Introduction to Subatomis Physics

Homework 3

March 25 2024
Due: April 1 2024

1. (70 points) In radioactive decays, the energy of the emitted particles corresponds to the change in binding energy between mother and daughter nucleus. What is the typical energy for particles emitted in radioactive decays (order of magnitude)?
    i. 1-10eV
    ii. 10-100 keV
    iii. 1-5 MeV
    iv. 1-2 GeV

   With e.g., electrons of this energy, what are the length scales that can be resolved?
    v. 1mm
    vi. 1nm
    vii. 100fm
    viii. 1fm

2. (30 points) For circular accelerators (synchrotrons), the energy that can be achieved is limited by the strength of the magnets. If one wants to build a collider with a beam energy of 100 TeV and a 91km circumference, what magnetic field is needed?
    i. 1Tesla
    ii. 5 Tesla
    iii. 15 Tesla
    iv. 50 Tesla