Substituting value of dt_1 from equation (iv) in this, we obtain,

$$\nu_1 = \frac{\nu \cdot \cancel{dt}}{\cancel{dt}\left(1 - \frac{v}{c}\cos\alpha\right)}$$

or $$\nu_1 = \frac{\nu}{1 - \frac{v}{c}\cos\alpha} \quad \ldots\ldots\ldots (vi)$$

This gives the apparent frequency

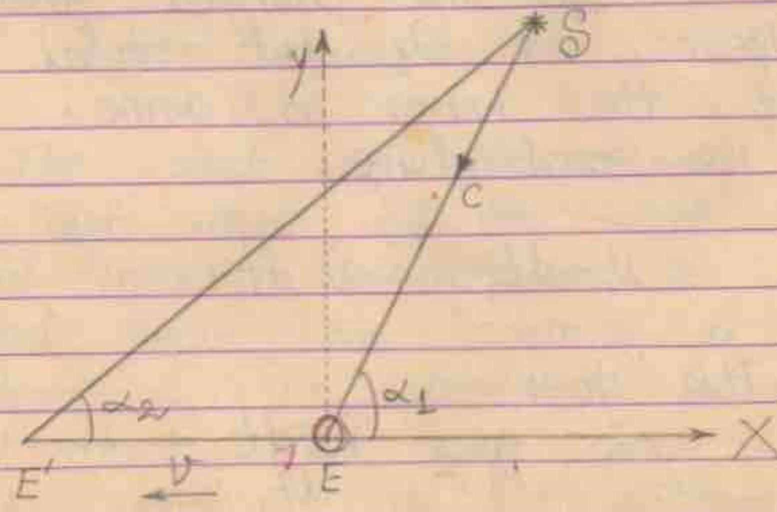
$$\nu_1 \simeq \nu\left(1 + \frac{v}{c}\cos\alpha\right) \quad \ldots\ldots (vii)$$

where higher powers of v/c has been neglected.

This change of frequency is observable only with velocity v comparable to that of light.

aberration

b) Astronomical ~~abbreation~~



The apparent change of angular position of a star (source of light) due to change in position of observer is called astronomical ~~abbration~~ aberration.

For calculating abberation we consider the rectangular set of axes relative to origin at point E, which is represented as X, Y and Z. With axes X-Y in the plane of paper and Z perpendicular to it at E, marked by small circle. In this system point E, which is the Earth is at rest at an instant of time t_1. At this instant light coming from distant star S makes angle α_1 with positive X-axis as is viewed by static observer on the Earth.

Let us now consider another instant of time t_2 when the Earth is supposed to be moving with velocity v relative to the static axes X, Y and Z. In order that a ray of light coming from star S may be received in a telescope moving with the Earth. The telescope must be inclined at an angle α_2 at position E'.

For triangle $EE'S$,
let $SE = c$, $EE' = v$ then,