$$1 - \int_a^b \left[E(x,t)\right]^2 dx = 1 - \int_a^b P(u(t)|x)H(t|x)\, dx$$

$$= 1 - \int_a^b da$$

$$= 1 - A\int_a^b \frac{mw}{2\pi\hbar} e^{\frac{-mw^2}{2\hbar}x^2}\, dx$$

$$= 1 - A\sqrt{\frac{mw}{2\pi\hbar}}\int_a^b e^{\frac{-mw^2}{2\hbar}x^2}\, dx$$

For

$$V(x) = \frac{1}{2}mw^2x^2$$

$$\frac{1}{2}m\alpha^2$$

For

$$\hbar\omega = \alpha$$

$$\Rightarrow 1 - \int_a^b \left[\Phi(u(t)|x)\right]^2 dx \approx 0.5$$