FCC RADIO TEST REPORT

FCC ID	:	**QI3BIL-MLG714C**
Equipment	:	**4G / LTE module**
Brand Name	:	**BILLION, BEC**
Model Name	:	**MLG714C**
Applicant	:	**Billion Electric Co., Ltd.** **8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei City 23146, Taiwan (R.O.C.)**
Manufacturer	:	**Billion Electric Co., Ltd.** **8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei City 23146, Taiwan (R.O.C.)**
Standard	:	**FCC 47 CFR Part 2, and 90(Z)**

The product was received on Nov. 07, 2018 and testing was started from Nov. 28, 2018 and completed on Dec. 06, 2018. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Jones Tsai

Approved by: Jones Tsai

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

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History of this test report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG8N0725	Rev. 01	Initial issue of report	Dec. 14, 2018

Summary of Test Result

Report Section	FCC Rule	Description	Result	Remark
3.2	§2.1046	Conducted Output Power and Effective Isotropic Radiated Power	PASS	-
3.3	-	Peak-to-Average Ratio	Reporting only	-
3.4	§90.1321	Peak EIRP Density	PASS	-
3.5	§2.1049 §90.1323	Bandwidth Limitations Measurement	PASS	-
3.6	§2.1051 §90.1323	Band Edge Measurement	PASS	-
3.7	§90.210	Emission Mask	PASS	
3.8	§2.1051 §90.1323	Conducted Spurious Emission	PASS	
3.9	§2.1055	Frequency Stability Measurement	PASS	-
4.2	§2.1053 §90.1323	Radiated Spurious Emission	PASS	Under limit 23.08 dB at 14688.000 MHz

Declaration of Conformity:
The judgment of conformity in the report is based on the measurement results excluding the measurement uncertainty.
Comments and Explanations:
None

Reviewed by: Wii Chang

Report Producer: Nancy Yang

1 General Description

1.1 Feature of Equipment Under Test

LTE

Product Specification subjective to this standard	
Antenna Type	WWAN: PCB Antenna and Dipole Antenna

1.2 Modification of EUT

No modifications are made to the EUT during all test items.

1.3 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1190 and TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	**Sporton Site No.**
	TH05-HY

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH12-HY

1.4 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC 47 CFR Part 2, 90
- ANSI / TIA-603-E
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- FCC KDB 412172 D01 Determining ERP and EIRP v01r01

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

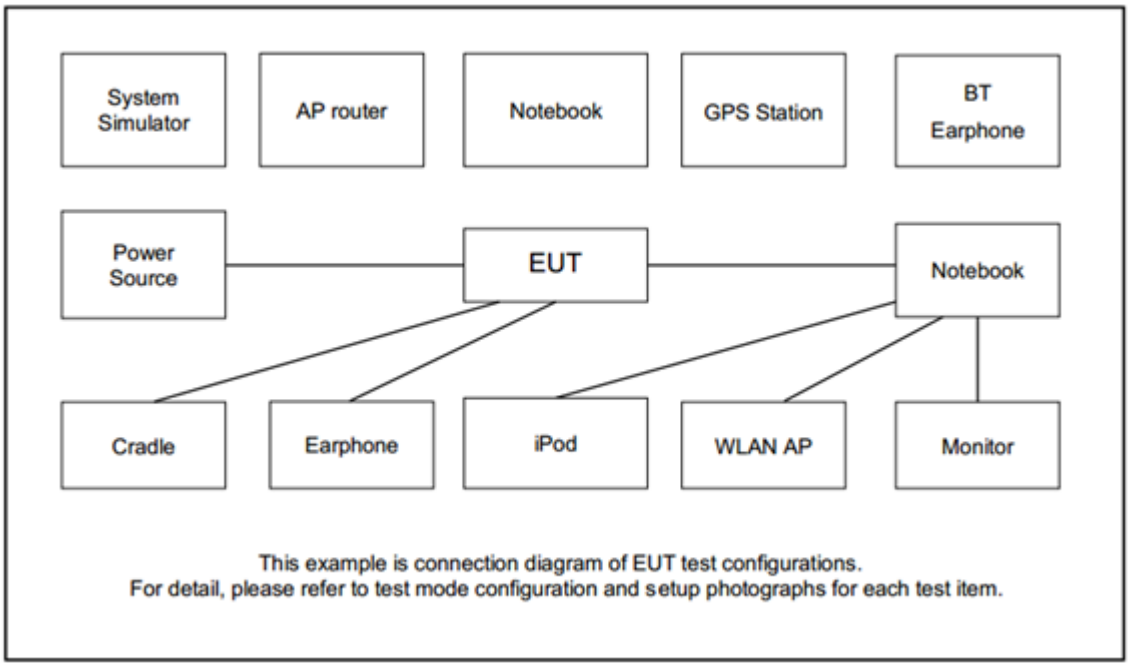
2.1 Test Mode

Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane for IDU antenna and X plane for ODU antenna) were recorded in this report.

Test Items	Band	Bandwidth (MHz)						Modulation			RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	64QAM	1	Half	Full	L	M	H
Max. Output Power	43	-	-	v	v	v	v	v	v	v	v	v	v	v	v	v
Peak-to-Average Ratio	43	-	-				v	v	v	v	v		v	v	v	v
E.I.R.P PSD	43	-	-	v	v	v	v	v	v	v			v	v	v	v
26dB and 99% Bandwidth	43	-	-	v	v	v	v	v	v	v			v	v	v	v
Conducted Band Edge	43	-	-	v	v	v	v	v	v	v	v		v	v		v
Emission Mask	43	-	-	v	v	v	v	v	v				v	v	v	v
Conducted Band Edge	43	-	-	v	v	v	v	v	v	v	v		v	v		v
Conducted Spurious Emission	43	-	-	v	v	v	v	v	v	v	v			v	v	v
E.I.R.P.	43	-	-	v	v	v	v	v	v	v	v	v		v	v	v
Frequency Stability	43	-	-		v			v					v		v	
Radiated Spurious Emission	43	Worst Case												v	v	v
Note	1. The mark "v" means that this configuration is chosen for testing 2. The mark "-" means that this bandwidth is not supported. 3. For E.R.P/E.I.R.P. measurement, the widest bandwidth of each band is chosen for testing due to highest conducted power. Besides, the lowest bandwidth of each band is also measured for reporting only. 4. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported.															

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between RF conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level will be exactly the RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

The following shows an offset computation example with RF cable loss 4.2 dB and a 10dB attenuator.

Example :

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.2 + 10 = 14.2 (dB)

2.5 Frequency List of Low/Middle/High Channels

LTE Band 43 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
20	Channel	44190	44340	44490
	Frequency	3660	3675	3690
15	Channel	44165	44340	44515
	Frequency	3657.5	3675	3692.5
10	Channel	44140	44340	44540
	Frequency	3655	3675	3695
5	Channel	44115	44340	44565
	Frequency	3652.5	3675	3697.5

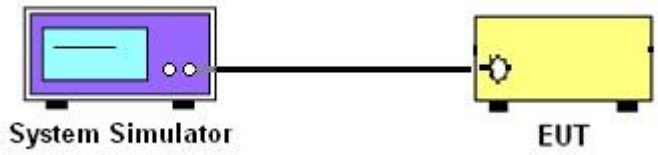
3 Conducted Test Items

3.1 Measuring Instruments

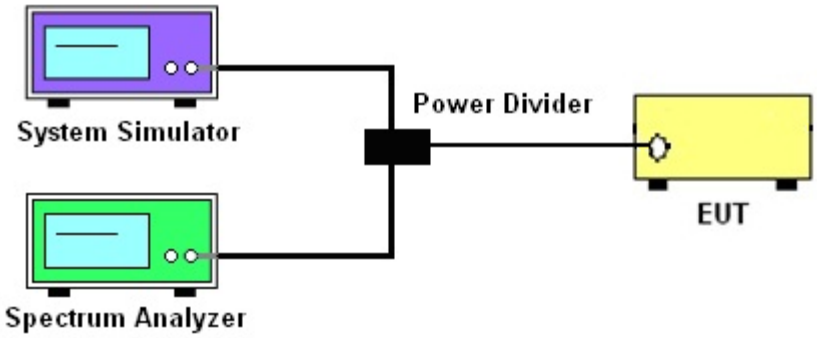
See list of measuring instruments of this test report.

3.1.1 Test Setup

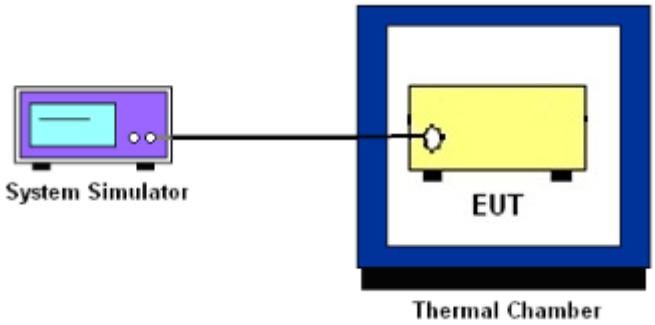
3.1.2 Conducted Output Power



3.1.3 Peak-to-Average Ratio, Peak EIRP Density, Occupied Bandwidth, Conducted Band-Edge, Emission Mask, and Conducted Spurious Emission



3.1.4 Frequency Stability



3.1.5 Test Result of Conducted Test

Please refer to Appendix A.

3.2 Conducted Output Power and EIRP

3.2.1 Description of the Conducted Output Power Measurement and EIRP Measurement

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at maximum output power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

Base and fixed stations are limited to 25 watts/25 MHz equivalent isotropically radiated power (EIRP). In any event, the peak EIRP power density shall not exceed 1 Watt in any one-megahertz slice of spectrum.
Mobile and portable stations are limited to 1 watt/25 MHz EIRP. In any event, the peak EIRP density shall not exceed 40 milliwatts in any one-megahertz slice of spectrum.
According to KDB 412172 D01 Power Approach,
EIRP = $P_T + G_T – L_C$, where
P_T = transmitter output power in dBm
G_T = gain of the transmitting antenna in dBi
L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

3.2.2 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through the system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure and record the power level from the system simulator.

3.3 Peak-to-Average Ratio

3.3.1 Description of the PAR Measurement

Reporting only

3.3.2 Test Procedures

1. The EUT was connected to spectrum and system simulator via a power divider.
2. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
3. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
4. Record the deviation as Peak to Average Ratio.

3.4 Peak EIRP Density

3.4.1 Description of the Peak EIRP Density

In any event, the peak EIRP power density shall not exceed 1 Watt in any one-megahertz slice of spectrum.

3.4.2 Test Procedures

1. Set instrument center frequency to OBW center frequency.
2. Set span to at least 1.5 times the OBW.
3. Set the RBW to the specified reference bandwidth (often 1 MHz).
4. Set VBW ≥ 3 × RBW.
5. Detector = RMS (power averaging).
6. Ensure that the number of measurement points in the sweep ≥ 2 × span/RBW.
7. Spectrum is configured to trigger a sweep at the beginning of each transmission burst
8. Sweep time = auto couple.
9. Employ trace averaging (RMS) mode over a minimum of 100 traces.
10. Use the peak marker function to determine the maximum amplitude level within the reference bandwidth (PSD).
11. Determine the EIRP by adding the effective antenna gain to the adjusted power level.

3.5 Bandwidth Limitations Measurement

3.5.1 Description of (Occupied) Bandwidth Limitations Measurement

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

3.5.2 Test Procedures

1. The testing follows FCC KDB 971168 D01 v03r01 Section 4.2
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.

3.6 Conducted Band Edge

3.6.1 Description of Conducted Band Edge Measurement

The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or less, but at least one percent of the emission bandwidth of the fundamental emission of the transmitter, provided the measured energy is integrated over a 1 MHz bandwidth.

3.6.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 6.0.

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The band edges of low and high channels for the highest RF powers were measured. Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
3. Set spectrum analyzer with RMS detector.
4. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
5. The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
   = P(W)- [43 + 10log(P)] (dB)
   = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
   = -13dBm.

3.7 Emission Mask

3.7.1 Description of Emission Mask

The power of any emission must be attenuated below the unmodulated carrier power(P) as below:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but no more than 100 percent of the authorized bandwidth at least 25dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but no more than 250 percent of the authorized bandwidth at least 25dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth at least 43+10log(P) dB.

3.7.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 6.0.

12. The EUT was connected to spectrum analyzer and system simulator via a power divider.
13. The band edges of low and high channels for the highest RF powers were measured. Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
14. Set spectrum analyzer with RMS detector.
15. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.8 Conducted Spurious Emission

3.8.1 Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30MHz up to a frequency including its 10^{th} harmonic.

3.8.2 Test Procedures

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The middle channel for the highest RF power within the transmitting frequency was measured.
4. The conducted spurious emission for the whole frequency range was taken.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
7. The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
   = P(W)- [43 + 10log(P)] (dB)
   = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
   = -13dBm.

