

## Post-doc position available at MPQ laboratory – University Paris Diderot

### Theoretical modelling of superradiant emitters

The infrared optical response of a two-dimensional electron gas confined in a semiconductor quantum well is a cooperative phenomenon that gathers all the oscillator strength in one and only resonance, corresponding to a many-body excitation of the system, a two-dimensional plasmon [1]. This two-dimensional plasmon has a superradiant nature as its spontaneous emission lifetime depends on the number of electrons involved in the interaction and it can be even shorter than the typical non-radiative lifetime [2,3].

The possibility of exploiting this extremely short (~100 fs) spontaneous emission lifetime is very appealing for the realisation of efficient light-emitting devices. The aim of this project will be to theoretically investigate how an electronic dc current can excite a confined plasmon, in order to realise very bright electromagnetic sources based on a quantum engineering of collective excitations rather than single electronic states.

We are looking for a highly motivated and creative young researcher, with a strong background in general concepts of solid-state and many-body physics. The post-doc will work at University Paris Diderot in close interaction with experimental researchers of the team Quantum Physics and Devices, and with researchers specialized in plasma physics at LSPM - University Paris Nord.

The position will be initially for one year, with the possibility of renewal for another year. The starting date is quite flexible, with a preference for fall 2017.

#### References

1. A. Delteil, A. Vasanelli, Y. Todorov, C. Feuillet-Palma, M. Renaudat St-Jean, G. Beaudoin, I. Sagnes and C. Sirtori, *Charge induced coherence between intersubband plasmons in a quantum structure*, Phys. Rev. Lett. **109**, 246808 (2012).
2. T. Laurent, Y. Todorov, A. Vasanelli, A. Delteil, C. Sirtori, I. Sagnes, G. Beaudoin, *Superradiant Emission from a Collective Excitation in a Semiconductor*, Phys. Rev. Lett. **115**, 187402 (2015).
3. S. Huppert, A. Vasanelli, G. Pegolotti, Y. Todorov, and C. Sirtori, *Strong and ultrastrong coupling with free-space radiation*, Phys. Rev. B **94**, 155418 (2016).

#### Contact:

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