SPIRE Spectrometer expert provided data products

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Exploiting the Herschel Science Archive
• Standard pipeline products: SPGs, a recap
  Detailed in “SPIRE Spectrometer pipeline products”

• Highly Processed Data Products: HPDPs
  e.g. background subtracted spectra

• Ancillary data products: ADPs
  e.g. mission logs, trend analysis plots

• User Provided Data Products: UPDPs
  A brief note

• Summary of product availability status
Standard Product Generation (SPG)  
A recap

- SPGs are products generated by the instrument pipelines
  - this is an automatic and generic process
  - for the Spectrometer the processing and calibration used depends on observing mode and resolution only
  - there is no fine tuning

- **HIPE 14.1** SPGs use the final *and best* SPIRE calibration

- The products are available in the HSA and the Herschel Science Archive Inter-Operability Subsystem: HAIO

- All processing levels and necessary auxiliary and calibration products are available for reprocessing the data

  *Although running the pipeline is only possible within HIPE*

- SPG science-readiness details are in the presentation

**SPIRE Spectrometer SPG Products**
Highly-Processed Data Products (HPDPs)

- Created by instrument experts
- soon to be available in the HSA
- Described and listed here:
  
  http://www.cosmos.esa.int/web/herschel/highly-processed-data-products

(Although the claim all SPG products can be significantly improved by processing them further is somewhat overstating things)

**HPDPs improve on SPG products that are not science ready**
**HPDPs planned for the SPIRE Spectrometer**

1. Spectra corrected for **source size** or **pointing** using SECT

![Graph showing flux density vs frequency for different beam sizes](image)

**Flux loss in less pronounced for SLW due to its larger beam**

**After correction there is good agreement between SLW and SSW**

**Flux loss in SSW for a semi-extended source calibrated as a point source**

**WHY PROVIDE THESE?**

- the Semi-Extended Correction Tool (SECT) is currently only implemented in HIPE
**Beyond the SPG**

**Expert provided data products**

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**HPDPs planned for the SPIRE Spectrometer**

2. Spectra of point-like sources corrected for **extended background**

Extended background + point-source calibration = distorted continuum

There is less distortion seen for SSW due to its relatively smaller beam size

After correction there is good agreement between SLW and SSW

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**WHY PROVIDE THESE?**

- Visual inspection of the spectra and associated PACS maps is required
  - *the approach cannot be automated*
- But therefore it is a subjective process and their use needs consideration

See the release note for all the details: [Background subtracted HPDP release note](#)
HPDPs planned for the SPIRE Spectrometer

3. Anomalous data correction
   • isolated cases of failed processing due to some on-board anomaly
   • removal of bad scans or detectors from observations
     Spectral cubes projected with degraded scans removed
   • Bumpy HR SLW spectra that can be empirically corrected following the same method as for LR data
   • SLW flux droop

WHY PROVIDE THESE?
   • Expert processing is required
   • Some fixes happen way up the pipeline stream
   • the tasks to best analyse and fix exist in HIPE

   a tall order for the non-calibration-specialist non-HIPE-using
HPDPs planned for the SPIRE Spectrometer

4. The **SPIRE FTS Spectral Feature Finder (FF) products**
   - the FF detects significant feature and estimates SNRs
   - the products per obsid
     - a catalogues of features with SNR $\geq$ 5
     - fitted continuum parameters
     - a postcard per obsid
   - plus one searchable combined catalogue

**WHY PROVIDE THESE?**
- The sinc-like line profile + asymmetry == tough job

**BUT**
- this is a blind detection process
- No line flux is provided
- SPG products are used

*So the FF is a starting point for your own direct inspection and analysis of the data*
HPDPs planned for the SPIRE Spectrometer

4. The SPIRE FTS Spectral Feature Finder (FF) products e.g. 1

CRL 618 Observation ID 1342268302; (27/30)
4. The SPIRE FTS Spectral Feature Finder (FF) products e.g. Beyond the SPG

HPDPs planned for the SPIRE Spectrometer

CRL 618 Observation ID 1342268302; (16/19)
HPDPs planned for the SPIRE Spectrometer

4. The SPIRE FTS Spectral Feature Finder (FF) products e.g. 2

CW Leo Observation ID 1342197466; (37/47)
Beyond the SPG
Expert provided data products

HPDPs planned for the SPIRE Spectrometer

4. The SPIRE FTS Spectral Feature Finder (FF) products

![Graphs showing spectral features in GHz frequency range]
**HPDPs planned for the SPIRE Spectrometer**

5. Unaveraged point-source calibrated spectra: a UPDP

- The spectral scans have been averaged in the final SPG product

**WHY PROVIDE THESE?**

- The pipeline must be re-run in HIPE
- The data is averaged using a simple mean, so you might want to try other methods of combining the scans and/or omit outlying scans
- You might want to perform statistical analysis on the scans

**WHY ARE THESE UPDPs?**

- They are seen as less processed than the SPG results, so not highly processed
Ancillary Data Products (ADPs)

Ancillary Data Products (ADPs)

• Preserved
  • because they may be needed by users of the archive
  • as a source of information for future missions

Planned SPIRE Spectrometer related ADPs:

• Calibration: Uranus (prime calibrator), other planets and asteroid models
• Software: on-board software images and release notes
• Observatory: uplink-related products (mission database, etc)
• Engineering: trend-analysis and health monitoring data from the instrument “HouseKeeping” (e.g. telescope temperature)
• Historical: Telemetry and Science data from pre-launch test campaign
• Documents: 1000s of documents you will likely never want to read, but somewhere in the depths of HELL might be exactly the solution to your spectral problem!
User-Provided Data Products (UPDPs) - A note

**User Provided Data Products** are thin on the ground for the Spectrometer, so briefly:

- There are two Spectrometer UPDPs available
- One advises in the accompanying release note
  - “Anyone desiring a more uniformly processed data set is encouraged to start with the products from the HSA, which can be compared with the data in this release for reference.”
  - Which is sage advice
- More UPDPs may join these two in the future, so if you do want to recreate someone else’s published results, it’s worth checking the [UPDP page at the Herschel Science Centre](#)
- The quality of a UPDP is not checked before they are ingested so they do need careful inspection and comparison to HIPE 14.1 processed data
## SPIRE Spectrometer Product availability

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