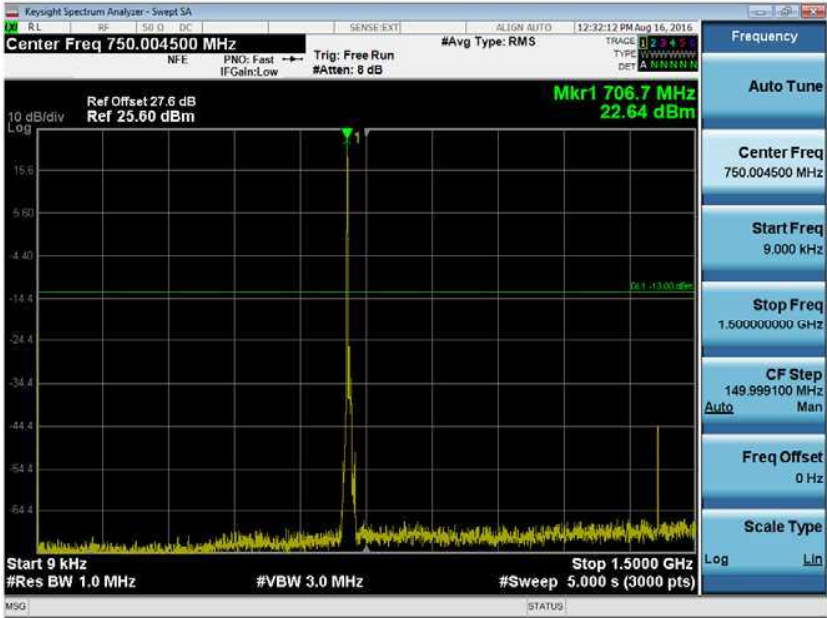




Product Service

10.0 MHz Bandwidth – 16-QAM

711.0 MHz - 1 Resource Block - Low – 9 kHz to 1.5 GHz



711.0 MHz - 1 Resource Block - Low – 1.5 GHz to 8.0 GHz



FCC 47 CFR Part 27 Limit Clause 27.53 (g)

-13 dBm



2.4 SPURIOUS EMISSIONS AT BAND EDGE

2.4.1 Specification Reference

FCC 47 CFR Part 27, Clause 27.53 (h)
FCC 47 CFR Part 2, Clause 2.1051

2.4.2 Equipment Under Test and Modification State

S/N: IMEI 004401115905172 - Modification State 0

2.4.3 Date of Test

16 August 2016

2.4.4 Test Equipment Used

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

2.4.5 Test Procedure

This test was performed in accordance with KDB 971168 D01 v02r02, clause 6.

2.4.6 Environmental Conditions

Ambient Temperature	21.8°C
Relative Humidity	59.1%



Product Service

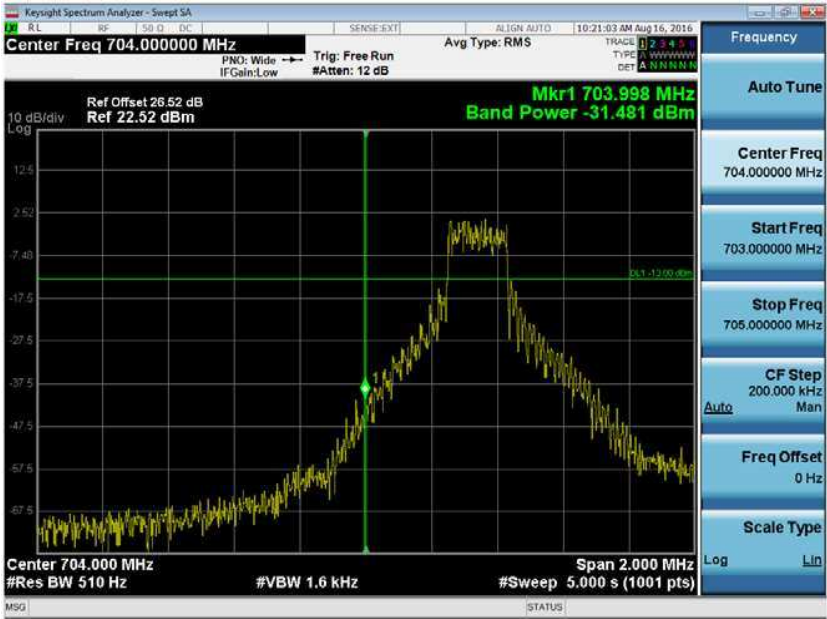
2.4.7 Test Results

LTE FDD17, Spurious Emissions at Band Edge Results

5.0 MHz Bandwidth - QPSK

Band Edge (dBm)			
706.5 MHz		713.5 MHz	
1 Resource Block	All Resource Blocks	1 Resource Block	All Resource Blocks
Low		High	
-31.48	-30.04	-33.13	-32.08

