Carl von Ossietzky
Universität
Oldenburg
Institut für PHYSIK

PHYSICAL COLLOQUIUM

INVITATION

Monday, 07.06.2021, 4.15 p.m.,
video conference: https://meeting.uol.de/b/anj-2vc-j6s-fwe

speaks

Dr. Alex S. Clark,

**Royal Society University Research Fellow, Centre for Cold Matter,
Imperial College London**

about

"Molecular Quantum Photonics"

Single photons lie at the heart of many quantum technologies, but are often difficult to generate and collect with high efficiency. Organic molecules present many favourable characteristics to overcome these issues [1].
When dibenzoterrylene (DBT) is embedded in anthracene it is photostable and forms a pseudo-two-level system which can be used to generate narrowband photons at cryogenic temperature [2-3]. The DBT interaction with its environment also forms an interesting open-quantum system forming vibrational lines and phonon sidebands in emission [4], which I will discuss. I will then present recent developments in coupling DBT emission to photonic and plasmonic nano-fabricated devices [5-6].
Such devices not only form the basis for building efficient photon sources, but can also be used for other applications where a strong light-matter interaction is required, including photon switching, number filtering, nonlinear photon-photon interactions, and quantum memories. The transition frequency of DBT molecules can be tuned using a DC electric field via the Stark effect or via strain tuning. I will show that single DBT molecules can be tuned across the D2 hyperfine resonances of rubidium, making solid-state molecular photon sources compatible with atomic quantum memories.

References
[1] C. Toninelli et al., arXiv:2011.05059 (2021).
[2] S. Grandi et al., Phys. Rev. A 94, 063839 (2016).
[3] R. C. Schofield et al., Opt. Mater. Express 10, 1586-1596 (2020).
[4] C. Clear et al., Phys. Rev. Lett. 124, 153602 (2020).
[5] S. Grandi et al., APL Photonics 4, 086101 (2019).
[6] S. Boissier et al., Nature Communications 12, 706 (2021).

All interested persons are cordially invited.

Sgd. Dr. Carlos Anton-Solanas