2018 International Symposium on Quantum Technologies

31 Oct.-Nov.3, 2018

Shanghai

Conference Program

Organization:

The conference is organized by State Key Laboratory of Precision Spectroscopy, East China Normal University and supported by Ambassade de France en Chine.

Conference address:

Conference hall, Yifu Building, East China Normal University (Zhongbei Campus)

华东师范大学（中山北路校区 上海市中山北路 3663 号）逸夫楼报告厅

TEL: +86-21-62601058

Register:

18:00-20:00, Oct. 30, 2018

08:30-11:30, Nov. 1, 2018

Address: Yifu Building, East China Normal University (3663 Zhongshan North Road, Shanghai)

华东师范大学（中山北路校区，上海市中山北路 3663 号）逸夫楼

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The field of Quantum Technologies covers the domains of quantum communication, computation, simulation, sensors and metrology, and their implementation using various platforms from atoms and ions to solid states, superconducting circuits and optics. It has been supported in China and Europe by an unprecedented financial effort in the recent years. This workshop aims at gathering the community to stimulate scientific exchanges and promote quantum technologies. To share the advanced knowledge to this flourishing field, 2018 International Symposium on Quantum Technologies will be held on October 31-November 3 of 2018 in Shanghai.

French Scientific committee:

- Prof. Michèle Leduc (LKB ENS)
- Prof. Elisabeth Giacobino (LKB Paris-Sorbonne)
- Prof. Nicolas Treps (LKB Paris-Sorbonne)
- Prof. Jean-François Roch (ENS Cachan)
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- Prof. Jing Zhang (Shanxi University)
- Prof. Lijian Zhang (Nanjing University)
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- Prof. Nicolas Treps (LKB Paris-Sorbonne)
- Prof. Jean-François Roch (ENS-Paris Saclay)
- Prof. Heping Zeng (ECNU)
- Prof. E Wu (ECNU)

Program at a glance

Wednesday, October 31		Thursday, November 1st		Friday, November 2		Saturday, November 3	
9:00-9:15	Opening Ceremony	9:00-9:30	Tiancai Zhang	9:00-9:30	Nicolas Treps	9:00-9:30	Denis Vion
	Photo-taking	9:30-10:00	Haibin Wu	9:30-10:00	Xiaojun Jia	9:30-10:00	Chuanfeng Li
9:15-9:45	Jean-Francois Roch	10:00-10:30	Romain Long	10:00-10:30	Jietai Jing	10:00-10:30	Matthias Weidemuller
9:45-10:15	Wolfgang Ertmer	10:30-11:00	Break	10:30-11:00	Break	10:30-11:00	Break
10:15-10:45	Break	11:00-11:20	Michèle Leduc	11:00-11:30	Gerd Leuchs	11:00-11:30	Arnaud Landragin
10:45:11:30	Alain Aspect	11:20-11:50	Quan Li	11:30-12:00	Chaoyang Lu	11:30-12:00	Ruifang Dong
11:30-12:15	Jianwei Pan	11:50-12:20	E Wu	12:00-12:30	Olivier Alibart	12:00-12:30	Kun Huang
12:15-14:00	Lunch	12:20-14:00	Lunch	12:30-14:15	Lunch	12:30-14:00	Lunch
14:00-14:45	Philippe Bouyer	14:00-14:30	Xiaoji Zhou	14:15-14:45	Jean-Jacques Greffet	14:00-16:30	Lab tour
14:45-15:00	Break	14:30-15:00	Goulven Quemener	14:45-15:15	Isabelle Robert-Philip		
15:00-16:00	Round Table discussion	15:00-15:30	Xing Rong	15:15-15:45	Somachi Niccolo		
16:00-16:30	Interview	15:30-16:00	Break	15:45-16:15	Break		
		16:00-16:30	Elisabeth Giacobino	16:15-16:45	Ivan Favero		
		16:30-17:00	Xiaoyong Wang	16:45-17:15	Perola Milman		
18:30-21:00	Conference Banquet	18:00-	Poster Session				
	Shanghai city center		/ Reception				

Program

Oct.31

9:00-9:15 ***Heping Zeng - Opening and Photo taking***

Session 1 Chair: Tiancai Zhang

9:15-9:45 **Invited talk: Magnetometry with NV color centers in diamond: Application to high-pressure physics**
Prof. Jean-Francois Roch
Laboratoire Aimé Cotton, ENS-Paris Saclay, France

9:45-10:15 **Invited talk: Spaceborne Bose-Einstein Condensation for atom interferometr**
Prof. Wolfgang Ertmer
Leibniz Universität Hannover, Germany

10:15-10:45 ***Break***

Session 2 Chair: Nicolas Treps

10:45-11:30 **Tutorial talk: Landmarks in the second quantum revolution: from photons to atoms**
Prof. Alain Aspect
Institut d'Optique, Palaiseaux, France

11:30-12:15 **Tutorial talk: From tests of quantum foundations to new quantum technologies**
Prof. Jianwei Pan
University of Science and Technology of China, China

12:00-14:00 ***Lunch Break***

Session 3 Chair: Michèle Leduc

14:00-14:45 **Tutorial talk: To be announced**
Prof. Philippe Bouyer
Institute d'optique, France

14:45-15:00 ***Break***

Session 4 Chair: Pierre Lemonde and Gaetan Messin

15:00-16:00 ***Round table discussion***

16:00-16:30 ***Interview***

15:40-16:00 ***Conference Banquet***

17:30-19:00 ***Banquet****

*The conference banquet will begin at Sofitel Shanghai Hyland (上海索菲特海仑宾馆) at 505 Nanjing Road East (上海南京东路 505 号). A bus will be arranged to take you to the restaurant in front of the YiFu Building at 16:45. If you miss the bus, please manage to reach the restaurant by yourselves.

Nov.1

Session 5 Chair: Quan Li

9:00-9:30 **Invited talk: Single atom manipulation and measurement in optical trap and optical cavity**
Prof. Tiancai Zhang
Shangxi University, China

9:30-10:00 **Invited talk: The universal dynamics in scale invariant quantum gases**
Prof. Haibin Wu
East China Normal University, China

10:00-10:30 **Invited talk: Towards cavity-based entanglement of an atomic register under a microscope**
Prof. Romain Long
Sorbonne Université, ENS-Paris, France

10:30-11:00 ***Break***

Session 6 Chair: Arnaud Landragin

11:00-11:20 **Invited talk: SIRTEQ, a research network on Quantum Technologies in the Paris area**
Michèle Leduc
Prof. Michèle Leduc
Lab. Kastler Brossel, ENS-Paris, France

11:20-11:50 **Invited talk: Enabling diamond quantum sensing at elevated temperatures**
Prof. Quan Li
Chinese University of Hong Kong, China

11:50-12:20 **Invited talk: High-efficiency broadband single-photon frequency upconversion**
Prof. E Wu
East China Normal University, China

12:20-14:00 ***Lunch Break***

Session 7 Chair: Wolfgang Ertmer

14:00-14:30 **Invited talk: Echo-Ramsey interferometry with atomic quantum motional states**
Prof. Xiaoji Zhou
Peking University, China

14:30-15:00 **Invited talk: Controlling the scattering length of ultracold dipolar molecules**
Prof. Goulven Quemener
Laboratoire Aimé Cotton, CNRS, Université Paris-Sud, ENS Paris-Saclay

15:00-15:30 **Invited talk: Explore physics beyond standard model by single spin quantum sensors**
Prof. Xing Rong

University of Science and Technology of China, China

15:30-16:00 ***Break***

Session 8 Chair: Jean-Jacques Greffet

16:00-16:30 **Invited talk: Topological excitations in quantum polariton fluids and perspectives for quantum simulation**
Prof. Elisabeth Giacobino
Lab. Kastler Brossel, Sorbonne Université, Franc

16:30-17:00 **Invited talk: Single perovskite nanocrystals: from exciton fine-structure splitting to coherent optics**
Prof. Xiaoyong Wang
Nanjing University, China

18:00- ***Poster Session/Reception***
Ground floor in Science Building.