3.9 Frequency Stability Measurement

3.9.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center frequency.

3.9.2 Test Procedures for Temperature Variation

The testing follows FCC KDB 971168 D01 v03r01 Section 9.0.

1. The EUT was set up in the thermal chamber and connected with the system simulator.
2. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
3. With power OFF, the temperature was raised in 10°C step up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

3.9.3 Test Procedures for Voltage Variation

The testing follows FCC KDB 971168 D01 v03r01 Section 9.0.

1. The EUT was placed in a temperature chamber at 25±5° C and connected with the system simulator.
2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
3. The variation in frequency was measured for the worst case.

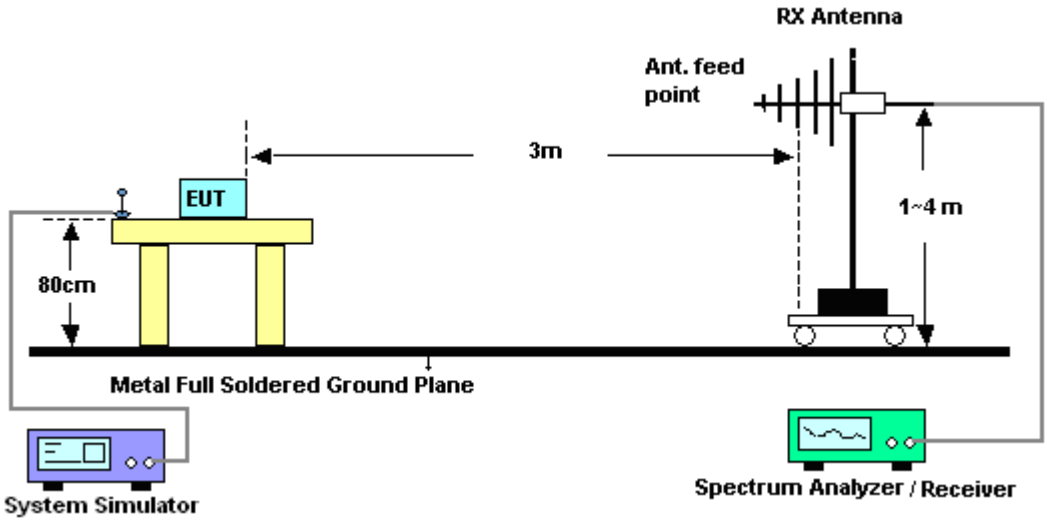
4 Radiated Test Items

4.1 Measuring Instruments

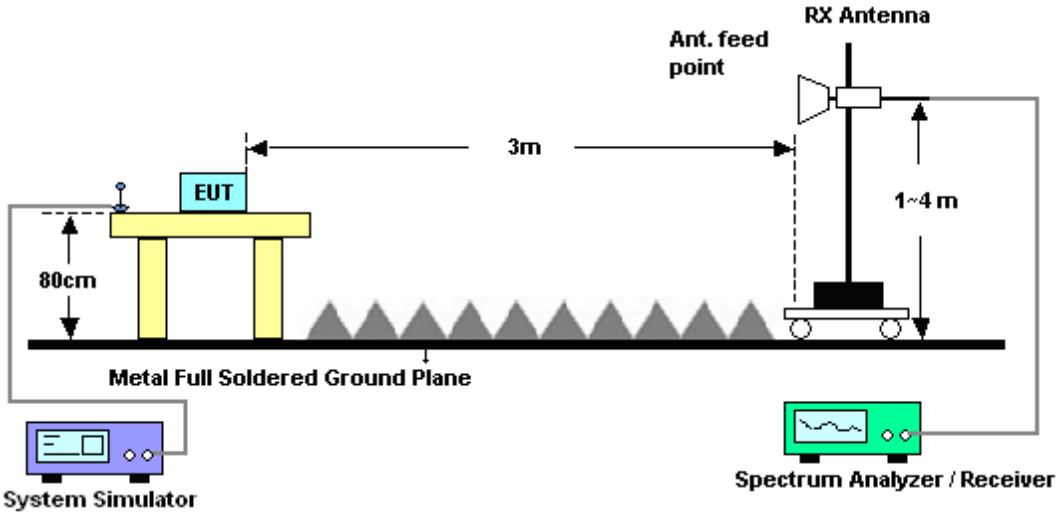
See list of measuring instruments of this test report.

4.1.1 Test Setup

For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



4.1.2 Test Result of Radiated Test

Please refer to Appendix B.

4.2 Radiated Spurious Emission

4.2.1 Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI / TIA-603-E. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

4.2.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 5.8 and ANSI / TIA-603-E Section 2.2.12.

8. The EUT was placed on a rotatable wooden table with 0.8 meter above ground.
9. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
10. The table was rotated 360 degrees to determine the position of the highest spurious emission.
11. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
12. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
13. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
14. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
15. Taking the record of output power at antenna port.
16. Repeat step 7 to step 8 for another polarization.
17. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
    The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
    = P(W)- [43 + 10log(P)] (dB)
    = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
    = -13dBm.

5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	37059&01	30MHz~1GHz	Oct. 13, 2018	Nov. 29, 2018 ~ Nov. 30, 2018	Oct. 12, 2019	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1328	1GHz ~ 18GHz	Nov. 09, 2018	Nov. 29, 2018 ~ Nov. 30, 2018	Nov. 08, 2019	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170576	18GHz ~ 40GHz	May 08, 2018	Nov. 29, 2018 ~ Nov. 30, 2018	May 07, 2019	Radiation (03CH12-HY)
Preamplifier	COM-POWER	PA-103	161075	10MHz~1GHz	Mar. 26, 2018	Nov. 29, 2018 ~ Nov. 30, 2018	Mar. 25, 2019	Radiation (03CH12-HY)
Preamplifier	Keysight	83017A	MY53270148	1GHz~26.5GHz	Jan. 15, 2018	Nov. 29, 2018 ~ Nov. 30, 2018	Jan. 14, 2019	Radiation (03CH12-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz ~ 40GHz	Dec. 05, 2017	Nov. 29, 2018 ~ Nov. 30, 2018	Dec. 04, 2018	Radiation (03CH12-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100390	20Hz~26.5GHz	Dec. 25, 2017	Nov. 29, 2018 ~ Nov. 30, 2018	Dec. 24, 2018	Radiation (03CH12-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	10Hz~44GHz	Mar. 15, 2018	Nov. 29, 2018 ~ Nov. 30, 2018	Mar. 14, 2019	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1522	1GHz ~ 18GHz	May 10, 2018	Nov. 29, 2018 ~ Nov. 30, 2018	May 09, 2019	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz ~ 40GHz	Nov. 20, 2018	Nov. 29, 2018 ~ Nov. 30, 2018	Nov. 19, 2019	Radiation (03CH12-HY)
Signal Generator	Rohde & Schwarz	SMF100A	101107	100kHz~40GHz	May 21, 2018	Nov. 29, 2018 ~ Nov. 30, 2018	May 20, 2019	Radiation (03CH12-HY)
Base Station	Anritsu	MT8821C	6201432816	GSM / GPRS /WCDMA / LTE FDD/TDD with 44) /LTE-3CC DLCA,2CC ULCA	May 02, 2017	Nov. 29, 2018 ~ Nov. 30, 2018	May 01, 2019	Radiation (03CH12-HY)
Filter	Wainwright	WLKS1200-12SS	SN2	1.2GHz Low Pass	Mar. 21, 2018	Nov. 29, 2018 ~ Nov. 30, 2018	Mar. 20, 2019	Radiation (03CH12-HY)
Filter	Wainwright	WHKX8-5272.5-6750-18000-40ST	SN2	6.75G Highpass	Mar. 21, 2018	Nov. 29, 2018 ~ Nov. 30, 2018	Mar. 20, 2019	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0058/126E	30M-18G	Mar. 14, 2018	Nov. 29, 2018 ~ Nov. 30, 2018	Mar. 13, 2019	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30M~40GHz	Oct. 06, 2018	Nov. 29, 2018 ~ Nov. 30, 2018	Oct. 05, 2019	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30M~40GHz	Oct. 06, 2018	Nov. 29, 2018 ~ Nov. 30, 2018	Oct. 05, 2019	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Nov. 29, 2018 ~ Nov. 30, 2018	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Nov. 29, 2018 ~ Nov. 30, 2018	N/A	Radiation (03CH12-HY)
Software	Audix	E3 6.2009-8-24	RK-000989	N/A	N/A	Nov. 29, 2018 ~ Nov. 30, 2018	N/A	Radiation (03CH12-HY)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
LTE Base Station	Anritsu	MT8820C	6201432821	GSM/GPRS /WCDMA/LTE	Oct. 14, 2018	Nov. 28, 2018 ~ Dec. 12, 2018	Oct. 13, 2019	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101397	10Hz~40GHz	Nov. 13, 2018	Nov. 28, 2018 ~ Dec. 12, 2018	Nov. 12, 2019	Conducted (TH05-HY)
Temperature Chamber	ESPEC	SH-641	92013720	-40℃~90℃	Aug. 29, 2018	Nov. 28, 2018 ~ Dec. 12, 2018	Aug. 28, 2019	Conducted (TH05-HY)
Programmable Power Supply	GW Instek	PSS-2005	EL890094	1V~20V 0.5A~5A	Oct. 02, 2018	Nov. 28, 2018 ~ Dec. 12, 2018	Oct. 01, 2019	Conducted (TH05-HY)
Coupler	Woken	0.5-18G 10dB 30W	DOM5CIW3A1	0.5-18GHz	Feb. 21, 2018	Nov. 28, 2018 ~ Dec. 12, 2018	Feb. 20, 2019	Conducted (TH05-HY)

6 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.36**

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.70**

Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.98**

Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power)

