APLC Design Summary

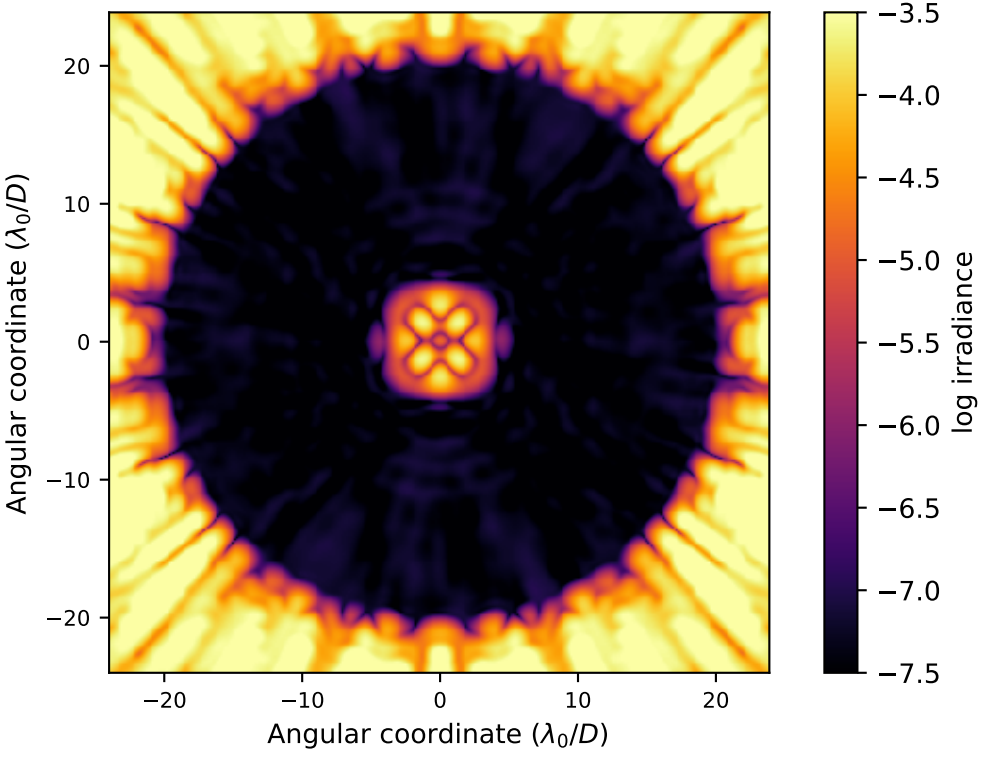
Instrument	SPHERE
nPup	100 x 100 pixels
Coronagraphic throughput (transmitted energy)	0.2539
Core throughput (encircled energy)	0.1768
Lyot stop inner diamater (% of inscribed circle)	0.002
Lyot stop outer diameter (% of inscribed circle)	0.1
Bandpass	20.0%
# wavelengths	3
FPM radius (grayscale)	2.252 λ/D
nFPM	100 pixels
IWA — OWA	5.0—20.0 λ/D
Contrast constraint	10^{-7}
Lyot Stop alignment tolerance	1 pixels

Input Files :

