

# Barem

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## 1 Steaua puternica

Pentru HE 01075240, tipul spectral G = T= 5700 K

$$E_{\lambda} = \frac{8\pi hc^2}{\lambda^5} \frac{1}{e^{hc/\lambda kT} - 1} \quad (1)$$

$$E = \int_0^{\infty} E_{\lambda} d\lambda = \frac{P}{A} \quad (2)$$

$$\frac{P}{A} = \sigma T^4 \Rightarrow P = \sigma AT^4 \quad (3)$$

P=17695310296851980241715989023.264 W

## 2 Flux

$$\frac{F1}{F2} = 2.512^{-(m1-m2)} \quad (4)$$

$$F1 = 0.12F2 \quad (5)$$

## 3 pp chain

$$m_{4He} - m_{4p} = -4.57 * 10^{-29} Kg \quad (6)$$

$$E = mc^2 \Rightarrow E = 4.11 * 10^{-12} J \quad (7)$$

## 4 Gamma

Pentru  $\theta = 90^\circ$   $\lambda = 1.88 * 10^{-2} \text{ \AA}$ :

$$\Delta\lambda = \frac{h}{m_0 c} (1 - \cos\theta) = 0.0243 \text{ \AA} \quad (8)$$

$$\frac{hc}{\lambda} = \frac{hc}{(\lambda + \Delta\lambda)} + K \quad (9)$$

$$K = \frac{\Delta\lambda}{\lambda(\lambda + \Delta\lambda)} \quad (10)$$

K = 378 KeV

## 5 Muon vs Fe

$$-\frac{dE}{dx} = Kz^2 \frac{Z}{A} \frac{1}{\beta^2} \left[ \frac{1}{2} \ln \frac{2m_e c^2 \beta^2 \gamma^2 T_{max}}{I^2} - \beta^2 - \frac{\delta}{2} \right] \quad (11)$$

Pentru  $\rho_{Fe} = 7.87g/cm^3$   $\frac{1}{\rho} \frac{dE}{dx} \approx 1.4MeVcm^2/g$ , ( $\beta_\gamma = 3$ )  
 $dE \approx 1.4 * 100cm * 7.87 = 1102 \text{ MeV}$

## 6 camera cu bule

$$p = eBr = 8 * 10^{-22} kg - m/s \quad (12)$$

$$E^2 = c^2 p^2 + (m_0 c^2)^2 = 1.6MeV \quad (13)$$

$$h\nu = 2E = 3.2MeV \quad (14)$$