The Cool Universe:

The ESA *Herschel Space Observatory*: First Year in Flight and Status

Göran Pilbratt

Herschel Project Scientist

HerschelUG#1 meeting
IoA, Cambridge, 20-21/10/2010

→ Herschel First Results Symposium

4-7 May 2010
ESA ESTEC, Noordwijk, The Netherlands

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esa.conference.bureau@esa.int

http://www.congrex.nl/10A10/

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www.esa.int **European Space Agency**

Launch on 14 May 2009!

Herschel Science Centre

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

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Herschel Science Centre

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20-October-2010 00:59:14

Right now OD#524 is (not...) underway!

Herschel General Information

- Herschel Science Centre Home
- Herschel People
- Latest News
- Mission Overview
- Science Instruments
- Community Information
- Conferences/Workshops
- Press Releases
- e-News
- Useful links

Herschel Announcement of Opportunity (OT1)

- Introduction
- 'How-to' step-by-step
- Documentation
- Tools
- AO Latest News

Herschel Observing

- Observing Log
- Observing Schedule
- AOTs Release Status
- Key Programmes

Herschel Latest News

Status summary: Herschel was successfully launched together with Planck on 14 May 2009. Currently Herschel is conducting routine science phase operations.

523 T 09 : 52 : 50

Days Hours Minutes Seconds

Elapsed time since launch on 14 May 2009 at 13:12 (UTC).

Herschel discovery published in Nature. The discovery of a multitude (more than 60) of spectral lines from warm water vapour in the circumstellar environment around the ageing carbon star IRC +10216 (aka CW Leo and AFGL 1381) and the resulting implications have been published in Nature on 2 September 2010 by Leen Decin and her collaborators in the Herschel MESS consortium. The images above are combined PACS and SPIRE images (PACS 160 μm blue, SPIRE 250 μm green and 350 μm red) approximately covering 15x15 arcmin (Courtesy ESA/PACS /SPIRE/MESS consortia). See also the ESA Corporate and SciTech webstories.

Herschel AO OT1 response consolidated. After a period of consolidation of the OT1 proposals received, including identifying and removing duplicate proposals and other checks, the consolidated response is a total of 576 proposals requesting 20962 hours of Herschel observing time. These proposals are provided to the Herschel Time Allocation Committee (HOTAC) for scientific assessment.

From launch to observatory

HERSCHEL SPACE OBSERVATORY

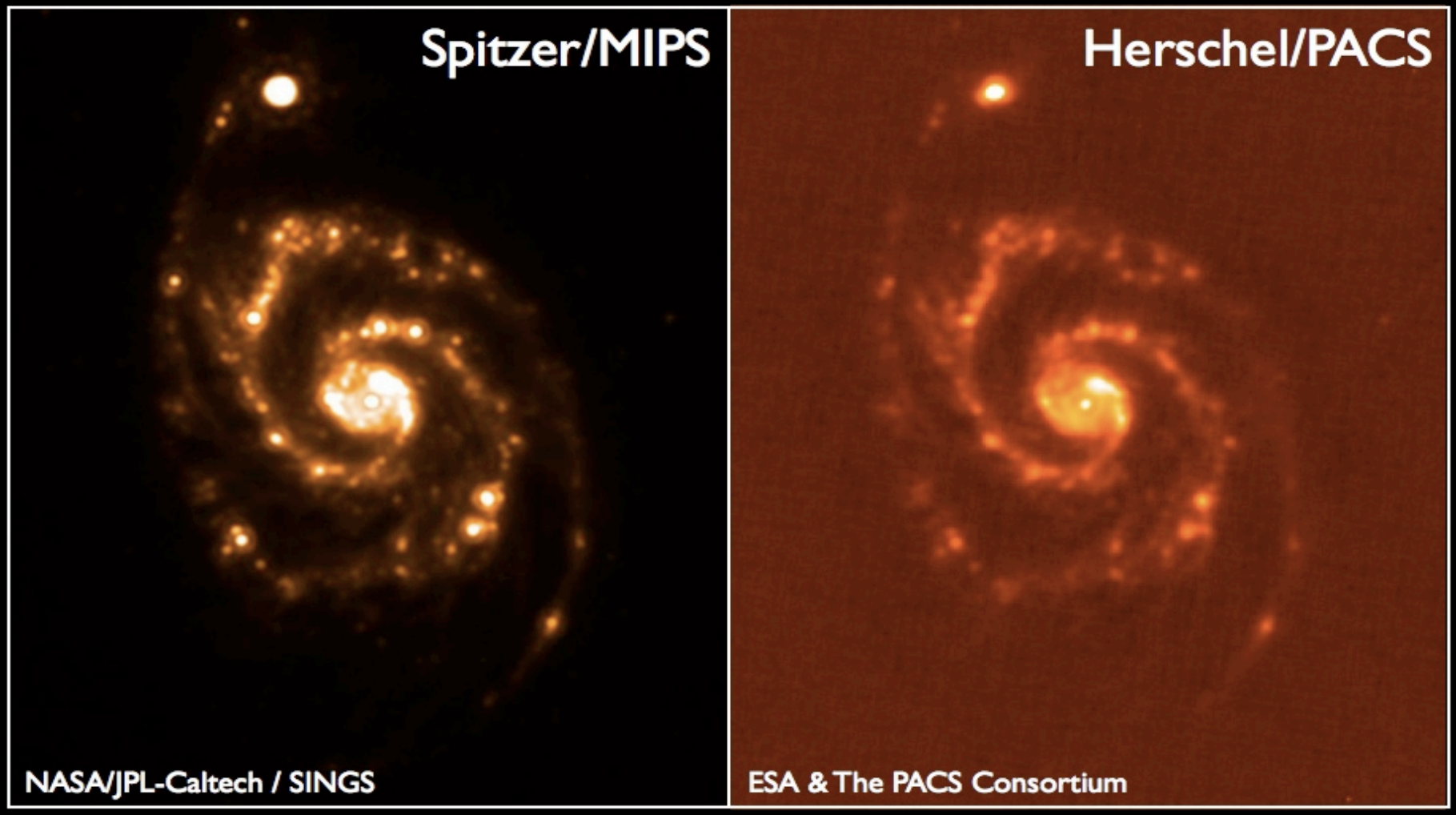
Early mission phases

- **Launch on 14 May 2009**
  - 'Nominal' launch – with very high precision
- **Commissioning Phase ~2 months**
  - Functional testing
  - Cryocover opening on 14 June 2009 – very first observation (PACS M51 scanmap) attempt immediately following
  - **Output**: Commissioning phase review and handover from the 'implementors' (Project Manager) to the 'users' (Mission Manager) of a spacecraft system that fulfills the specifications (performance and operability) including functionally verified instruments
  - In-Orbit Commissioning Review (IOCR) was held in July 2009 with Board meeting and handover to MM on 21 July 2009
  - Was carried out close to nominal plan

