RF TEST REPORT

Test item	:	4G LTE CPE
Model No.	:	C773
Order No.	:	DEMC1306-02017
Date of receipt	:	2013-06-26
Test duration	:	2013-08-26 ~ 2013-09-09
Date of issue	:	2013-09-13
Use of report	:	FCC Original Grant

Applicant : BIT & PULSE CO., LTD
2F Baegang B/D, 666-14 Sinsa-dong, Gangnam-gu, Seoul 135-897, Korea

Test laboratory : Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Gyeonggi-Do, 449-080, Korea

Test specification	:	§24, §27
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:	Witnessed by:	Reviewed by:
Engineer HyunSu Son	N/A	Deputy General Manager WonJung Lee

Test Report Version

Test Report No.	Date	Description
DRTFCC1309-0883	Sep. 13, 2013	Initial issue

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1. GENERAL INFORMATION

Applicant Name: **BIT & PULSE CO., LTD**

Address: **2F Baegang B/D, 666-14 Sinsa-dong, Gangnam-gu, Seoul 135-897, Korea**

FCC ID	:	CO3BPLC773
FCC Classification	:	Licensed Non-Broadcast Station Transmitter (TNB)
EUT Type	:	4G LTE CPE
Model Name	:	C773
Add Model Name	:	N/A
Supplying power	:	Switching Adaptor - MODEL: FJ-SW1202000U - INPUT : 100-240V 50/60Hz 0.6Amax - OUTPUT : 12V & 2000mA
Antenna Information	:	External Antenna
Tx Frequency	:	LTE Band 13: 782.0 MHz LTE Band 4: 1715.0 MHz ~ 1750.0 MHz LTE Band 25: 1855.0 MHz ~ 1910.0 MHz
Rx Frequency	:	LTE Band 13: 751.0 MHz LTE Band 4: 2115.0 MHz ~ 2150.0 MHz LTE Band 25: 1935.0 MHz ~ 1990.0 MHz
Max. RF Output Power	:	LTE Band 13: 0.124 W ERP(20.94 dBm) LTE Band 4: 0.169 W EIRP(22.28 dBm) LTE Band 25 0.125 W EIRP(20.99 dBm)
Emission Designator(s)	:	LTE Band 13(QPSK): 8M95G7D LTE Band 13(16QAM): 8M96W7D LTE Band 4(QPSK): 8M96G7D LTE Band 4(16QAM): 8M94W7D LTE Band 25(QPSK): 8M92G7D LTE Band 25(16QAM): 8M94W7D

2. INTRODUCTION

2.1. EUT DESCRIPTION

The Equipment Under Test(EUT) supports CDMA and EVDO(Rev. A) of Cellular/PCS bands and LTE(Band 4, 13, 25) with 2.4GHz WLAN. The EUT has below 3 transceivers.

1. CDMA 1x
2. LTE/CDMA 1x EVDO(Rev. A)
3. 2.4GHz WLAN

2.2. 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.

2.3. TEST FACILITY

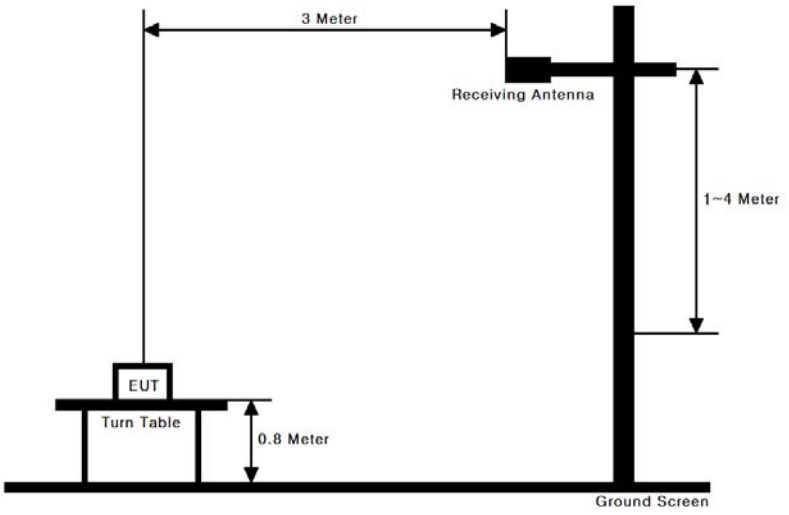
The 3&10M test site and conducted measurement facility used to collect the radiated data are located at the 683-3, Yubang-Dong, Yongin-Si, Gyunggi-Do, 449-080, South Korea. The site is constructed in conformance with the requirements.

- 3&10M test site registration Number: 678747

3. DESCRIPTION OF TESTS

3.1 ERP&EIRP
(Effective Radiated Power & Equivalent Isotropic Radiated Power)

Test Set-up



Test Procedure

These measurements were performed at 3 & 10m test site. The equipment under test is placed on a wooden turntable 0.8-meters above the ground plane and 3meters from the receive antenna.

Test setting

The spectrum Analyzer`s channel power function is enabled.

1. RBW = 1 ~ 5% of the expected OBW, not to exceed 1MHz & VBW ≥ 3 X RBW
2. Span = 1.5 times the OBW & Number of sweep point ≥ 2 X span / RBW
3. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the gating function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power.
4. Detector = RMS & RMS trace averaging over 100 sweeps for stabilizing

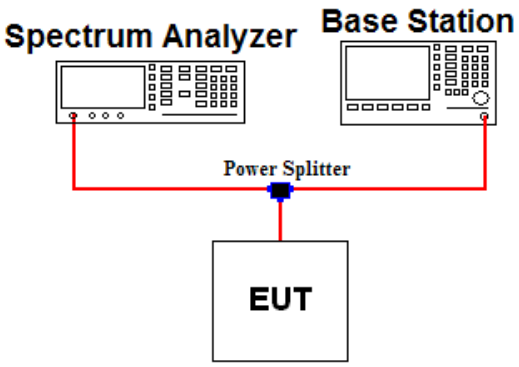
The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer.
A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminal of the substitute antenna is measured.
The ERP/EIRP is calculated using the following formula:

ERP/EIRP = The conducted power at the substitute antenna`s terminal + Substitute Antenna gain

For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn antenna and an isotropic antenna are taken into consideration.

3.2 PEAK TO AVERAGE RATIO

Test set-up



Test Procedure

A peak to average ratio measurement is performed at the conducted port of the EUT.
The spectrum analyzers Complementary Cumulative Distribution Function(CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The present of time the signal spends at or above the level defines the probability for that particular power level.

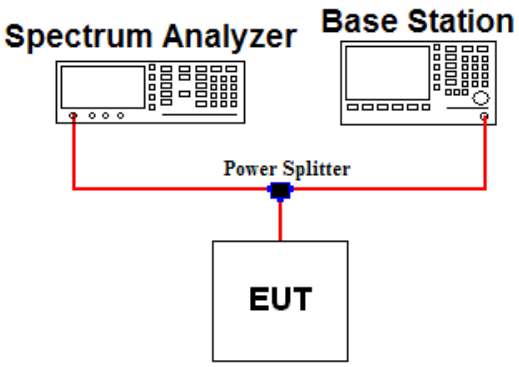
Test setting

The spectrum Analyzer`s channel power function is enabled.

1. Set resolution/measurement bandwidth ≥ signal`s occupied bandwidth
2. Set the number of counts to a value that stabilizes the measured CCDF curve
3. Set the measurement interval as follows:
   1) For continuous transmissions, set to 1 ms
   2) For burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
4. Record the maximum PAPR level associated with a probability of 0.1%

3.3 OCCUPIED BANDWIDTH.

Test set-up



Test Procedure

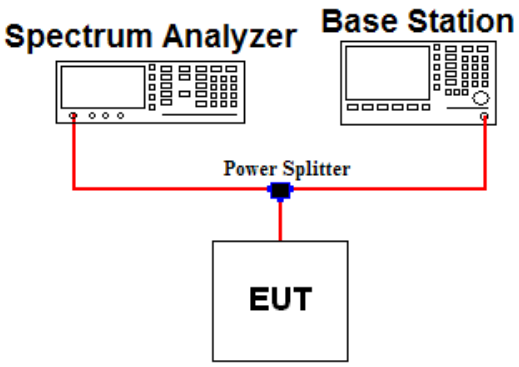
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power of a given emission.

Test setting

1. The signal analyzer`s automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 ~ 5% of the expected OBW & VBW ≥ 3 X RBW
3. Detector = Peak
4. Trance mode = Max hold
5. Sweep = Auto couple
6. The trace was allowed to stabilize
7. If necessary, step 2 ~ 7 were repeated after changing the RBW such that it would be within 1 ~ 5% of the 99% occupied bandwidth observed in step 7.

3.4 UNDESIRABLE EMISSIONS (CONDUCTED)

Test set-up



Test Procedure

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The EUT was setup to maximum output power at its lowest channel with all modulations RB size and RB offsets. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic.

Test setting

1. RBW = 100KHz or 1MHz & VBW ≥ 3MHz
2. Detector = RMS & Trace mode = Max hold
3. Sweep time = Auto & 3s for band edge
4. Number of sweep point ≥ 2 X span / RBW
5. The trace was allowed to stabilize

The highest, lowest and a middle channel were tested for out of band measurements.
the worst case data are reported in clause 8.3.

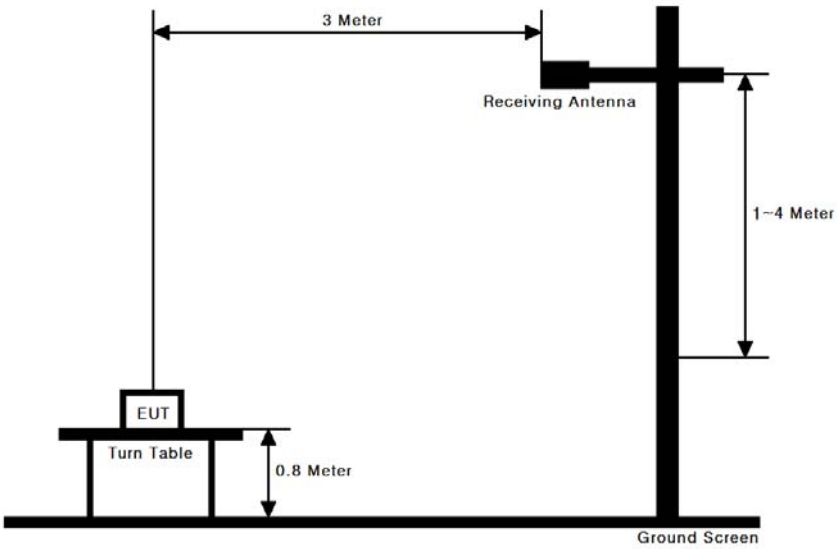
Note 1: In the 1MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter as employed to measure the out of band Emissions.

Note 2: Compliance with the applicable limits is based on the use of measurement instrumentation employing a RBW(100KHz if the authorized frequency band/block is at or below 1GHz and 1MHz if the authorized frequency band/block is above 1GHz.)

Note 3: For part 27.53(c)(4) measurement, the FCC limit is 65 + $10\log_{10}(P_{[Watts]})$= -35dBm in a 6.25KHz bandwidth. Since it was not possible to set the resolution bandwidth to 6.25KHz with the available equipment, a bandwidth of 10KHz was used instead to show compliance. By using a 10KHz bandwidth, the limit was adjusted by $10\log_{10}(10KHz/6.25KHz)$ = 2.04dB.
Thus, the limit shown in all plots in the test bands was -35dBm + 2.04dB = -32.96dBm.

3.5 UNDESIRABLE EMISSIONS (RADIATED)

Test Set-up



Test Procedure

This measurement was performedat 3meter test range. The equipment under test is placed on a wooden turntable 0.8meters above the ground plane and 3meters from the receive antenna.

Test setting

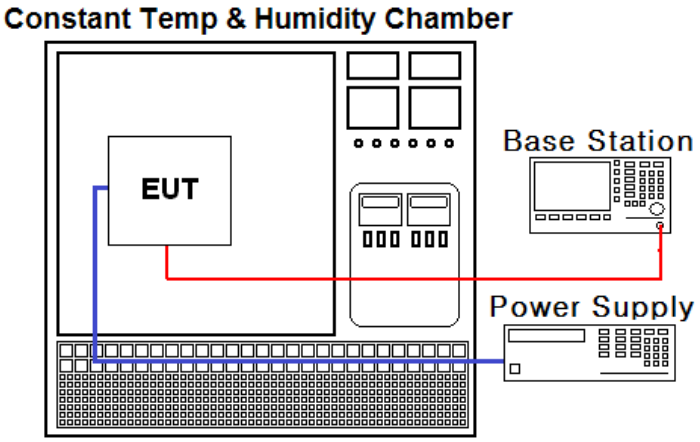
The spectrum Analyzer`s channel power function is enabled.

1. RBW = 1 ~ 5% of the expected OBW, not to exceed 1MHz & VBW ≥ 3 X RBW
2. Span = 1.5 times the OBW & Number of sweep point ≥ 2 X span / RBW
3. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the gating function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power.
4. Detector = RMS & RMS trace averaging over 100 sweeps for stabilizing

The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer.
For radiated power measurements below 1GHz, a half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading.
For radiated power measurements above 1GHz, a Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading. The difference between the gain of the horn and an isotropic antenna are taken into consideration.
This measurement was performed with the EUT oriented in 3 orthogonal axis.

3.6 FREQUENCY STABILITY

Test Set-up



Test Procedure

The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from - 30 °C to + 50 °C using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from battery end point to 115 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification - the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ± 0.000 25 %(± 2.5 ppm) of the center frequency.