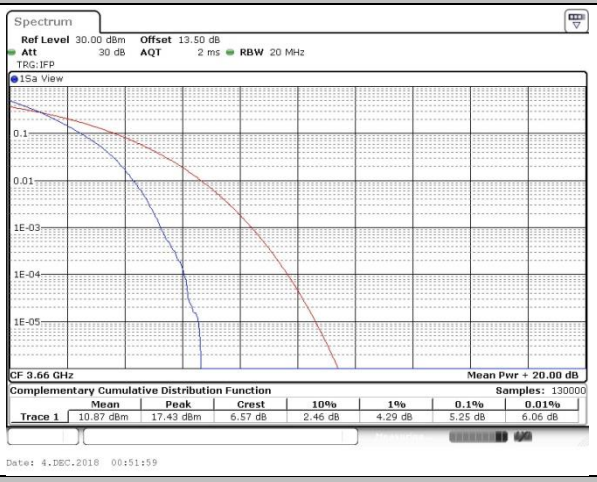
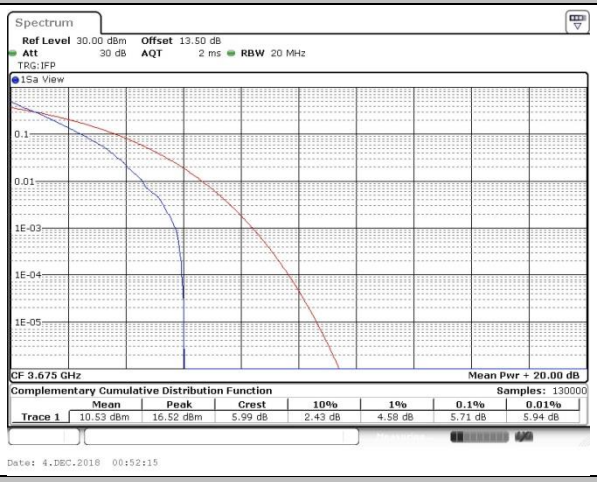
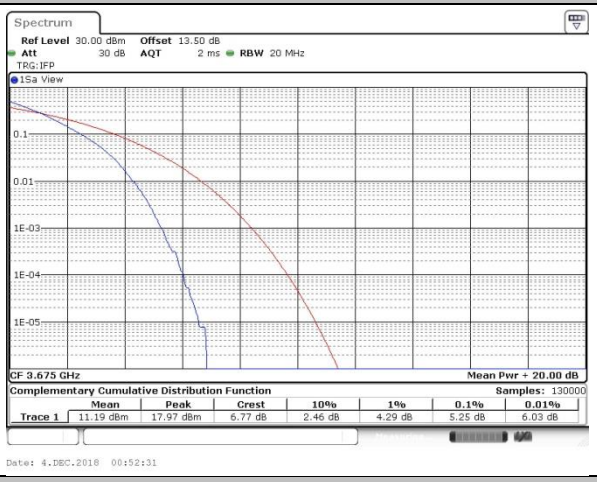
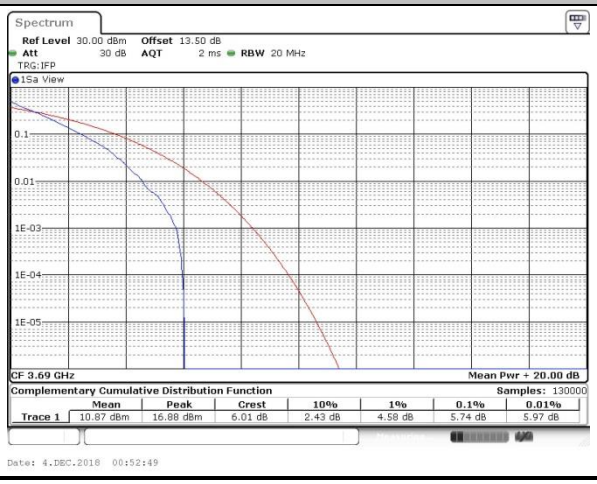
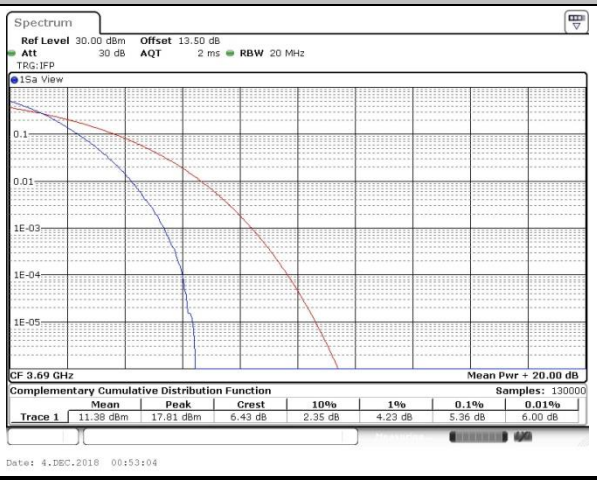
LTE Band 43 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
20	1	0	QPSK	12.37	12.71	**13.04**
20	1	49		12.18	12.61	12.87
20	1	99		12.58	12.85	12.77
20	50	0		11.30	11.60	11.88
20	50	24		11.16	11.59	11.76
20	50	50		11.24	11.65	11.69
20	100	0		11.21	11.62	11.88
20	1	0	16-QAM	11.66	11.97	12.25
20	1	49		11.38	11.82	12.17
20	1	99		11.81	12.05	11.97
20	50	0		10.33	10.53	10.86
20	50	24		10.24	10.55	10.74
20	50	50		10.21	10.61	10.67
20	100	0		10.23	10.56	10.88
20	1	0	64-QAM	11.62	11.80	12.09
20	1	49		11.34	11.64	11.99
20	1	99		11.62	11.88	11.80
20	50	0		10.30	10.47	10.79
20	50	24		10.27	10.49	10.67
20	50	50		10.23	10.54	10.59
20	100	0		10.30	10.60	10.92
15	1	0	QPSK	12.13	12.42	12.87
15	1	37		11.94	12.24	12.54
15	1	74		12.12	12.54	12.43
15	36	0		10.79	11.08	11.41
15	36	20		10.77	11.06	11.38
15	36	39		10.64	11.21	11.08
15	75	0		10.73	11.02	11.34
15	1	0	16-QAM	11.27	11.60	12.04
15	1	37		11.07	11.35	11.63
15	1	74		11.31	11.70	11.72
15	36	0		9.82	10.07	10.25
15	36	20		9.84	10.08	10.27
15	36	39		9.70	10.11	10.00
15	75	0		9.82	10.06	10.25
15	1	0	64-QAM	11.10	11.42	11.84
15	1	37		10.91	11.18	11.47
15	1	74		11.14	11.53	11.55
15	36	0		9.85	10.09	10.28
15	36	20		9.86	10.09	10.29
15	36	39		9.71	10.12	10.01
15	75	0		9.81	10.05	10.23

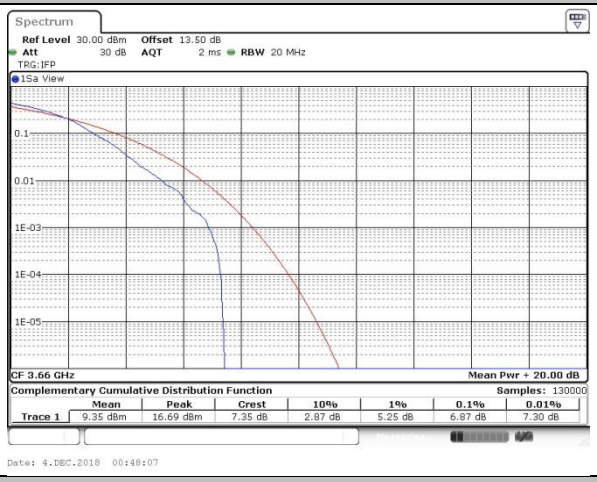
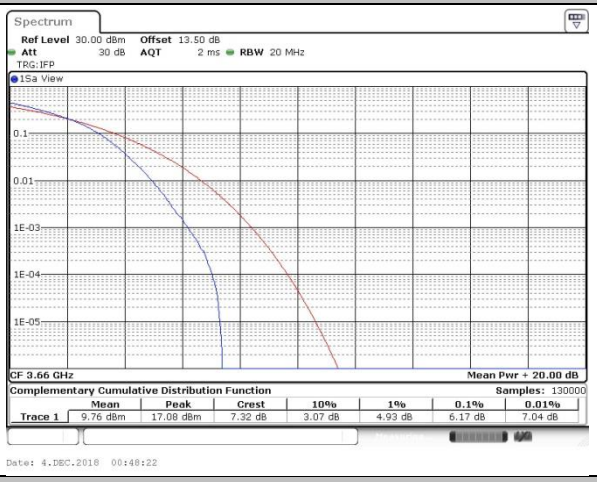
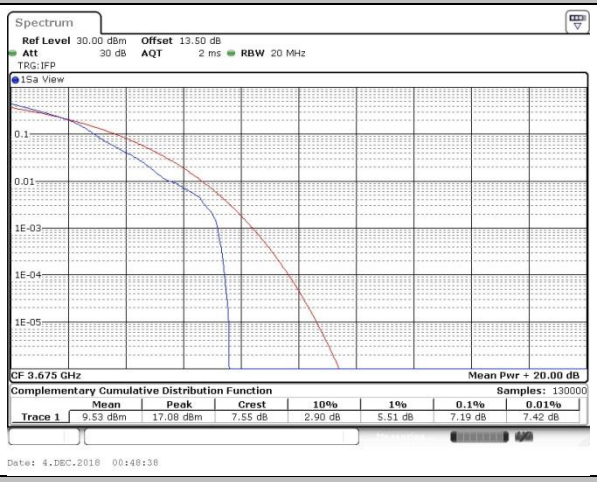
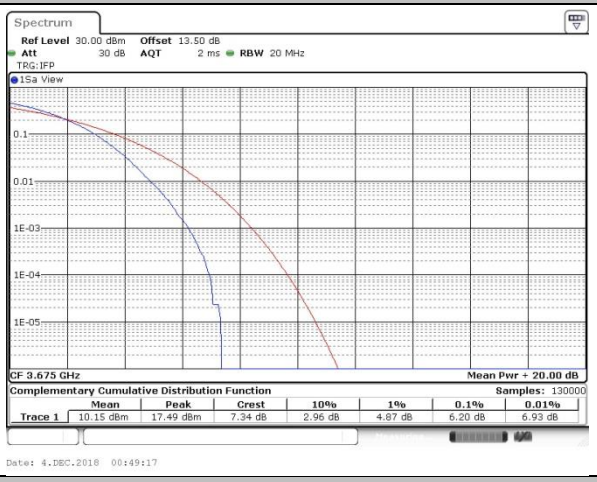
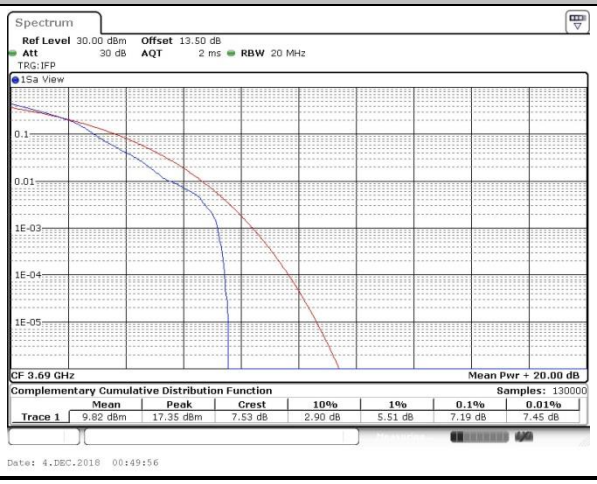
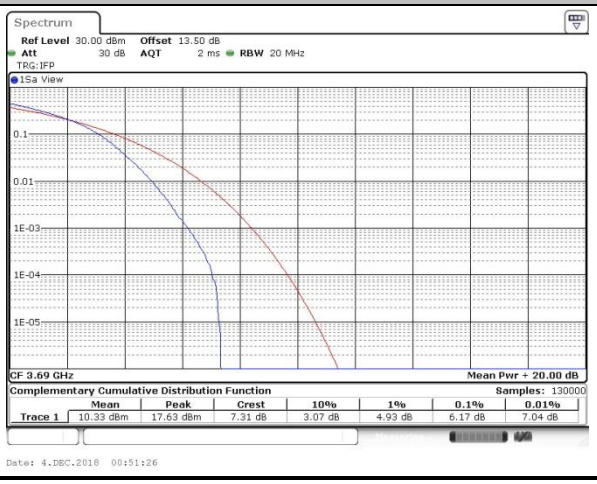
LTE Band 43 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
10	1	0	QPSK	11.81	12.14	12.40
10	1	25		11.90	12.30	12.44
10	1	49		11.76	12.23	12.22
10	25	0		10.75	11.16	11.45
10	25	12		10.87	11.25	11.39
10	25	25		10.68	11.20	11.25
10	50	0		10.73	11.11	11.30
10	1	0	16-QAM	11.03	11.41	11.83
10	1	25		11.21	11.51	11.64
10	1	49		10.93	11.49	11.51
10	25	0		9.85	10.21	10.40
10	25	12		9.90	10.31	10.44
10	25	25		9.76	10.25	10.17
10	50	0		9.81	10.16	10.22
10	1	0	64-QAM	10.82	11.22	11.66
10	1	25		11.03	11.32	11.47
10	1	49		10.78	11.33	11.34
10	25	0		9.79	10.15	10.34
10	25	12		9.91	10.24	10.39
10	25	25		9.83	10.18	10.11
10	50	0		9.87	10.10	10.16
5	1	0	QPSK	11.63	12.14	12.25
5	1	12		11.81	12.17	12.27
5	1	24		11.67	12.15	12.13
5	12	0		10.97	11.45	11.52
5	12	7		10.82	11.17	11.29
5	12	13		10.87	11.11	11.22
5	25	0		10.91	11.16	11.26
5	1	0	16-QAM	10.93	11.30	11.41
5	1	12		11.11	11.35	11.43
5	1	24		10.97	11.35	11.31
5	12	0		10.04	10.48	10.58
5	12	7		9.78	10.26	10.37
5	12	13		9.84	10.20	10.26
5	25	0		9.88	10.24	10.31
5	1	0	64-QAM	10.75	11.13	11.26
5	1	12		10.94	11.19	11.29
5	1	24		10.79	11.18	11.16
5	12	0		9.94	10.39	10.50
5	12	7		9.70	10.19	10.30
5	12	13		9.75	10.12	10.18
5	25	0		9.79	10.16	10.22

