

APLC Design Summary

Instrument	SPHERE
nPup	100 x 100 pixels
Coronagraphic throughput (transmitted energy)	0.6759
Core throughput (encircled energy)	0.4547
Lyot stop inner diameter (% of inscribed circle)	0.002
Lyot stop outer diameter (% of inscribed circle)	0.1
Bandpass	20.0%
# wavelengths	1
FPM radius (grayscale)	2.252 λ/D
nFPM	100 pixels
IWA — OWA	5.0—20.0 λ/D
Contrast constraint	10^{-8}
Lyot Stop alignment tolerance	1 pixels

Input Files :

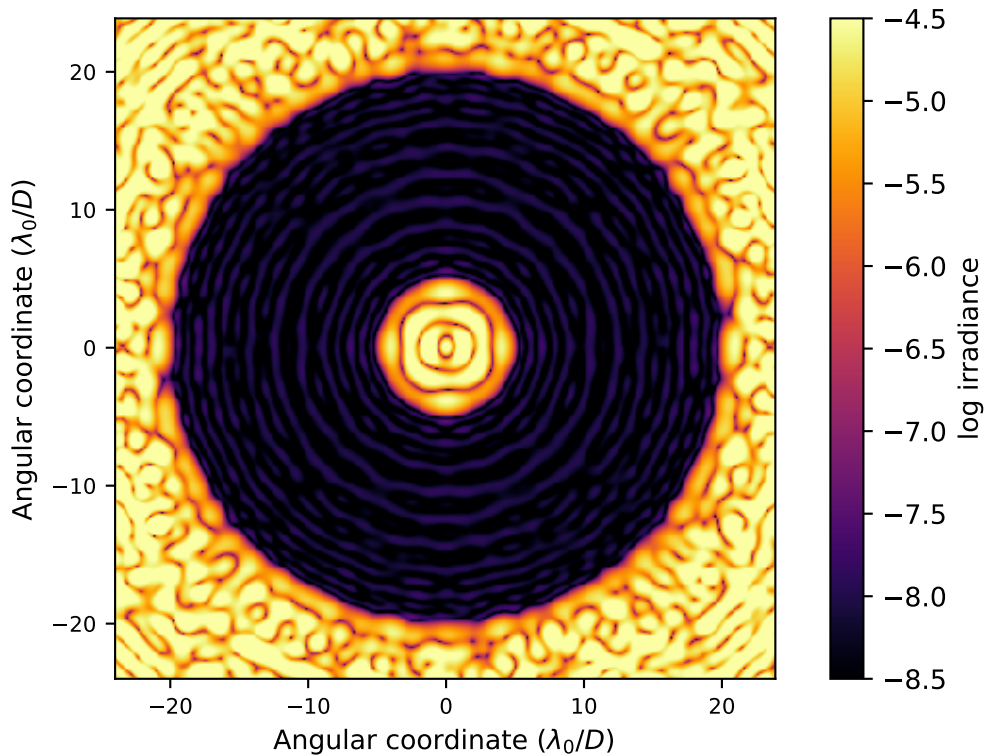
▷ *Pupil file* : SPHERE/pupil=vlt_btwnPup=100.fits

