# Keysight Technologies U8903B Performance Audio Analyzer

Data Sheet





## Introduction

Make multi-function, high performance audio measurements with the new U8903B audio analyzer. The U8903B comes with a residual distortion of < -110 dB, allowing you to measure the most demanding devices. The wide analysis bandwidth of 1.5 MHz offers the highest resolution 2-channel measurements available, and an in-built test sequencer offers pre-configured measurements, including the latest voice quality analysis. With the U8903B audio analyzer, you get a test solution that is configurable to meet your specific application needs for audio and beyond.

### Key Features

- Low residual distortion of < -110 dB to measure low distortion devices
- Wide measurement bandwidth; measure DC or from 10 Hz to 96 kHz or 1.5 MHz (with wide bandwidth option N3431A)
- Flexible configuration with an array of options, including up to 8 analog analyzer and digital options
- Test sequence function to implement automatic test
- Speech and audio quality measurements with Perceptual Objective Listening Quality Assessment (POLQA) and Perceptual Evaluation of Speech Quality (PESQ)
- Characterize Signal-to-Noise Ratios, SINAD, IMD, DFD, TND+N ratio, THD+N level, crosstalk and more
- Apply weighing functions, standard filters and custom filters, including notch filter features
- Customize your unit with flexible digital audio interface options, offering AES3/SPDIF or DSI standard digital audio format
- Test a variety of current components and applications with a logic level input range of 1.2 V to 3.3 V (DSI)
- Eliminate the need to rewrite programs into SCPI command with the built-in HP 8903B code compatibility mode

## Expand Your Options to Meet Your Application Needs

#### Configurable measurement channels

The U8903B audio analyzer can be configured to 4, 6 or 8 analog analyzer channels. The instrument is capable of simultaneous measurement, on all channels, making the U8903B the ideal choice for multichannel systems such as 5.1 or 7.1 surround sound.

÷ .				nalyzer	Analog A	
Func. Config	ON		Frequency 1.0000 kHz	Amplitude 1.0000 Vrms	Waveform Sine	
	ON		Frequency 1.0000 kHz	Amplitude 1.0000 Vrms	Waveform Sine	
Filters Config	ON	4.THD+N Level 2.3820 µV	3.THD+N Ratio -112.6 dB	2.Vac 1.0260 V	1.Frequency 1.0000 kHz	AA1
Meas Config	ON	4.THD+N Level 2.2856 μV	3.THD+N Ratio -112.9 dB	<sup>2.Vac</sup> 1.0196 V	1.Frequency 1.0000 kHz	
	ON	4.THD+N Level 2.5063 μV	3.THD+N Ratio -112.2 dB	<sup>2.Vac</sup> 1.0271 V	1.Frequency 1.0000 kHz	
Input Config	ON	4.THD+N Level 2.3843 µV	3.THD+N Ratio -112.6 dB	2.Vac 1.0198 V	1.Frequency 1.0000 kHz	
Way File	ON	4.THD+N Level 2.4823 µV	3.THD+N Ratio -112.3 dB	<sup>2.Vac</sup> 1.0241 V	1.Frequency 1.0000 kHz	
00 UV 1 116	ON	4.THD+N Level 2.4507 μV	3.THD+N Ratio -112.3 dB	<sup>2.Vac</sup> 1.0202 V	1.Frequency 1.0000 kHz	
Statistics	ON	4.THD+N Level 2.2467 μV	3.THD+N Ratio -113.2 dB	2.Vac 1.0330 V	1.Frequency 1.0000 kHz	
Track Channel	ON	4.THD+N Level 2.9388 µV	3.THD+N Ratio -110.8 dB	<sup>2.Vac</sup> 1.0191 V	1.Frequency 1.0000 kHz	AAG.

Figure 1. The U8903B's GUI, showing 8 analyzer channel measurements.

#### 1.5 MHz wide bandwidth

The U8903B's wide bandwidth option (N3431A) offers two measurement channels, each with 1.5 MHz bandwidth and 24 bit resolution. No other test instrument can match this bandwidth and resolution. The one million point FFT then releases unprecedented measurement capability. This option is ideal for looking at the spectrum from Class D amplifiers or switching supplies where frequency components or noise well above the audio band can have a detrimental effect on audio quality. This option is also suited to applications where low frequency spectrum analyzers were previously used.

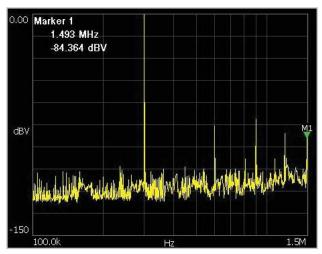


Figure 2. This screenshot shows an FFT plot of a 300 kHz source and the U8903B's unique ability to measure up the 5th harmonic with unprecedented resolution.

#### Voice quality with PESQ and POLQA

The U8903B audio analyzer now offers the ITU-T standard perceptual objective listening quality assessment (POLQA), which is also known as ITU-T P.862, as well as perceptual evaluation of speech quality (PESQ) as recommended in ITU-T P.862.

POLQA and PESQ works by comparing a degraded (usually by typical network transmission interferences) or processed signal to the original reference signal. The perceptual differences between the two signals are then rated based on the mean opinion score (MOS) test, which uses a scale from 1 (bad) to 5 (excellent).

POLQA comes with improvements over its predecessor, PESQ (ITU-T P.862), and has been extended to handle higher bandwidth audio signals, supporting measurements in the common audio bandwidth carried by telephone networks (300 – 3400 Hz) as well as wideband and super-wideband speech signals (up to 14000 Hz) needed to assess HD voice quality. With POLQA, the U8903B is suited to testing 3G and 4G/LTE mobile phone network equipment, VOIP phone and network equipment and HD voice test applications.

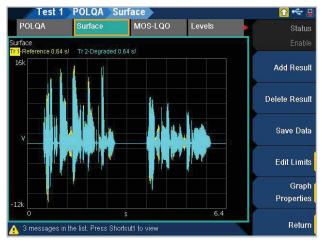


Figure 3. A graph comparison view between the Reference source file and Degraded file.



Figure 4. The MOS (Mean Opinion Score) scoring, indicating the rating of the DUT's voice quality.

### Advance Measurement Testing

### Low residual distortion

The U8903B comes with extremely low residual distortion and noise. The residual distortion is < -110 dB, enabling the measurement of the most demanding devices. This performance is available for up to 8 channels simultaneously.

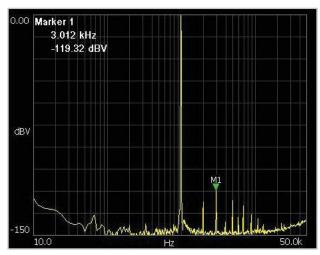


Figure 5. An FFT plot showing the residual distortion

#### Test sequence control

The in-built test sequencer allows users to create flexible and easy-to-use test sequences that automates testing and provides test reports. This function removes the need to write complicated programming code or to purchase an additional external controller. Users can setup and define the types of measurements as well as define Pass/Fail decisions, reducing test development time as well as test time for the device-under-test (DUT).

Project Te	st 1 POLQA		🖸 🗠 🚊
Project	Report	AC Level Frequency Phase	Status Enable
Test 1 V		SNR THD+N DC Level	Add Measurement
	1	Crosstalk SMPTE IMD DFD IMD Noise Level	Delete Measurement
POLQA 🗹		Multitone Analyzer Stepped Freq. Sweep SMPTE Freq. Sweep	Edit
		DFD Freq, Sweep Stepped Level Sweep SMPTE Level Sweep	Settings
	•	DFD Level Sweep DC Level Sweep RF Power Sweep Measurement Recorder	Properties
A 3 messages in the lis	t. Press Shortcut1 to view	POLQA	

Figure 6. The test sequence control function comes with a selection of preconfigured measurements and allows users to select the most frequently used test sequences for their daily measurement.

## Expand Your Digital Audio Test Capabilities

# Cover your application needs with multiple digital audio interface options

Test a wide range of digital audio applications with the industry's standard interfaces: AES3/SPDIF and Digital Serial Interface (DSI). Used in the testing and validation of consumer electronics and digital audio related ICs, both digital audio interfaces are available with the U8903B Option 113, with further options (Option 114 and 115) giving you the flexibility to choose either interface. The U8903B also supports multiple DSI formats, such as I<sup>2</sup>S, Left Justified, Right Justified and DSP. These formats are suitable for most digital audio design and verification applications.

# Measure more applications with a wide logic level input range

The U8903B comes with completely variable logic I/O levels between 1.2 V and 3.3 V, offering the ultimate in compatibility with current and future devices. In addition, the U8903B-105 DSI cable (optional accessories) is designed to make connections between the audio analyzer and the DUT extremely simple. The cable provides convenient connection to the 25-way DSI connector on the rear of the instrument. The other end of the cable offers all the data and clock lines on individual BNC connectors for quick and easy connection to the DUT.

#### HP 8903B mode

The U8903B comes with HP 8903B mode to help HP 8903B customers transition to the new generation of audio analyzers. This mode allows the new U8903B to mimic the HP 8903B, performing measurements and even displaying the same GUI measurement screen as the legacy audio analyzer. For customers currently using the HP 8903B in their test rack, the U8903B also comes with a built-in code emulator that automatically converts HP 8903B R2D2 code directly into SCPI commands, the language used by the U8903B.



Figure 7. The HP 8903B graphical user interface

## **Product Characteristics**

Description	
Power consumption	≤ 250 VA
Power requirements	$100 V_{ac}$ to 240 V <sub>ac</sub>
	47 Hz to 63 Hz
Operating environment	Operating temperature from 0 °C to 55 °C
	Relative humidity at 20% to 80% RH (non-condensing)
	Altitude up to 3000 m
	Pollution Degree 2
	Installation Category II
Storage compliance	–55 °C to 75 °C
Safety compliance :	IEC 61010-1:2010/EN61010-1:2010
	Canada: CAN/CSA-C22.2 No. 61010-1-12
	USA: ANSI/UL Std. No. 61010-1 (3rd Edition)
EMC compliance	IEC 61326-1:2005/EN 61326-1:2006
	Canada: ICES-001:2004
	Australia/New Zealand: AS/NZS CISPR11:2004
Instrument dimensions (W x D x H)	425.60 mm (16.76 in) x 425.00 mm (16.73 in) x 133.60 mm (5.25 in)
Weight	8.5 kg
Warranty	Three year for product
	Three months for product accessories

### Specifications

The following specifications are based on performance with 30 minutes warm-up time and at a temperature of 0 °C to 55 °C unless stated otherwise.

