

**SUBJECT:** FIRST/Planck technical meeting with SPIREJ.L. Augueres
C. Cara
B. Swinyard
K. King
M. Griffin
B. Guillaume
M. Angeregg
T. Passvogel
H. SchaapCEA
CEA
RAL
RAL
QMW
ESTEC
ESTEC
ESTEC
ESTECM. Griffin QMW
K. King RAL
J. Augueres CEA
C. Cara CEA
B. Swinyard RAL
FF; TP; BG; MA; PE; FV; HS.
GP.
Project file.**AGREEMENTS STATEMENTS****ACTION**

The meeting followed the agenda as in PT-05693 (attachment A1)

1. Instrument Management

M. Griffin made a presentation on the organisation of the SPIRE team. (Attachment B1 and B2)

- SPIRE stated that the organisational structure as presented in B1 was in fact for the purpose of the instrument proposal and needs adaptation.

- SPIRE has quite a high number of groups in various countries, that's why the organisational structure is planned to be fairly rigid and direct at the moment. It is planned by SPIRE to allow some evolution of the management structure. ESA states that the structure and communication links are not clear from the overview in B1.

- At the moment the Project Manager is the focal point for all activities and has in fact overall control of the 4 other functions at his level. SPIRE stated that at a later stage there might be a different way of communication, with the aim to off-load the PM.

- It appears that the Instrument Scientist is the responsible for the overall control of specifications/documentation. There is the need to clarify the responsibilities of the team members.

- SPIRE stated that the Systems Team is actually in function and that the Instrument Steering Group had not yet met.

AGREEMENTS STATEMENTS	ACTION
<ul style="list-style-type: none"> - ESA questioned the way the Systems Engineer functions with for example the Systems Team. - SPIRE will provide a management plan with a description of all functional lines and responsibilities. - ESA will comment/address specific items of the management structure as a prompt for the information to be provided in the management plan. - The SPIRE team will provide a copy of their documentation tree. - SPIRE have scheduled a PDR in mid 1999. By that time all interfaces/budgets shall be defined. 	<ul style="list-style-type: none"> AI-SPIRE-1 AI-SPIRE-2 AI-SPIRE-3
<p>2. FSEC Report</p>	
<ul style="list-style-type: none"> - M. Griffin made a short presentation summary of the FSEC recommendations concerning the SPIRE instrument. (attachment C1 and C2) - There are a couple of changes in SPIRE as a result of the FSEC report. (see attachment) - For the FTS, two options are under study presently. By next October these two options will be frozen and in January 1999 one of the options will be selected. - A resolution > 100 for spectrophotometry, although not the baseline, might be implemented if this does not seriously impact the costs. - The TM rate study carried-out by ESA is almost completed. The information needs formalisation. The approach to be adopted will have to take FIRST/Planck commonality into consideration as well. There are discussions with the USA and Canada in the area of TM transponders. ESA will close the matter by the beginning of the year 1999. - SPIRE mission implementation in February 1999 might be driven by funding issues on the payload. The funding issue on the FPU structure was not yet resolved. It 	

AGREEMENTS STATEMENTS	ACTION
<p>is hoped that from the October meeting, to be held at ESA HQ, the direction of the funding will be clear and the issue resolved in February 1999.</p> <p>- The status of the DPU funding (It.) is presently unclear. This might impact on the overall funding (knock-on effect)</p> <p>3. Instrument Design Status</p> <p>FPU design:</p> <p>- SPIRE continue the study of their various detector options and wish to provide cryo-harness listings for each one of them. One of the options requires a FET box close to the (bolometer) detectors. The dissipation of this box is approx. 1 mW. per bolometer, which for the total number of bolometers means approx. 260 mW.</p> <p>SPIRE are studying various thermal design options and request ESA to identify possible alternative configurations, together with a table of allowable power levels at the different temperatures within the cryostat. Spire will provide overviews on thermal design options for ESA to consider and react.</p> <p>ESA was also requested to supply figures for the possible length of the cryo-harness especially the one from and to the BAU.</p> <p>- Present indications are that the FPU mass is fairly high. SPIRE will provide an update on the FPU mass situation after their meeting in September. Except for the FET box, SPIRE claim that the various detector options have no significant impact on FPU mass. A double-pass FTS option (FSEC recommendation) would add another 5 kg. SPIRE will submit FPU mass budgets for all options in early October.</p> <p>FPU temperature stability:</p> <p>- In order to get a feeling for the temperature stability of the Focal Plane, SPIRE were requested to submit power profiles for the different FPU operating modes as well as temperature stability criteria.</p> <p>Sorption cooler:</p> <p>- SPIRE will have to perform qualification of the cooler. Qualification includes amongst other things also life test, vibration, cooler performance and possible EMC impact.</p> <p>- The cooler design is based on a model flown already, but needs</p>	<p>AI-SPIRE-4</p> <p>AI-SPIRE-5</p> <p>AI-SPIRE-6</p> <p>AI-SPIRE-7</p>

