Present:

Augueres Jean-Louis	28, 29
Baluteau Jean-Paul	28, 29
Cara Christophe	28, 29
Coker John	28, 29
Cunningham Colin	28, 29
Delderfield John	28, 29
Di Giorgio Anna Maria	28, 29
Dohlen Kjetil	29
Duband Lionel	28
Ellery Alex	28, 29
Ferrand Didier	28, 29
Griffin Matt	28, 29
Hargrave Peter	28, 29
King Ken	28, 29
Parks Gary	Videocon only
Peterson Don	28, 29
Pouliquen Domonique	28, 29
Richards Tony	29
Stobie Brian	28, 29
Swinyard Bruce	28, 29
Taylor Joe	28, 29
Winter Berend	28, 29

Introduction:
The order in which topics were covered at the meeting was governed by who was available at what time and wasn't necessarily logical according to interface control document structure. In order to make things more readily understandable I have here tried to order the comments and actions by Interface Document according to John's scheme.

Digital Processing Unit:

Interface to FIRST

DPU power consumption is 10 W and the mass is 7 kg

Action: Renato Orfei to raise issue providing a sych. pulse for the 28V line to the FCU at the next CDMS meeting.
(Discussed informally with ESA at System Review – this does not seem to be a problem)

DPU to DRCU interface

Discussion as to who is responsible for this document. Decision is that IFSI will be formally responsible for the ICD between the DPU and DRCU in line with the interface control policy of each unit's ICD looking "downwards" towards the cold units. Christophe Cara will contribute the appropriate sections for the FCU and DCU and Anna Di Giorgio will be the custodian.

Discussion on the expected commanding rate from the DPU to the FCU and DCU. The DPU will receive commands from the CDMS at the times determined by the operating mode timeline – and predetermined on the ground. The DPU will unpack the instrument level

commands and send the low level commands on to the FCU and/or DCU with the correct relative timing between them. In the basic operating modes it is not thought that the commanding rate between the DPU and DRCU will be high (a few Hz at most).

However for the engineering or diagnostic modes there may well be a requirement for a high rate of commanding in order to sample housekeeping parameters at a high rate. These need further definition.

The necessary lower level commands from the DPU to the DRCU units needs definition and will be written in a separate "Command Definition Document" and not into the ICD.

Action: LAM to define diagnostics modes for MCU and to confirm that these will be compatible with the DPU/DRCU interface.
Action: Christophe Cara to define diagnostics modes for DCU and SCU.
Action: Christophe Cara to collate low level commands for DRCU units and circulate to RAL and IFSI.

DRCU:

Interface to FIRST

DC/DC synch. pulse – see section on DPU to FIRST interface above

The connector type specified for the DRCU (DCU?) to FIRST harness are double density – there is some confusion as to whether this is allowed by ESA as the harness to the CVV will be essentially a cryoharness.

Power consumption figures presented by Christophe are:

	Consumption
DCU	32 W
MCU	14 W
SCU	5 W
Total	67 W

This includes 70% DC/DC converter efficiency but not margin

Mass will be FCU 11 kg and DCU 14.35 kg – including some margin. Agreed that the allocation should be 23 kg total for the FCU plus DCU with 4 kg held as instrument level margin.

The positioning and orientation of the warm electronics units on the SVM is of concern as there is a requirement to minimise the ground loops and the mechanical design needs to know what orientation the units will be in during launch.

The ordering of the units within the DCU should be optimised to prevent ground loops.

Action: John Delderfield to check with ESA on which connectors can be used for DRCU to FIRST harness interface
Action: John Delderfield to raise positioning and orientation of the warm electronics units on the SVM with ESA.

Interface to Cold Subsystems:

DCU-Detectors

Wiring diagram presented by Frederick Pinsard. This appears to contain misconceptions – John Delderfield will consult and clarify with a view to providing the definitive harness layout.

