PACS Spectrometer
simulated flux modulation by pointing jitter
draft v0.1

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• Only spaxel[2,2]

• Instead of using the beam profile for spaxel[2,2], a narrower Gaussian (FWHM=8.2”) is used to simulate the beam convolved with the spaxel (@ 84.5 micron)

• The jitter excursion is assumed to be well represented by the Ra/Dec residuals in the PacsCube (L1) product

• Any uncertainties in the chopper position to sky angle calibration are ignored

• The 2D Gaussian flux model is evaluated for every frame at the jitter position, the peak flux at the peak is 1.0
Observation summary

OBSID: 1342230902
AOR Label: PSpecR-Range [164-174]+[82-87] – HD44179
Proposal: OT1_cjoblin_2
Target: HD 44179
Observing Day (OD): 881
Total duration (incl. slew): 2944.0 seconds
AOT: PacsRangeSpec
Observing mode: Pointed, Chop/Nod
Chopper throw: small
Nod cycles: 1
Sampling: High density mode

Observation block summary

Number of requested primary lines/ranges: 1
List of requested primary ranges [microns]:
    Line/range 1 : 164.0 - 174.0 microns, 1 repetitions, ID Range 1
The observation
The observation – pointing jitter from PP

- RA offset vs Frames
- Dec offset vs RA offset
- Frequency vs d: offset from centre [arcsec]
Simulated spectra

Y-offset=0.0, Z-offset = [0.0…6.0] (arcsec)
Simulated spectra

$Y$-offset=0.0, $Z$-offset = [0.0…6.0] (arcsec)

Change in the shape of the noise spectrum?
Simulated spectra

Y-offset=0.0, Z-offset = [0.0…6.0] (arcsec)
Simulated spectra

Y-offset=0.0, Z-offset = [0.0…6.0] (arcsec)

RMS peak at ~3.5”
Simulated spectra

Y-offset=0.0, Z-offset = [0.0…6.0] (arcsec)
Simulated spectra

Anticorrelated features
Observed vs. simulated spectra

Y-offset=0.0, Z-offset =0.0

Similar frequencies, but rather anticorrelated features?
Observed vs. simulated spectra

Y-offset=0.0, Z-offset =0.0

d: pointing jitter rebinned to the same grid as science signal
Observed vs. simulated spectra

Y-offset=0.0, Z-offset =0.0

Anticorrelated curves, as expected

\[ d = \sqrt{(\text{RAoffset} \times \text{Cos(DEC)})^2 + (\text{DEOffset}^2)} \]

Simulated product, Z-offset: 0.0, Jitter dilution factor: 0.0
• RMS increases within 1-sigma APE offset

• Change in the noise power-spectrum shape (high frequencies start to dominate with increasing APE offset)

• Simulation reproduces noise frequencies somewhat similar to observation at Z-offset=0.0, but noise amplitude is factor ~3 higher (!) in the observed spectrum

• Pixels should be correlated (with some offset?) but spaxels should be anti-correlated for a very bright source

• Maybe inverting the jitter pattern (d) could be a starting point (page 5, bottom-right figure) to better explain the relation between observed flux variation and jitter pattern