飞行时间法测中子能量.

$E_{neutron} = \frac{1}{2} m_n \left(\frac{L}{T_{OF}}\right)^2$ 其中 L 为长度测量. T_{OF} 为飞行时间的测量.

设长度测量的方差为 σ_L，飞行时间的测量误差为 σ_{TOF}. 题意 L 与 T_{OF} 是相互独立的参量. 即 $cov(L, T_{OF}) = 0$.

所以 $\Delta E^2 = \left(\frac{\partial E_{neutron}}{\partial L}\right)^2 \sigma_L^2 + \left(\frac{\partial E}{\partial T_{OF}}\right)^2 \sigma_{TOF}^2$.

$= \left(\frac{m_n L}{T_{OF}^2}\right)^2 \sigma_L^2 + \left(\frac{m_n L^2}{T_{OF}^3}\right)^2 \sigma_{TOF}^2$. (*)

$\Delta E = (*)^{\frac{1}{2}}$ $R(E) = \frac{\Delta E}{E_{neutron}}$

$= \gamma \left(\frac{\sigma_L^2}{L^2} + \frac{\sigma_{TOF}^2}{T_{OF}^2}\right)^{\frac{1}{2}}$