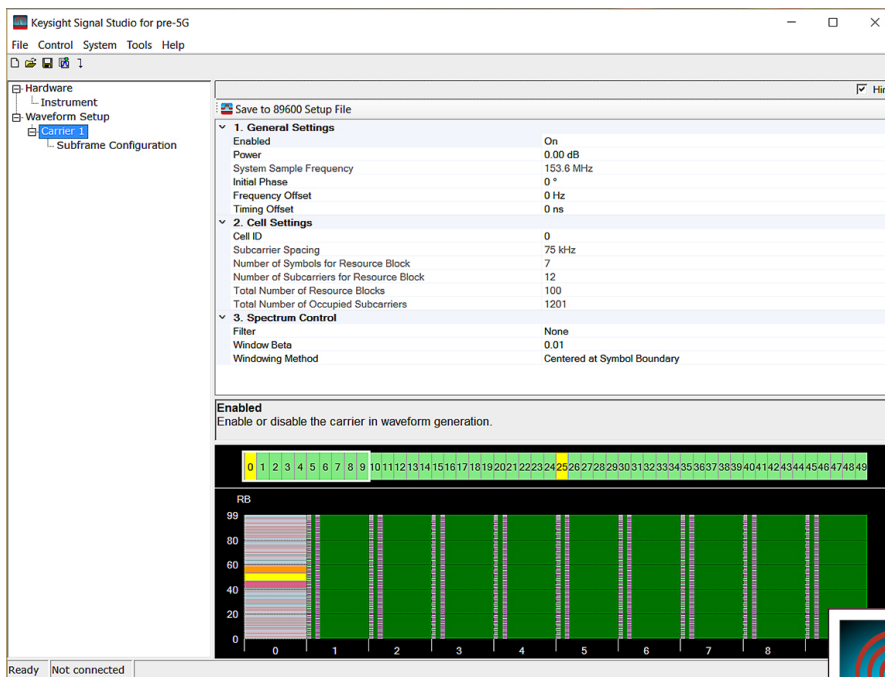# Keysight Technologies
Signal Studio Pro for Pre-5G
N7630C

Technical Overview

- Generate Verizon Pre-5G (5GTF) standard-compliant signals for testing base stations, mobile terminal transmitters and receivers with channel coding and multi-antenna port support
- Support single-carrier and multi-carrier (up to 8 carriers)
- Export to 89600 VSA setup file or to a custom OFDM X-Series measurement application setup file for custom OFDM modulation analysis or Pre-5G modulation analysis
- Download and playback Pre-5G signal waveforms with a signal generator

KEYSIGHT
TECHNOLOGIES

Simplify Custom Signal Creation

Keysight Technologies, Inc. Signal Studio Pro for Pre-5G software is a flexible signal creation tool that will reduce the time you spend on signal simulation. Quickly and easily generate Verizon Pre-5G signals for component, transmitter, and receiver test.

Two types of licenses are available: 1) A PC based license for waveform creation and download to a supported signal generators (N7630APPC), 2) An instrument embedded license only for waveform offline playback (N7630EMBC).

Component and transmitter test

Signal Studio uses waveform playback mode to create and customize waveform files needed to test components and transmitters. Its user-friendly interface lets you configure signal parameters, calculate the resulting waveforms, and download files for playback. The applications for these test signals include parametric test of components such as amplifiers and filters, and performance characterization and verification of RF sub-systems.

Receiver test

Signal Studio enables you to create signals for receiver Block Error Rate (BER) for early testing of receiver hardware.

Apply your signals in real-world testing

Once you set up your signals in Signal Studio Pro, you can download them to a variety of Keysight instruments. This offers flexibility in generating signals at various carrier frequencies with different bandwidths for multiple applications. Signal Studio Pro software provides a cost-effective way to tailor your test equipment to your measurement needs in design and development.

