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

Deliverable D10.4

Updated Data Management Plan

Lead Beneficiary	ICCS
Contact Person	Prof. Hercules Avramopoulos
Address	9, Iroon Polytechneiou, 15780 Athens, Greece
Phone	+30 210 772 2057
e-mail	hav@mail.ntua.gr

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Authors	Philip Menz, Dr. Aristeidis Stathis, Mr. Argiris Ntanos, Mr. Panagiotis Kourelias, Dr. Giannis Giannoulis

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List of abbreviations

DMP	Data Management Plan
EPPS	Entangled Photo Pair Source
EU	European Union
EOSC	European Open Science Cloud
FAIR	Findable, Accessible, Interoperable, Re-usable
FSO	Free-space optical
GA	Grant Agreement
GEO	Geostationary Earth Orbit
HTTP	Hypertext Transfer Protocol Secure
IA	Innovation Action
ICT	Information and Communication Technology
InM	Innovation Manager
InMC	Innovation Management Committee
IPR	Intellectual Property Rights
DS-BB84	Decoy-State BB84
QBER	Quantum Bit Error Rate
SKR	Secure Key Rate
OA	Open Access
OAI-PMH	Open Archives Initiative Protocol for Metadata Harvesting
OGS	Optical Ground Station
OKD	Optical Key Distribution
PC	Project Coordinator
P&M	Prepare and Measure
QKD	Quantum Key Distribution

Executive Summary

This document provides the updated version of the Data Management Plan (DMP) that is implemented by LaiQa project beneficiaries. LaiQa DMPs are deliverables of WP10 (D10.3 and D10.4), which prescribe how LaiQa contributes to the Horizon Europe objectives for Open Research Data Pilot, introduced in aiming to improve and maximize access to and re-use of research data generated by projects. Relevant, detailed information can be found in submitted Deliverable D10.3. This document provides the updated version of the Data Management Plan (DMP) implemented by the LaiQa project beneficiaries.

Keywords: Data Management Plan (DMP), open science, FAIR (Findable, Accessible, Interoperable, Re-usable data), Dissemination level, data sets, research data management, quantum cryptography, satellite communications payload and systems

1 INTRODUCTION

The Horizon Europe framework recommends that a Data Management Plan ('DMP') is established and regularly updated. The scope of the DMP is to describe how to select, structure, store and make FAIR (Findable, Accessible, Interoperable and Re-usable), the "background" information used, and the project "results" generated during the project lifecycle.

The present deliverable is the Initial Data Management Plan for LaiQa project, and it is structured along the guidelines of Data Management Plan (HE) template[1]. In completing the sections of the template, the requirements on "Intellectual Property Rights- Background and Results-Access Rights and Rights of Use" as stipulated in Article 16, as well as the "Communication, Dissemination and Visibility" requirements as stipulated in Article 17 in the Annotated Grant Agreement, are taken into account.

Horizon Europe framework has adopted the **Open Science** approach in its Data Management strategy - that is based on open cooperative work and systematic sharing of knowledge and tools as early and widely as possible. The Open Science approach aims at increasing the quality and efficiency of research and accelerate the advancement of knowledge and innovation by sharing results, making them more reusable and improving their reproducibility. Open Science and Open Access requirements and how LaiQa fulfils them are discussed in this document.

Furthermore, the DMP contains information related to (i)the types of data the project will collect, use and generate, (ii) the data standards to be employed and (iii) how project partners may disseminate and exploit project results. The DMP deliverable also reports on the data sets that will be made available in open repositories together with the necessary reference details for accessing the open data.

More specifically, the DMP identifies:

- What types of data will be generated and/or collected,
- What data will be exploited/and which will be the data dissemination level,
- What standards will be used to manage data/ metadata,
- How will data be preserved, during and after project completion.

This updated version of the Data Management Plan builds upon the foundations laid in the original deliverable, reflecting the evolving data landscape and the progress of the LAIQA project to date. It incorporates recent updates to dataset availability, refinements to metadata standards, and any changes in data security, legal, and ethical considerations. This revised plan ensures continued alignment with FAIR principles and strengthens our commitment to open science and responsible data stewardship throughout the project lifecycle.

At this stage, no significant changes or new developments are foreseen that would require further updates to the data management procedures outlined in the original plan. As such, this deliverable serves primarily as confirmation that the initial strategy remains valid and appropriate for the project's current status. As such the only addition is a new open research dataset: DS1 – *Simulation studies of DS-BB84 QKD systems for different grades of OGS terminals (LAIQA_WP2_VX.0)*, which has been made available in line with the project's open data policy. Apart from this, all other aspects of the original plan remain valid and applicable to the current status of the project.

[1] https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/how-to-participate/reference-documents?programmePeriod=2021-2027&frameworkProgramme=43108390

2 LAIQA OPEN RESEARCH DATASETS

Following the 1st open research datasets *DS1 Simulation studies of DS-BB84 QKD systems for different grades of OGS terminals_ LAIQA_WP2_V1.0* which was uploaded to Zenodo public repository during the 1st year of the project, we report a new open research dataset indicated as "Data set 03 Intra-campus and Inter-campus FSO links characterization campaign for polarization-encoded QKD_LAIQA_WP8_*V1.0*" in D10.3 Initial Data Management Plan.

Data set Reference Name	*DS3 Intra-campus and Inter-campus FSO links characterization campaign for polarization-encoded QKD_ LAIQA_WP8_V1.0.*
Description	This dataset comprises experimental characterization results for installed Km-scale FSO links in Athens. Link characteristics including link loss, stability over time, intensity variation measurements will be included.
Standards and Metadata	In the absence of a well-defined metadata standard for this type of data, a simple README file will be used. This will be generated in raw text format and will describe basic details that will help people to find the data, including who created or contributed to the data, its title, date of creation and under what conditions it can be accessed. Documentation will also include details on the methodology used as well as file and folder naming conventions. The following fields will be used:
	1. Dataset Title *DS3 Intra-campus and Inter-campus FSO links characterization campaign for polarization-encoded QKD_ LAIQA_WP8_VX.0.*
	2. Name(s) of dataset creator(s) *ICCS staff* **3. Description of Data** FSO link characterization for 0.5 km intra-campus link and 0.8 km intercampus link in the city of Athens. **4. Data Source** *This dataset is a primary output of LAIQA project.* **5. Creation Date** *30/06* **6. Format** *TXT, PDF* **7. Size** 2.79 MB **8. Location of Data** https://zenodo.org/records/15776230 **9. Digital Object Identified (DOI)** *10.5281/zenodo.15776230* **10. Access status** Open Data **11. Embargo** No embargo period foreseen for this dataset **12. Funding Statement** This project has received funding from the European Union's Horizon Europe Framework Program (HORIZON) under G.A No 101135245. The results of this dataset reflect only the creator's view and the Commission is not responsible for any use that may be made of the information it contains. **13. Work Package** *WP8*

	14. Related publications Bibliographical details of publications based on the dataset will be listed, with links to abstracts and, where possible, full text. **15. Dataset Citation** A 'ready-to-use' citation reference for the dataset will be provided – incorporating the core descriptive elements. **16. Keywords** LAIQA, FSO-QKD, Polarization Stability, Link Loss **17. Version number** **1.0**
Data sharing **Archiving and preservation**	♦ **Repository** The research data will be deposited and maintained in Zenodo, the research data repository launched by CERN and OpenAIRE. ♦ **Date of Repository Submission** *30/06/2025* For redundancy, besides uploading the data on Zenodo it will be also maintained on a university-owned storage server at ICCS (PCRL group). The server offers real-time data mirroring through RAID (redundant array of independent disks) and weekly backups to external disk drives. The dataset will be preserved for at least 5 years after the project end and the associated costs will be covered by ICCS through own funds.

Fig. 1 below shows indicative screenshots from the Zenodo repository where the datasets are

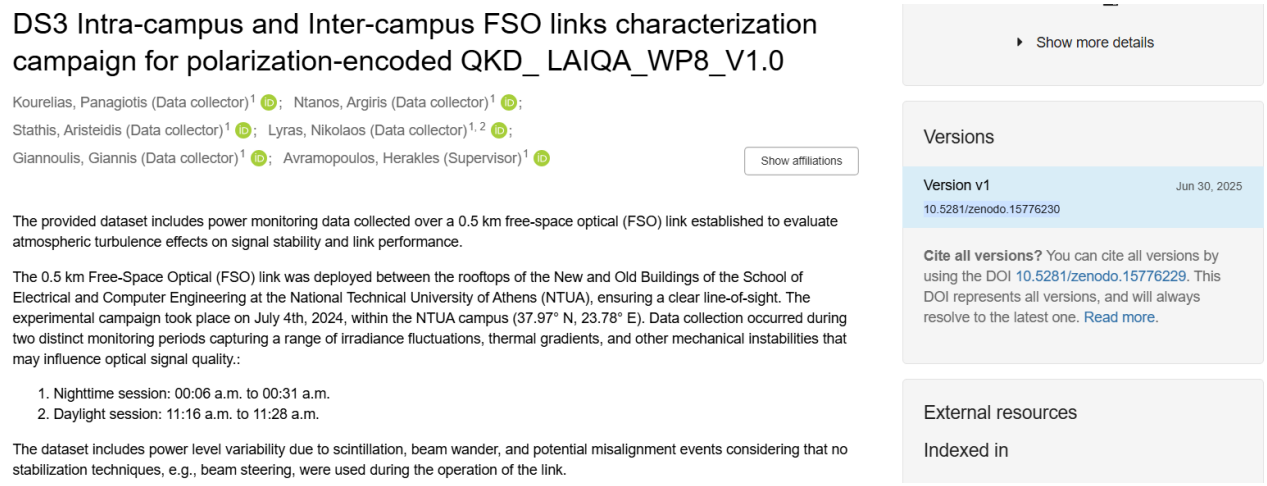

Figure 1. DS3 of LaiQa uploaded to Open research dataset Zenodo.

uploaded.

3 LAIQA RESTRICTED DATASETS

The datasets anticipated to be restricted are listed in Table 4 below. In D10.4 (Updated Data Management Plan), no changes are foreseen regarding these restricted datasets. Consequently, each of them is stored either in the respective beneficiary's repository or in LaiQa's SharePoint, which serves as the common repository for the consortium.

Table 1. Restricted datasets in LaiQa

Dataset Description	Related WP	Related deliverables	Dataset Owner
Technical Specifications for the entire LaiQa ecosystem, including HW and SW	WP2	D2.1	qssys

Dataset Description	Related WP	Related deliverables	Dataset Owner
components			
Simulation analysis datasets provided by the LaiQa's SKR calculator	WP2	D2.3	ICCS
Definition of assembly process for space-qualified sources and functional/environmental test plans	WP2	D2.4	qtlabs
Detailed design of the EPPS on-board source.	WP3	D3.1	qtlabs
Detailed design of the P&M on-board source	WP3	D3.2	qssys
Assessment of components for EPPS and P&M source	WP3	D3.3	qtlabs
Design and performance characterization of PIC-based EPPS	WP4	D4.1	TNO
Setup installation and calibration for Quantum Memory blocks performance evaluation	WP4	D4.2	TNO
Calibration and evaluation of the memory preparation phase of the experimental cycle	WP4	D4.2	TNO
Calibration and evaluation of the memory storage protocol	WP4	D4.2	TNO
Design and interface definition for the interfacing between a PIC-EPPS photonic qubit and an absorptive quantum memory, and photon-echo experimental data	WP4	D4.3	TNO
Detailed report on the design of the LaiQa Receiver Breadboard (LRBB), including Adaptive Optics pre-correction for improved free space to fiber coupling efficiency	WP5	D5.1	TNO
Design Layout and Engineering Developments for Hybrid POGS	WP5	D5.2	ICCS
Optically Switched quantum network design. Reporting of WDM – routed entanglement distribution demonstration results for implementations included in T5.3	WP5	D5.4	NKUA
Optical key distribution design & simulation files	WP6	D6.1	TU/e
Optimized coding scheme	WP6	D6.2	TU/e
Prototype of EPS Documents: Implementation and Assembly Plan, Test Plan, Test Report	WP7	D7.1	qtlabs
Engineering model of the P&M source: Implementation and Assembly Plan, Validation Test Plan, Validation Test Report	WP7	D7.2	qssys
EPPS and P&M source tested in relevant Environment: Qualification Test Plan, Qualification Test Report	WP7	D7.3	qssys
Definition of testing methodologies and testbed setups configuration: Implementation Plan, Methodology Documents	WP8	D8.1	qtlabs
Reporting of field demonstration experiments in Helmos OGS.	WP8	D8.4	NOA

4 CONCLUSIONS

In conclusion, this updated Data Management Plan confirms the continued relevance and applicability of the original data management strategy for both open and restricted datasets established and reported in detail *D10.3 Initial Data Management Plan* of LaiQa project. All existing protocols remain appropriate for ensuring data is handled according to FAIR principles and open science commitments. The inclusion of the new open research dataset **DS3** demonstrates ongoing progress in data sharing and transparency. No further updates or adjustments are currently required, and the data management approach will continue to be monitored and revised as necessary throughout the remainder of the project.

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