CERTIFICATION TEST REPORT

Report Number. : 12150036-E1V3

Applicant	:	SEOWON INTECH 69, LS-RO 115BEON-GIL GUNPO-SI,GYEONGGI-DO, 15809 KOREA
FCC ID	:	V7MSLC-120T42OGA
ISED	:	23728-S120T42OGA
Model	:	SLC-120T42OGA
EUT Description	:	LTE NETWORK OUTDOOR CPE
Test Standard(s)	:	FCC CFR47 PART 90 INDUSTRY CANADA RSS-197 ISSUE 1

Date Of Issue:
JULY 05, 2018

Prepared by:
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NVLAP TESTING
NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	5/29/18	Initial Issue	--
V2	6/12/18	Updated sections 5.2, 5.3, and 9.2	Steven Tran
V3	7/05/18	Updated section 5.2, 9.2, 9.2.1 and frequency range	Dan Coronia

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1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	SEOWON INTECH 69, LS-RO 115BEON-GIL GUNPO-SI, GYEONGGI-DO, KOREA 15809
FCC ID	V7MSLC-120T42OGA
ISED	23728-S120T42OGA
Model	SLC-120T42OGA
EUT Description	LTE NETWORK OUTDOOR CPE
Serial Number	KRSD182010448-00048, KRSD1733910448-00037
Date Tested	JUNE 20, 2018 to JULY 05, 2018
Applicable Standards	FCC CFR47 PART 90 and INDUSTRY CANADA RSS-197
Test Results	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released For
UL Verification Services Inc. By:

Dan Coronia
Operations Leader
UL Verification Services Inc.

Reviewed By:

Kiya Kedida
Project Engineer
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.26:2015, TIA-603-E, FCC CFR 47 Part 90, FCC KDB 971168 D01 v03 and RSS-197.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
☐ Chamber A (ISED:2324B-1)	☐ Chamber D (ISED:22541-1)
☒ Chamber B (ISED:2324B-2)	☐ Chamber E (ISED:22541-2)
☐ Chamber C (ISED:2324B-3)	☐ Chamber F (ISED:22541-3)
	☐ Chamber G (ISED:22541-4)
	☐ Chamber H (ISED:22541-5)

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.24 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT is LTE Network Outdoor CPE.

5.2. MAXIMUM OUTPUT POWER

ERP/EIRP LIMIT

FCC: §2.1046, §90.1321, RSS197§5.6

EIRP/ERP TEST PROCEDURE

KDB 971168 Section 5.6

Base and fixed stations are limited to 25 watts/25MHz equivalent isotropically power (EIRP).

ERP/EIRP = PMeas + GT − LC
where: ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm);
PMeas = measured transmitter output power or PSD, in dBm or dBW;
GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);
LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.2

For devices utilizing multiple antennas, KDB 662911 provides guidance for determining the effective array transmit antenna gain term to be used in the above equation.

The transmitter has a maximum average conducted and ERP / EIRP output powers as follows:

LTE BAND 43

Part 90	
EIRP Limit (dBm)	44.00
Antenna Gain (dBi)	10.59

Bandwidth (MHz)	Frequency Range (MHz)	Modulation	Conducted Average (dBm)	EIRP Average		Margin (dB)
				dBm	mW	
5.0	3650-3700	QPSK	24.10	34.69	2944.42	-9.31
		16QAM	23.30	33.89	2449.06	-10.11
		64QAM	22.50	33.09	2037.04	-10.91
10.0		QPSK	24.50	35.09	3228.49	-8.91
		16QAM	23.90	34.49	2811.90	-9.51
		64QAM	22.90	**33.49**	**2233.57**	-10.51
15.0		QPSK	24.50	35.09	3228.49	-8.91
		16QAM	23.80	34.39	2747.89	-9.61
		64QAM	22.50	33.09	2037.04	-10.91
20.0		QPSK	24.70	**35.29**	**3380.65**	-8.71
		16QAM	24.00	**34.59**	**2877.40**	-9.41
		64QAM	22.90	**33.49**	**2233.57**	-10.51

5.3. MAXIMUM ANTENNA GAIN

Please see table below:

LTE Bands	Antenna Gain (dBi)
LTE Band 43, 3650 – 3700 MHz	10.59

5.4. WORST-CASE CONFIGURATION AND MODE

The EUT support LTE Band 43.

The worst-case scenario for all measurements is based on the average conducted output power measurement investigation results. Output power measurements were measured on QPSK, 16QAM, and 64QAM modulations. It was found that QPSK, and 16QAM results were worst case. All testing was performed using QPSK, and 16QAM modulations to represent the worst case.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y, & Z, and it was determined that Y-Axis with POE Power Adapter was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y-Axis with POE Power Adapter orientation.

5.5 DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List			
Description	**Manufacturer**	**Model**	**Serial Number**
POE Power Supply	ChungKwang Tech Inc.	PIF-4800045-1KMW	N/A

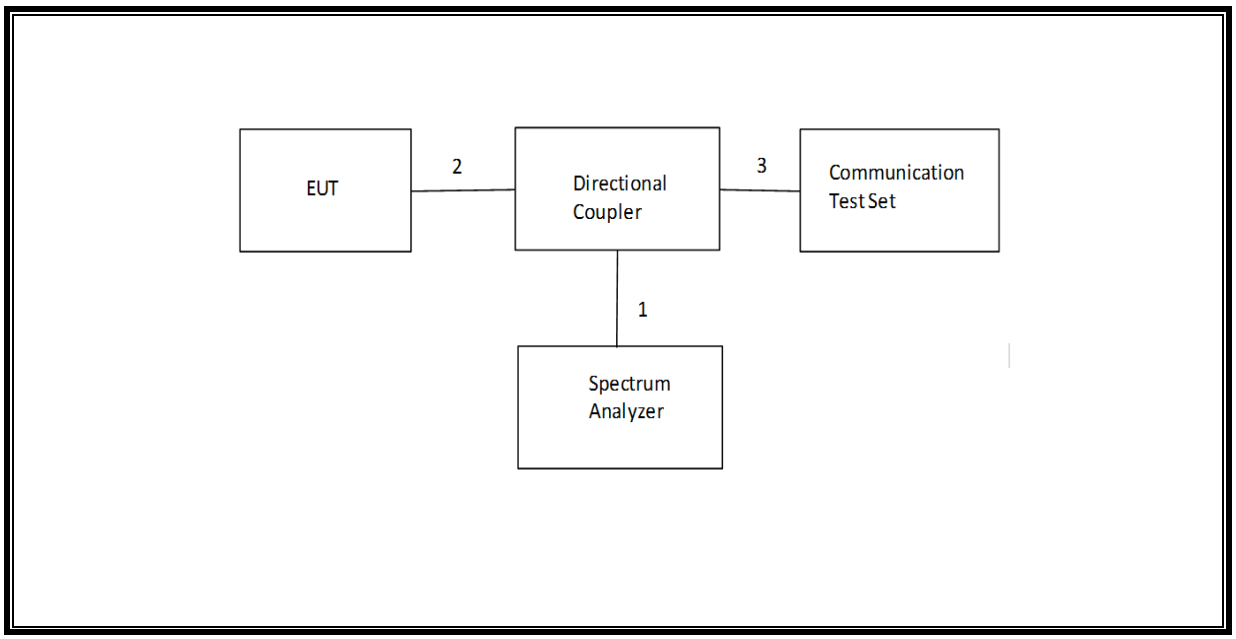
I/O CABLES (RF Conducted Test)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	RF Out	1	Spectrum Analyzer	Shielded	None	NA
2	Antenna Port	1	EUT	Shielded	0.1m	NA
3	RF In/Out	1	Communication Test Set	Shielded	1m	NA

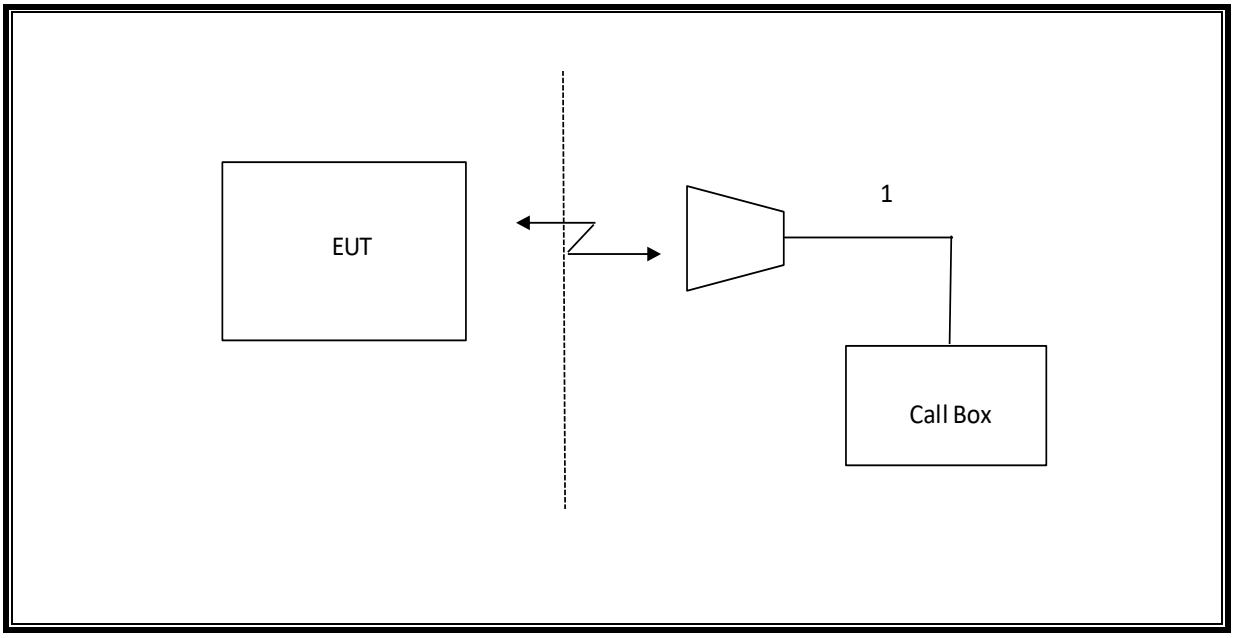
I/O CABLES (RF Radiated Test)

I/O Cable List						
Cable No	**Port**	**# of identi**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	RF In/out	1	Communication Test Set	Un-shielded	2m	No

CONDUCTED SETUP



RADIATED SETUP



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST					
Description	**Manufacturer**	**Model**	**ID Num**	**Cal Due**	**Last Cal**
High pass Filter, 6 GHz	MICRO-TRONICS	HPS17542	T483	12/16/18	12/16/17
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T862	05/24/2019	05/24/2018
RF Amplifier	MITEQ	AFS42-00101800-25-S-42	T493	12/16/2018	12/16/2017
Directional Coupler	Mini-Circuits	ZUDC10-183+	T1136	06/18/19	06/18/18
Wideband Communication Test Set, Call Box	R&S	CMW500	T919	03/28/19	03/28/18
Chamber, Environmental	Thermotron	SE-600-10-10	T80	02/22/19	02/22/18
Spectrum Analyzer	Agilent (Keysight) Technologies	E4446A	T146	07/18/2018	07/18/2017
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T1454	01/18/2019	01/18/2018

UL AUTOMATION SOFTWARE			
CLT Software	UL	UL RF	Ver 7.6, November 11, 2017
Power Measurement Software	UL	UL RF	Ver 2.2, June 2017

NOTES:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

7. RF OUTPUT POWER VERIFICATION

The below tables contain the highest of all configurations average conducted output powers as follows:

7.1. LTE Band 43

ID:	39005	Date:	6/21/18

OUTPUT POWER FOR LTE BAND 43 (5.0 MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Conducted Average (dBm)		
				44115	44340	44565
				3652.5	3675.0	3697.5
5.0	QPSK	1	0	23.6	23.9	24.0
		1	12	24.0	24.0	24.0
		1	24	**24.1**	23.9	24.0
		12	0	23.2	23.4	23.5
		12	6	22.9	23.0	23.0
		12	11	22.9	22.9	23.0
		25	0	22.9	22.9	23.0
	16QAM	1	0	22.9	23.1	23.2
		1	12	**23.3**	23.2	23.2
		1	24	23.2	23.1	23.2
		12	0	22.3	22.4	22.4
		12	6	22.2	22.0	22.1
		12	11	22.1	21.9	22.0
		25	0	21.9	21.8	22.0
	64QAM	1	0	22.0	22.0	22.1
		1	12	**22.5**	22.1	22.2
		1	24	22.3	22.0	22.0
		12	0	21.2	21.5	21.4
		12	6	21.0	21.3	21.2
		12	11	21.0	21.1	21.0
		25	0	20.9	21.1	21.1

