SUBJECT: FIRST/Planck 2nd SPIRE technical meeting.

PLACE: ESTEC (Ea112)

Participants	Organisation	Distribution
C. Cunningham	ROE	Those present + ESTEC:
M. Griffin	QMWC	F. Vandenbussche
K. King	RAL	B. Guillaume
B. Swinyard	RAL	M. Anderegg
B. Collaudin	ESTEC	FIRST/Planck Project file
P. Estaria	ESTEC	
F. Felici	ESTEC	
T. Passvogel	ESTEC	
G. Pilbratt	ESTEC	
H. Schaap	ESTEC	

AGREEMENTS STATEMENTS	ACTION
The meeting followed the agenda as in PT-06031 (attachment A1-A4) **1. Next meeting date** - 15-03-'99 TBC will be the date for the next meeting. The meeting will take place at ESTEC **2. Status of AI's from MoM. dd. 29-07-'98 ref. PT-MM-05719** - The status of all AI's is "Closed"	
3. Status of AI's from MoM. dd. 30-09-'98 ref. PT-MM-05886 (Telescope meeting) - Info on AI-3 from SPIRE has been received in email messages dated 5-11-'98 and 10-11-'98. The response is being studied by ESTEC. **4. Instrument Design Status** - The design of the SPIRE instrument does not basically differ from the one presented at the Paris meeting. - SPIRE are preparing simulation models for typical observations of their instrument. - The Science Requirements Doc. is being prepared. - SPIRE has set up two additional working groups: "Structure and Internal Layout", and "On-Board Electronics and Software"	

AGREEMENTS STATEMENTS	**ACTION**
- The design of the SPIRE FPU is there, but it has not yet been verified in terms of its behaviour w.r.t. vibration, thermal loads, resonant frequency, choice of materials, etc. A basic thermal and mechanical analysis of the concept will be completed by Christmas. Mass is very high at the moment, optimisation is in progress. Worst case mass is presently 40 kg. (without margin) The design concept assessed at present is expected to lead to a significantly lower mass (approx. 30 kg)	
- For the detector-array programme a meeting has been scheduled on 21, 22 Jan. 1999 in London. Two external specialists have been invited to attend.	
- G. Pilbratt reported an info from the ODIN team, where the preference for the TSC21020 microprocessor for the instruments was questioned for FIRST/Planck. They seem to prefer the SPARC. No final selection for FIRST/Planck has been made though, the matter will be handled by the CWG. G. Pilbratt will contact the ODIN people to get further input/rationale.	**AI-SPIRE-19**
- With reference to AI-SPIRE-4, SPIRE have had a look at all inputs provided as far as FPU power profiles is concerned. The IID-B updates received, need some readjustment for reasons of consistency. B. Swinyard presented a viewgraph showing dissipations at the various FPU temperature levels. (attachment B1) Please note that an originally anticipated 30K temp. level has been replaced by a 15K level. ESTEC will provide details on the Optical Bench including dissipations, after inputs have been received about the other instruments. SPIRE power profiles shall show all possible observation modes including recycling. Recycling (duration approx. 2 hours) should be performed after approx. 46 hours of observation and if possible during a FIRST data download period.	**AI-SPIRE-21**
- For interface definition the IID-B shall show a worst-case instrument composition. There shall however also be a note to outline the 3 possible SPIRE options.	
- With reference to AI-SPIRE-8, a technical note was handed-over showing a preliminary description of the BAU. (attachment C1-C4) Because of the already high number of pin functions it was agreed that only BAU functions pass through the box and any other signals are routed separately. ESTEC will think about a design (probably based on an existing ISO-CAM one) to mount the BAU externally to the cryostat using definitions received from SPIRE on the BAU so far.	**AI-SPIRE-27**

AGREEMENTS STATEMENTS	ACTION
- With reference to AI-SPIRE-10, ESA will study the concept of cryostat-cover GSE to provide a "cold" background during instrument testing. In case SPIRE temperature requirements can not be met, a shutter will have to be included in the SPIRE PFU. SPIRE also suggested the inside of the cryostat cover to act as a retro-reflector. SPIRE will provide some figures for the reflectivity to ESA. ESA will assess the possible impact on other instruments and in the area of straylight. During ground operations the cover will nominally be at approx. 210 K, during TV testing this will be below 100 K. - With reference to AI-SPIRE-12, CSL might be interested in performing cold-vibration tests on the FIRST FPU's. LAS could not accommodate the SPIRE FPU because of its size and would have to build a new facility. The latter is not anticipated. - The decision date for the FTS options will be made in January. Resolution requirement is approx. 100, goal is between 500 and 1000 depending on its cost impact, if any. - As a matter of interest for the discussion on a common OBDH to Instrument interface, it was noted that SPIRE intend to use a 1553 based interface between its DPU and SPU. The hardware solution seems to be of MMS origin. **5. Instrument Development Plan** - This plan is under preparation. The schedule as in the original proposal needs another careful look before a development plan could be produced. A first draft would be available for the SPIRE-internal consortium review scheduled for the beginning of December. After this review the plan will be finalised and submitted to ESA. ESA would like to receive a high-level development plan by mid December. A copy of the LFI plan was handed-over for information purposes. **6. Instrument Schedule** - In the schedule versus funding area, SPIRE presented a schedule which would be compatible with French (CNES) funding. (attachment D1) The schedule as presented in PT-MM-05719 would be inconsistent with French funding, moreover the French version is probably more realistic. Also there might be a problem with Italian funding for the DPU. SPIRE will formally respond to the actions placed during the Payload meeting in Paris.	**AI-SPIRE-22** **AI-SPIRE-23**

