GaAs Quantum Dots as Sources of Highly Entangled and Indistinguishable Photons

Johannes Kepler University Linz, Austria

Armando Rastelli
Email: armando.rastelli@jku.at

Entanglement is one of the most peculiar phenomena in quantum science and a key resource for quantum technologies. More than two decades after the initial proposal, semiconductor quantum dots (QDs) are now beginning to outperform other light sources for the generation of entangled photon pairs. Among different material systems, QDs in the (Al)GaAs material platform have demonstrated the highest degree of polarization entanglement to date together with other appealing features for quantum science and technology. These QDs are obtained by GaAs overgrowth of an AlGaAs surface with nanoholes and are characterized by small inhomogeneous broadening, high oscillator strengths, shape with high in-plane symmetry, and high optical quality, especially when embedded in charge-tunable diode structures. In this talk, we will discuss the properties of GaAs QDs obtained by the droplet etching method and present recent results relevant to their application in quantum communication, as well as open challenges.

Short Bio:

Armando Rastelli received his PhD degree in Physics in 2003 from the University of Pavia, Italy and he is a professor of Semiconductor Physics at the at the Johannes Kepler University of Linz, Austria since 2012. During his PhD he was research assistant at the ETH Zürich, Switzerland, and Marie-Curie-Fellow at the Technical University of Tampere, Finland. From 2003 to 2007 he was first PostDoc and then group leader at the Max-Planck-Institute of Stuttgart, Germany, and, till 2012 at the Leibniz Institute of Dresden, Germany. In 2019 he was elected corresponding member of the Austrian Academy of Sciences. Throughout his career, he has been developing new methods to obtain, study, and control epitaxial

quantum dots. The main current focus of the research of his group is on the optimization of quantum dot structures as sources of quantum light and hosts of quantum information.