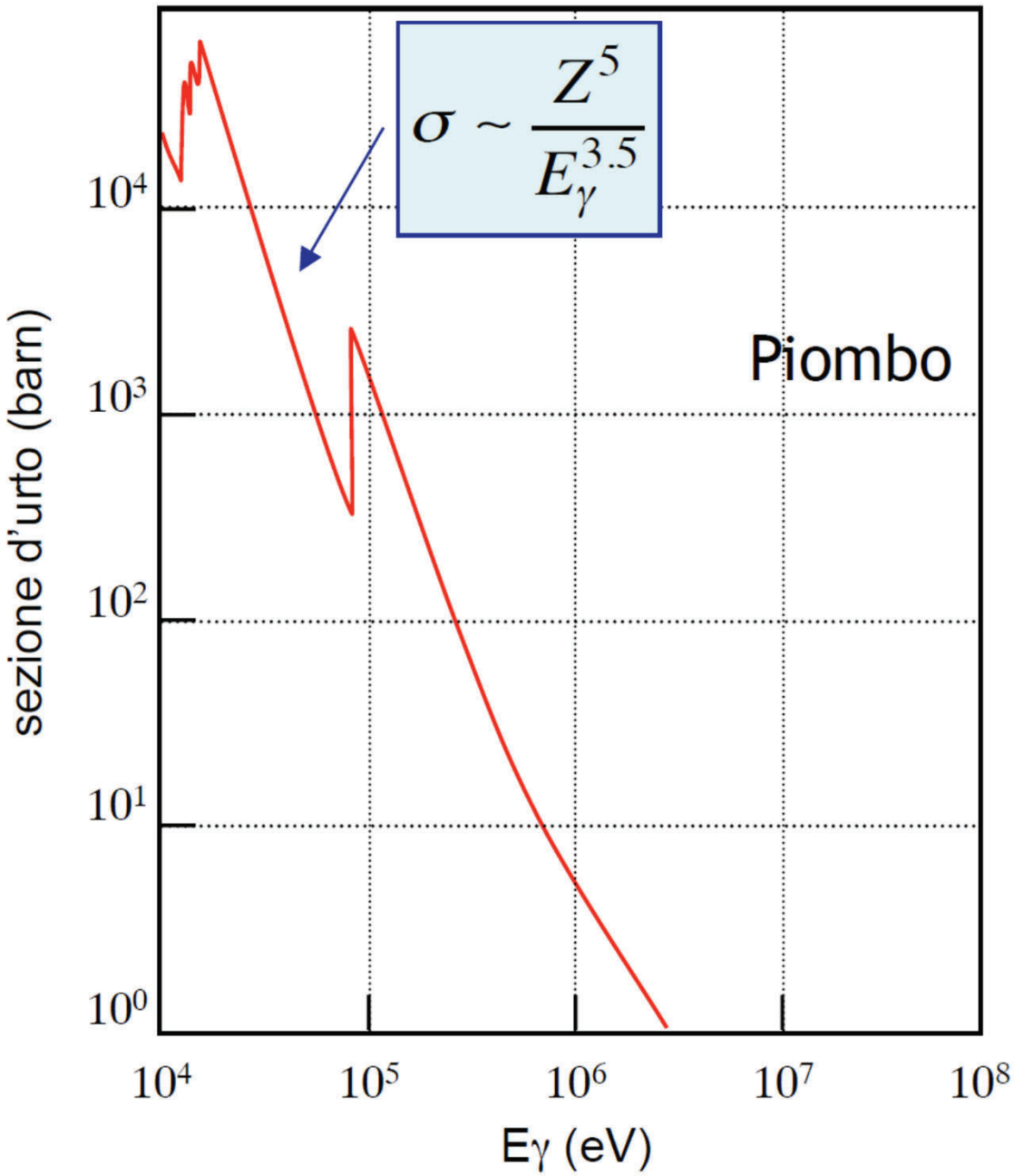
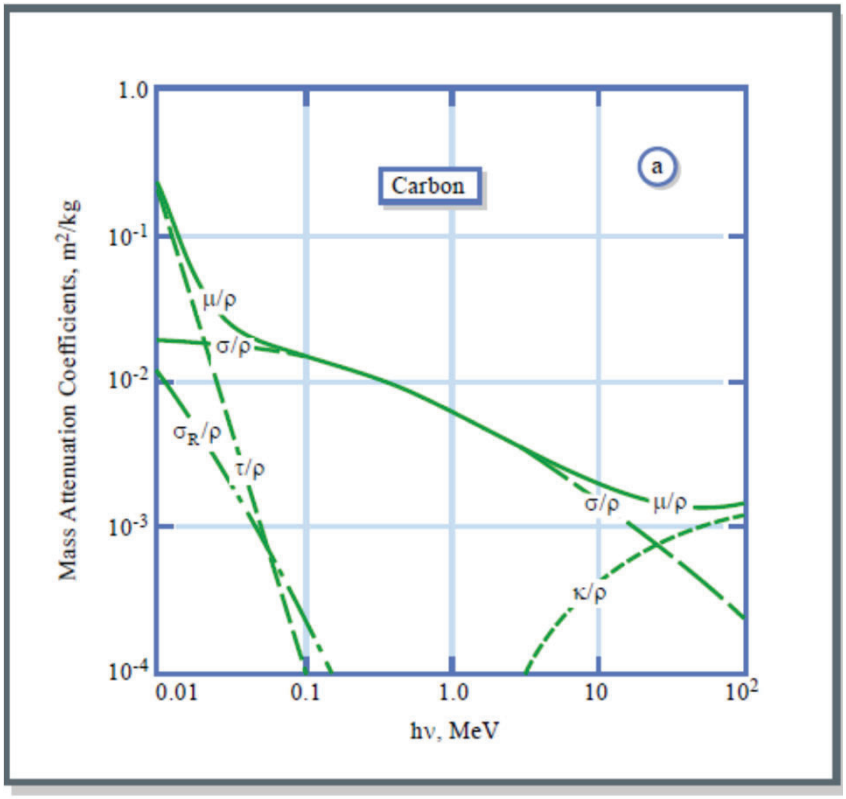