AGREEMENTS STATEMENTS	ACTION
<p>to be qualified. The design work performed under a TRP contract lasts 2 years, ends September 2000 and can only be considered as technological support to the SPIRE cooler qualification.</p> <ul style="list-style-type: none"> - Cooler recycling has very little impact on the tank temperature .i.e. < 1 mW. ESA is not worried about possible peak dumps of the cooler. - Cooler cycling shall be considered as part of the observation and be discussed within the Science framework. <p>BAU (SPIRE2):</p> <ul style="list-style-type: none"> - The values for the SPIRE2 allowed temperatures in the IID-B are wrong and will be amended. - SPIRE2 will have a total of 500 wires going in and 500 wires going out of the unit! - The unit will probably be mounted on a bracket outside the cryostat. Because of its power dissipation (2.5 W) active temperature control in the form of compensation heaters might be required. SPIRE will have to incorporate this into their design. - SPIRE will define the BAU in more detail, especially where it concerns the number of connectors, by early October. <p>4. Instrument Development Plan/Instrument Milestones</p> <ul style="list-style-type: none"> - K. King presented the high-level instrument development schedule, together with a planning for the relevant documentation. (attachment D1-D3) - The schedule is success-oriented and therefore has no margins/buffers. - The planning for the next level down will be done in the immediate future. - Information on the detector options has been minuted and circulated to G. Pilbratt. Mid September is the date for the next meeting to take place at GSFC. G. Pilbratt has been invited to attend. 	<p style="text-align: center;">AI-SPIRE-8</p>

AGREEMENTS STATEMENTS	ACTION
<ul style="list-style-type: none"> - M. Griffin will inform ESA of the various detector option details and milestones for its selection. - For the purpose of DPU planning, SPIRE requested that S/C interfaces are frozen around April 1999. 	AI-SPIRE-9
<p>5. Test Sequences and Instrument Model Philosophy</p> <p>The use of different models was clarified by ESA as follows:</p> <ul style="list-style-type: none"> - Avionics model to validate electronics and software for its interface with the S/C, including anything that exchanges information with for example the AOCS. In addition all tasks relevant to SPIRE autonomy shall be verified. - The CQM will undergo tests similar to those performed on the GIRL cryostat for ISO. The FPU will be mounted inside the cryostat. SPIRE will study the possibility of cooling down the BAU to simulate representative temperatures. The "warm" boxes will be mounted on a platform in such a way that representative tests can be done also in the area of EMC (conducted only). If necessary the Helium flow-rate could be adjusted (reduced) to simulate more accurately actual flight conditions. - The test set-up was discussed including the question to provide a cold background to the instrument, e.g. by the cryostat cover, resp. a GSE. SPIRE will provide input on environment needs. - During FIRST TV tests IST's will be conducted and the cooler exercised i.e. recycling. There may be a requirement to recycle the cooler in a certain S/C position i.e. horizontal, vertical or an in-between position. It is desired by ESA to have the capability to operate the cooler in any position. SPIRE will respond to the request for the cooler to operate in any position. - There are some schedule problems (FPU) to meet the requested delivery dates to ESA. These problems were not resolved at the meeting. SPIRE have no overlap between their QM and PFM programmes. - SPIRE handed-over an instrument electronics' block diagram for information purposes. (attachment E1)) 	

AGREEMENTS STATEMENTS	ACTION
<p>"Cold" vibration:</p> <ul style="list-style-type: none">- The cold vibration need not be performed at a temperature of 4 K. A temperature of 10 to 20 K is adequate. SPIRE will check with LAS whether the existing facility could test SPIRE, at its present size, at a temperature between 10 and 20 K. <p>FPU FS delivery:</p> <ul style="list-style-type: none">- SPIRE would prefer to deliver spare subsystems for the FPU rather than a complete FS. ESA stated that this would have an enormous cost impact on ESA, given the time required for transporting the FPU from and to SPIRE labs. and repairing/testing/vibrating the unit prior to its redelivery, in the event that the FM FPU needs repair. SPIRE will assess how long it takes to repair/test etc. a broken FM FPU. Nevertheless it is ESA's philosophy to have a dedicated FS FPU available during system activities.- For the purpose of refurbishment into a dedicated FS, the QM FPU would be returned to SPIRE in early 2004.- The meeting agreed that criteria should be defined in the FST (FIRST Science Team) for replacing a FPU in the cryostat.	<p>AI-SPIRE-12</p> <p>AI-SPIRE-13</p>
<p>6. Instrument Interface Document</p> <ul style="list-style-type: none">- The inputs received from SPIRE have been edited into version 0/0 i.e. the first non-draft version, of the IID-B. This version will be sent in electronic form to K. King before the middle of August.- The contents of chapter 10 shall be reconsidered as at the moment it contains too much detailed information.- T. Passvogel will send a simplified thermal model of the FIRST optical bench to SPIRE.	<p>AI-SPIRE-14</p> <p>AI-SPIRE-15</p>
<p>7. FIRST Telescope</p> <ul style="list-style-type: none">- T. Passvogel presented the status on the FIRST telescope activities and the milestones. Major upcoming milestone will be the availability of the two demonstrators (JPL-CFRP) and (MMS_SiC) in summer 1999.	

