



**FCC TEST REPORT and IC TEST REPORT
(Class II Permissive Change)**

For

4G LTE Embedded Mini-Card Module

Model: WW-DL060

Trade Name: Billion

Issued to

Billion Electric Co., Ltd.
8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist.,
New Taipei City 231, Taiwan (R.O.C.)

Issued by

Compliance Certification Services Inc.

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Issued Date: August 6, 2013



Testing Laboratory
1309

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	August 6, 2013	Initial Issue	ALL	Angel Cheng



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1. TEST RESULT CERTIFICATION

Applicant: Billion Electric Co., Ltd.
8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist.,
New Taipei City 231, Taiwan (R.O.C.)

Equipment Under Test: 4G LTE Embedded Mini-Card Module

Trade Name: Billion

Model: WW-DL060

Date of Test: July 26 ~ 29, 2013

FCC PART 27, SUBPART C, L, FCC PART 2	
OPERATING BAND: 704~716 MHz	
Standard	TEST TYPE AND LIMIT
2.1046 27.50(C)(10)	Maximum Peak Output Power Limit: max. 3 watts e.r.p peak power
2.1055 27.54	Frequency Stability
2.1049 27.53(g)	Occupied Bandwidth
27.50(d)(5)	Peak to average ratio
27.53(g)	Band Edge Measurements
2.1051 27.53(g)	Conducted Spurious Emissions
2.1053 27.53(g)	Radiated Spurious Emissions

Note: 1. The test result judgment is decided by the limit of test standard
2. The information of measurement uncertainty is available upon the customer's request.



Deviation from Applicable Standard
None

The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by

Reviewed by

Miller Lee
Section Manager
Compliance Certification Services Inc.

Angel Cheng
Section Manager
Compliance Certification Services Inc.



2. EUT DESCRIPTION

Product	4G LTE Embedded Mini-Card Module	
Model Number	WW-DL060	
Model Discrepancy	N/A	
Trade	Billion	
Received Date	July 17, 2013	
Power Source	Powered by host device.	
Modulation Technology	LTE Band 12	QPSK, 16QAM
Frequency Range	LTE Band 12 Channel Bandwidth: 5MHz	701.5MHz ~ 713.5MHz
	LTE Band 12 Channel Bandwidth: 10MHz	704.0MHz ~ 711.0MHz
Maximum ERP Power	LTE Band 12 Channel Bandwidth: 5MHz	QPSK: 24.91dBm 16QAM: 25.14dBm
	LTE Band 12 Channel Bandwidth: 10MHz	QPSK : 24.81dBm 16QAM: 25.70dBm
Category	LTE: 3	
Antenna Specification	LTE Band 12: Dipole Antenna / Gain: 1.37dBi	
Class II Permissive Change	Under same hardware design supports both band 2 and band 17 via software change.	

- Note: 1. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.*
- 2. Due to the frequency range of LTE Band 17 could be covered by LTE Band 12, therefore only LTE band 12 has been performed the testing.*



3. TEST METHODOLOGY

3.1 DESCRIPTION OF TEST TYPE

The EUT (model: WW-DL060) had been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting mode was programmed.

LTE Band 12: 704.0MHz ~ 711.0MHz

Three channels had been tested for each channel bandwidth.

Channel Bandwidth	5MHz		10MHz	
	Channel	Frequency(MHz)	Channel	Frequency(MHz)
Low channel (L)	23035	701.50	23060	704.00
Middle channel (M)	23090	707.00	23090	707.00
High channel (H)	23155	713.50	23130	711.00

This device supports LTE Bands 12 (699-716MHz) and 17 (704-716MHz).



4. INSTRUMENT CALIBRATION

4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

4.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Remark: Each piece of equipment is scheduled for calibration once a year.

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY43360131	03/20/2014
Power Meter	Anritsu	ML2495A	1012009	06/04/2014
Power Sensor	Anritsu	MA2411A	0917072	06/04/2014

3M Semi Anechoic Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510268	11/06/2013
EMI Test Receiver	R&S	ESCI	100064	02/17/2014
Pre-Amplifier	Mini-Circuits	ZFL-1000LN	SF350700823	01/12/2014
Bilog Antenna	Sunol Sciences	JB3	A030105	02/17/2014
Bilog Antenna	Sunol Sciences	JB3	A030205	10/02/2013
Horn Antenna	EMCO	3117	00055165	02/17/2014
Horn Antenna	EMCO	3117	00055167	01/28/2014
Horn Antenna	EMCO	3116	26370	01/07/2014
Loop Antenna	EMCO	6502	8905/2356	06/12/2014
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Site NSA	CCS	N/A	N/A	12/22/2013
Test S/W	EZ-EMC (CCS-3A1RE)			



4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683

Remark: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.



5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

No.81-1, Lane 210, Bade 2nd Rd., Luchu Hsiang, Taoyuan Hsien 338, Taiwan
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.




Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."



5.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	 FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12.2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method -47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	 IC 2324G-1 IC 2324G-2

** No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*



6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix I for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1.	3G+LTE	R&S	CMW500	1201.0002k50-116875. cA	N/A	N/A	N/A

Remark:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



7. TEST PROCEDURE AND RESULT

7.1 OUTPUT POWER MEASUREMENT

LIMITS

Portable stations (hand-held devices) operating in the 698–746 MHz band are limited to 3 watts ERP

TEST PROCEDURES

EIRP / ERP MEASUREMENT:

1. The EUT was set up for the maximum power with LTE link data modulation. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels (low, middle and high operational frequency range). RWB and VBW is 10MHz for LTE.
2. E.I.R.P power measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
3. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step a. Record the power level of S.G d. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$
4. $E.R.P = E.I.R.P - 2.15 \text{ dB}$

CONDUCTED POWER MEASUREMENT:

1. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
2. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.



TEST RESULTS

LTE Band 12

Channel Bandwidth: 5MHz

Conducted Output Power (QPSK 1 RB ALLOCATED AT THE LOWER EDGE)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
701.50	23035	23.94	0.24774
707.00	23090	23.71	0.23496
713.50	23155	24.26	0.26669

Conducted Output Power (QPSK 1 RB ALLOCATED AT THE UPPER EDGE)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
701.50	23035	22.45	0.17579
707.00	23090	22.34	0.17140
713.50	23155	23.15	0.20654

Conducted Output Power (QPSK 50% RB ALLOCATION CENTERED)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
701.50	23035	22.82	0.19143
707.00	23090	22.68	0.18535
713.50	23155	23.12	0.20512

Conducted Output Power (QPSK 100% RB ALLOCATION)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
701.50	23035	21.32	0.13552
707.00	23090	21.24	0.13305
713.50	23155	22.08	0.16144

Remarks:

1. Output Power (dBm) = Raw Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Power Splitter Loss (dB) + Cable Loss (dB) + 20dB Attenuator.
3. The value in bold is the worst.



Channel Bandwidth: 5MHz

Conducted Output Power (16QAM 1 RB ALLOCATED AT THE LOWER EDGE)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
701.50	23035	23.70	0.23442
707.00	23090	22.93	0.19634
713.50	23155	23.86	0.24322

Conducted Output Power (16QAM 1 RB ALLOCATED AT THE UPPER EDGE)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
701.50	23035	23.15	0.20654
707.00	23090	22.65	0.18408
713.50	23155	23.20	0.20893

Conducted Output Power (16QAM 50% RB ALLOCATION CENTERED)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
701.50	23035	22.66	0.18450
707.00	23090	22.00	0.15849
713.50	23155	22.77	0.18923

Conducted Output Power (16QAM 100% RB ALLOCATION)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
701.50	23035	22.12	0.16293
707.00	23090	21.55	0.14289
713.50	23155	22.19	0.16558

Remarks:

1. Output Power (dBm) = Raw Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Power Splitter Loss (dB) + Cable Loss (dB) + 20dB Attenuator.
3. The value in bold is the worst.



LTE Band 12

Channel Bandwidth: 10MHz

Conducted Output Power (QPSK 1 RB ALLOCATED AT THE LOWER EDGE)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
704.00	23060	22.97	0.19815
707.00	23090	23.06	0.20230
711.00	23130	23.10	0.20417

Conducted Output Power (QPSK 1 RB ALLOCATED AT THE UPPER EDGE)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
704.00	23060	23.00	0.19953
707.00	23090	23.03	0.20091
711.00	23130	23.00	0.19953

Conducted Output Power (QPSK 50% RB ALLOCATION CENTERED)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
704.00	23060	21.88	0.15417
707.00	23090	22.14	0.16368
711.00	23130	22.08	0.16144

Conducted Output Power (QPSK 100% RB ALLOCATION)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
704.00	23060	22.04	0.15996
707.00	23090	22.01	0.15885
711.00	23130	22.09	0.16181

Remarks:

1. Output Power (dBm) = Raw Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Power Splitter Loss (dB) + Cable Loss (dB) + 20dB Attenuator.
3. The value in bold is the worst.



Conducted Output Power (16QAM 1 RB ALLOCATED AT THE LOWER EDGE)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
704.00	23060	23.03	0.20091
707.00	23090	23.69	0.23388
711.00	23130	24.18	0.26182

Conducted Output Power (16QAM 1 RB ALLOCATED AT THE UPPER EDGE)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
704.00	23060	22.87	0.19364
707.00	23090	23.42	0.21979
711.00	23130	24.00	0.25119

Conducted Output Power (16QAM 50% RB ALLOCATION CENTERED)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
704.00	23060	22.89	0.19454
707.00	23090	23.09	0.20370
711.00	23130	23.73	0.23605

Conducted Output Power (16QAM 100% RB ALLOCATION)			
Frequency (MHz)	Channel	Output Power	
		(dBm)	(W)
704.00	23060	22.57	0.18072
707.00	23090	22.82	0.19143
711.00	23130	23.57	0.22751

Remarks:

1. Output Power (dBm) = Raw Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Power Splitter Loss (dB) + Cable Loss (dB) + 20dB Attenuator.
3. The value in bold is the worst.



ERP POWER

LTE Band 12

Channel Bandwidth: 5MHz / QPSK

Channel	Frequency (MHz)	Antenna Pol.	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
23035	701.50	V	21.67	3.12	6.36	*24.91	38.45	-13.54
	701.50	H	11.16	3.12	6.36	14.40	38.45	-24.05
23090	707.00	V	21.51	3.12	6.36	24.75	38.45	-13.70
	707.00	H	10.57	3.12	6.36	13.81	38.45	-24.64
23155	713.50	V	21.24	3.12	6.37	24.49	38.45	-13.96
	713.50	H	10.94	3.12	6.36	14.18	38.45	-24.27

Channel Bandwidth: 5MHz / 16QAM

Channel	Frequency (MHz)	Antenna Pol.	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
23035	701.50	V	21.89	3.12	6.37	*25.14	38.45	-13.31
	701.50	H	10.94	3.12	6.36	14.18	38.45	-24.27
23090	707.00	V	23.18	3.13	6.32	26.37	38.45	-12.08
	707.00	H	19.36	3.14	6.3	22.52	38.45	-15.93
23155	713.50	V	21.5	3.15	6.35	24.70	38.45	-13.75
	713.50	H	18.64	3.15	6.4	21.89	38.45	-16.56

Remark:

1. Output Power (dBm) = Raw Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = S.G Level + Gain of Substitution horn + TX cable loss.
3. The value in bold is the worst.



Channel Bandwidth: 10MHz / QPSK

Channel	Frequency (MHz)	Antenna Pol.	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
23060	704.00	V	11.59	3.14	6.31	24.77	38.45	-13.68
	704.00	H	11.59	3.14	6.31	14.76	38.45	-23.69
23090	707.00	V	21.02	3.13	6.32	24.21	38.45	-14.24
	707.00	H	11.4	3.14	6.31	14.57	38.45	-23.88
23130	711.00	V	21.64	3.14	6.31	*24.81	38.45	-13.64
	711.00	H	12.36	3.14	6.31	15.53	38.45	-22.92

Channel Bandwidth: 10MHz / 16QAM

Channel	Frequency (MHz)	Antenna Pol.	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
23060	704.00	V	22.26	3.13	6.33	25.46	38.45	-12.99
	704.00	H	12.47	3.13	6.32	15.66	38.45	-22.79
23090	707.00	V	21.86	3.13	6.32	25.05	38.45	-13.40
	707.00	H	12.76	3.13	6.32	15.95	38.45	-22.50
23130	711.00	V	22.53	3.14	6.31	*25.70	38.45	-12.75
	711.00	H	12.86	3.14	6.3	16.02	38.45	-22.43

Remark:

1. Output Power (dBm) = Raw Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = S.G Level + Gain of Substitution horn + TX cable loss.
3. The value in bold is the worst.



7.2 FREQUENCY STABILITY MEASUREMENT

LIMIT

According to the FCC part 27.54 shall be tested the frequency stability. The rule is defined that "The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation. The test extreme voltage is according to the 2.1055(d)(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and the extreme temperature rule is comply with the 1055(a)(1) $-30^{\circ}\text{C} \sim 50^{\circ}\text{C}$.

