



Geneva, May 1st, 2013

## **Announcement: 6<sup>th</sup> Winter School on Practical Quantum Communications in the Swiss Alps in January 2014**

Dear Sir/ Madam,

Based on the success of our previous Winter Schools on Practical Quantum Cryptography, ID Quantique is proud to announce the 6<sup>th</sup> Winter School on Practical Quantum Communications. This program will deal with quantum cryptography, quantum computing and quantum repeaters. The goal of this event is to introduce this exciting topic in a relaxed and stimulating atmosphere to a general audience of physicists and computer scientists with little or no background in practical quantum communications. Special emphasis will be placed on practical aspects of quantum communications, such as the implementation of Quantum Key distribution systems and quantum repeaters, as well as concrete steps towards a quantum computer. The emerging applications of these promising technologies will also be discussed.

In addition, by including hands-on tutorials, the Winter School will offer participants the unique opportunity to learn to operate a real quantum cryptography system and single-photon detectors. In order to maximize interaction with instructors and to allow intensive hands-on tutorials, the number of participants is limited. Applications will be accepted on a first-come first-served basis.

### **What's new for the 6<sup>th</sup> edition?**

Beside the new focus since the 5<sup>th</sup> Winter School, on quantum computing and quantum repeater we have now an extended edition:

- One additional day
- New additional keynote speakers: Prof. Gilles Brassard, Prof. Massimiliano Sala and Dr. Troels Rønnow

**Dates:** ▶ Sunday January 19 to Thursday January 23, 2014  
(Arrival on Saturday afternoon and departure on Friday morning)

**Location:** ▶ Les Diablerets in the Swiss Alps  
(More information available on: <http://www.diablerets.ch/en/index.cfm>)

**Accommodation:** ▶ Hotel Les Sources; [www.hotel-les-sources.ch](http://www.hotel-les-sources.ch)

**Instructors:** ▶ Members of the ID Quantique R&D team

**Keynote Speakers:** ▶ See page 3 to 5 of this announcement



**Price:** ▶ € 3'480.- per participant (**Early booking discount, see below**)

The price includes:

- Board and accommodation (5 nights, single room in a \*\*\* hotel)
- Course participation
- Teaching materials
- Recreational activities (various winter sports)

Travel to and from Les Diablerets not included.

**Certificate:** ▶ Granted upon completion of the Winter School

**Insurance:** ▶ Health and accident insurance is the responsibility of the participant.

**Accompanying Person:** ▶ Possibility to come with an accompanying person.

Price: € 1'200.- per person, which includes:

Accommodation in a double room, breakfast, lunch and dinner, and recreational activities. Travel to and from Les Diablerets not included.

**Application:** ▶ Before November 15<sup>th</sup>, 2013

(The number of participants is limited. Applications will be accepted on a first come first served basis.)

**Early booking:** ▶ For booking and payment before October 15<sup>th</sup>, 2013, special price of € 2'780.- per participant (€ 960.- per accompanying person).  
Act quickly to take advantage of this **20% discount!**

**Optional visit:** ▶ Possibility to visit the premises of ID Quantique on Friday morning and/or the Group of Applied Physics of the University of Geneva on Friday afternoon, January 24<sup>th</sup>, 2014.

Participants wishing to take advantage of this opportunity will leave Les Diablerets by train for Geneva at 8.00am.

The train ticket must be purchased by the participant, but the visit(s) is free of charge.

Registration and organizational issue for the visit(s) will be taken during the Winter School

Come join us in Les Diablerets next winter! This Winter School is a unique opportunity to learn about state-of-the-art practical quantum communications and to gain hands-on experience. The program will also allow participants to network and socialize, while discovering winter sports such as downhill skiing, sledding or snowshoe hiking in a beautiful Swiss Alps winter landscape.

Your faithfully,



Grégoire Ribordy



## Keynote Speakers

### Prof. Dr. Gilles Brassard

Canada Research Chair in Quantum Information Processing, Université de Montréal



Gilles Brassard was born in Montreal, Canada, in 1955. He received a Masters degree from the Université de Montréal in 1975, and his Ph.D. in Computer Science from Cornell University in 1979, working in the field of cryptography with John Hopcroft as his advisor. He has been a faculty member of the Université de Montréal ever since, where he became Full Professor in 1988 and was given a Canada Research Chair in 2001.

