



Terahertz technology for ultra-broadband and ultra-wideband operation of backhaul and fronthaul links in systems with SDN management of network and radio resources

Information & Communication Technologies (ICT)  
Research and Innovation Action (RIA)  
G.A. no: 871668  
Start Date: 01.11.2019 [M01]  
Duration: 36 Months



*Funded by the Horizon 2020  
Framework Programme of the European Union*

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## Deliverable D8.1

### Project Announcement

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## List of abbreviations

EC	European Commission
ICT	Information and Communication Technology

## Executive Summary

The following document reports on the preparation of basic material for the announcement of TERAWAY project through the official tools of the European Commission (EC) and through the dissemination channels of the consortium partners. More specifically, the document reports on the preparation of the project factsheet and the preparation of a short presentation of the project for the official website of the EC, the preparation of two press-releases (by Fraunhofer-Heinrich Hertz Institute and Institute of Communications & Computer Systems).

**Keywords:** Dissemination, Project presentation, Press release, Factsheet

## 1 Introduction

The 5G vision for a fully mobile and connected society drives today the herculean efforts worldwide on designing, developing and commercializing the next generation of wireless networks that can address the huge requirements in terms of coverage, traffic capacity, reliability, latency and network energy efficiency. Main results of these efforts designate that a wireless technology with high agility, but optical fiber-like capacity is necessary in order to act as a natural extension of the core (optical fiber) network and deliver this massive capacity to the gNB or to the radio part of it.

TERAWAY comes as a technology intensive project aiming to develop a new generation of THz transceivers that can overcome these limitations and enable the commercial uptake of THz technology. Leveraging optical concepts and photonic integration techniques, TERAway will develop a common technology base for the generation, emission and detection of wireless signals with selectable symbol rate and bandwidth up to 25.92 GHz within an ultra-wide range of carrier frequencies covering the W-band (92-114.5 GHz), D-band (130-174.8 GHz) and THz band (252-322 GHz).

TERAWAY is a 3-year Research and Innovation Action project that brings together twelve (12) leading European research centers and companies. The project was launched in November 2019 and is expected to finish in October 2022. TERAway project is funded by the European Commission through the Horizon 2020 programme under the Photonics Public Private Partnership ([www.photonics21.org](http://www.photonics21.org)). The initial announcement of the project launch to the general public and the scientific and technical community is pursued through the publication of the project factsheet and the project presentation through the cordis website of the EC and through two press-releases from an industry-oriented research institute (FhG-HHI) and an academic partner (ICCS) of the consortium. This dissemination material is presented below.

## 2 Project Factsheet

The 2-page long project factsheet follows a typical format and provides standard information about the project (call identifier, consortium, time-line, budget, contact persons and project website), a short description about the motivation behind the project, a short description about the main technical concepts and the main objectives, and an overview about the exploitation plans and the expected impact. The factsheet will go public and will be made available through the project website ([ict-teraway.eu](http://ict-teraway.eu)), which is under development during the time of writing this deliverable and will be also available through the cordis website. The project factsheet is appended to the present report as [Appendix I](#).

## 3 Project short presentation

The short presentation of the project includes fourteen (14) slides that provide the same information as the project factsheet with stronger emphasis on the technical scope and the technical concepts of the project. The short presentation of the project will be made available through the project website ([ict-teraway.eu](http://ict-teraway.eu)) and will be also available through the cordis website. This presentation is appended to the present report as [Appendix II](#).

## 4 Press releases

Within the first month of the project, two (2) press releases were prepared to announce TERAWAY to the general public and the scientific and technical community. The first one by the Fraunhofer Heinrich Hertz Institute was wired through the News section of the Institute's website (<https://www.hhi.fraunhofer.de/en/departments/pc/projects/teraway.html>) addressing the German and international general public and technical community (see Figure 1).

**Fraunhofer HHI**  
Fraunhofer Institute for Telecommunications,  
Heinrich Hertz Institute, HHI

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**PHOTONIC COMPONENTS**

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**TERAWAY**

**Terahertz technology for ultra-broadband and ultra-wideband operation of backhaul and fronthaul links in systems with SDN management of network and radio resources**

Project ID: 871668  
Co-funded by the European Commission's under the Horizon2020 programme  
Duration: November 2019 – October 2022

Cooperation:  
ICCS/NTUA (Greece), Universidad Carlos III de Madrid (Spain), Lionix International B.V. (The Netherlands), Optagon Photonics P.C. (Greece), Telefonía Investigación y Desarrollo (Spain), Forschungsvorhaben Berlin - Ferdinand-Braun-Institut (Germany), Phix B.V. (Netherlands), Intracom S.A. Telecom Solutions (Greece), SAE Microelettronica S.p.A. (Italy), Aalto-korkeakoulusäätiö SR (Finland), CumuCore Oy (Finland)

**Topic:**

TERAWAY will develop a disruptive generation of THz transceivers that can overcome the current limitations of THz technology and enable its commercial uptake. Leveraging optical concepts and photonic integration techniques, TERAWAY will develop a common technology base for the generation, emission and detection of wireless signals within an ultra-wide range of carrier frequencies that will cover the W (92-114.5 GHz), D (130-174.8 GHz) and THz band (252-322 GHz). In this way, the project will provide for the first time the possibility to organize the spectral resources of a network within these bands into a common pool of radio resources that can be flexibly coordinated and used. In parallel, the use of photonics will enable the development of multi-channel transceivers with amplification of the wireless signals in the optical domain and with multibeam optical beamforming in order to have a radical increase in the directivity of each wireless beam.

