

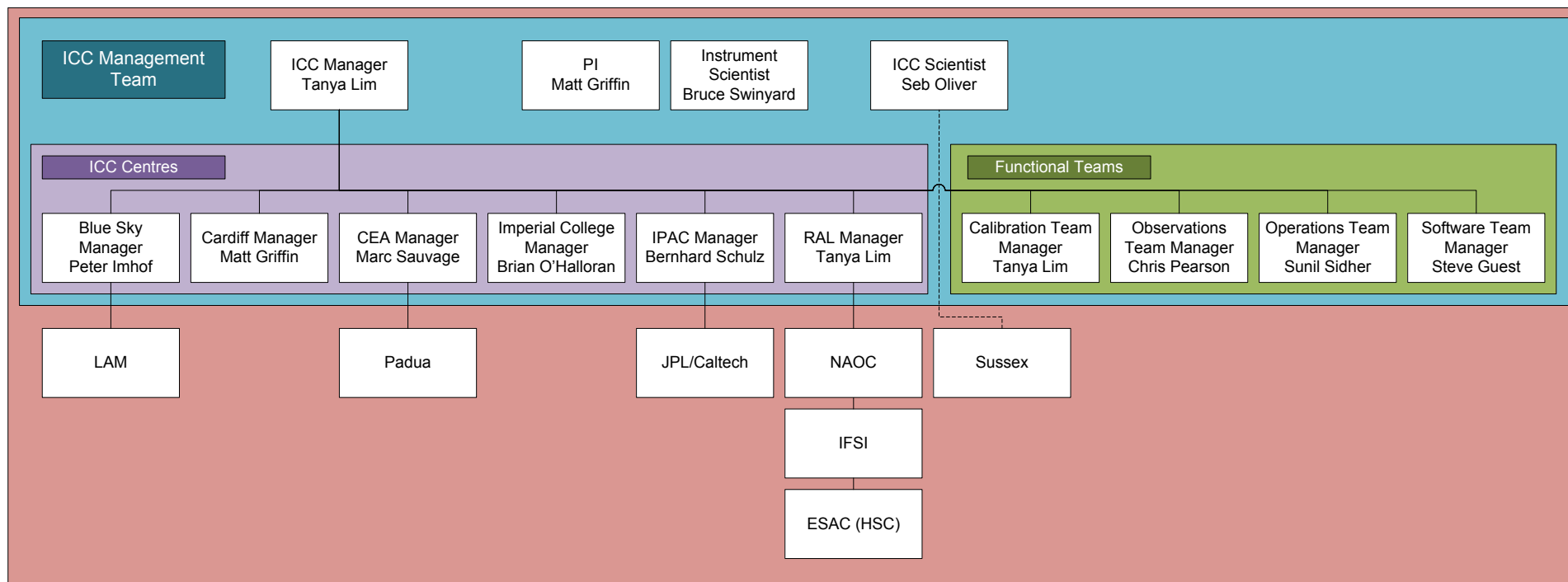


SPIRE ICC in Post-Ops

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The SPIRE Team



Current Staff: 17.05

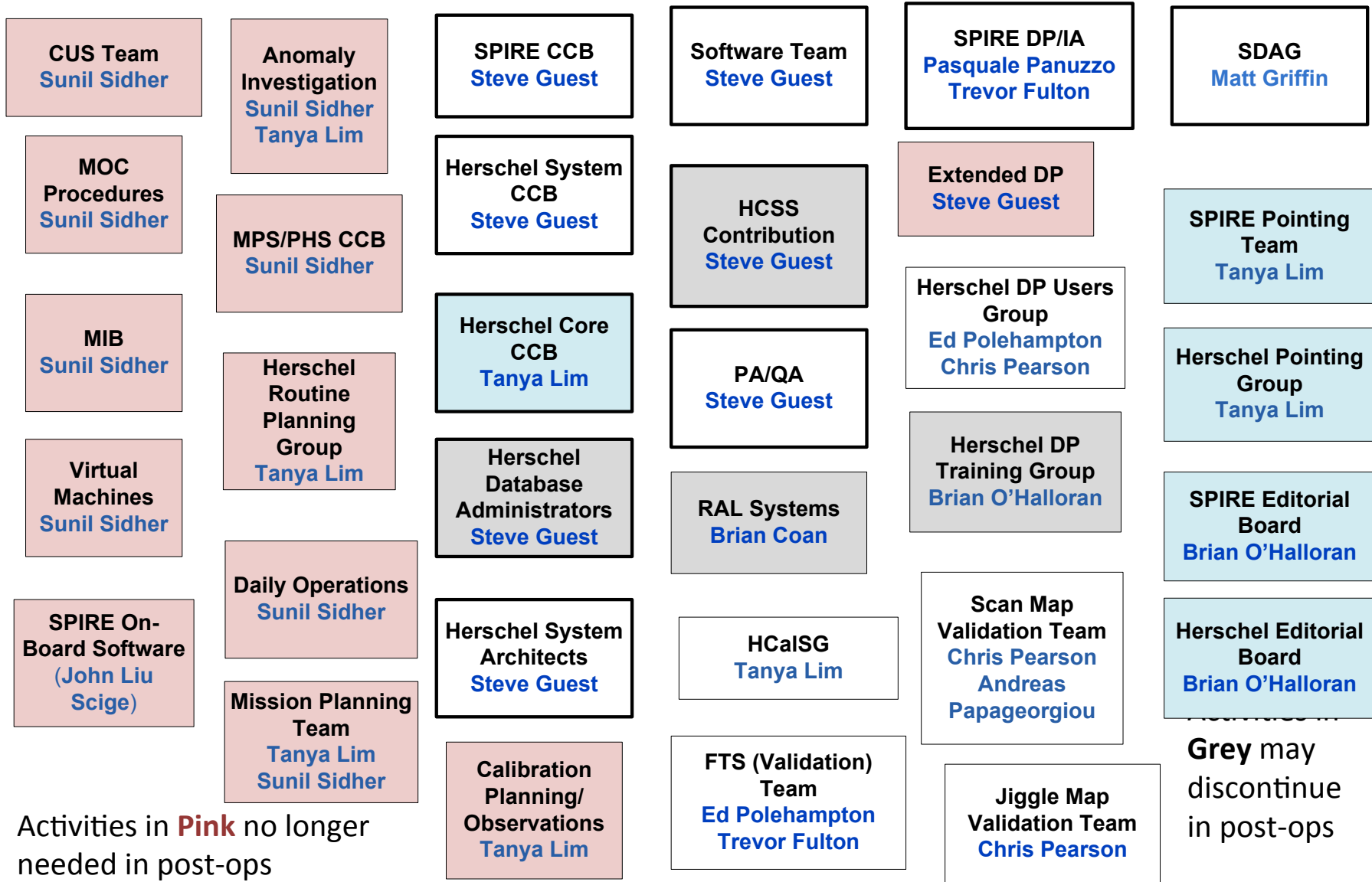
- UK (3 locations) – 5.65
- France (2 locations) – 2.1
- Italy – 1.0
- Canada – 3.3
- China – 2.1
- NHSC ~ 2.9

Post Ops Staff: 11.30

- UK – 3.8
- France – 2.0
- Italy – 1.0
- Canada – 2.0 (TBC)
- Spain – 1.0 (TBC)
- NHSC ~ 1.5



Activities



Activities in **Pink** no longer needed in post-ops



Photometer

Priorities for HCSS 10

1. Improved Flux Calibration (Zero Point Calibration from Planck)

- Will be Included as an option in the version 10 User Pipeline Script.

2. Bolometer Signal Jumps

- Cooler burps - Included as an option in the version 9 User Pipeline Script and is working well.
- For V10, we plan to generate a general calibration product and use this automatically for cooler burp affected observations.

