SPIRE/RAL/M/0053.10

SPIRE SYSTEMS TEAM MEETING

VIEWGRAPHS O/L

5-6th November 98 at the UK Astronomy Technology Centre

Thursday Start at 13:30 in Conference Centre

Item	Time	Thursday Afternoon : Full Team	Chair/Leader
1	13:30	Introduction & Purpose of Meeting	*Cunningham*
2	13:45	Status of Project	*Griffin*
3	14:00	Systems Milestones for Project Plan	*King*
4	14:15	Systems Team Organisation	*Griffin*
5	14:30	Brief summary of systems documentation plan	*Cunningham*
	14:45	**Coffee**	
Parallel splinter groups: Structure, Science Requirements, On-board Software			
6	15:00	**Structure (in Conference Centre)**	*Oliver*
		Mary Carter, Fraser Morrison (Until 16:30), Peter Hastings, Colin Cunningham, Dominique Pouliquen, William Gray, Bruce Swinyard via Video conference	
6.1	15:00	Set Thermal and Mass budgets eg requirements	*Cunningham*
6.2	15:30	Structure layout design – Review document & decide basic principles	*Oliver*
6.3	16:30	Plans & schedule for Structural Analysis	*Oliver*
6.4	16:45	Plans & schedule for Thermal Analysis	*Oliver*
6.5	17:00	Detail	*Oliver*
		Materials Testing & Selection	*Oliver*
		Electrical wiring integration with the structure	*Cunningham*
		Thermal Interfaces	*Cunningham*
		JFET Box layout & thermal load	*Cunningham*
		FPU interface definition documents for array options	*Oliver*
	15:00	**Scientific Requirements (in Conference Room)**	*Gear*
7		Matt Griffin, Jean-Paul Baluteau, William Duncan etc	
7.1	15:00	Review draft document	
7.2	16:00	Suggested additions/modifications	
7.3	16:30	Flat fielding	
7.4	16:45	Point source extraction	
7.5	17:00	Identification and discussion of areas of trade-off	
7.6	17:15	Verification procedures	
7.7	17:30	Identification of actions required	
7.8	17:45	Scientific Systems Models for FTS & Photometer	
8		**On –board software (in Tech Meeting Room)**	*King*
		Louis, Christophe, Jean-Louis, Malcolm Stewart	
8.1		Software Systems Team	
8.2		Work-package responsibility	
8.3		Requirements	
8.4		Computing power needed for SPU & DPU	
	18:00	**Finish 19:00 for 19:30 Dinner at Maxie's Bistro**	

Item	Time	Friday: Full Team in Conference Centre	Chair/Leader
9	9:00	Reports from Splinter groups:	Swinyard
9.1	9:00	Structure	Cunningham
9.2	9:15	Science Requirements	Gear
9.3	9:30	On-board software	King
10	9:45	Systems Documentation	Swinyard
10.1	9:45	Scientific Requirements Document (SRD)	Gear
10.2	10:00	Instrument Systems Requirements Document (ISRD)	Swinyard
10.3	10:15	AIV plan – links to SRD & ISRDs for verification	Swinyard
10.4	10:30	Subsystems Requirements Documents (SSRD)	Swinyard
		Template	
		Definition of requirements from SRD	
		Define review process	
11	10:45	Interface definition and control	Cunningham
11.1		Subsystem definition	
11.2		Interface matrix	
11.3		Template for Internal Interface Control Documents (IICDs)	
11.4		Control process	
12	11:00	IID-B updates for ESA meeting – what is missing?	Cunningham
13	11:15	Document management system	King
14	11:30	Timetable for production and review of systems documents	King
15	11:45	Warm Electronics	Rodriguez
15.1		Electronics systems design for array options	
15.2		Wiring harness: responsible organisations?	
15.3		Signal processing and data rate requirements	
15.4		Qualification and type approval of components	
15.5		BAU, RF filter box specifications	
	12:45	**Lunch**	
	13:30	**Afternoon Session**	
16	13:30	Plan of activities leading up to CDR	King
16.1	13:35	Milestones	
16.2	13:45	Proposal: Weekly Systems Team Teleconferences	
16.3	13:50	Monthly Reports	
16.4	14:00	Meetings Plan inc. videoconferences	
16.5	14:10	Date and place of next meeting	
17	14:20	Review action list from meeting for review by weekly teleconference	Swinyard
18	14:30	Summary of meeting Successes Opportunities Failures Threats	Cunningham
19	14:45	Agreed list of priorities for review at weekly teleconference	Swinyard
		Finish at 15:00, followed by short tour of ATC Labs for those with time.	
		FAILURE MODES ANALYSIS	

SPIRE SYSTEM MEETING

COLIN	CUNNINGHAM	UK ATC (ROE)	CRC@ROE.AC.UK
BILL	GRAY	JPL	wbgray@jpl.nasa.gov
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~~Ken~~	~~King~~	~~RAL~~	~~k.j.king~~
WILF	OLIVER	MSSL	WJO@MSSL.UCL.AC.UK
WALTER	GLATZEL	MSSL	wkpg@mssl.ucl.ac.uk
Gillian	Wright	UK-ATC	gsw@roe.ac.uk.

SPIRE SYSTEMS TEAM MEETING

5-6th November 98 at the UK Astronomy Technology Centre

Purpose of Meeting:

- Get systems team organised
- Review the first-draft Scientific Requirements Document
- Review the SPIRE FPU Structure design
- Set up software team
- Review the systems designs for the array options
- Ensure IID-B is updated for the ESA meeting on 17th Nov
- Establish interface definition & control system
- Formulate priorities and plan of activities leading up to SPIRE PDR in mid-1999.

