[27 FEBRUARY 2026]	Efficient verification of quantum computing architectures with bosons
	D5.5 – RP2 UPDATE OF THE DATA MANAGEMENT PLAN Version 0.3 – Final PUBLIC
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Deliverable Name

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Version	Created/Modifier	Comments
0.1	Giulia Petrarulo (INRIA)	First draft
0.2	Axel Eriksson (CUT), Rui Soares Barbosa (INL), Alessandro Ferraro (UNIMI), Mattia Walschaers (SU/CNRS)	Contributors
0.3	Ulysse Chabaud	Review and Final version

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Acronyms

CA	Consortium Agreement
CC	Creative Commons Licences
CUT	Chalmers University of Technology
DMP	Data Management Plan
DPO	Data Protection Officer
FAIR	Findable Accessible Interoperable Reusable
GA	Grant Agreement
GDPR	General Data Protection Regulation
INRIA	Institut National de Recherche en sciences et technologies du numérique
OAI-PMH	Open Archives Initiative Protocol for Metadata Harvesting
SU	Sorbonne Université
WP	Work Package

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Abstract

The VeriQuB Data Management Plan (DMP) provides information regarding the collection, management, and processing of data collected and/or produced during the project, and outlines measures to make this data FAIR (findable, accessible, interoperable, reusable). This document constitutes an intermediate updated version and has been elaborated as a deliverable (D5.5) covering data management procedures applicable to all consortium members. The present version will be updated again one last time at the end of the project (D5.6), in an iterative process. It is led by the coordinator and completed by each partner to describe the data collection, storage and use in each WP.

Whenever necessary or required, the content will be updated by the consortium to suit the technical and administrative purposes of the VeriQuB project as it evolves over its lifetime.

The challenge tackled by the VeriQuB project is to identify new methods for verifying the performance of quantum computers using bosons and continuous variables (CV), being able to guarantee the reliability and precision of new quantum architectures. “Bosons” are physical systems that are used as carriers of information, for example, the photons that make up the light of a laser. The consortium has the ambition to propose an efficient toolbox for verifying the reliability of quantum computing architectures using bosons. Indeed, these architectures suffer from reliability issues, even though they could soon outperform conventional computers. Another specific feature of the VeriQuB research is the use of performance indicators known as “fidelity witnesses”. These indicators are used to determine whether a quantum state is close to another state, and thus to quickly measure its quality. Unlike classical bits, for which it can be quickly indicated whether they have a perfect or zero correspondence, there is a diverse range of quantum states for which the consortium tries to determine their degree of proximity. Fidelity witnesses will give a quick indication of the potential proximity between these quantum states, and therefore of the conformity of the encoded information and the validity of the quantum calculation being performed. Ultimately, by implementing reliable and efficient verification methods, the European Union should be able to position itself at the forefront of the rapidly evolving field of quantum computing using bosons. Start-ups in the sector are currently developing performance indicators for their own platforms, but these indicators do not allow platforms to be benchmarked against each other. The theoretical verification framework developed by VeriQuB will also help the European Union in its drive to standardise quantum computing machines.

1. INTRODUCTION

The VeriQuB Data Management Plan[1] includes information on:

- The handling of scientific data during and after the end of the project;
- Which types of data are collected, processed, and/or generated;
- Which methodology and standards are applied;
- Whether data are shared/made open access;
- How data are curated and preserved (including after the end of the project).

The VeriQuB DMP is based on the Horizon Europe Data Management Plan Template (version 1.0, 05 May 2021). The DMP is envisaged as a living document and will be updated over the course of the project if any significant changes arise. All changes to the DMP will be noted in a "History of Changes" table to be included as an annex in all updated versions. The VeriQuB DMP follows the definition of research data and research data management as outlined in the "Practical Guide to the International Alignment of Research Data Management - Extended Edition"[2] of 2021 by Science Europe. The DMP takes into account compliance with the GDPR (General Data Protection Regulation) and the FAIR[3] requirements, as already stated in the Grant Agreement (see table 1 below).

