DEVELOPMENT OF AIR MICRO PLASMA SOURCE USING A MAGNETIC LOOP WITH OPERATION AT MODULATED ULTRA HIGH FREQUENCIES

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Micro plasma sources are a rapidly growing area of study in plasma sciences, attracting widespread attention due to the large number of possible applications such as biomedical sterilizers, plasma displays, and chemical analyzers. The micro plasma operating power, gas, and pressure are three main issues to address in order to make portable micro plasma devices.

We report on the generation of an air micro plasma using a magnetic loop at atmospheric pressure (Figure 1). The micro plasma device can self-ignite and operate for several hours at the frequency of 740 MHz without any noticeable adverse effects on the electrodes. The minimum powers for self-ignition and sustained operation were 9.5 and 3 watts, respectively.

Amplitude modulation technique was applied on the radio frequency power of the micro plasma source to study the effects of the modulation on the operation of the device. Interestingly, by using an amplitude modulated signal, the power required for self ignition and operation of the device was reduced by the order of approximately four. With an amplitude modulated radio frequency signal, we were able to generate and sustain the plasma with powers of 2.5 and 2 watts, respectively.

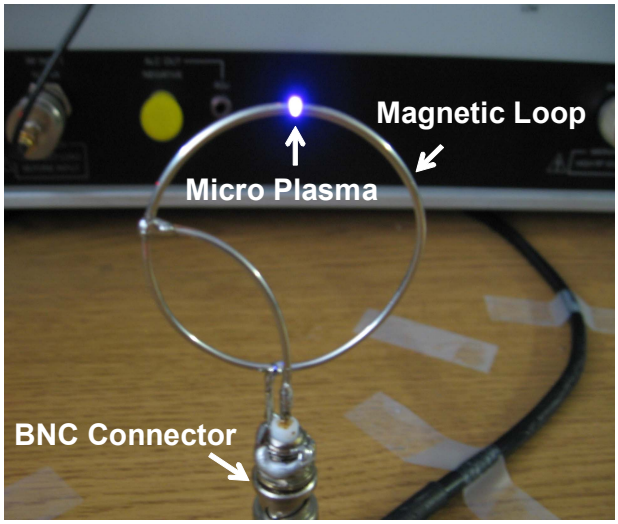

Figure 1. The air micro plasma generated with the magnetic loop operating under ambient conditions at the frequency of 740 MHz.