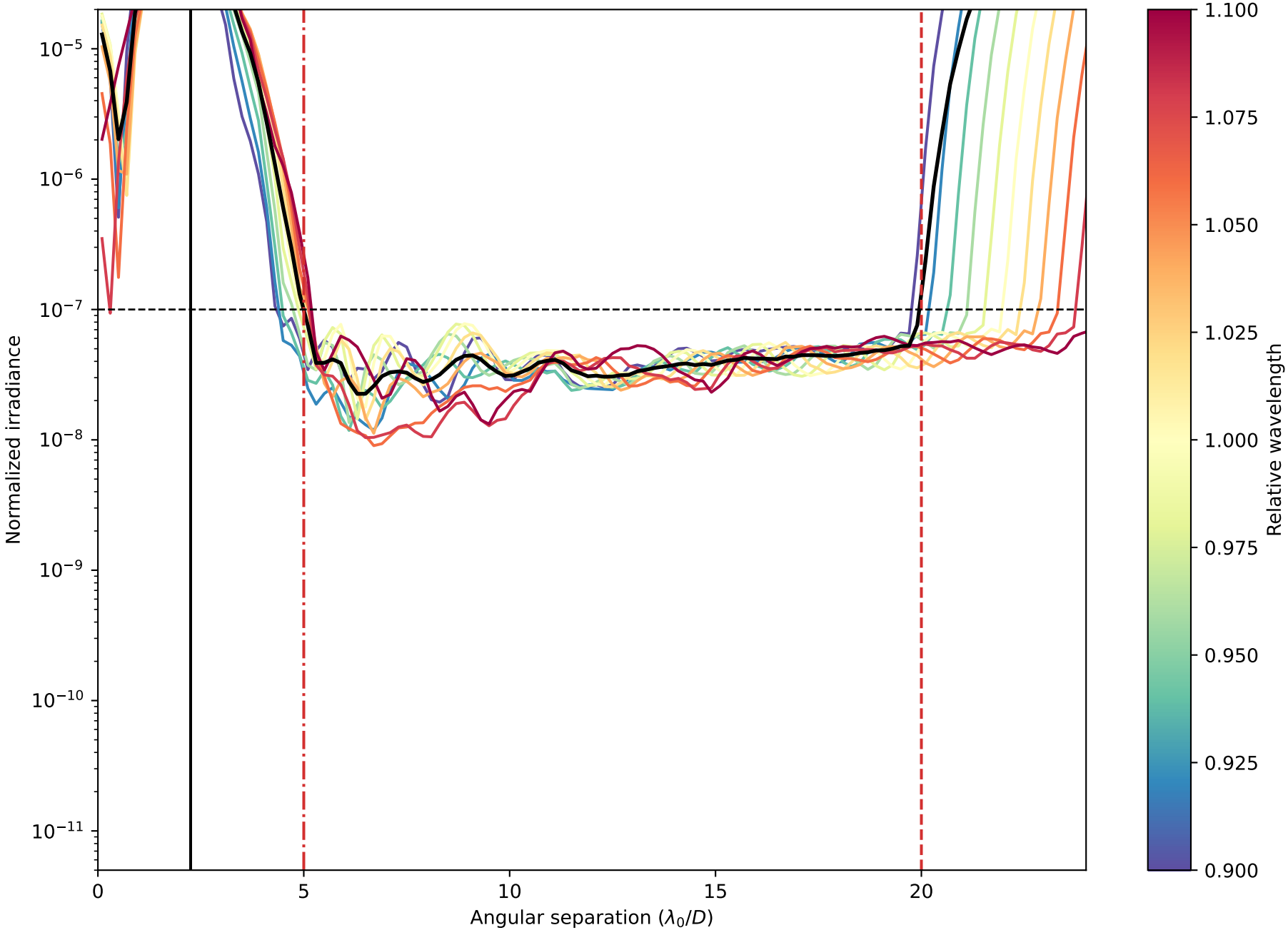
- ▷ *Pupil file* : SPHERE/pupil=vlt_btw_nPup=100.fits
- ▷ *Lyot stop file* : SPHERE/sphere_stop_ST_ALC2_nPup0100.fits

Solution File :