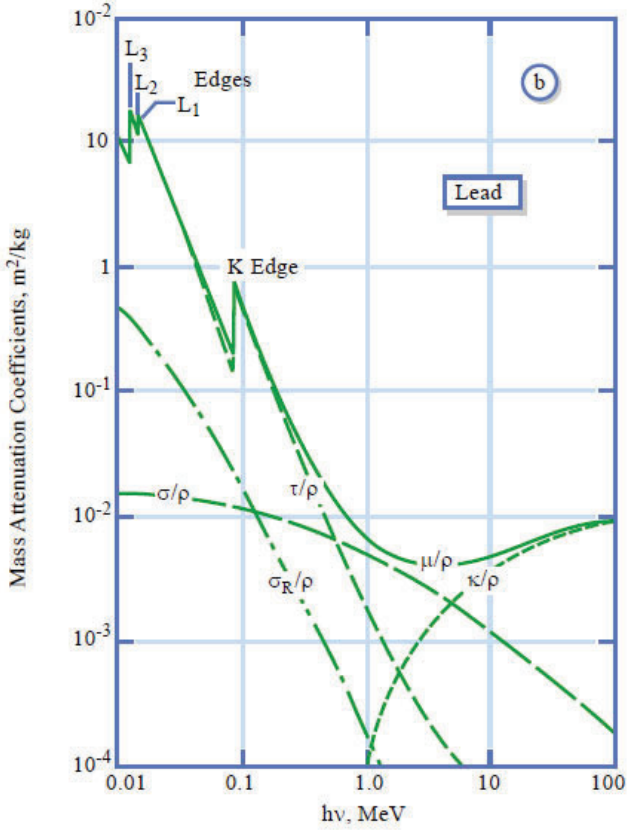