TEST PROCEDURE

1. Because of the measure the carrier frequency under the condition of the AFC lock, it shall be used the mobile station in the LTE link mode. This is accomplished with the use of the communication simulator station. The oven room could control the temperatures and humidity.
2. Power must be removed when changing from one temperature to another or one voltage to another voltage. Power warm up is at least 15 min and power applied should perform before recording frequency error.
3. Laptop pc is connected the external power supply to control the AC input power. The various Volts from the minimum 126.5 Volts to 93.5 Volts. Each step shall be record the frequency error rate.
4. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the $\pm 0.5^{\circ}\text{C}$ during the measurement testing.
5. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

NOTE: The frequency error was recorded frequency error from the communication simulator.



TEST RESULTS

FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT:

LTE Band 12

Reference Frequency: LTE Band 12 707 MHz @ 20°C						
Limit: ± 2.5 ppm = 1767.5Hz						
Power Supply Vdc	Environment Temperature (°C)	5M Frequency (Hz)	Delta (Hz)	10M Frequency (Hz)	Delta (Hz)	Limit (Hz)
5	50	706999967	-28	707000035	47	2091
5	40	707000030	35	707000014	26	
5	30	706999981	-14	706999979	-9	
5	20	706999995	0	706999988	0	
5	10	706999960	-35	706999952	-36	
5	0	706999988	-7	706999954	-34	
5	-10	706999980	-15	707000030	42	
5	-20	706999986	-9	707000039	51	
5	-30	706999987	-8	707000012	24	



FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT:

LTE Band 12

Reference Frequency: LTE Band 12 707 MHz @ 20°C						
Limit: ± 2.5 ppm = 1767.5Hz						
Power Supply Vdc	Environment Temperature (°C)	5M Frequency (Hz)	Delta (Hz)	10M Frequency (Hz)	Delta (Hz)	Limit (Hz)
5.5	20	707000016	21	706999982	-6	1775
5		706999995	0	706999988	0	
4.25		706999954	-41	706999936	-52	



7.3 OCCUPIED BANDWIDTH MEASUREMENT

LIMITS

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 power of a given emission.

TEST PROCEDURES

1. The EUT makes a phone call to the communication simulator. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels. (low, middle and high operational frequency range.)
2. The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
3. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.



TEST RESULTS

LTE Band 12

CHANNEL BANDWIDTH: 5MHz / QPSK

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
Low	701.50	4.5033
Mid	707.00	4.4982
High	713.50	4.5007

CHANNEL BANDWIDTH: 5MHz / 16QAM

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
Low	701.50	4.4989
Mid	707.00	4.5115
High	713.50	4.4957

CHANNEL BANDWIDTH: 10MHz / QPSK

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
Low	704.00	8.9850
Mid	707.00	8.9915
High	711.00	8.9506

CHANNEL BANDWIDTH: 10MHz / 16QAM

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
Low	704.00	8.9685
Mid	707.00	8.9563
High	711.00	8.9580



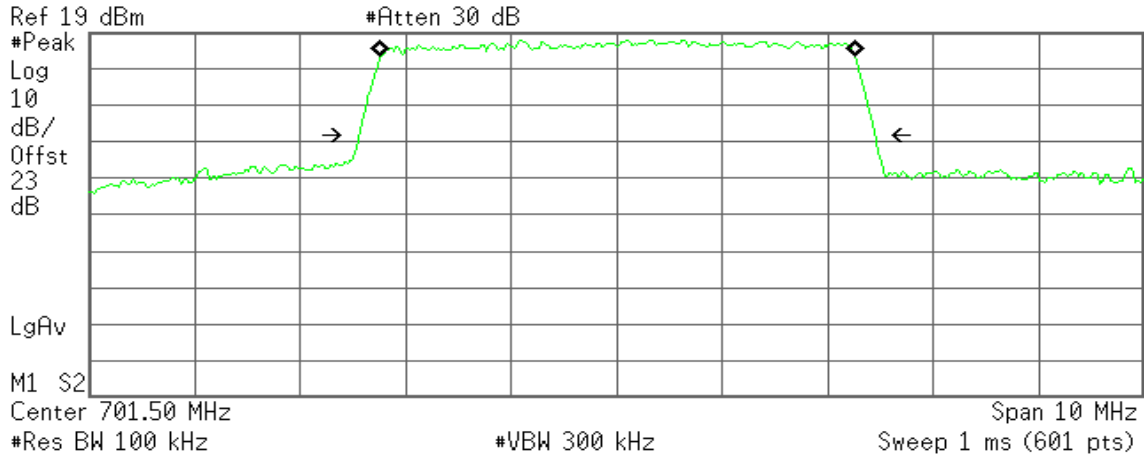
LTE Band 12

CHANNEL BANDWIDTH: 5MHz / QPSK

CH Low

Agilent 22:12:48 Jul 29, 2013

R T



Occupied Bandwidth
4.5033 MHz

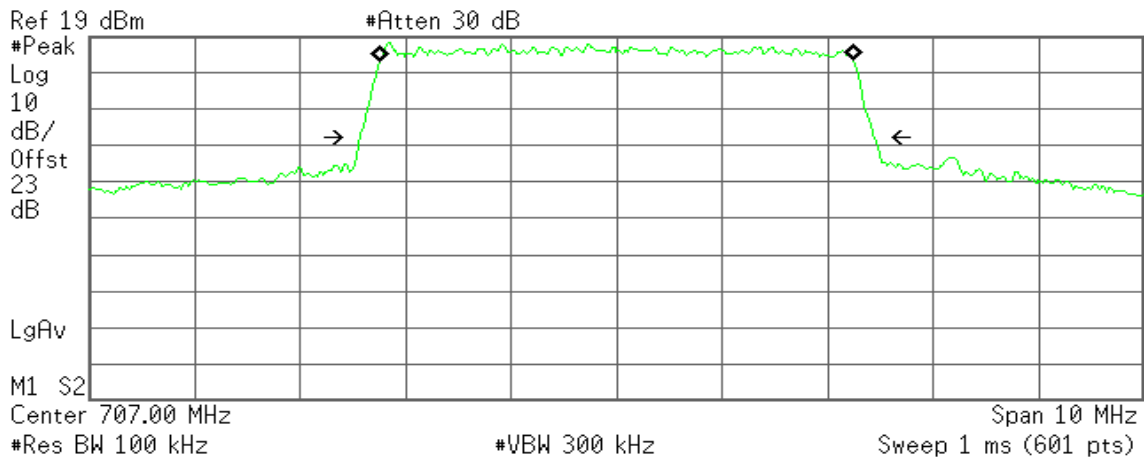
Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 8.779 kHz
x dB Bandwidth 4.900 MHz

CH Mid

Agilent 22:14:44 Jul 29, 2013

R T



Occupied Bandwidth
4.4982 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

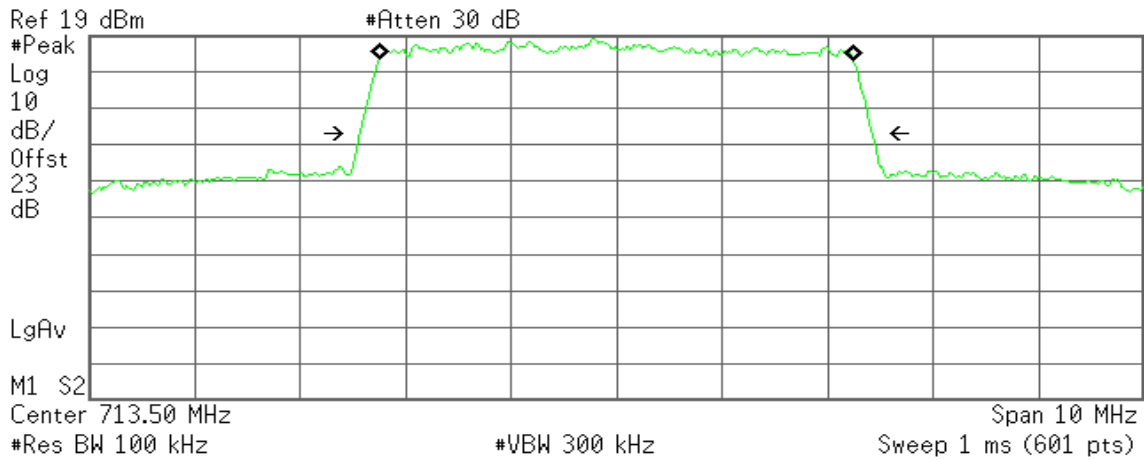
Transmit Freq Error 3.261 kHz
x dB Bandwidth 4.892 MHz



CH High

Agilent 22:15:48 Jul 29, 2013

R T



Occupied Bandwidth
4.5007 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

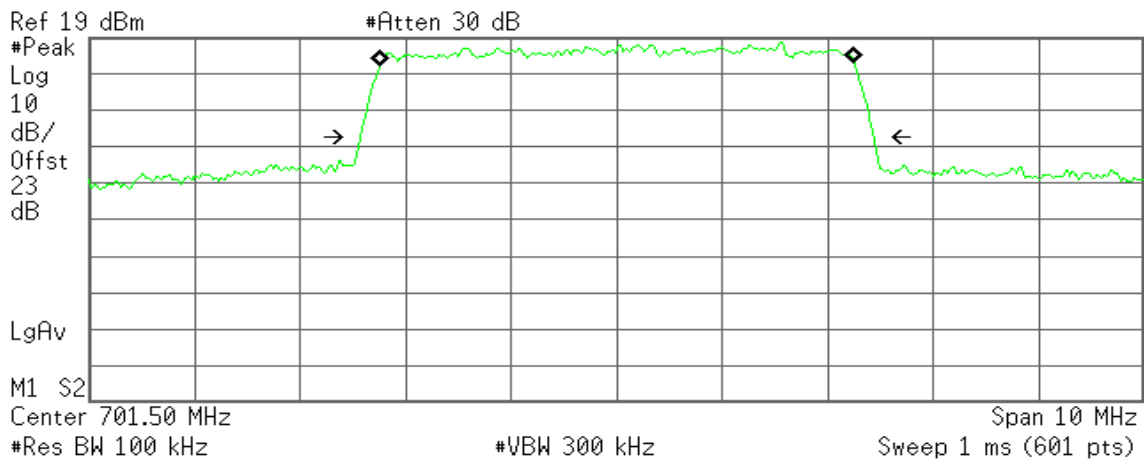
Transmit Freq Error -4.055 kHz
x dB Bandwidth 4.870 MHz

CHANNEL BANDWIDTH: 5MHz / 16QAM

CH Low

Agilent 22:13:36 Jul 29, 2013

R T



Occupied Bandwidth
4.4989 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

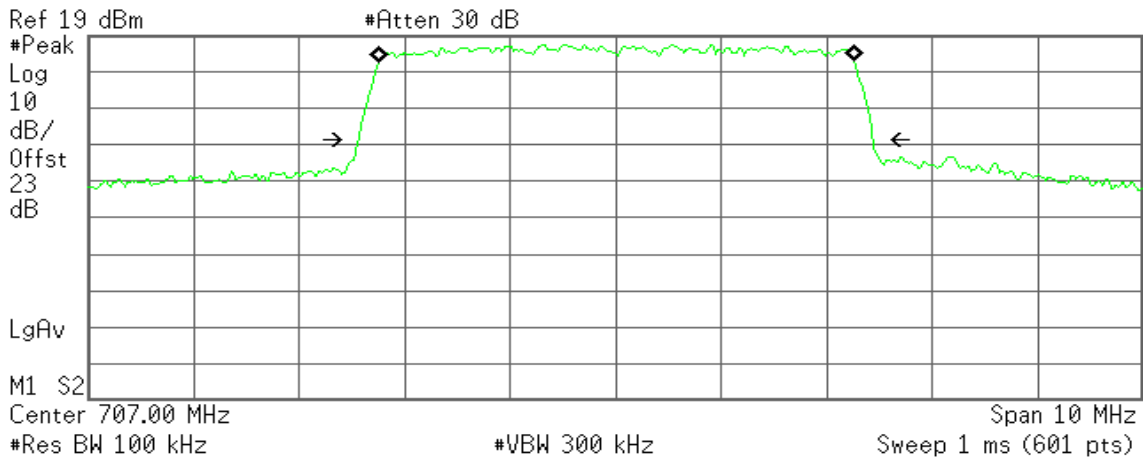
Transmit Freq Error 6.606 kHz
x dB Bandwidth 4.877 MHz