OUTPUT POWER FOR LTE BAND 43 (10.0 MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Conducted Average (dBm)		
				44140	44340	44540
				3655.0	3675.0	3695.0
10.0	QPSK	1	0	24.2	24.4	24.3
		1	24	24.2	24.1	24.2
		1	49	**24.5**	24.3	24.5
		25	0	23.1	23.1	23.2
		25	12	23.2	23.1	23.2
		25	24	23.2	23.1	23.3
		50	0	23.1	23.1	23.4
	16QAM	1	0	23.4	23.7	23.7
		1	24	23.4	23.3	23.5
		1	49	23.9	23.7	**23.9**
		25	0	22.2	22.0	22.0
		25	12	22.3	22.1	22.1
		25	24	22.3	22.1	22.2
		50	0	22.2	22.1	22.2
	64QAM	1	0	22.6	22.5	22.4
		1	24	22.7	22.1	22.3
		1	49	**22.9**	22.5	22.6
		25	0	21.2	21.1	21.1
		25	12	21.3	21.2	21.2
		25	24	21.3	21.1	21.2
		50	0	21.1	21.1	21.2

OUTPUT POWER FOR LTE BAND 43 (15.0 MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Conducted Average (dBm)		
				44165	44340	44515
				3657.5	3675.0	3692.5
15.0	QPSK	1	0	24.3	24.4	24.1
		1	37	24.3	24.3	24.3
		1	74	24.5	24.3	**24.5**
		36	0	23.1	23.1	22.8
		36	16	23.1	23.1	23.1
		36	35	23.1	23.0	23.1
		75	0	23.1	23.1	23.1
	16QAM	1	0	23.4	23.6	23.5
		1	37	23.4	23.4	23.4
		1	74	23.7	23.6	**23.8**
		36	0	22.2	22.1	21.8
		36	16	22.2	22.1	22.1
		36	35	22.1	21.9	22.1
		75	0	22.2	22.0	22.0
	64QAM	1	0	22.3	22.2	22.3
		1	37	22.4	22.2	22.2
		1	74	22.4	22.4	**22.5**
		36	0	21.1	21.2	20.9
		36	16	21.3	21.3	21.2
		36	35	21.2	21.0	21.1
		75	0	21.2	21.1	21.0

OUTPUT POWER FOR LTE BAND 43 (20.0 MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Conducted Average (dBm)		
				44190	44340	44490
				3660.0	3675.0	3690.0
20.0	QPSK	1	0	24.4	24.6	24.5
		1	49	24.4	24.3	24.1
		1	99	24.5	24.4	**24.7**
		50	0	23.0	23.3	23.2
		50	24	23.2	23.1	23.1
		50	49	23.2	23.2	23.2
		100	0	23.2	23.2	23.1
	16QAM	1	0	23.8	24.0	23.9
		1	49	23.6	23.5	23.3
		1	99	24.0	23.9	**24.0**
		50	0	22.1	22.2	22.2
		50	24	22.2	22.1	22.0
		50	49	22.2	22.1	22.1
		100	0	22.1	22.1	22.0
	64QAM	1	0	22.7	22.7	22.8
		1	49	22.5	22.3	22.1
		1	99	22.7	22.7	**22.9**
		50	0	21.2	21.2	21.1
		50	24	21.4	21.2	21.0
		50	49	21.3	21.1	21.1
		100	0	21.3	21.1	21.1

8. EMISSION DESIGNATOR

FCC Rule Part	Bandwidth (MHz)	Frequency Range	Modulation	Emission Designator
90	20.0	3650-3700	QPSK	17M9G7D
			16QAM	17M8D7W

9. CONDUCTED TEST RESULTS

9.1. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §90.209, RSS197§5.2

LIMITS

For reporting purposes only

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the middle channel in each band. The 99% and -26dB bandwidths was also measured and recorded.

MODES TESTED

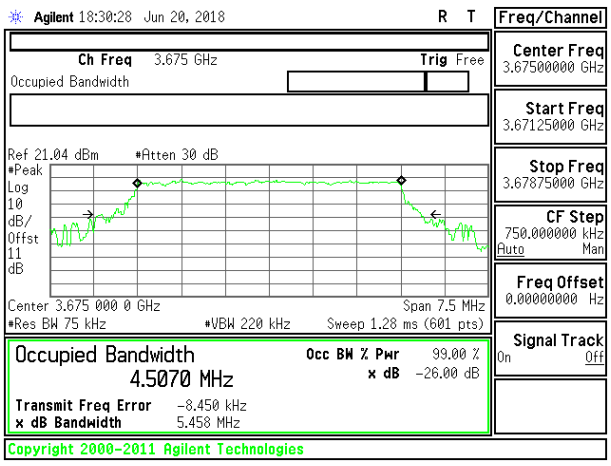
- LTE Band 43

RESULTS

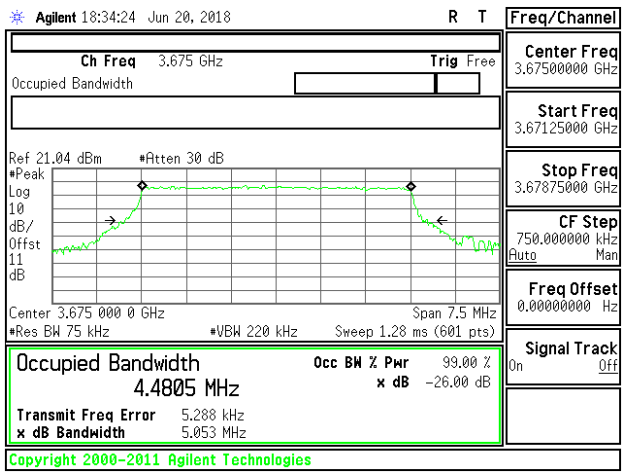
LTE BAND 43

Band	Mode	RB Allocation/RB Offset	f(MHz)	99% BW (MHz)	-26dB BW (MHz)
LTE BAND 43	5 MHz, QPSK	25/0	3750.0	4.5070	5.458
	5 MHz, 16QAM			4.4805	5.053
	10 MHz, QPSK	50/0		8.9547	9.924
	10 MHz, 16QAM			8.9538	9.603
	15 MHz, QPSK	75/0		13.4002	14.989
	15 MHz, 16QAM			13.4079	14.164
	20 MHz, QPSK	100/0		17.8963	18.892
	20 MHz, 16QAM			17.7767	18.971

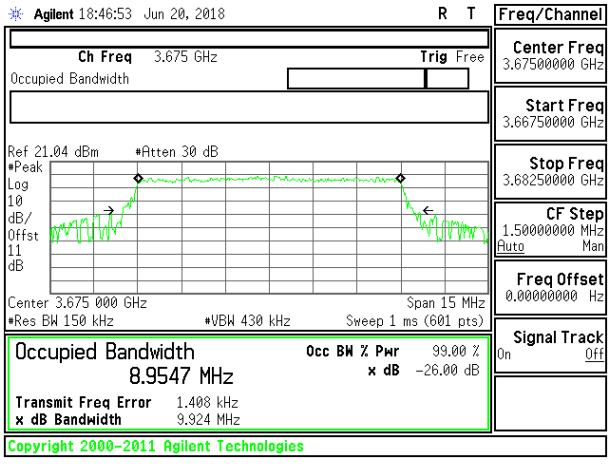
9.1.1. LTE BAND 43



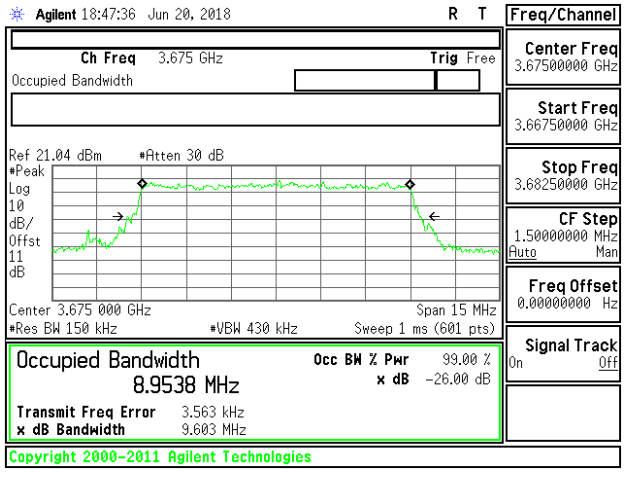
LTE B43 5MHz QPSK Mid Channel RB25-0



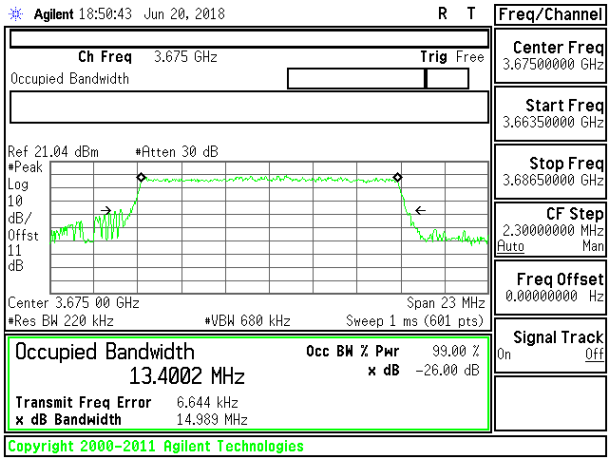
LTE B43 5MHz 16QAM Mid Channel RB25-0



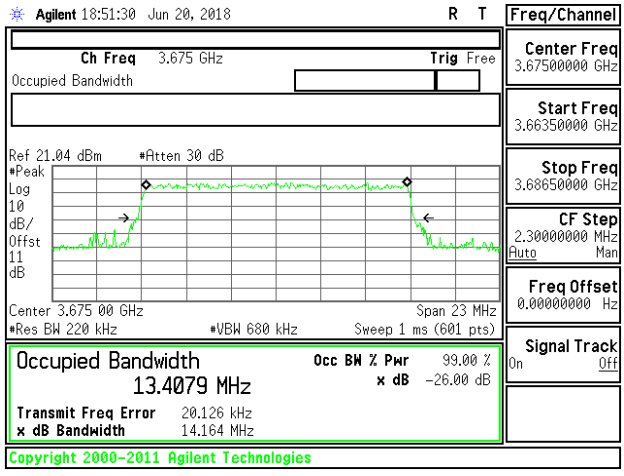
LTE B43 10MHz QPSK Mid Channel RB50-0



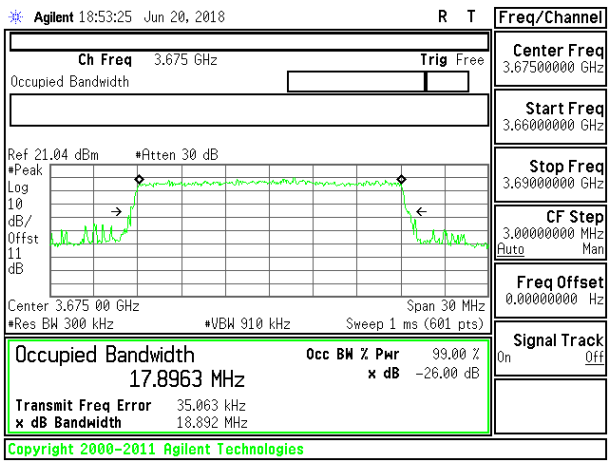
LTE B43 10MHz 16QAM Mid Channel RB50-0



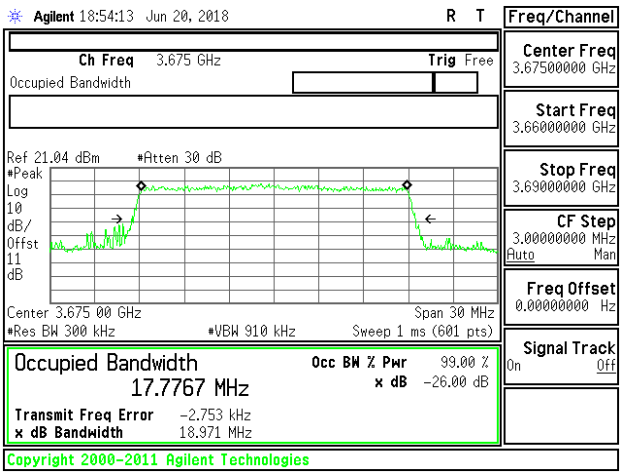
LTE B43 15MHz QPSK Mid Channel RB75-0



LTE B43 15MHz 16QAM Mid Channel RB75-0



LTE B43 20MHz QPSK Mid Channel RB100-0



LTE B43 20MHz 16QAM Mid Channel RB100-0

9.2. PSD

PSD LIMIT

FCC: §2.1046, §90.1321, RSS197§5.6

TEST PROCEDURE

§90.1321/ANSI C63.26:2015/KDB 971168

For base and fixed stations, peak EIRP power density shall not exceed 1 Watt in any 1MHz slice of spectrum.

