Deliverable 10.2:
IPR, Risk and data management

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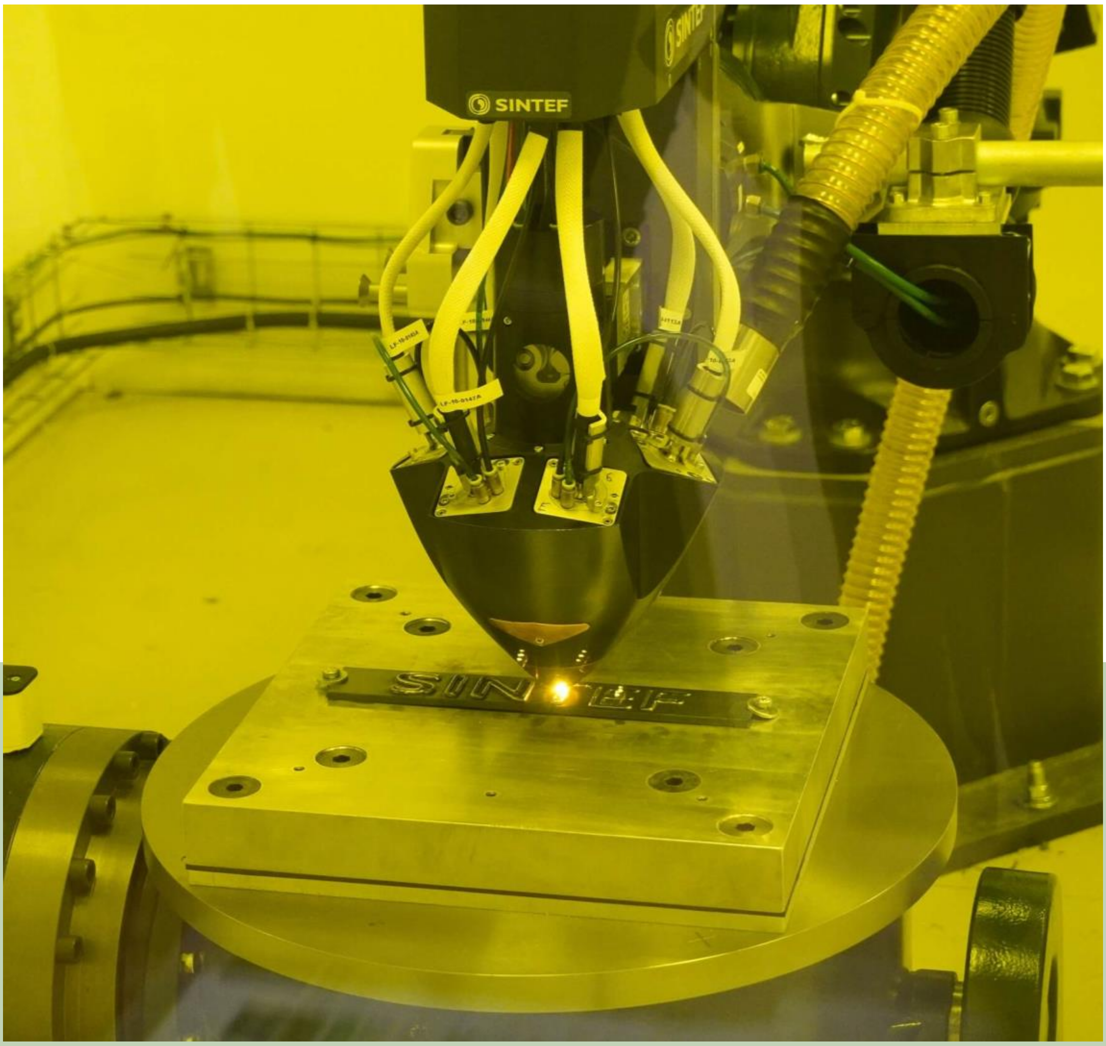

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Project

Project title	Acronym	Grant agreement nr.	Project start	Project end
Adaptive Laser Beam for Additive Manufacturing	ALABAMA	101138842	01.01.2024	01.01.2028

Deliverable

Name of deliverable	Deliverable nr.	Work Package
IPR, Risk and data management	10.2	WP10

Dates & Partners

Due date	Submission date	Main authors	Contributing partners	Reviewers
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Abstract

This document outlines the Intellectual Property Rights (IPR), Risk, and Data Management Plan (DMP) for the ALABAMA project.

IPR topics identified to be protected are defined and listed with initial possible protection strategies for the Key Exploitable results of the project. This provides an initial strategic approach to IPR management to ensure that IP is properly protected, fairly exploited, and efficiently shared among consortium members and external partners.

The risk management strategy is outlined, where the ALABAMA project will maintain its own Risk Register, where all partners continuously document and manage risks. These risks will be developed and focused according to probability and impact for directed solutions during the project execution. An initial risk assessment table is provided.

Finally, the preliminary Data Management Plan (DMP) for ALABAMA is presented. It details the consortium's agreements on data management, exploitation, and protection, and provides an overview of the policy regarding technical and personal data, in compliance with the FAIR (Findable, Accessible, Interoperable, Reusable) principles for datasets and GDPR for personal data.

Additionally, the DMP outlines the procedures for handling and maintaining datasets during and after the project. It includes plans to mitigate any risks of data loss or other threats that could compromise the usability or legibility of the data.

Keywords

Risk, Data Management, Intellectual property rights

Revisions

Version	Submission date	Comments	Author
v0.1	2024-09-24	First draft	Serkan Eren
v0.2	2024-11-04	Added chapter	TVS
V0.3	2024-12-10	Added chapters	CRF + EUT
V0.9	2024-12-20	Reviewed	LTU
V1.0	2024-12-29	Final revision	Coordinator

Disclaimer

Acronyms and definitions

Acronym	Meaning
ALABAMA	Adaptive Laser Beam for Additive Manufacturing
AI	Artificial Intelligence
AMCOE	Additive Manufacturing Centre of Excellence
AMF	Additive Manufacturing File Format
API	Application Programming Interface
ASCII	American Standard Code for Information Interchange
CAD	Computer-Aided Design
CO2	Carbon Dioxide
CSV	Comma Separated Values
DMP	Data Management Plan
DNSH	Do not significant harm principle
DoA	Description of the Action
DOCX	Document Extended
DOI	Digital Object Identifiers
DPD	Data Protection Description
DPP	Digital Product Passports
EC	European Commission
FAIR	Findable, Accessible, Interoperable and Re-usable
GDPR	General Data Protection Regulation
HTML	Hypertext Markup Language
IEC	International Electrotechnical Commission
ISO	International Standards Organization
JPEG	Joint Photographic Experts Group
LCA	Life-Cycle Assessment
NIST	National Institute of Standards and Technology
ODF	Open Document Format
OWL	Web Ontology Language
PDF	Portable Document Format
PID	Persistent identifiers
PNG	Portable Network Graphic
POPD	Protection of Personal Data
PPTX	PowerPoint Open XML
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RoHS	Restriction of (the use of certain) Hazardous Substances
RTF	Rich Text Format
STEP	Standard for the Exchange of Product Data
STL	Stereolithography
STP	Standard for the Exchange of Product
TBD	To Be Defined
TVS	Technovative Solutions
WPS	welding procedure specifications
XML	Extensible Markup Language

About the ALABAMA project

The ALABAMA project aims to develop and mature adaptive laser technologies for AM. The objective is to decrease the porosity and to tailor the microstructure of the deposited material by shaping the laser beam, both temporally and spatially, during the AM process.

The key innovations in the project are to develop multiscale physics-based models to enable optimization of the AM process. These process parameters will be tested and matured for multi-beam control, laser beam shaping optics and high-speed scanning. To ensure the quality of the process, advanced online process monitoring and closed loop control will be performed using multi spectral imaging and thermography to control the melt pool behaviour coupled with wire-current and high-speed imaging to control the process.

To verify that the built material fulfils the requirements, advanced characterization will be conducted on coupons and on use-cases. The matured technology will be tested on three use-cases; aviation, maritime and automotive. These three industrial sectors span a broad part of the manufacturing volumes: from low numbers with high added value, to high numbers with relatively low cost. However, all these sectors struggle with distortions, stresses and material quality.

The ALABAMA use-case demonstrators will improve the compensation for distortions during the AM process, reduce the build failures due to residual stresses, reduce porosity and improve tailoring of the microstructure. Overall, this will contribute to up to 100% increase in process productivity, 50% less defects, 33% cost reduction due to increased productivity and energy savings, a reduction of 15% in greenhouse gases and enable first time-right manufacturing thanks to simulation, process monitoring and adaptive control.

The end users will implement the technologies while the sub-technologies developed in the work packages will be commercialized. This will increase the autonomy for a resilient European industry.

Contents

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This project has received funding from the European Union's Horizon Europe Research and Innovation programme under Grant Agreement No. 101138842.

1. Intellectual Property Rights (IPR)

The Intellectual Properties Rights (IPR) are essential during a research project, especially when it includes many different partners with various backgrounds and technology fields. The ALABAMA project involves three main industry sectors represented by three use cases: compressor case for Aviation industry (UC-1), propeller for Maritime industry (UC-2), and frontal frame for Automotive industry (UC-3). As these sectors undergo significant transformations driven also by advancements in Additive Manufacturing, the need to effectively manage IPR has become a central concern. AM technologies enable highly innovative production methods, but they also raise complex questions regarding the ownership, protection, and commercialization of intellectual property, particularly when multiple industry stakeholders are involved. The goal of this document is to outline the framework for managing intellectual property within the project, ensuring that innovations are safeguarded, shared responsibly, and exploited in a way that benefits all parties involved. This IPR management strategy addresses the unique challenges and opportunities presented by the intersection of AM technologies with these three dynamic industries, which are each characterized by distinct regulatory environments, technical requirements, and market conditions. The rapid pace of innovation in AM introduces new opportunities for intellectual property creation, collaboration, and commercialization. However, it also presents significant challenges in protecting, sharing, and managing these innovations across multiple stakeholders.

IP Rights have been identified in the Consortium Agreement as potential barriers to ALABAMA technologies adoption and commercialization. In the CA, six main topics were identified to be protected:

1. Adaptive laser technologies: The 3 different laser technologies will be patented using the EU-Patents
2. Monitoring and Control technologies: 2 monitoring & control technologies will be patented using the EU-Patents
3. Technology for fatigue life estimation: Methods for HCF life estimation will be patented using the EU-Patents.
4. Digital models and toolchain for process modelling: Protected by confidentiality.
5. LCA, LCC models and DPP within a manufacturing platform: Protected by confidentiality.
6. Use Case results from a) aerospace, b) industrial machinery and c) automotive: Protected by confidentiality.

This document presents the strategic approach to IPR management within the project, aiming to ensure that intellectual property is properly protected, fairly exploited, and efficiently shared among consortium members and external partners regarding these six topics and the related Key Exploitation Results (KERs).

ALABAMA's overall results are development and demonstration of adaptive DED-LB/M technologies, digital simulation tools and advanced metrology. Key exploitable results are:

- Adaptive laser technology in general
- Adaptive laser technology for AM
- Melt pool simulation methodology
- Materials models
- Online monitoring and control

ALABAMA will also provide:

- Lifecycle assessments (LCA) of the different processes
- Skills training through webinars, summer schools, and online tools

Outcomes for manufactured products:

- Improved quality
- Reduced costs

Outcomes for manufacturing process:

- Reduced defects & waste
- Reduced raw material usage
- Reduced energy usage & GHG emissions
- Increased productivity
- Improved flexibility
- Usage of ALABAMA technologies in ALABAMA OEM partner countries (Norway, Sweden, Italy)
- Worldwide awareness of ALABAMA technologies

In addition to the identification of project results, its characterisation and background carried by each partner, it is relevant to define an individual IPR protection strategy for each of the Key Exploitable Results.

