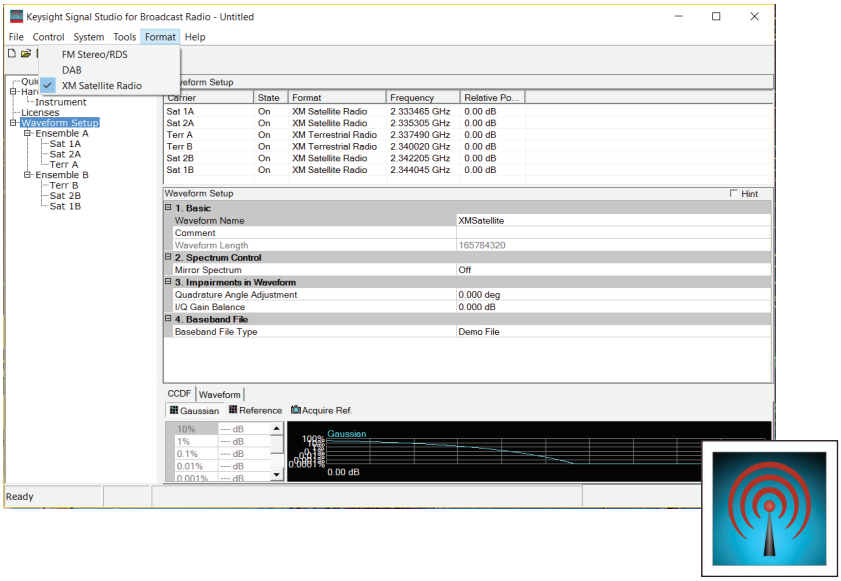
Keysight Technologies
N7611B Signal Studio for Broadcast Radio

Technical Overview



- Create Keysight validated and performance optimized reference signals compliant to FM Stereo/RDS, DAB, DAB+, T-DMB, and XM standards
- Provide 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

The Keysight Technologies, Inc. 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
- PXB baseband generator and channel emulator
- SystemVue simulation software

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

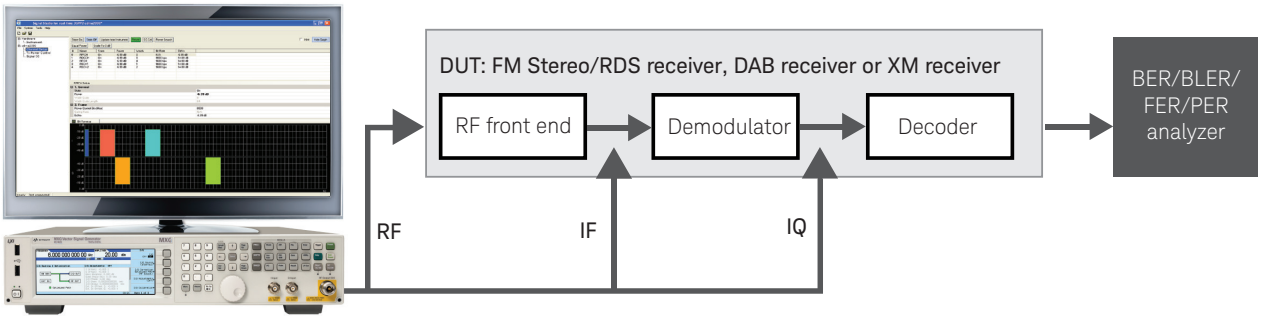


Figure 2. Fully channel-coded signals to evaluate the BER, BLER, PER, FER or other functions of your receiver with Keysight X-Series signal generators and Signal Studio's advanced capabilities.

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 component settings, FIG (fast information group) and more
- Set up the payload types and associated parameters for individual service components 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 N7605B 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	**N7611B-QFP**
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	**N7611B-RFP**
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	**N7611B-EFP**
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 N7611B-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	
7.3.3 Selectivity	2 MXG/EXG/ESG/EXT/M9381A
7.3.4 Performance in a Rayleigh channel	PXB + 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:

- Fixed license: Allows you to create unlimited I/Q waveforms with a specific Signal Studio product and use them with a single, specific platform.
- Transportable/floating license: Allows you to create unlimited I/Q waveforms with a specific Signal Studio product and use them with a single platform (or PC in some cases) at a time. You may transfer the license from one product to another.
- Waveform license: Allows you to generate up to 545 user-configured I/Q waveforms with any Signal Studio product and use them with a single, specific platform.

The table below lists fixed, perpetual licenses only; additional license types may be available. For detailed licensing information and configuration assistance, please refer to the Licensing Options web page at **www.keysight.com/find/SignalStudio_licensing**

N7611B Signal Studio for broadcast radio

Model-Option	Description
Connectivity	
N7611B-1FP	Connect to E4438C ESG signal generator
N7611B-3FP	Connect to N5182/62 MXG, N5172 EXG signal generator
N7611B-6FP	Connect to N5106A PXB baseband generator and channel emulator
N7611B-7FP	Connect to Keysight simulation software
N7611B-8FP	Connect to E6607 EXT wireless communications test set
N7611B-9FP	Connect to M9381A
Capability	
N7611B-QFP	Advanced FM Stereo/RDS waveform playback
N7611B-RFP	Advanced DAB/DAB+/DMB waveform playback
N7611B-SFP	ETI support for DAB/DMB[1]
N7611B-EFP	Advanced XM

1. N7611B-SFP requires N7611B-RFP.

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/free_trials

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**

Additional Information

Websites

Access the comprehensive online documentation, which includes the complete software HELP
www.keysight.com/find/n7611b
www.keysight.com/find/SignalStudio

Digital video and broadcast audio solution table
www.keysight.com/find/digitalvideo_solution

Literature

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

Signal Studio Software, Brochure, 5989-6448EN

www.keysight.com/find/n7611b

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