Problema 5, Probl. Tema 3

$$p + {}^{7}Li \longrightarrow \alpha + \alpha$$

$T_p = 18.6\ MeV$

$\theta_{CM} = 75^\circ$

Primero obtenemos $\theta_L = \theta_\alpha = \theta$ para una de ellas en el sistema LAB

$$tg\,\theta = \frac{sen\,\theta_{CM}}{\cos\theta_{CM} + \gamma}$$

donde

$$\gamma = \left[\frac{m_a m_b}{M_A M_B}\,\frac{T_a}{T_a + Q\left(1 + \frac{m_a}{M_A}\right)}\right]^{1/2}$$

$$Q = \left[M(^1H) + M(^7Li) - 2\,M(^4_2He)\right]c^2 =$$

$$= 17.346\ MeV$$

$$\gamma = \sqrt{\frac{1}{7}\,\frac{18.6}{18.6 + \frac{8}{7}\cdot 17.346}} = 0,01157$$

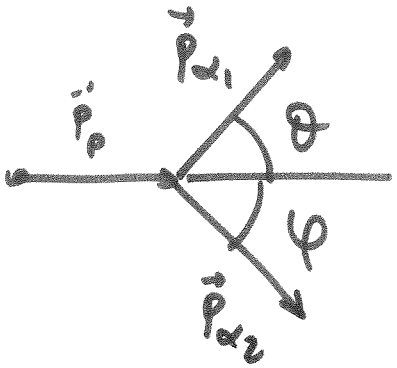
$$tg\,\theta = 3.5739 \qquad \theta = 74.368^\circ$$

Conservación E-p

$$T_p + Q = T_{\alpha_1} + T_{\alpha_2} = \frac{P_{\alpha_1}^2}{2M_\alpha} + \frac{P_{\alpha_2}^2}{2M_\alpha} \qquad M_\alpha = 3727\ MeV/c^2$$

$$P_p = P_{\alpha_1}\cos\theta + P_{\alpha_2}\cos\varphi$$

$$0 = P_{\alpha_1}\operatorname{sen}\theta - P_{\alpha_2}\operatorname{sen}\varphi$$



$\operatorname{sen}\theta = 0.963$
$\cos\theta = 0.269$
$T_p = 18.6\ MeV$

$$P_p = \sqrt{2M_p T_p} = \sqrt{2 \cdot 938 \cdot 18{,}6} = 186.82\ MeV/c$$

Energías en MeV, momentos en MeV/c :

$$2.68 \cdot 10^5 = P_{\alpha_1}^2 + P_{\alpha_2}^2$$

$$186.8 = 0.269\,P_{\alpha_1} + \cos\varphi\, P_{\alpha_2}$$
$$0 = 0.963\,P_{\alpha_1} - \operatorname{sen}\varphi\, P_{\alpha_2}$$

- $\operatorname{sen}\varphi\, P_{\alpha_2} = 0.963\, P_{\alpha_1}$
  $\cos\varphi\, P_{\alpha_2} = 187 - 0.269\, P_{\alpha_1}$

Resolviendo el sistema

$P_{\alpha_1} = 368.95$ MeV/c

$P_{\alpha_2} = 365.90$ MeV/c

b) $\psi = 76.18^\circ$