

Demo: SPIRE Spectrometer Data Reprocessing Scenarios for Medium to Faint Point Sources

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On behalf of the SPIRE ICC

- ◆ The data from HSA are mostly processed with SPG 4 (equivalent to HIPE 4 with `spire_cal_4`). There is a **big improvement** in the calibration and data processing algorithm from SPG 4 to 5, which affects even medium sources (10 – 100 Jy).

Example: NGC7027 (Obsid=1342189124; in the workshop sample data set)

- ◆ For faint sources (of a few Jy), there is further improvement from SPG 5 to 6 (e.g., an improved phase calibration). But even the SPG-6 result may not be satisfactory in some cases due to, e.g., a poor telescope background removal. You may improve the background subtraction by reprocessing.

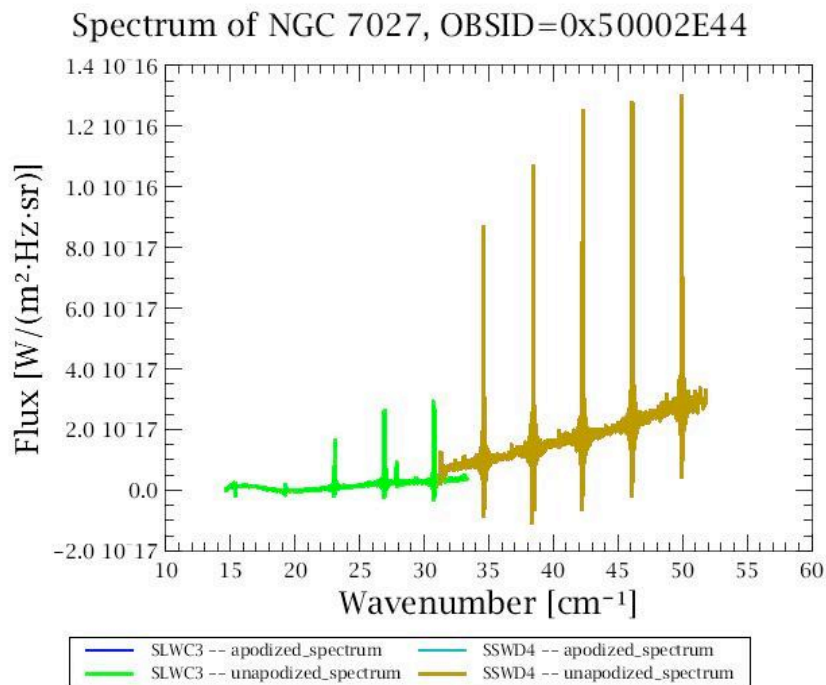
Example: Mrk231 (Obsid=1342187893; in the workshop sample data set).

- ◆ There may be other cases where a reprocessing can offer clues to understand or/and improve your results.

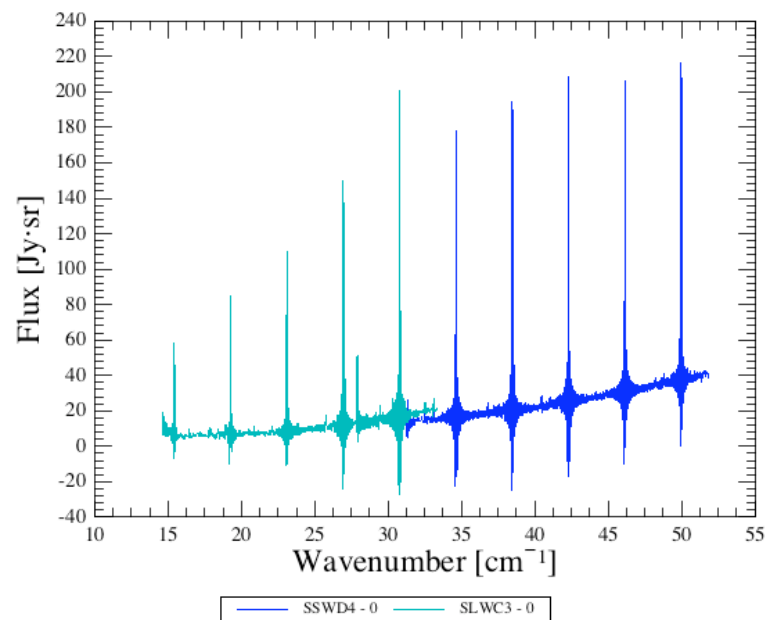
e.g., Spectral noises appear significantly higher than what HSPOT predicted;
Residual phase problem;

➔ See the SPIRE Data Reduction Guide, Section 6.2.5.1, for more info.

