APLC Design Summary

Instrument	SCDA
nPup	500 x 500 pixels
Coronagraphic throughput (transmitted energy)	0.044
Core throughput (encircled energy)	0.0555
Lyot stop inner diamater (% of inscribed circle)	0.12
Lyot stop outer diameter (% of inscribed circle)	0.982
Bandpass	10.0%
# wavelengths	3
FPM radius (grayscale)	3.5 λ/D
nFPM	150 pixels
IWA — OWA	3.4—12.0 λ/D
Contrast constraint	10^{-10}
Lyot Stop alignment tolerance	0 pixels

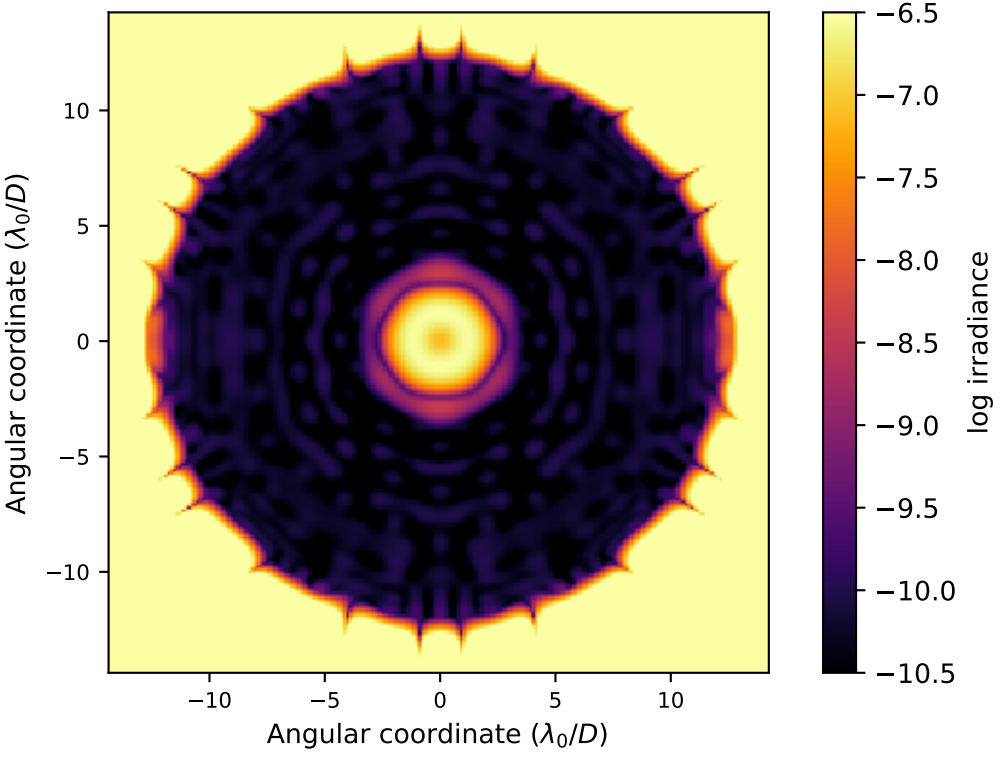
Input Files:

▷ *Pupil file*: SCDA/TelAp_SCDA_03-Hex_clipped_gy_gap_pad02_ovsamp03_N0500.fits

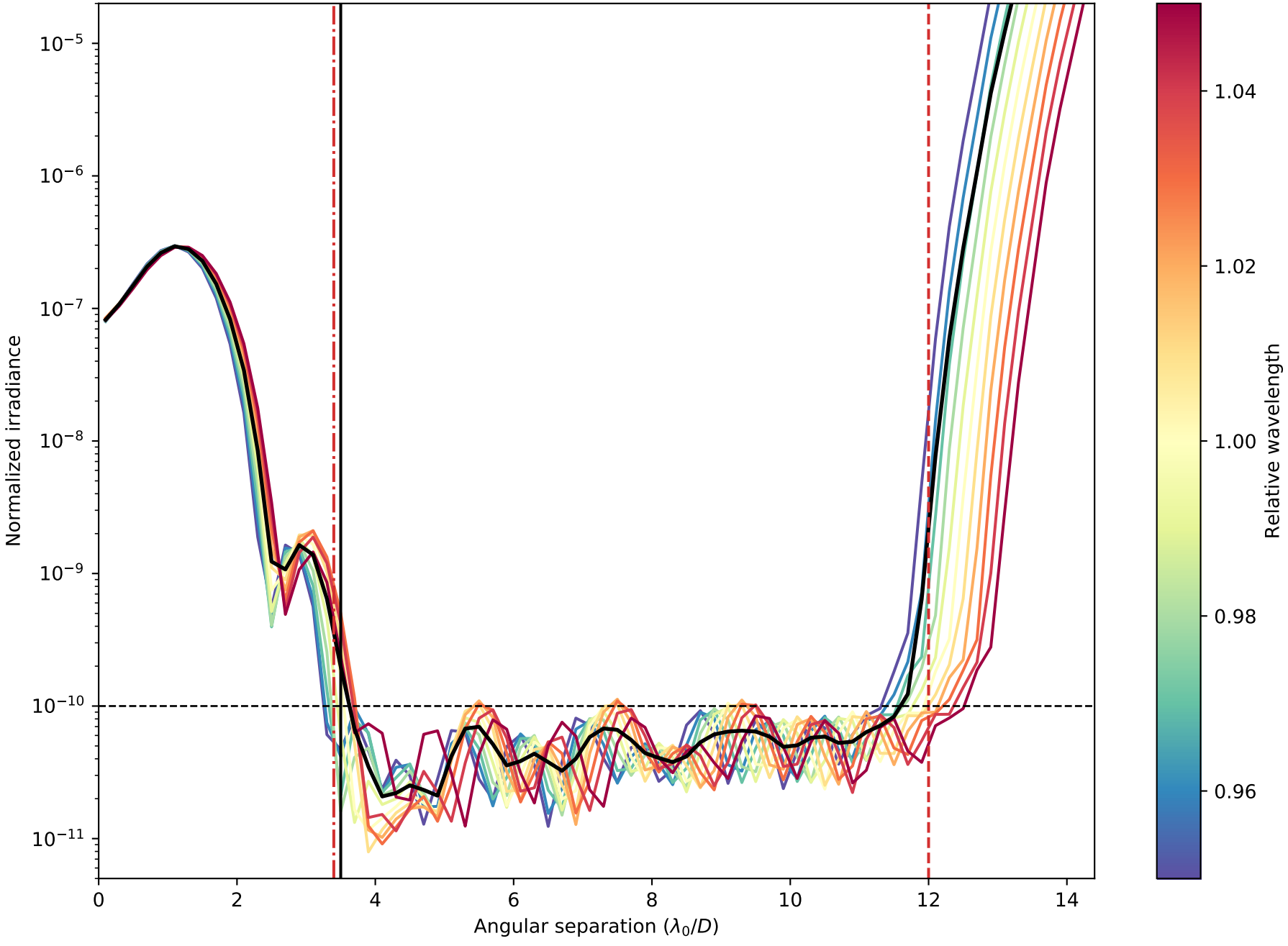
▷ *Lyot stop file*: SCDA/LS_SCDA_ID0120_OD0982_no_struts_gy_ovsamp3_N0500.fits

Solution File:

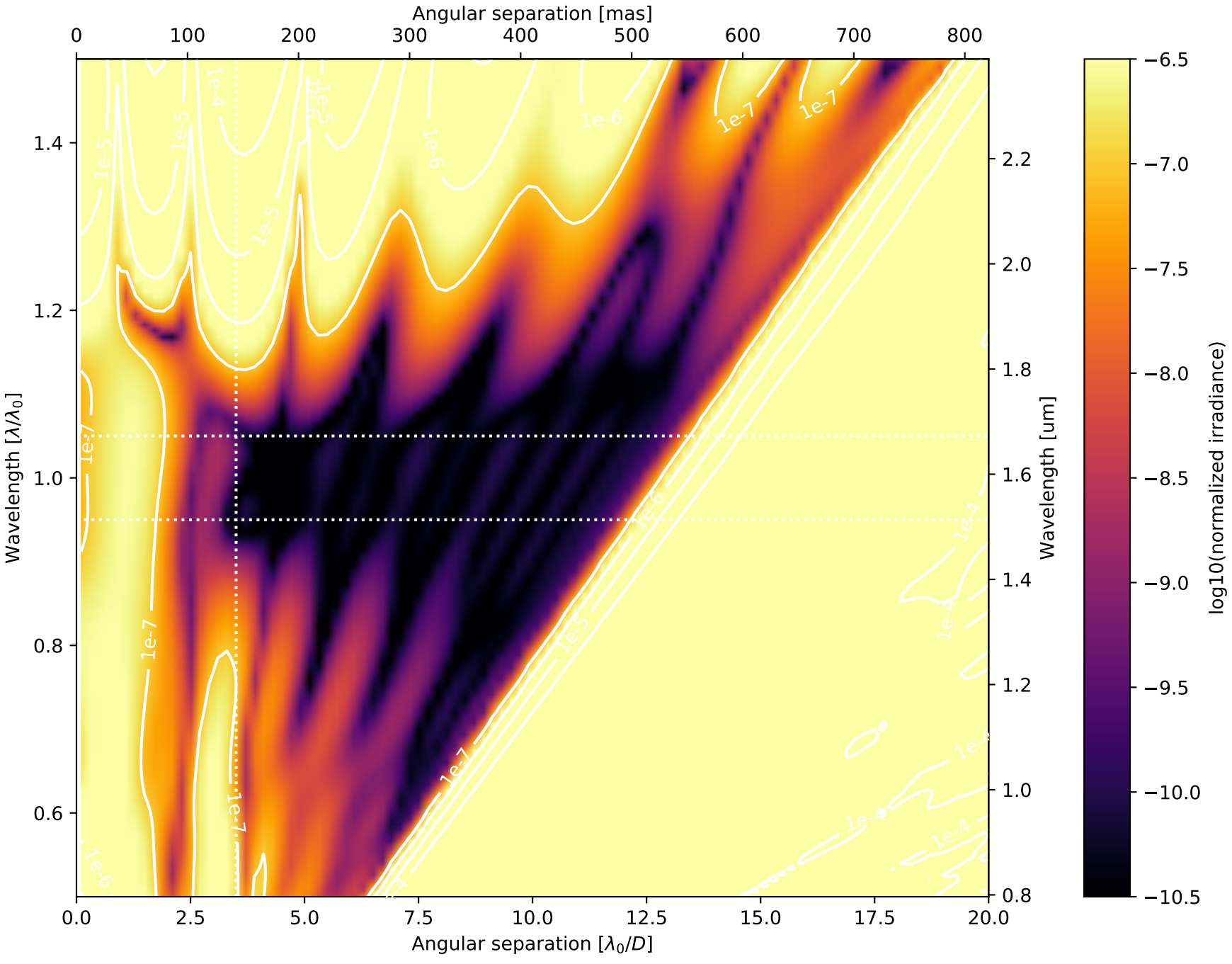
▷ 00_SCDA_N500_FPM350M0150_IWA0340_OWA01200_C10_BW10_Nlam3_LS_ID0_OD0_OD_no__ls_truts_gy_ovs.fits Mon Dec 20 22:29:13 2021