3. Improved extended source calibration framework

- Takes into account the changing size of the beam across the band, including the colour correction.
- Effect on the calibration constant is a few percent compared with current scheme.
- Output simple look-up table of colour correction factors which can be applied to the data.
- Also working on calibration scheme for partially resolved Gaussian source.
- This is separate from the relative gain corrections, which also need to be applied.



Photometer

Priorities for HCSS 10

4. Improved Destriper

- Second Level Deglitching, residual glitches still a problem for parallel mode, especially fast parallel mode. Requires deglitching without cross-linked maps.
- Bright source flag
- Destriper in entire timeline mode

5. Drizzling

- Creation of kernel-smoothed maps directly from timelines
- Prototype already in version 10 build, under test

6. Added Map Projections

- Under development

7. Minor fixes to Sigmas Kappa Deglitcher

8. Tool to provide bolometer timelines crossing a certain pixel in the map

- Prototype under test



Post Operations (Goals)

Priority 1

- Final refinement of timelines including correction for electrical crosstalk, residual thermal effects, improved deglitching, etc.
- Assessment and implementation if appropriate of enhanced/iterative mapmaking method (MadMap as the baseline candidate)
- Refinement and documentation of all calibration models and methods, including cross-calibration with PACS, Planck-HFI, and other facilities
- Definition and documentation of the calibration scheme and methods to be adopted for the final data products (including comprehensive assessment of cross-calibration with other instruments/facilities)
- Evaluation and guidance on treatment of semi-extended sources as well as the extremes of point or fully extended emission
- Iterative colour correction tool using multicolour (SPIRE; SPIRE + PACS; SPIRE + PACS + other) data
- Tools for common and compatible PACS-SPIRE data analysis

Priority 2

- Tools for astrometric accuracy improvement using ancillary data
- Iterative multi-band source detection and photometry
- Tools for optimum source extraction and fitting, including prior-based analysis of SPIRE data in conjunction with ancillary data
- Iterative source detection and fitting (similar to the CLEAN algorithm in radio astronomy) allowing for detection of sources fainter than classical confusion limits.
- Super-resolution analysis, taking advantage of detailed knowledge of the SPIRE beam and the very high S/N available in many SPIRE maps of galactic regions and nearby galaxies



Post Operations (Current Work In Progress)

- **Super Resolution Maps**
 - High resolution maps for high S/N observations, possibly using Hi-Res MEM algorithm
 - Status: Run sub-sample of data to the code (IRAS algorithm), Plank is getting 2 times improvement in FWHM. For SPIRE getting 20% improvement in FWHM.
- **Source Extraction**
 - Various improvements under development, expected to continue into post-ops
 - e.g. List driven methods and improvements related to updated beams
- **Definition of User Archive Processing**
 - Profiles for on demand processing will enable the astronomer to select a processing mode suited to his science needs.
 - Potential on demand profiles could be tuned for weak point sources, strong point sources, SSOs, faint extended sources, strong extended sources
- **Improve Bright Source Calibration**
- **Update calibration when new Neptune model is delivered**
- **Lower Priority**
 - Improve Deglitching Scheme
 - Re-investigate whether some bolometers currently excluded can be included



Priorities for HCSS 10

- **Improved Calibration**

- Updated point source calibration to account for new BSM position.
- Correction to point source calibration for pointing uncertainty in Uranus observation (using map observed before Uranus scans)
- Improved telescope model for off-axis detectors
- Improved mapping calibration
 - Jiggle darks to be combined and used to make RSRF deeper
- LR calibration updated so current cal files include recent ODs.