706.5 MHz - 1 Resource Block - Low



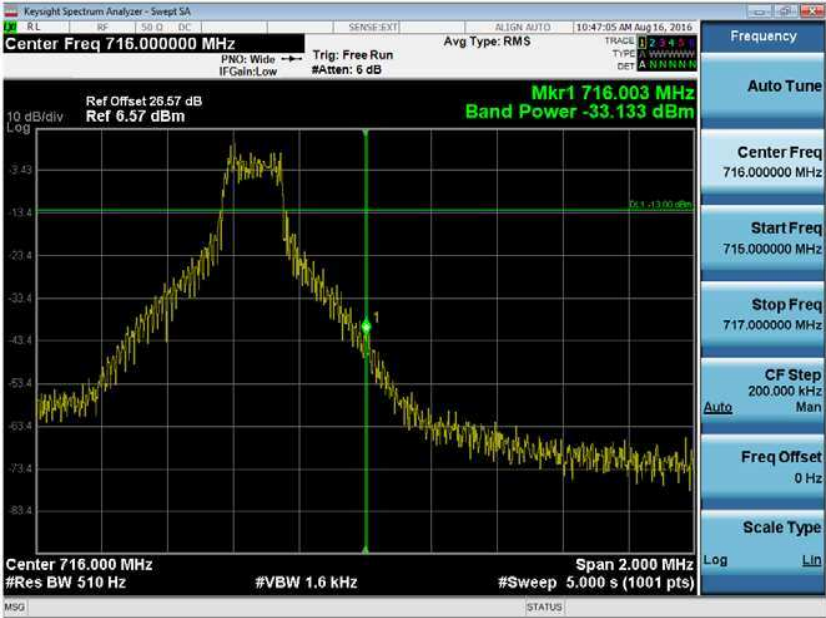


Product Service

706.5 MHz - All Resource Blocks



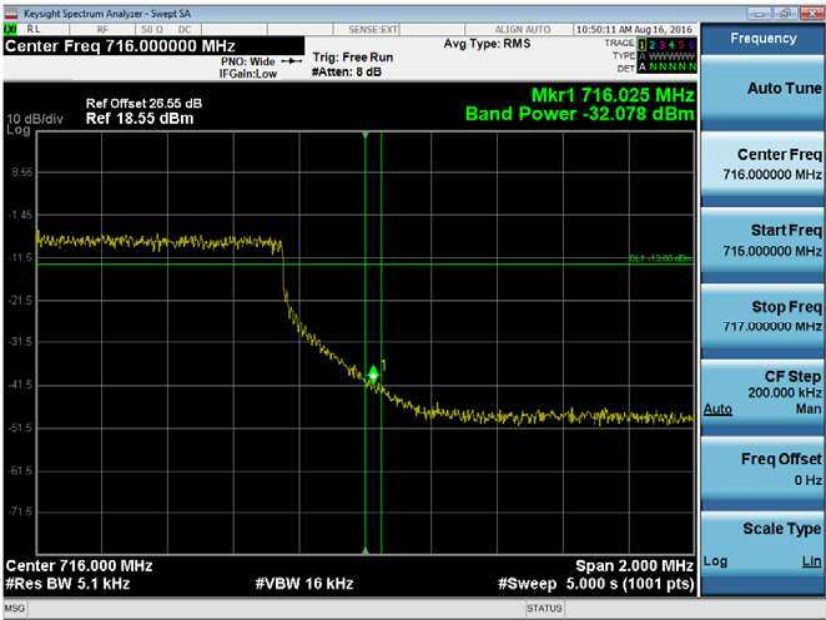
713.5 MHz - 1 Resource Block - High





Product Service

713.5 MHz - All Resource Blocks



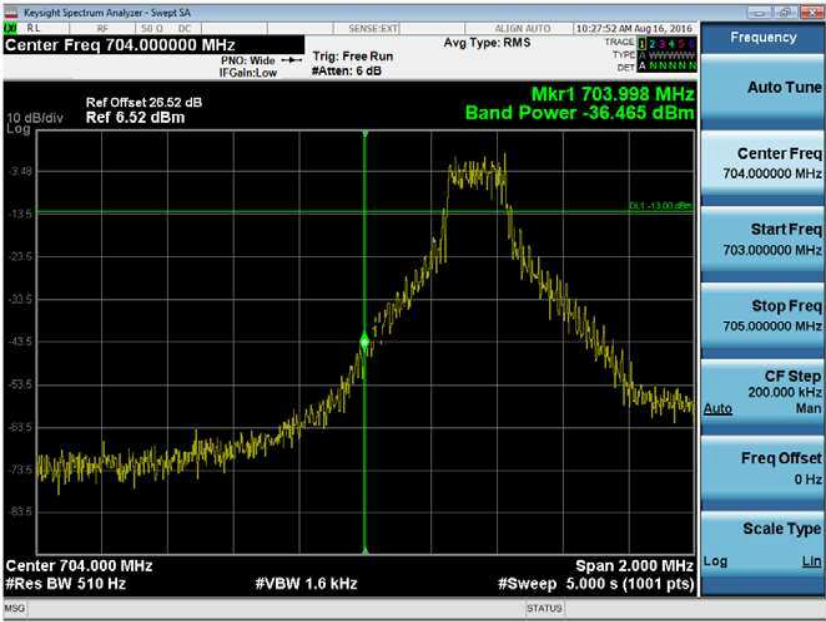


Product Service

5.0 MHz Bandwidth - 16-QAM

Band Edge (dBm)			
706.5 MHz		713.5 MHz	
1 Resource Block	All Resource Blocks	1 Resource Block	All Resource Blocks
Low		High	
-36.47	-30.93	-35.16	-32.87

