

# IQcell™

## Technical Specifications



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IQcell is a highly-integrated, manufacturing optimized, multi-DUT signaling test set, tailored to verifying performance of cellular devices in high-volume production environments. Optimized for end-of-line product testing, IQcell provides cellular signaling test capabilities for LTE-FDD, LTE-TDD, WCDMA, and GSM Smartphone, Tablet, Data-Card, or other devices that use cellular modules.

### Optimized Multi-cell, Multi-DUT Architecture

The IQcell is designed from the ground up to provide the smallest footprint and highest throughput of any signaling capable tester. With four completely independent cells, and each cell capable of LTE-FDD, LTE-TDD, WCDMA and GSM, the IQcell provides four times the throughput with only half the footprint of single cell test solutions. In addition to the signaling capabilities, each cell has its own VSG/VSA for high speed, high accuracy, technology specific parametric measurements.

This configuration and capability fits easily into existing high volume test environments and provides the highest throughput and lowest overall cost per test of any signaling capable test set.

With the IQcell, you have confidence that your device has been calibrated accurately, the antenna has been properly connected, the SIM card is functional, and the correct software has been loaded. With its compact 2U rack-height form factor, IQcell is the highest density cellular signaling tester available on the market.

### Superior User Experience

In addition to TX and RX measurements, the IQcell supports advanced signaling features such as the ability to connect multiple DUTs to a single cell – enabling mobile-to-mobile calling and verifying peak data throughput. Exercising the mobile device in its native operating mode, with real use-case scenarios, helps to ensure shipping the highest quality product and minimize customer returns.

### IQcell Features

- **Cellular signaling device control:** Includes support for LTE-FDD, LTE-TDD, WCDMA/HSPA, GSM. The hardware architecture supports future enhancements up to 3GPP Release 10.
- **Technology and frequency handovers:** Supports intra-band, inter-band, and inter-RAT handover and redirection.
- **Multi-cell technology:** Four independent cells provide the highest test throughput in a high volume test environment.
- **Compact size:** Industry's highest density cellular signaling platform in 2U rack-height form factor.
- **Advanced signaling features:** Mobile-to-mobile calling and packet data throughput.

### Wireless Standards Support

IQcell supports a wide variety of wireless standards and tests. As a software driven instrument, these capabilities will be updated from time to time to keep up with the changing requirements. This includes the addition of new bands or enhancements to the standards.

Currently, IQcell includes direct support for the standards-based testing documented in the following tables. In addition to the tests listed here, other measurements that provide additional information relevant to a specific test are also available. For details, see the IQcell user documentation.

IQcell supports a continuous frequency range between 400 MHz and 3800 MHz. Technology-specific frequency band support is detailed in the following section, but does not imply that frequency support is limited to only the bands listed.

## GSM Frequency Bands Supported

| Frequency Bands | Frequency Range (Generator) | Frequency Range (Analyzer) |
|-----------------|-----------------------------|----------------------------|
| GSM 850 band    | 869 MHz to 894 MHz          | 824 MHz to 849 MHz         |
| E-GSM 900 band  | 921 MHz to 960 MHz          | 876 MHz to 915 MHz         |
| DCS 1800 band   | 1805 MHz to 1880 MHz        | 1710 MHz to 1785 MHz       |
| PCS 1900 band   | 1930 MHz to 1990 MHz        | 1850 MHz to 1910 MHz       |

## GSM Signaling Call Support (Requires UMTS Signaling License)

| Supported Call Modes          | Notes   |
|-------------------------------|---|
| Frequency Range               | See general hardware specifications                       |
| Frequency Setting             | Channel number  |
| Input / Output level range    | See general hardware specifications                       |
| Input / Output level accuracy | See general hardware specifications                       |
| Voice Calls                   | MO/MT Calls with Audio Loopback                           |
| Loopback                      | Voice BER: Test Mode C                                    |
| In-call Handover, Redirection | Intra-band & Inter-band handover<br>Inter-RAT redirection |

