Design of a fully integrated quantum number generator

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Random numbers are an essential resource for different applications such as secure communications, numerical simulation or quantitative finance. Quantum random number generators (QRNGs) based on phase diffusion have achieved high bit rates and passed severe random tests, making this method adequate to obtain random numbers [1]. However, so far, they have been realized with discrete optical components, often leading to devices of large size and high power consumption. In this work we demonstrate the design of a monolithically integrated QRNG. The photonic integrated circuit (PIC) was designed for InP technology available through Smart Photonics multi-project wafer runs. The schematic of the QRNG is shown in Figure 1 (a). In this configuration a Gain-switched (GS) laser produces periodic pulses, which propagate through two Mach-Zehnder interferometers (MZIs) in series. An integrated photodetector (PD) at the end of the circuit converts the light into an electrical signal. The MZI 1 balances the power of the input to the arms of the MZI 2 for maximal extinction ratio, while MZI 2 converts random phase variations between the consecutive optical pulses into amplitude variations, which the PD detects.
Despite the availability of the required components in integrated platforms, the PICs are less flexible than their bulk prototypes. This means that a lot of attention should be paid to the component specification in the design stage of the PIC, in particular that of the laser source. It is important that the GS laser provides single mode operation and the laser reaches a quantum noise level between pulses. The first condition is necessary for efficient interference between the pulses in MZI 2, whereas the second condition is required in order to obtain phase randomness between the pulses. In addition, the laser should operate at relatively high speeds (up to 1 GHz) and it should not require high RF input power. There are several ways to achieve single mode operating lasers in InP active-passive technology. In this work we have chosen to use a Fabry-Perot cavity with distributed Bragg reflectors (DBR) as mirrors. The laser performance was simulated using FreeTWM. The simulations show that single mode-performance can be achieved with right and a left DBRs having a relative shift in their reflection peak wavelength of approximately 1 nm. Figure 1 (b) shows the evolution of the optical spectrum of the DBR laser with spectrally shifted DBRs. Moreover, it was shown that depending on the spectral position of the laser emission with respect to the gain peak, a higher net gain modulation can be achieved at the same RF power. In other words, the laser exhibits a higher net gain variation when operating around the gain peak. Figure 1 (c) shows a time trace of the GS laser. The design of the rest of the circuit takes into account fabrication limitations, optical loss and extinction ratio constraints in the MZIs.

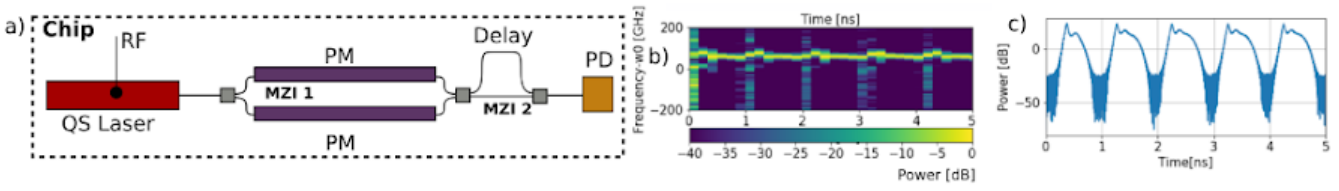

Figure 1: a) Sketch of the integrated QRNG. b) Simulated optical spectrum of the GS laser change in time . c) Simulated GS laser time trace.

In summary, we have proposed a design of the first fully integrated QRNG based on phase diffusion for realization in a generic monolitWehic photonic integration process. We have theoretically investigated laser performance and optimized the laser design for use in a QRNG circuit.

Acknowledgements

We wish to acknowledge H2020-MSCA-ITN-2018 EDIFY (Project number 813467)

References

[1] M. Jofre, M. Curty, F. Steinlechner, G. Anzolin, J. P. Torres, M. W. Mitchell and V. Pruneri, “True random numbers from amplified quantum vacuum”, Optics Express, vol. 19, No. 21 (2011).

FRANCISCO JAVIER DIAZ OTERO - (Id 443685)

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Autor/a

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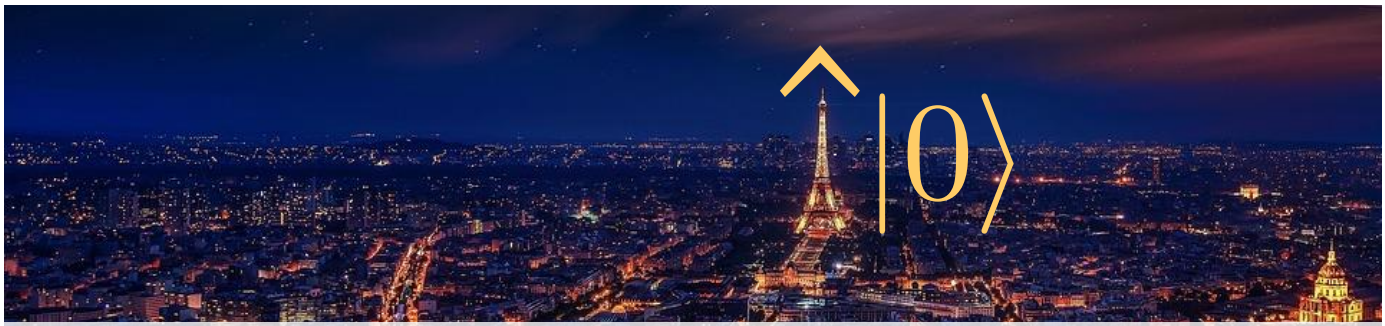

ICIQP2018 – October 15-17, 2018

International Conference on Integrated Quantum Photonics

Université Paris Diderot – Paris 7

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Welcome message

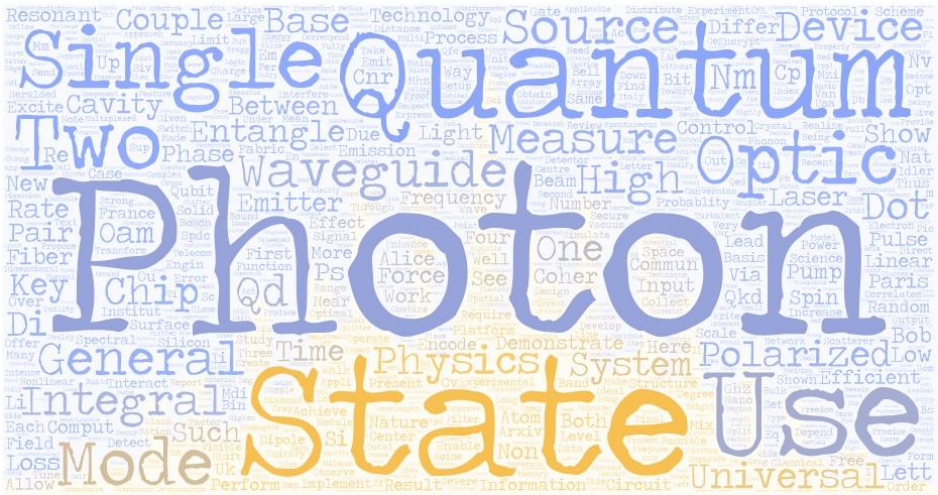
On behalf of the organizing committee, we are honoured and delighted to welcome you at the International Conference of Integrated Quantum Photonics in Paris!
This conference follows the successful series of conferences initiated within the European consortium PIQUE and aims at becoming a regular international meeting for the integrated quantum optics community, where leading groups worldwide meet to present and discuss the latest progress and future challenges. Our meeting is organized over three days, with prestigious invited speakers, oral presentations and two poster sessions.
The conference covers the following research topics:

- Quantum light sources
- Discrete and continuous variables
- On-chip light manipulation
- Quantum cryptography and communication
- Optical quantum computation
- On-chip quantum light detection

We thank the members of the Scientific Committee for their thorough and timely reviewing of the papers and suggestion of invited speakers, and our sponsors who have helped us keep down the costs of ICIQP for all participants.
Finally we thank you all for your great contributions and your participation!
Enjoy !

