



FCC RF Test Report

APPLICANT : HTC Corporation
EQUIPMENT : Smartphone
MODEL NAME : OP90300
FCC ID : NM80P90300
STANDARD : 47 CFR Part 2, 27
CLASSIFICATION : PCS Licensed Transmitter Held to Ear (PCE)

The product was received on Jun. 05, 2014 and testing was completed on Jul. 12, 2014. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA / EIA-603-C-2004 and the testing has shown the tested sample to be in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG460526B	Rev. 01	Initial issue of report	Jul. 28, 2014



SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	§2.1046	RSS-Gen(4.8) RSS-130(4.4) RSS-139 (6.4)	Conducted Output Power	Reporting Only	PASS	-
3.2	N/A	RSS-130(4.4) RSS-139 (6.4)	Peak-to-Average Ratio	Reporting Only	PASS	-
3.3	§27.50(b)(10)	N/A	Effective Radiated Power (Band 13)	ERP < 3 Watt	PASS	-
3.3	§27.50(d)(4)	RSS-139 (6.4) SRSP-513(5.1.2)	Equivalent Isotropic Radiated Power (Band 4)	EIRP < 1Watt		
3.4	§2.1049 §27.53(h)(3)	RSS-GEN(4.6.1) RSS-139 (3.1)	Occupied Bandwidth	Reporting Only	PASS	-
3.5	§2.1051 §27.53(c)(2) §27.53(h)	RSS-GEN(4.9) RSS-130(4.6) RSS-139 (6.5)	Conducted Band Edge Measurement (Band 4) (Band 13)	< 43+10log ₁₀ (P[Watt])	PASS	-
3.6	§2.1051 §27.53(c)(2) §27.53(h)	RSS-GEN(4.9) RSS-130(4.6) RSS-139 (6.5)	Conducted Spurious Emission (Band 4) (Band 13)	< 43+10log ₁₀ (P[Watts])	PASS	-
3.7	§2.1053 §27.53(c)(2) §27.53(h)	RSS-GEN(4.9) RSS-130(4.6) RSS-139 (6.5)	Radiated Spurious Emission (Band 4) (Band 13)	< 43+10log ₁₀ (P[Watts])	PASS	Under limit 12.79 dB at 1600.000 MHz
3.8	§2.1055 §27.54	RSS-GEN(4.7) RSS-130(4.3) RSS-139 (6.3)	Frequency Stability Temperature & Voltage	< 2.5 ppm	PASS	



1 General Description

1.1 Applicant

HTC Corporation

No. 23, Xinghua Rd., Taoyuan City, Taoyuan County 330, Taiwan.

1.2 Manufacturer

HTC Corporation

No.23, Xinghua Rd., Taoyuan City, Taoyuan County 330, Taiwan.

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Smartphone
Model Name	0P9O300
Sample 1	EUT with LCM, Camera Front, Camera Back, and Battery 1
Sample 2	EUT with LCM, Camera Front, Camera Back, and Battery 2
FCC ID	NM80P9O300
EUT supports Radios application	CDMA/EV-DO/LTE/NFC WLAN 11b/g/n HT20 Bluetooth v4.0 EDR/LE
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. All the tests were performance with Sample 1.



1.4 Product Specification subjective to this standard

Product Specification subjective to this standard	
Tx Frequency	LTE Band 4 : 1710.7 MHz ~ 1754.3 MHz LTE Band 13 : 779.5 MHz ~ 784.5 MHz
Rx Frequency	LTE Band 4 : 2110.7 MHz ~ 2154.3 MHz LTE Band 13 : 748.5 MHz ~ 753.5 MHz
Bandwidth	LTE Band 4 : 1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz LTE Band 13 : 5MHz / 10MHz
Maximum Output Power to Antenna	LTE Band 4 : 22.97 dBm LTE Band 13 : 22.95 dBm
Antenna Type	Fixed Internal Antenna
Antenna Gain	LTE Band 4 : -2.20 dBi LTE Band 13 : -3.10 dBi
Type of Modulation	QPSK / 16QAM

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Maximum ERP/EIRP Power, Frequency Tolerance, and Emission Designator

FCC Rule	System	Type of Modulation	BW	Emission Designator	Frequency Tolerance (ppm)	Maximum ERP/EIRP
Part 27	LTE Band 4	QPSK	5MHz	4M50G7D	-	0.08
Part 27	LTE Band 4	16QAM	5MHz	4M50D7W	-	0.06
Part 27	LTE Band 4	QPSK	10MHz	9M06G7D	0.006 ppm	-
Part 27	LTE Band 4	16QAM	10MHz	9M04D7W	-	-
Part 27	LTE Band 4	QPSK	15MHz	13M5G7D	-	0.11
Part 27	LTE Band 4	16QAM	15MHz	13M5D7W	-	0.08
Part 27	LTE Band 4	QPSK	20MHz	18M4G7D	-	0.11
Part 27	LTE Band 4	16QAM	20MHz	18M4D7W	-	0.08
Part 27	LTE Band 13	QPSK	10MHz	9M06G7D	0.007 ppm	0.05
Part 27	LTE Band 13	16QAM	10MHz	9M06D7W	-	0.03



1.7 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sporton Site No.	
	TH02-HY	03CH07-HY

1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 2, 27
- ♦ ANSI / TIA / EIA-603-C-2004
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v02r01

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



2 Test Configuration of Equipment Under Test

2.1 Test Mode

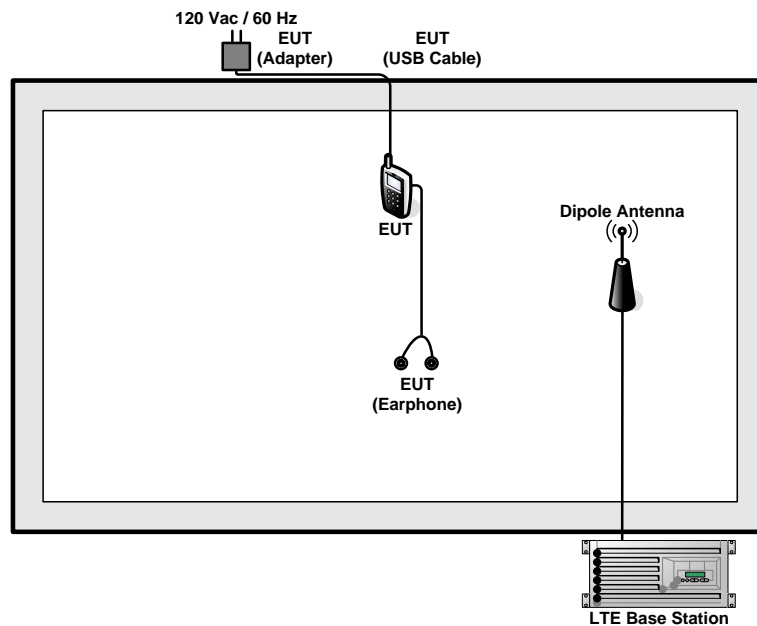
Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v02r01 with maximum output power.

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes to find the maximum emission.

Test Items	Band	Bandwidth (MHz)						Modulation		RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
Max. Output Power	4	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	13	-	-	-	✓	-	-	✓	✓	✓	✓	✓	✓	✓	✓
Peak-to-Average Ratio	4	-	-				✓		✓	✓		✓	✓	✓	✓
	13	-	-	-	✓	-	-		✓	✓		✓	✓	✓	✓
26dB and 99% Bandwidth	4	-	-	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
	13	-	-	-	✓	-	-	✓	✓			✓	✓	✓	✓
Conducted Band Edge	4	-	-	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓
	13	-	-	-	✓	-	-	✓	✓	✓		✓	✓		✓
Conducted Spurious Emission	4	-	-	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓
	17	-	-	-	✓	-	-	✓	✓	✓			✓	✓	✓
Frequency Stability	4	-	-		✓			✓				✓		✓	
	17	-	-	-	✓	-	-	✓				✓		✓	
E.R.P./ E.I.R.P.	4	-	-	✓		✓	✓	✓	✓	✓			✓	✓	✓
	13	-	-	-	✓	-	-	✓	✓	✓			✓	✓	✓

Test Items	Band	Bandwidth (MHz)						Modulation		RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
Radiated	4	-	-	√	√	√	√	√		√			√	√	√
Spurious Emission	17	-	-	-	√	-	-	√		√			√	√	√
Note	<p>1. The mark “√ “ means that this configuration is chosen for testing</p> <p>2. The mark “-“ means that this bandwidth is not supported.</p> <p>3. For E.R.P/E.I.R.P. measurement, the widest bandwidth of each band is chosen for testing due to highest conducted power. Besides, the lowest bandwidth of each band is also measured for reporting only.</p> <p>4. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported.</p>														

2.2 Connection Diagram of Test System





2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	LTE Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

Example :

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\ &= 4.2 + 10 = 14.2 \text{ (dB)} \end{aligned}$$

3 Test Result

3.1 Conducted Output Power Measurement and ERP/EIRP Measurement

3.1.1 Description of the Conducted Output Power Measurement and ERP/EIRP Measurement

A system simulator was used to establish communication with the EUT. Its parameters were set to force the EUT transmitting at maximum output power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The ERP of mobile transmitters must not exceed 3 Watts for Band 13

The EIRP of mobile transmitters must not exceed 1 Watts for LTE Band 4.

According to KDB 412172 D01 Power Approach,

$EIRP = P_T + G_T - L_C$, $ERP = EIRP - 2.15$, where

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

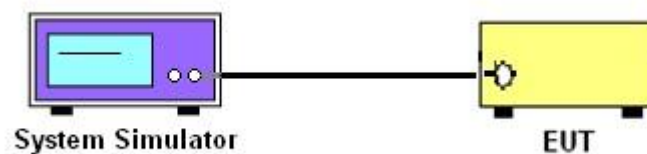
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through the system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure and record the power level from the system simulator.

3.1.4 Test Setup





3.1.5 Test Result of Conducted Output Power

<LTE Band 4 Conducted Power>

BW [MHz]	Modulation	RB Size	RB Offset	Power (dBm) Low Ch. / Freq.	Power (dBm) Middle Ch. / Freq.	Power (dBm) High Ch. / Freq.
Channel				20050	20175	20300
Frequency (MHz)				1720	1732.5	1745
20	QPSK	1	0	22.97	22.96	22.90
20	QPSK	1	49	22.95	22.69	22.86
20	QPSK	1	99	22.64	22.67	22.89
20	QPSK	50	0	21.95	21.84	21.76
20	QPSK	50	24	21.88	21.58	21.73
20	QPSK	50	49	21.76	21.61	21.70
20	QPSK	100	0	21.87	21.71	21.78
20	16QAM	1	0	21.91	21.81	21.70
20	16QAM	1	49	21.83	21.53	21.67
20	16QAM	1	99	21.48	21.45	21.69
20	16QAM	50	0	20.90	20.71	20.60
20	16QAM	50	24	20.82	20.53	20.63
20	16QAM	50	49	20.72	20.54	20.67
20	16QAM	100	0	20.87	20.64	20.61
Channel				20025	20175	20325
Frequency (MHz)				1717.5	1732.5	1747.5
15	QPSK	1	0	22.95	22.97	22.89
15	QPSK	1	37	22.94	22.62	22.84
15	QPSK	1	74	22.58	22.65	22.88
15	QPSK	36	0	21.88	21.82	21.68
15	QPSK	36	18	21.86	21.48	21.64
15	QPSK	36	37	21.70	21.60	21.75
15	QPSK	75	0	21.78	21.64	21.70
15	16QAM	1	0	21.82	21.80	21.66
15	16QAM	1	37	21.73	21.49	21.64
15	16QAM	1	74	21.41	21.40	21.59
15	16QAM	36	0	20.90	20.70	20.53
15	16QAM	36	18	20.78	20.50	20.53
15	16QAM	36	37	20.67	20.47	20.62
15	16QAM	75	0	20.80	20.59	20.52



BW [MHz]	Modulation	RB Size	RB Offset	Power (dBm) Low Ch. / Freq.	Power (dBm) Middle Ch. / Freq.	Power (dBm) High Ch. / Freq.
Channel				20000	20175	20350
Frequency (MHz)				1715	1732.5	1750
10	QPSK	1	0	22.96	22.90	22.80
10	QPSK	1	24	22.93	22.64	22.85
10	QPSK	1	49	22.63	22.57	22.83
10	QPSK	25	0	21.90	21.77	21.63
10	QPSK	25	12	21.85	21.57	21.72
10	QPSK	25	24	21.74	21.59	21.67
10	QPSK	50	0	21.86	21.64	21.71
10	16QAM	1	0	21.88	21.78	21.60
10	16QAM	1	24	21.81	21.50	21.61
10	16QAM	1	49	21.47	21.35	21.59
10	16QAM	25	0	20.80	20.67	20.54
10	16QAM	25	12	20.80	20.46	20.60
10	16QAM	25	24	20.71	20.45	20.59
10	16QAM	50	0	20.86	20.58	20.56
Channel				19975	20175	20375
Frequency (MHz)				1712.5	1732.5	1752.5
5	QPSK	1	0	22.96	22.95	22.86
5	QPSK	1	12	22.93	22.59	22.82
5	QPSK	1	24	22.62	22.58	22.81
5	QPSK	12	0	21.90	21.74	21.64
5	QPSK	12	6	21.78	21.51	21.68
5	QPSK	12	11	21.66	21.54	21.70
5	QPSK	25	0	21.83	21.65	21.70
5	16QAM	1	0	21.88	21.74	21.61
5	16QAM	1	12	21.77	21.43	21.59
5	16QAM	1	24	21.45	21.37	21.59
5	16QAM	12	0	20.85	20.62	20.54
5	16QAM	12	6	20.76	20.51	20.59
5	16QAM	12	11	20.62	20.52	20.66
5	16QAM	25	0	20.77	20.58	20.60



<LTE Band 13 Conducted Power>

BW [MHz]	Modulation	RB Size	RB Offset	Power (dBm) Low Ch. / Freq.	Power (dBm) Middle Ch. / Freq.	Power (dBm) High Ch. / Freq.
Channel					23230	
Frequency (MHz)					782	
10	QPSK	1	0		22.95	
10	QPSK	1	24		22.91	
10	QPSK	1	49		22.92	
10	QPSK	25	0		21.94	
10	QPSK	25	12		21.87	
10	QPSK	25	24		21.88	
10	QPSK	50	0		21.88	
10	16QAM	1	0		21.76	
10	16QAM	1	24		21.72	
10	16QAM	1	49		21.75	
10	16QAM	25	0		20.85	
10	16QAM	25	12		20.85	
10	16QAM	25	24		20.81	
10	16QAM	50	0		20.81	

Note: maximum average power for LTE.



3.1.6 Test Result of Conducted Output Power

PCS Band						
Modes	LTE Band 4 (QPSK,BW=5M)			LTE Band 4 (16QAM,BW=5M)		
Channel	19975(Low)	20175 (Mid)	20375 (High)	19975(Low)	20175 (Mid)	20375 (High)
Frequency (MHz)	1712.5	1732.5	1752.5	1712.5	1732.5	1752.5
Conducted Power P _T (dBm)	22.96	22.95	22.86	21.88	21.74	21.61
Conducted Power P _T (Watts)	0.20	0.20	0.19	0.15	0.15	0.14

PCS Band						
Modes	LTE Band 4 (QPSK,BW=10M)			LTE Band 4 (16QAM,BW=10M)		
Channel	20000 (Low)	20175 (Mid)	20350 (High)	20000 (Low)	20175 (Mid)	20350 (High)
Frequency (MHz)	1715	1732.5	1750	1715	1732.5	1750
Conducted Power P _T (dBm)	22.96	22.90	22.80	21.88	21.78	21.6
Conducted Power P _T (Watts)	0.20	0.19	0.19	0.15	0.15	0.14

PCS Band						
Modes	LTE Band 4 (QPSK,BW=15M)			LTE Band 4 (16QAM,BW=15M)		
Channel	20025 (Low)	20175 (Mid)	20325 (High)	20025 (Low)	20175 (Mid)	20325 (High)
Frequency (MHz)	1717.5	1732.5	1747.5	1717.5	1732.5	1747.5
Conducted Power P _T (dBm)	22.95	22.97	22.89	21.82	21.80	21.66
Conducted Power P _T (Watts)	0.20	0.20	0.19	0.15	0.15	0.15



PCS Band						
Modes	LTE Band 4 (QPSK,BW=20M)			LTE Band 4 (16QAM,BW=20M)		
Channel	20050 (Low)	20175 (Mid)	20300 (High)	20050 (Low)	20175 (Mid)	20300 (High)
Frequency (MHz)	1720	1732.5	1745	1720	1732.5	1745
Conducted Power P _T (dBm)	22.97	22.96	22.9	21.91	21.81	21.7
Conducted Power P _T (Watts)	0.20	0.20	0.19	0.16	0.15	0.15

Cellular Band		
Modes	LTE Band 13 (QPSK,BW=10M)	LTE Band 13 (16QAM,BW=10M)
Channel	23230 (Mid)	23230 (Mid)
Frequency (MHz)	782	782
Conducted Power P _T (dBm)	22.95	21.76
Conducted Power P _T (Watts)	0.20	0.15

3.2 Peak-to-Average Ratio

3.2.1 Description of the PAR Measurement

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

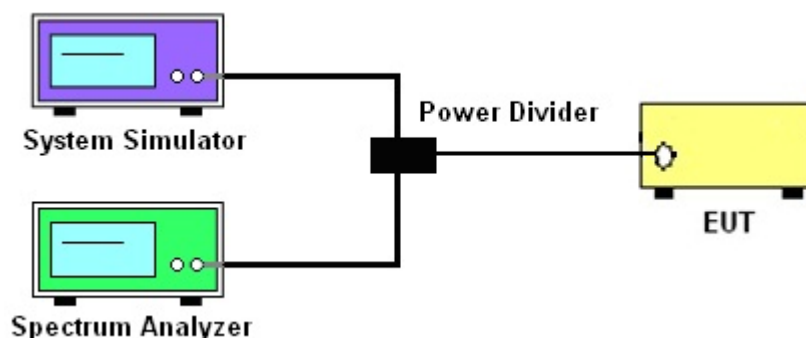
3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

1. The EUT was connected to spectrum and system simulator via a power divider.
2. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
3. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
4. Record the deviation as Peak to Average Ratio.

