

# WJ5900A

WaveJudge wireless analyzer

## Introduction

The Keysight WJ5900A WaveJudge Wireless Analyzer is a unique solution for passive signal capture and analysis. Offering a channel bandwidth up to 800 MHz per RF port with 2 to 8 RF ports per chassis, it is the ideal tool for debugging and troubleshooting in during the development phase of any wireless technology such as 4G, 5G, WLAN, or V2X.



# Definitions and Conditions

The test set will meet its specifications when:

- The test set has been stored at an ambient temperature within the allowed operating range for at least two hours before being turned on, if it had previously been stored at a temperature range inside the allowed storage range, but outside the allowed operating range.
- The test set has been turned on for at least 30 minutes.

## Specifications

Specifications describe the performance parameters covered by the product warranty and are valid from 20 to 35 °C unless otherwise noted.

## Typical

Typical describes additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 95 percent of the units exhibit with a 95 percent confidence level. This data, shown in *Italics*, does not include measurement uncertainty, and is valid only at room temperature, 23 °C.

## Nominal

Nominal values indicate expected performance or describe product performance that is useful in the application of the product but are not covered by the product warranty.

# General Specifications

This document describes the performance parameters and the main specifications of the WJ5900A WaveJudge 5G real-time wireless analyzer. First, the general features are described, and then specifications are provided for the instrument and each module.

## Key features

- Unique solution for passive signal capture and analysis
- 5G NR real-time decoding
- 3GPP 5G NR Releases 15 to 17, including 5G NR NTN, RedCap, and V2X
- 3GPP LTE Releases 9 to 16
- IEEE Wi-Fi 802.11ax and 802.11be
- SSD storage for long IQ captures to troubleshoot intermittent issues
- Superior EVM and decoding performance
- Scalable ports per chassis: 2, 4, 6 or 8
- Channel bandwidth up to 800 MHz
- Single RF module covering FR1 and FR2 bands, with mmWave module for frequency conversion up to 42.5 GHz
- Unlimited time analysis for 5G
- Streaming analytics and charting
- Advanced triggers, stack breakpoints
- Expanded filtering and visualizations

## Modulation formats

- QFDMA/SC-FDMA with BPSK
- QPSK
- 16QAM
- 64QAM
- 256QAM
- 1024QAM
- 4096QAM
- Zadoff-Chu

## Traces

- Constellation
- 2D physical
- Time domain power
- EVM vs. subcarrier
- EVM vs. symbol time
- MIMO rank per subcarrier
- MIMO rank per symbol
- Spectral flatness (frequency domain)
- Amplitude flatness (time domain)
- CCDF, PAPR
- Spectral power
- Amplitude, phase, frequency during synchronization signal
- Impulse response

## Statistics (partial)

- EVM
- Peak EVM
- Reference signal EVM
- Carrier and sampling clock frequency error
- IQ offset
- CFI error rate
- Payload bits
- RSSI, RSRP, RSRQ
- MCS
- N resources
- Modulation type

# Instrument Specifications

The following tables describe the characteristics and specifications for the instrument including the chassis.

Description	Specification
Input voltage and frequency	100/120/220/240 V AC, 50/60 Hz, nominal
Input power consumption (fully-loaded configuration)	1100 W
Chassis dimensions (H x W x L)	94.2 x 425.2 x 518.5 mm (3.7 x 16.7 x 20.4 inches)
Weight	10 kg (22.05 lbs)
Operating temperature	20 to 35 °C, 30 g/m <sup>3</sup> absolute humidity, 5 to 85 % non-condensing relative humidity
Storage temperature	-40 to 7 °C, 50 g/m <sup>3</sup> absolute humidity, 5 to 85 % non-condensing relative humidity
Altitude	≤ 2000 m
EMC	CISPR Pub 11 Group 1, class A AS/NZS CISPR 11 ICES/NMB-001. This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.
Mechanical resistance	EN60068-2-6, EN60068-2-27, EN60068-2-64
Safety	Complies with European Low Voltage Directive 2006/95/EC
	IEC/EN 61010-1, 3 <sup>rd</sup> edition
	Canada: CAN/CSA C22.2 No. 61010-1012
	USA: UL std no. 61010-1, 3 <sup>rd</sup> edition
	Acoustic statement (European Machinery Directive 2002/42/EC, 1.7.4.2u)
	Acoustic noise emission, LpA < 70 dB, Operator position, Normal operation mode, Per ISO 7779
Standard warranty	One year (extensions are available)

Connectors and interfaces	Description	Specification
WAN (Wide Area Network) port		1 GB Ethernet
LAN (Local Area Network) ports		1 GB Ethernet
Rear panel GPS ANT input	Connector type	MCX
	Maximum input power	15 dBm
	Maximum antenna bias voltage/current	6 V / 100 mA
	Active antenna minimum gain	15 dB
	Active antenna maximum gain	50 dB
	Active antenna maximum noise figure	1.5 dB

# WJ5900A-RA1 RXJudge RF Receiver Module Specifications

The following tables describe the characteristics and specifications of one RXJudge RF receiver module in the chassis.

