Grenoble

SERVICE DES BASSES TEMPERATURES

Minutes of Meeting ref. : Cooler Interface Meeting (CIM 2001-01)
Date : 12 January, 2001

Subject : Discussion on cooler interfaces.

Meeting date :

Place CEA - SBT GRENOBLE

Chair : Lionel DUBAND

Present :

Sam Heys (RAL)
John Delderfield (RAL)
Bruce Winter (MSSL)
John Coker (MSSL)
Jerome Martignac (SAp)
Roger Dallcorba (SBT)
Laurent Tiquet (SBT)
Laurent Guillemet (SBT)
Lionel Duband (CSBT)

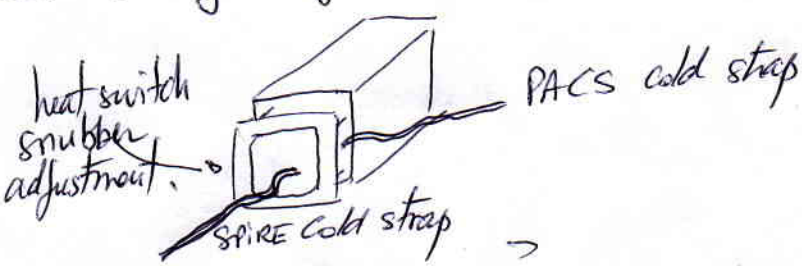
Copies : Those present +

Bruce Swinyard
Jean Louis Augueres

Description	Action

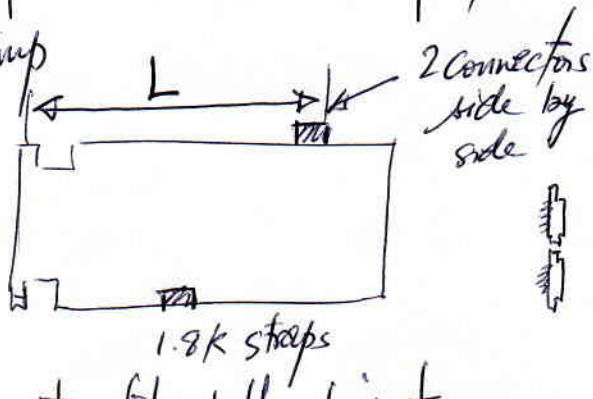
Presentation by LD on Coder status (see attached doc.).

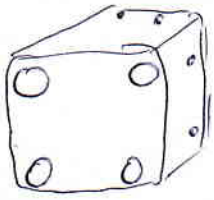
- Discussion on Cold tip interface – the two open faces at the end flange can be partly closed (PACS still needs side access and SPIRE also needs side access on the opposite side to adjust the heat switch snubber.) (SPIRE cold strap will exist at the bottom of the Coder (along longitudinal axis)) (see page 5)

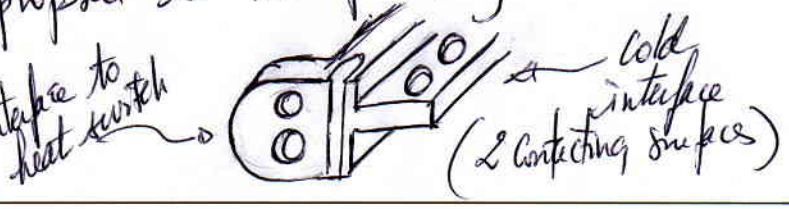


→ ok to partly close side access — CEA-SBT

- Interface on heat switches to cryostat strap: Bernard suggests we leave it as it is - the two 1.8K straps will be suspended anyway and the mechanical constraints on the switch base will be very limited - Jerome agrees.

