

OPTI 415/515L

Lab 3 Wavefront Quality

Overview

As in the last lab we will look at the wavefront produced by the same set up as made the images containing astigmatism and coma

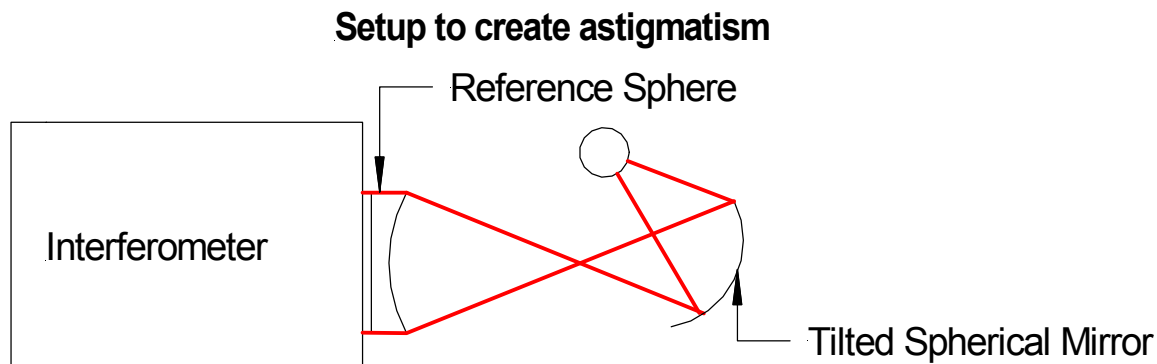
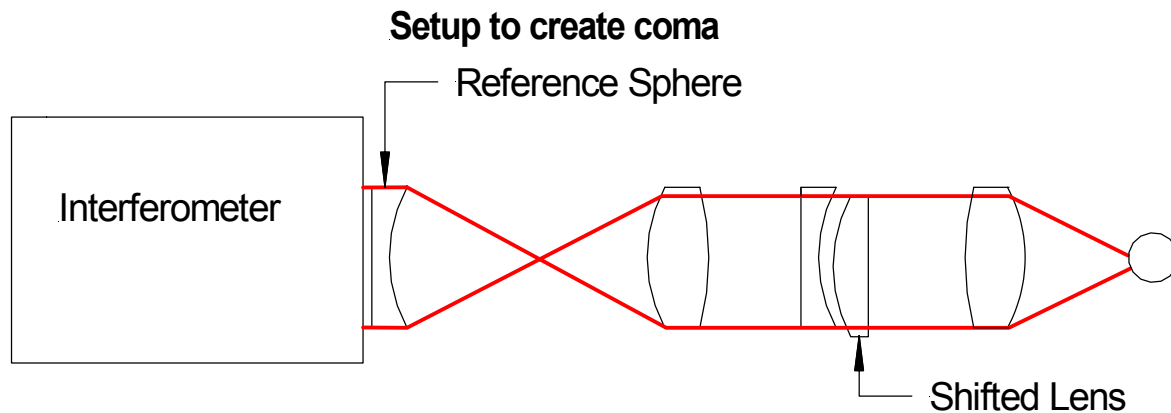
The idea is to see what wavefront shape produces an image of the shape seen in the last lab

Here we want to see how focus affects the shape and look of the wavefront containing astigmatism and coma

The astigmatic wavefront is particularly interesting going through focus

Procedure

- Attach the curved reference surface (transmission sphere) onto the Zygo interferometer.
- Align the experiment as shown below

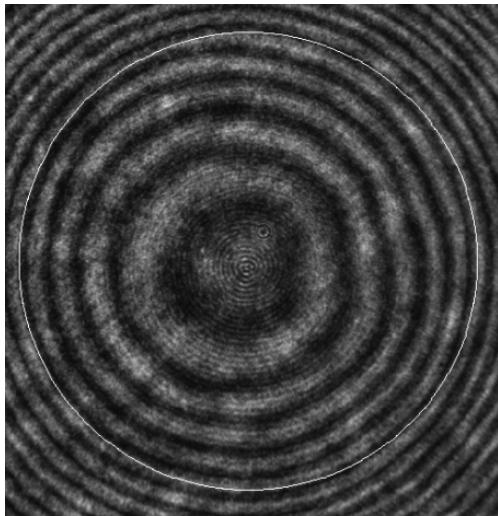


Coma

- Measure the aberrations without displacing the lens. Correct for tilt and defocus if needed. Get used to the software by studying the wavefront profile, sidel aberrations, interference fringes and the PSF.
- Observe fringes and record aberration by changing tilt and defocus.
- Shift the lens and observe the fringes and record aberrations.
- Introduce tilt and / or defocus along with the coma.
- Change the spacing between the 2 matched lenses and observe a change in spherical aberration

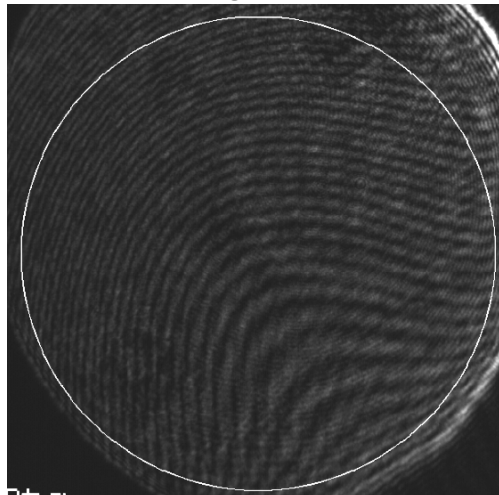
Coma (Cont.)