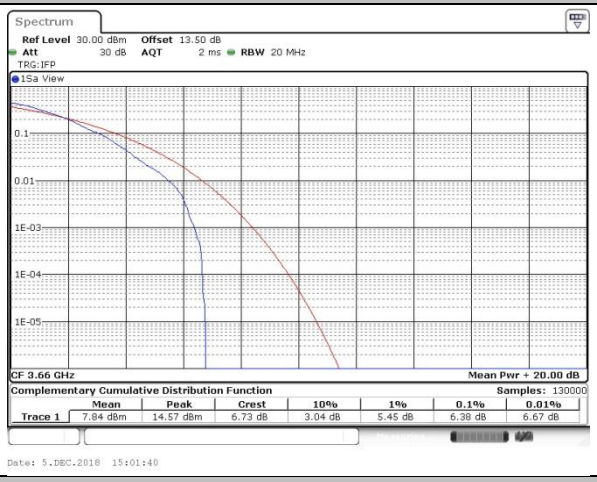
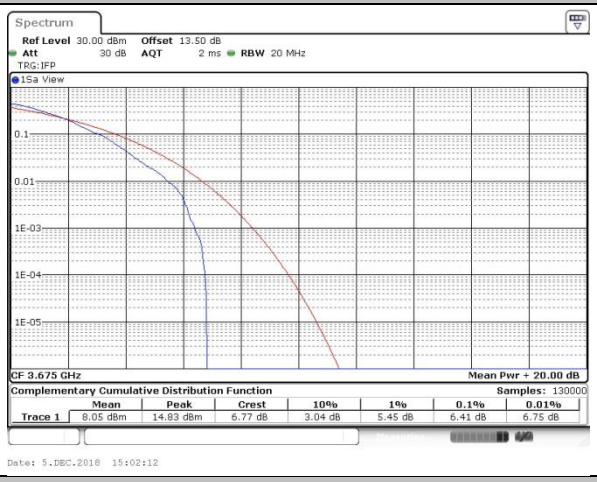
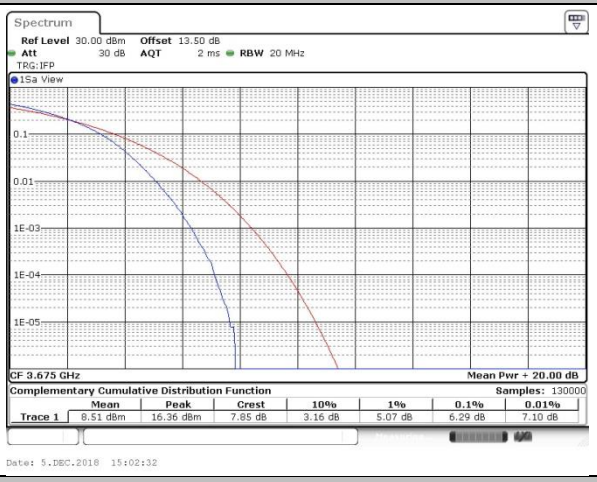
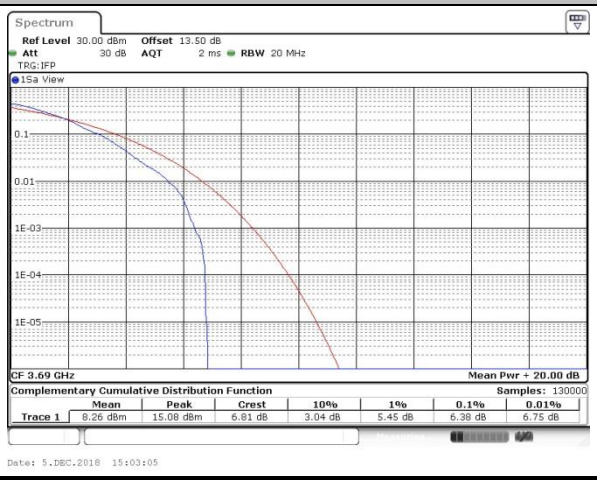
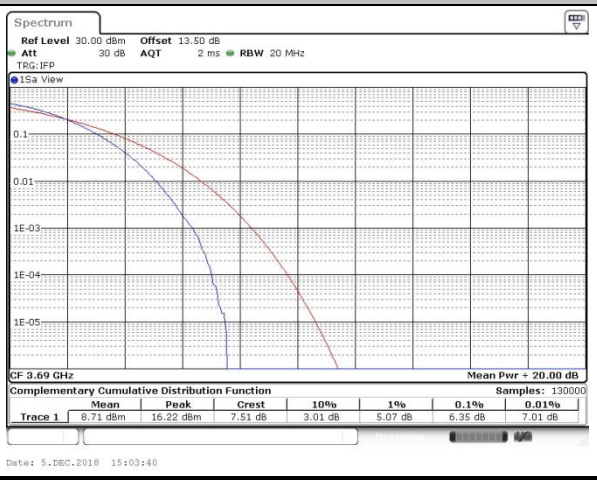
LTE Band 43

Peak-to-Average Ratio

Mode	LTE Band 43 / 20MHz				
Mod.	QPSK		16QAM		Limit: 13dB
RB Size	1RB	Full RB	1RB	Full RB	Result
Lowest CH	5.94	5.25	6.87	6.17	PASS
Middle CH	5.71	5.25	7.19	6.20	
Highest CH	5.74	5.36	7.19	6.17	
Mode	LTE Band 43 / 20MHz				
Mod.	64QAM		-		Limit: 13dB
RB Size	1RB	Full RB	-	-	Result
Lowest CH	6.38	6.32			PASS
Middle CH	6.41	6.29			
Highest CH	6.38	6.35			

LTE Band 43 / 20MHz / QPSK	
Lowest Channel / 1RB	**Lowest Channel / Full RB**
	
Middle Channel / 1RB	**Middle Channel / Full RB**
	
Highest Channel / 1RB	**Highest Channel / Full RB**
	

LTE Band 43 / 20MHz / 16QAM	
Lowest Channel / 1RB	**Lowest Channel / Full RB**
	
Middle Channel / 1RB	**Middle Channel / Full RB**
	
Highest Channel / 1RB	**Highest Channel / Full RB**
	

LTE Band 43 / 20MHz / 64QAM	
Lowest Channel / 1RB	**Lowest Channel / Full RB**
	
Middle Channel / 1RB	**Middle Channel / Full RB**
	
Highest Channel / 1RB	**Highest Channel / Full RB**
	

Peak EIRP Density

Mode	LTE Band 43 : Peak Conducted Power Density (dBm/MHz)							
BW	5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	12.41	11.29	12.34	10.87	12.04	11.00	12.14	11.70
Middle CH	12.40	11.48	12.58	11.76	12.90	11.42	12.85	12.58
Highest CH	12.46	11.81	12.84	12.24	12.74	12.25	13.04	12.41
Mod.	64QAM	-	64QAM	-	64QAM	-	64QAM	-
Lowest CH	9.64		9.54		10.62		10.59	
Middle CH	9.85		9.73		10.18		9.63	
Highest CH	10.17		10.61		10.36		10.37	

Use IDU Antenna for Mobile and portable stations

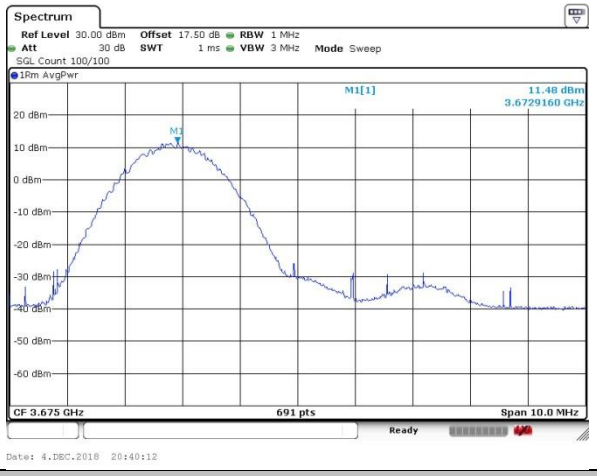
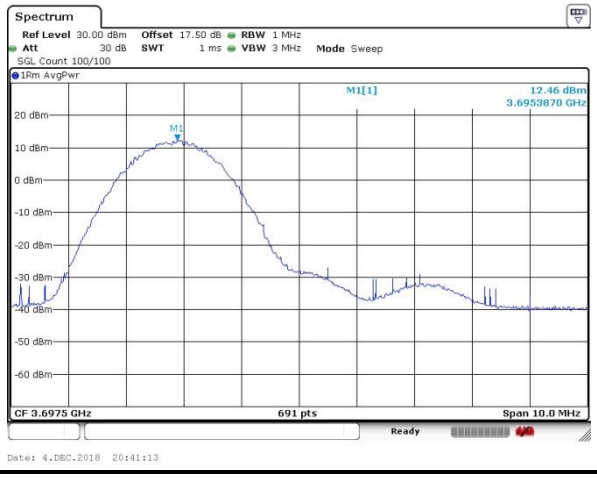
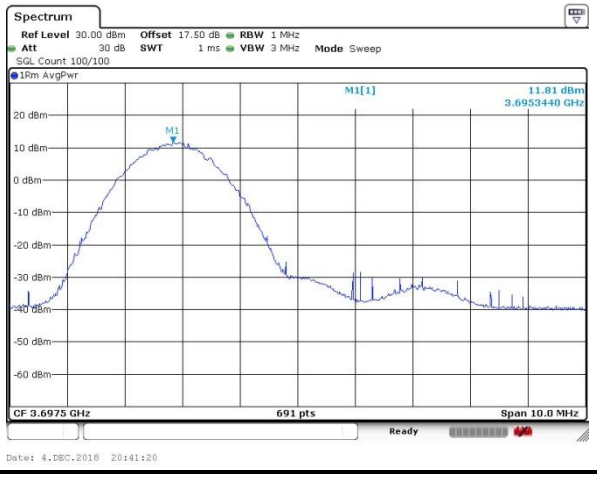
Mode	LTE Band 43 : EIRP Power Density (dBm/5MHz)							
BW	5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	15.04	13.92	14.97	13.50	14.67	13.63	14.77	14.33
Middle CH	15.03	14.11	15.21	14.39	15.53	14.05	15.48	15.21
Highest CH	15.09	14.44	15.47	14.87	15.37	14.88	15.67	15.04
Mod.	64QAM	-	64QAM	-	64QAM	-	64QAM	-
Lowest CH	12.27		12.17		13.25		13.22	
Middle CH	12.48		12.36		12.81		12.26	
Highest CH	12.80		13.24		12.99		13.00	
Antenna Gain	2.63 dBi							
Limit	40mW / MHz = 16dBm / MHz							
Result	Pass							

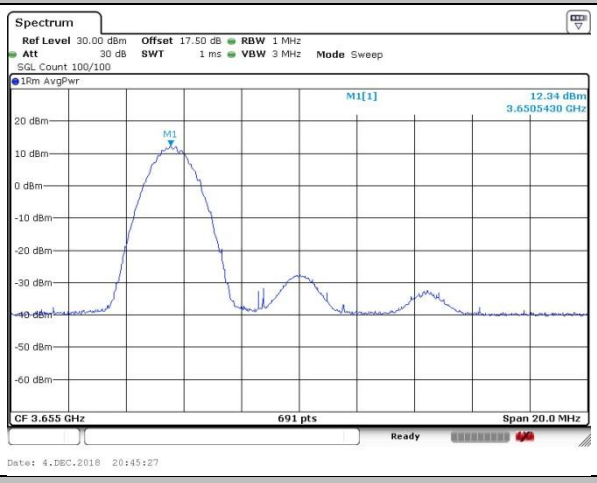
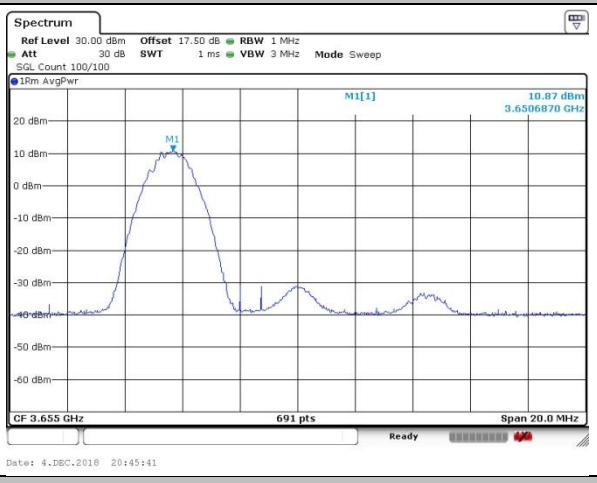
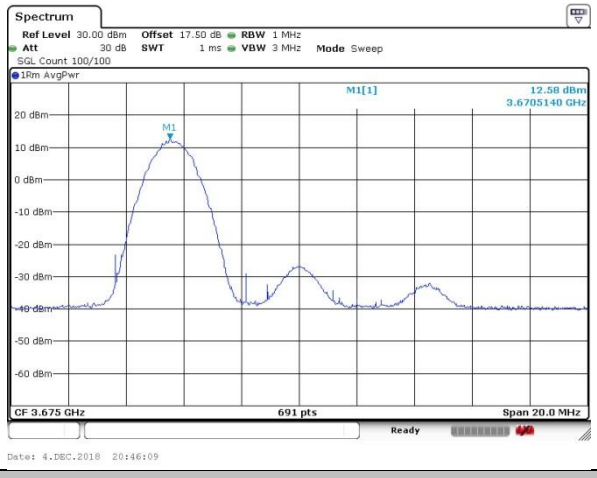
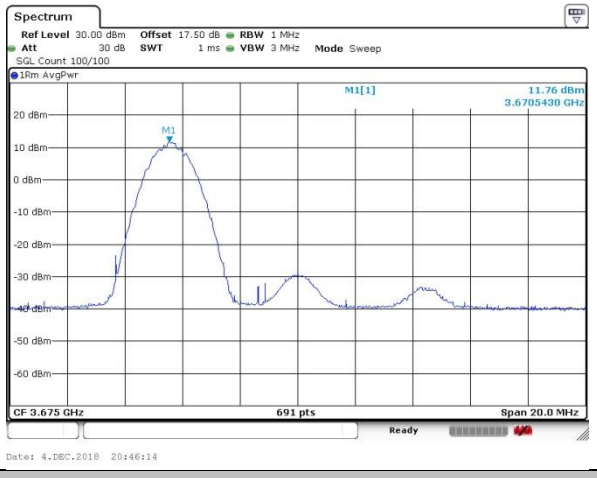
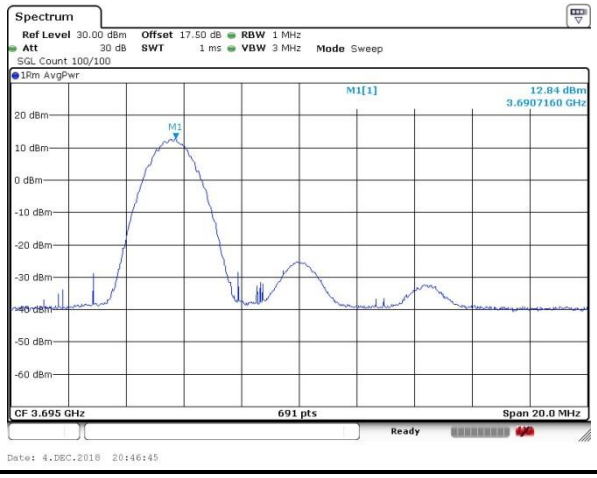
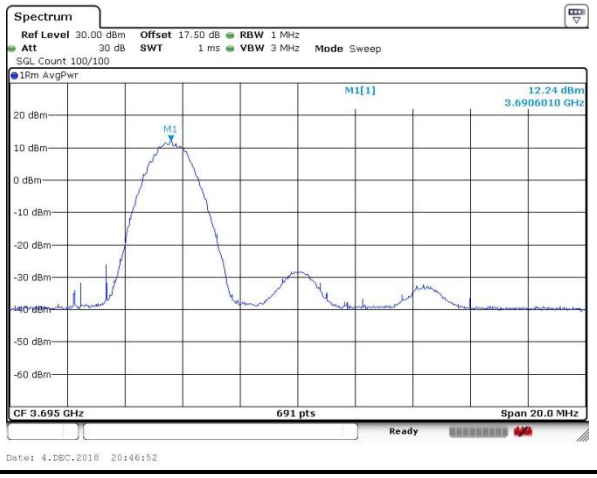
Note: Peak EIRP Density (dBm/MHz) = Peak Conducted Power Density (dBm/MHz) + Antenna Gain