▷ *Lyot stop file* : SPHERE/sphere_stop_ST_ALC2_nPup0100_ud.fits

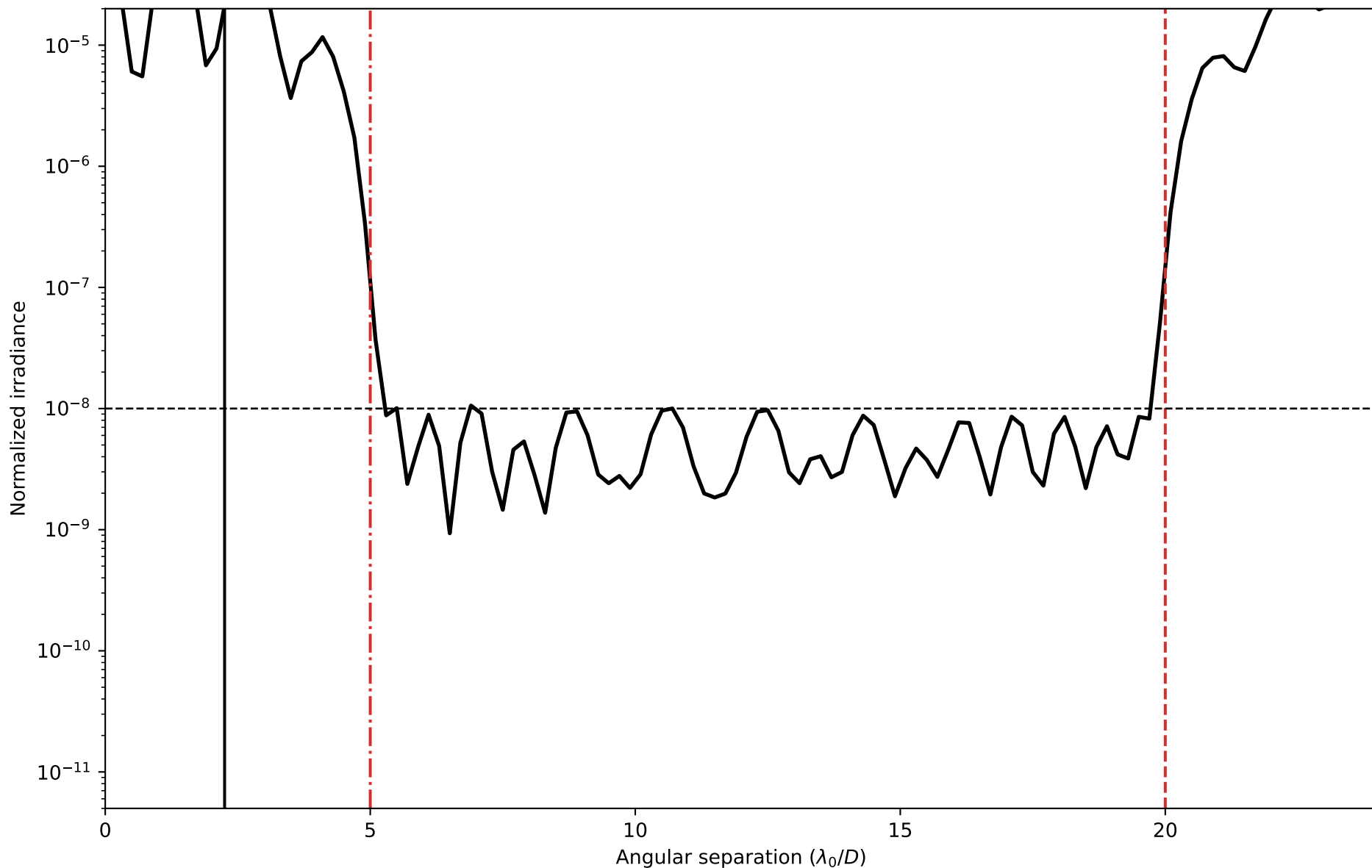
Solution File :

▷ 0_SPHERE_N100_FPM225M0100_IWA0500_OWA02000_C8_BW20_Nlam1_LS_ID_ST_A_OD_nPu_Is_0100_ud.fits.fits