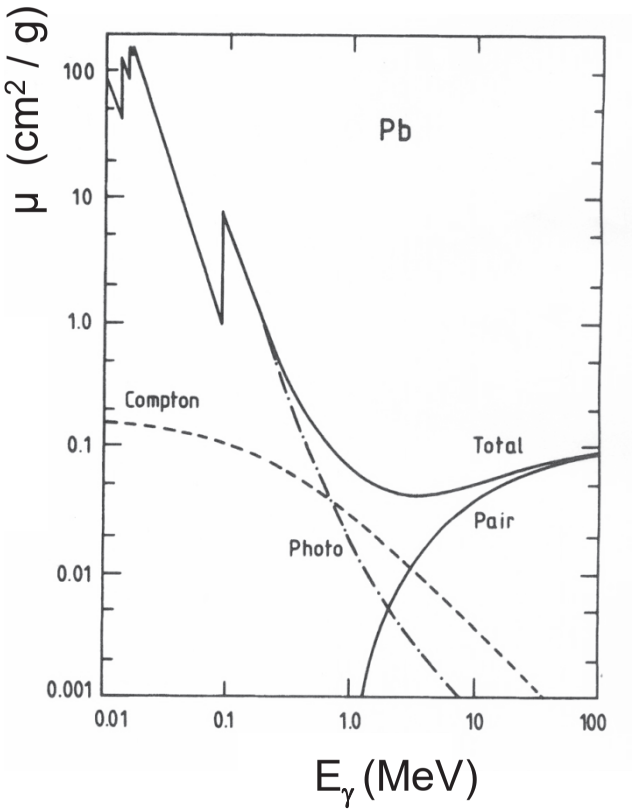
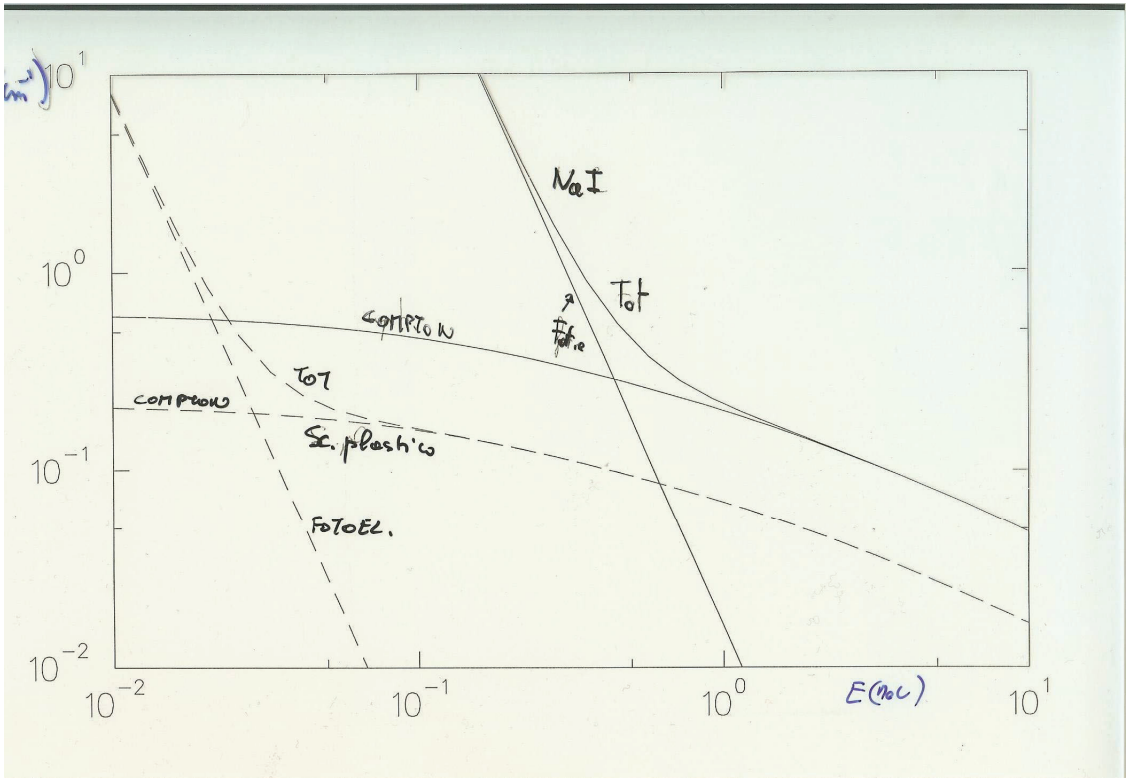

