

- Instrument Schedules and Deliveries (H-P-ASP-MN-3408): Pages 2 – 16
- Planck Instruments Open Areas (H-P-ASP-MN-3419): Pages 17 – 25
- Instruments Interfaces Management Meeting (H-P-ASP-MN-3420): Pages 26 – 39
- Herschel Instrument Interface Open Points (H-P-ASP-MN-3421): Pages 40 - 84



**HERSCHEL/PLANCK**

REF.: H-P-ASP-MN- 3408  
 DATE: 16/7/03 PAGE: 1/1

**COMPTE RENDU DE REUNION / MINUTES OF MEETING**

LIEU / PLACE: Cannes - Alcatel

OBJET / PURPOSE: instrument schedules and deliveries  
 CLASSIFICATION: Splinter Meeting

PARTICIPANTS ATTENDEES	SOCIETE FIRM	SIGNATURE SIGNATURE	PARTICIPANTS ATTENDEES	SOCIETE FIRM	SIGNATURE SIGNATURE
see attached list			Collaudin		
			O. H. Poite		
			W. Ruhe		
			J. J. Tulliet		
			T. Passvogel		
			Kwafelbakkor		
			E. Sawyer		
REDACTEUR / WRITTEN BY: B. Collaudin					

CONCLUSION :

DISTRIBUTION :  
 PARTICIPANTS / ATTENDEES

POUR ACTION : FOR FURTHER ACTION  
 ESA, ASTRUM, PACS, SAIRE, HIFI, Alenia HFI, LFI

POUR INFORMATION : FOR INFORMATION



APPROUVE PAR / APPROVED BY

NOM / NAME				
SIGNATURE / SIGNATURE				

Participants list

schedule splinter meeting

NAME	Company	Name	Company
Juillet J-J	ASP.	P. MUJI	ALENIA
Collaudin B	ASP	H. FAAS	Astrium/EADS
J. Charva	IAS	D. Schinke	Astrium
Suy GUYOT	IAS	G. LUND	ALCATEL
M. BALASINI	CAB	E. Hölzel	Astrium/EADS
R.C. BUTLER	IASP/CNR	H. Peitzker	Astrium/EADS
Carsten Schramberg	ESA	W. Tühe	Astrium/EADS
JP CHARBELLAND	ALCATEL	C. CROWE	ESA/ESTEC
J. MARTI CANALES	ESA	G. Pilbratt	ESA
Luis Aloy	ESA	E. SAWYER	RAL; SPIRE
OSVALDO PIERANTI	ESA	MATT GRIFFIN	CARDIFF; SPIRE UNIV.
A. HESKE	ESA	D. MONTET	ALCATEL
T. Passvogel	ESA	G. DOUBROVNIK	ALCATEL
J.C. Boschel	ASP		
O.H. Pœuier	MPE		
A. Poglitsch	MPE		
C. Wafelhaekker	SRON		
Th. de Graauw	SRON		
H.K. von Lüding	Astrium		
MONICA CHIAPPOSIO	ALENIA		
M. SUIVA	ALENIA		
G. DE BERNARDI	ALENIA		
M. CESA	ALENIA		

		REF.: H-P-ASP-MN-3608	
		DATE:	PAGE: 2
COMpte Rendu de Reunion / MINUTES OF MEETING		LIEU / PLACE:	

## Objective of the meeting:

agree on a set of delivery dates for instruments QM - AM - FM which are a realistic baseline for all parties.

1) planck schedule. (see annex 1)

QM staggered delivery: Feb to April 04

Questions 1) why DPU are needed early.

Participation of IIF & Database.

e) LFI express the need to perform an early test of the 1533 IIF.

+ instrument EGSE vs CCS.

- Alcatel replies that PLM EGSC is delivered in Sept 03, and that test should be possible Oct-Nov 03.

- ESA stress that this should be debated in AIV meeting.



- HFI DPU could also be tested at the same period

SUITE / CONTINUED:

3) Alcatel repeat that we need definition of the RAA. (FPU & BEU) to start manufacturing of RAA STM

LABEN reply that the CAD files & ICD's are available for delivery, but not manufacturing or detailed drawings

ACTION

		REF.: H-P-ASP-MN- 3408	
		DATE :	PAGE : 3
COMpte Rendu de Reunion / MINUTES OF MEETING		LIEU / PLACE :	

SUITE / CONTINUED :

ACTION

- ESA ask why manufacturing drawing cannot be delivered.
- LABEN has replied to Alcatel Request in a fax.
- ESA ask formally LFI to deliver the manufacturing drawings.

4) Alcatel ask HFI / LFI their position on proposed delivery dates (annes 1)

QM

HFI: the proposed sequence (by HFI) is different.

- coolers are available earlier (except DCCU)

HFI sequence: + calibration of instrument  
↓ general Electrical verification.

so DPU would be available later.

~~DATA:~~

FPU : 15 June 04.

DPU : 2 weeks to 1 month later.



4K cooler : earlier than 1/4/04

DCCU Not before May 04.

REU/PAU (Bellow) : with FPU

SUITE / CONTINUED :

ACTION

		REF.: H-P-ASP-MN-3608	
		DATE:	PAGE: 4/
COMpte Rendu de Reunion / MINUTES OF MEETING		LIEU / PLACE:	

Globally: HFI is late by  $\sim$  4 months wrt proposed schedule.

precision - FPU Assembly means HFI + LFI integrated Together  
 HFI FPU would be necessary early February 04.

Alternatives: DCCU could be replaced by a DGSE if too late (ie tanks if DCCU would be located outside of the CSL chamber)

- the Alcatel <sup>QM</sup> need dates are accepted as a target by HFI
- It is also accepted that the dilution control will be outside of the chambre.



SUITE / CONTINUED :

ACTION

FM - planck dates are about 1 year later (February to March 05) than QM.

HFI states that they are not compliant by  $\sim$  2 months with these dates (31 March) ability to recover on CQM might change these dates.

Again - need date for FPU means HFI + LFI (+ 1 month)

		REF.: H-P-ASP-MN-3608	
		DATE:	PAGE: 5/
COMpte Rendu de Reunion / MINUTES OF MEETING		LIEU / PLACE:	

LFI current availability date <sup>could be</sup> 25/01/05 (goal)  
 if no vibrations on RAA are necessary.  
 otherwise, it is early 2/04/05 (baseline)

Alcatel states that planck <sup>FM</sup> vibrations are only end 2005. i.e. late with respect to discovery of problems

LABEM proposes to have vibration test on each set of Waveguides.

LFI ask for an expert discussion on the mechanical qualification of WG

- Alcatel will organise such a meeting - solution could be to integrate WG on STM - Pb is RF verification

- AI 1.

SUITE / CONTINUED :

ACTION



- FPU (RAA) & scraper cooler are integrated ~ together

- ESA states that the current need date for FPU (assembly, 1/2/05) represents one month <sup>earlier</sup> w.r.t earlier agreed dates.

- delivery dates in I/O A 3.0 are 1/2/05.

- LFI ask for a need date for LFI AVM current need date is 02/3/05 (includes 15 days inspection)

LFI express a concern for supporting both the AVM campaign (system) and LFI

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COMpte Rendu de Reunion / MINUTES OF MEETING		LIEU / PLACE :	

FM campaign :

- HFI ask if "all the rest" in annex 1 includes SCE. answer is yes -

proposed dates are need dates w/ Satellite integration & testing (for a Sept 06 delivery to ESA) - they will be included in WDA -

SUITE / CONTINUED : Herschel

ACTION

need dates are proposed in annex 1.


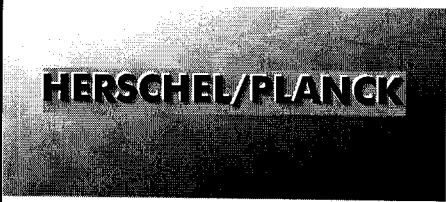
- CQM Warm units . 7-Jan 04
- CQM FPU 31 March 04
- PFM WU & FPU 31 Jan. 05

these dates were negotiated with Astrum in the rationale : PFM have been fully tested together (ie no staggered delivery for PFM)

for CQM, the staggered delivery correspond to integration & verification of warm units & interface.

- AIFI propose an alternative to check the FPU electrical I/F. before closing the cryostat using dedicated EGSE.
- what would be then the need dates for WU ?



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COMpte Rendu de Reunion / MINUTES OF MEETING		LIEU / PLACE:	

- it is not possible to switch on the instrument warm units with FPU in warm conditions: electrical <sup>health</sup> check can be done.

For QM, integration of FPU on optical Bench takes place about 1 month after need date (early May for QM)

SUITE / CONTINUED:

(but this is linked to the delivery date of DBA, not accepted yet by ASED).

For FM 7/02/05 for warm units and 15/06/05 for FPU's (actual integration dates)

ACTION

PACS instruments state that CQM could be delivered near April 04 <sup>(to be optimised)</sup> but FM schedule is not stable enough to commit to any dates - clarification will not be done before fall 2003.

SPIRE: warm units are late compared to FPU. (which could be on time (end Jan 05)) in addition, warm units FM would have never been connected to FPU FM (DRCU).

HIFI QM would like to keep the LSU <sup>QM</sup> longer than expected.

- Spectrometers cannot be in CQM & AVM
- FM is still not ready before Oct 05.

Summary

for CQM, the schedules are marginally compliant - (to be optimised) - a solution can be found ( $\Rightarrow$  dedicated working meeting to be organised)

for FM: a target date has to be found. for FM deliveries which allow to keep the launch date.

- delivery date of January 05 is not realistic for instrument
- Target date of May or June 05 is more realistic.

ACTION

Action

A12

25/7/03

- Assuming 1 week per instrument (with TBD EGSE) to verify the health of the FPU, Astrium should propose new Need date (scheduled exercise) for instrument FPU (e EGSE) (exercise CQM & FM technical concepts)

- instrument will prepare for this FPU verification (CQM & FM)

A I 3, 4, 5

25/7/03

**ACTION ITEM LIST**

REF.: H-D.ASP-MN.3408

MEETING TITLE:

DATE: 16/7/03

**HERSCHEL/PLANCK**

PAGE:

INITIATOR Firm / person	ACTION			DATE
	N°	DESCRIPTION	ACTIONEE Firm / person	DUE
	1	Alcatel will organise an expert meeting on the Mechanical validation/qualification of LFI wave guides	J.D. Chamberland	25/7
	2	Astrum will perform a schedule exercise, (assuming 1 week per instrument to verify the FPI inside the crystal) to define what would be need dates for instruments (for QM & FM)	Astrum W. Rine.	25/7.
	3	PACS } will prepare a technical concept for FPI verification inside the crystal (QM & FM)	PACS: O. Bauer	25/7
	4		SAIRE: E. Saurye	
	5		HIFI: K. Wafelbakker	



