IDENTITY

Juliette MANGENEY (CNRS – LPENS, Paris)

Short Biography

Dr Juliette Mangeney is a CNRS researcher in the NanoTHz group of the Laboratoire Physique de l'Ecole Normale Supérieure, Paris since 2012. Her main research focuses on exploring nanomaterials and novel physical concepts to develop advanced THz devices and instrumentation to support the development of THz technology. She currently coordinates an ERC consolidator project (2019-2025) on graphene quantum dots for coherent THz emission. Previously to her current position, she was a CNRS researcher at the Institute of Fundamental Electronics (IEF), Univ. Paris Sud, and studied devices and metrology tools driven by telecom optical waves for THz optoelectronics. She is the author of 101 publications in peer-reviewed journals, 29 invited talks and she holds 4 patents. She headed the French national network on "Nanodevices for THz and MIR radiation" from 2015 to 2023 and the French side of the Russian-French international research network FIRLAB from 2018 to 2022.

Title of Oral Presentation

Two-level system in graphene double quantum dots and Tamm resonators for THz quantum technology

Keywords

Graphene, Quantum Dots, Terahertz, Resonators

Abstract of Oral Presentation

Quantum technologies are experiencing considerable growth in the microwave and optical domains, while their development in the THz spectral range is still in its infancy, but promises significant technological impact1. In this context, developing a novel technology to realize two-level quantum systems at THz frequencies compatible with direct on-chip integration would represent a major breakthrough.

To this aim, graphene quantum dots are very attractive due to their high flexibility in engineering electronic states through their size, shape, and edges2. Here, we present a two-level system based on a hBN-encapsulated graphene double quantum dot (DQD) exhibiting a tunable transition frequency within the THz spectral range. Using low temperature transport measurements, we demonstrate a two-level system with resonance frequency of up to 0.14 THz. We further show that a single graphene QD exhibits a large THz electric dipole with a length of ≈230 nm, revealed by transport measurements under coherent THz illumination and the photon-assisted tunnelling phenomenon3. We also present original hybrid THz resonators4,5 that combine relatively high quality factors (Q~37) with a deep subwavelength mode volume (V~3.2x10−4λ3). Coupling graphene DQDs to these Tamm resonators opens new avenues for generating and detecting non-classical THz light states, essential building blocks of quantum technologies.

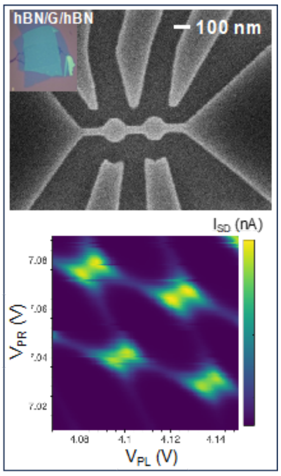

Figure 1 : Top) SEM image of the graphene DQD. Bottom) Measured charge stability diagram of a graphene DQD based device.

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References

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