Department Of Instrumentation and Applied Physics Seminar Series

Reconfigurable Optical Mask for Patterning on Silicon Wafers

Date: 28th Jan 2026 **Time:** 3PM **Venue:** SVN Auditorium

Abstract: Photolithographic masks play a critical role in defining patterns on silicon wafers for integrated circuit fabrication. While conventional physical masks are highly effective for large scale manufacturing, they are expensive, inflexible, and time consuming to modify, which limits their performance for rapid prototyping and research oriented device fabrication.

Existing maskless photolithography techniques based on Digital Light Processors (DSP's) and Electrically Addressed Spatial Light Modulators (EASLM's) provide some flexibility, but their resolution is fundamentally limited by pixel size.

We propose a reconfigurable optical masking based on a reflection mode Optically Addressed Spatial Light Modulators (OASLM) for silicon wafer patterning. Our system employs a two wavelength scheme in which write light (550 nm) is used to write spatial information onto the OASLM. The absorbed write beam (550 nm) produces a spatially varying voltage across the modulating (liquid crystal) layers which makes it to switch. An ultraviolet (405 nm) read beam is dynamically patterned in accordance with write beam to expose on photoresist.

Our architecture enables pixel independent, high resolution pattern transfer and isolation of the read and write beams. Main objective of the project is to design and fabricate a fully functional reflection mode OASLM capable of high contrast, sub-micron resolution, and rapid reconfigurability.

About the Speaker

PROF. ANILTHAKUR
PROFESSOR OF PHYSICS AT HINDUSTAN INSTITUTE OF TECHNOLGY & SCIENCE, CHENNAI

Prof. Thakur is currently a Professor of Physics at Hindustan Institute of Technology & Science (HITS),Chennai, with over 20 years of international research experience in electro-optic materials, liquid crystals, and adaptive photonic systems. He received my PhD in Physics from the University of Delhi and have held research positions in Japan, France, UK, USA and India, contributing to both fundamental research and technology development. He has authored 36 peer reviewed research publications & successfully led and executed multiple nationally and internationally funded projects e.g., iDEX supported research on adaptive camouflage systems, UGC-DAE-CSR projects on electro-optic materials, and international grants from the Leverhulme Trust (UK), MSCA and Kent State University (OH, USA).

His research achievements are the fabrication of Si-LC devices, demonstration of voltage controlled nanoarrays, electro-optical modulation and development of reconfigurable optical and photomechanical systems with direct relevance to strategic applications.