1. SPIRE Photometer Launch Pad

1.1 Does the Photometer observation data need re-processing?

*Inspecting your maps for possible problems is covered in **SDRG[1] § 5.4.2**.*

In many cases, the photometer data is great straight out of the HSA, however, there may be occasions when reprocessing using the User pipeline scripts in HIPE may benefit your observation:

- By using newer improved calibration files - to check the Calibration Tree version see the ***SDRG § 4.2.*** Updating to a new Calibration Tree is described in the ***SDRG § 4.4***
- If you see strange artefacts in the maps or bad quality maps in general (***SDRG § 5.4.2***)
- By improving already usable maps (e.g. destriping, adding turnaround data, ***SDRG § 5.8.1***)

1.2 Re-processing with the User Pipeline Scripts

*This topic is covered in **SDRG § 5.4.1** for the Large Map and Parallel mode and **SDRG § 5.5.1** for the Small Map mode. The mapping pipeline flowchart is shown in **SDRG Fig. 5.24.***
*SPIA is covered in **SDRG § 11**.*

Simplified User Pipeline Scripts for re-processing SPIRE data are provided in HIPE:

- Accessed directly from the ***Pipeline>SPIRE*** menu at the top of the HIPE window
- Separate pipeline script for each observation mode
- Include processing steps taking data from Level 0.5, through Level 1 to the final Level 2 maps
- Final maps are saved as FITS files (not a pool) to any specified directory
- The Observation Context can also be updated and saved to a new Pool (***SDRG § 5.4.1***)

Line by line descriptions of the scripts with example plots are shown in ***SDRG § 5.4.1, 5.5.1***

The scripts assume the following;

- The data is already on disk stored in a pool on your disk
- The latest ***Calibration Tree*** is stored as a pool on your disc (to do this, see ***SDRG § 4***)

To run the User Scripts, 3 options must be set ***inside*** the script:

- Observation ID, data pool name, output directory path (See ***SDRG § 5.4.1*** for other options)

Memory problems encountered during processing extremely large maps can be overcome by using a ***Temporal Pool*** (To do this, see ***SDRG § 9.2***)

From Level 0.5 to Level 1, the pipeline modules that users may want to experiment with are mainly:

- If the observation has strong residual drifts the **Recalculate Temperature Drifts** module can be tried (see **SDRG *§* 5.4.2**)
- ***Deglitching*** algorithms (residual glitches are easily identifiable in the Error Maps)
- In some circumstances the ***Signal Jump Identifier*** (see ***SDRG § 5.4.2***)
- In rare circumstances ***Low Pass Filter Correction*** (see ***SDRG § 5.4.2***)

From Level 1 to Level 2, the pipeline carries out an iterative **Destriping** process as default in order to remove low frequency noise. If problems are encountered in the final maps, the SPIRE pipeline offers alternatives to the this baseline removal:

- Available from the ***Scripts >SPIRE UsefulScripts*** menu
- Median Baseline Removal (see ***SDRG § 5.8.1***)

[1] ***SDRG = SPIRE Data Reduction Guide***

- Polynomial Baseline Removal (see ***SDRG § 5.8.1***)

Although the default Naïve mapper usually produces good maps, alternative mapping algorithms are also available (See ***SDRG § 5.4.1.4***).

For observations where producing maps of **extended emission** are the most important objective, additional **Relative Gain Corrections** are required to take into account the fact that all bolometers do not have the same uniform beam shape. This is set by an option in the SPIRE user pipeline (**SDRG § 5.4.1.4**)

The SPIA (SPIRE Photometer Interactive Analysis) package provides a structured GUI-based access to the more intricate parts of the scan map photometer pipeline and consists of tailored functions for I/O, Level 1, and Level 2 processing of SPIRE photometer scan map datasets (SPIA is described in **SDRG § 11**)

1.3 Further Analysis

*Source Extraction and Photometry is described in the **SDRG § 5.7.1***
*The Map Merging topic is described in the **SDRG § 5.8.2***
*SPIRE astrometry is covered in the **SDRG § 5.8.3***
*Treatment of Moving Object Maps is explained in the **SDRG § 5.9.1** and **§ 5.9.2**)*

Various Post Pipeline analysis tools are available for SPIRE through HIPE. Users are also encouraged to read the Calibration chapter of the SPIRE Observers Manual.

- **Source extraction** from SPIRE maps can be carried out using either the *DAOphot* or *SUSSEXtractor* algorithms implemented within HIPE (***SDRG § 5.7.1.3***)
- A **Timeline Source Fitter** is available for source photometry from SPIRE timelines (described in **SDRG *§* 5.7.1.4**). The current recommendation is to extract sources with one of the above algorithms and to carry out photometry at these positions using the timeline based fitter.
- **Aperture photometry** can be performed by selecting an image in the *Variables* view and selecting *annularSkyAperturePhotometry* in the *Tasks* view (***SDRG § 5.7.1.5***).
  The SDRG describes the recipes for aperture photometry of point sources and diffuse emission.

- A **Map Merging** Script accessible from the ***Pipeline>SPIRE Useful scripts*** menu can be used to merge the Level 1 timeline data from multiple observations (e.g. Parallel Mode, creating mosaics from many maps) to create a single map and output it as a FITS file (***SDRG § 5.8.2***)

- An **Astrometry Correction** script accessible from the ***Scripts > SPIRE Useful Scripts*** menu which allows SPIRE astrometry to be improved by aligning observations with each other, ancillary images or a source list (see **SDRG § 5.8.3**)

- Two **Moving Object scripts** accessible from the ***Scripts > SPIRE Useful Scripts*** menu are available to correct the maps for observations of moving objects to the moving object frame (see **SDRG § 5.9.1**) and to identify the position of a faint moving object target in a map (see **SDRG § 5.9.2**)

- A **Bolometer Finder script** accessible from the **Scripts > SPIRE Useful Scripts** menu allows a User to click on a photometer map and to bring up a plot of the timelines of any bolometer crossing that map pixel. Useful for checking which bolometer timelines are responsible for map artefacts.