

Problem sheet 5

Plasma Physics course
TU Dresden
Lecturer: Katerina Falk
Summer semester April – July 2021

Question 1:

a) Consider the pressure equilibrium in a Z-pinch (magnetic confinement approach in inertial confinement fusion research) that has been compressed by its self-generated magnetic field to a radius of $100\ \mu\text{m}$. What is the magnetic pressure at the surface of the pinch, when the total current amounts to 10 kA? How compares this to atmospheric pressure?

b) Assume that the plasma inside the pinch is homogeneous and that $T_e = T_i$ and the electron density is $n_e = 10^{24}\ \text{m}^{-3}$. What is the temperature inside this plasma that is necessary to balance the magnetic pressure by gas kinetic pressure?

Question 2:

Calculate the magnetic field B that is necessary to produce magnetic pressure at the surface of a magnetically confined fusion that is 4 times the kinetic pressure in the plasma center, when the central density is $n_e = 10^{20}\ \text{m}^{-3}$ and the temperature is $T = 20\ \text{keV}$.