## WCDMA/HSPA/HSPA+ Frequency Bands

| Frequency Bands | Frequency Range (Generator) | Frequency Range (Analyzer) |
|-----------------|-----------------------------|----------------------------|
| I               | 2110 MHz to 2170 MHz        | 1920 MHz to 1980 MHz       |
| II              | 1930 MHz to 1990 MHz        | 1850 MHz to 1910 MHz       |
| III             | 1805 MHz to 1880 MHz        | 1710 MHz to 1785 MHz       |
| IV              | 2110 MHz to 2155 MHz        | 1710 MHz to 1755 MHz       |
| V               | 869 MHz to 894 MHz          | 824 MHz to 849 MHz         |
| VI              | 875 MHz to 885 MHz          | 830 MHz to 840 MHz         |
| VII             | 2620 MHz to 2690 MHz        | 2500 MHz to 2570 MHz       |
| VIII            | 925 MHz to 960 MHz          | 880 MHz to 915 MHz         |
| IX              | 1844.9 MHz to 1879.9 MHz    | 1749.9 MHz to 1784.9 MHz   |
| X               | 2110 MHz to 2170 MHz        | 1710 MHz to 1770 MHz       |
| XI              | 1475.9 MHz to 1495.9 MHz    | 1427.9 MHz to 1447.9 MHz   |
| XII             | 728 MHz to 746 MHz          | 698 MHz to 716 MHz         |

|      |                        |                          |
|------|------------------------|--------------------------|
| XIII | 746 MHz to 756 MHz     | 777 MHz to 787 MHz       |
| XIV  | 758 MHz to 768 MHz     | 788 MHz to 798 MHz       |
| XIX  | 877.4 MHz to 887.6 MHz | 832.4 MHz to 842.6 MHz   |
| XX   | 791 MHz to 821 MHz     | 832 MHz to 862 MHz       |
| XXI  | 1495 MHz to 1510.9 MHz | 1447.9 MHz to 1462.9 MHz |
| XXII | 3510 MHz to 3590 MHz   | 3410 MHz to 3490 MHz     |
| XV   | 1930 MHz to 1995 MHz   | 1850 MHz to 1915 MHz     |
| XVI  | 859 MHz to 894 MHz     | 814 MHz to 849 MHz       |

### WCDMA Signaling Call Support (Requires UMTS Signaling Suite license)

| Supported Call Modes           | Notes   |
|--------------------------------|---|
| Standards Supported            | 3GPP FDD, Rel-99 to Rel-7   |
| Frequency Range                | See general hardware specifications   |
| Frequency Setting              | Channel number  |
| Input / Output level range     | See general hardware specifications   |
| Input / Output level accuracy  | See general hardware specifications   |
| Voice Calls                    | MO/MT voice calls with audio loopback<br>Mobile to mobile voice calls   |
| Data Session                   | R99 packet switched up to 384 kbps<br>HSDPA, Cat 1-14, data up to 21.1 Mbps<br>HSUPA, Cat 1-6, data up to 5.76 Mbps |
| Reference Measurement Channels | RMC 12.2 kbps<br>RMC 64 kbps  |
| In-call Handover               | Intra-band, Inter-band, & Inter-RAT handover  |
| Loopback                       | CS RMC 12.2 kbps: Test Mode 1 BER   |

