

TECHNICAL SPECIFICATIONS

IQgig-UWB™

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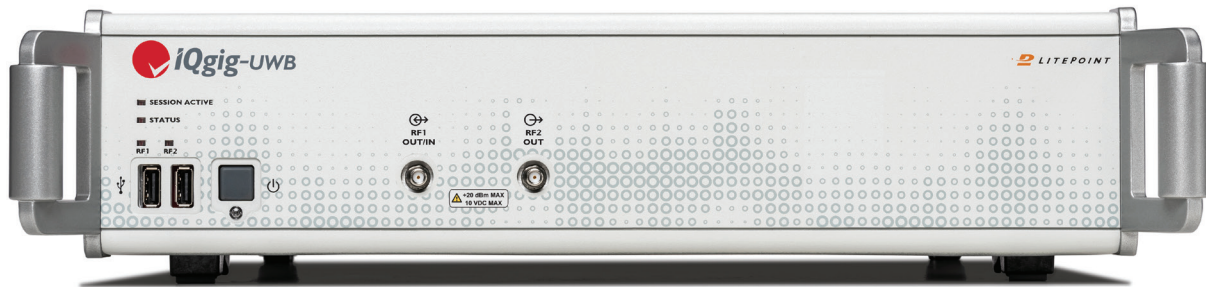
Overview

IQgig-UWB™ is the first fully-integrated, one-box test solution for physical-layer testing of devices enabled with UWB technology. The internal Vector Signal Generator (VSG) and Vector Signal Analyzer (VSA) enable comprehensive transmitter and receiver testing with over 500 MHz of single-shot bandwidth. IQgig-UWB has a precision trigger and response mechanism to enable accurate Time of Flight (ToF) measurements with picosecond level of accuracy.

Combined with the IQ5631 Power and Delay Control Module (PDCM), IQgig-UWB enables per-antenna receiver sensitivity testing for signals below -100 dBm. Additionally the programmable delay of the IQ5631 enables picosecond resolution variable delay for validating Angle of Arrival (AoI).

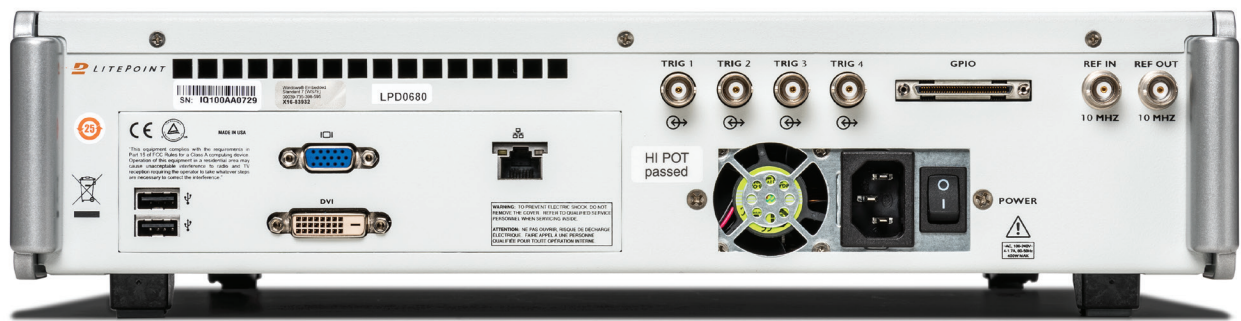
IQgig-UWB is ideal for both R&D characterization as well as high-volume production, making it the perfect platform to enable a cost-effective, seamless transition from the lab to the manufacturing floor.

