Hybrid Photonic Integration for Next-Generation Wireless Communications

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Hybrid PICs

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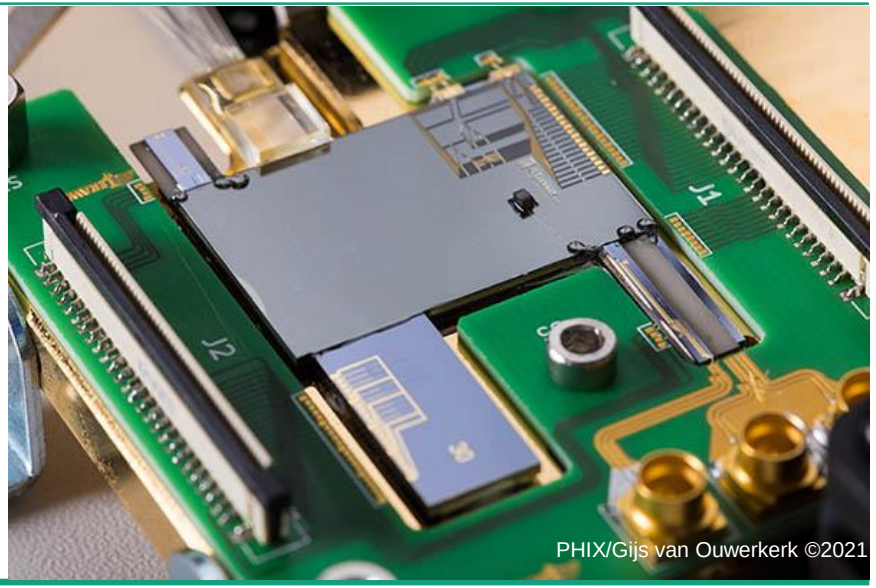

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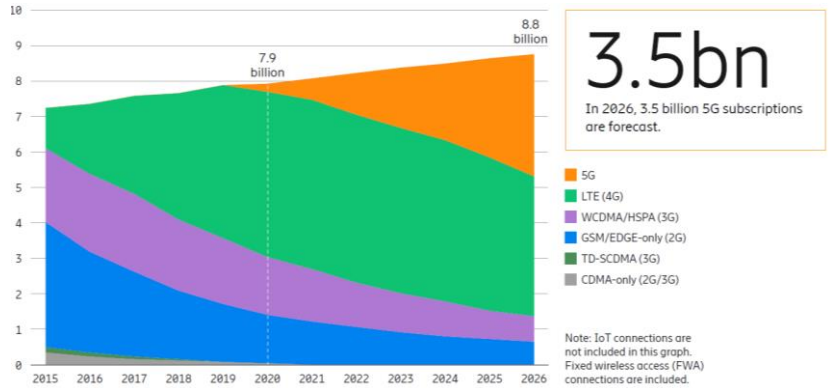
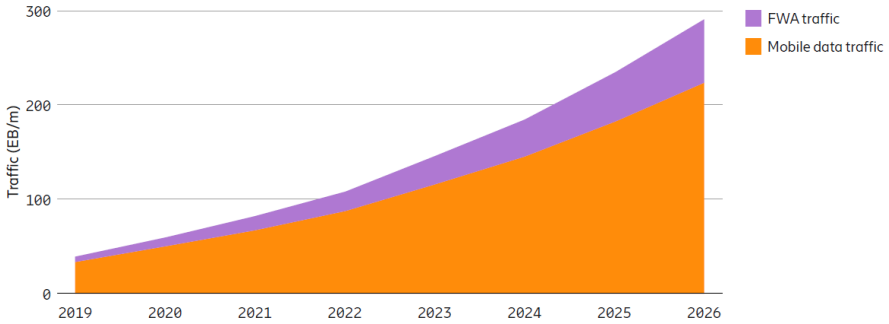
Some Forecasts for Wireless Communications

Mobile subscriptions (in billion)



Mobile and Fixed Wireless Access Traffic (EB/month)



