



# **Introduction**

**Matt Griffin**



## Meeting Objectives

### Instrument and ICC:

- Update the full consortium and science team on the instrument and Herschel Project Status
- Review ICC development
  - Data products, AOTs, Pipelines
  - Consortium resources and planning

### SPIRE Science Programme

- Review updated GT proposals produced by the SAGs
- Update the plan for preparation of the SPIRE Science Teams proposals for GT (and OT)



# Meeting Format

## Day 1:

- Introduction and updates on Herschel and SPIRE projects
- Review of flight Instrument Performance based on CQM and PFM 1 test results so far
- ICC update
- Photometer and FTS simulators
- ICC Steering Group meeting



## Meeting Format

### Day 2: SPIRE Science Team GT programmes

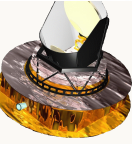
- **ESA plans for observing time calls**
- **Status of PACS and HIFI science programmes**
- **SPIRE SAGs splinter meetings**
- **Open time Key Programmes (HIGAL, ExtraHot)**
- **Report on recent BLAST flight**
- **Reports by the SAG coordinators**
- **Steering Group/Co-Investigators' meeting**
  - **Funding status**
  - **Science Team membership**
    - **Updated list**
    - **Activity monitoring**
    - **Guidelines and timescales for new appointments**
  - **Revision of SPIRE Science Programme Plan**



# Meeting Format

## Day 3: ICC

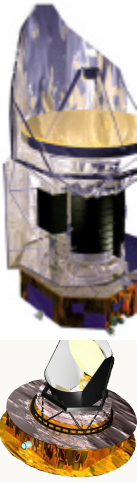
- Report on Co-Is and ICC SG meetings
- ICC status and plan
  - AOTs
  - Pipeline and data products
  - HSPOT demonstration



# SPIRE Consortium Meeting

## ESA Project Status

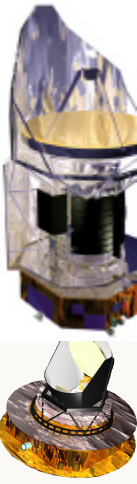
**Sarah Leeks on behalf of Carsten Scharmberg**



# Spacecraft Integration and Test – Highlights 1/4

## Major Milestones

- CDR Planck Payload Module Apr 15 – Jun 10, 2004
- CDR Herschel Payload Module May 11- Jul 7, 2004
- CDR Space Segment Aug 17 - Oct 12, 2004
- Mission CDR (final Board meeting) Apr 2005
  
- Launch Acceptance Review Feb 2007
- **Launch Aug 2007**



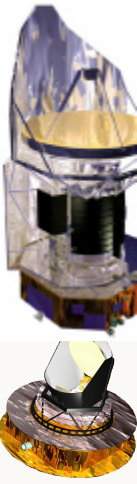
## Spacecraft Integration and Test – Highlights 2/4

### Herschel Payload Module

- EQM
  - Instrument warm unit tests completed
  - Cool down to start soon
  - IMT & EMC in Sep/Oct 05
  
- PFM
  - Integration completed of thermal dummies



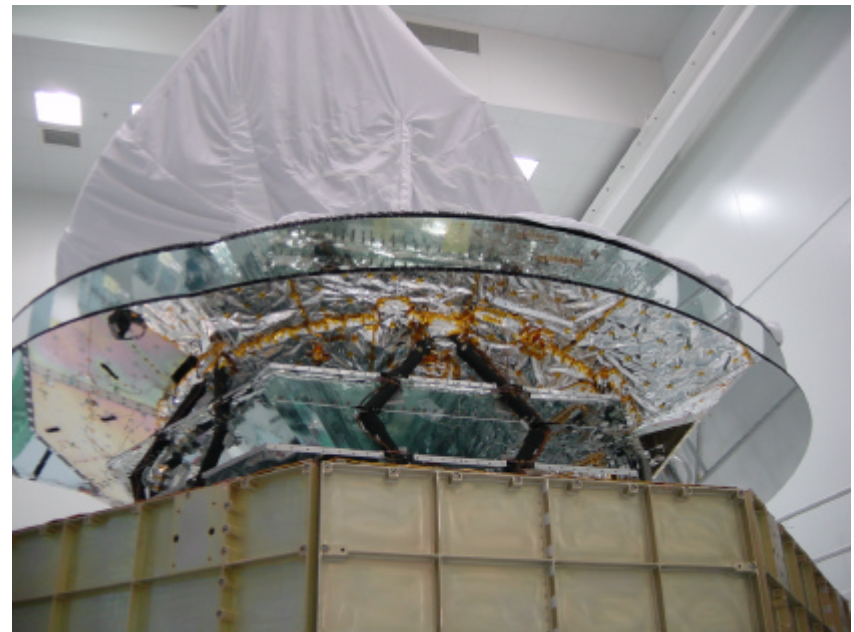


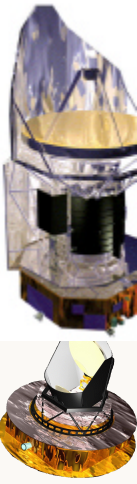


## Spacecraft Integration and Test – Highlights 3/4

### Planck Payload Module

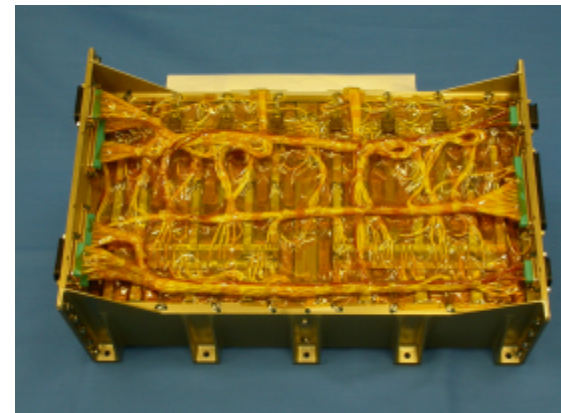
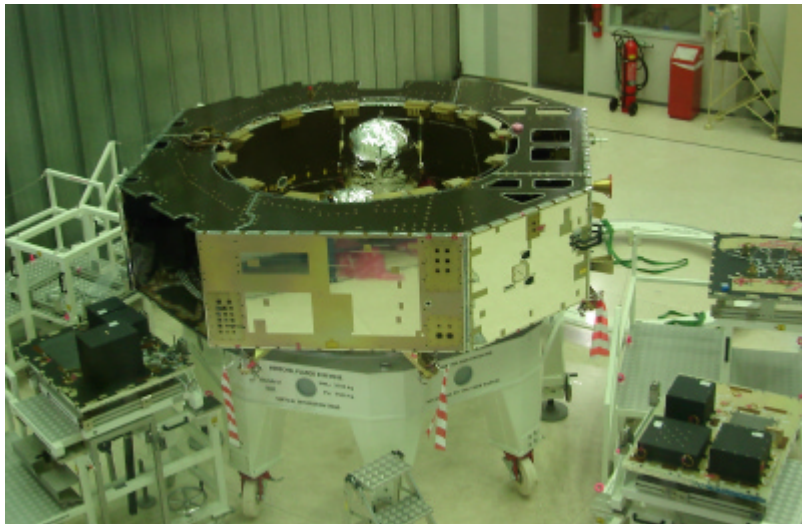
- CQM shipped to CSL
  - Test campaign:  
Jul 10 – Aug 20, 2005
  
