

Microwave plasma source in overmoded cavity: space-time plasma steering source

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The aim of this communication is first to present the concept of the innovative plasma source we introduced recently, namely the “space-time plasma steering source”. It has been introduced to address the challenge of controlling plasmas in large cavities (overmoded) that has been identified in the literature [1,2]. Contrary to conventional microwave plasma technologies, the idea is not to ignite a plasma occupying the entire volume of a plasma vessel, but rather to ignite a localized plasma whose location in the vessel can be dynamically controlled. This dynamic control is made possible by changing the temporal waveform of the transmitted signal to an overmoded cavity. It is then the behavior of the waves inside the cavity that control the plasma location, hence the name of space-time plasma steering source (see Figure 1). Based on this principle, we successfully managed to control in a pulsed regime the plasma location on several igniters in an overmoded cavity using time reversal [3] and later using a more elaborated technique [4]. In the present communication, we will focus on the unusual characteristics of this microwave plasma source: plasma dimensions and location are uncorrelated from the cavity design, low rise time (in the order of the nanosecond) and very low duty cycle (in the order of 0.05%). This work is a continuation of our paper [5], in which we proposed a first spatio-temporal description of these original plasmas.

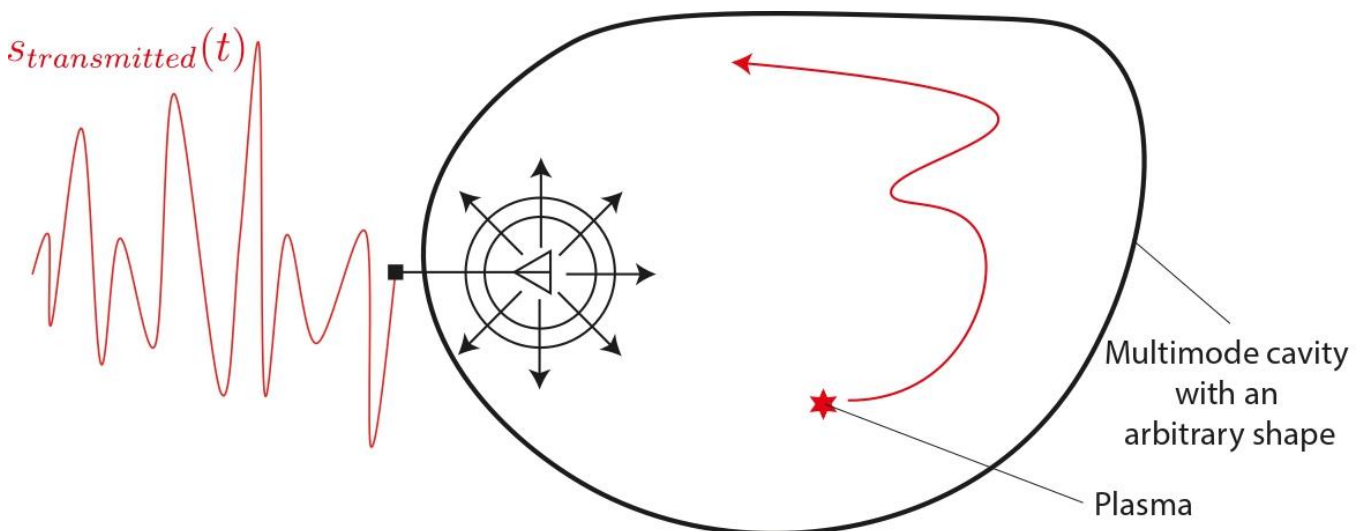


Figure 1: Principle of the “Space-Time Plasma Steering Source”.

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