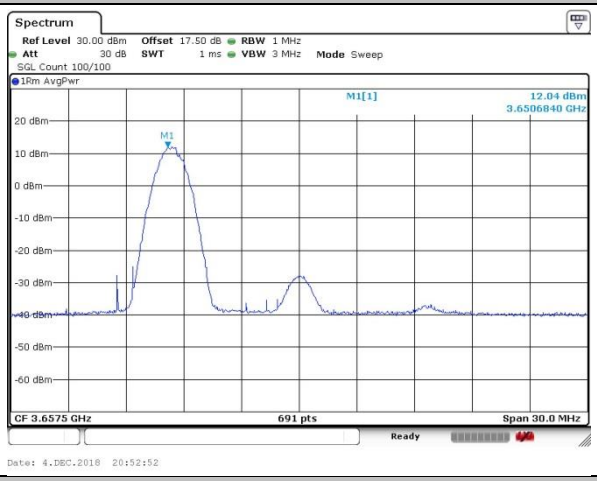
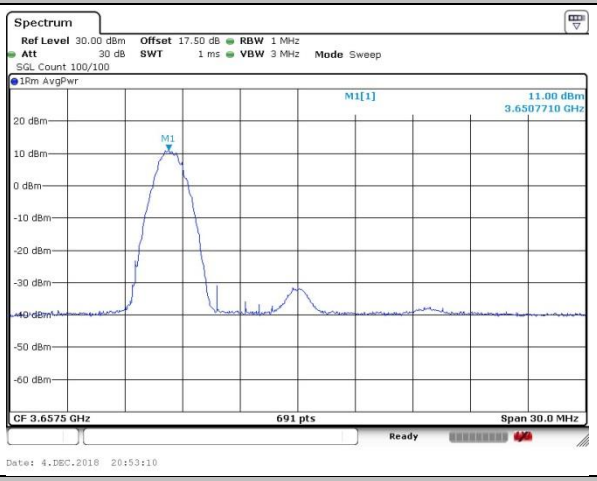
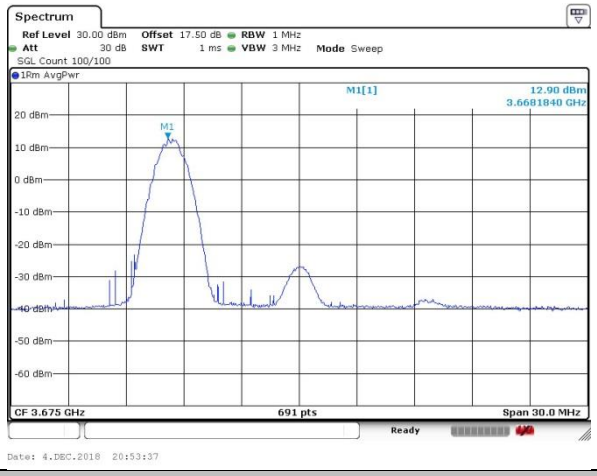
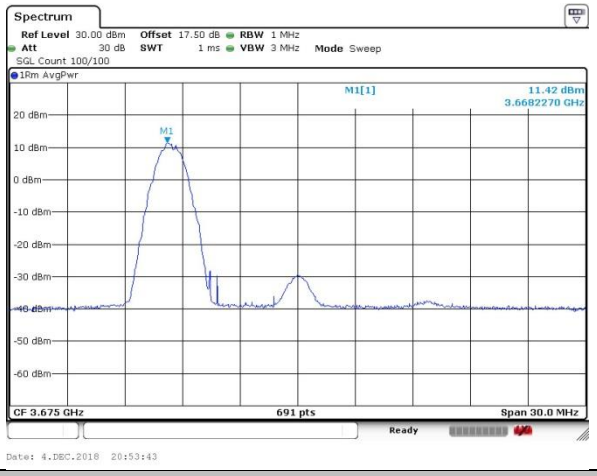
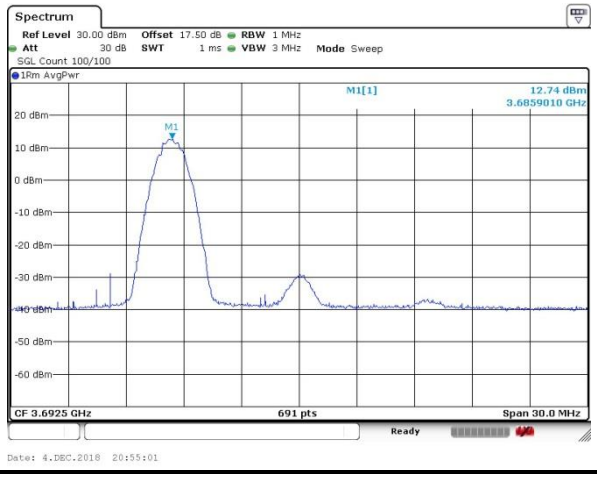
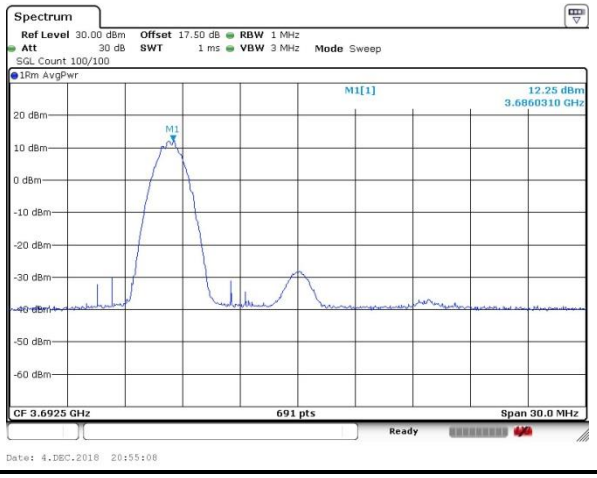
Use ODU Antenna for Base and fixed stations

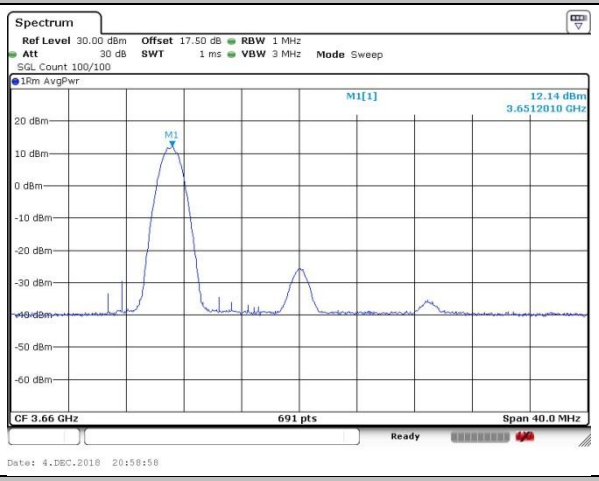
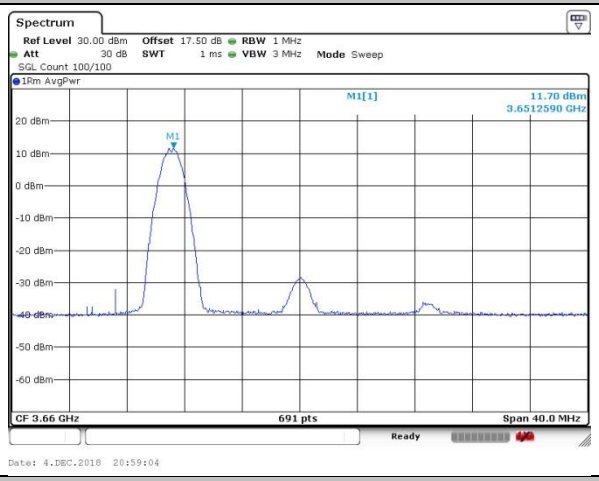
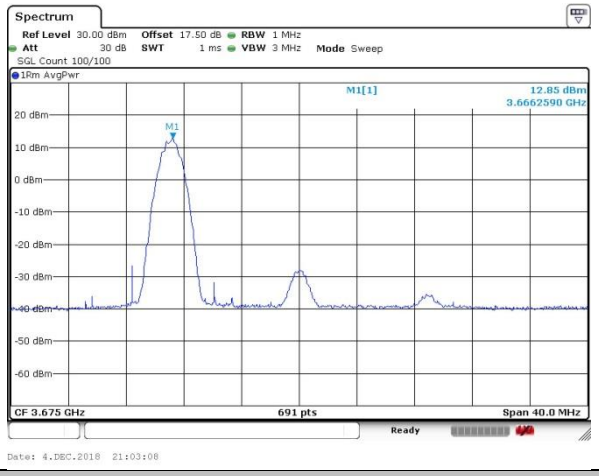
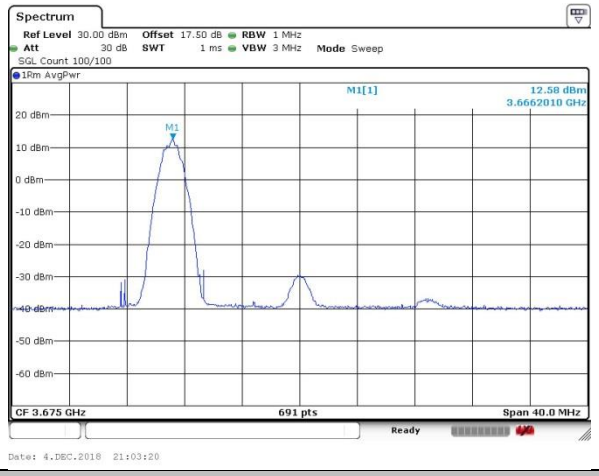
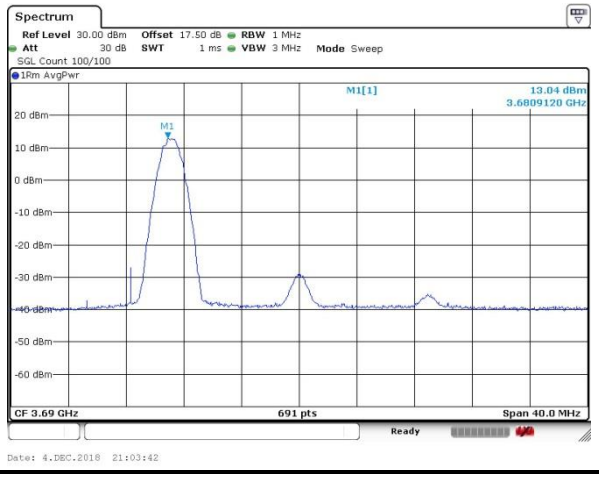
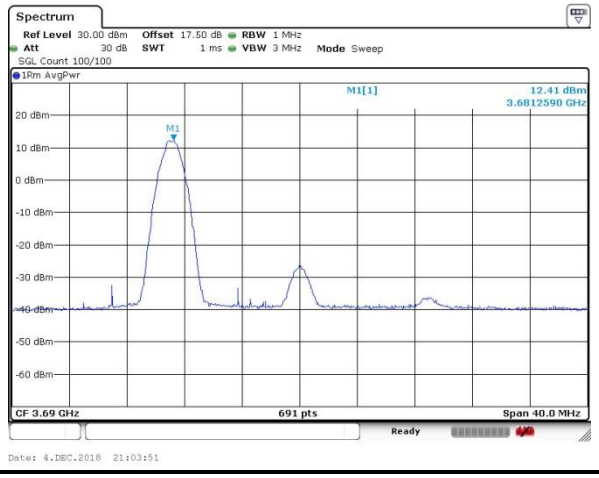
Mode	LTE Band 43 : EIRP Power Density (dBm/5MHz)							
BW	5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	27.21	26.09	27.14	25.67	26.84	25.8	26.94	26.50
Middle CH	27.20	26.28	27.38	26.56	27.70	26.22	27.65	27.38
Highest CH	27.26	26.61	27.64	27.04	27.54	27.05	27.84	27.21
Mod.	64QAM	-	64QAM	-	64QAM	-	64QAM	-
Lowest CH	24.44		24.34		25.42		25.39	
Middle CH	24.65		24.53		24.98		24.43	
Highest CH	24.97		25.41		25.16		25.17	
Antenna Gain	14.8 dBi							
Limit	1W / MHz = 30dBm / MHz							
Result	Pass							