At the end of this development, TERAWAY will make available a set of truly disruptive transceivers including a 2- and a 4-channel module with operation from 92 up to 322 GHz, data rate per channel up to 108 Gbps, transmission reach in the THz band of more than 400 m, and possibility for the formation of wireless beams that can be independently steered in order to establish backhaul and fronthaul connections between a set of fixed and moving nodes. TERAWAY will evaluate these transceivers under an application scenario of communication and surveillance coverage of outdoor mega-events using moving nodes in the form of drones that will carry a gNB or the radio part of it.

The network during the implementation of this scenario in the 5G testbed of Aalto will be controlled by an innovative SDN controller that will perform the management of the network and radio resources in a homogeneous way with large benefits for the network performance, energy efficiency, slicing efficiency and possibility to support heterogeneous services.

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**Further Information**

- Hybrid PICs Group
- Projects of Hybrid PICs Group
- Terahertz Sensor and Systems Group
- Photonic InP Foundry Group

**Artistic layout of the hybrid, photonics-enabled platform for the generation of W/D and THz signals.**  
The following units are comprised and shown in the diagram: (1) Optical carrier generation unit, (2) Optical phase locking unit, (3) Optical modulation unit, (4) Optical filtering unit, and (5) Optical amplification, up-conversion and wireless emission unit. The structures are not shown in scale.

**Artistic layout of the hybrid, photonics-enabled platform for the detection of W/D and THz signals.**  
The following units are comprised and shown in the diagram: (1) Optical carrier generation unit, (2) Optical phase locking unit, (3) Optical phase shift unit, and (4) wireless detection and IQ photonic mixing unit. Silicon lenses are on top of each bow-tie antenna. Structures are not shown in scale.

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Figure 1. The Press Release of TERAWAY project at FhG-HHI's official website.


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## TERAWAY Project Launch – Kick-off meeting



The implementation of TERAWAY project was officially inaugurated with the kick-off meeting that took place on the 3rd and 4th of December 2019. All the twelve (12) members of the consortium were gathered for a two-day productive meeting at the premises of Fraunhofer Heinrich-Hertz Institute (HHI) in Berlin in order to analyze TERAWAY's workplan in-depth, specify in detail the role of each partner in the project's deployment and define the next actions.

**TERAWAY is a H2020 SCPPP Phase III project funded by the European Union coming as a technology intensive project aiming to develop a disruptive generation of THz transceivers for high-capacity BH and FH links in 5G networks.**

Leveraging optical concepts and photonic integration techniques, TERAWAY will develop a common technology base for the generation, emission and detection of wireless signals with selectable symbol rate and bandwidth up to 25 Gb/s within an ultra-wide range of carrier frequencies covering the THz band (0.1-1 THz). D-band (130-174.8 GHz) and THz band (250-322 GHz). In this way, TERAWAY steps into providing for the first time the possibility to organize the spectral resources of a network within these bands into a common pool of radio resources that can be flexibly coordinated and used. The use of photonics will enable the development of multi-channel transceivers with amplification of the wireless signals in the optical domain and with multi-beam optical beamforming in order to have a radical increase in the directivity of each wireless beam. In parallel, aiming to take the most out of the THz technology and enable its commercial uptake, the project will develop a new software defined networking (SDN) controller and an extended control hierarchy that will perform the management of the network and the radio resources in a homogeneous way with obvious benefits for the network performance and energy efficiency and with possibilities for the provision of network slices in order to support heterogeneous services. At the end of this development, TERAWAY will make available a set of ground breaking transmitter modules including channel modules operating from 92 up to 322 GHz, with possibility to offer 241 Gbps total data rate, to have more than 400 m transmission reach in the THz band (and few Km in the lower bands), and with 4-wireless beams that can be independently steered and establish BH and FH connections between fixed terrestrial and moving network nodes. The TERAWAY transceivers will be evaluated at the 5G demo site of Aalto and Nokia in Finland, under an application scenario of communication and surveillance coverage of outdoor mega-events using moving nodes in the form of heavy-duty drones.

