Estimating the Neutron and Spallation Background Noise

- Same method for the rigidity correction: $\mathrm{F}(R_c) = \frac{M(R_c)}{\mathrm{M}(4.7)}$

Correction for new detector thickness:

$$B_{n+s}(E_\gamma) = \mathrm{F}(R_c) \times \frac{\boldsymbol{x}}{\boldsymbol{x_{sigma}}} \times B_{fig}(E_\gamma)$$

Using the detector example in the book for Sigma for a 2cm thick NaI detector

$$B_{n+s}(E_\gamma) = \mathrm{F}(R_c) \times \frac{\boldsymbol{x}}{\boldsymbol{2}} \times B_{fig}(E_\gamma)$$

Correction for material type:

Need to correct for new detector material, Q, and volume, V_{det}:

$$\boldsymbol{m_Q = \rho_Q V_{det} = \rho_Q x_{det} A_{det}}$$

Where A_{det} is the detector area and x is the detector thickness.

$$B_{n+s}(E_\gamma) = \mathrm{F}(R_c) \times \frac{\boldsymbol{m_Q}}{\boldsymbol{m_{sigma}}} \times B_{fig}(E_\gamma)$$

Using the detector example in the book for Sigma for a 2cm thick NaI detector with $A_{Sigma} = 2200cm^2$

$$B_{n+s}(E_\gamma) = \mathrm{F}(R_c) \times \frac{\boldsymbol{\rho_Q x_{det} A_{det}}}{\boldsymbol{\rho_{NaI}(2cm)(2200cm^2)}} \times B_{fig}(E_\gamma)$$

$$\boxed{B_{n+s}(E_\gamma) = \mathrm{F}(R_c) \times \frac{\boldsymbol{\rho_Q x_{det} A_{det}}}{\boldsymbol{\rho_{NaI}(8800cm^3)}} \times B_{fig}(E_\gamma)}$$