

APLC Design Summary

Instrument	SPHERE
nPup	100 x 100 pixels
Coronagraphic throughput (transmitted energy)	0.0993
Core throughput (encircled energy)	0.0727
Liot stop inner diameter (% of inscribed circle)	0.002
Liot stop outer diameter (% of inscribed circle)	0.1
Bandpass	20.0%
# wavelengths	3
FPM radius (grayscale)	2.252 λ/D
nFPM	100 pixels
IWA — OWA	5.0—20.0 λ/D
Contrast constraint	10^{-8}
Liot Stop alignment tolerance	1 pixels

Input Files :

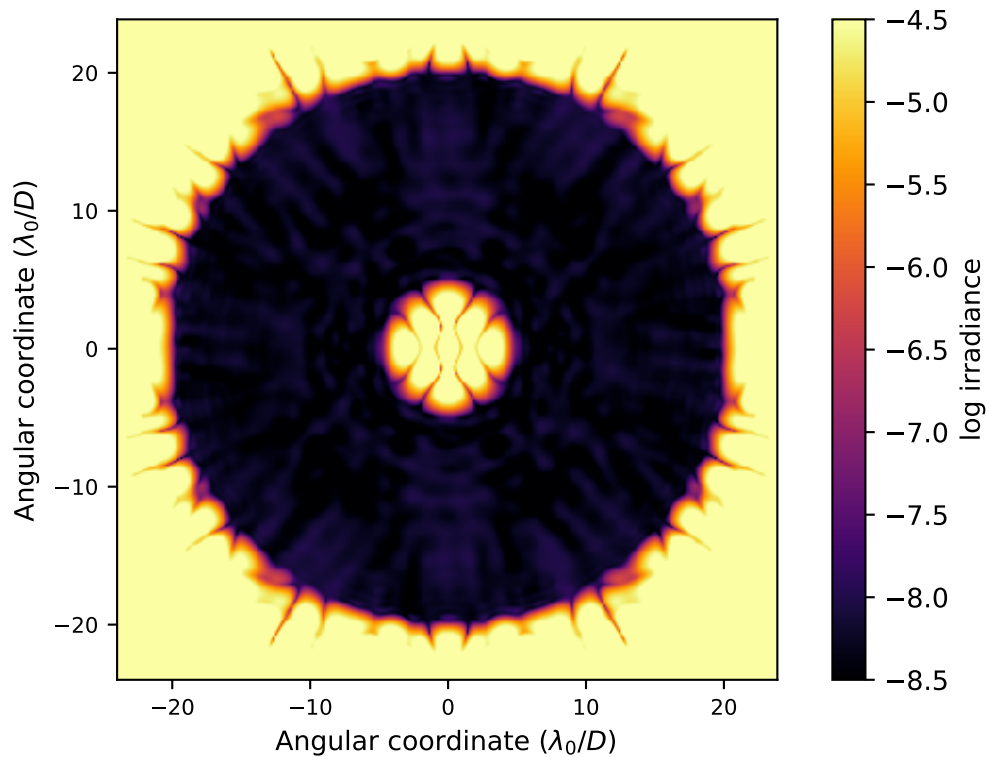
▷ *Pupil file* : SPHERE/pupil=vlt_btw_nPup=100.fits

