Diffraction and Imaging part II

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Diffraction and imaging I program

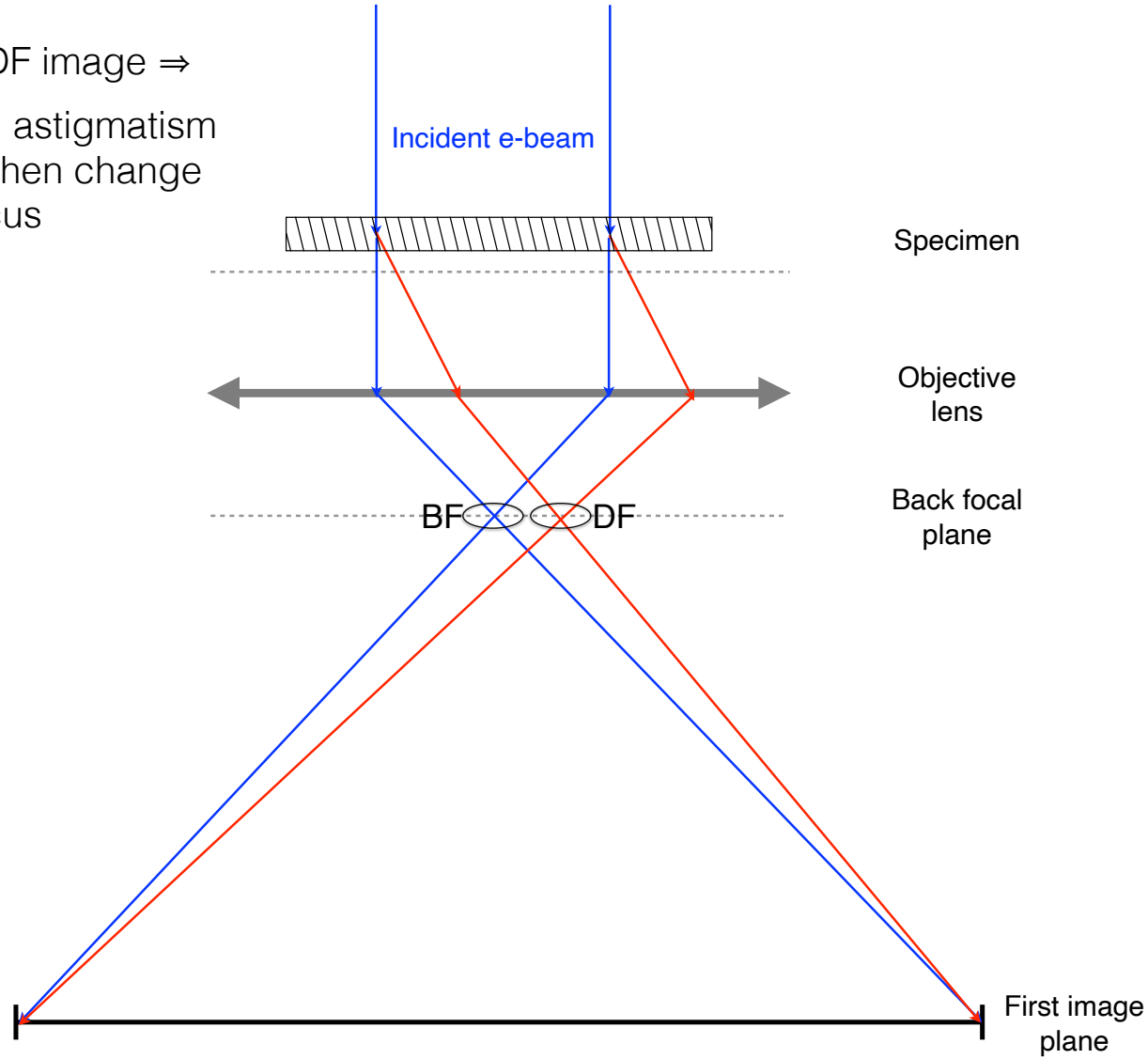
- Q and A from MOOC week 4 lectures and exercises
- Mini-lecture on:
  - Centred dark-field imaging in 2-beam condition
- Demo: 2-beam diffraction and imaging using centred dark-field

