Herschel Calibration Workshop: Summary

Anthony Marston, Herschel Instrument and Calibration Scientist Team Lead, HSC, ESAC.

➢ From last time and to be updated this time:

- **Reduction in photometer errors in scan maps/improvements** – filters/destripers/external mappers. Which mappers should we go for now? Recommendations?
  - Plethora of mapping routines. Not always clear what to use (for user). Clear recommendations.
  - Roberta's presentation was NOT on mappers….. However showed differences. Understandable?
- ***PACS extended emission was left as an issue***. Believed closed, but further updates here. Can we say this is completely done and what needs to be communicated to users?
  - Still ongoing….. Put non-linearity correction -> PSF changes -> ~5% change on extended emission (in the right direction)
- **Stellar/asteroid/planetary models.** Feedback from observations and improvements on these models and their usage. All stars okay for calibration? K-band normalization? Asteroid models being used, which, consistency and use outside Herschel, cross-cal?
  - Instrument feedback suggesting adjustment to models (really small). But looks like SPIRE will be changing calibrator model (ESA3 over ESA2 for Neptune now established?).
  - Updates to asteroid model – beating up TM?
- **SPIRE extended emission** – zero point assessment using Planck HFI data. This is really doable on a large scale?
  - Like treacle…. But we seem ready to get SPIRE phot offsets, need to sort out details with the Planck HFI instrument.

➤Spectroscopy:

- Best practices for data reduction. Including methods of creating final spectra.
  - Is this clear? And explained in documentation?
- Calibration checks for spectroscopy. Sources used and methods of comparison.
  - Also see cross-calibration.
- Beam information (variation with wavelength?). Affect on spectral extractions and flux assessments?
  - Beams known – updates to come, which will affect extended emission, plus HIFI cal (TBD – how much likely?).
- Pointing effects and mitigations.
  - Particularly affects PACS-S. 3x3 and 5x5 helps somewhat. How much further can we go with the data we have? Is jitter really the answer to some of the residuals or is there something else too?
- Mapping routines and flux conservance/consistency
  - Does doGridding for HIFI do something similar to other mapping resamplings for spectrometers? Can we use a single means of creating spectral cubes?
- Key areas of errors – external information helps?

➢ Cross-calibration:

- Use Cases document (HERSCHEL-HSC-DOC-1720, April 2010) gives broad outline of what we should be checking and where feedback may be possible to improve on calibrator models.
  - Consistency check by comparisons…. Inconsistency…. Leads to cross calibration
  - PACS red leak – clearly difficult. Some understanding from other instruments but clearly not sole answer.
  - We have identified some of the prime cross-calibration for spectral emission line comparisons especially. Complete – could be for point sources, add W Hya? Need more, why? Tentative continuum comparisons now being made and mapping use cases being taken up.
  - Some comparisons to data from other flown experiments such as SOFIA observations can also be useful as that mission progresses. Good, for a start.
  - As a by-product: best ways to extract fluxes (spectrometers) very
- Initial results appear in HERSCHEL-HSC-REP-1935, Jan 2012. Feedback and updates now necessary.

➢ Stellar/Planetary/asteroid Models – a Herschel Legacy:

- Improved knowledge of the models used for calibration purposes (planetary/asteroid/stellar) via feedback from Herschel observations.
  - Looks like we will be moving to updated SPIRE calibrators (10Jy kludge disappears!).
  - ESA4 model of Uranus to come soon. Neptune maybe somewhat later.
  - Information for Cohen models for users?
- As a by-product we can expect to provide improved calibrator models which may of use to future observatories such as ALMA, SOFIA and SPICA.
  - Asteroids. Pressure on TM to update some models? Is this appropriate?
  - Some outreach.

Overall

➢ Many complications in all areas of the observatory.

➢ Need to make this crystal clear for users, although a lot goes into updated calibration trees.

➢ Need to come to agreed methods and recommendations on best processing and information extraction for all modes. Much done, but more to do.

- Mappers/ reprocessing (when needed or not)
- Extraction of point sources (PACS)
- Good to see tricky correlated noise being handled and PACS error maps coming to a conclusion

➢ Changes in sensitivity towards end of cooler hold times for PACS/SPIRE, especially as mission ending. How much?

➢ To improve PACS-S – tricky pointing issues (disentangle?) and need to understand RSRF residuals.

➢ Converge to single Neptune/Uranus models for calibration for both PACS and SPIRE, (version 4 for Neptune?). Differences are small but noticeable.

➢ Cross-calibration to pull out "last" of the calibration issues.

➢ Calibration legacy – potentially very large.