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DOCUMENT

PACS Photometer PSFs and EEFs as Ancillary Data Products: Release note

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1 INTRODUCTION

This document contains information about the Point Spread Functions (PSFs) and the Encircled Energy Fractions (EEFs) of the three Herschel-PACS photometric bands (70, 100, 160 micron), as they are distributed as Ancillary Data Products.

2 DESCRIPTION OF THE ANCILLARY DATA PRODUCTS

2.1 Scope and method for the product generation

A detailed description of the PACS PSFs and EEFs obtained in-flight are reported in the technical note released on November 2015 by the PACS ICC, which can be found at:

http://herschel.esac.esa.int/twiki/pub/HSC/PACSLevel1/bolopsf_22.pdf

2.2 Content of the Ancillary Data Products

2.2.1 Deliverable format and structure

The PSFs in this data-set have been obtained from Vesta observations acquired from OD160 and OD345, while the EEFs curves have been obtained from a combination of Vesta and Mars observations. The PACS-P PSFs and EEFs strongly depend on the scanning mode and these products are provided for different observing modes (Prime and Parallel) and scanning velocities (20"/sec and 60"/sec). For Parallel mode, the increase of the on-board frames averaging (8 rather than 4) in the blue and green filters produces a further elongation of the PSFs in the scan direction compared to the Prime mode (especially at the fastest scanning velocity of 60"/s), while for the red camera the sampling is identical to the Prime mode, and thus the PSFs are the same.

The naming convention of the PSF FITS files is as follows:

`psf20_<band>_<speed>_<source>_<OD>_<ama>_<remarks>.fits` where:

- `<band>` is the camera filter. It can be `blu`, `grn` or `red` for the 70, 100 or 160 microns band, respectively ;
- `<speed>` is the telescope scanning velocity (20 or 60 "/sec);

- `<source>` is the name of the target (Vesta for the delivered PSFs);
- `<OD>` is the Herschel Observing Day;
- `<ama>` (array-to-map-angle) provides the scan direction in comparison to the PACS array (it corresponds to the `mapScanAngle` meta information)
- `<remarks>` provides further information: if the observation is *recentered*, by means of a posteriori correction of the pointing variations and/or if the projection performed by the `photProject` mapper was set with the parameter `pixfrac` (projected-to-input pixel size ratio) equal to 0.1 (*Op10*) or to 1 (no remark). Noticeably, `pixsize = 0.1` is the value adopted by the Standard Pipeline and Table 7 of the technical note¹ summarizes a comparison between PSFs widths obtained for recentered and normal processing.

Each FITS file is about 600 Kb (compressed) in size and the following extensions are present (standard outputs for the `photProject` mapper):

- *image*: Vesta PSF image, given as 201 x 201 pixels array. The pixels size is 1 arcsec for all the filters;
- *error*: this dataset provides the error map obtained by using the `photCoverage2Noise` task
- *coverage*: this dataset provides a measurement of the amount of data falling onto one spatial pixel

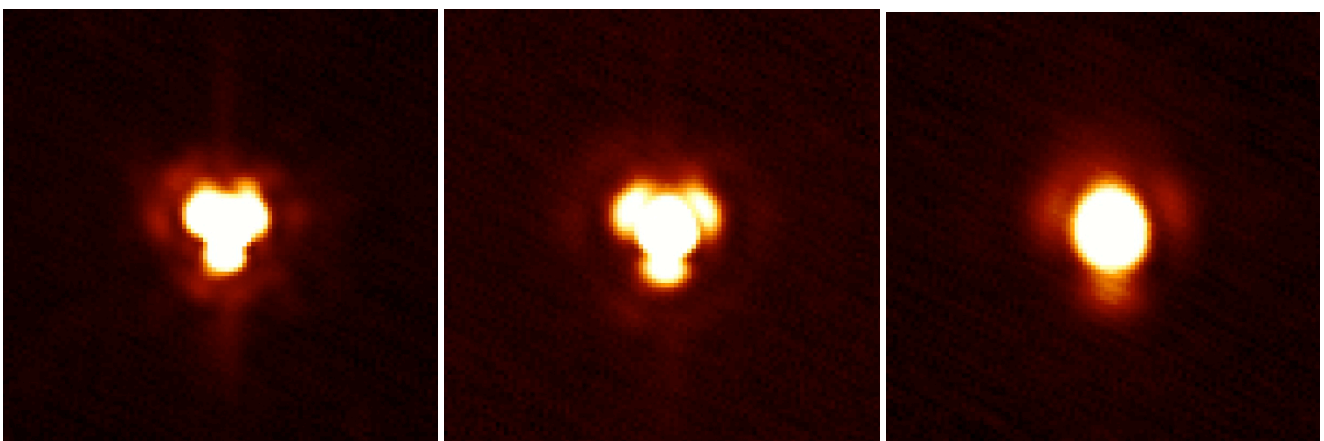


Figure 1: Three examples of Vesta PSFs. From left to right, blue, green and red images acquired at 20"/sec scan speed.