Time Period and Procedure:

1. The carrier frequency of the transmitter is measured at room temperature. (25°C to provide a reference).
2. The equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

4. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal. Date (yy/mm/dd)	S/N
Multimeter	HP	34401A	13/02/27	14/02/27	3146A13475
DC Power Supply	H.P	6622A	13/02/27	14/02/27	3448A03760
Power Splitter	Anritsu	K241B	12/09/17	13/09/17	020611
Attenuator	Aeroflex/Weinschel	56-3	12/09/17	13/09/17	Y2342
Attenuator	WEINSCHEL	23-10-34	12/09/17	13/09/17	BP4386
Thermohygrometer	BODYCOM	BJ5478	13/01/14	14/01/14	090205-4
Constant Temp & Humidity Chamber	JISICO	KR-100/J-RHC2	12/09/17	13/09/17	30604493/021031
Dipole Antenna	Schwarzbeck	VHA9103	12/03/12	14/03/12	2116
Dipole Antenna	Schwarzbeck	VHA9103	12/03/22	14/03/22	2117
Dipole Antenna	Schwarzbeck	UHA9105	12/03/12	14/03/12	2261
Dipole Antenna	Schwarzbeck	UHA9105	12/03/22	14/03/22	2262
Bilog Antenna	SCHAFFNER	CBL6112B	12/11/06	14/11/06	2737
HORN ANT	ETS	3115	12/02/20	14/02/20	6419
HORN ANT	ETS	3115	13/02/28	15/02/28	00021097
HORN ANT	A.H.Systems	SAS-574	13/03/20	15/03/20	154
HORN ANT	A.H.Systems	SAS-574	13/05/27	15/05/27	155
HORN ANT	Schwarzbeck	BBHA 9120D	12/10/21	14/10/21	9120D-1014
Amplifier	Agilent	8447E	13/01/08	14/01/08	2945A02865
Amplifier	Agilent	8449B	13/02/27	14/02/27	3008A00370
High-pass filter	Wainwright Instruments	WHKX1.0	12/09/17	13/09/17	9
High-Pass Filter	Wainwright	WHNX2.1	12/09/17	13/09/17	1
Wideband Radio Communication Tester	Rohde Schwarz	CMW500	13/09/12	14/09/12	101414
Vector Signal Generator	Rohde Schwarz	SMJ100A	13/01/08	14/01/08	100148
Signal Generator	Rohde Schwarz	SMF100A	13/07/22	14/07/22	102341
Amplifier	EMPOWER	BBS3Q7ELU	12/09/18	13/09/18	1020
MXA Signal Analyzer	Agilent	N9020A	13/01/08	14/01/08	MY49100833
Spectrum Analyzer	Rohde Schwarz	FSQ26	13/02/14	14/02/14	200445
Spectrum Analyzer	Agilent	E4440A	12/10/22	13/10/22	US45303051

5. SUMMARY OF TEST RESULTS

LTE Band Class	FCC Part Section(s)	Test Description	Test Limit	Test Condition	Result
4 13 25	2.1049	Occupied Bandwidth	N/A	Conducted	Comply
4 13 25	2.1046 27.50(d)(4) 27.50(b)(10)	Conducted Output Power	N/A		Comply
4 25	24.232(d) 27.50(d)(5)	Peak to Average Ratio	< 13dB		Comply
4 13 25	2.1051 24.238(a) 27.53(c)(2) 27.53(h)	Undesirable Emissions at band edge and for all out-of-band emissions	< 43+10log$_{10}$(P) dB		Comply
13	27.53(c)(4)	Undesirable Emissions in 763 ~ 775MHz & 793 ~ 805MHz	< 65+10log$_{10}$(P) dB		Comply
4 13 25	2.1055 24.235 27.54	Frequency Stability	Fundamental emissions must stay within authorized frequency block		Comply
13	27.50(b)(10)	Effective Radiated Power	< 3W ERP	Radiated	Comply
4	27.50(d)(4)	Equivalent Isotropic Radiated Power	< 1W EIRP		Comply
25	24.232(c)	Equivalent Isotropic Radiated Power	< 2W EIRP		Comply
4 13 25	2.1051 24.238(a) 27.53(c)(2) 27.53(h)	Undesirable Emissions at band edge and for all out-of-band emissions	< 43+10log$_{10}$(P) dB		Comply
13	27.53(f)	Undesirable Emissions in 1559 ~ 1610MHz	< -70dBW/MHz (-40dBm/MHz)		Comply
13	27.53(c)(4)	Undesirable Emissions in 763 ~ 775MHz & 793 ~ 805MHz	< 65+10log$_{10}$(P) dB		Comply

Note 1: The sample was tested according to the following specification:
ANSI/TIA/EIA-603-C-2004 and KDB 971168 D01 v02r01

6. SAMPLE CALCULATION

A. Emission Designator

LTE Band 13(QPSK) Emission Designator

Emission Designator = **8M95G7D**
LTE OBW = 8947.8 kHz
(Measured at the 99.75% power bandwidth)
G = Phase Modulation
7 = Quantized/Digital Info
D = Data Transmission

LTE Band 13(16QAM) Emission Designator

Emission Designator = **8M96W7D**
LTE OBW = 8957.5 kHz
(Measured at the 99.75% power bandwidth)
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

LTE Band 4(QPSK) Emission Designator

Emission Designator = **8M96G7D**
LTE OBW = 8960.2 kHz
(Measured at the 99.75% power bandwidth)
G = Phase Modulation
7 = Quantized/Digital Info
D = Data Transmission

LTE Band 4(16QAM) Emission Designator

Emission Designator = **8M94W7D**
LTE OBW = 8940.5 kHz
(Measured at the 99.75% power bandwidth)
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

LTE Band 25(QPSK) Emission Designator

Emission Designator = **8M92G7D**
LTE OBW = 8915.9 kHz
(Measured at the 99.75% power bandwidth)
G = Phase Modulation
7 = Quantized/Digital Info
D = Data Transmission

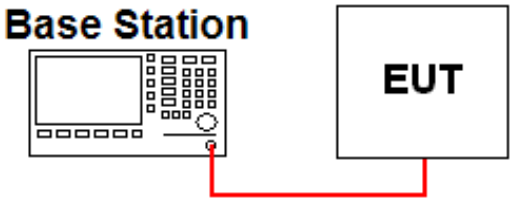
LTE Band 25(16QAM) Emission Designator

Emission Designator = **8M94W7D**
LTE OBW = 8942.5 kHz
(Measured at the 99.75% power bandwidth)
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data Transmission

7. TEST DATA

7.1 CONDUCTED OUTPUT POWER

A base station simulator was used to establish communication with the EUT. The base station simulator parameters were set to produce the maximum power from the EUT. This device was tested under all configurations and the highest power is reported. Conducted Output Powers of EUT are reported below.



LTE Band Class	BW [MHz]	Freq. [MHz]	Modulation Type	Conducted Power [dBm]					
				RB Size 1			RB Size 25		RB Size 50
				RB offset 0	RB offset 25	RB offset 49	RB offset 0	RB offset 25	RB offset 0
13	10	782	QPSK	20.86	20.24	**21.12**	19.14	19.34	19.02
			16QAM	19.93	19.33	**20.29**	18.20	18.52	18.23
4	10	1715.0	QPSK	20.17	20.41	**20.44**	19.41	19.58	19.30
			16QAM	19.22	**20.32**	19.30	18.50	18.62	18.42
		1732.5	QPSK	20.41	20.72	**20.77**	19.23	19.30	19.14
			16QAM	19.44	**20.70**	20.67	18.34	18.42	18.20
		1750.0	QPSK	19.60	19.87	**19.91**	18.22	18.34	18.19
			16QAM	18.62	**18.90**	18.83	17.31	17.44	17.23
25	10	1855.0	QPSK	**19.17**	18.53	18.35	17.32	16.62	17.06
			16QAM	**18.22**	17.44	17.34	16.28	15.73	16.23
		1882.5	QPSK	**18.44**	17.67	17.03	16.50	15.73	16.42
			16QAM	**17.56**	17.53	16.13	15.47	14.82	15.17
		1910.0	QPSK	**16.55**	16.52	15.72	14.55	13.92	15.59
			16QAM	**15.46**	14.67	14.56	13.59	12.95	13.63

7.2 PEAK TO AVERAGE RATIO

- Plots of the EUT's Peak- to- Average Ratio are shown in Clause 8.1

7.3 OCCUPIED BANDWIDTH

Band	Frequency	Modulation	Test Result(KHz)
LTE Band 13	782	QPSK	8947.80
		16QAM	8957.50
LTE Band 4	1732.5	QPSK	8960.20
		16QAM	8940.50
LTE Band 25	1880.0	QPSK	8915.90
		16QAM	8942.50

- Plots of the EUT's Occupied Bandwidth are shown in Clause 8.2

7.4 UNDESIRABLE EMISSIONS (CONDUCTED)

- Plots of the EUT's Conducted Spurious Emissions are shown in Clause 8.3

7.6 EFFECTIVE RADIATED POWER (LTE Band 13)

Freq. (MHz)	Modulation Type	RB Size/ Offset	EUT Position (Axis)	Reading Value (dBm)	Pol. (H/V)	Level at Substitute Antenna Terminal (dBm)	Substitute Antenna Gain (dBd)	ERP (dBm)	ERP (W)	Power Supply
782	**QPSK**	**1/49**	**Y**	**-18.62**	**H**	**19.34**	**1.60**	**20.94**	**0.124**	**DC 12 V**
	16QAM	1/49	Y	-19.43	H	18.53	1.60	20.13	0.103	DC 12 V

Note: This device was tested under all modulations, RB size and RB offsets and the worst case data are reported in the table above.

7.7 EQUIVALENT ISOTROPIC RADIATED POWER (LTE Band 4)

Freq. (MHz)	Modulation Type	RB Size/ Offset	EUT Position (Axis)	Reading Value (dBm)	Pol. (H/V)	Level at Substitute Antenna Terminal (dBm)	Substitute Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Power Supply
1715.00	QPSK	1/49	Z	-15.33	H	12.76	8.98	21.74	0.149	DC 12 V
	16QAM	1/49	Z	-16.72	H	11.37	8.98	20.35	0.109	DC 12 V
1732.50	**QPSK**	**1/49**	**Z**	**-14.98**	**H**	**13.21**	**9.07**	**22.28**	**0.169**	**DC 12 V**
	16QAM	1/49	Z	-15.72	H	12.47	9.07	21.54	0.143	DC 12 V
1750.00	QPSK	1/49	Z	-14.84	H	12.64	9.15	21.79	0.151	DC 12 V
	16QAM	1/49	Z	-15.67	H	11.81	9.15	20.96	0.125	DC 12 V

Note: This device was tested under all modulations, RB size and RB offsets and the worst case data are reported in the table above.

7.8 EQUIVALENT ISOTROPIC RADIATED POWER (LTE Band 25)

Freq. (MHz)	Modulation Type	RB Size/ Offset	EUT Position (Axis)	Reading Value (dBm)	Pol. (H/V)	Level at Substitute Antenna Terminal (dBm)	Substitute Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Power Supply
1855.00	**QPSK**	**1/0**	**X**	**-16.69**	**H**	**11.33**	**9.66**	**20.99**	**0.125**	**DC 12 V**
	16QAM	1/0	X	-17.82	H	10.20	9.66	19.86	0.097	DC 12 V
1882.50	QPSK	1/0	X	-18.15	H	10.65	9.78	20.43	0.110	DC 12 V
	16QAM	1/0	X	-19.23	H	9.57	9.78	19.35	0.086	DC 12 V
1910.00	QPSK	1/0	X	-19.96	H	9.12	9.92	19.04	0.080	DC 12 V
	16QAM	1/0	X	-21.17	H	7.91	9.92	17.83	0.061	DC 12 V

Note: This device was tested under all modulations, RB size and RB offsets and the worst case data are reported in the table above.

7.9 UNDESIRABLE EMISSIONS (RADIATED)

7.9.1 UNDESIRABLE EMISSIONS (LTE Band 13)

Fundamental Frequency ERP	Tested Frequency (MHz)	EUT Position (Axis)	POL (H/V)	Level at Substitute Antenna Terminal (dBm)	Substitute Antenna Gain (dBd)	Correct Generator Level (dBm)	Result (dBc)	Limit (dBc)
782 MHz 0.124 W	2359.41	Z	V	-59.57	6.73	-52.84	75.18	33.94
	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	

Note 1: Limit Calculation= 43 + 10 $\log_{10}$(ERP [W]) [dBc]
Note 2: This device was tested under all modulations, RB size and RB offsets and the worst case data are reported in the table above.(The worst case mode is the QPSK modulation type with RB size 1 and RB offset 49)
Note 3: No other spurious and harmonic emissions were reported greater than listed emissions above table.

7.9.2 UNDESIRABLE EMISSIONS IN 1599 ~ 1610 MHz(LTE Band 13)

Tested Frequency (MHz)	EUT Position (Axis)	POL (H/V)	Level at Substitute Antenna Terminal (dBm)	Substitute Antenna Gain (dBi)	Correct Generator Level (dBm)	Margin (dB)	Limit (dBm/MHz)
1571.64	Z	V	-59.69	7.47	-52.22	12.22	-40
-	-	-	-	-	-	-	

Note 1: This device was tested under all modulations, RB size and RB offsets and the worst case data are reported in the table above. (The worst case mode is the QPSK modulation type with RB size 1 and RB offset 49)
Note 2: No other spurious and harmonic emissions were reported greater than listed emissions above table.

7.9.3 UNDESIRABLE EMISSIONS IN 763 ~ 775 MHz & 793 ~ 805 MHz(LTE Band 13)

Fundamental Frequency ERP	Tested Frequency (MHz)	EUT Position (Axis)	POL (H/V)	Level at Substitute Antenna Terminal (dBm)	Substitute Antenna Gain (dBd)	Correct Generator Level (dBm)	Result (dBc)	Limit (dBc)
782 MHz	763.544	Z	V	-79.11	1.91	-77.20	98.14	55.94
0.124 W	803.032	Z	V	-79.76	1.29	-78.47	99.41	

Note 1: This device was tested under all modulations, RB size and RB offsets and the worst case data are reported in the table above. (The worst case mode is the QPSK modulation type with RB size 1 and RB offset 49)
Note 2: For part 27.53(c)(4) measurement, the FCC limit is 65 + 10$\log_{10}$($P_{[Watts]}$)= -35dBm in a 6.25KHz bandwidth. Since it was not possible to set the resolution bandwidth to 6.25KHz with the available equipment, a bandwidth of 10KHz was used instead to show compliance. By using a 10KHz bandwidth, the result was adjusted by 10$\log_{10}$(10KHz/6.25KHz) = 2.04dB.
Note 3: No other spurious and harmonic emissions were reported greater than listed emissions above table.

