

## 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 $\lambda/D$
nFPM	100 pixels
IWA — OWA	5.0—20.0 $\lambda/D$
Contrast constraint	$10^{-8}$
Lyot Stop alignment tolerance	1 pixels

### Input Files :

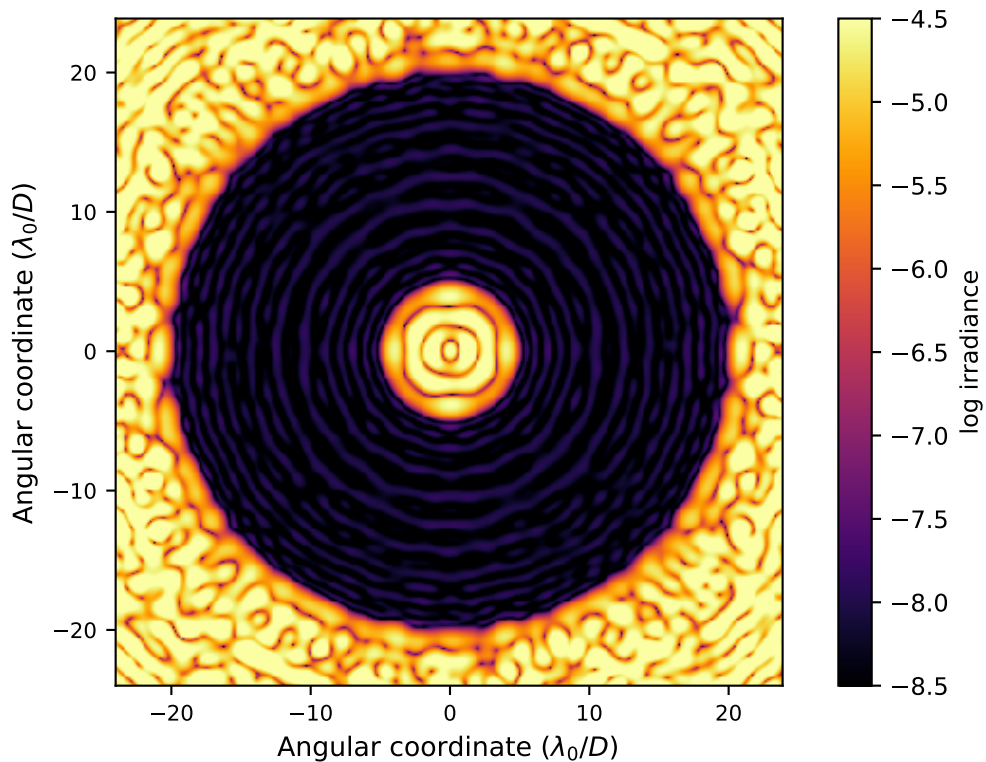
▷ *Pupil file* : SPHERE/pupil=vlt\_btwnPup=100.fits

