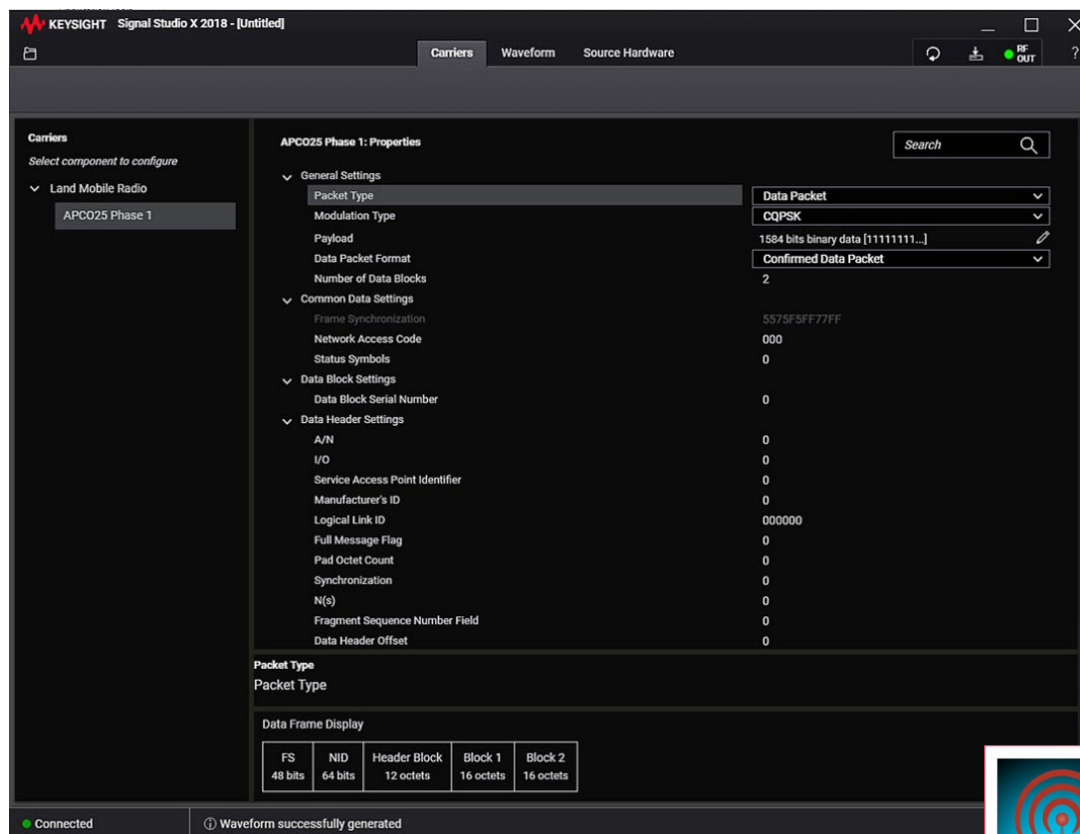# Signal Studio X for Land Mobile Radio (LMR) Test

N7640CN

- Generate standard-compliant LMR APCO25 Phase 1 signals for testing user equipment or fixed station with channel coding and pre-defined test pattern generation
- Download and playback LMR signal waveforms with Keysight supported signal generators
- Easily setup tests with powerful and intuitive graphical user interface built with HTML5 and JavaScript
- Supports Red Hat Enterprise Linux, Microsoft Windows 7 and 10

KEYSIGHT

Simplify Custom Signal Creation

Signal Studio X provides a major step forward over our popular Signal Studio software series. With an updated, modern GUI built with HTML5 and JavaScript, it supports Red Hat Enterprise Linux, as well as Windows 7 and 10.

Signal Studio X for Land Mobile Radio (LMR) test software is a flexible signal creation tool that will reduce the time you spend on signal simulation. Quickly and easily generate LMR signals for component, transmitter, and receiver test.

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, 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 software provides a cost-effective way to tailor your test equipment to your measurement needs.

- X-Series Signal Generators: N5182A/B MXG, N5172B EXG
- ESG Vector Signal Generator: E4438C

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.

N7640C Signal Studio X enables you to generate LMR APCO25 Phase 1 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
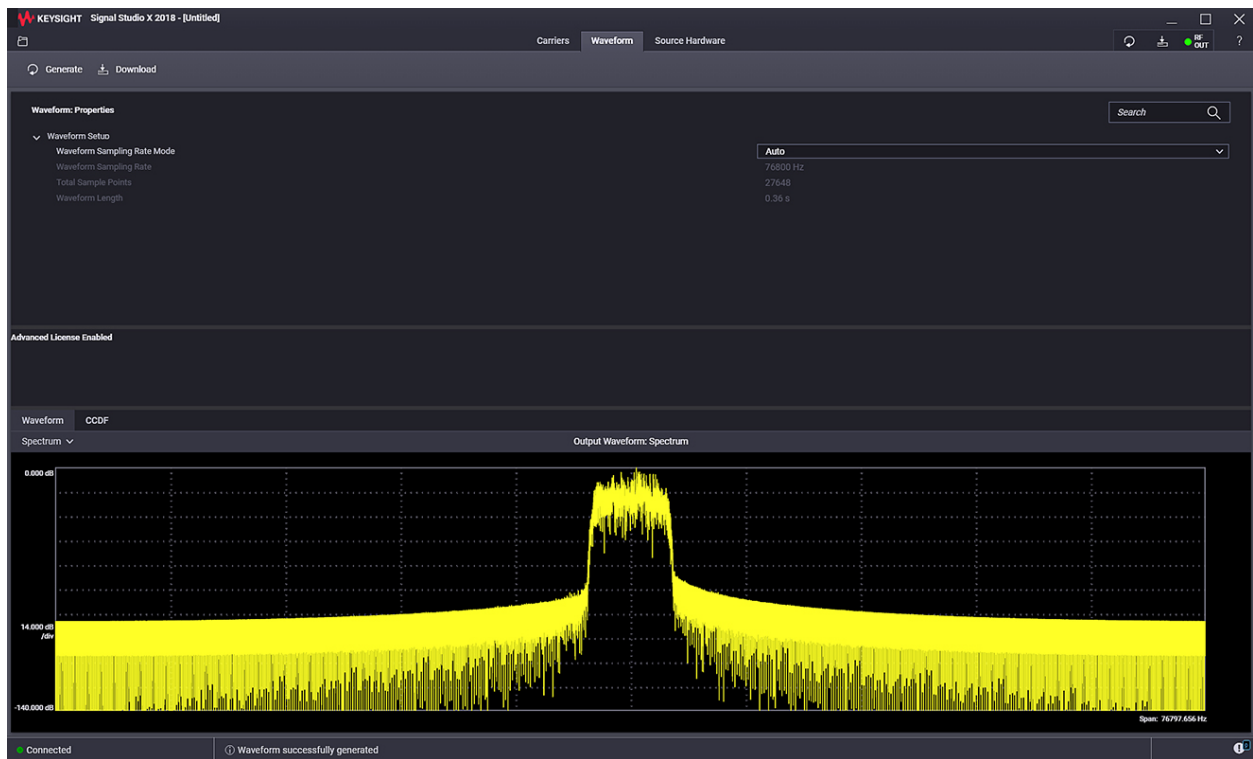
Figure 2. LMR APCO 25 output waveform spectrum view

Receiver Test

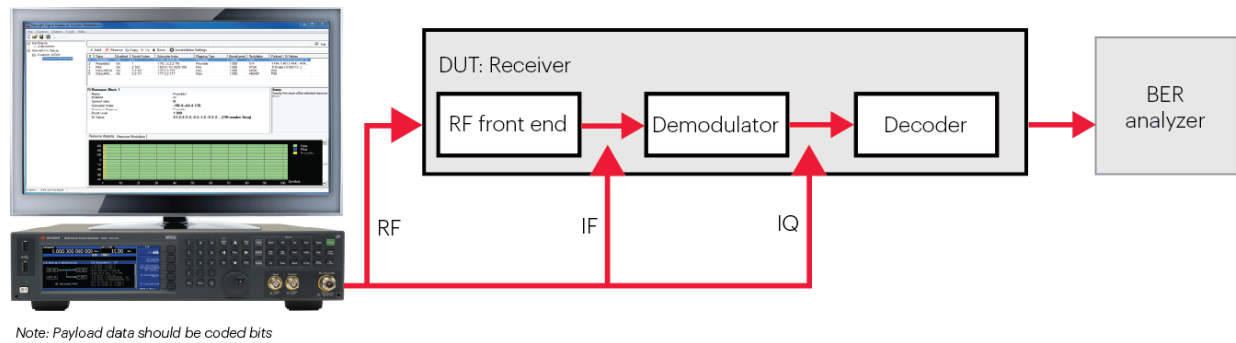Note: Payload data should be coded bits

Figure 3. Generate receiver test signals for early testing of your receiver with Keysight X-Series signal generators and Signal Studio.

Signal Studio X for LMR Test can be used to generate radio test signals for early receiver testing of user equipment or fixed station hardware. You can also evaluate receiver performance at various stages of the receiver chain (RF, IF, and IQ) with Keysight's 89600 VSA or X-apps measurement application software and signal analyzers and/or oscilloscopes.

Easily testing of receiver hardware

- Generate LMR APCO25 Phase 1 standard-compliant signals for receivers testing with channel coding and pre-defined test pattern
- User definable header ID and voice or data packet payload with full channel coding support
- Specify the modulation type as C4FM, COQPSK, LSM or WCQPSK
- Provide some predefined test pattern as Tone 1011 Hz, Silence, Busy, Interference, Idle, Calibration etc.
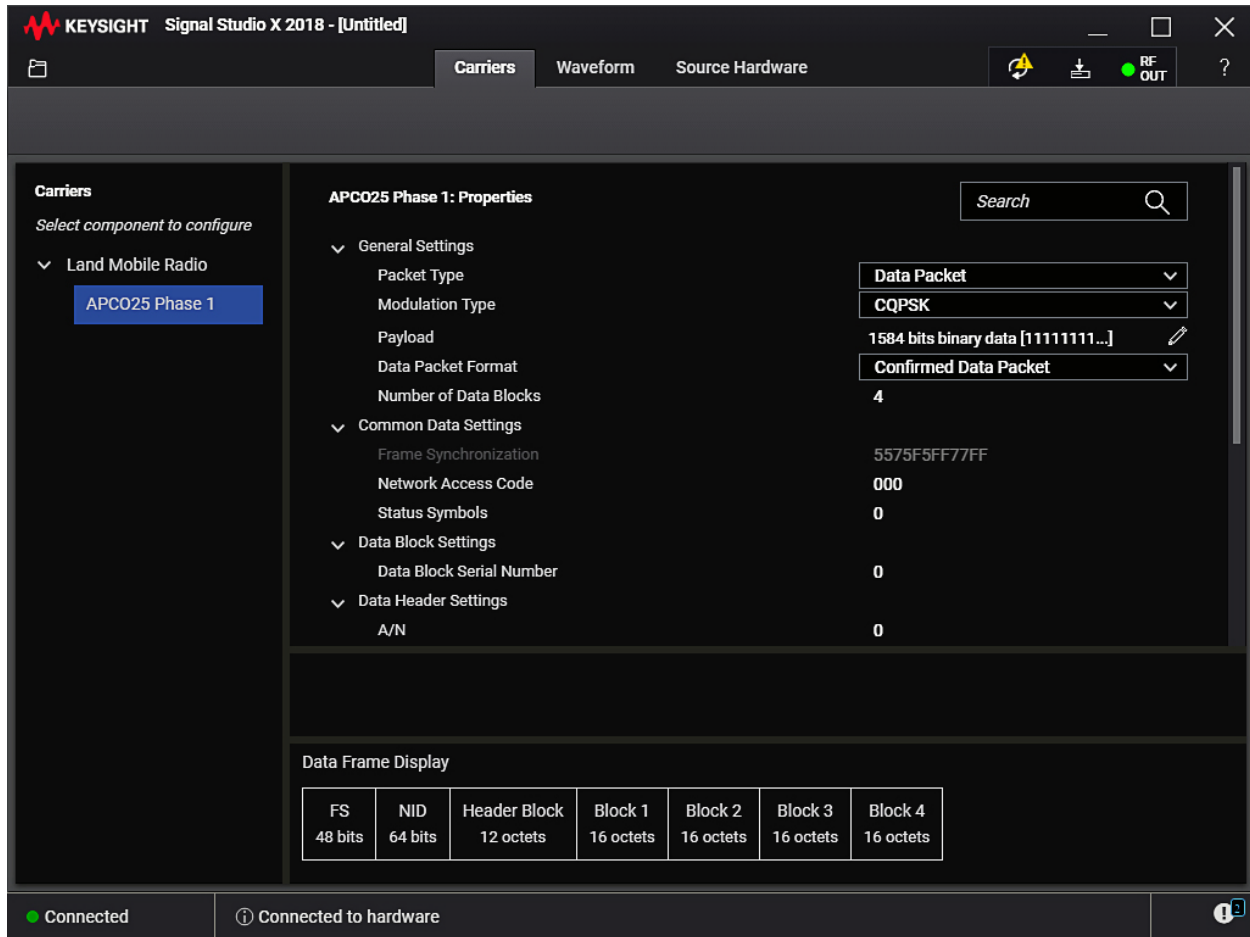
Figure 4. LMR signal with user defined header configuration example

Signal Studio X Licensing

Signal Studio X for Land Mobile Radio (LMR) supports two types of licenses: a PC-based license (N7640APPC) and a waveform playback license (N7640EMBC).
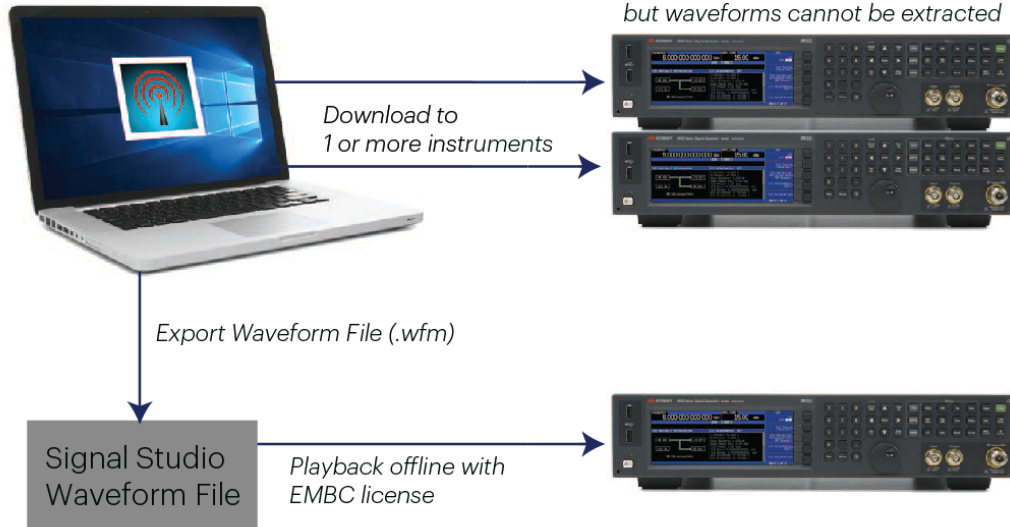
- **N7640APPC** is PC based license which enables you to use Signal Studio X for LMR software to generate, export and make a live connection to download LMR signal waveforms into the signal generator without the embedded N7640EMBC license. N7640APPC is recommended for R&D teams.

- Without N7640APPC, you can still use the N7640C software to generate and export waveforms but you will not have a live connection to the signal generator for downloading.

- **N7640EMBC** is an embedded license that runs on a signal generator, which enables you to playback LMR signal waveforms with Keysight signal generators offline, without a live connection. N7640EMBC is recommended for manufacturing teams or for pre-generated waveforms.

- **N7640APPC** is available in the following license types: node-locked, transportable, floating or USB portable, each with perpetual or time-based flexible license terms.

- **N7640EMBC** 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

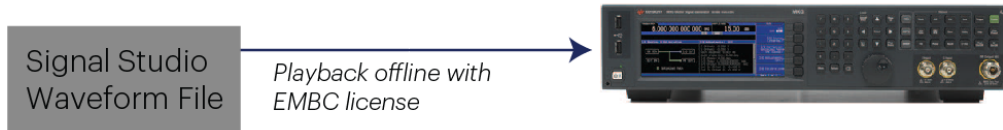Keysight X-Series Signal Generators

*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 LMR Test allows you to create APCO25 Phase 1 fully standard-compliant signals for component, transmitter or receiver testing. Two types of licenses are available: a PC-based license (N7640APPC) and a waveform playback license (N7640EMBC).

Capabilities	N7640APPC	N7640EMBC
GUI features HTML5 and Java script based on Keysight Software Framework (KSF)	•	•
Supports Linux Red Hat Enterprise, Win7 and Win10	•	•
C4FM, COQPSK, LSM and WCQPSK modulation types	•	•
Specify oversampling ratio	•	•
Waveform view as spectrum, Power, CCDF, time domain (I+Q or I|Q)	•	•
Payload with voice packet and data packet	•	•
Voice packet with test pattern as Tx Symbol Rate, Tone 1011 Hz, Silence, Interference, Busy, Idle, Calibration, AutoFreqControl, Tx Test PN9, Tx Low Deviation, Tx Modulation Fidelity	•	•
Data packet with data packet format as confirmed data packet, unconfirmed data packet, confirmed enhanced addressing, unconfirmed enhanced addressing, and response packet	•	•
Demo setup with • C4FM Tx Symbol Rate Pattern • C4FM Voice Packet with Link Control Terminator • CQPSK Calibration pattern • CQPSK Data Packet Confirmed • CQPSK Tx Test PN9	•	•
Live connection and download waveform into signal generator	•	
Source Hardware configuration including frequency, amplitude and runtime scaling	•	
Export waveform files (encrypted Signal Studio waveform file)	•	•
Save setup file as scp format	•	•
Offline waveform file playback	•[1]	•

1. N7640APPC can playback waveform offline when it is installed on the PC controller of modular instrument like PXIe VXT.

Supported Standards

Specification	Name	Version	Date
Project25	FDMA-common air interface	TIA-102.BAAA-B	June 2017
Project25	Digital C4FM/CQPSK transceiver measurement	TIA-102.CAAA-E	March 2016

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.

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 and options

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

N7640 Signal Studio X for Radio Test LMR

PC application licenses (N7640APPC)

Software	Support Contract	Description
N7640APPC-1FP	R-Y5B-001-A[2]	Node-locked perpetual license
N7640APPC-1FL	R-Y4B-001-L[1]	Node-locked 12-month license
N7640APPC-1TP	R-Y5B-004-D[2]	Transportable perpetual license
N7640APPC-1TL	R-Y4B-004-L[1]	Transportable 12-month license
N7640APPC-1NP	R-Y5B-002-B[2]	Floating perpetual license
N7640APPC-1NL	R-Y4B-002-L[1]	Floating 12-month license
N7640APPC-1UP	R-Y5B-005-E[2]	USB portable perpetual
N7640APPC-1UL	R-Y4B-005-L[1]	USB portable 12-month license

Waveform playback licenses (N7640EMBC)

Software	Support Contract	Description
N7640EMBC-1FP	R-Y5B-001-A[2]	Node-locked perpetual license
N7640EMBC-1FL	R-Y4B-001-L[1]	Node-locked 12-month license
N7640EMBC-1TP	R-Y5B-004-D[2]	Transportable perpetual license
N7640EMBC-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

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 Land Mobile Radio (LMR) Test

www.keysight.com/find/N7640C

www.keysight.com/find/N7640APPC

www.keysight.com/find/N7640EMBC

Comprehensive Online Documentation

www.keysight.com/find/signalstudio_support

Signal Studio Signal Creation Software

www.keysight.com/find/signalstudio_software

Literature

Signal Studio Software, Brochure, 5989-6448EN

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