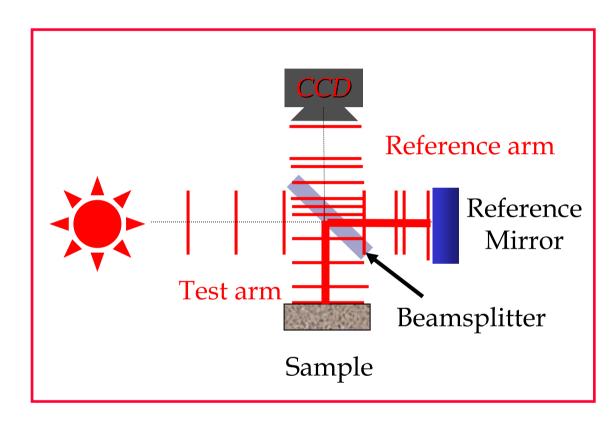


Interferometer

Typical Interferometer



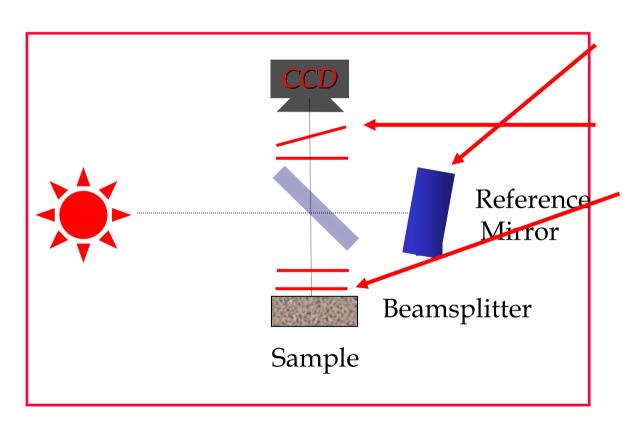
Optical Path Difference (OPD)

- difference in optical path lengths that beams travel in Reference and Test arms.

- The expanded beam exiting from the light source is divided by a Beamsplitter into two beams.
- One beam is reflected from the Reference Mirror, and the other one from the Sample.
- These two beams are recombined by the Beamsplitter to interfere.
- The imaging lens images the interferogram onto the CCD camera.



Tilt of one of Mirrors in Interferometer



If one of the mirrors is slightly tilted,

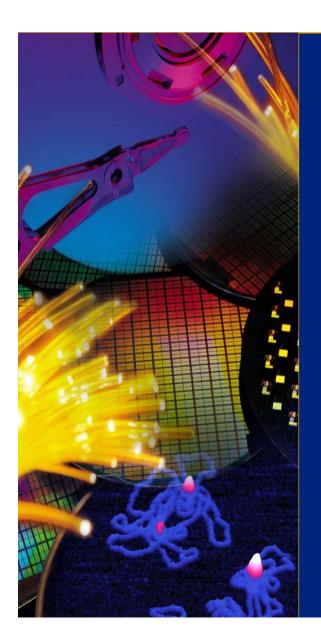
then the reflected beam (wavefront) also is tilted.

If mirror and flat sample are perfectly perpendicular, then reflected wavefronts are parallel.

For two tilted and flat wavefronts, an interferogram of straight, parallel, light and dark bands will be formed.







Interferogram

Interferogram for Flat Wavefronts with Tilt

Reference beam (wavefront).

 3λ

Multiple λ distances between wavefronts, where λ is the wavelength of the source.

Tested beam

(wavefront)

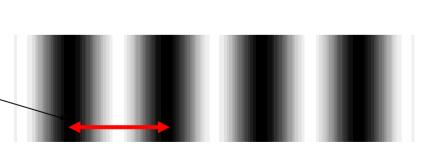
Two interfering wavefronts

Interference between two wavefronts is constructive at these multiple λ points, destructive at others,

forming an

interferogram.

Fringe spacing corresponds to λ path difference between wavefronts.