Types of data/research outputs	The VERIQUB project will collect experimental data relating to the two experimental platforms considered. We will store experimental data in a matrix structure. A detailed listing, including creator, file types and intended usage will be provided in the DMP and be kept updated.
Findability of data/research outputs: Types of persistent and unique identifiers	The corresponding datasets will be placed in a trusted research data repository that facilitates linking publications and underlying data through persistent identifiers and data citations, such as Zenodo.
Accessibility of data/research outputs: IP considerations and timeline for open access	We will make our data accessible, '*as open as possible, as closed as necessary*', i.e., in all cases where Intellectual Property (IP) protection is not jeopardised. Each partner will ensure open access to the research data.
Interoperability of data/research outputs: Standards, formats and vocabularies for data and metadata	The research data will be provided in a variety of standard formats such as *text* (txt) and *comma-separated values* (csv) to ensure interoperability.
Reusability of data/research outputs: Licences for data sharing and re-use	The project will enable third parties to access, exploit, reproduce and disseminate (free of charge for any user) these research data by attaching Creative Commons Licences to the data deposited. The project will provide information via the research repository about the tools available to the users that are needed to validate the results (e.g., specialised software or software code, algorithms, and analysis protocols). Whenever possible, the project will also provide these instruments.
Curation and storage/preservation costs: person/team responsible for data management and quality assurance	The data repository Zenodo is a free service. For each WP, the data will be managed by the WP leader, following the DMP developed in WP5. The protection of the data will be ensured at least up to 4 years after project ends for each partner by the Data Protection Officer of their respective institutions: - dpo@inria.fr (INRIA) - dataskydd@chalmers.se (CUT) - dpd@sorbonne-universite.fr (SU) - pierluigi.perri@unimi.it (UNIMI)

TABLE 1 DATA RESEARCH OUTPUTS MANAGEMENT

[1] In compliance with the Horizon Europe Data Management Plan Template (version 1.0 5 May 2021)

[2] Science Europe. "Practical Guide to the International Alignment of Research Data Management - Extended Edition". 2021. https://doi.org/10.5281/zenodo.4915861

[3] See more on the FAIR principles: https://www.go-fair.org/fair-principles/.

2. DATA SUMMARY

VeriQuB collects and generates experimental data related to two experimental quantum architectures. The experimental data are stored in a matrix structure described below in sections 1.1 and 1.2.

The project collects and generates meaningful non-sensitive data that do not fall into any special categories of personal data as described within the GDPR[4]. Data may be quantitative or qualitative and are analysed from a range of methodological perspectives, with a view to producing insights that feed the project activities, enabling the consortium to deliver relevant outputs.

1.1 Experimental data platform Superconducting circuits

Data type	Arrays and matrices of numerical data
Data formats	.hdf5, .npy
Size	~ kilo byte – mega byte
GDPR issues	N/A
Data collection purpose	Demonstrate quantum properties such as Wigner tomography and spectroscopy data
Accessibility level	Open access

TABLE 2 TYPE OF DATA COLLECTED IN SUPERCONDUCTING EXPERIMENTAL PLATFORMS

1.2 Experimental data platform Multimode quantum optics

Data type	Array and matrices of numerical data (with and without header)
Data formats	.csv, .txt, .hdf5
Size	~kilo byte – giga byte
GDPR issues	N/A
Data collection purpose	Verification of the generation of quantum states with non- Gaussian properties
Accessibility level	Open access (published data), available upon reasonable request (raw data)

TABLE 3 TYPE OF DATA COLLECTED IN OPTICAL EXPERIMENTAL PLATFORMS

[4] https://gdpr-info.eu/

3. FAIR DATA

1.3 Making data findable, including provisions for metadata

Open data and datasets generated by the project are placed in GitHub trusted research data repositories that facilitates sharing, linking publications and underlying data through persistent identifier and data citations (via platforms such as Zenodo[5]).

A Digital Object Identifier (DOI) is assigned to each uploaded open deliverable or report. This DOI is used in any relevant publications to direct readers to the underlying document. The process of collecting open datasets for VeriQuB is currently underway and the beneficiaries use persistent identifiers (DOI) provided by Zenodo and ArXiv.

Type	Title	Authors	Title of the journal or equivalent	Journal number	PID (Publisher version of record)	PID of deposited publication
Journal	A machine learning based approach to the identification of spectral densities in quantum open systems	Jessica Barr; Shreyasi Mukherjee; Alessandro Ferraro; Mauro Paternostro; Giorgio Zicari	The European Physical Journal Special Topics		10.1140/epjs/s11734-025-01954-9	10.48550/arxiv.2507.13730
Journal	Bridging Magic and Non-Gaussian Resources via Gottesman-Kitaev-Preskill Encoding	Oliver Hahn; Giulia Ferrini; Ryuji Takagi	PRX Quantum	PRX Quantum 6, 010330	10.1103/prxquantum.6.010330	10.48550/arxiv.2406.06418
Journal	Classical simulation and quantum resource theory of non-Gaussian optics	Oliver Hahn; Ryuji Takagi; Giulia Ferrini; Hayata Yamasaki	Quantum		10.22331/q-2025-10-13-1881	10.48550/arxiv.2404.07115
Journal	Classical Simulation of Circuits with Realistic Odd-Dimensional Gottesman-Kitaev-Preskill States	Calcluth, Cameron and Hahn, Oliver and Bermejo-Vega, Juani and Ferraro, Alessandro and Ferrini, Giulia	Phys. Rev. Lett.	135, 010601	10.1103/xmtw-g54f	
Journal	Complexity of quantum tomography from genuine non-Gaussian entanglement	Xiaobin Zhao, Pengcheng Liao, Francesco Anna Mele, Ulysse Chabaud, Quntao Zhuang	Nature Communications		10.1038/s41467-025-67062-3	
Journal	Detection of mode-intrinsic quantum entanglement	Carlos E. Lopetegui, Mathieu Isoard, Nicolas Treps, Mattia Walschaers	Optica Quantum	Vol. 3, Issue 4, pp. 312-328 (2025)	10.1364/OPTICAQ.560594	10.48550/arXiv.2407.18095
Journal	Digital homodyne and heterodyne detection for stationary bosonic modes	Ingrid Strandberg, Axel M. Eriksson, Baptiste Royer, 2 Mikael Kervinen and Simone Gasparinetti	PHYSICAL REVIEW LETTERS	133, 063601 (2024)	10.1103/PhysRevLett.133.063601	10.48550/arXiv.2312.14720
Journal	Effective descriptions of bosonic systems can be considered complete	Arzani, F., Booth, R.I. & Chabaud, U.	Nat Commun	16, 9744 (2025)	10.1038/s41467-025-64872-3	10.1038/s41467-025-64872-3
Journal	Enhanced Quantum Frequency Estimation by Nonlinear Scrambling	Victor Montenegro; Sara Dornetti; Alessandro Ferraro; Matteo G.A. Paris	Physical Review Letters		10.1103/39bt-37yl	10.48550/arxiv.2503.01959
Journal	Sufficient condition for universal quantum computation using bosonic circuits	Cameron Calcluth, Nicolas Reichel, Alessandro Ferraro, and Giulia Ferrini	PRX Quantum	Volume 5, Issue 2 April - June 2024	10.1103/prxquantum.5.020337	10.48550/arxiv.2309.07820
Journal	Variational quantum simulation using non-Gaussian continuous-variable systems	Stornati, Paolo; Acin, Antonio; Chabaud, Ulysse; Dauphin, Alexandre; Parigi, Valentina; Centrone, Federico	Phys. Rev. Research	Vol. 6, Iss. 4 — November - December 2024	10.1103/PhysRevResearch.6.043212	10.48550/arxiv.2310.15919
Preprint	An efficient quantum state verification framework and its application to bosonic systems	Upreti, Varun; Chabaud, Ulysse	Quantum		10.48550/arxiv.2411.04688	10.48550/arxiv.2411.04688
Preprint	Assessing non-Gaussian quantum state conversion with the stellar rank	Hahn, Oliver; Ferrini, Giulia; Ferraro, Alessandro; Chabaud, Ulysse	Quantum		10.48550/arxiv.2410.23721	10.48550/arxiv.2410.23721

[5] Zenodo: https://zenodo.org/

Preprint	Bounding the computational power of bosonic systems	Varun Upreti, Ulysse Chabaud	Npj Quantum Information		10.48550/arXiv.2503.03600	10.48550/arXiv.2503.03600
Preprint	Identifying quantum resources in encoded computations	Jack Davis, Nicolas Fabre, Ulysse Chabaud	Npj Quantum Information		10.48550/arXiv.2407.18394	10.48550/arXiv.2407.18394
Preprint	Interplay of resources for universal continuous-variable quantum computing	Varun Upreti, Ulysse Chabaud	Physical Review Letters		10.48550/arXiv.2502.07670	10.48550/arXiv.2502.07670
Preprint	Lecture notes on quantum computing	Kockum, Anton Frisk; Soro, Ariadna; García-Álvarez, Laura; Vikstål, Pontus; Douce, Tom; Johansson, Göran; Ferrini, Giulia			10.48550/arxiv.2311.08445	10.48550/arxiv.2311.08445
Preprint	Resourcefulness of non-classical continuous-variable quantum gates	Frigerio, Massimo; Debray, Antoine; Treps, Nicolas; Walschaers, Mattia	Quantum		10.48550/arxiv.2410.09226	10.48550/arxiv.2410.09226
Preprint	The symplectic rank of non-Gaussian quantum states	Francesco Anna Mele, Salvatore Francesco Emanuele Oliviero, Varun Upreti, Ulysse Chabaud	PRX Quantum		10.48550/arXiv.2504.19319	10.48550/arXiv.2504.19319
Preprint	Native linear-optical protocol for efficient multivariate trace estimation	Leonardo Novo, Marco Robbio, Ernesto F. Galvão, Nicolas J. Cerf	N/A	N/A	N/A	10.48550/arXiv.2601.14204

TABLE 4 LIST OF OPEN ACCESS VERIQUB PUBLICATIONS AND THEIR DOI

The consortium generates calculation simulation data, measurement of e.g. quantum chips such as calibrated Wigner tomography measurements, processed and calibrated homodyne and double homodyne measurements for various quantum states. Data is harvested in internal secured repositories of each beneficiary, for instance, on local computers and GitHub for calculation and simulation data. More specifically, CUT partners gather their data from dilution refrigerators at Chalmers University, and SU from the optical tables' setups at the LKB, Jussieu campus of Sorbonne University. At CUT, data is then stored in local IT services and key publication data is shared open source via Zenodo. UNIMI uses the Dataverse[6] of the University of Milano, an open-source FAIR-compliant repository software built by Harvard University. It upholds the principles of Open Research Data, recognizing them as essential for ensuring reproducibility and unrestricted access to scientific discoveries. Emphasizing the significance of data management in upholding research integrity, the University maintains stringent standards for data collection, storage, and preservation, enabling convenient uploading, description, and sharing of research data with expert assistance from university staff.

1.4 Making data accessible

The consortium makes the data accessible "*as open as possible, as closed as necessary*", i.e., in all cases where any potential IP protection is not jeopardised and/or applicable. Each partner ensures open access to the research datasets.

VeriQuB collects a variety of data, the vast majority of which are open. Nevertheless, the consortium anticipated confidential industrial or research issues which require different levels of accessibility as described below:

- "Confidential to partner": this option applies to data collected by a specific partner containing personal information that cannot be protected once disclosed;

[6] https://rdm.unimi.it/dataverse/

- "Confidential to consortium members": this option applies to data containing confidential information or data with no wide-scope of use or long-term value.

The data collected during the progress of the tasks are initially stored locally by the partner who collected them. Confidential ones will be classified as "confidential to partner" and used for the restricted purpose of this project only. Its preservation and maintenance during and after the project will be handled by the data owners.

Scientific publications, once completed, are considered as processed data, and as such, become public and available on Zenodo, via the local host institutions repositories and on open-access dissemination platforms (i.e., ArXiv, HAL[7] and the project website[8]). To facilitate deposit, update, and management, the collected public data is available via the Zenodo VeriQuB community[9].

