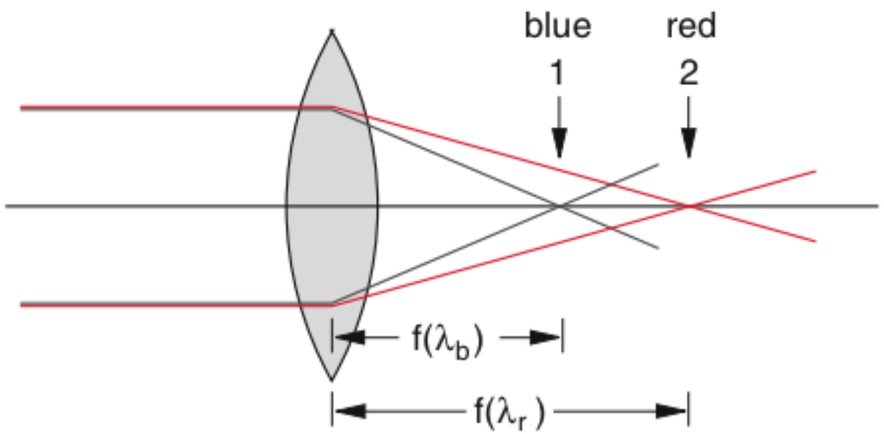
Experimental Physics 3 - Em-Waves,Optics, Quantum mechanics