▷ *Liot stop file* : SPHERE/sphere_stop_ST_ALC2_nPup0100.fits

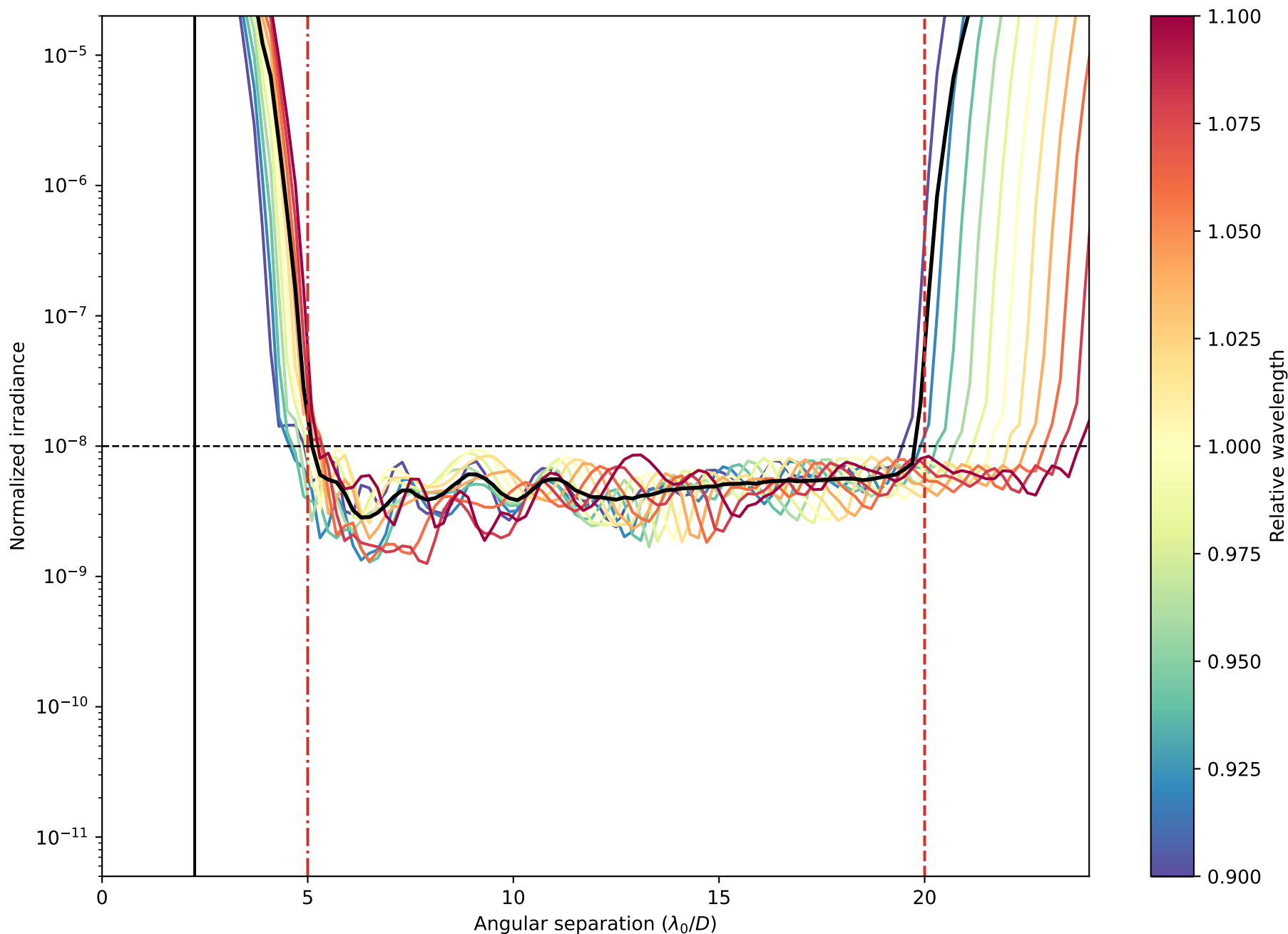
Solution File :

▷ 0_SPHERE_N100_FPM225M0100_IWA0500_OWA02000_C8_BW20_Nlam3_LS_ID_ST_A_OD_nPu_ls_0100.fits.fits

