# 2.45 GHz Microwave-induced Sheet Plasma Source

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Sheet plasma sources produce reaction regions with high density gradient ideal for thin films and coatings applications. This plasma configuration is realized by combining linear magnetic field to a dual dipole magnetic field.

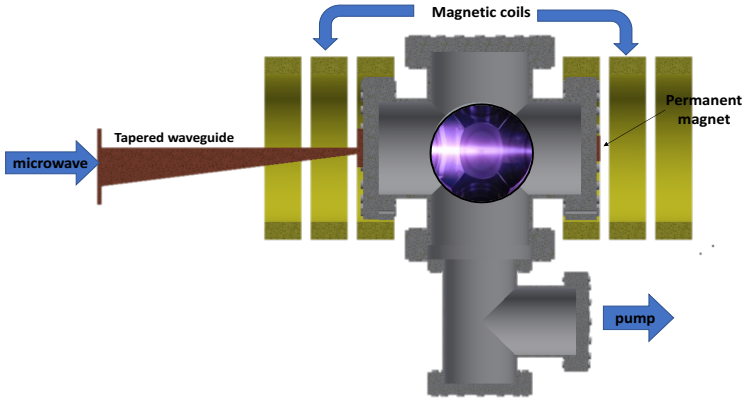


Figure 1: The device set-up showing sheet plasma as seen from the chamber viewport.

The device, as shown in Figure 1, employs a 2.45 GHz microwave generator that can provide a maximal microwave power of 3 kW. Electromagnetic radiation is delivered into the main chamber by a tapered waveguide through a 110 mm by 7 mm horizontal quartz window. Plasma propagates from the microwave inlet region and across the chamber towards a set of neodymium permanent magnets. Six magnetic coils enhance the propagation and confines the plasma into a sheet-like configuration. In this report, ignition parameters and conditions for a stable argon gas discharge were identified.

In the existing device set-up, the microwave power is kept below 1.5 kW to prevent excessive heating of the quartz window which might eventually damage the o-ring that vacuum seals this region. Plasma is attained at lower power with increasing pressure. Higher magnetic field intensity generates plasma at lower power. Sustaining power is found to be independent of the ignition powers as shown in Figure 3. Plasma can be stably maintained at 240 W microwave power at maximum linear magnetic field. Power reflection can be reduced down to 10%.

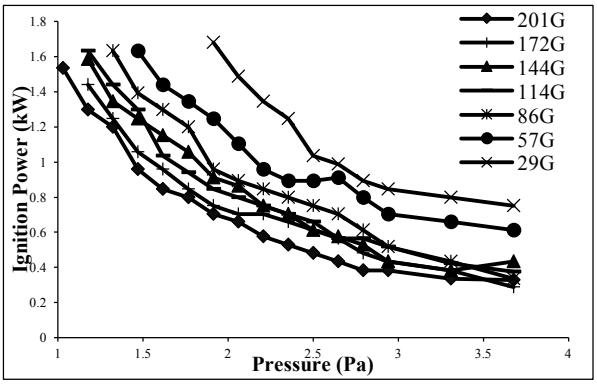


Figure 2: Ignition power at varying chamber pressure for varying magnetic field strength.

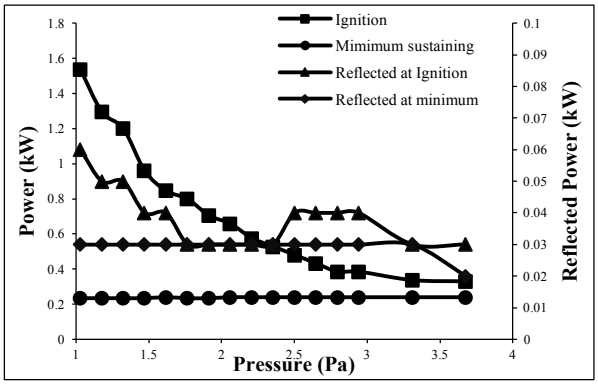


Figure 3: Ignition and sustaining powers at 201 G with corresponding power reflection.

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