



140 GHz communications for 6G



A compact, low-power telecom/datacom technology offering unprecedented speed for tomorrow's connectivity

What it is

CEA-Leti's 140 GHz wireless communication solution includes a transmitter, smart antenna, receiver, and signal processing algorithms, all developed to minimize energy consumption. The smart antenna focuses the signal for point-to-point communication, even around obstacles when used as an active reflector. Signal processing algorithms correct signal imperfections and can be embedded or installed on a remote PC.

The radiofrequency transmitter-receiver and antenna, developed at CEA-Leti, are completed with off-the-shelf components for the non-critical functions, resulting in a flexible platform compatible with commercial or under-development equipments (such as base-stations or baseband processors) and capable of running any 140 GHz-based application.

What it can do

CEA-Leti's 140 GHz link addresses high-speed communication needs like:

- Fronthaul and backhaul links in telecommunications networks for the transmission of multiple users' signals simultaneously. This high-speed wireless link can replace optical fiber, avoiding the cost and hassle of burying cable.
- It can also be used in data centers, as a lower-cost alternative to fiber optic cables.
- The transmission speeds and distances offered by this solution are also ideal for professional networks needing very high data-rate and low latency, such as real-time environment aware robot operation and navigation in smart factories.

What makes it unique

CEA-Leti's high-speed link can cover distances in the hundreds of meters for telecommunications and in the tens of meters for data communications. This solution offers a tenfold increase in capacity over today's commercial fronthaul and backhaul systems while ensuring very low power consumption. The smart antenna allows to increase the system gain and address longer communication range in subTHz frequencies.

In tomorrow's 6G networks, very-low-power high-speed wireless links like this one will play a vital role in ensuring the low latency necessary for AI-enabled IoT and IIoT services.

Smart factory use case: transmission of robot cameras' data for real-time 3D environment reconstruction on a remote server using a non-line-of-sight 140 GHz link with an active reflector ▼



Working with CEA-Leti

Telecommunications and data communications equipment and component manufacturers and operators can work with CEA-Leti to develop high-speed links drawing on CEA-Leti's integrated circuit, antenna, and signal processing expertise. CEA-Leti experts can develop a solution based on all or parts of this complete solution.

The complete solution has been proven on the reconstruction of an industrial environment to avoid collisions between robots and people. This type of smart factory use case requires very low latency to transmit data from multiple cameras to a central server for 3D reconstruction of the environment of the robots in real time.

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At a glance

- Transmits in the D-band (129 GHz-157 GHz), creating new possibilities for high-capacity use cases.
- At up to 30 GHz of bandwidth, 100 Gbps data-rate 10x faster than commercial fronthaul and backhaul links.
- 50 pJ/bit for 116 Gbps total data rate using 16-QAM modulation over 16 aggregated 2 GHz baseband channels

Scientific publications

- González-Jiménez, J. L., et al. (2024). "A 57.6 Gb/s D-band point-to-point link based on real time baseband processors and transmissive RIS." 54th European Microwave Conference, pp. 409-412.
- González-Jiménez, J. L., et al. (2024). "An Energy-Efficient 56-Gb/s D-Band TX-to-RX Link Using CMOS ICs and Transmitarray Antennas." IEEE Microwave and Wireless Technology Letters, vol. 34, no. 6, pp. 801-804.

Interested in this technology?

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