1. **Bare detectors.**
2. **Coherent detectors.**
3. **Reading the datafiles.**

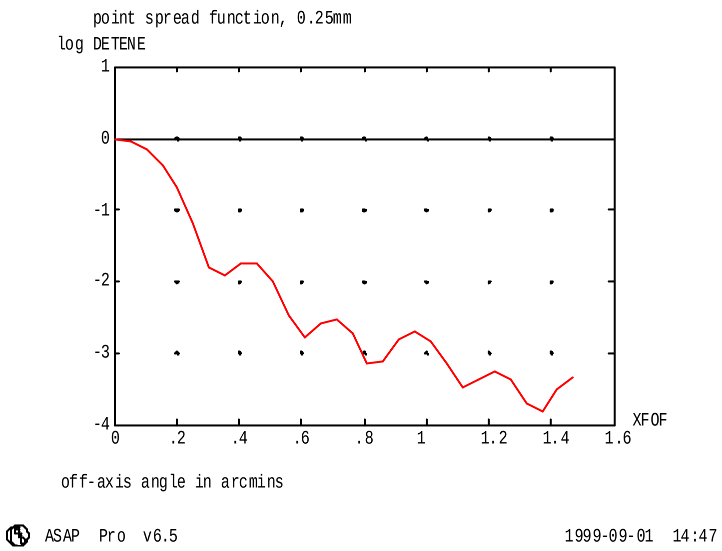
The analysis is based on the beam-propagation model described in (SPIRE/RAL/N0101.01). The model calculates the beam pattern at several components, and includes clipping by the instrument cold stop, telescope field stop, the telescope pupil (with undersizing of zero) and the central obscuration. The relevant beam pattern data have been recorded and checked against the previous model, but they are not included here.

The optical prescription has been updated to BPH126B. This includes the channel separating components, but for simplicity the propagation is made only for the 'straight-through' channel (0.5um). This simplification is allowable since the back focal distance is the same in all channels (i.e. no channel-dependent focusing optics)

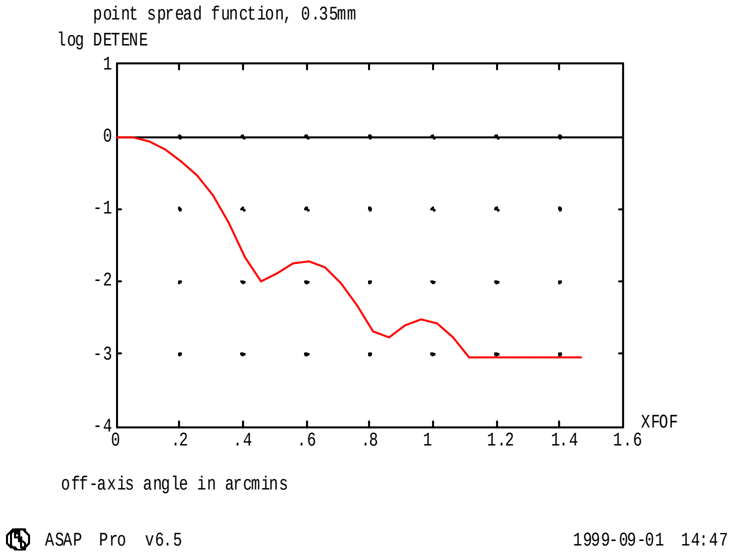
The PSF plot was simulated in the +X-direction only (that within PHOT's plane of symmetry). It is calculated at the centre wavelength of each channel, i.e. 0.25, 0.35 & 0.5 mm.

