

AI PHY Layer Development Testbed

Boost Your AI PHY Layer Algorithm Development

Enhance RAN PHY Layer Efficiency with AI

AI-powered physical layer intelligence transforms wireless performance by learning directly from real-world radio conditions. Instead of relying on fixed models and conservative margins, advanced machine learning algorithms optimize channel estimation, beamforming, signal detection, and adaptive modulation in real time. The result is higher spectral efficiency, improved reliability, reduced latency, and better energy efficiency, even in fast-changing, interference-heavy environments. By continuously adapting to network dynamics and hardware imperfections, AI enables smarter, more resilient, and future-ready 5G-Advanced and 6G systems.

Keysight AI PHY Layer Development Testbed

The AI PHY Development Testbed accelerates development, training, and validation of AI-based physical layer algorithms under realistic RF conditions. Solution scales from single-antenna research setups to full Massive MIMO deployments.

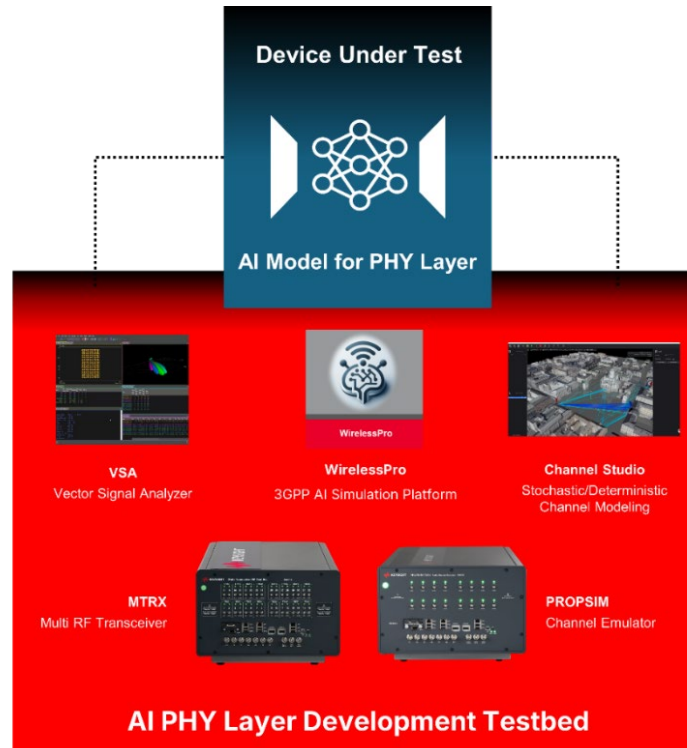


Figure 1. Keysight AI PHY Layer Development Testbed

With this testbed the user can train AI PHY layer models to enhance and optimize base station performance in various challenging scenarios:

- Ensure AI Model PHY/L1 level performance using 3GPP signals
- Comprehensive support for technologies including SRS UL, CSI Compression etc.
- Scale from SISO to Massive MIMO
- Generate realistic datasets for AI validation
- Integrate AI models as part of the test bed
- Seamless hardware in-the-loop integration
- Fast implementation of scripting

What benefits testbed provides?

- Automated workflow, reduced risk

Say goodbye to tedious data wrangling. The built-in conversion process eliminates manual formatting, significantly reducing setup time and the risk of human error - so your team can focus on innovation, not file management. Seamless integration with Python scripts for fast automation workflow design including instrument control, AI model deployment etc.

- Accelerated R&D with realistic foundations

With site-specific, high-resolution channel data as your baseline, your engineers can confidently explore advanced beamforming techniques, resource allocation strategies, and AI/ML-driven RAN features.

- Greater confidence in design decisions

Simulations grounded in real-world propagation conditions yield more accurate performance predictions. This empowers you to make informed design choices, reduce costly iterations, and accelerate time-to-market.

- Consistency across teams and scenarios

Pre-processed and reproducible channel datasets ensure consistent results across simulation runs and collaborative teams. This is essential for validating outcomes, benchmarking solutions, and building trust in your system models.

