DIAGNOSTICS OF PLASMA CHANNELS CREATED BY FOCUSING FEMTOSECOND LASER PULSES IN GASES by Transverse INTERFEROMETRY METHOD [[1]](#footnote-1)\*)

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Filamentation of femtosecond laser radiation attracts scientific interest for more than two decades, since this process is accompanied by many nonlinear effects. Also, filaments generate
X-ray radiation, high-order harmonics in the UV, supercontinuum and terahertz radiation [1, 2]. There are a number of methods for measuring the spatial parameters of the filament plasma channel and the plasma density inside it, based on measuring conductivity of the gap between the electrodes with plasma channel inside the gap [3], fluorescence [4], pump-probe techniques, including transverse interferometry [5–7]. The work is devoted to an experimental study of the process of filament plasma channel formation and plasma decay during the first hundreds of picoseconds in gases at different pressures using this diagnostic method.

The data on plasma decay in air, nitrogen, and argon are presented for different laser pulse durations.

Filamentation of a 150 fs pulse in air revealed a nonlinear dependence of the initial peak electron density in the plasma channel on air pressure. The plasma density increases almost 2 times with pressure rising from 3 to 4 atm.

The anisotropy of the refractive index is revealed, which appears during the propagation of
a high-intensity laser pump pulse in a medium.

References

1. Kandidov V.P., Shlenov S.A., Kosareva O.G., Quantum Electron, 2009, 39, 3, 205.
2. Couairon A., Mysyrowicz A., Physics Reports 2007, 441, 47.
3. Abdollahpour D., Suntsov S., Papazoglou D. G., Tzortzakis S., Opt. Express, 2011, 19, 18, 16866.
4. Théberge F., Liu W., Simard P.Tr., Becker A., Chin S.L., Phys. Rev. E., 2006, 74, 3, 036406.
5. La Fontaine, B., Vidal, F., Jiang, Z., Chien, C.Y., Comtois, D., Desparois, A., Johnston, T.W., Kieffer, J.-C., Pepin, H., Phys. Plasmas 1999, 6, 1615.
6. Papazoglou D.G., Tzortzakis S., Appl. Phys. Lett., 2008, 93, 4, 041120.
7. Bodrov S., Bukin V., Tsarev M., Murzanev A., Garnov S., Aleksandrov N., Stepanov A., Opt. Express., 2011, 19, 7, 6829
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/It/ru/CJ-Chizhov.docx) [↑](#footnote-ref-1)