

TECHNICAL SPECIFICATIONS

IQgig-5G™ Model B

5G mmWave Test System

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Overview

The IQgig-5G is a fully-integrated, non-signaling solution for testing 5G mmWave products. All signal generation, analysis, and RF front-end routing hardware are self-contained inside a single chassis. The IQgig-5G has over 1.7 GHz of instantaneous bandwidth, supporting all 3GPP carrier aggregation test cases. The IQgig-5G solution contains a Vector Signal Generator (VSG) and Vector Signal Analyzer (VSA) and can be configured with either two or four bi-directional source and measurement ports, each with 2.4 mm connector coaxial interface. The VSG and VSA can be tuned independently to different frequencies over the entire specified frequency range. Each RF port can be switched on-the-fly to the internal VSG or VSA.

The IQgig-5G is the simplest solution for testing 5G mmWave products as all the required hardware is self-contained inside a single chassis, enabling the source and measure capabilities to be calibrated at the instrument front panel. This full hardware integration significantly reduces the test set up complexity and improves efficiency yielding the following benefits:

- Simplest test fixture set up with direct connection to the calibrated front panel interface
- Fully-integrated and calibrated – make high performance mmWave measurements in minutes instead of hours
- Seamless transition from the lab to the manufacturing floor

Port Descriptions

Front Panel

4-port



2-port



| I/O | Function | Type |
|--------------------------|---|-------------------|
| Power Button | Power On/Off | Pushbutton Switch |
| Power Indicator | LED solid red – test system is in standby mode LED blinking red – test system is powering off LED blinking green – test system is booting up LED solid green – test system is powered on | 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 |
| RF1 Indicator | LED green – port is a VSA input LED red – port is a VSG output | LED indicator |
| RF2 Indicator | LED green – port is a VSA input LED red – port is a VSG output | LED indicator |

| I/O | Function | Type |
|-----------------|---|---------------|
| RF3 Indicator | LED green – port is a VSA input LED red – port is a VSG output | LED indicator |
| RF4 Indicator | LED green – port is a VSA input LED red – port is a VSG output | LED indicator |
| LINK1 Indicator | LED green – LINK1 connected | LED indicator |
| LINK2 Indicator | LED green – LINK2 connected | LED indicator |
| RF1 | VSA input or VSG output | 2.4mm female |
| RF2 | VSA input or VSG output | 2.4mm female |
| RF3 | VSA input or VSG output | 2.4mm female |
| RF4 | VSA input or VSG output | 2.4mm female |

Rear Panel



| I/O | Function | Type |
|----------------|--|---------------|
| 10 MHz REF IN | 10 MHz reference input | BNC female |
| 10 MHz REF OUT | 10 MHz reference output | BNC female |
| TRIG/MKR 1 | TTL Trigger Input / Output | BNC female |
| TRIG/MKR 2 | TTL Trigger Input / Output | BNC female |
| LO1 IN | LO1 Input | SMA female |
| LO1 OUT | LO1 Output | SMA female |
| LO2 IN | LO2 Input | SMA female |
| LO2 OUT | LO2 Output | SMA female |
| USB (4 ports) | USB 3.0 compatible connection to external controller | USB Type A |
| HDMI | Video Output | HDMI |
| LAN | 1000 Base-T LAN | RJ-45 |
| DATA 1 | DATA 1 Connection | iPass PCIe x4 |
| DATA 2 | DATA 2 Connection | iPass PCIe x4 |
| AUX 1 | General Purpose I/O | iPass |
| AUX 2 | General Purpose I/O | iPass |
| AUX 3 | General Purpose I/O | iPass |
| TRIG I/O | Not Used | |

General Hardware Specifications

Vector Signal Analyzer (VSA)

| Parameters | Value | |
|---|--|---------|
| Frequency Range | 23 GHz – 45 GHz | |
| Center Frequency Resolution | 0.01 Hz | |
| Frequency Settling Time (to 0.1 ppm) | <10ms | |
| Maximum Capture Bandwidth | 1.7 GHz | |
| Maximum Input Power | +20 dBm (CW) | |
| Input Power Accuracy | ±1.5 dB (+20 to -55 dBm) (CW) ±2.5 dB (-55 to -70 dBm) (CW) | |
| Input Power Measurement Repeatability | 0.1 dB at ≥ -40 dBm | |
| Reference Level Range | +20 to -70 dBm | |
| Digitizer Resolution | 12 bits | |
| Sampling Rate | 122.88, 245.76, 491.52, 983.04, 2457.6 MHz | |
| Waveform Capture Duration | at 122.88 MHz sampling data rate | 4360 ms |
| | at 245.76 MHz sampling data rate | 2180 ms |
| | at 491.52 MHz sampling data rate | 1090 ms |
| | at 983.04 MHz sampling data rate | 218 ms |
| | at 2457.6 MHz sampling data rate | 218 ms |
| Spurious (signal applied) ¹ | < -40 dBc or -70 dBm, whichever is higher, 1 MHz RBW | |
| Image Rejection ¹ | < -45 dBc (CW) | |
| Inherent Spurious Floor ¹ (no signal applied) | ≤ -80 dBm at minimum attenuation, 1 MHz RBW | |
| Carrier Leakage | < -35 dBc | |
| Spectral Flatness ¹ | ≤ 2.0 dB peak to peak | |
| Integrated Phase Noise | < 0.7 degrees (10 kHz to 10 MHz) | |
| Noise Figure (at minimum input attenuation) | ≤ 22 dB, ≤ 30 GHz ≤ 24 dB, > 30 - 43 GHz | |