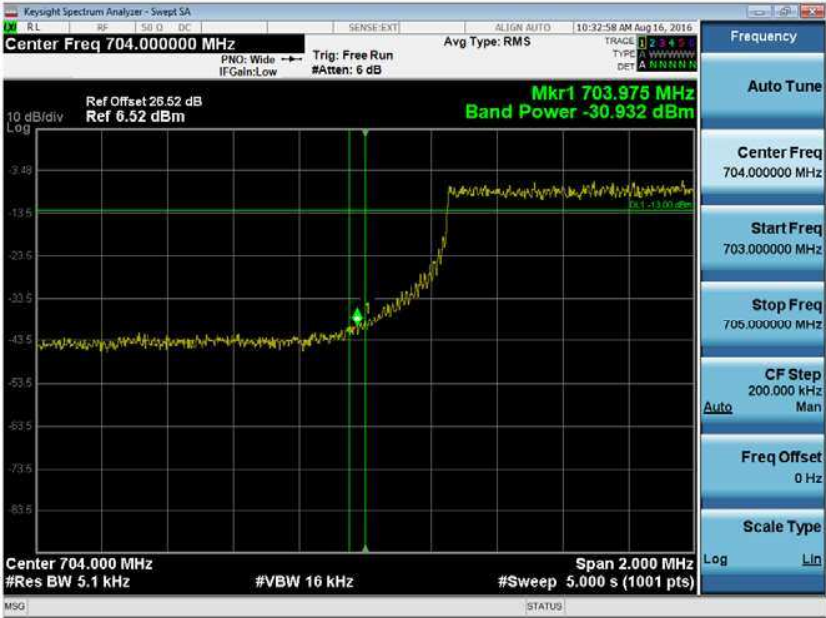
706.5 MHz - 1 Resource Block - Low



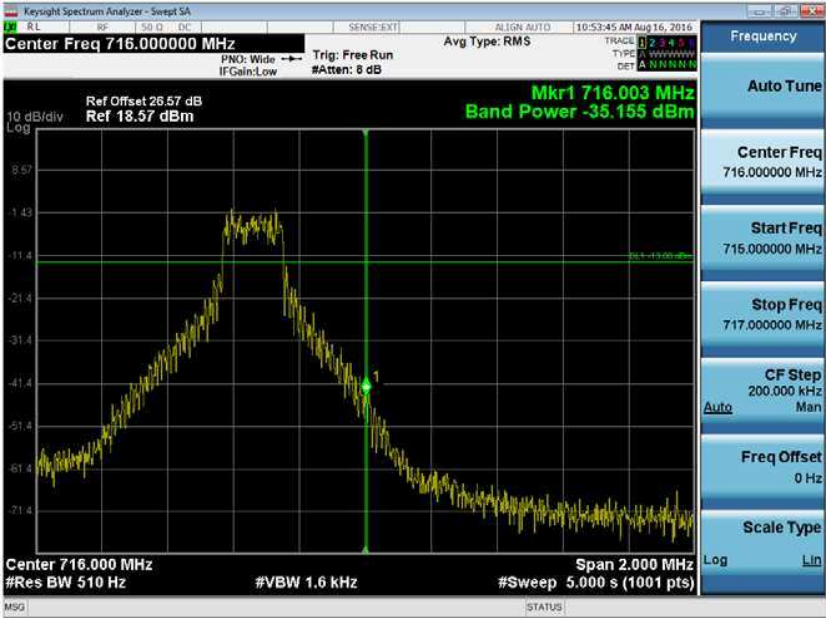


Product Service

706.5 MHz - All Resource Blocks



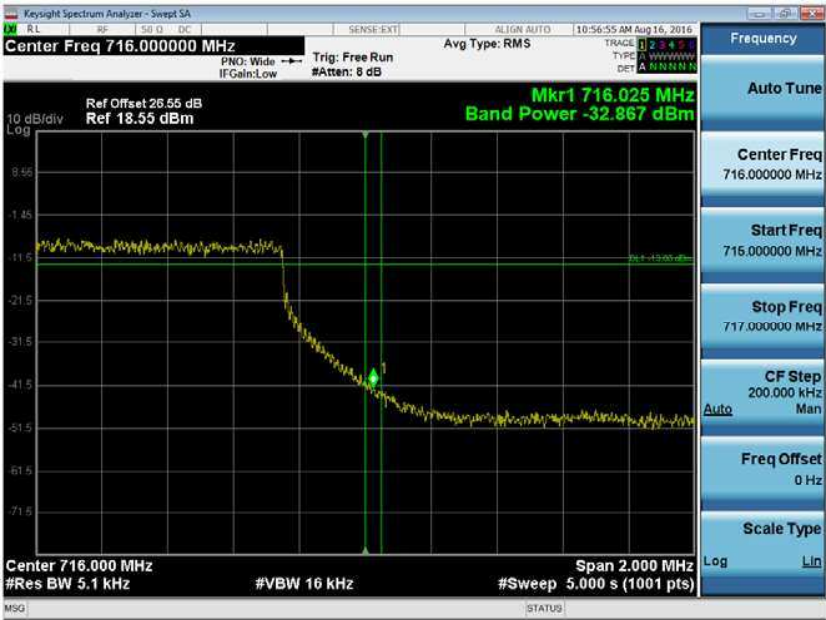
713.5 MHz - 1 Resource Block - High





Product Service

713.5 MHz - All Resource Blocks



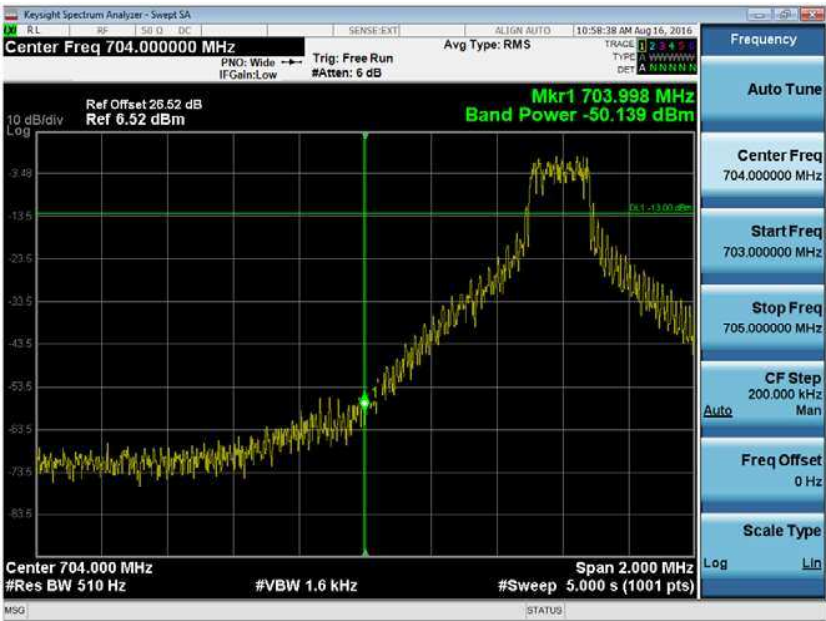


Product Service

10.0 MHz Bandwidth - QPSK

Band Edge (dBm)			
709.0 MHz		711.0 MHz	
1 Resource Block	All Resource Blocks	1 Resource Block	All Resource Blocks
Low		High	
-50.14	-31.96	-47.51	-34.74

