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## **Photonics research at KTH: fundamentals, materials, and communication.**

In this presentation, research activity at the Photonics department at KTH will be surveyed. Several most interesting and productive areas of our research will be covered, including following topics:

### **- polymer materials and Si-photonics**

Integrated photonics is facing numerous challenging to meet requirements of modern communication and data processing systems – to provide highly integrated, low-cost and low-energy solutions. Si-photonics is rather mature technology capable to satisfy most of the tasks. On the other hand, rapidly developing branch of polymer materials offers efficient solutions which still have many challenges to provide performance comparable to Si-photonics. Both topics have been actively investigated at our department.

### **- novel organic materials for photonics**

Recent progress in the technology of transparent wood has attracted strong interest to this material in scientific community. This anisotropically scattering material with high transmission and strong haze in visible range has a great potential for various applications. Basic properties of light propagation in this material, including demonstration of first wood-based laser, have been studied in our research group, and will be discussed in the presentation.

### **- near-field optics for time-spatial resolved investigation**

Near-field optics has literally triggered a revolution in optical imaging allowing to break diffraction limitations, and develop systems with sub-wavelength resolution. In a combination with the ultra-fast pump-probe technique, such systems allow collecting the information about high-speed radiation phenomena in several domains by one “shot”, and create light intensity image, spectral information, characterization of time-domain processes, and topography profiles simultaneously. Research on this topic at KTH photonics department will be presented.

### **- optical communication with fiber and THz free-space technology**

KTH in cooperation with the Research Institute of Sweden (RISE) runs a joint Kista High Speed Transmission Lab. In our projects, we implement advanced modulation formats in different transmission ranges, including traditional communication C-band and THz bands, to achieve ultra-high capacity transmission system.