HERSCHEL SPACE OBSERVATORY


SUN307
D2
DESK-10356
Cryocover opening on 14 June 2009
Print Display
Print Details
Active Printjobs:
Abort
Display Info: ZGA09999 : Estimated Attitude Erros
PRINT DISPLAY
PRINT HISTORY
PRINT HISTORY FROM:
PRINT HISTORY UP TO / FOR:
STOP TIME
DURATION
FILE/PRINTER
ASCII FILE ONLY
PRINTER ONLY
Filename:
Browse
OK
Apply
Cancel
AUTO HARD COPY
OFF
VALUE
UNIT
VLDITY
SAMPLE TIME
MIN
MAX
LINE
1.5284e-06 rad VALID 2009.165.10.57.28.958 -0.00005 0.00005
4.0642e-07 rad VALID 2009.165.10.57.28.958 -0.00001 0.00001
5.1601e-07 rad VALID 2009.165.10.57.28.958 -0.00001 0.00001
165.10.57.44.959
0.000009
-0.000009
165.10.57.44.959
165.10.57.38 [sun307:0:HONTNdsk_RT::12582] execute: Print job started on ncp622

Spitzer 24 um and Herschel 100 um



Spiral Galaxy M51 ("Whirlpool Galaxy") at 24μm (MIPS) and 100μm (PACS)

Early mission phases

- **Performance Verification Phase ~3 months**
  - Scientific verification of instruments …
  - … but also spacecraft e.g. pointing, timing
  - Optimisation, verification, and release of observing modes
  - **Output**: Observing modes (AOTs) that are released for performing scientific observations
- **Science Demonstration Phase ~1+ month**
  - Execute snippets of Key Programmes for 'validation' using the released AOTs
  - Also a few 'specially designed' observations (e.g. polarisation)
  - Get initial science as 'by-product'
  - **Output**: Observing programmes (the Key Programmes) that are released for execution in the Routine Science Phase

HERSCHEL SPACE OBSERVATORY

Early mission phases

- **Performance Verification & Science Demonstration Phases (& Routine Science Phase) overlapping**
  - Early on in PVP HIFI anomaly on 2 August -> replan for without HIFI
  - Stress on all teams:
    - HIFI investigation
    - PACS and SPIRE higher pace
    - HSC replanning and scheduling
  - Scan map modes very successful, released 'early' for SDP and RSP
  - Most SDP observing carried out in November-December 2009
  - Concerted effort to construct 3 weeks of schedules for Xmas/New Year to give teams some respite
  - HIFI back on 10 January 2010, allocated ~½ the time Feb-Apr 2010
  - HIFI (CoP/)PVP/SDP and SPIRE & PACS RSP and delta-PVP (incl 2nd generation AOTs) observing in winter/spring 2010

Taking stock – first year in-flight

Launched on 14 May 2009

- 14 June 2009 - cryo-cover opening, followed by first observation
- 15 July 2009 - Performance Verification Phase commenced
- 2 August 2009 - HIFI anomaly
- 12 September 2009 – first Science Demonstration Phase observation
- 18 October 2009 – first Routine Science Phase observation

SDP Initial Results workshop 17-18 December 2009

- 10-14 January 2010 – HIFI turned on
- February-April 2010 – HIFI catching up, allocated ~50% of the time
- 9 March 2010 – HSA and HIPE publicly available
- 31 March 2010 – submission deadline A&A Special Issue papers

HIFI Initial Results workshop 12-13 April 2010

Herschel First Results symposium 4-7 May 2010

- 20 May 2010 – first in-flight open time (OT1) AO issued
- 31 May 2010 – submission deadline A&A HIFI Special Feature papers
- 22 July 2010 – OT1 proposal submission deadine

HERSCHEL SPACE OBSERVATORY

Routine Science Phase

- **Routine Science Phase**
  - Execute the ‘validated’ Key Programmes
  - Issue in-flight calls for additional observing proposals
- **Scheduling**
  - In each scheduling ‘cycle’ (~ 2 weeks) reflect available AORs
    - Early significant restrictions due to
      - Available AOTs – all of HIFI ‘late’, spectroscopy generally lagging photometry for PACS and SPIRE
      - Released AORs – some observers chosing to wait
  - Schedule for max observatory (helium use) efficiency
  - No particular observing programme preferences
    - This point was discussed and rejected in HerschelST

AOT release overview

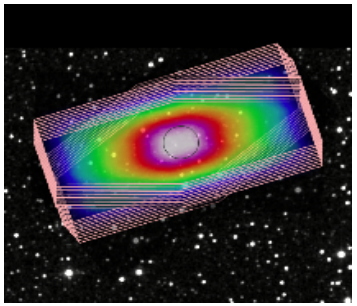
AOT description	AOT Release Telecon	#OD / Date 1st scheduled	
SPIRE Scan Maps	11-Sep-09	121 / 11-Sep-2009	
PACS Scan Maps	06-Oct-09	148 / 9-Oct-2009	
SPIRE PACS Parallel Mode	14-Oct-09	159 / 19-Oct-2009	
PACS Line Spectroscopy (chop-nod)	30-Oct-09	165 / 26-Oct-2009	
PACS Line/Range Spectroscopy (chop-nod)	06-Nov-09	179 / 9-Nov-2009	
PACS Point Source Photometry (chop-nod)	12-Nov-09	186 / 16-Nov-2009	
PACS Mapping Spectroscopy	18-Nov-09	196 / 26-Nov-2009	
PACS Spectroscopy - wavelength switching	02-Dec-09	235 / 4-Jan-2010	
SPIRE 7-point jiggle point photometry	04-Dec-09	301 / 11-Mar-2010	
SPIRE sparse map spectroscopy	04-Dec-09	209 / 9-Dec-2009	
PACS SED mode and Range spectroscopy for large ranges	15-Jan-10	297 / 7-Mar-2010	
HIFI Dual Beam Switch	25-Feb-10	291 / 28-Feb 2010	
SPIRE Small Map photometry	17-Mar-10	288 / 26-Feb-2010	
HIFI point non-DBS modes	06-Apr-10	332 / 11-Apr-2010	
SPIRE Spectrometer mapping modes	19-Apr-10	383 / 1-Jun-2010	
SPIRE Point Source Photometry	26-Apr-10	not used	
HIFI Mapping modes	12-Jul-10	397 / 15-Jun-2010 (tests)	441 / 28-Jul-2010
SPIRE Spectroscopy - bright source mode	07-Sep-10	494 / 19-Sep-2010	
PACS Unchopped spectroscopy #2nd Generation	17-Sep-10	523 / 18-Oct-2010	

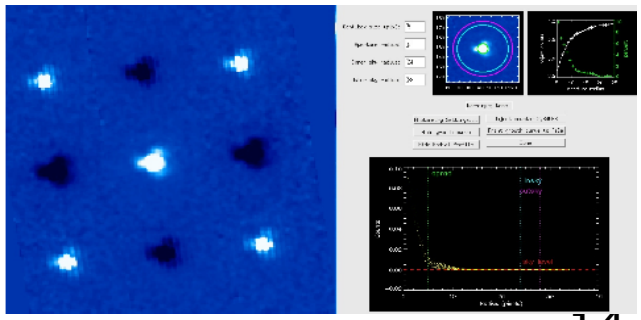
Observing status

PACS photometer AOTs

HerschelST#43:

