Homework n.1 (2024)

A) Evaluate numerically and plot graphically the convolution integral of the energy spectrum f(E) with a gaussian resolution g(E) defined below.

$f(E) = a_1 f_1(E) + a_2 f_2(E) + a_3 f_3(E)$

$f_1(E) = 1/E$ for $0.1 < E < 0.95$ MeV
$f_1(E) = 0$ for $E < 0.1$ or $E > 0.95$ MeV

$f_2(E) = G(\mu = 1.2 \text{ MeV}, \sigma = 0.01 \text{ MeV})$
$f_3(E) = G(\mu = 0.5 \text{ MeV}, \sigma = 0.01 \text{ MeV})$
with
$a_1 = 1$
$a_2 = 0.5$
$a_3 = 0.1$
in the following 4 cases:

1. $g(E) = G(E, \sigma)$ with $\sigma/E = 5\%/\sqrt{E(\text{MeV})}$
2. $g(E) = G(E, \sigma)$ with $\sigma/E = 10\%/\sqrt{E(\text{MeV})}$
3. $g(E) = G(E, \sigma)$ with $\sigma/E = 30\%/\sqrt{E(\text{MeV})}$
4. $g(E) = G(E, \sigma)$ with $\sigma/E = 1\%/\sqrt{E(\text{MeV})}$

B) (optional) invent yourself an f(E) distribution with sharp edges or peaks and repeat the previous exercise to point out the effect of different resolutions on f(E).