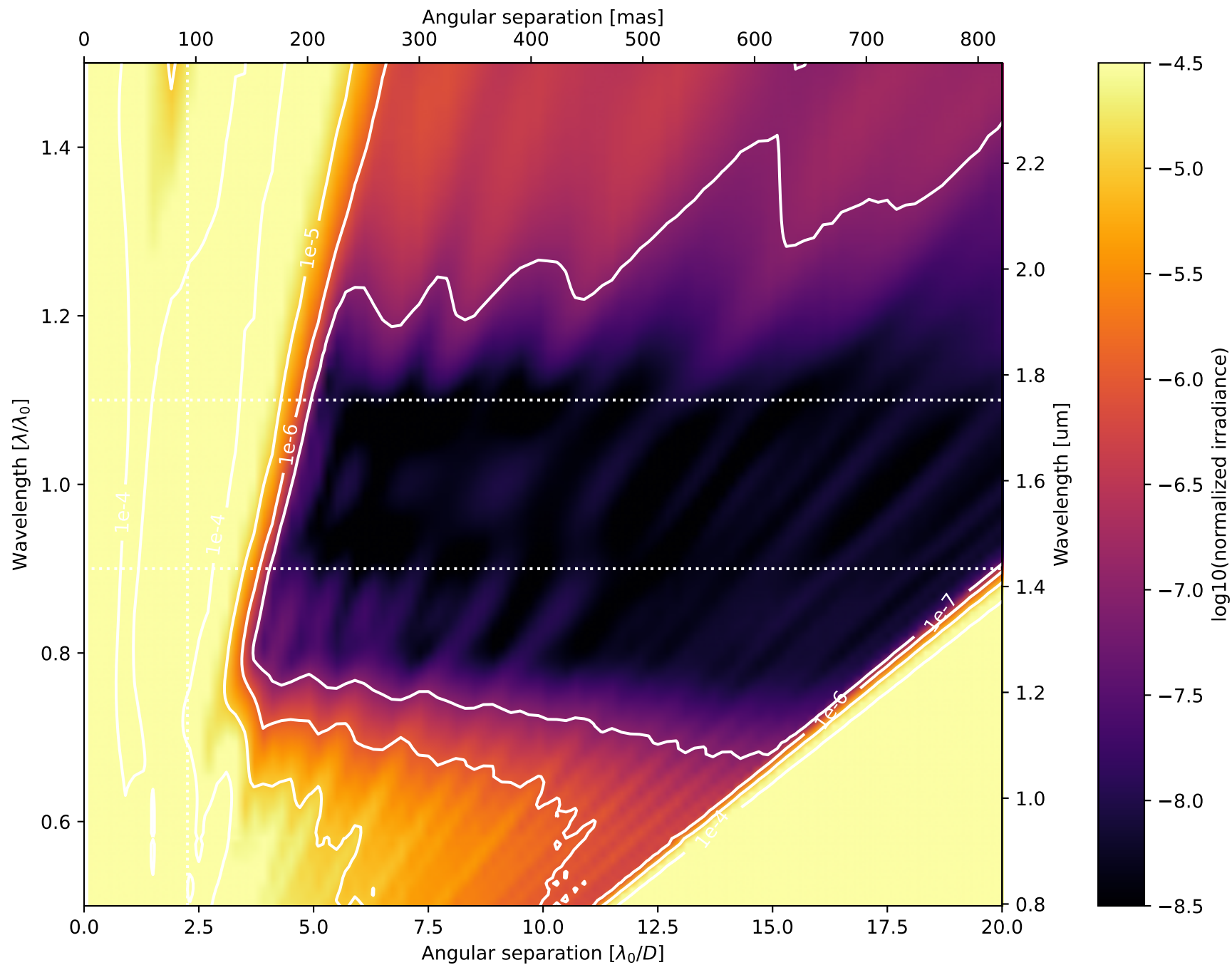
Tue Aug 1 18:14:00 2023

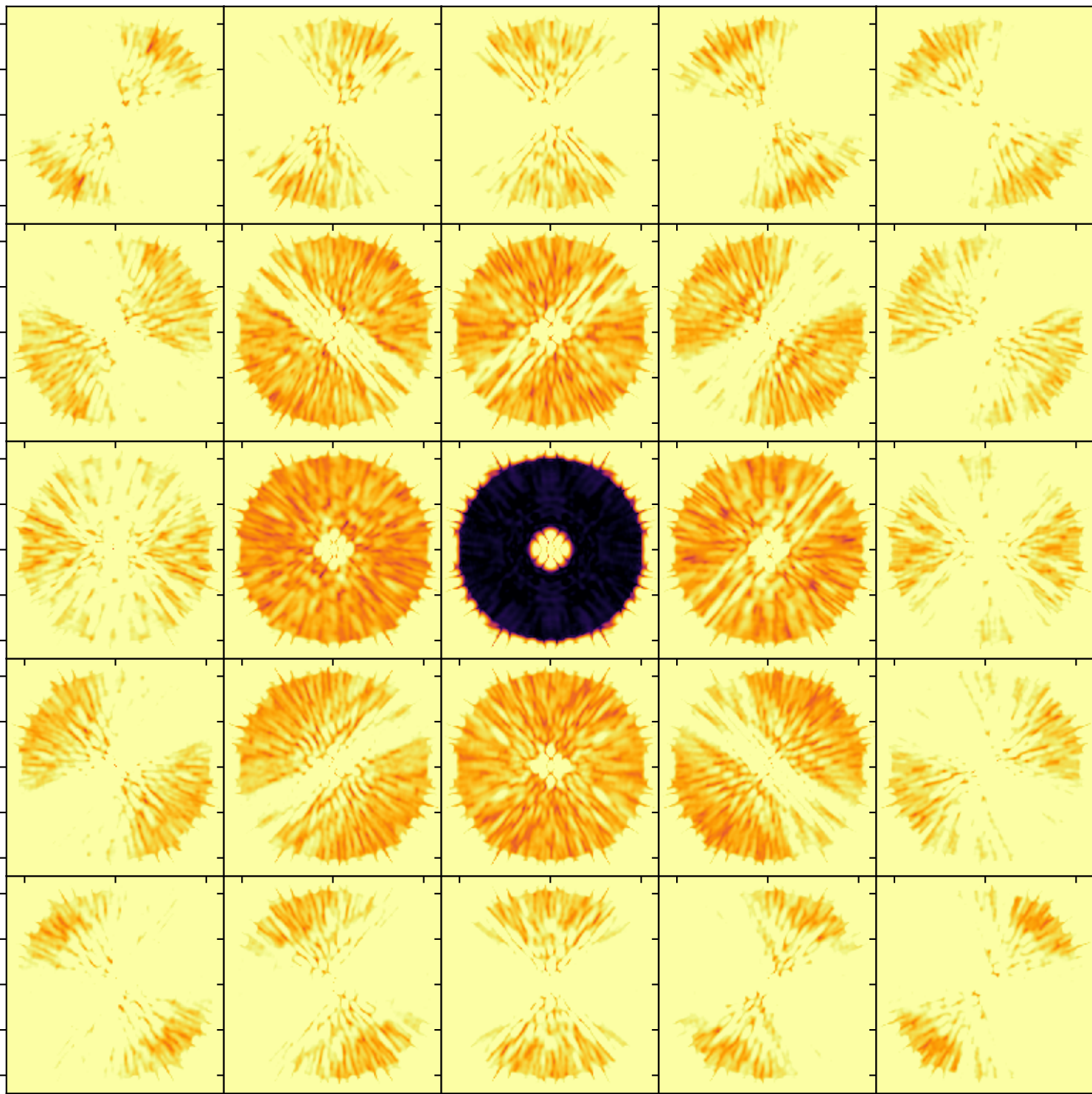


*On – axis PSF in log irradiance,
normalized to the peak irradiance value.*

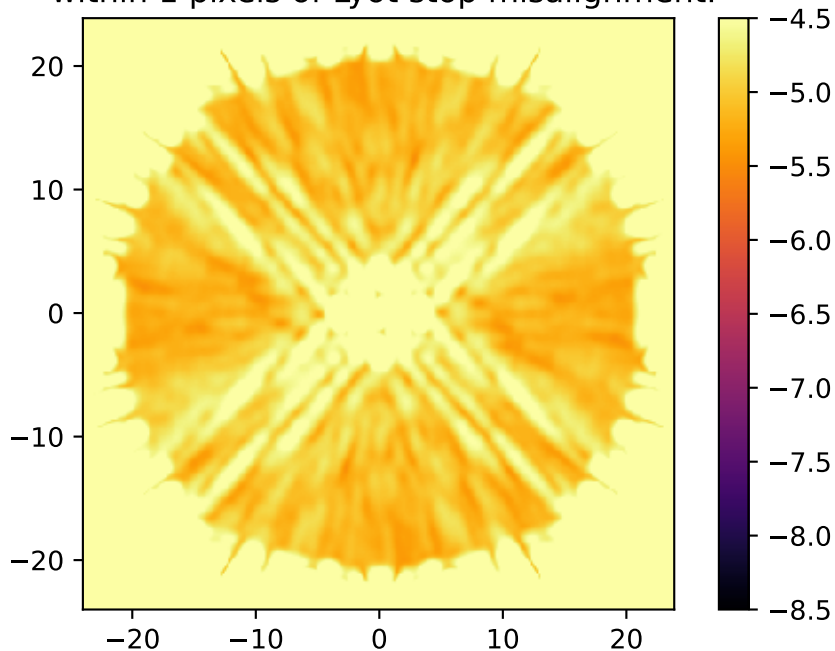


Radial intensity profile for the broadband APLC design at 11 simulated wavelengths centered around λ_0/D and equally spatially sampled over the 20.0% bandpass. The black curve shows the average intensity across the 11 wavelength samples. The dashed red vertical lines delimit the high-contrast dark zone (between 5 and $20 \lambda_0/D$). The blue dotted line delimits the FPM radius, set to $2.25 \lambda_0/D$.