- **Semi-extended correction tool**

- There is a prototype but more work is needed
- A version will go in to HCSS 10
- More work is likely to be needed in post-ops



Spectrometer

- **Reduced size of observation context**
 - removal of MR calibration products
 - Work has started
 - Averaging of Level-1 data
 - Being analysed
 - Spectral apodisation?
 - Removes all apodisation dependent calibration products
 - Can use any function to apodise
 - Being worked on - Looks promising
- **Improve efficiency of pipeline (multithreading)**
 - Already done for waveletDeglitcher() in HCSS 10 (work already completed)
 - Other modules were already done in HCSS 9



Spectrometer Post Operations (Goals)

Priority 1

- Refinement and documentation of all calibration models and methods, including cross-calibration with PACS, HIFI, and other facilities
- Definition and documentation of the calibration scheme and methods to be adopted for the final data products
- Tools for common and compatible PACS-SPIRE data analysis
- Final implementation of an optimised scheme for removal of instrument and telescope emission, using all available mission data
- Final spectral map data cube production schemes and corresponding processing of all map data
- User-friendly routines for treatment and re-calibration of semi-extended sources.

Priority 2

- Enhanced line fitting and defringing routines and guidance on their use
- Line identification routines coupled to line databases
- Simple mapping tools for sparse data
- Spectral interpretation tools (e.g., use of CASSIS; implementation of an interface to make CASSIS easily accessible may be needed).
- Tools for optimum extraction of map information using other data sets (see photometer “Bandmerge” – could possibly be adapted for spectral cubes as well)



Post Operations (Current Work In Progress)

- **Reduced size of observation context**
 - Simplification of bright/nominal pipelines
- **Tool to match the FTS continuum with the SPIRE photometry**
 - Prototype available
- **Optimize wavelet deglitching**
 - make it more aggressive but still keep the centre burst safe
 - Full study not yet completed - fine tuning is difficult
- **Create a drizzle projection task for creating spectral cubes**
 - based on the photometer drizzle (kernel smoothed) map maker
- **Point source extraction from spectral cubes**
 - either a new task or instructions/recipe for doing this



Assumptions

We are currently adopting the following assumptions:

- **Start date:**
 - SPIRE adopted a He exhaustion date of end April 2013 followed by a three month Operations wind-down period
 - The formal Post-Ops period starts at the end of July 2013.
 - This is consistent with the current definition of the Operations period adopted in the UK programme.
 - But we note that the most recent information on the lifetime is actually somewhat less optimistic, with He exhaustion envisaged in Feb - March 2013.
- **Duration:**
 - A three-year SPIRE Post-Operations programme is planned, after which the SPIRE Post-Ops Team will effectively cease to exist



Workpackages

1. Management and Coordination

- Priority 1
 - Planning, prioritisation, management, and coordination of all SPOT activities
 - Formal liaison with and reporting to ESA
 - Financial administration of the UK programme and reporting to UKSA
- Staff effort needed 0.6 SY
- This workpackage will be UK-based (RAL and Cardiff)
- 100% SPIRE

2. Computer system support at SPIRE Post-Operations Centre

- Priority 1
 - Provide and maintain computing facilities at RAL to be used by the SPIRE Post-Operations Team
- Staff effort needed 0.3 SY in Year 1 (P1) 0.3 SY continued throughout (P2)
- This workpackage will be UK-based (RAL)
- Effort after year 1 depends on whether or not the HSC can effectively undertake this function



Workpackages

3. SPIRE pipelines

- Priority 1
 - Production of final SPIRE pipelines and associated calibration products to be available in HIPE, with an emphasis on being able to produce the final data products.
- Staff effort needed 29.5 SY
- This workpackage will be shared between all participants, with the detailed allocation of tasks defined by the management team in accordance with the overall prioritisation and the skills and effort available.



