Properties of the transmission function

- **Analytical transmission function (isotropic source)**
  \[
  T(E_0, \varphi) = \begin{cases} 
  0 & \text{for } E_0 < E_a \\
  1 - \frac{E - E_a}{E_{\text{max}}} & \text{for } E_a < E_0 < E_a + \Delta E \\
  1 - \frac{E_{\text{max}} - E_a}{E_{\text{max}}} & \text{for } E_0 > E_a + \Delta E
  \end{cases}
  \]
  defined by MAC-E filter properties

- **Energy resolution** \( \frac{\Delta E}{E} \approx \frac{B_{\text{min}}}{B_{\text{max}}} \sim 1 \text{ eV at } E_0 = 18.6 \text{ keV} \)

- **Response function** is convolution of spectrum, transmission function and other systematics

- **Near future**: Investigation by dedicated electron source (see poster #26)

Emission of cyclotron radiation

- **Cyclotron radiation** depends on pitch angle and z-position

- **Asymmetric broadening** of transmission function by amount of emitted cyclotron radiation

- **Influence visible at \(^{83}\text{mKr}\)-campaign by broadening of lines up to 3% (see poster #13)

Impact on \( m_e \) measurement

Correction of cyclotron radiation compensates the systematic shift of \( \Delta m_e^2 = -2.41 \cdot 10^{-3} \text{ eV}^2 \) not to exceed the total error budget of \( \sigma_{\text{sys tot}} = 0.017 \text{ eV}^2 \)

Electric and magnetic field studies

- **Detailed magnetic and electrostatic simulations** required for modeling of transmission function

- **Kassiopeia software package** used for particle-tracking and field calculations

Impact on \( m_e \) measurement

Correcting for radial dependencies compensates the systematic shift of \( \Delta m_e^2 = +3.3 \cdot 10^{-3} \text{ eV}^2 \) \((B_{\text{min}})\) and \( \Delta m_e^2 = -3.6 \cdot 10^{-3} \text{ eV}^2 \) \((U_a)\)