1. SPIRE Spectrometer Launch Pad

1.1 Does the observation data need re-processing?

*Data processing recipes for the Spectrometer are covered in **SDRG[1] §6.4.***

Re-processing spectrometer data 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***
- By tailoring individual pipeline steps, to optimize the processing for different astronomical sources, e.g. faint, bright, or extended (see ***SDRG §6.4***)

1.2 Re-processing with the User Pipeline Scripts

*This topic is covered in **SDRG §6.3.1.***
*The Spectrometer pipeline flowchart is shown in **SDRG Figure 6.31**.*

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
- Include processing steps taking the data from Level 0.5, through to Level 1 and 2
- Final results 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

Line by line descriptions of the Spectrometer scripts with example plots are shown in ***SDRG §6.3.1***

The scripts assume the following:

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

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

- Observation ID, data pool name, output directory path (see ***SDRG §6.3.3*** for other options).

Considerations for reprocessing with the Spectrometer User scripts are:

- ***Memory usage*** can be reduced by limiting the number of detectors processed in the script
- ***Apodization*** removes the ringing from the instrumental line function at the cost of reduced spectral resolution. Apodized line profiles can be fitted well by Gaussian functions
- ***Second level deglitching*** parameters can be modified in the script if there are outlying scans seen in the level-1 spectra (***SDRG §6.3.1***)

Inspecting the data at various stages can provide diagnostic information (see ***SDRG §6.3.1***)

General considerations for ***faint*** and ***medium strength*** sources are (see ***SDRG §6.4.1***):

- Optimise telescope and instrument correction
- Check spectral noise with respect to expected HSpot values
- Compare with SPIRE Photometer
- Compare point source and extended calibration

And for ***extended*** sources (see ***SDRG §6.4.3***):

- Check for clipping in individual interferograms
- Restrict the data made into the cube

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

- Examine the actual positions on sky observed
- Change the algorithm used for gridding
- Examine coverage and redundancy in the cube
- Maps with faint continuum
- Account for beam effects

1.3 Further Analysis

*SPIRE spectral analysis is described in **SDRG §6.5** and cube analysis in **SDRG §6.6.***

Spectral analysis and visualisation tools are provided in HIPE (right click on product in *Variables* tab > **Open With**):

- SPIRE specific ***SDI/SDS Explorer*** (***SDRG §6.2.6***) for viewing spectral/interferograms via a clickable footprint of the detector arrays
- ***Spectrum Explorer*** (***Herschel Data Analysis Guide Chapters 5 and 6***) for viewing one-, two-, and three-dimensional spectral products
- ***Spectrum Toolbox*** (***Herschel Data Analysis Guide Chapters 5 and 6***) for a set of mathematical functions that operate on Herschel spectral data (launched from Spectrum Explorer dialogs menu)
- ***Spectrum Fitter GUI*** (***Herschel Data Analysis Guide Chapter 7***) for interactive line and continuum fitting (launched from Spectrum Explorer dialogs menu)
- ***Cube Spectrum Analysis Toolbox*** (***Herschel Data Analysis Guide Chapter 6***) for spectral cube related tasks (launched from Spectrum Explorer dialogs menu)

Spectrometer useful scripts (***Scripts > SPIRE Useful scripts*** menu at the top of the HIPE window):

- Spectrometer Array Footprint Plot ***SDRG §6.4.1***
- Spectrometer Background Subtraction ***SDRG §6.4.1***
- Spectrometer Line Fitting ***SDRG §6.5***
- Spectrometer Thumbnail Mosaic Plot ***SDRG §6.2.7***
- Spectrometer Convolve Spectrum
- Spectrometer Noise Estimate ***SDRG §6.4.1***

Additional notes for SPIRE Spectrometer data:

- The data obtained from the HSA have not been corrected to the Local Standard of Rest (see ***SDRG Section 6.5***)
- Lines in high resolution FTS spectra should be fitted with a ***Sinc*** profile for ***unapodized*** data, and a ***Gaussian*** for ***apodized*** data. Various tools exist within and outside of HIPE to fit lines to spectra (see ***SDRG Section 6.5***)
- The beam size of the FTS changes across the band of each array in a non-trivial way (see ***SDRG Section 6.4.1.4***)