Nano optics and photonics
Fine light patterning controlled via cross-correlation technique

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Creation of light patterns having specific intensity distribution is highly demanded by many practical uses. Such applications include photolithography, which stands forward as a powerful technique to fabricate smart integrated photonic devices exploiting complicated micro-structured surface. Also shaping a beam intensity profile to contain sharp zero-intensity points in the nano-scale range is required for particle trapping, optical tweezers and super-resolution spectroscopy. Various holographic techniques are known to be effective for light patterning, including creation, processing and transformation of required intensity distributions in laser beams.

Our present research concentrates on the cross-correlation technique and its ability to form required light intensity patterns [1, 2]. The particular feature of the method being developed by our group is that not one but several sequential transformations of complex fields are involved. We have developed both an experimental set-up and a computer simulation to form composed fields and manipulate them. In particular, we have investigated: (i) formation of laser beams having dark-soliton-like intensity profile as well as the near-field optics of such beams; (ii) spatio-temporal beam engineering due to diffraction on a set of subsequently located diffraction gratings.

1. *Bugaychuk S.A., Gnatovskyy V.O., Negriyko A.M., Pryadko I.I.* Multiplication and commutation of laser beams under cross-correlation interaction of periodic fields // Ukr. J. Phys.-2016.-**61**, N 4.- P. 311-318.
2. *Bugaychuk S.A., Negriyko A.M., Sidorenko A.V., Gnatovskyy V.O., Medvid N.V.* Beam shaping with the desired intensity profiles based on the correlation technique // IEEE Catalog Number CFP16814-CDR.-2016.-P. 240-242.