H2020-FETOPEN-2019-01

FET-Open Challenging Current Thinking

POSEIDON

NanoPhOtonic devices applying Self-assembled colloIDs for novel ON-chip light

Starting date of the project: 01/01/2020
Duration: 48 months

= Deliverable D6.8 =

Report on Dissemination activities

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Dissemination level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	
CI	Classified, information as referred to in Commission Decision 2001/844/EC	

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VALIDATION PROCESS

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Executive Summary

The timely and effective dissemination of results is an essential part of every research project. This ensures that the gained knowledge or exploitable foreground can benefit the whole society, and that duplication of research and development activities is reduced.

This document describes achievements of project's dissemination activities, its impact and the internal procedures that made up the framework in which the project's dissemination and communication efforts were undertaken. The communication and dissemination of the project's achievements never jeopardised protected intellectual property because strict rules of prior notice to all partners were applied according to EC guidelines and the POSEIDON Consortium Agreement. Partners had the opportunity to refuse dissemination of their own know-how (background or results) by others when it could potentially harm their interests.

Table of contents

Executive Summary....3
1. Introduction....5
2. Dissemination and Communication strategy and plan....6
2.1.1. Workshop....7
2.1.2. Research Highlights....8
2.1.3. Podcast....9
2.1.4. Final Video....9
3. Dissemination material that has been prepared....10
3.1 Project logo....10
3.2 Webpage....11
3.3 Roll up....12
3.4 Social Media- LinkedIn....12
4. Publication of POSEIDON results....13
4.1 Presentations at conferences, symposia, meetings....13
4.2 Scientific articles in relevant journals and periodicals....14
5. Conclusions....15
6. Degree of Progress....15
7. Dissemination Level....15

1. Introduction

Deliverable 6.8 ‘Report on Dissemination activities’ is part of the task 6.1 Communication materials. The task states that partners will define a working document **outlining the dissemination strategy** (definition of internal procedures, target audience, and timelines) **and communication strategy** (means, methods and tools used to approach the defined target audience during the life of the project).

The document summarizes dissemination activities that achieved the identified main objectives:

- Implement communication activities targeted to different stakeholders!
- Produce publicity materials for project outputs and involve the scientific community throughout all phases of the project.
- Participating in conferences, workshops, trade-shows to foster relationships with other framework projects and initiatives (clustering activities).

2. Dissemination and Communication strategy and plan

In relation to the external communication, the dissemination of the project's achievements never jeopardized the potential protection of generated intellectual property (e.g. patent, product design) and further industrial application. Therefore, before any dissemination activity (publication, presentation) strict rules of prior notice to all partners were applied, according to EC guidelines. Prior notice of any planned publication was given to other consortium members at least 45 calendar days before the publication (Figure 1). Partners had the possibility to refuse dissemination of their own know-how (background or results) when it could potentially harm the partner's interests. The Project Coordinator in cooperation with the Project Manager followed the approval processes and acted as an internal executive approval body for any dissemination action organized by different partners.

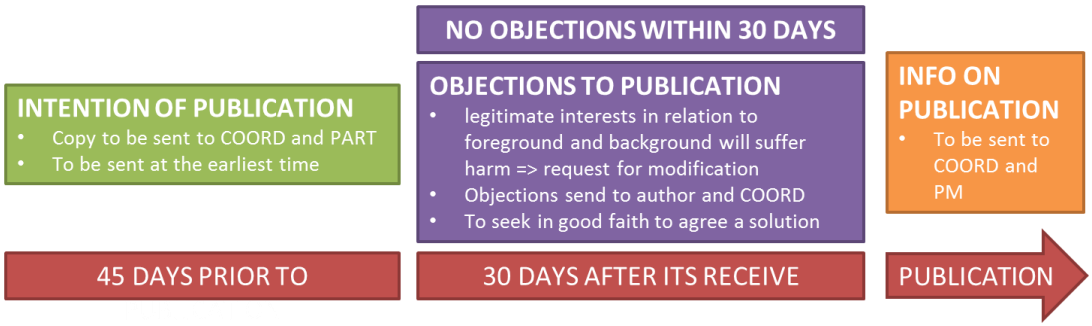


Figure 1: Information and timeline of intention of publication

The above stated procedures ensured that all dissemination material is quality assured through checking:

- ✓ messages to be transmitted outside of the consortium, including the suitability of the messages for the people addressed, the stress on the benefits and the relevance for the industry (when applicable);
- ✓ technical contents control in order to ensure the quality of achieved scientific and research objectives of project brochures, info on the homepage etc.;
- ✓ that scientific papers and publications contain sufficient reference to the project; and
- ✓ layout quality and suitability to the standard

All project outcomes acknowledged the support of the European Commission as it is requested by the Article 29 (Dissemination of Results, Open Access, Visibility of EU Funding) and Article 38 (Promoting the Action, Visibility of EU Funding) of the H2020 MGA. The following information was always mentioned in the publication: "This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 861950, project POSEIDON".

2.1 Overview of dissemination activities

Below is the overview of the POSEIDON communication and dissemination activities. All phases have been completed.

Timeline	List of fulfilled activities
Phase 1 (M1 – M12):	✓ webpage creation ✓ factsheet creation ✓ dissemination strategy
Phase 2 (M13 – M24):	✓ mid-term report on dissemination ✓ webpage updated ✓ scientific publications of the POSEIDON results ✓ partners participating in conferences ✓ press release ✓ LinkedIn active
Phase 3 (M25 – M36):	✓ webpage update - news ✓ roll up
Phase 4 (M37 – M48):	✓ workshop organized ✓ clustering activities ✓ *research highlights created on the website ✓ business cards created with QR code to POSEIODN web ✓ *Podcast "In Her Shoes" produced, highlighting female scientists in POSEIDON ✓ final report on dissemination activities ✓ scientific publications of the POSEIDON results ✓ final video summarizing the whole project

*Extra activity

2.1.1. Workshop

AMO GmbH and RWTH Aachen University organized a workshop on November 21-22, 2022 in Aachen, bringing together experts from academia and industry to discuss recent advances on the integration of novel materials into silicon photonic platforms. The scope of the workshop "**Integration of novel materials into silicon photonics**" was to present the recent advances of the field, and to discuss the possible advantages and challenges posed by different materials – from quantum dots, to perovskites, to 2D-materials, etc. – and by different integration strategies.
The workshop included a hybrid session dedicated to the integration of 2D materials to nanophotonics, in cooperation with the 2D-Experimental Pilot Line.
The POSEIDON team was also present at the workshop with a Roll-Up that was placed next to the stage. Stephan Suckow presented parts of POSEIDON in the opening and Mario Zapata gave a talk on the plasmonically enhanced particle-on-a-mirror light emitters we are researching in POSEIDON. Another talk from the consortium was planned but had to be cancelled due to the speaker not being available. Finally, AMIRES created a nice summary video (Link for the video is here). For more information refer to the deliverable 6.7.

Figure 2:Promotional image on POSEIDON LinkedIn + overview of the workshop meeting room

2.1.2.Research Highlights

Within the POSEIDON project, numerous scientific publications have been produced. The full list is available on the homepage. Additionally, we have prepared a selection of highlights, available on the home page and promoted via LinkedIn. The intention of these highlights is to explain some results to non-experts.

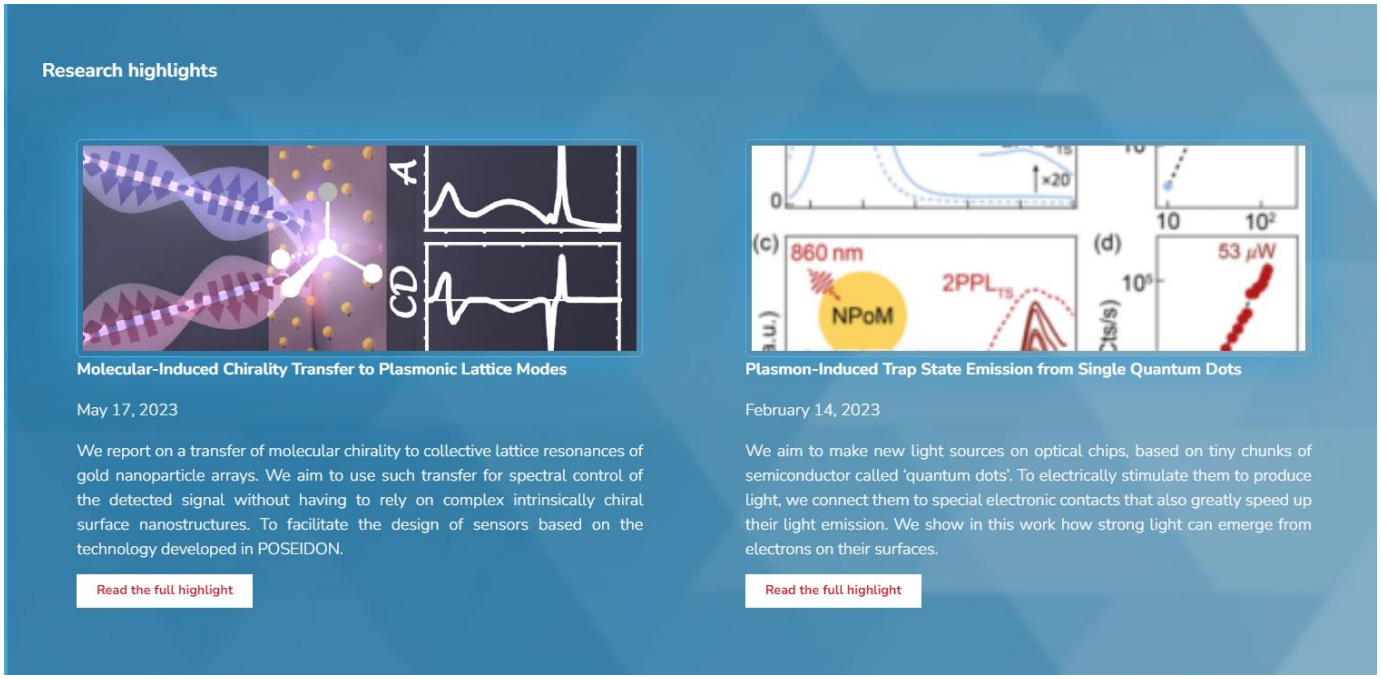


Figure 3: Summary of publications available on home page website

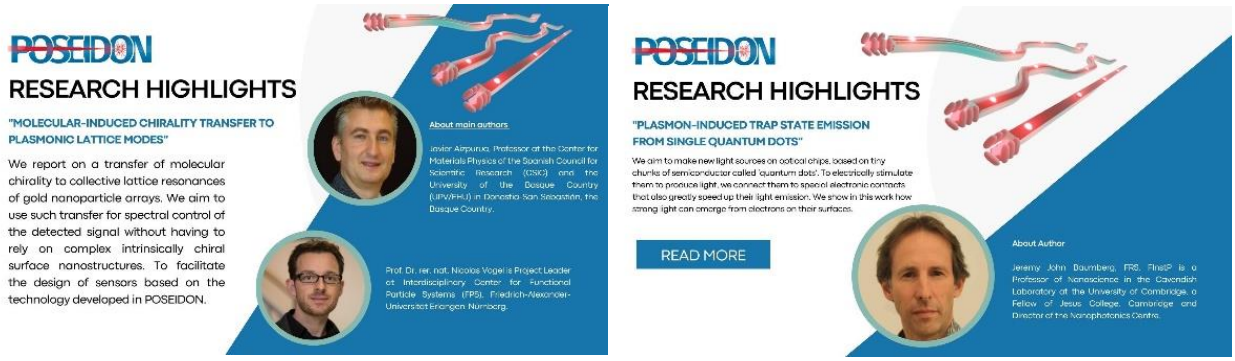


Figure 4: Summary of publications promoted on LinkedIn

2.1.3.Podcast

Women still represent just 33,3%*[1] of researchers globally, and their work rarely gains the recognition it deserves. Less than 4% of Nobel Prizes for science have ever been awarded to women, and only 11% of senior research roles are held by women in Europe. Therefore, we initiated a new activity – a PODCAST on the journey and life of women in science. To get views from a senior professor in Europe up to a mum of two with love of nanotechnology we interviewed 3 women actively involved in POSEIODN:

- Prof. Dr. Anna Lena Schall-Giesecke
- Dr. Alina Muravitskaya
- Prof. Dr. Nerea Zabala

The Podcast is available on Spotify: https://open.spotify.com/show/5aOxF8xC9yAQTRuUiKig1Yz
The outcome was excellent: in the first week after posting the first episode we achieved 100 downloads on Spotify, were listened in 10 countries and the LinkedIn post achieved >1000 impressions, >40 likes, 2 comments and 5 reposts. Since then, these numbers have grown to 207 downloads on Spotify. Above all, we are convinced that displaying positive role models can inspire others through their journey.

Figure 5: Podcast In Her shoes

2.1.4.Final Video

We are in the process of finalizing a final video summarizing key aspect of the project. We have decided to produce the video towards the end of the project to be able to include results rather than just the original concept. It will soon be available on the main page https://poseidon-fet.eu/
Below is the script:

"Welcome to the world of the POSEIDON research project, where innovation in self-assembly of nano-scale structures meets nanophotonics. Our goal is to use self-assembly of tiny nanoparticles into periodic structures, to form highly efficient light emitters which radiate into nanophotonic waveguides. We are researching a low-cost manufacturing process which can be used to integrate such emitters into microprocessors, as used in data centers or someday even in your mobile phone. With innovation at the

[1] UNESCO Science Report: towards 2030

core, our multidisciplinary team addresses these very challenging targets through a strong partnership between world leading research groups, SME and the key industrial players IBM, Hitachi, Osram, Causeway Sensors and Senseair who are integrated into the project through our External Advisory Board.

Our journey begins with controlled synthesis, we harness the power of low-cost colloids to create the building blocks of our revolutionary devices. Through hierarchical assembly, these tiny particles self-organize, merging into intricate structures at nanometre scales. This breakthrough technology can eliminate the limitations of traditional top-down fabrication, tearing down the barriers of cost and complexity. At the heart of our light emitters are plasmonic nanocavities, where the interaction between matter and light is very strongly enhanced. To take advantage of this nanoantenna effect, the emitters are located at precisely controlled nanogaps between metals. We explore and simulate different nanocavity configurations to locate the emitters, such as tip-to-tip assembled metal nanorods or particle-on-mirror configurations. We also explored the coupling of the emitter-nanocavity system with the waveguide and optimized the efficiency of light funneling into the waveguide. Here we are synthesizing various nanoparticles, like gold rods coated with light emitting quantum dots. The luminescence of such solutions in a glass vial can even be seen by our naked eyes. These nanoparticles are then arranged into supra-particles, using for example polymer chemistry, or into regular patterns by self-assembly. This photoluminescence map demonstrates light emission enhancement from our regularly arranged nanoparticles array coated with quantum dots. Here the bright area represents emission enhancement of the array. For the integration with waveguides, we have chosen nano patch antennas, which form a very regular hexagonal pattern on flat reference substrates. This hexagonal pattern is preserved well when these structures are placed into cavities etched into nanophotonic waveguides. Photoluminescence confirms the selective particle deposition only in the waveguide cavity. The chips are then characterized in optical measurement setups, where the emitted light is guided to the chip edge by the waveguides and is there captured by a glass fiber and analyzed. Most of our light emitters are excited by other light sources, like LEDs, from outside the chips. But the holy grail of integrated light emitters are electrically driven light emitters. We have demonstrated for the first time to enhance the emission of such a light source, so that it becomes visible even though it consists of just a single nanoparticle and the metallic antenna.

POSEIDON is paving the way towards future nanophotonics. Visit our website to learn more."

3. Dissemination material that has been prepared

Several types of dissemination materials were prepared to create awareness and inform wide and various audiences about the POSEIDON project and its development. These materials have been extensively used by POSEIDON partners whenever they presented at conferences etc. The following promotional materials were developed during the POSEIDON project:

- **Project logo**
- **Project webpage**
- **Project factsheet**
- **Press release**
- **Template for Presentation at conferences, symposia, meetings**
- **Template posts for LinkedIn and Podcast**
- **Roll up**
- **Business cards**
- **Promotional video of the project**

3.1 Project logo

The project logo was used in all the project related advertising materials.

Figure 6: official POSEIDON logo

3.2 Webpage

The official POSEIDON website https://poseidon-fet.eu/ was regularly updated throughout the project. About 6000 users visited the POSEIDON website for the whole duration of the project. The most visited pages are Project team, followed by scientific publication and results.

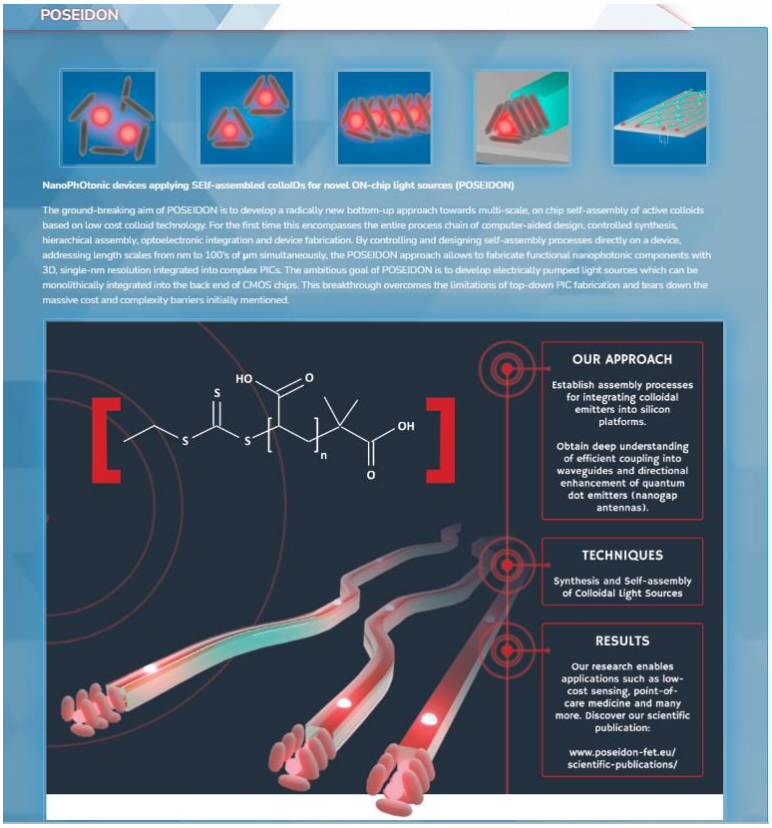


Figure 7: POSEIDON website

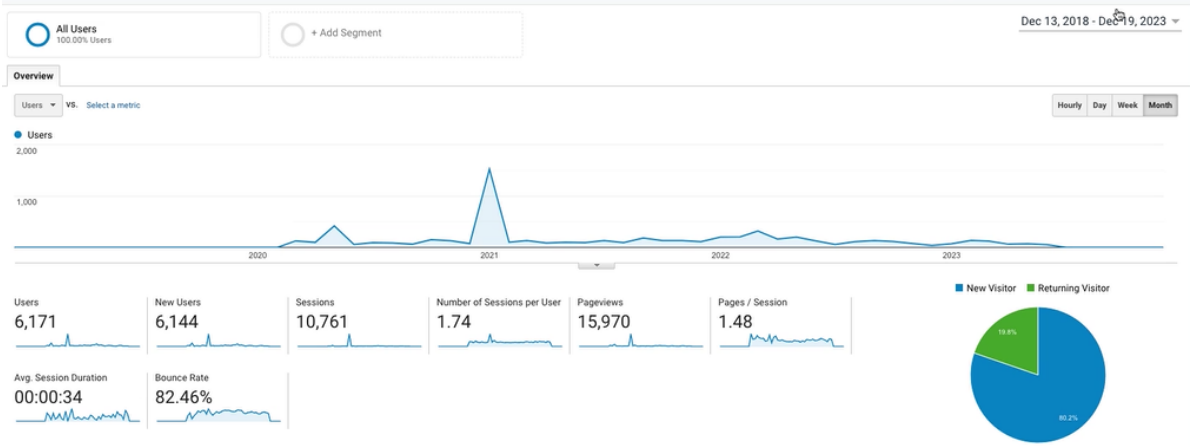


Figure 8: POSEIDON homepage analytics

3.3 Roll up

To present the POSEIDON project at different events a roll-up was developed including the general project information, the description of the POSEIDON concept and approach with visual contents, the logos of partners and the webpage link.

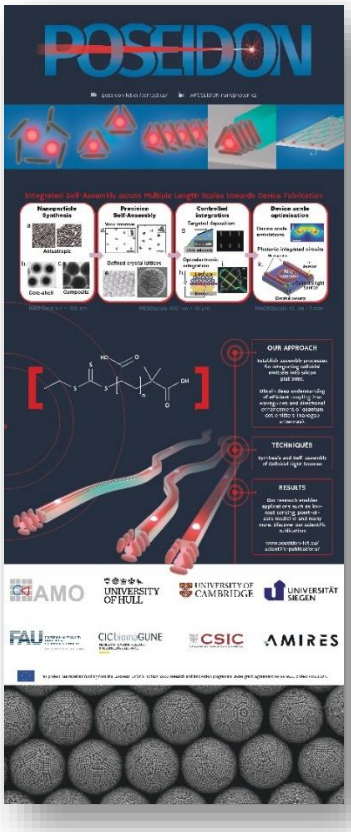
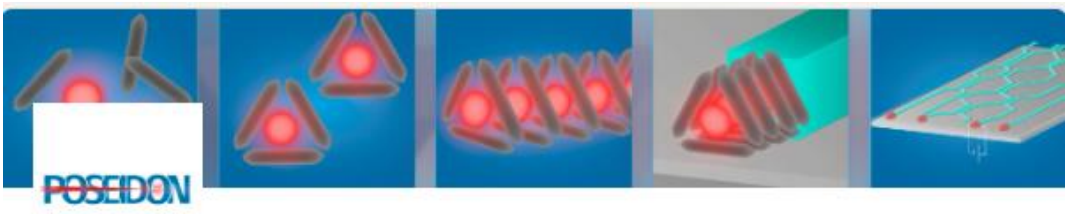


Figure 9: POSEIDON roll up

3.4 Social Media- LinkedIn

Social media gained further importance during the coronavirus pandemic and had been used significantly to gain traction and attract third parties. Short news on the POSEIDON project and its development were shared on the POSEIDON LinkedIn account, that reached around 274 followers. Approximate reach per post is 1000 impressions.

	Dec 2020 M12	June 2021 M18	Dec 2021 M24	June 2022 M30	Dec 2023
LinkedIn followers	51	87 (+36)	113(+26)	156(+43)	274(+118)



POSEIDON nanophotonics

Self-assembled colloids for low cost, scalable light sources in photonics

Nanotechnology Research · 274 followers · 2-10 employees

Figure 10: POSEIDON LinkedIn page

4. Publication of POSEIDON results

4.1 Presentations at conferences, symposia, meetings

A set of conferences, workshops, and seminars were attended by partners to disseminate POSEIDON results. Here are a few examples of events where POSEIDON presented:

- ImagineNano2020-2023
- Nanolight 2020-2023
- London Plasmonics Forum 2020- 2023
- Spanish Conference on Nanophotonics 2021-2023
- NanoGe Spring Meeting, 2021-2023

Below is the list of events attended by partners in 2022 and 2023:

Conference	PAC Symposium	03 March 2022	Utrecht (The Nederlands),
Conference	ACS Spring 2022, "Optical Spectroscopy of Nanoscale Surfaces, Interfaces and Structures"	20–24 Mar 2022	San Diego (USA)
Conference	ACS Spring 2022, "ACS Award in Colloid Chemistry: Symposium in Honor of Molly Stevens"	20–24 Mar 2022	San Diego (USA),
Conference	XVII LatinAmerican Polymer Symposium / XV IberoAmerican Polymer Congress	8-12 May 2022	San Sebastián, Spain
Conference	PIERS 2023	3-6 Jule 2023	Prague, Czech
Conference	XVII LatinAmerican Polymer Symposium / XV IberoAmerican Polymer Congress	8-12 May 2022	San Sebastián, Spain
Conference	Indtech	27-29 June 2022	Grenoble, France
Conference	UK Colloids	17-19 July 2023	Liverpool, UK
Conference	European Colloids and Interface Society	03-08 September 2023	Naples, Italy
Conference	2nd Virtual Congress on	MARCH 29-31,	Online
Conference	META 2023, 13th International	Paris, France, July	Paris
conference	Nanophotonics and Micro/Nano Optics	Barcelona, spain, 27-	online (just for
Conference	International Soft Matter Conference 2023	4-8 September 2023	Osaka, Japan
Conference	Colloquium	22 March 2023	London, UK
Conference	Materials Research Society (MRS)	10-14 Apr 2023	San Francisco (USA)
Conference	Surface Plasmon Photonic 10	21-26 May 2023	Houston (USA)
Conference	Colloquium	31 May 2023	Lemont (USA)
Conference	Colloquium	01 June 2023	Chicago (USA)
Conference	Gordon Research Conference on Plasmonically Powered Processes	04-09 June 2023	Ventura (USA)
Conference	Thinking institute at the university of Vigo	7-9 June 2023	Vigo, Spain
Conference	VI Congreso de Jóvenes Investigadores e Investigadoras en Coloides e Interfases	13-15 September 2023	Granada, Spain
Seminar	Leibniz Institute for Solid State and Materials Research Dresden (Germany)	24 May 2023	Dresden, Germany
Conference	ChinaNano	26-28 August 2023	Beijing, China
Public Lecture	Science Week, Oviedo University	24 April 2023	Oviedo, Spain

4.2 Scientific articles in relevant journals and periodicals

Publication of POSEIDON results in relevant scientific and industrial periodicals and journals in Europe was encouraged during the project. All POSEIDON publications are available here.

Examples of journals, where POSEIDON partners contributed:

Nature, https://www.nature.com/
Science, https://www.sciencemag.org/
Nature Communication, https://www.nature.com/commsenv/
Nature Photonics, https://www.nature.com/naturephotonics
Opt. Express, https://www.osapublishing.org/oe/home.cfm
ACS Photonics, https://pubs.acs.org/journal/apchd5
ACS Nano, https://pubs.acs.org/journal/ancac3
Nanoscale, https://www.rsc.org/journals-books-databases/about-journals/nanoscale/
Advanced Materials, https://onlinelibrary.wiley.com/journal/15214095
Nano Letters, https://pubs.acs.org/journal/nalefd

To highlight a few examples, the following is a list of publications where POSEIDON partners have contributed so far:

- Molecular-Induced Chirality Transfer to Plasmonic Lattice Modes
- Plasmon-Induced Trap State Emission from Single Quantum Dots
- Controlling Optically Driven Atomic Migration Using Crystal-Facet Control in Plasmonic Nanocavities; ACS
- Complex plasmon-exciton dynamics revealed through quantum dot light emission in a nanocavity; Springer Nature
- Adsorption Trajectories of Non-spherical Particles at Liquid Interface; APS
- Pattern formation in two-dimensional hard-core/soft-shell systems with variable soft shell profiles; The Royal Society of Chemistry

5. Conclusions

We fulfilled the identified objectives:

- ✓ Implemented all (and beyond the plan) communication activities
- ✓ Produced a number of dissemination materials for project outputs and involve the scientific community throughout all phases of the project.
- ✓ Participated in conferences, workshops, trade-shows to foster relationships with other framework projects and initiatives (clustering activities).

Below is a summary of our impact:

Impact of dissemination activities

Activity	Reach	Impact
Workshop	120 participants	• Increased visibility + collaboration with other project > New followers on LinkedIn
Research Highlights	100 total engagements/clicks	• Helped understand complex publication> a high visibility of the project
Podcast	150downloads first 10 days, 1k total reach on LinkedIn	• Visibility of women in POSEIDON and POSEIDON'S activities
Publication	30 publications	• Publicly available, recognition of POSEIDON> cover of ACS Photonics
Conferences	Attended	• Increased visibility > New followers on LinkedIn
Website	6000visitors	• Huge USA company(making mass OLED materials) approached UCAM too making mass OLED materials, • Venture Capital firm- LDV Capital> discuss plans/vision to commercialize

6. Degree of Progress

100% fulfilled.

7. Dissemination Level

The Deliverable D6.8 is public and therefore it will be available to download on the project's website and on demand.