Nuclear recoils simulations with SRIM

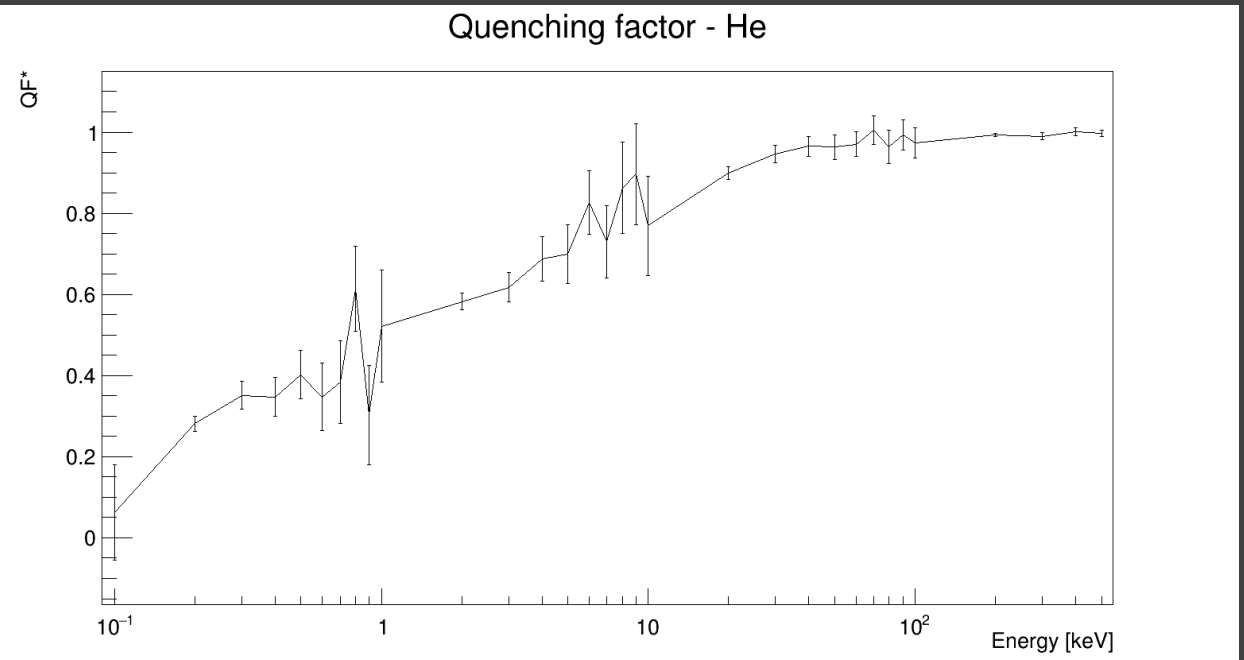
CYGNO SIMULATION MEETING – 21/12/2020

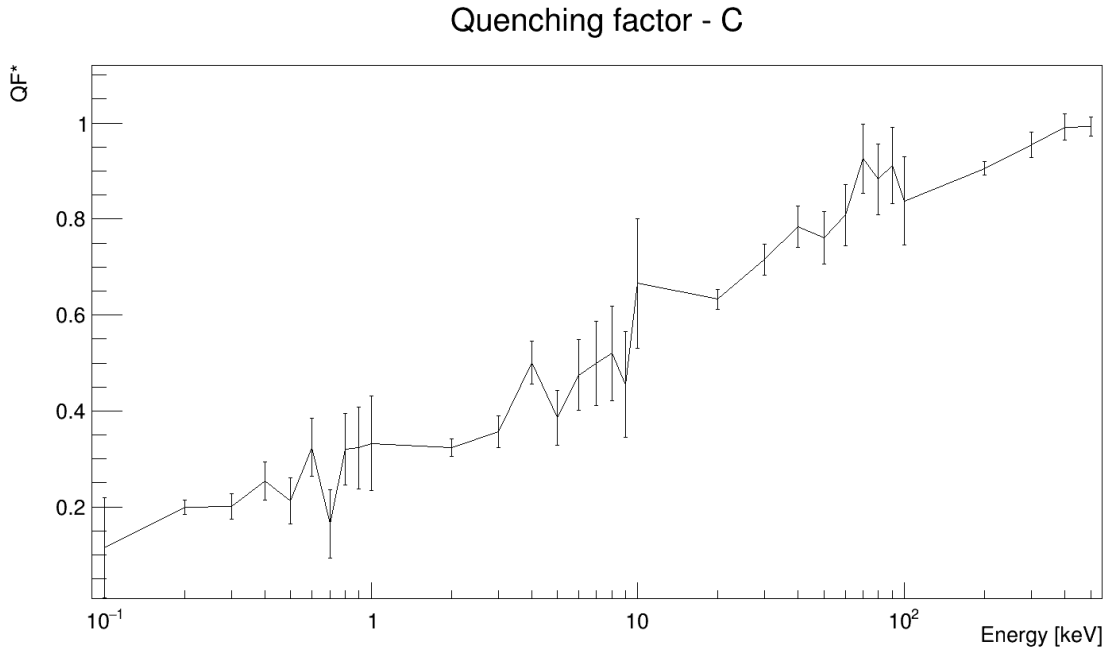
F. DI GIAMBATTISTA, A.F.V. CORTEZ, D. PINCI, E. BARACCHINI

