Nalanda Open University

B.Sc Part – II

Course – Physics

Paper – III

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Topic : Construction and working of a Babinet's compensator : - A Babinet compensator is a continuously variable, zero order retarder. It consists of two birefringent wedges, one of which is moveable, and another is fixed to a compensator plate. A Babinet compensator is construction from two pieces of birefringent optical material (quartz prism) with indices n_0 and n_e for light polarized perpendicular and parallel to the optic axis respectively .This device can be inclined towards positive value or negative value as per adjustment. Half wave plate or quarter wave plate is place in device for wavelength. A narrow laser beam with wavelength of ƛ is linearly polarized in the X Z plane at 45^0 to X and propagates through the compensator from left to right along the Y-axis.

(i) For d << 1 , calculate the relative phase shift of the X and Y polarized components of the exit beam in terms of n_0 , n_e , ƛ , 1, d , x .

(ii) Find the value of x, for the case that the emerging light is linearly polarized and circularly polarized. If the path difference in integral multiple of wavelength Δ = nƛ .The path difference due to second birefringent material is Δ = (ƛ/ß)dß

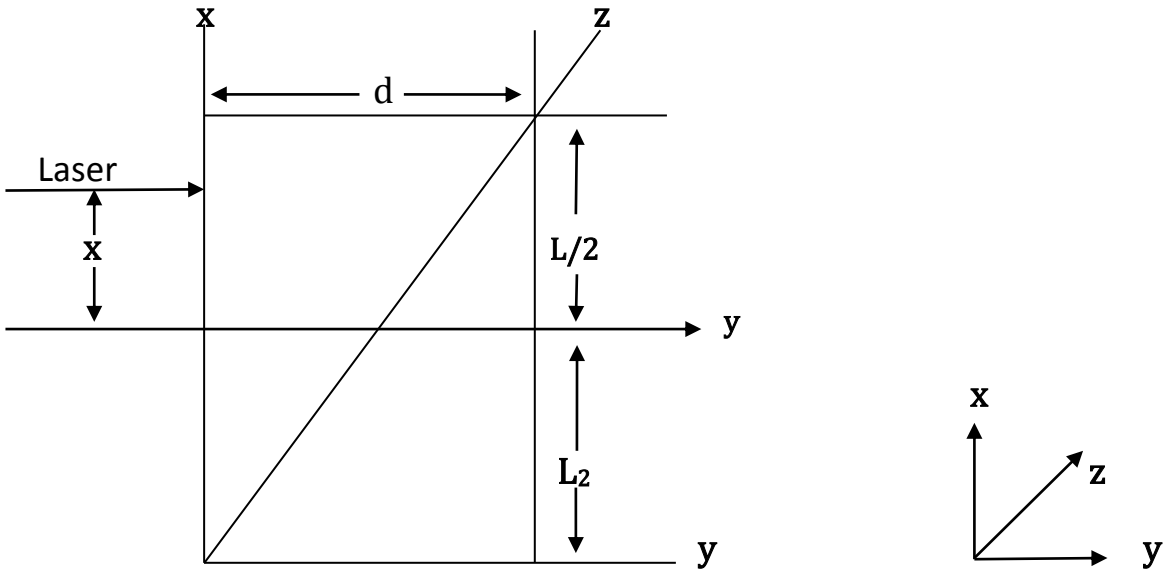

Figure-(1)

Formula used $(n_0-n_e) = ƛdß/ßt$

- Where dß is the fringe shift with second material
- ß is fringe width without the second material
- t is the thickness of the second material
- ƛ is wavelength of the light used
- (n_0-n_e) is difference in the refractive indices of the O and E rays.

Working:- It is a constantly varying wave plate of zero order. It is used for spectrum range to achieve retardance. Long birefringes wedges position for attaining desired retardance. Now, set up the apparatus then using the micrometer of the Babinet Compensator, the fringe width is measured.A mica sheet is introduced between the polarizer and compensator so there will be fringe shift. Measure the fringe shift through micrometer for different fringes and time the fringe shift is calculated the birefringence by using the above formula.

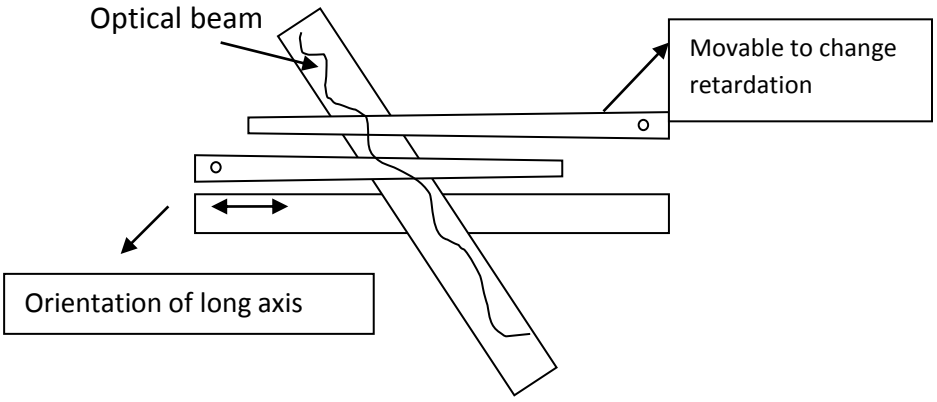

Figure.-(2)