

Theme : New Display

Subject : Visible/Near IR Active Light Modulation

Introduction

The purpose of this subject is to seek for novel free space light modulation methods, especially for imaging applications. Efficient light modulation is a key technology for many commercial applications. Widely used technologies such as liquid crystal based modulators, digital mirror devices, electro-optic, and electro-absorption modulators have their own weaknesses. Next generation image sensors may require active on-chip or external light modulation to realize diverse functionalities, which impose challenging requirements: small form factor, high modulation speed, wavelength selectivity, high on-state transmission, low power consumption, and low cost.

Recent demonstration of infrared and terahertz modulation based on new materials such as graphene gives a hint for innovative modulation methods. New material systems and device architectures for light modulation should have potentials for meeting the above requirements.

Scope

Challenges of devising novel device architectures and material systems that can be integrated with typical image sensors, and that enable electrical modulation, small size, wavelength selectivity in near IR or possibly visible wavelength range:

- Materials and systems based on novel optical properties that may include plasmonic or metamaterial structures but not be limited to
- Device architectures in a small form factor that can maximize peak transmission, modulation depth and speed

Research questions

We are interested in the following research questions. Other research questions not stated here are open to discuss with research partners.

- Could emerging two dimensional materials having novel optical properties be platforms for innovative light modulation?
- Could operating wavelength of the modulators using two dimensional materials extend to near IR or visible wavelength range?
- Would resonant optical structures such as conventional optical cavity or plasmonic structure be helpful for efficient narrow bandwidth modulation?

Expected Deliverables

The following is open to discussion:

- Theoretical calculations and experimental evidence of the proposed devices
- Prototype samples (if available)
- Patents with Samsung (if agreed)
- Detailed quarterly progress reports summarizing accomplishments