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



Analysis Summary

Apodizer &
Telescope Aperture

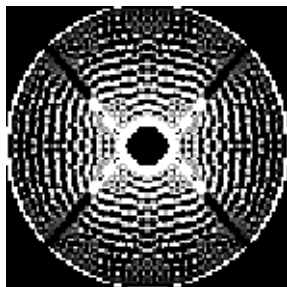


Image plane

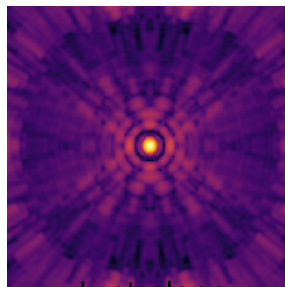
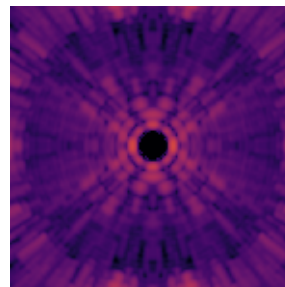
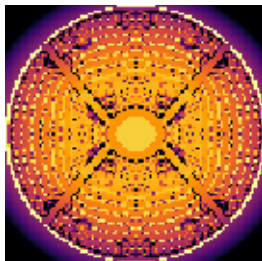


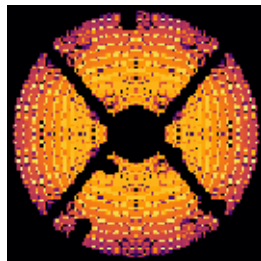
Image plane
w/FPM



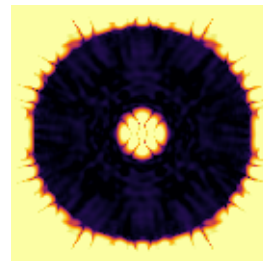
Lyot plane

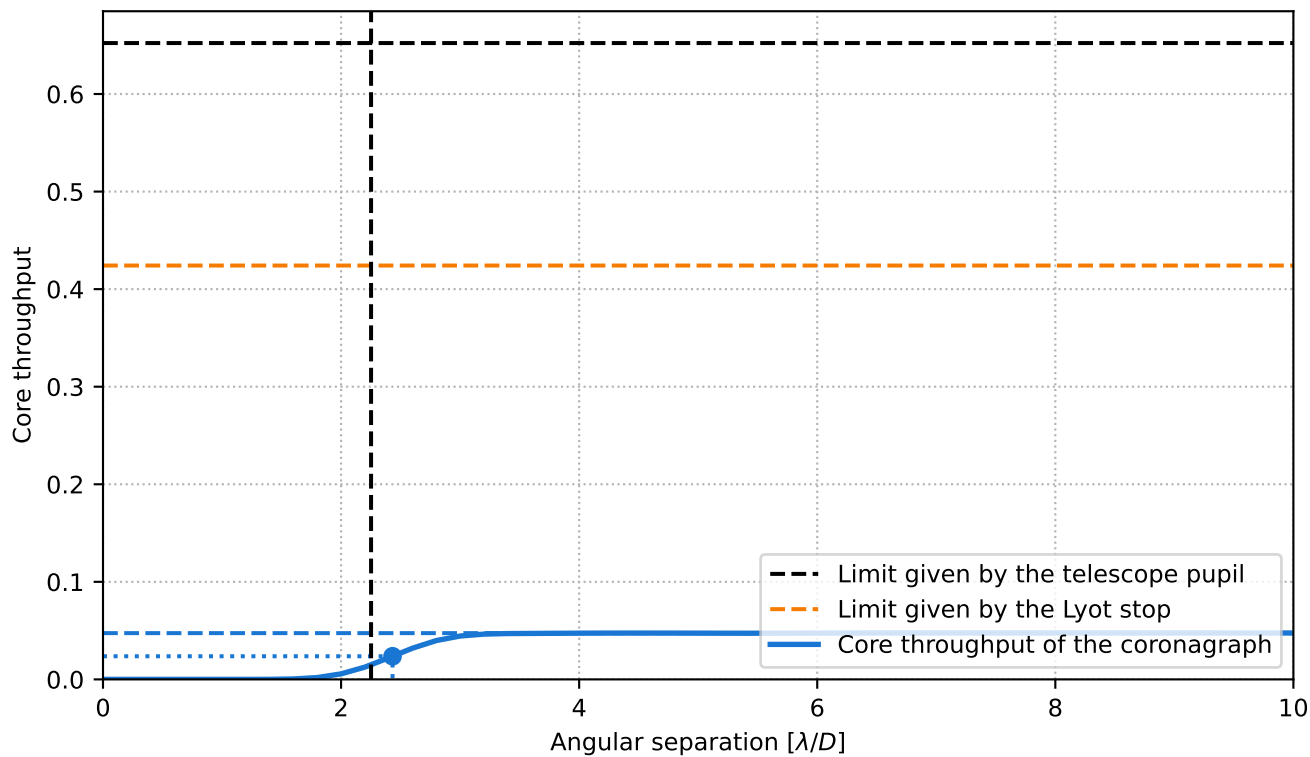


Lyot plane
w/lyot stop



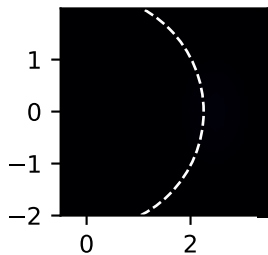
Final image plane



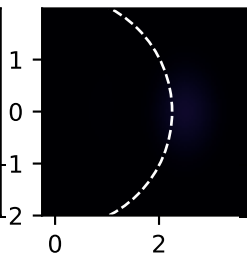


Pupil core throughput:	0.6522279295085497
Lyot stop core throughput:	0.42418974570130463
Maximum core throughput:	0.04741966044638423
Maximum core throughput w.r.t. pupil core throughput:	0.07270412428077819
Maximum core throughput w.r.t. Lyot stop core throughput:	0.11178879481866359
Inner working angle:	2.432446995136855 λ_0/D