AGREEMENTS STATEMENTS	ACTION
7. ESA comments to SPIRE documents -There seems to be some duplication in the Documentation tree. ESA would like to see the next level in the tree with delivery dates. SPIRE will deliver an update after the consortium meeting in December.	**AI-SPIRE-24**
- SPIRE Product Tree: A first draft was handed-over at the meeting (attachment E1 etc.)	
8. IID-B updating - IID-B updates were sent via email on 13 Nov. SPIRE will review the whole of the items discussed at the meeting and provide updates by 25 Dec. for tasks that can not be completed before that date 15 Jan. is the deadline.	**AI-SPIRE-25**
- It was agreed that for the purpose of standardisation the Project codes used for the instruments would partly follow the guidelines for the WBS as proposed by ESA. Since the ESA proposal could not reflect subsystem names, the following codes were agreed for the 6 SPIRE subsystems presently identified as SPIRE 1-6 respectively: FSFPU, FSBAU, FSDRC, FSSPU, FSDPU and FSHAR. (Warm Interconnect Harness) In these codes the last three letters resemble the already defined subsystem abbreviations. The WBS will make reference to these codes.	
9. Outstanding answers form AO activities. - A response to AI-STP-2 (dichroics) will be sent by SPIRE around 24-11-'98.	**AI-SPIRE-18**
- AI-IID-6 dealing with cleanliness requirements on the instrument will be deferred to the tasks of a dedicated Commonality Working Group. For the time being all numbers are TBD. As a first guess requirements might be identical or less stringent than those for ISO. The AI will be closed upon the CWG accepting it.	
10. PLM/FPU straylight - In order for RAL to perform the straylight analysis (under separate contract), the Focal-plane design shall be finalised. The APART files could be used for the purpose of the analysis. The model probably needs update later, however the analysis should continue. As for the information required by RAL there seems to be one missing file i.e. *.IN1	

AGREEMENTS STATEMENTS	ACTION
RAL will send details i.e. duration/costs of the analysis to ESA on 20 Nov. The exact way of running the contract is at the moment TBD. **11. FSEC matters** - Radiation: SPIRE will not formally participate in the ISO POPS Glitches WG, however, SPIRE follows the work of the group. - TM rate: Assessment of end-to-end problem ongoing in ESOC. Answer due 30-11-'98. **12. FM replacement criteria.** - With reference to AI-SPIRE-13, ESA could not accept an approx. 51 day turn-around for repair and test of a failed FPU. The 51 days does not include a period of at least 3 weeks between the decision to repair the FPU and its removal from the cryostat. ESA's baseline is to have a full FS FPU. The matter will undoubtedly be discussed, also with the other PI's, at the next funding meeting scheduled to take place in Paris in the first half of January. The meeting identified the need for a document specifying replacement criteria (as was done for ISO), however considered it still too early to write a detailed one for FIRST. The top level outline, however, should be prepared already and discussed in the Science Team. The point was raised what should be done in case a FS replacement unit performs better than its equivalent FM. Would this justify replacement? It was agreed that the FIRST Science Team should pick-up the issue.	
13. External DMS access K. King will supply a list of people requiring access to the SA-provided DMS system. In addition G. Pilbratt will set up an area for SPIRE. **14. AOB** - Progress reports: The reports shall show achieved/not-achieved milestones and typically be approx. half a page per unit. ESA will provide a template for such reports. - ICC funding participation: SPIRE will request funding participation from ESA. ESA needs details i.e. a funding profile. This will be done well in advance of the next funding meeting.	**AI-SPIRE-20**

AGREEMENTS STATEMENTS	ACTION
- Telescope size: Whatever the telescope size will be i.e. 3.5 or 3.8 m, the system f-number will be identical. - Management meeting: Instead of the meeting it is proposed to have a video/audio conference involving ESTEC, RAL and possibly CEA. The proposal is to have the conference on 16 Dec. between 10.00 and 12.00 ESTEC time. The technical details will have to be sorted out before. - FPU lay-out: Beginning of December the three FIRST instrument teams will finalise their proposal for Focal Plane lay-out. This will be the result of the discussion held recently at ESTEC between the teams. - TM data rate: SPIRE would be very happy with an increase of the present TM rate by a factor of 4. For sizing the on-board memory SPIRE needs an answer by mid '99. - S versus X-band links: ESTEC indicated that almost certainly TM links will be in the X-band, whilst TC might still be S-band. Investigations are being carried-out on the Ground stations into the impact of a change-over to X-band and TM rate change for FIRST/Planck use. - PR activities: M. Griffin will send relevant material to G. Pilbratt. - SPC paper: Inputs for the SPC paper need to be defined. It is proposed to discuss this item as part of the conference scheduled for 16 Dec. What is important to SPIRE momentarily is to discuss the table of contents for the paper. - ICC status: The existing Science Implementation Plan is still valid (no addition foreseen). At a splinter session during the next consortium meeting work allocation will be discussed. - AI list: A copy of the AI list has already been forwarded to the SPIRE team.	