TERAWAY project comprises twelve (12) partners from six (6) European countries among which: **three vendors:** Telefonica Investigación y Desarrollo (ES), INTRACOM S.A. Telecom Solutions (GR) and SAE Microelettronica S.p.A. (IT); **two industry-oriented research institutes:** Fraunhofer Heinrich-Hertz Institute (DE) and Ferdinand-Braun-Institut, Leibniz-Institut für Hochfrequenztechnik (GDR); **four SMEs:** Lionix International BV (NL), Optagon Photonics (GR), Phix Photonics Assembly (NL), Cumucore Oy (FIN) and **three academic organizations:** Universidad Carlos III de Madrid (ES), Aalto University (FIN) and the Institute of Communications & Computer Systems of the National Technical University of Athens (GR) that coordinates the action.



For more info, visit TERAWAY website: [www.photonics21.org](https://www.photonics21.org)



TERAWAY project is funded by one of the calls under the Photonics Public Private Partnership.

### CONTACT US

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The second press release by Institute of Communications and Computers Science (ICCS) was wired through the [Projects section](#) of the Photonics Communication Research Laboratory website and a second announcement about the Project Launch published to the News Section just after the official Kick-off meeting of the project (3-4 December 2019).

The content of the specific press release- Project announcement has been distributed to all partners of the project and is expected to be launched to the official websites of their organization within the following days (for the content of this announcement please go to [Appendix III](#)).

## Link

<https://www.photonics.ntua.gr/teraway-project-launch-kick-off-meeting/>

Figure 2. Project Announcement and Kick-off Press release at ICCS-PCRL website.



## 5 Conclusions

Dissemination material for the project has been prepared. It is in the form of a 2-page factsheet that contains a brief overview of the motivation of project, its objectives, the exploitation strategy and the expected impact. The content of the factsheet has been elaborated in a short presentation, presenting also in more detail the role of the partners and the underlying technology. The project has been announced through the websites of the organizations participating, through their websites and two press releases have be prepared and issued.

## Appendix I – TERAWAY Factsheet



Terahertz technology for ultra-broadband and ultra-wideband operation of backhaul and fronthaul links in systems with SDN management of network and radio resources

### TERAWAY Factsheet

**Call identifier:** H2020-ICT-2019-2

**Contract No.:** 871668

**Timeline:** 1 November 2019 – 31 October 2022

**Overall budget:** € 5 999 498,88

**EC contribution:** € 5.999.498,75

#### Contact

Institute of Communications & Computer Systems

Photonics Communication Research Lab

Prof. H. Avramopoulos

Dr. Maria Massaouti

Christos Tsokos

**Project Website:** <http://ict-teraway.eu/>

**Consortium:** 12 Partners (6 EU countries)



**TERAWAY** is a H2020 5GPPP Phase III project funded by the European Union aiming to develop a disruptive generation of THz transceivers for high-capacity BH and FH links in 5G networks.

### Motivation

The 5G vision for a fully mobile and connected society drives today the herculean efforts worldwide on designing, developing and commercializing the next generation of wireless networks that can address the huge requirements in terms of coverage, traffic capacity, reliability, latency and network energy efficiency. Main results of these efforts designate that a wireless technology with high agility, but optical fiber-like capacity is necessary in order to act as a natural extension of the core (optical fiber) network and deliver this massive capacity to the gNB or to the radio part of it.

Terahertz (THz) wireless communication technology with carrier frequencies in the 300 GHz regime has been designated as a possible candidate for this extension due to the abundance of bandwidth that can be found there. However, despite the technical progress and the individual achievements that have been made in the field, THz technology appears still to be short in turning its indisputable potential at the conceptual level into true industrial impact. Reasons for that include i) the challenge to take advantage of the available bandwidth and generate broadband signals of high quality in a practical way, ii) the challenge to develop a common technology base and iv) make the operation of THz links compatible at the component and the system level with operation of conventional mmWave links, and v) the challenge to overcome the difficulties in the handling and the propagation of the THz waves.



TERAWAY project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under G.A No 871668 and it is an initiative of the Photonics Public Private Partnership.

### Concept - Objectives

TERAWAY comes as a technology intensive project aiming to develop a new generation of THz transceivers that can overcome these limitations and enable the commercial uptake of THz technology.

Leveraging optical concepts and photonic integration techniques, TERAWAY will develop a common technology base for the generation, emission and detection of wireless signals with selectable symbol rate and bandwidth up to 25.92 GHz within an ultra-wide range of carrier frequencies covering the W-band (92-114.5 GHz), D-band (130-174.8 GHz) and THz band (252-322 GHz).

In this way TERAWAY steps into providing for the first time the possibility to organize the spectral resources of a network within W/D/THz bands into a common pool of radio resources that can be flexibly coordinated and used.

The use of photonics will enable the development of multi-channel transceivers with amplification of the wireless signals in the optical domain and with multi-beam optical beamforming in order to have a radical increase in the directivity of each wireless beam.