Brassard is best known for his fundamental work in quantum cryptography, quantum teleportation, quantum entanglement distillation, quantum pseudo-telepathy, and the classical simulation of quantum entanglement. Some of these concepts have been implemented in the laboratory.

In 1984, together with Charles H. Bennett, he invented the BB84 protocol for quantum cryptography. He later extended this work to include the Cascade error correction protocol, which performs efficient detection and correction of noise caused by eavesdropping on quantum cryptographic signals.

Brassard was the editor-in-chief of the Journal of Cryptology from 1991 to 1998. In 2000, he won the Prix Marie-Victorin, the highest scientific award of the government of Quebec. He was elected as a Fellow of the International Association for Cryptologic Research in 2006, the first Canadian to be so honored. In June 2010, he was awarded the Gerhard Herzberg Canada Gold Medal, Canada's highest scientific honour. He is also a Fellow of the Royal Society of Canada.

### Prof. Dr. Nicolas Gisin

Head of the Group of Applied Physics at the University of Geneva



Professor Nicolas Gisin is the group leader of the Group of Applied Physics at the University of Geneva. After a master in physics and a degree in mathematics, he received his Ph.D. degree in Physics from the University of Geneva in 1981 for his dissertation in quantum and statistical physics. The "Fondation Louis de Broglie" recognized this work with an award.

After a post-doc at the University of Rochester, NY, he joined a start-up company, Alphatronix, dedicated to fiber instrumentation for the telecommunication industry. Initially head of the software, he quickly became responsible for the hardware-software interface. Four years later he joined a Swiss software company developing an image processing package which received the attention of the American journal "PC

Magazine".

In 1988 an opportunity to join the Group of Applied Physics at the University of Geneva as head of the optics section brought him back to the academic life. At the time the optics section was entirely devoted to support of the Swiss PTT (now Swisscom). In order to achieve a critical mass and stability, the optics section under the direction of Prof. N. Gisin started two new research directions, one in optical sensors, one in quantum optics. The telecom and the sensing activities led to many patents and technological transfers to Swiss and international industries. Several products had and still have a commercial success. The quantum optics activities are more oriented to basic research. The main theme is to combine the large expertise of the group in optical fibers with basic quantum effects. More recently, the demonstration of quantum cryptography and of long distance quantum entanglement received attention from the international scientific community as well as from the broader media.



### **Prof. Dr. Vadim Makarov**

Head of the Quantum hacking lab at the Institute for Quantum Computing in Waterloo, Canada



Vadim Makarov is a research assistant professor at the Institute for Quantum Computing in Waterloo, Canada, where he leads the Quantum hacking lab. Prior to this, Makarov was a postdoctoral researcher at NTNU (Trondheim, Norway). He has extensive experience in quantum hacking and practical security of QKD systems. He has become internationally well-known as a pioneer on practical security of QKD. He has previously worked as a postdoctoral researcher for one year at the Department of Physics, Pohang University of Science and Technology (Korea). He has received PhD degree in quantum cryptography from the Norwegian University of Science and Technology (2007) and Master's degree in radiophysics from the St. Petersburg State Polytechnical University (1998).

### **Dr. Tracy Northup**

Senior Scientist in Rainer Blatt's group at the University of Innsbruck



Tracey Northup is a senior scientist at the University of Innsbruck, where she holds an Elise Richter fellowship from the Austrian Science Fund. Within Prof. Rainer Blatt's Quantum Optics and Spectroscopy group, she leads a research project on cavity quantum electrodynamics. She received a bachelor's degree in physics from Harvard University in 1999 and a Ph.D. in physics from the California Institute of Technology in 2008. After arriving in Innsbruck as a postdoc in 2008, she held a Marie Curie International Incoming Fellowship from 2009 - 2011. Her research focuses on constructing quantum networks between strings of trapped ions, which are promising candidates for quantum computers.