#### Analog generator specifications

Generated waveforms Sine, dual sine, variable phase, square, noise (Gaussian and rectangular), arbitrary, DC, multitone, SMPTE IMD (11, 41, and 10:1), DFD (IEC 60118/IEC 60268), WAV file piayback Connection type   Balanced XLR   Unbalanced BNC   Common mode XLR   Impedanced 20, 500, 600 0   Unbalanced 20, 500, 600 0   Common mode 400, 1000, 600 0 or 10 0 Unbalanced as per IEC-60268   Grounding Grounding   True floating or grounded Maximum output power into 600 0   Balanced (600 0) 20 dBm   Unbalanced (600 0) 20 dBm   Unbalanced (600 0) 14 dBm   Sine, dual sine, and variable phase Prequency, amplitude, phase   Frequency Prequency, amplitude, phase   Frequency Prequency, amplitude, phase   Frequency 2 ppm + 100 µH2   Range 5 Hz to 80 Hz   Accuracy 2 ppm + 100 µH2   Range (anbalanced/common) 0 to 16 V <sub>imp</sub> Range (anbalanced/common) 0 to 16 V <sub>imp</sub> Conrent limit (typical) 50 mA   Amplitude resolution 1 µ V <sub>imp</sub> (impt of to five digits of resolution)   Flatass Ref 1 KH2 ± 0.09 dB (1%) (from 0 °C to 55 °C)   Amplitude resolution 1 µ V <sub>imp</sub> (impt of to five digits of resolution) <td< th=""><th>Output specifications</th><th></th></td<>	Output specifications	
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Impedance     Mail       Balanced     40 Ω, 100 Ω, 600 Ω       Unbalanced     20 Ω, 50 Ω, 600 Ω       Common mode     40 Ω, 100 Ω, 600 Ω or 10 Ω Unbalanced as per IEC-60268       Grounding     Three floating or grounded       Maximum output power into 600 Ω     Balanced (600 Ω)       Balanced (600 Ω)     20 dBm       Unbalanced (600 Ω)     20 dBm       Unbalanced (600 Ω)     14 dBm       Sine, dual sine, and variable phase     Ubalanced (600 Ω)       Phase     -180 ° to 179.99 °       Sweep     Frequency, amplitude, phase       Frequency     Range       Range     5 Hz to 80 kHz       Accuracy     2 pm + 100 µHz       Resolution     0 to 16 V <sub>rms</sub> Range (balanced/common)     0 to 8 V <sub>rms</sub> Current limit (typical)     50 mA       Amplitude resolution     1 µ V <sub>rms</sub> (limited to five digits of resolution)       Haten SBH 1 Hz     ±0.09 dB (±1%) (from 0 °C to 55 °C)       SHz to 80 Hz     ±0.08 dB       5 Hz to 80 Hz     ±0.08 dB       5 Hz to 80 Hz     ±0.08 dB       5 Hz to 80 Hz     ±0.08 dB	Unbalanced	BNC
Balanced     40 Ω, 100 Ω, 600 Ω       Unbalanced     20 Ω, 50 Ω, 600 Ω       Common mode     40 Ω, 100 Ω, 600 Ω or 10 Ω Unbalanced as per IEC-60268       Grounding     True floating or grounded       Maximum output power into 600 Ω     20 dBm       Balanced (600 Ω)     20 dBm       Unbalanced (600 Ω)     14 dBm       Sine, dual sine, and variable phase     Ubalanced (600 Ω)       Dual sine ratio range     0% to 100%       Phase     -180 ° to 179.99 °       Sweep     Frequency, amplitude, phase       Frequency     E       Range     5 Hz to 80 kHz       Accuracy     2 pm + 100 µHz       Range (balanced/common)     0 to 16 V <sub>rms</sub> Range (balanced/common)     0 to 16 V <sub>rms</sub> Range (unbalanced/common)     0 to 8 V <sub>rms</sub> Current limit (typical)     50 mA       Amplitude resolution     1 µ V <sub>rms</sub> (limited to five digits of resolution)       Elates 861 HAz     ±0.008 dB       5 Hz to 80 kHz	Common mode	XLR
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Grounding     True floating or grounded       Maximum output power into 600 Ω     Balanced (600 Ω)     20 dBm       Unbalanced (600 Ω)     14 dBm     Sine, dual sine, and variable phase       Dual sine ratio range     0% to 100%     Phase       Phase     -180 ° to 179.99 °     Sweep       Srequency     amplitude, phase     Phase       Frequency     Frequency, amplitude, phase     Frequency       Range     5 Hz to 80 kHz     Accuracy     2 ppm + 100 µHz       Range (unbalanced/common)     0.to 16 V <sub>rms</sub> Range (unbalanced/common)     0 to 18 V <sub>rms</sub> Range (unbalanced/common)     0 to 16 V <sub>rms</sub> Range (unbalanced/common)     0 to 8 V <sub>rms</sub> Current limit (typical)     5 0m A     Amplitude accuracy at 1 kHz     ±0.09 dB (±1%) (from 0 °C to 55 °C)       Amplitude resolution     1 μ V <sub>rms</sub> (limited to five digits of resolution)     Flatenses Ref 1 kHz       5 Hz to 80 kHz     ±0.008 dB     5     5 Hz to 80 kHz     ±0.008 dB       THD and THD+N     ≤ -108 dB, typically < -110 dB (at 23 °C ±5 °C) <sup>1</sup> ≤ -100 dB (from 0 °C to 55 °C) <sup>1</sup> Residual THD     < -100 dB (from 0 °C to 55 °C) <sup>1</sup> 20 Hz to 20 kHz	Unbalanced	20 Ω, 50 Ω, 600 Ω
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Balanced (600 0.)     20 dBm       Unbalanced (600 0.)     14 dBm       Sine, dual sine, and variable phase       Dual sine ratio range     0% to 100%       Phase     -180 ° to 179.99 °       Sweep     Frequency, amplitude, phase       Frequency     Frequency, amplitude, phase       Frequency     2 ppm + 100 µHz       Range     5 Hz to 80 kHz       Accuracy     2 ppm + 100 µHz       Resolution     0.1 Hz       Output     Range (balanced)       Range (balanced)     0 to 16 V <sub>rms</sub> Range (balanced)     0 to 18 V <sub>rms</sub> Current limit (typical)     50 mA       Amplitude accuracy at 1 kHz     ±0.09 dB (±1%) (from 0 °C to 55 °C)       Amplitude resolution     1 µ V <sub>rms</sub> (limited to five digits of resolution)       Flatness Ref 1 kHz     ±0.008 dB       5 Hz to 80 kHz     ±0.008 dB       THD and THD+N     ≤ -108 dB, typically < -110 dB (at 23 °C ±5 °C) <sup>1</sup> Residual THD + N at 1 kHz, 1 V <sub>rms</sub> ≤ -108 dB, typically < -110 dB (at 23 °C ±5 °C) <sup>1</sup> Residual THD + N at 1 kHz, 1 V <sub>rms</sub> ≤ -108 dB, typically < -110 dB (at 23 °C ±5 °C) <sup>1</sup> (20 Hz to 20 kHz ban	True floating or grounded	
Unbalanced (60 Ω)14 dBmSine, dual sine, and variable phase $0\%$ to 100%Dual sine ratio range0% to 179.99 °SweepFrequency, amplitude, phaseFrequencyFrequency, amplitude, phaseFrequency2 ppm + 100 µHzRange5 Hz to 80 kHzAccuracy2 ppm + 100 µHzResolution0.1 HzOutput $0$ to 16 V <sub>rms</sub> Range (nbalanced/common)0 to 8 V <sub>rms</sub> Current limit (typical)50 mAAmplitude accuracy at 1 kHz $\pm 0.09$ dB (±1%) (from 0 °C to 55 °C)Amplitude resolution1 µ V <sub>rms</sub> (limited to five digits of resolution)Flatness Ref 1 kHz $\pm 0.008$ dB5 Hz to 80 kHz $\pm 0.08$ dBTHD and THD+N $\leq -108$ dB, typically < -110 dB (at 23 °C ±5 °C)^1Residual THD + N at 1 kHz, 1 V <sub>rms</sub> $\leq -108$ dB, typically < -110 dB (at 23 °C ±5 °C)^1Residual THD $< -87$ dBCresstalk $< -87$ dB	Maximum output power into 600 $\Omega$	
Sine, dual sine, and variable phaseDual sine ratio range0% to 100%Phase $-180 °$ to 179.99 °SweepFrequency, amplitude, phaseFrequencyFrequency, amplitude, phaseRange5 Hz to 80 kHzAccuracy2 ppm + 100 µHzResolution0.1 HzOutputURange (balanced)0 to 16 V <sub>rms</sub> Range (unbalanced/common)0 to 8 V <sub>rms</sub> Current limit (typical)50 mAAmplitude accuracy at 1 kHz $\pm 0.09 \text{ dB}$ (±1%) (from 0 °C to 55 °C)Amplitude resolution1 $\mu$ V <sub>rms</sub> (limited to five digits of resolution)Flatness Ref 1 kHz $\pm 0.08 \text{ dB}$ 5 Hz to 80 kHz $\pm 0.08 \text{ dB}$ 5 Hz to 80 kHz $\pm 0.08 \text{ dB}$ THD and THD+N $\leq -108 \text{ dB}$ , typically < $-110 \text{ dB}$ (at 23 °C ±5 °C) <sup>1</sup> Residual THD + N at 1 kHz, 1 V <sub>rms</sub> $\leq -108 \text{ dB}$ , typically < $-100 \text{ dB}$ (from 0 °C to 55 °C)Residual THD $< -87 \text{ dB}$ Crosstalk $= -87 \text{ dB}$	Balanced (600 Ω)	20 dBm
Dual sine ratio range     0% to 100%       Phase     -180 ° to 179.99 °       Sweep     Frequency, amplitude, phase       Frequency     Frequency, amplitude, phase       Range     5 Hz to 80 kHz       Accuracy     2 ppm + 100 µHz       Resolution     0.1 Hz       Output     V       Range (balanced/common)     0 to 16 V <sub>rms</sub> Range (unbalanced/common)     0 to 8 V <sub>rms</sub> Current limit (typical)     50 mA       Amplitude accuracy at 1 kHz     ±0.09 dB (±1%) (from 0 °C to 55 °C)       Amplitude resolution     1 µ V <sub>rms</sub> (limited to five digits of resolution)       Flatness Ref 1 kHz     ±0.008 dB       5 Hz to 20 kHz     ±0.08 dB       5 Hz to 80 kHz     ±0.08 dB       THD and THD+N     ≤ -108 dB, typically < -110 dB (at 23 °C ±5 °C)^1	Unbalanced (600 Ω)	14 dBm