7.9.4 UNDESIRABLE EMISSIONS (LTE Band 4)

Fundamental Frequency EIRP	Frequency (MHz)	EUT Position (Axis)	POL (H/V)	Level at Substitute Antenna Terminal (dBm)	Substitute Antenna Gain (dBi)	Correct Generator Level (dBm)	Result (dBc)	Limit (dBc)
1715.0 MHz 0.149 W	3438.20	X	H	-44.97	9.86	-35.11	56.86	34.74
	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	
1732.5 MHz 0.169 W	3473.87	X	H	-48.10	9.86	-38.24	60.52	35.28
	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	
1750.0 MHz 0.151 W	3507.87	X	H	-42.34	9.87	-32.47	54.27	34.79
	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	

Note 1: Limit Calculation= 43 + 10 $\log_{10}$(ERP [W]) [dBc]
Note 2: This device was tested under all modulations, RB size and RB offsets and the worst case data are reported in the table above.(The worst case mode is the QPSK modulation type with RB size 1 and RB offset 49)
Note 3: No other spurious and harmonic emissions were reported greater than listed emissions above table.

7.9.5 UNDESIRABLE EMISSIONS (LTE Band 25)

Fundamental Frequency EIRP	Frequency (MHz)	EUT Position (Axis)	POL (H/V)	Level at Substitute Antenna Terminal (dBm)	Substitute Antenna Gain (dBi)	Correct Generator Level (dBm)	Result (dBc)	Limit (dBc)
1855.0 MHz 0.125 W	3701.00	Z	H	-49.83	9.90	-39.93	60.92	33.99
	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	
1882.5 MHz 0.110 W	3756.25	Z	H	-52.32	9.90	-42.42	62.84	33.43
	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	
1910.0 MHz 0.080 W	3811.55	Z	H	-48.39	9.91	-38.48	57.52	32.04
	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	

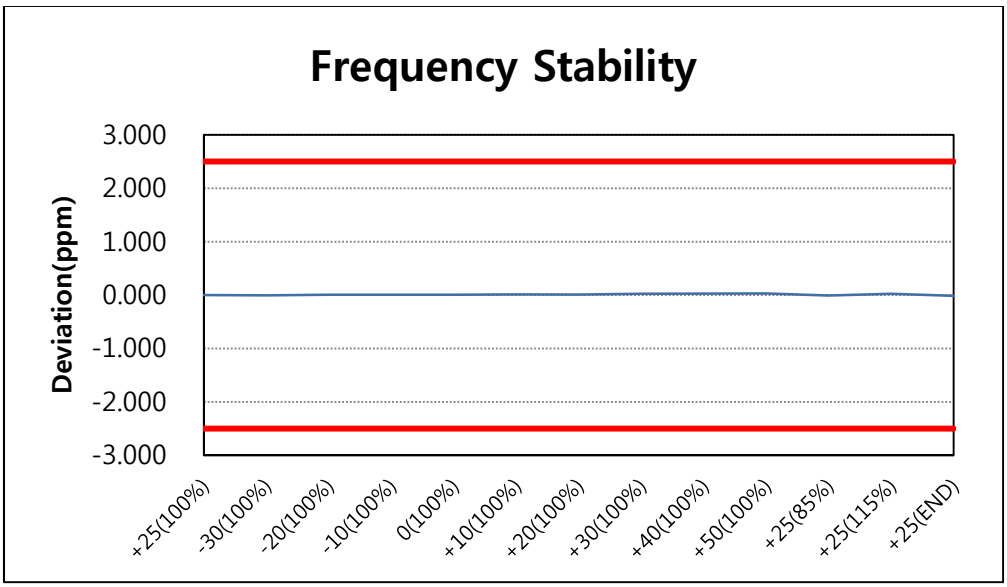
Note 1: Limit Calculation= 43 + 10 $\log_{10}$(ERP [W]) [dBc]
Note 2: This device was tested under all modulations, RB size and RB offsets and the worst case data are reported in the table above.(The worst case mode is the QPSK modulation type with RB size 1 and RB offset 49)
Note 3: No other spurious and harmonic emissions were reported greater than listed emissions above table.

7.10 FREQUENCY STABILITY

7.10.1 FREQUENCY STABILITY (LTE Band 13)

OPERATING FREQUENCY : 781,999,985 Hz
FREQUENCY : 782(Mid)
REFERENCE VOLTAGE : 12.00V DC
DEVIATION LIMIT : ± 0.00025 % or 2.5 ppm

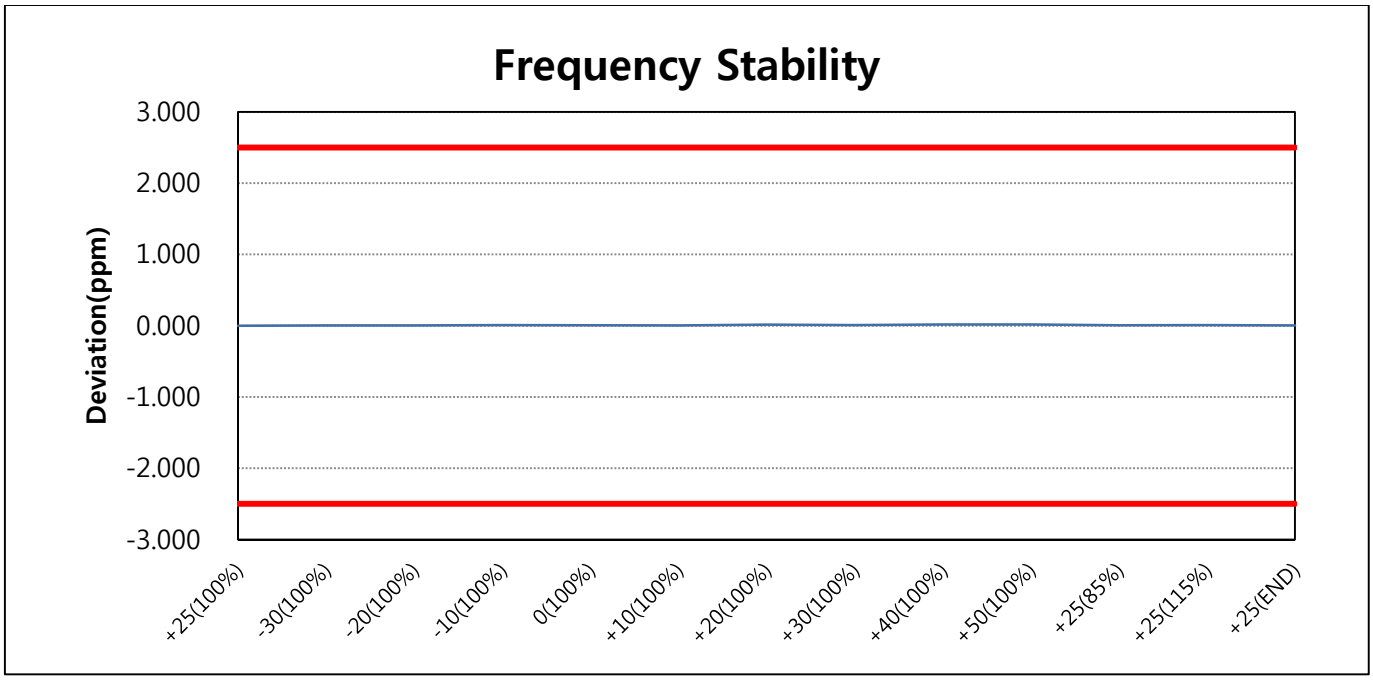
VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation	
				(ppm)	(%)
100%	12.00	+25(Ref)	781,999,985	0.000	0.00000000
100%		-30	781,999,981	-0.005	-0.00000051
100%		-20	781,999,992	0.009	0.00000090
100%		-10	781,999,990	0.006	0.00000064
100%		0	781,999,992	0.009	0.00000090
100%		+10	781,999,995	0.013	0.00000128
100%		+20	781,999,993	0.010	0.00000102
100%		+30	782,000,006	0.027	0.00000269
100%		+40	782,000,009	0.031	0.00000307
100%		+50	782,000,010	0.032	0.00000320
85%	10.20	+25	781,999,978	-0.009	-0.00000090
115%	13.80	+25	782,000,006	0.027	0.00000269
BATT.ENDPOINT	-	-	-	-	-



7.10.2 FREQUENCY STABILITY (LTE Band 4)

OPERATING FREQUENCY : 1,732,499,978Hz
FREQUENCY : 1732.50(Mid)
REFERENCE VOLTAGE : 12.00V DC
DEVIATION LIMIT : ± 0.00025 % or 2.5 ppm

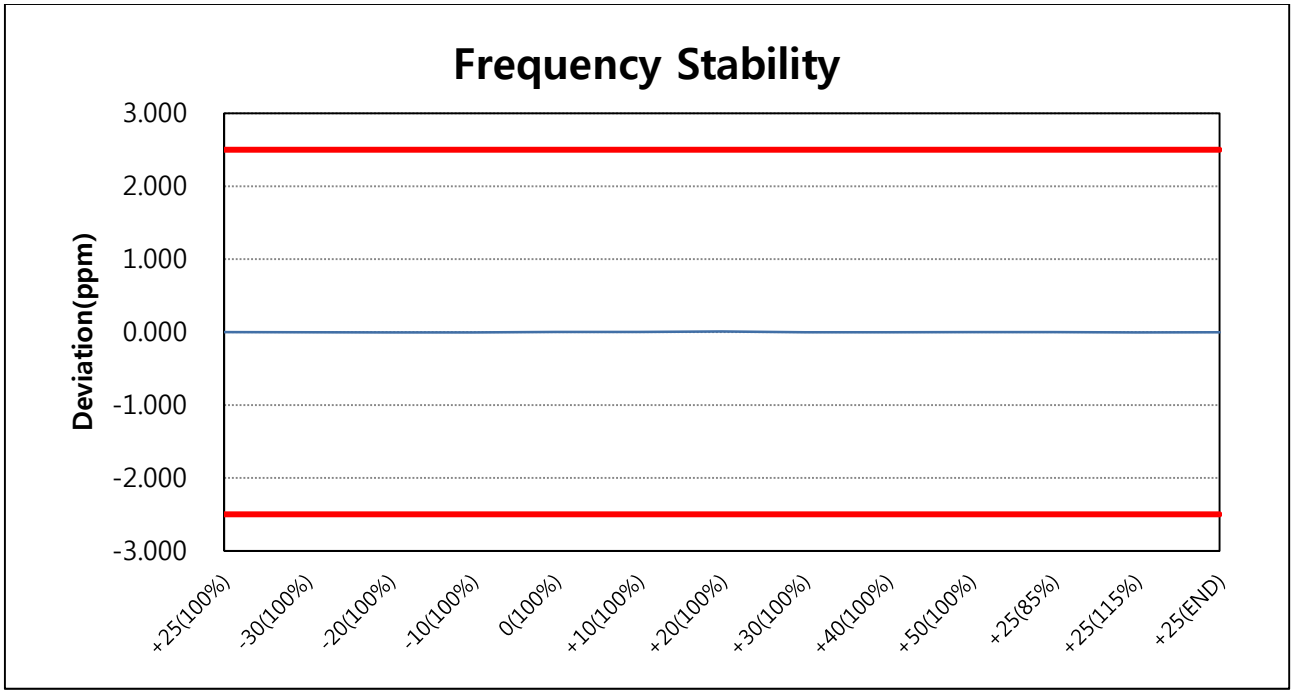
VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation	
				(ppm)	(%)
100%	12.00	+25(Ref)	1,732,499,978	0.000	0.00000000
100%		-30	1,732,499,986	0.005	0.00000046
100%		-20	1,732,499,985	0.004	0.00000040
100%		-10	1,732,499,992	0.008	0.00000081
100%		0	1,732,499,991	0.008	0.00000075
100%		+10	1,732,499,986	0.005	0.00000046
100%		+20	1,732,500,007	0.017	0.00000167
100%		+30	1,732,499,995	0.010	0.00000098
100%		+40	1,732,500,011	0.019	0.00000190
100%		+50	1,732,500,012	0.020	0.00000196
85%	10.20	+25	1,732,499,990	0.007	0.00000069
115%	13.80	+25	1,732,499,992	0.008	0.00000081
BATT.ENDPOINT	-	-	-	-	-



7.10.3 FREQUENCY STABILITY (LTE Band 25)

OPERATING FREQUENCY : 1,882,499,988Hz
FREQUENCY : 1882.50(Mid)
REFERENCE VOLTAGE : 12.00V DC
DEVIATION LIMIT : ± 0.00025 % or 2.5 ppm

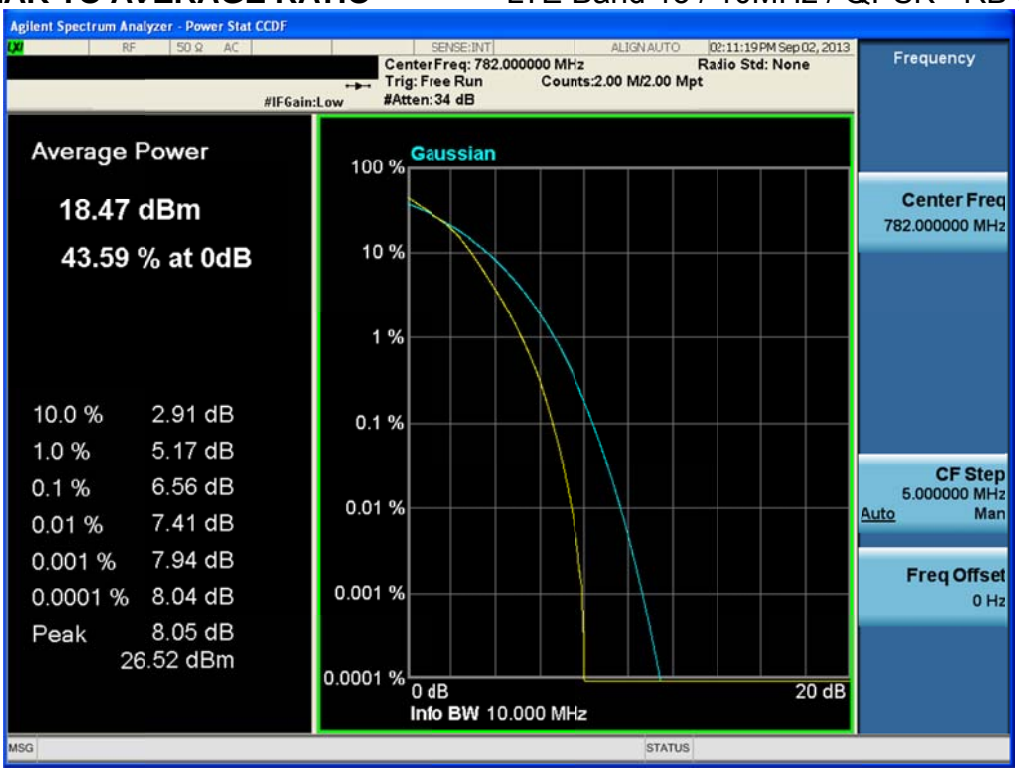
VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation	
				(ppm)	(%)
100%	12.00	+25(Ref)	1,882,499,988	0.000	0.00000000
100%		-30	1,882,499,985	-0.002	-0.00000016
100%		-20	1,882,499,981	-0.004	-0.00000037
100%		-10	1,882,499,979	-0.005	-0.00000048
100%		0	1,882,499,993	0.003	0.00000027
100%		+10	1,882,499,994	0.003	0.00000032
100%		+20	1,882,500,006	0.010	0.00000096
100%		+30	1,882,499,986	-0.001	-0.00000011
100%		+40	1,882,499,983	-0.003	-0.00000027
100%		+50	1,882,499,987	-0.001	-0.00000005
85%	10.20	+25	1,882,499,988	0.000	0.00000000
115%	13.80	+25	1,882,499,978	-0.005	-0.00000053
BATT.ENDPOINT	-	-	-	-	-



