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The role of disorder in plasmonic devices for biological applications

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In recent years, the interest of researchers on plasmonic devices for biological applications has significantly increased. Nanostructured metallic structures, in fact, allow for a precise control and enhancement of the electromagnetic field up to the nanoscale, and play a key role in many advanced spectroscopy and imaging applications. Plasmonic devices, however, usually rely on highly symmetric and regular geometries, and the natural roughness arising from the fabrication process is generally unwanted. Fabrication disorder can be reduced optimizing the fabrication process, but this usually implies a significant increase in fabrication complexity and costs. In this talk, we will show that, once opportunely tailored, fabrication disorder can actually play a positive role in plasmonic biological applications. The structure of the talk is as follows: first, we will provide an extensive introduction to the field of plasmonics, stressing out the main concepts involved in biological spectroscopy applications. We will then provide an introduction to the Finite-Differences-in-Time-Domain (FDTD) algorithm and some details on the realistic representation of metallic dispersion in numerical simulations. Finally, we will show how the role of disorder can be studied in the case of a state-of-the-art nano-focusing device. Surprisingly, once realistic fabrication roughness is introduced, the performance of the plasmonic device significantly improves, and this opens new and interesting perspectives in the field of disordered plasmonics for biological applications.

Biography

J S Totero Gongora is currently a PhD Candidate in Andrea Fratalocchi's PRIMALIGHT group at KAUST University, Saudi Arabia. He graduated with full honors in Theoretical Physics from Sapienza University, Italy in 2012 and his current research is focused on radiation-matter interaction in disordered systems.

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