UNIVERSITÉ DE GENÈVE

# PRESS RELEASE

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## Quantum cryptography over more than 300 kilometers

**Since the mid-1990s, quantum cryptography has been giving us a glimpse of great opportunities. This technique which relies on quantum mechanics enables the secure transfer of sensitive data without them being intercepted. So far, the transmission distance for encrypted data was the main obstacle to widespread use, but today physicists at the University of Geneva (UNIGE), Switzerland, have managed to distribute quantum keys over 307 kilometres, which can be used to encode a message. They have also managed to improve the security analysis and have developed a compact and practical technology. An article published in *Nature Photonics*.**

Alice is in charge of delivering a suitcase containing a secret key to Bob. When she meets him, Bob asks her if she had a good journey and if anyone tried to intercept the suitcase. Apparently Bob does not have any irrefutable way to make sure of it...Except that Bob and Alice are in reality two boxes communicating with each other via optical fiber. Alice's key is encoded in photons, light particles, which are sent through an optical fiber. Bob would immediately know if, en route, a spy tried to intercept the key. Indeed, according to quantum mechanics, a measurement perturbs the photons. Thus, upon arrival, if by comparing a small part of the sent and received keys and no dissimilarity is visible, Bob would be fully assured of the inviolability of the key. It may then be used to encrypt secret messages.

### Going even further

Until now, the delivery distance of a quantum key had never exceeded 150 kilometres, with detectors enabling the use of this technology at the industrial level. Today, Hugo Zbinden's team from the Applied Physics Group of the UNIGE has managed to transmit a quantum key over a distance of 307 kilometres – a record. "To do this, we developed very low noise level detectors, substantially more compact than those previously used and therefore more practical. We also used new generation optical fiber", explained Boris Korzh, the lead author of the article. The old low noise level detectors relied generally on the phenomenon of superconductivity, which involved extreme cryogenic cooling, hence the large size of these devices. The Geneva researchers have now developed detectors that require much less cooling, thereby reducing their size and making them more user friendly.

### Enhanced data processing

When we send light across optical fiber, there are unavoidable losses, which increase with the distance. To limit these losses and therefore errors, physicists from the Faculty of Science of the UNIGE chose new generation ultra-low loss optical fiber, supplied by Corning Inc., based

in the US. “We have also significantly improved the efficiency of processing of data needed to verify if the key has been intercepted,” said Hugo Zbinden.

The technological advance in this field will be of interest to banks, for example, which may be looking to transfer confidential information to their branches using such a secure and practical system.

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