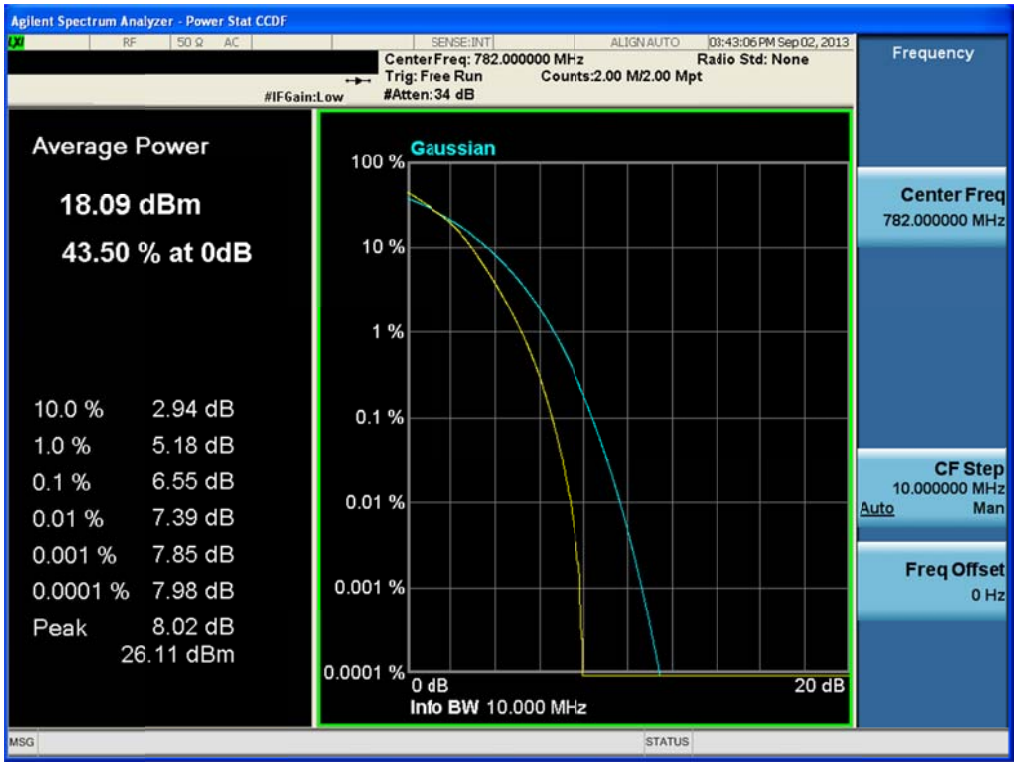
8. TEST PLOTS

8.1 PEAK TO AVERAGE RATIO

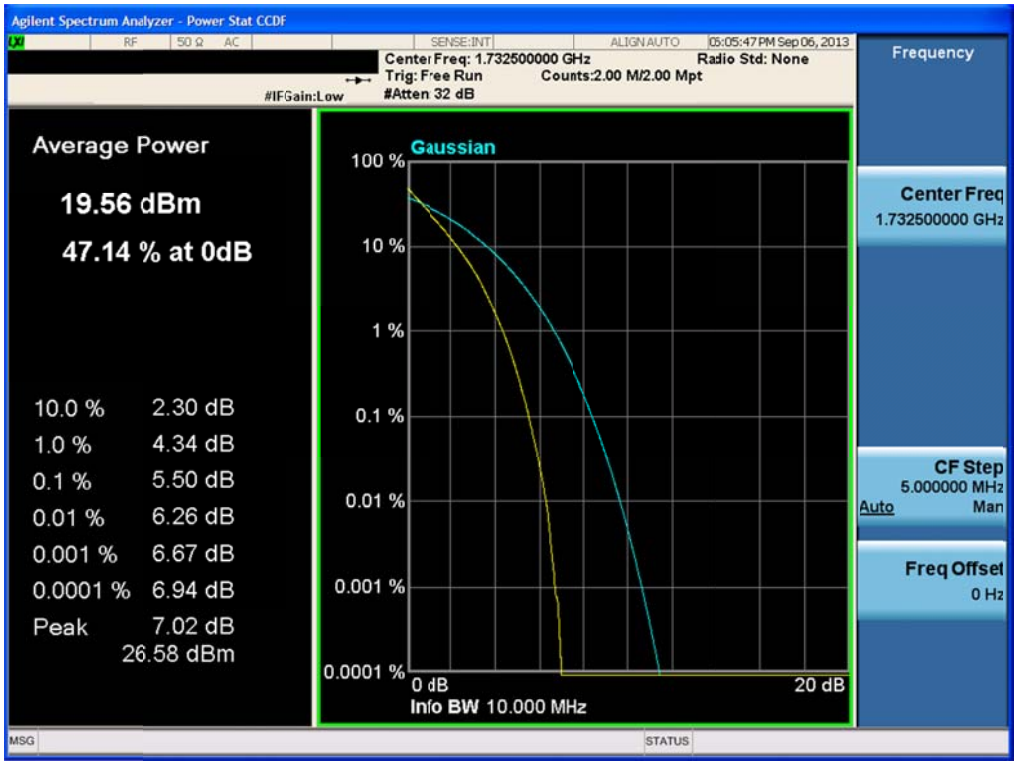
LTE Band 13 / 10MHz / QPSK - RB Size 50



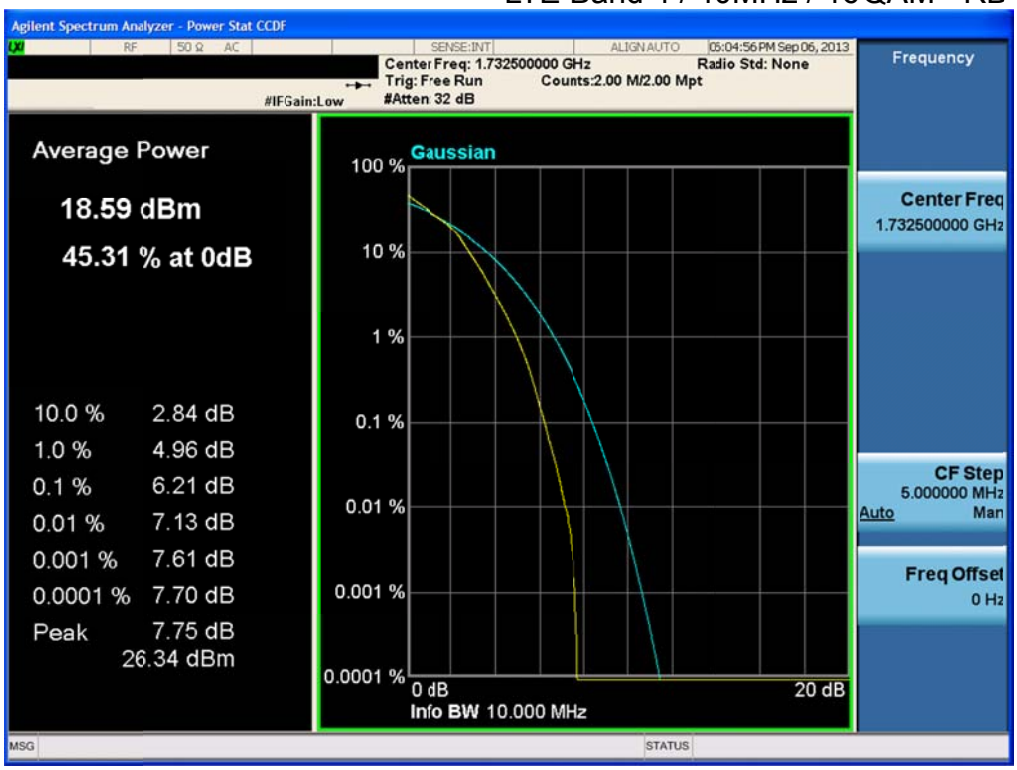
LTE Band 13 / 10MHz / 16QAM - RB Size 50



