

# The physics of PENELOPE

José M. Fernández-Varea

Facultat de Física (FQA & ICC), Universitat de Barcelona

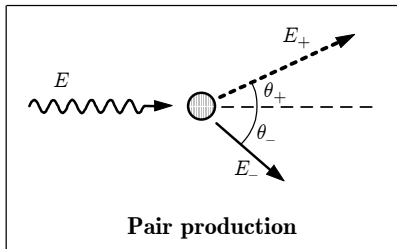
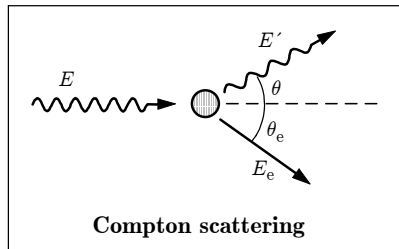
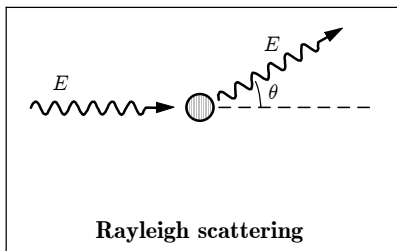
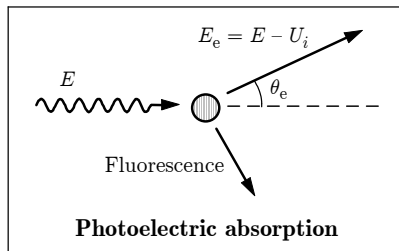
jose@fqa.ub.edu

Universidade de São Paulo, 2019



UNIVERSITAT DE  
BARCELONA

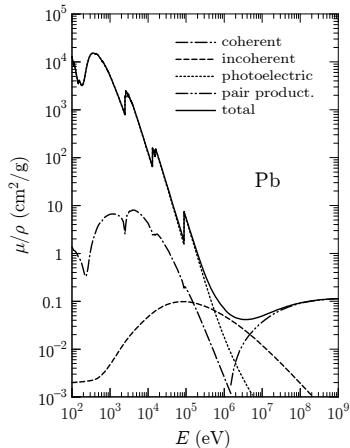
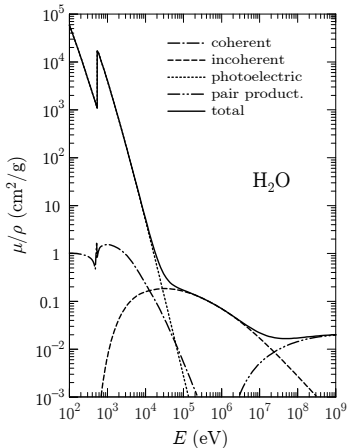
# Interactions of photons



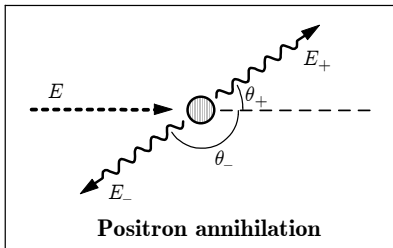
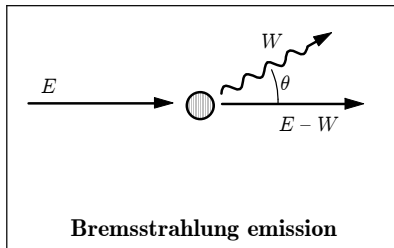
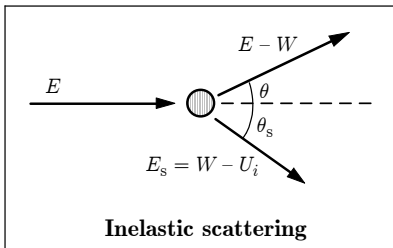
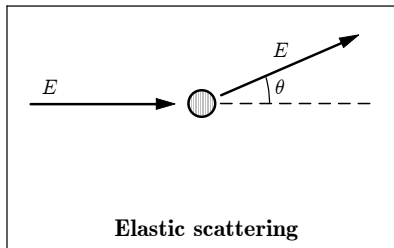
Detailed simulation

# Mass attenuation coefficients

$$\frac{\mu}{\rho} = \frac{N_A}{A_w} (\sigma_{pe} + \sigma_{coh} + \sigma_{inc} + \sigma_{pp})$$



# Interactions of electrons and positrons



Mixed (class II) simulation

# Inverse mean free paths

$$(\rho\lambda)^{-1} = \frac{N_A}{A_w} (\sigma_{\text{el}} + \sigma_{\text{in}} + \sigma_{\text{br}})$$