Description	Action
• Electrical interface: electrical connectors are moved to the side opposite to 1.8K straps, and toward the pump 	SBS
This portion seems to fit both projects - Benoit and John will confirm what is the minimum "L" (see above drawing) we can go down to. Connectors type S-(socket) on the cooler.	MSSL.
Jerome will further check on this, but the connectors will be positioned on this side anyway.	SAP.
• Mechanical Interface | Benoit's side mounting for SPIRE is not an option.	
• End cover on the dewpoint pump: add some extension to provide a snubber. Include additional screws to fix this	

Description	Action
Cover (2 on each side (right now 2 on two opposite side)). → Cover will be fitted with 4 hole (not thru hole), one in each corner, 8mm in diameter, 3 mm deep.  Material = aluminum. • Interface with optical bench detailed design of the bottom flange (interface to OBP) to be slightly reviewed (some corners to be added, etc...). Berend is convinced 8 holes 8-32 are enough and it is not necessary to use 10-32 holes. SBT proposes to left this as a "to be confirmed" for now (until we have the outputs of the vibratio/mechanical analyses from Roser). for PACS: no problem 5 x M5 screws.	CEA - SBT SBT

Description	Action
Short presentation by Roser R. of the numerical analysis (finite elements) of the Codex structure. Preliminary results – • Thermal aspects Provide Sam with cooling power curves for various heat sink temperature and various structure temperature – Ideally provide a mathematical law she can input into her model. • 300mK interface Needs some redesign – the idea is to provide two thru holes (Ø 3mm) and use screw + nut and two wrenches to prevent any torque on the evap. but right now the access to the nuts is very difficult – We need to reorientate the cold interface. What is proposed is the following :  	CEA-SBT

Additions to minutes from my notes: JD.

1. Cooler Status:

Looking at a fuller programme schedule, a Detailed Subsystem Design Review would be held at the end of the detailed drawing phase, before Manufacturing Start. Grenoble end-March TBC.

2. Heat switch Interfaces:

Forces on interfaces can potentially cause switches not to turn off fully. The one to the evaporator is meant to spend much the greater portion of its time open/off and would be the more problematic if it were to exhibit such an effect. A distortion of 0.1mm was mentioned. (Distinguish which I/F is which by labels on I/F drawing).

The immobilisation key to oppose I/F fixing torques was fine in the interface area but it would probably need the big rectangle shown externally to be altered to permit the use of the tool through an aperture in the HSFPU.

For SPIRE the baseline is to suspend a short flexible from these cooler interfaces to mechanical mountings which have additional functionality (light-tight, R.F. tight etc.) mounted on the HSFPU. This effectively removes the forces imparted by 1.8K braid due to the relative movement between the ESA cryostat and the cooler. The option of pre-integrating this mounting to a modified cooler side-panel instead was not favoured, and Berend pointed out that the number of actual integrations to this cooler interface could be minimised by not completing them until it was hoped that the photometer cover did not have to come off again! So the I/F will be subject to any relative movement between cooler and HSFPU.

3. Electrical Interface:

The two connectors on the cooler (prime and redundant wires) would be 37Way MDM female sockets, each with two anchor posts, the top of the sockets and the anchor posts determining the I/F plane.

4. Mechanical Analysis:

Before short presentation by Roser, the meeting saw the development coolers and cryostat in the laboratory.

The high frequencies, even with un-optimised development cooler framework, suggest that cooler to HSFPU movement should be small.

End mounting interface to be flat to 0.05mm so that skimmed SPIRE optics baseplate does not exert disturbing forces as unit is affixed. Any relief away from around the boltholes, at present not thought to be needed, would be implemented by leaving raised lands on the baseplate.

5. 300mK Interface:

To be re-schemed as shown and circulated for comment, noting that SPIRE uses both straps shown on page 2, not just one of them.

6. Envelope:

Fastener head projection was mentioned. Head projection must be dimensioned and lie inside permitted envelope. No heads proud on surface where harnesses leave connectors.

COOLER DESIGN : STATUS

- **Cooler size**
  - increased from 4 to 6 l TPN, same overall vol.
- **Kevlar tensioning system reviewed**
  - step by step tensioning + locking improved
- **Heat switches design reviewed**
  - shield added : shield + snubber
- **SPIRE/PACS compatibility**
  - ≈ OK
- **STM**
  - mech. representative, but no thermal capabilit.

COOLER DESIGN : TO BE DONE

- **300 mK interface**

  - need efficient conductance + easy access + no constraint on cold tip + SPIRE/PACS compat.