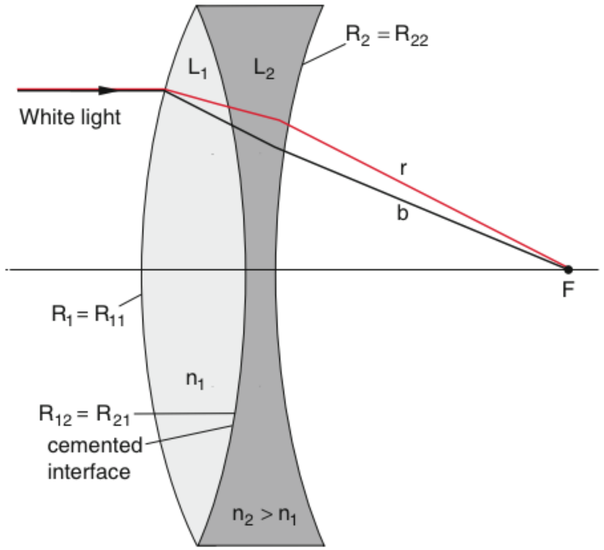
Lecture 7

Prof. Dr. Frank Cichos
WS 2020/21

Aberrations

Chromatic Aberration

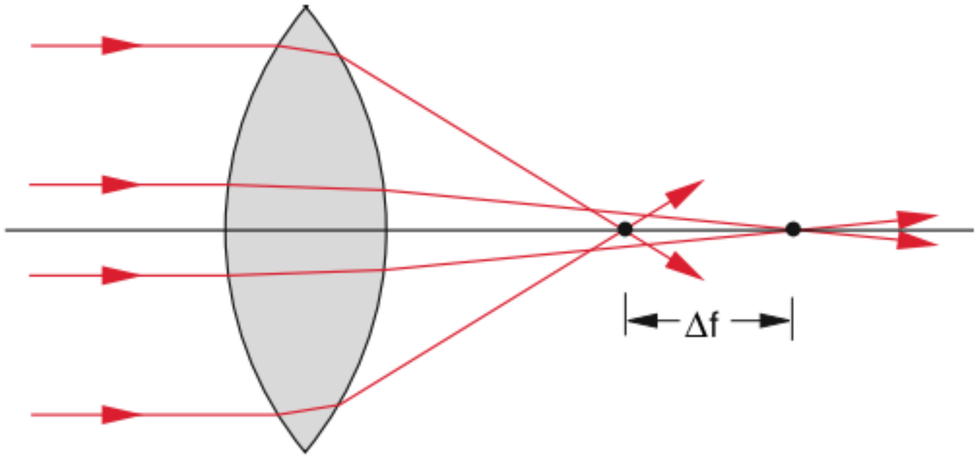


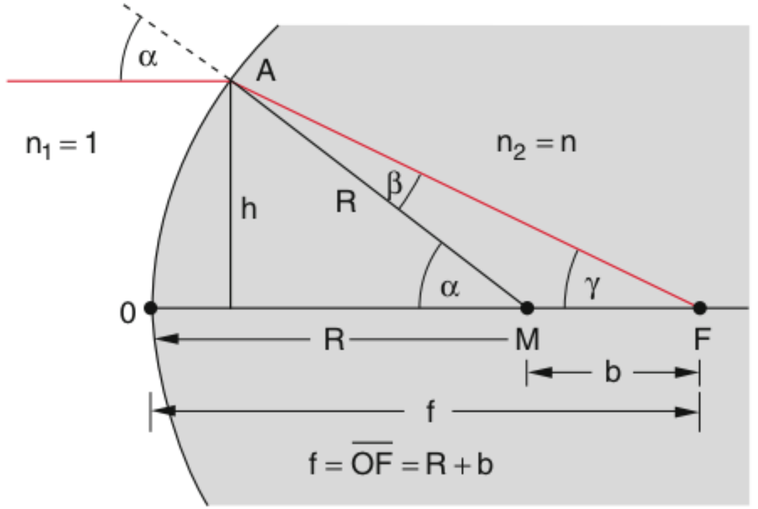


$$\frac{R_2}{R_1} = \frac{n_{2b} - n_{2r}}{2(n_{1b} - n_{1r}) - (n_{2b} - n_{2r})}$$

