Chiral optical Tamm states: coupled mode theory

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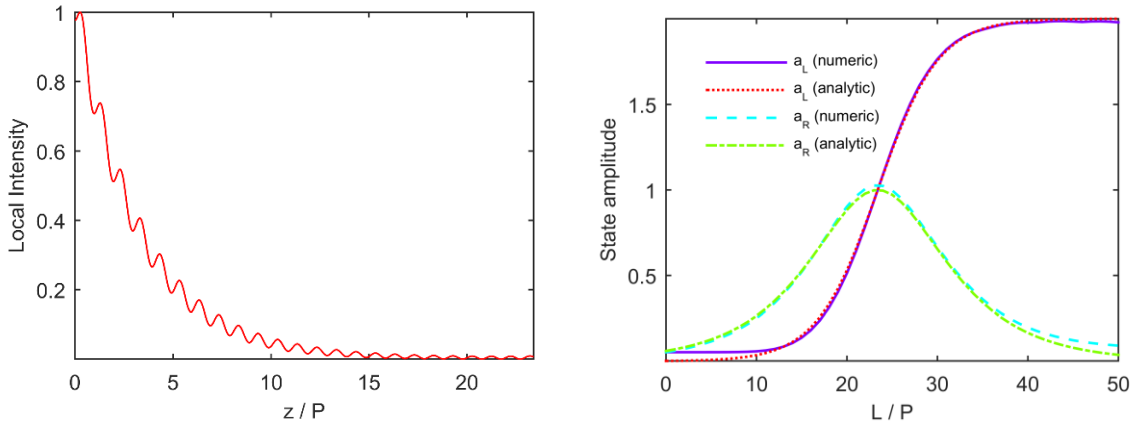
The coupled mode theory [1] is favored for its ability to sketch extremely complicated wave phenomena using just a few values. A collection of chiral localized waves in optics of liquid crystals is known to possess unusual features [2]. Recently, a new species has been proposed for this collection [3], chiral Optical Tamm state shown in Fig. 1(a). In this talk, coupled mode theory is used to describe the phenomenon in terms of mode frequency and decay rates. Fig. 1(b) demonstrates an anomalous crossover in mode excitation polarization. Analytical estimations agree well with precise numerical calculations, allowing intelligent optimization for laser and photovoltaic applications.



(a) (b)

Fig. 1. (a) Local intensity $|E^2|$ of the chiral Optical Tamm state in cholesteric layer versus the distance z from the boundary with an ideal polarization preserving anisotropic mirror [3]. (b) State amplitudes when excited using left (a_L) and right (a_R) circularly polarized light at the resonance wavelength versus cholesteric thickness L. Both z and L are normalized to the cholesteric period P. The cholesteric anisotropy $(\varepsilon_\parallel - \varepsilon_\perp)/(\varepsilon_\parallel + \varepsilon_\perp) = 0.1$.

References

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Speaker Biography

Ivan V. Timofeev received M.S. and Ph.D. degrees in Optics from Siberian Federal University, Krasnoyarsk, Russia in 2000 and 2003, respectively. Since 2001, he has been with the Kirensky Institute of Physics, Federal Research Center KSC SB RAS, Krasnoyarsk, Russia, where he is currently a Senior Researcher. He was awarded from Siberian Branch of Russian Academy of Sciences in 2008 and from Krasnoyarsk Territory governor in 2016.