

Baryon  $n^0$

Heisenberg  
Uncertainty  
principle

$N^0$  particles

$$B = \frac{1}{3} (N(q) - N(\bar{q}))$$

$$\Delta x \Delta p \geq \hbar/2$$

$$\Delta E \Delta t \geq \hbar/2$$

$$\delta N = -N \lambda \delta t$$

$$\frac{dN}{dt} = -N \lambda$$

$$N = N_0 e^{-\lambda t}$$

Half life

$$e^{-\lambda t} = 1/2$$

$$t_{1/2} = \frac{\ln(2)}{\lambda}$$

Mean life

$$1/\lambda$$

Planck length

gravity

$$\left(\frac{G\hbar}{c^3}\right)^{1/2} \sim 10^{-55} \text{ m}$$

$$\left(\frac{\hbar c^3}{G}\right) \sim 10^{19} \text{ GeV}$$

Initial activity

$\langle \text{activity} \rangle$

$$\lambda N_0$$

$$A = \frac{N_0/2}{\ln(2)/\lambda} = \frac{N_0 \lambda}{2 \ln(2)}$$

Range force  
exchange  $p$   $E_0$

if  $\frac{hc}{2E} \geq E_0$

$\lambda_B \leq \text{range int'ct}$

Special relativity

$$hc/E_0$$

$$\frac{hc}{uE} \leq \frac{hc}{E_0}$$

$$E^2 = (pc)^2 + (m_0 c^2)^2$$

$$E = m_0 c^2 + uE$$

