

## コヒーレント光科学セミナーのご案内

下記の要領でセミナーを開催いたします。

Chandran Thodika 氏はハイデラバード大学で学位取得後、11月から本学でポスドクとして研究されています。

今回は Chandran Thodika 氏の紹介を兼ねて光のスピン-軌道相互作用についてお話し頂きます。

研究室の研究者、学生の皆様もお誘い合わせのうえ、奮ってご参加下さい。

## Coherent Optical Science Seminar on Information Optics

Date: Friday, 21 December 2018

Time: 15:10-16:10

Place: Room #803, East 6 Building, UEC

Speaker: CHANDRAN THODIKA Samlan, UEC

Title: Experimental investigations on spin-orbit interactions of light in anisotropic crystals

Abstract:

Optical crystals have always remained a research topic of interest in optics since the 17th century due to its versatile characteristics such as birefringence, dichroism and optical activity. With the invention of laser beam, the confinement of optical field and paraxial propagation lead to a class of higher order optical modes with well defined spatial structures. Propagation of such beams through optical crystals leads to an interplay between polarization (spin angular momentum - SAM) and complex spatial mode (orbital angular momentum - OAM) mediated by geometric phase of pancharatnam type.

Here I present our investigations on fundamental spin-orbit interaction (SOI) of light beams in anisotropic crystals, that can be classified based on the symmetry of the system:

i) Spin to orbital angular momentum conversion (SOC): When the crystal

axis orientation is along the beam propagation that exhibits a rotational symmetry [1].

ii) Spin Hall effect (SHE) of light: When the rotational symmetry is broken as a result of tilted optic-axis relative to the beam propagation axis [2].

Experimental demonstration of SOC in diverging optical beam resulting from the azimuthal (rotationally symmetric) accumulation of geometric phase in a c-cut birefringent crystal was revealed. Disentangling the isogyres from the isochromates appearing in the radial and azimuthal coordinates in the recorded conoscopic interference pattern via closed-fringe Fourier analysis, the role played by the accumulated geometric phase and its manifestation in spin-orbit interactions in optical crystals was studied.

A novel example of the spin-Hall effect (SHE) of light manifested as transverse spin-dependent shift of the paraxial light beam transmitted through the crystal plate was experimentally demonstrated. In an elegant experiment using only tilted halfwave plate and polarizers, the SHE was studied using polarimetric and quantum-weak-measurement techniques.

References:

1. C.T. Samlan, Dinesh N. Naik and Nirmal K. Viswanathan, "Isogyres - Manifestation of Spin-orbit interaction in uniaxial crystal: A closed-fringe Fourier analysis of conoscopic interference," Sci. Rep. 6, 33141 (2016).
2. Konstantin Y. Bliokh, C. T. Samlan, Chandravati Prajapati, Graciana Puentes, Nirmal K. Viswanathan, and Franco Nori, "Spin-Hall effect and circular birefringence of a uniaxial crystal plate", Optica 3, 1039-1047 (2016).

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