Status of the Project

Funding/Schedule/Politics

FIRST/Planck Payload Funding Meeting, Paris Oct. 21

- **Formal schedule unchanged: no visible willingness on ESA's part to relax PFM delivery date**
- **UK funding situation improved**
- **Funding problems generally in Europe ⇒ uncertainties in the schedule**
- **FIRST and Planck "confirmation" planned for the February 1999 SPC meeting**
- **Actions on Instrument teams: Determine**
  - **(i) what can be done within available funding limits and profiles**
  - **(ii) what additional resources would be needed to meet the current schedule**

FIRST Science Team will meet for first time on Dec. 18

Telescope, Focal plane, Instrument

- 3.8-m antenna under study by JPL
- Modified photometer design proposed by Kjetil Dohlen (improved image quality)
- Alternative layout of focal plane being considered, with PACS and SPIRE closer to the centre
  - ⇒ Improved image quality
  - ⇒ Simpler optical design ?
  - ⇒ Other implications for SPIRE ?

  New focal plane sharing scheme being drawn up by HIFI for circulation to PACS and SPIRE by end November Joint proposal to ESA early Dec.
- Use of X-band transponders increasingly likely ⇒ available data rate should go up by factor of ~ 4.
- Intensity beam-dividing FTS has replaced the double-pass option as the alternative FTS design
- Detector array development:
  - Development/test schedule very tight
  - SPIRE deep survey simulations will be used as basis of selection
  - Progress very slow on systems designs for the US options

Important forthcoming meetings

1. Technical meeting with ESA: Nov. 17 at ESTEC

   - Actions from previous meeting in July
   - Instrument design status
   - Instrument development plan
   - Instrument schedule
   - ESA comments on SPIRE documents
   - IID-B update (systems designs needed for all options)
   - Outstanding issues from AO activities
   - PLM/FPU stray light
   - FSEC matters
   - PFM replacement criteria
   - External DMS access
   - Discussions on budgets/interfaces

2. SPIRE consortium meeting: RAL Dec. 1, 2
   (Dec. 3 available for additional technical splinters)

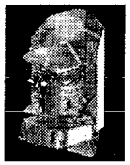
   - Draft agenda have been circulated

3. Detector Array Group meeting: Jan. 21, 22 QMW

   - Review of progress and planning of the array development and testing programme
   - Review of the array selection criteria based on simulations of SPIRE observations
   - Review systems design documents for the various options

4. FTS Group meeting: Jan. TBD, QMW

   - Review of FTS design options and selection



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			

(8)

SPIRE Systems Team Organisation

- Responsibilities (from current draft of SPIRE Management Plan)
  - Oversee the specification and control of all internal and external interfaces
  - Establish the necessary procedures and teams for monitoring system aspects of instrument design, construction, calibration, operation
  - Identify and take action on actual or potential problems at system level
  - Advise the PI and the Project Manager on all of these issues

The Systems Team will act as a focus for, and will monitor the activities of, all SPIRE working groups

- **Chairman** Rodriguez

- **Key members**

FPU Systems Engineer	Cunningham
Warm Electronics Systems Engineer	Rodriguez
ICC Systems Engineer	TBD
Instrument Scientist	Swinyard

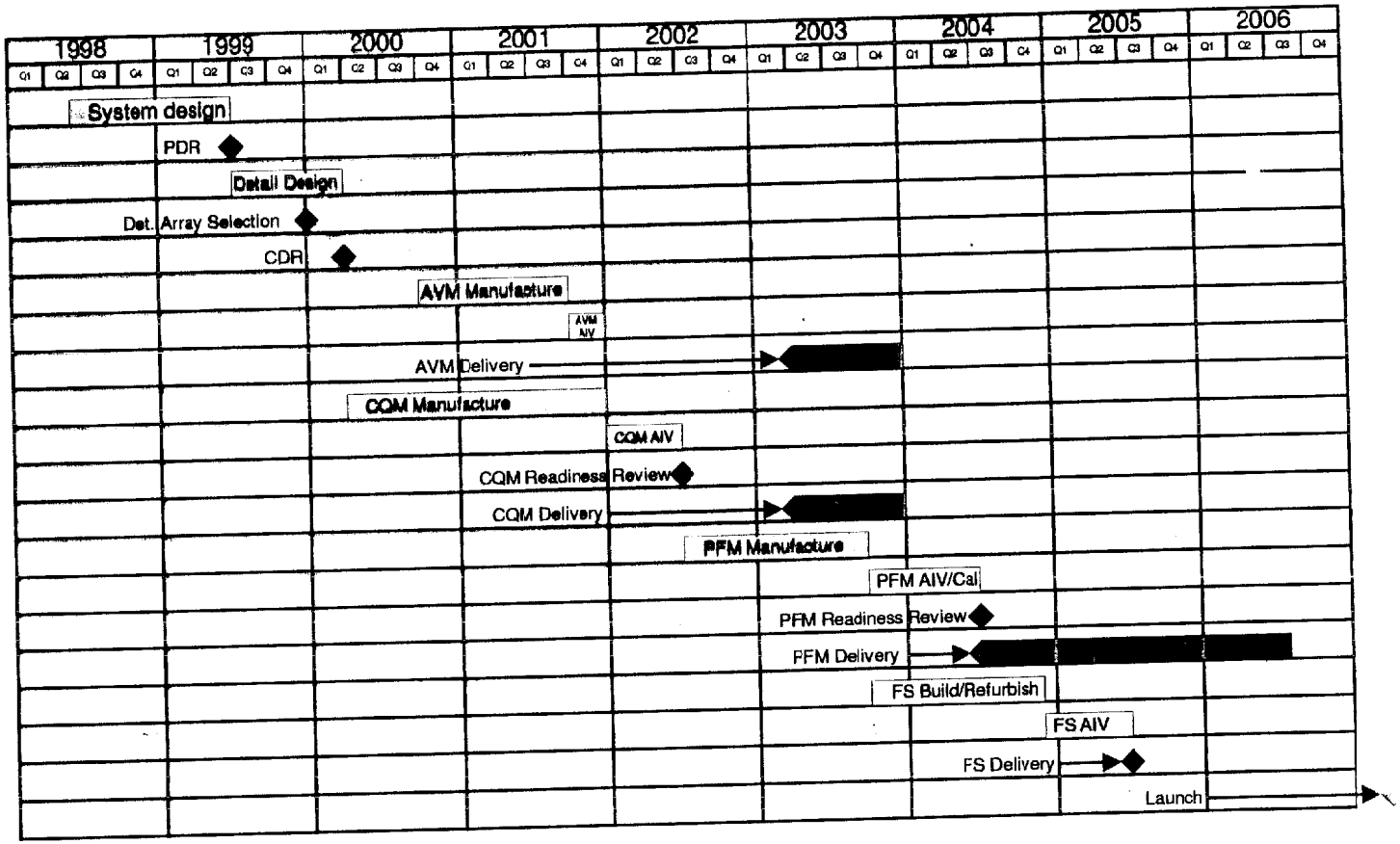
Their duties

- Represent SPIRE at meetings with ESA
- Host/organise Systems Team meetings
- Monitor and co-ordinate activities of SPIRE groups
- Establish other groups as and when necessary