Phase     -180 ° to 179.99 °       Sweep     Frequency, amplitude, phase       Frequency     5 Hz to 80 kHz       Accuracy     2 ppm + 100 μHz       Resolution     0.1 Hz       Output     0       Range (balanced)     0 to 16 V <sub>rms</sub> Range (ubalanced/common)     0 to 8 V <sub>rms</sub> Current limit (typical)     50 mA       Amplitude accuracy at 1 kHz     ±0.09 dB (±1%) (from 0 °C to 55 °C)       Amplitude resolution     1 μ V <sub>rms</sub> (limited to five digits of resolution)       Flatness Ref 1 kHz     ±0.008 dB       5 Hz to 20 kHz     ±0.008 dB       THD and THD+N     ±0.008 dB       THD and THD+N     ≤ -108 dB, typically < -110 dB (at 23 °C ±5 °C) <sup>1</sup> Residual THD     < -100 dB (from 0 °C to 55 °C)	Sine, dual sine, and variable phase	
SweepFrequency amplitude, phaseFrequencyRange5 Hz to 80 kHzAccuracy2 ppm + 100 µHzResolution0.1 HzOutputRange (balanced)0 to 16 $V_{rms}$ Range (unbalanced/common)0 to 8 $V_{rms}$ Current limit (typical)50 mAAmplitude accuracy at 1 kHz $\pm 0.09$ dB ( $\pm$ 1%) (from 0 °C to 55 °C)Amplitude resolution1 $\mu$ $V_{rms}$ (limited to five digits of resolution)Flatness Ref 1 kHz $\pm 0.008$ dB5 Hz to 20 kHz $\pm 0.08$ dB5 Hz to 80 kHz $\pm 0.08$ dBTHD and THD+N $\leq -108$ dB, typically < -110 dB (at 23 °C $\pm$ 5 °C) <sup>1</sup> Residual THD $< -87$ dBCrosstalk $< -87$ dB	Dual sine ratio range	0% to 100%
FrequencyRange5 Hz to 80 kHzAccuracy2 ppm + 100 µHzResolution0.1 HzOutput0 to 16 $V_{rms}$ Range (balanced)0 to 16 $V_{rms}$ Range (unbalanced/common)0 to 8 $V_{rms}$ Current limit (typical)50 mAAmplitude accuracy at 1 kHz±0.09 dB (±1%) (from 0 °C to 55 °C)Amplitude resolution1 $\mu$ $V_{rms}$ (limited to five digits of resolution)Flatness Ref 1 kHz±0.008 dB5 Hz to 20 kHz±0.008 dBTHD and THD+N $\times$ -108 dB, typically < -110 dB (at 23 °C ±5 °C)^1	Phase	–180 ° to 179.99 °
Range5 Hz to 80 kHzAccuracy2 ppm + 100 µHzResolution0.1 HzOutput $0.1 Hz$ Range (balanced)0 to 16 V <sub>rms</sub> Range (unbalanced/common)0 to 8 V <sub>rms</sub> Current limit (typical)50 mAAmplitude accuracy at 1 kHz±0.09 dB (±1%) (from 0 °C to 55 °C)Amplitude resolution1 $\mu$ V <sub>rms</sub> (limited to five digits of resolution)Flatness Ref 1 kHz±0.008 dB5 Hz to 20 kHz±0.008 dB5 Hz to 80 kHz±0.008 dBTHD and THD+NResidual THD + N at 1 kHz, 1 V <sub>rms</sub> ≤ -108 dB, typically < -110 dB (at 23 °C ±5 °C)^1 < -100 dB (from 0 °C to 55 °C)	Sweep	Frequency, amplitude, phase
C     2 ppm + 100 μHz       Resolution     0.1 Hz       Output     0to 16 V <sub>rms</sub> Range (balanced)     0 to 16 V <sub>rms</sub> Range (unbalanced/common)     0 to 8 V <sub>rms</sub> Current limit (typical)     50 mA       Amplitude accuracy at 1 kHz     ±0.09 dB (±1%) (from 0 °C to 55 °C)       Amplitude resolution     1 μ V <sub>rms</sub> (limited to five digits of resolution)       Flatness Ref 1 kHz     ±0.008 dB       5 Hz to 20 kHz     ±0.08 dB       5 Hz to 80 kHz     ±0.08 dB       THD and THD+N     ≤ -108 dB, typically < -110 dB (at 23 °C ±5 °C) <sup>1</sup> c20 kHz bandwidth)     ≤ -100 dB (from 0 °C to 55 °C)       Residual THD     < -87 dB	Frequency	
Resolution0.1 HzOutputRange (balanced)0 to 16 $V_{rms}$ Range (unbalanced/common)0 to 8 $V_{rms}$ Current limit (typical)50 mAAmplitude accuracy at 1 kHz $\pm 0.09 \text{ dB} (\pm 1\%) (from 0 °C to 55 °C)$ Amplitude resolution1 $\mu V_{rms}$ (limited to five digits of resolution)Flatness Ref 1 kHz $\pm 0.008 \text{ dB}$ 5 Hz to 20 kHz $\pm 0.008 \text{ dB}$ 5 Hz to 80 kHz $\pm 0.008 \text{ dB}$ THD and THD+N $\leq -108 \text{ dB}$ , typically < $-110 \text{ dB}$ (at 23 °C $\pm 5 °C$ ) <sup>1</sup> Residual THD + N at 1 kHz, 1 $V_{rms}$ $\leq -100 \text{ dB}$ (from 0 °C to 55 °C) <sup>1</sup> Residual THD $< -87 \text{ dB}$ Crosstalk $= 100 \text{ dB}$	Range	5 Hz to 80 kHz
OutputRange (balanced)0 to 16 VrmsRange (unbalanced/common)0 to 8 VrmsCurrent limit (typical)50 mAAmplitude accuracy at 1 kHz±0.09 dB (±1%) (from 0 °C to 55 °C)Amplitude resolution1 $\mu$ Vrms (limited to five digits of resolution)Flatness Ref 1 kHz±0.008 dB5 Hz to 20 kHz±0.008 dB5 Hz to 80 kHz±0.008 dBTHD and THD+NResidual THD + N at 1 kHz, 1 Vrms≤ -108 dB, typically < -110 dB (at 23 °C ±5 °C)^1	Accuracy	2 ppm + 100 μHz
Range (balanced)0 to 16 $V_{rms}$ Range (unbalanced/common)0 to 8 $V_{rms}$ Current limit (typical)50 mAAmplitude accuracy at 1 kHz $\pm 0.09$ dB ( $\pm 1\%$ ) (from 0 °C to 55 °C)Amplitude resolution1 $\mu$ $V_{rms}$ (limited to five digits of resolution)Flatness Ref 1 kHz $\pm 0.008$ dB5 Hz to 20 kHz $\pm 0.008$ dB5 Hz to 80 kHz $\pm 0.08$ dBTHD and THD+N $\pm -108$ dB, typically < $-110$ dB (at 23 °C $\pm 5$ °C) <sup>1</sup> Residual THD $< -87$ dBCrosstalk $< -87$ dB	Resolution	0.1 Hz
Range (unbalanced/common)0 to 8 $V_{rms}$ Current limit (typical)50 mAAmplitude accuracy at 1 kHz $\pm 0.09 \text{ dB} (\pm 1\%) (from 0 °C to 55 °C)$ Amplitude resolution1 $\mu V_{rms}$ (limited to five digits of resolution)Flatness Ref 1 kHz $\pm 0.008 \text{ dB}$ 5 Hz to 20 kHz $\pm 0.008 \text{ dB}$ 5 Hz to 80 kHz $\pm 0.08 \text{ dB}$ THD and THD+N $\leq -108 \text{ dB}$ , typically < $-110 \text{ dB} (at 23 °C \pm 5 °C)^1$ Residual THD + N at 1 kHz, 1 $V_{rms}$ $\leq -100 \text{ dB} (from 0 °C to 55 °C)^1$ Residual THD $< -87 \text{ dB}$ Crosstalk $< -87 \text{ dB}$	Output	
Current limit (typical)     50 mA       Amplitude accuracy at 1 kHz     ±0.09 dB (±1%) (from 0 °C to 55 °C)       Amplitude resolution     1 µ V <sub>rms</sub> (limited to five digits of resolution)       Flatness Ref 1 kHz     ±0.008 dB       5 Hz to 20 kHz     ±0.008 dB       5 Hz to 80 kHz     ±0.08 dB       THD and THD+N     ±0.08 dB, typically < -110 dB (at 23 °C ±5 °C) <sup>1</sup> (20 Hz to 20 kHz bandwidth)     ≤ -108 dB, typically < -110 dB (at 23 °C ±5 °C) <sup>1</sup> Residual THD + N at 1 kHz, 1 V <sub>rms</sub> ≤ -108 dB, typically < -110 dB (at 23 °C ±5 °C) <sup>1</sup> Residual THD     < -87 dB	Range (balanced)	0 to 16 V <sub>rms</sub>
Current limit (typical)     50 mA       Amplitude accuracy at 1 kHz     ±0.09 dB (±1%) (from 0 °C to 55 °C)       Amplitude resolution     1 µ V <sub>rms</sub> (limited to five digits of resolution)       Flatness Ref 1 kHz     ±0.008 dB       5 Hz to 20 kHz     ±0.008 dB       5 Hz to 80 kHz     ±0.08 dB       THD and THD+N     ±0.08 dB, typically < -110 dB (at 23 °C ±5 °C) <sup>1</sup> (20 Hz to 20 kHz bandwidth)     ≤ -108 dB, typically < -110 dB (at 23 °C ±5 °C) <sup>1</sup> Residual THD + N at 1 kHz, 1 V <sub>rms</sub> ≤ -108 dB, typically < -110 dB (at 23 °C ±5 °C) <sup>1</sup> Residual THD     < -87 dB	Range (unbalanced/common)	0 to 8 V <sub>rms</sub>
Amplitude resolution $1 \mu V_{rms}$ (limited to five digits of resolution)Flatness Ref 1 kHz $\pm 0.008 \text{ dB}$ 5 Hz to 20 kHz $\pm 0.008 \text{ dB}$ 5 Hz to 80 kHz $\pm 0.08 \text{ dB}$ THD and THD+N $\pm -108 \text{ dB}$ , typically < $-110 \text{ dB}$ (at 23 °C $\pm 5 \text{ °C}$ ) <sup>1</sup> Residual THD + N at 1 kHz, 1 V <sub>rms</sub> $\leq -108 \text{ dB}$ , typically < $-110 \text{ dB}$ (at 23 °C $\pm 5 \text{ °C}$ ) <sup>1</sup> (20 Hz to 20 kHz bandwidth) $\leq -100 \text{ dB}$ (from 0 °C to 55 °C) <sup>1</sup> Residual THD< -87 \text{ dB}Crosstalk $-87 \text{ dB}$	Current limit (typical)	
International StrengthereFlatness Ref 1 kHz5 Hz to 20 kHz $\pm 0.008  dB$ 5 Hz to 80 kHz $\pm 0.08  dB$ THD and THD+NResidual THD + N at 1 kHz, 1 V <sub>rms</sub> $\leq -108  dB$ , typically < $-110  dB$ (at 23 °C $\pm 5$ °C) <sup>1</sup> (20 Hz to 20 kHz bandwidth) $\leq -100  dB$ (from 0 °C to 55 °C) <sup>1</sup> Residual THD< -87  dB	Amplitude accuracy at 1 kHz	±0.09 dB (±1%) (from 0 °C to 55 °C)
5 Hz to 20 kHz   ±0.008 dB     5 Hz to 80 kHz   ±0.08 dB     THD and THD+N      Residual THD + N at 1 kHz, 1 V <sub>rms</sub> ≤ -108 dB, typically < -110 dB (at 23 °C ±5 °C) <sup>1</sup> (20 Hz to 20 kHz bandwidth)   ≤ -100 dB (from 0 °C to 55 °C) <sup>1</sup> Residual THD   < -87 dB	Amplitude resolution	1 $\mu$ V <sub>rms</sub> (limited to five digits of resolution)
$5 \text{ Hz to } 80 \text{ kHz}$ $\pm 0.08 \text{ dB}$ THD and THD+NResidual THD + N at 1 kHz, 1 V <sub>rms</sub> $\leq -108 \text{ dB}$ , typically < $-110 \text{ dB}$ (at $23 \ ^{\circ}\text{C} \pm 5 \ ^{\circ}\text{C}$ ) <sup>1</sup> $(20 \text{ Hz to } 20 \text{ kHz bandwidth})$ $\leq -100 \text{ dB}$ (from $0 \ ^{\circ}\text{C}$ to $55 \ ^{\circ}\text{C}$ ) <sup>1</sup> Residual THD< -87 \text{ dB}	Flatness Ref 1 kHz	
THD and THD+NResidual THD + N at 1 kHz, 1 $V_{rms}$ $\leq -108  dB$ , typically < $-110  dB$ (at 23 °C ±5 °C) <sup>1</sup> (20 Hz to 20 kHz bandwidth) $\leq -100  dB$ (from 0 °C to 55 °C) <sup>1</sup> Residual THD< -87  dB	5 Hz to 20 kHz	±0.008 dB
Residual THD + N at 1 kHz, 1 V rms $\leq$ -108 dB, typically < -110 dB (at 23 °C ±5 °C)1 $\leq$ -100 dB (from 0 °C to 55 °C)1Residual THD< -87 dB	5 Hz to 80 kHz	±0.08 dB
(20 Hz to 20 kHz bandwidth) ≤ -100 dB (from 0 °C to 55 °C) <sup>1</sup> Residual THD < -87 dB	THD and THD+N	
Crosstalk		
	Residual THD	< -87 dB
	≤ 20 kHz	≤ –130 dB + 0.1 μV