Refractive index depends on the wavelength of light

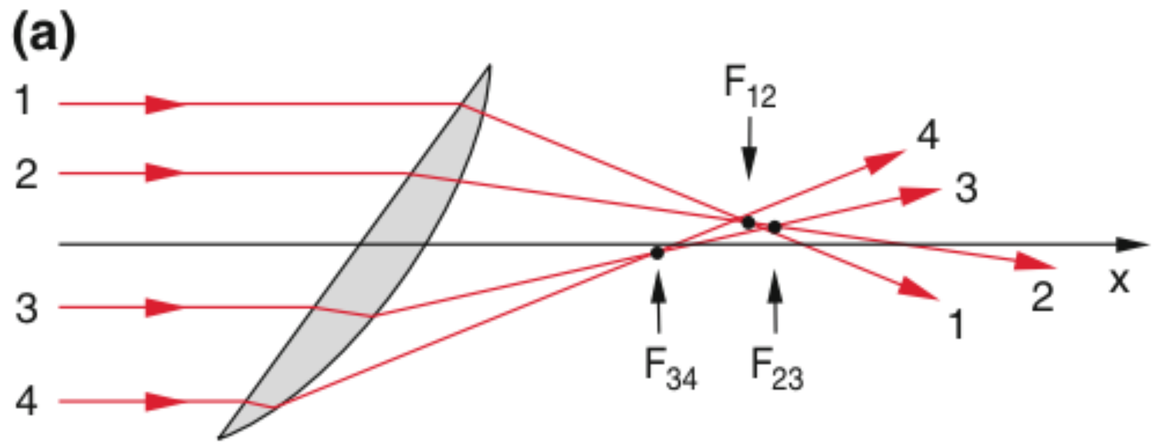
Spherical Aberration

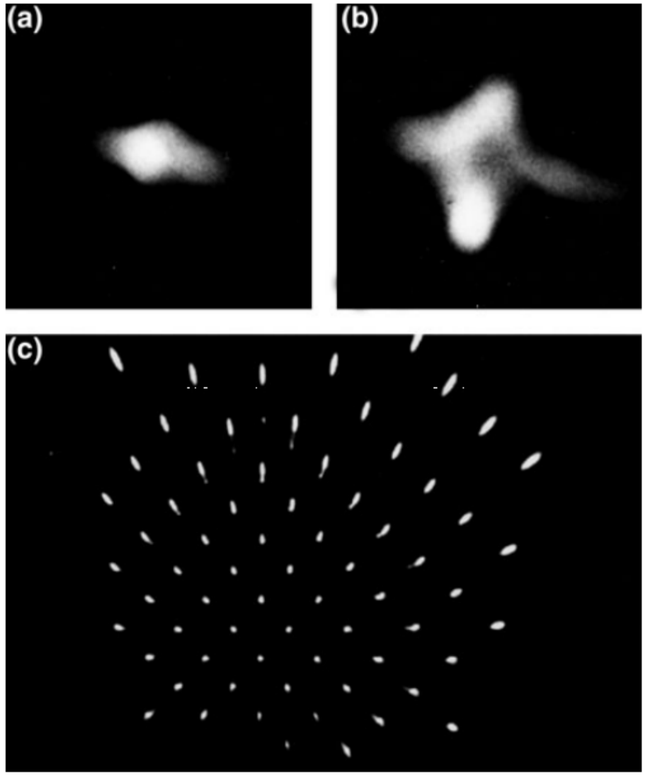




parallel rays more distant from the optical axis
have a shorter focal distance on spherical surfaces