$\sigma \sim \frac{Z^5}{E_\gamma^{3.5}}$
Piombo
sezione d'urto (barn)
10^4
10^3
10^2
10^1
10^0
10^4
10^5
10^6
10^7
10^8
Eγ (eV)

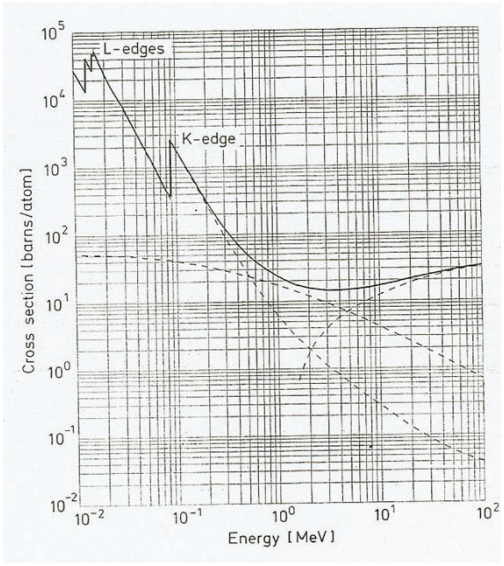




Mass attenuation coefficients for carbon (a) and lead (b). τ/ρ indicates the contribution of the photoelectric effect, σ/ρ is that of the Compton effect, κ/ρ that of pair production, and σ_R/ρ that of Rayleigh (coherent) scattering. μ/ρ is their sum, which is closely approximated in Pb by the τ/ρ curve below $h\nu = 0.1$ MeV.


μ (cm² / g)
Pb
Compton
Photo
Pair
Total
100
10
1.0
0.1
0.01
0.001
0.01
0.1
1.0
10
100
Eγ (MeV)


NaI
Tot
COMPTON
Tot
COMPTON
Sc. plastico
FOTOEL.
E(MeV)


L-edges
K-edge
Cross section [barns/atom]
Energy [MeV]

