AirCard 313U Modem

Test Report

FOR

FCC and IC Certifications

IC: 2417C-AC313U
FCC ID: N7NAC313U

Table of Contents

1 Introduction and Purpose

This document provides test data for the AC313U modem intended for FCC and Industry Canada certifications. The tests included in this report are limited to all conducted tests required. The radiated tests were performed at an external test facility.

2 Test Summary

FCC Rule	IC Standards	DESCRIPTION OF TEST	RESULT	PAGE
2.1046	RSS-132, 4.4 RSS-133, 6.4	RF Power Output	Complies	
2.1049, 24.238(a)(b), 27.53(h)	RSS-Gen, 4.6	Occupied Bandwidth	Complies	
2.1051, 22.901(d) 22.917, 24.238(a), 27.53(h)	RSS-132, 4.5 RSS-133, 6.5	Out of Band Emissions at Antenna Terminals	Complies	
2.1053	RSS-132, 4.5 RSS-133, 6.5	Field Strength of Spurious Radiation	Complies	See Report
2.1055, 22.355, 24.235, 27.54	RSS-132, 4.3 RSS-133, 6.3	Frequency Stability versus Temperature	Complies	
2.1055, 22.355, 24.235, 27.54	RSS-132, 4.3 RSS-133, 6.3	Frequency Stability versus Voltage	Complies	
24.232(d), 27.50(d)		Peak to Average Ratio	Complies	

3 Description of Equipment under Test

The AC313U modem, referred to as "EUT" hereafter, is a multi-band wireless modem operating on the GSM/GPRS/EDGE/UMTS/LTE networks. In the US and Canada, cellular and PCS bands are used for GSM/GPRS/UMTS operation, and LTE Band 17 and Band 4 are used, so this test report only contains data for these four bands (850MHz, 1900MHz, 700MHz Band 17, and 1700MHz Band 4).

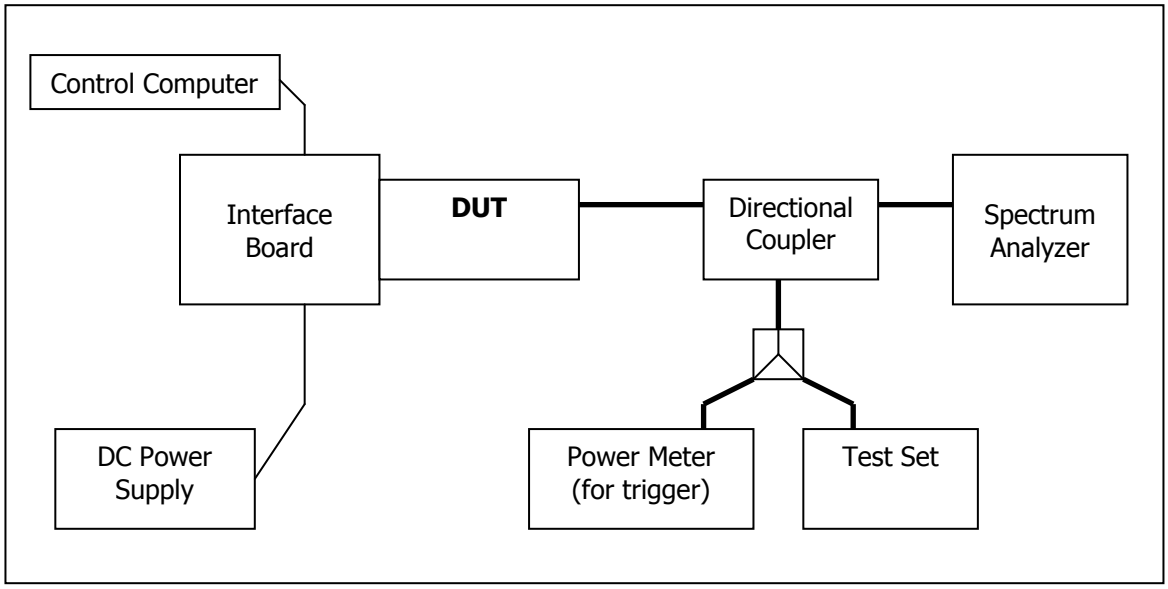
4 RF Power Output

FCC 2.1046, 27.53(h)

4.1 Test Procedure

The transmitter output was connected to a Rohde & Schwarz CMU200 Test Set (for GSM and WCDMA) or a CMW500 (for LTE) and configured to operate at maximum power in a call. The power was measured using the spectrum analyzer at three equally spaced operating frequencies for each band. The RBW was set to 300 KHz for the GSM and EDGE measurements, 5MHz for the WCDMA and HSPA measurements, and 5MHz for LTE. The spectrum analyzer was set to measure the RF output power with the cable and coupler losses accounted for.

Test Setup



4.2 Test Equipment

EQUIPMENT	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE
Control Computer	TC	Generic PC	100488	N/A
Wireless Test Set	Rohde & Schwarz	CMU200	110520	October 31, 2010
Wireless Test Set	Rohde & Schwarz	CMW500	101532	May 10, 2010
Spectrum Analyzer	Agilent	E4440A	US41422168	November 26, 2010
DC Power Supply	HP	6632A	3530A	N/A
Interface Board	Shop built	ATEMux	N/A	N/A
Directional Coupler	Pasternack	PE2209-10	N/A	N/A

4.3 Test Results GSM/EDGE Output Power (GMSK: MCS4; 8-PSK: MCS9)

Frequency (MHz)	Channel	GMSK Mode							
		1 Time Slot		2Time Slots		3Time Slots		4Time Slots	
		RMS Power (dBm)	Peak Power (dBm)	RMS Power (dBm)	Peak Power (dBm)	RMS Power (dBm)	Peak Power (dBm)	RMS Power (dBm)	Peak Power (dBm)
824.2	128	32.30	32.20	31.61	32.15	AC313U is Class 10 for GMSK Mode. Two transmit timeslots only for multislot.			
836.6	190	32.40	32.11	32.08	32.13				
848.8	251	32.10	32.30	31.27	32.18				
1850.2	512	29.40	29.71	27.15	27.25				
1880.0	661	29.45	29.63	27.08	27.18				
1909.8	810	29.33	29.85	27.23	27.43				

Frequency (MHz)	Channel	8-PSK Mode							
		1 Time Slot		2Time Slots		3Time Slots		4Time Slots	
		RMS Power (dBm)	Peak Power (dBm)	RMS Power (dBm)	Peak Power (dBm)	RMS Power (dBm)	Peak Power (dBm)	RMS Power (dBm)	Peak Power (dBm)
824.2	128	26.70	29.60	26.66	29.58	26.39	29.47	26.34	29.13
836.6	190	26.34	29.51	26.24	29.19	26.57	29.31	26.21	29.30
848.8	251	26.30	29.50	26.38	29.41	26.14	29.45	26.11	29.29
1850.2	512	25.10	28.60	25.10	28.56	24.65	27.50	23.51	26.44
1880.0	661	25.31	28.74	25.02	28.70	24.56	27.56	23.31	26.56
1909.8	810	25.14	28.45	25.09	28.46	24.53	27.40	23.29	26.36

4.4 Test Results UMTS Output Power

4.4.1 Test 1: RF Output Power Results for WCDMA R99

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 V7.5.0 specification. The EUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7). RMC 12.2kps is used for this testing.

The test was performed according to section 5.2 of the 3GPP TS34.121-1 V7.5.

Frequency (MHz)	Channel	WCDMA R99	
		RMS Power (dBm)	Peak Power (dBm)
826.4	4132	23.29	26.64
836.4	4182	23.11	26.79
846.6	4233	23.31	26.65
1852.4	9262	22.93	26.45
1880.0	9400	22.89	26.37
1907.6	9538	22.94	26.29

Note: The results above reflect max power with all up bits.

4.4.2 Test 2: RF Output Power Results for HSDPA Rel6

The EUT supports Category 8 FDD HS-DSCH physical layer. As stated in the 3GPP TS25.306 V7.3.0 Table 5.1a, the details of Category 8 are as follows:

- Maximum of 10 E-DSCH received codes
- Minimum 1 inter-TTI interval
- Maximum 14411bits in an E-DSCH transport block received within an E-DSCH TTI
- Total number of soft channel bits is 134400
- Support of QPSK and 16QAM

A detailed list of all settings used is included 4.5.

The following Sub-Tests were completed according to the test requirements outlined in section 5.2A of the 3GPP TS34.121-1 V7.5.0 specification. All TX RMS and Peak power requirements for Power Class 3 were met according to table 5.2AA.5 and achieved through the outlined test procedure in section 5.2AA.4.2. All UE channels and power ratio's are set according to table C10.1.4 in the 3GPP TS34.121-1 V7.5.0 specification. A summary of these settings is illustrated below:

Subtest	Mode	Call Type	RMC (kbps)	HSDPA FRC	Power Class 3 Max Limit dBm	βc/βd	βhs	CM (db)	MPR (db)
1	HSDPA	PS	12.2	H-Set 1 QPSK	24 (+1.7/-3.7 db)	2 /15	4/15	0.0	0.0
2	HSDPA	PS	12.2	H-Set 1 QPSK	24 (+1.7/-3.7 db)	12 /15	24/15	1.0	0.0
3	HSDPA	PS	12.2	H-Set 1 QPSK	23.5 (+2.2/-3.7 db)	15 /8	30/15	1.5	0.5
4	HSDPA	PS	12.2	H-Set 1 QPSK	23.5 (+2.2/-3.7 db)	15 /4	30/15	1.5	0.5

Note: The recommended HSDPA MPRs are implemented as per following sub-tests.

4.4.2.1 Sub-Test 1

βc=2/15, βd=15/15, βhs=4/15. MPR=0dB translates the min. and max. power limits to 20.3dBm and 25.7dBm respectively.

Frequency (MHz)	Channel	Power (dBm)	
		20.3dBm<Measured RMS (dBm)<25.7dBm	Comments
826.4	4132	23.10	Pass
836.4	4182	23.01	Pass
846.6	4233	23.07	Pass
1852.4	9262	22.87	Pass
1880.0	9400	22.80	Pass
1907.6	9538	22.83	Pass

4.4.2.2 Sub-Test 2

βc=12/15, βd=15/15, βhs=24/15. MPR=0dB translates the min. and max. power limits to 20.3dBm and 25.7dBm respectively.

Frequency (MHz)	Channel	Power (dBm)	
		20.3dBm<Measured RMS (dBm)<25.7dBm	Comments
826.4	4132	22.87	Pass
836.4	4182	22.73	Pass
846.6	4233	22.84	Pass
1852.4	9262	22.51	Pass
1880.0	9400	22.48	Pass
1907.6	9538	22.67	Pass

4.4.2.3 Sub-Test 3

βc=15/15, βd=15/8, βhs=30/15. MPR=0.5dB translates the min. and max. power limits to 19.8dBm and 25.7dBm respectively.

Frequency (MHz)	Channel	Power (dBm)	
		19.8dBm<Measured RMS (dBm)<25.7dBm	Comments
826.4	4132	22.32	Pass
836.4	4182	22.40	Pass
846.6	4233	22.31	Pass
1852.4	9262	21.98	Pass
1880.0	9400	21.88	Pass
1907.6	9538	21.83	Pass

4.4.2.4 Sub-Test 4

βc=15/15, βd=4/15, βhs=30/15. MPR=0.5dB translates the min. and max. power limits to 19.8dBm and 25.7dBm respectively.

Frequency (MHz)	Channel	Power (dBm)	
		19.8dBm<Measured RMS (dBm)<25.7dBm	Comments
826.4	4132	22.19	Pass
836.4	4182	22.23	Pass
846.6	4233	22.26	Pass
1852.4	9262	21.92	Pass
1880.0	9400	21.86	Pass
1907.6	9538	21.88	Pass

4.4.3 Test 3: RF Output Power Results for HSPA (HSDPA & HSUPA) Rel6

The EUT supports Category 5 FDD E-DCH physical layer. As stated in the 3GPP TS25.306 V7.3.0 Table 5.1g, the details of Category 5 are as follows:

- Maximum of 2 E-DCH transmitted codes
- Minimum spreading factor of SF2
- Support for only 10 ms TTI E-DCH
- Maximum 20000 bits in an E-DCH transport block within a 10 ms E-DCH TTI
- Data rate of 2 Mbps
- Support of QPSK only

A detailed list of all settings used is included in section 4.5.

The following five Sub-Tests were completed according to the test requirements outlined in section 5.2B of the 3GPP TS34.121-1 V9.1.0 specification. All TX RMS and Peak power requirements were met according to table 5.2B.5 and achieved through the outlined test procedure in section 5.2B.4.2. All UE channels and power ratios are set according to table C11.1.3 in the 3GPP TS34.121-1 V9.1.0 specification. A summary of these settings is illustrated below:

Subtest	Mode	Call Type	RMC (kbps)	HSDPA FRC	Power Class 3 Max Limit dBm	βc/βd	βhs	βec	βed	CM (db)	MPR (db)
1	HSPA	PS	12.2	H-Set 1 QPSK	24 (+1.7/-6.7 db)	11 /15	22/15	209/225	1309/225	1.0	0.0
2	HSPA	PS	12.2	H-Set 1 QPSK	22 (+3.7/-5.2 db)	6 /15	12/15	12/15	94/75	3.0	2.0
3	HSPA	PS	12.2	H-Set 1 QPSK	23 (+2.7/-5.2 db)	15 /9	30/15	30/15	47/15	2.0	1.0
4	HSPA	PS	12.2	H-Set 1 QPSK	22 (+1.7/-5.2 db)	2/15	4/15	2/15	56/75	3.0	2.0
5	HSPA	PS	12.2	H-Set 1 QPSK	24 (+1.7/-3.7 db)	-	5/15	5/15	47/15	1.0	0.0

Note: The recommended HSUPA MPRs are implemented as per following sub-tests.

4.4.3.1 Sub-Test 1:

βc=11/15, βd=15/15, βhs=22/15, βec=209/225, βed=1039/225, AG=20, 1xSF4, E-TFCI=75. MPR=0dB translates the min. and max. power limits to 18.8dBm and 25.7dBm respectively.

Frequency (MHz)	Channel	Power (dBm)	
		18.8dBm<Measured RMS (dBm)<25.7dBm	Comments
826.4	4132	22.33	Pass
836.4	4182	22.19	Pass
846.6	4233	22.01	Pass
1852.4	9262	22.10	Pass
1880.0	9400	22.18	Pass
1907.6	9538	22.19	Pass

4.4.3.2 Sub-Test 2:

βc=6/15, βd=15/15, βhs=12/15, βec=12/15, βed=94/75, AG=12, 1xSF4, E-TFCI=67. MPR=2dB translates the min. and max. power limits to 16.8dBm and 25.7dBm respectively.

Frequency (MHz)	Channel	Power (dBm)	
		16.8dBm<Measured RMS (dBm)<25.7dBm	Comments
826.4	4132	20.95	Pass
836.4	4182	20.78	Pass
846.6	4233	20.80	Pass
1852.4	9262	20.57	Pass
1880.0	9400	20.19	Pass
1907.6	9538	20.25	Pass

4.4.3.3 Sub-Test 3:

βc=15/15, βd=9/15, βhs=30/15, βec=30/15, βed=47/15, AG=15, 2xSF4. E-TFCI=92, Note: # of Reference E-TFCI=2. MPR=1dB translates the min. and max. power limits to 17.8dBm and 25.7dBm respectively.

Frequency (MHz)	Channel	Power (dBm)	
		17.8dBm<Measured RMS (dBm)<25.7dBm	Comments
826.4	4132	21.28	Pass
836.4	4182	21.66	Pass
846.6	4233	21.64	Pass
1852.4	9262	21.54	Pass
1880.0	9400	21.46	Pass
1907.6	9538	21.78	Pass

4.4.3.4 Sub-Test 4:

βc=2/15, βd=15/15, βhs=4/15, βec=2/15, βed=56/75, AG=17, 1xSF4, E-TFCI=71. MPR=2dB translates the min. and max. power limits to 16.8dBm and 25.7dBm respectively.

Frequency (MHz)	Channel	Power (dBm)	
		16.8dBm<Measured RMS (dBm)<25.7dBm	Comments
826.4	4132	21.58	Pass
836.4	4182	22.06	Pass
846.6	4233	22.01	Pass
1852.4	9262	21.55	Pass
1880.0	9400	21.43	Pass

1907.6	9538	21.97	Pass

4.4.3.5 Sub-Test 5:

βc=15/15, βd=0, βhs=5/15, βec=5/15, βed=47/15, AG=12, 1xSF4, E-TFCI=67. MPR=0dB translates the min & max power limits to 20.3dBm and 25.7dBm respectively.

Frequency (MHz)	Channel	Power (dBm)	
		18.8dBm<Measured RMS (dBm)<25.7dBm	Comments
826.4	4132	22.10	Pass
836.4	4182	22.38	Pass
846.6	4233	22.24	Pass
1852.4	9262	22.10	Pass
1880.0	9400	21.25	Pass
1907.6	9538	21.78	Pass

4.5 Test Settings for UMTS Mode on CMU200

WCDMA R99 Mode Settings:

UE Power Control Settings
Maximum allowable UE-Power = 24.0 dBm
UL Target Power = 24.0 dBm

Node B Settings
Primary Scrambling Code = 9
Output Channel Power = -51.7 dBm
OCNS = Off
Total Output Power (Ior+Ioc) = -51.7 dBm

RMC Settings
Reference Channel Type: 12.2 kbps Downlink/Uplink
DL DTCH Transport Format: 12.2 kbps
DL Resources in Use: 100 %
UL CRC (Sym. Loop Mode 2): Off
Test Mode: Loop Mode 1
Channel Data Source DTCH: PRBS9

Voice Settings
Voice Source: Echo
Loopback Type: Off

Adaptive Multirate Settings
Active Code Set: Selection A

Codec Mode: 12.2 kbps

Signaling RAB Settings
SRB Cell DCH: 3.4 kbps

BS Down Link Physical Channels Settings
Ior = -51.7 dBm
P-CPICH = -3.3 dB
P-SCH = -8.3 dB
S-SCH = -8.3 dB
P-CCPCH = -5.3 dB
S-CCPCH = -5.3 dB
S-CCPCH Channel Code = 2
PICH = -8.3 dB
PICH Channel Code = 3
AICH = -8.3 dB
AICH Channel Code = 6
DPDCH = -10.3 dB
DPDCH Channel Code = 96
Power Offset (DPCCH/DPDCH) = 0.0 dB
DL DPCH Timing Offset = 0
Secondary Scrambling Code = 0
Secondary Scrambling Code (HSDPA) = 0
HSDPA Channels = On

TPC Settings
Algorithm = 2
TPC Step Size = 1dB
TPC Pattern Setup = Set 1 (All 1, after linked to get maximum power)

HSDPA Mode Settings:
Node B Settings
Primary Scrambling Code = 9
Output Channel Power = -86 dBm
OCNS = Off
Total Output Power (Ior+Ioc) = -86 dBm

Network Settings
Packet Switched Domain = ON

HSDPA Test Mode Settings
Radiobearer Setup = RMC 12.2 kbps + HSPDA
RMC Test Loop = Loop Mode 1 RLC TM

HSDPA HS-DSCH
CQI Feedback Cycle = 4ms
CQI Repetition Factor = 2
ACK/NACK Repetition Factor = 3
UE Category = 8
Channel Configuration Type = FRC
H-Set Selection = H-Set 1 QPSK
RV Coding Sequence {0,2,5,6}

HSDPA Gain Factors are set according to each specific sub-test in table C.10.1.4 of 3GPP TS 34.121.

HSPA Mode Settings:
UE Power Control Settings
Maximum allowable UE-Power = 24.0 dBm
UL Target Power: Set according to each specific sub-test in table 5.2B.5 of 3GPP TS 34.121 less 5db for starting point.

UE Packet Data Gain Factors
Bc and Bd: *
ΔACK, ΔNACK,ΔCQI=8

HSUPA
E-DCH Physical Layer Category = 5
E-TFCI Table Index = 1
Minimum Set E-TFCI = 1*
Maximum Channelisation Code: 1xSF4 or 2xSF4*
Initial Service Grant: *

UE Gain Factors
ΔE-DPCCH: *
Number of Reference E-TFCIs: **
Reference E-TFCI's: **
E-TFCI Power offsets: **

Node B Settings
Primary Scrambling Code = 9
Output Channel Power = -86 dBm
OCNS = Off
Total Output Power (Ior+Ioc) = -86 dBm
Paket Switched
DCH Type: HSUPA Test Mode
Data Rate: HSDPA/HSUPA

HSDPA Test Mode Settings
Radiobearer Setup = RMC 12.2kbps + HSDPA
RMC Test Loop = Loop Mode 1 RLC TM

HSDPA HS-DSCH
CQI Feedback Cycle = 4ms
CQI Repetition Factor = 2
ACK/NACK Repetition Factor = 3
UE Category = 8
Channel Configuration Type = FRC
H-Set Selection = H-Set 1 QPSK
RV Coding Sequence {0,2,5,6}

HSUPA Test Mode Settings
Radiobearer Setup = SRB 3.4 + HSPA
HSUPA Settings
TTI mode: 10ms
E-AGCH
Pattern Length: 1 AG Value: *

Downlink Physical Channels
HSUPA Channels: On
E-AGCH: -6.0db
E-AGCH Chan. Code: 6
E-RGCH/E-HICH: -5.0db
E-RGCH Active: Off
E-RGCH/E-HICH Chan. Code: 6

*Set according to each specific sub-test in table C.11.1.3 of 3GPP TS 34.121.
** Set according to each specific sub-test in table 5.2B.2/3 of 3GPP TS 34.121.

4.6 Test Results for LTE Output Power

According to 3GPP 36.521, V9.1.0., the output power level for Power Class 3 LTE is to be 23.0dBm ± 2.7dB

Maximum Power Reduction (MPR) is allowed due to higher order modulation and transmit bandwidth configurations. These MPR levels reduce the lower limit of each output power by the either 1 or 2dB. The limits for these power levels can be found in Table 6.2.3.5-1 (UE Power Class Test Requirements) of 3GPP 36.521. The highlighted columns represent the bandwidths supported by AC313U.

Modulation	**Channel Bandwidth/Transmission Bandwidth Configuration (RB)**						**MPR (dB)**
	1.4MHz	3.0MHz	5.0MHz	10MHz	15MHz	20MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

4.6.1 Output Power Results for LTE Band 17

Frequency (MHz)	UL Channel	BW (MHz)	RB Size	RB Offset	Modulation	MPR (dB)	Maximum Average Power (dBm)
706.5	23755	5	1	0	QPSK	0	23.56
			1	24	QPSK	0	23.44
			12	6	QPSK	1	22.69
			25	0	QPSK	1	22.43
			1	0	16-QAM	1	22.75
			1	24	16-QAM	1	22.28
			12	6	16-QAM	2	21.14
			25	0	16-QAM	2	21.22
710.0	23790	5	1	0	QPSK	0	23.42
			1	24	QPSK	0	23.55
			12	6	QPSK	1	22.77
			25	0	QPSK	1	22.28
			1	0	16-QAM	1	22.45
			1	24	16-QAM	1	22.04
			12	6	16-QAM	2	21.05
			25	0	16-QAM	2	21.44
710.0	23790	10	1	0	QPSK	0	23.46
			1	49	QPSK	0	23.50
			25	12	QPSK	1	22.30
			50	0	QPSK	1	22.23
			1	0	16-QAM	1	22.43
			1	49	16-QAM	1	22.15
			25	12	16-QAM	2	21.12
			50	0	16-QAM	2	21.38
713.5	23825	5	1	0	QPSK	0	23.78
			1	24	QPSK	0	23.62
			12	6	QPSK	1	22.78
			25	0	QPSK	1	22.46
			1	0	16-QAM	1	22.75
			1	24	16-QAM	1	22.28
			12	6	16-QAM	2	21.78
			25	0	16-QAM	2	21.85

4.6.2 Output Power Results for LTE Band 4

Frequency (MHz)	UL Channel	BW (MHz)	RB Size	RB Offset	Modulation	MPR (dB)	Maximum Average Power (dBm)
1712.5	19975	5	1	0	QPSK	0	23.55
			1	24	QPSK	0	23.52
			12	6	QPSK	1	22.78
			25	0	QPSK	1	22.42
			1	0	16-QAM	1	22.61
			1	24	16-QAM	1	22.32
			12	6	16-QAM	2	21.79
			25	0	16-QAM	2	21.85
1715.0	20000	10	1	0	QPSK	0	23.58
			1	49	QPSK	0	23.32
			25	12	QPSK	1	22.44
			50	0	QPSK	1	22.43
			1	0	16-QAM	1	22.37
			1	49	16-QAM	1	22.62
			25	12	16-QAM	1	21.48
			50	0	16-QAM	2	21.51
1732.5	20175	5	1	0	QPSK	0	23.42
			1	24	QPSK	0	23.47
			12	6	QPSK	1	22.85
			25	0	QPSK	1	22.28
			1	0	16-QAM	1	22.33
			1	24	16-QAM	1	22.14
			12	6	16-QAM	2	21.05
			25	0	16-QAM	2	21.44
1732.5	20175	10	1	0	QPSK	0	23.40
			1	49	QPSK	0	23.42
			25	12	QPSK	1	22.44
			50	0	QPSK	1	22.31
			1	0	16-QAM	1	22.16
			1	49	16-QAM	1	22.08
			25	12	16-QAM	1	21.11
			50	0	16-QAM	2	21.30
1750.0	20350	10	1	0	QPSK	0	23.38
			1	49	QPSK	0	23.43
			25	12	QPSK	1	22.60
			50	0	QPSK	1	22.33
			1	0	16-QAM	1	22.46

			1	49	16-QAM	1	22.65
			25	12	16-QAM	1	21.23
			50	0	16-QAM	2	21.19
1752.5	20375	5	1	0	QPSK	0	23.44
			1	24	QPSK	0	23.49
			12	6	QPSK	1	22.74
			25	0	QPSK	1	22.44
			1	0	16-QAM	1	22.65
			1	24	16-QAM	1	22.80
			12	6	16-QAM	2	21.19
			25	0	16-QAM	2	21.22

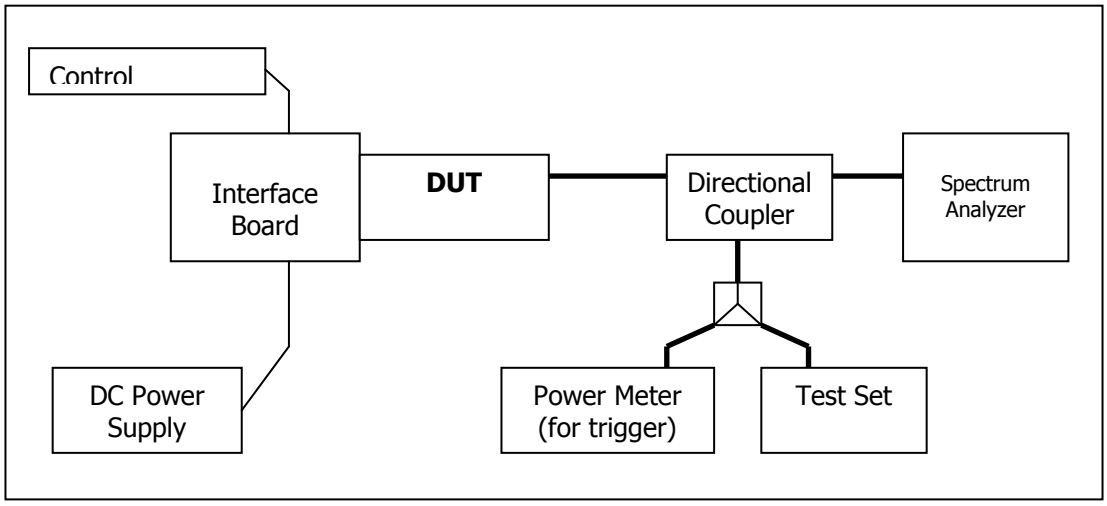
5 Occupied Bandwidth

FCC 2.1049, 24.238(a)(b), 27.53(h)

5.1 Test Procedure

The transmitter output was connected to a spectrum analyzer through a calibrated coaxial cable and a directional coupler. The occupied bandwidth (defined as the 99% Power Bandwidth) was measured with the spectrum analyzer at low, middle, and high frequencies in each band. The –26dB bandwidth was also measured and recorded.

Test Setup



5.2 Test Equipment

EQUIPMENT	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE
Control Computer	TC	Generic PC	100488	N/A
Wireless Test Set	Rohde & Schwarz	CMU200	110520	October 31, 2010
Wireless Test Set	Rohde & Schwarz	CMW500	101532	May 10, 2010

Spectrum Analyzer	Agilent	E4440A	US41422168	November 26, 2010
DC Power Supply	HP	6632A	3530A	N/A
Interface Board	Shop built	ATEMux	N/A	N/A
Directional Coupler	Pasternack	PE2209-10	N/A	N/A

5.3 Test Results

The performance of the GSM 850 MHz Cellular band is shown in plots 5.3.1 to 5.3.6.
Performance of the GSM 1900 MHz PCS band is shown in plots 5.3.7 to 5.3.12.
Performance of the UMTS 850 Cellular band is shown in plots 5.3.13 to 5.3.15.
Performance of the UMTS 1900 PCS band is shown in plots 5.3.16 to 5.3.18.

The following GSM test results are based on single slot, and use CS1 for GMSK and MCS9 for 8PSK mode. For WCDMA testing, RMC 12.2kps has been used.

5.3.1 GSM Results

Frequency (MHz)	Channel	99% Occupied Bandwidth (kHz)		-26dBc Occupied Bandwidth (kHz)	
		GMSK Mode	8-PSK Mode	GMSK Mode	8-PSK Mode
824.2	128	244	244	314	298
836.6	190	244	240	312	300
848.8	251	246	242	316	304
1850.2	512	243	242	302	308
1880.0	661	246	244	298	300
1909.8	810	245	243	314	290

5.3.2 WCDMA Results

Frequency (MHz)	Channel	99% Occupied Bandwidth (MHz)	-26dBc Occupied Bandwidth (MHz)
826.4	4132	4.1775	4.6225
836.4	4182	4.1625	4.6350
846.6	4233	4.1700	4.6200
1852.4	9262	4.1850	4.6050
1880.0	9400	4.1700	4.6500
1907.6	9538	4.1850	4.6200

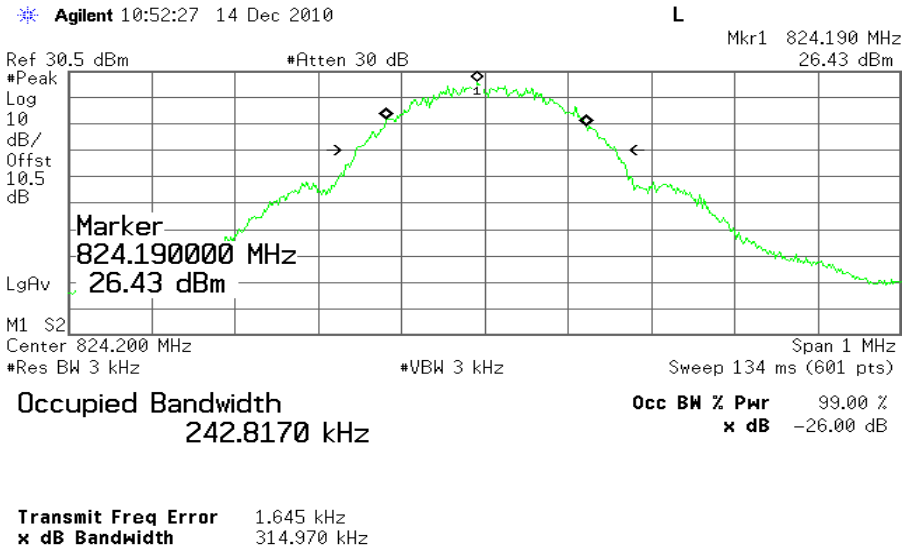
5.3.3 LTE Results

Frequency (MHz)	Channel	Modulation	BW	RB	99% Occupied Bandwidth (MHz)	-26dBc Occupied Bandwidth (MHz)
706.6	23756	QPSK	5	25	4.5434	4.975
710.0	23790	QPSK	5	25	4.5466	4.971
710.0	23790	QPSK	10	50	8.9379	9.778
713.4	23824	QPSK	5	25	4.5378	4.952
706.6	23756	16-QAM	5	25	4.5456	4.987

710.0	23790	16-QAM	5	25	4.5417	4.979
710.0	23790	16-QAM	10	50	8.9432	9.843
713.4	23824	16-QAM	5	25	4.5364	4.969
1712.6	19976	QPSK	5	25	4.5544	4.995
1732.5	20175	QPSK	5	25	4.5561	4.986
1732.5	20175	QPSK	10	50	8.9457	9.478
1752.4	20374	QPSK	5	25	4.5496	4.99
1712.6	19976	16-QAM	5	25	4.5473	4.983
1732.5	20175	16-QAM	5	25	4.5501	4.988
1732.5	20175	16-QAM	10	50	8.9510	9.497
1752.4	20374	16-QAM	5	25	4.5471	4.985

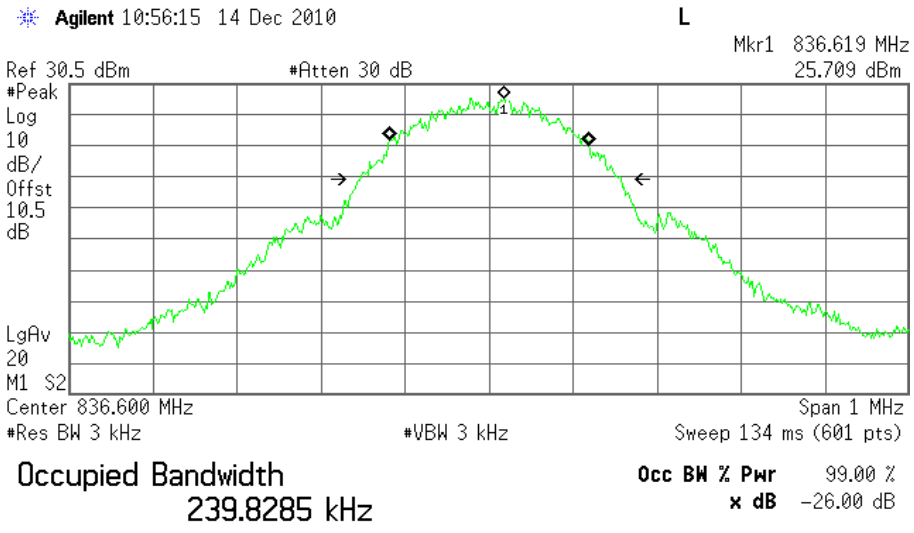
5.4 Test Plots

5.4.1 GMSK Occupied Bandwidth, Cellular Low channel, 824.2 MHz, 99% BW



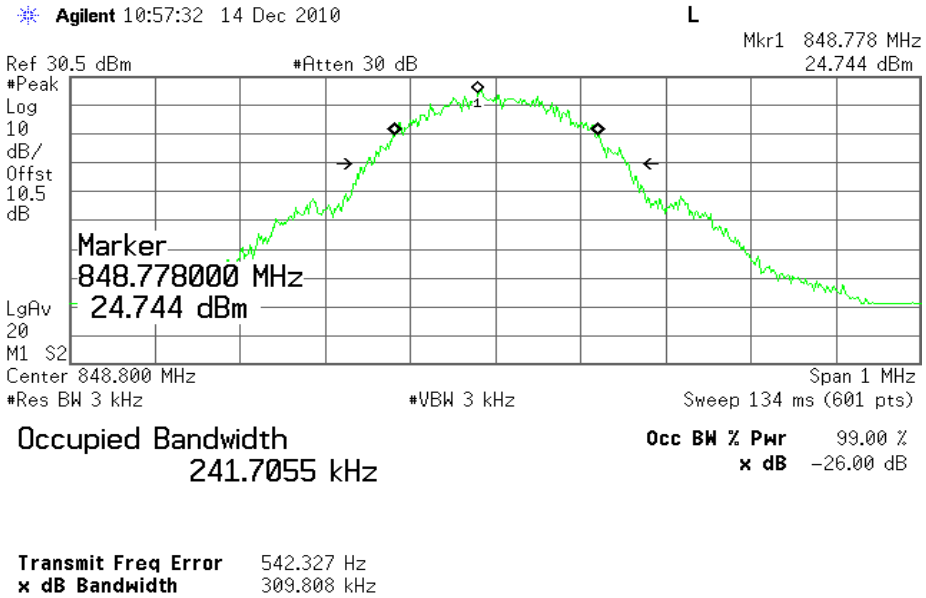
Transmit Freq Error 1.645 kHz
x dB Bandwidth 314.970 kHz

5.4.2 GMSK Occupied Bandwidth, Middle channel, 836.6 MHz, 99% bandwidth

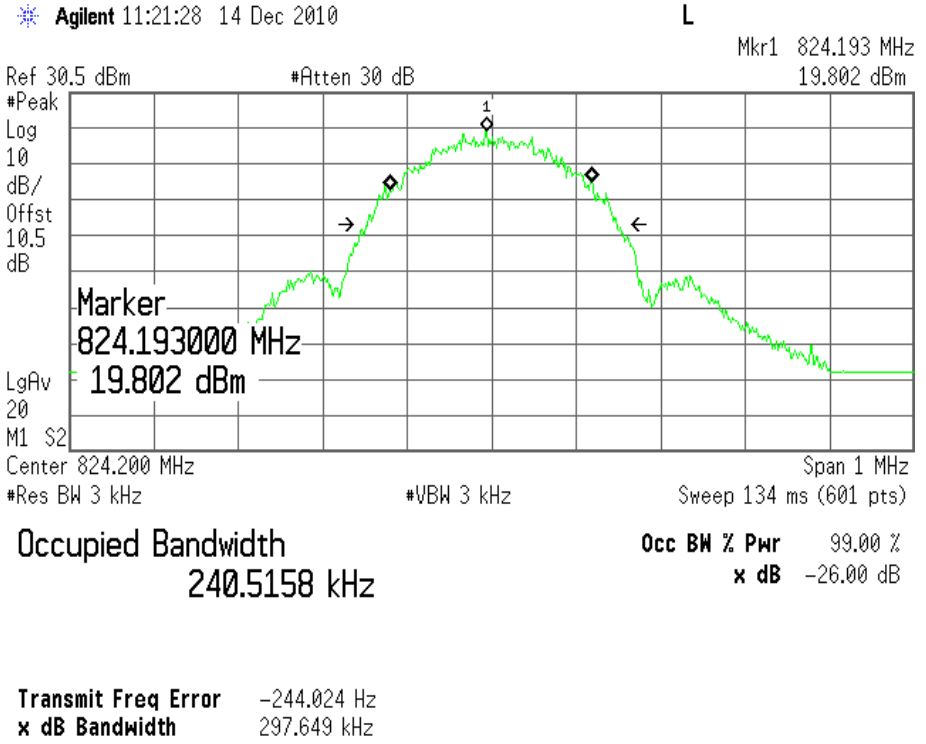


Transmit Freq Error 599.937 Hz
x dB Bandwidth 310.881 kHz

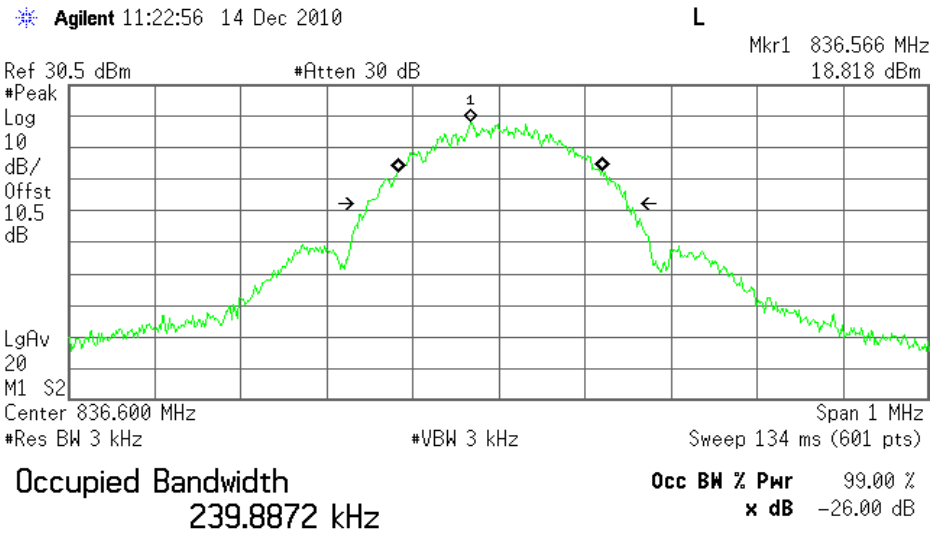
5.4.3 GMSK Occupied Bandwidth, High channel, 848.8 MHz, 99% bandwidth



5.4.4 8-PSK Occupied Bandwidth, Cellular Low channel, 824.2 MHz, 99% BW

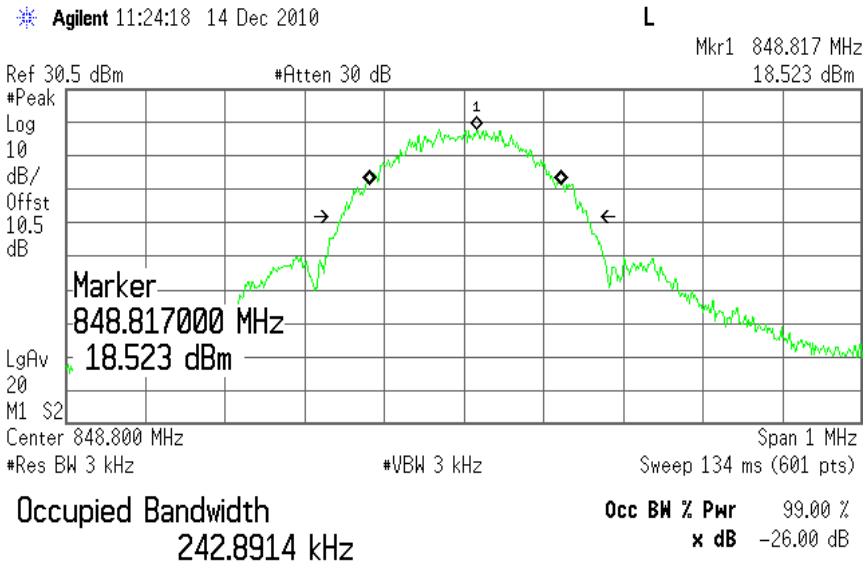


5.4.5 8-PSK Occupied Bandwidth, Middle channel, 836.6 MHz, 99% bandwidth



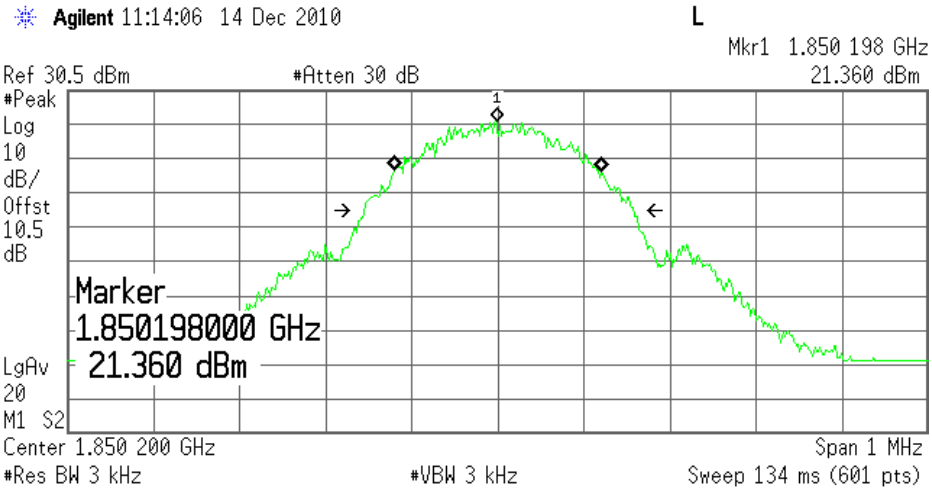
Transmit Freq Error 1.457 kHz
x dB Bandwidth 303.630 kHz

5.4.6 8-PSK Occupied Bandwidth, High channel, 848.8 MHz, 99% bandwidth



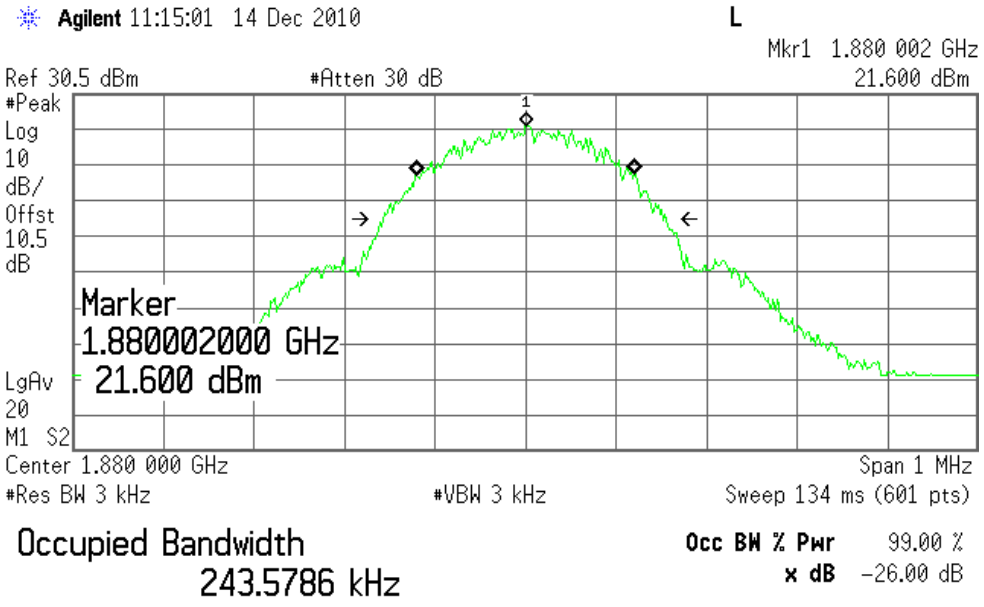
Transmit Freq Error 1.283 kHz
x dB Bandwidth 312.305 kHz

5.4.7 GMSK Occupied Bandwidth, PCS Low channel, 1850.2 MHz, 99% BW



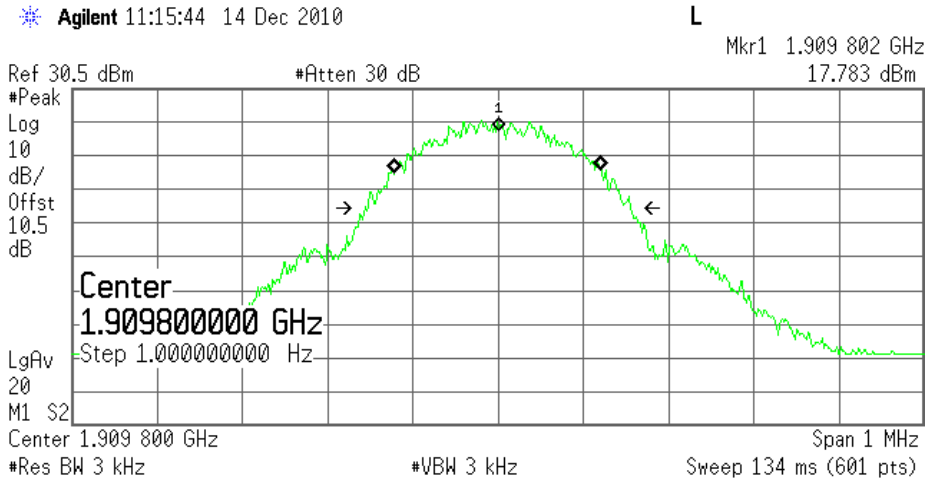
Transmit Freq Error 161.117 Hz
x dB Bandwidth 315.550 kHz

5.4.8 GMSK Occupied Bandwidth, PCS Middle channel, 1880.0 MHz, 99% BW



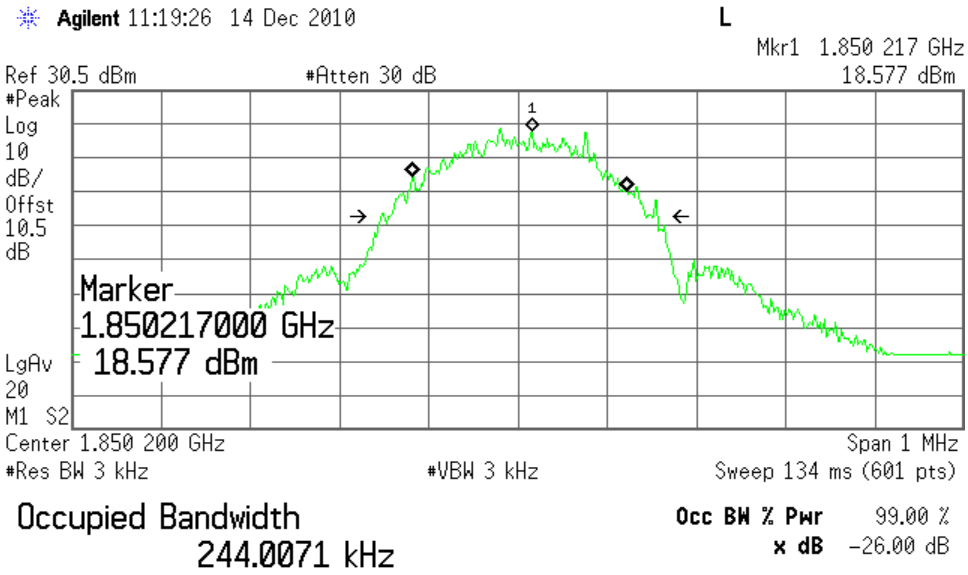
Transmit Freq Error -411.291 Hz
x dB Bandwidth 315.317 kHz

5.4.9 GMSK Occupied Bandwidth, PCS High channel, 1909.8 MHz, 99% BW



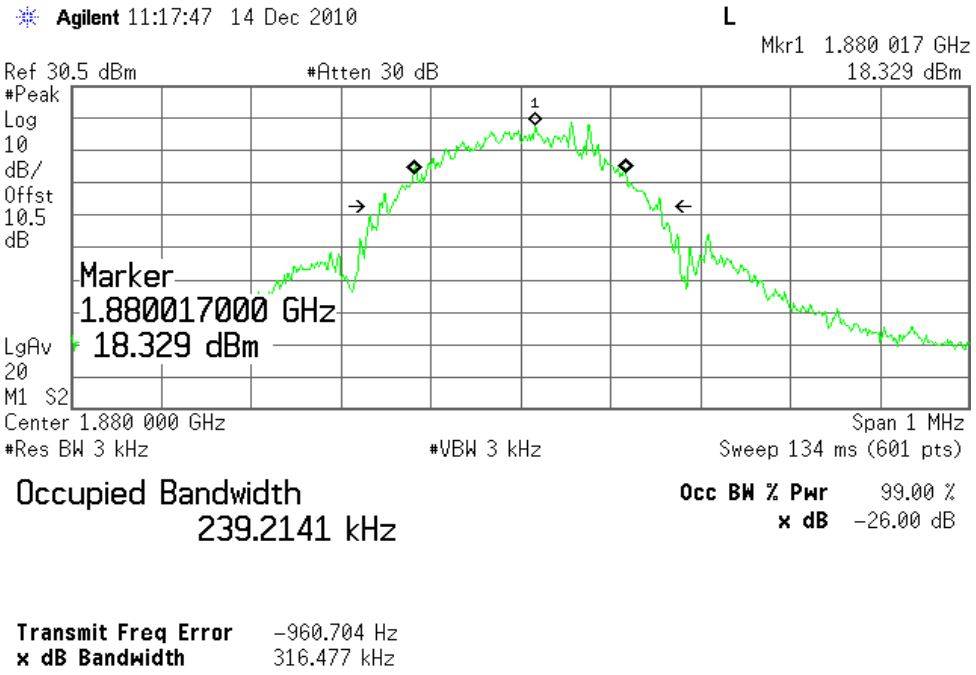
Transmit Freq Error −329.385 Hz
x dB Bandwidth 314.345 kHz

5.4.10 8-PSK Occupied Bandwidth, PCS Low channel, 1850.2 MHz, 99% BW

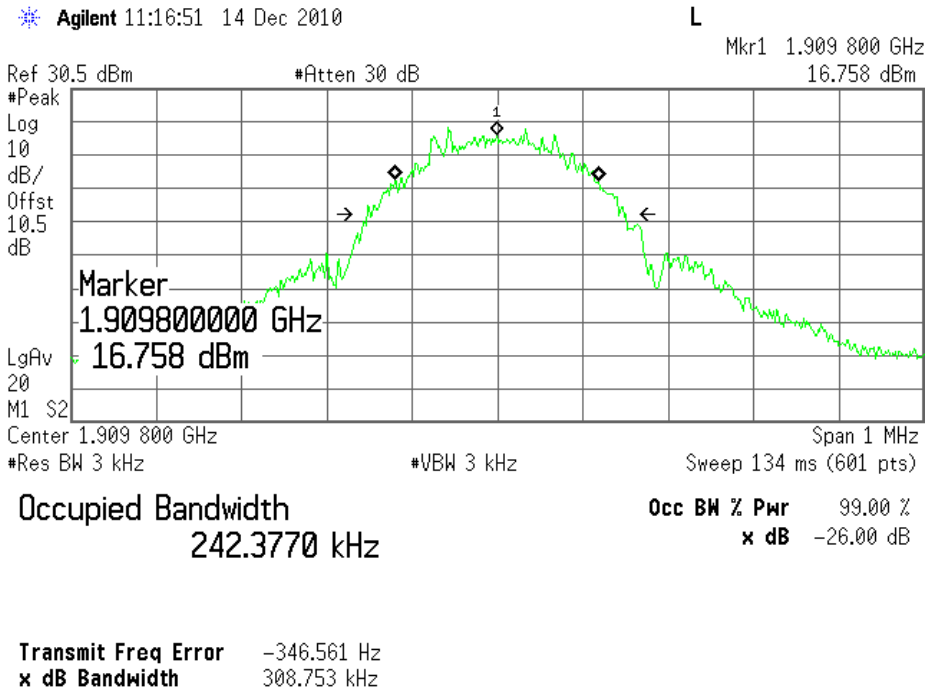


Transmit Freq Error 1.737 kHz
x dB Bandwidth 313.231 kHz

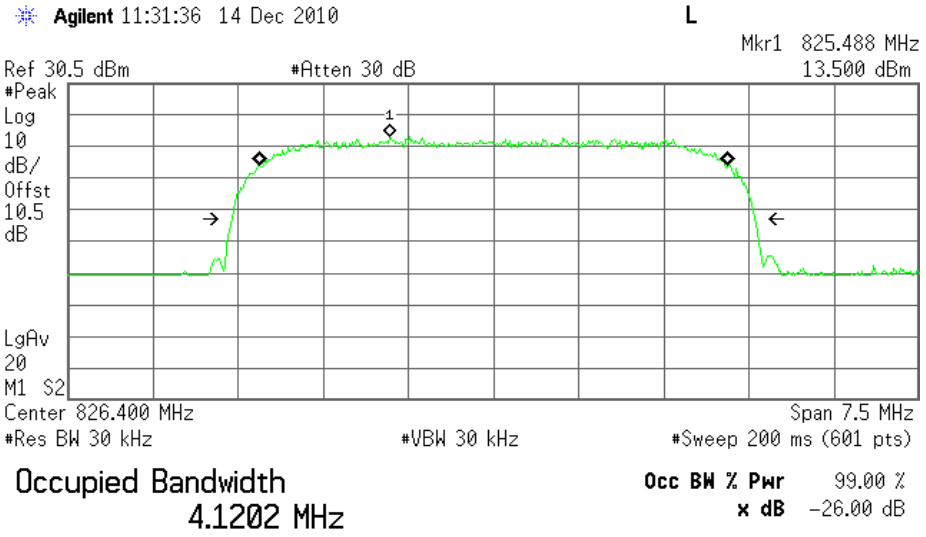
5.4.11 8-PSK Occupied Bandwidth, PCS Middle channel, 1880.0 MHz, 99% BW



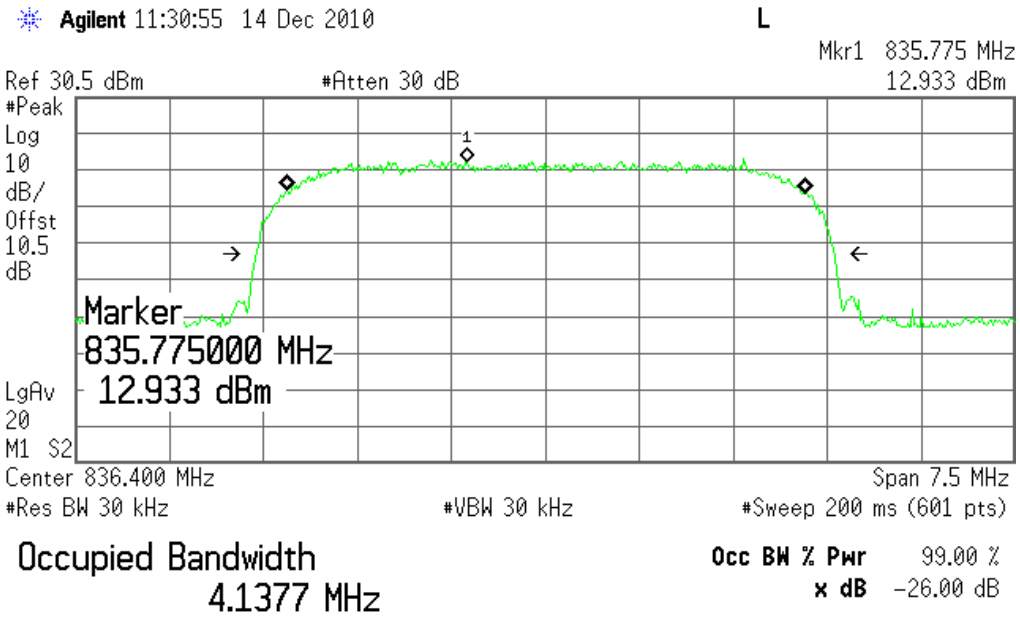
5.4.12 8-PSK Occupied Bandwidth, PCS High channel, 1909.8 MHz, 99% BW



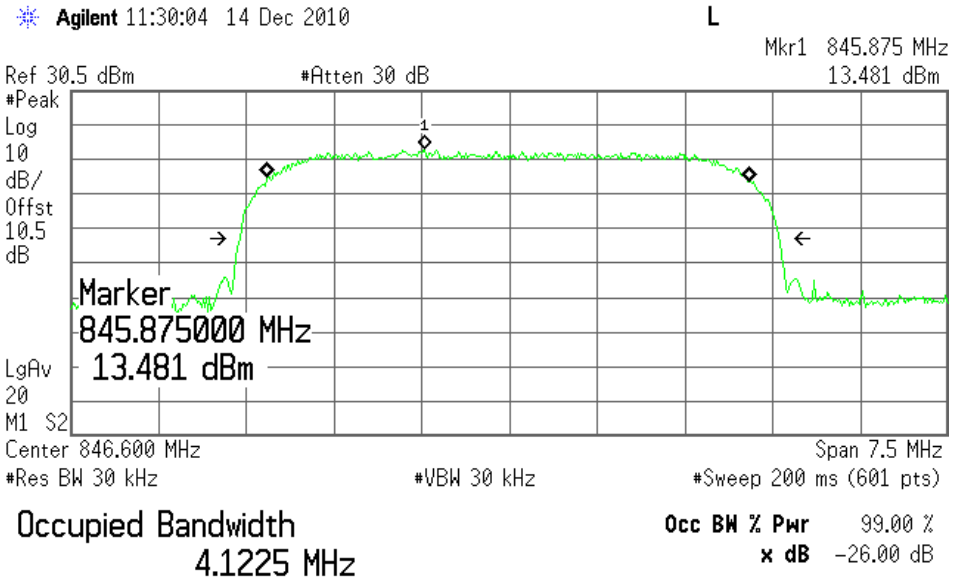
5.4.13 WCDMA Occupied Bandwidth, Cellular Low channel, 826.4 MHz, 99% BW



5.4.14 WCDMA Occupied Bandwidth, Cellular Middle channel, 836.4 MHz, 99% BW

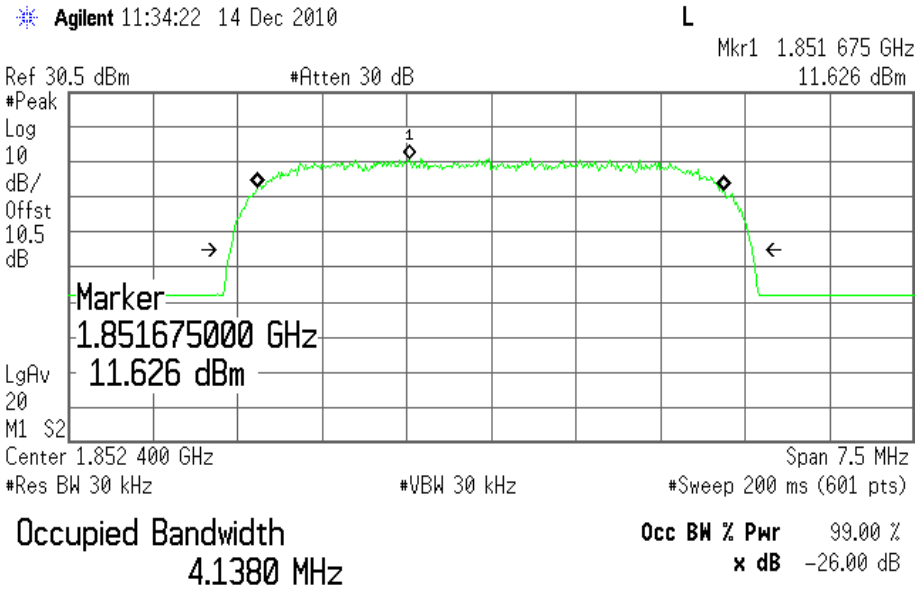


5.4.15 WCDMA Occupied Bandwidth, Cellular High channel, 846.6 MHz, 99% BW



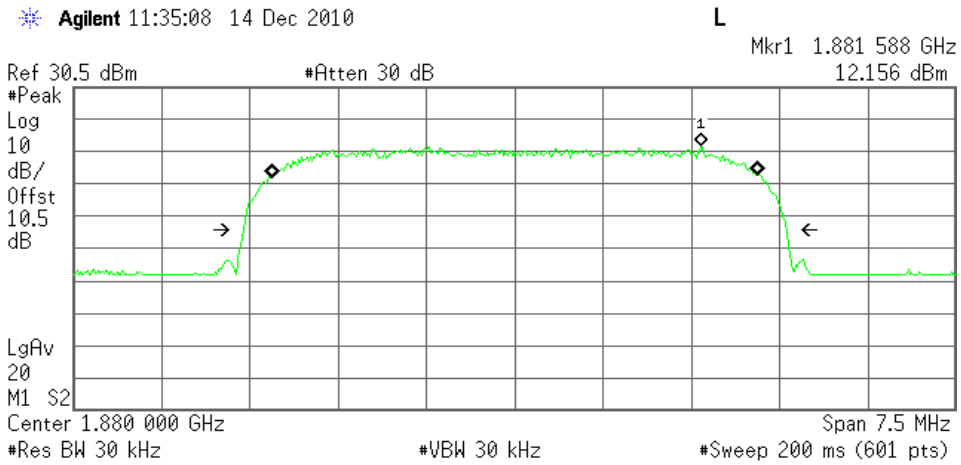
Transmit Freq Error −8.302 kHz
x dB Bandwidth 4.611 MHz

5.4.16 WCDMA Occupied Bandwidth, PCS Low channel, 1852.4 MHz, 99% BW



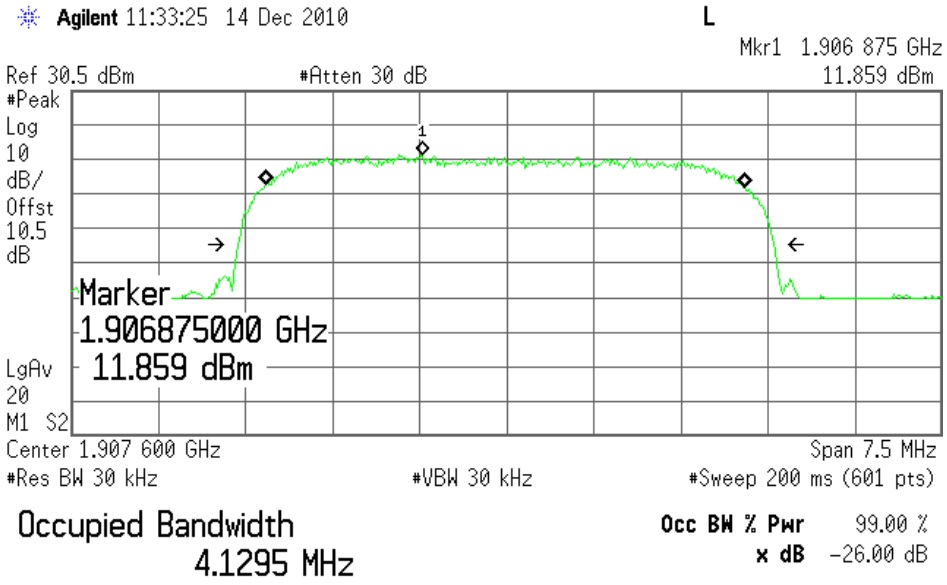
Transmit Freq Error −6.088 kHz
x dB Bandwidth 4.620 MHz

5.4.17 WCDMA Occupied Bandwidth, PCS Middle channel, 1880 MHz, 99% BW



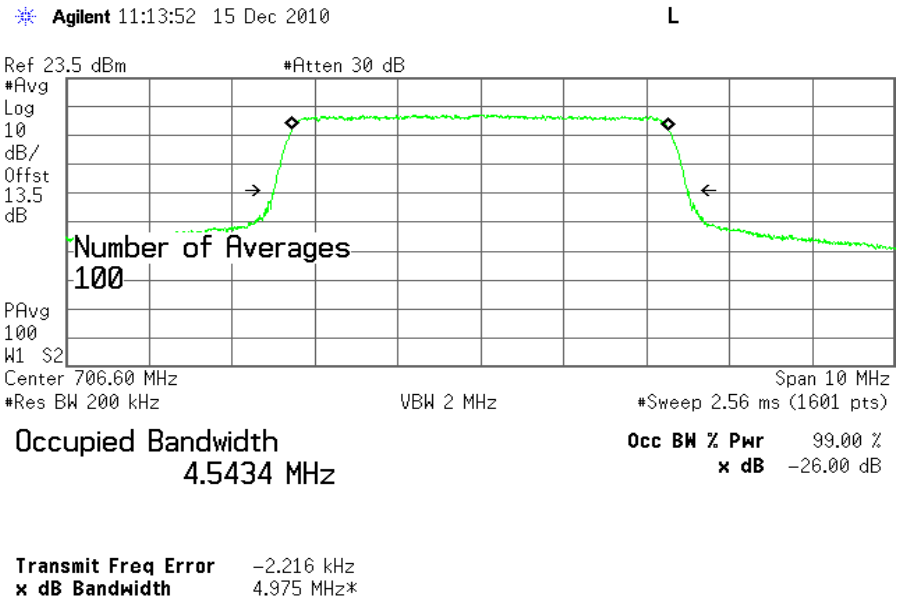
Transmit Freq Error 2.979 kHz
x dB Bandwidth 4.615 MHz

5.4.18 WCDMA Occupied Bandwidth, PCS High channel, 1907.6 MHz, 99% BW

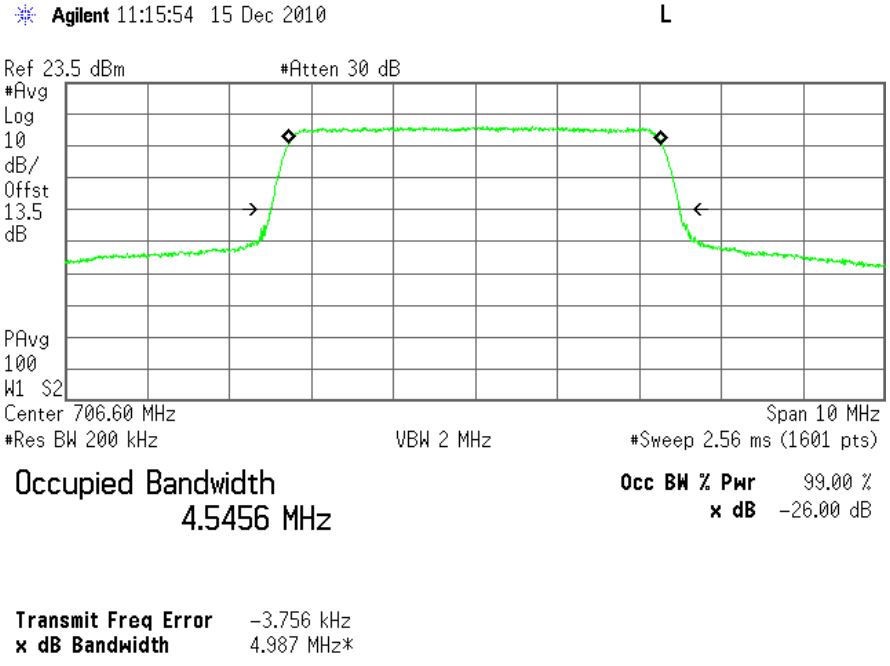


Transmit Freq Error -16.149 kHz
x dB Bandwidth 4.615 MHz

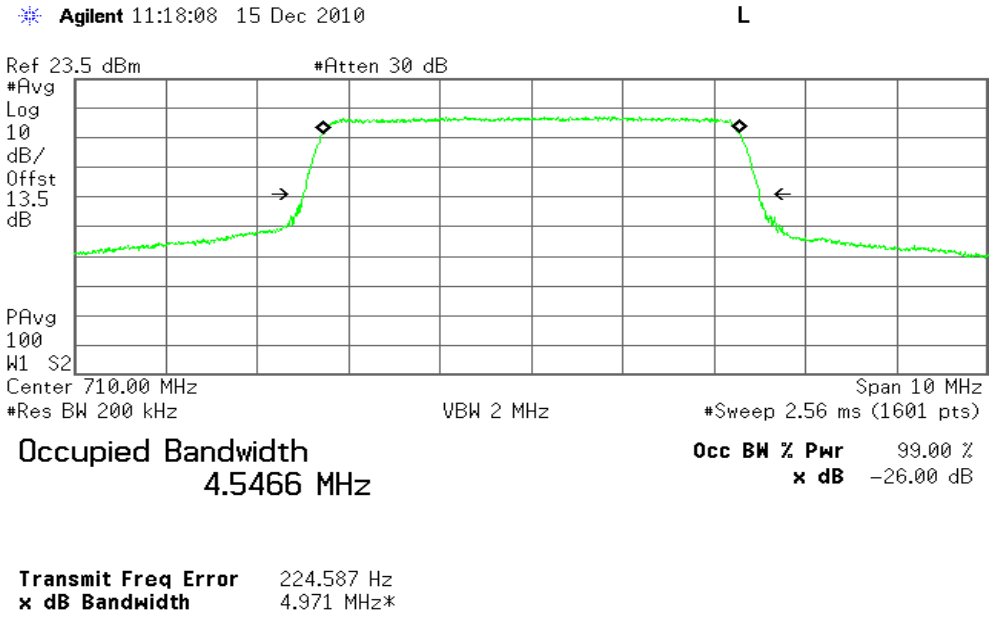
5.4.19 LTE Occupied Bandwidth, Band17 low channel (23756) BW=5MHz RB=25 QPSK 99% BW



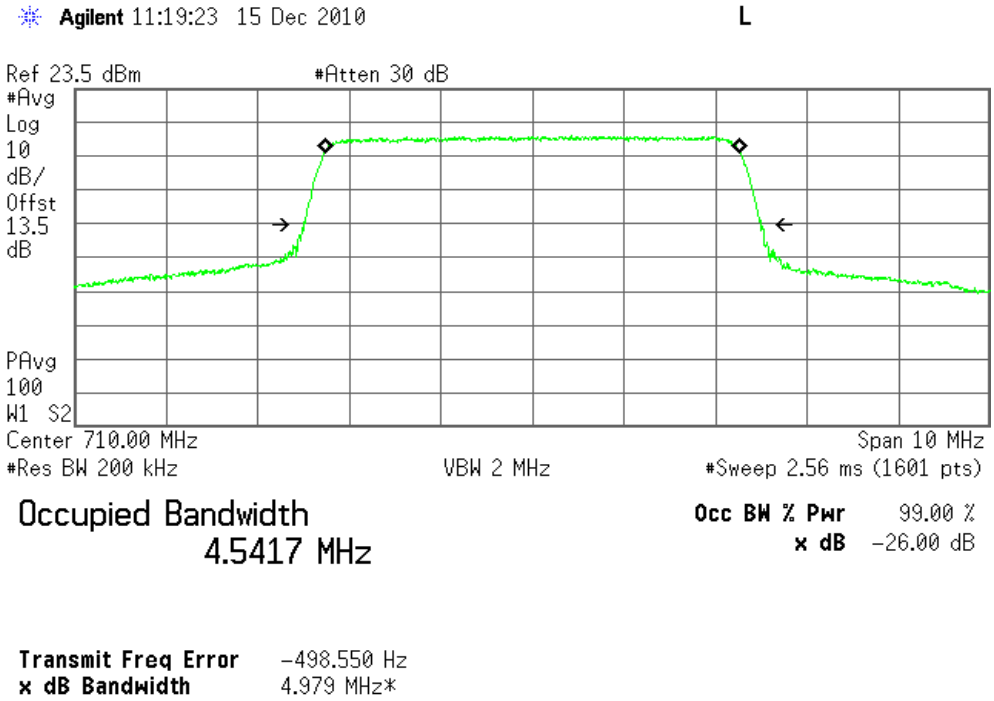
5.4.20 LTE Occupied Bandwidth, Band17 low channel (23756) BW=5MHz RB=25 16QAM 99% BW



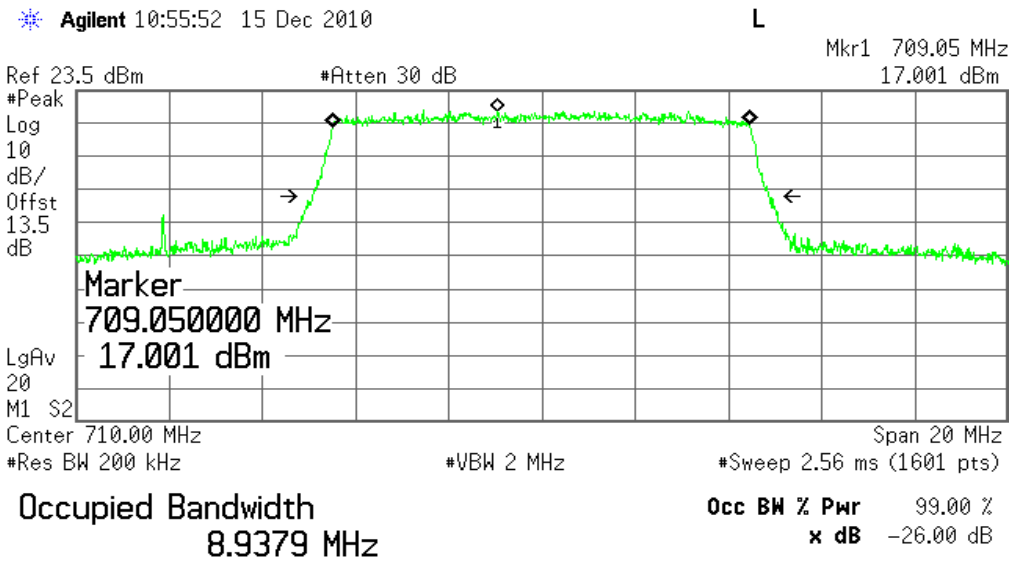
5.4.21 LTE Occupied Bandwidth, Band17 mid channel (23790) BW=5MHz RB=25 QPSK 99% BW



5.4.22 LTE Occupied Bandwidth, Band17 mid channel (23790) BW=5MHz RB=25 16QAM 99% BW

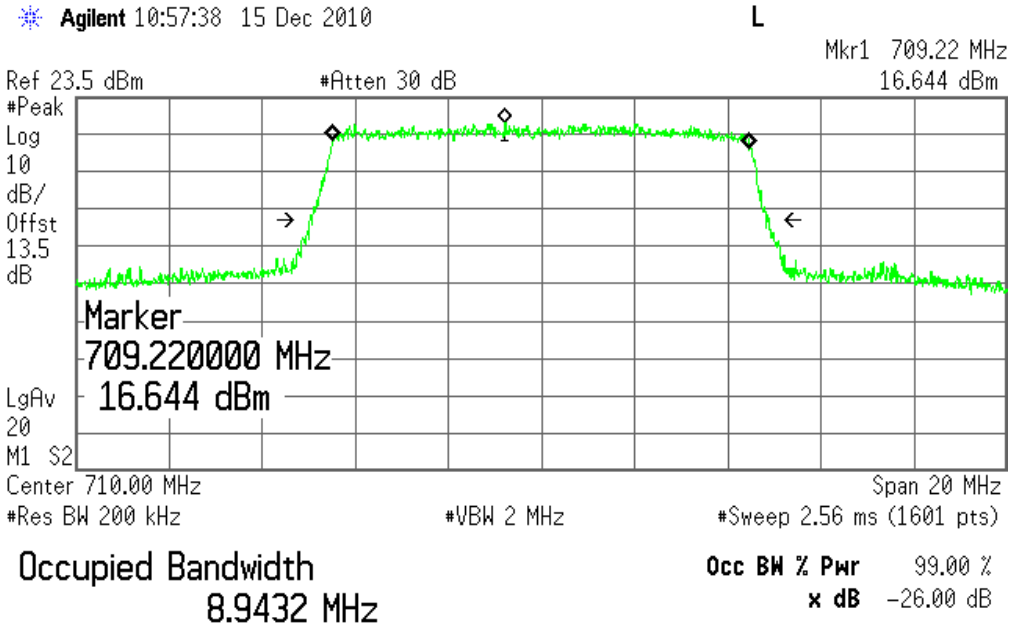


5.4.23 LTE Occupied Bandwidth, Band17 mid channel (23790) BW=10MHz RB=50 QPSK 99% BW



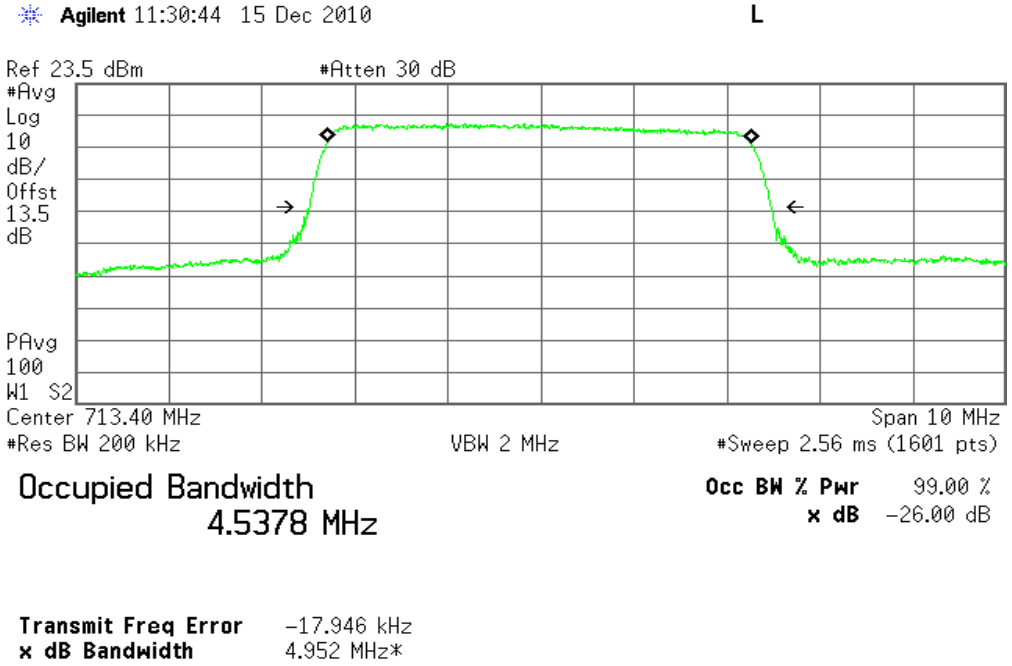
Transmit Freq Error −12.712 kHz
x dB Bandwidth 9.778 MHz

5.4.24 LTE Occupied Bandwidth, Band17 mid channel (23790) BW=10MHz RB=50 16QAM 99% BW

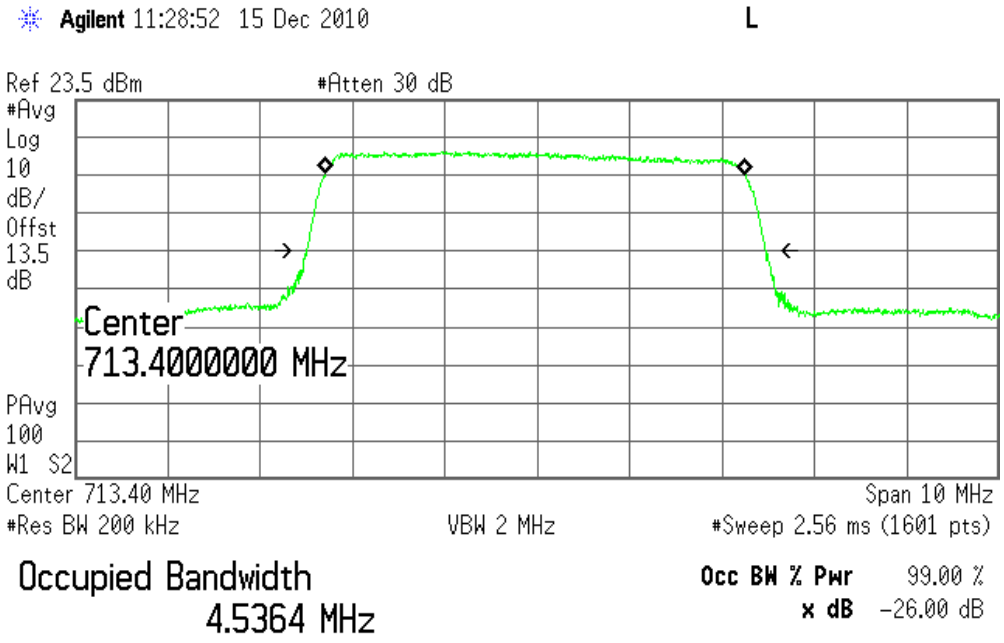


Transmit Freq Error −12.483 kHz
x dB Bandwidth 9.843 MHz

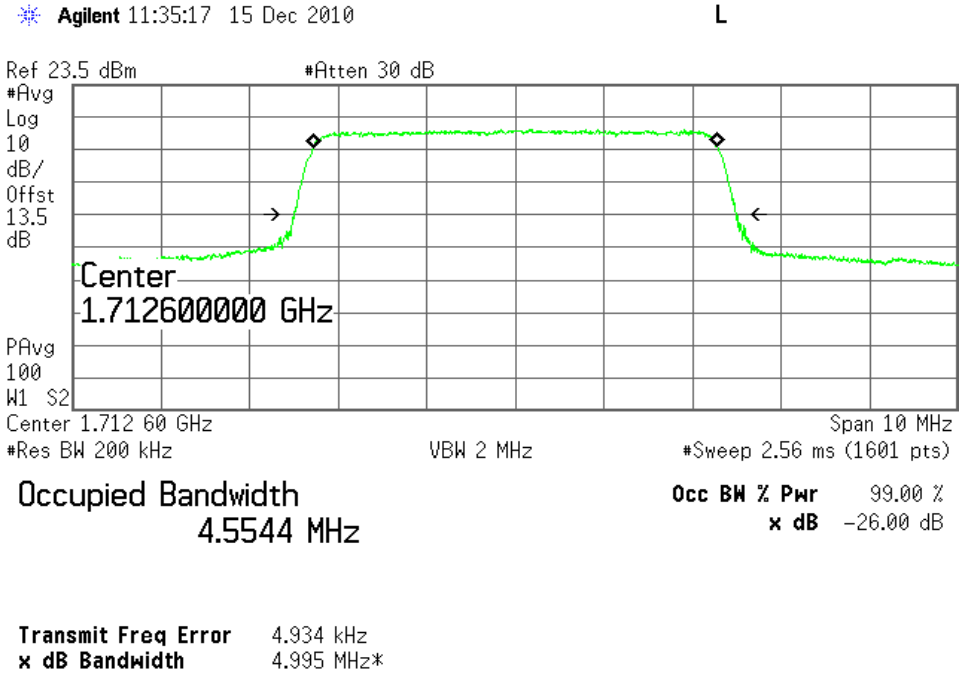
5.4.25 LTE Occupied Bandwidth, Band17 high channel (23790) BW=5MHz RB=25 QPSK 99% BW



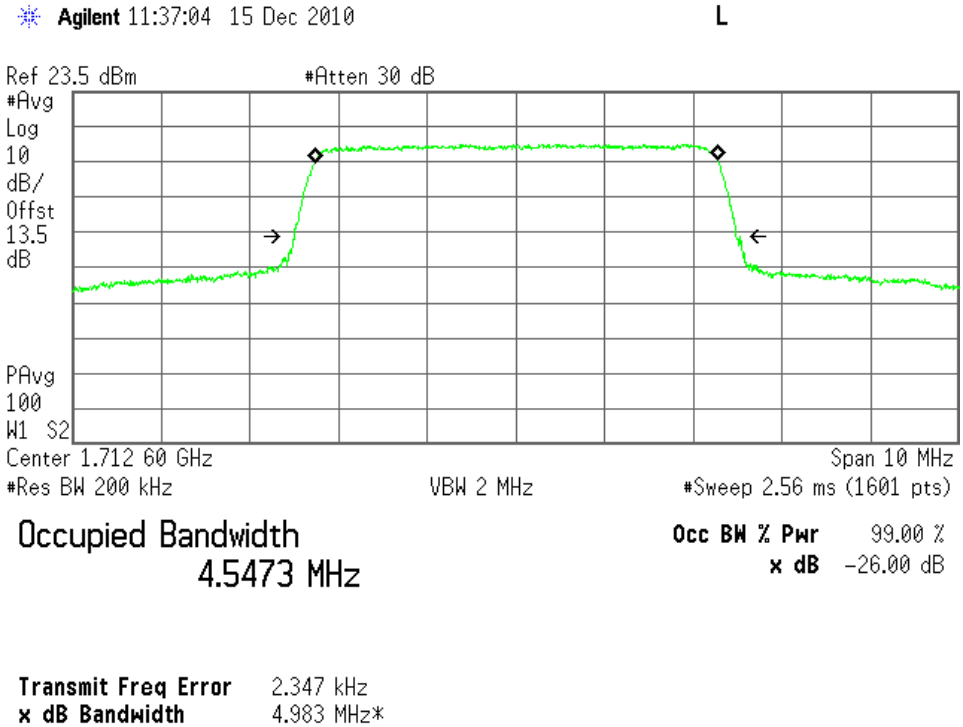
5.4.26 LTE Occupied Bandwidth, Band17 high channel (23790) BW=5MHz RB=25 16QAM 99% BW



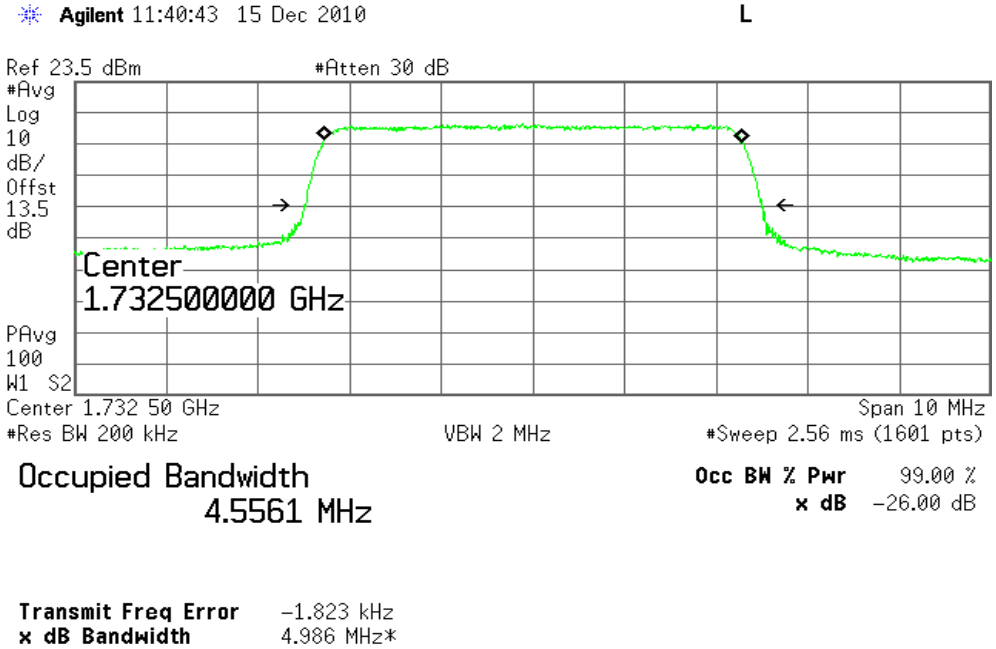
5.4.27 LTE Occupied Bandwidth, Band4 low channel (19976) BW=5MHz RB=25 QPSK 99% BW



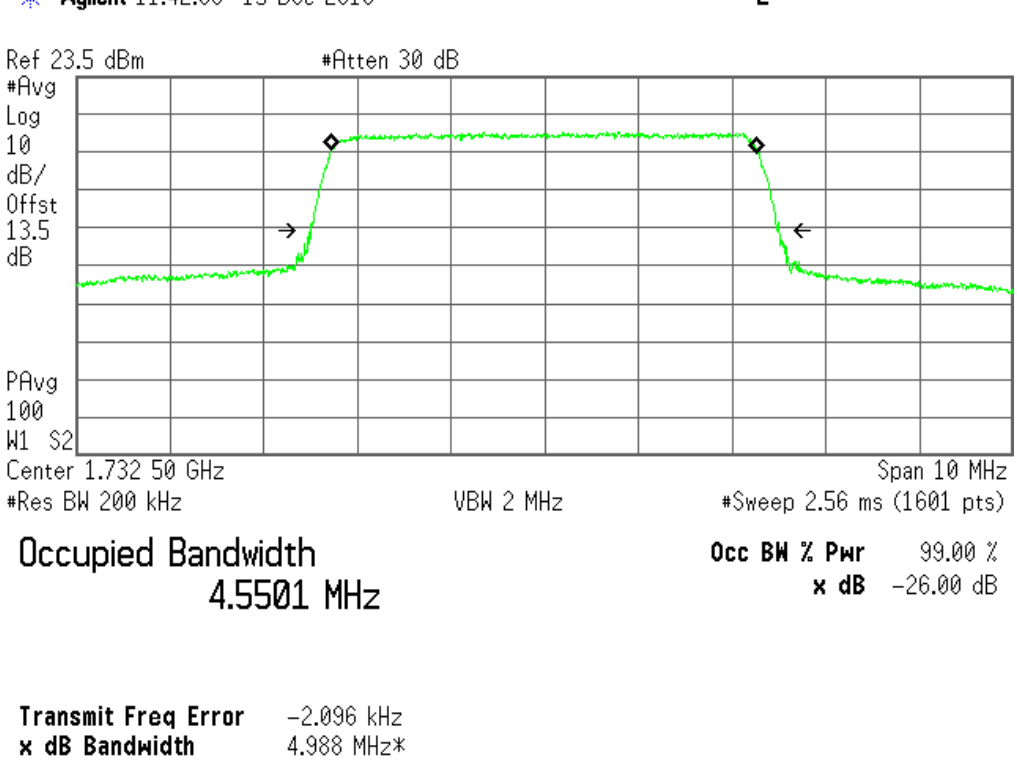
5.4.28 LTE Occupied Bandwidth, Band4 low channel (19976) BW=5MHz RB=25 16QAM 99% BW



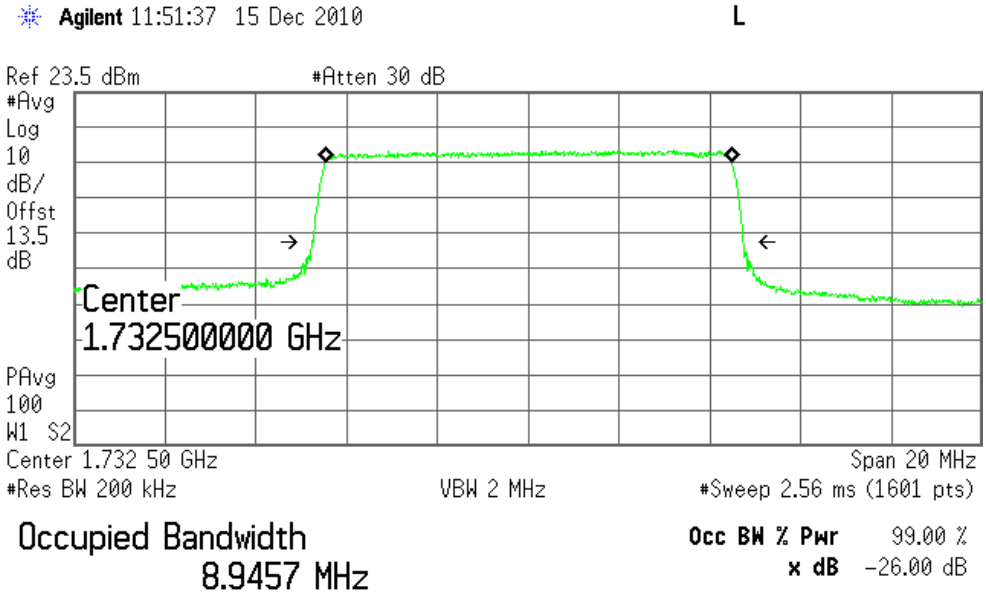
5.4.29 LTE Occupied Bandwidth, Band4 mid channel (20175) BW=5MHz RB=25 QPSK 99% BW



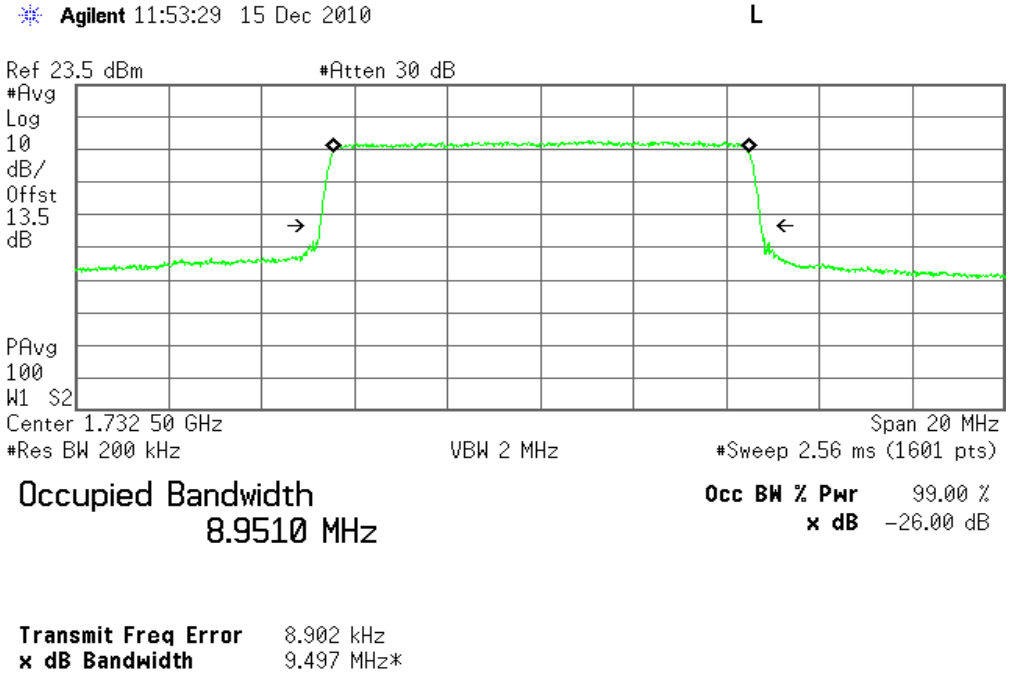
5.4.30 LTE Occupied Bandwidth, Band4 mid channel (20175) BW=5MHz RB=25 16QAM 99% BW



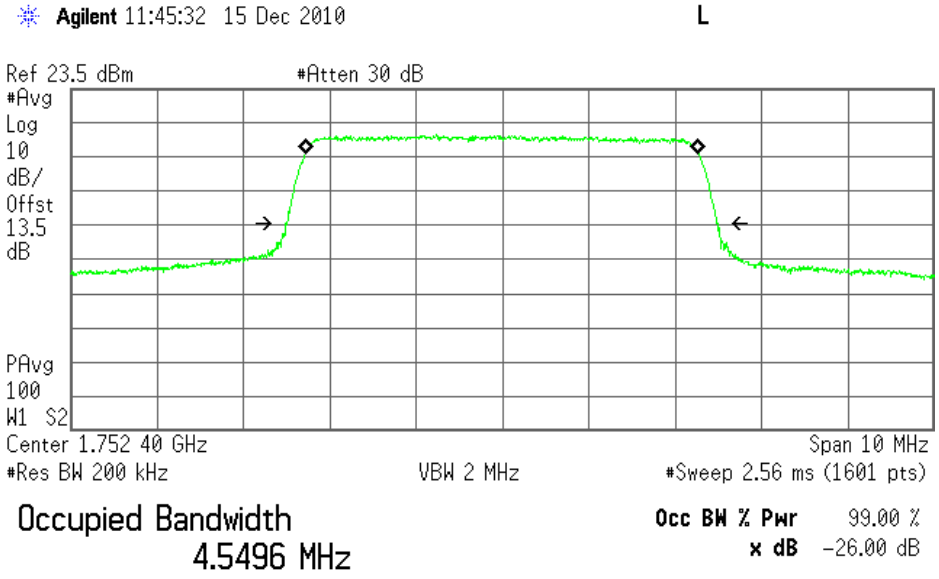
5.4.31 LTE Occupied Bandwidth, Band4 mid channel (20175) BW=10MHz RB=50 QPSK 99% BW



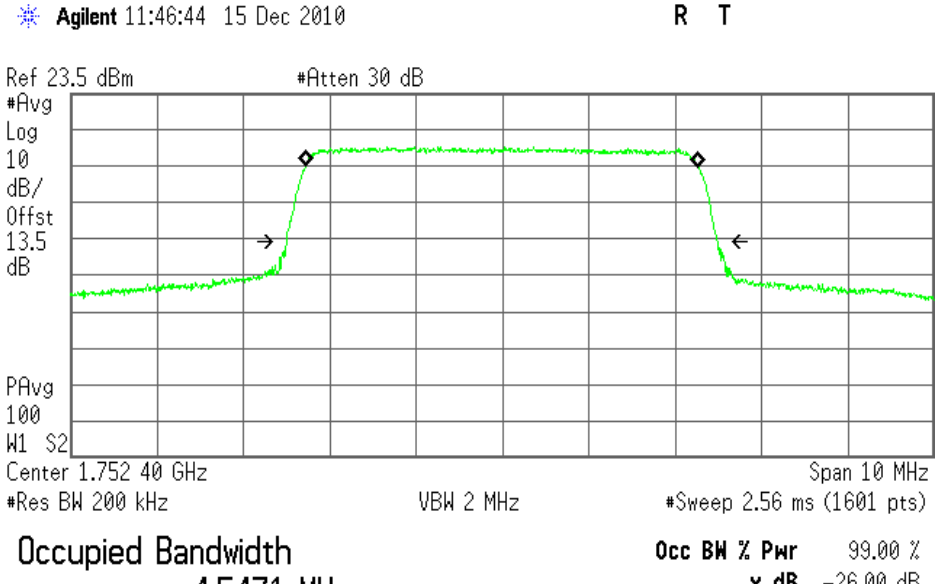
5.4.32 LTE Occupied Bandwidth, Band4 mid channel (20175) BW=10MHz RB=50 16QAM 99% BW



5.4.33 LTE Occupied Bandwidth, Band4 high channel (20734) BW=5MHz RB=25 QPSK 99% BW



5.4.34 LTE Occupied Bandwidth, Band4 high channel (20734) BW=5MHz RB=25 16QAM 99% BW



6 Out of Band Emissions at Antenna Terminals

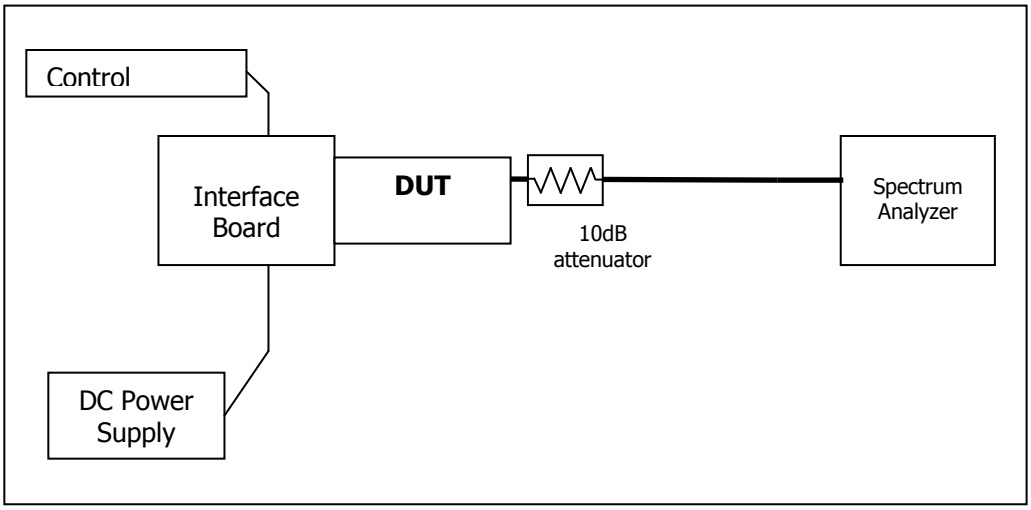
FCC 22.901(d), 22.917, 24.238(a), 27.53(h)

Out of Band Emissions:
The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency outside the frequency band by at least (43 + 10 log P) dB. The out of band emission limit translates to a worst case absolute limit of -13dBm in this case.

6.1 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. The EUT was scanned for spurious emissions from 1MHz to 20GHz with sufficient bandwidth and video resolution. Data plots are included. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were captured.

Test Setup



6.2 Test Equipment

EQUIPMENT	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE
Control Computer	TC	Generic PC	100488	N/A
Wireless Test Set	Rohde & Schwarz	CMU200	110520	October 31, 2010
Wireless Test Set	Rohde & Schwarz	CMW500	101532	May 10, 2010
Spectrum Analyzer	Agilent	E4440A	US41422168	November 26, 2010
DC Power Supply	HP	6632A	3530A	N/A
Interface Board	Shop built	ATEMux	N/A	N/A
Directional Coupler	Pasternack	PE2209-10	N/A	N/A

6.3 Test Results

Refer to the following plots.

- **Cellular Band**

Plot Number	Description
6.4.1 – 6.4.3	GMSK Mode, Low channel, 824.20 MHz
6.4.4 – 6.4.6	GMSK Mode, Middle Channel, 836.6 MHz
6.4.7 – 6.4.9	GMSK Mode, High Channel, 848.8 MHz
6.4.10 – 6.4.12	8-PSK Mode, Low channel, 824.20 MHz
6.4.13 – 6.4.15	8-PSK Mode, Middle Channel, 836.6 MHz
6.4.16 – 6.4.18	8-PSK Mode, High Channel, 848.8 MHz

- **PCS Band**

Plot Number	Description
6.4.19 – 6.4.21	GMSK Mode, Low Channel, 1850.2 MHz
6.4.22 – 6.4.24	GMSK Mode, Middle Channel, 1880.0 MHz
6.4.25 – 6.4.27	GMSK Mode, High Channel, 1909.8 MHz
6.4.28 – 6.4.30	8-PSK, Mode, Low Channel, 1850.2 MHz
6.4.31 – 6.4.33	8-PSK Mode, Middle Channel, 1880.0 MHz
6.4.34 – 6.4.36	8-PSK Mode, High Channel, 1909.8 MHz

- **UMTS Cellular Band**

Plot Number	Description
6.4.37 – 6.4.39	WCDMA Mode, Low Channel, 826.4 MHz
6.4.40 – 6.4.42	WCDMA Mode, Middle Channel, 836.4 MHz
6.4.43 – 6.4.45	WCDMA Mode, High Channel, 846.6 MHz

- **UMTS PCS Band**

Plot Number	Description
6.4.46 – 6.4.48	WCDMA Mode, Low Channel, 1852.4 MHz
6.4.49 – 6.4.51	WCDMA Mode, Middle Channel, 1880.0 MHz
6.4.52 – 6.4.54	WCDMA Mode, High Channel, 1907.6 MHz

- **LTE Band 17 ((5MHz &10MHz BW, 25RB &50 RB, QPSK&16-QAM))**

Plot Number	Description
6.4.55-6.4.60	**LTE Mode, Low channel, 706.6MHz, 5MHz, QPSK&16-QAM**
6.4.61-6.4.68	**LTE Mode, Mid channel, 710.0MHz, 5MHz&10MHz, QPSK&16-QAM**
6.4.69-6.4.74	**LTE Mode, high channel, 713.4MHz, 5MHz, QPSK&16-QAM**

- **LTE Band 4 (5MHz &10MHz BW, 25RB &50 RB, QPSK&16-QAM)**

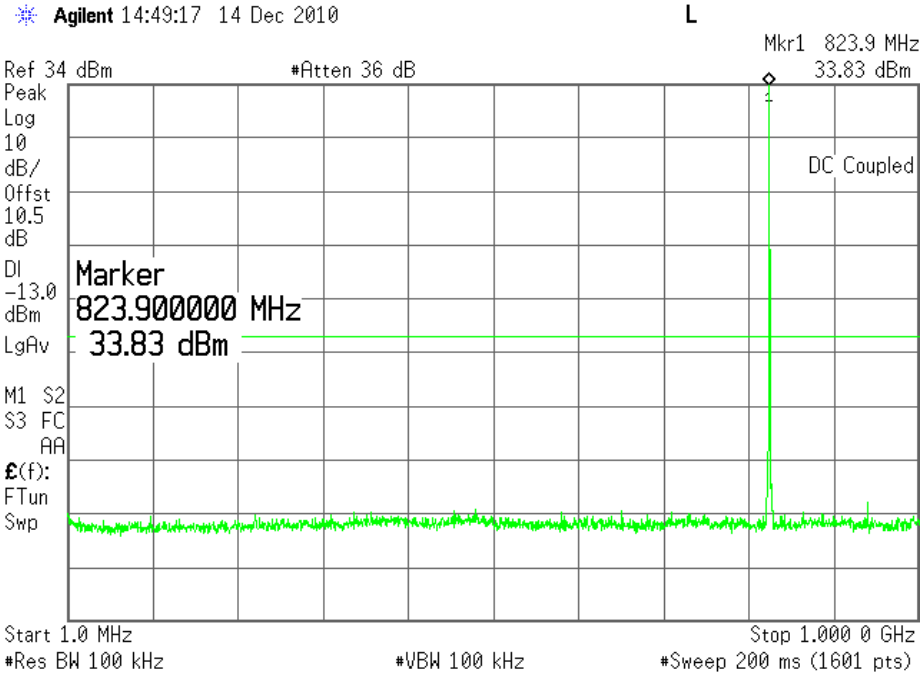
Plot Number	Description
6.4.75-6.4.82	**LTE Mode, Low channel, 1712.6MHz&1715.1MHz,5MHz&10MHz, QPSK&16-QAM**
6.4.83-6.4.90	**LTE Mode, Mid channel, 1732.5MHz, 5MHz&10MHz, QPSK&16-QAM**
6.4.91-6.4.98	**LTE Mode, high channel, 1749.9MHz&1752.4MHz, 5MHz&10MHz, QPSK&16-QAM**

The plots below show that the conducted emission limits requirements are met.

6.4 Test Plots

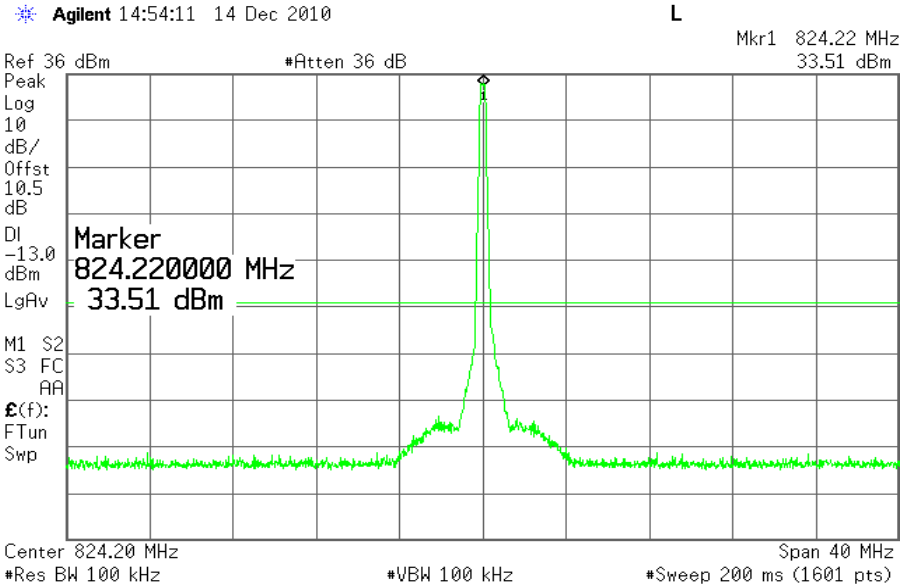
Plot 6.4.1) Out of Band Emissions at Antenna Terminals

GMSK, Low channel, 824.200 MHz, 1 MHz to 1 GHz



Plot 6.4.2) Out of Band Emissions at Antenna Terminals

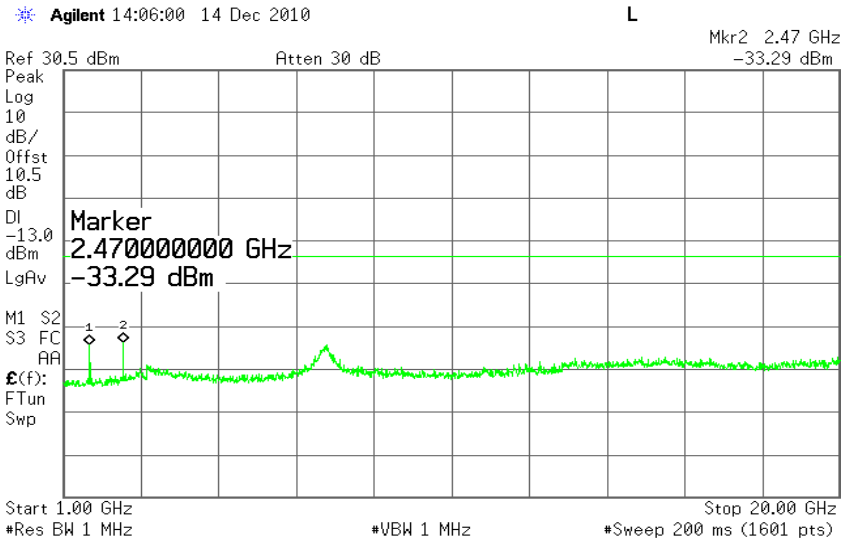
GMSK, Low channel, 824.200 MHz, TX signal +/- 20 MHz



The strong emission shown in each case is the carrier signal.

Plot 6.4.3) Out of Band Emissions at Antenna Terminals

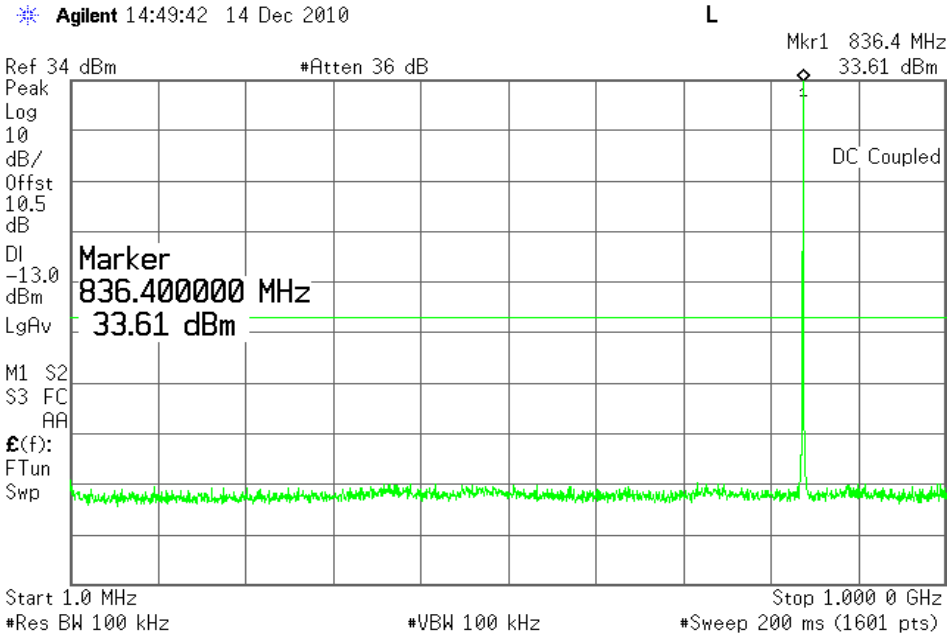
GMSK, Low channel, 824.200 MHz, 1 GHz to 20 GHz



Cellular Harmonics for Ch. 128 (824.2 MHz)	Level (dBm)
Second	**-34.73 dBm**
Third	**-33.29 dBm**
Others	**----**

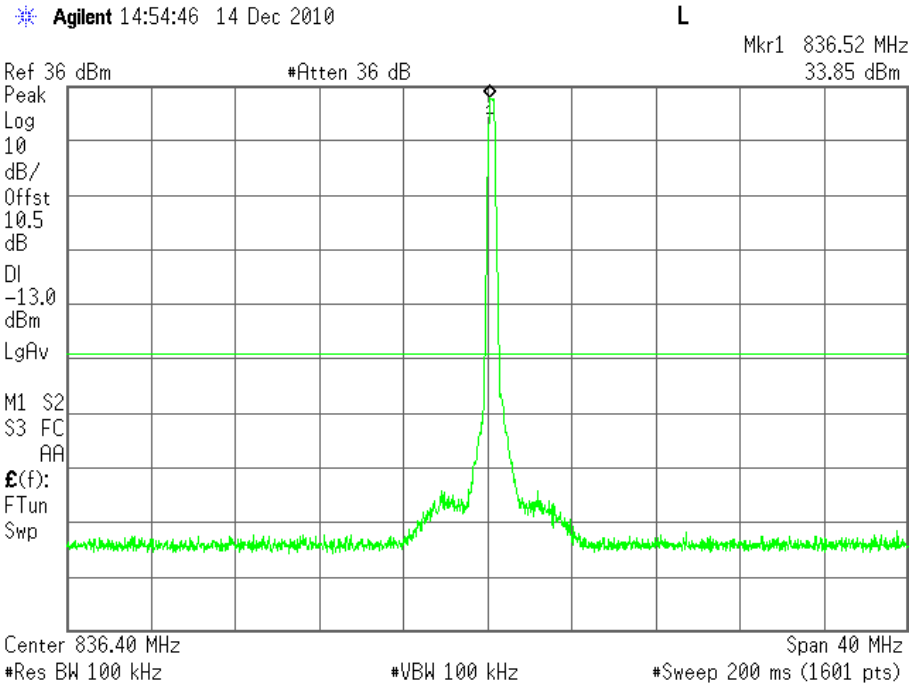
Plot 6.4.4) Out of Band Emissions at Antenna Terminals

GMSK, Mid Channel, 836.6 MHz, 1 MHz to 1 GHz



Plot 6.4.5) Out of Band Emissions at Antenna Terminals

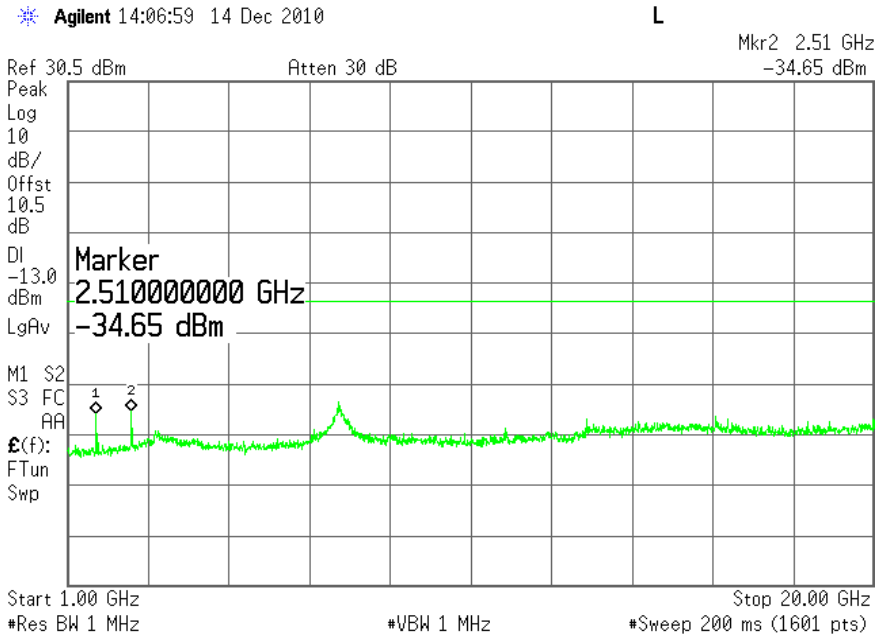
GMSK, Mid Channel, 836.6 MHz, TX signal +/- 20 MHz



The strong emission shown in each case is the carrier signal.

Plot 6.4.6) Out of Band Emissions at Antenna Terminals

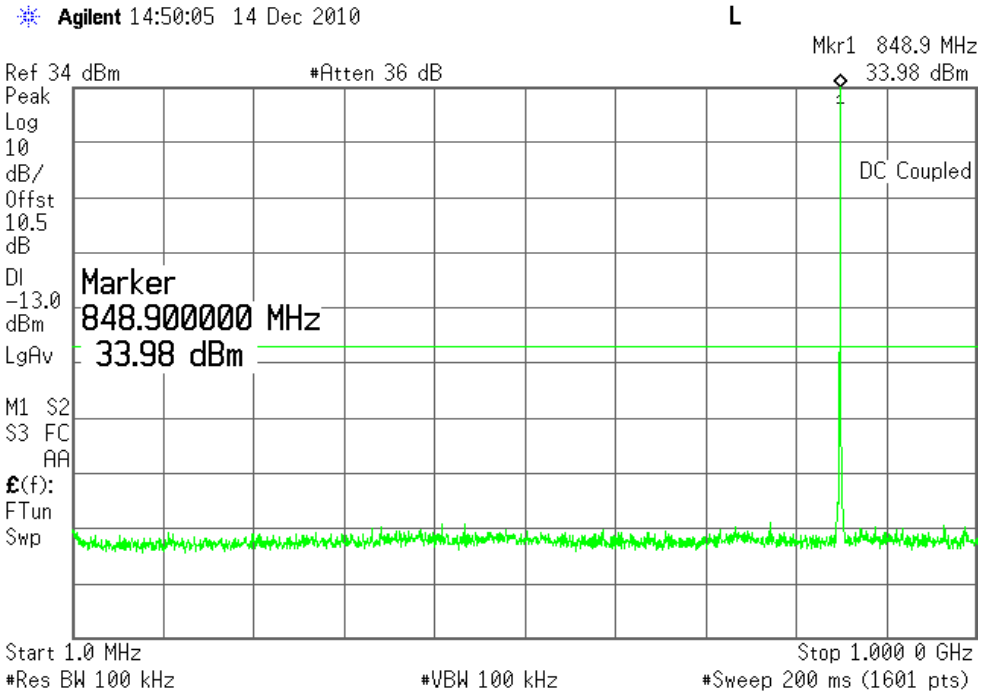
GMSK, Mid Channel, 836.6 MHz, 1 GHz to 20 GHz



Cellular Harmonics for Ch. 190 (836.6 MHz)	Level (dBm)
Second	**-35.74 dBm**
Third	**-34.65 dBm**
Others	**----**

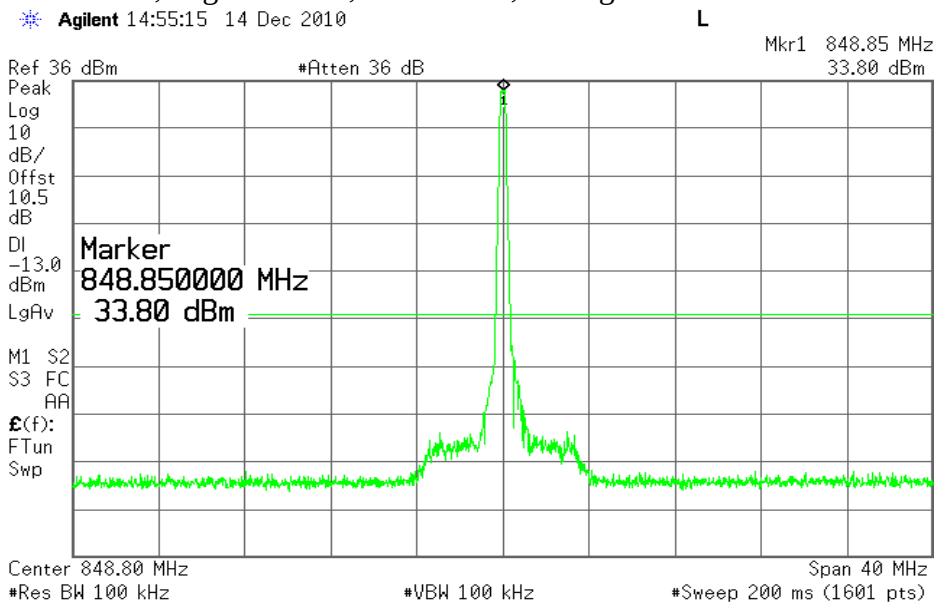
Plot 6.4.7) Out of Band Emissions at Antenna Terminals

GMSK, High Channel, 848.8 MHz, 1 MHz to 1 GHz



Plot 6.4.8) Out of Band Emissions at Antenna Terminals

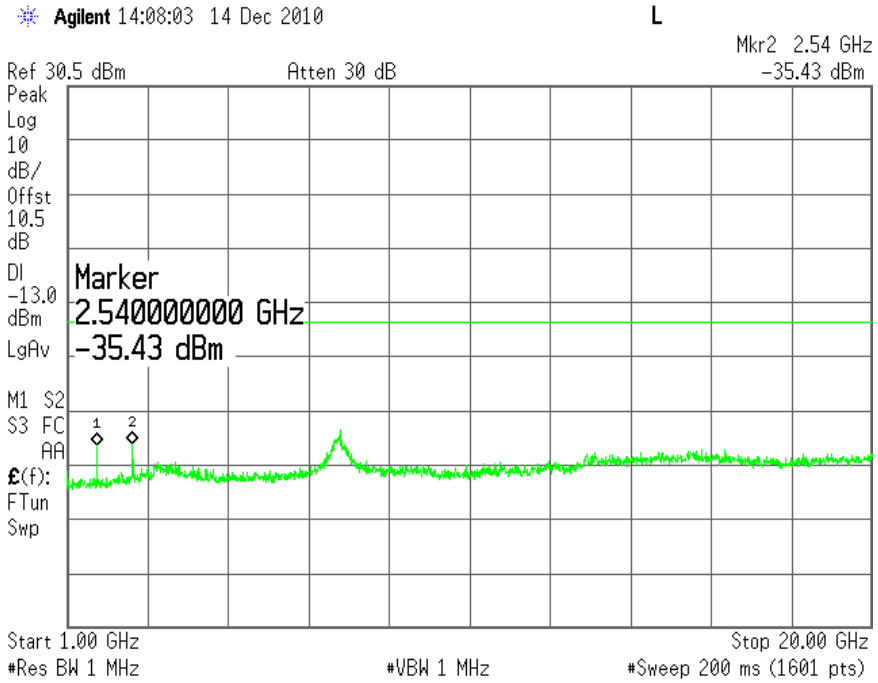
GMSK, High Channel, 848.8 MHz, TX signal +/- 20 MHz



The strong emission shown in each case is the carrier signal.

Plot 6.4.9) Out of Band Emissions at Antenna Terminals

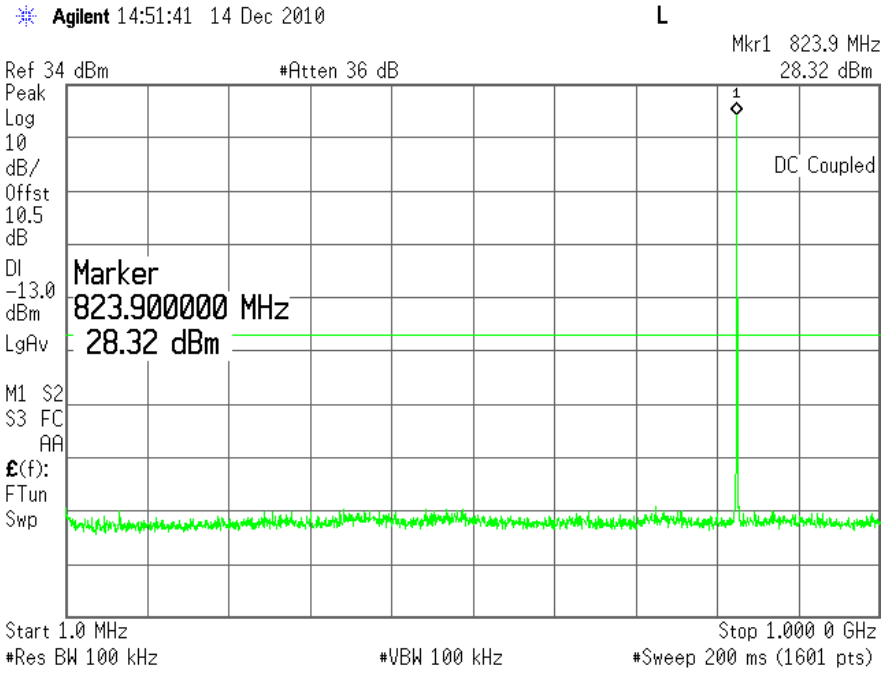
GMSK, High Channel, 848.8 MHz, 1 GHz to 20 GHz



Cellular Harmonics for Ch. 251 (848.8 MHz)	Level (dBm)
Second	**-36.27 dBm**
Third	**-35.43 dBm**
Others	**----**

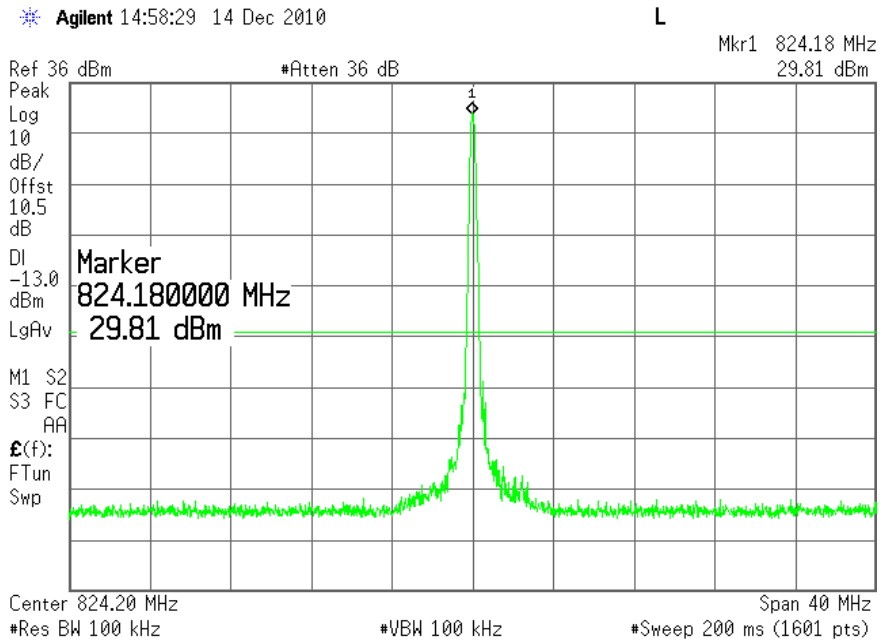
Plot 6.4.10) Out of Band Emissions at Antenna Terminals

8-PSK, Low channel, 824.200 MHz, 1 MHz to 1 GHz



Plot 6.4.11) Out of Band Emissions at Antenna Terminals

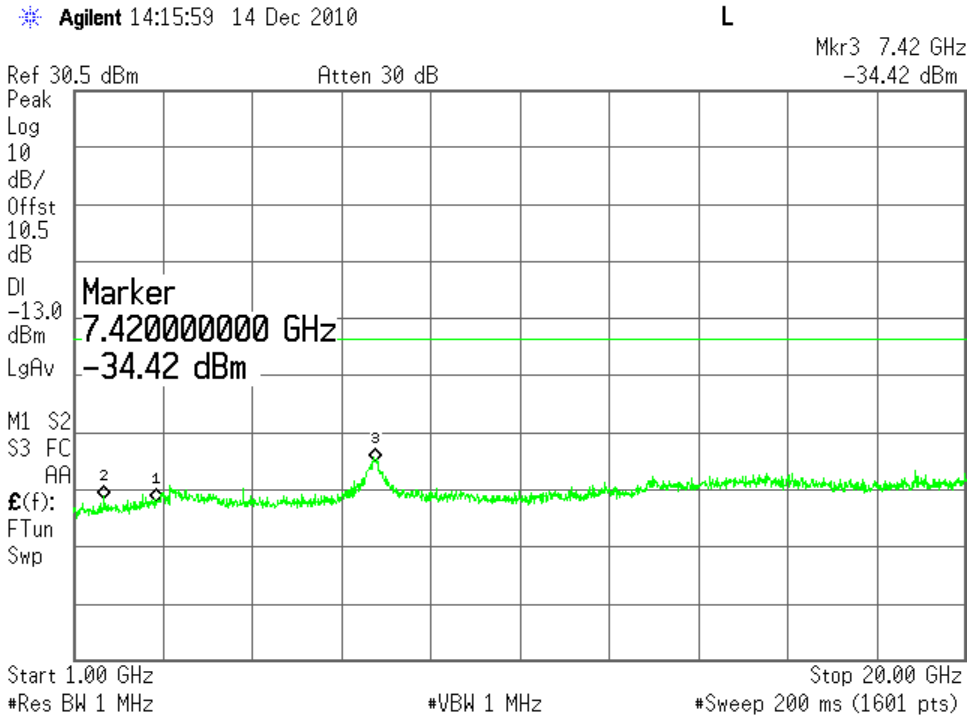
8-PSK, Low channel, 824.200 MHz, TX signal +/- 20 MHz



The strong emission shown in each case is the carrier signal.

Plot 6.4.12) Out of Band Emissions at Antenna Terminals

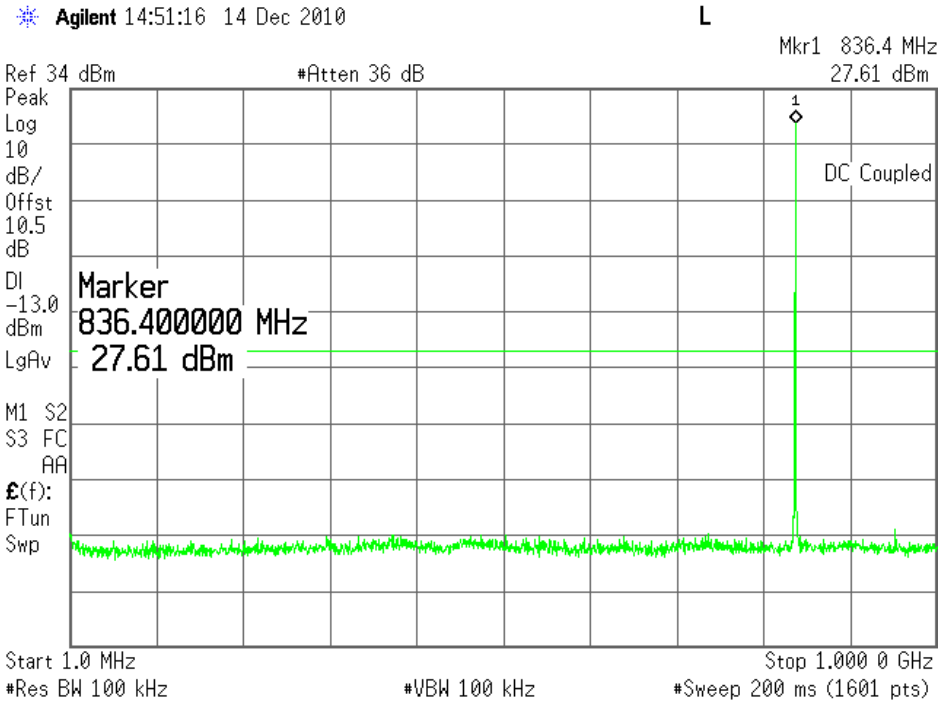
8-PSK, Low channel, 824.200 MHz, 1 GHz to 20 GHz



Cellular Harmonics for Ch. 128 (824.2 MHz)	Level (dBm)
Second	**<-40 dBm**
Third	**<-40 dBm**
Others	**----**

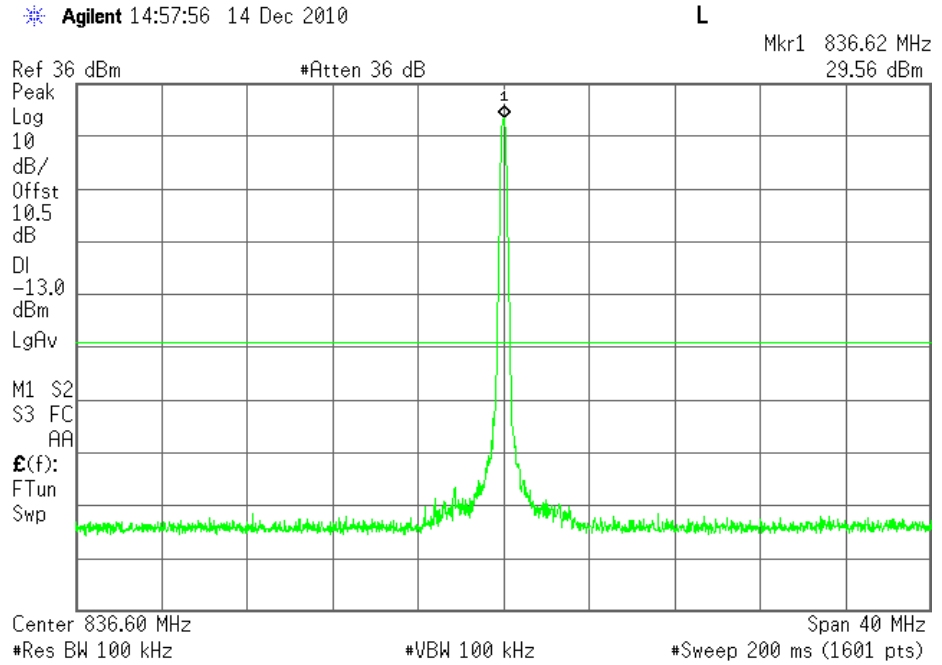
Plot 6.4.13) Out of Band Emissions at Antenna Terminals

8-PSK, Mid Channel, 836.6 MHz, 1 MHz to 1 GHz



Plot 6.4.14) Out of Band Emissions at Antenna Terminals

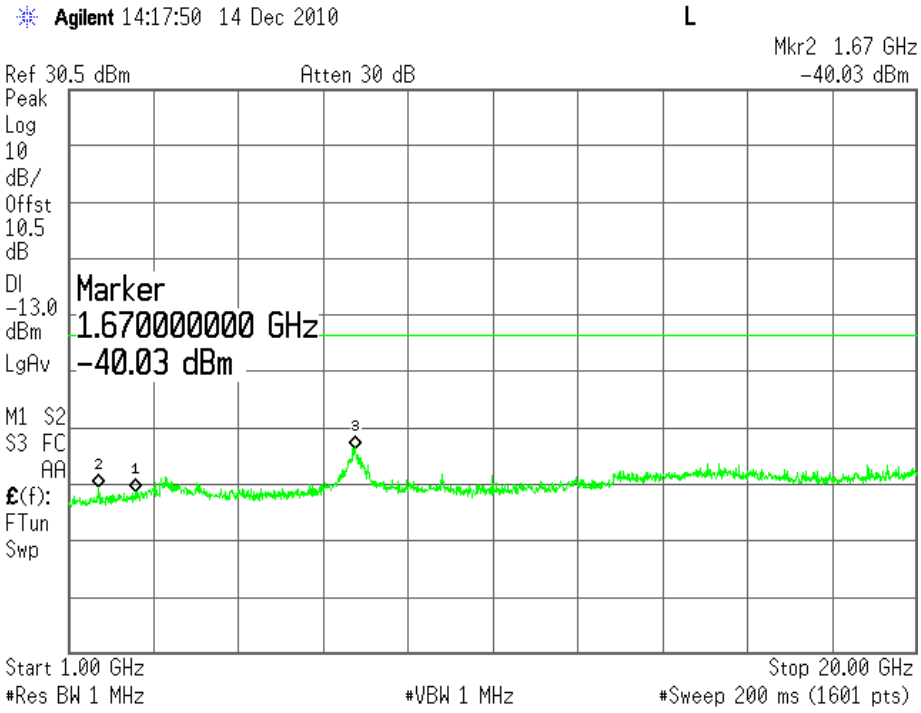
8-PSK, Mid Channel, 836.6 MHz, TX signal +/- 20 MHz



The strong emission shown in each case is the carrier signal.

Plot 6.4.15) Out of Band Emissions at Antenna Terminals

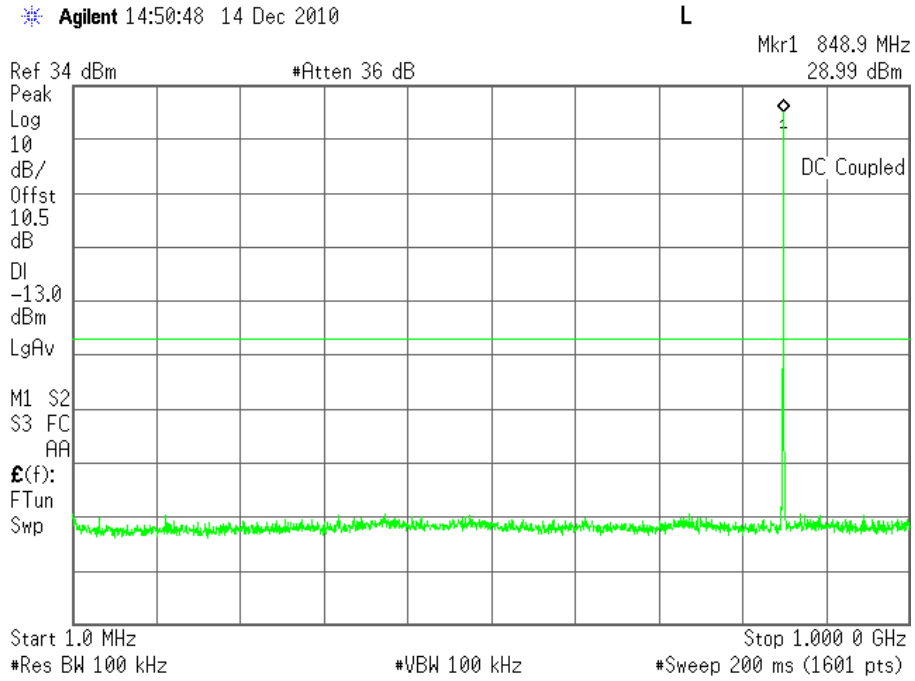
8-PSK, Mid Channel, 836.6 MHz, 1 GHz to 20 GHz



Cellular Harmonics for Ch. 190 (836.6 MHz)	Level (dBm)
Second	**<-40 dBm**
Third	**<-40 dBm**
Others	**----**

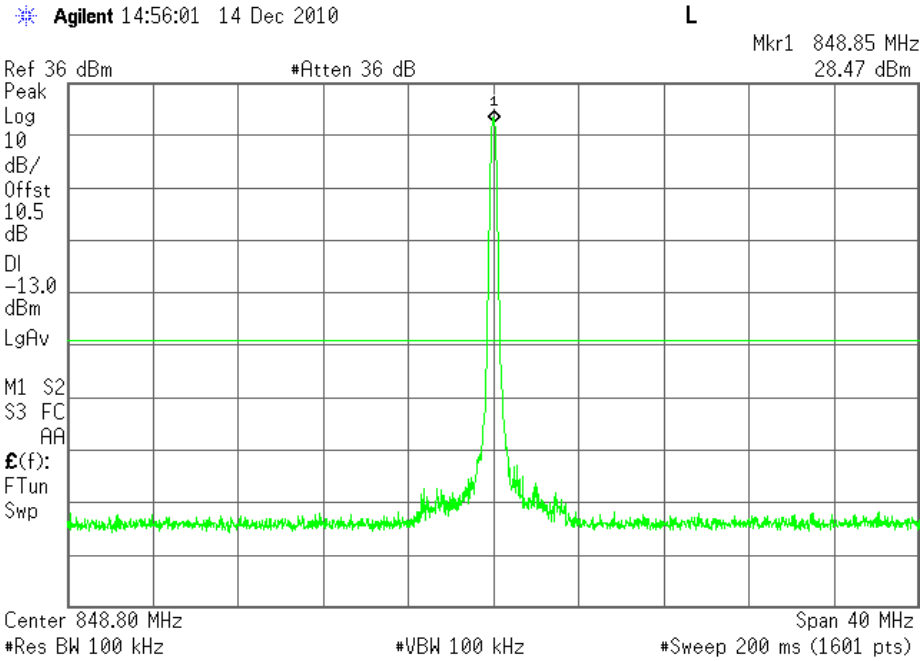
Plot 6.4.16) Out of Band Emissions at Antenna Terminals

8-PSK, High Channel, 848.8 MHz, 1 MHz to 1 GHz



Plot 6.4.17) Out of Band Emissions at Antenna Terminals

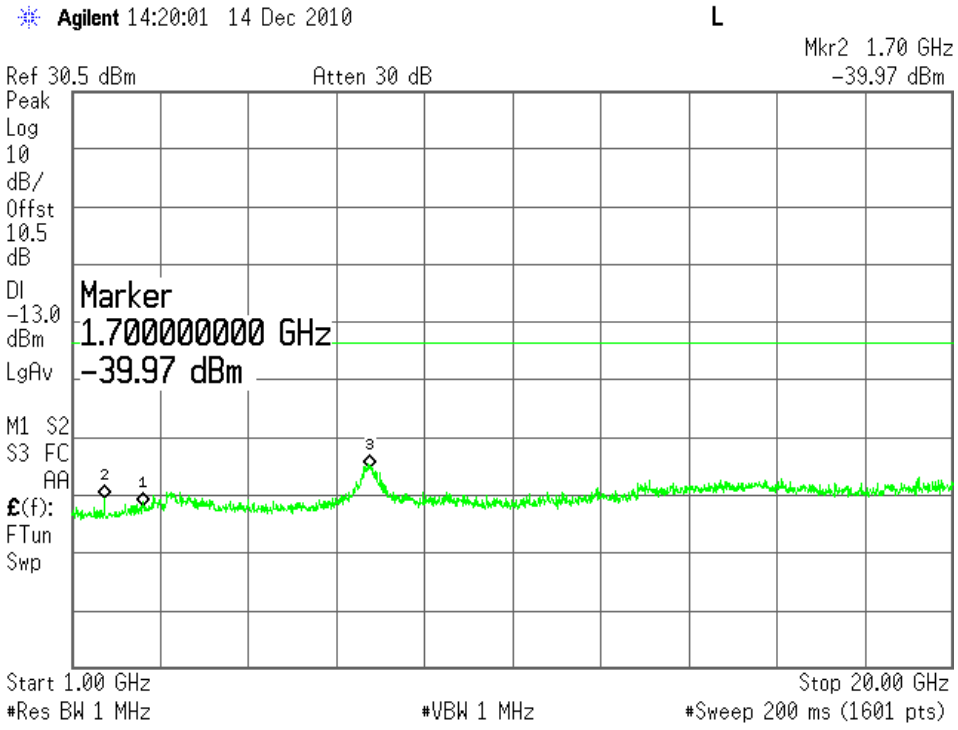
8-PSK, High Channel, 848.8 MHz, TX signal +/- 20 MHz



The strong emission shown in each case is the carrier signal.

Plot 6.4.18) Out of Band Emissions at Antenna Terminals

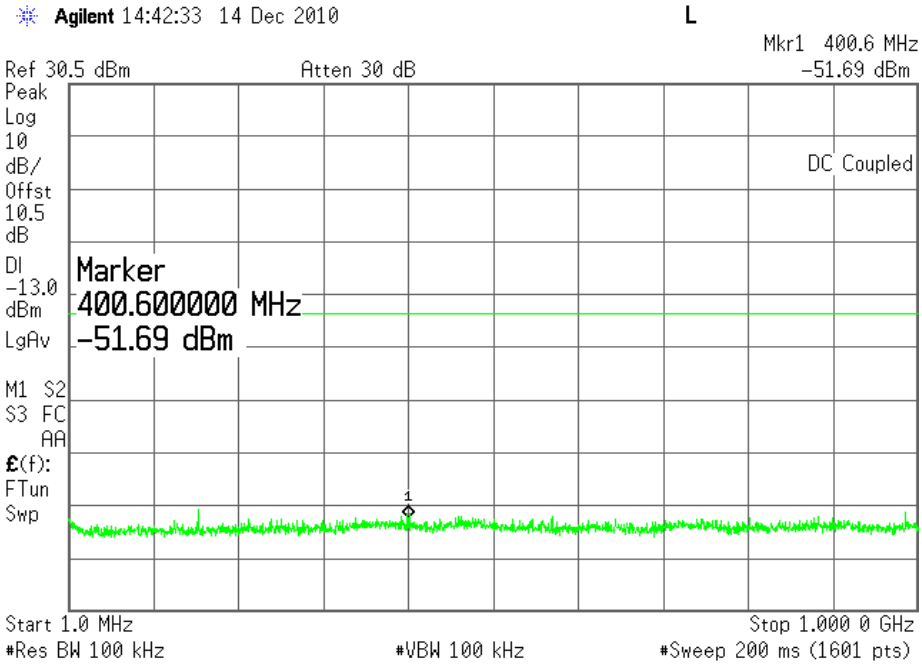
8-PSK, High Channel, 848.8 MHz, 1 GHz to 20 GHz



Cellular Harmonics for Ch. 251 (848.8 MHz)	Level (dBm)
Second	**-39.97 dBm**
Third	**<-40 dBm**
Others	**----**

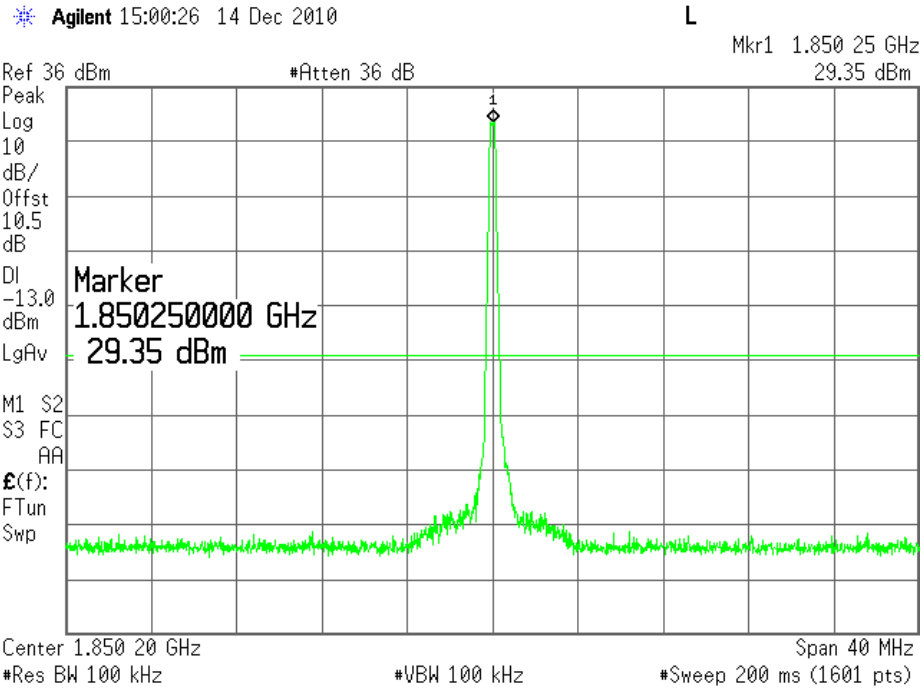
Plot 6.4.19) Out of Band Emissions at Antenna Terminals

GMSK, Low channel, 1850.2 MHz, 1 MHz to 1 GHz



Plot 6.4.20) Out of Band Emissions at Antenna Terminals

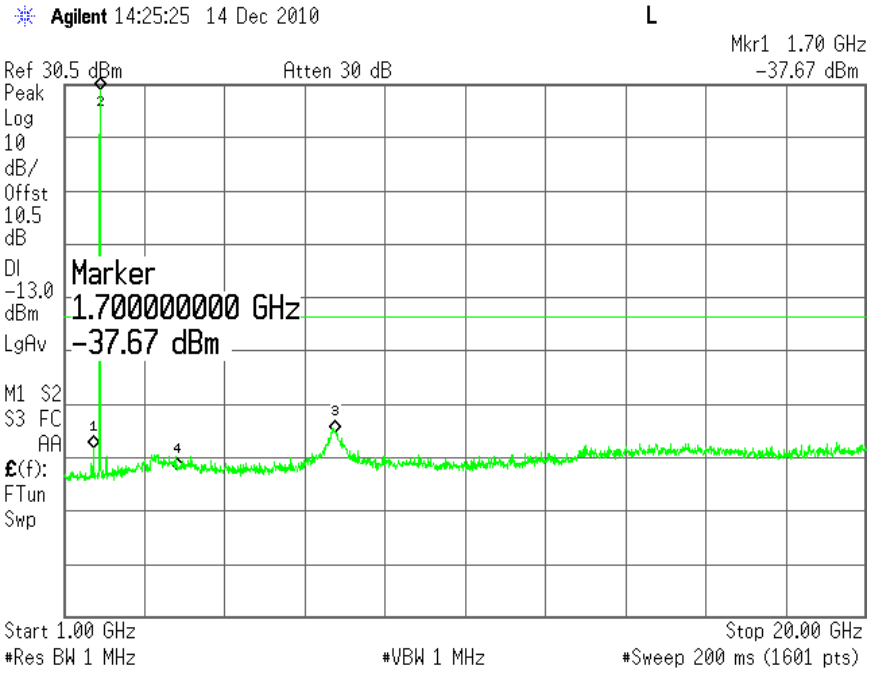
GMSK, Low channel, 1850.2 MHz, TX signal +/- 20 MHz



The strong emission shown is the carrier signal.

Plot 6.4.21) Out of Band Emissions at Antenna Terminals

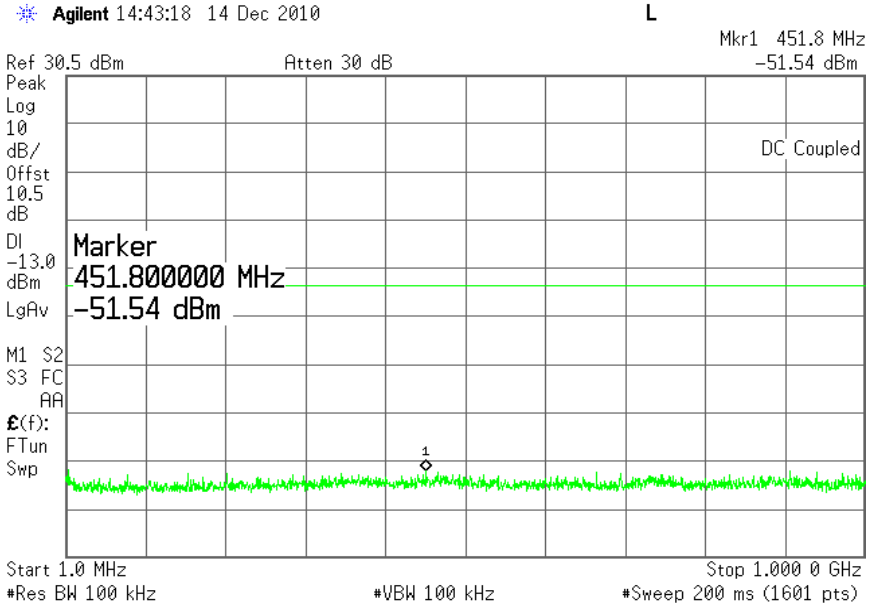
GMSK, Low channel, 1850.2 MHz, 1 GHz to 20 GHz



The strong emission shown is the carrier signal.

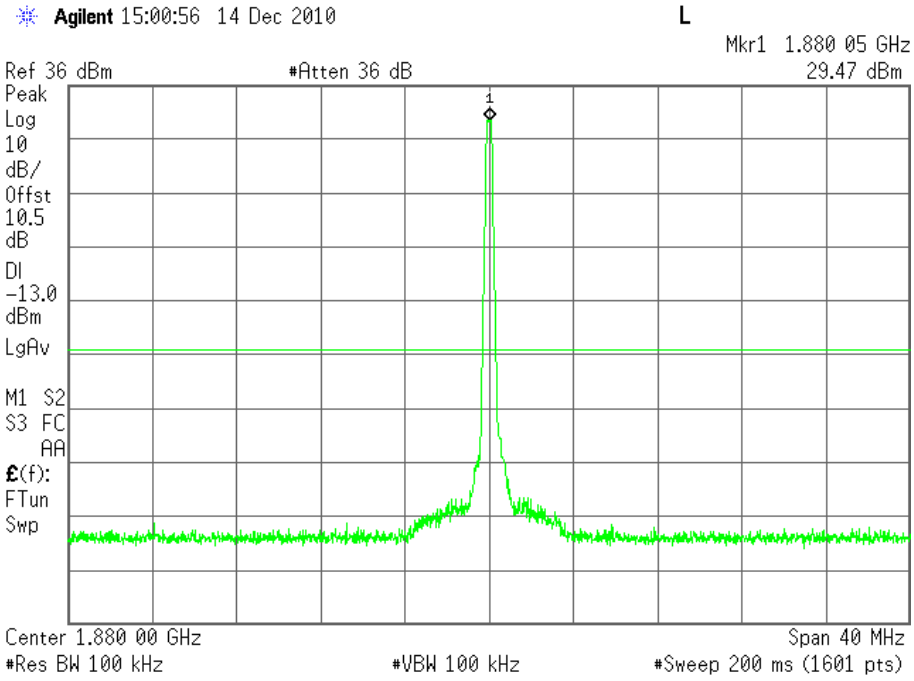
Plot 6.4.22) Out of Band Emissions at Antenna Terminals

GMSK, Middle channel, 1880.0 MHz, 1 MHz to 1 GHz



Plot 6.4.23) Out of Band Emissions at Antenna Terminals

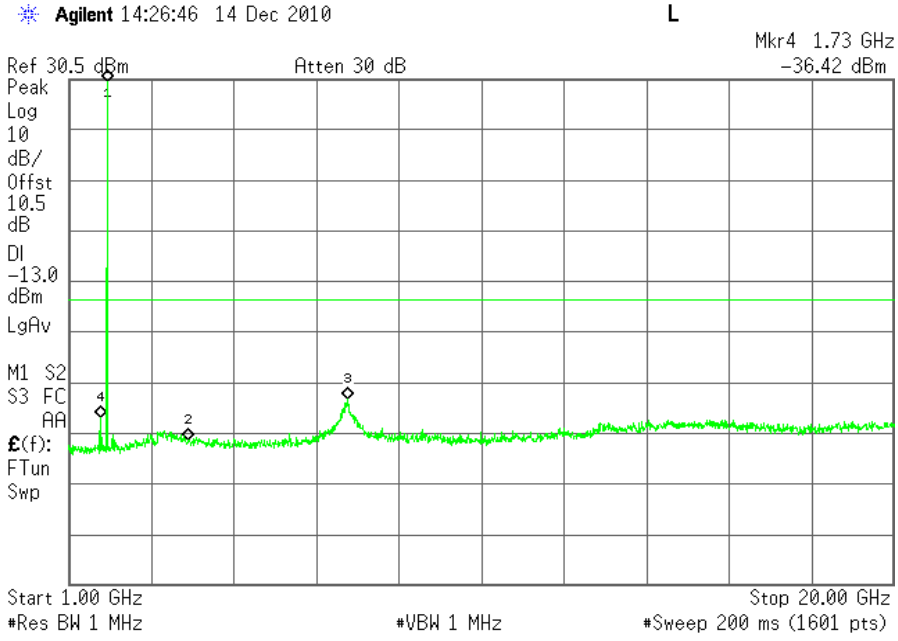
GMSK, Middle channel, 1880.0 MHz, TX signal +/- 20 MHz



The strong emission shown is the carrier signal.

Plot 6.4.24) Out of Band Emissions at Antenna Terminals

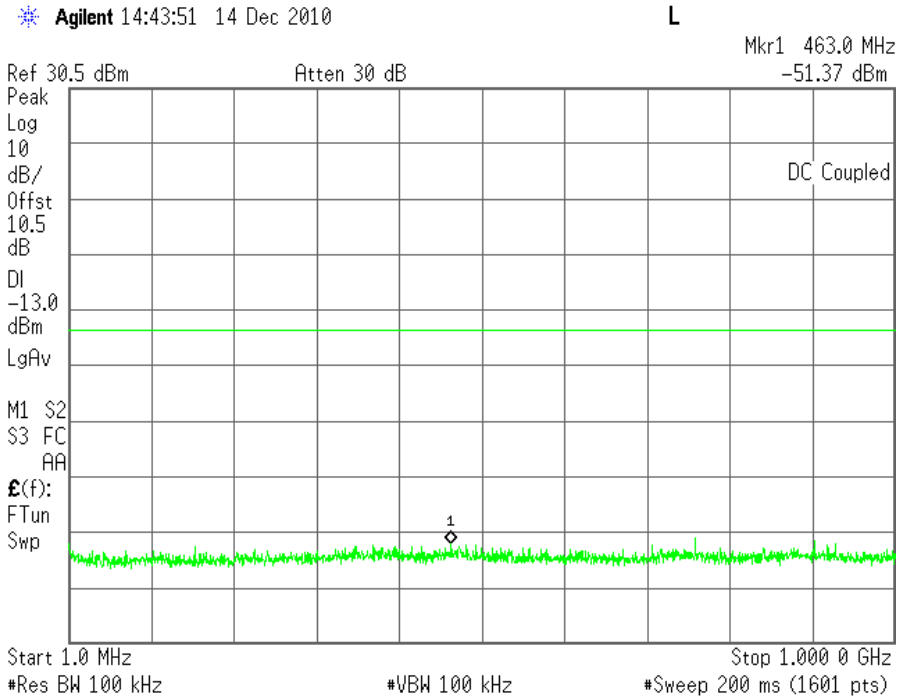
GMSK, Middle channel, 1880.0 MHz, 1 GHz to 20 GHz



The strong emission shown is the carrier signal.

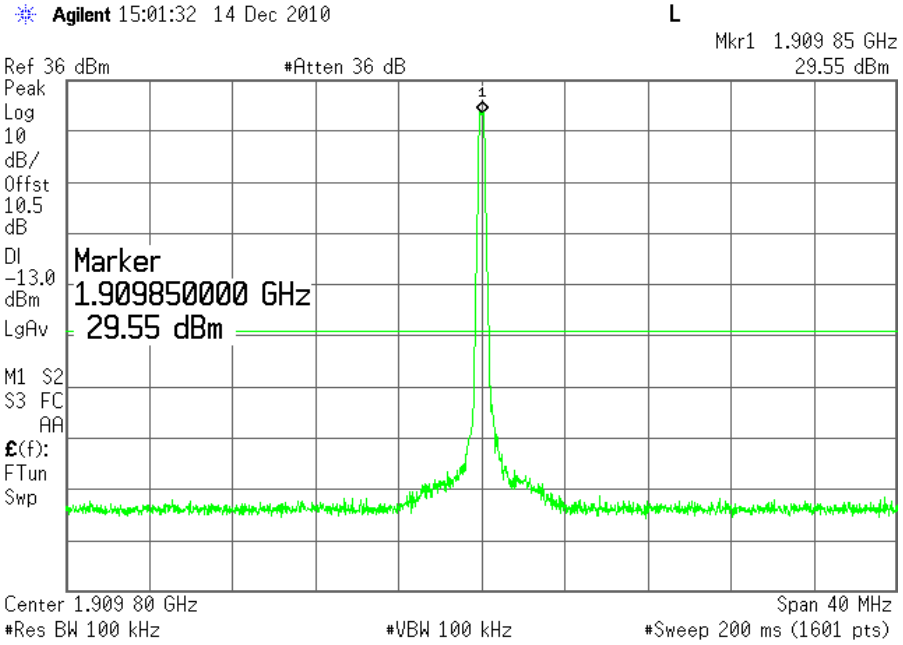
Plot 6.4.25) Out of Band Emissions at Antenna Terminals

GMSK, High channel, 1909.8 MHz, 1 MHz to 1 GHz



Plot 6.4.26) Out of Band Emissions at Antenna Terminals

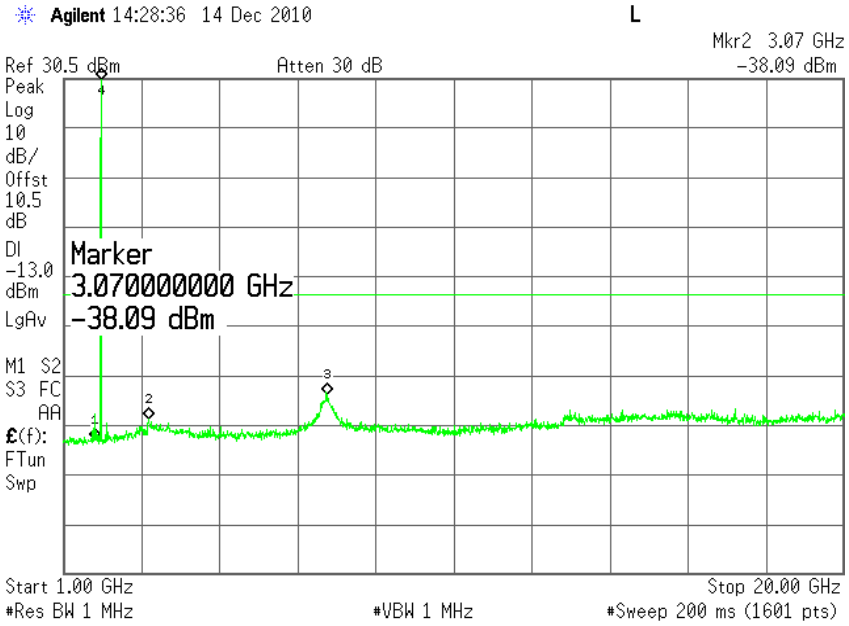
GMSK, High channel, 1909.8 MHz, TX signal +/- 20 MHz



The strong emission shown is the carrier signal.

Plot 6.4.27) Out of Band Emissions at Antenna Terminals

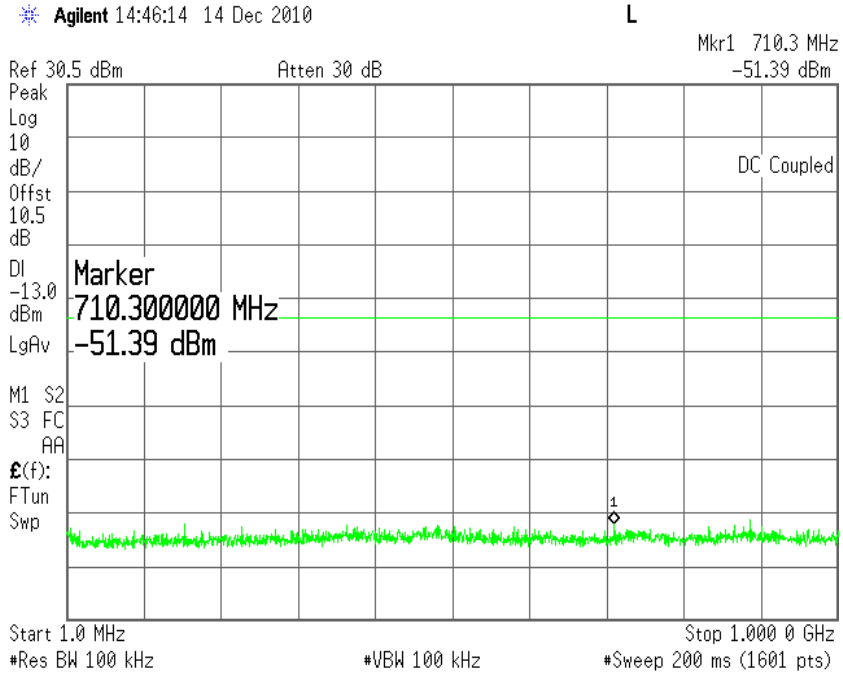
GMSK, High channel, 1909.8 MHz, 1 GHz to 20 GHz



The strong emission shown is the carrier signal.

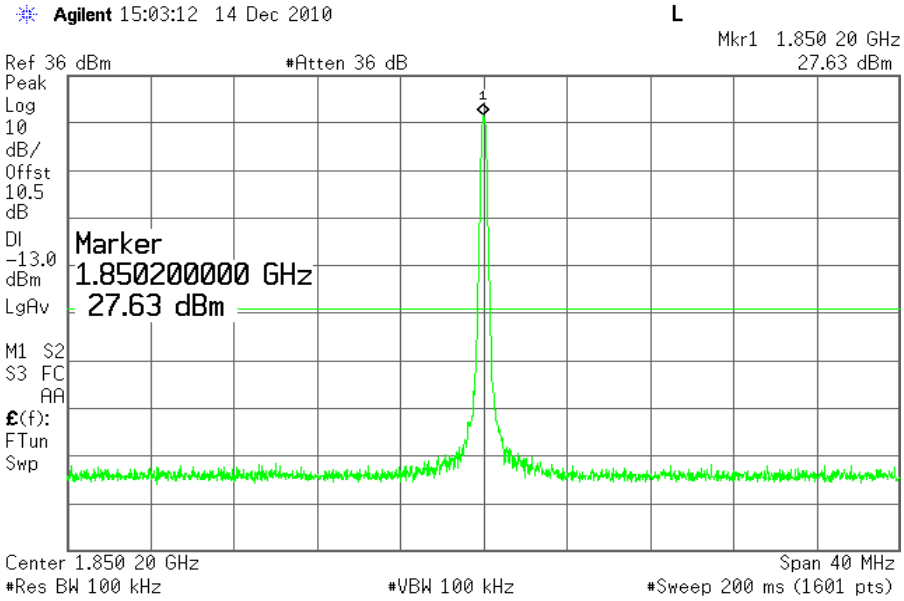
Plot 6.4.28) Out of Band Emissions at Antenna Terminals

8-PSK, Low channel, 1850.2 MHz, 1 MHz to 1 GHz



Plot 6.4.29) Out of Band Emissions at Antenna Terminals

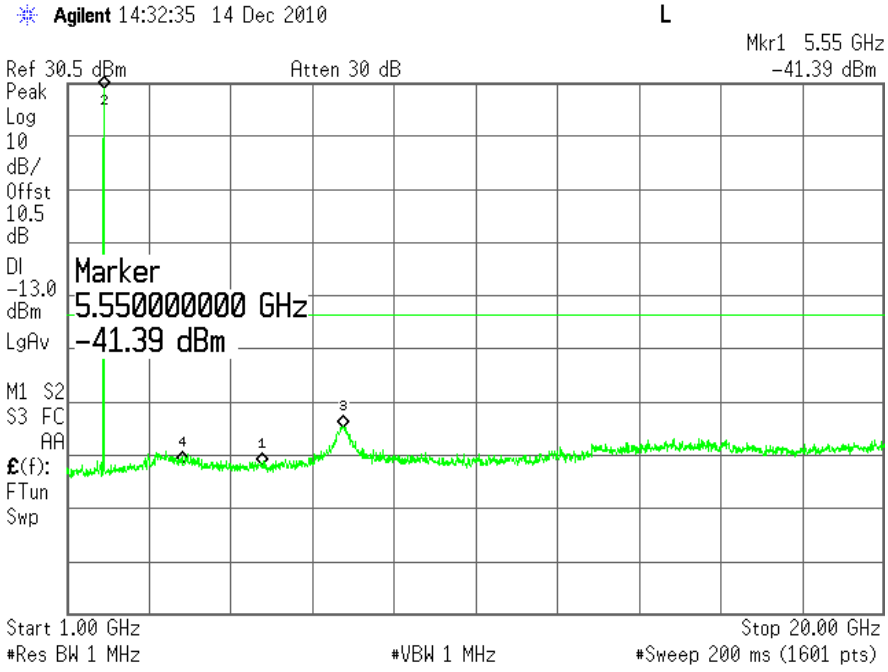
8-PSK, Low channel, 1850.2 MHz, TX signal +/- 20 MHz



The strong emission shown is the carrier signal.

Plot 6.4.30) Out of Band Emissions at Antenna Terminals

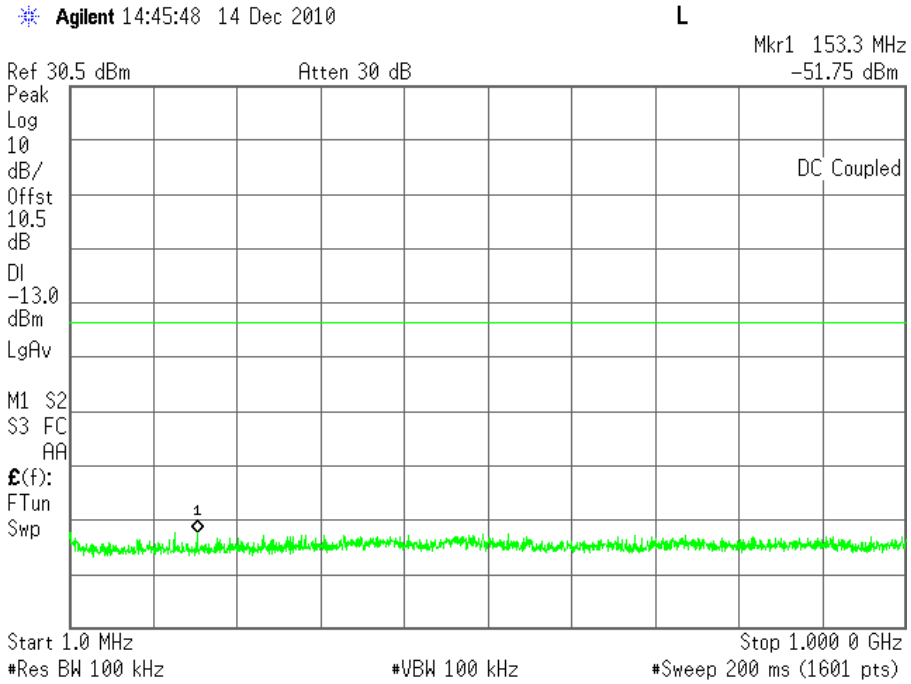
8-PSK, Low channel, 1850.2 MHz, 1 GHz to 20 GHz



The strong emission shown is the carrier signal.

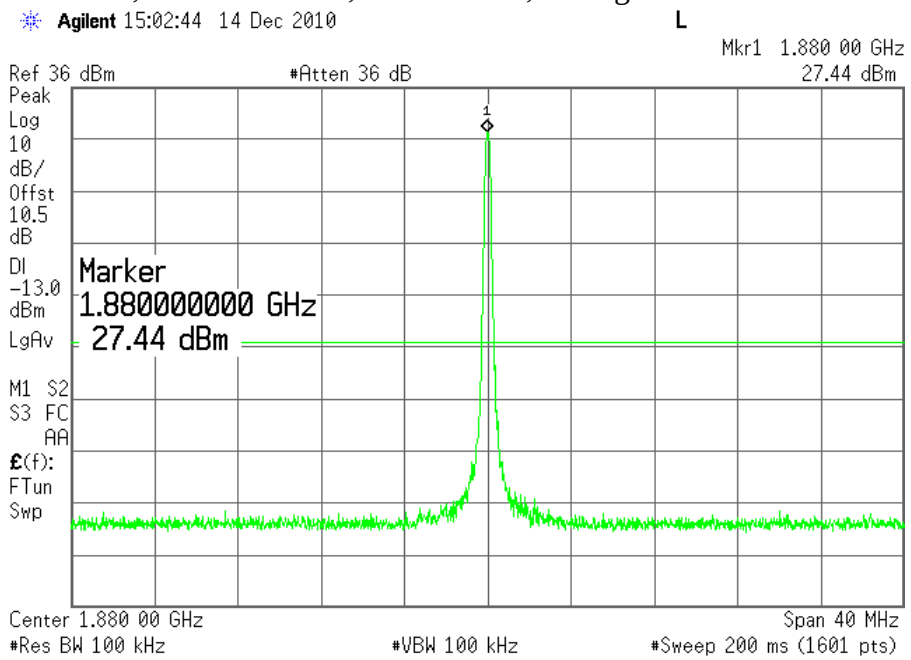
Plot 6.4.31) Out of Band Emissions at Antenna Terminals

8-PSK, Middle channel, 1880.0 MHz, 1 MHz to 1 GHz



Plot 6.4.32) Out of Band Emissions at Antenna Terminals

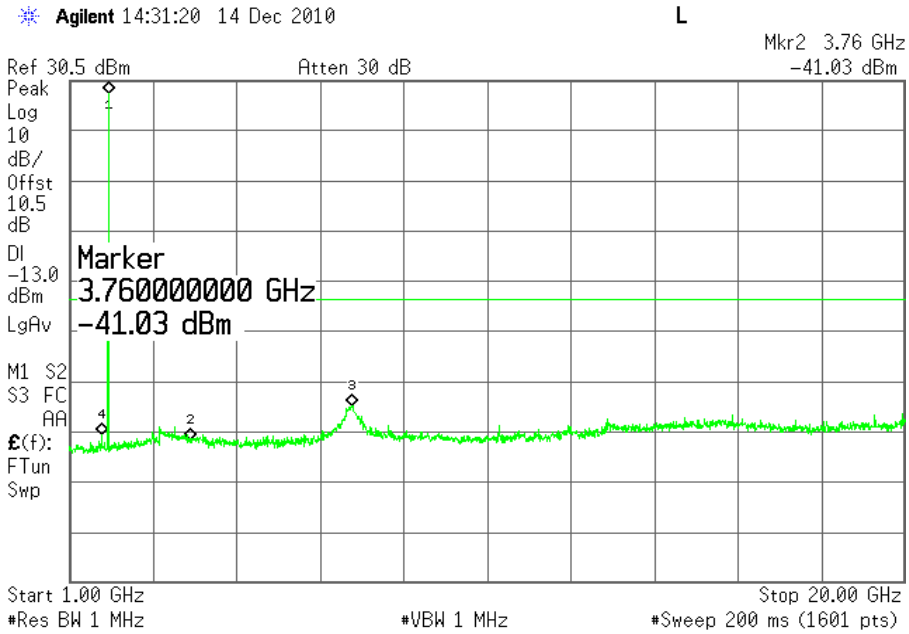
8-PSK, Middle channel, 1880.0 MHz, TX signal +/- 20 MHz



The strong emission shown is the carrier signal.

Plot 6.4.33) Out of Band Emissions at Antenna Terminals

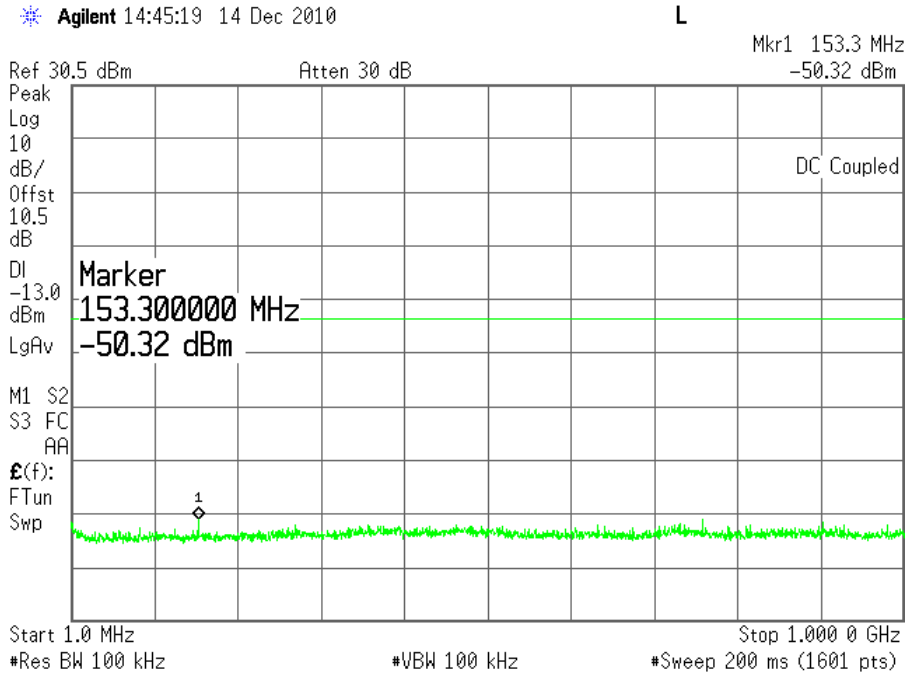
8-PSK, Middle channel, 1880.0 MHz, 1 GHz to 20 GHz



The strong emission shown is the carrier signal.

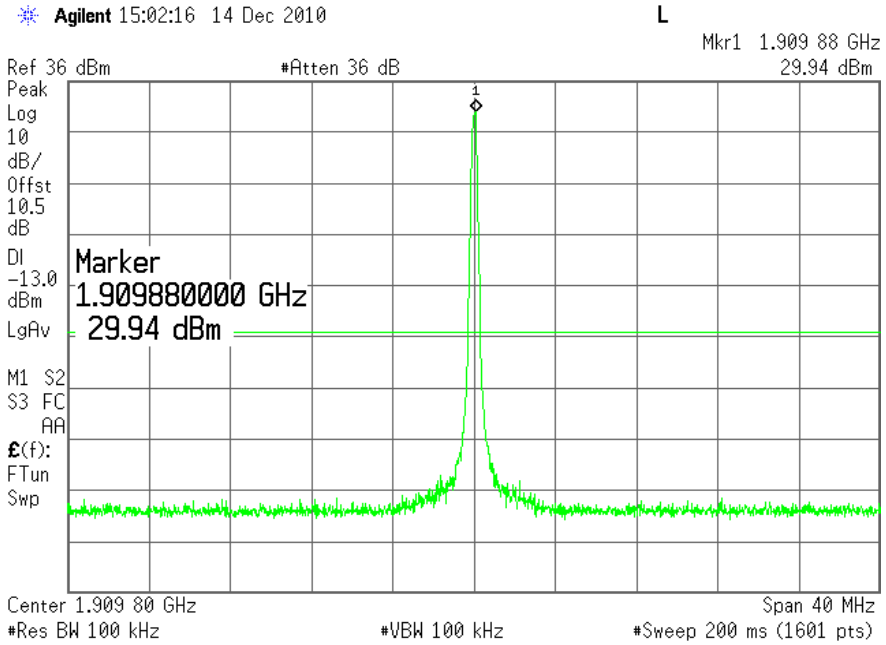
Plot 6.4.34) Out of Band Emissions at Antenna Terminals

8-PSK, High channel, 1909.8 MHz, 1 MHz to 1 GHz



Plot 6.4.35) Out of Band Emissions at Antenna Terminals

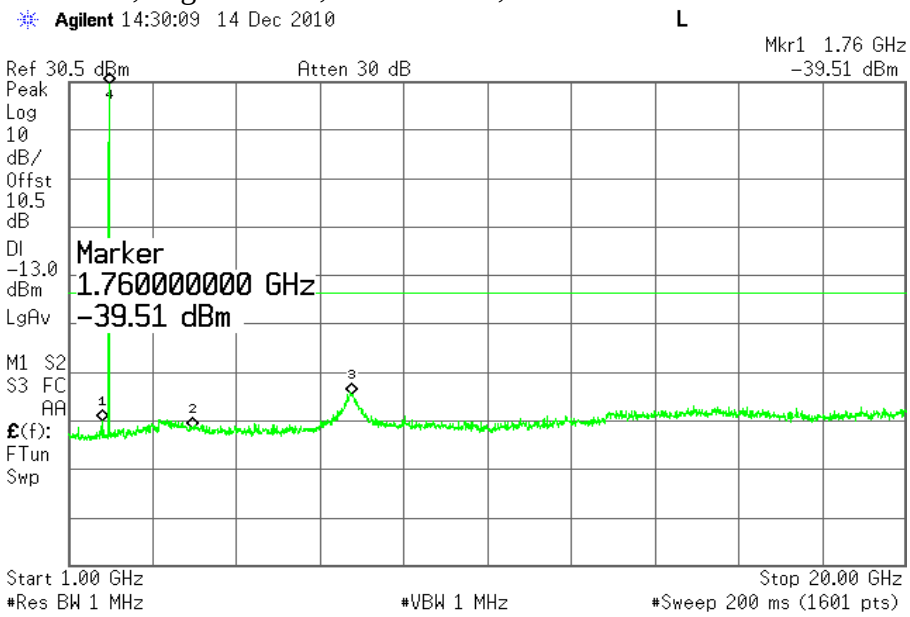
8-PSK, High channel, 1909.8 MHz, TX signal +/- 20 MHz



The strong emission shown is the carrier signal.

Plot 6.4.36) Out of Band Emissions at Antenna Terminals

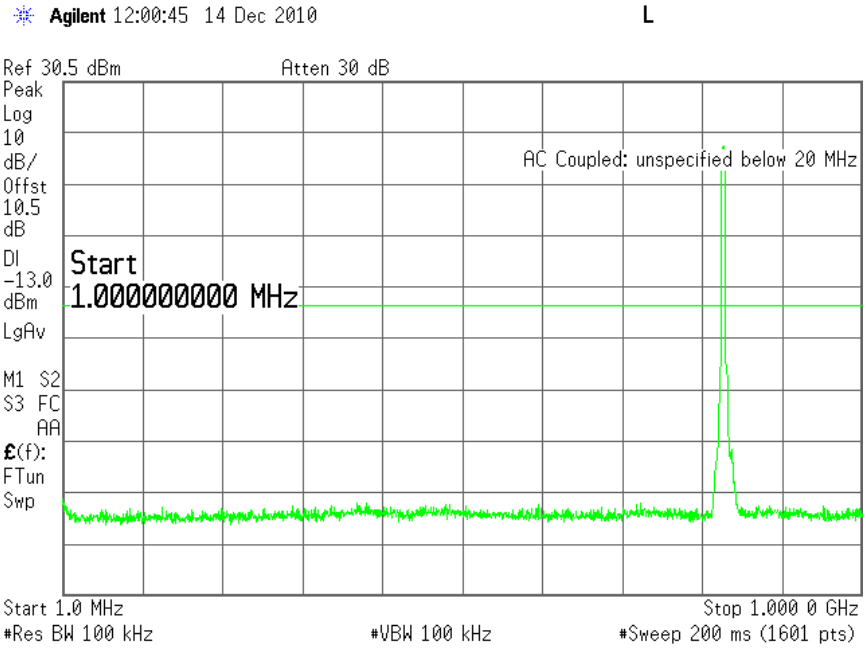
8-PSK, High channel, 1909.8 MHz, 1 GHz to 20 GHz



The strong emission shown is the carrier signal.

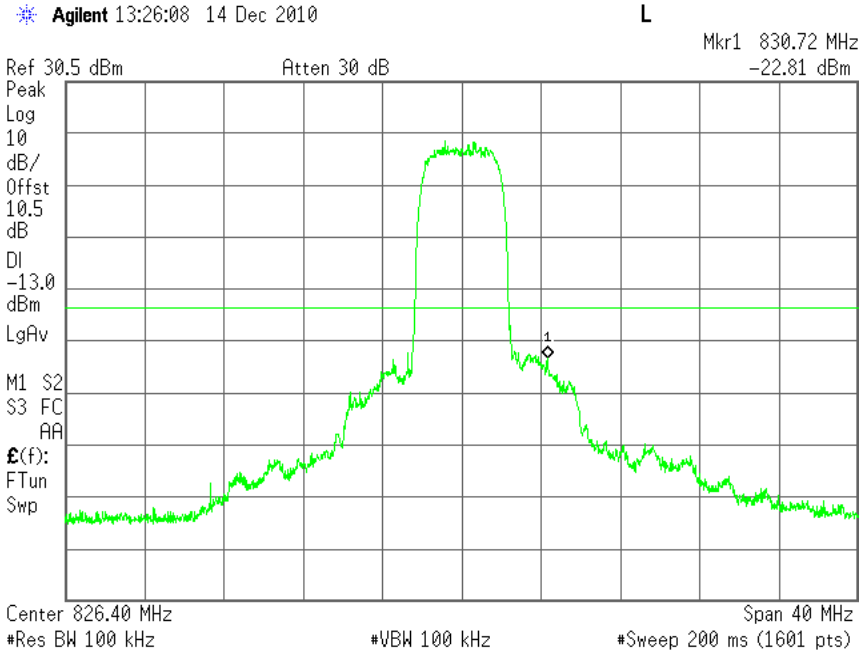
Plot 6.4.37) Out of Band Emissions at Antenna Terminals

WCDMA, Low channel, 826.4 MHz, 1 MHz to 1 GHz



Plot 6.4.38) Out of Band Emissions at Antenna Terminals

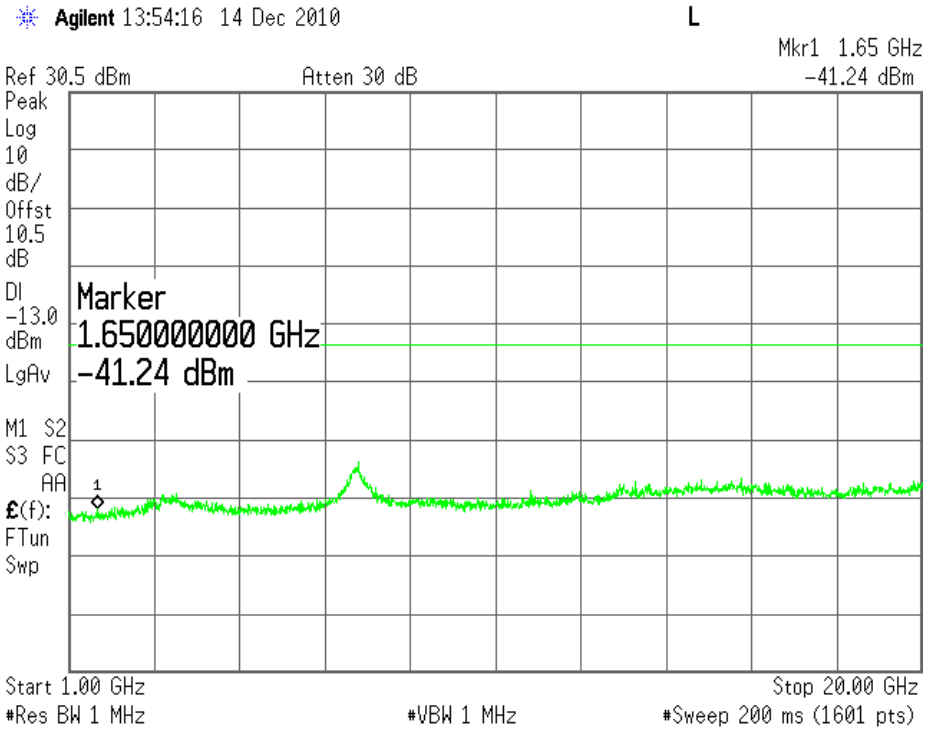
WCDMA, Low channel, 826.4 MHz, TX signal +/- 20 MHz



The strong emission shown in each case is the carrier signal.

Plot 6.4.39) Out of Band Emissions at Antenna Terminals

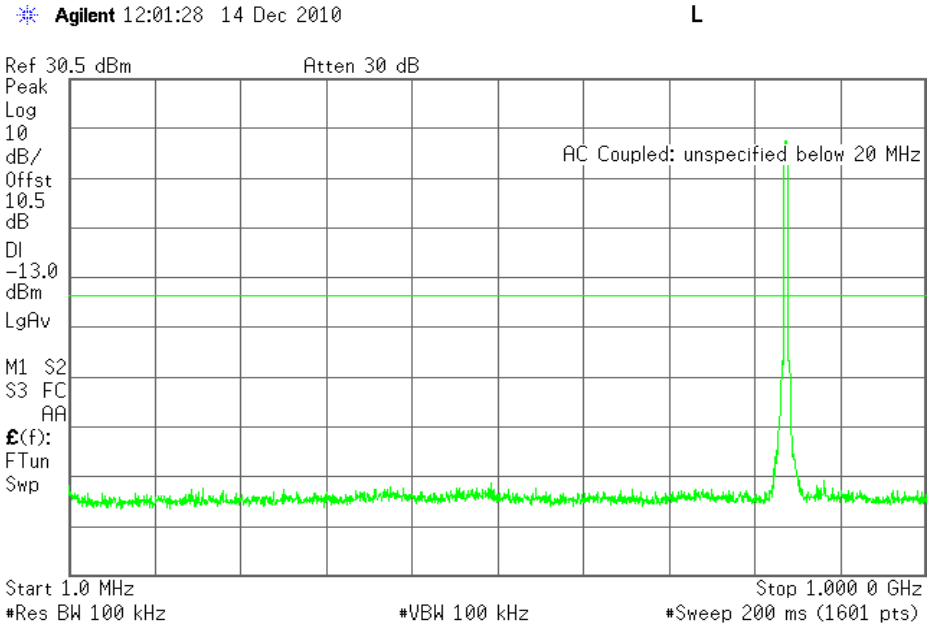
WCDMA, Low channel, 826.4 MHz, 1 GHz to 20 GHz



Cellular Harmonics for Ch. 4132 (826.4 MHz)	Level (dBm)
Second	**<-40 dBm**
Third	**<-40 dBm**
Others	**----**

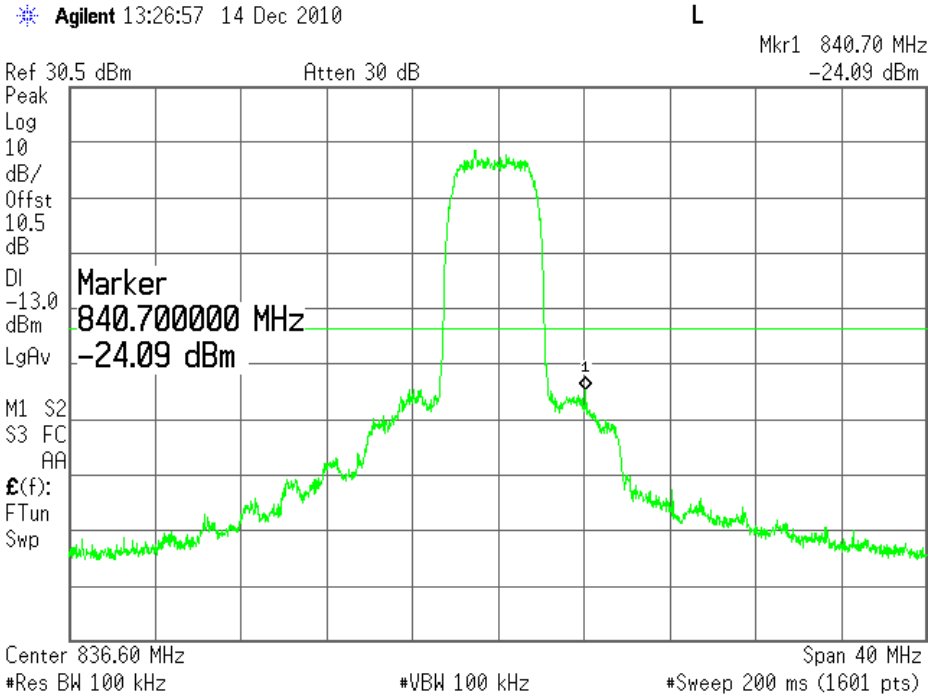
Plot 6.4.40) Out of Band Emissions at Antenna Terminals

WCDMA, Middle channel, 836.4 MHz, 1 MHz to 1 GHz



Plot 6.4.41) Out of Band Emissions at Antenna Terminals

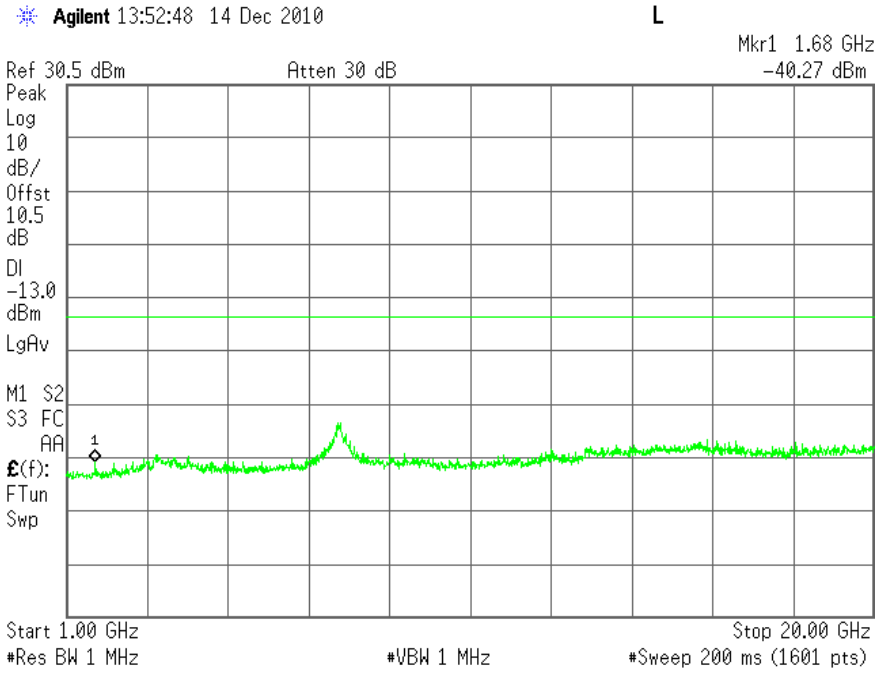
WCDMA, Middle channel, 836.4 MHz, TX signal +/- 20 MHz



The strong emission shown in each case is the carrier signal.

Plot 6.4.42) Out of Band Emissions at Antenna Terminals

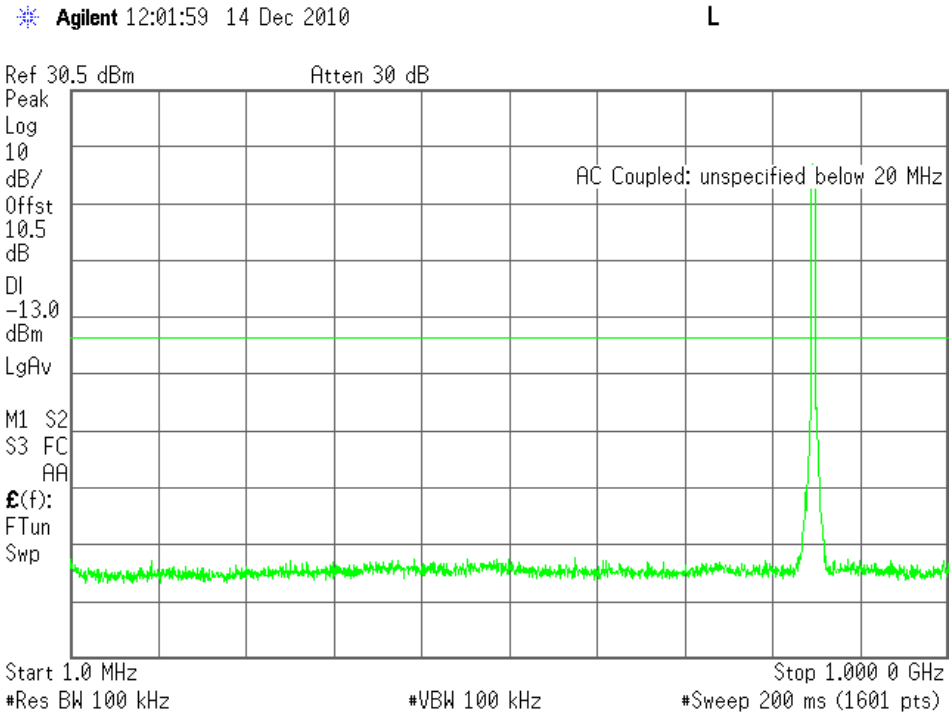
WCDMA, Middle channel, 836.4 MHz, 1 GHz to 20 GHz



Cellular Harmonics for Ch. 4182 (836.4 MHz)	Level (dBm)
Second	**-40.27 dBm**
Third	**----**
Others	**----**

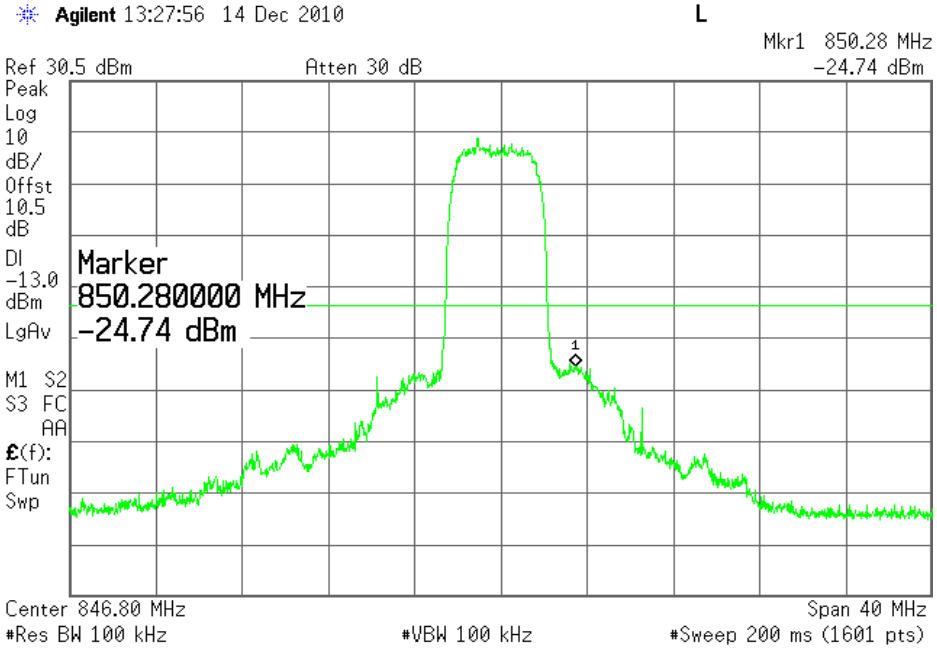
Plot 6.4.43) Out of Band Emissions at Antenna Terminals

WCDMA, High Channel, 846.6 MHz, 1 MHz to 1 GHz



Plot 6.4.44) Out of Band Emissions at Antenna Terminals

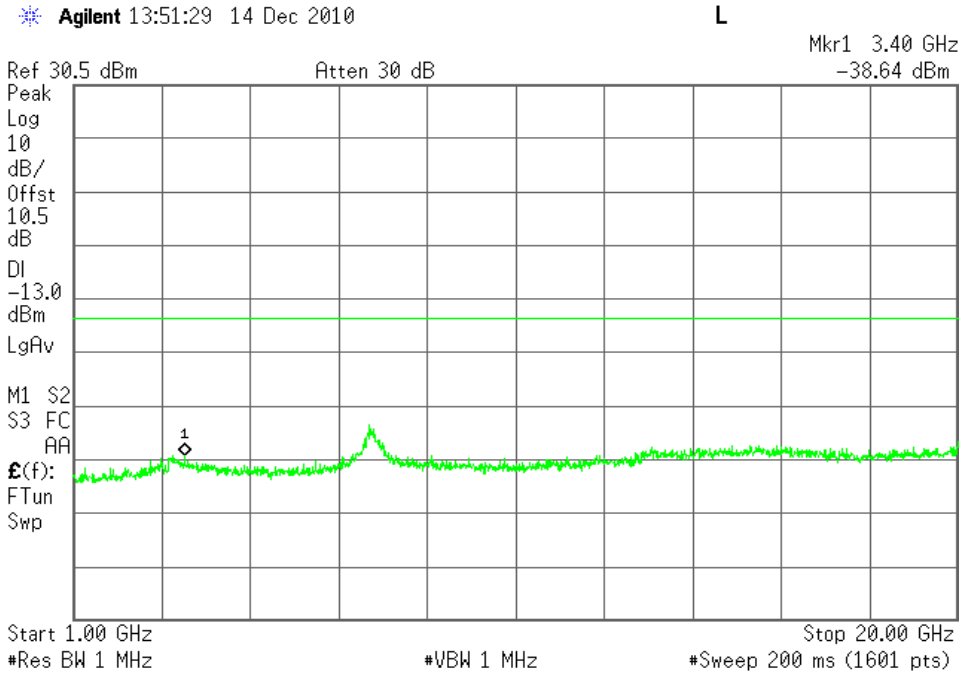
WCDMA, High Channel, 846.6 MHz, TX signal +/- 20 MHz



The strong emission shown in each case is the carrier signal.

Plot 6.4.45) Out of Band Emissions at Antenna Terminals

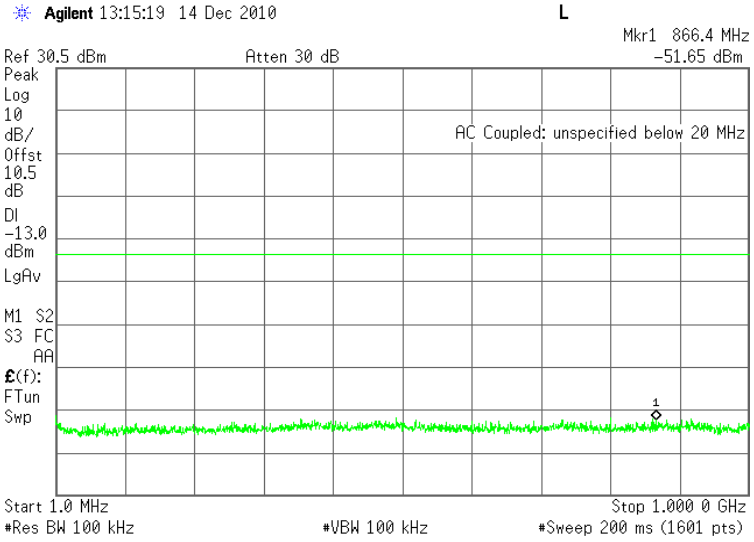
WCDMA, High Channel, 846.6 MHz, 1 GHz to 20 GHz



Cellular Harmonics for Ch. 4233 (846.6 MHz)	Level (dBm)
Second	**<-40 dBm**
Third	**<-40 dBm**
Others	**----**

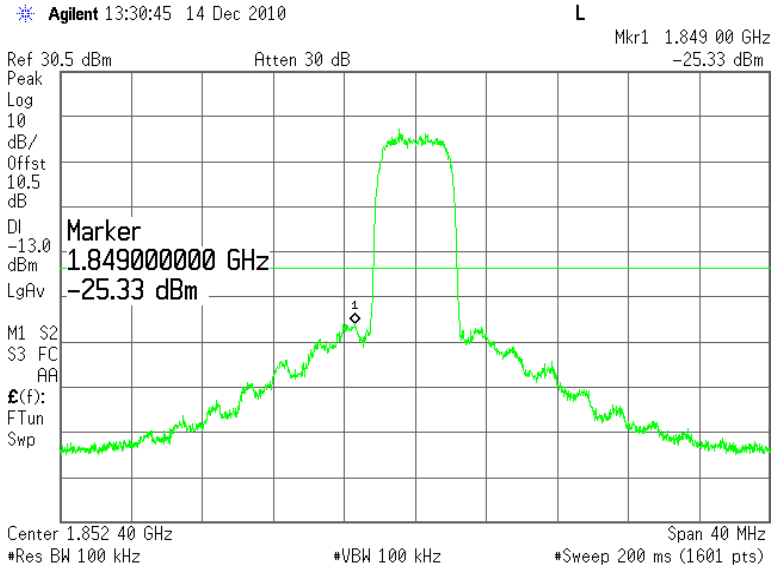
Plot 6.4.46) Out of Band Emissions at Antenna Terminals

WCDMA, Low channel, 1852.4 MHz, 1 MHz to 1 GHz



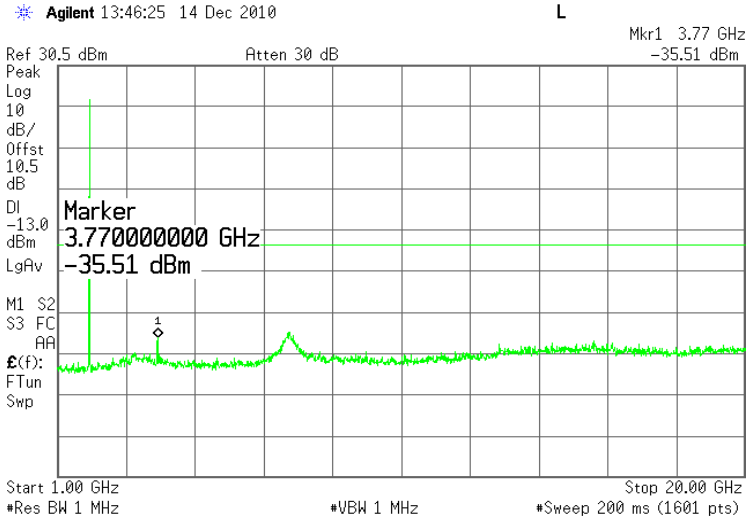
Plot 6.4.47) Out of Band Emissions at Antenna Terminals

WCDMA, Low channel, 1852.4 MHz, TX signal +/- 20 MHz



Plot 6.4.48) Out of Band Emissions at Antenna Terminals

WCDMA, Low channel, 1852.4 MHz, 1 GHz to 20 GHz

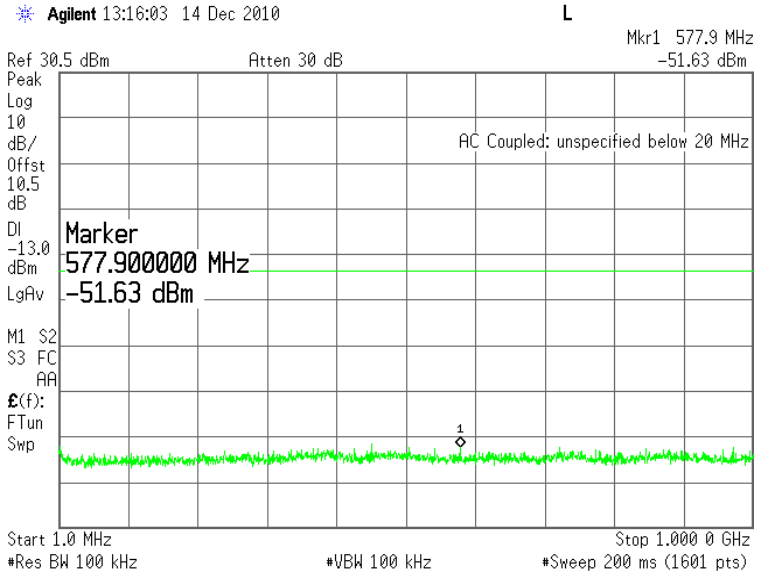


The strong emission shown is the carrier signal.

PCS Harmonics for Ch. 9262 (1852.4 MHz)	Level (dBm)
Second	- 35.51 dBm
Third	----
Others	----

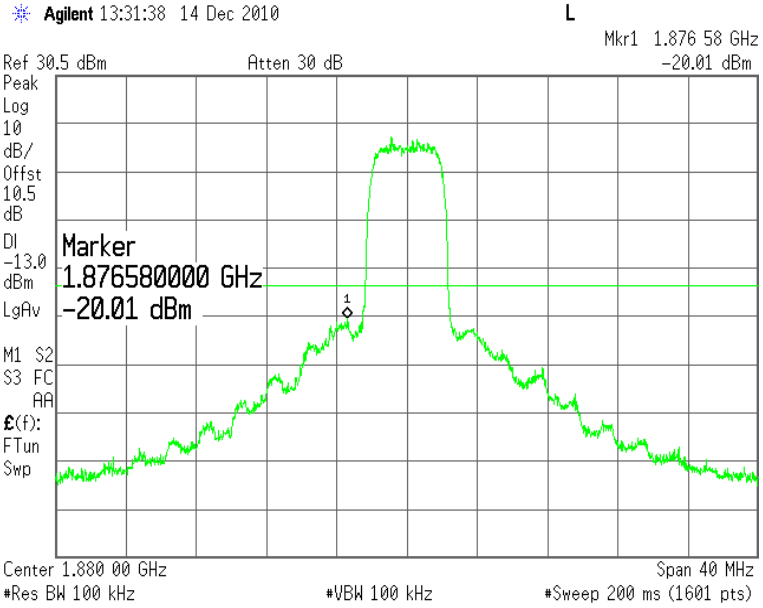
Plot 6.4.49) Out of Band Emissions at Antenna Terminals

WCDMA, Middle channel, 1880 MHz, 1 MHz to 1 GHz



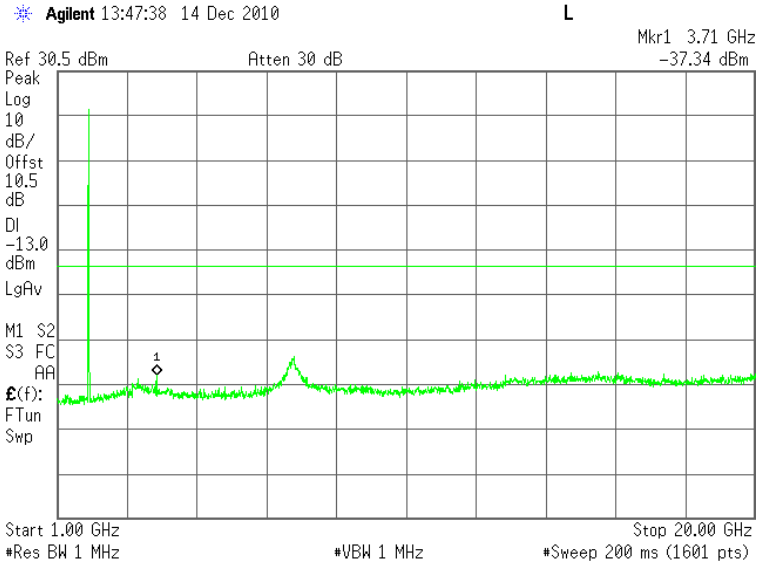
Plot 6.4.50) Out of Band Emissions at Antenna Terminals

WCDMA, Middle channel, 1880 MHz, TX signal +/- 20 MHz



Plot 6.4.51) Out of Band Emissions at Antenna Terminals

WCDMA, Middle channel, 1880 MHz, 1 GHz to 20 GHz

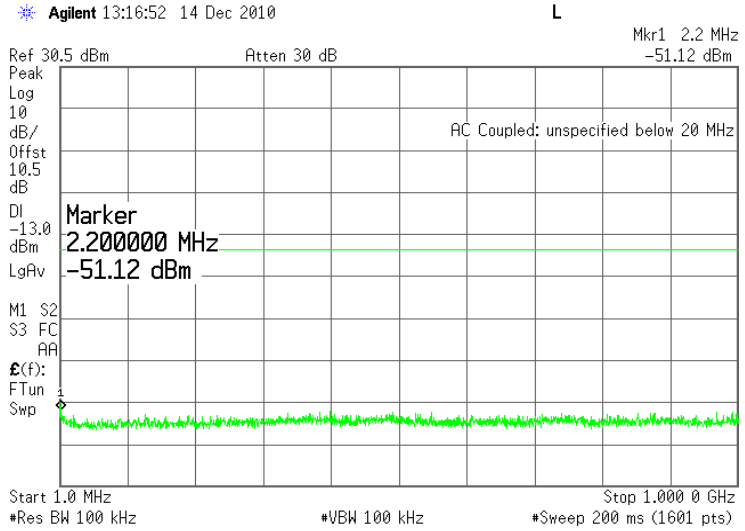


The strong emission shown is the carrier signal.

PCS Harmonics for Ch. 9400 (1880.0 MHz)	Level (dBm)
Second	-37.43 dBm
Third	----
Others	----

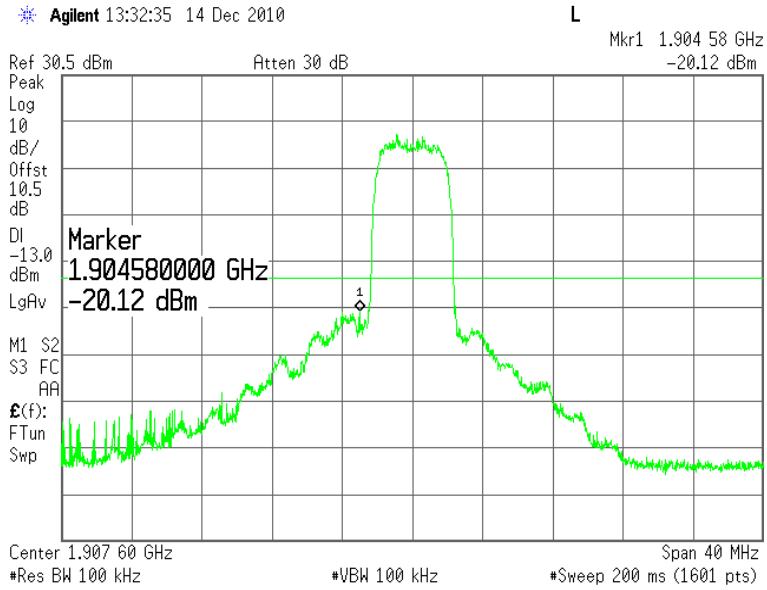
Plot 6.4.52) Out of Band Emissions at Antenna Terminals

WCDMA, High channel, 1907.6 MHz, 1 MHz to 1 GHz



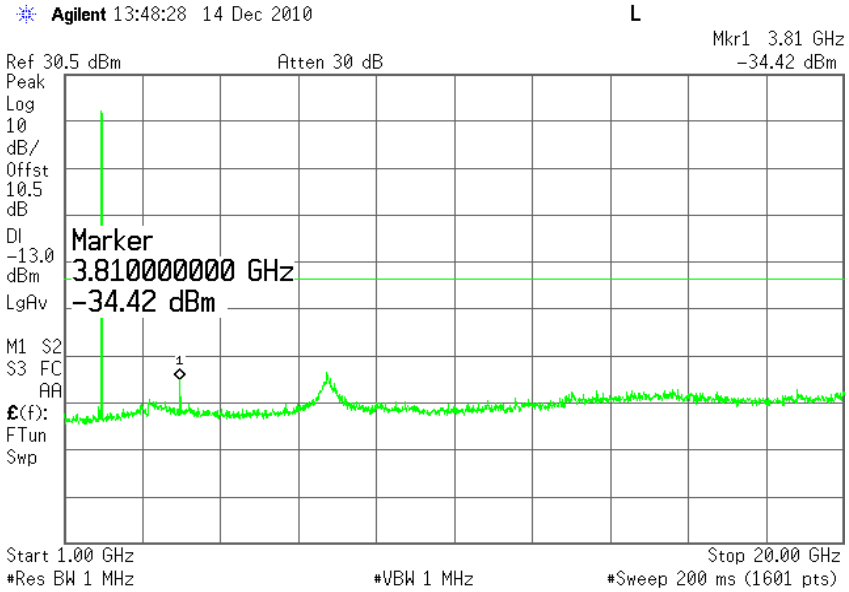
Plot 6.4.53) Out of Band Emissions at Antenna Terminals

WCDMA, High channel, 1907.6 MHz, TX signal +/- 20 MHz



Plot 6.4.54) Out of Band Emissions at Antenna Terminals

WCDMA, High channel, 1907.6 MHz, 1 GHz to 20 GHz

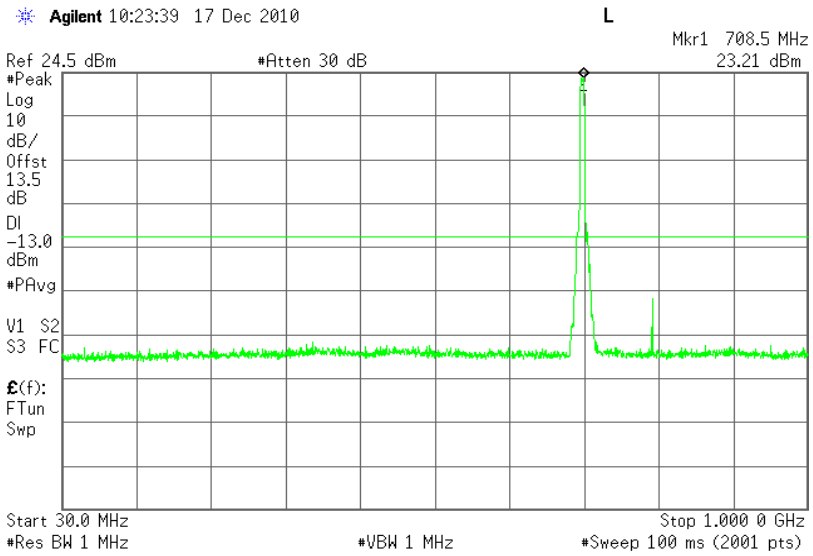


The strong emission shown is the carrier signal.

PCS Harmonics for Ch. 9538 (1907.6 MHz)	Level (dBm)
Second	-34.42 dBm
Third	----
Others	----

Plot 6.4.55) Out of Band Emissions at Antenna Terminals

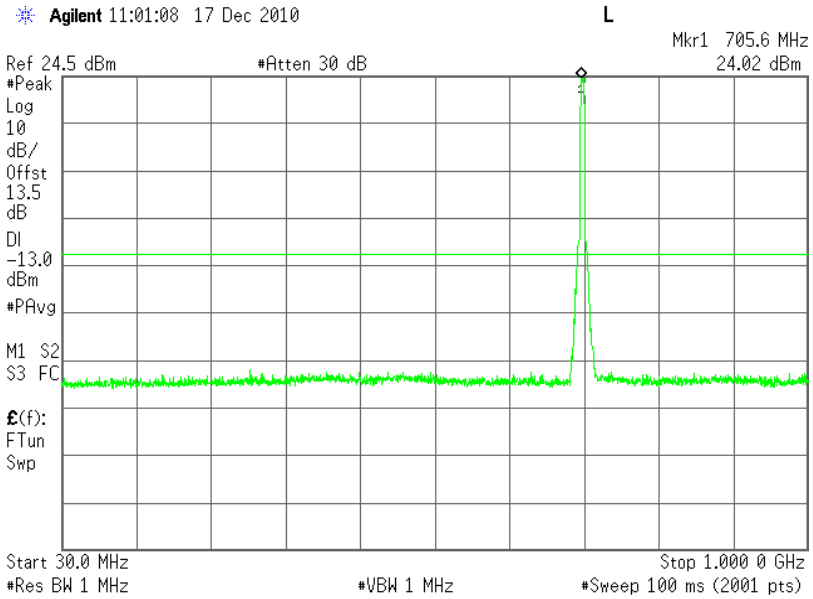
LTE, Low channel, 706.6 MHz, 5MHz BW, 25RB, QPSK, 30MHz to 1 GHz



The strong emission shown in each case is the carrier signal.

Plot 6.4.56) Out of Band Emissions at Antenna Terminals

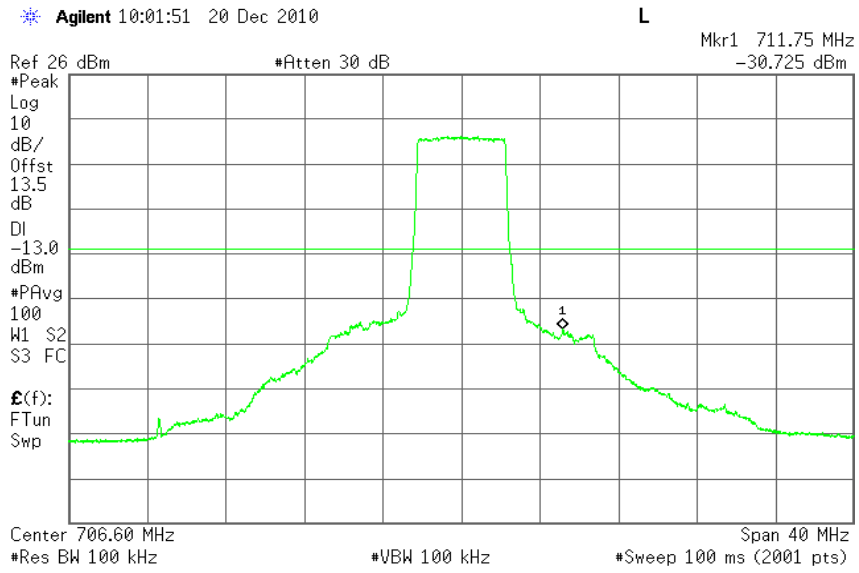
LTE, Low channel, 706.6 MHz, 5MHz BW, 25RB, 16-QAM, 30MHz to 1 GHz



The strong emission shown in each case is the carrier signal.

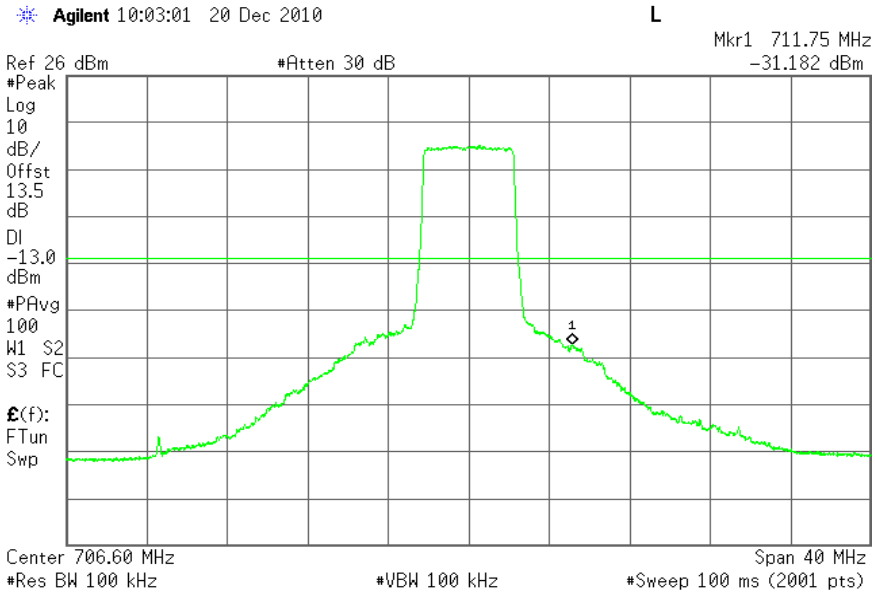
Plot 6.4.57) Out of Band Emissions at Antenna Terminals

LTE, Low channel, 706.6 MHz, 5MHz BW, 25RB, QPSK, TX carrier +/- 40MHz



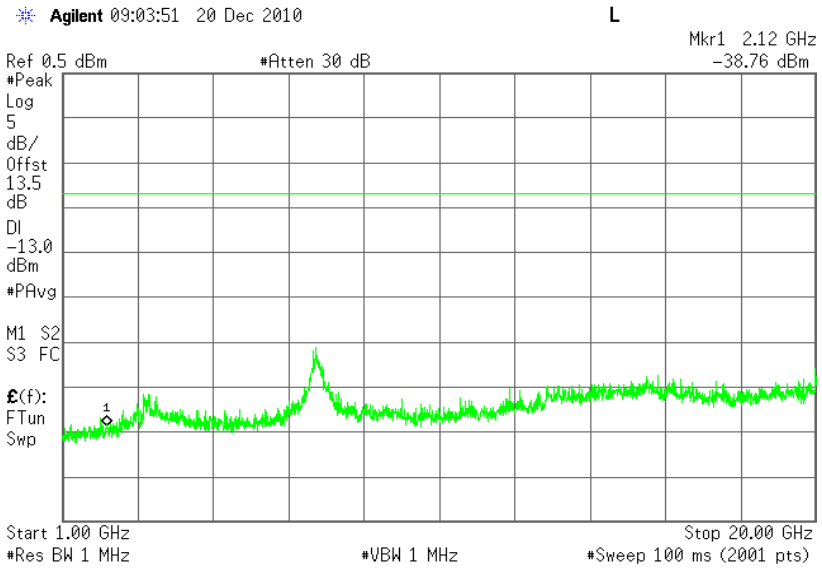
Plot 6.4.58) Out of Band Emissions at Antenna Terminals

LTE, Low channel, 706.6 MHz, 5MHz BW, 25RB, 16-QAM, TX carrier +/- 40MHz



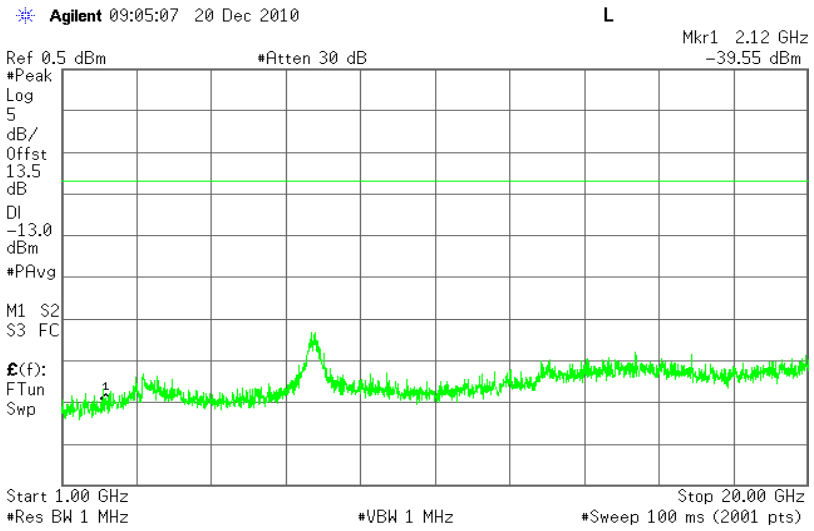
Plot 6.4.59) Out of Band Emissions at Antenna Terminals

LTE, Low channel, 706.6 MHz, 5MHz BW, 25RB, QPSK, 1GHz to 20 GHz



Plot 6.4.60) Out of Band Emissions at Antenna Terminals

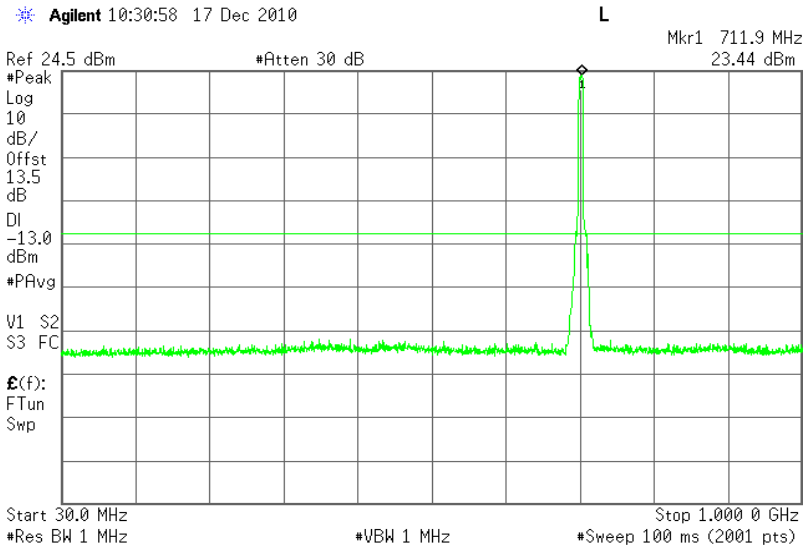
LTE, Low channel, 706.6 MHz, 5MHz BW, 25RB, 16-QAM, 1GHz to 20 GHz



LTE B17 Harmonics for Ch. 23756 (706.6 MHz)	Level (dBm)
Second Third Others	<-35dBm dBm <-35dBm dBm ----

Plot 6.4.61) Out of Band Emissions at Antenna Terminals

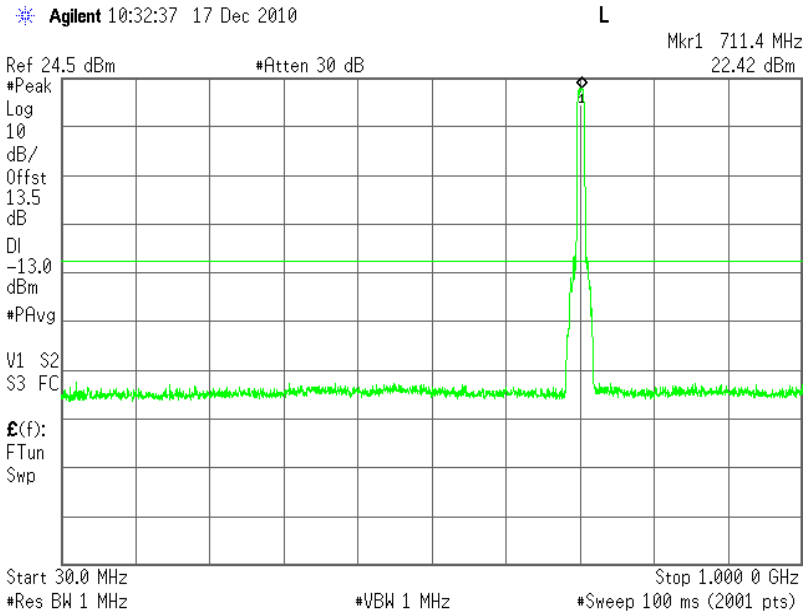
LTE, Mid channel, 710 MHz, 5MHz BW, 25RB, QPSK, 30MHz to 1 GHz



The strong emission shown is the carrier signal.

Plot 6.4.62) Out of Band Emissions at Antenna Terminals

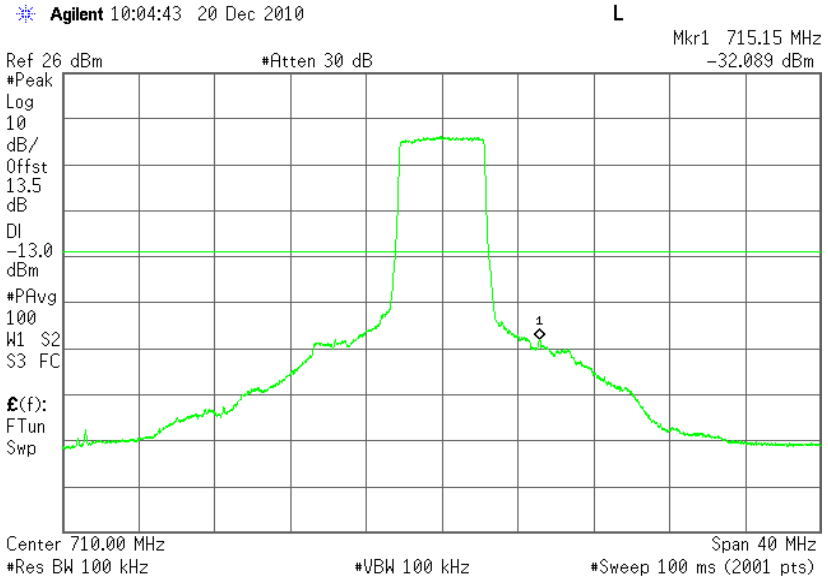
LTE, Mid channel, 710 MHz, 10MHz BW, 50RB, 16-QAM, 30MHz to 1 GHz



The strong emission shown is the carrier signal.

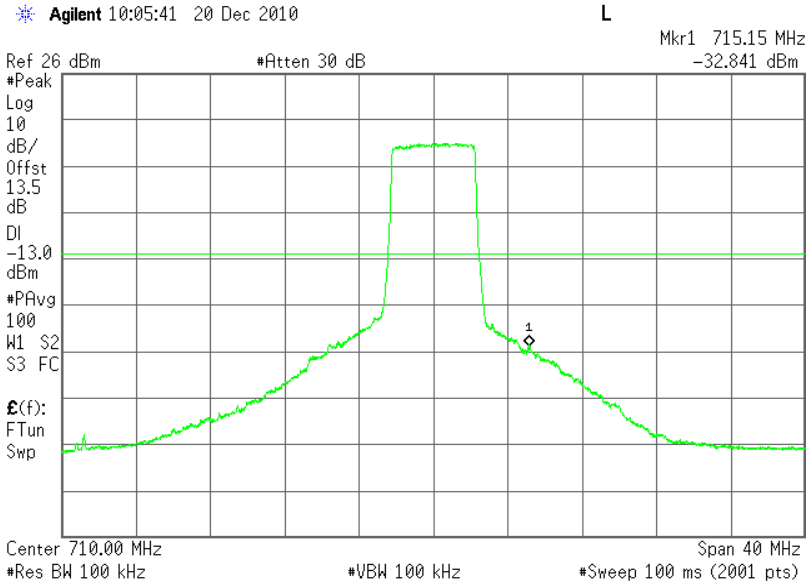
Plot 6.4.63) Out of Band Emissions at Antenna Terminals

LTE, Mid channel, 710 MHz, 5MHz BW, 25RB, QPSK, TX carrier +/- 40MHz



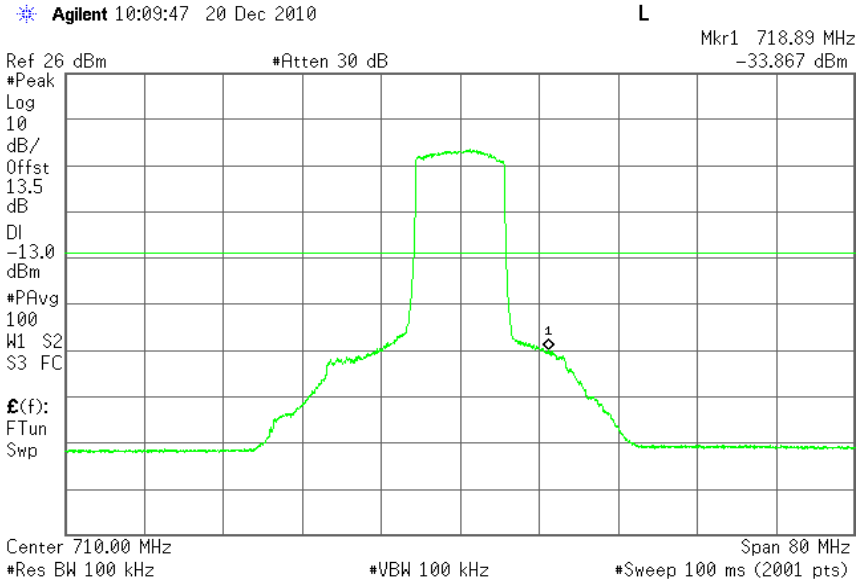
Plot 6.4.64) Out of Band Emissions at Antenna Terminals

LTE, Mid channel, 710 MHz, 5MHz BW, 25RB, 16-QAM, TX carrier +/- 40MHz



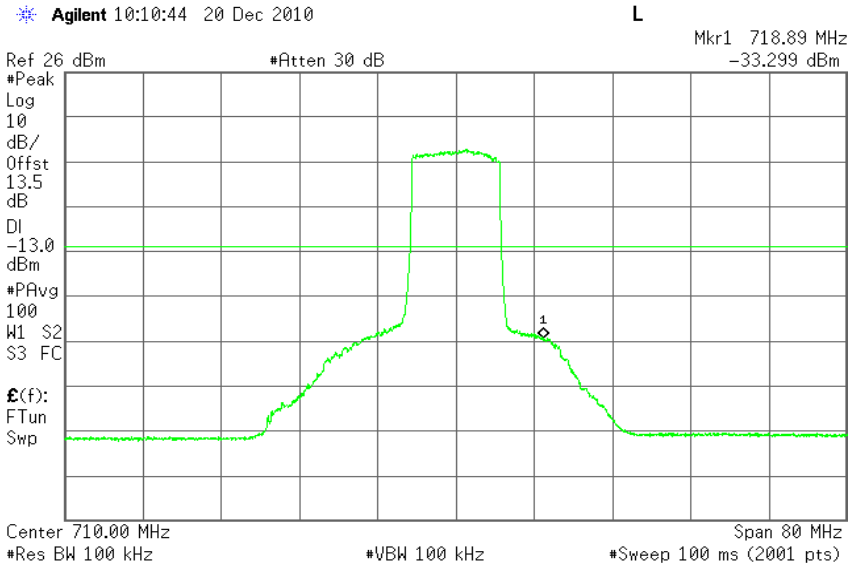
Plot 6.4.65) Out of Band Emissions at Antenna Terminals

LTE, Mid channel, 710 MHz, 10MHz BW, 50RB, QPSK, TX carrier +/- 80MHz



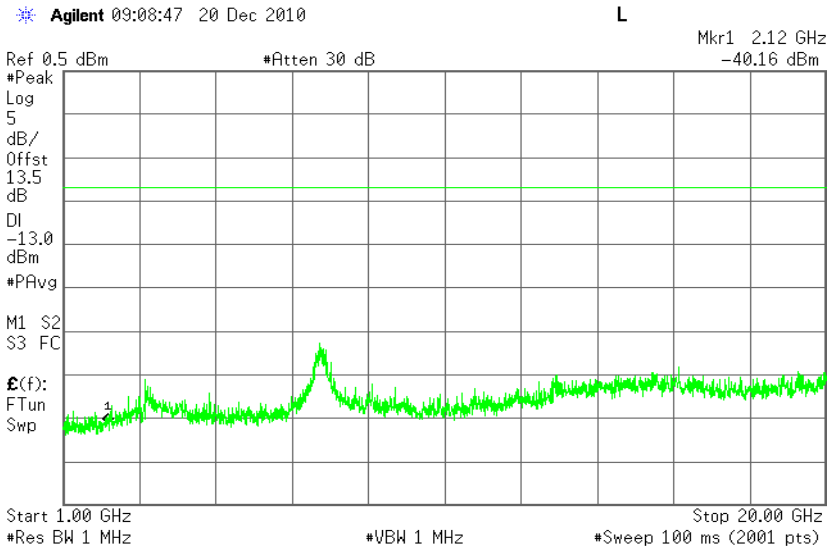
Plot 6.4.66) Out of Band Emissions at Antenna Terminals

LTE, Mid channel, 710 MHz, 10MHz BW, 50RB, 16-QAM, TX carrier +/- 80MHz



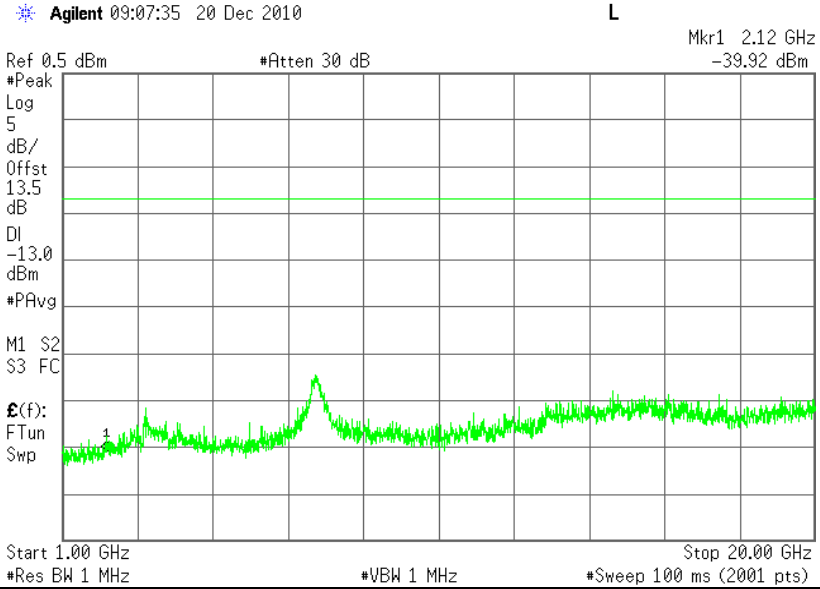
Plot 6.4.67) Out of Band Emissions at Antenna Terminals

LTE, Mid channel, 710 MHz, 5MHz BW, 25RB, QPSK, 1GHz to 20 GHz



Plot 6.4.68) Out of Band Emissions at Antenna Terminals

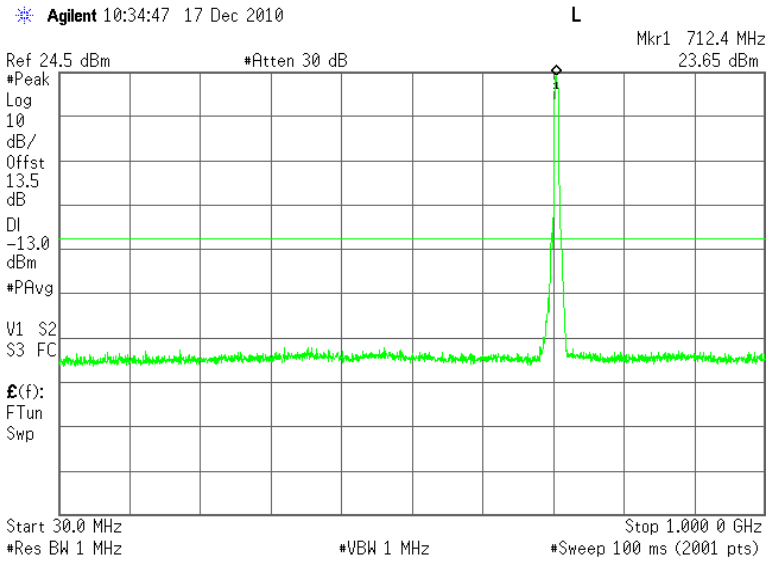
LTE, Mid channel, 710 MHz, 10MHz BW, 50RB, 16-QAM, 1GHz to 20 GHz



LTE B17 Harmonics for Ch. 23790 (710 MHz)	Level (dBm)
Second	<-35dBm dBm
Third	<-35dBm dBm
Others	----

Plot 6.4.69) Out of Band Emissions at Antenna Terminals

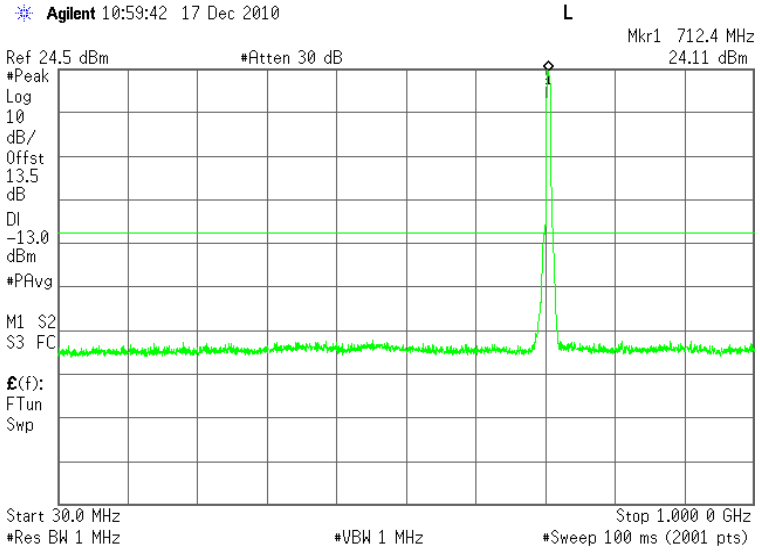
LTE, High channel, 713.4 MHz, 5MHz BW, 25RB, QPSK, 30MHz to 1 GHz



The strong emission shown is the carrier signal.

Plot 6.4.70) Out of Band Emissions at Antenna Terminals

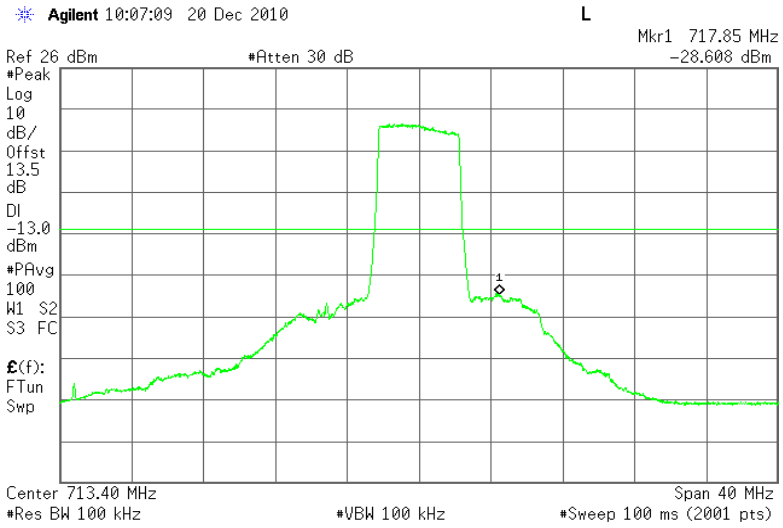
LTE, High channel, 713.4 MHz, 10MHz BW, 50RB, 16-QAM, 30MHz to 1 GHz



The strong emission shown is the carrier signal.

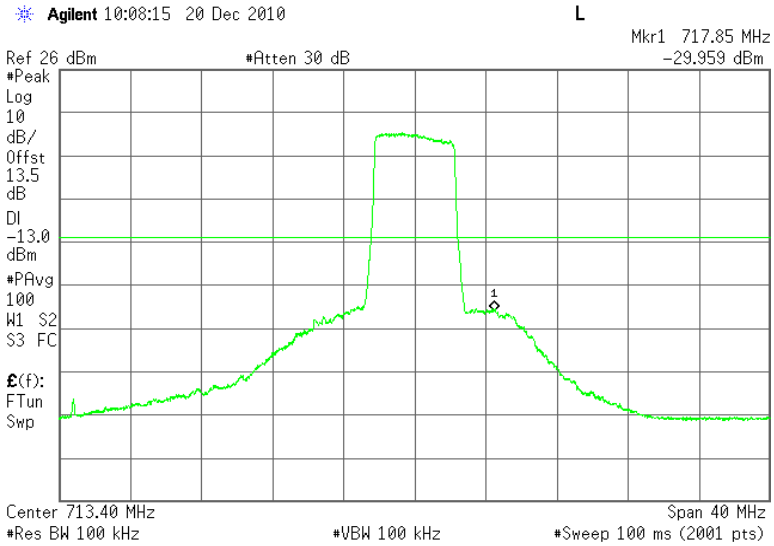
Plot 6.4.71) Out of Band Emissions at Antenna Terminals

LTE, High channel, 713.4 MHz, 5MHz BW, 25RB, QPSK, TX carrier +/- 40MHz



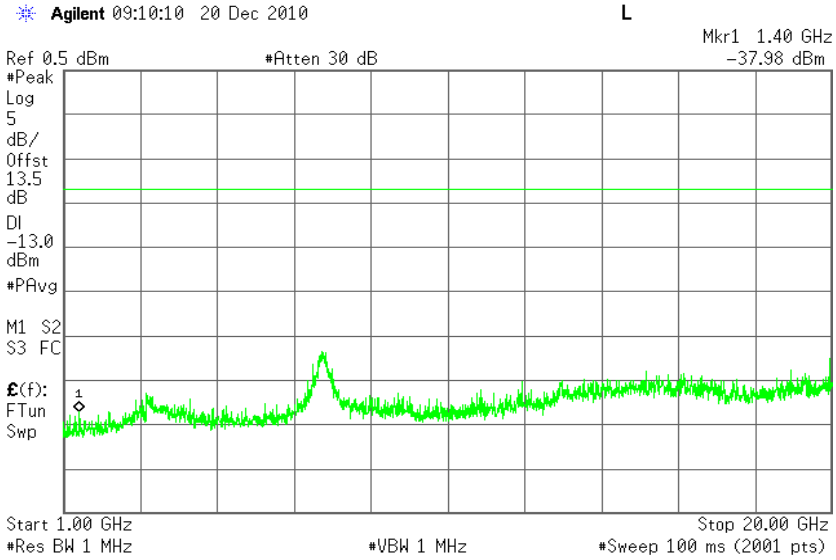
Plot 6.4.72) Out of Band Emissions at Antenna Terminals

LTE, High channel, 713.4 MHz, 5MHz BW, 25RB, 16-QAM, TX carrier +/- 40MHz



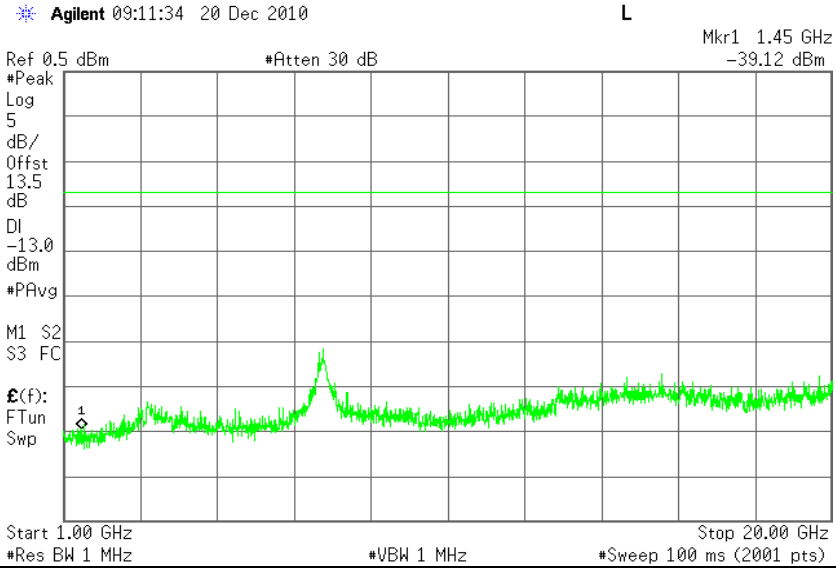
Plot 6.4.73) Out of Band Emissions at Antenna Terminals

LTE, High channel, 713.4 MHz, 5MHz BW, 25RB, QPSK, 1GHz to 20 GHz



Plot 6.4.74) Out of Band Emissions at Antenna Terminals

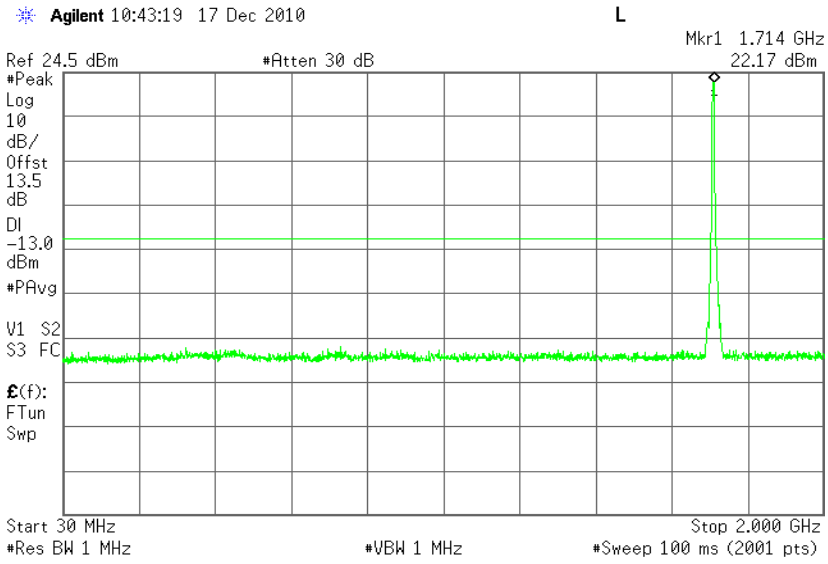
LTE, High channel, 713.4 MHz, 5MHz BW, 25RB, 16-QAM, 1GHz to 20 GHz



LTE B17 Harmonics for Ch. 23824 (713.4 MHz)	Level (dBm)
Second	<-35dBm dBm
Third	<-35dBm dBm
Others	----

Plot 6.4.75) Out of Band Emissions at Antenna Terminals

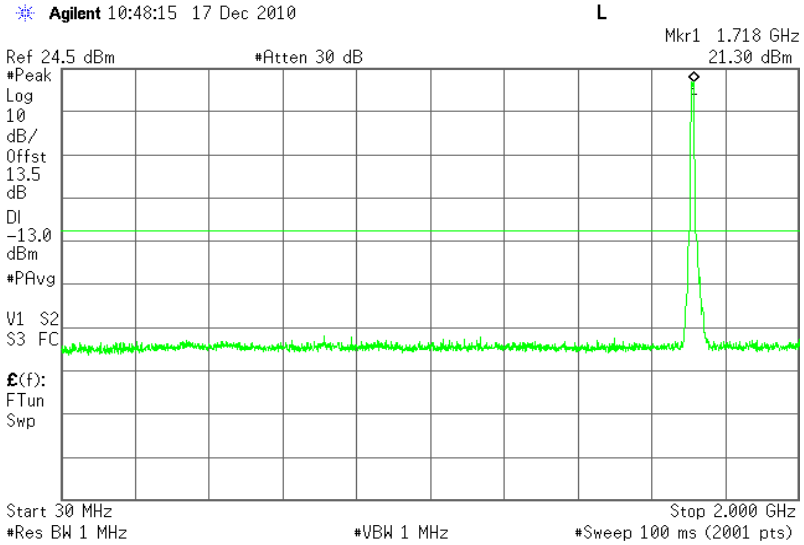
LTE B4, Low channel, 1712.6 MHz, 5MHz BW, 25RB, QPSK, 30MHz to 2 GHz



The strong emission shown is the carrier signal.

Plot 6.4.76) Out of Band Emissions at Antenna Terminals

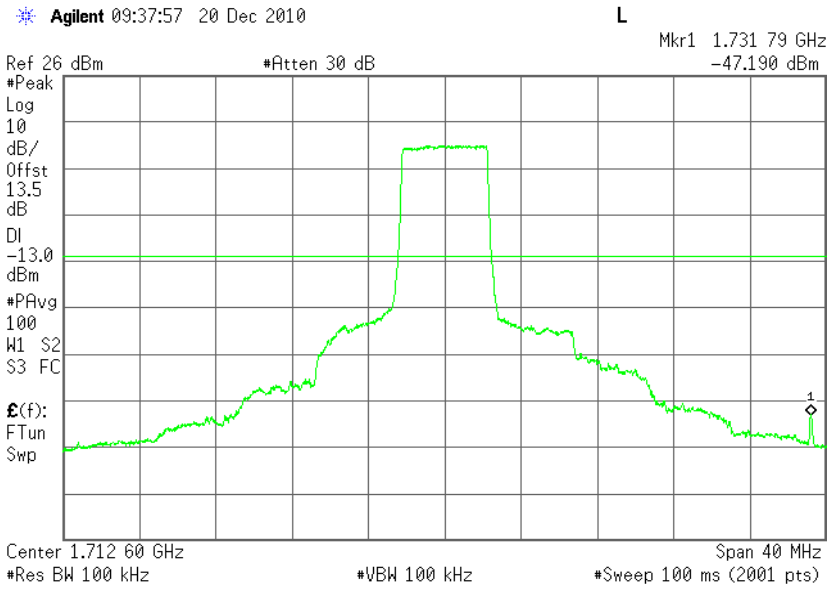
LTE B4, Low channel, 1715.1 MHz, 10MHz BW, 50RB, 16-QAM, 30MHz to 2 GHz



The strong emission shown is the carrier signal.

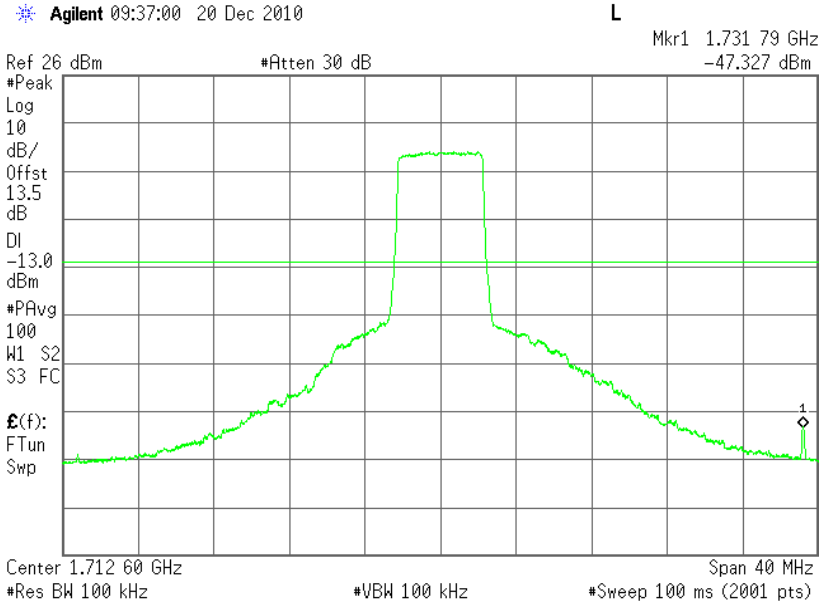
Plot 6.4.77) Out of Band Emissions at Antenna Terminals

LTE B4, Low channel, 1712.4 MHz, 5MHz BW, 25RB, QPSK, TX carrier +/- 40MHz



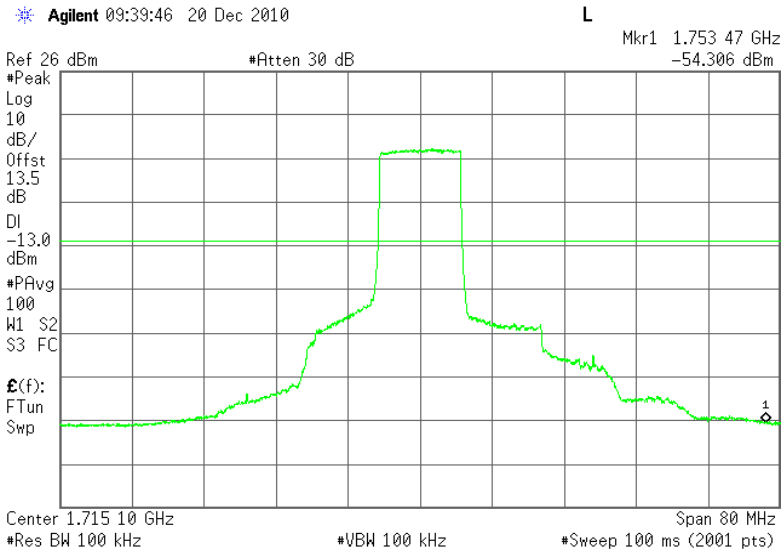
Plot 6.4.78) Out of Band Emissions at Antenna Terminals

LTE B4, Low channel, 1712.4 MHz, 5MHz BW, 25RB, 16-QAM, TX carrier +/- 40MHz



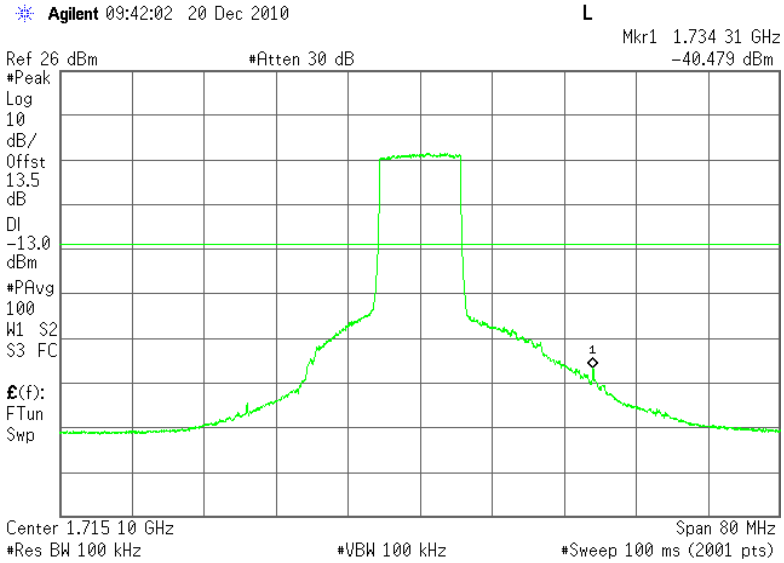
Plot 6.4.79) Out of Band Emissions at Antenna Terminals

LTE B4, Low channel, 1715.1 MHz, 10MHz BW, 50RB, QPSK, TX carrier +/- 80MHz



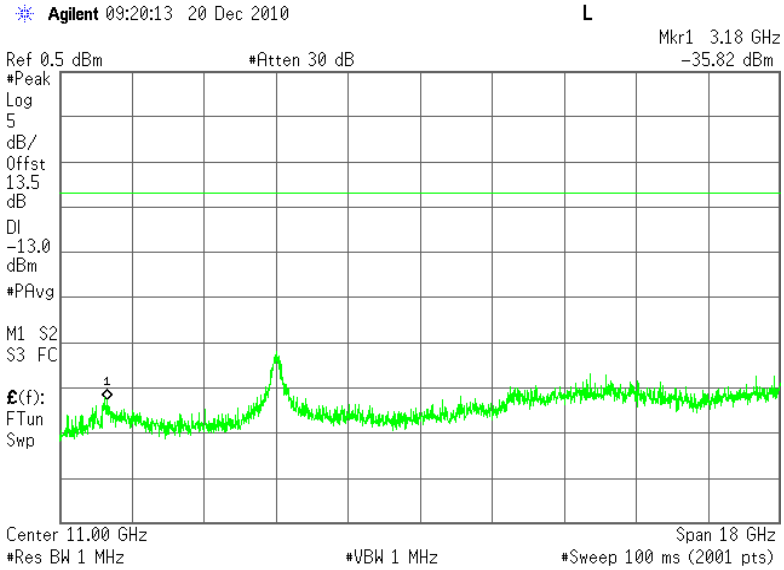
Plot 6.4.80) Out of Band Emissions at Antenna Terminals

LTE B4, Low channel, 1715.1 MHz, 10MHz BW, 50RB, 16-QAM, TX carrier +/- 80MHz



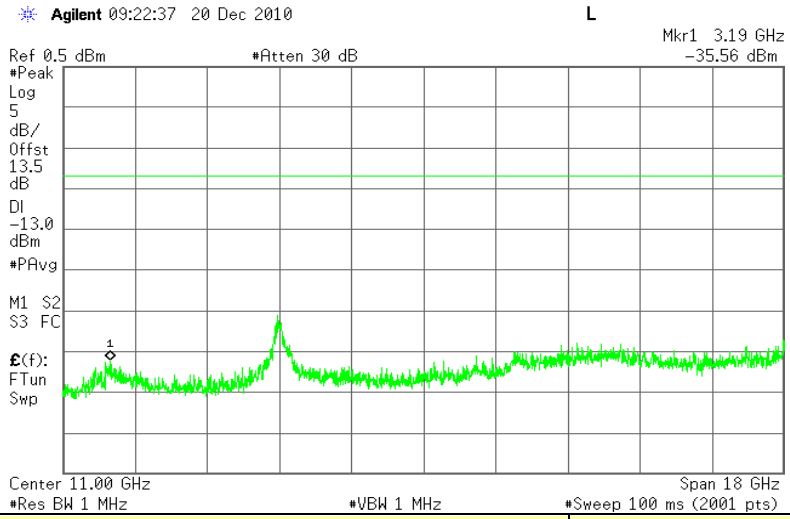
Plot 6.4.81) Out of Band Emissions at Antenna Terminals

LTE B4, Low channel, 1712.6 MHz, 5MHz BW, 25RB, QPSK, 2GHz to 18 GHz



Plot 6.4.82) Out of Band Emissions at Antenna Terminals

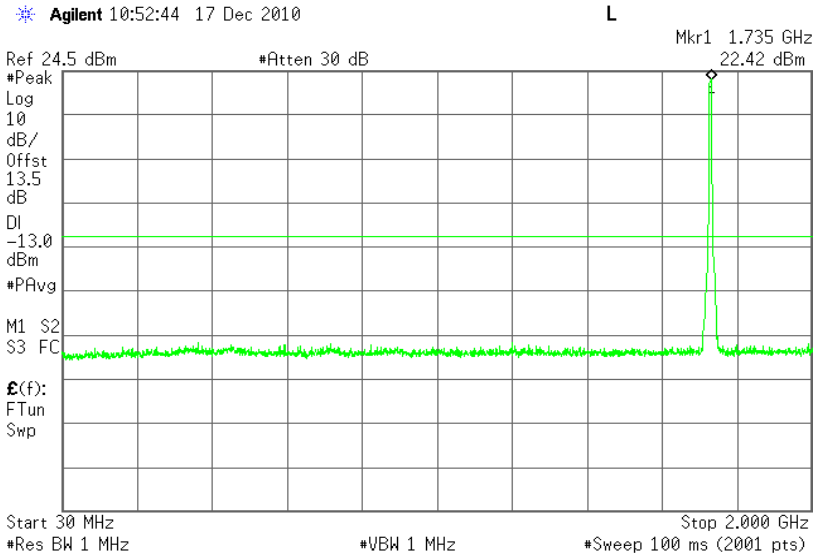
LTE B4, Low channel, 1712.6 MHz, 10MHz BW, 50RB, 16-QAM, 2GHz to 18 GHz



LTE B4 Harmonics for Ch. 19776 (1712.6 MHz) &Ch.20001(1715.1MHz)	**Level (dBm)**
Second **Third** **Others**	**<-35dBm dBm** **<-35dBm dBm** **----**

Plot 6.4.83) Out of Band Emissions at Antenna Terminals

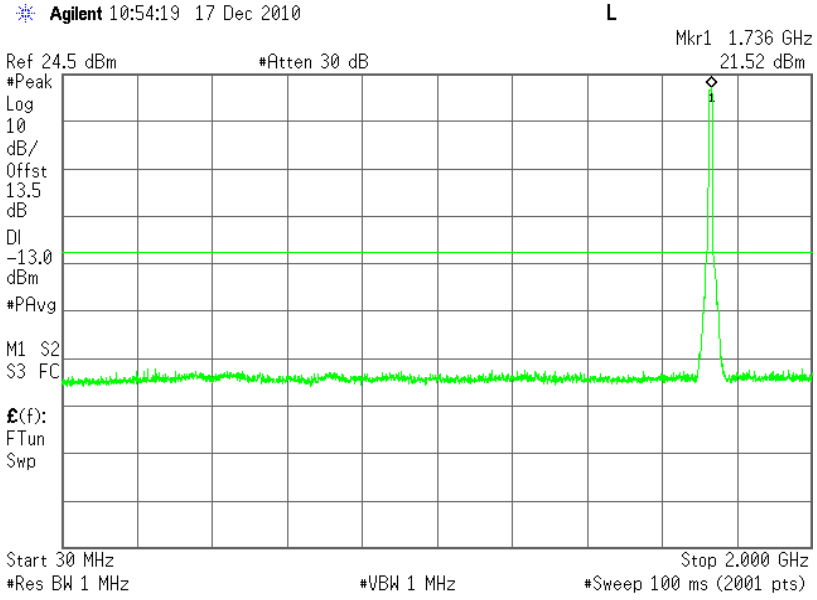
LTE B4, Mid channel, 1732.5 MHz, 5MHz BW, 25RB, QPSK, 30MHz to 2 GHz



The strong emission shown is the carrier signal.

Plot 6.4.84) Out of Band Emissions at Antenna Terminals

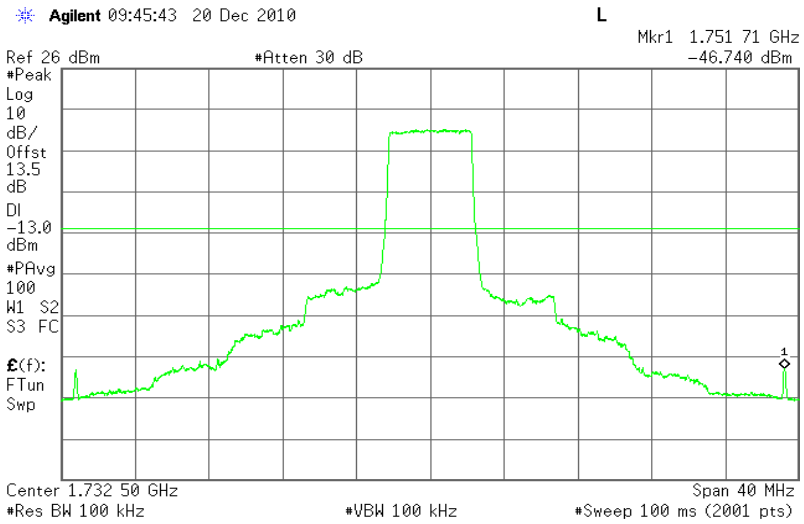
LTE B4, Mid channel, 1732.5 MHz, 10MHz BW, 50RB, 16-QAM, 30MHz to 2 GHz



The strong emission shown is the carrier signal.

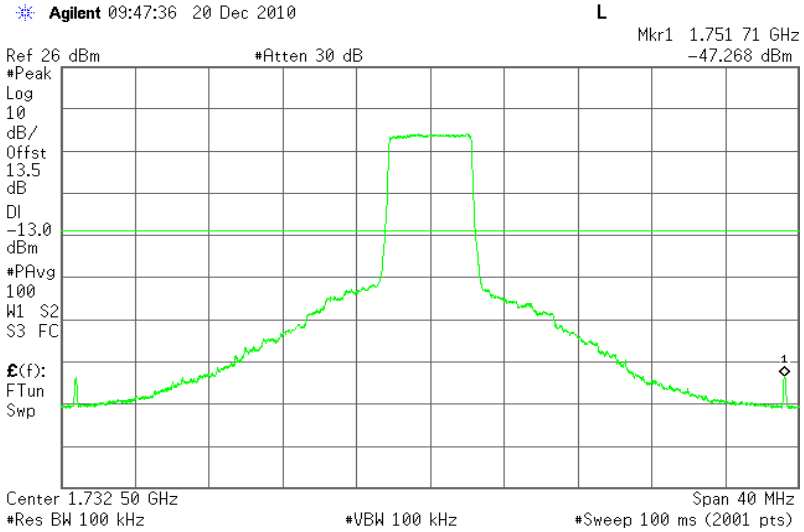
Plot 6.4.85) Out of Band Emissions at Antenna Terminals

LTE B4, Mid channel, 1732.5 MHz, 5MHz BW, 25RB, QPSK, TX carrier +/- 40MHz



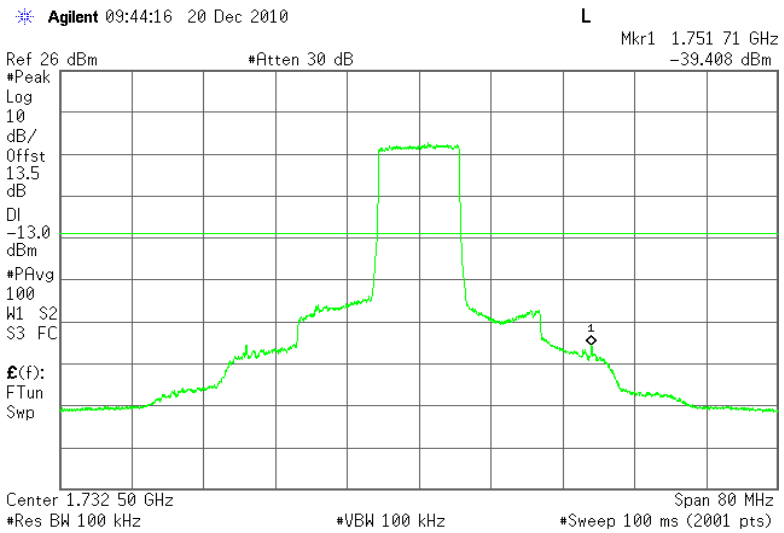
Plot 6.4.86) Out of Band Emissions at Antenna Terminals

LTE B4, Mid channel, 1732.5 MHz, 5MHz BW, 25RB, 16-QAM, TX carrier +/- 40MHz



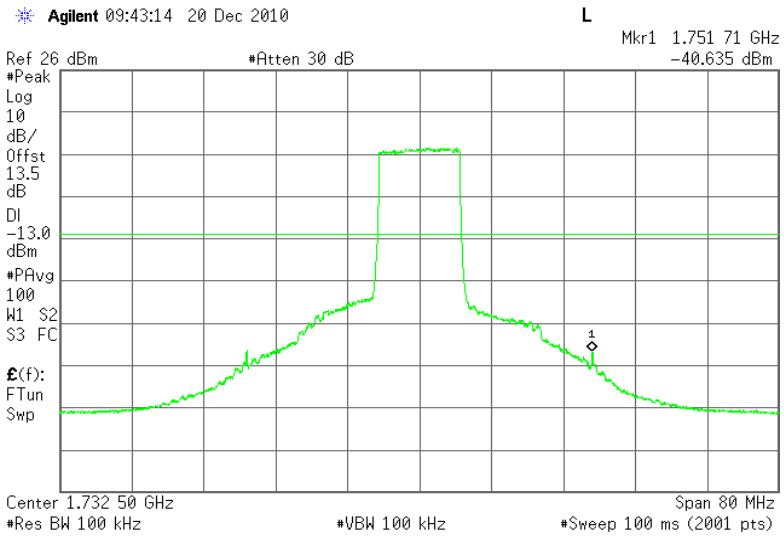
Plot 6.4.87) Out of Band Emissions at Antenna Terminals

LTE B4, Mid channel, 1732.5 MHz, 10MHz BW, 50RB, QPSK, TX carrier +/- 80MHz



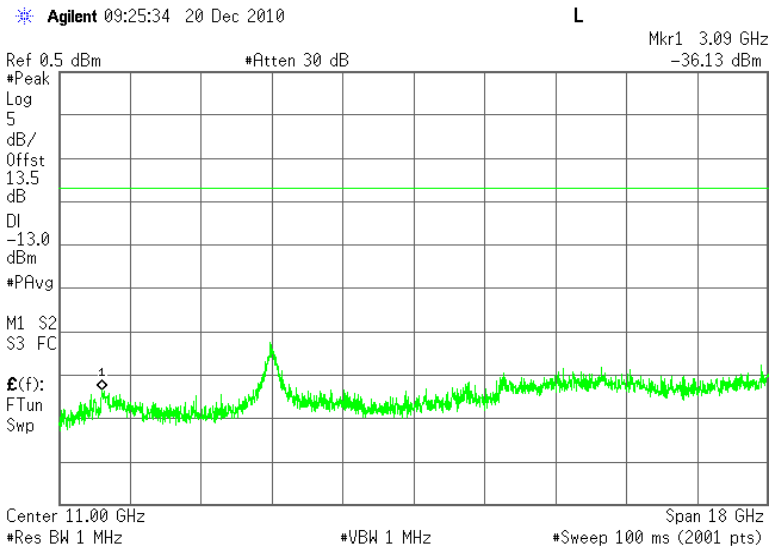
Plot 6.4.88) Out of Band Emissions at Antenna Terminals

LTE B4, Mid channel, 1732.5 MHz, 10MHz BW, 50RB, 16-QAM, TX carrier +/- 80MHz



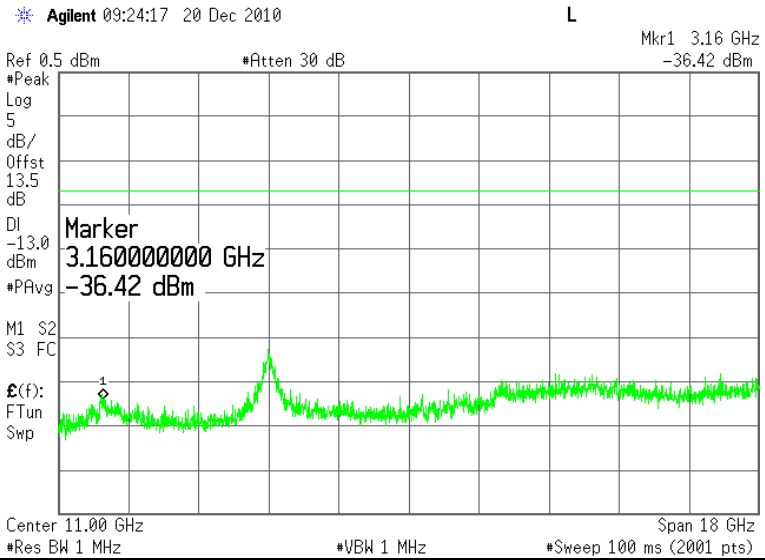
Plot 6.4.89) Out of Band Emissions at Antenna Terminals

LTE B4, Mid channel, 1732.5 MHz, 5MHz BW, 25RB, QPSK, 2GHz to 20 GHz



Plot 6.4.90) Out of Band Emissions at Antenna Terminals

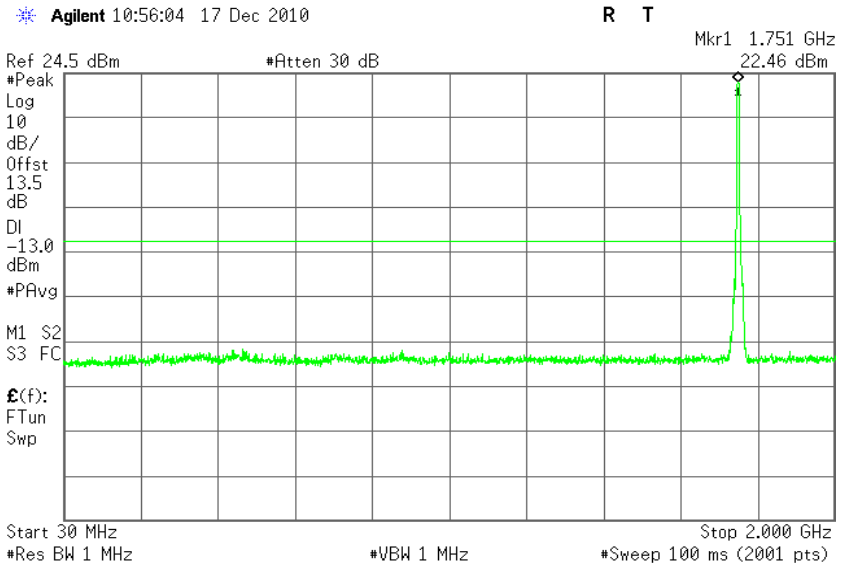
LTE B4, Mid channel, 1732.5 MHz, 10MHz BW, 50RB, 16-QAM, 2GHz to 20 GHz



LTE B4 Harmonics for Ch. 20175 &(1732.5MHz)	Level (dBm)
Second	**<-35dBm dBm**
Third	**<-35dBm dBm**
Others	**----**

Plot 6.4.91) Out of Band Emissions at Antenna Terminals

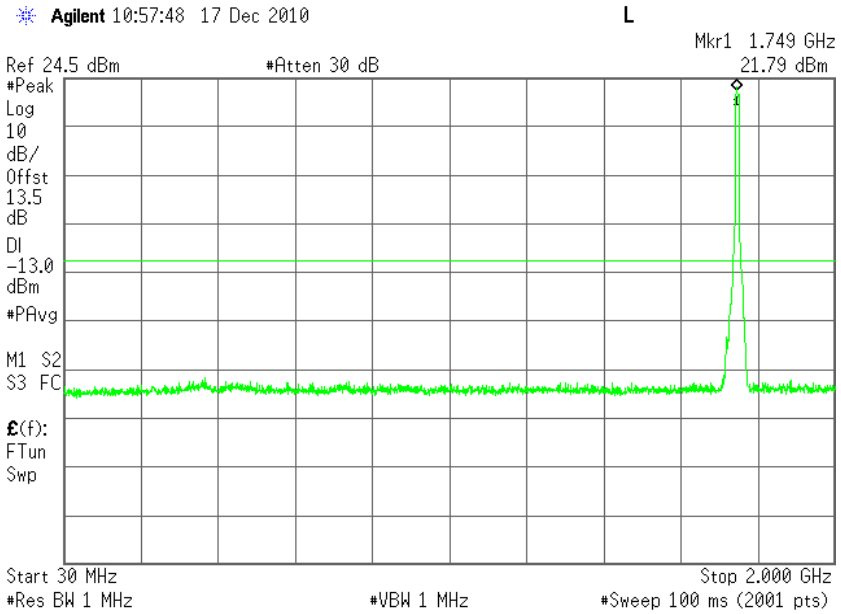
LTE, High channel, 1752.4 MHz, 5MHz BW, 25RB, QPSK, 30MHz to 2 GHz



The strong emission shown is the carrier signal.

Plot 6.4.92) Out of Band Emissions at Antenna Terminals

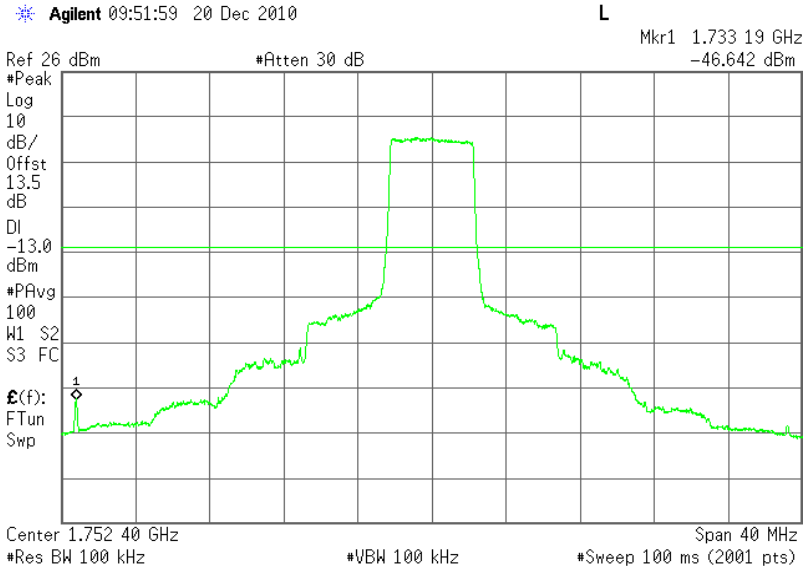
LTE, High channel, 1749.9 MHz, 10MHz BW, 50RB, 16-QAM, 30MHz to 2 GHz



The strong emission shown is the carrier signal.

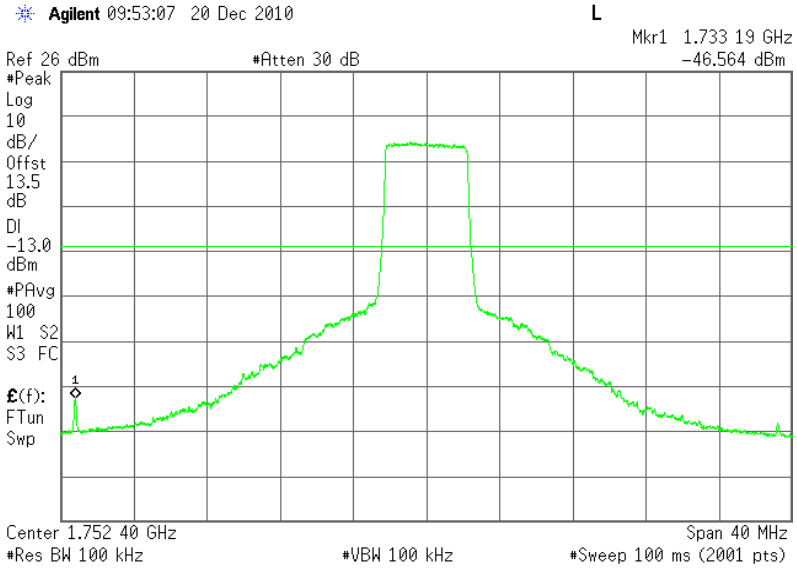
Plot 6.4.93) Out of Band Emissions at Antenna Terminals

LTE, High channel, 1752.4 MHz, 5MHz BW, 25RB, QPSK, TX carrier +/- 40MHz



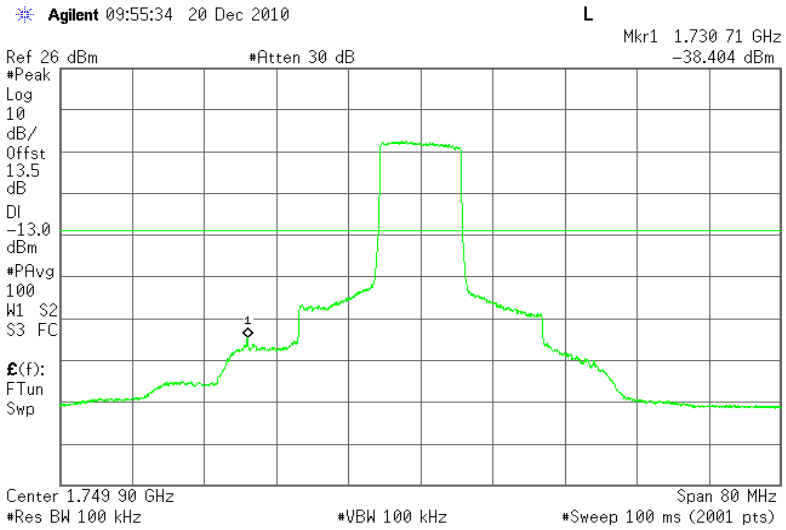
Plot 6.4.94) Out of Band Emissions at Antenna Terminals

LTE, High channel, 1752.4 MHz, 5MHz BW, 25RB, 16-QAM, TX carrier +/- 40MHz



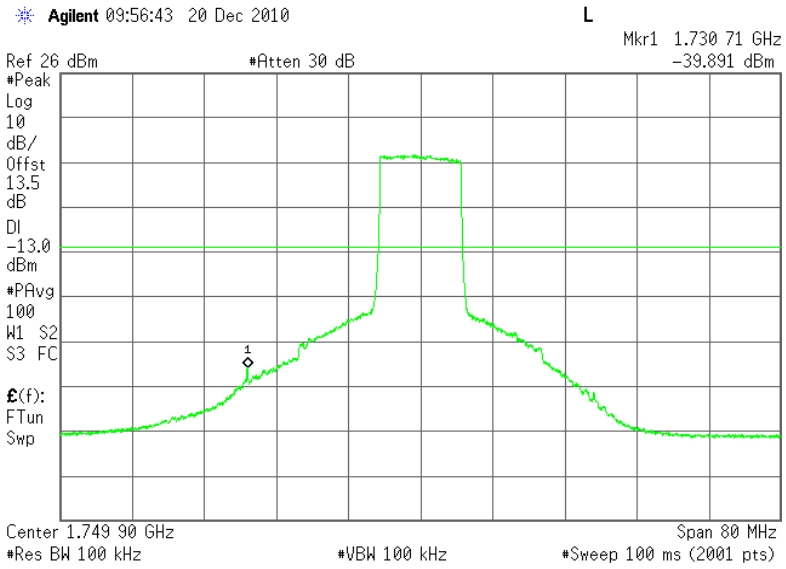
Plot 6.4.95) Out of Band Emissions at Antenna Terminals

LTE, High channel, 1752.4 MHz, 10MHz BW, 50RB, QPSK, TX carrier +/- 80MHz



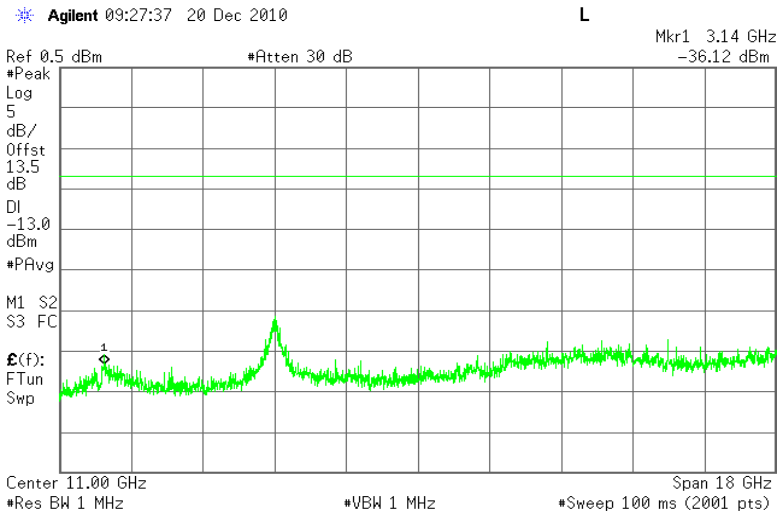
Plot 6.4.96) Out of Band Emissions at Antenna Terminals

LTE, High channel, 1752.4 MHz, 10MHz BW, 50RB, 16-QAM, TX carrier +/- 80MHz



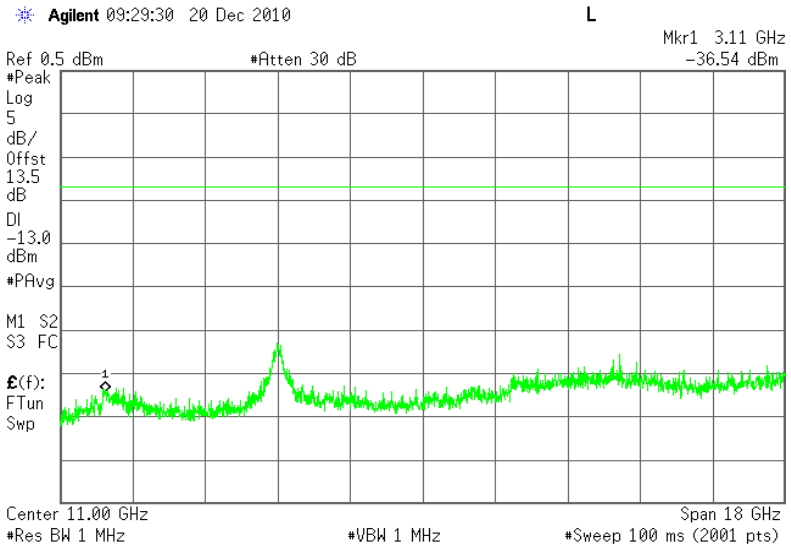
Plot 6.4.97) Out of Band Emissions at Antenna Terminals

LTE, High channel, 1752.4 MHz, 5MHz BW, 25RB, QPSK, 2GHz to 20 GHz



Plot 6.4.98) Out of Band Emissions at Antenna Terminals

LTE, High channel, 1749.9 MHz, 10MHz BW, 50RB, 16-QAM, 2GHz to 20 GHz



LTE B4 Harmonics for Ch. 20349(1749.9MHz) &Ch 20374 (1752.4MHz)	Level (dBm)
Second Third Others	<-35dBm dBm <-35dBm dBm ----

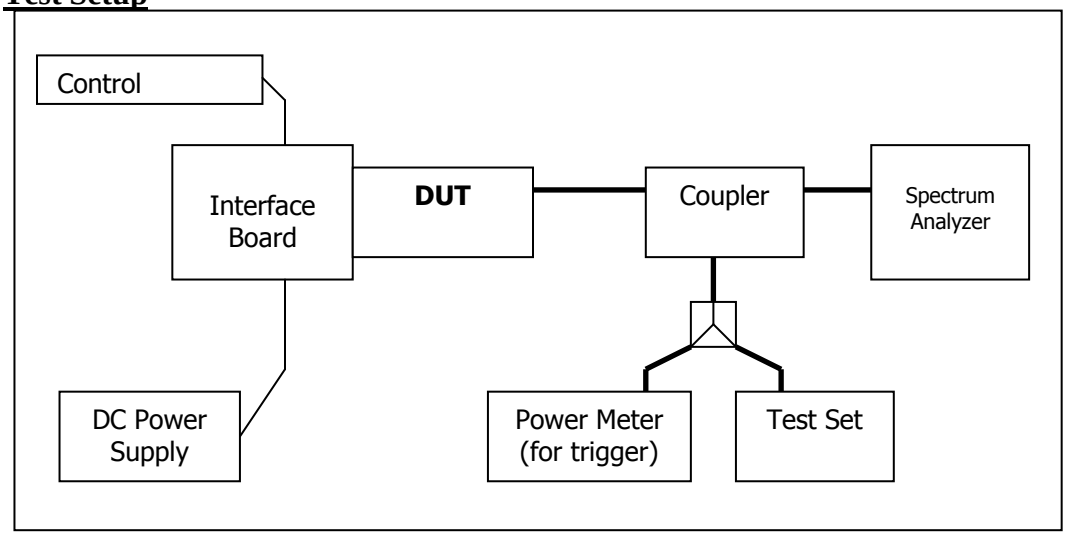
7 Block Edge Compliance

FCC Part 22(h)/24(e)/27.54(h)

7.1 Test Procedure

The transmitter output was connected to a Rohde & Schwarz CMU200 Test Set (or CMW500 for LTE), through a coaxial RF cable and a directional coupler, and configured to operate at maximum power. The block edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

Test Setup



7.2 Test Equipment

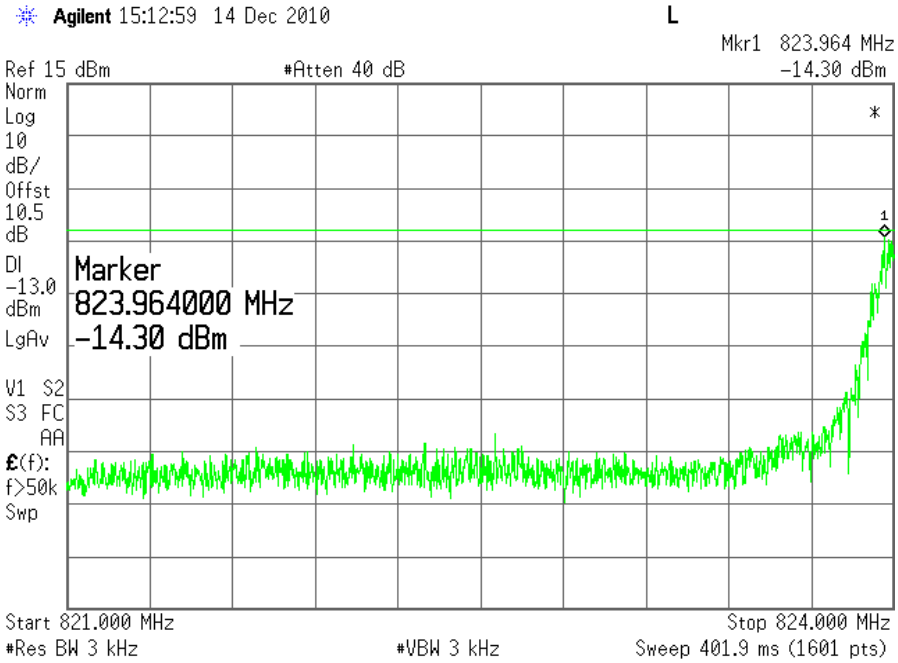
EQUIPMENT	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE
Control Computer	TC	Generic PC	100488	N/A
Wireless Test Set	Rohde & Schwarz	CMU200	110520	October 31, 2010
Wireless Test Set	Rohde & Schwarz	CMW500	101532	May 10, 2010
Spectrum Analyzer	Agilent	E4440A	US41422168	November 26, 2010
DC Power Supply	HP	6632A	3530A	N/A
Interface Board	Shop built	ATEMux	N/A	N/A
Directional Coupler	Pasternack	PE2209-10	N/A	N/A

7.3 Test Results

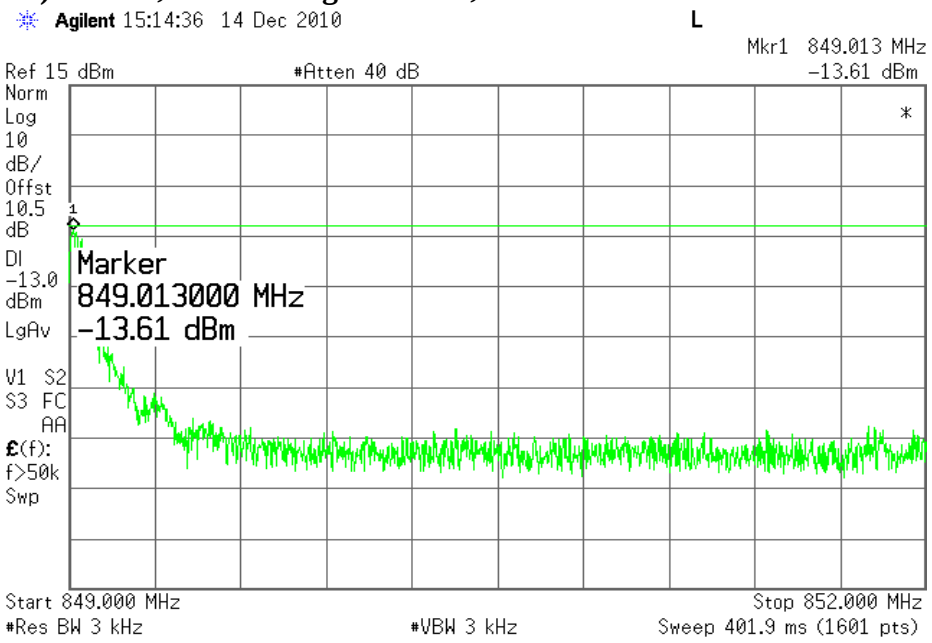
Block Test	Frequency Boundaries (MHz)	Channels Tested	Corresponding Plots	Result
1	GMSK: Below 824 MHz, above 849 MHz	128, 251	7.4.1, 7.4.2	Complies
2	8PSK: Below 824 MHz, above 849 MHz	128, 251	7.4.3, 7.4.4	Complies
3	GMSK: Below 1850MHz, above 1910MHz	512, 810	7.4.5, 7.4.6	Complies
4	8PSK: Below 1850MHz, above 1910MHz	512, 810	7.4.7, 7.4.8	Complies
Block Test	Frequency Boundaries (MHz)	Channels Tested	Corresponding Plots	Result
1	WCDMA: Below 824MHz, above 849MHz	4132, 4233	7.4.9, 7.4.10	Complies
2	WCDMA: Below 1850MHz, above 1910MHz	9262, 9538	7.4.11, 7.4.12	Complies
Block Test	Frequency Boundaries (MHz)	Channels Tested	Corresponding Plots	Result
1	LTE: Below 704MHz	23756,23790	7.4.13-7.4.16	Complies
2	LTE: above 716MHz	23824,23790	7.4.17-7.4.20	Complies
3	LTE: below 1707 MHz and 1710MHz	19976,20001	7.4.21-7.4.24	Complies
4	LTE: above 1755MHz and 1758 MHz	20374,20349	7.4.25-7.4.28	Complies

7.4 Test Plots

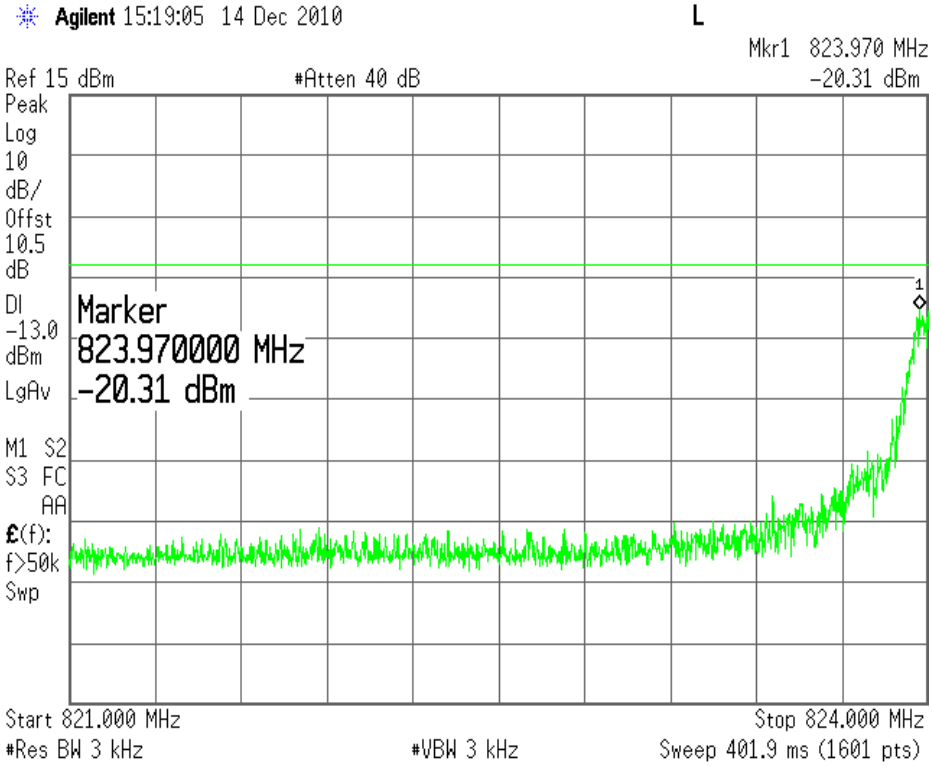
Plot 7.4.1) GSMK; Cellular low channel, below 824 MHz



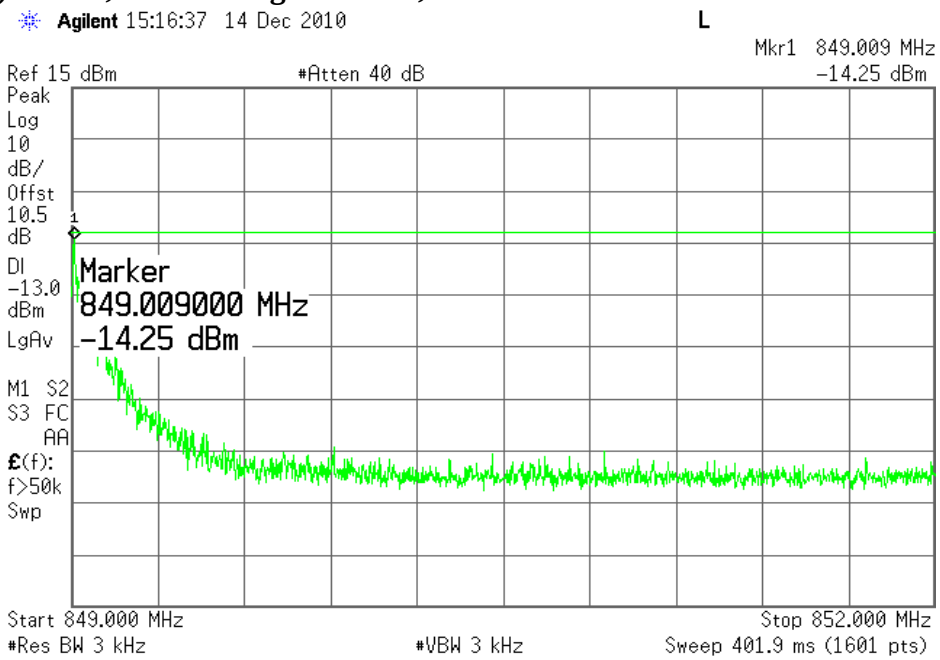
Plot 7.4.2) GMSK; Cellular high channel, above 849 MHz



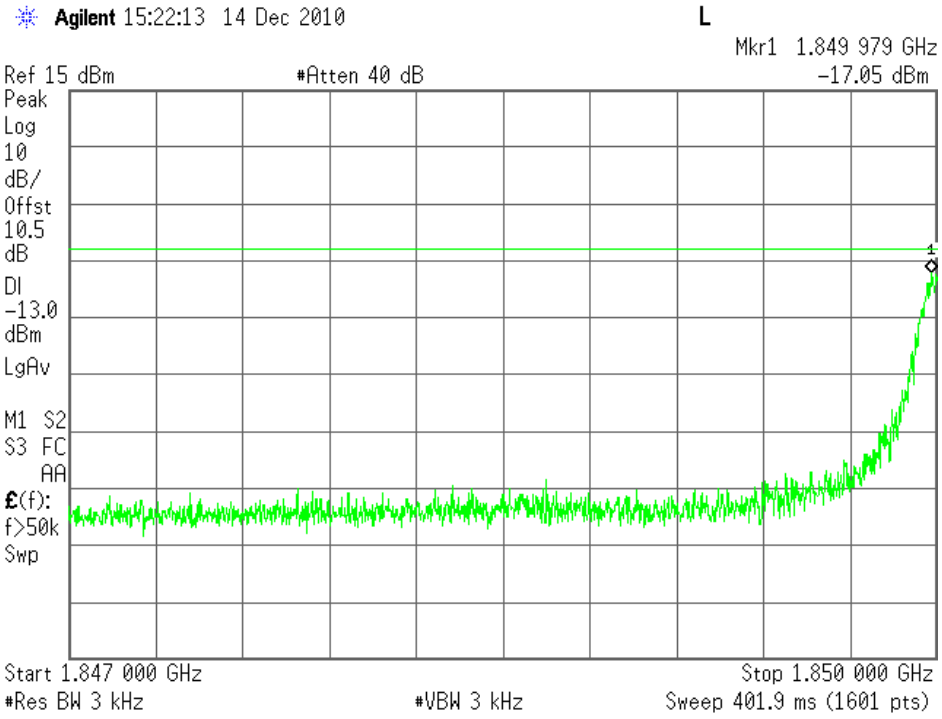
Plot 7.4.3) 8-PSK; Cellular low channel, below 824 MHz



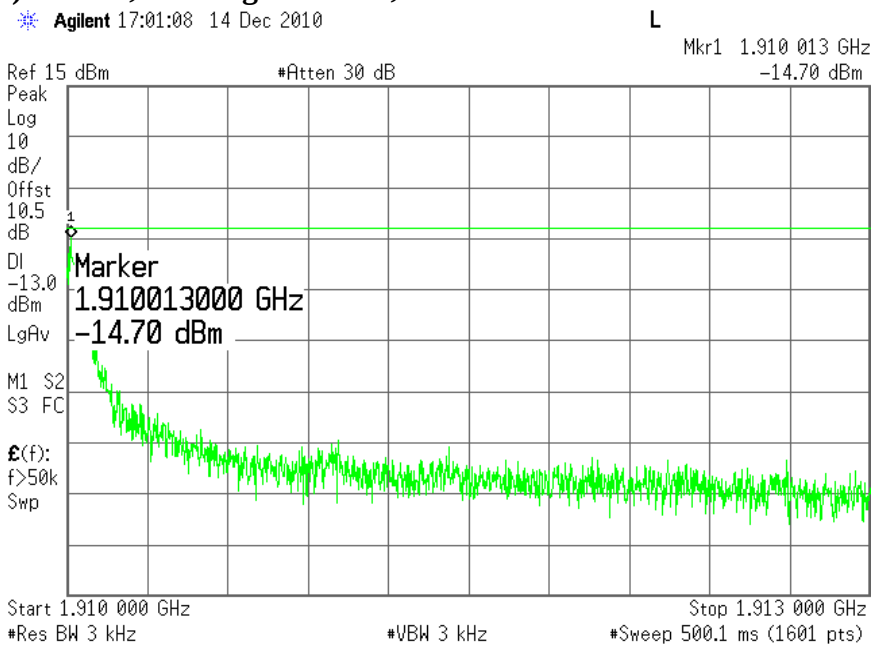
Plot 7.4.4) 8-PSK; Cellular high channel, above 849 MHz



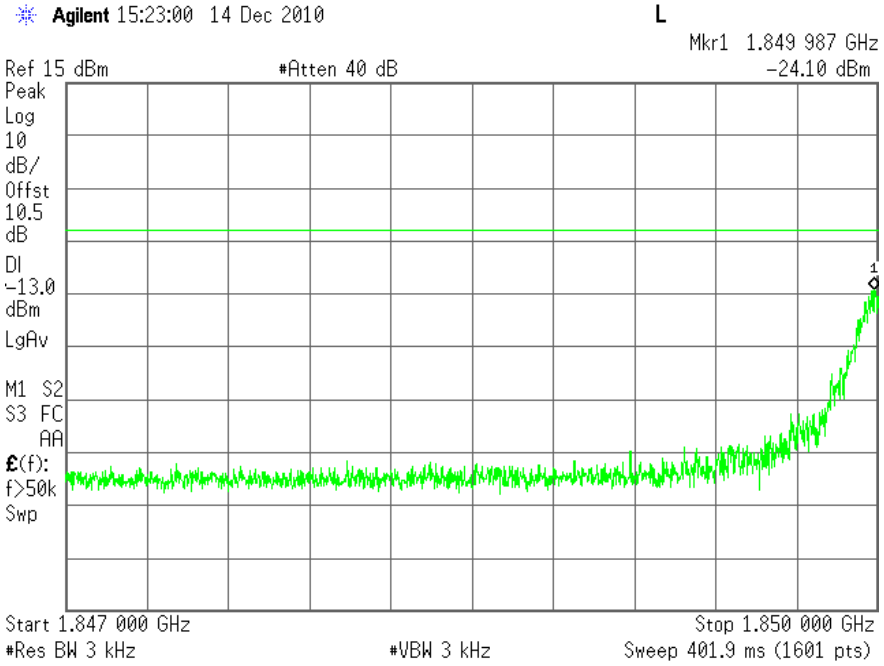
Plot 7.4.5) GMSK; PCS low channel, below 1850 MHz



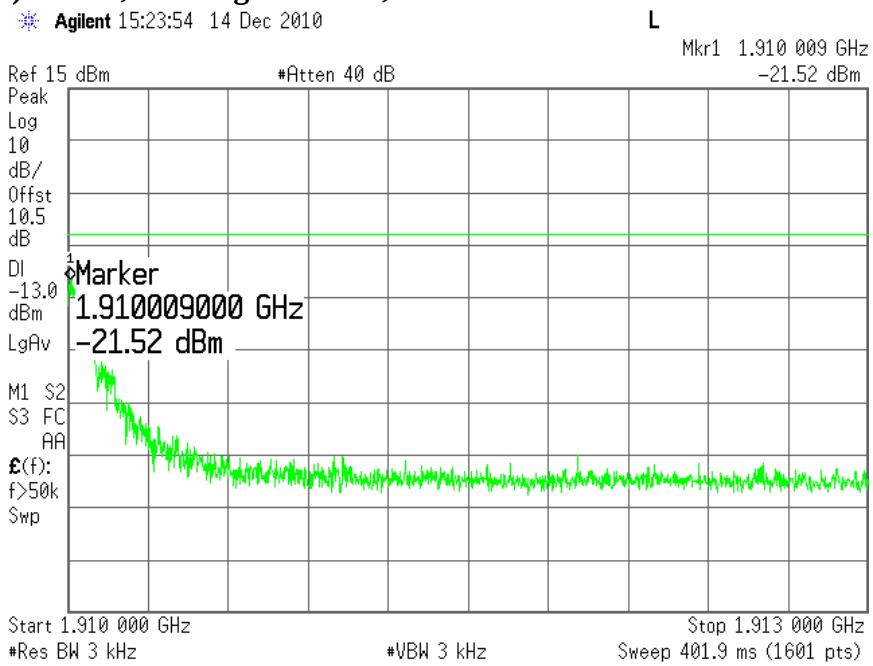
Plot 7.4.6) GMSK; PCS high channel, above 1910 MHz



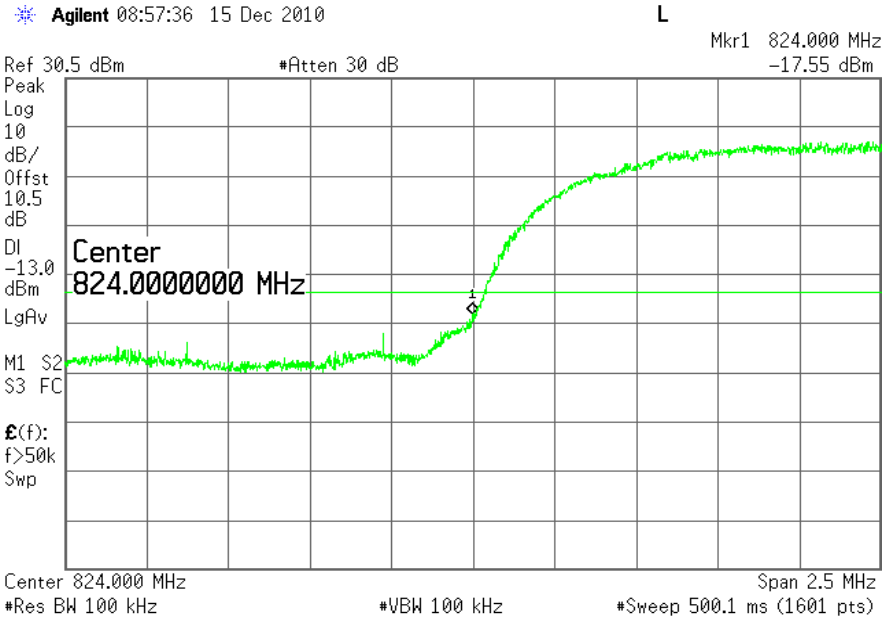
Plot 7.4.7) 8-PSK; PCS low channel, below 1850 MHz



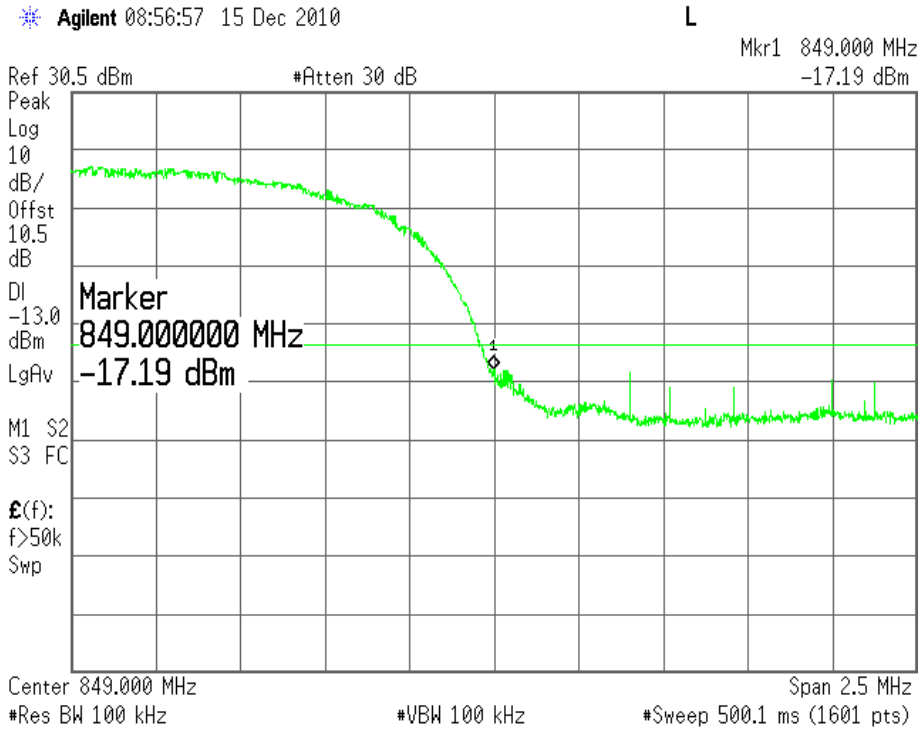
Plot 7.4.8) 8-PSK; PCS high channel, above 1910 MHz



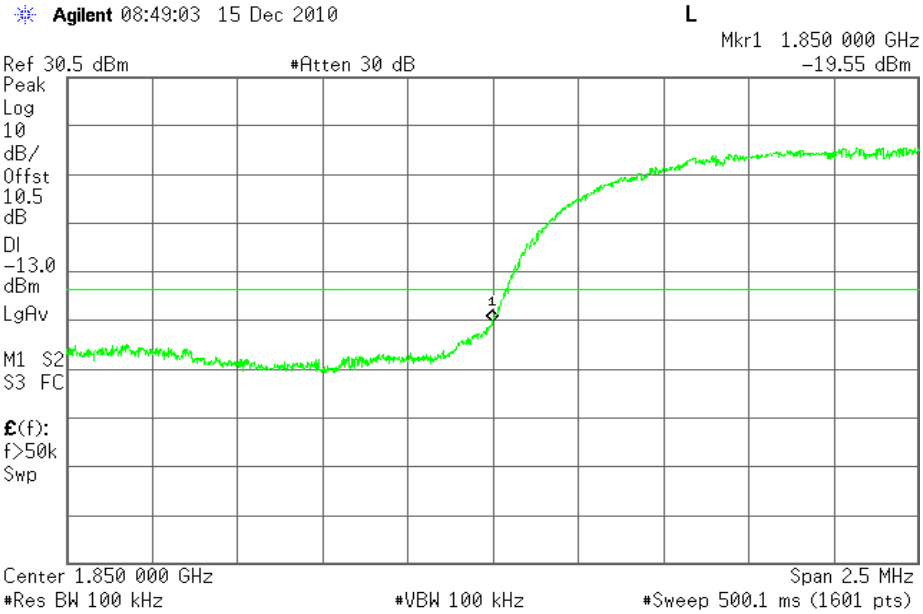
Plot 7.4.9) WCDMA; Cellular low channel, below 824 MHz



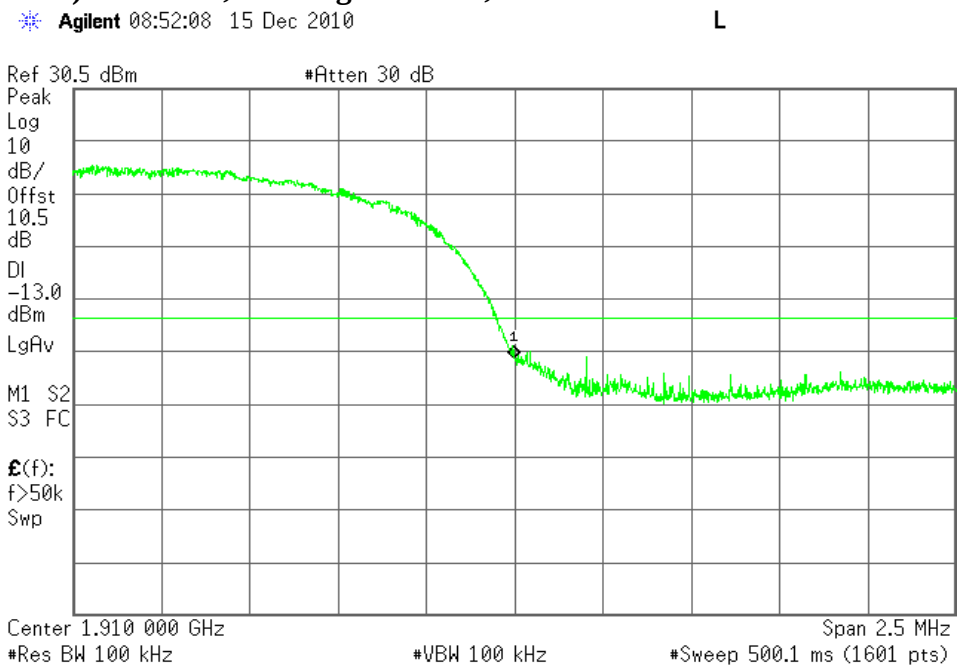
Plot 7.4.10) WCDMA; Cellular high channel, above 849 MHz



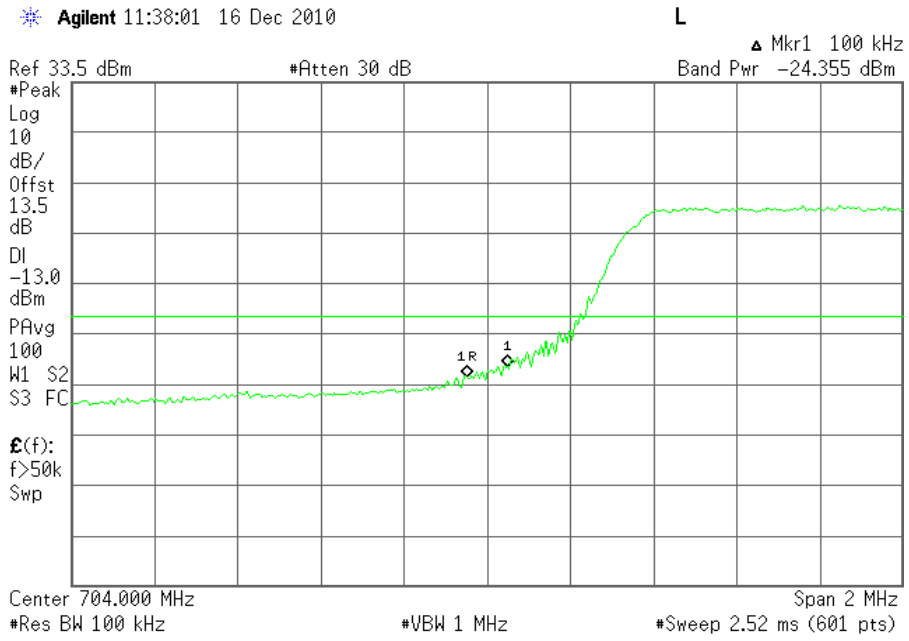
Plot 7.4.11) WCDMA; PCS low channel, below 1850 MHz



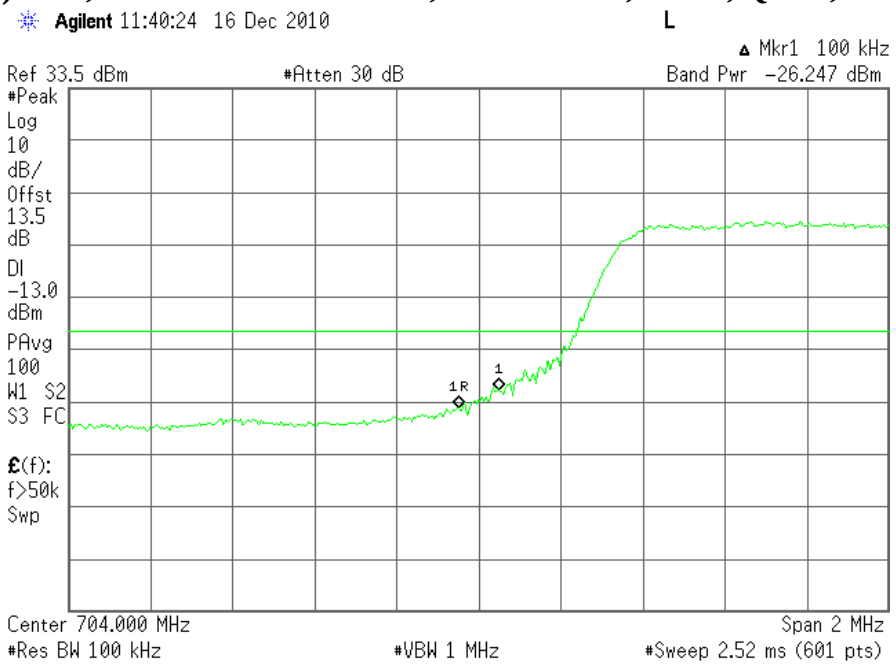
Plot 7.4.12) WCDMA; PCS high channel, above 1910 MHz



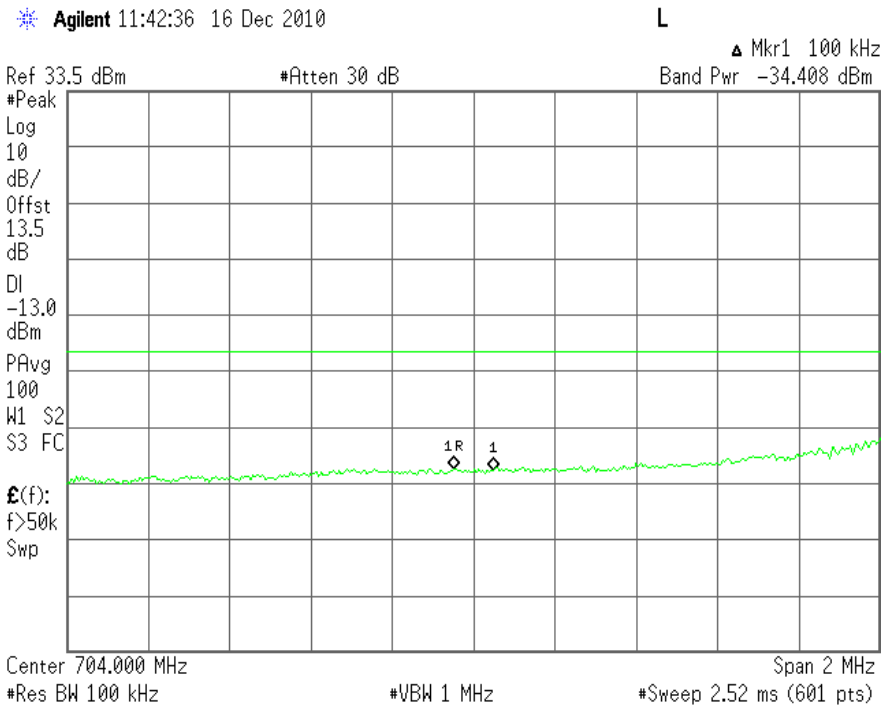
Plot 7.4.13) LTE; Band17 below 704 MHz with ch23756, 5MHz, QPSK, 25RB



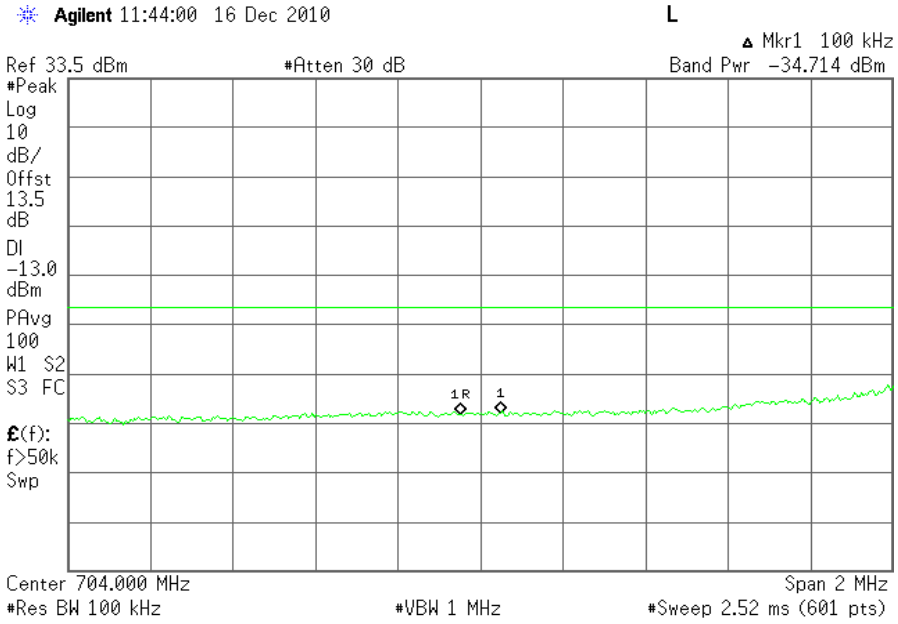
Plot 7.4.14) LTE; Band17 below 704 MHz, with ch23756, 5MHz, QPSK, 25RB



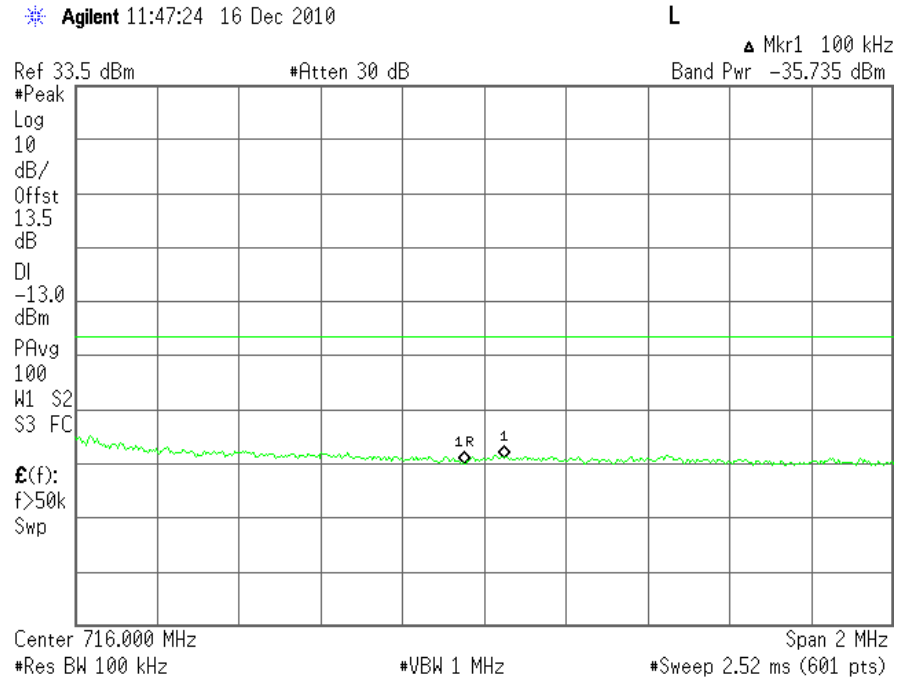
Plot 7.4.15) LTE; Band17 below 704 MHz, with ch23790, 10MHz, QPSK, 50RB



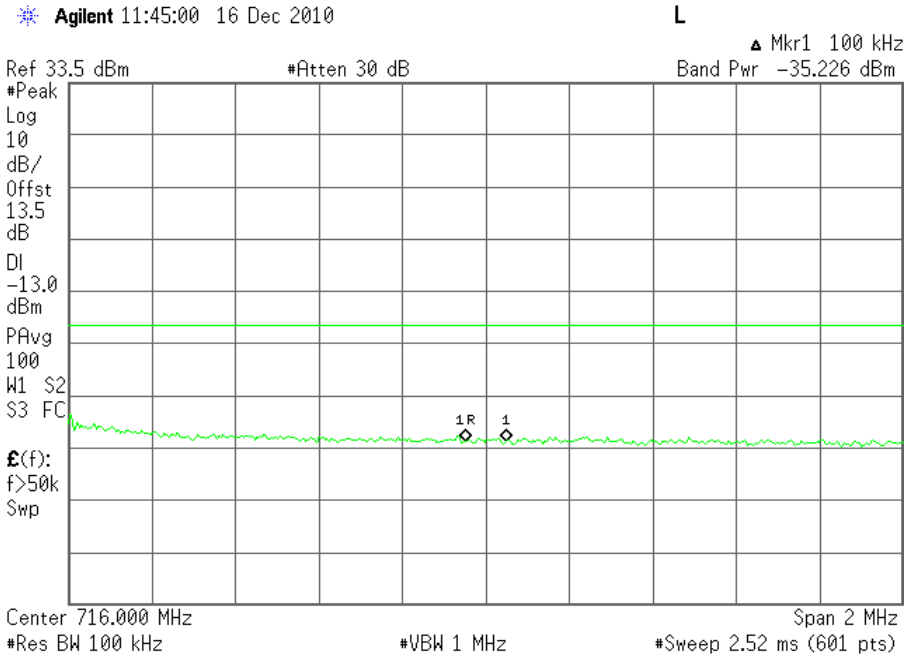
7.4.16) LTE; Band17 below 704 MHz, with ch23790, 10MHz, 16-QAM, 50RB



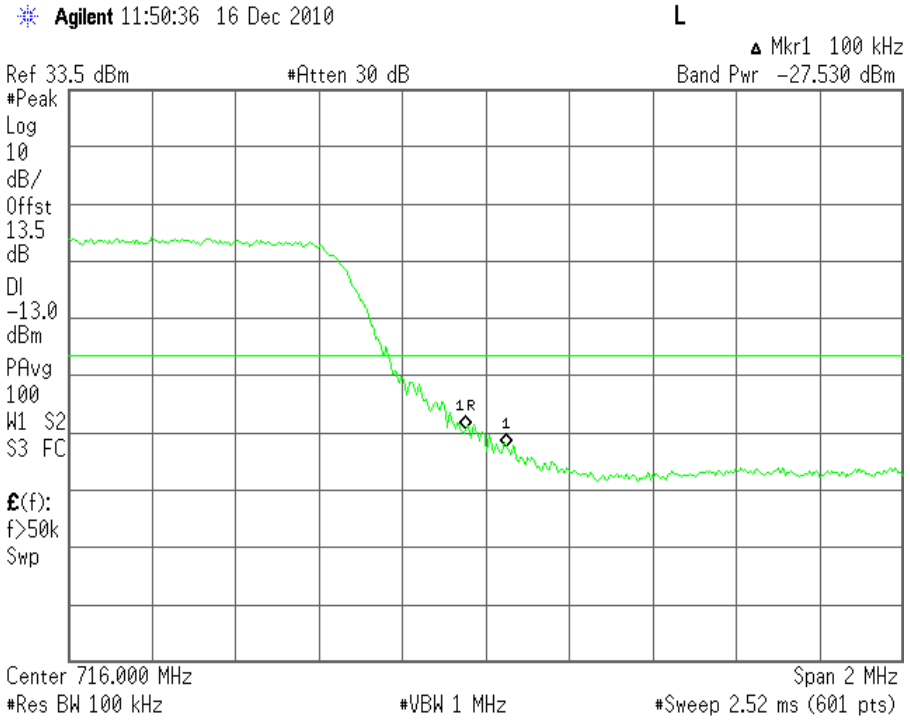
7.4.17) LTE; Band17 above 716 MHz, with ch23790, 10MHz, QPSK, 50RB



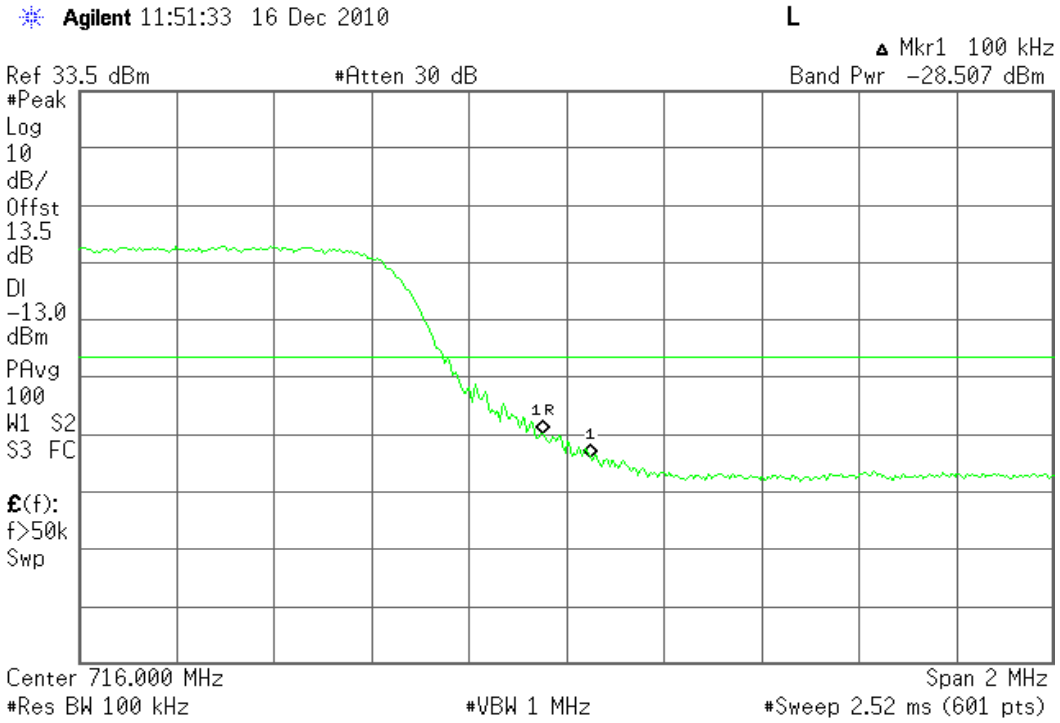
7.4.18) LTE; Band17 above 716 MHz, with ch23790, 10MHz, 16-QAM, 50RB



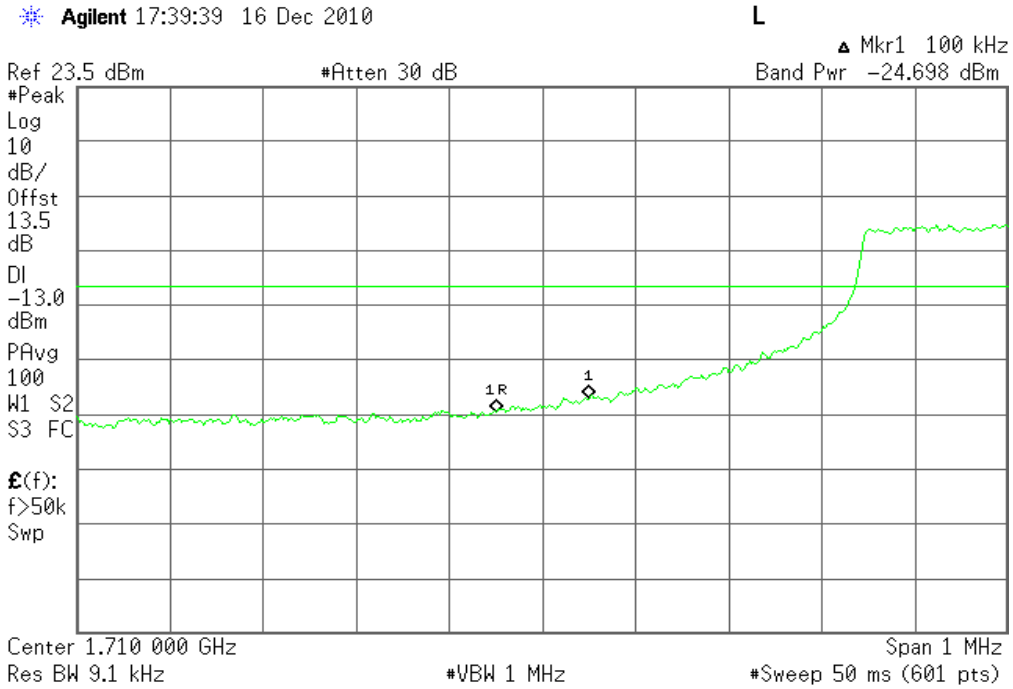
7.4.19) LTE; Band17 above 716 MHz, with ch23824, 5MHz, QPSK, 25RB



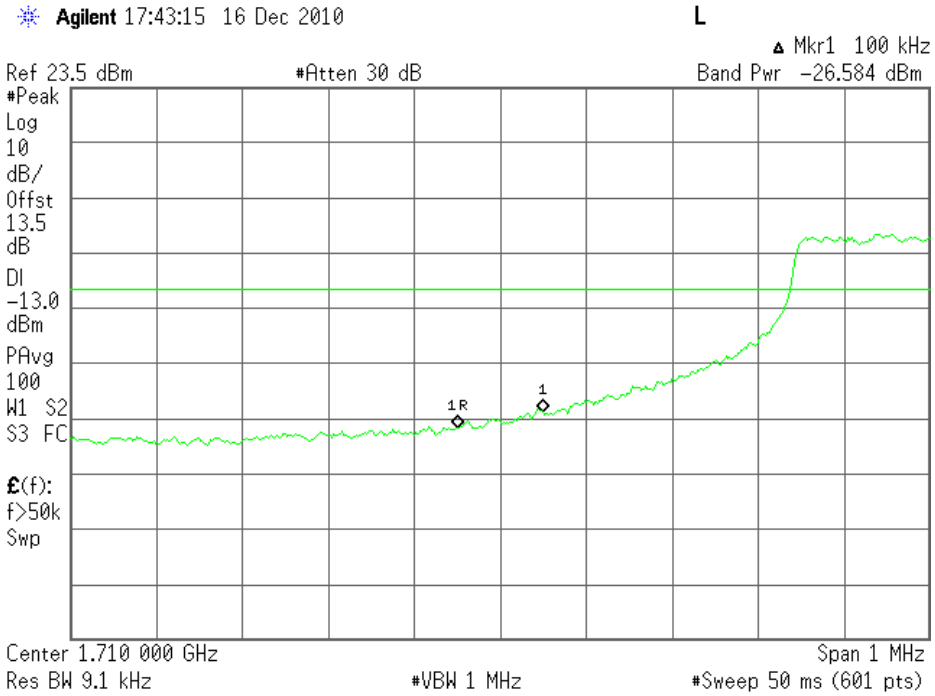
7.4.20) LTE; Band17 above 716 MHz, with ch23824, 5MHz, 16-QAM, 25RB



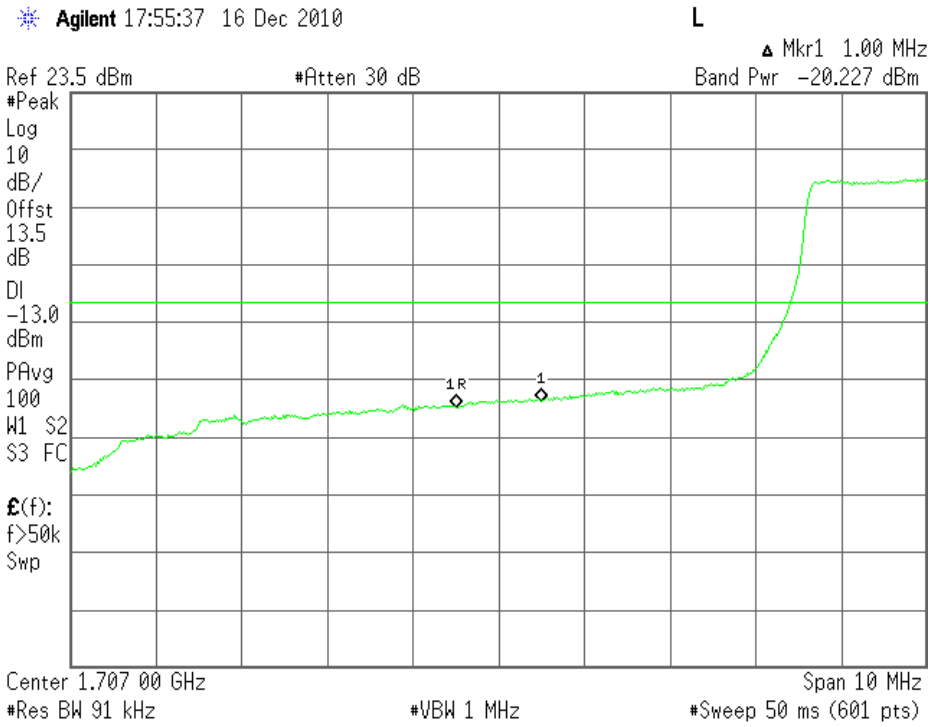
7.4.21) LTE; Band4 below 1710 MHz, with ch19976, 5MHz, QPSK, 25RB



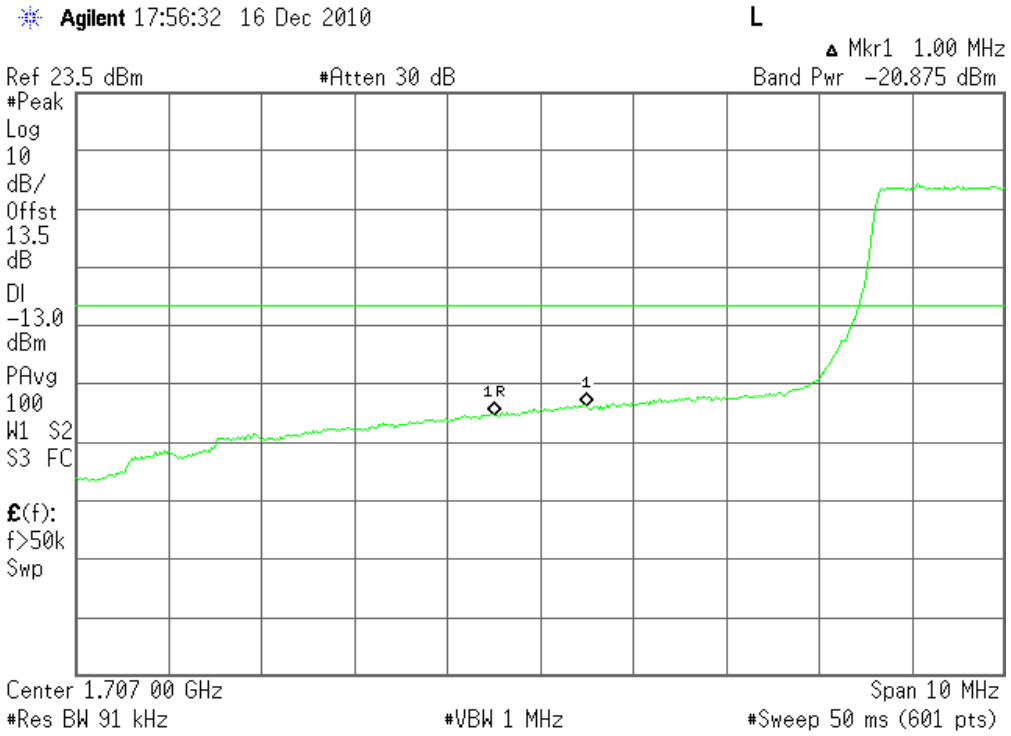
7.4.22) LTE; Band4 below 1710 MHz, with ch19976, 5MHz, 16-QAM, 25RB



