Carlos Anton-Solanas

About me

My area of expertise is nanophotonics and solid-state quantum optics. My PhD (Univ. Autonoma of Madrid, 2015, Spain) was focused on the properties of exciton-polariton condensates in semiconductor microcavities, from fundamental phenomena (such as superfluidity and vortex dynamics) to newcomer applications (logic gates, transistors).

During my 1st postdoc (C2N-CNRS, 2015-2019, France) I worked on solid state quantum optics, using quantum dots coupled to micropillar cavities. I obtained an **Individual Marie Sklodowska-Curie Fellowship** to work on "Scalable Quantum Photonics with Ultra Bright Photon Sources". My research explored three topics: (1) *generation of quantum light,* (2) *single-photon gates* and (3) *multiphoton interference and entanglement*.

During my 2nd postdoc (University of Würzburg, 2019-2020, Germany) I worked on excitons and exciton polaritons in atomically thin crystals of transition metal dichalcogenides. Check a recent press release about my research on this topic here.

From July 2020, I joined Prof. Christian Schneider to create an experimental research group on ***Quantum Materials*** in the Institute of Physics of the University of Oldenburg, where I am doing my Habilitation. At the moment I am investigating novel quantum materials and their coupling to light to study cavity quantum electrodynamics phenomena.

Here I include a list of my research activity:

- **Works on solid-state quantum optics**

2021

Wein, S. C. *et al.* Photon-number entanglement generated by sequential excitation of a two-level atom. *arXiv:2106.02049* (2021).

Thomas, S. E. *et al.* Bright Polarized Single-Photon Source Based on a Linear Dipole. *Phys. Rev. Lett.* **126**, 233601 (2021).

Ollivier, H. *et al.* Hong-Ou-Mandel Interference with Imperfect Single Photon Sources. *Phys. Rev. Lett.* **126**, 063602 (2021).

Iff, O. *et al.* Purcell-Enhanced Single Photon Source Based on a Deterministically Placed WSe_2 Monolayer Quantum Dot in a Circular Bragg Grating Cavity. *Nano Lett.* acs.nanolett.1c00978 (2021)

Prior to 2021

Ollivier, H. *et al.* Reproducibility of High-Performance Quantum Dot Single-Photon Sources. *ACS Photonics* **7**, 1050–1059 (2020).

Istrati, D. *et al.* Sequential generation of linear cluster states from a single photon emitter. *Nat Commun* **11**, 5501 (2020).

Hilaire, P. *et al.* Deterministic assembly of a charged-quantum-dot–micropillar cavity device. *Phys. Rev. B* **102**, 195402 (2020).

Loredo, J. C. *et al.* Generation of non-classical light in a photon-number superposition. *Nat. Photonics* **13**, 803–808 (2019).

De Santis, L. *et al.* Overcomplete quantum tomography of a path-entangled two-photon state. *Phys. Rev. A* **99**, 022312 (2019).

Antón, C. *et al.* Interfacing scalable photonic platforms: solid-state based multi-photon interference in a reconfigurable glass chip. *Optica* **6**, 1471 (2019).

Hilaire, P. *et al.* Accurate measurement of a 96% input coupling into a cavity using polarization tomography. *Appl. Phys. Lett.* **112**, 201101 (2018).

Grange, T. *et al.* Reducing Phonon-Induced Decoherence in Solid-State Single-Photon Sources with Cavity Quantum Electrodynamics. *Phys. Rev. Lett.* **118**, 253602 (2017).

De Santis, L. *et al.* A solid-state single-photon filter. *Nature Nanotechnology* **12**, 663–667 (2017).

Antón, C. *et al.* Tomography of the optical polarization rotation induced by a single quantum dot in a cavity. *Optica* **4**, 1326–1332 (2017).

Somaschi, N. *et al.* Near-optimal single-photon sources in the solid state. *Nature Photonics* **10**, 340–345 (2016).

Loredo, J. C. *et al.* Scalable performance in solid-state single-photon sources. *Optica* **3**, 433–440 (2016).

Giesz, V. *et al.* Cavity-enhanced two-photon interference using remote quantum dot sources. *Phys. Rev. B* **92**, 161302 (2015).

Martín, M. D., Antón, C., Viña, L., Piętka, B. & Potemski, M. Recombination dynamics of excitons and exciton complexes in single quantum dots. *EPL* **100**, 67006 (2012).

- **Works on exciton-polaritons and TMDCs**

2021

Michl, J. *et al.* Intrinsic circularly-polarized exciton emission in a twisted van-der-Waals heterostructure. *arXiv:2105.09948* (2021).

Lackner, L. *et al.* Fully tunable exciton-polaritons emerging from WS$_{2}$ monolayer excitons in an optical lattice at room temperature. *arXiv:2102.09565* (2021).

Shan, H. *et al.* Coherent light emission of exciton-polaritons in an atomically thin crystal at room temperature. *arXiv:2103.10459* (2021).

Anton-Solanas, C. *et al.* Bosonic condensation of exciton–polaritons in an atomically thin crystal. *Nat. Mater.* (2021) doi:10.1038/s41563-021-01000-8.

Prior to 2021

Martín, M. D., Rozas, E., Antón, C., Savvidis, P. G. & Viña, L. On the remote coherence of polariton condensates in 1D microcavities: A photoluminescence study. *Journal of Luminescence* **228**, 117612 (2020).

Gao, T. *et al.* Spin selective filtering of polariton condensate flow. *Appl. Phys. Lett.* **107**, 011106 (2015).

Antón, C. *et al.* Optical control of spin textures in quasi-one-dimensional polariton condensates. *Phys. Rev. B* **91**, 075305 (2015).

Antón, C. *et al.* Quantum coherence in momentum space of light-matter condensates. *Phys. Rev. B* **90**, 081407 (2014).

Antón, C. *et al.* Ignition and formation dynamics of a polariton condensate on a semiconductor microcavity pillar. *Phys. Rev. B* **90**, 155311 (2014).

Antón, C. *et al.* Operation speed of polariton condensate switches gated by excitons. *Phys. Rev. B* **89**, 235312 (2014).

Antón, C. *et al.* Energy relaxation of exciton-polariton condensates in quasi-one-dimensional microcavities. *Phys. Rev. B* **88**, 035313 (2013).

Antón, C. *et al.* Quantum reflections and shunting of polariton condensate wave trains: Implementation of a logic AND gate. *Phys. Rev. B* **88**, 245307 (2013).

Spano, R. *et al.* Coherence properties of exciton polariton OPO condensates in one and two dimensions. *New Journal of Physics* **14**, 075018 (2012).

Antón, C. *et al.* Role of supercurrents on vortices formation in polariton condensates. *Optics Express* **20**, 16366 (2012).

Antón, C. *et al.* Dynamics of a polariton condensate transistor switch. *Applied Physics Letters* **101**, 261116-261116–4 (2012).

Tosi, G. *et al.* Onset and Dynamics of Vortex-Antivortex Pairs in Polariton Optical Parametric Oscillator Superfluids. *Physical Review Letters* **107**, 036401 (2011).

Adrados, C. *et al.* Motion of Spin Polariton Bullets in Semiconductor Microcavities. *Physical Review Letters* **107**, 146402- (2011).

- **Pedagogic papers**

Anton, C. & Brun, J. L. Gravitational pocket billiards with MathematicaTM. *Rev. Mex. Fis.* **55**, 168–175 (2009).

Antón, C. & Brun, J. L. Isochronous oscillations: Potentials derived from a parabola by shearing. *American Journal of Physics* **76**, 537–540 (2008).