



POLYmer based electro-optic PCB motherboard integration with Si<sub>3</sub>N<sub>4</sub> Chiplets, InP Components and Electronic ICs enabling affordable photonic modules for THz Sensing and quantum computing applications

## Deliverable D7.3

### Data Management Plan

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## TABLE OF CONTENTS

<b>Document History</b> .....	<b>3</b>
<b>List of abbreviations</b> .....	<b>5</b>
<b>Executive Summary</b> .....	<b>6</b>
<b>Definitions of Terminology</b> .....	<b>7</b>
<b>1 Introduction</b> .....	<b>8</b>
<b>2 POLYNICES – Project Overview</b> .....	<b>9</b>
<b>3 POLYNICES – Data Management Planning</b> .....	<b>10</b>
<b>3.1 Open Science Approach by POLYNICES</b> .....	<b>10</b>
3.1.1 Open access to publications .....	11
3.1.2 Research Data Management .....	12
<b>3.2 FAIR (Findable, Accessible, Interoperable, and Reusable) data</b> .....	<b>13</b>
3.2.1 Making data findable, including provisions for metadata .....	14
3.2.2 Making data openly accessible .....	15
3.2.3 Making data interoperable .....	16
3.2.4 Increase data re-use (through clarifying licenses) .....	17
<b>4 Data Summary</b> .....	<b>18</b>
<b>5 POLYNICES Open Research Datasets</b> .....	<b>21</b>
5.1.1 DS1   Simulation studies of the THz FMCW spectrometers_POLYNICES (WP2).....	21
5.1.2 DS2   Simulation studies of the Quantum information processors (WP2) .....	22
5.1.3 DS3   Characterization of FMCW THz spectrometer in lab settings _POLYNICES .....	23
<b>6 POLYNICES RESTRICTED Datasets</b> .....	<b>24</b>
<b>7 Allocation of Resources</b> .....	<b>25</b>
<b>8 Data Security</b> .....	<b>25</b>
<b>9 Ethical Aspects</b> .....	<b>26</b>
<b>9.1 Confidentiality</b> .....	<b>27</b>
<b>10 Other Issues</b> .....	<b>27</b>
<b>11 Conclusions</b> .....	<b>27</b>
<b>Appendix I – Example Metadata File Template</b> .....	<b>28</b>
<b>List of Tables</b> .....	<b>30</b>



## DOCUMENT HISTORY

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POLYNICES website: <https://horizon-de-polynices.eu/>





## LIST OF ABBREVIATIONS

<b>CA</b>	Consortium Agreement
<b>DMP</b>	Data Management Plan
<b>DOI</b>	Digital Object Identifier
<b>EC</b>	European Commission
<b>EOPCB</b>	Electro-Optic Printed Circuit Board
<b>EOSC</b>	European Open Science Cloud
<b>EU</b>	European Union
<b>FAIR</b>	Findable, Accessible, Interoperable, Re-usable data
<b>FMCW</b>	Frequency Modulated Continuous Wave
<b>GA</b>	Grant Agreement
<b>IP</b>	Intellectual Property
<b>IPR</b>	Intellectual Property Rights
<b>OA</b>	Open Access
<b>PC</b>	Project Coordinator
<b>PIC</b>	Photonic Integrated Circuit
<b>PZT</b>	Lead Zirconate Titanate
<b>QIP</b>	Quantum Information Processing



## EXECUTIVE SUMMARY

This document provides the initial version of the Data Management Plan (DMP) to be implemented by POLYNICES project team. The POLYNICES DMP is a deliverable of WP7, and more than is a document that prescribes how POLYNICES 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. In line with this decision, in this initial phase POLYNICES has identified a number of data sets which will be generated within the project and shared with the research community. The main objectives of the project are to improve the exchange and dissemination of research results and possibly to enable and promote a wider validation of the project results and to encourage a fair comparison and evaluation of different solutions in the technical areas of POLYNICES.

The Data Management Plan deals with all the concerns about the treatment of the data that will be collected, processed or generated in the whole project lifecycle and has been structured in compliance with the guidelines and the template conveyed by the European Commission.

Hereafter are reported the main aspects that will be considered in the Data Management Plan, for each of the data set identified in the project:

- Types of data generated, collected or processed Standards used to manage data
- Data exploitation methodology
- Accessibility to data produced by the Project Data Dissemination level
- Data Preservation and re-use

The DMP is a 'live' document in which the respective information will be made available on a finer level of granularity through updates as the implementation of the project progresses and when significant changes occur. This document is the first version of the DMP, providing an initial description of the expected data sets and their management plan, while more details and potentially further data sets might be added during the course of the project implementation. The document will be maintained active and regularly updated with additional data sets or details about the existing ones during the total duration of the project.

**Keywords:** Data Management Plan (DMP), open science, FAIR (Findable, Accessible, Interoperable, Re-usable data), Dissemination level, data sets, research data management



## DEFINITIONS OF TERMINOLOGY

**Dataset:** Digital information created in the course of research, but which is not a published research output. Research data excludes purely administrative records. The highest priority research data is that which underpins a research output. Research data do not include publications, articles, lectures or presentations.

**Background:** any data, know-how or information — whatever its form or nature (tangible or intangible), including any rights such as intellectual property rights — that is:

- (a) held by the beneficiaries before they acceded to the Agreement and
- (b) needed to implement the action or exploit the results.

**Results:** any tangible or intangible effect of the action, such as data, know-how or information, whatever its form or nature, whether or not it can be protected, as well as any rights attached to it, including intellectual property rights.

**Data Management Plan (DMP):** A formal working document which outlines how datasets will be handled both during the active research phase and after the project is completed. DMPs in some form are now a requirement of a research project and therefore must be addressed at the earliest phase of the research lifecycle.

**Digital Object Identifier (DOI):** A persistent identifier or handle used to identify objects uniquely and to direct communications to the correct server, developed by the [International DOI Foundation](#). An implementation of the Handle System, DOIs are in wide use mainly to identify academic, professional, and government information, such as journal articles, research reports and data sets, and official publications.

**Metadata:** Information about datasets stored in a repository/database template. For example, an image may include metadata that describes how large the picture is, the color depth, the image resolution, when the image was created, and other data. A text document's metadata may contain information about how long the document is, who the author is, when the document was written, and a short summary of the document.

**Repository:** A digital repository is a mechanism for managing and storing digital content. Repositories can be subject or institutional in their focus.

**Zenodo:** A general-purpose open-access repository (<https://about.zenodo.org>) developed under the European [OpenAIRE](#) program and operated by [CERN](#). It allows researchers to deposit data sets, research software, reports, and any other research related digital artifacts. For each submission, a persistent digital object identifier (DOI) is minted, which makes the stored items easily citable.



## 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.

The present deliverable is the first release of the POLYNICES DMP, and it is structured along the guidelines of Data Management Plan (HE) template<sup>1</sup>. 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, and on "Communication, Dissemination and Visibility" as stipulated in Article 17 in the Annotated Grant Agreement, are taken into account.