CH Mid

Agilent 22:14:19 Jul 29, 2013

R T



Occupied Bandwidth
4.5115 MHz

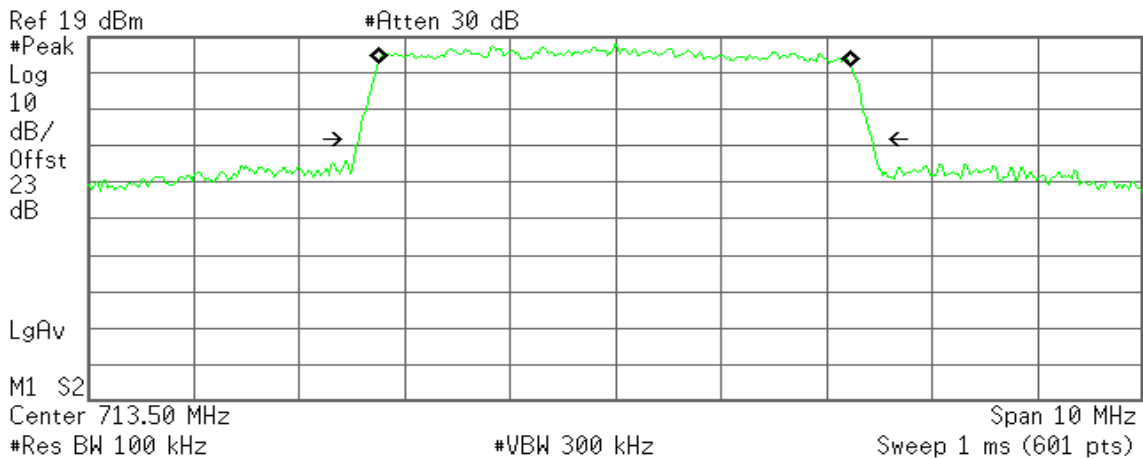
Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 8.648 kHz
x dB Bandwidth 4.883 MHz

CH High

Agilent 22:16:08 Jul 29, 2013

R T



Occupied Bandwidth
4.4957 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -8.449 kHz
x dB Bandwidth 4.873 MHz

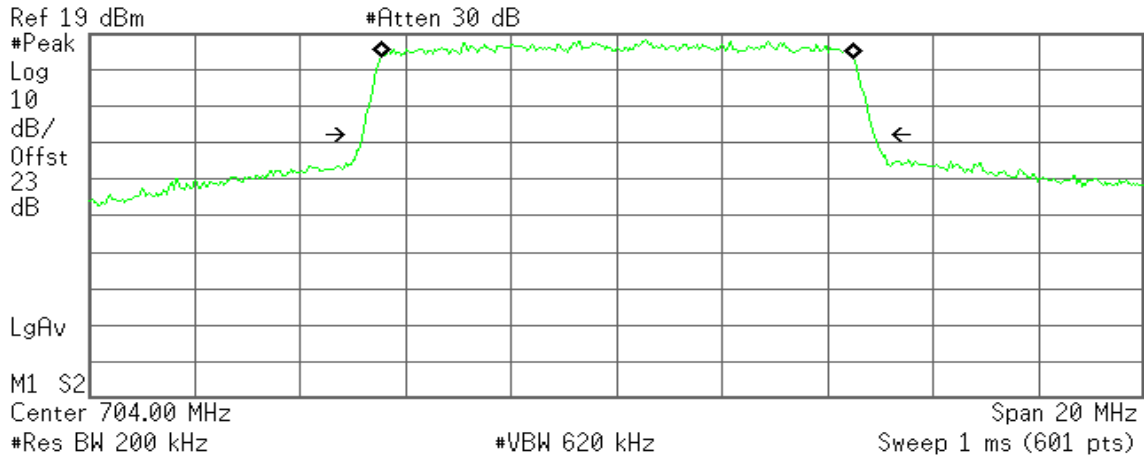


CHANNEL BANDWIDTH: 10MHz / QPSK

CH Low

Agilent 22:19:40 Jul 29, 2013

R T



Occupied Bandwidth
8.9850 MHz

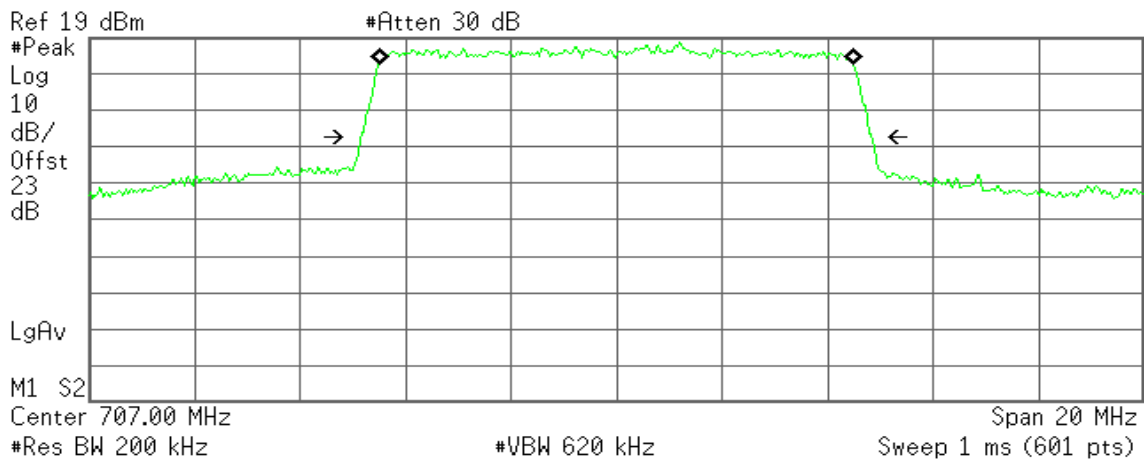
Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 10.624 kHz
x dB Bandwidth 9.713 MHz

CH Mid

Agilent 22:34:10 Jul 29, 2013

R T



Occupied Bandwidth
8.9915 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

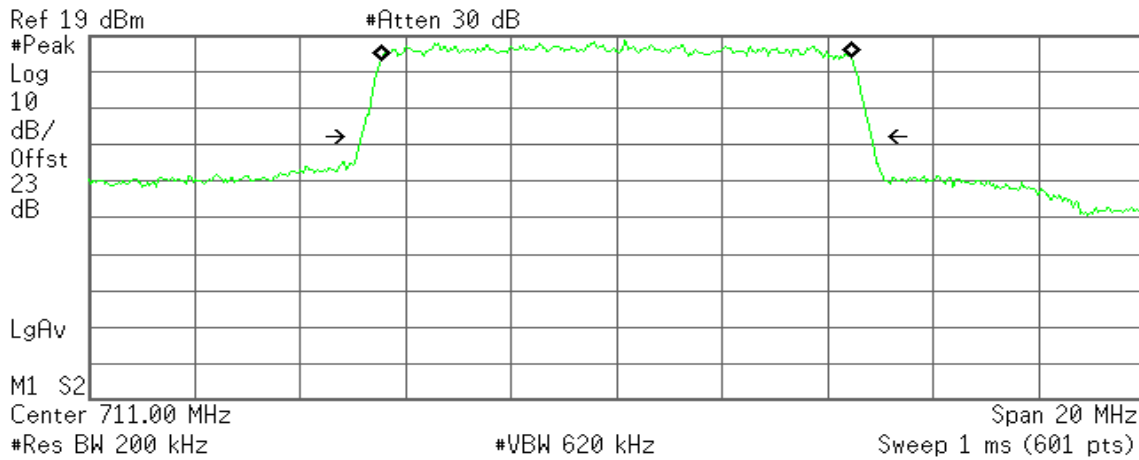
Transmit Freq Error -8.279 kHz
x dB Bandwidth 9.711 MHz



CH High

Agilent 22:34:47 Jul 29, 2013

R T



Occupied Bandwidth
8.9506 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

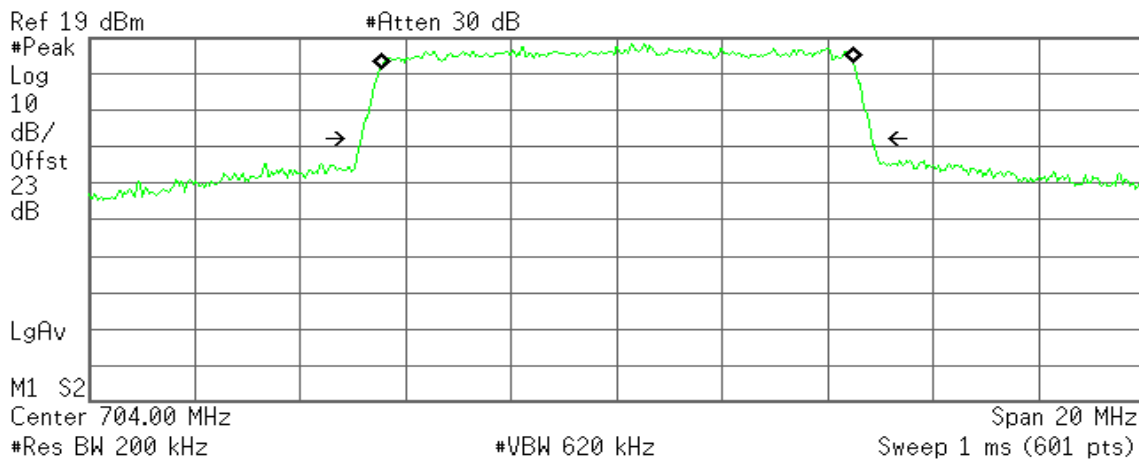
Transmit Freq Error 727.762 Hz
x dB Bandwidth 9.676 MHz

CHANNEL BANDWIDTH: 10MHz / 16QAM

CH Low

Agilent 22:20:06 Jul 29, 2013

R T



Occupied Bandwidth
8.9685 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

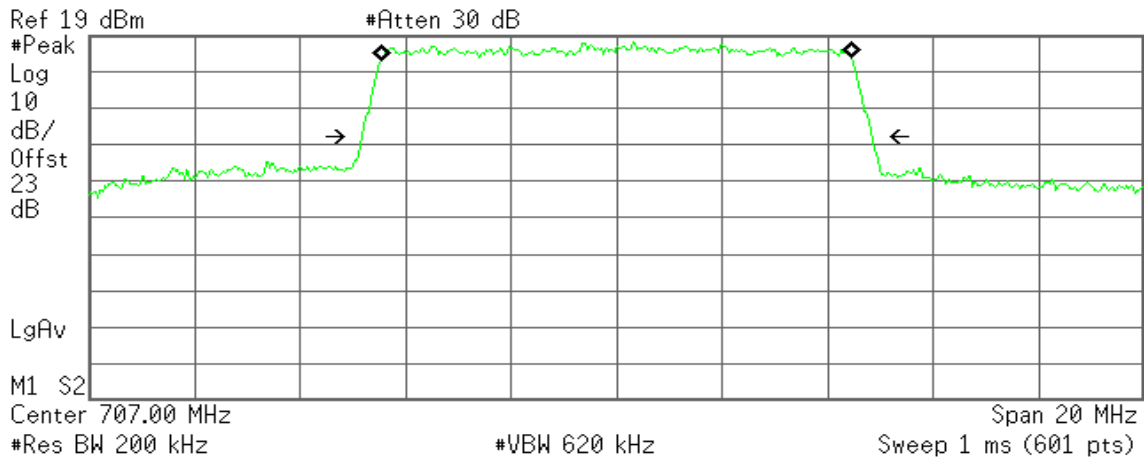
Transmit Freq Error 15.394 kHz
x dB Bandwidth 9.697 MHz



CH Mid

Agilent 22:33:44 Jul 29, 2013

R T



Occupied Bandwidth
8.9563 MHz

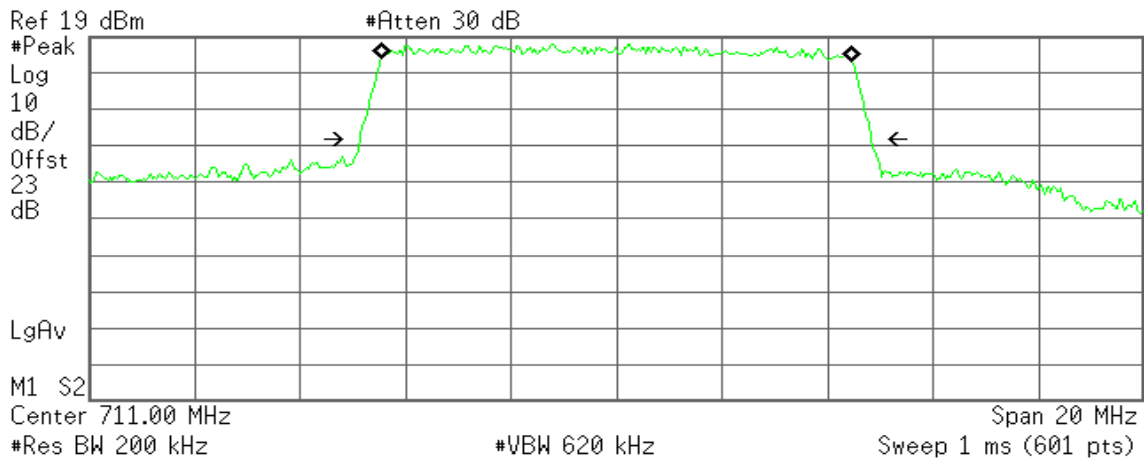
Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -5.147 kHz
x dB Bandwidth 9.694 MHz

CH High

Agilent 22:35:17 Jul 29, 2013

R T



Occupied Bandwidth
8.9580 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -480.966 Hz
x dB Bandwidth 9.719 MHz



7.4 BAND EDGE MEASUREMENT

LIMIT

For operations in the 698–746 MHz band, 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 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed. For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB. The limit of emission equal to -13dBm . In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

TEST PROCEDURES

1. The EUT was set up for the maximum peak power with LTE link data modulation. The power was measured with Spectrum Analyzer. All measurements were done at 2 channels (low and high operational frequency range.).
2. The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer. This splitter loss and cable loss are the worst loss 7.2 dB in the transmitted path track.
3. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 50kHz and VB of the spectrum is 200kHz.
4. Record the max trace plot into the test report.



