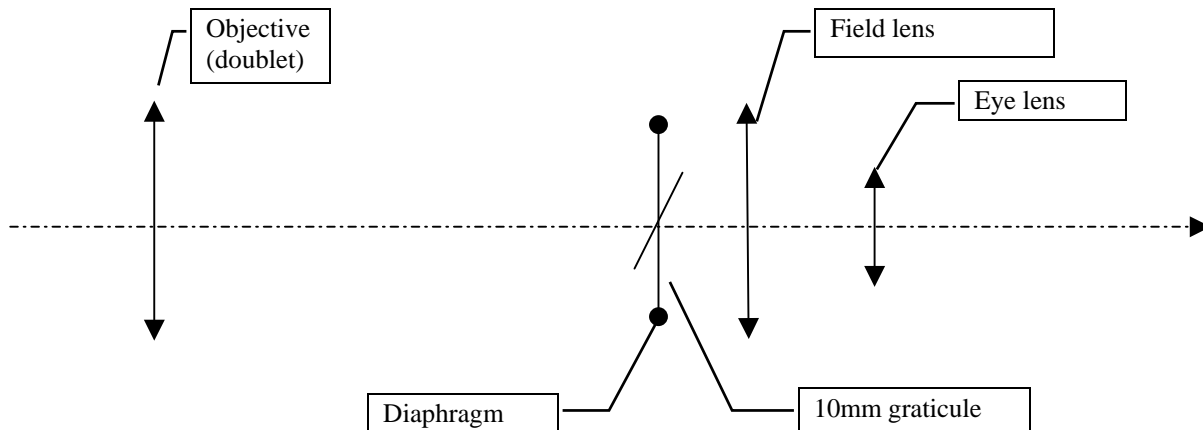


Lab about afocal visual system

18 nov 2009

First part : calculation of the properties of the afocal system

The objective is a doublet lens (corrected from spherical and chromatic aberrations) and the eyepiece has a magnifying power of 10 (ie a focal length of 25mm) (standard eyepiece used in the student labs).



Characteristics of each element of the system

Elements	Diameter (mm)	Focal length (mm)
Objective	23	120
Field lens	20	45
Eye lens	13	30

Diameter of the diaphragm in the plane of the graticule : 17 mm

- 1 :** Calculate the distance e between the two lenses of the eyepiece. Calculate the position of its first and second focal points. How will the focal length of the eyepiece change if the distance e is increased or decreased by 1mm?
 - 2 :** The field lens is at a fixed distance from the graticule and the eye lens is adjustable. If the eye accommodates at 25cm, what will be the distance e that we will have chosen ? (hint : this distance should be smaller than the proper distance).
 - 3 :** Calculate the magnification of the afocal system (for a perfect adjustment of the eyepiece).
 - 4 :** Calculate the position and diameter of the exit pupil.
 - 5 :** Calculate the size and position of the diaphragm conjugated with the eye lens in the intermediate space (the space where the graticule is located).
 - 6 :** Make a drawing to scale (1 along the optical axis, 2 in the transverse direction) of the afocal system and draw the path of a bundle of rays from an object at infinity passing through the whole system with the maximum aperture.
- * *Calculation of the field of view in the intermediate space.*
- 7 :** Determine graphically the bright field diameter. Which element is limiting this field ?
 - 8 :** Determine graphically the total field diameter. Which element is limiting this field ?
 - 9 :** Calculate the fields in the intermediate space and then the corresponding fields in the object and image space. Write all these values in a table that you will take with you in the lab room.

Second part (in the lab room): measurement of the properties of the afocal system

- 1: Adjustment of the system to make it afocal: adjust the eyepiece, then the objective. You have at your disposal a collimator and an afocal viewer (that needs to be adjusted using the collimator as a reference).
- 2: Measurement of the magnification of the afocal system using the afocal viewer – Comparison
- 3: Measurement of the diameter of the exit pupil (using the low magnification microscope) – Calculation of the magnification knowing the diameter of the entrance pupil.
- 4: Observation and measurement of the field of view in the image space (using the rotating “eyepiece”)
- 5: Observation and measurement of the variation of flux exiting the system for a point object moving in the object field of the system – Vigneting – Evaluation of the bright field and total fields from this measurement.