WJ5000A WaveJudge 5000

This document describes the performance parameters and the main specifications of the WJ5000A WaveJudge 5000. First, the general specifications are described, and then more details are provided for each module.

Specifications

- Scalable architecture allowing up to 256 modules
- Flexibility of modules include RF, Synth, DSP, and SSD memory
- RF wideband support 380 MHz up to to 11.4 GHz up to 800 MHz BW
- mmWave module for FR2 frequency conversion (up to 42.5 GHz)
- Wide dynamic range supports use in the lab and in the field
- Coherent RF ports up to 16 per set
- Support for all transmission modes up to 8 layers
- CA (×8) support with up to 800 MHz channels
- Real-time streaming analysis of unlimited UEs for any length of time
- IQ storage in expandable SSD for minutes or hours
- Close-in phase noise

WJ5000A WaveJudge 5000 Analysis

Modulation formats

- OFDMA/SC-FDMA with BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM, 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)

KEYSIGHT TECHNOLOGIES

- Amplitude Flatness (Time Domain)
- CCDF, PAPR
- Spectral Power
- Amplitude, Phase, Frequency during synchronization signal
- Impulse Response

Statistics (partial)

- EVM
- EVM Peak
- Reference signal EVM
- Carrier and Sampling Clock Frequency Error
- IQ Offset
- CFI Error Rate
- Payload Bits
- RSSI, RSRP, RSRQ
- MCS
- N Resources
- Modulation type

Protocol analyzer decodes

- MAC
- RLC
- PDCP
- RRC
- NAS
- TCP/IP (WireShark supported decodes available)

WJ5000A WaveJudge 5000 chasis

- Operating Temperature Range: 0°C to +55°C
- Storage Temperature Range: -40°C to +80°C
- Dimensions: 16.75" width × 1.72" height × 12" depth
- Power, Converter to Chassis: 12 V, 15 A
- Power, AC to Converter: 110 to 240 V, 2.5 A, 50 to 60 Hz

Mobility and MIMO

- No. of Ports per Chassis: 8
- No. of Synthesizers per Chassis: 2

Inputs and Outputs

- 1 Gb Ethernet – 20 Gb SRIO
- GPS, ANT IN, PPS IN, PPS OUT (SMA)
- Power Jack

StoraJudge memory module

- SSD-based 1TB per module

IntelliJudge2 Analysis Module

Dual TMS320C6670 multi-core DSPs

- 4 GB DDR3 SDRAM per Module
- Gen2 SRIO 8 port switch
- Per DSP SRIO 1 port @ 5 GHz = 16 Gbps
- Backplane SRIO 3 ports @ 6 GHz = 60 Gbps
- Front plane SRIO 1 Port @ 6 GHz = 20 Gbps
- Front Panel SFP support for Gigabit Ethernet PHY
- Charts
- EVM
- Power
- CRC
- Throughput
- TB Count
- SINR, RSSI, RSRP, RSRQ
- 2D Physical
- RNTI

RXJudge RF module

General Specifications

- No. of Receiver Modules per chassis: 2
- No. of RX per Module: 4

Amplitude Specifications

- Variable Attenuator: 0 to 60 dB in 2 dB Steps
- Variable Gain Ex. at 2 GHz: -35 to +25 dB
- Measurement Range: DANL to Maximum

Input Level

- Maximum Input Level: +22 dBm
- DANL – 1024 pts, 10 MHz channel BW (~15 kHz RBW) Normalized to 1 Hz, -172 dBm
- Absolute Amplitude Accuracy: ±2.5 dB
- Relative Amplitude Accuracy: (adjacent tones ~11 kHz) ±0.2 dB

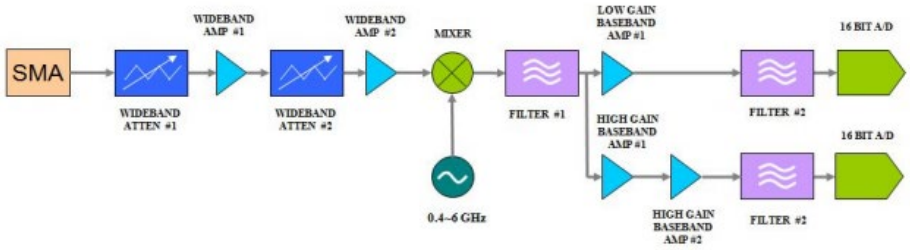
Sampling System

- A/D Bits: 16 bits
- A/D Clock (Sampling Frequency) ~90 MHz
- 2nd Harmonic Distortion: -70 dBc
- 3rd Harmonic Distortion: -70 dBc
- Two Tone intermodulation: -80 dBc
- Sample Frequency Set (Fs): 1 to 45 MHz (optimized for channel BW)
- Sample Frequency Set Accuracy: 10 Hz