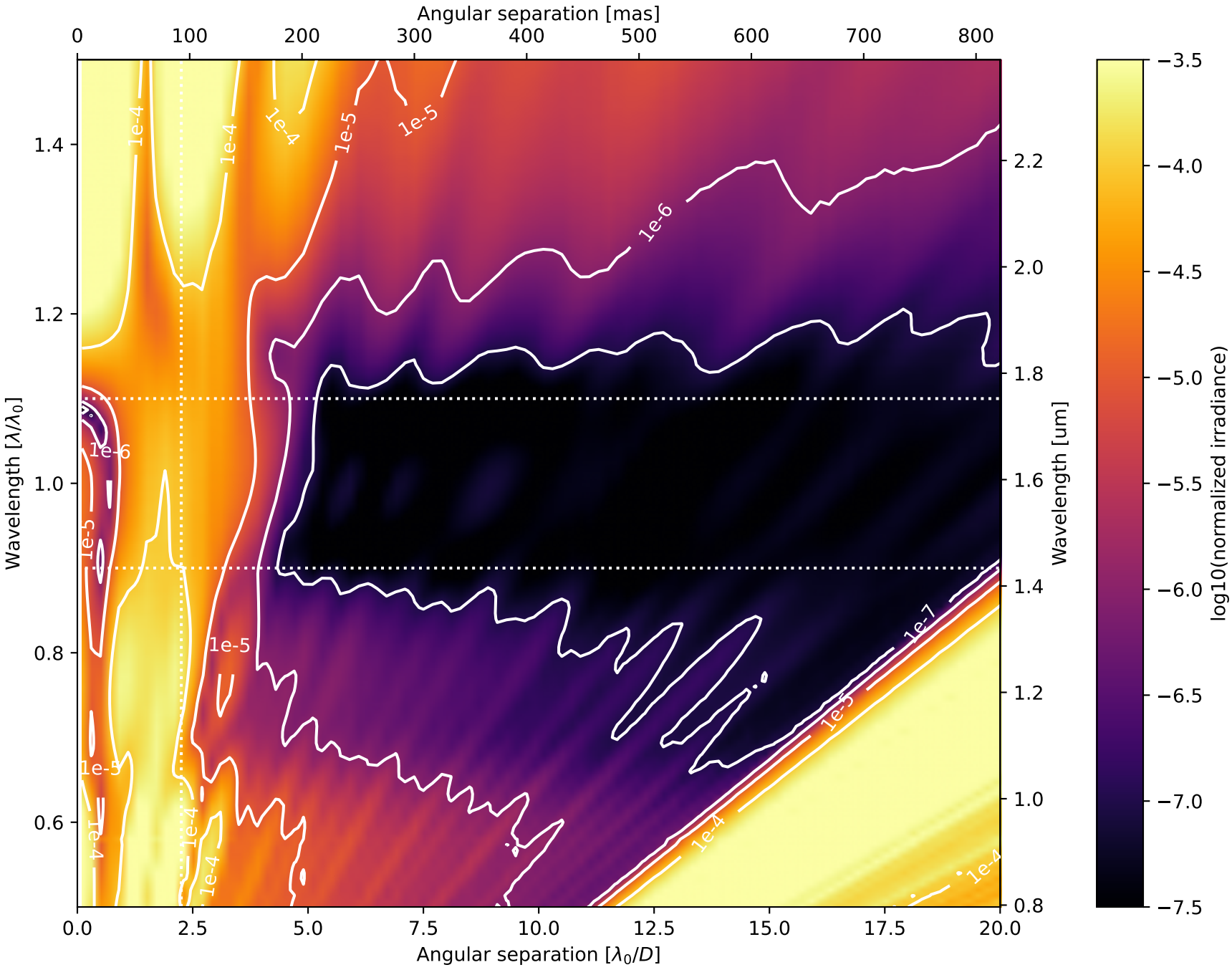
▷ 0_SPHERE_N100_FPM225M0100_IWA0500_OWA02000_C7_BW20_NIam3_LS_ID_ST_A_OD_nPu_ls_0100.fits.fits Tue Aug 1 18:22:20 2023

