Herschel Open Time Key Program Workshop

Venue: 20-21 February 2007, ESTEC, Noordwijk, The Netherlands
Information: http://www.rssd.esa.int/Herschel/

Science Organisation:
Herschel Science Team
Local Organisation:
Herschel Science Centre

First Announcement
has been issued

Register online!

Welcome!

Welcome !!

Herschel Mission Overview and the Key Programme AO

Herschel Open Time Key Programme Workshop

ESTEC, Noordwijk, 20-21 February 2007

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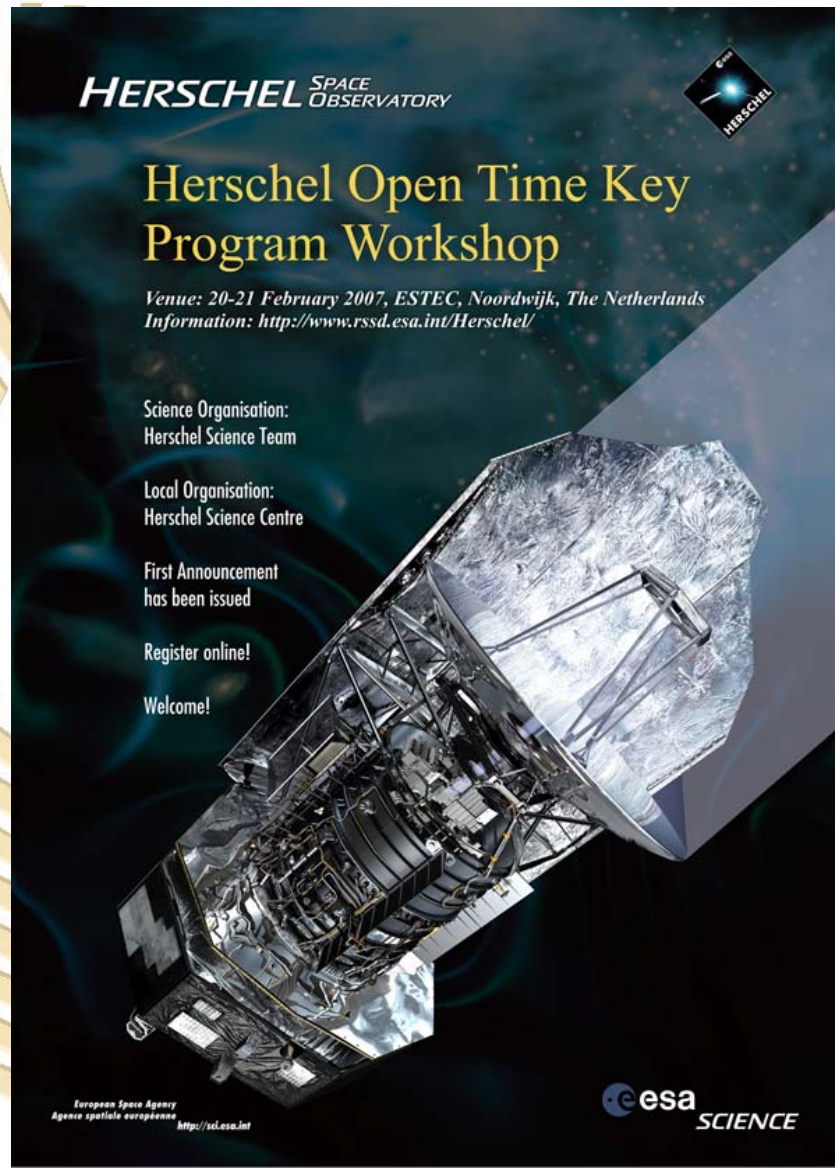
Herschel Project Scientist
Astrophysics Missions Division
Research and Scientific Support Department

HERSCHEL SPACE OBSERVATORY

Workshop introduction

- Science opportunities offered by Herschel
- Information of Herschel science capabilities
- Preliminary information about GT programs
- Provide forum for the exchange of ideas for possible OT programs
- Provide observation planning information
- ➔
- Maximise science return



HERSCHEL SPACE OBSERVATORY

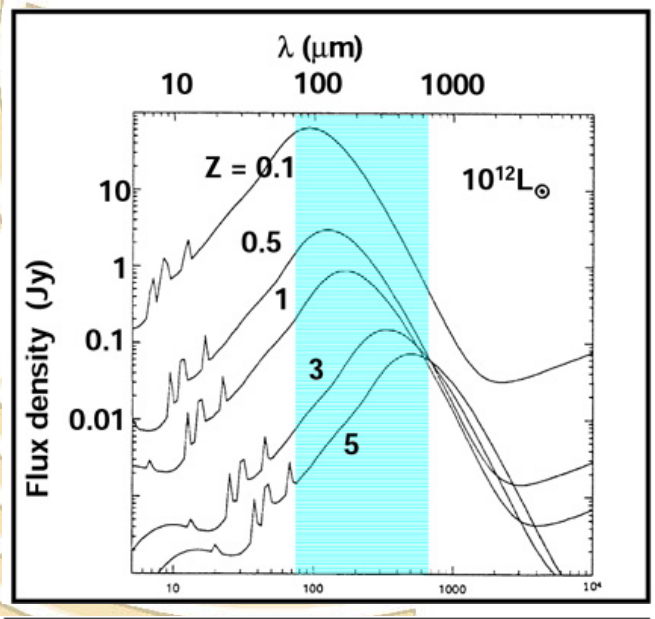
Herschel in a nutshell

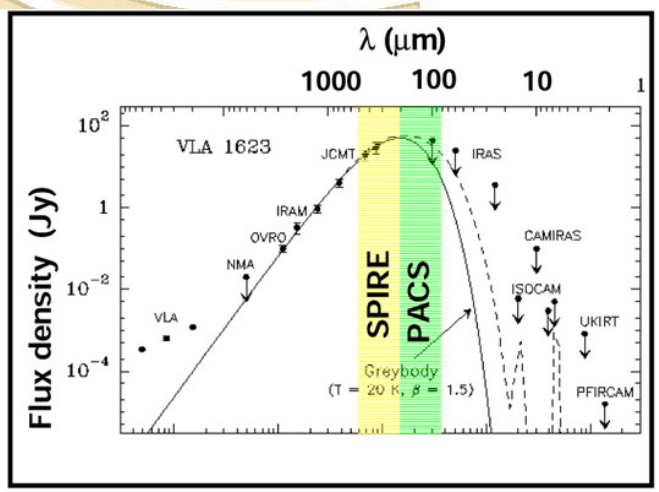
- **ESA cornerstone observatory**
  - instruments ‘nationally’ funded, int’l - NASA, CSA, Poland – collaboration
  - ~1/3 guaranteed time, ~2/3 open time
- **FIR (57 - 670 μm) space facility**
  - large (3.5 m) monolithic low emissivity passively cooled telescope
  - 3 focal plane science instruments
  - 3 years routine operational lifetime
  - full spectral access
  - low and stable background
- **Unique and complementary**
  - for λ < 200 μm larger aperture than cryogenically cooled telescopes (IRAS, ISO, Spitzer, Akari,…)
  - more observing time than balloon- and/or air-borne instruments
  - larger field of view than interferometers
- **Launch in 2008**
  - **the initial observing AO was issued on 1 Feb 2007**

HERSCHEL SPACE OBSERVATORY

The Cool Universe

- **Herschel spectral coverage**
  - black-bodies 5-50 K
    - continuum radiation
    - dust grains (re-)radiating
  - gases 10-few100 K
    - brightest atomic/molecular lines
- **Herschel strengths**
  - covers IR dominated galaxies & protostar SED peaks
  - wide area mapping
  - full coverage spectral scans & particular (water) lines
- **Herschel emphasis**
  - formation and evolution of galaxies & stars
  - ISM physics & chemistry
  - solar system bodies





HERSCHEL SPACE OBSERVATORY

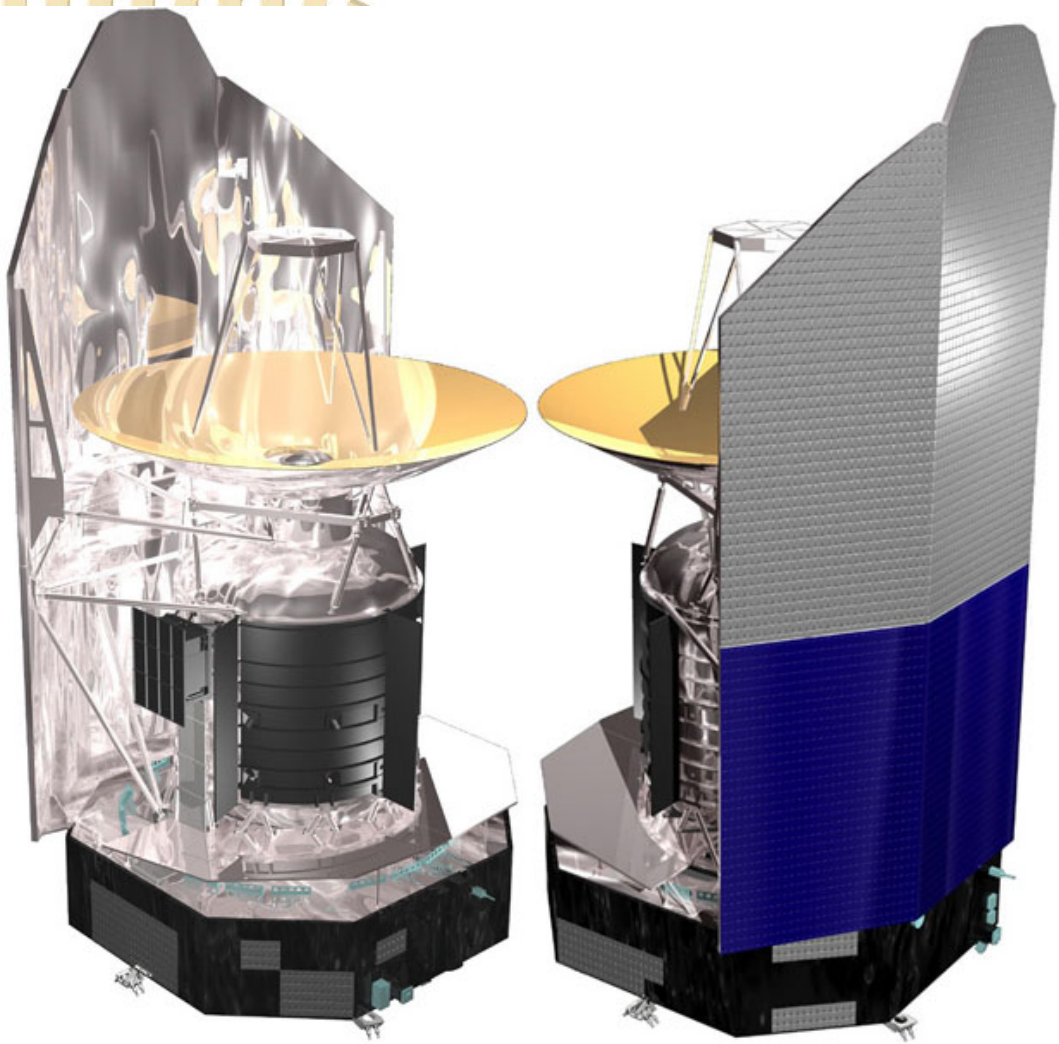
Herschel mission elements

- **Space segment**
  - Spacecraft, with
  - Payload
  - Telescope
- **Mission operations**
  - Mission Operations Centre (MOC), ESOC
  - Ground stations, Australia & Spain
- **Science ground segment**
  - Herschel Science Centre (HSC), ESAC
  - Instrument Control Centres (ICCs), SRON-G, RAL, MPE
  - NASA HSC, IPAC

HERSCHEL SPACE OBSERVATORY

Herschel spacecraft *specs*

- telescope (eff) diam (3.3) 3.5 m
- *telescope WFE* *< 6 μm*
- *telescope temp* *< 90 K*
- *telescope emissivity* *< 4%*
- *abs/rel pointg (68%)* *< 3.7” / 0.3”*
- science instruments 3
- science data rate 130 kbps
- *cryostat lifetime* *> 3.5 years*
- height / width ~ 7.5 / 4 m
- launch mass ~ 3300 kg
- power ~ 1500 W
- orbit ‘large’ Lissajous around L2
- solar aspect angle 60-120 deg
- launcher (w Planck) Ariane 5 ECA