- Two point source photometry modes available:
  - Chopped photometry & minimaps
- Recent findings: minimaps superior for all cases
  - AOT release note will be updated accordingly
  - All GT KP / OT KP / GT1 proposals already use this
  - HSC will screen OT1 observations for phase 2





PACS spectrometer AOTs release status

HerschelST#43:

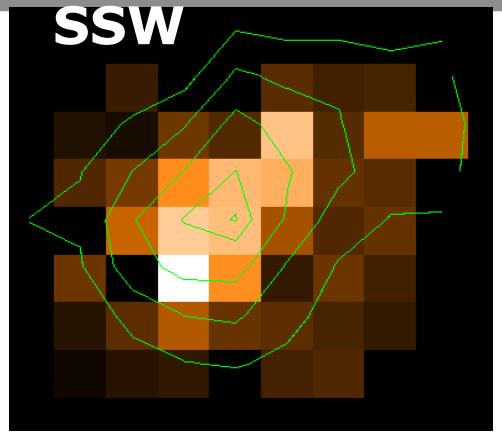
- Released PACS unchopped line scan & unchopped range scan on 20 September 2010
- To be used where no clean chop off position is available to do chopped line / range spectroscopy
- Unchopped line scan supersedes wavelength switching
- Line or range scan repeated at off position for background subtraction
  - Within the AOR for unchopped line spectroscopy
  - As concatenated AOR for unchopped range spectroscopy

SPIRE AOT Release Status

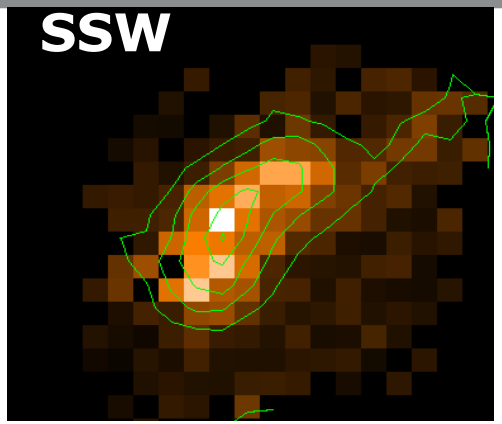
HerschelST#43:

- Final sub-mode Spectrometer bright source mode now released
- No other changes
- No changes planned unless absolutely necessary
  - A lot of effort
  - Non-uniform archival data

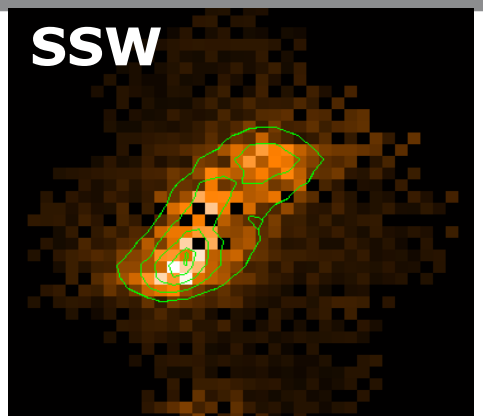
SPIRE Spectral Mapping



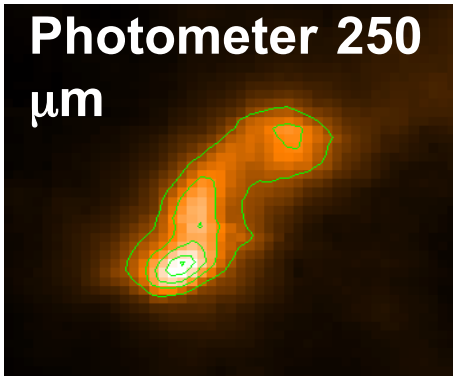
Sparse (38” pixels)

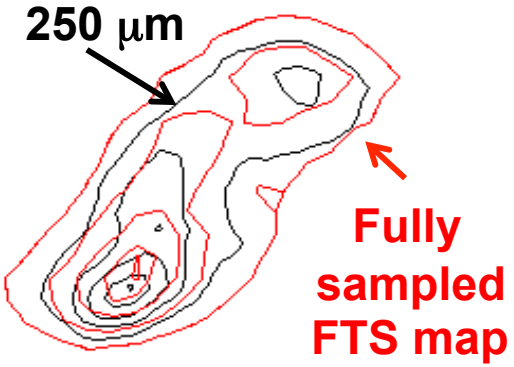


Intermediate (19” pixels)



Full (9.5” pixels)





- **Full 194 – 671 μm spectrum (~ 1000 resolution elements) in (35, 19) positions simultaneously**
- **Standard observation: 4 scans x 67 sec. per pointing**

HIFI AOT validation – status and time line

HerschelST#43 reporting:

DBS and variations approved March 5, released March 8

Point		Map		Scan	
DBS	Bands 1-5	DBSRaster	Bands 1-5	DBS	Bands 1-5
FastDBS	All Bands	FastDBSRaste	All Bands	FastDBS	All Bands
		DBSCross	On Hold		
		FastDBSCross	On Hold		

Point Non-DBS and variations approved March 26, released April 6

Point		Map		Scan	
PosSwitch	All Bands	OTF	In progres		
LoadChop	All Bands	OTFLChop	In progress	LoadChop	In progress
LoadChopNoRef	All Bands	OTFLChopNoRef	In progress	LoadChopNoRef	In progress
FreqSwitch	Bands 1-5	OTFFSwitch	In progress	FreqSwitch	In progress
FreqSwitchNoRef	Bands 1-5	OTFFSwitchNoRef	In progress	FreqSwtichNoRef	In progress

Freq. Switch maps in [CII] will be attempted

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HIFI released all its AOTs - 16 July 2010

HerschelST#43 reporting cont'd:

HIFI calibration

- An accelerated re-commissioning, PV and AOT validation has been done.
- Release of
  - Double Beam Switch Modes in single pointings and raster scans
  - Frequency switch, load chop and position switch modes in single pointings and raster scans
  - OTF mapping modes – these modes rely on exact timing and space craft operation
  - Cross modes
- All modes are now released – caveats exist
  - fast chopping needed in the HEB bands
  - No frequency switch in HEB bands, except at [CII]

Observing status – 15 Oct 2010

Status as per OD#519 (14-15 October 2010)

	Total	Executed	Scheduled
#AORs:	14965	6494 (43.4%)	566 (3.8%)
Time (hr):	11312	5230 (46.2%)	380 (3.4%)

Status per 'AO' and between observing programmes

- The above numbers are the totals
- Executed per 'AO' status
  - SDP 100.0% of 606 hr
  - KPGT 52.6% of 5533 hr
  - KPOT 42.7% of 5223 hr
  - GT1 18.2% of 551 hr
- Detailed execution statistics has been generated