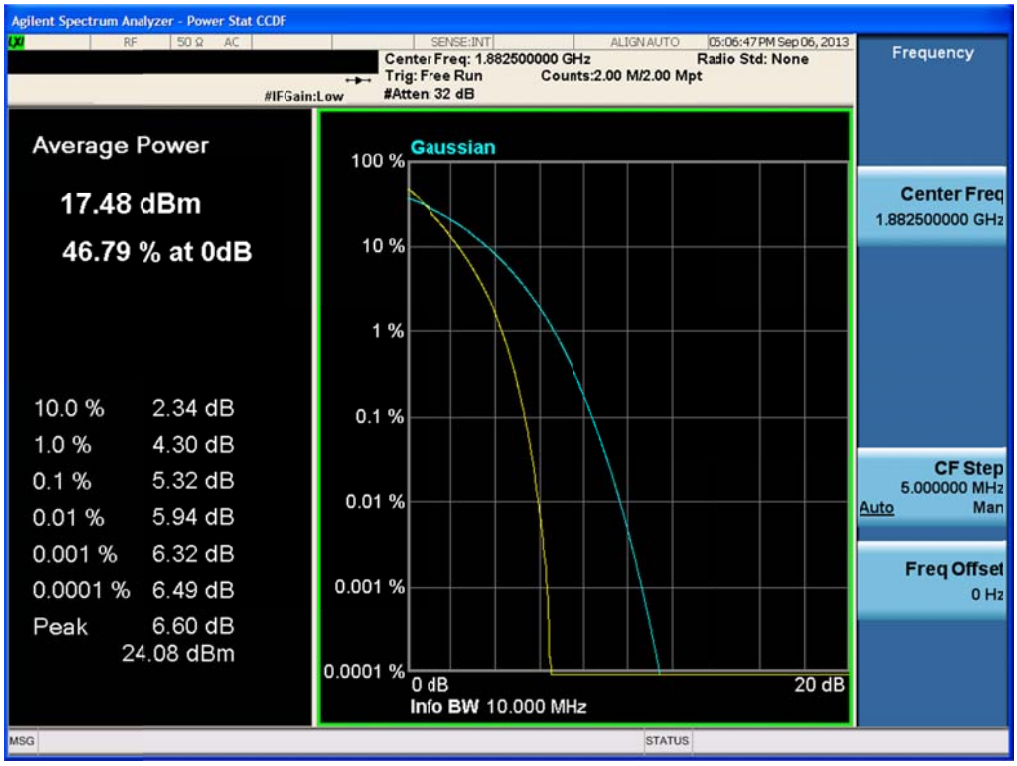
LTE Band 4 / 10MHz / QPSK - RB Size 50



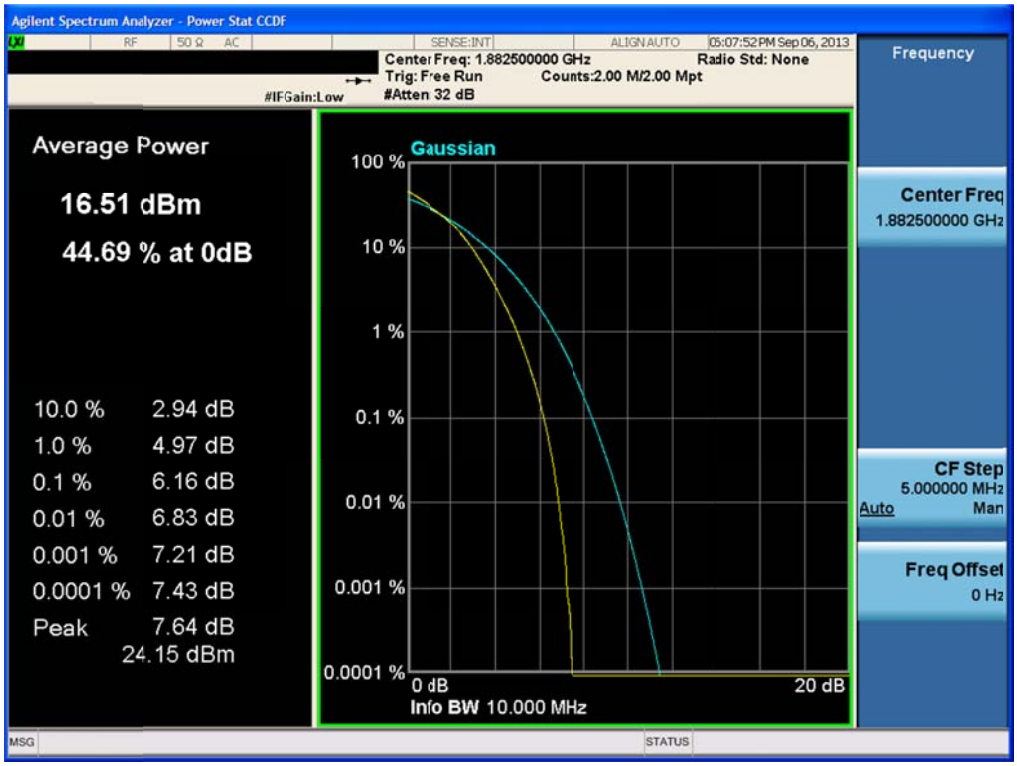
LTE Band 4 / 10MHz / 16QAM - RB Size 50



LTE Band 25 / 10MHz / QPSK - RB Size 50



LTE Band 25 10MHz 16QAM - RB Size 50



8.2 OCCUPIED BANDWIDTH

LTE Band 13 / 10MHz / QPSK - RB Size 50

LTE Band 13 / 10MHz / 16QAM - RB Size 50

LTE Band 4 / 10MHz / QPSK - RB Size 50

LTE Band 4 / 10MHz / 16QAM - RB Size 50

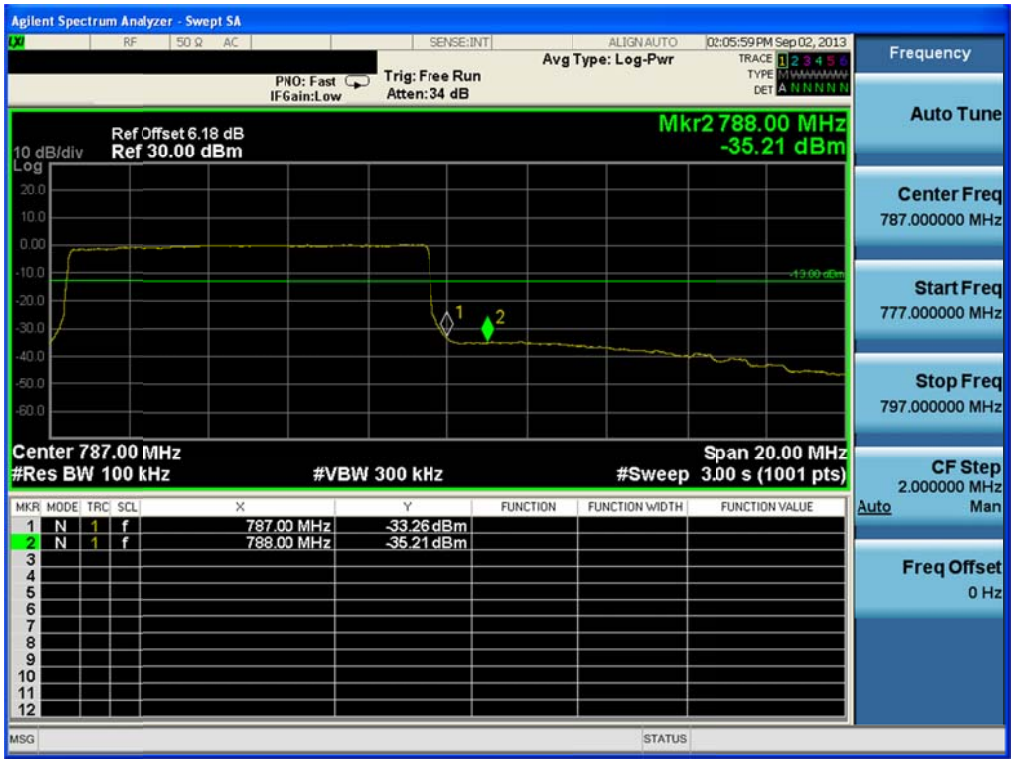
LTE Band 25 / 10MHz / QPSK - RB Size 50

LTE Band 25 / 10MHz / 16QAM - RB Size 50

8.3 UNDESIRABLE EMISSIONS (CONDUCTED)

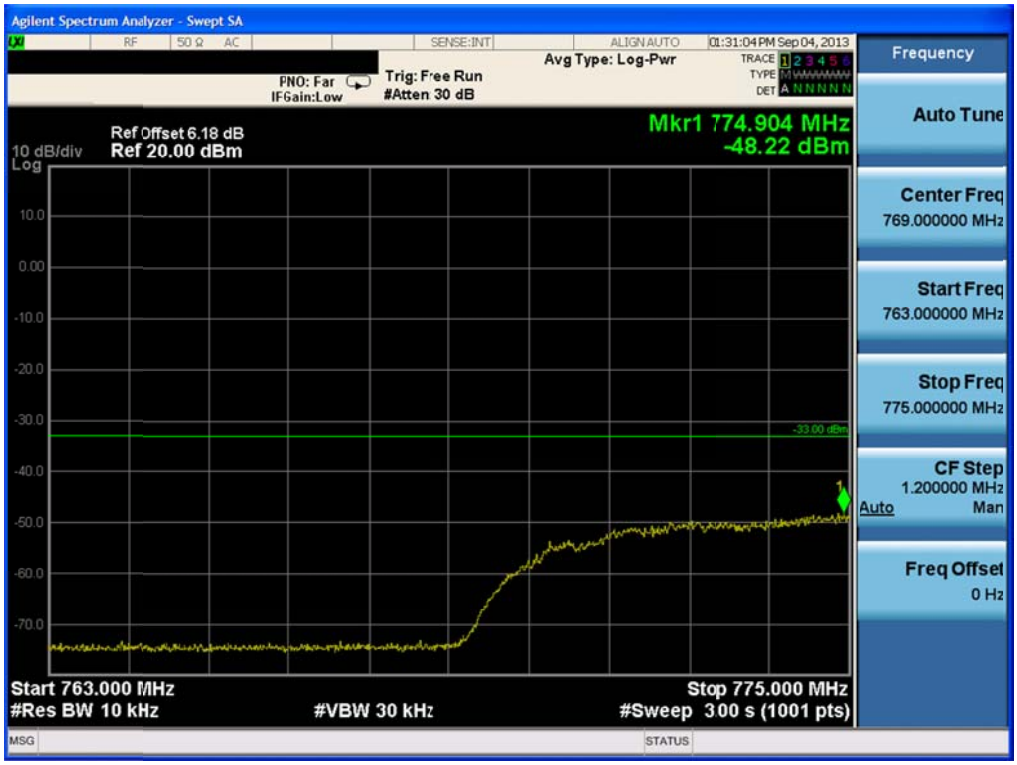
Undesirable emissions at band edge

LTE Band 13 / 10MHz / QPSK - RB Size 50 - Lowest Channel(782MHz)



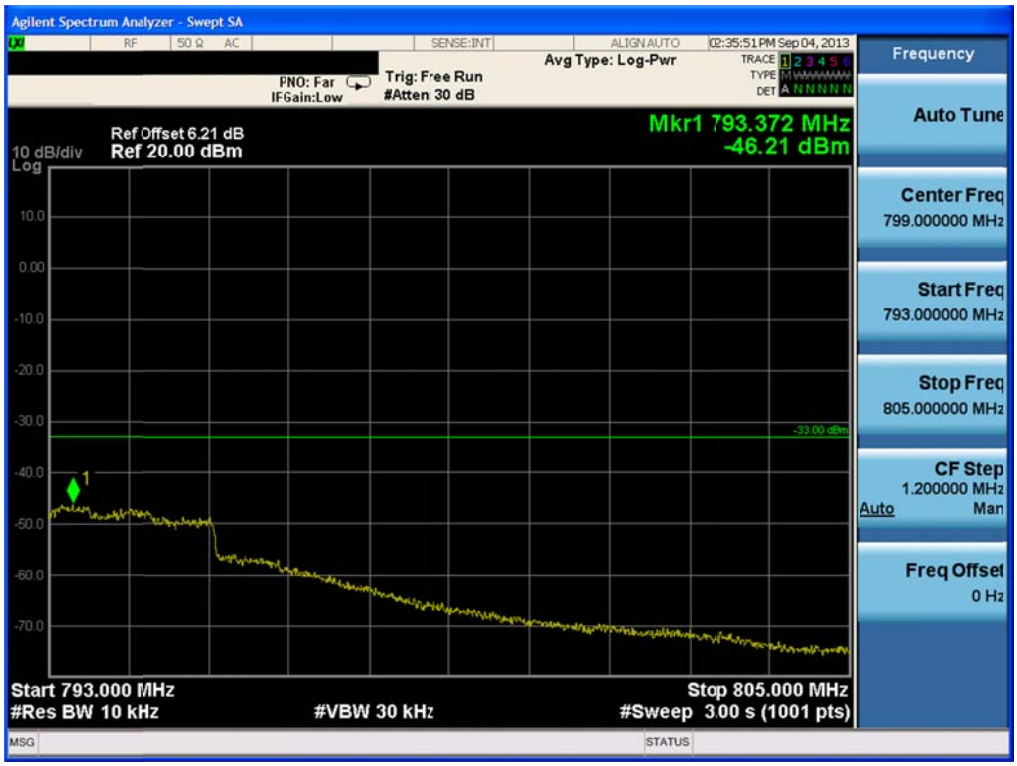
LTE Band 13 / 10MHz / QPSK - RB Size 50 (782 MHz)

Undesirable emissions in 763 ~ 775 MHz



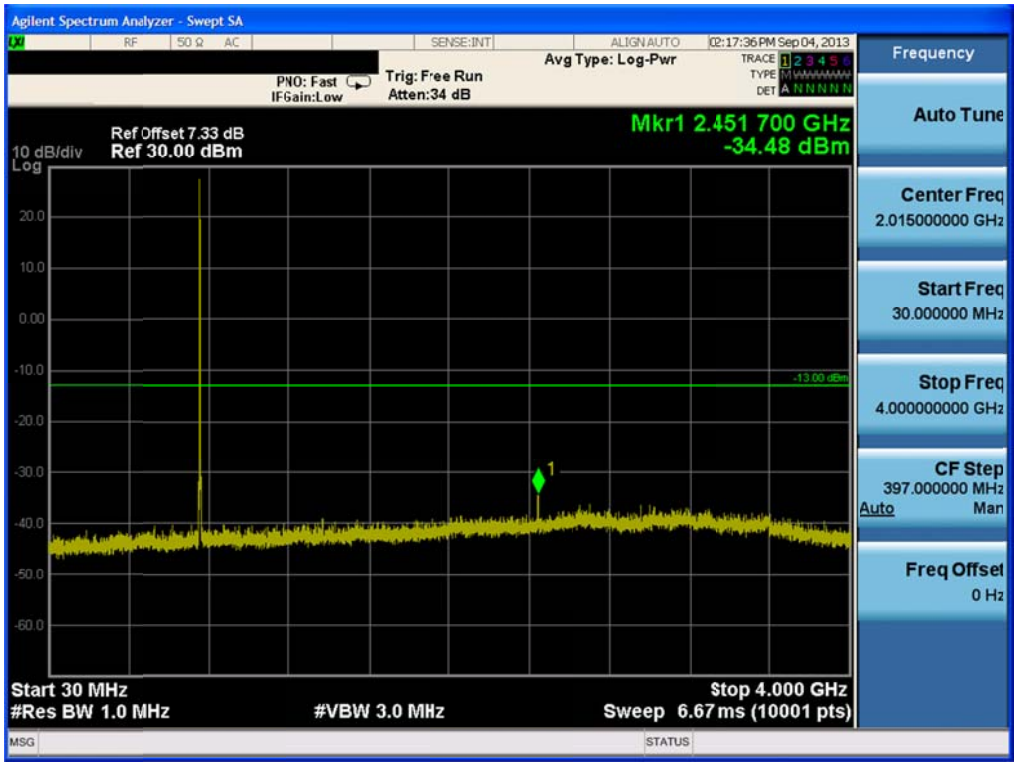
LTE Band 13 / 10MHz / QPSK - RB Size 50 - Lowest Channel(782MHz)

Undesirable emissions in 793 ~ 805 MHz

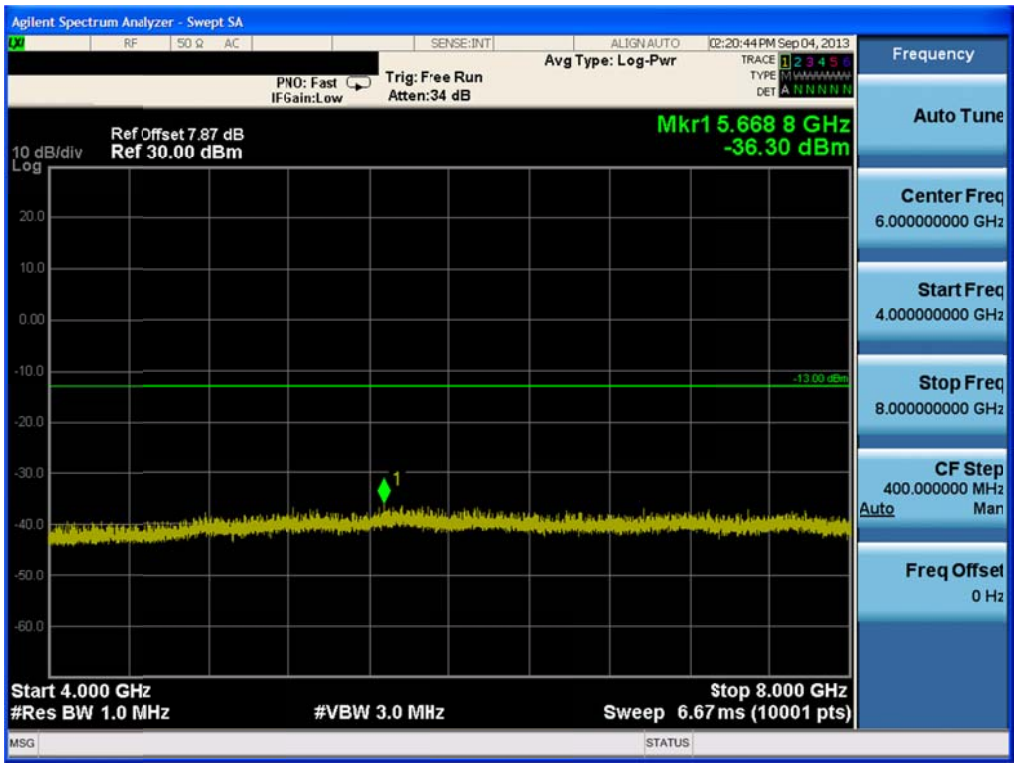


LTE Band 13 / 10MHz / QPSK - RB Size 50 - Lowest Channel(782MHz)

Undesirable emissions for all out-of-band emissions



LTE Band 13 / 10MHz / QPSK - RB Size 1, RB Offset 0 - Lowest Channel(782MHz)



LTE Band 13 / 10MHz / QPSK - RB Size 1, RB Offset 0 - Lowest Channel(782MHz)

Undesirable emissions at band edge

LTE Band 4 / 10MHz / QPSK - RB Size 50 - Low Channel(1715MHz)