709 MHz - 1 Resource Block - Low





Product Service

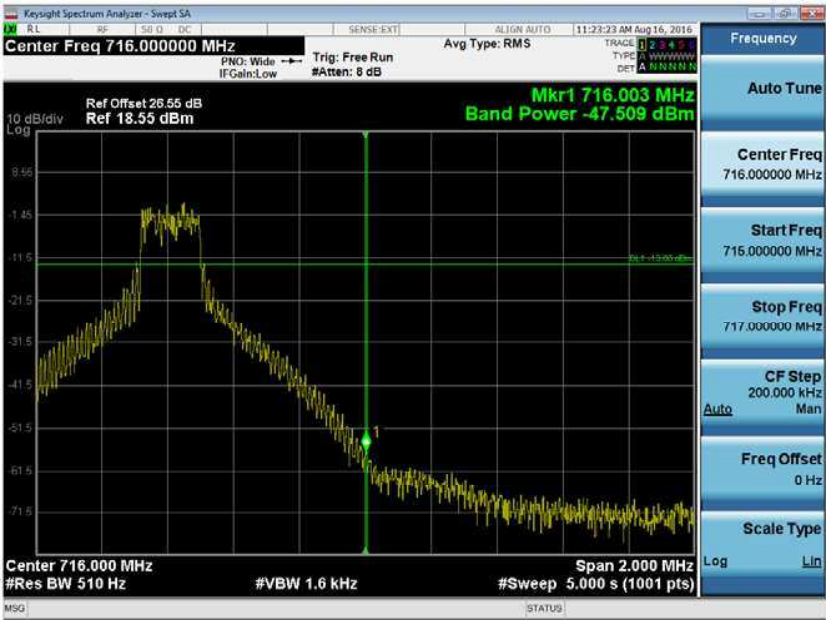
709 MHz - All Resource Blocks





Product Service

711 MHz - 1 Resource Block - High



711 MHz - All Resource Blocks



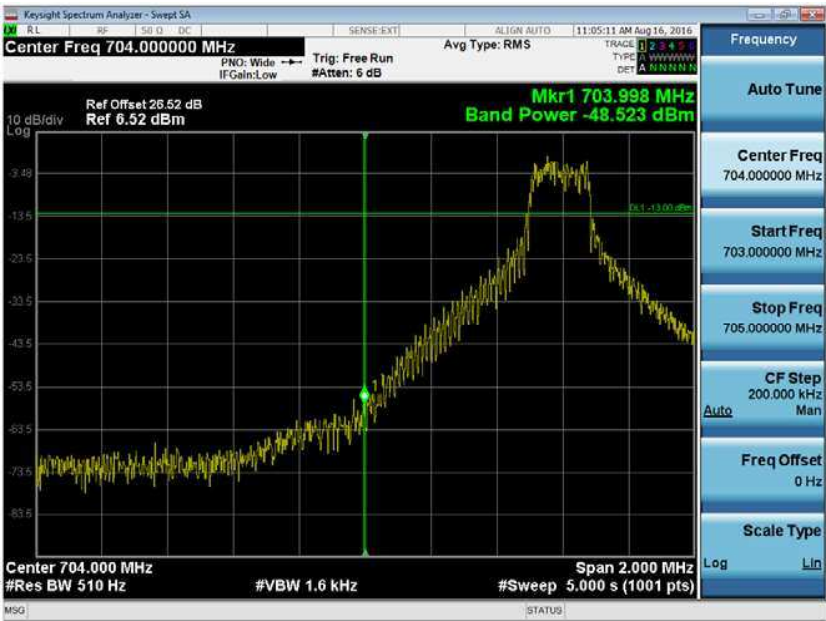


Product Service

10.0 MHz Bandwidth - 16-QAM

Band Edge (dBm)			
709.0 MHz		711.0 MHz	
1 Resource Block	All Resource Blocks	1 Resource Block	All Resource Blocks
Low		High	
-48.52	-33.07	-46.46	-35.49

709 MHz - 1 Resource Block - Low



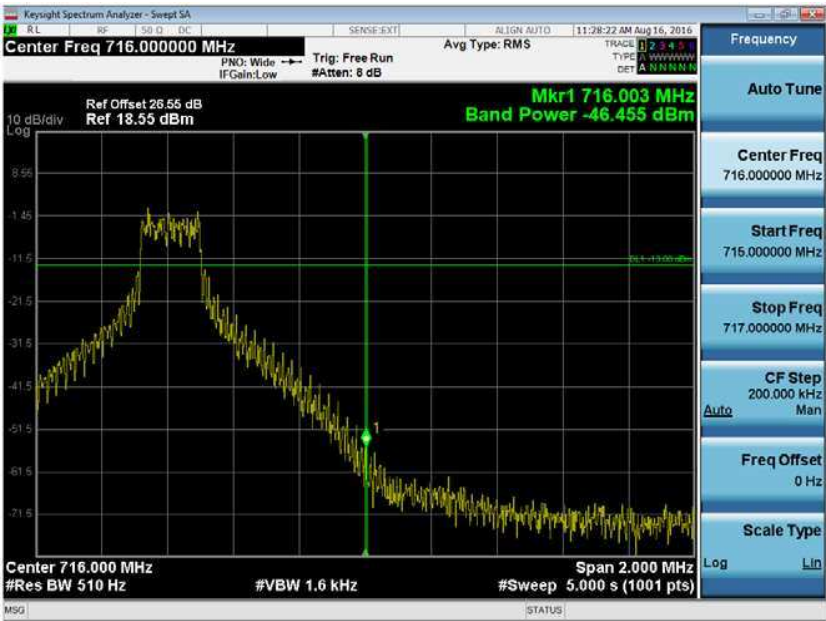


Product Service

709 MHz - All Resource Blocks



711 MHz - 1 Resource Block - High





Product Service

711 MHz - All Resource Blocks



FCC 47 CFR Part 27, Limit Clause 27.53 (h)

Out of band emissions: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.



2.5 26 dB BANDWIDTH

2.5.1 Specification Reference

FCC 47 CFR Part 27, Clause 27.53 (h)(3)
FCC 47 CFR Part 2, Clause 2.1051

2.5.2 Equipment Under Test and Modification State

S/N: IMEI 004401115905172 - Modification State 0

2.5.3 Date of Test

16 August 2016

2.5.4 Test Equipment Used

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

2.5.5 Test Procedure

This test was performed in accordance with KDB 971168 D01 v02r02, clause 4.1.

2.5.6 Environmental Conditions

Ambient Temperature	21.8°C
Relative Humidity	59.1%



Product Service

2.5.7 Test Results

LTE FDD 17, 26 dB Bandwidth Results

5.0 MHz Bandwidth - QPSK

26 dB Bandwidth (kHz)											
706.5 MHz				710.0 MHz				713.5 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	375.7	N/T	4941.7	N/T	364.3	N/T	4921.8	N/T	415.1	N/T	4902.7

706.5 MHz - 1 Resource Block - Middle





Product Service

706.5 MHz - All Resource Blocks



710 MHz - 1 Resource Block - Middle





Product Service

710 MHz - All Resource Blocks



713.5 MHz - 1 Resource Block - Middle





713.5 MHz - All Resource Blocks





Product Service

5.0 MHz Bandwidth - 16-QAM

26 dB Bandwidth (kHz)											
706.5 MHz				710.0 MHz				713.5 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	430.9	N/T	4942.6	N/T	416.1	N/T	4896.0	N/T	434.8	N/T	4837.8

706.5 MHz - 1 Resource Block - Middle



706.5 MHz - All Resource Blocks



710 MHz - 1 Resource Block - Middle





710 MHz - All Resource Blocks





Product Service

713.5 MHz - 1 Resource Block - Middle



713.5 MHz - All Resource Blocks





Product Service

10.0 MHz Bandwidth - QPSK

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	372.4	N/T	9717.9	N/T	364.7	N/T	9663.3	N/T	376.8	N/T	9661.5

709 MHz - 1 Resource Block - Middle





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	430.9	N/T	9723.6	N/T	421.5	N/T	9676.0	N/T	403.0	N/T	9675.2