- **"Cold" wires thermal coupling**

  - Grooves to be added on thermal shunt

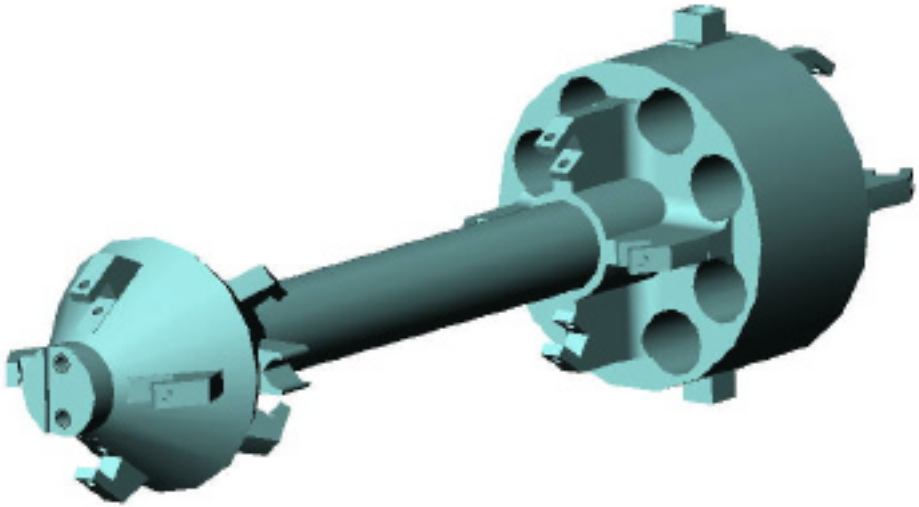
- **Thermal straps (heat switches)**

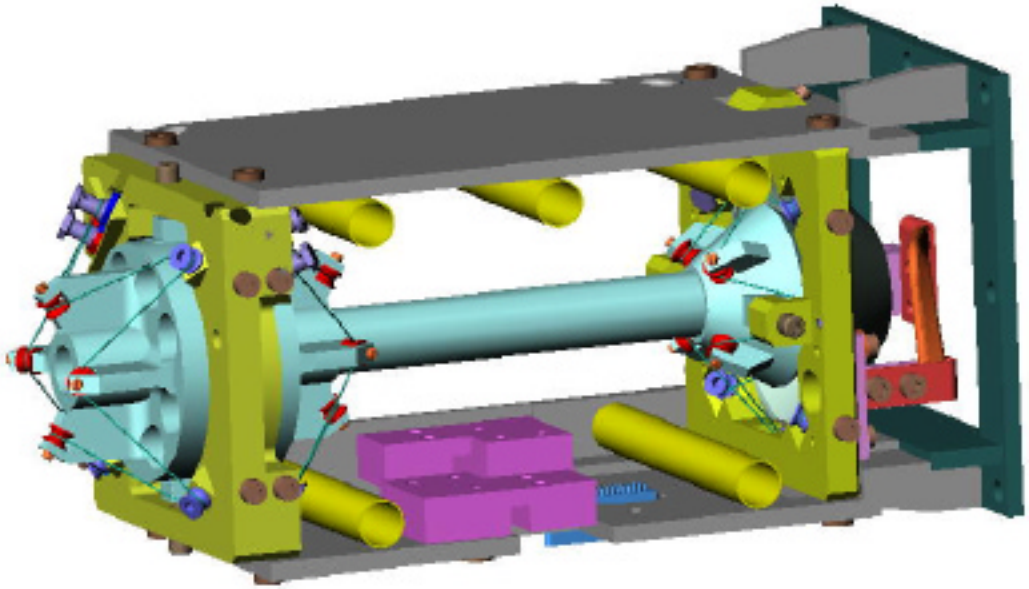
  - Evaluation in progress.

