



## Seminar announcement

**Thursday, July 10, 2025**

**12:30 pm**

**ZNN, Seminar room EG 0.001**

**Exclusively in person**

### **“Quantum dots: Between quantum computing and communication”**

Quantum dots (QDs) are emerging as efficient single-photon sources, propelling advancements across quantum technologies from secure communications to scalable quantum computing. Thanks to the breakthroughs in the last decade, QDs now exhibit high brightness, exceptionally high single-photon purity, high indistinguishability and the ability to generate entangled photons. Those properties make them perfect candidates for applications like Quantum Key Distribution (QKD) and photonic quantum computing.

In this seminar, we will explore both topics. The first part looks into how the spin dynamics of a single electron confined in a semiconductor QD can be harnessed to generate cluster states, key resources for measurement-based quantum computing. We will also explore how to generate more intricate graph states, known as caterpillar states, through advanced pulse sequences.

In the second part, we will shift focus to quantum communication. I will present recent proof-of-concept experiments demonstrating an implementation of QKD using QD-based single-photon sources. We will further examine how secret key rates scale with distance using QDs and weak laser beams, revealing a promising intermediate regime where both sources can be mixed.



Dario Fioretto studied experimental physics in Padova where he graduated in 2014. From 2015 to 2021, he performed his PhD in Innsbruck in the group of Prof. T. Northup, focusing on the implementation of quantum network infrastructure and protocols based on trapped ions coupled to optical cavities. Through this experience he developed a strong interest in quantum networking and quantum cryptography. Now a permanent researcher at C2N, his research focusses on the implementation of quantum communication protocols with QD sources.

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