

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 53 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 FS16 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

<p>RF ports in a single unit</p>	<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>
<p>MIMO fading channels</p>	<p>Up to 256 digital channels in single unit (16x16) Up to 1024 fading channels in multi-unit configuration (4)</p> <p>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.</p>
<p>MIMO and massive MIMO emulation</p>	<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.
<p>MESH and MANET emulation</p>	<p>Up to 16 radio full mesh (single F8820A unit)</p> <p>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.</p>
<p>Frequency range</p>	<ul style="list-style-type: none"> • Opt-R30 450 - 3 000 MHz • Opt-R60 450 - 6 000 MHz • Opt-R04 3 - 450 MHz (requires -R30 or -R60) (*) <p>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* (***)</p> <p>(*) 3 MHz is the RF range edge (*) F882SATxA operation supported above 140 MHz (**) Requires Opt.-R60</p>
<p>Connectivity Options</p>	<p>RF cabled connectivity Over the Air (OTA) chambers</p>
<p>Instantaneous signal BW</p> <p>EXT-BW operation is not specified below 450 MHz</p>	<p>Instantaneous signal bandwidth F8820A options</p> <ul style="list-style-type: none"> • Opt-040 40 MHz, max. 16 TRX channels • Opt-010 100 MHz, max. 16 TRX channels • Opt-016 160 MHz, max. 16 TRX channels <p>Extended bandwidth options (*)</p> <ul style="list-style-type: none"> • Opt-EX1 300 MHz, max. 8 TRX channels • Opt-EX2 450 MHz, max. 4 TRX channels • Opt-EX3 600 MHz, max. 4 TRX channels • Opt-EX4 900 MHz, max. 2 TRX channels

	<ul style="list-style-type: none"> • Opt-EX5 1200 MHz, max. 2 TRX channels <p>(*) Extended BW operation is specified for frequencies above 450 MHz. (*) Extended BW use with F880SATxA requires external VNA for precise response correction</p>
Carrier Aggregation support	Contiguous up to 1200 MHz (TDD or FDD) Non-contiguous up to 8 CA bands
Independent RF local oscillators in single F8820A	Up to 8
Frequency conversion e.g. from band A to band B	Yes. Requires a minimum of 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 μ s standard feature Options: <ul style="list-style-type: none"> • With -ED1 option 1500 ms, Aerospace emulation mode (*) • With -ED2 option 100 ms, terrestrial long delay option (*) <p>(*) One digital channel per TRX channel supported when -ED1 or -ED2 option is active.</p>
Doppler emulation	Up to \pm 1.5 MHz, requires F880SATxA option
Test setup calibration	Integrated test setup amplitude and phase calibration. <ul style="list-style-type: none"> • 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	<p>CW Independent uncorrelated sources at each output port Adjustable frequency offset Absolute and SNR based level settings</p> <p>AWGN Independent uncorrelated sources at each output port User adjustable BW and frequency offset Absolute and SNR based level settings</p> <p>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.</p>
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 FS16 units

<p>PROPSIM software and channel models</p>	<p>PROPSIM Standard Tools software includes</p> <ul style="list-style-type: none"> • 3GPP 5G NR TDL channel models for FR1 and FR2 testing • LTE, WCDMA, GSM and Static Butler <p>Channel Studio GCM Tool supports</p> <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) <p>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</p> <p>High-Speed Train channel model pack (mobile network operator test plan)</p>
<p>Fast fading profiles</p>	<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>
<p>Pathloss/Shadowing</p>	<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
<p>Delay profiles</p>	<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

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/TX 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 16 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 16 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 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 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
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 a 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 F8820B PROPSIM FS16 Channel Emulator, visit <https://www.keysight.com/product/F8820B/>
- 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, visit <https://www.keysight.com/us/en/product/M1749B>

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