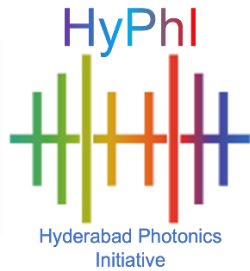




HYPHI COLLOQUIUM



Date: **5 Feb 2024, Monday**

Time: **16:00 Hrs (Tea/Coffee 15:45 Hrs)**

Venue: **TIFRH Auditorium**

Title: Forward and inverse spin-Hall effect in optics

Speaker: Prof. Subhasish Dutta Gupta, TIFR Hyderabad, IISER Kolkata, IIT Jodhpur

Abstract:

After a very brief introduction to optical waves carrying spin and orbital angular momentum, a concise overview of some of the typical manifestations of spin-orbit interaction in optics will be presented. Conversion of angular momentum from one form to another and transfer to material particles will also be discussed. We cite some of the first examples of spin-locking, spin-Hall effect and inverse spin-Hall effect (aka spin-direction-spin coupling) touching upon their solid state counterpart. Finally, we consider a simple waveguide plasmonic crystal, supporting leaky hybridised modes, capable of capturing both the direct and the inverse effects in the same embodiment. The forward and inverse effects are demonstrated as simultaneous input spin-dependent directional guiding of waves (spin-direction coupling) and wavevector-dependent spin acquisition (direction-spin coupling) of the scattered light. Necessary principles of Jones and Mueller formalisms are introduced for better comprehension. The signatures of both the forward and inverse effects are shown to leave their signatures in the momentum domain spectra and the Mueller matrix elements. In order to enhance the signal-to-noise ratio, a dark field measurement technique is employed leaving unambiguous imprints on the momentum domain measurements in the far field. Resonance enabled enhancement of these effects is also demonstrated by utilising the spectral Fano resonance of the hybridised modes. Both the effects are shown to owe their origin to the space varying polarization and azimuthal variation of the Berry phase.