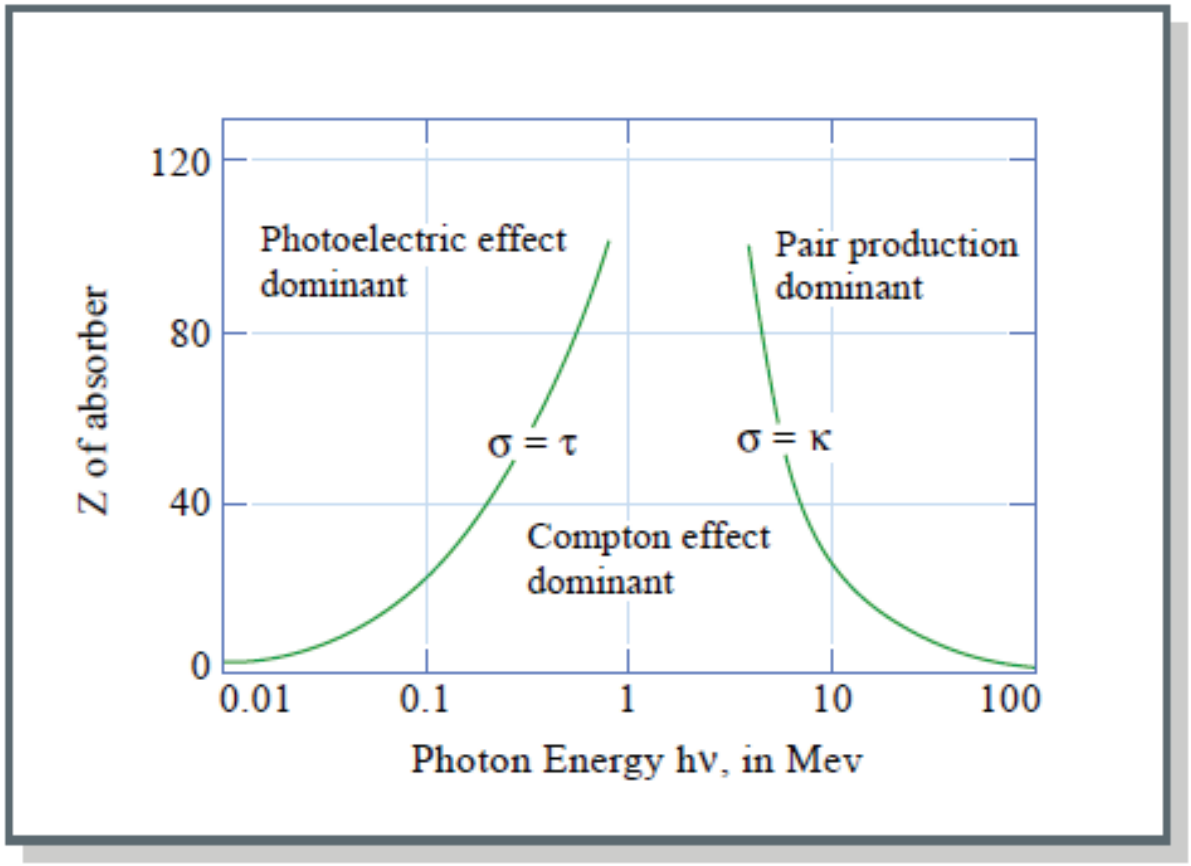
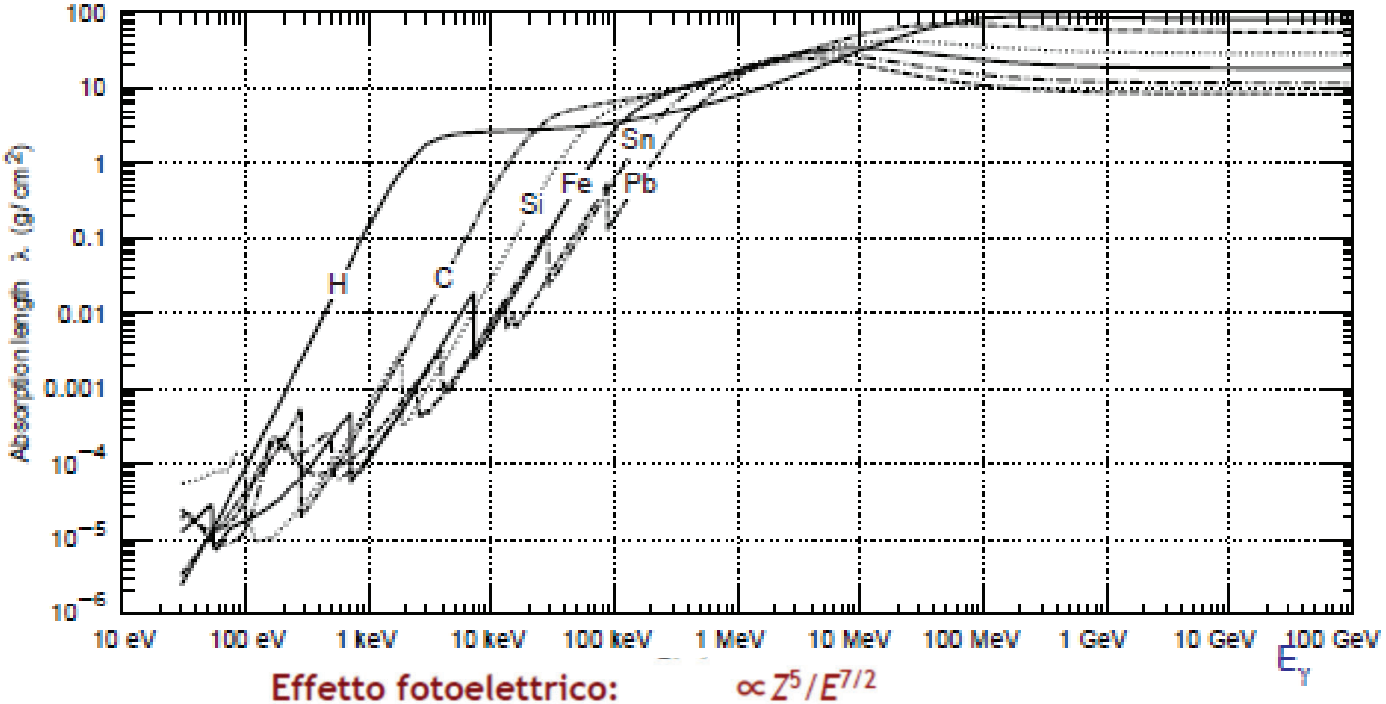


Figure by MIT OCW.