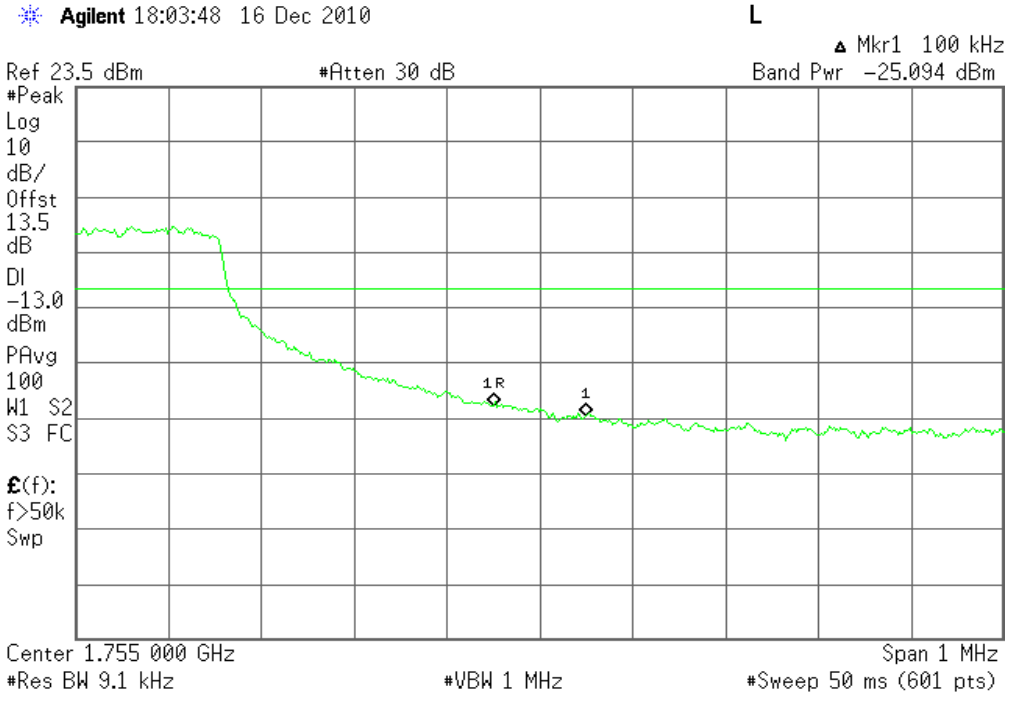
7.4.23) LTE; Band4 below 1707 MHz, with ch20001, 10MHz, QPSK, 50RB



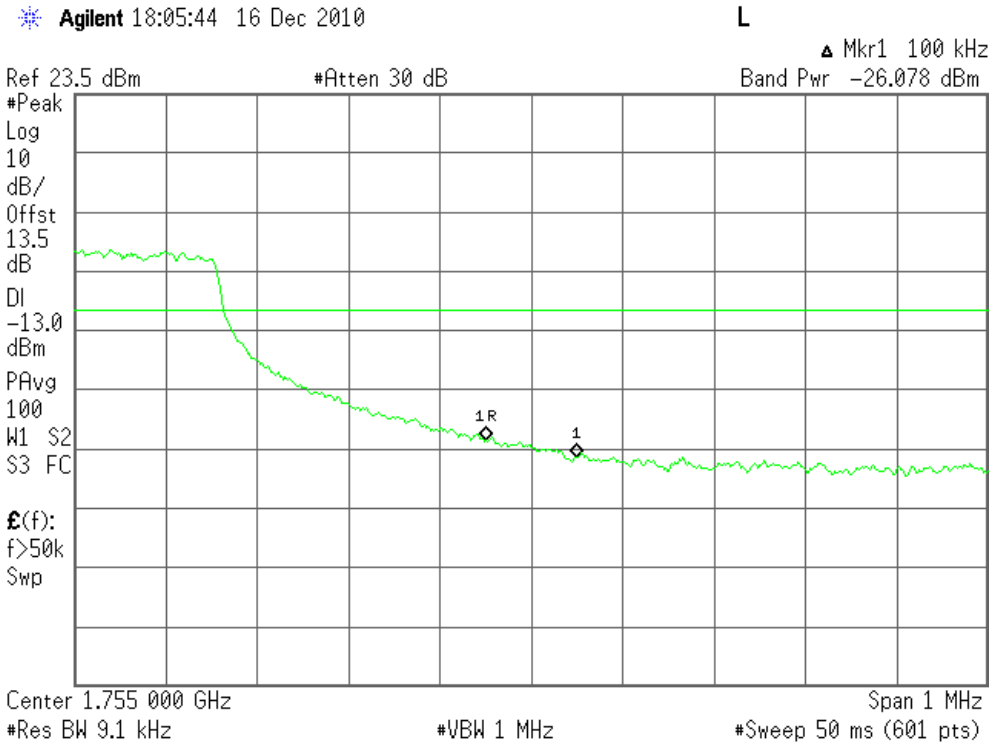
7.4.24) LTE; Band4 below 1707 MHz, with ch20001, 10MHz, 16-QAM, 50RB



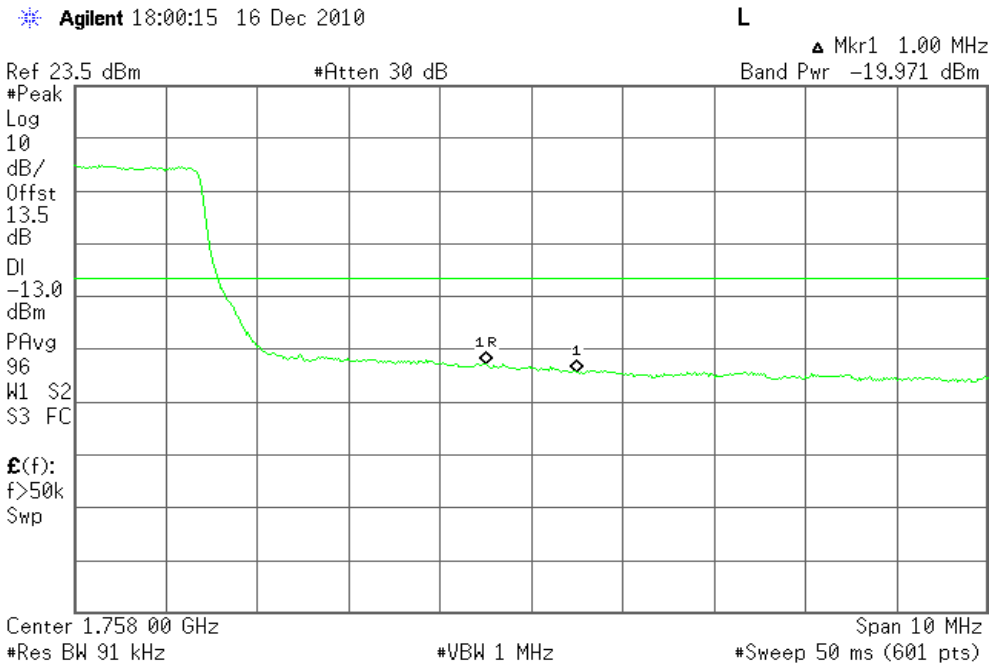
7.4.25) LTE; Band4 above 1755 MHz, with ch20374, 5MHz, QPSK, 25RB



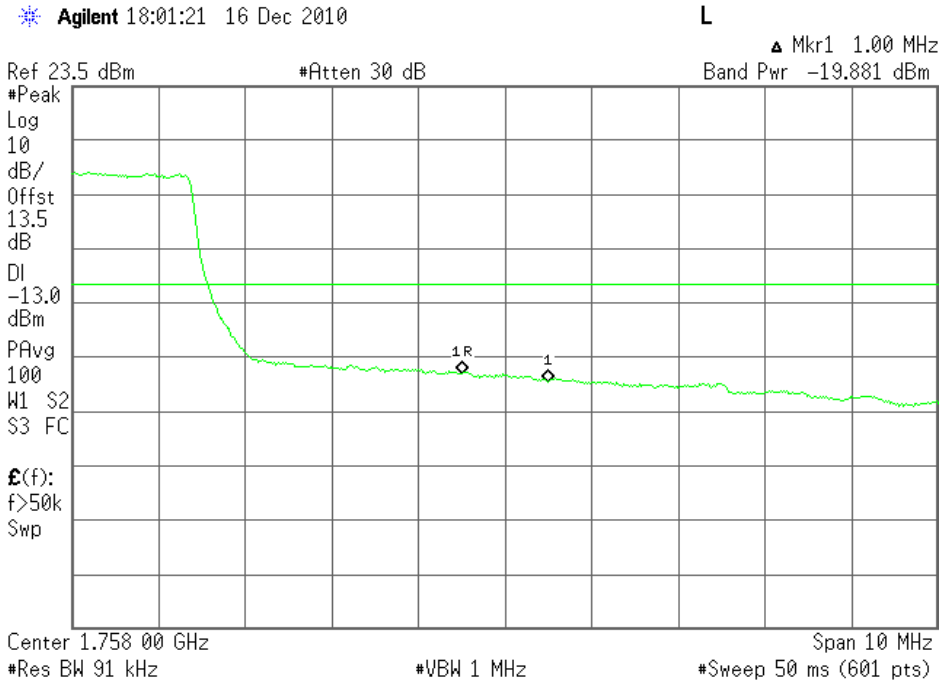
7.4.26) LTE; Band4 above 1755 MHz, with ch20374, 5MHz, 16-QAM, 25RB



7.4.27) LTE; Band4 above 1758 MHz, with ch20349, 10MHz, QPSK, 50RB



7.4.28) LTE; Band4 above 1758 MHz, with ch20349, 10MHz, 16-QAM, 50RB



8 Frequency Stability versus Temperature

FCC 2.1055, FCC 22.355, FCC 24.235, FCC 27.54

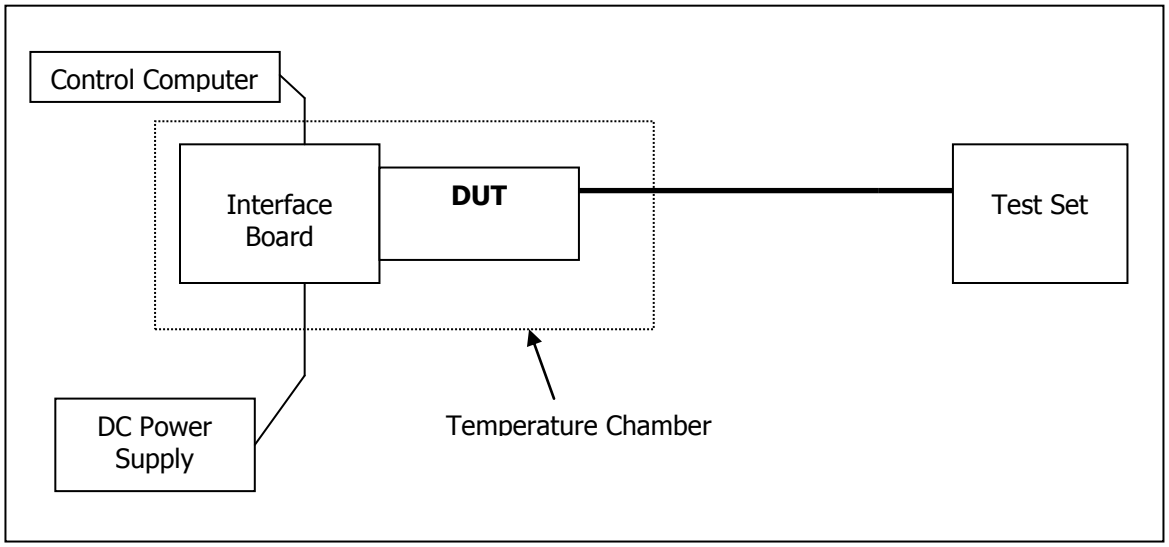
8.1 Summary of Results

The EUT's Frequency Stability versus temperature meets the requirements of less than 2.5ppm when temperature varies from -30°C to +50°C.

8.2 Test Procedure

The EUT was placed inside a temperature chamber. The temperature was set to -30°C and maintained to stabilize. After sufficient soak time, the transmitting frequency error was measured. The temperature was then increased by 10 degrees, maintained to stabilize, and the measurement was repeated. This procedure was repeated until +50°C is reached. Frequency metering included internal averaging of the CMU200 (for GSM/WCDMA) or the CMW500 (for LTE) to stabilize the reading. Reference power supply voltage for these tests is 5.0 volts.

Test Setup



8.3 Test Equipment

EQUIPMENT	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE
Control Computer	TC	Generic PC	100488	N/A
Wireless Test Set	Rohde & Schwarz	CMU200	110520	October 31, 2010
Wireless Test Set	Rohde & Schwarz	CMW500	101532	May 10, 2010
Spectrum Analyzer	Agilent	E4440A	US41422168	November 26, 2010
DC Power Supply	HP	6632A	3530A	N/A
Interface Board	Shop built	ATEMux	N/A	N/A

8.4 Test Results

8.4.1 GSM Frequency Error over Temperature

Temp (°C)	Cellular Band: 824MHz to 848MHz				PCS Band: 1850MHz to 1910MHz			
	GMSK Mode		8PSK Mode		GMSK Mode		8PSK Mode	
	Offset (Hz)	Offset (ppm)	Offset (Hz)	Offset (ppm)	Offset (Hz)	Offset (ppm)	Offset (Hz)	Offset (ppm)
-30	-15.10	-0.0180	-30.38	-0.0363	-16.40	-0.0087	-43.65	-0.0232
-20	16.10	0.0192	7.97	0.0095	-8.27	-0.0044	14.69	0.0078
-10	12.50	0.0149	-16.66	-0.0199	-4.78	-0.0025	0.97	0.0005
0	-1.16	-0.0014	1.26	0.0015	-7.17	-0.0038	18.27	0.0097
10	2.97	0.0036	3.26	0.0039	-0.84	-0.0004	21.41	0.0114
20	-21.10	-0.0252	1.00	0.0012	-16.50	-0.0088	-30.45	-0.0162
30	-5.10	-0.0061	-18.66	-0.0223	-20.00	-0.0106	-32.77	-0.0174
40	-26.50	-0.0317	-14.82	-0.0177	-39.50	-0.0210	-27.64	-0.0147
50	-29.10	-0.0348	-40.16	-0.0480	-57.90	-0.0308	-67.22	-0.0358

8.4.2 UMTS Frequency Error over Temperature

Temp (°C)	UMTS Mode			
	850 MHz Band		1900 MHz Band	
	Offset (Hz)	Offset (ppm)	Offset (Hz)	Offset (ppm)
-30	-4.39	-0.0052	-5.14	-0.0027
-20	-2.64	-0.0032	-5.91	-0.0031
-10	-1.95	-0.0023	-9.54	-0.0051
0	-8.77	-0.0105	-13.05	-0.0069
10	-3.98	-0.0048	-18.36	-0.0098
20	-5.59	-0.0067	-7.71	-0.0041
30	0.85	0.0010	-7.22	-0.0038
40	-1.30	-0.0016	1.14	0.0006
50	-6.29	-0.0075	-9.86	-0.0052

8.4.3 LTE Frequency Error over Temperature

Temp (°C)	LTE Band 17: 704MHz to 716MHz				LTE Band 4: 1710MHz to 1755MHz			
	16-QAM Mode		16-QAM Mode		16-QAM Mode		8PSK Mode	
	Offset (Hz)	Offset (ppm)	Offset (Hz)	Offset (ppm)	Offset (Hz)	Offset (ppm)	Offset (Hz)	Offset (ppm)
-30	34	0.05	22	0.03	23	0.01	55	0.03
-20	43	0.06	26	0.04	-45	-0.03	33	0.02
-10	-23	-0.03	-42	-0.06	-66	-0.04	-34	-0.02
0	-12	-0.02	-74	-0.10	-24	-0.01	23	0.01
10	44	0.06	32	0.05	52	0.03	-45	-0.03
20	-23	-0.03	-12	-0.02	-11	-0.01	-64	-0.04
30	87	0.12	44	0.06	15	0.01	-22	-0.01
40	-54	-0.08	65	0.09	17	0.01	13	0.01
50	56	0.08	-32	-0.05	43	0.02	45	0.03

9 Frequency Stability versus Voltage

FCC 2.1055, FCC 22.355, FCC 24.235, FCC 27.54

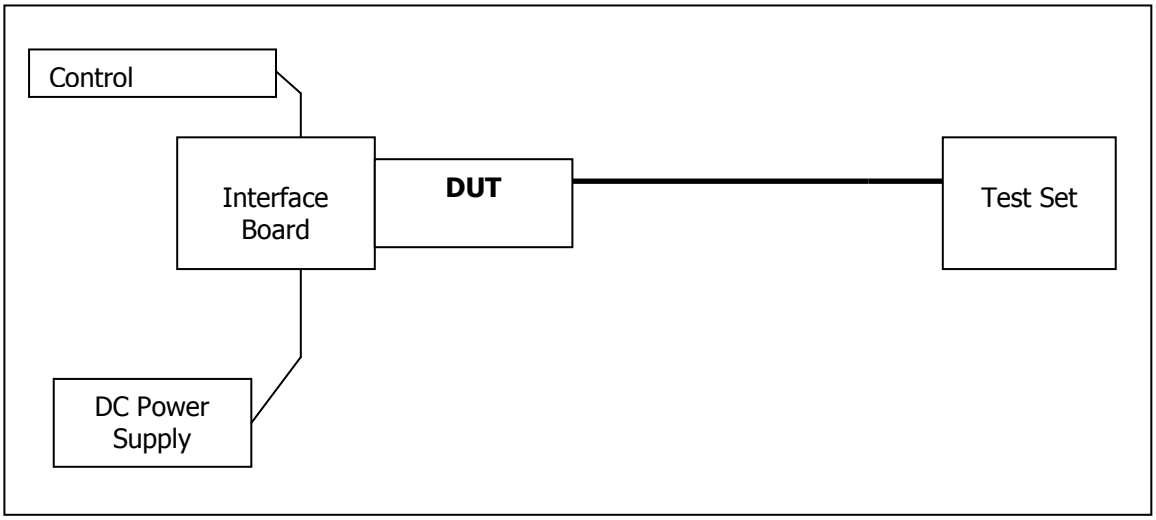
9.1 Summary of Results

The EUT is specified to operate with a supply voltage varying between 4.25VDC and 5.75VDC, having a nominal voltage of 5.0 VDC. It meets the frequency stability limit of less than 2.5ppm when supply voltage varies within the specified limits. Operation above or below these voltage limits is prohibited by firmware in order to prevent improper operation.

9.2 Test Procedure

The EUT was connected to a DC Power Supply and a UMTS test set (CMU 200, or LTE test set CMW500) with frequency error measurement capability. The power supply output was adjusted to the test voltage as measured at the input terminals to the device while transmitting. A voltmeter was used to confirm the terminal voltage. The peak frequency error is recorded (worst case). The test voltages are 4.25 volts to 5.75 volts.

Test Setup



9.3 Test Equipment

EQUIPMENT	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE
Control Computer	TC	Generic PC	100488	N/A
Wireless Test Set	Rohde & Schwarz	CMU200	110520	October 31, 2010
Wireless Test Set	Rohde & Schwarz	CMW500	101532	May 10, 2010
Spectrum Analyzer	Agilent	E4440A	US41422168	November 26, 2010
DC Power Supply	HP	6632A	3530A	N/A
Interface Board	Shop built	ATEMux	N/A	N/A
Directional Coupler	Pasternack	PE2209-10	N/A	N/A

9.4 Test Results

9.4.1 GSM Frequency Error over Voltage

Voltage (V)	Cellular Band: 824MHz to 848MHz				PCS Band: 1850MHz to 1910MHz			
	GMSK Mode		8PSK Mode		GMSK Mode		8PSK Mode	
	Offset (Hz)	Offset (ppm)	Offset (Hz)	Offset (ppm)	Offset (Hz)	Offset (ppm)	Offset (Hz)	Offset (ppm)
4.25	-34	-0.04	-74	-0.09	-12	-0.01	33	0.02
5.00	33	0.04	32	0.04	44	0.02	-34	-0.02
5.75	22	0.03	-12	-0.01	-23	-0.01	23	0.01

9.4.2 UMTS Frequency Error over Voltage

Voltage (V)	850 MHz Band		1900 MHz Band	
	Offset (Hz)	Offset (ppm)	Offset (Hz)	Offset (ppm)
4.25	22	0.03	44	0.02
5.00	26	0.03	-33	-0.02
5.75	-42	-0.05	23	0.01

9.4.3 LTE Frequency Error over Voltage

Voltage (V)	LTE Band 17: 704MHz to 716MHz				LTE Band 4: 1710MHz to 1755MHz			
	16-QAM Mode		16 QAM Mode		16-QAM Mode		16 QAM Mode	
	Offset (Hz)	Offset (ppm)	Offset (Hz)	Offset (ppm)	Offset (Hz)	Offset (ppm)	Offset (Hz)	Offset (ppm)
4.25	34	0.05	-22	-0.03	-5	0.00	-24	-0.01
5.00	-3	0.00	-21	-0.03	2	0.00	23	0.01
5.75	12	0.01	30	0.04	11	0.01	12	0.01

10 Peak to Average Ratio

FCC 27.50(d)

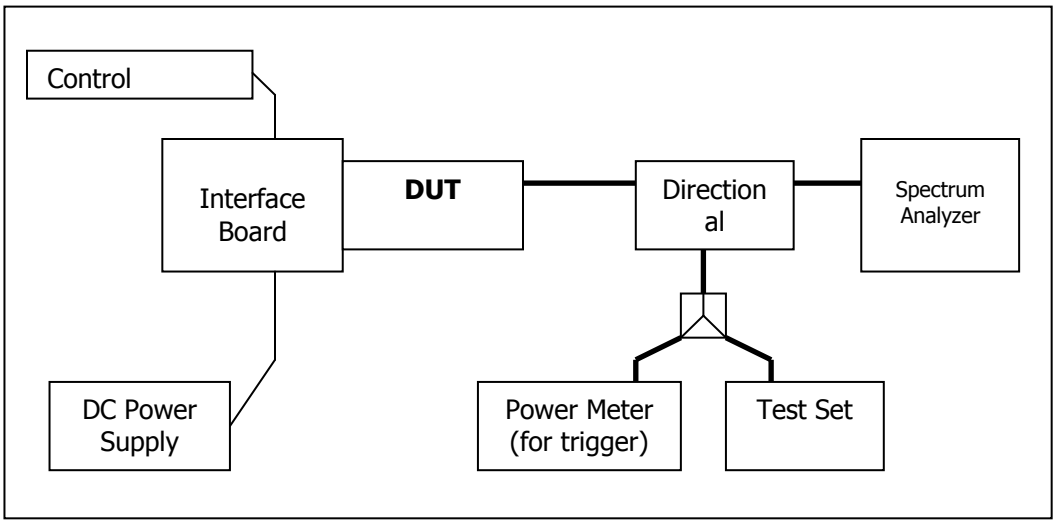
10.1 Summary of Results

The EUT meets the requirement of having a peak to average ratio of less than 13dB.

10.2 Test Procedure

The transmitter output was connected to a Rohde & Schwarz CMW500 through a coaxial RF cable and directional coupler, and configured to operate at maximum power. The peak to average ratio was measured at the required operating frequencies in each band on the Spectrum Analyzer.

Test Setup



10.3 Test Equipment

EQUIPMENT	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE
Control Computer	TC	Generic PC	100488	N/A
Wireless Test Set	Rohde & Schwarz	CMU200	110520	October 31, 2010
Wireless Test Set	Rohde & Schwarz	CMW500	101532	May 10, 2010
Spectrum Analyzer	Agilent	E4440A	US41422168	November 26, 2010
DC Power Supply	HP	6632A	3530A	N/A
Interface Board	Shop built	ATEMux	N/A	N/A
Directional Coupler	Pasternack	PE2209-10	N/A	N/A

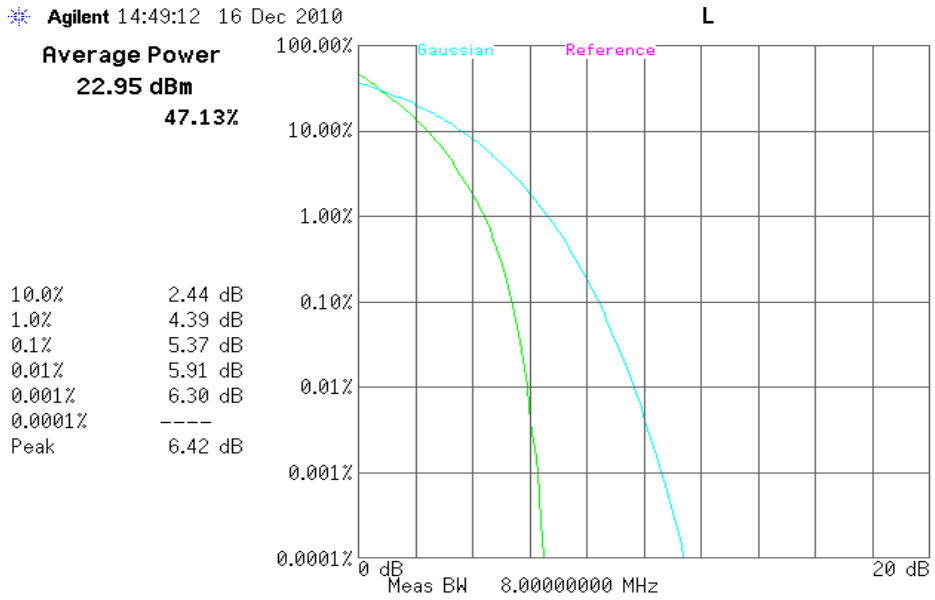
10.4 Test Results

Frequency (MHz)	Channel	Modulation	BW	RB	Plots	Peak to Average Ratio (dB)
706.6	23756	QPSK	5	25	8.5.1	6.42
710.0	23790	QPSK	5	25	8.5.2	6.58
710.0	23790	QPSK	10	50	8.5.3	6.38
713.4	23824	QPSK	5	25	8.5.4	6.39
706.6	23756	16-QAM	5	25	8.5.5	7.21
710.0	23790	16-QAM	5	25	8.5.6	7.41
710.0	23790	16-QAM	10	50	8.5.7	7.87
713.4	23824	16-QAM	5	25	8.5.8	7.31
1712.6	19975	QPSK	5	25	8.5.9	6.32
1732.5	20175	QPSK	5	25	8.5.10	6.77
1732.5	20175	QPSK	10	50	8.5.11	6.46
1752.4	20325	QPSK	5	25	8.5.12	6.05
1712.6	19975	16-QAM	5	25	8.5.13	7.03
1732.5	20175	16-QAM	5	25	8.5.14	7.46
1732.5	20175	16-QAM	10	50	8.5.15	7.67
1752.4	20325	16-QAM	5	25	8.5.16	6.86

10.5 Test Plots

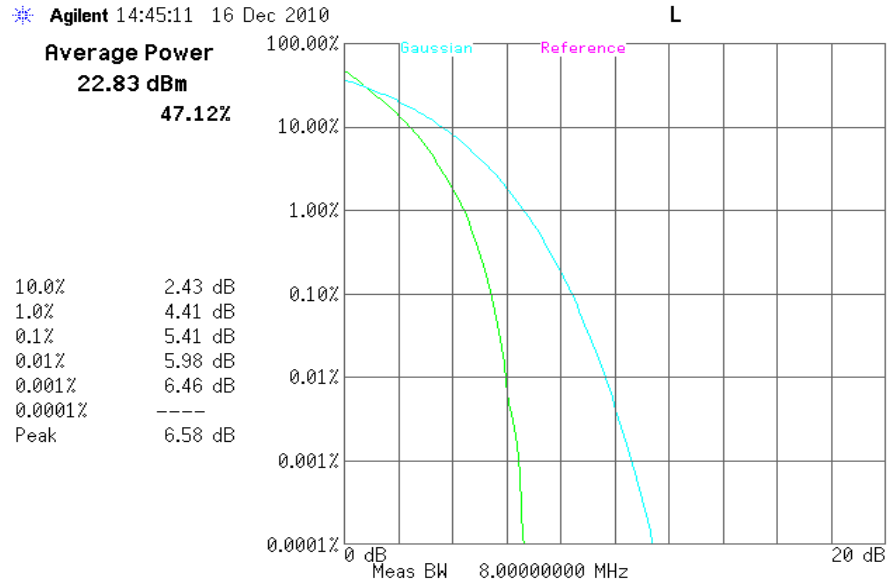
10.5.1 LTE peak to average ratio, QPSK

Band17, Low channel, 706.6 MHz, 5MHz BW, 25RB



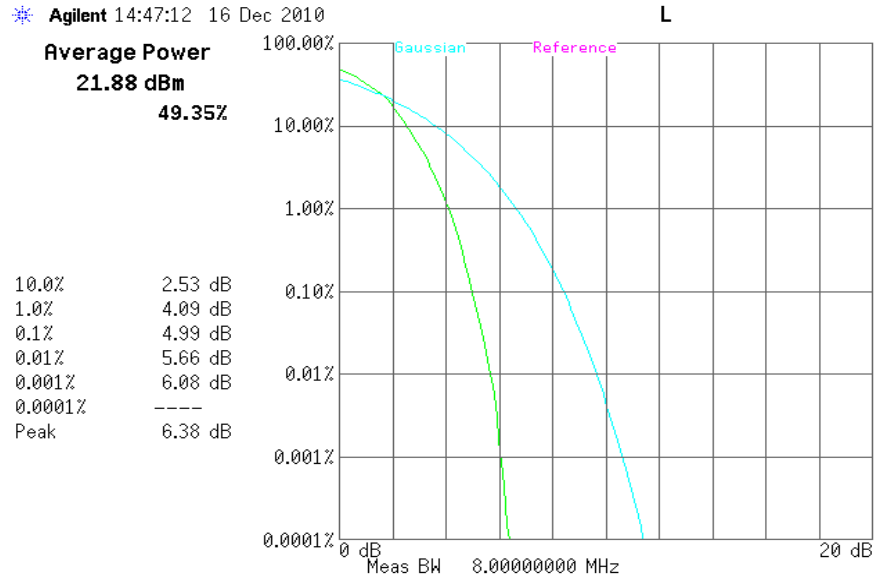
10.5.2 LTE peak to average ratio, QPSK

Band17, mid channel, 710 MHz, 5MHz BW, 25RB



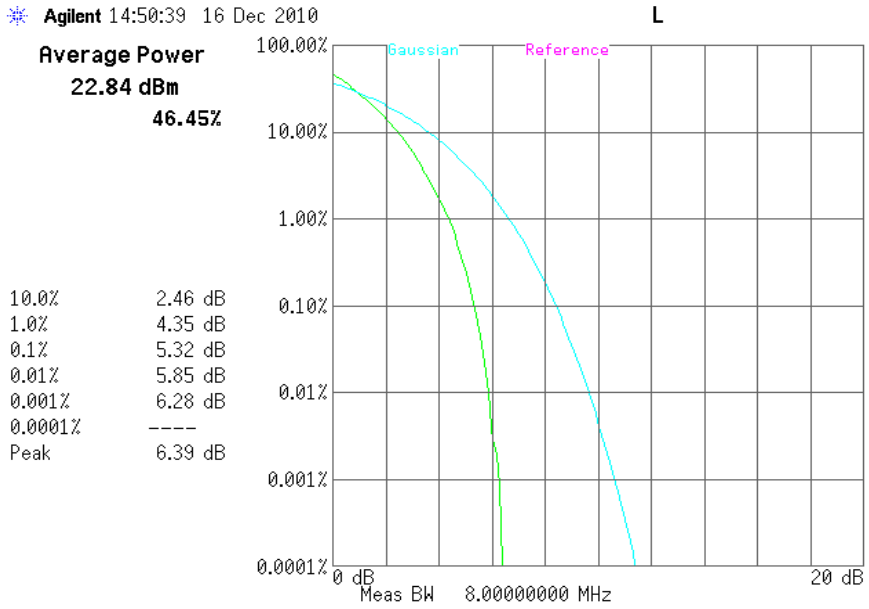
10.5.3 LTE peak to average ratio, QPSK

Band17, mid channel, 710 MHz, 10MHz BW, 50RB



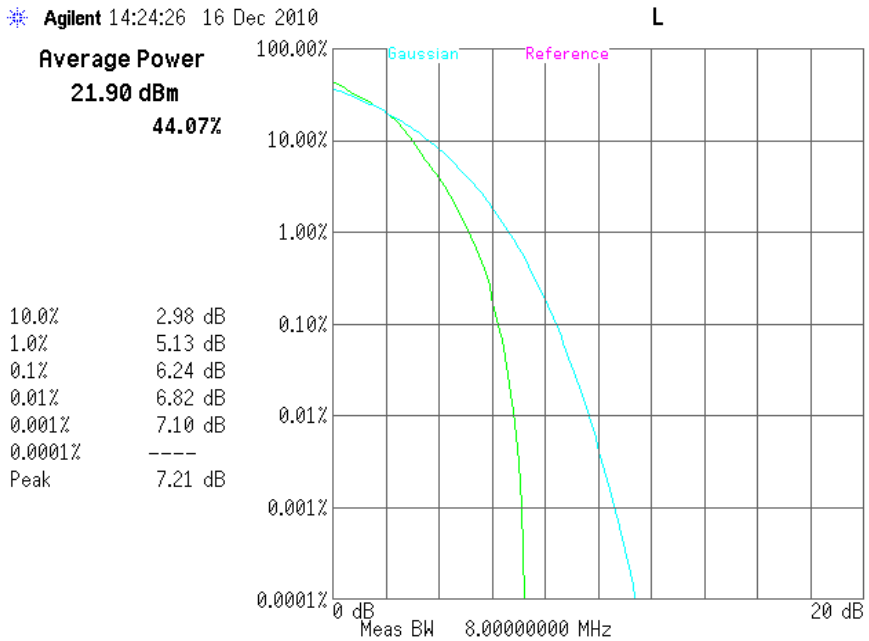
10.5.4 LTE peak to average ratio, QPSK

Band17, high channel, 710 MHz, 10MHz BW, 50RB



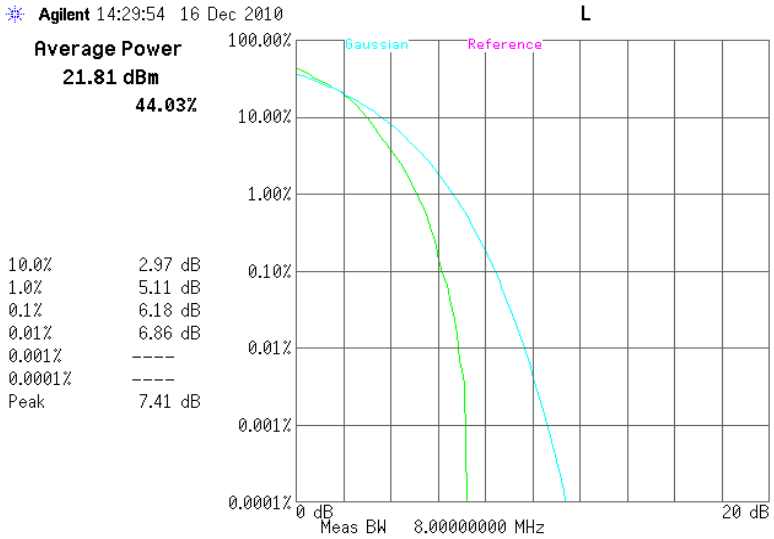
10.5.5 LTE peak to average ratio, 16-QAM

Band17, Low channel, 706.6 MHz, 5MHz BW, 25RB



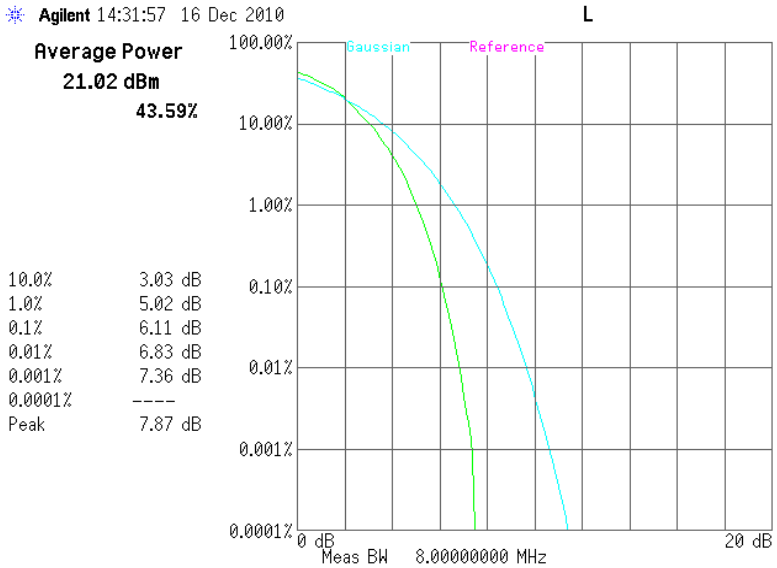
10.5.6 LTE peak to average ratio, 16-QAM

Band17, Mid channel, 710 MHz, 5MHz BW, 25RB



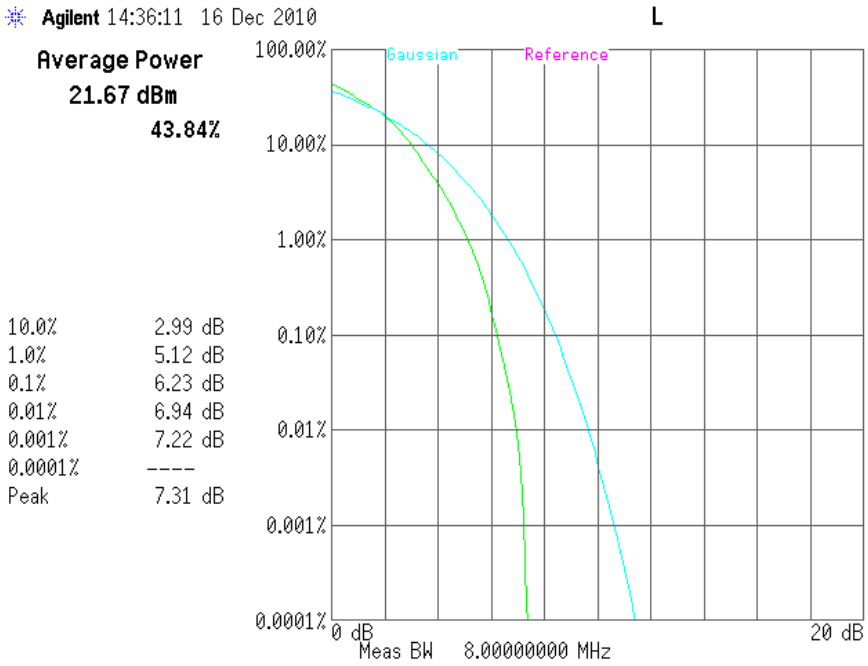
10.5.7 LTE peak to average ratio, 16-QAM

Band17, Mid channel, 710 MHz, 10MHz BW, 50RB



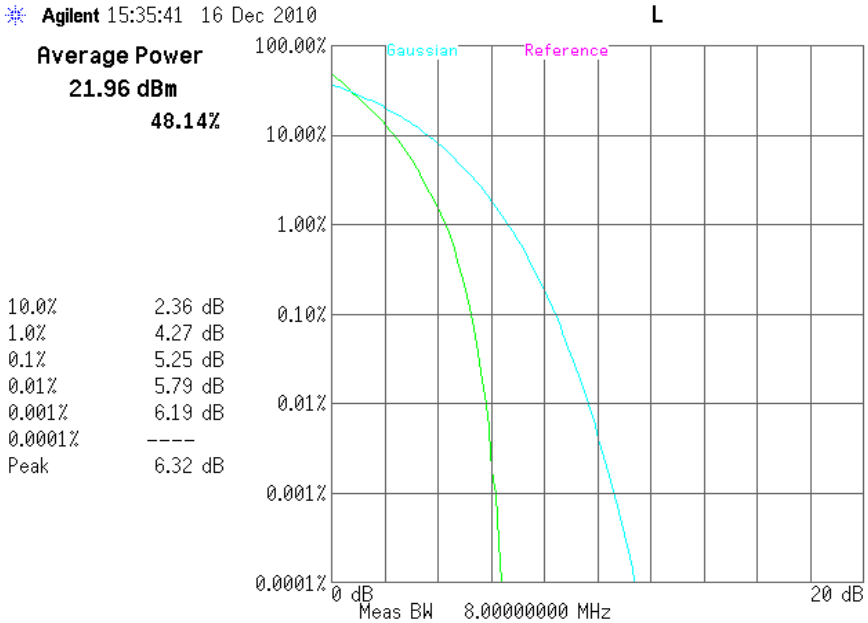
10.5.8 LTE peak to average ratio, 16-QAM

Band17, high channel, 713.4 MHz, 5MHz BW, 25RB



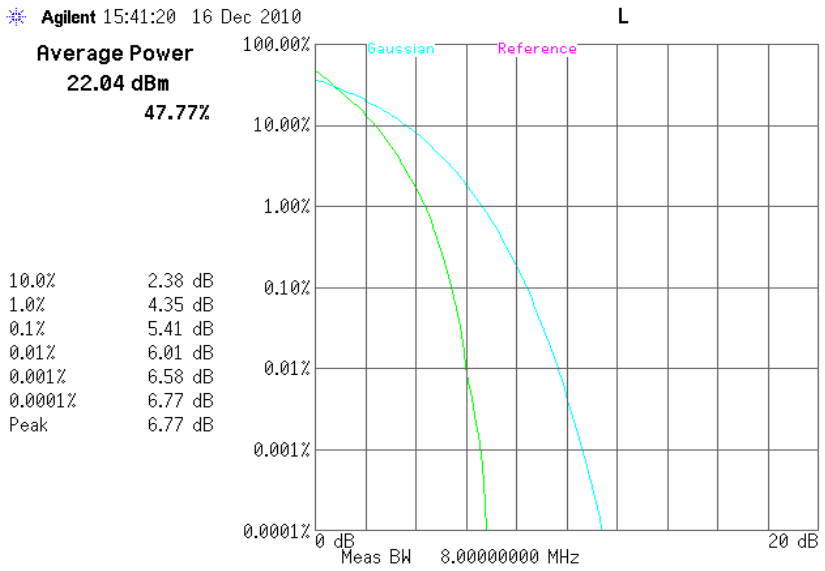
10.5.9 LTE peak to average ratio, QPSK

Band4, low channel, 1712.6 MHz, 5MHz BW, 25RB



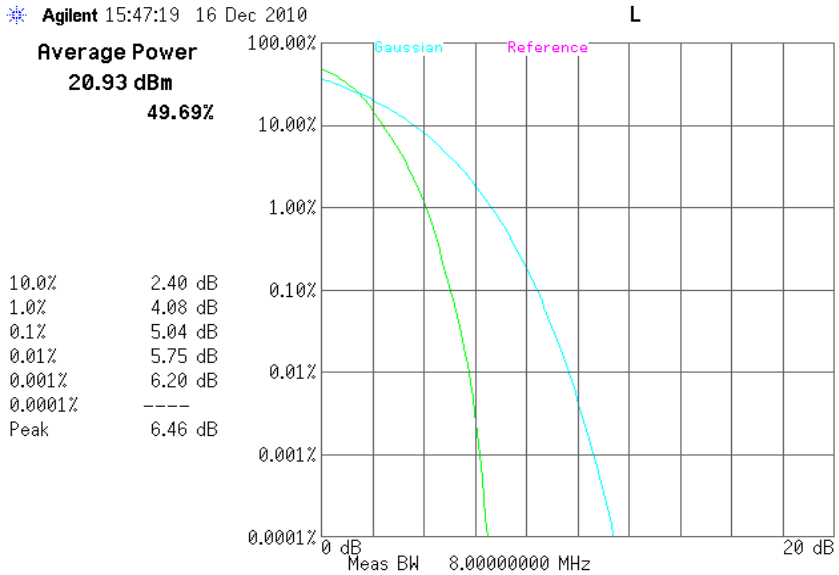
10.5.10 LTE peak to average ratio, QPSK

Band4, mid channel, 1732.5 MHz, 5MHz BW, 25RB



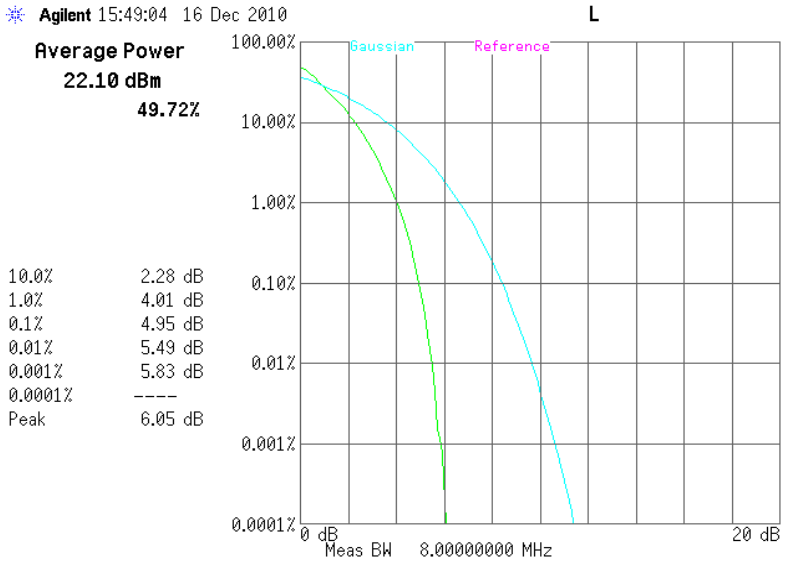
10.5.11LTE peak to average ratio, QPSK

Band4, mid channel, 1732.5 MHz, 10MHz BW, 50RB



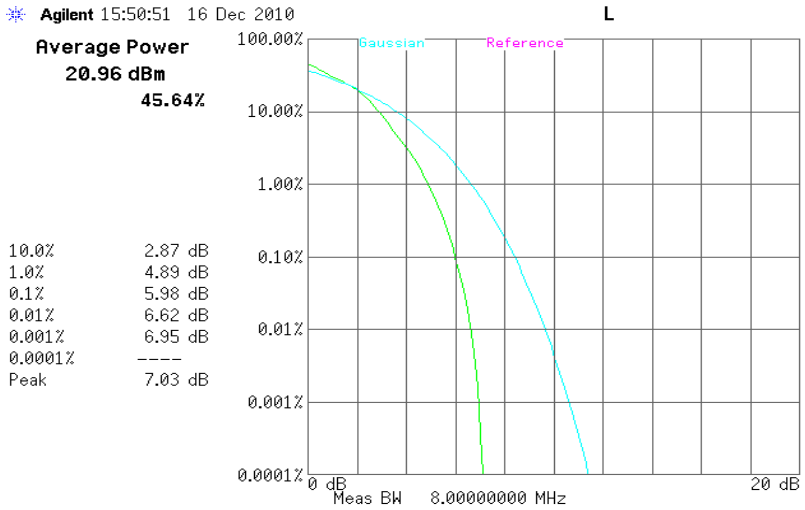
10.5.12 LTE peak to average ratio, QPSK

Band4, high channel, 1752.4 MHz, 5MHz BW, 25RB



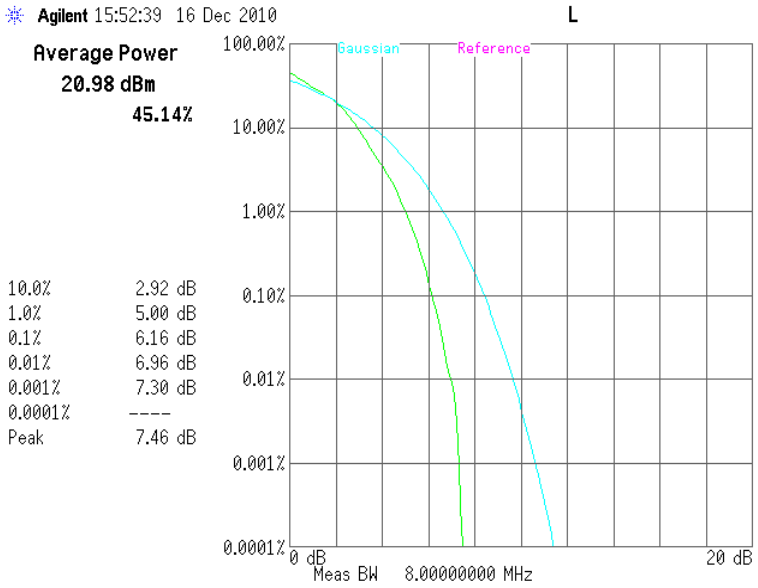
10.5.13 LTE peak to average ratio, 16QAM

Band4, low channel, 1712.6 MHz, 5MHz BW, 25RB



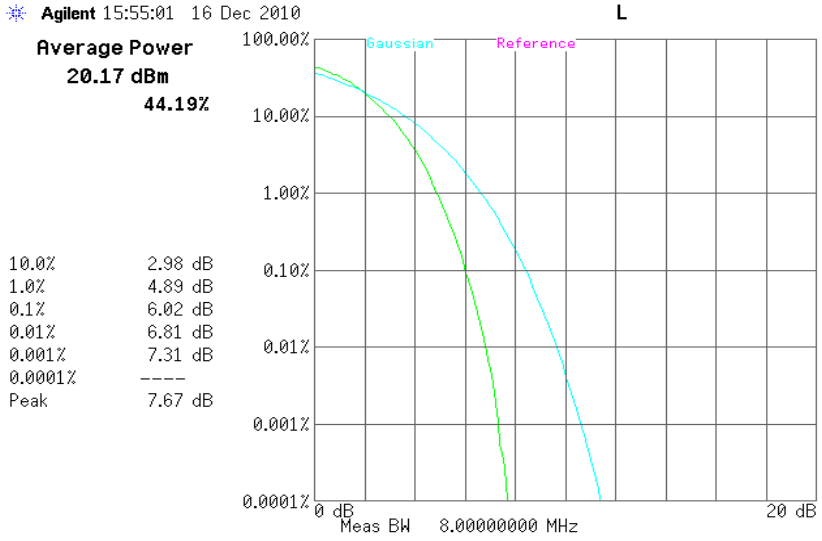
10.5.14 LTE peak to average ratio, 16QAM

Band4, mid channel, 1732.5 MHz, 5MHz BW, 25RB



10.5.15 LTE peak to average ratio, 16QAM

Band4, mid channel, 1732.5 MHz, 10MHz BW, 50RB



10.5.16 LTE peak to average ratio, 16QAM

Band4, high channel, 1752.4 MHz, 5MHz BW, 25RB