▷ *Lyot stop file* : SPHERE/sphere\_stop\_ST\_ALC2\_nPup0100\_lr.fits

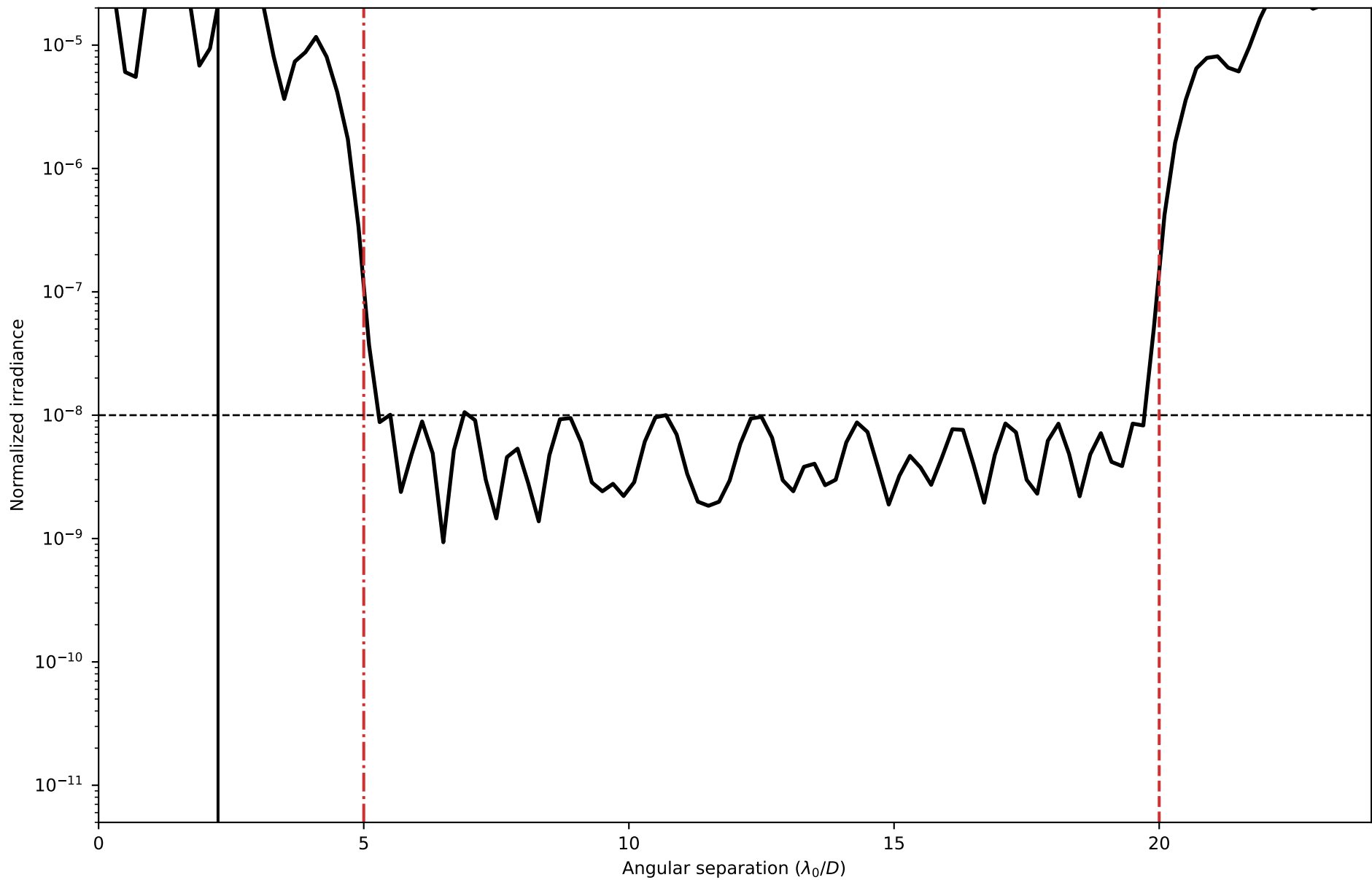
### Solution File :

▷ 2\_SPHERE\_N100\_FPM225M0100\_IWA0500\_OWA02000\_C8\_BW20\_Nlam1\_LS\_ID\_ST\_A\_OD\_nPu\_Is\_0100\_lr.fits

