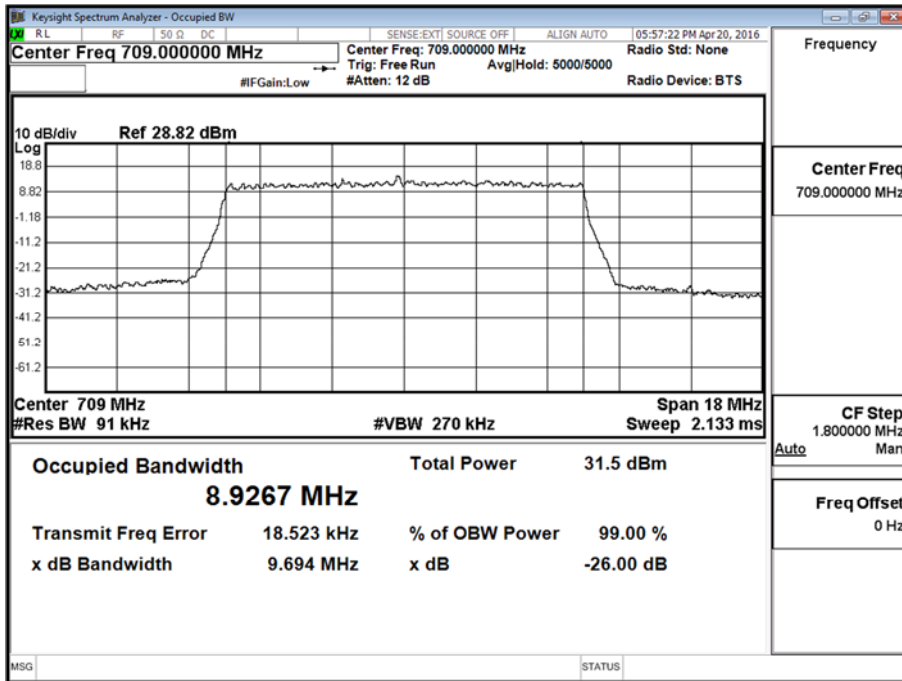


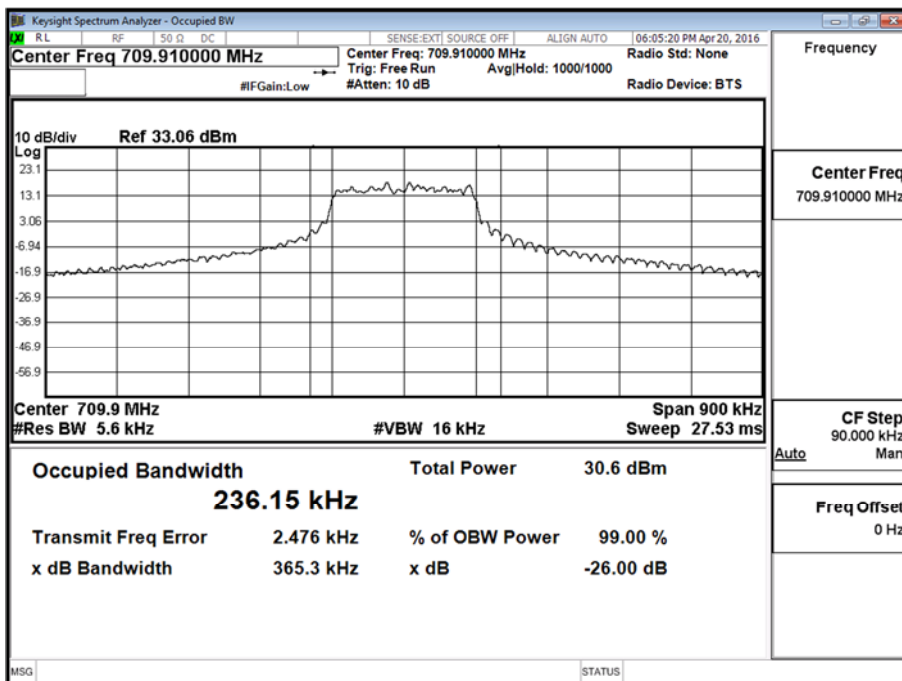


Product Service

### 709 MHz - All Resource Blocks



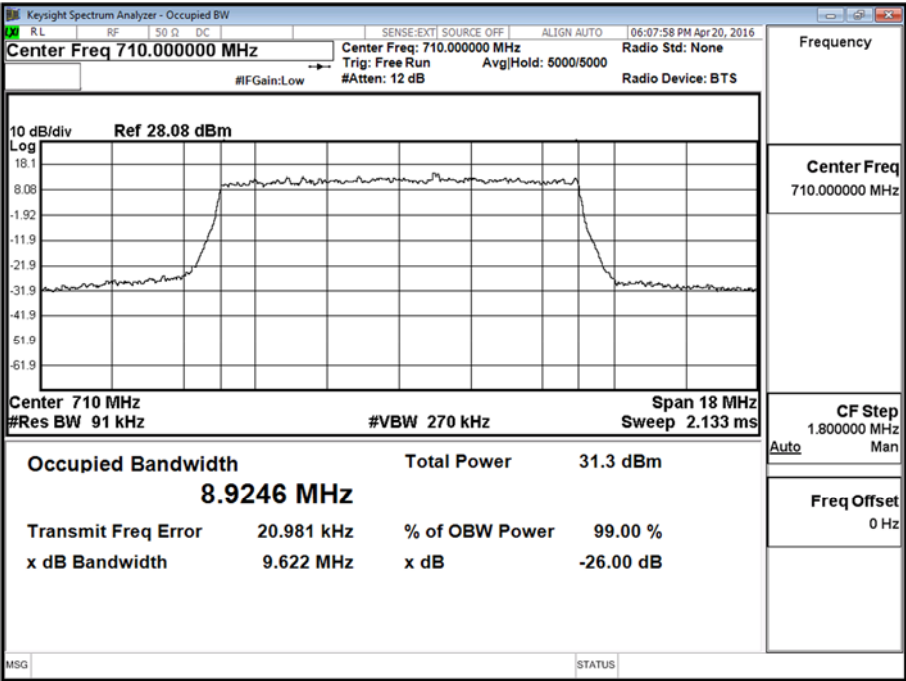
### 710 MHz - 1 Resource Block - Middle



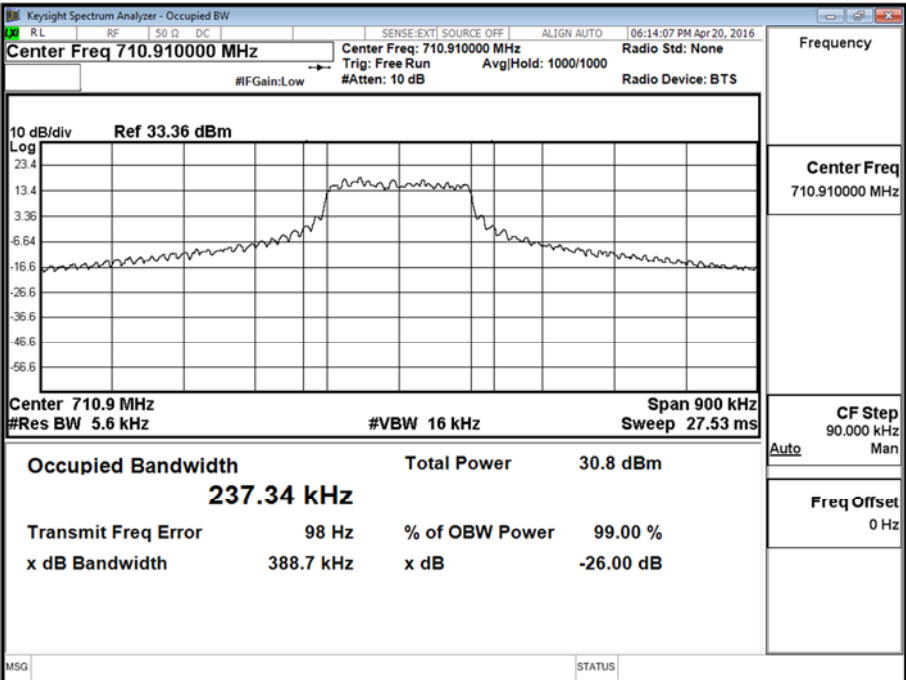


Product Service

710 MHz - All Resource Blocks



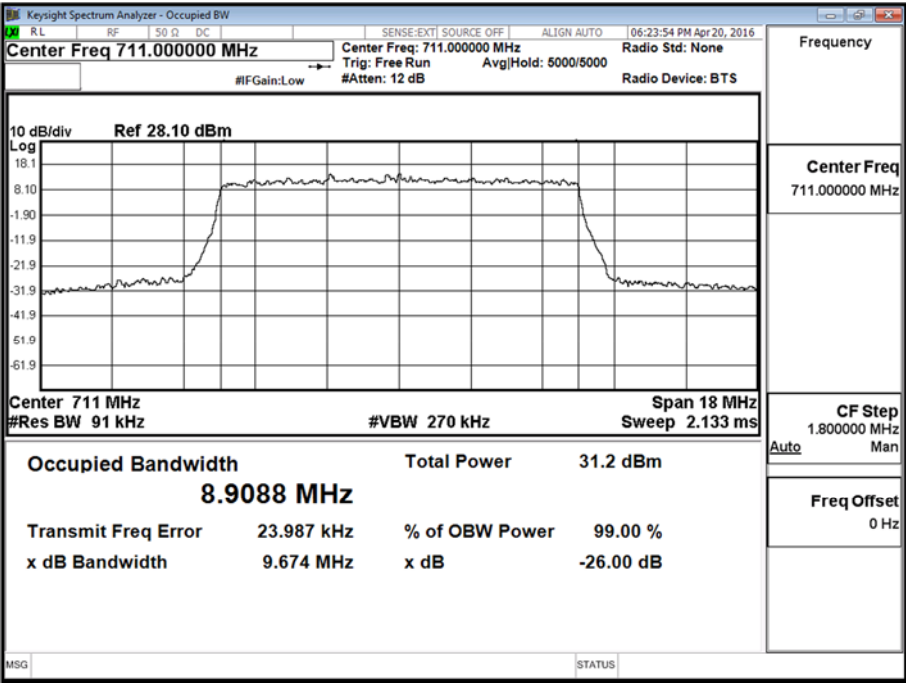
711 MHz - 1 Resource Block - Middle





Product Service

711 MHz - All Resource Blocks

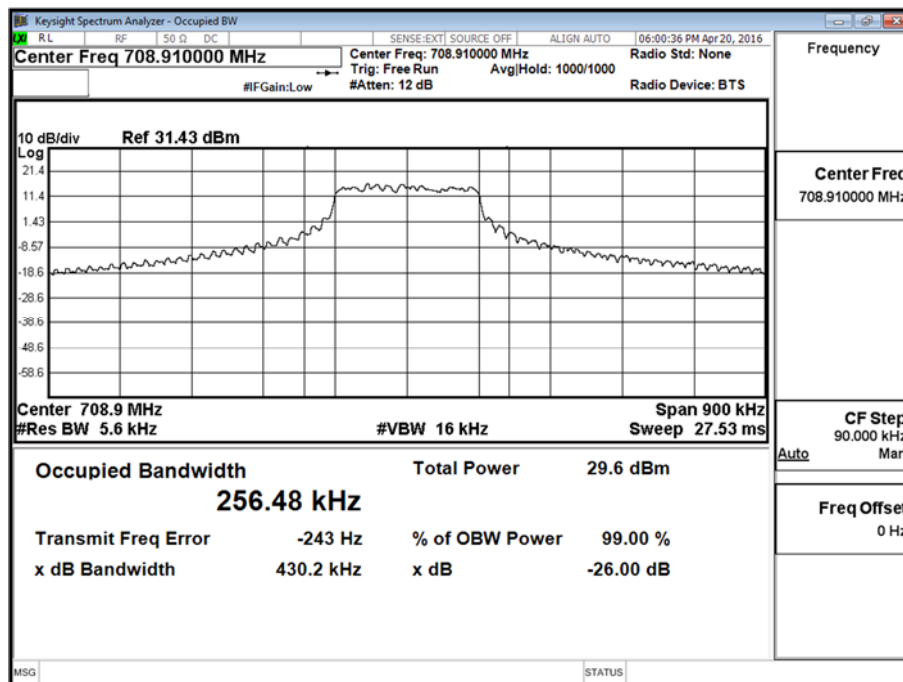




Product Service

10.0 MHz Bandwidth - 16-QAM

| 26 dB Bandwidth (kHz) |       |      |                     |                  |       |      |                     |                  |       |      |                     |
|-----------------------|-------|------|---------------------|------------------|-------|------|---------------------|------------------|-------|------|---------------------|
| 709.0 MHz             |       |      |                     | 710.0 MHz        |       |      |                     | 711.0 MHz        |       |      |                     |
| 1 Resource Block      |       |      | All Resource Blocks | 1 Resource Block |       |      | All Resource Blocks | 1 Resource Block |       |      | All Resource Blocks |
| Low                   | Mid   | High |                     | Low              | Mid   | High |                     | Low              | Mid   | High |                     |
| N/T                   | 430.2 | N/T  | 9708.6              | N/T              | 422.4 | N/T  | 9604.5              | N/T              | 402.6 | N/T  | 9661.8              |