HERSCHEL SPACE OBSERVATORY

Execution status – 15 Oct 2010 - top

Name	#AORs	Duration(h)	Alloc.(h)	# Executed	% # Executed	Executed(h)	% T Executed
KPOT_mmeixner_1	29	234.83	238.00	29	100.00	234.83	100.00
KPOT_delbaz_1	191	361.30	362.60	191	100.00	361.30	100.00
GT1_mkidger_2	12	10.70	10.70	12	100.00	10.70	100.00
GT1_ivaltcha_1	7	12.05	12.00	7	100.00	12.05	100.00
KPGT_seales01_1	236	87.13	112.60	226	95.76	84.74	97.26
GT1_jcernich_4	14	45.06	45.00	13	92.86	41.95	93.11
KPGT_dlutz_1	376	663.50	654.90	325	86.44	563.30	84.90
KPGT_vbujarra_1	324	180.42	214.60	270	83.33	149.01	82.59
KPOT_eegami_1	132	309.18	292.30	108	81.82	250.79	81.11
KPGT_okrause_1	240	85.34	111.70	190	79.17	68.20	79.91
KPOT_gsmith01_1	86	147.21	145.00	58	67.44	96.99	65.88
KPGT_golofs01_1	43	63.07	61.00	27	62.79	41.40	65.65
KPGT_fmotte_1	82	129.18	126.00	41	50.00	83.60	64.71
KPGT_ebergin_1	280	374.55	346.80	189	67.50	234.14	62.51
KPGT_evandish_1	731	392.56	499.00	466	63.75	229.64	58.50
KPOT_pgolds01_1	129	140.15	140.00	75	58.14	78.20	55.80
KPOT_smolinar_1	120	340.70	344.30	60	50.00	172.45	50.61
KPOT_thmuelle_1	917	391.56	372.70	599	65.32	194.38	49.64
KPGT_mgroen01_1	450	324.36	330.00	280	62.22	160.46	49.47
KPOT_pvanderw_1	61	99.08	100.00	44	72.13	49.00	49.46
KPGT_smadde01_1	287	103.55	104.90	152	52.96	51.07	49.32
KPGT_aabergel_1	178	146.69	163.00	109	61.24	71.49	48.74
KPGT_cceccare_1	136	250.32	281.00	53	38.97	118.53	47.35
TOTAL/MEAN	14953	11,299.97	11,812.40	6482	43.35	5,218.04	46.18

Execution status – 15 Oct 2010 - bottom

Name	#AORs	Duration(h)	Alloc.(h)	# Executed	% # Executed	Executed(h)	% T Executed
KPOT_mjuvela_1	610	150.86	150.90	27	4.43	15.85	10.50
GT1_dlutz_4	79	40.38	41.00	8	10.13	4.76	11.79
KPOT_tmegeath_2	308	198.41	200.00	68	22.08	25.74	12.97
GT1_msanchez_2	90	15.05	15.10	11	12.22	2.22	14.73
GT1_epoleham_1	26	6.82	7.00	4	15.38	1.06	15.51
KPOT_cmarti01_1	77	115.38	125.00	28	36.36	18.63	16.15
GT1_lorourke_9	34	16.71	20.30	10	29.41	2.96	17.70
KPOT_nevans_1	201	249.65	250.00	85	42.29	48.01	19.23
GT1_pbarthel_1	211	37.56	38.00	33	15.64	7.70	20.51
KPOT_bdent_1	945	390.33	400.00	173	18.31	88.53	22.68
KPOT_rkennicu_1	839	393.79	536.60	165	19.67	99.17	25.18
KPOT_seales01_2	66	585.40	600.00	19	28.79	149.11	25.47
KPGT_cwilso01_1	103	145.59	143.90	35	33.98	39.37	27.04
KPOT_bmatthew_1	978	140.64	140.00	258	26.38	43.02	30.59
KPOT_aedge_1	77	129.27	140.50	26	33.77	43.08	33.32
KPGT_esturm_1	529	343.55	295.50	157	29.68	115.95	33.75
KPGT_mgerin_1	948	111.31	128.00	382	40.30	38.18	34.30
KPGT_pharto01_1	412	294.96	293.70	96	23.30	102.62	34.79
KPGT_kmeisenh_1	400	149.14	164.50	178	44.50	52.78	35.39
KPOT_jdavie01_1	30	226.51	286.00	12	40.00	80.92	35.72
KPGT_vossenko_1	275	138.74	160.00	147	53.45	49.72	35.84
GT1_cdedes_1	10	3.47	3.20	5	50.00	1.27	36.54
KPGT_pandre_1	203	460.99	461.00	85	41.87	179.19	38.87
GT1_lspinogl_4	23	13.98	14.00	9	39.13	5.46	39.08
KPGT_rguesten_1	416	270.96	326.80	181	43.51	108.27	39.96
KPOT_wlanger_1	573	223.28	223.00	253	44.15	89.98	40.30
KPGT_soliver_1	394	822.70	900.00	275	69.80	364.27	44.28
KPOT_ceiroa_1	388	139.98	140.00	176	45.36	63.72	45.52
TOTAL/MEAN	14953	11,299.97	11,812.40	6482	43.35	5,218.04	46.18

Execution status – 15 Oct 2010 - KPGT

esa

Name	#AORs	Duration(h)	Alloc.(h)	# Executed	% # Executed	Executed(h)	% T Executed
KPGT_aabergel_1	178	146.69	163.00	109	61.24	71.49	48.74
KPGT_cceccare_1	136	250.32	281.00	53	38.97	118.53	47.35
KPGT_cwilso01_1	103	145.59	143.90	35	33.98	39.37	27.04
KPGT_dlutz_1	376	663.50	654.90	325	86.44	563.30	84.90
KPGT_ebergin_1	280	374.55	346.80	189	67.50	234.14	62.51
KPGT_esturm_1	529	343.55	295.50	157	29.68	115.95	33.75
KPGT_evandish_1	731	392.56	499.00	466	63.75	229.64	58.50
KPGT_fmotte_1	82	129.18	126.00	41	50.00	83.60	64.71
KPGT_golofs01_1	43	63.07	61.00	27	62.79	41.40	65.65
KPGT_kmeisenh_1	400	149.14	164.50	178	44.50	52.78	35.39
KPGT_mgerin_1	948	111.31	128.00	382	40.30	38.18	34.30
KPGT_mgroen01_1	450	324.36	330.00	280	62.22	160.46	49.47
KPGT_okrause_1	240	85.34	111.70	190	79.17	68.20	79.91
KPGT_pandre_1	203	460.99	461.00	85	41.87	179.19	38.87
KPGT_pharto01_1	412	294.96	293.70	96	23.30	102.62	34.79
KPGT_rguesten_1	416	270.96	326.80	181	43.51	108.27	39.96
KPGT_seales01_1	236	87.13	112.60	226	95.76	84.74	97.26
KPGT_smadde01_1	287	103.55	104.90	152	52.96	51.07	49.32
KPGT_soliver_1	394	822.70	900.00	275	69.80	364.27	44.28
KPGT_vbujarra_1	324	180.42	214.60	270	83.33	149.01	82.59
KPGT_vossenko_1	275	138.74	160.00	147	53.45	49.72	35.84