3.2.4 Test Setup





3.2.5 Test Result of Peak-to-Average Ratio

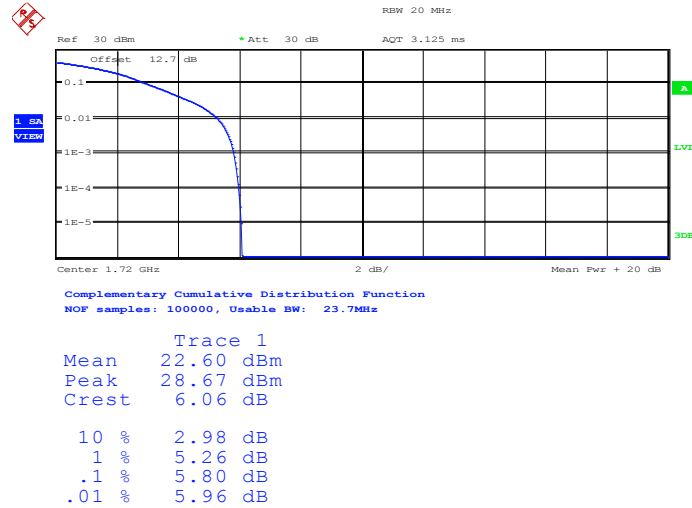
LTE Band 4						
BW [MHz]	Modulation	RB Size	RB Offset	Power (dBm) Low Ch. / Freq.	Power (dBm) Middle Ch. / Freq.	Power (dBm) High Ch. / Freq.
Channel				20050	20175	20300
Frequency (MHz)				1720	1732.5	1745
20	16QAM	1	0	5.80	5.74	5.71
20	16QAM	100	0	6.31	6.25	6.33

LTE Band 13						
BW [MHz]	Modulation	RB Size	RB Offset	Power (dBm) Low Ch. / Freq.	Power (dBm) Middle Ch. / Freq.	Power (dBm) High Ch. / Freq.
Channel					23230	
Frequency (MHz)					782	
10	16QAM	1	0		5.26	
10	16QAM	50	0		6.22	



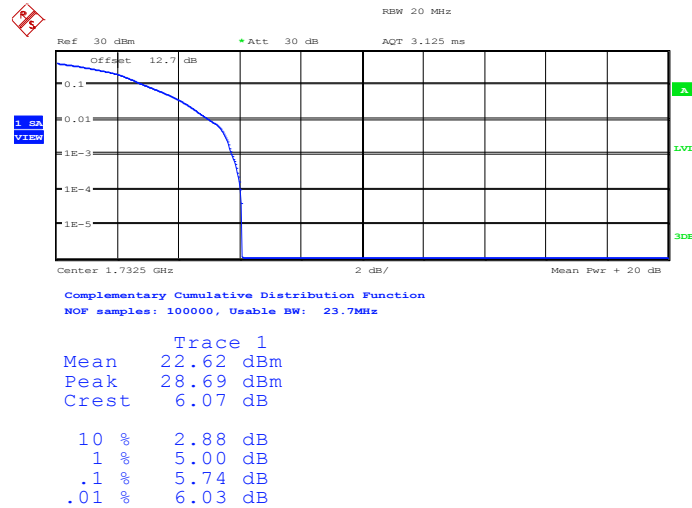
3.2.6 Peak to Average Power Ratio

Peak-to-Average Ratio on LTE Band 4 20MHz / 16QAM in Ch. 20050 (1RB Size)



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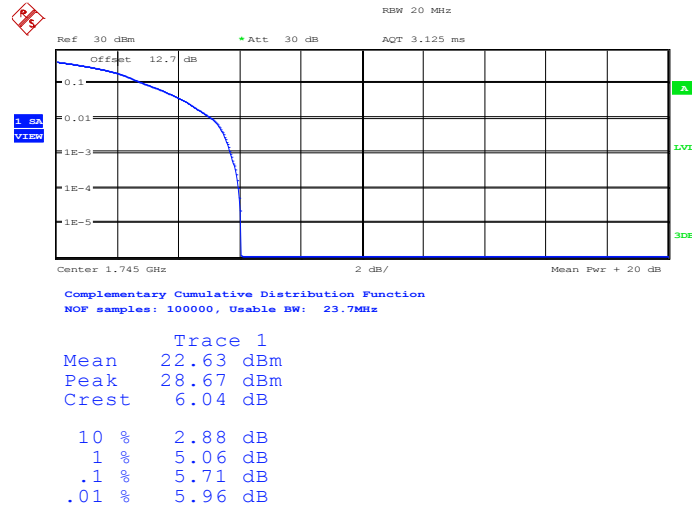
Peak-to-Average Ratio on LTE Band 4 20MHz / 16QAM in Ch. 20175 (1RB Size)



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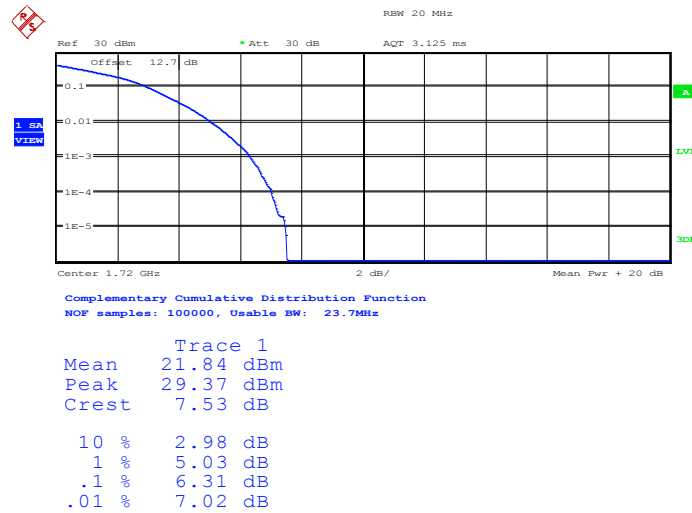


Peak-to-Average Ratio on LTE Band 4
20MHz / 16QAM in Ch. 20300 (1RB Size)



Date: 12.JUN.2014 20:03:14

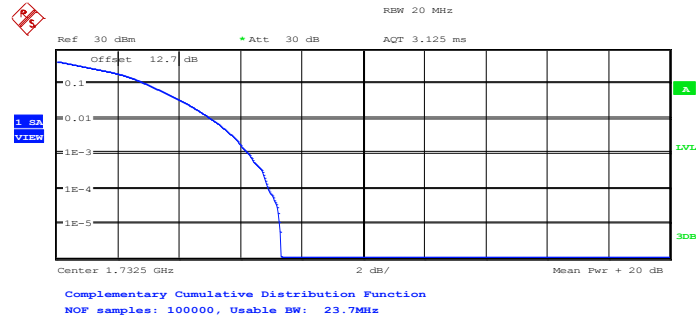
Peak-to-Average Ratio on LTE Band 4
20MHz / 16QAM in Ch. 20500 (100RB Size)



Date: 12.JUN.2014 20:01:47



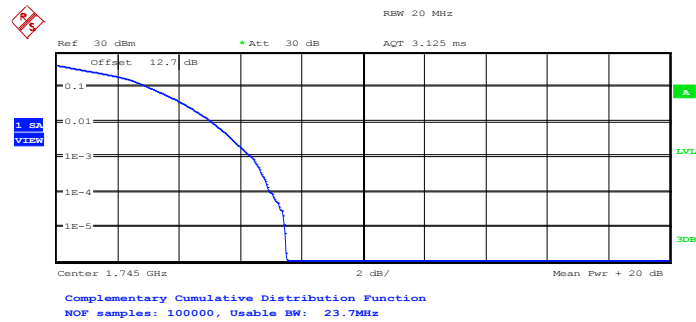
Peak-to-Average Ratio on LTE Band 4
20MHz / 16QAM in Ch. 201750 (100RB Size)



Trace 1	
Mean	21.63 dBm
Peak	28.97 dBm
Crest	7.34 dB
10 %	2.92 dB
1 %	5.03 dB
.1 %	6.25 dB
.01 %	6.92 dB

Date: 12.JUN.2014 20:03:01

Peak-to-Average Ratio on LTE Band 4
20MHz / 16QAM in Ch. 20300 (100RB Size)



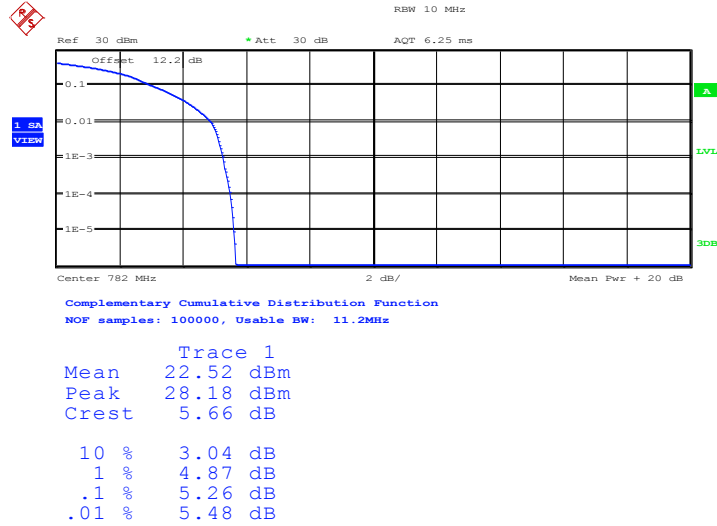
Trace 1	
Mean	21.80 dBm
Peak	29.30 dBm
Crest	7.50 dB
10 %	3.01 dB
1 %	5.06 dB
.1 %	6.35 dB
.01 %	6.99 dB

Date: 12.JUN.2014 20:03:28



Peak-to-Average Ratio on LTE Band 13

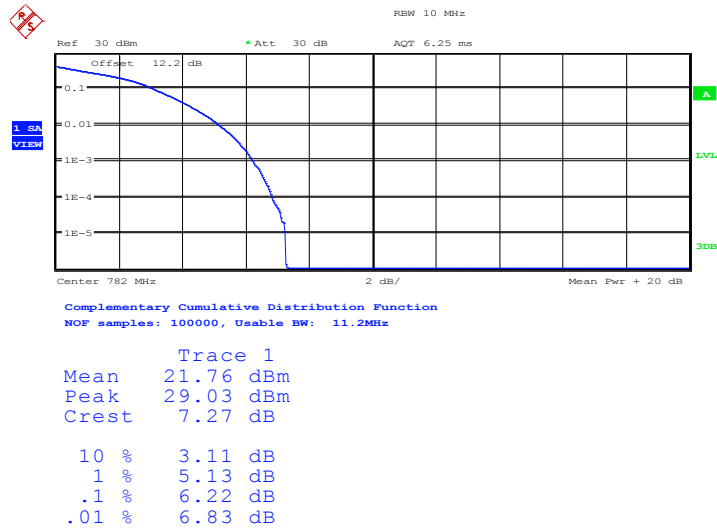
10MHz / 16QAM in Ch. 23230 (1RB Size)



Date: 12.JUN.2014 22:41:18

Peak-to-Average Ratio on LTE Band 13

10MHz / 16QAM in Ch. 23230 (50RB Size)



Date: 12.JUN.2014 22:41:38



3.3 Effective Radiated Power and Equivalent Isotropic Radiated Power Measurement

3.3.1 Description of the ERP/EIRP Measurement

Effective radiated power output measurements by substitution method according to ANSI / TIA / EIA-603-C-2004, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v02r01. Mobile and portable (hand-held) stations operating are limited to average ERP of 3 watts with LTE band 13

Equivalent isotropic radiated power output measurements by substitution method according to ANSI / TIA / EIA-603-C-2004, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v02r01. Mobile and portable (hand-held) stations operating are limited to average EIRP of 1 watt with LTE band 4.

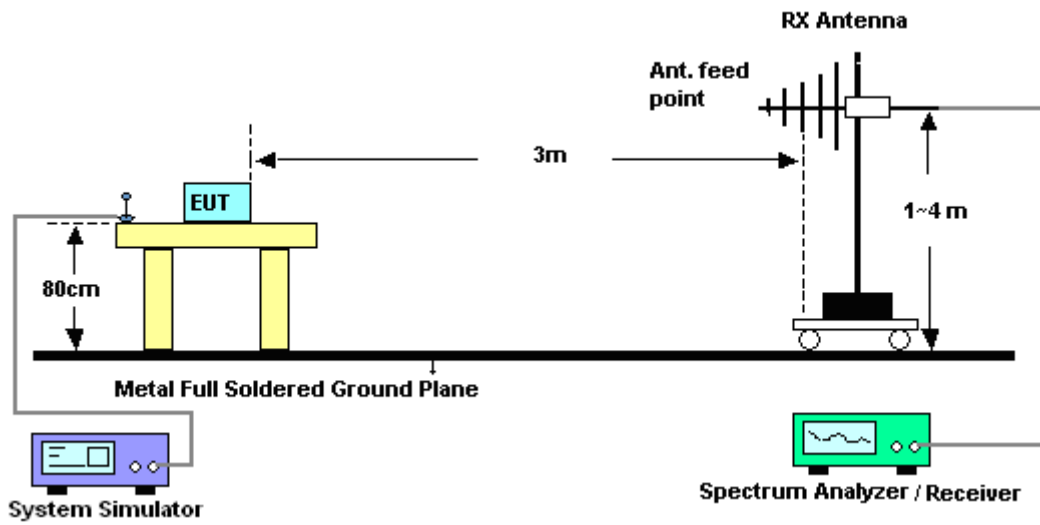
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

1. The EUT was placed on a turntable 1.5 meters high in a fully anechoic chamber.
2. The EUT was placed 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. Set RBW= 100 kHz, VBW= 300 kHz, RMS detector over frame, and use channel power option with bandwidth=5MHz, per KDB 971168 D01.
4. The table was rotated 360 degrees to determine the position of the highest radiated power.
5. The height of the receiving antenna is adjusted to look for the maximum ERP/EIRP.
6. Taking the record of maximum ERP/EIRP.
7. A dipole antenna was substituted in place of the EUT and was driven by a signal generator.
8. The conducted power at the terminal of the dipole antenna is measured.
9. Repeat step 3 to step 5 to get the maximum ERP/EIRP of the substitution antenna.
10. $ERP/EIRP = P_s + E_t - E_s + G_s = P_s + R_t - R_s + G_s$
Ps (dBm) : Input power to substitution antenna.
Gs (dBi or dBd) : Substitution antenna Gain.
 $E_t = R_t + AF$
 $E_s = R_s + AF$
AF (dB/m) : Receive antenna factor
Rt : The highest received signal in spectrum analyzer for EUT.
Rs : The highest received signal in spectrum analyzer for substitution antenna.

3.3.4 Test Setup





3.3.5 Test Result of ERP/EIRP

LTE Band 4 Radiated Power EIRP for BW 5MHz / QPSK						
Horizontal Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
1712.50	-35.35	-51.88	0.00	1.96	18.49	0.07
1732.50	-37.06	-52.99	0.00	2.00	17.93	0.06
1752.50	-37.85	-54.28	0.00	1.98	18.41	0.07
Vertical Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
1712.50	-34.93	-52.13	0.00	1.96	19.16	0.08
1732.50	-37.07	-53.17	0.00	2.00	18.10	0.06
1752.50	-37.11	-54.13	0.00	1.98	19.00	0.08

LTE Band 4 Radiated Power EIRP for BW 5MHz / 16QAM						
Horizontal Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
1712.50	-36.71	-51.88	0.00	1.96	17.13	0.05
1732.50	-38.38	-52.99	0.00	2.00	16.61	0.05
1752.50	-39.21	-54.28	0.00	1.98	17.06	0.05
Vertical Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
1712.50	-36.33	-52.13	0.00	1.96	17.76	0.06
1732.50	-38.45	-53.17	0.00	2.00	16.72	0.05
1752.50	-38.45	-54.13	0.00	1.98	17.66	0.06



LTE Band 4 Radiated Power EIRP for BW 15MHz / QPSK						
Horizontal Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
1717.50	-33.61	-51.88	0.00	1.96	20.23	0.11
1732.50	-35.32	-52.99	0.00	2.00	19.67	0.09
1745.50	-36.85	-54.28	0.00	1.98	19.41	0.09
Vertical Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
1717.50	-35.93	-52.13	0.00	1.96	18.16	0.07
1732.50	-37.49	-53.17	0.00	2.00	17.68	0.06
1745.50	-38.38	-54.13	0.00	1.98	17.73	0.06

LTE Band 4 Radiated Power EIRP for BW 15MHz / 16QAM						
Horizontal Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
1717.50	-34.85	-51.88	0.00	1.96	18.99	0.08
1732.50	-36.58	-52.99	0.00	2.00	18.41	0.07
1745.50	-38.06	-54.28	0.00	1.98	18.20	0.07
Vertical Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
1717.50	-37.29	-52.13	0.00	1.96	16.80	0.05
1732.50	-38.47	-53.17	0.00	2.00	16.70	0.05
1745.50	-39.61	-54.13	0.00	1.98	16.50	0.04



LTE Band 4 Radiated Power EIRP for BW 20MHz / QPSK						
Horizontal Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
1720.00	-33.62	-51.88	0.00	1.96	20.22	0.11
1732.50	-35.30	-52.99	0.00	2.00	19.69	0.09
1745.00	-37.03	-54.28	0.00	1.98	19.23	0.08
Vertical Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
1720.00	-36.09	-52.13	0.00	1.96	18.00	0.06
1732.50	-37.39	-53.17	0.00	2.00	17.78	0.06
1745.00	-38.46	-54.13	0.00	1.98	17.65	0.06

LTE Band 4 Radiated Power EIRP for BW 20MHz / 16QAM						
Horizontal Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
1720.00	-35.08	-51.88	0.00	1.96	18.76	0.08
1732.50	-36.73	-52.99	0.00	2.00	18.26	0.07
1745.00	-38.17	-54.28	0.00	1.98	18.09	0.06
Vertical Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
1720.00	-37.51	-52.13	0.00	1.96	16.58	0.05
1732.50	-38.86	-53.17	0.00	2.00	16.31	0.04
1745.00	-39.87	-54.13	0.00	1.98	16.24	0.04



LTE Band 13 Radiated Power ERP for BW 10MHz / QPSK						
Horizontal Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
782.00	-31.23	-48.92	0.00	-0.93	16.76	0.05
Vertical Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
782.00	-38.73	-48.42	0.00	-0.93	8.76	0.01

LTE Band 13 Radiated Power ERP for BW 10MHz / 16QAM						
Horizontal Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
782.00	-32.72	-48.92	0.00	-0.93	15.27	0.03
Vertical Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
782.00	-40.15	-48.42	0.00	-0.93	7.34	0.01

3.4 Occupied Bandwidth

3.4.1 Description of Occupied Bandwidth Measurement

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

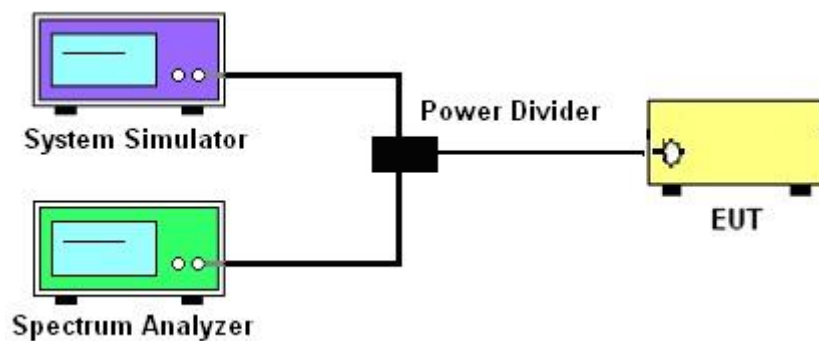
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The 26dB and 99% occupied bandwidth (BW) of the middle channel for the highest RF power with full RB sizes were measured.