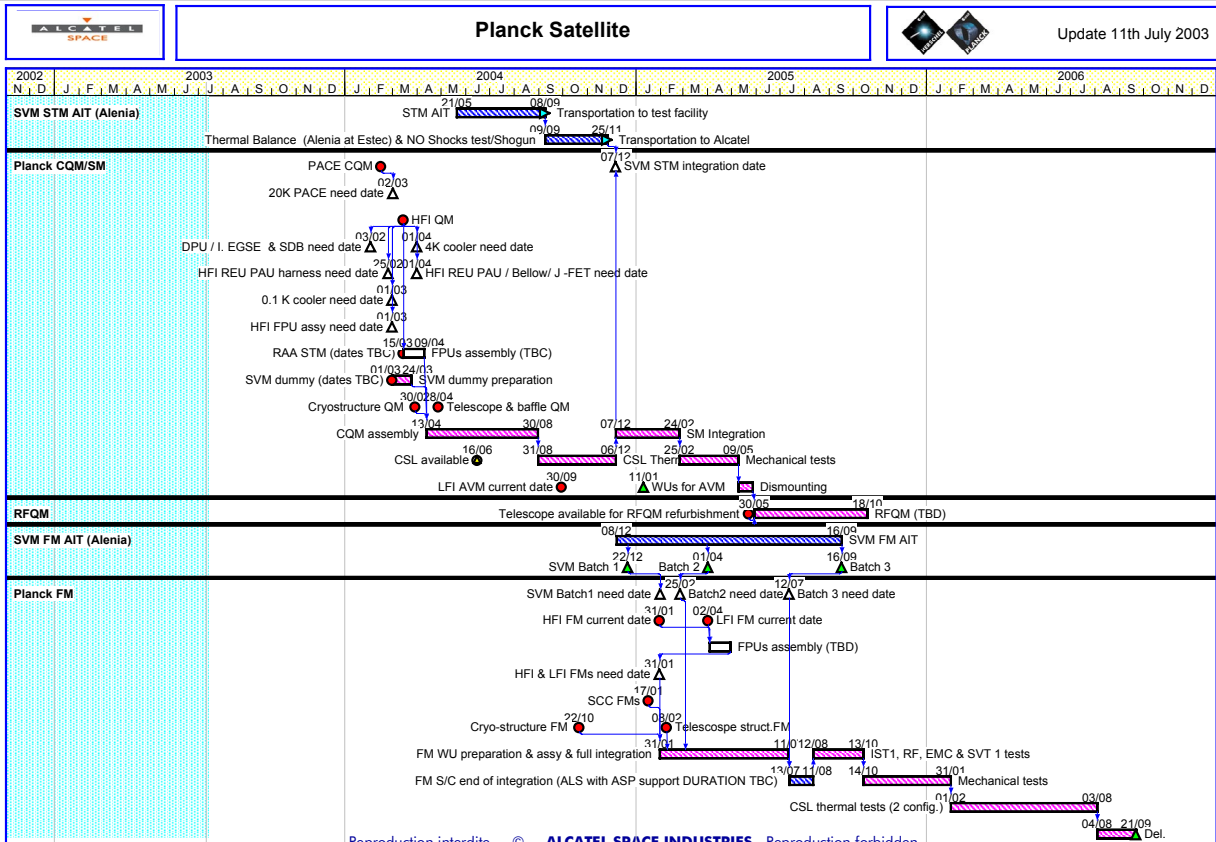
## Instruments Schedule & Deliveries

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1

IA025-A

## Planck Schedule Status



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2

IA025-A

**Assumptions :**

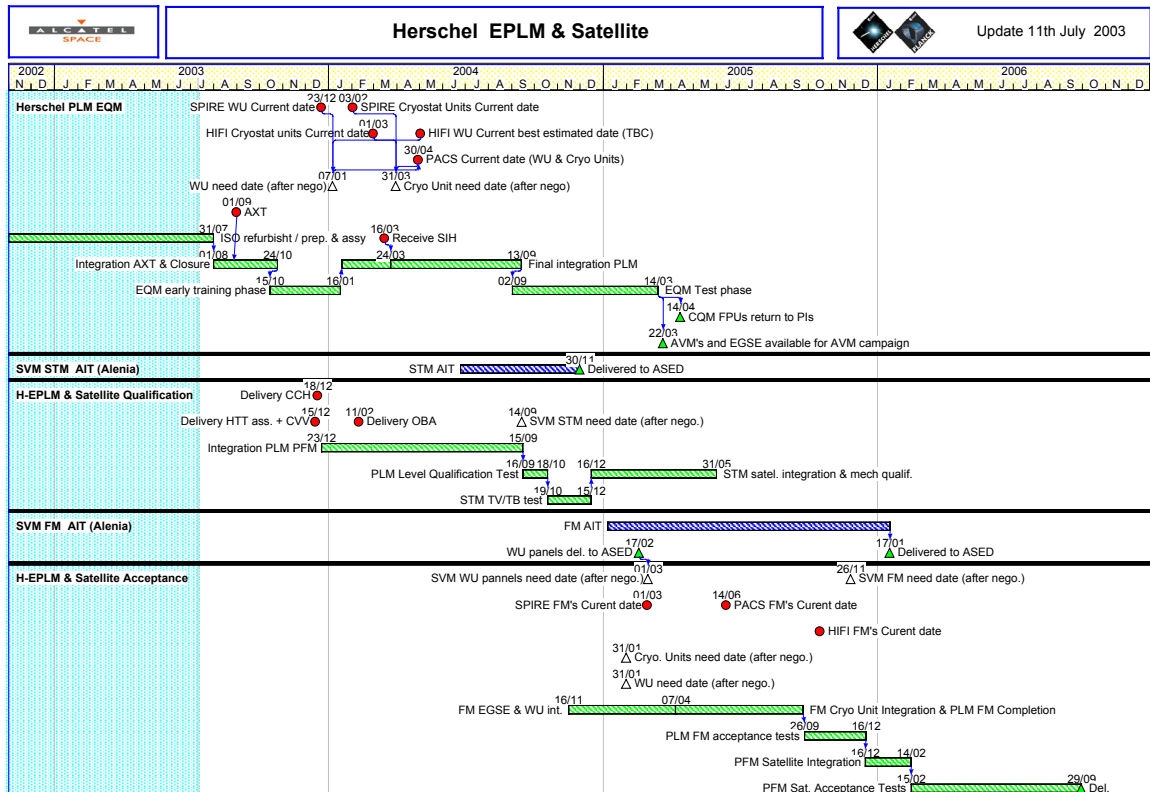
- ▼ Unit / "subsystem" qualification & acceptance completed at instrument level;
- ▼ LFI / HFI FPU FM integrated by a combined LFI / HFI team (in Cannes as proposed or anywhere else). If needed, post assembly checks made;
- ▼ support & assistance to piping integration and checks is provided by instruments team to Alcatel in Alcatel Cannes clean rooms

**CQM :**

- ▼ DPU | EGSE & DB 02/02/04
- ▼ REU / PAU harness 25/02/04
- ▼ HFI FPU assembly 01/03/04
- ▼ 20K PACE / 0.1K cooler 01/03/04
- ▼ 4 K cooler 01/04/04
- ▼ REU / PAU / bellow / J-FET 01/04/04

**FM :**

- ▼ RAA assembly (HFI & LFI) 01/02/05
- ▼ DPU & REBA 01/02/05
- ▼ SCC FM x 2 01/02/05
- ▼ 0.1K cooler 01/02/05
- ▼ Harness REU / PAU 01/02/05
- ▼ all the rest 01/03/05



MILESTONE DESCRIPTION	CURRENT DATE	NEED DATE (nego)
Spire WU	23/12/2003	07/01/2004
Pacs WU	30/04/2004	07/01/2004
Hifi WU	01/05/2004	07/01/2004
Spire FPU	03/02/2004	31/03/2004
Pacs FPU	30/04/2004	31/03/2004
Hifi FPU	01/03/2004	31/03/2004
Spire FM's WU	01/03/2005	31/01/2005
Pacs FM's WU	14/06/2005	31/01/2005
Hifi FM's WU	01/10/2005	31/01/2005
Spire FM's FPU	01/03/2005	31/01/2005
Pacs FM's FPU	14/06/2005	31/01/2005
Hifi FM's FPU	01/10/2005	31/01/2005

As per negotiation with Astrium-D, the AIT need dates ( arrived at Integration site) are :

- ▼ CQM WU's : 7 Jan 04
- ▼ CQM FPU's : 31 Mar 04
- ▼ PFM WU's & FPU's : 31 Jan 05

The PFM cold and warm units are needed together for having the required common Short Functional Test of real flight hardware ( and Cryo harness ) before the PFM Cryostat closure.

The entire link warm unit / I-EGSE / PLM EGSE shall be properly tested and validated before the Cryostat AIT phase.

- Both

- ▼ PFM WU's / FPU's check before closure cancellation,
- ▼ and the FM link WU's / updated I-EGSE / updated PLM EGSE be checked at the latest,

are unacceptable risks for Industry.

- Contractual baseline shall remain =

- ▼ Instrument real Flight configuration (WU's & FPU's serial numbers) formally tested and accepted at Instruments premises before delivery.

- Industry do not intend to require Instrument delivery before real need.



**ALCATEL**

SPACE

**HERSCHEL/PLANCK**

REF.: H-P-ASP-MN- 3419

DATE: 17/7/03

PAGE: 1/

**COMPTE RENDU DE REUNION / MINUTES OF MEETING**

LIEU / PLACE: CANNES

OBJET / PURPOSE :

CLASSIFICATION :

PLANCK INSTRUMENTS OPEN AREAS

PARTICIPANTS ATTENDEES	SOCIETE FIRM	SIGNATURE SIGNATURE	PARTICIPANTS ATTENDEES	SOCIETE FIRM	SIGNATURE SIGNATURE
J. Monte Combes	ESA		JB Biti	ASP	
B. Guillaume	ESA		Y. Brocchini	ESA	
J. Charrois	IAS		P. Armand	ASP	
G. Guyot	IAS		JP Chambelland	ASP	
C. Butler	IASF		L. Aloy	ESJ	
M. BALASINI	LABEN				
T Loicic	ASP				
REDACTEUR / WRITTEN BY :					

CONCLUSION :

DISTRIBUTION :



PARTICIPANTS /  
ATTENDEES

POUR ACTION :  
FOR FURTHER ACTION

POUR INFORMATION :  
FOR INFORMATION

APPROUVE PAR / APPROVED BY

NOM / NAME				
SIGNATURE / SIGNATURE				

		REF. : H-P-ASP-MN-	
		DATE :	PAGE : 2/
COMpte Rendu de Reunion / MINUTES OF MEETING		LIEU / PLACE :	

SUITE / CONTINUED :

HFI OPEN AREAS

HK Cooler temperature:

SUB panel is at 15°C nominal, 24°C with margin.  
RAL stated that this should be OK, but ASP is not convinced at all that the assumptions taken are correct. ASP need some clarification on the thermal model.

HK compressor EOL

HFI will provide availability of REU in September.

HFI is looking at the possibility to shield the compressor



HK compressor qualification

HFI to prepare a qualification and acceptance test on HK compressor.

ACTION

AI 1 HFI  
end July 03

AI 2 HFI  
end July 03

		REF. : H-P-ASP-MN-	
		DATE :	PAGE : 3/
COMpte RENDU DE REUNION / MINUTES OF MEETING		LIEU / PLACE :	

SUITE / CONTINUED :

ACTION

LFI Instrument

BEU redesign

Design is in progress at LABEN.

Next week a teleconference will be held

between ASP & LABEN to settle the

interface between BEU & S/C.

ASP to provide out of plane strength of the structure  
Mechanical analyses

AI 3 ASP

LABEN will deliver the analyses end of July.

RAA FEM will be delivered end of July also.

Displacement analyses not expected before beginning of September.

LABEN provides draft drawing of the RAA.

LABEN proposed some text on W/G

(see annex).



SCS Instrument:

SCC attachment: work in progress with Alenia

SCC deliveries: listed in redline copy of

IIDB. JPL will also provide a dummy

Cold End.

		REF.: H-P-ASP-MN-	
		DATE :	PAGE : 4/
COMpte Rendu de Reunion / MINUTES OF MEETING		LIEU / PLACE :	

SUITE / CONTINUED :

ACTION

### COLD TARGET FOR CSL FACILITY

The definition provided by LFI, following the request from Alcatel, appears to be far too complex ~~for~~ to implement for the purpose of the functional test.

LFI will provide a rationalised engineering approach to avoid the tall pyramids. In addition, a possible solution could be implemented with an ECCOSORB<sup>®</sup> piece finished ~~with~~ <sup>with</sup> a rough surface.

### HEAT SWITCH

The heat switch is a priori needed only on ground. It could be developed by L. Durban if ordered beginning of September. Development duration: about 6 months. The <sup>cool-down</sup> time gained by this heat switch is still to be computed and balanced against the cost of the HSW.

ASP has to propose an accommodation for the HSW.

ATI 4 ASP



**ACTION ITEM LIST**

REF. :

MEETING TITLE:

DATE :

**HERSCHEL/PLANCK**

PAGE :

INITIATOR Firm / person	ACTION			DATE
	N°	DESCRIPTION	ACTIONEE Firm / person	DUE
	1	HFI to provide documentation on TDR of GKCCU	HFI	31/7/03
	2	HFI to propose qualification program of GKCCU	HFI	31/7/03
	3	ASP to provide out of plane strength of the elements on the subplatform	ASP	31/7
	4	ASP to propose an accommodation for the head switch	ASP	31/07

## HFI INSTRUMENT

### 4K compressor temperature issue

Previous max temperature at CCU side interface in IID-B 2.1 was 40°C

New requirement from HFI : 15°C (25°C max)

SVM panel is at 15°C nominal ; 24°C with margin for uncertainties

Gradient between panel and CCU feet estimated at 20°C due to very poor thermal interface between the feet and the panel (56 cm<sup>2</sup>).