Example: NGC 7027 (Obsid=1342189124)

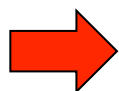


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HSA standard processing (SPG 4.1.0)

Reprocessing with HIPE 6.0
(with spire_cal_6_0)

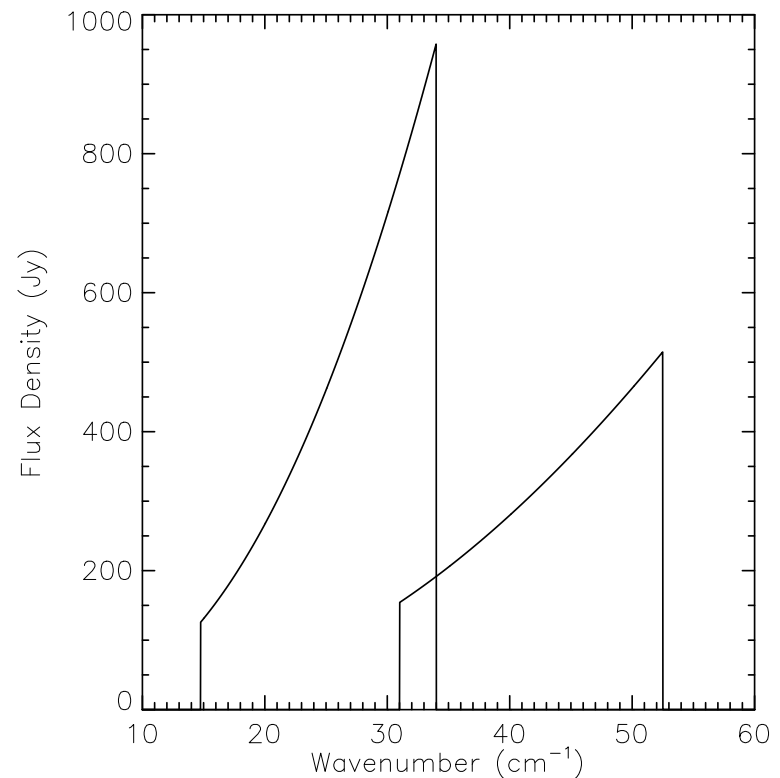


So definitely reprocess your data if they are prior to SPG 5!