- FM
  - integration started
  - First cold tests end 2005

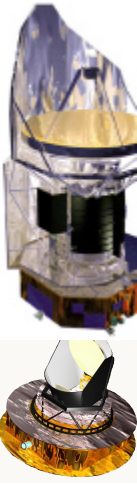
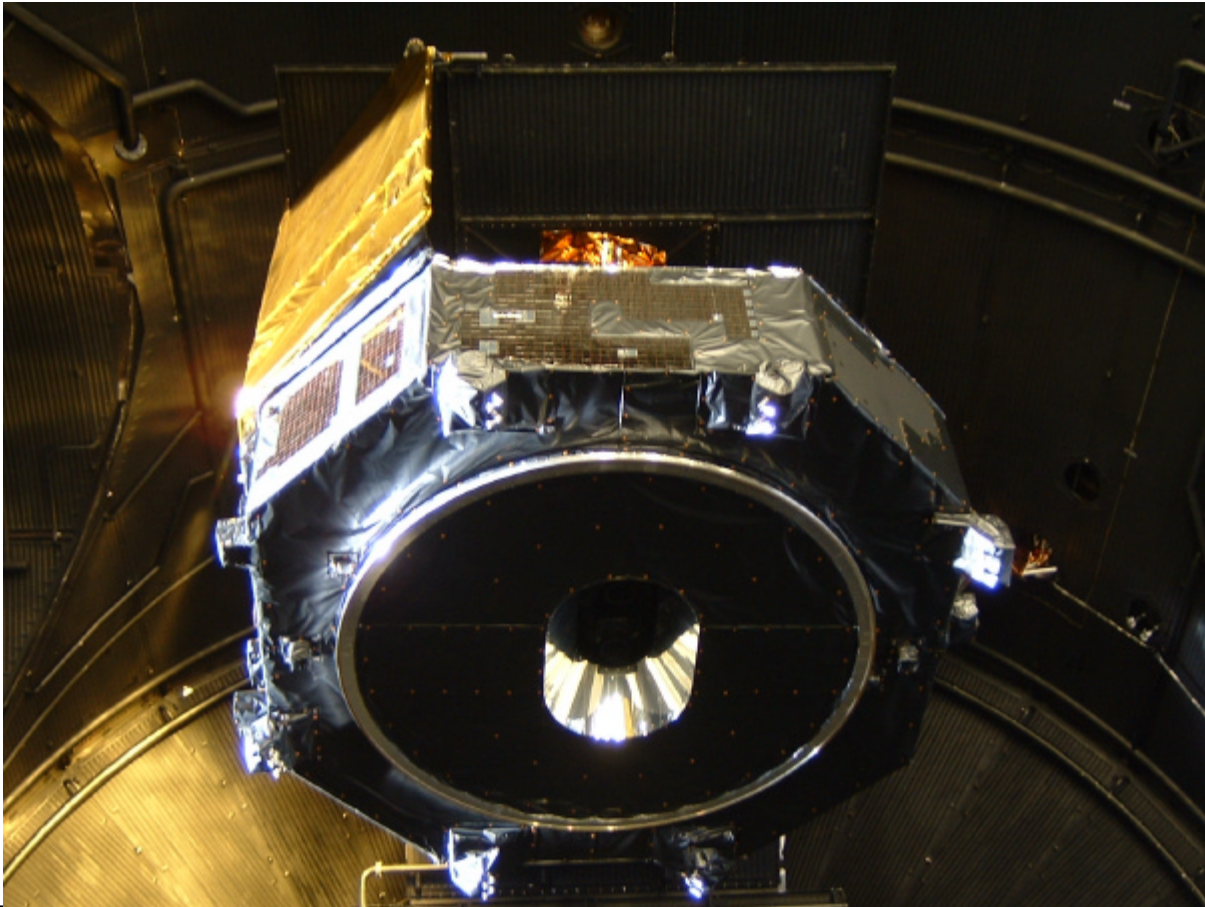


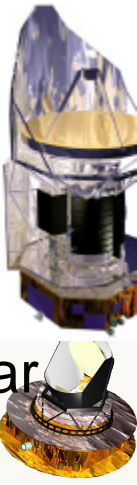


## Spacecraft Integration and Test – Highlights 4/4 Service Module

- ❑ STM Service Module (SVM) at ESTEC, Thermal Vacuum/Thermal Balance test in LSS completed
- ❑ Herschel and Planck FM SVMs integration started