TEST RESULTS:

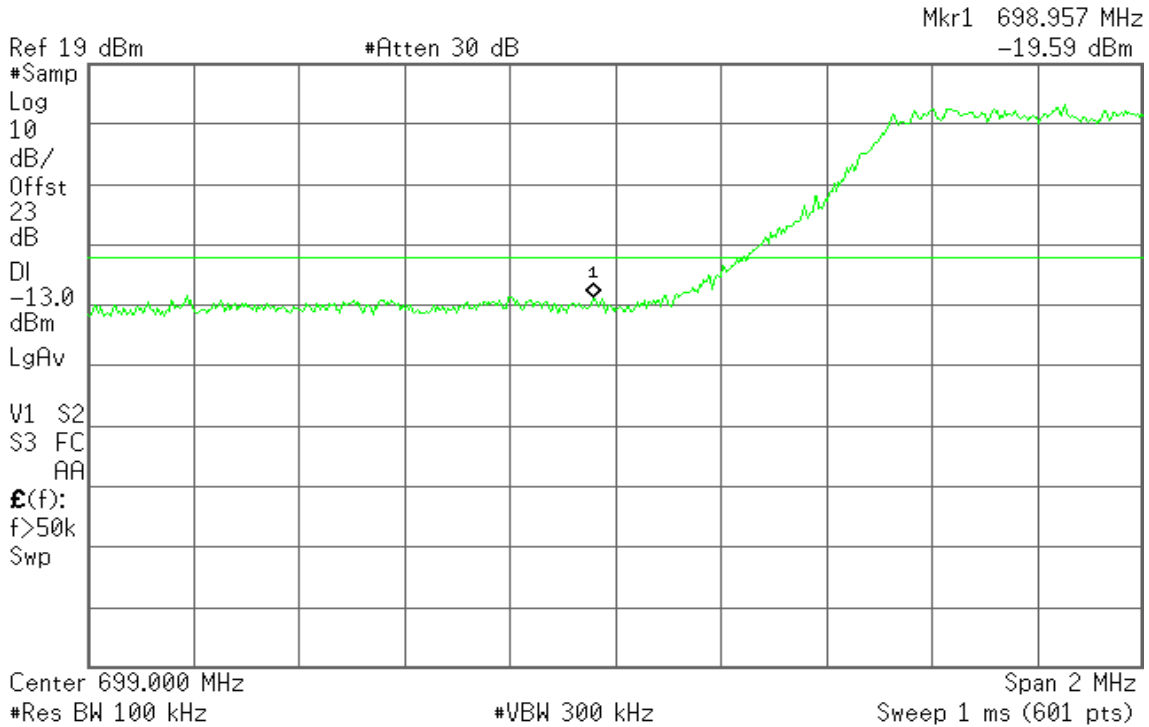
LTE Band 12

CHANNEL BANDWIDTH: 10MHz / QPSK / FULL RB ALLOCATED

LOWER BAND EDGE

Agilent 22:44:31 Jul 29, 2013

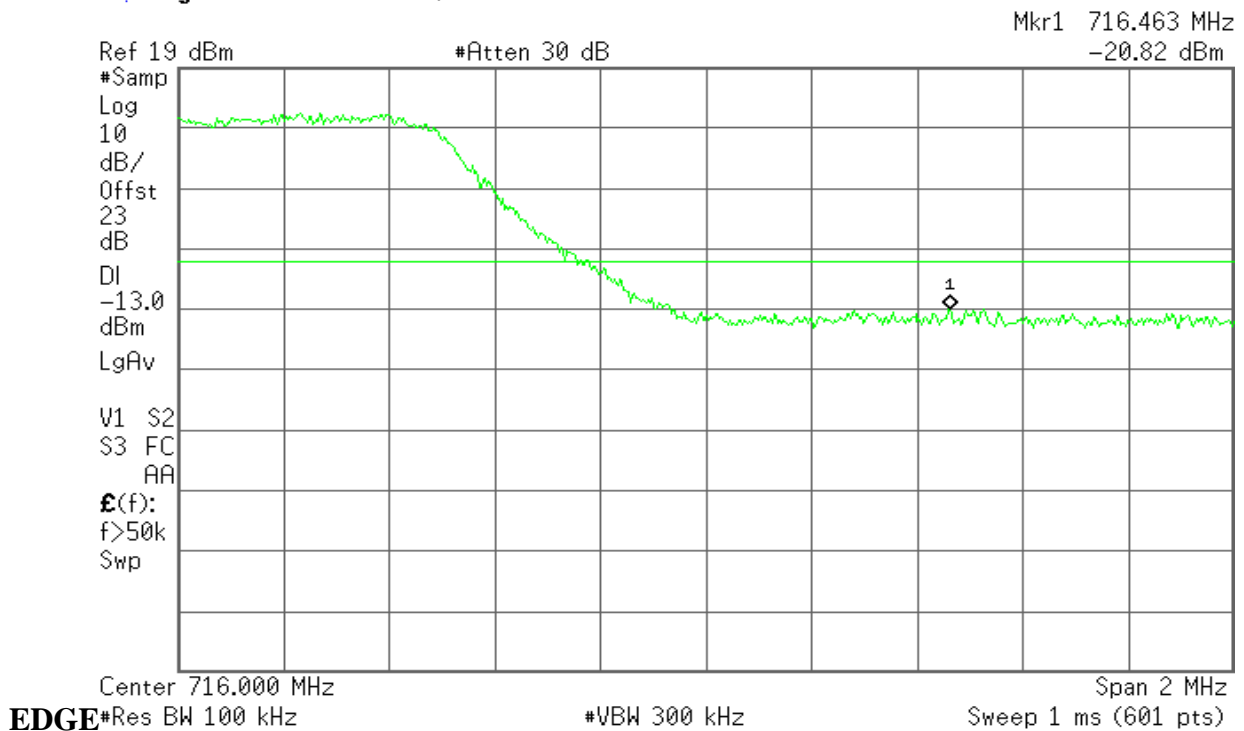
R T



HIGHER BAND

Agilent 22:48:12 Jul 29, 2013

R T



EDGE



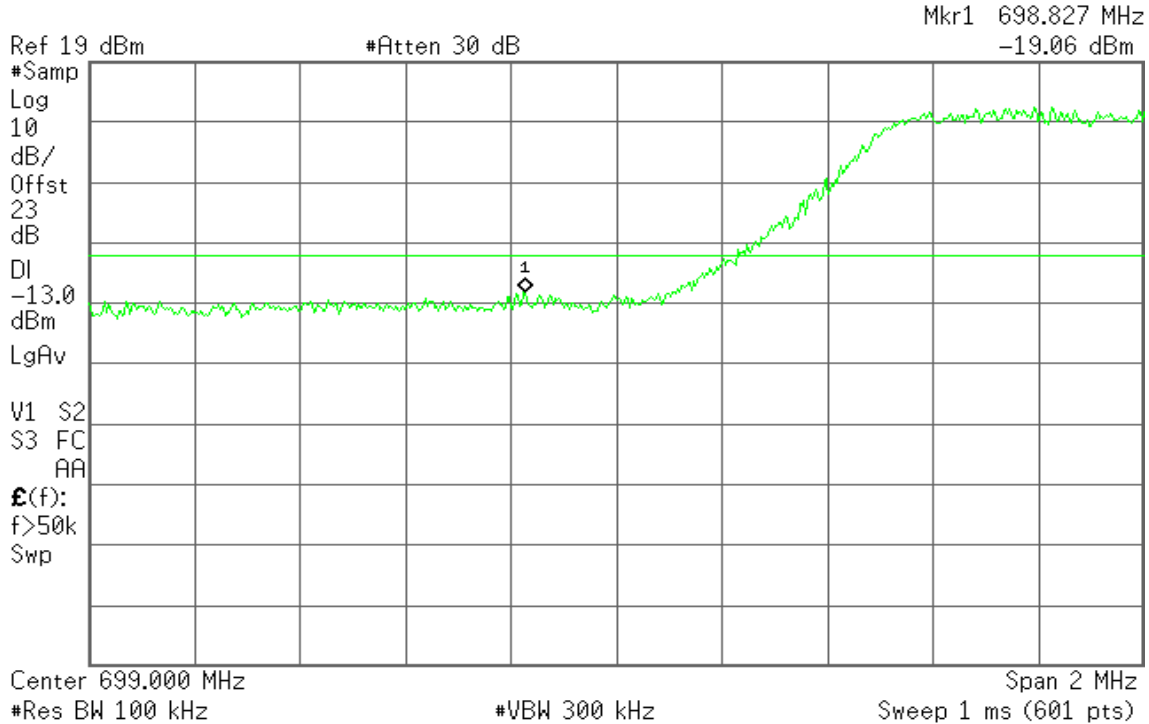
LTE Band 12

CHANNEL BANDWIDTH: 10MHz / 16QAM / FULL RB ALLOCATED

LOWER BAND EDGE

Agilent 22:45:32 Jul 29, 2013

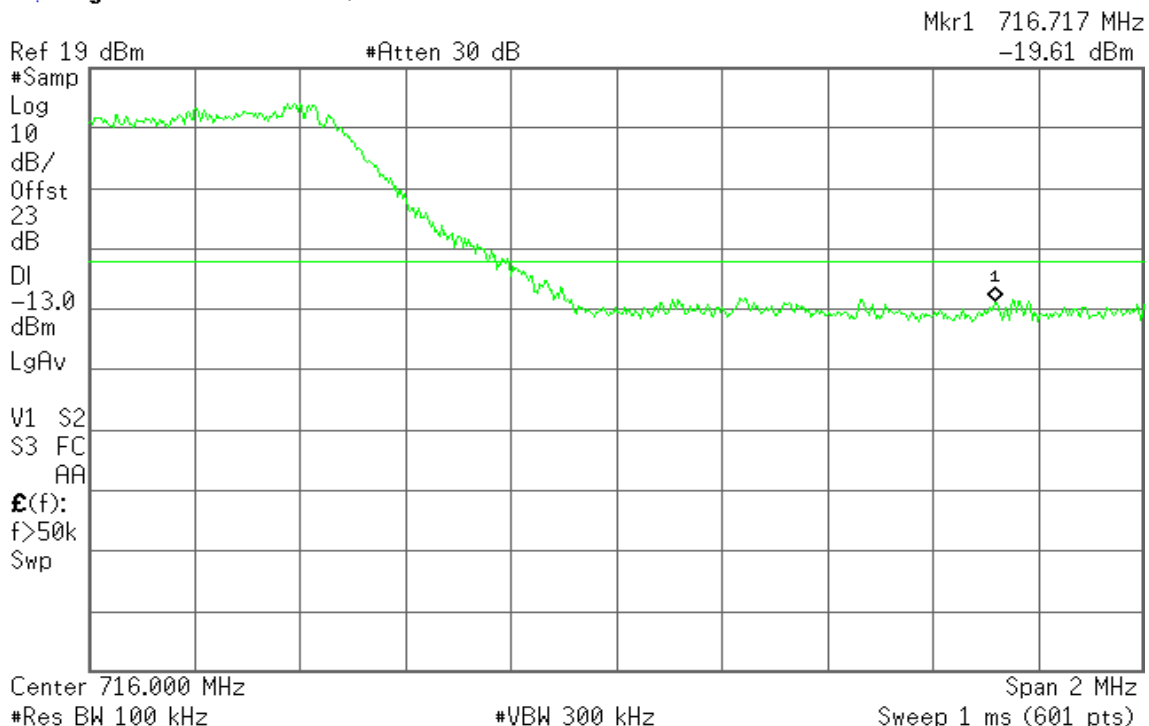
R T



HIGHER BAND EDGE

Agilent 22:47:25 Jul 29, 2013

R T





7.5 CONDUCTED SPURIOUS EMISSIONS

LIMITS

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB. The limit of emission equal to -13dBm

TEST PROCEDURES

1. The EUT was set up for the maximum peak power with LTE link data modulation. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels (low, middle and high operational frequency range.).
2. The conducted spurious emission used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
3. When the spectrum scanned from 30MHz to 3GHz, it shall be connected to the band reject filter attenuated the carried frequency. The spectrum set RB=1MHz, VB=3MHz.
4. When the spectrum scanned from 3GHz to 20GHz, it shall be connected to the high pass filter attenuated the carried frequency. The spectrum set RB=1MHz, VB=3MHz.