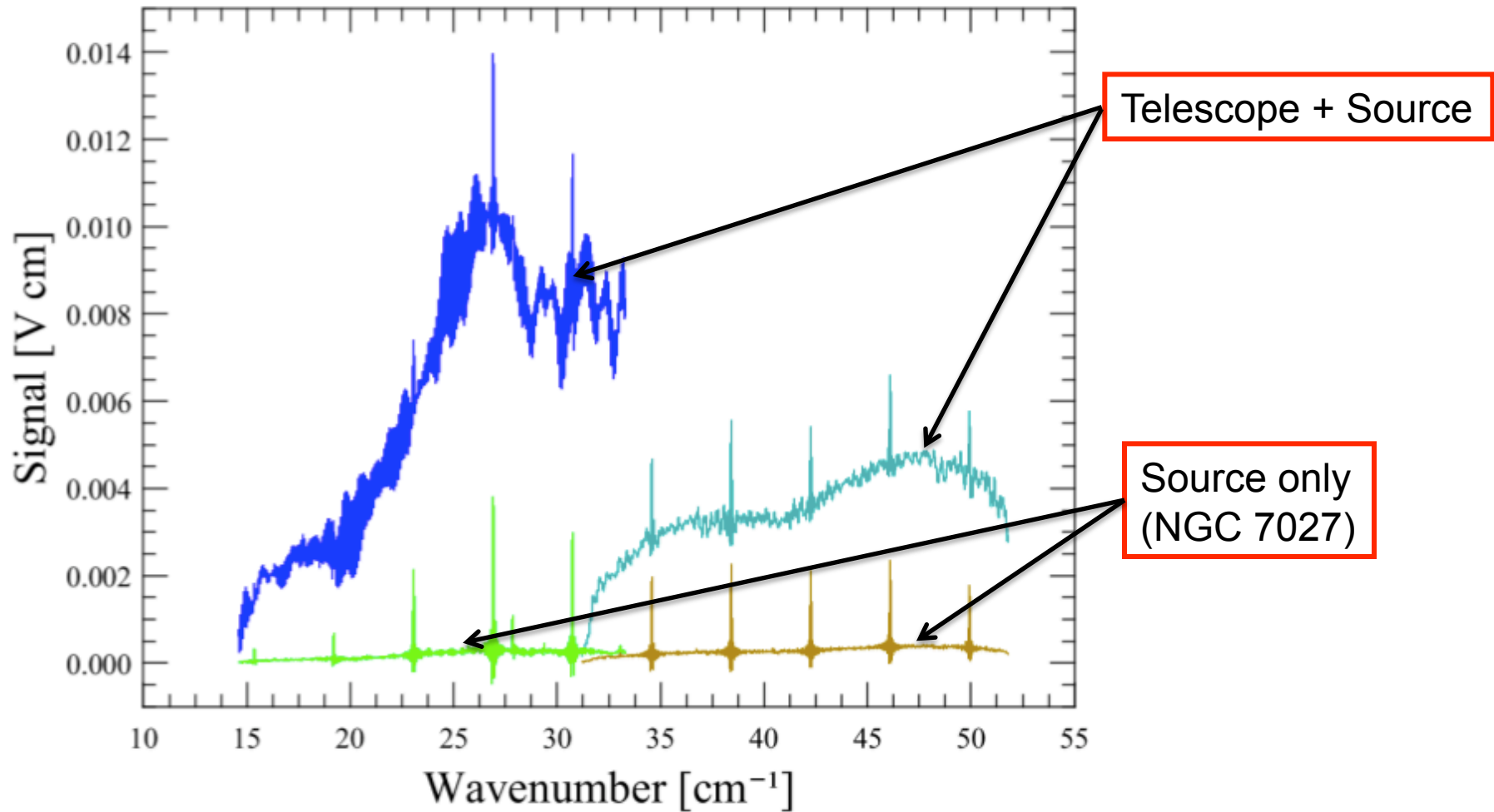
Telescope Background Removal is Crucial

- Faint source observations are dominated by the telescope background.
- In the pipeline, the telescope background subtraction is based on a telescope model emission multiplied by the mean telescope RSRF function (averaged over many “dark” observations).
- But the telescope temperatures drift slowly. In some cases, this default telescope RSRF is not good enough in cases of faint source observations