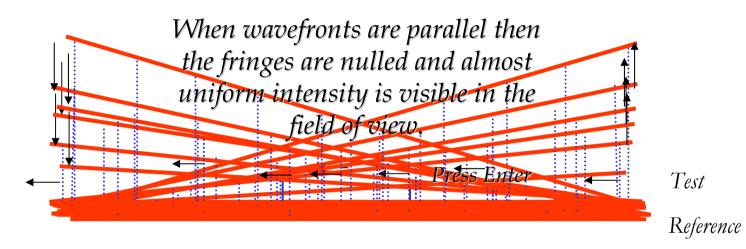
Intensity profile of interferogram.

Interferogram, (interference pattern or fringe pattern)



Change in Tilt Causes Change in Number of Fringes.

NULL FRINGES





The number and spacing of fringes changes with tilt.

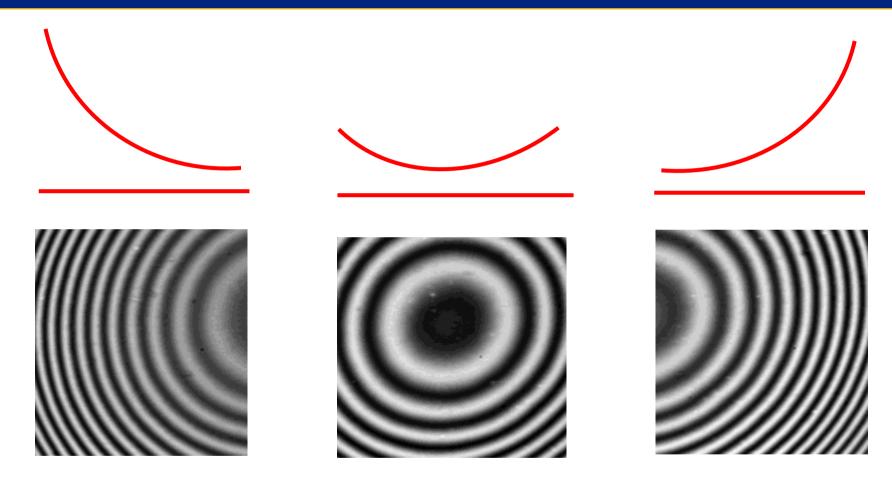






Shape of fringes

Interferograms for Spherical Sample

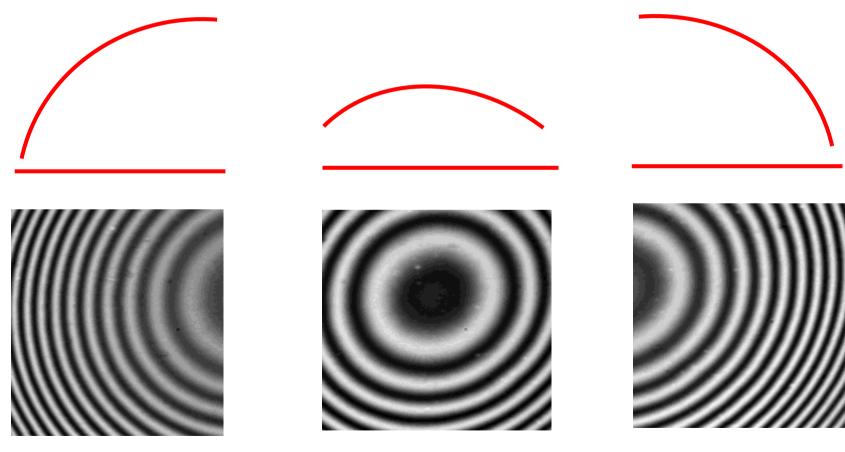


When one wavefront is spherical and the other is flat, and in addition there is some tilt between interfering wavefronts, then the fringes will be curved. When tilt is not present, the fringes are circular.



Interferograms for Spherical Sample

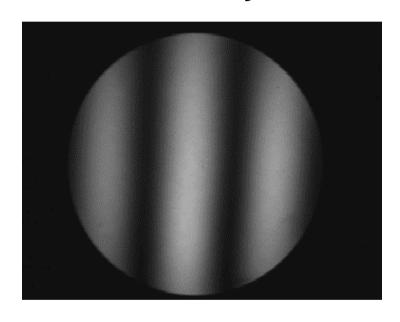
The fringes can represent a concave wavefront instead convex wavefront as on previous slide.