1. Includes contributions from Generator and Analyzer. Individual contributions are typically less than the values stated.

Square	
Frequency range	5 Hz to 30 kHz
Rise time	< 2 µs
Output	
Range (balanced)	0 to 45.2 V <sub>pp</sub>
Range (unbalanced/common)	0 to 22.6 V <sub>pp</sub>
Amplitude accuracy at 1 kHz	± 1%
SMPTE IMD (1:1/4:1/10:1)	
Mixed ratio (LF:HF)	10:1, 4:1, or 1:1
Residual IMD (20 Hz to 20 kHz)	≤ –95 dB (at 23 °C ±5 °C), ≤ –90 dB (from 0 °C to 55 °C)
Sweep	Upper frequency, lower frequency, amplitude
Frequency	
Low frequency (LF) tone	40 Hz to 500 Hz
High frequency (HF) tone	2 kHz to 60 kHz
Output	
Range (balanced)	0 to 16 V <sub>rms</sub>
Range (unbalanced/common)	0 to 8 V <sub>rms</sub>
DFD (IEC 60118/IEC 60268)	
Inherent distortion (20 Hz to 20 kHz)	≤ –106 dB at 1 V <sub>rms</sub>
Sweep	Upper frequency, center frequency, amplitude
Frequency	
Difference frequency	80 Hz to 2 kHz
Upper frequency	3 kHz to 80 kHz
Center frequency	3 kHz to 79 kHz
Output	
Range (balanced)	0 V to 16 V <sub>rms</sub>
Range (unbalanced/common)	0 V to 8 V <sub>rms</sub>
Noise	
Туре	Gaussian, rectangular, pink
Output	
Range (balanced)	0 to 7.2 V <sub>rms</sub> (Gaussian), 0 to 10 V <sub>rms</sub> (Rectangular), 0 to 7.2 V <sub>rms</sub> (Pink)
Range (unbalanced/common)	0 to 3.6 V <sub>rms</sub> (Gaussian), 0 to 5 V <sub>rms</sub> (Rectangular), 0 to 3.6 V <sub>rms</sub> (Pink)
Arbitrary	
Signal	Determined by the user selected file
Sample rate	192 kHz
Length	Up to 5 minutes, depending on waveform file
Multitone	
Signal	Determined by the user specified frequency, amplitude and phase data
Sample rate	192 kHz
Length	1024 to 65536 points/channel
Maximum number of tones	64
WAV file playback	
Type of file	.WAV file
Sample rate	192 kHz
Length	Up to 5 minutes, depending on waveform file

#### DC

DC		
Output		
Range (balanced)	-22.6 V to 22.6 V	
Range (unbalanced/common)	–11.3 V to 11.3 V	
Amplitude accuracy	±1%	
DC offset		
Applicable for all waveform types except	variable phase, DC, and square	
Output level		
Range	–11.3 V to 11.3 V	
Amplitude accuracy <sup>1</sup>	±1.5% (±250 mV to ±11.3 V)	

1. DC output and DC offset output are functional from 0 to ±250 mV. The amplitude accuracy for this range is not warranted.

### Analog analyzer specifications

Input specifications	
Frequency range	10 Hz to 96 kHz
Coupling	DC, AC
Input ranges	320 mV to 140 V <sub>rms</sub> <sup>1</sup> (unbalanced)
	320 mV to 300 V <sub>rms</sub> <sup>1</sup> (balanced)
Measurement range	< 1 $\mu$ V <sup>2</sup> to 300 V <sub>rms</sub>
Maximum rated input	200 Vp for altitude up to 3000 m
Input protection	Overload protection for all ranges, onscreen warning message on the front panel
Connection type	
Balanced	XLR
Unbalanced	BNC
Measurement bandwidth	
Bandwidth	96 kHz
Impedance	
Balanced	300 $\Omega$ (3 W max), 600 $\Omega$ (1.5 W max), 200 k $\Omega$
Unbalanced	300 Ω (3 W max), 600 Ω (1.5 W max), 100 kΩ
CMRR	
≤ 20 kHz (input range ≤ 3.2 V)	≥ 80 dB <sup>3</sup>
≤ 20 kHz (input range > 3.2 V)	≥ 50 dB <sup>3</sup>
Crosstalk	
≤ 20 kHz	$\leq$ -140 dB + 0.1 $\mu$ V

For the available input ranges, refer to the U8903B User Guide.
Defined by the 24-bit measurement.
When AC coupled, CMRR will deteriorate at low frequencies.