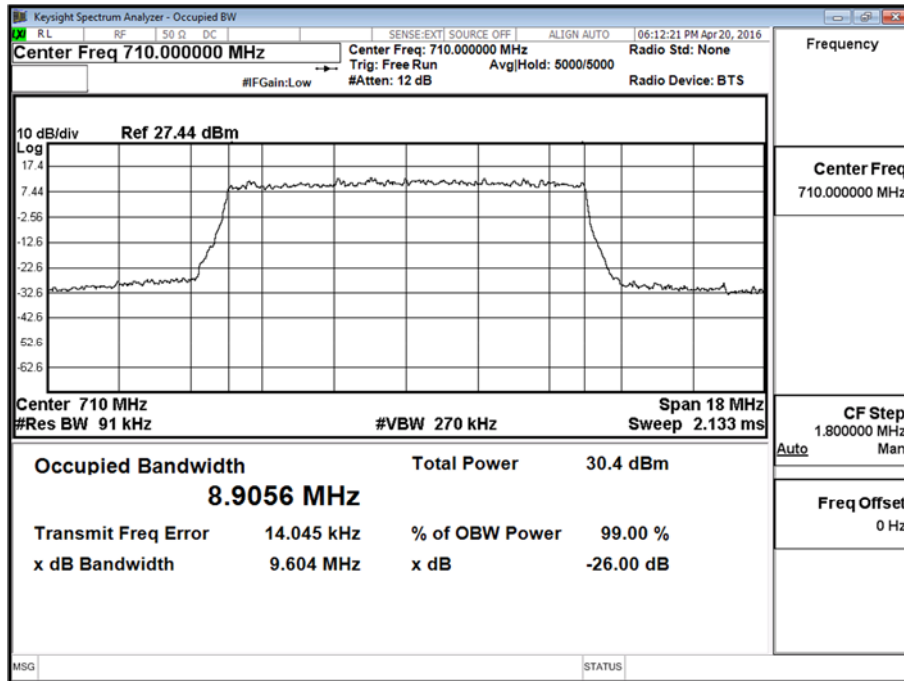
709 MHz - 1 Resource Block - Middle



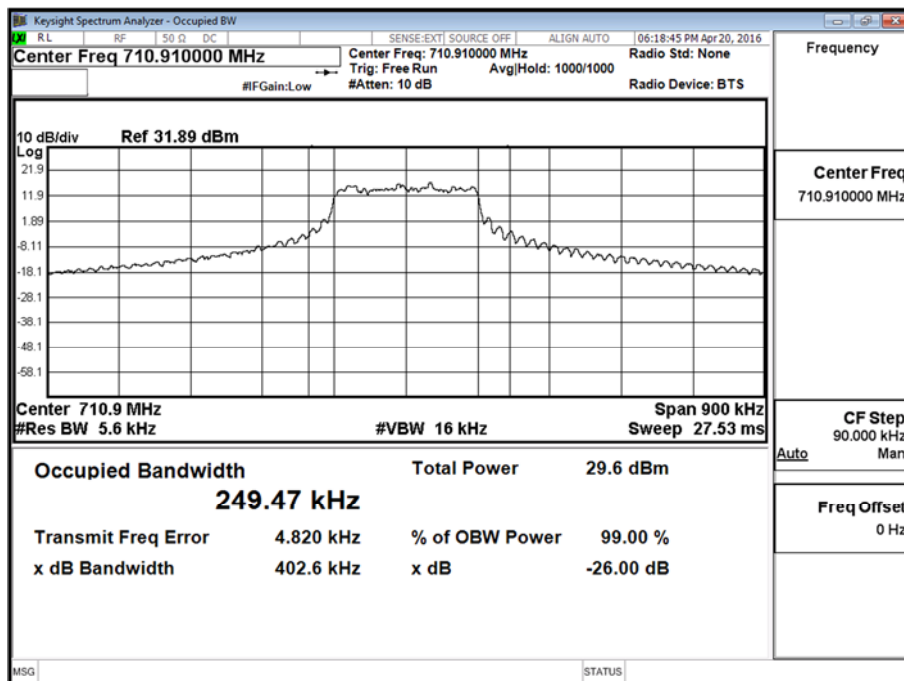


Product Service

### 710 MHz - All Resource Blocks



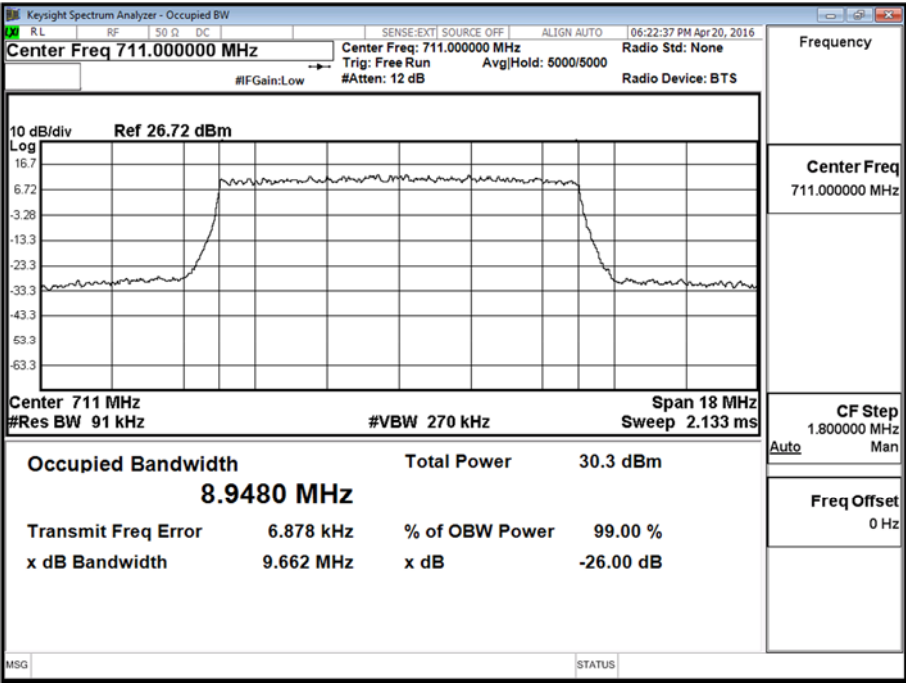
### 711 MHz - 1 Resource Block - Middle





Product Service

711 MHz - All Resource Blocks



FCC 47 CFR Part 27, Limit Clause

None specified



Product Service

**2.6 FREQUENCY STABILITY****2.6.1 Specification Reference**

FCC 47 CFR Part 27, Clause 27.54  
FCC 47 CFR Part 2, Clause 2.1055

**2.6.2 Equipment Under Test and Modification State**

S/N: IMEI 004401115744563 - Modification State 0

**2.6.3 Date of Test**

27 April 2016

**2.6.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.6.5 Test Procedure**

This test was performed in accordance with FCC 47 CFR Part 2, clause 2.1055.

**Remarks**

The CMW500 frequency measurement function was used to measure the frequency error using a nominal uplink frequency of 710.0 MHz,

**2.6.6 Environmental Conditions**

|                     |        |
|---------------------|--------|
| Ambient Temperature | 22.5°C |
| Relative Humidity   | 25.5%  |



Product Service

## 2.6.7 Test Results

4.0 V DC Supply

### LTE FDD17, Frequency Stability Results

#### Under Temperature Variations

#### 10 MHz Bandwidth - QPSK

| Frequency Error (Hz) |                         |                     |
|----------------------|-------------------------|---------------------|
| 710.0 MHz            |                         |                     |
| Supply Voltage       | Temperature Interval °C | All Resource Blocks |
| 3.7 V DC             | +20                     | 13.96               |
| 4.0 V DC             | -30                     | 10.44               |
| 4.0 V DC             | -20                     | 9.07                |
| 4.0 V DC             | -10                     | 8.17                |
| 4.0 V DC             | 0                       | 8.75                |
| 4.0 V DC             | +10                     | 9.36                |
| 4.0 V DC             | +20                     | 14.49               |
| 4.0 V DC             | +30                     | 17.27               |
| 4.0 V DC             | +40                     | -8.03               |
| 4.0 V DC             | +50                     | -7.42               |

#### 10 MHz Bandwidth - 16-QAM

| Frequency Error (Hz) |                         |                     |
|----------------------|-------------------------|---------------------|
| 710.0 MHz            |                         |                     |
| Supply Voltage       | Temperature Interval °C | All Resource Blocks |
| 3.7 V DC             | +20                     | 10.23               |
| 4.0 V DC             | -30                     | 8.11                |
| 4.0 V DC             | -20                     | 8.73                |
| 4.0 V DC             | -10                     | 8.57                |
| 4.0 V DC             | 0                       | 8.74                |
| 4.0 V DC             | +10                     | 7.71                |
| 4.0 V DC             | +20                     | 8.01                |
| 4.0 V DC             | +30                     | -8.31               |
| 4.0 V DC             | +40                     | 7.17                |
| 4.0 V DC             | +50                     | -7.61               |

#### FCC 47 CFR Part 27, Limit Clause 27.54

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorised bands of operation.