- **Current and suggested *new* SPIRE groups linked to Systems Team**

	Group	Chairman
1	Scientific requirements and performance	Gear/Baluteau
2	FTS	Swinyard
3	Detector arrays	Griffin
4	Instrument simulations	Vigroux
5	*Structure and internal layout*	*Oliver (TBC)*
6	*Electronics and on-board S/W*	*Cara (TBC)*
7	*Ground software/ICC*	*TBD*
8	ESA's Commonality Group	King

SPIRE Instrument Development Schedule



SPIRE Structure splinter

Agreed to study & review basic principles of structure & optics mounting as in BS document

Agreed basic principles of interface control & document management via web version

Agreed no specific thermal load for structure & some relaxation of budget

Agreed current baseline of photometer & FTS with linear mechanism

Agreed basic interface documentation & control procedure

MSSL **Don't agree** 18 Kg structure mass budget

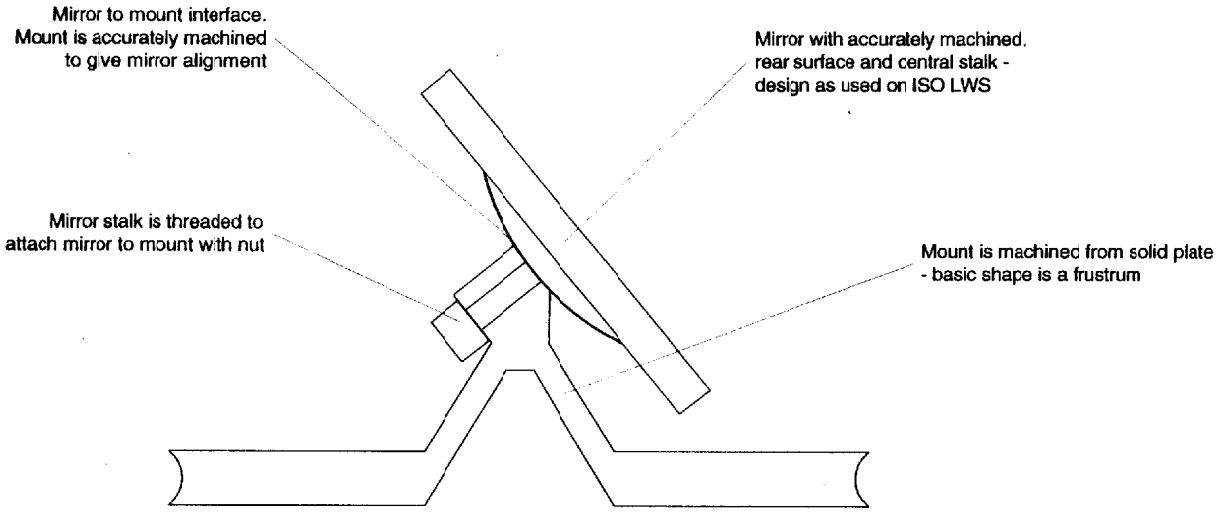


Figure 4: Concept for mounting mirrors on 4-K and 2-K plates

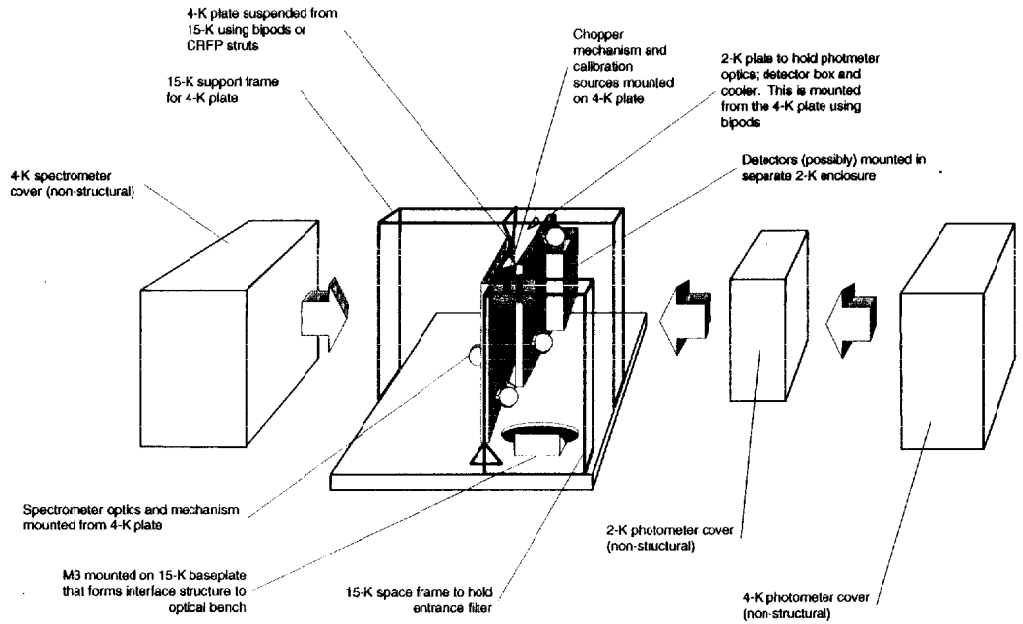


Figure 1: Conceptual layout for the SPIRE structure based on non structural covers (15-K cover not shown)

From: Kjetil Dohlen <dohlen@observatoire.cnrs-mrs.fr>
To: Bruce Swinyard <B.M.Swinyard@rl.ac.uk>
Cc: domini@astrsp-mrs.fr <domini@astrsp-mrs.fr>; saisse@lasm0b.astrsp-mrs.fr <saisse@lasm0b.astrsp-mrs.fr>; baluteau@astrsp-mrs.fr <baluteau@astrsp-mrs.fr>
Date: 29 October 1998 09:23
Subject: Re: Alignment Tolerances.....

