

Solutions to exam in Optical Physics 110110

1-2

The only reasonable way to construct it is with an eyepiece made out of two lenses (or more). One (not very good) example is an objective with $f = 150$ mm and an eyepiece with two $f = 30$ mm lenses where the distance between the lenses can be varied between 0 and 30 mm. If the first eyepiece lens is chosen to diameter 20 mm the fov will be $3,8^\circ$

3

Phase change as function of incident angle can be found in the figure to the right. 45° and 58°

4

Brewster angle (from air) is 76.0°

$R = 0.78$ for TE and 0 for TM.

The total reflectance will then be

$$R = \frac{1}{2}(0 + R + (1 - R)^2 R) = 0.41$$

For the desired polarisation component the reflectance is 0.82.

5

The maximum angle outside the etalon is $\arctan(30/200) = 8.53^\circ$, which gives $b = 5.53^\circ$

$$2nd \cos 0^\circ = p\lambda \text{ and } 2nd \cos 5.53^\circ = (p - 40)\lambda \Rightarrow d = \frac{40\lambda}{2n(1 - \cos 5.53^\circ)} = 1.64 \text{ mm}$$

6

There will be four lines corresponding to twice the fundamental frequency of the double slit