The conference chairs

Eleni Diamanti
Sara Ducci
Pascale Senellart-Mardon



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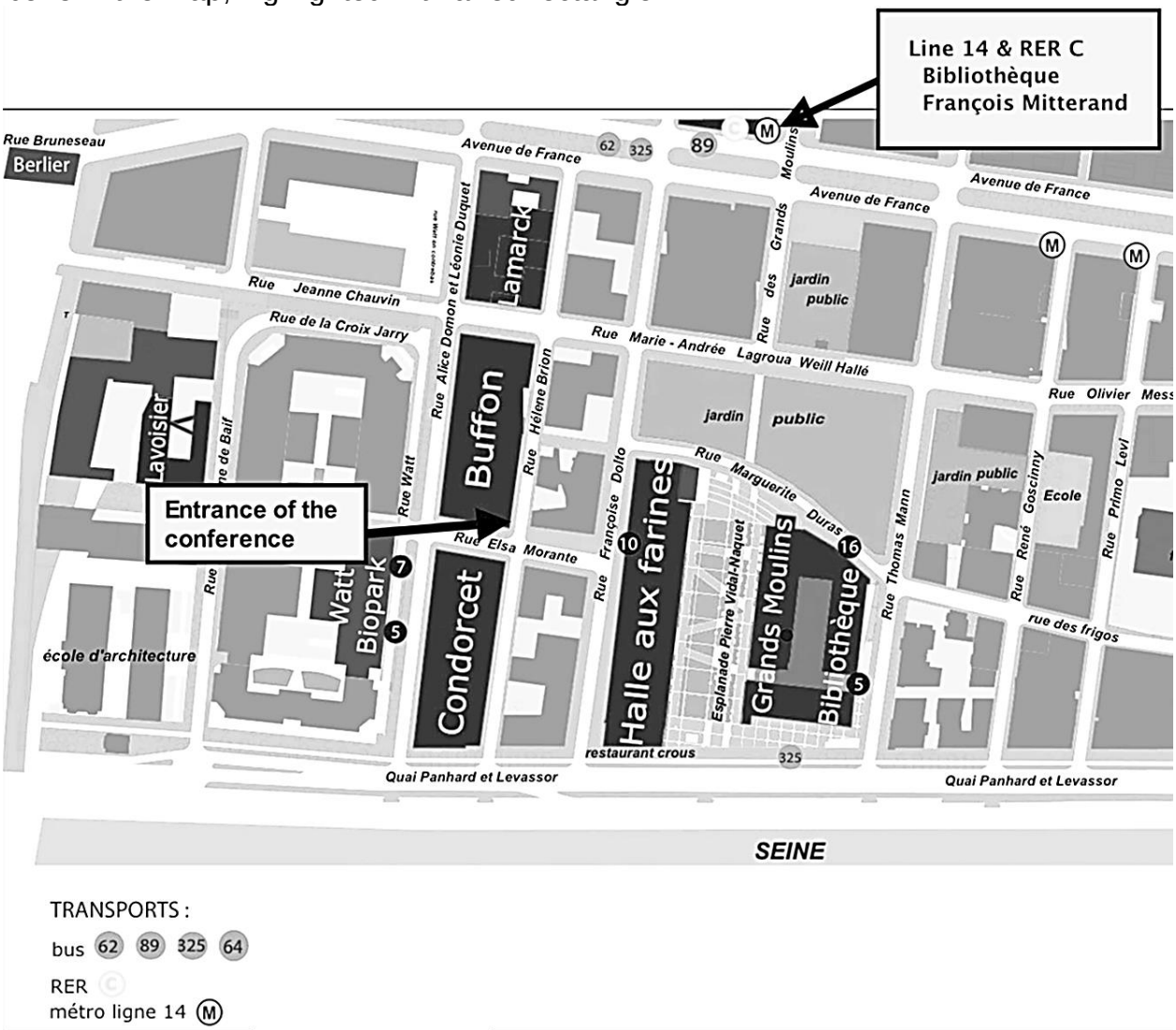
How to reach the conference venue

ICIQP 2018 is held at Université Paris Diderot - Paris 7 in the Amphitheatre **Buffon** in building **Bâtiment Buffon**, address: 15 rue Hélène Brion, 75013 Paris (France).

- Tram: T3a (**Avenue de France)**
- Train and subway: RER C and line 14 (**Bibliothèque François Mitterrand**)
- Bus: lines 62 (**Porte de France**), 64 (**Pont de Tolbiac**), 89 (**Porte de France**), 325 (**Watt**).
- Vélib' Métropole (public bicycles)**:** Station **n°13055**

The Amphitheatre **Buffon** is located in the building **Bâtiment Buffon** (15 rue Hélène Brion), number 5 in the map, highlighted with a red rectangle.



Internet connection

Eduroam connection is accessible in the university campus. Check your badge where you will see an alternative Wi-Fi connection with personal login and password to connect to a local internet access.

Oral presentations

The oral contributions will be organised in the following way

- **Invited talks** will have 25 min presentation and 5 min questions
- **Accepted contributed talks** will consist in 15 min presentation and 5 min questions

Poster sessions

Space and material for installing a vertical DIN-A0-size poster will be facilitated in a room close to the conference room.

The two posters sessions will be organized in the following way: posters with **odd numbers** will be presented on **Monday** and posters with **even numbers** will be presented on **Tuesday** (see colour code in the poster titles).

Here it is the list of accepted posters:

1. Matteo Menotti, Zachary Vernon, John Sipe and Marco Liscidini
   Controlling spectral correlations in integrated sources: from energy-entangled to uncorrelated photon pairs
2. Gediminas Juska, Stefano T. Moroni, Simone Varo, Tung-Hsun Chung, Agnieszka Gocalinska and Emanuele Pelucchi
   Engineering opportunities with MOVPE grown site-controlled Pyramidal quantum dots
3. Wolfgang Löffler, H. J. Snijders, J. A. Frey, J. Norman, A. Gossard, J. E. Bowers and D. Bouwmeester
   Polarization and high-fidelity fiber-integrated quantum dot cavity-QED devices
4. Mackrine Nahra, Aurelie Broussier, Valery Davydov, Viatcheslav Agafonov and Christophe Couteau
   Single photon source in nanodiamonds for integrated quantum photonic
5. Kanupriya Sinha, B. Prasanna Venkatesh and Pierre Meystre
   Tailoring Casimir-Polder Interactions in Nanophotonic Systems
6. Lior Cohen, Yehuda Pilnyak, Daniel Istrati, Nicholas Studer, Jonathan Dowling and Hagai Eisenberg

Absolute self-calibration of single-photon and multiplexed photon-number-resolving detectors

7. Benjamin Kambs, Jonas Heinrich Weber, Jan Kettler, Simon Kern, Hüseyin Vural, Simone Luca Portalupi, Michael Jetter, Christoph Becher and Peter Michler
Remote two-photon interference at 1550 nm via quantum frequency conversion of quantum dot photons

8. Jacob Bulmer, Jasleen Lugani and Ian Walmsley
Low depth N×N optical switches using a generalized Mach-Zehnder interferometer on a 2D/3D hybrid waveguide platform

9. Alessandro Seri, Giacomo Corrielli, Dario Lago-Rivera, Andreas Lenhard, Hugues de Riedmatten, Roberto Osellame and Margherita Mazzera
A novel integrated platform for quantum storage of heralded single photons

10. Yehuda Pilnyak, Yuval Schechter, Dean Pleban, Leonid Vidro, Pini Zilber, Lior Cohen, Daniel Istrati and Hagai S. Eisenberg
Photon states encoded in polarization and picosecond time-bins

11. Morgane Gandil, Johannes Görlitz, Dennis Herrmann, Philipp Fuchs, Takayuki Iwasaki, Takashi Taniguchi, Mutsuko Hatano and Christoph Becher
Investigation of the tin vacancy center in diamond for realization of spin-photon interfaces