Improvement of this interface may solve the problem.

Gradient between CCU feet and head estimated at 25°C

### 4K compressor EMC issue

ASP proposal to put a mu-metal cover on the compressor seems to be difficult to accommodate. Waiting for a formal answer from HFI

### PAU-REU harness accommodation issue

Length expected to be < 5 meters by integration with a half opened SVM panel

Details of accommodation of the loop on REU side still to be defined

Grounding to be defined

JFET box interface : frozen on our side, waiting for a design from O Galileo

## LFI INSTRUMENT

### BEU redesign

Goal is to reduce the mass to 30.6 kg (IIDB 2.1 allocation)

Interface with the spacecraft will change (based on preliminary design)

3 box instead of 1 (thermal and mechanical behaviour to be analysed)

Waveguide upper structure now directly attached to the subplafrom : new interface

Harness now coming from the space side : degradation of thermal dissipation, difficult/impossible to accommodate the harness in this area

ASP is waiting for a formal proposal

### Mechanical analyses still ongoing in LABEN

FEM model of the RAA delivery due date on 13 June

Dynamic analysis delivery due date on 11 June

Displacement analysis between BEU and FPU asked in march 2003, no answer

### RAA interfaces

Information needed urgently for both PPLM design and RAA STM design

No answer form LABEN for the last 2 months

## SORPTION COOLER

SCC attachment on SVM panel

New proposal from ALS leads to negative margin on pipes within the compressor (because of the offset change from 25 mm to 30 mm)

JPL advise a baseplate under the non bed area

Nevertheless, JPL analysis are based on the old FEM model from ALS with the old attachment pattern

Way forward :

- ASP and ALS to improve the current ALS proposal,

- ALS to issue a new FEM model of the panel

- JPL to perform coupled analysis SCC/panel to check the stress in the pipes

SCC test on a dummy panel

- JPL test definition based on the TN from P Clavel

- Offset of the heat pipes taken as in ALS model : 25 mm

Pipes elementary test on a panel (agreed on last February meeting)

- JPL to sent test prediction this week

- Test postponed to October due to funding problem



## SORPTION COOLER

JPL delivery status

JPL will deliver a dedicated PACE for the CQM test

JPL will deliver dummy pre-coolers for the second CQM PACE

JPL will deliver both flight PACE welded to their compressor

JPL will deliver bits and pieces for the PGSE. ASP is currently analysing 2 options : using the hardware from JPL or developing a complete PGSE (subcontract to Air Liquide)

SCS MGSE still unclear

**COMPTE RENDU DE REUNION / MINUTES OF MEETING**

LIEU / PLACE: Alcatel

OBJET / PURPOSE:

CLASSIFICATION:

instruments interfaces Management Meeting.  
QPM 16 splunde

PARTICIPANTS ATTENDEES	SOCIETE FIRM	SIGNATURE SIGNATURE	PARTICIPANTS ATTENDEES	SOCIETE FIRM	SIGNATURE SIGNATURE
Alcatel . BC, GL, GD, JAC			HFI: J.C		
Astrum E.H, DS, HF			LFI . CB		
Alenia M.C					
ESA GC, AH, CS, J.MC, GP					
SPIRE: M.R. ES					
DACS: OAB					
HFI: Th DG, KW					
REDACTEUR / WRITTEN BY:					

CONCLUSION:

DISTRIBUTION :  
PARTICIPANTS /  
ATTENDEES

POUR ACTION :  
FOR FURTHER ACTION

POUR INFORMATION :  
FOR INFORMATION

APPROUVE PAR / APPROVED BY

NOM / NAME	Collaudin			
SIGNATURE / SIGNATURE				

SUITE / CONTINUED:

ACTION

- CR process. (see annex 1)
  - shall be described properly in interface management document -
  - Time scale for CR's processing: 15 days is the "formal" time scale to reply. but this is not practical when CR's has to go to several layers
  - Astrium inform that they are in fixed price contract (i.e. all changes will need financial coverage)
  - implement CR's on ffp

→ AI 1  
31/07

- IID B's.

SPIRE

- caveat for thermal interfaces (level 0) will be proposed by Alcatel.

this will allow to sign IIBB -

- also caveat on internal overshield.

~~PACCS~~

this has to be solved (harness on hold)



This advise to spend time on solving the problem, rather than on the caveat.


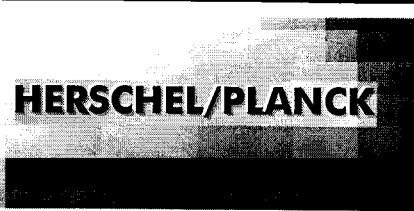
→ AI 2  
Alcatel

- PACCS

- harness verified

- PACS harness document 3.2. available this week → AI 3

- warmup drawings

		REF. : H-P-ASP-MN-	
		DATE :	PAGE : 3/
COMpte RENDU DE REUNION / MINUTES OF MEETING		LIEU / PLACE :	

SUITE / CONTINUED :

- the PACS IWB will be closed with the document received before 24/7/03.
- HFI - also closed with data received next week.
- HIFI → not before September
- SCS - ICD.
- LFI : No changes

ACTION

Comments : HFI : update through Doors does not include detailed changes in tables.

Demand HIFI

- Comments on IIDA : to be sent to Alcatel (B. Collaudin), copy ESA (G. crone) copy Astrium (H. Faas)
- Waivers : sent to ESA (P. Olivier.) G. crone) copy Alcatel (Ch. Masse, B. Collaudin)

SUITE / CONTINUED :

ACTION

- instruments ask to be informed about satellite milestones : which should be discussed in interface meetings.

- update of delivery dates for IIO's

PACS	}	End July close issues signed by <del>early</del> Sept Mid.
SPIRE		
HFI		

SCS	}	mid <del>end</del> September to close issues signed by end September
HIFI		
IIDA		
LFI		

Herschel & Planck to establish meeting (interface & AIU) list up to End 2003.

→ AJ L  
Alcatel  
JPC  
G.D.  
G.L.  
SJ



**ACTION ITEM LIST**

REF.: *H-P-ASP-MN 3620*

MEETING TITLE:

DATE :

**HERSCHEL/PLANCK**

PAGE :

INITIATOR Firm / person	ACTION			DATE
	N°	DESCRIPTION	ACTIONEE Firm / person	DUE
	1	Alcatel to include . update of the CR process in instrument Management document HP-ASP-RP-0122	Alcatel-Gaucher	31/7/03
	2	Alcatel will propose caveat. to SPIRE for <del>requirements</del> thermal requirement on Evaporator stage	Alcatel Doubravik	31/7
	3	PACS will make the harness definition document. version 32 available	PACS	31/7
	4	Alcatel will propose instrument interface Meeting up to end 03	Alcatel	31/8

## Content

- ▼ Industry Instrument interface team updates
- ▼ IID's and CR's
  - Update process
  - update schedule
- ▼ IF meetings
- ▼ Communication

▼ ESA:

→ Carsten Scharmberg for HIFI & SPIRE as replacement of J.Bruston

▼ Alcatel:

→ G.Doubrovik replaces G.Lund for Herschel Instruments

→ However, G.Lund gives support for some time (PACS IID-B & interfaces)

▼ Astrium

→ No changes

▼ Alenia

→ Marco Cesa is now subcontractor, and located outside Alenia.



## ▼ Update process

→ As agreed at PDR:

- ✓ Changes expected to have schedule/cost impact via Change request
- ✓ Changes without impact, or typo's..; via red lined copy

→ Changes to be discussed/agreed at IF meetings or dedicated teleconferences

→ Change request sent formally to ESA/Alcatel

→ Alcatel emits cover CR's to Alenia /Astrium if Change affects SVM of HPLM

## ▼ Status at QPM

→ CR process still much too long

→ feedback from Astrium/Alenia (CCB's) not always relevant: most of the time needs iterations

→ Feedback to Instrument ESA very poor (CCB's)

## ▼ Use of CR formalism

- HIFI: OK, but too many CR's, and no discussion before emission.
- SPIRE: OK. Description of the change not always clear (JD)
- PACS: Many expected CR's. A lot of new & informal drawings
- HFI: Many CR's issued by Alcatel. Dangerous
- LFI: very few changes

## ▼ Proposition to improve

- Emission rate of CR's should decrease
- Discussion before emission of CR should be improved
- Alcatel to improve speed to relay CR's to Astrium/Alenia
- Astrium/Alenia to improve speed of reply (Respect the date of validity (15 days)).
- Feedback in parallel by fax and E.mail
- First rapid evaluation ROM estimation of the impact
- Proposition to use ftp site for on line feedback to ESA/instrument

- ▼ IID-B PACS: 3.0 Draft 3 on ftp server
  - iteration with Instruments (HP-ASPI-MN-3351 - PACS IIDB Convergence Mtg 4/7/03)
  - Passed Alcatel CCB n°24 (H-P-ASP-MN-3346 7/7/03)
  - Major Open points:
    - ✓ Level 0 requirements & definition
    - ✓ Cryoharness: PACS cryoharness document 3.1 to be updated. Currently we have 3.1 + CR's + agreements in meetings.
  
- ▼ IID-B SPIRE: 2.3 draft 4 on ftp server
  - Several iteration with instruments (draft 1 & 2)
  - Passed Alcatel CCB n° 25 (H-P-ASP-MN- 3376 11/7)
  - Major Open Point:
    - ✓ Level 0 (not yet agreement on IF temperature)
    - ✓ Cryoharness: Implementation does not includes overshield in SPIRE document 1.1
  
- ▼ IID-B HFI: 3.0 draft 2 (mailed to HFI & Back)
  - Iteration with Instrument
  - Passed Alcatel CCB n° 26 (H-P-ASP-MN- 3377 )
  - Major Open Points
    - ✓ 5.7.3: 4K Cooler temperature reduction not accepted (not modified. Need justification)
    - ✓ 5.7.4 JFET temperature 40K
    - ✓ 5.14: Bonding of the cooler pipes

- ▼ IID-B HIFI: 2.3 draft 1 on ftp server
  - Comments received from HIFI
  
- ▼ IID-B SCS ICD:
  - Draft prepared at Alcatel (7/7) (Little changes)
  - To be sent for comments
  
- ▼ IID-B LFI: too Little input from LFI/Laben (CR's, drawings, ...) to be able to update it
  
- ▼ IID-A:
  - All on ftp server except
    - ✓ section 5 & 7
    - ✓ annex 5 (SVM ICD) & annex 7 (PPLM ICD)
  - Little comments (Only HFI)

- ▼ IID-B's complete
  - Approval on current available draft. (updated by CCB)
  - OK--> Edition of version for signature
  
- ▼ Un-complete IID's (HIFI, IID-A) to be completed by End summer
  
- ▼ LFI : to be agreed with instrument / Laben when update is feasible

			PM 14		PM16	
		issue	draft	Final	draft	Final
Planck	HFI	3.0		30-mai-03	OK	31-juil-03
	SCS	3.0	30-mai-03	30-juin-03	OK	31-juil-03
	LFI	3.0	target after LFI IBDR (mid may)			no data
Herschel	SPIRE	3.0	30-avr-03	30-juin-03	OK	31-juil-03
	HIFI	3.0	16-mai-03	31-juil-03	OK	31-juil-03
	PACS	3.0	16-juin-03	31-juil-03	OK	31-juil-03
IID-A		3.1	30-mai-03	rev. by inst	(not fully complete)	31-juil-03

- ▼ IF meeting schedule to be established for Herschel Planck
  - no meetings in the last 6 months for Planck
  - Evaluate the possibility to have more frequent tele or videoconferences
  
- ▼ IF meetings should be the place where main interface aspects are discussed
  - CR's, schedule,
  
- ▼ Links between IF meetings and Working groups (EMC, Data, Cryo, ...), and AIV meetings should be improved.
  
- ▼ Technical meetings or teleconf should be initiated whenever necessary

- ▼ Complains about the instrument interfaces should be discussed & solved within the team, rather than with ESA
- ▼ difficult to get feedback on our demands (harnesses, pointing, ....)
- ▼ ftp site set up for data exchanges
  - comments
  - useful ?
  - What should be the content ?
  - How to improve ?