Dear Bruce,

Sorry for my delayed response. Below is a resume of the discussions we had at LAS with Michel Saisse 17/9/98.

Cheers
Kjetil.

Surface quality.

We understood the FIRST telescope spec TEPE-095 to mean that the integrated scatter within the FOV should be less than 10-4. As a conservative (and simplified) calculation we took this to equal the total integrated scatter, TIS.

We then assumed the telescope TIS to be representative of the TIS we should require for our instrument.

TIS is related to RMS surface roughness, sigma, by the relation:

$$TIS = (4 \pi \sigma/\lambda)^2$$

With TIS = 10-4 and lambda = 200 um, we found sigma = 160 nm. With an optical train consisting of 10 mirrors and assuming RSS summatio of roughness values, the roughness per mirror is 160/root(10) = 50 nm.

This value is incompatible with classical numerically controlled machining, but apparently easily within reach of diamond machining.

Alignment

We agreed that pupil alignment would probably be more critical than image quality constraints in our instrument. Requiring pupil alignment to within 1/20 of the pupil diameter appears reasonnable for the mechanical alignment. For ten'ish independent (hence RSS summation) mirrors contributing to the alignment, we allow 1/(20*root(10)) ~ 1/60 pupil diameter per mirror.

For mirror separations of typically 200 mm and pupil sizes of 25 to 50 mm, the alignment requirement is of the order of 10'-20' per mirror. Assuming shims at three points around the edge of the mirrors, this corresponds to shims of 0.05 to 0.1 mm.

Such alignment requirements fit within the accuracy of mechanical measuring machines, indicating the possibility for blind alignment of the SPIRE optics.

Bruce Swinyard wrote:
>
> Kjetil,Dominique
> I'm writing something up trying to sumarise all the various discussion
> and thoughts we've had on the structure and the mounting of the optics
> - could you confirm what the alignment tolerance will be for an
> individual mirror and what this means in terms of machining tolerance
> on the mirror mount - thanks.....
>
>
> Cheers B.

--
****
Kjetil DOHLEN, mailto:dohlen@observatoire.cnrs-mrs.fr
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2, Place Le Verrier, 13248 Marseille Cedex 4, FRANCE
Tel.: (+33) 4 95 04 41 24, Fax.: (+33) 4 91 62 11 90
****

Electronics and On Board Software Group I

Goal: to progress the definition of the electronics system to the point at which it can be reviewed

Discussion of process for definition of electronics design => need to define requirements before progress can be made, but

Electronics system requirement definition needs:

- System requirements – still TBW
- FPU subsystem designs – TBD
- OIRD – draft available with AO
- IID Part A – available

Which will take some time to complete
but

in the meantime DPU and SPU definition is being pushed forward by inputs from other instrument groups – we do not want to find that the DPU and SPU are not adequate for our requirements

Conclusion: we must start requirements definition with what we already have in order to:

- Feedback potential problems to other groups
- Minimise the risk of missing requirements on the DPU, SPU.

Electronics and On Board Software Group II

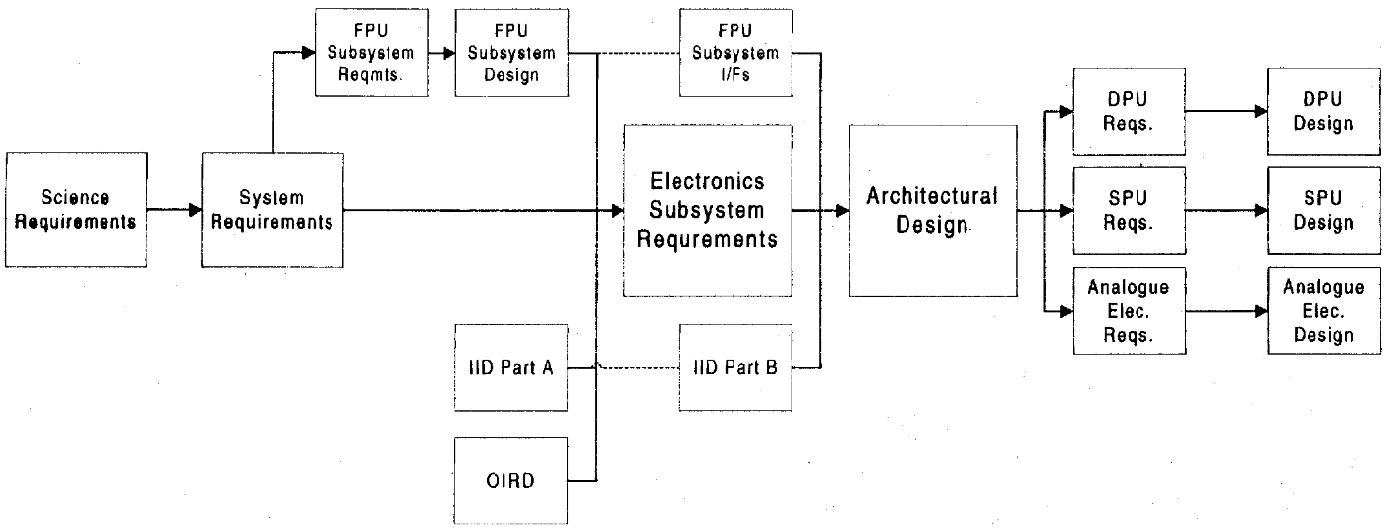
Next steps:

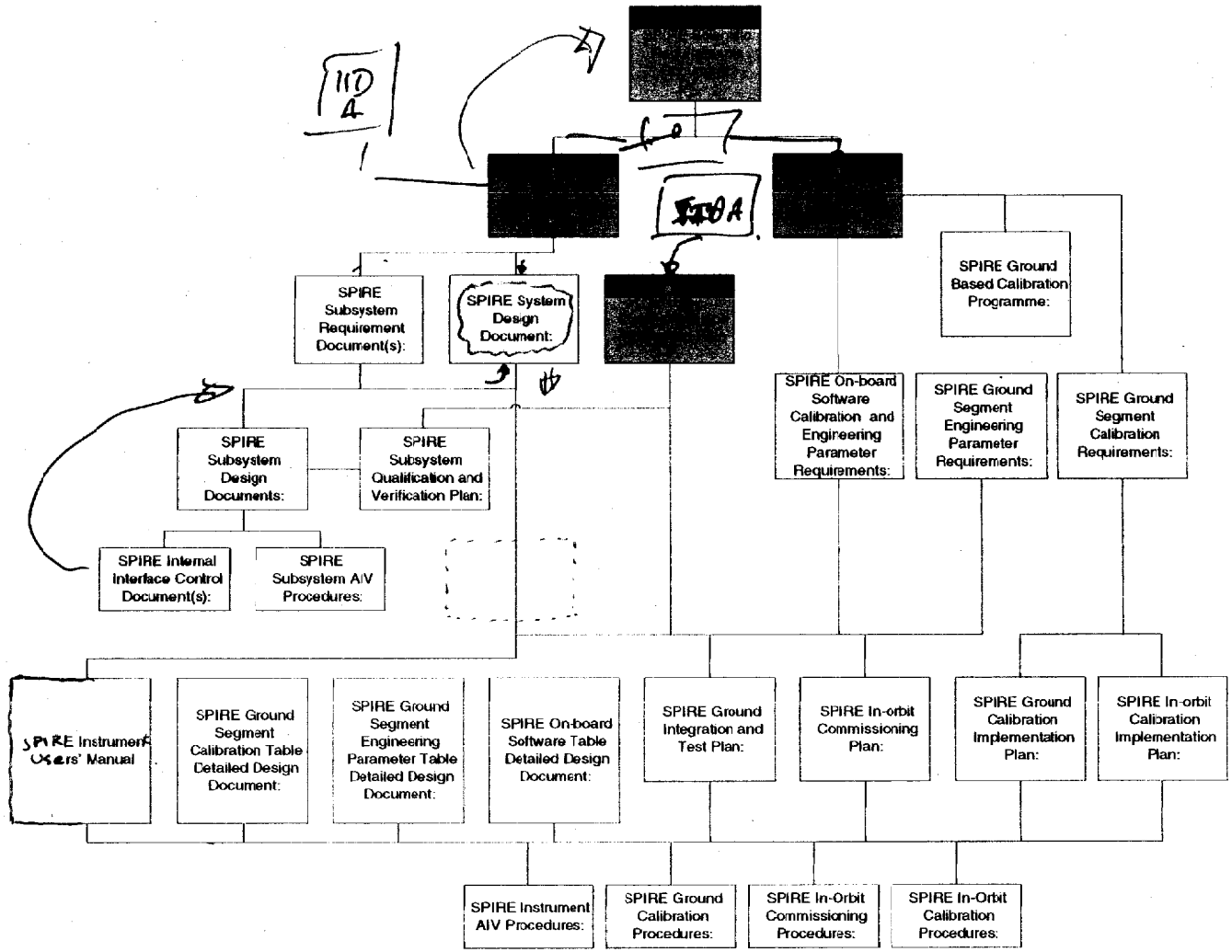
- List currently known requirements from the available documents (Cara)
- Generate scenarios to test the applicability/necessity of requirements (Rodriguez)
- Check requirements for consistency and missing items (Feb meeting)
- Interact with other groups to provide missing information
- Produce Requirements (approved by System Team?)
- Produce Architectural Design
- Produce DPU, SPU Requirements
- Check DPU, SPU design consistent with these
- Iterate

Meetings:

Dec: at Consortium meeting, with DPU, SPU reps to get them involved.

Feb: to review available requirements and formulate questions for other groups.


Science Requirements
System Requirements
FPU Subsystem Reqmts.
FPU Subsystem Design
FPU Subsystem I/Fs
Electronics Subsystem Requrements
IID Part A
IID Part B
OIRD
Architectural Design
DPU Reqs.
SPU Reqs.
Analogue Elec. Reqs.
DPU Design
SPU Design
Analogue Elec. Design



SPIRE SYSTEMS DESIGN DOCUMENTS INFORMATION TREE

SPIRE/RAL/D/00??	SPIRE Scientific Requirements Document:	This contains the requirements placed on the instrument design in order that it meets the core scientific goals of the mission. As far as possible these will be set down in terms in pure astronomical terms (FOV; beam size etc) without reference to the baseline design of the instrument. This document will also set down an assessment of the impact of the uncertainty of the calibration of the instrument performance on the science goals of the mission. Taken together these will lead on to the Instrument System Requirements and the Calibration Requirements.
SPIRE/RAL/D/00??	SPIRE Instrument System Requirements Document:	This describes the overall design of the instrument and translates the science requirements into the "engineering" requirements for the instrument as a whole. The global budgets for optical/mechanical alignment; thermal; electrical; telemetry; EMI; EMC etc etc will be detailed in this document. Also the system grounding and power distribution scheme; the instrument control and commanding scheme; on board data processing; instrument autonomy; flight operations modes etc will be described in outline in this document.
SPIRE/RAL/D/00??	SPIRE Subsystem Requirement Document(s):	This is a set of documents (one for each sub-system) that describes the overall design of the subsystem and translates the top level system requirements into detailed requirements on the subsystem design.
SPIRE/RAL/D/00??	SPIRE Internal Interface Control Document(s):	This is a series of documents, one for each subsystem to subsystem interface, that detail the mechanical; thermal; electrical etc interfaces for the subsystems.