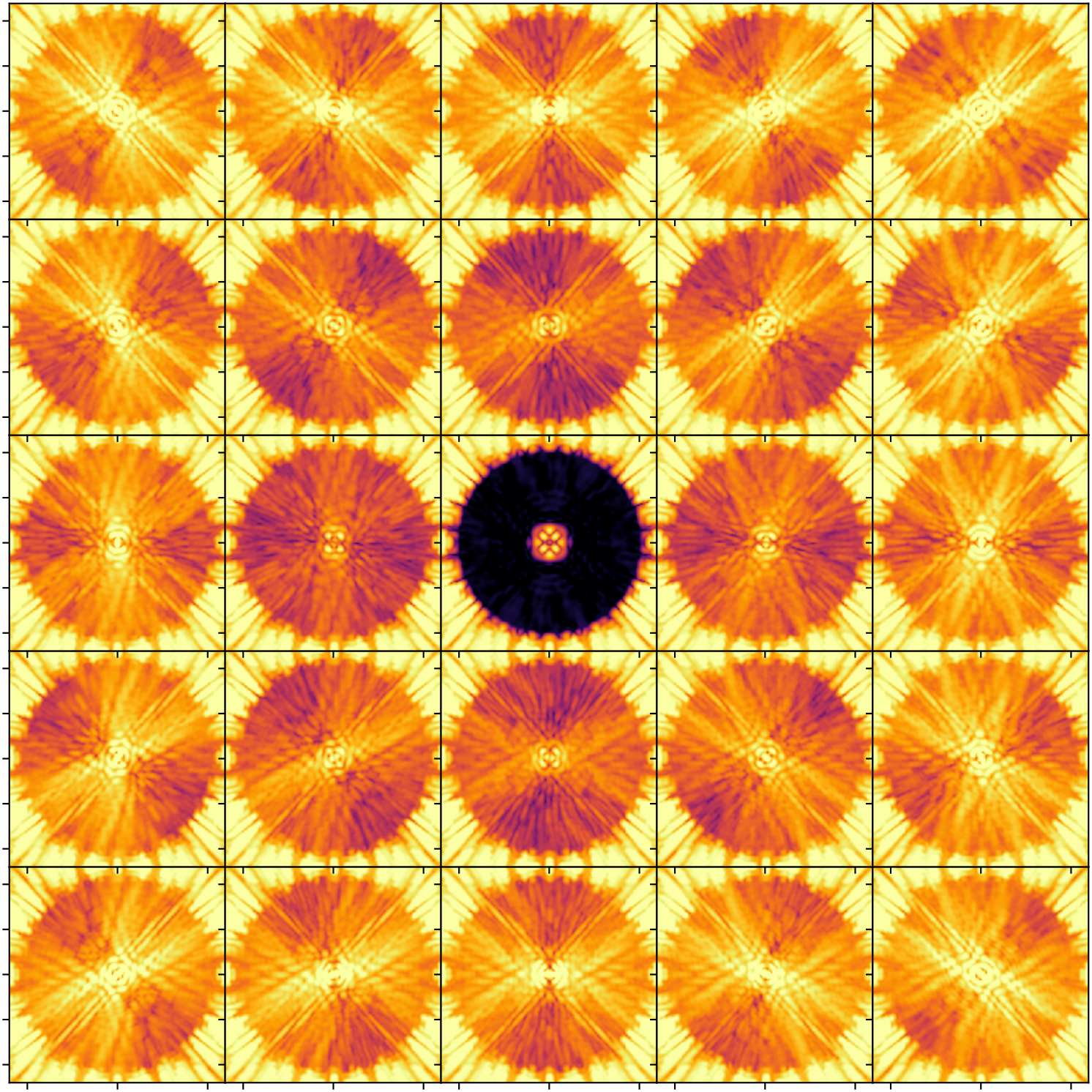


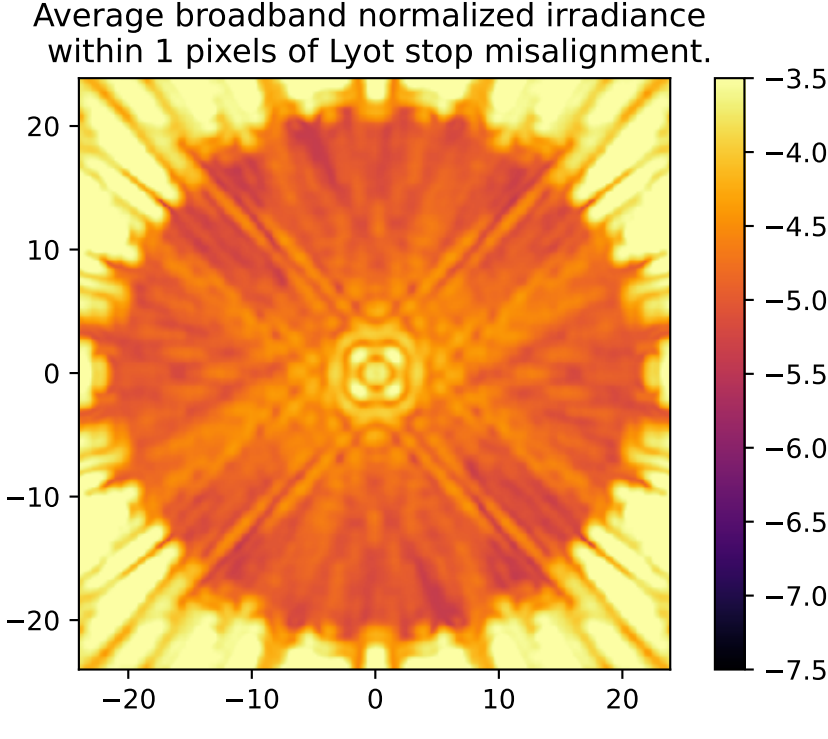
On − axis PSF in log irradiance,
normalized to the peak irradiance value.



