prof. Vidya Sagar
Department of physics
B.Sc (Part-I) Hons

Fresnel's Drag Coefficient:-

Let ω be the velocity of water with respect to the appartus and c/μ is the velocity of light relative to water, where μ is the refractive index of water. Thus in our formula for addition of velocity is

$$u' = \frac{c}{\mu} \text{ and } v = \omega$$

The velocity of light relative to appartus is

$$u = \frac{u' + v}{1 + u'v/c^2}$$

$$= \frac{\frac{c}{\mu} + \omega}{1 + \frac{c}{\mu} \cdot \frac{\omega}{c^2}}$$

$$= \frac{\frac{c}{\mu} + \omega}{1 + \frac{\omega}{\mu c}}$$

or. $u = \left(\frac{c}{\mu} + \omega\right)\left(1 + \frac{\omega}{\mu c}\right)^{-1}$

or, $u \approx \left(\frac{c}{\mu} + \omega\right)\left(1 - \frac{\omega}{\mu c}\right)$

$$\therefore u = \frac{c}{\mu} - \frac{c\omega}{\mu^2 c} + \omega - \frac{\omega^2}{\mu c}$$

Neglecting the term $\frac{\omega^2}{\mu c}$, we get

$$\mu = \frac{c}{\mu} + \omega\left(1 - \frac{1}{\mu^2}\right) \quad \text{—— (5)}$$

This is exactly the observed first order effect as observed by Fresnel and is called Fresnel's drag equation

$$\therefore \mu = \frac{c}{\mu} + K\omega$$

where $K = \left(1 - \frac{1}{\mu^2}\right)$ and is called Fresnel's drag Cofficient. Thus the Fresnel's drag is the necessary Consequence of the relativistic addition of velocities and not due to any drag of ether as thought of by Fresnel.

Scanned with CamScanner