3.4.4 Test Setup

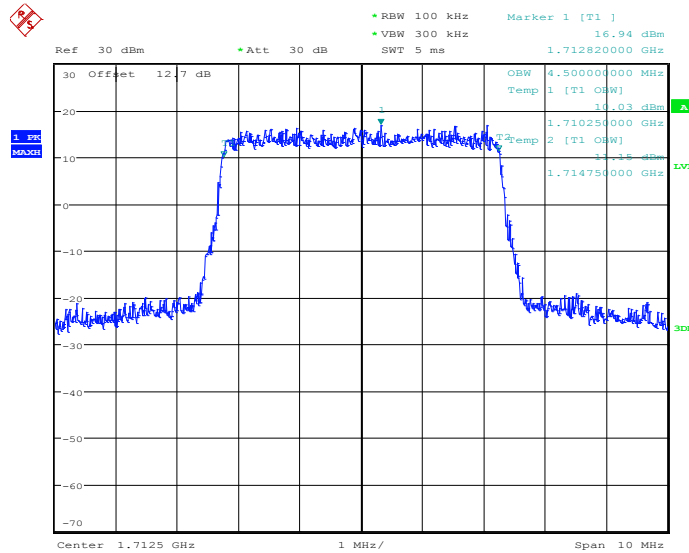




3.4.5 Test Result (Plots) of Occupied Bandwidth

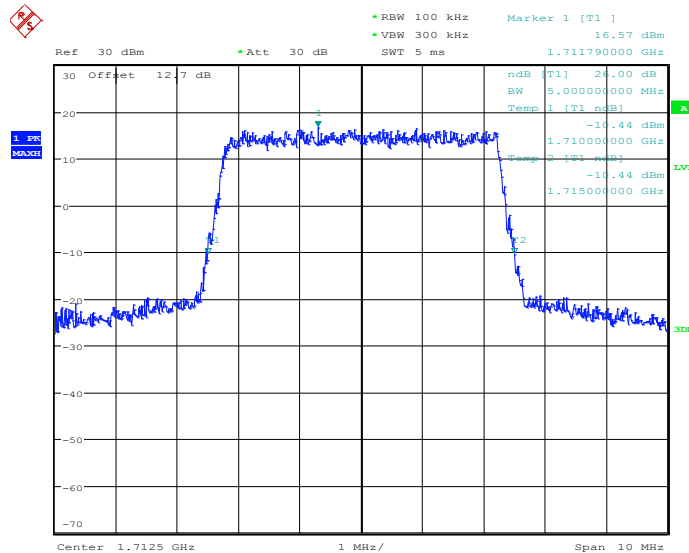
Band :	LTE Band 4	BW / Mod. :	5MHz / QPSK
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99% Occupied Bandwidth Plot on Channel 19975



Date: 11.JUN.2014 01:49:23

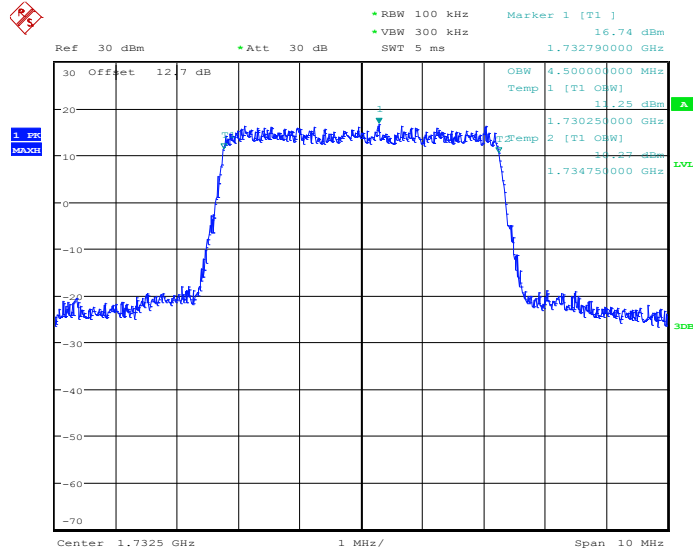
26dB Bandwidth Plot on Channel 19975



Date: 11.JUN.2014 01:50:00

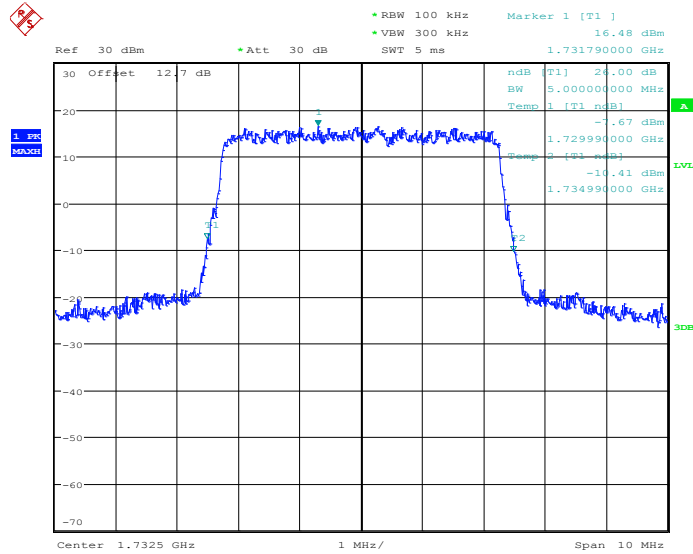


99% Occupied Bandwidth Plot on Channel 20175



Date: 11.JUN.2014 01:55:56

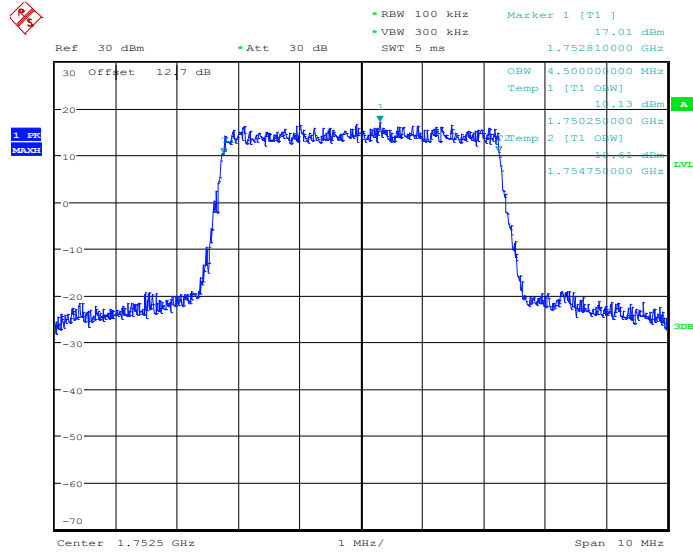
26dB Bandwidth Plot on Channel 20175



Date: 11.JUN.2014 01:56:33

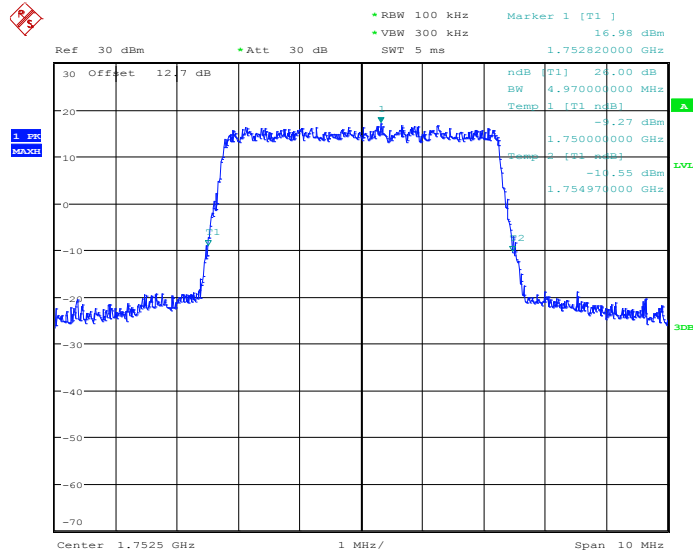


99% Occupied Bandwidth Plot on Channel 20375



Date: 11.JUN.2014 01:59:14

26dB Bandwidth Plot on Channel 20375

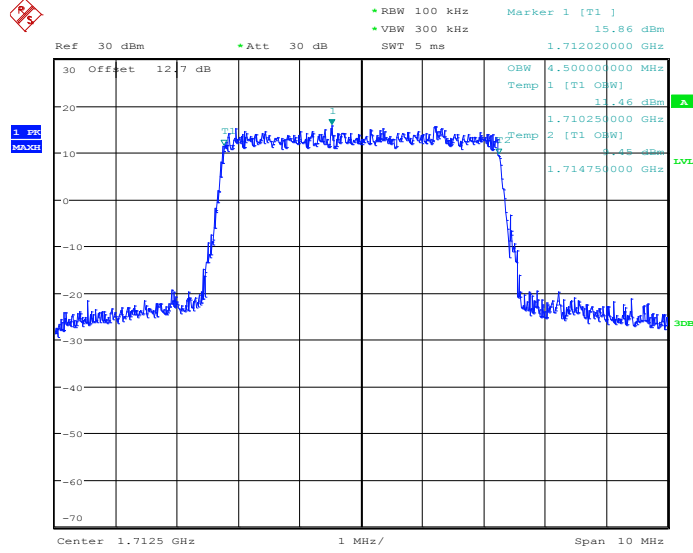


Date: 11.JUN.2014 01:59:50



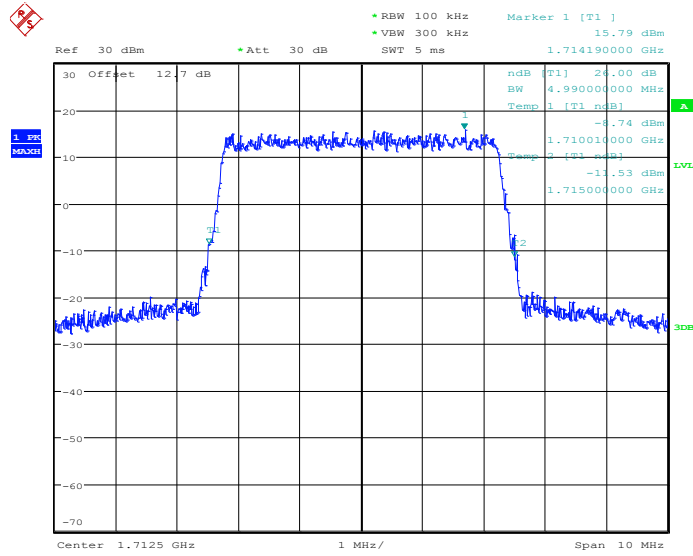
Band :	LTE Band 4	BW / Mod. :	5MHz / 16QAM
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99% Occupied Bandwidth Plot on Channel 19975



Date: 11.JUN.2014 01:49:41

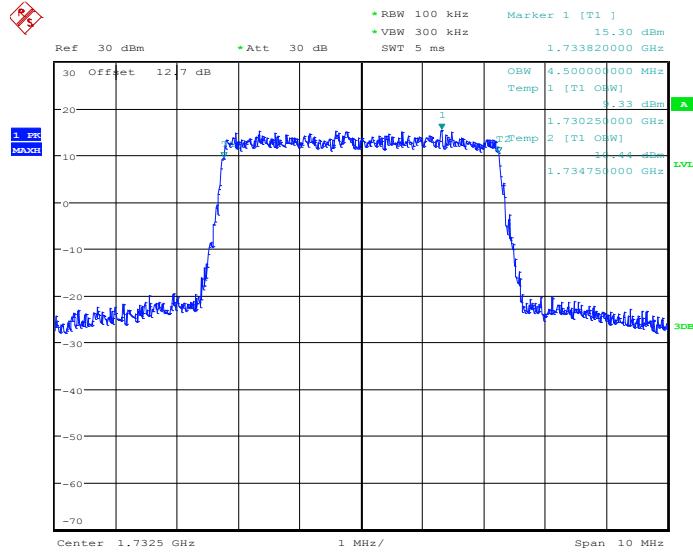
26dB Bandwidth Plot on Channel 19975



Date: 11.JUN.2014 01:50:19

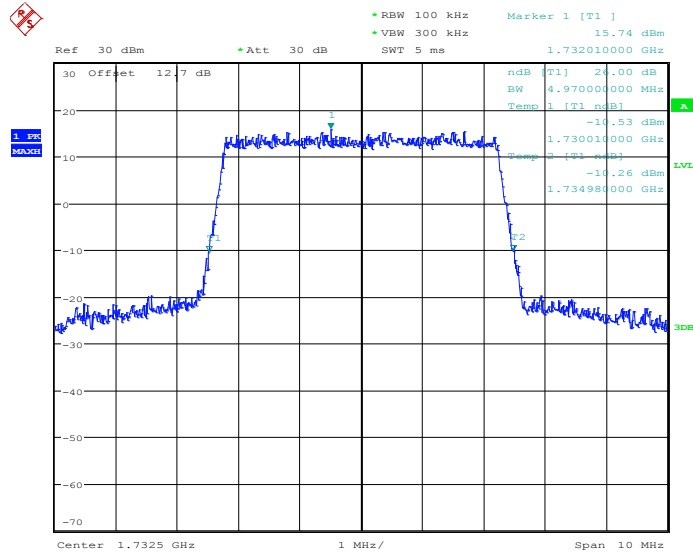


99% Occupied Bandwidth Plot on Channel 20175



Date: 11.JUN.2014 01:56:14

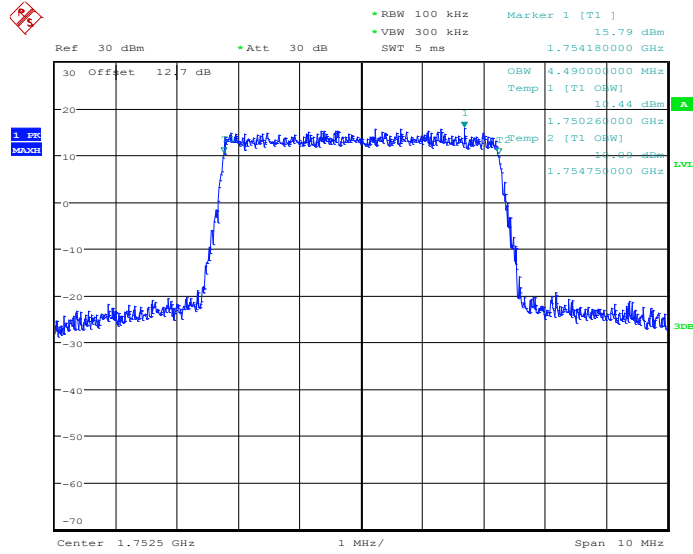
26dB Bandwidth Plot on Channel 20175



Date: 11.JUN.2014 01:56:52

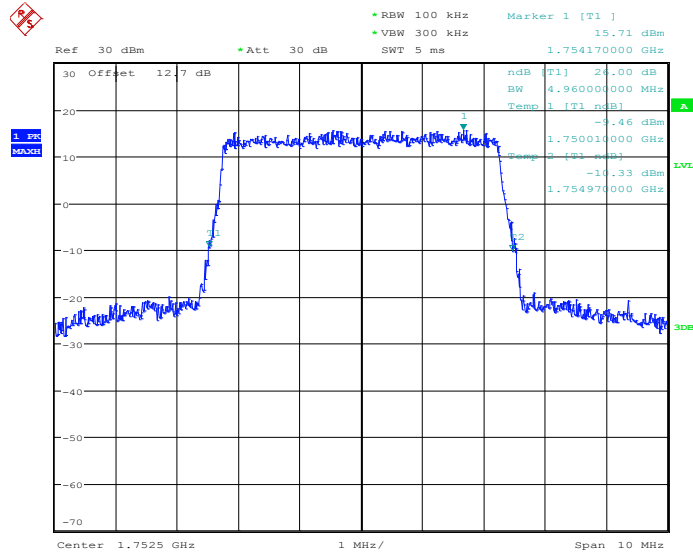


99% Occupied Bandwidth Plot on Channel 20375



Date: 11.JUN.2014 01:59:31

26dB Bandwidth Plot on Channel 20375

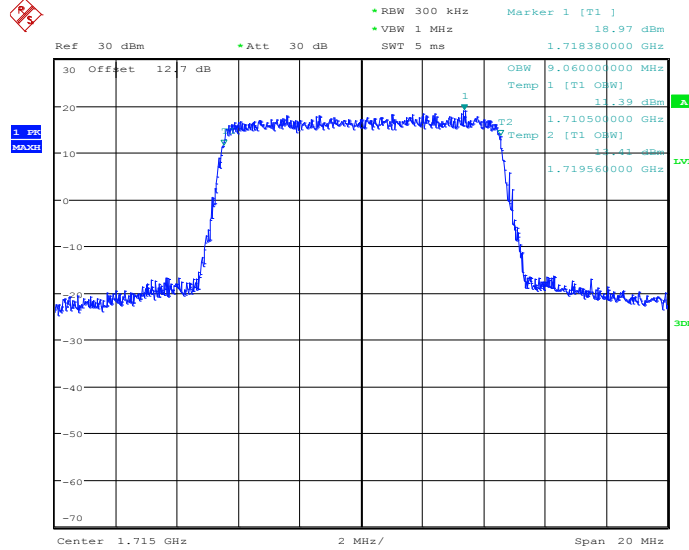


Date: 11.JUN.2014 02:00:10



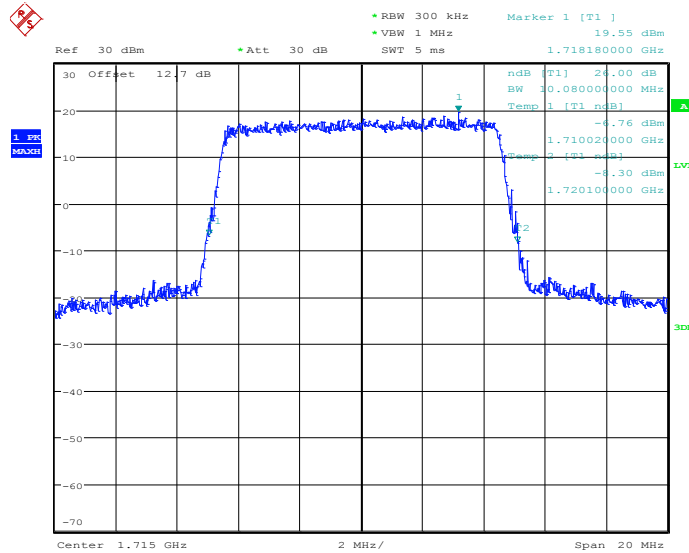
Band :	LTE Band 4	BW / Mod. :	10MHz / QPSK
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99% Occupied Bandwidth Plot on Channel 20000