TEST RESULTS

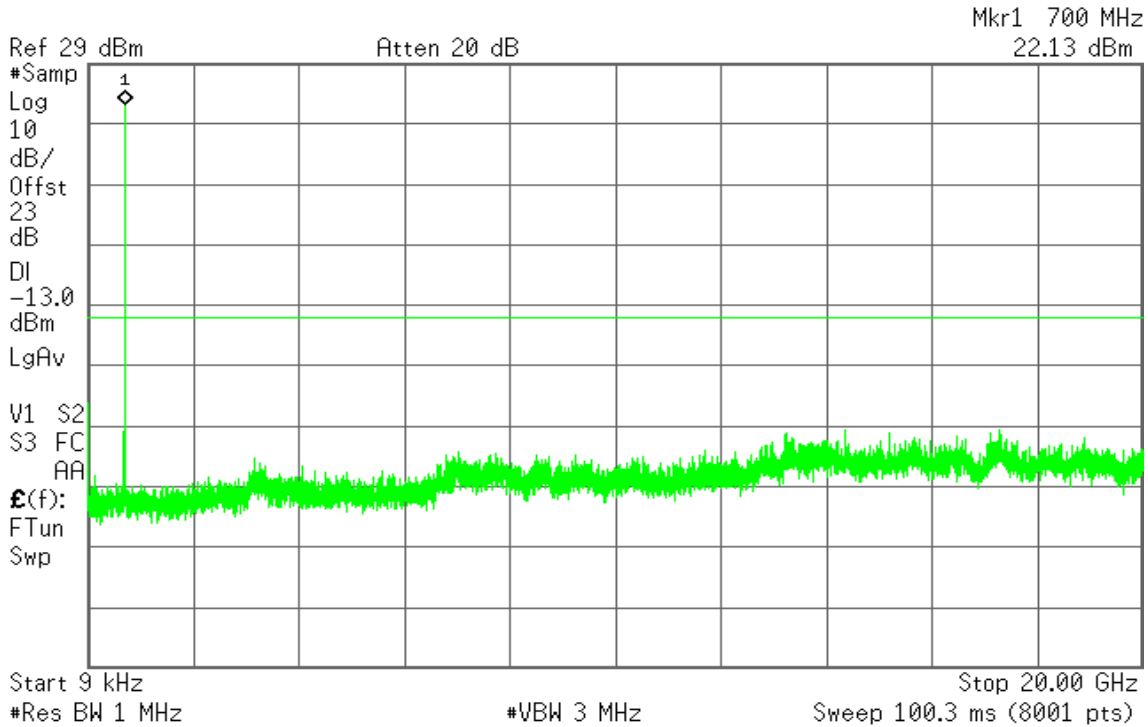
LTE Band 12

CHANNEL BANDWIDTH: 5MHz / QPSK

CH Low

Agilent 23:02:31 Jul 29, 2013

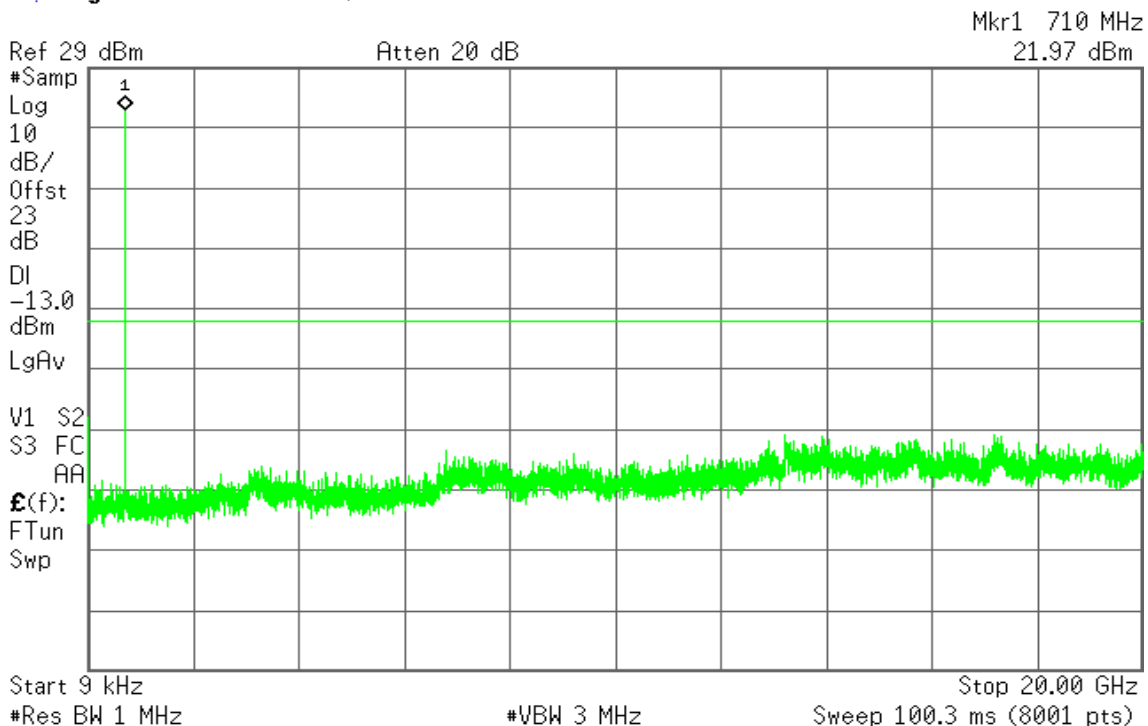
R T



CH Mid

Agilent 23:14:04 Jul 29, 2013

R T



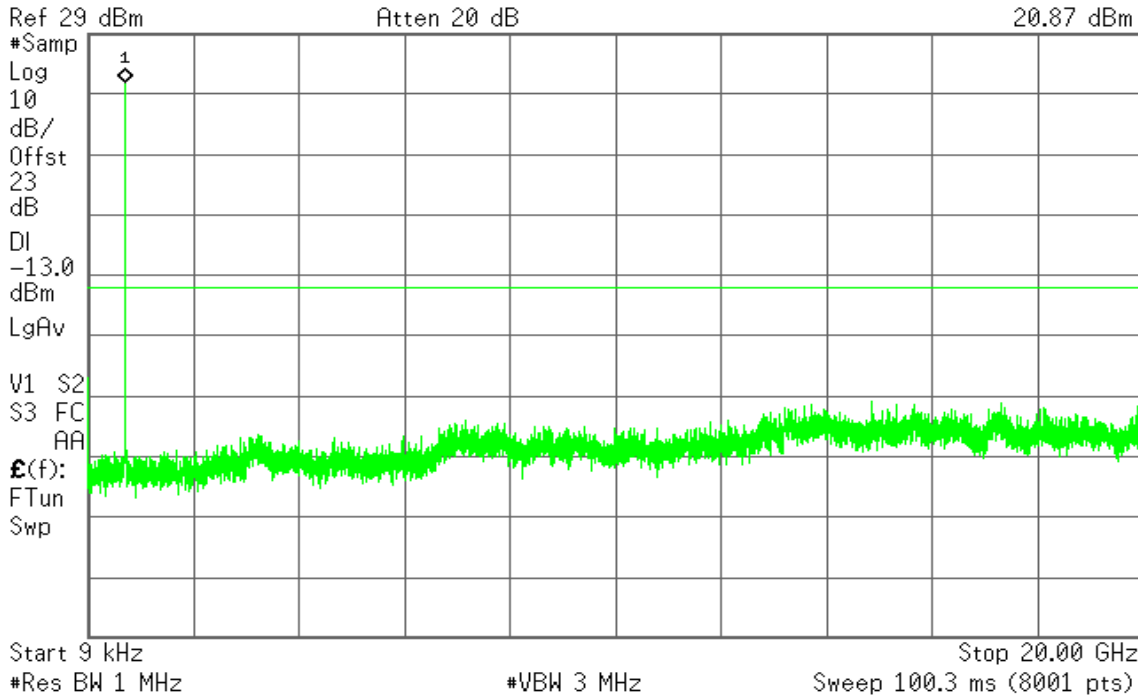


CH High

Agilent 23:15:39 Jul 29, 2013

R T

Mkr1 710 MHz
20.87 dBm



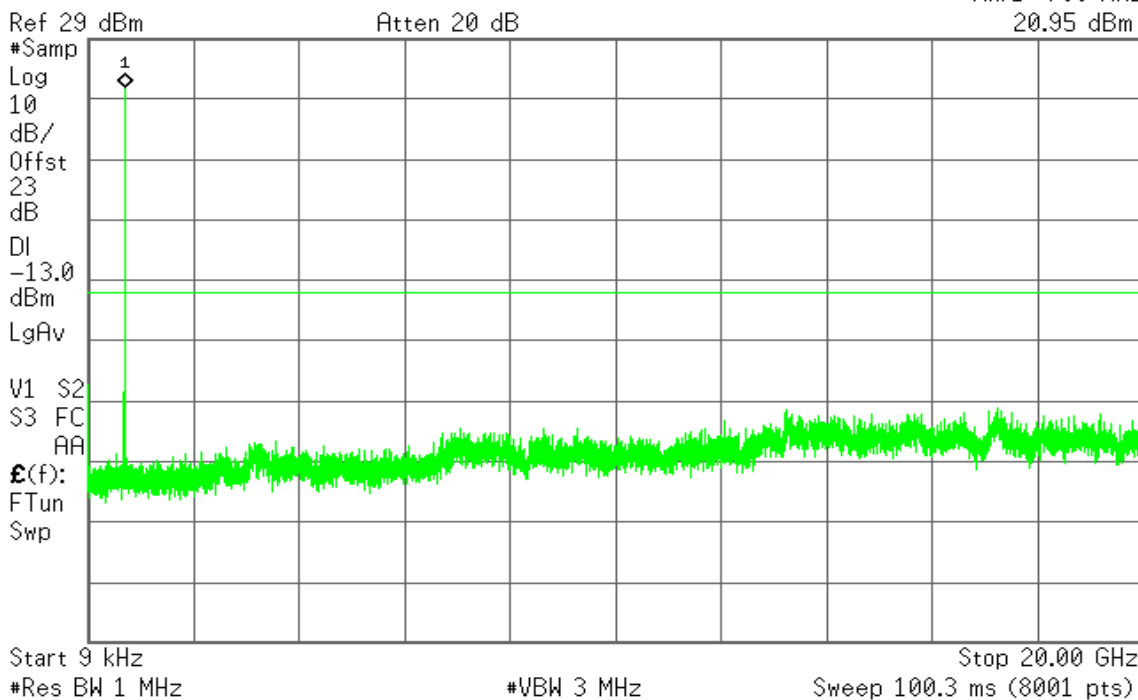
CHANNEL BANDWIDTH: 5MHz / 16QAM

CH Low

Agilent 23:04:31 Jul 29, 2013

R T

Mkr1 700 MHz
20.95 dBm



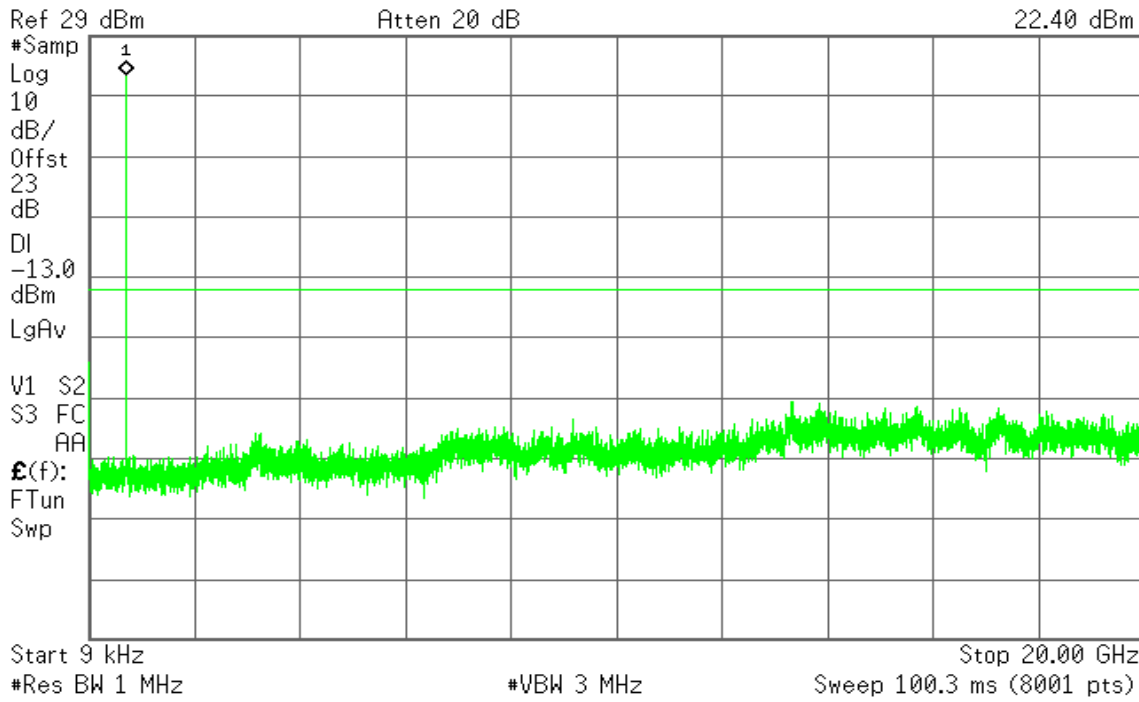


CH Mid

Agilent 23:11:17 Jul 29, 2013

R T

Mkr1 710 MHz
22.40 dBm

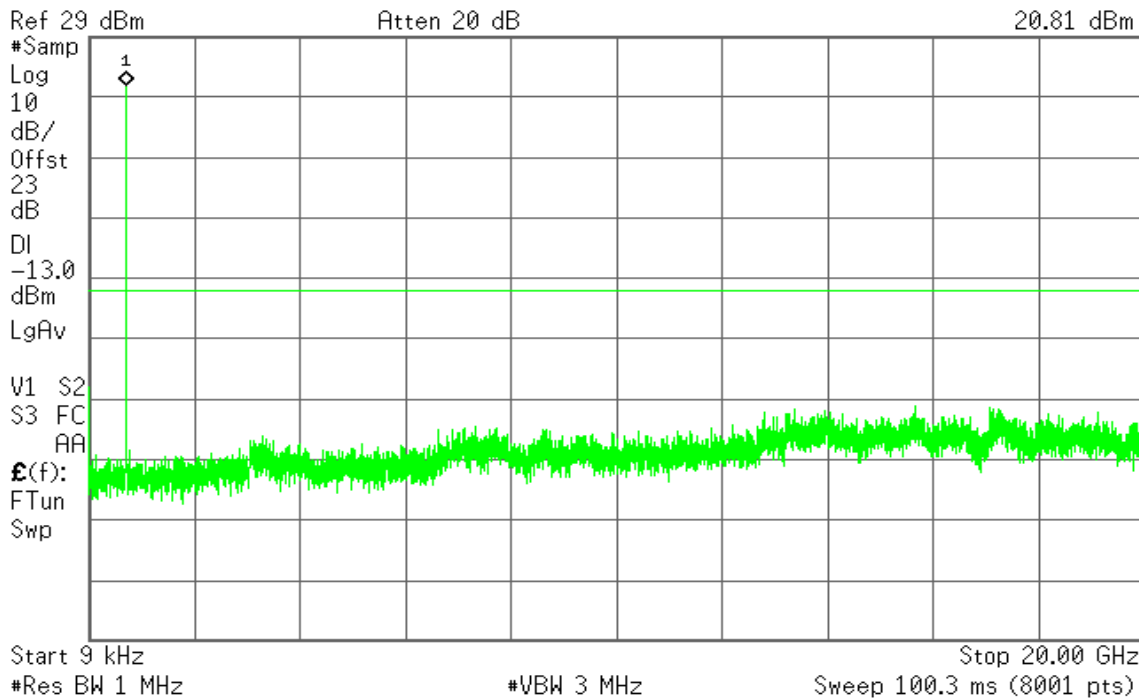


CH High

Agilent 23:16:52 Jul 29, 2013

R T

Mkr1 710 MHz
20.81 dBm





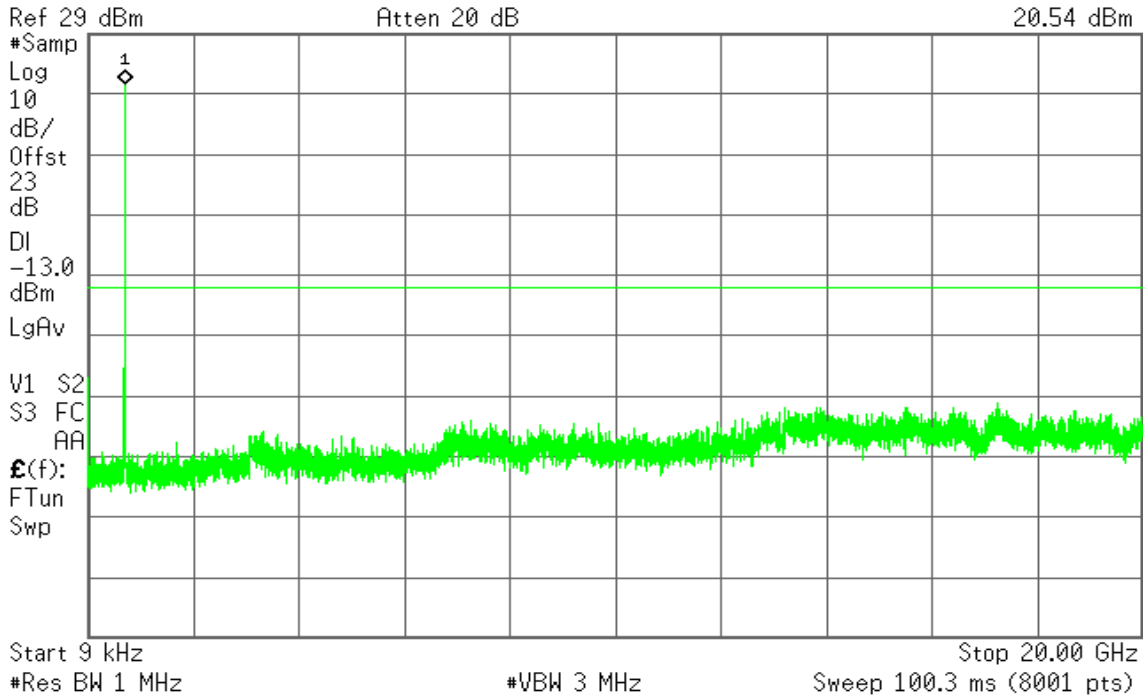
CHANNEL BANDWIDTH: 10MHz / QPSK

CH Low

Agilent 22:58:55 Jul 29, 2013

R T

Mkr1 710 MHz
20.54 dBm

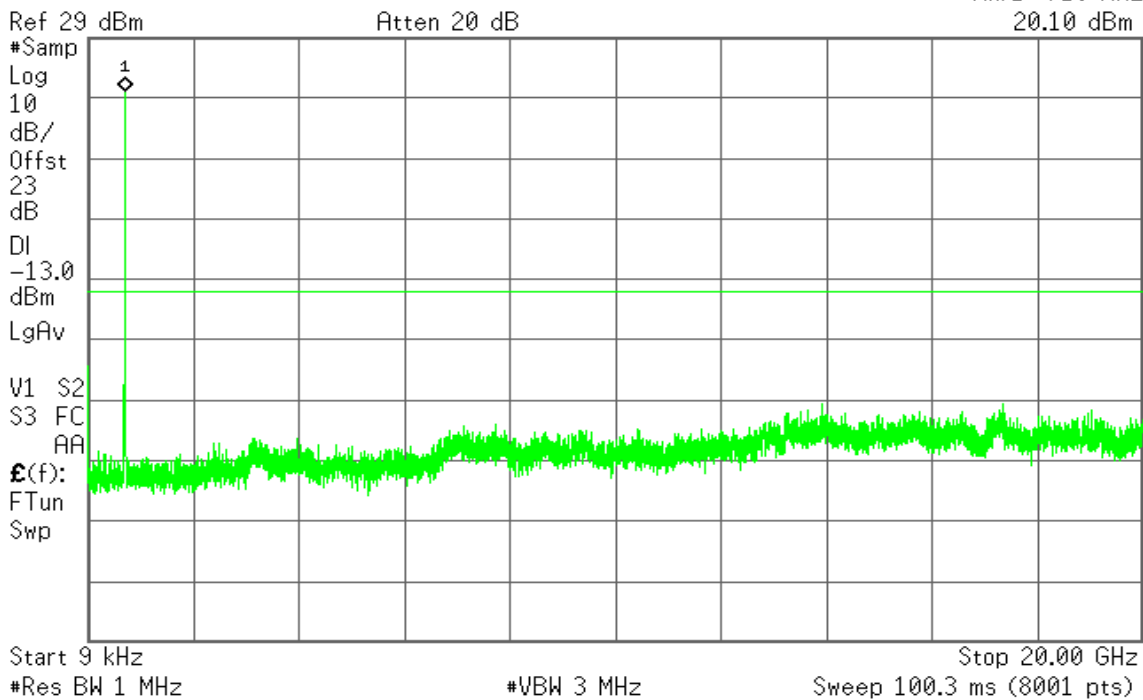


CH Mid

Agilent 22:58:13 Jul 29, 2013

R T

Mkr1 710 MHz
20.10 dBm



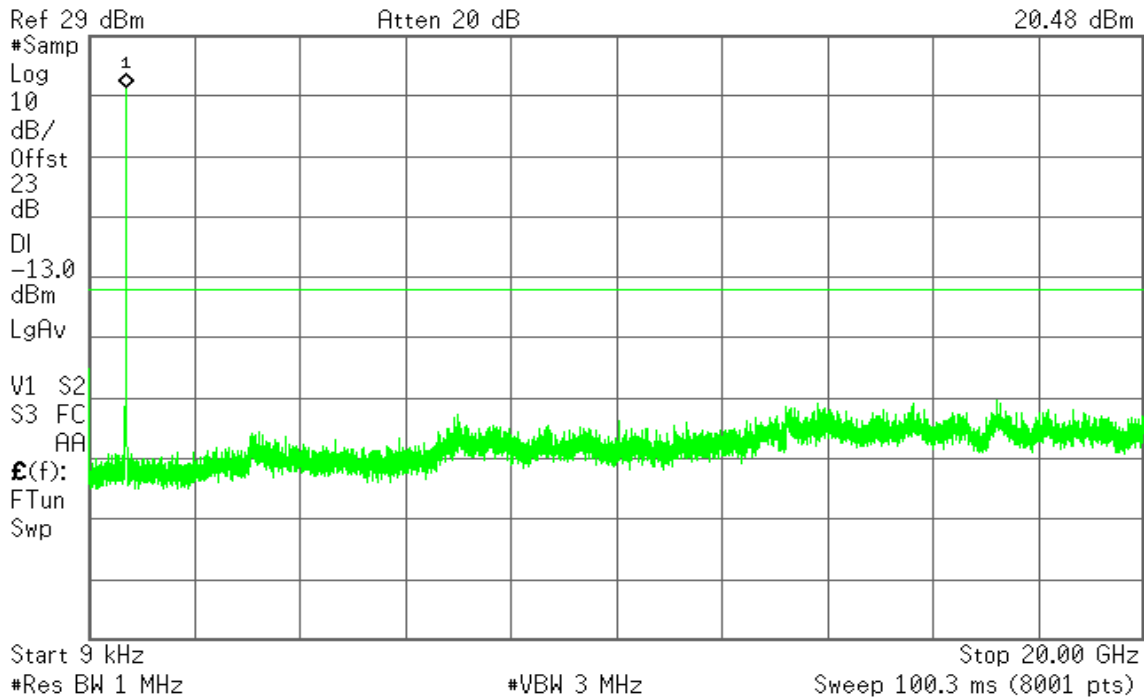


CH High

Agilent 22:55:29 Jul 29, 2013

R T

Mkr1 710 MHz
20.48 dBm



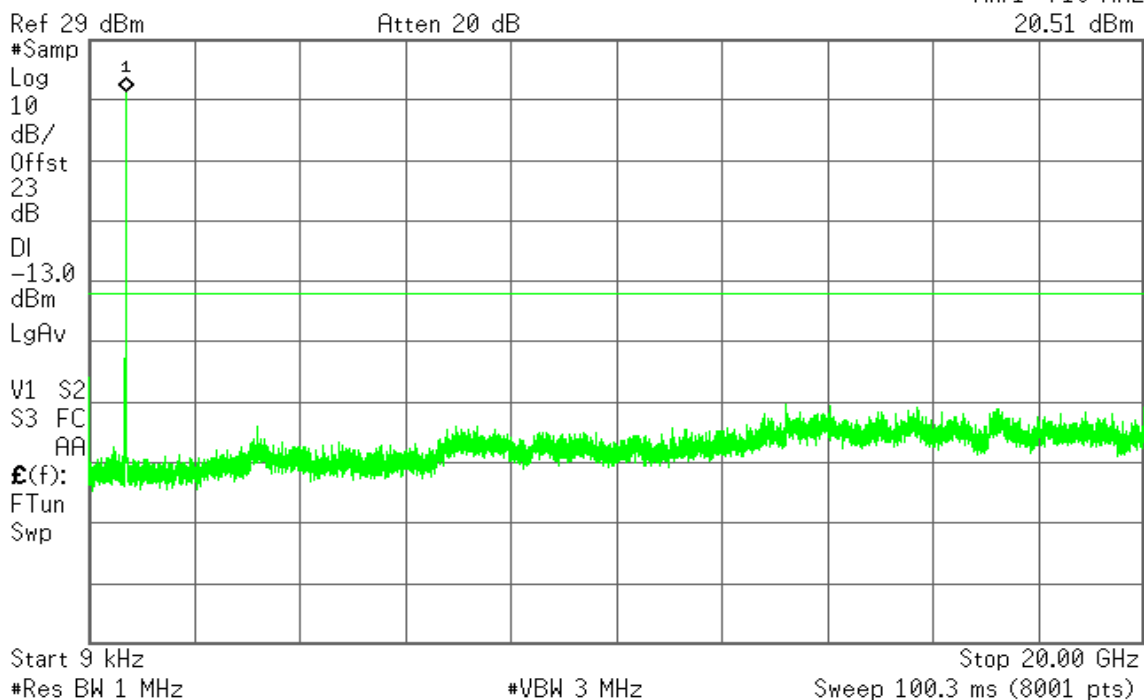
CHANNEL BANDWIDTH: 10MHz / 16QAM

CH Low

Agilent 23:00:17 Jul 29, 2013

R T

Mkr1 710 MHz
20.51 dBm

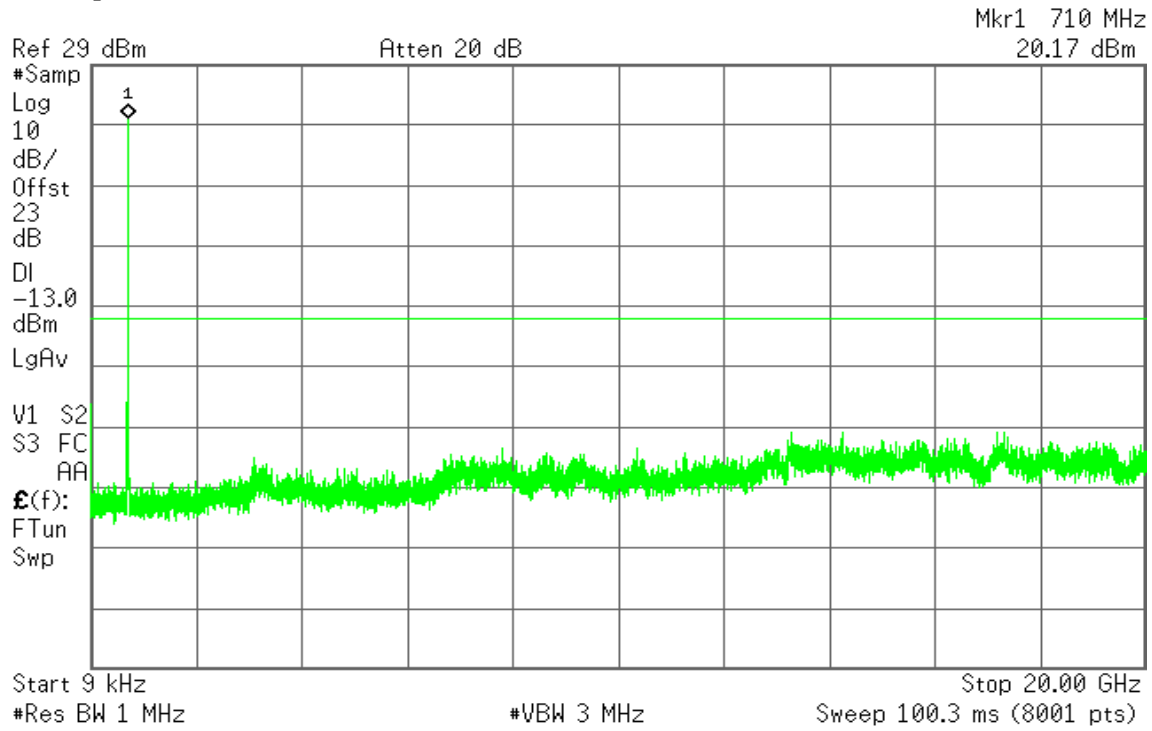




CH Mid

Agilent 22:57:24 Jul 29, 2013

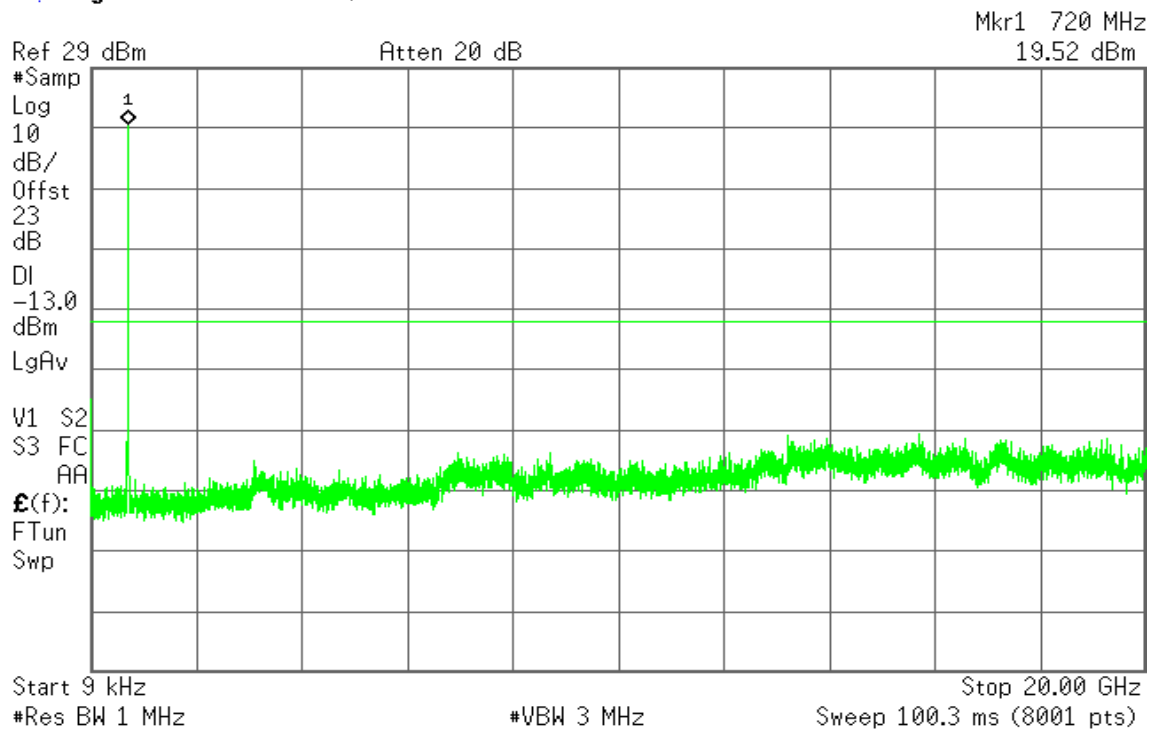
R T



CH High

Agilent 22:56:33 Jul 29, 2013

R T





7.6 RADIATED EMISSION MEASUREMENT

LIMITS

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB. The limit of emission equal to -13 dBm

So the limit of emission is the same absolute specified line.

Limits	EQUIVALENT FIELD STRENGTH AT 3m (dBuV/m) (NOTE)
-13	82.22

NOTE: The following formula is used to convert the equipment radiated power to field strength.

$$E = [1000000\sqrt{(30P)}] / 3 \text{ uV/m, where P is Watts}$$

TEST PROCEDURES

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the receiving antenna, which was mounted on antenna tower and its position at 0.8 m above the ground.
3. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading and recorded the value.
4. Repeat step 1 ~ 3 for horizontal polarization.

NOTE: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.