SPIRE/RAL/D/00??	SPIRE System Design Document:	This document contains the detailed description of the instrument function; operation and design as the instrument was built.
SPIRE/RAL/D/00??	SPIRE Subsystem Design Documents:	These documents give a detailed description of the function; operation and design of each subsystem.
SPIRE/RAL/D/00??	SPIRE Instrument Users' Manual:	This document is intended for use by the in-flight operations team and describes the function and operation of the instrument from a user's point of view (this may not be necessary given the previous two documents have been properly written)
SPIRE/RAL/D/00??	SPIRE Subsystem Qualification and Verification Plan:	This details the steps that will be undertaken by each subsystem provider for the qualification and verification of the subsystem to assure compliance with the SPIRE Qualification and Verification Plan.
SPIRE/RAL/D/00??	SPIRE Ground Integration and Test Plan:	This outlines the procedures to be undertaken for the assembly; integration and functional test of the SPIRE instrument. It will include the outline flow diagram; location and description of test facilities for the AIV of each of the SPIRE models. A schedule for the instrument AIV for each model is given. This document does NOT include the instrument calibration.
SPIRE/RAL/D/00??	SPIRE Instrument AIV Procedures:	(Grimly) Detailed step by step procedures to be followed for the assembly; integration; functional test and environmental test (and verification of the same) of each instrument model during ground test.
SPIRE/RAL/D/00??	SPIRE Subsystem AIV Procedures:	(Grimly) Detailed step by step procedures to be followed for the assembly; integration; functional test and environmental test (and verification of the same) of each instrument subsystem model before integration and during integration into the instrument.

SPIRE/RAL/D/00??	SPIRE In-orbit Commissioning Plan:	This outlines the procedures that will be carried out once the instrument is in orbit to ensure the proper functioning of each of the instrument subsystems and operations modes. A schedule for the in-orbit instrument commissioning is given. This document does NOT include the instrument calibration.
SPIRE/RAL/D/00??	SPIRE In-Orbit Commissioning Procedures:	(Grimly) Detailed step by step procedures to be followed for the commissioning, and verification of the commissioning, of the instrument in orbit.
SPIRE/RAL/D/00??	SPIRE Calibration Requirements Document:	In this document the requirements on the calibration from the Science Requirements Document are translated into requirements on what calibration procedures need to be carried out on the instrument and to what level of accuracy together with the requirements on the facilities required to carry out the ground calibration. The ground-based observations that will be required to implement the in-orbit calibration of the instrument are also described.
SPIRE/RAL/D/00??	SPIRE Ground Calibration Implementation Plan:	This outlines procedures to be carried out during ground test of the instrument in order to fulfil the Calibration Requirements; Data Processing Calibration Requirements and Calibration Table Detailed Design Document. The calibration facilities needed are described in detail and a schedule for the ground calibration of the instrument is given.
SPIRE/RAL/D/00??	SPIRE Ground Calibration Procedures:	(Grimly) Detailed step by step procedures to be followed for the ground calibration of the instrument.
SPIRE/RAL/D/00??	SPIRE In-orbit Calibration Implementation Plan:	This outlines the observations and procedures that will be carried out in-orbit in order to fulfil the Calibration

		Requirements; Data Processing Calibration Requirements and Calibration Table Detailed Design. A schedule for the in-orbit calibration is given.
SPIRE/RAL/D/00??	SPIRE In-Orbit Calibration Procedures:	(Grimly) Detailed descriptions of the observation and procedures to be carried out during the in-orbit calibration of the instrument.
SPIRE/RAL/D/00??	SPIRE Ground Based Calibration Programme:	This details the observations and facilities that will be used in order to fulfil the requirements for the ground based observations of astronomical sources described in the Calibration Requirements Document and/or the Data Processing Calibration Requirements and Calibration Table Detailed Design. This includes any simultaneous observations required during in-orbit calibration.
SPIRE/RAL/D/00??	SPIRE On-board Software Calibration and Engineering Parameter Requirements:	This document describes in outline the on-board software scheme for the SPIRE instrument and details the requirements this places on the ground and in-orbit calibration; functional test and commissioning. This will include an outline description of the data products that are required from the ground and in-orbit calibration; functional test and commissioning and a schedule of need dates for the production of those products. This document covers both SPU and DPU requirements
SPIRE/RAL/D/00??	SPIRE On-board Software Table Detailed Design Document:	This document describes in (grim) detail the contents of each table required by the SPIRE on-board software (as outlined in the On-board Software Calibration and Engineering Parameter Requirements). The contents of these tables will be provided from the ground and in-orbit calibration; functional test and commissioning.

		This document covers both SPU and DPU calibration tables.
SPIRE/RAL/D/00??	SPIRE Ground Segment Engineering Parameter Requirements:	This document describes in outline the ground segment check out and health monitoring software (this is ALL the ICC software listed under section 5.3 that processing engineering and housekeeping telemetry packets) for the SPIRE instrument and details the requirements this places on the ground and in-orbit functional test and commissioning. This will include an outline description of the data products that are required from the ground and in-orbit functional test and commissioning and a schedule of need dates for the production of those products.
SPIRE/RAL/D/00??	SPIRE Ground Segment Engineering Parameter Table Detailed Design Document:	This documents describes in (grim) detail the contents of each engineering parameter table required by the SPIRE ground segment check out and health monitoring software (as outlined in the Ground Segment Engineering Parameter Requirements). The contents of these tables will be provided from the ground and in-orbit functional test and commissioning.
SPIRE/RAL/D/00??	SPIRE Ground Segment Calibration Requirements:	This document describes in outline the ground segment science processing and analysis software (this is ALL the ICC software listed under section 5.3 that processes science telemetry formats) for the SPIRE instrument and details the requirements this places on the ground and in-orbit calibration. This will include an outline description of the data products that are required from the ground and in-orbit calibration and a schedule of need dates for the production of those products.
SPIRE/RAL/D/00??	SPIRE Ground Segment Calibration Table Detailed Design Document:	This documents describes in (grim) detail the contents of each calibration table required by the SPIRE ground segment software (as outlined in the Ground Segment Calibration Requirements). The contents of these tables will be provided from the ground and in-orbit calibration.

SPIRE Document Management I

DMS Facilities

Created by ESA SSD for circulation of documents, not development – single files, no strict Config. Cntrl.