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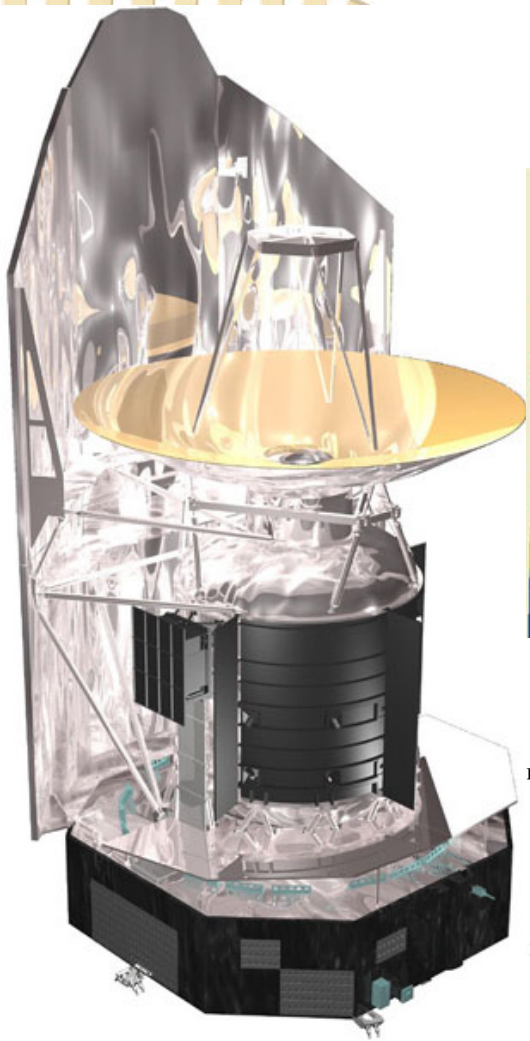
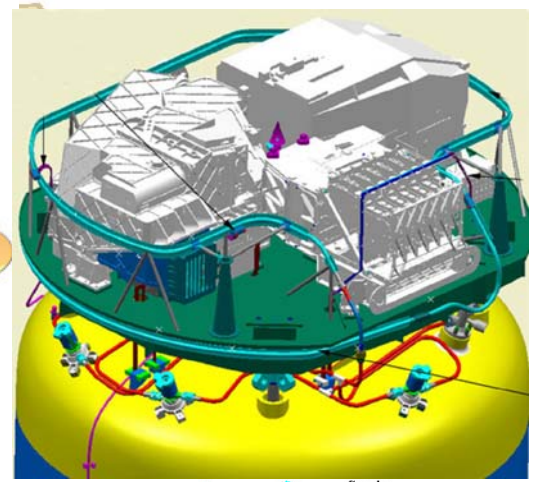
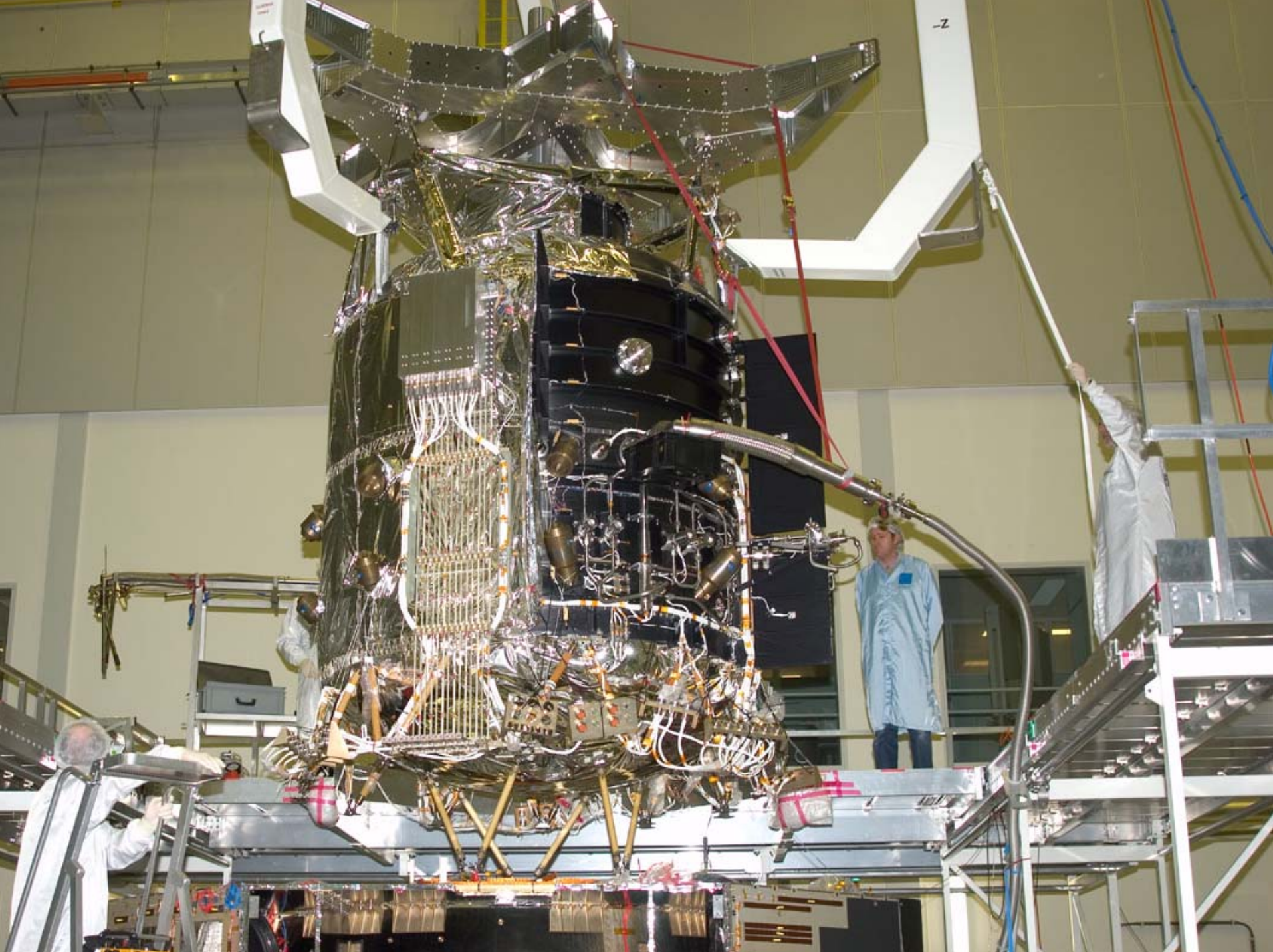






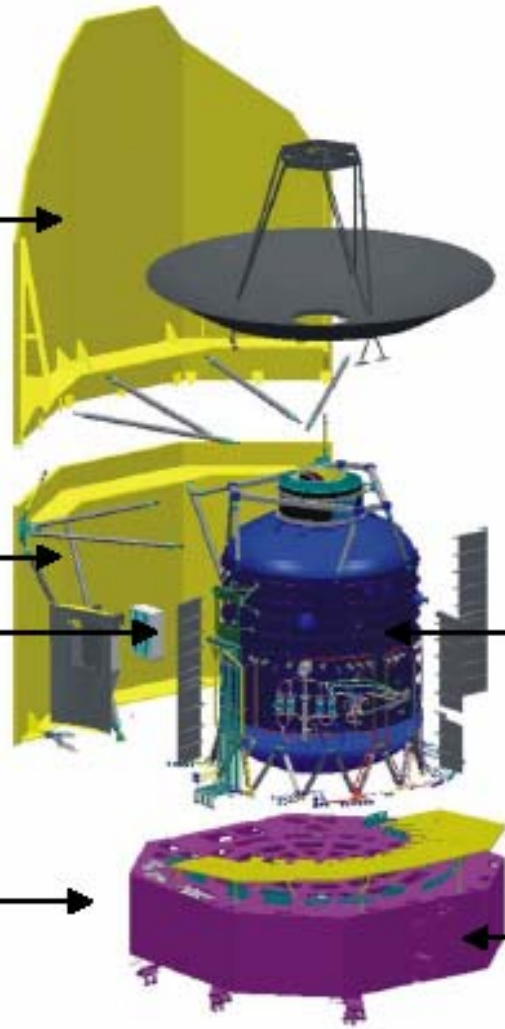

-Z
APCO
APCO

Herschel STM satellite

Herschel Science Team visited the ESTEC Test Centre to view the Herschel STM satellite on 1 Feb 2006