Photon Absorption Length λ

Definition of mass absorption coefficient: $\lambda = \frac{1}{(\mu/\rho)}\ [g\ cm^{-2}]$

$\sigma_{Ph} \propto \frac{Z^5}{E^{3.5}}$ $\sigma_{Compton} \propto \frac{\ln E}{E} \cdot Z$ $\sigma_{Pair} \propto Z^2$



Effetto fotoelettrico: $\propto Z^5/E^{7/2}$

Effetto Compton $\propto Z/E$

Produzione di coppie: su nucleo $\propto Z^2$

su elettroni $\propto Z$

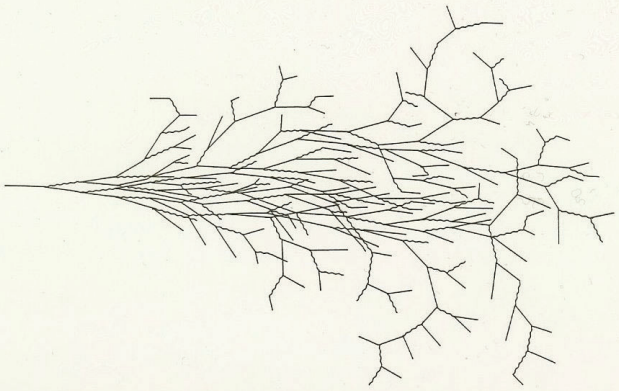
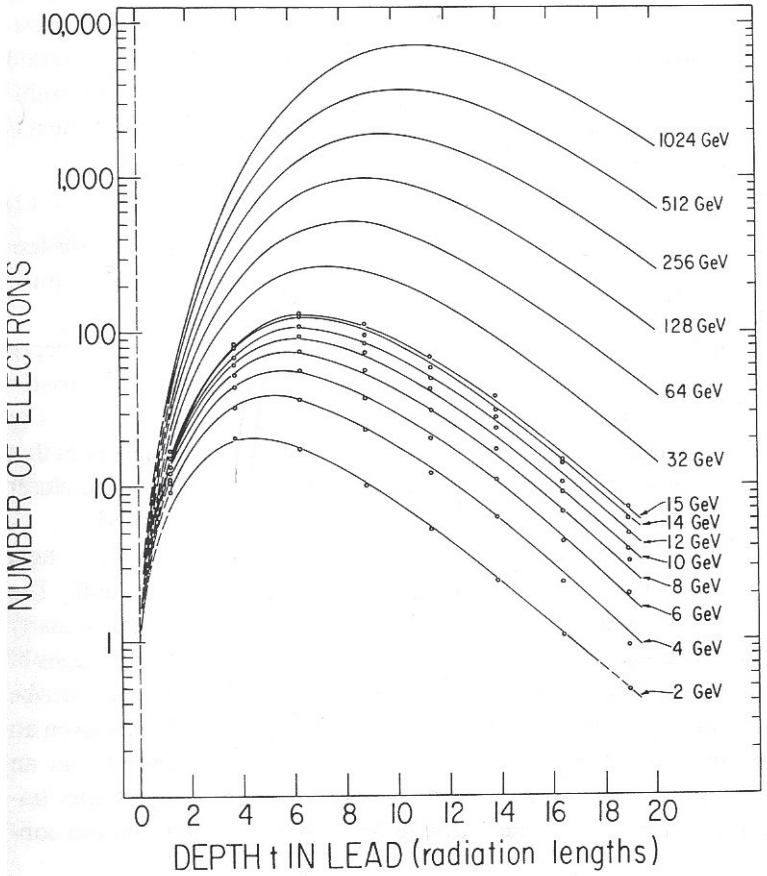
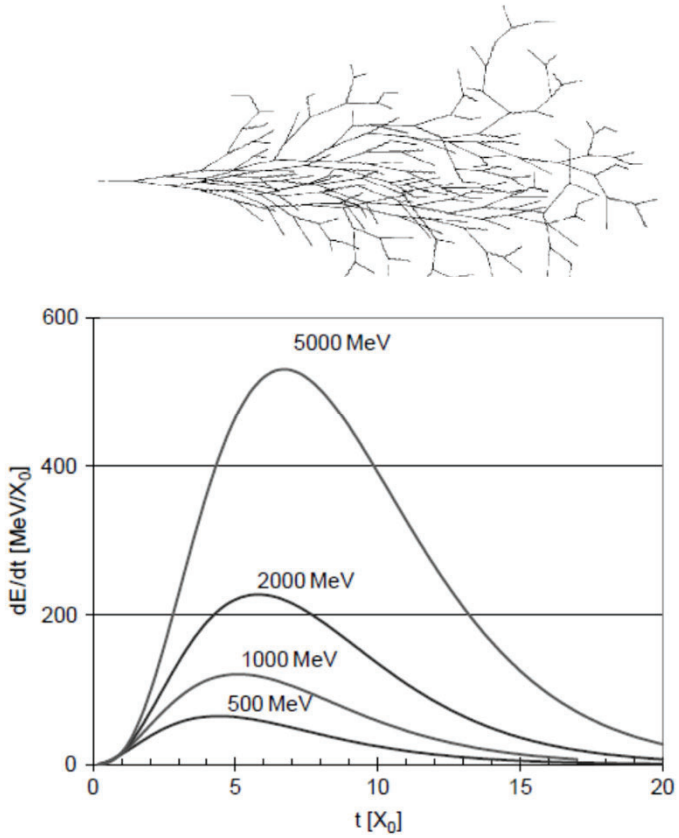


