PROPSIM FS16

RF Channel Emulator F8820A

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, LTE and 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 (F8800A) 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.

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 satellite radio systems
- Mixed terrestrial, aerospace and satellite radio systems

Key capabilities and features

Capability/Feature	
RF ports in single unit	Software configurable by user, up to • 16 bidirectional TRX ports or • 16 unidirectional TX and RX ports SMA-female connectors at all ports
	Shipping 2, 4, 8, 12, 16 (T)RX+TX port configurations
	Bidirectional and unidirectional fading supported
MIMO fading channels	Up to 256 digital channels in single unit (16x16)
	Up to 1024 fading channels in multi-unit configuration (4)
MIMO and massive MIMO emulation	Arbitrary MIMO and multi-link topologies
	Single unit:
	• MIMO testing up to 8x8bi or 16x16uni
	• MIMO OTA 2x16, 4x16 and 8x16
	• Simplified Antenna Array Sampling Massive MIMO testing with external antenna interfacing unit or RF phase shifter matrix. BS 32TR/64TR/128TR with 4/8/16 layers
	Multiple unit
	• MIMO OTA 2x32, 4x32 and 8x32
	• Simplified bidirectional Antenna Array Sampling Massive MIMO testing with external antenna interfacing unit or RF phase shifter matrix. BS 32TR/64TR/128TR with 4/8/16 layers
	• Full Scale Antenna Array Sampling Massive MIMO testing up to 16x8bi or 16x16bi with two F8820A units, 32x8bi or 32x16bi with four F8820A units
	• Test cases covering MU-MIMO TM9 UE feedback and uplink SRS based massive MIMO scheduler/beamformer testing
MESH and MANET emulation	Up to 16 radio full mesh (single F8820A unit)
Frequency range	3 MHz to 6 GHz
	With E7770A: 6 GHz to 12 GHz
	With M1740A: 24.25 GHz to 29.5 GHz and 37 GHz to 43.5 GHz
Connectivity Options	RF cabled connectivity
	Over the Air (OTA) connectivity chambers
Instantaneous signal BW in single F8820A (EXT-BW operation is not specified below 450 MHz)	40/100/160 MHz. With F8820ACE1 40 MHz/125 MHz
	EXT-BW 300 MHz. With F8820ACE1 250 MHz
	EXT-BW 450 MHz. With F8820ACE1 375 MHz
	EXT-BW 600 MHz. With F8820ACE1 500 MHz
	EXT-BW 900 MHz. With F8820ACE1 750 MHz
	EXT-BW 1200 MHz. With F8820ACE1 1000 MHz
LTE/5G NR 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 minimum two RFLOs

Internal RF band combination into single RF port supported 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
Delay range	2.6 us…. > 1000 ms [1]
Delay Doppler emulation	Up to ± 1.5 MHz [1]
Test setup calibration	Integrated test setup amplitude and phase calibration
	No need for external VNA instrument
Programmable and synchronous Interference sources	CW and AWGN
	LTE[1] and NR[1] waveforms
IQ data recording	Simultaneous uplink and downlink IQ data capturing [1]
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
PROPSIM Software	PROPSIM Standard Tools software includes
	• 3GPP 5G NR TDL channel models for FR1 and FR2 testing
	• LTE, WCDMA, GSM and Static Butler
	PROPSIM GCM Tool supports
	• 3GPP TR38.901, TR36.873, WINNER and SCME
	• Ray-tracing data import
	• 3D Antenna pattern inclusion in to channel model
	• Custom test topology creation for massive MIMO, Device-to-Device (D2D), Vehicle-to-everything (V2X)
	• MIMO OTA channel models (CTIA/3GPP/CCSA). RTS MIMO OTA
	PROPSIM WLAN Tool software includes 802.11n/ac/ax channel models
	VDT Toolset for 5G NR, LTE, WCDMA, GSM and WLAN
	• RF field to lab test scenarios
	• Test Executive with test automation and reports
	High-Speed Train 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)
Pathloss/Shadowing	PROPSIM Standard Tools software with 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

1) Planned capability in future software release, may require additional option/license for operation.

RF Characteristics

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

Ordering Information

Product	Description
F8820ACxx	PROPSIM FS16 Hardware configurations and options
F8820xxxx	PROPSIM Standard Tools Software applications and options
F9860Axxx	Geometric Channel Modeling Tool and options
F9870Axxx	WLAN 802.11ax/ac software tool and options
F9340Axxx	Virtual Drive Testing Toolset (field-to-lab) and options
F9809A	MIMO OTA Test Model pack
F8820ACE1	Aerospace emulation option.
F9510A	Massive MIMO Antenna Interfacing Unit

For detailed product configuration items and product support services please contact your sales representative for 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 Keysight's PathWave, visit www.keysight.com/find/pathwave
- For more information on the M1740A mmWave transceiver, visit www.keysight.com/find/m1740a
- For more information on the E7770A CIU, visit www.keysight.com/find/e7770a

Keysight's 5G Network Emulation Solutions leverage the E7515B UXM 5G Wireless Test Platform (www.keysight.com/find/e7515b) and include:

- 5G Protocol R&D Toolset: www.keysight.com/find/5g-protocol
- 5G Protocol Conformance Toolset: www.keysight.com/find/5g-protocol-conformance
- 5G RF/RRM Conformance Toolset: www.keysight.com/find/5g-rf-conformance

Learn more at: www.keysight.com

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