¹ Measured in 1.5 GHz modulation bandwidth

Vector Signal Generator (VSG)

| Parameters | Value | |
|---------------------------------|---|---------|
| Frequency Range | 23 GHz – 45 GHz | |
| Center Frequency Resolution | 0.01 Hz | |
| Maximum Modulation Bandwidth | 1.7 GHz | |
| Output Power Range | +10 to -70 dBm (CW) 23 GHz – 40 GHz +5 to -70 dBm (CW) > 40 GHz – 43 GHz | |
| Output Power Accuracy | ±1.5 dB, ≤40 GHz, signal level ≥ -40 dBm (CW) ±2 dB, >40 GHz – 43 GHz, signal level ≥ -40 dBm (CW) ±2.5 dB, ≤43 GHz, signal level < -40 dBm to -70 dBm (CW) | |
| Level Settling Time | < 1 ms to 0.1 dB | |
| Generator Resolution | 14 bits | |
| Generator Sampling Rate | 122.88, 245.76, 491.52, 2457.6 MHz | |
| Waveform Playback Duration | at 122.88 MHz sampling data rate | 1000 ms |
| | at 245.76 MHz sampling data rate | 500 ms |
| | at 491.52 MHz sampling rate | 250 ms |
| | at 2457.6 MHz sampling data rate | 50 ms |
| Spectral Flatness ¹ | ≤ 2.0 dB peak to peak ² | |
| Spurious (in band) ³ | < -40 dBc or -70 dBm, (CW) whichever is higher | |
| Spurious (out of band) | < -20 dBc or -70 dBm, (CW) whichever is higher | |
| Carrier Leakage | < -30 dBc (CW) | |
| Image Rejection ³ | < -40 dBc (CW), <42.5 GHz center frequency Output Power ≤ -10dBm | |
| Integrated Phase Noise | < 0.7 degrees (10 kHz to 10 MHz) | |

1 Measured in 800 MHz modulation bandwidth

2 Flatness measured at 0 dBm (≤40 GHz), at -5 dBm (>40 GHz to ≤42.5 GHz)

3 Measured in 1.5 GHz modulation bandwidth

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) | 60 minutes |

Frequency Reference Input

| Parameters | Value |
|-------------------------|----------------------------------|
| Frequency | 10 MHz |
| Max Frequency Variation | 0.5 ppm |
| Input Voltage Range | +1 to +16 dBm (0.7Vpp to 4.0Vpp) |
| Impedance | 50 Ω |

Frequency Reference Output

| Parameters | Value |
|----------------|---|
| Frequency | 10 MHz |
| Output Voltage | +8.5 dBm minimum (1.7vpp) +11.0 dBm nominal (2.2vpp) |
| Impedance | 50 Ω |

TTL Trigger Input/Output

| Parameters | Value |
|-----------------------------------|---|
| Impedance | 5 k Ω nominal |
| Trigger/Marker 1 & 2 Input Level | 3.5 V – V (IH) 1.5 V – V (IL) |
| Trigger/Marker 1 & 2 Output Level | 3.8V to 4.9V – V(OH), 32mA max 0.1V to 0.55V – V(OL), 32mA max |