The transmitter output was connected to a CMW500Test Set and configured to operate at maximum power. The PSD were measured at the required operating frequencies in each band on the Spectrum Analyzer.

For each out of band emissions measurement:

- The PSD was measured using following analyzer settings: RBW=1MHz, VBW=3MHz, detector=rms, sweep time 10 seconds, max hold. Multiple sweeps were made until the display capturing the highest peak point.

MODES TESTED

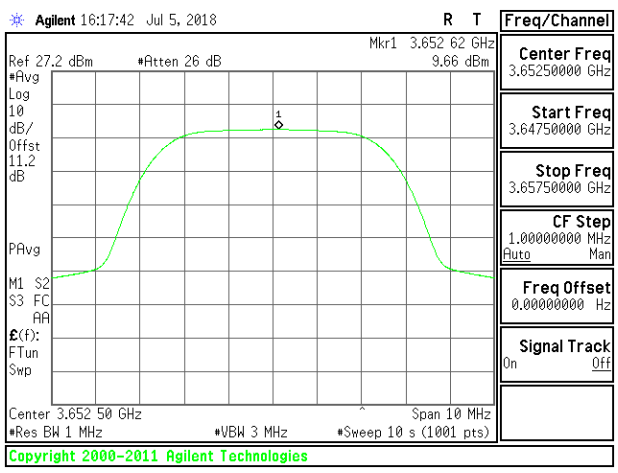
- LTE Band 43

RESULTS

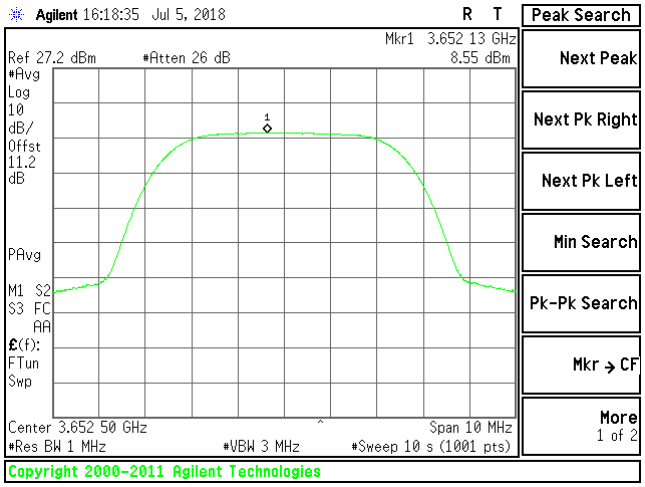
Part 90	
PSD EIRP Limit (dBm/MHz)	30.00
Antenna Gain (dBi)	10.59

Bandwidth (MHz)	Modulation	Frequency	PSD (dBm/MHz)	EIRP PSD		Margin (dB)
				dBm/MHz	W/MHz	
5.0	QPSK	3652.5	9.66	20.25	0.106	-9.75
		3675.0	9.22	19.81	0.096	-10.19
		3697.5	9.41	20.00	0.100	-10.00
	16QAM	3652.5	8.55	19.14	0.082	-10.86
		3675.0	8.10	18.69	0.074	-11.31
		3697.5	8.13	18.72	0.074	-11.28
10.0	QPSK	3655.0	7.10	17.69	0.059	-12.31
		3675.0	6.83	17.42	0.055	-12.58
		3695.0	6.77	17.36	0.054	-12.64
	16QAM	3655.0	6.10	16.69	0.047	-13.31
		3675.0	5.71	16.30	0.043	-13.70
		3695.0	5.58	16.17	0.041	-13.83
15.0	QPSK	3657.5	5.51	16.10	0.041	-13.90
		3675.0	4.95	15.54	0.036	-14.46
		3692.5	4.97	15.56	0.036	-14.44
	16QAM	3657.5	4.29	14.88	0.031	-15.12
		3675.0	3.72	14.31	0.027	-15.69
		3692.5	3.84	14.43	0.028	-15.57
20.0	QPSK	3660.0	4.43	15.02	0.032	-14.98
		3675.0	4.13	14.72	0.030	-15.28
		3690.0	3.96	14.55	0.029	-15.45
	16QAM	3660.0	3.38	13.97	0.025	-16.03
		3675.0	3.06	13.65	0.023	-16.35
		3690.0	2.93	13.52	0.022	-16.48

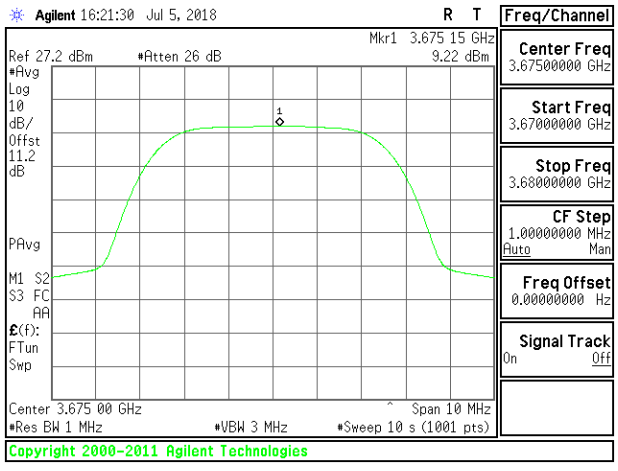
9.2.1. LTE BAND 43



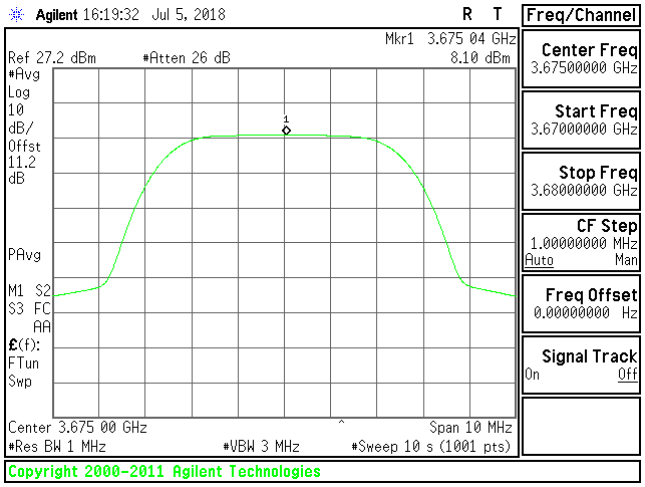
LTE B43 5MHz QPSK Low Channel RB25-0



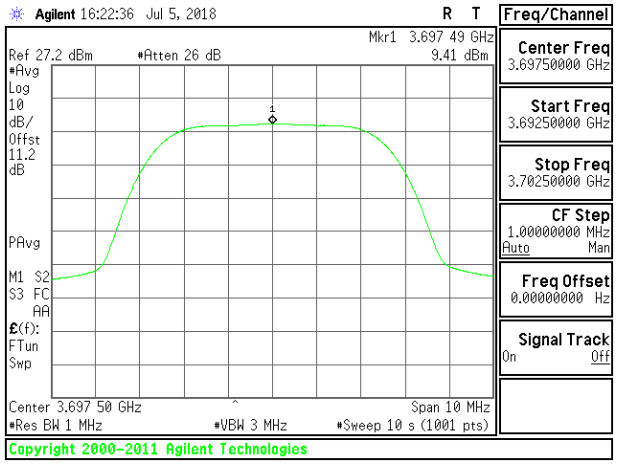
LTE B43 5MHz 16QAM Low Channel RB25-0



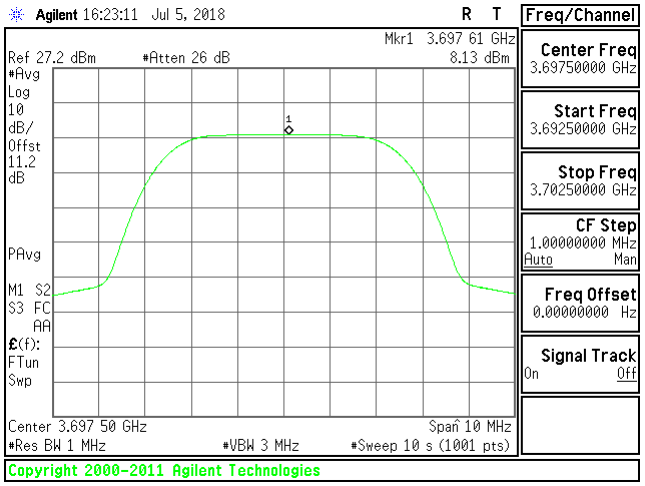
LTE B43 5MHz QPSK Middle Channel RB25-0



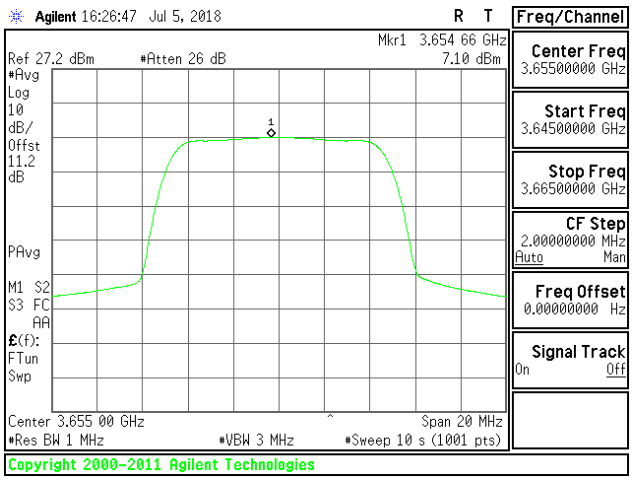
LTE B43 5MHz 16QAM Middle Channel RB25-0



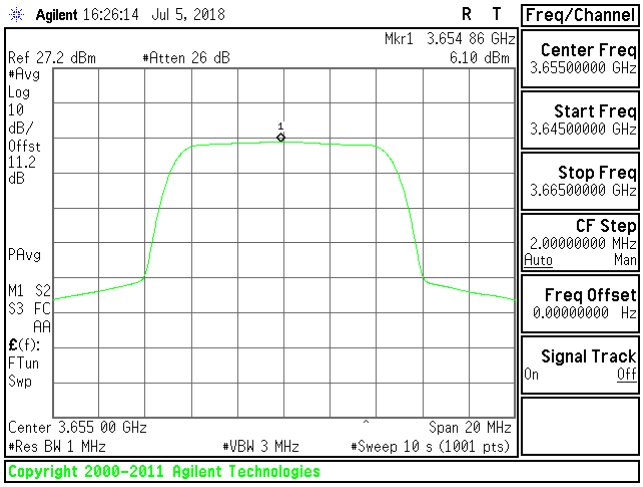
LTE B43 5MHz QPSK High Channel RB25-0



LTE B43 5MHz 16QAM High Channel RB25-0



LTE B43 10MHz QPSK Low Channel RB50-0



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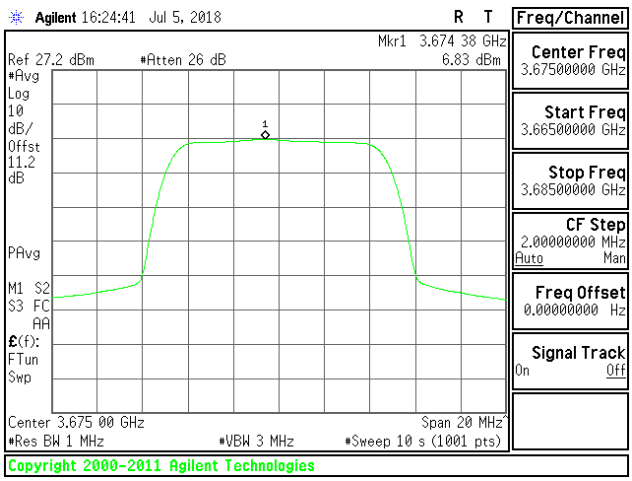
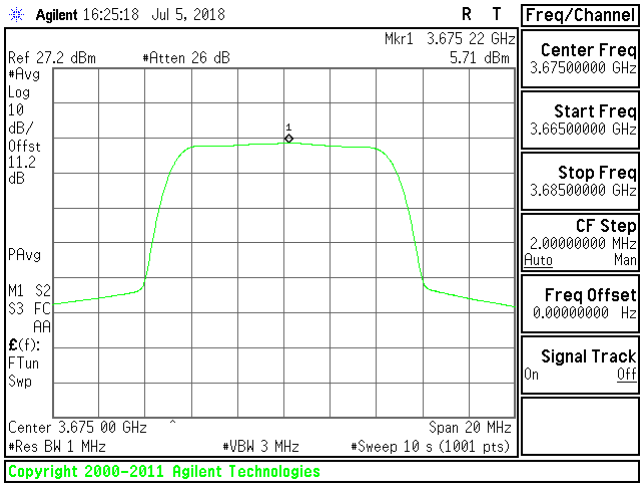
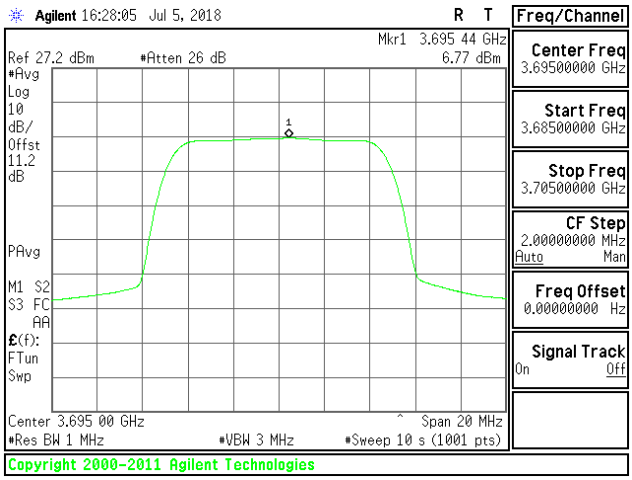


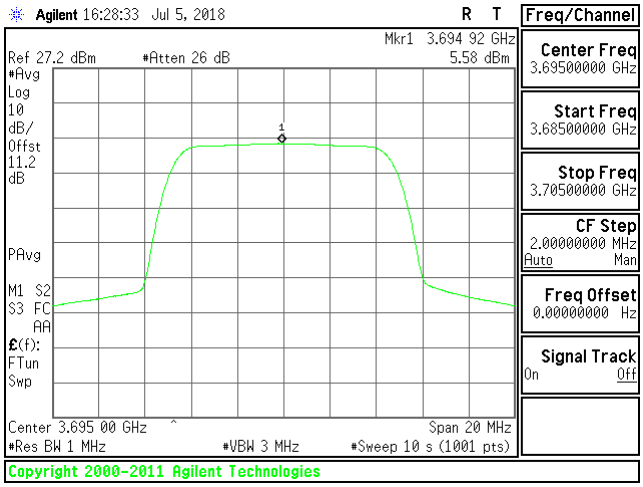
LTE B43 10MHz QPSK Middle Channel RB50-0



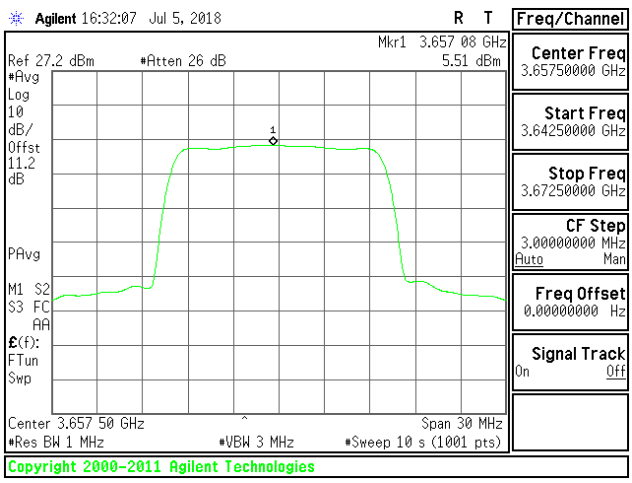
LTE B43 10MHz 16QAM Middle Channel RB50-0



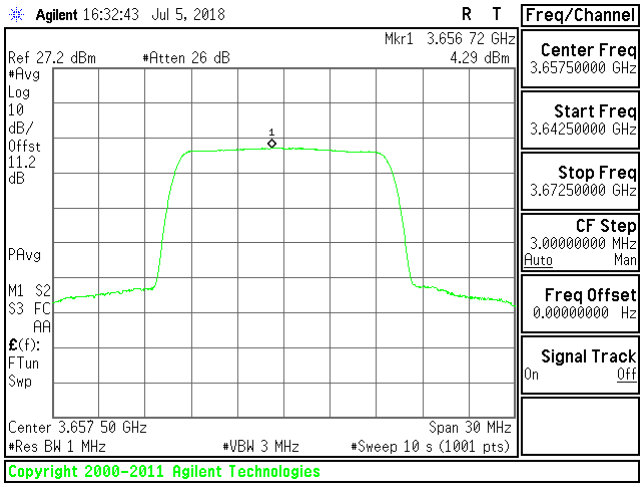
LTE B43 10MHz QPSK High Channel RB50-0



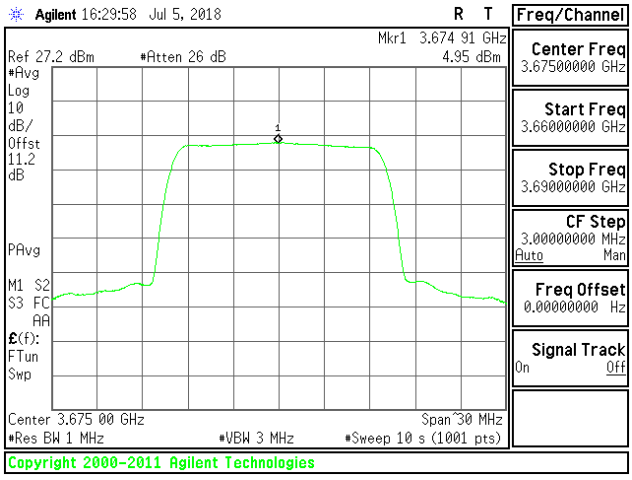
LTE B43 10MHz 16QAM High Channel RB50-0



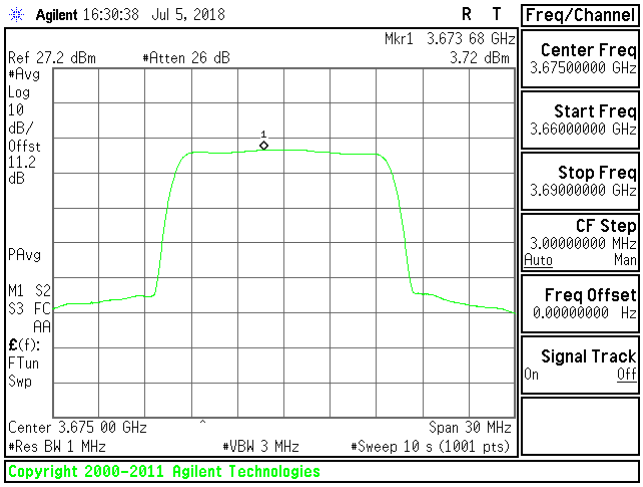
LTE B43 15MHz QPSK Low Channel RB75-0



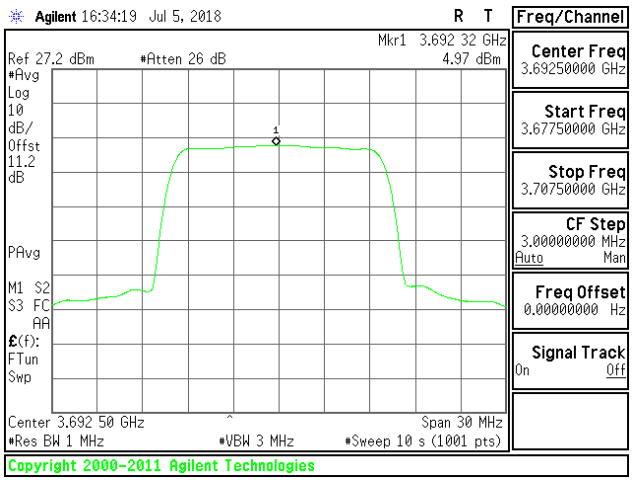
LTE B43 15MHz 16QAM Low Channel RB75-0



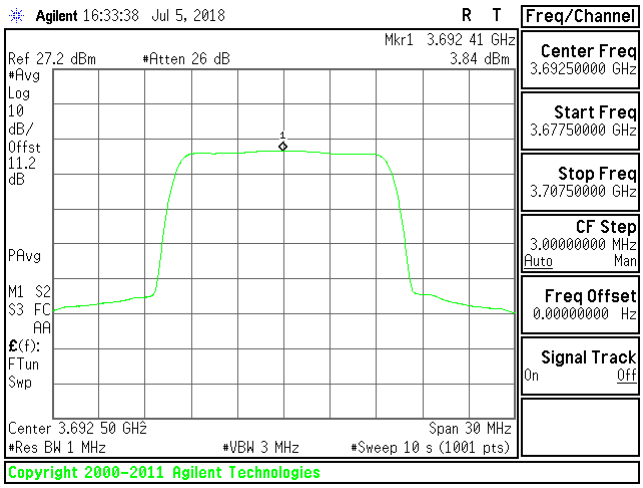
LTE B43 15MHz QPSK Middle Channel RB75-0



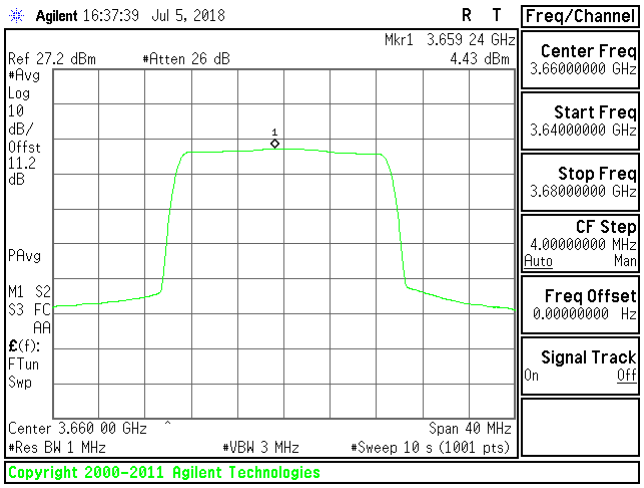
LTE B43 15MHz 16QAM Middle Channel RB75-0