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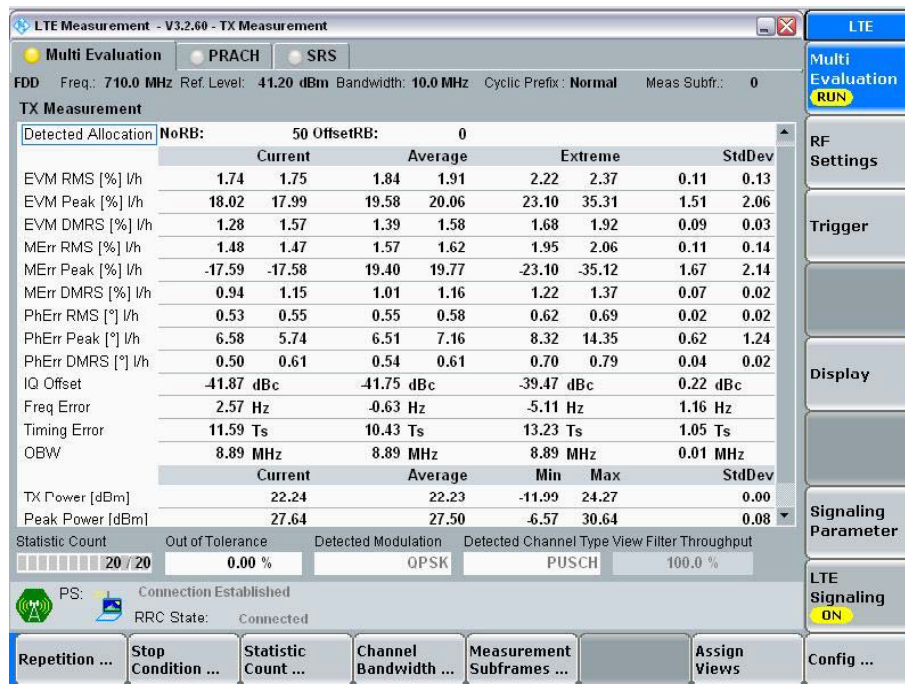
## 2.7 MODULATION CHARACTERISTICS

### 2.7.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1047 (d)

### 2.7.2 Test Results

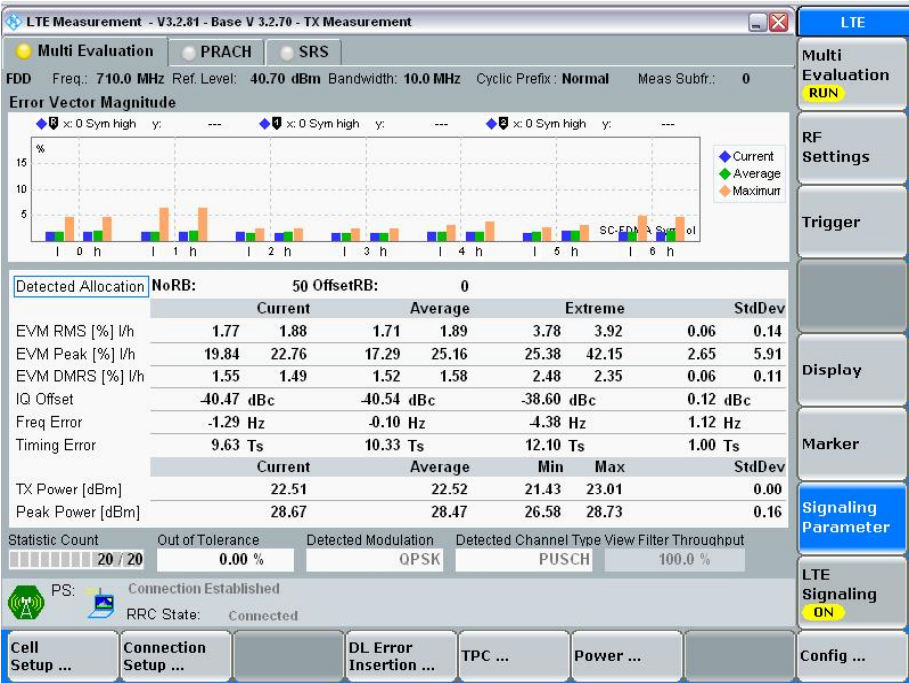
LTE FDD17, 10.0 MHz Bandwidth, QPSK, Transmitter Summary, Modulation Characteristic Plot



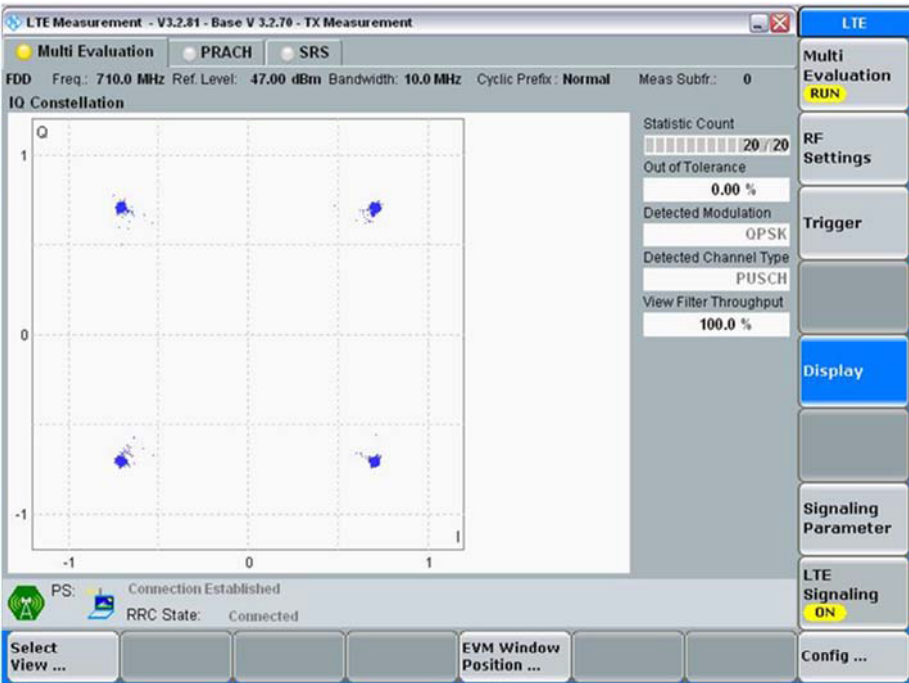


Product Service

LTE FDD17, 10.0 MHz Bandwidth, QPSK, EVM, Modulation Characteristic Plot

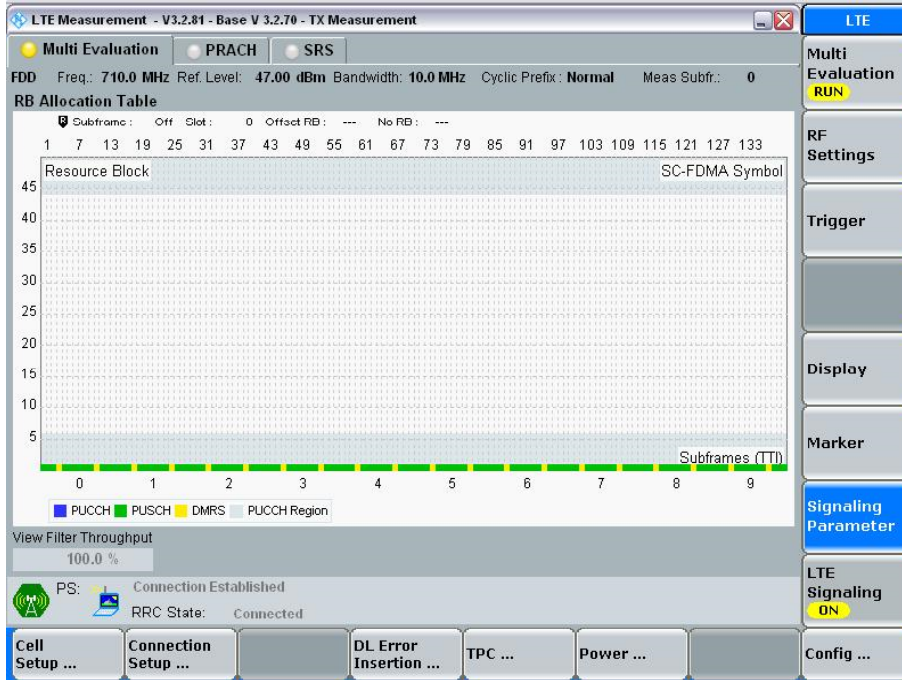


LTE FDD17, 10.0 MHz Bandwidth, QPSK, IQ Constellation, Modulation Characteristic Plot