## Mission CDR – Board Queries

**Spacecraft** – Reaction Control System tank membrane, solar array assembly and structure

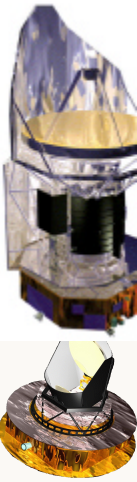
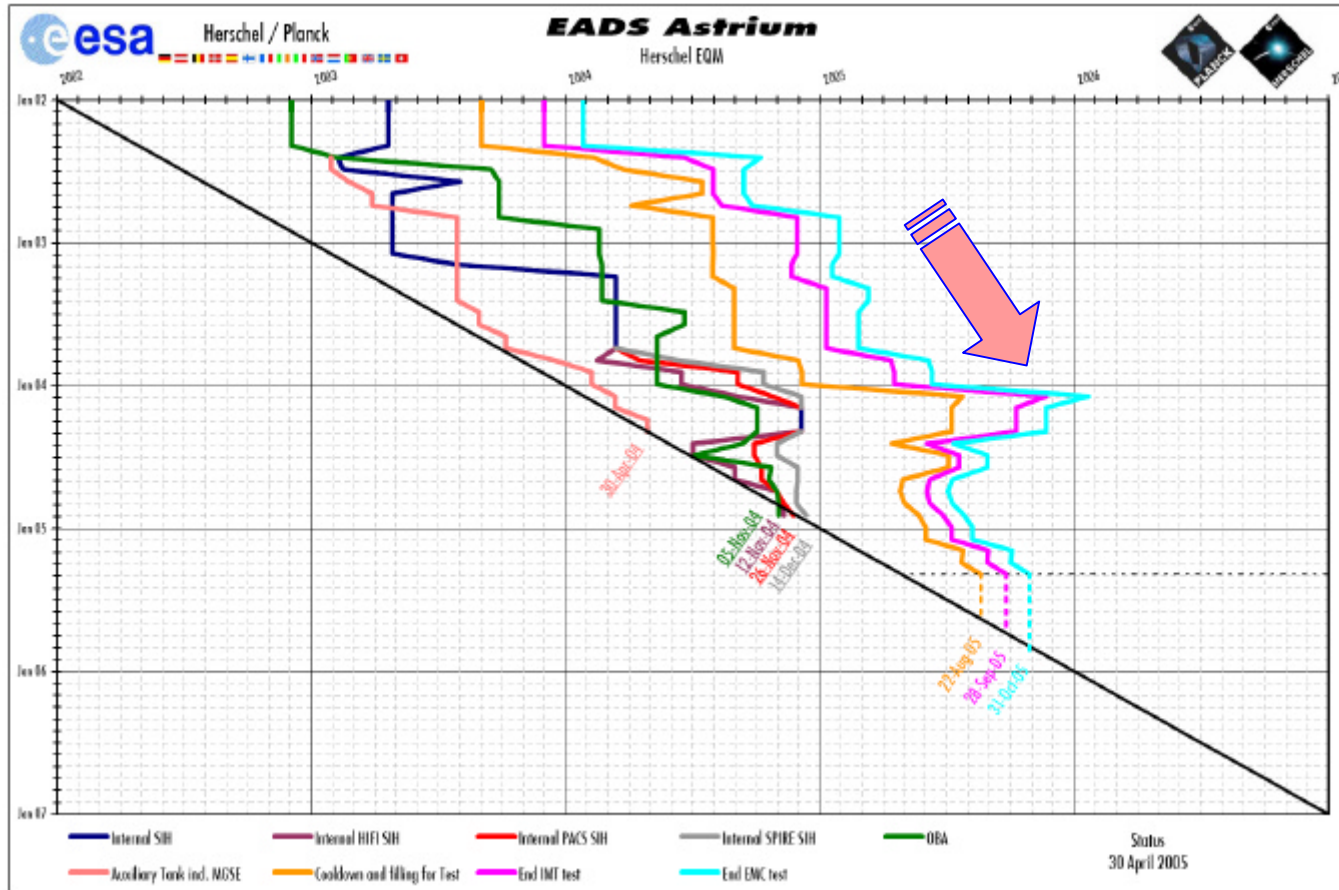
**Telescopes** – Planck reflectors/telescope verification and Herschel M1-M2 distance monitoring

### Instruments –

- Instrument schedule incompatibility with need dates
  - **Address root cause & reinforce initiated control**
- Recovery and re-scope scenarios
  - **To meet launch date assess necessity of re-scoping of instrument or verification program**

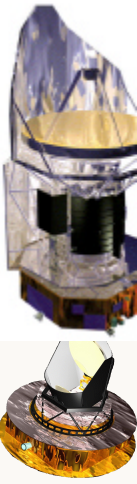
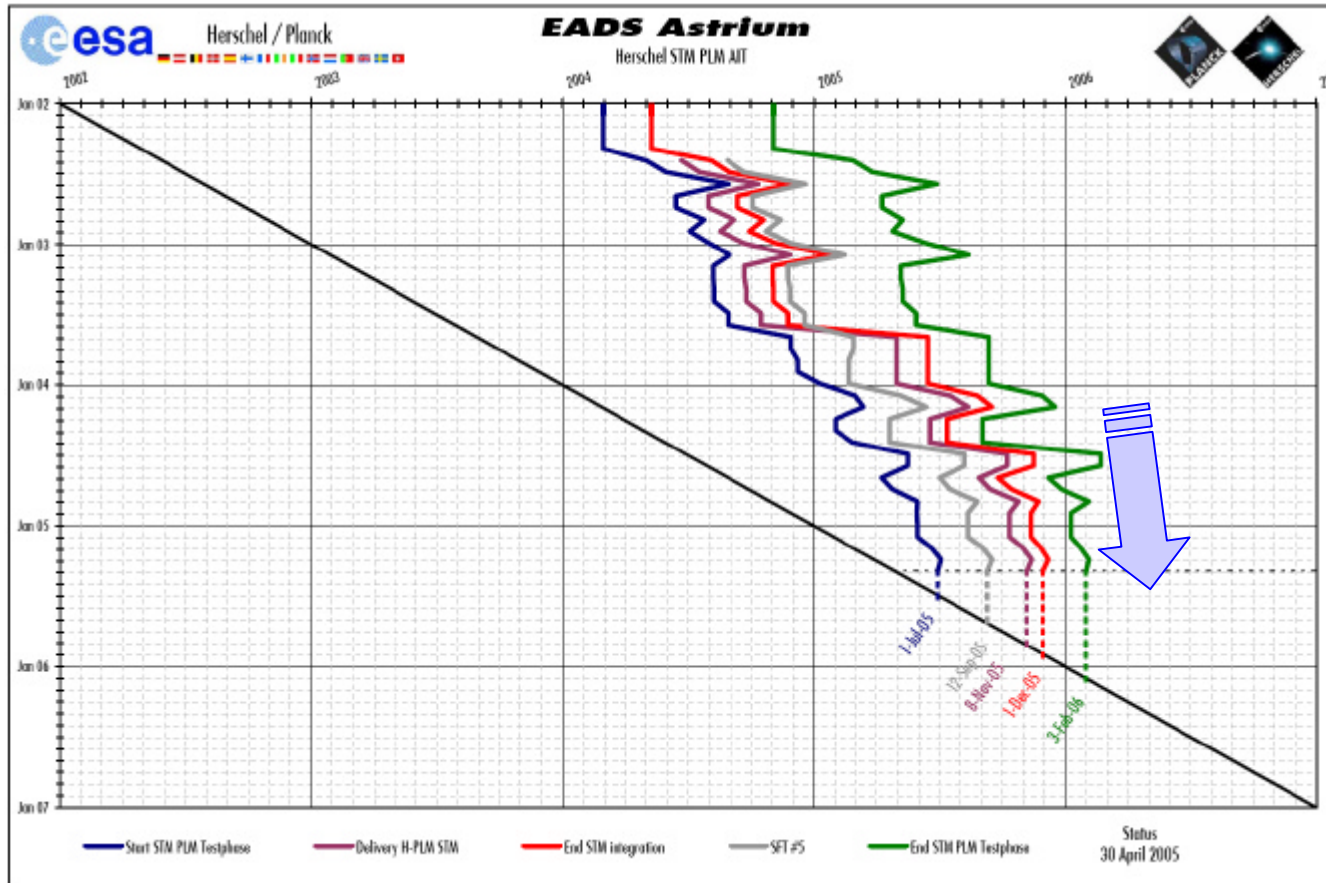