In line with Zenodo policies, when uploading public documents, consortium members select an option among the following:

- Open Access: this is the highly recommended option which provides free access and rights to data. This is mandatory for all projects under the Horizon Europe funded programme[10], including VeriQuB.
- Embargoed Access: this option concerns data underpinning project-related articles not yet published. Data will indeed be deposited as soon as possible, but open access will be provided only once the data has been published in a scientific journal, to preserve the authorship of all contributors involved. In such cases, information about data will be published and details of when the data will become available will be included in the metadata.
- Restricted Access: this option, although not recommended, will be adopted for those data with an access that should be monitored and approved by the depositor if certain requirements to be defined are met.
- Closed Access: this option concerns private (but not confidential) data.

Although the embargoed or closed access options provided by Zenodo could be a valid choice, the consortium agrees that the confidential data and datasets to be collected will not be deposited, to avoid compromising their protection or commercialisation prospects. This concerns mainly potential restriction due to patenting.

Visibility and access to publicly shared datasets will be facilitated by Zenodo metadata research as well as to the automatic link to both Open AIRE and to the CORDIS project page, i.e. for public project deliverables.

If an embargo is applied to give time to publish or seek protection of the intellectual property (e.g., patents), the situation is studied on a case-by-case basis (due to potential restrictions due to patenting), but the aim of the consortium is to publish the datasets as soon as possible.

[7] https://hal.science/

[8] https://ulyssechabaud.github.io/Veriqub/Veriqub%201fa0eab1ca7840828e013ec7864af606/Project%2050097c41b9e9425084f0b732d498ade9.html

[9] https://zenodo.org/communities/veriqub_project_reports/records?q=&l=list&p=1&s=10&sort=newest

[10] https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/guidance/aga_en.pdf

The coordinator does not use any software for the purpose of the project. The data are described by metadata in a readme file on GitHub.

UNIMI does not collect nor generate confidential or non-open data. All data are open and accessible via Dataverse UNIMI, the coordinator GitHub account or the VeriQuB Zenodo community.

Data can be read by open-source tools. Whenever possible SU and CUT share data in very simple formats, such as .csv, which should remain accessible without any software. If any software would be needed to use the data, this will be made available on GitHub.

1.5 Making data interoperable

VeriQuB aims to collect and document the data in a standardised way to ensure that the data and datasets can be understood, interpreted, reused, and shared in isolation alongside the accompanying metadata and documentation.

Standard vocabulary is used for all data types present in the datasets to allow interdisciplinary interoperability. Research data are provided in a variety of standard formats such as a text (txt) and comma- separated values (csv) to ensure interoperability.

In addition, whenever required, the documentation will include a general glossary used to share information about the vocabulary and general methodologies employed for the generation of the data.

CUT uses open data formats such as npy and hdf and do not foresee any proprietary data formats.

UNIMI and INL do not use any software for the purpose of the project. They use open data formats such as .csv and .txt and no proprietary data format is foreseen.

1.6 Increase data re-use

The project enables third parties to access, exploit, reproduce, and disseminate (free of charge for any user) this research data by attaching Creative Commons Licences to the data deposited. The collected public data will be made openly available, once ready for dissemination. To allow the widest possible reuse, the consortium will attach a specific license to every deposited data or dataset. Whenever possible, the Creative Commons Attribution 4.0 International (CC BY 4.0) license is used, in order to allow third parties to share and adapt data with no restrictions if attribution is provided. In case the partner would like to further limit access to the uploaded data, an alternative license will be selected among the following options offered by Zenodo:

- Creative Commons Attribution Share-Alike 4.0 International (CC BY-SA 4.0). Allows modification of the data for any purpose as long as it is distributed under the same original license (or a license listed as compatible).
- Creative Commons Attribution-NoDerivatives 4.0 International (CC BY-ND 4.0). Allows distribution of the data for any purpose, but forbidding the distribution of derivative work.

- Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0). Allows sharing and modification, but limiting use to non-commercial purposes.
- Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NCND 4.0). Allows sharing but restricting both derivative work and commercial use of data. Although not directly provided through Zenodo, an additional Creative Commons Attribution license can be applied upon specific request to the Zenodo team:
- Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) allows modification as long as it is distributed for non-commercial purposes and under the same original license (or a license listed as compatible).

