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Pulsed inductive discharge as new method for gas lasers pumping

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Abstract

To obtain a population inversion on electronic and vibrational-rotational transitions of different gas atoms and molecules the use of pulsed inductive discharges is proposed. In contrast to well-known conventional pulsed longitudinal and transverse discharges, a pulsed inductive discharge is formed due to the magnetic field inductance produced by the excitation system without any electrodes into the active medium. An appropriate choice of the tube material may ensure the active medium purity and to realize a high laser service life. The formation of such a discharge is not accompanied by the appearance of cathode spots on the electrode surfaces, which are responsible for the discharge instability and contraction.

Using this new method nitrogen λ1= 337.1 nm and λ2 = 357.7 nm), FI (λ1 = 703, λ2 = 713 and λ.3= 731 nm), H2 (0.89 – 1.12 μm), HF (2.7 – 3.2 μm) and CO_2 (10.6 μm) lasers were created. Characteristic feature of new lasers is ring shape of laser beam. Its outer diameter is near the inner discharge tube diameter and the thickness depends on active medium and resonator Q-factor, and is about 2 – 5 mm. Lasers pumped by pulsed inductive discharge have high pulse-to-pulse stability (ratio ΔI/I does not exceed 1%) and low divergence (0.1 – 12 mrad depending on active medium).

Biography

Dmitry S. Churkin received the Master's degree in physics from the Novosibirsk State University in 2005. He received the Ph.D. degree in 2009. He currently works in the Institute of Laser Physics SD RAS as a scientific researcher. His research interests include development and investigation gas lasers pumped by pulsed and RF inductive discharge.