General	Specification
Receive modules per chassis	1 or 2
RF input ports	1, 2, 3 or 4

Amplitude	Specification
Variable attenuator	65 dB
Attenuator step size	1 dB
Measurement range	$\leq 5$ dBm RF input power
Absolute maximum RF input	$\leq 15$ dBm
Absolute amplitude accuracy	$< \pm 2.5$ dB $< \pm 1.5$ dB, nominal
Relative amplitude accuracy for adjacent tones 1.44 MHz apart	$< \pm 0.2$ dB

Frequency	Description	Specification	
Synthesizer output	Center frequency range	500 MHz to 8 GHz	
	Center frequency resolution	0.03 Hz	
	Spectral purity/single sideband phase noise	See Figure 2 for <i>typical noise at 4 GHz</i>	
Reference frequency output	98.304 MHz OCXO	External reference input (optional)	10 MHz or 100 MHz
		Temperature stability $\Delta F/F$ , with reference to 25 °C	$\pm 20$ ppb
		Aging per year	$\pm 200$ ppb

RF measurement performance	Description	Specification
<i>Typical 100 MHz channel performance</i>	Measured EVM noise level	0.3 to 1 % (see Figure 1)
	Actual noise floor	-90 to -88 dBm
	Theoretical noise floor	-94 dBm
	Noise figure (Atten = 0)	4 to 6 dB