Source: Ericsson Mobility Report, 2020

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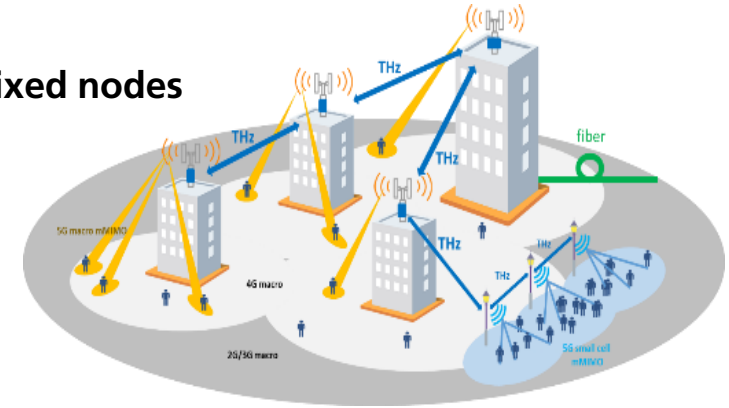
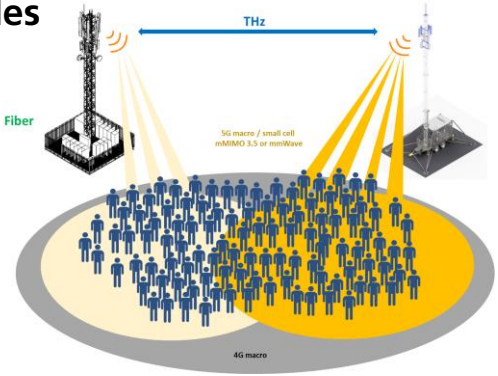
The Key Challenges in Next-Gen Wireless Communications

- Mobile services with ever increasing bandwidth demand
- Larger aggregated capacities in fronthaul
- Fiber deployment not possible / not economically viable everywhere
- Mobile nodes necessary
  - Massive outdoor events
  - Emergency scenarios

Fixed nodes



Mobile nodes



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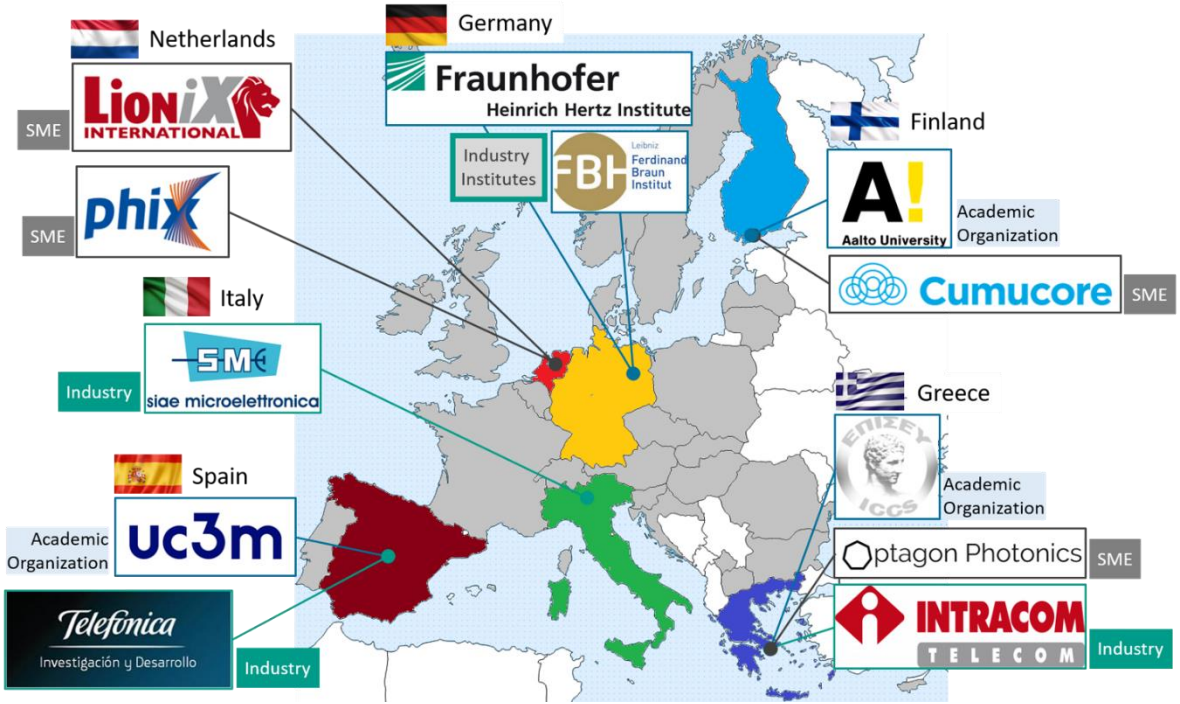
The EU TERAWAY Project – Photonics for Next-Gen Wireless

