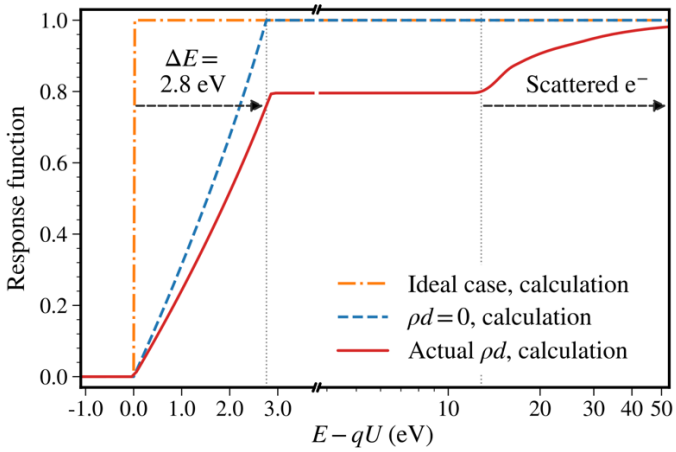
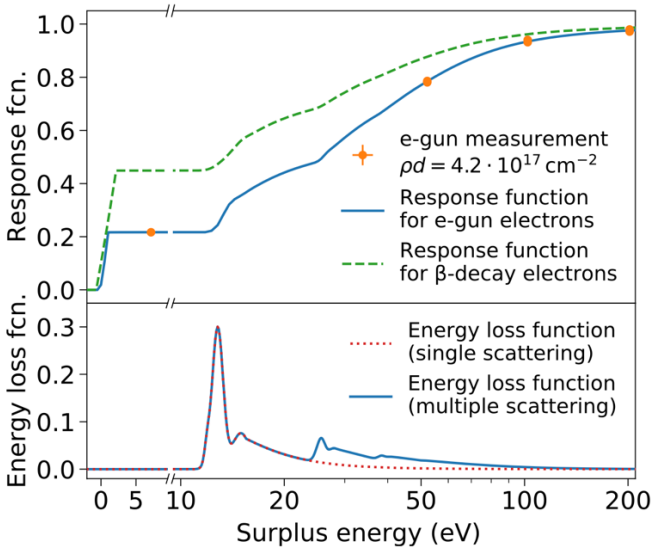
The KATRIN response

KATRIN uses magnetic fields to collimate the β electrons with adiabatic transportation. As the transverse energy of the electron is transformed into longitudinal energy at the analyzing plane, the remaining transverse energy determines the width of the transmission function. Reflection by the maximum magnetic fields limits the maximum pitch angle of electrons, as shown below:



Before reaching the analyzing plane, electrons lose energy by synchrotron radiation and scattering off tritium gas molecules in the source. Therefore, the KATRIN response is described by a convolution of the transmission function and the energy loss function, summed over all possible numbers of scatterings:



The energy loss function is calibrated with the electron gun in between β-decay measurements.