12. Gerard Queraltó Isach, Verònica Ahufinger Breto and Jordi Mompart Penina
Continuous supersymmetric transformations in optical waveguides

13. Paul Hilaire, Carlos Anton, Clément Millet, Abdelmounaim Harouri, Aristide Lemaître, Isabelle Sagnes, Olivier Krebs, Norberto Daniel Lanzillotti Kimura, Niccolo Somaschi, Pascale Senellart and Loïc Lanco
Tomography of the optical polarization rotation induced by a single quantum dot in a cavity

14. Jessica Maclean, M.T. Greenaway, R.P. Campion, T.M. Fromhold, A.J. Kent and C.J. Mellor
Aluminium Gallium Arsenide Photonic Integrated Circuits for 780 nm Optical Delivery for Quantum Sensors

15. Philipp-Immanuel Schneider, Lin Zschiedrich, Xavier Garcia-Santiago and Sven Burger
Benchmarking different optimization algorithms for maximizing the extraction efficiency of a single-photon source

16. Saverio Francesconi, Arnault Raymond, Florent Baboux, Guillaume Boucher, Jonathan Belhassen, Aristide Lemaître, Maria Amanti and Sara Ducci
Controlling frequency correlations and biphoton statistics in a semiconductor photonic chip

17. David Phillips, Mattia Walschaers, Jan Sperling, Nicolas Treps and Ian Walmsley
Certification of Gaussian Boson Sampling Using Two-Point Correlation Functions

18. Mauro Brotons-Gisbert, Artur Branny, Santosh Kumar, Raphaël Picard, Raphaël Proux and Brian D. Gerardot

Charge-tunable quantum dots in monolayer WSe2

19. Clément Millet, Paul Hilaire, Juan Loredo, Carlos Antón, Abdelmounaim Harouri, Aristide Lemaître, Isabelle Sagnes, Daniel Kimura, Niccolo Somaschi, Olivier Krebs, Pascale Senellart and Loïc Lanco
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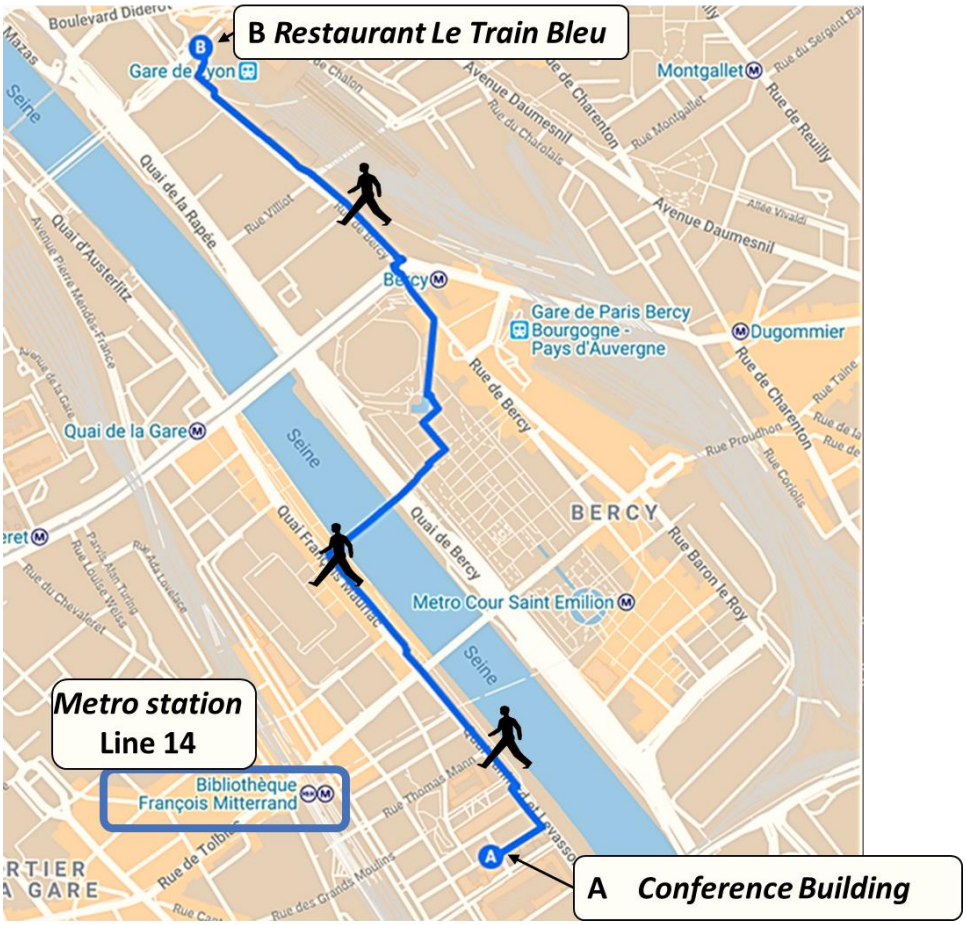
Conference Gala Dinner

The conference fee includes coffee breaks and buffet for the noon meals.

The conference dinner will take place on **Tuesday 16th of October** at the restaurant **Le Train Bleu** (1st floor Gare de Lyon, Place Louis Armand 75012 PARIS). You can reach the place by foot (35 min) or metro 14 (20 min, direct trip: Bibliothèque Francois Mitterand to Gare de Lyon):



Conference program

Monday 15

08:30	Registration
09:20	Opening
	PHOTONIC CIRCUITS I - *Chair of the session: Andrew White*
09:30	**Dirk Englund**: Memory-Integrated Photonic Integrated Circuits for Quantum Networks
10:00	**Klaus Joens**: Hybrid quantum photonic integrated circuits
10:20	**Mirko Lobino:** Continuous Variable quantum optics on-chip
10:40	Coffee Break
	PHOTONIC CIRCUITS II - *Chair of the session: Frederic Grosshans*
11:10	**Fabio Sciarrino**: Machine learning for processing and certification of photonic quantum information
11:40	**Caterina Taballione**: Programmable 8×8 linear optical network based on silicon nitride waveguides for quantum information processing
12:00	**Presentation of exhibitors**
12:20	Lunch break
14:00	**Poster session I** (odd numbers)
	QUANTUM PROTOCOLS I - *Chair of the session: Edo Waks*
15:30	**Chao-Yang Lu**: Efficient boson sampling with single-photon source
16:00	**Jelmer Renema:** The hardness of boson sampling under imperfections
16:20	**Jonas Zeuner:** Experimental Quantum Homomorphic Encryption
16:40	Coffee Break

	PHOTON-PHOTON GATES - *Chair of the session: Kartik Srinivasan*
17:10	**Stephan Goetzinger**: Close to perfect coupling of photons to a single molecule in a microcavity
17:40	**Daniel Najer**: Coupling a charge-tunable quantum dot to a cavity mode with cooperativity above one hundred
18:00	**Dominic Hallett**: Quantum non-linear optics with a quantum dot in a nano-photonic waveguide: Influence of the Fano effect on photon statistics
18:20	End of day 1

Tuesday 16

	QUANTUM PROTOCOLS II - *Chair of the session: Sophia Economou*
09:30	**Andrew White**: Hypercubes, drums, and single photons
10:00	**Carlos Anton-Solanas**: Interfacing solid-state single-photon sources and integrated photonics circuits: high rate three-photon coalescence
10:20	**Andrea Olivo**: Investigating the optimality of ancilla-assisted linear optical Bell measurements
10:40	Coffee break
	SOURCES I - *Chair of the session: Mirko Lobino*
11:10	**Virginia d'Auria**: On chip squeezing generation and detection
11:40	**Simone Atzeni**: Integrated source of entangled photon pairs in a hybrid laser-written circuit
12:00	**Marcelo Davanco:** Heterogeneous Quantum Integrated Photonics with InAs Quantum Dots
12:20	Lunch break
	QUANTUM PROTOCOLS III - *Chair of the session: Fabio Sciarrino*
14:00	**Edo Waks**: Photonic quantum information processing enabled by semiconductor spin
14:30	**Dario Lago-Rivera**: Storage of frequency-multiplexed heralded single photons in a laser-written waveguide
14:50	**Marco Avesani**: Secure heterodyne-based quantum random number generator at 17 Gbps