TEST RESULTS

Below 1GHz

LTE Band 12 / CHANNEL BANDWIDTH: 5MHz / QPSK

Operation Mode: Tx / Low channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
99.8400	-59.7	1.15	-0.37	-61.22	-13.00	-48.22	V
232.7300	-66.17	1.8	5.39	-62.58	-13.00	-49.58	V
299.6600	-63.81	2.09	5.59	-60.31	-13.00	-47.31	V
366.5900	-71.45	2.29	5.77	-67.97	-13.00	-54.97	V
431.5800	-74.98	2.5	5.81	-71.67	-13.00	-58.67	V
624.6100	-70.68	2.96	6.15	-67.49	-13.00	-54.49	V
99.8400	-53.93	1.15	-0.37	-55.45	-13.00	-42.45	H
199.7500	-57.91	1.63	2.94	-56.60	-13.00	-43.60	H
299.6600	-60.12	2.09	5.59	-56.62	-13.00	-43.62	H
366.5900	-67.04	2.29	5.77	-63.56	-13.00	-50.56	H
450.9800	-66.49	2.59	5.74	-63.34	-13.00	-50.34	H
624.6100	-64.39	2.96	6.15	-61.20	-13.00	-48.20	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / Middle channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
99.8400	-59.9	1.15	-0.37	-61.42	-13.00	-48.42	V
232.7300	-65.97	1.8	5.39	-62.38	-13.00	-49.38	V
299.6600	-64.12	2.09	5.59	-60.62	-13.00	-47.62	V
364.6500	-72.34	2.28	5.75	-68.87	-13.00	-55.87	V
500.4500	-76.79	2.7	5.9	-73.59	-13.00	-60.59	V
624.6100	-70.62	2.96	6.15	-67.43	-13.00	-54.43	V
99.8400	-53.83	1.15	-0.37	-55.35	-13.00	-42.35	H
232.7300	-59.98	1.8	5.39	-56.39	-13.00	-43.39	H
299.6600	-60.31	2.09	5.59	-56.81	-13.00	-43.81	H
364.6500	-66.66	2.28	5.75	-63.19	-13.00	-50.19	H
500.4500	-73.39	2.7	5.9	-70.19	-13.00	-57.19	H
624.6100	-64.42	2.96	6.15	-61.23	-13.00	-48.23	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / High channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
99.8400	-59.89	1.15	-0.37	-61.41	-13.00	-48.41	V
232.7300	-65.97	1.8	5.39	-62.38	-13.00	-49.38	V
299.6600	-64.26	2.09	5.59	-60.76	-13.00	-47.76	V
431.5800	-74.4	2.5	5.81	-71.09	-13.00	-58.09	V
599.3900	-71.59	2.9	6.39	-68.10	-13.00	-55.10	V
624.6100	-70.49	2.96	6.15	-67.30	-13.00	-54.30	V
99.8400	-53.87	1.15	-0.37	-55.39	-13.00	-42.39	H
232.7300	-60.65	1.8	5.39	-57.06	-13.00	-44.06	H
298.6900	-59.98	2.09	5.57	-56.50	-13.00	-43.50	H
366.5900	-67.05	2.29	5.77	-63.57	-13.00	-50.57	H
481.0500	-70.48	2.64	5.52	-67.60	-13.00	-54.60	H
624.6100	-64.47	2.96	6.15	-61.28	-13.00	-48.28	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*