# Industry EQM Schedule



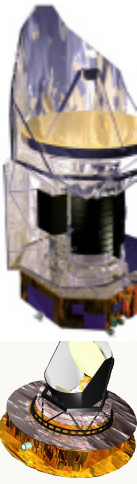
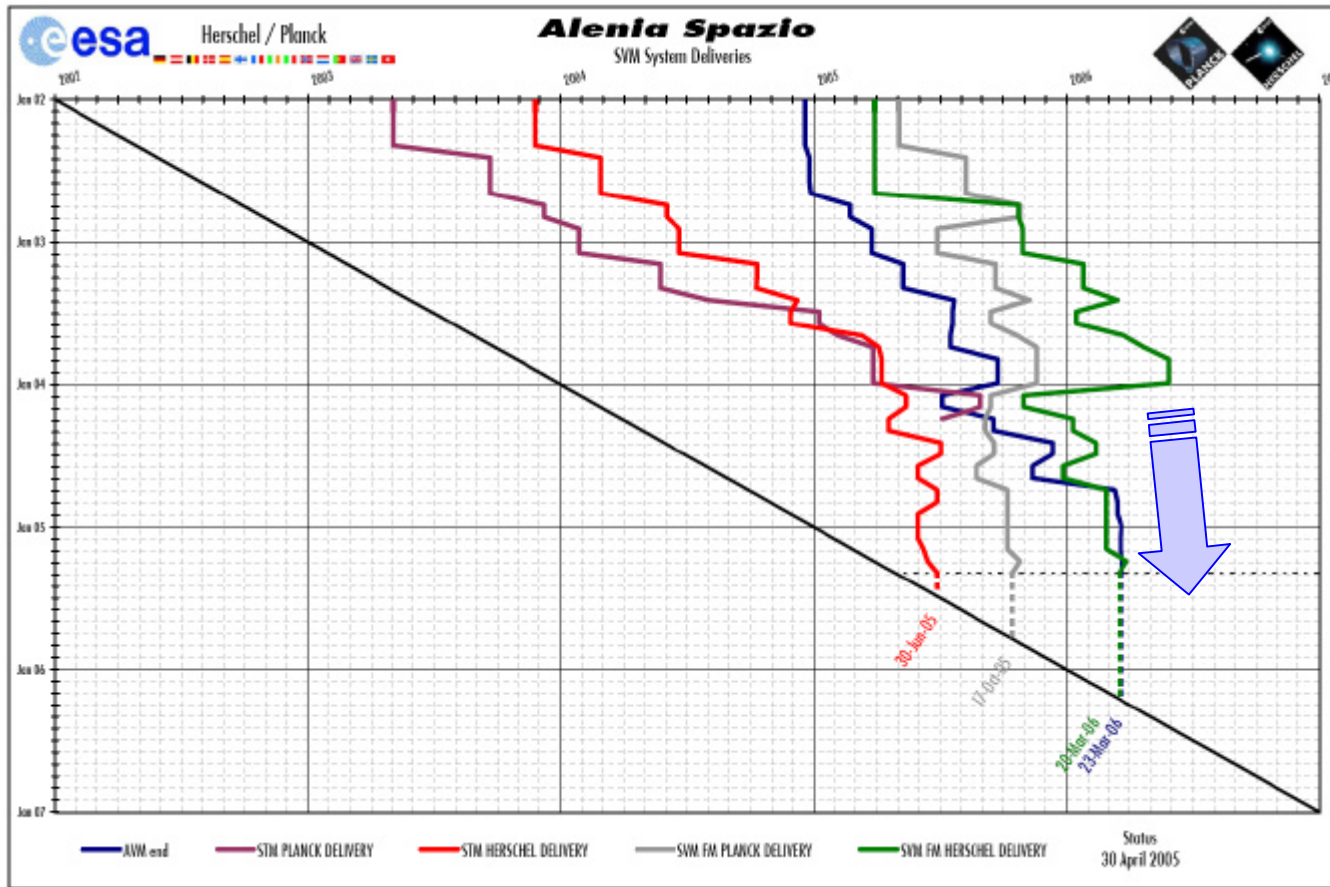


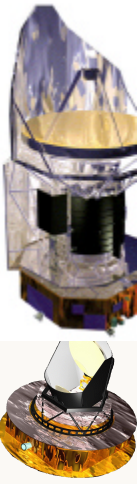
# Industry FM Schedules (1/2)





# Industry FM Schedules (2/2)

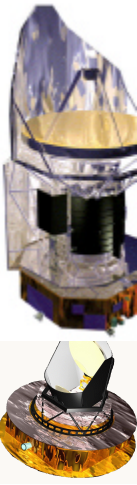




## Payload – Highlights (1/2)

- **Herschel/Planck PI and PM Meetings with ESA**
  - Held May 25 at ESTEC
  - Main message from ESA project: satellite FM on track for launch in Aug 2007 (see previous viewgraphs)
  - Next Meeting: 26 July 2005
- **DPU/ICU Status** 
  - Contract SIGNED
  - K.O. Jun 07, 05
  - CAPTEC takes over OBSW coordination at IFSI





## Payload – Highlights (2/2)

- **Instrument Schedules**

- (new) Critical areas identified
- Follow-up with national funding agencies
- FULL attention on FM program to ensure delivery at need date

- **Delivery Dates for Herschel Instruments:**

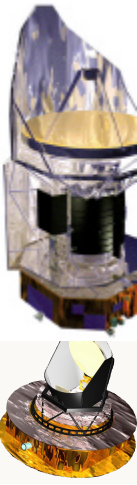
**CQM/AVM: delivered!**

**FM: Feb 28, 2006**

- **Instrument Interfaces**

**IID-A → 3.3 (3.4 to be issued soon)**

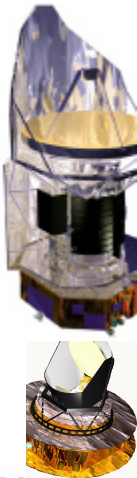
**IID-B SPIRE → 3.3 (3.4 to be issued soon)**



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## Instrument Qualification Review – IQR – Resumé

- ✓ IQR process completed and reported to Mission CDR Board
- ✓ In general – qualification status of instrument's FPU's is OK
- ✓ Warm unit qualification still needs to be performed either with dedicated QM's or with PFM's – delta reviews required.
- ✓ Board reports have been circulated
- ✓ Close-out of actions ... needs some more discipline !