Before shifting the lens (with some defocus)



Seidel Coefficients		
From 36 term Zernike fit		
Aberration	Magnitude	Angle
	waves	degs
TILT	1.736	-136
FOCUS	-11.818	
ASTIGMATISM	0.354	78
COMA	0.198	-61
SPHERICAL	2.406	

After shifting the lens

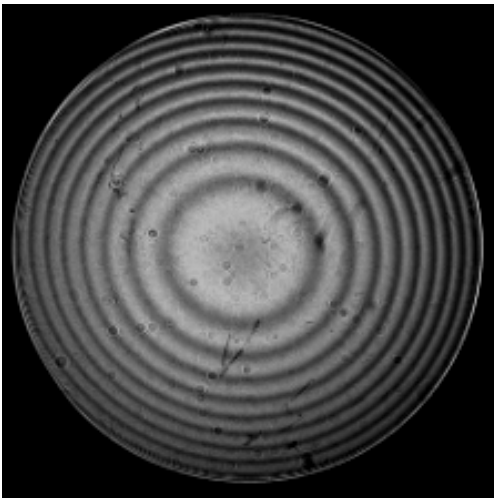


Seidel Coefficients		
From 36 term Zernike fit		
Aberration	Magnitude	Angle
	waves	degs
TILT	13.119	-100
FOCUS	-16.878	
ASTIGMATISM	5.683	16
COMA	22.094	16
SPHERICAL	24.318	

Astigmatism

- Measure the aberrations without tilting the mirror. Correct for tilt and defocus if needed.
- Observe fringes and record aberration by changing tilt and defocus.
- Tilt the mirror and observe the fringes and record aberrations.
- Go through the sigittal, medial and tangential foci and observe the wavefronts.

Before tilting the mirror (with some defocus)

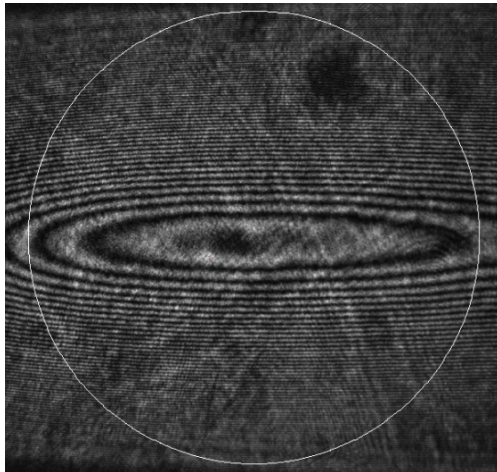


Seidel Coefficients		
From 36 term Zernike fit		
Aberration	Magnitude waves	Angle degs
TILT	0.336	39
FOCUS	4.592	
ASTIGMATISM	0.582	74
COMA	0.150	-83
SPHERICAL	0.145	

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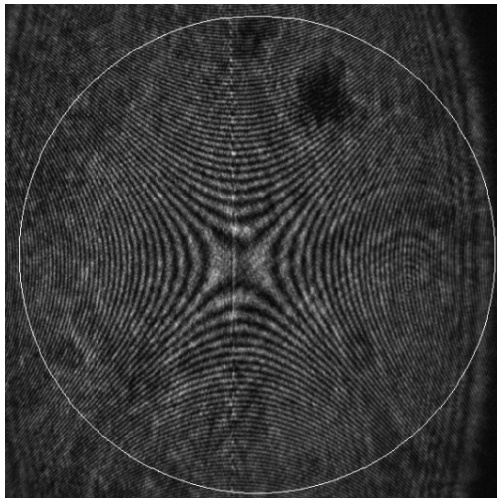
Astigmatism (Cont.)

After tilting the mirror, at sagittal focus



Seidel Coefficients		
From 36 term Zernike fit		
Aberration	Magnitude	Angle
	waves	degs
TILT	6.604	-87
FOCUS	-44.925	
ASTIGMATISM	85.470	0
COMA	2.519	47
SPHERICAL	-1.013	

After tilting the mirror, at medial focus (note the small defocus term)



Seidel Coefficients		
From 36 term Zernike fit		
Aberration	Magnitude	Angle
	waves	degs
TILT	7.379	-106
FOCUS	1.987	
ASTIGMATISM	107.748	-0
COMA	2.110	-89
SPHERICAL	1.481	