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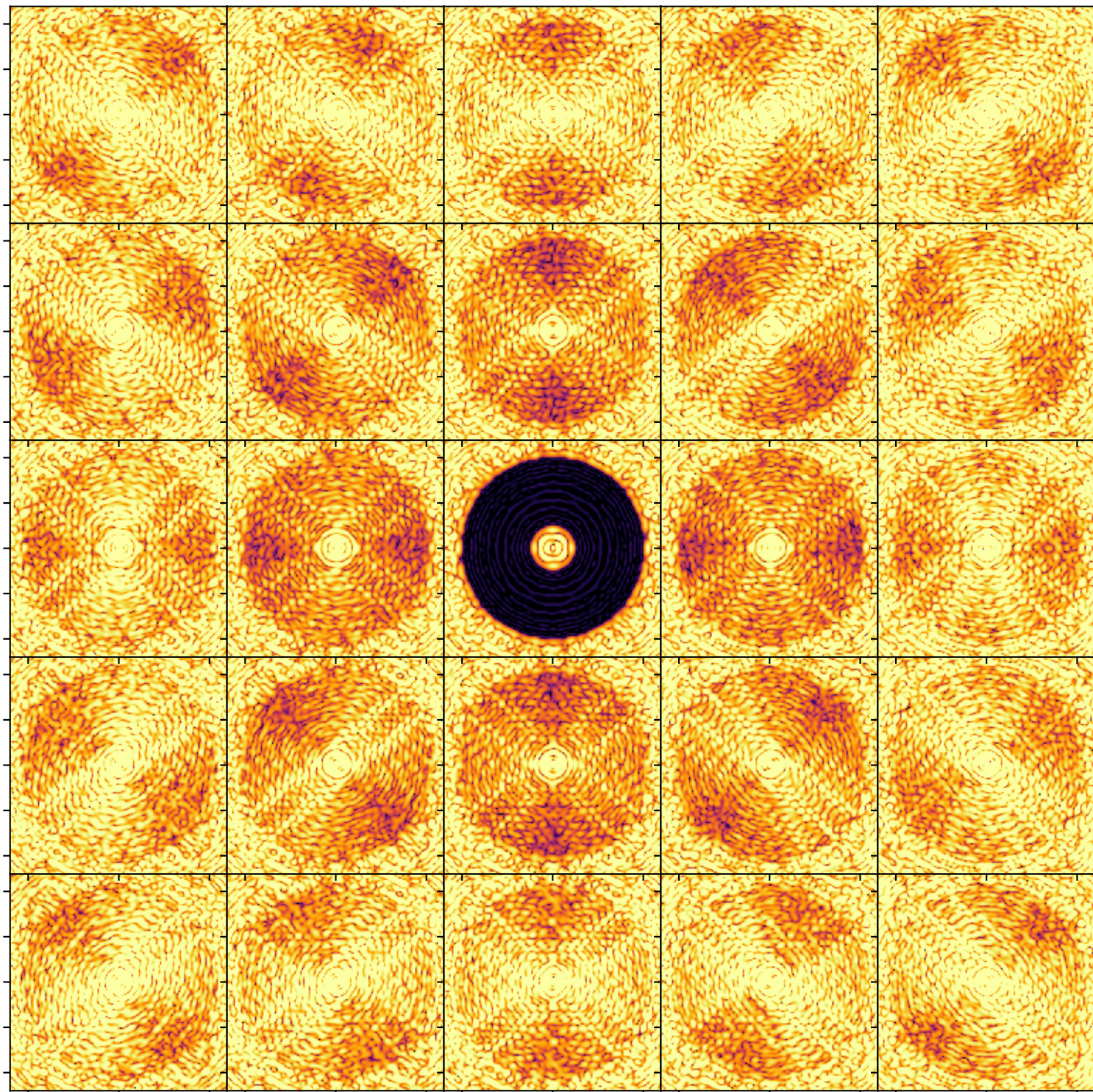


*Monochromatic on – axis PSF in log irradiance,  
normalized to the peak irradiance value.*



