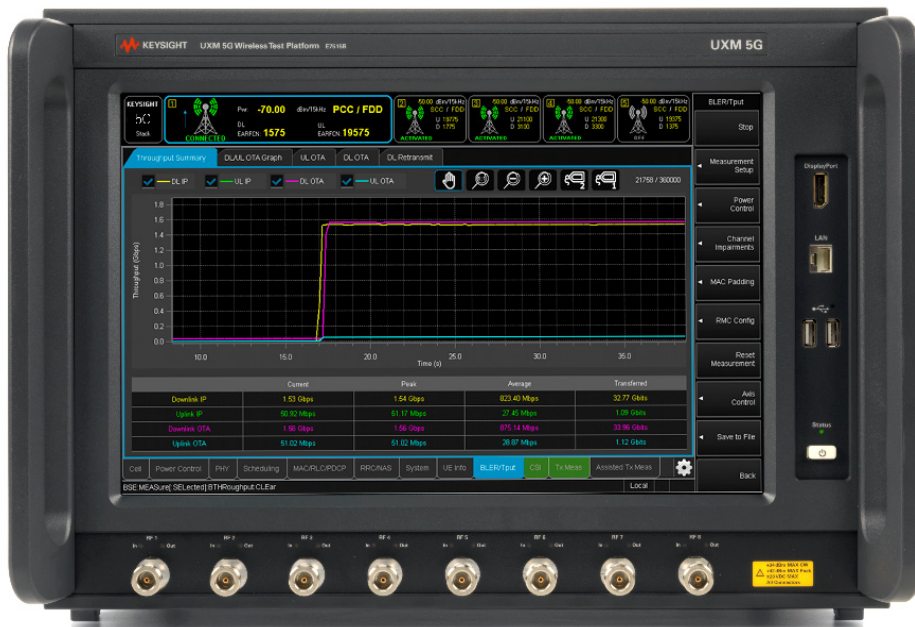


# E7515B

## UXM 5G Wireless Test Platform



## Definitions and Conditions

Unless otherwise noted, this data sheet applies to eight transmitters and four receiver port E7515B units with serial numbers ending with 5951xxxx or greater.

The test set will meet its specifications when

- The test set is within its calibration cycle.
- 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 30 °C unless otherwise noted.

## Typical

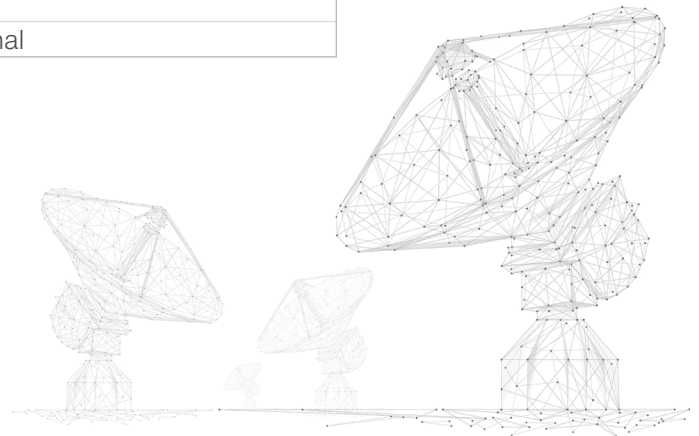
Typical describes additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 95 percent of the units exhibit with a 95 percent confidence level. This data, shown in italics, does not include measurement uncertainty, and is valid 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.