¹ http://herschel.esac.esa.int/twiki/pub/HSC/PACSLevel1/bolopsf_22.pdf

The EEFs are distributed as ASCII (.txt) files and their naming convention is:

EEF_<band>_<speed>_<version>.txt

- <band> is the camera filter. It can be blu, grn or red for the 70, 100 or 160 microns band, respectively;
- <speed> is the telescope scanning velocity (20 or 60 "/sec). It is specified if the observing mode is Parallel;
- <version> is the version release. The first release (v2.0) contains the EEFs only for standard observations (Prime mode, slow speed), while EEFs for all the other observing modes were distributed in the subsequent releases;

The EEFs ASCII files are composed of 5 columns:

- Radius in arcsec is the aperture that the corrections refer to;
- EEF normal is computed by setting pixfrac = 1 in the photProject mapper
- EEF is computed by setting pixfrac = 0.1 in the photProject mapper
- Vesta normal is the uncorrected Vesta EEPs with pixfrac = 1
- Vesta EEFs with pixfrac = 0.1

Since Vesta is used for characterising the brightest regions go the PSF cores, the EEFs in the last 2 columns is reported up to a radius of 60 arcsec.

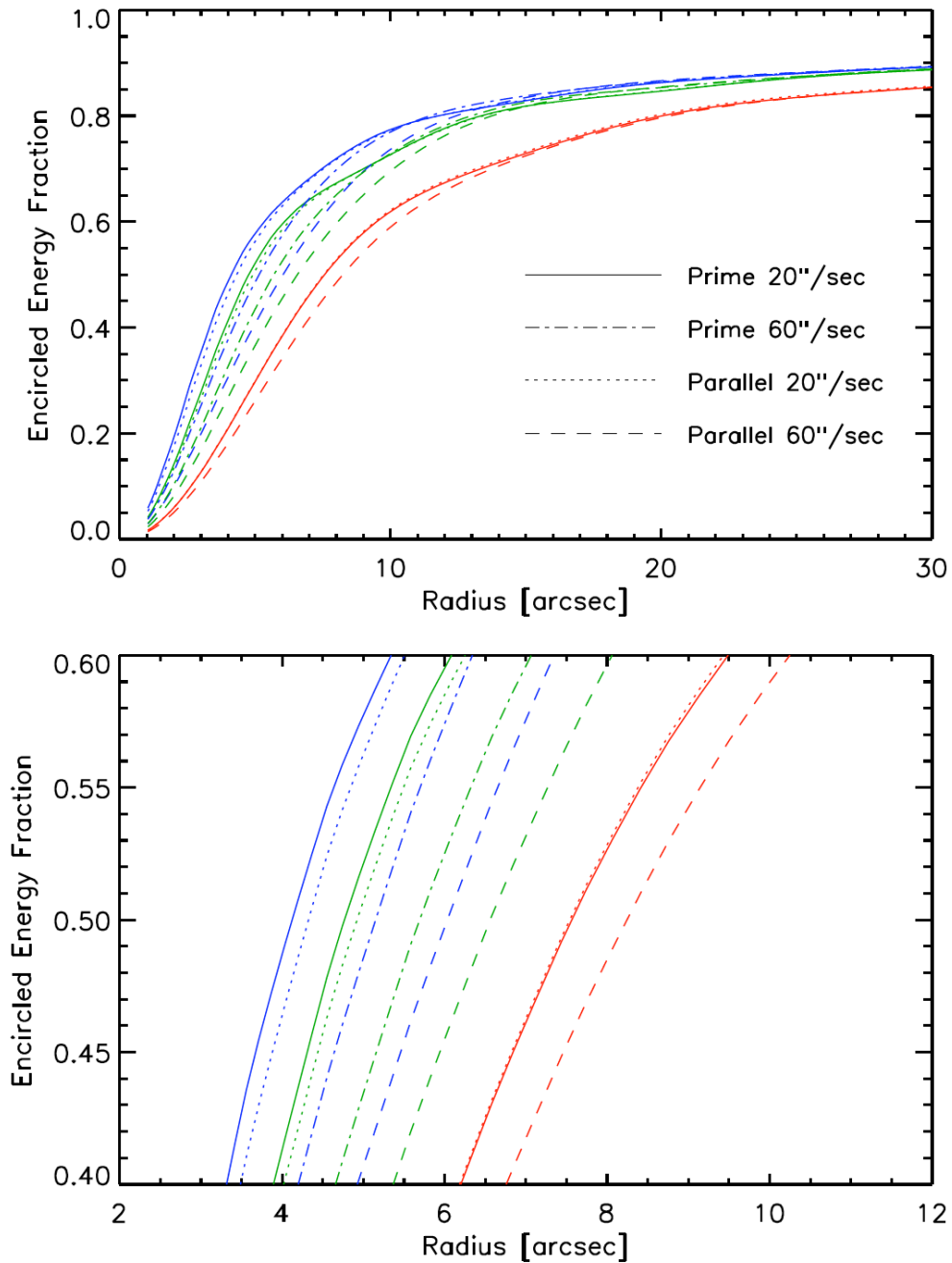


Figure 2: EEFs for the PACS bands (blue=70, green=100, red=160) as functions of the observing mode (Prime or Parallel) and scanning speed (20 arcsec/sec, 60 arcsec/sec).