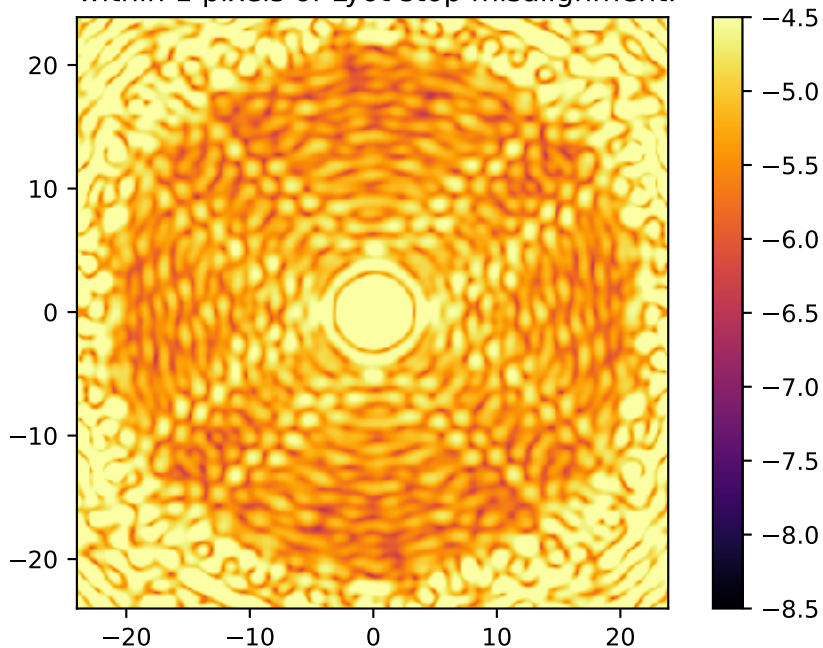
*Monochromatic on – axis PSF azimuthally averaged over angular separations  $0.1\text{--}33.9 \lambda/D$ , normalized to the peak irradiance. The vertical, solid black line at separation  $2.252 \lambda/D$  marks the radius of the FPM occulting spot. The vertical, red lines at  $5.0$  and  $20.0 \lambda/D$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

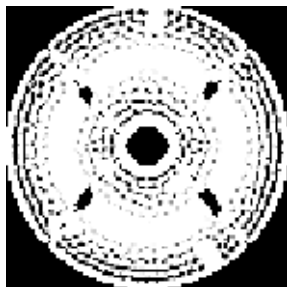


Image plane

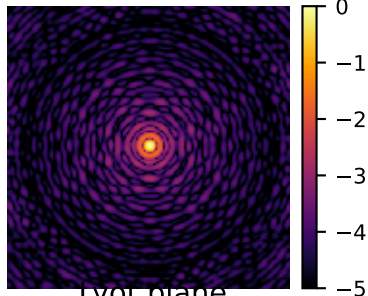
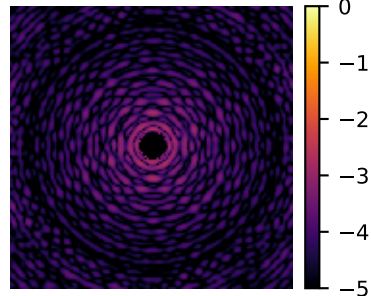
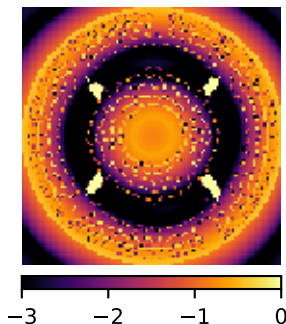