Nov.2

Session 9 Chair: Gerd Leuchs

9:00-9:30 **Invited talk: Tailored non-Gaussian multimode optical states**
Prof. Nicolas Treps
Lab. Kastler Brossel, Sorbonne Université, France

9:30-10:00 **Invited talk: Deterministic quantum teleportation through fiber-channel**
Prof. Xiaojun Jia
Shanxi University, China

10:00-10:30 **Invited talk: Quantum light sources based on four-wave mixing processes from hot atomic vapor**
Prof. Jietai Jing
East China Normal University, China

10:30-11:00 ***Break***

Session 10 Chair: Xiaojun Jia

11:00-11:30 **Invited talk: Space quantum telecommunications**
Prof. Gerd Leuchs
Max-Planck-Institute for the Science of Light, Germany

11:30-12:00 **Invited talk: Toward "quantum supremacy" with photons**
Prof. Chaoyang Lu
University of Science and Technology of China, China

12:00-12:30 **Invited talk: Quantum photonics on a chip**
Prof. Olivier Alibart
University of Nice Sophia-Antipolis

12:30-14:00 ***Lunch Break***

Session 11 Chair: Haibin Wu

14:00-14:30 **Invited talk: Quantum optics with surface plasmons**
Prof. Jean-Jacques Greffet
Institut d'optique, France

14:30-15:00 **Invited talk: Quantum sensing at nanoscale with NV centers in diamond**
Prof. Isabelle Robert-Philip
University of Montpellier, France

15:00-15:30 **Invited talk: Commercialization of solid-state single photon sources for the development of quantum technologies**
Dr. Somachi Niccolo
Quandela

15:30-16:00 ***Break***

Session 12 Chair: Xiaoji Zhou

16:00-16:30 **Invited talk: Collective Nano-OptoMechanics**
Prof. Ivan Favero

University of Paris Diderot, France

16:30-17:00 **Invited talk: Quantum computing and modular variables using fréquence degrees of freedom**

Porf. Perola Milman

Université Paris Diderot, CNRS

Nov.3

Session 13 Chair: Elisabeth Giacobino

9:00-9:30 **Invited talk: Quantum microwaves with a DC-biased Josephson junction**
Prof. Denis Vion
CEA-Saclay, France

9:30-10:00 **Invited talk: Quantum network based on solid state quantum memory**
Prof. Chuanfeng Li
University of Science and Technology of China, China

10:00-10:30 **Invited talk: Universal non-equilibrium dynamics in a gas of Rydberg spins**
Prof. Matthias Weidemuller
Heidelberg University, Germany

10:30-11:00 ***Break***

Session 14 Chair: E Wu

11:00-11:30 **Invited talk: Atom interferometry for high sensitivity in inertial measurements**
Prof. Arnaud Landragin
SYRTE, Observatoire de Paris, France

11:30-12:00 **Invited talk: Research on quantum enhanced two-way time transfer via frequency entangled biphoton source**
Prof. Ruifang Dong
National Time Service Center, CAS, China

12:00-12:30 **Invited talk: Optical hybrid entanglement between discrete- and continuous-variable states**
Prof. Kun Huang
University of Shanghai for Science and Technology, China

12:30-14:00 ***Lunch Break***

14:00-16:00 **Lab Tour**

Magnetometry with NV color centers in diamond:

Application to high-pressure physics

Jean-François ROCH

Laboratoire Aimé Cotton，ENS Paris-Saclay, France

The nitrogen-vacancy (NV) color center is a point defect of diamond that behaves as an artificial atom with a discrete spectrum of quantum states. Due to this remarkable property, the NV center can be used as a magnetic field, pressure, and temperature solid-state quantum sensor down to the atomic scale.

I will describe how NV-based magnetic sensing can be implemented inside a diamond anvil cell in order to investigate the magnetic and superconducting properties of high-pressure materials. Indeed, the diamond anvil cell is a table-top system that implements in laboratory conditions pressures above the megabar range, leading to the onset of specific quantum states of matter. However, confining the sample in the tiny dimension of the diamond anvil cell makes the implementation of any non-optical sensing technique highly challenging. I will describe the results obtained on a model phase transition induced by applying a pressure between 10 and 40 GPa inside a diamond anvil cell. This NV-based high-pressure sensing method is compatible with synchrotron-based characterization of the crystalline structure. The implementation of these complementary techniques in a single set-up will open a broad range of applications.

Spaceborne Bose-Einstein Condensation for Atom Interferometry

Wolfgang Ertmer
Leibniz Universität Hannover, Hannover, Germany for the QUANTUS-MAIUS Team

On January 23rd 2017 the first Bose-Einstein Condensate (BEC) in Space has been created onboard the sounding rocket mission MAIUS-1. The successful operation of the atom-chip based BEC source marks a major advancement in the effort of performing matter wave interferometry in weightlessness in space vehicles. Thanks to the high-flux source, experiments could be performed during the microgravity phase of the flight, which lasted six minutes. The experiments served to characterize the creation and features of the space BECs: the transition between a thermal ensemble and a BEC, the free evolution of BECs, their coherence and state preparation. In addition, the creation of cold atomic clouds in highly dynamic environments was observed during the launch and ascend of the rocket. There will be two follow-up missions planned which will include dual-species atom interferometry using Rubidium-87 and Potassium-41. Based on the successful QUANTUS projects, MAIUS-1 opens a new path towards space born inertial sensing employing atom interferometers with high accuracy and unprecedented sensitivity. In the recent past several missions have been proposed ranging from a test of the universality of free fall using a dual-species atom interferometer for earth observation. Due to their small initial size and low expansion rates BECs are the ideal source for such an interferometric measurement in space (This research has been funded by the German Space Agency DLR under grant number DLR 50WP1435).

Landmarks in the second quantum revolution: from photons to atoms

Alain Aspect
Institut d'Optique Graduate School
Université Paris-Saclay

The second quantum revolution is based on entanglement, discovered by Einstein and Schrödinger in 1935. Its extraordinary character has been experimentally demonstrated by landmark experiments in quantum optics: Hanbury Brown and Twiss effect, Hong Ou Mandel effect, Bell's inequalities violations…

At Institut d'Optique, we are currently revisiting these landmarks using atoms instead of photons, and after the observation of the atomic HBT[1] and HOM effects[2], we are progressing towards a test of Bell's inequalities with pairs of momentum entangled atoms[3].

