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Robust mmWave/sub-THz multi-connectivity using minimal coordination and coarse synchronization

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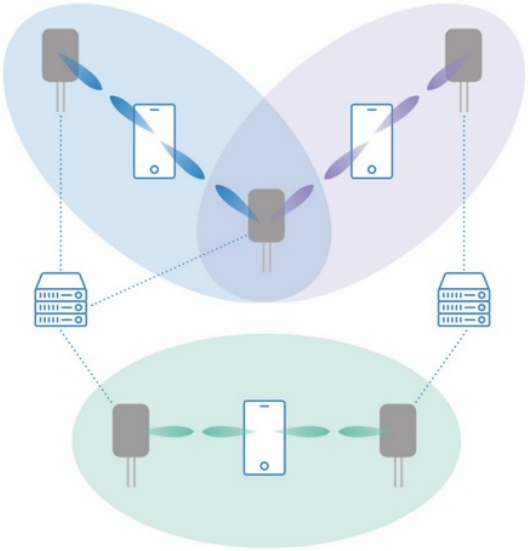
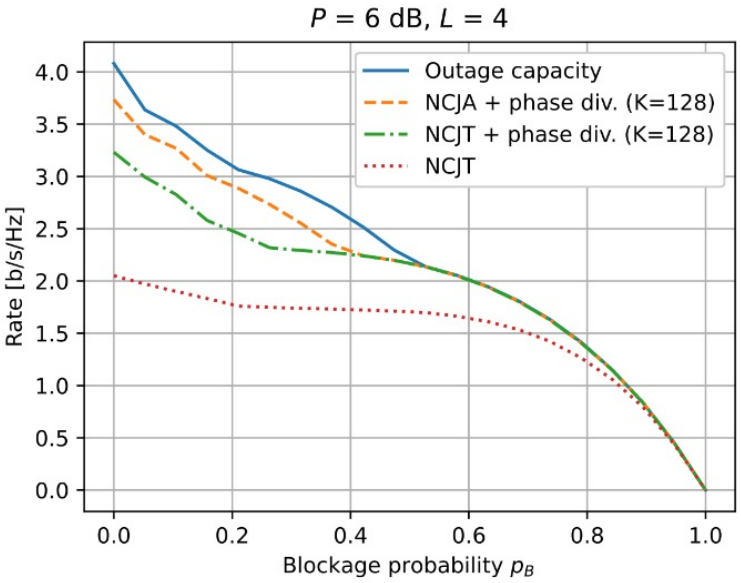
How to counteract signal blockage and deliver seamless high-rate connectivity in practical sub-THz systems?





Transmitting simultaneously from multiple access points offers robust connectivity against signal blockages. At mmWave/sub-THz frequencies, the key challenge is how to realize this benefit using low complexity and cost-effective devices and network infrastructure. Fortunately, our results demonstrate that it is possible to achieve nearly optimal performance while keeping the simplicity of non-coherent joint transmission (NCJT).

KEY FINDINGS

By taking an information-theoretic viewpoint, we demonstrate analytically that with a careful design, full macrodiversity gains and significant SNR gains can be achieved through canonical receivers and minimal coordination and synchronization requirements at the infrastructure side. Our proposed scheme extends non-coherent joint transmission by employing a special form of diversity to counteract artificially induced deep fades that would otherwise make this technique often compare unfavorably against standard transmitter selection schemes. Additionally, the inclusion of an Alamouti-like space-time coding layer is shown to recover a significant fraction of the optimal performance. Our conclusions are based on an insightful multi-point intermittent block fading channel model that enables rigorous ergodic and outage rate analysis, while also considering timing offsets due to imperfect delay compensation. Although simplified, our approach captures the essential features of modern mmWave/sub-THz communications, thereby providing practical design guidelines for realistic systems.

L. Miretti, G. Caire, and S. Stanczak, "Robust mmWave/sub-THz multi-connectivity using minimal coordination and coarse synchronization", IEEE Trans. Wireless Commun., 2024