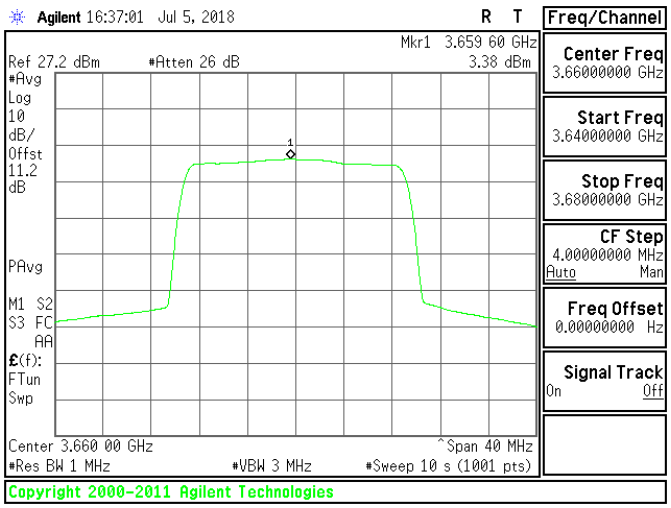
LTE B43 15MHz QPSK High Channel RB75-0



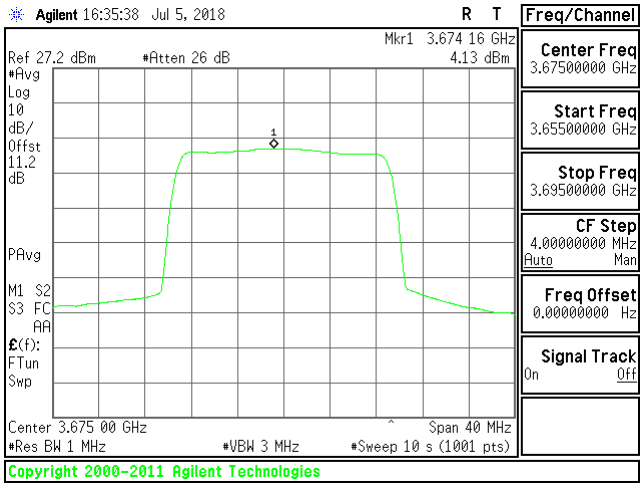
LTE B43 15MHz 16QAM High Channel RB75-0



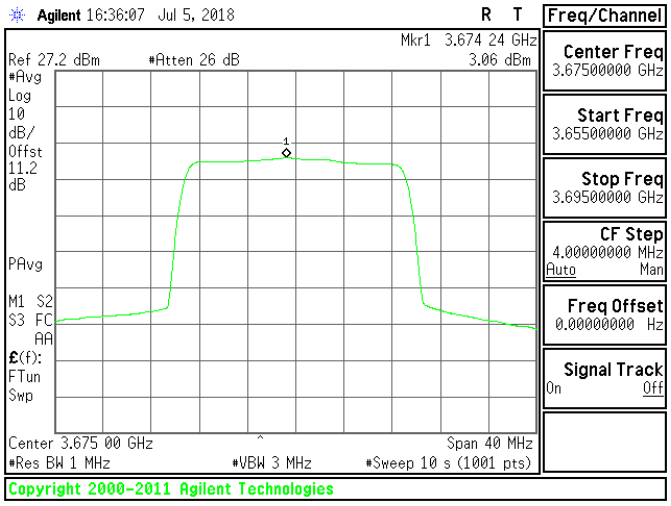
LTE B43 20MHz QPSK Low Channel RB100-0



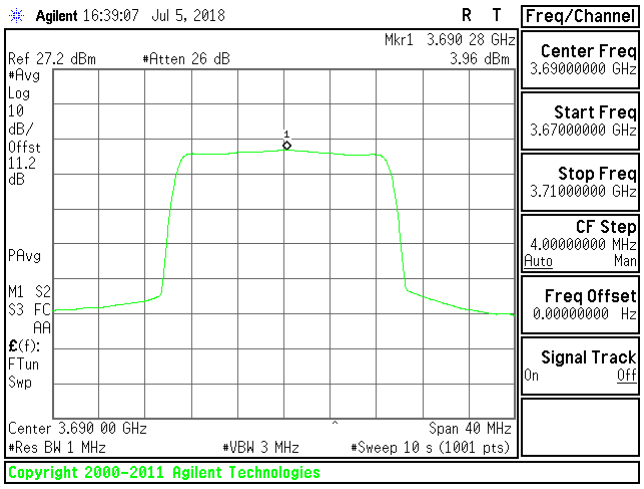
LTE B43 20MHz 16QAM Low Channel RB100-0



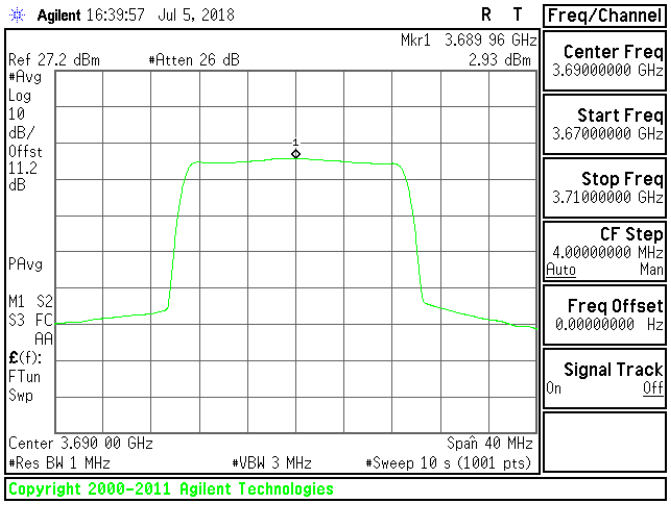
LTE B43 20MHz QPSK Middle Channel RB100-0



LTE B43 20MHz 16QAM Middle Channel RB100-0



LTE B43 20MHz QPSK High Channel RB100-0



LTE B43 20MHz 16QAM High Channel RB100-0

9.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §90.1323, RSS197§5.7

LIMITS

FCC: §90.1323

The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.

TEST PROCEDURE

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

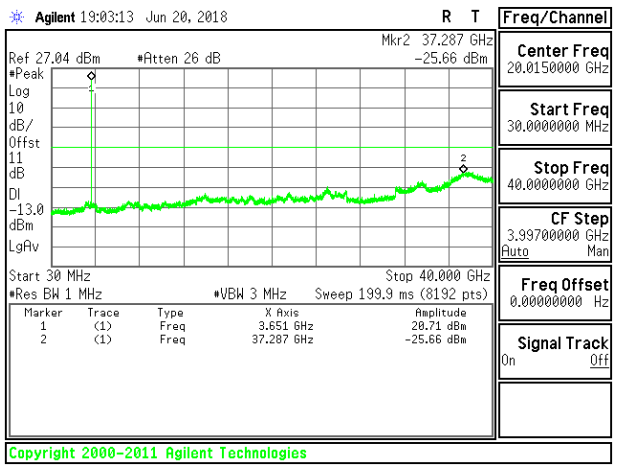
- Set display line at -13 dBm
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz. (NOTE: Worst case set RBW/VBW to 1MHz/3MHz)