Fig. 7.20. Schematic representation of an electromagnetic cascade. The wavy lines are photons and the solid lines electrons or positrons.

Figure 11.2 Shower profiles in lead. The number of electrons should be multiplied by a normalization factor of 0.79. (D. Müller, Phys. Rev. D 5: 2677, 1972.)





Svilupo longitudinale di una shower em.

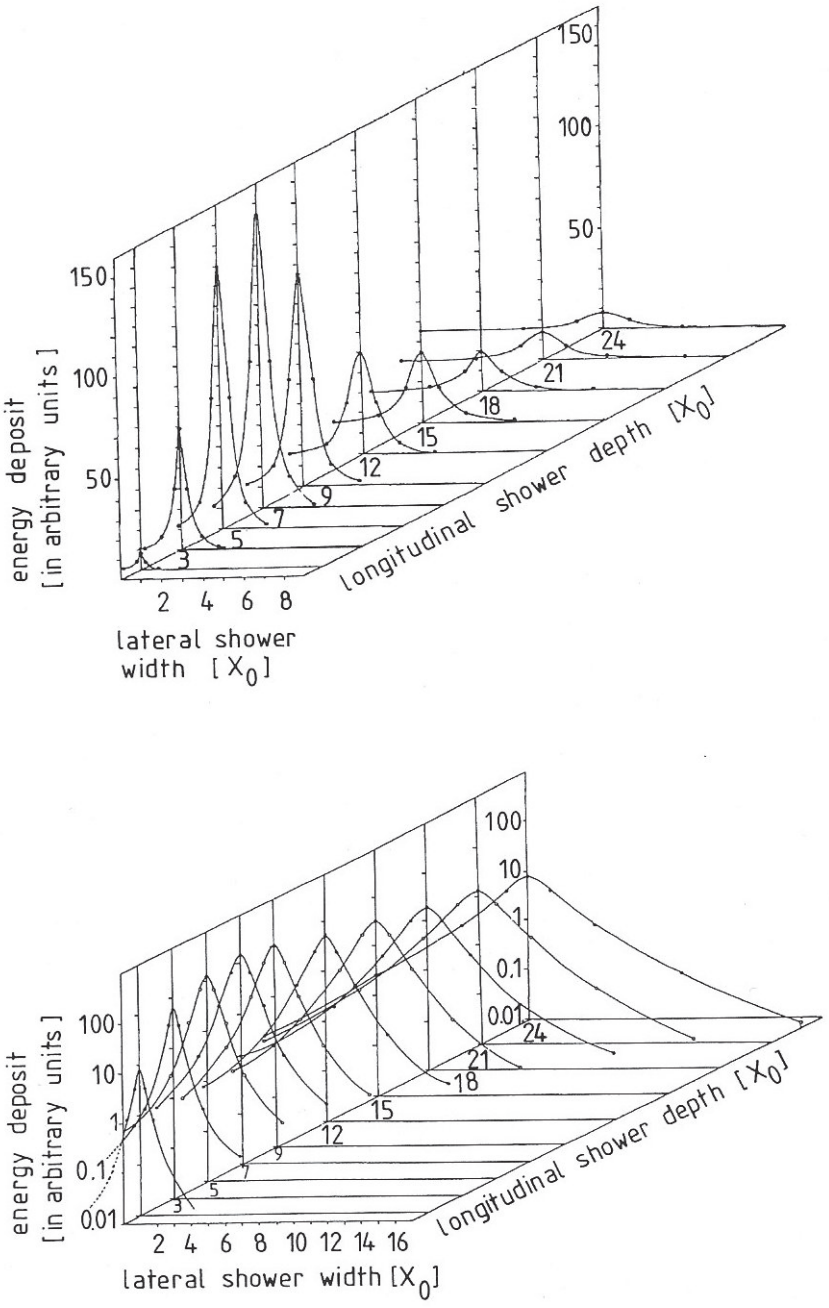


Fig. 7.23. Longitudinal and lateral development of an electron shower (6 GeV) in lead shown with linear and logarithmic scales (based on [504, 505]).