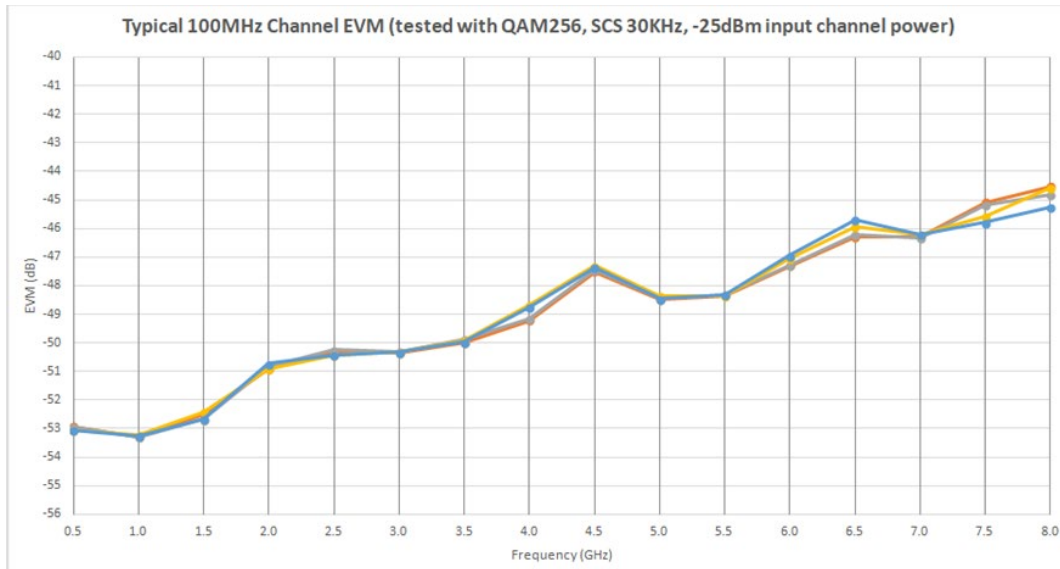


Figure 1. Measured EVM noise level graph

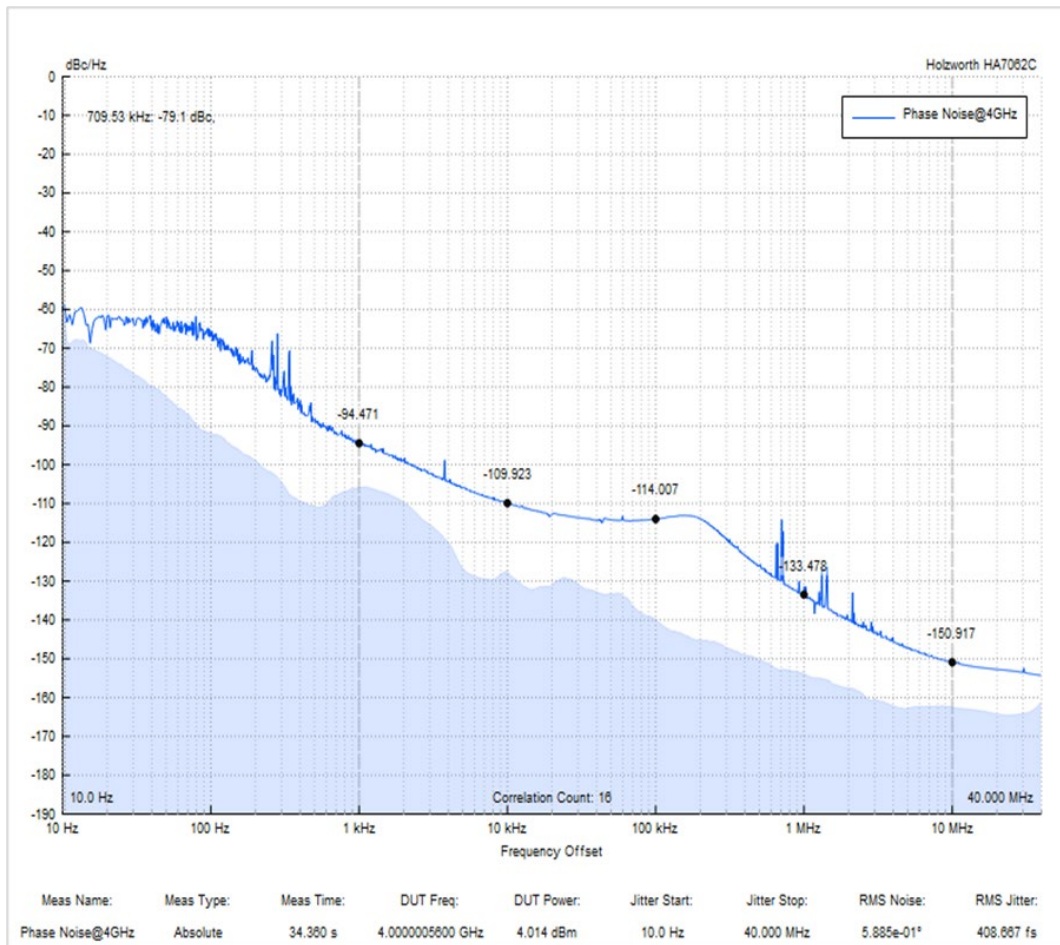


Figure 2. Graph of typical phase noise at 4 GHz

Sampling system	Specification
A/D bits	16 bits
A/D clock	983.04 MHz
Sample frequency accuracy	< ±2 Hz

Input center carrier / LO frequency	Input channel bandwidth
500 to 600 MHz	100 MHz
600 to 1310 MHz	200 MHz
1310 to 2000 MHz	400 MHz
2000 to 8000 MHz	800 MHz

Non-real-time capture analysis depth	Configuration	Specification
4 port configuration	4 port x 800 MHz/port	0.546 second/port
	4 port x 400 MHz/port	1.092 second/port
	4 port x 200 MHz/port	2.184 second/port
	4 port x 100 MHz/port	4.368 second/port
2 port configuration	2 port x 800 MHz/port	1.092 second/port
	2 port x 400 MHz/port	2.184 second/port
	2 port x 200 MHz/port	4.368 second/port
	2 port x 100 MHz/port	8.736 second/port



Front panel connectors	Description	Specification
RF In 1 to 4	Connector	2.92 mm receptacle
	Impedance	50 ohms
	Coupling	AC
	Input	≤ 5 dBm
Ref Clk input	Connector	SMA receptacle
	Impedance	290 ohms
	Coupling	DC
	Maximum $V_{pp}$	1800 mV
	Minimum $V_{pp}$	800 mV
Trig In	Connector	SMA receptacle
	Impedance	High impedance
	Coupling	DC
	Max $V_{pp}$	1800 mV
	Min $V_{pp}$	0 mV
	Trigger level	800 mV
Aux Out	Connector	SMA receptacle
	High level out	2.6 $V_{min}$
	Low level out	0.4 $V_{max}$
	Drive strength	12 mA
LED indicators	Lock (top)	Indicates RF LO locked
	Lock (bottom)	Indicates sampling system locked
	mmWave1	Indicates mmWave RRH detected
	mmWave2	Indicates mmWave RRH detected
	Err	Indicates hardware failure
	Ext Ref	Indicates lock to external reference
	Prog Mezz	Mezzanine card detected and running
RF – 1 to 4 outputs	Digital baseband output	50 Gbps throughput

Rear panel connector	Description	Specification
GPS ANT input	Connector	2.92 mm receptacle
	Impedance	50 ohms
	Coupling	AC
	Max $V_{pp}$	1400 mV
	Min $V_{pp}$	800 mV

# WJ5900A-DA1 IntelliJudge Module Specifications

The following tables describe the characteristics and specifications of one IntelliJudge module in the chassis.

General characteristics	Specification
DSP	8 core DSP at 1.25 GHz
SDRAM (DSP)	4 GB
FPGA	Xilinx XCKU115
SDRAM (FPGA)	8 GB
SSD	3.6 TB

Front panel connectors	Description	Specification
SRIO – 1 to 2		6 GHz x 4 lane = 20 Gbps
RF – 1 to 4	Digital baseband input	50 Gbps

# Simplify Troubleshooting of RF and Signaling Issues

Keyight's WJ5900A WaveJudge Wireless Analyzer makes resolving RF and signaling issues easy.

- Unique solution for passive signal capture and analysis
- Real-time decoding of 5G NR signals
- FR1 and FR2 with channel bandwidth up to 800 MHz
- Scalable ports per chassis

For more information, visit the following links.

[WJ5900A WaveJudge Wireless Analyzer](#)

[SJ001A WaveJudge Wireless Analyzer Toolset](#)

[WJ001000A WaveJudge Wireless Analyzer software](#)

[WJ1000A mmWaveJudge Remote Receiver](#) (for extension to FR2)

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