709 MHz - 1 Resource Block - Middle





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



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 004401115905172 - Modification State 0

2.6.3 Date of Test

2 September 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 as per the tables below.

2.6.6 Environmental Conditions

Ambient Temperature	24.6°C
Relative Humidity	55.4%



2.6.7 Test Results

LTE FDD 17, 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	3.93
4.0 V DC	-30	-3.99
4.0 V DC	-20	4.89
4.0 V DC	-10	4.49
4.0 V DC	0	4.51
4.0 V DC	+10	6.90
4.0 V DC	+20	4.72
4.0 V DC	+30	-3.93
4.0 V DC	+40	-5.79
4.0 V DC	+50	-3.95

10 MHz Bandwidth - 16-QAM

Frequency Error (Hz)		
710.0 MHz		
Supply Voltage	Temperature Interval °C	All Resource Blocks
3.7 V DC	+20	4.15
4.0 V DC	-30	-4.39
4.0 V DC	-20	4.91
4.0 V DC	-10	4.62
4.0 V DC	0	4.49
4.0 V DC	+10	4.85
4.0 V DC	+20	3.81
4.0 V DC	+30	-4.73
4.0 V DC	+40	-4.03
4.0 V DC	+50	-4.19

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.



Product Service

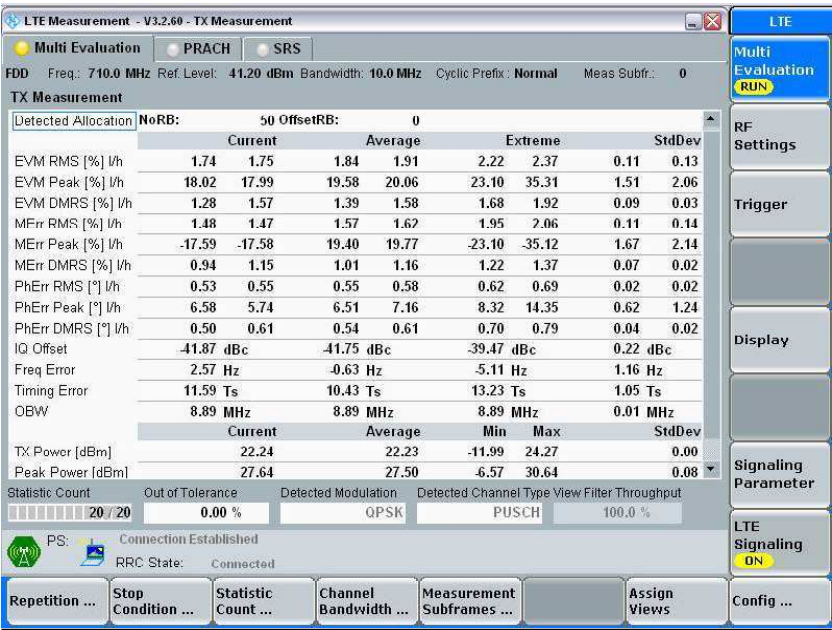
2.7 MODULATION CHARACTERISTICS

2.7.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1047 (d)

2.7.2 Test Results

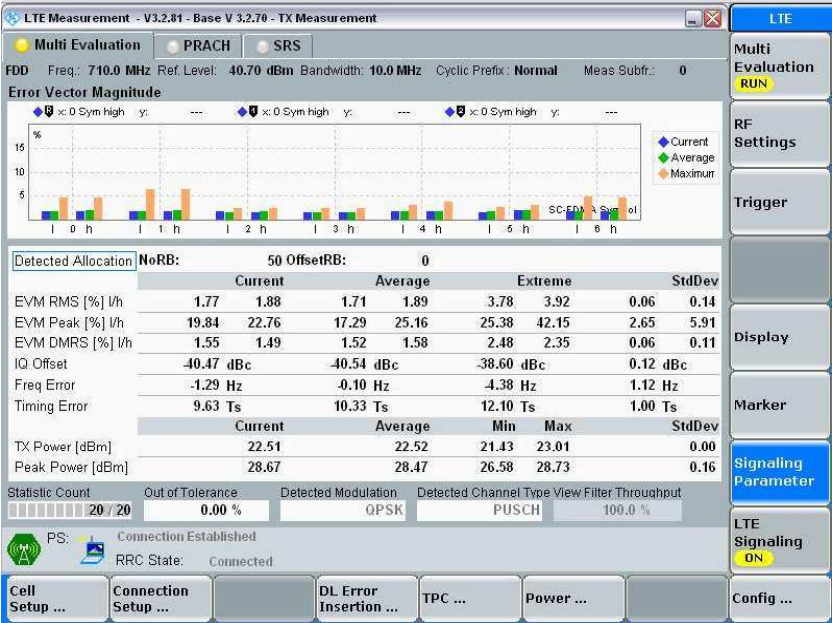
LTE FDD17, 10.0 MHz Bandwidth, QPSK, Transmitter Summary, Modulation Characteristic Plot



