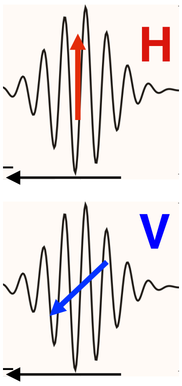
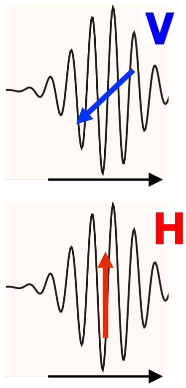
Collapse of a wavefunction

Measurement of the polarization of two distant entangled photons with opposite polarization



$\Psi_{\uparrow\downarrow}$

$\Psi_{\downarrow\uparrow}$



r_1 r_2

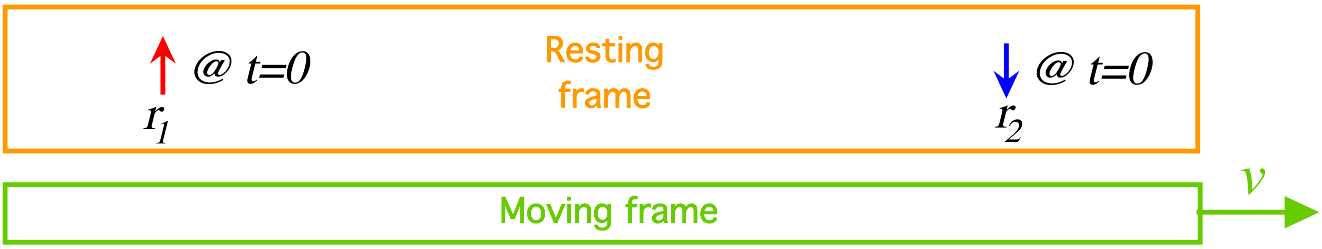
Before a measurement in r_1: $\Psi = \alpha\Psi_{\uparrow\downarrow} + \beta\Psi_{\downarrow\uparrow}$ with $\alpha^2 + \beta^2 = 1$

With a measurement in r_1: $\alpha = 0$ or 1, $\beta = 1$ or 0

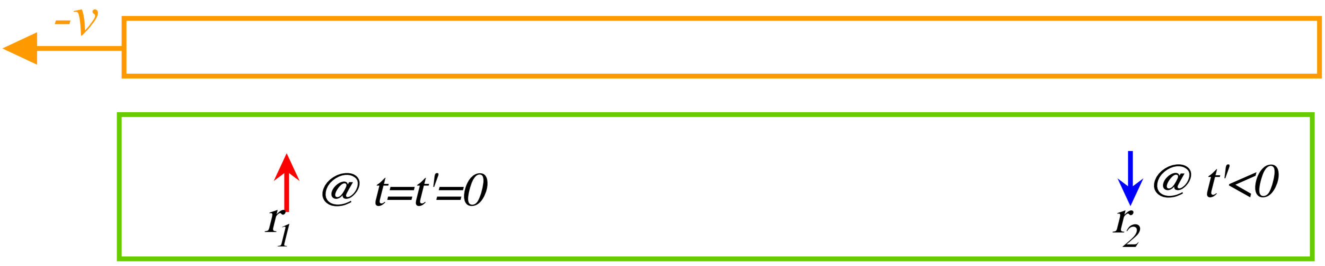
(wavefunction "collapses" to $\Psi_{\uparrow\downarrow}$ or $\Psi_{\downarrow\uparrow}$)

The same experiment in a "resting" frame and in a frame moving at relativistic velocity v:

Resting frame: *"I measure α =1 and conclude that β =0 at t = 0"*



Frame moving with v: "A measurement of $\alpha = 1$ at $t = t' = 0$ *would imply that $\beta = 0$ was determined already at a time $t' < 0$."*



$$t' = -\gamma(v)\frac{v}{c^2}(r_2 - r_1)$$

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