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

6G EWOC

Newsletter
nº 7
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Interaction with NorthStar 5G Innovation Program

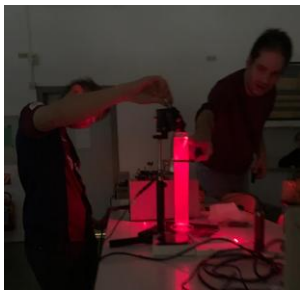
NorthStar is a Swedish 5G innovation program exploring the latest 5G capabilities, with 6G-EWOC partner Magna Electronics being a member. In November, Johan Thor from Magna presented the overall objectives and progress of 6G-EWOC made during the first half of the project at one of the well-visited NorthStar partner program meetings. The presentation sparked an interest in the possibilities of the technologies developed in the project and the following Q&A lifted relevant questions. The NorthStar capabilities are partly funded by the EU through several projects.

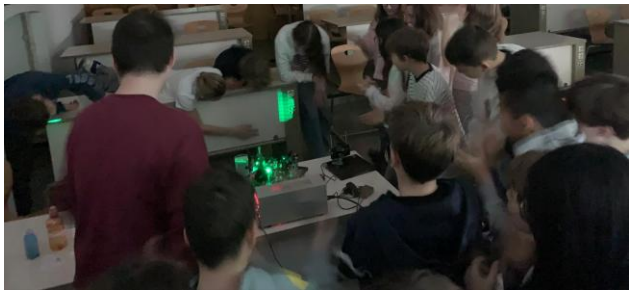
Back to School: Hands-On Experiments in Physics

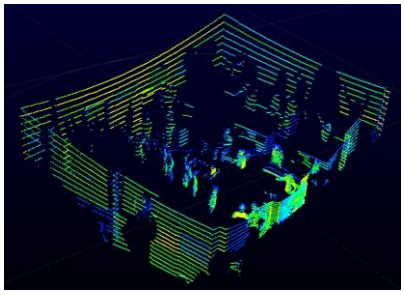
Visits to schools is one of the science communication activities anchored within larger research projects. An elegant way to explain science in a way comprehensible to the general public and young students is to get them in touch with hands-on experiments. Last year, the team of AIT visited a middle school in Vienna to enrich two physics lab courses of second-grade classes of the school's scientific branch.

Within each of the lab courses, students were able to grasp the physics behind light, including basics concepts from optics such as refraction, reflection and diffraction. Music was streamed over a jet of water to resemble fiber-optic channels that convey light based on total internal reflection. Water samples were analyzed through a simplified microscope consisting of nothing more than a droplet of water, yielding a 500-fold magnification that enabled the students to see fine-grained organic particles within the liquid. Diffraction at human and feline hair samples allowed them to precisely determine their widths in the range of 10 to 100 microns. LiDAR allowed them to take a rather unusual class photo with the eyes of a car, while the fringes of light projected by an interferometer were dancing at the rhythm of their voice. These interactive experiments were complemented by further hands-on setups including LiFi to switch between classic music and the latest hits, thermal imaging to probe the capacity of different chocolate biscuits to store energy, and a virtual journey to the end of the universe, where the physical principles of optics can be found at much large scale, as for example evidenced through gravitational lenses.

As also experienced in the past, the outreach activity was rewarded by the strong interest of the students and a very positive feedback. We look forward for further engagement with the scientists of the next generation, who will take care of future generations of radio and optical communication technologies.







