Interferometric detection of OAM-carrying Helico-conical beams

Helico-conical beams (HCBs) are a class of orbital angular momentum (OAM)-carrying beams with spiral phase and intensity profiles. In this communication, we demonstrate the use of a common path interferometer (CPI) to phase-image incoming HCBs and directly detect their OAM-associated properties. The output intensity of the CPI is a direct mapping of the HCB’s phase, hence both the topological charge value and sign manifest in the output intensity distribution. The topological charge value is calculated by fringe counting, while the helicity is determined by observing the intensity along the region. With our current CPI setup, we can firmly detect up to \( l = 20 \). Higher values of \( l \) lead to a decrease in the fringe visibility, but this can in principle be improved by tailoring the parameters of the phase contrast filter (PCF) employed in the CPI. We present analytical expressions to optimize the CPI for HCB charge detection.

General information
Publication status: Published
Organisations: Department of Photonics Engineering, Programmable Phase Optics, OptoRobotix ApS
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Pages: 247-251
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Optics Communications
Volume: 433
ISSN (Print): 0030-4018
Ratings:
BFI (2018): BFI-level 2
Scopus rating (2018): CiteScore 2.06 SJR 0.615 SNIP 0.967
Web of Science (2018): Impact factor 1.961
Web of Science (2018): Indexed yes
Original language: English
Keywords: Diffractive optics, Physical optics, Interferometric imaging
DOIs:
10.1016/j.optcom.2018.10.019
Source: FindIt
Source ID: 2440433929
Research output: Contribution to journal › Journal article – Annual report year: 2018 › Research › peer-review