7-28-2007
Plasma Lab Notes

July 29, 2007

1 The Current I

Given:

$$I = \frac{V}{R}$$

and

$$I = \frac{Q}{T} \, or \, \frac{dQ}{dT}$$

is the equation for the current I where V is voltage and R is resistance. In addition:

$$I = nvqA$$

where n is the density in number of molecules per cm^3. V is the root mean squared velocity and q is the charge of an electron 1.6×10^{-19}. A is the area of the probe.

2 V_{rms} The root mean squared velocity

This is the velocity with which the positive ions hit the probe.
Given equation:

$$V_{rms} = (\frac{K_b T_e}{m_I})^{1/2}$$

where K_b is the Boltzman constant and T_e is the temperatures of the electron and m_I is the mass of the ion.

3 Solve for n

We try to solve for the density of the plasma using the constants we know.

$$R = 890\Omega$$

$$Voltage = 1Volt$$

because we are testing the density per single volt

$$V_{rms} \approx 2.7 \times 10^{11}$$

$$A = \pi \times (\frac{1}{8})^2 \times \frac{1}{4} \times (\frac{1}{2.54})^2$$

Once all the variables are plugged in, the final density for that trial should be:

$$n \approx 1.66 \times 10^{11}$$