This talk will be an opportunity to know *Everything (almost) you always wanted to know about HBT, HOM, etc… (but were afraid to ask)."*

1. T. Jeltes, J. M. McNamara, W. Hogervorst, W. Vassen, V. Krachmalnicoff, M. Schellekens, A. Perrin, H. Chang, D. Boiron, A. Aspect, and C. I. Westbrook, "Comparison of the Hanbury Brown-Twiss effect for bosons and fermions," Nature 445 (7126), 402-405 (2007).

2. Lopes, R., Imanaliev, A., Aspect, A., Cheneau, M., Boiron, D., & Westbrook, C. I. (2015). Atomic Hong-Ou-Mandel experiment. *Nature*, *520*(7545), 66-68.

3. P. Dussarrat, M. Perrier, A. Imanaliev, R. Lopes, A. Aspect, M. Cheneau, D. Boiron, and C. I. Westbrook, "Two-Particle Four-Mode Interferometer for Atoms," Physical Review Letters 119 (17) (2017).

Single atom manipulation and measurement in optical trap and optical cavity

Tiancai Zhang
State Key Laboratory of Quantum Optics and Quantum Optics Devices,
Institute of Opto-Electronics, Shanxi University, Taiyuan 030006, China

A well control single atom is a good system for demonstrating quantum manipulation and studying decoherence of a quantum system. It is also the basics for the control of multiple atoms for quantum simulation. We will show some progress of single atom manipulation and measurement either in optical trap or the cavity. Single neutral atoms is trapped either in red or blue traps. A single atom Ramsey interferometer is set up and the imbalance losses are deliberately introduced to the system and we demonstrate the wavelike or particle-like behavior. Bohr's complementarity principle (BCP) based on wave-particle duality of a massive quantum system of single neutral atom is tested. The experimental results can be completely explained theoretically by quantum mechanics without considering the interference between wave and particle behaviors. The experiment can be extended to the delayed-choice experiment with single neutral atom. Another experiment is the full measurement of complete and continuous Wigner functions of a two-level cesium atom in both a nearly pure state and highly mixed states. We have used the definition of strictly constructing continuous Wigner functions for any qubit systems given by Tilman [3]. We find that the Wigner function of all pure states of a qubit has negative regions and the negativity completely vanishes when the purity of an arbitrary mixed state is less than 2/3. We experimentally demonstrate these findings using a single neutral atom which undergoes a nearly pure dephasing process.

I will also show the experimental progress of atom manipulation in an optical cavity.

The universal dynamics in scale invariant quantum gases

Haibin Wu

State Key Laboratory of Precision Spectroscopy, East China Normal University,

Shanghai 200062, P. R. China

Understanding the nonequilibrium dynamics of complex quantum systems, often in the presence of strong correlations between constituent particles, is crucial for solving many fundamental problems in physics. Ultracold quantum gases provide unprecedented opportunities for studying such phenomena under controlled conditions. In this talk, I will present our recent study on the dynamics of a scale invariant trapped unitary Fermi gas, including novel Efimovian expansion and finite-time quantum thermodynamics.

Towards Cavity-Based Entanglement of an Atomic Register Under a Microscope

Romain Long
Sorbonne Université, ENS-Paris, France

Cavity Quantum Electrodynamics with cold atoms is one of the promising avenues to generate multi-particle entangled states, such as spin-squeezed states potentially useful for entanglement-enhanced metrology. Such experiments rely on the collective coupling of the atoms with a cavity mode while single-particle control is usually not implemented.

We will present our progress towards the generation of multi-particle entangled states of tens of the atoms by their interaction with an optical micro-cavity, while the detection and control of each individual atom will be provided thanks to a high-resolution microscope.

More specifically, we have developed a new generation of dual-wavelength high-finesse fiber Fabry-Perot cavity. Rubidium atoms are trapped in a one-dimensional lattice (at 1560 nm) along the cavity axis, allowing a maximal and identical coupling of all the atoms with a cavity mode resonant at the Rb atomic transition (780 nm). The resonator is placed at the focus of a high-NA lens, which will provide single-site resolution. Starting from a magneto-optical trap about 1 cm below the resonator, we load up to 2000 atoms in the cavity mode by transporting them in an ”atom elevator”. We will present the first signature of strong coupling between the atoms and the resonant cavity mode, as well as a cavity protection effect preserving small linewidth despite inhomogeneities.

The prospects to generate multi-particle entangled states with this experimental platform will be discussed.

SIRTEQ, a research network on Quantum Technologies in the Paris area

Michèle Leduc
CNRS Research Director emeritus at Laboratoire Kastler-Brossel, ENS, Paris

The activity of the SIRTEQ network (Science and Engineering in Ile de France Region for Quantum Technologies) will be presented, with focus on the different research axes in progress (sensors and metrology, quantum simulation, quantum communication and quantum computing), as well as the technological resources developed in parallel. Examples will be given on research projects recently supported by the network, as well as on the proactive efforts to encourage the creation of startups.

Enabling diamond quantum sensing at elevated temperatures

Quan Li

Department of Physics, The Chinese University of Hong Kong, Shatin, New Territories, Hong Kong

Nitrogen-vacancy (NV) in diamond serves as a promising sensor for many applications ranging from condense matter physics to biomedicine. The long spin coherence time of NV makes it particular attractive for room temperature measurements. However, at elevated temperatures, the coherent signal would be lost, making high temperature sensing applications impossible. In the present work, we demonstrate a feasible scheme that enables quantum sensing up to 1000K using nanodiamond. We show that by room temperature initialization/readout and high temperature control, manipulation of quantum coherence of NV center electron spins can be achieved at high temperatures. This work has been carried out in collaboration with Renbao Liu, Gangqin Liu, Xi Feng, and Ning Wang. We acknowledge funding from the National Basic Research Program of China (973 Program) under Grant No. 2014CB921402; CRF of RGC (Project No. C4006-17G); and CUHK Group Research Scheme (Project No. 31110126).

High-efficiency broadband single-photon frequency upconversion

Huiqin Hu, Jianhui Ma, Yu Chen, Haifeng Pan, E Wu
[1]*State Key Laboratory of Precision Spectroscopy, East China Normal University, Shanghai, 200062, China*
ewu@phy.ecnu.edu.cn

Nowadays, single-photon frequency upconversion detectors (UCDs) have recently drawn a great deal of attention because it can be utilized as a quantum interface that enable qubits to transfer from infrared to visible regime, while preserving the quantum state information and then use Si-APDs to count the visible sum-frequency replicas of the infrared photons with high detection efficiency, high signal-to-noise ratio, short dead time, low timing jitter. The UCDs are increasingly used in more fields of importance, such as quantum key distribution (QKD), quantum metrology, quantum computation and quantum tomography. However, when pulse duration of the signal photons are very short to femtosecond where the spectrum of signal photons is very broadband to fulfill the Fourier transformation, the conversion efficiency will be much decreased, because the spectral width from these source is much wider than the acceptance bandwidth of the PPLN waveguide (0.2 nm). Here, we demonstrated a high efficiency telecom wavelength broadband single-photon frequency upconversion in PPLN crystal. By optimizing the pump light spectral bandwidth, we got 10.4 % conversion efficiency with a signal spectral bandwidth of 8.1 nm.

This work is funded by NSFC (11722431,61378033,11621404); 111 Program of (B12024); Shanghai International Cooperation Project (16520710600); Shuguang Program (15SG22).

