2. Landau theory

For a particle of mass m_x traversing a thickness of material δx, the Landau probability distribution may be written in terms of the universal Landau function $\phi(\lambda)$ as[1]:

$$f(\epsilon, \delta x) = \frac{1}{\xi}\phi(\lambda)$$

where

$$\begin{aligned}
\phi(\lambda) &= \frac{1}{2\pi i}\int_{c+i\infty}^{c-i\infty} \exp(u\ln u + \lambda u)\, du \qquad c \geq 0 \\
\lambda &= \frac{\epsilon - \bar{\epsilon}}{\xi} - \gamma' - \beta^2 - \ln\frac{\xi}{E_{\max}} \\
\gamma' &= 0.422784\ldots = 1 - \gamma \\
\gamma &= 0.577215\ldots \text{(Euler's constant)} \\
\bar{\epsilon} &= \text{average energy loss} \\
\epsilon &= \text{actual energy loss}
\end{aligned}$$

2.1. Restrictions

The Landau formalism makes two restrictive assumptions: