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Leap in Advancing of critical Quantum key distribution-spAce components (LaiQa)

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LaiQa Promotion video activities

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List of abbreviations

LaiQa	Leap in advancing of critical QKD-space components
QKD	Quantum Key Distribution
ICSO	*International Conference on Space Optics*
EU	European Union

Executive Summary

This document provides a comprehensive report on the release of the official LaiQa promotional video, which is designed to communicate the project's objectives and applications in a clear and engaging manner for a broad audience. It includes key highlights, representative screenshots, and the narrative text used in the video. Additionally, a more technical presentation of the project has been shared on LaiQa's official social media channels to further engage stakeholders and enhance outreach.

Keywords: Project video, technical video presentation, documentation, dissemination

1 INTRODUCTION

This document provides a comprehensive report on the dissemination of the LaiQa promotional video, detailing the steps taken to introduce the project to a broad audience. The promotional campaign began with the release of a short, animated teaser, designed to spark curiosity and generate anticipation for the full video. Following this, the official LaiQa video was launched, offering a clear and engaging presentation of the project's vision, objectives, and technological impact. The video contextualizes the challenges that LaiQa aims to address, their relevance in everyday life, and the innovative solutions being developed within the project. It also highlights the diverse application fields LaiQa targets and the benefits it brings to the market. To complement the video, a technical presentation was also prepared, providing a deeper insight into the project's advancements and methodologies. This presentation was officially showcased at ICSO 2024 in France last October, reaching a specialized audience in photonics and space optics. Both the promotional video and the technical presentation have been disseminated through the communication channels of LaiQa and its partners to maximize outreach and engagement.

2 PREPARATION OF LAIQA'S OFFICIAL VIDEO

2.1 Teaser Video

The LaiQa teaser video was a short, animated scene designed to spark curiosity and intrigue. Without revealing specific details, it aimed to capture the audience's attention and generate anticipation for the full promotional video. This visually engaging teaser served as a first step in introducing LaiQa to the public, encouraging further interest in the project.