15:10	Coffee break
	INTEGRATED DETECTORS - *Chair of the session: Wolfgang Loeffler*
15:40	**Wolfram Pernice**: Detection of single photons in nanophotonic circuits
16:10	**Jan Philipp Höpker**: Integrated transition edge sensors on lithium niobate waveguides
16:30	**Luis Trigo Vidarte**: Correlations with on-chip detection for continuous-variable QKD
16:50	**Poster session II** (even numbers)
18:20	End of poster session
19:30	**Banquet**
23:30	End of day 2

Wednesday 17

	SOURCES II - *Chair of the session: Stephan Goetzinger*
09:30	**Hiroki Takesue**: Quantum communication experiments with optical waveguide devices
10:00	**Yannick Chassagneux**: Exploiting 1D exciton-phonon coupling for tunable single photon source with carbon nanotube
10:20	**Maja Colautti**: Integrated Organic Molecules for Quantum Technologies
10:40	Coffee break
	PHOTONIC CIRCUITS III - *Chair of the session: : Maria Amanti*
11:10	**Anthony Laing**: Photonic simulations of molecular quantum dynamics
11:40	**Giacomo Corrielli**: Quantum interference between topologically protected edge states in a laser written waveguide array
12:00	**Devin H. Smith**: Modular Linear Circuits for Integrated Quantum Optics
12:20	Lunch break

	ENTANGLEMENT I - *Chair of the session: Anthony Laing*
14:00	**Sophia Economou**: Spin-photon interfaces for quantum computing and communication
14:30	**Stefano Paesani**: High-dimensional entanglement in large-scale Silicon quantum photonics
14:50	**Hagai Eisenberg**: Generating multi-photon entangled states from a single deterministic single-photon source
15:10	Coffee break
	ENTANGLEMENT II - *Chair of the session Isabelle Zaquine*
15:40	**Maria Amanti**: Generation and manipulation of hyper-entangled frequency combs in an AlGaAs chip
16:10	**Christophe Galland**: Photonic quantum correlations mediated by individual phonons
16:30	Conclusion
16:40	End of day 3

Summary of partners and sponsors

We would like to acknowledge the numerous partners from local, regional and national French institutions supporting this conference; and also from the five private companies collaborating to this event.

Attocube

Website: http://www.attocube.com/

Attocube systems AG is a German manufacturer of cryogenic equipment: low vibration helium free cryostats, liquid helium based cryostats, cryogenic scanning probe microscopes; also a manufacturer of nano components: nano positioners, metrology sensors, electronic and software control units.

The fundamental innovation of the company was the development of ultra-compact, nanoprecise positioning devices, which were – for the first time ever – adaptable to extreme conditions, such as cryogenic temperatures (close to the absolute zero point of temperature, -273.15°C, or 0 K, down to 300 mK), ultra-high vacuum environments (5x10-11 mbar) and highest magnetic fields (+31 T).

ID Quantique

Website: https://www.idquantique.com/

ID Quantique (IDQ) provides quantum-safe network encryption, secure quantum key generation and quantum key distribution solutions and services to the financial industry, enterprises and government organisations globally.

IDQ also commercializes a quantum random number generator, which is the reference in the security, simulation and gaming industries.

GDR IQFA (Website in French)

Website: http://gdriqfa.unice.fr

After a year of transition, the birth of a new GDR, supported by the INP and INSIS CNRS Institutes, with which quantum information community is mostly associated, appeared to be essential. The goal of the GDR "Quantum Information: Foundations and Applications" is two-fold: first, to establish a common base of knowledge, and second, to use this platform to emulate new knowledge.

Lip6

Website: https://www.lip6.fr/

The LIP6, Sorbonne University and French National Center for Scientific Research (CNRS), UMR 7606 Sorbonne University - CNRS, is a computer science research laboratory dedicated to the modeling and the resolution of fundamental problems driven by applications, as well as to the implementation and the validation through academic and industrial partnerships.

My Cryo Firm

Website: http://www.mycryofirm.com/

My Cryo Firm was created in 2013 by Julien Paris , Cryogenic Engineer. After 10 years of experience in cryogenics that led him among others to design and build cryogenic systems such as dilution cryostats (up to 10mK), 300mK cryostat on liquid base and cryogenerator, Julien founds his own company with the desire to create fully customizable and scalable cryostats for leading applications in research and industry.

NanoSaclay

Website: http://nanosaclay.fr/

The 'LabEx NanoSaclay' is an interdisciplinary cluster of excellence dedicated to nanosciences and nanotechnology. It is supported by local renowned research and training institutions and integrated to the Paris-Saclay University.

The LabEx NanoSaclay unifies 450 scientists in a world-size cluster focused on interdisciplinarity and reactivity, able to address key fundamental, economic and societal issues. For the first fourth years, the scientific dynamism was organized around three 'flagship projects': (i) Quantum and spin-based nanoelectronics, (ii) Nano-drugs for the treatment of severe diseases and (iii) NanoPhotonics, nano-objects for energy control.

PCQC

Website: http://www.pcqc.fr/

The Paris Centre for Quantum Computing (PCQC) in Paris, France, brings together computer scientists, theoretical & experimental physicists and mathematicians that work in and around Paris. Our goal is to develop novel quantum information and communication technologies and lead the way from a Personal Computer (PC) to a Quantum Computer (QC).

Quandela

Website: http://quandela.com/

QUANDELA is a spinoff company from the Centre of Nanoscience and Nanotechnology (C2N - CNRS), in France, founded in 2017. We commercialize top-class quantum light sources to boost the research in quantum optics, to allow the emergence of further innovations in the field of quantum photonics and scale up quantum technologies outside the academic world.

Single Quantum

Website: http://singlequantum.com/

Single Quantum was founded in January 2012 in Delft, the Netherlands as a spin-off from Kavli Institute of Nanoscience at TU Delft. Single Quantum develops and manufactures single photon detection systems based on the technology of superconducting nanowires. We are a team of scientists and engineers who are devoted to commercialize the technology and bring the best products and service to our users.

Seam Labex

Website: http://www.labex-seam.fr/

The " Science and Engineering for Advanced Materials and devices " (SEAM) Labex (Lab of Excellence) project is focused on material sciences using a multi-scale approach, from material elaboration, characterization, description, integration in specific devices and applications in various fields of technology. Inorganic nano-materials, nanostructured carbon-based materials, diamond single crystal and nanostructured materials are processed allowing applications in the field of photonics, electronics, opto-electronics and aeronautics. It was approved in 2010 by a panel of international experts and is funded by the French Government.

SirTeq

Website: http://www.sirteq.org/

The SIRTEQ project labeled Major Area of Interest (IMG) is funded by the Île-de-France Region. SIRTEQ brings together the largest European concentration of academic teams in the field of quantum technologies. Its main objective is to promote an academic research of excellence in the field of quantum technologies in Île-de-France taking into account current social issues and the importance of knowledge and technology transfer.

ICIQP 2018

Quantum light is a key building block for the development of future quantum technologies, including quantum communications, quantum computing and simulation, and quantum sensing. In the last decade, the field of integrated quantum photonics has shown impressive progress, providing an excellent experimental test bench for a large panel of novel concepts introduced within the framework of quantum information science theory. Thanks to the efforts of a large scientific community the possibility to generate, manipulate and detect quantum light on-chip is becoming a reality, opening the path to a scalable platform for advanced quantum technologies.