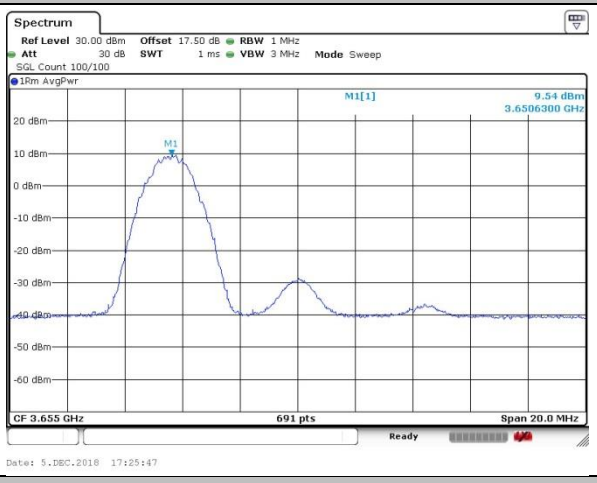
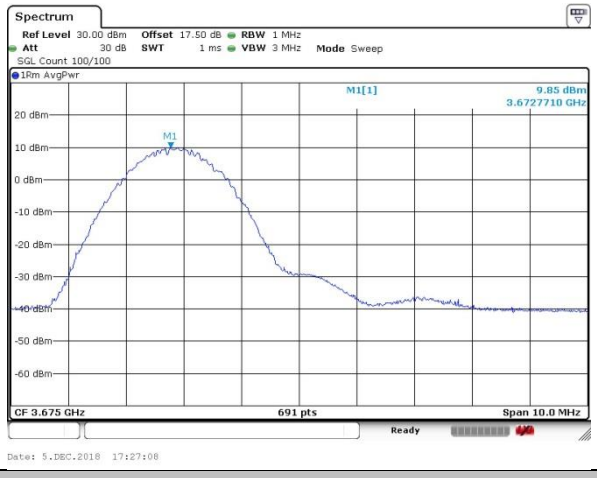
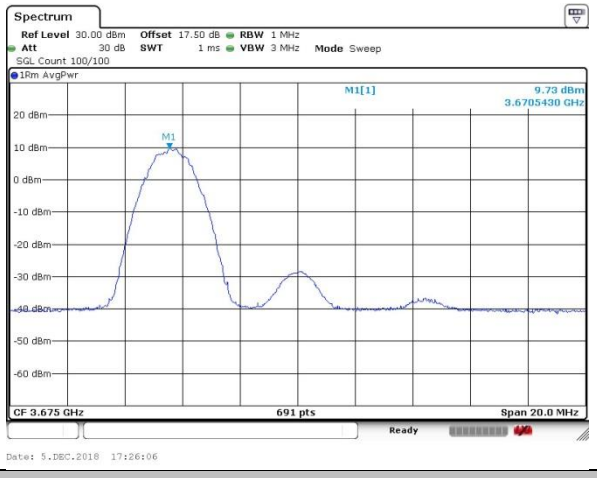
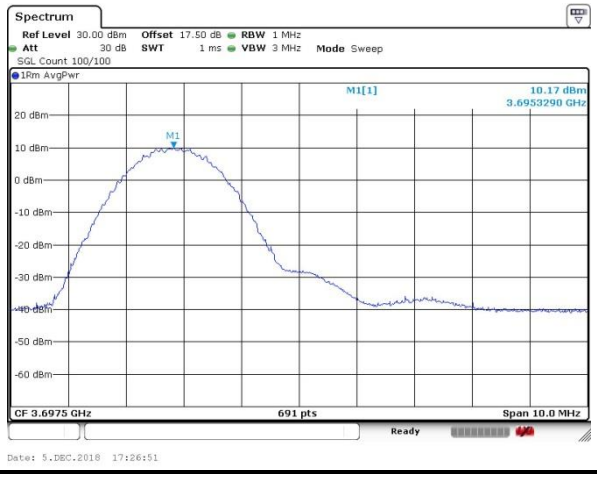
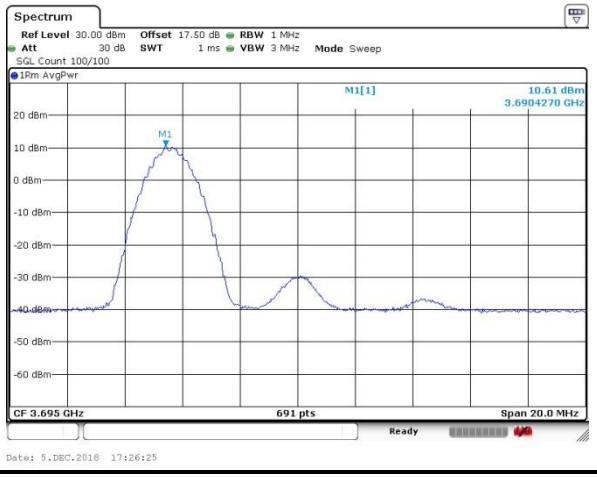
Note: Peak EIRP Density (dBm/MHz) = Peak Conducted Power Density (dBm/MHz) + Antenna Gain

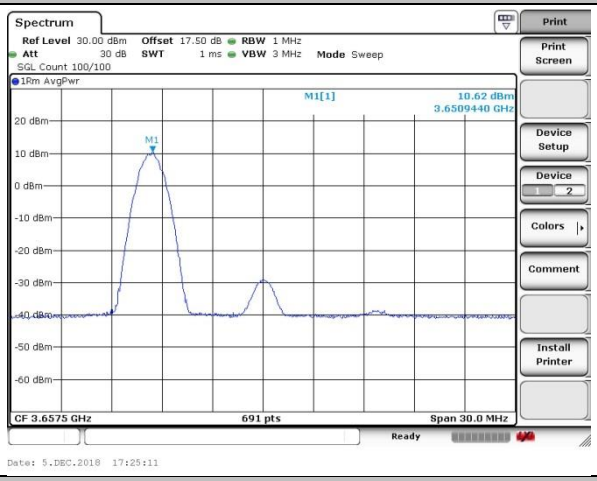
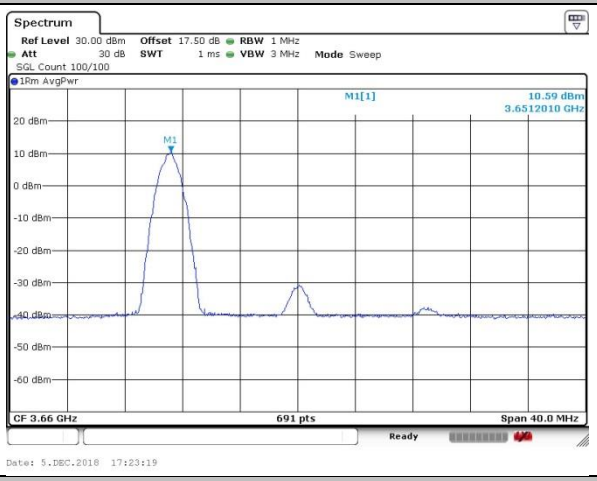
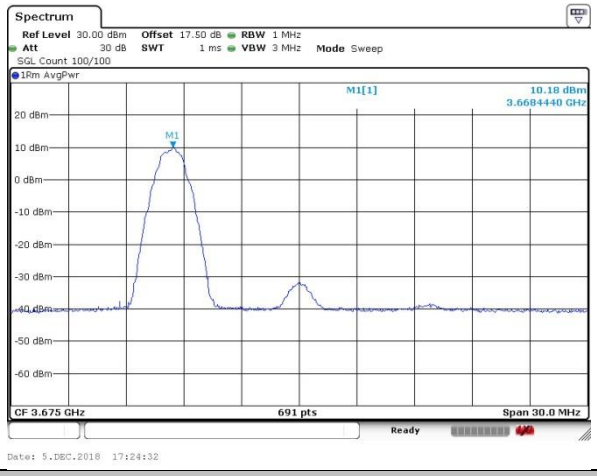
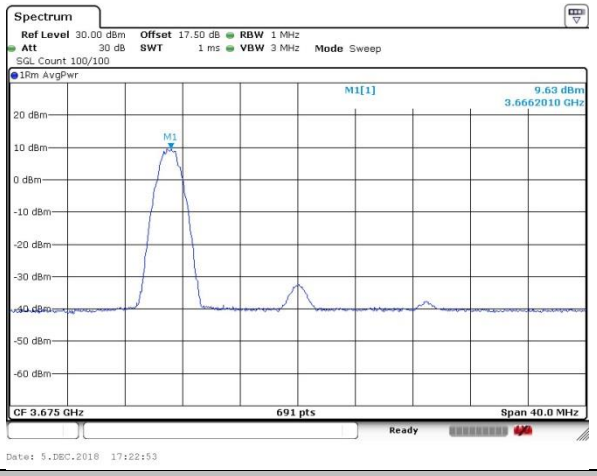
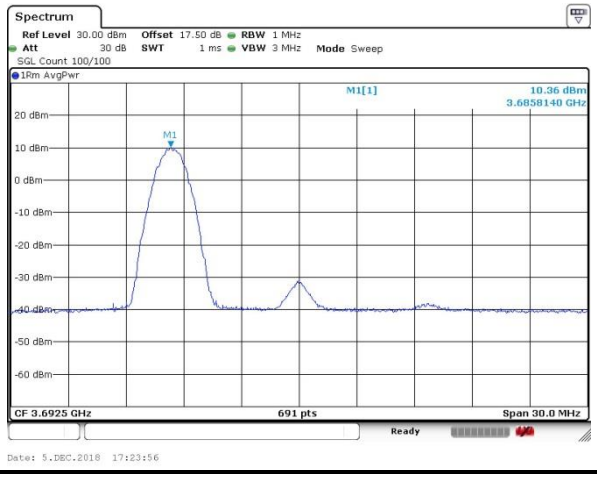
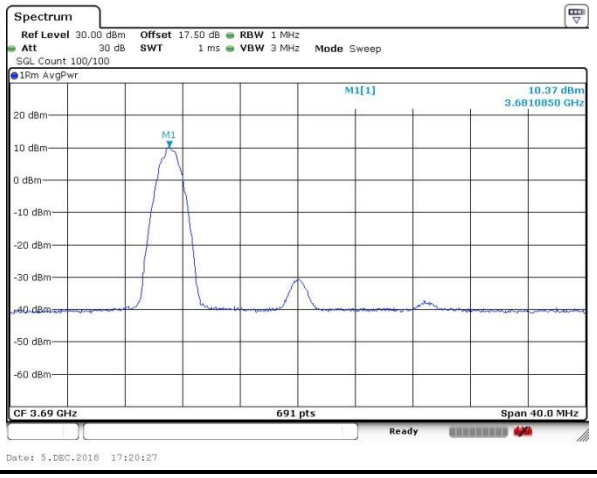
LTE Band 43 / 5MHz	
QPSK	**16QAM**
Lowest Channel / 1 RB	**Lowest Channel / 1 RB**
	