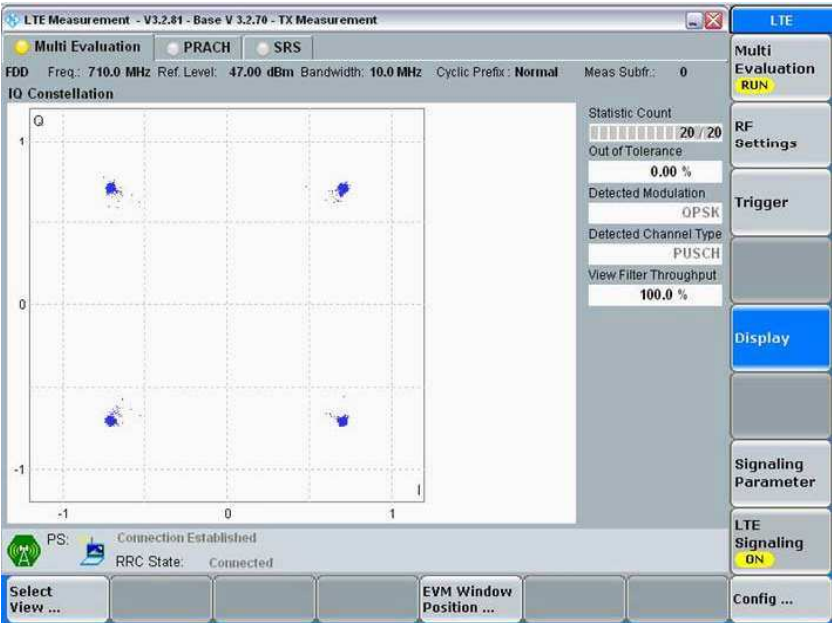


Product Service

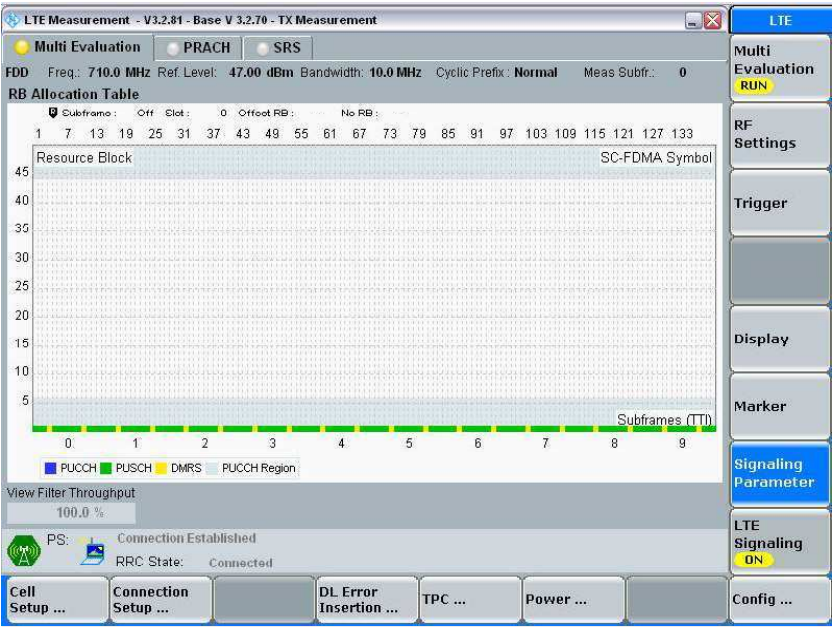
LTE FDD17, 10.0 MHz Bandwidth, QPSK, EVM, Modulation Characteristic Plot



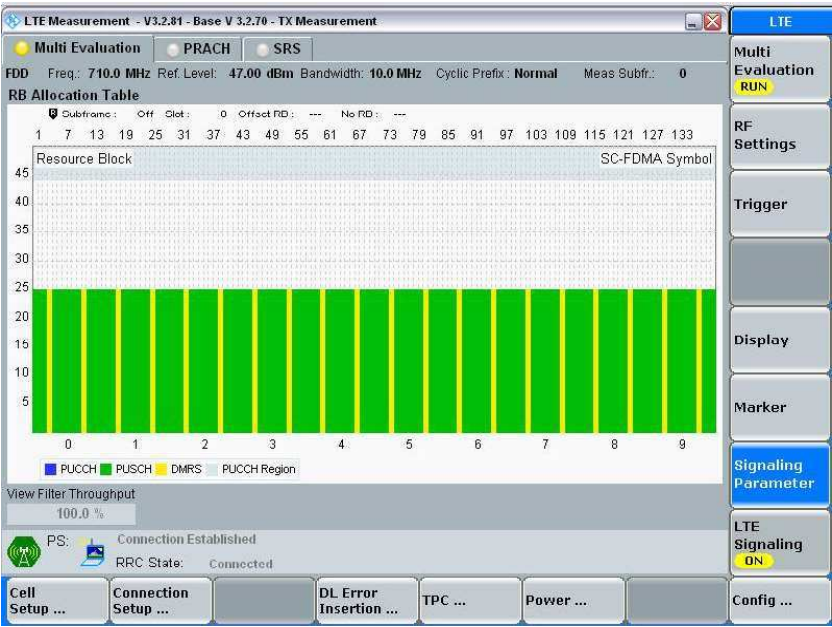
LTE FDD17, 10.0 MHz Bandwidth, QPSK, IQ Constellation, Modulation Characteristic Plot



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



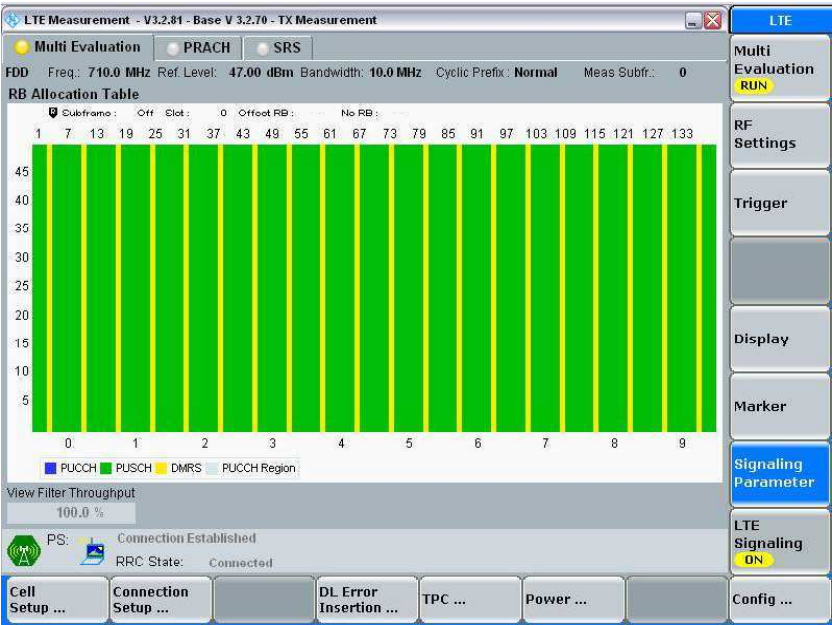
LTE FDD17, 10.0 MHz Bandwidth, QPSK, 25 Resource Block Allocation, Modulation Characteristic Plot