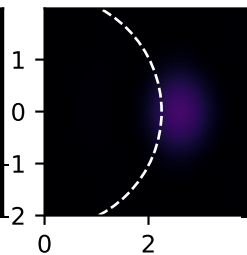
$1.50 \lambda_0/D$



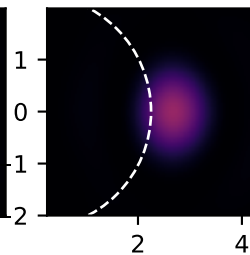
$1.75 \lambda_0/D$



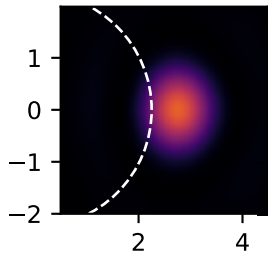
$2.00 \lambda_0/D$



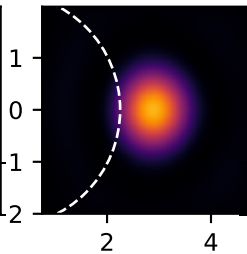
$2.25 \lambda_0/D$



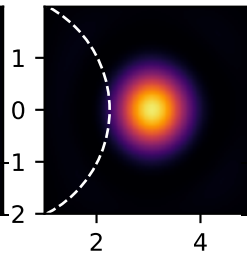
$2.50 \lambda_0/D$



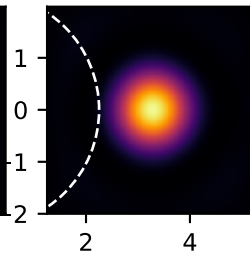
$2.75 \lambda_0/D$



$3.00 \lambda_0/D$

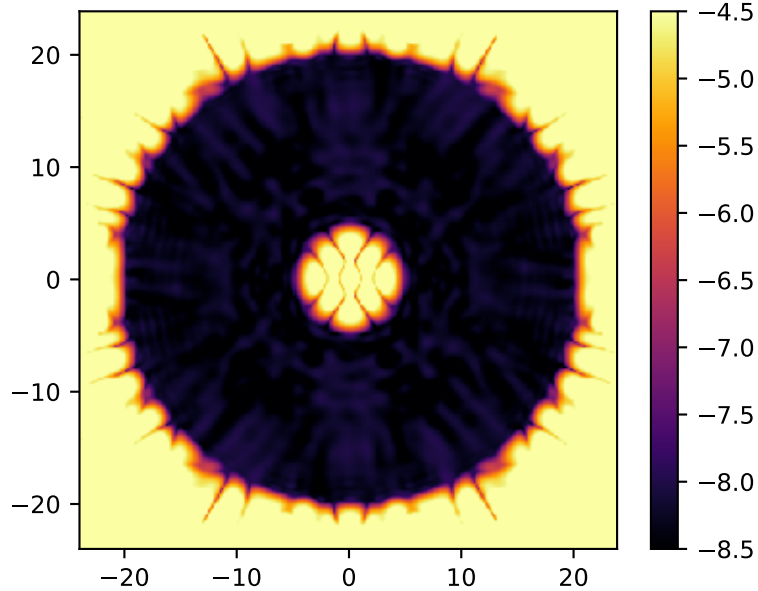


$3.25 \lambda_0/D$

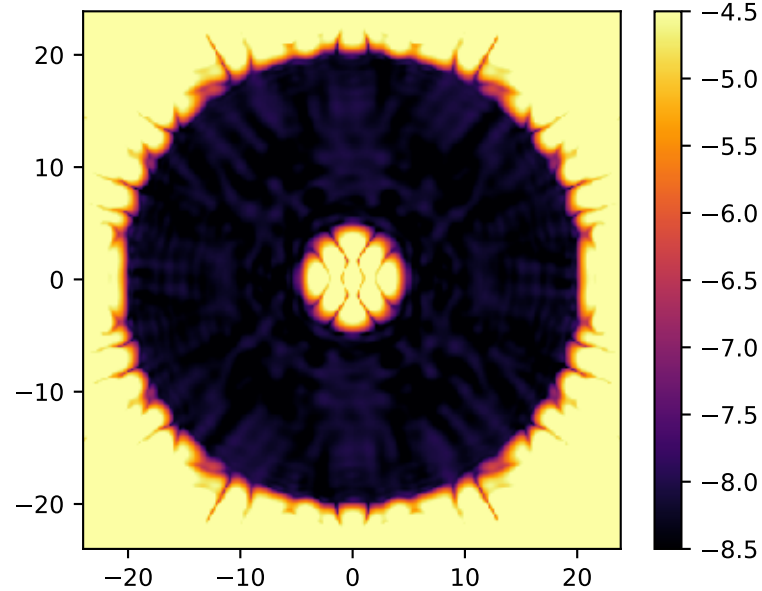


Broadband normalized irradiance for four representative levels of residual pointing jitter.