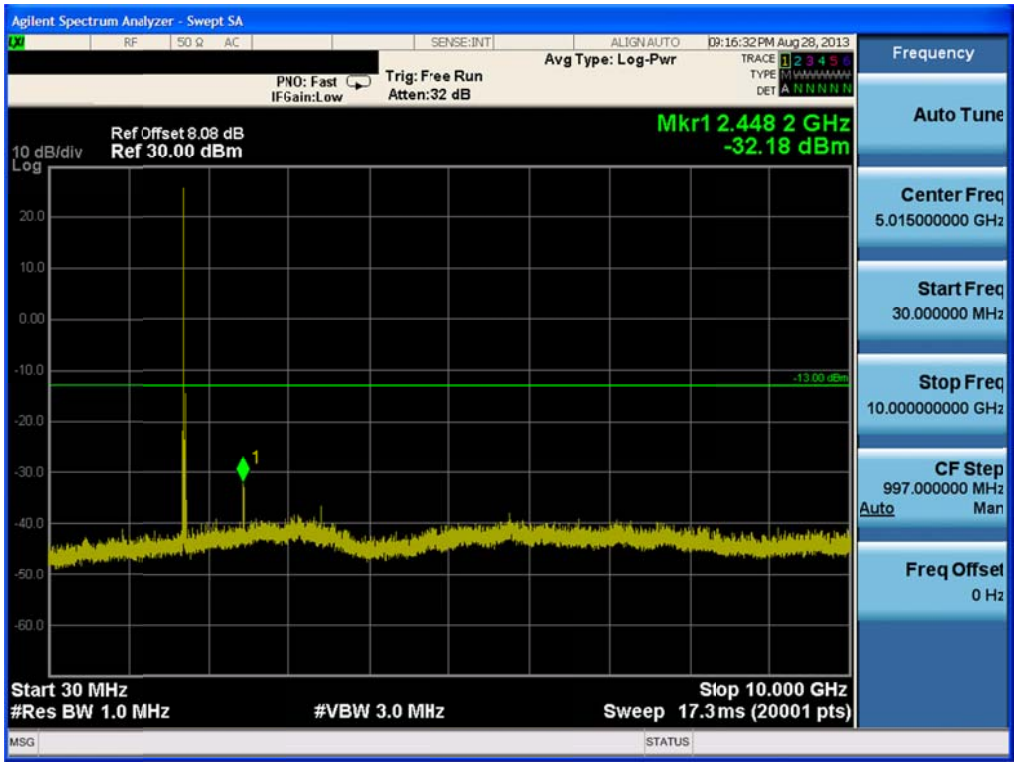
LTE Band 4 / 10MHz / QPSK - RB Size 50 - Low Channel(1715MHz)

Undesirable emissions at band edge

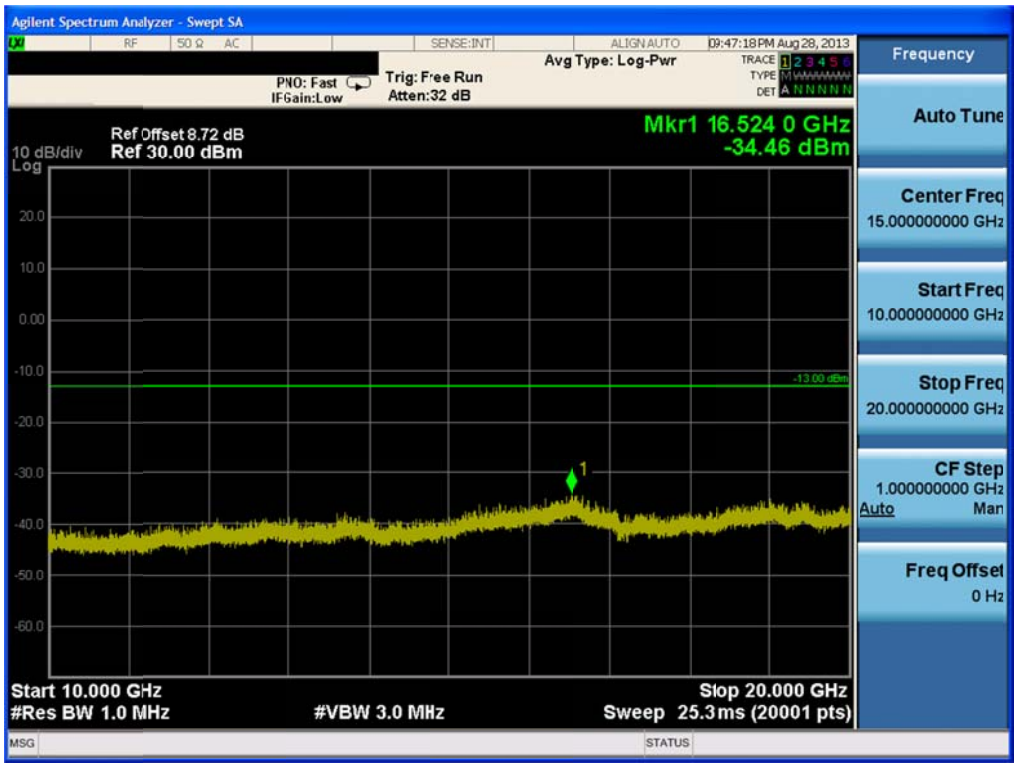
LTE Band 4 / 10MHz / QPSK - RB Size 50 - High Channel(1750MHz)

LTE Band 4 / 10MHz / QPSK - RB Size 50 - High Channel(1750MHz)

Undesirable emissions for all out-of-band emissions

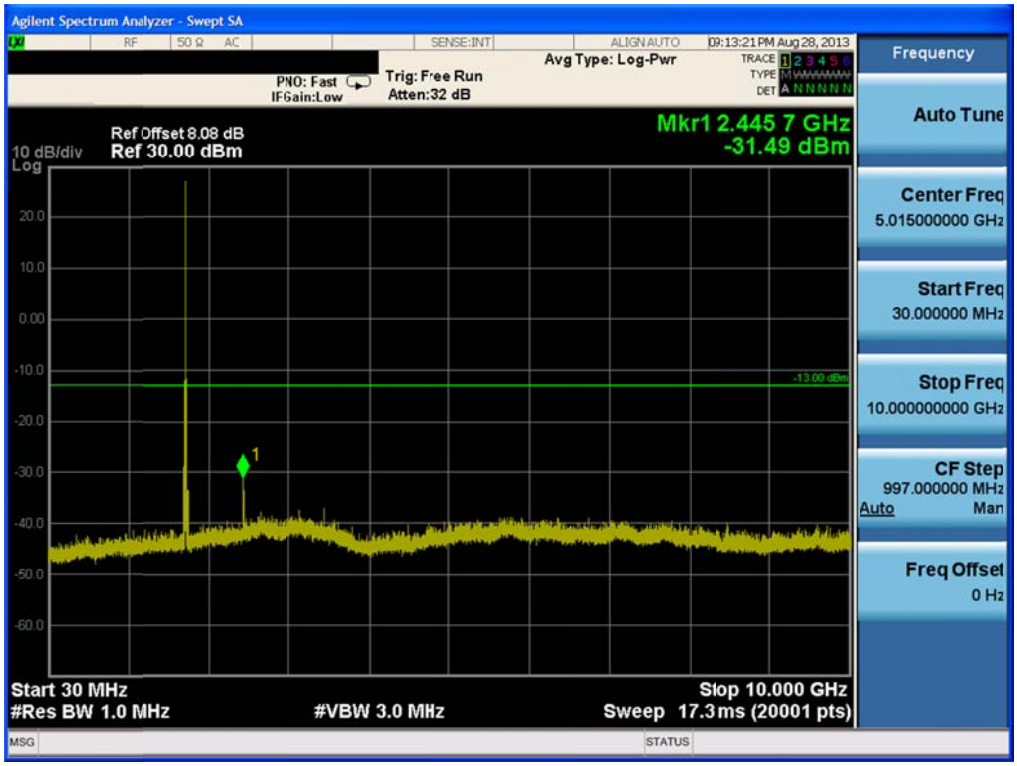


LTE Band 4 / 10MHz / QPSK - RB Size 1, RB Offset 0 - Low Channel(1715MHz)

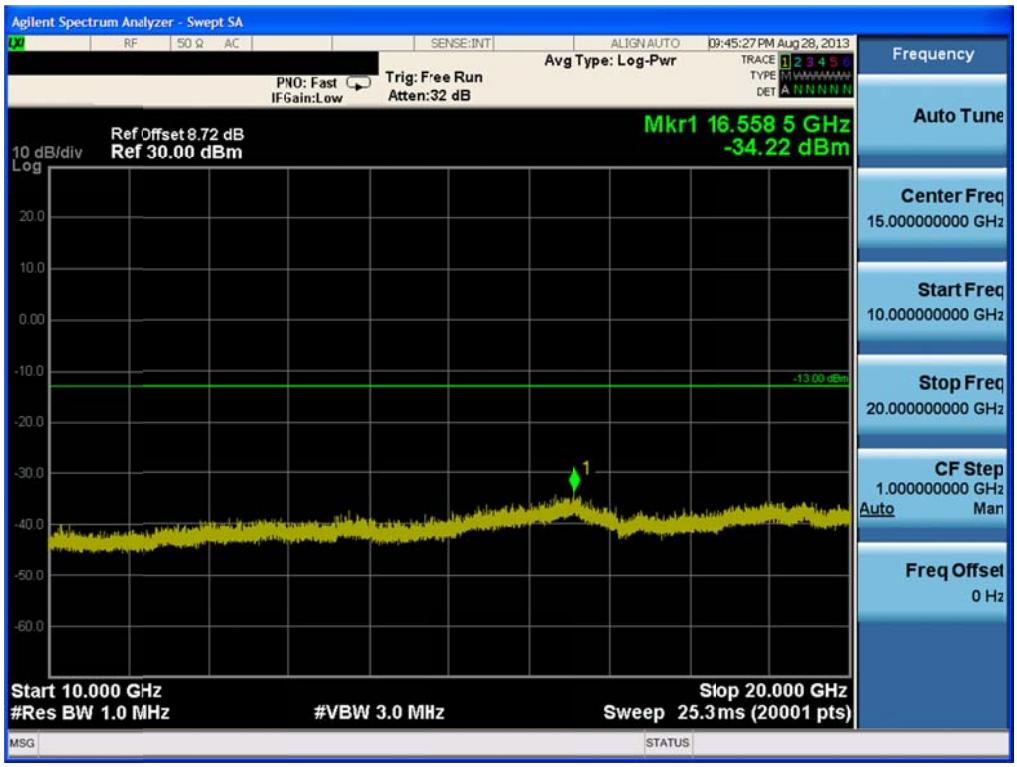


LTE Band 4 / 10MHz / QPSK - RB Size 1, RB Offset 0 - Low Channel(1715MHz)

Undesirable emissions for all out-of-band emissions

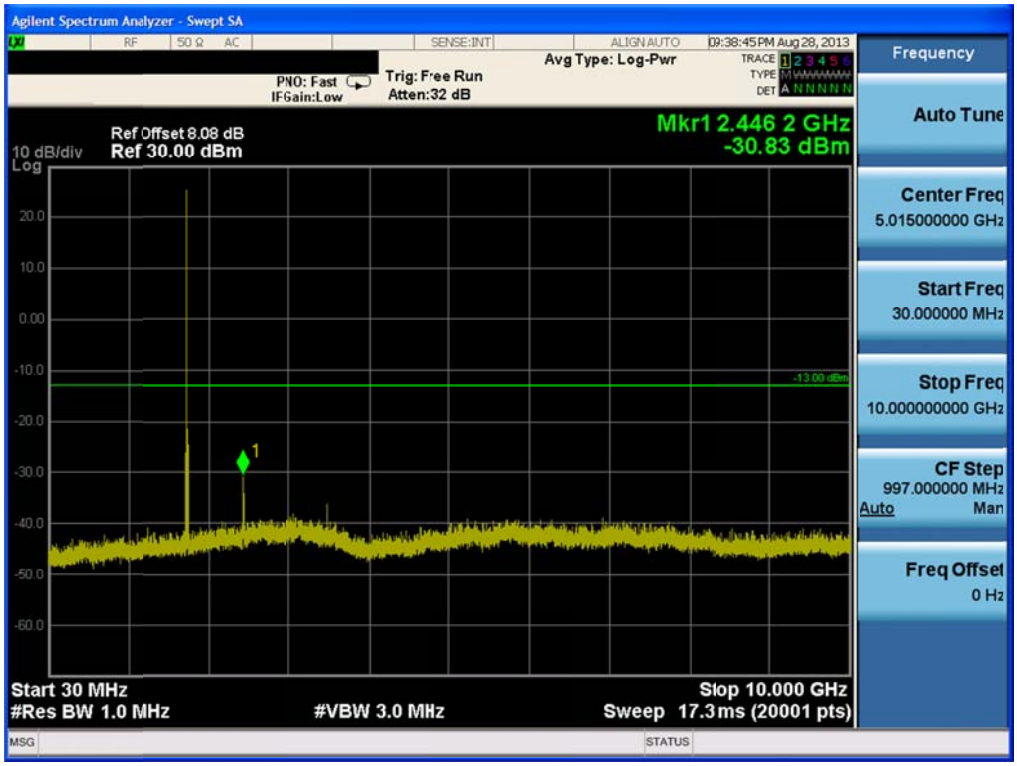


LTE Band 4 / 10MHz / QPSK - RB Size 1, RB Offset 0 - Mid Channel(1732.5MHz)