Execution status – 15 Oct 2010 - KPOT

esa

Name	#AORs	Duration(h)	Alloc.(h)	# Executed	% # Executed	Executed(h)	% T Executed
KPOT_aedge_1	77	129.27	140.50	26	33.77	43.08	33.32
KPOT_bdent_1	945	390.33	400.00	173	18.31	88.53	22.68
KPOT_bmatthew_1	978	140.64	140.00	258	26.38	43.02	30.59
KPOT_ceiroa_1	388	139.98	140.00	176	45.36	63.72	45.52
KPOT_ckrame01_1	42	237.45	191.90	4	9.52	8.25	3.47
KPOT_cmarti01_1	77	115.38	125.00	28	36.36	18.63	16.15
KPOT_delbaz_1	191	361.30	362.60	191	100.00	361.30	100.00
KPOT_eegami_1	132	309.18	292.30	108	81.82	250.79	81.11
KPOT_gsmith01_1	86	147.21	145.00	58	67.44	96.99	65.88
KPOT_jdavie01_1	30	226.51	286.00	12	40.00	80.92	35.72
KPOT_mjuvela_1	610	150.86	150.90	27	4.43	15.85	10.50
KPOT_mmeixner_1	29	234.83	238.00	29	100.00	234.83	100.00
KPOT_nevans_1	201	249.65	250.00	85	42.29	48.01	19.23
KPOT_pgolds01_1	129	140.15	140.00	75	58.14	78.20	55.80
KPOT_pvanderw_1	61	99.08	100.00	44	72.13	49.00	49.46
KPOT_rkennicu_1	839	393.79	536.60	165	19.67	99.17	25.18
KPOT_seales01_2	66	585.40	600.00	19	28.79	149.11	25.47
KPOT_smolinar_1	120	340.70	344.30	60	50.00	172.45	50.61
KPOT_thmuelle_1	917	391.56	372.70	599	65.32	194.38	49.64
KPOT_tmegeath_2	308	198.41	200.00	68	22.08	25.74	12.97
KPOT_wlanger_1	573	223.28	223.00	253	44.15	89.98	40.30

Execution status – 15 Oct 2010 - instr

Status	HIFI(#)	HIFI(AORs %)	HIFI(h)	HIFI(T%)	PACS(#)	PACS(AORs %)	PACS(h)	PACS(T%)
EXECUTED	2111	51.34	1,167.19	50.50	2927	34.86	2,278.24	40.93
SCHEDULED	290	7.05	104.20	4.51	241	2.87	209.65	3.77
RELEASED	1499	36.45	718.45	31.08	3513	41.84	1,988.45	35.73
ACCEPTED	212	5.16	321.52	13.91	1716	20.44	1,089.32	19.57
SUBMITTED	0	0.00	0.00	0.00	0	0.00	0.00	0.00
TOTAL	4112	100.00	2,311.36	100.00	8397	100.00	5,565.66	100.00

Status	SPIRE(#)	SPIRE(AORs %)	SPIRE(h)	SPIRE(T%)	SP_PAR(#)	SP_PAR(AORs %)	SP_PAR(h)	SP_PAR(T %)
EXECUTED	1188	60.43	709.53	64.20	256	53.56	1,063.09	45.87
SCHEDULED	15	0.76	7.24	0.66	20	4.18	59.53	2.57
RELEASED	542	27.57	300.00	27.15	202	42.26	1,195.21	51.57
ACCEPTED	221	11.24	88.34	7.99	0	0.00	0.00	0.00
SUBMITTED	0	0.00	0.00	0.00	0	0.00	0.00	0.00
TOTAL	1966	100.00	1,105.12	100.00	478	100.00	2,317.83	100.00

Execution status – 15 Oct 2010 - instr

Status	HIFI(#)	HIFI(AORs %)	HIFI(h)	HIFI(T%)	PACS(#)	PACS(AORs %)	PACS(h)	PACS(T%)
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SCHEDULED	15	0.76	7.24	0.66	20	4.18	59.53	2.57
RELEASED	542	27.57	300.00	27.15	202	42.26	1,195.21	51.57
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SUBMITTED	0	0.00	0.00	0.00	0	0.00	0.00	0.00
TOTAL	1966	100.00	1,105.12	100.00	478	100.00	2,317.83	100.00

Publication status

Simple publication search

Using ADS on 19/10/2010:

- From 07/2010 (publ date of A&A Herschel Special Issue)
- Abstract should include (and/or): Herschel, PACS, SPIRE, HIFI
- All refereed articles, select only articles ticked
- Initial result: 246
  - Quick abstract inspection: subtract ~15
- Result: 231
  - Journals: A&A, MNRAS, ApJ, Nature
- Known that additional Science and Nature papers are forthcoming… clearly others too
- A publication list will be maintained on the HSC website

A&A Herschel Special Issue (16 July 2010)

Astronomy and Astrophysics

Vol. 518 (July-August 2010)

Herschel: the first science highlights

Free

Editorial

***Herschel* special feature** E1
C. M. Walmsley, C. Bertout, F. Combes, A. Ferrara, T. Forveille, T. Guillot, A. Jones and S. Shore
Published online: 16 July 2010
DOI: 10.1051/0004-6361/201015246
Abstract | Full HTML | PDF (33.43 KB) | PS (13.16 KB) | NASA ADS Abstract Service

Free

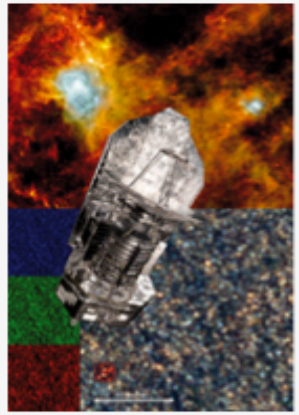
***Herschel* Space Observatory - An ESA facility for far-infrared and submillimetre astronomy** L1
G. L. Pilbratt, J. R. Riedinger, T. Passvogel, G. Crone, D. Doyle, U. Gageur, A. M. Heras, C. Jewell, L. Metcalfe, S. Ott and M. Schmidt
Published online: 16 July 2010
DOI: 10.1051/0004-6361/201014759
Abstract | Full HTML | PDF (1.551 MB) | PS (1.440 MB) | References | NASA ADS Abstract Service

Free

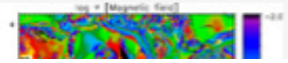
The Photodetector Array Camera and Spectrometer (PACS) on the *Herschel* Space Observatory L2
A. Poglitsch et al.
Published online: 16 July 2010
DOI: 10.1051/0004-6361/201014535
Abstract | Full HTML | PDF (1.534 MB) | PS (25.29 MB) | References | NASA ADS Abstract Service

