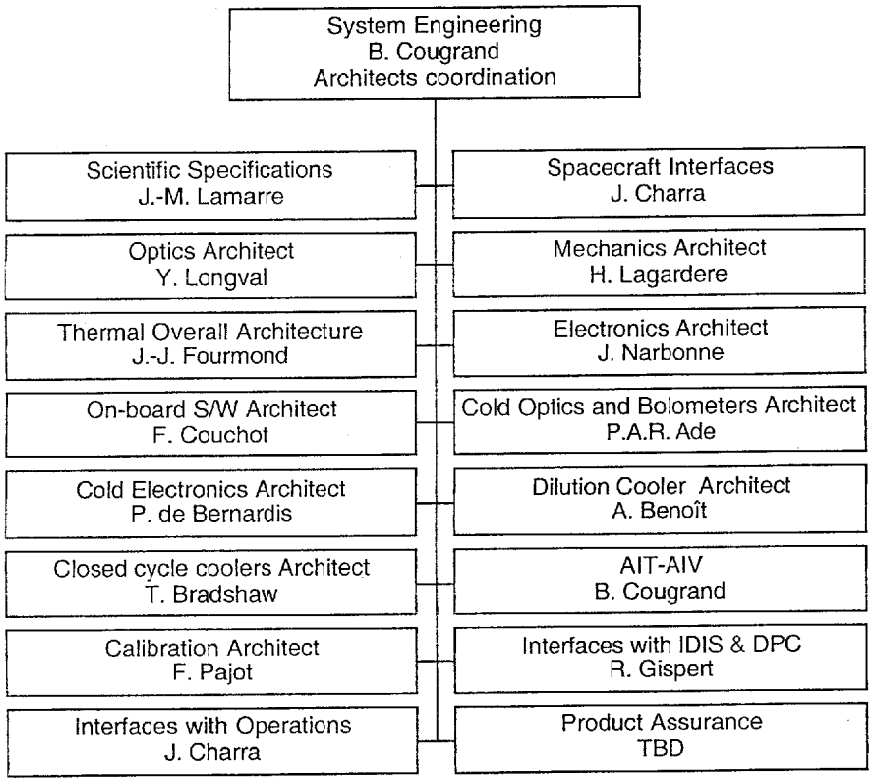
3 RTA / QLA

4 OPERATIONS + ON-BOARD SOFTWARE

5 OPERATION & TEST LANGUAGE

6 FINDAS & IDIS


HFI Coordination Activities
J. Charra
Local Managers Coordination
Caltech
J. Bock
CESR
R. Pons
CRTBT
A. Benoit
IAS
J.-J. Fourmond
IN2P3
F. Couchot
JPL
L. Wade
Roma University
P. de Bernardis
RAL
T. Bradshaw
QMWC
P. Ade


System Engineering
B. Cougrand
Architects coordination
Scientific Specifications
J.-M. Lamarre
Spacecraft Interfaces
J. Charra
Optics Architect
Y. Longval
Mechanics Architect
H. Lagardere
Thermal Overall Architecture
J.-J. Fourmond
Electronics Architect
J. Narbonne
On-board S/W Architect
F. Couchot
Cold Optics and Bolometers Architect
P.A.R. Ade
Cold Electronics Architect
P. de Bernardis
Dilution Cooler Architect
A. Benoît
Closed cycle coolers Architect
T. Bradshaw
AIT-AIV
B. Cougrand
Calibration Architect
F. Pajot
Interfaces with IDIS & DPC
R. Gispert
Interfaces with Operations
J. Charra
Product Assurance
TBD