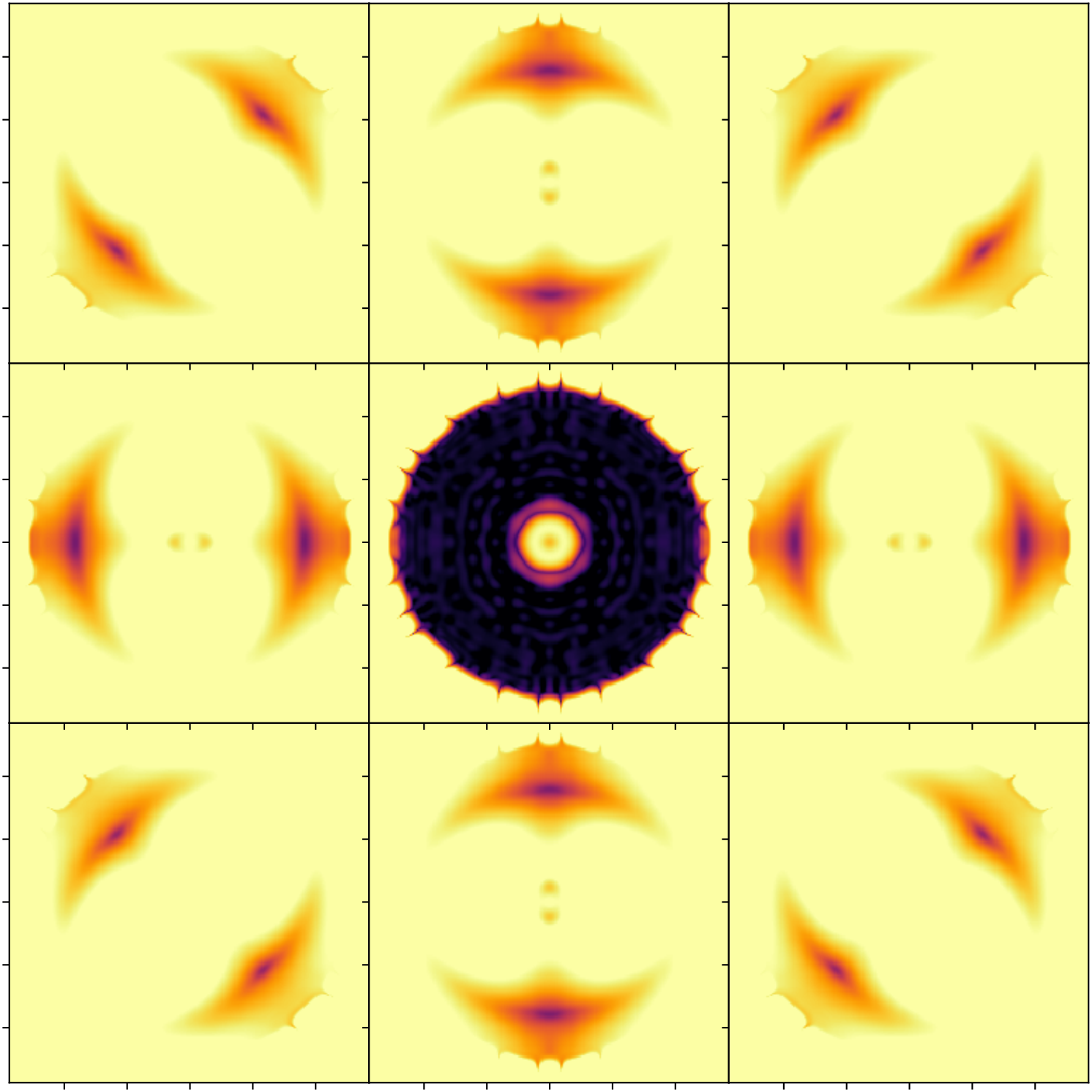


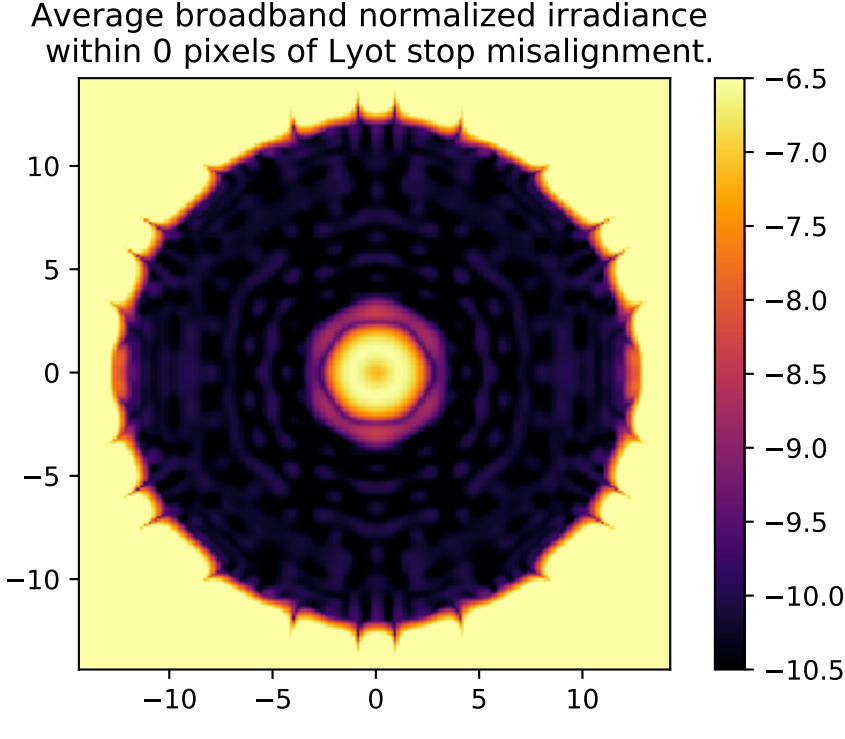
On − axis PSF in log irradiance,
normalized to the peak irradiance value.



