from triangle EE'S we have

$$\frac{c}{\sin\alpha_2} = \frac{v}{\sin(\alpha_1-\alpha_2)} \quad \ldots\ldots\ldots (i)$$

Since $\angle ESE' = (\alpha_1-\alpha_2)$

$\angle(\alpha_1-\alpha_2)$ is very small for relative motion v and c. Therefore, we may replace the angle for sine function and write

$$\sin(\alpha_1-\alpha_2) \simeq \alpha_1-\alpha_2$$

Such that equation (i) gives

$$\alpha_1-\alpha_2 = \frac{v}{c}\sin\alpha_2 \quad \ldots\ldots (ii)$$

This angle is known as the angle of aberration. By measuring this angle with the help of some arrangement we can calculate velocity of light. This was ~~first observed~~ first of all used by Bradley for determination of velocity of light in the year 1727.

It layed to the conclusion that velocity of light is measurable and can be measured.

instant of time defined by (is given by the time of start 't + dt' plus time taken by the wave in travelling distance S'P),

$$t + dt + \frac{S'P}{c}$$

$$= t + dt + \frac{l - v\,dt\cos\alpha}{c} \quad \ldots\ldots \text{(iii)}$$

Therefore, during the time dt_1 $\nu \cdot dt$ waves will arrive at point P, where we have,

dt_1 = Time taken for last wave − Time taken for first wave.

or, $$dt_1 = (t + dt) + \frac{l - v\,dt\cos\alpha}{c} - \left(t + \frac{l}{c}\right)$$

or, $$dt_1 = dt - \frac{v\,dt\cos\alpha}{c}$$

or, $$dt_1 = dt\left(1 - \frac{v}{c}\cos\alpha\right) \quad \ldots\ldots\ldots \text{(iv)}$$

If the changed frequency appears as ν_1 but total number of the waves is the same. we must have,

$$\nu_1 \cdot dt_1 = \nu \cdot dt$$

This gives,

$$\nu_1 = \frac{\nu \cdot dt}{dt_1} \quad \ldots\ldots\ldots\ldots \text{(v)}$$