AGREEMENTS STATEMENTS	ACTION
<p>ESA provided an updated copy of the telescope specification at the meeting.</p> <ul style="list-style-type: none"> - SPIRE asked whether emissivity of primary and secondary mirrors would be identical. ESA confirmed this. - SPIRE requested information on the design of the telescope e.g. the finish of the tripod. - SPIRE are requested to provide an ASAP/APART model of the photometer. - SPIRE questions if any should be forwarded in writing to ESA and will be raised at the planned design review of the telescope. - M. Griffin will review the numbers for the temperature-gradient requirements on the telescope. 	<p>AI-SPIRE-16</p> <p>AI-SPIRE-17</p>
<p>8. AOB</p> <ul style="list-style-type: none"> - ESA indicated its plans to have meetings with the instrument teams at a roughly 3 months' interval. - The alignment working group should be revitalised. - The use of the DMS (Data Management System) for information exchange was discussed in the Commonality Working Group and will be followed-up there. - ESA handed over copies on the status of questions and answers related to the AO phase. (attachment F1 and F2) Only a few questions remain to be answered. 	



FIRST/Planck Project

Action Item Initiation Sheet

Date : 29/07/1998
Ref : PT-MM-05719
Page : 8 of 9Title: FIRST/Planck technical meeting
with SPIRE

Place:

Ordinal Action Number	Title and Description	Due Date	Originator		Actionee		Completion	
			Firm	Person	Firm	Person	Date	By Document No.
AI-SPIRE-1	Provide a management plan.	09-10-1998	ESA	Passvogel	QMW	Griffin		
AI-SPIRE-2	Comment/address specific items of the management structure as a prompt for the information to be provided in the management plan	31-08-1998	QMW	Griffin	ESA	Passvogel		
AI-SPIRE-3	Provide copy of documentation tree.	09-10-1998	ESA	Passvogel	QMW	Griffin		
AI-SPIRE-4	Provide overviews on thermal design options.	18-09-1998	ESA	Passvogel	QMW	Griffin		
AI-SPIRE-5	Supply figures for the possible length of the cryo-harness.	18-09-1998	QMW	Griffin	ESA	Passvogel		
AI-SPIRE-6	Submit FPU mass budgets for all options.	09-10-1998	ESA	Passvogel	QMW	Griffin		
AI-SPIRE-7	Submit power profiles for the different FPU operating modes.	09-10-1998	ESA	Passvogel	QMW	Griffin		
AI-SPIRE-8	Define BAU in more detail, especially where it concerns the number of connectors.	09-10-1998	ESA	Passvogel	QMW	Griffin		
AI-SPIRE-9	Inform ESA on various detector options.	09-10-1998	ESA	Passvogel	QMW	Griffin		



FIRST/Planck Project

Action Item Initiation Sheet

Title: FIRST/Planck technical meeting
with SPIRE

Place:

Date : 29/07/1998
Ref : PT-MM-05719
Page : 9 of 9

AI-SPIRE-10	Provide environment needs for a "cold" cryostat cover.	09-10-1998	ESA	Passvogel	QMW	Griffin		
AI-SPIRE-11	Respond to request for cooler to operate in any position.	09-10-1998	ESA	Passvogel	QMW	Griffin		
AI-SPIRE-12	Check with LAS whether the existing facility could test SPIRE.	09-10-1998	ESA	Passvogel	QMW	Griffin		
AI-SPIRE-13	Assess how long it takes to repair/test etc. a broken FM FPU.	09-10-1998	ESA	Passvogel	QMW	Griffin		
AI-SPIRE-14	IID-B. This version will be sent in electronic form.	15-08-1998	QMW	Griffin	ESA	Schaap		
AI-SPIRE-15	Send a simplified thermal model of the FIRST optical bench	30-08-1998	QMW	Griffin	ESA	Passvogel		
AI-SPIRE-16	Provide ASAP/APART model of photometer.		ESA	Passvogel	QMW	Griffin		
AI-SPIRE-17	Review the numbers for the temperature-gradient requirements	-	ESA	Passvogel	QMW	Griffin	04-08-1998	Email ref. 0005718



FIRST/Planck Project

Telefax

Fax No : (31) 71 565 5244

Tel. No : (31) 71 565 5962

Ref. : PT-05693

Date : 22 July, 1998

From : T. Passvogel (SCI-PT)

Page : 1 of 1

To : M. Griffin
K. King

Fax No: 0044 181 980 0986 ✓
0044 1235 44 6667 ✓

Cc : F. Felici, M. Anderegg, F. Vandenbussche, P. Estaria, M. v. Hoegen,
B. Guillaume, B. Collaudin, G. Pilbratt

Subject : FIRST/Planck Technical Meeting with SPIRE

Please find below the proposed agenda for the technical meeting with the SPIRE instrument, agreed for the 29.07.98 at ESTEC. The meeting will be held in room AF205 and start at 9:00.