Centred aperture dark-field imaging

Displaced aperture dark-field

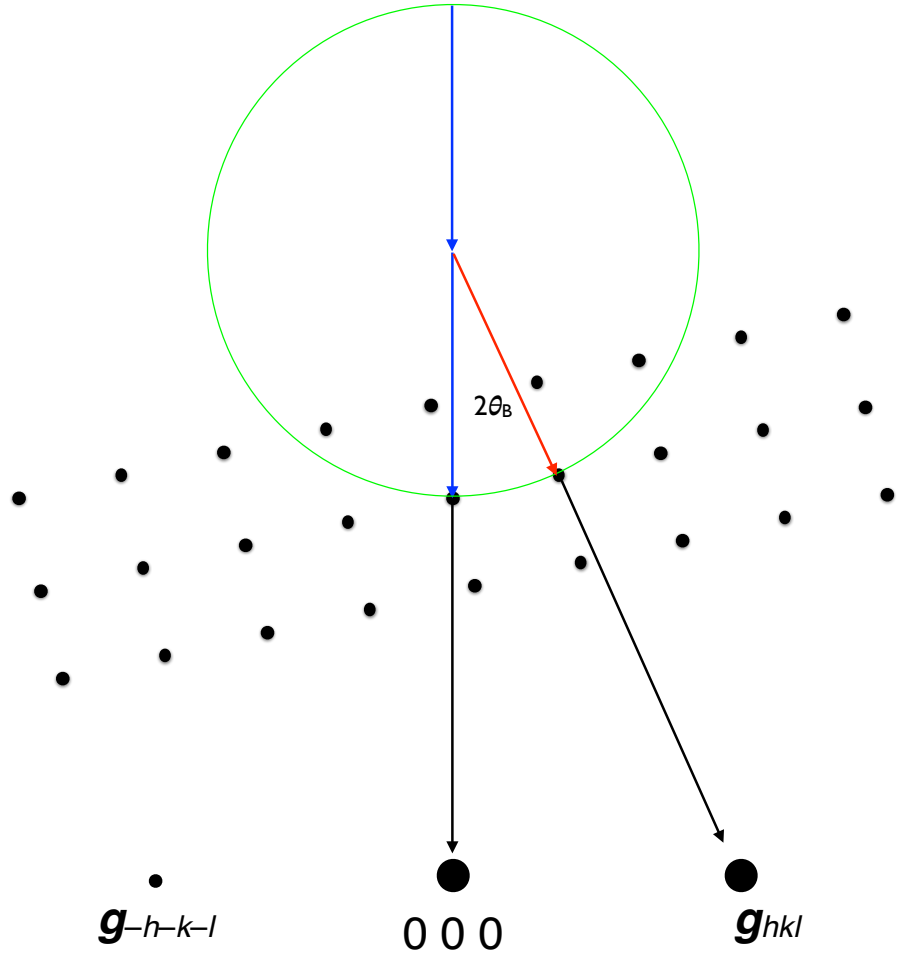
Off-axis rays for DF image ⇒

– aberrations and astigmatism
– image moves when change objective lens focus



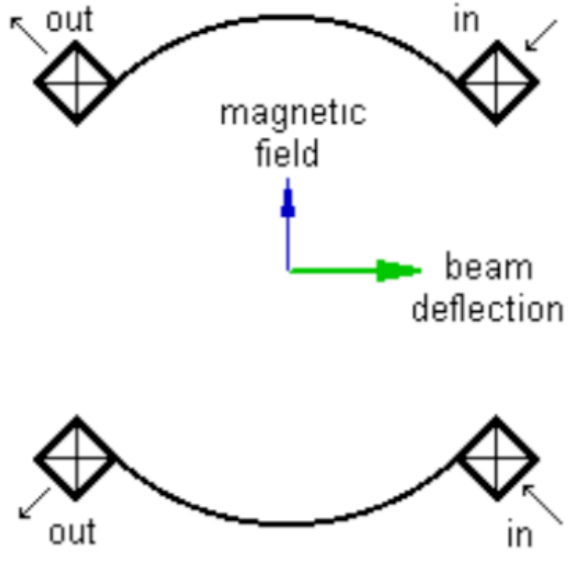
Displaced aperture dark-field

- Ewald sphere cuts reciprocal lattice node exactly
- Off-axis rays form DF image
  ⟹ aberrations and astigmatism
  ⟹ image moves when change objective lens focus



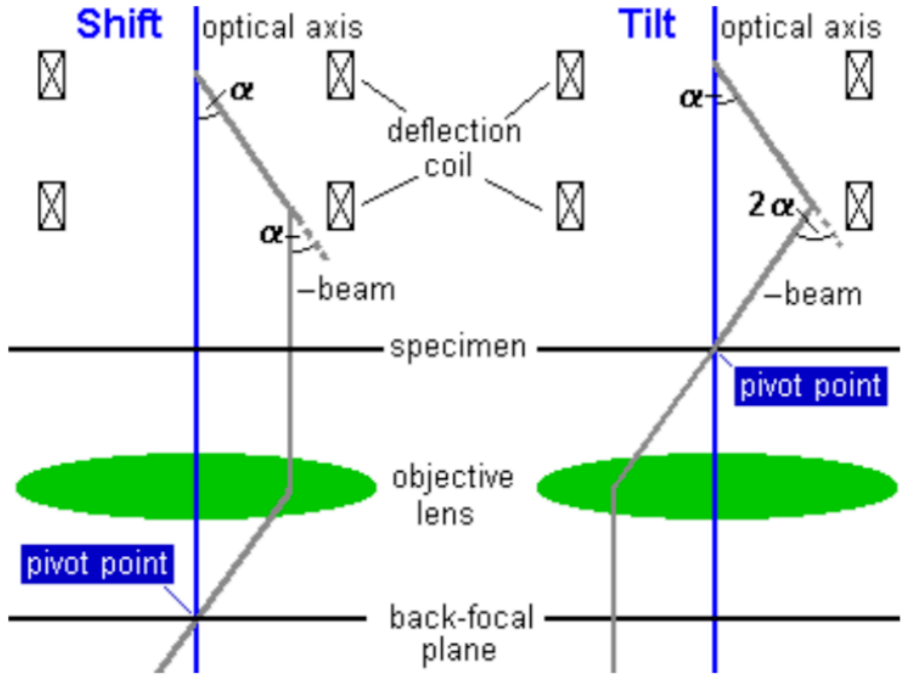
Beam deflection coils

- Deflection coils: set of coils either side of e^- beam
- Apply positive magnetic field to one, negative to the other
  $\Longrightarrow$ Deflection of e^- beam towards positive field
- Arcs used to generate homogeneous magnetic field
- Two perpendicular sets allow deflection in *X* and *Y* directions



Beam deflection coils

- Above objective lens have set of double deflection coils
- Can be used to:
  - Shift incident beam on sample
  - Tilt incident beam on sample

