

Quantum physics and condensed matter in advanced technology

Nom	Company	Date	Titre	Resume
Sylvain Gigan	LightOn	15-janv	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.
Dimitri Labat	Chipiron	22-janv	Portable IRM for medical imaging based on superconducting detectors	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.
Mathias VAN DEN BOSSCHE	THALES	29-janv	Satellite Quantum Information Networks - status and research need	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.
Pascale Senellart & Shane Mansfield	QUANDELA	05-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.
Zaki Leghtas	Alice & Bob	12-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.

Mathieu Carras	MirSense	19-févr	Quantum cascade laser	<p>I will present mirSense, a company which dedicates its effort to the democratization of the quantum cascade laser technology, a semiconductor laser generating light in the mid-infrared. I will illustrate my personal experience as a founder and current director of the company.</p> <p>I will also show how the quantum cascade laser has found its market and how it has changed the way we sense the world around us. A long history that have started from abstract quantum well concepts in the 70's to air quality monitoring, glucose sensing in blood and people security today.</p>
Thibault Laurent	Safran	05-mars	Opto-electronics and optical functions for space, astronomy and defense applications	<p>I will present my career path from the PhD to today. I will present how the physics of condensed matter and quantum physics are used in my activities of applied science in the industry, what are the limitations and challenges for the years to come. I will also describe how I have applied and the skills acquired during my years in research laboratories to the space, astronomy and defense industries.</p>
Jakob Reichel	VIRGO	12-mars	High-finesse optical cavities from the micrometer to the kilometer: Advanced technology in the making	<p>Optical cavities are everywhere, from DVD players to gravitational wave detectors. More than a century after Fabry and Pérot, cavity technology has recently entered another phase of rapid development, initially driven by new demands in fundamental research, and enabling new applications of its own. Looking more closely at this impressive progress however, its pathways are much more sinuous and surprising than a naive view of directed research and development might suggest. We will discuss a few recent examples that illustrate this complex interplay of research, development and business.</p>
Giulia Frucci	ID quantique	19-mars	Superconducting Nanowire Single Photon Detectors and systems	<p>Over the past decade, superconducting nanowire single photon detectors (SNSPDs) have emerged as a key enabling technology for quantum optics and free-space optical communication. Superconducting detectors can outperform other photon-counting technologies in a variety of performance metrics such as detection efficiency, dark count rate, timing jitter, reset time, and photon-number resolution. In this presentation, I will discuss how IDQ has exploited SNSPD technology to build a single photon detection system for industry, quantum related applications and academic research.</p>