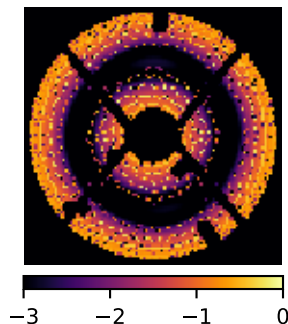
Image plane  
w/FPM



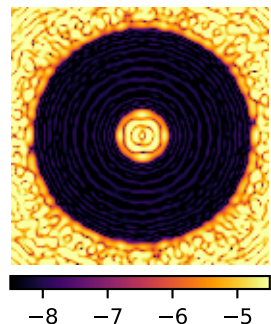
Lyot plane

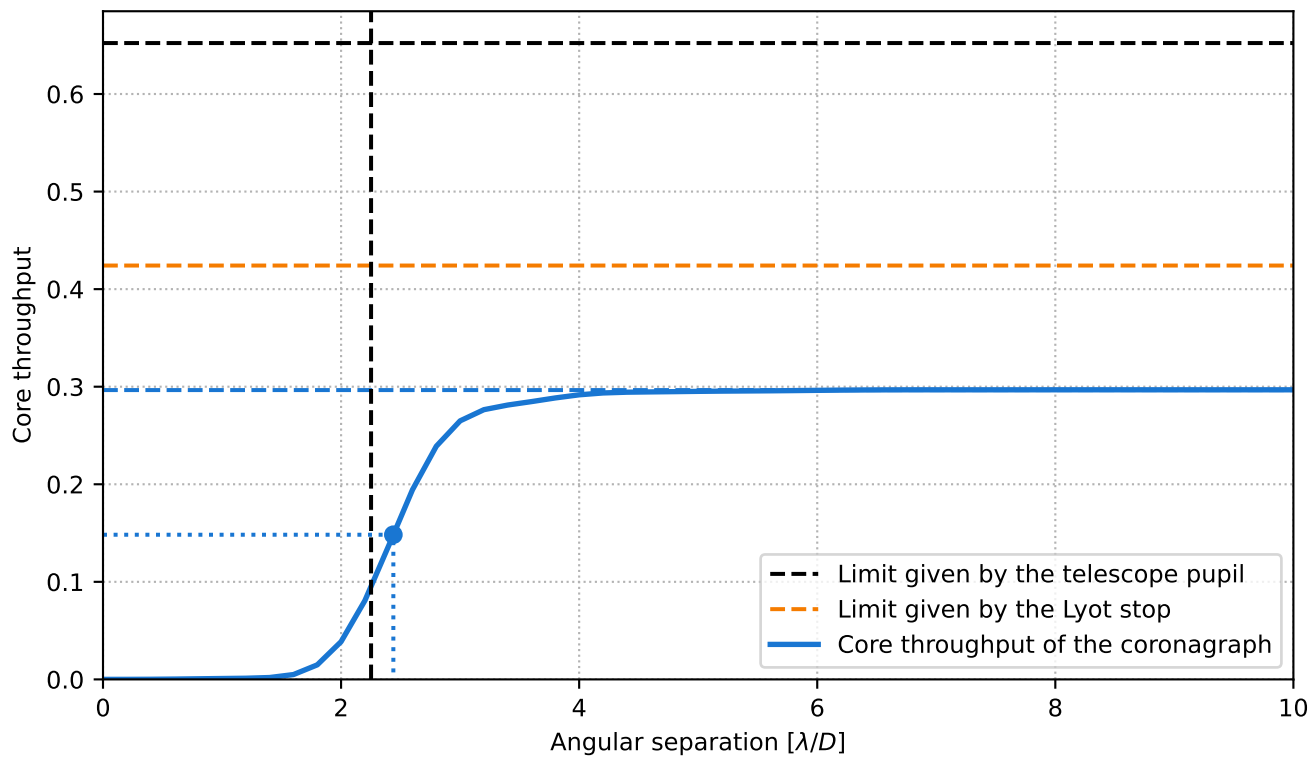


Lyot plane  
w/lyot stop

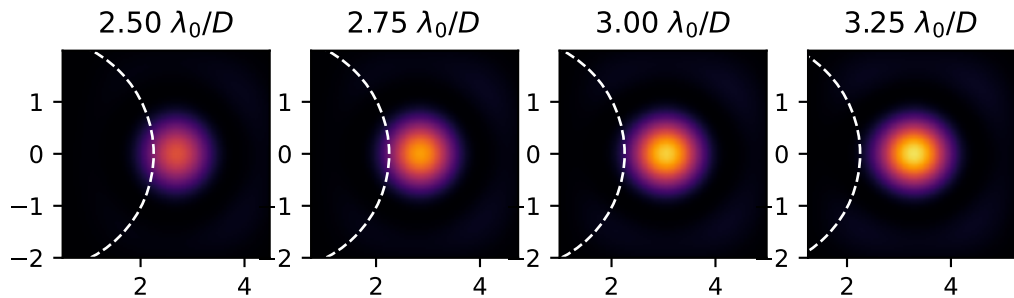
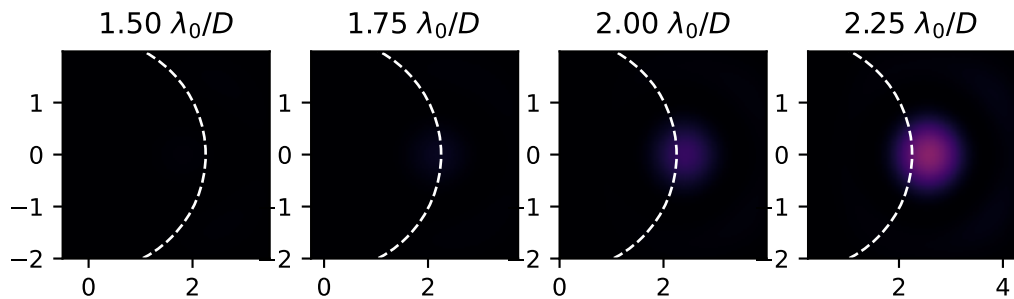


Final image plane





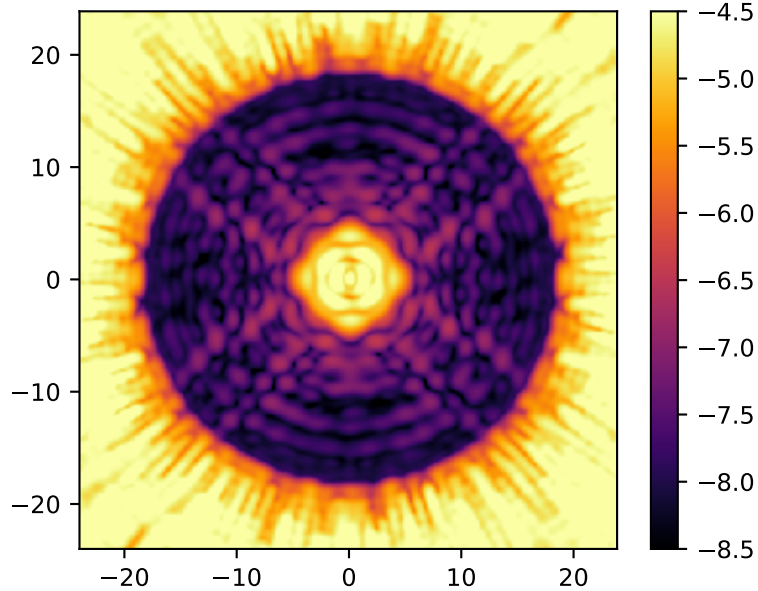
Pupil core throughput:	0.6522279295085497
Lyot stop core throughput:	0.4241897457013047
Maximum core throughput:	0.29654197153356776
Maximum core throughput w.r.t. pupil core throughput:	0.45466003235557634
Maximum core throughput w.r.t. Lyot stop core throughput:	0.6990785952246457
Inner working angle:	2.43912444216185 $\lambda_0/D$