The **International Conference on Integrated Quantum Photonics - ICIQP** aims at becoming a regular international meeting for the integrated quantum optics community, where leading groups worldwide meet to present and discuss the latest progress and future challenges. The meeting will be organized over three days, with prestigious invited speakers, oral presentations and a poster session. The conference covers the following broad research topics:

- Quantum light sources
- Discrete and continuous variables
- On-chip light manipulation
- Quantum cryptography and communication
- Optical quantum computation
- On-chip quantum light detection

This conference follows the successful series of conferences initiated within the European consortium PIQUE. The ICIQP 2018 edition will take place in **Paris** on **October 15-17th 2018**.

Important dates

- ~~Submission deadline: June 12th, 2018, 23:59h Paris time (UTC+2)~~
- ~~Decision notification: July 20th, 2018~~
- ~~Late-Poster submission deadline: August 30th, 2018~~
- ~~Early-bird registration deadline: September 14th, 2018~~
- Conference: October 15-17th, 2018

Previous events in the series

- International Conference on Integrated Quantum Photonics 2017. Final Conference of PICQUE and QUCHIP projects: Rome, Italy

Contact

In order to contact us, click here.

We gratefully acknowledge the support from:

FRANCISCO JAVIER DIAZ OTERO - (Id 443685)

Tipo
Autor/a

Colectivos

Puesto
Alumno/a tese / doutorado () (01/09/2018 - 31/08/2019)

Unidad de investigación
D00t14 - Teoría do sinal e comunicacións

Grupo de investigación
SC7 - Antenas, Radar e Comunicacións Ópticas

Tipología
Investigación

Convocatoria
Produción de Investigación

Área de conocimiento
A0800 - Teoría de la señal y comunicaciones

Año de cómputo
2018

Observaciones sobre valoraciones
breve

Datos de la Comunicación (Id 80880)

Título
Design of a fully integrated quantum number generator

DOI

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Número

Volumen

Nº autoras/es
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Autoras/es

Orden	Firma	Nombre y Apellidos	Identificador	P. Univ.	Afiliación
1	V. Moskalenko			No	
2	R. Broeke			No	
3	E. Bente			No	
4	Outerelo, D.A.			Sí	
5	P. Vilar Gómez			No	
6	F. J. Díaz Otero			Sí	

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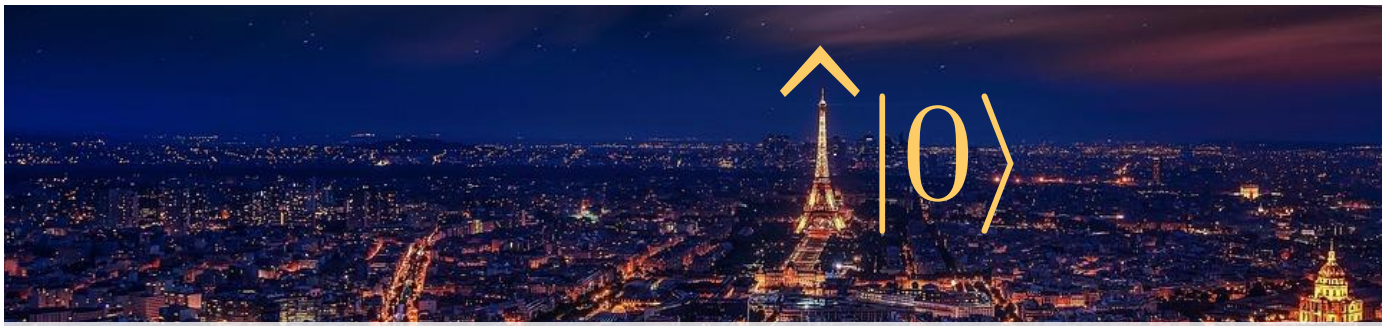
Volver



ICIQP2018 – October 15-17, 2018

International Conference on Integrated Quantum Photonics

Université Paris Diderot – Paris 7

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Welcome message

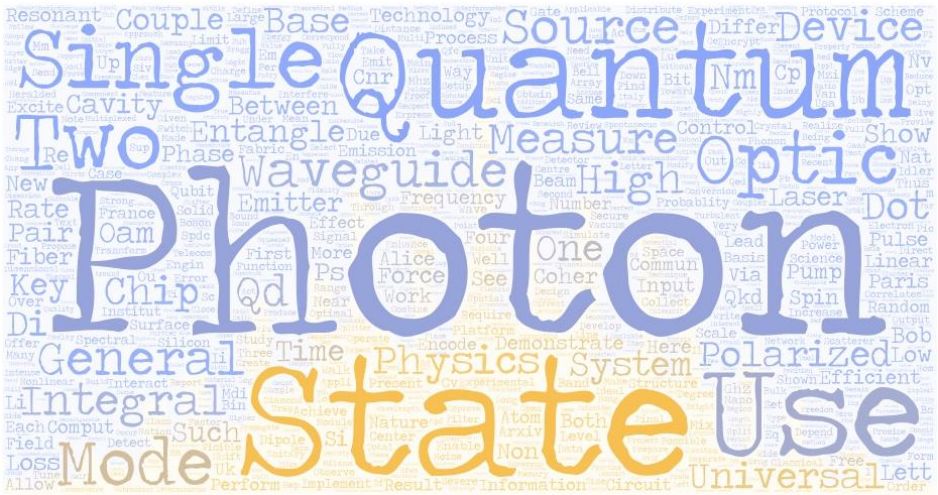
On behalf of the organizing committee, we are honoured and delighted to welcome you at the International Conference of Integrated Quantum Photonics in Paris!
This conference follows the successful series of conferences initiated within the European consortium PIQUE and aims at becoming a regular international meeting for the integrated quantum optics community, where leading groups worldwide meet to present and discuss the latest progress and future challenges. Our meeting is organized over three days, with prestigious invited speakers, oral presentations and two poster sessions.
The conference covers the following research topics:

- Quantum light sources
- Discrete and continuous variables
- On-chip light manipulation
- Quantum cryptography and communication
- Optical quantum computation
- On-chip quantum light detection

We thank the members of the Scientific Committee for their thorough and timely reviewing of the papers and suggestion of invited speakers, and our sponsors who have helped us keep down the costs of ICIQP for all participants.
Finally we thank you all for your great contributions and your participation!
Enjoy !

The conference chairs

Eleni Diamanti
Sara Ducci
Pascale Senellart-Mardon



Committees

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- Pascale SENELLART-MANDON (CNRS, University Paris Saclay)