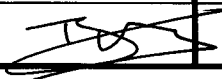
**COMPTE RENDU DE REUNION / MINUTES OF MEETING**

LIEU / PLACE: Alcatel

OBJET / PURPOSE :

CLASSIFICATION :

Herschel instrument interface Open points  
splinter Meeting.

PARTICIPANTS ATTENDEES	SOCIETE FIRM	SIGNATURE SIGNATURE	PARTICIPANTS ATTENDEES	SOCIETE FIRM	SIGNATURE SIGNATURE
- Alcatel	BC, GL, GD, JCS, JPR, MP				
- Asstrum	WR, EH, DS, HF, JL, TL, AVI, RH				
- Alenia	MC				
- ESA	GC, AH, CS, GP				
- SPIRE	MG, ES				
- DACS	OS				
- HIFI	Thao, KW				
REDACTEUR / WRITTEN BY: Collaudin 					

CONCLUSION :

**DISTRIBUTION :**  
PARTICIPANTS /  
ATTENDEES

POUR ACTION :  
FOR FURTHER ACTION



---

POUR INFORMATION :  
FOR INFORMATION

APPROUVE PAR / APPROVED BY

NOM / NAME	Collaudin			
SIGNATURE / SIGNATURE				



		REF.: H-P-ASP-MN- 3621	
		DATE :	PAGE : 1/
COMpte Rendu de Reunion / MINUTES OF MEETING		LIEU / PLACE :	

SUITE / CONTINUED :

ACTION

Open points Herschel

- grand testing of instrument
  - . instruments to state about recycling of the cooler (feasibility) during grand test. (ref AIT Meeting - 25 May 03)
- EQM cryo Harness (reduction w RT FM)
  - instruments 1) All connectors are here on the CQM FPU.
  - 2) harness shall be representative in term of EMC & thermal
  - comments HIFI: all connections are properly terminated (inside dummies)
- A Pas has been sent to instrument to identify which signal are used.
- HIFI states that they do not want the CQM harness to be reduced.
- PACS will reconfirm. end of next week & SPIRES
- Astrium & Alcatel ~~the~~ position is that non used cables could be brased together to be thermally & EMC representative)

AI 2  
→ End 08/03

AI 2  
25/7/03

SUITE / CONTINUED :

ACTION

Level 0

- industry part of Thermal Strap is being tested at CEA Grenoble (SBT)
- PDR of thermal strap - next week (21/7)
- test results are presented on 28/7/03 in ~~CEA~~ Grenoble (Air liquide)
- all industry activity is aiming for a thermal strap of 0.1W/K
- despite of the last level 0 meeting in April 03
- the reserve for a 3<sup>rd</sup> Pod is implemented with a hole already drilled (and blind flanged)
- ESA will take the lead of the System aspects of level 0 strap (industry + instrument part of strap).
- Alcatel will collect from instrument (PACS & SPIRE)
  - definition and Candudence of strap from I/F to evaporator.
  - heat flows for design case.
- Astrium will provide best

→ AI 3  
10 Sept. 03

→ AI 4  
1 Sept. 03

→ AI 5  
1 Sept 03

SUITE / CONTINUED :

ACTION

Estimation and measurement of industry shap.

from this, assessment shall be done on the feasibility of existing solution (external strap) or the need of a Pod. (

### HIFI - Standing waves

- an analysis of standing waves is being performed at ESA (expected with IIDA) a meeting will be organised ~~with~~ with all parties to present the results when available.

### Stray light

latest results (not presented here as PACS & SPIRE have left) will be sent to instrument for Evaluation.

- pessimistic assumption have been used and give out of Spec results -
- optimistic assumption gives also out of Spec. results

RFD will be sent together with update of Straylight analysis

SUITE / CONTINUED:

ACTION

Cryo harness

Spike overshield - 3 solutions hatched off by Astrum

- 1) wire solution (baseline)
- 2) manganese overall shield  $+20\text{mm}^2$   $\checkmark$   $+13$  day ECP 54
- 3) double cable screening  $+9\text{mm}^2$   $\sim$  1 week  
 $\hookrightarrow$  needs to order additional cables  
 $+$  modify database,

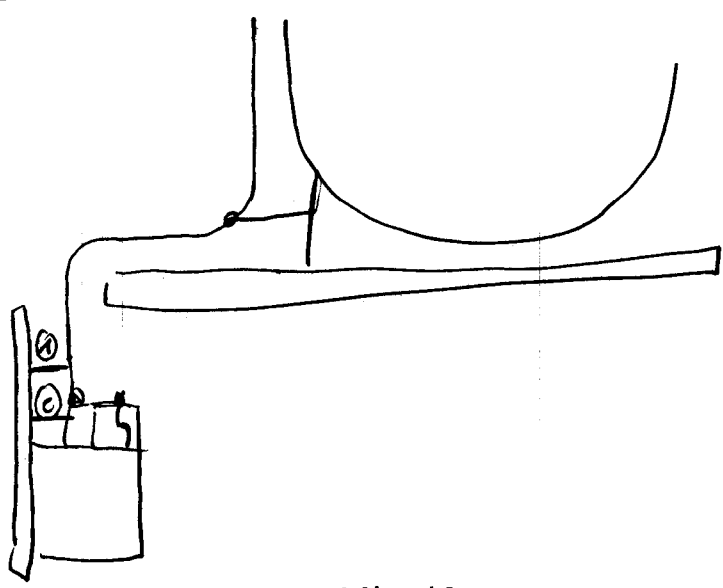
1) proposition for option 3 must be sent to Spike for agreement. Astrum  
3117103



2) ROM of Cost and schedule (4 to 6 weeks) Astrum  
3117103

3) Decision to implement an answer to part 1 & 2 (ESA1)

4) ECP to be prepared.

LSU wave guides



		REF. : H-P-ASP-MN-3421	
		DATE :	PAGE : 9/
COMpte Rendu de Reunion / MINUTES OF MEETING		LIEU / PLACE :	

SUITE / CONTINUED :

there are 2 solution :- WG bracket is fixed on HIFI panel(1), or on LSU(2) both options should be evaluated both on LSU (by HIFI) or by Astrum (bracket / Alenia (insert)).

ACTION

AI 8  
 → Astrum  
 end July  
 31/8/03



**ACTION ITEM LIST**

REF. :

MEETING TITLE:

DATE :

**HERSCHEL/PLANCK**

PAGE :

INITIATOR Firm / person	ACTION			DATE
	N°	DESCRIPTION	ACTIONEE Firm / person	DUE
	1	instrument to state about feasibility of cooler recycling during ground testing (data from last AT Meeting)	PACS - SPIRE	29/8/03
	2	PACS & SPIRE to confirm their position about simplification of EQM Harness (removal of non use cables)	PACS - SPIRE	25/7/03
	3	ESA will compile industry & instrument level 0 strap conductance	ESA	10 Sept. 03
	4	Alcatel will provide inf. Called and provide instrument data on internal level 0 straps (conductance)	Alcatel	10 Sept 03
	5	Astrum will provide Estimation and Measured data on level 0 strap (industry part)	Astrum	1 Sept 03
	6	Astrum will get the agreement of SPIRE on New internal overshield proposition (option 3)	Astrum	31/7/03
	7	Astrum will make a ROM estimation of the implementation of option 3 (cont. schedule)	Astrum	31/7/03
	8	Astrum will evaluate the 2 option of focaten of LOU wave guides (on SVM or on LSH)	Astrum	31/8/03

## ▼ Herschel General

→ Instruments schedule (see dedicated presentation & splinter)

→ Level 0 interfaces (PACS & SPIRE)

- ✓ Long iterations and still no agreement on Level 0 interfaces
- ✓ Main concern is PACS & SPIRE cooler evaporator strap.
  - Current requirement situation is Tank at 1.7K, Tank strap  $>0.1\text{W/K}$  (evaporator & pump) + option for 3rd strap with He bell.
  - Thermal interface included thermal contact (on industry side)
  - Strap conductance dominated by Thermal contacts
  - Design heat flow was 30mW (end of condensation), leading to 2K at interface, and 2.3-2.5K (? As no data) at evaporator (too high)
  - Measurement on cooler indicate that 15mW can be used (SPIRE IHDR)-  
-> lead to 1.85K at thermal interface could be acceptable by industry (combination of agreed requirements)
  - Not agreed by instruments
- ✓ PACS return to Thermal I/F direct on Cooler heat switch (agreed if PACS integrates)
- ✓ SPIRE is improving the level 0 straps

## ▼ General (con't)

### → Testability of instruments on Ground

- ✓ Large heat flow from cover make the feasibility of sorption cooler recycling questionable

### → Herschel Cryo-harness design approval by instrument

- ✓ Important that instruments are in the agreement loop
- ✓ Check of Harness data-pack (interfaces FPU & warm units pin allocation) proposed using extract of H-EPLM EICD --> IID-A
- ✓ SPIRE internal over-shield not implemented (following rejection of related ECP by ESA). However SPIRE still claims that the instrument grounding & performances design will be jeopardised
- ✓ Late implementation of over-shield (CR 39) will have schedule impacts
- ✓ Comments on PACS vacuum feedthroughs pin allocation only partially taken into account (redundant=nominal)

### → Instruments FPU connectors (Glenair - Cannon - Cristech)



## ▼ HIFI

- Still lot of CR's on Warm units interfaces (instrument definition not stable) requiring now modifications having cost & schedule impacts (footprint, harness routing, analyses to be re-performed)
  - ✓ LSU, FCU, IF up-loader
- LOU radiator design not frozen
- WG interfaces (type) still modified recently

## ▼ PACS

- Definition of DECMEC not available. Alcatel ICD & CAD used instead)

## ▼ SPIRE

- Test of Sorption cooler indicates that the tilt angle needed to recycle the cooler is 30° instead of 20° expected.
- Impact is an incomplete recycling (lower cycle time) & full verification of instruments
- Test adapter for Herschel FM TV Test is limited to 25°

## Level 0

- A progress meeting was held on the 11.06.03.
- Level 0 PDR is planned for 21./22. July at Sener
- The raw materials thermal conduction have been measured and are in accordance or better than the assumed engineering data.
- A model of the Level 0 design (including tank and internal pod) is under thermal testing at CEA, France. Results will be available before the Level 0 PDR
- A flange design for the two additional open tank I/F's has been implemented on the HTT and thermal performance data of this possible Level 0 connection have been calculated.