Date: 12.JUN.2014 19:13:48

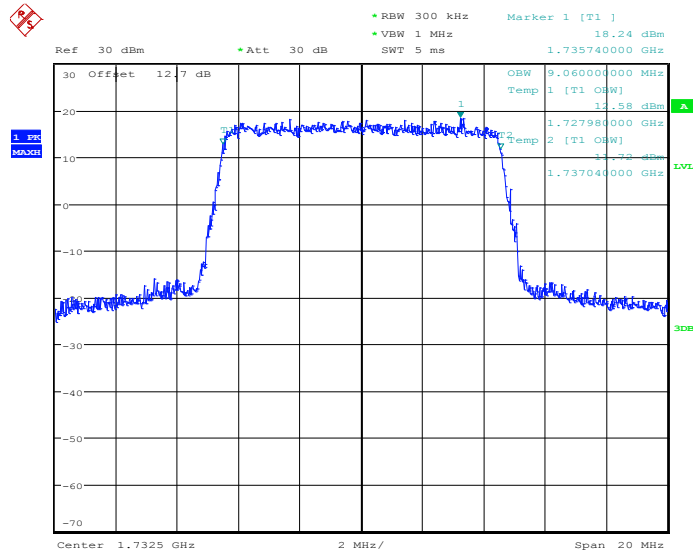
26dB Bandwidth Plot on Channel 20000



Date: 12.JUN.2014 19:14:22

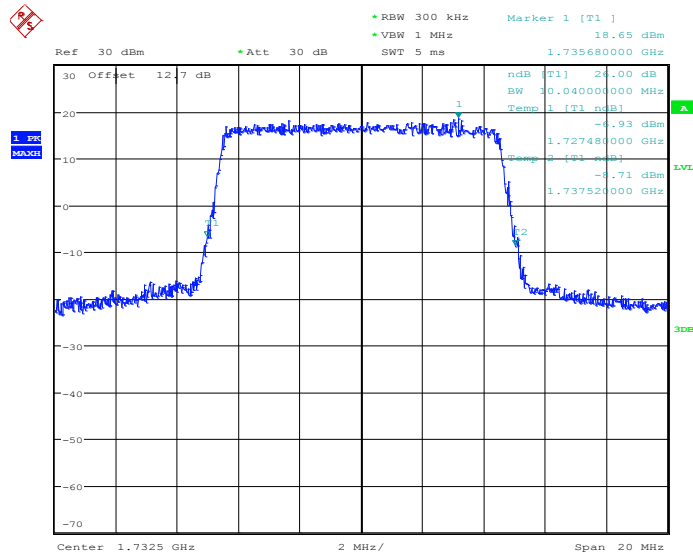


99% Occupied Bandwidth Plot on Channel 20175



Date: 12.JUN.2014 19:20:02

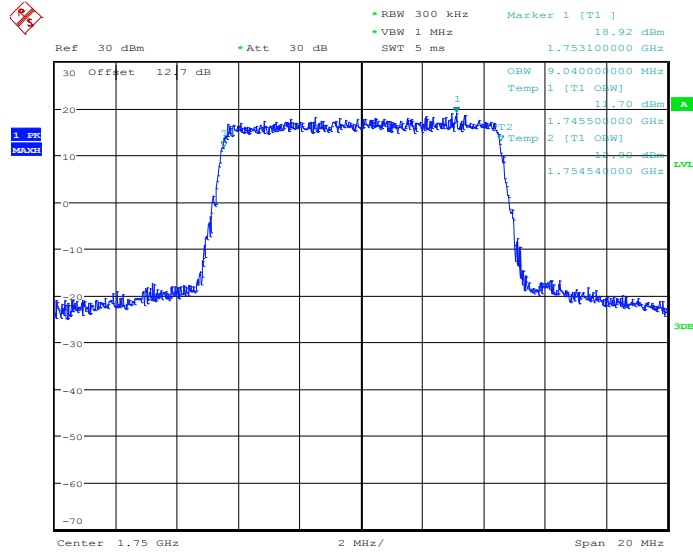
26dB Bandwidth Plot on Channel 20175



Date: 12.JUN.2014 19:20:34

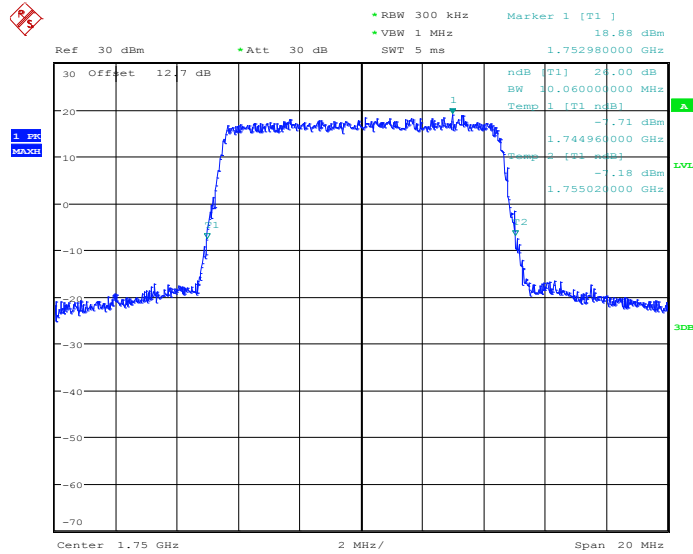


99% Occupied Bandwidth Plot on Channel 20350



Date: 12.JUN.2014 19:23:07

26dB Bandwidth Plot on Channel 20350

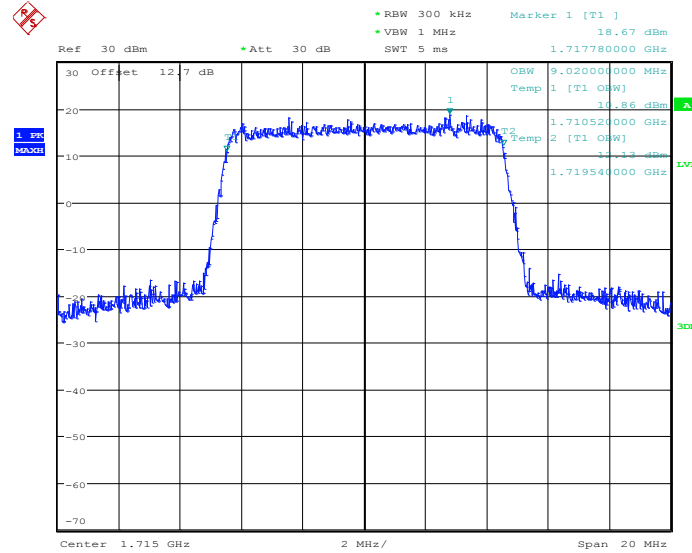


Date: 12.JUN.2014 19:23:39



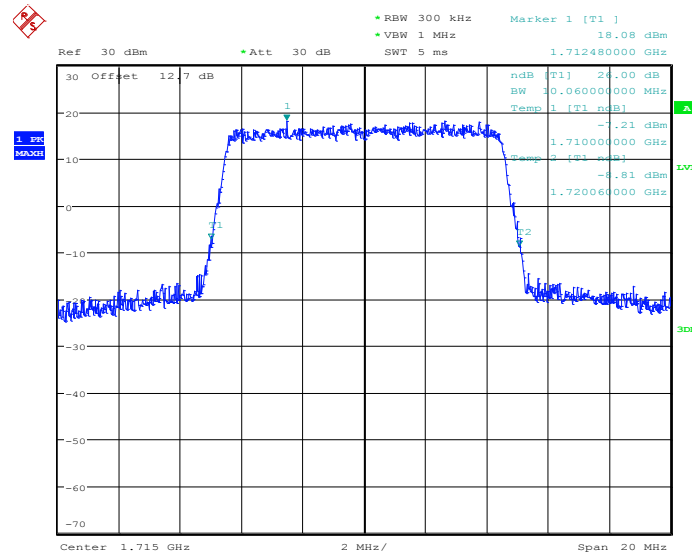
Band :	LTE Band 4	BW / Mod. :	10MHz / 16QAM
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99% Occupied Bandwidth Plot on Channel 2000



Date: 12.JUN.2014 19:14:05

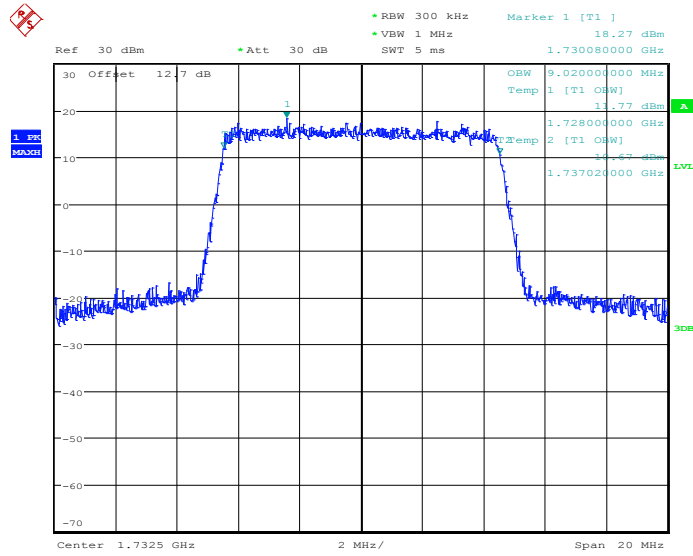
26dB Bandwidth Plot on Channel 2000



Date: 12.JUN.2014 19:14:39

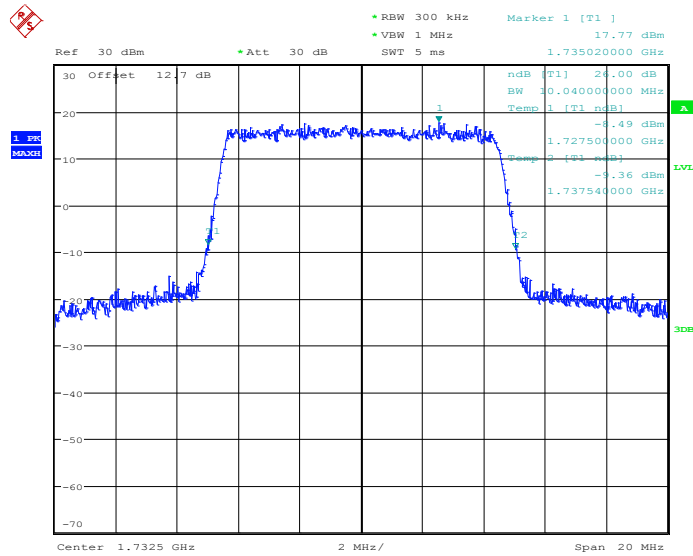


99% Occupied Bandwidth Plot on Channel 20175



Date: 12.JUN.2014 19:20:17

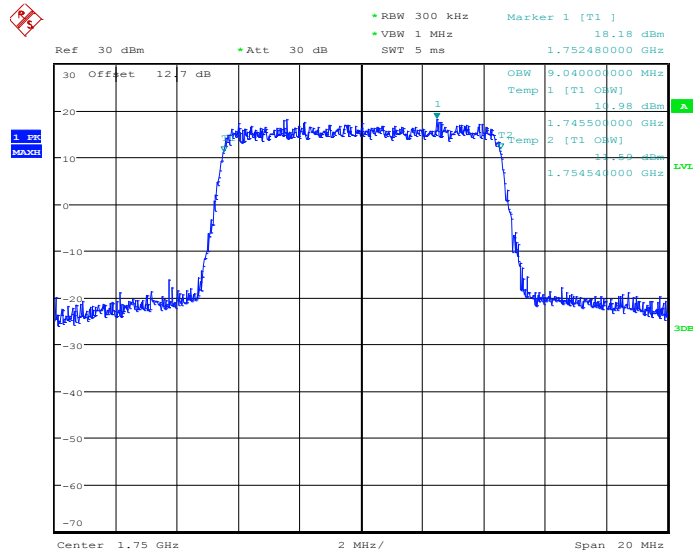
26dB Bandwidth Plot on Channel 20175



Date: 12.JUN.2014 19:20:51

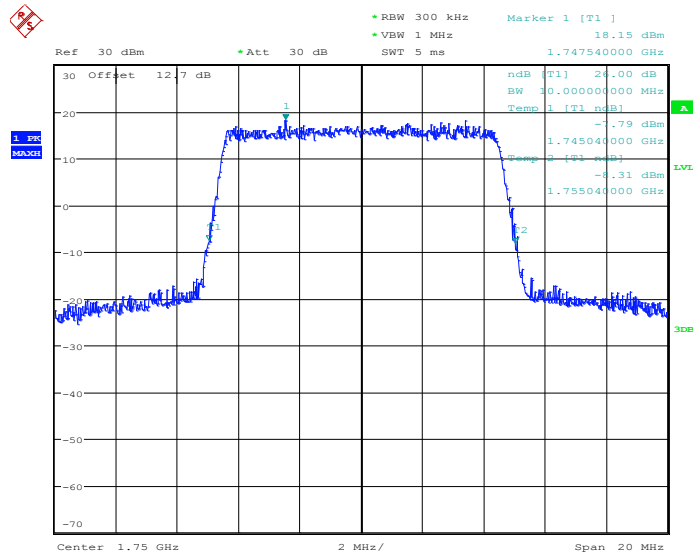


99% Occupied Bandwidth Plot on Channel 20350



Date: 12.JUN.2014 19:23:22

26dB Bandwidth Plot on Channel 20350

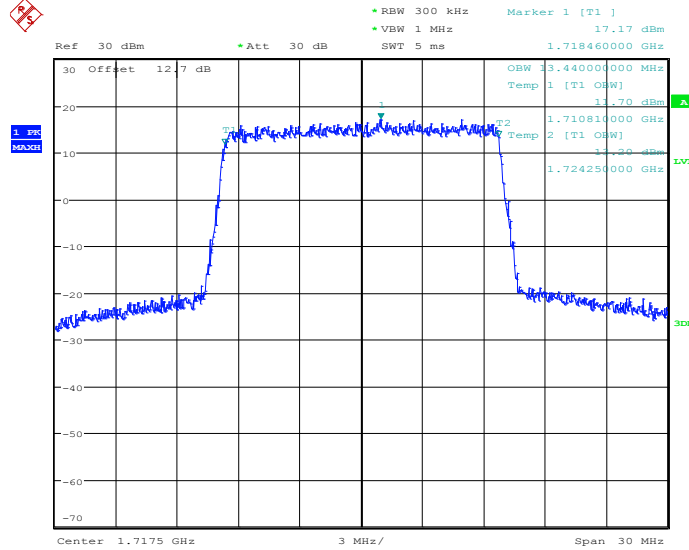


Date: 12.JUN.2014 19:23:57



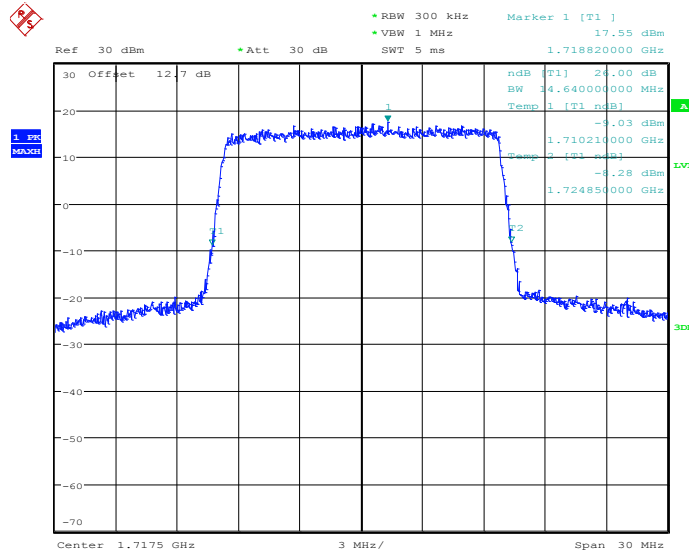
Band :	LTE Band 4	BW / Mod. :	15MHz / QPSK
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99% Occupied Bandwidth Plot on Channel 2025