# Herschel Telescope

2005 Events:

Primary mirror:

Polishing completed  
(Opteon) Apr 05

Coating (Calar- Alto) May 05

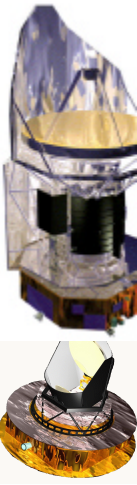
Hexapod and Telescope  
integration (EADS-Astrium-F)

Jun-Aug 05

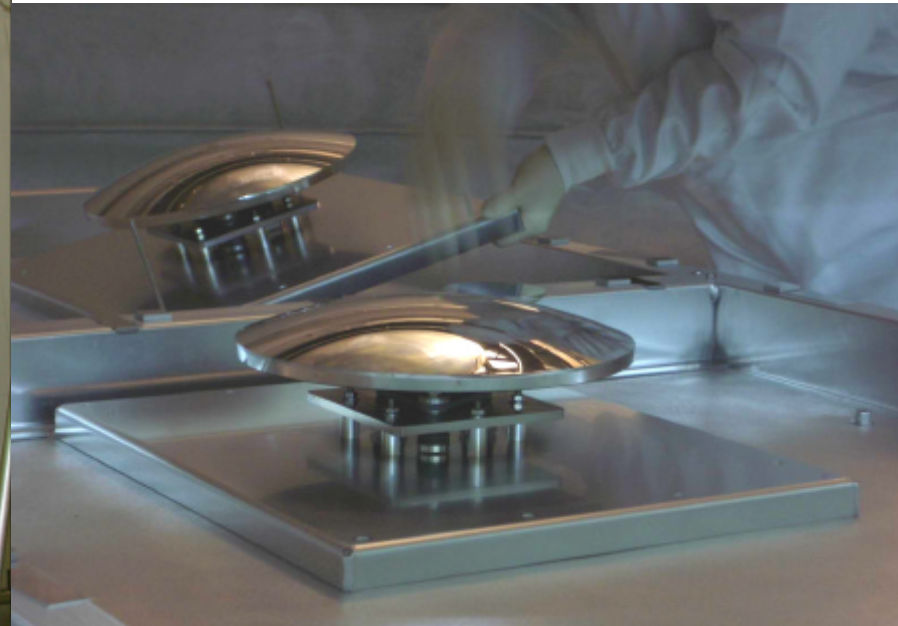
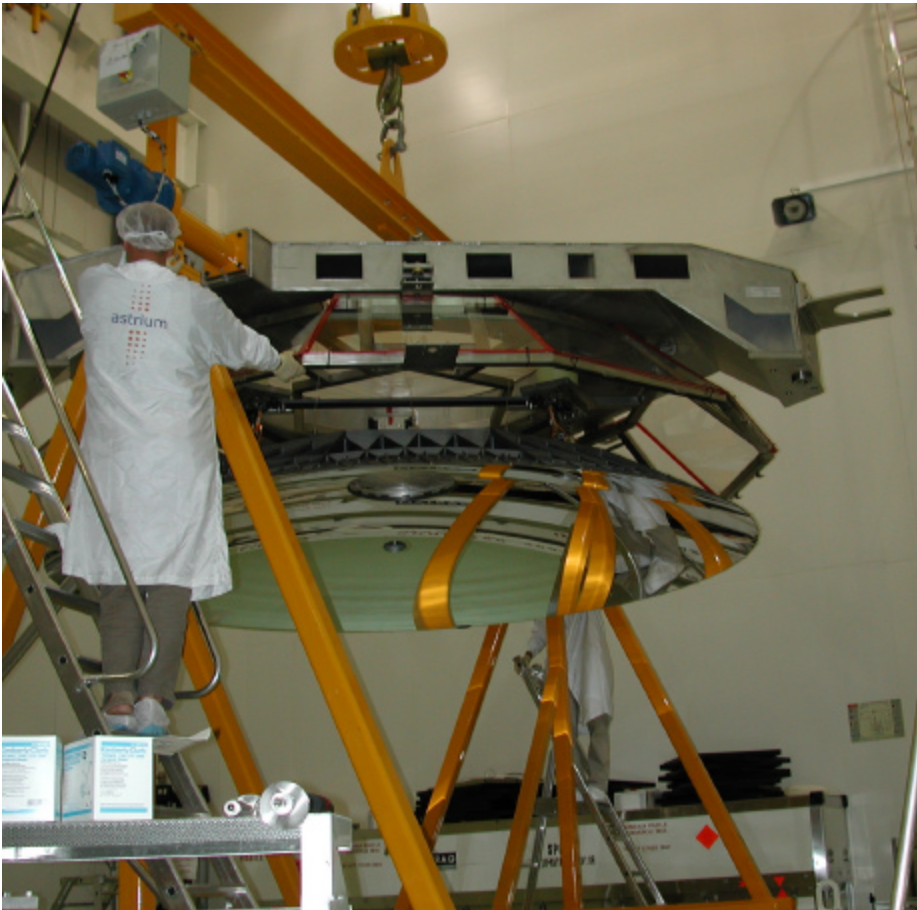
Telescope tests (CSL)

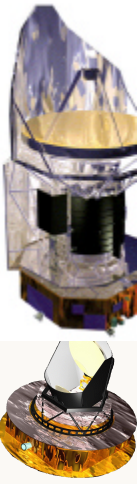
Oct-Nov 05





## The Mirrors





## Future Events

- **Industry:**

- EQM campaign (in Ottobrunn)

- \* SFT prior CVV Cooldown Aug 26, 05
- \* IMT Sep 15, 05
- \* EMC Oct 10, 05

- **Payload - Instruments**

- Next SPIRE progress meeting (telecon) Aug 5, 05



# Instrument Test Programme Progress and Schedule

Eric Sawyer/Ken King

## Topics

- Progress since last consortium meeting
- Present status
- Schedule
- Reviews
- Update on problem areas and risks



