Real-space Mapping of Plasmons in Graphene using s-SNOM

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The real-space visualisation of Dirac plasmons propagating in graphene was for the first time succeeded with an infrared near-field optical microscope [1, 2]. Graphene plasmon interference mapping allows the extraction of local material properties, such as conductivity, intrinsic doping and defects. Controlled surface plasmon propagation in graphene applying resonant antennas and conductivity patterns can be imaged using the same scattering-type near-field optical microscopy (s-SNOM) technology [3, 4]. For a deeper understanding of the physics in graphene, we are looking towards the study of ultra-fast dynamics [5] and effects at low temperature. Low-temperature s-SNOM permits to give insight into the mechanisms of plasmon-polariton damping [6]. We will introduce the cryo-neaSNOM closed-cycle low temperature s-SNOM, which makes it possible to study plasmonic materials at sample temperatures down to below 10 K [7].

References

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[3] P. A. Gonzales et al., Science 344 (2014), 1369
[4] M. B, Lundeberg et al., Nature Mat. 16 (2016), 204
[5] M. Wagner et al., Nano Lett. 14 (2014) 4529
[6] G. Ni et al., Nature 557 (2018) 530
[7] W. Luo et al., Nature Comm. 10 (2019) 2774

Figures

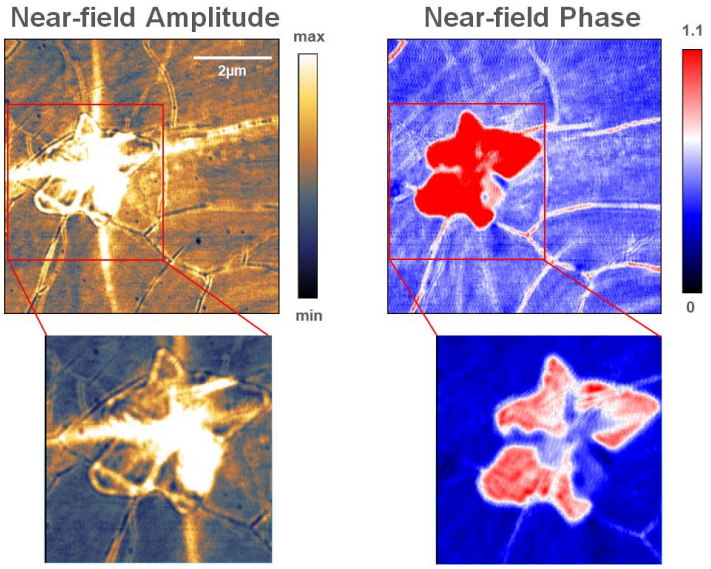

Figure 1: Amplitude and phase-resolved plasmon interference optical near-field mapping of graphene at 930 cm^{-1} and at 8.5 K.