Federal University of Santa Catarina (UFSC) Joinville Technological Center (CTJ) Graduate Program in Engineering and Mechanical Sciences (Pós-ECM)

Course: Plasmas and Electrical Discharges in Gases (ECM410054) Professor: Diego A. Duarte

Glow discharges and Plasmas (List 7)

- 1. For a certain gas, the first Townsend coefficient of ionization is given by the standard equation with A = 15 cm⁻¹·torr⁻¹ and B = 365 V/cm·torr. If the secondary ionization coefficient is equal to 10^{-4} , calculate the minimum breakdown voltage and the minimum value of the pressure-distance product.
- 2. If the breakdown voltage of two parallel plates separated by a gap of 0.1 cm is 4500 V, calculate the total secondary coefficient of ionization γ if the gas is air at a pressure of 760 torr and temperature of 25°C. Take A = 15 cm⁻¹·torr⁻¹ and B = 365 V/cm·torr.
- 3. Calculate the Debye length in a plasma at T = 5000 K if the gas pressure is 0.1 torr and the degree of ionization of the singly ionized is 0.1.
- 4. What is the number of charged particles in the Debye sphere of the above problem?
- 5. Locate the plasma of problem 3 on the chart below and determine the type of plasma, and whether it is natural or man-made.



- 6. Determine the plasma frequency of the positive column of a glow discharge in which the electron density is 1.5×10^{10} electrons/cm³.
- 7. If a certain region of the earth's ionosphere has an electron density of 2×10^5 electrons/cm³, what is the plasma frequency?