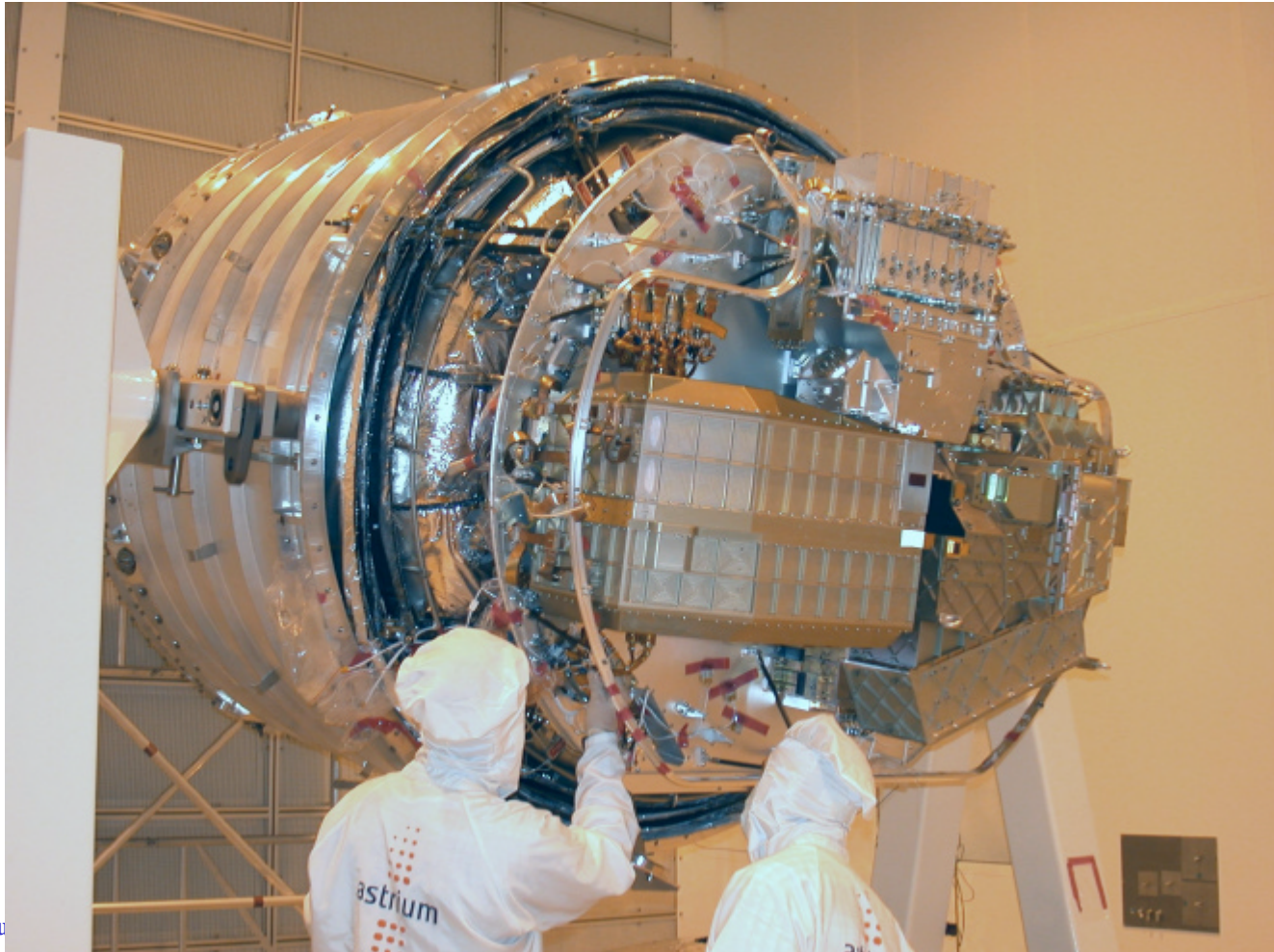
# Progress since last consortium meeting



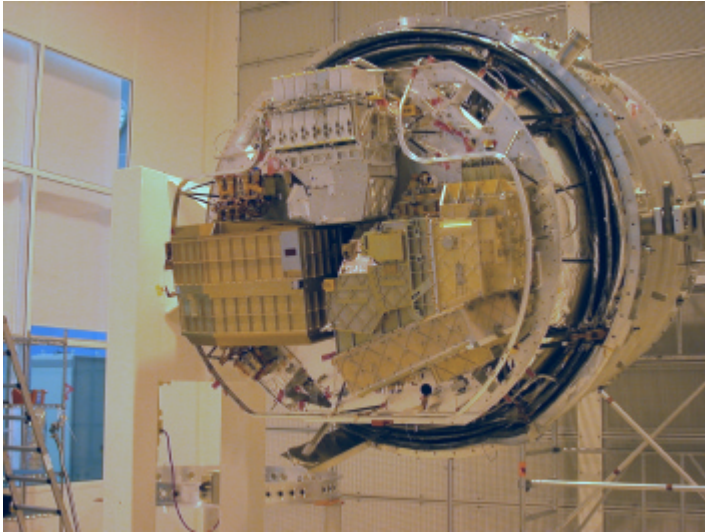
## Cold Qualification Model (CQM)

- At the time of the last consortium meeting in September 04 we had just started the post vibration cold test campaign "CQM2".
- This test has been completed.
- CQM instrument delivered to Astrium on 15th November.
- Functional test with warm electronics.
- Warm units returned to UK to be used in the PFM1 test campaign.
- Warm units redelivered on 15<sup>th</sup> April
- Harness connection 11 July
- Warm test with FPU 18 July

## Cold Qualification Model (CQM)



## Cold Qualification Model (CQM)



## AIV Facility Operation

- Test cryostat
  - 6 cool downs
  - One empty
  - Five with load (dummy, alignment model, CQMx2, PFM1)
  - Cool down procedure now well established
  - Minor modifications have been added
  - We can now control the Level-0 temperature
  - Helium usage much less than early runs
- FTS, telescope simulator, laser
  - Up and running since last September
  - Routinely used as part of the test equipment

## Proto Flight Model (PFM)

- First build was spectrometer only with working but non-flight SMEC
- First cold test (PFM1) started 18<sup>th</sup> February
- Completed on 15<sup>th</sup> April (warm)
- PFM reconfigured to full flight standard except for SMEC (still CQM) and dichroics
- Next test campaign (PFM2) due to start 29<sup>th</sup> July
- Then cold vibration test at CSL (with DM SMEC) late September.
- Then fit FM SMEC and do final test and calibration.
- May need to do additional cold vibration test.
- Final flight electronics (DRCU and DPU) not available until early 2006 - representative models will be used until then

