

F8820A PROPSIM FS16

Radio channel emulator

Scalable RF Channel Emulator for Diverse Use Cases

The PROPSIM FS16 emulates – in real-time – dynamic radio channels in between transmitters and receivers. The channel emulator cost-effectively supports uni- and bidirectional fading test configurations required in wireless testing across 5G, 4G, aerospace, and defense applications. The solutions support configurations from 2 up to 256 fading channels in a single unit and up to 1024 fading channels in a multi-unit configuration.

Keysight's PROPSIM F64 RF channel emulator supports fading capacity needs that extend beyond these configurations. PROPSIM FS16, a compact and cost-effective choice for 5G NR MIMO and MIMO OTA fading testing in FR1 and FR2 frequency bands, integrates smoothly with Keysight's network emulation solutions and mmWave over-the-air test solutions.



Take testing to the next level

The PROPSIM FS16 offers high modularity with flexible uni- and bidirectional operation of each RF port for cost effective fading performance testing of:

- Devices and base stations supporting 5G LTE-A and legacy technologies
- WLAN 802.11ax access points and devices

The wide RF range – from 3 MHz up to 43.5 GHz – and ultrawide instantaneous signal bandwidth support enables users to implement realistic and repeatable lab-based testing for:

- Tactical MANET/Mesh radio systems
- Aerospace and 5G NTN satellite radio systems
- Mixed terrestrial, aerospace, and satellite radio systems

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 a single unit	<p>Software configurable by user, up to</p> <ul style="list-style-type: none"> • 16 bidirectional TRX ports or • 16 unidirectional TX and RX ports <p>SMA-female connectors at all ports</p> <p>Shipping 2 (F8820AC02), 4 (F8820AC04), 8 (F8820AC08), 12 (F8820AC12), 16 (F8820AC16) (T)RX+TX port configurations</p> <p>Bidirectional and unidirectional fading supported</p>
MIMO fading channels	<p>Up to 256 digital channels in single unit (16x16)</p> <p>Up to 1024 fading channels in multi-unit configuration (4)</p>
MIMO and massive MIMO emulation	<p>Arbitrary MIMO and multi-link topologies</p> <p>Single F8820A unit:</p> <ul style="list-style-type: none"> • MIMO testing up to 8x8bi or 16x16uni • MIMO OTA 2x16, 4x16 and 8x16 <p>Multiple F8820A units:</p> <ul style="list-style-type: none"> • Simplified Antenna Array Sampling Massive MIMO testing with external antenna interfacing unit or RF phase shifter matrix.
MESH and MANET emulation	Up to 16 radio full mesh (single F8820A unit)
Frequency range	<p>3 MHz to 6 GHz</p> <p>With E7770A: 6 GHz to 12 GHz or 7 GHz to 15 GHz</p> <p>With M1740A: 24.25 GHz to 29.5 GHz and 37 GHz to 43.5 GHz</p>
Connectivity Options	<p>RF cabled connectivity</p> <p>Over the Air (OTA) chambers</p>
Instantaneous signal BW	<p>40/100/160 MHz</p> <p>EXT-BW 300 MHz</p> <p>EXT-BW 450 MHz</p> <p>EXT-BW 600 MHz</p> <p>EXT-BW 900 MHz</p> <p>EXT-BW 1200 MHz</p>
EXT-BW operation is not specified below 450 MHz	
Carrier Aggregation support	<p>Contiguous up to 1200 MHz (TDD or FDD)</p> <p>Non-contiguous up to 8 CA bands</p>
Independent RF local oscillators in single F8820A	Up to 8
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 need to use external RF plumbing in typical lab setups
Fading paths per fading channel	Up to 48
Minimum delay	2.6 μ s
Maximum delay	1000 ms, requires F8820ACEA option
Doppler emulation	Up to \pm 1.5 MHz, requires F8820ACEA option

Capabilities and features with applicable configurations and options (continued)

Test setup calibration	Integrated test setup amplitude and phase calibration. No need for external VNA instrument NR and LTE DL signal-based input phase alignment
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 FS16 units
Signal Capture (*)	Up to 16 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. <ul style="list-style-type: none"> • Trigger from GUI / SCPI / LVTTTL (BNC port) • Emulation time based
Signal Waveform Playback (*)	Up to 16 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 <ul style="list-style-type: none"> • Trigger from GUI / SCPI / LVTTTL (BNC port) • Emulation time based
PROPSIM software and channel models	PROPSIM Standard Tools software includes <ul style="list-style-type: none"> • 3GPP 5G NR TDL channel models for FR1 and FR2 testing • LTE, WCDMA, GSM and Static Butler Channel Studio GCM Tool supports <ul style="list-style-type: none"> • 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) Aerospace Modeling Tool

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

Capabilities and features with applicable configurations and options (continued)

Fast fading profiles	<p>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</p> <p>Each digital channel can be set for independent fading profile (delay, doppler, amplitude, correlation)</p>
Pathloss/Shadowing	<p>PROPSIM Standard Tools software with a shadowing option:</p> <ul style="list-style-type: none"> • Each TRX channel independently, 100 dB dynamic range • Each digital fading channel independently, 60 dB dynamic range
Delay profiles	<p>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</p> <p>Each digital fading channel has independent delay setting</p>

RF Characteristics

F8820A: 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 < -155 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 < -43 dB RMS, 20 MHz, 64 QAM, 100 MHz
Crosstalk between TRX/TX 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 F8820A

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 ± 0.1 ppm/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	2 x 200 to 240 VAC, 50/60Hz
Power consumption FS16-8 TRX FS16-16 TRX	800 W 1200 W
Current consumption	1 x 15 A MAX
Dimensions (H x W x D)	290mm x 435mm x 600mm 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 www.keysight.com/find/5G.

- For more information about PROPSIM Channel Emulation Solutions, visit <http://www.keysight.com/find/propsim>
- For more information on F8820A PROPSIM FS16 Channel Emulator, visit <http://www.keysight.com/find/propsim/f8820a>
- For more information on PROPSIM Platforms, visit <http://www.keysight.com/find/propsimplatforms>

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