HERSCHEL SPACE OBSERVATORY

Herschel spacecraft



Sun Shade

Telescope

Solar Array

Local Oscillator Unit

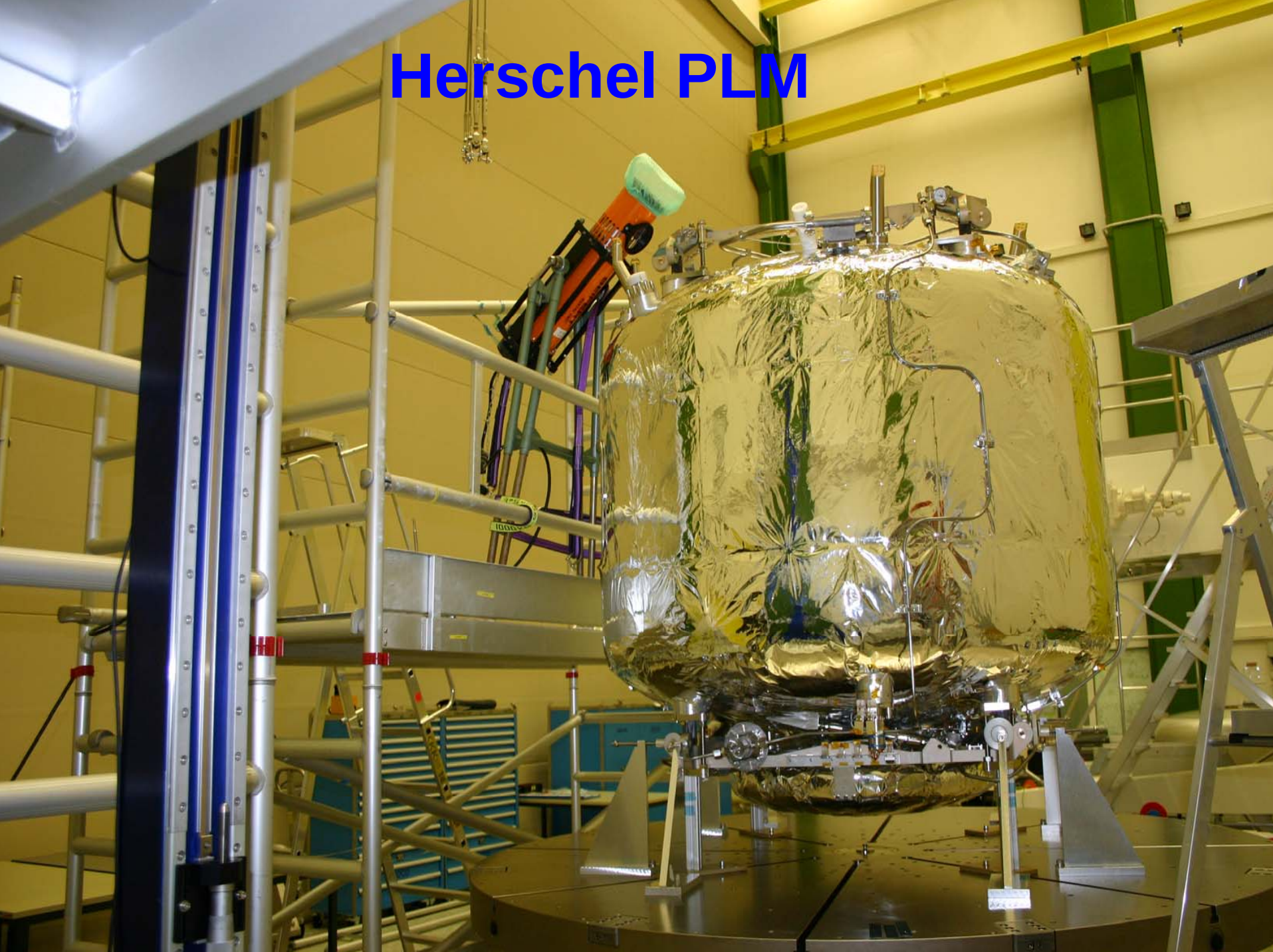
Cryo Vacuum Vessel

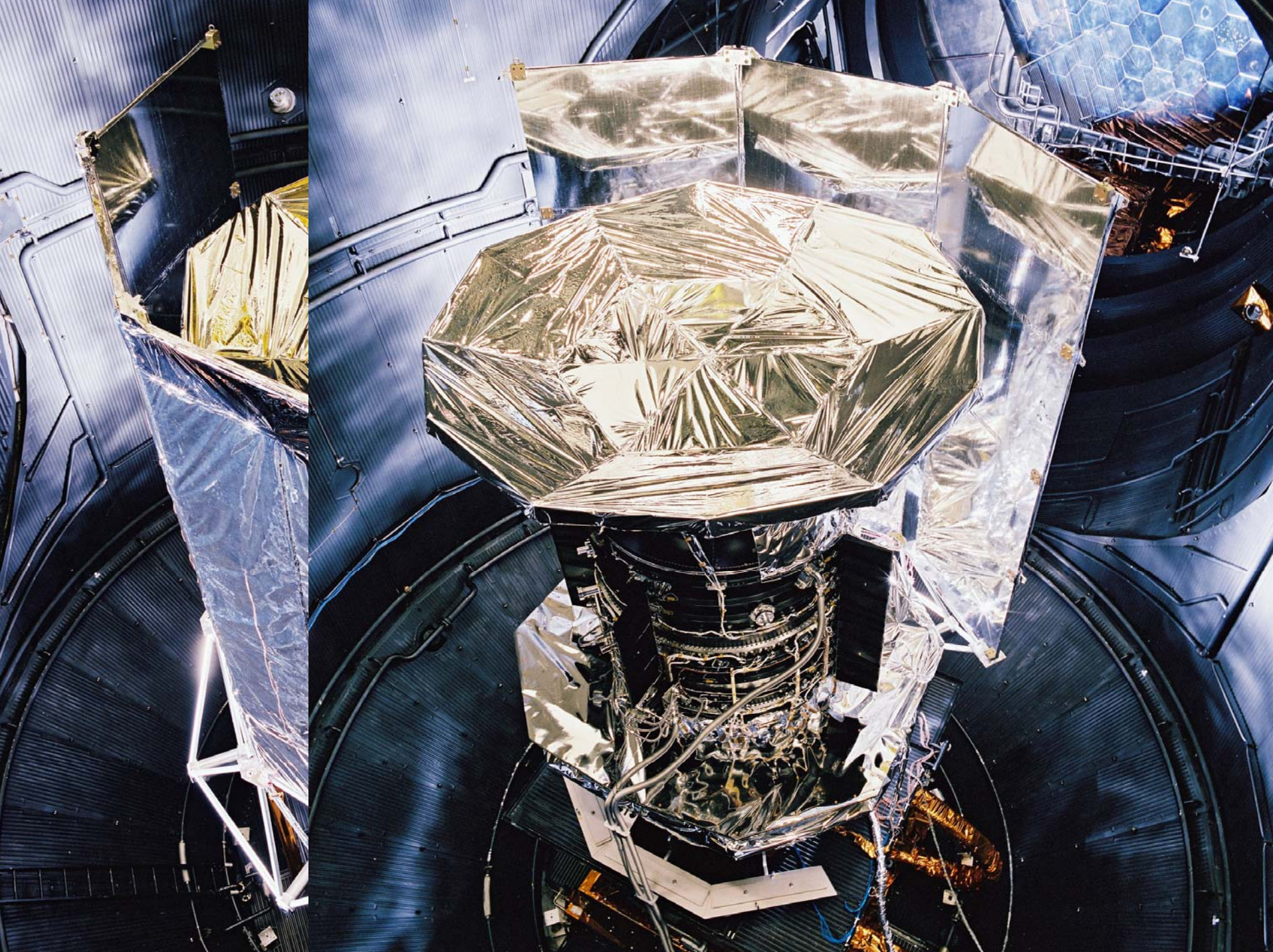
Service Module

Thermal Shields

Instrument Warm Units

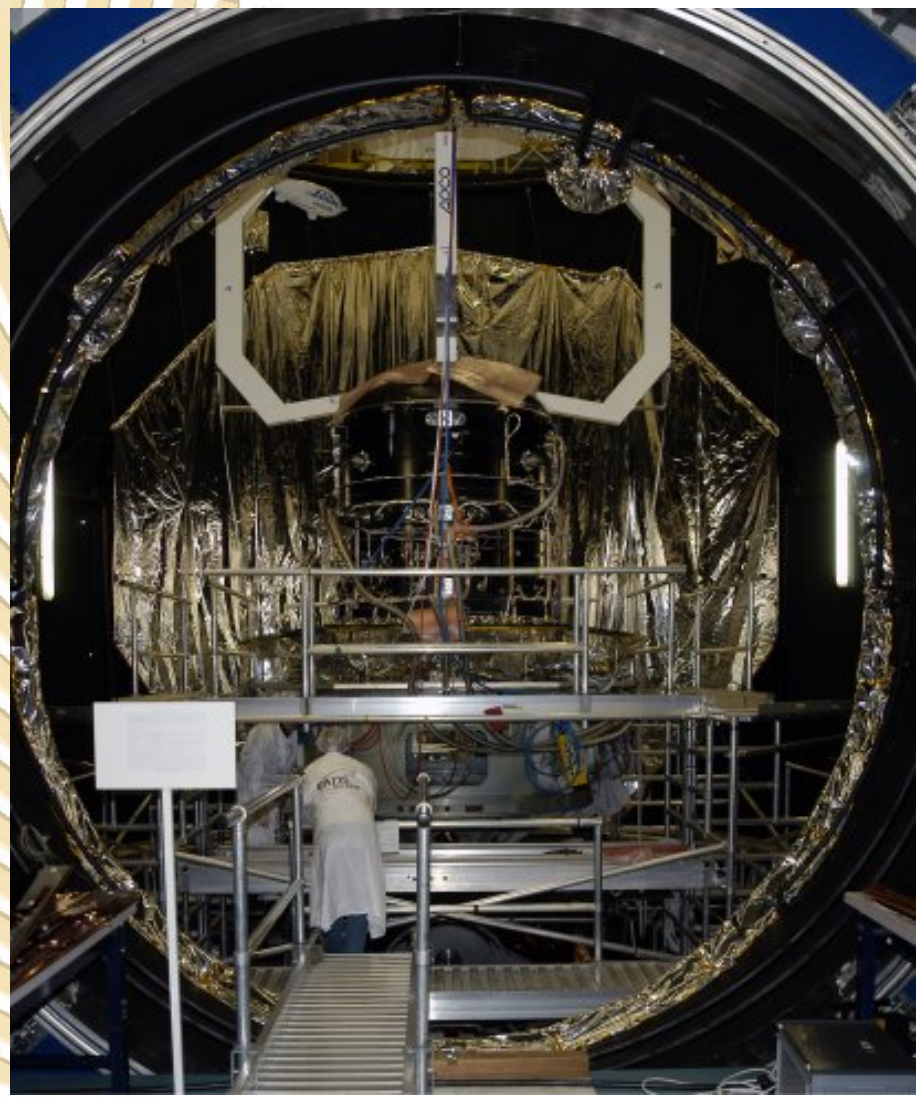
Herschel PLM





Cryostat refurbishment & lifetime

- **Lifetime requirement is being validated**
  - TB/TV test (ended today)
  - Model correlation
- **Science requirement**
  - Routine science operations for 3 years
  - Cryostat lifetime 3.5 years
- **Model predictions**
  - Contractual conditions 3.9 +/-0.4 years
  - ‘Actual’ dissipations 4.1 +/- 0.4 years
  - ‘Predicted’ lifetime 4.7 +/- 0.4 years
- **Should know by QR Board**
  - initial feedback positive



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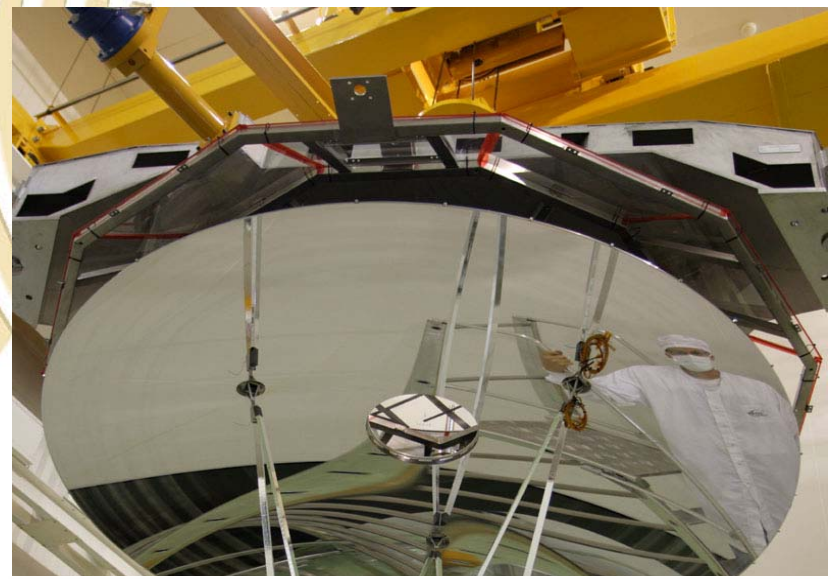
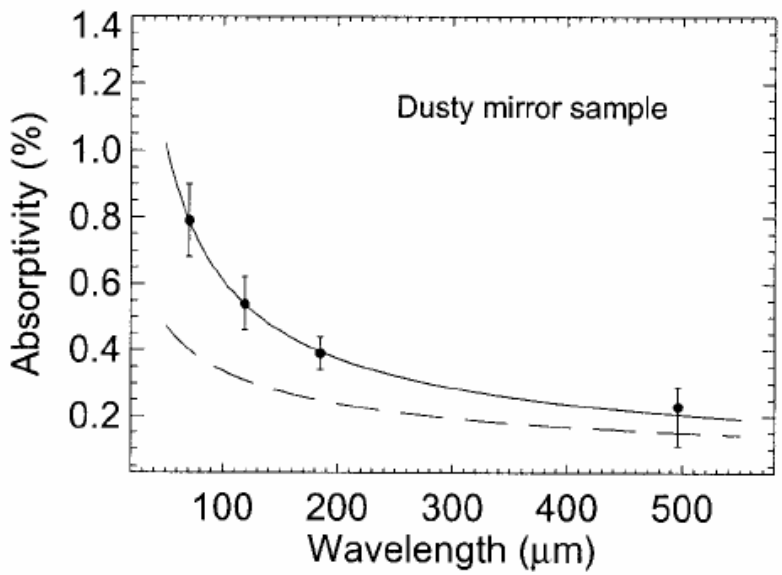
Herschel telescope

- **Cassegrain optics**
- **M1 diameter 3.5 m**
- **M2 is undersized (stop)**

➔ **effective aperture 3.3 m**

- **WFE at the best focus 5.5 μm at 70 K OK**
- **Encircled energy OK**
- **Mass 315 kg (~90% SiC)**
- **Predicted**
  - operating temp somewhere in the range 60-90 K
  - Gradients across M1 small
    - Sun direction ~0.2 K
    - Orthogonal ~0 K
  - Gradient M1-M2 ~2 K





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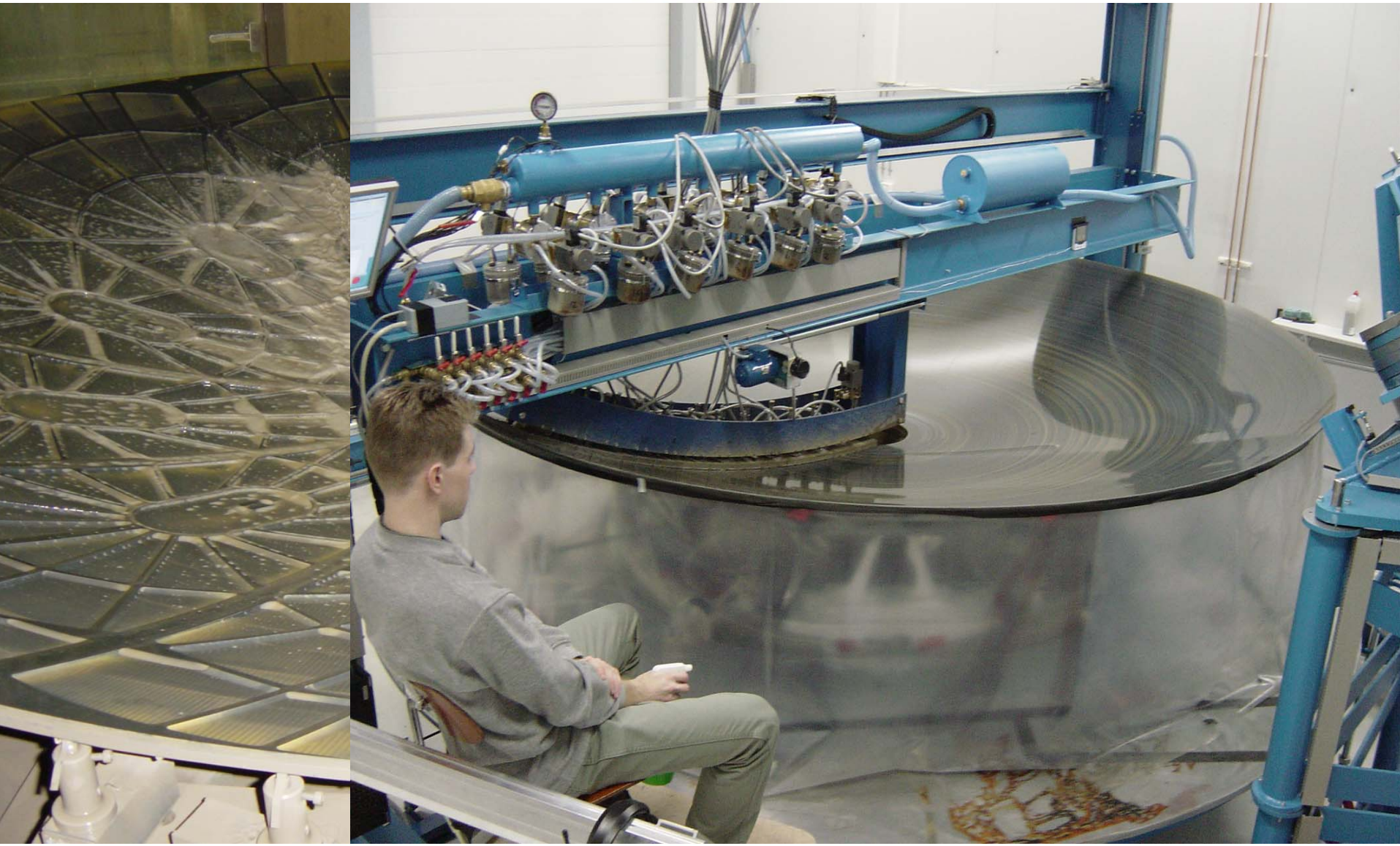
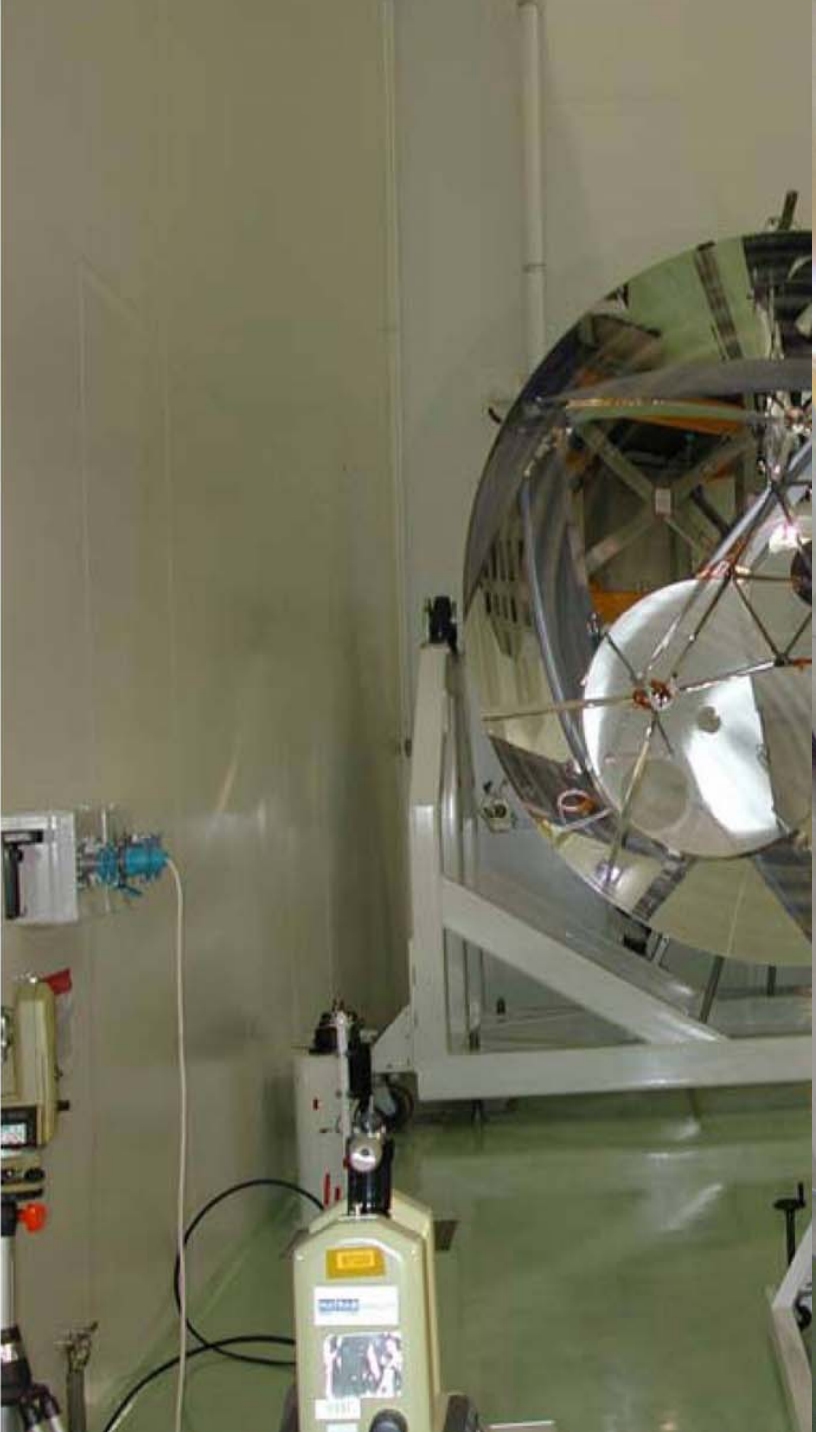
Brazing of primary mirror ‘blank’