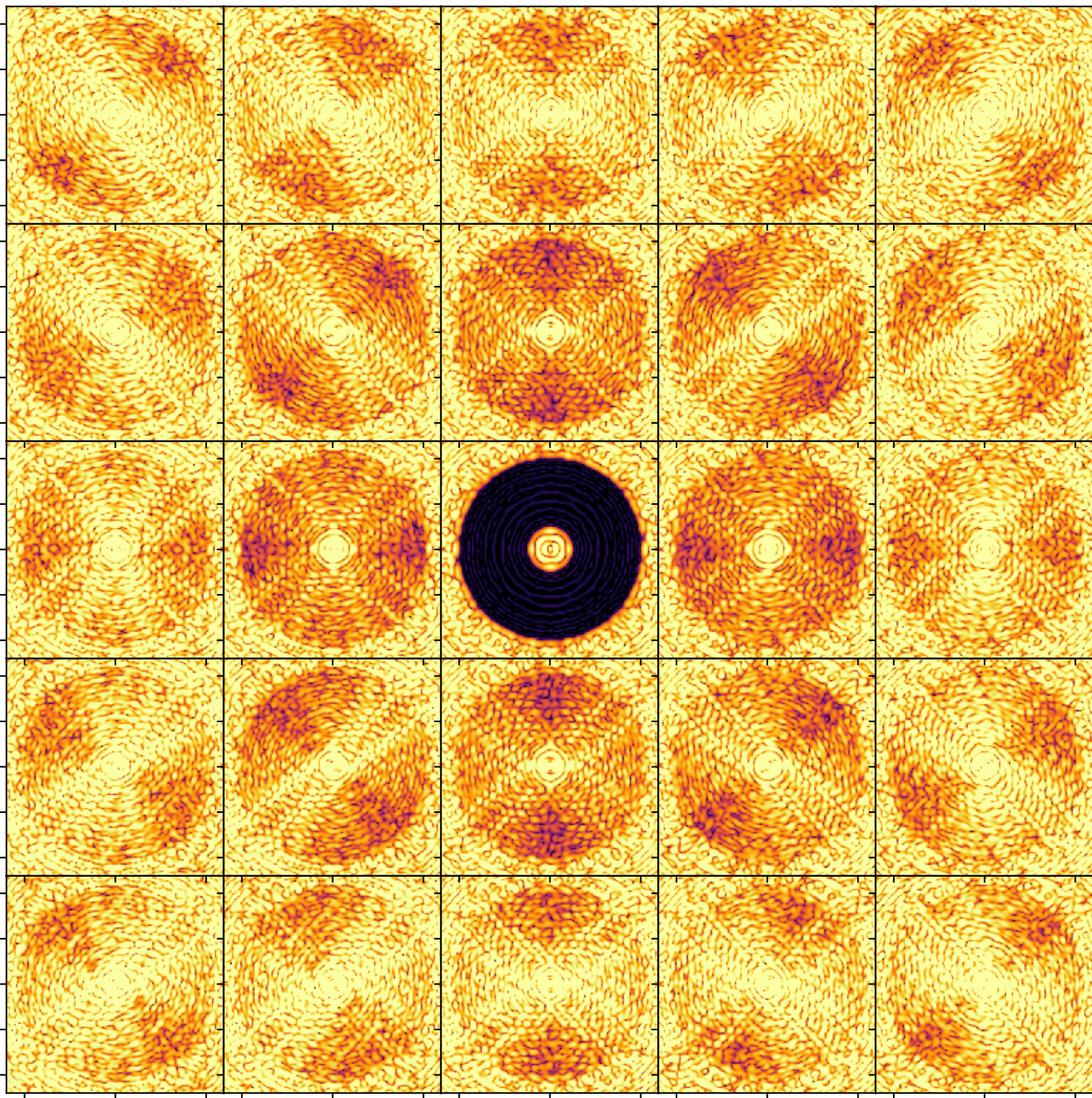
Tue Aug 1 17:04:09 2023



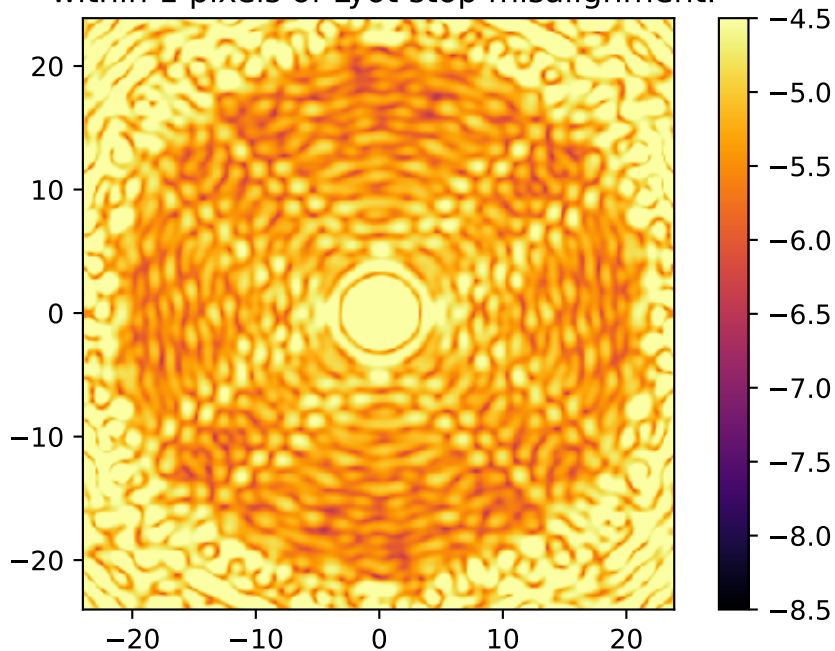
*Monochromatic on – axis PSF in log irradiance,
normalized to the peak irradiance value.*



Monochromatic on – axis PSF azimuthally averaged over angular separations $0.1\text{--}33.9 \lambda/D$, normalized to the peak irradiance. The vertical, solid black line at separation $2.252 \lambda/D$ marks the radius of the FPM occulting spot. The vertical, red