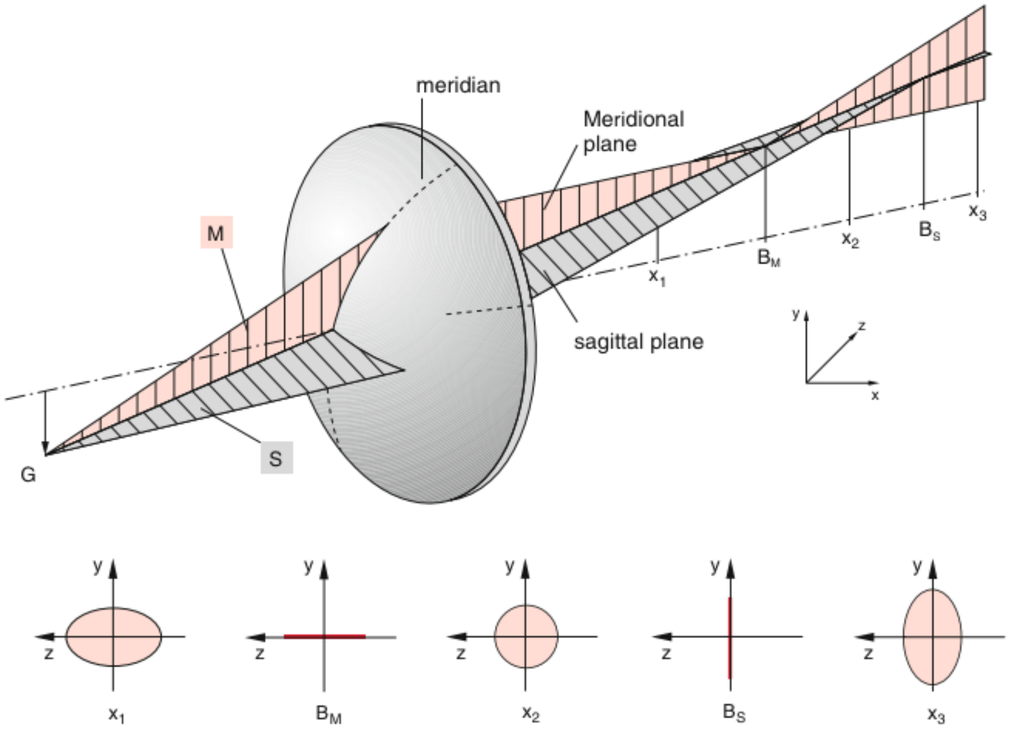
Coma





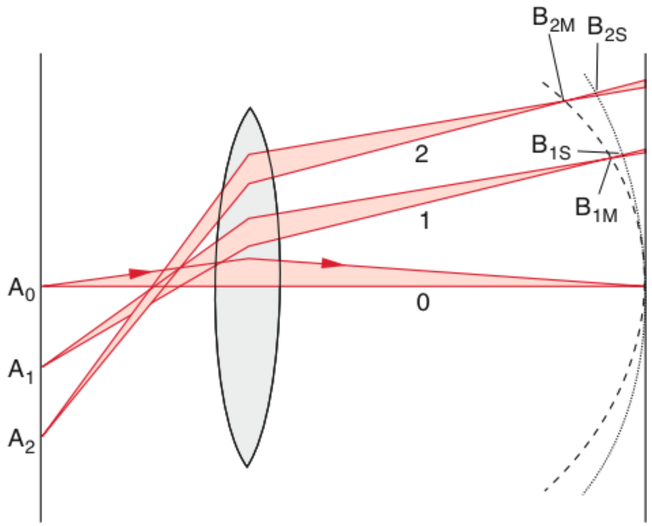
Skew light is not focused into a single point