Radial intensity profile for the broadband APLC design at 11 simulated wavelengthscentered around λ_0/D and equally spatially sampled over the 10.0% bandpass. The black curve shows the average intensity across the 11 wavelength samples. The dashed red vertical lines delimitthe high-contrast dark zone (between 3.4 and 12.0 λ_0/D). The blue dotted line delimits the FPM radius, set to 3.5 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)
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
−9.5
−10.0
−10.5
1e-4
1e-5
1e-6
1e-7




Average broadband normalized irradiance
within 0 pixels of Lyot stop misalignment.
10
5
0
−5
−10
−10
−5
0
5
10
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
−9.5
−10.0
−10.5

Analysis Summary

Apodizer &
Telescope Aperture

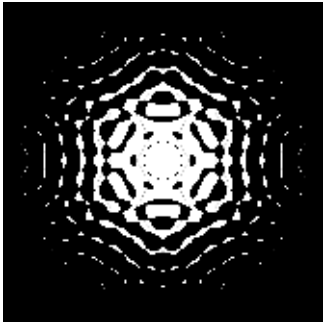


Image plane

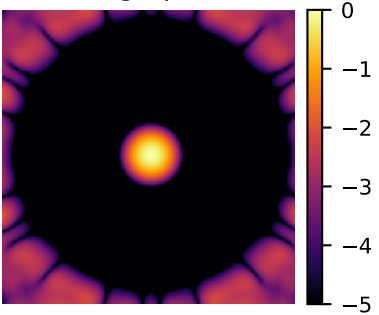
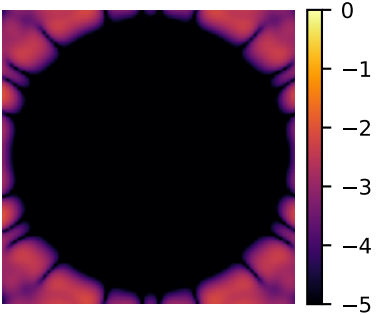
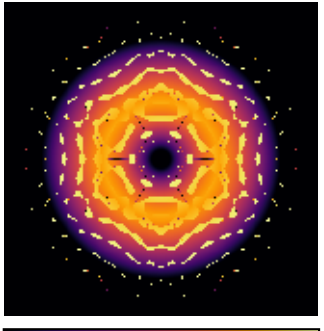