4. Bare detectors.

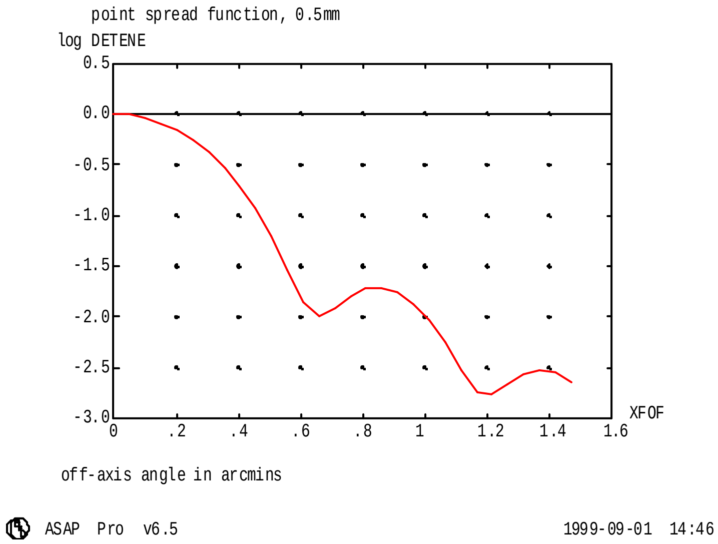
Here the detector is modelled as a fully incoherent receiver, with a finite spatial extent (circular with radius = ¼ of Airy disc radius), and Lambertian angular response. The PSF is then the energy portion of the beam falling on the detector , versus incident beam angle (FOV angle on the sky). This is calculated by repeating the full beam analysis over the FOV range of interest. The FOV range used was 0 out to ¾ of the edge of the field stop (which is at 2 arcmin in X).



File: PSF25.din (Wavelength 0.25mm)



File: PSF35.din (Wavelength 0.35mm)



File: PSF05.din (Wavelength 0.5mm)

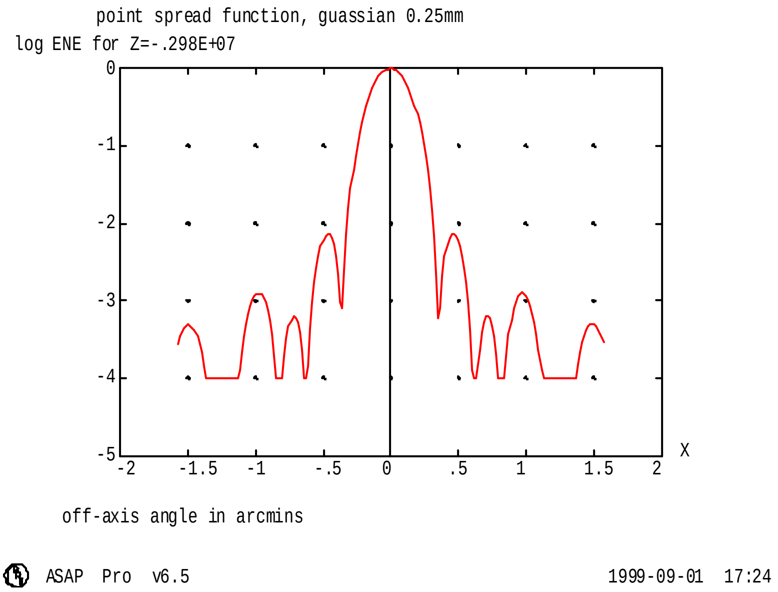
5. Coherent detectors.

These detectors are modelled as fully coherent spatially in that they receive energy in a single electromagnetic mode. They have spatial & angular responses which are tied together in the mode shape, and spatially they may be regarded as point-like. The PSF for such detectors can be calculated as the mode pattern in the far-field for the on-axis (zero FOV) beam, providing that the pattern shape does not significantly vary with beam incident (FOV) angle. This condition holds for our case since a) the clipping applied at the 2 pupil spots is independent of FOV angle b) the clipping at the field stop is negligible. C) the clipping at the central obscuration varies in position with FOV angle, but by an amount which is negligible compared to the beam size at this point (3.5m diameter).