Inputs

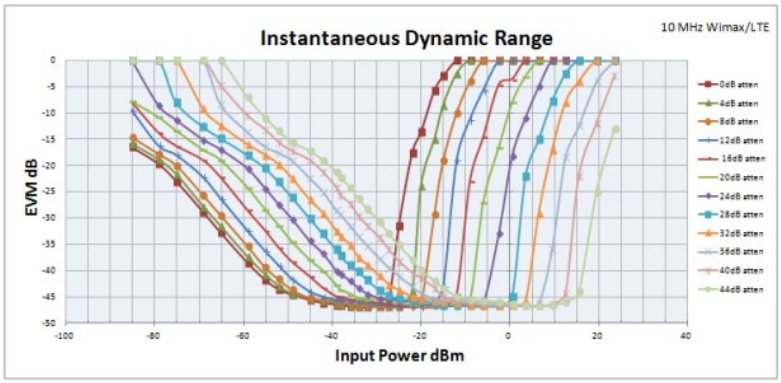
- Receive RX 1: MCX female, 50 Ohm
- Receive RX 2: MCX female, 50 Ohm
- Receive RX 3: MCX female, 50 Ohm
- Receive RX 4: MCX female, 50 Ohm

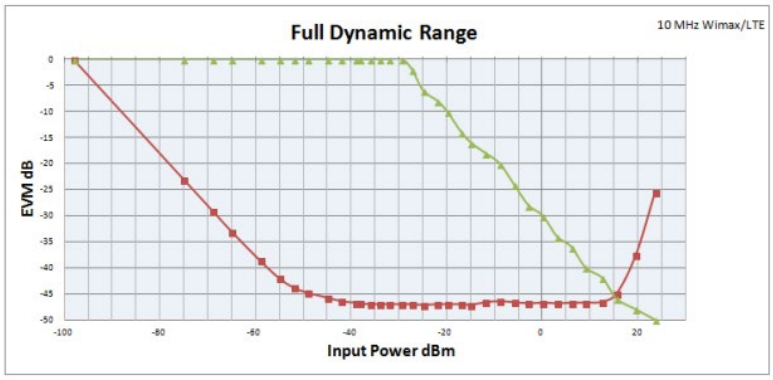
Frequency specifications			
General	Synthesizer	Frequency Range	.38 to 6GHz
		Center Frequency Resolution	1Hz
	Spectral Purity, Single Sideband Phase Noise (normalized to 2GHz)	1 kHz offset	-92 dBc/Hz
		10 kHz offset	-103 dBc/Hz
		100 kHz offset	-108 dBc/Hz
		1 MHz offset	-115 dBc/Hz
Reference Frequency	100 MHz OCXO	External Input (optional)	10 MHz MCX, AC coupled, 50ohm Terminated, Level: 0.8V – 3.3Vp-p (max)
		Source	100 MHz OCXO
		Frequency Stability (0ºC to +50ºC)	+/- 50 ppb
		Aging per year	+/- 500 ppb
		Aging over 10 years	+/- 3 ppm
Aux Inputs	Synth Front Panel Trigger In	Connector Type	MCX
		Input Range	0 to 4 Volts
		Input Impedance	10K Ohms
		Minimum Trigger	2 Volts Rising Edge
		Protection	Diode Clamped
	Chassis Back Panel GPS In	Connector Type	SMA, Older models have SMB
		Input Range	0 – 5 Volts
		Input Current	0.1 uAmps
		Input High Level	1.2 Volts
		Input Low Level	0.9 Volts



Receiver block diagram

Measured performance		
10 MHz Channel Parameter	Measured EVM Noise Level	-98.1 dBm
	PHY Estimator Noise	2 dB
	Actual Noise Floor	-100.1 dBm
	Theoretical Noise Floor	-104 dBm
	Noise Figure (Atten = 0)	3.9 dB





SynthJudge 2-OCXO module

Carrier Frequency

- Frequency Range: 380 MHz to 6 GHz
- Center Frequency Set Resolution: 4 Hz
- Frequency Calibration Accuracy: 1 ppm ±4 Hz

Reference Frequency Source

- 100 MHz OCXO
- 10 MHz Ref Input, MCX
- Internal GPS, External 1pps
- Another WJ5000A WaveJudge 5000