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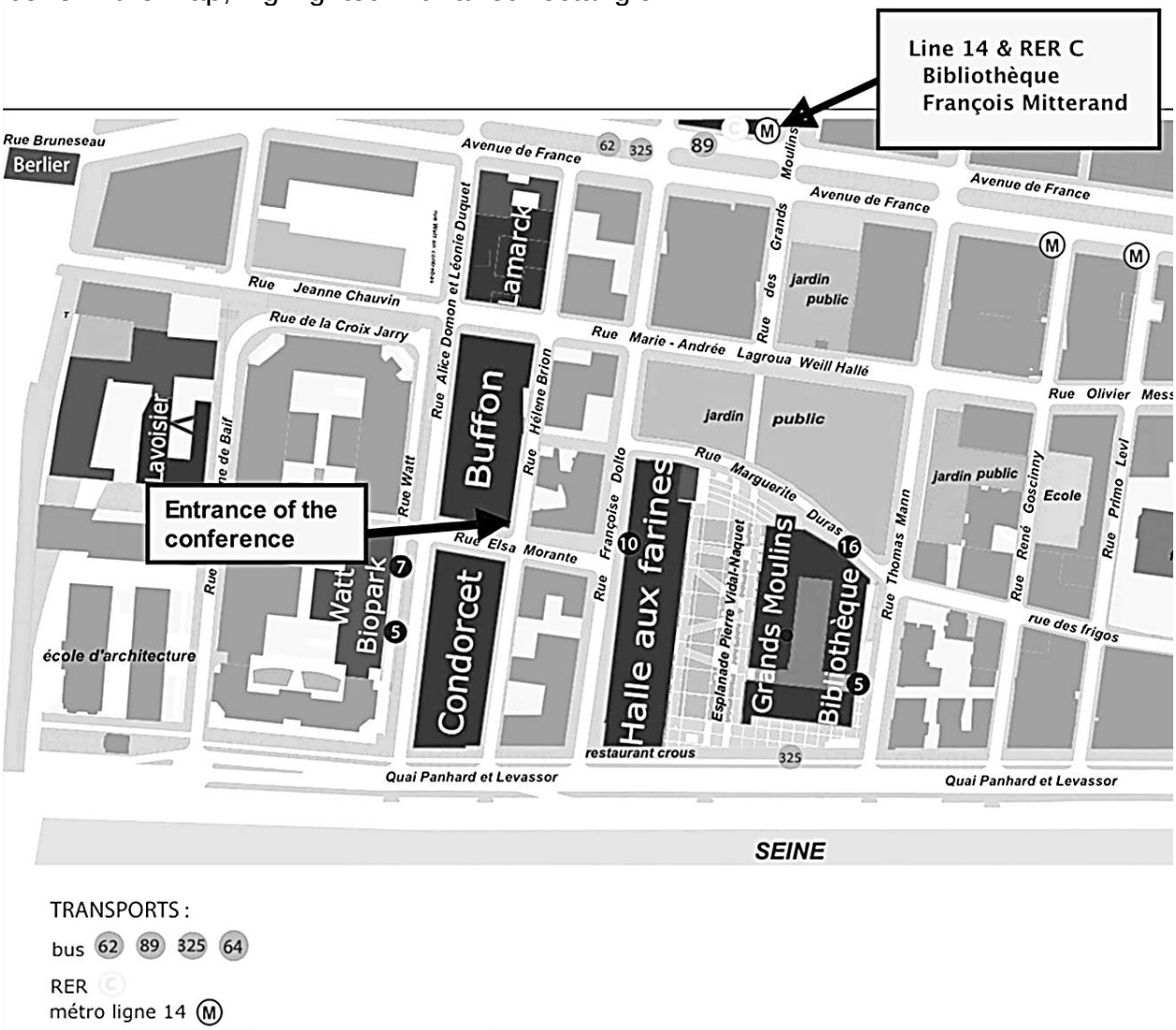
- Luis TRIGO VIDARTE (Sorbonne Univ., Institut d'Optique Graduate School)

How to reach the conference venue

ICIQP 2018 is held at Université Paris Diderot - Paris 7 in the Amphitheatre **Buffon** in building **Bâtiment Buffon**, address: 15 rue Hélène Brion, 75013 Paris (France).

- Tram: T3a (**Avenue de France)**
- Train and subway: RER C and line 14 (**Bibliothèque François Mitterrand**)
- Bus: lines 62 (**Porte de France**), 64 (**Pont de Tolbiac**), 89 (**Porte de France**), 325 (**Watt**).
- Vélib' Métropole (public bicycles)**:** Station **n°13055**

The Amphitheatre **Buffon** is located in the building **Bâtiment Buffon** (15 rue Hélène Brion), number 5 in the map, highlighted with a red rectangle.



Internet connection

Eduroam connection is accessible in the university campus. Check your badge where you will see an alternative Wi-Fi connection with personal login and password to connect to a local internet access.

Oral presentations

The oral contributions will be organised in the following way

- **Invited talks** will have 25 min presentation and 5 min questions
- **Accepted contributed talks** will consist in 15 min presentation and 5 min questions

Poster sessions

Space and material for installing a vertical DIN-A0-size poster will be facilitated in a room close to the conference room.

The two posters sessions will be organized in the following way: posters with **odd numbers** will be presented on **Monday** and posters with **even numbers** will be presented on **Tuesday** (see colour code in the poster titles).

Here it is the list of accepted posters:

1. Matteo Menotti, Zachary Vernon, John Sipe and Marco Liscidini
   Controlling spectral correlations in integrated sources: from energy-entangled to uncorrelated photon pairs
2. Gediminas Juska, Stefano T. Moroni, Simone Varo, Tung-Hsun Chung, Agnieszka Gocalinska and Emanuele Pelucchi
   Engineering opportunities with MOVPE grown site-controlled Pyramidal quantum dots
3. Wolfgang Löffler, H. J. Snijders, J. A. Frey, J. Norman, A. Gossard, J. E. Bowers and D. Bouwmeester
   Polarization and high-fidelity fiber-integrated quantum dot cavity-QED devices
4. Mackrine Nahra, Aurelie Broussier, Valery Davydov, Viatcheslav Agafonov and Christophe Couteau
   Single photon source in nanodiamonds for integrated quantum photonic
5. Kanupriya Sinha, B. Prasanna Venkatesh and Pierre Meystre
   Tailoring Casimir-Polder Interactions in Nanophotonic Systems
6. Lior Cohen, Yehuda Pilnyak, Daniel Istrati, Nicholas Studer, Jonathan Dowling and Hagai Eisenberg

Absolute self-calibration of single-photon and multiplexed photon-number-resolving detectors

7. Benjamin Kambs, Jonas Heinrich Weber, Jan Kettler, Simon Kern, Hüseyin Vural, Simone Luca Portalupi, Michael Jetter, Christoph Becher and Peter Michler
Remote two-photon interference at 1550 nm via quantum frequency conversion of quantum dot photons

8. Jacob Bulmer, Jasleen Lugani and Ian Walmsley
Low depth N×N optical switches using a generalized Mach-Zehnder interferometer on a 2D/3D hybrid waveguide platform

9. Alessandro Seri, Giacomo Corrielli, Dario Lago-Rivera, Andreas Lenhard, Hugues de Riedmatten, Roberto Osellame and Margherita Mazzera
A novel integrated platform for quantum storage of heralded single photons

10. Yehuda Pilnyak, Yuval Schechter, Dean Pleban, Leonid Vidro, Pini Zilber, Lior Cohen, Daniel Istrati and Hagai S. Eisenberg
Photon states encoded in polarization and picosecond time-bins

11. Morgane Gandil, Johannes Görlitz, Dennis Herrmann, Philipp Fuchs, Takayuki Iwasaki, Takashi Taniguchi, Mutsuko Hatano and Christoph Becher
Investigation of the tin vacancy center in diamond for realization of spin-photon interfaces

12. Gerard Queraltó Isach, Verònica Ahufinger Breto and Jordi Mompart Penina
Continuous supersymmetric transformations in optical waveguides

13. Paul Hilaire, Carlos Anton, Clément Millet, Abdelmounaim Harouri, Aristide Lemaître, Isabelle Sagnes, Olivier Krebs, Norberto Daniel Lanzillotti Kimura, Niccolo Somaschi, Pascale Senellart and Loïc Lanco
Tomography of the optical polarization rotation induced by a single quantum dot in a cavity

14. Jessica Maclean, M.T. Greenaway, R.P. Campion, T.M. Fromhold, A.J. Kent and C.J. Mellor
Aluminium Gallium Arsenide Photonic Integrated Circuits for 780 nm Optical Delivery for Quantum Sensors

15. Philipp-Immanuel Schneider, Lin Zschiedrich, Xavier Garcia-Santiago and Sven Burger
Benchmarking different optimization algorithms for maximizing the extraction efficiency of a single-photon source

16. Saverio Francesconi, Arnault Raymond, Florent Baboux, Guillaume Boucher, Jonathan Belhassen, Aristide Lemaître, Maria Amanti and Sara Ducci
Controlling frequency correlations and biphoton statistics in a semiconductor photonic chip

17. David Phillips, Mattia Walschaers, Jan Sperling, Nicolas Treps and Ian Walmsley
Certification of Gaussian Boson Sampling Using Two-Point Correlation Functions

