

Wyko 6000 PSI Lab with spherical surfaces

Start by using the CaliBall as your convex mirror surface

Use the f/3.3 transmission sphere (TS)– Anoop will have it installed on the interferometer

Align the TS. The alignment scheme is slightly different than the Zygo but essentially the same

Get a Cat's eye reflection off the surface of the CaliBall and minimize the power fringes

Move the ball toward the interferometer by half the diameter, about 0.5 inches

You should be close to the center of curvature, align for minimum tilt and focus

Note the linear scale reading

Move back to the Cat's eye. How far did you have to move? Can you use the focus Zernike terms at both ends of the measurement to correct the scale reading? Does this make a big difference in the radius on the .01% of radius scale? That is, $0.5 \times .0001 = 50$ microinches or 1250 nm?

Go back to the center of curvature, misalign the ball by decentering. Can you re-align by tilting? Why?

If there is time take a series of measurements at the center of curvature but with many tilt fringes both plus and minus. Record the first nine Zernike coefficients at each tilt and plot the result. Which coefficients change with tilt. Can you think of a reason why?

Go back to the center of curvature and do the same experiment going through focus. What does the 3rd order spherical aberration coefficient do? Is there a reason?

Do you see why it is suggested to minimize the number of fringes when doing phase measuring interferometry?

Take an average of a large number of measurements (say 30 to 50). The random noise in the measurements would average out. Using this as your reference, subtract it from a single measurement to determine the noise in your measurement.

The CaliBall is designed to calibrate the wavefront produced by the transmission sphere. Rotate the ball to several random positions and store each wavefront map. When you have 5 or 6 maps, average them and look at the difference between the average and a single measurement. How good is the ball?

Purposely misalign the TS a modest amount. Make sure light is still going back to the detector, i.e., you still see the alignment dots. Do another test of the ball. One or two maps should be sufficient. Do you see why the TS must be well aligned?

Finish up by making an interferogram of a concave spherical surface. What defines the aperture now?

Could you use the calibrated wavefront of the TS to remove its error from your test data?