In parallel, aiming to take the most out of the THz technology and enable its commercial uptake, the project will develop a new software defined networking (SDN) controller and an extended control hierarchy that will perform the management of the network and the radio resources in a homogeneous way with obvious benefits for the network performance and energy efficiency and with possibilities for the provision of network slices in order to support heterogeneous services.

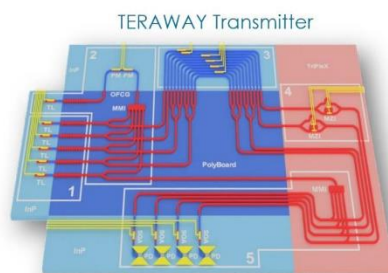


Figure 1. Artistic layout of the hybrid, photonics-enabled platform for the generation of W/D and THz signals. The following units are comprised and shown in the diagram: (1) Optical carrier generation unit, (2) Optical phase locking unit, (3) Optical modulation unit, (4) Optical filtering unit, and (5) Optical amplification, up-conversion and wireless emission unit.

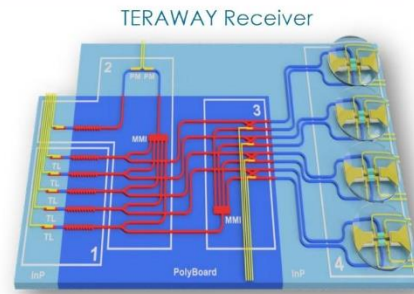


Figure 2. Artistic layout of the hybrid, photonics-enabled platform for the detection of W/D and THz signals. The following units are comprised and shown in the diagram: (1) Optical carrier generation unit, (2) Optical phase locking unit, (3) Optical phase shift unit, and (4) wireless detection and IQ photonic mixing unit. Silicon lenses are on top of each bow-tie antenna. Structures are not shown in scale.

At the end of this development, TERAWAY will make available a set of ground breaking transceiver modules including 4-channel modules operating from 92 up to 322 GHz, with possibility to offer 241 Gb/s total data rate, to have more than 400 m transmission reach in the THz band (and few Km in the lower bands), and with 4 wireless beams that can be independently steered and establish BH and FH connections between fixed terrestrial and moving network nodes.

The TERAWAY transceivers will be evaluated at the 5G demo site of AALTO and NOKIA in Finland, under an application scenario of communication and surveillance coverage of outdoor mega-events using moving nodes in the form of heavy-duty drones.

### Impact

TERAWAY is expected to have a disruptive effect on the usability of the THz band (252-322 GHz), which can be considered today still as unexplored, by developing a technology base that will facilitate the thorough investigation of the THz transmission solutions and their incorporation inside a meaningful system environment, creating the conditions for their actual use inside next generation networks.

It will have a disruptive effect on the usage of the radio spectrum in three different ways and is expected to develop valuable knowhow and methodologies regarding the placement of the moving nodes and the management of their resources and have a disruptive impact on the dynamic scalability of the network capabilities.



TERAWAY project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under G.A No 871668 and it is an initiative of the Photonics Public Private Partnership.

<https://www.photonics21.org/>

## Appendix II – TERAWAY Project Presentation



Terahertz technology for ultra-broadband and ultra-wideband operation of backhaul and fronthaul links in systems with SDN management of network and radio resources



## Terahertz technology for ultra-broadband and ultra-wideband operation of backhaul and fronthaul links in systems with SDN management of network and radio resources

**Topic:** 5G Long Term Evolution

**Type:** RIA

**Call:** H2020-ICT-2019-2

**Contract No:** 871668

**Start date:** 1 November 2019

**Duration:** 36 Months

**EC contribution:** € 5 999 498.75



*Funded by the Horizon 2020 Framework Programme of the European Union under the Photonics Public Private Partnership*

