AI-Enhanced Fiber-Wireless Optical 6G Network in Support for Connected Mobility

6G-EWOC Newsletter

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On the Showfloor:

6G-EWOC @ Mobile World Congress

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The UPC stand at MWC 2025 showcased innovative research in #6G, #AI, and edge computing. Over four days, pioneering prototypes like the 6G-EWOC technology connected academia and industry.

"From Multimodal Fusion to Collaborative Perception"

A real-time demo combined MIMO FMCW radar and camera data. While the radar estimated object distances but misclassified types, the camera recognized people yet couldn't determine distance. The multimodal fusion technology corrected these gaps, associating distances with people and filtering out non-human objects.

But 6G-EWOC showed how intermediate-level fusion improves average precision and collaborative perception combines vehicular sensors at different viewpoints overcoming occlusions, with edge computing and OWC as vital enablers. The presentation concluded with videos showcasing improvements in detection accuracy for Connected Autonomous Vehicles, using both synthetic and real-world datasets, highlighting the transformative potential of these technologies. High-level **representatives of 6G-SNS** attended the presentation.

Source: UPC

Source: UPC

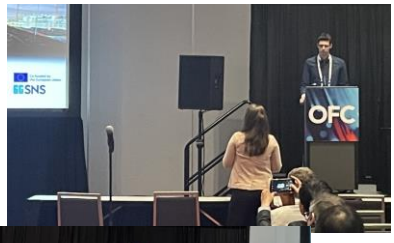
Source: UPC

To Brave all Turbulences:

6G-EWOC's Fi-Wi-Fi Bridge Receives Top-Score at OFC

In a contributed paper that has been top-scored (i.e., ranked within the top-10% of all accepted papers) and presented at OFC, 6G-EWOC's researchers demonstrate the mitigation of optical turbulence – an atmospheric effect that spoils optical free-space communications if left unaddressed. AIT's team uses a very simplistic diversity scheme that can be smoothly integrated with the 91-element focal plane array beamformer that further simplifies the initial alignment of the Fi-Wi-Fi bridge.

The paper has been presented together with another oral paper on VLC.



With over 16,000 registrants from 80+ countries, a showcase of more than 600 exhibiting global companies and more than 750 papers, OFC is the world's largest conference on optical telecommunications.

For more details, check out the paper preprint on our project webpage.

The 6G-EWOC project has received funding from the Smart Networks and Services Joint Undertaking (SNS JU) under the EU's Horizon Europe research and innovation programme under Grant Agreement No. 101139182. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Smart Networks and Services Joint Undertaking. Neither the European Union nor the granting authority can be held responsible for them.

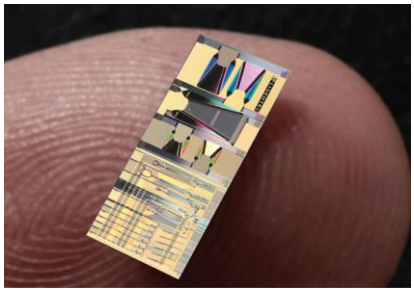
Co-funded by the European Union 6G SNS

Enabling Technology:
Thin-Film Lithium-Niobate on Silicon PICs

by *Camiel Op de Beeck*,
LIGENTEC

Photonic Integrated Circuits (PICs) are microchips that can manipulate light to perform optical functions such as modulation, switching, and routing. Unlike traditional optical systems that rely on discrete components, PICs bring these functions onto a single substrate, enabling precise control of light signals at high speeds.

Integrating optical functions on a chip reduces the need for manual alignment and packaging of individual components, makes manufacturing at scale more cost effective, and provides more mechanically robust solutions, comparing to bulk optics. Hence, applications sensitive to size, weight, cost, and power consumption, such as in the automotive and communications sector, benefit maximally from photonic integration. Comparing to electronics, PICs also offer a major performance edge in latency-sensitive applications.



Light can be modulated and routed with minimal delay, enabling faster response times in systems like optical switches and LiDAR sensors — where speed and precision are paramount. This makes PICs particularly valuable in fields requiring real-time signal processing and fast data throughput. Thin-Film Lithium Niobate is emerging as a leading material in this realm due to its strong electro-optic effect, which enables fast, efficient modulation directly on-chip.

In the 6G-EWOC project, LIGENTEC integrates this promising material onto their mature passive silicon-nitride platform, to support rapid signal switching for network infrastructure with low end-to-end loss, and to enhance optical wireless communication performance with faster beam steering and sharper resolution — critical for autonomous vehicles, robotics, future communication networks, and IoT applications.

Our Recent Publications

- F. Honz et al., *"Bidirectional and Turbulence-Resilient Fi-Wi-Fi Bridge,"* in Proc. Opt. Fiber Comm. Conf. (OFC), San Francisco, United States, Mar.-Apr. 2025, M4G.3
- B. Schrenk, *"VLC over High-Flux LEDs Using Simple Baseband Signaling: Spectral Stitching vs. Beam Combining,"* in Proc. Opt. Fiber Comm. Conf. (OFC), San Francisco, United States, Mar.-Apr. 2025, M2J.5
- J. Lo, et al., *"Quantum Machine Learning Techniques for Network Intrusion Detection in Software-Defined Networks,"* in Proc. 39th Annual AAAI Conf. on Artificial Intelligence, Philadelphia, United States, Feb.-Mar. 2025, W21: QC+AI paper QML2

Meet the 6G-EWOC Team

We are delighted to present further project results at two more conferences. Take the opportunity to meet us at

- *IEEE Int. Conf. on Machine Learning for Communication and Networking (ICMLCN), Barcelona, 26th – 29th of May*
- *EuCNC & 6G Summit 2025, Poznan, 3rd – 6th of June*
- *25th Int. Conf. on Transparent Optical Networks (ICTON), Barcelona, 6th – 10th of July*

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