### **Prof. Dr Sandu Popescu**

Professor at the University of Bristol, Great Britain



Sandu Popescu is well known as one of the founders of, and most active researchers in, quantum information. Popescu's work has completely changed the subject of quantum entanglement and non-locality. He helped create the quantitative approach to entanglement which became the central paradigm of the field, namely "entanglement as a resource". He also pioneered research on multi-partite entanglement and on the non-locality of interactions (rather than of states) and was the first to extend the notion of non-locality beyond quantum mechanics. The study of super-quantum nonlocal correlations (the so called Popescu-Rohrlich correlations) is at present an entire research area by itself. With Massar, he initiated the area of quantum state estimation. With Gisin he initiated the subject of alignment of frames of reference by quantum means. He also initiated the area of entangled photons spectroscopy. Popescu also has had very successful interactions with experimentalists: for example, he designed the experimental scheme for the first quantum teleportation experiment.

Finally, Popescu conducted seminal work on the foundations of statistical mechanics, showing from first principles, that every system in contact with a much larger one (bath) reaches equilibrium (a "holy grails" of the subject).



### **Dr. Massimiliano Sala**

Associate Professor in Algebra at University of Trento



Professor Massimiliano Sala obtained the Master's degree (MSC) in Mathematics at the University of Pisa in 1995 and the Ph.D. in Mathematics with a thesis entitled: "On some algebraic methods for coding theory", at the University of Milan in 2001.

Currently, he is an Associate Professor in Algebra and research professor in Coding Theory and Cryptography at the University of Trento.

He leads (and has founded) the Laboratory of Cryptography at the University of Trento (CryptoLabTN), which has established collaborations with several major Italian companies.

He has organized 15 conferences/workshops and lectured 30 courses. He has given more than 20 talks at conferences and has authored more than 40 scientific papers.

You can find other information on his web site: <http://www.science.unitn.it/~sala/>

### **Dr. Mikael Afzelius**

Leader of the Quantum Memory/Repeater Group in the Group of Applied Physics at the University of Geneva



Mikael Afzelius received his PhD in physics at Lund University (Sweden). He then received a two-year scholarship from the Swedish Research Council to work as post-doc at the Group of Applied Physics (Geneva University, Switzerland) in the group of N. Gisin. He currently holds a position of Maitre d'enseignement et de Recherche in the same group where his research is focused on coherent light-matter interactions for quantum memories.

### **Dr. Troels Rønnow**

Post-doc in the group of Professor Matthias Troyer at ETH Zurich, Switzerland



He did his masters in physics at Aalborg University in Denmark where he also got his PhD. During this period, he developed an interest for computational methods in physics which led him to apply for a position as a post. doc. in Matthias Troyers group at ETH. Today he works with quantum annealing and development of algorithms for efficiently simulating quantum hardware. In 2013, he published an article on quantum annealing with 108 qubit on D-Wave One device.


## **Sponsorship**






## 6th Winter School on Practical Quantum Communications in the Swiss Alps

# Preliminary Program at a Glance

	<b>Saturday Jan. 18, 2014</b>	<b>Sunday Jan. 19, 2014</b>	<b>Monday Jan. 20, 2014</b>	<b>Tuesday Jan. 21, 2014</b>
07:15 - 08:00		Breakfast	Breakfast	Breakfast
08:00 - 10:00		Quantum Information Processing / QRNG Introduction to BB84	<b>KEYNOTE: Massimiliano Sala</b> Introduction to Cryptography	Security of QKD Characterization of QKD
10:00 - 12:00		Key distillation - 1 Key distillation - 2	Hands-On Session 2	Session: QKD in network Session: Other protocols
12:00 - 14:00		Lunch	Recreational Activity Ski	Recreational Activity Glacier 3000
14:00 - 16:00		Components for QC Assembling a QKD system	Recreational Activity Ski	Recreational Activity Glacier 3000
16:00 - 18:00	17:30 - 18:00 Presentation of the program	Hands-On Session 1	Recreational Activity Ski	<b>KEYNOTE: Vadim Makarov</b> Quantum Hacking
18:00 - 20:00	Dinner	Dinner	Dinner	Dinner
20:00 - 22:00	Recreational activity Curling	Recreational activity Snow Shoes	<b>KEYNOTE: Gilles Brassard</b> History of Quantum Cryptography	Hands-On Session 3