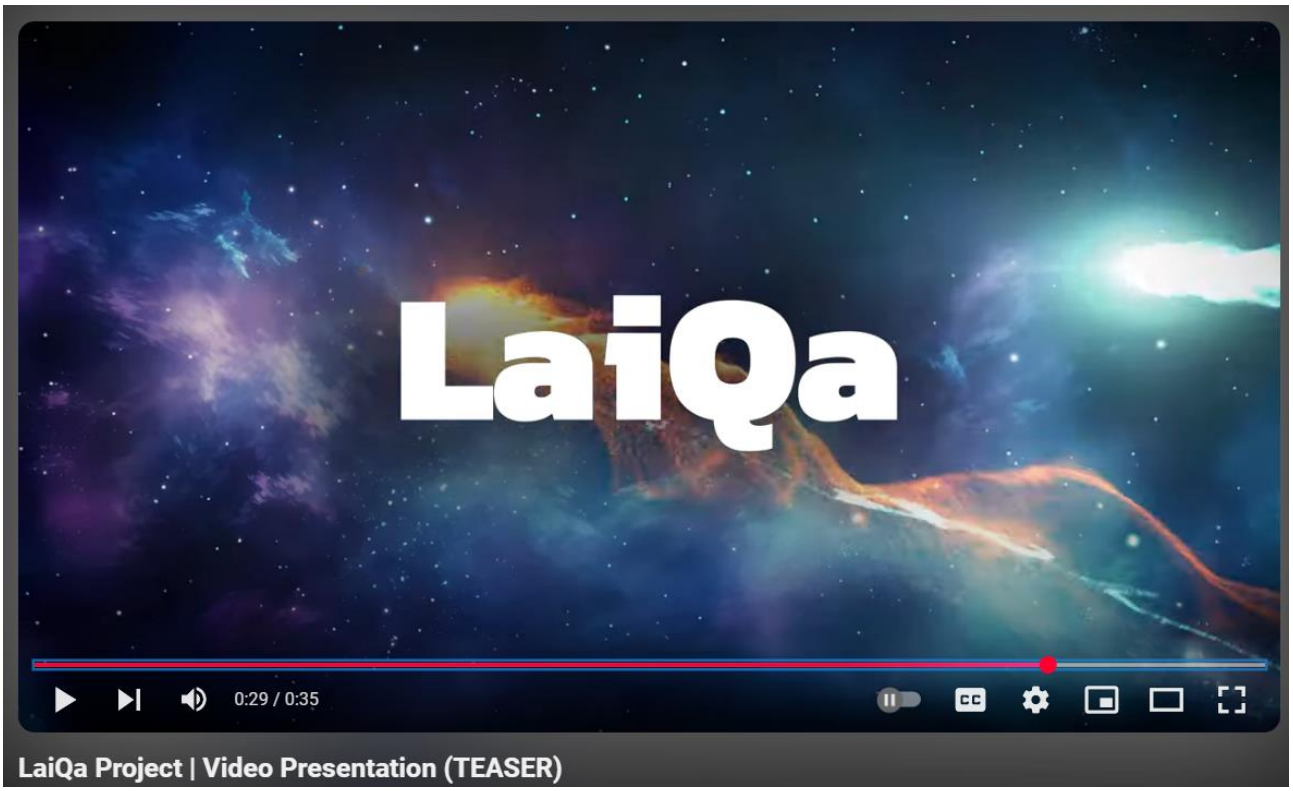

Figure 1. Indicative screenshot from the teaser video of LaiQa's official project video

2.2 Technical Presentation

The LaiQa technical presentation provided a deeper dive into the project's core technologies, methodologies, and application areas. It detailed the scientific and engineering advancements behind LaiQa, offering insights into its innovative solutions. This presentation was officially showcased at ICSO 2024 in France last October [1], reaching a specialized audience in the fields of photonics and space optics.

