

Experimental Study on the Surface Discharge Optical Pumping Source with High Repetition Mode

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A surface discharge optical pumping source module with high repetition mode is described. The maximum pulse repetition rate is up to 90 Hz. The electrical and radiative properties of the optical pumping source have been studied. The equivalent resistance and inductance, the maximum current and the deposition efficiency of the discharge circuit under various distance of electrodes have been compared.

A surface discharge which slides along the surface of an insulating slab with a formed conducting channel has some of the following characteristics: (1) intense broadband radiation which can be produced over a wide range of gas pressure from vacuum to several atmospheres; (2) VUV radiation and even more shorter wavelength radiation; (3) intense line radiation with selected dielectric surface material; and (4) possibility of long pulse operation and high pumping power density for optically pumped lasers. With these attractive characteristics, surface discharges is applicable to preionization sources and plasma electrodes for gas lasers [1], photoinitiation sources for chemical lasers [2], and especially photodissociation sources for the XeF laser [3,4].

In this paper, a surface discharge optical pumping source module with high repetition mode is described. The electrical and radiative properties of the optical pumping source have been studied. The equivalent resistance and inductance, the maximum current and the deposition efficiency of the discharge circuit under various distance of electrodes have been compared. The framing photographs of XeF₂ photodissociation wave have been obtained which show the XeF laser can be formed under the experimental condition. The repetition characteristics of the optical pumping source have been experimentally studied. The maximum pulse repetition rate is up to 90 Hz. The ablation of the dielectric material surface is considered.

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