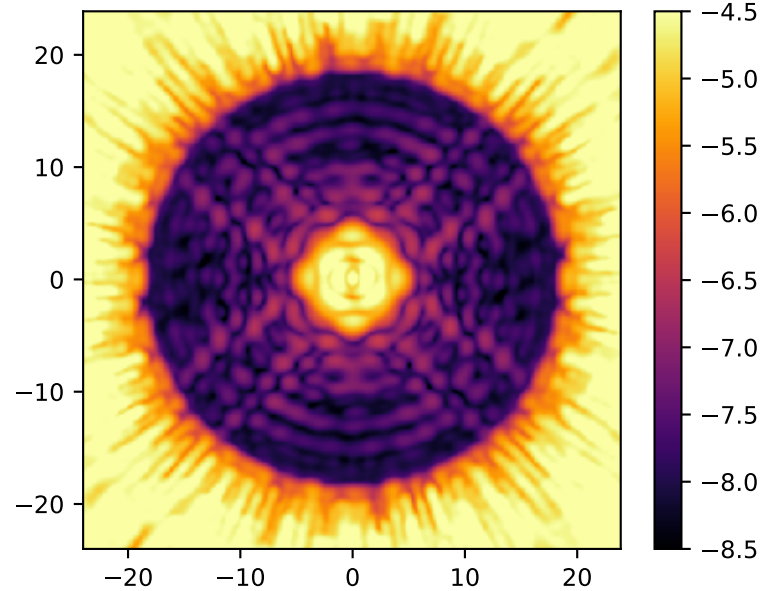


Broadband normalized irradiance for four representative levels of residual pointing jitter.

