



TERAWAY: Disruptive Technologies for Photonics-enabled THz Transceivers for ultra-broadband links

Muhsin Ali

Research Associate
Optoelectronic and Laser Technology Group (GOTL)
Universidad Carlos III de Madrid
Spain

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 Consortium



12 Partners

6 EU countries

3 Large Companies

4 SMEs

2 Industry-oriented
Research Institutes

3 Academic
Organizations

Topic: 5G Long Term Evolution

Type: RIA



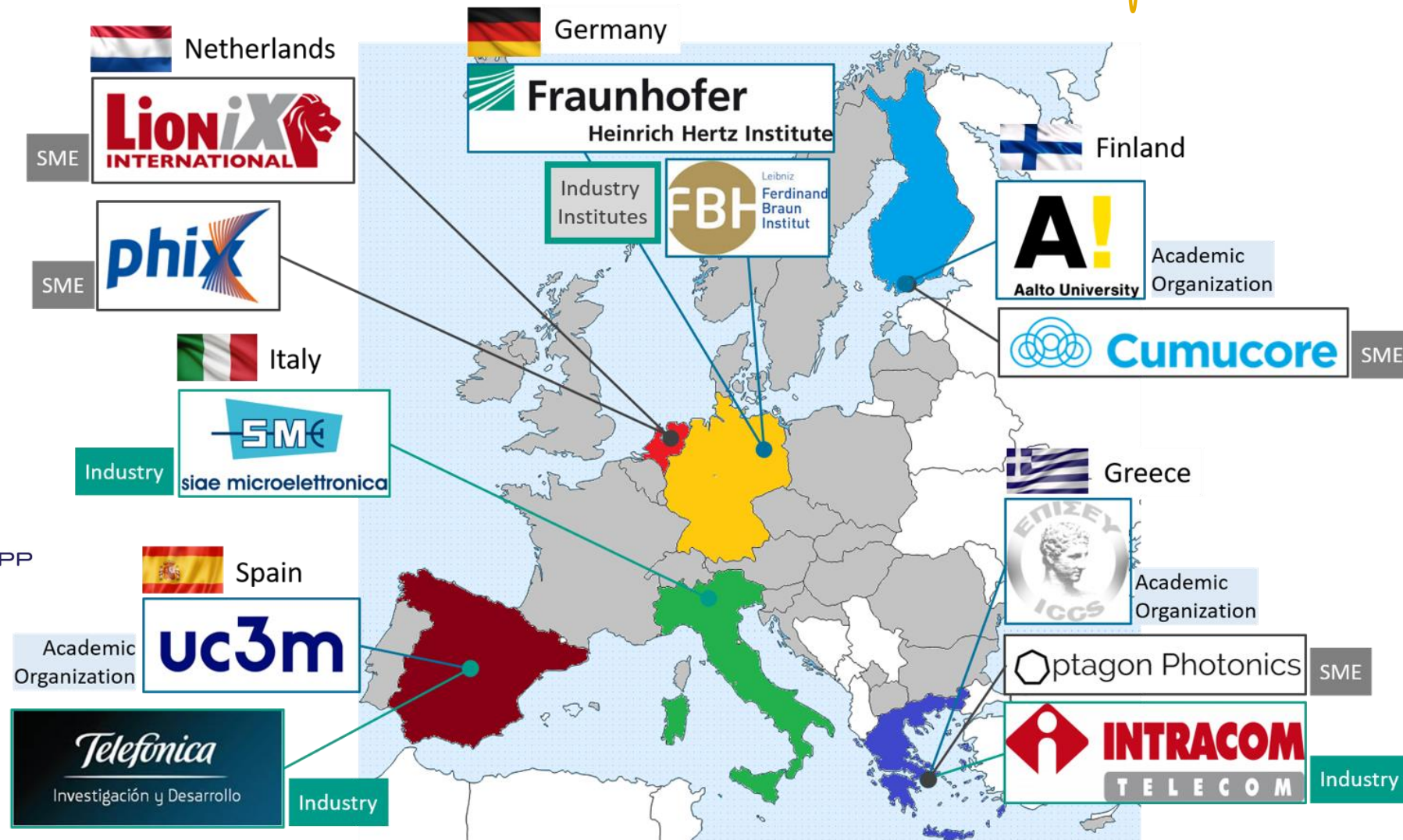
Call: H2020-ICT-2019-2

Contract No: 871668

Start date: 1 November 2019

Duration: 36 Months

EC contribution: €5 999 498.75





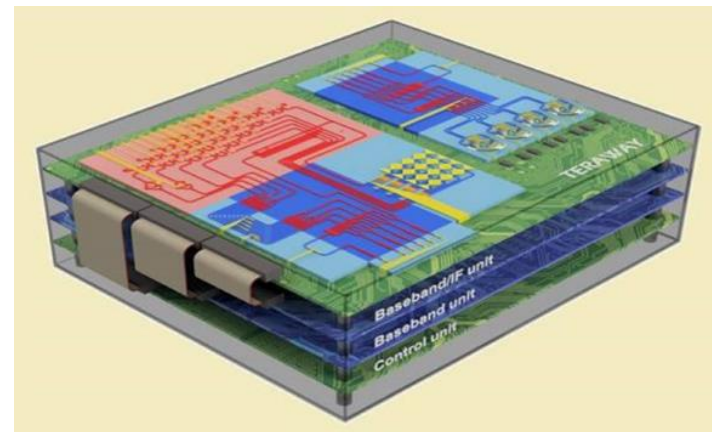
 [https:// ict-teraway.eu/](https://ict-teraway.eu/)

 @teraway_eu

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