THD + N and SINAD	
Display range	-999.999 dB to 0 dB
Accuracy	
< 20 kHz	± 0.5 dB
< 100 kHz	± 0.7 dB
Input voltage range	< 1 µV to 140 V <sub>rms</sub>
3 dB measurement bandwidth	Measurement bandwidth 96 kHz
Detection	RMS
Display resolution	% up to 3 decimal places (dB up to 2 decimal places)
Residual THD + N at 1 kHz, 1 V <sub>rms</sub>	$\leq$ –108 dB, typically <–110 dB (at 23 °C ±5 °C) <sup>4</sup>
(20 Hz to 20 kHz bandwidth)	≤ –100 dB (from 0 °C to 55 °C)
Residual noise 20 Hz to 20 kHz bandwidth	$\leq$ 1.3 $\mu$ V <sub>rms</sub>
SNR	
Display range –999.999 dB to 0 dB	–999.999 dB to 0 dB
Accuracy	
< 20 kHz	± 0.5 dB
< 100 kHz	± 0.7 dB
Input voltage range	< 1 µV to 140 V <sub>rms</sub>
Triggering	
Туре	Free Run, External
Level	5 V
Minimum trigger high voltage	1.25 V
Maximum trigger low voltage	0.5 V
Input impedance	> 10 kΩ
Amplitude	
DC measurement range	0 V to ± 200 V
DC accuracy	±1%
AC accuracy (at 1 kHz)	0.03 dB (0.35%) (at 23 °C ±5 °C)
	0.05 dB (0.58%) (from 0 °C to 55 °C)
Flatness Ref 1 kHz	
≤ 20 kHz	$\pm 0.008 \text{ dB}$ (typically < $\pm 0.003 \text{ dB}$ )
≤ 80 kHz	±0.08 dB
≤ 96 kHz	±0.1 dB
AC level detection	RMS, Peak-to-Peak, Quasi Peak
Frequency	
Range	10 Hz to 96 kHz
Minimum input	1 mV (S/N > 40 dB)
Accuracy	2 ppm +100 μHz (≤ 50 kHz) < 5 ppm (> 50 kHz)
Resolution	6 digits
Phase	
Accuracy	
< 20 kHz	±2°
< 100 kHz	±4°
Minimum input	1 mV (S/N > 40 dB)
Resolution	0.01 °
SMPTE IMD	
Residual IMD	≤ 0.0025% (-92 dB)
Noolaadt IMD	

4. Includes contributions from generator and analyzer. Individual contributions are typically less than the values stated.

### Analog audio filters

Low pass filter	
	2 kHz, 3 kHz, 5 kHz, 8 kHz, 10 kHz, 10 kHz, 20 kHz, 22 kHz, 30 kHz, 40 kHz, 50 kHz, 80 kHz
High pass filter	
	15 Hz, 20 Hz, 22 Hz, 30 Hz, 50 Hz, 70 Hz, 100 Hz, 200 Hz, 300 Hz, 400 Hz
Weight filter	
	A weighting (ANSI-IEC "A" weighted, per IEC Rec 179)
	CCIR 1K weighted (CCIR Rec 468)
	CCIR 2K weighted (Dolby 2K)
	C-Message (C-Message per IEEE743)
	Deemphasis (50 µs, 75 µs)
	CCITT (ITU-T Rec. 041, ITU-T Rec. P.53)
	User-defined <sup>5</sup>

1. User-defined filters can be uploaded through standard I/O connections.

### Graph specs

#### FFT analyzer

Size/ Acquisition length	256, 512, 1024, 2048, 4096, 8192, 16384, 32768, 65536, 131072, 262144, 524288, 1M, 2M
Window	Rectangular, Hanning, Hamming, Blackman-Harris, Rife-Vincent 1 and 3, flat top, Kaiser
Amplitude accuracy (flat top window)	±0.1 dB (±1.2%)

### Sweep

Generator sweep	
Parameters	Frequency, amplitude, phase
Sweep spacing	Linear, logarithmic
Sweep mode	Auto sweep, auto list
Hold	None, max, min

### Audio monitor

U8903A-AUX	
Monitor output	Scaled to give 1 $V_{\rm rms}$ at the top of each analyzer input range
Aux output	0.5 $\rm V_{\rm DC}$ to 5.1 $\rm V_{\rm DC}$ ±5% current limited to 100 mA
Headphone connector	
Recommended headphone	Headphone with 3.5 mm connector

### 1.5 MHz bandwidth (Option N3431A)

10 Hz to 1.5 MHz
2 ppm (> 50 kHz)
1.5 MHz
± 0.1 dB
± 0.5 dB
± 1.0 dB

### POLQA measurement (Option N3432A), licensed by OPTICOM GmbH

Perceptual Objective Listening Quality Assessment (in line with ITU-T Rec. P.863)	
Numeric results	POLQA score MOS-LQO narrowband and wideband average only
Graphic display (versus time)	POLQA score, MOS-LQO, delay, dropouts, reference signal and degraded signal

### PESQ measurement (option N3433A), licensed by OPTICOM GmbH

Perceptual Objective Listening Quality Assessment (in line with ITU-T Rec. P.862, 862.1 and 862.2)		
Numeric results	PESQ score MOS-LQO narrowband and wideband average only	
Graphic display (versus time)	PESQ score, MOS-LQO, delay, dropouts, reference signal and degraded signal	

### Digital generator specifications<sup>1</sup>

Sine, dual sine, and variable phase	
Frequency	
Range	5 Hz to 0.45 sampling rate (Fs)
Accuracy	±10 ppm
Flatness	±0.001 dB
Residual THD + N	≤ -140 dB
Square	
Frequency range	5 Hz to 0.45 Fs
SMPTE IMD (1:1/4:1/10:1)	
Frequency	
Low frequency (LF) tone	40 Hz to 500 Hz
High frequency (HF) tone	2 kHz to 60 kHz, or 0.45 Fs (whichever is lower)
Mixed ratio (LF:HF)	10:1, 4:1, or 1:1
Sweep	Upper frequency, lower frequency, and amplitude
DFD (IEC 60118/IEC 60268)	
Frequency	
Difference frequency	80 Hz to 2 kHz
Upper frequency	3 kHz to 80 kHz, or 0.45 Fs (whichever is lower)
Center frequency	3 kHz to 79 kHz, or 0.45 Fs (whichever is lower)
Sweep	Upper frequency, lower frequency, and amplitude
Noise	
Туре	Rectangular, Gaussian, Triangular, and Pink
Amplitude	0 to 1 FFS
Arbitrary	
Signal	Determined by the user selected file
File format	WAVE (.wav)
Maximum file size	5.0 MB
File resolution	8, 16, or 24 bits
Frequency range	2 Hz to 0.45 Fs
Multitone	2 112 10 0.43 1 3
Signal	Determined by the user specified frequency, amplitude, and phase data
Frequency rate	2 Hz to 0.45 Fs
Maximum number of tones	64
Sine burst	04
Period	2 cycles to 65535 cycles
_	1 cycles to (65534 or period – 1, whichever is lower)
Burst on Burst on to burst off ratio	0 to 100%
Monotonicity	1 . 00700
Samples/step	1 to 32768
Walking one and walking zero	
Samples/step	1 to 65535
Constant value	
Amplitude	-1 FFS to 1 FFS
DC offset	
DC offset	-1 FFS to 1 FFS
Dither	
Distribution	None, triangular, or rectangular
Level	0.5 LSB

1. Digital generator specifications refer to 24 bits FFS.

Validity flag

### AES3/SPDIF interface specifications

Output specifications	
Output connector type	
Balanced	XLR (transformer coupling)
Unbalanced	BNC (grounded)
Optical	TOSLINK connector
Output impedance	
Balanced	110 Ω
Unbalanced	75 Ω
Output level	
Balanced	0.3 V <sub>pp</sub> to 5.1 V <sub>pp</sub>
Unbalanced	0.3 V <sub>pp</sub> to 2.5 V <sub>pp</sub>
Sampling rate	28 kHz to 192 kHz
Sampling rate accuracy	±5 ppm
Output level accuracy	±1 dB (typical), ±1.5 dB
Audio bit	8 bits to 24 bits
Inherent jitter (typical)	
Balanced	≤ 1.5 ns
Unbalanced	≤ 1.5 ns
Optical	≤ 5 ns
Clock and sync	
Internal master clock	
Maximum clock rate	192 kHz
Accuracy	±5 ppm
Inherent jitter	≤ 1 ns
Sync clock output	
Connector type	25-pin male D-SUB connector pin-1
Impedance	50 Ω
Output level	3.3 V (LVCMOS IO standard)
Polarity	Normal or invert
Output type	Bit clock (128 Fs)
Protocol	
Channel status bits	Professional or consumer (all applicable bits are editable for advanced settings)
Format	Professional or consumer
User bits	Set or cleared
-	