# Vector Signal Analyzer Performance

| Frequency and time specification   |                              |
|--|------------------------------|
| Operating frequency range  |                              |
| <ul style="list-style-type: none"> <li>E7515B-506</li> </ul>   | 380 MHz to 6 GHz             |
| <ul style="list-style-type: none"> <li>Frequency setting resolution</li> </ul>                         | 100 kHz                      |
| <ul style="list-style-type: none"> <li>Frequency accuracy</li> </ul>                                   | See Timebase specifications  |
| VSWR all RF_in/ RF_out ports   |                              |
| 380 MHz to 600 MHz   | < 1.5 nominal                |
| > 600 MHz to 2 GHz   | < 1.3 nominal                |
| > 2 GHz to 4 GHz   | < 1.5 nominal                |
| > 4 GHz to 6 GHz   | < 1.8 nominal                |
| Amplitude and range specifications   |                              |
| CW level accuracy  |                              |
| +5 to +30 dBm for all receiver ports   |                              |
| <ul style="list-style-type: none"> <li>380 MHz to 3 GHz</li> </ul>                                     | $\pm 0.43$ dB <i>typical</i> |
| <ul style="list-style-type: none"> <li>&gt; 3 GHz to 4.2 GHz</li> </ul>                                | $\pm 0.71$ dB <i>typical</i> |
| <ul style="list-style-type: none"> <li>&gt; 4.2 GHz to 6 GHz</li> </ul>                                | $\pm 0.79$ dB <i>typical</i> |
| -60 to +5 dBm for all receiver ports   |                              |
| <ul style="list-style-type: none"> <li>380 MHz to 4.2 GHz</li> </ul>                                   | $\pm 0.3$ dB <i>typical</i>  |
| <ul style="list-style-type: none"> <li>&gt; 3 GHz to 4.2 GHz</li> </ul>                                | $\pm 0.33$ dB <i>typical</i> |
| <ul style="list-style-type: none"> <li>&gt; 4.2 GHz to 6 GHz</li> </ul>                                | $\pm 0.4$ dB <i>typical</i>  |
| -40 to +5 dBm for all receiver ports   |                              |
| <ul style="list-style-type: none"> <li>380 MHz to 4.2 GHz</li> </ul>                                   | $\pm 0.9$ dB warranted       |
| Level flatness   |                              |
| <ul style="list-style-type: none"> <li>Over 100 MHz bandwidth relative to central frequency</li> </ul> |                              |
| <ul style="list-style-type: none"> <li>380 MHz to 3 GHz</li> </ul>                                     | $\pm 0.30$ dB <i>typical</i> |
| <ul style="list-style-type: none"> <li>&gt; 3 GHz to 4.2 GHz</li> </ul>                                | $\pm 0.32$ dB <i>typical</i> |
| <ul style="list-style-type: none"> <li>&gt; 4.2 GHz to 6 GHz</li> </ul>                                | $\pm 0.36$ dB <i>typical</i> |
| <ul style="list-style-type: none"> <li>Over 800 MHz bandwidth relative to central frequency</li> </ul> |                              |
| <ul style="list-style-type: none"> <li>380 MHz to 3 GHz</li> </ul>                                     | $\pm 0.39$ dB <i>typical</i> |
| <ul style="list-style-type: none"> <li>&gt; 3 GHz to 4.2 GHz</li> </ul>                                | $\pm 0.42$ dB <i>typical</i> |
| <ul style="list-style-type: none"> <li>&gt; 4.2 GHz to 6 GHz</li> </ul>                                | $\pm 0.58$ dB <i>typical</i> |
| Noise spectral density all RF_in/RF_out ports  |                              |
| <ul style="list-style-type: none"> <li>RF_out set to max DL power</li> </ul>                           | < -130 dBm/Hz nominal        |
| <ul style="list-style-type: none"> <li>RF_out set to OFF</li> </ul>                                    | < -150 dBm/Hz nominal        |
| <ul style="list-style-type: none"> <li>Maximum CW input level</li> </ul>                               |                              |
| <ul style="list-style-type: none"> <li>RF_in/ RF_out ports</li> </ul>                                  | +34 dBm nominal              |



