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QUBE - QUANTUM KEY DISTRIBUTION WITH CUBESAT

Abstract

QUBE (Quantum Key Distribution with CubeSat) is one out of three pilot projects in the frame of the national initiative QUTEGA to promote quantum technologies. The project is funded by the German Federal Ministry of Education and Research (BMBF) with co-funding of the industry as preparation for the European flagship on Quantum Technology.

With current breakthroughs in quantum computation, it has been postulated that in less than two decades quantum machines might be able to break today's codes, which are currently based on mathematical problems difficult to solve with classical computation. This shows the urgent need for quantum-safe encryption that is resistant to attacks of both, quantum and classical, computers. The solution for quantum-safe encryption is the use of a completely random, so-called One-Time-Pad generated with QKD (Quantum Key generation and Distribution).

Transmission of quantum keys in local networks is limited to approx. 100 km due to damping within

the glass fibers. For longer distances only satellites can transmit the quantum keys so far. Here, QUBE will demonstrate the technologies in orbit with a cubesat platform. In the medium term a QKD in-orbit demonstration shall be the next step with a constellation as perspective for the future.

Within the project, hardware is being developed for space application. This includes two quantum light sources and a quantum random number generator (QRNG). As platform, a cubesat has been selected for rapid demonstration in a space environment, expanded by necessary technology components. In the current phase a first cubesat will be launched within 2.5 years.

The QUBE consortium consists of the LMU (Ludwig-Maximilians-Universität, faculty of physics) in Munich, the Max Planck Institute for the Science of Light (MPL) in Erlangen, the Institute of Communications and Navigation of DLR in Oberpfaffenhofen, OHB System in Oberpfaffenhofen Munich Area, the ZfT in Würzburg, and Tesat as associated partner.

The paper will explain the mission, the project and the programmatic of quantum key generation & distribution and QUBE as technology demonstration, will give a technological overview, the present schedule, details and the future prospective.