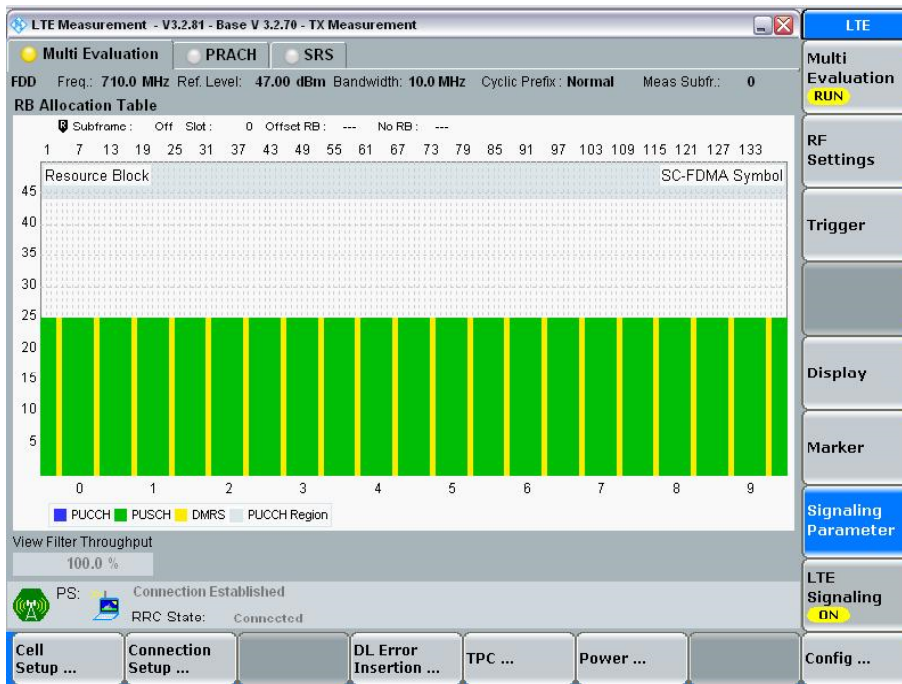




### LTE FDD17, 10.0 MHz Bandwidth, QPSK, 1 Resource Block Allocation, Modulation Characteristic Plot



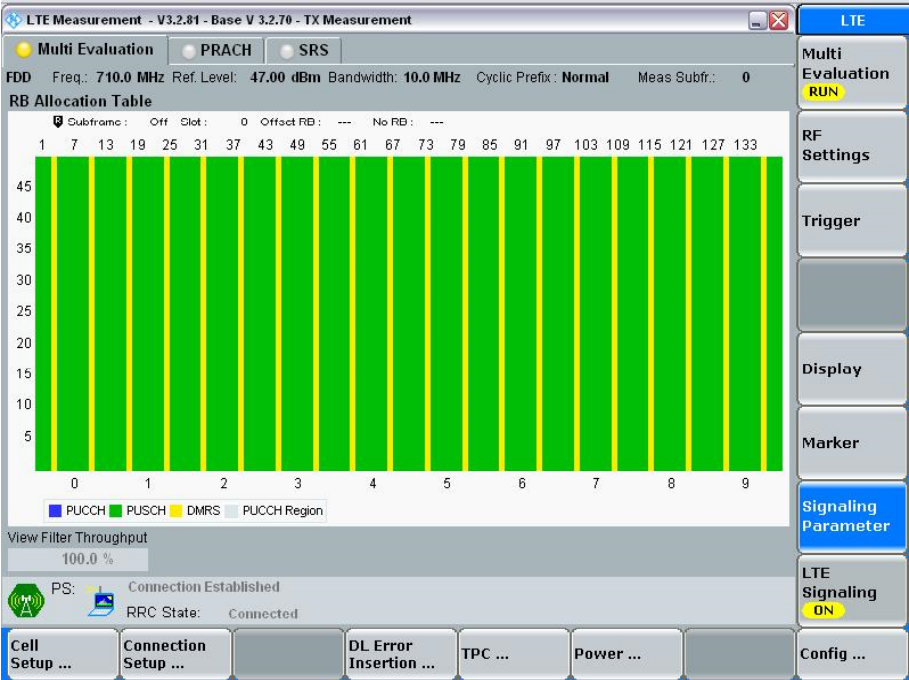
### LTE FDD17, 10.0 MHz Bandwidth, QPSK, 25 Resource Block Allocation, Modulation Characteristic Plot



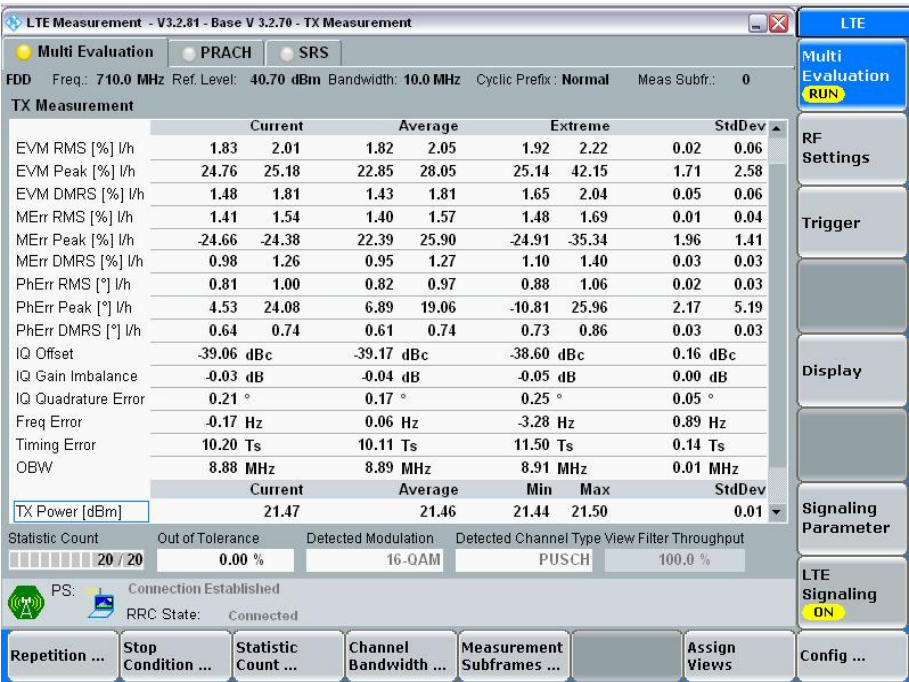


Product Service

LTE FDD17, 10.0 MHz Bandwidth, QPSK, 50 Resource Block Allocation, Modulation Characteristic Plot



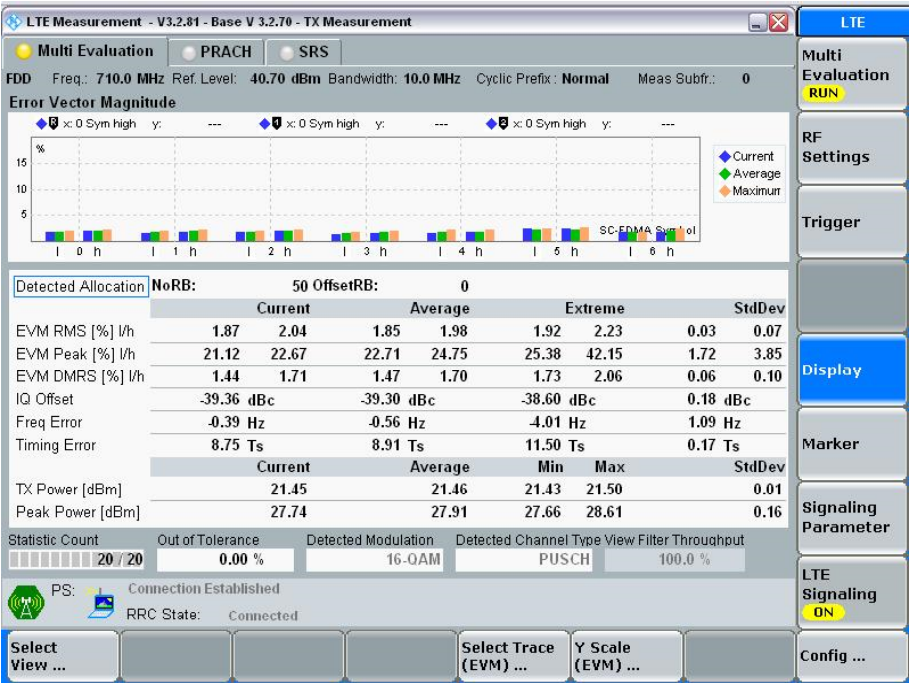
LTE FDD17, 10.0 MHz Bandwidth, 16-QAM, Transmitter Summary, Modulation Characteristic Plot



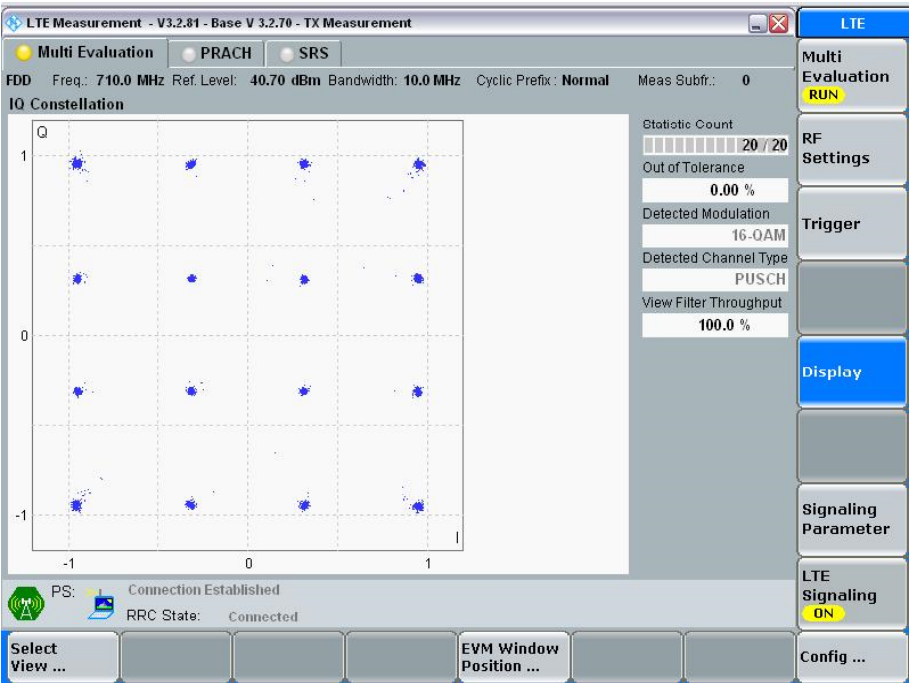


Product Service

LTE FDD17, 10.0 MHz Bandwidth, 16-QAM, EVM, Modulation Characteristic Plot

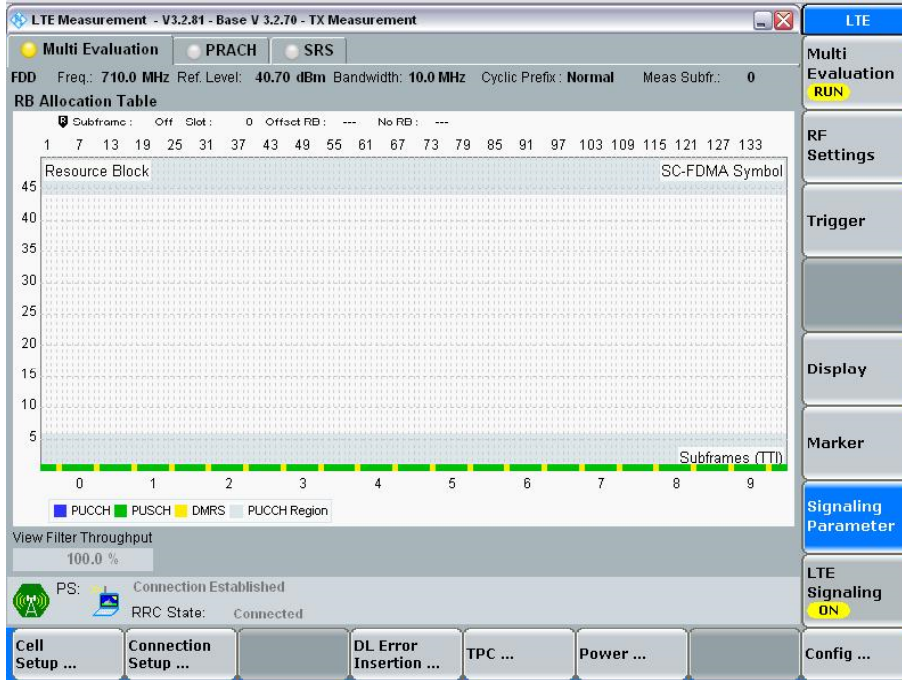


LTE FDD17, 10.0 MHz Bandwidth, 16-QAM, IQ Constellation, Modulation Characteristic Plot

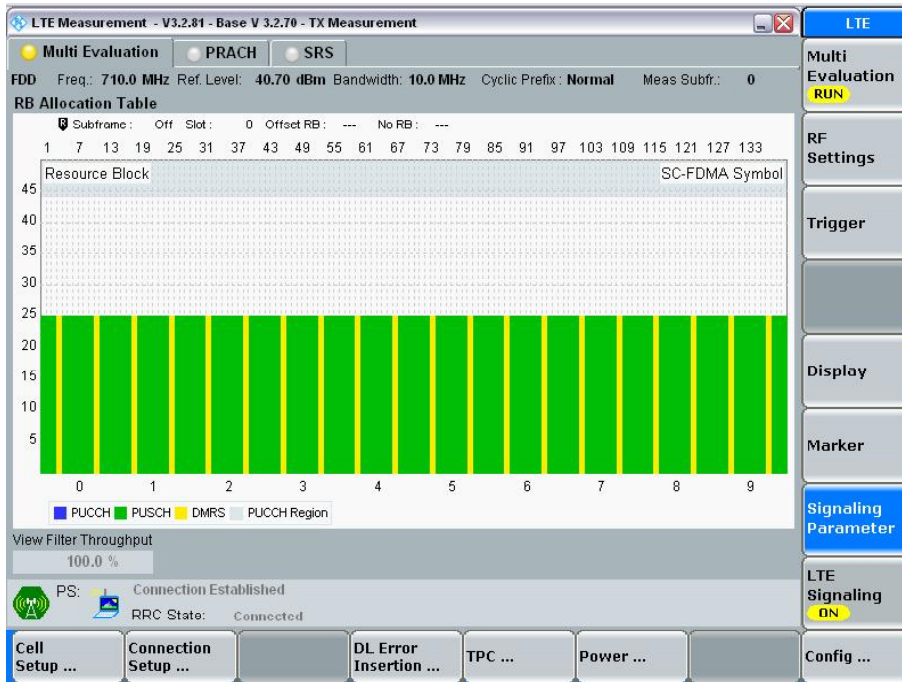




LTE FDD17, 10.0 MHz Bandwidth, 16-QAM, 1 Resource Block Allocation, Modulation Characteristic Plot



