**Exercises on High Voltage Engineering (Feb 27, 2025):**

**Exercise 1-2:** Why is collision ionization mainly caused by electrons and not by ions?

**Exercise 1-4:** The ionization energy of oxygen molecule (O2) is 12.5eV. If the average kinetic energy of the gas molecule directly causes O2 to produce thermal ionization, what should be the thermal temperature of the gas?

**Exercise 1-5:** How are negative ions formed? What is the effect of the formation of negative ion on gas discharge?

**Exercise 1-8:** What is the meaning of collision ionization coefficient *α* and cathode surface ionization coefficient *γ*? Why can't the discharge of only *α* process form a self-sustained discharge? How to determine the value of *α* experimentally?

**Exercise 1-9:** What is the significance of the *γ* process for self-sustained discharge? What are the factors that affect *γ*?

**Exercise 1-11:** In a parallel plate electrode device, 107 pairs of positive and negative ions are generated per second per 1cm3 atmosphere due to X-ray irradiation. If the distance between the electrodes *d*=5cm, what is the saturation current density?

**Exercise 1-12:** To obtain the *α* of a gas experimentally. When the distance between the parallel electrodes is 0.4cm and the voltage is 8kV, the current at the steady state is 3.8×10-8 A. Maintaining the field strength, when the distance between the electrodes is reduced to 0.1cm, the current is reduced to 3.8×10-9 A. Try to calculate the *α*, and the number of electrons emitted by the cathode per second by the external ionization factor.

**Supplementary Exercise 1:** What are the new AC transmission voltage levels in China in past 50 years? From which power transmission project and which year do these new voltage levels begin?

**Supplementary Exercise 2:** How to understand "the determination of voltage level is a key issue in the development of power grid"?

**Supplementary Exercise 3:** What are the advantages or characteristics of AC and DC in terms of power transmission capacity?