## Vector Signal Generator Performance

| Frequency and time specification                     |  |
|--|--|
| Operating frequency range                            |  |
| • E7515B-506   | 380 MHz to 6 GHz   |
| Frequency setting resolution                         | 100 kHz  |
| Frequency accuracy                                   | See Time base specifications                                 |
| VSWR all RF_in/ RF_out ports                         |  |
| 380 MHz to 600 MHz                                   | < 1.5 nominal  |
| > 600 MHz to 2 GHz                                   | < 1.3 nominal  |
| > 2 GHz to 4 GHz                                     | < 1.5 nominal  |
| > 4 GHz to 6 GHz                                     | < 1.8 nominal  |
| Amplitude and range specifications                   |  |
| CW output level accuracy                             |  |
| –110 dBm to +7 dBm for all transmitter ports         |  |
| • 380 MHz to 3 GHz                                   | ± 0.68 dB <i>typical</i>                                     |
| • > 3 GHz to 4.2 GHz                                 | ± 0.62 dB <i>typical</i>                                     |
| –100 dBm to +3 dBm for all transmitter ports         |  |
| • 380 MHz to 4.2 GHz                                 | ± 0.4 dB <i>typical</i>                                      |
| • > 4.2 GHz to 6 GHz                                 | ± 0.6 dB <i>typical</i>                                      |
| –50 dBm to –3 dBm for all transmitter ports          |  |
| • 380 MHz to 4 GHz                                   | ± 1.2 dB warranted and ± 0.48 dB <i>typical</i>              |
| Output level setting resolution                      | 0.1 dB   |
| Output level settling time                           |  |
| • No amplitude change, frequency change within band  | ± 1.0 dB within 100 µs nominal                               |
| • Amplitude change, no frequency change              | ± 0.1 dB within 25 µs nominal                                |
| • Frequency change                                   | ± 0.1 dB within 100 ms nominal                               |
| Output flatness                                      |  |
| Over 100 MHz bandwidth relative to central frequency |  |
| • 380 MHz to 3 GHz                                   | ± 0.21 dB <i>typical</i>                                     |
| • > 3 GHz to 4.2 GHz                                 | ± 0.23 dB <i>typical</i>                                     |
| • > 4.2 GHz to 6 GHz                                 | ± 0.45 dB <i>typical</i>                                     |
| Over 800 MHz bandwidth relative to central frequency |  |
| • 380 MHz to 3 GHz                                   | ± 0.25 dB <i>typical</i>                                     |
| • > 3 GHz to 4.2 GHz                                 | ± 0.36 dB <i>typical</i>                                     |
| • > 4.2 GHz to 6 GHz                                 | ± 0.52 dB <i>typical</i>                                     |
| Wideband noise floor (for DL at max CW power)        | –130 dBm/Hz <i>typical</i>                                   |
| Maximum reverse power (Operating)                    |  |
| • All RF_in/ RF_out ports                            | 34 dBm average power, nominal<br>42 dBm peak power, nominal  |
| Maximum reverse power (Damage)                       |  |
| • All RF_in/ RF_out ports                            | 34 dBm average power, nominal<br>42 dBm peak power, nominal  |
| Phase noise  |  |
| • 380 MHz to 6 GHz                                   | –100 dBc at 100 kHz, nominal<br>–110 dBc at 300 kHz, nominal |

| Harmonics   |                  |
|---|------------------|
| Attenuation of 2 <sup>nd</sup> harmonic all RF_in/ RF_out ports |                  |
| • 380 MHz to 4 GHz, power < -10 dBm                             | > 30 dBc nominal |
| • > 4 GHz to 6 GHz, power < -10 dBm                             | > 45 dBc nominal |
| Attenuation of 3 <sup>rd</sup> harmonic all RF_in/ RF_out ports |                  |
| • 380 MHz to 4 GHz, power < -10 dBm                             | > 40 dBc nominal |
| • > 4 GHz to 6 GHz, power < -10 dBm                             | > 55 dBc nominal |