All public collected data will be stored in Zenodo, once ready for dissemination and at the latest upon publication of the related scientific publication, where it will remain available for the lifetime of the repository, which is currently warrantied for a minimum of 20 years. This will promote its reuse by other researchers and end-users, thereby contributing to the dissemination of the VeriQuB technological components and research advances aspects.

Therefore, data is documented in a Readme file. For SU and CUT beneficiaries, both quantum computing developers, publications contain detailed explanations of how the data has been calibrated and collected. These publications will be (green or gold) open access.

For SU, data quality assurance processes are ensured internally via independent analysis by different people, checking validity of data using consistency checks (i.e., standard techniques from experimental physics). Externally, all data are published in high-level scientific journal and therefore undergo peer review.

UNIMI data are saved and stored on open and secured repository (Dataverse UNIMI, Zenodo, and GitHub), documented and accompanied with a Readme file. Internal data quality assurance process is intern to UNIMI including checking validity of data using consistency checks (i.e., standard techniques from experimental physics). Externally, all data are published in high-level scientific journal and therefore undergo peer review.

4. OTHER RESEARCH OUTPUTS

4.1 Software license and sub-licensing rights

As stated in the Consortium Agreement, where a party has access rights to object code and/or API that is results for exploitation, such access shall, in addition to the access for exploitation foreseen as far as needed for the exploitation of the party's own Results, comprise the right:

- To make an agreed number of copies of object code[11] and API; and
- To distribute, make available, market, sell, and offer for sale such object code and API alone or as part of or in connection with products or services of the party having the access rights;

provided however that any product, process or service has been developed by the party having the access rights, in accordance with its rights to exploit object code and API for its own results.

If it is intended to use the services of a third party, the parties concerned shall agree on the terms thereof with due observance of the interests of the party granting the access rights.

In addition, access rights to object code shall, as far as needed for the exploitation of the party's own results, comprise the right to grant in the normal course of the relevant trade to end-user customers buying/using the product/services, a sublicense to the extent as necessary for the normal use of the relevant product or service to use the object code alone, or as part of or in connection with or integrated into products and services of the party having the access rights and, as far as technically essential:

- to maintain such product/service;
- to create for its own end-use interacting interoperable Software in accordance with the Directive 2009/24/EC of the European Parliament and of the Council of 23 April 2009 on the legal protection of computer programs.

4.2 Source Code

Where a partner of the consortium has access rights to source code that is one of the project's results for exploitation, access rights to such source code, as far as needed for the exploitation of the party's own results, shall comprise a worldwide right to use, to make copies, to modify, to develop, to adapt source code for research, to create/market a product/process, and to create/provide a service.

4.3 Software description

[11] "Object Code" means Software in machine-readable, compiled and/or executable form including, but not limited to, byte code form and in form of machine-readable libraries used for linking procedures and functions to other software.

Software description	Generated or reuse?	Why is this code generated?	Is the source code open or closed?	Location of the code source	What institution harvests the code source?
Python code for design, measurement and data analysis	Generated	To design the chips, measure them and perform the data analysis	Closed	Bitbucket	CUT
Python code for drivers that operate experimental equipment	Generated	To operate the experiments	Closed	GitHub and internal servers of LKB (Leon)	SU/CNRS
Python and mathematical codes to simulate experiments	Generated	To generate simulated experimental data to perform realistic tests of newly developed protocols	Closed	GitHub and internal servers of LKB (Leon)	SU/CNRS

TABLE 5 SOFTWARE DESCRIPTION

4.4 Other output section

Nature of the output (workflow, protocol, model)	Description	Describe the information process	Describe the output data	Is the data openly circulated
Design workflow	Guidelines and recommendations for the design choices	Knowledge is contributed to a shared wiki	Knowledge is produced in a shared wiki	No
Measurement workflow	How the calibrations are connected to each other	Knowledge is contributed to a shared wiki	Knowledge is produced in a shared wiki	No

TABLE 6 OTHER RESEARCH OUTPUT DESCRIPTION

5. ALLOCATION OF RESOURCES

All costs associated with making data FAIR are covered by the full-time equivalent provisions of the VeriQuB project.