Horizon Europe framework has adopted the Open Science approach<sup>2</sup> 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 in the process. 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 POLYNICES fulfils them are discussed in this document.

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

In particular, the DMP identifies:

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

This document provides an initial description of the expected data sets and their management plan, while more details and potentially further data sets might be added during the project implementation. The document will be maintained active and regularly updated with additional data sets or updates on the existing ones. As a minimum, updated versions of the DMP document will be released with D7.6 'Updated report on exploitation plans, dissemination/communication activities and DMP', due in M18 and D7.7 'Final report on exploitation plans, dissemination /communication activities and updated DMP', due in M42.

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<sup>1</sup> <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/how-to-participate/reference-documents;programCode=HORIZON>

<sup>2</sup> [https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/programme-guide\\_horizon\\_en.pdf](https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/programme-guide_horizon_en.pdf)





## 2 POLYNICES – PROJECT OVERVIEW

POLYNICES is a 42-month Research Programme part of the HORIZON Research and Innovation Actions, funded by the European Union through the Horizon Europe framework. It is launched on 1 January 2023.

Photonic integration technology has made significant strides in recent years, evolving from simple photonic integrated circuits (PICs) with limited functionalities to larger, more complex photonic integrated modules. This evolution has opened up new application fields beyond traditional telecommunications. The growing popularity of photonic integration technology can be attributed to its advantages in terms of size, energy efficiency, and speed, leading to a continuous expansion of the photonic integration market.

However, despite its increasing popularity, photonic integration technology still faces challenges in terms of cost-efficiency and compatibility with high-volume production. One of the main reasons for this is the lack of a simple, low-cost, wafer-scale compatible production process. The fabrication processes of PICs, as well as the photonic packaging, contribute to these challenges. Monolithic fabrication becomes expensive and faces scalability issues due to factors such as yield reduction with increasing size and complexity, heat dissipation and thermal crosstalk, and accommodating a large number of electrical pads at the edges of the PIC. Heterogeneous integration, such as die-to-wafer bonding, is compatible with wafer-scale production but requires optimization of multiple processes to achieve high-quality devices. Hybrid integration, which involves the integration of PICs and other micro-optical elements at the chip level, is emerging as a practical solution for high-performance, multi-functional PICs. However, the lack of packaging standards leads to fragmentation in the production process as each machine needs to be adjusted to the specific PIC and assembly task.

Another barrier in terms of cost and time is the photonic assembly of PICs and their electrical connection to other PICs or electronic integrated circuits (ICs) as separate processes. In fact, it is estimated that more than 75% of the cost of a photonic module can be attributed to the photonic packaging. Traditional wirebonding of PICs to printed circuit boards (PCBs) becomes challenging when multiple PICs with a large number of electrical pads need to be combined or when there are height differences and gaps to bridge. Optimizing the optical assembly process often involves compromises in the electrical assembly, and vice versa.

To overcome these barriers and provide a general-purpose photonic integration platform with the necessary cost, performance, scalability, and manufacturability credentials for the next generation of photonic modules, the POLYNICES project was initiated. POLYNICES aims to develop a low-cost Electro-Optic PCB (EOPCB) motherboard using Fraunhofer's PolyBoard material spin-coated on PCBs. This EOPCB will host silicon nitride chipllets, InP components, and micro-optical elements for advanced functionalities. LioniX's Si<sub>3</sub>N<sub>4</sub> platform with PZT actuators will be utilized to realize matrices, and novel narrow linewidth external cavity lasers in compact chipllets will be integrated with ultra-low power consumption. The chipllets' electrical pads will be arranged in a grid array, allowing for passive optical alignment and electrical connection to the EOPCB's pads in a single assembly step. By defining standard building blocks with consistent size and interfaces, POLYNICES enables customization and scalability with minimal effort and cost. Moreover, POLYNICES adopts a unified approach to photonic integration and packaging by co-packaging electronic ICs on the same EOPCB, significantly reducing packaging costs. The EOPCB's good high-frequency properties also facilitate the direct integration of THz antennas on the substrate.

Leveraging these novel concepts and building blocks, POLYNICES aims to develop several advanced photonic modules. These include a fully integrated optoelectronic frequency modulated continuous wave (FMCW) THz spectrometer with a bandwidth exceeding 2 THz, an 8 THz antenna array with beam steering capabilities for plastic quality inspection, a 16x16 quantum processor with



an integrated 780 nm light source and non-linear crystals, and a 24x24 quantum processor with an integrated squeezed light state source. The overarching goal of POLYNICES is to provide a holistic approach to photonic integration and packaging, making advanced photonic modules accessible and affordable to small and medium-sized enterprises (SMEs) in the industry.

The POLYNICES project is an ambitious but achievable endeavour that has been carefully planned and discussed with the consortium. Although it carries some risks, the project is considered realistic within its three-year duration. The project aims to address the existing challenges in photonic integration and packaging, bringing together innovative technologies and methodologies to enable low-cost photonic system-in-packages for various applications, including wide-band THz spectroscopy and quantum information processing. Ultimately, POLYNICES seeks to empower SMEs in the photonic industry by providing them with accessible and cost-effective photonic integration solutions.

### 3 POLYNICES – DATA MANAGEMENT PLANNING

The present section describes the plans of POLYNICES consortium for the management of the different sets of research data that will be produced, collected, and used for internal processing and validation in the project.

#### 3.1 Open Science Approach by POLYNICES

POLYNICES will apply the Open science policies as prioritized by the Horizon Europe framework. Open science practices will be applied to ensure that research data, of all sorts, generated in the course of the project are **F**indable, **A**ccessible, **I**nteroperable, and **R**eusable (**FAIR**). This means that interested parties –academia, industry, end users, civil society- will be able to search for, find and access research, as well as to understand and use the research data. This access will help in maintaining and checking the quality of research conducted in the framework of the project, but also will offer an opportunity to interact with interested communities.

**Open Science Practices:** Open science practices include early and open sharing of research (for example through preregistration, registered reports, pre-prints, or crowd-sourcing); research output management; measures to ensure reproducibility of research outputs; providing open access to research outputs (such as publications, data, software, models, algorithms, and workflows); participation in open peer-review.

In the framework of Horizon Europe, a couple of open science practices are identified as mandatory, such as:

- (i) open access to scientific publications,
- (ii) responsible management of research data in line with the FAIR principles of 'Findability', 'Accessibility', 'Interoperability' and 'Reusability', under the principle 'as open as possible, as closed as necessary',
- (iii) information about the research outputs/tools/instruments needed to validate the conclusions of scientific publications or to validate/re-use research data,
- (iv) digital or physical access to the results needed to validate the conclusions of scientific publications, unless exceptions apply,
- (v) in cases of public emergency, if requested by the granting authority, immediate open access to all research outputs under open licenses or, if exceptions apply, access under fair and reasonable conditions to legal entities that need the research outputs to address the public emergency.