18. Mauro Brotons-Gisbert, Artur Branny, Santosh Kumar, Raphaël Picard, Raphaël Proux and Brian D. Gerardot

Charge-tunable quantum dots in monolayer WSe2

19. Clément Millet, Paul Hilaire, Juan Loredo, Carlos Antón, Abdelmounaim Harouri, Aristide Lemaître, Isabelle Sagnes, Daniel Kimura, Niccolo Somaschi, Olivier Krebs, Pascale Senellart and Loïc Lanco
Deterministic assembly of a spin-photon interface based on a semiconductor quantum dot

20. Alistair Brash, C.L. Phillips, J. O'Hara, F. Liu, L.M.P.P. Martins, R.J. Coles, B. Royall, C. Bentham, I. Itskevich, L.R. Wilson, M.S. Skolnick and A.M. Fox
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Switchable mode entangled photon pairs from integrated optic Mach Zehnder interferometeric circuit and an elctro-optic modulator

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QKD silicon based Integrated photonics devices for space application

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Fundamental cavity-waveguide interplay in cavity QED

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Using four-wave mixing in silica waveguides to create photons on chip

25. Tobias Huber, Yichen Shuai, Marcelo Davanco, Olivier Gazzano and Glenn Solomon
Filter-free quantum dot resonance fluorescence in an integrated cavity-waveguide device

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Band structure engineering in nanomechanical devices in the 100s GHz regime

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Nonlinear AlGaAs nanoantennas for sum-frequency light and heralded photons generation

32. Nicolas Fabre, Belhassen Jonathan, Aurianne Minecci, Simone Felicetti, Maria Amanti, Arne Keller, Florent Baboux, Thomas Coudreau, Sara Ducci and Perola Milman
The Ou-Mandel experiment revisited: producing delocalized Schrödinger cats by local frequency-time filtering

33. Thibault Harlé, Martin Cordier, Isabelle Zaquine and Philippe Delaye
Non-uniformity induced distinguishability of nonlinearly generated photon pairs

34. Daniel Riedel, Immo Söllner, Brendan Shields, Sebastian Starosielec, Patrick Appel, Elke Neu, Patrick Maletinsky and Richard Warburton
Deterministic enhancement of coherent photon generation from a nitrogen-vacancy centre in ultrapure diamond

35. Zhuodan Zhu, Shanghong Zhao and Chen Dong
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A guidonics-based quantum circuit

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Engineering four-wave mixing spectral entanglement in hollow-core fibers

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The nonlinear Chi(2) directional coupler: a versatile source for continuous variable quantum information

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Quantum superiority for verifying NP-complete problems with coherent states and linear optics

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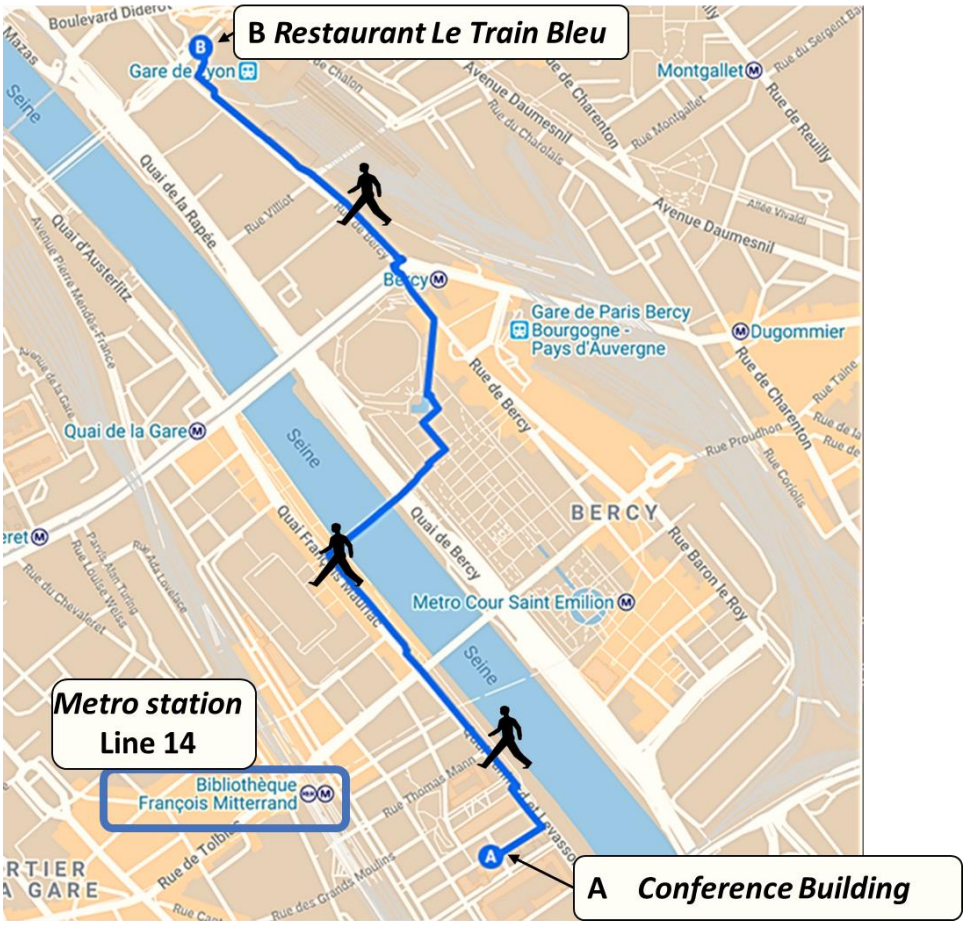
Reconfigurable photonics on a glass chip

Conference Gala Dinner

The conference fee includes coffee breaks and buffet for the noon meals.

The conference dinner will take place on **Tuesday 16th of October** at the restaurant **Le Train Bleu** (1st floor Gare de Lyon, Place Louis Armand 75012 PARIS). You can reach the place by foot (35 min) or metro 14 (20 min, direct trip: Bibliothèque Francois Mitterand to Gare de Lyon):



Conference program

Monday 15

08:30	Registration
09:20	Opening
	PHOTONIC CIRCUITS I - *Chair of the session: Andrew White*
09:30	**Dirk Englund**: Memory-Integrated Photonic Integrated Circuits for Quantum Networks
10:00	**Klaus Joens**: Hybrid quantum photonic integrated circuits
10:20	**Mirko Lobino:** Continuous Variable quantum optics on-chip
10:40	Coffee Break
	PHOTONIC CIRCUITS II - *Chair of the session: Frederic Grosshans*
11:10	**Fabio Sciarrino**: Machine learning for processing and certification of photonic quantum information
11:40	**Caterina Taballione**: Programmable 8×8 linear optical network based on silicon nitride waveguides for quantum information processing
12:00	**Presentation of exhibitors**
12:20	Lunch break
14:00	**Poster session I** (odd numbers)
	QUANTUM PROTOCOLS I - *Chair of the session: Edo Waks*
15:30	**Chao-Yang Lu**: Efficient boson sampling with single-photon source
16:00	**Jelmer Renema:** The hardness of boson sampling under imperfections
16:20	**Jonas Zeuner:** Experimental Quantum Homomorphic Encryption
16:40	Coffee Break

	PHOTON-PHOTON GATES - *Chair of the session: Kartik Srinivasan*
17:10	**Stephan Goetzinger**: Close to perfect coupling of photons to a single molecule in a microcavity
17:40	**Daniel Najer**: Coupling a charge-tunable quantum dot to a cavity mode with cooperativity above one hundred
18:00	**Dominic Hallett**: Quantum non-linear optics with a quantum dot in a nano-photonic waveguide: Influence of the Fano effect on photon statistics
18:20	End of day 1