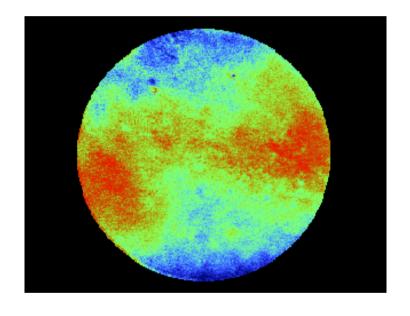




Typical Interferogram for

Flat Surface





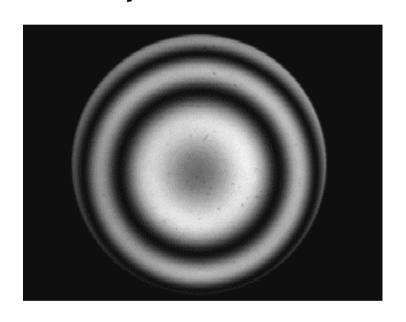
Fringes λ 2λ 3λ

Phase map



Typical Interferogram for

Spherical Surface



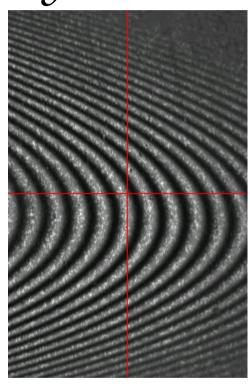
Fringes

Phase map

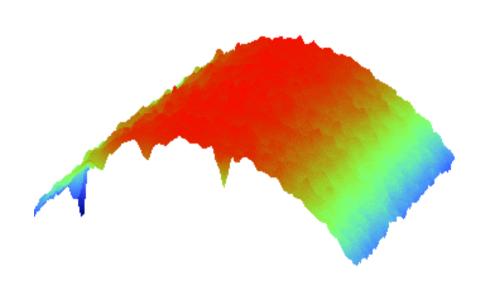


Typical Interferogram for

Cylindrical Surfaces



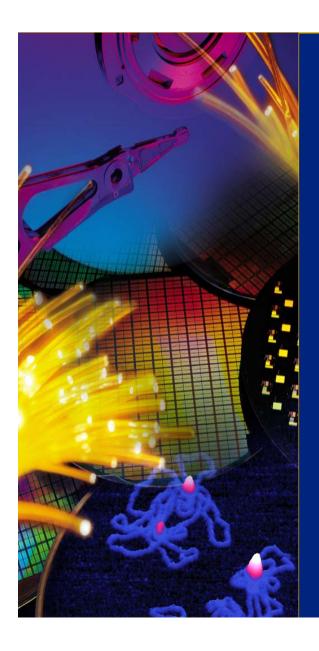




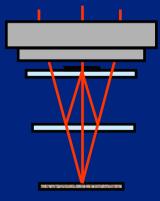
Phase map







Interference Microscope



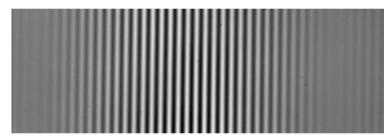
Filter Bandwidth and Number of Fringes

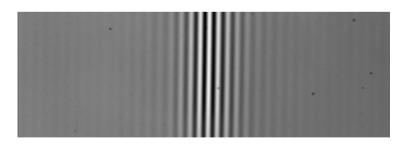
 Narrow bandwidth filter (3nm) (in PSI)

 Medium bandwidth filter (40nm)

 Wide bandwidth filter (300nm) - white light (in VSI)