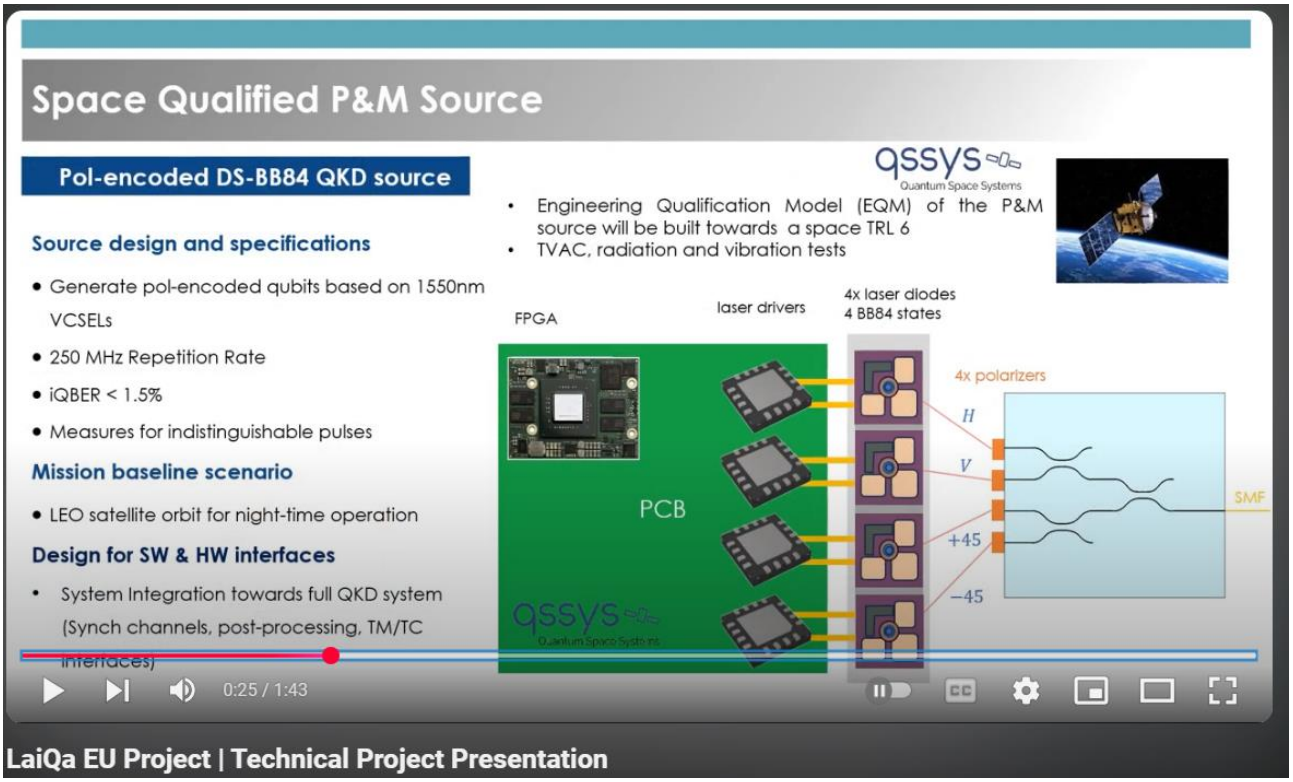

Figure 2. Indicative screenshot of the technical presentation of LaiQa's project.

2.3 LaiQa's official video

The official LaiQa project video was designed and produced by ICCS. The script was written in a way that is comprehensible to a broader audience. Where applicable, simple metaphors and examples from everyday life were used to trigger the viewer to search for more information around the project's objectives. Both the voice-over text and the animations were carefully consolidated, and in some cases different versions were considered and reviewed. The video was reviewed and approved by the SAB members as well as by the consortium. The duration of the video was kept within a timeframe of 4:29, increasing the chances for the audience to stay engaged from the beginning until the end of the video.

The **voice-over** text of the LaiQa project video is presented below:

"In the modern world, data transfer security has become paramount. As quantum computers become more powerful, classical means of data encryption which rely on computational difficulty become increasingly vulnerable to quantum algorithms.

To solve this problem, Quantum Key Distribution promises unbreakable cryptosystems based on the laws of Quantum Mechanics.

Unlike traditional classical information, a quantum object can exist in two states simultaneously, a property called superposition, crucial in quantum encryption for detecting eavesdropping.

Additionally, quantum entanglement plays a vital role in ensuring security. Entanglement is a phenomenon where two or more quantum particles become interconnected, so the state of one instantly influences the state of the other, regardless of the distance between them.

To deliver the encryption key, 'Alice' encodes the information in single photons, and 'Bob' detects these photons to retrieve the key information. Due to the laws of quantum mechanics, any attempt by an eavesdropper to measure or alter the photons will unavoidably cause detectable changes, alerting Alice and Bob to the intrusion.

As Alice and Bob move farther apart, the increased attenuation in the optical fiber—caused by factors like scattering, absorption, and material imperfections—leads to a significant loss of photons, posing challenges for maintaining reliable communication.

To tackle this, Satellite communication links provide a significant advantage for distributing cryptographic keys over long distances, as most of the transmission occurs through empty space, preserving the photons during free-space transmission.

Today, the development of critical components and technologies underpinning the way forward for secure space quantum communication within Europe is of strategic importance.

LaiQa is a Horizon Europe project funded by the EU aiming to enhance the technology readiness level of critical components for space-suitable quantum communication blocks, towards enabling space-based quantum secured communications around the globe.

In short, the LaiQa project will include:

The development of an ultra-high brightness, compact and lightweight Entangled Photon Pair Source and a 250 Megahertz Prepare-and-Measure source operating in the C-band telecommunication window.

Since space is a hostile environment for optics and electronics, the sources will be space-qualified, and their performance will be evaluated under vacuum and harsh radiation conditions. This will allow the sources to be potentially used in future satellite missions.

LaiQa will also develop and test a Photonic Integrated Chip-based Entangled Photon Pair Source, designed to leverage the lightweight and compact nature of photonic chips for use in satellite missions. Along with the photon source, a Quantum Memory will be developed and integrated with the Photonic Chip to demonstrate a quantum repeater. This technology could pave the way for applications beyond Quantum Key Distribution, such as the development of a quantum internet.

LaiQa's sources will be tested over a 2.5 kilometer terrestrial free-space link. To achieve this, light is transmitted and received with optical telescopes, like the ones we use to look at the stars.