Tuesday 16

	QUANTUM PROTOCOLS II - *Chair of the session: Sophia Economou*
09:30	**Andrew White**: Hypercubes, drums, and single photons
10:00	**Carlos Anton-Solanas**: Interfacing solid-state single-photon sources and integrated photonics circuits: high rate three-photon coalescence
10:20	**Andrea Olivo**: Investigating the optimality of ancilla-assisted linear optical Bell measurements
10:40	Coffee break
	SOURCES I - *Chair of the session: Mirko Lobino*
11:10	**Virginia d'Auria**: On chip squeezing generation and detection
11:40	**Simone Atzeni**: Integrated source of entangled photon pairs in a hybrid laser-written circuit
12:00	**Marcelo Davanco:** Heterogeneous Quantum Integrated Photonics with InAs Quantum Dots
12:20	Lunch break
	QUANTUM PROTOCOLS III - *Chair of the session: Fabio Sciarrino*
14:00	**Edo Waks**: Photonic quantum information processing enabled by semiconductor spin
14:30	**Dario Lago-Rivera**: Storage of frequency-multiplexed heralded single photons in a laser-written waveguide
14:50	**Marco Avesani**: Secure heterodyne-based quantum random number generator at 17 Gbps

15:10	Coffee break
	INTEGRATED DETECTORS - *Chair of the session: Wolfgang Loeffler*
15:40	**Wolfram Pernice**: Detection of single photons in nanophotonic circuits
16:10	**Jan Philipp Höpker**: Integrated transition edge sensors on lithium niobate waveguides
16:30	**Luis Trigo Vidarte**: Correlations with on-chip detection for continuous-variable QKD
16:50	**Poster session II** (even numbers)
18:20	End of poster session
19:30	**Banquet**
23:30	End of day 2

Wednesday 17

	SOURCES II - *Chair of the session: Stephan Goetzinger*
09:30	**Hiroki Takesue**: Quantum communication experiments with optical waveguide devices
10:00	**Yannick Chassagneux**: Exploiting 1D exciton-phonon coupling for tunable single photon source with carbon nanotube
10:20	**Maja Colautti**: Integrated Organic Molecules for Quantum Technologies
10:40	Coffee break
	PHOTONIC CIRCUITS III - *Chair of the session: : Maria Amanti*
11:10	**Anthony Laing**: Photonic simulations of molecular quantum dynamics
11:40	**Giacomo Corrielli**: Quantum interference between topologically protected edge states in a laser written waveguide array
12:00	**Devin H. Smith**: Modular Linear Circuits for Integrated Quantum Optics
12:20	Lunch break

	ENTANGLEMENT I - *Chair of the session: Anthony Laing*
14:00	**Sophia Economou**: Spin-photon interfaces for quantum computing and communication
14:30	**Stefano Paesani**: High-dimensional entanglement in large-scale Silicon quantum photonics
14:50	**Hagai Eisenberg**: Generating multi-photon entangled states from a single deterministic single-photon source
15:10	Coffee break
	ENTANGLEMENT II - *Chair of the session Isabelle Zaquine*
15:40	**Maria Amanti**: Generation and manipulation of hyper-entangled frequency combs in an AlGaAs chip
16:10	**Christophe Galland**: Photonic quantum correlations mediated by individual phonons
16:30	Conclusion
16:40	End of day 3

Summary of partners and sponsors

We would like to acknowledge the numerous partners from local, regional and national French institutions supporting this conference; and also from the five private companies collaborating to this event.

Attocube

Website: http://www.attocube.com/

Attocube systems AG is a German manufacturer of cryogenic equipment: low vibration helium free cryostats, liquid helium based cryostats, cryogenic scanning probe microscopes; also a manufacturer of nano components: nano positioners, metrology sensors, electronic and software control units.

The fundamental innovation of the company was the development of ultra-compact, nanoprecise positioning devices, which were – for the first time ever – adaptable to extreme conditions, such as cryogenic temperatures (close to the absolute zero point of temperature, -273.15°C, or 0 K, down to 300 mK), ultra-high vacuum environments (5x10-11 mbar) and highest magnetic fields (+31 T).

ID Quantique

Website: https://www.idquantique.com/

ID Quantique (IDQ) provides quantum-safe network encryption, secure quantum key generation and quantum key distribution solutions and services to the financial industry, enterprises and government organisations globally.

IDQ also commercializes a quantum random number generator, which is the reference in the security, simulation and gaming industries.

GDR IQFA (Website in French)

Website: http://gdriqfa.unice.fr

After a year of transition, the birth of a new GDR, supported by the INP and INSIS CNRS Institutes, with which quantum information community is mostly associated, appeared to be essential. The goal of the GDR "Quantum Information: Foundations and Applications" is two-fold: first, to establish a common base of knowledge, and second, to use this platform to emulate new knowledge.

Lip6

Website: https://www.lip6.fr/

The LIP6, Sorbonne University and French National Center for Scientific Research (CNRS), UMR 7606 Sorbonne University - CNRS, is a computer science research laboratory dedicated to the modeling and the resolution of fundamental problems driven by applications, as well as to the implementation and the validation through academic and industrial partnerships.

My Cryo Firm

Website: http://www.mycryofirm.com/

My Cryo Firm was created in 2013 by Julien Paris , Cryogenic Engineer. After 10 years of experience in cryogenics that led him among others to design and build cryogenic systems such as dilution cryostats (up to 10mK), 300mK cryostat on liquid base and cryogenerator, Julien founds his own company with the desire to create fully customizable and scalable cryostats for leading applications in research and industry.

NanoSaclay

Website: http://nanosaclay.fr/

The 'LabEx NanoSaclay' is an interdisciplinary cluster of excellence dedicated to nanosciences and nanotechnology. It is supported by local renowned research and training institutions and integrated to the Paris-Saclay University.

The LabEx NanoSaclay unifies 450 scientists in a world-size cluster focused on interdisciplinarity and reactivity, able to address key fundamental, economic and societal issues. For the first fourth years, the scientific dynamism was organized around three 'flagship projects': (i) Quantum and spin-based nanoelectronics, (ii) Nano-drugs for the treatment of severe diseases and (iii) NanoPhotonics, nano-objects for energy control.

PCQC

Website: http://www.pcqc.fr/

The Paris Centre for Quantum Computing (PCQC) in Paris, France, brings together computer scientists, theoretical & experimental physicists and mathematicians that work in and around Paris. Our goal is to develop novel quantum information and communication technologies and lead the way from a Personal Computer (PC) to a Quantum Computer (QC).

Quandela

Website: http://quandela.com/

QUANDELA is a spinoff company from the Centre of Nanoscience and Nanotechnology (C2N - CNRS), in France, founded in 2017. We commercialize top-class quantum light sources to boost the research in quantum optics, to allow the emergence of further innovations in the field of quantum photonics and scale up quantum technologies outside the academic world.

Single Quantum

Website: http://singlequantum.com/

Single Quantum was founded in January 2012 in Delft, the Netherlands as a spin-off from Kavli Institute of Nanoscience at TU Delft. Single Quantum develops and manufactures single photon detection systems based on the technology of superconducting nanowires. We are a team of scientists and engineers who are devoted to commercialize the technology and bring the best products and service to our users.

Seam Labex

Website: http://www.labex-seam.fr/

The " Science and Engineering for Advanced Materials and devices " (SEAM) Labex (Lab of Excellence) project is focused on material sciences using a multi-scale approach, from material elaboration, characterization, description, integration in specific devices and applications in various fields of technology. Inorganic nano-materials, nanostructured carbon-based materials, diamond single crystal and nanostructured materials are processed allowing applications in the field of photonics, electronics, opto-electronics and aeronautics. It was approved in 2010 by a panel of international experts and is funded by the French Government.

SirTeq

Website: http://www.sirteq.org/

The SIRTEQ project labeled Major Area of Interest (IMG) is funded by the Île-de-France Region. SIRTEQ brings together the largest European concentration of academic teams in the field of quantum technologies. Its main objective is to promote an academic research of excellence in the field of quantum technologies in Île-de-France taking into account current social issues and the importance of knowledge and technology transfer.