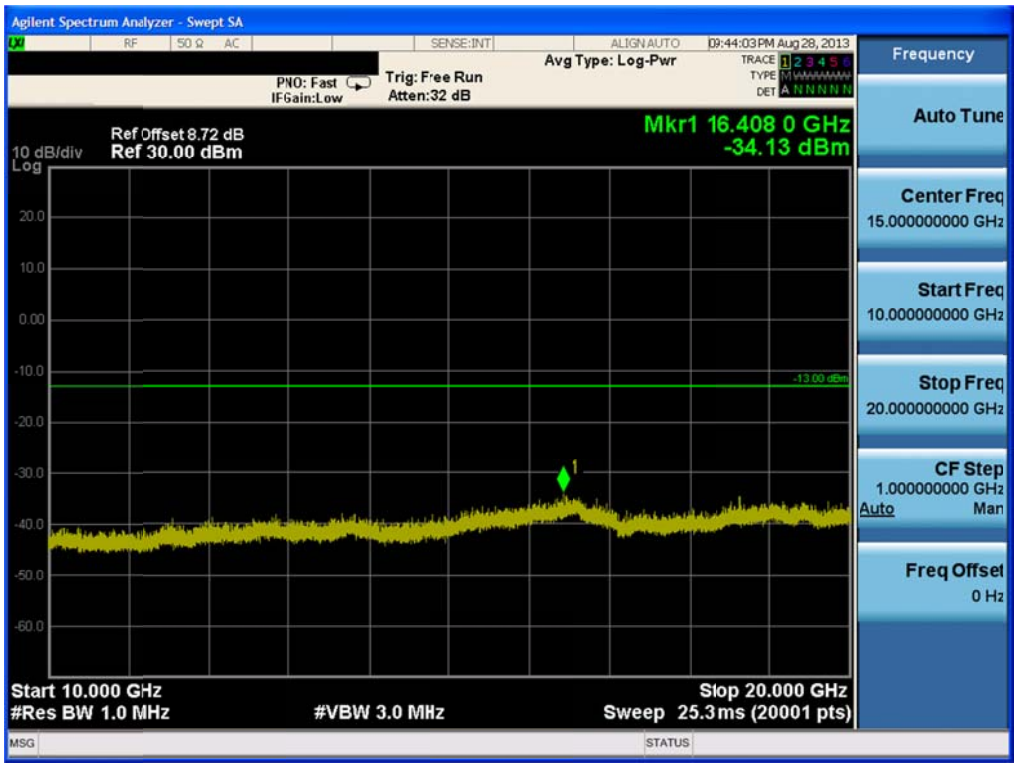


LTE Band 4 / 10MHz / QPSK - RB Size 1, RB Offset 0 - Mid Channel(1732.5MHz)

Undesirable emissions for all out-of-band emissions

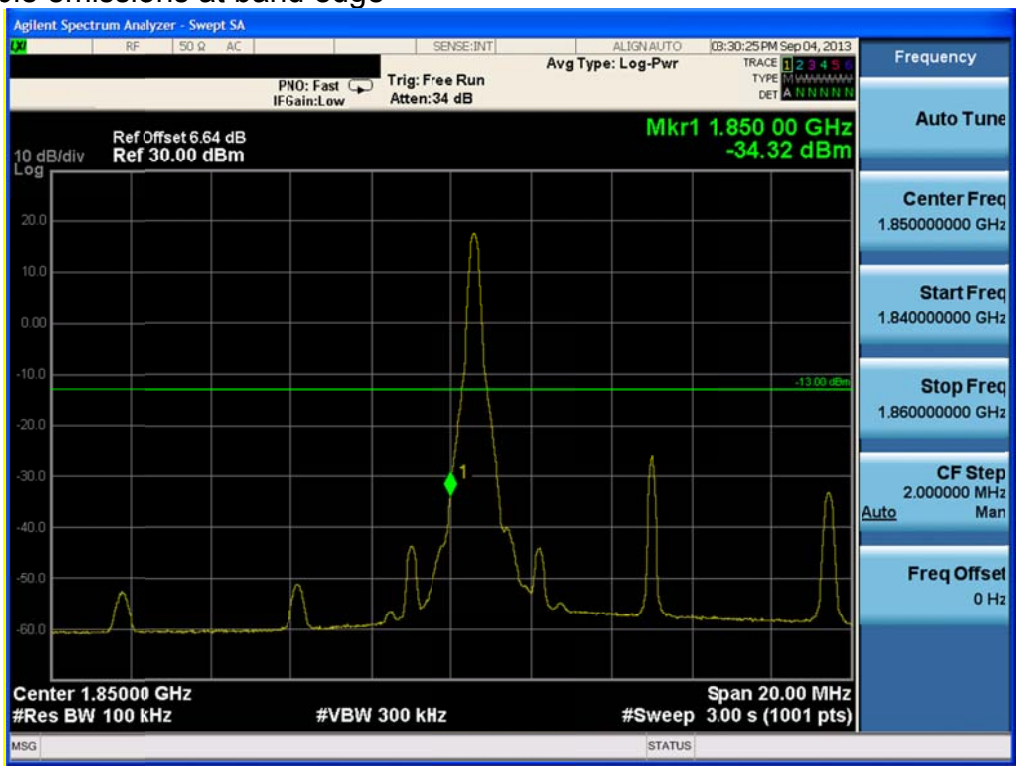


LTE Band 4 / 10MHz / QPSK - RB Size 1, RB Offset 0 - High Channel(1750MHz)

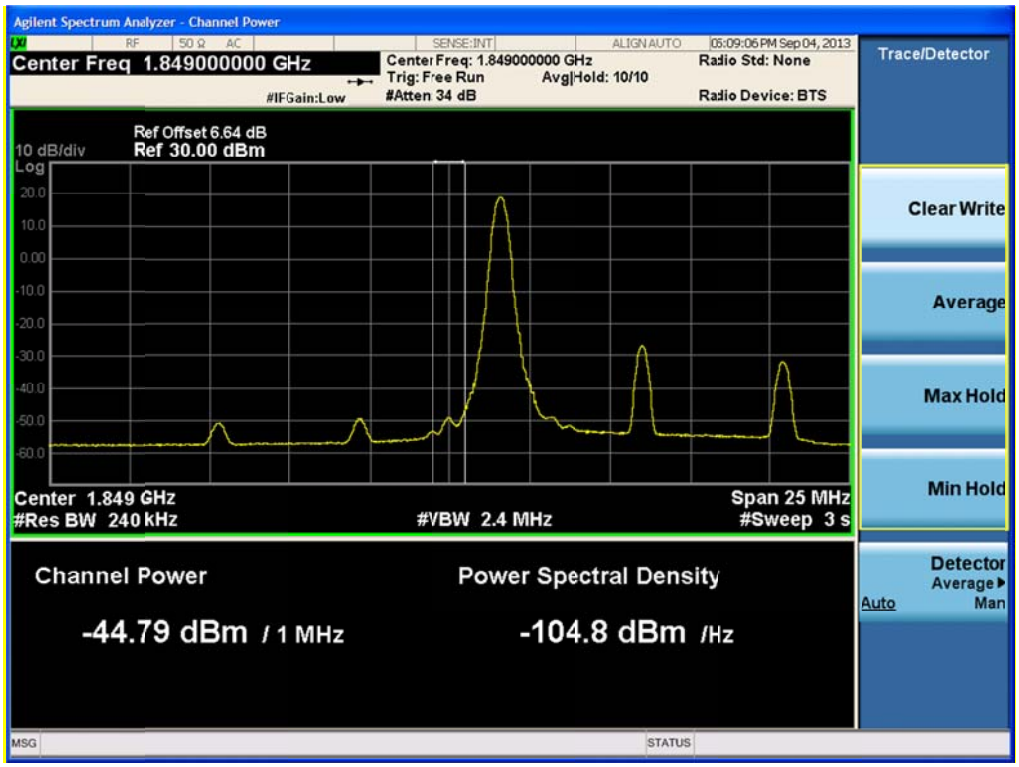


LTE Band 4 / 10MHz / QPSK - RB Size 1, RB Offset 0 - High Channel(1750MHz)