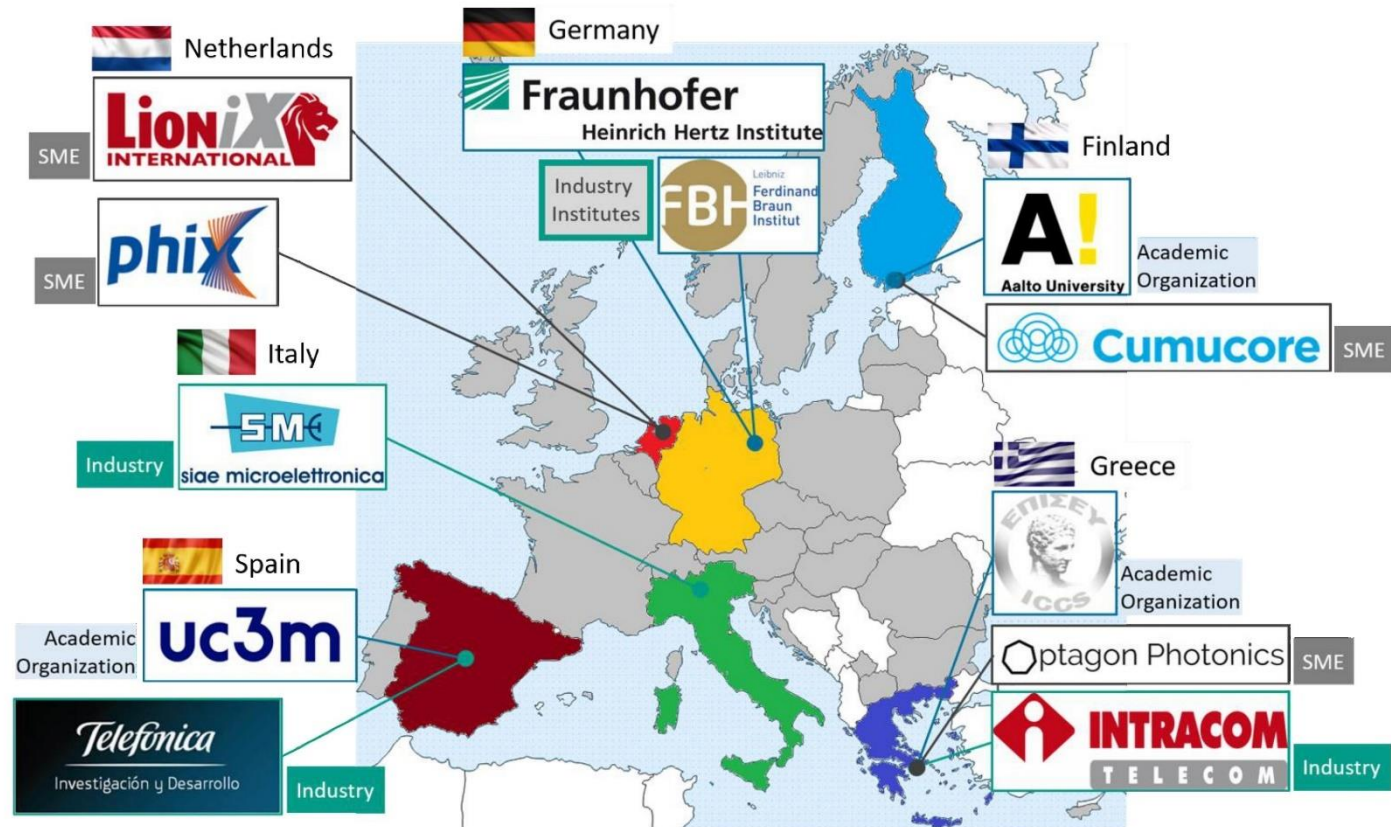


# TERAWAY Consortium



12 Partners  
6 EU countries

- 3 Large Companies
- 4 SMEs
- 2 Industry-oriented Research Institutes
- 3 Academic Organizations



# TERAWAY Project

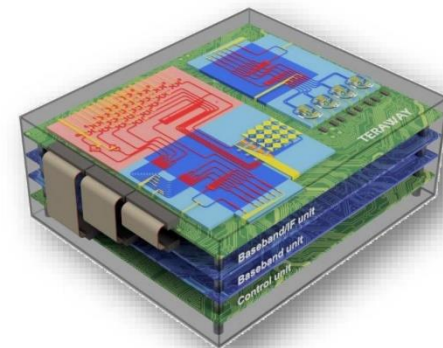


A new disruptive generation of photonic-enabled THz transceivers for high-capacity BH and FH links in 5G networks.

## Vision- Concept

*"enabling industrialization of THz wireless communication technology"*

- ◆ **Development of a common technology base for the generation, emission and detection of wireless signals in the THz (252–322 GHz) and W/D bands**
- ◆ **Multi-channel, ultra-wide band transmitters:** Generation/emission of THz/W/D signals with selectable symbol rate, high bandwidth and of high transmission reach
- ◆ **Multi-channel, ultra-wide band receivers:** Detection of THz/W/D band signals and their direct down-conversion to baseband
- ◆ **Integration of the nodes inside a functional network system of high-flexibility and efficiency:** New network management platforms (based on SDN) and an extended control hierarchy to perform the management of the network and radio resources.



3



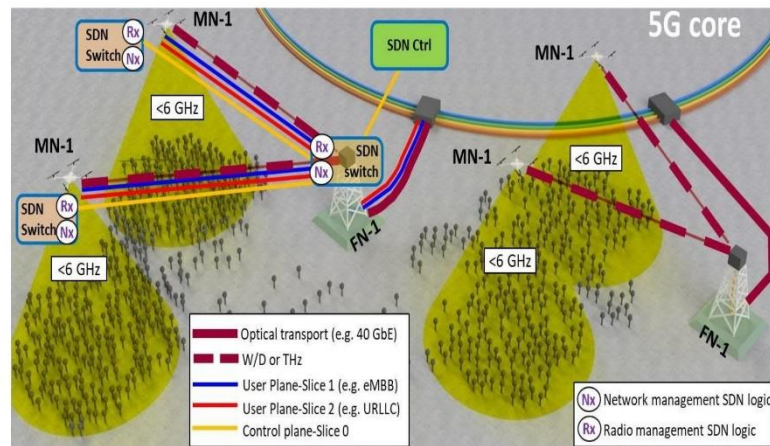
# TERAWAY Project



A new disruptive generation of photonic-enabled THz transceivers for high-capacity BH and FH links in 5G networks.