Middle Channel / 1 RB	**Middle Channel / 1 RB**
	
Highest Channel / 1 RB	**Highest Channel / 1 RB**
	

LTE Band 43 / 10MHz	
QPSK	**16QAM**
Lowest Channel / 1 RB	**Lowest Channel / 1 RB**
	
Middle Channel / 1 RB	**Middle Channel / 1 RB**
	
Highest Channel / 1 RB	**Highest Channel / 1 RB**
	

LTE Band 43 / 15MHz	
QPSK	**16QAM**
Lowest Channel / 1 RB	**Lowest Channel / 1 RB**
	
Middle Channel / 1 RB	**Middle Channel / 1 RB**
	
Highest Channel / 1 RB	**Highest Channel / 1 RB**
	

LTE Band 43 / 20MHz	
QPSK	**16QAM**
Lowest Channel / 1 RB	**Lowest Channel / 1 RB**
	
Middle Channel / 1 RB	**Middle Channel / 1 RB**
	
Highest Channel / 1 RB	**Highest Channel / 1 RB**
	

LTE Band 43 / 5MHz	LTE Band 43 / 10MHz
64QAM	64QAM
Lowest Channel / 1 RB	Lowest Channel / 1 RB
	
Middle Channel / 1 RB	Middle Channel / 1 RB
	
Highest Channel / 1 RB	Highest Channel / 1 RB
	

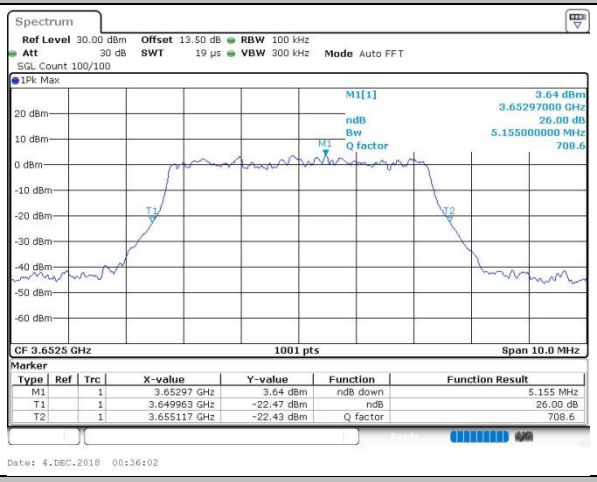
LTE Band 43 / 15MHz	LTE Band 43 / 20MHz
64QAM	64QAM
Lowest Channel / 1 RB	Lowest Channel / 1 RB
	
Middle Channel / 1 RB	Middle Channel / 1 RB
	
Highest Channel / 1 RB	Highest Channel / 1 RB
	

26dB Bandwidth

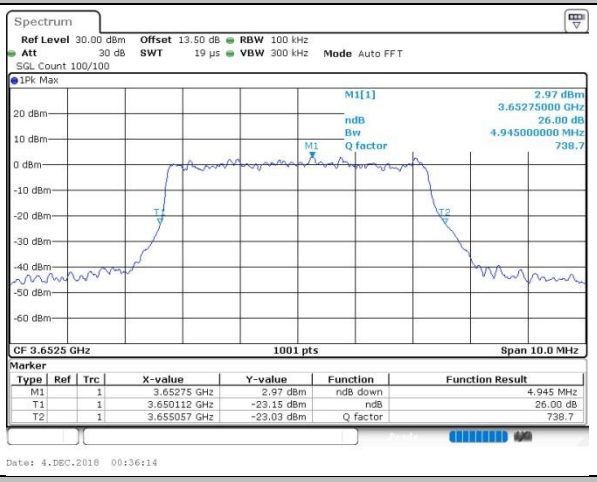
Mode	LTE Band 43 : 26dB BW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH					5.16	4.95	9.65	9.63	14.33	14.27	20.06	20.10
Middle CH					5.14	5.09	9.61	9.79	14.24	14.15	20.10	20.02
Highest CH					5.11	4.95	9.91	9.61	14.60	14.39	20.10	20.18
Mode	LTE Band 43 : 26dB BW(MHz)											
BW	1.4MHz		3MHz		5MHz		10MHz		15MHz		20MHz	
Mod.	64QAM	-	64QAM	-	64QAM	-	64QAM	-	64QAM	-	64QAM	-
Lowest CH					5.00		9.91		14.42		20.22	
Middle CH					5.04		10.03		14.12		20.06	
Highest CH					5.02		9.89		14.36		20.30	