## Instrument Specifications

| Input power requirements  |   |
|---|---|
| Voltage and frequency   | 100/120/220/240 VAC, 50/60 Hz, nominal  |
| Power consumption (Fully loaded configuration)  | 1400W max   |
| Additional specifications   |   |
| Dimensions (H x W x L)  |   |
| • Without feet and handles  | 309 mm x 436 mm x 554 mm  |
| • With feet and handles   | 323 mm x 453 mm x 554 mm  |
| Weight  |   |
| • Fully loaded configuration  | 42.4 kg   |
| Operating temperature   | +10 to +40 °C, 30 g/m <sup>3</sup> absolute humidity, 5 to 85% non-condensing relative humidity                     |
| Storage temperature   | -40 to +70 °C, 50 g/m <sup>3</sup> absolute humidity, 5 to 85% non-condensing relative humidity                     |
| Altitude  | Up to 2000 m  |
| EMC   | Complies with European EMC Directive 2004/108/EC  |
|   | • IEC/EN 61326-1  |
|   | • CISPR Pub 11 Group 1, class A   |
|   | • AS/NZS CISPR 11   |
|   | • ICES/NMB-001  |
|   | • This ISM device complies with Canadian ICES-001.<br>• Cet appareil ISM est conforme a la norme NMB-001 du Canada. |
| • South Korean Class A EMC declaration: This equipment is Class A suitable for professional use and is for use in electromagnetic environments outside of the home. |   |
|   | A급 기기 (업무용 방송통신기 자재)<br>이 기기는 업무용 (A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.           |
| 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, 3rd edition   |
|   | • Canada: CAN/CSA C22.2 No. 61010-1012  |
|   | • USA: UL std no. 61010-1, 3rd 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  |   |

## Instrument Specifications (Continued)

| RF connections                                  |   |
|---|---|
| RF_in/ RF_out ports                             | N-type female, 50 $\Omega$ nominal  |
| Other connectors and interfaces                 |   |
| Display/Manual user interface                   | 15.4 in (391 mm) active matrix, color, 1280 x 800-pixel resolution TFT-LCD flat panel display with touch panel controls |
| USB ports                                       |   |
| • Front panel                                   | 2x USB 2.0  |
| • Rear panel                                    | 2x USB 3.0  |
| LAN (local area network) ports                  | One external, 1 Gbps, LAN port rear panel<br>One external, 1 Gbps, LAN port front panel                                 |
| Digital data acquisition                        |   |
| General memory budgets and considerations       |   |
| • Available memory (capture and/or playback)    | 16 GB total   |
| Signal acquisition                              |   |
| • IQ data acquisition channels                  | 4 (one per UL RF_in port)   |
| • Samples rates                                 | 122.88 and 1228.8 MSa/s   |
| • Maximum sample storage                        | 1 GSa per UL RF_in port   |
| Maximum capture size                            | 4 GB per channel  |
| Trigger control                                 | Immediate and external  |
| Analyzer bandwidth                              | 100 MHz bandwidth (122.88 MSa/s)<br>800 MHz bandwidth (1228.8 MSa/s)  |
| Channel emulation                               |   |
| Antenna configuration                           | 1x1, 1x2, 1x4, 1x8, 2x1, 2x2, 2x4, 2x8, 4x1, 4x2, 4x4, 4x8, 8x1, 8x2, 8x4, 8x8  |
| Gaussian noise generator                        |   |
| Independent channels                            | 8   |
| RF_IN/ RF_OUT port                              | Configured via RFIO   |
| Digital frequency offset                        | $-400 \text{ MHz} + \text{BW}_{\text{Noise}}/2$ to $400 \text{ MHz} - \text{BW}_{\text{Noise}}/2$                       |
| Continuous wave generation                      |   |
| Independent channels                            | 8   |
| RF_IN/ RF_OUT port                              | Configured via RFIO   |
| Digital frequency offset                        | -400 to 400 MHz   |
| Arbitrary wave generation                       |   |
| Independent channels                            | 8   |
| Antenna output                                  | Configured via RFIO   |
| Digital frequency offset                        |   |
| • Bandwidth 100 MHz                             | -350 MHz to 350 MHz   |
| Memory allocation for arbitrary wave generation | 16 GB (shared with digital data acquisition)  |
| Waveform sampling rate                          |   |
| • Bandwidth 100 MHz                             | 122.88 MSa/s  |
| Maximum waveform file size                      | 4 GB  |
| Waveform play modes                             | Single, continuous  |

