

VIAVI 6G Research

Supporting the all-encompassing ambition for universal coverage

From Idea to Impact: VIAVI Marconi Labs™

The development of 6G and associated candidate technologies is well underway. VIAVI is a key player in several projects driving 6G research and development.

As 6G is a step change from the previous generation, it will rely heavily on other candidate technologies to help deliver its unique technical requirements. VIAVI Marconi Labs offers world-leading research and innovation capabilities for advanced wireless communications.

New multiple-access technologies: Rate-Splitting Multiple Access (RSMA) addresses the challenges in MU-MIMO due to imperfect CSI estimation and increased network density. It will help in improving spectral efficiency to meet the anticipated demands of 6G networks.

New spectrum: The THz spectrum (100 GHz to 10 THz) will be crucial for many of the new sensing applications in 6G. It will give improved spatial resolution and can also penetrate certain materials, making it viable for security screening, pharmaceutical quality control, and material characterization.

New waveforms: 6G will rely heavily on 3D networks and their ability to ensure uninterrupted coverage during aerospace travel, therefore the proposal and testing of new waveforms will be important for the success of 6G. Orthogonal Time Frequency Space (OTFS) is one of the candidate waveforms due to its strong delay- and Doppler resilience. OTFS operates in the delay-doppler domain, simultaneously processing both dimensions rather than treating them as separate entities.

Proofs of Concepts



- ✓ Rate-Splitting Multiple Access (RSMA)
- ✓ Orthogonal Time Frequency Space (OTFS) waveforms
- ✓ Terahertz Communication, Imaging and Sensing with Reconfigurable Intelligence Surface
- ✓ AI-empowered Real-time Ray-Tracing Channel Generator and Network Planning Tool
- ✓ 3D Channel Modelling and Mobility Management for 3D Terrestrial and Non-Terrestrial Networks
- ✓ AI/ML for Air Interface
- ✓ Joint Communications and Sensing; Semantic Communications



6G 3D Mobility Management Capture

World-First Real-Time Over-the-Air Proof of Concept:

1. Multiple Access: Rate-Splitting Multiple Access (RSMA)

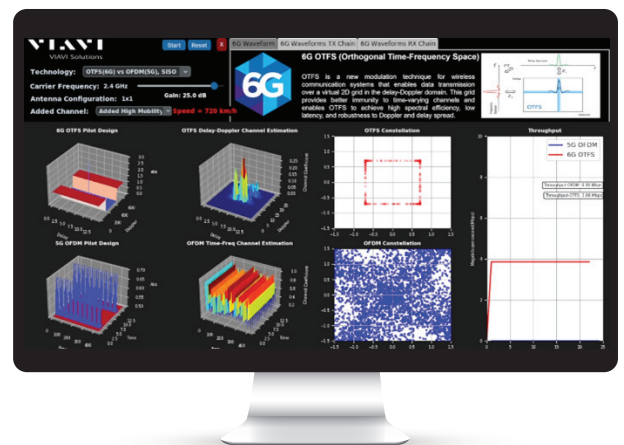
For multi-user communications with mobility to increase data rate and connectivity. RSMA employs Rate-Splitting (RS) at the transmitter level and Successive Interference Cancellation (SIC) at the receivers. By partially decoding the multi-user interference and partially treating it as noise, RSMA achieves better performance and copes with interference more effectively than existing approaches like MU-MIMO and NOMA. Owing to its flexible framework, it can support use cases, such as non-orthogonal unicast and multicast, in an efficient manner and achieves an enhanced performance.

2. New Waveforms: Orthogonal Time Frequency Space (OTFS)

OTFS is a cutting-edge modulation technique tailored for highly dispersive wireless channels. Unlike traditional modulation schemes that function in the time-frequency domain, OTFS operates in the delay-Doppler domain. In this two-dimensional space, one axis represents the delays from multipath components, while the other denotes the Doppler shifts due to relative motion between transmitters and receivers. By mapping symbols in this domain, OTFS effectively harnesses the channel's diversity in both delay and Doppler, offering enhanced resilience to channel impairments and rapid variations. This makes it particularly suitable for high-mobility scenarios, including vehicular communications, high-speed trains, and satellite transmissions.



Rate Splitting Multiple Access (RSMA)



Orthogonal Time Frequency Space (OTFS)

Why VIAVI for 6G

- ✓ **Decades of experience in Wireless Communications**
- ✓ **TM500 Network Tester** used in 80% of NEMs Worldwide
- ✓ **TeraVM** used by major Tier 1 Vendors and Operators for RAN to Core lab testing, firewall and RIC testing.
- ✓ **Proven solutions** for multi-technology/multi-vendor radio networks

VIAVI is involved in various research and development projects which underscores its dedication to 6G advancement. Collaborating with organizations like the O-RAN ALLIANCE, one6G, the 5-6 innovation center, leading education bodies and the DSIT ONE research project, which received a significant research grant from the UK government, to name a few. VIAVI not only provides integration and testing solutions but also actively participates in and co-leads critical research and innovation work across the globe.

Let's develop next generation wireless technology together

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