Who we are

12 Partners
6 EU countries

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



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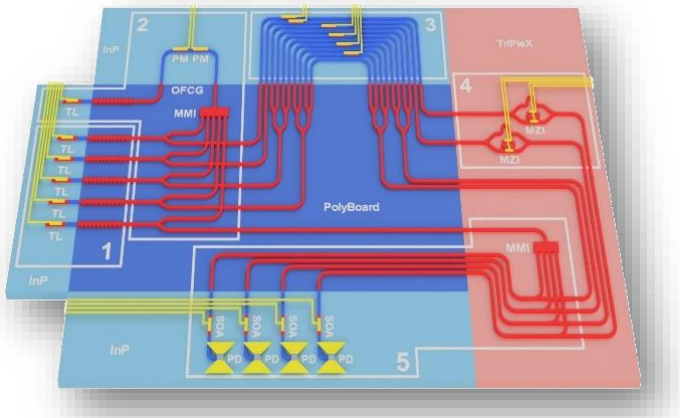
The EU TERAWAY Project – Photonics for Next-Gen Wireless

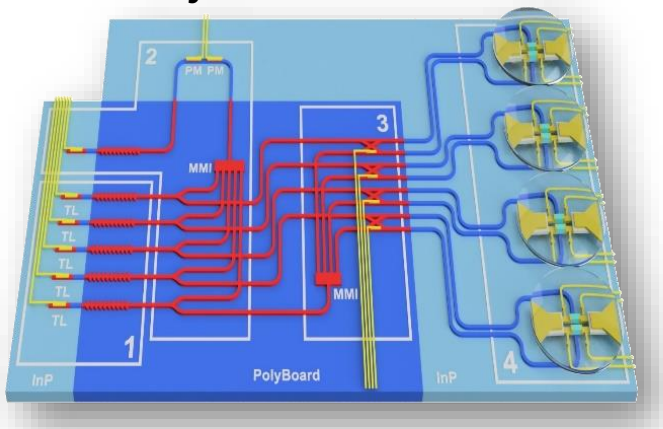
Our approach

Hybrid Transmitter PIC



1. **Optical signals for carrier generation** (HHI's InP + PolyBoard)
2. **Optical injection locking** (HHI's InP + PolyBoard)
3. **Optical data modulation** (HHI's InP)
4. **Optical beamforming unit** (LioniX'S Si_3N_4)
5. **Optical amplification and mmW/THz generation** (HHI's InP)

Hybrid Receiver PIC



1. **Optical signals for carrier generation** (HHI's InP + PolyBoard)
2. **Optical injection locking** (HHI's InP + PolyBoard)
3. **Optical phase shifters for I/Q detection** (HHI's PolyBoard)
4. **mmWave/THz I/Q detection** (HHI's InP)