Echo-Ramsey Interferometry with Atomic Quantum Motional States

Xiaoji Zhou
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Ramsey interferometers (RIs) using internal electronic or nuclear states already have played an important role in accurate quantum state engineering and quantum metrology. In general, echo techniques are used in RIs to suppress dephasing for significantly increasing the coherent time. These conventional echo-RIs rarely exploit the quantum interference of external center-of-mass motional states. a RI with motional states of a Bose-Einstein condensate (BEC) holds great promises for studying quantum many-body physics out of equilibrium, quantum metrology with non-classical motional states and quantum information processing with motional qubits.

We demonstrate an echo-RI with quantum motional states of atoms in optical lattice (OL). A key challenge for constructing this RI is to realize Pi- and Pi/2-pulses. Using a shortcut loading method, we efficiently prepare a superposition of atoms in S- and D-band states in the OL with high fidelity within tens of microseconds. Keeping the lattice on, we observe state interference and measure the decay of the coherent oscillations. We further employ a matter wave band echo technique to significantly enhance the coherence time by one order of magnitude. We have identified the mechanisms leading to the contrast decay for the RI signal. The contrast decay is closely related to nonuniform optical lattice, laser intensity fluctuation and interaction-induced transverse expansion, and finite temperature dynamics of a BEC. All except for the effects of finite temperature can be suppressed by a matter-wave band echo sequence. Thus the damping from thermal fluctuations is well uncovered in this way. So far, the pulses and /2 pulses for echo-RI using motional quantum states (MQS) are designed based on zero temperature single atom dynamics. In future developments, it would be interesting to unveil quantum many body dynamics in OL. These deliberate quantum control technologies could be applied in quantum information and precise measurements based on MQS of atoms.

Controlling the scattering length of ultracold dipolar molecules

Goulven Quéméner,
Laboratoire Aimé Cotton, CNRS, Université Paris-Sud, ENS Paris-Saclay,
Université Paris-Saclay, 91405 Orsay, France

Ultracold dipolar molecules are excellent candidates for engineering quantum applications and controlled chemistry [1]. Therefore a lot of effort is devoted nowadays to produce ground state ultracold molecules in high densities as well as to understand their properties [2]. One of a main goal is to create a quantum degenerate gas of dipolar molecules such as a Bose-Einstein condensate or a degenerate Fermi gas. This is for now a major missing step for ultracold molecules.

Unfortunately, when the molecules start to collide, whether they are chemically reactive or not, a lot of molecules are lost in the process. Hoping for a long-lived quantum degenerate gas is then compromised unless to shield the molecules from collisional losses. This can be achieved by using a static electric field [3] but also by using microwaves [4].

By applying a circularly polarized and slightly blue-detuned microwave field with respect to the first excited rotational state of a dipolar molecule, one can [5]:

(i) bring the ratio good to bad collisions $\gamma = \beta_{el} / \beta_{qu}$ (elastic over quenching rate coefficient) to high values such that evaporative cooling techniques can be successful,

(ii) suppress the imaginary part of the scattering length and shield the molecules against losses,

(iii) tune the real part of the scattering length to small or large values, positive or negative and control the interaction strength of an ultracold molecular gas.

We adopt in our theoretical formalism an adimensional approach, where all the molecules are characterized by a unique parameter. This theoretical proposal might be a necessary requirement for successful evaporative cooling of molecules and for reaching quantum degeneracy. The ability to control the molecular scattering length opens the door for a rich, strongly correlated, many-body physics for ultracold molecules, similar than that for ultracold atoms.

I acknowledge the financial support of the FEW2MANY-SHIELD project (#ANR-17-CE30-0015), the COPOMOL project (#ANR-13-IS04-0004) and the BLUESHIELD project (#ANR-14-CE34-0006) from Agence Nationale de la Recherche in France.

[1] L. Carr et al., New J. Phys. 11, 055049 (2009) ; J. L. Bohn et al., Science 357, 1002 (2017)

[2] G. Quéméner, P. Julienne, Chem. Rev. 112, 4949 (2012)

[3] M. L. González-Martínez, J. L. Bohn, G. Quéméner, Phys. Rev. A 96, 032718 (2017)

[4] A. Micheli et al., Phys. Rev. A 76, 043604 (2007)

[5] L. Lassablière, G. Quéméner, submitted, arXiv:1806.09995 (2018)

Explore physics beyond standard model

by single spin quantum sensors

Rong Xing

University of Science and Technology of China, China

Searching for new particles beyond the standard model is crucial for understanding several fundamental conundrums in physics and astrophysics. Several hypothetical particles can mediate exotic spin-dependent interactions between ordinary fermions, which enable laboratory searches via the detection of the interactions. We present a novel platform for investigating exotic spin-dependent interactions with micrometer scales. Single spin quantum sensors in diamonds have been introduced to explore exotic spin dependent interactions which are beyond the standard model.

Topological excitations in quantum polariton fluids and perspectives for quantum simulation

Elisabeth Giacobino
Laboratoire Kastler Brossel, Sorbonne Université, Ecole Normale Supérieure, CNRS, Collège de France.

In a semiconductor microcavity, exciton-polaritons, which are superpositions of matter and light states, arise from strong coupling between cavity photons and quantum well excitons. Polaritons keep the properties of cavity photons, in particular a low effective mass, and they interact through their excitonic component.

Polaritons have been shown to exhibit condensation and quantum fluid properties at temperatures of a few K. Superfluid motion of polaritons has been demonstrated in our group several years ago. We now investigate topological excitations such as dark solitons and various kinds of vortices when the flow velocity is varied. Recently we have shown how these properties can be engineered by using an additional support laser field which improves the propagation of the topological excitations and modifies their strength.

These novel properties of polaritons open the way to their use for realization of engineered particle circuits in a polariton chip and to quantum simulation.

Single perovskite nanocrystals: from exciton fine-structure splitting to coherent optics

Xiaoyong Wang
Nanjing University, China

Semiconductor perovskite nanocrystals (NCs) have just emerged as a novel type of semiconductor nanostructure capable of emitting single photons with suppressed photoluminescence (PL) blinking and spectral diffusion. Here we show the bright-exciton fine-structure splitting (FSS) in single perovskite CsPbI3 NCs at the cryogenic temperature, with an energy separation as large as hundreds of μeV between the two orthogonally- and linearly-polarized states. With enhanced quantum confinement in single CsPbI3 NCs, this PL doublet would be transformed to a triplet configuration, suggesting the joint influence of electron-hole exchange interaction and Rashba effect on the energy-level FSS. The coherent optical property of quantum interference is also observed in the optical emission of a single CsPbI3 NC to yield an dephasing time of ~10 ps for the charged excitons. The above findings signify that semiconductor perovskite NCs have entered the “artificial atom” regime, which is critical for both fundamental tests in quantum mechanics/optics and practical applications in quantum information processing.