Agenda

1. Instrument Management
2. FSEC Report (updated baseline design?)
3. Instrument Design Status
(Emphasis on FPU, Sorption cooler, Buffer Amplifier Unit)
4. Instrument Development Plan/Critical Developments/Instrument Milestones
(Alternative concepts – selection strategy, impact on s/c interfaces and requirements)
5. Test Sequences and Instrument Model Philosophy
6. Instrument Interface Document (IID-B) update
7. FIRST Telescope
(Straylight model, temperature gradient requirements, general status)
8. AOB

For the agenda items 1 through 6, input is expected from SPIRE during the meeting.

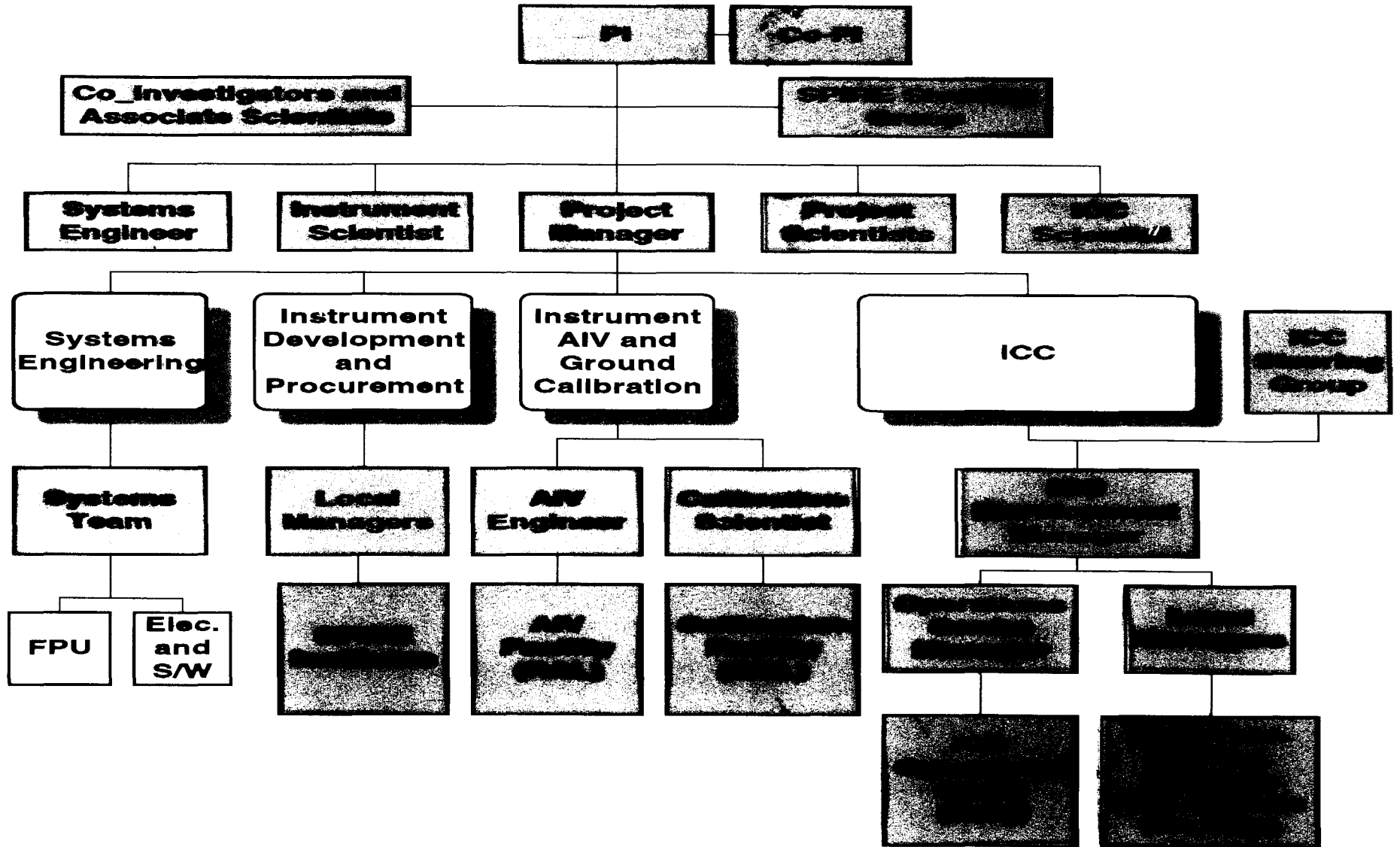
Please confirm the agenda and provide the list of participants.

