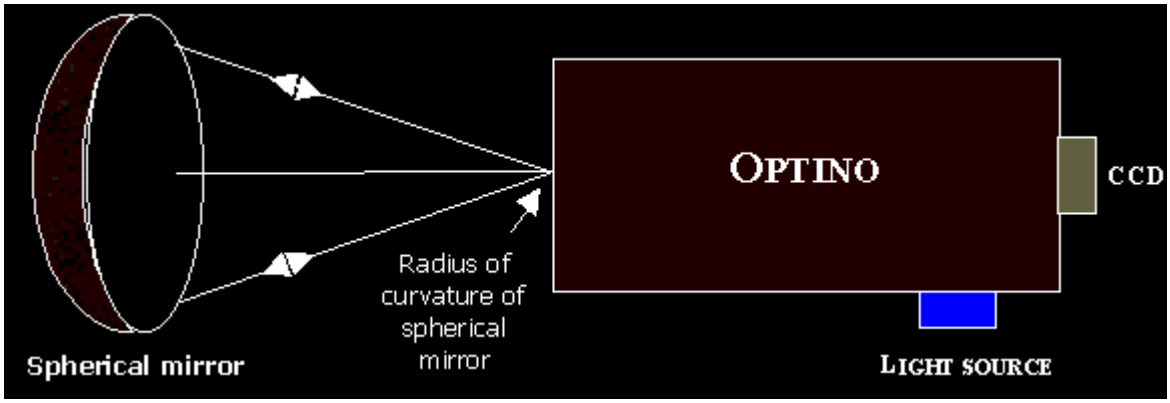
SpotOptics
The software people for optics

Shack-Hartmann wavefront sensor test of multi-component lens with a flat mirror internal illumination



Setup: In the above configuration, light from **Optino**, it comes to a focus at **F** (which is also the radius of curvature of the spherical mirror). It falls on the spherical mirror, and retraces its path, passing though **Optino** again, going through the SH system.

The aberrations of the SH system itself are removed taking a calibration frame of a small high quality spherical mirror instead of the lens **L**. This determines the accuracy of the test.

The spherical aberration of a mirror at its center of curvature is given by:

$$ASA = -K\frac{r^3}{2R^3}$$

Here ***ASA*** is the angular spherical aberration (diameter of image at best focus – in radians), ***K*** the conic coefficient of the mirror, *r* the ray height on the mirror, and ***R*** the radius of curvature. Spherical mirrors have zero **ASA** (*K =0),* while parabolic (*K* =-1) and hyperbolic (*K* <-1) mirrors have large positive spherical aberration. However, Sensoft is capable of testing mirrors with hundreds of wavelengths of aberrations.

The accuracy of the tests depends on the quality of the spherical mirror **S** and the flat mirror used for the calibration.

Instrument:

Optino :Focal ratio range: f/1 to f/500.

Output:

Along with the Zernike coefficients, the wavefront and optical quality, Sensoft gives diagnostics for correcting defocus and spherical aberration (which is minimized by shifting the focal plane). These corrections can be based on analytical formulae, or on a lookup table provided by the user.

The test can also be used to derive the conic coefficient *K* from the measured *ASA* using the above equation.

How the test is done

1. Mount Optino on a suitable optical bench.
2. Under remote control from the PC, take the reference calibration frame, using the inbuilt light source.
3. Mount the optical element being tested in the configuration which is suitable for the test (lens, spherical mirror, flat mirror etc.)
4. Take the Shack-Hartmann image of the optical element.
5. Do the Analysis using Sensoft. The results are ready in about 10 seconds.
6. If required, take multiple SH frames for reducing noise.
7. Run Analysis. Sensoft automatically computes the average values.
8. Align the optical elements (if it's a multi-element system) using the indications given by Sensoft.
9. Find the correct focal plane using the indications given by Sensoft.
10. Correct support problems using the plots of the wavefront/mirror surface.

Requirements:

Instrument	Optino
Focal ratios covered	f/0.5 to f/500 standard.
Sampling on the pupil	25x25 spots standard. Up to 65x65 spots can be used.
Analysis Software	Sensoft Optino
CCD for SH	8-bit un-cooled or 16-bit cooled CCD.