Free

The *Herschel*-SPIRE instrument and its in-flight performance L3
M. J. Griffin et al.
Published online: 16 July 2010
DOI: 10.1051/0004-6361/201014519



Computer rendering of the Herschel satellite overlaid on a PACS/SPIRE image of a stellar nursery in Aquila, where hundreds of stars are forming (top).
The lower panel shows a SPIRE three-colour image of GOODS-N with thousands of visible galaxies with an inset of the famous JCMT/SCUBA image for comparison.
(see Herschel special feature)



HERSCHEL SPACE OBSERVATORY

A&A HIFI Special Feature (October 2010)

Astronomy and Astrophysics

Vol. 521 (October 2010) (open volume)

Herschel/HIFI: first science highlights

Free

Editorial

***Herschel*/HIFI: first science highlights** E1
C. M. Walmsley, C. Bertout, F. Combes, T. Forveille, T. Guillot, A. Jones and S. Shore
Published online: 1 October 2010
DOI: 10.1051/0004-6361/201015613
Abstract | PDF (30.77 KB) | PS (11.87 KB) | NASA ADS Abstract Service

Free

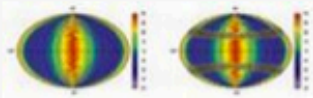
HIFI spectroscopy of low-level water transitions in M 82 L1
A. Weiß et al.
Published online: 1 October 2010
DOI: 10.1051/0004-6361/201015078
Abstract | PDF (296.9 KB) | PS (320.2 KB) | NASA ADS Abstract Service

Free

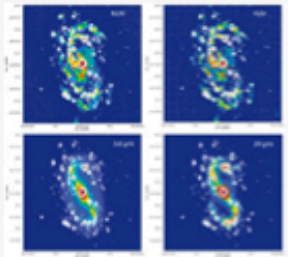
Excitation of the molecular gas in the nuclear region of M 82 L2
A. F. Loenen et al.
Published online: 1 October 2010
DOI: 10.1051/0004-6361/201015114
Abstract | PDF (348.8 KB) | PS (256.2 KB) | NASA ADS Abstract Service

Free

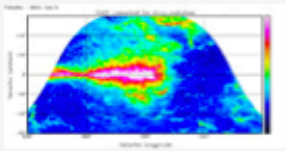
***Herschel*/HIFI observations of high-*J* CO transitions in the protoplanetary nebula CRL 618** L3
V. Bujarrabal et al.
Published online: 1 October 2010



The heliospheric magnetic shock obliquity (Scherer, K., et al., 521, A1)



Hα contours on morphologically complex barred spiral NGC 2903 (Popping, G., et al., 521, A8)



Milky Way 21 cm line emission at

HERSCHEL SPACE OBSERVATORY

IRC +10216 – warm water vapour

nature

Vol 467|2 September 2010|doi:10.1038/nature09344

LETTERS

Warm water vapour in the sooty outflow from a luminous carbon star

L. Decin[1,2], M. Agúndez[3,7], M. J. Barlow[4], F. Daniel[3], J. Cernicharo[3], R. Lombaert[1], E. De Beck[1], P. Royer[1], B. Vandenbussche[1], R. Wesson[4], E. T. Polehampton[5,6], J. A. D. L. Blommaert[1], W. De Meester[1], K. Exter[1], H. Feuchtgruber[8], W. K. Gear[9], H. L. Gomez[9], M. A. T. Groenewegen[10], M. Guélin[16], P. C. Hargrave[9], R. Huygen[1], P. Imhof[11], R. J. Ivison[12], C. Jean[1], C. Kahane[17], F. Kerschbaum[14], S. J. Leeks[5], T. Lim[5], M. Matsuura[4,15], G. Olofsson[13], T. Posch[14], S. Regibo[1], G. Savini[4], B. Sibthorpe[12], B. M. Swinyard[5], J. A. Yates[4] & C. Waelkens[1]

The detection[1] of circumstellar water vapour around the ageing carbon star IRC +10216 challenged the current understanding of chemistry in old stars, because water was predicted[2] to be almost absent in carbon-rich stars. Several explanations for the water were postulated, including the vaporization of icy bodies (comets or dwarf planets) in orbit around the star[1], grain surface reactions[3], and photochemistry in the outer circumstellar envelope[4]. With a single water line detected so far from this one carbon-rich evolved star, it is difficult to discriminate between the different mechanisms proposed. Here we report the detection of dozens of water

IRC +10216, each one making a specific prediction for the spatial distribution of H_2O in the envelope: grain-surface reactions, such as Fischer-Tropsch catalysis on the surface of small grains[3], which would imply that water reaches its maximum abundance at a radius around 2×10^{15} cm; and formation in the outer envelope through the radiative association of atomic oxygen and molecular hydrogen[4]. It has also been suggested that water could be formed in the warm and dense inner envelope[9], although no specific formation mechanism has been proposed for such an origin.

On 12 and 19 November 2009, IRC +10216 was observed with the

AO-1 and AO-2

HERSCHEL SPACE OBSERVATORY

Community information

Key Programmes allocated in 2007

- KPGT and KPOT approx equal in time, partly overlapping people
  - Want to expand user community in AO-1
  - Important to disseminate information, data, knowledge, tools

Science Demonstration Phase

- Produce early observational results, demonstrating science capabilities
- Early workshops
  - Data proc, observing results (December 2009, April 2010)
  - First Science Results - ESLAB (May 2010)
- Public 'real' data, software, and archive (March 2010)
- Herschel A&A Special Issue – subm deadline 31 Mar 2010 (+31 May)

AO-1 Open Time issued on 20 May 2010

- Presentations and A&A paper manuscripts publicly available online
- **HSpot, HIPE, and HSA with Herschel data (few x100 hours)**

HERSCHEL SPACE OBSERVATORY

Herschel ESLAB workshop May 2010

HERSCHEL SPACE OBSERVATORY

AO OT1 – from HSC Latest News

Herschel Open Time Announcement of Opportunity released! The first in-flight Open Time (OT1) Announcement of Opportunity (AO) process has started. The OT1 call has been released on 20 May 2010. It offers 6592 hours of Herschel observing time with proposal submission deadline on 22 July 2010 at 12:00h UT. See the menu on the left.

Herschel Open Time Announcement of Opportunity closed. The proposal submission deadline for the first in-flight Open Time (OT1) Announcement of Opportunity (AO) was on 22 July 2010. The preliminary outcome is a total of 585 proposals requesting 21760 hours of observing time. These numbers are still TBC.

Herschel AO OT1 response consolidated. After a period of consolidation of the OT1 proposals received, including identifying and removing duplicate proposals and other checks, the consolidated response is a total of 576 proposals requesting 20962 hours of Herschel observing time. These proposals are provided to the Herschel Time Allocation Committee (HOTAC) for scientific assessment.

This is the public information!