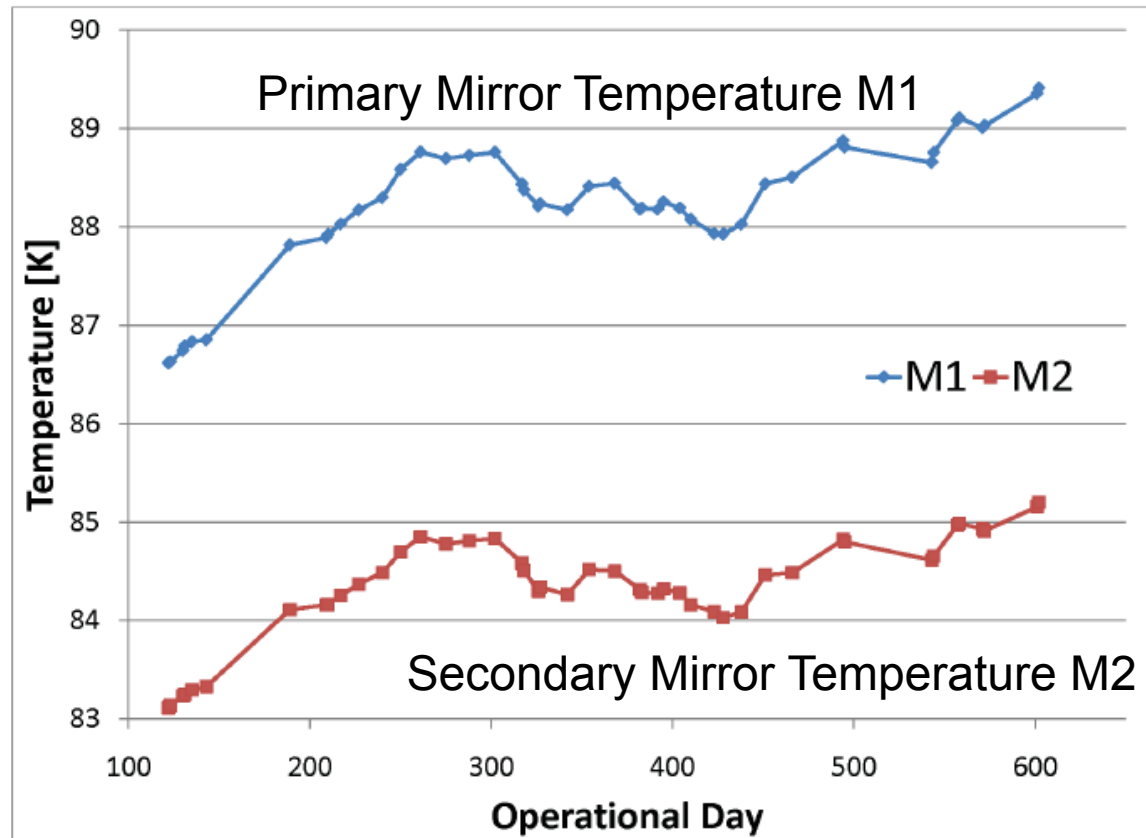
Model spectrum of the telescope



Telescope Background vs. Your Source



Telescope Mirror Temperatures Drift

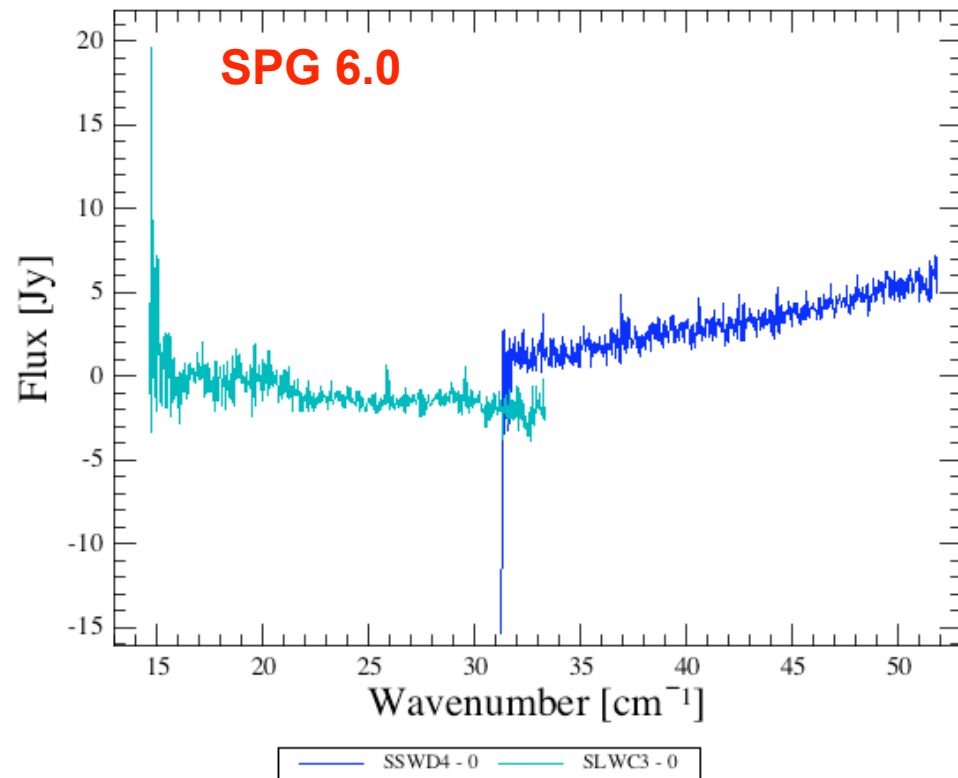


Herschel telescope temperature history available at:

http://www.spire.rl.ac.uk/icc/logs/web_reports/SpireOps_TelescopeTemps.html

Example: SPG-6 Result of Mrk231 (obsid = 1342187893)

