

New tech for tackling increasing demand by 'internet of things' on mobile networks

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A novel technology to manage demands on mobile networks from multiple users using Terahertz frequencies has been developed by University of Leicester computer scientists.

As we see an explosion of devices joining the "[internet of things](#)," this solution could not only improve speed and [power consumption](#) for users of mobile devices but could also help reap the benefits from the next generation of mobile technologies, 6G.

They have detailed the technology in a [new study](#) in *IEEE Transactions on Communications*.

Demands on the UK's mobile telecommunications [network](#) are growing, with [Mobile UK estimating](#) that twenty-five million devices are connected to [mobile networks](#), a number expected to rise to thirty billion by 2030. As the 'internet of things' grows, more and more technology will be competing for access to those networks.

State-of-the-art telecommunication technologies have been established for current applications in 5G, but with increasing demands of more users and devices, these systems demonstrate slower connections and costly energy consumption.

These systems suffer from the self-interference problem that severely affects communication quality and efficiency. To deal with these challenges, a technique known as multicarrier-division duplex (MDD) has been recently proposed and studied, which allows a receiver in the network to be nearly free of self-interference in the digital domain by relying only on the fast Fourier transform (FFT) processing.

This project proposed a [novel technology](#) to optimize the assignment of subcarrier sets and the number of access point clusters and improve communication quality in different networks. The team tested their technology in a simulation based on a real-world industrial setting, finding that it outperformed existing technologies. A 10% power consumption reduction can be achieved compared to other state-of-the-art technologies.

Lead Principal Investigator Professor Huiyu Zhou from the University of Leicester School of Computing and Mathematical Sciences said, "With our proposed technology, 5G/6G systems require less energy consumption, have faster device selection, and less resource allocation. Users may feel their mobile communication is quicker, wider, and with reduced power demands."

"The University of Leicester is leading the development of AI solutions for device selection and access point clustering. AI technologies, reinforcement learning in particular, help us to search for the best parameters used in the proposed wireless communication systems quickly and effectively. This helps to save power, resources, and human labor. Without using AI technologies, we will spend much more time on rendering the best parameters for system set-up and device selection in the network."

The team is now continuing to work on optimizing the proposed technologies and reducing the computational complexity of the technique. The source code of the proposed method has been published and shared with the entire world to promote the research.

The study forms part of the [6G BRAINS project](#), which will develop an AI-driven self-learning platform to intelligently and dynamically allocate resources, enhancing capacity and reliability, and improving positioning accuracy while decreasing latency of response for future industrial applications of massive scale and varying demands.

More information: Bohan Li et al, MDD-Enabled Two-Tier Terahertz Fronthaul in Indoor Industrial Cell-Free Massive MIMO, *IEEE Transactions on Communications* (2023). [DOI: 10.1109/TCOMM.2023.3330893](#)

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