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).

This 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 5G Photonics Public Private Partnership



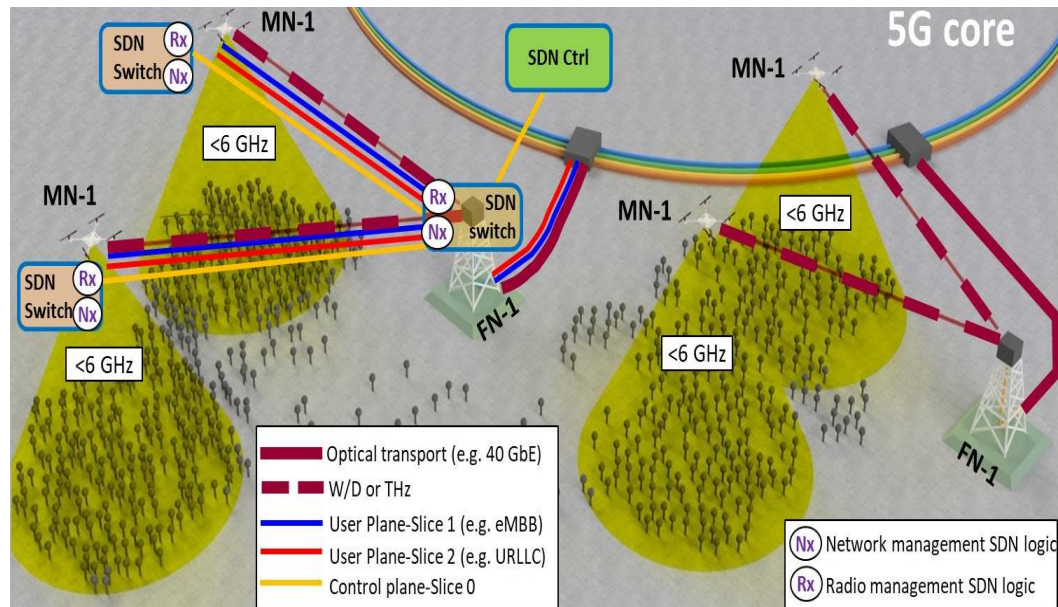
TERAWAY Overview (ii)



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.



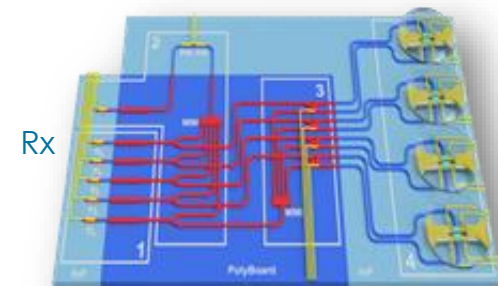
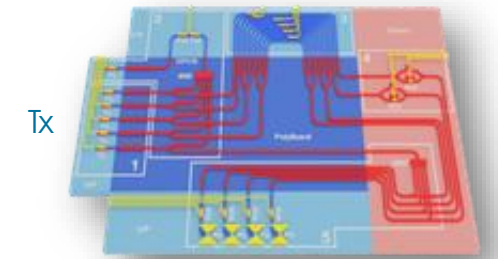
TERAWAY Technology
Enabling new applications of
commercial and societal interest

WP2 & WP8

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

Key Technological Innovations

- Hybrid photonic platform for ultra-wideband wireless Tx & RX
- Optical multi-beam beamforming processor
- Antennas: Ultra-wideband emission structures
- Optoelectronic packaging engine
- Tools for network management, resource allocation and service provision