Ordinal Action Number	Title and Description	Due Date	Originator		Actionee		Completion	
			Firm	Person	Firm	Person	Date	By Document No.
AI-SPIRE-18	Respond to SPIRE-STP-2	24.11.98	ESTEC	Schaap	QMWC	Griffin		
AI-SPIRE-19	Contact ODIN on their choice of microprocessor i.e. SPARC	31.12.98	ESTEC	Schaap	ESTEC	Pilbratt		
AI-SPIRE-20	Provide a template for Progress reporting by Instrument Teams	31.12.98	QMWC	Griffin	ESTEC	Passvogel		
AI-SPIRE-21	Provide numbers on the FPU structure and harness for the Optical Bench also considering observation modes of other instruments	29.1.99	QMWC	Griffin	ESTEC	Collaudin		
AI-SPIRE-22	SPIRE to deliver their Development Plan (First draft)	16.12.98	ESTEC	Passvogel	QMWC	Griffin		
AI-SPIRE-23	Complete Schedule versus Funding v.v. AI's from Paris meeting	7.12.98	ESTEC	Passvogel	QMWC	Griffin		
AI-SPIRE-24	Send updated Documentation Tree to ESTEC	25.12.98	ESTEC	Schaap	QMWC	Griffin		
AI-SPIRE-25	Send IID-B updates	25.12.98	ESTEC	Schaap	QMWC	Griffin		
AI-SPIRE-26	Provide PR relevant info	7.12.98	ESTEC	Pilbratt	QMWC	Griffin		
AI-SPIRE-27	Provide a design for mounting the BAU to the cryostat wall	15.3.99	QMWC	Griffin	ESTEC	Collaudin		

A1

esa

FIRST/Planck Project Telefax

Fax No : (31) 71 565 5244
Tel. No : (31) 71 565 3489

Ref. : PT-06031 **Date** : 3 November, 1998

From : H. Schaap (SCI-PT) **Page** : 1 of 2 + 2 attached

To : M. Griffin (QMWC/London) **Fax No:** 44 181 980 0986
K. King (RAL/Oxfordshire) 44 1235 44 6667

Copy : F. Felici, M. Anderegg, T. Passvogel, P. Estaria, F. Vandenbussche, B. Guillaume, M. von Hoegen, G. Pilbratt, B. Collaudin, P. de Maagt

Subject: **Technical/Schedule and Management Meeting with SPIRE**

Please find below the proposed agenda for subject meetings to be held with SPIRE at ESTEC on 17.11 (Technical/Schedule) and 16.12.1998 (Management) both in room Ea112 starting at 09.00 hrs. Please note that the option of 15.12.1998 for the management meeting has been removed!

Agenda for 17.11.1998

1. Next meeting date.
2. Status of AI's from MOM. dd. 29.07.98. ref. PT-MM-05719.
3. Status of AI's from MOM. dd. 30.09.98, ref. PT-MM-05886. (Telescope meeting)
4. Instrument Design Status.
5. Instrument Development Plan.
6. Instrument Schedule. (Response to AI's from Paris meeting w.r.t instrument schedule and funding)
7. ESA comments to SPIRE documents.
8. IID-B updating.
9. Outstanding answers from AO activities. (see attachment)
10. PLM/FPU straylight.
11. FSEC matters.
12. FM replacement criteria.
13. External DMS access. (An ESA Document Management System)
14. A.O.B.

Agenda for 16.12.1998

1. Instrument management

As a reminder I have attached the status of the question and answer session resulting from the AO activities. Please provide answers to the outstanding items i.e. SPIRE-STP-2 and SPIRE-IID-6.

Please confirm/amend the agenda and provide lists of participants.

Best regards,

Harm Schaap

SPIRE (Status 20.10.1998)

File: PSCIENCE/DATA/...../SPIRE-evaluation1.doc

Evaluation form for SPIRE answers received on questions from ESA Technical Panel.
Questions were sent to the Instrument Team as fax under reference:PT-05387, dated 23 March 1998. In the cases where answers were requested after instrument preselection these have been marked as: To be answered.

In addition reference is made to open points raised in the FSEC Final report.

