F8800A PROPSIM F64

Radio channel emulator

Real-World Performance Testing in the Lab

PROPSIM F64 is a versatile multi-channel radio channel emulation solution that enables users to emulate field test conditions in a laboratory environment for software and hardware testing of radio network systems, mobile devices, WLAN, MANET/Mesh radios, 5G NTN satellites, and RF sensor systems. It is used to perform wireless industry benchmarking of devices and base stations across the entire product creation workflow – from research, development, to acceptance and field performance optimization.

Take testing to the next level

Industry-leading mobile device, modem and network equipment manufacturers use Keysight's PROPSIM F64 radio channel emulator to

- Integrate new 5G and 4G product features
- Verify new hardware and software releases in a 24/7 automated test environment

Tier-1 mobile operators use PROPSIM F64 to validate 5G and 4G devices and base stations. Unique capabilities in PROPSIM F64 enable users to validate a wide range of RF and mmWave applications in the aerospace, avionics, satellite, and defense industries.

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The PROPSIM F64 emulates dynamic radio channels between transmitters and receivers and is thus independent of system technology or signal modulations. Its capabilities are designed for end-to-end realistic and repeatable real-world performance testing of 5G multimode devices and base stations in the laboratory to accelerate successful 5G rollouts.

Definitions and Conditions

PROPSIM F64 will meet its specifications when:

- The PROPSIM hardware is within its calibration cycle.
- The PROPSIM hardware has been stored at an ambient temperature within the allowed operating range for at least six (6) hours before being turned on; if it had previously been stored at a temperature range inside the allowed storage range, but outside the allowed operating range.
- The test set has been turned on for at least 60 minutes.
- No other application or 3rd party software is running simultaneously with PROPSIM running view on the PROPSIM integrated PC windows operating system.

Specifications

Specifications describe the performance parameters covered by the product warranty and are valid from 20 to 30 °C unless otherwise noted.

Typical

Typical describes additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 95 percent of the units exhibit with a 95 percent confidence level. This data does not include measurement uncertainty, and is valid only at room temperature, 23 °C.

Nominal

Nominal values indicate expected performance or describe product performance that is useful in the application of the product but are not covered by the product warranty.

Key Capabilities and Features

Capabilities and features with applicable configurations and options

RF ports in single F8800A	With F8800ARF1 channel units: Up to 64 TRX ports N-female connectors Shipping 8, 16, 24, 32, 40, 48, 56, 64 TRX port configurations Bidirectional and unidirectional fading supported With F8800ARF2 channel units: Up to 64(T)RX+64TX SMA-female connectors Flexible configurations with software up to • 64 bidirectional TRX ports or • 64 unidirectional TX & RX ports Shipping 8, 16, 24, 32, 40, 48, 56, 64 (T)RX+TX port configurations
MIMO/mesh emulation	256/512/1024 digital MIMO/mesh channels in F8800A unit Flexible MIMO/mesh topologies uni- and bi-directional fading e.g., 2x2, 4x2, 4x4, 8x2, 8x4, 8x8, 16x8, 16x16 etc.
MIMO and massive MIMO emulation	Single F8800A unit: Full Antenna Array Port Sampling Massive MIMO testing 32x16bi for complete base station MU-MIMO TM9 UE feedback and uplink SRS based massive MIMO scheduler / beamformer testing Massive MIMO testing with external F9510A Antenna Interface Unit or RF phase shifter matrix. Two F8800A units: • Full Antenna Array Sampling 64x4bi, 64x8bi, 64x16bi
MESH and MANET emulation	Up to 64 radios
Frequency range	F8800ARF1: 450 MHz to 6 GHz F8800ARF2: 3 MHz to 6 GHz With E7770A: 6 GHz or 7 GHz to 15 GHz With M1740A: 24.25 GHz to 29.5 GHz, 37 GHz to 43.5 GHz
Connectivity Options	RF cabled connectivity Over the Air (OTA) chambers
Instantaneous signal BW EXT-BW operation is not specified below 450 MHz	40/100/160 MHz EXT-BW 300 MHz EXT-BW 450 MHz EXT-BW 600 MHz EXT-BW 900 MHz EXT-BW 1200 MHz
Carrier Aggregation support	Contiguous up to 1200 MHz (TDD or FDD) Non-contiguous up to 32 CA bands
Independent RF local oscillators in single F8800A	Up to 32
Frequency conversion e.g. from band A to band B	Yes. Requires minimum two RFLOs
Internal RF band combination into single RF TRX port above 450 MHz	Up to 8 RF bands. Removes the need to use external RF plumbing in typical lab setups
Fading paths per fading channel	Up to 48
Minimum delay	2.6 μs
Maximum delay	1000 ms, requires F8800ACEA option
Doppler emulation	Up to ± 1.5 MHz, requires F8800ACEA option
Test setup calibration	Integrated test setup amplitude and phase calibration. No need for an external VNA instrument. NR and LTE DL signal-based input phase alignment

