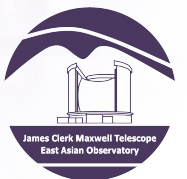


# ***SCUBA-2* Calibration: Flux Conversion Factors (FCFs)**

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# FCFs - Overview

- Flux Conversion Factors (FCFs)
  - What they are
  - How to use them
  - Which ones to use, when
- *SCUBA-2* Calibrator Database
- Standard FCFs
- Generating FCFs
- FCF Hints & Tips

# Flux Conversion Factors (FCFs)

- Flux Conversion Factors (FCFs)
  - Value needed to convert data from pW to Jy
  - Calculated by observing known calibrator - bright point sources with well-known flux densities
- FCF values for any project (ideally) calculated using calibrator closest to project science data (in both time & space)
- Both science & calibrator data should be reduced with latest version of *Starlink*, using same configuration file & same pixel size

**General advice: reduce all calibrators taken near observations & watch out for major deviations!**

# SCUBA-2 Calibration Database

<http://www.eaobservatory.org/sc2cal>

## SCUBA-2 Calibration Database

Welcome to the JCMT SCUBA-2 calibration database. This database exists to help JCMT users easily identify calibrations that were taken on nights where they had data taken. It allows searching either by date or by entering a project from the drop-down menus, and the results can be filtered by target and tau at 225 GHz. Graphs of either arcsecond or peak FCFs can also be generated by selecting the appropriate option. Mousing over any of the question marks will pop-up a short help message.

### Dates

**Start Date or Single Date (UT)**  
yyyyymmdd ?

**End Date, Optional (UT)**  
yyyyymmdd ?

**Project Code**  
Semester  Project Code  ?

**Tau<sub>225 GHz</sub> Range**  
**Min Tau** 0 ?  
**Max Tau** 0.5 ?

Submit

### Calibrators

Uranus  
 CRL 2688  
 CRL 618  
 Arp 220  
 Mars

### Graphing Options

Generate graph of results  
 Arcsec FCFs ?  
 Peak FCFs ?

	y-min	y-max
450 $\mu\text{m}$	<input type="text"/>	<input type="text"/>
850 $\mu\text{m}$	<input type="text"/>	<input type="text"/>

- **Primary calibrators:** Mars & Uranus
- **Secondary calibrators commonly used:** CRL 2688, CRL 618 & Arp 220;

<http://www.eaobservatory.org/jcmt/instrumentation/continuum/scuba-2/calibration/calibrators/>

# Standard FCFs

Waveband	Peak	Aperture
450 $\mu\text{m}$	491	4.71
850 $\mu\text{m}$	537	2.34

- Derived from *makemap* reductions of *Daisy* maps of calibrators using:
  - *bright\_compact\_dimmconfig* file; 1 arcsec map pixel size
- Should be used in one of two ways:
  - Check derived FCF values before applying to user data (preferred method)
  - Apply as first pass at source & noise strength estimation (not recommended)
- To calibrate science data, always re-reduce calibrator observations with same pixel size as science data

**Always reduce archival SCUBA-2 data with latest *Starlink* release!**

# Generating FCFs

```
% picard -log sf -nodisplay -recpars myparams.ini  
SCUBA2_CHECK_CAL calibrator.sdf
```

- Produces several FCF values in ***log.calstats*** file (created in directory where run)
- Which FCF value to actually apply depends on science objective
  - e.g. investigate surface-brightness, aperture photometry, measuring absolute peak flux densities, etc.
- **Peak (or beam) FCF [Jy/pW/beam]**
  - Multiply map by this FCF if aim is measurement of absolute peak fluxes of discrete sources
  - Listed as ***FCFbeam*** in *log.calstats*
- **Aperture (or arcsecond) FCF: [Jy/pW/arcsec<sup>2</sup>]**
  - Multiply map by this FCF if aim is to perform aperture photometry
  - Listed as ***FCFasec*** in *log.calstats*

# FCFs: Hints & Tips

**Sanity check: Calculated FCF values should fall within 10% & 5% of standard values at 450 & 850  $\mu\text{m}$  respectively**

- Calibrator reduced with science configuration file may look poor (i.e. exhibit deep negative bowing) if displayed, but profile fitting will still yield reasonable estimate of FCF
- FCF values change with map pixel size!
- Application of filters (including matched filtering) may change FCFs
- If custom FCFs are to be applied to pipeline-reduced data, the default calibration should be removed first

**Some/all of above advice may change in future!**

# FCFs: Hints & Tips

- If FCF values calculated differ wildly, may be due to configuration file used
  - Try re-reducing calibrator with `dimconfig_bright_compact.lis` file & re-run aforementioned PICARD command
  - If FCFs are still outside above ranges, contact your Friend of Project (FOP)
- Possible to apply standard FCFs to science data, but caution is needed
- FCFs for daytime observations, or for observations made within ~1 - 2 hours after sunset are higher than those for nighttime observations
- If using *Picard* Recipe `SCUBA2_CALIBRATE_IMAGES`, specify both `USEFCF=True` & `FCF_CALTYPE` to ensure non-beam `CALTYPE` used

```
% picard -log sf -nodisplay -
recpars="USEFCF=True,FCF_CALTYPE=ARCSEC"
CALIBRATE_SCUBA2_DATA myfile.sdf
```

**Some/all of above advice may change in future!**