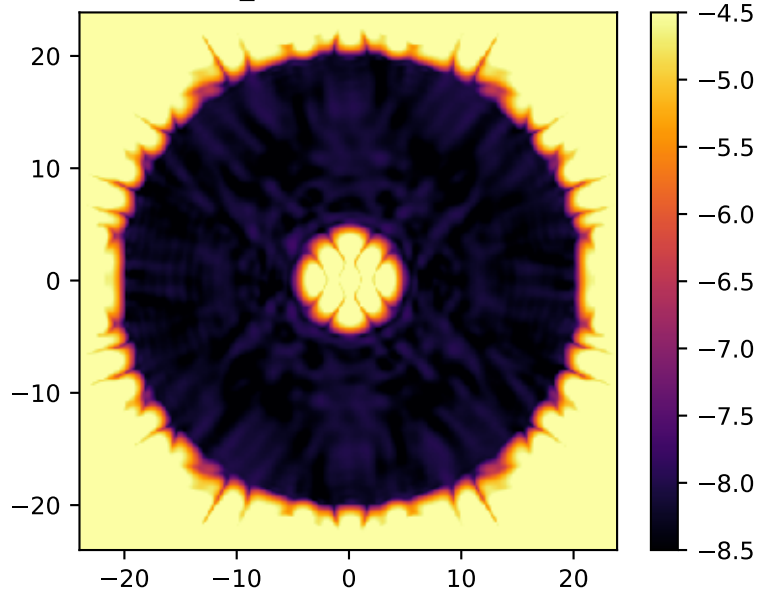
$\sigma_{\text{rms}} = 0.01 \lambda/D$



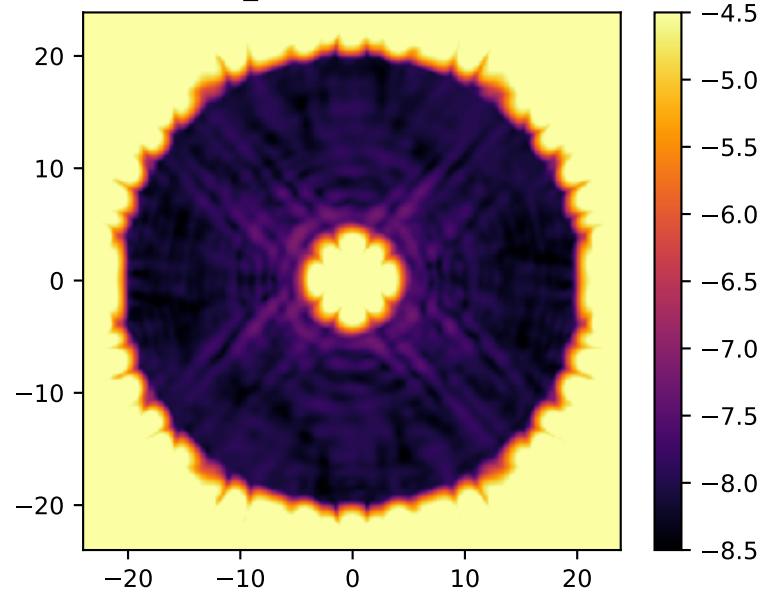
$\sigma_{\text{rms}} = 0.03 \lambda/D$

