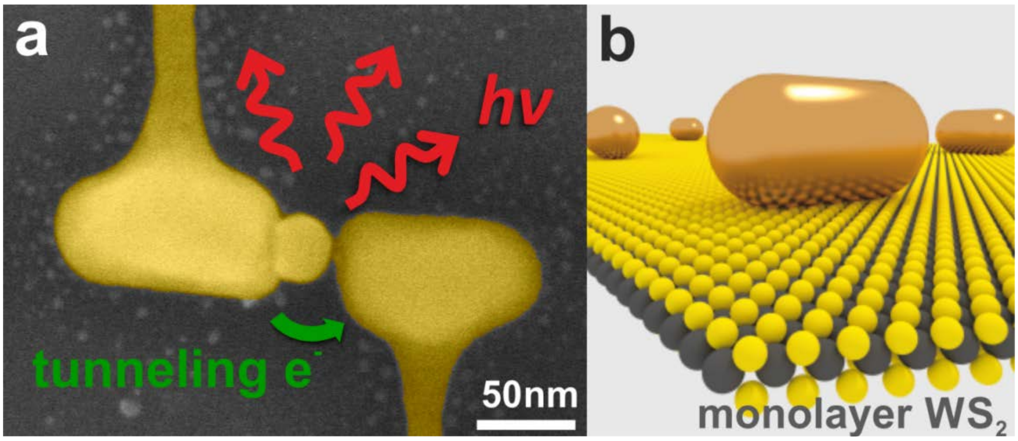
Plasmons and Excitons at the atomic-scale

Dr. Johannes Kern

AG Bratschitsch

Physikalisches Institut, Universität Münster

Plasmonic nanoantennas can provide strongly localized and enhanced optical fields.
In this talk I will present two recent experiments, which exploit plasmonic near-fields in order to enhance the interaction between light and matter on the atomic scale.



a) Electrically driven optical antennas
So far, optical antennas cannot be fed by electrical generators, since conventional electrical circuits are unable to generate oscillating currents with frequencies in the high terahertz regime. We have overcome this limitation and could electrically drive an optical antenna by the broadband quantum-shot noise of electrons tunneling across its atomic-scale feed gap [1].
b) Nanoantenna-Enhanced Light-Matter Interaction in Atomically Thin WS_2
The light–matter coupling for atomically thin transition metal dichalcogenides (TMDCs) is limited by their small absorption length and low photoluminescence quantum yield. We were able to significantly increase the light–matter interaction in monolayer tungsten disulfide (WS_2) by coupling the atomically thin semiconductor to a plasmonic nanoantenna [2].

References

1. Kern et al., “Electrically driven optical antenna”, *Nature Photonics* **9**, 582-586 (2015).
2. Kern et al., „Nanoantenna-Enhanced Light-Matter Interaction in Atomically Thin WS_2”, *ACS Photonics* **2**, 1260-1265 (2015).