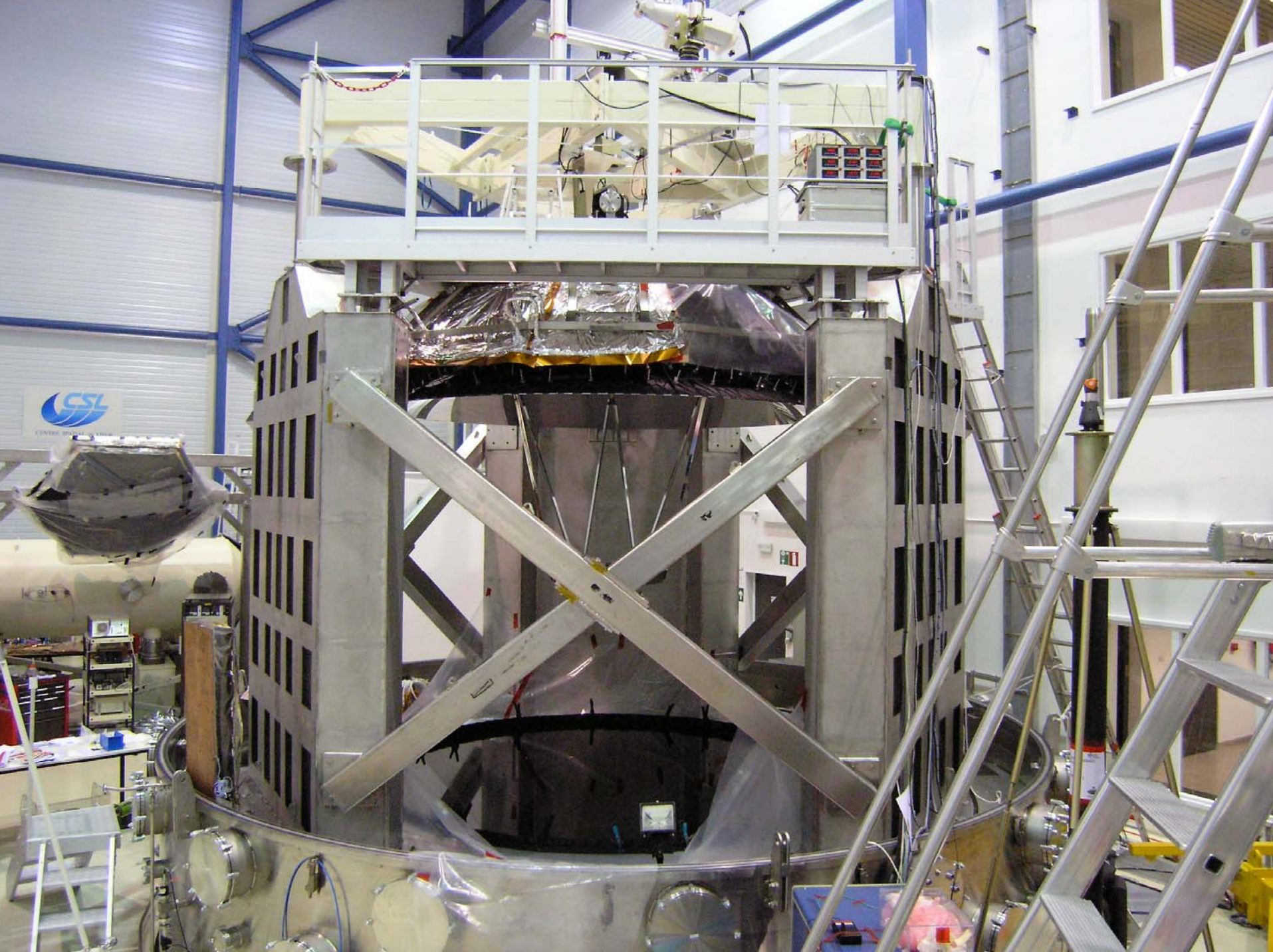
HERSCHEL SPACE OBSERVATORY

Grinding and lapping/polishing





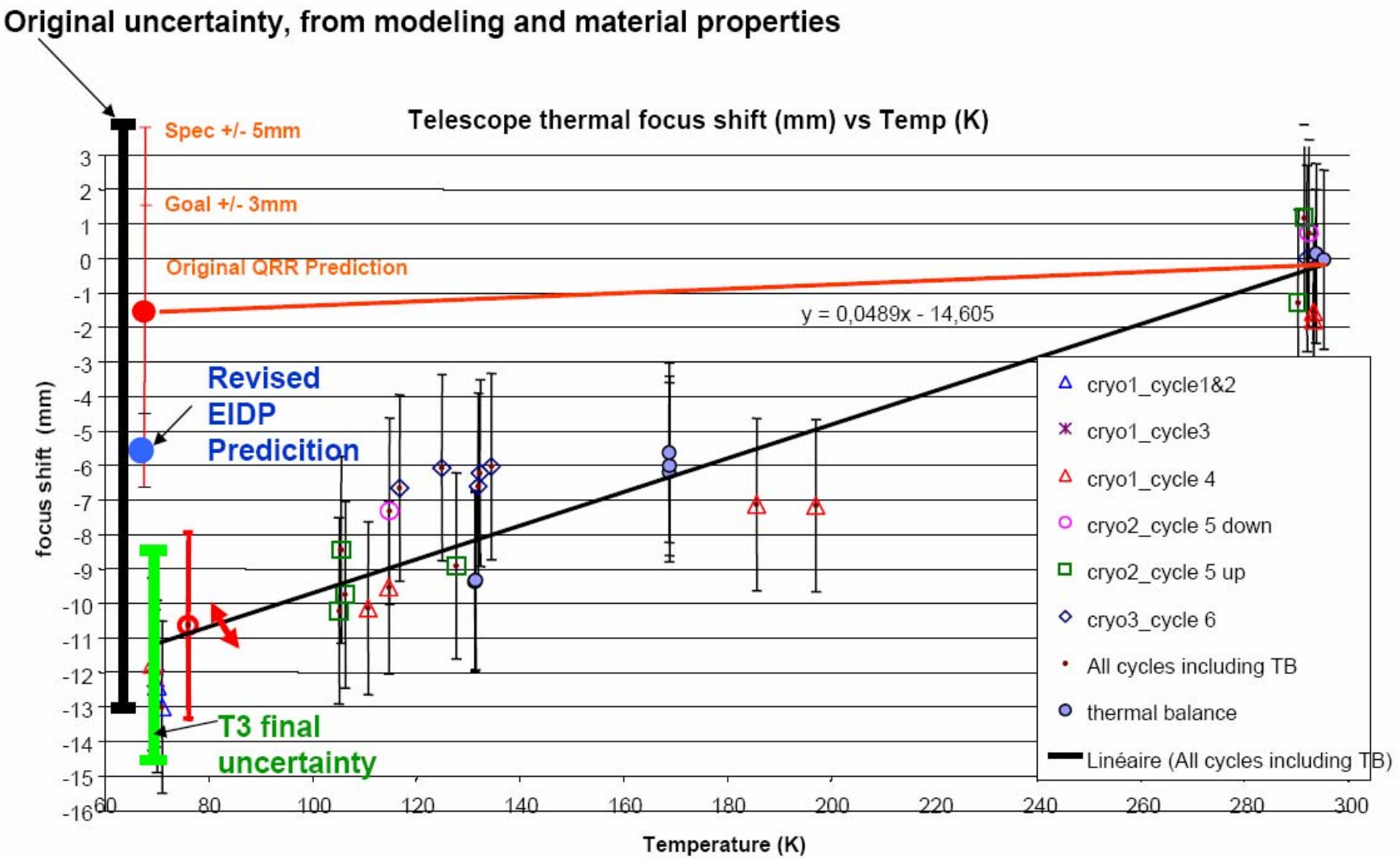

ADC
125kN



Focus position

- At the time of commencing the tests a focus shift of 1.6 mm was expected at cooldown to 70 K
- It was immediately apparent that this was wrong
- The real focus shift was about 11 mm
- Confirmed by additional cooldown
- Initial ‘explanation’ was wrong
- Crisis?
- Careful analysis of measurement set-up and data
- Independent parallel work by Telescope Tiger Team
- Agreement T3 and industrial contractor

Focus position



HERSCHEL SPACE OBSERVATORY

Herschel telescope

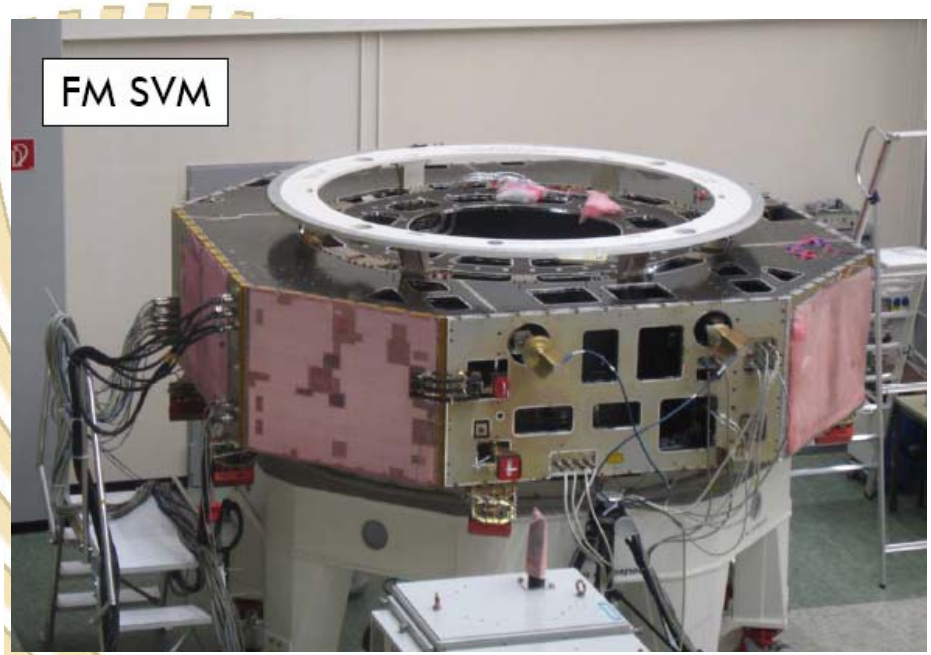
- **Telescope Tiger Team (T3)**
  - Focus shift with temperature is a real telescope feature
    - Not a measurement artifact
  - It is repeatable over several cryo-cycles
  - In hindsight not surprising
    - Telescope design (fast primary, high magnification)
    - Material properties not known with enough accuracy
    - ➔ Not feasible to make (very) accurate prediction
- **Actual measurements**
  - Telescope measured down to 70 K – without thermal blankets
  - Telescope measured down to 130 K – in in-flight configuration
  - Same behaviour ➔ confidence in in-flight focus position
  - Improved materials properties measurements ongoing
    - Could provide more accurate 'prediction'
- **Telescope in storage – waiting for integration**
- **Integration/alignment of telescope vs instruments still to be performed – telescope considered known well within specs**