Best regards

Thomas Passvogel

ESTEC

Postbus 299 - NL 2200 AG Noordwijk - Keplerlaan 1 - NL 2201 AZ Noordwijk ZH
<http://sci.esa.int/first>



SPIRE Systems Team

- **Establishes subsystem requirements and interface budgets**
- **Oversees specification and control of all internal and external interfaces (maintain Interface Control Documents)**
- **Monitors systems aspects of instrument design, construction and calibration**
- **Identifies and takes action on problems as system level**
- **Core membership:**
 - **Elec. & S/W Systems Engineer** Louis Rodriguez
(Chair)
 - **FPU systems Engineer** Colin Cunningham
 - **Project Manager** Ken King
 - **Project Scientists** Jean-Paul Baluteau
Walter Gear
 - **Instrument Scientist** Bruce Swinyard
- **Subgroups/additional membership:**
 - **PA and QA experts**
 - **AIV and Ground Calibration team**
 - **Experts from relevant subsystem teams**

Summary of FSEC recommendations concerning SPIRE

- **FSEC approve of the SPIRE photometer capabilities and design.**
- **Low resolution ($R \sim 20-100$) spectrophotometry is essential for SED measurement - higher resolving power is not essential.**

High resolution is no longer a design driver but we will implement $R > 100$ if it means little extra cost or complexity.

- **Martin-Puplett design good for broad wavelength coverage, but we are urged to improve efficiency by recovering lost light at input.**

Double-pass FTS option is being studied.

- **We are encouraged to see if we can incorporate the spectrometer into the photometer.**

We have considered this and judge it to be impractical.

- **We are advised to study in detail the relative merits of full sampling of the diffraction spot (filled arrays vs. feed-horn fed arrays).**

We are doing this as part of the array evaluation/selection programme.

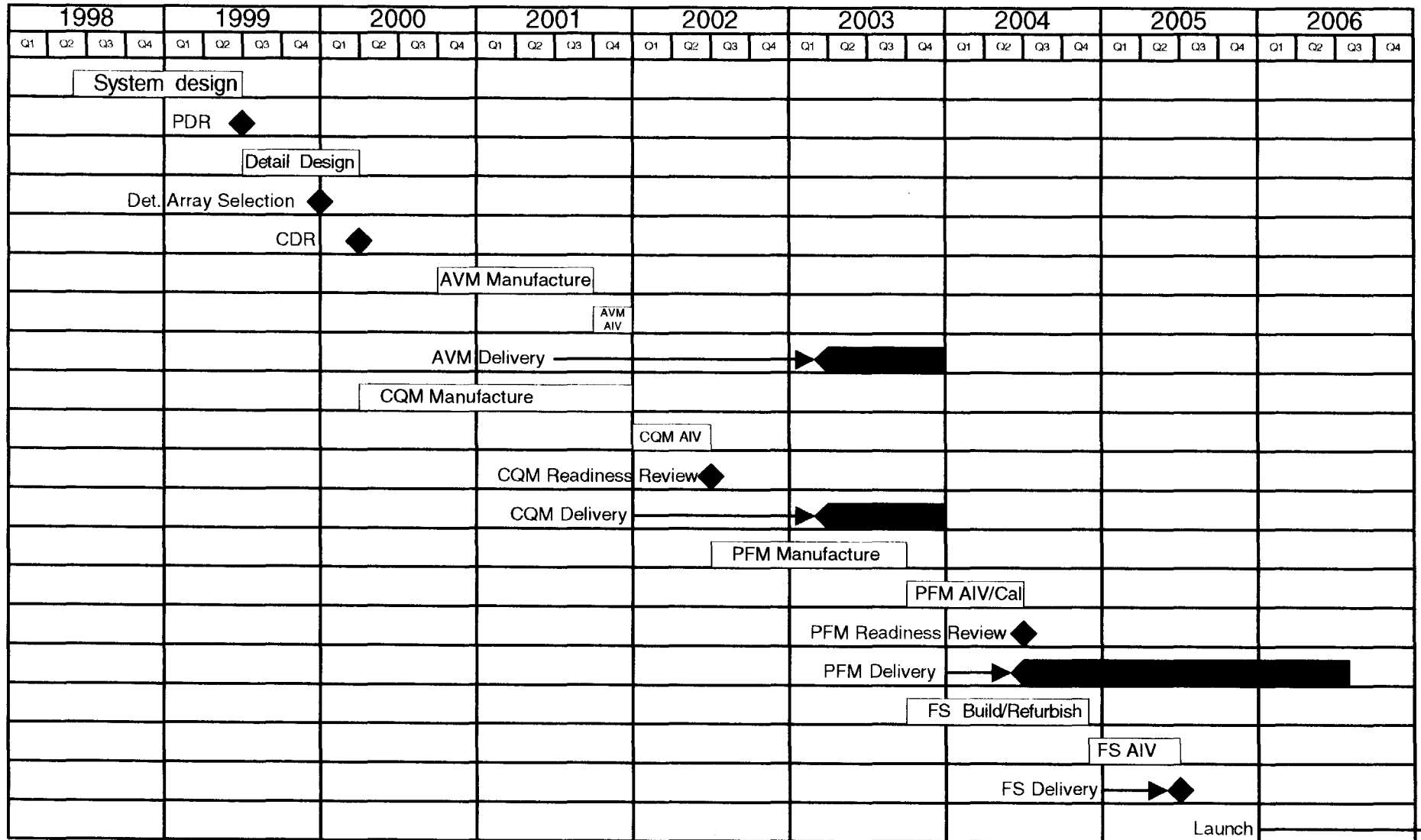
- **On-board data processing is seen as a problem for all FIRST instruments – FSEC recommends that convincing and detailed plans be drawn up at an early stage.**

