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HiPower 5.0

D7.4 Data Management Plan

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AUTHORS/REVIEWERS TABLE

	Author(s) / Organization	**Date**
Written by	Christian Meyne / IFAG	2025-12-23
Reviewed by	Christoph Abart / AVL	2026-01-07
Approved by	Coordinator / AVL	2026-01-07

EXECUTIVE SUMMARY

Deliverable on handling research data and other outcomes, which will specify in depth the kinds of data and research outcomes and how those data will be findable, accessible, interoperable, and reusable. Summarize the results, conclusions or recommendations made in this report.

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1 Introduction

A Data Management Plan (DMP) is a formal document that outlines how research data will be collected, organized, managed, preserved, and shared during and after a research project. It serves as a guideline for HiPower 5.0 team members to ensure that data is handled effectively throughout the entire research lifecycle.

The purpose of a Data Management Plan is to provide a structured framework for the effective management of data throughout the HiPower 5.0 project. It helps researchers maintain the integrity and usability of their data, facilitate collaboration and reproducibility, meet legal and ethical requirements, and maximize the value of their research. A DMP helps to promote transparency, data sharing, and adherence to best practices in research data management.

The target group for the HiPower 5.0 DMP consists of project team members, researchers and project managers. External stakeholders will be informed about available public datasets through the communication, dissemination and exploitation activities.

This DMP has been identified as HiPower 5.0 Deliverable 7.4 and is intended to be a living document. It will be periodically revised to reflect changes in the data that may be made available by the project, and to provide additional information on the datasets as this information is developed during the specifications of the experimental phases.

The major aim of the DMP is to ensure that HiPower 5.0 research data is FAIR – Findable, Accessible, Interoperable, and Re-usable, respecting also the GDPR from the EU (2016/679). The document shall raise awareness among the partners for data to be collected, processed and or generated by the project. The HiPower 5.0 data management plan will improve the handling of data during the project and enhance the availability of research data while considering exploitation and the protection of the results.

The Data Management Plan provides guidance and best practice for data management within the HiPower 5.0 project.

The Data Management Plan focuses on three main tasks:

- Protect commercially sensitive data
- Publication and Dissemination of project findings wherever possible
- Compliance with GDPR and/or other relevant personal data legislation and requirements.

2 DMP execution & target groups

2.1 Data Management lifecycle

Data management life cycles can be in general divided into phases as summarized in Figure 2-1. The process usually starts with the collection and/or creation of primary and/or secondary research data that are kept in a local workspace before they are processed and analysed. In the second phase, the quality of the data is defined to reach a decision about their further usability and processing. The high-quality data are evaluated, interpreted and further processed and then need to be preserved for future research. In the next step the data are prepared for long-term archiving, exploitation and publication where also documentation and coding of data play a role. After a determined time of preservation, a decision for some data must be made about further archiving or disposal.

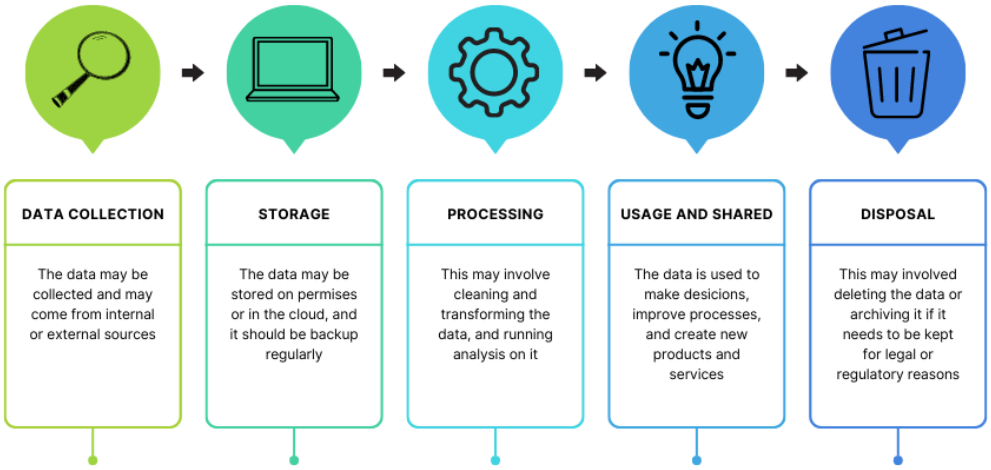


Figure 2-1: Data Management process

2.2 Target group

The target audience of the DMP includes project team members, researchers, data scientists, project managers and stakeholders involved in the HiPower 5.0 project. The DMP itself is a public document. The external stakeholders will be informed about public datasets through the communication, dissemination and exploitation activities.

In addition, the DMP may also be of interest to regulators, funders and other external parties involved in monitoring or evaluating the project. It provides transparency about data handling processes, privacy measures and compliance with relevant regulations.

2.3 Documentation and data

Proper documentation helps a wide audience to understand, interpret and thus reuse data. Metadata shall be provided together with the data and comprise detailed information about the respective data. Since there is no general standard for such metadata, free text can be utilised. The project partners document their data in diverse ways and orient themselves to the current standards and naming conventions like organization standards or the project structure. Special focus is given on a clear and easy to use folder structure as well as searchable metadata.

To make data findable and re-usable, it is proposed to include the persistent identifier “HiPower 5.0”, a title indicating the nature of the data, a date and / or version number and the format. For project internal material that is stored on the project repository, naming conventions have been defined in D7.2 Quality Assurance and Risk Management Plan already. Basically, data / file names must contain:

- Project Name: HiPower 5.0
- Title: Short description of the document
- Date: date of creation / update – yyyy-mm-dd
- Format: .doc, .ppt, .xls, .pdf
- Version: vX.Y … use position X for a major release, and position Y for a minor release (e.g. v0.1, v0.2, v1.0, v1.1, v2.0 …)
- Example: Date_Project Name_Title_Version.Format

2.4 Internal Storage and management of data

For the internal storage and access, data are stored in a data platform accessible to all project partners. To gain access to this platform, project partners must be formally part of the project by signing the HiPower 5.0 Grant Agreement and the project Consortia Agreement.

In the HiPower 5.0 project, the coordinator provides an AVL-internal data platform for the sharing and exchanging of data. Data is securely stored and accessible via a password-protected login. For word-documents saved on the platform simultaneous editing is possible for multiple users. This platform offers access control features, version control, and tools for seamless collaboration. It ensures the HiPower 5.0 project's data management is secure and well-organized, while also promoting effective teamwork and streamlining project processes.

By using the platform from AVL, the HiPower 5.0 project benefits from a centralized and easily accessible platform for storing, organizing, and collaborating on project-related information as well as common reporting. This supports efficient project management and informed decision-making throughout the duration of the project. The main parts of the data types that are stored as documents on the platform are described in the continuation of this document.

Further details can be found in in D7.2 Quality Assurance and Risk Management Plan.

3 Data Summary

The HiPower 5.0 project relies on an ongoing data collection process. The collected data is categorized by the project partners based on its type and purpose, with specific goals defined during the project's setup and initial data collection phase.
Within the HiPower 5.0 project, various types of data serve distinct purposes. Project communication and dissemination data ensure effective outreach and communication strategies. Descriptive project data offer valuable insights into the project's progress and overall performance. Additionally, research data constitutes the foundation for research outcomes and contributes to advancing scientific knowledge and exploitation in further research and development.
The proper management, organization, and documentation of these diverse data types are of utmost importance to achieve project success. Furthermore, it facilitates seamless collaboration among stakeholders and paves the way for future research and data sharing opportunities.

3.1 Collected data types

This chapter states the purpose of the data collection/generation of the project. Furthermore, it specifies the types, formats, expected size (if known / preliminary estimation) and origin of the data generated/collected. Further, it clarifies, if existing data is being re-used. Finally, additional possible users are outlined.
During the project, different kinds of data will be generated. It must be noted that especially industrial partners have the intention to create new IP, respectively exploit data for creation of future commercial products. Such partners typically do not produce data that can be openly shared. Sometimes the data is only shared directly to a cooperation partner within the project (for example sharing of the data between two or more partners involved for a specific use case demonstrator).

3.1.1 Communication and dissemination data

The HiPower 5.0 initiative places great emphasis on ensuring efficient communication and widespread dissemination of project-related public information. For this purpose, data will be gathered and structured to enable transparent and effective interaction with stakeholders and the general audience. This dataset encompasses public deliverables, project-related publications, media materials (like videos and images), and the project's active presence on social media channels. The primary objective is to actively engage, inform, and raise awareness about the project's advancements, results, and overall impact.
Channels for disseminating research findings in the HiPower 5.0 project encompass a diverse range of publication opportunities aiming to reach a broader audience and fostering collaboration and knowledge exchange. These channels strictly adhere to rigorous peer review processes to ensure the credibility and validity of the research content. Examples of traditional publication channels include academic journals, conference proceedings, and technical papers related to the project.
Furthermore, the HiPower 5.0 project employs various online platforms to effectively communicate and disseminate information. The project's dedicated website, www.HiPower50.eu, acts as a central hub for stakeholders to access comprehensive project information, regular updates, public research findings, and relevant resources. All publications and media content are made readily available on the website. Audiovisual materials, such as videos and podcasts, will be available in their respective sections to be viewed, listened to and shared on social networks.
Additionally, the project maintains an active presence on LinkedIn, a professional networking platform. Through LinkedIn, the HiPower 5.0 project shares updates, news, achievements, and relevant articles or publications, engaging with professionals, organizations, and potential collaborators in the project's field.

3.1.2 Project Management data

For efficient project management, communication and reporting in the HiPower 5.0 project data related to project management, coordination and financial management must be handled. The management data category in HiPower 5.0 includes:
Official documents: Results or outcomes of specific project tasks or milestones, final versions of deliverables and milestones, the Grant Agreement, the Consortium Agreement and documentation related to the HiPower 5.0 project. These documents and the information contained may not be copied, used or disclosed, entirely or partially, outside of the HiPower 5.0 consortium without prior permission of the partners in written form.
Contact information: Contains relevant contact information for project team members involved in the project. This information ensures efficient communication and collaboration between project participants.
Meetings: Minutes and presentations from all meetings of the consortium are stored on the AVL-platform, to be consolidated at any time if required.
WPs: Every work package has its own folder for storage of all WP's specific data. From there, the content is also shared with other partners since the access rights are not WPs' specific.
Reporting: All periodical reports are saved on the AVL-platform.
Templates and logos: to provide a unified image of HiPower 5.0, templates and logos have been made available to all consortium members for use for their various purposes.
HiPower 5.0 will use a standardised naming convention for all the project files and folders at data repositories that will be constructed using defined characteristics as outlined in D7.2 Quality Assurance and Risk Management Plan.

3.1.3 Research data

Research data sets are collections of data collected, curated, and used specifically for research purposes. These datasets play a critical role in scientific investigations, allowing researchers to analyze and derive insights from the data to answer research questions, test hypotheses, and make new discoveries. The data sets used in this (and the reuse of existing data sets of other) projects are on the one hand usually highly sensitive data, e.g. in terms of design secrets or open patents, and on the other hand data needed to comply with data protection rules for privacy reasons.

HiPower 5.0 partners have identified the datasets that will be produced during the different phases of the project. These fall into the following categories (may be extended during the project):

- Material and defects
- Process
- Electrical device and test structures
- Reliability
- Packaging and cooling
- Circuit design and layout
- Circuit simulations
- Circuit and system characterization

3.1.4 Data Types

In the course of the project, different kinds of data will be generated whereas not all partners are involved in scientific research and publications and therefore do not produce any kind of research data. The data sets include existing data from project partners and third parties as well as newly created data that will all be needed to fulfill the overall project objectives.

Most of the data is generated as part of HiPower 5.0 actions or comes from surveys, market analysis, simulations, measurements, tests, conclusions of workshops, company-internal databases, etc. The expected size of the data is not clear yet but is expected to range for each data set from some kB text up to some TB for real design data and measurement statistics. The collected data will have various formats (e.g., *.docx, *.xls, *. csv, etc.) and sizes. But in order to ensure interoperability, data will be readable using widely used formats (see below). The following table shows a summary of types and formats expected.

Type of data to be generated	Data format needed
Simulations, thermal, electrical and reliability tests.	xls, csv, .mat, .m
Design files, rules, material specifications	.gds, .pdf, .xls
Accepted coding HDL and simulation standards	*.RTL, *.cir, *.sch
Results from measurements or simulations will be stored in human readable text or be presented as graphics	S-parameter s2p format, .png
Images, spectra, SEM	. TIFF, .SXM; .TXT
Data will be ASC-II data for measured and extracted models as well as ADS format data for the design and GDS-2 data for manufacturing.	
Presentations, Publications, Web Pages, Videos, Newsletters, Social Media Posts	.txt, .avi, .mp4, .pdf, pptx
In the range of 5-8 GB, including budget calculations, documentation, reporting, generated contracts, agreements, deliverables, presentations, administrational and organizational documents etc.	.docx, .pdf, .pptx, .xlsx

Table 3-1: Examples of type of data and data format generated in HiPower 5.0

4 FAIR Data Management

FAIR data management refers to the principles and practices that ensure data are **findable, accessible, interoperable** and **reusable**. These principles aim to maximise the value and impact of research data by making it more discoverable, understandable and usable by both humans and machines.

Findable: data should be easily discoverable and identifiable using unique identifiers, metadata, and standardized descriptions. This enables researchers, and interested parties, to locate and access the data efficiently.

Accessible: data should be openly available or accessible with clear and defined protocols, allowing users to retrieve and obtain the data without unnecessary barriers or restrictions. Access should be granted based on appropriate permissions and data usage agreements.

Interoperable: data should be structured and formatted in a way that facilitates seamless integration and interoperability with other datasets. Commonly accepted standards and protocols should be followed to ensure compatibility and the ability to combine data from various sources.

Reusable: data should be well-documented, clearly described, and include sufficient contextual information to enable its reuse for different purposes. This includes providing information on the methodology, data collection procedures, and any applicable licensing or usage terms.

4.1 Making data findable

The HiPower 5.0 project data will be hosted in an AVL-internal data repository. According to the FAIR principles, public data will be provided via open access (like, e.g., Zenodo) to the research community.

4.2 Making data accessible

Access to HiPower 5.0 data can be facilitated through various mechanisms to ensure wide availability and appropriate use. The specific access procedures may vary depending on the sensitivity of the data and any legal or ethical considerations. The access is granted at least through the internal data share and through public downloads on the website, through e.g., Zenodo, repository.

4.3 Making data interoperable

Making HiPower 5.0 data interoperable ensures that data sets from different sources within the project can work together seamlessly and be shared, integrated and understood by different systems, tools and stakeholders. It involves the implementation of standards, formats and protocols that enable effective communication, collaboration and integration of data across different platforms, applications and domains. HiPower 5.0 ensures that data from different sources within the HiPower 5.0 project are harmonised, i.e. transformed, mapped and aligned to a common representation or ontology. This enables data integration and facilitates cross referencing and analysis of heterogeneous data sets.

5 Allocation of Resources

The duration of the storage and curation, storage and preservation costs are allocated as follows:

5.1 Project internal data storage

Project partners can store non-public datasets free of charge in the project's internal data storage. The costs associated with this storage will be covered by the project coordinator AVL. This will ensure that partners have a dedicated and secure space to share and access data within the project for at least three years after the project has ended. The access for the internal data storage via the AVL-platform will be available 6 Months after the project ends. The partners are able to download the internal published data and use it under the GA conditions further on.

5.2 Project website

AVL, as the project coordinator, will bear the costs of maintaining the project website. This includes costs related to hosting, domain registration and other technical aspects. The website will serve as a central platform for the dissemination of project information and may include access to public datasets, publications and other project-related resources. A section will be added to the website with links to the collected datasets and project related publications. The website and the corresponding links to the data sets will be available 3 years after the project ended.

5.3 Public data sets

Only data published in scientific journals will be openly available. For public datasets the partners can also use data repositories like Zenodo. Publication of data sets in Zenodo, a repository for long-term storage of research data, is usually free of charge. This allows the project to openly publish and share datasets in accordance with the FAIR Data Principles. Zenodo assigns a Digital Object Identifier (DOI) to each uploaded dataset, ensuring its long-term accessibility and citation. It is designed to be a reliable and sustainable repository for the preservation and sharing of research results. Zenodo's mission is to provide a permanent home for research data, ensuring its long-term availability and accessibility.

5.4 Responsibility of publishing partners

The responsibility for accessing and disseminating other publishable data, such as scientific publications in the form of journal articles and conference papers, lies with the respective publishing partner. This may involve following appropriate publishing models, such as Green Open Access, where the publishing partner ensures the accessibility and availability of the publications.

6 Data Security

6.1 Project Internal Data Security

The HiPower 5.0 project data share uses the AVL-internal platform, as a coordinator owned and hosted file sync and sharing platform. This offers various features and mechanisms to ensure data security. The platform is based on Microsoft Teams technology. The platform offers unlimited sharing duration, but preservation is limited due to AVL internal policies up to 10 years after the project end.
This platform offers access control features, version control, and tools for seamless collaboration. It ensures the HiPower 5.0 project's data management is secure and well-organized, while also promoting effective teamwork and streamlining project processes.
Key aspects of data security on the AVL-SharePoint-platform:

1. Access Control
2. Authentication and User Management
3. Secure Communication
4. Server Security

6.2 Public data storage security

The HiPower 5.0 webpage will be used as main public data point with publicly available content (public deliverables, public publications, audiovisual materials, etc.), has security-support with manual backup of files and database is possible and automated backups are also executed. Details about the webpage are provided in Deliverable “D7.1 Website”.

Only data published in scientific journals will be openly available. The partners can also upload public data to repositories like Zenodo. Zenodo takes security very seriously and does their best to protect their data.

- CERN Data Centre: The data center is located on CERN premises and all physical access is restricted to a limited number of staff with appropriate training and who have been granted access in line with their professional duties (e.g. Zendo staff do not have physical access to the CERN Data Centre).
- Servers: The servers are managed according to the CERN Security Baseline for Servers, meaning e.g. remote access to our servers are restricted to Zenodo staff with appropriate training, and the operating system and installed applications are kept updated with latest security patches via our automatic configuration management system Puppet.
- Network: CERN Security Team runs both host and network-based intrusion detection systems and monitors the traffic flow, pattern and contents into and out of CERN networks in order to detect attacks. All access to zenodo.org happens over HTTPS, except for static documentation pages which are hosted on GitHub Pages.
- Data: Zenodo stores user passwords using strong cryptographic password hashing algorithms (currently PBKDF2+SHA512). Users’ access tokens to GitHub and ORCID are stored encrypted and can only be decrypted with the application’s secret key.

7 Ethical and Legal aspects

7.1 Ethical considerations

Privacy and confidentiality: Privacy and confidentiality are protected throughout the data management process. Relevant data protection regulations, such as the General Data Protection Regulation (GDPR), when collecting, storing and sharing personal data are applicated.
Informed consent: Informed consent from individuals whose data is collected, ensuring that they understand the purpose and scope of the data collection, use, and sharing is obligated. Also, clear information about their rights, including the right to withdraw consent and request deletion or modification of their data.
Data ownership and intellectual property: Data ownership and intellectual property rights within the project have to be clarified.
Responsible data sharing and collaboration: Responsible data sharing and collaboration within the project and with external stakeholders are promoted. Data sharing policies, including data access agreements, data sharing protocols, and appropriate data de-identification or anonymization techniques are used.

7.2 Legal

All legal aspects for privacy and sharing of data are handled in the HiPower 5.0 Project Consortium Agreement (PCA), especially in Section 8: Results and there 8.1. Ownership of Results and Section 11: Privacy and data protection.

8 Conclusion

In conclusion, the Data Management Plan for the HiPower 5.0 project establishes a comprehensive framework for the collection, storage, sharing, and preservation of data. The DMP considers project communication and dissemination data, descriptive project data and research data.

This DMP was triggered by the project coordinator, and each beneficiary is responsible for implementing its underlying procedures for any research data that is collected or generated by them during HiPower 5.0. To be more precise, especially for research data that is used in scientific publications, each partner owning such data is responsible for long-term storage and retrieval, as required by rules of good scientific practice. The HiPower 5.0 project follows the principle “as open as possible, as closed as necessary” whenever dealing with data.

Overall, the HiPower 5.0 Data Management Plan sets a solid foundation for responsible and ethical data management practices within the project. By adhering to the outlined guidelines, the project can ensure data integrity, promote collaboration, and contribute to the advancement of knowledge in the field of federated learning and energy systems.

This document will be updated during the project whenever significant changes like new data, changes in the consortium policies and changes in the consortium composition and external factors arise.

9 Terms, Abbreviations and Definitions

HiPower 5.0	Leading edge semiconductor, integration, and control system technologies for highly compact and smart edrive components towards more sustainable power electronics 5.0
DEC	Websites, patents filing, press & media actions, videos, etc.
DEM	Demonstrator, pilot, prototype, plan designs
DMP	Data Management Plan
DOI	Digital Objective Identifier
GaN	Gallium Nitride
GDPR	General Data Protection Regulation
HW	Hardware
PU	Public, fully open, e.g. web (Deliverables flagged as public will be automatically published in CORDIS project's page)
PCA	Project Consortium Agreement
R	Document, report (excluding the periodic and final reports)
SEN	Sensitive, limited under the conditions of the Grant Agreement
SiC	Silicon Carbide
WP	Work Package

Table 9-1: Terms, Abbreviations and Definitions