lines at 5.0 and $20.0 \lambda/D$ respectively indicate the radii of the inner and outermost constraints applied during the apodizer optimization.



Average monochromatic normalized irradiance
within 1 pixels of Lyot stop misalignment.



Analysis Summary

Apodizer &
Telescope Aperture

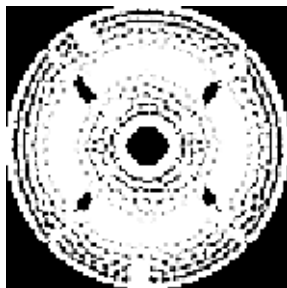


Image plane

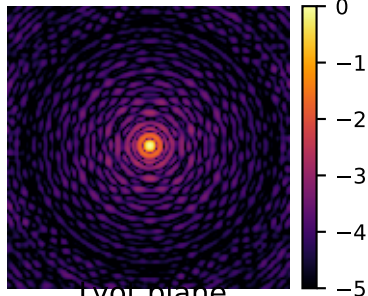
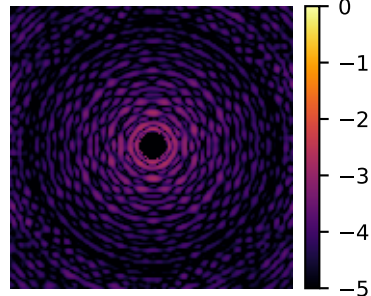
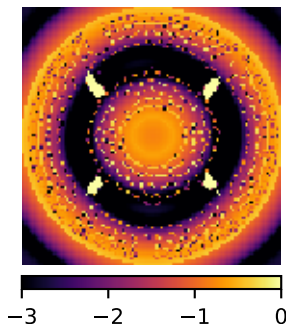