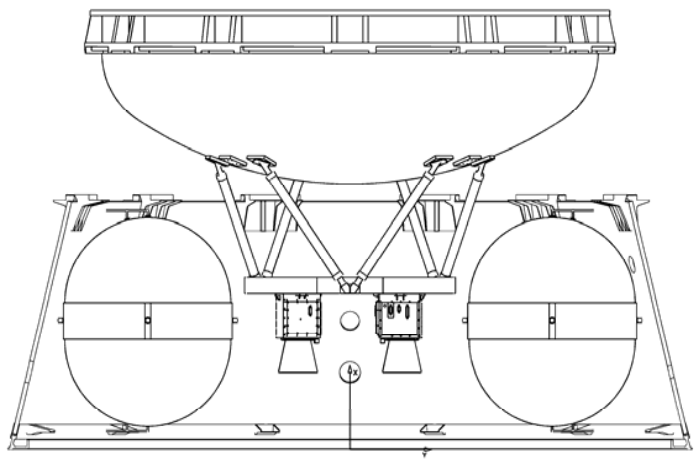
HERSCHEL SPACE OBSERVATORY

Herschel SVM/STM

Service module

- **FM SVM delivered**
- **In Friedrichshafen**
  - in storage
- **Instrument WEs**
  - yet to be integrated





HERSCHEL SPACE OBSERVATORY

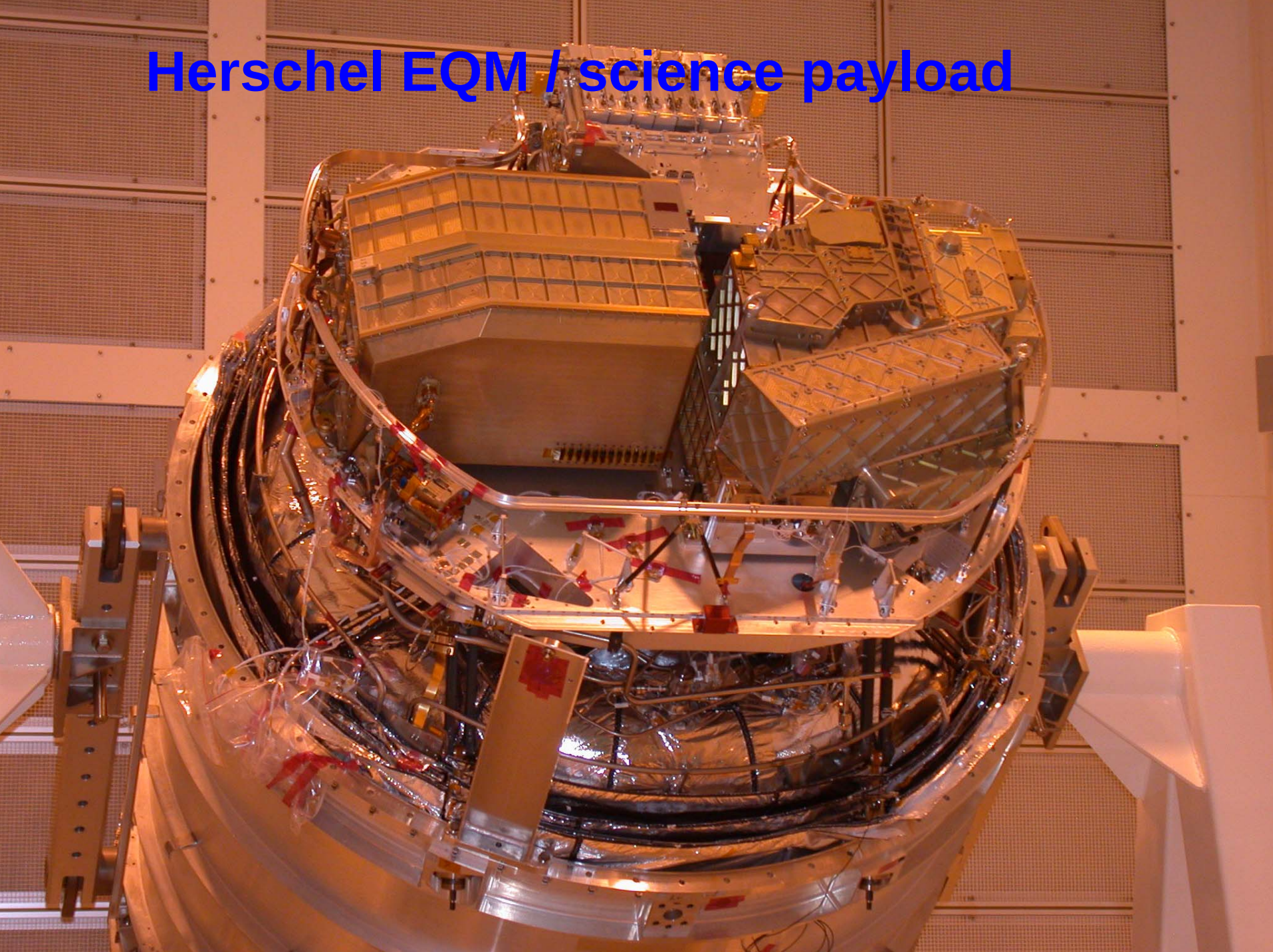
Pointing – QR 'hot of the press'

- **Pointing modes**
  - pointing APE, RPE, AME
  - scanning APE, RPE, AME
  - raster 'relative' SRPE
    - APE absolute error
    - RPE noise 1 min
    - AME reconstituted
- **Pointing specs (68%)**
  - pointing 3.7", 0.3", 3.1"
  - scanning 3.7", 1.2", 3.1"
  - raster 1.0"
- **Pointing goals (68%)**
  - pointing 1.5", 0.3", 1.2"
  - scanning 1.5", 0.8", 1.2"
  - raster 1.0"
- **Predicted performance**
  - it is predicted
  - predictions cannot be validated on the ground

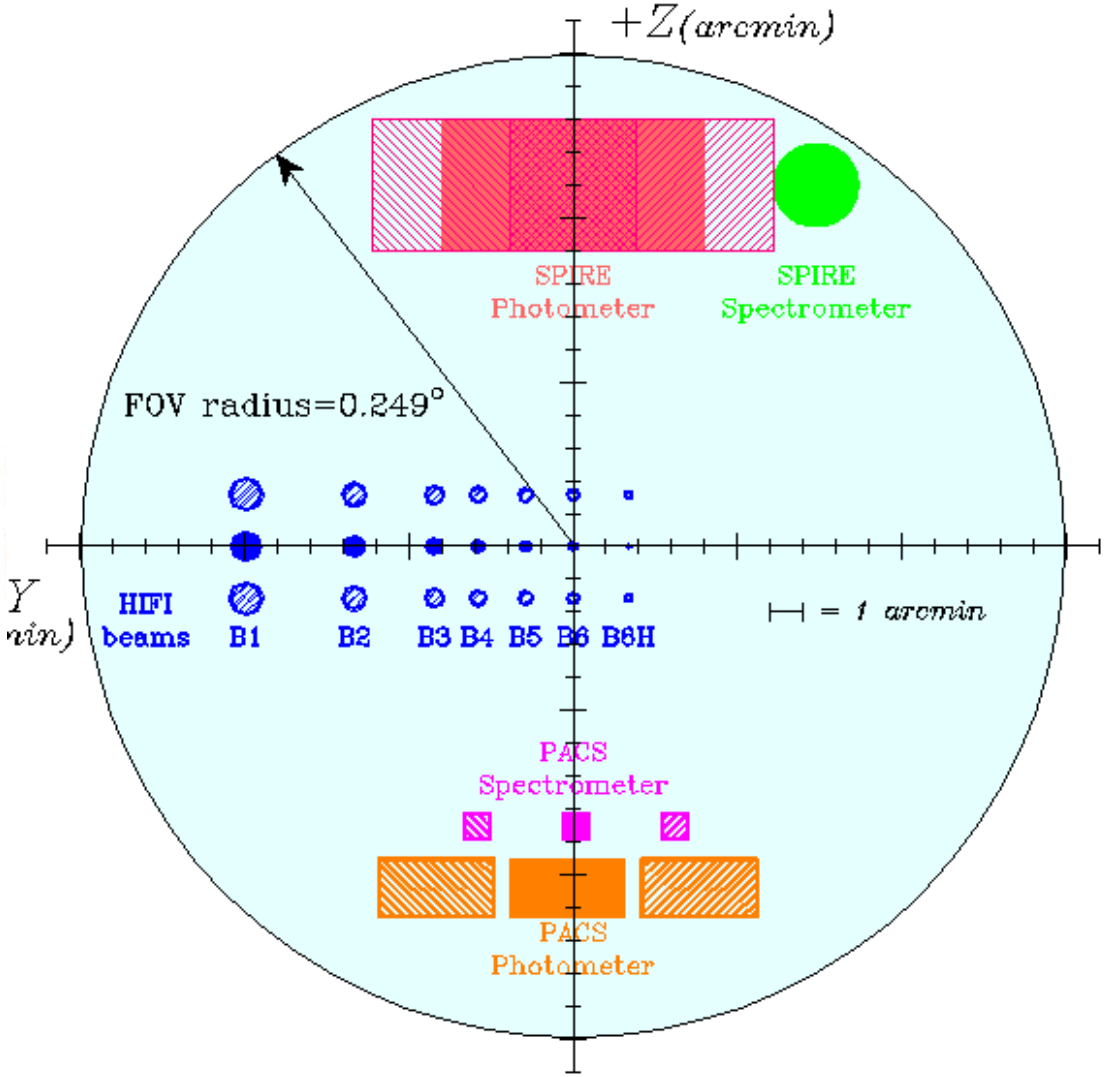
  ➔ we will only know in-flight
  - hopefully pessimistic…
- **Pointing performance (68%)**
  - pointing 2.05", 0.24", 1.99"
  - scanning 2.55", 0.96", 2.53"
  - raster 1.97"
- **Pointing goals (68%)**
  - pointing 1.16", 0.24", 1.12"
  - scanning 1.59", 0.62", 1.58"
  - raster 1.32"
- **Goal performance: restricted SAA range & STR interlacing**

HERSCHEL SPACE OBSERVATORY

Herschel EQM / science payload



Herschel focal plane



HERSCHEL SPACE OBSERVATORY

Herschel observatory capabilities

- **Photometry - imaging, 6 broad bands in 75-500 μm range**
  - **PACS** – simultaneous 2 colour fully-sampled (0.5Fλ) imaging with FOV 1.75x3.5 arcmin and R~2.5 centred at 75/110 and 170 μm
  - **SPIRE** – simultaneous 3 colour 2Fλ imaging with FOV 4x8 arcmin and R~3 centred at 250, 350, and 500 μm
  - for larger fields 'on-the-fly' mapping, mosaicing
  - sensitivity is somewhat wavelength and observing mode dependant, very roughly for point sources 1mJy - 1σ - 1 hour; for mapping confusion limit is important
- **Spectroscopy - in 57-670 μm range, varying R in 20-10^7 range**
  - **PACS** – grating spectrometer, 5x5 spatial x16 spectral pixels, FOV 0.8 arcmin, R ~ 1500-4000, λ ~ 57-210 μm
  - **SPIRE** – FTS spectrometer, R ~ 20-100+, FOV 2.6 arcmin, λ ~ 200-670 μm
  - **HIFI** – heterodyne spectroscopy with R up to 10^7, λ ~157-212 and 240-625 μm, 2 orthogonal polarisations, 4000 spectral channels per polarisation, single pixel on the sky, mapping by 'on-the fly' or mosaicing observations

Following talks !!