OCXO

- Aging per year: ±500 ppb
- Aging over 10 years: ±3 ppm
- Temperature stability (0°C to +50°C): ±50 ppb
- Calibration accuracy: ±1 ppm
- Accuracy: ± (time since last adjust × aging rate) + temperature stability + calibration accuracy

Sideband Phase Noise (normalized to 2 GHz)

- 1 kHz offset: -96 dBc/Hz
- 10 kHz offset: -106 dBc/Hz
- 100 kHz offset: -111 dBc/Hz
- 1 MHz offset: -121 dBc/Hz

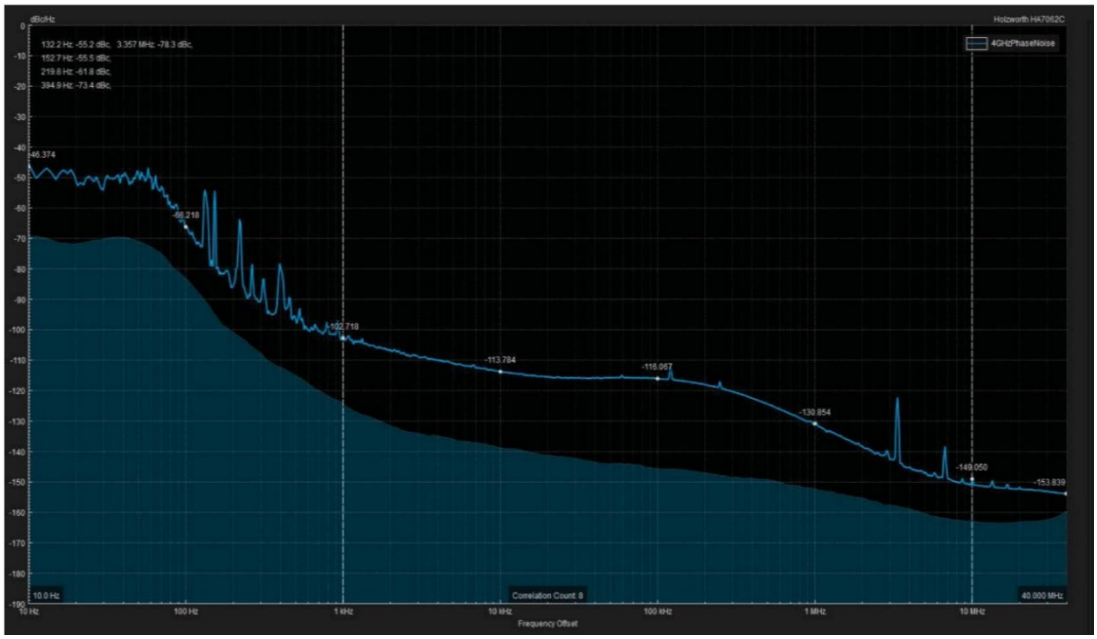
Inputs and Outputs

- 10 MHz Reference Input: MCX female, 50 Ohm
- Synth 1: 380 MHz TO 6 GHz, female (×4), 50 Ohm

RXJudge2 Digital IF (800 MHz Module)

RF Module with 2.4 Ghz -11 Ghz center frequency without frequency gap with 800 Mhz bandwidth.

Frequency		
Channel coverage extent including Instantaneous Bandwidth (range -400 to range+400)		
Full range	2 - 11.4	GHz
Instantaneous bandwidth		
Bandwidth	800	MHz
Card center frequency		
Range	2.4 - 11	GHz
Typical phase noise @ 4 GHz		



Amplitude			
Input power range	**Min**	**Max**	
Optimal	-32	-2	dBm
Absolute max		15	dBm

Front panel

REFCLK			
	Connector	SMA	
	Impedance	300	Ohm
	Coupling	AC	
	Max P-P voltage	1.8	V p-p
	Min P-P voltage	0.8	V p-p
TRIG IN			
	Connector	SMA	
	Impedance	100K	Ohm
	Coupling	DC	
	Min P-P voltage	3.3	V
	Min P-P voltage	0	V
	Trigger level	1.2	V
AUX OUT			
	Connector	SMA	
	Hi-level out	3.3	V
	Low-level out	0	V
	Drive strength	50	mA
LEDs			
	LOCK (Bottom)	LIT indicates baseband sampling clock is working correctly.	
	ERROR	Board failure detected.	
	EXT REF	Blink indicates secondary module failed locking to primary module. LIT indicates secondary module locked to primary module.	
	PROG-MEZZ	Mezz detected and running.	
	LOCK (Top)	Indicates RF synth lock	

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