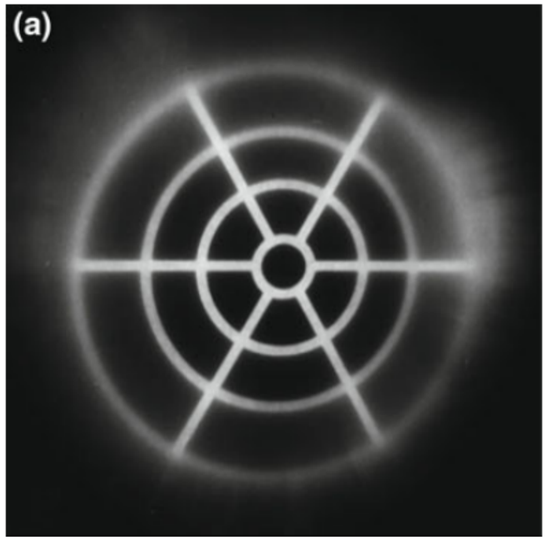
Astigmatism



Off axis point sources do not focus into a single point

Field Curvature





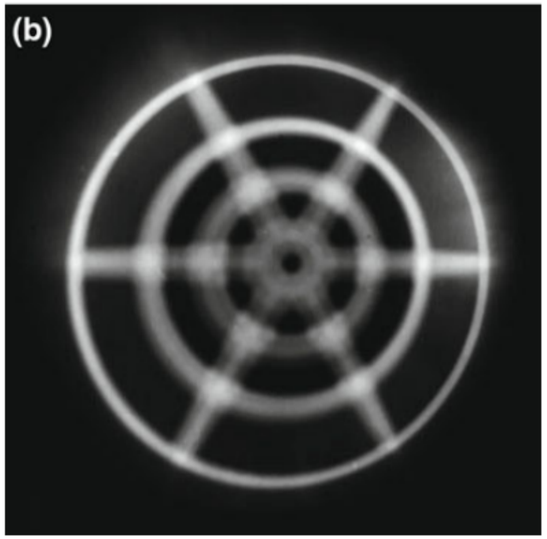
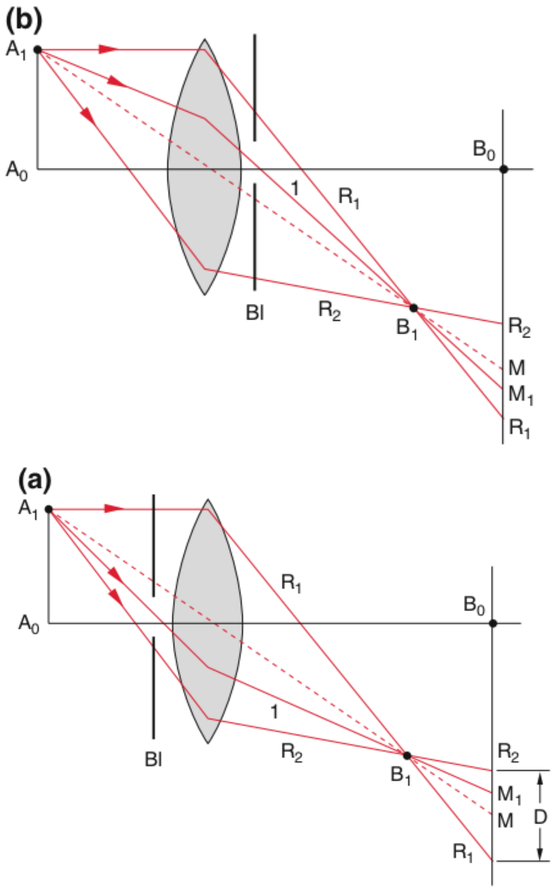
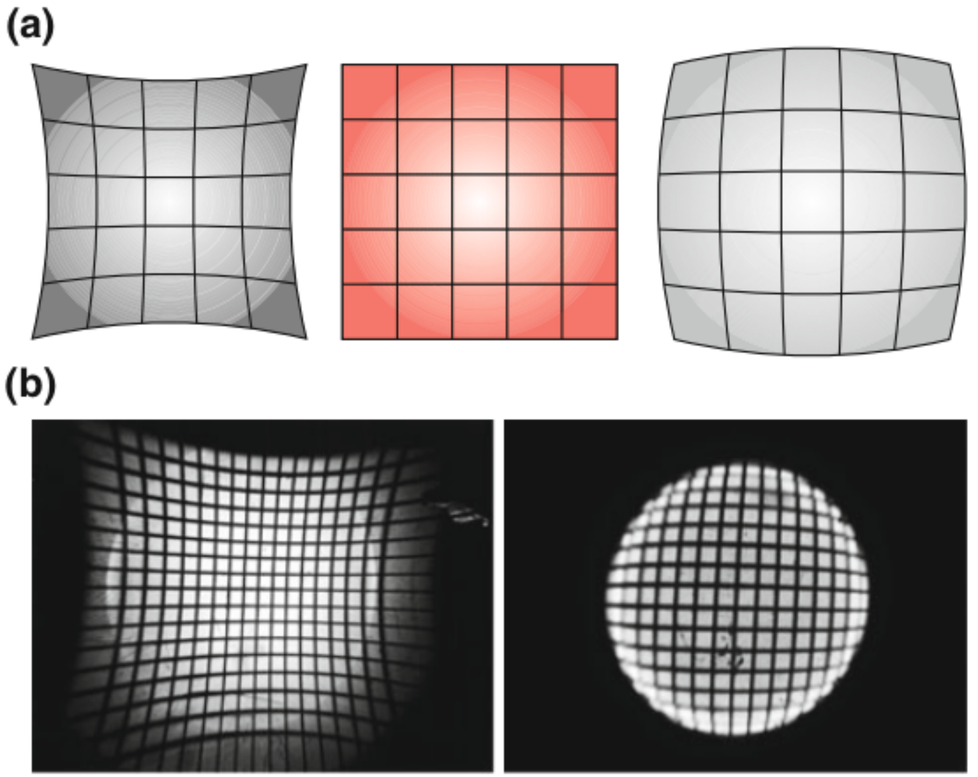