HERSCHEL SPACE OBSERVATORY

Herschel spacecraft status

- **Service Module**
  - In storage
  - Science payload warm electronics to be integrated
- **Payload Module**
  - Undergoing TB/TV test for lifetime verification
  - Helium-I system repair to be performed
  - Science payload focal plane units to be integrated
- **Telescope**
  - In storage
- **Sunshade/solar array**
  - Under remanufacture due to delamination problem
- **Payload – next talks**

- **Qualification Review**
  - Started last week
  - Finishes end next month
- **Previous reviews**
  - System Requirements Review (SRS) – Oct 2001
  - Preliminary Design Review (PDR) – Jul 2002
  - Critical Design Review (CDR) – Oct 2004
- **Future Reviews**
  - Flight Acceptance Review (FAR) – spring 2008
  - Launch Readiness Review (LRR) – mid 2008
  - In-orbit Commissioning Review (IOCR)

HERSCHEL SPACE OBSERVATORY

Herschel key dates

- FIRST feasibility study: 1982-83
- …
- FIRST confirmed 4th Cornerstone: Dec 1993
- …
- Selection of science instruments/PIs: 1997-98
- FIRST becomes Herschel: Dec 2000
- Start of spacecraft Phase B: mid 2001
- Start of spacecraft Phase C/D: early 2003
- SVM, PLM, telescope, CQM/EQM testing 2005
- **SVM, telescope, PLM, instruments deliveries: 2006/07**
- **Issue of first AO for proposals: 1 Feb 2007**
- **Integration & tests/verification: 2007/08**
- **Launch: 2008, target date 31 July**
- **Early operations: first 6 months**
- **Routine Science Operations: 2009 – 2012/13?**

HERSCHEL SPACE OBSERVATORY

Launcher

- Launcher version:
  - Ariane 5 - ECA (cryogenic upper stage)
  - qualification flight V164
- Payload configuration:
  - Planck in lower position
  - Herschel in upper position
  - Sylda5/ACU2624
  - Long fairing
- Launch Autonomy:
  - 25 hours
- L2 Injection strategy:
  - direct injection
  - 25 minutes powered phase
- L2 Injected mass capability:
  - ≥6273 kg including adaptors

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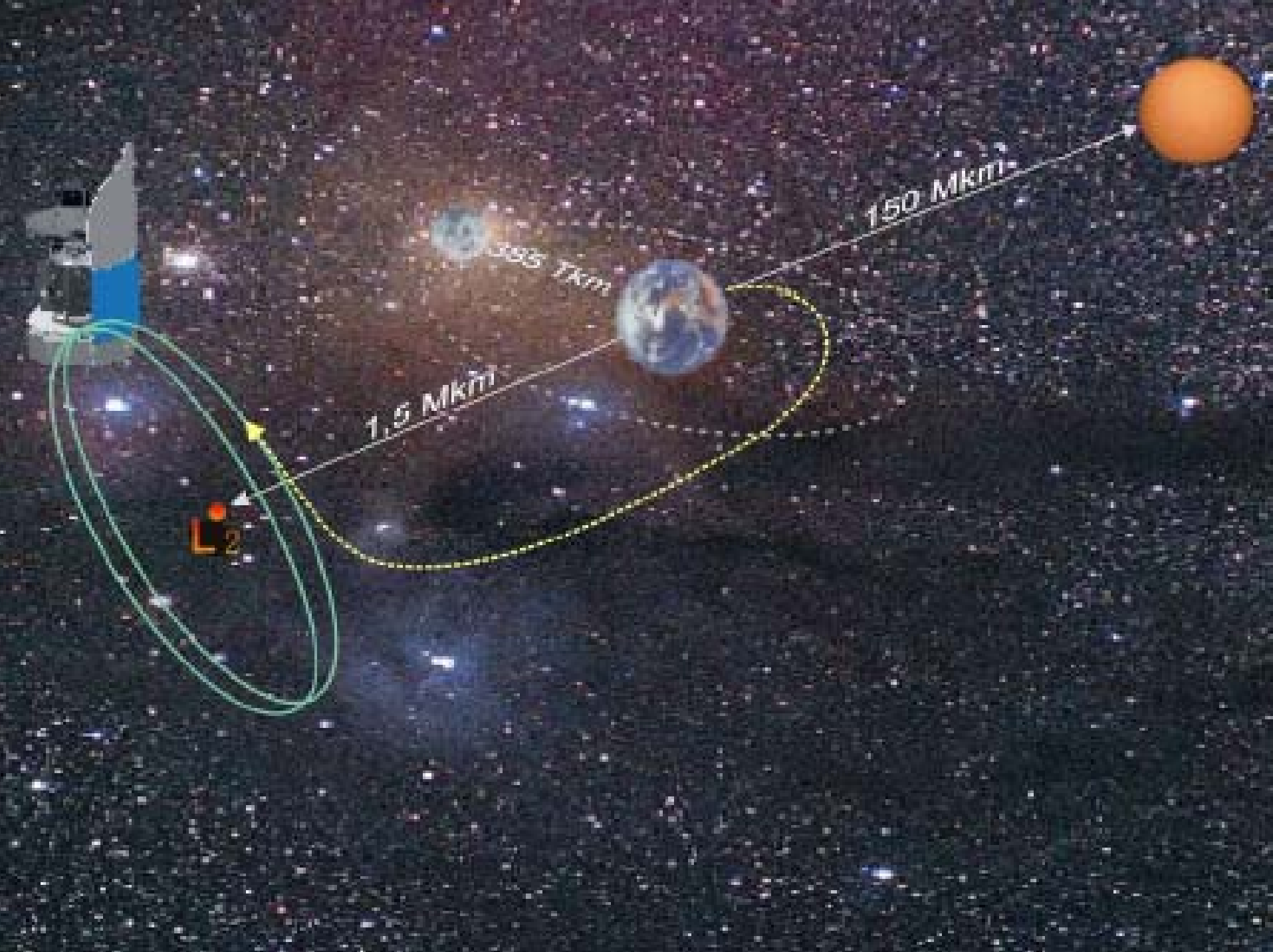
HERSCHEL SPACE OBSERVATORY

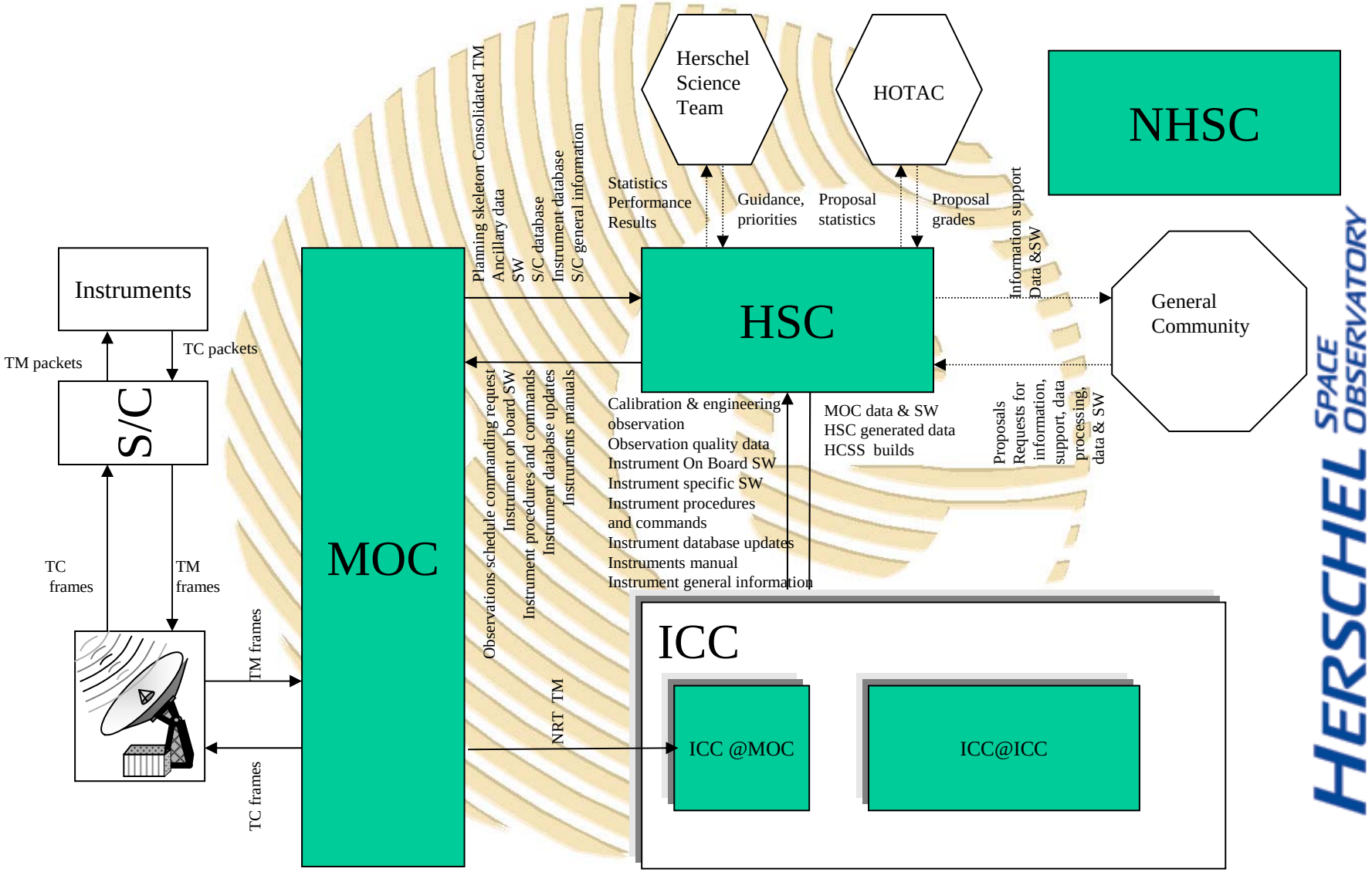

150 Mkm
1,5 Mkm
L2

Herschel mission phases

- **Launch and early operations (LEOP) – month 1**
  - telescope kept warm during s/c cooldown (~20 days)
  - cryo-cover opening (first light!) ~1 month after launch
- **Commissioning and performance verification – months 2-4**
  - PV plans being worked on
  - telescope cooling down (~50 days)
  - availability of particular sources (often solar system objects)
- **Science demonstration phase – months 5-6**
  - optimise how to best operate the observatory using in-flight knowledge (sensitivities, stability, background, pointing, …)
  - demonstrate the capabilities of the observatory
  - convince ourselves we can achieve expected science objectives
  - generate 'pretty pictures' – and 'pretty spectra' – for PR
  - **workshop & observations updating for routine phase**
- **Routine science operations phase (month 7 onwards)**
  - initially Key Progs (GT & OT) and 'regular' GT progs
  - Herschel operates autonomously – poor ToO capability

HERSCHEL SPACE OBSERVATORY

Ground segment



Herschel observing opportunities

- **Herschel is an observatory**
  - Guaranteed and Open Time
  - Open Time open to worldwide scientific community
  - Standard competitive proposal procedure
- **Routine science operations phase (36 months)**
  - **Approx 1000 days / 20000 hours of schedulable science time**
  - **Guaranteed time programmes – GT (32%)**
    - open for GT holders only
  - **Open time programmes – OT (68%)**
    - including discretionary time and targets of opportunity
    - open for all – including GT holders
- **Three 'Call for proposals' (AO) cycles are foreseen**
  - one Call for 'Key Projects' programmes only (GT and OT)
  - two Calls for regular programmes (GT and OT)
- **Each AO will be divided in two parts**
  - GT awarded first
  - OT awarded after GT in same cycle

Herschel 'Key Projects'

- **Foreseen to be important upfront (SMP/instrument AO)**
  - introduced to ensure that 'unusually large' observing programmes can be proposed, selected, and observed
  - need 'pre-identified' due to the nature of the foreseen science objectives and the lack of 'precursor' (IRAS-type) mission
- **Definition of a 'Key Project' programme - it must**
  - exploit unique Herschel capabilities address (an) important scientific issue(s) in a comprehensive manner
  - require a large amount of observing time to be used in a uniform and coherent fashion
  - produce a resulting well characterised dataset of high archival value
- **Data reduction**
  - it is recognised that there is a legitimate science return interest that
    - the data generated by the observations are timely reduced, and
    - the data products and tools are made public
  - therefore 'Key Project' consortia must demonstrate commitment and ability to perform data reduction, and must make data products and tools publicly available at the end of the proprietary time period

Overall KP AO schedule

- **1 Feb 2007: Issue AO for 'Key Projects' proposals**
- **4 Apr 2007: Submission deadline for GT KP proposals**
- HOTAC procedure
- ~1 June 2007: Phase 2 proposal entering
- Construction of Reserved Observations list
- **5 Jul 2007: Announcement of GT KP programmes**
  'Effectively' the AO date for open time proposers
- **25 Oct 2007: Submission deadline for OT KP proposals**
- HOTAC procedure
- Phase 2 proposal entering
- Construction of Reserved Observations list
- **28 Feb 2008: Announcement of OT KP programme**

Please note

- **AO package was issued on 1 Feb 2007**
- **HSpot to be reissued for phase 2 proposal entering**
- **Reissue of (updated) AO package planned for 5 Jul 2007**

AO doc package

- **Cover letter – formal Call by D/SCI**
- **Executive summary**
  - duplicates as ‘AO manual’
  - points to online package with latest news
- **Policies and procedures**
  - politics / policies etc.
- **Herschel Observers’ manual**
  - spacecraft matters (pointing, visibility, etc)
- **4 x Instrument Observers’ manual**
  - SPIRE, PACS, HIFI, SPIRE/PACS parallel mode
- **HSpot manual**
  - + additional tools (background noise estimator, confusion noise estimator, …)
- **Guaranteed time programme description (for OT deadline)**
  - with Reserved Observations list
- **Plus additional information**
- **Plus ‘latest information’ webpage**

General Information
- Home
- Herschel introduction
- Fact sheets
- FIR astronomy
- Science
- Observing
- About William Herschel

Resources
- Conferences/Workshops
- Useful links

Announcement of Opportunity for Herschel Key Programmes

AO Documentation

The Announcement of Opportunity (AO) for Key Programmes (KPs) package consists of the following documentation:

- **Herschel Key Programme Announcement of Opportunity**, PDF (58kb). This letter from the ESA Director of Scientific Programme is the formal Announcement of Opportunity inviting the scientific community to apply for the Herschel Key Programme observing time.
- **Executive Summary**, PDF (32kb) or HTML. Summarises the AO and associated documents, tools, and services, providing the reader with a concise overview and help on where to find what information.
- **Policies and procedures**, PDF (94kb) or HTML. This is the "administrative" document of the Announcement of Opportunity, providing all necessary information about the policies adopted and the procedures to be followed.
- **Herschel Observers' Manual**, PDF (1.8Mb) or HTML. Provides information about Herschel pertinent to using the observatory from the perspective of an observer.
- **Heterodyne Instrument for the Far Infrared (HIFI) Observers' Manual**, PDF (3.5Mb) or HTML. Provides information about and how to use the HIFI instrument to perform observations.
- **Photodetector Array Camera & Spectrometer (PACS) Observers' Manual**, PDF (8.9Mb) or HTML. Provides information about and how to use the PACS instrument to perform observations.
- **Spectral and Photometric Imaging Receiver (SPIRE) Observers' Manual**, PDF (5.0Mb) or HTML. Provides information about and how to use the SPIRE instrument to perform observations.
- **SPIRE / PACS Parallel Mode Observers' Manual**, PDF (361kb) or HTML. Provides information about and how to use the SPIRE/PACS instrument parallel mode to perform observations.
- **Reserved Observations List**: Describes the Guaranteed Time Key

Herschel User information
- Latest News
- Mission Overview
- Science Payload
- Science Team
- Community Information

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- AO Introduction and Schedule Overview
- AO Documentation and HSpot tool
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- **Spectral and Photometric Imaging Receiver (SPIRE) Observers' Manual**, PDF (5.0Mb) or HTML. Provides information about and how to use the SPIRE instrument to perform observations.
- **SPIRE / PACS Parallel Mode Observers' Manual**, PDF (361kb) or HTML. Provides information about and how to use the SPIRE/PACS instrument parallel mode to perform observations.
- **Reserved Observations List**: Describes the Guaranteed Time Key Programme reserved observations, together they make up the GT Key Programme. (Available only as of 5 July 2007 after the completion of the GT HOTAC activities.)
- The Latest News page provide last minute updates and corrections to the AO documention package.