MODES TESTED

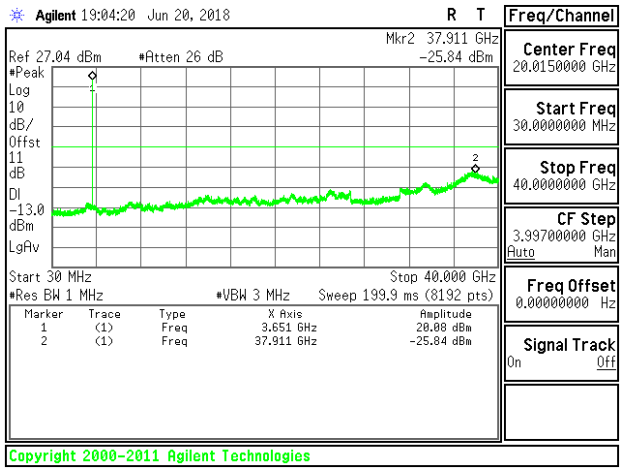
- LTE Band 43

RESULTS

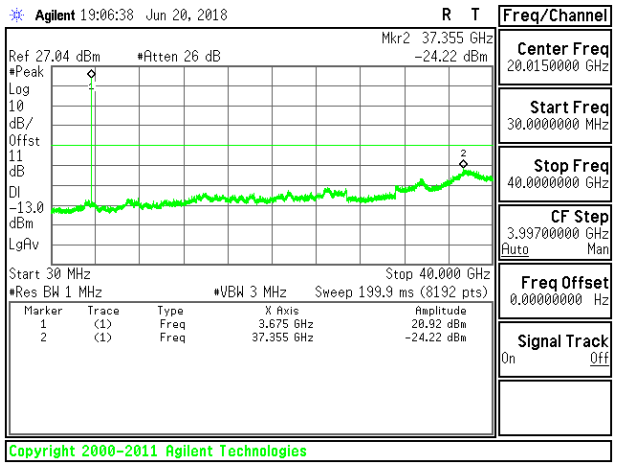
9.3.1. LTE BAND 43



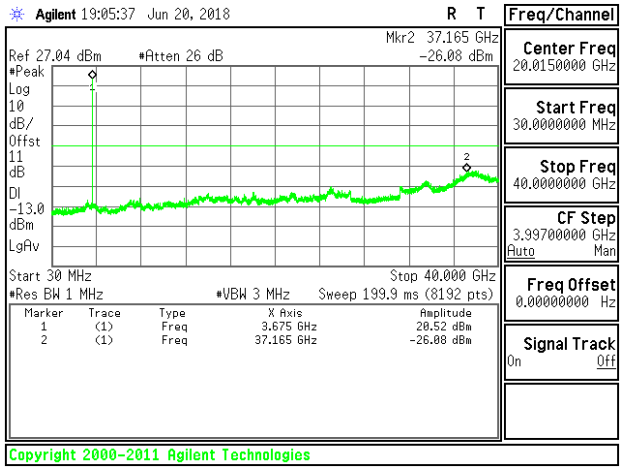
LTE B43 5MHz QPSK Low Channel RB1-0



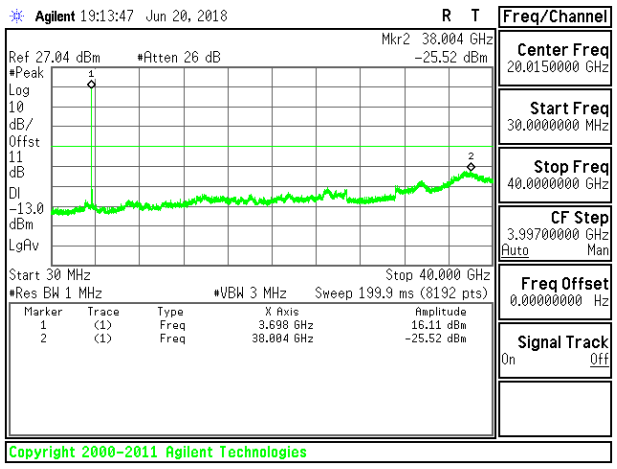
LTE B43 5MHz 16QAM Low Channel RB1-0



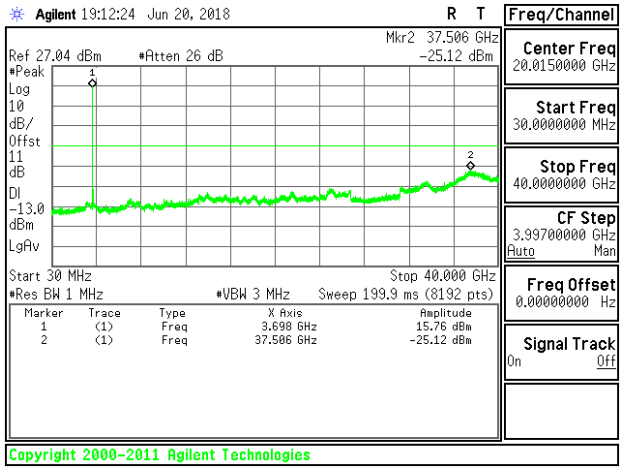
LTE B43 5MHz QPSK Middle Channel RB1-0



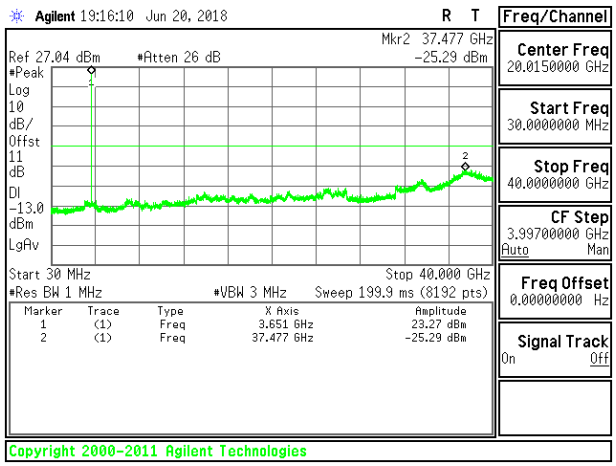
LTE B43 5MHz 16QAM Middle Channel RB1-0



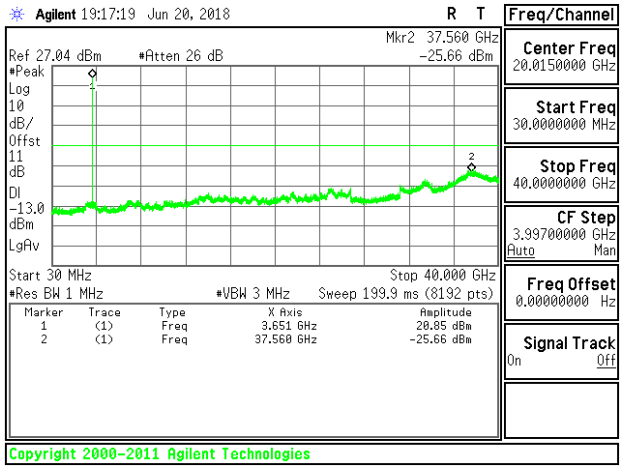
LTE B43 5MHz QPSK High Channel RB1-0



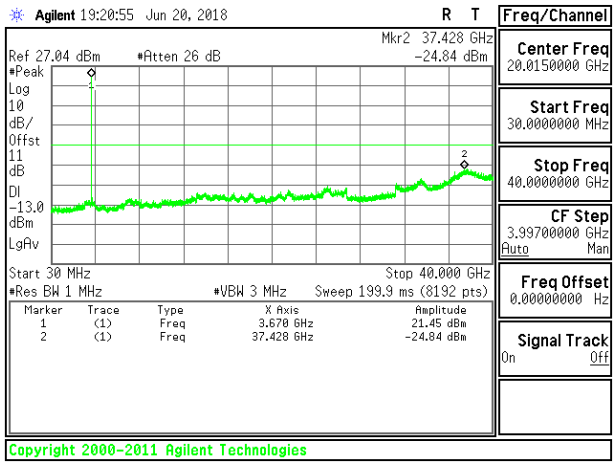
LTE B43 5MHz 16QAM High Channel RB1-0



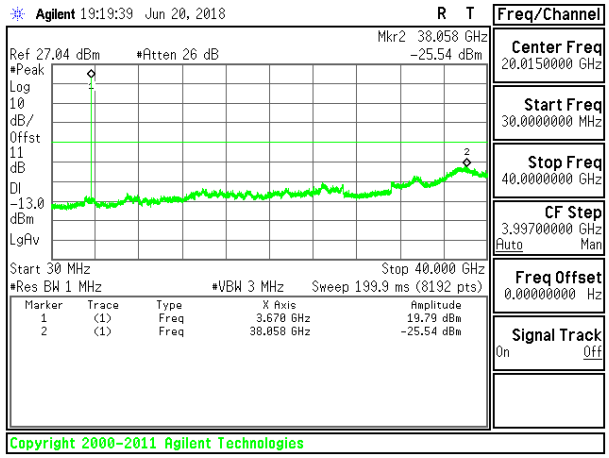
LTE B43 10MHz QPSK Low Channel RB1-0



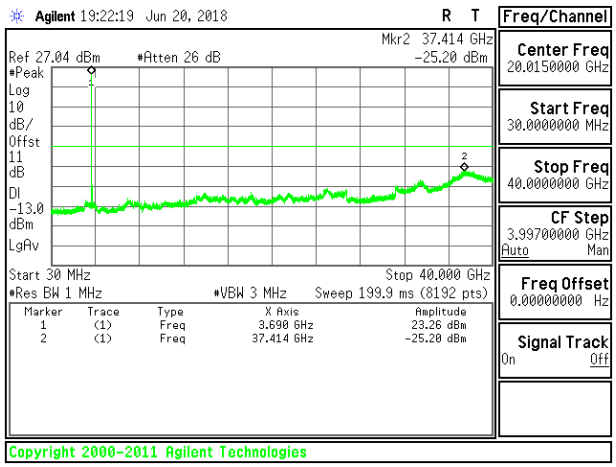
LTE B43 10MHz 16QAM Low Channel RB1-0



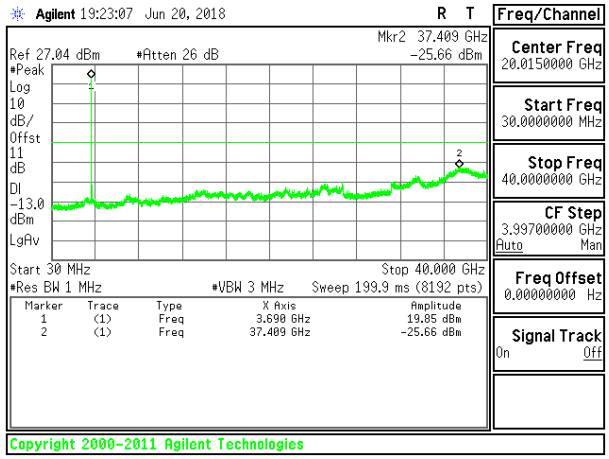
LTE B43 10MHz QPSK Middle Channel RB1-0



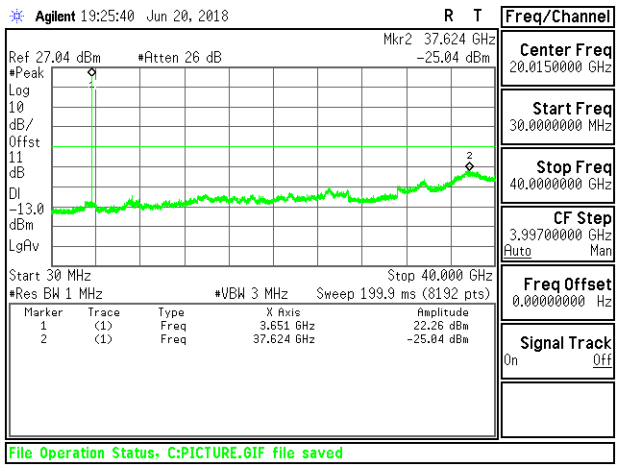
LTE B43 10MHz 16QAM Middle Channel RB1-0



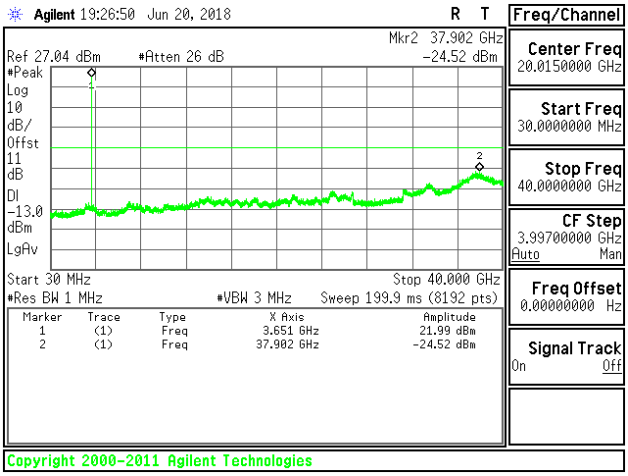
LTE B43 10MHz QPSK High Channel RB1-0



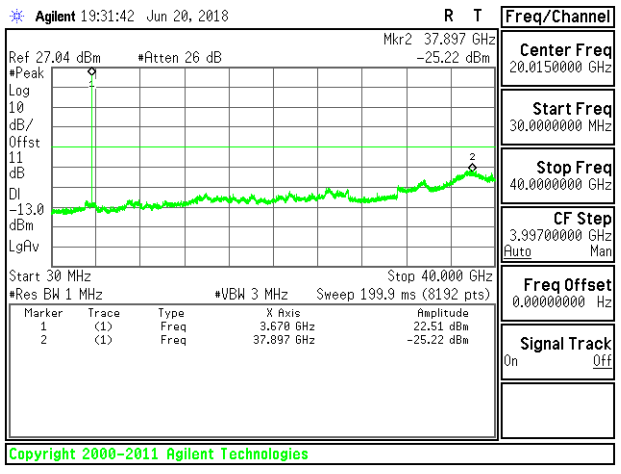
LTE B43 10MHz 16QAM High Channel RB1-0



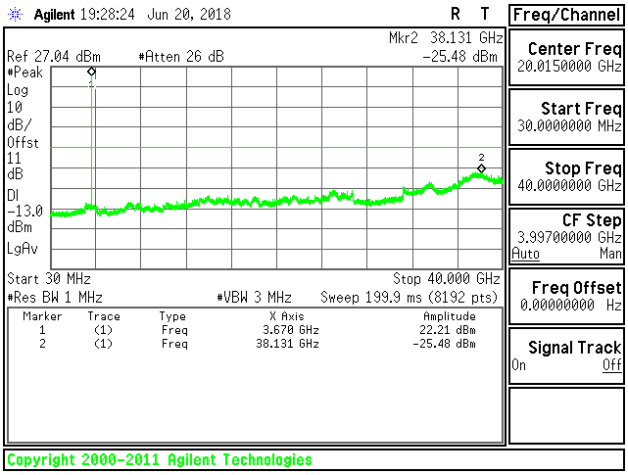
LTE B43 15MHz QPSK Low Channel RB1-0



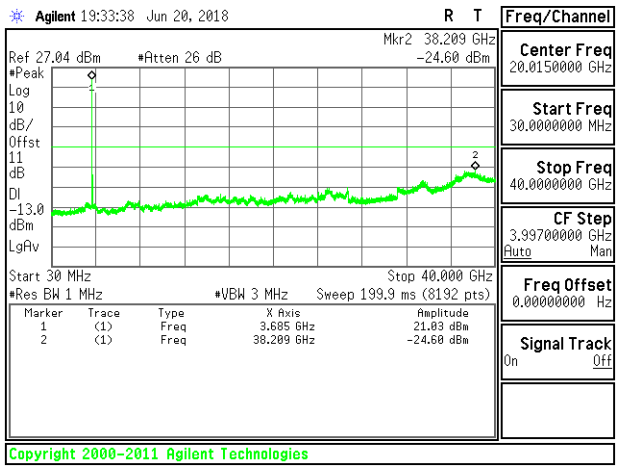
LTE B43 15MHz 16QAM Low Channel RB1-0



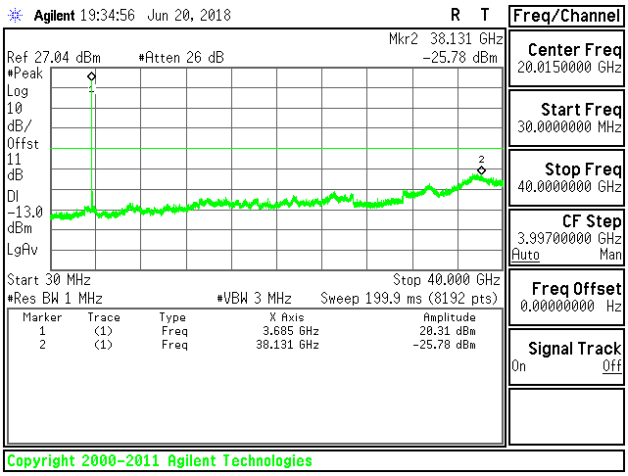
LTE B43 15MHz QPSK Middle Channel RB1-0



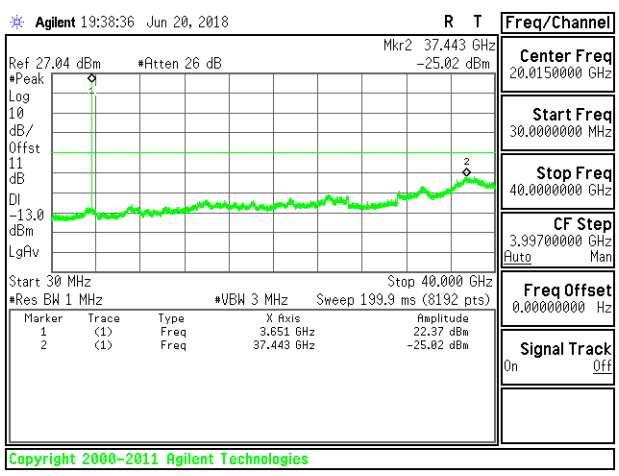
LTE B43 15MHz 16QAM Middle Channel RB1-0