# Level 0

## Foreseen thermal performance (W/K)

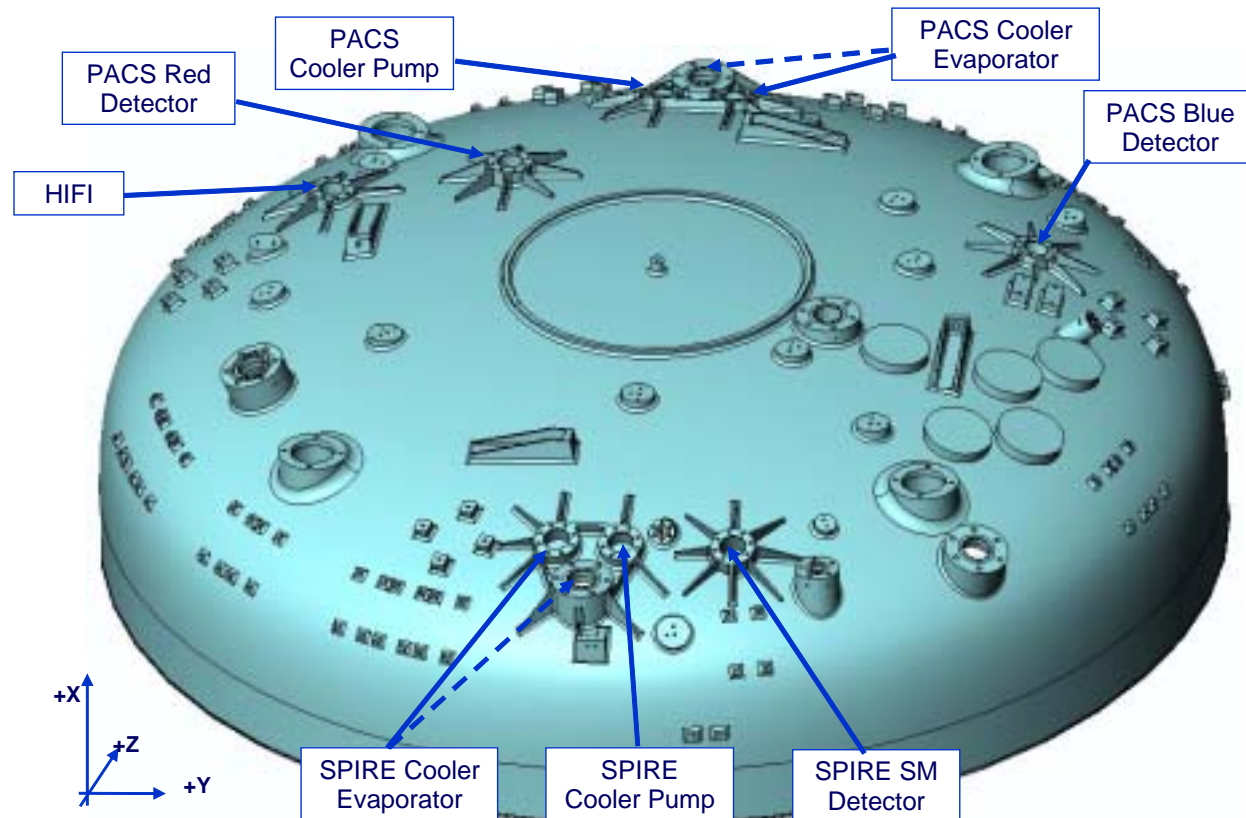
Instruments	Spec W/K (on ground)	Result Ground	Margin % Ground	Spec W/K (In orbit)	Result Orbit	Margin % Orbit	Result	Margin
Pacs Blue Detector	0.016	0.031	+90	0.016	0.043	+150		
Pacs Red Detector	0.043	0.049	+15	0.1	0.085	-15		
Pacs Cooler Pump	0.038	0.053	+40	0.1	0.097	-3		
Pacs Cooler Evaporator	0.060	0.053	-11	0.1	0.097	-3	0.240 W/K	+110 %
Spire SM Detector Enclosure	0.050	0.055	+10	0.1	0.102	+2		
Spire Cooler Pump HS	0.038	0.055	-44	0.1	0.102	+2		
Spire Cooler Evaporator	0.060	0.055	-9	0.1	0.102	+2	0.560 W/K	+400 %
HIFI L0 Detector Enclosure	0.035	0.030	-15	0.035	0.040	+10		

CR 12

Trough wall  
additional pods

# Level 0

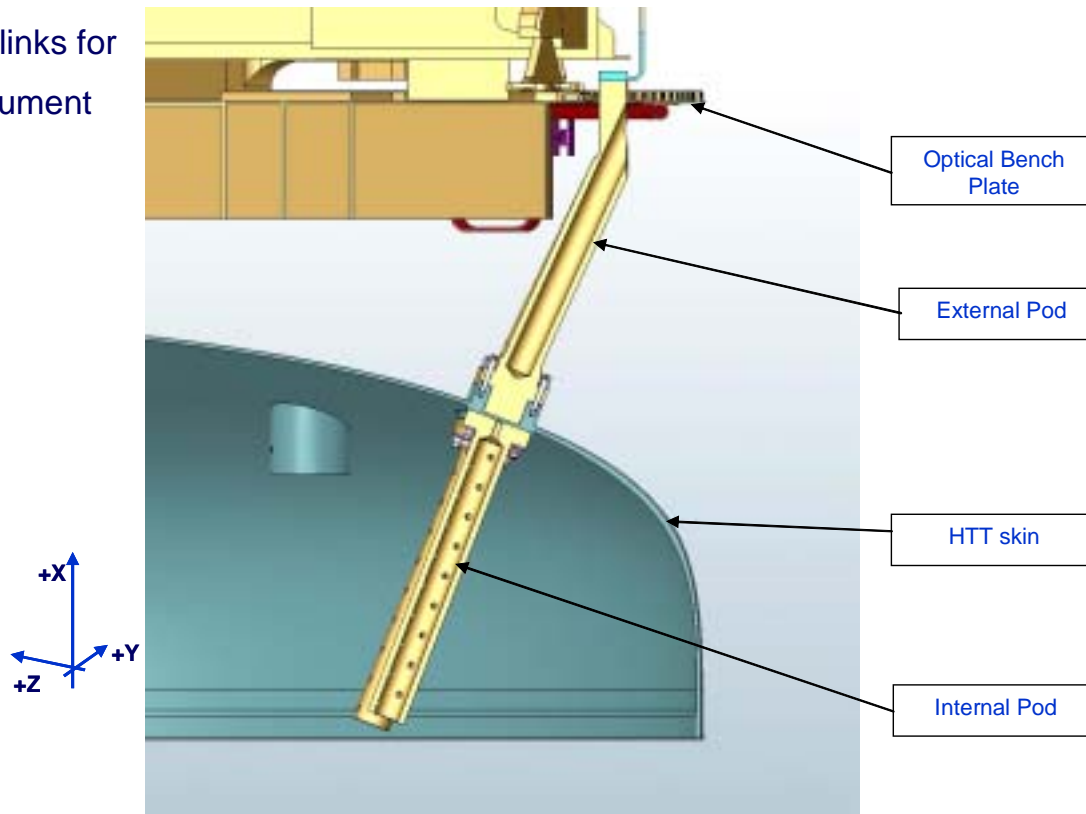
## HTT upper bulkhead updated design



# Level 0

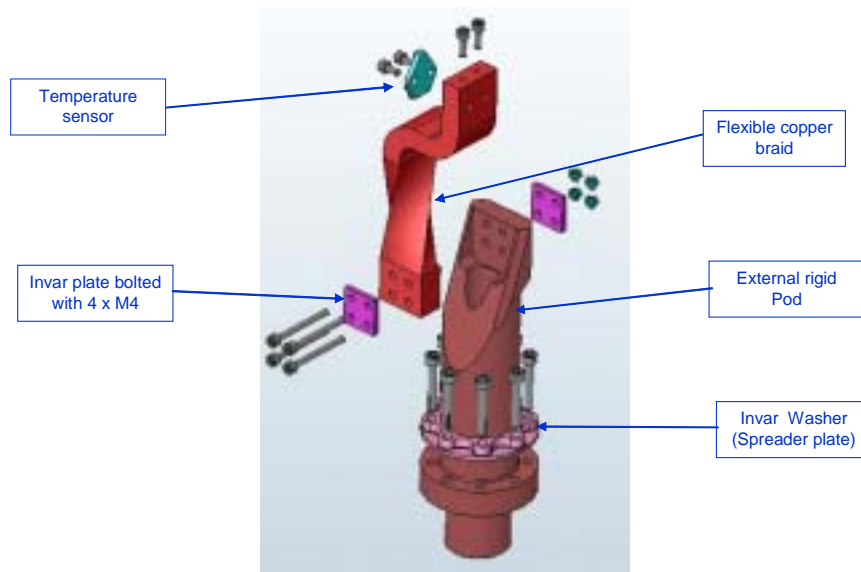
## L0 Design

L0 Thermal links for  
Spire Instrument



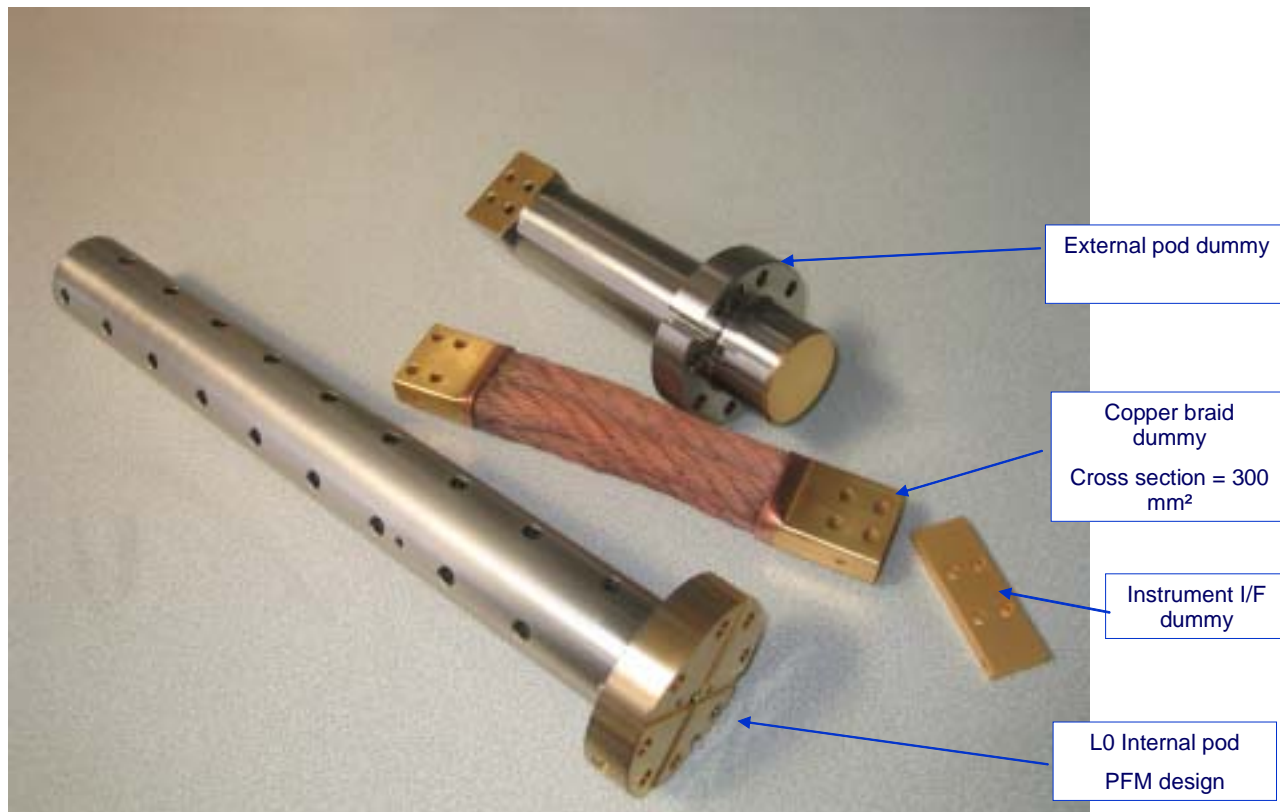
# Level 0

## PACS LO Mounting (Red detector)



## Level 0

### Test dummies (preparation)



# SPIRE ECR-039

- 3 Options:
  - Option 1: 2-Wire solution (baseline)
  - Option 2: Manganin Overall Shield
  - Option 3: Double Cable Screening



# ECR-039 Option1: 2 wire solution

- One isolated, twisted pair AWG38 SST per FPU connector
- 5 TP per SIH branch (10 contact per FTHR)
- solder process on FTHR
- soldered Ground lug on FPU connector side
- lifetime impact: not assessed
- manufacturable

# ECR-039 Option 2: Manganin overall shield

- Proposal covered in HP-2-ASED-CP-054
- Cross section of 20mm<sup>2</sup>, equivalent to Lifetime impact of 13 days
- Cable branch overshield:
  - with 70% optical coverage: cross section on CVV: 12mm<sup>2</sup>, Cold Units: 30mm<sup>2</sup>
  - with 90% optical coverage: cross section on CVV: 19mm<sup>2</sup>, Cold Units: 43mm<sup>2</sup>
- Solder shield jumper process to be trained

# ECR-039 Option 3: Double Cable Screening

- SIH C1 to C9 double cable shields calculated for sensitive lines (signal & bias)
- all other cables in C1 to C9 unshielded
- CIH C10 to C13: unshielded
- Cross Section: approx. 9mm SST AWG44
- Shield jumper length to be increased (>65mm)
- Manufacturing process to be clarified with CASA



# **HERSCHEL**

## **Straylight**

Quarterly Progress  
Meeting 16  
15.-18. July 2003

HP-2-ASED-HO-0050

# Herschel Straylight

## ASAP models: Changes in large model since OSWG October 2002

sunshade model:

- enlarged sunshade introduced

telescope model:

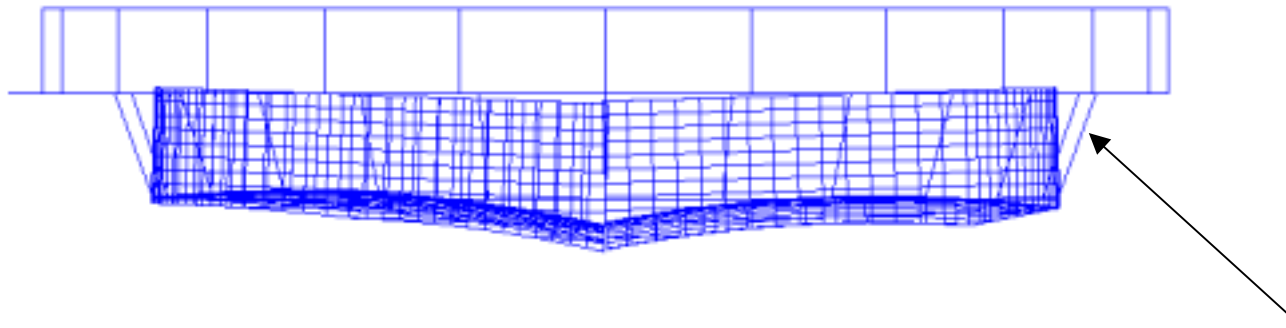
- new mirror scattering function
- new hexapod barrel inclinations (support by V.Kirschner)

cryostat model:

- some minor dimensional changes due to consistent recalculations  
warm  $\Leftrightarrow$  cold      ambient pressure  $\Leftrightarrow$  vacuum
- some dimensional changes due to thermal optimizations, e.g. shorter instrument shield tube

# Herschel Straylight

ASAP models: Changes in large model since OSWG October 2002 (cont'd)



- some emissivity changes due to thermal optimizations, short cone of cryocover closure now is black (probably black anodized, emissivity at scientific wavelengths  $\approx 0.5$ ), instrument shield is reflective

# Herschel Straylight

## ASAP models: Changes in large model since OSWG October 2002 (cont'd)

### SPIRE model:

- new reflectivities and scattering functions for FP unit (i.e. entrance box, now being more absorbing than before)
- new scattering function for thermal filter 1 (very recently, only a fraction of results obtained so far are based on the new scattering function), the new scattering function resembles that of a rough mirror.

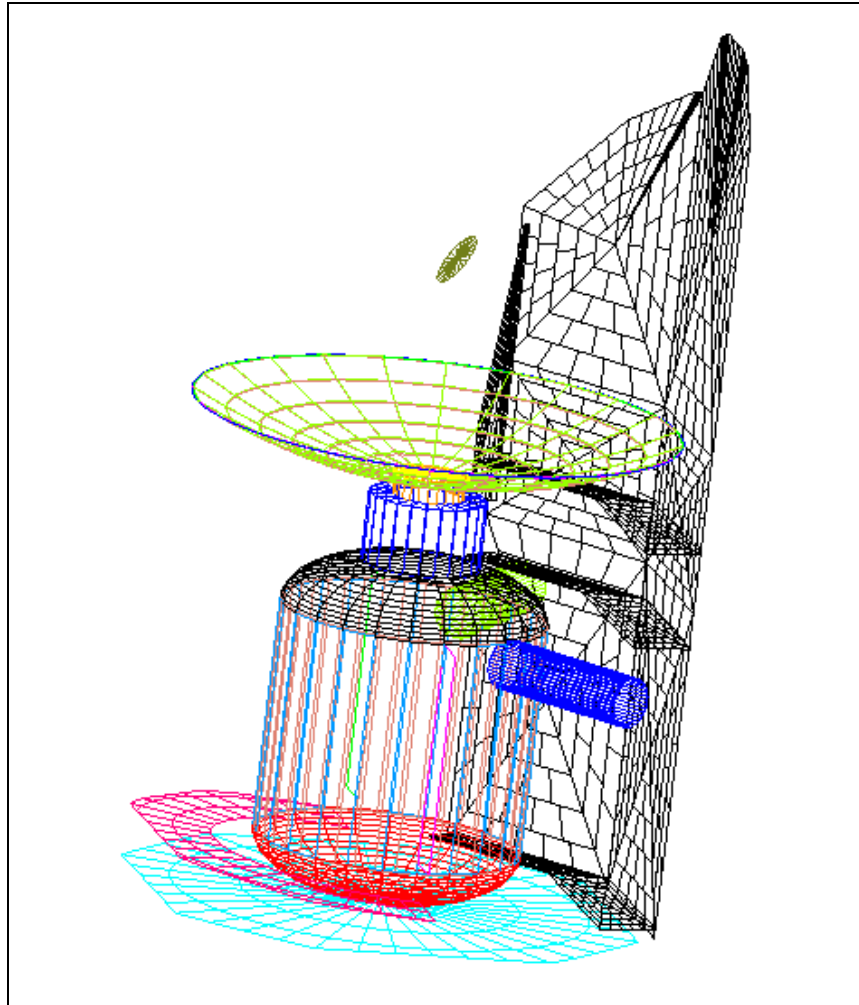
### PACS model:

- N. Geis suggested the inclusion of new commands for all PACS Mirrors in the model, also the calibration mirrors are included now (ASAP commands set by ASED based on data tables from N. Geis).

### Two auxiliary models created (not included in the large model)

- model for objects below the gap between sunshade and M1
- model for thermal shields from LOU windows to the cryostat opening.

# Herschel Straylight



Separate model for objects below the gap between sunshade and M1

result: the gap has a radiation with an apparent emissivity of 0.10 at  $T=204$  K, i.e. grey instead of black

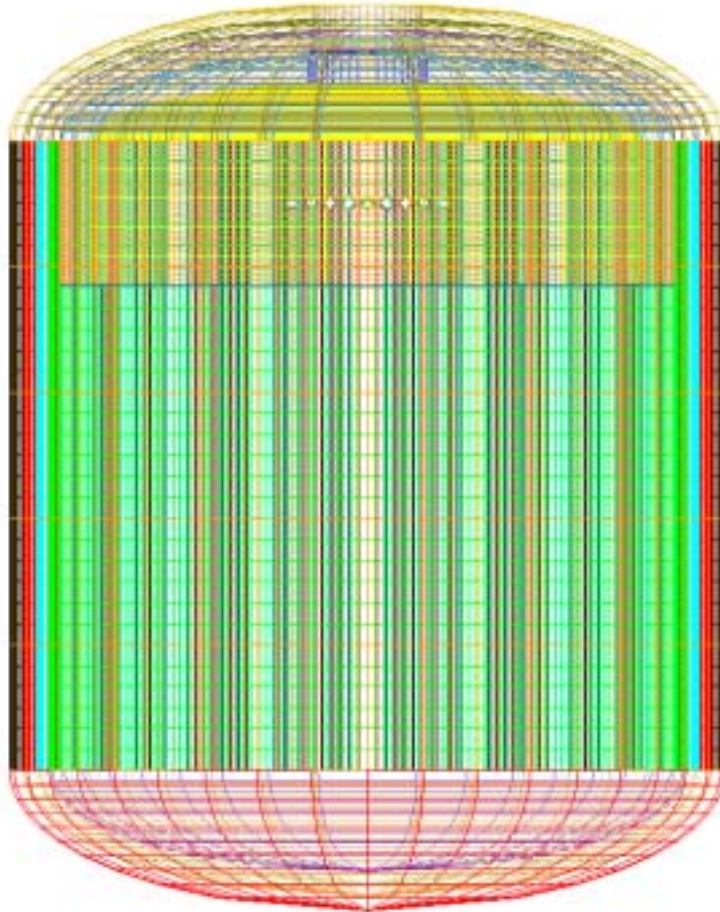
reasons:

- open directions to cold space
- some temperatures below 204 K

⇒ results for straylight from the gap (of october 2002) are reduced considerably (by 0.1/0.9), both scatter and diffraction results are reduced to below 1%



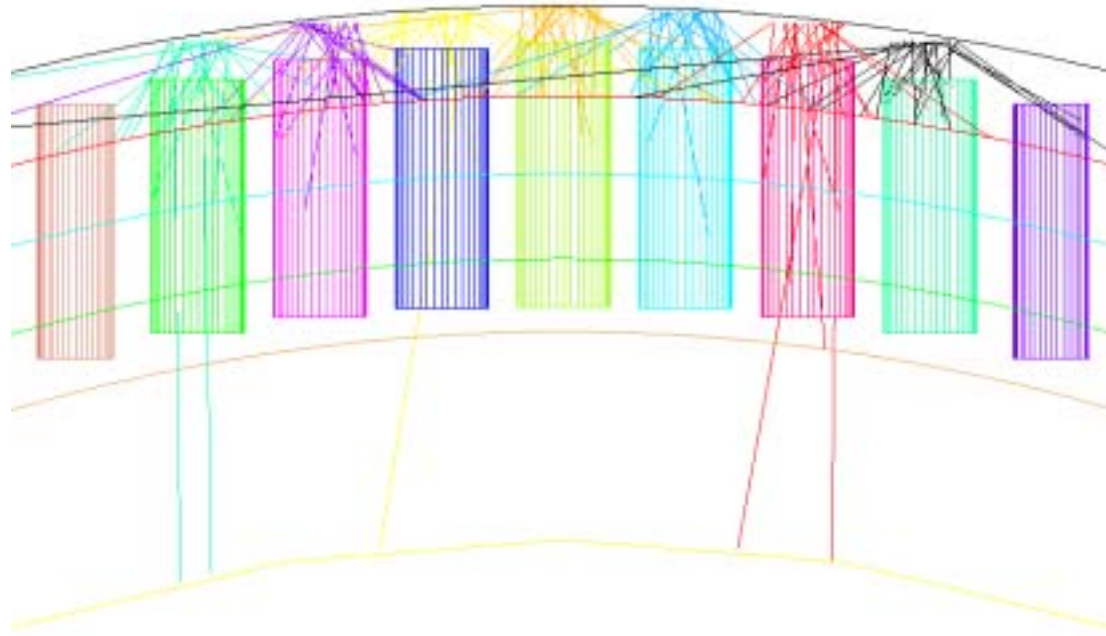
# Herschel Straylight



Separate model for thermal shields from LOU windows to the cryostat opening

Simulation of ray transport by a roughness random parameter of size 0.02 radian (for tubes and top spheres only, not for bottom spheres and for LOU baffles). This parameter slightly changes the ray direction from pure specular reflection

# Herschel Straylight



Details around the LOU windows for the preceding model.  
The different spheres from top to bottom are CVV, thermal shields 3, 2, 1, instrument shield and instruments (in a curved approximation)

Results for the radiation transport through the shields: negligible

# Herschel Straylight

## Requirements

a) Requirement on sources inside the FOV: compliant according to ASEF analysis.

b) Requirement on straylight from external sources (outside FOV):

Emitting Object	PACS	SPIRE	COMPLIANCE <sup>2)</sup>
Moon at 13 degrees	8.7E-04	5.0E-04	yes/no
Earth at 23 degrees	4.1E-03	1.8E-03	yes/no

<sup>2)</sup> Requirement: <1% of thermal self emission of both reflectors

Non-compliance – Moon within allowed solid angle at some specific directions: factor 17 above requirement due to reflections on hexapod structure (worst case – Moon bright zone, 80 $\mu$ )

c) Requirement on self emission: <10% of thermal self emission of both reflectors, see next slides.

# Herschel Straylight

## Diffraction calculations

### ---Diffraction at a rim within a pupil plane

expected distribution on detector planes: fairly homogeneous

most important case:

- source is the gap near the sunshade.
- diffraction at the rim of the secondary mirror.