Observation planning tool - HSpot

The Herschel observation planning tool has been built starting from the tool developed for the Spitzer Space Observatory called Spot, thus Herschel-Spot or simply HSpot. The look and feel of this tool is that of the Spitzer tool, but it has been fully adapted for Herschel.

- Herschel Observation Planning Tool (HSpot) download
- **HSpot Users' Manual**, PDF (19Mb) or HTML. Provides information about and how to use the HSpot tool itself for planning Herschel observations.
- **HSpot and Proposal Handling Known problems**, HTML.

Background and confusion noise

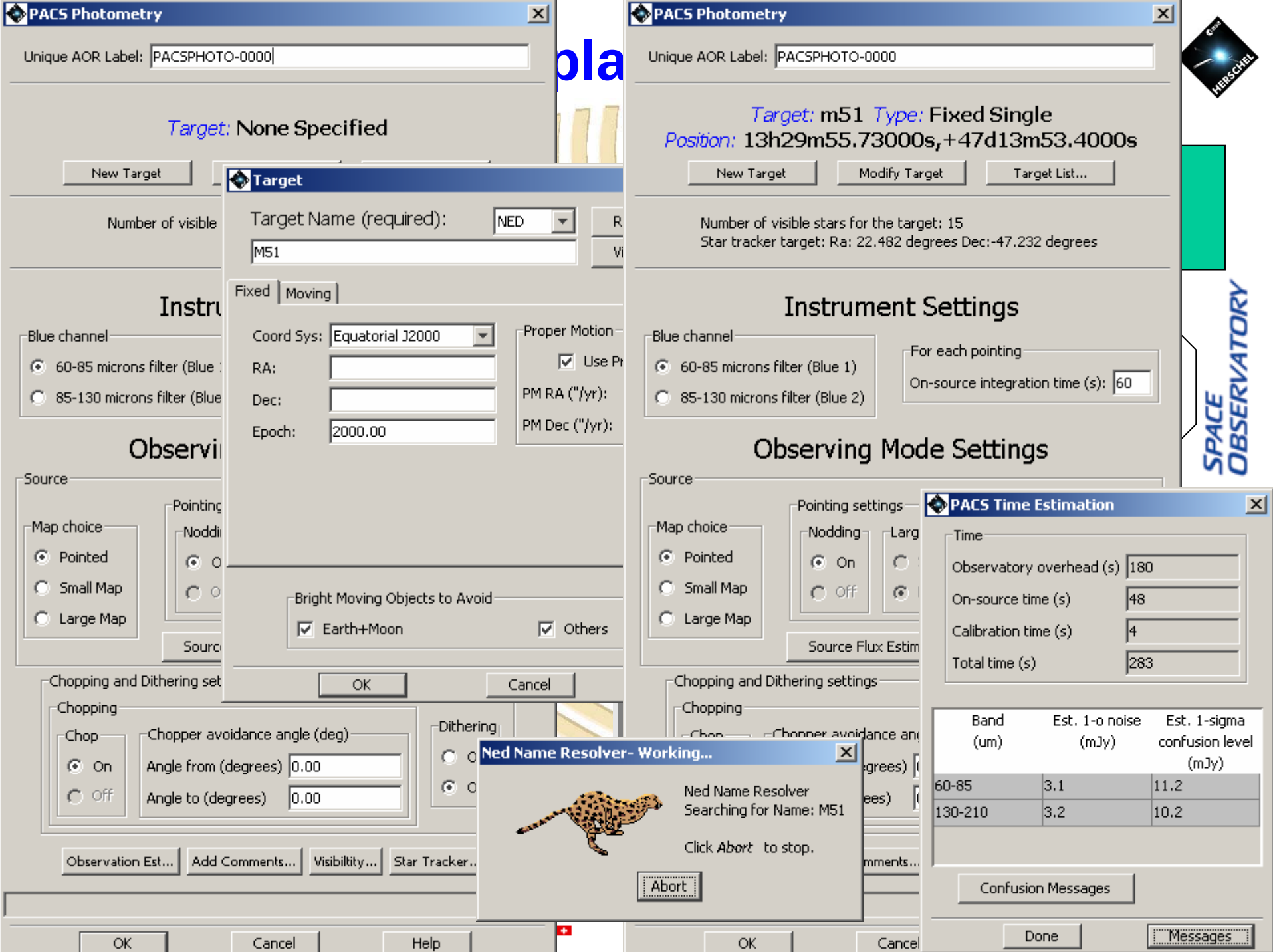
The Herschel observation planning tool HSpot has built in sky background and confusion noise estimator functions.

Herschel Background Estimator. The infrared background estimator provided in HSpot is an extended version of the tool developed for the Spitzer

Herschel Observation Planning Tool (HSpot) Download

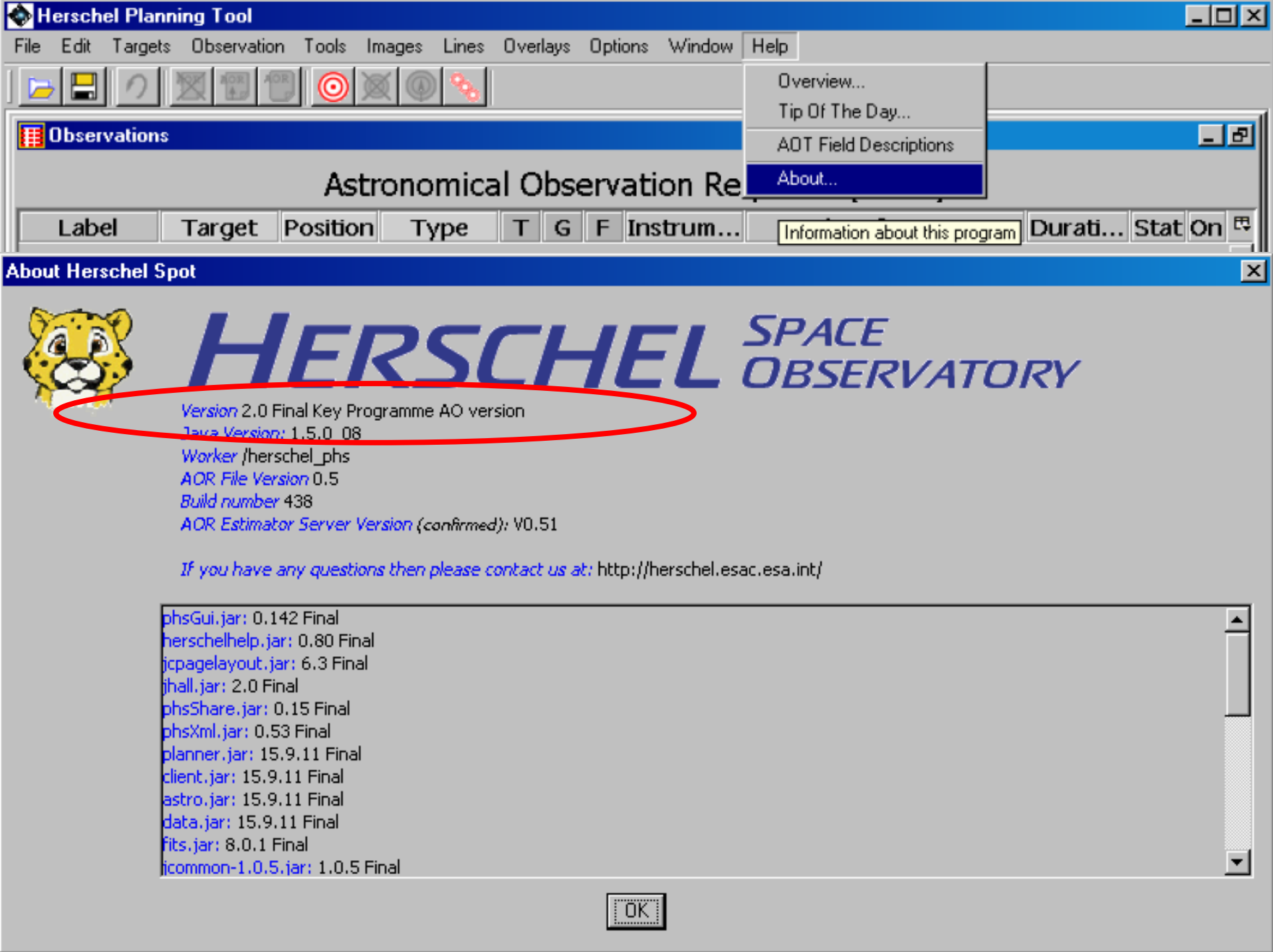
For detailed HSpot installation instructions, or where problems arise, please have a look at the Herschel-Spot User's Guide.

Installation Files	Size	To Install the software
Windows HSpot_V2_0_0_Windows_Installer.exe	70MB	(a) Download the relevant installer (b) Double-click on the file via an explorer window to install it (c) Launch the application via Start/Programs/HerschelSpot
Solaris HSpot_V2_0_0_Solaris_Installer.bin	99MB	(a) Right click on the link and Save As... (b) Run the installer: from the directory where you have saved the file, type: sh HSpot_V2_0_0_Solaris_Installer.bin (c) Launch the application by typing: ./runHerschelSpot from the installation directory.
Linux HSpot_V2_0_0_Linux_Installer.bin	100MB	(a) Right click on the link and Save As... (b) Run the installer: from the directory where you have saved the file, type: sh HSpot_V2_0_0_Linux_Installer.bin (c) Launch the application by typing: ./HerschelSpot from the installation directory.
Mac OS X HSpot_V2_0_0_MacOSX_Installer.zip	30MB	(a) Download and unzip the relevant installer (b) Run the Installer that has been unzipped (c) Launch the application by double-clicking on HerschelSpot


PACS Photometry
Unique AOR Label: PACSPHOTO-0000
Target: None Specified
New Target
Number of visible
Target
Target Name (required):
NED
M51
Fixed
Moving
Coord Sys: Equatorial J2000
RA:
Dec:
Epoch: 2000.00
Proper Motion
Use Pr
PM RA ("/yr):
PM Dec ("/yr):
Bright Moving Objects to Avoid
Earth+Moon
Others
OK
Cancel
Instru
Blue channel
60-85 microns filter (Blue
85-130 microns filter (Blue
Observi
Source
Map choice
Pointed
Small Map
Large Map
Pointing
Noddi
Sourc
Chopping and Dithering set
Chopping
Chop
On
Off
Chopper avoidance angle (deg)
Angle from (degrees) 0.00
Angle to (degrees) 0.00
Dithering
Observation Est...
Add Comments...
Visibiltity...
Star Tracker...
OK
Cancel
Help
Ned Name Resolver- Working...
Ned Name Resolver
Searching for Name: M51
Click Abort to stop.
Abort
PACS Photometry
Unique AOR Label: PACSPHOTO-0000
Target: m51 Type: Fixed Single
Position: 13h29m55.73000s,+47d13m53.4000s
New Target
Modify Target
Target List...
Number of visible stars for the target: 15
Star tracker target: Ra: 22.482 degrees Dec:-47.232 degrees
Instrument Settings
Blue channel
60-85 microns filter (Blue 1)
85-130 microns filter (Blue 2)
For each pointing
On-source integration time (s): 60
Observing Mode Settings
Source
Map choice
Pointed
Small Map
Large Map
Pointing settings
Nodding
On
Off
Source Flux Estim
Chopping and Dithering settings
Chopping
OK
Cancel
PACS Time Estimation
Time
Observatory overhead (s) 180
On-source time (s) 48
Calibration time (s) 4
Total time (s) 283
Band (um)
Est. 1-o noise (mJy)
Est. 1-sigma confusion level (mJy)
60-85 3.1 11.2
130-210 3.2 10.2
Confusion Messages
Done
Messages
HERSCHEL
SPACE OBSERVATORY

Important !!

- You MUST use the AO version of HSpot to plan and submit your proposals
- For KP GT proposals: Version ‘2.0 Final KP AO Version’
- For KP OT proposals: suitably named later version
- To check your HSpot version:
  - inside HSpot, press ‘Help’ then ‘About’


Herschel Planning Tool
File Edit Targets Observation Tools Images Lines Overlays Options Window Help
Overview...
Tip Of The Day...
AOT Field Descriptions
About...
Observations
Astronomical Observation Re
Label Target Position Type T G F Instrum... Durati... Stat On
Information about this program
About Herschel Spot
HERSCHEL SPACE OBSERVATORY
Version 2.0 Final Key Programme AO version
Java Version: 1.5.0_08
Worker /herschel_phs
AOR File Version 0.5
Build number 438
AOR Estimator Server Version (confirmed): V0.51
If you have any questions then please contact us at: http://herschel.esac.esa.int/
phsGui.jar: 0.142 Final
herschelhelp.jar: 0.80 Final
jcpagelayout.jar: 6.3 Final
jhall.jar: 2.0 Final
phsShare.jar: 0.15 Final
phsXml.jar: 0.53 Final
planner.jar: 15.9.11 Final
client.jar: 15.9.11 Final
astro.jar: 15.9.11 Final
data.jar: 15.9.11 Final
fits.jar: 8.0.1 Final
jcommon-1.0.5.jar: 1.0.5 Final
OK

Important !!