Need to study whether it is possible to select a portion of each array for telemetry to the ground in the case where there are problems the amount of telemetry bandwidth. This could either be done by the DCU specifying a shorter fixed packet or by selection by the DPU. Both options should be studied and commented upon.

Frederick should be included on all interface discussions.

(Frederick's e-mail is frp@astro.caltech.edu)

FCU-Calibrators (from MJG notes)

QMW to provide range of max currents to allow SAP to determine range of set-on-test resistors.
Need to specify DPU parameters PID?
Change: Make SCAL heaters 4-wire drive with doubly-connected parallel wires
Multiple LUTs is OK - specify typical requirements for Anna
Get all information to Anna within a week - in the form of the internal DDD. Try an label the parameters in some sensible way

Action: MJG to attach MathCad sheet as appendix to Calibrators document

Action: MJG/BMS to specify generic reqs for Cernox thermometers on the structure based on Cernox 1070 and temp range/accuracy

Action: Peter Hargrave to define whether PCAL can be operated at room temperature

Action: Peter Hargrave to provide OBS requirements for PCAL and SCAL to IFSI.

FCU-SMEC

1. The SMEC is configured by setting values in a table of parameters (size ~ 100 words). If we want to have more than one type of scan, then we need to have the ability to store more than 1 table on board and select between them. The OBS should provide this possibility.

2. The SMEC electronics has a trace mode which saves disgnostic data into the DSP memory. As this is not available through the high speed interface, this has to be read through the low-speed link. The amount of data is ~ 32Kwords at ~ 500 words/sec.

3. The SMEC electronics provides for two words in the high speed data frames to be set by the DSP. The project needs to define what parameters should be placed in these words. Note: if the contents of these two words is fixed, then the selection can be implemented in hardware.

[J.D. note: we need a write-up of the functionality that causes the SMEC to send data down its high and low speed data lines, both in normal operation and if a particular (group of) variable(s) is being diagnostically sampled.]

FCU-Thermometers

Delderfield will ask all users of thermometers for their requirements (range and accuracy).

FCU-BSM

The BSM document was shown by ATC but had not been distributed. State as of meeting would be circulated.

The above is cobbled together from Ken and John's note – I need everybody else's notes on this to ensure accuracy……

Action: Brian Stobie to circulate BSM electronics interface document

Action: Delderfield to ask for requirements on thermometer accuracy from system/sub-system point of view.

Structure:

Structure to FIRST

Dealt with in the IID-B and interface drawing therein. Issues remain over the shock load and the precise positioning and support of the thermal straps onto the LHe tank.

Structure to FPU sub-systems

There will be a single document covering all the interfaces between the structure and the rest of the cold FPU sub-systems; the harnesses and any connectors to the outside of the FPU.

The custodian for this document will be Berend Winter. This document was discussed section by section in the meeting. The mechanical interface drawings for each sub-system will be provided by the sub-system supplier and will be included in this document.

Cooler

The cooler will have two thermal straps to the LHe tank
The cooler electrical connectors will be at 4-K with an isothermal harness to the RF filters. This harness will be provided by SAp.
There will be a straylight baffle on the strap exits from the 4-K enclosure.

The cooler "heart" will have a mass of 800 g and the estimated mass of the cooler structure will be 800 g. The budget allocation for the cooler will be increased to 1400 g with a 20% contingency held at instrument level.

The vibration loads quoted in the document are those that will be seen during instrument qualification.

The interface between the cooler and the straps to the LHe tank needs to be defined in terms of the allowable loads and the stiffness.

Action: Lionel Duband to specify allowed interface loads and stiffness for the thermal straps onto the cooler.

Detectors:

Outstanding issue over how the detector harness is routed and supported to the outside of the FPU box. A dedicated meeting is required to address this issue.

Action: John Delderfield to arrange meeting to discuss detailed implementation of FPU harnesses.

Beam Steering Mirror

Microvibration levels need to be added to the input/output sections. BSM will have an expected maximum μvib level to cope and will have a specified maximum of exported μvib.

Mechanical interface drawing is being finalised a new one will be available from ATC very soon.

