$$L = v\frac{1}{2}(\Delta t)_{\rm red}$$

$$R = \sqrt{H^2 + (\frac{1}{2}v\Delta t_{\rm r})^2}$$

$$\Delta t_{\rm r} = \frac{2R}{c} = \frac{2\sqrt{H^2 + (\frac{1}{2}v\Delta t_{\rm r})^2}}{c}$$

$$\Delta t_{\rm r} = \frac{2H}{c}\frac{1}{\sqrt{1 - (\frac{v^2}{c^2})}}$$

$$\gamma \equiv \frac{1}{\sqrt{1 - (\frac{v^2}{c^2})}}$$

$$\Delta t_{\rm b} = \frac{2H}{c}$$

$$\Delta t_{\rm r} = \frac{2H}{c}\gamma$$