Located on server outside ESA firewall which allows access via WWW interface (could be replicated)

Requires V4 of IE or Netscape to search, but Netscape more reliable for retrieval

Documents are held in 'domains' - each group will have two domains e.g. SPIRE & SPIRE_internal etc.

Each domain has a set of users with privileges (read, read/write) and access levels – each document also has an access level assigned

All members of SPIRE consortium will have read access to 'external' domains (e.g. SPIRE, PACS, HIFI etc) and read/write access to SPIRE_internal.

All users will have an access level of 50 and documents will have an access level of 30 – users can, by default, read any document in the domains they have read access to.

SPIRE Document Management II

FIRST use of DMS

All documents entered into DMS must be provided with the following information:

- **Author(s)**
- **Title**
- **Type of Document**
- **Reference Designation**
- **Issue**
- **Date**
- **Keywords**
- **Custodian**

When a document is added to DMS, all users are notified by email

Document formats will be limited to:

- **ASCII**
- **PDF**
- **HTML**

Documents will be maintained by a custodian

All documents will have a unique Reference Designator
FIRST-SPI-yyy-nnnnn
SPIRE-iii-yyy-nnnn

SPIRE Document Management III

SPIRE Guidelines

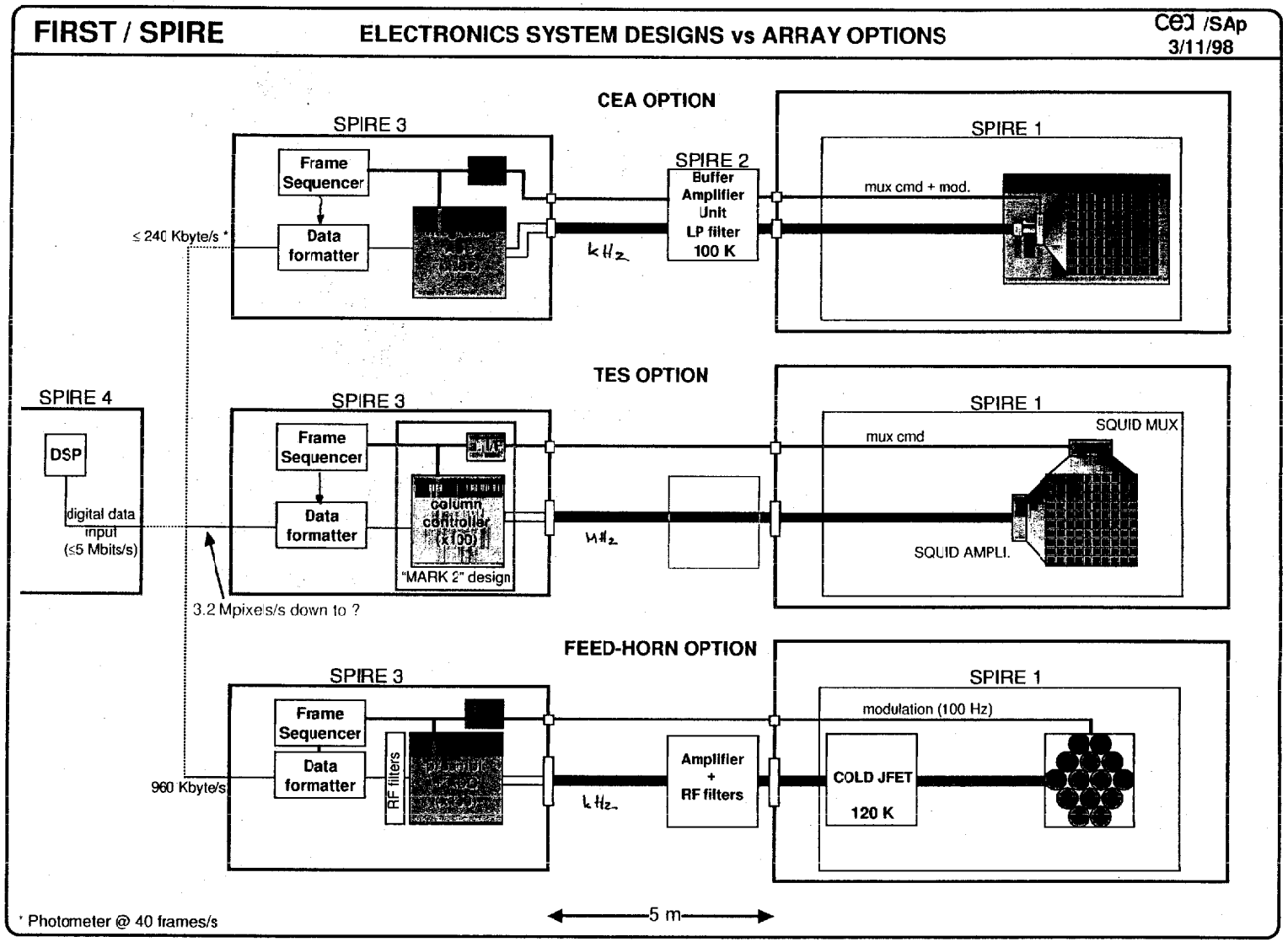
Normally all SPIRE documentation will be put into the SPIRE_internal domain.

The SPIRE domain will be used for documents to be distributed to the rest of satellite teams (formal project documents, reports etc).

Documents will be placed in the SPIRE domain and controlled by the project office

Project documents will be written using templates – these will be provided in the SPIRE_internal domain.

Documents of type 'document' will be reserved for formal project documents. These will only be entered by the project office and will be maintained under configuration control by the project office.