Mass budget 1100g including bracket plus 30 g for PCAL + 20% instrument level margin

Tony Richards has generated an IGES file of the beams into and out of the CM4 area – this is available.

SMEC

Total travel for the mechanism will be 40 mm

Connectors will be provided on the outside of the SMEC to take the harness to the RF filters.

LAM still want to retain two sets of interface holes for the SMEC in case the mechanism proves not to be stiff enough laterally.

The required flatness across the interface points needs to be defined. There was some discussion over what the affect of the mechanical response would be when the SMEC is bolted down. The possibility that the frequency of the mechanism might change must be accounted for by allowing the control parameters to be changed in the electronics.

The problem of defining the required flatness is complicated and possibly beyond analysis. A test must be carried out to simulate what level of deformation can be withstood by the SMEC.

The possibility of incorporating a thermal strap from the moving part of the SMEC to the fixed part needs to be considered as the flexures will be thermally isolating.

Alignment requirement is set at present as ±100 μm – this needs to be verified.

The mass budget is 1100g for the mechanism; 200 g for the mirrors; 200 g for the pre-amplifier and box (SMECp). All plus 20% instrument level margin.

Measurements have been made of the μvibration level in the still laboratory under which the control loop was closed on the GSFC prototypes. The level from 3-3000 Hz (response window of the accelerometer) was 10 millig rms. There is no measurement of the spectral density of this.

Note the SMEC (and the mirrors) will be AL 6061-T6

Action: LAM to define and execute test programme to define required flatness for the interface points on the SPIRE optical bench

Action Kjetil Dohlen to verify the optical alignment requirements for the SMEC with respect to the SPIRE optical bench.

Shutter

No interface details are settled for the shutter. The ass budget remains 200 g with 20% instrument level margin.

Spectrometer Calibrator

Interface on SPIRE optical bench is defined. Thermal contact with optical bench is important as heat must be efficiently diffused into bench and then to external thermal strap to prevent calibrator surround warming up. The exact beam size and pupil at the calibrator position needs to be defined and passed to QMW.

The mass budget for the spectrometer calibrator is 200 g plus 20% instrument level contingency.

Thermal Straps

There was no discussion on the external thermal strap interfaces except the need to define the interface requirements on the ESA provided straps (see cooler above). The issue of the number of 300 mK straps from the evaporator was touched on. Two holes will be provided for on the evaporator interface plate for one or two flexible links to the 300-mK busbars.

Thermometers

The thermometry for the flight instrument has been rethought and a new table provided in the IID-B. The thermometers requiring separate harnesses will be those on the detector boxes; and possibly 1 or 2 on the entrance baffle and the optics sub-bench at level 1.

Filters

The beam splitters in the FTS may have to be vacuum gap type. Most filters and dichroics will be ring mounted and will drop into recesses machined in the structure or filter supports. Some will be mounted with a clamp ring directly into the structure or filter support.

The final sizes for the filters can now be defined and these will be passed on to QMW.

The mass budget for the filters in total is 450 g plus 20% instrument level margin.

Action: MSSL to give final filter sizes to QMW.

Harness

There was a discussion on the implementation of the harness pin allocation and bundling. This needs some revision but it is close to being finalised. There is a remaining issue of the harness routing through the FPU which will be discussed at a dedicated meeting (see Detector section above)

The present connector requirements for non-detector sub-systems are:

SCAL	1x25 way
Cooler	2x37 way
BSM/PCAL	2x37 way
SMEC	4x37 way
Shutter	2x25 way
Thermistors	2x37 way
	13 in total.

This would require 5 RF filter units if we can re-allocate wires from the sub-system side connectors to the cryoharness side connectors.

The wiring harness list was revisited for all subsystems and a couple of updates noted. Noted the philosophy worked out the previous day of augmenting the simple prime/redundant two half instrument with some resistance to failure of critical wires to reduce chance of getting failure combinations that seriously compromise instrument performance. JD to circulate revised version.