Radial intensity profile for the broadband APLC design at 11 simulated wavelengthscentered 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 delimitthe high-contrast dark zone (between 5 and 20 λ_0/D). The blue dotted line delimits the FPM radius, set to 2.25 λ_0/D.


Angular separation [mas]
0
100
200
300
400
500
600
700
800
Wavelength [λ/λ_0]
1.4
1.2
1.0
0.8
0.6
Wavelength [um]
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
Angular separation [λ_0/D]
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
log10(normalized irradiance)
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5
1e-4
1e-5
1e-6
1e-7




Average broadband normalized irradiance
within 1 pixels of Lyot stop misalignment.
20
10
0
−10
−20
−20
−10
0
10
20
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5

Analysis Summary

Apodizer &
Telescope Aperture

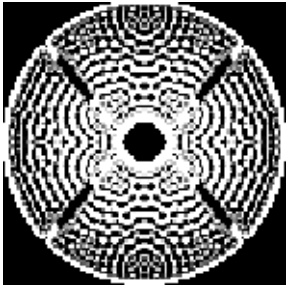


Image plane

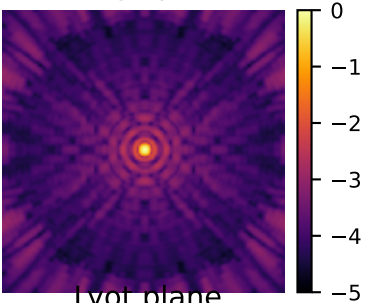
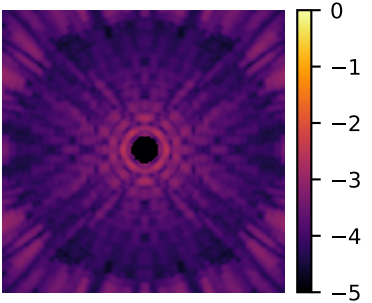
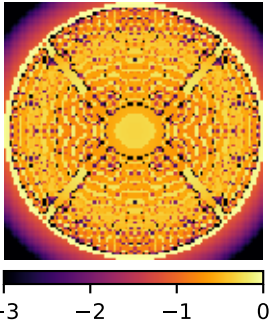


