**High-rate intercity quantum key distribution with a semiconductor single-photon source**

*Leibniz University Hannover, Germany*

**Fei Ding**

**Email: fei.ding@fkp.uni-hannover.de**

The use of on-demand quantum light sources in QKD (QKD) protocols is expected to help improve security and maximum tolerable loss. Semiconductor quantum dots (QDs) are a promising building block for quantum communication applications because of the deterministic emission of single photons with high brightness and low multiphoton contribution. Here we report on the first intercity QKD experiment using a bright deterministic single photon source. A BB84 protocol based on polarisation encoding is realised using the high-rate single photons in the telecommunication C-band emitted from a semiconductor QD embedded in a circular Bragg grating structure. Utilising the 79 km long link with 25.49 dB loss (equivalent to 130 km for the direct-connected optical fibre) between the German cities of Hannover and Braunschweig, a record-high secret key bits per pulse of 4.8e-5 with an average quantum bit error ratio of 0.65 % are demonstrated. An asymptotic maximum tolerable loss of 28.11 dB is found, corresponding to a length of 144 km of standard telecommunication fibre. Deterministic semiconductor sources therefore compete with state-of-the-art decoy state QKD with weak coherent pulses with respect to high secret key rate and have the potential to excel in measurement device independent protocols and quantum repeater applications.

穿西装的男孩

描述已自动生成 **Short Bio:**

**Fei Ding received Ph.D. in 2009 through the joint doctoral promotion program of the Max Planck Society in Germany and the Chinese Academy of Sciences. Then he joined the IBM Zurich Research Laboratory from 2010 to 2012, as a Marie Curie fellow. Continuing his academic journey, Fei assumed the role of a group leader at IFW Dresden, Germany, from 2012 to 2016. In 2016, he received a tenured full professorship (W3 Chair) at Leibniz University Hannover. He received the prestigious ERC grant for two times.**