Workpackage 3

Breakdown of tasks and staff effort needs

- Algorithm development 6.0 SY
- Calibration development 6.0 SY
- Calibration deliveries 0.3 SY
- JAVA coding and unit testing 7.5 SY
- Developer documentation (Module Req. Doc. etc.) 1.0 SY
- Coding and unit testing of user scripts 0.8 SY
- Code maintenance 1.8 SY
- Pre-delivery testing (functionality and performance) 3.0 SY
- Defining/testing profiles for archive use 0.6 SY
- Production of acceptance test plans 0.3 SY
- Acceptance testing 0.3 SY
- CCBs and EBs 0.3 SY
- Software management (JIRA, deliveries etc.) 0.6 SY
- Transfer of HCSS development activities to ESA 0.5 SY
- Participation in ESA working groups and reviews 0.5 SY



Workpackages

4. Documentation

- Priority 1
 - Progressive updating and generation of final versions of all key user and supporting technical documents covering:
 - all aspects of the observations, the calibration, and the data processing;
 - advice to users (or tools) to combine SPIRE data with other datasets;
 - full characterisation of instrument systematics ;
 - practical guides;
 - a prioritised list will be compiled;
 - description of content, meaning and use of housekeeping (S/C and SPI|RE) in the context of SPIRE data reduction
- Staff effort needed 3 SY
- This activity will be carried out mainly by the UK team, but with significant participation and input from other partners.
- Shared with HSC



Workpackages

5. Assessment and selective HIPE implementation of processing tools

- Priority 2
 - Assessment and selective implementation of user-supplied routines (to be provided to the HSC as an obligation by Key Project teams) .
 - Implementation of tools (pipeline options and add-ons) developed by SPIRE, and guidance on data analysis covering optimal approaches for different science
- Staff effort needed 2 SY
- This activity will be shared under the auspices of the pipeline groups

6. Development of selected common Herschel archive tools

- Priority 1/2
 - Combination of SPIRE/PACS (photometric) observations with common conventions and well documented calibration scheme (Priority 1, bearing in mind the fact that use of photometric data products in the archive is foreseen to be heaviest)
 - Combination of SPIRE/PACS and SPIRE/HIFI (spectroscopic) observations (Priority 2, bearing in mind the fact that use of SPIRE spectroscopic data products in the archive is foreseen to be less heavy than for photometric products)
- Staff effort needed 1 SY
- This activity will be shared under the auspices of the pipeline groups



Workpackages

8. SPIRE history archive

- Priority 1
 - Organised archive of potentially useful information, e.g.,
 - data quality, e.g., on a particular OD (HSC responsibility?)
 - categorisation of all SPIRE observations as scientifically usable or otherwise;
 - trend analysis history of key parameters
 - SPIRE mission log and tele-command history
 - consolidated observation log with full information relevant to users
 - archive of SPIRE Instrument-Level Test data and relevant documentation, to be available via the *Herschel archive* (lower priority)
- Staff effort needed 1 SY
- Mainly HSC but SPIRE will need to provide input (will definitely be effort-limited)

9. User Support

- Priority 1/2
 - Support of and participation in ESA DP workshops
 - Assistance to the HSC in addressing users' queries and requests for assistance
 - Operation of the FTS User Support Group
- FTS for year 1: 0.3 SY in yr 1 (P1) FTS continued throughout: 0.2 SY yr 2; 0.1 SY yr 3 (P2)
Photometer throughout Post-Ops: 0.3 SY (P2)
- This will be a major problem in the first year or two after Operations, because SPIRE is likely to have a low level of formal effort. Any effort devoted to User Support will inevitably detract from Post-Ops work. This will pose serious difficulties, especially with respect to FTS observations, many of which will be made late in the mission by non-specialist users.



Where We Are

Workpackage	Staff Years	
	P1	P2
1	0.6	
2	0.3	0.6
3	29.5	
4	3	
5		2
6		1
7		1
8		1
9	0.3	0.6
Total staff years	33.7	6.2
Total FTE	11.2	3.1

Post Ops Staff: **11.30**

- **UK – 3.8**
- **France – 2.0**
- Italy – 1.0
- **Canada – 2.0 (TBC)**
- Spain – 1.0 (TBC)
- **NHSC ~ 1.5**

A total of approximately 14 FTE is therefore needed to implement the SPIRE Post-Operations programme in a satisfactory manner, and around 11 is essential in order to accommodate the bare minimum Priority-1 elements.