Action: JD to revise and circulate the wiring harness allocations.

JFET Boxes

The thermal interfaces between the JFET modules and the FIRST cryostat is not entirely optimised.

It is agreed that all RF screening for the JFET to FPU harness will be implemented in the harness itself.

The interconnect between the JFET box RF filters and the JFET modules themselves will be via an RF screened back harness – no backplane is required in the enclosure. If the JFET modules are made RF tight (probable) then the JFET “enclosures” need only be support frames.

Action: JPL to confirm the arrangements for RF screening of the JFET modules and back interconnect harness.

Optical Interfaces

FIRST Telescope and Cryostat

At present the alignment requirement in the IID-B is quoted as ±3.9 mm. This needs verification and an angular tolerance needs to be added.

The geometrical beams through the cryostat need revising with the latest design of the focal plane aperture plate.

Action: Kjetil Dohlen to redefine and issue alignment requirements for SPIRE with respect to FIRST telescope.

Action: Tony Richards to write up and issue the design of the SPIRE field plate.

Action: Tony Richards to provide the jiggled and chopped beams throught cryostat and telescope spaces for the definition of the apertures through the cryostat shields.

Baffles

Tony Richards has provided IGES files showing the maximum baffling possible with the current photometer design. It may not be possible or practical to implement this scheme.

An alternative approach is suggested whereby MSSL define the minimum physically possible set of baffles consistent with the structure design and pass these to Tony for analysis. This approach was adopted.

This will include the spectrometer baffles.

Action: MSSL to provide Tony Richards with design of minimum structurally possible set of photometer and spectrometer baffles.

Mirrors

No clashes are left between mirrors. The latest set of mirrors from Pascal now fit. The IGES files for these need to be placed under configuration control.

Action: Kjetil Dohlen raise the issue of configuration control of mirror designs at LAM.

SMEC

IGES files of the beams around the SMEC need to be provided and Pascal will set up the SMEC 3-D model with respect to these.

Action: Tony Richards define set of beams into and out of the SMEC (at ZPD?) and provide IGES files to LAM.

Filters

(Also see above) Now need to define the size of the 4-K aperture and the filter that goes onto it. MSSL will do this. The size of the FTS beam splitters needs to be

confirmed. The size of the rings for all the filters needs to be defined before the end of December.

Beam Steering Mirror

The issue of whether a baffle is really required here was discusses again in the light of the difficulties implementing one on the BSM structure. Possibly we do not need one – or such an extensive one – as there is a good clean image of the pupil at this point.

Tony will study the effect of placing a warm source around the periphery of the pupil image at CM4 to evaluate what baffling is required to prevent the potentially warm actuators contributing to the photon background.

The mirror size and hole size and position were discussed – it was agreed that rather than over-sizing or right-sizing the hole it should be undersized to prevent the image falling off M2. Tony will redo his analysis on this basis.

I have a note that Kjetil will provide the detector footprint at CM4 – what does this mean – does it make sense?

Action: Tony Richards to conduct study into effect of warm source at periphery of CM4

Action: Tony Richards to redo CM4 mirror size and hole size analysis with undersized hole.

Detectors

The positions of the detectors are not well known. Bruce Swinyard will finalise the positions with JPL and circulate.

Action: BMS to finalise detector positions and issue a technical note.

Redundancy

In the various discussions over the three days the issue of the redundancy philosophy was raised under several headings – harnessing; the necessity for cold redundant units and the system level criticality. The redundancy for the cooler and FTS mechanism are clearly the most important aspects to face up to. It may be that the redundancy philosophy defined at the moment is too inflexible and a more graceful "failure before switch over" approach needs to be identified with some redundancy within each side. The warm electronics designers are asked to look at this issue.

Action: Chritophe Cara; Didier Ferrand; John Delderfield – study the approach to electrical redundancy and comment on the possibility of a more flexible system especially with regard to the cooler and SMEC.