HERSCHEL SPACE OBSERVATORY

Herschel – community

Herschel community:

- The number of 'registered Herschel users' is currently ~1500
- KP user community consists of ~800 unique people
  - There were ~1500 names on the 42 accepted proposals
- The OT1 proposals represent ~2400 unique people
  - There are ~5000 names on the proposals
- There are 74 people with their names on 10 proposals or more
  - The record is being on 42 proposals…

Herschel status and 'issues'

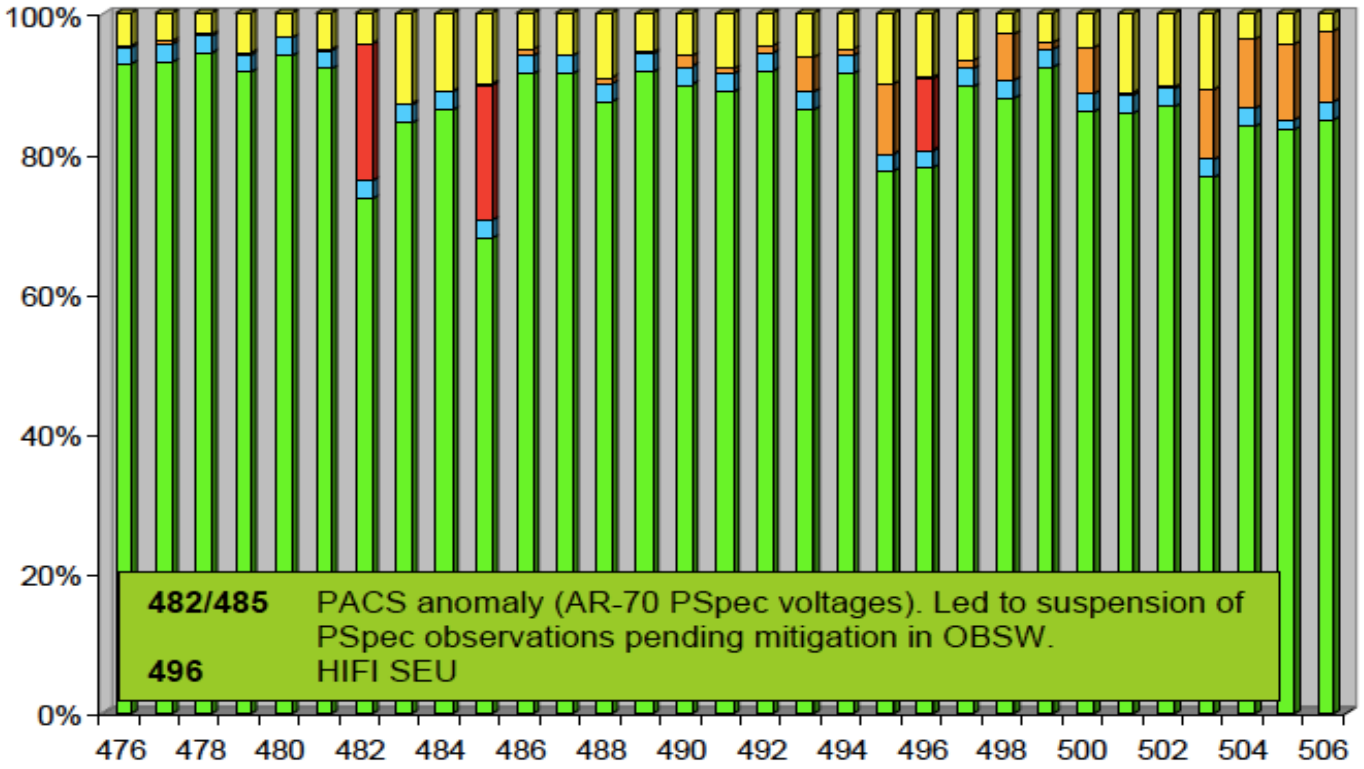
HERSCHEL SPACE OBSERVATORY

Overall mission status

Herschel is working well and producing good data!

- All subsystems on 'prime' except HIFI warm electronics
- Observatory efficiency is generally very high

4. Histogram of Mission Time usage per OD (ODs 476 to 506)



Operations Windows include orbit manoeuvres, reaction wheel biasing etc.

"Not used" time includes thermal stabilisation times and other operationally required inactive periods.

- Slew Time
- Not used Time
- Lost Time
- Operations Windows
- Observation Time

HERSCHEL SPACE OBSERVATORY

Observation 'production'

Charged time to various programmes:

- 'Science' refers to time 'charged' to KPGT/KPOT/GT1 programmes
- Mission design nominally 0.86x21 hr = 18.06 hr per 24 hr

Cycle 20

OD	Instrument	Time used	Science	Cal/Eng	[Cal	Eng]	
455	P_PHOT	22.70h	18.66h	4.04h	[1.03h	3.01h]	
456	P_PHOT	22.47h	19.17h	3.30h	[2.67h	0.63h]	
457	P_PHOT,P_SPEC	22.29h	12.58h	9.71h	[8.22h	1.49h]	
458	SP_PAR,S_PHOT	23.06h	19.22h	3.84h	[3.63h	0.21h]	
459	SP_PAR,S_PHOT	22.82h	21.73h	1.09h	[0.42h	0.67h]	
460	P_PHOT,P_SPEC	29.11h	17.28h	11.83h	[10.13h	1.70h]	longer OD
461	HIFI	16.27h	13.83h	2.44h	[0.17h	2.27h]	shorter OD
462	HIFI	23.06h	18.69h	4.37h	[1.13h	3.24h]	
463	HIFI	19.96h	4.60h	15.36h	[8.54h	6.82h]	
464	SP_PAR,S_PHOT,P_PHOT	23.06h	19.43h	3.63h	[0.00h	3.63h]	
465	SP_PAR,P_PHOT	23.48h	22.81h	0.67h	[0.00h	0.67h]	
466	S_SPEC	22.68h	17.95h	4.73h	[2.74h	1.99h]	
467	S_PHOT	22.55h	21.96h	0.59h	[0.43h	0.16h]	
468	S_PHOT	22.96h	21.96h	1.00h	[0.00h	1.00h]	

Observation 'production'

Charged time to various programmes:

- 'Science' refers to time 'charged' to KPGT/KPOT/GT1 programmes
- Mission design nominally 0.86x21 hr = 18.06 hr per 24 hr

