ENLIGHT'EM

European Training Network in
Low-Energy Visible Light IoT Systems

Innovative Training Networks (ITN)
H2020-MSCA-ITN-2018

Deliverable D5.3

Second report on dissemination and exploitation results

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Deliverable D5.3

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Contributors

All beneficiaries and partners.

Abstract

Results of dissemination and outreach activities completed during the second year of the project by the partners and beneficiaries within the scope of ENLIGHT'EM project.

Revision History

Version	Editor	Date	Change
0.0	Borja Genovés	17/01/2020	Created initial template.
0.7	Sercan Karaağaç	25/05/2021	Second Year Report Generated with Beneficiary Inputs
0.8	Borja Genovés and Domenico Giustiniano	28/05/2021	Review of deliverable and integration of additional inputs from partners.
0.9	Rui Bian, Daniele Puccinelli	31/05/2021	Final review and inputs received
1.0	Borja Genovés and Domenico Giustiniano	31/05/2021	Final review

Executive summary

This document captures Dissemination and Exploitation Results for the second year of the project of the ENLIGHT'EM project partners. The present Second Annual Report on Dissemination and Exploitation Results – prepared within the Dissemination and Outreach Work Package (WP5) – will ensure that dissemination activities from various WPs and the project in general are captured, and well presented.

The document includes all the dissemination, communication and outreach efforts. Results of the tasks such as the review and mapping of stakeholders at European, national and local levels, timing of communication and dissemination activities, media channels, and division of tasks between partners are detailed.

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List of Abbreviations

ENLIGHT'EM	European Training Network in Low-energy Visible Light IoT Systems Project
MSCA	Marie Skłodowska-Curie Action
ITN	Innovative Training Networks
ETN	European Training Networks
ESR	Early Stage Researcher
SB	Supervisory Board
IPR	Intellectual Property Rights
IP	Intellectual Property
IoT	Internet of Things
VLC	Visible Light Communication
LiFi	Light Fidelity

1. Introduction

ENLIGHT'EM is training the next generation of researchers in energy efficient IoT systems based on VLC. This project consolidates pan-European collaborations among leading groups in the field, and it is fostering its contribution to the consolidation of the 5G ecosystem by developing low-energy VLC systems and also plans to feed into standardization activities. Disseminating the results of such research and explaining its impact on the design of IoT systems that leverage the low baseline energy consumption of LEDs is an important objective of the ENLIGHT'EM project.

In this report, all research, dissemination, and exploitation activities, carried out during the second year of the project are provided as a summary as reported by the project partners.

1.1.   Responsibilities and Points of Contact

The following table lists the main network wide bodies responsible for the dissemination and outreach activities tasks of ENLIGHT'EM and the updated list of responsible project participants constituting the respective bodies.

Table 1: Contact persons details

Contact person	Role	Institution
Sercan Karaağaç, skaraag1@ford.com.tr	WP5 - Dissemination and Outreach lead	FORD
Ilenia Tinnirello, ilenia.tinnirello@unipa.it	T5.1 – Academic Dissemination Lead	UNIPA
Daniele Puccinelli, daniele.puccinelli@supsi.ch	T5.2 – Communication and Outreach Lead	SUPSI
Rui Bian, rui.bian@purelifi.com	T5.3 – Exploitation and Impact Plan Lead	PLF

2. Dissemination Results

This section presents dissemination activities in which ENLIGHT'EM participants have been involved during the second year of the project. These activities have been used by ESRs to disseminate the initial ENLIGHT'EM outcomes.

2.1 TU Delft

TU Delft researchers involved in the ENLIGHT'EM got the following accepted papers related to the project:

<u>James Broadhead</u>, Przemysław Pawełczak, "Data Freshness in Mixed-Memory Intermittently-Powered Systems" accepted at ISIT 2021. (Link to paper: https://arxiv.org/abs/2102.01572)

<u>James Broadhead</u> presented a paper: James Broadhead, Przemysław Pawełczak, "Position Paper: Why Intermittent Computing Could Unlock Low-Power VLC" at workshop "Light Up the IoT" co-located with ACM MobiCom 2020. (Link to the presentation: LIoT 7. Position Paper: Why Intermittent Computing Could Unlock Low-Power VLC - James Broadhead - YouTube)

<u>Talia Xu</u> submitted a paper to ACM MobiCom on 25 March 2021.