Port Descriptions



IQgig-UWB Front Panel

| I/O | Function | Type |
|----------------------------|--|-------------------|
| Power Switch | Power On/Off | Pushbutton Switch |
| Power Indicator | LED Red – Powered Up, Standby LED Green – Powered Up, Running | LED indicator |
| Session Active Indicator | LED Green – remote session active LED Red – remote session lock | LED indicator |
| Status Indicator | LED Green – no faults/errors detected LED Orange – Software error detected LED Red – Hardware fault detected | LED indicator |
| Port Status Indicators (2) | LED Green – Port is a VSA input LED Red – Port is a VSG output | LED indicator |
| USB (2) | USB Input / Output | Type A |
| RF1 OUT/IN | RF Output/Input (50Ω nom, 10V DC Max) | SMA female |
| RF2 OUT | RF Output (50Ω nom, 10V DC Max) | SMA female |



IQgig-UWB Rear Panel General I/O

| I/O | Function | Type |
|----------------|--------------------------------|------------------|
| 10 MHz REF In | 10 MHz Reference In | BNC female |
| 10 MHz REF Out | 10 MHz Reference Out | BNC female |
| TRIG 1 | TTL Trigger Input / Output | BNC female |
| TRIG 2 | TTL Trigger Input / Output | BNC female |
| TRIG 3 | TTL Trigger Input / Output | BNC female |
| TRIG 4 | TTL Trigger Input / Output | BNC female |
| GPIO | General Purpose Input / Output | 50-pin connector |

IQgig-UWB Test Controller Communication I/O

| I/O | Function | Type |
|-------|--------------------|-------------|
| VGA | Video Output | 15 pin DSUB |
| DVI | Video Output | DVI-I |
| USB 1 | USB I/O – Keyboard | Type A |
| USB 2 | USB I/O – Mouse | Type A |
| LAN 1 | 1000 Base-T LAN | RJ-45 |

General Hardware Specifications

RF Analyzer

| Parameter | Ports | Value | |
|--------------------------------|-------|--|--------|
| Frequency Range | RF1 | 5.8 to 18.5 GHz (Carrier frequency) 4.9 to 19.4 GHz (Input RF spectrum) | |
| IF bandwidth | RF1 | 1.9 GHz | |
| Input Power Maximum | RF1 | +20 dBm | |
| Input Power Range | RF1 | -10 to -40 dBm (Average modulated power) 0 to -40 dBm (CW) | |
| Input Power Accuracy | RF1 | ±1 dB | |
| Input Return Loss | RF1 | > 11 dB (Typ) | |
| Spurious ¹ | RF1 | < -50 dBc (CW) at Input Power = -10 dBm | |
| Image Rejection | RF1 | < -30 dBc (CW) at Input Power = -10 dBm | |
| Carrier Leakage | RF1 | < -45 dBc, 5.8 to 16 GHz < -35 dBc, 16 GHz to 18.5 GHz | |
| Spectral flatness | RF1 | ≤ 1.4 dB, 5.8 to 17 GHz center frequency MAX - MIN (±850 MHz) | |
| Inherent spurious floor | RF1 | ≤ -80 dBm at minimum input attenuation | |
| Noise figure | RF1 | ≤ 20 dB, ≤ 17 GHz ≤ 22 dB, > 17 GHz at minimum input attenuation | |
| Integrated phase noise | RF1 | < 0.85 degrees (100 kHz to 100 MHz) | |
| VSG/VSA Isolation | RF1 | > 40 dB, VSG output power > -10 dBm | |
| Digitizer Resolution | RF1 | 12 bits | |
| Sampling data rate | RF1 | 300, 600, 1200, 2400 MHz | |
| Waveform capture duration | RF1 | at 300 MHz sampling data rate | 200 ms |
| | | at 600 MHz sampling data rate | 100 ms |
| | | at 1200 MHz sampling data rate | 50 ms |
| | | at 2400 MHz sampling data rate | 25 ms |
| Absolute minimum trigger level | RF1 | -40 dBm | |
| Absolute maximum trigger level | RF1 | 0 dBm | |
| Trigger relative threshold | RF1 | 30 dB | |
| Trigger Level Accuracy | RF1 | < ±2 dB | |