Date: 12.JUN.2014 19:29:19

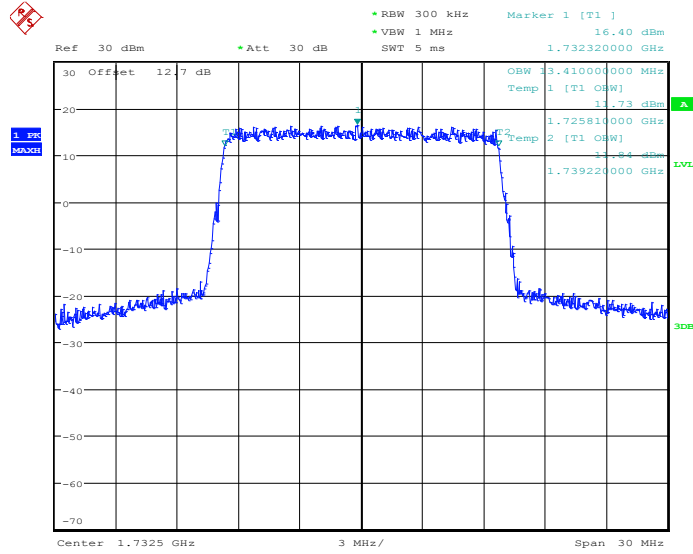
26dB Bandwidth Plot on Channel 2025



Date: 12.JUN.2014 19:29:52

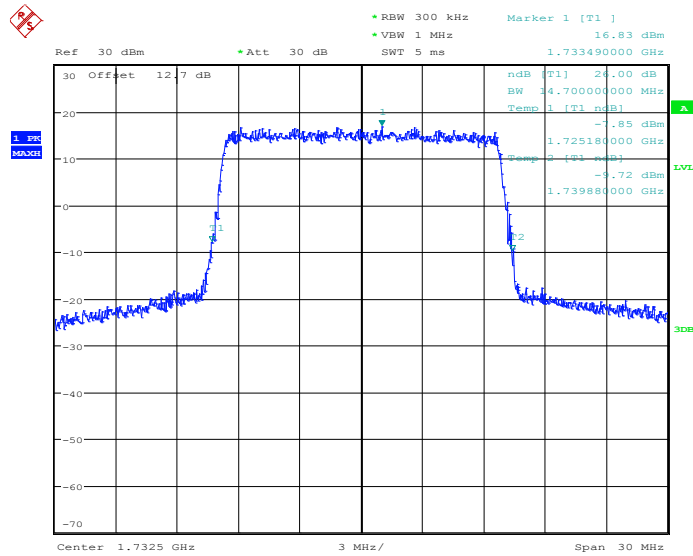


99% Occupied Bandwidth Plot on Channel 20175



Date: 12.JUN.2014 19:35:31

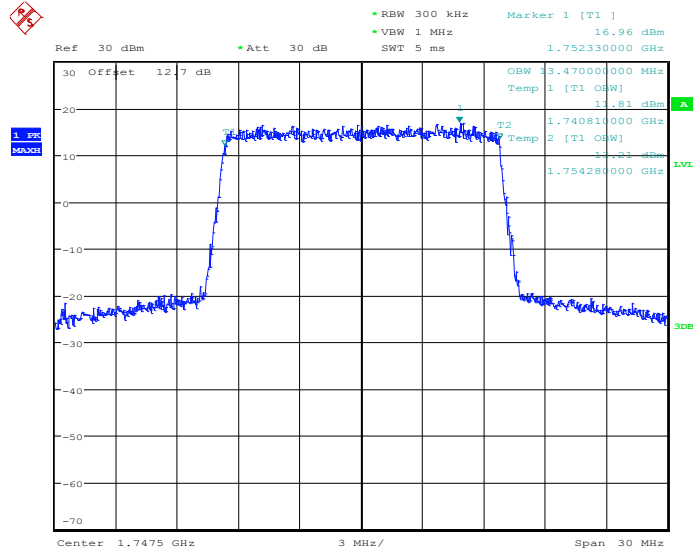
26dB Bandwidth Plot on Channel 20175



Date: 12.JUN.2014 19:36:03

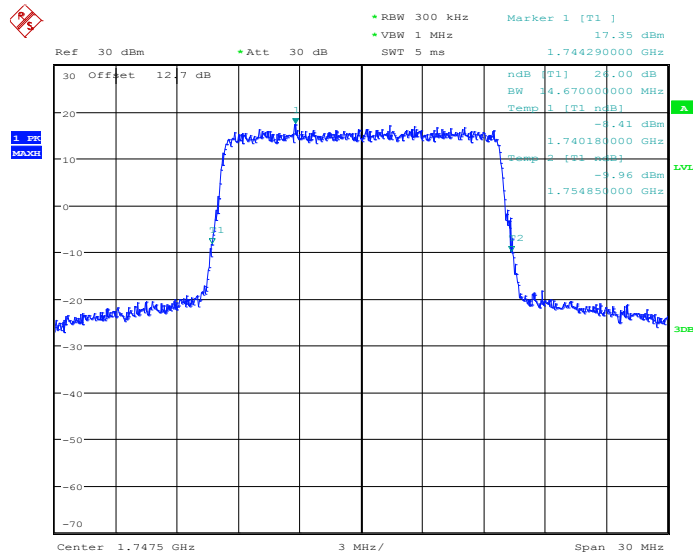


99% Occupied Bandwidth Plot on Channel 20325



Date: 12.JUN.2014 19:38:35

26dB Bandwidth Plot on Channel 20325

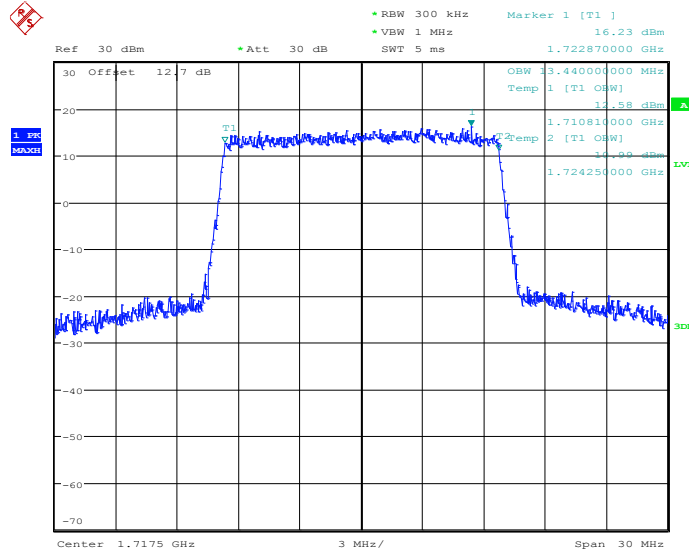


Date: 12.JUN.2014 19:39:08



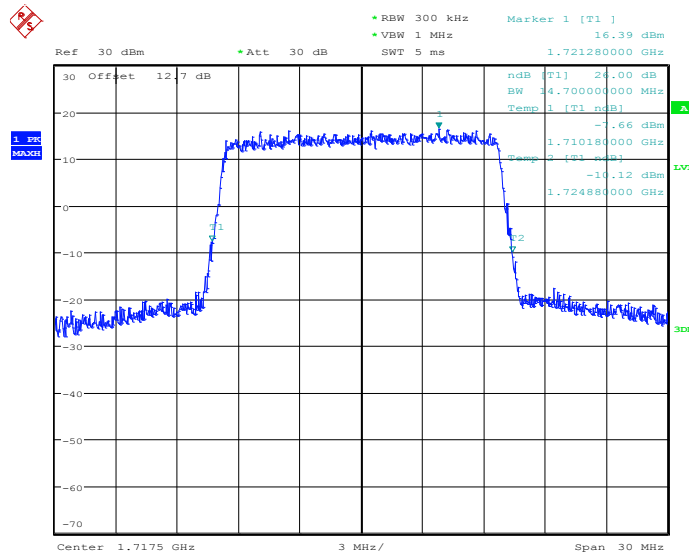
Band :	LTE Band 4	BW / Mod. :	15MHz / 16QAM
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99% Occupied Bandwidth Plot on Channel 2025



Date: 12.JUN.2014 19:29:34

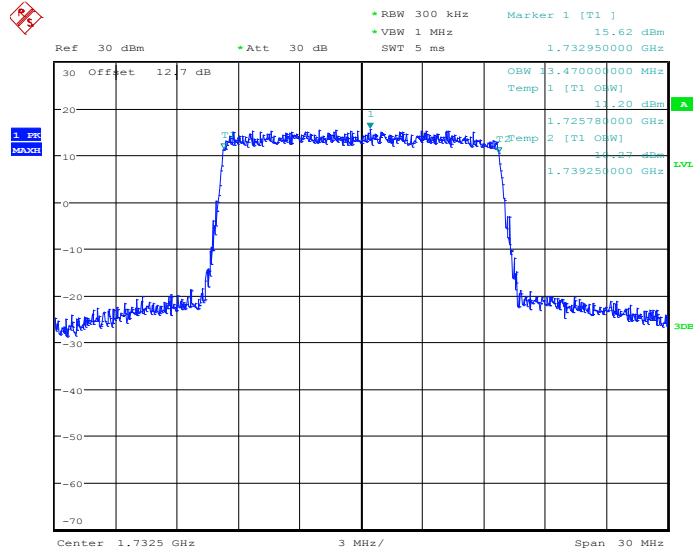
26dB Bandwidth Plot on Channel 2025



Date: 12.JUN.2014 19:30:09

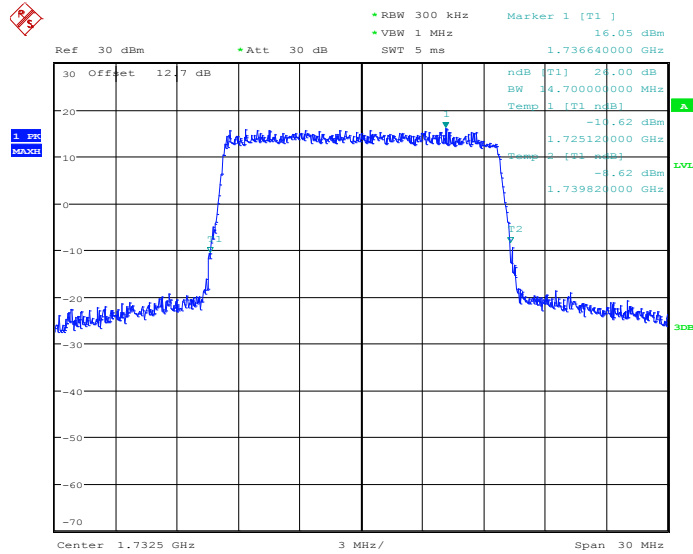


99% Occupied Bandwidth Plot on Channel 20175



Date: 12.JUN.2014 19:35:46

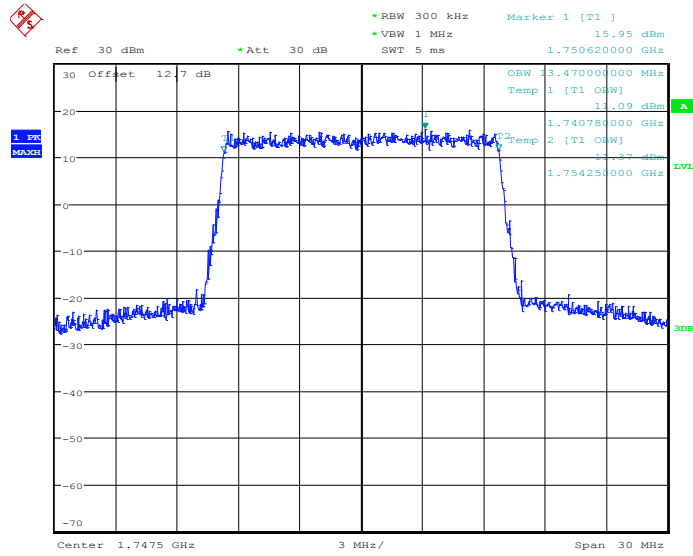
26dB Bandwidth Plot on Channel 20175



Date: 12.JUN.2014 19:36:20

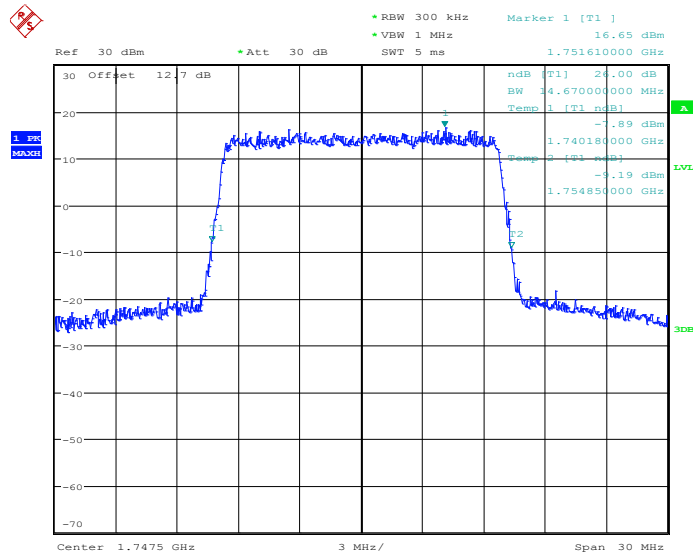


99% Occupied Bandwidth Plot on Channel 20325



Date: 12.JUN.2014 19:38:51

26dB Bandwidth Plot on Channel 20325

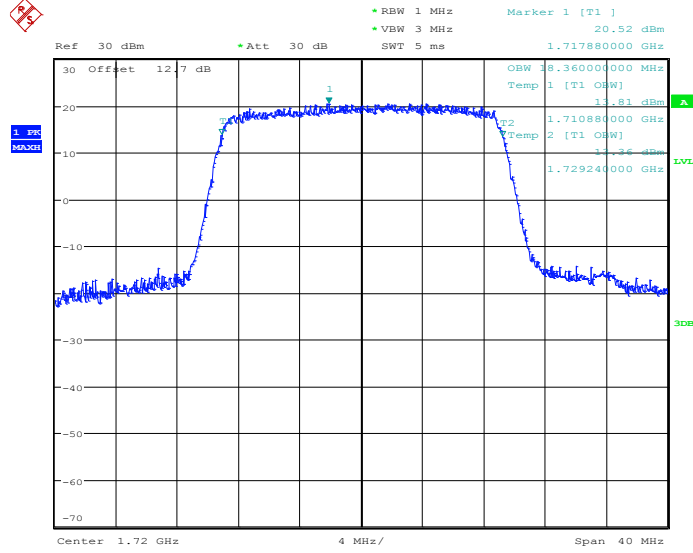


Date: 12.JUN.2014 19:39:25



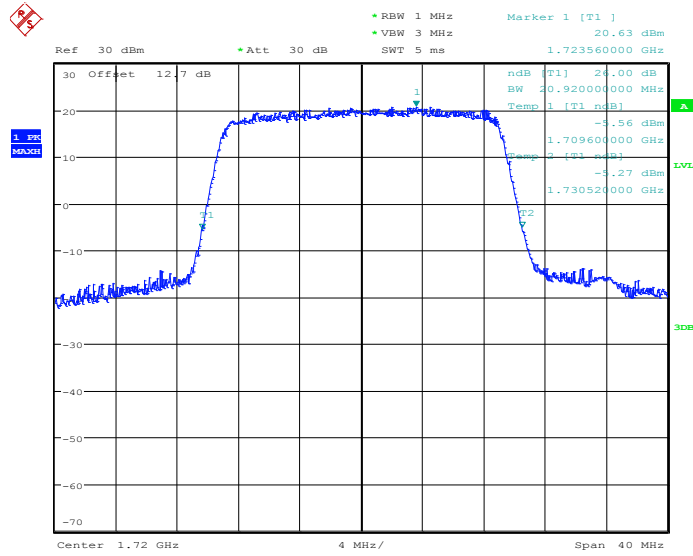
Band :	LTE Band 4	BW / Mod. :	20MHz / QPSK
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99% Occupied Bandwidth Plot on Channel 20050