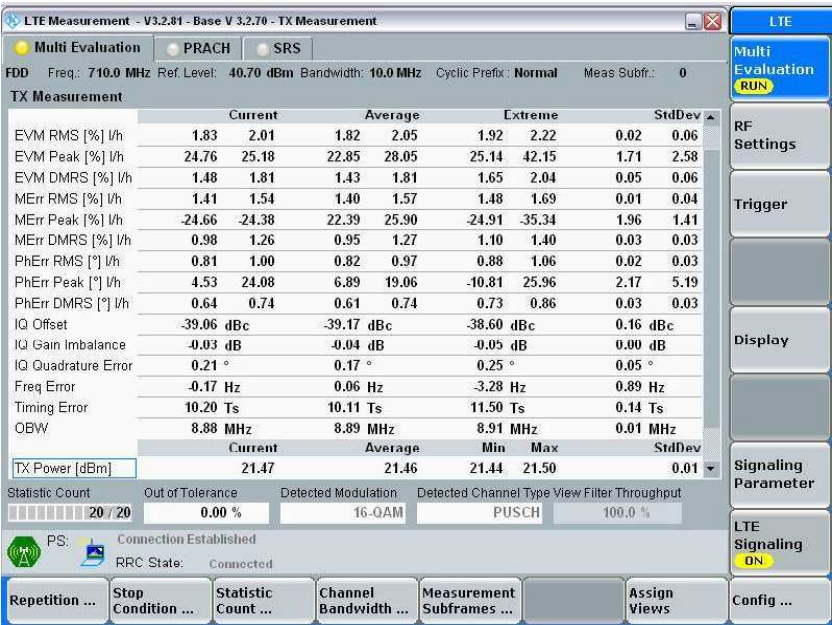


Product Service

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



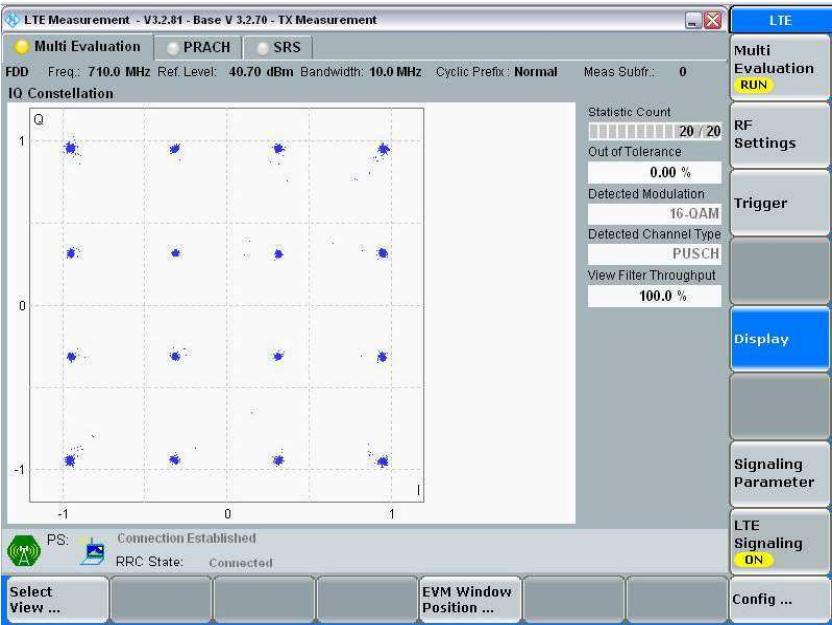


Product Service

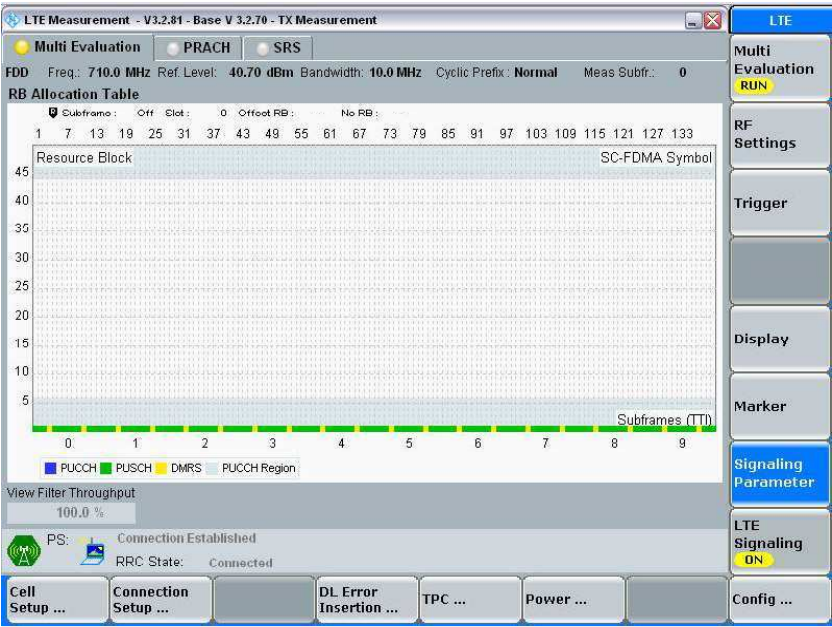
LTE FDD17, 10.0 MHz Bandwidth, 16-QAM, EVM, Modulation Characteristic Plot



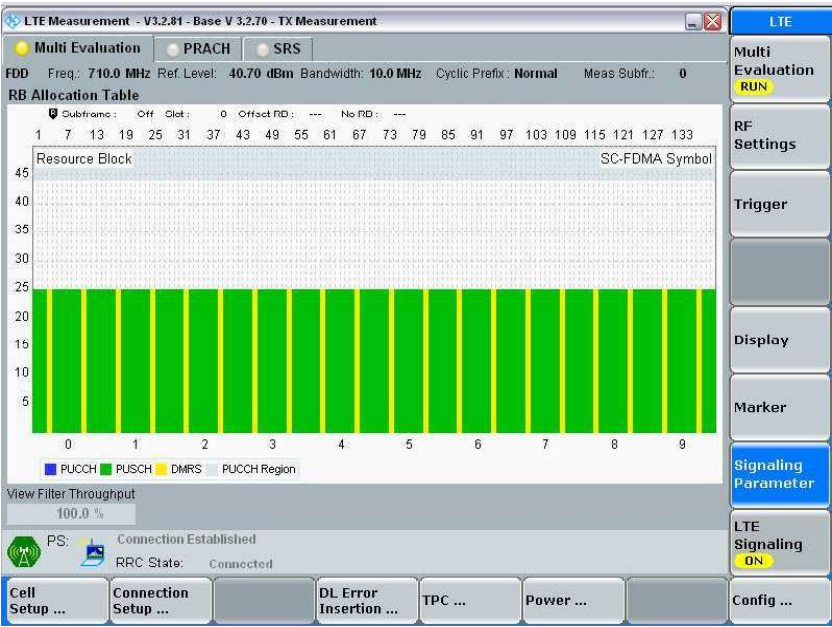
LTE FDD17, 10.0 MHz Bandwidth, 16-QAM, IQ Constellation, Modulation Characteristic Plot