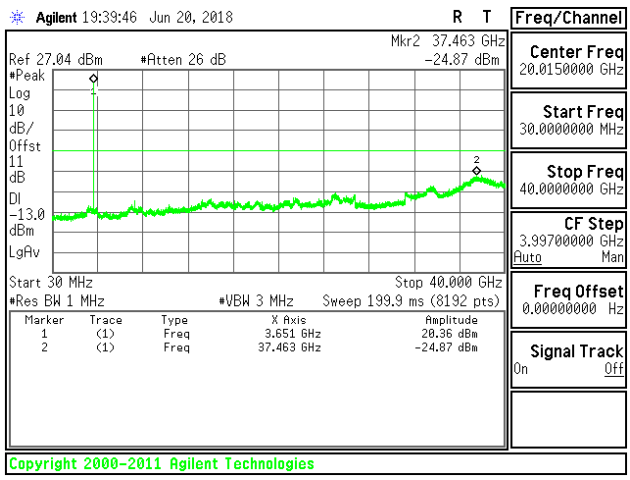
LTE B43 15MHz QPSK High Channel RB1-0



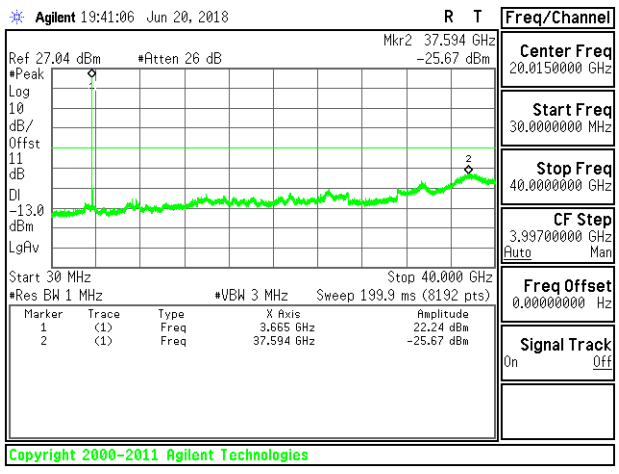
LTE B43 15MHz 16QAM High Channel RB1-0



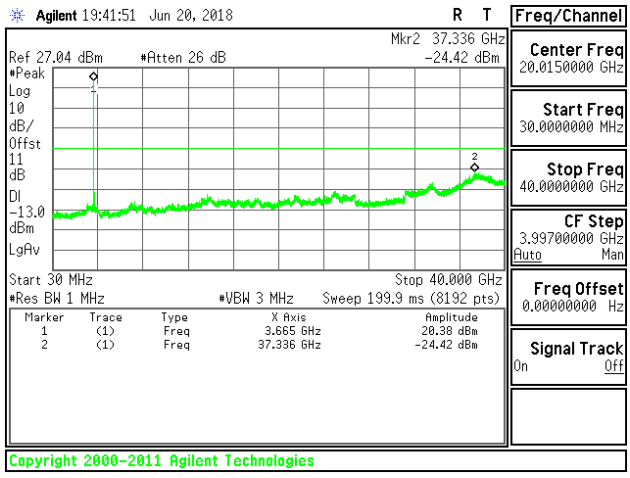
LTE B43 20MHz QPSK Low Channel RB1-0



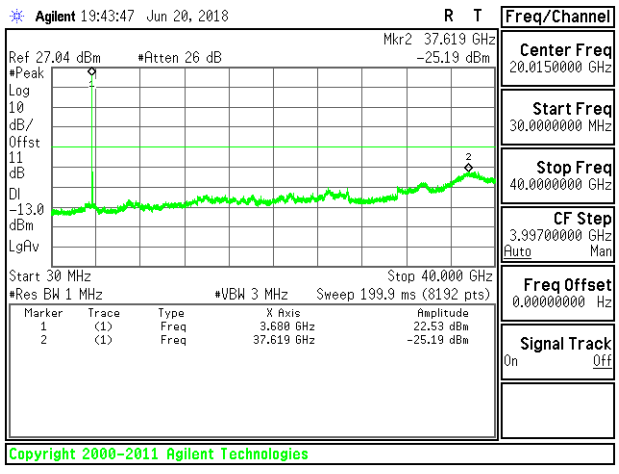
LTE B43 20MHz 16QAM Low Channel RB1-0



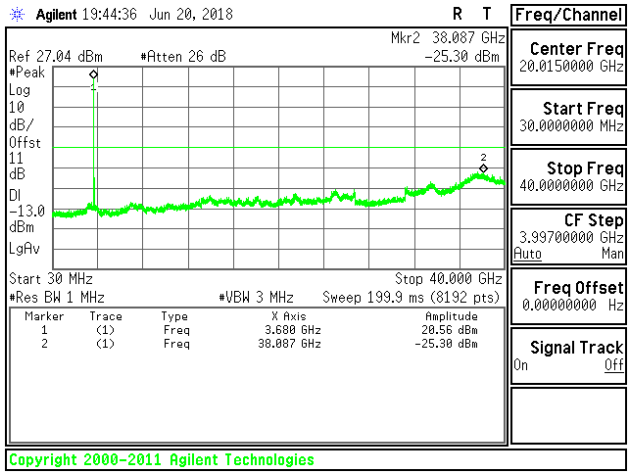
LTE B43 20MHz QPSK Middle Channel RB1-0



LTE B43 20MHz 16QAM Middle Channel RB1-0



LTE B43 20MHz QPSK High Channel RB1-0



LTE B43 20MHz 16QAM High Channel RB1-0

9.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, FCC: §90.213, RSS197§5.3

LIMITS

FCC: §90.213

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- Temp. = −30° to +55°C
  Low voltage, 40.8VDC, Normal, 48VDC and High voltage, 55.2VDC.
  End Voltage, 34.0VDC.

Frequency Stability vs Temperature:

The EUT is place inside a temperature chamber. The temperature is set to 20ºC and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +55ºC is reached.

Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

MODES TESTED

- LTE Band 43

RESULTS

See the following pages.

9.4.1. LTE BAND 43

ID:	39005	Date:	6/21/18

QPSK, (20MHz BANDWIDTH)

Limit		3650	3700	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	3650.7290	3699.2690		
Extreme (50C)		3650.7290	3699.2690	-42.3	-0.012
Extreme (40C)		3650.7290	3699.2690	-41.3	-0.011
Extreme (30C)		3650.7290	3699.2690	-38.0	-0.010
Extreme (10C)		3650.7290	3699.2690	-35.6	-0.010
Extreme (0C)		3650.7290	3699.2690	-36.1	-0.010
Extreme (-10C)		3650.7290	3699.2690	-34.5	-0.009
Extreme (-20C)		3650.7290	3699.2690	-36.3	-0.010
Extreme (-30C)		3650.7290	3699.2690	-33.1	-0.009
20C	15%	3650.7290	3699.2690	-34.9	-0.009
	-15%	3650.7290	3699.2690	-37.9	-0.010
	End Point	3650.7290	3699.2690	-36.3	-0.010

10. RADIATED TEST RESULTS

10.1. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §90.1323, RSS197§5.7

LIMITS

FCC: §90.1323

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

TEST PROCEDURE

KDB 971168 D01 v02r02/D02 v01

MODES TESTED

- LTE Band 43

RESULTS

10.1.1. LTE BAND 43

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Seowon Intech
Project #: 12150036
Date: 6/21/2018
Test Engineer: 39005 RA
Configuration: EUT + POE Power Supply
Location: Chamber B
Mode: LTE_QPSK Band 43 Harmonics, 5MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 3652.5MHz									
7305.00	-11.4	V	3.0	35.7	1.0	-46.1	-13.0	-33.1	
10957.50	-10.6	V	3.0	35.6	1.0	-45.1	-13.0	-32.1	
14610.00	-7.0	V	3.0	34.1	1.0	-40.1	-13.0	-27.1	
7305.00	-9.7	H	3.0	35.7	1.0	-44.4	-13.0	-31.4	
10957.50	-9.0	H	3.0	35.6	1.0	-43.6	-13.0	-30.6	
14610.00	-8.8	H	3.0	34.1	1.0	-41.9	-13.0	-28.9	
Mid Ch, 3675MHz									
7350.00	-14.9	V	3.0	35.7	1.0	-49.6	-13.0	-36.6	
11025.00	-6.2	V	3.0	35.5	1.0	-40.7	-13.0	-27.7	
14700.00	-9.5	V	3.0	34.1	1.0	-42.6	-13.0	-29.6	
7350.00	-14.5	H	3.0	35.7	1.0	-49.2	-13.0	-36.2	
11025.00	-7.0	H	3.0	35.5	1.0	-41.5	-13.0	-28.5	
14700.00	-6.9	H	3.0	34.1	1.0	-40.0	-13.0	-27.0	
High Ch, 3697.5MHz									
7395.00	-12.2	V	3.0	35.7	1.0	-46.9	-13.0	-33.9	
11092.50	-5.4	V	3.0	35.5	1.0	-39.9	-13.0	-26.9	
14790.00	-7.0	V	3.0	34.0	1.0	-40.0	-13.0	-27.0	
7395.00	-9.8	H	3.0	35.7	1.0	-44.5	-13.0	-31.5	
11092.50	-6.7	H	3.0	35.5	1.0	-41.2	-13.0	-28.2	
14790.00	-4.5	H	3.0	34.0	1.0	-37.5	-13.0	-24.5	

LTE B43 5MHz QPSK

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Seowon Intech
Project #: 12150036
Date: 6/21/2018
Test Engineer: 39005 RA
Configuration: EUT + POE Power Supply
Location: Chamber B
Mode: LTE_16QAM Band 43 Harmonics, 5MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 3652.5MHz									
7305.00	-11.9	V	3.0	35.7	1.0	-46.6	-13.0	-33.6	
10957.50	-11.8	V	3.0	35.6	1.0	-46.3	-13.0	-33.3	
14610.00	-7.5	V	3.0	34.1	1.0	-40.6	-13.0	-27.6	
7305.00	-10.6	H	3.0	35.7	1.0	-45.3	-13.0	-32.3	
10957.50	-10.8	H	3.0	35.6	1.0	-45.3	-13.0	-32.3	
14610.00	-9.0	H	3.0	34.1	1.0	-42.1	-13.0	-29.1	
Mid Ch, 3675MHz									
7350.00	-15.3	V	3.0	35.7	1.0	-50.1	-13.0	-37.1	
11025.00	-6.6	V	3.0	35.5	1.0	-41.1	-13.0	-28.1	
14700.00	-10.1	V	3.0	34.1	1.0	-43.2	-13.0	-30.2	
7350.00	-15.0	H	3.0	35.7	1.0	-49.7	-13.0	-36.7	
11025.00	-7.4	H	3.0	35.5	1.0	-42.0	-13.0	-29.0	
14700.00	-7.3	H	3.0	34.1	1.0	-40.3	-13.0	-27.3	
High Ch, 3697.5MHz									
7395.00	-12.8	V	3.0	35.7	1.0	-47.6	-13.0	-34.6	
11092.50	-5.7	V	3.0	35.5	1.0	-40.2	-13.0	-27.2	
14790.00	-7.3	V	3.0	34.0	1.0	-40.3	-13.0	-27.3	
7395.00	-10.1	H	3.0	35.7	1.0	-44.8	-13.0	-31.8	
11092.50	-7.5	H	3.0	35.5	1.0	-42.0	-13.0	-29.0	
14790.00	-6.1	H	3.0	34.0	1.0	-39.1	-13.0	-26.1	