General and Environmental

| Parameter | Description |
|------------------------------------|--|
| Dimensions | 14.5" W x 3.2" H x 20.5" D (368 mm x 82 mm x 521 mm) |
| Weight | 28 lb (12.7 kg) |
| Power consumption (maximum) | 300W |
| Power consumption (average) | 225W |
| Power requirements | 100 - 240 VAC, 50-60 Hz |
| Supported browsers | Google Chrome, Mozilla Firefox |
| Operating temperature | +10°C to +50°C |
| Storage temperature | -20°C to +70°C (IEC EN60068-2-1, 2, 14) |
| Specification validity temperature | 20°C to 35°C (valid range for specifications) |
| System warm-up time | 60 minutes |
| Operating humidity | 15% to 95% relative humidity, non-condensing (IEC EN60068-2-30) |
| EMC/EMI | 61326-1: 2013 Industrial Environment, CISPR11 Class A per EN61326-1:2013, FCC Part 15 Class A, VCCI V-3 Class A, BSMI CNS-13438 Class A, ACMA AS/NZS CISPR11: 2011, ICES-003 Class A |
| Safety | IEC 61010-1, EN61010-1, UL61010-1:2012 and Canada: CSA C22.2 No. 61010-1, G11, G12 |
| Mechanical vibration | MIL-STD 810G for Random Vibration |
| Mechanical shock | ASTM D3332-99 |
| Recommended connector torque | 8 lb-in (90 N-cm) |
| Recommended calibration cycle | 12 months |
| Warranty | 12 months hardware, 12 months software updates |

5G NR Measurements

| Measurement | TS 38.101-2 Paragraph Reference | Notes |
|------------------------------|---------------------------------|--|
| Transmit Power | 6.2 | Maximum Power |
| Output Power Dynamics | 6.3 | Min Power Relative Power |
| Transmit Signal Quality | 6.4 | Frequency Error EVM 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, no recommended for manufacturing. Requires additional signal generator) |
| | 7.6 | In-Band Blocking (Characterization only, no recommended for manufacturing. Requires additional signal generator) |

5G NR Measurement Specifications

| Measurement | Performance |
|-------------------------------------|--|
| Maximum output power | See general H/W specifications |
| Minimum output power | See general H/W specifications |
| Transmit off power | See general H/W specifications |
| Frequency error | See timebase specifications |
| Residual EVM (Typical) ¹ | <p>1x100 MHz CC, @-10 dBm <0.8% (-42 dB), ≥ 24.25GHz - ≤ 40 GHz <1.0% (-40 dB), > 40GHz - ≤ 43.5 GHz</p> <p>1x 400 MHz CC, @ -10 dBm <1.1% (-39 dB), ≥ 24.25GHz - ≤ 40 GHz</p> <p>8x100 MHz CC, @ -10 dBm <1.8% (-35 dB), ≥ 24.25GHz - ≤ 40 GHz</p> |
| Carrier leakage | See general H/W specifications |
| Occupied bandwidth | See general H/W specifications |
| ACLR | See general H/W specifications |
| Spectrum emission mask | See general H/W specifications |
| Spurious emissions | Limited to 23 GHz – 45 GHz |
| Reference sensitivity | DUT support required |
| Maximum input level | DUT support required |

¹ Measured in system loopback with LO offset and 5G NR waveform with mu=3, CP-OFDM, 256 QAM

5G NR Small Cell Base Station Tests

| Code | TS 38.141-2 Paragraph Reference | Notes |
|--------------------------------------|---------------------------------|--|
| Radiated transmit power | 6.2 | |
| OTA Base Station Output Power | 6.3 | |
| OTA Output Power Dynamics | 6.4.3 | OTA Total Power Dynamic Range |
| OTA Transmit ON/OFF Power | 6.5.1 6.5.2 | OTA Transmitter OFF Power OTA Transmitter Transient Period |
| OTA Transmitted Signal Quality | 6.6.2 6.6.3 6.6.4 | OTA Frequency Error OTA Modulation Quality OTA Time Alignment Error |
| OTA Unwanted Emissions | 6.7.2 6.7.3 | OTA Occupied Bandwidth OTA Adjacent Channel Leakage Power Ratio (ACLR) |
| OTA Reference Sensitivity Level | 7.3 | DUT support required |
| OTA In-Band Selectivity and Blocking | 7.5.1 7.5.2 | OTA Adjacent Channel Selectivity OTA In-Band Blocking (Characterization only, not recommended for manufacturing. Requires additional signal generator) |
| OTA Receiver Intermodulation | 7.8 | Characterization only, not recommended for manufacturing. Requires additional signal generator |
| OTA In-Channel Selectivity | 7.9 | Characterization only, not recommended for manufacturing. Requires additional signal generator |

Order Codes

| Code | Product |
|---------------|---|
| 0100-IG5G-011 | IQgig-5G Model B Test System, 4 port version |
| 0100-IG5G-013 | IQgig-5G Model B Test System, 2 port version |
| 0300-IG5G-003 | 3GPP NR 5G Software License |
| 0300-IG5G-016 | 5G Small Cells Measurement Suite Software License |
| 0150-IG5G-102 | 5G mmWave OTA Test Chamber. Suitable for 24 to 70 GHz frequency range. Includes a 2-axis DUT rotator and flexible antenna mounting system for multiple antennas and angles. |
| 0150-IG5G-005 | 5G mmWave OTA Test Chamber with temperature capability. Suitable for 24 to 70 GHz frequency range. |

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