## LTE Frequency Bands Supported

| Frequency Bands | Frequency Range (Generator) | Frequency Range (Analyzer) | Duplex Mode |
|-----------------|-----------------------------|----------------------------|-------------|
| 1               | 2110 MHz to 2170 MHz        | 1920 MHz to 1980 MHz       | FDD         |
| 2               | 1930 MHz to 1990 MHz        | 1850 MHz to 1910 MHz       | FDD         |
| 3               | 1805 MHz to 1880 MHz        | 1710 MHz to 1785 MHz       | FDD         |
| 4               | 2110 MHz to 2155 MHz        | 1710 MHz to 1755 MHz       | FDD         |
| 5               | 869 MHz to 894 MHz          | 824 MHz to 849 MHz         | FDD         |
| 7               | 2620 MHz to 2690 MHz        | 2500 MHz to 2570 MHz       | FDD         |
| 8               | 925 MHz to 960 MHz          | 880 MHz to 915 MHz         | FDD         |
| 9               | 1845 MHz to 1880 MHz        | 1750 MHz to 1785 MHz       | FDD         |
| 10              | 2110 MHz to 2170 MHz        | 1710 MHz to 1770 MHz       | FDD         |
| 11              | 1476 MHz to 1496 MHz        | 1428 MHz to 1448 MHz       | FDD         |
| 12              | 728 MHz to 746 MHz          | 698 MHz to 716 MHz         | FDD         |
| 13              | 746 MHz to 756 MHz          | 777 MHz to 787 MHz         | FDD         |
| 14              | 758 MHz to 768 MHz          | 788 MHz to 798 MHz         | FDD         |
| 17              | 734 MHz to 746 MHz          | 704 MHz to 716 MHz         | FDD         |
| 18              | 860 MHz to 875 MHz          | 815 MHz to 830 MHz         | FDD         |
| 19              | 875 MHz to 890 MHz          | 830 MHz to 845 MHz         | FDD         |
| 20              | 791 MHz to 821 MHz          | 832 MHz to 862 MHz         | FDD         |
| 21              | 1495.9 MHz to 1510.9 MHz    | 1447.9 MHz to 1462.9 MHz   | FDD         |
| 22              | 3510 MHz to 3590 MHz        | 3410 MHz to 3490 MHz       | FDD         |
| 23              | 2180 MHz to 2200 MHz        | 2000 MHz to 2020 MHz       | FDD         |
| 24              | 1525 MHz to 1559 MHz        | 1626.5 MHz to 1660.5 MHz   | FDD         |
| 25              | 1930 MHz to 1995 MHz        | 1850 MHz to 1915 MHz       | FDD         |
| 26              | 859 MHz to 894 MHz          | 814 MHz to 849 MHz         | FDD         |
| 27              | 852 MHz to 869 MHz          | 807 MHz to 824 MHz         | FDD         |
| 28              | 758 MHz to 803 MHz          | 703 MHz to 748 MHz         | FDD         |
| 30              | 2350 MHz to 2360 MHz        | 2305 MHz to 2315 MHz       | FDD         |
| 31              | 462.5 MHz to 467.5 MHz      | 452.5 MHz to 457.5 MHz     | FDD         |
| 33              | 1900 MHz to 1920 MHz        | 1900 MHz to 1920 MHz       | TDD         |
| 34              | 2010 MHz to 2025 MHz        | 2010 MHz to 2025 MHz       | TDD         |
| 35              | 1850 MHz to 1910 MHz        | 1850 MHz to 1910 MHz       | TDD         |

