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# CORRELATION OPTICS PARADIGM IN MEASURING COHERENCE AND POLARIZATION OF LIGHT

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**Abstract.** *In this survey we represent novel feasibilities provided by correlation optics as one of the versions of "optics of observable quantities" (E. Wolf) in measuring coherence and polarization of optical fields. It is shown by two examples that the introduced approaches are relevant to solving diverse problems connected with the presence of optical singularities (both scalar and vector) in heterogeneous in polarization and incompletely spatially coherent light beams. Namely, we present specific vector singularities arising in partially coherent combined beams and demonstrate interconnections between coherence and polarization in controlling new optical phenomenon referred to as optical currents.*

**Keywords:** partial coherence, partial polarization, optics of observable quantities, correlation optics.

## 1. Introduction

In this survey we consider applying the Correlation Optics paradigm for measuring intrinsically interconnected characteristics of light fields, such as intensity, polarization and coherence. Conceptually, all these quantities are derived from the Wolf's coherency matrix [1]. New insight on interconnection of them is accentuated by the novel singular-optical approach [2, 3] predicting existence of important regularities in electromagnetic fields which were early considered as quite random ones. So, phase singularities, viz. 'optical vortices' of scalar (homogeneously polarized), polarization singularities of vector (inhomogeneously polarized) fields, as well as singularities of correlation functions of partially coherent, partially polarized fields constitute specific skeletons, sui generis "bearing structures". Really, knowing the loci and characteristics of singular elements, one can judge on behaviour of a field at its other areas, at least in qualitative manner, but quite reliably [4]. Potentially, this circumstance opens new feasibilities for metrology of optical fields and leads to prospective practical applications of relevant measuring techniques. Developing earlier approaches [5], here we show the framework for generalization

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