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Dissemination, Communication & Exploitation Plan

D1.3



HALLOA

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¹ Use one of the following codes: R=Document, report (excluding the periodic and final reports)

DEM=Demonstrator, pilot, prototype, plan designs

DEC=Websites, patents filing, press & media actions, videos, etc.

OTHER=Software, technical diagram, etc.

ORDP: Open Research Data Pilot

² Use one of the following codes: PU=Public, fully open, e.g. web

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List of acronyms

Acronym	Full name
CC BY	Creative Commons Attribution International Public Licence
CNES	Centre National d'Études Spatiales
DCEP	Dissemination, Communication and Exploitation plan
DBR	Distributed Bragg Reflector
DIAL	Differential Absorption Lidar
EC	European Commission
EOSAM	European Optical Society Annual Meeting
ESA	European Space Agency
EU	European Union
IPDA	Integrated Path Differential Absorption
JRC	Joint Research Centre
KER	Key Exploitation Result
LiDAR	Light Detection And Ranging
OS	Optical Switch
SFO	Société Française d'Optique
TDFA	Thulium-Doped Fiber Amplifier
TRL	Technology Readiness Level
WP	Work Package

Table of contents

1.	Introduction	5
1.1.	Project in a nutshell	5
1.2.	Objectives of this documents	5
1.3.	Definitions.....	5
1.4.	Communication and dissemination policy rules.....	6
2.	Communication plan.....	7
2.1.	Communication management	7
2.2.	Communication target audiences and key messages	8
2.3.	Communication tools	10
2.3.1.	Project specific communication tools and channels	10
2.3.2.	Partner's existing communication channels.....	11
2.4.	Evaluation of the communication activities	11
3.	Dissemination plan	12
3.1.	Dissemination impacts	12
3.2.	Target audience and key messages	13
3.3.	Dissemination tools & activities	13
3.4.	Dissemination evaluation	16
4.	Exploitation of the results	16
4.1.	Exploitation objectives and activities	17
4.2.	Exploitation roadmap	18
4.2.1.	Main exploitation path	18
4.2.2.	Other activities identified	19
4.3.	Key exploitation results	20

1. Introduction

1.1. Project in a nutshell

The HALLOA project is dedicated to the complete development of a pulsed laser system suited for CO₂ (main product), H₂O and wind speed (secondary products) monitoring by space-borne Light Detection And Ranging (LiDAR) using differential absorption method in the 2.05 μ m spectral region. For non-dependency purpose, the project will establish a European supply chain for such laser as well as new European capabilities in two key technologies: 2.05 μ m pulsed fiber amplifier and 79x nm high-power laser diode.

Atmospheric LiDAR generally includes a complex laser design, introducing substantial mechanical constraints. The HALLOA project tackles this issue by designing and developing a so-called hybrid laser that synergistically combines the benefits of compact, alignment-free fiber-based systems with the high-power capabilities of free-space design. This development aims to reach the genuine optical performance required for LiDAR CO₂/H₂O/wind monitoring from space and the Technology readiness level (TRL6) level using European Union (EU)-only components and sub-systems.

It will pave the way for building a cutting-edge and competitive European supply-chain. The TRL6 demonstration will represent a major step forward a future EU space mission for greenhouse gas monitoring.

1.2. Objectives of this document

The Dissemination, Communication and Exploitation Plan (DCEP) aims to define a strategy and related activities to support the communication, dissemination (when relevant), and exploitation of HALLOA results and ensure a follow-up of the activities throughout the project life cycle.

The plan is set up based on a common strategy and vision adopted by all consortium members.

This DCEP is a live document and thus may evolve in the next stages of the project. Changes and adjustments to the DCEP will be made during the whole duration of the project as an internal tool to ensure strong communication, dissemination and exploitation.

1.3. Definitions

The deliverable addresses three key areas: communication, dissemination, and exploitation actions, which are separately reported in this DCEP.

- + **Communication** means taking strategic and targeted measures towards promoting the action itself and its results to a multitude of audiences, including the media and the public, and possibly engaging in a two-way exchange to reach out to society as a whole and demonstrate how EU funding contributes to tackling societal challenges. It must be strategically planned with pertinent messages, the right medium and means. Communication is about the project and results.
- + **Dissemination** is the public disclosure of the results by appropriate means, other than resulting from protecting or exploiting the results, including by scientific publications in any medium. It

ensures the circulation of knowledge and results to the ones that can best make use of them by enabling the value of results to be potentially wider than the original focus. Dissemination is essential to all good research practices and a vital part of the project plan.

- ✦ **Exploitation** represents the use of results in further research and innovation activities, including, among other things, commercial exploitation such as developing, creating, manufacturing, and marketing a product or process, creating and providing a service, or in standardization and policy-making activities. It is important to recognize exploitable results and their stakeholders and identify the value added from their use. Partners can exploit their results or let interested third parties exploit them. Exploitation is an actual use of the results for scientific, societal, economic, and policy-making purposes.

1.4. Communication and dissemination policy rules

Communication activities of the beneficiaries related to the action (including media relations, conferences, seminars, information material, such as brochures, leaflets, posters, presentations, etc., in electronic form, via traditional or social media, etc.), dissemination activities and any infrastructure, equipment, vehicles, supplies or major result funded by the grant must acknowledge EU support and display the European flag (emblem) and funding statement (translated into local languages, where appropriate):

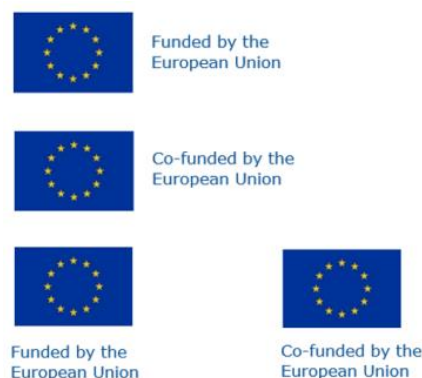


Figure 1. European emblem to integrate in each communication material

The emblem must remain distinct and separate and cannot be modified by adding other visual marks, brands or text. Apart from the emblem, no other visual identity or logo may be used to highlight the EU support. When displayed in association with other logos (e.g., of beneficiaries or sponsors), the emblem must be displayed at least as prominently and visibly as the other logos. For their obligations under this Article, the beneficiaries may use the emblem without first obtaining approval from the granting authority. This does not, however, give them the right to exclusive use. Moreover, they may not appropriate the emblem or any similar trademark or logo, either by registration or by any other means. Any communication or dissemination activity related to the action must use factually accurate information. Moreover, it must indicate the following disclaimer (translated into local languages where appropriate):

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2. Communication plan

2.1. Communication management

Communication activities are designed to maximise the impact of the project. A dedicated communication manager from ERDYN has been assigned to the project to ensure the efficient management of these activities. The manager will be responsible for implementing the mass media communications and follow-up of the communication activities. Special emphasis will be placed on assuring to avoid common mistakes in communication (e.g. communicate without identifying the target audience, focus on the medium and not on the message, etc.).

Partners will also contribute to the communication activities throughout the project's implementation, based on well-defined strategies, objectives, and target groups.

The project's communication objectives must flow from the project's overall objective which come from the expected outcomes identified by the European Commission in the call for proposals HORIZON-CL4-2023-SPACE-01-72 associated.

Table 1. HALLOA project's contribution to the European Commission expected outcomes

Expected outcomes	Contribution of HALLOA to the expected outcomes
✦ To reduce the dependence on critical technologies and capabilities from outside EU for the EU space programme components (i.e. Galileo/EGNOS, Copernicus, Govsatcom and SSA) and other space applications ✦ To develop or regain in the mid-term the European capacity to operate independently in space ✦ To enhance the technical capabilities and overall competitiveness of European space industry vendors on the worldwide market ✦ To open new competition opportunities for European manufacturers by reducing dependency on export restricted technologies that are of strategic	✦ To advance CO₂ monitoring by utilizing advanced LiDAR technology ✦ To develop a 2.05 µm hybrid laser, enabling CO₂ (main product), H₂O and wind measurements (secondary products) from space. ✦ To develop new EU industrial capabilities for two key laser sub-systems: 2.05 µm pulsed-fiber amplifier and high-power 79x nm laser diodes at TRL6 ✦ To build a complete hybrid laser based on EU-only components and demonstrate full compliance with space-mission requirements

Expected outcomes	Contribution of HALLOA to the expected outcomes
importance to future European space efforts ✦ To improve the overall European space technology landscape and complement and/or create synergy with activities of European and national programmes either in the space or non-space fields	

Based on these elements, we defined the four general communication objectives as follow:

Table 2. HALLOA's communication objectives

HALLOA general communication objectives	Details
Raise public awareness of HALLOA's significance	Highlight EU technological advancements in space and in laser technologies. Raise awareness of the public on the broader societal relevance of space missions.
Promote HALLOA's innovation and mission	Share the objectives, vision, and scientific potential of the project with a broad audience.
Engage and inspire future scientists and engineers	Use accessible formats and outreach to generate interest in space science and photonics among students and young professionals.
Communicate with industry and political stakeholders	Ensure key stakeholders understand the importance of the project and its potential impact on the European market and strategic autonomy.

2.2. Communication target audiences and key messages

The audience listed in the following table have been identified as likely to be interested in the project outputs, and the consortium has, therefore, targeted them for communication activities. For each of them, a message has been defined. Those audiences and key messages were established because they answer one or several of the project's objective.

To communicate clear messages, it is important to keep the following communication principles in mind:

- ✦ Messages should be clear, simple (but no more simple than necessary), and easy to understand. The language should be appropriate for the target audience, and non-technical language should be used where deemed better.

- ✦ Messages should be tailored to the recipient(s). It is crucial to consider what they should know about the project carefully.
- ✦ Messages of different projects related to the same subject can be coordinated to enhance impact.
- ✦ Information should be correct and realistic.

Partners already worked on key messages easy to use for all type of communication:

Table 3. HALLOA's communication target audience and key messages according to the objectives

Target audience	HALLOA's General communication objectives	Key messages
Public	Raise public awareness of the EU project's significance	Raise awareness about EU achievements in space tech; communicate broader impacts of space missions; inspire future scientists and engineers.
	Engage and inspire future scientists and engineers	Explain the importance of photonics and space; present career opportunities and societal benefits.
Policy makers, space agencies	Communicate with industry and political stakeholders	Use findings to support policy-making on space autonomy and capabilities; demonstrate strategic and technological relevance.
Photonics industry	Communicate with industry and political stakeholders	Present the project's industrial relevance and its role in developing a sovereign supply chain for 2 μ m fiber lasers.
Industries (aerospace, etc.)	Communicate with industry and political stakeholders	Showcase impact on supply chains and potential industrial applications; encourage industrial collaboration.
Scientific community	Promote the project's innovation and mission	Share advancements in laser and LiDAR tech; encourage innovation and collaboration in the space optics domain.
Other EC-funded projects (e.g. JRC)	Promote the project's innovation and mission	Share results and promote alignment and synergies with other R&I initiatives.

2.3. Communication tools

2.3.1. Project specific communication tools and channels

The following communication tools and channels are being implemented to promote the project:

Communication kit

A wide communication package including a logo, icons, a Word and slideshow template has been created. All these elements have been shared to the project members. Those elements will be detailed in D1.5 Communication Kit. By the time, a generic illustration and a generic poster will be added.



Figure 2. HALLOA logo

Project website

The project website (halloa-project.eu) will be the main communication tool, providing easy access to a broad audience. It will be maintained and updated regularly to promote and disseminate project activities, results, and promotional outputs. Regular sector and project-related news and result updates will be published and shared via the website. The project website will be launched at M6.

Social media

Social media account on LinkedIn has been created and is currently complemented by a unified social media strategy for the whole consortium to engage users and spread the word about the

project results coherently, creating synergies with each partner's own social media channels. ERDYN will oversee the creation and maintenance of social media.

The HALLOA LinkedIn page is accessible via the following link:
<https://www.linkedin.com/company/halloa-project/>

Motion video

A motion video about the project concept and objectives will be available at month 21 of the project and widespread online.

Newsletter

Project newsletters will be prepared to communicate about the project and disseminate key project achievements. They will include among others: innovation results, presentations at conferences, announcements of workshops/other events, achievements interviews with key research and industry personnel, and future planned innovation and development activities.

Events

Partners will participate in high-visibility events aiming to address the public, such as the European Researchers' Night, Science on Stage Festival, European Science Festival, and French "Fête de la science". Each partner is responsible for its own activities.

2.3.2. Partner's existing communication channels

Project partners will undertake several communication actions to give maximum visibility to the project. For this purpose, they will use different communication tools during the whole project life cycle:

- + Articles in magazines/scientific journals/annual reports
- + Conference presentation, exhibition, workshop
- + Brochures, press releases, project fact sheet, newsletter
- + Publications on social media, partners websites

2.4. Evaluation of the communication activities

Partners will use various Key performance indicators (KPI) to evaluate the impact of the different communication activities. A list of potential, proposed KPIs is given in Table 4.

Table 4. Communication tools and KPIs

Communication tool	KPI
HALLOA website	500 visitors/year
HALLOA social media (LinkedIn)	150 followers; 2 posts/month
Motions video	1 video
HALLOA newsletter	2/ year
Brochure and leaflet	Production of at least one generic communication support

3. Dissemination plan

3.1. Dissemination impacts

The dissemination strategy will support the HALLOA project by promoting the work done during the project. The goal is to engage the different targeted groups with information adjusted carefully to their needs, raise awareness of those who could benefit from HALLOA, and encourage multi-stakeholder dialogue.

Each new result will be disseminated by the partner(s) who have generated the result(s), when it is not protected or exploited. In addition, the project management will explore the use of European commission (EC) tools for dissemination.

To structure the dissemination strategy, the project has defined four main dissemination impacts.

Table 5. HALLOA's dissemination impacts

HALLOA's general dissemination impacts	Details
Foster scientific knowledge sharing and collaboration	Disseminate research results to the scientific community through publications, conferences, and training to stimulate further research and cooperation.
Enable policy uptake of the project's findings	Provide evidence-based insights to support decision-making in policy and regulatory frameworks related to space capabilities and strategic autonomy.
Promote industrial exploitation of research results	Share exploitable results with relevant industries, highlighting commercial applications and fostering innovation and competitiveness in the EU market.
Contribute to the development of EU strategic autonomy in space technologies	Strengthen Europe's technological independence by disseminating findings that support the establishment of sovereign supply chains and critical capacities.

3.2. Target audience and key messages

Each target audience of HALLOA for dissemination of results has defined key messages to help structure the dissemination strategy.

Table 6. HALLOA's dissemination target audience and key messages according to the expected impacts

Target audience	HALLOA's general dissemination expected impacts	Key messages
Scientific community	Foster scientific knowledge sharing and collaboration	Share breakthroughs in laser and LiDAR technologies; contribute to ongoing scientific progress and training of young researchers.
Policy makers, space agencies	Enable policy uptake of the project's findings	Provide scientific evidence to support space-related policy decisions and promote EU autonomy in strategic technologies.
Photonics industry	Promote industrial exploitation of research results	Emphasize solutions tailored to industry needs and share updates on the creation of a sovereign 2 μ m fiber laser supply chain.
Industries (aerospace, etc.)	Promote industrial exploitation of research results	Engage industrial actors with potential applications; share the project's impact on innovation and the value chain.
Other EC-funded projects (e.g. JRC)	Foster scientific knowledge sharing and collaboration	Facilitate knowledge exchange and project alignment via clustering, joint workshops, and shared dissemination channels.

3.3. Dissemination tools & activities

In addition to the communication tools, the following specific dissemination tools and channels will be used to ensure the promotion of the project's results:

Open access peer-reviewed publications

Publications are expected on topics such as:

- + Space radiation testing of Thulium doped fibers and amplifiers (WP6 +WP7)
 - + Complete laser system design and performance (WP8)
 - + Space CO₂ LiDAR
 - + 50 μ l Thulium-doped fiber amplifier for space (WP4)
- 250 W peak power at 2051nm fiber laser for LiDAR system (WP4)

The list will evolve during project implementation.

Below are the examples of journals for dissemination of HALLOA's results:

- + Optica –Applied Optics or Optics Express or Optics letter,
- + Optical Materials Express, Optics & Laser Technology,
- + CEAS Space Journal

Reminder

The beneficiaries must ensure open access to peer-reviewed scientific publications relating to their results. In particular, they must ensure that:

- + at the latest at the time of publication, a machine-readable electronic copy of the published version or the final peer-reviewed manuscript accepted for publication is deposited in a trusted repository for scientific publications
- + immediate open access is provided to the deposited publication via the repository, under the latest available version of the Creative Commons Attribution International Public Licence (CC BY) or a licence with equivalent rights; for monographs and other long-text formats, the licence may exclude commercial uses and derivative works (e.g. CC BY-NC, CC BY-ND) and
- + information is given via the repository about any research output or any other tools and instruments needed to validate the conclusions of the scientific publication.

Beneficiaries (or authors) must retain sufficient intellectual property rights to comply with the open access requirements.

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

Only publication fees in full open access venues for scientific publications are eligible for reimbursement.

Conferences and international networks

Presentation at major conferences and international networks are expected. Below are the examples of conference for dissemination of HALLOA's results:

- ✦ International Conference on Space Optics,
- ✦ Photonics West,
- ✦ International Laser Radar Conference,
- ✦ CLEO Europe

Table 7. Provisional conference schedule

Conference	Date and location	Partner(s)
European Optical Society Annual Meeting (EOSAM)	2027	All
Photonics West	17 - 22 January 2026 San Francisco, California, US January/February 2027 San Francisco, California, US	LZH, KEOPSYS, LPI
International Conference on Space Optics (ICSO)	2026 – 2027	ONERA, LZH, LMD
CLEO Europe	2026 - 2027	ONERA
International Laser Radar Conference	July 2026 Hiroshima, Japan	ONERA, LMD
Congrès de la Société Française d'Optique (SFO)	2026	ONERA, LMD

Final workshop

A final workshop will be organized by ONERA supported by ERDYN at the end of the project to present and ensure successful uptake of HALLOA results, including the technical roadmap and business plan for commercialization.

Lectures, Training, Student exchanges

Lectures, Training, Student exchanges will be conducted in alignment with partners' usual practices targeting Master's degree and/or PhD students of optic and laser areas. HALLOA will contribute to existing summer schools. ONERA and LMD are responsible for this action. First activities are planned for the next French SFO LiDAR summer school in June 16-20, 2026 at Observatoire de Haute Provence, France.

Advisory board meetings

Advisory board meetings gathering at least 2-5 experts in HALLOA fields will be created, for instance: CNES, ESA, ADS.

Clustering activities with major EU projects funded

Clustering activities with major EU projects funded: clustering activities with other EU projects such as networking, workshops, are foreseen and will be discussed with the European Commission.

A clustering workshop with SIROCO project is under discussion for a possible in-person meeting in September 2025. A special session at EOSAM 2027 to expose HALLOA-SIROCO main results is also envisaged.

Public deliverables

Additionally, all public deliverables will be published on the project website ensuring that all project results are shared with interested stakeholders.

3.4. Dissemination evaluation

Partners will use various KPIs to evaluate the impact of the different dissemination activities. A list of potential, proposed KPIs is given in Table 8.

Table 8. Dissemination tools and KPIs

Dissemination tool	KPI
Open access peer-reviewed scientific publications	2 peer-reviewed publications and 2 publications
Conferences and international networks	At least 4 conferences
Final workshop	At least 25 participants
Lectures, Training, Student exchanges	~30 young researchers
Advisory board meetings	At least 2 meetings
Clustering activities with major EU projects funded	At least 2 clustering activities
Public deliverables	Publication on the project website

4. Exploitation of the results

Exploitation measures will address the full range of potential users and uses and will be reflected in the D2.3 Final Exploitation Plan due to December 2027 (month 36) to be agreed with all partners. HALLOA is expected to provide risk reduction on hybrid laser solution for space-based

CO₂/H₂O monitoring (TRL6). This step will support a future proposition to a space agency for CO₂/H₂O monitoring from space based on the laser solution developed in HALLOA.

4.1. Exploitation objectives and activities

The exploitation strategy will be organized around five key types of goals, and some activities have already been identified:

Table 9. Exploitation objectives and activities identified

Type of exploitation	Objective	Key activities
Securing the value chain	✦ Ensure control and resilience in the supply chain ✦ Increase market share ✦ Explore new geographical markets and new applications for LiDAR technology	✦ <u>During HALLOA</u>: identify European component providers (WP4, WP9) and define mitigation strategies where vulnerabilities of the supply chain are identified (WP9) ✦ <u>After HALLOA</u>: implement strategic partnerships and supplier agreement and launch targeted marketing campaigns <i>Leader: KEOPSYS & LPI</i>
Commercialization and Market Entry	Industrialize the new European technology building blocks (pulsed amplifier and laser diodes mainly)	✦ <u>During HALLOA</u>: clarify market entry strategy thanks to market analysis and development of a business plan (WP9). ✦ <u>After HALLOA</u>: engage with potential commercial partners and establish licensing agreements for the technology if applicable. EU stands as the first commercial target, however on the longer term, commercialization will be possible worldwide. <i>Leader: KEOPSYS & LPI</i>
Space Mission Integration	Integrate the space qualified Laser technology into upcoming space missions, collaborating with space agencies or private entities planning relevant projects	✦ <u>During HALLOA</u>: develop roadmap for space mission insertion (WP9). ✦ <u>After HALLOA</u>: two exploitation routes will be needed: - Integrate the hybrid laser system for first airborne measurements; - Engage in discussions with mission planners, ensure compliance with mission requirements, and conduct necessary testing and integration activities in accordance with European Cooperation for Space Standardization (ESCC) rules.

Type of exploitation	Objective	Key activities
		<i>Leader: ONERA & EP-LMD</i>
Technology Transfer and Spin-Offs	Facilitate the transfer of technology and knowledge from the project to other applications or industries	✦ <u>During HALLOA</u>: continuously identify key exploitable results beyond LiDAR technologies ✦ <u>After HALLOA</u>: develop spin-off opportunities in areas such as telecommunications, environmental monitoring, or defense, and initiate technology transfer agreements <i>Leader: KEOPSYS, LPI & ONERA</i>
Continuous Improvement and Innovation	Maintain an ongoing commitment to innovation and improvement in laser technology for space applications	✦ Establish a framework for continuous research and development ✦ Monitor advancements in related fields ✦ Participate in collaborative research projects <i>Leader: ONERA & EP-LMD</i>

4.2. Exploitation roadmap

4.2.1. Main exploitation path

The main exploitation path (see Figure 3) will be to integrate the laser system in a LiDAR and to demonstrate further technology maturity through an airborne mission (expected to take two years after the end of HALLOA) targeting by 2030 first airborne measurements. Additional funding will be needed to include the laser system in a LiDAR architecture and permits to build a LiDAR demonstrator to support future space LiDAR development (for example, CHARM-F Lidar development that support the MERLIN space mission project) and participate to the calibration/validation activities of space-based instrument for CO₂ monitoring.

The second step would be to apply to a future space mission organized by ESA. This would require contacting industrial partners (e.g. Airbus Defense and Space, Thales Alenia Space, ...) who would be in charge of integrating the LiDAR in the payload for space launch. Considering that a space mission usually requires more than 10 years of development before space launch, it is estimated that HALLOA laser system could be in space by 2040.

In addition to integration in the space mission, the airborne LiDAR could continue to be used for air campaigns and would provide valuable data to validate satellite data (Cal/Val - calibration/validation - mission), as it allows to measure wind, water vapor and CO₂. ONERA and LMD have a strong expertise in this domain, being involved in MAGIC campaigns led by CNRS with support of CNES and ESA.

Beyond the main exploitation route for space applications, the laser system developed by HALLOA is simple enough to be used for industrial applications for ground LiDAR to measure CO₂, H₂O and wind for environmental monitoring purposes.

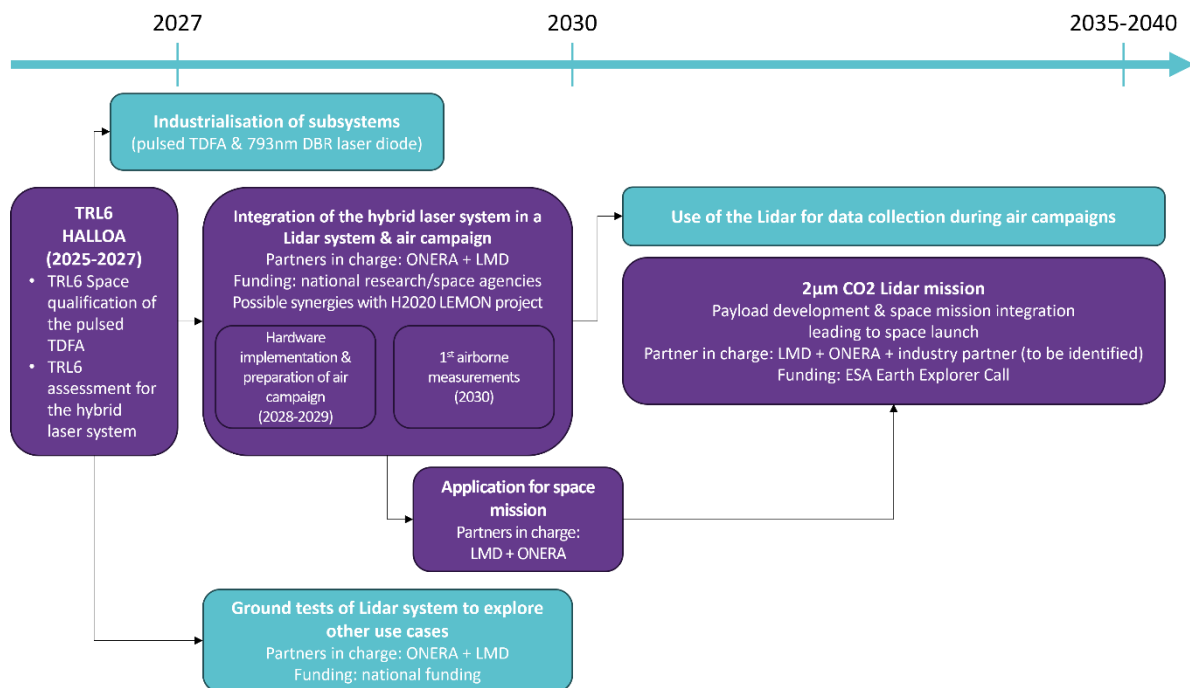


Figure 3. HALLOA exploitation roadmap

4.2.2. Other activities identified

To maximize the impact of HALLOA, other exploitation strategies are envisaged for HALLOA results, with potential short(er) term market entry:

- ✦ The exploitation of the pulsed TDFA developed by Keopsys will start as soon as the prototype is available at M18 (in parallel to the environmental qualification planned in the second half of the project).

Additional activities would be needed on electronics integration (not tackled in HALLOA) but this is a standard activity performed by Keopsys. Lifecycle assessment and reliability tests would also be needed. Therefore, if the results are promising, market entry of the pulsed TDFA could be expected by (or before) 2028. The strategy of Keopsys is to offer this pulsed TDFA as a standardized off-the-shelf component to attract the first customer. The pulsed TDFA can then be customized and optimized to match the customers' requirements. Keopsys is already a well-known company in the field of fiber lasers, wind LiDAR, DIAL and space laser. This will considerably facilitate the access of the new pulsed TDFA on the market.

- ✦ The exploitation of the wavelength stabilization technology at 793 nm developed by LPI could also start as soon as the diode prototype is available, relying on the same suppliers of epitaxial growth and DBR writing used in the project. For high volume production of DBR lasers an investment of about 2.5 M€ for an Electron Beam Lithography equipment would be needed. The technology developed for wavelength stabilization at 793 nm, i.e. the monolithic

integration of a DBR section into a 793 nm laser diode, could be used for medical and space applications. In particular, when tight control of the emitted wavelength and low drift over the injected current and temperature are necessary.

The exploitation strategy involves activities to broaden the scope of applications (besides LiDAR) to ensure the viability of the technologies. As mentioned above, the fiber laser system could also be of interest for medical applications since it allows to modulate water vapor absorption by tissues. Finally, the technology for frequency conversion with non-linear crystals could have application in the military infrared domain.

Specific activities are planned during HALLOA to support the exploitation of the project's results. Besides the close monitoring of the key exploitable results throughout the project (WP1 and WP2), WP9 is dedicated to the non-dependence objective and market implementation. The partners will prepare: 1) a market analysis identifying applications for the 2 μ m fiber amplifier (with identification of possible customers) and a business plan to address this market, and 2) a roadmap outlining the technical roadmap for product development and roadmap for space mission insertion.

For a period of up to 4 years after the end of the project, access rights to the use of products and/or processes generated by the project will be given to European entities, in compliance with the signed Grant Agreement and with no legal restrictions and limitations stemming from International Traffic in Arms Regulations (ITAR), EAR99 or equivalent instruments applicable in other jurisdictions.

4.3. Key exploitation results

Partners have already started identifying the project key exploitation results (KERs). Most project activities will result in Publications and Patents. These will be further detailed and quantified during the project.

Table 10. Key-based exploitable results and exploitation route

Key exploitation results	Owners	Exploitation strategy
Pulsed Thulium-Doped Fiber Amplifier (TDF) @2 μ m	+ KEOPSYS for the IP + ONERA for the tangible developed product	+ Trade secret for the manufacturing process + Publication on pulsed TDFA performances + Patent may be envisaged
+ High efficiency of the DBR high-power laser (low insertion loss); + Compactness and high manufacturability of the laser source (monolithic device, identical layer structure)	LPI	Patent

Key exploitation results	Owners	Exploitation strategy
Frequency Reference System	EP-LMD	Publication
Optical Switch (OS)	ONERA	Publication
Experimental hybrid laser system	✦ ONERA ✦ EPLMD ✦ KEOPSYS	✦ Presentation of the system (not dismantled) in optics-related conference ✦ Publication of performances
Detailed characterization of the performance of the hybrid laser system	✦ ONERA ✦ EPLMD	✦ Publication, conferences This result will be the baseline for future actions as it will justify the potential of the developed hybrid laser system.
Dataset related to the environmental qualification	✦ LZH ✦ KEOPSYS	✦ Publication if not secret (possibly linked to the complete system)



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