## PFM 2 – Recent Problems

- PFM 2 cooldown has been delayed by some last-minute problems (as has occurred on all previous cooldowns . . . .)
  - Two in particular
    - Dichroics
    - JFETs
- Photometer dichroics
  - Hot pressed dichroics failed qualification
  - Reverted to previously qualified vacuum-gap design with metal spacers
  - New components were manufactured but failed under thermal cycling due to warping of improperly annealed rings
  - Solution:
    - Spare, non-flight units have been installed for PFM 2
    - New vacuum gap components being manufactured for installation after PFM 2 cooldown is complete
  - Dichroics re-work has delayed replacement of the flight SCAL with a re-optimised unit (tailored to accommodate lower telescope background)
    - New SCAL unit will be installed after PFM 2 cooldown

## PFM 2 - Some Recent Problems

- JFET module failure
  - An FM JFET module had four bad channels when tested warm at RAL
  - ESD damage suspected
  - Review of RAL facilities and handling procedure was carried out (including on-site audit by JPL ESD specialist)
  - Faulty unit returned to JPL for inspection
    - Faults found to be intermittent - not ESD
    - Possible mechanical problem - JPL are continuing to investigate
  - An alternative unit is being provided for PFM 2 cooldown

## SMEC Qualification Progress

- Successful warm vibration of SMEC DM at LAM to - 3 dB with respect to qual. levels
- This unit had
  - Nominal pivots (compatible with full FTS spectral resolution)
  - Dummy latch (fixed pin)
- SPIRE and ESA have agreed the levels used in this test
  - 6 dB for acceptance
  - 3 dB for qualification
- Further work needed on the latch qualification - to be completed on DM before delivery
- Qualification to be completed by cold vibration of the DM in the SPIRE FPU at CSL





# Schedule



# Current Flight Model I LT Plan

## PFM 2 cooldown

- Pump-down start 3 August
- FPU cold 15 August
- End of cold tests 9 Sept.
- Install flight dichroics, SCAL, and DM SMEC
- Cold vibration campaign Ship 26 Sept.  
(assuming that CSL facility available) Return 9 Nov.
- Install FM SMEC 11 Nov.

## PFM 3 cooldown

- Pump-down start 28 Nov.
- FPU cold 12 Dec.
- Cold testing
  - With FM DRCU from 6 Jan. (delivery date has been brought forward from Feb. by CEA)
- End of cold tests 18 Jan.

PFM FPU deliverability to Industry 13 Feb.

PFM DPU delivery to SPIRE (or spacecraft) March



# Reviews

## Reviews

- Instrument qualification review (IQR)
- 16<sup>th</sup> November 04 - successful for FPU did not cover warm units as they had not been qualified at this stage - some RID/Actions
- Instrument delivery review (DRB)
- 11<sup>th</sup> November - Instrument accepted for delivery
- Support from subsystems required, timely DRBs
- Subsystem EIDPs form part of the instrument EIDP



# Major problems and risks

## Update on major problems and risks

### 1 Schedule

- Some relaxation in delivery dates was announced
- Further adaptation of existing plan was required to stay on track.
- Still very tight

### 2 Warm Electronics

- DRCU schedule more or less consistent with the rest of the planning.
  - Very limited testing time available at system level
- DPU still delivered at end of testing
- OBS
  - ESA supporting development planning coordination
  - Version 2 planned for Oct/Nov

## Major problems and risks

### 3 Thermal design.

- We now have a workable thermal design, but still small margins
- The next test campaign (PFM2) will qualify the thermal design
- Final verification will only be at system level

### 4 Overshield on cryoharness

- Workaround solution has been implemented by Astrium

## Major problems and risks

### 5 Funding

- All groups have some funding problems
- Probably less of an issue than at the last meeting
- System group have a large amount of mopping up operations.
- Further delays are causing more cost escalations

### 6 FTS Mechanism Vibration Qualification

This unit is now close to being qualified; design improvements combined with reduced levels have brought success.



## Major problems and risks

### **7 FTS mechanism delivery**

The PFM planning is now shaped by this delivery

### **8 BDA Performance and Quality**

All PFM units now installed in FPU

Waiver accepted on DQE

EI DPs being finalised

### **9 JFET Noise and Power Dissipation**

Waiver accepted by SPIRE awaiting acceptance from ESA

## Major problems and risks

### **10 Microvibrations**

Detectors and SMEC appear not to be sensitive to levels in the test facility, which should be higher than on the spacecraft in orbit.

### **11 Flight SPARE**

SPIRE is committed to building and testing full FS FPU

UK budget for this will come under threat due to extension of the FM programme



SPIRE Consortium Meeting, Caltech, July 19-21 2005

# SPIRE Project Status

**Matt Griffin**

## Herschel and Planck Funding

- **Overall Cost at Completion (CaC) of Herschel-Planck has been increased by ~ €180M**
  - **Total CaC is now €1038M**
  - **This includes ESA and Industry costs (instrument costs are additional)**
- **ESA Science Programme Committee (SPC) established an “Investigation Group” before agreeing to increased cost**
  - **Various recommendations for Herschel-Planck and future projects**
- **New CaC includes provision for ESA support of ICCs to allow delivery of more advanced data products**

Nobody expects the



Spic Inquisition !

