

Entanglement and Complete Positivity : Relevance and Manifestations in Classical Optics

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Abstract. Entanglement and Complete Positivity of maps are aspects of states of (composite) quantum systems, and of their laws of evolution. They have achieved prominence with the recent growth of quantum information science. Viewed as mathematical concepts, however, in the context of tensor products of complex linear (Hilbert) spaces, it is understandable that they may play useful roles in non-quantum contexts as well. This talk describes such roles in the classical wave optical regime, through several examples taken from both ‘scalar’ wave optics and polarization optics. Our examples include propagation and other characteristics of both coherent and partially coherent Gaussian light beams, and the determination of the class of physically allowed Mueller matrices in polarization optics. We are led to new insights and ways of understanding of some classical wave optical phenomena previously understood in more traditional ways.