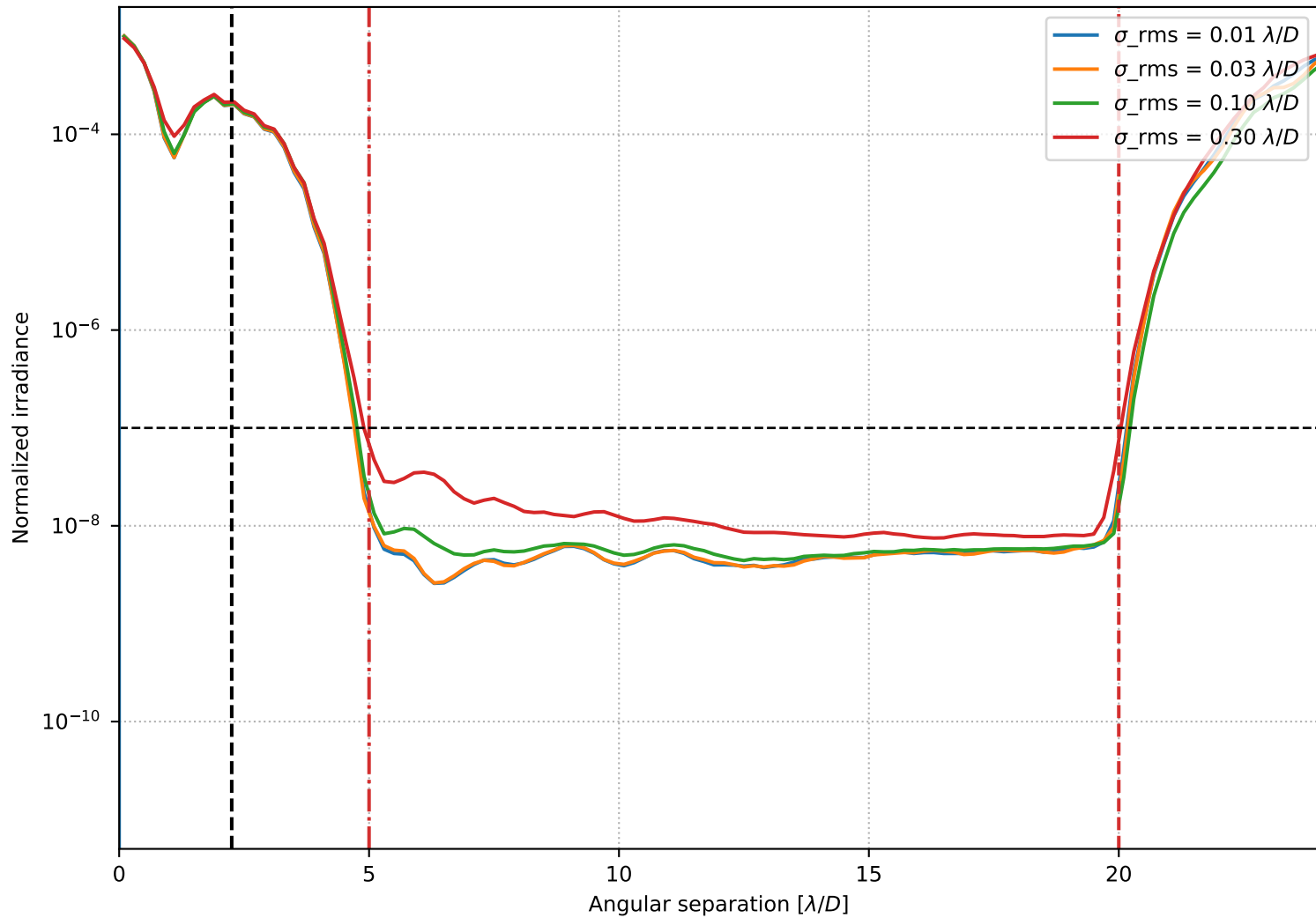


$\sigma_{\text{rms}} = 0.10 \lambda/D$



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





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