LTE Band 12 / CHANNEL BANDWIDTH: 5MHz / 16QAM

Operation Mode: Tx / Low channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
99.8400	-59.81	1.15	-0.37	-61.33	-13.00	-48.33	V
166.7700	-66.47	1.54	2.15	-65.86	-13.00	-52.86	V
232.7300	-65.9	1.8	5.39	-62.31	-13.00	-49.31	V
299.6600	-63.96	2.09	5.59	-60.46	-13.00	-47.46	V
431.5800	-75.12	2.5	5.81	-71.81	-13.00	-58.81	V
624.6100	-70.63	2.96	6.15	-67.44	-13.00	-54.44	V
99.8400	-54.19	1.15	-0.37	-55.71	-13.00	-42.71	H
232.7300	-60.15	1.8	5.39	-56.56	-13.00	-43.56	H
298.6900	-59.68	2.09	5.57	-56.20	-13.00	-43.20	H
364.6500	-66.93	2.28	5.75	-63.46	-13.00	-50.46	H
431.5800	-71.92	2.5	5.81	-68.61	-13.00	-55.61	H
624.6100	-64.1	2.96	6.15	-60.91	-13.00	-47.91	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / Middle channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
99.8400	-59.8	1.15	-0.37	-61.32	-13.00	-48.32	V
232.7300	-66.54	1.8	5.39	-62.95	-13.00	-49.95	V
298.6900	-64.04	2.09	5.57	-60.56	-13.00	-47.56	V
366.5900	-72.11	2.29	5.77	-68.63	-13.00	-55.63	V
481.0500	-76.75	2.64	5.52	-73.87	-13.00	-60.87	V
624.6100	-70.35	2.96	6.15	-67.16	-13.00	-54.16	V
99.8400	-53.97	1.15	-0.37	-55.49	-13.00	-42.49	H
232.7300	-60.44	1.8	5.39	-56.85	-13.00	-43.85	H
299.6600	-59.94	2.09	5.59	-56.44	-13.00	-43.44	H
366.5900	-66.29	2.29	5.77	-62.81	-13.00	-49.81	H
466.5000	-67.99	2.61	5.82	-64.78	-13.00	-51.78	H
624.6100	-63.83	2.96	6.15	-60.64	-13.00	-47.64	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “ N/A ” remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / High channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
99.8400	-60.07	1.15	-0.37	-61.59	-13.00	-48.59	V
232.7300	-66.4	1.8	5.39	-62.81	-13.00	-49.81	V
299.6600	-63.8	2.09	5.59	-60.30	-13.00	-47.30	V
366.5900	-72.19	2.29	5.77	-68.71	-13.00	-55.71	V
431.5800	-75.11	2.5	5.81	-71.80	-13.00	-58.80	V
624.6100	-70.38	2.96	6.15	-67.19	-13.00	-54.19	V
99.8400	-54.25	1.15	-0.37	-55.77	-13.00	-42.77	H
232.7300	-60.28	1.8	5.39	-56.69	-13.00	-43.69	H
298.6900	-59.47	2.09	5.57	-55.99	-13.00	-42.99	H
432.5500	-72.31	2.5	5.82	-68.99	-13.00	-55.99	H
500.4500	-72.9	2.7	5.9	-69.70	-13.00	-56.70	H
624.6100	-64.22	2.96	6.15	-61.03	-13.00	-48.03	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*



