

As Built Optics
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1. Introduction

This document describes the as built WIYN telescope optics based on shop tests of the individual optics and in situ measurements of the system. General notes include the dimensions, weights, and measured surface quality of the optics. This is followed by prescriptions and parameters for each of the optical trains in the telescope.

As of this writing the ADC optics are in fabrication. The optical prescription presented here is the final design corrected for glass melt data. Details of the Modified Cassegrain optics train are incomplete as of this date. This section will be added when data on the as built system becomes available.

2. General

Primary diameter	3498.85 mm (137.75")
Primary focal ratio	1.7505
Tertiary location above primary	475.4 mm (18.72")
Baffle diameter	1446.2 mm (56.94")
Obscuration	17.1%
Useable focii	2 Nasmyth (MOS & WIYN) Folded Cass Modified Cass

2.1 Primary

Blank diameter	3511.55 mm (138.25")
Diameter (to bevels)	3498.85 mm (137.75")
Edge thickness	463.9 mm (18.264")
Center Hole diameter	965.2 mm (38")
Sagitta	124.92 mm (4.918")
Cass hole sagitta	9.4 mm (0.370")
Glass	Borosilcate
Mirror weight	1964 Kg (4320 lb)
Cell weight	5854 Kg (12,280 lbs)
CG location	468 mm (18.43") from vertex
Surface quality	0.025 waves rms 0.34 waves P-V 0.09 arcseconds FWHM @ 500 nm
Surface roughness	8.0 Angstrom average

2.2 Secondary Mirror

Diameter	1200 mm (47.25")
Center thickness	156 mm (6.142")
Glass	Zerodur
Weight	119.5 Kg (263 lb)
Cell weight	110 Kg
Surface quality	0.024 waves rms 0.26 waves P-V
Surface roughness	11.6 Angstroms average

2.3 Tertiary Mirror

Ellipse dimensions	1101 mm x 776 mm (43.35 x 30.55")
Thickness	101.6 mm (4.00")
Weight	60 Kg (132 lb)
Cell weight	79 Kg (173 lb)
Glass	Zerodur
Surface quality	0.026 waves rms 0.428 waves P-V 0.022 arcseconds FWHM
Surface roughness	Better than 20 Angstroms

3. As Built Optical Prescriptions

3.1 Bare RC Telescope

(WIYN and Folded Cass ports)

Eff. Focal Len.		22004.5			
Total Track		4202.87			
Image Space F/#		6.28906			
Exit Pupil Dia.		1361.08			
Exit Pupil Pos.		-8559.89			
Back focal dis		2706.81			
Plate scale (on axis)		9.374 arc-sec per mm			
Distortion		0.002% 0.2 degree off axis			
Magnification		3.5915			
Field of View		12 arcminute (aproximate)			
Wavelength coverage		panchromatic			
Lens Units		Millimeters			
Surf	Radius	Thickness	Glass	Diameter	Conic
STO	-12253.5	-4202.869	MIRROR	3500	-1.0708
2	-5332.5	4202.869	MIRROR	1136.592	-3.74
3	Infinity	-475.4		536.8658	0
4	Infinity	0	MIRROR	797.9691	0
5	Infinity	-3182.21		604.2212	0
IMA	2115.486	0		153.6653	0

3.2 Wide field corrector (MOS port)

Eff. Focal Len.	21980.8
Total Track	6902.25
Image Space f/#	6.28024
Exit Pupil Dia.	1177.87
Exit Pupil Pos.	-7399.59
Back Focal Dis.	2699.01
Plate scale (on axis)	9.384 arc-sec per mm
Plate scale (63% field R)	9.408 arc-sec per mm
Distortion	0.635% (0.5 degrees off axis)
Magnification	3.5877
Field of View	1 degree
Wavelength coverage	0.49 to 1.1 microns
Lens Units	Millimeters

Surf	Radius	Thickness	Glass	Diameter	Conic
STOP	-12253.5	-4203.239	MIRROR	3498.85	-1.0708
2	-5332.5	4203.239	MIRROR	1118.326	-3.74
3	Infinity	-475.4		693.5089	0
4	Infinity	2267.51		748.2776	0
5	1424	20	SILICA	484.655	0
6	1954.9	1		482.0019	0
7	599.77	20	SILICA	476.3526	0
8	519.99	0		466.5941	0
9	Infinity	865.9		472.1198	0
10	Infinity	0		386.6157	0
IMA	-5675.2	0		385.9148	0

Notes:

The corrector consists of two fused silica lenses with all spherical surfaces in an elastomeric mounting to a PH-17 stainless steel cell.

Lens diameter	500 mm (19.685")
Cell diameter	543.8 mm (21.41")

Wavefront quality	0.074 waves rms
	0.38 waves P-V

This is the full aperture wavefront quality, however the wavefront to any one image is much smaller, hence the wavefront error contribution is negligible.

3.3 ADC corrector (can be installed or removed on WIYN port only)

Eff. Focal Len.	22369.4
Total Track	6910.89
Exit Pupil Dia.	562.13
Exit Pupil Pos.	-3593.94
Back focal dis	2706.81
Plate scale (on axis)	9.221 arc-sec per mm
Plate scale (63% R)	9.232
Distortion	0.246% (0.25 degrees off axis)
Magnification	3.6511
Field of View	0.5 degrees
Wavelength coverage	0.35 to 1.05 microns
Lens Units	Millimeters

Surf	Radius	Thickness	Glass	Diameter	Conic	Angle
STO	-12253.5	-4203.868	MIRROR	3498.85	-1.0708	
2	-5332.5	4203.868	MIRROR	1143.869	-3.74	
3	Infinity	-475.4		561.7073	0	
4	Infinity	2671.42		627.0687	0	
5	Infinity	18	LLF1	259.7828	0	2.608
6	Infinity	28	PSK3	258.2231	0	
7	-777.8992	64		256.7133	0	
8	-603.8694	15	PSK3	235.3227	0	3.400
9	Infinity	19	LLF1	233.6373	0	
10	Infinity	367		232.4383	0	
IMA	Infinity	0		195.7279	0	

Notes:

ADC lens is mounted on a slide for remotely controllable deployment or removal from the beam.
The two lenses are mounted on rotating stage with 0.1 degree step resolution.