Appendix:
Matt's verbatim notes of Videocon with JPL

Notes on Videocon with JPL 29 November 2000

Topics Diode temp sensors
Harness implementation
Mechanical interfaces
JPL presentation for tomorrow
EMC testing; Equivalent circuit model of the detector + bias + JFET system
Development plan
JPL DDR

Present: JPL end: Frederic, Viktor, Jerry, Dustin, Charmaine
RAL end: Colin, John, Berend, Bruce, Matt, Gary, Ken

1. JD: thanks for information yesterday and today
2. JFETS temperature measurement through forward bias arrangement not represented in the JPL wiring diagram
   - Viktor: can use JFETs themselves to measure the temperature
   - JD: proposal by Jamie was to use a spare JFET as a diode
   - JD: will go through what was sent and try to understand it
3. JD: Harness definition for type 2 and type 3 connectors is unclear
   FP: Don't know yet what signal definitions are - up to Jamie to specify
   VK: Answer could be on Autocad drawing that Jamie sent this morning
   VK: Please include Frederic in all e-mails from now on - OK

4. Mechanical interfaces and JFET box:
   BW: Status of connectors to make integration feasible and to heat sink the cables at 4 K?
   JD: Jamie suggested gluing harnesses with epoxy at the 4-K level rather than having connectors
   BW: Need mass estimates for the harness. Depends on how harness is routed. Please update mass assuming average of 150 mm between connector panel and JFET box. Include the connectors (connector panel ones will dominate)
   JD: Is it still Cooner wire or Manganin?
   DC: Don't know
   BW: RF screening from connector to connector - no separate RF screen around JFET modules: is that correct?
   JD: How is RF shield connected tot the FPU? Need outer shield between the two connectors over and above the shielding on the cables. Sam Heys' thermal study shows that an external shield (one per wire bundle) on the backshells - 12-ax shields can then be signal grounds instead of RF shield
   BW: Can we have each JFET module as RF shield - then we wouldn't have to make the JFET box enclosure RF-tight?
   VH: Yes.
   BW: Still need to define the connector positions. How should we define this? MSSL are using the thermal strap as reference.
   DC: Look at datum A and B on the ICD.

BW: OK
JD: Need extra dimensioning on the mating surface of the module. DC: OK
BW: Positioning of array wrt BDA enclosure - how to hold it during mounting or dismounting of the thermal straps.
DC: Still looking at this.
BW: Location of the PLW detector (difficulty of access when it's mounted)?
JD: Fiducial marks:
DC: Putting fiducial marks on the back with view-holes to see them.
CRC: What's status of mass estimates. Last spreadsheet = 515g average. Current allocation is 500g with 20% contingency - should be aiming for this.
DC: That's still correct (but with no margin). Once feedhorn technology is decided, will be able to be more accurate on the mass.
JD: Question on connector implementation on the RF filter modules . . .Will propose a scheme and send to JPL for comment. Maybe specify tracking on the pc boards inside.
VH: How is RF tightness implemented at special RF filters?
BMS: According to Jamie, JPL will do this within the system - Jamie has indicated the concept on a drawing sent over.
GP: Need to be clear about this and other points.
JL: Have not heard about this - will check if this can be done.
BMS: See p16 of SSSD - JFET box interconnect harness to be provided by JPL. How it's made RF-tight is to eb decided by JPL. Making it RF tight is not a big deal - it's isothermal at 10 K.
JD: Question about timing of detector sampling (need to go above 3 ms for time to sample them all) - need specific proposal from JPL about what's desired/possible.
VK: Would like analysis of possible mechanical resonances in the 200 Hz - 1 kHz range.
BW: OK

5. **EMC**

CRC: What plans for EMC validation, particularly conducted susceptibility?

Development plan:

MJG: We'll be required to produce it and be convincing after this review
KJK: DP is more than the schedule - also demonstration of how/why tests will verify it and the organisation, qualification plan etc.
GP: CDR next summer will go into great detail
MJG: MJG/KJK will send out summary of what the Dp should be and should contain.
GP: Also lets have a telecon on this.