Tailored non-Gaussian multimode optical states

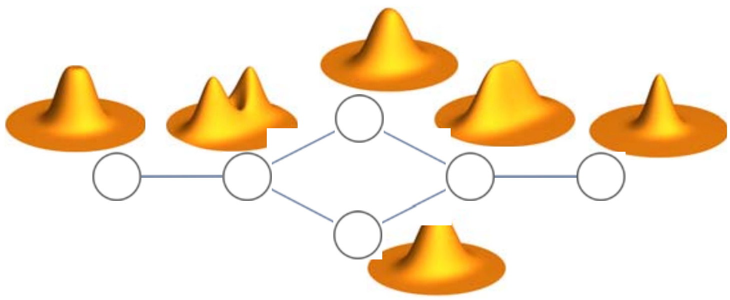
Nicolas Treps

Laboratoir Kastler Brossel, Sorbonne Université, Paris, France

Quantum technologies depend on information encoding into a physical system that can be coherently generated, manipulated and measured. Light provides a suitable platform, but the most easily generated quantum optical states- the Gaussian states- are simply described and cannot be used for nontrivial quantum computation.

We will explore here the conditional preparation of non-Gaussian states of light through appropriate non-Gaussian measurements on an ancillary system, and the control and characterization of these states. The objective is to benefit from the scalability and versatility of Gaussian states generation, along with the computational advantage offered by non-Gaussian states.

We will demonstrate experimentally such multimode states generated from ultrafast optical pulses (optical frequency combs) and parametric down conversion[1]. Mode dependent photon subtraction is implemented through sum-frequency generation[2], and characterization is performed through frequency resolved homodyne detection.



We will then study, both theoretically and experimentally, the influence of a non Gaussian ingredient on a Gaussian graph state. In particular, we will demonstrate propagation properties of non-gaussianity within the graph, and its implications on the nature of entanglement[3,4].

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Deterministic quantum teleportation through fiber-channel

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Quantum teleportation means to transfer an unknown quantum state from one station to another over certain distance with the help of nonlocal Einstein-Podolsky-Rosen entangled state shared by sender and receiver. It has been widely used as a fundamental element in quantum communication and quantum computation. Here, we report the experimental realization of deterministic quantum teleportation of an optical coherent state through 6.0 kilometer fiber fiber-channel. The fidelity of 0.62 is achieved for the retrieved quantum state, which breaks through the classical limit of 1/2. A fidelity of 0.69 breaking through the no-cloning limit of 2/3 has also been achieved when the transmission distance is 2.0 kilometers.

Quantum light sources based on four-wave mixing processes from hot atomic vapor

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Generation of quantum light sources, such as multipartite quantum entanglement or quantum correlations has been given broad attention due to its importance for fundamental science, quantum information processing and quantum metrology. In this talk, I will review our recent works on generation of quantum light sources based on atomic ensemble. Several types of quantum light sources with strong quantum correlations are generated from cascaded four-wave mixing processes in hot atomic ensembles. We study its quantum features by exploiting different types of entanglement criteria. Our studies and results have potential applications in quantum information and quantum metrology.

Space Quantum Telecommunications

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Cyber security requires conscious behavior and actions at all levels. On the hardware side of long distance communication, quantum physics offers security based on the fundamental laws of nature, by solving the cryptographic key distribution problem. Quantum key distribution systems are already commercially available for distances across cities. For longer distances there are two different approaches: (1) quantum communication through fibre links using quantum repeater stations; and (2) quantum communication via satellite links [1]. Here I will address our recent progress along the second approach. Note, that the security of currently deployed cryptographic methods is based on computational complexity for which no mathematical proof exists. Furthermore, the methods most popular today will be obsolete once a quantum computer of large enough scale will have become available. Therefore, new classical algorithms are developed for which no efficient attack by a quantum computer algorithm is known. But the security will still be based on computational complexity. Quantum communication, on the other hand offers security based on the laws of quantum physics. Regarding really long distances, electromagnetic waves have been successfully reflected off a retro reflector placed on the moon and even off Venus without any manmade reflector, but the attenuation was enormous and way too high for any quantum application. Furthermore, a retro reflector sends light essentially back to where it came from. Therefore, several groups are developing links via satellites with the up-link and the down-link pointing in different directions or by using the satellite motion in case of a low earth orbit, such as has been done in the Chinese Micius project [3]. A quantum communication channel may be operated with discrete or continuous quantum variables. A German consortium analyzed the quantum performance of the down-link from a geostationary satellite [2]. I will discuss current activities, including the development of quantum key distribution with coherent optical communication in earth-bound optical free space communication, as well as air-to-ground and satellite-to-ground scenarios.

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Toward “quantum supremacy” with photons

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Abstract: We develop single-photon sources that simultaneously combines high purity, efficiency, and indistinguishability. We demonstrate entanglement among 12 single photons. We construct high-performance multi-photon boson sampling machines to race against classical computers.

Boson sampling is considered as a strong candidate to demonstrate the “quantum advantage / supremacy” over classical computers. However, previous proof-of-principle experiments suffered from small photon number and low sampling rates owing to the inefficiencies of the single-photon sources and multi-port optical interferometers. In this talk, I will report two routes towards building Boson Sampling machines with many photons.

In the first path, we developed SPDC two-photon source with simultaneously a collection efficiency of ~70% and an indistinguishability of ~91% between independent photons. With this, we demonstrate genuine entanglement of ten photons [1]. Very recently, we managed to observe 12-photon entanglement using a novel SPDC source [arXiv.1810.04823]. Such a platform will provide enabling technologies for teleportation of multiple properties of photons [2] and efficient scattershot boson sampling.

In the second path, using a QD-micropillar, we produced single photons with high purity (>99%), near-unity indistinguishability for >1000 photons [3], and high extraction efficiency [4]—all combined in a single device compatibly and simultaneously. We build 3-, 4-, and 5-bosonsampling machines which runs >24,000 times faster than all the previous experiments, and for the first time reaches a complexity about 100 times faster than the first electronic computer (ENIAC) and transistorized computer (TRADIC) [5,6]. We are currently increasing the rate by optimizing the single-photon system efficiency to near unity using elliptical micropillar [arXiv.1809.10992], and using improved schemes such as boson sampling with photon loss [7], with the hope of achieving 20-photon boson sampling in the near term.

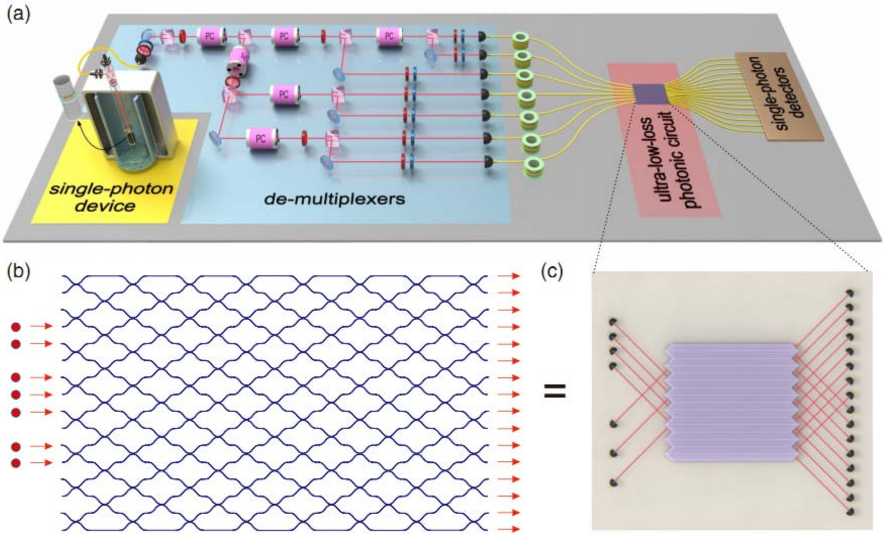

Figure 1: Experimental setup for boson sampling with 7 input single photons into an ultra-low-loss 16*16 interferometer. Quantum dot single photon extraction (system) efficiency is 82% (34%). Photon indistinguishability 94% (90%) at time separation of 13 ns (15 μs). Three-photon count rate ~80 kHz.