## Application- Demo scenarios

Communication and surveillance coverage of outdoor mega-events using fixed and moving nodes in the form of heavy-duty drones, carrying either gNBs or solely their radio parts.



**TERAWAY Technology**  
Enabling new applications of commercial and societal interest

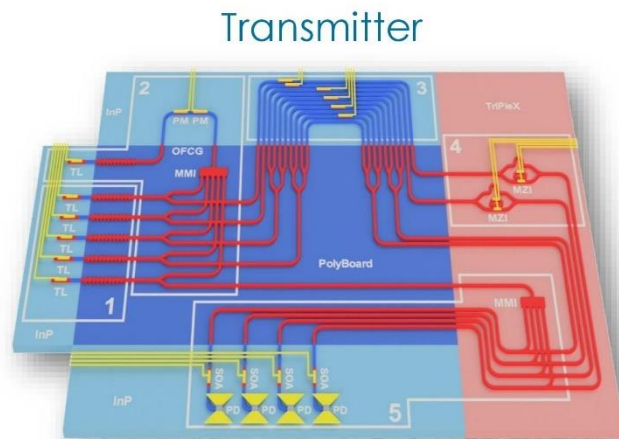
# TERAWAY high-capacity W/D/THz transceivers



## Hybrid photonics-based platform for ultra-wideband signal generation and emission

Objective 1

Objective 2



### 1. Optical carrier generation unit

Tunable Lasers (TLs): Free selection of the emission wavelength over a range of more than 10 nm

### 2. Optical phase locking unit

Optical Frequency comb generator (OFCG) + optical circuit: low phase noise

### 3. Optical modulation unit

Phase Modulators for • low-capacity links (2.16 GHz bandwidth) and • IQ Modulators for high-capacity links (25.92 GHz)

### 4. Optical filtering unit

### 5. Optical multi-beamforming unit

Independent steering of the transmitted wireless beam

### 6. Optical amplification, frequency up- conversion and wireless emission unit

Use of semiconductor optical amplifiers, PIN- photodiodes as photonic mixer and bow-ties antennas

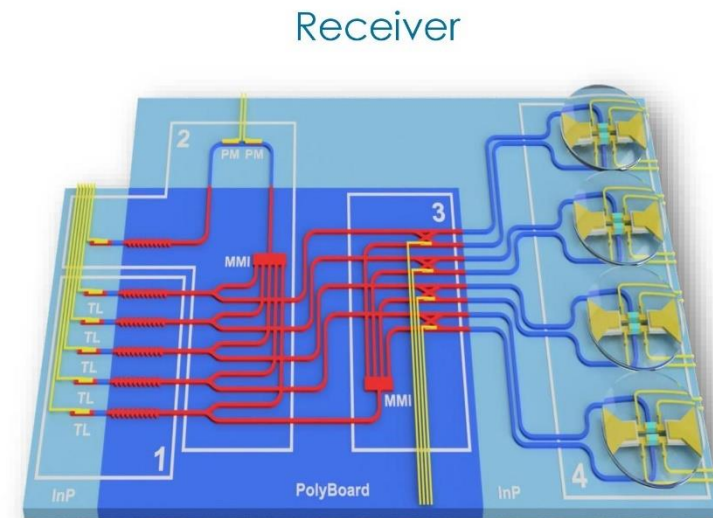
# TERAWAY high-capacity W/D/THz transceivers



## Hybrid photonics-based platform for ultra-wideband signal detection and reception

### Objective 3

- 1. Optical carrier generation unit**  
Same as transmitter
- 2. Optical frequency comb generator unit**  
Same as transmitter
- 3. Optical phase shift unit**  
Introduction of 90° phase difference between copies of the same optical carrier
- 4. Wireless detection and IQ photonic mixing unit**  
Use of bow-tie antennas with silicon lenses and photoconductive elements for down-conversion to the baseband  
Development of low-noise and high bandwidth TIAs



# TERAWAY Modules

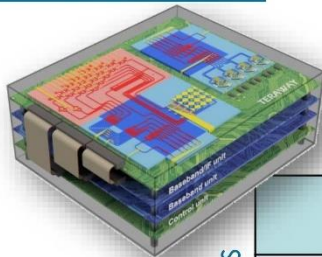


## Multi-channel transceiver Modules with total capacity up to 241 Gb/s

### Objective 4

Development and integration of 4 Transceiver Modules

- Modules -1, -2 (Precursor units)
- Modules -3, -4 (Main Transceiver Modules)