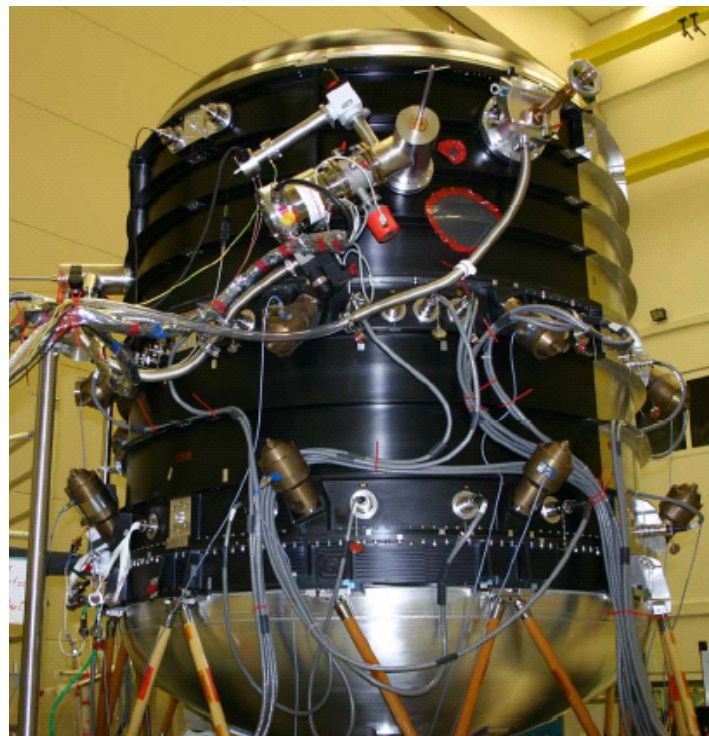
MONTY PYTHON'S  
FLYING CIRCUS

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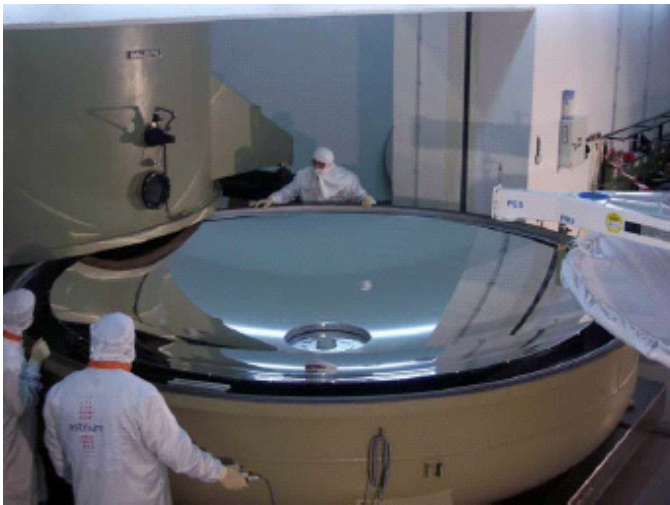
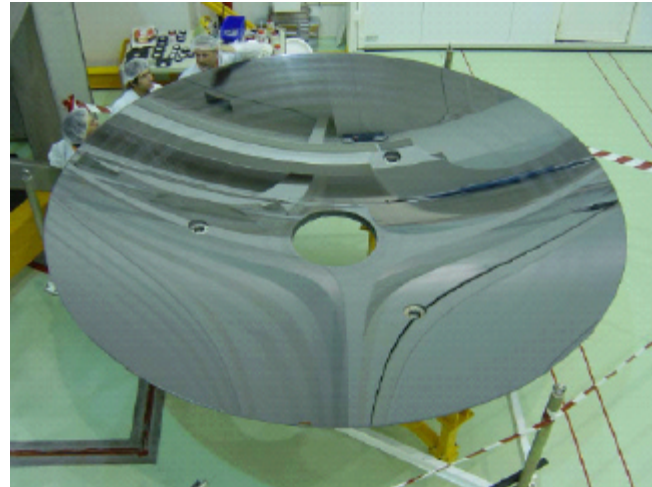
## Herschel- Planck Schedule

- August 2007 launch date is increasingly difficult
  - Industry can be ready to receive the Herschel instruments in February 2007



## **Telescope**

- **M1 and M2 now coated and under test**
- **Spec and schedule are OK**







## Herschel-Planck Schedule

- **Instrument teams latest schedules:**
  - **PACS: Delivery June 2006**
  - **HIFI: Delivery August 2006**
  - **SPIRE: “Deliverability” Feb. 2006**
    - **But more time needed for proper testing**
  - **Planck instruments: broadly similar situation**
- **ESA want**
  - **To avoid any science descopes**
  - **All possible measures to be taken by instrument teams and their supporting agencies to maintain or improve schedules and launch as early as possible**
- **Programmatic meeting planned with ESA, Instruments, PI agencies (plus NASA) on July 26 to discuss plans and implications**



## Herschel-Planck Schedule: ESA Project Manager's View

- Options for reconciliation:
  - #1: Recover instrument schedule by increased support
  - #2: Re-shuffle satellite FM test sequences (advance SC testing)
  - #3: Re-scope instrument capabilities to achieve delivery dates
  - #4: Launch delay
- Emphasis on options #1 and #2:
  - Tri-lateral Meetings held with ASI (DPU's), CNES (PACS, SPIRE, HFI), DLR (HIFI), SRON(HIFI)
- First feedback shows that some additional support and recovery is possible,
- SPC and funding agencies are aware of the situation
- Meeting organized at ESTEC on 26<sup>th</sup> July 2005 to agree on the way forward

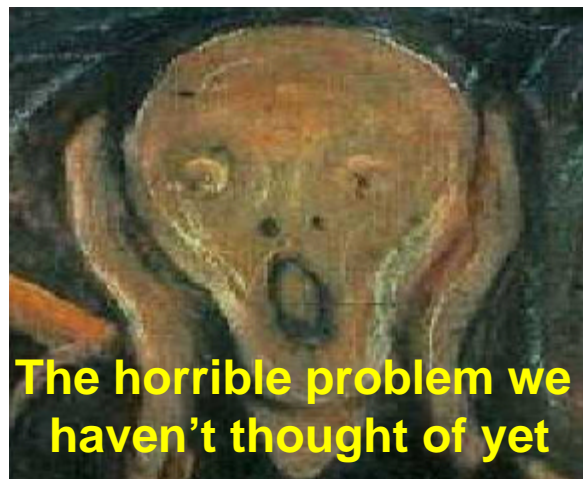


## UK Funding

- **PPARC has approved our funding bid for Herschel and Planck in the UK**
- **Preserves SPIRE Flight Spare programme**
- **Accommodates launch delay from Feb. to August 2007 (team continuation)**
- **Includes some modest technical contingency**
  - **But . . .**
    - **Exact details are to be confirmed**
    - **Flight model programme is likely to eat into funding for the FS**

## Status Summary

- **Flight Model programme is following a step-by-step approach**
  - Dictated by subsystem availability
  - Effective in retiring risk, gaining experience, optimising performance
- **Scientific performance is basically compatible with 1998 proposal**
  - But not not all aspects have been tested yet
  - Will rely on proper verification, characterisation and de-bugging
  - See Instrument Performance Review for details
- **Major outstanding issues**
  - Spectrometer mechanism delivery
  - FPU vibration qualification
  - Warm electronics deliveries
  - Thermal system verification
- **ICC can deliver basic data products, and partnership with HSC can extend to higher level products**
- **Science programme definition is in progress**
  - Optimisation and collaboration with other GT teams is now important



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