Entangled Particle Holographic Optical Nanostorage

Source: http://www.derkeiler.com/Newsgroups/sci.crypt/2005−04/0699.html

---

From: holoman (*fedrive_at_pacbell.net*)
Date: 04/11/05

```
Date: 11 Apr 2005 09:33:35 −0700
```

Vienna, 21. April 2004
World Premiere: Bank Transfer via Quantum Cryptography Based on Entangled Photons
Press conference and demonstration of the ground−breaking experiment: 21 April 2004, 11:30, Vienna City Hall − Steinsaal

A collaboration of: group of Professor Anton Zeilinger, Vienna University; ARC Seibersdorf research GmbH; City of Vienna; Wien Kanal Abwassertechnologien GmbH and Bank Austria −Creditanstalt Today, the Bank Austria Creditanstalt has, on behalf of the City of Vienna, performed the World's first bank transfer encoded via quantum cryptography.

This novel technology was demonstrated by the group of Professor Anton Zeilinger, Vienna University in collaboration with the group Quantum Technologies (Information Technologies Division) of Seibersdorf research. The bank transfer was initiated by Vienna's Mayor Dr. Michael Häupl, and executed by the Director of the Bank Austria Creditanstalt, Dr. Erich Hampel. The information was sent via a glass fiber cable, laid by the company Wien Kanal Abwassertechnologien from the Vienna City Hall to the Bank Austria Creditanstalt branch office "Schottengasse".

Entangled photon pairs enable absolutely secure transfer of information
In quantum cryptography, a data key for encoding messages is created using quantum technologies. It provides solutions for two problems yet unsolved by today's commonly used classical cryptography systems: The creation and the transfer of absolutely random keys. On the one hand, the security of the produced keys is based on the laws of Nature − and not on the complicated mathematical procedures used by today's systems. On the other hand, quantum cryptography simplifies the distribution of the keys. Trustworthy human messengers who personally deliver a key, still the common carriers of information in cases of highly confidential transfer of information, are finally a thing of the past. The keys can now be produced simultaneously by transmitter and receiver − the transfer is made redundant. The keys for encoding

information are produced via entangled photon pairs. Austrian physicist Erwin Schrödinger introduced the term entanglement (later referred to as "spooky
action at a distance" by Albert Einstein) as the essential characteristic of quantum physics. That is: the properties of one particle depend on the properties of another particle − independent from the distance between the two. Both particles − without properties at before the measurement − receive their properties at the moment of the measurement. These properties of the two particles are correlated − "entangled".

At the transmitter station in the Bank Austria Creditanstalt branch office, a laser produces the two entangled photon pairs in a crystal. One of the two photons is sent via the glass fiber data channel to the City Hall, the other one remains at the bank. Both the receiver in the City Hall and the transmitter in the bank then measure the properties of their particles.

The measuring results are then converted into a string of 0s and 1s − the cryptographic key. The sequence of the numbers 0 and 1 is, due to the laws of quantum physics, completely random. Identical strings of random numbers, used as the key for encoding the information, are produced both in the bank and the City Hall.

The information is encoded using the so−called "one time pad" procedures. Here, the key is as long as the message itself. The message is linked with the key bit by bit and then transferred via the glass fibre data channel.

Eavesdropping can be detected already during the production of the key − before the transfer of the encoded message has even started. Any intervention into the transfer of the photons changes the sequence of the number strings at the measuring stations. In case of eavesdropping, both partners receive an unequal sequence. By comparing part of the key, any eavesdropping effort can be discerned. Though the eavesdropper is able to prevent the
transfer of the message, he is unable to gain any information contained in the message!

Hard− and Software developed in Austria
The device to produce the key for message encoding was developed at the Vienna Institut für Experimentalphysik in the research group of Professor Anton Zeilinger in close collaboration with the group "quantum technologies" of ARC Seibersdorf research under the management of Dr. Christian Monyk. One of the main goals of this collaboration, which started two years ago, is the development of a marketable quantum cryptography system.

Zeilinger's group, a world leader in the field of quantum information, was the first to demonstrate quantum cryptography with entangled photons world−wide (1998). Monyk's new, but already

renowned group has contributed the electronics, the implementation of the protocols for the production of the keys and the message encoding and, in general, the "interface" between the quantum physics device and the real−world demands of existing ITtechnologies.
Strong Partners in Industry and Commerce The glass fibre used for the data transfer was laid by the company WKA − Wien Kanal Abwassertechnologien specifically for this demonstration. The WKA, a specialist in communication infrastructure development, has supported Zeilinger's group for years. In
spring 2003, free−space quantum communication across the river Danube was demonstrated from the WKA labs to the Vienna Donauinsel.

The City of Vienna has for long years been a strong partner in the area of quantum physics research. The Bank Austria Creditanstalt, whose priority lies in data security and privacy, has kindly agreed to be part of this demonstration.

Contact: Universität Wien, Institut für Experimentalphysik
Andrea Aglibut, Tel. +43 (0)1 4277 DW 51166;
E−Mail: andrea.aglibut@univie.ac.at
ARC Seibersdorf research GmbH

Julia Petschinka, Tel. +43 (0)664 825 10 64
E−Mail: julia.petschinka@arc.ac.at
Bank Austria Creditanstalt Group Public Relations

Tiemon Kiesenhofer, Tel. +43 (0)5 05 05 DW 52819;
E−Mail: tiemon.kiesenhofer@ba−ca.com
Stadt Wien

Public Relations, Präsidialbüro des Bürgermeisters
Dr. Ingrid Duschek, Tel. +43(0)1−4000−81857;
E−Mail: dus@mdp.magwien.gv.at
WKA − Wien Kanal Abwassertechnologien GmbH & Co KG

Monika Müllner, Tel. +43 1 795 14 − 93 015;
E−Mail: office@wienkanal.at

Further information: www.quantenkryptographie.at

−−−

Thank you methomas.

Recently Lazarus and I were discussing possible retarding features of scientific and technological progress that may prevent a Singularity from arising. He brought up the speed of light limitation on the exchange of information as such a retarding feature, a seemlingly unavoidable physical constant.

If quantum entanglement can bypass this limit, and if we're able to apply it technologically then perhaps we can avoid that situation altogether.