FIRST / SPIRE
ELECTRONICS SYSTEM DESIGNS vs ARRAY OPTIONS
CEA /SAp
3/11/98
CEA OPTION
SPIRE 3
Frame Sequencer
Data formatter
≤ 240 Kbyte/s *
kHz
SPIRE 2
Buffer Amplifier Unit
LP filter
100 K
SPIRE 1
mux cmd + mod.
TES OPTION
SPIRE 4
DSP
digital data input
(≤5 Mbits/s)
SPIRE 3
Frame Sequencer
Data formatter
column drivers
column controller (x100)
"MARK 2" design
MHz
SPIRE 1
mux cmd
SQUID MUX
SQUID AMPLI.
3.2 Mpixels/s down to ?
FEED-HORN OPTION
SPIRE 3
Frame Sequencer
Data formatter
RF filters
960 Kbyte/s
kHz
Amplifier + RF filters
SPIRE 1
modulation (100 Hz)
COLD JFET
120 K
5 m
* Photometer @ 40 frames/s

FIRST - SPIRE
BUFFER AMPLIFIER UNIT

• DESIGN :

- BASED ON MOSFET OPERATIONNAL AMPLIFIER (ABLE TO OPERATE FROM 80K TO 300K)

- SIMILAR BUFFER ALREADY DESIGNED FOR THE ISO PROJECT :

  CAM3 UNIT
  OPERATIONNAL TEMPERATURE : 100 K
  TEXAS INSTRUMENT TLC27M2 DEVICE

- LOW POWER QUAD AMPLIFIER (DIP14 PACKAGE) AVAILABILITY TO BE INVESTIGATED

- USE OF HYBRIDE OR ASIC TO BE ANALYSED IF VOLUME REDUCTION IS REQUIRED

• BUDGET :

- ESTIMATED POWER CONSUMPTION : 2.5 W

- VOLUME : 3 L

- WEIGHT : 2.5 kg

• LOCATION :

– CLOSE TO THE CRYOSTAT FEEDTHROUGH

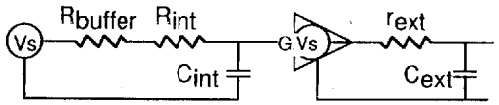
FIRST - SPIRE
BUFFER AMPLIFIER UNIT

· GOAL :

- REDUCTION OF THE CAPACITIVE LOAD DUE TO HARNESS

  • **REQUIRED BANDWITH : ~2 kHz (FOR 1 kHz MODULATION)**

  • **BOLOMETER SIGNAL BANDWITH IS LIMITED BY COLD BUFFER OUTPUT IMPEDANCE (~3 kΩ), HARNESS RESISTANCE AND CAPACITANCE**



if $r_{ext} << R_{int}$:
• $f_c = 1/2\pi R_{int}(C_{int}+C_{ext})$ without buffer
• $f_c = 1/2\pi R_{int}C_{int}$ with buffer

- REDUCTION OF ELECTROMAGNETIC PERTURBATIONS

  • **BY AMPLIFYING THE COLD BUFFER OUTPUT SIGNAL (INITIAL RANGE 10μV to 200 mV)**

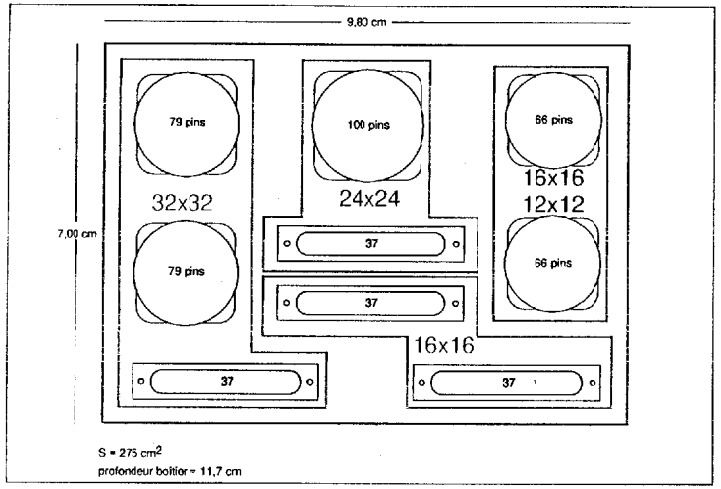
  • **BY TRANSMITTING THE SIGNAL IN DIFFERENTIAL MODE**

  • **BY REDUCING THE OUTPUT SIGNAL IMPEDANCE (3kΩ + HARNESS RESISTANCE)**

- ADDITIONNAL FUNCTION : SENSITIVE FPU BIAS LOW-PASS FILTERING

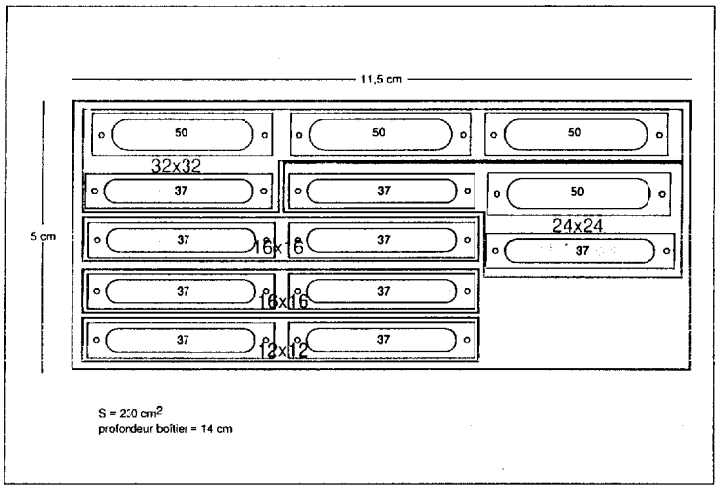
BAU BOX CONNECTIONS

OPTION 1 : CIRCULAR AND SUB-D CONNECTORS



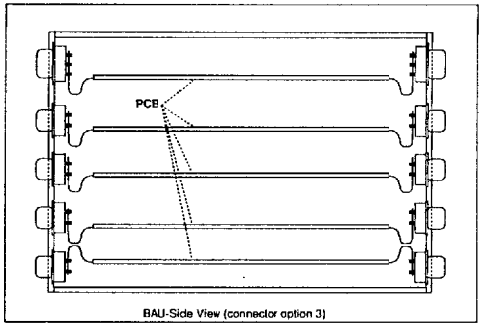
S = 275 cm²
profondeur boîtier = 11,7 cm

OPTION 2 : SUB-D CONNECTORS



S = 200 cm²
profondeur boîtier = 14 cm

INTERNAL VIEW (OPTION 2)



BAU-Side View (connector option 3)

INSTRUMENT HARNESSES