|    |                      |                      |     |
|----|----------------------|----------------------|-----|
| 36 | 1930 MHz to 1990 MHz | 1930 MHz to 1990 MHz | TDD |
| 37 | 1910 MHz to 1930 MHz | 1910 MHz to 1930 MHz | TDD |
| 38 | 2570 MHz to 2620 MHz | 2570 MHz to 2620 MHz | TDD |
| 39 | 1880 MHz to 1920 MHz | 1880 MHz to 1920 MHz | TDD |
| 40 | 2300 MHz to 2400 MHz | 2300 MHz to 2400 MHz | TDD |
| 41 | 2496 MHz to 2690 MHz | 2496 MHz to 2690 MHz | TDD |
| 44 | 703 MHz to 803 MHz   | 703 MHz to 803 MHz   | TDD |
| 45 | 1447 MHz to 1467 MHz | 1447 MHz to 1467 MHz | TDD |
| 46 | 5150 MHz to 5925 MHz | 5150 MHz to 5925 MHz | TDD |
| 49 | 3550 MHz to 3700 MHz | 3550 MHz to 3700 MHz | TDD |
| 50 | 1432 MHz to 1517 MHz | 1432 MHz to 1517 MHz | TDD |
| 51 | 1427 MHz to 1432 MHz | 1427 MHz to 1432 MHz | TDD |
| 52 | 3300 MHz to 3400 MHz | 3300 MHz to 3400 MHz | TDD |
| 65 | 2110 MHz to 2200 MHz | 1920 MHz to 2010 MHz | FDD |
| 66 | 2110 MHz to 2200 MHz | 1710 MHz to 1780 MHz | FDD |
| 68 | 753 MHz to 783 MHz   | 698 MHz to 728 MHz   | FDD |
| 70 | 1995 MHz to 2020 MHz | 1695 MHz to 1710 MHz | FDD |
| 71 | 617 MHz to 652 MHz   | 663 MHz to 698 MHz   | FDD |
| 72 | 461 MHz to 466 MHz   | 451 MHz to 456 MHz   | FDD |
| 73 | 460 MHz to 465 MHz   | 450 MHz to 455 MHz   | FDD |
| 74 | 1475 MHz to 1518 MHz | 1427 MHz to 1470 MHz | FDD |
| 85 | 728 MHz to 746 MHz   | 698 MHz to 716 MHz   | FDD |

### LTE Signaling Call Support (Requires LTE Signaling Suite license)

| Supported Call Modes | Notes   |
|----------------------|---|
| Standards Supported  | 3GPP E-UTRA FDD & TDD   |
| 3GPP Release Version | Release 8   |
| Supported Bandwidths | 5, 10, 15, 20 MHz   |
| UE Category          | UE Cat 1-6  |
| Voice Calls (VoLTE)  | MO/MT calls with audio loopback<br>Mobile to Mobile Voice Calls |

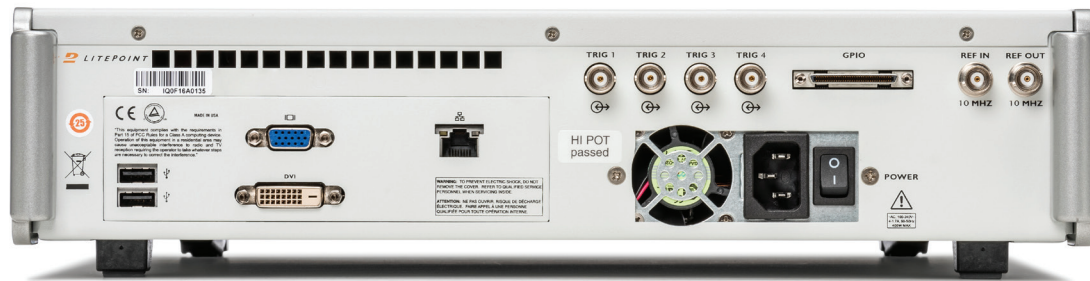
|                  |   |
|------------------|---|
| Data Session     | FDD & TDD SISO / 2x2 MIMO<br>Uplink data rate up to: 51 Mbps<br>Downlink data rate up to: 150 Mbps (2x2 MIMO) |
| In-call Handover | Intra-Band, Inter-Band, Inter-RAT Redirection to WCDMA & GSM  |
| Loopback         | Type A Downlink Packet Error Rate (PER)   |