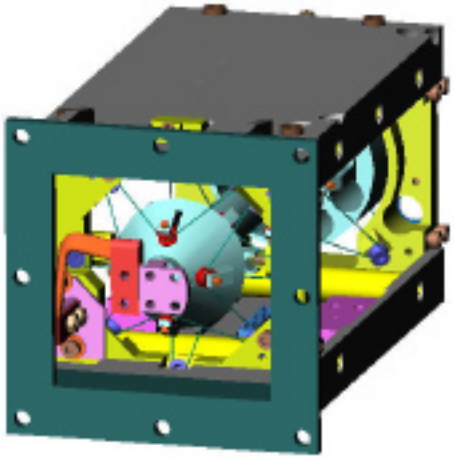
- **Thermal straps to cryostat**

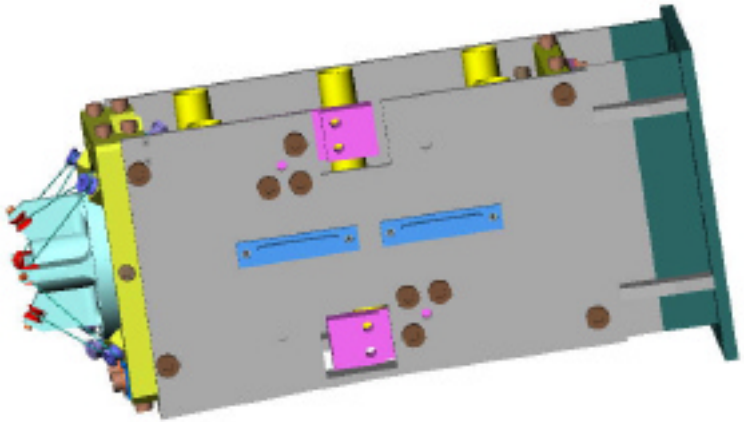
  - interface with switch base : reinforce the base tube versus cooler perf. ?