Responsible for communication related to data management is Ulysse Chabaud (VeriQub Scientific Coordinator): ulysse.chabaud@inria.fr.

Responsible for the data management is Anne Combe (INRIA Data Protection Officer): anne.combe@inria.fr.

To ensure future access and long-term preservation, formats and metadata adhere to widely-recognized and utilized open standards. In particular, Zenodo is harvestable via the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH). This low-barrier mechanism for repository interoperability ensures that metadata is accessible even when the digital object is no longer there. All non-personal data will be saved as backup on the Notion project management tool. The files' final versions will also be saved on the dedicated servers of INRIA, as the project coordinator institution.

As for the collected data tied to the confidential datasets, each partner is responsible for its collection. Therefore, its maintenance, backup and versioning and long-term preservation and archival is guaranteed by the partners' own resources and at their own expense.

The additional costs foreseen for data management are indeed related to:

- The working time to set up and perform data collection and analysis activities;
- The working time to set up and maintain local and shared data collection devices/servers;
- The working time needed to write documentation, metadata, etc.

The project coordinator is in charge of the DMP from both the scientific and technical perspective. The registration of datasets and metadata, as well as backing up data for sharing through open access repositories, is the responsibility of the partner that collects the data in its related Work Package. Quality control of these data is the responsibility of the relevant Work Package leader, supported by the Project Coordinator. Each partner should respect the policies set out in this DMP.

Publications featuring project-related data will be made available in open access on arXiv, Zenodo, and/or HAL, by selecting journals or conferences allowing immediate public access on institutional repositories, open access journals, or journals or conferences featuring a short embargo period. Possible costs related to open access will be claimed as part of the Horizon Europe grant (or accordingly to each partner's internal accounting procedures). Finally, in line with the Consortium Agreement, each partner should give at least 15 days prior notice to the other partners before disseminating/publishing project-related data.

6. DATA SECURITY

All VeriQuB project partners involved in generating or collecting data for the project are responsible for a secure recovery, storage, and transfer of data - both personal and non-personal data included. The project coordination team supports the partners with specific information about procedures and general regulation if needed.

Institution	Data storage
INRIA	GitHub and Zenodo
SU	GitHub, Zenodo, local servers of the lab
CUT	GitHub, local servers of the lab
UNIMI	GitHub, UNIMI Dataverse

TABLE 7 DATA STORAGE DESCRIPTION

As soon as the publication targets are achieved, the public collected datasets will be deposited on Zenodo as previously described. More precisely, open data security will be addressed by taking advantage of Zenodo's services of secure storage, backup and preservation and protected transfer mechanisms.

Regarding the collected data tied to the confidential datasets, different approaches will be used by each data-owner's organisation, but common rules apply. As presented in Table 1, data will be saved in servers and under the direct control and management of the organisation's personnel. Such infrastructure is equipped with different features, e.g., secure physical access, air conditioning, fire protection measures, and hardware/electricity recovery measures.

Different data access permissions, e.g., read-only, read-write, etc., will be granted to users and authorised computers by relevant staff, according to a well-defined protocol. Additionally, confidentiality is guaranteed by supplementary methods, e.g., encryption and pseudonymisation, depending on the data's nature and applications. Furthermore, regular backups are envisaged for either security purposes, hardware failure recovery, or for archival purposes. Following the completion of the project, all the responsibilities concerning data recovery and secure storage will go to the repository storing the dataset. Long-term preservation is guaranteed even in the unlikely event that Zenodo will cease operation; migration of content on other repositories is planned.

7. ETHICS

There are no ethical issues identified in the overall work plan in terms of the methodology adopted, the objectives pursued and the potential impact of the expected project results. The coordinator partner INRIA has designated a Data Protection Officer (DPO), "Déléguée à la Protection des Données," to handle data processing and privacy issues with CNIL, in compliance with Chapter 4, section 4 of the General Data Protection Regulation of 27 April 2016. All personal data (e.g., registration data collected by participants in project events, data included in stakeholders' database/contact lists, etc.) collected or generated during the project will be processed in line with the GDPR by the project coordination team and the DPO, in terms of informed consent procedures security measures to prevent unauthorised access, data minimisation and anonymisation and data transfer procedures.