Set or cleared

### DSI specifications

Output specifications	
Output connector type	25-pin male D-SUB connector 25-pin female D-SUB to BNC connector (optional accessories)
Output impedance	50 Ω
Logic level	1.2 V, 1.5 V, 1.8 V, 2.5 V, 3.3 V, or user-defined (LVCMOS standard)
Sampling rate	6.75 kHz to 400 kHz
Sampling rate accuracy	±5 ppm
Master-clock	
Multiplier	64 to 1024 (depends on the Word Length)
Maximum frequency	51.2 MHz
Maximum bit clock	51.2 MHz
Maximum sampling rate	400 kHz
Data format	Left Justified, Right Justified, I <sup>2</sup> S, or DSP
Word length	8 bits to 32 bits per channel
Audio bit	8 bits to 24 bits (step by 1 bit)
Word clock rate	6.75 kHz to 400 kHz
Clock and sync	
Internal master clock	
Maximum clock rate	10 MHz
Accuracy	±5 ppm
Inherent jitter	≤ 1 ns
Clock source setting (analyzer and generator)	
	Incoming bit clock from DUT
	Internal clock
	External clock from external sync clock input
DSI clock output	
Impedance	10 kΩ typical
Output level	1.2 V <sub>pp</sub> to 3.3 V <sub>pp</sub>
Polarity	Normal or invert
Word clock polarity	Leading edge or falling edge (with respect to bit clock)

## Digital analyzer specifications

Amplitude	
AC level range	< -120 dBFS to 0 dBFS
DC level range	±1 FFS
AC accuracy	±0.001 dB (at 1 kHz)
DC accuracy	±0.001 dB
AC flatness	±0.001 dB (10 Hz to 0.45 Fs)
Unit (reference)	FFS, %FS, V, dBFS, LSB, dBr, dBu, dBV, Hex, Dec, and x
Frequency	
Range	5 Hz to 0.45 Fs
Accuracy	±5 ppm (10 Hz to 0.45 Fs)
Phase	
Accuracy	±0.005 °
Resolution	±0.001 °
THD+N	
Range	10 Hz to 0.45 Fs
Accuracy	±0.3 dB
Residual distortion	≤ -140 dB
IMD	
SMPTE IMD	1:1/4:1/10:1
High frequency	2 kHz to 60 kHz, or 0.45 Fs (whichever is lower)
Low frequency	40 Hz to 500 Hz
Accuracy	±0.5 dB
DFD	
Frequency difference	80 Hz to 2 kHz
Center frequency	3 kHz to 79 kHz, or 0.45 Fs (whichever is lower)
Accuracy	±0.5 dB

### AES3/SPDIF interface specifications

Input specifications	
Input connector type	
Balanced	XLR (transformer coupling)
Unbalanced	BNC (grounded)
Optical	TOSLINK connector
Input impedance	
Balanced	110 Ω or high impedance (> 2 kΩ)
Unbalanced	75 Ω or high impedance (20 kΩ typical)
Input level	
Balanced	0.3 Vpp to 5.1 Vpp
Unbalanced	0.3 Vpp to 2.5 Vpp
Sampling rate	28 kHz to 192 kHz
Sampling rate accuracy	±5 ppm
Output level accuracy	±1 dB (typical), ±1.5 dB
Audio bit	8 bits to 24 bits
Inherent jitter (typical)	
Balanced	≤ 1.5 ns
Unbalanced	≤ 1.5 ns
Optical	≤ 5 ns
Clock and sync	
Internal master clock	
Maximum clock rate	192 kHz
Accuracy	±5 ppm
Inherent jitter	≤1 ns
Sync clock input	
Connector type	BNC (SYNC IN on the rear panel)
Impedance	10 kΩ
Polarity	Normal or invert
Protocol	
Channel status bits	Professional or consumer (all applicable bits are editable for advanced settings)
Format	Professional or consumer
User bits	Set or cleared
Validity flag	Set or cleared

### DSI specifications

Input specifications	
Input connector type	25-pin male D-SUB connector
	25-pin female D-SUB to BNC connector (optional accessories)
Input impedance	≥ 10 kΩ
Logic level	1.2 V, 1.5 V, 1.8 V, 2.5 V, 3.3 V, or user-defined (LVCMOS standard)
Sampling rate	6.75 kHz to 400 kHz
Sampling rate accuracy	±5 ppm
Master-clock	
Multiplier	64 to 1024 (depends on the Word Length)
Maximum frequency	51.2 MHz
Maximum bit clock	51.2 MHz
Maximum sampling rate	400 kHz
Data format	Left Justified, Right Justified, I2S, or DSP
Word length	8 bits to 32 bits per channel
Audio bit	8 bits to 24 bits (step by 1 bit)
Word clock rate	6.75 kHz to 400 kHz
Clock and sync	
Internal master clock	
Maximum clock rate	10 MHz
Accuracy	±5 ppm
Inherent jitter	≤ 1 ns
Clock source setting (analyzer and generator)	
	Incoming bit clock from DUT
	Internal clock
	External clock from external sync clock input
DSI clock input	
Impedance	10 kΩ typical
Output level	1.2 V <sub>pp</sub> to 3.3 V <sub>pp</sub>
Polarity	Normal or invert
Word clock polarity	Leading edge or falling edge (with respect to bit clock)