Question #	Answer rcvd.	Responsible	Comment
SPIRE_GEN_1	Fax 14-04-1998	GP	Closed.
SPIRE_STP_1	Fax 14-04-1998	GP	Closed.
SPIRE_STP_2	To be answered	GP	
SPIRE_STP_3	Fax 14-04-1998	GP	Closed.
SPIRE_STP_4	Fax 14-04-1998	GP	Closed.
SPIRE_STP_5	Fax 14-04-1998	GP	Closed.
SPIRE_STP_6	Fax 14-04-1998	BC	FTS mechanism dissipation is the same as the one used for LWS/SWS. However the helium flow rate will be smaller, and a factor of 2 in response (K/W) is expected.
SPIRE_STP_7	Fax 14-04-1998	TP	Closed
SPIRE_STP_8	Fax 14-04-1998	BC	The heat switches prequalified under ESTEC-TRP have a continuous dissipation of 2 mW. The one used for IRST had 0.05 mW. The objective is to reach 0.1 mW. for FIRST. Delta design and qualification will be necessary!
SPIRE_STP_9	NA	HS	No longer relevant. Handled by CWG.
SPIRE_STP_10	Fax 14-04-1998	HS	Closed. Further discussion required to define max. interface data rate
SPIRE_STP_11	Fax 14-04-1998	HS	Closed
SPIRE_IID_1	Fax 14-04-1998	TP	Closed. Design approach for BAU to be implemented in cryostat design

A3

SPIRE_IID_2	Fax 14-04-1998	HS	Closed
SPIRE_IID_3	NA	HS	No longer relevant, dealt with in IID-B updating.
SPIRE_IID_4	Fax 14-04-1998	HS	Closed
SPIRE_IID_5	Fax 14-04-1998	HS	Closed
SPIRE_IID_6	To be answered	MvH	
SPIRE_IID_7	Fax 14-04-1998	HS	Closed
Costing/ Funding	Fax 14-04-1998	TP	Not answered. Not further relevant !
SPIRE_FSEC_1			
SPIRE_FSEC_2			
SPIRE_FSEC_3			
SPIRE_FSEC_4			

SPIRE_FSEC_1:
Funding for the science instruments needs to be rapidly formalised and realistic funding schedules defined.

SPIRE_FSEC_2:

SPIRE_FSEC_3:

SPIRE_FSEC_4:

SPICE POWER OPTION

		GATES				JFET	
		ON	OFF	P	S	ON	OFF
15k		–	–	–	–	15	0
						5	10
4k	WIRES	1.1	1.1	1.1	1.1	– " –	
	RAD.	0.6	0.6	0.6	0.6		
	MECUS	0	0	2	7.4	– " –	
	STRUC (11k)	2	2	2	2		
	TOTAL	3.7	3.7	5.7	11.1		
2k	ECAC	2	0	2	2	0	
	WIRE	0.1	0.1	0.1	0.1	– " –	
	COOLER	1	1	1	1	– " –	
	STRUCT	1	1	1	1	– " –	
	TOTAL	4.1	2.1	4.1	4.1	2.1	
1k						2	1

TECHNICAL NOTE

BAU PRELIMINARY DESCRIPTION

DSM-DAPNIA SAp

SAp-SPIRE-CCa-007-98
Issue: 1.0
16/10/98

Written by C. CARA

INTRODUCTION

This preliminary description of the BAU is given with the following assumptions:
- the CEA/LIR detector is used
- the multiplexing rate of the bolometer array is 8 → 1
- it is possible to locate the BAU close (a few tenth of centimetres) to the vacuum tank feedthrough

This leads in particular to a total number of detector output for both photometer and spectrometer of 282.

BUFFER AMPLIFIER UNIT (SPIRE2) PRELIMINARY DESCRIPTION

The Buffer Amplifier Unit is an electronic box located close to the vacuum tank feedthrough. It's purpose is to limit the effects of electromagnetic perturbations on the detector signals before processing in the DRCU (SPIRE 3) by reducing the signal impedance and amplifying this signal. The initial impedance of the signal is given by the sum of the cold readout electronics (k•) and the harness inside the vacuum tank contributions (TBD). When introducing the BAU the signal impedance is given by the output impedance of an operational amplifier (< 10 •). A complementary function is to reduce the injected noise on detector bias with passive low pass filters.

The proposed design takes advantage of the experience acquired with the ISO instrument where MOSFET TLC27M (Texas Instrument) have been used in the CAM3 box. The operating temperature of this sub-system was 100K. Additional tests performed at lower temperatures (77K and below) on TLC251 (slew-rate programmable version of the TLC271) have shown this device may operate at very low temperature (up to 4K). When estimating the power consumption the increasing current supply at low temperature has been taken into account (see figure 1).

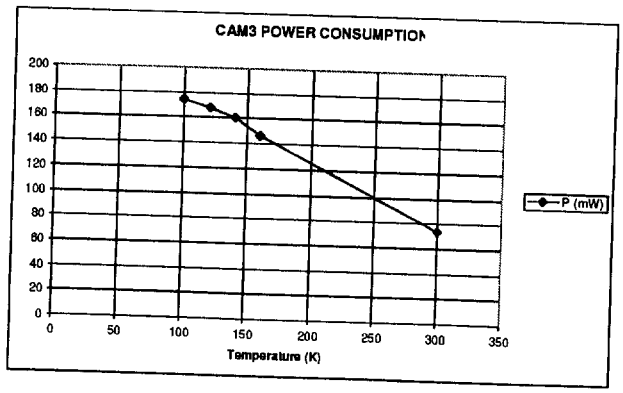


FIGURE 1

The figure 2 shows the functional block diagram of this box.

