

Keysight Technologies

Signal Studio for Real-time Fading

N7605C

Technical Overview

Path	Enabled	Fading Type	Spectral Shape	Delay Type	Delay	Loss	Vehicle Speed	Doppler Frequency
1	<input checked="" type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
2	<input checked="" type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
3	<input checked="" type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
4	<input checked="" type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
5	<input checked="" type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
6	<input checked="" type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
7	<input checked="" type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
8	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
9	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
10	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
11	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
12	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
13	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
14	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
15	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
16	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
17	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
18	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
19	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
20	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
21	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
22	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz
23	<input type="checkbox"/>	Rayleigh	Classical 5dB	Fixed	0.0000 us	0.00 dB	0.00 km/h	0.000 Hz



- Apply real-time fading on signals for receiver test and access flexible configurations for all fading parameters
- Select from different fading types, including Rayleigh, Rician, Suzuki, log normal, pure Doppler, and constant phase to simulate different propagation environments
- Use pre-configured setups for many communication standards including LTE, WLAN, W-CDMA, cdma2000®
- Add AWGN (Option 403 on N5172B EXG/N5182B MXG X-Series signal generators) with calibrated S/N to the signals
- Accelerate the signal creation process with a user interface based on parameterized signal configuration and tree-style navigation

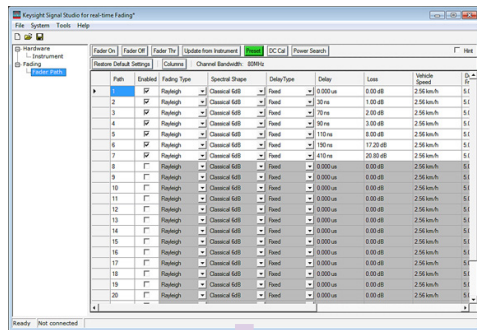
Introduction

A fading channel emulator allows engineers to comprehensively evaluate wireless communication systems by predicting their performance in response to real-world conditions. Signal Studio for real-time fading software (N7605C) paired with an EXG (N5172B) or MXG (N5182B) vector signal generator provides a comprehensive diagnostic toolset for designing and verifying wireless signal processing devices. This solution applies real-time fading to a baseband signal in a single general-purpose signal generator.

Receiver test in dynamic environments for early R&D and performance verification

N7605C Signal Studio for real-time fading software is a powerful tool for verifying your cellular communications, WLAN, digital video/audio, or satellite/military communication receiver designs. Use this software to fade your digital baseband signals and apply AWGN, and to convert the faded and noisy signals to RF frequencies in the N5172B EXG/N5182B MXG vector signal generator. Pre-configured fading profiles simplify initial setup, or you can choose user-defined fading profiles to meet your specific test needs.

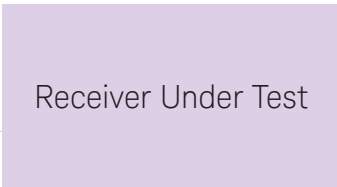
- Conformance test under fading conditions of receivers, during RF/baseband integration and system verification
- Verifications of the baseband subsystems, in the process of chip design and integrated circuit development.



N7605C Signal Studio for Real-time Fading running in a PC



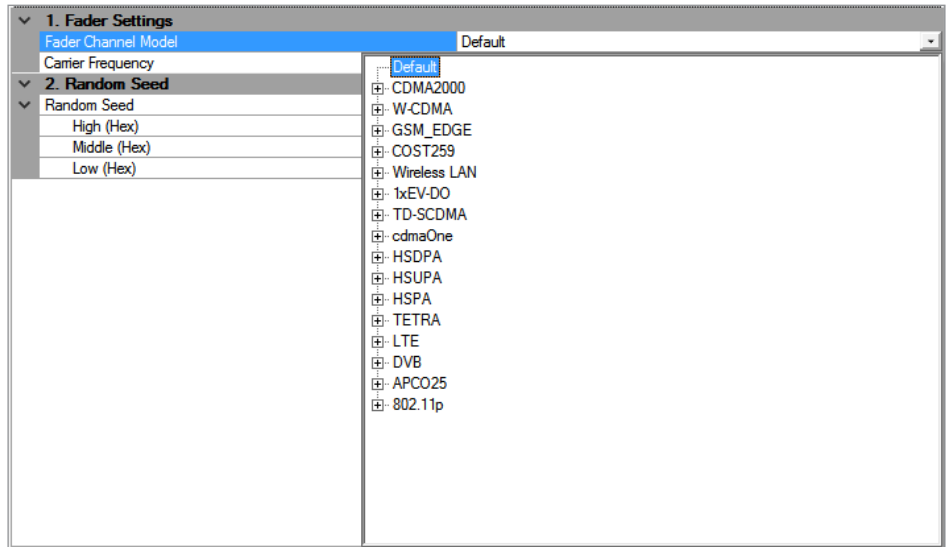
N5172B EXG/N5182B MXG



Receiver Under Test

Predefined fading profile setups

Predefined setups for common wireless and digital video formats are included with the software to simplify test preparation. You can modify these standard profiles to provide custom configurations for simulating specific environments.



Add AWGN with ease and accuracy

Add noise on the faded signals easily on the N7605C. You can set the signal-to-noise ratio, carrier bandwidth, noise bandwidth and many other parameters on the user interface of the software.

3. Real-time AWGN Setup	
Real-time AWGN	Off
Power Control	Total
Carrier to Noise Ratio Format	C/N
Eb/No	0.00 dB
Carrier to Noise Ratio	0.00 dB
Carrier Power	0.00 dBm
Total Noise Power	0.00 dBm
Channel Noise Power	0.00 dBm
Carrier Bandwidth	1 Hz
Noise Bandwidth	1 Hz
Carrier Bit Rate	1 bit/s
MUX	Sum

Key Specifications

Simulate real-world conditions to test multi-format receivers more quickly and validate design robustness earlier in the development cycle with the EXG/MXG signal generator.

Number of faders	1
Paths per fader	6 paths @ 160 MHz 12 paths @ 80 MHz 24 paths @ 40 MHz
Power accuracy	See N5182B MXG/N5172B EXG data sheet for performance details.
Predefined channel models	W-CDMA, HSDPA, HSUPA, COST 259, TD-SCDMA, cdma2000®, cdmaOne, 1xEV-DO, GSM, EDGE, WLAN, TETRA, 802.16 OFDM, 802.16 OFDMA, LTE (includes high speed train), MBRAI models for DVB-T and DVB-H
Random seed	89 bits
Fading types	Pure Doppler, Rayleigh, Rician, Suzuki, log normal
Spectral shape	Classical 3 dB, classical 6 dB, flat, rounded, Jakes classical, Jakes rounded, Gaussian, Half Bathtub, Jakes Half Bathtub
Rayleigh distribution	0.5 dB from -30 to + 10 dB of mean power level deviation from CDF, filtered noise
Rician	
Power ratio (k) range	-84 dB to 84 dB
LOS AoA	0 to 180°
Path delay	0 to 2.5 ms
Resolution	0.1 ns
Phase shift	0 to 360°
Resolution	0.01°
Path loss	0 to 84 dB
Resolution	0.01 dB
Vehicle speed ¹	0 to 864 km/h @ 2 GHz
Resolution	0.01 km/h
Doppler frequency ¹	0 Hz to 1.6 kHz
Resolution	0.001 Hz
Angle of arrival (AoA)	-360 to 360°
Resolution	0.01°
Angle of departure (AoD)	-360 to 360°
Resolution	0.01°
AoA Azimuth spread	0.01 to 180°
Resolution	0.01°
AoD Azimuth spread	0.01 to 180°
Resolution	0.01°
Log normal	
Standard deviation	0 to 12 dB
Decorrelation length	1 m to 1 km

1. Doppler frequency of vehicle speed is coupled to the carrier frequency setting.

Ordering Information

Software licensing and configuration

Signal Studio offers flexible licensing options, including:

- **Node-locked:** Allows you to use the license on one specified instrument/computer.
- **Transportable:** Allows you to use the license on one instrument/computer at a time. This license may be transferred to another instrument/computer using Keysight's online tool.
- **Floating:** Allows you to access the license on networked instruments/computers from a server, one at a time. For concurrent access, multiple licenses may be purchased.
- **Time-based:** License is time limited to a defined period, such as 12-months.

N7605C Signal Studio for Real-time Fading

Waveform playback licenses (N7605EMBC)

Software	Support Contract	Description
N7605EMBC-1FP	R-Y5B-001-A ²	Node-locked perpetual license
N7605EMBC-1FL	R-Y4B-001-L ¹	Node-locked 12-month license
N7605EMBC-1TP	R-Y5B-004-D ²	Transportable perpetual license
N7605EMBC-1TL	R-Y4B-004-L ¹	Transportable 12-month license

Software support subscription for perpetual licenses ³

Support Contract	Description
R-Y6B-001-L	12-months of support for node-locked licenses
R-Y6B-004-L	12-months of support for transportable licenses
R-Y6B-501	1-month of support for node-locked licenses (extension after 1 st year)
R-Y6B-504	1-month of support for transportable licenses (extension after 1 st year)

1. All time-based software licenses include a 12-month support contract.
2. Support contracts must be purchased for all perpetual licenses in the first year. All software upgrades and KeysightCare support are provided for software licenses with valid support contracts.
3. After the first year, support contracts for all perpetual licenses may be extended with annual and monthly support extensions.

Try Before You Buy!

Free 30-day trials of Signal Studio software provide unrestricted use of the features and functions, including signal generation, with your compatible platform. Redeem a trial license online at

www.keysight.com/find/SignalStudio_trial

Hardware configurations

To learn more about compatible hardware and required configurations, please visit: www.keysight.com/find/SignalStudio_platforms

PC requirements

A PC is required to run Signal Studio. www.keysight.com/find/SignalStudio_pc

Model numbers & options

To learn more about Signal Studio licensing, model numbers and options, please visit: www.keysight.com/find/signalstudio_model

Websites

www.keysight.com/find/SignalStudio

www.keysight.com/find/N7605C

Comprehensive Online Documentation

www.keysight.com/find/signalstudio_support

Signal Studio and Signal Creation Software

www.keysight.com/find/signalstudio_software

Literature

Signal Studio Software, Brochure, literature number **5989-6448EN**

EXG X-Series Signal Generator, Data Sheet, literature number **5991-0039EN**

MXG X-Series Signal Generator, Data Sheet, literature number **5991-0038EN**

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