However, due to IP or commercial considerations, may not all data/tools/methods be at open access. Potential restrictions to open access will be evaluated on a case-by-case basis. In such cases –where immediate open access is not recommended, the consortium is committed to deposit research data and outputs retrospectively in repositories and provide open access the earliest possible. In the remaining section, the how those practices are applied by POLYNICES is discussed.

### 3.1.1 Open access to publications

The first aspect to be considered in the DMP is related to the open access (OA) to the publications generated within the context of the project and made available online to any user at no charge. In line with the Horizon Europe guidelines on open access to scientific publications, the publications that will arise from the POLYNICES project will be made public through the following channels:

- a) **Open access publishing:** This means that the scientific article is immediately placed in open access mode (e.g., open access journals, books, publishing, platforms, repositories or preprint servers or minor/sister journals). POLYNICES will preferably target Open access journals which apply article processing charges for the article to be published and then it is freely available online via the Open Access journal site.
- b) **Hybrid publishing:** Publications at hybrid publishing venues which provide part of their scholarly content in open access, while another part is accessible through subscriptions/payments (e.g., hybrid journals and books). These are often journals/books based on subscription/purchase which provide open access to part of their content when an open access fee is paid by their authors/institutions (paid ad hoc or on the basis of an institutional agreement with the publishers).
- c) **Self-archiving:** The beneficiaries will ensure open access to the publication by depositing their publication in a machine-readable format (i.e. structured format that can automatically be read and processed by a computer) in a trusted repository(e.g., [Zenodo](#)) -before or at publication time- and immediately provide open access to the publication through that repository, in-line with the open access obligations established by the EC.

In all cases, beneficiaries/authors will deposit the final peer-reviewed manuscript accepted for publication or to the final published peer-reviewed version in a trusted repository, providing **immediate open access through the repository**, in accordance with the open access requirements.

Furthermore, the consortium partners will use the Open Research Europe publishing platform to enable direct publication of the research outputs in support of research integrity, reproducibility, transparency and open science practices. We should note here that there may be cases where the project participants, may need to submit articles to journals (or proceedings) that only offer a lower level of open-access, requiring either parallel publication or an embargo period.

Additionally, whenever possible the POLYNICES consortium will retain the ownership of the copyright for their work using a 'License to Publish', which is a publishing agreement between author and publisher. With this agreement, authors can retain copyright and the right to deposit the article in an Open Access repository, while providing the publisher with the necessary rights to publish the article.

All publications will acknowledge the project funding. This acknowledgment will be included also in the metadata of the generated information since it allows to maximize the discoverability and visibility of publications and to ensure the acknowledgment of EU funding.

Metadata of deposited publications will be open under a Creative Common Public Domain Dedication (CC 0) or equivalent, in line with the FAIR principles (in particular machine actionable) and provide information at least about the following: publication (author(s), title, date of publication, publication venue); Horizon Europe ; grant project name, acronym and number; licensing terms; persistent identifiers for the publication, the authors involved in the action and, if possible, for their organisations and the grant. Where applicable, the metadata will include persistent identifiers for



any research output or any other tools and instruments needed to validate the conclusions of the publication (GA, Article 17).

To ensure open access -via the repository- to the bibliographic metadata that identify the deposited publication, the metadata must be in a standard format and will include the following:

- the term 'Horizon Europe'
- the grant project name, acronym and number
- the publication author(s), title, date of publication, and publication venue and
- the publication's persistent identifier (e.g., DOI)

### 3.1.2 Research Data Management

Apart from the open access to publication explained in the previous section, POLYNICES will adopt the European Open Science Cloud (EOSC) as the trusted environment for hosting and processing research data. The EOSC portal capabilities will be explored and embraced as a medium to underpin the open access research policy. In specific, two types of data sets are defined:

**Background:** any data, know-how or information (tangible or intangible), including any rights such as intellectual property rights, that already exist or have been already generated and reported by other research initiatives or held by the consortium members from their own research and development activities prior or in parallel with the project and which might be used as inputs in POLYNICES in implementing the project or exploiting its results. POLYNICES will act only as recipient of this type of data and, if just re-used "as-is", the project will not define any specific strategy for their management which is already handled by other organizations.

**Results:** any data, know-how (tangible or intangible) - whether or not it can be protected, as well as any rights attached to it, including IPRs - that is produced as a result of project activities.

Before a dataset is deposited in an open access repository, the partner(s) responsible for uploading and preserving the data will seek consent for data preservation and sharing from all partners involved (according to the provisions of the CA and with the guidance of the Innovation Management Committee [InMC]). The respective partners, in collaboration with the Project Coordinator (PC) and the Innovation Manager (InM) will be responsible for postponing or restricting data sharing to allow enough time for publishing the results in peer-reviewed journals or for seeking patents. To facilitate handling of datasets especially where multiple partners are involved, to expedite data dissemination and ensure that no ethical issues are associated to the respective datasets, the process will be overseen by the InMC.



### 3.2 FAIR (Findable, Accessible, Interoperable, and Reusable) data

Data and research outcomes generated by POLYNICES activities will be managed and curated in line with the FAIR principles. In summary, the application of FAIR principles for POLYNICES generated data, i.e. publications, simulation data and experimental data as identified in DoA, is as follows:

#### For Publications

**F:** Reputable publications, **A:** Open/Hybrid access or self-archiving; deposited in trusted repositories e.g., Zenodo,

**I:** Readable online, downloadable, and printable, Machine-readable copies, standard text file formats. Use of bibliographic metadata including terms, name of project, acronym and grant number, publication data and persistent identifier,

**R:** Efforts will be made to provide right to copy, distribute, search, link, crawl and mine on an as-needed basis. (**Curation:** By the author, Article Processing Charges (APCs) for publishing at Open/Hybrid publishing venues have been included in partners' other costs where applicable).

#### For Simulation Data from components/sub-system modelling activities

**F:** Types of persistent, unique identifiers (e.g., digital object identifiers); deposited in trusted repositories e.g. Zenodo,

**A:** Open access over standard protocols (e.g., HTTP and OAI-PMH); IPR considerations and timeline for open access; provisions for access to restricted data for commercial exploitation and/or verification purposes,

**I:** Standards, formats and vocabularies for data and metadata; accompanied with a "README" file describing any of the relevant information to a specific dataset,

**R:** Licenses for data sharing and re-use (e.g., Creative Commons, Open Data Commons); availability of tools/software/models for data generation and validation/interpretation/reuse. Storage/preservation costs; person/team responsible for data management and quality assurance.

