## **Chigo Okonkwo**

Vincent van Vliet, Menno van den Hout, Kadir Gümüş, Sergio Vera Andreu and Eduward Tangdiongga

High Capacity Optical Transmission Laboratory, Eindhoven University of Technology, Eindhoven, The Netherlands

## 5.7 Tb/s Transmission Over a 4.6 km Field-Deployed Free-Space Optical Link in Urban Environment

We transmitted 5.7 Tb/s over a 4.6 km free-space optical link in an urban city environment, spanning the city of Eindhoven, the Netherlands, using a 1.1 THz wide wavelength-division multiplexed signals

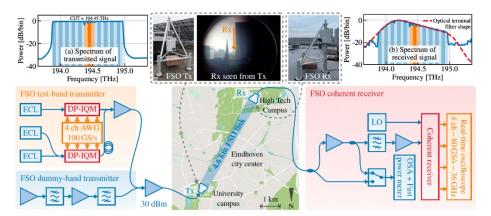


Fig. 1: Experimental setup for coherent FSO transmission with 22 WDM channels over a 4.6 km link traversing the city of Eindhoven. Inset (a) and (b) show the spectra of the transmitted and received signal, respectively, with the CUT set to 194.45 THz. The CUT and the two side channels are highlighted in dark and light orange, respectively. The filtering effect of the optical terminals is detailed in (b).

## References

[1] M. A. Khalighi and M. Uysal, "Survey on Free Space Optical Communication: A Communication Theory Perspective," IEEE Commun. Surv. Tutorials 16, 2231–2258 (2014).

[2] M. A. Fernandes et al., "Achieving multi-terabit FSO capacity with coherent WDM transmission over a 1.8 km field trial," in ECOC 2023, p. We.D.1.1.

[3] Y. Dikmelik and F. M. Davidson, "Fiber-coupling efficiency for free-space optical communication through atmospheric turbulence," Appl. Opt. 44, 4946–4952 (2005).

[4] D. J. Elson et al., "Investigation of bandwidth loading in optical fibre transmission using amplified spontaneous emission noise," Opt. Express 25, 19529–19537 (2017).

[5] "Safety of laser products - Part 1: Equipment classification and requirements," International Standard IEC 60825-1:2014, International Electrotechnical Commission, Geneva, CH (2014).

[6] V. van Vliet et al., "Coherent Terrestrial Free-Space Optical Communications using Optical and Electrical Automatic Amplifier Gain Control for Mitigation of Atmospheric Turbulence-Induced Fading," in ECOC 2024, p. W2A.153.

[7] M. van den Hout, "Ultra-wideband and Space-division Multiplexed Optical Transmission Systems," chap. 3, Ph.D. thesis, Eindhoven University of Technology, Electrical Engineering (2024).

[8] G. Rademacher et al., "Peta-bit-per-second optical communications system using a standard cladding diameter 15-mode fiber," Nat. Commun. 12, 4238 (2021).

[9] Z. Ghassemlooy et al., Optical Wireless Communications: System and Channel Modelling with MATLAB. (CRC Press, 2019), 2nd ed.

[10] L. C. Andrews and R. L. Phillips, Laser beam propagation through random media (SPIE, 2005), 2nd ed