GENEration of terahertz emission under the optical breakdown in gases: from microplasma to filament [[1]](#footnote-1)\*)

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Research on the methods of generation and registration of terahertz (THz) radiation has been actively conducted over the past three decades, which is associated with the broad prospects for   
the use of this radiation in problems of science and technology [1]. A particular interest is in   
the generation of THz radiation from a laser plasma generated by the irradiation of femtosecond laser emission on gaseous media, due to the possibility of obtaining an ultra-wide emission spectrum in the range from 0.1 to 200 THz [2]. One of the important areas of research is the influence of the focusing of pump radiation on the properties of laser-plasma sources. This work is devoted to studying the influence of the focusing regime of two-color femtosecond laser radiation in gas media on the spatial distribution of THz radiation.

The results of measuring the angular distribution of the THz radiation power from a plasma generated by different focusing of a two-color femtosecond laser radiation containing the main and second harmonics are presented. Frequency-angular power distributions of THz radiation are obtained for various focuses of the pump optical radiation.

A broadening of the directivity pattern of THz radiation from a laser plasma was registered with an increase in the numerical aperture of a focused femtosecond two-color laser radiation.   
As the numerical aperture decreases to 0.02, a ring structure appears in the frequency-angular spectra in the frequency range 0.1–2 THz, which is associated with the scattering of THz radiation from the plasma as an obstacle.

In the case of tight focusing of two-color femtosecond radiation into the air, the presence of   
a part of the THz radiation is detected, which propagates from the plasma in the direction opposite to the direction of laser radiation propagation. This part of the THz radiation has a spectrum in the low-frequency region (0.1–1.5 THz) in comparison with the spectrum of THz radiation propagating in the direction coinciding with the propagation of laser radiation.

References

1. Zhang X.-C., Xu. J. Introduction to THz Wave Photonics, Springer, 2010, 1–246.
2. Matsubara E., Nagai M., Ashida M., Applied Physics Letters, 2012, 101, 011105.

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/It/ru/CK-Ushakov.docx) [↑](#footnote-ref-1)