ANALYTICAL EXPRESSIONS FOR ROUND PULSED SCALAR AND ELECTROMAGNETIC SPATIOTEMPORAL OPTICAL VORTICES

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Spatiotemporal optical vortices (STOVs) are a type of optical beams carrying orbital angular momentum flowing in the spatial and temporal domains [1-3]. Here, we present analytical expressions for pulsed STOVs carrying transverse orbital angular momentum that are as round as possible. Those analytical expressions were obtained by application of specific mathematical differential operators to travelling light "blobs" presenting a Poisson frequency spectrum and modelled using the complex source point method [4]. Both scalar and electromagnetic cases are presented.
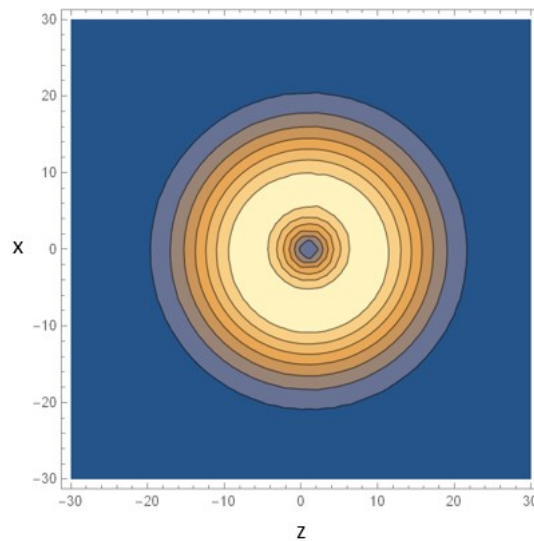
Fig. 1: Theoretically generated scalar STOV

[1]. N. Jhajj, I. Larkin, E.W. Rosenthal, S. Zahedpour, J.K. Wahlstrand, H.M. Milchberg, Physical Review X, **6**(3), 031037 (2016)
[2]. A. Chong, C. Wan, J. Chen, Q. Zhan, Nature Photonics, **14**, 350-354 (2020)
[3]. S. Huang, P. Wang, X. Shen, J. Liu, Optics Express, **29**, 26995-7003 (2021)
[4]. S. Vo, R. Gutierrez-Cuevas, M.A. Alonso, *in preparation* (2023).