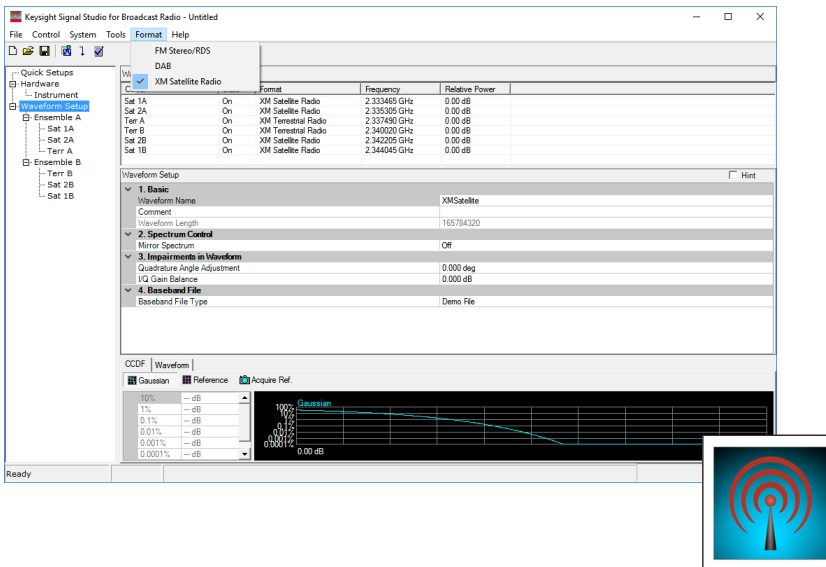# Keysight Technologies
Signal Studio for Broadcast Radio N7611C

Technical Overview

- Create Keysight validated and performance optimized reference signals compliant with FM Stereo/RDS, DAB, DAB+, T-DMB, and XM standards
- Generate ARB waveforms and real-time signals for XM
- Independently configure multi-carriers/multi-channels for up to 12 carriers
- Add real-time fading, AWGN, and interferers
- Accelerate the signal creation process with a user interface based on parameterized and graphical signal configuration and tree-style navigation

![KEYSIGHT TECHNOLOGIES]

Simplify Broadcast Radio Signal Creation

Signal Studio software is a flexible suite of signal-creation tools that will reduce the time you spend on signal simulation. For broadcast radio standards including FM Stereo/RDS, DAB, DAB+, T-DMB, and XM, Signal Studio's performance-optimized reference signals—validated by Keysight—enhance the characterization and verification of your devices. Through its application-specific user-interface you'll create standards-based and custom test signals for component, transmitter, and receiver test.

Component and transmitter test

Signal Studio's advanced capabilities use 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 partially-coded, statistically correct signals include
- Parametric test of components, such as amplifiers and filters
- Performance characterization and verification of RF sub-systems

Receiver test

Signal Studio's advanced capabilities enable you to create fully channel-coded signals for receiver bit-error-rate (BER), block-error-rate (BLER), packet-error-rate (PER), or frame error rate (FER) analysis. Applications include:

- Performance verification and functional test of receivers, during RF/baseband integration and system verification
- Coding verification of baseband subsystems, including FPGAs, ASICs, and DSPs

Apply your signals in real-world testing

Once you have set up your signals in Signal Studio, you can download them to a variety of Keysight instruments. Signal Studio software complements these platforms by providing a cost-effective way to tailor them to your test needs in design, development and production test.

- Vector signal generators
  - X-Series: MXG and EXG
  - ESG
  - PXIe M9381A

Typical measurements

Typical FM Stereo/RDS component measurements
- ACLR
- THD
- SINAD
- Channel power

Typical DAB/DAB+/DMB/XM component measurements
- ACLR
- CCDF
- MER
- S/N
- Channel power
- Occupied bandwidth
- Spectrum emissions

Typical FM Stereo/RDS receiver measurements
- Sensitivity
- L/R channel separation
- Frequency characteristic
- THD
- SINAD
- Pilot suppression
- RDS BLER

Typical DAB/DAB+/DMB/XM receiver measurements
- Sensitivity
- Maximum input power
- Selectivity
- Performance in Rayleigh Channel
- Acquisition time after synchronization loss

Component and Transmitter Test

Figure 1. Typical component test configuration using Signal Studio's basic capabilities with a Keysight X-Series signal generator and an X-Series signal analyzer.

Signal Studio's advanced capabilities enable you to create and customize FM Stereo/ RDS or DAB/DAB+/T-DMB/XM waveforms to characterize the power and modulation performance of your components and transmitters. Easy manipulation of a variety of signal parameters, including transmission bandwidth, cyclic prefix, and modulation type, simplifies signal creation.

- Create spectrally-correct signals for ACLR, channel power, and spectral mask testing
- Set parameters such as FM deviation, pilot deviation, RDS deviation, and RDS information for FM Stereo/RDS signals and transmission mode, service/service component settings, FIG for DAB/DAB+/T-DMB signals, one terrestrial carrier and two satellite carriers in ensemble A and B, respectively for XM signals
- Configure multi-carrier waveforms, each with different settings
- View CCDF, spectrum and time domain graphs to investigate the effects of power ramps, modulation formats, power changes, clipping, and more on device performance
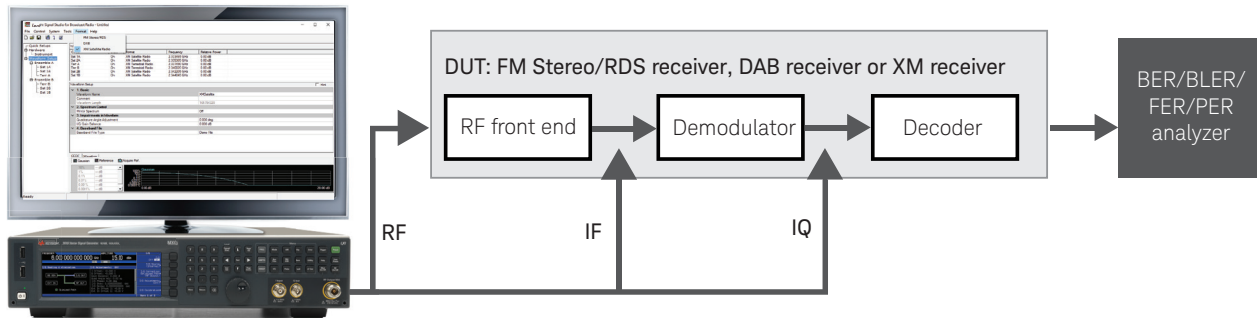
Receiver Test

Figure 2. Fully channel-coded signals to evaluate the BER, BLER, PER, FER or other functions of your receiver with Keysight X-Series signal generators and Signal Studio's advanced capabilities.

Signal Studio's advanced capabilities address applications in FM Stereo/RDS, DAB and XM receiver test, including the verification of baseband designs and the integration of the baseband and RF modules.

FM Stereo/RDS receiver testing

– Create FM Stereo signals with configurable FM deviation, stereo frequency, pilot, pilot deviation, RDS deviation and more
– Configure EON, TP, TA, PTY, PS, AF, CT, and RT to test RDS functions

DAB receiver testing

– Create DAB signals with configurable transmission mode, service/service compo-nent settings, FIG (fast information group) and more
– Set up the payload types and associated parameters for individual service compo-nents or for the whole ensemble
– Use demo files and your own stream files for typical receiver testing and use test patterns for BER testing when payload is input by each service component
– Automatically read the ensemble's related parameters into the software when an ETI stream file is used as the payload
– Provide demo ETI files including DAB tone, DAB+ tone, and slideshow

XM receiver testing

– Create XM signals with configurations for one terrestrial carrier and two satellite carriers in ensemble A and B respectively for XM signals
– Use real-time mode for functional test with long play time
– Use ARB mode for performance test with N7611B real time channel emulation
– Read XM baseband file as payload with the help embedded of tool
– Provide demo of XM baseband files

Features Summary

Broadcast radio receiver and component testing	Signal Studio advanced waveform playback mode
FM Stereo/RDS	
FM MPX (multiplex) signal generation	●
Settable FM deviation (up to 300 kHz)	●
Settable pilot deviation: 0.1% to 50% of FM deviation in 0.1% steps	●
Settable RDS deviation	●
Flexible RDS information configuration	
DAB/DAB+/DMB	
DAB, DAB+, and T-DMB waveform generation	●
Flexible service and service component settings	●
User-defined FIG for flexible configuration	●
Payload types: audio files for each service component and ETI stream files	●[1]
ETI demo files and DAB, DAB+ audio demo files provided	●[1]
XM	
XM waveform and real time signal generation	●
Each carrier can be turned ON/OFF and power level differences can be set	●
Overlay mode support	●
Baseband file as payload	●

1. This feature requires N7611C–SFP.

Supported Standards and Test Configurations

Formats	Standards
FM Stereo/RDS	IEC 62106:1999 standard
DAB	ETSI EN 300 401 V1.3.3
ETI	ETS 300 799, September 1997

DAB receiver tests (BS EN50248:2001)[1]

Receiver characteristics (Section 7.3)	Hardware
7.3.1 Sensitivity	MXG/EXG/ESG/EXT/M9381A
7.3.2 Maximum input power	MXG/EXG/ESG/EXT/M9381A
7.3.3 Selectivity	2 MXG/EXG/ESG/EXT/M9381A
7.3.4 Performance in a Rayleigh channel	MXG/EXG/ESG
7.3.4.2 Acquisition time after synchronization loss	2 MXG/EXG/ESG/EXT/M9381A

1. For XM standards, please contact SiriusXM and refer to buyer's guide document for configurations

Performance Characteristics

Definitions

Characteristic performance:

Non-warranted value based on testing during development phase of this product.

The following performance characteristics apply to the instruments shown in the tables. For performance characteristics of other instruments, refer to the respective product data sheet.

Note: The results for the M9381A reflect a more comprehensive and improved test method relative to the way the X-Series signal generators were tested. X-Series signal generator data will be updated to reflect this methodology in a future release of this publication.

FM Stereo/RDS performance	M9381A	
Test condition	1 kHz rate, 75 kHz deviation	
Bandpass filter type	A-weighted audio	CCITT
Characteristic performance		
FM deviation accuracy (%)	7.08	2.94
Distortion/Total Vrms (%)	0.043	0.029
THD (%)	0.02	0.007
SINAD (dB)	67.43	71.09
Left to right (dB)	60.74	61.16

DAB characteristic performance	X-Series signal generators	M9381A
Test condition	Frequency: 229.072 MHz, amplitude: –30 dBm	
DAB Mode	Modulation Accuracy Rate (MER) (dB)	
Mode 1	39.15	51.021
Mode 2	39.56	51.169
Mode 3	42.44	51.138
Mode 4	41.80	51.084

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.

N7611C Signal Studio for Broadcast Radio

Waveform playback licenses (N7611EMBC)

Software	Support Contract	Description
N7611EMBC-1FP	R-Y5B-001-A[2]	Node-locked perpetual license
N7611EMBC-1FL	R-Y4B-001-L[1]	Node-locked 12-month license
N7611EMBC-1TP	R-Y5B-004-D[2]	Transportable perpetual license
N7611EMBC-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 1st year)
R-Y6B-504	1-month of support for transportable licenses (extension after 1st 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/N7607C

Comprehensive Online Documentation

www.keysight.com/find/signalstudio_support

Signal Studio and Signal Creation Software

www.keysight.com/find/signalstudio_software

Digital Video and Broadcast Audio Solution Table

www.keysight.com/find/digitalvideo_solution

Literature

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

Digital Audio Broadcasting Receiver Testing Solutions, Demo Guide, literature number
5990-8477EN

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