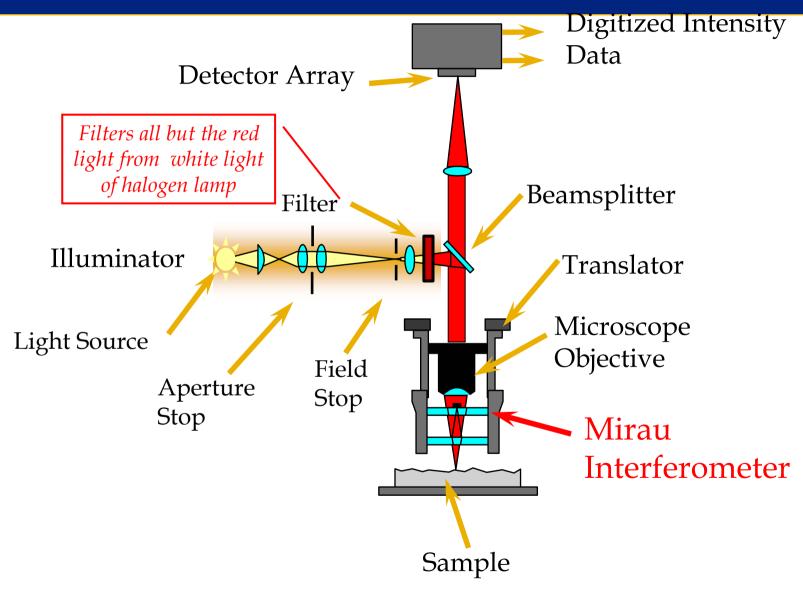




of fringes $\approx 2\lambda/\Delta\lambda$

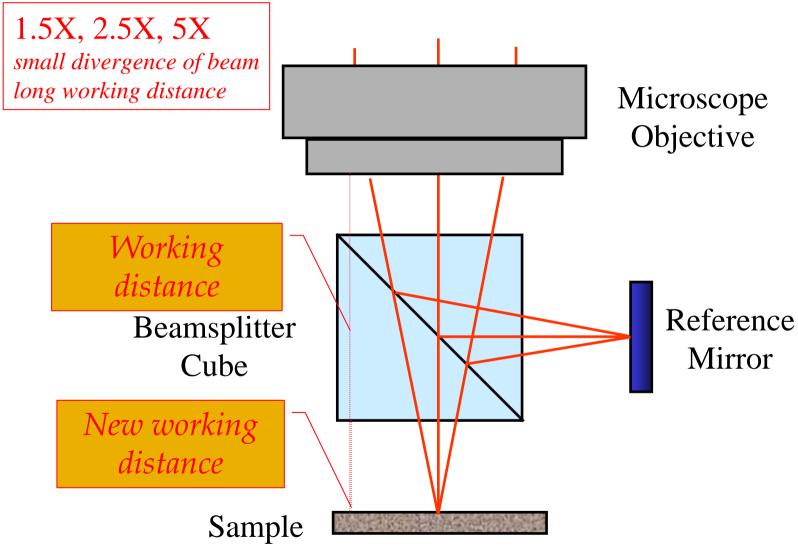


Interference Microscope Diagram



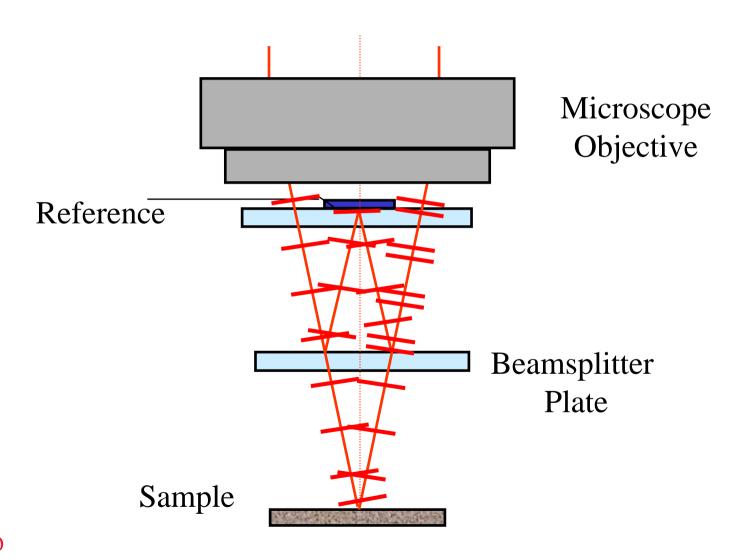


Michelson Interferometer





Mirau Interferometer





Mirau Interferometer for Small Magnification?