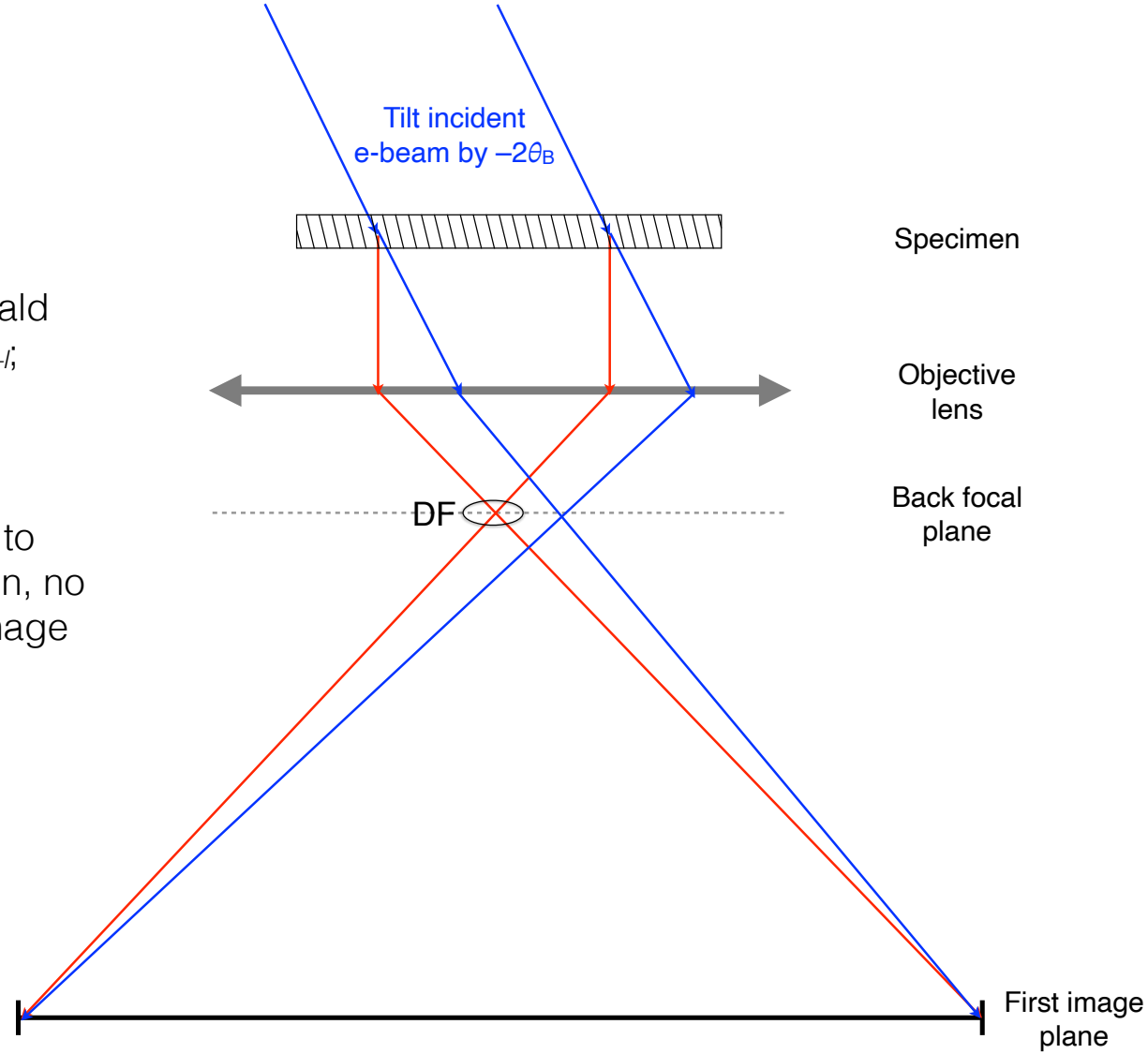


Centred aperture dark-field

Corresponds to tilting of Ewald sphere by $2\theta_B$, excite $\boldsymbol{g}_{-h\,-k\,-l}$;

0 0 0 takes place of $\boldsymbol{g}_{h\,k\,l}$ in SADP

Can now go from BF image to DF image by pressing button, no off-axis aberrations in DF image



Centred aperture dark-field

- Corresponds to tilting of Ewald sphere by $2\theta_B$, excite $\boldsymbol{g}_{-h-k-l}$;
  0 0 0 takes place of $\boldsymbol{g}_{hkl}$ in SADP
- Can now go from BF image to DF image by pressing button, no off-axis aberrations in DF image