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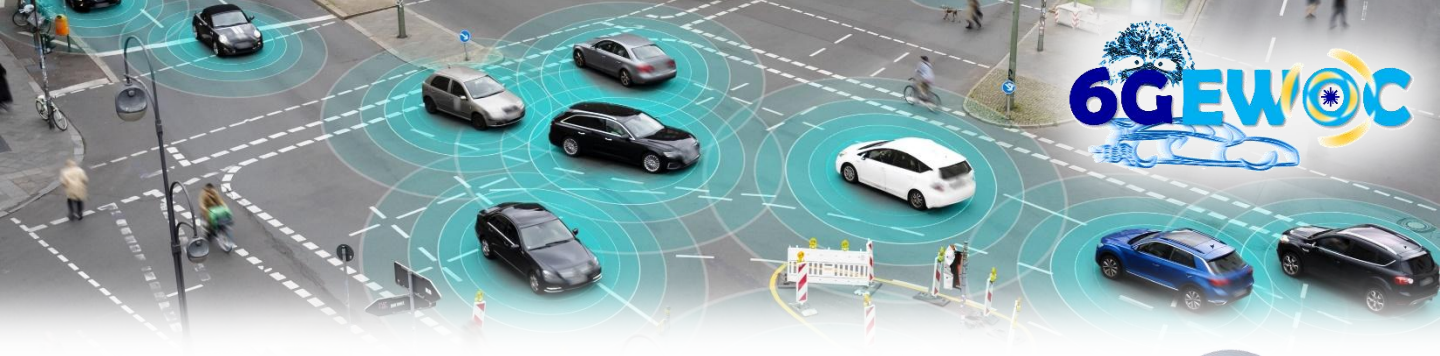


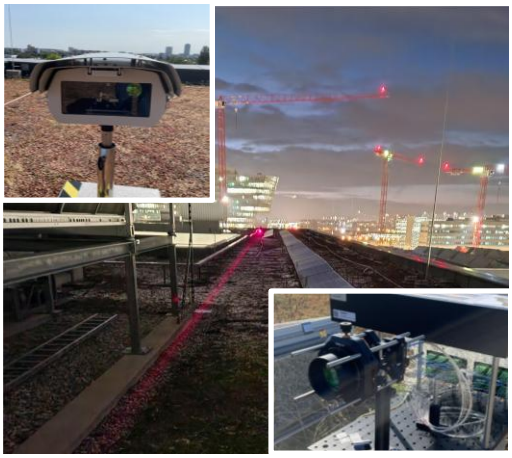
Enabling Technology:
Over-the-Air Transmission Using Light

by *Bernhard Schrenk*,
AIT Austrian Inst. of Technology

Optical wireless communication (OWC) is an alternative choice to traditional radio-frequency wireless technology. Instead of employing radio waves in the frequency range up to 300 GHz, it builds on much higher carrier frequencies in the electro-magnetic spectrum, which reach up to 750 THz.

Even though this sounds bizarre at first, these waves are nothing more than light – from the visible to the infrared wavelength region. By adopting light waves as information carrier, we can transport a much higher data capacity up to the multi-Tb/s range while we can further shape ideal antenna beams that are shaped like a pencil. This allows us to focus light during free-space propagation and enables to dedicate user-centric data relay through dedicating beams to the individual participants of a communication network under eye-safe conditions.

In the 6G-EWOC project, we dedicate OWC to a number of wireless systems, involving point-to-point links between infrastructure assets, communication between vehicles through re-use of lighting or sensing assets in cars, or in between street furniture and cars – to offload data acquired by the cars to a centralized processing cluster. However, the use of OWC also comes with practical challenges, such as operation under poor weather conditions or restrictions through line-of-sight blocking. For this reason, OWC typically comes in pair with a traditional radio based system and the network selects the optimal transmission medium.



Public Data-Set

We have released a public data-set containing a sample scene of 20s acquired by the prototype vehicle used in 6G-EWOC. The data set and further information can be found through our webpage.

Our Recent Publications

Journal Papers

• F. Honz, and B. Schrenk, “Turbulence-Resilient Reflective Fi-Wi-Fi Bridge for Terrestrial Free-Space Optical Data Links”, Journal of Lightwave Technology, DOI: 10.1109/JLT.2025.3612214.

Conference Papers

• A. Sánchez-Alcántara, F. Dios, J.A. Lázaro, J. Pinazo, and A. Lerín, *“Joint Communication and Sensing for Connected Vehicles with Commercial Devices”*, National Symposium of the Scientific Radio Union (URSI) 2025, Tarragona, Spain, Sep. 2025

Meet the 6G-EWOC Team

We are delighted to present further project results at three more spring conferences. Meet us at

- *Mobile World Congress (MWC), Barcelona, Spain, 2nd – 5thof March*
- *Optical Fiber Communication Conference (OFC), Los Angeles, United States, 15th – 19th of March*
- *European Conf. on Networks and Communications / 6G Summit, Malaga, Spain, 2nd – 5thof June*

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