Image plane for the object plane is no longer a plane

Field Distortion

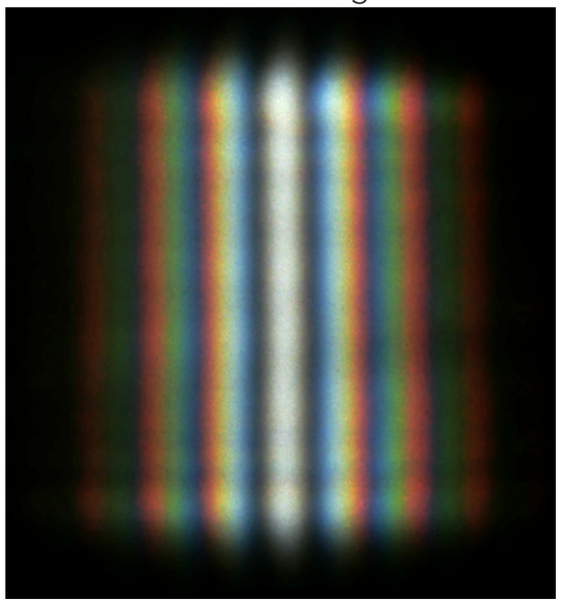




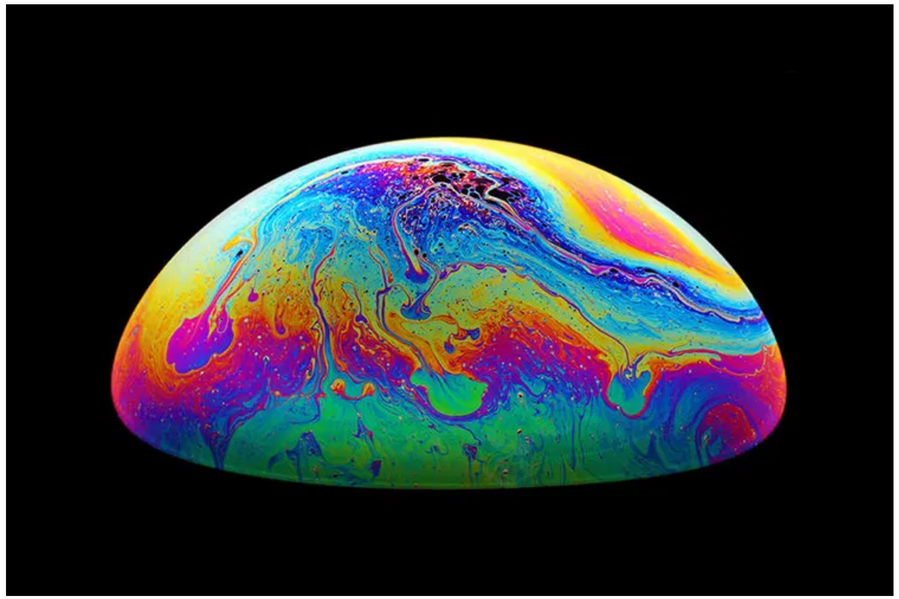
2. Wave Optics

Signatures of waves - Interference

double slit with white light

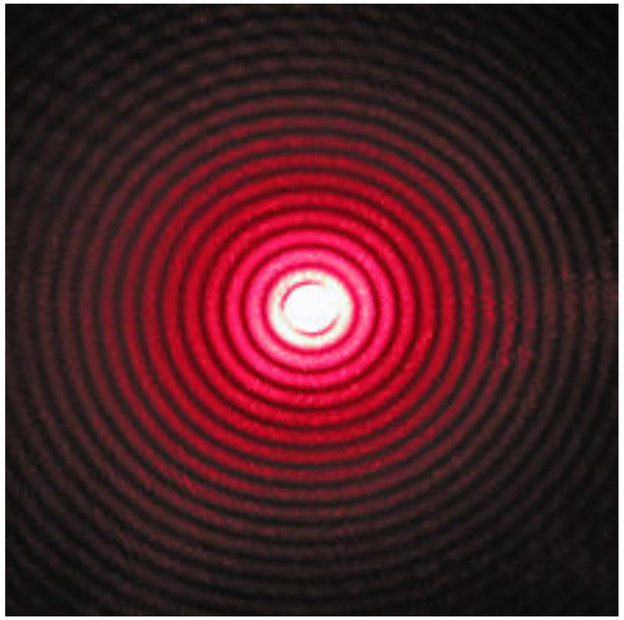