Date: 12.JUN.2014 19:44:48

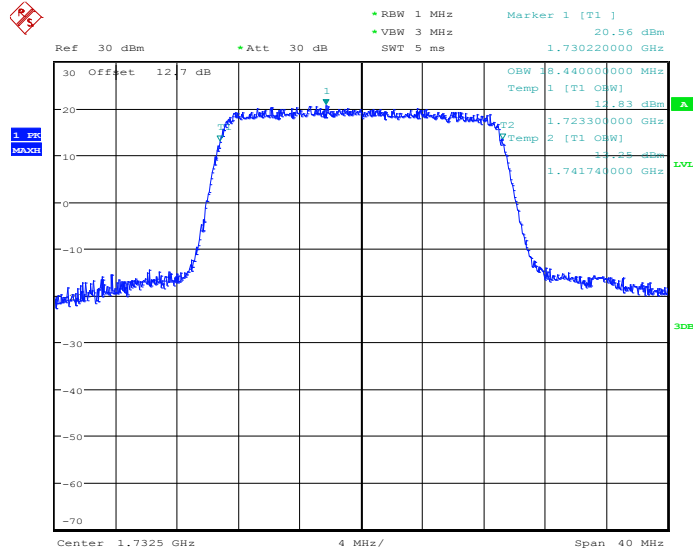
26dB Bandwidth Plot on Channel 20050



Date: 12.JUN.2014 19:45:20

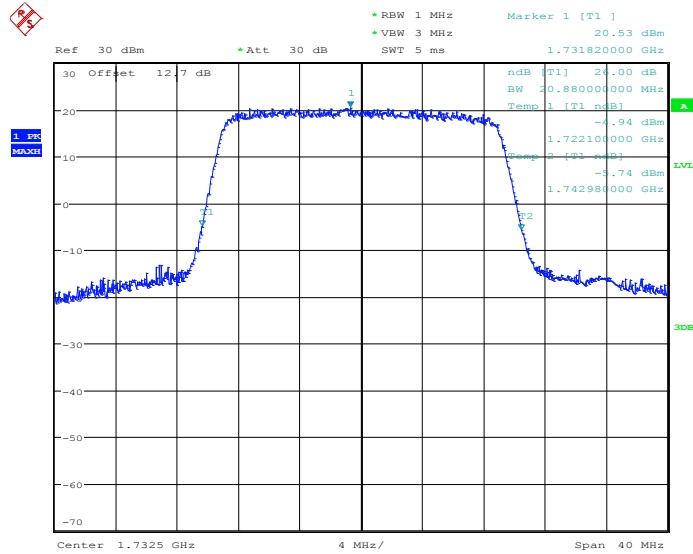


99% Occupied Bandwidth Plot on Channel 20175



Date: 12.JUN.2014 19:50:59

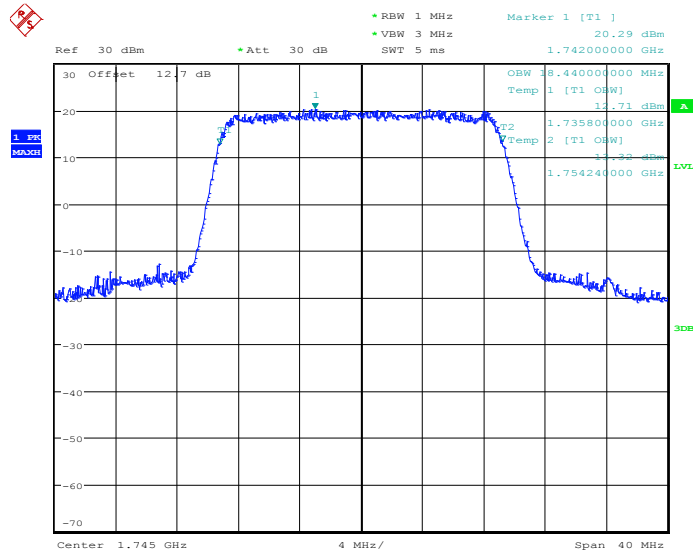
26dB Bandwidth Plot on Channel 20175



Date: 12.JUN.2014 19:51:32

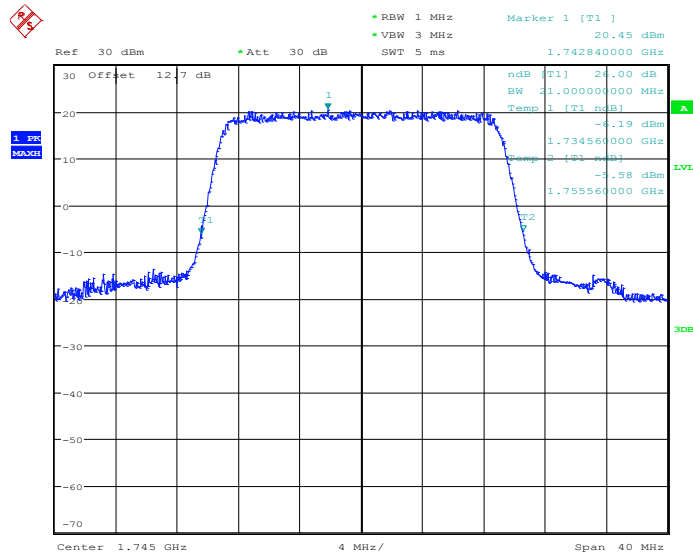


99% Occupied Bandwidth Plot on Channel 20300



Date: 12.JUN.2014 19:54:04

26dB Bandwidth Plot on Channel 20300

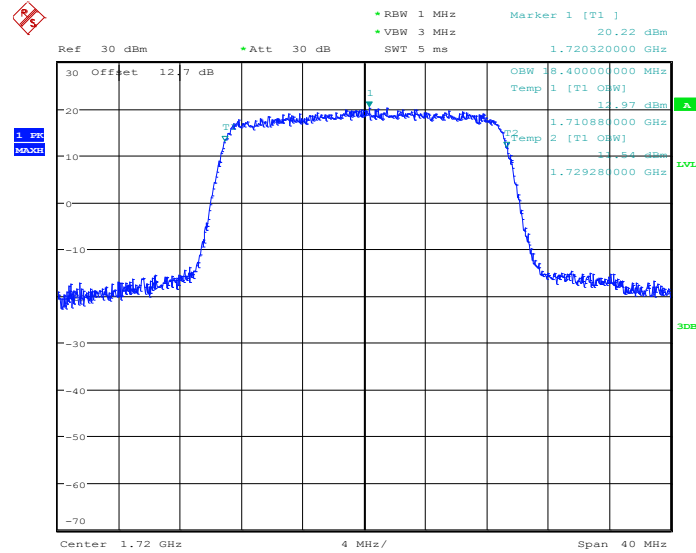


Date: 12.JUN.2014 19:54:37



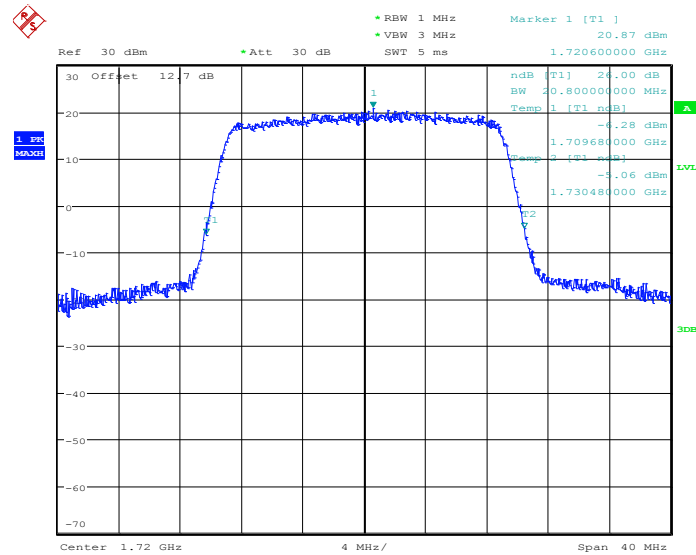
Band :	LTE Band 4	BW / Mod. :	20MHz / 16QAM
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99% Occupied Bandwidth Plot on Channel 20050



Date: 12.JUN.2014 23:00:20

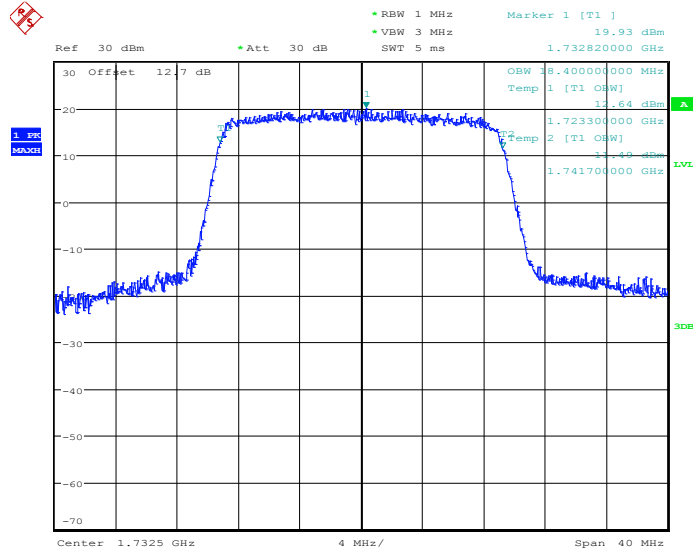
26dB Bandwidth Plot on Channel 20050



Date: 12.JUN.2014 19:45:37

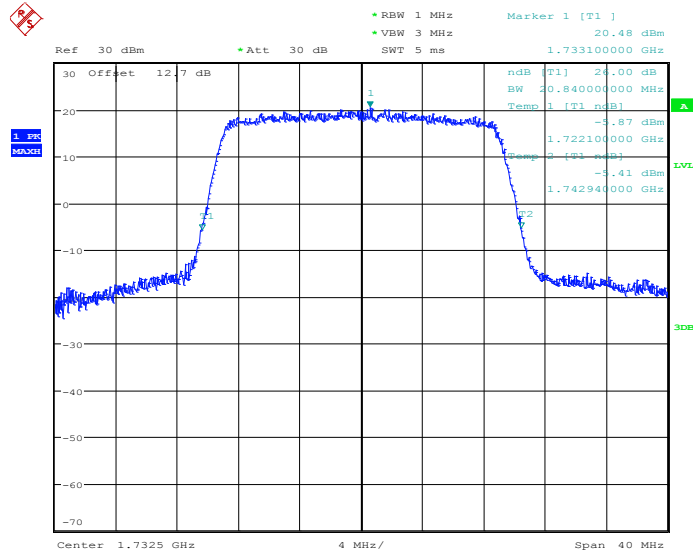


99% Occupied Bandwidth Plot on Channel 20175



Date: 12.JUN.2014 19:51:15

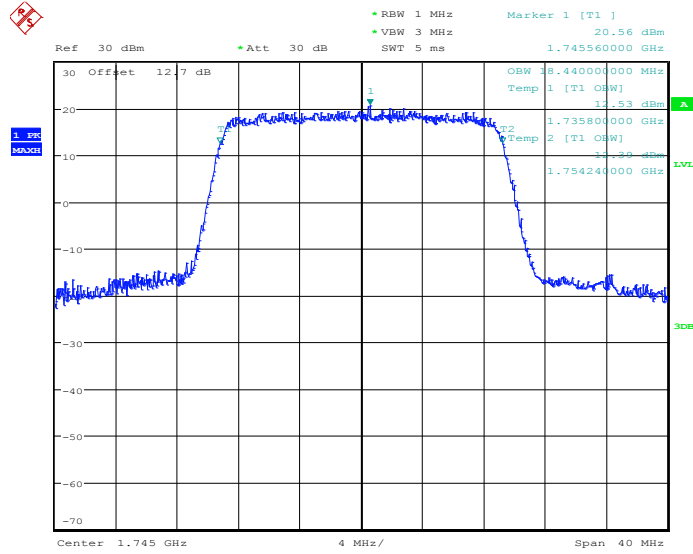
26dB Bandwidth Plot on Channel 20175



Date: 12.JUN.2014 19:51:49

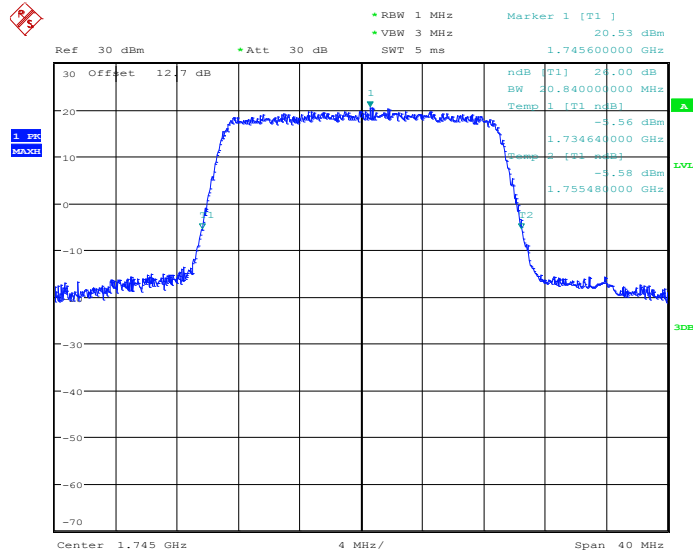


99% Occupied Bandwidth Plot on Channel 20300



Date: 12.JUN.2014 19:54:20

26dB Bandwidth Plot on Channel 20300

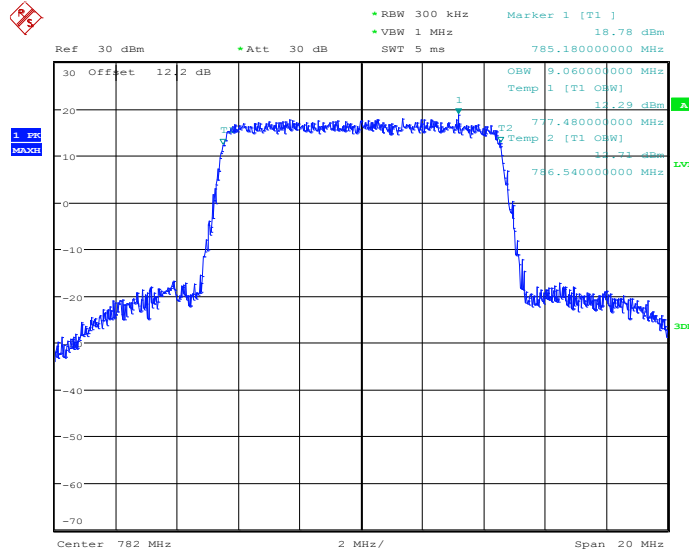


Date: 12.JUN.2014 19:54:54



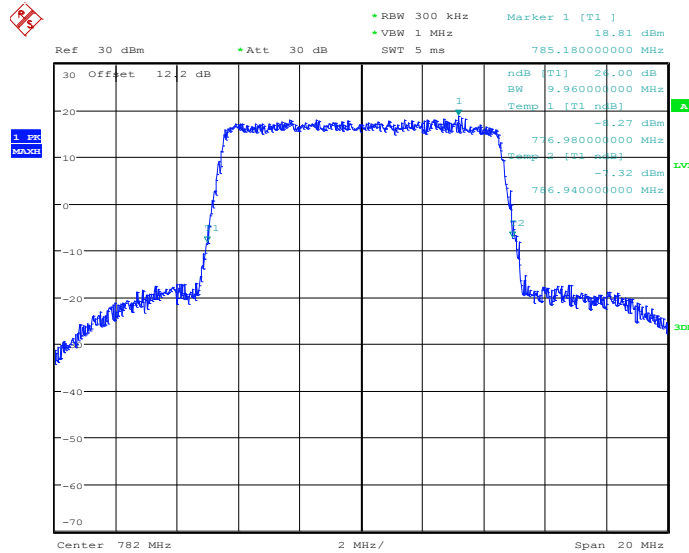
Band :	LTE Band 13	BW / Mod. :	10MHz / QPSK
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99% Occupied Bandwidth Plot on Channel 23230



Date: 12.JUN.2014 20:08:31

26dB Bandwidth Plot on Channel 23230

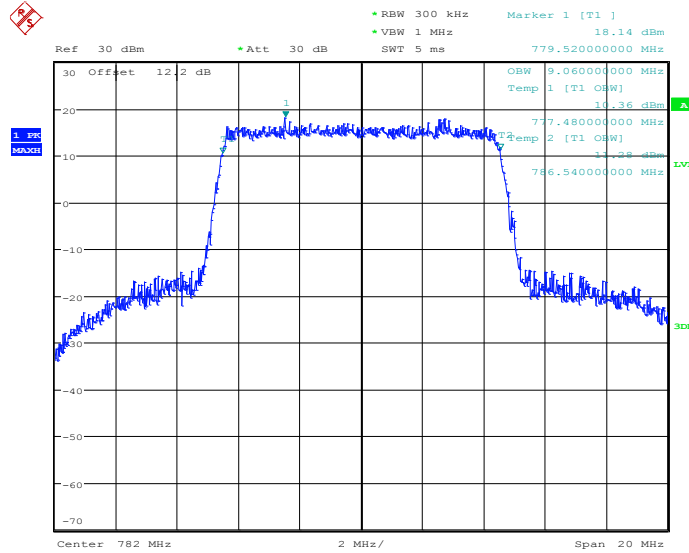


Date: 12.JUN.2014 20:09:03



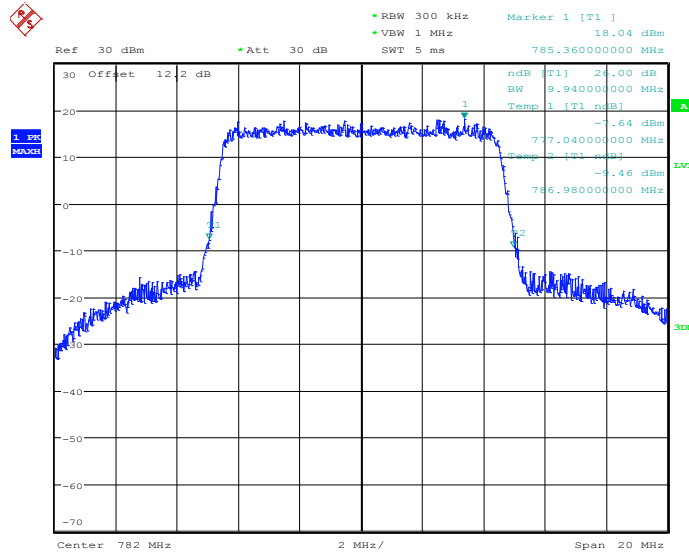
Band :	LTE Band 13	BW / Mod. :	10MHz / 16QAM
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99% Occupied Bandwidth Plot on Channel 23230



Date: 12.JUN.2014 20:08:46

26dB Bandwidth Plot on Channel 23230



Date: 12.JUN.2014 20:09:20



3.5 Conducted Band Edge Measurement

3.5.1 Description of Conducted Band Edge Measurement

27.53 (c) and RSS – 130 for Band 13

For operations in the 776-788 MHz band, the FCC limit is $43 + 10\log_{10}(P[\text{Watts}])$ dB below the transmitter power P(Watts) in a 100 kHz bandwidth. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed. In addition, the power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least $65 + 10 \log_{10} p(\text{watts})$, dB, for mobile and portable equipment.

27.53 (h) and RSS – 139 for Band 4

For operations in the 1710 – 1755 MHz band, the FCC limit is $43 + 10\log_{10}(P[\text{Watts}])$ dB below the transmitter power P(Watts) in a 1 MHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

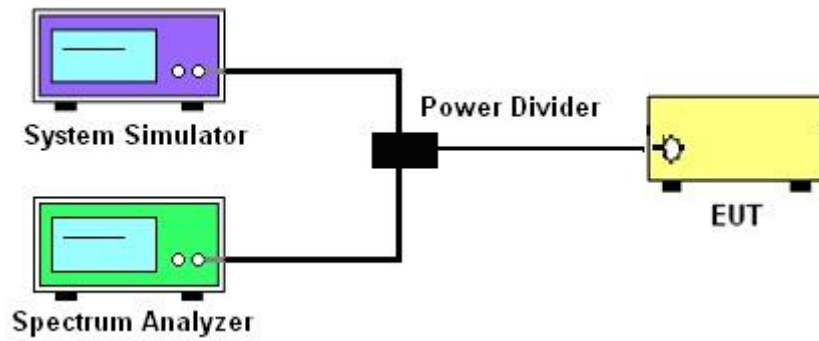
3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The band edges of low and high channels for the highest RF powers were measured. Set RBW $\geq 1\%$ EBW in the 1MHz band immediately outside and adjacent to the band edge.
3. Set spectrum analyzer with RMS detector.
4. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
5. The limit line is derived from $43 + 10\log(P)\text{dB}$ below the transmitter power P(Watts)
 $= P(W) - [43 + 10\log(P)]$ (dB)
 $= [30 + 10\log(P)]$ (dBm) - $[43 + 10\log(P)]$ (dB)
 $= -13\text{dBm}$.