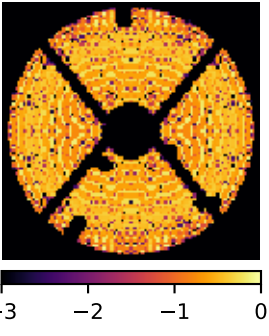
Image plane
w/FPM



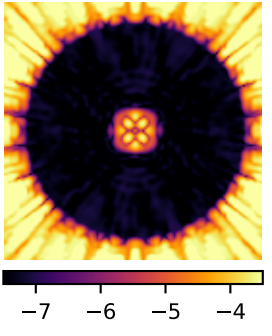
Lyot plane

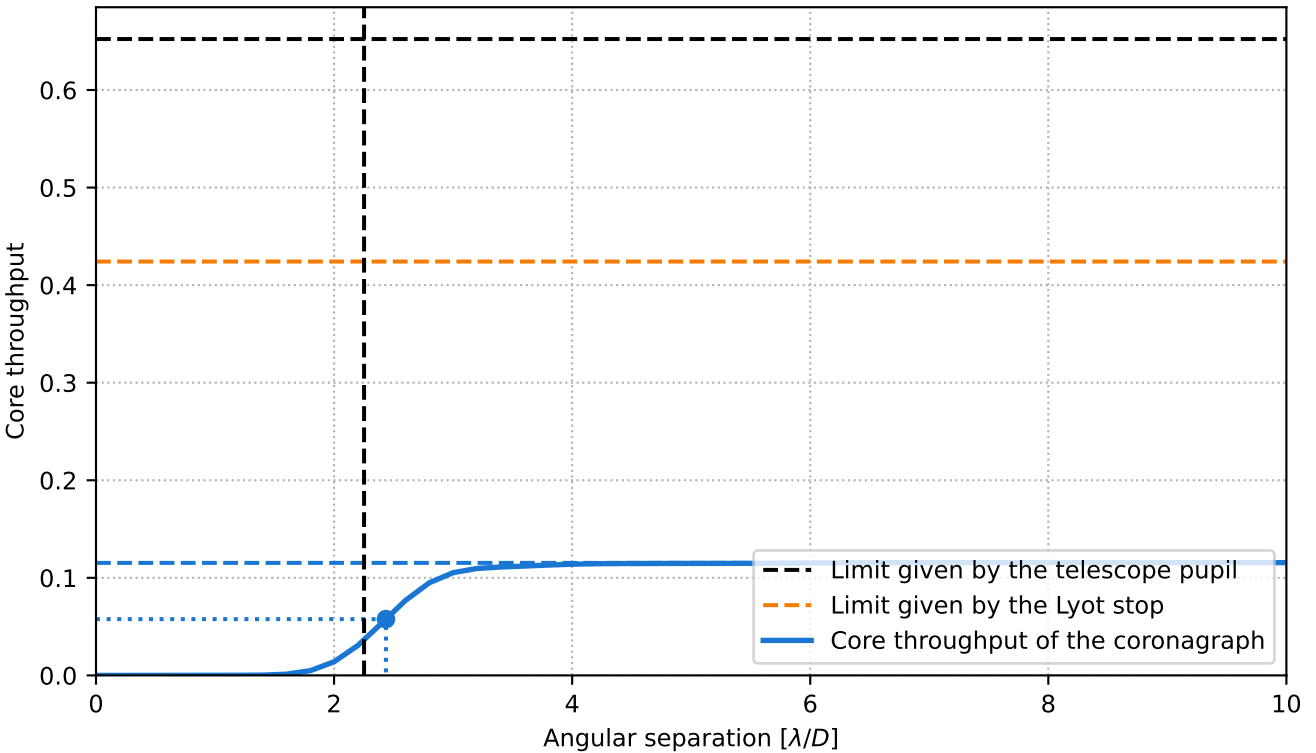


Lyot plane
w/lyot stop

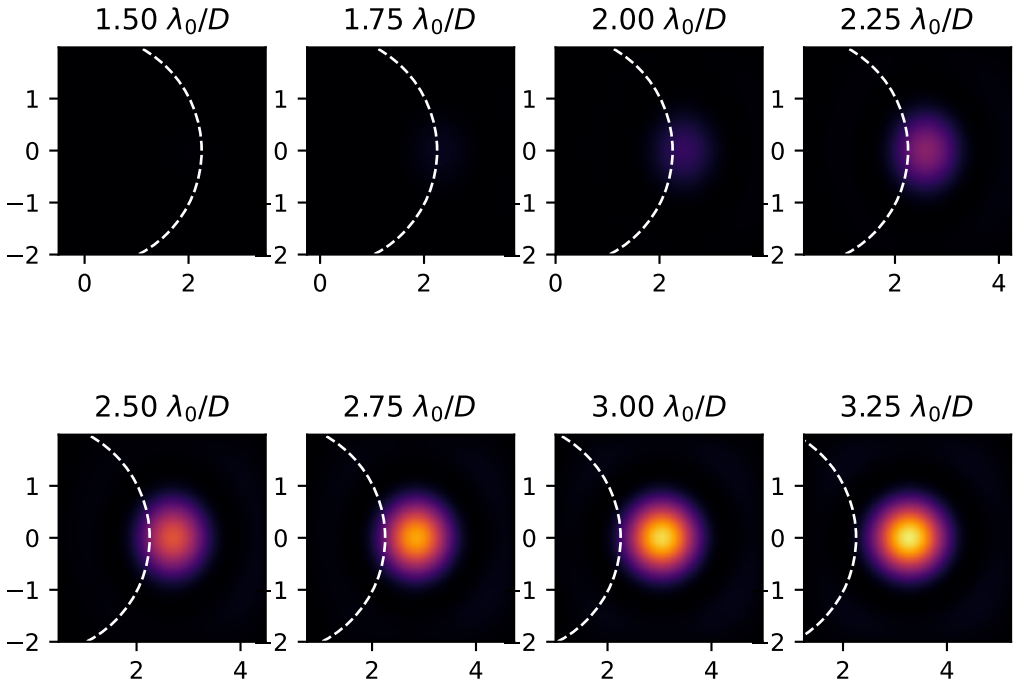


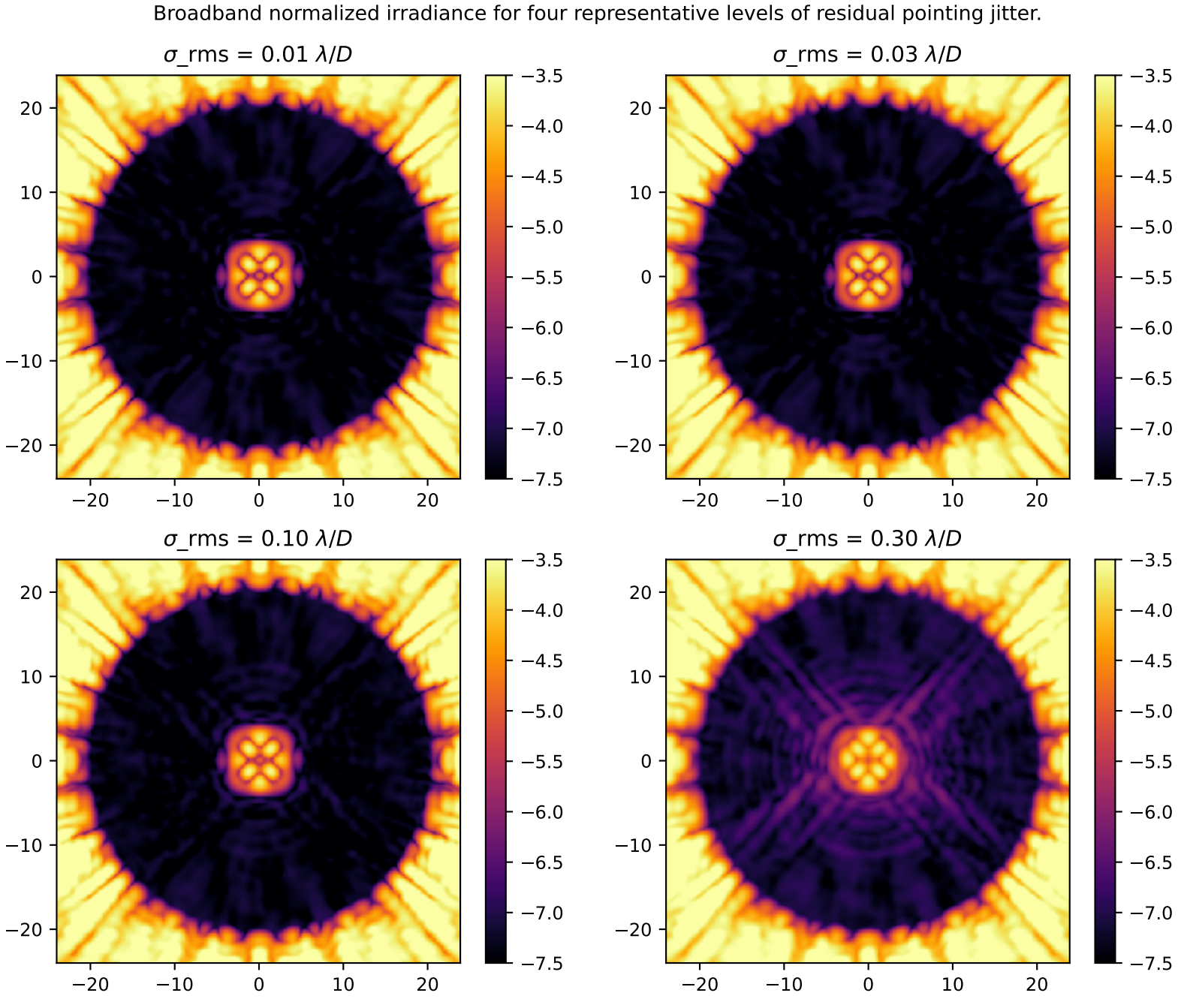
Final image plane

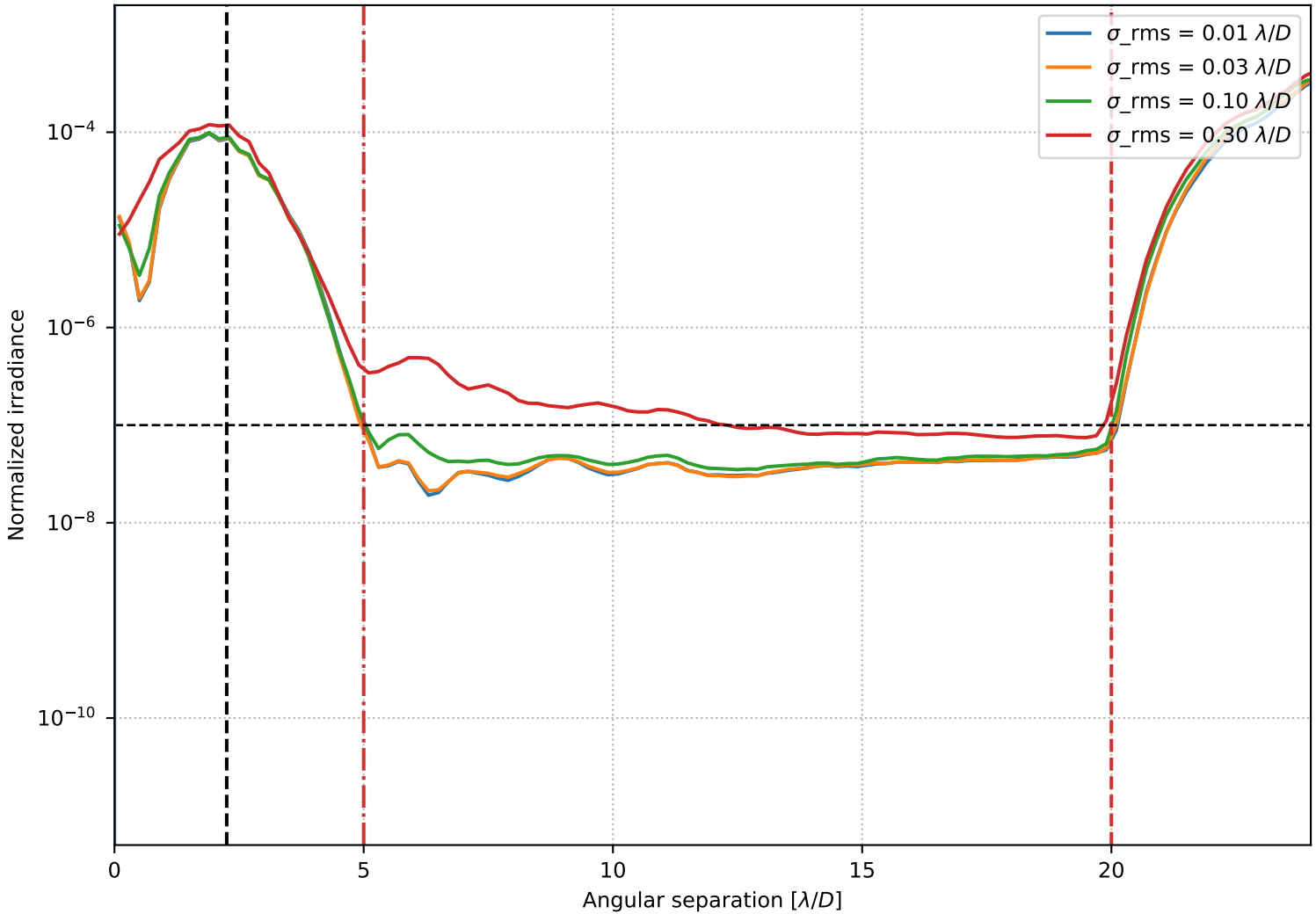




Pupil core throughput:	0.6522279295085497
Lyot stop core throughput:	0.42418974570130463
Maximum core throughput:	0.11532134461297446
Maximum core throughput w.r.t. pupil core throughput:	0.17681141729068314
Maximum core throughput w.r.t. Lyot stop core throughput:	0.2718626411449808
Inner working angle:	2.4357533413100185 λ_0/D


1.50 λ_0/D
1.75 λ_0/D
2.00 λ_0/D
2.25 λ_0/D
2.50 λ_0/D
2.75 λ_0/D
3.00 λ_0/D
3.25 λ_0/D


Broadband normalized irradiance for four representative levels of residual pointing jitter.
σ_rms = 0.01 λ/D
σ_rms = 0.03 λ/D
σ_rms = 0.10 λ/D
σ_rms = 0.30 λ/D
20
10
0
−10
−20
−20
−10
0
10
20
−3.5
−4.0
−4.5
−5.0
−5.5
−6.0
−6.5
−7.0
−7.5



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