

ABERRATIONS

I. Quantifying aberrations

I.A Refraction at a spherical surface

I.B Criteria for evaluating the aberrations

I.C Approximations

1.C.1 Paraxial approximation or Gaussian optics

1.C.2 Third order approximation

II. Seven primary aberrations that lead to imperfect images

II. A SPHERICAL ABERRATIONS

Longitudinal and transverse spherical aberration

Minimizing spherical aberrations

by optimizing lens' shape

by exploiting the existence of conjugate points in spherical lenses (their use in oil-immersion microscope objectives)

II. B COMA

Meridional or tangential plane, sagittal plane, tangential coma, saggital comma

Skew rays

II.C ASTIGMATISM

Meridional or tangential focal surface

Sagittal focal surface

II.D PETZVAL FIELD CURVATURE

II.E DISTORSION

II.F LONGITUDINAL CHROMATIC ABERRATION

II.G LATERAL CHROMATIC ABERRATION

Correcting CA: The design of an "achromatic doublet"

SEVEN primary lens aberrations
that lead to imperfect imagery