3.5.4 Test Setup

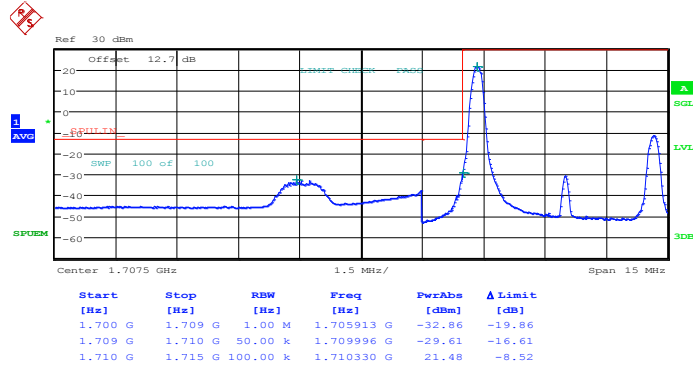




3.5.5 Test Result (Plots) of Conducted Band Edge

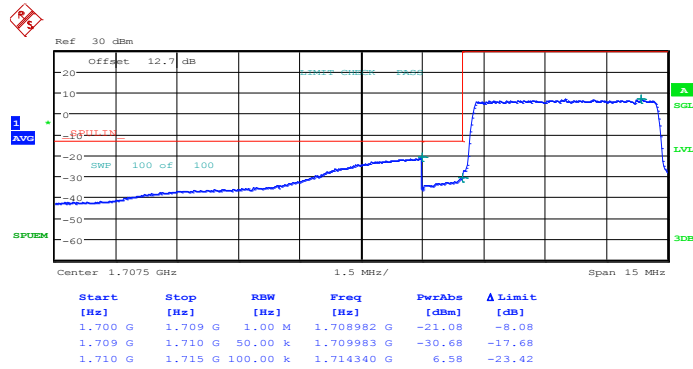
Band :	LTE Band 4	Band Width :	5MHz / QPSK
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Lower Band Edge Plot for QPSK-RB Size 1, RB Offset 0



Date: 11.JUN.2014 01:51:08

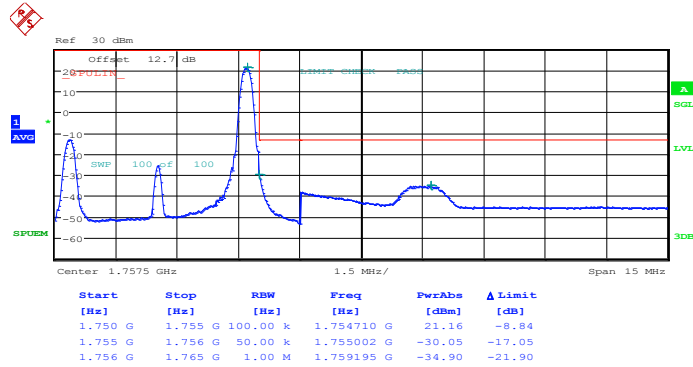
Lower Band Edge Plot for QPSK-RB Size 25, RB Offset 0



Date: 11.JUN.2014 01:52:46

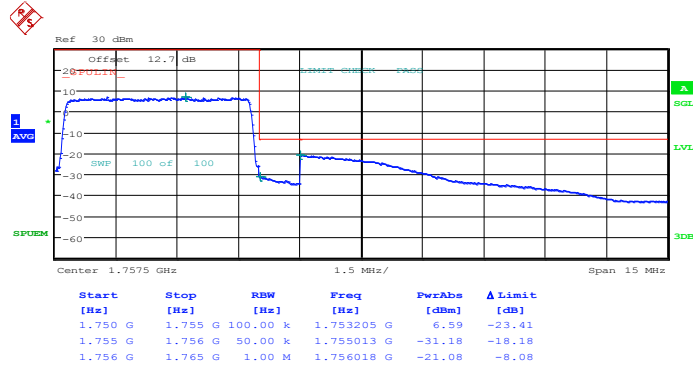


Higher Band Edge Plot for QPSK-RB Size 1, RB Offset 24



Date: 11.JUN.2014 02:00:58

Higher Band Edge Plot for QPSK-RB Size 25, RB Offset 0

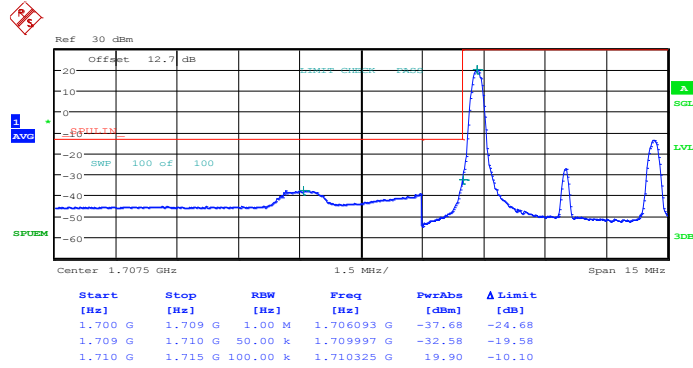


Date: 11.JUN.2014 02:02:36



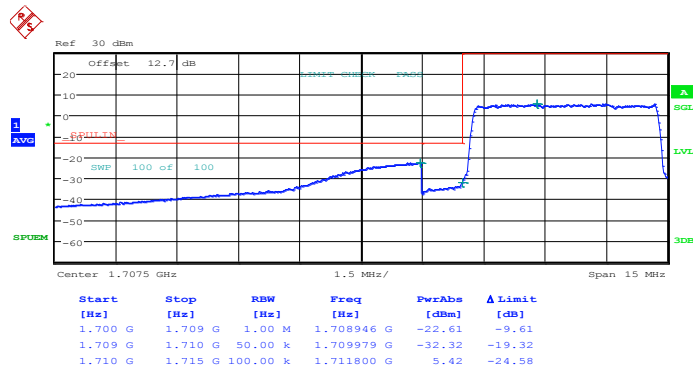
Band :	LTE Band 4	Band Width :	5MHz / 16QAM
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Lower Band Edge Plot for 16QAM-RB Size 1, RB Offset 0



Date: 11.JUN.2014 01:51:57

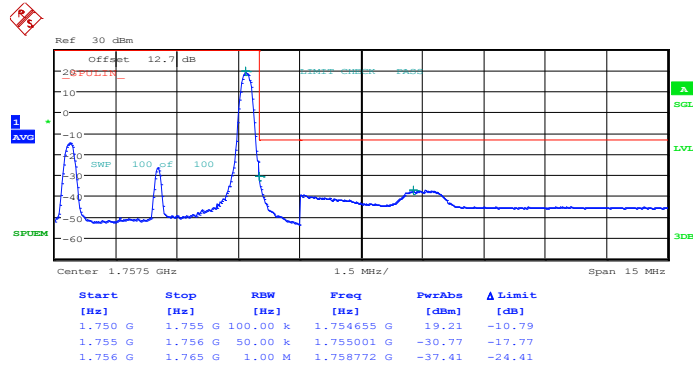
Lower Band Edge Plot for 16QAM-RB Size 25, RB Offset 0



Date: 11.JUN.2014 01:53:35

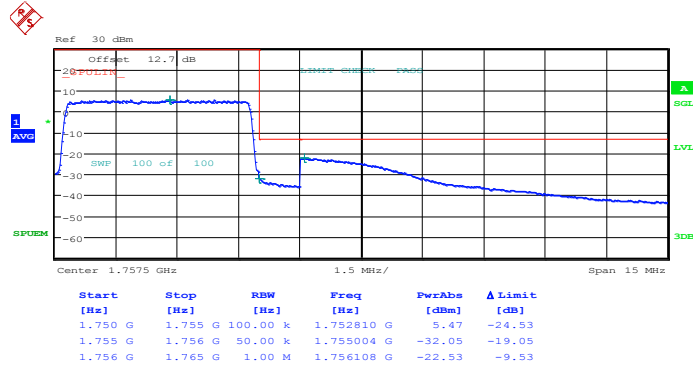


Higher Band Edge Plot for 16QAM-RB Size 1, RB Offset 24



Date: 11.JUN.2014 02:01:47

Higher Band Edge Plot for 16QAM-RB Size 25, RB Offset 0

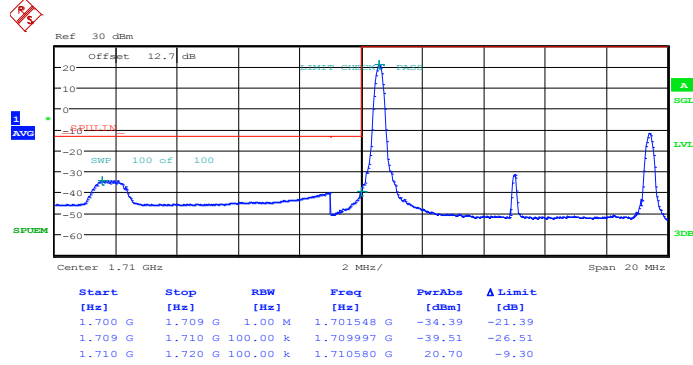


Date: 11.JUN.2014 02:03:26



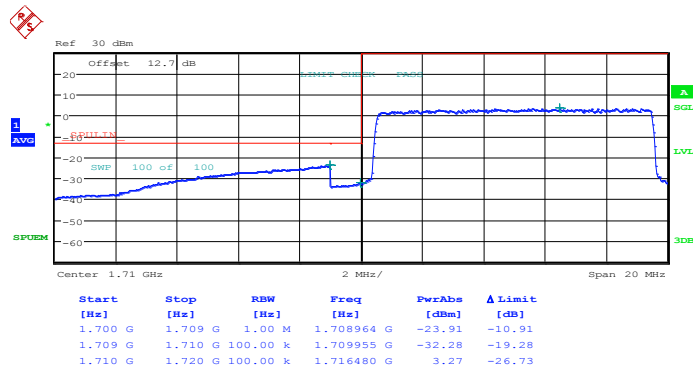
Band :	LTE Band 4	Band Width :	10MHz / QPSK
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Lower Band Edge Plot for QPSK-RB Size 1, RB Offset 0



Date: 12.JUN.2014 19:15:26

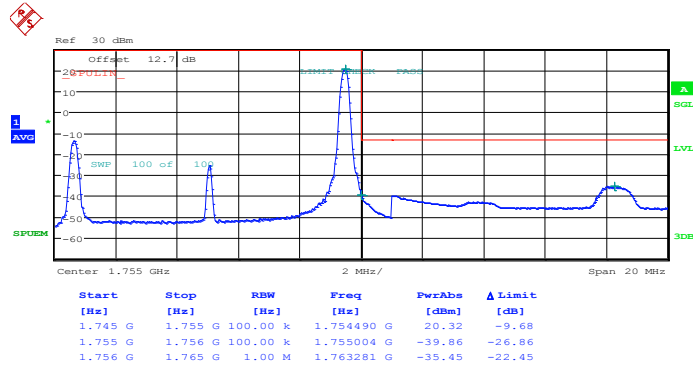
Lower Band Edge Plot for QPSK-RB Size 50, RB Offset 0



Date: 12.JUN.2014 19:16:59

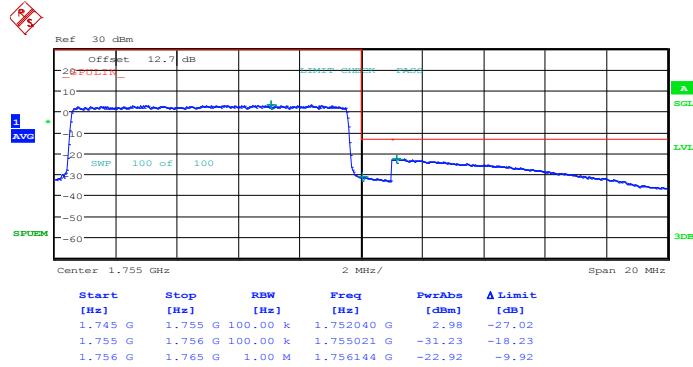


Higher Band Edge Plot for QPSK-RB Size 1, RB Offset 49



Date: 12.JUN.2014 19:24:43

Higher Band Edge Plot for QPSK-RB Size 50, RB Offset 0

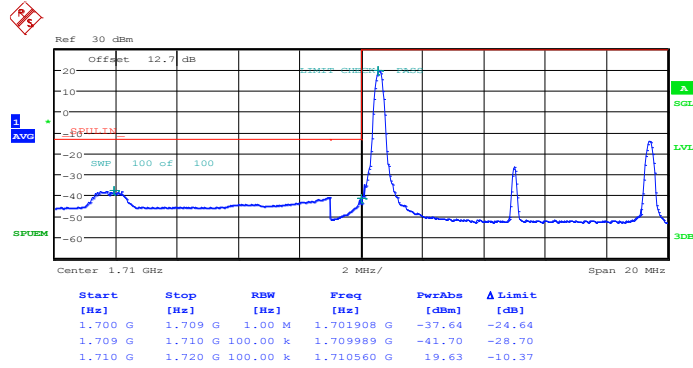


Date: 12.JUN.2014 19:26:17



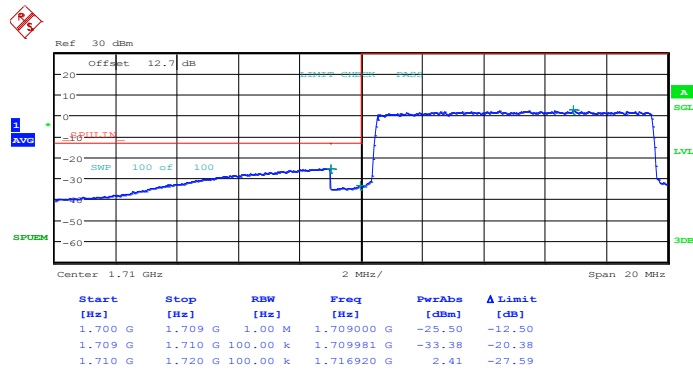
Band :	LTE Band 4	Band Width :	10MHz / 16QAM
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Lower Band Edge Plot for 16QAM-RB Size 1, RB Offset 0



Date: 12.JUN.2014 19:16:13

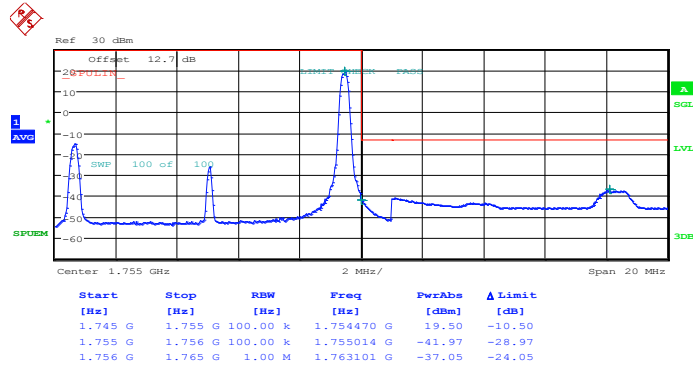
Lower Band Edge Plot for 16QAM-RB Size 50, RB Offset 0



Date: 12.JUN.2014 19:17:46

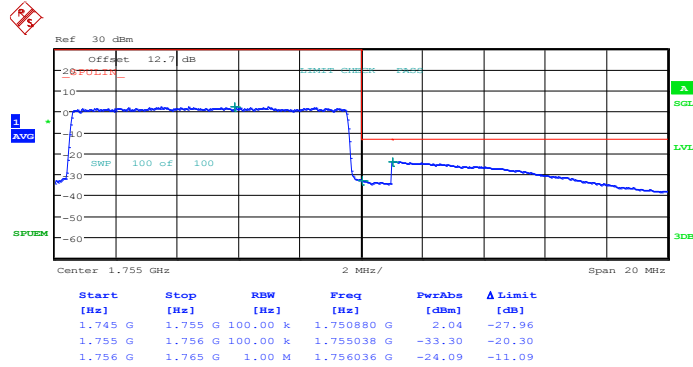


Higher Band Edge Plot for 16QAM-RB Size 1, RB Offset 49



Date: 12.JUN.2014 19:25:30

Higher Band Edge Plot for 16QAM-RB Size 50, RB Offset 0

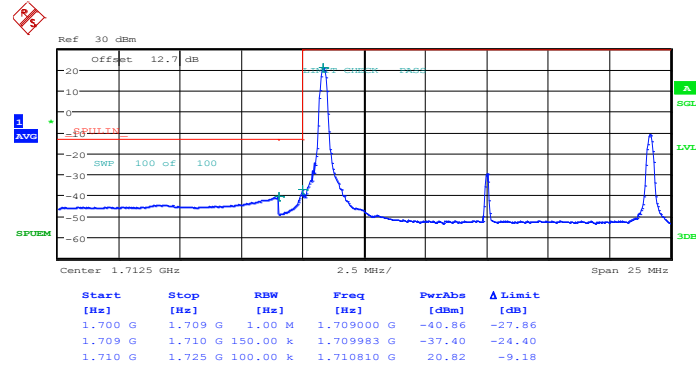


Date: 12.JUN.2014 19:27:04



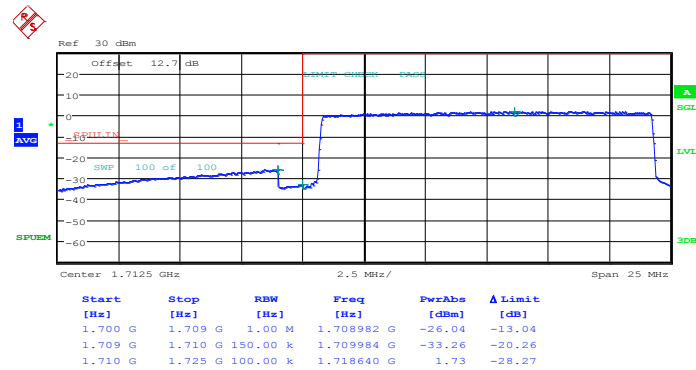
Band :	LTE Band 4	Band Width :	15MHz / QPSK
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Lower Band Edge Plot for QPSK-RB Size 1, RB Offset 0



Date: 12.JUN.2014 19:30:55

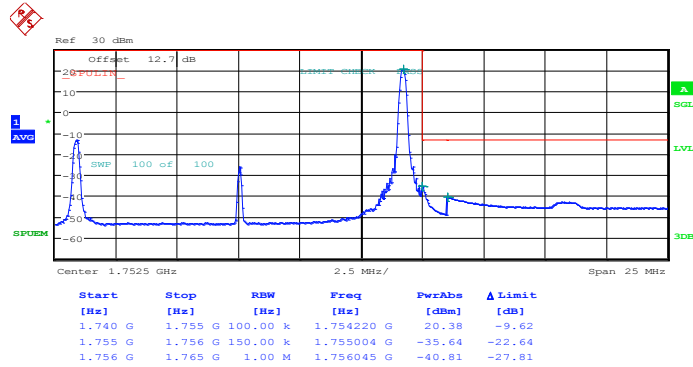
Lower Band Edge Plot for QPSK-RB Size 75, RB Offset 0



Date: 12.JUN.2014 19:32:29

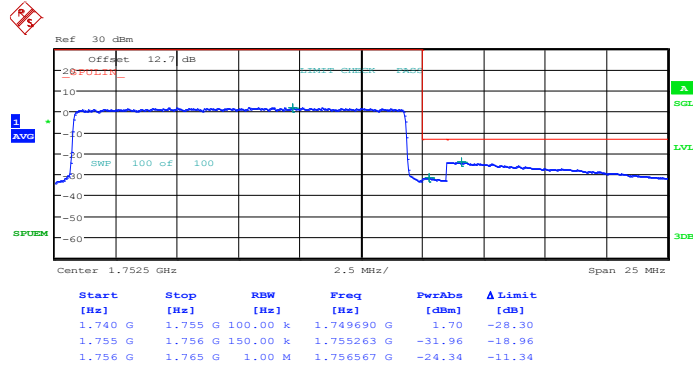


Higher Band Edge Plot for QPSK-RB Size 1, RB Offset 74



Date: 12.JUN.2014 19:40:12

Higher Band Edge Plot for QPSK-RB Size 75, RB Offset 0

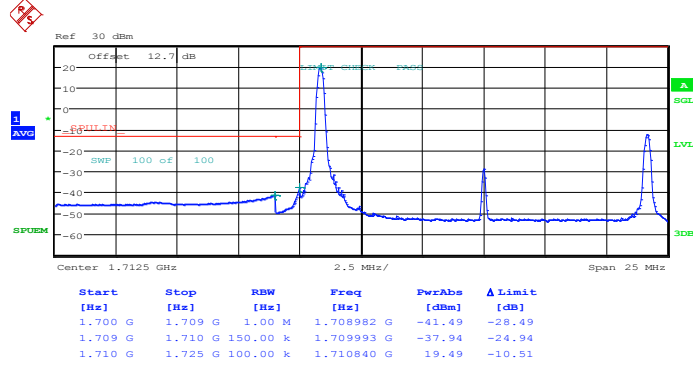


Date: 12.JUN.2014 19:41:45



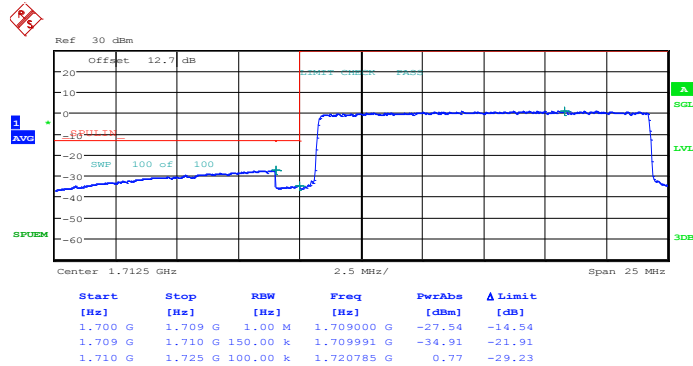
Band :	LTE Band 4	Band Width :	15MHz / 16QAM
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Lower Band Edge Plot for 16QAM-RB Size 1, RB Offset 0



