

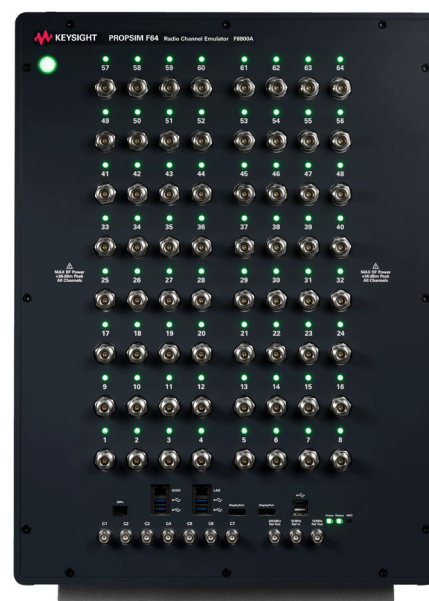
F8800A PROPSIM F64

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

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.



Take testing to the next level

Industry-leading mobile device, modem, and network equipment manufacturers use Keysight's PROPSIM F64 Radio Channel Emulator to develop and validate new technologies and features for

- Integrating and validating 5G Advanced product features.
- Develop antenna arrays, beamforming and massive MIMO applications requiring high number of coherent TRX ports.
- Aerospace and Airborne radios and Non-Terrestrial Networks (NTN). MANET/mesh radio systems.
- Verifying new hardware and software releases in a 24/7 automated test environment

The unique capabilities of PROPSIM F64 enable users to validate a wide range of RF and mmWave radio communication systems in the aerospace, avionics, satellite, and defense industries.

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 15 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 eight (8) channel unit slot frame	F8800ARF1 channel unit RF Ports : 8 RF In/Out ports N-female connectors F8800ARF2 channel units - RF Ports: 8 RF In/Out + 8 RF Out SMA-female connectors. Supported Channel Unit (CU) configurations in F8800A: - F8800ARF1 CU 1...8 pcs - or - F8800ARF2 CU 1...8 pcs
MIMO fading channels	Up to 2048 digital channels in single F8800A unit Flexible MIMO/mesh topologies uni- and bi-directional fading e.g., 2x2, 4x2, 4x4, 8x2, 8x4, 8x8, 16x8, 16x16. Note, the most complex fading channel combinations within available TRX ports, RFLOs and digital fading channels may not be supported due to too complex data routing requirement in base band. User must always check the fading channel configurations with PROPSIM emulator and standard tools software if complex fading channel configuration is supported or not.
MIMO and massive MIMO emulation	Single F8800A unit: Massive MIMO testing 32x16bi for complete base station MU-MIMO TM9 UE feedback and uplink SRS. based massive MIMO scheduler / beamformer testing. O-RAN Uplink Performance Improvement, ULPI. Massive MIMO testing 64x8bi with external F9510x Antenna Interface Unit. Two F8800A units: 64x4bi, 64x8bi, 64x16bi
MESH and MANET emulation	Up to 64 radios Up to 45 radios full mesh Note, the maximum number of radios depends on the bandwidth and channel model characteristics and may not be supported due to too complex data routing requirement in base band. User must always check the fading channel configurations with PROPSIM emulator and standard tools software if complex fading channel configuration is supported or not.
Frequency range	F8800ARF1: 450 MHz to 6 GHz - Opt-R30 450 - 3 000 MHz - Opt-R60 450 - 6 000 MHz F8800ARF2: 3 MHz to 6 GHz - Opt-R30 450 - 3 000 MHz - Opt-R60 450 - 6 000 MHz - Opt-R04 3 - 450 MHz (requires -R30 or -R60) (*) With M1742A: 10 GHz to 32 GHz (**) With M1740A: 24.25 GHz to 29.5 GHz, 37 GHz to 43.5 GHz (**) With M1749B: 24.5 to 53 GHz* (**) (*) 3 MHz is the RF range edge (*) F882SATxA operation supported above 140 MHz (**) Available for F8800ARF2 and Requires Opt.-R60
Connectivity Options	RF cabled connectivity Over the Air (OTA) chambers
Instantaneous signal BW EXT-BW operation is not specified below 450 MHz	Instantaneous signal bandwidth F8800A options - Opt-040 40 MHz, max. 64 TRX channels. - Opt-010 100 MHz, max. 64 TRX channels. - Opt-016 160 MHz, max. 64 TRX channels. Extended bandwidth options (*) - Opt-EX1 300 MHz, max. 32 TRX channels

	• Opt-EX2 450 MHz, max. 16 TRX channels • Opt-EX3 600 MHz, max. 16 TRX channels • Opt-EX4 900 MHz, max. 8 TRX channels • Opt-EX5 1200 MHz, max. 8 TRX channels (*) Extended BW operation is specified for frequencies above 450 MHz. (*) Extended BW use with F880SATxA requires external VNA for precise response correction
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
Fading paths per fading channel	Up to 48
Minimum delay	< 2 μ s, MIMO single Channel Unit topologies (@100/160 MHz BW)
Maximum delay	335 μs standard feature Options: • With -ED1 option 150 0ms, Aerospace emulation mode (*) • With -ED2 option 100 ms, terrestrial long delay option (*) (*) One digital channel per TRX channel supported when -ED1 or -ED2 option is active.
Doppler emulation	Up to $\pm$ 1.5 MHz, requires F880SATxA option
Test setup calibration	Integrated test setup amplitude and phase calibration. • Phase amplitude alignment with loop back connection (*) • Automated Response correction with external VNA instrument 3GPP NR and LTE DL signal-based input phase alignment (*) Available above 110MHz
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 Independent PathWave Signal Generation generated waveforms. Possibility to split/combine and add fading impairments to interference sources. Supports user defined and standard-based modulations, bursts, modulated pulses, chirps and many more.
Automatic input level setting	Continuous and RF burst modes
Uplink and downlink separation	Integrated uplink and downlink separation
User definable input/ output ports	User-defined active connector settings

Other interfaces	10 MHz reference IN and OUT HW trigger port for emulation start/stop Synchronization ports for multiple PROPSIM F64 units
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 Satellite and Aerospace Tools software includes • Aerospace model editor • Satellite paths with terrestrial multipath components 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 NTN Tool for satellite scenarios and 3GPP NTN models according 3GPP TR38.811 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)
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)
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
Frequency response flatness	± 0.5dB typical
RF output level accuracy	< ± 0.5 dB, at center frequency, typical
Output noise floor	< -170 dBm/Hz, (output level ≤ -40 dBm), typical
Residual EVM	< -46 dB RMS typical, 5G NR 100 MHz, 1024QAM, 3.5 GHz < -44 dB RMS typical, 802.11ax 160 MHz, 1024QAM, 5.815 GHz Note 1: Residual EVM is the EVM contribution added by the PROPSIM instrument to the input signal.

	Note 2: 802.11ax measurement settings: 16 data OFDM symbols, Phase tracking from pilots only, EQ training preamble only, Channel estimation filter Wiener (DS 0.001)
Crosstalk between TRX ports	< -100 dB
VSWR all RF ports	3 MHz to 700 MHz < 1.8, nominal 700 MHz to 2 GHz < 1.3, nominal 2 GHz to 6 GHz < 1.5, nominal

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

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, typical
Output noise floor	< -170 dBm/Hz, (output level ≤ -40 dBm), typical < -160 dBm/Hz below 30 MHz, (output level ≤ -40 dBm), typical
Residual EVM	< -48 dB RMS typical, 5G NR 100 MHz, 1024QAM, 3.5 GHz < -45 dB RMS typical, 802.11ax 160 MHz, 1024QAM, 5.815 GHz Note 1: Residual EVM is the EVM contribution added by the PROPSIM instrument to the input signal. Note 2: 802.11ax measurement settings: 16 data OFDM symbols, Phase tracking from pilots only, EQ training preamble only, Channel estimation filter Wiener (DS 0.001)
Crosstalk between TRX ports	< -100 dB, typical
VSWR all RF ports	3 MHz to 700 MHz < 1.8, nominal 700 MHz to 2 GHz < 1.3, nominal 2 GHz to 6 GHz < 1.5, nominal

Signal capture and signal playback (requires applicable configuration and options)

Signal capture (*)	Up to 32 simultaneous and phase coherent captures, with F8800A-ME1 option up to 64 captures. File formats: Keysight PathWave 89600 VSA, WaveJudge Wireless Analyzer software and open format. Maximum instantaneous signal BW 160MHz. Installation of Signal Capture option is performed in Keysight service center.
Capture triggering	Single trigger from GUI / SCPI / LVTTTL (BNC-port) User adjustable trigger delay +/-1000ms Emulation time based
Signal waveform playback (*)	Up to 32 simultaneous phase coherent sources, with F8800A-ME1 option up to 64 sources. Supports Keysight PathWave Signal Generation waveforms. Maximum instantaneous signal BW 160MHz. Installation of Signal Waveform playback option is performed in Keysight service center.
Playback triggering	Single trigger from GUI / SCPI / LVTTTL (BNC-port) User adjustable trigger delay 5us ... 1000ms
Playback and capture memory	1000ms (BW 100/160MHz MHz) per RF port.

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

RF Channel Unit Options for F8800A



F8800ARF1 RF channel units



F8800ARF2 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 $\pm 0.1\text{ppm}/2$ years Warm-up time 30min
Synchronization	HW trigger port for emulation start/stop. Synchronization ports for multiple PROPSIM hardware units UTC-time trigger to start the emulation synchronously with other instruments in the system using the same network time reference. Uses Network Time Protocol (NTP) for adjusting the system time. Corrected time is used in all timestamps across the system. UTC synchronization precision with a low stratum level NTP server is < 20ms (typical)
Other interfaces	10 MHz reference IN and OUT LAN 1Gbps 6x USB 2x Display port
Removable HDD option	Enables instrument declassification procedures in customer lab. Designed to meet requirements in DoD 5220.22-M, Chapter 8 Available for new PROPSIM F64 -ARF2 unit configurations
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 the 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 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 <https://www.keysight.com/product/F8800A/>
- For more information on PROPSIM Platforms, visit <https://www.keysight.com/us/en/products/channel-emulators/propsim-platforms.html>
- For more information about Keysight's PathWave, visit <http://www.keysight.com/find/pathwave>
- For more information on the M1740A mmWave transceiver, visit <http://www.keysight.com/find/m1740a>
- For more information on the M1742A Transceiver 10-32 GHz, visit [M1742A Transceiver](#)
- For more information on the M1749B Transceiver 24-53 GHz, visit <https://www.keysight.com/us/en/product/M1749B>



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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