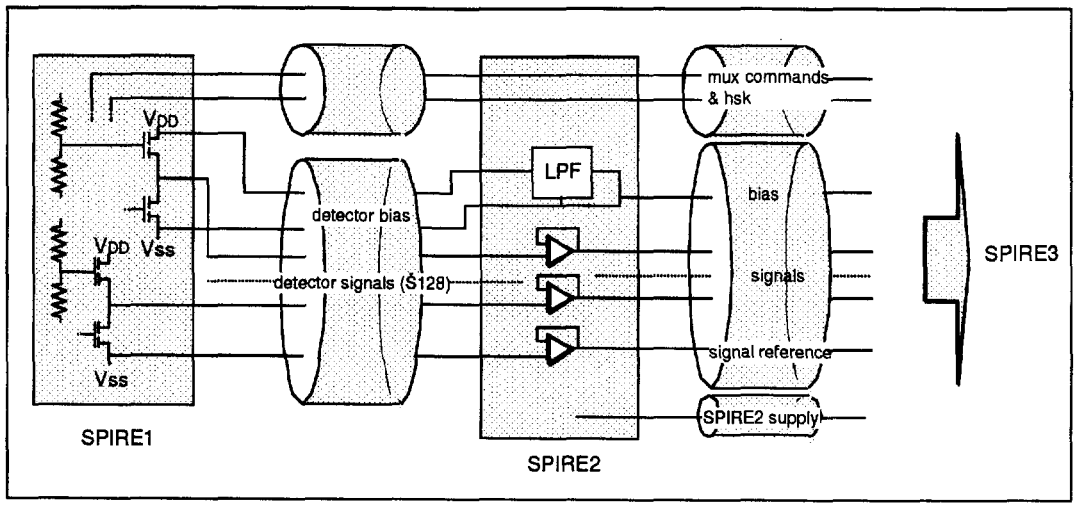


FIGURE 2

The figure 2 shows different connector layouts:

- option 1 is based on cylindrical 38999 type and sub D connectors
- option 2 is based on cylindrical 38999 type and MDM 37 connectors
- option 3 is based exclusively on sub D connectors

The 38999-type option allows a reduction of the total number of connectors while the sub D option may simplify the internal connections with the printed circuit boards by using flex-rigid technology. The « SPIRE 3» side of the BAU also includes a connector (max 37 pins) for power supplies.