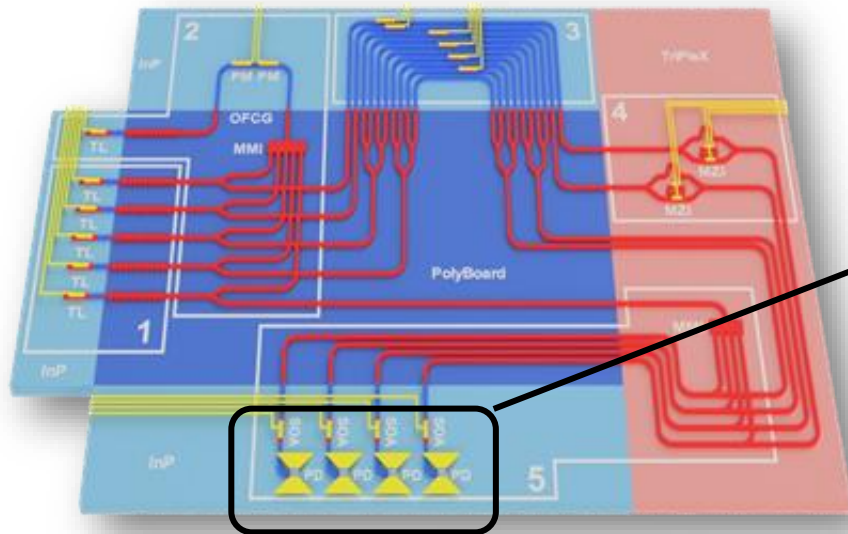


TERAWAY technology for high-capacity THz links



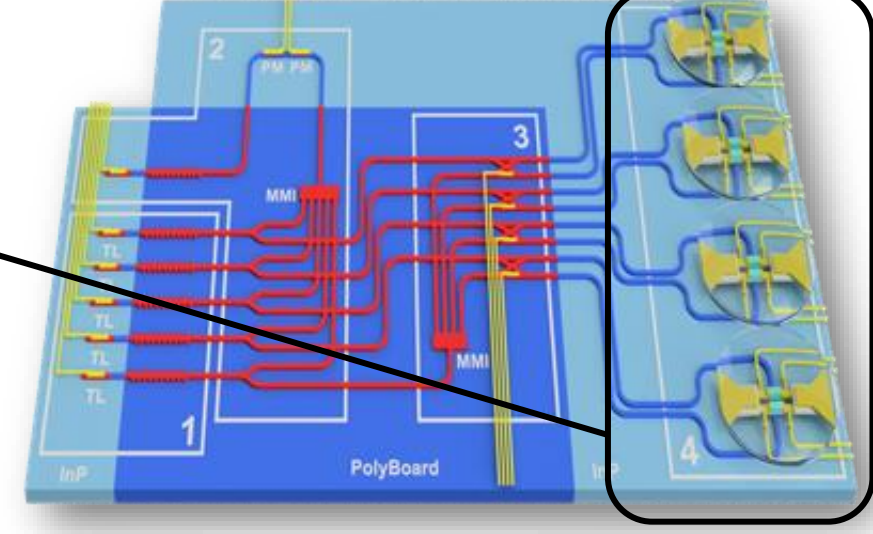
Hybrid photonics-based platform for **ultra-wideband signal generation**, emission and **detection**

Transmitter (Tx)



Antennas

Receiver (Rx)