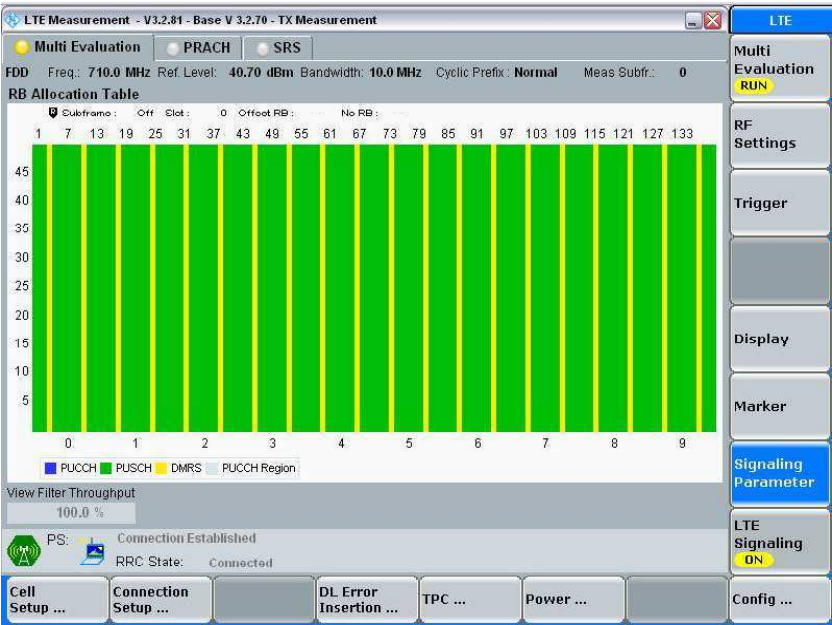
LTE FDD17, 10.0 MHz Bandwidth, 16-QAM, 1 Resource Block Allocation, Modulation Characteristic Plot



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



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
Section 2.1 - Maximum Conducted Output Power					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
20dB/2W Attenuator	Narda	4772-20	462	-	TU
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
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	7-Jun-2017
P-Series Power Meter	Agilent Technologies	N1911A	3980	12	25-Sep-2016
50 MHz-18 GHz Wideband Power Sensor	Agilent Technologies	N1921A	3982	12	25-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
Wideband Radio Test Set	Rohde & Schwarz	CMW500	4546	12	3-Feb-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	8-Oct-2016
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU
Section 2.2 - Emission Limitations					
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	11-Jun-2017
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	2-Nov-2016
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	matur GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	matur GmbH	NCD	3917	-	TU
Digital thermo Hygrometer	Radio Spares	1260	4300	12	23-Aug-2017
Cable (Yellow, Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4527	-	TU
Wideband Radio Test Set	Rohde & Schwarz	CMW500	4546	12	3-Feb-2017
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	29-Dec-2016



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.3 - Spurious Emissions at Antenna Terminals					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
20dB/2W Attenuator	Narda	4772-20	462	-	TU
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	30-Oct-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	5-Mar-2017
Filter	Daden Anthony Ass	MH-1500-7SS	2778	12	5-Feb-2017
Hygrometer	Rotronic	I-1000	3220	12	23-Aug-2017
Power Divider	Weinschel	1506A	3345	12	7-Jun-2017
High Pass Filter (3GHz)	RLC Electronics	F-100-3000-5-R	3349	12	1-Jun-2017
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	26-Feb-2017
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
Combiner/Splitter	Weinschel	1506A	3878	12	7-Jun-2017
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	5-Mar-2017
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	8-Mar-2017
Digital Multi-meter	Iso-tech	IDM93N	4435	12	25-Aug-2017
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4518	12	16-Feb-2017
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4-KMS	4519	12	16-Feb-2017
Wideband Radio Test Set	Rohde & Schwarz	CMW500	4546	12	3-Feb-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	8-Oct-2016
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU
Section 2.4 - Spurious Emissions at Band Edge					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
20dB/2W Attenuator	Narda	4772-20	462	-	TU
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	30-Oct-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	5-Mar-2017
Hygrometer	Rotronic	I-1000	3220	12	23-Aug-2017
Power Divider	Weinschel	1506A	3345	12	7-Jun-2017
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
Combiner/Splitter	Weinschel	1506A	3878	12	7-Jun-2017
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	5-Mar-2017
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	8-Mar-2017
Digital Multi-meter	Iso-tech	IDM93N	4435	12	25-Aug-2017
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4518	12	16-Feb-2017
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4-KMS	4519	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
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	8-Oct-2016
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.5 - 26 dB Bandwidth					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
20dB/2W Attenuator	Narda	4772-20	462	-	TU
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	30-Oct-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Radio Communications Test Set	Rohde & Schwarz	CMU 200	2809	12	19-Jul-2017
Climatic Chamber	TAS	Micro 225	2892	-	O/P Mon
Radio Communications Test Set	Rohde & Schwarz	CMU 200	3035	12	16-Nov-2016
Thermocouple Thermometer	Fluke	51	3174	12	9-Dec-2016
Hygrometer	Rotronic	I-1000	3220	12	23-Aug-2017
Power Divider	Weinschel	1506A	3345	12	7-Jun-2017
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
Combiner/Splitter	Weinschel	1506A	3878	12	7-Jun-2017
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
Hygropalm Temperature and Humidity Meter	Rotronic	HP21	4410	12	27-Apr-2017
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4518	12	16-Feb-2017
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4-KMS	4519	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
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	8-Oct-2016
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU
Section 2.6 - Frequency Stability					
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	30-Oct-2016
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Radio Communications Test Set	Rohde & Schwarz	CMU 200	2809	12	19-Jul-2017
Climatic Chamber	TAS	Micro 225	2892	-	O/P Mon
Thermocouple Thermometer	Fluke	51	3174	12	9-Dec-2016
Hygrometer	Rotronic	I-1000	3220	12	23-Aug-2017
Power Divider	Weinschel	1506A	3345	12	7-Jun-2017
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4144	12	16-Nov-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
Hygropalm Temperature and Humidity Meter	Rotronic	HP21	4410	12	27-Apr-2017
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4518	12	16-Feb-2017
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4-KMS	4519	12	16-Feb-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	8-Oct-2016
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU

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	± 3.454 dB
26 dB Bandwidth	84.51 kHz
Emission Limitations	Radiated Emissions ; 30 MHz to 1 GHz ; ± 5.1 dB Radiated Emissions ; 1 GHz to 40 GHz ; 6.2 dB ERP / EIRP ; ± 3.0 dB
Frequency Stability	± 37.73 Hz
Spurious Emissions at Band Edge	± 3.454 dB
Maximum Conducted Output Power	± 0.7 dB



Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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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