

Quantum physics in advanced technology

Presenter	Company	Date	Title	Abstract
Matthias Van de Bossche	THALES-Alenia Space	17-janv	Satellite Quantum Information Networks - status and research needs	Quantum communication networks will require satellites to allow efficient long distance links. This presentation introduces key concepts in quantum communications, and then draws the focus on quantum information networks (QIN) that will allow generic quantum state transfers between processors or sensors, or both. The overall architecture principles of QIN systems are detailed, critical enabler and key performance drivers are identified. The state of the art for the various elements is presented, and the progress needs in specific domains to go beyond proof of principle are identified.
Dimitri Labat	Chipiron	24-janv	Unlocking access to MRI with superconducting detection systems	MRI is the most powerful and versatile medical imaging technique to date, yet it remains very inaccessible due to its cost and the technical constraints related to the use of high magnetic fields (of the order of Tesla) produced by a superconducting magnet. Chipiron is building an MRI system based on low-Tc SQUID, high sensitivity magnetometers with flat frequency response. These features allow the working field to be lowered to milliTesla while maintaining images of sufficient high quality for diagnosis. In the future, MRI will be made as simple as routine blood sampling.
Clement Barraud	Pioniq	31-janv	Emerging quantum materials and their applications	During this class, I will introduce the concept of quantum materials and heterostructures from a Physicist point of view. I will discuss about present and future industrial applications and I will present the next milestones to achieve.
Zaki Leghtas	Alice&Bob	07-févr	Quantum information with superconducting circuits	In this presentation I will introduce superconducting circuits and explain how they are being widely used to encode, protect and manipulate quantum information. The remarkable progress achieved over the last 20 years in this field has triggered a recent interest of the industrial sector, which I will briefly review.
Pierre-Emmanuel Emeriau & Sébastien Boissier	QUANDELA	14-févr	Quantum optics with solid-state emitters: toward a quantum computing platform	In this presentation, we will discuss how conducting fundamental studies of light-matter interaction with semiconductor quantum dots, our team progressively developed useful devices for optical quantum technologies. These devices, namely efficient sources of single photons, are now commercialised by Quandela, a spin-off company created in 2017. With continuing progresses on the technological side, Quandela is now working on the development of an intermediate-scale quantum computing platform based on photons. We will discuss the assets and challenges of such a platform.

Vincent Ménoret	Exail Quantum Sensors	21-févr	Industrial quantum gravity sensors: from research labs to volcanoes	Transforming a high-precision laboratory experiment into a commercial instrument is a long process. I will describe the challenges faced by Exail Quantum Sensors (formerly Muquans) during the development of a cold atom absolute gravimeter, and show some examples of applications.
Christophe Jurczak	Quantonation	07-mars	Investing in the quantum future: how venture capital and startups are driving quantum innovation	Quantonation is a very special fund, investing exclusively in startups leveraging quantum technologies and what we call "deep physics". We back startups - in their vast majority founded by quantum physicists - from day one, towards growth and ultimately putting products on markets for applications that have a deep impact on society. We have invested in Pasqal (neutral atoms quantum computing), Quandela (photonics), Nord Quantique (superconducting qubits), Cryptonext (post-quantum cryptography), Qnami (quantum sensing) and many more, all around the world. I have been trained as quantum scientist and will discuss exciting opportunities, but also challenges and pitfalls for the emerging quantum industry.
Sylvain Gigan	LightOn	14-mars	Computing with white paint? yes, we can.	I will describe our path, from fundamentals of light in complex media and biological imaging in our team at the physics department of ENS, to the founding of LightOn, a young startup that proposes to address modern machine learning challenges, leveraging on the same concepts, i.e. what I would call "optical computing with white paint".
Roland Teissier	mirSense	21-mars	Quantum Cascade Lasers: from semiconductor physics to real world applications	Quantum cascade lasers came into being 30 years ago thanks to advances in the physics of semiconductor quantum heterostructures and the development of highly demanding manufacturing techniques using molecular beam epitaxy and clean-room processing. The French company mirSense, a start-up from the research laboratories of 3-5 Labs, CEA LETI and the University of Montpellier, markets these infrared lasers for defense and gas detection applications. I'll be presenting the physics of QCLs and the current challenges in their design, manufacture and industrialization.