¹ Excludes harmonic products, image rejection, and carrier leakage

RF Generator

| Parameter | Ports | Value |
|------------------------------------|----------|--|
| Frequency Range | RF1, RF2 | 5.8 to 18.5 GHz (Carrier frequency) 4.9 to 19.4 GHz (Output RF spectrum) |
| IF bandwidth | RF1, RF2 | 1.9 GHz |
| Output Power Range | RF1, RF2 | 0 to -60 dBm (Ave modulated power) +5 to -60 dBm (CW) <-60 to -110 dBm (with optional IQ5631 PDCM) |
| Output Power Accuracy | RF1, RF2 | +5 to -30 dBm: ±1 dB, 5.8 GHz to 17 GHz ±2 dB, > 17 GHz < -30 to -50 dBm: ±1.25 dB, 5.8 GHz to 17 GHz ±2 dB, > 17 GHz |
| Output Return Loss | RF1, RF2 | > 11 dB (Typ) |
| Spurious (in channel) ² | RF1, RF2 | < -35 dBc |
| Image Rejection | RF1, RF2 | < -30 dBc, 5.8 to 17 GHz center frequency |
| Spectral flatness | RF1, RF2 | ≤ 1.8 dB MAX - MIN (± 850 MHz), 5.8 to 17 GHz center frequency |
| Integrated phase noise | RF1, RF2 | < 0.85 degrees (100 kHz to 100 MHz) |
| Carrier leakage ³ | RF1, RF2 | < -30 dBc, < 12 GHz (Output power > -10 dBm) < -35 dBc, 12 to 17 GHz (Output power > -10 dBm) |
| Generator Resolution | RF1, RF2 | 14 bits |
| Sampling data rate | RF1, RF2 | 2.4 GS/s |
| Waveform playback duration | RF1, RF2 | 25 ms |

Timebase

| Parameters | Value |
|--|--|
| Oscillator type | OcXO |
| Frequency | 10 MHz |
| Initial accuracy (25°C, after 60 minute warm-up) | < ±0.05 ppm |
| Maximum aging | < ±0.1 ppm per year |
| Temperature stability | < ±0.05 ppm over 0°C to 50°C range, referenced to 25°C |
| Warm-up time (to within +/-0.1ppm at 25°C) | <30 minutes |

² Excludes harmonic products, image rejection, and carrier leakage

³ Relative to total transmit power against Carrier Leakage

General and Environmental

| Parameters | Value |
|---|---|
| Dimensions | 15.5" W x 3.2" H x 20" D (394 mm x 82 mm x 508 mm) |
| Weight | 24.1 pounds (10.95 kg) |
| Power consumption (maximum) | < 220 W |
| Power consumption (average) | 155 W |
| Power requirements | 100 - 240 VAC, 50-60 Hz |
| Supported browsers | Google Chrome |
| Operating temperature | +10°C to +55°C (IEC EN60068-2-1, 2, 14) |
| Storage temperature | -20°C to +70°C (IEC EN60068-2-1, 2, 14) |
| Specification validity temperature ⁴ | 20°C to 35°C (valid range for specifications) |
| Operating humidity | 15% to 95% relative humidity, non-condensing (IEC EN60068-2-30) |
| EMC | EN61326-1 Class A, EN55011 |
| EMI (Immunity) | EN61000-4 |
| Safety | IEC 61010-1, EN61010-1, UL61010-1:2012 and CAN/CSA-C22.2 No. 61010-1-12 |
| Mechanical vibration | IEC 60068-2-6 for Sine Vibration and MIL-STD 810G for Random Vibration |
| Mechanical shock | ASTM D3332-99 |
| Recommended calibration cycle | 12 months |
| Warranty | 12 months hardware, 12 months software updates |

⁴ VSA/VSG accuracy specifications >17 GHz require use of internal Temperature Compensation function

UWB (802.15.4) Measurement Specification

| Measurement | Description |
|------------------------------|---|
| Spectrum Mask | Transmit spectrum mask |
| Symbol Modulation Accuracy | Correlation to reference pulse (%) |
| Carrier Frequency Offset | Carrier frequency error (kHz) |
| Chip Clock Error | Error in ppm |
| Chip Frequency Error | Error in Hz |
| Pulse Main Lobe Width | Width of main lobe in time (ns) |
| Pulse Side Lobe Power | Power relative to main lobe (%) |
| Power (Preamble & Data) | Average power of complete data capture (dBm) |
| Peak Power (Preamble & Data) | Peak power over all symbols (dBm) |
| Pulse Jitter | Jitter in ps |
| Pulse NMSE | Normalized Mean Square Error (ppm) |
| RX PER | Receiver Packet Error Rate (requires DUT support) |