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The reason:

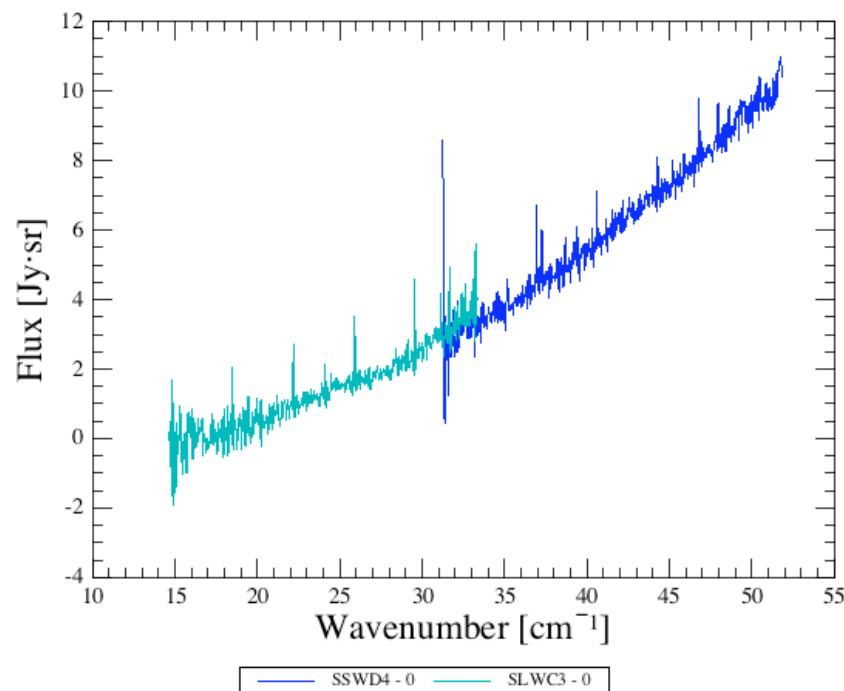
The telescope temperature on that observation day (OD209) is about half degree colder than the average value. The default telescope RSRF file in the calibration product does not do a good enough job here.

The solution:

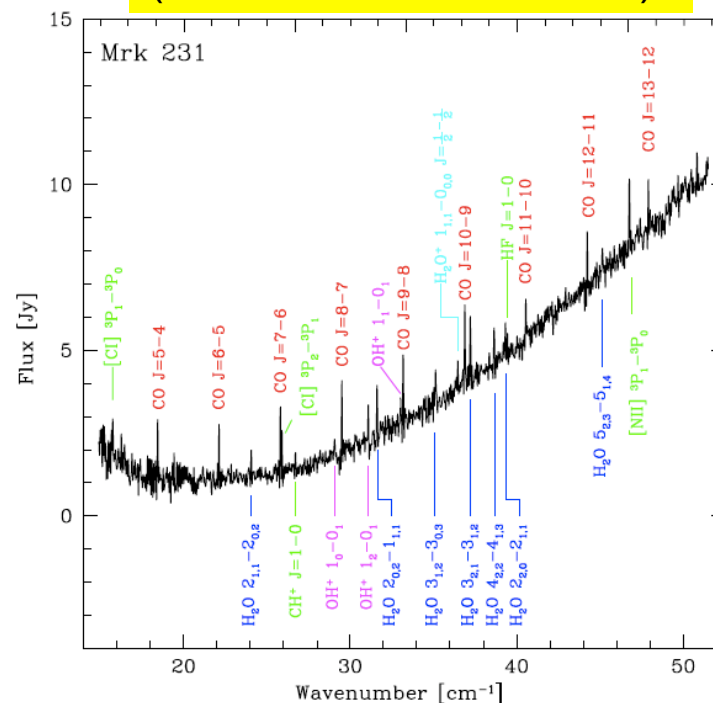
Reprocess the data using a telescope RSRF based on a dark observation from the same OD.

