Caffè Scientifico di Fisica della Materia

IV Ciclo di seminari del settore Fisica della Materia

Novel silicon photonics devices and fiber optics systems
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Study on strained silicon photonics devices and orbital angular momentum ultracompact emitters

Silicon photonics (SiPh) technology has raised growing interest combining outcomes from material and semiconductor sciences with photonics and micro-fabrication technologies. Research activity on SiPh has been strongly pushed by Webcomcom companies and is currently finding applications in functionalities for big data exchange such those managed by IT infrastuctures functionalities. Nevertheless such emerging technology can enable many other applications such as telecommunications, sensors, lifescience, quantum computers and other high-end applications.

In this presentation I will discuss some outcomes of a simulative and experimental study carried out on strained-silicon micrometric and nanomentric structures and devices for photonic applications. The scope of this study was to perform a thorough analysis on the novel material properties, as well as to develop accurate and reliable simulative models for the design of photonic devices based on strained silicon technology, and assess the possible use of innovative experimental techniques for the strain measurement in photonic structures.

SiPh technology provides promising solutions in fields where the deployment of bulk optical components, due to their large size and the slow switching speed, proved to be unsuitable, as the case of Orbital Angular Momentum (OAM)-based optical communications.

In this presentation I will report the results of an experimental study carried out on SiPh integrated emitters of beams carrying a well-defined OAM order. The OAM emitters are basically ring-shaped resonator photonic structures embedding second order angular grating capable of extracting circulating light and imposing a particular phase distribution, together with a well-defined OAM order, to the radiation. The characterization of emitted OAM beams, in terms of purity and intensity of the radiated modes, is aimed at providing a proof of concept of the working principle of this innovative devices and supply information on the possible use of these geometry in efficient multiplexing schemes.