Wireless LAN (802.11ad) Measurement Specification

| Measurement | Description | Performance |
|--------------------|---|--|
| EVM | EVM averaged over payload based on standard requirements | Preamble only channel estimation: MCS 1: < -35 dB Typ (-5 to -20 dBm), < -32 dB Typ (-20 to -30 dBm) MCS 12: < -33 dB Typ (-5 to -20 dBm), < -31 dB Typ (-20 to -30 dBm) Note: - 8 to 17 GHz - Averaged over 20 CPHY/SC packets, 512+/1000+ data symbols long - Measured in system loopback |
| TX Peak power | Peak power over all symbols (dBm) | VSA power accuracy: ±1.0 dB (-10 to -40 dBm) |
| TX RMS power | All: average power of complete data capture (dBm) | |
| | No gap: average power over all symbols after removal of any gap between packets (dBm) | |
| TX Max avg power | Peak value of the amplitude as a moving average over 40 samples (dBm) | |
| TX Frequency error | Carrier frequency error (kHz) | VSA measurement error: ≤ ±0.2 ppm calibrated |

| | | |
|--|---|--|
| TX RMS phase noise | Integrated phase noise (degrees) | VSA residual integrated phase noise: < 0.75 degrees (100 kHz to 100 MHz) |
| TX PSD | Power spectral density (dBm/Hz) versus frequency offset center frequency ± 850 MHz | |
| TX Spectral mask | Transmit spectrum mask | ± 3.06 GHz |
| TX Spectral flatness | Reflects variation of signal energy as a function of OFDM subcarrier number 802.11ad OFDM signals only | ≤ 1.4 dB, MAX - MIN (± 850 MHz) |
| TX center freq. (LO) leakage (LOFT) | | VSA residual < -35 dBc with respect to overall transmit power |
| TX CCDF (complementary cumulative distribution function) | Probability of peak signal power being greater than a given power level versus peak-to-average power ratio (dB) | |
| TX Power on / power down ramp | | (10 to 90% of average frame power) |
| RX TX Turnaround Time max. | | |
| RX TX Switch Time max. | | |
| TX PSDU data | Recovered binary data sequence, including the MAC header and Frame Check Sequence, if present | |
| TX Raw capture data | I and Q signals versus time | |
| TX General waveform analysis | DC offset, RMS level, minimum/maximum amplitude, peak-to-peak amplitude, RMS I- and Q-channel levels | |
| TX CW frequency analysis | Frequency & power of CW tone | |
| RX Sensitivity | Receiver sensitivity | VSG power accuracy: ± 1 dB |
| RX Maximum Input Level | | VSG power range: 0 to -30 dBm |

5G Measurement Specifications

| 3GPP TS 38.101-2 | Paragraph Reference | Notes |
|------------------------------|---------------------|--|
| Transmit Power | 6.2 | Maximum Power |
| Output Power Dynamics | 6.3 | Min Power Relative Power On/Off Time Mask |
| Transmit Signal Quality | 6.4 | Frequency Error EVM - Typical tester EVM performance = -38 dB (1.2%), MCS10/MCS14, 7 to 11GHz, system loopback Carrier Leakage In-band Emissions |
| Output RF Spectrum Emissions | 6.5 | Occupied Bandwidth Spectrum Emission Mask ACLR |
| Receiver Sensitivity | 7.3 | Reference Sensitivity Power |
| Receiver Level | 7.4 | Maximum Input Level |
| Receiver Blocking | 7.5 | Adjacent Channel Selectivity (Characterization only, not recommended for manufacturing) |
| | 7.6 | In-band Blocking (Requires DUT support) |

Order Codes

| Code | Product |
|---------------|--|
| 0100-IUWB-001 | IQgig-UWB Test System, including UWB license |
| 0300-IUWB-001 | WiGig 802.11ad Software License |
| 0300-IUWB-005 | WiGig 802.11ay Software License |
| 0300-IUWB-009 | 5G 3GPP Software License |
| 0150-5631-002 | IQ5631 Power and Delay Control Module (PDCM) |

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