– Vector signal generators
  – X-Series: N5182B MXG
  – M9383A PXIe Microwave Signal Generator (1 MHz to 44 GHz)
  – M9381A PXIe VSG (1 MHz to 6 GHz)
  – M9420A/M9421A PXIe VXT (1 MHz to 6 GHz)
– Arbitrary waveform generator (AWG)
  – M8190A AWG DUC mode
  – M8190A AWG and E8267D PSG

Typical Measurements

Test components and transmitters:
  – CCDF
  – EVM
  – Channel power
  – Occupied bandwidth
  – Spectrum

Test receivers:
  – Component test along receiver chain
  – Receiver sensitivity
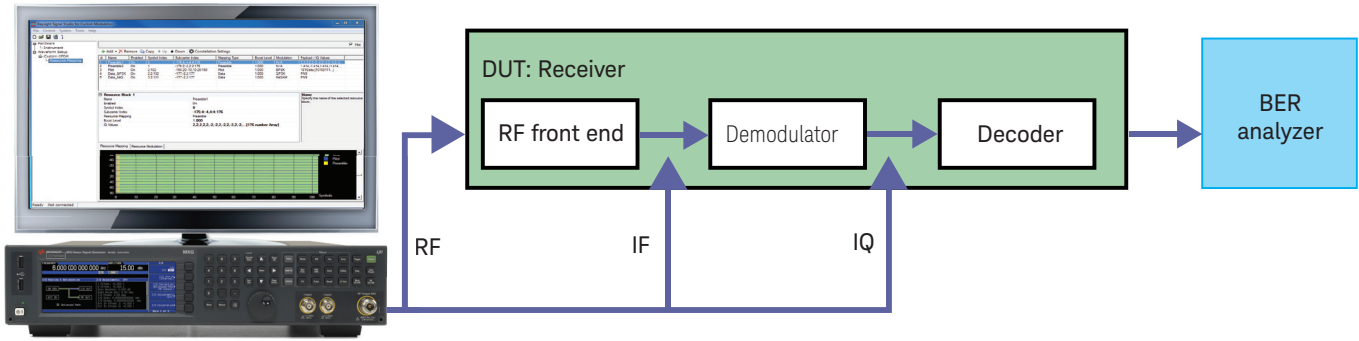 – BER

Component and Transmitter Test

Figure 1. Typical component test configuration using Signal Studio with an X-Series signal generator and analyzer.

N7630C Signal Studio Pro for Pre-5G enables you to generate Verizon Pre-5G (5GTF) signals to characterize the power and modulation performance of your components and transmitters. Easily manipulate a variety of signal parameters to simplify signal creation.

 – Create spectrally-correct signals for channel power, spectral mask, and spurious testing
 – View CCDF, spectrum, time domain, and power envelope graphs to investigate the effects of power ramps, modulation formats, power changes, clipping, and other effects on device performance
 – Save 89600 VSA custom OFDM modulation analysis (Opt. BHF) or Pre-5G modulation analysis (Opt. BHN) setup files for EVM testing with Keysight signal analyzers or oscilloscopes hardware
 – Save X-Series measurement application (N9054EM1E) custom OFDM setup files for EVM testing with Keysight N90x0B X-Series signal analyzers

www.keysight.com/find/n7630c

Receiver Test

Note: Payload data should be coded bits

Figure 2. Generate receiver test signals for early testing of your receiver with Keysight X-Series signal generators and Signal Studio.

Signal Studio for Pre-5G can be used to generate Verizon Pre-5G (5GTF) signals for early testing of receiver system and component hardware. Evaluate receiver performance at various stages of the receiver chain (RF, IF, and IQ) with Keysight's 89600 VSA software, or X-Series measurement applications and signal analyzers and/or oscilloscopes.

Early testing of receiver hardware

– Generate Verizon Pre-5G (5GTF) standard-compliant signals for receiver testing with channel coding and multi-antenna port support
– Supports uplink and downlink configuration with flexible sub-frame allocations
– Supports multi-user channel generation with xPUSCH and xPDSCH
– Supports single-carrier and multi-carriers (preset for 8 carriers)
– Customize data: PN9, PN15, custom bit pattern, or user-defined file with coded bits for BER testing
– Save 89600 VSA custom OFDM modulation analysis (Opt. BHF) or Pre-5G modulation analysis (Opt. BHN) setup files for EVM testing with Keysight signal analyzers or oscilloscopes at RF, IF, and IQ
– Save X-Series measurement application (N9054EM1E) custom OFDM setup files for EVM testing with Keysight N90x0B X-Series signal analyzers at RF, IF or IQ
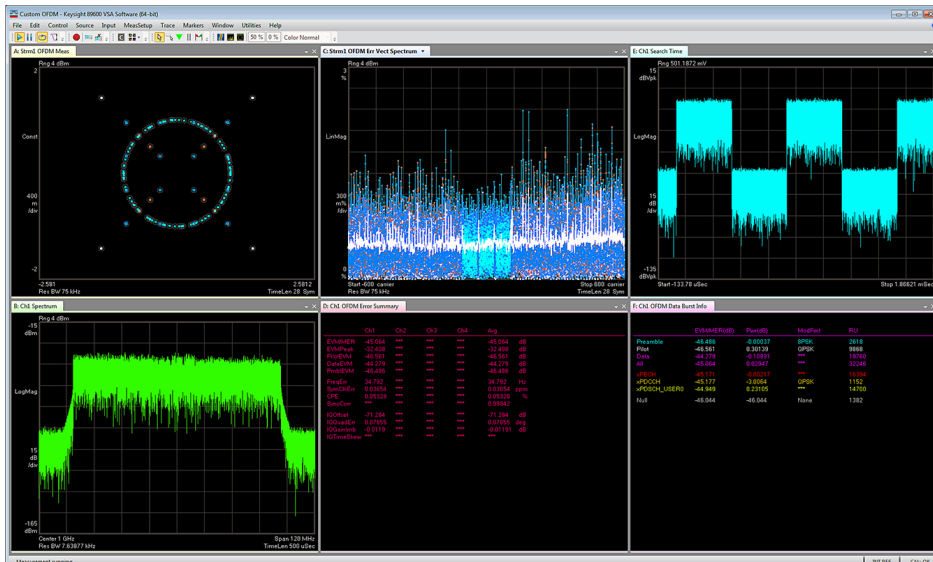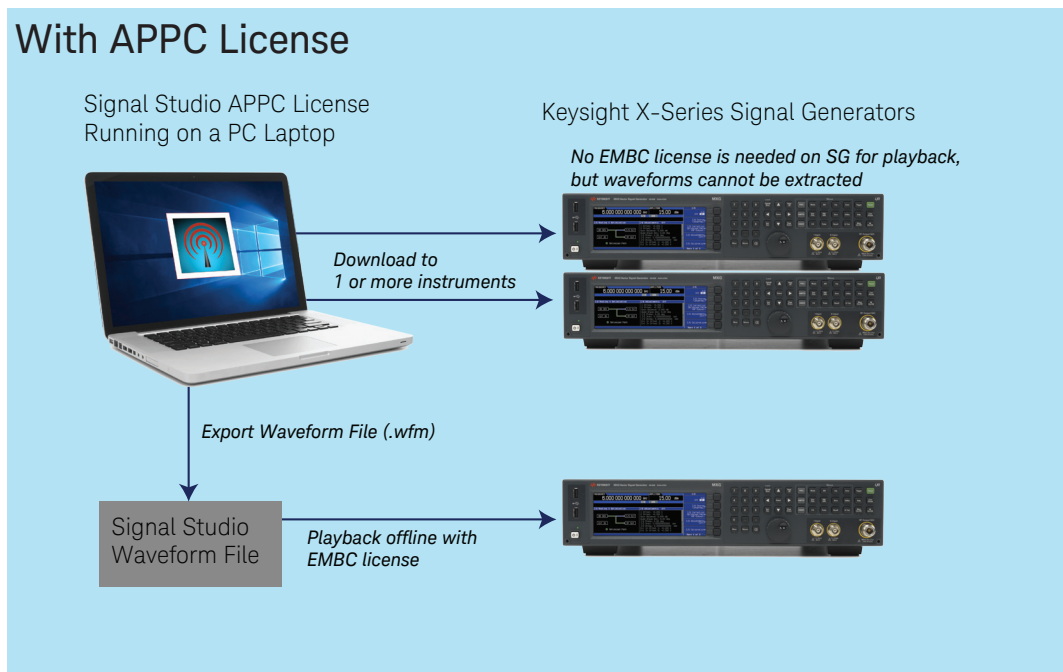

Figure 3. Pre-5G single carrier measurement with 89601B-BHF
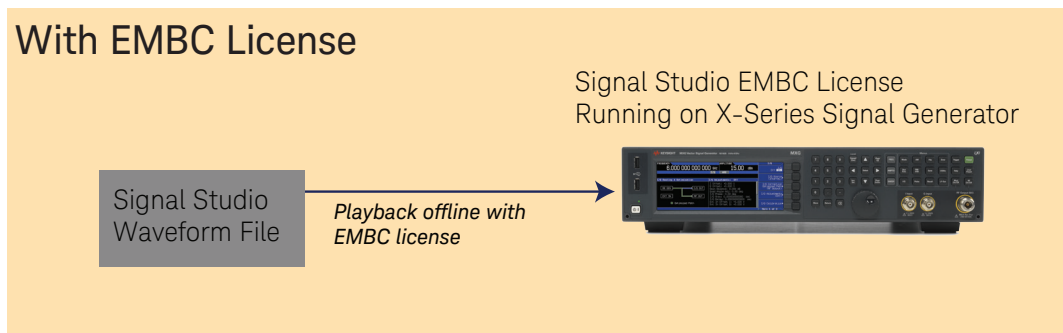
Signal Studio Pro Licensing

Signal Studio Pro for Pre-5G supports two types of licenses: a PC-based license (N7630APPC) and a waveform playback license (N7630EMBC).

- **N7630APPC** is PC based license which enables you to use Signal Studio Pro for Pre-5G software to generate, export and make a live connection to download Pre-5G signal waveforms into the signal generator without the embedded N7630EMBC license. N7630APPC is recommended for R&D teams.
- Without N7630APPC, you can still use the N7630C software to generate and export waveforms but you will not have a live connection to the signal generator for downloading.
- **N7630EMBC** is an embedded license that runs on a signal generator, which enables you to playback Pre-5G signal waveforms with Keysight signal generators or AWGs offline, without a live connection. N7630EMBC is recommended for manufacturing teams or for pre-generated waveforms.
- **N7630APPC** is available in the following license types: node-locked, transportable, floating or USB portable, each with perpetual or time-based flexible license terms.
- **N7630EMBC** is available in the following license types: node-locked, or transportable, each with perpetual or time-based flexible license terms.

With APPC License

Signal Studio APPC License
Running on a PC Laptop

Keysight X-Series Signal Generators

No EMBC license is needed on SG for playback, but waveforms cannot be extracted

*Download to
1 or more instruments*

Export Waveform File (.wfm)

Signal Studio
Waveform File

*Playback offline with
EMBC license*

With EMBC License

Signal Studio EMBC License
Running on X-Series Signal Generator

Signal Studio
Waveform File

*Playback offline with
EMBC license*

Features Summary

Signal Studio for Pre-5G allows you to create Verizon Pre-5G fully standard-compliant signals or BTS or UE testing. Two types of licenses are available: a PC-based license (N7630APPC) and a waveform playback license (N7630EMBC).

Capabilities	N7630APPC	N7630EMBC
Downlink channels: xPDSCH, xPDCCH, xPBCH, ePBCH	●	●
Downlink signals: CSI-RS, BRS, BRRS, PSS, SSS, ESS	●	●
Uplink channels: xPUSCH, xPUCCH, xPRACH	●	●
Uplink signals: SRS	●	●
Multi-user xPUSCH and xPDSCH	●	●
LDPC channel coding for DL-SCH, UL-SCH	●	●
TBCC coding for xBCH, DCI and UCI	●	●
DCI auto generation with xPDSCH/xPUSCH schedule information	●	●
Uplink and downlink configuration with flexible subframe allocations	●	●
Multi-antenna transmission support (Tx diversity and spatial multiplexing)	●	●
Support both single carrier and multi-carrier (preset for 8 carrier configuration)	●	●
Inject CRC error to random sub-frame	●	●
Power boosting on all physical channels and signals	●	●
256QAM on xPDSCH	●	●
Graphical display for frame resource allocation	●	●
Export VSA custom OFDM setup file for demodulation analysis[1]	●	●
Export VSA Pre-5G modulation analysis setup file for demodulation analysis[1]	●	●
Export X-Series measurement application vector modulation analysis custom OFDM setup file	●	●
Export waveform files (encrypted Signal Studio waveform file)	●	●
Offline waveform file playback	●[2]	●
Download waveforms into the supported signal generators	●	

1. To demodulate Pre-5G signals, you may recall the exported setup file with 89600 VSA software. This requires a 89601B-BHF Custom OFDM Modulation Analysis license or 89601B-BHN Pre-5G Modulation Analysis license.
2. If the N7630APPC license is installed on a PXIe or AXIe PC controller, it can enable offline waveform playback.

Supported Standards

Specification	Name	Version	Date
TS V5G.211	Physical channels and modulation	V1.7	2016-10
TS V5G.212	Multiplexing and channel coding	V1.5	2016-09
TS V5G.213	Physical layer procedures	V1.4	2016-10
TS V5G.201	Physical layer general description	V1.0	2016-06

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.
- **USB portable:** Allows you to move the license from one instrument/computer to another by end-user only with certified USB dongle, purchased separately.
- **Time-based:** License is time limited to a defined period, such as 12-months.

N7630C Signal Studio Pro for Pre-5G

PC application licenses (N7630APPC)

Software	Support Contract	Description
N7630APPC-1FP	R-Y5B-001-A[2]	Node-locked perpetual license
N7630APPC-1FL	R-Y4B-001-L[1]	Node-locked 12-month license
N7630APPC-1TP	R-Y5B-004-D[2]	Transportable perpetual license
N7630APPC-1TL	R-Y4B-004-L[1]	Transportable 12-month license
N7630APPC-1NP	R-Y5B-002-B[2]	Floating perpetual license
N7630APPC-1NL	R-Y4B-002-L[1]	Floating 12-month license
N7630APPC-1UP	R-Y5B-005-E[2]	USB portable perpetual
N7630APPC-1UL	R-Y4B-005-L[1]	USB portable 12-month license

Waveform playback licenses (N7630EMBC)

Software	Support Contract	Description
N7630EMBC-1FP	R-Y5B-001-A[2]	Node-locked perpetual license
N7630EMBC-1FL	R-Y4B-001-L[1]	Node-locked 12-month license
N7630EMBC-1TP	R-Y5B-004-D[2]	Transportable perpetual license
N7630EMBC-1TL	R-Y4B-004-L[1]	Transportable 12-month license

Extensions to support contracts for perpetual licenses[3]

Support Contract	Description
R-Y6B-001-L	12-months of support for node-locked licenses
R-Y6B-002-L	12-months of support for floating licenses
R-Y6B-004-L	12-months of support for transportable licenses
R-Y6B-005-L	12-months of support for USB portable licenses
R-Y6B-501	1-month of support for node-locked licenses
R-Y6B-502	1-month of support for floating licenses
R-Y6B-504	1-month of support for transportable licenses
R-Y6B-505	1-month of support for USB portable licenses

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/Signal Studio_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

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.

Websites

www.keysight.com/find/signalstudio

Signal Studio for Pre-5G

www.keysight.com/find/n7630c
www.keysight.com/find/N7630APPC
www.keysight.com/find/N7630EMBC

Comprehensive Online Documentation

www.keysight.com/find/signalstudio_support

Signal Studio and Signal Creation Software

www.keysight.com/find/signalstudio_software

5G Test Solutions, Application Notes and Videos

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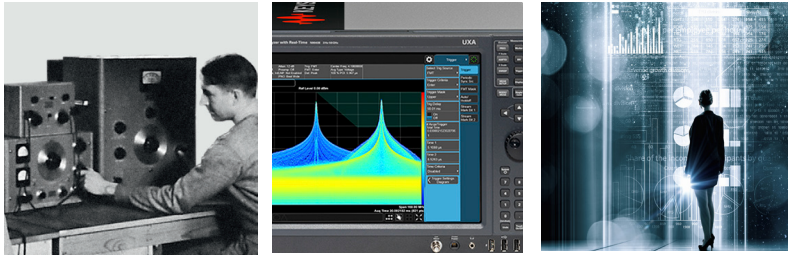www.keysight.com/find/Pre5G

Literature

Signal Studio Software, Brochure, 5989-6448EN

89600 VSA Software Custom OFDM Modulation Analysis, Technical Overview, 5990-6625EN

89600 VSA Software Pre-5G Modulation Analysis, Technical Overview, 5992-2383EN

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