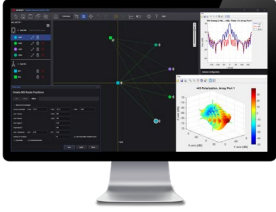
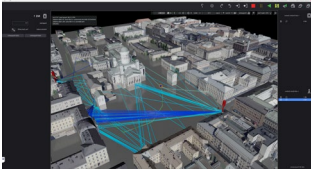
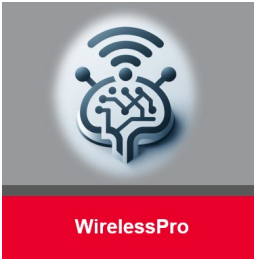
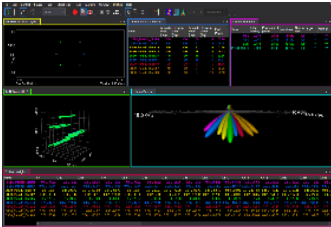
Testbed Components

Testbed contains the following key components described in the table below.

Hardware Components

Model	Function	Description
 E6416A E6464A	MTRX Multiport RF transceiver Scalable, high-performance 5G testing with up to 64 phase and time-coherent RF transceivers, simplifying MIMO and beamforming validation.	• Scalable multi-channel architecture • From 4 up to 64 Signal Sources and Signal Analysers • Wide frequency coverage up to 7,25 GHz and 200 MHz BW. • MIMO and beamforming support • Phase and time coherent operation of Signal Sources and Signal Analysers • Software integration
 F8820B F8800B	PROPSIM Channel Emulator Emulate radio conditions, model mobility, interference, and fading, and validate performance under a wide range of repeatable and controllable scenarios using a combination of hardware emulators and software tools.	• Real-time RF channel emulation • Massive MIMO and beamforming support • Wideband and multi-link capability • Standard and custom channel models • Seamless test system integration

Software Components

Model	Function	Description
 F9860000A	Channel Studio GCM Stochastic Channel Modeling.	- Advanced RF Channel Modelling Engine - Support for Complex Multi-Device Scenarios - Broad Technology & Use-Case Coverage - Integration with Digital Twin & Emulation Workflows - User-Friendly Scenario Creation & Visualization
 F9860500A	Channel Studio RaySim Field scenario-based Deterministic RF Ray Tracing simulations.	- Link-, System- and Network-Level Digital Twins - Benchmarking of Devices and BS/RAN in HW-in-the-loop test with Keysight's End-to-End Emulation Solutions - Datasets for AI / ML model Training and Benchmarking across Wireless AI-RAN and AI-Device R&D workflows
 W8301B	WirelessPro 3GPP AI Simulation Platform Provides tools to simulate 5G New Radio, 5G Advanced, and engage with 6G standardization and research.	- Integrated AI/ML Model Support - Unified Simulation Framework –supports both link-level and system-level simulations. - Standards Alignment with 3GPP – Built to align with the latest 3GPP specifications (including 5G NR and emerging 6G standards) - Flexible Development APIs - Realistic Channel and Hybrid System Modelling
 89600 VSA	Vector Signal Analyzer Perform 5G NR/5G-Advanced gNB/UE modulation analysis.	- Comprehensive Modulation Analysis - Advanced Vector Signal Demodulation - Wideband & Multi-Channel Analysis - Flexible Hardware Compatibility - Custom & User-Defined Signal Analysis

For More Information

- E6416 MTRX model for up to TR16
- E6464 MTRX model for up to TR64
- F8820B PROPSIM FS16 Channel Emulator
- F8800B PROPSIM F64 Channel Emulator
- F9860000A Channel Studio
- 89600 Vector Signal Analysis
- W8301B Wireless Pro 3GPP AI Simulation Platform
- White Paper: Enabling AI-Driven Innovation in 5G-Advanced and 6G Air Interfaces
- Solution Brief: Precision Beamforming Starts Here



Keysight enables innovators to push the boundaries of engineering by quickly solving design, emulation, and test challenges to create the best product experiences. Start your innovation journey at www.keysight.com.

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