soap bubble

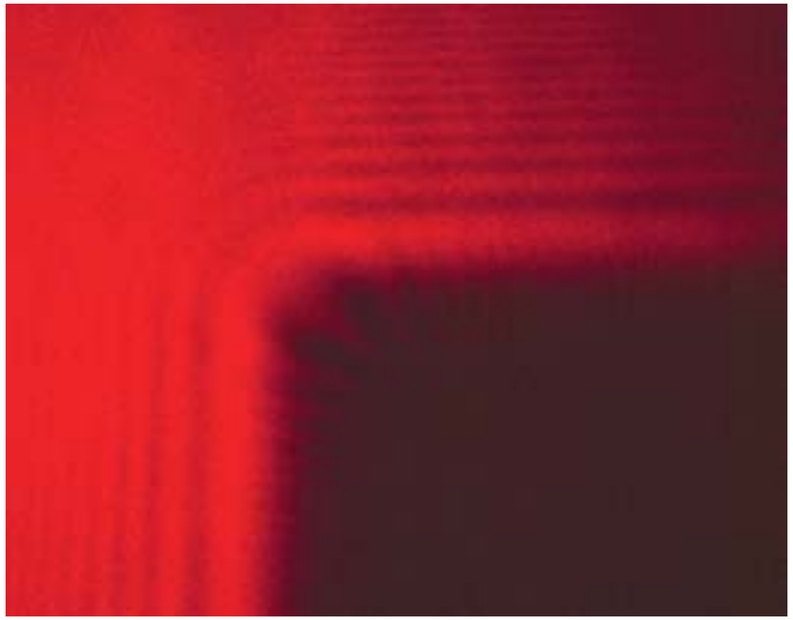


Signatures of Waves - Diffraction

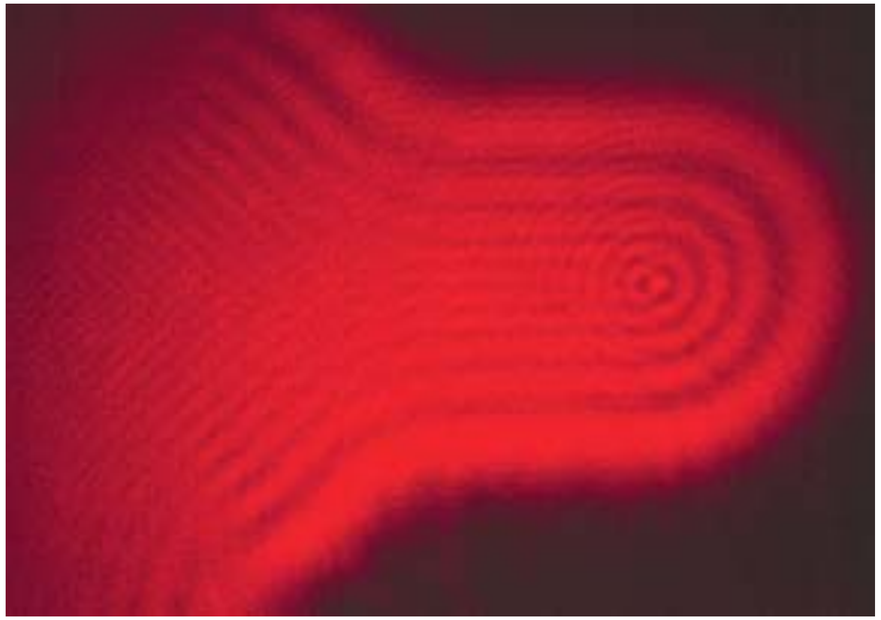
pinhole diffraction



edge diffraction



keyhole diffraction



f/5.6

f/8

f/22

f/32

Electromagnetic Spectrum