SOTuA2.pdf

Characterization of fiber supercontinuum by chromatic scattering

E. F. Martynovich, V. P. Dresvianski and A. A. Starchenko
Irkutsk Branch of Institute of Laser Physics SB RAS , 130a Lermontov str., Irkutsk, 664033, Russia
filial@ilph.irk.ru

S. M. Kobtsev and S. V. Kukarin
Novosibirsk State University, Pirogov str., Novosibirsk, 630090, Russia

S. N. Bagayev
Institute of Laser Physics SB RAS, Acad. Lavrentyev's prosp., 13/3, Novosibirsk, 630090, Russia

Abstract: Chromatic scattering has been proved to characterize the polarization state of the fiber supercontinuum spectral components during propagation in media. Applications are considered for novel technology of multi-layer data recording.
OCIS codes: 060.2270; 210.4770; 320.6629

To implement the technology of multilayer information recording on optical media, as described in [1], requires the use of low coherent optical radiation of high intensity. Such requirements are satisfied by the generators of laser-fiber supercontinuum. They are able to provide a small amount of time the longitudinal coherence of the radiation up to a few femtoseconds. In this work, experimentally observed and studied the effect of chromatic radiation scattering of the fiber supercontinuum in optical media with the natural and induced anisotropy. We investigated the supercontinuum radiation produced in the thin waist of the quartz fiber in contact with the radiation of the first harmonic of titanium-sapphire laser. The experimentally observed spatial pattern of colored scattering was modeled mathematically. Results of mathematical simulation of the experiment are shown in Fig. 1. Calculated pattern is equivalent to the experimental one.

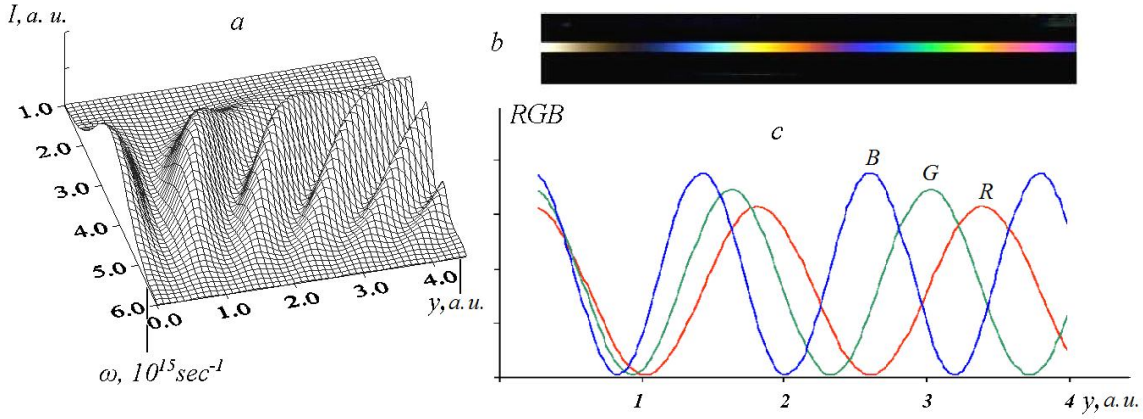

Fig. 1. *a* - calculated spatial distribution of the fiber supercontinuum scattering spectrum (the coherence time ~ 5 fs), *b* - the corresponding chromatic pattern, *c* - the tristimulus *RGB* scattering values

The results obtained in this work give the opportunity to experimentally, virtually visually, monitor the spatial dynamics of the change of the polarization state of different spectral components of the supercontinuum during its propagation in a medium. These data are of interest, among other things, for investigating the spatial features of the excitation of luminescence or the photochemical transformation of oriented centers in anisotropic media [2], under poorly explored conditions where the pulse duration of exciting radiation is less than the phase relaxation time of the centers interacting with radiation.

[1] E.F. Martynovich, "Mechanisms of Photophysical Processes of Interaction of Laser Radiation with Optical Media", in *Fundamental Research in East Siberia,* N.I.Voropay, ed. (Novosibirsk, Publisher of SB RAS, 2007), Chap. 1.2, 41-71.

[2] E.F. Martynovitch, Guillaume Petite, V.P. Dresvianski and A.A. Starchenko, "Spatially Periodical Structures under Femtosecond Pulsed Excitation of Crystals", Applied Physics Letters **84**, 4550-4552 (2004).