The background information and the partners' knowledge are mapped and reported:

Partner	Background	Foreground
Fraunhofer-Gesellschaft SCAI (FHG)	• VMAP standard community. • Semantic concepts & ontologies, based on already published open-source documentations. • Ontology framework & interfaces will be a new development.	• VMAP SC will hold any extension or adaptation of VMAP. • Semantic concepts & ontologies will be available to the general public for wider dissemination. • Ontology framework & interfaces through software tools and modules offered as licensed product

SINTEF Manufacturing AS (SIN)	Expertise in metal AM and multi-laser DED systems.	Academic publishing on the use of multi-laser DED and wire-current system as monitoring system.
Aerobase Innovations AB (AER)	AM process control optimization and control over metallurgical and mechanical properties, through own base material models.	Further development of models to optimized laser-based AM techniques.
Luleå University of Technology (LTU)	Expertise in modelling of AM processes and material modelling.	Further development of process simulation models to better predict residual stresses and deformations. Also further develop physically based material models.
GKN Aerospace Sweden AB (GKN)	Provider of structural and rotating engine components. Expertise on advanced process and product control over strict requirements,	
Nordic Additive Manufacturing (NAM)	Experience in DED-AM process, with actual applications in Maritime industry.	ALABAMA DED innovative technologies implementation
Manufacturing Technology Norwegian Catapult AS (MTNC)	Large test capability and competences in AM. Research institutes and enterprises cooperation experience.	
Centro Ricerche Fiat (CRF)	Material expertise inside Stellantis and material development in many European projects. Experience in AM characterization for internal applications of samples and components.	Using AM reinforcements (hybrid manufacturing) to define design archetypes for simplifying the supply chain (reduction of the bill of materials) and lightweighting

Eurecat (EUT)	Advanced characterization tests for metallic materials, also applied to metals AM.	Further application of advanced testing on novel ALABAMA technology development.

CRF has an ALABAMA pre-existing patent application regarding the use of local thermal treatments during LMD to tailor the mechanical property at the interface between the deposited material and substrate and reducing the effect of the heat affected zone.

Eurecat currently holds patent EP4193138A1, which pertains to a rapid fatigue test applicable to multiple materials. Within the ALABAMA project, this patent can be modified or enhanced to meet the specific requirements of testing materials produced through additive manufacturing. This will provide valuable insights into improving the cyclic properties of these materials, contributing to the development of high-performance additive manufacturing processes.

GKN especially underline the need that no data, know-how or information of GKN Aerospace Sweden AB is needed by another Party for implementation of the project, as agreed in the CA.

No other existing patents have been reported by the rest of the partners on the topics ALABAMA aims at developing.

SINTEF has identified the use of laser formations in multi-laser DED as a possible patent to be pursued in WP11.

An initial list of possible protection strategies has been identified:

- Patenting – Any invention, product or process that offers a new way of doing something or provides a new solution to a problem.
- Utility Model – Minor inventions or minor improvements of existing products.
- Trademark – Any sign capable of distinguishing your goods or services from your competitors.
- Copyright – Literary and artistic works: music, books, paintings, computer programs, databases, etc.
- Trade Secret – Any information that is not generally known, confers a competitive edge and is subject to reasonable efforts to maintain its secrecy.
- Design protection – Any design that include visual features of shape, configuration, pattern, and ornamentation of the design that can be differentiated from others.

Through this IPR management strategy, the project seeks to create an environment where innovation can thrive while safeguarding the intellectual contributions of all stakeholders. This deliverable serves as a guide for project partners and collaborators, providing the necessary framework to manage and protect valuable intellectual assets and ensure that they are used to maximize the project's impact on the future of additive manufacturing in these critical industries.

The current version (M12) of Deliverable 10.2 presents the initial IPR management plan for the ALABAMA project. The plan is divided into three periods:

- Period 1: M1-M12
- Period 2: M13-M30
- Period 3: M31-M48.

In the Interim (M30) and Final (M48) IPR management tasks, the adopted strategies will be further defined and detailed, and this Deliverable 10.2 updated.

2. Risk Management

Effective risk management is crucial for successful project execution, requiring ongoing attention to potential risk. In that sense, the ALABAMA project maintains its own Risk Register, where all partners continuously document and manage risks. The Risk Register excel sheet has three coloured columns (new register between two reporting period, new risk register for reporting period, risk assessment update). These different coloured columns help risk assessor to choose correct group to fill in as explained below.

Each reported risk is classified as foreseen risk (risk assessment prior the project starts) or unforeseen risk (any risk registered afterwards the start of the project) and identified with the date of risk registry. A Risk assessment guideline has been published for conducting risk assessments in the ALABAMA project. ALABAMA risk assessment considers the probability, the impact level and the rating of each risk:

- Probability: Probability refers to the likelihood of a risk event happening. There are three levels of probability in this risk register: *Low means* (the event is unlikely to occur), *Medium means* (the event could occur occasionally), *High means* (the event is very likely to happen).
- Impact level: Impact level refers to the severity of consequences if a risk event occurs. There are three levels if impact in this risk register: Minor (means the event would have minimal or negligible effects), *Moderate* (means the event would cause noticeable but manageable disruption), *Critical* (means the event would result in severe consequences or significant disruption)
- Rating: The Rating combines both the probability and impact to determine the overall severity of the risk. The Rating is automatically calculated based on chosen probability and impact level.
  Based on the assessment, an "arrow of attention is graphically constructed:

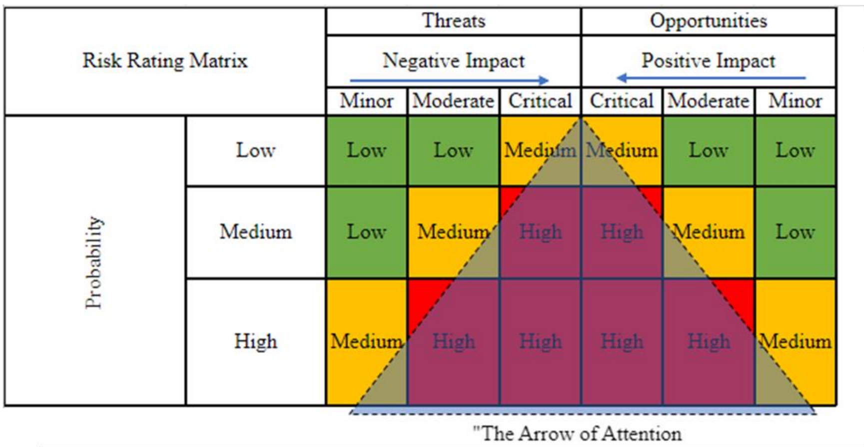

Figure 1. Risk Rating Matrix

Table 1 outlines the identified risks for the ALABAMA project. The unforeseen risk identified before the project's initiation is marked as U (Unforeseen). In this table, each risk is rated using colour coding based on the assigned probability and impact level, as illustrated in Figure 1.

Table 1. Risk assessment

Risk	Description of Risk	WP	Proposed risk-mitigation	Impact
1	External circumstances (e.g., Covid) causing delays	All	Early identification, communication, and report to the EC officer to discuss solutions/alternative strategies.	If no mitigation measures are taken, the project may be delayed.
2	Failure of a partner in fulfilling its contractual obligations	All	Early identification, communication, and report to the EC officer to discuss solutions/alternative strategies.	If countermeasures are not implemented, work package, tasks deliverables may be delayed which may eventually lead that project will be delayed as well.
3	Lack of coordination and communication between partners introducing delay	All	The coordinator could set up additional face-to-face/online consortium meetings to improve communication issues, implementing new strategies and/or using new tools.	Lack of communication may lead to delays with deliverables, tasks, etc.
4	Data formats are too heterogeneous and partially incompatible with each other, such that the definition of standardized interfaces will be limited in scope.	WP1	If some data format cannot be replaced/covered by a standard, format converters will provide a suitable work-around.	
5	Semantic descriptions are too heterogeneous and partially incompatible with each other, such that the definition of a common data model might be quite limited in scope.	WP2	If some domain semantics cannot be fully integrated, these parts can be linked by external hyperlinks without resolving all internal information details.	
6	Data pipeline cannot be fully integrated due to missing links to databases and tools.	WP3	Interface wrappers and format converters will act as workarounds to close gaps in the data pipeline.	
7	Robustness of CBC laser source and integration in DED-LB/P system	WP4	Manufacturing of highly simplified coupons with CBC laser source or use of other less flexible laser beam shaping technologies available at FHG (e.g. diffractive optical elements, liquid crystal spatial light modulators, etc.)	
8	Camera-based feedback control systems for DED-LB/W must be placed off-axis respect to the wire and laser delivery, which may result in a dependency of the system with respect to the movement direction	WP5	Integration of the directional dependency of the camera measurements in the feedback control system.	

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9	Delayed delivery of coupons for testing and macro-micro characterization results	WP6	Efficient communication between coupons suppliers and other partners. Realistic estimation and replanning of the activities if it is needed. Subcontracting or redistribution of some characterization tests.	
10	Too large experimental scatter to define a robust laser absorption model	WP7	Identify the sources for the experimental scatter using the developed model	
11	Not possible to reach the quality in the digital models to have the capability to design process parameters	WP8	Use digital tools as a guide for the experimental work, instead of as a design tool.	
12	One or more use-cases can´t achieve all the expected improvements both in terms of building rate and material quality	WP9	Reduction of the building rate improvement to achieve the required material quality or, if economically viable, improve the material properties with postprocessing (e.g., HIP process)	
13	Low number of participants during the project summer school/workshops/webinars	WP13	A specific and targeted marketing campaign will be put in place to mitigate low participation. The WP6 leader and partners will use their own networks of contacts and will build a strategy for engagement	
14	Relevant events are not falling within project lifetime or overlapping with important project phases	WP10, WP11, WP12	To avoid this risk, a first draft dissemination plan will already be made available internally before M5, so each representative can promote properly the project results.	Without a clear plan, the project may miss important events, etc that are crucial for project's dissemination.
15	Dissemination of project results is insufficient to create impact	WP10, WP11, WP12	Dissemination will be reviewed regularly. If the impact is not sufficient, remedial measures will be proposed the consortium	
U1	Laser upgrade of the multi-laser system, damage to fibers and collimators	WP4	Plan the upgrade and the work procedure well. Follow instructions from supplier.	If not monitored closely, the impact of project cannot be achieved as desired.
U2	Suffocation hazard from low oxygen atmosphere in relation to activities done during or after titanium builds.	WP4	1. Plan each step of operating the argon system. 2. Each operator wears an oxygen sensor in chest height that alarms at 19 % Oxygen or lower. 3. Make procedures for O2 alarms.	Suffocation leading to brain damage or death.

3. Data Management Plan (DMP)

Executive summary

The ALABAMA project, as part of the EU Horizon initiative, actively participates in the open research data action. This document aims to outline the guidelines for dataset collection, storage, preservation, and the sharing policies that will be adopted to make these datasets available to the research community. Effective data management is crucial for European projects, ensuring the long-term preservation and accessibility of data during and after the project's completion.

The current version (M6) of Deliverable 10.2 presents the preliminary Data Management Plan (DMP) for the project. It details the consortium's agreements on data management, exploitation, and protection, and provides an overview of the policy regarding technical and personal data, in compliance with the FAIR (Findable, Accessible, Interoperable, Reusable) principles for datasets and GDPR for personal data.

Additionally, the DMP outlines the procedures for handling and maintaining datasets during and after the project. It includes plans to mitigate any risks of data loss or other threats that could compromise the usability or legibility of the data.