## Ordering Information

LSB cables     USB cables       Power cord     Keysight U8903B audio analyzer product reference CD-ROM       Certificate of calibration     Certificate of calibration       Resurement channel options     Analog analyzer, 4 channels       18903B-AN8     Analog analyzer, 8 channels       18903B-DGT     Digital audio card       tundling options     Performance audio analyzer with 4 analog analyzer channel, digital audio (AES3/SPDIF and DSI digital audio)       19903B-201     Performance audio analyzer with 4 analog analyzer channel, digital audio (AES3/SPDIF and DSI digital audio)       19903B-201     Performance audio analyzer with 4 analog analyzer channel, digital audio (AES3/SPDIF and DSI digital audio)       19903B-201     Performance audio analyzer with 4 analog analyzer channel, digital audio (AES3/SPDIF and DSI digital audio)       19903B-201     Ver monitor outputs and one auxiliary output (DC)       19903B-30X     Wide bandwidth option -1.5 MHz (fixed perpetual license)       13431A     Wide bandwidth option -1.5 MHz (fixed perpetual license)       13435A     POLQA and PESQ measurement software (fixed perpetual license)       13435A     AES3/SPDIF and DSI digital audio (fixed perpetual license)       13435A     AES3/SPDIF and DSI digital audio (fixed perpetual license)       13435A     DSI digi	Product model	Description
Power cord       Keysight U8903B audio analyzer product reference CD-ROM       Certificate of calibration       feasurement channel options       18903B-AN4     Analog analyzer, 4 channels       18903B-AN8     Analog analyzer, 8 channels       18903B-AN8     Analog analyzer, 8 channels       18903B-DGT     Digital audio card       fundling options     Used analyzer with 4 analog analyzer channel, digital audio       (AES3/SPDIF and DSI digital audio)     (AES3/SPDIF and DSI digital audio)       fptional hardware     Used analyzer on unput on the auxiliary output (DC)       uptional software     Used analyzer (fixed perpetual license)       13431A     Wide bandwidth option -1.5 MHz (fixed perpetual license)       13432A     POLQA and PESQ measurement software (fixed perpetual license)       13433A     POLQA and PESQ measurement software (fixed perpetual license)       13434A     AES3/SPDIF and DSI digital audio (fixed perpetual license)       13435A     DSI digital audio (fixed perpetual license)       13436A	U8903B-STD	Performance audio analyzer, 2 channels
Keysight U8903B audio analyzer product reference CD-ROM       Certificate of calibration       Reasurement channel options       18903B-AN4     Analog analyzer, 4 channels       18903B-AN8     Analog analyzer, 8 channels       18903B-DGT     Digital audio card       tundling options     Understand       18903B-201     Performance audio analyzer with 4 analog analyzer channel, digital audio (AES3/SPDIF and DSI digital audio)       1903B-201     Performance audio analyzer with 4 analog analyzer channel, digital audio (AES3/SPDIF and DSI digital audio)       1903B-AUX     Two monitor outputs and one auxiliary output (DC)       1910Bat Software     Unde bandwidth option -1.5 MHz (fixed perpetual license)       12343A     POLQA and PESQ measurement software (fixed perpetual license)       12343A     POLQA and PESQ measurement software (fixed perpetual license)       12343A     POLQA and PESQ measurement software (fixed perpetual license)       12343A     POLQA and PESQ measurement software (fixed perpetual license)       12343A     POLQA and PESQ measurement software (fixed perpetual license)       12343A     POLQA and PESQ measurement software (fixed perpetual license)       12343A     POLQA measurement software (fixed perpetual license)       12343A     DSI	Standard shipped accessories	USB cables
Certificate of calibration       Reasurement channel options       18903B-AN4     Analog analyzer, 4 channels       18903B-AN8     Analog analyzer, 8 channels       18903B-AN8     Analog analyzer, 8 channels       18903B-AN8     Analog analyzer, 8 channels       18903B-DGT     Digital audio card       undling options     (AES3/SPDIF and DSI digital audio)       18903B-201     Performance audio analyzer with 4 analog analyzer channel, digital audio (AES3/SPDIF and DSI digital audio)       19803B-AUX     Two monitor outputs and one auxiliary output (DC)       1910anl software     113431A       193431A     Wide bandwidth option -1.5 MHz (fixed perpetual license)       193432A     POLQA measurement software (fixed perpetual license)       193433A     POLQA and PESQ measurement software (fixed perpetual license)       193434A     AES3/SPDIF and DSI digital audio (fixed perpetual license)       193435A     AES3/SPDIF digital audio (fixed perpetual license)       193436A     DSI digital audio (fixed perpetual license)       193436A     DSI digital audio (fixed perpetual license)       19403A-101     Male BNC to male BNC cable; 1.2 m       19803A-102     Male BNC to male RCA cable, 2 m <tr< td=""><td></td><td>Power cord</td></tr<>		Power cord
Heasurement channel options       18903B-AN4     Analog analyzer, 4 channels       18903B-AN8     Analog analyzer, 8 channels       18903B-DGT     Digital audio card       tundling options     Itel audio card       18903B-201     Performance audio analyzer with 4 analog analyzer channel, digital audio (AES3/SPDIF and DSI digital audio)       19tional hardware     Itel audio card       18903B-AUX     Two monitor outputs and one auxiliary output (DC)       19tional software     Itel bandwidth option -1.5 MHz (fixed perpetual license)       13431A     Wide bandwidth option -1.5 MHz (fixed perpetual license)       13433A     POLQA and PESQ measurement software (fixed perpetual license)       13434A     AES3/SPDIF and DSI digital audio (fixed perpetual license)       13435A     POLQA and PESQ measurement software (fixed perpetual license)       13435A     AES3/SPDIF digital audio (fixed perpetual license)       13435A     AES3/SPDIF digital audio (fixed perpetual license)       13436A     DSI digital audio (fixed perpetual license)       19403A-101     Male BNC to male BNC cable; 1.2 m       18903A-102     Male BNC to male RCA cable; 2 m       18903A-103     Male XLR to female XLR cable; 2 m       18903A-		Keysight U8903B audio analyzer product reference CD-ROM
IBB03B-AN4Analog analyzer, 4 channelsIBB03B-AN8Analog analyzer, 8 channelsIBB03B-DGTDigital audio cardItandling optionsPerformance audio analyzer with 4 analog analyzer channel, digital audio (AES3/SPDIF and DSI digital audio)IPbional hardwareIBB03B-AUXIVB03B-AUXTwo monitor outputs and one auxiliary output (DC)IVbional softwareIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII		Certificate of calibration
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I3433APOLQA and PESQ measurement software (fixed perpetual license)I3434AAES3/SPDIF and DSI digital audio (fixed perpetual license)I3435AAES3/SPDIF digital audio (fixed perpetual license)I3436ADSI digital audio (fixed perpetual license)I8903A-102Male BNC to male BNC cable; 2 mI8903A-103Male XLR to female XLR cable; 2 mI8903A-105Cable, accessory - Male XLR-2 male BNC analyzer, 0.26 mI8903A-108Cable, accessory - Female XLR-2 male BNC generator, 0.26 mI8903A-109BNC accessory kit	N3431A	Wide bandwidth option –1.5 MHz (fixed perpetual license)
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Image: Pittonal accessories18903A-101Male BNC to male BNC cable; 1.2 m18903A-102Male BNC to male RCA cable, 2 m18903A-103Male XLR to female XLR cable; 2 m18903A-908Rackmount kit18903B-105Cable, digital serial interface18903A-107Cable, accessory - Male XLR-2 male BNC analyzer, 0.26 m18903A-108Cable, accessory - Female XLR-2 male BNC generator, 0.26 m18903A-109BNC accessory kit	N3435A	AES3/SPDIF digital audio (fixed perpetual license)
Nale BNC to male BNC cable; 1.2 m18903A-101Male BNC to male BNC cable; 1.2 m18903A-102Male BNC to male RCA cable, 2 m18903A-103Male XLR to female XLR cable; 2 m18903A-908Rackmount kit18903B-105Cable, digital serial interface18903A-107Cable, accessory - Male XLR-2 male BNC analyzer, 0.26 m18903A-108Cable, accessory - Female XLR-2 male BNC generator, 0.26 m18903A-109BNC accessory kit	N3436A	DSI digital audio (fixed perpetual license)
Nale BNC to male RCA cable, 2 m18903A-103Male XLR to female XLR cable; 2 m18903A-908Rackmount kit18903B-105Cable, digital serial interface18903A-107Cable, accessory - Male XLR-2 male BNC analyzer, 0.26 m18903A-108Cable, accessory - Female XLR-2 male BNC generator, 0.26 m18903A-109BNC accessory kit	Optional accessories	
Nale XLR to female XLR cable; 2 m18903A-103Male XLR to female XLR cable; 2 m18903A-908Rackmount kit18903B-105Cable, digital serial interface18903A-107Cable, accessory - Male XLR-2 male BNC analyzer, 0.26 m18903A-108Cable, accessory - Female XLR-2 male BNC generator, 0.26 m18903A-109BNC accessory kit	U8903A-101	Male BNC to male BNC cable; 1.2 m
18903A-908Rackmount kit18903B-105Cable, digital serial interface18903A-107Cable, accessory - Male XLR-2 male BNC analyzer, 0.26 m18903A-108Cable, accessory - Female XLR-2 male BNC generator, 0.26 m18903A-109BNC accessory kit	U8903A-102	Male BNC to male RCA cable, 2 m
18903B-105Cable, digital serial interface18903A-107Cable, accessory - Male XLR-2 male BNC analyzer, 0.26 m18903A-108Cable, accessory - Female XLR-2 male BNC generator, 0.26 m18903A-109BNC accessory kit	U8903A-103	Male XLR to female XLR cable; 2 m
I8903A-107Cable, accessory - Male XLR-2 male BNC analyzer, 0.26 mI8903A-108Cable, accessory - Female XLR-2 male BNC generator, 0.26 mI8903A-109BNC accessory kit	U8903A-908	Rackmount kit
18903A-108Cable, accessory - Female XLR-2 male BNC generator, 0.26 m18903A-109BNC accessory kit	U8903B-105	Cable, digital serial interface
18903A-109 BNC accessory kit	U8903A-107	Cable, accessory - Male XLR-2 male BNC analyzer, 0.26 m
	U8903A-108	Cable, accessory - Female XLR-2 male BNC generator, 0.26 m
Varranty and services	U8903A-109	BNC accessory kit
	Warranty and services	
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