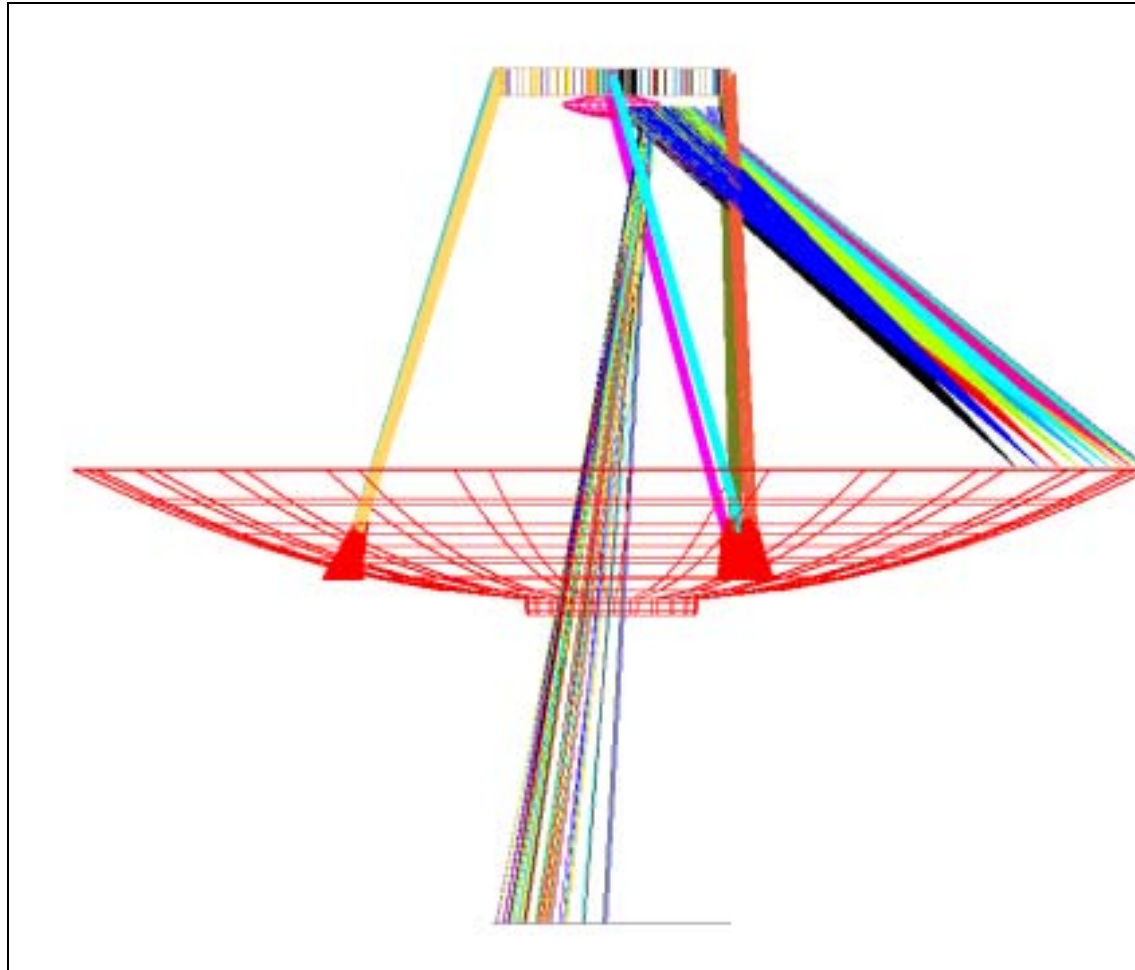
### ---Diffraction at a rim within an image plane

expected distribution on detector planes: steep increase from center to rim

most important case:

- sources are the warm objects during ground testing (CVV, gap etc.)
- diffraction at the rim of rectangular opening/filter in the telescope focal surface.

# Herschel Straylight



Diffraction at the rim of the secondary mirror.

Beams used for the calculation are shown.

Source is the gap near the sunshade

Calculation of irradiance in the telescope focal surface with ASAP's coherent module

# Herschel Straylight

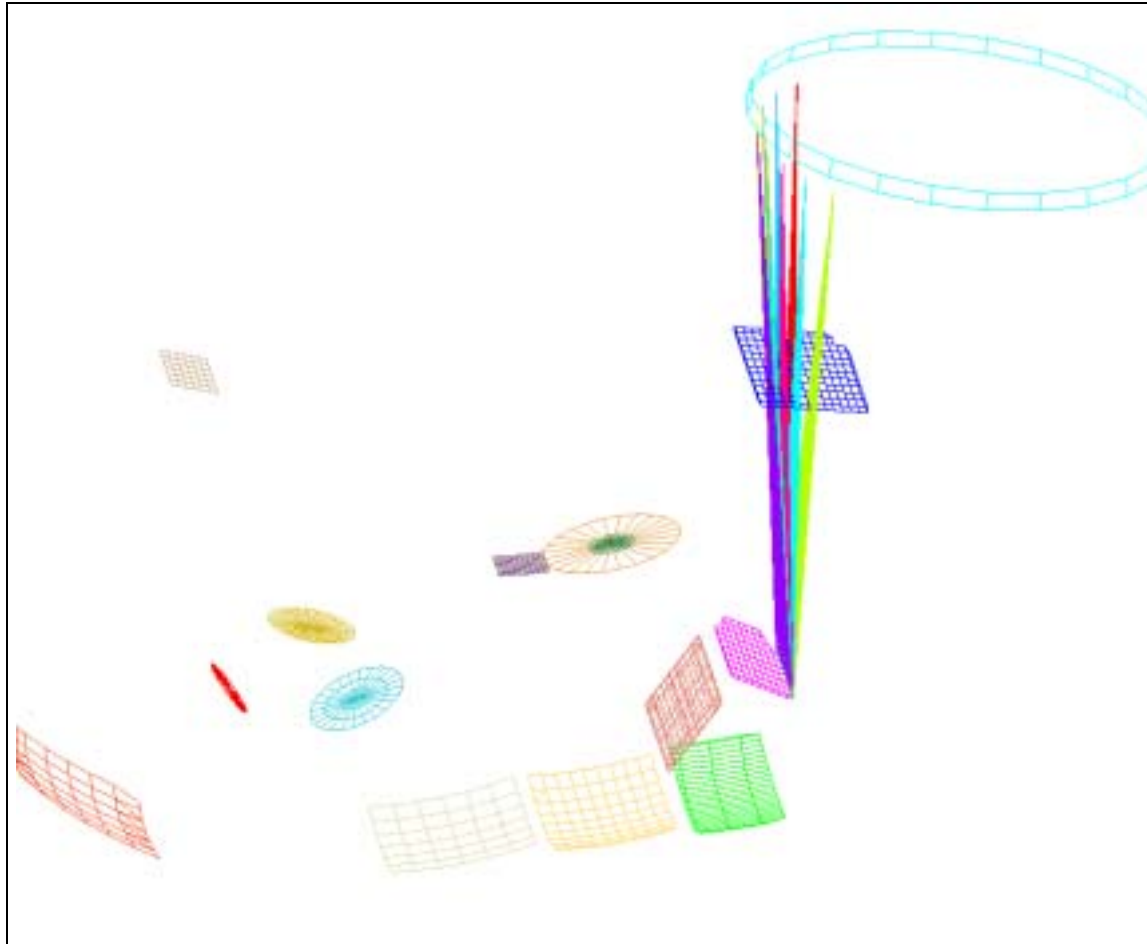
**Results for diffraction at the rim of the secondary mirror, source is the gap near the sunshade (orbit case).**

The diffraction is somewhat higher for the long wavelength end of SPIRE.

	SPIRE	PACS
	at Z=-90 mm	at Z=+80 mm
earlier results october 2002 ( $\varepsilon=0.9$ )	5%	4%
corrected with emissivity reduction $0.9 \rightarrow 0.1$ from auxiliary model	0.55%	0.44%

Data for PACS and SPIRE are in %  
with 100%= telescope irradiation (70 K, total  $\varepsilon=0.03$ )

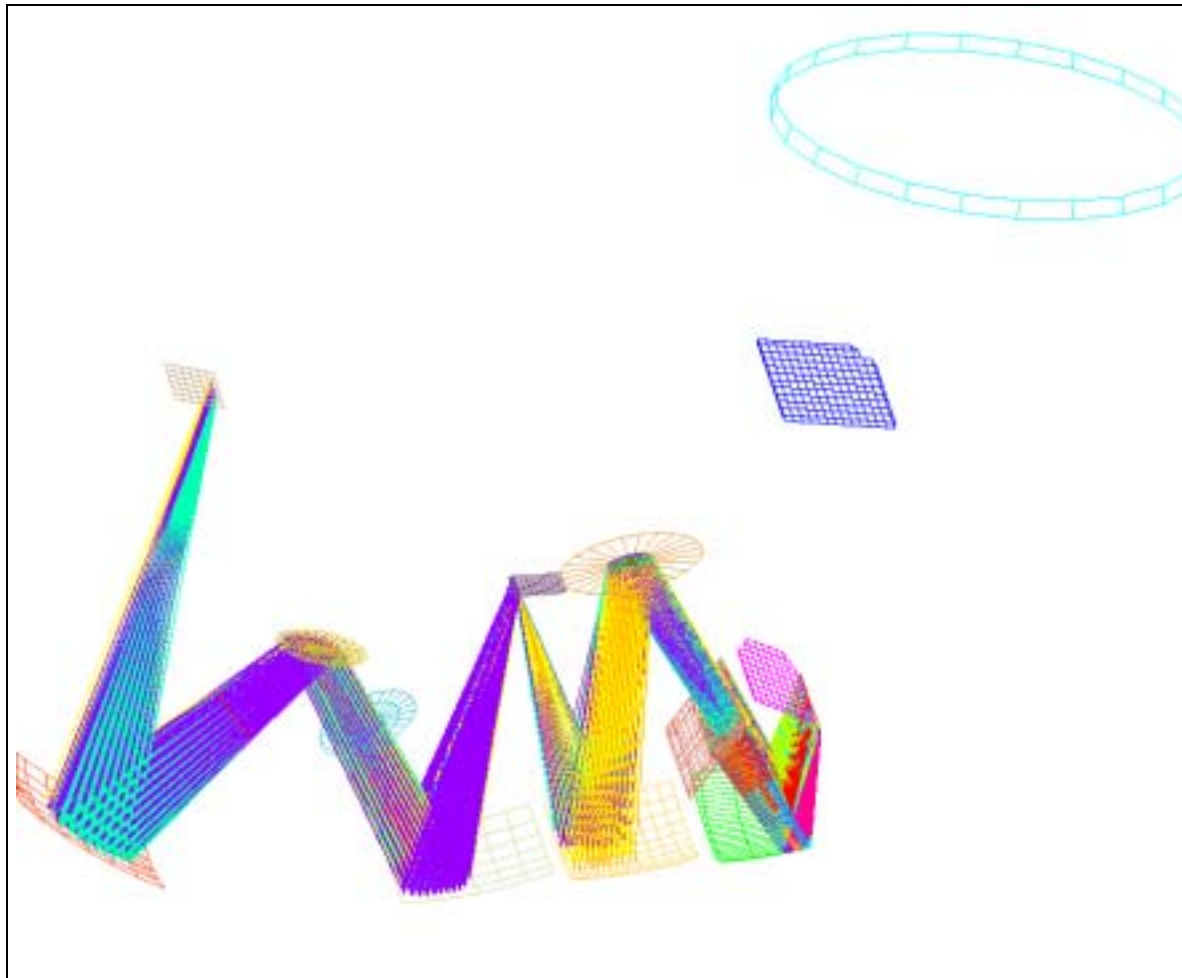
# Herschel Straylight



**Diffraction on rim of thermal filter 1 of SPIRE (within telescope focal surface), sources are CVV and objects nearby during ground testing, i.e. with warm rings = worst case**

STEP 1:  
--calculation of irradiance onto thermal filter 1 (shown schematically on the left)

