PHY 525 Homework 6 Due: Tuesday, Nov 19, 2019

1. Recombination

You do a recombination experiment in a weakly ionized gas in which the main loss mechanism is recombination. You create a plasma of density 10^{20} m^{-3} by a sudden burst of ultraviolet radiation and observe that the density decays to half its initial value in 10 msec. What is the value of the recombination coefficient?

2. Diffusion in a fully ionized plasma

Estimate the classical diffusion time of a plasma cylinder 10 cm in radius, with $n=10^{21}$ m^{-3}, $T_e=T_i=10$KeV, and B=5T.

3. Resistivity

The plasma is heated by a current along a uniform magnetic field B. The Joule heat (ηJ^2) goes to electrons. Find how the electron temperature T_e increases as a function of time. Assume that the plasma density is uniform $n=10^{19}$ m^{-3}, and the current density is 10^5 A/m^2. Calculate the rate of increase of T_e at the time when $T_e=10$eV.