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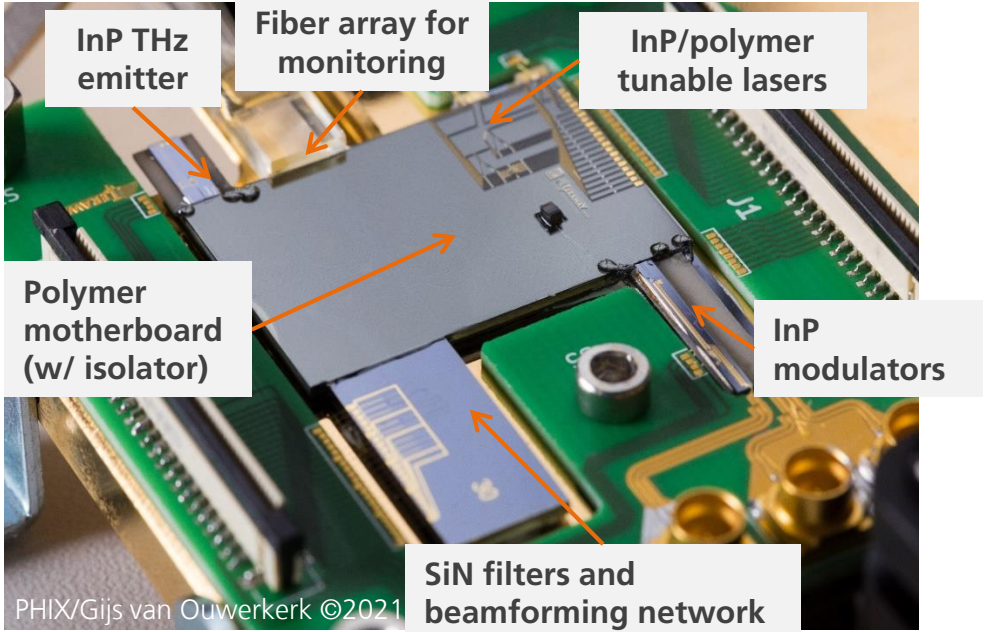
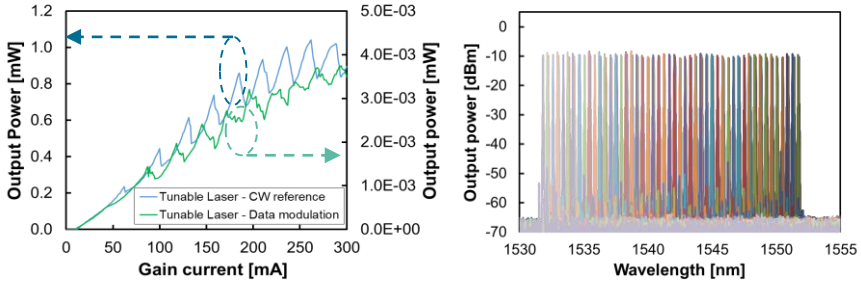
mm-Wave/THz Transmitter PIC

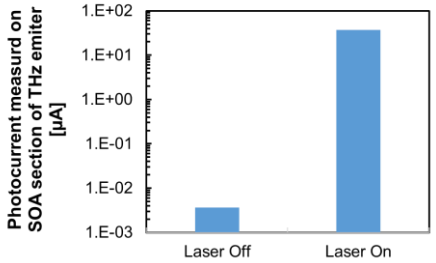
First demonstrator



Characterisation of tunable Lasers (after hybrid assembly)



Characterisation of THz emitter (after hybrid assembly)