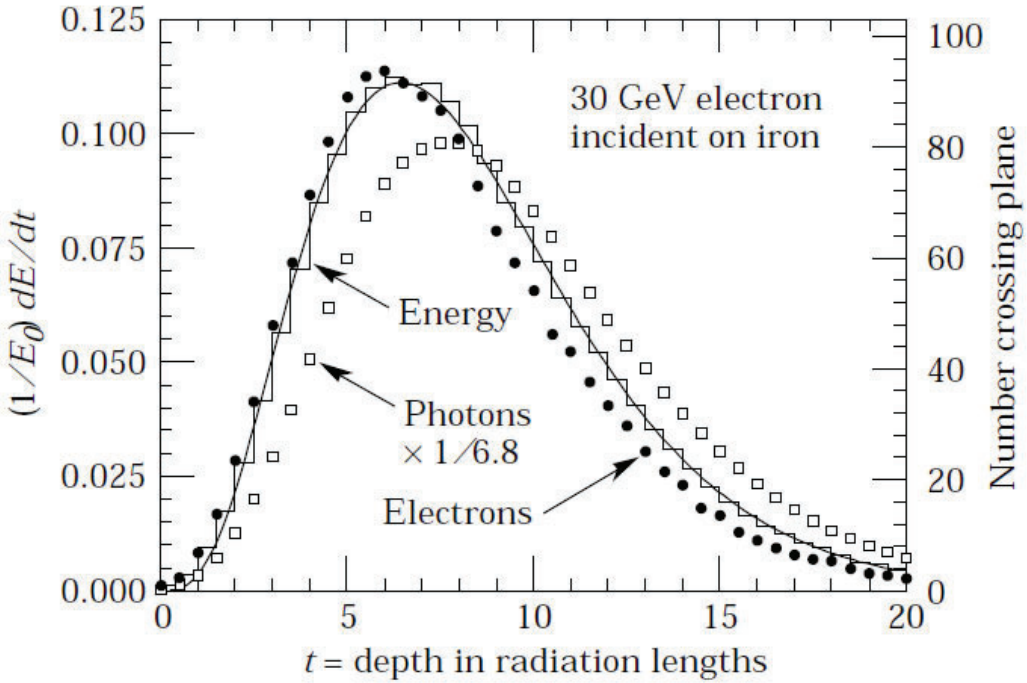


Figure 27.18: An EGS4 simulation of a 30 GeV electron-induced cascade in iron. The histogram shows fractional energy deposition per radiation length, and the curve is a gamma-function fit to the distribution. Circles indicate the number of electrons with total energy greater than 1.5 MeV crossing planes at $X_0/2$ intervals (scale on right) and the squares the number of photons with $E \geq 1.5$ MeV crossing the planes (scaled down to have same area as the electron distribution).