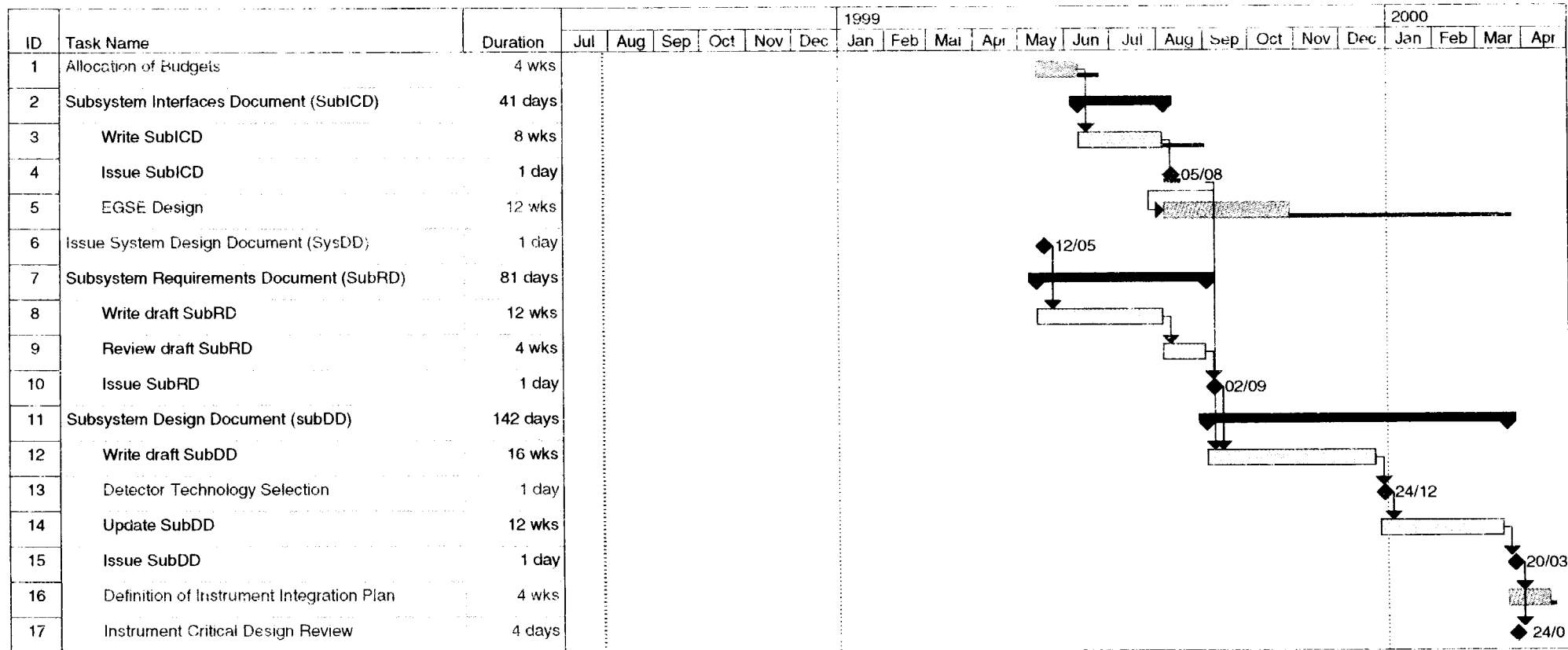
We will do this – OBSW study group to be set up under Systems Team.

