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Diffractive wavefront correction of remote sensing systems based on pulsed laser diodes

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Abstract:

A variety of optoelectronic devices (rangefinders, velocity meters, terrestrial scanners, lidars, free space optics communication systems and others) based on semiconductor laser technology feature low−quality and highly asymmetric beams. It results from optical characteristics of the applied high−peak−power pulsed laser sources, which in most cases are composed of several laser chips, each containing one or a few active lasers. Such sources cannot be considered as coherent, so the resultant beam is formed by the superposition of many optically uncorrelated sub-sources. Far−field distribution of laser spots in such devices corresponds to the shape of laser emitting area, which instead of desired symmetry shows layout composed of one or several discrete lines or rectangles. In some applications, especially if small targets are concerned, it may be crucial to provide more symmetrical and uniform laser beam cross−section. In the paper, the novel strategy of such correction, combining coherent and incoherent approaches, is presented. All aspects of technological implementations are discussed covering general theoretical treatment of the problem, diffractive optical element (DOE) design in the form of computer generated hologram (CGH), its fabrication and testing in case of selected laser module beam correction.