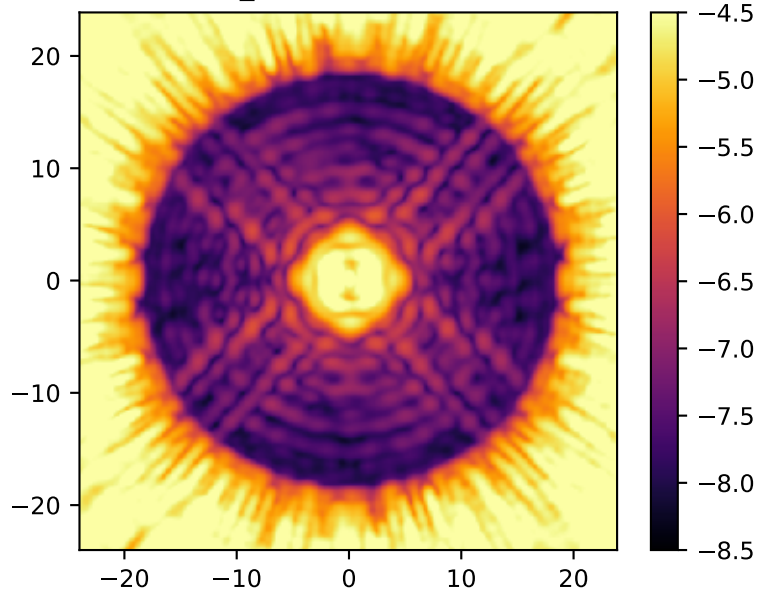
$\sigma_{\text{rms}} = 0.01 \lambda/D$



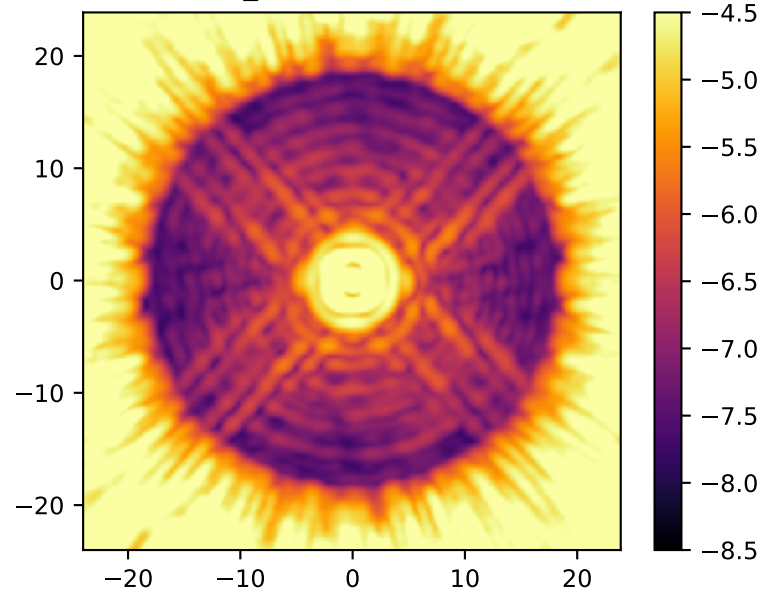
$\sigma_{\text{rms}} = 0.03 \lambda/D$

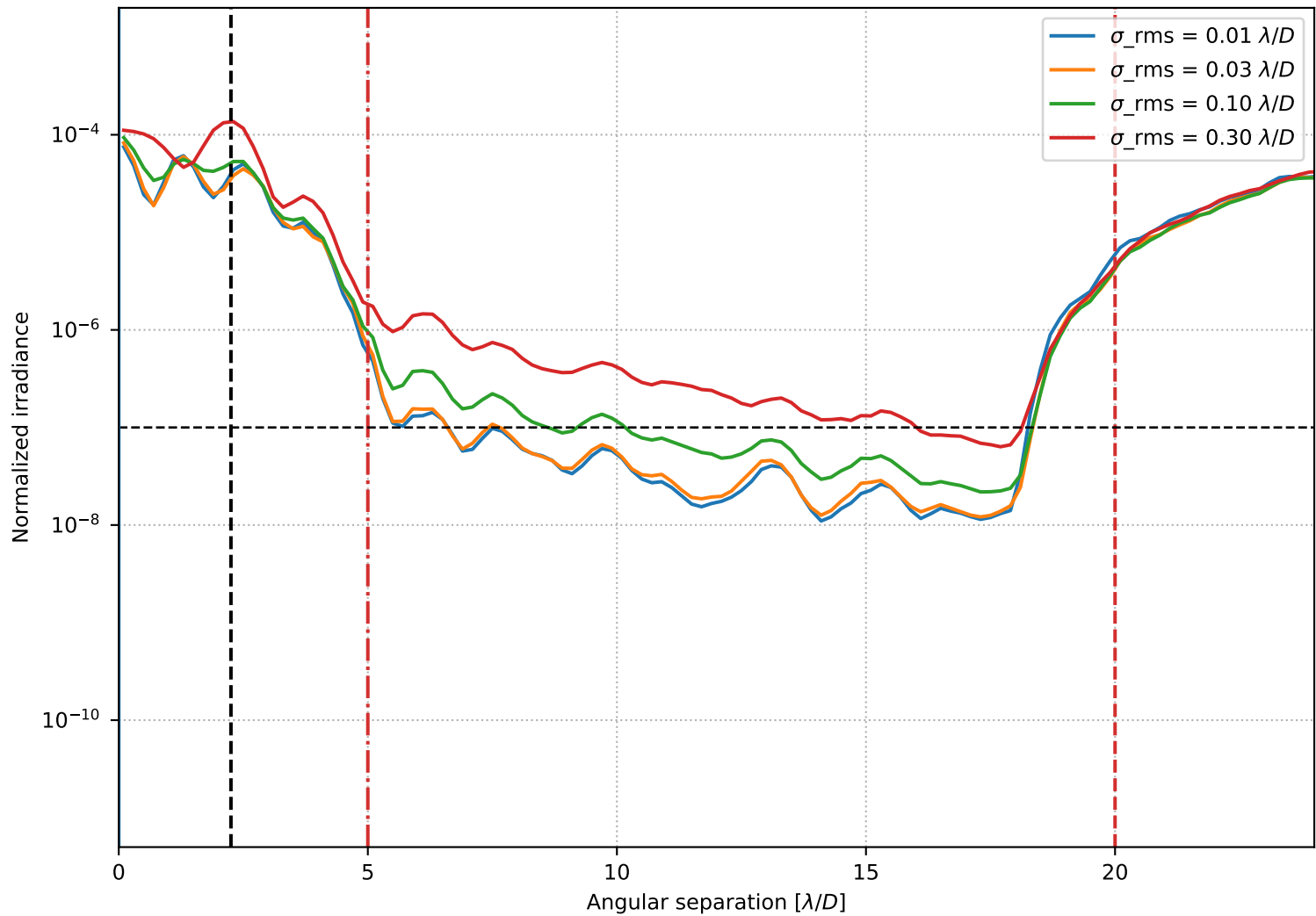


$\sigma_{\text{rms}} = 0.10 \lambda/D$



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





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