	<b>Wednesday Jan. 22, 2014</b>	<b>Thursday Jan. 23, 2014</b>	<b>Friday Jan. 24, 2014</b>
07:15 - 08:00	Breakfast	Breakfast	Breakfast
08:00 - 10:00	<b>KEYNOTE: Sandu Popescu</b> Theory of Quantum Computer	<b>KEYNOTE: Nicolas Gisin</b> Quantum repeater Architecture	Optional: IDQ visit in Geneva
10:00 - 12:00	<b>KEYNOTE: Tracy Northup</b> Experimental Quantum Computer	<b>KEYNOTE: Mikael Afzelius</b> Quantum memory	
12:00 - 14:00	Lunch	Lunch	Lunch
14:00 - 16:00	Hands-On Session 4	<b>KEYNOTE: Gilles Brassard</b> Quantum Cryptography beyond QKD	Optional: GAP Optique visit in Geneva
16:00 - 18:00	<b>KEYNOTE: Troels Rønnow</b> Experimental Quantum Computer 2	Free time	
18:00 - 20:00	Dinner	Dinner	
20:00 - 22:00	Evening sledge	Swiss Party	

Legend					
Meals	Hands-On Session	Keynote Speaker	Recreational Activity	Normal Session	Various



## Notes

- Preliminary program. Final program will be announced subsequently.
- For hands-on tutorials, participants will work in groups. Each group will take part in the following tutorials:
 

Hands-On 1 – Experimental QKD,	Hands-On 2 – Gated Single-photon detection and TDC.
Hands-On 3 – Free running photon counter,	Hands-On 4 – QKD in commercial application.

 The courses will not focus solely on ID Quantique’s products, but will use them for illustrative purposes.
- All presentations are in English

## 6th Winter School on Practical Quantum Communications in the Swiss Alps

### Les Diablerets ([www.diablerets.ch](http://www.diablerets.ch))



## Presentation

**Enjoy the pure mountain air in a charming family resort at the foot of a magnificent glacier. Les Diablerets is an unspoiled country village set amid spectacular Alpine scenery. Majestic summits, pristine forests... Les Diablerets has done such a good job of meeting the needs of tourism that visitors feel right at home!**

In winter, the mountain offers you all the pleasures of skiing, snow and meeting family or friends: Alpine skiing and snowboarding, but also cross-country skiing, snowshoes or hikes, day or night sledge runs, ice-skating or curling, swimming-pool and other sports or fun activities. In summer, the numerous beautiful landscapes of our valley guarantee you will enjoy sun and pure air. Hikes, mountain biking, Via Ferrata, husky rides and snow bus on the glacier as well as fun sports guarantee you well-being, fun and a unique experience. The Alpine Coaster, on the glacier, with its ten curves, six waves, three jumps, two bridges and a 520-degree loop await those who dare.





## 6<sup>th</sup> Winter School on Practical Quantum Communications in the Swiss Alps

### Fax Back Answer Sheet

- Yes, I will attend the “6<sup>th</sup> Winter School on Practical Quantum Cryptography” from Saturday January 18 to Friday January 24, 2014 for €3’480  
This fee includes the items described on page 1  
This fee does not include travel to and from Les Diablerets.  
This amount must be paid in full to ID Quantique by November 15<sup>th</sup>, 2013 and is non-refundable.
- I will come with an accompanying person for an additional €1’200.--  
This fee includes:
- Board and accommodation (6 nights, double room in a \*\*\* hotel).
  - Recreational activities (various winter sports)
- This fee does not include travel to and from Les Diablerets.  
This amount must be paid in full to ID Quantique by November 15<sup>th</sup>, 2013 and is non-refundable.
- Early booking: see page 2 of this announcement.
- I cannot attend the Winter School on Practical Quantum Cryptography but would like to be informed of future events.

To be returned by Fax: +41 22 301 83 79

Email: [info@idquantique.com](mailto:info@idquantique.com)

Company/Organization: .....

First Name: ....., Surname: .....

Address: .....

City: ..... Country: .....

Phone: ..... Fax: .....

Email: .....

Comments: .....