# Herschel Straylight



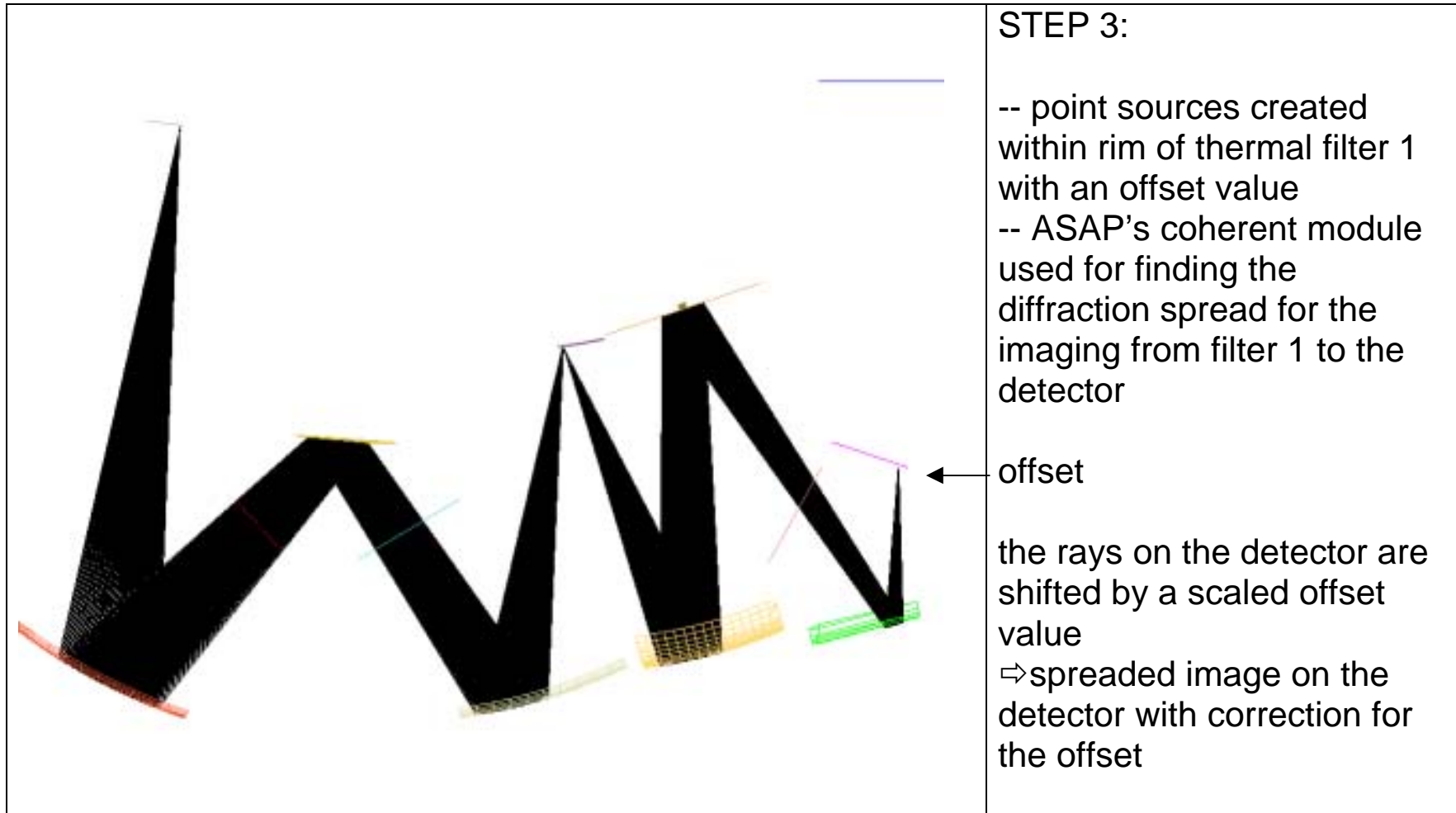
## STEP 2:

--diffracted rays created at the rim of thermal filter 1  
-- ray directions and fluxes as from method of stationary phase  
-- flux of diffracted rays collected on detector

calculational problem:  
rays converge outside rims of M6 and detector (by design)  
⇒ M6 and detector enlarged, the collected flux is an overestimation  
⇒ step 3



# Herschel Straylight



# Herschel Straylight

## Results for diffraction at a rim within an image plane, ground testing

emitting object	CVV (293K, $\varepsilon=0.05$ )		gap (293K, $\varepsilon=0.5$ )		black cone (70K, $\varepsilon=0.5$ )	
diffraction at a single rim of thermal filter 1 of SPIRE						
irradiance onto detector	230 $\mu\text{m}$	670 $\mu\text{m}$	230 $\mu\text{m}$	670 $\mu\text{m}$	230 $\mu\text{m}$	670 $\mu\text{m}$
maximum	0.0926	0.7949	0.0211	0.1812	0.1934	2.1276
average	0.0033	0.0379	0.0008	0.0086	0.0069	0.1015
minimum	0.0000	0.0003	0.0000	0.0001	0.0000	0.0008
diffraction at a single rim of PACS input (plane of rearview mirrors)						
irradiance onto detector	80 $\mu\text{m}$	230 $\mu\text{m}$	80 $\mu\text{m}$	230 $\mu\text{m}$	80 $\mu\text{m}$	230 $\mu\text{m}$
maximum	smaller than for 230 $\mu\text{m}$	0.0070	smaller than for 230 $\mu\text{m}$	0.0875	smaller than for 230 $\mu\text{m}$	0.0208
average		0.0003		0.0042		0.0010
minimum		0.0000		0.0000		0.0000

Data for PACS and SPIRE are in % with 100%= telescope irradiation (70 K, total  $\varepsilon=0.03$ )

# Herschel Straylight

## Summary for diffraction at a rim within an image plane

The irradiances listed in the preceding table actually occur at 4 sides of the detector (not only the one shown in the graph). The corresponding average values still are negligibly small.

This is also true, if another diffracting edge is taken into account (e.g. the input edge of SPIRE, the input edge of PACS). Although the diffraction effect varies from edge to edge, there is enough margin for that statement. Not all edges contribute appreciably to diffraction, since not all are irradiated by strong sources.

So, in general, the diffraction at edges close to the experiment openings are considered to have no appreciable effect.

Exception: For SPIRE the increase of irradiance towards the detector rim is not negligible at the longest wavelengths, there an appreciable rim of 3...10% has to be expected.

# Herschel Straylight

---

## Summary for diffraction at a rim within an image plane (cont'd)

The irradiances for the orbit case are reduced (compared to those shown for the ground testing), since the sources are colder.

All statements above rely on the condition that the detectors do not have a view onto those edges which are irradiated appreciably (near experiment openings). Misalignments (also within experiments) must not destroy this avoidance.

# Herschel Straylight

Self emission onto PACS/SPIRE detectors, small scattercone, pessimistic case

emitting object	temperat.	emiss.	PACS	SPIRE
sunshade	204 K	0.05	1.863	0.801
gap between sunshade and M1, scattered	204 K	0.10	0.189	0.091
gap betw. sunsh. and M1, diffracted on M2 rim	204 K	0.10	0.444	0.556
hexapod (ASEF analysis)	70 K	0.02	4.34	4.34
M1+M2 via hexapod (ASEF analysis)	70 K	0.015	7.54	7.54
scattercone (ASEF analysis)	70 K	0.015	0.62	0.62
M1 baffle flat + cone / cylinder	75 K	0.05	4.821	1.570
M1 baffle gap (12 mm) between cone / cylinder	75 K	0.90	1.511	0.324
cryocover mirrors	75 K	0.05	0.663	0.025
other reflecting parts of cryocover	75 K	0.05	0.067	0.020
short black cone of cryocover	75 K	0.80	1.714	0.242
reflecting objects near cryocover	75 K	0.05	0.454	0.068
black slits around and below cryocover and M1-baffle	75 K	0.90	2.436	0.362

Data for PACS and SPIRE are in % with 100%= telescope irradiation (70 K, total  $\epsilon=0.03$ )

# Herschel Straylight

Self emission onto PACS/SPIRE detectors, small scattercone, pessimistic case  
(continued)

emitting object	temperat.	emiss.	PACS	SPIRE
CVV plate top	75 K	0.05	1.212	0.076
gap between CVV and thermal shield 2 baffle	60 K	0.90	0.290	0.080
thermal shield 2 baffle	43 K	0.80	1.775	2.247
instrument shield baffle	12 K	0.05	0.002	0.002
gap betw. instr. shield baffle and instruments	12 K	0.90	0.075	0.033
LOU windows via HiFi	150 K	0.90	0.05	0.04
LOU windows via gaps between CVV and thermal shield 2 baffle instrument shield and instruments	150 K	0.90	0.226	0.020
<b>SUM</b>			<b>30.3</b>	<b>19.1</b>

Data for PACS and SPIRE are in % with 100%= telescope irradiation (70 K, total  $\epsilon=0.03$ ).  
Requirement is 10%

# Herschel Straylight

Self emission onto PACS/SPIRE detectors, small scattercone, optimistic case

emitting object	temperat.	emiss.	PACS	SPIRE
sunshade	155 K	0.015	0.361	0.174
gap between sunshade and M1, scattered	204 K	0.08	0.151	0.073
gap betw. Sunsh. and M1, diffracted on M2 rim	204 K	0.08	0.356	0.444
hexapod (ASEF analysis)	70 K	0.015	3.25	3.25
M1+M2 via hexapod (ASEF analysis)	70 K	0.015	7.54	7.54
scattercone (ASEF analysis)	70 K	0.015	0.62	0.62
M1 baffle flat + cone / cylinder	64 K	0.015	1.138	0.391
M1 baffle gap (5 mm) between cone / cylinder	64 K	0.90	0.495	0.112
cryocover mirrors	64 K	0.015	0.209	0.008
other reflecting parts of cryocover	64 K	0.015	0.016	0.005
short black cone of cryocover	64 K	0.50	0.843	0.126
reflecting objects near cryocover	64 K	0.015	0.107	0.017
black slits around and below cryocover and M1-baffle	64 K	0.90	1.917	0.301

Data for PACS and SPIRE are in % with 100%= telescope irradiation (70 K, total  $\epsilon=0.03$ )

# Herschel Straylight

Self emission onto PACS/SPIRE detectors, small scattercone, optimistic case  
(continued)

emitting object	temperat.	emiss.	PACS	SPIRE
CVV plate top	64 K	0.015	0.286	0.019
gap between CVV and thermal shield 2 baffle	55 K	0.90	0.251	0.072
thermal shield 2 baffle	40 K	0.50	0.965	1.280
instrument shield baffle	12 K	0.015	0.001	0.001
gap between instr. shield baffle and instruments	12 K	0.90	0.075	0.033
LOU windows via HiFi	136 K	0.90	0.05	0.04
LOU windows via gaps between CVV and thermal shield 2 baffle instrument shield and instruments	136 K	0.90	0.191	0.017
<b>SUM</b>			<b>18.8</b>	<b>14.5</b>

Data for PACS and SPIRE are in % with 100%= telescope irradiation (70 K, total  $\epsilon=0.03$ ).  
Requirement is 10%



# Herschel Straylight

Self emission onto PACS/SPIRE detectors with closed cryocover, without diffraction

emitting object	temperat.	emiss.	PACS	SPIRE
CVV	295 K	0.05	0.007	0.759
gap between CVV and thermal shield 2 baffle	295 K	0.50	0.042	0.484
short black cone of cryocover	75 K	0.50	0.134	5.748
thermal shield 2 baffle	50 K	0.80	0.137	0.695
gap betw. instrument shield and instruments	12 K	0.90	0.014	0.084
LOU/CVV via space below instrument shield	295 K	0.90	0.173	0.048
<b>SUM</b>			<b>0.51</b>	<b>7.8</b>

Data for PACS and SPIRE are in % with 100%= telescope irradiation (70 K, total  $\epsilon=0.03$ )

Remarks: The short black cone of cryocover recently changed from reflecting to black anodized due to thermal reasons.

# Herschel Straylight

Trade-off for emissivity of short cone of cryocover

Predicted Interface Temperatures for Ground Test

.	SPIRE L1	PACS L1	HIFI L1	SPIRE L3
temperature with black short cone of cryocover	6.7 K	6.6 K	4.8 K	8.1 K
temperature increase with reflecting short cone of cryocover	+1.5 K	+0.9 K	+0.3 K	+0.4 K

(L0 does not change appreciably)

	orbit		ground test	
	SPIRE	PACS	SPIRE	PACS
straylight with black short cone of cryocover	19.1%	30.3%	7.8%	0.51%
straylight decrease with reflecting short cone of cryocover	-0.2%	-1.5%	-5.1%	-0.12%

# Herschel Straylight

Waivers to be raised on:

- Requirement on straylight from external sources (outside FOV)
- Requirement on self emission.

Straylight requirement values are relative to telescope emission.

Proposal (agreed on OSWG meeting in June) :

Adherence to 'reference telescope' used earlier in the analyses, i.e. temperature 70 K, emissivity 0.015 for a single reflector (total 0.03).

Advantage:

Easy comparison with earlier analyses

Waiver has a fixed basis

Avoidance of apparent straylight 'changes' parallel to actual telescope changes.

The analysis will present multiplication factors for varying temperatures and emissivities of the telescope, i.e. supply the reader with data allowing for different telescope properties.

# Herschel Straylight

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Request from HIFI for a conical baffle shape within the center of M1 (instead of a plane ring)

- not included in the calculations since raised very late
- discussion with straylight specialists (ESTEC, Alcatel) on next actions only just started.