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Quantum photonics on a chip

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Over the last decades, quantum photonics has become a thriving field of research, promoting both fundamental investigation of quantum phenomena [1] and a broad variety of disruptive quantum technologies [2].
In this framework, integrated optics technologies not only allow engineering non-classical source of light but also realizing complex and scalable quantum circuits [3]. Such advances find striking repercussions in all the above mentioned research areas, otherwise unreachable using bulk approaches. Notably, quantum random walks (QRW) and boson sampling are good examples of new topics in quantum physics being enabled by integrated optics [24].
The seminar aims at providing a general background on quantum technologies and showing that integrated photonics provides a powerful technological basis for a broad class of advanced quantum experiments. We will provide an introduction on quantum information and its applications. An overview on quantum communication, metrology and processing will allow to understand the meaning of what "quantum supremacy" means in term of information sciences. In the meantime, we will shine a spotlight on the integrated quantum photonics approach, which provides straightforward solutions to the Q-communication field but also to the Q-metrology and Q-processing activities.

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Quantum optics with surface plasmons

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In this talk, we report experiments aiming at exploring the physics of surface plasmons in the single plasmon regime. In other words, we revisit quantum optics using surface plasmons. We report four typical quantum optics experiments: i) tests of the wave-particle duality of surface plasmons [1], ii) observation [2] of the coalescence and anticoalescence of plasmons on a lossy beam splitter (see Fig.1), iii) observation of entanglement between a photon and a plasmon [3] and iv) interferences of N00N states [4].

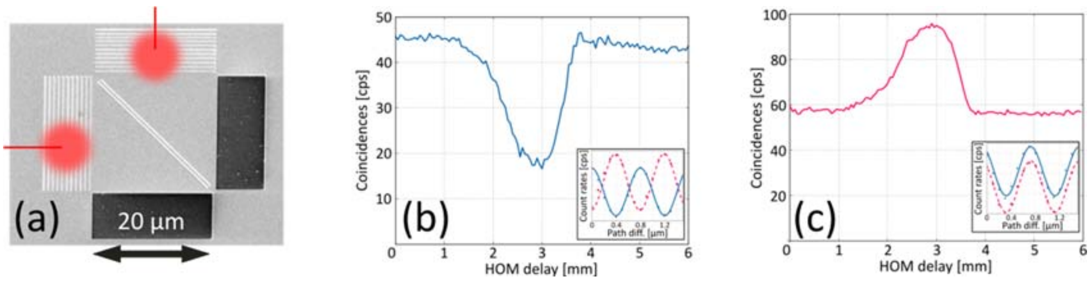

Fig. 1 (a) SEM picture of the plasmonic platform, showing the two coupling gratings, the beamsplitter and the outcoupling slits. (b) Hong-Ou-Mandel-type experiment for beamsplitters fulfilling $t=\pm ir$ or (c) $t=\pm r$ and $|t|=|r|=1/2$. The curve shows the rate of coincidences at the output of the two slits as a function of the delay between the two plasmons at the beam splitter. The dip observed in b) indicates that plasmons coalesce. Figure c) shows anticoalescence. The insets are interferograms of classical fringes, at the output of the beamsplitter, showing either π or 0 phase-shift.

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Quantum sensing at nanoscale with NV centers in diamond

Isabelle ROBERT-PHILIP[1], Rana TANOS[1], Waseem AKHTAR[1], Csilla GERGELY[1], Vincent JACQUES[1], Guillaume BAFFOU[2], Serge MONNERET[2], Felipe FAVARO de OLIVEIRA[3], Mathieu MUNSCH[3], Luc LE GRATIET[4], Isabelle SAGNES[4]
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Sensing using spin qubits is a rapidly growing field, enabling to probe a large variety of quantities. These quantities include magnetic field, electric field, pressure or temperature to name a few. Single spin qubits associated with the NV centers in diamond are outstanding in this respect, thanks to their long coherence time even at room temperature. The most advanced NV-based sensors are nanoscale magnetometers that currently enable noninvasive, quantitative and vectorial magnetic field imaging with an unprecedented combination of nanoscale spatial resolution and ultrahigh magnetic sensitivity. These unique capabilities will be here exemplified by applying such probes to explore exotic spin textures in ferromagnetic nanostructures and to tackle fundamental problems in spintronics [1]. More recently, electronic spins associated NV centers also revealed attractive nanothermometers. The electronic spin resonance indeed depends on the temperature due to thermal expansion and vibronic interactions in the diamond lattice. This feature has already been exploited for thermal sensing at nanoscale, revealing sensitivities down to mK/Hz1/2 in bulk diamond and 100 mK/Hz1/2 in nanodiamonds [2]. Various practical sensing configurations are envisioned depending on the sensor geometry and have been here investigated: (i) wide-field or confocal imaging with bulk diamond or (ii) confocal imaging with nanodiamonds. Our experiments corroborated by numerical simulations demonstrate the strong assets of the nanodiamond-based configuration compared to bulk diamond geometry. In order to push the sensor's sensitivity, one recently-implemented strategy builds on a hybrid architecture, exploiting a conversion of temperature variations on magnetic field variations. It takes advantage of the high sensitivity of the electronic spin to magnetic fields (down to nT/Hz1/2 and the efficient transduction of temperature changes on magnetic field provided by ferromagnetic or ferrimagnetic coatings attached or deposited on the nanodiamond hosting the probing spin [3]. Such hybrid strategy promises to reach sensitivities down to sub-mK//Hz1/2.

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Commercialization of solid-state single photon sources for the development of Quantum Technologies

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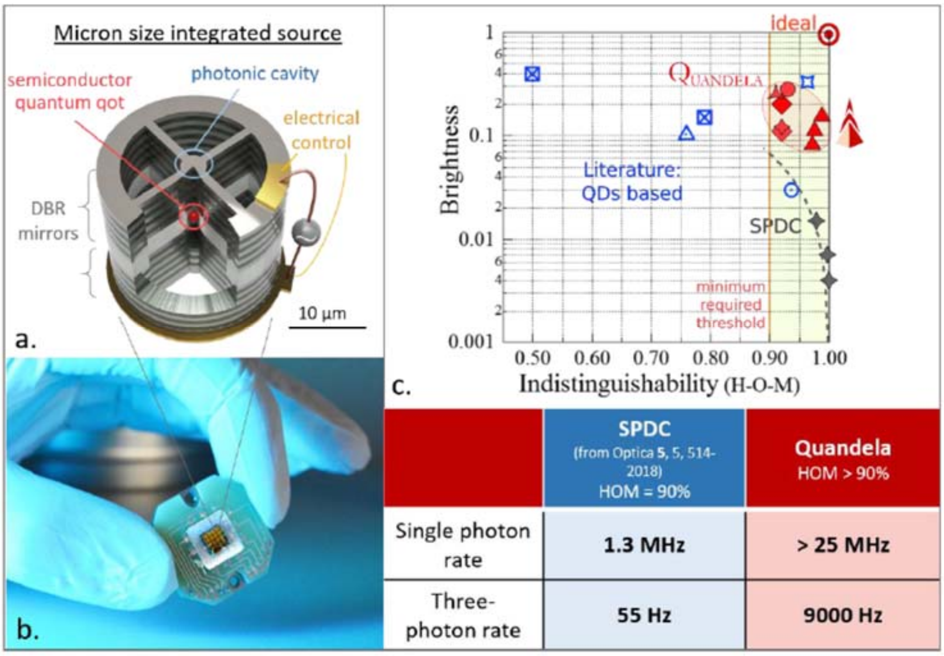
Development of optical quantum technologies for reaching computational complexity towards a quantum advantage and beyond is presently out of target. Together with linear optical elements, in form of waveguides and phase-shifters as part of integrated circuit, sources and detectors represent the ubiquitous hardware for reaching such a complexity.

