6GTandem concludes with algorithm-hardware co-design solutions to deploy and operate sub-THz wireless systems, demonstrators and strong scientific impact

After 42 months of research and innovation, 6GTandem has successfully concluded its work on a dual-frequency distributed deployment approach for future wireless connected applications. Funded by the European Union under Horizon Europe under grant agreement no. 101096302, the project ran from January 2023 to June 2026.

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6GTandem developed and validated a tandem concept that combines sub-10 GHz and sub-THz operation with a highly integrated distributed radio-stripe architecture. The results show how this approach can strengthen service continuity, support ultra-high-capacity links, enable positioning-assisted operation and open new options for flexible fronthaul while addressing energy efficiency, cost and practical deploy ability.

At its outset, 6GTandem set out to help shape Europe's future wireless infrastructure by advancing smart, flexible and scalable radio access network evolution and by developing hardware concepts with strong RF performance, cost-, spectrum- and energy-efficiency potential. It also aimed to enable future high-demand services at acceptable cost, strengthen Europe's position in telecommunications, and contribute to more resilient and reliable services for society.

The nine-partner consortium united four industry partners, four academic and research partners, and one SME: Ericsson AB, KU Leuven, Infineon Technologies AG Austria, Chalmers University of Technology, Linköping University, Lund University, Infineon Technologies AG Germany, associated partner Huber + Suhner AG, and the project coordinator Technikon. Throughout the project, the consortium advanced system level dual-frequency distributed architecture, cross-layer dual-frequency algorithms, waveform evaluation, radio-stripe hardware, antenna-in-package solutions, RX/TX circuits, phase shifters, and polymer microwave fibre integration, supported by a strong scientific publication record and broad dissemination activities.

Four final demonstrators validated the concept:

In the final phase of the project, 6GTandem translated its research into four demonstrators that made the overall concept tangible and application-oriented. Together, they showed how dual-frequency operation, distributed deployment, and advanced hardware integration can support future high-performance 6G systems.

- **Demo 1 – Consistent and reliable coverage:** The first demonstrator shows how distributed ceiling-mounted radio units connected through polymer microwave fibre stripes can support robust indoor coverage. With complementary sub-10 GHz support and intelligent radio-unit selection, it demonstrated how service continuity can be maintained even in challenging environments with blockage and difficult geometry.
- **Demo 2 – Terabits-per-second capacity:** The second demonstrator validates ultra-high-capacity links by combining polymer microwave fibre and wireless sub-THz transmission. In laboratory tests, the developed platform supported data rates above 108 Gbit/s over 1-meter fibre segments and above 24 Gbit/s over wireless sub-THz links.
- **Demo 3 – Dual-frequency operation:** The third demonstrator shows how sub-10 GHz positioning information can support the selection of the most suitable sub-THz radio unit. With just 3 access points, the system achieved better than 10 cm RMSE positioning accuracy, with a maximum error of around 25 cm — accurate enough to support reliable RU selection in realistic environments. This reduced unnecessary scanning, improved link establishment and confirmed the practical value of combining robust lower-frequency signals with high-capacity sub-THz communication.
- **Demo 4 – Wireless sub-THz fronthaul:** The fourth demonstrator explores the use of radio stripes to connect conventional sub-10 GHz base stations through wireless sub-THz fronthaul. The results highlighted a more flexible deployment option while still enabling high data-rate connectivity.

Taken together, these demonstrations underline the relevance and potential of the 6GTandem approach for future reliable, flexible, and high-capacity infrastructures.

For more information about the 6GTandem project, visit our website or contact the project coordinator:

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