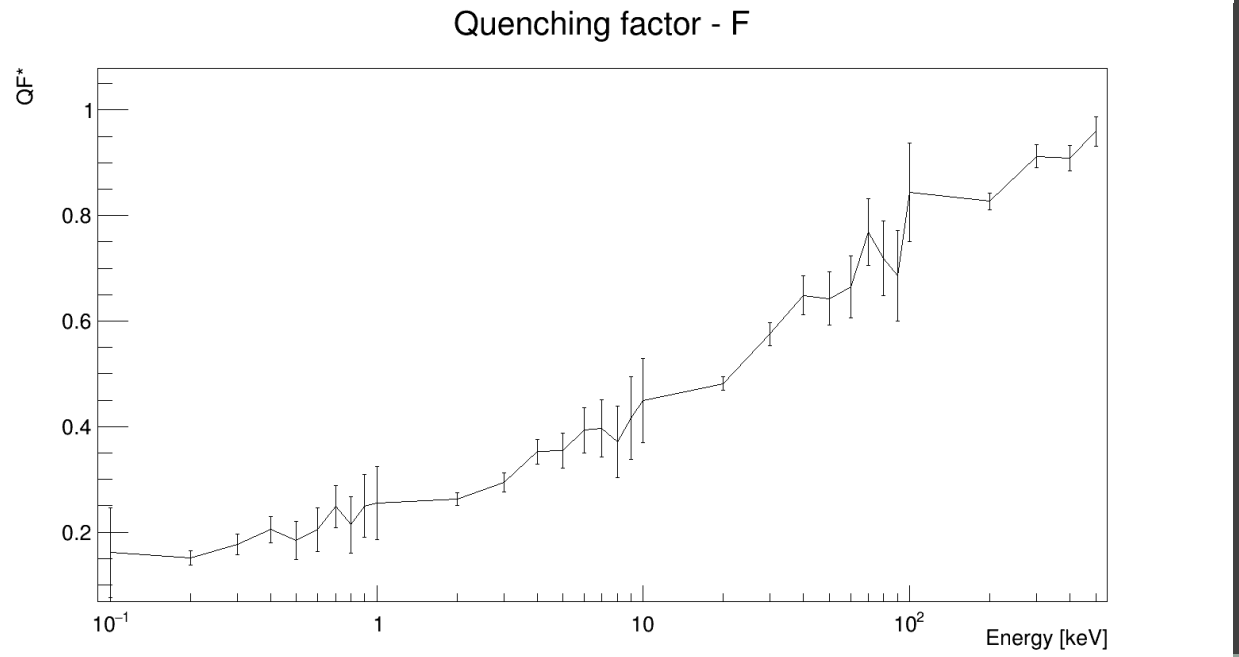
Ionization energy computation

- $E_{ioniz} = E_{dep} \times QF$ at each step
- $QF(E) = \frac{E_{ioniz}^{tot}}{E_{dep}} = \frac{E_{ioniz}^{tot}}{E}$ computed from SRIM output files
- Ions lose energy along the track → QF changes at each energy deposit step ΔE, we need a different definition of QF
- Ionization energy lost by an ion of initial energy $E + \Delta E$ and final energy E:
  - $E_{ioniz}(\Delta E, E) = E_{ioniz}^{tot}(E + \Delta E) - E_{ioniz}^{tot}(E)$
  - $E_{ioniz}(\Delta E, E) = (E + \Delta E) \times QF(E + \Delta E) - E \times QF(E)$
  - New definition: $QF^* = \frac{E_{ioniz}(\Delta E, E)}{\Delta E} = \frac{(E+\Delta E) \times QF(E+\Delta E) - E \times QF(E)}{\Delta E}$

Computed from the «new» definition







Computed from the «old» definition, for energies below 1keV
It should be zero below the ionization potential