## Instrument Specifications (Continued)

| Time base  |   |
|--|---|
| Standard frequency reference   |   |
| <ul style="list-style-type: none"> <li>Maximum frequency drift</li> </ul>                      | $\pm 50$ ppb/2 years <i>typical</i>               |
| <ul style="list-style-type: none"> <li>Warm-up time</li> </ul>                                 | 30 min  |
| External clock time reference  |   |
| Connector type   | SMA connector 10 MHz IN, rear panel               |
| Frequency  |   |
| <ul style="list-style-type: none"> <li>Sine wave</li> </ul>                                    | 10 MHz  |
| <ul style="list-style-type: none"> <li>Square wave (greater than 40% ON duty cycle)</li> </ul> | 10 MHz  |
| <ul style="list-style-type: none"> <li>Input voltage range</li> </ul>                          | 0.4 to 2 Vpp                                      |
| <ul style="list-style-type: none"> <li>Impedance</li> </ul>                                    | 50 $\Omega$ nominal                               |
| Format alignment trigger   |   |
| External connector   | SMA Channel 0                                     |
| Trigger duration configurable according to format  | Samples resolution = $(1 / 30.72) \times 10^{-6}$ |
| <ul style="list-style-type: none"> <li>VZW 5GTF</li> </ul>                                     | 1 to $2^{31} - 1$ samples                         |
| Trigger offset delay   | In terms of 1/6 of the period of the sample       |
| Trigger period configurable according format   |   |
| <ul style="list-style-type: none"> <li>VZW 5GTF</li> </ul>                                     | 1 to $2^{31} - 1$ samples                         |
| Generic trigger  |   |
| External connector   | SMA channel 1, 2, 3 (Input, Output)               |
| Arm channel for receiving trigger  | Only input channels                               |
| External trigger generation  | Only output channels                              |
| Warranty and calibration   |   |
| Standard warranty  | One year  |
| Recommended calibration cycle  | One year  |

## Verizon 5GTF Measurements

| Modulation and channels   |  |
|---|--|
| Signal structure  | TDD (with appropriate license)             |
| Signal bandwidth  | 100 MHz                                    |
| VZW 5GTF signal generation  |  |
| Error vector magnitude (EVM)  |  |
| 100 MHz 5GTF PDSCH signal with full allocation modulation = 64 QAM; power = -20 dBm |  |
| <ul style="list-style-type: none"> <li>300 MHz to 3.5 GHz</li> </ul>                | < 1 % RMS nominal                          |
| <ul style="list-style-type: none"> <li>&gt; 3.5 GHz to 6 GHz</li> </ul>             | < 1 % RMS nominal                          |
| VZW 5GTF power measurements   |  |
| Level range (BW 100 MHz, OFDM, 64 QAM)  | -45 to +30 dBm, RMS (only if PAPR < 12 dB) |
| Residual EVM (100 MHz bandwidth)  | < 1.5% RMS nominal at -20 dBm input power  |

# 5G NR Measurements

| Modulation and channels  |                                |
|--|--------------------------------|
| Signal structure   | TDD (with appropriate license) |
| Signal bandwidth   | 100 MHz                        |
| 5G NR signal generation  |                                |
| Error vector magnitude (EVM)                                   |                                |
| 100 MHz 5G NR PDSCH, signal modulation = QPSK; power = -10 dBm |                                |
| • 300 MHz to 6 GHz   | < 1 % RMS nominal              |

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