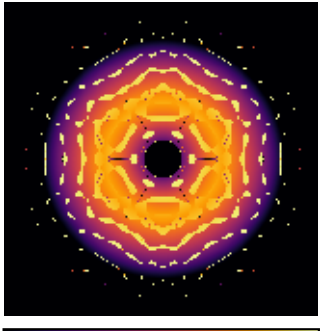
Image plane
w/FPM



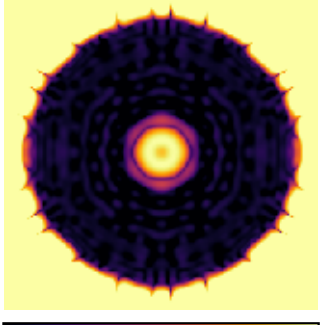
Lyot plane

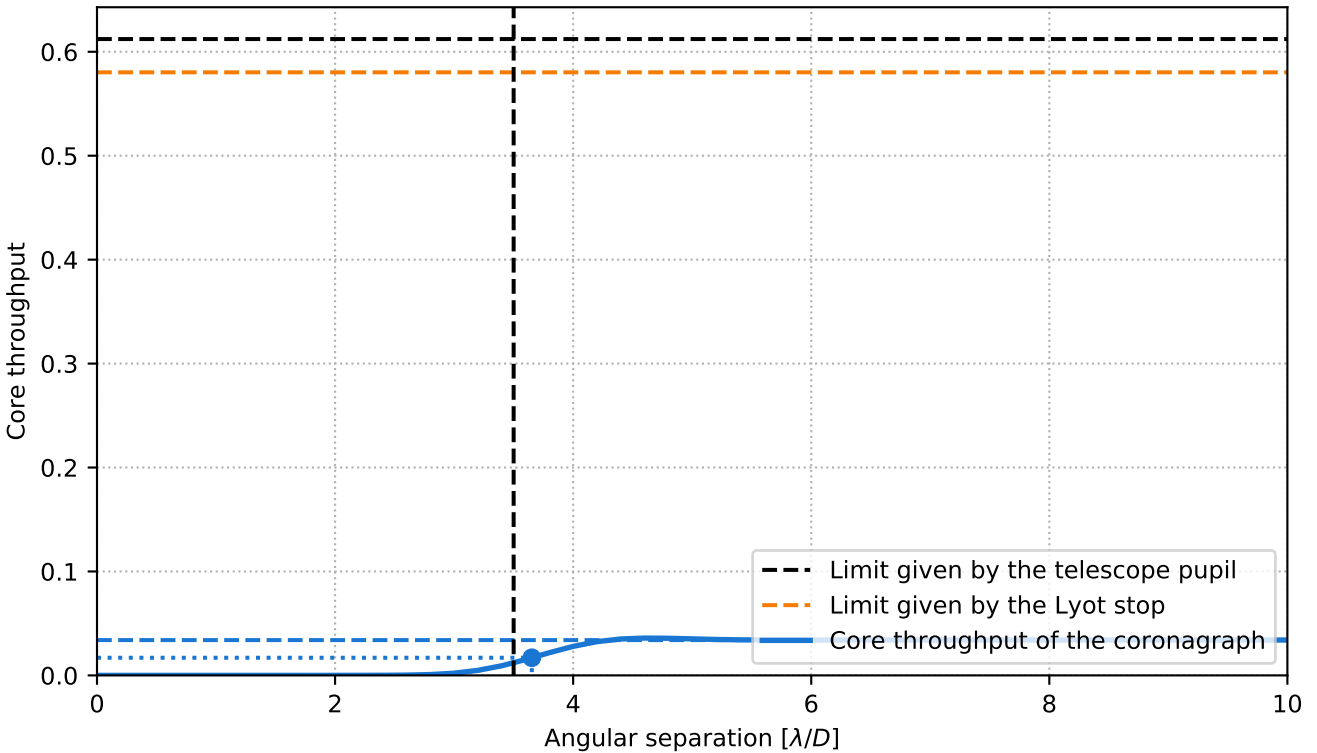


Lyot plane
w/lyot stop

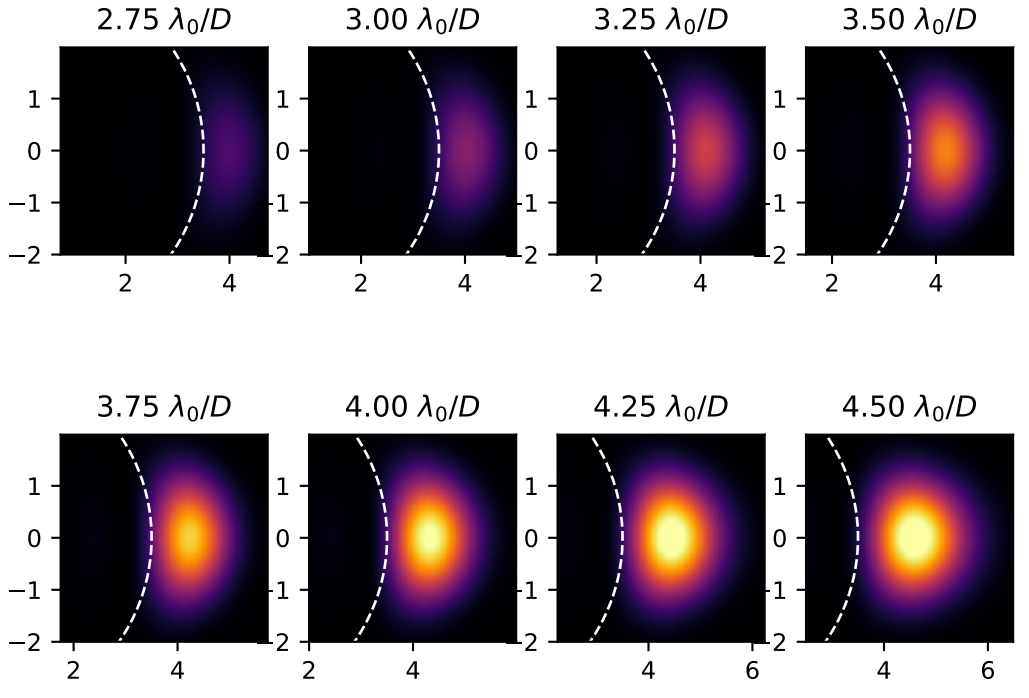


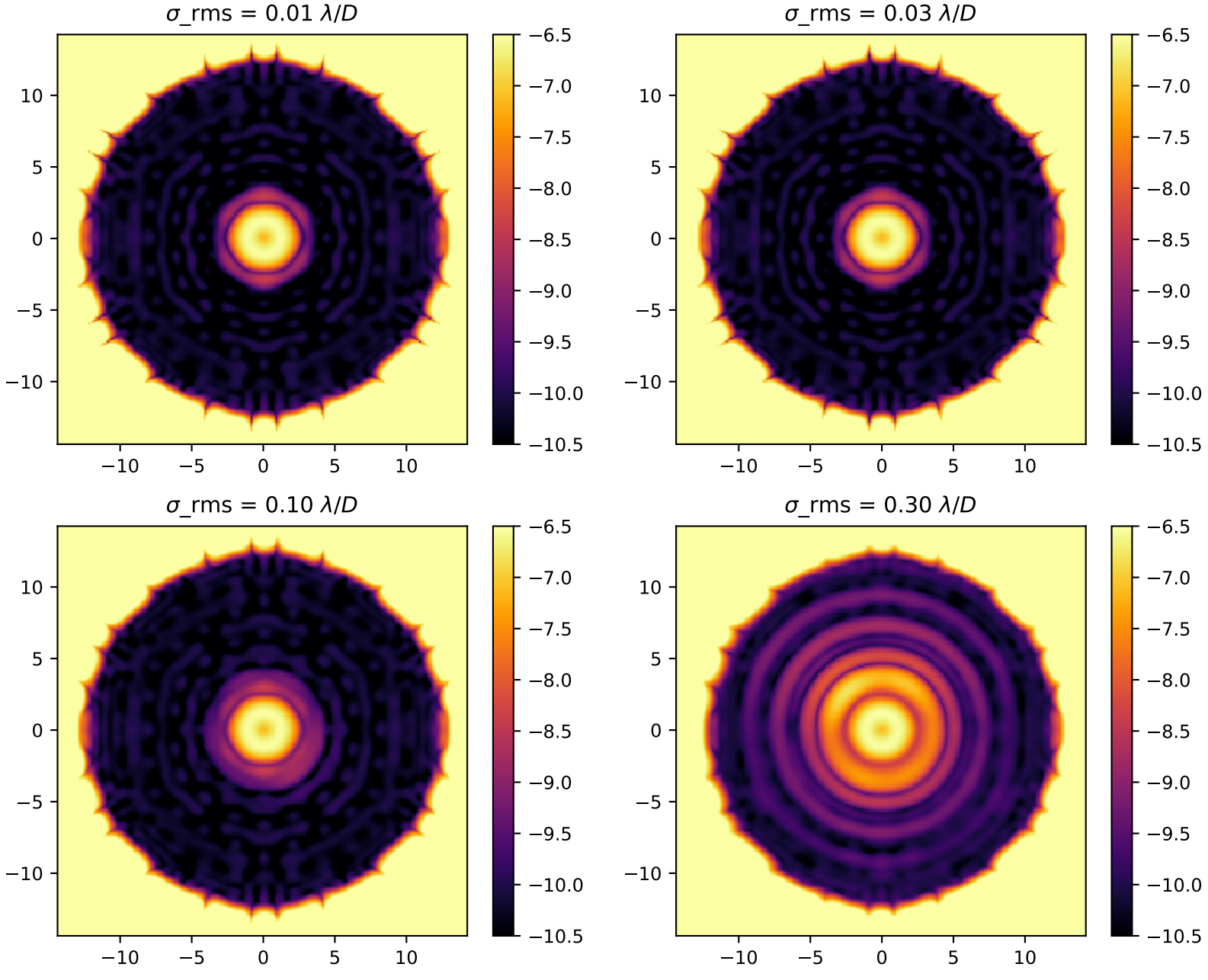
Final image plane

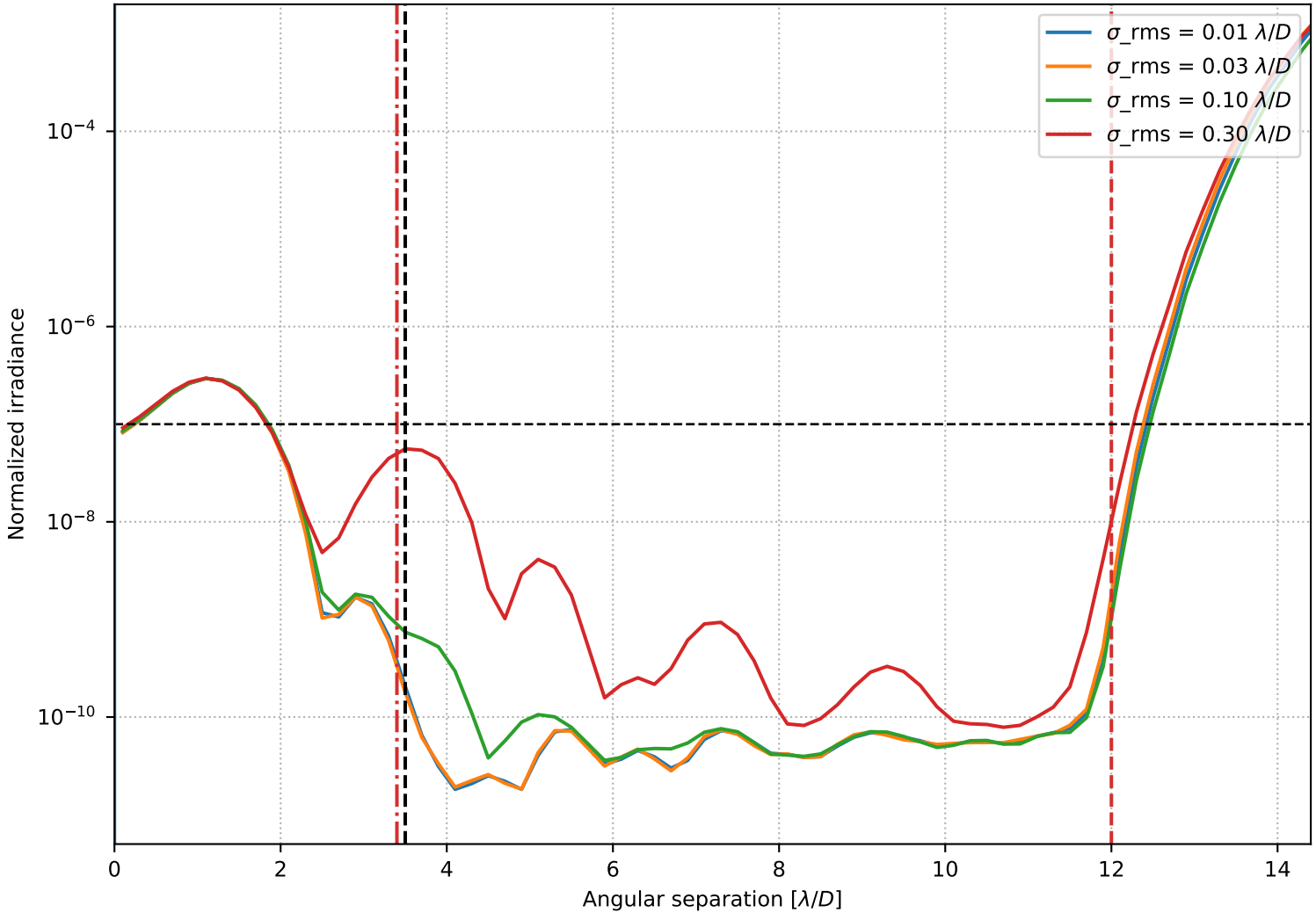




Pupil core throughput:	0.6122421910480316
Lyot stop core throughput:	0.5802246363146598
Maximum core throughput:	0.03396144809546217
Maximum core throughput w.r.t. pupil core throughput:	0.05547061047414459
Maximum core throughput w.r.t. Lyot stop core throughput:	0.05853155135081966
Inner working angle:	3.6528000183366465 λ_0/D


2.75 λ_0/D
3.00 λ_0/D
3.25 λ_0/D
3.50 λ_0/D
3.75 λ_0/D
4.00 λ_0/D
4.25 λ_0/D
4.50 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
10
5
0
−5
−10
−10
−5
0
5
10
−6.5
−7.0
−7.5
−8.0
−8.5
−9.0
−9.5
−10.0
−10.5



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