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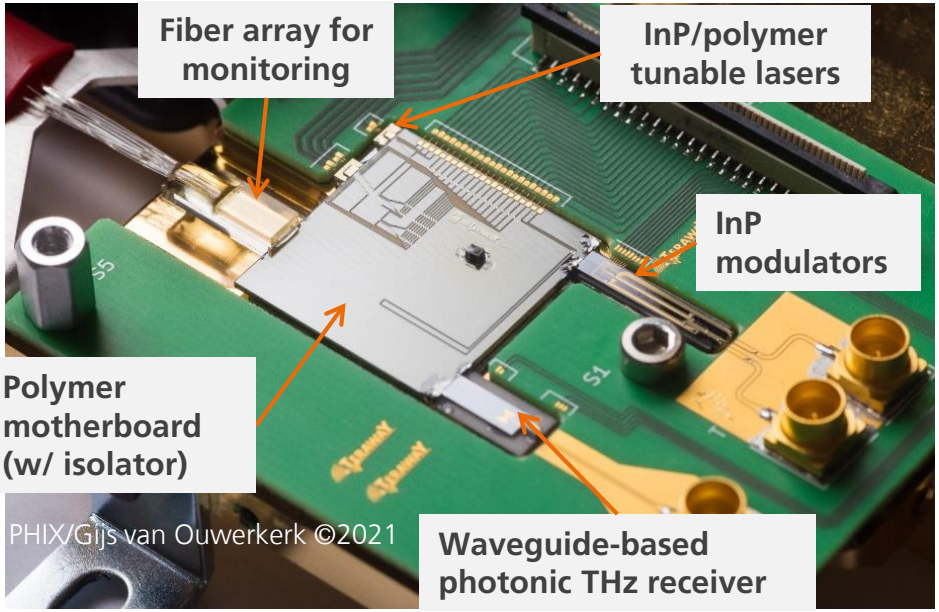
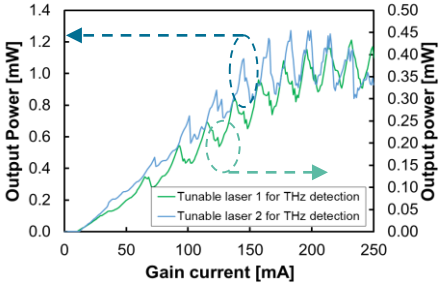
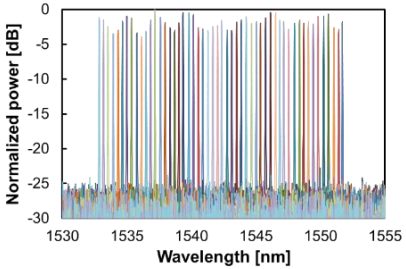
mm-Wave/THz Receiver PIC

First demonstrator

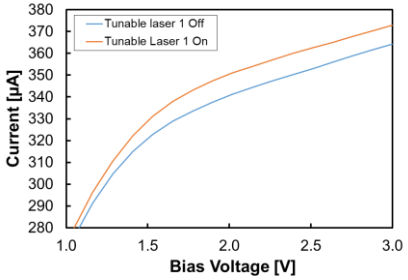


Characterisation of tunable Lasers (after hybrid assembly)





Characterisation of THz photonic receiver (after hybrid assembly)



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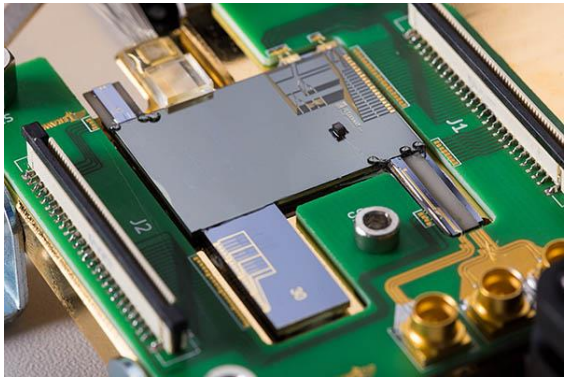
Summary

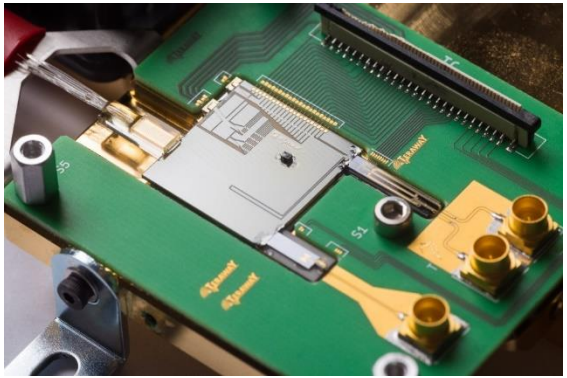
Photonic integration in wireless communications enables

- Large bit rates
- Beam steering
- Miniaturization
- Scalability

... and hybrid photonic integration enables

- using the best material for each function!





For more info, visit TERAWAY website: ict-teraway.eu/

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Fraunhofer HHI – Hybrid PICs Group

THANK YOU

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