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DEVELOPMENT OF A SPACE-QUALIFIED SOURCE FOR SATELLITE QUANTUM KEY  
DISTRIBUTION

**Abstract**

Quantum key distribution (QKD) is a technique used to establish a secure communication channel between two parties, known as Alice and Bob, whose security of QKD is based on the principles of quantum mechanics. QKD is a promising technology for secure communication because it offers unconditional security, meaning that the security of communication is guaranteed by the laws of physics. Satellite links could offer a solution for enabling communication over long distances by taking advantage of the free-space channel's low attenuation and satellite mobility.

Here we report on the development of a space-qualified QKD source within two European projects QUANGO (<https://quango.eu/>) and QUDICE (<https://qudice.eu/>) coordinated by the University of Padova. Within the project QUANGO, we developed a high-speed (Ghz qubit preparation rate) breadboard-level QKD at TRL4. The source was tested in free-space links within the University of Padova campus. The source were realized with an iPOGNAC-based modular scheme that simplifies its development, testing, and qualification, especially for space missions.

In the follow-up project QUDICE, together with the University Spin-Off company ThinkQuantum, we are developing an engineering model of the above-mentioned source, with the target of TRL6 at the end of 2025. We also report on the advancement in the space-qualified source design and realization.