Reprocessing Example: Mrk231 (obsid=1342187893) Using HIPE 6 with a daily-dark telescope RSRF

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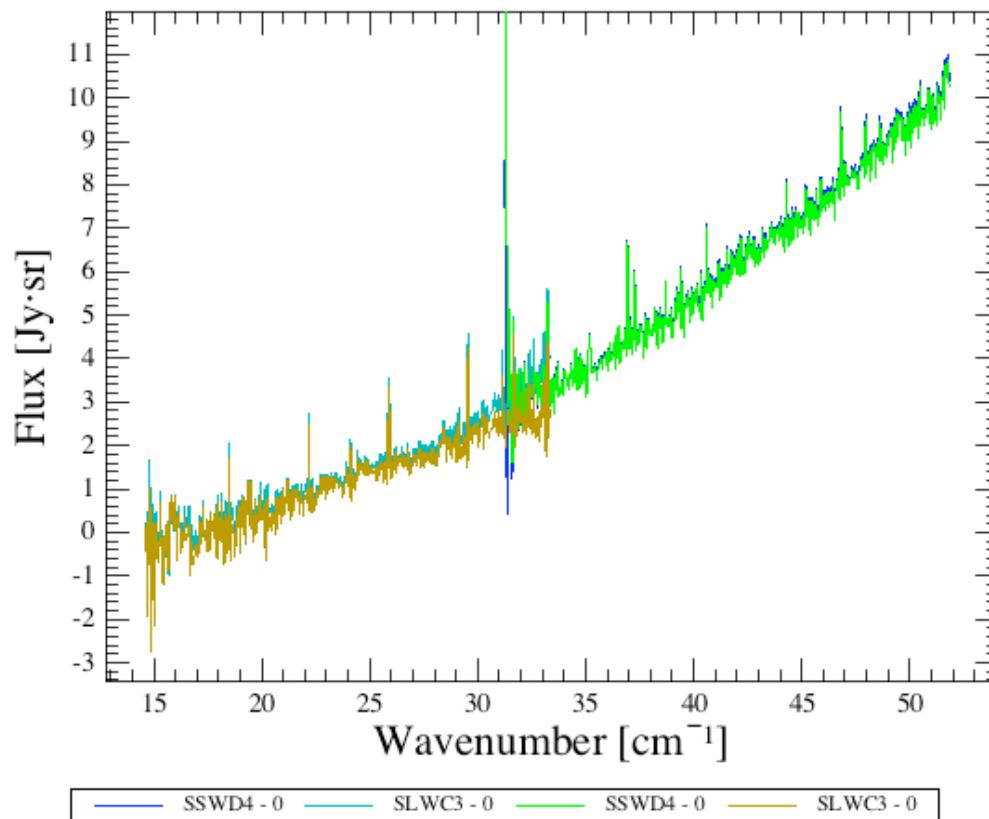
(Van der Werf et al 2010)



Daily-dark based telescope RSRF calibration files for HIPE 6 reprocessing are available at: http://www.spire.rl.ac.uk/icc/DailyDarkFiles_v6.htm

What if you don't have a daily dark TeleRsrf file?
 Reprocessing Example: Mrk231 (obsid=1342187893)
 Direct Dark Subtraction Option

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- The result using daily-dark teleRSRF is shown in **blue** + **cyan**.
- The result from direct dark subtraction is shown in **green** + **brown**.

In fact, the direct dark subtraction approach may become the standard method in the future version of the pipeline.

- ◆ The reprocessing script comes with HIPE:
`/...../scripts/spire/ia/scripts/reproc/Spectrometer_Point_Pipeline.py`

- ◆ Once you load the script into your HIPE session, you should modify a few simple field in the user input area near the top:
 - Data (obsid & data pool name).
 - Do you want to process the central channels only?
 - Want your spectra to be unapodized or apodized?
 - Directory path where the results will be written to.
 - If H+L data: choose to process either H or L.
 - If you want to supply your own TeleRsrfile (e.g., a daily dark based TeleRsrfile), you can specify it.

- ◆ Next, as a demo, let's reprocess the observation of NGC 7027 (obsid = 1342189124; 17 repeats), which is a medium-bright source .
[\[Note: It takes much longer to reprocess the data of the fainter source Mrk 231 \(obsid=1342187893, 50 repeats\). But the processing steps are the same.\]](#)