

Título: Room-temperature continuous-wave upconverting micro- and nanolasing

Ángel Fernandez Bravo

Lawrence Berkeley National Lab, USA

Abstract:

Nanolasers that operate under continuous-wave pump and are robust in diverse environments will make possible compact optoelectronic devices, biomedical imaging, and large-scale quantum photonics. However, current nanolasers require low temperatures or pulsed excitation because their small mode volumes severely limit gain relative to cavity loss. Here, I will present continuous-wave upconverting micro- and nanolasing at room temperature with record-low thresholds and high photostability even after six hours of constant operation. I will talk about the coupling between Tm³⁺-based energy-looping nanoparticles (ELNPs) and optical microcavities with implications in deep-tissue imaging. I will also cover how to achieve directional lasing to enhance interactions at the nanoscale and selective single-mode lasing from Yb³⁺/Er³⁺-co-doped upconverting nanoparticles conformally coated on silver nanopillar arrays supporting sharp lattice plasmon modes. The intense electromagnetic near-fields resulted in a threshold of 70 W/cm², orders of magnitude lower than other small lasers.