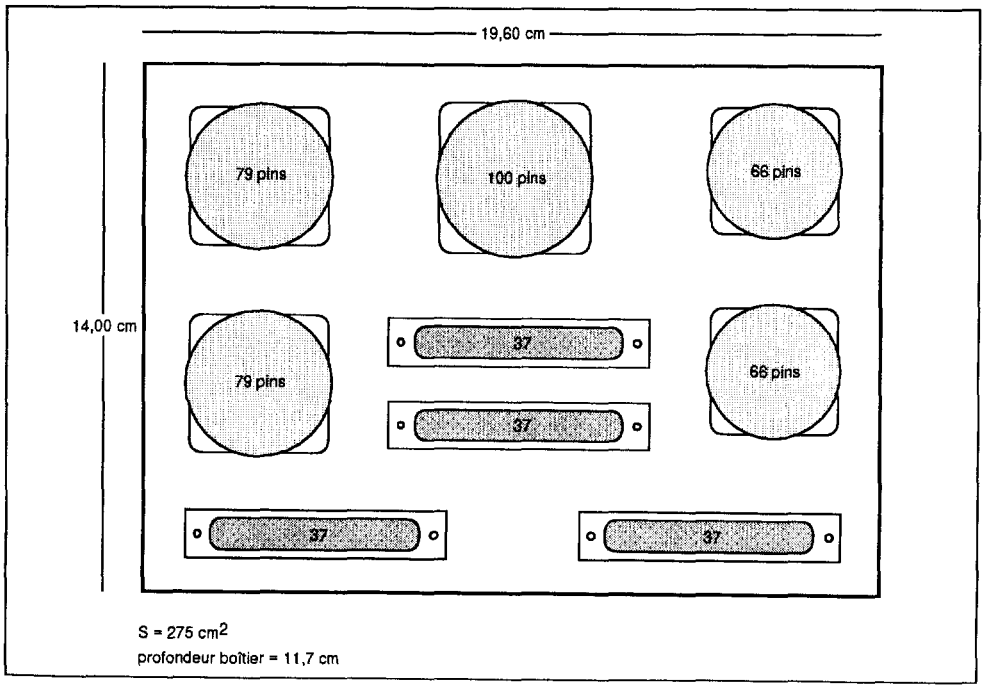


FIGURE 2 – OPTION 1

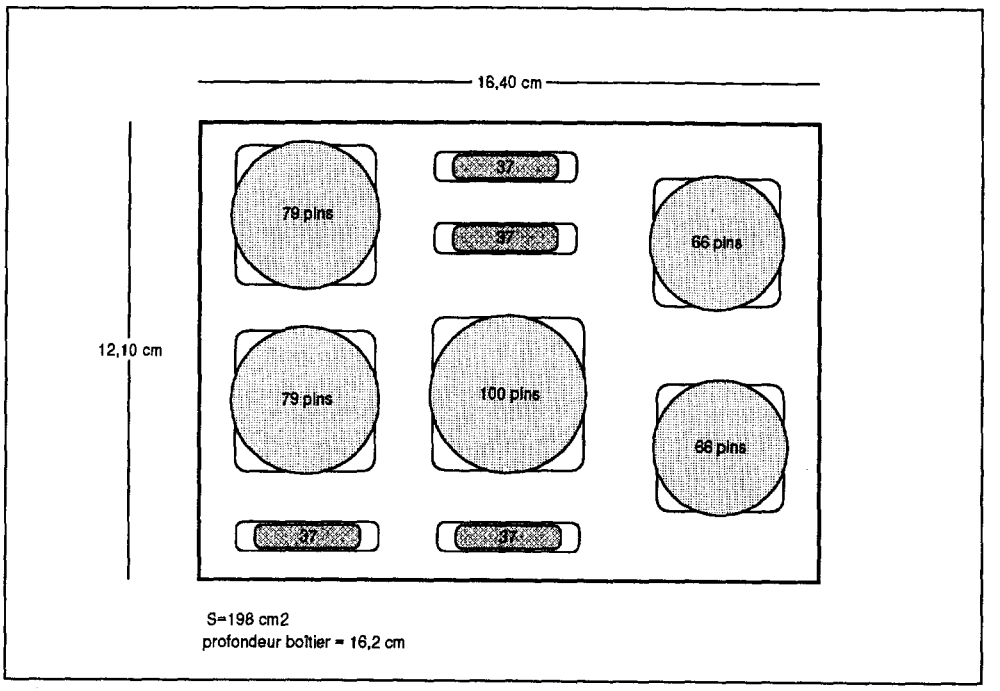


FIGURE 2 – OPTION 2

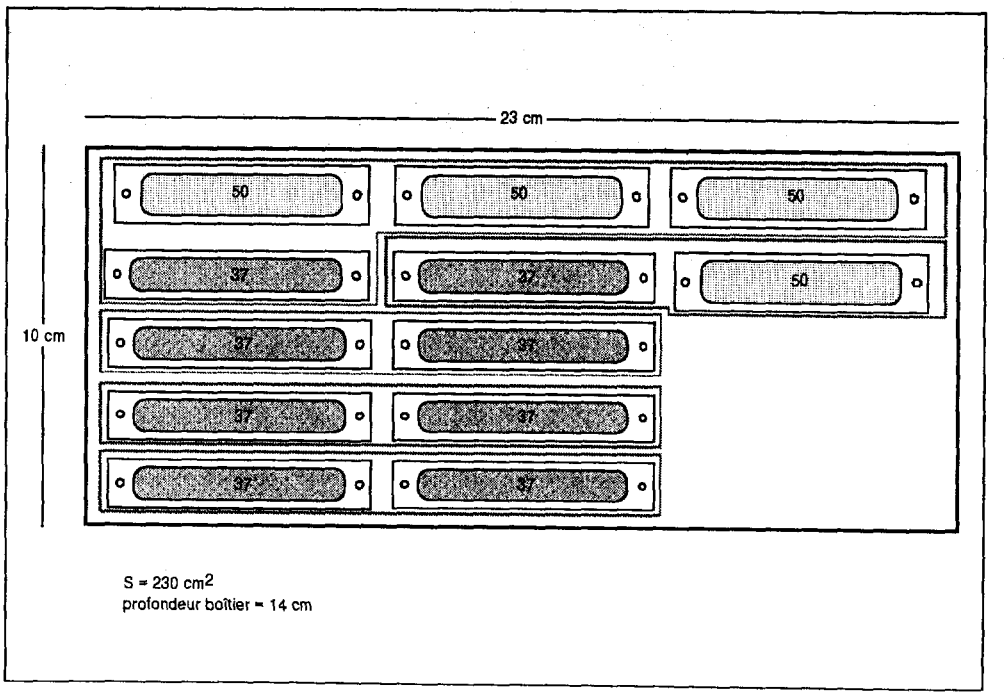
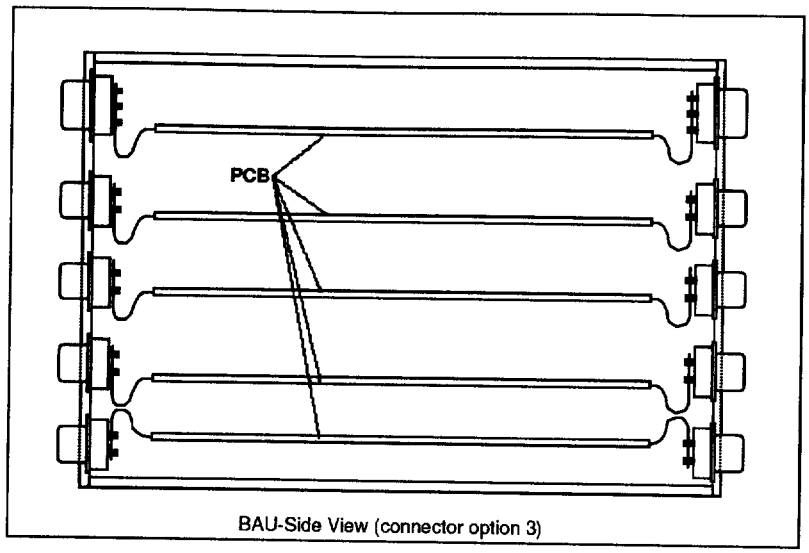