System specifications

TERAWAY Module	Tx Module-1 (Precursor)	Tx Module-2 (Precursor)	Tx Module-3 (Main Module)	Tx Module-4 (Main Module)
# of channels	1	1	2	4
IF or baseband	IF	Baseband	1 IF / 1 Baseband	2 IF / 2 Baseband
Symbol rate (Gbaud)	~1.5	18	1.5 / 18	2x1.5 / 2x18
Modulation format	Up to 256-QAM	Up to 64-QAM	256-QAM / 64-QAM	256-QAM / 64-QAM
Total bit rate (Gb/s)	~ 12.5	108	120.5	2x120.5
OBFN	NO	1x4 Blass matrix	2x16 Blass matrix	4x16 Blass matrix
Electrical units	Modem, CU			
Operation band	W/ D/ THz			



# TERAWAY Nodes (Fixed & Moving)

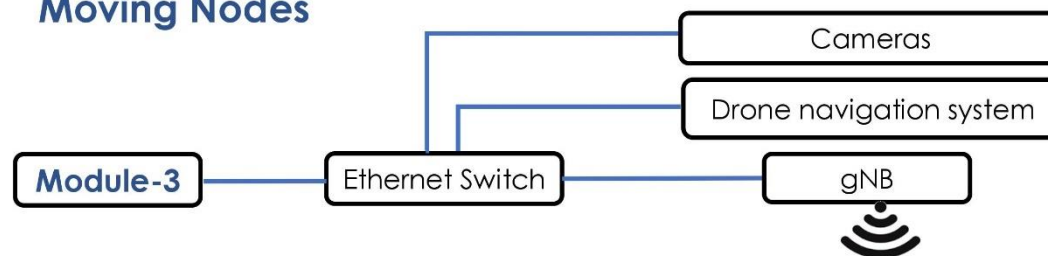
## Network Nodes for BH and FH connectivity

### Objective 5

#### Fixed Nodes



#### Moving Nodes



# THz propagation model & localization techniques



## Objective 6

### Development of 3D path-loss map

- Development of a simulator for the generation of path-loss maps for THz signals inside realistic propagation environments
- Development of modeling tools for effects such as Doppler spread, shadowing effects and the interference effects from co-channels or adjacent channels
- Enable the optimization of the link geometries via the selection of the optimum positions of the moving nodes

### Development localization algorithms

- Calculation of the distance between two nodes by combining the symmetrical double-sided two-way ranging method and the beam steering capabilities of the TERAWAY nodes

# Network management and application tools



**Objective 7** Optimum use of network and radio resources and accommodation of eMBB and URLLC services

## SDN platform

- **Re-organization of the network traffic flows** based on the path-loss maps and the positions of the drones
- **Configuration of the system parameters** of the TERAWAY transceivers (e.g. frequency band, channel bandwidth, modulation format/rate)
- **Development of SBIs and NBIs**

## Slicing manager

- Identification/ categorization of the network slices that will be created and allocation of the network and radio resources  
(**End-to-End slices**)

## Platform for processing of surveillance data

- Local processing of the surveillance data at the edge of the network  
(**Critical latency reduction**)

# Evaluation strategy of TERAWAY technology



## Stage 1 – Benchtop evaluation

## Stage 2 – Field trials at 5G demo site

ICCS's campus

### Phase 1 – Lab settings

- Validation of ultra-wideband operation in the W/D and THz bands
- Validation of multi-beam beamforming operation
- Generation of low-bandwidth signals
- Generation of high-bandwidth signals

### Phase 2 – Outdoor experiments

- Use of drones for carrying the TERAWAY modules
- Validation of link initialization process
- Transmission reach up to 400 m
- Extraction of experimental results for the THz channel modeling activities
- Localization methods

AALTO's campus

### Phase 1 – Planning phase

- File applications for drone lights
- Arrangements of any legal issues
- Securing local spectrum licenses for radio transmission

### Phase 2 – Field trials

- Execution of the two main demonstration scenarios for BH and FH connectivity
- Provide communication and surveillance coverage
- Network topology reconfiguration
- Network and radio resources optimization
- End-to-end connections to the users below the drones
- Local processing of surveillance data