<u>Talia Xu</u> presented a published paper on February 2021: Blokker, Roy; Xu, Talia; Zúñiga Zamalloa, Marco A. "Communication with Ambient Light using Digital Micromirror Devices" workshop on Computer Human Interaction in IoT Applications (CHIIoT1) co-located with EWSN21.

2.2 University of Applied Sciences and Arts of Italian Switzerland (SUPSI)

The SUPSI ESR has not engaged in any specific dissemination activities.

However, as planned, SUPSI has taken the lead of the organization of the "Light Up the IoT" (LIoT) Workshop Co-located with ACM MobiCom 2020 (on 25 September 2020), and successfully completed the event that is also a part of Training Event 3. The general chairs were Daniele Puccinelli (SUPSI) and Julio Rufo (LightBee - LBEE). LIoT was accepted by the ACM Mobicom organizers as a half-day workshop and took place virtually on September 25th, 2020. Results of this workshop be reached from the link: https://enlightem.eu/results/workshops/light_up_the_iot/

Also as planned, SUPSI is also organizing a new workshop called "Internet of Lights", as a forum for researchers to share research results. It will take place on the 25th June, 2021, co-located with ACM Mobisys 2021. The general chairs are Daniele Puccinelli (SUPSI) and Frank Lochmann (Tridonic) The website of the workshop is: https://enlightem.eu/results/workshops/iol-workshop/

2.3   LightBee Corp (LBEE)

LightBee has also been involved in the co-organization of the ACM Workshop titled 'Light Up the IoT', co-located with the ACM MobiCom 2020 at London, United Kingdom in September 2020. As mentioned above, it is co-organized by SUPSI and LightBee.

2.4   IMDEA Networks (IMDEA)

IMDEA ESRs involved in the ENLIGHT'EM carried out the following research dissemination activities during year 2 of the project:

- Conference paper presentation: Muhammad Sarmad Mir, Borja Genoves Guzman, Ander Galisteo, Domenico Giustiniano, "Non-linearity of LEDs for VLC IoT applications" at "Light Up the IoT" co-located with ACM MobiCom 2020.

- Journal paper submission for VLC prototyping (Sarmad Mir).

- Conference paper submission to ACM Mobicom 2021 (Sarmad Mir).

- Conference paper submission to workshop 'Internet of Lights' (Sarmad Mir and Behnaz Majlesein from LBEE).

2.5   The University of Edinburgh (UEDIN)

UEDIN has contributed to dissemination with the following activities:

Tilahun Gutema has attended conference at workshop "Light Up the IoT" co-located with MobiCom 2020, and presented his published workshop paper: Tilahun Zerihun Gutema, Harald Haas, Wasiu O. Popoola "OFDM Based Visible Light Communication with Probabilistic Shaping".

Tilahun has also published a journal paper in a high reputational journal: T. Z. Gutema, H. Haas and W. O. Popoola, "Bias Point Optimisation in LiFi for Capacity Enhancement," in *Journal of Lightwave Technology*, doi: 10.1109/JLT.2021.3083510.

2.6   PureLiFi (PLF)

PureLiFi has contributed to dissemination with the following activities:

Gianluca Martena has submitted a paper of research findings to ACM MobiSys 2021 - Workshop on '' Internet of Lights (IoL)'' conference.

2.7   Ozyegin University (OZU)

Khadijeh Ali Mahmoodi has attended "Light Up the IoT" co-located with MobiCom 2020 conference in September 2020 as a participant. He also attended the 3rd West Asian Symposium on Optical and millimeter wave Wireless Communications Conference.

Khadijeh Ali Manhmodi has published and presenter a paper of his research findings to IEEE Blackseacom 2021 conference: Khadijeh Ali Mahmoodi and Murat Uysal, "AUV Trajectory Optimization for an Optical Underwater Sensor Network in the Presence of Ocean Currents" (Event link: https://blackseacom2021.ieee-blackseacom.org/)

2.8   University of Palermo (UNIPA)

Kien Ngo has submitted a paper of their research findings to the conference, MedComNet 2021: Kien Trung Ngo, Stefano Mangione, Ilenia Tinnirello, "Exploiting EDCA for Feedback Channels in Hybrid VLC/WiFi Architectures". The paper has been accepted and will be presented at the conference.

2.9   Toshiba Research Europe Ltd. (TREL)

Jagdeep Singh presented a workshop paper: Jagdeep Singh and Usman Raza "Passive Visible Light Positioning Systems: An Overview" during the conference "Light Up the IoT" co-located with ACM MobiCom 2020

2.10   Ford Otosan (FORD)

Unfortunately, due to the late incorporation of Bismillah Nasir Ashfaq and Daniel Tettey to the project, they have not accomplished any dissemination activity yet.

3. Communication and Outreach

3.1   Communication through open electronic media

IMDEA has been in charge of promoting and disseminating the results of the events organized within the ENLIGHT'EM project.

IMDEA is updating the [website of the project](#) with every new event and result obtained from the project.

After revising our Social Network strategy, we decided to open a LinkedIn account in November 2020 because we consider it very useful to reach professional profiles interested in our field of research. Besides, our Facebook page was removed by Facebook without notice and we couldn't reactivate it. Then, we decided to focus on Twitter and YouTube.

The following table shows the activity of ENLIGHT'EM in open electronic media, with the aim of disseminating outcomes and drawing the attention of the general public.

Table 2: Activity in open electronic media during the second year of the project

Social Network Channel	Activity
Facebook	Removed by Facebook without any valid reason
YouTube	67 Videos, 7 Playlists Views: 3.500 times, 127.8 hours, 33.900 impressions
Twitter	246 Tweets, 539.126 Impressions 561 Following, 143 Followers
LinkedIn	352 Views, 40 Followers

All ESRs have introduced their projects through individual short videos. They are being disseminated through ENLIGHT'EM social media channels. We are releasing one video every Friday. All these videos can be found at ENLIGHT'EM social media channel, but they are redirecting to the Youtube ENLIGHT'EM channel where videos are uploaded:

https://www.youtube.com/playlist?list=PLGH-oHXjzcdERRfqdayxF94zQiB9gSm3l

3.2   Communication through the formal press

IMDEA Networks sent a Press Release at 'Revista Acción Telefónica' March 2021, where ENLIGHT'EM project is mentioned. Link to the press release:

https://www.telefonica.com/es/web/zona-accionistas/revista-accion-marzo-2021

3.3 Communication through public events

The following communication activities to the public at large have taken place to disseminate the project implications on the possibility to provide affordable, low-cost and low-energy technologies for Internet access.

IMDEA (Coordinator Domenico, Project Manager Borja, ESR Sarmad), Univ. of Strathclyde (Supervisor Harald Haas), PLF (ESR Janis), and UoE (Supervisor Popoola, ESR Tilahun) participated in the event "Science is Wonderful 2020" on 22-24 Sept 2020, which was part of the European Research and Innovation Days. Links to the event recordings:

- https://www.youtube.com/playlist?list=PLGH-oHXjzcdGBAI-ZvrCGA1ZtuwPcaT5Y
  https://ec.europa.eu/research/mariecurieactions/events/science-wonderful-2020_en

In what follows, we list the activities for communication by the single beneficiaries:

IMDEA:
The ESR Muhammad Sarmad Mir, the Project Manager Borja Genoves Guzman and the Project Coordinator Domenico Giustiniano have attended "Week of Science 2020" event organized by Government of Region of Madrid in November 2020 to disseminate Sarmad's project outcomes. Links to the presentation, and the event:

- https://www.youtube.com/watch?v=zuG6CBOdAiE&list=PLGH-oHXjzcdHnLaXfcSLVi3rhHxqHmaNW&index=3

- https://networks.imdea.org/es/actualidad/agenda-de-eventos/science-and-innovation-week-2020-green-light-for-the-earth/

- http://www.madrimasd.org/lanochedelosinvestigadores/actividad/imdea-networks-luz-verde-para-la-tierra

Muhammad Sarmad Mir has attended the "European Researcher's Night 2020" to disseminate Sarmad's project outcomes together with Borja Genoves Guzman and Domenico Giustiniano from IMDEA Networks. Links:

- https://networks.imdea.org/es/noche-europea-de-los-investigadores-2020/

- https://www.madrimasd.org/notiweb/noticias/luz-verde-tierra-imdea-networks-en-noche-europea-los-investigadores

Muhammad Sarmad and Dayrene have presented their projects during "European Researcher's Night 2021"

- Sarmad: https://www.youtube.com/watch?v=FHFgYF_UUk8

- Dayrene: https://www.youtube.com/watch?v=5QNliYIXzaI

UEDIN:

Tilahun Gutema has attended "European Research and Innovation Days - Online Science Exhibition at Science is Wonderful! 2020", and presented his research results to the date.

PureLiFi:

Janis Sperga has presented a video demo on Gigabit LiFi System during the "Online Science Exhibition at Science is Wonderful! 2020" conference. Video recording of the presentation is below:

https://www.youtube.com/watch?v=Iz47ETthTys&t=1s&form=MY01SV&OCID=MY01SV

UNIPA:

The ESR Kien Ngo, and his advisors Prof. Stefano Mangione and Prof. Ilenia Tinnirello have presented their research results to the date during "European Researchers' Night: Palermo" conference in November 2020. (Event link: https://enlightem.eu/european-researchers-night-palermo/)

FORD:

Bismillah Nasir Ashfaq and Daniel Tettey are working on an indoor VLC based video transmission demonstration to be performed on June 2021 using Ford F-Max Truck LED headlights with the following data transmission performance metrics; data rate ~4Mbps, range ~15m, latency ~30ms. A video will be created during the demo, and will be shared over the project social media accounts. The outcomes of the study will be documented in a paper, and will be presented.

4. Exploitation of results and intellectual property

ESRs Dayrene (IMDEA), Sarmad (IMDEA) and Kien (UNIPA) have submitted a proposal to the "EIT Jumpstarter 2021" to get support to turn their ideas into business.

Jagdeep Singh, Usman Raza has completed the first step of a patent application internally within Toshiba for future exploitation.

All ESRs will receiving training on Intellectual properties and patents issues between June and July 2021:

- Event 4: **Training on VLC technology & Research commercialization**, and project meeting #4

- Event 5: **Training on research exploitation**, Presentation at IEEE standardization meeting, and project meeting #5

The ESRs did not contribute to standardization bodies or creation of startups yet, although first initiatives are growing up (e.g., participation at EIT Jumpstarter 2021 mentioned above). Besides, ESRs will attend Meetings of IEEE Plenary session, all of them spread over July 09-23. This activity is part of Training Event 5:

- Event 5: Training on research exploitation, **Presentation at IEEE standardization meeting**, and project meeting #5

Besides, ESRs received training on entrepreneurship on Event 3:

- Event 3: **Training on entrepreneurship**, Workshop at conference, and project meeting #3

Finally, beneficiary pureLiFi is founding member of the Light Communication Alliance (LCA) whose mission is to lead the global adoption of light communication technologies, offer unprecedented wireless communications and to build a far-reaching, coherent & sustainable ecosystem. PureLiFi plans to use the LCA platform to disseminate ENLIGHT'EM outcomes.

5. Conclusion

This document has summarized the dissemination activities of the second year of the ENLIGHTEM project. In particular, we have presented the summary of industrial and academic contributions. As can be seen from the report, dissemination activities through publications and conference presentations are progressing. Furthermore, the project partners have built a community through presentations to a broader public, and planning further dissemination initiatives, included specific workshops on the project themes.

Annex

Annex A: Official project event during second year of ENLIGHT'EM project

The following official project Events have been accomplished during the second year of the project:

Table 3: Main network-wide Training Events organized along the second year of the project

Main Training Events & Conferences		ECTS	Lead Institution	Completion Status
Event 2	Training on research skills, and **project meeting #2**	2.4	**IMDEA/UEDIN** Held virtually	**Completed – July 2020 (M14)**
Event 3	Training on entrepreneurship, Workshop at conference, and project meeting #3	2.4	**LBEE/VEL/SUPSI** **Held virtually and co-located with**	**Completed – September 2020 (M16)**