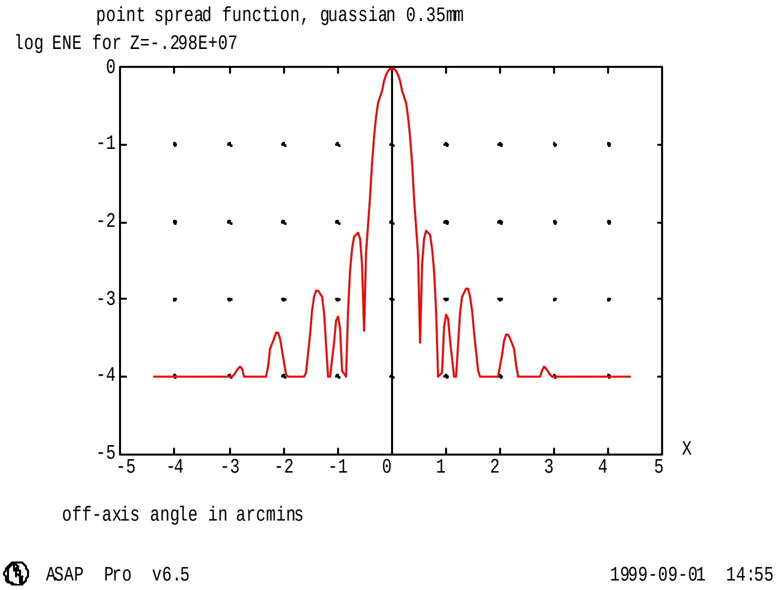
For cases where this invariance does not hold, the PSF computation has to proceed as per that for the bare detector, above, i.e. calculating the signal on the detector due to the beam at each FOV position.

Here the added complication is that this signal is no longer a simple sum of beam energy across the detector, but instead the coupling of the beam field to the detector modal response.

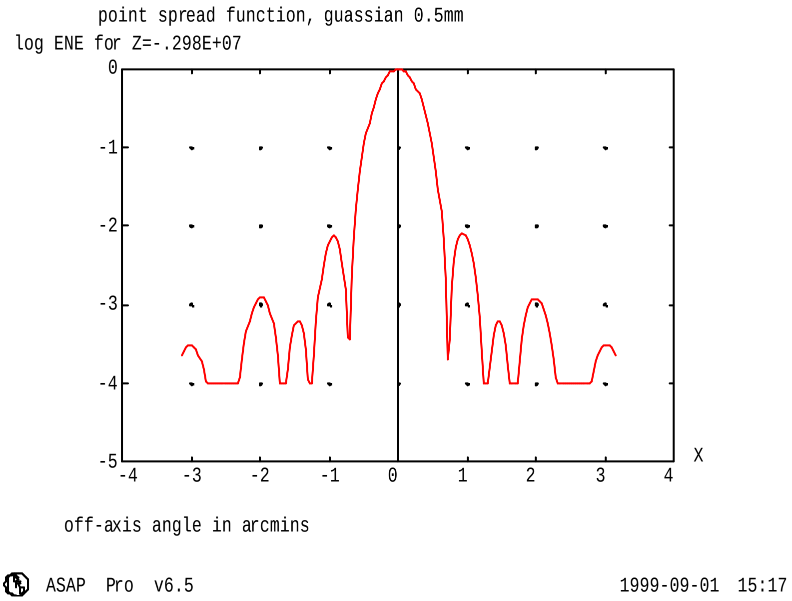
The detector mode is taken as a pure gaussian. The waist is chosen to have position at the geometric focus , and size such that the far-field beam illuminates the instrument pupil at a level (edge taper) of 1/e in field amplitude.



File: CG1L2424Y25.din



File: CG1L2424Y35.din



File: CG1L2424Y05.din

Reading the datafiles.

The above files can be read & plotted using the IDL 5.2 program:

Prog2.pro

This uses a function defined in library file:

Rea_asap1.pro.

These files plus the 6 *.din textual datafiles are in the RAL network drive:

T:/transfer max 1 week/mec59.