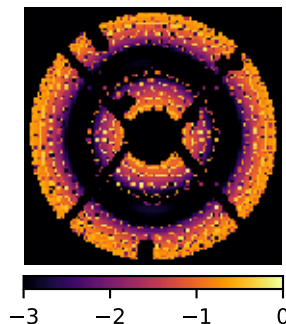
Image plane
w/FPM



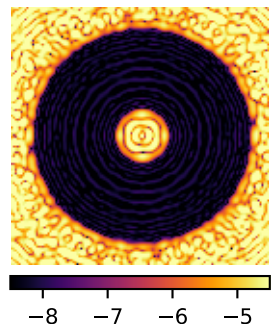
Lyot plane

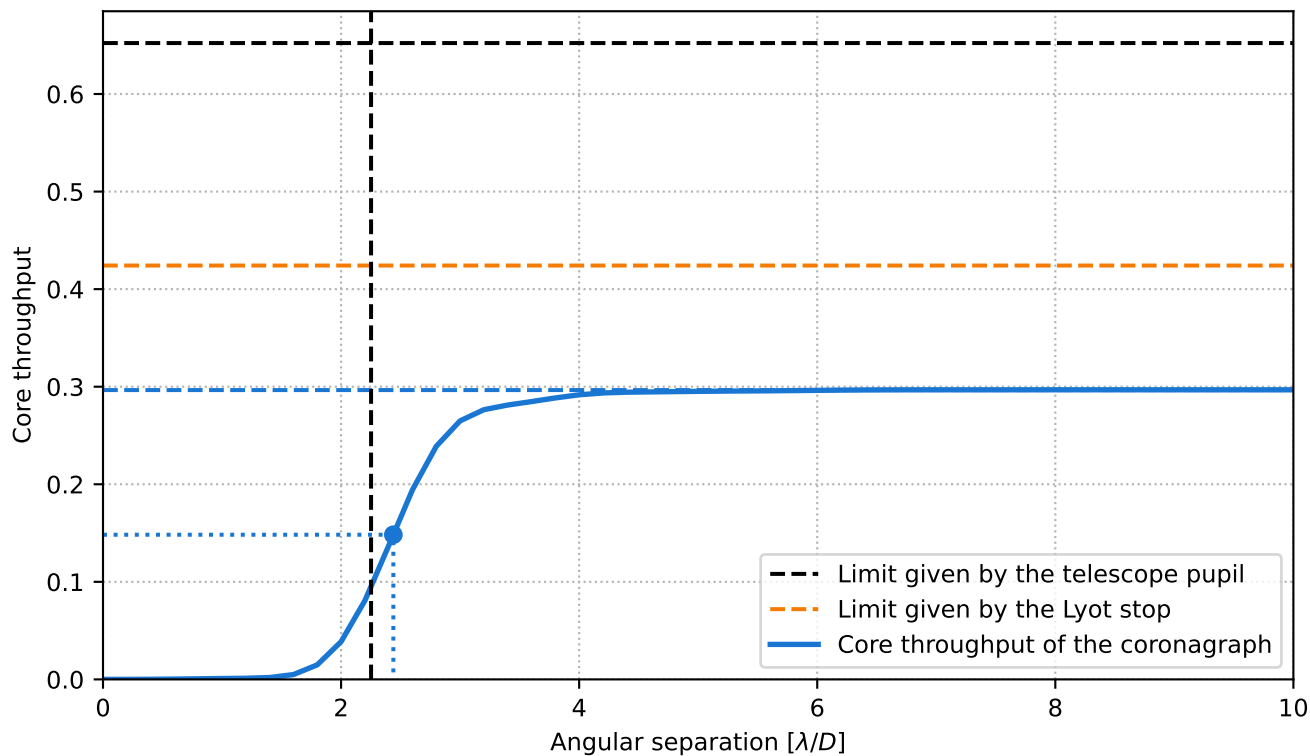


Lyot plane
w/lyot stop



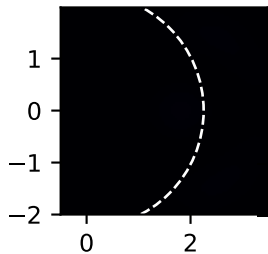
Final image plane



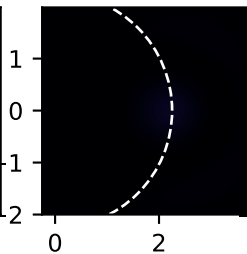


Pupil core throughput:	0.6522279295085497
Lyot stop core throughput:	0.4241897457013047
Maximum core throughput:	0.29654197099141333
Maximum core throughput w.r.t. pupil core throughput:	0.4546600315243417
Maximum core throughput w.r.t. Lyot stop core throughput:	0.6990785939465515
Inner working angle:	2.4391244424918797 λ_0/D