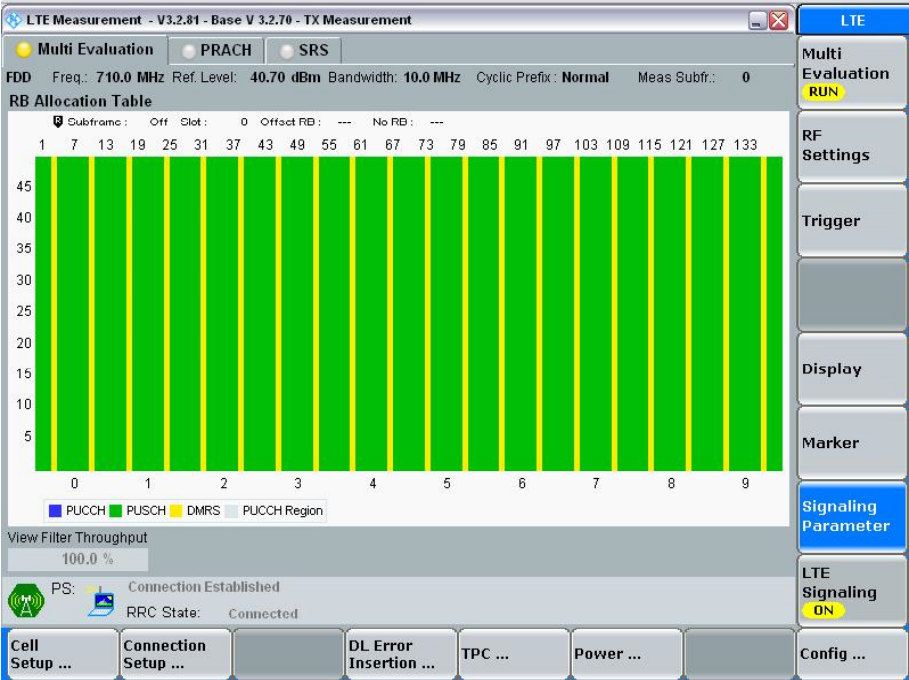
LTE FDD17, 10.0 MHz Bandwidth, 16-QAM, 25 Resource Block Allocation, Modulation Characteristic Plot





Product Service

LTE FDD17, 10.0 MHz Bandwidth, 16-QAM, 50 Resource Block Allocation, Modulation Characteristic Plot



FCC 47 CFR Part 27, Limit Clause 2.1047 (d)

A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.



Product Service

### **SECTION 3**

#### **TEST EQUIPMENT USED**



### 3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

| Instrument                                                   | Manufacturer             | Type No.                   | TE No. | Calibration Period (months) | Calibration Due |
|--------------------------------------------------------------|--------------------------|----------------------------|--------|-----------------------------|-----------------|
| <b>Section 2.1 - Maximum Conducted Output Power</b>          |                          |                            |        |                             |                 |
| Multimeter                                                   | White Gold               | WG022                      | 190    | 12                          | 24-Nov-2016     |
| Radio Communications Test Set                                | Rohde & Schwarz          | CMU 200                    | 442    | 12                          | 18-Jan-2017     |
| Attenuator (20dB/ 2W)                                        | Pasternack               | PE7004-20                  | 489    | 12                          | 30-Oct-2016     |
| Power Supply                                                 | Hewlett Packard          | 6104A                      | 1948   | -                           | TU              |
| Programmable Power Supply                                    | Iso-tech                 | IPS 2010                   | 2437   | -                           | O/P Mon         |
| Hygrometer                                                   | Rotronic                 | I-1000                     | 3220   | 12                          | 19-Aug-2016     |
| Network Analyser                                             | Rohde & Schwarz          | ZVA 40                     | 3548   | 12                          | 2-Sep-2016      |
| Combiner/Splitter                                            | Weinschel                | 1506A                      | 3878   | 12                          | 2-Jun-2016      |
| P-Series Power Meter                                         | Agilent Technologies     | N1911A                     | 3981   | 12                          | 25-Sep-2016     |
| 50 MHz-18 GHz Wideband Power Sensor                          | Agilent Technologies     | N1921A                     | 3983   | 12                          | 25-Sep-2016     |
| Calibration Unit                                             | Rohde & Schwarz          | ZV-Z54                     | 4368   | 12                          | 7-Sep-2016      |
| 2 metre SMA Cable                                            | Florida Labs             | SMS-235SP-78.8-SMS         | 4517   | 12                          | 16-Feb-2017     |
| Wideband Radio Test Set                                      | Rohde & Schwarz          | CMW500                     | 4546   | 12                          | 3-Feb-2017      |
| PXA Signal Analyser                                          | Keysight Technologies    | N9030A                     | 4653   | 12                          | 8-Oct-2016      |
| <b>Section 2.2 - Emission Limitations</b>                    |                          |                            |        |                             |                 |
| Turntable Controller                                         | Inn-Co GmbH              | CO 1000                    | 1606   | -                           | TU              |
| Antenna (Bilog)                                              | Chase                    | CBL6143                    | 2904   | 24                          | 11-Jun-2017     |
| Signal Generator (10MHz to 40GHz)                            | Rohde & Schwarz          | SMR40                      | 3171   | 12                          | 28-Sep-2016     |
| EMI Test Receiver                                            | Rohde & Schwarz          | ESU40                      | 3506   | 12                          | 2-Nov-2016      |
| Tilt Antenna Mast                                            | maturo GmbH              | TAM 4.0-P                  | 3916   | -                           | TU              |
| Mast Controller                                              | maturo GmbH              | NCD                        | 3917   | -                           | TU              |
| Double Ridged Waveguide Horn Antenna                         | ETS-Lindgren             | 3117                       | 4722   | 12                          | 29-Dec-2016     |
| <b>Section 2.3 - Spurious Emissions at Antenna Terminals</b> |                          |                            |        |                             |                 |
| Multimeter                                                   | White Gold               | WG022                      | 190    | 12                          | 24-Nov-2016     |
| Attenuator 10dB/25W                                          | Weinschel                | 46-10-43                   | 400    | 12                          | 18-Jun-2016     |
| Radio Communications Test Set                                | Rohde & Schwarz          | CMU 200                    | 442    | 12                          | 18-Jan-2017     |
| Power Splitter                                               | Weinschel                | 1506A                      | 607    | 12                          | 31-Mar-2017     |
| Rubidium Standard                                            | Rohde & Schwarz          | XSRM                       | 1316   | 6                           | 3-Sep-2016      |
| Power Supply                                                 | Hewlett Packard          | 6104A                      | 1948   | -                           | TU              |
| High Pass Filter (7GHz)                                      | Lorch                    | 9HP7-7000-SR               | 2246   | 0                           | Class 1 (Int)   |
| Multimeter                                                   | Iso-tech                 | IDM101                     | 2424   | 12                          | 29-Sep-2016     |
| Programmable Power Supply                                    | Iso-tech                 | IPS 2010                   | 2436   | -                           | O/P Mon         |
| Programmable Power Supply                                    | Iso-tech                 | IPS 2010                   | 2437   | -                           | O/P Mon         |
| Filter                                                       | Daden Anthony Ass        | MH-1500-7SS                | 2778   | 12                          | 5-Feb-2017      |
| Attenuator (20dB, 2W)                                        | Pasternack               | PE7004-20                  | 2943   | 12                          | 4-Apr-2017      |
| Hygrometer                                                   | Rotronic                 | I-1000                     | 3220   | 12                          | 19-Aug-2016     |
| Network Analyser                                             | Rohde & Schwarz          | ZVA 40                     | 3548   | 12                          | 2-Sep-2016      |
| Calibration Unit                                             | Rohde & Schwarz          | ZV-Z54                     | 4368   | 12                          | 7-Sep-2016      |
| Frequency Standard                                           | Spectracom               | Secure Sync 1200-0408-0601 | 4393   | 6                           | 3-Sep-2016      |
| PXA Signal Analyser                                          | Agilent Technologies     | N9030A PXA                 | 4409   | 12                          | 8-Mar-2017      |
| Suspended Substrate Highpass Filter                          | Advance Power Components | 11SH10-3000/X18000-O/O     | 4411   | 12                          | 23-Mar-2017     |
| Wideband Radio Test Set                                      | Rohde & Schwarz          | CMW500                     | 4546   | 12                          | 3-Feb-2017      |



