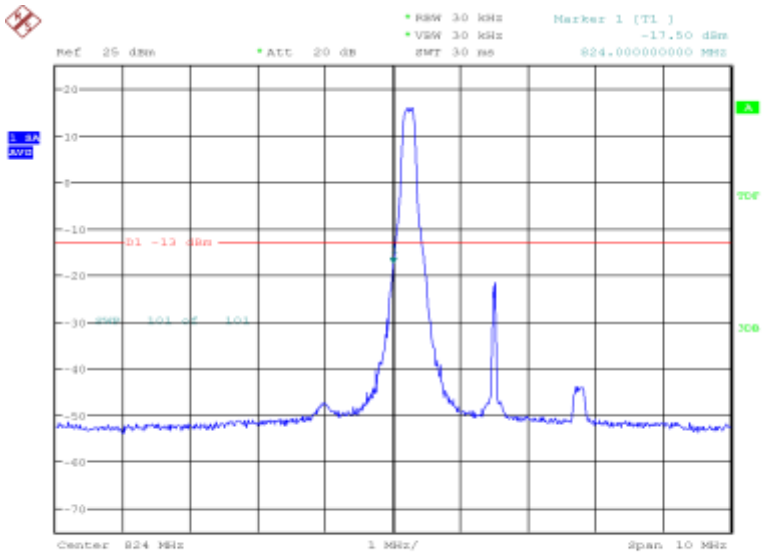
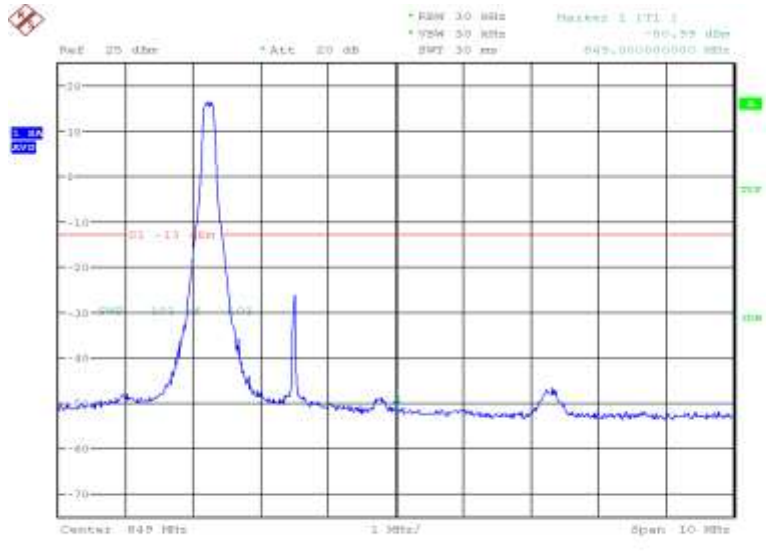
16QAM Band 5 (3 MHz BANDWIDTH)

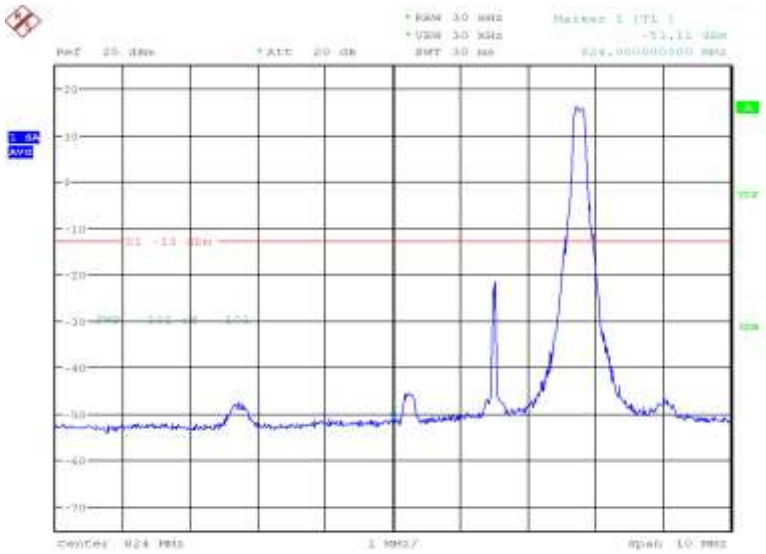
LOW CH, RB1-0



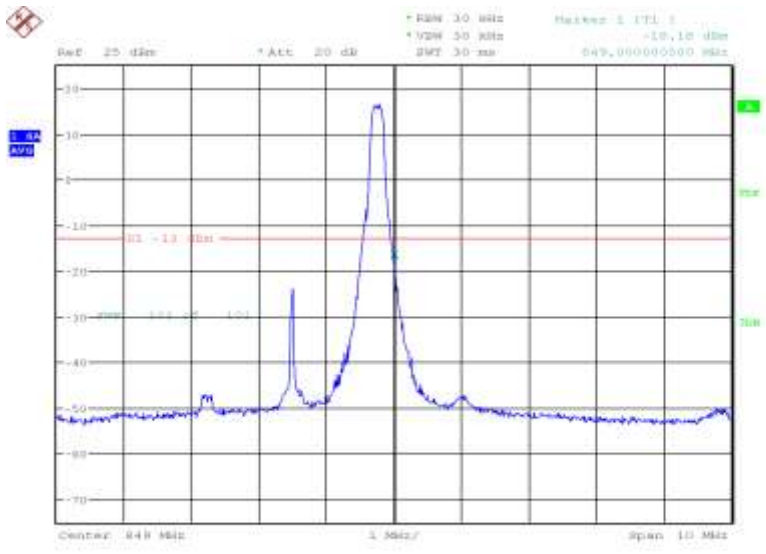
HIGH CH, RB1-0



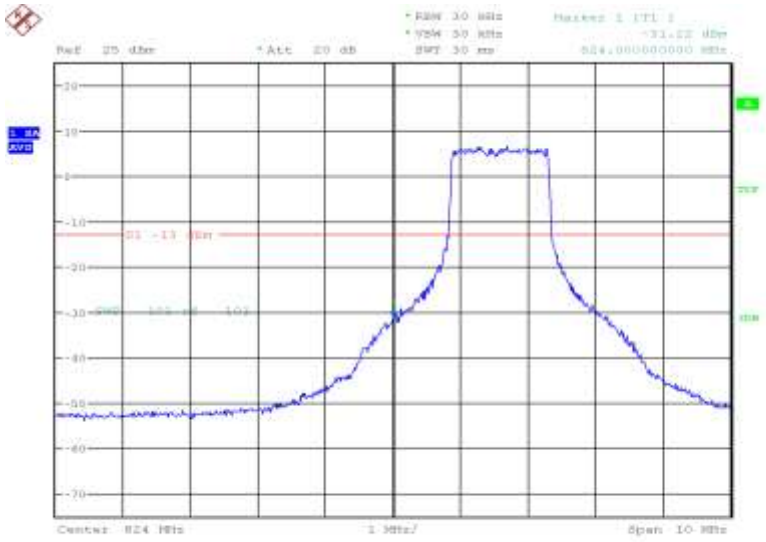
LOW CH, RB1-14



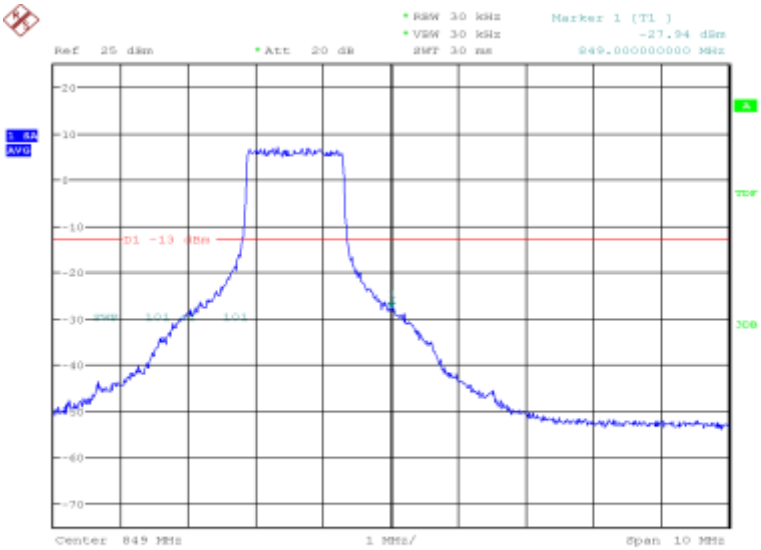
HIGH CH, RB1-14



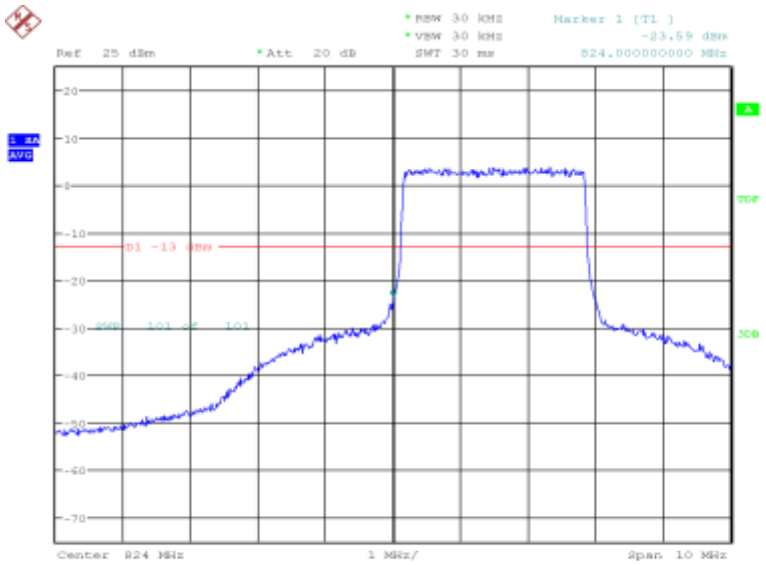
LOW CH, RB8-4



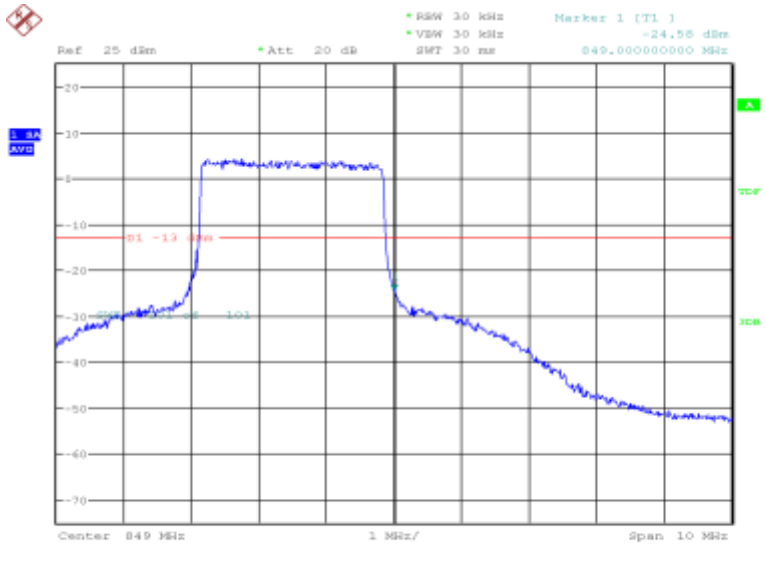
HIGH CH, RB8-4



LOW CH, RB15-0

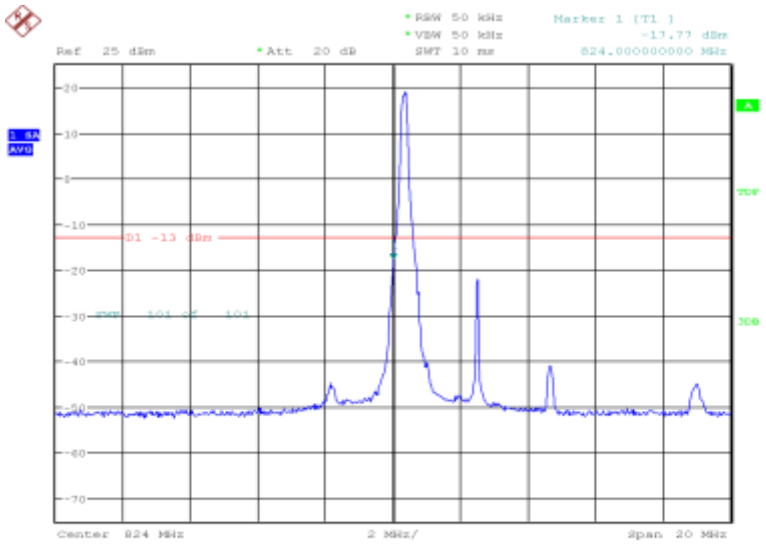


HIGH CH, RB15-0

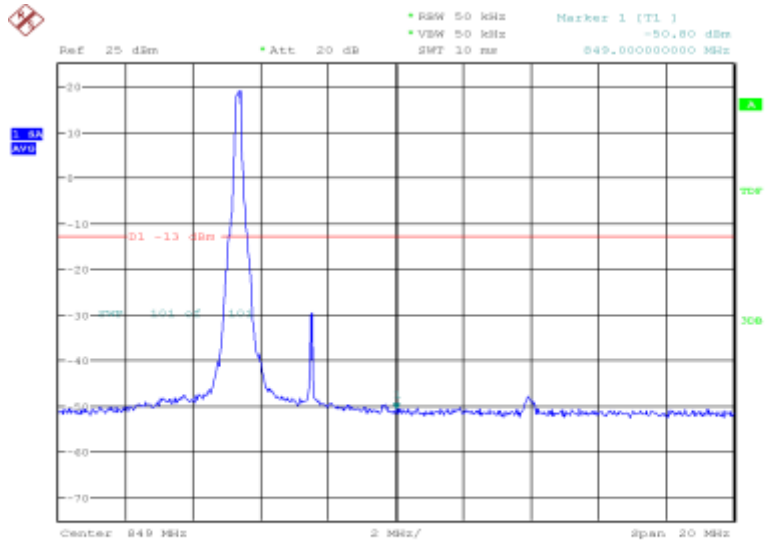


QPSK Band 5 (5 MHz BANDWIDTH)

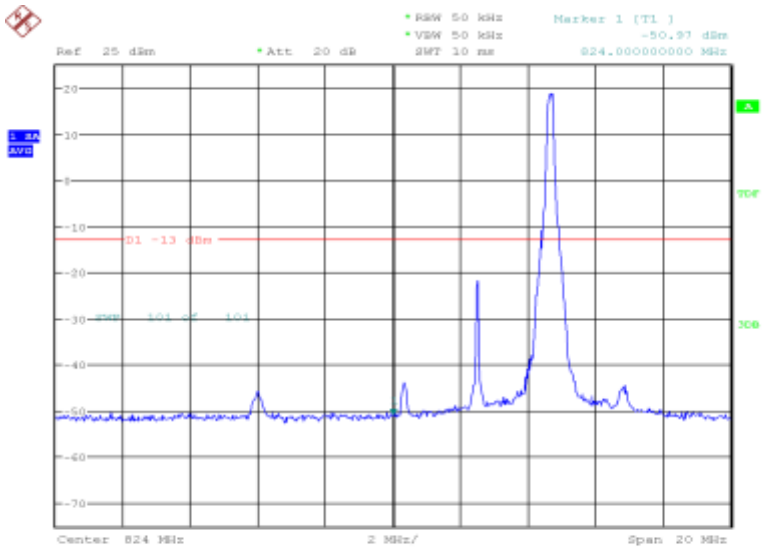
LOW CH, RB1-0



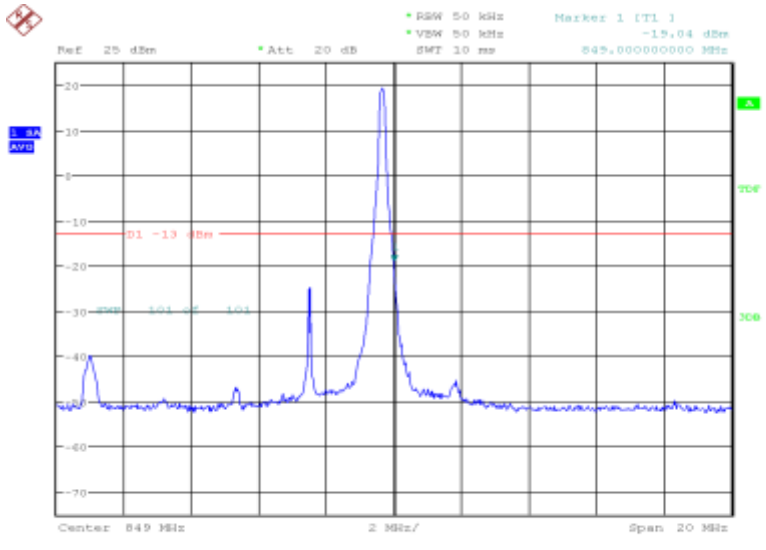
HIGH CH, RB1-0



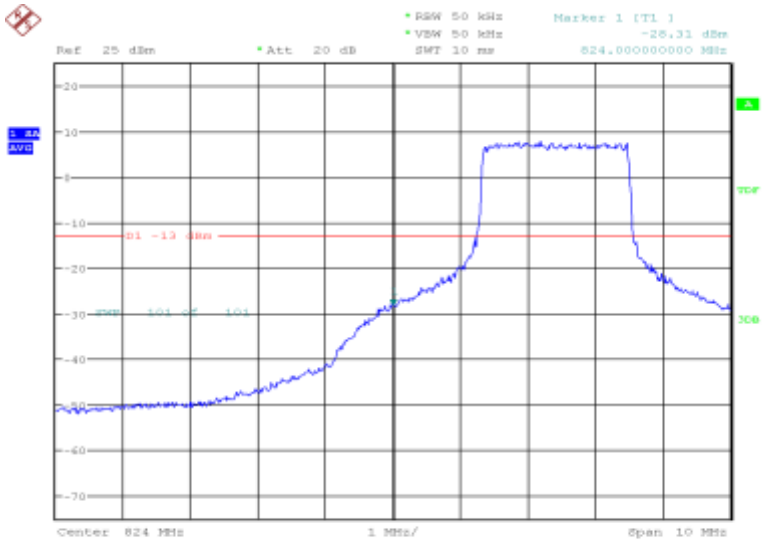
LOW CH, RB1-24



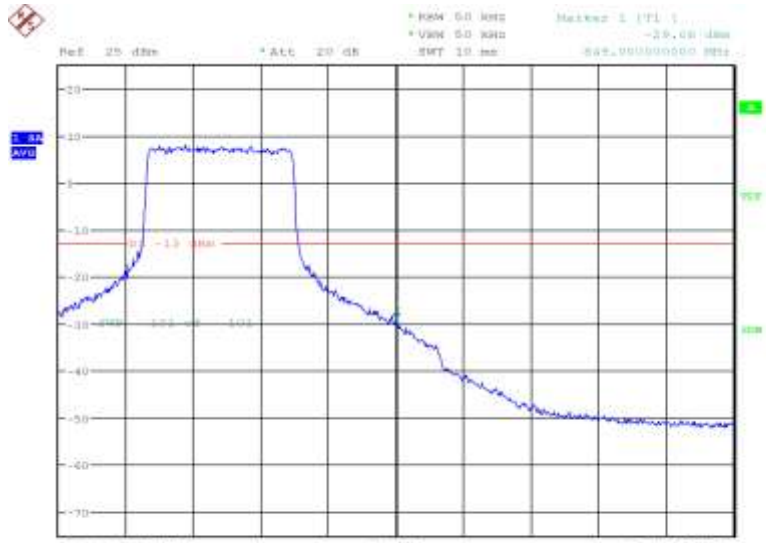
HIGH CH, RB1-24



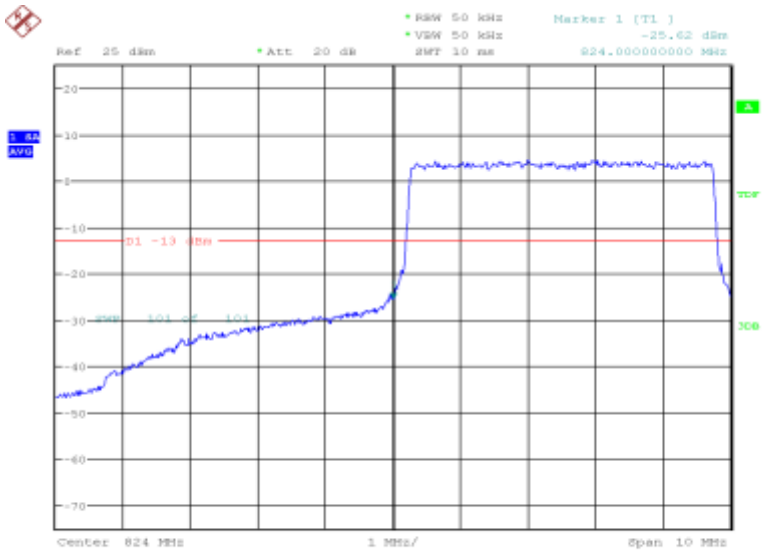
LOW CH, RB12-6



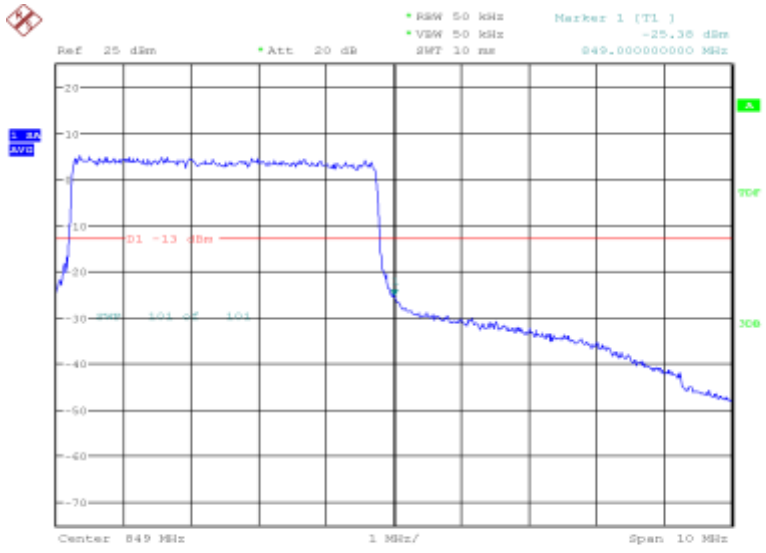
HIGH CH, RB12-6



LOW CH, RB25-0

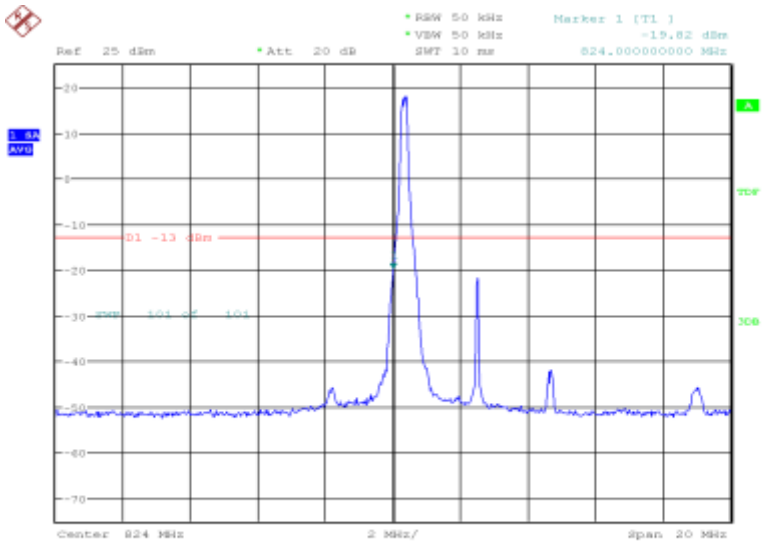


HIGH CH, RB25-0

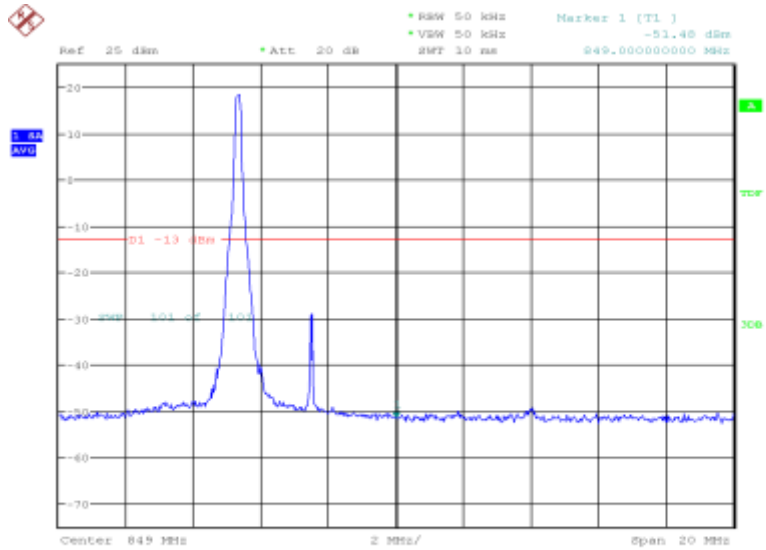


16QAM Band 5 (5 MHz BANDWIDTH)

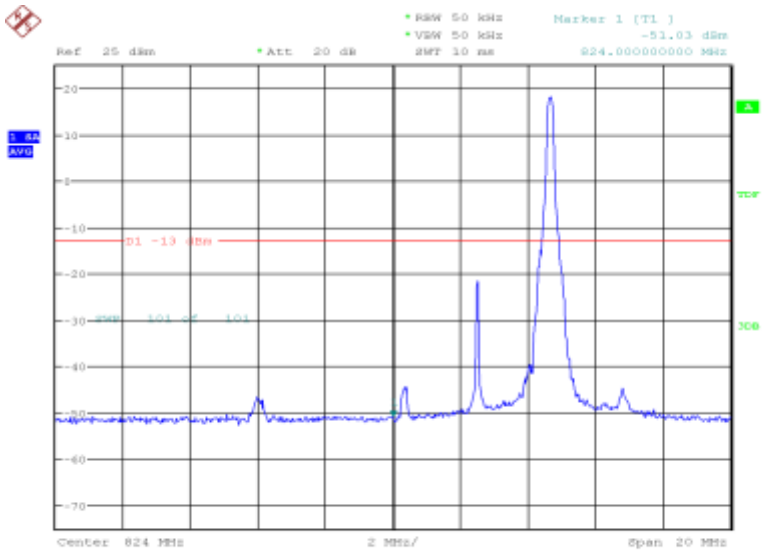
LOW CH, RB1-0



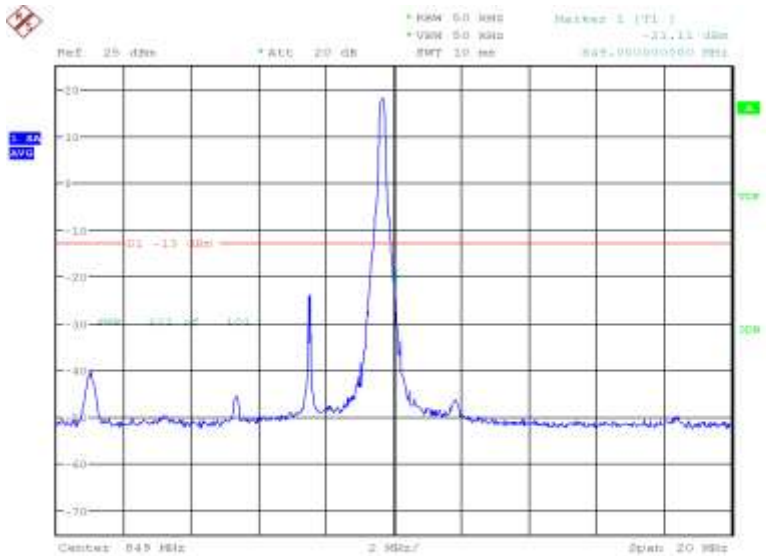
HIGH CH, RB1-0



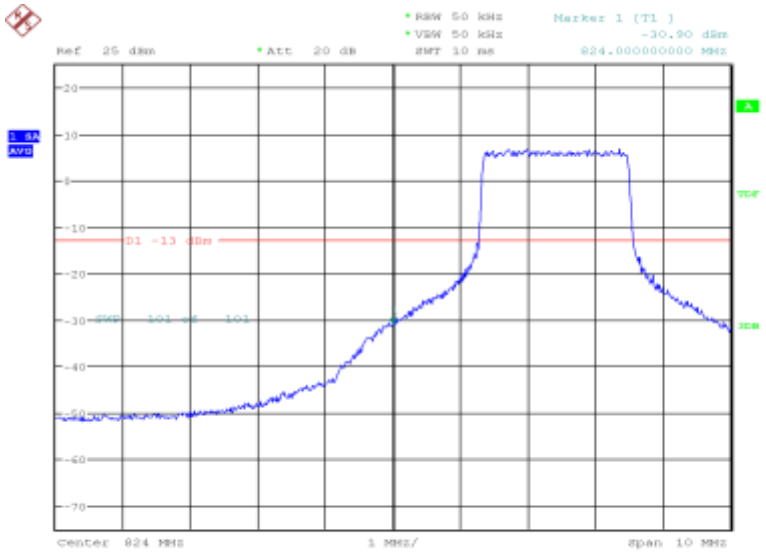
LOW CH, RB1-24



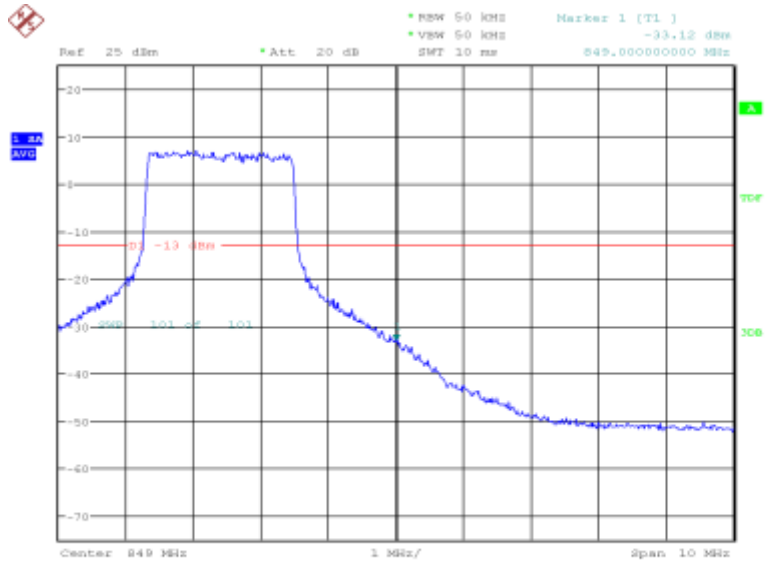
HIGH CH, RB1-24



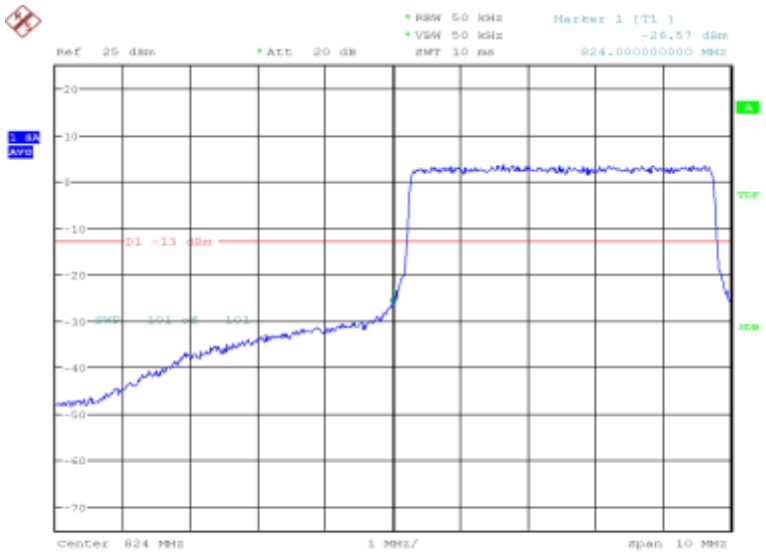
LOW CH, RB12-6



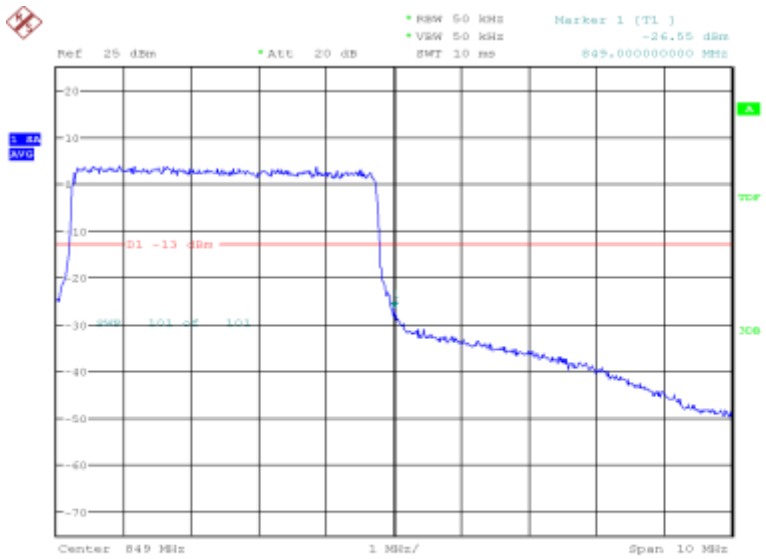
HIGH CH, RB12-6



LOW CH, RB25-0

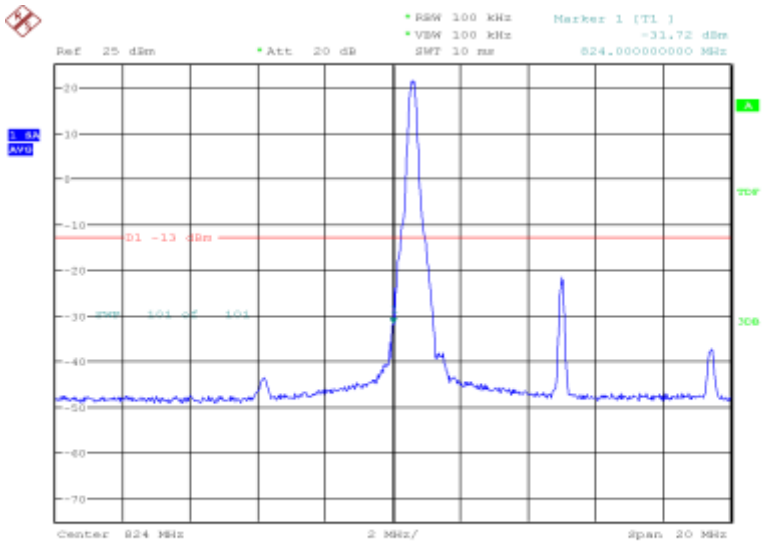


HIGH CH, RB25-0

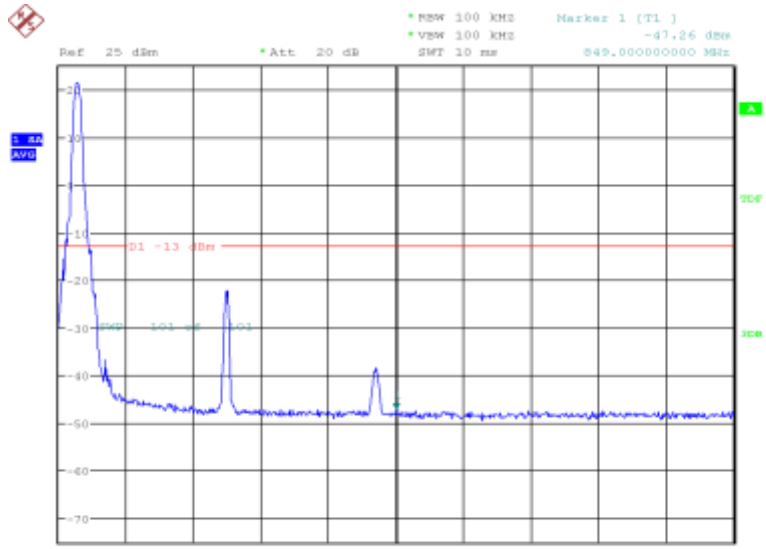


QPSK Band 5 (10 MHz BANDWIDTH)

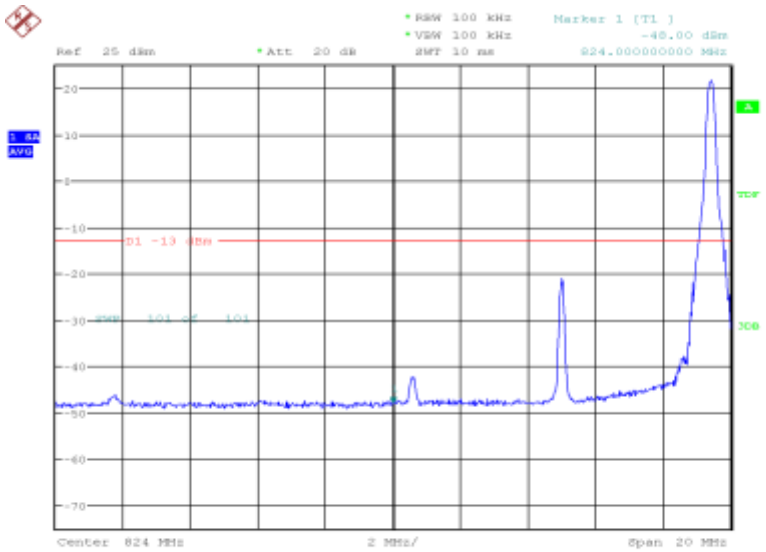
LOW CH, RB1-0



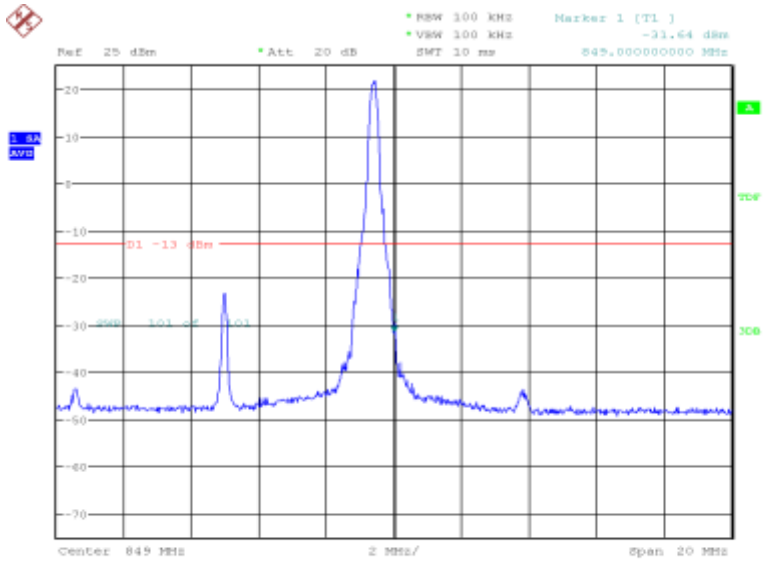
HIGH CH, RB1-0



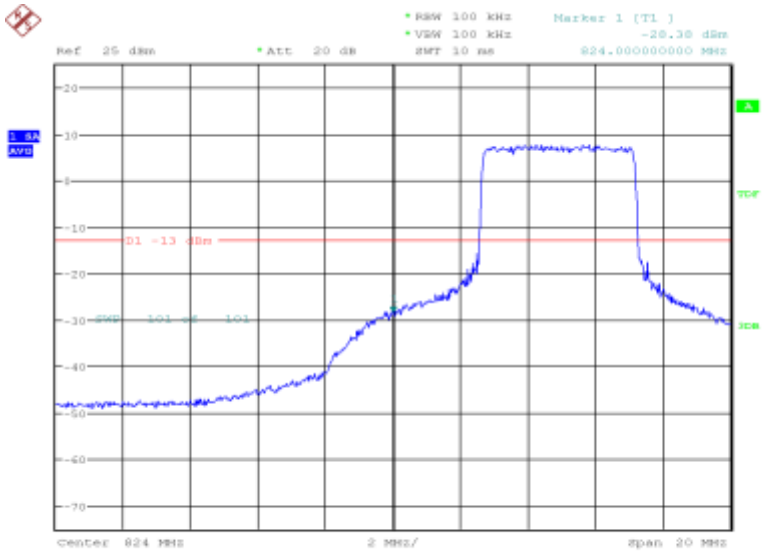
LOW CH, RB1-49



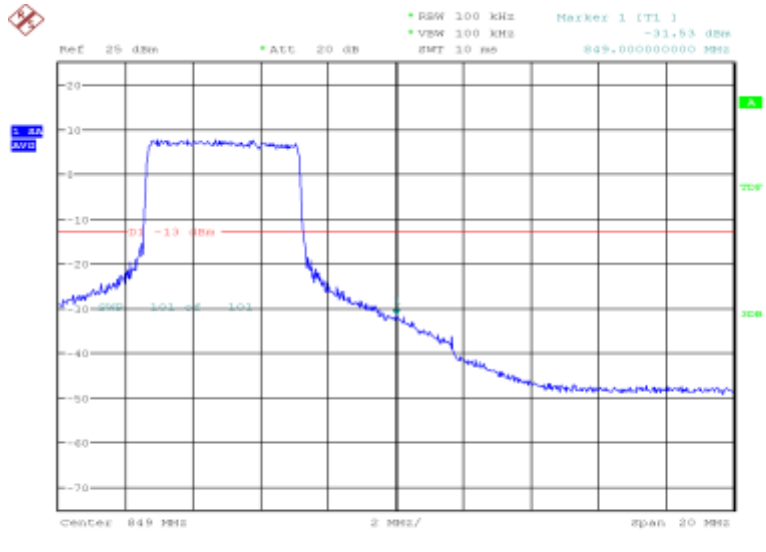
HIGH CH, RB1-49



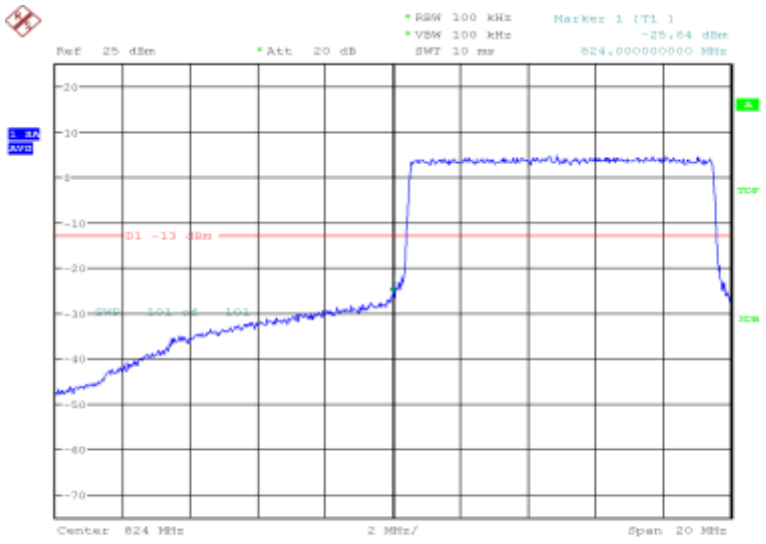
LOW CH, RB25-12



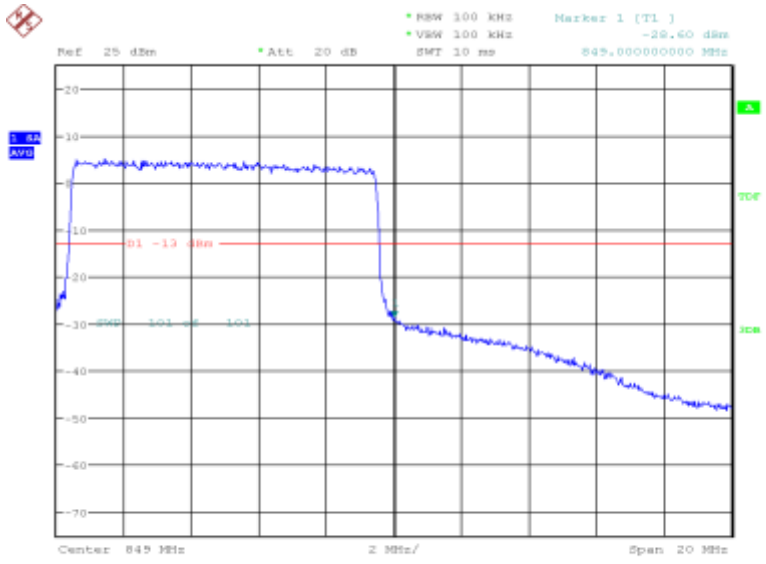
HIGH CH, RB25-12



LOW CH, RB50-0

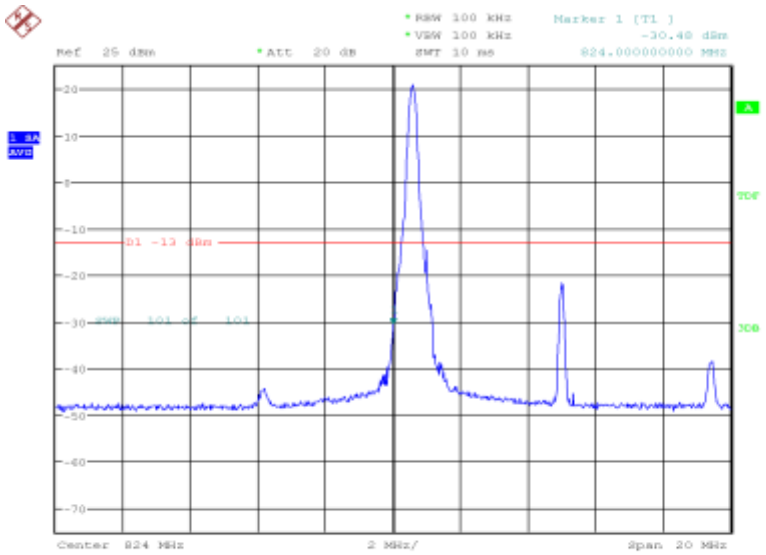


HIGH CH, RB50-0

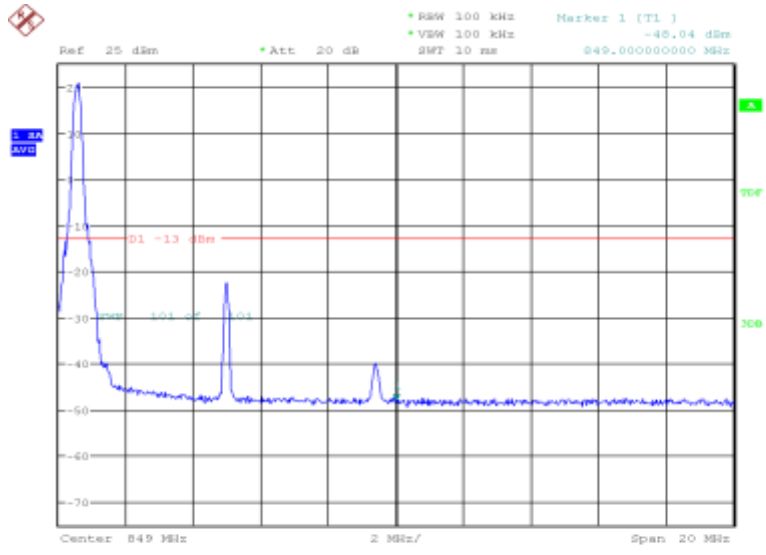


16QAM Band 5 (10 MHz BANDWIDTH)

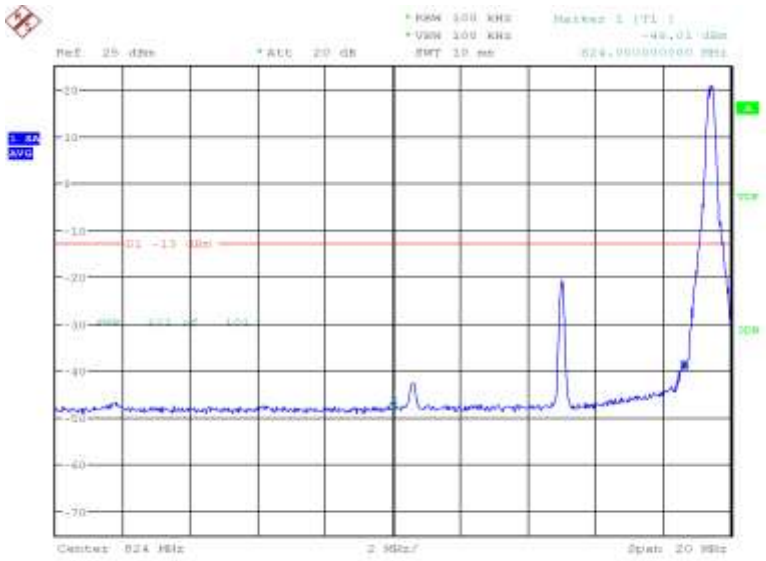
LOW CH, RB1-0



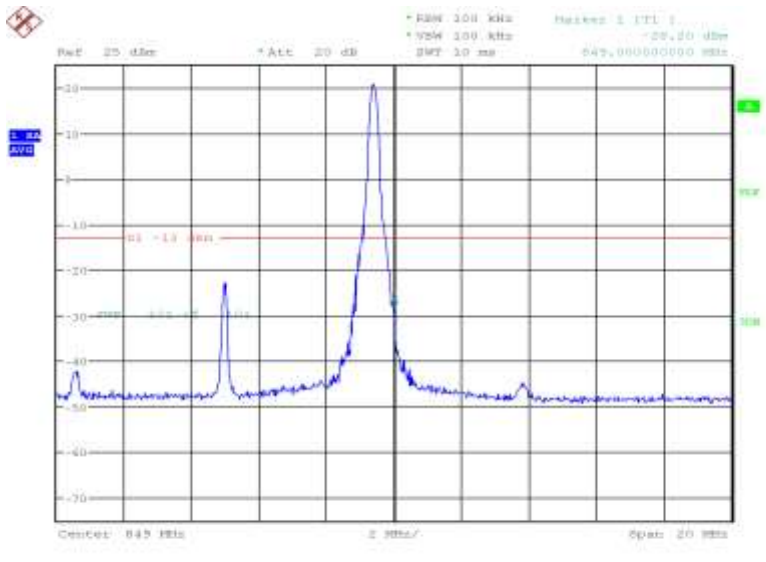
HIGH CH, RB1-0



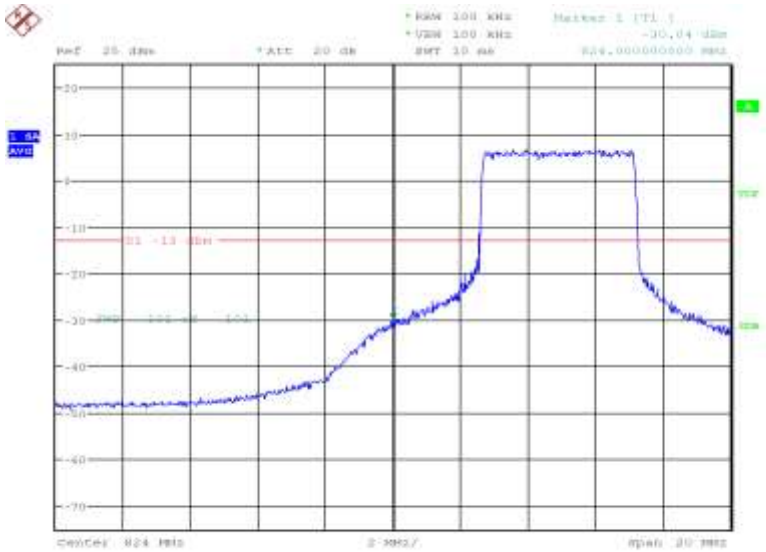
LOW CH, RB1-49



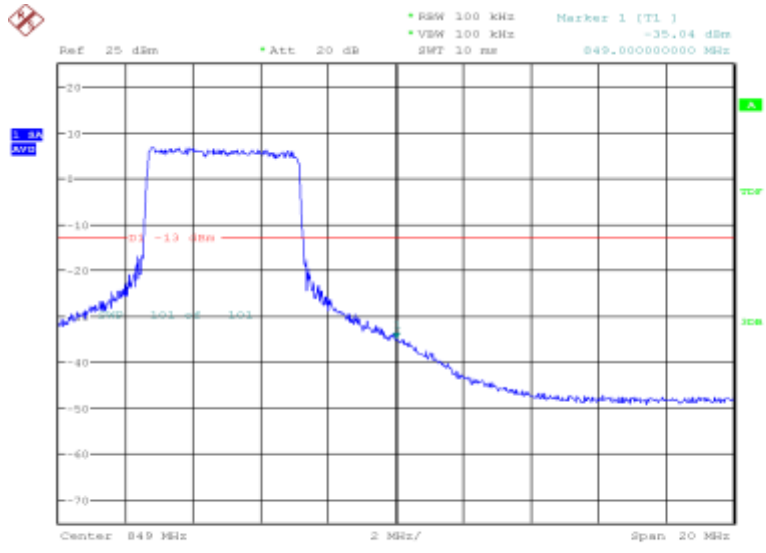
HIGH CH, RB1-49



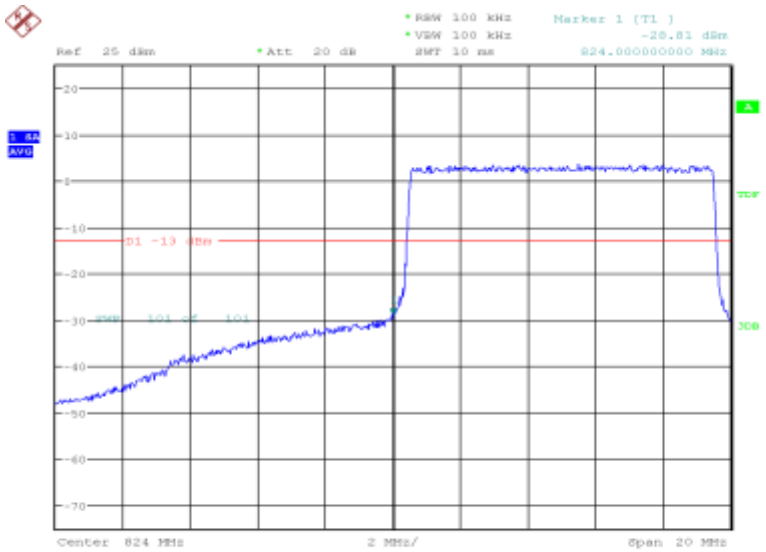
LOW CH, RB25-12



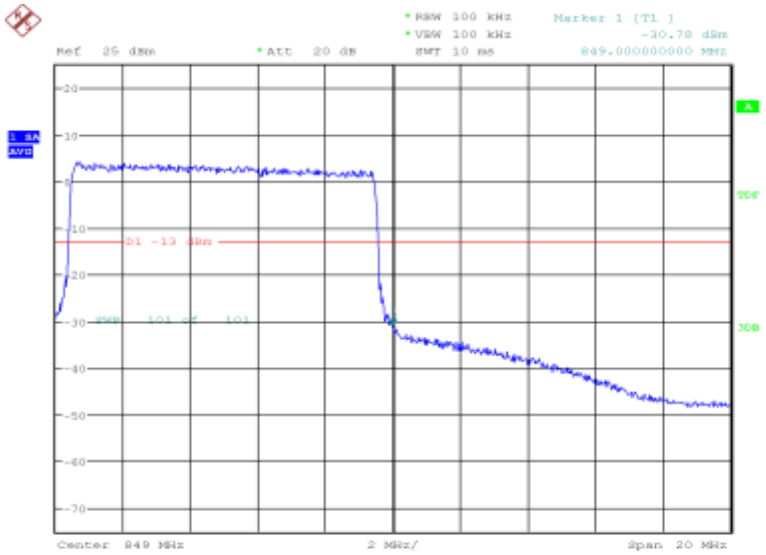
HIGH CH, RB25-12



LOW CH, RB50-0



HIGH CH, RB50-0



8.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §24.238

LIMITS

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

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.

MODES TESTED

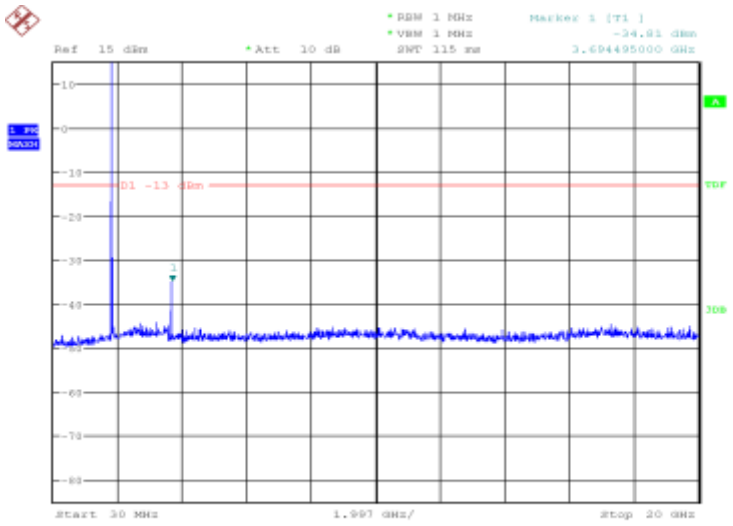
- LTE BAND 2
- LTE BAND 5

RESULTS

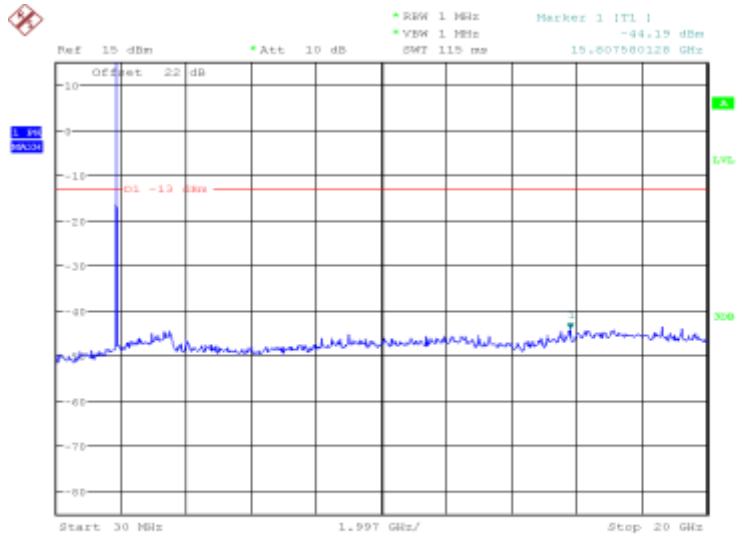
8.3.1. LTE BAND 2

LTE QPSK (1.4 MHz BANDWIDTH)

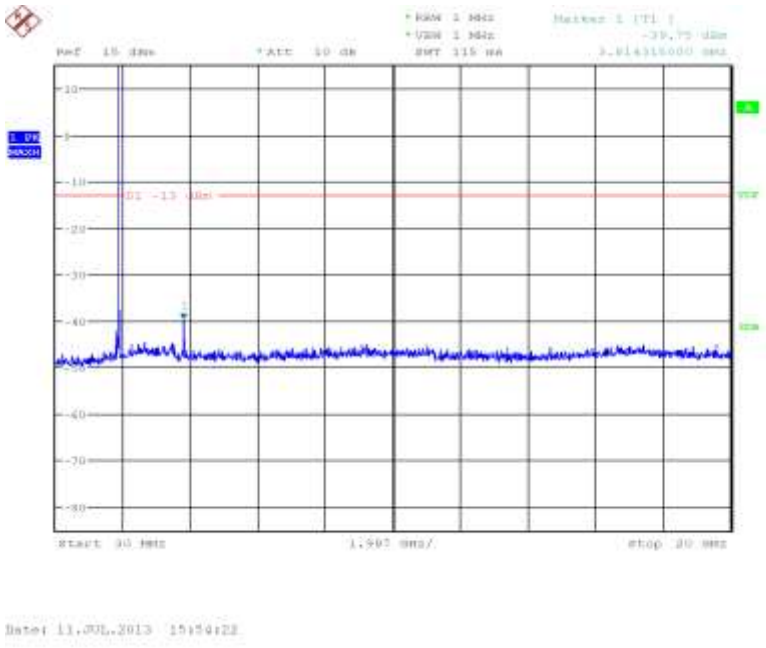
LOW, RB1-0, 30MHz TO 20000 GHz



MID, RB1-0, 30MHz TO 20000 GHz

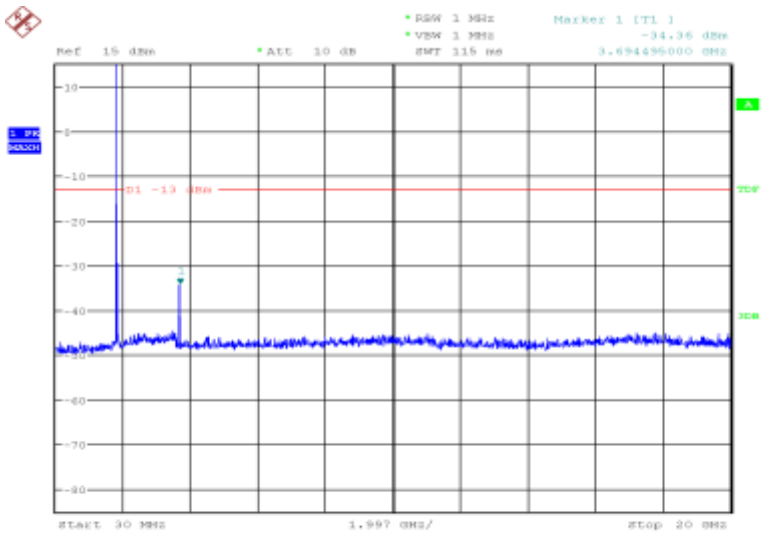


HIGH, RB1-0, 30MHz TO 10000 GHz

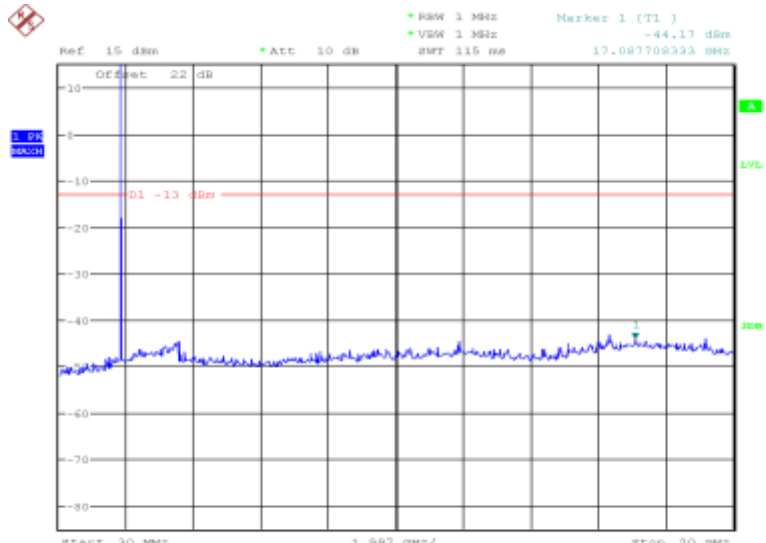


LTE 16QAM

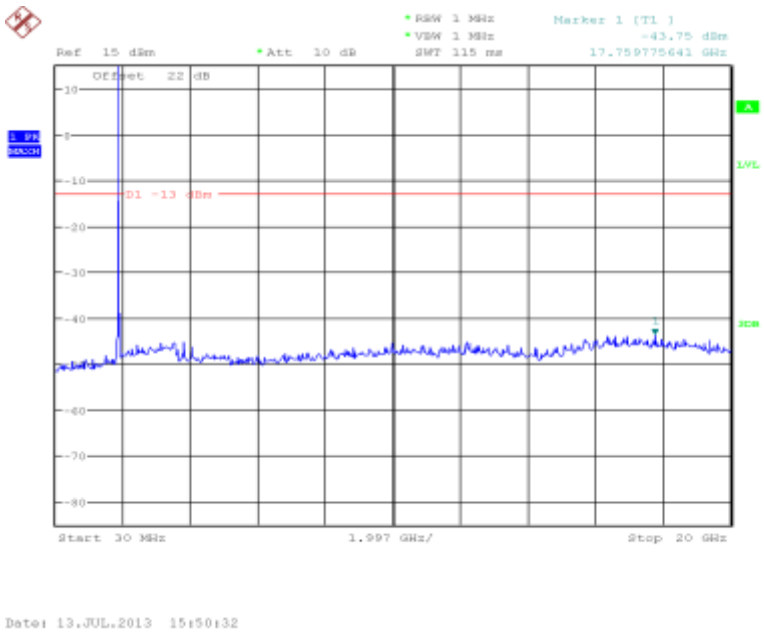
LOW, RB1-0, 30MHz TO 20000 GHz



MID, RB1-0, 30MHz TO 20000 GHz



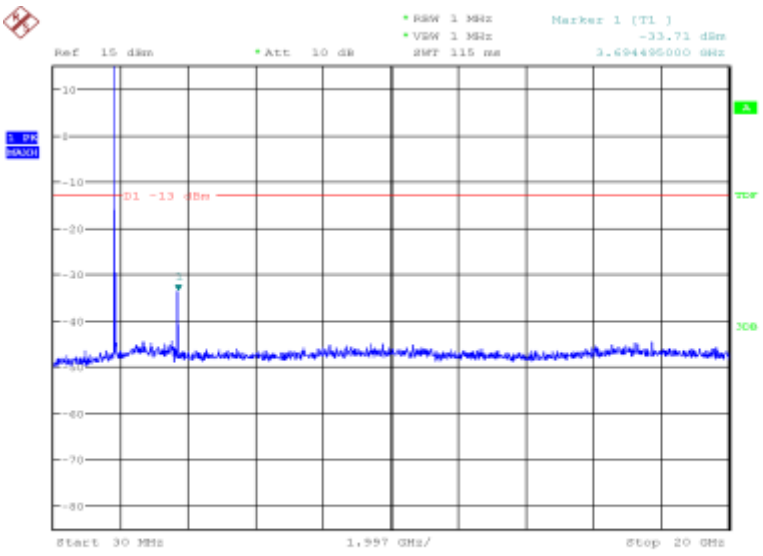
HIGH, RB1-0, 30MHz TO 20000 GHz



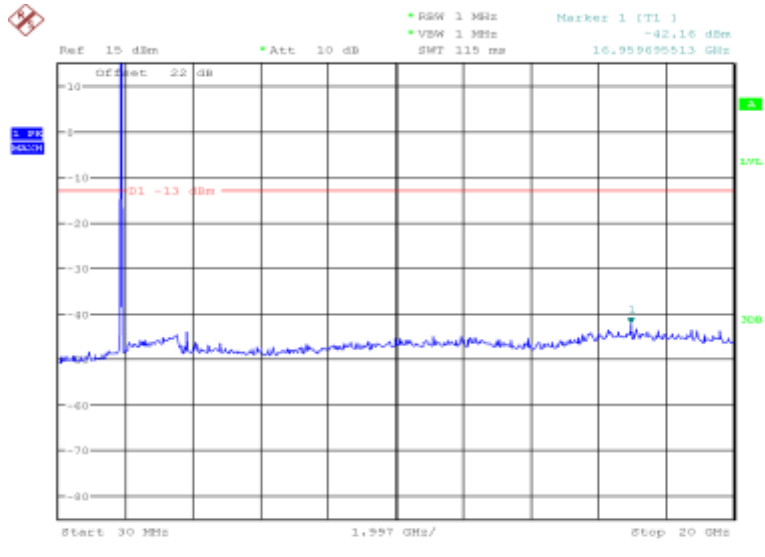
Band 2 (3.0 MHz BANDWIDTH)

LTE QPSK

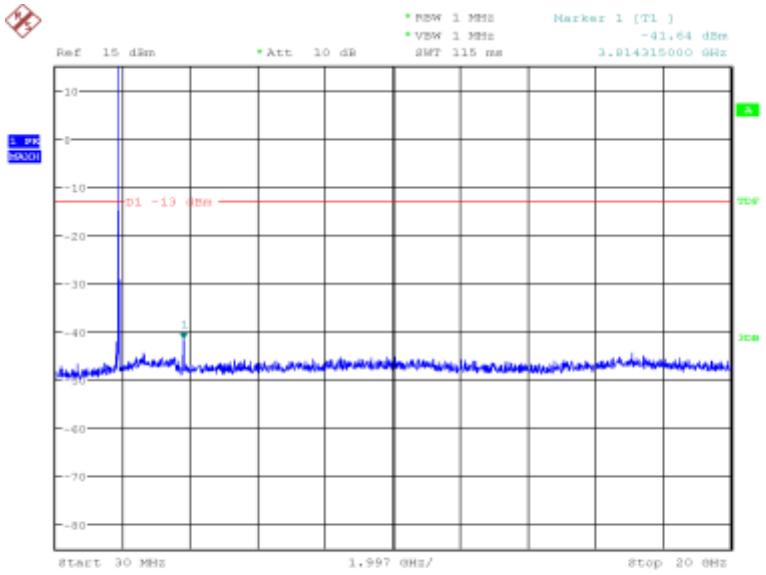
LOW, RB1-0, 30MHz TO 20000 GHz



MID, RB1-0, 30MHz TO 20000 GHz

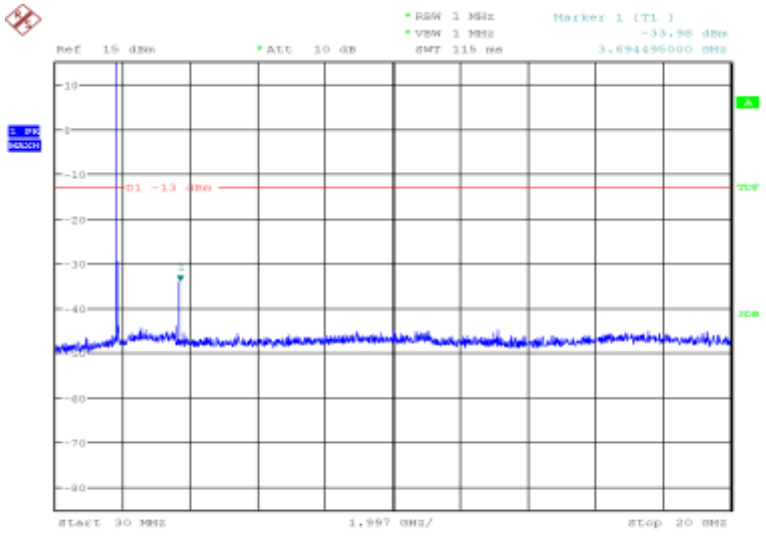


HIGH, RB1-0, 30MHz TO 20000 GHz

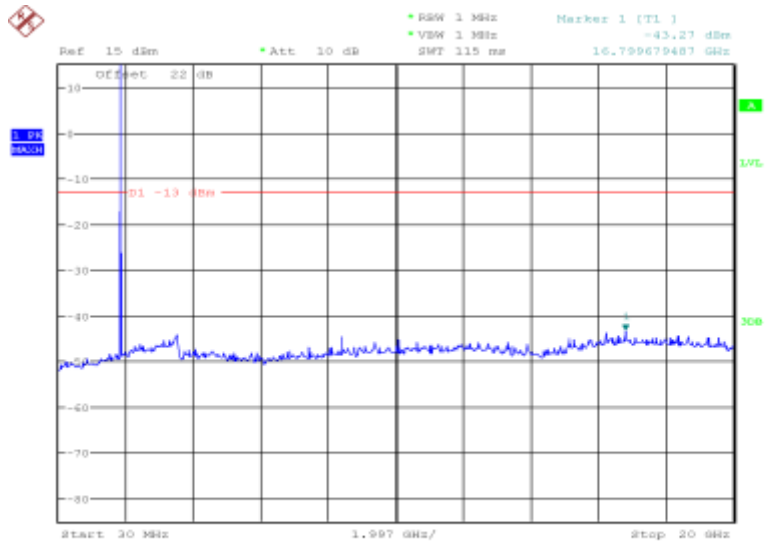


LTE 16QAM

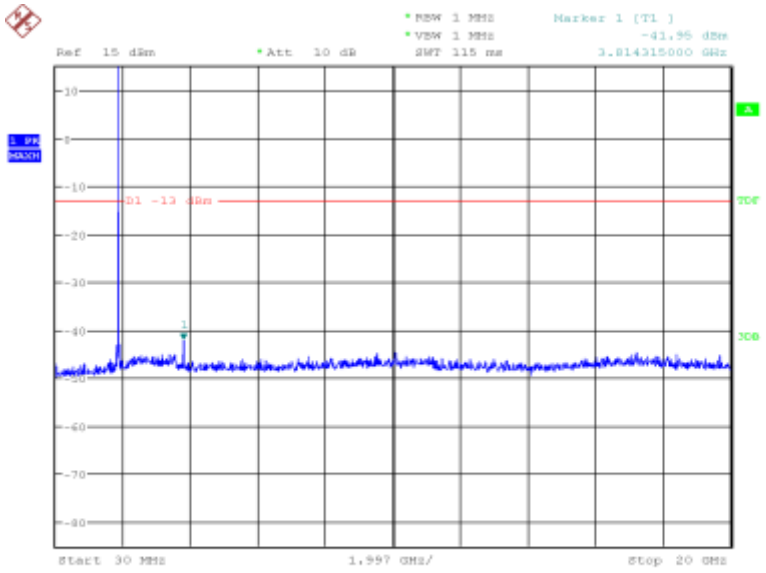
LOW, RB1-0, 30MHz TO 20000 GHz



MID, RB1-0, 30MHz TO 20000 GHz



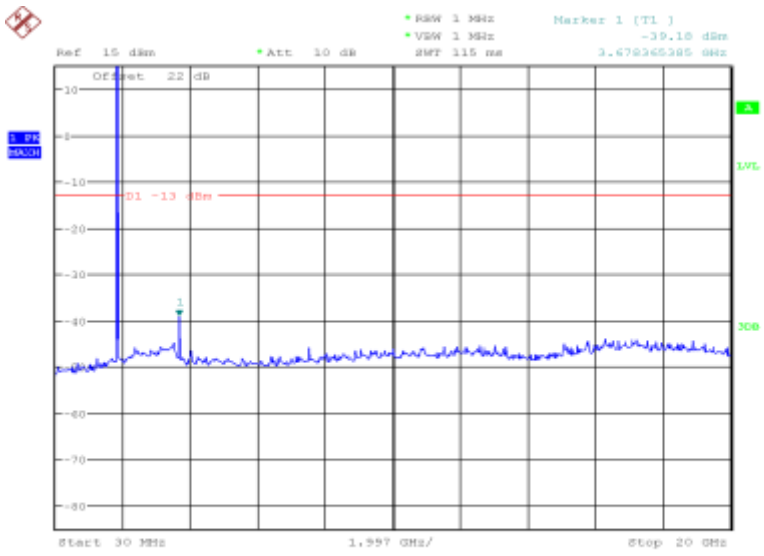
HIGH, RB1-0, 30MHz TO 20000 GHz



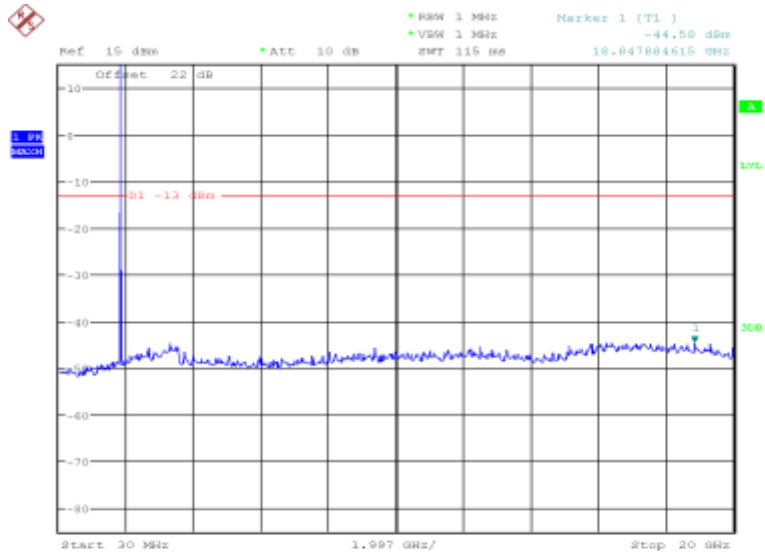
Band 2 (5 MHz BANDWIDTH)

LTE QPSK

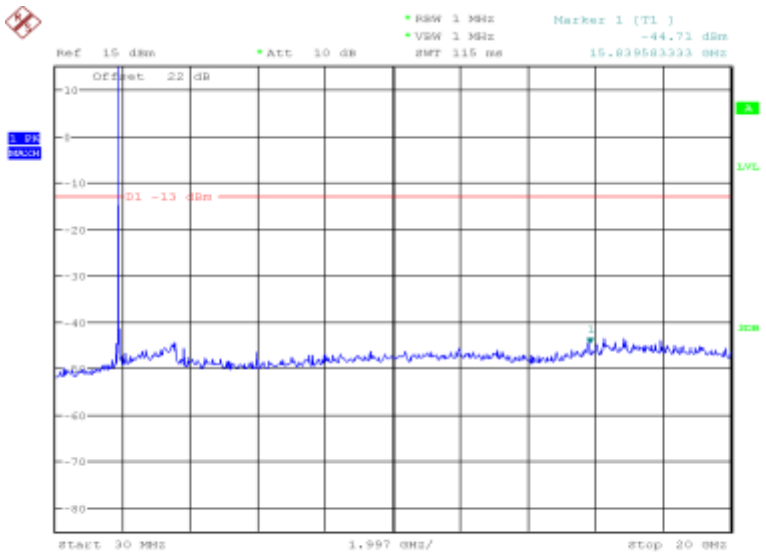
LOW, RB1-0, 30MHz TO 20000 GHz



MID, RB1-0, 30MHz TO 20000 GHz

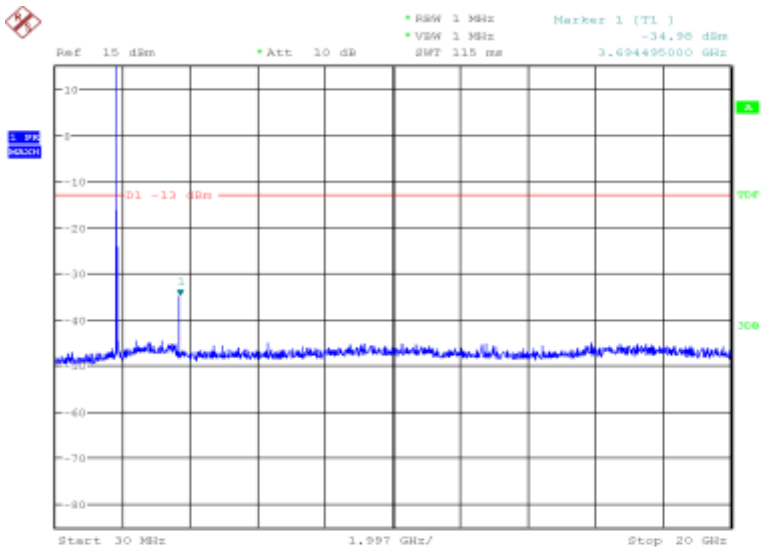


HIGH, RB1-0, 30MHz TO 20000 GHz

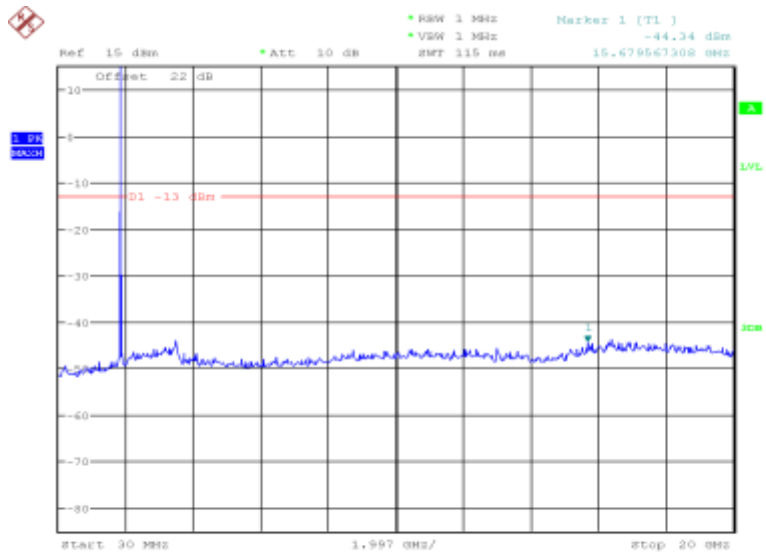


LTE 16QAM

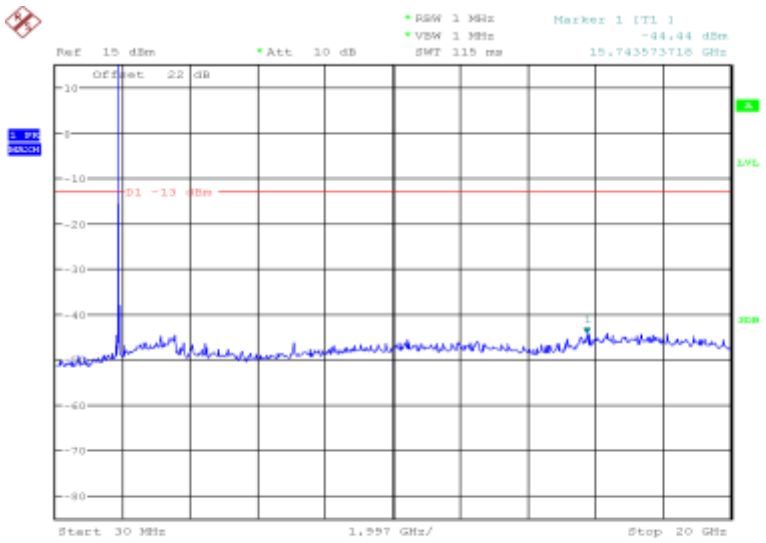
LOW, RB1-0, 30MHz TO 20000 GHz



MID, RB1-0, 30MHz TO 20000 GHz



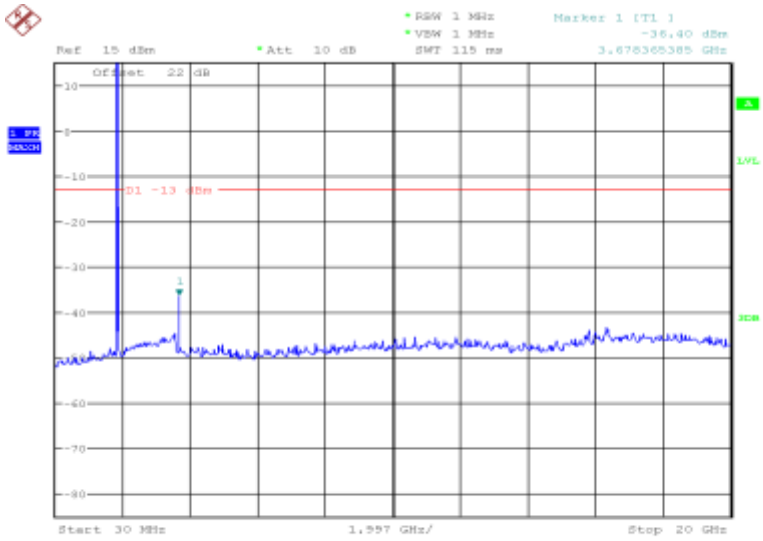
HIGH, RB1-0, 30MHz TO 20000 GHz



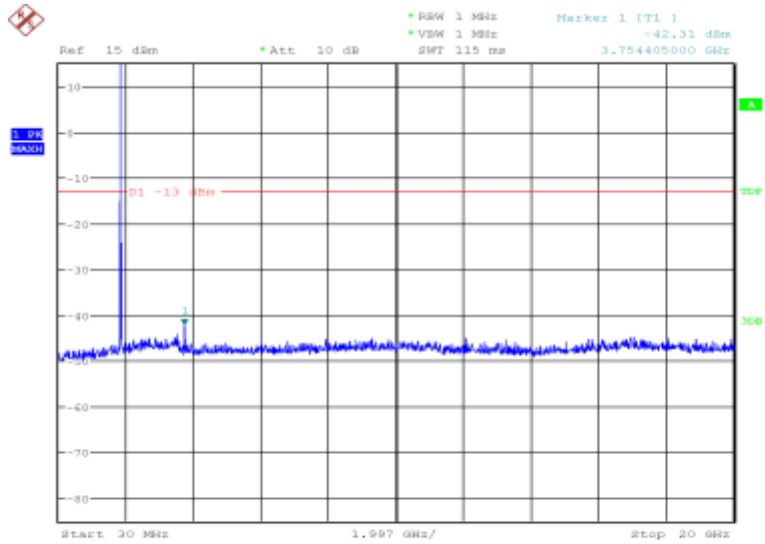
Band 2 (10 MHz BANDWIDTH)

LTE QPSK

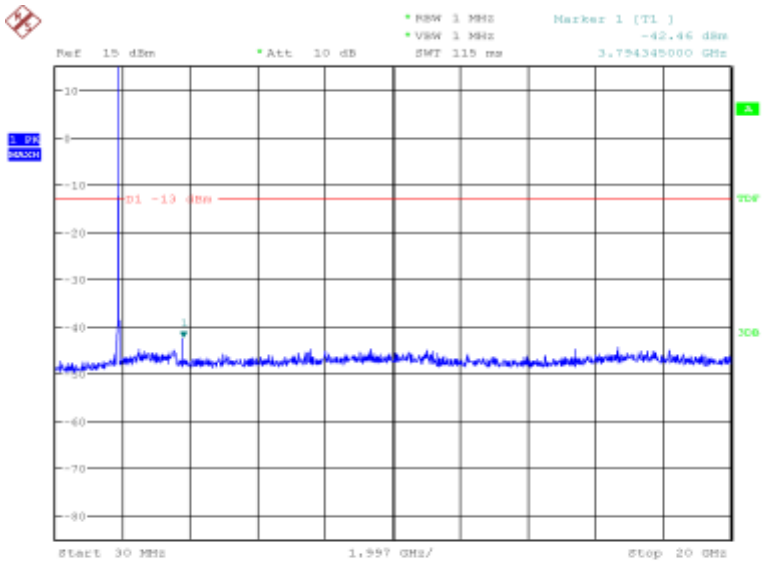
LOW, RB1-0, 30MHz TO 20000 GHz



MID, RB1-0, 30MHz TO 20000 GHz

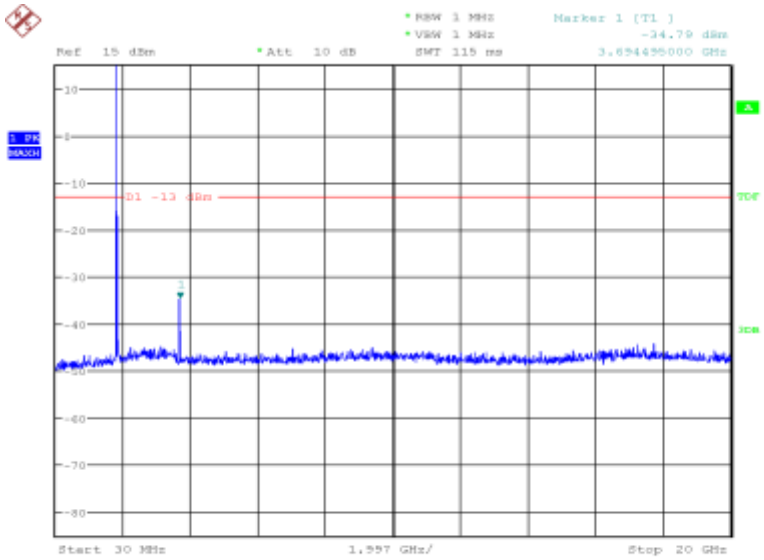


HIGH, RB1-0, 30MHz TO 20000 GHz

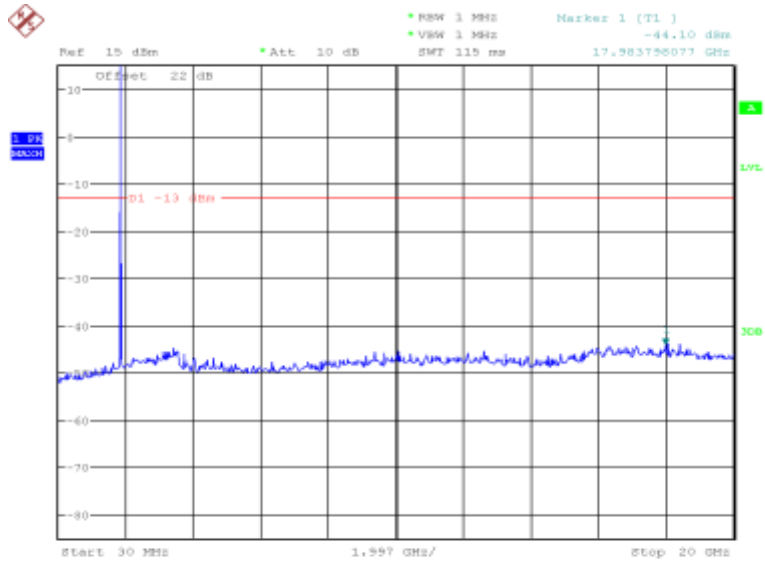


LTE 16QAM

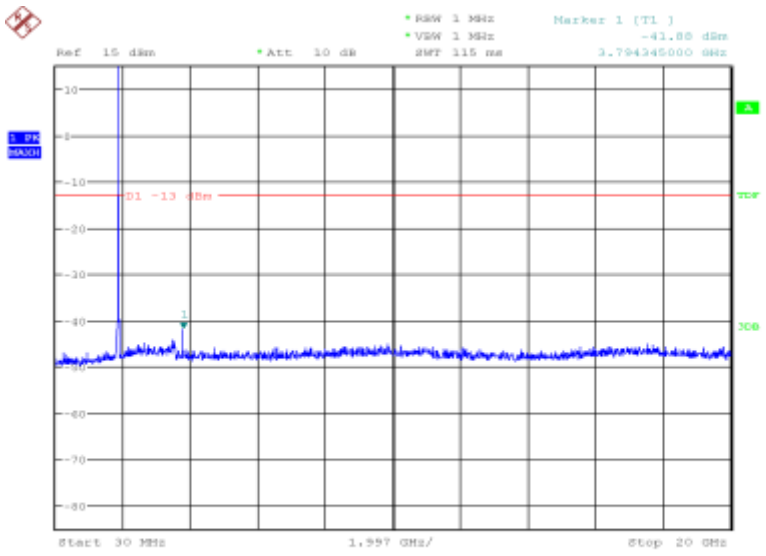
LOW, RB1-0, 30MHz TO 20000 GHz



MID, RB1-0, 30MHz TO 20000 GHz



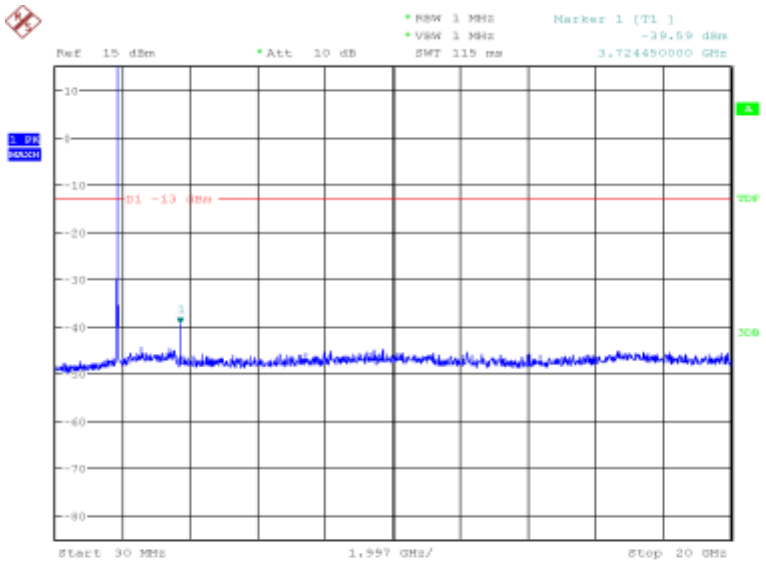
HIGH, RB1-0, 30MHz TO 20000 GHz



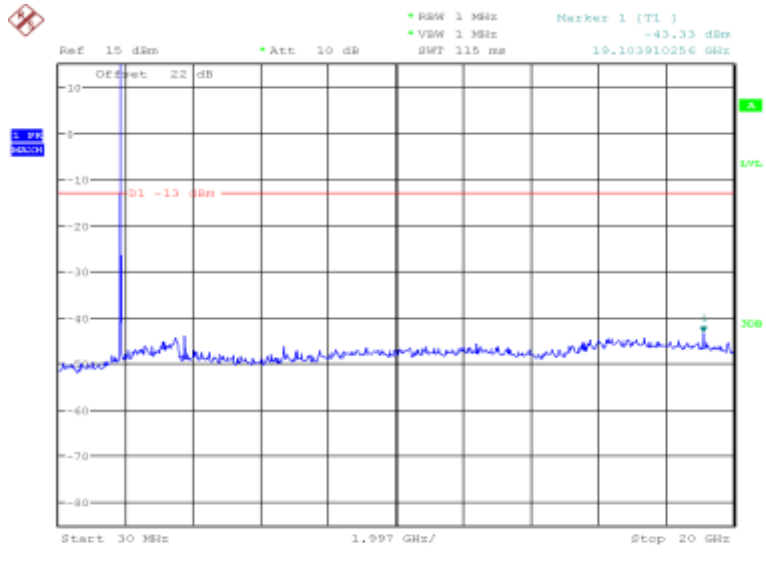
Band 2 (15 MHz BANDWIDTH)

LTE QPSK

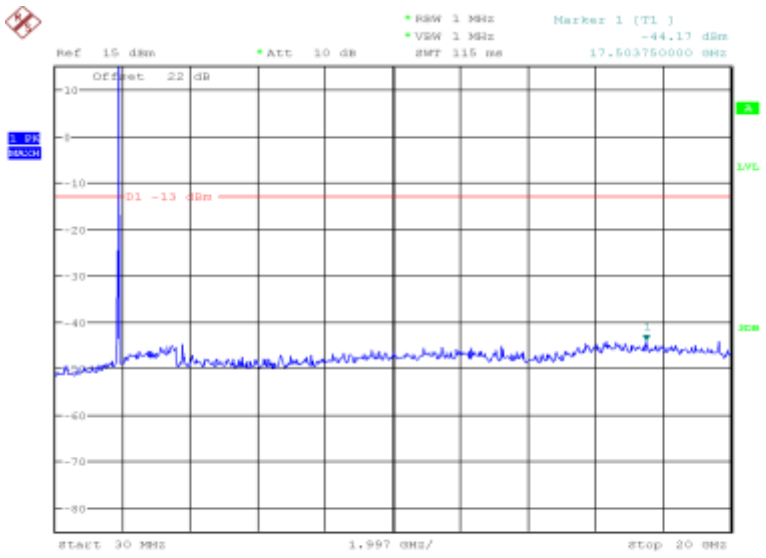
LOW, RB1-0, 30MHz TO 20000 GHz



MID, RB1-0, 30MHz TO 20000 GHz

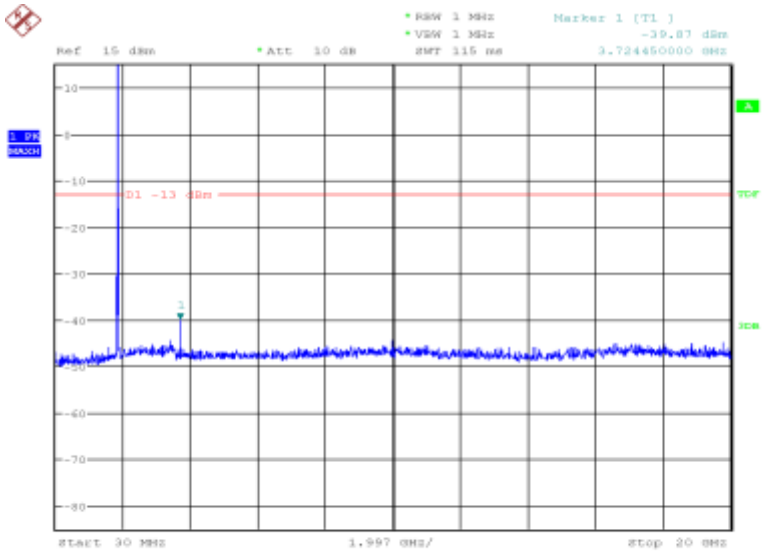


HIGH, RB1-0, 30MHz TO 20000 GHz

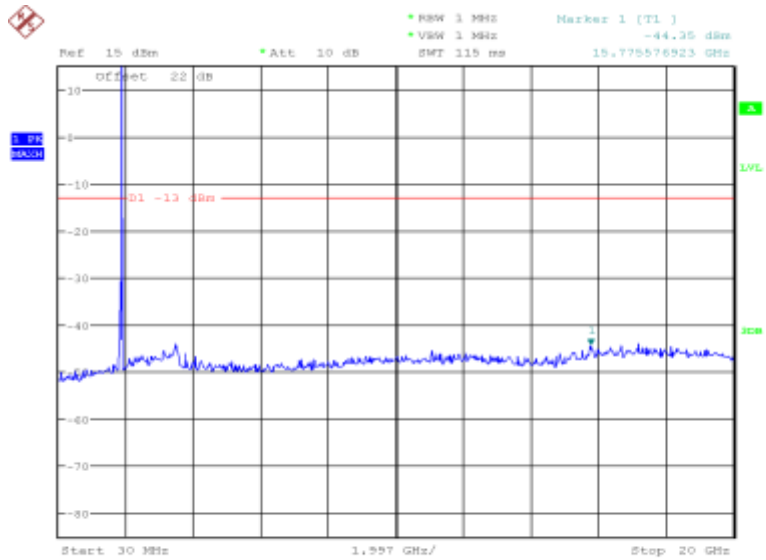


LTE 16QAM

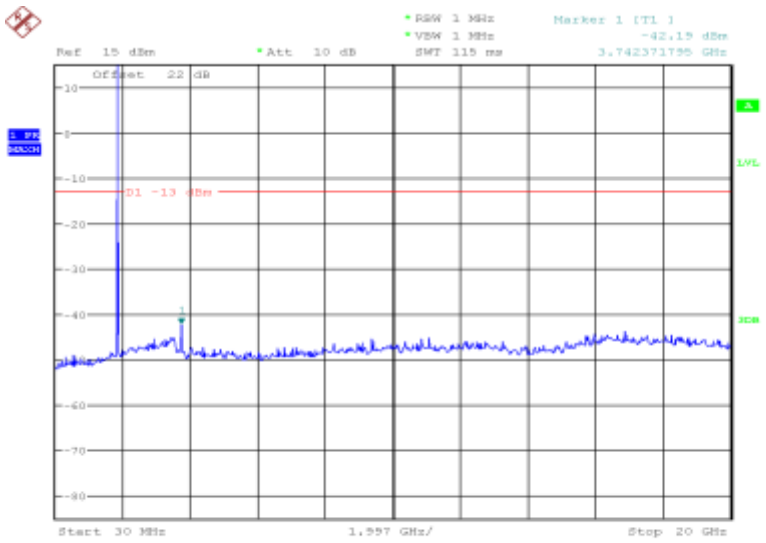
LOW, RB1-0, 30MHz TO 20000 GHz



MID, RB1-0, 30MHz TO 20000 GHz



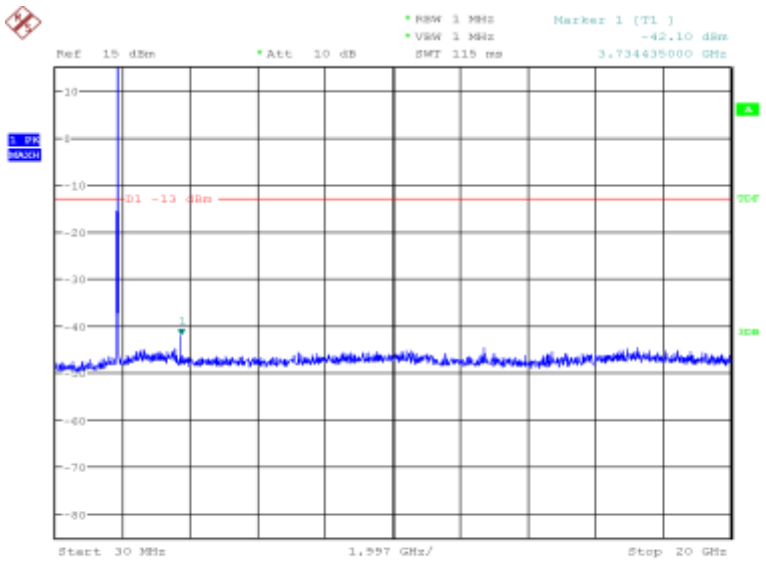
HIGH, RB1-0, 30MHz TO 20000 GHz



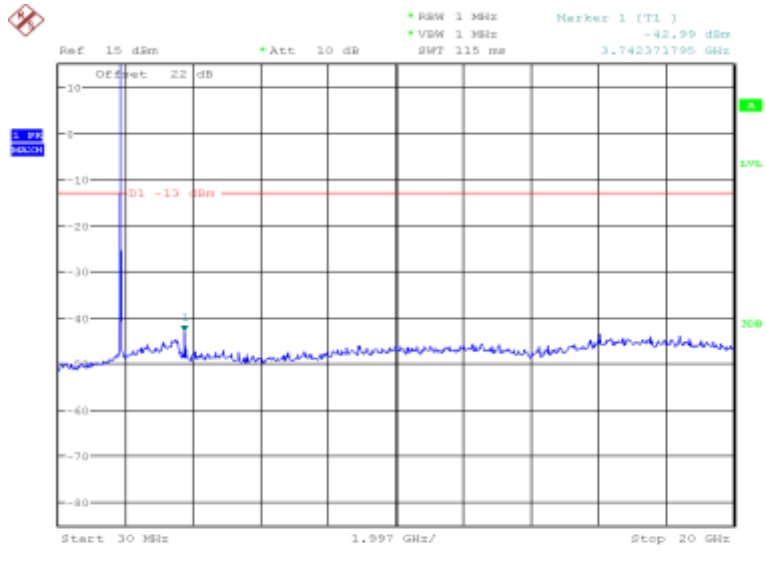
Band 2 (20 MHz BANDWIDTH)

LTE QPSK

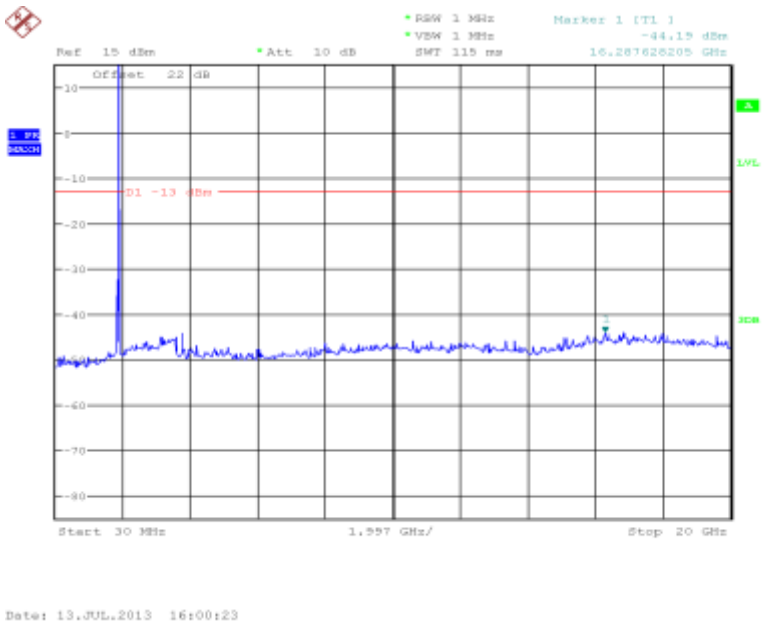
LOW, RB1-0, 30MHz TO 20000 GHz



MID, RB1-0, 30MHz TO 20000 GHz

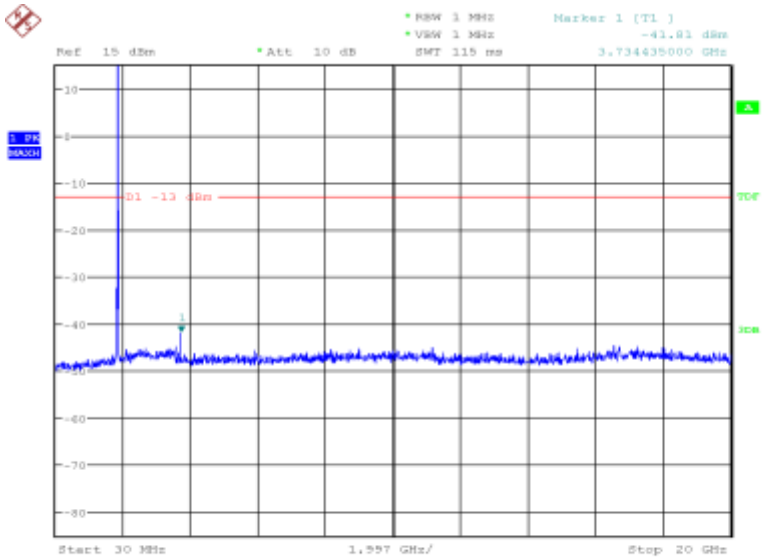


HIGH, RB1-0, 30MHz TO 20000 GHz

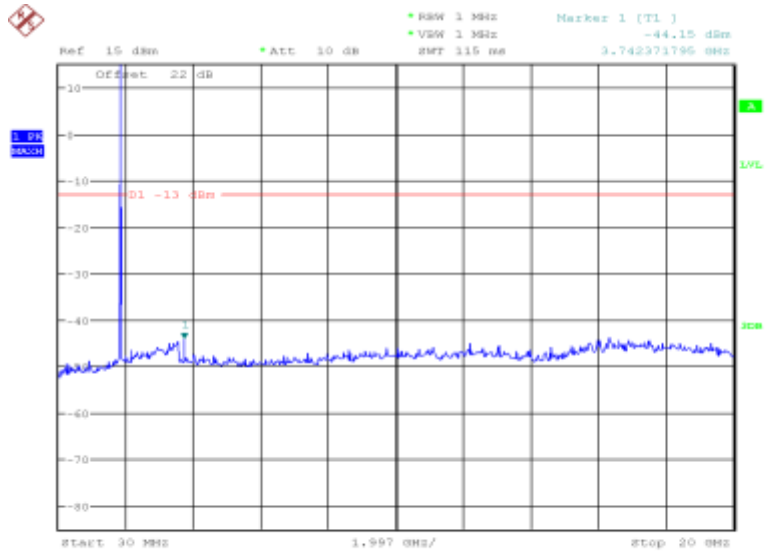


LTE 16QAM

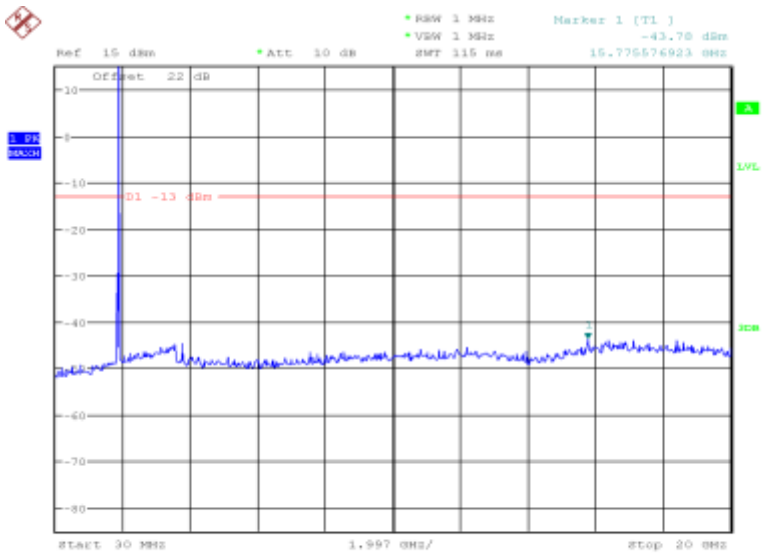
LOW, RB1-0, 30MHz TO 20000 GHz



MID, RB1-0, 30MHz TO 20000 GHz



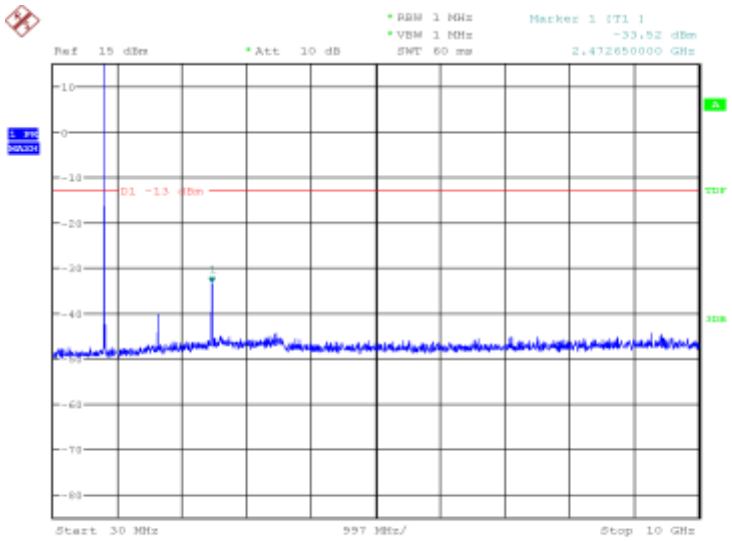
HIGH, RB1-0, 30MHz TO 20000 GHz



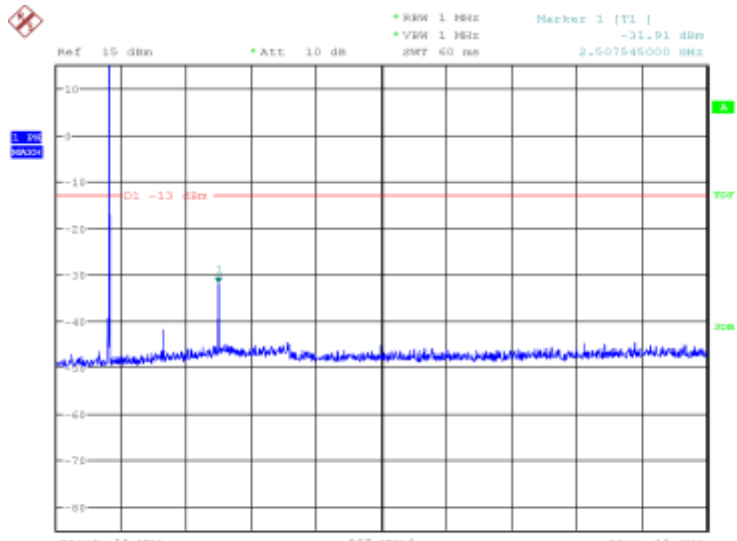
8.3.2. LTE BAND 5

LTE QPSK (1.4 MHz BANDWIDTH)

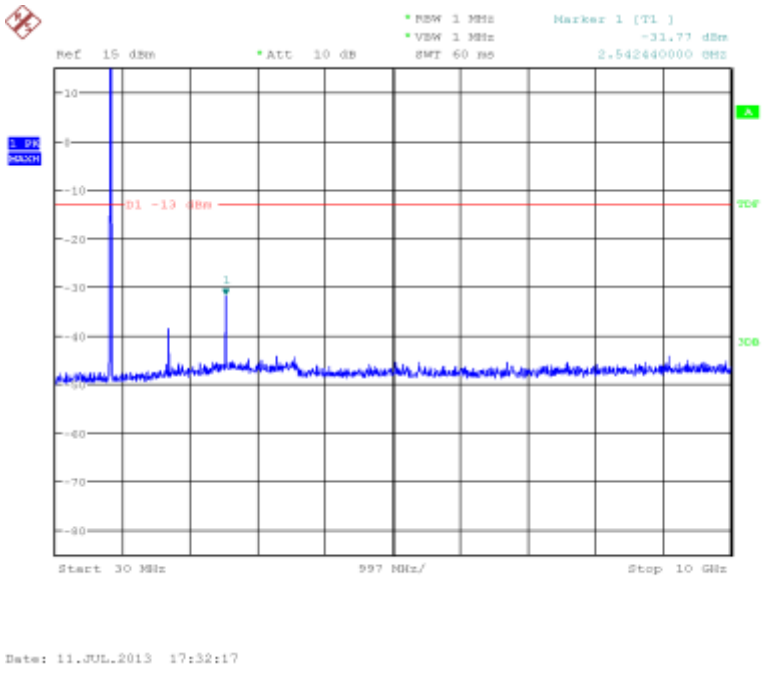
LOW, RB1-0, 30MHz TO 10000 GHz



MID, RB1-0, 30MHz TO 10000 GHz

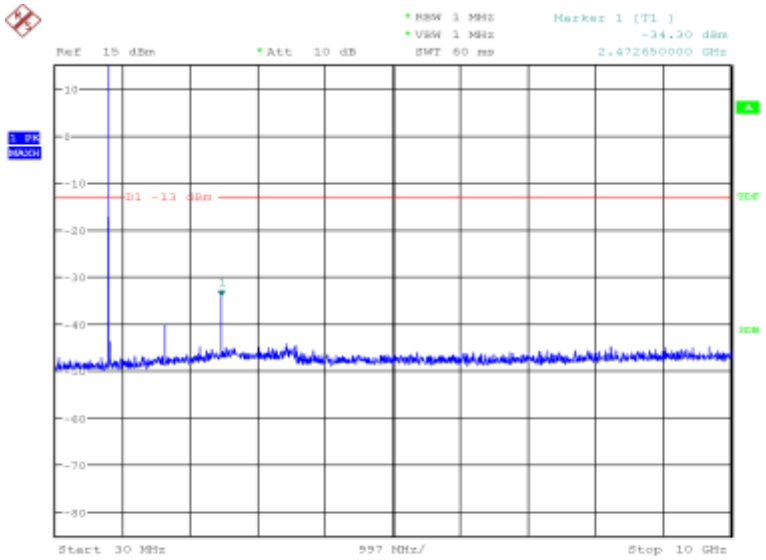


HIGH, RB1-0, 30MHz TO 10000 GHz

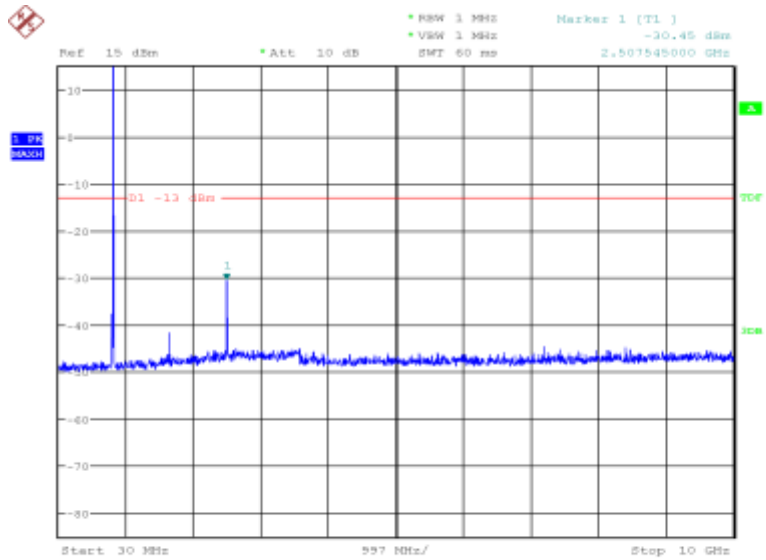


LTE 16QAM

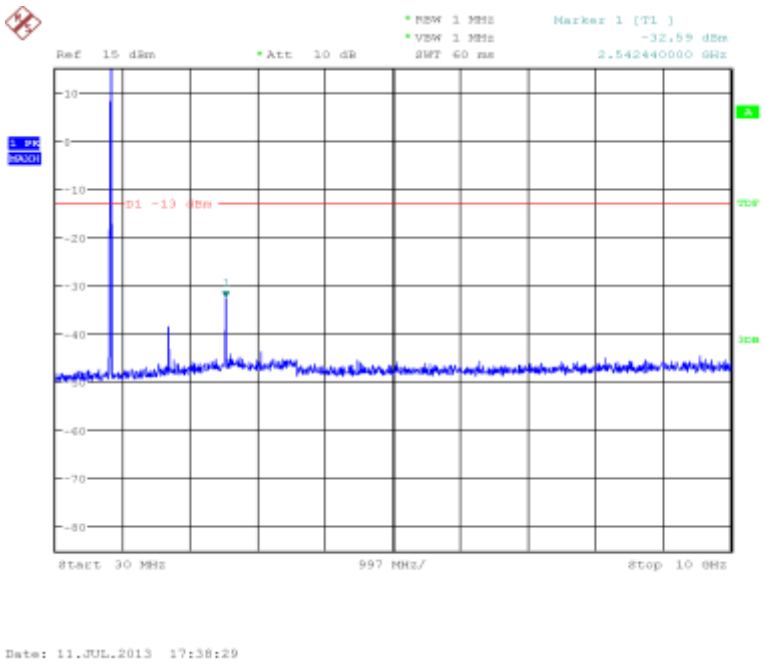
LOW, RB1-0, 30MHz TO 10000 GHz



MID RB1-0, 30MHz TO 10000 GHz



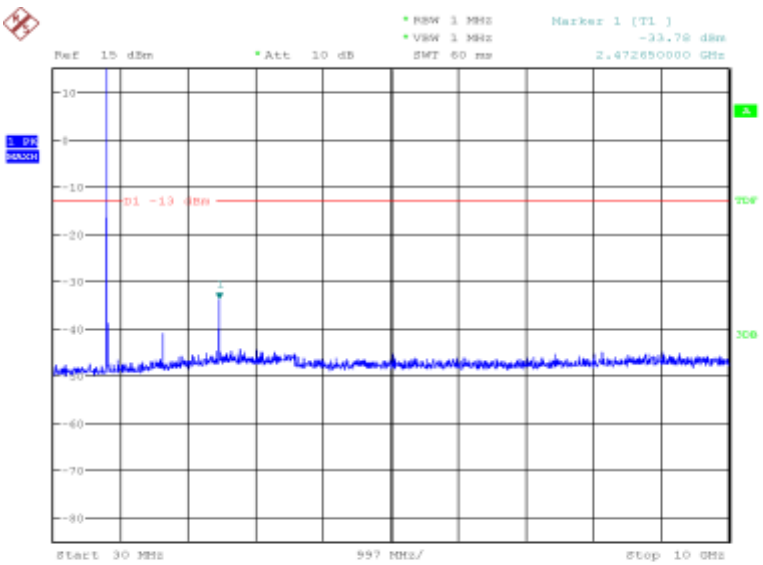
HIGH, RB1-0, 30MHz TO 10000 GHz



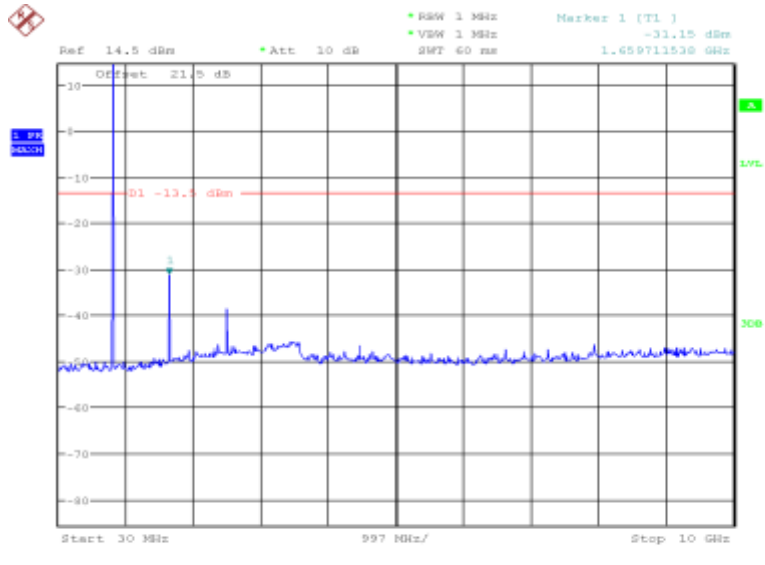
Band 5 (3.0 MHz BANDWIDTH)

LTE QPSK

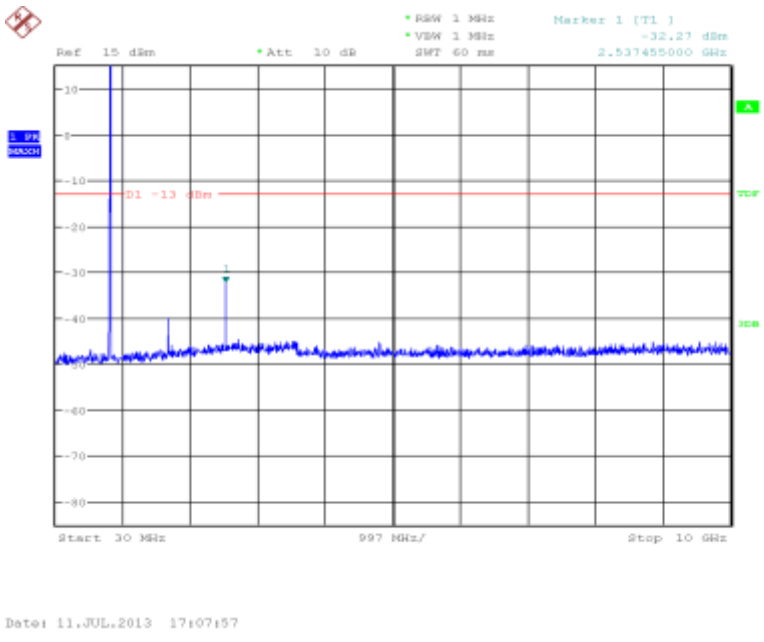
LOW, RB1-0, 30MHz TO 10000 GHz



MID, RB1-0, 30MHz TO 10000 GHz

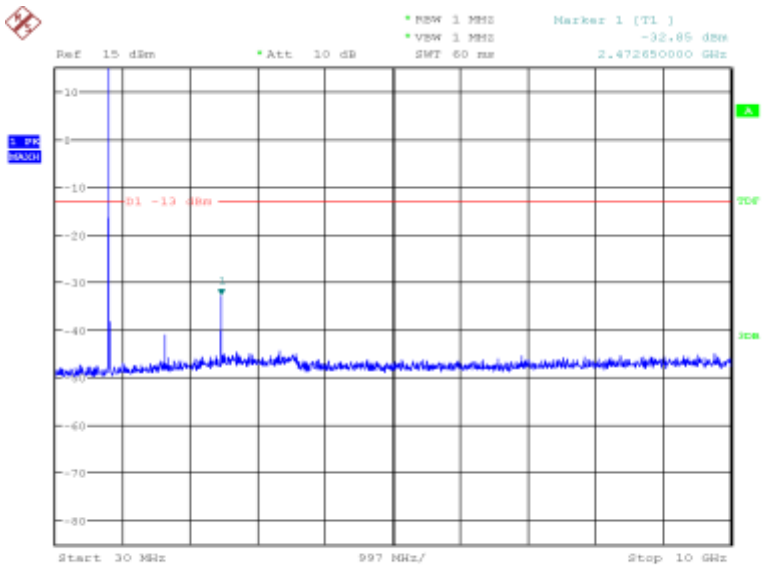


HIGH, RB1-0, 30MHz TO 10000 GHz

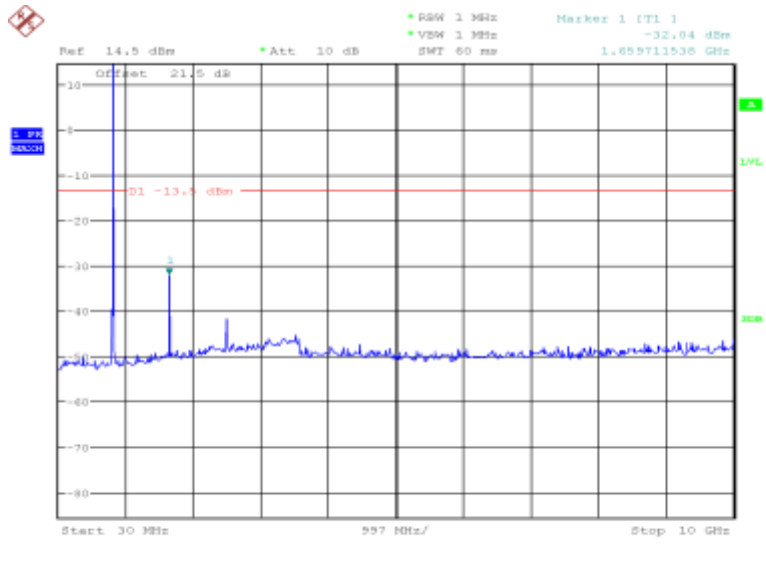


LTE 16QAM

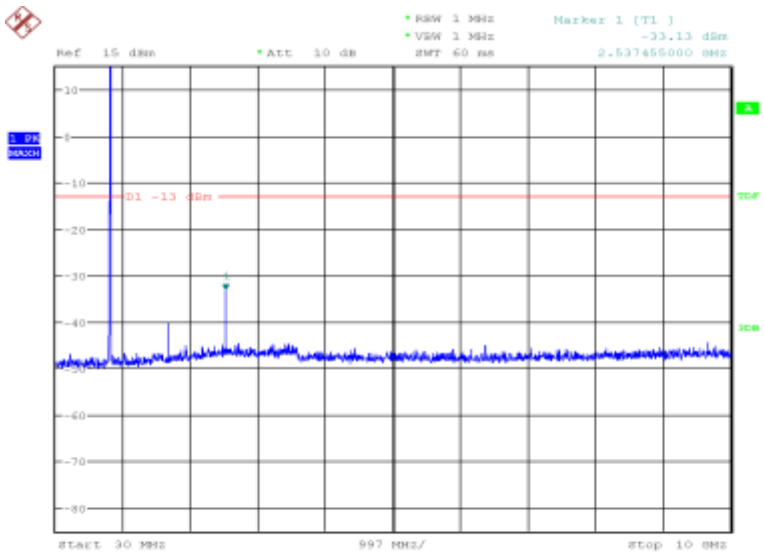
LOW, RB1-0, 30MHz TO 10000 GHz



MID, RB1-0, 30MHz TO 10000 GHz



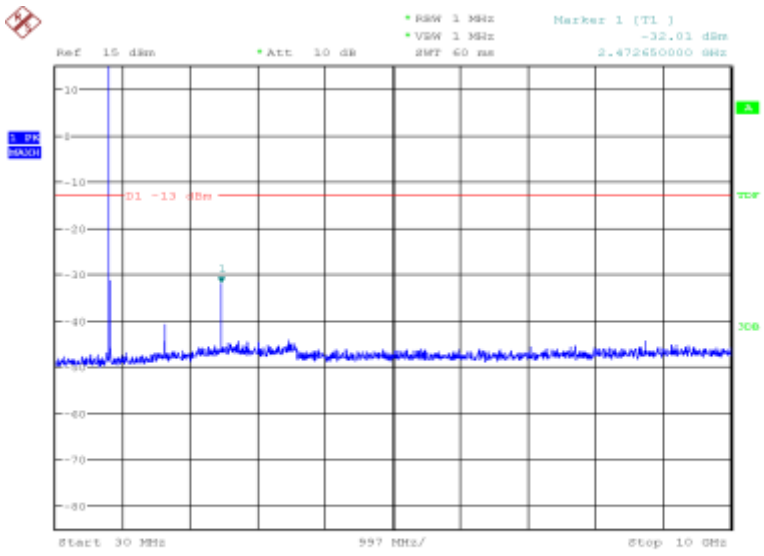
HIGH, RB1-0, 30MHz TO 10000 GHz



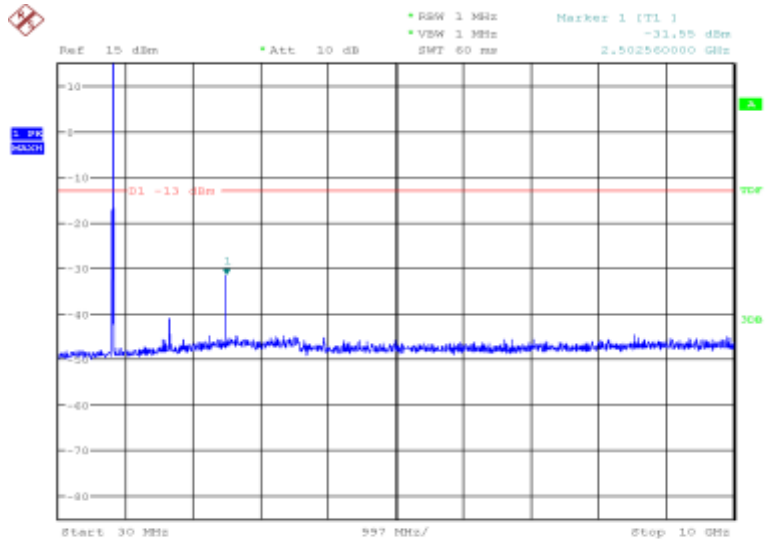
Band 5 (5 MHz BANDWIDTH)

LTE QPSK

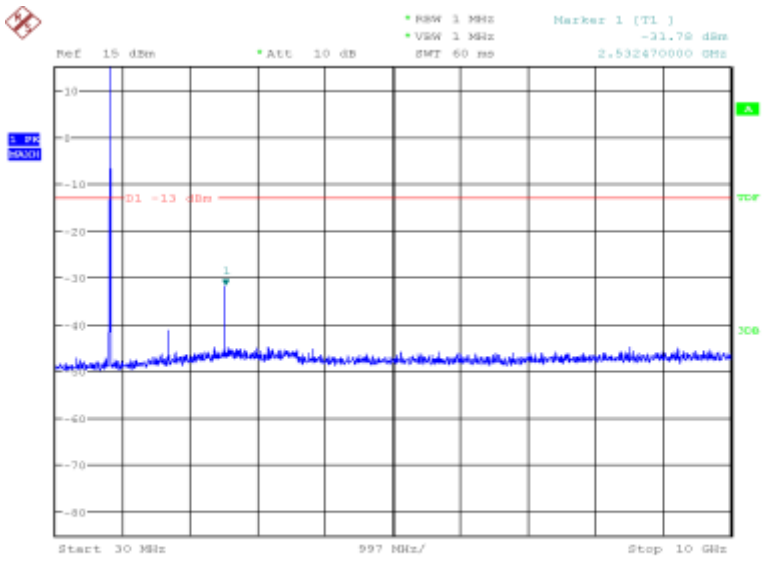
LOW, RB1-0, 30MHz TO 10000 GHz



MID, RB1-0, 30MHz TO 10000 GHz

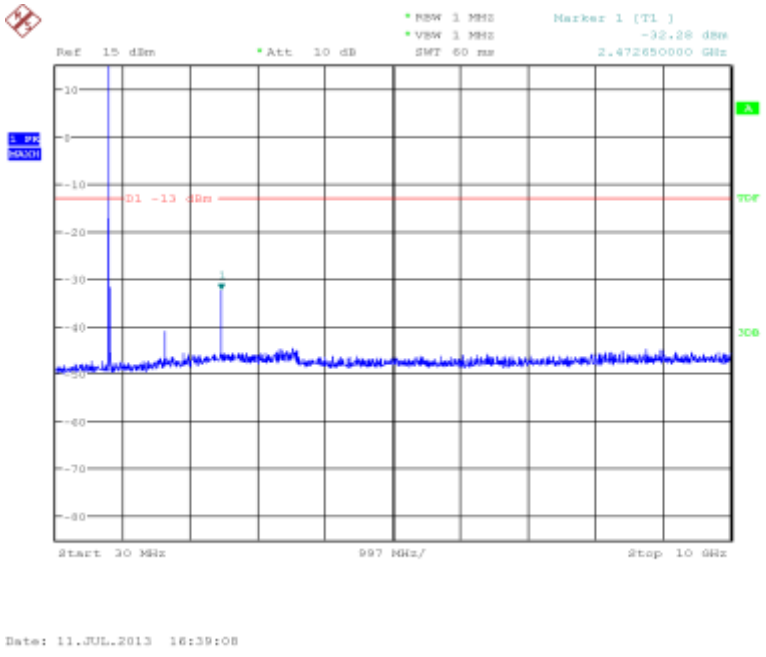


HIGH, RB1-0, 30MHz TO 10000 GHz

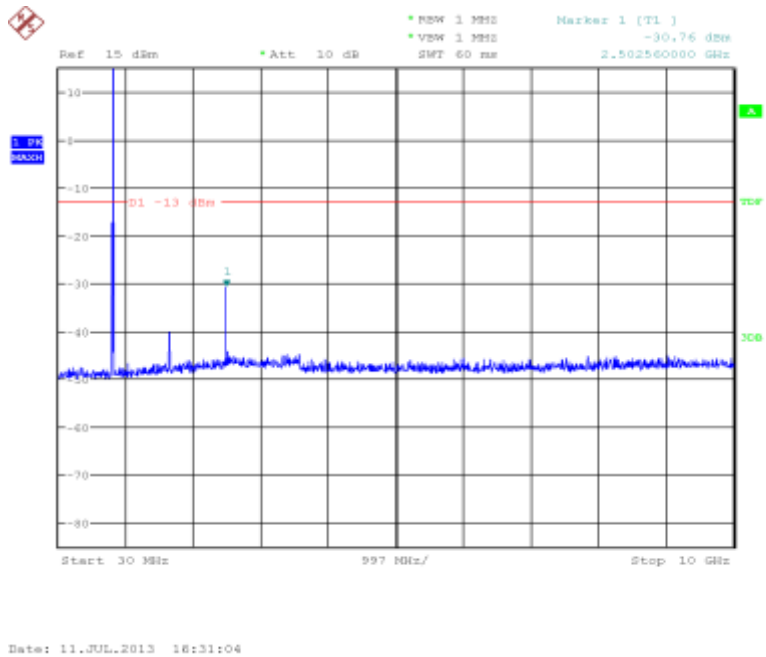


LTE 16QAM

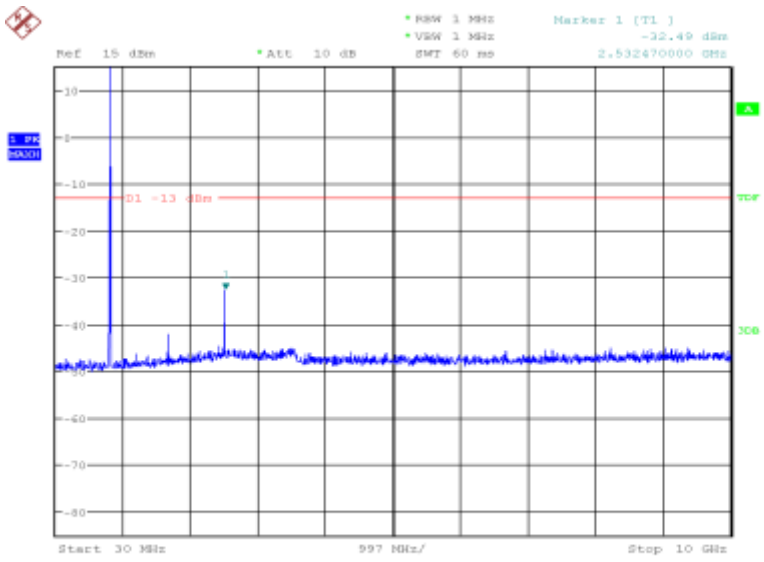
LOW, RB1-0, 30MHz TO 10000 GHz



MID, RB1-0, 30MHz TO 10000 GHz



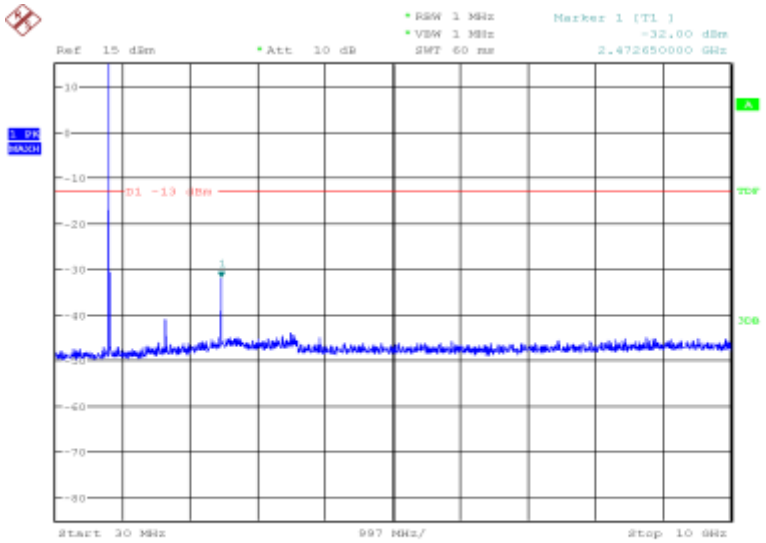
HIGH, RB1-0, 30MHz TO 10000 GHz



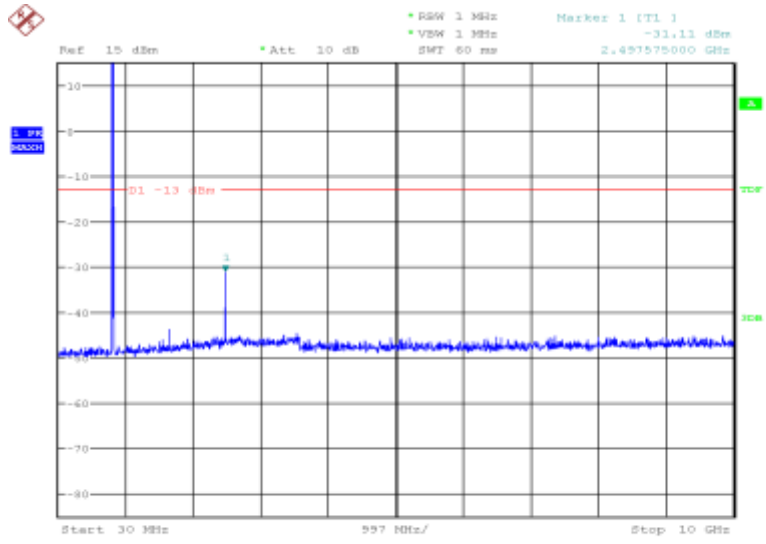
Band 5 (10 MHz BANDWIDTH)

LTE QPSK

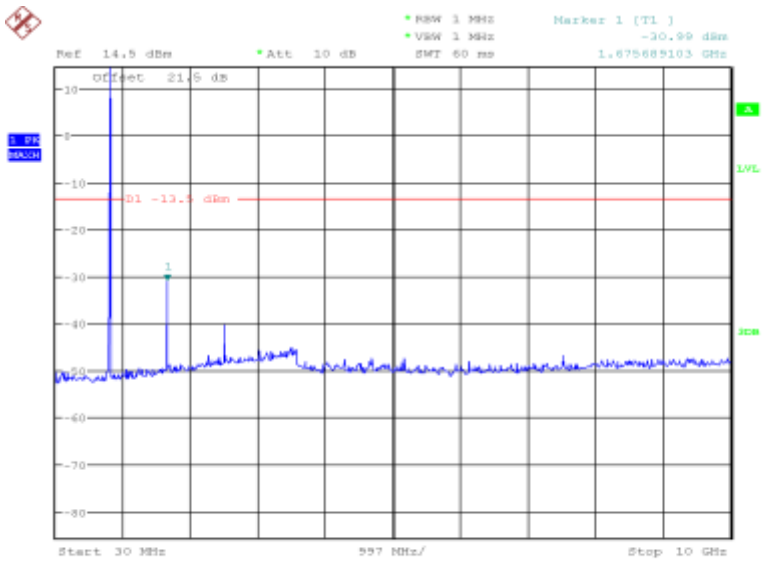
LOW, RB1-0, 30MHz TO 10000 GHz



MID, RB1-0, 30MHz TO 10000 GHz

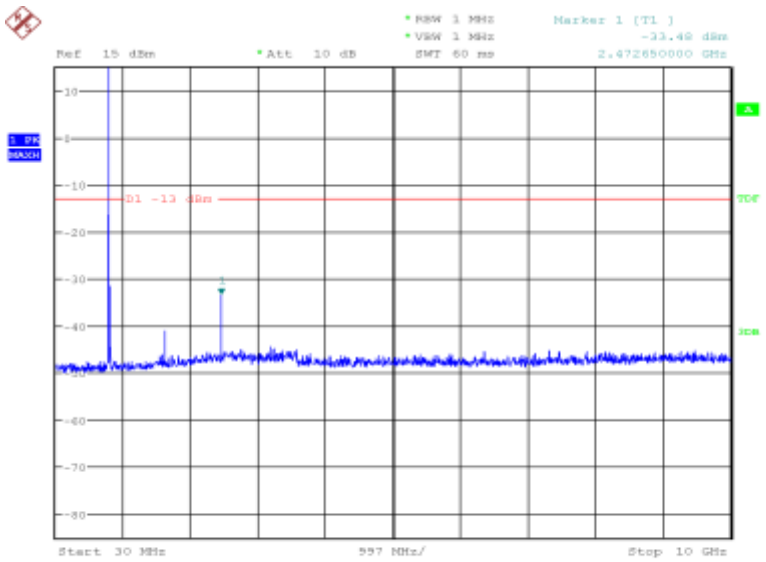


HIGH, RB1-0, 30MHz TO 10000 GHz



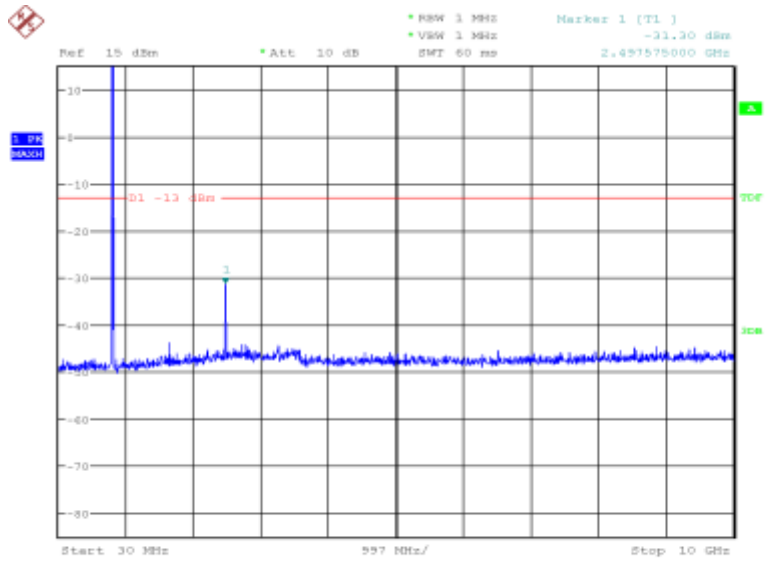
LTE 16QAM

LOW, RB1-0, 30MHz TO 10000 GHz



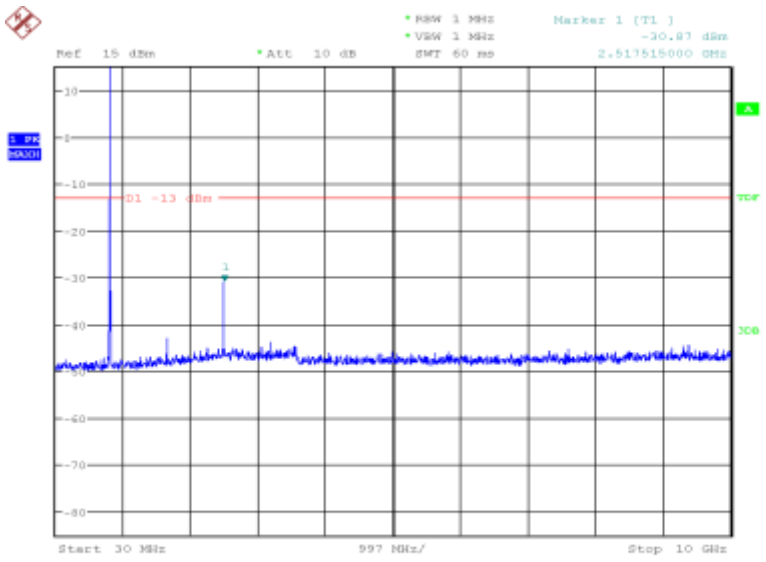
Date: 11.JUL.2013 16:14:38

MID, RB1-0, 30MHz TO 10000 GHz



Date: 11.JUL.2013 16:06:30

HIGH, RB1-0, 30MHz TO 10000 GHz



9. RADIATED TEST RESULTS

9.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913, §24.232 and §27.50

LIMITS:

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

TEST PROCEDURE

ANSI / TIA / EIA 603C Clause 2.2.17
KDB 971168 D01 Power Meas License Digital Systems v02r01, “Measurement Guidance for Certification of Licensed Digital Transmitters”

MODES TESTED

- LTE Band 2
- LTE Band 5

RESULTS

LAT BAND 2

LAT EIRP LTE Band 2 (1.4 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	EIRP (Peak)	
			dBm	mW
1.4MHz Band QPSK	6/0	1850.7	27.12	515.23
		1880.0	**28.10**	645.65
		1909.3	27.26	532.11
1.4MHz Band 16QAM	6/0	1850.7	26.10	407.38
		1880.0	**27.18**	522.40
		1909.3	26.24	420.73

LAT EIRP LTE Band 2 (3.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	EIRP (Peak)	
			dBm	mW
3.0MHz Band QPSK	15/0	1851.5	27.20	524.81
		1880.0	**28.18**	657.66
		1908.5	27.64	580.76
3.0MHz Band 16QAM	15/0	1851.5	26.30	426.58
		1880.0	**27.18**	522.40
		1908.5	26.64	461.32

LAT EIRP LTE Band 2 (5.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	EIRP (Peak)	
			dBm	mW
5.0MHz Band QPSK	25/0	1852.5	28.20	660.69
		1880.0	**29.08**	809.10
		1907.5	28.64	731.14
5.0MHz Band 16QAM	25/0	1852.5	27.30	537.03
		1880.0	**28.18**	657.66
		1907.5	27.64	580.76

LAT EIRP LTE Band 2 (10.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	EIRP (Peak)	
			dBm	mW
10.0MHz Band QPSK	50/0	1855.0	28.20	660.69
		1880.0	**29.38**	866.96
		1905.0	28.74	748.17
10.0MHz Band 16QAM	50/0	1855.0	27.30	537.03
		1880.0	**28.48**	704.69
		1905.0	27.74	594.29

LAT EIRP LTE Band 2 (15.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	EIRP (Peak)	
			dBm	mW
15MHz Band QPSK	75/0	1857.5	28.70	741.31
		1880.0	**29.48**	887.16
		1902.5	29.04	801.68
15MHz Band 16QAM	75/0	1857.5	27.70	588.84
		1880.0	**28.48**	704.69
		1902.5	28.14	651.63

LAT EIRP LTE Band 2 (20.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	EIRP (Peak)	
			dBm	mW
20.0MHz Band QPSK	100/0	1860.0	29.30	851.14
		1880.0	**29.78**	950.60
		1900.0	29.04	801.68
20MHz Band 16QAM	100/0	1860.0	28.30	676.08
		1880.0	**28.78**	755.09
		1900.0	28.04	636.80

LAT BAND 5

LAT ERP LTE Band 5 (1.4.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	ERP (Average)	
			dBm	mW
1.4MHz Band QPSK	1/0	824.7	21.10	128.82
		836.5	**21.20**	131.83
		848.3	20.20	104.71
1.4MHz Band 16QAM	1/0	824.7	20.10	102.33
		836.5	**20.30**	107.15
		848.3	19.20	83.18

LAT ERP LTE Band 5 (3.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	ERP (Average)	
			dBm	mW
3.0 MHZ BAND QPSK	1/0	825.5	**21.30**	134.90
		836.5	20.60	114.82
		847.5	20.50	112.20
3.0 MHZ BAND 16QAM	1/0	825.5	**20.40**	109.65
		836.5	19.60	91.20
		847.5	19.50	89.13

LAT ERP LTE Band 5 (5.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	ERP (Average)	
			dBm	mW
5MHz Band QPSK	1/0	826.5	**21.40**	138.04
		836.5	20.80	120.23
		846.5	20.50	112.20
5MHz Band 16QAM	1/0	826.5	**20.40**	109.65
		836.5	19.80	95.50
		846.5	19.50	89.13

LAT ERP LTE Band 5 (10.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	ERP (Average)	
			dBm	mW
10.0 MHZ BAND QPSK	1/0	829.0	**21.20**	131.83
		836.5	20.70	117.49
		844.0	20.90	123.03
10.0 MHZ BAND 16QAM	1/0	829.0	**20.30**	107.15
		836.5	19.70	93.33
		844.0	19.90	97.72

UAT BAND 2

UAT EIRP LTE Band 2 (1.4 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	EIRP (Peak)	
			dBm	mW
1.4MHz Band QPSK	6/0	1850.7	19.70	93.33
		1880.0	**21.48**	140.60
		1909.3	19.84	96.38
1.4MHz Band 16QAM	6/0	1850.7	18.70	74.13
		1880.0	**20.48**	111.69
		1909.3	18.84	76.56

UAT EIRP LTE Band 2 (3.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	EIRP (Peak)	
			dBm	mW
3.0MHz Band QPSK	15/0	1851.5	22.20	165.96
		1880.0	21.88	154.17
		1908.5	**22.24**	167.49
3.0MHz Band 16QAM	15/0	1851.5	21.20	131.83
		1880.0	20.88	122.46
		1908.5	**21.24**	133.05

UAT EIRP LTE Band 2 (5.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	EIRP (Peak)	
			dBm	mW
5.0MHz Band QPSK	25/0	1852.5	21.90	154.88
		1880.0	21.88	154.17
		1907.5	**21.94**	156.31
5.0MHz Band 16QAM	25/0	1852.5	20.90	123.03
		1880.0	20.88	122.46
		1907.5	**20.94**	124.17

UAT EIRP LTE Band 2 (10.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	EIRP (Peak)	
			dBm	mW
10.0MHz Band QPSK	50/0	1855.0	22.20	165.96
		1880.0	22.38	172.98
		1905.0	**22.84**	192.31
10.0MHz Band 16QAM	50/0	1855.0	21.20	131.83
		1880.0	21.38	137.40
		1905.0	**21.84**	152.76

UAT EIRP LTE Band 2 (15.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	EIRP (Peak)	
			dBm	mW
15MHz Band QPSK	75/0	1857.5	21.90	154.88
		1880.0	**22.48**	177.01
		1902.5	22.44	175.39
15MHz Band 16QAM	75/0	1857.5	20.90	123.03
		1880.0	**21.48**	140.60
		1902.5	21.44	139.32

UAT EIRP LTE Band 2 (20.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	EIRP (Peak)	
			dBm	mW
20.0MHz Band QPSK	100/0	1860.0	21.70	147.91
		1880.0	22.58	181.13
		1900.0	**22.64**	183.65
20MHz Band 16QAM	100/0	1860.0	20.70	117.49
		1880.0	21.58	143.88
		1900.0	**21.64**	145.88

UAT BAND 5

UAT ERP LTE Band 5 (1.4.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	ERP (Average)	
			dBm	mW
1.4MHz Band QPSK	1/0	824.7	**13.80**	23.99
		836.5	11.30	13.49
		848.3	13.10	20.42
1.4MHz Band 16QAM	1/0	824.7	**12.80**	19.05
		836.5	10.30	10.72
		848.3	12.10	16.22

UAT ERP LTE Band 5 (3.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	ERP (Average)	
			dBm	mW
3.0 MHZ BAND QPSK	1/0	825.5	**12.40**	17.38
		836.5	10.80	12.02
		847.5	10.40	10.96
3.0 MHZ BAND 16QAM	1/0	825.5	**11.40**	13.80
		836.5	9.80	9.55
		847.5	9.40	8.71

UAT ERP LTE Band 5 (5.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	ERP (Average)	
			dBm	mW
5MHz Band QPSK	1/0	826.5	**12.80**	19.05
		836.5	11.30	13.49
		846.5	11.50	14.13
5MHz Band 16QAM	1/0	826.5	**11.80**	15.14
		836.5	10.30	10.72
		846.5	10.50	11.22

UAT ERP LTE Band 5 (10.0 MHz BAND WIDTH)

Mode	RB/RB SIZE	f (MHz)	ERP (Average)	
			dBm	mW
10.0 MHZ BAND QPSK	1/0	829.0	**13.10**	20.42
		836.5	11.30	13.49
		844.0	10.90	12.30
10.0 MHZ BAND 16QAM	1/0	829.0	**12.10**	16.22
		836.5	10.30	10.72
		844.0	9.90	9.77

9.1.1. LAT LTE BAND 2

EIRP LTE QPSK Band 2 (1.4 MHz BAND WIDTH)

PEAK

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 07/03/13
Test Engineer: Roy Zheng
Configuration: EUT Only
Mode: LTE band 2, 1.4MHz BW
QPSK, Peak, RB6-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.851	19.4	V	1.50	7.94	25.86	33.0	-7.1	
1.851	19.8	H	1.50	8.80	27.12	33.0	-5.9	
Mid Ch								
1.880	20.5	V	1.50	7.95	26.97	33.0	-6.0	
1.880	20.9	H	1.50	8.68	28.10	33.0	-4.9	
High Ch								
1.909	20.0	V	1.50	7.97	26.43	33.0	-6.6	
1.909	20.2	H	1.50	8.57	27.26	33.0	-5.7	

Rev. 3.17.11

EIRP LTE 16QAM Band 2 (1.4 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 07/03/13
Test Engineer: Roy Zheng
Configuration: EUT Only
Mode: LTE band 2, 1.4MHz BW
16QAM, Peak, RB6-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.851	18.3	V	1.50	7.94	24.74	33.0	-8.3	
1.851	18.8	H	1.50	8.80	26.10	33.0	-6.9	
Mid Ch								
1.880	18.4	V	1.50	7.95	24.85	33.0	-8.2	
1.880	20.0	H	1.50	8.68	27.18	33.0	-5.8	
High Ch								
1.909	18.9	V	1.50	7.97	25.37	33.0	-7.6	
1.909	19.2	H	1.50	8.57	26.24	33.0	-6.8	

Rev. 3.17.11

EIRP LTE QPSK Band 2 (3.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 3MHz BW
QPSK, Peak, RB15-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.852	17.6	V	1.50	7.94	24.04	33.0	-9.0	
1.852	19.9	H	1.50	8.80	27.20	33.0	-5.8	
Mid Ch								
1.880	17.9	V	1.50	7.95	24.35	33.0	-8.7	
1.880	21.0	H	1.50	8.68	28.18	33.0	-4.8	
High Ch								
1.909	16.6	V	1.50	7.97	23.07	33.0	-9.9	
1.909	20.6	H	1.50	8.57	27.64	33.0	-5.4	

Rev. 3.17.11

EIRP LTE 16QAM Band 2 (3.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 3MHz BW
16QAM, Peak, RB15-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.852	16.7	V	1.50	7.94	23.14	33.0	-9.9	
1.852	19.0	H	1.50	8.80	26.30	33.0	-6.7	
Mid Ch								
1.880	16.9	V	1.50	7.95	23.35	33.0	-9.7	
1.880	20.0	H	1.50	8.68	27.18	33.0	-5.8	
High Ch								
1.909	15.7	V	1.50	7.97	22.17	33.0	-10.8	
1.909	19.6	H	1.50	8.57	26.64	33.0	-6.4	

Rev. 3.17.11

EIRP LTE QPSK Band 2 (5.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 5MHz BW
QPSK, Peak, RB25-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.853	18.0	V	1.50	7.94	24.44	33.0	-8.6	
1.853	20.9	H	1.50	8.80	28.20	33.0	-4.8	
Mid Ch								
1.880	18.7	V	1.50	7.95	25.15	33.0	-7.9	
1.880	21.9	H	1.50	8.68	29.08	33.0	-3.9	
High Ch								
1.908	17.8	V	1.50	7.97	24.27	33.0	-8.7	
1.908	21.6	H	1.50	8.57	28.64	33.0	-4.4	

Rev. 3.17.11

EIRP LTE 16QAM Band 2 (5.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 5MHz BW
16QAM, Peak, RB25-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.853	17.0	V	1.50	7.94	23.44	33.0	-9.6	
1.853	20.0	H	1.50	8.80	27.30	33.0	-5.7	
Mid Ch								
1.880	17.7	V	1.50	7.95	24.15	33.0	-8.9	
1.880	21.0	H	1.50	8.68	28.18	33.0	-4.8	
High Ch								
1.908	16.8	V	1.50	7.97	23.27	33.0	-9.7	
1.908	20.6	H	1.50	8.57	27.64	33.0	-5.4	

Rev. 3.17.11

EIRP LTE QPSK Band 2 (10.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 10MHz BW
QPSK, Peak, RB50-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.855	18.0	V	1.50	7.94	24.44	33.0	-8.6	
1.855	20.9	H	1.50	8.80	28.20	33.0	-4.8	
Mid Ch								
1.880	19.1	V	1.50	7.95	25.55	33.0	-7.5	
1.880	22.2	H	1.50	8.68	29.38	33.0	-3.6	
High Ch								
1.905	18.7	V	1.50	7.97	25.17	33.0	-7.8	
1.905	21.7	H	1.50	8.57	28.74	33.0	-4.3	

Rev. 3.17.11

EIRP LTE 16QAM Band 2 (10.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 10MHz BW
16QAM, Peak, RB50-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.855	17.0	V	1.50	7.94	23.44	33.0	-9.6	
1.855	20.0	H	1.50	8.80	27.30	33.0	-5.7	
Mid Ch								
1.880	18.2	V	1.50	7.95	24.65	33.0	-8.4	
1.880	21.3	H	1.50	8.68	28.48	33.0	-4.5	
High Ch								
1.905	17.7	V	1.50	7.97	24.17	33.0	-8.8	
1.905	20.7	H	1.50	8.57	27.74	33.0	-5.3	

Rev. 3.17.11

EIRP LTE QPSK Band 2 (15.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 15MHz BW
QPSK, Peak, RB75-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.858	18.6	V	1.50	7.94	25.04	33.0	-8.0	
1.858	21.4	H	1.50	8.80	28.70	33.0	-4.3	
Mid Ch								
1.880	19.4	V	1.50	7.95	25.85	33.0	-7.2	
1.880	22.3	H	1.50	8.68	29.48	33.0	-3.5	
High Ch								
1.903	18.4	V	1.50	7.97	24.87	33.0	-8.1	
1.903	22.0	H	1.50	8.57	29.04	33.0	-4.0	

Rev. 3.17.11

EIRP LTE 16QAM Band 2 (15.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 15MHz BW
16QAM, Peak, RB75-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.858	17.6	V	1.50	7.94	24.04	33.0	-9.0	
1.858	20.4	H	1.50	8.80	27.70	33.0	-5.3	
Mid Ch								
1.880	18.4	V	1.50	7.95	24.85	33.0	-8.2	
1.880	21.3	H	1.50	8.68	28.48	33.0	-4.5	
High Ch								
1.903	17.5	V	1.50	7.97	23.97	33.0	-9.0	
1.903	21.1	H	1.50	8.57	28.14	33.0	-4.9	

Rev. 3.17.11

EIRP LTE QPSK Band 2 (20.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 20MHz BW
QPSK, Peak, RB100-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.860	18.3	V	1.50	7.94	24.74	33.0	-8.3	
1.860	22.0	H	1.50	8.80	29.30	33.0	-3.7	
Mid Ch								
1.880	19.5	V	1.50	7.95	25.90	33.0	-7.1	
1.880	22.6	H	1.50	8.68	29.78	33.0	-3.2	
High Ch								
1.900	18.8	V	1.50	7.97	25.27	33.0	-7.7	
1.900	22.0	H	1.50	8.57	29.04	33.0	-4.0	

Rev. 3.17.11

EIRP LTE 16QAM Band 2 (20.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 20MHz BW
16QAM, Peak, RB100-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.860	17.3	V	1.50	7.94	23.74	33.0	-9.3	
1.860	21.0	H	1.50	8.80	28.30	33.0	-4.7	
Mid Ch								
1.880	18.4	V	1.50	7.95	24.85	33.0	-8.2	
1.880	21.6	H	1.50	8.68	28.78	33.0	-4.2	
High Ch								
1.900	17.8	V	1.50	7.97	24.27	33.0	-8.7	
1.900	21.0	H	1.50	8.57	28.04	33.0	-5.0	

Rev. 3.17.11

9.1.2. LAT LTE BAND 5

ERP LTE QPSK Band 5 (1.4 MHz BAND WIDTH)

AVERAGE

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 07/01/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: LTE Band 5 , 1.4MHz BW
QPSK, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
824.70	21.70	V	0.6	0.0	21.10	38.5	-17.3	
824.70	1.60	H	0.6	0.0	1.00	38.5	-37.4	
Mid Ch								
836.50	21.80	V	0.6	0.0	21.20	38.5	-17.2	
836.50	0.50	H	0.6	0.0	-0.10	38.5	-38.5	
High Ch								
848.30	20.80	V	0.6	0.0	20.20	38.5	-18.2	
848.30	1.84	H	0.6	0.0	1.24	38.5	-37.2	

Rev. 3.17.11

ERP LTE 16QAM Band 5 (1.4 MHz BAND WIDTH)

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 07/01/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: LTE Band 5 , 1.4MHz BW
16QAM, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
824.70	20.70	V	0.6	0.0	20.10	38.5	-18.3	
824.70	0.60	H	0.6	0.0	0.00	38.5	-38.4	
Mid Ch								
836.50	20.90	V	0.6	0.0	20.30	38.5	-18.1	
836.50	-0.50	H	0.6	0.0	-1.10	38.5	-39.5	
High Ch								
848.30	19.80	V	0.6	0.0	19.20	38.5	-19.2	
848.30	0.84	H	0.6	0.0	0.24	38.5	-38.2	

Rev. 3.17.11

ERP LTE QPSK Band 5 (3.0 MHz BAND WIDTH)

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: LTE Band 5 , 3MHz BW
QPSK, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
825.50	21.90	V	0.6	0.0	21.30	38.5	-17.1	
825.50	3.90	H	0.6	0.0	3.30	38.5	-35.1	
Mid Ch								
836.50	21.20	V	0.6	0.0	20.60	38.5	-17.8	
836.50	3.00	H	0.6	0.0	2.40	38.5	-36.0	
High Ch								
847.50	21.10	V	0.6	0.0	20.50	38.5	-17.9	
847.50	0.94	H	0.6	0.0	0.34	38.5	-38.1	

Rev. 3.17.11

ERP LTE 16QAM Band 5 (3.0 MHz BAND WIDTH)

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: LTE Band 5 , 3MHz BW
16QAM, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
825.50	21.00	V	0.6	0.0	20.40	38.5	-18.0	
825.50	2.90	H	0.6	0.0	2.30	38.5	-36.1	
Mid Ch								
836.50	20.20	V	0.6	0.0	19.60	38.5	-18.8	
836.50	2.00	H	0.6	0.0	1.40	38.5	-37.0	
High Ch								
847.50	20.10	V	0.6	0.0	19.50	38.5	-18.9	
847.50	-0.06	H	0.6	0.0	-0.66	38.5	-39.1	

Rev. 3.17.11

ERP LTE QPSK Band 5 (5.0 MHz BAND WIDTH)

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: LTE Band 5 , 5MHz BW
QPSK, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
826.50	22.00	V	0.6	0.0	21.40	38.5	-17.0	
826.50	3.80	H	0.6	0.0	3.20	38.5	-35.2	
Mid Ch								
836.50	21.40	V	0.6	0.0	20.80	38.5	-17.6	
836.50	3.00	H	0.6	0.0	2.40	38.5	-36.0	
High Ch								
846.50	21.10	V	0.6	0.0	20.50	38.5	-17.9	
846.50	1.34	H	0.6	0.0	0.74	38.5	-37.7	

Rev. 3.17.11

ERP LTE 16QAM Band 5 (5.0 MHz BAND WIDTH)

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: LTE Band 5 , 5MHz BW
16QAM, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
826.50	21.00	V	0.6	0.0	20.40	38.5	-18.0	
826.50	2.80	H	0.6	0.0	2.20	38.5	-36.2	
Mid Ch								
836.50	20.40	V	0.6	0.0	19.80	38.5	-18.6	
836.50	2.00	H	0.6	0.0	1.40	38.5	-37.0	
High Ch								
846.50	20.10	V	0.6	0.0	19.50	38.5	-18.9	
846.50	0.44	H	0.6	0.0	-0.16	38.5	-38.6	

Rev. 3.17.11

ERP LTE QPSK Band 5 (10.0 MHz BAND WIDTH)

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: LTE Band 5 , 10MHz BW
QPSK, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
829.00	21.80	V	0.6	0.0	21.20	38.5	-17.2	
829.00	3.90	H	0.6	0.0	3.30	38.5	-35.1	
Mid Ch								
836.50	21.30	V	0.6	0.0	20.70	38.5	-17.7	
836.50	3.30	H	0.6	0.0	2.70	38.5	-35.7	
High Ch								
844.00	21.50	V	0.6	0.0	20.90	38.5	-17.5	
844.00	2.24	H	0.6	0.0	1.64	38.5	-36.8	

Rev. 3.17.11

ERP LTE 16QAM Band 5 (10.0 MHz BAND WIDTH)

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/24/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: LTE Band 5 , 10MHz BW
16QAM, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
829.00	20.90	V	0.6	0.0	20.30	38.5	-18.1	
829.00	3.00	H	0.6	0.0	2.40	38.5	-36.0	
Mid Ch								
836.50	20.30	V	0.6	0.0	19.70	38.5	-18.7	
836.50	2.30	H	0.6	0.0	1.70	38.5	-36.7	
High Ch								
844.00	20.50	V	0.6	0.0	19.90	38.5	-18.5	
844.00	1.34	H	0.6	0.0	0.74	38.5	-37.7	

Rev. 3.17.11

9.1.3. UAT LTE BAND 2

EIRP LTE QPSK Band 2 (1.4 MHz BAND WIDTH)

PEAK

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 07/03/13
Test Engineer: Roy Zheng
Configuration: EUT Only
Mode: LTE band 2, 1.4MHz BW
QPSK, Peak, RB6-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.851	12.4	V	1.50	7.94	18.84	33.0	-14.2	
1.851	12.4	H	1.50	8.80	19.70	33.0	-13.3	
Mid Ch								
1.880	12.6	V	1.50	7.95	19.05	33.0	-14.0	
1.880	14.3	H	1.50	8.68	21.48	33.0	-11.5	
High Ch								
1.909	12.7	V	1.50	7.97	19.17	33.0	-13.8	
1.909	12.8	H	1.50	8.57	19.84	33.0	-13.2	

Rev. 3.17.11

EIRP LTE 16QAM Band 2 (1.4 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 07/03/13
Test Engineer: Roy Zheng
Configuration: EUT Only
Mode: LTE band 2, 1.4MHz BW
16QAM, Peak, RB6-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.851	11.5	V	1.50	7.94	17.94	33.0	-15.1	
1.851	11.4	H	1.50	8.80	18.70	33.0	-14.3	
Mid Ch								
1.880	11.6	V	1.50	7.95	18.05	33.0	-15.0	
1.880	13.3	H	1.50	8.68	20.48	33.0	-12.5	
High Ch								
1.909	11.7	V	1.50	7.97	18.17	33.0	-14.8	
1.909	11.8	H	1.50	8.57	18.84	33.0	-14.2	

Rev. 3.17.11

EIRP LTE QPSK Band 2 (3.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 3MHz BW
QPSK, Peak, RB15-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.852	14.3	V	1.50	7.94	20.74	33.0	-12.3	
1.852	14.9	H	1.50	8.80	22.20	33.0	-10.8	
Mid Ch								
1.880	14.0	V	1.50	7.95	20.45	33.0	-12.6	
1.880	14.7	H	1.50	8.68	21.88	33.0	-11.1	
High Ch								
1.909	12.7	V	1.50	7.97	19.17	33.0	-13.8	
1.909	15.2	H	1.50	8.57	22.24	33.0	-10.8	

Rev. 3.17.11

EIRP LTE 16QAM Band 2 (3.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 3MHz BW
16QAM, Peak, RB15-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.852	13.3	V	1.50	7.94	19.74	33.0	-13.3	
1.852	13.9	H	1.50	8.80	21.20	33.0	-11.8	
Mid Ch								
1.880	13.0	V	1.50	7.95	19.45	33.0	-13.6	
1.880	13.7	H	1.50	8.68	20.88	33.0	-12.1	
High Ch								
1.909	11.7	V	1.50	7.97	18.17	33.0	-14.8	
1.909	14.2	H	1.50	8.57	21.24	33.0	-11.8	

Rev. 3.17.11

EIRP LTE QPSK Band 2 (5.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 5MHz BW
QPSK, Peak, RB25-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.853	15.0	V	1.50	7.94	21.44	33.0	-11.6	
1.853	14.6	H	1.50	8.80	21.90	33.0	-11.1	
Mid Ch								
1.880	14.2	V	1.50	7.95	20.65	33.0	-12.4	
1.880	14.7	H	1.50	8.68	21.88	33.0	-11.1	
High Ch								
1.908	14.1	V	1.50	7.97	20.57	33.0	-12.4	
1.908	14.9	H	1.50	8.57	21.94	33.0	-11.1	

Rev. 3.17.11

EIRP LTE 16QAM Band 2 (5.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 5MHz BW
16QAM, Peak, RB25-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.853	14.1	V	1.50	7.94	20.54	33.0	-12.5	
1.853	13.6	H	1.50	8.80	20.90	33.0	-12.1	
Mid Ch								
1.880	13.2	V	1.50	7.95	19.65	33.0	-13.4	
1.880	13.7	H	1.50	8.68	20.88	33.0	-12.1	
High Ch								
1.908	13.1	V	1.50	7.97	19.57	33.0	-13.4	
1.908	13.9	H	1.50	8.57	20.94	33.0	-12.1	

Rev. 3.17.11

EIRP LTE QPSK Band 2 (10.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 10MHz BW
QPSK, Peak, RB50-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.855	14.8	V	1.50	7.94	21.24	33.0	-11.8	
1.855	14.9	H	1.50	8.80	22.20	33.0	-10.8	
Mid Ch								
1.880	15.4	V	1.50	7.95	21.85	33.0	-11.2	
1.880	15.2	H	1.50	8.68	22.38	33.0	-10.6	
High Ch								
1.905	14.4	V	1.50	7.97	20.87	33.0	-12.1	
1.905	15.8	H	1.50	8.57	22.84	33.0	-10.2	

Rev. 3.17.11

EIRP LTE 16QAM Band 2 (10.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 10MHz BW
16QAM, Peak, RB50-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.855	13.8	V	1.50	7.94	20.24	33.0	-12.8	
1.855	13.9	H	1.50	8.80	21.20	33.0	-11.8	
Mid Ch								
1.880	14.4	V	1.50	7.95	20.85	33.0	-12.2	
1.880	14.2	H	1.50	8.68	21.38	33.0	-11.6	
High Ch								
1.905	13.4	V	1.50	7.97	19.87	33.0	-13.1	
1.905	14.8	H	1.50	8.57	21.84	33.0	-11.2	

Rev. 3.17.11

EIRP LTE QPSK Band 2 (15.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 15MHz BW
QPSK, Peak, RB75-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.858	14.7	V	1.50	7.94	21.14	33.0	-11.9	
1.858	14.6	H	1.50	8.80	21.90	33.0	-11.1	
Mid Ch								
1.880	14.4	V	1.50	7.95	20.85	33.0	-12.2	
1.880	15.3	H	1.50	8.68	22.48	33.0	-10.5	
High Ch								
1.903	14.1	V	1.50	7.97	20.57	33.0	-12.4	
1.903	15.4	H	1.50	8.57	22.44	33.0	-10.6	

Rev. 3.17.11

EIRP LTE 16QAM Band 2 (15.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 15MHz BW
16QAM, Peak, RB75-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.858	13.7	V	1.50	7.94	20.14	33.0	-12.9	
1.858	13.6	H	1.50	8.80	20.90	33.0	-12.1	
Mid Ch								
1.880	13.4	V	1.50	7.95	19.85	33.0	-13.2	
1.880	14.3	H	1.50	8.68	21.48	33.0	-11.5	
High Ch								
1.903	13.1	V	1.50	7.97	19.57	33.0	-13.4	
1.903	14.4	H	1.50	8.57	21.44	33.0	-11.6	

Rev. 3.17.11

EIRP LTE QPSK Band 2 (20.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 20MHz BW
QPSK, Peak, RB100-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.860	15.1	V	1.50	7.94	21.54	33.0	-11.5	
1.860	14.4	H	1.50	8.80	21.70	33.0	-11.3	
Mid Ch								
1.880	14.7	V	1.50	7.95	21.15	33.0	-11.9	
1.880	15.4	H	1.50	8.68	22.58	33.0	-10.4	
High Ch								
1.900	15.1	V	1.50	7.97	21.57	33.0	-11.4	
1.900	15.6	H	1.50	8.57	22.64	33.0	-10.4	

Rev. 3.17.11

EIRP LTE 16QAM Band 2 (20.0 MHz BAND WIDTH)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT Only
Mode: LTE band 2, 20MHz BW
16QAM, Peak, RB100-0

Test Equipment:
Receiving: Horn T59, and Chamber D SMA Cables
Substitution: Horn T217 Substitution, 8ft SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1.860	14.1	V	1.50	7.94	20.54	33.0	-12.5	
1.860	13.4	H	1.50	8.80	20.70	33.0	-12.3	
Mid Ch								
1.880	13.7	V	1.50	7.95	20.15	33.0	-12.9	
1.880	14.4	H	1.50	8.68	21.58	33.0	-11.4	
High Ch								
1.900	14.1	V	1.50	7.97	20.57	33.0	-12.4	
1.900	14.6	H	1.50	8.57	21.64	33.0	-11.4	

Rev. 3.17.11

9.1.4. UAT LTE BAND 5

ERP LTE QPSK Band 5 (1.4 MHz BAND WIDTH)

AVERAGE

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company:	Apple
Project #:	13U15037
Date:	07/03/13
Test Engineer:	Roy Zheng
Configuration:	EUT only
Mode:	LTE Band 5 , 1.4MHz BW
	QPSK, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
824.70	14.40	V	0.6	0.0	13.80	38.5	-24.6	
824.70	-4.90	H	0.6	0.0	-5.50	38.5	-43.9	
Mid Ch								
836.50	11.90	V	0.6	0.0	11.30	38.5	-27.1	
836.50	-4.90	H	0.6	0.0	-5.50	38.5	-43.9	
High Ch								
848.30	13.70	V	0.6	0.0	13.10	38.5	-25.3	
848.30	-2.06	H	0.6	0.0	-2.66	38.5	-41.1	

Rev. 3.17.11

ERP LTE 16QAM Band 5 (1.4 MHz BAND WIDTH)

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 07/03/13
Test Engineer: Roy Zheng
Configuration: EUT only
Mode: LTE Band 5 , 1.4MHz BW
16QAM, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
824.70	13.40	V	0.6	0.0	12.80	38.5	-25.6	
824.70	-5.80	H	0.6	0.0	-6.40	38.5	-44.8	
Mid Ch								
836.50	10.90	V	0.6	0.0	10.30	38.5	-28.1	
836.50	-5.90	H	0.6	0.0	-6.50	38.5	-44.9	
High Ch								
848.30	12.70	V	0.6	0.0	12.10	38.5	-26.3	
848.30	-3.46	H	0.6	0.0	-4.06	38.5	-42.5	

Rev. 3.17.11

ERP LTE QPSK Band 5 (3.0 MHz BAND WIDTH)

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: LTE Band 5 , 3MHz BW
QPSK, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
825.50	13.00	V	0.6	0.0	12.40	38.5	-26.0	
825.50	-5.50	H	0.6	0.0	-6.10	38.5	-44.5	
Mid Ch								
836.50	11.40	V	0.6	0.0	10.80	38.5	-27.6	
836.50	-5.10	H	0.6	0.0	-5.70	38.5	-44.1	
High Ch								
847.50	11.00	V	0.6	0.0	10.40	38.5	-28.0	
847.50	-5.56	H	0.6	0.0	-6.16	38.5	-44.6	

Rev. 3.17.11

ERP LTE 16QAM Band 5 (3.0 MHz BAND WIDTH)

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: LTE Band 5 , 3MHz BW
16QAM, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
825.50	12.00	V	0.6	0.0	11.40	38.5	-27.0	
825.50	-6.50	H	0.6	0.0	-7.10	38.5	-45.5	
Mid Ch								
836.50	10.40	V	0.6	0.0	9.80	38.5	-28.6	
836.50	-6.10	H	0.6	0.0	-6.70	38.5	-45.1	
High Ch								
847.50	10.00	V	0.6	0.0	9.40	38.5	-29.0	
847.50	-6.56	H	0.6	0.0	-7.16	38.5	-45.6	

Rev. 3.17.11

ERP LTE QPSK Band 5 (5.0 MHz BAND WIDTH)

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: LTE Band 5 , 5MHz BW
QPSK, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
826.50	13.40	V	0.6	0.0	12.80	38.5	-25.6	
826.50	-5.20	H	0.6	0.0	-5.80	38.5	-44.2	
Mid Ch								
836.50	11.90	V	0.6	0.0	11.30	38.5	-27.1	
836.50	-5.00	H	0.6	0.0	-5.60	38.5	-44.0	
High Ch								
846.50	12.10	V	0.6	0.0	11.50	38.5	-26.9	
846.50	-5.26	H	0.6	0.0	-5.86	38.5	-44.3	

Rev. 3.17.11

ERP LTE 16QAM Band 5 (5.0 MHz BAND WIDTH)

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: LTE Band 5 , 5MHz BW
16QAM, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
826.50	12.40	V	0.6	0.0	11.80	38.5	-26.6	
826.50	-6.20	H	0.6	0.0	-6.80	38.5	-45.2	
Mid Ch								
836.50	10.90	V	0.6	0.0	10.30	38.5	-28.1	
836.50	-6.00	H	0.6	0.0	-6.60	38.5	-45.0	
High Ch								
846.50	11.10	V	0.6	0.0	10.50	38.5	-27.9	
846.50	-6.26	H	0.6	0.0	-6.86	38.5	-45.3	

Rev. 3.17.11

ERP LTE QPSK Band 5 (10.0 MHz BAND WIDTH)

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: LTE Band 5 , 10MHz BW
QPSK, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
829.00	13.70	V	0.6	0.0	13.10	38.5	-25.3	
829.00	-4.50	H	0.6	0.0	-5.10	38.5	-43.5	
Mid Ch								
836.50	11.90	V	0.6	0.0	11.30	38.5	-27.1	
836.50	-4.60	H	0.6	0.0	-5.20	38.5	-43.6	
High Ch								
844.00	11.50	V	0.6	0.0	10.90	38.5	-27.5	
844.00	-4.66	H	0.6	0.0	-5.26	38.5	-43.7	

Rev. 3.17.11

ERP LTE 16QAM Band 5 (10.0 MHz BAND WIDTH)

High Frequency Substitution Measurement
Compliance Certification Services Chamber D

Company: Apple
Project #: 13U15037
Date: 06/25/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: LTE Band 5 , 10MHz BW
16QAM, Average, RB1-0

Test Equipment:
Receiving: Sunol T243, and Chamber D N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 4ft SMA Cable Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch								
829.00	12.70	V	0.6	0.0	12.10	38.5	-26.3	
829.00	-5.50	H	0.6	0.0	-6.10	38.5	-44.5	
Mid Ch								
836.50	10.90	V	0.6	0.0	10.30	38.5	-28.1	
836.50	-5.60	H	0.6	0.0	-6.20	38.5	-44.6	
High Ch								
844.00	10.50	V	0.6	0.0	9.90	38.5	-28.5	
844.00	-5.66	H	0.6	0.0	-6.26	38.5	-44.7	

Rev. 3.17.11

9.2. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917, §24.238 and §27.53

LIMIT

§22.917 (e) and §24.238 (a): Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

§27.53 (g) 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.

§27.53 (h) 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 log10(P) dB.

TEST PROCEDURE

For Cellular equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

For PCS equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

MODES TESTED

- LTE BAND 2, and 5 (LAT & UAT)

RESULTS

9.2.1. LAT / PORT A

LAT BAND 2 (EIRP)

BAND 2 QPSK (1.4 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company:	Apple
Project #:	13U15037
Date:	07/02/13
Test Engineer:	R Zheng
Configuration:	EUT only
Mode:	TX, LTE band 2, 1.4MHz, QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber E	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1850.7 MHz)									
3.701	-23.9	V	3.0	30.2	1.0	-53.1	-13.0	-40.1	
5.552	-30.4	V	3.0	28.4	1.0	-57.8	-13.0	-44.8	
3.701	-23.3	H	3.0	30.2	1.0	-52.5	-13.0	-39.5	
5.552	-29.1	H	3.0	28.4	1.0	-56.5	-13.0	-43.5	
Mid Ch, (1880 MHz)									
3.760	-24.9	V	3.0	30.1	1.0	-54.1	-13.0	-41.1	
5.640	-30.2	V	3.0	28.3	1.0	-57.5	-13.0	-44.5	
3.760	-25.8	H	3.0	30.1	1.0	-54.9	-13.0	-41.9	
5.640	-29.1	H	3.0	28.3	1.0	-56.4	-13.0	-43.4	
High Ch, (1909.3 MHz)									
3.819	-25.1	V	3.0	30.1	1.0	-54.2	-13.0	-41.2	
5.728	-30.6	V	3.0	28.2	1.0	-57.8	-13.0	-44.8	
3.819	-25.6	H	3.0	30.1	1.0	-54.7	-13.0	-41.7	
5.728	-29.0	H	3.0	28.2	1.0	-56.2	-13.0	-43.2	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

16QAM Band 2 (1.4 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company:	Apple
Project #:	13U15037
Date:	07/02/13
Test Engineer:	R Zheng
Configuration:	EUT only
Mode:	TX, LTE band 2, 1.4MHz, 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber E	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1850.7 MHz)									
3.701	-24.9	V	3.0	30.2	1.0	-54.1	-13.0	-41.1	
5.552	-31.4	V	3.0	28.4	1.0	-58.8	-13.0	-45.8	
3.701	-24.2	H	3.0	30.2	1.0	-53.4	-13.0	-40.4	
5.552	-30.1	H	3.0	28.4	1.0	-57.5	-13.0	-44.5	
Mid Ch, (1880 MHz)									
3.760	-25.9	V	3.0	30.1	1.0	-55.1	-13.0	-42.1	
5.640	-31.2	V	3.0	28.3	1.0	-58.5	-13.0	-45.5	
3.760	-26.5	H	3.0	30.1	1.0	-55.6	-13.0	-42.6	
5.640	-30.0	H	3.0	28.3	1.0	-57.3	-13.0	-44.3	
High Ch, (1909.3 MHz)									
3.819	-26.0	V	3.0	30.1	1.0	-55.1	-13.0	-42.1	
5.728	-31.5	V	3.0	28.2	1.0	-58.7	-13.0	-45.7	
3.819	-29.6	H	3.0	30.1	1.0	-58.7	-13.0	-45.7	
5.728	-29.7	H	3.0	28.2	1.0	-56.9	-13.0	-43.9	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 2 (3.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company:	Apple
Project #:	13U15037
Date:	07/02/13
Test Engineer:	R Zheng
Configuration:	EUT only
Mode:	TX, LTE band 2, 3MHz, QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber E	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1851.5 MHz)									
3.703	-26.9	V	3.0	30.2	1.0	-56.1	-13.0	-43.1	
5.555	-30.5	V	3.0	28.4	1.0	-57.9	-13.0	-44.9	
3.703	-27.1	H	3.0	30.2	1.0	-56.3	-13.0	-43.3	
5.555	-29.3	H	3.0	28.4	1.0	-56.7	-13.0	-43.7	
Mid Ch, (1880 MHz)									
3.760	-26.7	V	3.0	30.1	1.0	-55.9	-13.0	-42.9	
5.640	-30.2	V	3.0	28.3	1.0	-57.5	-13.0	-44.5	
3.760	-26.9	H	3.0	30.1	1.0	-56.0	-13.0	-43.0	
5.640	-29.0	H	3.0	28.3	1.0	-56.3	-13.0	-43.3	
High Ch, (1908.5 MHz)									
3.817	-26.9	V	3.0	30.1	1.0	-56.0	-13.0	-43.0	
5.726	-30.4	V	3.0	28.2	1.0	-57.6	-13.0	-44.6	
3.817	-27.0	H	3.0	30.1	1.0	-56.1	-13.0	-43.1	
5.726	-29.4	H	3.0	28.2	1.0	-56.6	-13.0	-43.6	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 2 (3.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 3MHz, 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber E	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1851.5 MHz)									
3.703	-28.0	V	3.0	30.2	1.0	-57.2	-13.0	-44.2	
5.555	-31.5	V	3.0	28.4	1.0	-58.9	-13.0	-45.9	
3.703	-28.1	H	3.0	30.2	1.0	-57.3	-13.0	-44.3	
5.555	-29.2	H	3.0	28.4	1.0	-56.6	-13.0	-43.6	
Mid Ch, (1880 MHz)									
3.760	-27.7	V	3.0	30.1	1.0	-56.9	-13.0	-43.9	
5.640	-31.1	V	3.0	28.3	1.0	-58.4	-13.0	-45.4	
3.760	-27.7	H	3.0	30.1	1.0	-56.8	-13.0	-43.8	
5.640	-31.0	H	3.0	28.3	1.0	-58.3	-13.0	-45.3	
High Ch, (1908.5 MHz)									
3.817	-27.9	V	3.0	30.1	1.0	-57.0	-13.0	-44.0	
5.726	-31.4	V	3.0	28.2	1.0	-58.6	-13.0	-45.6	
3.817	-28.0	H	3.0	30.1	1.0	-57.1	-13.0	-44.1	
5.726	-30.3	H	3.0	28.2	1.0	-57.5	-13.0	-44.5	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 2 (5.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 5MHz, QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber E	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1852.5 MHz)									
3.705	-26.2	V	3.0	30.2	1.0	-55.4	-13.0	-42.4	
5.558	-30.7	V	3.0	28.4	1.0	-58.0	-13.0	-45.0	
3.705	-26.4	H	3.0	30.2	1.0	-55.6	-13.0	-42.6	
5.558	-29.7	H	3.0	28.4	1.0	-57.1	-13.0	-44.1	
Mid Ch, (1880 MHz)									
3.760	-26.5	V	3.0	30.1	1.0	-55.7	-13.0	-42.7	
5.640	-30.6	V	3.0	28.3	1.0	-57.9	-13.0	-44.9	
3.760	-27.3	H	3.0	30.1	1.0	-56.4	-13.0	-43.4	
5.640	-29.4	H	3.0	28.3	1.0	-56.7	-13.0	-43.7	
High Ch, (1907.5 MHz)									
3.815	-25.7	V	3.0	30.1	1.0	-54.8	-13.0	-41.8	
5.723	-30.8	V	3.0	28.2	1.0	-58.0	-13.0	-45.0	
3.815	-26.7	H	3.0	30.1	1.0	-55.8	-13.0	-42.8	
5.723	-29.6	H	3.0	28.2	1.0	-56.8	-13.0	-43.8	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 2 (5.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 5MHz, 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber E	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1852.5 MHz)									
3.705	-27.2	V	3.0	30.2	1.0	-56.4	-13.0	-43.4	
5.558	-31.7	V	3.0	28.4	1.0	-59.0	-13.0	-46.0	
3.705	-26.5	H	3.0	30.2	1.0	-55.7	-13.0	-42.7	
5.558	-30.7	H	3.0	28.4	1.0	-58.1	-13.0	-45.1	
Mid Ch, (1880 MHz)									
3.760	-27.4	V	3.0	30.1	1.0	-56.6	-13.0	-43.6	
5.640	-31.5	V	3.0	28.3	1.0	-58.8	-13.0	-45.8	
3.760	-28.4	H	3.0	30.1	1.0	-57.5	-13.0	-44.5	
5.640	-30.5	H	3.0	28.3	1.0	-57.8	-13.0	-44.8	
High Ch, (1907.5 MHz)									
3.815	-26.6	V	3.0	30.1	1.0	-55.7	-13.0	-42.7	
5.723	-31.8	V	3.0	28.2	1.0	-59.0	-13.0	-46.0	
3.815	-27.7	H	3.0	30.1	1.0	-56.8	-13.0	-43.8	
5.723	-30.6	H	3.0	28.2	1.0	-57.8	-13.0	-44.8	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 2 (10.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/01/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 10MHz, QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber E	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1855 MHz)									
3.710	-26.1	V	3.0	30.2	1.0	-55.3	-13.0	-42.3	
5.565	-30.3	V	3.0	28.4	1.0	-57.6	-13.0	-44.6	
3.710	-26.6	H	3.0	30.2	1.0	-55.8	-13.0	-42.8	
5.565	-29.2	H	3.0	28.4	1.0	-56.6	-13.0	-43.6	
Mid Ch, (1880 MHz)									
3.760	-26.8	V	3.0	30.1	1.0	-56.0	-13.0	-43.0	
5.640	-30.4	V	3.0	28.3	1.0	-57.7	-13.0	-44.7	
3.760	-27.5	H	3.0	30.1	1.0	-56.6	-13.0	-43.6	
5.640	-29.2	H	3.0	28.3	1.0	-56.5	-13.0	-43.5	
High Ch, (1905 MHz)									
3.810	-26.4	V	3.0	30.1	1.0	-55.5	-13.0	-42.5	
5.715	-30.7	V	3.0	28.2	1.0	-57.9	-13.0	-44.9	
3.810	-27.1	H	3.0	30.1	1.0	-56.2	-13.0	-43.2	
5.715	-29.6	H	3.0	28.2	1.0	-56.8	-13.0	-43.8	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 2 (10.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/01/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 10MHz, 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber E	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1855 MHz)									
3.710	-27.2	V	3.0	30.2	1.0	-56.4	-13.0	-43.4	
5.565	-31.4	V	3.0	28.4	1.0	-58.7	-13.0	-45.7	
3.710	-27.5	H	3.0	30.2	1.0	-56.7	-13.0	-43.7	
5.565	-30.3	H	3.0	28.4	1.0	-57.7	-13.0	-44.7	
Mid Ch, (1880 MHz)									
3.760	-27.7	V	3.0	30.1	1.0	-56.9	-13.0	-43.9	
5.640	-31.3	V	3.0	28.3	1.0	-58.6	-13.0	-45.6	
3.760	-28.6	H	3.0	30.1	1.0	-57.7	-13.0	-44.7	
5.640	-30.2	H	3.0	28.3	1.0	-57.5	-13.0	-44.5	
High Ch, (1905 MHz)									
3.810	-27.4	V	3.0	30.1	1.0	-56.5	-13.0	-43.5	
5.715	-31.6	V	3.0	28.2	1.0	-58.8	-13.0	-45.8	
3.810	-28.0	H	3.0	30.1	1.0	-57.1	-13.0	-44.1	
5.715	-30.6	H	3.0	28.2	1.0	-57.8	-13.0	-44.8	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 2 (15.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/01/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 15MHz, QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber E	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1857.5 MHz)									
3.715	-27.3	V	3.0	30.2	1.0	-56.5	-13.0	-43.5	
5.573	-30.7	V	3.0	28.3	1.0	-58.0	-13.0	-45.0	
3.715	-27.1	H	3.0	30.2	1.0	-56.3	-13.0	-43.3	
5.573	-28.8	H	3.0	28.3	1.0	-56.2	-13.0	-43.2	
Mid Ch, (1880 MHz)									
3.760	-26.2	V	3.0	30.1	1.0	-55.4	-13.0	-42.4	
5.646	-29.7	V	3.0	28.3	1.0	-57.0	-13.0	-44.0	
3.760	-27.1	H	3.0	30.1	1.0	-56.2	-13.0	-43.2	
5.646	-28.6	H	3.0	28.3	1.0	-55.9	-13.0	-42.9	
High Ch, (1902.5 MHz)									
3.805	-25.7	V	3.0	30.1	1.0	-54.8	-13.0	-41.8	
5.708	-29.0	V	3.0	28.2	1.0	-56.3	-13.0	-43.3	
3.805	-27.3	H	3.0	30.1	1.0	-56.4	-13.0	-43.4	
5.708	-28.9	H	3.0	28.2	1.0	-56.1	-13.0	-43.1	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 2 (15.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/01/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 15MHz, 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber E	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1857.5 MHz)									
3.715	-28.3	V	3.0	30.2	1.0	-57.5	-13.0	-44.5	
5.573	-31.7	V	3.0	28.3	1.0	-59.0	-13.0	-46.0	
3.715	-28.1	H	3.0	30.2	1.0	-57.3	-13.0	-44.3	
5.573	-29.8	H	3.0	28.3	1.0	-57.2	-13.0	-44.2	
Mid Ch, (1880 MHz)									
3.760	-27.1	V	3.0	30.1	1.0	-56.3	-13.0	-43.3	
5.646	-30.6	V	3.0	28.3	1.0	-57.9	-13.0	-44.9	
3.760	-28.0	H	3.0	30.1	1.0	-57.1	-13.0	-44.1	
5.646	-29.6	H	3.0	28.3	1.0	-56.9	-13.0	-43.9	
High Ch, (1902.5 MHz)									
3.805	-26.6	V	3.0	30.1	1.0	-55.7	-13.0	-42.7	
5.708	-30.0	V	3.0	28.2	1.0	-57.3	-13.0	-44.3	
3.805	-28.3	H	3.0	30.1	1.0	-57.4	-13.0	-44.4	
5.708	-29.8	H	3.0	28.2	1.0	-57.0	-13.0	-44.0	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 2 (20.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 20MHz, QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber E	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1860 MHz)									
3.720	-26.6	V	3.0	30.2	1.0	-55.8	-13.0	-42.8	
5.580	-30.1	V	3.0	28.3	1.0	-57.5	-13.0	-44.5	
3.720	-27.4	H	3.0	30.2	1.0	-56.6	-13.0	-43.6	
5.580	-29.1	H	3.0	28.3	1.0	-56.4	-13.0	-43.4	
Mid Ch, (1880 MHz)									
3.760	-26.4	V	3.0	30.1	1.0	-55.6	-13.0	-42.6	
5.640	-30.2	V	3.0	28.3	1.0	-57.5	-13.0	-44.5	
3.760	-26.9	H	3.0	30.1	1.0	-56.0	-13.0	-43.0	
5.640	-29.1	H	3.0	28.3	1.0	-56.4	-13.0	-43.4	
High Ch, (1900 MHz)									
3.800	-26.0	V	3.0	30.1	1.0	-55.1	-13.0	-42.1	
5.700	-30.3	V	3.0	28.2	1.0	-57.6	-13.0	-44.6	
3.800	-27.3	H	3.0	30.1	1.0	-56.4	-13.0	-43.4	
5.700	-28.6	H	3.0	28.2	1.0	-55.9	-13.0	-42.9	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 2 (20.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 20MHz, 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber E	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1860 MHz)									
3.720	-27.7	V	3.0	30.2	1.0	-56.9	-13.0	-43.9	
5.580	-31.2	V	3.0	28.3	1.0	-58.6	-13.0	-45.6	
3.720	-28.5	H	3.0	30.2	1.0	-57.7	-13.0	-44.7	
5.580	-29.9	H	3.0	28.3	1.0	-57.2	-13.0	-44.2	
Mid Ch, (1880 MHz)									
3.760	-27.4	V	3.0	30.1	1.0	-56.6	-13.0	-43.6	
5.640	-31.1	V	3.0	28.3	1.0	-58.4	-13.0	-45.4	
3.760	-27.9	H	3.0	30.1	1.0	-57.0	-13.0	-44.0	
5.640	-29.9	H	3.0	28.3	1.0	-57.2	-13.0	-44.2	
High Ch, (1900 MHz)									
3.800	-26.9	V	3.0	30.1	1.0	-56.0	-13.0	-43.0	
5.700	-31.7	V	3.0	28.2	1.0	-59.0	-13.0	-46.0	
3.800	-28.4	H	3.0	30.1	1.0	-57.5	-13.0	-44.5	
5.700	-29.6	H	3.0	28.2	1.0	-56.9	-13.0	-43.9	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LAT BAND 5

LTE QPSK Band 5 (1.4 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/01/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 1.4M QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (824.7MHz)									
1.649	-23.3	V	3.0	32.7	1.0	-55.0	-13.0	-42.0	
2.474	-27.0	V	3.0	31.4	1.0	-57.4	-13.0	-44.4	
1.649	-26.4	H	3.0	32.7	1.0	-58.1	-13.0	-45.1	
2.474	-28.3	H	3.0	31.4	1.0	-58.7	-13.0	-45.7	
Mid Ch, (836.5MHz)									
1.672	-23.0	V	3.0	32.6	1.0	-54.6	-13.0	-41.6	
2.508	-26.7	V	3.0	31.5	1.0	-57.2	-13.0	-44.2	
1.672	-26.5	H	3.0	32.6	1.0	-58.1	-13.0	-45.1	
2.508	-28.3	H	3.0	31.5	1.0	-58.8	-13.0	-45.8	
High Ch, (848.3MHz)									
1.697	-23.3	V	3.0	32.6	1.0	-54.8	-13.0	-41.8	
2.544	-25.7	V	3.0	31.4	1.0	-56.1	-13.0	-43.1	
1.697	-27.0	H	3.0	32.6	1.0	-58.5	-13.0	-45.5	
2.544	-28.7	H	3.0	31.4	1.0	-59.1	-13.0	-46.1	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 5 (1.4 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/01/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 1.4M 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (824.7MHz)									
1.649	-23.8	V	3.0	32.7	1.0	-55.5	-13.0	-42.5	
2.474	-27.5	V	3.0	31.4	1.0	-57.9	-13.0	-44.9	
1.649	-27.1	H	3.0	32.7	1.0	-58.8	-13.0	-45.8	
2.474	-28.9	H	3.0	31.4	1.0	-59.3	-13.0	-46.3	
Mid Ch, (836.5MHz)									
1.672	-24.1	V	3.0	32.6	1.0	-55.7	-13.0	-42.7	
2.508	-27.1	V	3.0	31.5	1.0	-57.6	-13.0	-44.6	
1.672	-27.5	H	3.0	32.6	1.0	-59.1	-13.0	-46.1	
2.508	-29.1	H	3.0	31.5	1.0	-59.6	-13.0	-46.6	
High Ch, (848.3MHz)									
1.697	-24.4	V	3.0	32.6	1.0	-55.9	-13.0	-42.9	
2.544	-26.4	V	3.0	31.4	1.0	-56.8	-13.0	-43.8	
1.697	-27.8	H	3.0	32.6	1.0	-59.3	-13.0	-46.3	
2.544	-29.1	H	3.0	31.4	1.0	-59.5	-13.0	-46.5	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 5 (3.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/01/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 3M QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (825.5MHz)									
1.648	-23.5	V	3.0	32.7	1.0	-55.2	-13.0	-42.2	
2.473	-26.4	V	3.0	31.4	1.0	-56.8	-13.0	-43.8	
1.648	-26.1	H	3.0	32.7	1.0	-57.8	-13.0	-44.8	
2.473	-29.2	H	3.0	31.4	1.0	-59.6	-13.0	-46.6	
Mid Ch, (836.5MHz)									
1.670	-22.8	V	3.0	32.6	1.0	-54.4	-13.0	-41.4	
2.505	-26.5	V	3.0	31.5	1.0	-57.0	-13.0	-44.0	
1.670	-25.2	H	3.0	32.6	1.0	-56.9	-13.0	-43.9	
2.505	-28.7	H	3.0	31.5	1.0	-59.2	-13.0	-46.2	
High Ch, (847.5MHz)									
1.692	-23.3	V	3.0	32.6	1.0	-54.8	-13.0	-41.8	
2.538	-26.1	V	3.0	31.4	1.0	-56.5	-13.0	-43.5	
1.692	-26.1	H	3.0	32.6	1.0	-57.6	-13.0	-44.6	
2.538	-28.7	H	3.0	31.4	1.0	-59.2	-13.0	-46.2	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 5 (3.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/01/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 3M 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (825.5MHz)									
1.648	-24.4	V	3.0	32.7	1.0	-56.1	-13.0	-43.1	
2.473	-27.0	V	3.0	31.4	1.0	-57.4	-13.0	-44.4	
1.648	-26.9	H	3.0	32.7	1.0	-58.6	-13.0	-45.6	
2.473	-29.8	H	3.0	31.4	1.0	-60.2	-13.0	-47.2	
Mid Ch, (836.5MHz)									
1.670	-23.0	V	3.0	32.6	1.0	-54.6	-13.0	-41.6	
2.505	-27.0	V	3.0	31.5	1.0	-57.5	-13.0	-44.5	
1.670	-26.1	H	3.0	32.6	1.0	-57.8	-13.0	-44.8	
2.505	-29.5	H	3.0	31.5	1.0	-60.0	-13.0	-47.0	
High Ch, (847.5MHz)									
1.692	-23.9	V	3.0	32.6	1.0	-55.4	-13.0	-42.4	
2.538	-26.9	V	3.0	31.4	1.0	-57.3	-13.0	-44.3	
1.692	-26.9	H	3.0	32.6	1.0	-58.4	-13.0	-45.4	
2.538	-29.1	H	3.0	31.4	1.0	-59.6	-13.0	-46.6	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 5 (5.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/01/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 5M QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (826.5MHz)									
1.648	-23.7	V	3.0	32.7	1.0	-55.4	-13.0	-42.4	
2.473	-25.6	V	3.0	31.4	1.0	-56.0	-13.0	-43.0	
1.648	-27.1	H	3.0	32.7	1.0	-58.8	-13.0	-45.8	
2.473	-28.4	H	3.0	31.4	1.0	-58.8	-13.0	-45.8	
Mid Ch, (836.5MHz)									
1.669	-21.9	V	3.0	32.6	1.0	-53.5	-13.0	-40.5	
2.503	-26.2	V	3.0	31.5	1.0	-56.7	-13.0	-43.7	
1.669	-24.8	H	3.0	32.6	1.0	-56.5	-13.0	-43.5	
2.503	-28.1	H	3.0	31.5	1.0	-58.6	-13.0	-45.6	
High Ch, (846.5MHz)									
1.688	-24.0	V	3.0	32.6	1.0	-55.5	-13.0	-42.5	
2.532	-26.4	V	3.0	31.5	1.0	-56.9	-13.0	-43.9	
1.688	-26.6	H	3.0	32.6	1.0	-58.2	-13.0	-45.2	
2.532	-28.6	H	3.0	31.5	1.0	-59.1	-13.0	-46.1	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 5 (5.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/01/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 5M 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (826.5MHz)									
1.648	-24.4	V	3.0	32.7	1.0	-56.1	-13.0	-43.1	
2.473	-26.2	V	3.0	31.4	1.0	-56.6	-13.0	-43.6	
1.648	-27.8	H	3.0	32.7	1.0	-59.5	-13.0	-46.5	
2.473	-29.1	H	3.0	31.4	1.0	-59.5	-13.0	-46.5	
Mid Ch, (836.5MHz)									
1.669	-23.0	V	3.0	32.6	1.0	-54.6	-13.0	-41.6	
2.503	-27.1	V	3.0	31.5	1.0	-57.6	-13.0	-44.6	
1.669	-25.7	H	3.0	32.6	1.0	-57.4	-13.0	-44.4	
2.503	-28.9	H	3.0	31.5	1.0	-59.4	-13.0	-46.4	
High Ch, (846.5MHz)									
1.688	-24.9	V	3.0	32.6	1.0	-56.4	-13.0	-43.4	
2.532	-27.3	V	3.0	31.5	1.0	-57.8	-13.0	-44.8	
1.688	-27.4	H	3.0	32.6	1.0	-59.0	-13.0	-46.0	
2.532	-29.3	H	3.0	31.5	1.0	-59.8	-13.0	-46.8	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 5 (10.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/01/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 10M QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (829MHz)									
1.649	-22.9	V	3.0	32.7	1.0	-54.6	-13.0	-41.6	
2.474	-25.4	V	3.0	31.4	1.0	-55.8	-13.0	-42.8	
1.649	-26.0	H	3.0	32.7	1.0	-57.7	-13.0	-44.7	
2.474	-28.5	H	3.0	31.4	1.0	-58.9	-13.0	-45.9	
Mid Ch, (836.5MHz)									
1.664	-20.7	V	3.0	32.6	1.0	-52.4	-13.0	-39.4	
2.496	-25.4	V	3.0	31.5	1.0	-55.9	-13.0	-42.9	
1.664	-24.4	H	3.0	32.6	1.0	-56.0	-13.0	-43.0	
2.496	-28.3	H	3.0	31.5	1.0	-58.8	-13.0	-45.8	
High Ch, (844MHz)									
1.679	-23.5	V	3.0	32.6	1.0	-55.1	-13.0	-42.1	
2.519	-26.3	V	3.0	31.5	1.0	-56.8	-13.0	-43.8	
1.679	-26.4	H	3.0	32.6	1.0	-58.0	-13.0	-45.0	
2.519	-28.7	H	3.0	31.5	1.0	-59.2	-13.0	-46.2	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 5 (10.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/01/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 10M 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (829MHz)									
1.658	-23.9	V	3.0	32.6	1.0	-55.6	-13.0	-42.6	
2.487	-25.7	V	3.0	31.4	1.0	-56.1	-13.0	-43.1	
1.658	-26.4	H	3.0	32.6	1.0	-58.0	-13.0	-45.0	
2.487	-28.9	H	3.0	31.4	1.0	-59.4	-13.0	-46.4	
Mid Ch, (836.5MHz)									
1.664	-21.3	V	3.0	32.6	1.0	-52.9	-13.0	-39.9	
2.496	-25.9	V	3.0	31.5	1.0	-56.4	-13.0	-43.4	
1.664	-25.2	H	3.0	32.6	1.0	-56.8	-13.0	-43.8	
2.496	-28.7	H	3.0	31.5	1.0	-59.2	-13.0	-46.2	
High Ch, (844MHz)									
1.679	-24.1	V	3.0	32.6	1.0	-55.7	-13.0	-42.7	
2.519	-27.2	V	3.0	31.5	1.0	-57.7	-13.0	-44.7	
1.679	-27.0	H	3.0	32.6	1.0	-58.6	-13.0	-45.6	
2.519	-29.2	H	3.0	31.5	1.0	-59.7	-13.0	-46.7	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

9.2.2. UAT / PORT B

UAT BAND 2 (EIRP)

BAND 2 LTE QPSK Band 2 (1.4 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 1.4MHz, QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1850.7 MHz)									
3.701	-25.3	V	3.0	30.2	1.0	-54.5	-13.0	-41.5	
5.552	-30.3	V	3.0	28.4	1.0	-57.7	-13.0	-44.7	
3.701	-24.3	H	3.0	30.2	1.0	-53.5	-13.0	-40.5	
5.552	-28.9	H	3.0	28.4	1.0	-56.3	-13.0	-43.3	
Mid Ch, (1880 MHz)									
3.760	-26.7	V	3.0	30.1	1.0	-55.9	-13.0	-42.9	
5.640	-30.3	V	3.0	28.3	1.0	-57.6	-13.0	-44.6	
3.760	-26.0	H	3.0	30.1	1.0	-55.1	-13.0	-42.1	
5.640	-29.4	H	3.0	28.3	1.0	-56.7	-13.0	-43.7	
High Ch, (1909.3 MHz)									
3.819	-26.3	V	3.0	30.1	1.0	-55.4	-13.0	-42.4	
5.728	-30.0	V	3.0	28.2	1.0	-57.2	-13.0	-44.2	
3.819	-24.3	H	3.0	30.1	1.0	-53.4	-13.0	-40.4	
5.728	-29.2	H	3.0	28.2	1.0	-56.4	-13.0	-43.4	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 2 (1.4 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company:	Apple
Project #:	13U15037
Date:	07/02/13
Test Engineer:	R Zheng
Configuration:	EUT only
Mode:	TX, LTE band 2, 1.4MHz, 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1850.7 MHz)									
3.701	-26.3	V	3.0	30.2	1.0	-55.5	-13.0	-42.5	
5.552	-31.3	V	3.0	28.4	1.0	-58.7	-13.0	-45.7	
3.701	-25.3	H	3.0	30.2	1.0	-54.5	-13.0	-41.5	
5.552	-29.9	H	3.0	28.4	1.0	-57.3	-13.0	-44.3	
Mid Ch, (1880 MHz)									
3.760	-27.6	V	3.0	30.1	1.0	-56.8	-13.0	-43.8	
5.640	-31.3	V	3.0	28.3	1.0	-58.6	-13.0	-45.6	
3.760	-27.0	H	3.0	30.1	1.0	-56.1	-13.0	-43.1	
5.640	-30.4	H	3.0	28.3	1.0	-57.7	-13.0	-44.7	
High Ch, (1909.3 MHz)									
3.819	-27.4	V	3.0	30.1	1.0	-56.5	-13.0	-43.5	
5.728	-31.0	V	3.0	28.2	1.0	-58.2	-13.0	-45.2	
3.819	-25.4	H	3.0	30.1	1.0	-54.5	-13.0	-41.5	
5.728	-30.0	H	3.0	28.2	1.0	-57.2	-13.0	-44.2	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 2 (3.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 3MHz, QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1851.5 MHz)									
3.703	-26.6	V	3.0	30.2	1.0	-55.8	-13.0	-42.8	
5.555	-30.6	V	3.0	28.4	1.0	-58.0	-13.0	-45.0	
3.703	-26.2	H	3.0	30.2	1.0	-55.4	-13.0	-42.4	
5.555	-28.6	H	3.0	28.4	1.0	-56.0	-13.0	-43.0	
Mid Ch, (1880 MHz)									
3.760	-26.5	V	3.0	30.1	1.0	-55.7	-13.0	-42.7	
5.640	-29.9	V	3.0	28.3	1.0	-57.2	-13.0	-44.2	
3.760	-26.9	H	3.0	30.1	1.0	-56.0	-13.0	-43.0	
5.640	-29.1	H	3.0	28.3	1.0	-56.4	-13.0	-43.4	
High Ch, (1908.5 MHz)									
3.817	-26.3	V	3.0	30.1	1.0	-55.4	-13.0	-42.4	
5.726	-30.4	V	3.0	28.2	1.0	-57.6	-13.0	-44.6	
3.817	-27.1	H	3.0	30.1	1.0	-56.2	-13.0	-43.2	
5.726	-28.8	H	3.0	28.2	1.0	-56.0	-13.0	-43.0	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 2 (3.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 3MHz, 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1851.5 MHz)									
3.703	-27.6	V	3.0	30.2	1.0	-56.8	-13.0	-43.8	
5.555	-31.5	V	3.0	28.4	1.0	-58.9	-13.0	-45.9	
3.703	-27.2	H	3.0	30.2	1.0	-56.4	-13.0	-43.4	
5.555	-29.5	H	3.0	28.4	1.0	-56.9	-13.0	-43.9	
Mid Ch, (1880 MHz)									
3.760	-27.5	V	3.0	30.1	1.0	-56.7	-13.0	-43.7	
5.640	-30.9	V	3.0	28.3	1.0	-58.2	-13.0	-45.2	
3.760	-27.8	H	3.0	30.1	1.0	-56.9	-13.0	-43.9	
5.640	-30.1	H	3.0	28.3	1.0	-57.4	-13.0	-44.4	
High Ch, (1908.5 MHz)									
3.817	-27.3	V	3.0	30.1	1.0	-56.4	-13.0	-43.4	
5.726	-31.3	V	3.0	28.2	1.0	-58.5	-13.0	-45.5	
3.817	-28.1	H	3.0	30.1	1.0	-57.2	-13.0	-44.2	
5.726	-29.8	H	3.0	28.2	1.0	-57.0	-13.0	-44.0	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 2 (5.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 5MHz, QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1852.5 MHz)									
3.705	-26.3	V	3.0	30.2	1.0	-55.5	-13.0	-42.5	
5.558	-30.1	V	3.0	28.4	1.0	-57.4	-13.0	-44.4	
3.705	-26.6	H	3.0	30.2	1.0	-55.8	-13.0	-42.8	
5.558	-29.1	H	3.0	28.4	1.0	-56.5	-13.0	-43.5	
Mid Ch, (1880 MHz)									
3.760	-26.7	V	3.0	30.1	1.0	-55.9	-13.0	-42.9	
5.640	-30.1	V	3.0	28.3	1.0	-57.4	-13.0	-44.4	
3.760	-26.3	H	3.0	30.1	1.0	-55.4	-13.0	-42.4	
5.640	-28.5	H	3.0	28.3	1.0	-55.8	-13.0	-42.8	
High Ch, (1907.5 MHz)									
3.815	-26.6	V	3.0	30.1	1.0	-55.7	-13.0	-42.7	
5.723	-30.5	V	3.0	28.2	1.0	-57.7	-13.0	-44.7	
3.815	-26.7	H	3.0	30.1	1.0	-55.8	-13.0	-42.8	
5.723	-29.0	H	3.0	28.2	1.0	-56.2	-13.0	-43.2	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 2 (5.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company:	Apple
Project #:	13U15037
Date:	07/02/13
Test Engineer:	R Zheng
Configuration:	EUT only
Mode:	TX, LTE band 2, 5MHz, 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1852.5 MHz)									
3.705	-27.3	V	3.0	30.2	1.0	-56.5	-13.0	-43.5	
5.558	-31.0	V	3.0	28.4	1.0	-58.3	-13.0	-45.3	
3.705	-27.6	H	3.0	30.2	1.0	-56.8	-13.0	-43.8	
5.558	-30.0	H	3.0	28.4	1.0	-57.4	-13.0	-44.4	
Mid Ch, (1880 MHz)									
3.760	-27.6	V	3.0	30.1	1.0	-56.8	-13.0	-43.8	
5.640	-31.1	V	3.0	28.3	1.0	-58.4	-13.0	-45.4	
3.760	-27.3	H	3.0	30.1	1.0	-56.4	-13.0	-43.4	
5.640	-29.4	H	3.0	28.3	1.0	-56.7	-13.0	-43.7	
High Ch, (1907.5 MHz)									
3.815	-27.6	V	3.0	30.1	1.0	-56.7	-13.0	-43.7	
5.723	-31.5	V	3.0	28.2	1.0	-58.7	-13.0	-45.7	
3.815	-27.7	H	3.0	30.1	1.0	-56.8	-13.0	-43.8	
5.723	-30.0	H	3.0	28.2	1.0	-57.2	-13.0	-44.2	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 2 (10.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 10MHz, QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1855 MHz)									
3.710	-25.8	V	3.0	30.2	1.0	-55.0	-13.0	-42.0	
5.565	-30.8	V	3.0	28.4	1.0	-58.1	-13.0	-45.1	
3.710	-24.3	H	3.0	30.2	1.0	-53.5	-13.0	-40.5	
5.565	-28.7	H	3.0	28.4	1.0	-56.1	-13.0	-43.1	
Mid Ch, (1880 MHz)									
3.760	-26.1	V	3.0	30.1	1.0	-55.3	-13.0	-42.3	
5.640	-31.1	V	3.0	28.3	1.0	-58.4	-13.0	-45.4	
3.760	-27.4	H	3.0	30.1	1.0	-56.5	-13.0	-43.5	
5.640	-29.6	H	3.0	28.3	1.0	-56.9	-13.0	-43.9	
High Ch, (1905 MHz)									
3.810	-26.3	V	3.0	30.1	1.0	-55.4	-13.0	-42.4	
5.715	-30.1	V	3.0	28.2	1.0	-57.3	-13.0	-44.3	
3.810	-27.2	H	3.0	30.1	1.0	-56.3	-13.0	-43.3	
5.715	-28.9	H	3.0	28.2	1.0	-56.1	-13.0	-43.1	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 2 (10.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company:	Apple
Project #:	13U15037
Date:	07/02/13
Test Engineer:	R Zheng
Configuration:	EUT only
Mode:	TX, LTE band 2, 10MHz, 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1855 MHz)									
3.710	-26.7	V	3.0	30.2	1.0	-55.9	-13.0	-42.9	
5.565	-31.8	V	3.0	28.4	1.0	-59.1	-13.0	-46.1	
3.710	-25.4	H	3.0	30.2	1.0	-54.6	-13.0	-41.6	
5.565	-29.6	H	3.0	28.4	1.0	-57.0	-13.0	-44.0	
Mid Ch, (1880 MHz)									
3.760	-27.1	V	3.0	30.1	1.0	-56.3	-13.0	-43.3	
5.640	-32.0	V	3.0	28.3	1.0	-59.3	-13.0	-46.3	
3.760	-28.3	H	3.0	30.1	1.0	-57.4	-13.0	-44.4	
5.640	-30.5	H	3.0	28.3	1.0	-57.8	-13.0	-44.8	
High Ch, (1905 MHz)									
3.810	-27.3	V	3.0	30.1	1.0	-56.4	-13.0	-43.4	
5.715	-31.0	V	3.0	28.2	1.0	-58.2	-13.0	-45.2	
3.810	-28.1	H	3.0	30.1	1.0	-57.2	-13.0	-44.2	
5.715	-29.9	H	3.0	28.2	1.0	-57.1	-13.0	-44.1	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 2 (15.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 15MHz, QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1857.5 MHz)									
3.715	-26.0	V	3.0	30.2	1.0	-55.2	-13.0	-42.2	
5.573	-30.1	V	3.0	28.3	1.0	-57.4	-13.0	-44.4	
3.715	-26.8	H	3.0	30.2	1.0	-56.0	-13.0	-43.0	
5.573	-28.6	H	3.0	28.3	1.0	-56.0	-13.0	-43.0	
Mid Ch, (1880 MHz)									
3.760	-26.4	V	3.0	30.1	1.0	-55.6	-13.0	-42.6	
5.646	-30.4	V	3.0	28.3	1.0	-57.7	-13.0	-44.7	
3.760	-26.9	H	3.0	30.1	1.0	-56.0	-13.0	-43.0	
5.646	-29.2	H	3.0	28.3	1.0	-56.5	-13.0	-43.5	
High Ch, (1902.5 MHz)									
3.805	-26.0	V	3.0	30.1	1.0	-55.1	-13.0	-42.1	
5.708	-30.5	V	3.0	28.2	1.0	-57.8	-13.0	-44.8	
3.805	-27.1	H	3.0	30.1	1.0	-56.2	-13.0	-43.2	
5.708	-28.7	H	3.0	28.2	1.0	-55.9	-13.0	-42.9	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 2 (15.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 15MHz, 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1857.5 MHz)									
3.715	-26.9	V	3.0	30.2	1.0	-56.1	-13.0	-43.1	
5.573	-31.1	V	3.0	28.3	1.0	-58.4	-13.0	-45.4	
3.715	-27.8	H	3.0	30.2	1.0	-57.0	-13.0	-44.0	
5.573	-29.5	H	3.0	28.3	1.0	-56.9	-13.0	-43.9	
Mid Ch, (1880 MHz)									
3.760	-27.4	V	3.0	30.1	1.0	-56.6	-13.0	-43.6	
5.646	-31.4	V	3.0	28.3	1.0	-58.7	-13.0	-45.7	
3.760	-27.9	H	3.0	30.1	1.0	-57.0	-13.0	-44.0	
5.646	-30.1	H	3.0	28.3	1.0	-57.4	-13.0	-44.4	
High Ch, (1902.5 MHz)									
3.805	-27.0	V	3.0	30.1	1.0	-56.1	-13.0	-43.1	
5.708	-31.5	V	3.0	28.2	1.0	-58.8	-13.0	-45.8	
3.805	-28.0	H	3.0	30.1	1.0	-57.1	-13.0	-44.1	
5.708	-29.7	H	3.0	28.2	1.0	-56.9	-13.0	-43.9	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 2 (20.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 20MHz, QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1860 MHz)									
3.720	-26.3	V	3.0	30.2	1.0	-55.5	-13.0	-42.5	
5.580	-30.5	V	3.0	28.3	1.0	-57.9	-13.0	-44.9	
3.720	-27.0	H	3.0	30.2	1.0	-56.2	-13.0	-43.2	
5.580	-28.6	H	3.0	28.3	1.0	-55.9	-13.0	-42.9	
Mid Ch, (1880 MHz)									
3.760	-26.5	V	3.0	30.1	1.0	-55.7	-13.0	-42.7	
5.640	-30.3	V	3.0	28.3	1.0	-57.6	-13.0	-44.6	
3.760	-27.0	H	3.0	30.1	1.0	-56.1	-13.0	-43.1	
5.640	-29.1	H	3.0	28.3	1.0	-56.4	-13.0	-43.4	
High Ch, (1900 MHz)									
3.800	-26.3	V	3.0	30.1	1.0	-55.4	-13.0	-42.4	
5.700	-29.9	V	3.0	28.2	1.0	-57.2	-13.0	-44.2	
3.800	-27.1	H	3.0	30.1	1.0	-56.2	-13.0	-43.2	
5.700	-28.6	H	3.0	28.2	1.0	-55.9	-13.0	-42.9	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 2 (20.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: R Zheng
Configuration: EUT only
Mode: TX, LTE band 2, 20MHz, 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (1860 MHz)									
3.720	-27.3	V	3.0	30.2	1.0	-56.5	-13.0	-43.5	
5.580	-31.5	V	3.0	28.3	1.0	-58.9	-13.0	-45.9	
3.720	-27.9	H	3.0	30.2	1.0	-57.1	-13.0	-44.1	
5.580	-29.5	H	3.0	28.3	1.0	-56.8	-13.0	-43.8	
Mid Ch, (1880 MHz)									
3.760	-27.5	V	3.0	30.1	1.0	-56.7	-13.0	-43.7	
5.640	-31.2	V	3.0	28.3	1.0	-58.5	-13.0	-45.5	
3.760	-28.0	H	3.0	30.1	1.0	-57.1	-13.0	-44.1	
5.640	-30.1	H	3.0	28.3	1.0	-57.4	-13.0	-44.4	
High Ch, (1900 MHz)									
3.800	-27.3	V	3.0	30.1	1.0	-56.4	-13.0	-43.4	
5.700	-30.8	V	3.0	28.2	1.0	-58.1	-13.0	-45.1	
3.800	-28.0	H	3.0	30.1	1.0	-57.1	-13.0	-44.1	
5.700	-29.6	H	3.0	28.2	1.0	-56.9	-13.0	-43.9	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

UAT BAND 5

LTE QPSK Band 5 (1.4 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 1.4M QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (824.7MHz)									
1.649	-28.2	V	3.0	32.7	1.0	-59.9	-13.0	-46.9	
2.474	-27.2	V	3.0	31.4	1.0	-57.6	-13.0	-44.6	
1.649	-30.8	H	3.0	32.7	1.0	-62.5	-13.0	-49.5	
2.474	-28.9	H	3.0	31.4	1.0	-59.3	-13.0	-46.3	
Mid Ch, (836.5MHz)									
1.672	-28.4	V	3.0	32.6	1.0	-60.0	-13.0	-47.0	
2.508	-27.2	V	3.0	31.5	1.0	-57.7	-13.0	-44.7	
1.672	-30.0	H	3.0	32.6	1.0	-61.6	-13.0	-48.6	
2.508	-29.5	H	3.0	31.5	1.0	-60.0	-13.0	-47.0	
High Ch, (848.3MHz)									
1.697	-28.8	V	3.0	32.6	1.0	-60.3	-13.0	-47.3	
2.544	-27.8	V	3.0	31.4	1.0	-58.2	-13.0	-45.2	
1.697	-30.1	H	3.0	32.6	1.0	-61.6	-13.0	-48.6	
2.544	-29.3	H	3.0	31.4	1.0	-59.7	-13.0	-46.7	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 5 (1.4 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 1.4M 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (824.7MHz)									
1.649	-28.8	V	3.0	32.7	1.0	-60.5	-13.0	-47.5	
2.474	-27.7	V	3.0	31.4	1.0	-58.1	-13.0	-45.1	
1.649	-31.2	H	3.0	32.7	1.0	-62.9	-13.0	-49.9	
2.474	-29.6	H	3.0	31.4	1.0	-60.0	-13.0	-47.0	
Mid Ch, (836.5MHz)									
1.672	-28.9	V	3.0	32.6	1.0	-60.5	-13.0	-47.5	
2.508	-27.9	V	3.0	31.5	1.0	-58.4	-13.0	-45.4	
1.672	-30.6	H	3.0	32.6	1.0	-62.2	-13.0	-49.2	
2.508	-30.0	H	3.0	31.5	1.0	-60.5	-13.0	-47.5	
High Ch, (848.3MHz)									
1.697	-29.1	V	3.0	32.6	1.0	-60.6	-13.0	-47.6	
2.544	-28.5	V	3.0	31.4	1.0	-58.9	-13.0	-45.9	
1.697	-30.8	H	3.0	32.6	1.0	-62.3	-13.0	-49.3	
2.544	-29.9	H	3.0	31.4	1.0	-60.3	-13.0	-47.3	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 5 (3.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 3M QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (825.5MHz)									
1.648	-28.5	V	3.0	32.7	1.0	-60.2	-13.0	-47.2	
2.473	-27.3	V	3.0	31.4	1.0	-57.7	-13.0	-44.7	
1.648	-30.2	H	3.0	32.7	1.0	-61.9	-13.0	-48.9	
2.473	-28.8	H	3.0	31.4	1.0	-59.2	-13.0	-46.2	
Mid Ch, (836.5MHz)									
1.670	-28.8	V	3.0	32.6	1.0	-60.4	-13.0	-47.4	
2.505	-27.0	V	3.0	31.5	1.0	-57.5	-13.0	-44.5	
1.670	-30.4	H	3.0	32.6	1.0	-62.1	-13.0	-49.1	
2.505	-29.0	H	3.0	31.5	1.0	-59.5	-13.0	-46.5	
High Ch, (847.5MHz)									
1.692	-28.1	V	3.0	32.6	1.0	-59.6	-13.0	-46.6	
2.538	-27.2	V	3.0	31.4	1.0	-57.6	-13.0	-44.6	
1.692	-29.2	H	3.0	32.6	1.0	-60.7	-13.0	-47.7	
2.538	-28.8	H	3.0	31.4	1.0	-59.3	-13.0	-46.3	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 5 (3.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 3M 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (825.5MHz)									
1.648	-28.8	V	3.0	32.7	1.0	-60.5	-13.0	-47.5	
2.473	-27.8	V	3.0	31.4	1.0	-58.2	-13.0	-45.2	
1.648	-31.0	H	3.0	32.7	1.0	-62.7	-13.0	-49.7	
2.473	-29.5	H	3.0	31.4	1.0	-59.9	-13.0	-46.9	
Mid Ch, (836.5MHz)									
1.670	-29.1	V	3.0	32.6	1.0	-60.7	-13.0	-47.7	
2.505	-27.7	V	3.0	31.5	1.0	-58.2	-13.0	-45.2	
1.670	-31.1	H	3.0	32.6	1.0	-62.8	-13.0	-49.8	
2.505	-29.7	H	3.0	31.5	1.0	-60.2	-13.0	-47.2	
High Ch, (847.5MHz)									
1.692	-28.8	V	3.0	32.6	1.0	-60.3	-13.0	-47.3	
2.538	-27.4	V	3.0	31.4	1.0	-57.8	-13.0	-44.8	
1.692	-30.4	H	3.0	32.6	1.0	-61.9	-13.0	-48.9	
2.538	-29.6	H	3.0	31.4	1.0	-60.1	-13.0	-47.1	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 5 (5.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 5M QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (826.5MHz)									
1.648	-28.6	V	3.0	32.7	1.0	-60.3	-13.0	-47.3	
2.473	-27.4	V	3.0	31.4	1.0	-57.8	-13.0	-44.8	
1.648	-30.4	H	3.0	32.7	1.0	-62.1	-13.0	-49.1	
2.473	-28.9	H	3.0	31.4	1.0	-59.3	-13.0	-46.3	
Mid Ch, (836.5MHz)									
1.669	-28.8	V	3.0	32.6	1.0	-60.4	-13.0	-47.4	
2.503	-27.4	V	3.0	31.5	1.0	-57.9	-13.0	-44.9	
1.669	-30.2	H	3.0	32.6	1.0	-61.8	-13.0	-48.8	
2.503	-29.1	H	3.0	31.5	1.0	-59.6	-13.0	-46.6	
High Ch, (846.5MHz)									
1.688	-27.7	V	3.0	32.6	1.0	-59.2	-13.0	-46.2	
2.532	-27.5	V	3.0	31.5	1.0	-58.0	-13.0	-45.0	
1.688	-28.3	H	3.0	32.6	1.0	-59.9	-13.0	-46.9	
2.532	-29.1	H	3.0	31.5	1.0	-59.6	-13.0	-46.6	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 5 (5.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 5M 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (826.5MHz)									
1.648	-29.0	V	3.0	32.7	1.0	-60.7	-13.0	-47.7	
2.473	-27.9	V	3.0	31.4	1.0	-58.3	-13.0	-45.3	
1.648	-31.0	H	3.0	32.7	1.0	-62.7	-13.0	-49.7	
2.473	-29.5	H	3.0	31.4	1.0	-59.9	-13.0	-46.9	
Mid Ch, (836.5MHz)									
1.669	-29.1	V	3.0	32.6	1.0	-60.7	-13.0	-47.7	
2.503	-28.0	V	3.0	31.5	1.0	-58.5	-13.0	-45.5	
1.669	-30.8	H	3.0	32.6	1.0	-62.5	-13.0	-49.5	
2.503	-29.8	H	3.0	31.5	1.0	-60.3	-13.0	-47.3	
High Ch, (846.5MHz)									
1.688	-28.7	V	3.0	32.6	1.0	-60.2	-13.0	-47.2	
2.532	-28.0	V	3.0	31.5	1.0	-58.5	-13.0	-45.5	
1.688	-29.2	H	3.0	32.6	1.0	-60.8	-13.0	-47.8	
2.532	-29.7	H	3.0	31.5	1.0	-60.2	-13.0	-47.2	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE QPSK Band 5 (10.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 10M QPSK

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (829MHz)									
1.649	-27.8	V	3.0	32.7	1.0	-59.5	-13.0	-46.5	
2.474	-27.1	V	3.0	31.4	1.0	-57.5	-13.0	-44.5	
1.649	-30.4	H	3.0	32.7	1.0	-62.1	-13.0	-49.1	
2.474	-28.8	H	3.0	31.4	1.0	-59.2	-13.0	-46.2	
Mid Ch, (836.5MHz)									
1.664	-28.1	V	3.0	32.6	1.0	-59.7	-13.0	-46.7	
2.496	-27.6	V	3.0	31.5	1.0	-58.1	-13.0	-45.1	
1.664	-30.1	H	3.0	32.6	1.0	-61.7	-13.0	-48.7	
2.496	-30.5	H	3.0	31.5	1.0	-61.0	-13.0	-48.0	
High Ch, (844MHz)									
1.679	-28.3	V	3.0	32.6	1.0	-59.9	-13.0	-46.9	
2.519	-27.6	V	3.0	31.5	1.0	-58.1	-13.0	-45.1	
1.679	-30.6	H	3.0	32.6	1.0	-62.2	-13.0	-49.2	
2.519	-29.1	H	3.0	31.5	1.0	-59.6	-13.0	-46.6	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE 16QAM Band 5 (10.0 MHz BANDWIDTH)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 13U15037
Date: 07/02/13
Test Engineer: Mona Hua
Configuration: EUT only
Mode: TX, LTE B5 10M 16QAM

Chamber	Pre-amplifer	Filter	Limit
3m Chamber D	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, (829MHz)									
1.658	-28.2	V	3.0	32.6	1.0	-59.9	-13.0	-46.9	
2.487	-27.6	V	3.0	31.4	1.0	-58.0	-13.0	-45.0	
1.658	-31.0	H	3.0	32.6	1.0	-62.6	-13.0	-49.6	
2.487	-29.5	H	3.0	31.4	1.0	-60.0	-13.0	-47.0	
Mid Ch, (836.5MHz)									
1.664	-28.9	V	3.0	32.6	1.0	-60.5	-13.0	-47.5	
2.496	-27.7	V	3.0	31.5	1.0	-58.2	-13.0	-45.2	
1.664	-30.8	H	3.0	32.6	1.0	-62.4	-13.0	-49.4	
2.496	-30.8	H	3.0	31.5	1.0	-61.3	-13.0	-48.3	
High Ch, (844MHz)									
1.679	-29.0	V	3.0	32.6	1.0	-60.6	-13.0	-47.6	
2.519	-28.1	V	3.0	31.5	1.0	-58.6	-13.0	-45.6	
1.679	-31.2	H	3.0	32.6	1.0	-62.8	-13.0	-49.8	
2.519	-29.7	H	3.0	31.5	1.0	-60.2	-13.0	-47.2	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

9.3. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235

LIMITS

§22.355 & RSS-132 4.3 - The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

RSS-133 6.3 - The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

§24.235 - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- Temp. = −30° to +50°C
- Voltage = (85% - 115%)

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 +50ºC is reached.

Frequency Stability vs Voltage:
The peak frequency error is recorded (worst-case).

MODES TESTED

- LTE Band 2
- LTE Band 5

RESULTS

See the following pages.

QPSK, LTE BAND 2 – 1880.0 MHz

Reference Frequency: LTE Band 2_1880.000004 MHz @ 20°C Limit: to stay +- 2.5 ppm = 4700.000 Hz				
Power Supply	Environment	Frequency Deviation Measureed with Time Elapse		
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)
3.80	50	1879.999987	0.009	2.5
3.80	40	1879.999987	0.009	2.5
3.80	30	1879.999983	0.011	2.5
3.80	***20***	***1880.000004***	***0***	2.5
3.80	10	1879.999985	0.010	2.5
3.80	0	1879.999989	0.008	2.5
3.80	-10	1879.999986	0.010	2.5
3.80	-20	1879.999987	0.009	2.5
3.80	-30	1879.999987	0.009	2.5

Reference Frequency: LTE Band 2_ Mid Channel 1880.000004 MHz @ 20°C Limit: to stay +- 2.5 ppm = 4700.000 Hz				
Power Supply	Environment	Frequency Deviation Measureed with Time Elapse		
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)
3.80	***20***	***1880.000004***	***0***	***2.5***
4.20	20	1879.999990	*0.007*	2.5
3.40	20	1879.999989	*0.008*	2.5
End Voltage(3.3)	20	1879.999987	*0.009*	2.5

16QAM-LTE BAND 2 – 1880.0 MHz

Reference Frequency: LTE Band 2_1879.999980 MHz @ 20°C Limit: to stay +- 2.5 ppm = 4700.000 Hz				
Power Supply	Environment	Frequency Deviation Measureed with Time Elapse		
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)
3.80	50	1879.999961	0.010	2.5
3.80	40	1879.999959	0.011	2.5
3.80	30	1879.999960	0.011	2.5
3.80	***20***	***1879.999980***	***0***	2.5
3.80	10	1879.999961	0.010	2.5
3.80	0	1879.999961	0.010	2.5
3.80	-10	1879.999964	0.009	2.5
3.80	-20	1879.999960	0.011	2.5
3.80	-30	1879.999964	0.009	2.5

Reference Frequency: LTE Band 2_Mid Channel 1879.999980 MHz @ 20°C Limit: to stay +- 2.5 ppm = 4700.000 Hz				
Power Supply	Environment	Frequency Deviation Measureed with Time Elapse		
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)
3.80	***20***	***1879.999980***	***0***	***2.5***
4.20	20	1879.999965	*0.008*	2.5
3.40	20	1879.999979	*0.001*	2.5
End Voltage(3.2)	20	1879.999978	*0.001*	2.5

LTE BAND 5 – 836.5MHz, QPSK

Reference Frequency: LTE Band 5_Mid Channe 836.500006 MHz @ 20°C Limit: to stay +- 2.5 ppm = 2091.250 Hz				
Power Supply	Environment	Frequency Deviation Measureed with Time Elapse		
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)
3.80	50	836.500010	-0.005	2.5
3.80	40	836.500011	-0.006	2.5
3.80	30	836.500010	-0.005	2.5
3.80	***20***	***836.500006***	***0***	2.5
3.80	10	836.500011	-0.006	2.5
3.80	0	836.500011	-0.006	2.5
3.80	-10	836.500012	-0.007	2.5
3.80	-20	836.500012	-0.007	2.5
3.80	-30	836.500011	-0.006	2.5

Reference Frequency: LTE Band 5_Mid channel 836.500006 MHz @ 20°C Limit: to stay +- 2.5 ppm = 2091.250 Hz				
Power Supply	Environment	Frequency Deviation Measureed with Time Elapse		
(Vdc)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)
3.80	***20***	***836.500006***	***0***	***2.5***
4.20	20	836.500011	-0.006	2.5
3.40	20	836.500010	-0.005	2.5
End Volt(3.2)	20	836.500005	0.001	2.5

LTE BAND 5 – 836.5 MHz, 16QAM

Reference Frequency: LTE Band 5_Mid Channel 836.500003 MHz @ 20°C Limit: to stay +- 2.5 ppm = 2091.250 Hz				
Power Supply	Environment	Frequency Deviation Measureed with Time Elapse		
(Vac)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)
3.80	50	836.500000	0.004	2.5
3.80	40	836.500006	-0.004	2.5
3.80	30	836.500006	-0.004	2.5
3.80	***20***	***836.500003***	***0***	2.5
3.80	10	836.500006	-0.004	2.5
3.80	0	836.500008	-0.006	2.5
3.80	-10	836.500007	-0.005	2.5
3.80	-20	836.500007	-0.005	2.5
3.80	-30	836.500008	-0.006	2.5

Reference Frequency: LTE Band 5_Mid Channel 36.500003 MHz @ 20°C Limit: to stay +- 2.5 ppm = 2091.250 Hz				
Power Supply	Environment	Frequency Deviation Measureed with Time Elapse		
(Vac)	Temperature (°C)	(MHz)	Delta (ppm)	Limit (ppm)
3.80	***20***	***836.500003***	***0***	***2.5***
4.20	20	836.500007	*-0.005*	2.5
3.30	20	836.500006	*-0.004*	2.5
End Volt(3.2)	20	836.500002	*0.001*	2.5

9.4. PEAK-TO-AVERAGE RATIO

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

LTE BAND 5

Mode	Channel Band-width (MHZ)	Modulation	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio (PAR)
				*Peak	Average	
QPSK	1.4	RB1 0	836.5	28.35	24.32	4.03

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
16QAM	1.4	RB1 0	836.5	28.48	23.27	5.21

*Peak Reading = Average Reading + Peak-to-Average Ratio

Mode	Channel Band-width (MHZ)	Modulation	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio (PAR)
				*Peak	Average	
QPSK	3	RB1 0	836.5	28.29	24.2	4.09

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
16QAM	3	RB1 0	836.5	28.37	23.16	5.21

*Peak Reading = Average Reading + Peak-to-Average Ratio

Mode	Channel Band-width (MHZ)	Modulation	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio (PAR)
				*Peak	Average	
QPSK	5	RB1 0	836.5	28.19	24.28	3.91

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
16QAM	5	RB1 0	1880	28.33	23.24	5.09

*Peak Reading = Average Reading + Peak-to-Average Ratio

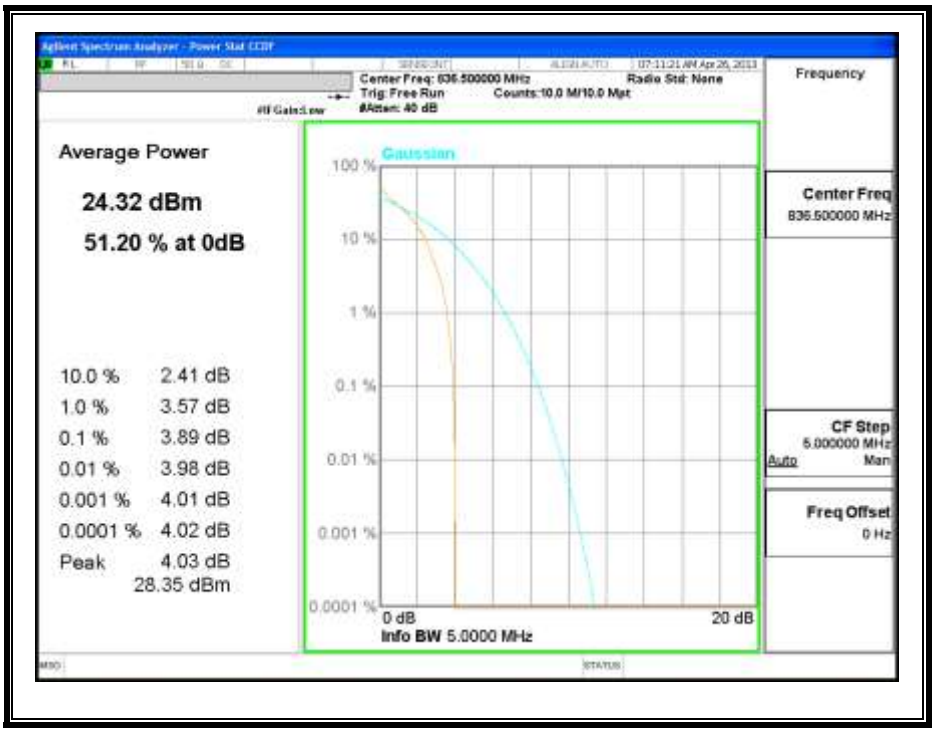
Mode	Channel Band-width (MHZ)	Modulation	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio (PAR)
				*Peak	Average	
QPSK	10	RB1 0	836.5	29.36	22.98	6.38

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
16QAM	10	RB1 0	836.5	29.4	22.04	7.36

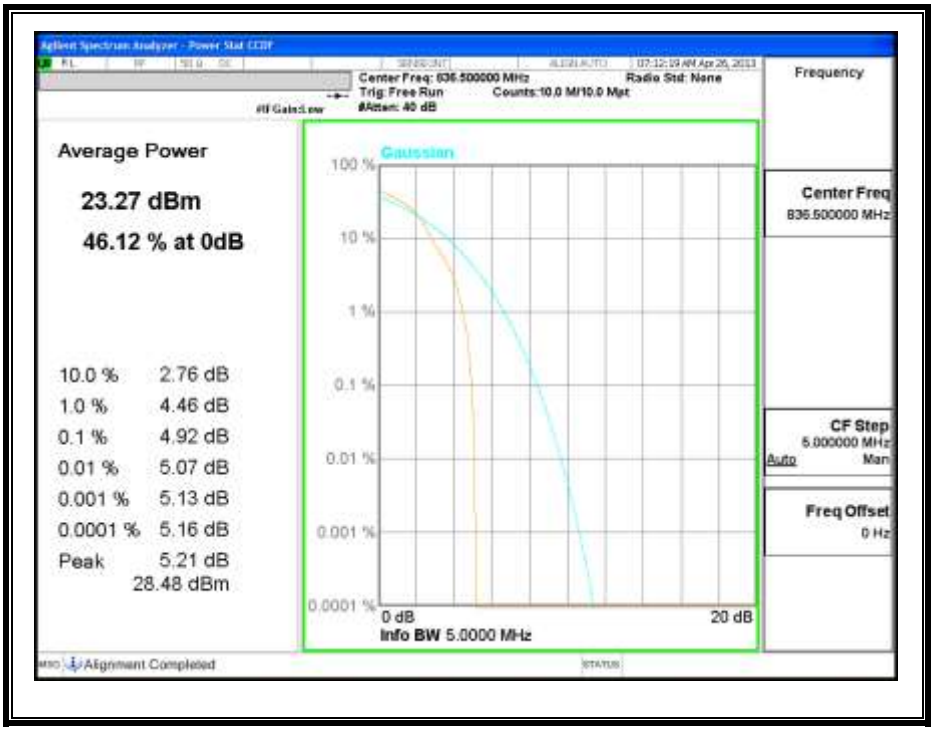
*Peak Reading = Average Reading + Peak-to-Average Ratio

LTE BAND 5

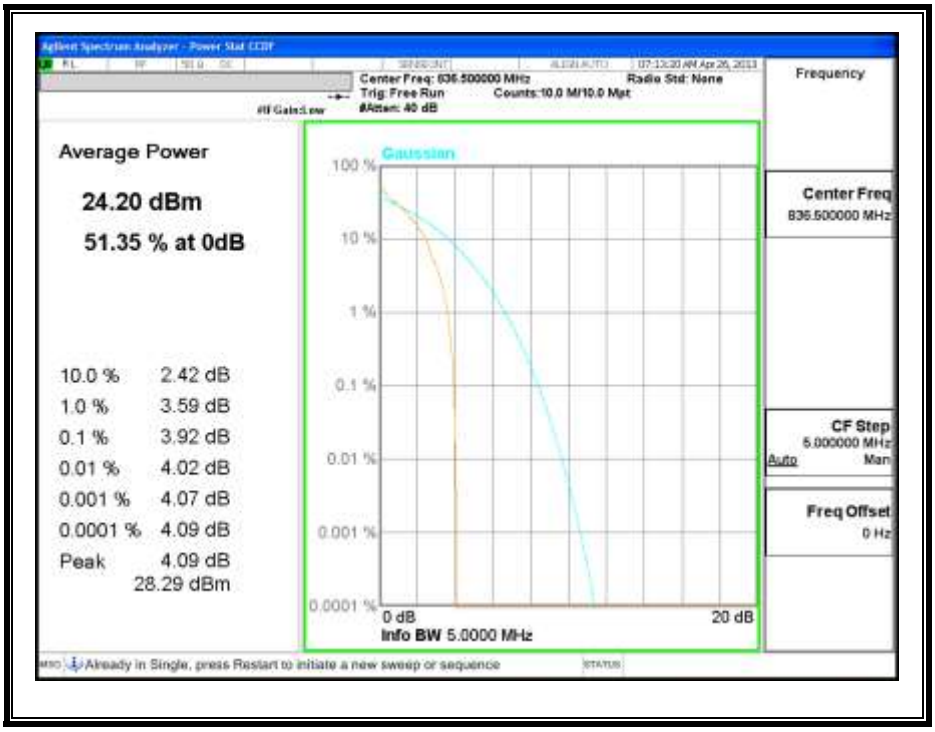
1.4MHz_QPSK



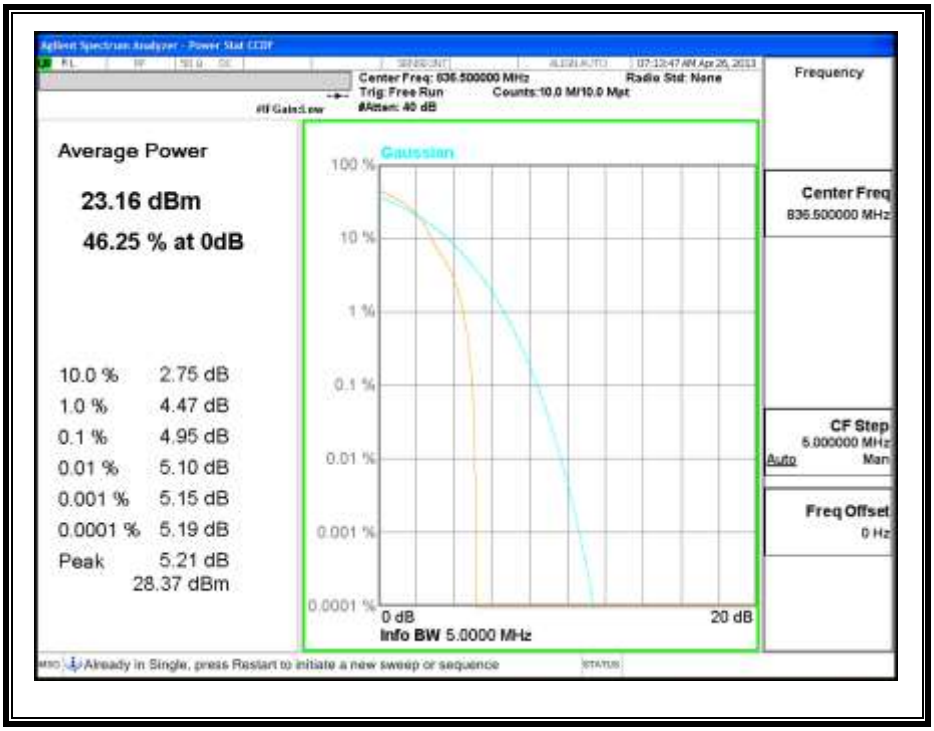
1.4MHz_16QAM



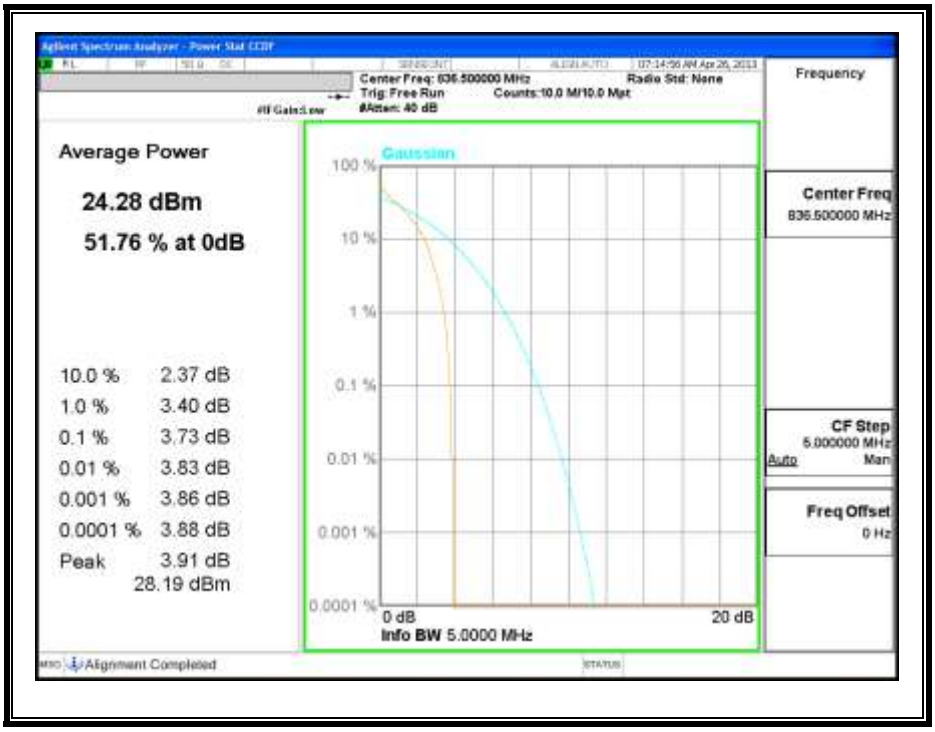
3.0MHz_QPSK, RB1-0



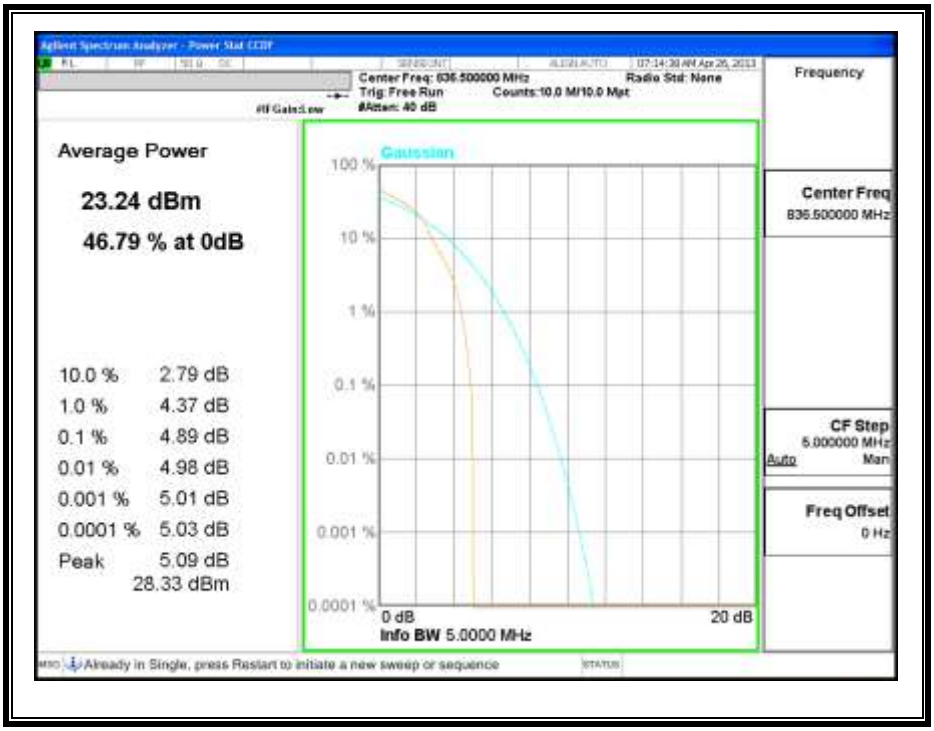
3.0MHz_16QAM



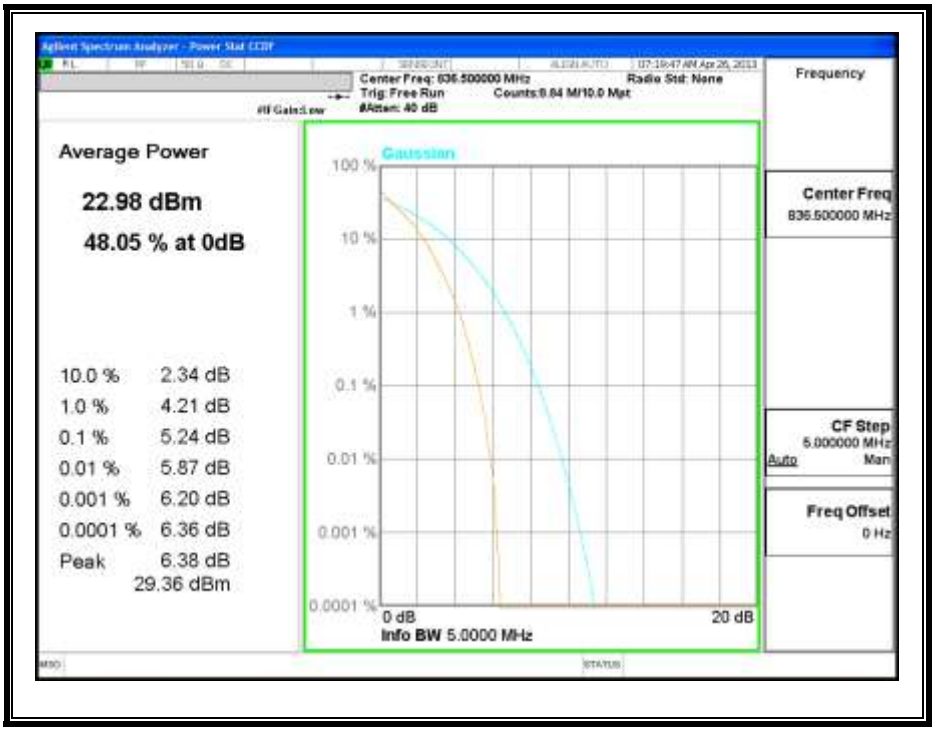
5.0MHz_QPSK



5.0MHz_16QAM



10MHz_QPSK



10MHz_16QAM