

(i) Parity conservation  $\rightarrow A=0$  or  $B=0$

$$(ii) |M|^2 = \frac{1}{2} \text{Tr} \left[ (A + B\gamma^5)(\not{p}_p + m_p)(A^* - B^*\gamma^5)(\not{p}_e + m_e) \right]$$
$$= (|A|^2 + |B|^2) \left( m_p^2 - m_e^2 + m_e^2 \right) + 2m_e m_p (|A|^2 - |B|^2)$$

for  $m_e = 0$ ,

$$\Gamma = \frac{1}{2m_p} \int |M|^2 d\Omega^{(2)} = \frac{|A|^2 + |B|^2}{16\pi} m_p \left( 1 - \frac{m_e^2}{m_p^2} \right)$$

$$(iii) \text{ so } |A|^2 + |B|^2 < 1.7 \times 10^{-63}$$

(iv) IN THE  $\bar{u}$  REF FRAME, THE  $\gamma$  DISTRIBUTION IS ISOTROPIC; NOW CHANGE TO P REF. FRAME:

$$\omega_0 \cos \theta_0 = \gamma (\omega \cos \theta - \beta \omega)$$
$$\omega_0 \sin \theta_0 = \omega \sin \theta$$

$$\text{so } \cos \theta_0 = \frac{\cos \theta - \beta}{1 - \beta \cos \theta} ; \text{ LET } d\Omega = 2\pi d\omega \sin \theta,$$

$$\text{AND } d\Omega_0 = d\Omega \frac{1 - \beta^2}{(1 - \beta \cos \theta)^2} = d\Omega \left( \frac{m_p}{E_p} \right)^2 \frac{1}{\left( 1 - \frac{p_p}{E_p} \cos \theta \right)^2}$$