## Port Descriptions



### Front Panel

| I/O             |       | Function   | Type              |
|-----------------|-------|--|-------------------|
| Power Switch    |       | Power On/Off   | Pushbutton Switch |
| Power Indicator |       | LED Red – Powered Up, Standby<br>LED Green – Powered Up, Running | LED indicator     |
| USB (2)         |       | USB Input / Output   | Type A            |
| ROUT 11         | ANT 1 | RF Input / Output Port   | N female          |
|                 | ANT 2 | RF Input / Output Port - MIMO                                    | N female          |
| ROUT 12         | ANT 1 | RF Input / Output Port   | N female          |
|                 | ANT 2 | RF Input / Output Port - MIMO                                    | N female          |
| ROUT 13         | ANT 1 | RF Input / Output Port   | N female          |
|                 | ANT 2 | RF Input / Output Port - MIMO                                    | N female          |
| ROUT 14         | ANT 1 | RF Input / Output Port   | N female          |
|                 | ANT 2 | RF Input / Output Port - MIMO                                    | N female          |



### 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 |

### 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

### Vector Signal Analyzer (VSA)

| Parameters  | Ports          | Value   |
|---|----------------|---|
| RF Frequency Range  | All RF Ports   | 400 MHz to 6000 MHz   |
| RF Maximum Input Power  |                | +36 dBm (peak envelope power)   |
| Effective Sample Rate   |                | 61.44 Msps  |
| Capture Memory Depth  |                | 64 Msamples   |
| Frequency Resolution  |                | < 5 Hz  |
| Input Impedance   |                | 50 $\Omega$ (nominal)   |
| Power Measurement Accuracy  |                | < +/- 0.4 dB (signal level > -40 dBm)   |
| Power Measurement Repeatability   |                | < 0.1 dB (within 30 seconds of initial value), signal level > -40 dBm   |
| Noise Figure  |                | < 30 dB (at MIN attenuation), 400 MHz to <700 MHz<br>< 29 dB (at MIN attenuation), 700 MHz to 3800 MHz  |
| Signal to Noise Ratio   |                | > 95 dB @ RBW = 1kHz, input > -10dBm, 400 MHz to <2000 MHz<br>> 85 dB @ RBW = 1kHz, input > -10dBm, 2000 MHz to 3800 MHz  |
| VSWR  |                | < 1.6 : 1 (RL > 12.5 dB) 400 MHz to < 700 MHz<br>< 1.3 : 1 (RL > 17 dB) 700 MHz to 3800 MHz   |
| Port Switching Time <sup>1</sup>  |                | < 50 $\mu$ s (to within 0.1 dB)   |
| Isolation   | ANT 1 to ANT 2 | Port-to-Port, VSG Duplex Mode<br>> 55 dB (400 MHz to <2400 MHz)<br>> 40 dB (2400 MHz to 3800 MHz)   |
|   | ROUT to ROUT   | > 100 dB  |
| Inherent Spurious Signals Floor (no input signal applied, RLEV = -10 dBm) | All Ports      | < -75 dBm (<700 MHz)<br>< -85 dBm (700 MHz to <2700 MHz)<br>< -75 dBm (2700 MHz to 3800 MHz)  |
| Input third order intercept point (IIP3)                                  |                | > +40 dBm (at MAX attenuation)  |
| Non-harmonic Attenuation  |                | > 50 dB (Input level < +15 dBm)   |
| Harmonic Attenuation  |                | > 40 dB   |
| Phase Noise   |                | < -108 dBc/Hz @ 900 MHz (250 kHz to 400 kHz offset)<br>< -102 dBc/Hz @ 1800 MHz (250 kHz to 400 kHz offset)<br>< -101 dBc/Hz @ 2400 MHz (250 kHz to 400 kHz offset) |