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Capabilities and features with applicable configurations and options (continued)

Interference sources	CW Independent uncorrelated sources at each output port Adjustable frequency offset Absolute and SNR based level settings AWGN Independent uncorrelated sources at each output port User adjustable BW and frequency offset Absolute and SNR based level settings Arbitrary Waveform interference PathWave Signal Generation generated waveforms
Automatic input level setting	Continuous and RF burst- triggering input power measurements
Uplink and downlink separation	Integrated uplink and downlink separation
User definable input/ output ports	User-defined active connector settings
Remote control	ATE SCPI commands. PROPSIM plugin for The Keysight Test Automation on PathWave (TAP) Ethernet
Other interfaces	10 MHz reference IN and OUT HW trigger port for emulation start/stop Synchronization ports for multiple PROPSIM hardware units
Signal Capture (*)	Up to 64 simultaneous and phase coherent captures. Up to 1000ms each RF port independently. Compatible file formats: Keysight PathWave 89600 VSA software, WaveJudge Wireless Analyser software, and open file format. Note: requires applicable options for operation. • Trigger from GUI / SCPI / LVTTL (BNC port) • Emulation time based
Signal Waveform Playback (*)	Up to 64 simultaneous and phase coherent sources. Up to 1000ms each RF port independently. Compatible file formats: Keysight PathWave Signal Generation VSG software and open file format. Note: requires applicable options for operation • Trigger from GUI / SCPI / LVTTL (BNC port) • Emulation time based
PROPSIM software and channel models	PROPSIM Standard Tools software includes • 3GPP 5G NR TDL channel models for FR1 and FR2 testing • LTE, WCDMA, GSM and Static Butler Channel Studio GCM Tool supports • 3GPP TR38.901, TR36.873, WINNER and SCME • Ray-tracing data import • 3D Antenna pattern inclusion into the channel model • Custom test topology creation for massive MIMO, Device-to-Device (D2D), Vehicle-to-everything (V2X) • MIMO OTA channel models (CTIA/3GPP/CCSA) Channel Studio WLAN Tool includes 802.11ax/be channel models Channel Studio RF Field-to-Lab Tool for 5G and LTE High-Speed Train channel model pack (mobile network operator test plan) Massive MIMO BTS channel model pack (mobile network operator test plan) Aerospace Modeling Tool
Fast fading profiles	**PROPSIM Standard Tools software:** Constant, Rayleigh, Rice, Nakagami, Lognormal, Suzuki, Pure Doppler, flat, rounded, Gaussian, Jakes, Butterworth, user-defined, and CIR data from 3rd party simulation tools Each digital channel can be set for independent fading profile (delay, doppler, amplitude, correlation)

(*) Installation of Signal Capture and Signal Waveform playback options is performed in Keysight service center.

Pathloss/Shadowing	**PROPSIM Standard Tools software** with a shadowing option: • Each TRX channel independently, 100 dB dynamic range Each digital fading channel independently, 60 dB dynamic range
Delay profiles	**PROPSIM Standard Tools software**: Constant, sliding delay, 3GPP birth-death, 3GPP sliding delay group, user- defined, delay profiles from 3rd party simulation tools, ray-tracing applications Each digital fading channel has independent delay setting

RF Characteristics

F8800ARF1: RF levels and linearity across 450 MHz to 6 GHz with 160 MHz BW signal. Typical values.

RF input level	+35 dBm, peak
RF output level	+5 dBm, peak
RF input/output resolution	0.1 dB
RF output gain setting range	+5…-100 dB
RF output level accuracy	< ±0.5 dB at center frequency
Output noise floor (output level ≤ –40 dBm)	< -168 dBm/Hz
EVM	< -47 dB RMS, 5G NR 100 MHz, 256 QAM, 3.5 GHz < -47 dB RMS, 802.11ax 160 MHz, 1024 QAM, 5.9 GHz
Crosstalk between TRX ports	< -100 dB
VSWR all RF ports	450 MHz to 700 MHz < 1.5 700 MHz to 2 GHz < 1.3 2 GHz to 6 GHz < 1.5

F8800ARF2: RF levels and linearity across 3 MHz to 6 GHz with 160 MHz BW signal. Typical values.

RF input level	+35 dBm, peak +15 dBm, peak below 100 MHz
RF output level	TRX port +5 dBm, peak TX port +15 dBm, peak
RF input/output resolution	0.1 dB
RF output gain setting range	TRX port +5…-100 dB TX port +15…-100 dB
RF output level accuracy	< ± 0.5 dB, at center frequency
Output noise floor (output level ≤ –40 dBm)	< -170 dBm/Hz < -160 dBm/Hz below 30 MHz
EVM	< -50 dB RMS, 5G NR 100 MHz, 256 QAM, 3.5 GHz < -50 dB RMS, 802.11ax 160 MHz, 1024 QAM, 5.9 GHz
Crosstalk between TRX ports	< -100 dB
VSWR all RF ports	3 MHz to 700 MHz < 1.8 700 MHz to 2 GHz < 1.3 2 GHz to 6 GHz < 1.5

RF Channel Unit Options for F8800A

F880ARF1 RF channel units

F880ARF2 RF channel units

Instrument Specifications

Remote control	ATE SCPI commands via Ethernet connection PROPSIM plugin for the Keysight Test Automation on PathWave (TAP)
Time base	Standard frequency reference 10MHz, nominal Maximum frequency drift ± 0.1ppm/2 years Warm-up time 30min
Synchronization	HW trigger port for emulation start/stop Synchronization ports for multiple PROPSIM hardware units
Other interfaces	10 MHz reference IN and OUT LAN 6x USB 2x Display port
Voltage and frequency F8800A-PW2 (support for 1...8 CUs) F8800A-PW1 (support for 1...6 CUs)	2 x 200 to 240 VAC, 50/60Hz 2 x 100 to 240 VAC, 50/60Hz
Power consumption F64-64 TRX F64-32 TRX F64-8 TRX	3600 W 2000 W 1200 W
Current consumption	2 x 15 A MAX
Dimensions (H x W x D)	615mm x 435mm x 610mm Fits into an 19-inch rack

For detailed product configuration items and product support services please contact your sales representative for required options and pricing.

Keysight 5G Solutions

Keysight's industry-first 5G end-to-end design and test solutions enable the mobile industry to accelerate 5G product design development from the physical layer to the application layer and across the entire workflow from simulation, design, and verification to manufacturing, deployment, and optimization.

Keysight offers common software and hardware platforms compliant to the latest 3GPP standards, enabling the ecosystem to quickly and accurately validate 5G chipsets, devices, base stations, and networks, as well as emulate subscriber behavior scenarios. Additional information about Keysight's 5G solutions is available at http://www.keysight.com/find/5G.

- For more information about PROPSIM Channel Emulation Solutions, visit http://www.keysight.com/find/propsim
- For more information on F8800A PROPSIM F64 Channel Emulator, visit http://www.keysight.com/find/propsim/f8800a
- For more information on PROPSIM Channel Emulator Platforms, visit http://www.keysight.com/find/propsimplatforms

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