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| Instrument                                           | Manufacturer          | Type No.                   | TE No. | Calibration Period (months) | Calibration Due |
|------------------------------------------------------|-----------------------|----------------------------|--------|-----------------------------|-----------------|
| <b>Section 2.4 - Spurious Emissions at Band Edge</b> |                       |                            |        |                             |                 |
| Attenuator 10dB/25W                                  | Weinschel             | 46-10-43                   | 400    | 12                          | 18-Jun-2016     |
| Radio Communications Test Set                        | Rohde & Schwarz       | CMU 200                    | 442    | 12                          | 18-Jan-2017     |
| Power Splitter                                       | Weinschel             | 1506A                      | 607    | 12                          | 31-Mar-2017     |
| Rubidium Standard                                    | Rohde & Schwarz       | XSRM                       | 1316   | 6                           | 3-Sep-2016      |
| Power Supply                                         | Hewlett Packard       | 6104A                      | 1948   | -                           | TU              |
| Multimeter                                           | Iso-tech              | IDM101                     | 2424   | 12                          | 29-Sep-2016     |
| Programmable Power Supply                            | Iso-tech              | IPS 2010                   | 2436   | -                           | O/P Mon         |
| Attenuator (20dB, 2W)                                | Pasternack            | PE7004-20                  | 2943   | 12                          | 4-Apr-2017      |
| Hygrometer                                           | Rotronic              | I-1000                     | 3220   | 12                          | 19-Aug-2016     |
| Network Analyser                                     | Rohde & Schwarz       | ZVA 40                     | 3548   | 12                          | 2-Sep-2016      |
| Calibration Unit                                     | Rohde & Schwarz       | ZV-Z54                     | 4368   | 12                          | 7-Sep-2016      |
| Frequency Standard                                   | Spectracom            | Secure Sync 1200-0408-0601 | 4393   | 6                           | 3-Sep-2016      |
| PXA Signal Analyser                                  | Agilent Technologies  | N9030A PXA                 | 4409   | 12                          | 8-Mar-2017      |
| <b>Section 2.5 - 26 dB Bandwidth</b>                 |                       |                            |        |                             |                 |
| Multimeter                                           | White Gold            | WG022                      | 190    | 12                          | 24-Nov-2016     |
| Attenuator 10dB/25W                                  | Weinschel             | 46-10-43                   | 400    | 12                          | 18-Jun-2016     |
| Radio Communications Test Set                        | Rohde & Schwarz       | CMU 200                    | 442    | 12                          | 18-Jan-2017     |
| Directional Coupler                                  | Hewlett Packard       | 11692D                     | 451    | 12                          | 13-Oct-2016     |
| Attenuator (20dB/ 2W)                                | Pasternack            | PE7004-20                  | 489    | 12                          | 30-Oct-2016     |
| Power Splitter                                       | Weinschel             | 1506A                      | 607    | 12                          | 31-Mar-2017     |
| Rubidium Standard                                    | Rohde & Schwarz       | XSRM                       | 1316   | 6                           | 3-Sep-2016      |
| Power Supply                                         | Hewlett Packard       | 6104A                      | 1948   | -                           | TU              |
| Multimeter                                           | Iso-tech              | IDM101                     | 2424   | 12                          | 29-Sep-2016     |
| Programmable Power Supply                            | Iso-tech              | IPS 2010                   | 2436   | -                           | O/P Mon         |
| Programmable Power Supply                            | Iso-tech              | IPS 2010                   | 2437   | -                           | O/P Mon         |
| Attenuator (20dB, 2W)                                | Pasternack            | PE7004-20                  | 2943   | 12                          | 4-Apr-2017      |
| Hygrometer                                           | Rotronic              | I-1000                     | 3220   | 12                          | 19-Aug-2016     |
| Network Analyser                                     | Rohde & Schwarz       | ZVA 40                     | 3548   | 12                          | 2-Sep-2016      |
| Combiner/Splitter                                    | Weinschel             | 1506A                      | 3878   | 12                          | 2-Jun-2016      |
| Calibration Unit                                     | Rohde & Schwarz       | ZV-Z54                     | 4368   | 12                          | 7-Sep-2016      |
| Frequency Standard                                   | Spectracom            | Secure Sync 1200-0408-0601 | 4393   | 6                           | 3-Sep-2016      |
| PXA Signal Analyser                                  | Agilent Technologies  | N9030A PXA                 | 4409   | 12                          | 8-Mar-2017      |
| Wideband Radio Test Set                              | Rohde & Schwarz       | CMW500                     | 4546   | 12                          | 3-Feb-2017      |
| PXA Signal Analyser                                  | Keysight Technologies | N9030A                     | 4653   | 12                          | 8-Oct-2016      |
| <b>Section 2.6 - Frequency Stability</b>             |                       |                            |        |                             |                 |
| Multimeter                                           | White Gold            | WG022                      | 190    | 12                          | 24-Nov-2016     |
| Temperature Chamber                                  | Montford              | 2F3                        | 467    | -                           | O/P Mon         |
| Rubidium Standard                                    | Rohde & Schwarz       | XSRM                       | 1316   | 6                           | 3-Sep-2016      |
| Power Supply                                         | Iso-tech              | IPS 2010                   | 2440   | -                           | O/P Mon         |
| Frequency Standard                                   | Spectracom            | Secure Sync 1200-0408-0601 | 4393   | 6                           | 3-Sep-2016      |
| Wideband Radio Test Set                              | Rohde & Schwarz       | CMW500                     | 4546   | 12                          | 3-Feb-2017      |

TU – Traceability Unscheduled

O/P MON – Output Monitored with Calibrated Equipment



### 3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

|                                         |                                                                                                                                         |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Test Discipline                         | MU                                                                                                                                      |
| Modulation Characteristics              | -                                                                                                                                       |
| Spurious Emissions at Antenna Terminals | $\pm 3.454$ dB                                                                                                                          |
| 26 dB Bandwidth                         | 1 Resource Block: $\pm 8.59$ kHz<br>All Resource Blocks: $\pm 84.51$ kHz                                                                |
| Emission Limitations                    | Radiated Emissions ; 30 MHz to 1 GHz ;<br>$\pm 5.1$ dB<br>Radiated Emissions ; 1 GHz to 40 GHz ;<br>6.2 dB<br>ERP / EIRP ; $\pm 3.0$ dB |
| Frequency Stability                     | $\pm 37.73$ Hz                                                                                                                          |
| Spurious Emissions at Band Edge         | $\pm 2.20$ dB                                                                                                                           |
| Maximum Conducted Output Power          | $\pm 0.7$ dB                                                                                                                            |



Product Service

## **SECTION 4**

### **ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



Product Service

#### 4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA  
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TÜV SÜD Product Service

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