# Work Plan - Timeline



## WP1. Project management & WP9. Ethics

M01-M36

WPL: ICCS, Contribution: All partners

## WP2. System Design, specifications and definition of software, hardware interfaces

M01-M34

WPL: ICCS, Contribution: All partners

## WP3. Optical part of TERAway transceivers

M03-M28

WPL: FhG-HHI, Contribution: UC3M, LXI, PHIX

## WP4. Electrical part and packaging of transceivers

M03-M30

WPL: PHIX, Contribution: FBH, FhG-HHI, UC3M, LXI

## WP5. Development of network management systems and extension of network slicing tools

M03-M32

WPL: CMC, Contribution: SIAE, AALTO, ICCS

## WP6. System integration of TERAway modules, nodes and network system

M05-M34

WPL: ICOM, Contribution: ICCS, Optagon, UC3M, AALTO, FhG-HHI, SIAE, CMC

## WP7. Testing of TERAway modules and demonstration of TERAway system (Field trials)

M04-M36

WPL: AALTO Contribution: ICCS, Optagon, UC3M, AALTO, FhG-HHI, SIAE, CMC

## WP8. Dissemination, exploitation, standardization and roadmapping

M01-M36

WPL: TID Contribution: FhG-HHI, ICCS, UC3M, PHIX, ICOM, AALTO, Optagon, SIAE, CMC



# Work plan - Roles of partners



## Modules development, DSP toolbox

- Development of the transceivers
- Integration and packaging of the transceivers
- Integration and packaging of the Modules
- Development of DSP tools and algorithms
- Testing of Modules in lab



## Network management, Nodes development, System experiments & Field trials

- Network management & slicing techniques
- Development of SDN agents
- THz propagation models, localization techniques, link establishment
- Integration and packaging of the Nodes
- Testing of Nodes in campus
- System Field trials



# Contact

For more info, visit TERAway website  
[ict-teraway.eu](http://ict-teraway.eu)



## Project Coordination

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## Appendix III – TERAWAY Press release @ PCRL-ICCS



Terahertz technology for ultra-broadband and ultra-wideband operation of backhaul and fronthaul links in systems with SDN management of network and radio resources

## Project Launch – Kick-off meeting


The implementation of TERAWAY project was officially inaugurated with the kick-off meeting that took place on 3<sup>rd</sup> and 4<sup>th</sup> of December 2019. All the twelve (12) members of the consortium were gathered for a two-day productive meeting at the premises of Fraunhofer Heinrich-Hertz Institute (HHI) in Berlin in order to analyze TERAWAY's workplan in depth, specify in detail the role of each partner in the project's deployment and define the next actions.

### Project Facts

5G Long Term Evolution  
H2020-ICT-2019-2  
GA ID. 871668

 1 November 2019

 36 Months

 5,999,498,75

 12 Partners  
6 EU countries

TERAWAY is a H2020 5GPPP Phase III project funded by the European Union coming as a technology intensive project aiming to develop a disruptive generation of THz transceivers for high-capacity BH and FH links in 5G networks.

Leveraging optical concepts and photonic integration techniques, TERAWAY will develop a common technology base for the generation, emission and detection of wireless signals with selectable symbol rate and bandwidth up to 25.92 GHz within an ultra-wide range of carrier frequencies covering the W-band (92-114.5 GHz), D-band (130-174.8 GHz) and THz band (252-322 GHz).

In this way, TERAWAY steps into providing for the first time the possibility to organize the spectral resources of a network within these bands into a common pool of radio resources that can be flexibly coordinated and used.

The use of photonics will enable the development of multi-channel transceivers with amplification of the wireless signals in the optical domain and with multi-beam optical beamforming in order to have a radical increase in the directivity of each wireless beam. In parallel, aiming to take the most out of the THz technology and enable its commercial uptake, the project will develop a new software defined networking (SDN) controller and an extended control hierarchy that will perform the management of the network and the radio resources in a homogeneous way with obvious benefits for the network performance and energy efficiency and with possibilities for the provision of network slices in order to support heterogeneous services.

At the end of this development, TERAWAY will make available a set of ground breaking transceiver modules including 4-channel modules operating from 92 up to 322 GHz, with possibility to offer 241 Gb/s total data rate, to have more than 400 m transmission reach in the THz band (and few Km in the lower bands), and with 4 wireless beams that can be independently steered and establish BH and FH connections between fixed terrestrial and moving network nodes. The TERAWAY transceivers will be evaluated at the 5G demo site of AALTO and NOKIA in Finland, under an application scenario of communication and surveillance coverage of outdoor mega-events using moving nodes in the form of heavy-duty drones.



TERAWAY project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under G.A No 871668 and it is an initiative of the Photonics Public Private Partnership.



TERAWAY project comprises twelve (12) partners from six (6) European countries among which:

**three vendors:** Telefónica Investigación y Desarrollo (ES), Intracom S.A. Telecom Solutions (GR) and SIAE Microelettronica S.p.A. (IT);

**two industry-oriented research institutes:** Fraunhofer Heinrich-Hertz Institute (DE) and Ferdinand-Braun-Institut Leibniz-Institut fuer Hoechstfrequenztechnik (DE);

**four SMEs:** LioniX International BV (NL), Optagon Photonics (GR), PHIX Photonics Assembly (NL), Cumucore OY (FIN) and

**three academic organizations:** Universidad Carlos III de Madrid (ES), Aalto University (FIN) and the Institute of Communications & Computer Systems of the National technical University of Athens (GR) that coordinates the action.



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