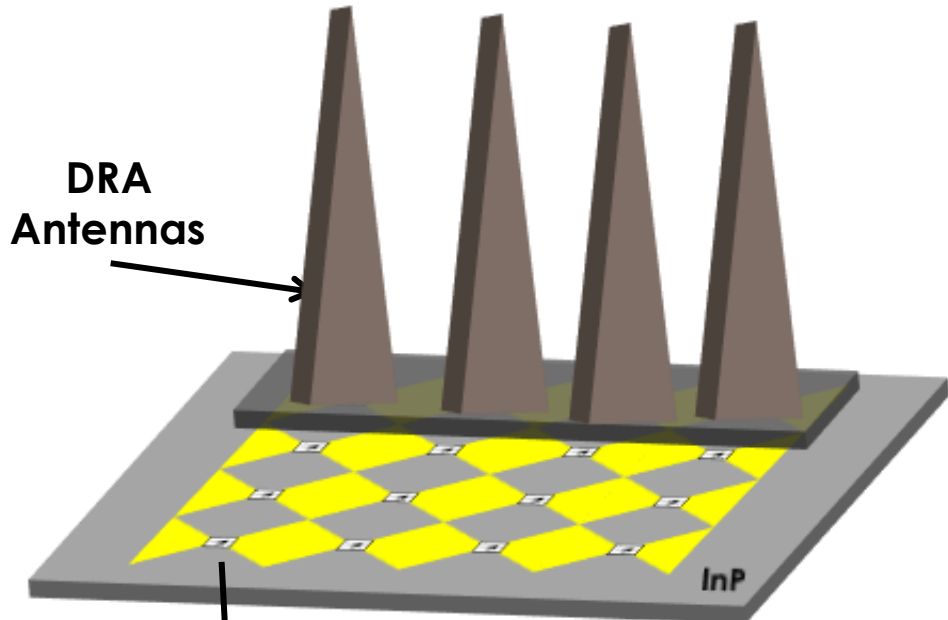


1. **Optical carrier generation unit** (InP + PolyBoard)
2. **Optical phase locking unit** (Optical Frequency comb)
3. **Optical modulation unit** (InP)
4. **Optical multi-beamforming unit** (TriPlex – Si_3N_4)
Independent steering of the transmitted wireless beam
5. **Optical amplification, frequency up-conversion and wireless emission unit** (InP + Si)

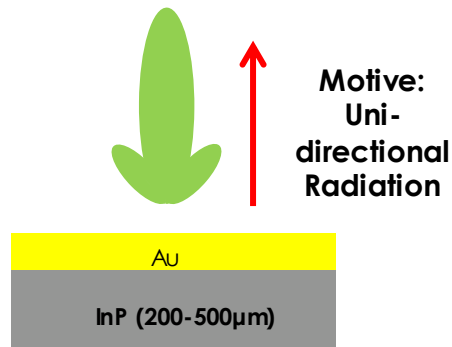
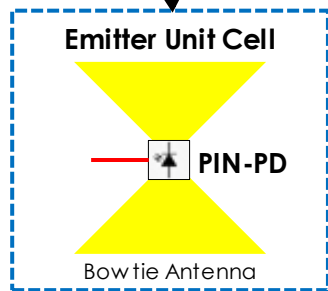
1. **Optical carrier generation unit** (InP + PolyBoard)
2. **Optical frequency comb generator unit** (InP + PolyBoard)
3. **Optical phase shift unit** (Photonic LO)
4. **Wireless detection and optical IQ photonic mixing unit**

Ultra-broadband Antennas

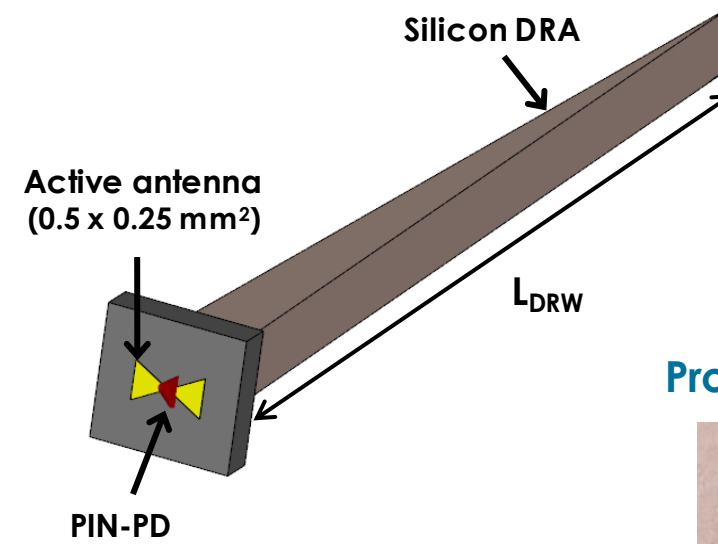
2D Photomixing THz Phased Antenna Array



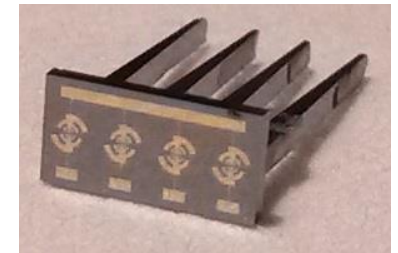
Example Layout



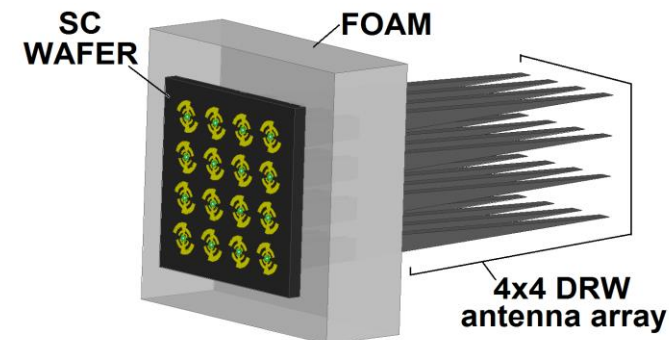
Dielectric Rod Antenna (DRA)



Prototype (1x4 DRA)



Dense Array (4x4)



Thank you!



Questions?