#### For Experimental data from components/sub-system characterization and demonstrators testing

**F:** Types of persistent and unique identifiers (e.g., digital object identifiers); deposited in trusted repositories e.g. Zenodo

**A:** Open access over standard protocols (e.g., HTTP and OAI-PMH); IPR considerations and timeline for open access; provisions for access to restricted data for commercial exploitation and/or verification purposes,

**I:** Standards, formats and vocabularies for data and metadata; accompanied with a "README" file describing any of the relevant information to a specific dataset,

**R:** Licenses for data sharing and re-use (e.g., Creative Commons, Open Data Commons); availability of tools/software/models for data generation and validation/interpretation /re-use. Storage/preservation costs; person/team responsible for data management and quality assurance.



### 3.2.1 Making data findable, including provisions for metadata

For the open datasets, a Digital Object Identifier (DOI) will be assigned to datasets for effective and persistent citation when it is uploaded to the repository [[Zenodo](#)]. This DOI can be used in any relevant publications to direct readers to the underlying dataset.

Each dataset generated during the project will be recorded in an Excel spreadsheet with a standard format and allocated a dataset identifier according to Table 1. The owner of each dataset will be responsible for the creation of the spreadsheet associated with the generated dataset, while ICCS (Project Coordinator) will be responsible for gathering and preserving the information of all the dataset in its local repository. The partner that possesses the data has the responsibility to manage the different versions and to make sure that the latest version is available. Quality control of the data is the responsibility of the relevant responsible partner generating the data.

POLYNICES naming convention for project datasets will comprise of the following:

- A unique chronological number of the datasets in the project will be added;
- The title of the dataset;
- A prefix "POLYNICES" indicating an POLYNICES dataset.
- Short Name(s) of the lead partner(s) responsible for the creation of the dataset.
- Each new version of a dataset will be allocated with a version number;

Search keywords will be provided when the dataset is uploaded to Zenodo, which will optimize possibilities for re-use. Zenodo follows the minimum Data Cite metadata standards. The information and metadata stored in the record-spreadsheet for each generated dataset is summarized in Table 1 below.

**Table 1. The structure (fields) of the record-spreadsheet for each generated dataset in POLYNICES**

<b>Data set Reference Name</b>	<i>The reference name will be based on the naming convention outlined above in Paragraph 3.2.1</i>
<b>Description</b>	<i>Description of the Dataset</i>
<b>Standards and Metadata</b>	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:
<b>1. Dataset Title:</b>	<i>The title of the dataset which should be easily searchable &amp; findable</i>
<b>2. Name(s) of dataset creator(s):</b>	<i>Lead partners responsible for the creation of the dataset</i>
<b>3. Description of Data:</b>	<i>Brief description of the open data to be included in the metadata</i>
<b>4. Data Source:</b>	<i>How/why was the dataset generated</i>
<b>5. Creation Date:</b>	<i>Date of generation of the dataset</i>
<b>6. Format:</b>	<i>Possible formats of the datasets e.g. DOC, XLSX, PDF, JPEG, TIFF, etc.</i>
<b>7. Size:</b>	<i>Approximate size of the dataset</i>
<b>8. Digital Object Identified (DOI):</b>	<i>The DOI can be entered once the dataset has been deposited in the repository</i>
<b>9. Access status:</b>	<i>Type of Dataset "Open" or "Restricted"</i>
<b>10. Embargo:</b>	<i>Embargo period of the dataset (if applicable)</i>



<b>11. Funding Statement:</b>	This project has received funding from the European Union's Horizon Europe Programme under Grant agreement ID: 101070549. 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.
<b>12. Work Package:</b>	<i>POLYNICES Work Package associated with this dataset</i>
<b>13. Related publications:</b>	<i>Bibliographical details of publications based on the dataset will be listed, with links to abstracts and, where possible, full text</i>
<b>14. Keywords:</b>	<i>Dataset related Keywords</i>
<b>15. Version number:</b>	<i>Dataset version number in order to keep track of changes to the dataset</i>
<b>16. Dataset Citation:</b>	<i>A 'ready-to-use' citation reference for the dataset will be provided – incorporating the core descriptive elements</i>
<b>Data sharing</b>	<b>Location of Data:</b> <i>Repository where the data will be stored</i> <b>Date of Submission:</b> <i>The date of data set submission to the repository will be added (DD.MM.YYYY)</i>
<b>Archiving and preservation</b>	For redundancy, besides uploading the data on a trusted repository, like Zenodo, the data will be also maintained on the partner's owned storage server: <i>Institutional repository where the data are stored.</i>

### 3.2.2 Making data openly accessible

Research data that are created during the project are owned by the beneficiary that generates them (G.A. Article 16). Each beneficiary must disseminate its results as soon as possible unless there is legitimate interest to protect the results. A beneficiary that intends to disseminate its results must give advance notice to the other beneficiaries — unless agreed otherwise — at least 45 days, together with enough information on the results it will disseminate (G.A. Article 17).

Generated research data will be deposited as follows:

- ⇒ **Restricted data** will be deposited in the repository of the partner that owns it.
- ⇒ **Data accessible by the consortium members only** will be deposited in the SharePoint Documents Repository of POLYNICES (Private area for consortium members only). More specifically a folder(-s) will be setup in the project's private area, for easy upload of project datasets visible to the consortium members.
- ⇒ **Open data** will be deposited in Zenodo repository. Zenodo.org is open, free, searchable and structured with flexible licensing allowing for storing all types of data: datasets, images, presentations, publications and software. In addition, Zenodo repository allows researchers to deposit both publications and data, while providing tools to link them.

POLYNICES project has chosen to use [Zenodo.org](https://zenodo.org) as the repository for storing the open project data for the following reasons:

- ✓ It enables *Shared Research* through the reposition of all research outputs from across all fields of research and science;
- ✓ It is *Citeable* and *Discoverable*: uploads get a Digital Object Identifier (DOI) to make them easily and uniquely citeable;
- ✓ It *fosters the establishment and curation of research Communities* through the creation of digital repositories, fully controlled by the owner;
- ✓ Allows the *identification* of grants, integrated in reporting lines for research funded by the European Commission via OpenAIRE;
- ✓ Allows for *Flexible* licensing and,
- ✓ *Ensures security of the stored research results* for the future in the same cloud infrastructure as CERN's own LHC research data.



Data objects will be deposited in Zenodo under:

- Open access to data files and metadata and data files provided over standard protocols such as HTTP and OAI-PMH;
- Use and reuse of data permitted;
- Privacy of its users protected.

For the data being deposited in an external repository (i.e., Zenodo), a dataset registry record will also be created in POLYNICES Documents Repository. The registry record will be updated by the partner that is responsible for the specific generated data and will include relevant metadata explaining what data exists and a DOI linking to where the data is available in the external repository.

During embargo periods, information about the restricted data will be published in the data repository, and details of when the data will become available will be included in the metadata. Where a restriction on open access to data is necessary, attempts will be made to make data available under controlled conditions to other individual researchers. In accordance with G.A. Article 16, data must be made available to partners upon request, including in the context of checks, reviews, audits or investigations. Data will be made accessible and available for re-use and secondary analysis.

In parallel to the available Open Research Datasets, several restricted datasets will be generated within the project. These datasets that contain critical details on POLYNICES developments will be protected in a restricted area. Each POLYNICES partner is responsible to identify these datasets, to communicate with the consortium the updates on these datasets. Of course, these datasets can be moved from restricted area to the Open Data zone of POLYNICES if their owners select to partially or fully release them. This change will be resembled in the Data Management Plan of the project.

### 3.2.3 Making data interoperable

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

Generated data will be preserved either in the POLYNICES SharePoint Documents Repository or in the institutional intranet platforms until the end of the Project (see [Section 8](#)).

#### a) General Information

- Title of the dataset
- Dataset Identifier
- Responsible Partner
- Author Information
- Date of data collection
- Geographic location of data collection
- Title of project and Funding sources that supported the collection of the data

#### b) Sharing/Access Information

- Licenses/access restrictions placed on the data
- Link to Data Repository
- Links to other publicly accessible locations of the data
- Links to publications that cite or use the data
- If the data derived from another source?

#### c) Dataset/File Overview

- This dataset contains X sub-dataset as listed below:
- What is the status of the documented data? – “complete”, “in progress”, or “planned”
- Are there plans to update the data?





#### **d) Methodological Information**

- Description of methods used for experimental design and data collection: <Include links or references to publications or other documentation containing experimental design or protocols used in data collection>
- Methods for processing the data: <Describe how the submitted data were generated from the raw or collected data>
- Instruments and software used in data collection and processing-specific information needed to interpret the data
- Standards and calibration information, if appropriate
- Environmental/experimental conditions
- Describe any quality-assurance procedures performed on the data
- Dataset benefits

An indicative example of a metadata file can be found in Appendix I of the present document.

#### **3.2.4 Increase data re-use (through clarifying licenses)**

The open datasets will be made available for re-use through uploads to the Zenodo community page for the project. In principle, the data will be stored in Zenodo after the conclusion of the Project without additional cost. All the research data will be of the highest quality, have long-term validity and will be well documented in order other researchers to be able to get access and understand them after 5 years.

If datasets are updated, the partner that possesses the data has the responsibility to manage the different versions and to make sure that the latest version is available in the case of publicly available data. Quality control of the data is the responsibility of the relevant responsible partner generating the data.



## 4 DATA SUMMARY

POLYNICES will produce several datasets during the lifetime of the project. The data will be both quantitative and qualitative in nature and will be analyzed from a range of methodological perspectives for project development and scientific purposes. These will be available in a variety of easily accessible formats, including Postscript (PDF, XPS), Excel (XLSX, XLS, CSV), Word (DOCX, DOC, RTF), Power Point (PPTX, PPT), image (JPEG, PNG, GIF, TIFF), compressed formats (TAR.GZ, MTZ).

Table 2 below summarizes the data that is foreseen to be generated during the implementation of POLYNICES project. They are listed under each of the Work Package taken from the GA Annex 1 – Description of Action (DoA). The datasets will have the same structure, in accordance with the guide of Horizon Europe for the Data Management.

**Table 2. The potential data that will be generated in POLYNICES project.**

Data Description	Related Deliverable (s)	Type	Format	Estimated Volume	Access	IPR Owner
<b>WP2. System design of POLYNICES demonstrators and definition of technology process flow</b>						
<b>Simulation studies of the THz FMCW spectrometers:</b> The data set will include simulation results regarding the system performance of the targeted prototypes, focusing on the impact of various types of losses and noises on the signal to noise ratio of the demodulated signal and the dynamic range of the system	D2.2 and D2.6	Results	TXT, TSV, CSV, JPEG	< 500 Mb	Open	<b>1.ICCS</b>
<b>Simulation studies of the Quantum information processors:</b> The data set will include simulation results regarding the impact of the insertion losses and cross-talk on the system performance	D2.2 and D2.6	Results	TXT, TSV, CSV, JPEG	< 250 Mb	Open	<b>1.ICCS</b>
<b>Evaluation of the beamforming algorithms:</b> The data set will include simulation results from the performance evaluation of the beamforming algorithms that will apply to the Blass-matrix-based optical beamforming network of POLYNICES	D2.2 and D2.6	Results	TXT, TSV, CSV, JPEG	< 250 Mb	Restricted <sup>3</sup>	<b>1.ICCS</b>
<b>Design and simulation of THz coupling structures on EOPCB:</b> The data set will include simulation results of the expected RF performance of the single and arrayed THz coupling structures to be integrated with PIN-PDs and PCAs	D2.4 and D2.5	Results	XLS, TXT, JPG	< 500 Gb	Restricted	<b>4. UC3M</b>

<sup>3</sup> Restricted/Data accessible by the consortium members only



<b>Radiation patterns of single and multiple integrated THz antennas:</b> The data set will include simulation results of the expected RF performance of the THz single- and antenna arrays	D2.4 and D2.5	Results	XLS, TXT, JPG	< 250 Mb	Restricted	<b>4. UC3M</b>
<b>3D mechanical modelling and thermal simulation studies:</b> The data set will include results of thermal simulation and step files of the 3D mechanical design	D2.3	Results	JPEG, .docx, PNG, STEP	< 250 Mb	Restricted	<b>6. PHIX</b>
<b>WP3. Development of POLYNICES integration process and methods</b>						
<b>Characterization results of unpackaged single PZT-based phase actuators:</b> The data set will include the frequency response of PZT-based phase actuators	D3.4 and D3.6	Results	JPEG, .docx	< 250 Mb	Restricted	<b>3.LXI</b>
<b>Development of flip-chipping and soldering processes:</b> The data set consists of results of developing the flip-chip soldering process in form of a document that includes the variables, the steps and post-analysis tests	D3.3 and D3.5	Results	JPEG, .docx, PNG	< 250 Mb	Restricted	<b>6. PHIX</b>
<b>WP4. Development of the EOPCB motherboard, flip-chip integr comp chiplets and components</b>						
<b>Layouts of EOPCB motherboards for all the demonstrators:</b> The data sets will refer to the low-resolution .gds files	D4.2 and D4.5	Designs	GDS, PPT	< 250 Mb	Restricted	<b>2. Fraunhofer</b>
<b>Layouts of optical matrices based on Blass and Clements architectures:</b> The data sets will refer to the low-resolution .gds files	D4.3 and D4.6	Designs	GDS, PPT	< 250 Mb	Restricted	<b>3.LXI</b>
<b>Layouts of external cavity laser sources at 780 and 1550 nm:</b> The data sets will refer to the low-resolution .gds files	D4.1, D4.3 and D4.6	Designs	GDS, PPT	< 250 Mb	Restricted	<b>3.LXI</b>
<b>Layouts of THz emitters and receivers:</b> The data sets will refer to the low-resolution .gds files	D4.4 and D4.7	Designs	GDS, PPT	< 250 Mb	Restricted	<b>2. Fraunhofer</b>
<b>WP5. Assembly and packaging of POLYNICES demonstrators</b>						
<b>Electronic design of the EOPCB:</b> The data sets will refer to the low-resolution .gds files	D5.6	Designs	GDS, PPT	< 250 Mb	Restricted	<b>1. ICCS</b>
<b>Finalizing the packaging engine:</b> The data set will contain the final assembly and packaging strategies in the form of a document illustrating the final 3D mechanical design and results from the thermal simulations.	D5.1	Results	JPEG, .docx, PNG, STEP	< 250 Mb	Restricted	<b>6. PHIX</b>



<b>Assembly and packaging of POLYNICES prototypes:</b> The data set will include reports on the completed prototypes	D5.2, D5.3, D5.4 and D5.5	Results and prototypes	JPEG, .docx, PNG, STEP	< 250 Mb	Restricted	<b>6. PHIX</b>
<b>WP6. Control electronics and testing of integrated POLYNICES demonstrators</b>						
<b>Phase and amplitude recovery algorithms:</b> The data set will include the block diagrams of the algorithms.	D6.2	Results	TXT, TSV, CSV, JPEG	< 250 Mb	Restricted	<b>5.OPTAGON</b>
<b>Characterization of FMCW THz spectrometer in lab settings:</b> The data set will include raw experimental results of the precursor modules in ICCS's lab.	D6.3	Results	TXT, TSV, CSV, JPEG	< 750 Mb	Open	<b>1. ICCS</b>
<b>Characterization of FMCW THz spectrometer in system vendors:</b> The data set will include the experimental results of the precursor modules in TOPTICA's lab.	D6.7	Results	TXT, CSV, PNG, PDF	< 750 Mb	Restricted	<b>8. TOPTICA</b>
<b>Characterization of QIP in lab settings:</b> The data set will include the experimental results of the precursor modules at ICCS's lab.	D6.4	Results	TXT, TSV, CSV, JPEG	< 750 Mb	Restricted	<b>1. ICCS</b>
<b>Characterization of QIP in system vendors:</b> The data set will include the experimental results of the precursor modules at QuiX's lab.	D6.7	Results	TXT, TSV, CSV, JPEG	< 750 Mb	Restricted	<b>7. QuiX</b>



## 5 POLYNICES OPEN RESEARCH DATASETS

The following tables detail the OPEN research DATASETS that are foreseen to be generated at this stage of the project. However, the DMP is a live document, and this information will be verified in the course of the project.

Table 3 summarizes the data sets identified as relevant for POLYNICES results validation and evaluation and are foreseen to be “Open access”. In the following paragraphs these datasets are described in detail.

**Table 3. List of Open data sets relevant to POLYNICES research activities.**

Data set name	WP related	Type
<a href="#">Data Set 1</a> : Simulation studies of the THz FMCW spectrometers	WP2	Results
<a href="#">Data Set 2</a> : Simulation studies of the Quantum information processors	WP2	Results
<a href="#">Data Set 3</a> : Characterization of FMCW THz spectrometer in lab settings	WP6	Results

### 5.1.1 DS1 | Simulation studies of the THz FMCW spectrometers\_POLYNICES (WP2)

Data Set Reference name	DS1. Simulation studies of the THz FMCW spectrometers_POLYNICES_ICCS
<b>Description</b>	The data set will include simulation results regarding the system performance of the targeted prototypes, focusing on the impact of various types of losses and noises on the signal to noise ratio of the demodulated signal and the dynamic range of the system.
<b>Standards and Metadata</b>	<i>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:</i>
	<b>1. Dataset Title:</b> Simulation studies of the THz FMCW spectrometers_ POLYNICES_ICCS
	<b>2. Name(s) of dataset creator(s):</b> ICCS
	<b>3. Description of Data:</b> Simulated optical and electrical waveforms of the fully integrated FMCW THz spectrometer
	<b>4. Data Source:</b> This dataset is a primary output of POLYNICES project
	<b>5. Creation Date:</b> <i>To be determined (TBD)</i>
	<b>6. Format:</b> TXT, TSV, CSV, JPEG
	<b>7. Size:</b> < 500 MB
	<b>8. Digital Object Identified (DOI):</b> <i>TBD</i> (DOI from Zenodo)
	<b>9. Access status:</b> Open Data
	<b>10. Embargo:</b> No embargo period foreseen for this dataset
	<b>11. Funding Statement:</b> This project has received funding from the European Union's Horizon Europe Programme under Grant agreement ID: 101070549. 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.
	<b>12. Work Package:</b> WP2
	<b>13. Related publications:</b> <i>Bibliographical details of publications based on the dataset will be listed, with links to abstracts and, where possible, full text</i>



<b>14. Keywords:</b> POLYNICES, FMCW, THz spectrometer, C-band, optical beamforming network	
<b>15. Version number:</b> TBD	
<b>16. Dataset Citation:</b> A 'ready-to-use' citation reference for the dataset will be provided – incorporating the core descriptive elements	
<b>Data sharing</b>	<p><b>Location of Data:</b> The research data will be deposited and maintained in Zenodo repository, <a href="https://zenodo.org/">https://zenodo.org/</a> (Exact link to be provided)</p> <p><b>Date of Submission:</b> The date of data set submission to the repository will be added (DD.MM.YYYY)</p>
<b>Archiving and preservation</b>	<p>For redundancy reasons, besides uploading the data on Zenodo repository, the data set will be also maintained on a university-owned storage server at ICCS (TBD). 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.</p>

### 5.1.2 DS2 | Simulation studies of the Quantum information processors (WP2)

Data Set Reference name	DS2. Simulation studies of the Quantum information processors_POLYNICES_ICCS
<b>Description</b>	The data set will include simulation results regarding the impact of the insertion losses and cross-talk on the system performance.
<b>Standards and Metadata</b>	<i>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:</i>
<b>1. Dataset Title:</b>	Simulation studies of the Quantum information processors_POLYNICES_ICCS
<b>2. Name(s) of dataset creator(s):</b>	ICCS
<b>3. Description of Data:</b>	Simulated optical and electrical waveforms of the fully integrated quantum information processors.
<b>4. Data Source:</b>	This dataset is a primary output of POLYNICES project
<b>5. Creation Date:</b>	<i>To be determined (TBD)</i>
<b>6. Format:</b>	TXT, TSV, CSV, JPEG
<b>7. Size:</b>	< 250 MB
<b>8. Digital Object Identified (DOI):</b>	<i>TBD (DOI from Zenodo)</i>
<b>9. Access status:</b>	Open Data
<b>10. Embargo:</b>	No embargo period foreseen for this dataset
<b>11. Funding Statement:</b>	This project has received funding from the European Union's Horizon Europe Programme under Grant agreement ID: 101070549. 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.
<b>12. Work Package:</b>	WP2
<b>13. Related publications:</b>	<i>Bibliographical details of publications based on the dataset will be listed, with links to abstracts and, where possible, full text</i>
<b>14. Keywords:</b>	POLYNICES, Quantum information processor, Clements matrix, Blass-matrix
<b>15. Version number:</b>	TBD



<p><b>16. Dataset Citation:</b> A 'ready-to-use' citation reference for the dataset will be provided – incorporating the core descriptive elements</p>	
<p><b>Data sharing</b></p>	<p><b>Location of Data:</b> The research data will be deposited and maintained in Zenodo repository, <a href="https://zenodo.org/">https://zenodo.org/</a> (Exact link to be provided)</p> <p><b>Date of Submission:</b> The date of data set submission to the repository will be added (DD.MM.YYYY)</p>
<p><b>Archiving and preservation</b></p>	<p>For redundancy reasons, besides uploading the data on Zenodo repository, the data set will be also maintained on a university-owned storage server at ICCS (TBD). 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.</p>

### 5.1.3 DS3 | Characterization of FMCW THz spectrometer in lab settings \_POLYNICES

Data Set Reference name	DS3. Characterization of FMCW THz spectrometer in lab settings_POLYNICES_ICCS
Description	The data set will include raw experimental results of the precursor modules in ICCS's lab.
Standards and Metadata	<i>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:</i>
	1. <b>Dataset Title:</b> Characterization of FMCW THz spectrometer in lab settings_POLYNICES_ICCS
	2. <b>Name(s) of dataset creator(s):</b> ICCS
	3. <b>Description of Data:</b> Experimental optical and electrical waveforms of an FMCW THz spectrometer.
	4. <b>Data Source:</b> This dataset is a primary output of POLYNICES project
	5. <b>Creation Date:</b> <i>To be determined (TBD)</i>
	6. <b>Format:</b> TXT, TSV, CSV, JPEG
	7. <b>Size:</b> < 750 MB
	8. <b>Digital Object Identified (DOI):</b> TBD (DOI from Zenodo)
	9. <b>Access status:</b> Open Data
	10. <b>Embargo:</b> No embargo period foreseen for this dataset
	11. <b>Funding Statement:</b> This project has received funding from the European Union's Horizon Europe Programme under Grant agreement ID: 101070549. 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.
	12. <b>Work Package:</b> WP6
	13. <b>Related publications:</b> <i>Bibliographical details of publications based on the dataset will be listed, with links to abstracts and, where possible, full text</i>
	14. <b>Keywords:</b> POLYNICES, FMCW, THz spectrometer, C-band, optical beamforming network
	15. <b>Version number:</b> TBD
	16. <b>Dataset Citation:</b> A 'ready-to-use' citation reference for the dataset will be provided – incorporating the core descriptive elements



<b>Data sharing</b>	<p><b>Location of Data:</b> The research data will be deposited and maintained in Zenodo repository, <a href="https://zenodo.org/">https://zenodo.org/</a> (Exact link to be provided)</p> <p><b>Date of Submission:</b> The date of data set submission to the repository will be added (DD.MM.YYYY)</p>
<b>Archiving and preservation</b>	For redundancy reasons, besides uploading the data on Zenodo repository, the data set will be also maintained on a university-owned storage server at ICCS (TBD). 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.

## 6 POLYNICES RESTRICTED DATASETS

The datasets that are foreseen to be restricted are listed in the Table 4.

**Table 4. Restricted datasets in POLYNICES.**

Dataset Description	Related WP	Related deliverables	Dataset Owner
Evaluation of the beamforming algorithms	WP2	D2.2, D2.6	ICCS
Design of the THz coupling structures on EOPCB	WP2	D2.4, D2.5	UC3M
Radiation patterns of single and multiple integrated THz antennas	WP2	D2.4, D2.5	UC3M
3D mechanical modelling and thermal simulation studies	WP2	D2.3	PHIX
Characterization results of unpackaged single PZT-based phase actuators	WP3	D3.4, D3.6	LXI
Development of flip-chipping and soldering processes	WP3	D3.3, D3.5	PHIX
Layouts of EOPCB motherboards for all the demonstrators	WP4	D4.2, D4.5	Fraunhofer
Layouts of optical matrices based on Blass and Clements architectures	WP4	D4.3, D4.6	LXI
Layouts of external cavity laser sources at 780 and 1550 nm	WP4	D4.1, D4.3, D4.6	LXI
Layouts of THz emitters and receivers	WP4	D4.4, D4.7	Fraunhofer
Electronic design of the EOPCB	WP5	D5.6	ICCS
Finalizing the packaging engine	WP5	D5.1	PHIX
Assembly and packaging of POLYNICES prototypes	WP5	D5.2, D5.3, D5.4, D5.5	PHIX
Phase and amplitude recovery algorithms	WP6	D6.2	OPTAGON
Characterization of FMCW THz spectrometer in system vendors	WP6	D6.7	TOPTICA
Characterization of QIP in lab settings	WP6	D6.4	ICCS
Characterization of QIP in system vendors	WP6	D6.7	QuiX





## 7 ALLOCATION OF RESOURCES

There are no immediate costs anticipated to make the datasets produced FAIR. The open datasets will be deposited in the Zenodo repository and will be preserved for at least 5 years after the conclusion of the project and in-line with the Deposit Data Policy of the European Commission. Any unforeseen costs related to open access to research data in Horizon Europe are eligible for reimbursement during the duration of the project under the conditions defined in the G.A. Article 6 and Article 6.2.C.3.

ICCS (Project Coordinator) will be the responsible for the implementation of Data Management Plan within POLYNICES project. All the consortium partners will also undertake to support the Data Management protocol by providing the types of generated data that have been described in the methodology of the DMP report.

In specific, ICCS will:

- a) prepare the Deliverable D7.3 (Data Management Plan);
- b) ensure its update during the project implementation;
- c) ensure the recording of the produced datasets;
- d) have the overall responsibility for the implementation of the Data Management Plan.

Each POLYNICES partner should respect the policies set out in this DMP. Datasets must be created, managed and stored appropriately and in line with European Commission and local legislation. Dataset validation and registration of metadata and backing-up data for sharing through repositories is the responsibility of the partner that generates the data in the respective Work Package.

## 8 DATA SECURITY

The data storage facilities of the members of POLYNICES project are summarized in the table below.

**Table 5. Description of data storage facilities of POLYNICES beneficiaries**

<b>Beneficiary Short Name</b>	<b>Description of Data Storage Facility</b>
<b>1. ICCS</b>	University-owned server at ICCS (PCRL). The server offers real-time data mirroring through RAID (redundant array of independent disks) and weekly backups to external disk drives. The Data will be preserved for at least 5 years after the project end and the associated costs will be covered by ICCS through own funds. Data will be also stored at the ICCS's SharePoint Documents Repository devoted to POLYNICES by the project end.
<b>2. Fraunhofer</b>	Internal servers at FhG-HHI premises.
<b>3. LIONIX</b>	The data storage is on a Lionix-owned server which has daily off-site backups. All original project data will be archived for at least 5 years after the project end. Data which is non-confidential and relevant for the partners will also be stored on the project SharePoint.
<b>4. UC3M</b>	UC3M storage services for the researchers are based on an institutional Google Drive account for each researcher, with unlimited capacity, enabling to grant access between members of UC3M. Furthermore, UC3M library gives support to UC3M group on issues related to Open Access/Open Science. This service cooperates intensively with the research service of UC3M, that has an institutional repository that belongs to



Beneficiary Short Name	Description of Data Storage Facility
	the Spanish repository RECOLECTA and is compatible with the European portal OpenAIRE. All these tools will be used, and the library's consultant office will support the PC.
<b>5. OPTAGON</b>	Internal servers at Optagon lab facility.
<b>6. PHIX</b>	All original data will be stored on local hard drives (with regular backups) and archived on a local network such that these are available and accessible for all employees involved in the project. Processed copies of these data will be maintained on the PHIX servers and network drives. All data will be managed under the FAIR (Findable, Accessible, Interoperable and Reusable) principles during the project for the researchers in the team. Raw and processed files will be stored on local hard drives (with regular backups) and archived on a local network for at least 10 years and will be accessible to the POLYNICES consortium. For the information that is used in publications, PHIX will upload the non-confidential original data onto the SharePoint (and MS TEAMS Workspace) or provide download links to other researchers upon request. Digital archives with sufficient storage capacity with adequate data transfer bandwidth will be made available during the length of the project and thereafter.
<b>7. QUIX</b>	Data is stored on a fileserver in a local data center operated by Quix Quantum's ISO 27001-certified IT partners. It is regularly backed up and can only be accessed directly from Quix Quantum's network or via Quix Quantum's VPN using two-factor authentication. Access to specific files and directories is controlled by Active Directory permissions.
<b>8. TOPTICA</b>	The data storage is on a TOPTICA-owned server which has daily off-site backups. All original project data will be archived for at least 5 years after the project end. Data which is non-confidential and relevant for the partners will also be stored on the project SharePoint.

## 9 ETHICAL ASPECTS

POLYNICES partners are to comply with the ethical principles as set out in the G.A. Article 14 which states that all activities must be carried out in compliance with:

- a) Ethical principles (including the highest standards of research integrity — as set out, for instance, in the European Code of Conduct for Research Integrity (European Science Foundation, 2011) — and including, in particular, avoiding fabrication, falsification, plagiarism or other research misconduct) and
- b) Applicable international, EU and national law including the EU Charter of Fundamental Rights and the European Convention for the Protection of Human Rights and Fundamental Freedoms and its Supplementary Protocols.

The POLYNICES consortium will conduct this action adhering to the fundamental principle of research integrity —as set out in the European Code of Conduct for Research Integrity<sup>4</sup>.

<sup>4</sup> <https://allea.org/code-of-conduct/>



This implies compliance with the following principles:

- **reliability** in ensuring the quality of research reflected in the design, the methodology, the analysis and the use of resources
- **honesty** in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair and unbiased way
- **respect** for colleagues, research participants, society, ecosystems, cultural heritage and the environment
- **accountability** for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts and means that beneficiaries must ensure that persons carrying out research tasks follow the good research practices including ensuring, where possible, openness, reproducibility and traceability and refrain from the research integrity violations described in the Code.

POLYNICES project does not involve the use of human participants or personal data in the research and therefore there is no requirement for ethical review.

## 9.1 Confidentiality

POLYNICES beneficiaries must and will retain any data, documents, or other material as confidential during the implementation for the project. Further details on confidentiality can be found in the G.A. Article 13 along with the obligation to protect results in Article 16.

## 10 OTHER ISSUES

No other national/funder/sectorial/departmental procedures for data management are being used by the POLYNICES partners.

## 11 CONCLUSIONS

This document has provided the first version of the Data Management Plan defined by POLYNICES consortium in the first six months of the project. The DMP has identified several data sets which will be generated within the project and, for each of them, has defined the strategy for the documentation, open access sharing and maintenance of the associated data, according to the guidelines provided by the EC in the Horizon Europe programme.

This document will be updated during the project lifecycle, in order to reflect any possible changes and additions in the data sets, as well as any refinement in the strategy to maximize the sharing and re-use of the project outcomes. These possible changes should be also reflected in the periodic reports of POLYNICES project. In particular, at least two further versions of the DMP will be released: one in M20 and the final version at the end of the project in M42.



## APPENDIX I – EXAMPLE METADATA FILE TEMPLATE

This metadata file was generated on <insert date> by <insert name>

### GENERAL INFORMATION

1. **Title of Dataset:**
2. **Dataset Identifier in Repository:**
3. **Responsible Partner:**
4. **Author Information:**  
 Investigator Contact Information Name:  
 Email:  
  
 Supervisor Contact Information Name:  
 Email:  
  
 Co-Supervisor Contact Information Name:  
 Email:
5. **Date of data collection:** .....
6. **Geographic location of data collection (where was data collected?):**  
 .....
7. **Title of project and Funding sources that supported the collection of the data:** .....

### SHARING/ACCESS INFORMATION

1. **Licenses/access restrictions placed on the data:**  
 .....
2. **Link to data Repository:**  
 .....
3. **Links to other publicly accessible locations of the data:**  
 .....
4. **Links to publications that cite or use the data:**  
 .....
5. **Was data derived from another source? If yes, list source(s):**  
 .....

### DATASET & FILE OVERVIEW

1. **This dataset contains X sub-dataset as listed below:**
  - A. Datasheet name:
  - B. Datasheet name:
  - C. Datasheet name:
  - D. Datasheet name:
2. **What is the status of the documented data? – “complete”, “in progress”, or “planned”**
3. **Plans to update the data**

### METHODOLOGICAL INFORMATION

1. **Description of methods used for experimental design and data collection:** <Include links or references to publications or other documentation containing experimental design or protocols used in data collection>  
 .....
2. **Methods for processing the data:** <describe how the submitted data were generated from the raw or collected data>  
 .....



3. **Instruments and software used in data collection and processing-specific information needed to interpret the data:**  
.....
4. **Standards and calibration information, if appropriate:**  
.....
5. **Environmental/experimental conditions:**  
.....
6. **Describe any quality-assurance procedures performed on the data:**  
.....



## LIST OF TABLES

Table 1. The structure (fields) of the record-spreadsheet for each generated dataset in POLYNICES .....	14
Table 2. The potential data that will be generated in POLYNICES project. ....	18
Table 3. List of Open data sets relevant to POLYNICES research activities. ....	21
Table 4. Restricted datasets in POLYNICES. ....	24
Table 5. Description of data storage facilities of POLYNICES beneficiaries.....	25