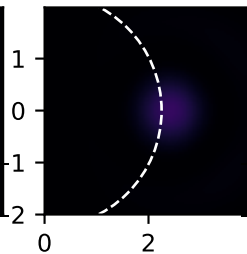
$1.50 \lambda_0/D$



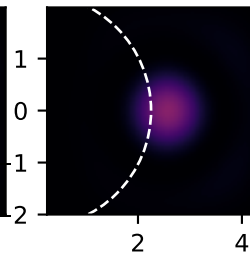
$1.75 \lambda_0/D$



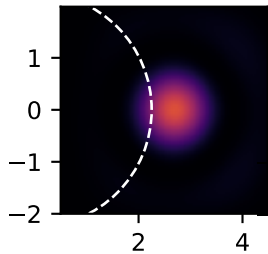
$2.00 \lambda_0/D$



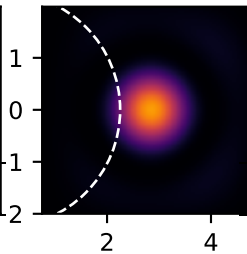
$2.25 \lambda_0/D$



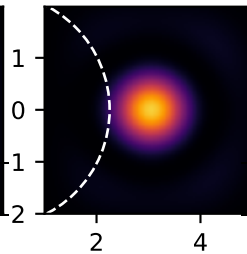
$2.50 \lambda_0/D$



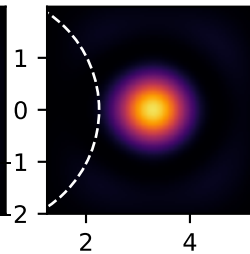
$2.75 \lambda_0/D$



$3.00 \lambda_0/D$

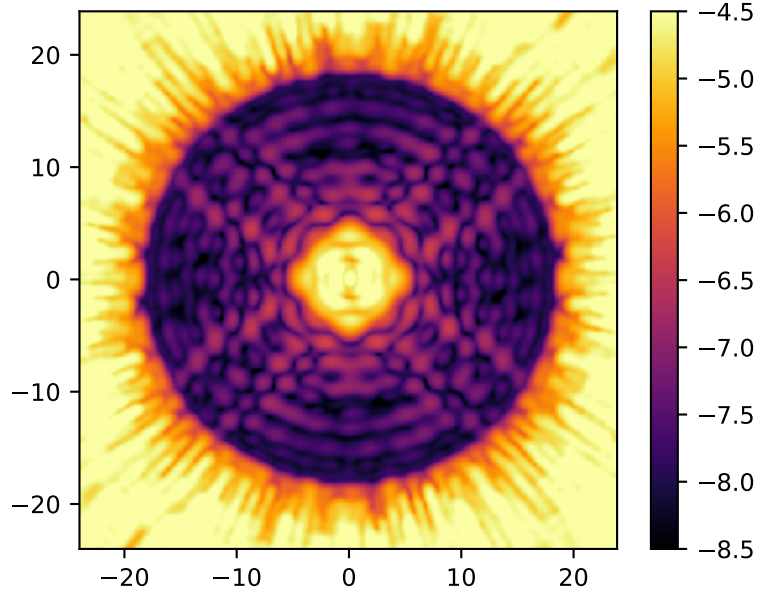


$3.25 \lambda_0/D$

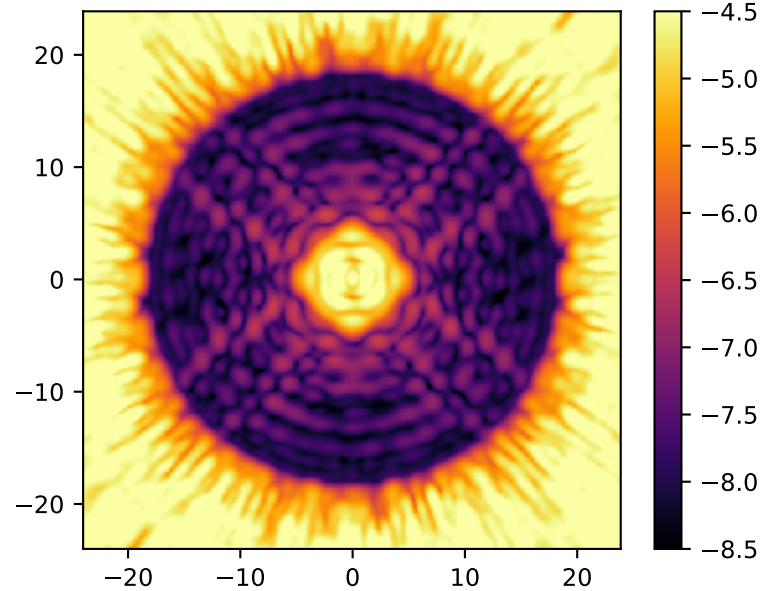


Broadband normalized irradiance for four representative levels of residual pointing jitter.

