Gas breakdown in focused beams of terahertz and sub-terahertz radiation

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In recent years, significant development has occurred in science and technology of sources of terahertz [1–4] and sub-terahertz [5, 6] radiation. It has become possible to study the discharges supported in focused beams of terahertz and sub-terahertz radiation [7, 8]. One of the possible applications of such discharges can be a source of extreme ultraviolet radiation [9, 10]. Recently, the authors initiated studies of a point-like discharge in an inhomogeneous gas stream supported by NovoFEL radiation [11]. In this paper, we present the results of calculations of breakdown curves for discharges initiated by 2.3 THz radiation of free electron laser. The work compares results of experimental studies of breakdown obtained at the new experimental stand at the user station on the NovoFEL with calculations made and with previous threshold breakdown calculation [12]. The paper also compares the calculated breakdown curves and experimental results for the discharges initiated by sub-terahertz radiation of gyrotron. Calculations and experiment are in satisfactory agreement. The influence of the wavelength and focusing of the heating radiation on the breakdown of gas is discussed. The work was supported by the RSF, project No. 19-72-20166.

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