LTE B43 5MHz 16QAM

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Seowon Intech
Project #: 12150036
Date: 6/21/2018
Test Engineer: 39005 RA
Configuration: EUT + POE Power Supply
Location: Chamber B
Mode: LTE_QPSK Band 43 Harmonics, 10MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 3655MHz									
7310.00	-12.7	V	3.0	35.7	1.0	-47.4	-13.0	-34.4	
10965.00	-11.6	V	3.0	35.6	1.0	-46.1	-13.0	-33.1	
14620.00	-10.0	V	3.0	34.1	1.0	-43.1	-13.0	-30.1	
7310.00	-12.5	H	3.0	35.7	1.0	-47.2	-13.0	-34.2	
10965.00	-10.9	H	3.0	35.6	1.0	-45.5	-13.0	-32.5	
14620.00	-8.6	H	3.0	34.1	1.0	-41.6	-13.0	-28.6	
Mid Ch, 3675MHz									
7350.00	-17.8	V	3.0	35.7	1.0	-52.5	-13.0	-39.5	
11025.00	-7.3	V	3.0	35.5	1.0	-41.9	-13.0	-28.9	
14700.00	-9.5	V	3.0	34.1	1.0	-42.6	-13.0	-29.6	
7350.00	-15.0	H	3.0	35.7	1.0	-49.7	-13.0	-36.7	
11025.00	-5.7	H	3.0	35.5	1.0	-40.2	-13.0	-27.2	
14700.00	-9.3	H	3.0	34.1	1.0	-42.3	-13.0	-29.3	
High Ch, 3695MHz									
7390.00	-15.7	V	3.0	35.7	1.0	-50.4	-13.0	-37.4	
11085.00	-6.4	V	3.0	35.5	1.0	-40.9	-13.0	-27.9	
14780.00	-5.8	V	3.0	34.0	1.0	-38.8	-13.0	-25.8	
7390.00	-15.4	H	3.0	35.7	1.0	-50.1	-13.0	-37.1	
11085.00	-11.2	H	3.0	35.5	1.0	-45.7	-13.0	-32.7	
14780.00	-9.2	H	3.0	34.0	1.0	-42.2	-13.0	-29.2	

LTE B43 10MHz QPSK

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Seowon Intech
Project #: 12150036
Date: 6/21/2018
Test Engineer: 39005 RA
Configuration: EUT + POE Power Supply
Location: Chamber B
Mode: LTE_16QAM Band 43 Harmonics, 10MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 3655MHz									
7310.00	-12.8	V	3.0	35.7	1.0	-47.5	-13.0	-34.5	
10965.00	-11.7	V	3.0	35.6	1.0	-46.3	-13.0	-33.3	
14620.00	-9.6	V	3.0	34.1	1.0	-42.7	-13.0	-29.7	
7310.00	-13.0	H	3.0	35.7	1.0	-47.7	-13.0	-34.7	
10965.00	-10.9	H	3.0	35.6	1.0	-45.5	-13.0	-32.5	
14620.00	-8.7	H	3.0	34.1	1.0	-41.8	-13.0	-28.8	
Mid Ch, 3675MHz									
7350.00	-17.7	V	3.0	35.7	1.0	-52.5	-13.0	-39.5	
11025.00	-7.1	V	3.0	35.5	1.0	-41.7	-13.0	-28.7	
14700.00	-9.7	V	3.0	34.1	1.0	-42.8	-13.0	-29.8	
7350.00	-15.4	H	3.0	35.7	1.0	-50.2	-13.0	-37.2	
11025.00	-5.8	H	3.0	35.5	1.0	-40.4	-13.0	-27.4	
14700.00	-9.2	H	3.0	34.1	1.0	-42.2	-13.0	-29.2	
High Ch, 3695MHz									
7390.00	-15.7	V	3.0	35.7	1.0	-50.4	-13.0	-37.4	
11085.00	-6.6	V	3.0	35.5	1.0	-41.1	-13.0	-28.1	
14780.00	-5.8	V	3.0	34.0	1.0	-38.9	-13.0	-25.9	
7390.00	-15.4	H	3.0	35.7	1.0	-50.1	-13.0	-37.1	
11085.00	-11.6	H	3.0	35.5	1.0	-46.1	-13.0	-33.1	
14780.00	-9.5	H	3.0	34.0	1.0	-42.5	-13.0	-29.5	

LTE B43 10MHz 16QAM

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Seowon Intech
Project #: 12150036
Date: 6/21/2018
Test Engineer: 39005 RA
Configuration: EUT + POE Power Supply
Location: Chamber B
Mode: LTE_QPSK Band 43 Harmonics, 15MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 3657.5MHz									
7315.00	-11.2	V	3.0	35.7	1.0	-45.9	-13.0	-32.9	
10972.50	-12.7	V	3.0	35.6	1.0	-47.3	-13.0	-34.3	
14630.00	-11.7	V	3.0	34.1	1.0	-44.8	-13.0	-31.8	
7315.00	-10.9	H	3.0	35.7	1.0	-45.7	-13.0	-32.7	
10972.50	-12.4	H	3.0	35.6	1.0	-47.0	-13.0	-34.0	
14630.00	-10.4	H	3.0	34.1	1.0	-43.5	-13.0	-30.5	
Mid Ch, 3675MHz									
7350.00	-12.5	V	3.0	35.7	1.0	-47.2	-13.0	-34.2	
11025.00	-8.3	V	3.0	35.5	1.0	-42.8	-13.0	-29.8	
14700.00	-10.1	V	3.0	34.1	1.0	-43.1	-13.0	-30.1	
7350.00	-11.5	H	3.0	35.7	1.0	-46.2	-13.0	-33.2	
11025.00	-10.9	H	3.0	35.5	1.0	-45.5	-13.0	-32.5	
14700.00	-10.7	H	3.0	34.1	1.0	-43.8	-13.0	-30.8	
High Ch, 3692.5MHz									
7385.00	-13.0	V	3.0	35.7	1.0	-47.7	-13.0	-34.7	
11077.50	-11.8	V	3.0	35.5	1.0	-46.3	-13.0	-33.3	
14770.00	-10.3	V	3.0	34.0	1.0	-43.3	-13.0	-30.3	
7385.00	-10.9	H	3.0	35.7	1.0	-45.6	-13.0	-32.6	
11077.50	-10.2	H	3.0	35.5	1.0	-44.8	-13.0	-31.8	
14770.00	-11.7	H	3.0	34.0	1.0	-44.7	-13.0	-31.7	

LTE B43 15MHz QPSK

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Seowon Intech
Project #: 12150036
Date: 6/21/2018
Test Engineer: 39005 RA
Configuration: EUT + POE Power Supply
Location: Chamber B
Mode: LTE_16QAM Band 43 Harmonics, 15MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 3657.5MHz									
7315.00	-11.4	V	3.0	35.7	1.0	-46.1	-13.0	-33.1	
10972.50	-12.8	V	3.0	35.6	1.0	-47.4	-13.0	-34.4	
14630.00	-9.6	V	3.0	34.1	1.0	-42.7	-13.0	-29.7	
7315.00	-11.1	H	3.0	35.7	1.0	-45.8	-13.0	-32.8	
10972.50	-13.6	H	3.0	35.6	1.0	-48.2	-13.0	-35.2	
14630.00	-11.3	H	3.0	34.1	1.0	-44.4	-13.0	-31.4	
Mid Ch, 3675MHz									
7350.00	-12.7	V	3.0	35.7	1.0	-47.4	-13.0	-34.4	
11025.00	-9.4	V	3.0	35.5	1.0	-43.9	-13.0	-30.9	
14700.00	-10.9	V	3.0	34.1	1.0	-44.0	-13.0	-31.0	
7350.00	-9.3	H	3.0	35.7	1.0	-44.0	-13.0	-31.0	
11025.00	-12.0	H	3.0	35.5	1.0	-46.5	-13.0	-33.5	
14700.00	-11.7	H	3.0	34.1	1.0	-44.7	-13.0	-31.7	
High Ch, 3692.5MHz									
7385.00	-12.2	V	3.0	35.7	1.0	-47.0	-13.0	-34.0	
11077.50	-12.7	V	3.0	35.5	1.0	-47.2	-13.0	-34.2	
14770.00	-11.2	V	3.0	34.0	1.0	-44.2	-13.0	-31.2	
7385.00	-10.6	H	3.0	35.7	1.0	-45.3	-13.0	-32.3	
11077.50	-11.0	H	3.0	35.5	1.0	-45.6	-13.0	-32.6	
14770.00	-12.7	H	3.0	34.0	1.0	-45.7	-13.0	-32.7	

LTE B43 15MHz 16QAM

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Seowon Intech
Project #: 12150036
Date: 6/21/2018
Test Engineer: 39005 RA
Configuration: EUT + POE Power Supply
Location: Chamber B
Mode: LTE_QPSK Band 43 Harmonics, 20MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 3660MHz									
7320.00	-13.7	V	3.0	35.7	1.0	-48.4	-13.0	-35.4	
10980.00	-10.1	V	3.0	35.6	1.0	-44.7	-13.0	-31.7	
14640.00	-10.1	V	3.0	34.1	1.0	-43.2	-13.0	-30.2	
7320.00	-10.8	H	3.0	35.7	1.0	-45.5	-13.0	-32.5	
10980.00	-10.0	H	3.0	35.6	1.0	-44.6	-13.0	-31.6	
14640.00	-8.5	H	3.0	34.1	1.0	-41.6	-13.0	-28.6	
Mid Ch, 3675MHz									
7350.00	-11.9	V	3.0	35.7	1.0	-46.6	-13.0	-33.6	
11025.00	-6.8	V	3.0	35.5	1.0	-41.3	-13.0	-28.3	
14700.00	-9.8	V	3.0	34.1	1.0	-42.8	-13.0	-29.8	
7350.00	-11.7	H	3.0	35.7	1.0	-46.5	-13.0	-33.5	
11025.00	-9.8	H	3.0	35.5	1.0	-44.3	-13.0	-31.3	
14700.00	-9.5	H	3.0	34.1	1.0	-42.6	-13.0	-29.6	
High Ch, 3690MHz									
7380.00	-11.3	V	3.0	35.7	1.0	-46.0	-13.0	-33.0	
11070.00	-4.6	V	3.0	35.5	1.0	-39.1	-13.0	-26.1	
14760.00	-5.8	V	3.0	34.0	1.0	-38.8	-13.0	-25.8	
7380.00	-9.6	H	3.0	35.7	1.0	-44.3	-13.0	-31.3	
11070.00	-6.5	H	3.0	35.5	1.0	-41.0	-13.0	-28.0	
14760.00	-4.4	H	3.0	34.0	1.0	-37.4	-13.0	-24.4	

LTE B43 20MHz QPSK

UL Verification Services, Inc.
Above 1GHz High Frequency Substitution Measurement

Company: Seowon Intech
Project #: 12150036
Date: 6/21/2018
Test Engineer: 39005 RA
Configuration: EUT + POE Power Supply
Location: Chamber B
Mode: LTE_16QAM Band 43 Harmonics, 20MHz Bandwidth

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 3660MHz									
7320.00	-14.8	V	3.0	35.7	1.0	-49.5	-13.0	-36.5	
10980.00	-10.9	V	3.0	35.6	1.0	-45.5	-13.0	-32.5	
14640.00	-11.1	V	3.0	34.1	1.0	-44.2	-13.0	-31.2	
7320.00	-12.3	H	3.0	35.7	1.0	-47.1	-13.0	-34.1	
10980.00	-11.2	H	3.0	35.6	1.0	-45.8	-13.0	-32.8	
14640.00	-10.2	H	3.0	34.1	1.0	-43.3	-13.0	-30.3	
Mid Ch, 3675MHz									
7350.00	-14.8	V	3.0	35.7	1.0	-49.5	-13.0	-36.5	
11025.00	-8.3	V	3.0	35.5	1.0	-42.9	-13.0	-29.9	
14700.00	-10.9	V	3.0	34.1	1.0	-44.0	-13.0	-31.0	
7350.00	-15.7	H	3.0	35.7	1.0	-50.5	-13.0	-37.5	
11025.00	-11.0	H	3.0	35.5	1.0	-45.6	-13.0	-32.6	
14700.00	-10.8	H	3.0	34.1	1.0	-43.9	-13.0	-30.9	
High Ch, 3690MHz									
7380.00	-12.4	V	3.0	35.7	1.0	-47.1	-13.0	-34.1	
11070.00	-5.6	V	3.0	35.5	1.0	-40.2	-13.0	-27.2	
14760.00	-6.9	V	3.0	34.0	1.0	-40.0	-13.0	-27.0	
7380.00	-10.7	H	3.0	35.7	1.0	-45.4	-13.0	-32.4	
11070.00	-7.5	H	3.0	35.5	1.0	-42.0	-13.0	-29.0	
14760.00	-5.5	H	3.0	34.0	1.0	-38.5	-13.0	-25.5	

LTE B43 20MHz 16QAM