LTE Band 12 / CHANNEL BANDWIDTH: 10MHz / QPSK

Operation Mode: Tx / Low channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
99.8400	-59.14	1.15	-0.37	-60.66	-13.00	-47.66	V
232.7300	-65.6	1.8	5.39	-62.01	-13.00	-49.01	V
299.6600	-63.51	2.09	5.59	-60.01	-13.00	-47.01	V
366.5900	-71.23	2.29	5.77	-67.75	-13.00	-54.75	V
431.5800	-73.69	2.5	5.81	-70.38	-13.00	-57.38	V
624.6100	-70.44	2.96	6.15	-67.25	-13.00	-54.25	V
199.7500	-60.19	1.63	2.94	-58.88	-13.00	-45.88	H
232.7300	-58.78	1.8	5.39	-55.19	-13.00	-42.19	H
299.6600	-59.47	2.09	5.59	-55.97	-13.00	-42.97	H
366.5900	-65.92	2.29	5.77	-62.44	-13.00	-49.44	H
500.4500	-73.84	2.7	5.9	-70.64	-13.00	-57.64	H
624.6100	-63.9	2.96	6.15	-60.71	-13.00	-47.71	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / Middle channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
232.7300	-64.98	1.8	5.39	-61.39	-13.00	-48.39	V
298.6900	-63.26	2.09	5.57	-59.78	-13.00	-46.78	V
366.5900	-71.01	2.29	5.77	-67.53	-13.00	-54.53	V
431.5800	-72.93	2.5	5.81	-69.62	-13.00	-56.62	V
624.6100	-69.06	2.96	6.15	-65.87	-13.00	-52.87	V
709.9700	-67.78	3.14	6.32	-64.60	-13.00	-51.60	V
99.8400	-53.95	1.15	-0.37	-55.47	-13.00	-42.47	H
232.7300	-59.77	1.8	5.39	-56.18	-13.00	-43.18	H
299.6600	-59.13	2.09	5.59	-55.63	-13.00	-42.63	H
366.5900	-66.19	2.29	5.77	-62.71	-13.00	-49.71	H
431.5800	-71.44	2.5	5.81	-68.13	-13.00	-55.13	H
624.6100	-64.14	2.96	6.15	-60.95	-13.00	-47.95	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / High channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
99.8400	-59.55	1.15	-0.37	-61.07	-13.00	-48.07	V
165.8000	-64.43	1.53	2.05	-63.91	-13.00	-50.91	V
232.7300	-65.9	1.8	5.39	-62.31	-13.00	-49.31	V
298.6900	-63.56	2.09	5.57	-60.08	-13.00	-47.08	V
364.6500	-71.02	2.28	5.75	-67.55	-13.00	-54.55	V
624.6100	-69.62	2.96	6.15	-66.43	-13.00	-53.43	V
99.8400	-53.61	1.15	-0.37	-55.13	-13.00	-42.13	H
198.7800	-58.25	1.63	3.05	-56.83	-13.00	-43.83	H
232.7300	-59.92	1.8	5.39	-56.33	-13.00	-43.33	H
299.6600	-59.23	2.09	5.59	-55.73	-13.00	-42.73	H
366.5900	-65.51	2.29	5.77	-62.03	-13.00	-49.03	H
624.6100	-63.77	2.96	6.15	-60.58	-13.00	-47.58	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.*



LTE Band 12 / CHANNEL BANDWIDTH: 10MHz / 16QAM

Operation Mode: Tx / Low channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
99.8400	-59.92	1.15	-0.37	-61.44	-13.00	-48.44	V
232.7300	-66.41	1.8	5.39	-62.82	-13.00	-49.82	V
298.6900	-63.98	2.09	5.57	-60.50	-13.00	-47.50	V
431.5800	-74.57	2.5	5.81	-71.26	-13.00	-58.26	V
500.4500	-77.39	2.7	5.9	-74.19	-13.00	-61.19	V
624.6100	-70.15	2.96	6.15	-66.96	-13.00	-53.96	V
99.8400	-54.31	1.15	-0.37	-55.83	-13.00	-42.83	H
232.7300	-60.31	1.8	5.39	-56.72	-13.00	-43.72	H
298.6900	-59.72	2.09	5.57	-56.24	-13.00	-43.24	H
366.5900	-65.99	2.29	5.77	-62.51	-13.00	-49.51	H
431.5800	-72.02	2.5	5.81	-68.71	-13.00	-55.71	H
624.6100	-63.92	2.96	6.15	-60.73	-13.00	-47.73	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / Middle channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
99.8400	-60.02	1.15	-0.37	-61.54	-13.00	-48.54	V
232.7300	-66.37	1.8	5.39	-62.78	-13.00	-49.78	V
299.6600	-64.22	2.09	5.59	-60.72	-13.00	-47.72	V
366.5900	-71.59	2.29	5.77	-68.11	-13.00	-55.11	V
432.5500	-74.87	2.5	5.82	-71.55	-13.00	-58.55	V
624.6100	-70.6	2.96	6.15	-67.41	-13.00	-54.41	V
99.8400	-54.01	1.15	-0.37	-55.53	-13.00	-42.53	H
232.7300	-59.21	1.8	5.39	-55.62	-13.00	-42.62	H
298.6900	-60.07	2.09	5.57	-56.59	-13.00	-43.59	H
366.5900	-66.24	2.29	5.77	-62.76	-13.00	-49.76	H
500.4500	-73.4	2.7	5.9	-70.20	-13.00	-57.20	H
624.6100	-64.3	2.96	6.15	-61.11	-13.00	-48.11	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “ N/A ” remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / High channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
99.8400	-59.62	1.15	-0.37	-61.14	-13.00	-48.14	V
232.7300	-66.47	1.8	5.39	-62.88	-13.00	-49.88	V
299.6600	-63.94	2.09	5.59	-60.44	-13.00	-47.44	V
432.5500	-74.91	2.5	5.82	-71.59	-13.00	-58.59	V
481.0500	-74.7	2.64	5.52	-71.82	-13.00	-58.82	V
624.6100	-70.39	2.96	6.15	-67.20	-13.00	-54.20	V
99.8400	-54.28	1.15	-0.37	-55.80	-13.00	-42.80	H
198.7800	-59	1.63	3.05	-57.58	-13.00	-44.58	H
232.7300	-59.67	1.8	5.39	-56.08	-13.00	-43.08	H
299.6600	-59.53	2.09	5.59	-56.03	-13.00	-43.03	H
364.6500	-66.77	2.28	5.75	-63.30	-13.00	-50.30	H
624.6100	-64.39	2.96	6.15	-61.20	-13.00	-48.20	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Above 1GHz

LTE Band 12 / CHANNEL BANDWIDTH: 5MHz / QPSK

Operation Mode: Tx / Low channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
2995.000	-56.81	7.02	7.39	-56.44	-13.00	-43.44	V
3912.000	-55.2	8.39	9.31	-54.28	-13.00	-41.28	V
N/A							
3940.000	-55.12	8.37	9.34	-54.15	-13.00	-41.15	H
5025.000	-54.6	9.42	10.61	-53.41	-13.00	-40.41	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “ N/A ” remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / Middle channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
2834.000	-57.13	6.93	6.97	-57.09	-13.00	-44.09	V
4325.000	-55.41	8.61	9.66	-54.36	-13.00	-41.36	V
N/A							
3884.000	-55.81	8.37	9.28	-54.90	-13.00	-41.90	H
4290.000	-54.84	8.59	9.63	-53.80	-13.00	-40.80	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “ N/A ” remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / High channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
2988.000	-56.74	7.03	7.37	-56.40	-13.00	-43.40	V
4906.000	-55.16	9.27	10.45	-53.98	-13.00	-40.98	V
N/A							
3058.000	-56.41	7.1	7.57	-55.94	-13.00	-42.94	H
4171.000	-54.03	8.48	9.54	-52.97	-13.00	-39.97	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.*



LTE Band 12 / CHANNEL BANDWIDTH: 5MHz / 16QAM

Operation Mode: Tx / Low channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
2519.000	-56.81	6.38	6.15	-57.04	-13.00	-44.04	V
4318.000	-54.56	8.61	9.65	-53.52	-13.00	-40.52	V
N/A							
4402.000	-54.47	8.65	9.72	-53.40	-13.00	-40.40	H
4556.000	-54.18	9.03	9.89	-53.32	-13.00	-40.32	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / Middle channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3884.000	-55.32	8.37	9.28	-54.41	-13.00	-41.41	V
6257.000	-51.27	10.95	11.11	-51.11	-13.00	-38.11	V
N/A							
3408.000	-57.58	7.59	8.62	-56.55	-13.00	-43.55	H
4283.000	-52.79	8.58	9.63	-51.74	-13.00	-38.74	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “ N/A ” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / High channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3156.000	-56.75	7.22	7.87	-56.10	-13.00	-43.10	V
4514.000	-54.76	8.94	9.82	-53.88	-13.00	-40.88	V
N/A							
5480.000	-53.6	9.92	10.79	-52.73	-13.00	-39.73	H
6292.000	-51.99	10.79	11.13	-51.65	-13.00	-38.65	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “ N/A ” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*



LTE Band 12 / CHANNEL BANDWIDTH: 10MHz/ QPSK

Operation Mode: Tx / Low channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1329.000	-52.26	4.55	5.07	-51.74	-13.00	-38.74	V
2652.000	-54.09	6.61	6.5	-54.20	-13.00	-41.20	V
N/A							
1308.000	-50.97	4.53	4.92	-50.58	-13.00	-37.58	H
4479.000	-52.23	8.85	9.78	-51.30	-13.00	-38.30	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / Middle channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
2652.000	-54.45	6.61	6.5	-54.56	-13.00	-41.56	V
4619.000	-54.01	9.13	9.99	-53.15	-13.00	-40.15	V
N/A							
3681.000	-55.18	8.18	9.08	-54.28	-13.00	-41.28	H
5109.000	-52.94	9.46	10.64	-51.76	-13.00	-38.76	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “ N/A ” remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / High channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1966.000	-51.76	5.63	5.46	-51.93	-13.00	-38.93	V
3107.000	-56.22	7.18	7.72	-55.68	-13.00	-42.68	V
N/A							
1210.000	-53.08	4.29	4.21	-53.16	-13.00	-40.16	H
6278.000	-49.27	10.85	11.12	-49.00	-13.00	-36.00	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.*



LTE Band 12 / CHANNEL BANDWIDTH: 10MHz/ 16QAM

Operation Mode: Tx / Low channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1994.000	-54.86	5.7	5.41	-55.15	-13.00	-42.15	V
5074.000	-54.55	9.44	10.63	-53.36	-13.00	-40.36	V
N/A							
4346.000	-54.33	8.62	9.68	-53.27	-13.00	-40.27	H
6285.000	-51.65	10.82	11.13	-51.34	-13.00	-38.34	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “ N/A ” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / Middle channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3786.000	-55.97	8.25	9.19	-55.03	-13.00	-42.03	V
5865.000	-54.16	10.41	10.87	-53.70	-13.00	-40.70	V
N/A							
5081.000	-53.78	9.44	10.63	-52.59	-13.00	-39.59	H
7020.000	-46.47	11.6	11.93	-46.14	-13.00	-33.14	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “ N/A ” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*



Operation Mode: Tx / High channel **Test Date:** July 26, 2013
Temperature: 25°C **Tested by:** David Shu
Humidity: 45% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
2659.000	-55.08	6.63	6.51	-55.20	-13.00	-42.20	V
3877.000	-55.03	8.36	9.28	-54.11	-13.00	-41.11	V
N/A							
2995.000	-56.11	7.02	7.39	-55.74	-13.00	-42.74	H
4535.000	-53.62	8.99	9.86	-52.75	-13.00	-39.75	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.*