Cycle 21

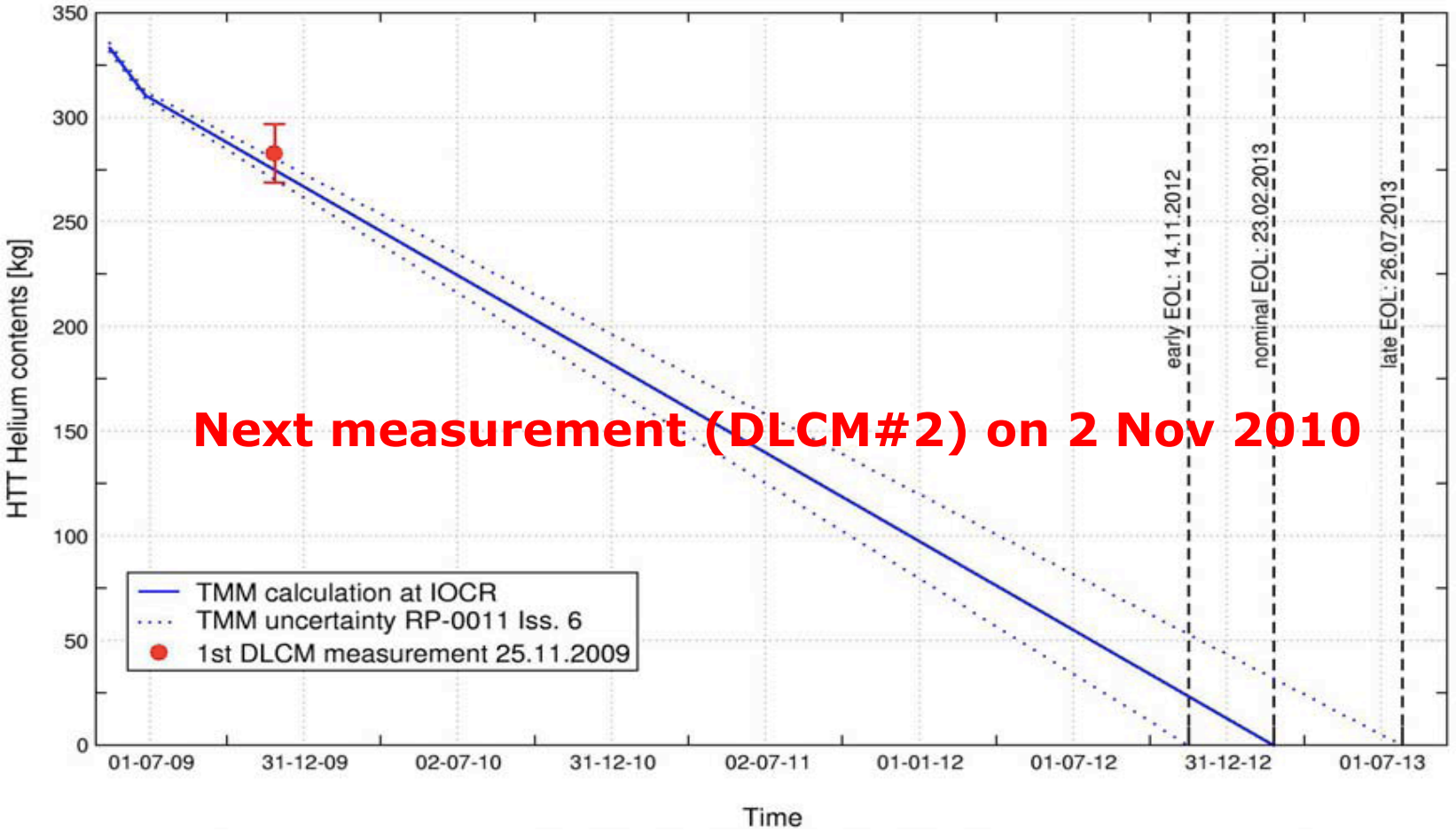
OD	Instrument	Time used	Science	Cal/Eng	[Cal	Eng]	
469	P_PHOT	23.09h	19.48h	3.61h	[0.61h	3.00h]	
470	P_PHOT (S_SPEC_Jfet)	23.34h	21.77h	1.57h	[0.00h	1.57h]	
471	P_PHOT, P_SPEC (S_DMP)	22.59h	20.38h	2.21h	[0.52h	1.69h]	
472	P_PHOT	23.34h	20.34h	3.00h	[0.00h	3.00h]	
473	P_PHOT, (HIFI)	23.37h	22.64h	0.73h	[0.64h	0.09h]	
474	P_PHOT, HIFI	23.16h	20.71h	2.45h	[1.02h	1.43h]	
475	HIFI	22.90h	20.73h	2.17h	[0.00h	2.17h]	
476	HIFI	26.43h	24.50h	1.93h	[0.65h	1.28h]	longer OD
477	HIFI	22.95h	20.99h	1.96h	[0.00h	1.96h]	
478	SP_PAR	23.22h	19.59h	3.63h	[0.00h	3.63h]	
479	SP_PAR, S_PHOT	22.90h	20.22h	2.68h	[0.68h	2.00h]	
480	SP_PAR, P_PHOT	23.21h	19.58h	3.63h	[0.00h	3.63h]	
481	SP_PAR, S_PHOT	22.55h	21.05h	1.50h	[0.83h	0.67h]	
482	P_SPEC	23.25h	18.96h	4.29h	[1.09h	3.20h]	

- This is considered representative of what is to come in general

HERSCHEL SPACE OBSERVATORY

Mission (cryostat) lifetime

Large uncertainties remain, but confidence in ≥ 3.5 years



HERSCHEL SPACE OBSERVATORY

Mission 'issues'

Instruments affected by (presumed) SEUs:

- SPIRE and HIFI are routinely affected by SEUs – checksum errors
  - Handled by operational routines (MOC, ICC, HSC)
  - HIFI anomaly in Aug 2009, only case so far affecting obs time
  - SPIRE lost 1+ day recently, only time so far with loss of obs time
- PACS experiencing spontaneous voltage changes in DECMEC unit
  - Most likely caused by SEUs in FPGAs
  - Normally not affecting data quality, but …
  - … recently 20 hours of data was lost in a total of 3 ODs
  - PACS spectrometer observing was temporarily suspended
  - Mitigation by updated onboard procedures now in place

Mission 'issues'

HIFI accumulating issues:

- Operating on redundant warm electronics units (LSU, LCU, FCU, ICU) since reboot in January 2010
- Comb calibration signal for polarization V for one section in WBS gradually degrading – known before launch – workaround calibration (use HRS) scheme can be put in place when needed (likely soon)
- Power spikes attributed to failing heater in LSU recently seen
  - In retrospect have been there intermittently since early June, but appears are now quasi-continuous
  - If heater fails will affect LO 'frequency normal' stability, thus will affect LO signal stability for all frequencies
  - Magnitude of effect and possible mitigation ('calibration') unclear – being looked into by HIFI
- Letter to HerschelST. HIFI recently got much observing time in GC/ Orion time (also because PACS spectrometer was not used)

ESLAB 2010 …

Conferences

- ESLAB, ESTEC, 4-7 May 2010
  - 4 days, 415 people
- AAS#216, Miami, 23-27 May 2010
  - Plenary & special session
- SPIE, San Diego, 27 June-2 July 2010
  - Plenary & special session
- COSPAR, Bremen, 19-24 July 2010
  - Plenary & special session
- Topical meetings
  - Göteborg/Särö, Zermatt, …

Journal papers

- A&A 202 papers (vols 518, 521)
  - Reprint booklet ~1000 pages
- MNRAS & ApJ papers
- Nature & Science papers