LTE Band 43

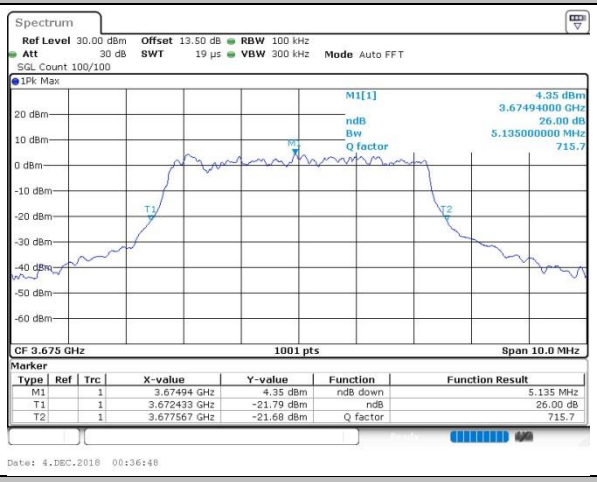
Lowest Channel / 5MHz / QPSK



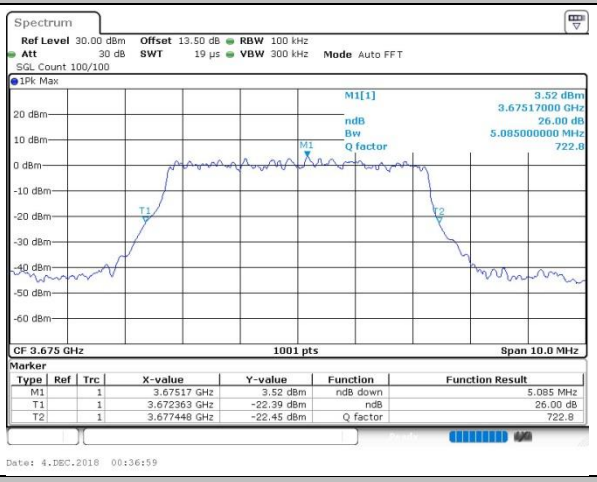
Lowest Channel / 5MHz / 16QAM



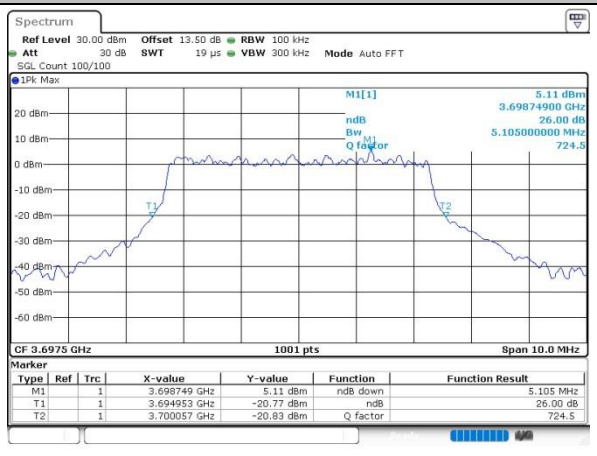
Middle Channel / 5MHz / QPSK



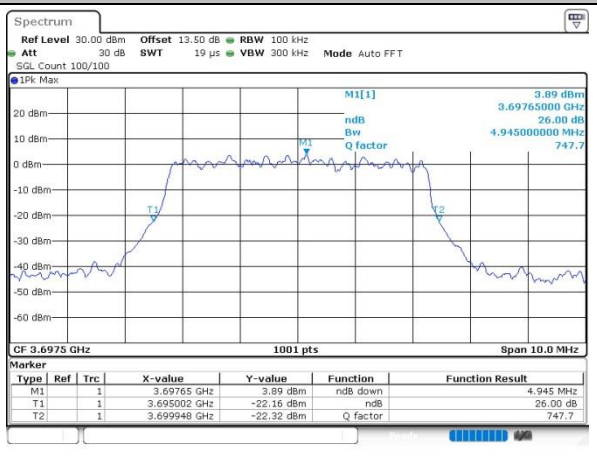
Middle Channel / 5MHz / 16QAM



Highest Channel / 5MHz / QPSK

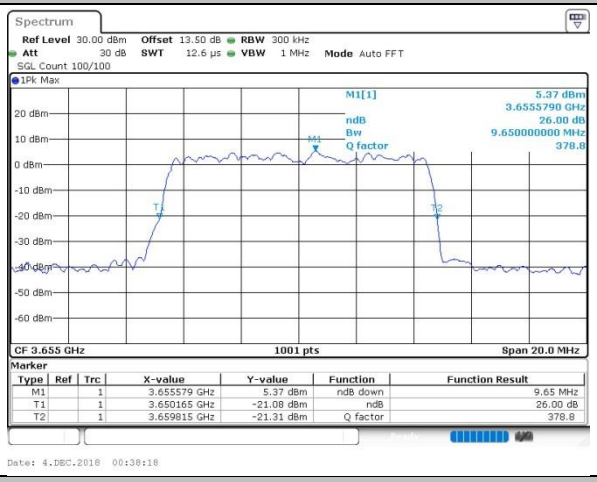


Highest Channel / 5MHz / 16QAM

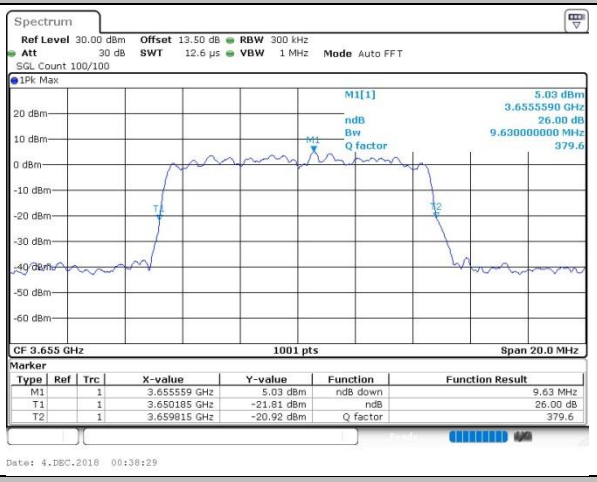


LTE Band 43

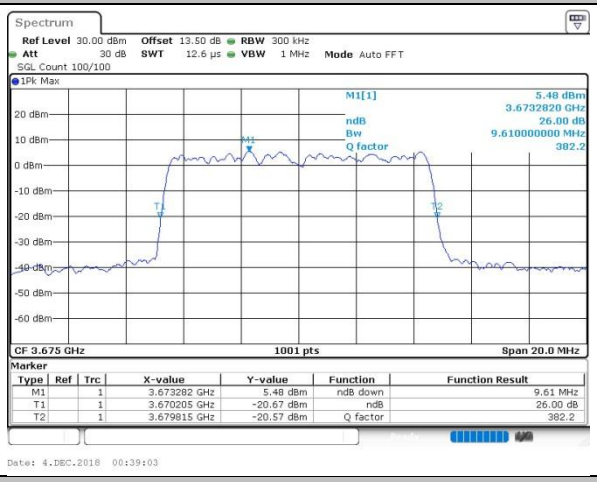
Lowest Channel / 10MHz / QPSK



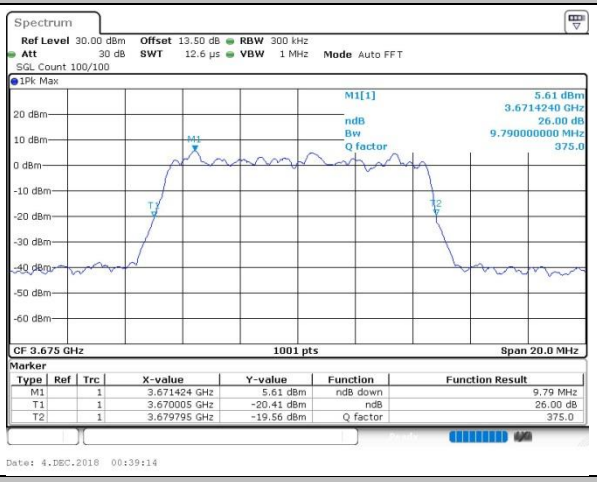
Lowest Channel / 10MHz / 16QAM



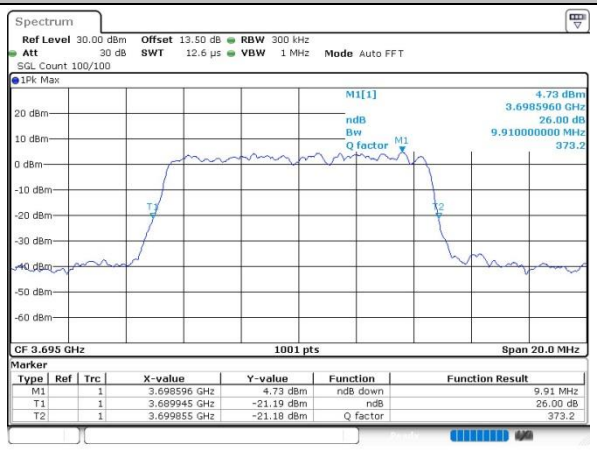
Middle Channel / 10MHz / QPSK



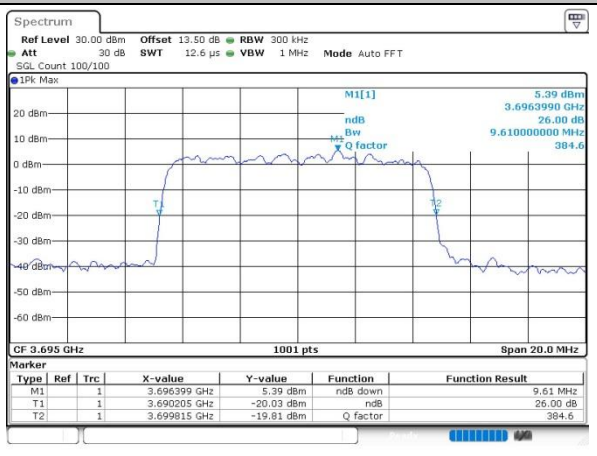
Middle Channel / 10MHz / 16QAM



Highest Channel / 10MHz / QPSK

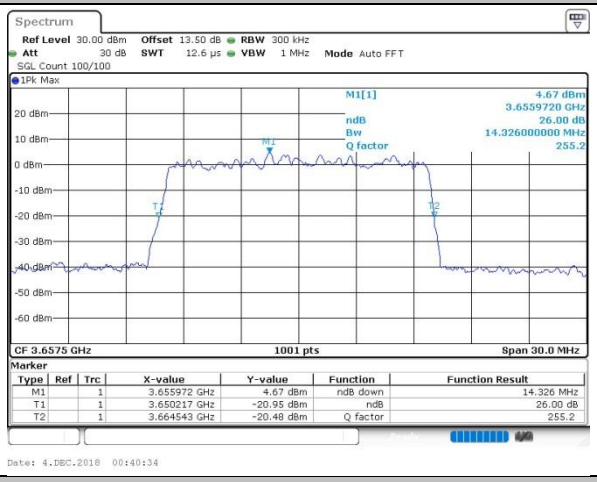


Highest Channel / 10MHz / 16QAM

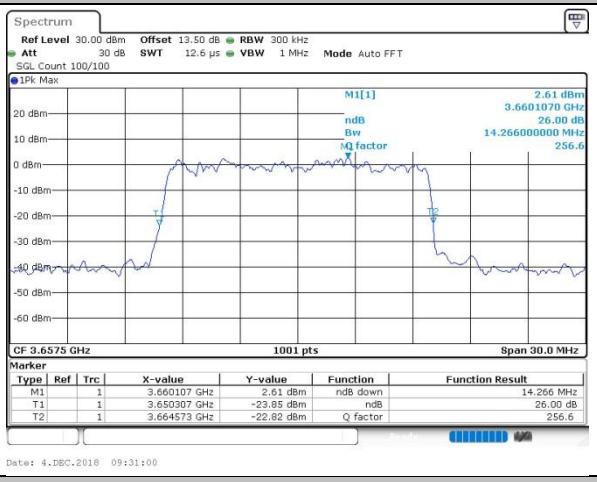


LTE Band 43

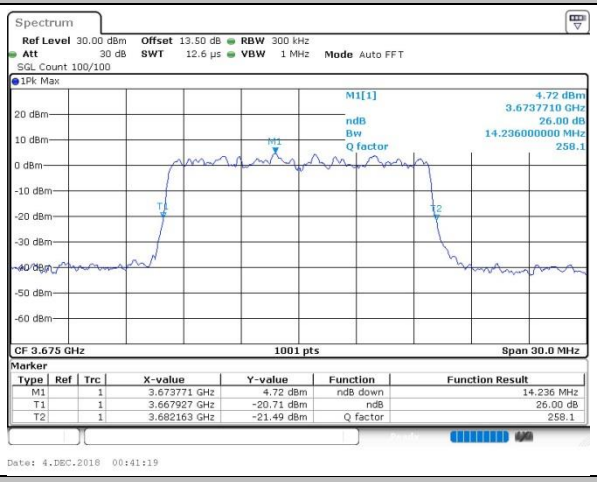
Lowest Channel / 15MHz / QPSK



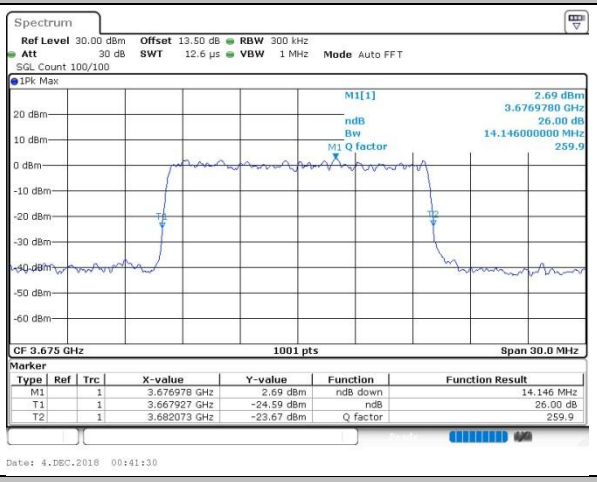
Lowest Channel / 15MHz / 16QAM



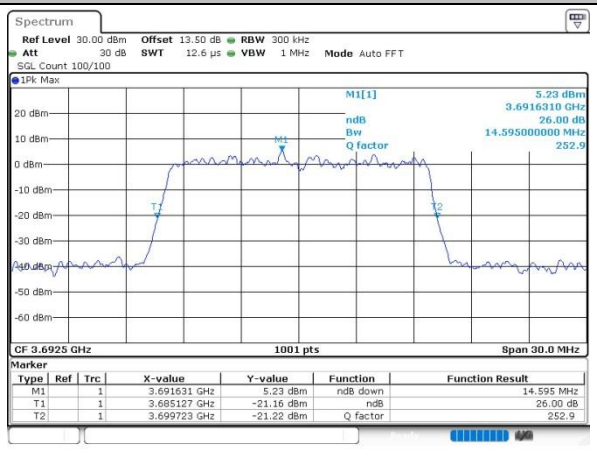
Middle Channel / 15MHz / QPSK



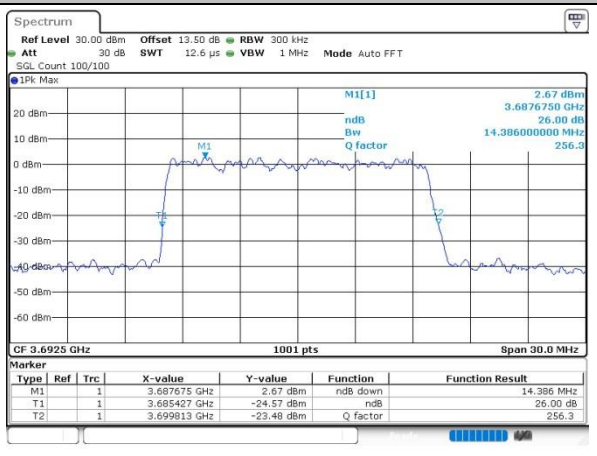
Middle Channel / 15MHz / 16QAM



Highest Channel / 15MHz / QPSK

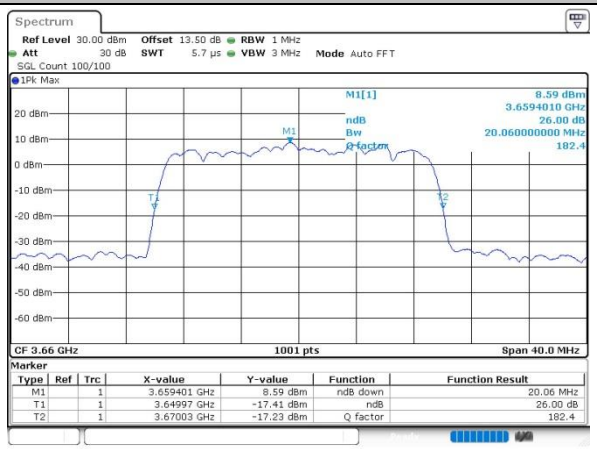


Highest Channel / 15MHz / 16QAM

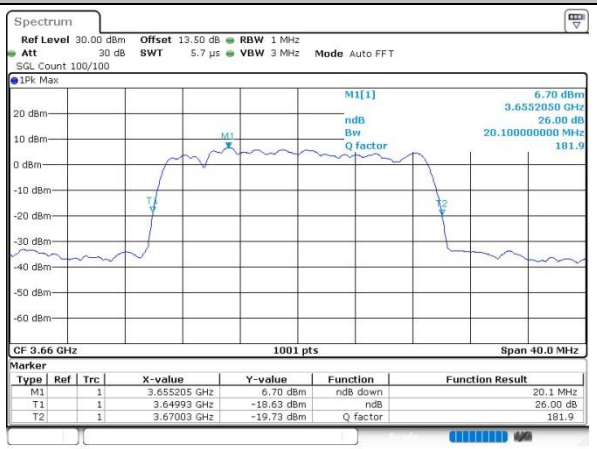


LTE Band 43

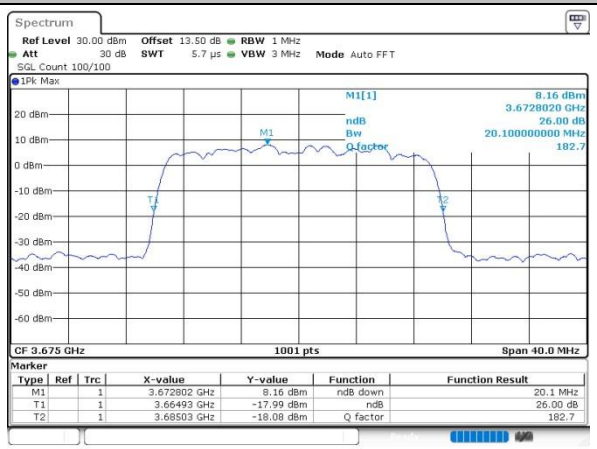
Lowest Channel / 20MHz / QPSK



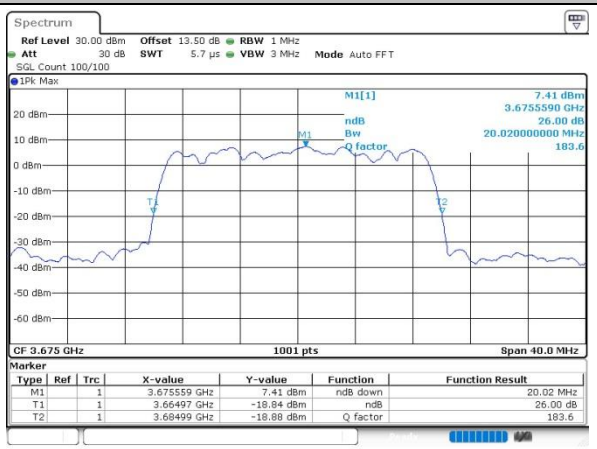
Lowest Channel / 20MHz / 16QAM



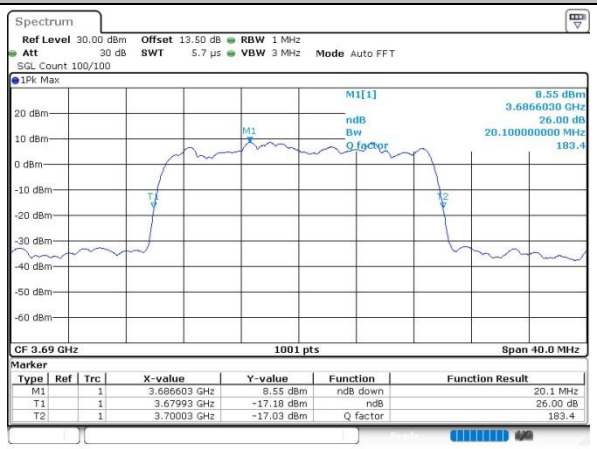
Middle Channel / 20MHz / QPSK



Middle Channel / 20MHz / 16QAM



Highest Channel / 20MHz / QPSK



Highest Channel / 20MHz / 16QAM