<sup>1</sup> When using hardware sequencing control

## Vector Signal Generator (VSG)

| Parameters                                 | Ports   | Value   |
|--|---|---|
| RF Frequency Range                         | All RF Ports  | 400 MHz to 6000 MHz   |
| RF Output Power Range                      |   | -15 dBm to -120 dBm   |
| Frequency Resolution                       |   | < 5 Hz  |
| Power Level Resolution                     |   | 0.1 dB  |
| Power Level Settling Time <sup>1</sup>     |   | < 50 us to within 0.1 dB  |
| Frequency Level Settling Time <sup>1</sup> |   | < 400 us to within 1 kHz  |
| Output Power Accuracy                      |   | +/- 0.5 dB (levels ≥ -50 dBm)<br>+/- 0.75 dB (-100 to < -50 dBm)                            |
| Power Level Repeatability                  |   | +/- 0.1 dB (within 30 seconds of initial value)   |
| VSWR                                       |   | < 1.6 : 1 (RL > 12.5 dB) 400 MHz to < 700 MHz<br>< 1.3 : 1 (RL > 17 dB) 700 MHz to 3800 MHz |
| Harmonic Attenuation                       |   | < -40 dBc (output levels < -30 dBm)   |
| Non-harmonic Attenuation                   |   | < -40 dBc (output levels < -30 dBm)   |
| Phase Noise                                | < -108 dBc/Hz @ 900 MHz (250 kHz to 400 kHz offset)<br>< -102 dBc/Hz @ 1800 MHz (250 kHz to 400 kHz offset)<br>< -101 dBc/Hz @ 2400 MHz (250 kHz to 400 kHz offset) |   |

## Timebase

| Parameter  | Value   |
|--|---|
| Oscillator Type                                  | OCXO  |
| Frequency  | 10 MHz  |
| Initial Accuracy (25°C, after 60 minute warm-up) | < +/- 0.04 ppm  |
| Maximum Aging                                    | < +/- 0.1 ppm per year  |
| Temperature Stability                            | < +/- 0.05 ppm over 0°C to 50°C range, referenced to 25°C<br>< +/- 0.01 ppm over 20°C to 30°C range |
| Warm-Up Time                                     | 60 minutes  |

<sup>1</sup> When using hardware sequencing control

## General and Environmental

| Parameter                                       | Value   |
|---|---|
| Dimensions                                      | 15.5" W x 3.2" H x 20" D (394 mm x 82 mm x 508 mm)                      |
| Weight  | 26.4 pounds (11.95 kg)  |
| Power consumption (maximum)                     | <350W   |
| Power requirements                              | 100 - 240 VAC, 50-60 Hz   |
| 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 <sup>1</sup> | 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   |
| RF port torque                                  | 13 lb-in (1.469Nm)  |
| Recommended calibration cycle                   | 24 months   |
| Warranty  | 12 months hardware, 12 months software updates                          |

## Order Codes

| Code          | Product  |
|---------------|--|
| 0100-CELL-001 | IQcell Mobile Test System – 8 port version includes 1 cell enabled.  |
| 0100-CELL-002 | IQcell Mobile Test System – 2 port version includes 1 cell enabled.  |
| 0150-CELL-002 | Test SIM Card Micro (2FF/3FF)  |
| 0150-CELL-003 | Test SIM Card Nano (4FF)   |
| 0300-CELL-001 | UMTS Signaling Suite Software License includes: <ul style="list-style-type: none"> <li>• GSM Signaling Suite</li> <li>• WCDMA Signaling Suite</li> </ul> |
| 0300-CELL-003 | LTE Signaling Suite Software License includes: <ul style="list-style-type: none"> <li>• LTE FDD &amp; TDD</li> </ul>                                     |
| 0300-CELL-005 | Multi-Cell Signaling License. Enables a total of 4 cells.  |
| 0300-CELL-006 | Dynamic Cell Switching Software License. Switching between cells for Inter-RAT & HO test   |

<sup>1</sup> Specifications valid over temperature range after invoking temperature compensation function. For highest accuracy, recommend to enable temperature compensation if ambient temperature changes by more than 2° C.

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#### CONTACT INFORMATION

LitePoint Corporation  
575 Maude Court  
Sunnyvale, CA 94085-2803  
United States of America

+1.866.363.1911

+1.408.456.5000

#### LITEPOINT TECHNICAL SUPPORT

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