In the past years the improvement of fabrication techniques for low loss and high speed integrated circuitry combined with commercialisation of near-unity efficient detectors have permitted to push forward the field up to the successful realisation of multi-qubits experiments and creation of entangled states of light.

Although, a technological bottleneck is still represented by the currently most implemented sources which are based on standard lasers combined with non-linear processes (ex. Spontaneous Parametric Down Conversion - SPDC). The probabilistic generation of single-photon, intrinsic in any of these laser sources, limits the emitted photon rate and puts clear barriers on the scalability of quantum protocols. On the contrary, deterministic emitters of quantum states of light, so called “photon guns”, represent the ideal solution for several quantum technologies and for this reason have been subject of an intensive technological effort.

Quandela fabricates and commercializes efficient sources of pure single-photons based on a fully integrated technology developed at the “Centre of Nanosciences and Nanotechnologies” (CNRS/UPSud) in the group of Prof. Pascale Senellart. By placing a single semiconductor quantum-dot in an optical cavity in a fully controlled way, we obtain single-photon sources with single-photon purity and indistinguishability over 95%, and brightness exceeding by a factor 20 the one of currently used sources based on SPDC [1-2]. Such performances permit to reduce computing time turning days into minutes and at the same time allow the efficient generation of large N-photon states for implementation of computation protocols with complexity levels much larger than the one currently achievable.

In this talk I will give a brief overview about the technology at the core of Quandela and discuss how these devices can be used as building-blocks for the realisation of an optical quantum computer.



	SPDC (from Optica **5**, 5, 514-2018) HOM = 90%	Quandela HOM > 90%
Single photon rate	1.3 MHz	> 25 MHz
Three-photon rate	55 Hz	9000 Hz

a). Cartoon of the micrometer single-photon source. **b).** Image of the photonic chip integrating several of the sources shown in **a)**. **c)** Upper panel: comparison table presenting the performances of single-photon sources (SPDCs, quantum dot based and Quandela) in terms of brightness and photon indistinguishability. Standard quantum computation protocols require a minimum indistinguishability value of around 0.9. Lower panel: table listing photon counts at the output of a single mode fibre, for SPDC and Quandela's sources. We present two cases: one for standard single-photon emission, and the other for three photons in three different spatial modes, separated via active demultiplexing.

Website: www.quandela.com

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Collective Nano-OptoMechanics

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The interaction between light and mechanical motion, at the core of optomechanics, is boosted in lightweight nanoscale resonators. After landmark optomechanics experiments realized on single resonators, the investigation of collective phenomena now requires controlling vast ensembles of coupled resonators, with the coupling mediated by light or vibrations. This evolution towards collective nano-optomechanics bears potential for a variety of sensing applications of course, but for quantum or topological photonics as well. It is however impeded by the residual disorder imposed by nanofabrication techniques, which naturally detunes high-Q resonators and precludes resonant interactions amongst them.

Here we present a new technique to resonantly tune ensembles of nanophotonic/mechanical resonators. The technique builds on the recent experimental development of nano-optomechanics in the liquid-state [1]. Laser light injected into the optical mode of a first resonator immersed in a fluid triggers an etching process, leading to a fine tuning of the resonators dimensions. The evolution of dimensions is monitored continuously by spectrally tracking the associated optical resonance. This tuning process, dubbed resonant photo-electrochemical etching, is naturally scalable to multiple resonators and has already allowed us to resonantly tune small ensembles (2 to 5 units) [2].

As an application of this technique, we explore the resonant optical interaction of multiple and distant nano-optomechanical systems. Light flowing uni-directionally along a chain of nano-optomechanical oscillators is observed to produce their frequency-locking above a certain threshold, which represents a first example of collective phenomenon in optomechanics [3]. Our experiments are explained by a minimal semi-classical model, and set the grounds for more advanced quantum experiments.

Acknowledgements: the work presented in this invited talk has been done in collaboration with E. Gil-Santos, W. Hease, A. Lemaitre, M. Labousse, C. Ciuti and G. Leo

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Quantum computing and modular variables using fréquence degrees of freedom

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I'll discuss the encoding of quantum information in states described by continuous variables. Such states, introduced by gottesman kitaev and preskill are also known as gkp states and are robust to errors caused by displacements (up to some amplitude) in phase space.

In spite of their obvious interest in quantum information, the experimental production of gkp states remain a challenge. We propose two ways of encoding such states in photonic system using the analogy between many photons in one mode and one photon in many modes. We'll show that in the discussed photonic systems gkp encoding and state manipulation appear naturally.

Quantum microwaves with a DC-biased Josephson junction

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Tunneling of a Cooper pair through a dc-biased Josephson junction is possible only if collective excitations (photons) are produced in the rest of the circuit to conserve the energy. Using very simple circuits with only one or two high impedance resonators in series with the junction, we produce quantum microwaves in an efficient way: we show the equality between the Cooper pair tunneling rate and the photon production rates [1]. Then we demonstrate a blockade regime for which the presence of a single photon blocks the next tunneling event, leading to a continuous beam of anti-bunched photons [2]. Finally, using two resonators with different frequencies, we demonstrate photon pair production [3], two-mode squeezing, and entanglement between the two modes leaking out of the resonators.

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Quantum network based on solid state quantum memory

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In this talk, I first give a brief review on the recent progress of quantum network, including the development of quantum operating nodes and storing nodes and quantum interface etc. Then I introduce our recent work on quantum network based on solid state memory, including the storage of polarization state of single photon, storage of deterministic single photon from single quantum dot, high-dimensional quantum memory and multiple-degree-of-freedom quantum memory.

Atom interferometry for high sensitivity in inertial measurements

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Since the pioneering experiments of 1991, atom interferometry has established as a unique tool for precision measurements of fundamental constants and of gravito-inertial effects. Atom interferometry covers multiple applications in metrology, inertial navigation, geophysics, tests of fundamental physics, and has been proposed for gravitational wave detection. Indeed, it combines both intrinsic high sensitivity and accuracy thanks to the high level of control of the atom-laser interaction. Beyond the proof of principle, the main difficulties lie on the development of the methods and the high level of control in order to fulfill these expectations.

One of the first major achievements so far in terms of application is the realization of absolute atomic gravimeters, which already compete with the state of the art absolute gravimeters [1]. After a first period of development and validation of their performances, including participations to international key comparisons, we will show that recent developments based on the use of ultra-cold atom sources allow reaching record-breaking accuracies at the level of 10^{-8} $m.s^{-2}$ [2].