To couple light from the telescope into telecommunication fiber, advanced Adaptive Optics systems will be developed to increase the system's efficiency by providing robustness from various atmospheric phenomena, such as turbulence.

Additionally, quantum key exchange will be also demonstrated over free space using a real astronomical observatory telescope of 2.3 meters located at the summit of Helmos mountain in Greece, aiming to demonstrate the source's functionality in a realistic environment.

Last but not least, LaiQa will contribute to the standardization of quantum space technologies to ensure the seamless integration of knowledge and components developed within the EU with those of international vendors.

But also identify emerging trends and opportunities in the space quantum communication networks industry.

Quantum communication:

keeping information exchange on a short leash, no matter the distance."

It should be noted that the copyright of all the material featured in the video (e.g. images, soundtrack, logos) has been acquired in compliance with the relevant EU legislation.

Figure 3. Indicative screenshot from the LaiQa project video illustrating the standardization committee and a map with all the partners.

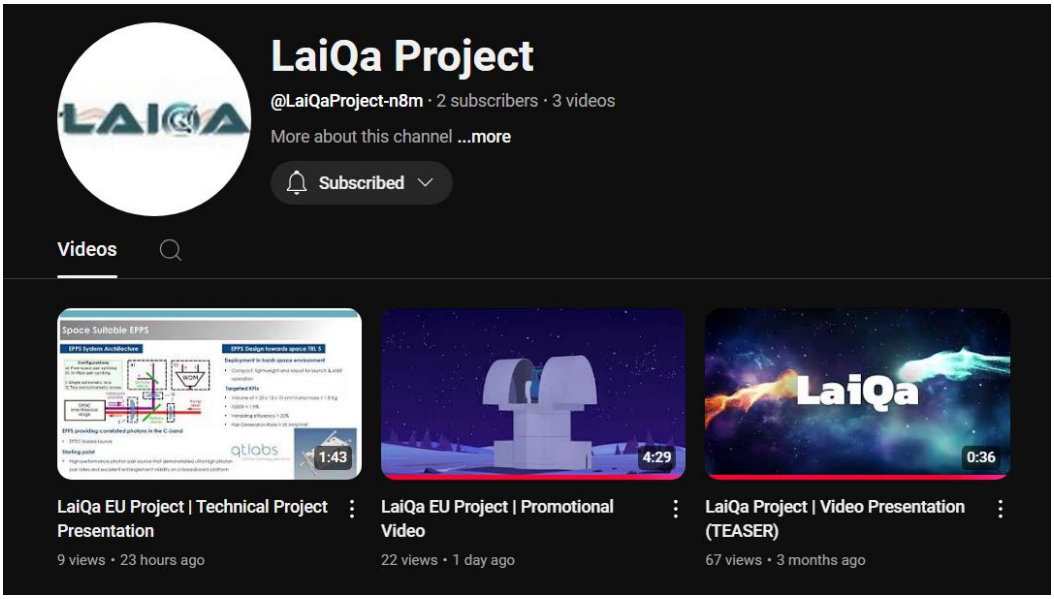

Figure 4. A caption of LaiQa's YouTube channel with the uploaded videos.

All three (3) videos have originally been uploaded at the project's YouTube channel (https://www.youtube.com/@LaiQaProject-n8m)and can be viewed online at different resolutions ranging from 144p for very slow connections up to 5K (2880p) for high-quality viewing on large screens or projectors. All three videos have or will be also uploaded at the official LaiQa's website (https://www.laiqa-horizon.eu/) and social accounts to maximize its visibility.

3 CONCLUSIONS

The dissemination of the LaiQa promotional materials followed a strategic approach, starting with an engaging teaser to spark curiosity, followed by the official video to communicate the project's vision, objectives, and impact. The addition of a technical presentation provided deeper insights into the scientific community. Through the combined efforts of LaiQa and its partners, these materials will be widely shared across multiple channels, ensuring broad visibility and engagement. This outreach not only enhances awareness of the project but also strengthens its impact within both the public and technical communities.

References

1. Giannoulis, G. *et al.* LaiQa: International Conference on Space Optics. *Proceedings of the 2024 International Conference on Space Optics (ICSO)* (2024).

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