Detector Operation Matrix – explanatory note
B. Swinyard

Change Notice

Issue 1.0	23 Mar 2009	Follows Sarah's injunction on the structure of calibration file derivation – explanation of the derivation of the status matrix in the excel spreadsheet
Issue 1.1	31 March 2009	Ed Polehampton has added details on processing scripts and calibration data

Reference Documents

AD1 Detectory Summary Spreadsheet SPIRE-RAL-TN-002783 v12.1

Scope

This note describes how the operational status of the SPIRE detectors given in AD1was derived. I attempt to follow the format requested by Sarah Leeks in her e-mail of 18 September 2009 – *vis.*

Documentation of Calibration Product Values

For each calibration product there needs to be a procedure that says how to derive the calibration data (including what algorithm should be used and any decisions and judgements to be made to get the data values) and also a note that says how each version of data were actually made (i.e. following the procedure version x using data from OBSID yyyyy, with script version www pipeline version zzz, etc ....).

The procedure only needs to be updated if the procedure changes.
However a new version of the note must accompany each delivery of (updated) data for a calibration file.
The note should reflect the full history of the calibration file (i.e. all releases, versions, editions etc in one document) with the most recent version at the start [note we will see how practical this turns out to be].

Also scripts used to get the values should be made available (possibly placed in CVS or more likely delivered with the data and the notes).

The purpose of the documentation is three fold:

1. *To enable someone else to be able to produce updated values (in case that the original person is not available).*
2. *To enable us to review and confirm that the values are what we want to use before a changed calibration file is released for use.*
3. *Also because we must be able to tell astronomers (and ourselves) how calibration data were made.*

The Detector Summary Sheet:

AD1 is an excel spreadsheet that has been used to track the operational status of the SPIRE detectors from the first instrument level tests through the system level testing. The operational status of the detectors is assessed using a combination of noise measurements, loadcurves and PCAL flashes. The noise measurements are self explanatory, the loadcurves are used to check the gain and basic operation and the PCAL flashes to check the speed of response.

Datasets used:
In this note I deal only with the data associated with the final status of the detectors – i.e. collected during the various IST campaigns. The particular datasets used were as follows:

Type	OBSID	Test Campaign
Photometer:		
Noise data	0xB00014D8	EMC – reference case
Cold Loadcurve	0xB00016F8	TVTB – reference case
Warm loadcurve	0xB00002D2	Warm functional check October 2007
PCAL Flash	0xB0001586	SPT – random PCAL flash
Spectrometer:		
Noise Data	0xB00014C7	EMC – reference case
Cold loadcurve	0xB000173A	SPT – wrong phase used only useful for basic check
Warm loadcurve	0xB00002D7	Warm functional check October 2007
PCAL Flash	0xB0001531	SPT – random PCAL flash

Data Reduction:
The noise data were reduced by Ed on Chichester (using SPIRE build number 727) using scripts *powerSpecGui.py* and *noiseUtil.py*. These scripts use the pipeline modules for raw data extraction and engineering conversion (as they were in build 727) with the calibration files for bolometer parameters and gains that went with that build.

All other data were exported into FITS format from the database *spire_fm_ist_db1* using the "Export" tool. The detector data were exported in raw format and the Housekeeping were converted using the flight model calibration (*SPIRE_PFM5_V2)*. The data files are available on the Test Team Website under the appropriate links on the "IST Data" page. Further processing was carried using standalone IDL routines.

Conclusions:
Three categories of unusable/dodgy detector were identified. Those that have failed completely or are so noisy as to be useless, those that are significantly noisier (at least a factor 2) than the average for the array and those that are slow as identified from the PCAL flashes. I recapitulate the summary here for completeness.

Photometer Final Preflight tally	**6 Unusable 9 Dodgy**
Unusable	6 (PLW-A6,PMW-T2,PSW-C12, PSW-D15, PSW-G8,PSW-G11)
Noisy but usable	6 (PLW-C9,PMW-B11,PMW-D1,PMW-D6,PMW-E8, PSW-F9)
Slow but usable	3 (PMW-A13, PSW-A13, PSW-A11)

Spectrometer Final preflight tally	**2 Unusable 0 Dodgy**
Unusable	2 (SSW-D5,SSW-F4)
Noisy but usable	0
Slow but usable	0