Undesirable emissions at band edge

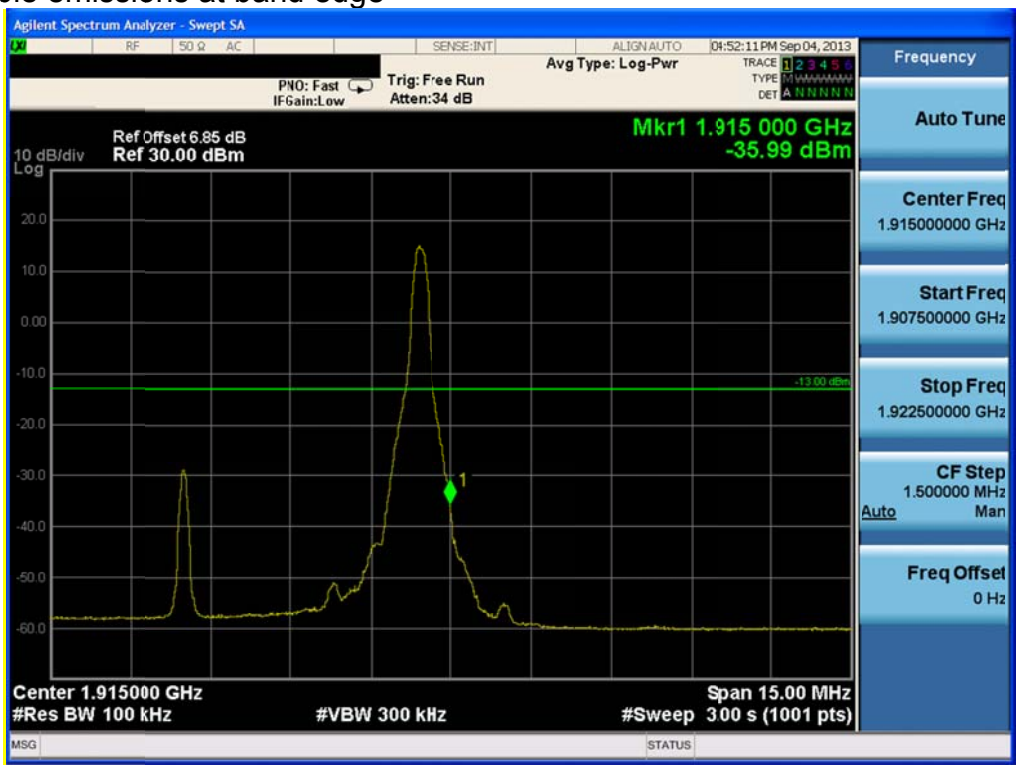


LTE Band 25 / 10MHz / QPSK - RB Size 1, RB Offset 0 - Low Channel

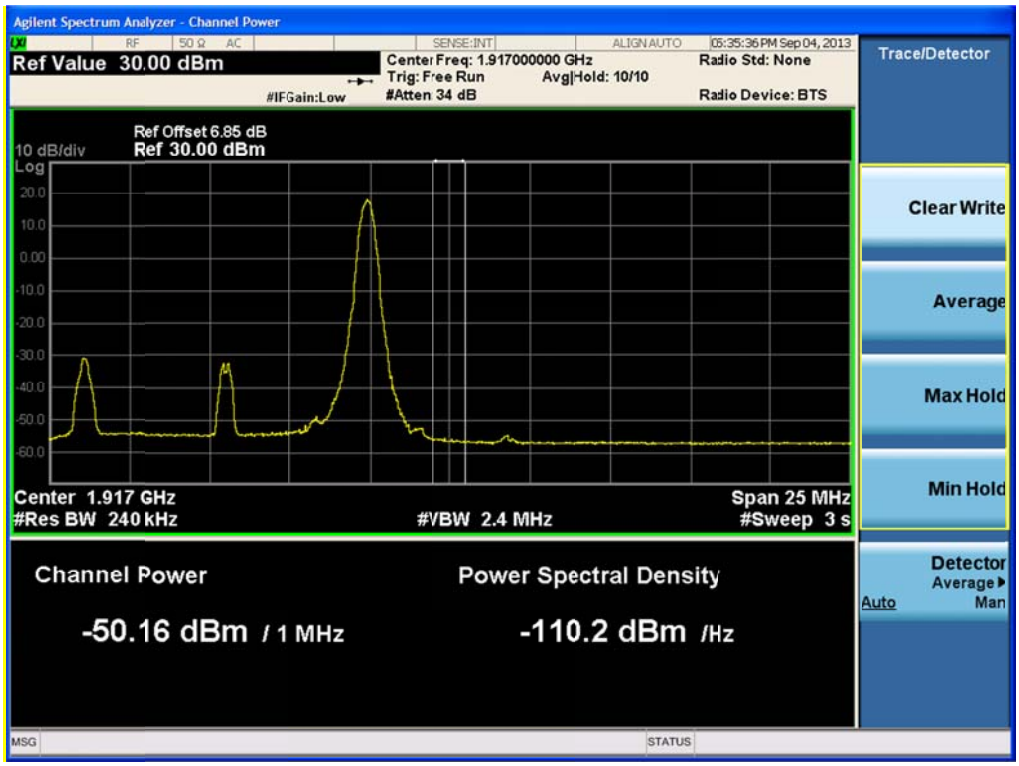


LTE Band 25 / 10MHz / QPSK - RB Size 1, RB Offset 0 - Low Channel

Undesirable emissions at band edge

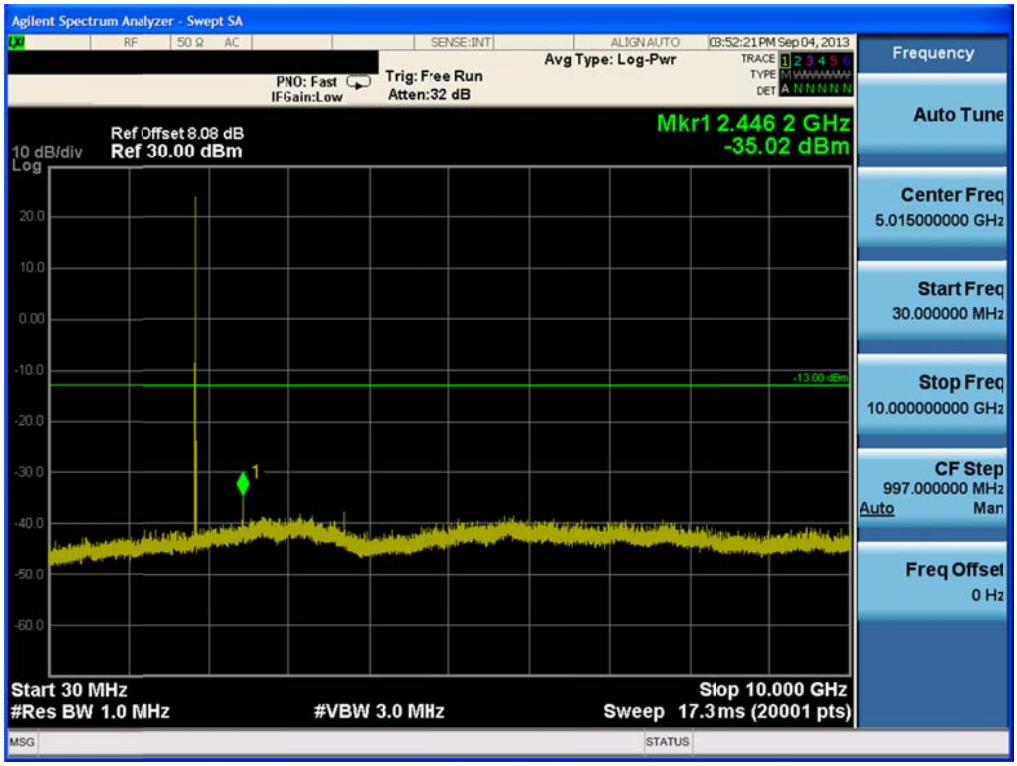


LTE Band 25 / 10MHz / QPSK - RB Size 1, RB Offset 49 - High Channel

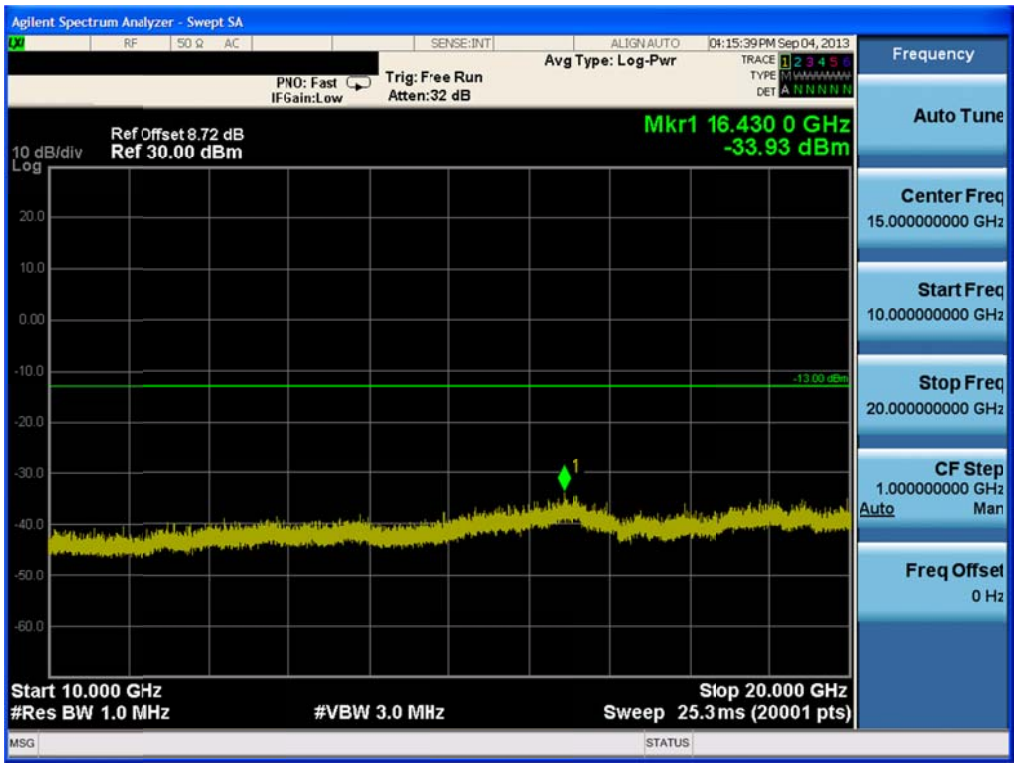


LTE Band 25 / 10MHz / QPSK - RB Size 1, RB Offset 49 - High Channel

Undesirable emissions for all out-of-band emissions

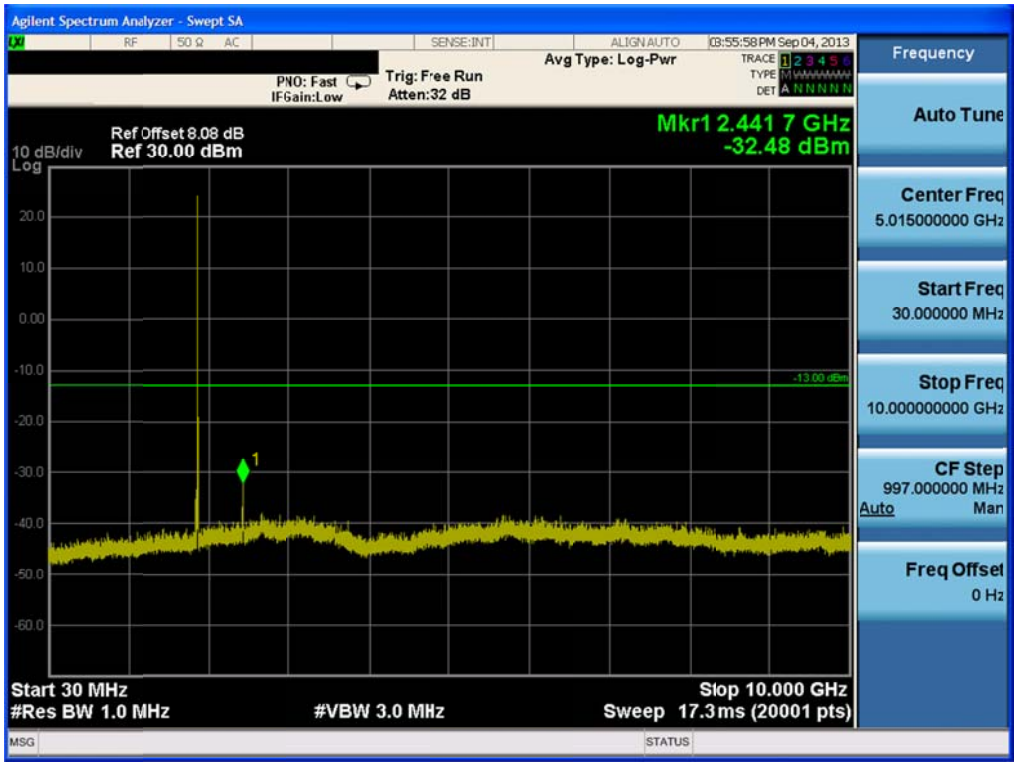


LTE Band 25 / 10MHz / QPSK - RB Size 1, RB Offset 0 - Low Channel(1855MHz)

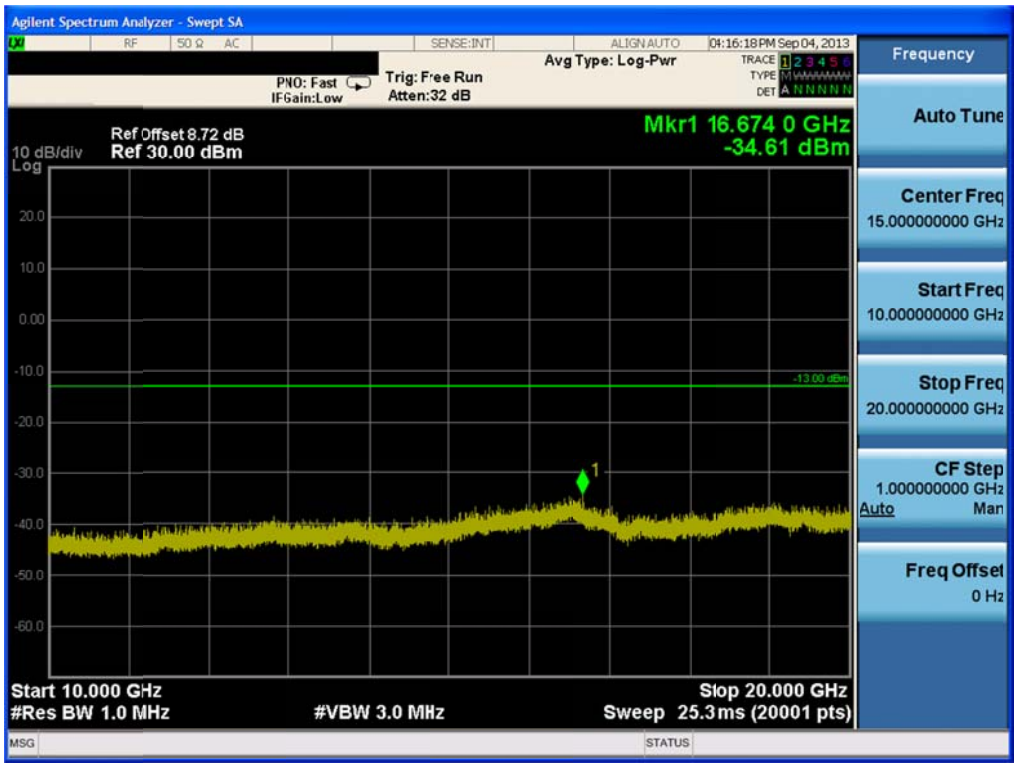


LTE Band 25 / 10MHz / QPSK - RB Size 1, RB Offset 0 - Low Channel(1855MHz)

Undesirable emissions for all out-of-band emissions

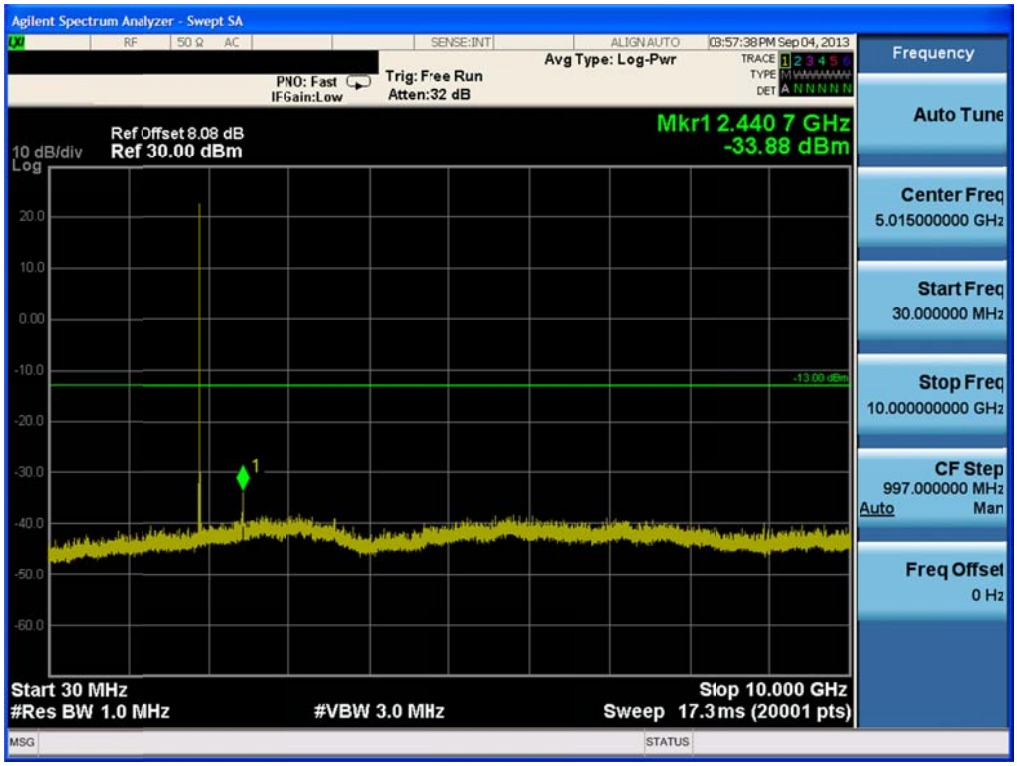


LTE Band 25 / 10MHz / QPSK - RB Size 1, RB Offset 0 - Mid Channel(1882.5MHz)

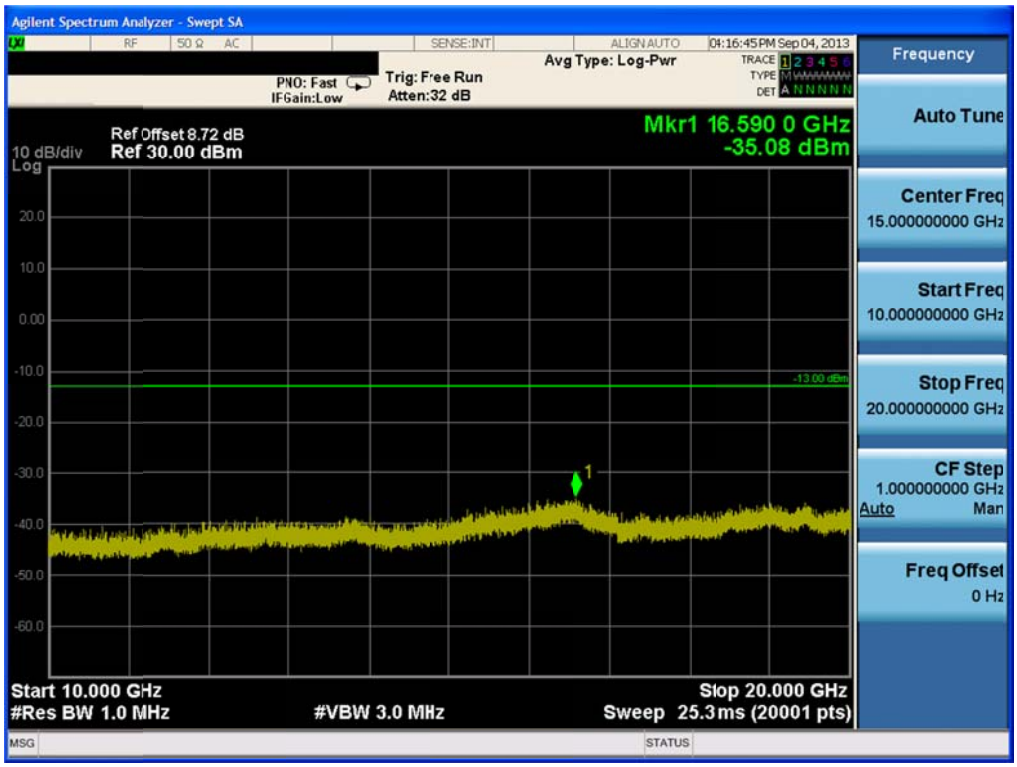


LTE Band 25 / 10MHz / QPSK - RB Size 1, RB Offset 0 - Mid Channel(1882.5MHz)

Undesirable emissions for all out-of-band emissions



LTE Band 25 / 10MHz / QPSK - RB Size 1, RB Offset 0 - High Channel(1910MHz)



LTE Band 25 / 10MHz / QPSK - RB Size 1, RB Offset 0 - High Channel(1910MHz)