FIGURE 2 - OPTION 3

C4



BAU-Side View (connector option 3)

Queries:

1) Should all connectors go via the BAU? Eg for Ø filters

2) BAU power consumption

French Contribution

Budget vs. Schedule

DSM-DAPNIA SAp

QMW meeting
Nov. 4, 1998
JLA

Nº	Task	1998				1999				2000				2001				2002				2003				2004				2005				2006				2007			
		T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4
1	Array Selection	Array Selection																																					
2	Det. Array Selection					Det. Array Selection																																			
3	System Design					System Design																																			
4	PDR									PDR																															
5	Detail Design									Detail Desig																															
6	CDR													CDR																											
7	AVM Manuf.													AVM Manuf.																											
8	AVM AIV																	AVM AIV																							
9	AVM Delivery																	AVM Delivery																							
10	CQM Manuf.													CQM Manuf.																											
11	CQM AIV																	CQM AIV																							
12	CQM Readiness Review													CQM Readiness Review																											
13	CQM Delivery																	CQM Delivery																							
14	PFM Manufacture																					PFM Manufacture																		
15	PFM AIV/Cal																									PFM AIV/C														
16	PFM Readiness Review																									PFM Readiness Review														
17	PFM Delivery																									PFM Delivery														
18	FS Build/Refurb.																									FS Build/Refurb.														
19	FS AIV																													FS AIV										
20	FS Delivery																													FS Delivery										
21	Launch																																	Launch						

E1

SPIRE

SUBJECT:	**SPIRE Product Tree**		
PREPARED BY:	**K.J. King**		
DOCUMENT No:	**SPIRE/RAL/D/0030**		
ISSUE:	**.01 (1st Draft)**	**Date:**	**1st October 1998**
CHECKED BY:	.....	**Date:**	.....
APPROVED BY:	**See next page**	**Date:**	

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Change Record

ISSUE	DATE	
.01	01/10/98	1st Draft issued for comments

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FIGURES

TABLES

Glossary

DAPSAS	Data Analysis and Science Analysis Software
ESA	European Space Agency
FIRST	Far Infra-Red Space Telescope
FSC	FIRST Science Centre
ICC	Instrument Control Centre
MOC	Mission Operations Centre
PI	Principle Investigator
SPIRE	Spectral and Photometric Imaging REceiver

1. SCOPE

This Product Tree is produced as part of the response to the FIRST/PLACK Instrument Interface Document Part A (AD1) as aprt of the SPIRE Management Plan (AD2). It covers all items to be produced during the instrument design and manufacturing phases, plus those produced during the ICC Development phase.

The intention is to identify ALL items that shall be delivered from one institute in the SPIRE consortium, to another institute or to ESA.

2. DOCUMENTS

2.1 Applicable Documents

AD1 FIRST/PLANCK Instrument Interface Document, Part A (PT-IID-A-04624)
AD2 FIRST Science Management Plan (ESA/SPC(97)22)

2.2 Reference Documents

3. PRODUCT TREE

3.1 Instrument Items

ID	Product Item	No. Units	AVM	CQM	PFM	FS	Description
AA	**Cold FPU (SPIRE1)**						
AA0_11	Structure			**x**	**x**	**TBC**	'15K', '4K' and '2K' boxes; Structure Thermistors; MGSE required to mount the structure on the satellite and AIV facilities; Transport Container
AA0_21	Optics			x	x	**TBC**	Photometer mirrors and their mounts; Spectrometer mirrors and their mounts; MGSE to install mirrors onto the structure
AA0_22	Photometer Filters			x	x	**TBC**	Passband filters; Fore-optics filters; Dichroics; Filter and Dichroics mounts (excluding detector filters); MGSE to install Filters and Dichroics
AA0_23	Spectrometer Filters			x	x	**TBC**	Passband Filters Dichroics; Polarising Grids; Filter, Grids and Dichroics mounts (excluding detector filters); MGSE to install Filters, Grids and Dichroics
AA0_31	Photometer Baffling			x	x	**TBC**	Photometer optical baffling Fore-optics baffling Baffle mounts MGSE to install Baffles
AA0_32	Spectrometer Baffling			x	x	**TBC**	Spectrometer optical baffling Fore-optics baffling Baffle mounts MGSE to install Baffles
AA0_41	Photometer Arrays			x	x	x	Photometer Bolometer arrays (3); Feed Optics; Cold readout electronics; Focal plane structure (including filter mounts);

