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### Electrically driven nanogap optical antennas

Gaps formed between metal surfaces control the coupling of localized plasmons, thus, allowing gap-tuning targeted to exploit the enhanced optical fields for different applications. Classical electrodynamics fails to describe this coupling across sub-nm gaps, where quantum effects become important owing to non-local screening and spill-out of electrons. The advantages of narrow gap antennas have mostly been demonstrated for processes like SERS that are excited optically, but promising new phenomena appear when such antennas are fed by electric generators. However, the extreme difficulty of engineering and probing an electrically driven optical nanogap antenna has limited experimental investigations of physical concepts at stake in these conditions. The feasibility of structuring electron-fed antennas as nano-light sources has been recently demonstrated; however, this configuration remains very limited. Too much power was lost as heat when operating the optical antenna, and the antenna operation time was limited by the structure lifetime to sustain a bias voltage for a few hours. The innovative structure that we suggest here will cope with all these limitations: ALD dielectric materials substitute the air gap to improve the antenna stability; a quantum efficiency of  $10^{-1}$  is targeted owing to a significantly efficient antenna (two orders of magnitude higher field enhancement). The resulting source will operate at room temperature and have a tunable spectral response (ranging from visible frequencies to THz regime) defined by the antenna geometry and the applied bias. Also, this source will be compact, Si-compatible, and will not request specific emitting materials (e.g. III-V semi-conductors) to operate.

### Biography

Claire Deeb is a Research Scientist at Centre de Nanoscience et de Nanotechnologies (C2N), France where she conducts research in the field of Optics, Active Plasmonics, and Nanophotonics. She has an international experience through working at prestigious Argonne National Laboratory (ANL, USA) and at outstanding Northwestern University, where she was specialized in "Advancing plasmon nano laser sources, investigating energy transfer processes at the nanoscale, and exploiting the characteristics of single nano-objects". She has also developed expertise in Nanofabrication, Nano-characterization, Optical Spectroscopy, and Near-Field Imaging. She has initiated and maintained collaborations with several leading groups at UC-Berkeley and Ludwig Maximilian University of Munich and has led many international projects. She has supervised two PhD theses, has given eight invited talks, and has published over 13 influential papers and one book chapter. Additionally, she has received two PhD awards and is serving the scientific community as an Editor of *Progresses in Nanotechnology and Nanomaterials*.

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