CHEOPS Point Spread Function (PSF)

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The file **IT_PSFwhite_20180713AO1v1.0.txt** is an ascii file in the form of a 200×200 matrix representing the energy distribution in a 200×200 window of the CHEOPS PSF. The centre of the PSF is at the centre of the matrix (approximately at (100, 100)). Each matrix element represents the fraction of energy that a pixel at this location will receive.

- Figure **IT_FigurePSFWhite_20180713AO1v1.0.eps** is a graphical representation of IT_PSFwhite_20180713AO1v1.0.txt.
- Figure **IT_FigurePSFWhiteZoomIn_20180713AO1v1.0.eps** is a zoom in of IT_FigurePSFWhite_20180713AO1v1.0.eps.

The PSF was obtained during the On-ground Instrument Calibration Campaign at the beginning of 2018. The white light source (an LDLS lamp) used for the illumination has the following spectral distribution:
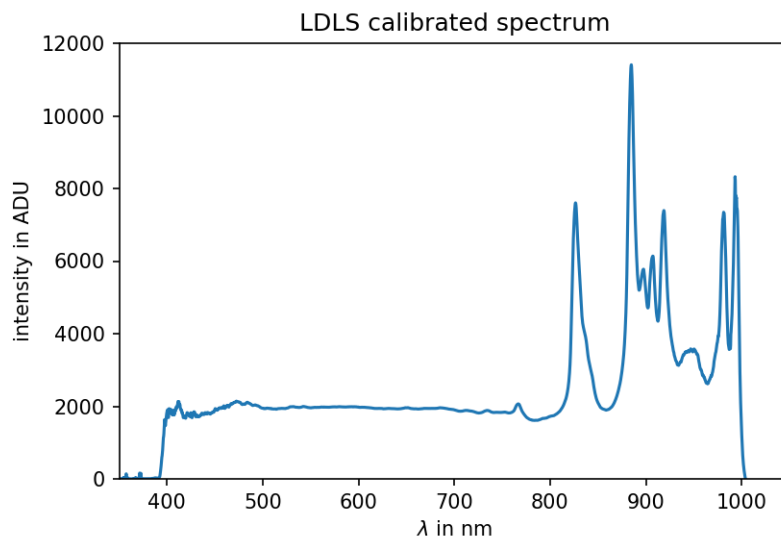
The white light measurements of the PSF were made using the LDLS lamp and a 500-800 nm filter. The file IT_PSFwhite_20180713AO1v1.0.txt was produced in the following way:
- 50 images were acquired,
- Bias, dark current, non-linearity and flat filed correction was applied to each image
- The barycenter of the PSF and the sharpness of the image was measured
- Images that were not sharp enough were discarded
- The remaining images were individually shifted to align all the PSF global average to produce a final image.

After doing this, a post processing was applied:

- Removing negative values: after the corrections applied in the previous steps, some pixels could end up being negative. A negative pixel was replaced by the mean value of its 8

neighbor pixels. This was repeated for all negative pixels. However, to preserve the total flux in the image, all pixels should be shifted by an offset. This offset is the difference between the original image and the corrected one (of course the pixel-wise value is divided by the number of the pixels in the image). This step was repeated until no negative pixels are left.
- Normalization of the image: the final image is simply divided by the total flux of the image.

There are 12 pixels in the PSF that contain more than 1% of the total energy each. The maximum fractional energy contained in one pixel is 2.02%.
The figure **IT_FigurePSFWhiteProfiles_20180713AO1v1.0.eps** shows the energy distribution across vertical cuts of the PSF that contain the pixels with fractional energy higher than 1%. For example, the purple curve labeled x=94 shows the energy distribution profile for x=94 along the y axis.
Note: the x axis is the horizontal axis in figure IT_FigurePSFWhite_20180713AO1v1.0.eps, while the y axis is the vertical one.