The project's efforts in open research data are outlined with particular attention to the following issues:

- **Types of Data**: The project specifies the open and non-open data that will be generated or collected by the consortium.
- **Preservation Technologies and Infrastructures**: The technologies and infrastructures to be used for long-term data preservation are detailed.
- **Standards**: Any standards that may be applied to further formalise the data are identified.
- **Data Exploitation Plans**: The project outlines a plan for the exploitation of the data.
- **Sharing and Access Policies**: The sharing and access policies for each dataset are explained.
- **Lessons Learned**: The document includes insights and lessons learned throughout the project.
- **Deliverables and Guidelines**: It references related deliverables and documents providing guidelines.

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3.1. Introduction

The European Commission has set the ambitious goal of the 'European Open Science Cloud' to provide a trusted environment for hosting and processing research data, thereby supporting the EU's leading role in global science. SINTEF, as the coordinator, along with all consortium members, is dedicated to fostering open and transparent science. The project emphasizes the early and open sharing of research through methods such as pre-registration, registered reports, preprints, and crowdsourcing, except for data that might affect the future commercialization of ALABAMA solutions and its individual results/services (including critical components, materials, and tools).

All future exploitation activities of the research outputs will be conducted under fair and reasonable conditions. ALABAMA partners are committed to the rapid and broad exploitation of project results. A public version of the ALABAMA platform will be made freely accessible to researchers and academia (for non-commercial activities) via the TVS or project website. Whenever possible, ALABAMA will follow a green open-access approach and will establish an online repository to manage and publish materials with varying access permissions. This repository will provide open access to peer-reviewed publications, shareable scientific research data, deliverables, and other project-generated materials.

The project will utilise Zenodo as a reference platform, allowing for the deposition of publications and data, while offering tools to link them. ALABAMA partners are committed to maximising the impact of the project's results through an Open Access approach, which will enhance the dissemination and exploitation of project outputs. High-impact open-access journals and conferences (Gold Open Access) will be targeted for dissemination. Given the complexity of Open Access publication rights, the partners will follow the green road, relying on their internal open-access consultant offices.

Research data management and management of other research outputs

ALABAMA is committed to Open Science and Open Data as mechanisms to ensure that society benefits from our research investments. Data management will be integrated into WP10-WP12 activities through tasks T10.5, T11.4, and T12.4, in parallel with project coordination and dissemination activities. We will adhere to the FAIR Data Management guidelines, the Rules on Open Access to Scientific Publications and Open Data Access to Research Data in H2020, and the data management guidelines established for Horizon Europe. The data management plan will encompass:

1. The handling of research data during and after the project.
2. The types of data to be collected, processed, and generated.
3. The methodologies and standards to be applied.

4. The criteria for data sharing and open access.
5. The curation and preservation strategies for data, including post-project.

ALABAMA may need to impose open access restrictions on certain data. These restrictions, overseen by the appointed Data Manager, will be assessed based on:

- Confidentiality and IP protection for specific deliverables, datasets, and outputs (e.g., underlying algorithms and methods susceptible to patents).
- Compliance with Directive 95/46/EC and GDPR Regulation 2016/679 for any sensitive or personal data collected during the project (e.g., contact leads in dissemination activities), considering consent, breach notification, right to access, and right to be forgotten.
- Protection of IP rights for pre-existing, non-public datasets applicable to dissemination materials.

To efficiently manage all data and potential exceptions to the open access policy, ALABAMA will deliver the first draft of the Data Management Plan (DMP) in M6 (T10.5, D10.2). The DMP will analyze each dataset's relation to the project's exploitable outputs to understand the limitations of the open access rule, if applicable, and its impact on exploitation and dissemination strategies.

We will strictly adhere to ethical guidelines for AI development and use. During the project, especially when exchanging technical information and results (both tangible and intangible), all project partners agree to comply fully with relevant export rules and regulations.

The Data Management Plan (DMP) is a formal document that outlines the management of datasets within the ALABAMA project, both during its duration and after its completion. Its initial objective is to provide comprehensive guidelines on data collection, persistence, and sharing. However, the DMP is a living document that will be regularly updated to support the data management lifecycle. By the end of the project, it will serve as the reference document for future data and information exploitation.

The DMP aims to identify all datasets that will be collected, generated, and used by the project, and for each dataset, it will define the following, if possible:

- Name, reference, and description.
- Users and companies involved.
- Standards and metadata.
- Methods of data generation, processing, and sharing during the project.
- Methods of data saving, persistence, and preservation during and after the project.
- Data sharing policy post-project.

All procedures outlined in the DMP comply with European Commission guidelines and regulations, including the European General Data Protection Regulation (GDPR) 2016/679, as stipulated in the Grant Agreement, and the Findable, Accessible, Interoperable, and Re-usable (FAIR) principles. This document is part of the activities of Task 10.5 (M1 – M12).

3.2. Data Summary

3.2.1. Datasets Purposes

The ALABAMA project aims to develop three innovative adaptive laser beam-shaping technologies that tailor photons both spatially and temporally. Additionally, three monitoring techniques integrated with a closed-loop (CL) control system will adapt process parameters to enhance stability and robustness. Advanced physics-based models combined with Machine Learning (ML) algorithms will generate reference values for the control system and optimisation of processes.

The project will also employ advanced Quality Assurance (QA) and metrology techniques for process and product optimisation. A digital product passport-based platform will be developed and interfaced with ontology-based standards to ensure the interoperability of digital tools and QA-Metrology data. The developed technologies will be demonstrated at the industrial level, with results validated using advanced QA methods and verified through detailed inspections at Original Equipment Manufacturers (OEMs).

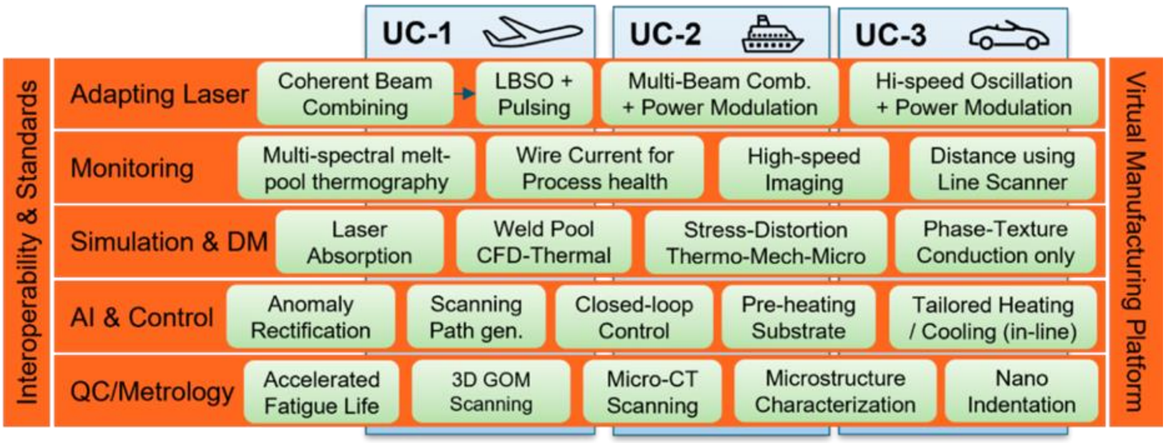

Figure 2: ALABAMA platform framework representation

3.2.2. Data Groups

The datasets generated in the ALABAMA project fall into several general categories:

1. **Monitoring and Evaluation**: These datasets track the project's progress, key performance indicators, impact of interventions, and ensure that project objectives are met.
2. **Research and Analysis**: Data is collected to support research activities, providing a basis for analysing the effectiveness of different strategies and approaches used in the project. This helps in understanding success factors and challenges faced during implementation.

3. **Reporting and Compliance**: These datasets serve as the foundation for reporting to stakeholders, including funding agencies, partners, and regulatory bodies. Accurate data collection and management demonstrate compliance with project requirements and ensure transparency in operations.
4. **Decision Support**: Data generated from the project informs decision-making processes. This includes adjusting project activities, allocating resources effectively, and planning future interventions based on empirical evidence.
5. **Stakeholder Engagement**: These datasets help engage various stakeholders by providing relevant information about the project. Sharing progress reports, success stories, and areas needing attention fosters collaboration and support from all involved parties.
6. **Documentation and Knowledge Sharing**: Collected data contributes to the documentation of the project's processes and outcomes. This knowledge can be shared with other organisations, communities, and stakeholders to replicate successful strategies and avoid common pitfalls.

More specifically, ALABAMA will apply the concept of knowledge representation through ontologies. A methodological approach adapted from the NeOn Methodology will guide common scenarios during ontology development, including identifying the ontology domain and scope, reviewing, reusing, and merging ontological resources, and developing Digital Product Passports (DPPs). DPP information will be shared with users through APIs with proper access control and authorization. This document will contain manufacturer/remanufacturer information, properties (physical, chemical, mechanical, tribological, metallurgical, etc.), CAD files, and energy and resource footprints. Unique instances of DPPs cover manufacturing and remanufacturing activity around a specific product/component, ensuring traceability with the product/component's history.

DPPs will be tamper-proof, decentralised, and secure using blockchain technology. When its properties of decentralisation, immutability, transparency, and security are combined, a notion of “trustlessness” is created. This will provide a single source of truth for the supply chain. DPPs enabled by blockchain can improve supply chain transparency, reduce waste, and increase sustainability. Data will be kept confidential and securely referenced off-chain using zero-knowledge proofs and smart contracts. Additionally, cryptographic techniques such as ring signatures, homomorphic encryption, and public-key encryption will ensure that only intended recipients can access the data.

Other relevant types of datasets for the ALABAMA platform include:

1. **Product Identification Datasets**: Unique identifiers, product codes, and serial numbers to ensure each product can be uniquely and accurately identified.

2. **Manufacturing Datasets**: Information on the manufacturing process, including production dates, locations, and materials used, which is essential for tracking product origin and production details.
3. **Supply Chain Datasets**: Details of the supply chain journey, including transportation, storage conditions, and handling practices, important for ensuring transparency and traceability.
4. **Compliance and Certification Datasets**: Records of compliance with regulatory standards, certifications obtained, and inspection results, necessary for verifying product compliance and quality standards.
5. **Maintenance and Repair Datasets**: Information on maintenance activities, repairs performed, and parts replaced, useful for tracking product lifespan, performance issues, and repair history.
6. **Usage and Performance Datasets**: Data on product usage patterns, performance metrics, and user feedback, which help assess product performance, identify common issues, and improve product design.
7. **Material Composition Datasets**: Detailed information about the materials used in the product, including type, grade, and source, important for assessing product quality, sustainability, and compliance with regulations.
8. **Material Certification Datasets**: Records of certifications and standards that the materials meet (e.g., ISO, RoHS, REACH), ensuring compliance with industry standards and environmental regulations.
9. **Material Properties Datasets**: Physical and chemical properties of the materials, such as strength, durability, and toxicity, helping to understand material performance and suitability for specific applications.
10. **Material Usage Datasets**: Data on how materials are used within the product, including quantities and specific parts/components, useful for lifecycle analysis and recycling purposes.
11. **Environmental Impact Datasets**: Data on the environmental footprint of materials, including carbon emissions, energy usage, and waste generation, important for sustainability assessments and reporting.

3.2.3. Formats and Standards

When it comes to binary data (files) within the ALABAMA project, we anticipate encountering the following unstructured data formats:

1. **Spreadsheets**:
   - **Formats**: Microsoft Excel (.xls, .xlsx)
   - **Usage**: Commonly used by organisations to store information in a tabular format. Data can often be used immediately, but spreadsheets containing macros and formulas might require additional handling.
2. **Comma Separated Values (CSV)**:
   - **Formats**: .csv

  - **Usage**: Useful for transferring structured data. However, the format is limited and often requires accompanying documentation or metadata to interpret the significance of each column accurately.

3. **Text Documents**:
   - **Formats**: DOCX, RTF, ODF, PDF
   - **Usage**: Suitable for various documents such as scientific journals, deliverables, and reports.
4. **Presentations**:
   - **Formats**: PPTX
   - **Usage**: Commonly used for project slideshows and presentations in Microsoft PowerPoint.
5. **Image or Photo Formats**:
   - **Formats**: .jpg, .png
   - **Usage**: Composed of digital data for display on computer screens or printers. These formats can store data in uncompressed, compressed, or vector formats.

Below is a list of information exchange standards commonly used by European industries and in Horizon projects. The specific standards to be used will be determined through a common agreement among consortium members and based on the requirements provided by the project pilots:

Table 2: Standard data formats with descriptions

No.	Standards/ Data Formats	Description
1	ISO/IEC 21778:2017 – JSON	JSON (JavaScript Object Notation) is a lightweight text-based syntax that facilitates the data exchange between all programming languages. JSON defines a small set of rules to structure data. It is a common data format used in electronic and web applications data exchange.
2	HDF5	HDF5 (Hierarchical Data Format) is a data model, library, and file format designed to store and manage large amounts of data. It is very flexible since it supports an unlimited variety of data types and is portable and extensible.
3	XML	XML (Extensible Markup Language) is a markup language and file format for storing and transporting data. XML standardises the information exchange between two systems.

4	ISO/IEC 15445:2000 – HTML	HTML (HyperText Markup Language) is a markup language to display information in a web browser. HTML defines how to structure a web page and its content.
5	ISO/IEC 15948:2004 – PNG	PNG (Portable Network Graphics) is a bitmap file format for a lossless, portable, compressed individual computer graphics image transmitted across the Internet.
6	JPEG	JPEG (Joint Photographic Experts Group) is a file format for digital images common for photo storage and web development.
7	ISO/IEC 20922:2016 – MQTT	MQTT (Message Queuing Telemetry Transport) is a lightweight, open, and simple messaging transport protocol. MQTT is commonly used for communication in the Machine to Machine (M2M) and Internet of Things (IoT) contexts.
8	IEC 62541 – OPC-UA	OPC-UA (OPC Unified Architecture) is a standard for data exchange from sensors to cloud applications. OPC-UA is open source with data models freely available for several types of industrial equipment.
9	IEC 61784 – Modbus	Modbus is an open-source data communication protocol developed for industrial applications for connecting electronic devices. Modbus is simple and easy to deploy, placing few restrictions on the data format to be transferred.
10	ISO 10303-21 – STEP or STP	STEP is a file format developed to easily represent and exchange 3D objects in computer-aided design with related information.
11	STL	STL is the most common file format for 3D objects. STL is simple and storage-efficient and can be easily imported and managed by different CAD software and 3D printing software.
12	DWG	DWG is a binary file format used to store 2D and 3D designs. DWG is the native format for AutoCAD and is widely used for CAD drawings.
13	ISO 10303	ISO 10303 is an International Standard for the computer-interpretable representation of product information and the exchange of product data. The objective is to provide a neutral mechanism capable of describing products throughout their life cycle. This mechanism is suitable not only for neutral file exchange, but also as a basis for implementing and sharing product databases, and as a basis for archiving. The information generated about a

		product during its design, manufacture, use, maintenance, and disposal is used for many purposes. To support such uses, organisations need to be able to represent their product information in a common computer-interpretable form that is required to remain complete and consistent when exchanged among different computer systems.
14	ISO/ASTM 52950:2021	Additive Manufacturing – General Principles – Overview of Data Processing Provides an overview of data processing principles in additive manufacturing, standardising the handling and preparation of data for 3D printing.
15	ISO 13584 (PLIB)	Parts Library Standardised. The representation of parts information, which can be utilised in developing ontologies for parts and components in manufacturing.
16	NIST AMCOE (Additive Manufacturing Conceptual Ontology)	An ontology developed by the National Institute of Standards and Technology (NIST) to support data interoperability and integration in additive manufacturing.
17	ISO/ASTM 52915:2020	Additive Manufacturing – Data Formats – Specification for Additive Manufacturing File Format (AMF) Version 1.2 Defines the AMF file format, which standardised how geometric and material data are represented in additive manufacturing files.
18	ISO/ASTM 52900:2015	Additive Manufacturing – General Principles – Terminology Provides standard terminology for additive manufacturing technologies, which is foundational for developing ontologies in this field.
19	ISO/ASTM 52915:2016	Standard Specification for Additive Manufacturing File Format (AMF) Version 1.2 Specifies the AMF file format for additive manufacturing, which includes geometry, material, colour, and metadata. This standard supports the creation of structured data models.
20	ISO/ASTM 52921:2013	Standard Terminology for Additive Manufacturing – Coordinate Systems and Test Methodologies

		Defines terms and concepts related to coordinate systems, building directions, and test methodologies, essential for developing consistent ontologies.
21	ISO/ASTM 52910:2018	Additive Manufacturing – Design – Requirements, Guidelines, and Recommendations Provides guidelines for designing parts for additive manufacturing, influencing the development of design-related ontologies.
22	ISO 14731:2019	Welding Coordination – Tasks and Responsibilities Specifies the tasks and responsibilities of personnel involved in welding, which can be structured into an ontology for welding processes.
23	ISO 15607:2019	Specification and Qualification of Welding Procedures for Metallic Materials – General Rules Defines the rules for the specification and qualification of welding procedures, which can be used to create procedural ontologies.
24	ISO 2553:2019	Welding and Allied Processes – Symbolic Representation on Drawings – Welded Joints Standardises the symbolic representation of welded joints on drawings, aiding in the development of ontologies for welding documentation.
25	ISO 9606-1:2017	Qualification Testing of Welders – Fusion Welding – Part 1: Steels Specifies the requirements for welder qualification tests, which can be incorporated into skill and competency ontologies.
26	ISO 15609-1:2019	Specification and Qualification of Welding Procedures for Metallic Materials – Welding Procedure Specification – Part 1: Arc Welding Standardise the format and content of welding procedure specifications (WPS), ensuring consistent documentation of welding processes and parameters.
27	ISO 15614-1:2017	Specification and Qualification of Welding Procedures for Metallic Materials – Welding Procedure Test – Part 1: Arc and Gas Welding of Steels and Nickel Alloys Standardised the qualification testing of welding procedures, ensuring consistent recording and reporting of test results.

28	ISO 9606-1:2017	Qualification Testing of Welders – Fusion Welding – Part 1: Steels Specifies standardised testing requirements for the qualification of welders, ensuring consistency in the documentation of welder qualifications.
29	ISO 3834-2:2005	Quality Requirements for Fusion Welding of Metallic Materials – Part 2: Comprehensive Quality Requirements Standardises the quality requirements for fusion welding processes, including documentation and data recording practices.

The ALABAMA project will apply these standards and formats in various contexts, including data collection, storage, processing, and sharing. These standards will be selected and applied based on consensus among the consortium members and aligned with the needs identified during the pilot phases of the project. The choice of standards ensures that data remains interoperable, secure, and compliant with industry and regulatory requirements. This approach fosters collaboration, enhances data integrity, and supports the project's overall goals of innovation and technological advancement.

3.3. F.A.I.R Principles in ALABAMA Project Data Management

3.3.1. Introduction

In the ALABAMA project, the management of research data is guided by the F.A.I.R principles—Findable, Accessible, Interoperable, and Reusable. These principles ensure that the data generated and collected throughout the project lifecycle is managed in a way that maximises its value and utility for the research community and other stakeholders.

While the F.A.I.R principles do not prescribe specific technologies or standards, the ALABAMA project will adopt various best practices and tools to operationalize these principles:

- **Persistent Identifiers**: Use of DOIs or other persistent identifiers to ensure data can always be found and cited.
- **Metadata Standards**: Adoption of metadata standards such as Dublin Core or DataCite to describe datasets consistently.
- **Data Repositories**: Use of recognized data repositories like Zenodo or institutional repositories that support open access and long-term preservation.
- **Interoperability Standards**: Utilisation of interoperability standards like JSON, XML, and APIs to facilitate data exchange and integration.
- **Documentation**: Providing extensive documentation, including user guides, data dictionaries, and example workflows to assist users in understanding and reusing the data.

By adhering to these principles and practices, the ALABAMA project ensures that its research data will be easily discoverable, accessible to a broad audience, interoperable with various systems, and reusable in diverse contexts, thereby maximising its impact and contribution to the scientific community and beyond.

3.3.2. Findable Data

In the ALABAMA project, ensuring that research data is findable involves systematic practices for data storage, identification, and accessibility. Here's how the project achieves these objectives:

Storage in Open-Access Repositories

1. **OpenAIRE Integration**: Datasets generated within the ALABAMA project will be stored in open-access repositories aligned with OpenAIRE guidelines. OpenAIRE is an EC-funded initiative supporting Open Access policies across Europe.
2. **Persistent Identifiers (PIDs)**: Each dataset will be assigned a Persistent Identifier (PID), typically in the form of a Digital Object Identifier (DOI). DOIs ensure unique identification and facilitate easy citation of ALABAMA findings and research data.
3. **Trusted Repositories**: Datasets will be deposited in trusted repositories like Zenodo, which provides DOIs for deposited datasets. This ensures long-term accessibility and preservation of the data.

Unique Naming and Identification

1. **Unique Name and ID**: Every dataset within the ALABAMA project will have a distinct name and ID. This ensures clarity and differentiation among various datasets used, processed, or generated during the project.
2. **Naming Convention**: All data files will follow a consistent naming convention:
    - **Prefix**: Each file will start with "ALABAMA".
    - **Content Descriptor**: Briefly describes the content of the dataset.
    - **Version Number or Date**: Indicates the version or date of the dataset.
    - **Organisation Short Name**: Optionally includes the short name of the relevant organisation.

    Example: ALABAMA_content-descriptor_v1.0_SIN.csv

Handling Different Data Formats

1. **Transformation Criteria**: Certain data, such as reports, surveys, or raw data in spreadsheets, text, or presentation formats, may not initially conform to preferred storage formats. In such cases, transformation criteria will be defined to convert data into suitable formats for long-term storage and accessibility.

Metadata and Description

1. **Comprehensive Metadata**: Each dataset will be accompanied by comprehensive metadata detailing its content, context, and characteristics. Metadata enhances discoverability and understanding of the dataset's relevance and usage.
2. **Brief Description**: A concise description will summarise each dataset's purpose and key attributes, aiding researchers in quickly assessing its suitability for their needs.

By implementing these practices, the ALABAMA project ensures that its research data is findable, accessible, interoperable, and reusable (FAIR). These measures not only comply with Open Access policies and standards but also enhance transparency, facilitate collaboration, and maximise the impact of ALABAMA project outcomes within the research community.

3.3.3. Accessible Data

Accessibility of data in the ALABAMA project is crucial to maximise its impact and ensure transparency and collaboration within the research community. Here's how the project ensures data accessibility:

Green Open-Access Approach

1. **Online Repository**: ALABAMA will establish an online repository dedicated to managing and publishing project materials. This repository will accommodate various access permissions, including:
    - Open access to peer-reviewed publications.
    - Shareable scientific research data.
    - Project deliverables and other generated materials.
2. **Commitment to Open Access**: Project partners are committed to the green open-access approach, which prioritises free access to research outputs. This approach aims to maximise the dissemination and utilisation of project results.
3. **Dissemination Strategies**: High-impact dissemination channels, such as open-access journals and conferences (Gold Open Access), will be targeted to amplify the visibility and reach of ALABAMA's findings. These channels enhance the project's influence and promote broader engagement with the research community.
4. **Internal Open Access Expertise**: Recognizing the complexity of Open Access publication rights, ALABAMA partners will leverage internal Open Access consultant offices. These experts will navigate and ensure compliance with Open Access policies and guidelines, facilitating effective dissemination strategies.

Data Sharing Policies

1. **Defined Sharing Policies**: ALABAMA will establish clear policies for sharing both open and non-open data. These policies will ensure:
    - Preservation of data integrity throughout the project duration and beyond.
    - Availability of data to interested parties, fostering ongoing research and collaboration.
2. **Long-Term Accessibility**: The project is committed to preserving data accessibility beyond the project's lifespan. This ensures that research outputs remain available for future analysis and reference, contributing to the continuity of scientific inquiry and knowledge advancement.

By adhering to these principles and strategies, ALABAMA ensures that its research data is accessible, both during and after the project. Through robust Open Access practices and defined sharing policies, the project promotes transparency, facilitates collaboration, and maximises the societal impact of its innovations in adaptive laser beam-shaping technologies and related research outcomes.

3.3.4. Interoperable data

Interoperability of data in the ALABAMA project is essential to facilitate seamless data exchange and reuse among project partners and stakeholders. Here is how the project ensures data interoperability:

Common Formats and Standards

1. **Community-Agreed Schemas**: ALABAMA relies on common formats, community-agreed schemas, controlled vocabularies, keywords, thesauri, and ontologies wherever possible. These standards ensure that data is structured uniformly and can be integrated with other datasets, applications, and workflows.
2. **Data and Metadata Vocabularies**: Throughout the project, ALABAMA defines data and metadata vocabularies, standards, and methodologies. These guidelines ensure that all project data adheres to interoperability requirements, allowing for seamless exchange and reuse among partners.
3. **Standard Vocabularies**: The project prioritises the use of standard vocabularies across all data types to promote interdisciplinary interoperability. When project-specific ontologies or vocabularies are necessary, mappings to more commonly used ontologies will be provided. This approach facilitates integration with existing frameworks and enhances data usability.

Principles for Interoperable Data

1. **Structured Data**: ALABAMA structures its data using well-defined schemas or formats. This practice ensures consistency and clarity in data representation, facilitating integration across diverse systems and applications.
2. **Adherence to Standards**: The project adheres to common data standards and ontologies within its domain or industry. This adherence ensures that data can be understood and utilised by different stakeholders, enhancing collaboration and data exchange.
3. **Standardised Data Formats**: Standard formats are used for timestamps, units of measurement, and other relevant data components. This standardisation simplifies data processing and interpretation, reducing compatibility issues across platforms.
4. **Clear Documentation**: Comprehensive documentation accompanies all datasets, explaining their structure, semantics, and relationships. This documentation aids in understanding the data’s meaning and facilitates its integration into various systems and workflows.

By implementing these strategies and principles, ALABAMA ensures that its research data is interoperable across different disciplines, applications, and stakeholders. This approach promotes collaboration, enhances data reuse, and maximises the impact of the project’s outcomes in the field of adaptive laser beam-shaping technologies and related research domains.

3.3.5. Reusable data

Ensuring the reusability of research output is a critical aspect of the ALABAMA project. Here's how the project supports data reusability:

Licensing for Data Sharing and Reuse

1. **Creative Commons Licences**: ALABAMA adopts Creative Commons licences, such as CC BY (Attribution), CC BY-SA (Attribution-ShareAlike), or CC0 (Public Domain Dedication), for datasets wherever applicable. These licences promote open access to data while allowing others to freely use and build upon the research outputs, with appropriate attribution.
2. **Open Data Commons**: The project considers licences from the Open Data Commons, which provide legal tools to support the open sharing of data and ensure that datasets are accessible for reuse under specified conditions.

Availability of Tools and Software

1. **Data Generation Tools**: ALABAMA ensures that tools and software used for data generation are documented and made available. This accessibility enables others to replicate experiments, validate findings, and generate new datasets using established methodologies.
2. **Validation and Interpretation Tools**: Tools and software used for data validation, interpretation, and analysis are also made available. This availability supports transparency and reproducibility, allowing researchers to verify results and derive new insights from existing data.
3. **Reuse of Models and Algorithms**: The project encourages the reuse of models and algorithms developed during research activities. These resources are documented and provided in a manner that facilitates integration into other projects or applications, enhancing their utility and applicability beyond the ALABAMA project.

Principles for Data Reusability

1. **Documentation and Metadata**: Comprehensive documentation accompanies datasets, describing their structure, methodology, and context. Metadata standards are employed to enhance discoverability and facilitate understanding, ensuring that datasets can be effectively reused by others.
2. **Standardised Formats**: ALABAMA employs standardised data formats and protocols wherever possible. This practice simplifies data access and compatibility across different platforms and systems, reducing barriers to reuse.

By adopting clear licensing strategies, ensuring tool availability, and adhering to principles that promote data transparency and compatibility, ALABAMA supports the reusability of its research outputs. These efforts contribute to advancing scientific knowledge, fostering collaboration, and maximising the impact of the project's findings in the field of adaptive laser beam-shaping technologies and related disciplines.

3.3.6. Ethics and GDPR

The ALABAMA project prioritises ethical standards and compliance with the General Data Protection Regulation (GDPR) and Protection of Personal Data (POPD) in handling personal datasets. Here's how these principles are integrated into the project:

Data Collection and Handling

1. **Purpose Limitation**: Personal datasets, including email addresses gathered for event registrations, email lists management, interviews, and surveys, are collected solely for specific project-related purposes within ALABAMA.
2. **Data Protection Description (DPD)**: A Data Protection Description (DPD) is created for each dataset that contains personal information. This document outlines how the data will be processed, stored, and protected in accordance with GDPR requirements.
3. **Anonymization**: When surveys are conducted, measures are implemented to ensure optimal anonymization of collected, analysed, and stored data. This helps protect the privacy of participants by dissociating their identity from their responses wherever possible.
4. **Informed Consent**: Participants, including interviewees, beneficiaries, and recipients of surveys, are informed about the data handling practices. They are explicitly asked for their consent when necessary, ensuring transparency and respecting their rights regarding data use.

Data Use and Sharing

1. **Project-exclusive Use**: All personal datasets collected within ALABAMA are used exclusively for project-related activities. They are not shared with any external physical or legal entities outside the project scope**.**
2. **Non-commercial Use**: Personal data collected will not be used for commercial purposes. This ensures that the privacy and rights of individuals are protected, and their data is not exploited for profit.

Compliance with GDPR and POPD

1. **GDPR Compliance**: ALABAMA strictly adheres to the GDPR guidelines regarding the collection, processing, storage, and protection of personal data. This includes implementing necessary technical and organisational measures to ensure data security and privacy.

2. **Protection of Personal Data (POPD)**: In addition to GDPR, ALABAMA respects local regulations and guidelines related to the protection of personal data, ensuring comprehensive compliance across all project activities.

By integrating ethical standards and GDPR compliance into its data handling practices, ALABAMA demonstrates its commitment to protecting the privacy and rights of individuals involved in the project. These measures not only uphold legal obligations but also foster trust and transparency among participants, stakeholders, and the broader research community.

3.3.7. Data Security

In the ALABAMA project, robust data security measures are implemented to safeguard information integrity, confidentiality, and accessibility throughout the project lifecycle. Here's an overview of the data security strategies employed:

Blockchain Technology Integration

1. **Tamper-Proof and Decentralised Digital Product Passport**: Blockchain technology is utilised to create a tamper-proof and decentralised digital product passport. This passport serves as a secure and transparent ledger that tracks and verifies a product's journey through the supply chain. The immutability of blockchain ensures that once data is recorded, it cannot be altered retroactively without consensus, enhancing data integrity.
2. **Single Source of Truth**: Blockchain provides a single source of truth for all stakeholders involved in the supply chain. This improves transparency by allowing authorised parties to access authenticated and reliable data regarding the product's origin, manufacturing process, and distribution history.

Benefits of Blockchain-Enabled Digital Product Passports

1. **Supply Chain Transparency**: By leveraging blockchain, ALABAMA enhances supply chain transparency. Stakeholders can trace the entire lifecycle of a product, including its components, materials, and manufacturing processes, promoting accountability and reducing the risk of counterfeit or substandard products.
2. **Waste Reduction and Sustainability**: The transparency and traceability facilitated by blockchain contribute to reducing waste and increasing sustainability efforts within the supply chain. This is achieved by optimising resource utilisation and enabling more efficient recycling and reuse practices.

Data Confidentiality and Access Control

1. **Confidentiality with Zero-Knowledge Proofs**: To maintain data confidentiality, ALABAMA employs zero-knowledge proofs. This cryptographic technique allows verification of information without revealing the actual data, ensuring that sensitive information remains private.
2. **Smart Contracts for Secure Transactions**: Smart contracts deployed on the blockchain facilitate secure and automated transactions. They enforce predefined rules and agreements between parties involved in data access and transactions, enhancing security and reliability.
3. **Cryptographic Techniques**: Additional cryptographic methods such as ring signatures, homomorphic encryption, and public-key encryption are used to secure data access and communication. These techniques ensure that only authorised parties can access specific datasets, and that data exchanged remains secure against unauthorised access or tampering.

By integrating blockchain technology and advanced cryptographic techniques, ALABAMA ensures robust data security throughout its project activities. These measures not only protect sensitive information but also promote transparency, efficiency, and sustainability within the supply chain. By adhering to these best practices, ALABAMA strengthens its data management framework and upholds its commitment to ethical and secure handling of data.

3.4. Datasets

Task 2.2, 3.1, 3.2

		Dataset 1	Dataset 2
TASK(S) N°	*Indicate the Task(s) where your data will be generated or re-used*	Smart contract data	Digital Product Passports
Codes	*Type and format*	SHA-256, which stands for Secure Hash Algorithm 256-bit, is a cryptographic hash function that is widely used in various security applications and protocols, including TLS and SSL and Blockchains. It is part of the SHA-2 family, developed by the National Security Agency (NSA) of the United States.	JSON
	Description *(Brief description of dataset)*	Anchoring of chain data to the blockchain	Dataset for the remanufacturing of rail axle, steel rollers for steel manufacturing application, propeller blade for marine application & a part for automotive applications will be represented through Digital Product Passports

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		Purpose *(What is the purpose of your data and its relation to the objectives of the project?)*	Data authenticity	To develop Digital Product Passport application for each remanufactured products containing General Product & Manufacturer Information, Materials & Composition, Value Chain Traceability, Environmental & Social Impact, Circularity & EOL Management, Compliance, Labels, Certifications and Manuals, and Performance Parameters.
		Origin	Digital Product Passport (DPP)	Application and domain ontologies from T3.1
		Expected size	TBD in future	~100 kB per passport
		Reuse *(Is your data generated or re-used?)*	Generated	Generated
		Utility *(To whom might your data be useful, outside the project?)*	Economic operator, Value chain actors	Economic operator, Value chain actors
FAIR DATA	**FINDABLE**	***Identification*** *(Are your data identified by a persistent identifier?)*	SHA256 Hash	UUID
		Metadata *(Are the data discoverable by using metadata? Possible keywords for metadata)*	Not applicable	Yes. Title, ID, Materials, Process, LCA parameters
		Standards *(What disciplinary or general standards will be followed?)*	FIPS PUB 180-2	Ecodesign for Sustainable Products Regulation (ESPR). Once passed the COM/2022/142 final will replace directive 2009/125/EC
	ACCESSIBLE	***Repository*** *(Will your data be deposited in a trusted repository?)*	Yes. Anchor of data will be published in the public blockchain in SHA256 format	Yes. Data will be stored in encrypted and secured database

		Availability *(Will your data be made openly available? If certain datasets cannot be shared (or need to be shared under restrictions), explain why, clearly separating legal and contractual reasons from intentional restrictions)*	Not applicable, SHA256 format will be used to check the off-chain data authenticity which will be accessed through DPP application based on access level of the users.	Some data will be made public according to the ESPR directives suggestions. Other data will be accessible to authorised users only through standard authentication process.
		Access *(If there are restrictions on use, how will access be provided? ; Is there a need for a data access committee: e.g. to evaluate/approve access requests to personal/sensitive data?)*	Not applicable, SHA256 format will be used to check the off-chain data authenticity which will be accessed through DPP application based on access level of the users.	Differential access will be provided through DPP applications. Persons with legitimate interests and the Commission will have access through standard authentication process.
	INTEROPERABLE	***Interoperability*** *(What data and metadata vocabularies, standards or methodologies will you follow to make your data interoperable to allow data exchange and re-use between researchers, institutions, organisations across disciplines?)*	Not applicable	We will use semantic web technologies like RDF (Resource Description Framework) and OWL (Web Ontology Language), to define a schema for DPP that ensures data consistency and compliance. This schema serves as a blueprint for validating and storing DPP data in databases, enhancing data integrity and facilitating its reusability across various platforms and stakeholders. This structured approach significantly aids in achieving interoperability, crucial for seamless data exchange and collaboration.

	RE-USE	***Documentation*** *(Will you provide documentation needed to validate data analysis and facilitate data re-use? If yes, what kind of documentation (e.g. readme files with information on methodology, codebooks, analyses, variable definitions, etc.)?)*	Not applicable	Not Applicable
		Third party *(Are your data useable by third parties, in particular after the end of the project? If the re-use of some data is restricted, explain why)*	Not applicable	Yes.
		Quality assurance *(Describe, if it exists, data quality assurance process)*	Not applicable	Data will be validated before publishing a DPP through the DPP application.
DATA SECURITY		***What provisions are in place for data?*** *(including data recovery as well as secure storage and transfer of sensitive data)*	SHA-256 is suitable for various security purposes like verifying data integrity, securing password storage, and digitally signing documents. The function is designed to be fast and secure, which is why it is used extensively in the digital world for ensuring the authenticity and integrity of data.	Data will be stored in a secured cloud server managed by TVS with backup and encryption-enabled servers.
		Will the data be safely stored in trusted repositories for long-term preservation and curation?	Yes. Anchor of data will be published in the public blockchain in SHA256 format	Yes.
ETHICS		*Are there, or could there be, any ethics or legal issues that can have an impact on data sharing? These can also be discussed in the context of the ethics review. If relevant, include references to ethics deliverables and the ethics chapter in the Description of the Action (DoA).*	No	Not Applicable
		Will informed consent for data sharing and long-term preservation be included in questionnaires dealing with personal data?	Not Applicable	Not Applicable

Task 4.1

		Dataset 1	Dataset 2	Dataset 3		Dataset 4
TASK(S) N°	*ontologies play a role in all tasks in WP4*	Design data:	Thermal data:	Process parameter data:	Mechanical testing data	Microstructure data:
Codes	*Type and format*	STL, 3MF, STEP	Video data, IRB-files and ravi	Standard Excel-sheet	Excel-sheets	Image files
	Description *(Brief description of the dataset)*	Test designs for microstruct ure and mechanica l properties	Video data of the wavelength and intensity leading to thermal images	Process specific data for testing. Laser Power, traverse speed, build strategy, laser formation strategy, wire feed speed, hatch spacing and much more.	The measured mechanical properties of certain parameter sets will be displayed in an Excel sheet.	Images of microstructures in the produced samples
	Purpose *(What is the purpose of your data and its relation to the objectives of the project?)*	Specificati on of test specimen design	Thermal analysis of the process	To remember what parameters that has been used for all samples.	Disseminate the test-results	
	Origin	From CAD programs	Thermal camera sensors	Written by tester	Written by tester	Any image file, SEM-analyzer, EBSD-software
	Expected size	0-100 MB per piece	0-30GB	0-1MB	0-5MB	0-300MB
	Reuse *(Is your data generated or re-used?)*	Both. Reuse of data is	Data use for AI is a possibility	Will be used for further evaluation	Will be used for further evaluation	Will be used for further evaluation

			very probable				
		Utility *(To whom might your data be useful, outside the project?)*	To understand what size of geometries we have made.	Simulation and modelling of the process and material leading to predictions	To anyone who should understand the physical testing.	To understand the material performance	To see the microstructure of the material
FAIR DATA	**FINDABLE**	***Identification*** *(Are your data identified by a persistent identifier?)*	A numbered list of the specimen design will be made.	A numbered list of the thermal video files explaining the use and connection it to the process data	The name describes the test-number, material and date	Sample number connected to the Process parameter excel-sheets	Sample number connected to the Process parameter excel-sheets
		Metadata *(Are the data discoverable by using metadata? Possible keywords for metadata)*	The list will contain the meta-data. Without the list the data is useless.	The list will contain the meta-data and will be linked through the file-name	Headlines describe the data well. A report will focus on each of the data sets.	Identification, standards, methods, equipment and notes	Identification, standards, methods, equipment and notes
		Standards *(What disciplinary or general standards will be followed?)*	Standards for mechanical testing		There exists no standard	Standards for mechanical testing	Standards for metal microstructure images.
	ACCESSIBLE	***Repository*** *(Will your data be deposited in a trusted repository?)*	At the SINTEF project folder.	Some will be available in the shared folder; some larger files will need to be stored on central hard drives with backup.	At the SINTEF project folder.	At the SINTEF project folder.	At the SINTEF project folder.

		Availability *(Will your data be made openly available? If certain datasets cannot be shared (or need to be shared under restrictions), explain why, clearly separating legal and contractual reasons from intentional restrictions)*	This data should be available to the consortium and can be shared in all disseminati on.	The raw data will be available upon request. Some of the data will be published and disseminated.	This data should be available to the consortium and can be shared in all dissemination.	This data should be available to the consortium and can be shared in all dissemination.	This data should be available to the consortium and can be shared in all dissemination.
		Access *(If there are restrictions on use, how will access be provided? ; Is there a need for a data access committee: e.g. to evaluate/app rove access requests to personal/sen sitive data?)*	No	No	No	No	No

	INTER OPER ABLE	***Interoperability*** *(What data and metadata vocabularies, standards or methodologies will you follow to make your data interoperable to allow data exchange and re-use between researchers, institutions, organisations across disciplines?)*	File-format standards for CAD-software and use with other applications.	All datasets will be standard. However, the IRB-standard format is only readable to the InfraTec-software. Reformatting the data is possible.	The data will be an understandable Excel-list	The data will be an understandable Excel-list	The data will be an understandable Excel-list
	RE-USE	***Documentation*** *(Will you provide documentation needed to validate data analysis and facilitate data re-use? If yes, what kind of documentation (e.g. readme files with*	The list will contain information about use and standards.	The list will contain information about use and standards.	A report will focus on the data sets	A report will focus on the data sets	A report will focus on the data sets

		information on methodology, codebooks, analyses, variable definitions, etc.)?)					
		Third party *(Are your data useable by third parties, in particular after the end of the project? If the re-use of some data is restricted, explain why)*	Yes, this will not be restricted.	Yes, this will not be restricted.	Yes, these are data that will be usable to anyone with the test-setup used in the project.	This will be highly usable to understand the outcome of the additive process.	This will be highly usable to understand the outcome of the additive process.
		Quality assurance *(Describe, if it exists, data quality assurance process)*	The data in different file formats will be checked in several applications that will tell if there is something wrong with the files.	The data will undergo scrutiny for its quality. Which is natural for this type of data.	Data will be analysed by several researchers.	Data will be analysed by several researchers.	Data will be analysed by several researchers.

DATA SECURITY	***What provisions are in place for data?*** *(including data recovery as well as secure storage and transfer of sensitive data)*	The servers are regularly backed up.	The servers are regularly backed up.	The servers are regularly backed up.	The servers are regularly backed up.	The servers are regularly backed up.
	Will the data be safely stored in trusted repositories for long term preservation and curation?	Yes	Yes	Yes	Yes	Yes
ETHICS	***Are there, or could there be, any ethics or legal issues that can have an impact on data sharing? These can also be discussed in the context of***	**No**	**No**	**No**	**No**	**No**

	the ethics review. If relevant, include references to ethics deliverables and ethics chapter in the Description of the Action (DoA).					
	Will informed consent for data sharing and long term preservation be included in questionnaires dealing with personal data?	**No**	**No**	**No**	**No**	**No**

Task 4.3

Work Package n°	WP4						
Task n°	Task 4.3	DRAFT	DRAFT				
Task leader contact person (Name, email)	IRIS, PAOLO CASTELLI, paolo.castelli@irissrl.eu						
		Dataset 1	**Dataset 1**	**Dataset 2**	**Dataset 3**		**Dataset 4**
TASK(S) N°	*ontologies play a role in all tasks in WP4*	Design data:	Design data:	Image data	Process parameter data:	Mechanical testing data	Microstructure data:
Codes	*Type and format*	STEP, STL	STEP, STL	Video data, avi, mp4	Standard Excel-sheet	Excel-sheets	Image files
	***Description** (Brief description of dataset)*	Test designs for microstructure and mechanical properties	design of stiffeners for preliminary testing and strategies	Video data from camera recording	Process specific data for testing. Laser Power, traverse speed, build strategy, laser formation strategy, wire feed speed, hatch spacing and much more.	The measured mechanical properties of certain parameter sets will be displayed in an excel sheet.	Images of microstructures in the produced samples

		***Purpose** (What is the purpose of your data and its relation to the objectives of the project?)*	Specification of test specimen design	Experimental testing of building strategies	melting pool analysis	To remember what parameters that has been used for all samples.	Disseminate the test-results	
		Origin	From CAD programs	From CAD programs	camera sensor	Written by tester	Written by tester	Any image file, SEM-analyser, EBSD-software
		Expected size	0-10 MB per piece	0-10 MB per piece	0-30GB	0-1MB	0-5MB	0-300MB
		***Reuse** (Is your data generated or re-used?)*	Both. Reuse of data is probable	Both. Reuse of data is probable	the data are experimentally generated	Will be used for further evaluation	Will be used for further evaluation	Will be used for further evaluation
		***Utility** (To whom might your data be useful, outside the project?)*	To fix what size of geometries we have made and use it for generating CAM programs	To fix what size of geometries we have made and use it for generating CAM programs	Process understanding e possibly simulation	To anyone who should understand the physical testing.	To understand the material performance	To see the microstructure of the material
FAIR DATA	**FINDABLE**	***Identification** (Are your data identified*	A numbered list of the specimen	A numbered list of the specimen	A numbered list of video files	The name describes the test-number,	Sample number connected to	Sample number connected to

		by a persistent identifier?)	design will be made.	design will be made.	explaining the use and connection it to the process data	material and date	the Process parameter excel-sheets	the Process parameter excel-sheets
		***Metadata** (Are the data discoverable by using metadata? Possible keywords for metadata)*	The list will contain the meta-data. Without the list the data is useless.	The list will contain the meta-data. Without the list the data is useless.	The list will contain the meta-data and will be linked through the file-name	Headlines describe the data well. A report will focus on each of the data sets.	Identification, standards, methods, equipment and notes	Identification, standards, methods, equipment and notes
		***Standards** (What disciplinary or general standards will be followed?)*	Standards for mechanical testing	Standards for mechanical testing		There exists no standard	Standards for mechanical testing	Standards for metal microstructur e images.
	ACCESSIBLE	***Repository** (Will your data be deposited in a trusted repository?)*	At the IRIS project folder.	At the IRIS project folder.	Some will be available in the shared folder, some larger files will need to be stored on central harddrives with backup.	At the IRIS project folder.	At the IRIS project folder.	At the IRIS project folder.

		***Availability** (Will your data be made openly available? If certain datasets cannot be shared (or need to be shared under restrictions), explain why, clearly separating legal and contractual reasons from intentional restrictions)*	This data should be available to the consortium and can be shared in all dissemination.	This data should be available to the consortium and can be shared in all dissemination.	The raw data will be available upon request. Some of the data will be published and disseminated.	This data should be available to the consortium and can be shared in all dissemination.	This data should be available to the consortium and can be shared in all dissemination.	This data should be available to the consortium and can be shared in all dissemination.
		***Access** (If there are restrictions on use, how will access be provided? ; Is there a need for a data access committee: e.g. to evaluate/approve access requests to personal/sensitive data?)*	No	No	No	No	No	No
	INTEROPERABLE	***Interoperability** (What data and metadata vocabularies, standards or methodologies will*	File-format standards for CAD-software and use with	File-format standards for CAD-software and use with	All datasets will be standard.	The data will be an understandable Excel-list	The data will be an understandable Excel-list	The data will be an understandable Excel-list

		you follow to make your data interoperable to allow data exchange and re-use between researchers, institutions, organisations across disciplines?)	other applications.	other applications.				
	RE-USE	***Documentation*** *(Will you provide documentation needed to validate data analysis and facilitate data re-use? If yes, what kind of documentation (e.g. readme files with information on methodology, codebooks, analyses, variable definitions, etc.)?)*	The list will contain information about use and standards.	The list will contain information about use and standards.	The list will contain information about use and standards.	A report will focus on the data sets	A report will focus on the data sets	A report will focus on the data sets
		Third party *(Are your data useable by third parties, in particular after the end of the project? If*	Yes, this will not be restricted.	Yes, this will not be restricted.	Yes, this will not be restricted.	Yes, these are data that will be usable to anyone with the test-	This will be highly usable to understand the outcome	This will be highly usable to understand the outcome

		the re-use of some data is restricted, explain why)				setup used in the project.	of the additive process.	of the additive process.
		Quality assurance *(Describe, if it exists, data quality assurance process)*	The data in different file formats will be checked in several applications that will tell if there is something wrong with the files.	The data in different file formats will be checked in several applications that will tell if there is something wrong with the files.	The data will undergo scrutiny for its quality. Which is natural for this type of data.	Data will be analysed by several researchers.	Data will be analysed by several researchers.	Data will be analysed by several researchers.
DATA SECURITY		***What provisions are in place for data?*** *(including data recovery as well as secure storage and transfer of sensitive data)*	The servers are regularly backed up.	The servers are regularly backed up.	The servers are regularly backed up.	The servers are regularly backed up.	The servers are regularly backed up.	The servers are regularly backed up.
		Will the data be safely stored in trusted repositories for long term preservation and curation?	Yes	Yes	Yes	Yes	Yes	Yes
ETHICS		***Are there, or could there be, any***	**No**	**No**	**No**	**No**	**No**	**No**

	ethics or legal issues that can have an impact on data sharing? These can also be discussed in the context of the ethics review. If relevant, include references to ethics deliverables and ethics chapter in the Description of the Action (DoA).						
	Will informed consent for data sharing and long term preservation be included in questionnaires dealing with personal data?	**No**	**No**	**No**	**No**	**No**	**No**

Task 7.1

			Material Models
TASK(S) N°		*ontologies play a role in all tasks in WP7*	Task 7.1
Codes		*Type and format*	Material parameters data, ASCII
		Description *(Brief description of the dataset)*	Calibrated parameters for the material model
		Purpose *(What is the purpose of your data and its relation to the objectives of the project?)*	Describe the behavior of the material including all the relevant mechanisms
		Origin	Obtained after calibration of the models
		Expected size	< 5 KB
		Reuse *(Is your data generated or re-used?)*	Generated
		Utility *(To whom might your data be useful, outside the project?)*	Simulation of AM/cladding/welding research & industry
FAIR DATA	**FINDABLE**	***Identification*** *(Are your data identified by a persistent identifier?)*	Yes
		Metadata *(Are the data discoverable by using metadata? Possible keywords for metadata)*	Yes
		Standards *(What disciplinary or general standards will be followed?)*	AER internal, If possible, will use VMAP
		Repository *(Will your data be deposited in a trusted repository?)*	Yes, AER internal repository will be used.

	ACCESSIBLE	***Availability*** *(Will your data be made openly available? If certain datasets cannot be shared (or need to be shared under restrictions), explain why, clearly separating legal and contractual reasons from intentional restrictions)*	Availability is limited, because the data is linked to deliverable D7.1, which is considered "sensitive".
		Access *(If there are restrictions on use, how will access be provided? ; Is there a need for a data access committee: e.g. to evaluate/approve access requests to personal/sensitive data?)*	Access will be provided to relevant consortium members (FPS, AER, LTU) and other consortium members upon request.
	INTEROPERABLE	***Interoperability*** *(What data and metadata vocabularies, standards or methodologies will you follow to make your data interoperable to allow data exchange and re-use between researchers, institutions, organisations across disciplines?)*	Data is read by the material model. ASCII format will be used to maximize compatibility.
	RE-USE	***Documentation*** *(Will you provide documentation needed to validate data analysis and facilitate data re-use? If yes, what kind of documentation (e.g. readme files with information on methodology, codebooks, analyses, variable definitions, etc.)?)*	Yes, via README or similar document with explanations.
		Third party *(Are your data useable by third parties, in particular after the end of the project? If the re-use of some data is restricted, explain why)*	Yes, the data is useable also after the project. The data will be restricted according to the consortium agreement for deliverables considered "sensitive".
		Quality assurance *(Describe, if it exists, data quality assurance process)*	Yes, simulations will be quality-controlled for grid/timestep sizes sensitivities and also compared to experimental results.
DATA SECURITY		***What provisions are in place for data?*** *(including data recovery as well as secure storage and transfer of sensitive data)*	Regular backups according to AER internal procedures.
		Will the data be safely stored in trusted repositories for long term preservation and curation?	Yes, data will be stored in AER internal repository for long term preservation

ETHICS	*Are there, or could there be, any ethics or legal issues that can have an impact on data sharing? These can also be discussed in the context of the ethics review. If relevant, include references to ethics deliverables and ethics chapter in the Description of the Action (DoA).*	Ethics is not relevant for this data. Regarding legal issues, data sharing will be in accordance with consortium agreement for sensitive deliverables.
	Will informed consent for data sharing and long-term preservation be included in questionnaires dealing with personal data?	No personal data is included.

Task 8.2/8.3/8.5

		Dataset 1	**Phase-Texture evolution models**	**AI-powered recipe book**
TASK(S) N°	*ontologies play a role in all tasks in WP8*	Task 8.2	Task 8.3	Task 8.5
Codes	*Type and format*	Flowphys simulation key results data, ASCII	Material & process parameters data, ASCII	Process parameters data, ASCII
	Description *(Brief description of dataset)*	Flowphys simulation key results data sets	Calibrated parameters for the material model, Scanning path optimization methods and parameters	Calibrated parameters for the material model, Process model parameters, melt-pool models, and defect models.
	Purpose *(What is the purpose of your data and its relation to the objectives of the project?)*	Train ML meta-models	Describe the behaviour of the material including all the relevant mechanisms	Database of all relevant parameters and models required for macro scale process simulation and optimization.
	Origin	Flowphys simulations performed by FPS	Obtained after calibration of the models	Obtained after calibration of the models

		Expected size	< 5 KB	< 5 KB	< 5 KB
		Reuse *(Is your data generated or re-used?)*	Generated	Generated	Generated
		Utility *(To whom might your data be useful, outside the project?)*	AM/cladding/welding research & industry	Simulation of AM/cladding/welding research & industry	Simulation of AM/cladding/welding research & industry
FAIR DATA	**FINDABLE**	***Identification*** *(Are your data identified by a persistent identifier?)*	Yes	Yes	Yes
		Metadata *(Are the data discoverable by using metadata? Possible keywords for metadata)*	Yes	Yes	Yes
		Standards *(What disciplinary or general standards will be followed?)*	FPS internal	AER internal, If possible, will use VMAP	AER internal, If possible, will use VMAP
	ACCESSIBLE	***Repository*** *(Will your data be deposited in a trusted repository?)*	Yes, FPS internal repository will be used. Selected data will also be stored on the project's shared folder system.	Yes, AER internal repository will be used.	Yes, AER internal repository will be used.
		Availability *(Will your data be made openly available? If certain datasets cannot be shared (or need to be shared under restrictions), explain why, clearly separating legal and contractual reasons from intentional restrictions)*	Yes, selected data will be openly available. Selection will be based on usefulness of data, as well as also after receiving approval from the consortium to make it publicly available.	Availability is limited because the data is linked to deliverable D8.2, which is considered "sensitive".	Availability is limited because the data is linked to deliverable D8.2, which is considered "sensitive".
		Access *(If there are restrictions on use, how will access be provided? ; Is there a need for a data access committee: e.g. to evaluate/approve access requests to personal/sensitive data?)*	Selected data will be openly available.	Access will be provided to relevant consortium members (FPS, AER, LTU) and other consortium members upon request.	Access will be provided to relevant consortium members (FPS, AER, LTU) and other consortium members upon request.

	INTEROPERABLE	***Interoperability*** *(What data and metadata vocabularies, standards or methodologies will you follow to make your data interoperable to allow data exchange and re-use between researchers, institutions, organisations across disciplines?)*	Data is small. ASCII format will be used to maximize compatibility.	Data is read by the material model. ASCII format will be used to maximize compatibility.	Data is read by the material model. ASCII format will be used to maximize compatibility.
	RE-USE	***Documentation*** *(Will you provide documentation needed to validate data analysis and facilitate data re-use? If yes, what kind of documentation (e.g. readme files with information on methodology, codebooks, analyses, variable definitions, etc.)?)*	Yes, via README or a similar document with explanations.	Yes, via README or similar document with explanations.	Yes, via README or similar document with explanations.
		Third party *(Are your data useable by third parties, in particular after the end of the project? If the re-use of some data is restricted, explain why)*	Yes, the data is useable also after the project.	Yes, the data is useable also after the project. The data will be restricted according to consortium agreement for deliverables considered "sensitive".	Yes, the data is useable also after the project. The data will be restricted according to consortium agreement for deliverables considered "sensitive".
		Quality assurance *(Describe, if it exists, data quality assurance process)*	Yes, simulations will be quality controlled for grid/timestep sizes sensitivities, and also compared to experimental results.	Yes, simulations will be quality controlled for grid/timestep sizes sensitivities, and also compared to experimental results.	Yes, simulations will be quality controlled for grid/timestep sizes sensitivities, and also compared to experimental results.
DATA SECURITY		***What provisions are in place for data?*** *(including data recovery as well as secure storage and transfer of sensitive data)*	Regular backups according to FPS internal procedures.	Regular backups according to AER internal procedures.	Regular backups according to AER internal procedures.
		Will the data be safely stored in trusted repositories for long term preservation and curation?	Yes, data will be stored in FPS internal repository for long term preservation	Yes, data will be stored in AER internal repository for long term preservation	Yes, data will be stored in AER internal repository for long term preservation

ETHICS	*Are there, or could there be, any ethics or legal issues that can have an impact on data sharing? These can also be discussed in the context of the ethics review. If relevant, include references to ethics deliverables and ethics chapter in the Description of the Action (DoA).*	Ethics is not relevant for this data. Regarding legal issues, data sharing will be in accordance with consortium agreement for sensitive deliverables.	Ethics is not relevant for this data. Regarding legal issues, data sharing will be in accordance with consortium agreement for sensitive deliverables.	Ethics is not relevant for this data. Regarding legal issues, data sharing will be in accordance with consortium agreement for sensitive deliverables.
	Will informed consent for data sharing and long-term preservation be included in questionnaires dealing with personal data?	No personal data is included.	No personal data is included.	No personal data is included.

Task 9.3

			Dataset 1
TASK(S) N°		*ontologies play a role in all tasks in WP9*	stl of simulation results
Codes		*Type and format*	stl
		Description *(Brief description of the dataset)*	Final geometry after deposition and cool-down predicted by the simulation
		Purpose *(What is the purpose of your data and its relation to the objectives of the project?)*	Validate simulation method
		Origin	Simulation results
		Expected size	50 MB
		Reuse *(Is your data generated or re-used?)*	generated
		Utility *(To whom might your data be useful, outside the project?)*	For validation of simulation methods in the project
FAIR DATA	**FINDABLE**	***Identification*** *(Are your data identified by a persistent identifier?)*	?

		Metadata *(Are the data discoverable by using metadata? Possible keywords for metadata)*	Results will be presented in a published paper
		Standards *(What disciplinary or general standards will be followed?)*	?
	ACCESSIBLE	***Repository*** *(Will your data be deposited in a trusted repository?)*	At GKN and in project repository, not in a public one.
		Availability *(Will your data be made openly available? If certain datasets cannot be shared (or need to be shared under restrictions), explain why, clearly separating legal and contractual reasons from intentional restrictions)*	Will be available on demand.
		Access *(If there are restrictions on use, how will access be provided?; Is there a need for a data access committee: e.g. to evaluate/approve access requests to personal/sensitive data?)*	The data will be export-controlled and a license might be needed to share the results
	INTEROPERABLE	***Interoperability*** *(What data and metadata vocabularies, standards, or methodologies will you follow to make your data interoperable to allow data exchange and reuse between researchers, institutions, and organisations across disciplines?)*	stl data format
	RE-USE	***Documentation*** *(Will you provide documentation needed to validate data analysis and facilitate data re-use? If yes, what kind of documentation (e.g. readme files with information on methodology, codebooks, analyses, variable definitions, etc.)?)*	yes, a paper will be written
		Third-party *(Are your data useable by third parties, in particular after the end of the project? If the re-use of some data is restricted, explain why)*	yes, on demand
		Quality assurance *(Describe, if it exists, data quality assurance process)*	not for the specific dataset
DATA SECURITY		***What provisions are in place for data?*** *(including data recovery as well as secure storage and transfer of sensitive data)*	Export Control, 1E001
		Will the data be safely stored in trusted repositories for long-term preservation and curation?	GKN will store internally at least
ETHICS		*Are there, or could there be, any ethics or legal issues that can have an impact on data sharing? These can also be discussed in the context of the ethics review. If relevant, include references to ethics deliverables and ethics chapter in the Description of the Action (DoA).*	No
		Will informed consent for data sharing and long-term preservation be included in questionnaires dealing with personal data?	No

Task 9.6

			Dataset 1
TASK(S) N°		*ontologies play a role in all tasks in WP9*	GOM scan of built hardware
Codes		*Type and format*	stl
		Description *(Brief description of the dataset)*	Final geometry after deposition and cool down from the deposited part
		Purpose *(What is the purpose of your data and its relation to the objectives of the project?)*	Validate simulation method and ensure build dimensions
		Origin	3D scan of hardware
		Expected size	500 MB
		Reuse *(Is your data generated or re-used?)*	generated
		Utility *(To whom might your data be useful, outside the project?)*	Everyone interested in validating DED simulations
FAIR DATA	**FINDABLE**	***Identification*** *(Are your data identified by a persistent identifier?)*	
		Metadata *(Are the data discoverable by using metadata? Possible keywords for metadata)*	Results will be presented in a published paper
		Standards *(What disciplinary or general standards will be followed?)*	
	ACCESSIBLE	***Repository*** *(Will your data be deposited in a trusted repository?)*	At GKN and in project repository, not in a public one.
		Availability *(Will your data be made openly available? If certain datasets cannot be shared (or need to be shared under restrictions), explain why, clearly separating legal and contractual reasons from intentional restrictions)*	Will be available on demand.
		Access *(If there are restrictions on use, how will access be provided? ; Is there a need for a data access committee: e.g. to evaluate/approve access requests to personal/sensitive data?)*	The data will be export-controlled and a license might be needed to share the results

	INTEROPERABLE	***Interoperability*** *(What data and metadata vocabularies, standards or methodologies will you follow to make your data interoperable to allow data exchange and re-use between researchers, institutions, organisations across disciplines?)*	stl data format
	RE-USE	***Documentation*** *(Will you provide documentation needed to validate data analysis and facilitate data re-use? If yes, what kind of documentation (e.g. readme files with information on methodology, codebooks, analyses, variable definitions, etc.)?)*	yes, a paper will be written
		Third party *(Are your data useable by third parties, in particular after the end of the project? If the re-use of some data is restricted, explain why)*	yes, on demand
		Quality assurance (Describe, if it exists, data quality assurance process)	not for the specific dataset
DATA SECURITY		***What provisions are in place for data ?*** *(including data recovery as well as secure storage and transfer of sensitive data)*	Export Control, 1E001
		Will the data be safely stored in trusted repositories for long-term preservation and curation?	GKN will store internally at least
ETHICS		*Are there, or could there be, any ethics or legal issues that can have an impact on data sharing? These can also be discussed in the context of the ethics review. If relevant, include references to ethics deliverables and ethics chapter in the Description of the Action (DoA).*	No
		Will informed consent for data sharing and long-term preservation be included in questionnaires dealing with personal data?	No

Task 13.1, 13.2

		Dataset 1	Dataset 2
TASK(S) N°	*Indicate the Task(s) where your data will be generated or re-used*	EcoInvent database for LCA modelling	Data from the literature review for Life Cycle Inventory (LCI) and Life Cycle Assessment (LCA) for the remanufacturing

			processes and products
Codes	*Type and format*	CSV, ILCD, and ecospold formats	excel, csv, pdf, docx
	Description *(Brief description of dataset)*	The ecoInvent Database, which is commonly used for life cycle assessment (LCA) studies, primarily utilizes a specific format for storing and distributing its data. The database contains detailed information on the environmental impact of producing different materials, products, and energy systems.	We will collect secondary data from literature review, and primary data from simulation and actual remanufacturing process from WP2 & WP3 to prepare LCI for the remanufacturing processes and products. Which can then be used to calculate LCA using LCA software such as SimaPro, OpenLCA etc.
	Purpose *(What is the purpose of your data and its relation to the objectives of the project?)*	To do Life Cycle Assessment studies	To do Life Cycle Assessment studies
	Origin	https://ecoinvent.org/database/	Primary and secondary data
	Expected size	~370 MB	<5 MB for each file

		Reuse *(Is your data generated or re-used?)*	Reused	Generated
		Utility *(To whom might your data be useful, outside the project?)*	LCA practitioners	LCA practitioners, Economic operators and Value chain actors
FAIR DATA	**FINDABLE**	***Identification*** *(Are your data identified by a persistent identifier?)*	Not Applicable	Not Applicable
		Metadata *(Are the data discoverable by using metadata? Possible keywords for metadata)*	Yes. Data are filterable by the keywords such as: Processes, Products, Locations, Technology Levels, Time period, Impact categories	Not Applicable
		Standards *(What disciplinary or general standards will be followed?)*	LCA standards ISO 14040, ISO 14044 and ILCD handbook	LCA standards ISO 14040, ISO 14044 and ILCD handbook
	ACCESSIBLE	***Repository*** *(Will your data be deposited in a trusted repository?)*	Not Applicable	Yes. We will store these data in RESTORE's internal SharePoint folder.
		Availability *(Will your data be made openly available? If certain datasets cannot be shared (or need to be shared under restrictions), explain why, clearly separating legal and contractual reasons from intentional restrictions)*	Not Applicable	Not Applicable. This is available only for consortium members
		Access *(If there are restrictions on use, how will access be provided? ; Is there a need for a data access committee: e.g. to evaluate/approve access requests to personal/sensitive data?)*	Accessible only for task leads	Not applicable

	INTER OPER ABLE	***Interoperability*** *(What data and metadata vocabularies, standards or methodologies will you follow to make your data interoperable to allow data exchange and re-use between researchers, institutions, organisations across disciplines?)*	The ecoinvent database ensures interoperability through: EcoSpold Format: Utilizes the EcoSpold XML format for LCA data. LCA Software Compatibility: Directly compatible with major LCA tools like SimaPro, GaBi, and OpenLCA. ILCD Format Support: Supports the European ILCD format for standardized data exchange. ISO Standards Compliance: Aligns with ISO 14040 and ISO 14044 for LCA, ensuring global usability.	Not applicable
	RE-USE	***Documentation*** *(Will you provide documentation needed to validate data analysis and facilitate data re-use? If yes, what kind of documentation (e.g. readme files with information on methodology, codebooks, analyses, variable definitions, etc.)?)*	https://support.ecoinvent.org/getting-started	Not applicable
		Third party *(Are your data useable by third parties, in particular after the end of the project? If the re-use of some data is restricted, explain why)*	Not applicable	Not applicable

		Quality assurance *(Describe, if it exists, data quality assurance process)*	The ecoinvent database ensures high data quality through: Peer Review: Each dataset undergoes expert peer review for accuracy and scientific validity. Consistency Checks: Automated and manual checks ensure data consistency and correctness. Transparency: Detailed metadata provides clarity on data sources, methodology, and scope. Regular Updates: The database is frequently updated to reflect the latest research and market changes. Collaborative Contributions: It benefits from global contributions by researchers and data providers.	LCA software like SimaPro, OpenLCA etc. maintain high data quality assurance standards through: Data Sources: Utilizes reputable databases like ecoinvent with rigorous data verification protocols. Transparency and Documentation: Offers extensive documentation on data origins and methodologies. Quality Indicators: Features quality indicators to evaluate data reliability based on representativeness and other factors. Consistency Checks: Includes tools for checking

				data consistency and completeness. Regular Updates: Regular updates to integrate the latest data and methodologies. User Training and Support: Provides comprehensive training and support to ensure proper usage and interpretation of LCA results.
DATA SECURITY		***What provisions are in place for data?*** *(including data recovery as well as secure storage and transfer of sensitive data)*	Data will be stored in a secured cloud server managed by TVS with backup and encryption enabled servers.	LCA software and LCI data will be hosted a secured cloud server managed by TVS with backup and encryption enabled servers.
		Will the data be safely stored in trusted repositories for long term preservation and curation?	Yes.	Yes.
ETHICS		*Are there, or could there be, any ethics or legal issues that can have an impact on data sharing? These can also be discussed in the context of the ethics review. If relevant, include references to ethics deliverables and ethics chapter in the Description of the Action (DoA).*	Not Applicable	Not Applicable
		Will informed consent for data sharing and long-term preservation be included in questionnaires dealing with personal data?	Not Applicable	Not Applicable

3.5. Conclusion

The ALABAMA project's DMP serves as a comprehensive guide for effective data management practices, ensuring that research data is handled ethically, securely, and in compliance with regulatory requirements. By adhering to these principles and continuously updating the DMP, ALABAMA aims to maximise the impact of its research outputs and promote transparency and accessibility within the scientific community and beyond.

4. References

1. European Commission, H2020 online manual, Data Management. https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cuttingissues/open-access-data-management/data-management_en.htm

2. Guidelines on FAIR Data Management in Horizon 2020 http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf

3. Metadata Standards Directory. https://www.rd-alliance.org/metadata-standardsdirectory
4. How to create a Data Management Plan. OpenAIRE [Internet].https://www.openaire.eu/how-to-create-a-data-management-plan
5. Zenodo platform. http://www.zenodo.org
6. Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)