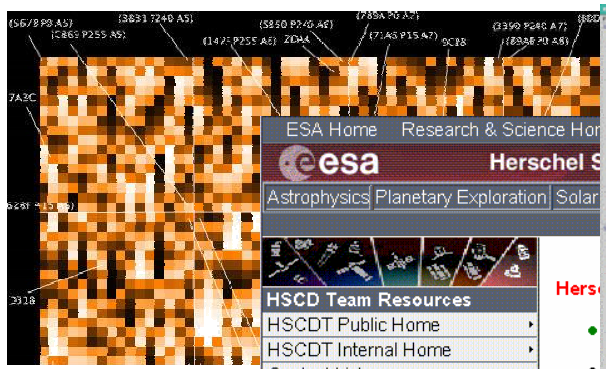
- You MUST use the AO version of HSpot to plan and submit your proposals
- For KP GT proposals: Version ‘2.0 Final KP AO Version’
- For KP OT proposals: suitably named later version
- To check your HSpot version:
  - inside HSpot, press ‘Help’ then ‘About’
- It is NOT possible to submit proposals with an incorrect version of HSpot
  - neither for GT proposals
  - nor for OT proposals

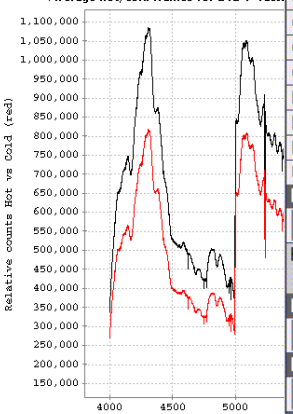
Data processing – HCSS/DP

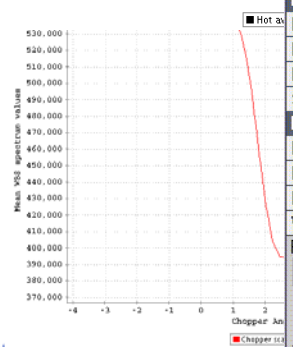
- Ensemble of services in a single, coherent platform-independent system – HCSS/DP
- Offering the astronomical community the means (data, products, software) to do science without the need to buy licenses
- Source of software, calibration and documentation to reduce and do science with Herschel data ('Observer IA')
- Source of software and documentation to support the commissioning of the instruments, the validation of the observing modes and the calibration of satellite pointing and instruments ('Calibration IA')
- Toolbox to develop data processing algorithms
- Generation of standard observation products and quality information by using IA modules ('SPG' & 'QC' pipelines)
- On-line, context-sensitive and printable help documentation for end-users and developers based on XML/DocBook
- Data and services Virtual Observatory compliant + FITS

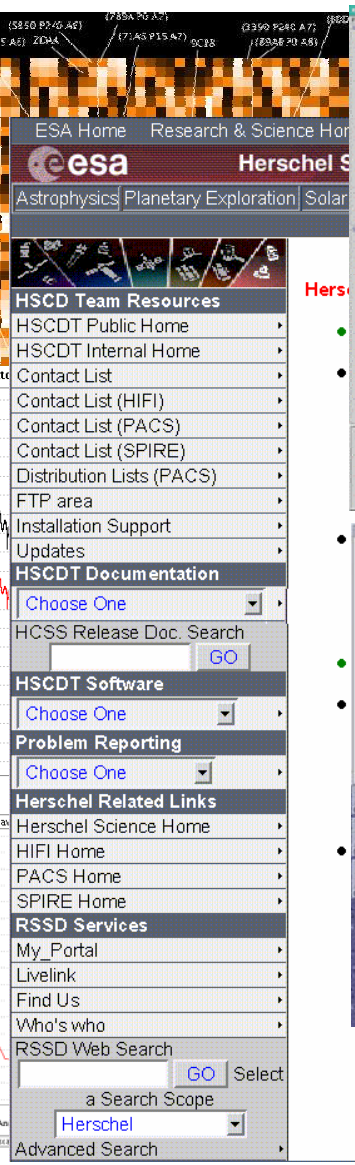
HERSCHEL SPACE OBSERVATORY

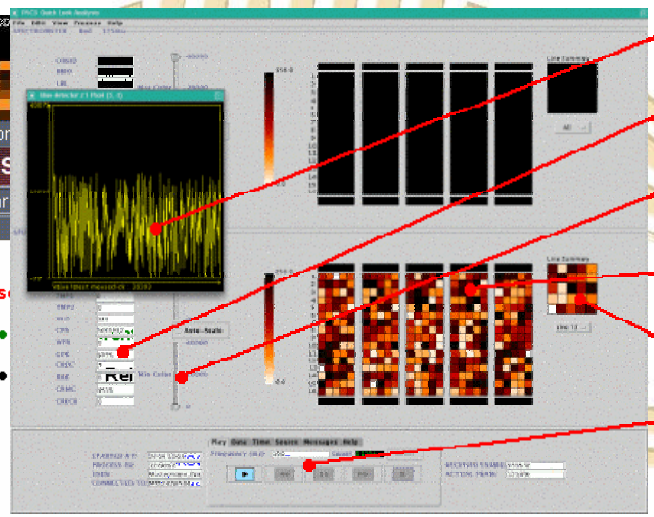
Herschel data processing

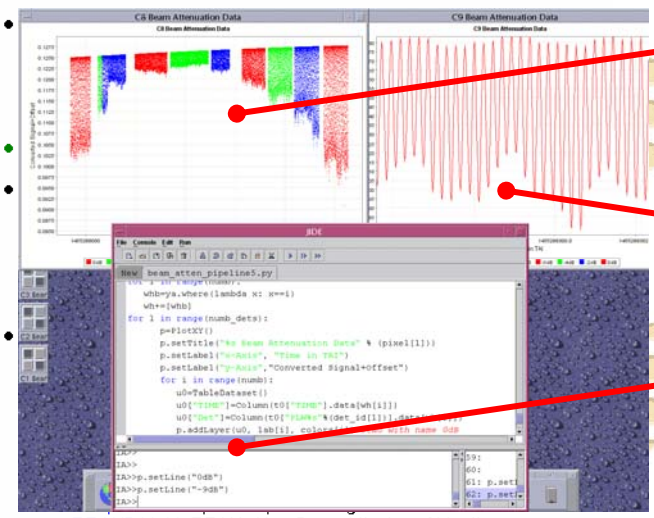












- DP-WG MoM: DP Working Group Minutes of Meetings
- Livelink documents: Other related documents under Livelink, including DP CCB and User Group documentation.

Last updated: Friday, 26-Aug-05 13:02:20

Strip chart

Dec Mec

Colour range

Instrument array

Line summary

Data selector

Linearity test

Demodulated signal

Script debugger for Interactive Analysis

HERSCHEL SPACE OBSERVATORY

Keeping track

- **Three-tier structure of ESA Herschel websites:**

- **Corporate level**
  - **intended for general public, media, …**
  - **http://www.esa.int/science/herschel/**

HERSCHEL SPACE OBSERVATORY

esa Space Science
European Space Agency

19-Feb-2007

Herschel overview

Status
In development

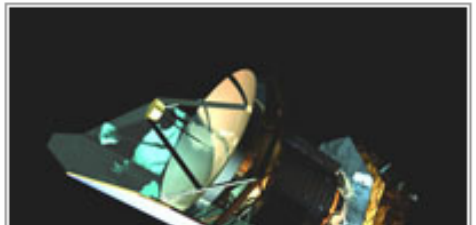
Objective
Exploring formation of stars and galaxies, ESA's Herschel space observatory (formerly called Far Infrared and Submillimetre Telescope, or FIRST) will give astronomers their best view yet of the universe at far-infrared and sub-millimetre wavelengths, bridging the gap in the spectrum between what can be observed from ground and earlier space missions of this kind.

Bookmark this page as:
http://www.esa.int/science/herschel
(Ctrl+D)

For more in-depth scientific and technical details of our Space Science Programme and missions, follow this link.

Herschel in depth

Space Science
About Space Science
ESA's 'Cosmic Vision'
Science & Technology in-depth
Multimedia
Science images



Mission

Herschel will be the largest space telescope of its kind when launched. Herschel's 3.5-metre diameter mirror will collect long-wavelength infrared

More about...
- Herschel factsheet
- ISO overview
- Planck overview

Related articles
- Observations: Seeing in infrared wavelengths

Keeping track

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- **Corporate level**
  - **intended for general public, media, …**
  - **http://www.esa.int/science/herschel/**
- **Science Directorate level 'SciTech'**
  - **intended for 'interested' public, 'general' science community, media, …**
  - **http://sci.esa.int/herschel/**
  - **Google 'Herschel' and this page comes as #1**

HERSCHEL SPACE OBSERVATORY

Mission Home
- Summary
- Fact Sheet
- Objectives
- Mission Team
- Industrial Team

News

Spacecraft
- 3D Model
- Instruments

Mission Operations
- Test Campaign
- Launch Information
- Launch Vehicle
- Orbit/Navigation

Mission Research

Astronomer's Website

Services

HERSCHEL

Make this your homepage

19-Feb-2007 19:30:12 UT

IMAGES AND VIDEOS

LAUNCH DATE:	2008
MISSION END:	2011-2012
LAUNCH VEHICLE:	Ariane-5
LAUNCH MASS:	3300 kg
MISSION PHASE:	Implementation

ORBIT:
Lissajous orbit about the second Lagrange point of the Earth-Sun system (L2)

OBJECTIVES:

- Study the formation of galaxies in the early universe and their subsequent evolution
- Investigate the creation of stars and their interaction with the interstellar medium
- Observe the chemical composition of the atmospheres and surfaces of comets, planets and satellites
- Examine the molecular chemistry of the universe

Keeping track

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- Science Directorate level – 'SciTech'
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  - http://sci.esa.int/herschel/
  - Google 'Herschel' and this page comes as #1
- Research and Science Support Dept (RSSD) level
  - intended for (potential) users of missions, …
  - http://herschel.esac.esa.int/
  - http://www.rssd.esa.int/herschel/ redirects to above
  - this the Herschel Science Centre site – intended for you!
  - Google 'Herschel science' and this page comes as #1

HERSCHEL SPACE OBSERVATORY

Herschel Science Centre - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://herschel.esac.esa.int/

Google

Herschel Science Centre

Research & Science Home | ESA Public Information Site | Sci-Tech Portal | Herschel Public Information Site | Herschel Sci-Tech Portal

esa Herschel Science Centre European Space Agency

Astrophysics Missions | Planetary Exploration Missions | Solar Terrestrial Science Missions | Fundamental Physics Missions

19-February-2007 20:36:59

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- FIR astronomy
- Science
- Observing
- About William Herschel

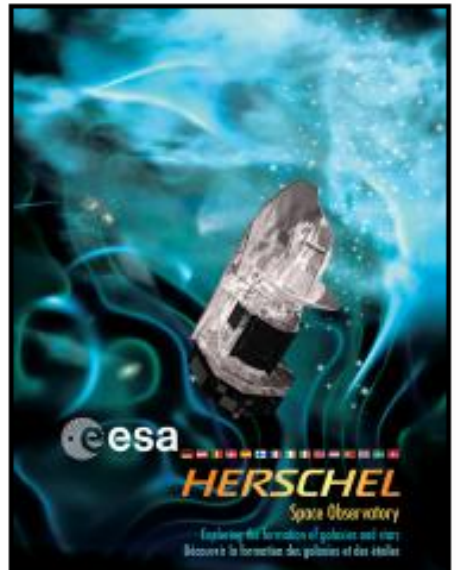
Resources

- Conferences/Workshops
- Useful links

HERSCHEL

Exploring the formation of galaxies and stars
Découvrir la formation des galaxies et des étoiles

Welcome to the **Herschel Astronomers' website** provided by the Herschel Science Centre (HSC) for the scientific community. For additional ESA Herschel websites see Useful links.



Herschel, short for the `Herschel Space Observatory', is the fourth `cornerstone' mission in the ESA science programme. It will perform photometry and spectroscopy in approximately the 57-670 μm range and is designed to observe the `cool universe'; it has the potential of discovering the earliest epoch proto-galaxies, revealing cosmologically evolving AGN/starburst symbiosis, and unravelling the mechanisms governing the formation of stars and planetary systems, such as our

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Google

Herschel Science Centre

Research & Science Home | ESA Public Information Site | Sci-Tech Portal | Herschel Public Information Site | Herschel Sci-Tech Portal

esa Herschel Science Centre European Space Agency

Astrophysics Missions | Planetary Exploration Missions | Solar Terrestrial Science Missions | Fundamental Physics Missions

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Herschel will be launched in 2008 and operated as an observatory facility. Commencing about six months after launch it will offer three years of routine science observations. It will be available for the worldwide scientific community, with roughly two thirds of the observing time being `open time', which will be allocated through a standard competitive proposal procedure.

Hot off the press!

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Help us help you!

- We are committed to helping you
- But you need to give us the chance
- Let others benefit from your questions
- Register as a Herschel user
- Use the Helpdesk

Herschel Open Time Key Program Workshop

Venue: 20-21 February 2007, ESTEC, Noordwijk, The Ne[illegible]
Information: http://www.rssd.esa.int/Herschel/

Welcome to Herschel !!

[illegible] Team

Local Organisation:
Herschel Scie[illegible]

[illegible]ncement
has been issued

Register online!

Welcome!