ID	Product Item	No. Units	AVM	CQM	PFM	FS	Description
							Cold harness and connector(s); MGSE to install Arrays; EGSE to test Arrays
AA0_42	Spectrometer Arrays			x	x	x	Spectrometer Bolometer arrays (2); Feed Optics; Cold readout electronics; Focal plane structure (including filter mounts); Cold harness and connector(s); MGSE to install Arrays; EGSE to test Arrays
AA0_51	Cooler			x	x	x	^{3}He Cooler Unit; Cooler cold harness and connectors; Mechanical interface structure; Cold finger interface structure; MGSE to install Cooler; EGSE to test Cooler
AA0_61	Chopper			x	x	x	Chopper unit; Mechanical interface structure; Cold harness and connector; MGSE to install Chopper EGSE to test Chopper
AA0_71	Spectrometer			x	x	x	Moving mirror support structure; Spectrometer motor; Mirror movement measurement system; Mechanical interface structure; Cold harness and connector; MGSE to install Spectrometer; EGSE to test Spectrometer
AA0_81	Photometer calibration source			x	x	x	Temperature controlled radiation source; Mechanical interface structure; Cold harness and connector; MGSE to install Calibration Source EGSE to test Calibration Source
AA0_82	Spectrometer calibration source			x	x	x	Temperature controlled radiation source; Mechanical interface structure; Cold harness and connector; MGSE to install Calibration Source; EGSE to test Calibration Source
AA0_91	JFET Module			x	x	x	JFETs and associated

ID	Product Item	No. Units	AVM	CQM	PFM	FS	Description
							components; RF Filters and associated components; Box and mechanical interface structure; Cold harness and connectors; MGSE to install JFET Module EGSE to test JFET Module
AB0_10	**Buffer Amplifier Unit (SPIRE2)**			**x**	**x**	**x**	Buffer Amplifier Unit; Savers; MGSE to install BAU; EGSE to test BAU
AC0_10	**Detector Read-out and Control Unit (SPIRE3)**			x	x	Parts	Detector Read-out and Control Unit; Savers;
BA0_10	**Digital Processing Unit (SPIRE5)**		x	x	x	Parts	Digital Processing Unit (including Power Supply); Savers;
CA0_10	**Signal Processing Unit (SPIRE4)**		x	x	x	Parts	Signal Processing Unit; Savers;
DA0_10	**Warm Interconnect Harness (SPIRE6)**		x	x	x	x	DPU to SPU harness; SPU to DRCU harness; DRCU to BAU harness; Savers; Breakout Box(es)
EA0_10	SPU On Board Software		x	x	x	x	SPU On Board Software
EB0_10	DPU On Board Software		x	x	x	x	DPU On Board Software

3.2 Support Items

ID	Product Item	No. Units	AVM	CQM	PFM	FS	Description
	EGSE	4					Simulates S/C interface to allow testing of DPU; includes: S/C Interface Hardware; EGSE Software;
	Digital Instrument Simulator	3					Simulates SPIRE 1, 2, 3 and 4 for testing operation of DPU; includes: DIS Hardware; DIS Software;
	Analogue Instrument Simulator	3					Simulates SPIRE 1, 2 and 3 for testing operation of SPU; includes: AIS Hardware; AIS Software;

ID	Product Item	No. Units	AVM	CQM	PFM	FS	Description
	FPU Simulator	3					Simulates SPIRE 1 and 2 for testing operation of DRCU; includes: FPUS Hardware; FPUS Software;
	AIV Facility	1					Instrument Cryostat; Facility Electronics; Clean Room; Infrastructure;
	Test Harness	1					Test Harness
	Calibration Facility	1					Calibration Optics; Calibration Sources; Facility Electronics
	Thermal Vacuum Facility	1					
	EMC Test Facility	1					
	Cold Vibration Facility	1					
	Warm Vibration Facility	1					

3.3 ICC Items

ID	Product Item	No. Units	AVM	CQM	PFM	FS	Description
	SPU On Board Software Maintenance System	1					SPU Software Maintenance Software; SPU Software Maintenance Hardware; Documentation
	DPU On Board Software Maintenance System	1					DPU Software Maintenance Software; DPU Software Maintenance Hardware; Documentation
	Instrument Simulator	2					Instrument Simulation Software; Instrument Simulator Hardware; Documentation
	Quick Look Facility	3					QLF Hardware; RTA/QLA Software; Documentation
	Instrument Users Manual	1					
	Instrument Database		x	x	x	x	
	Calibration Database				x	x	
	Instrument Time Estimator	2					
	Instrument Command Translator	1					

ID	Product Item	No. Units	AVM	CQM	PFM	FS	Description
	Trend Analysis Software	1					
	Calibration Analysis Software	1					
	Interactive Analysis	1					
	Science Processing Software	1					
	Science Analysis Software	1					
	Diagnostic Tools	1					
	ICC Operations Centre	1					Infrastructure; Computing Hardware
	DAPSAS (UK) Centre	1					Infrastructure; Computing Hardware
	DAPSAS (Fr) Centre	1					Infrastructure; Computing Hardware