If most of the results have been demonstrated in laboratory environment, some significant developments have been done in order to achieve field measurements [3] and even onboard mobile carrier. In particular, we have demonstrated the ability of performing measurements in a plane and in weightlessness with two different species of atoms, which constitutes a fundamental test of the equivalence principle [4]. This result is an important step in order to prepare both a test of the equivalence principle in a dedicated space mission [5] and inertial navigation applications.

Two important limitations of cold atom interferometers are the low bandwidth when using long interaction time for high sensitivity and dead times between successive measurements, corresponding to the preparation of the atom source prior to the injection in the interferometer. We present a matter-wave gyroscope with 11 cm^2 Sagnac area operating without dead times [6] and at a sampling frequency of 3.75 Hz [7]. This is achieved by interleaving the atom laser-cooling step and the interrogation of the atoms. We demonstrate a record short term sensitivity of 32 $nrad.s^{-1}.Hz^{-1/2}$, which allows us to characterize and stabilize systematic effects below 3×10^{-10} $rad.s^{-1}$ after 15 000 seconds of integration time. Such level of stability competes with best long term stabilities obtained with fiber-optics gyroscopes, and paves the way for applications of cold-atom sensors in inertial navigation or geoscience.

Beyond the developments of cold atom interferometers using free falling atoms, significant efforts are carried out in order to propose and demonstrate alternative methods based on trapped or guided atoms with dipole [8] and/or magnetic traps [9]. Such interferometers benefit from the possibility of extending the interrogation time and might lead to the realization of more compact sensors. As they keep the atom better localized, they are also promising candidates for applications to inertial navigation and local force measurements. We will present our latest results on an interferometer based on trapped atoms in an optical lattice [10], which features a state of the art force sensitivity, of 7.10^{-30} N/Hz$^{1/2}$, and an excellent spatial resolution of 2.5 µm. This sensor will be used to probe local (1-10µm) forces and perform fundamental tests of the short range atom-surface interactions.

In conclusion, atom interferometry is an active field both in term of sensors and in term of applications. The increasing knowledge in the domain leads to new projects as onboard gradiometry [11] and gravitational wave detection [12].

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Research on quantum enhanced two-way time transfer via frequency entangled biphoton source

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High precision time and frequency reference datum provides a space-time reference for realizing precise PNT (positioning, navigation and timing), provides technical means and ability for exploring physics frontier science. The time synchronization technology is the foundation of establishing the time and frequency reference datum. Recent investigations have shown that, utilizing quantum techniques, i.e. quantum measurement technique and quantum sources, to the time transfer system can break through the classical shot noise limit. Furthermore, quantum enhanced time transfer can defeat effects of dispersion of timing signals and provide a secure time transfer. In this presentation, we have proposed and experimentally demonstrated a fiber-based two-way quantum time transfer by using frequency entangled pulses and nonlocal time correlation measurement between them. The nonlocal cancellation of dispersion has been realized, and the security of the time-transfer protocol has been discussed. The results show that with a 20-km fiber coiling link in the time transfer setup between two units A and B referenced to a common time scale, a timing stability of 3.66±0.02ps at 10s and 0.43±0.30ps at 40960s is achieved. Without the fiber in, the time offset measurement between them gives a timing stability of 0.95±0.01ps at averaging time of 10s and 0.11±0.05s at averaging time of 40960s, which sets the lower limit for the achievable system stability. The nonlocal cancellation of dispersion in the fiber path improves the transfer stability for at least 3 folds. By using a new event timer with sub-picosecond precision and new SNSPDs with lower timing jitter, this result can be further improved. Besides the improved time transfer stability benefitted from the quantum techniques, quantum two-way time transfer system can avoid the unwanted effect from Rayleigh backscattering inherent in the traditional TWOTT system, thus the symmetry of the propagation conditions in both directions can be maintained by using equal wavelengths at both sites. The accuracy of the absolute time offset is investigated as a function of the fiber length. The mean time offset across 11 data sets corresponding to the fiber lengths varying from 1km to 23km remain almost unchanged at 5971ps, with an uncertainty of 1.31 ps in standard deviation. Furthermore, taking advantage of the entanglement-based signature of nonlocal dispersion cancellation, a secure quantum time transfer can be verified.

Optical hybrid entanglement between discrete- and continuous-variable states

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Following the wave-particle duality of light, optical qubits in quantum information processing have been traditionally implemented based either on discrete variables (DV) or on continuous variables (CV) of the electromagnetic field. Recently, tremendous progress has been seen to combine both approaches in a so-called optical hybrid architecture, with the aim of gathering benefits from both sides and exploring new capabilities in quantum information science. In this talk, I will present the generation, manipulation and characterization of high-fidelity DV and CV optical quantum states as well as the experimental realization of hybrid DV-CV entangled states. Such hybrid entanglement resources are then used to transfer quantum information between heterogeneous nodes functioning with different information encodings.

Posters:

1	Towards Bose polarons in a large-mass-ratio Fermi-Bose mixture Bing Zhu, Heidelberg University, Germany
2	SiV^- center in nanodiamonds as bio-marker and nanoscale intracellular thermometer Yan Liu, University of Ulm, Germany
3	Relaxation and hysteresis near Shapiro resonances in a driven spinor condensates An Qu, Laboratoire Kastler Brossel, France
4	An experimental apparatus for quantum simulation using strontium Rydberg atoms Luc Couturier, University of Science and Technology of China, China
5	Triphoton quantum correlation generation with six wave mixing of Rb atoms Yin Cai, Xi'an Jiaotong University, China
6	Characterization and assembly of single organic molecules in microcrystals for novel single-photon devices Tailin Huang, Huazhong Science and Technology University, China
7	High sensitivity quantum Michelson interferometer Xiaojie Zhuo, Shanxi University, China
8	Experimental comparison of contextuality in quantum and classical systems Lijian Zhang, Nanjing University, China
9	Fast response balanced homodyne detector for continuous-variable quantum memory Lixia Ma, Shanxi University
10	Dynamics of single-photon transport in a waveguide coupled to a micro-ring resonator containing a two-level quantum emitter Chaohua Tian, Huazhong Science and Technology University, China
11	Infrared single-photon detection and imaging via frequency upconversion Yu Chen, East China Normal University, China
12	Tunable plasmon enhanced luminescence in single upconversion nanocrystals by varying gold nanorod diameter Botao Wu, East China Normal University, China
13	High-resolution frequency comb spectroscopy with enhanced sensitivity Yan Ming, East China Normal University, China
14	Real-time observation of dissipative soliton build-up in mode-locked fibre lasers Junsong Peng, East China Normal University, China
15	1550-nm laser Lidar with GHz single-photon detection Bingcheng Du, East China Normal University, China
16	Photon-counting laser imaging Guangyue Shen, Tianxiang Zheng, East China Normal University, China
17	High precision laser pulse measurement with a low time-jitter single-photon detector Yurong Wang, East China Normal University, China
18	Strontium optical lattice clock at the National Time Service Center Xiaotong Lu, National Time Service Center，Chinese Academy of Sciences
19	High-power Broadband Yb-fiber comb Daping Luo, East China Normal University, China
20	Spectrum-encoded imaging via dual-comb spectroscopy Zejiang Deng, East China Normal University, China