STM COOLER

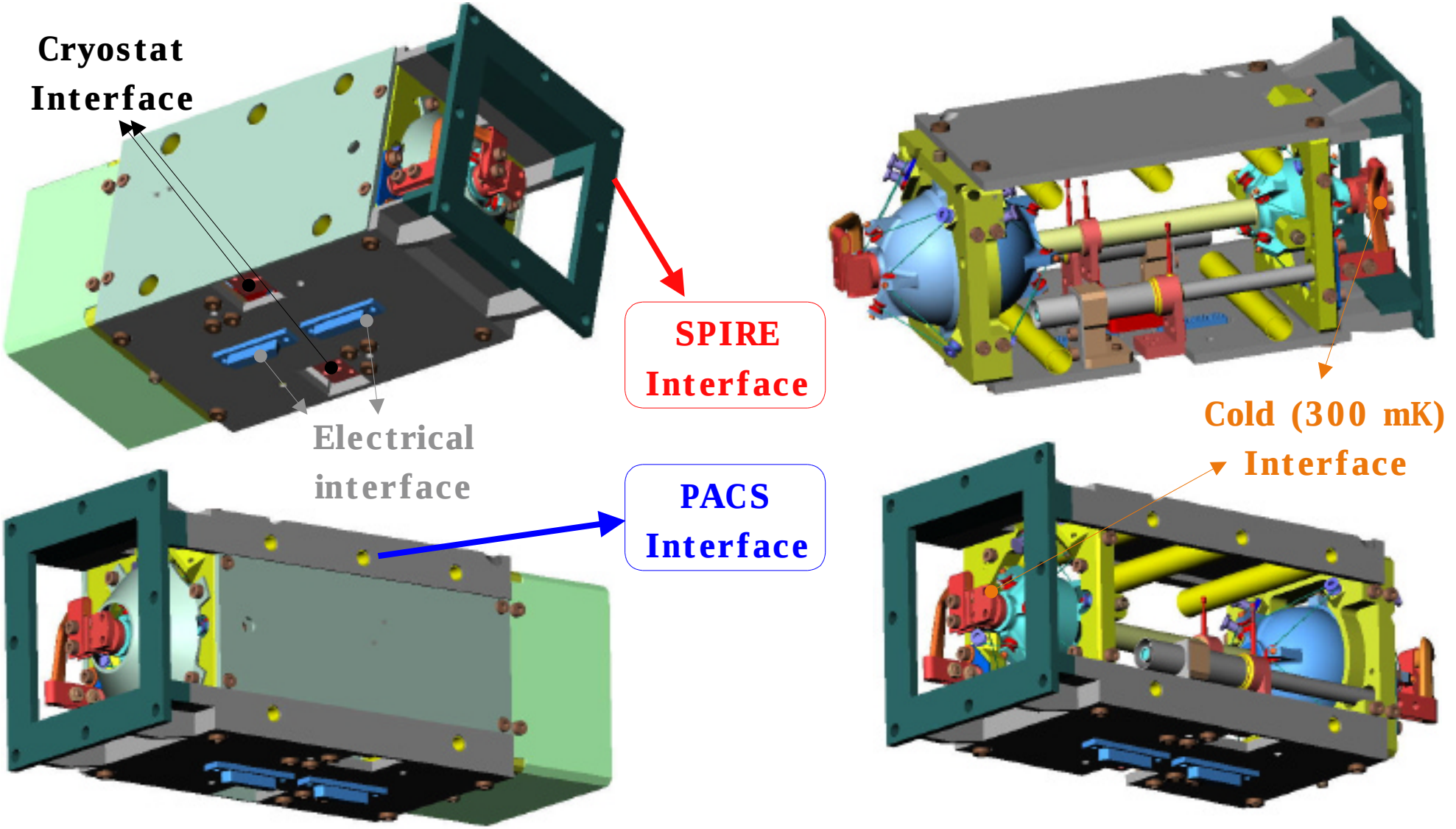








CQM COOLER CURRENT PROTOTYPE

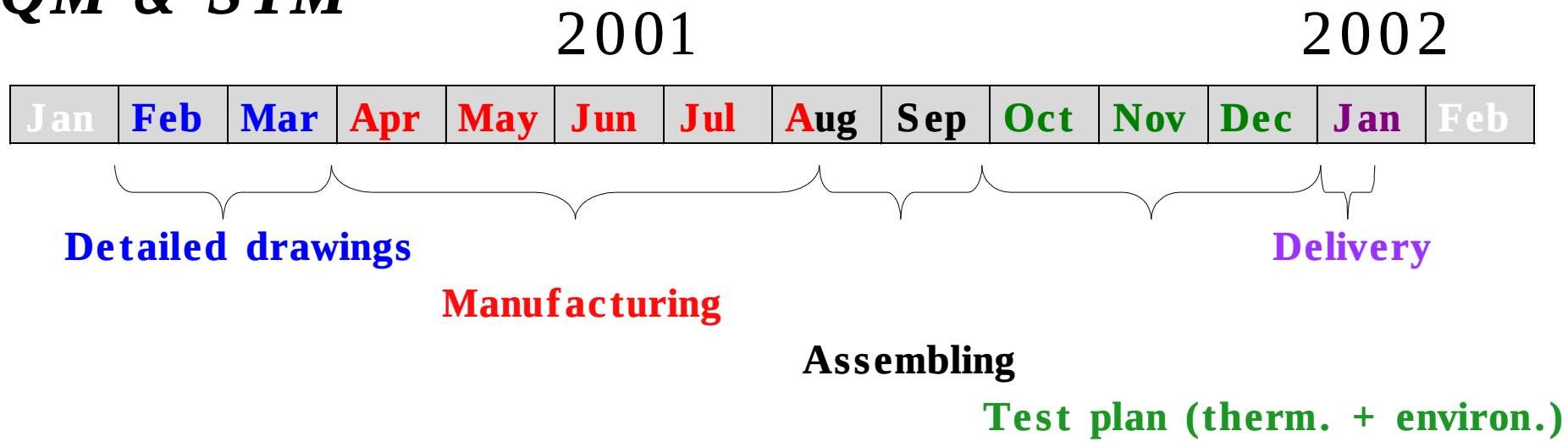


SELECTED SPECS

- 6 liters TPN
- Gas gap heat switches included
- Kevlar suspension system
- Snubbers and launch stops included
- Volume : 228.5 x 100 x 100 mm
- Mass : 1680 g
- Internal pressure ≈ 8 MPa
- 10 µW net heat lift at 290 mK for 2 D 20 h
- ≈ 730 Joules per cycle

SCHEDULE (AS OF TODAY)

CQM & STM



PFM & FS