- **Minimum acceptable SPIRE capabilities:**
 - **Photometer with fall-back arrays**
 - **Spectrometer: whole wavelength range but $R = 100$**
 - **Separate photometer and spectrometer not a scientific requirement**

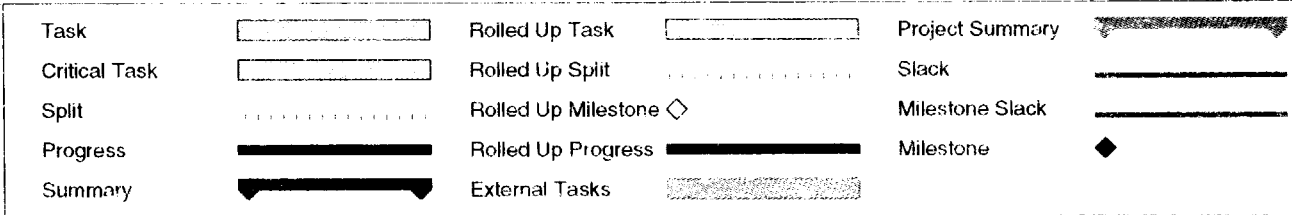
OK – but this is not being taken as a recommendation to de-scope the instrument.

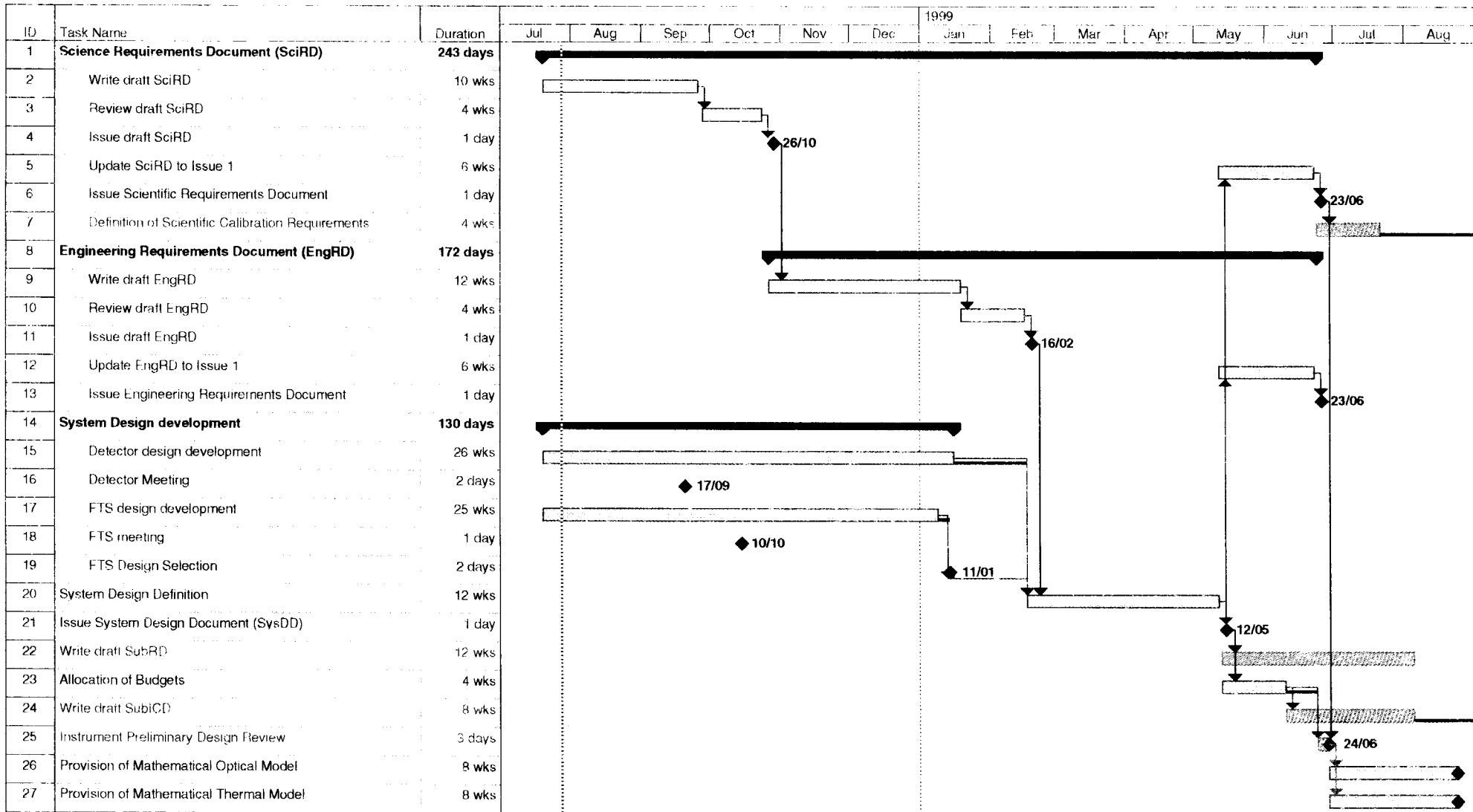
SPIRE Instrument Development Schedule





Project: Detailed Design
Date: Tue 28/07/98



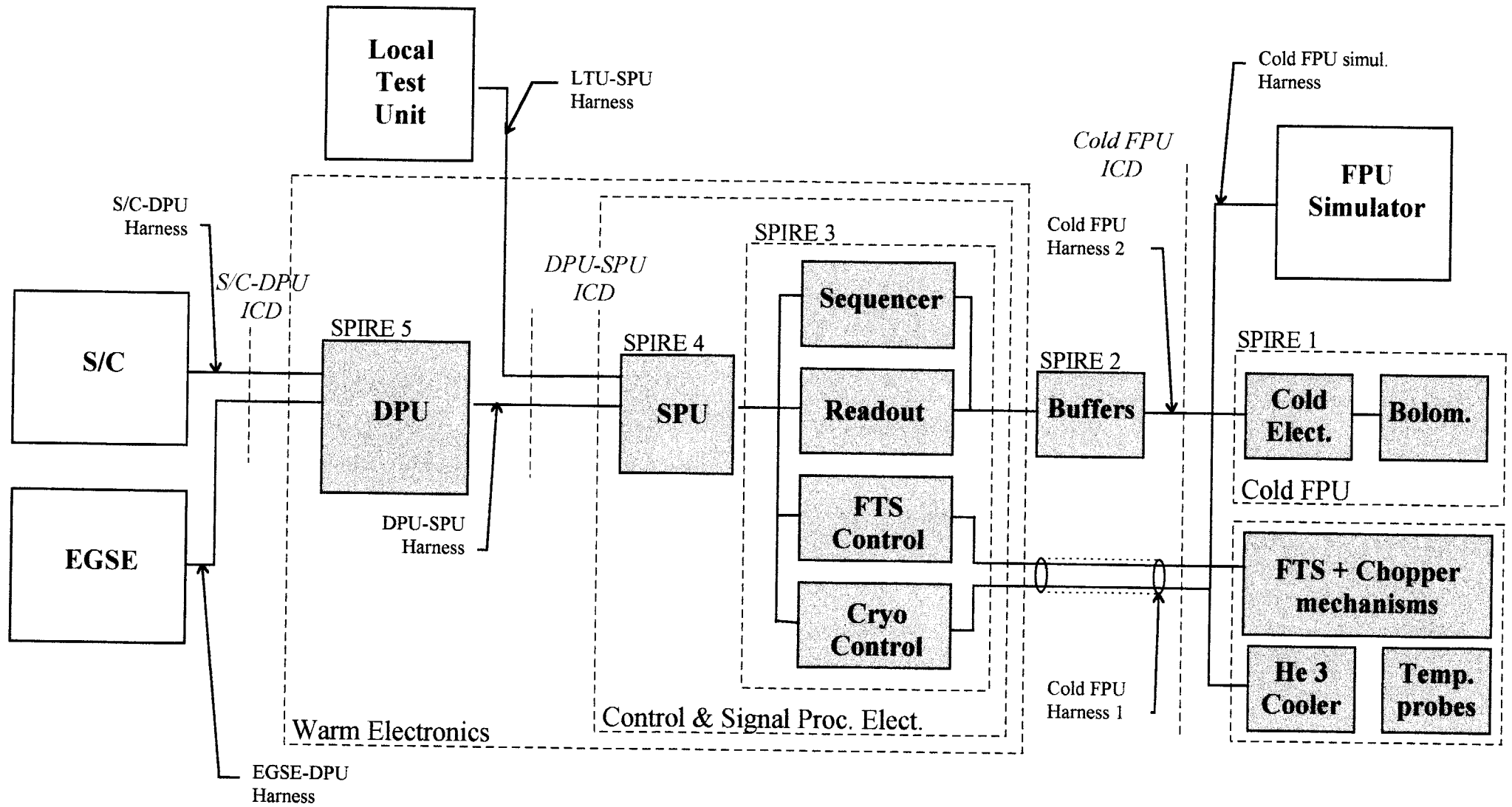


Project: System Design
Date: Tue 28/07/98

Task		Summary		Rolled Up Progress		Milestone Slack	
Critical Task		Rolled Up Task		External Tasks		Milestone	
Split		Rolled Up Split		Project Summary		Slack	
Progress		Rolled Up Milestone					

03

Electronics Block Diagram



SPIRE

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	
SPIRE_STP_1	Fax 14-04-1998	GP	
SPIRE_STP_2	To be answered	GP	
SPIRE_STP_3	Fax 14-04-1998	GP	
SPIRE_STP_4	Fax 14-04-1998	GP	
SPIRE_STP_5	Fax 14-04-1998	GP	
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	To be answered	HS	
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

SPIRE_IID_2	Fax 14-04-1998	HS	Closed
SPIRE_IID_3	To be answered	HS	
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: