



ENLIGHT'EM

European Training Network in Low-Energy Visible Light IoT Systems

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

Deliverable D5.2

Annual report on dissemination and exploitation results



Date of delivery: 31/05/2020

Version: 1.0

Start date of Project: 01/06/2019

Duration: 48 months

Deliverable D5.2

Annual report on dissemination and exploitation results

Project Number:	814215
Project Name:	European Training Network in Low-Energy Visible Light IoT Systems

Document Number:	H2020-MSCA-ITN-2018-ENLIGHTEM/D5.2
Document Title:	Annual report on dissemination and exploitation results
Deliverable Lead Organisation:	FORD
Workpackage:	WP5
Version:	1.0
Dissemination Level:	PU
Contractual Date of Delivery:	31/05/2020
Status:	Final
File Name:	D5_2_Annual_report_on_dissemination_and_exploitation_results_v1_0.docx

Editors

Sercan Karaağaç (FORD), Borja Genovés (IMDEA), Domenico, Giustiniano (IMDEA), Ilenia Tinnirello (UNIPA)

Contributors

All beneficiaries and partners: IMDEA, SUPSI, UNIPA, TREL, TUD, UEDIN, PureLiFi, OZY, FORD, LightBee, NOKIA Bell Labs, Tridonic, Zodiac Inflight Innovations, Velmenni, UC3M, ULPGC.

Abstract

Results of dissemination and outreach activities completed during the first 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.
0.1	Sercan Karaağaç	05/06/2020	First draft for first year activities
0.2	Ilenia Tinnirello	17/06/2020	Integrations and first revision of the document
0.3	Borja Genovés	17/06/2020	Additional fields for inputs to be filled in
0.4	Sercan Karaağaç	29/06/2020	Additional inputs from beneficiaries added
0.5	Borja Genovés and Domenico Giustiniano	2/07/2020	New changes to be submitted
1.0	Borja Genovés and Domenico Giustiniano	14/07/2010	T5.1, T5.2 and T5.3 leaders reviewed the document. Final revision.



Executive summary

This document captures Dissemination and Exploitation Results for the first year of the project of the ENLIGHT'EM project partners. The present 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.

Contents

Executive summary	5
Contents.....	6
List of Figures.....	7
List of Tables.....	8
List of Abbreviations	9
1. Introduction	11
1.1. Responsibilities and Points of Contact	11
2. Dissemination and Exploitation Results.....	13
2.1. Research Dissemination	13
2.1.1. TU Delft.....	13
2.1.2. University of Applied Sciences and Arts of Italian Switzerland (SUPSI).....	13
2.1.3. LightBee Corp (LBEE).....	13
2.1.4. IMDEA Networks (IMDEA)	14
2.1.5. The University of Edinburgh (UEDIN).....	14
2.1.6. PureLiFi	15
2.1.7. Ozyegin University (OZU)	15
2.1.8. University of Palermo (UNIPA).....	15
2.1.9. Toshiba Research Europe Ltd. (TREL)	15
2.1.10. Ford Otosan (FORD)	15
2.2. Education Dissemination.....	15
2.2.1. Massive open line course (MOOC)	15
3. Communication and Outreach.....	17
3.1. Communication through open electronic media.....	17
3.2. Communication through the formal press.....	17
3.3. Communication through public events.....	18
4. Exploitation of results and intellectual property.....	19
5. Conclusion	20
Official project event during first year of ENLIGHT'EM project.....	22

List of Figures

Figure 1: Muhammad Sarmad Mir presenting his poster at EWSN '20 conference..... 14

List of Tables

Table 1: Contact persons details	11
Table 2: Activity in open electronic media during first year of the project	17
Table 3: Main network-wide Training Events organized along the first year of the project	22

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

The deployment of Light-Emitting Diodes (LEDs) everywhere as the main illumination sources is positioning Visible Light Communication (VLC) as a promising technology to provide ubiquitous wireless networks. The booming Internet of Things (IoT) services can be guaranteed thanks to VLC and networked VLC which is also referred to as Light-Fidelity (LiFi). ENLIGHT'EM is contributing to the design of IoT systems leveraging the low baseline energy consumption of LEDs. Moving on, ENLIGHT'EM investigates low-energy VLC to provide sustainable wireless networking solutions.

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 contributing 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. ENLIGHT'EM's ESRs (as well as other members of the project) are receiving extensive training in communication, dissemination and outreach skills in order to act as ambassadors for the ENLIGHT'EM programme: they will disseminate its scientific aims, objectives and results to a range group of stakeholders including academia at large, industry for government agencies and, crucially, the public.

In this report, all research, dissemination, and exploitation activities, carried out during the first 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
Harald Haas, harald.haas@purelifi.com	T5.3 – Exploitation and Impact Plan Lead	PLF

2. Dissemination and Exploitation Results

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

2.1. Research Dissemination

2.1.1. TU Delft

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

James Broadhead, Przemysław Pawełczak, "Position Paper: Why Intermittent Computing Could Unlock Low-Power Visible Light Communication" accepted in 1st workshop on Light up the IoT (co-located with ACM MobiCom 2020). Association for Computing Machinery, New York, NY, USA, 2020.

2.1.2. University of Applied Sciences and Arts of Italian Switzerland (SUPSI)

Did not report any specific dissemination and communication activity conducted by the ESR, due to relatively late onboarding of the researcher.

As planned, SUPSI has taken the lead of the organization of the "Light Up the IoT" (LIoT) Workshop Co-located with MobiCom 2020 (in September 2020), which will be part of Training Event 3.

The general chairs are Daniele Puccinelli (University of Applied Sciences of Southern Switzerland - SUPSI) and Julio Rufo (LightBee). LIoT was accepted by the Mobicom organizers as a half-day workshop and it will take place virtually on September 21st, 2020.

SUPSI and LightBee have received a quite significant amount of paper submissions, which grants the success of the event. SUPSI will continue to take all the necessary steps to ensure a successful event.

2.1.3. LightBee Corp (LBEE)

Did not report any specific dissemination and communication activity conducted by the ESR, due to relatively late onboarding of the researcher.

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.

2.1.4. IMDEA Networks (IMDEA)

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

Muhammad Sarmad Mir, Borja Genoves Guzman, Deepak Solanki, Guenter Marent, Domenico Giustiniano “Poster: Integration between Home Automation and Visible Light Communications” International Conference on Embedded Wireless Systems and Networks (EWSN 2020), Lyon, France, 17-19 February 2020.

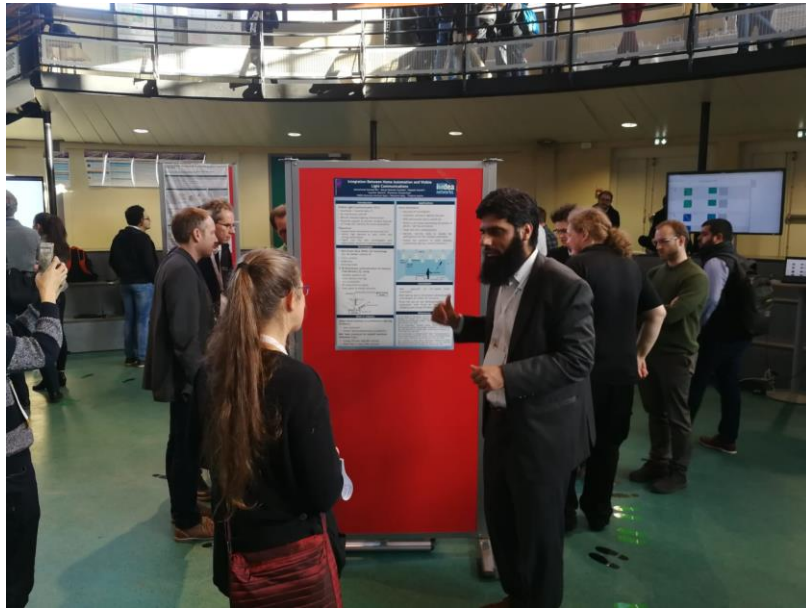


Figure 1: Muhammad Sarmad Mir presenting his poster at EWSN '20 conference

Muhammad Sarmad Mir, Borja Genoves Guzman, Ander Galisteo, Domenico Giustiniano, “Non-linearity of LEDs for VLC IoT applications” accepted in 1st workshop on Light up the IoT (co-located with ACM MobiCom 2020). Association for Computing Machinery, New York, NY, USA, 2020.

Furthermore, Muhammad Sarmad Mir has significantly contributed to release the latest version of both software and hardware of OpenVLC. OpenVLC will be used by several ESRs of ENLIGHT'EM for their research. Now it is open-source and available in

<https://github.com/openvlc/OpenVLC/>, and the announcement was made through the OpenVLC website (www.openvlc.org).

2.1.5. The University of Edinburgh (UEDIN)

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

Tilahun Zerihun Gutema, Harald Haas, Wasiru O. Popoola, "OFDM Based Visible Light Communication with Probabilistic Shaping" accepted in 1st workshop on Light up the IoT (co-located with ACM MobiCom 2020). Association for Computing Machinery, New York, NY, USA, 2020.

2.1.6. PureLiFi

Did not report any specific dissemination and communication activity conducted by ESRs, due to relatively late onboarding of the researcher.

2.1.7. Ozyegin University (OZU)

Did not report any specific dissemination and communication activity conducted by the ESR, due to relatively late onboarding.

2.1.8. University of Palermo (UNIPA)

Did not report any specific dissemination and communication activity conducted by the ESR, due to relatively late onboarding.

2.1.9. Toshiba Research Europe Ltd. (TREL)

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

Jaagdeep Singh, Usman Raza, "Passive Visible Light Positioning Systems: An Overview", accepted in 1st workshop on Light up the IoT (co-located with ACM MobiCom 2020). Association for Computing Machinery, New York, NY, USA, 2020

2.1.10. Ford Otosan (FORD)

Did not report any specific dissemination, and communication activity due to late onboarding of the ESR.

2.2. Education Dissemination

2.2.1. Massive open line course (MOOC)

As discussed in D5.1, ENLIGHT'EM participants are creating a MOOC about low-energy VLC for IoT. The course will enable the attendees to:

- Assess the benefits and limitations of visible light communication compared to traditional radio-frequency communication.
- Evaluate different modulation techniques considering their spectrum and energy efficiency, as well as, their performance under various environmental conditions.
- Construct two types of communication system, one using an inexpensive photodiode, the other using the camera in your smartphone.
- Identify methods to overcome the effects of various phenomena such as solar radiation, non-line of sight, mobility, multi-user access and co-channel interference.
- Describe the research work done in various universities around the world on topics related to visible light communication and sensing.

Note that the MOOC organization is ongoing and it is subject to change. We plan to involve the ESRs in the active realization and execution of the MOOC. The preliminary outline that has been decided is:

Module 0: Introduction

Module 1: Applications

Module 2: Physical Layer: Devices

Module 3: Physical Layer: Basic

Module 4: Physical Layer: Advanced

Module 5: Network Layer

Module 6: Smartphone Communication

Module 7: Backscatter Communication

The University of Edinburgh and TU Delft are members of Edx: <https://www.edx.org/>, a MOOC platform that gathers 50+ universities around the world. We will potentially post the course in that platform and use its tools.

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:

- Event 1 promotion (Tutorial at EWSN 2020): promotion was announced through project channels, i.e., [Twitter](#) and [Facebook](#) account. Besides, the videos of the talks as well as a summary video of the event were uploaded to the [youtube channel](#) of the ENLIGHT'EM project and it is accessible to everyone.
- Event 3 promotion (Workshop co-located with ACM Mobicom 2020): the call was disseminated through the project channels, i.e., using emails to distribution lists, Twitter and Instagram account.

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

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 first year of the project

Social Network Channel	Activity
Facebook	25 posts
YouTube	20 Videos, 1 Playlist Views: 449 times, 32.8 hours, 4.189 impressions
Twitter	173 Tweets – 89.782 Impressions 83 Following 46 Followers

3.2. Communication through the formal press

IMDEA Networks sent a Press Release on the 28/06/2019, “The birth of a new discipline: Low-energy Visible Light IoT Systems”.

Some links to webs where it was published:

- Madri+d: <http://www.madrimasd.org/en/notiweb/noticias/birth-new-discipline-low-energy-visible-light-iot-systems>

- SmartLighting: <https://smart-lighting.es/nacimiento-una-nueva-disciplina-sistemas-iot-comunican-luz-visible-consumo/>
- Conectronica: <https://www.conectronica.com/wireless/smart-city/sistemas-del-internet-de-las-cosas-que-comunican-por-luz-visible-de-bajo-consumo>

3.3. Communication through public events

Currently there is no communication activity to public at large yet. European, national and regional events are in our agendas to participate, and several proposals have been submitted towards the Sustainable Development Goals (SDG), focusing on the project implications on the possibility to provide affordable, low-cost and low-energy technologies for Internet access.

4. Exploitation of results and intellectual property

At the date of writing this document, the ESRs are in their first months of their projects, and did not have any Intellectual properties and patents issues. However, the ESRs will receive training about this in:

- Event 4: **Training on VLC technology & Research commercialisation**, and project meeting #4
- Event 5: **Training on research exploitation**, Presentation at IEEE standardization meeting, and project meeting #5

Due to the same reason, the ESRs did not contribute to standardization bodies or creation of startups yet. However, to optimize the success to this respect, the ESRs will receive a constant training about it along the whole project. The first knowledge about this topic that they will be receive will take place in:

- Event 3: **Training on entrepreneurship**, Workshop at conference, and project meeting #3
- Event 5: Training on research exploitation, **Presentation at IEEE standardization meeting**, and project meeting #5

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 first year of the ENLIGHTEM project. In particular, we have presented the summary of industrial and academic contributions. Although the project is in its early stage and several ESRs have incorporated later than expected due to COVID-19 crisis, dissemination activities through publications is already occurring. Furthermore, the project partners have begun to build a community through presentations to a broader public, and planning further dissemination initiatives, included specific workshops on the project themes.

Annex

Official project event during first year of ENLIGHT'EM project

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

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

Main Training Events & Conferences		ECTS	Lead Institution	Completion Status
Event 0	Kick-off project meeting	0	IMDEA/OZU Held at IMDEA	Completed - June 2019 (M1)
Event 1	Project meeting #1: welcome to ESRs and introductory tutorials at conference	3.2	TUD/NOK Held at EWSN 2020	Completed - Feb. 2020 (M9)
Event 2	Training on research skills, and project meeting #2	2.4	IMDEA/UEDIN Held at IMDEA	Postponed to M14 (20-22 July 2020) and it will be virtually due to the COVID-19 pandemic.