Survival probability (i.e. not undergoing an interaction/decay from A → B) fulfills:

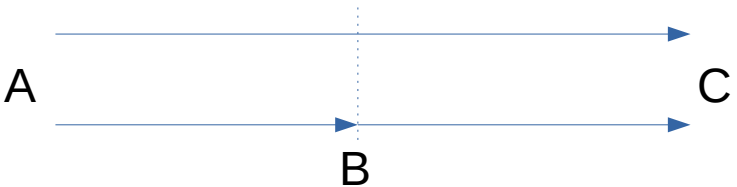
$$\frac{\mathrm{d}P_\mathrm{s}}{\mathrm{d}l} = -\alpha(l)P_\mathrm{s}$$

Non-negative **hazard function** $\alpha = \frac{\sigma\rho}{\langle m\rangle} + \frac{1}{\beta\gamma c\tau_0}$

Here, independent variable **length**, could be different: time, grammage, energy,...

solution: $$P_\mathrm{s}(A,B) = \exp\left(-\int_A^B \alpha(l)\,\mathrm{d}l\right)$$

$$P_\mathrm{s}(A,C) = \exp\left(-\int_A^C \alpha(l)\,\mathrm{d}l\right)$$



$$= \exp\left(-\int_A^B \alpha(l)\,\mathrm{d}l\right)\exp\left(-\int_B^C \alpha(l)\,\mathrm{d}l\right) = P_\mathrm{s}(A,B)\times P_\mathrm{s}(B,C)$$

Survival probability = complementary cumulative distribution function

We sample the place of an event from the probability density function

$$p(l) = \frac{\mathrm{d}}{\mathrm{d}l}(1 - P_{\mathrm{s}})$$