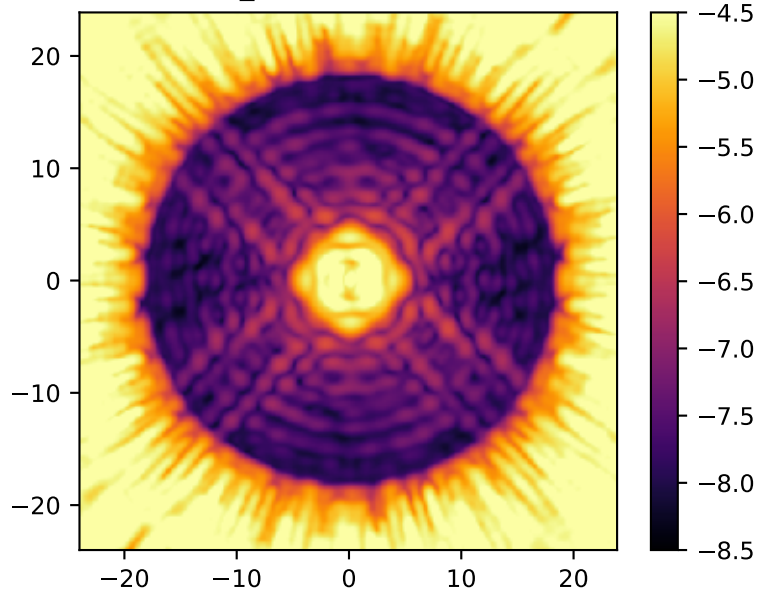
$\sigma_{\text{rms}} = 0.01 \lambda/D$



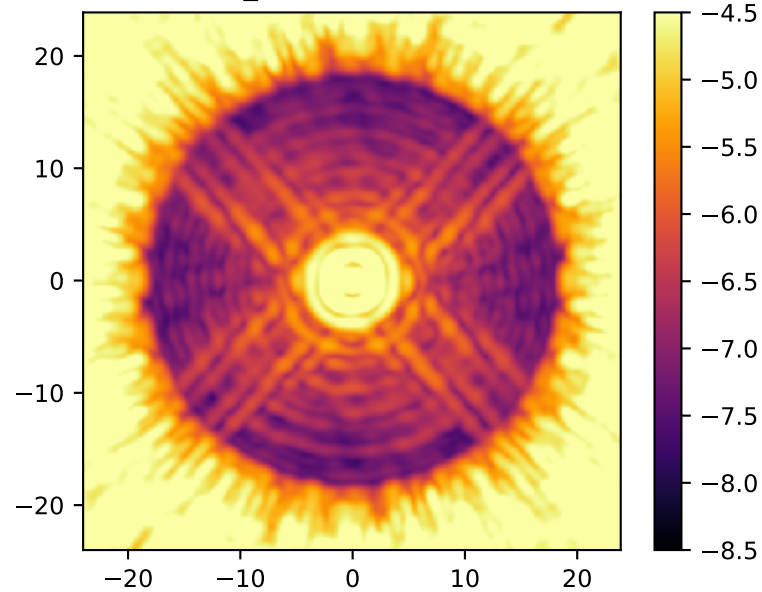
$\sigma_{\text{rms}} = 0.03 \lambda/D$

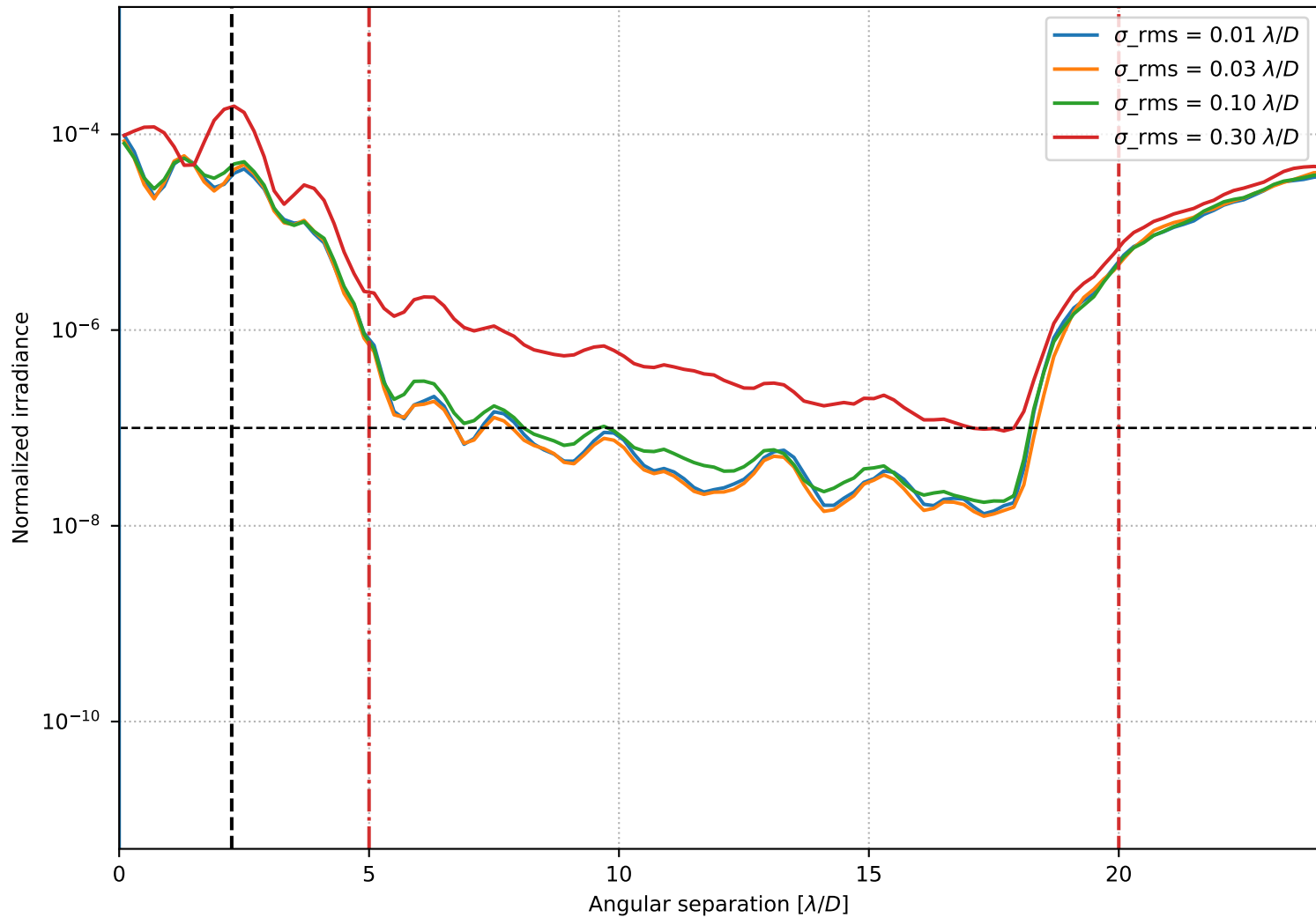


$\sigma_{\text{rms}} = 0.10 \lambda/D$



$\sigma_{\text{rms}} = 0.30 \lambda/D$





Azimuthally averaged raw contrast for four representative levels of rms residual pointing jitter.