Date: 12.JUN.2014 19:31:42

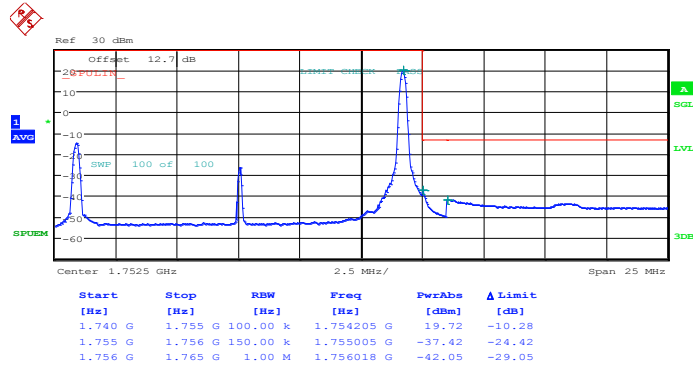
Lower Band Edge Plot for 16QAM-RB Size 75, RB Offset 0



Date: 12.JUN.2014 19:33:15

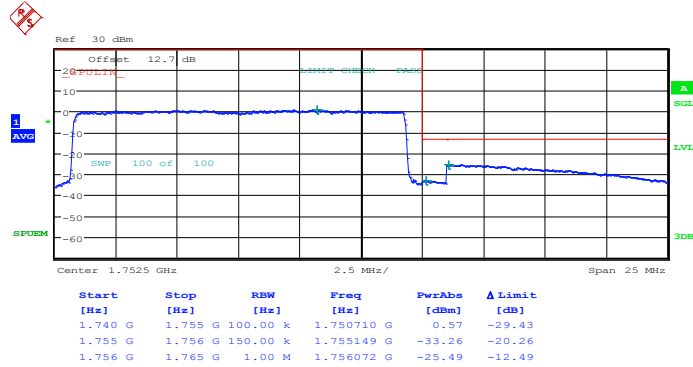


Higher Band Edge Plot for 16QAM-RB Size 1, RB Offset 74



Date: 12.JUN.2014 19:40:58

Higher Band Edge Plot for 16QAM-RB Size 75, RB Offset 0

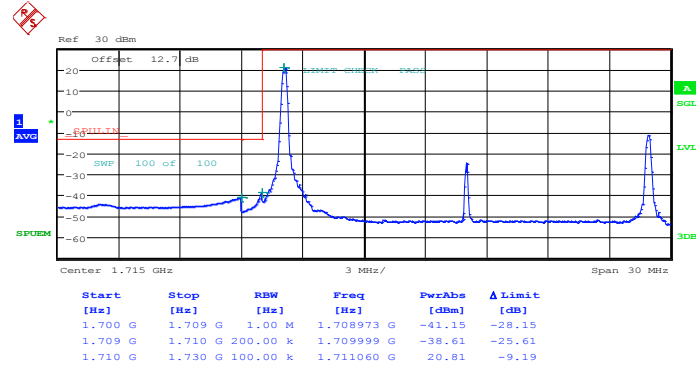


Date: 12.JUN.2014 19:42:32



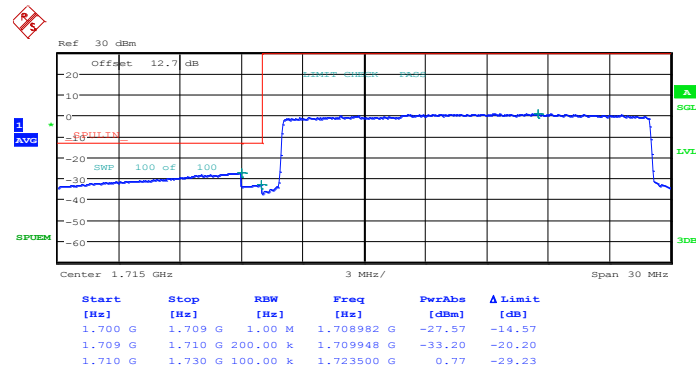
Band :	LTE Band 4	Band Width :	20MHz / QPSK
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Lower Band Edge Plot for QPSK-RB Size 1, RB Offset 0



Date: 12.JUN.2014 19:46:24

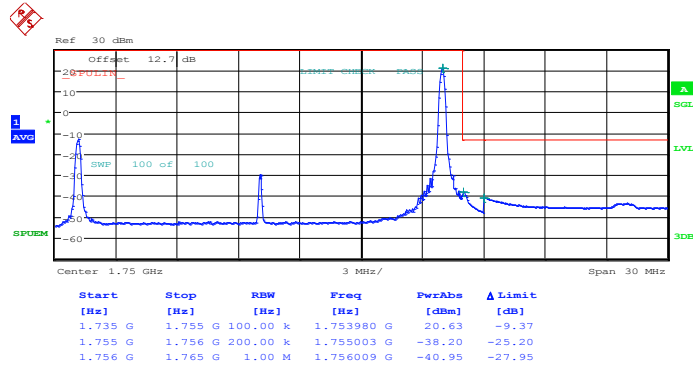
Lower Band Edge Plot for QPSK-RB Size 100, RB Offset 0



Date: 12.JUN.2014 19:47:58

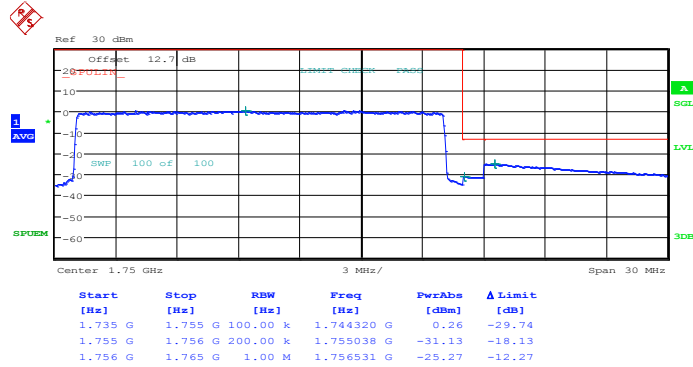


Higher Band Edge Plot for QPSK-RB Size 1, RB Offset 99



Date: 12.JUN.2014 19:55:41

Higher Band Edge Plot for QPSK-RB Size 100, RB Offset 0

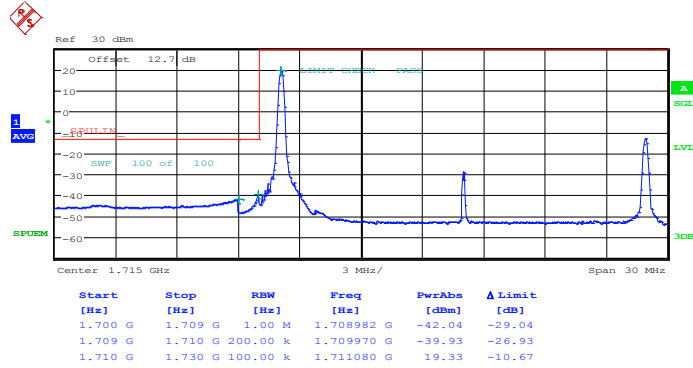


Date: 12.JUN.2014 19:57:14



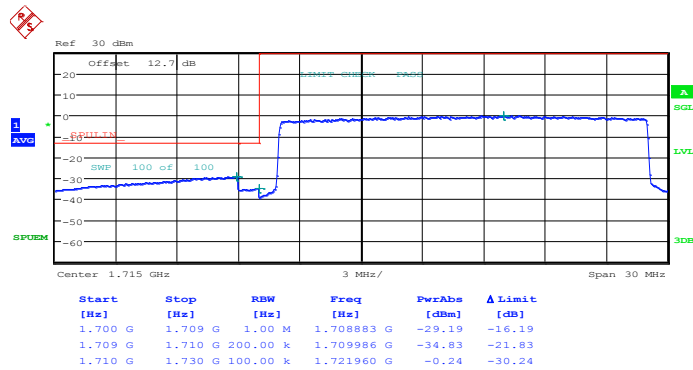
Band :	LTE Band 4	Band Width :	20MHz / 16QAM
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Lower Band Edge Plot for 16QAM-RB Size 1, RB Offset 0



Date: 12.JUN.2014 19:47:11

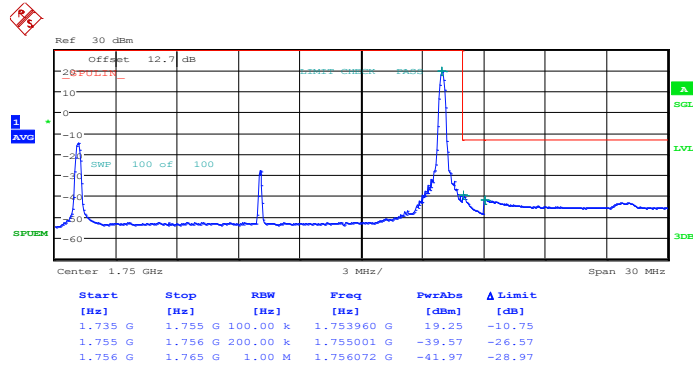
Lower Band Edge Plot for 16QAM-RB Size 100, RB Offset 0



Date: 12.JUN.2014 19:48:44

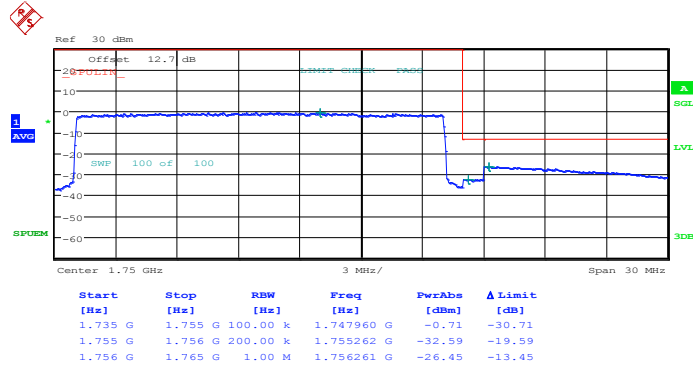


Higher Band Edge Plot for 16QAM-RB Size 1, RB Offset 99



Date: 12.JUN.2014 19:56:28

Higher Band Edge Plot for 16QAM-RB Size 100, RB Offset 0

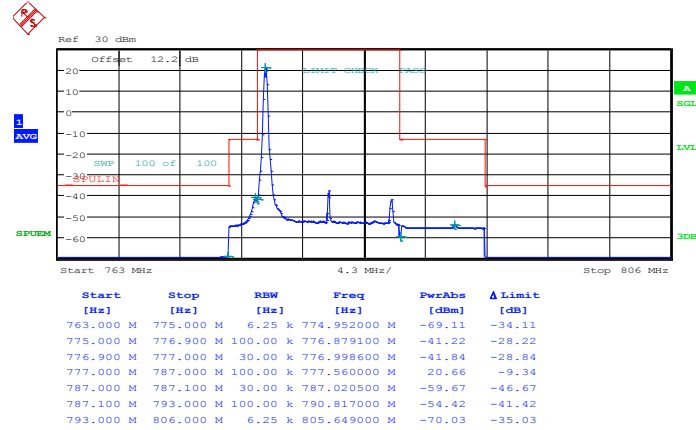


Date: 12.JUN.2014 19:58:01



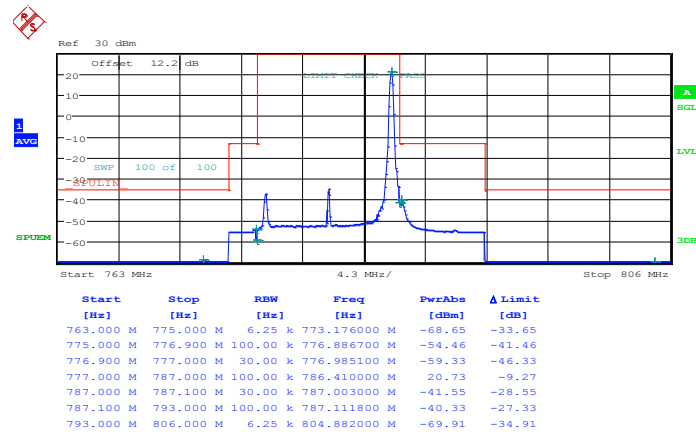
Band :	LTE Band 13	Band Width :	10MHz / QPSK
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Middle Band Edge Plot for QPSK-RB Size 1, RB Offset 0



Date: 12.JUN.2014 20:15:01

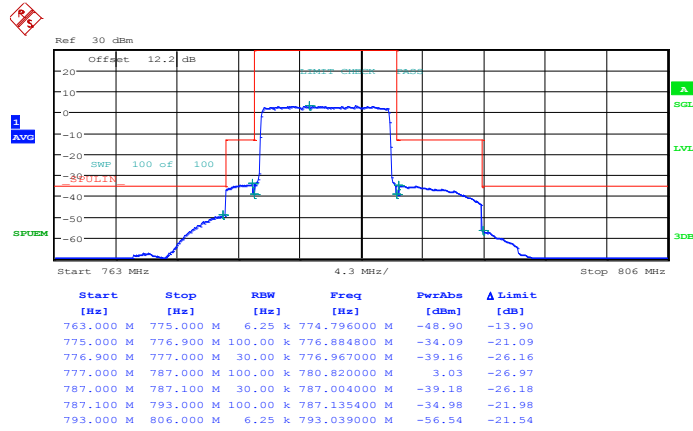
Middle Band Edge Plot for QPSK-RB Size 50, RB Offset 0



Date: 12.JUN.2014 20:32:57



Middle Band Edge Plot for QPSK-RB Size 1, RB Offset 49

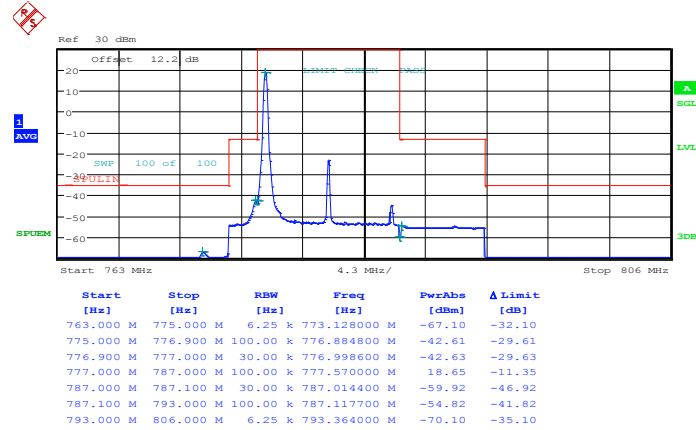


Date: 12.JUN.2014 20:23:19



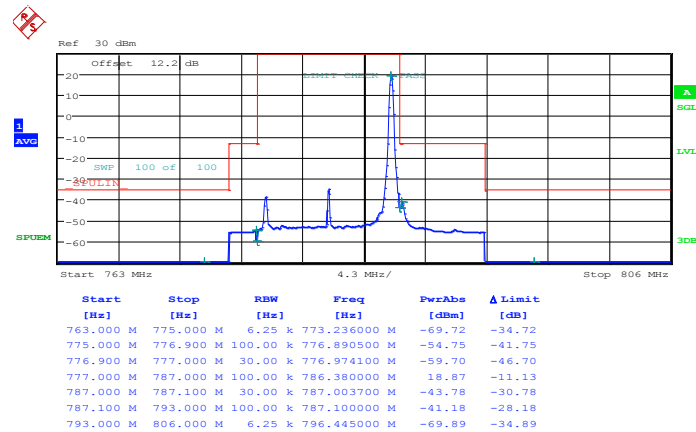
Band :	LTE Band 13	Band Width :	10MHz / 16QAM
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Middle Band Edge Plot for 16QAM-RB Size 1, RB Offset 0



Date: 12.JUN.2014 20:18:05

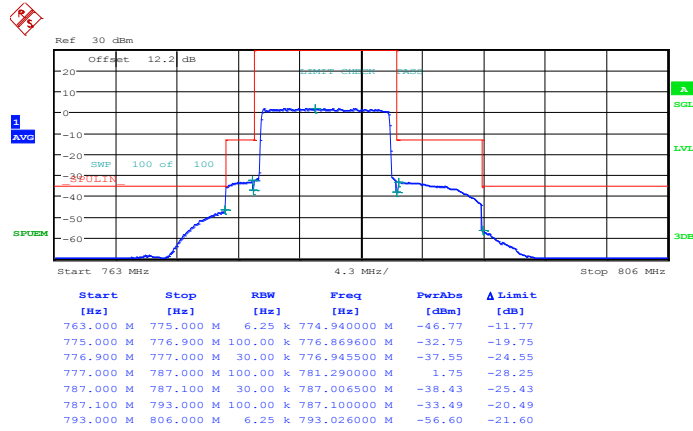
Middle Band Edge Plot for 16QAM-RB Size 50, RB Offset 0



Date: 12.JUN.2014 20:43:04



Middle Band Edge Plot for 16QAM-RB Size 1, RB Offset 49



Date: 12.JUN.2014 20:21:04

3.6 Conducted Spurious Emission Measurement

3.6.1 Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30MHz up to a frequency including its 10th harmonic.

3.6.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.6.3 Test Procedures

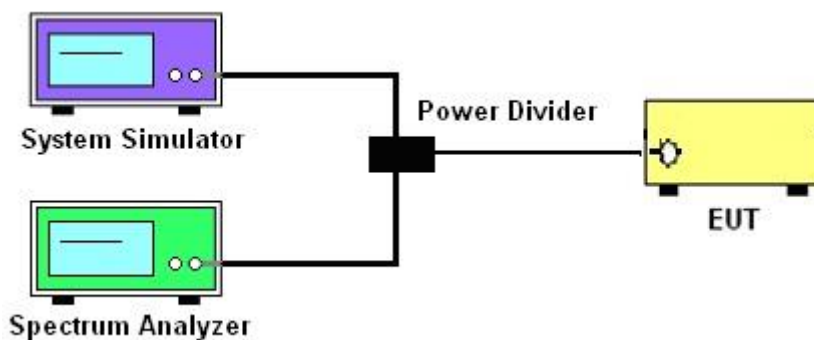
1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The middle channel for the highest RF power within the transmitting frequency was measured.
4. The conducted spurious emission for the whole frequency range was taken.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
7. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)

$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$$

$$= -13\text{dBm}.$$

3.6.4 Test Setup

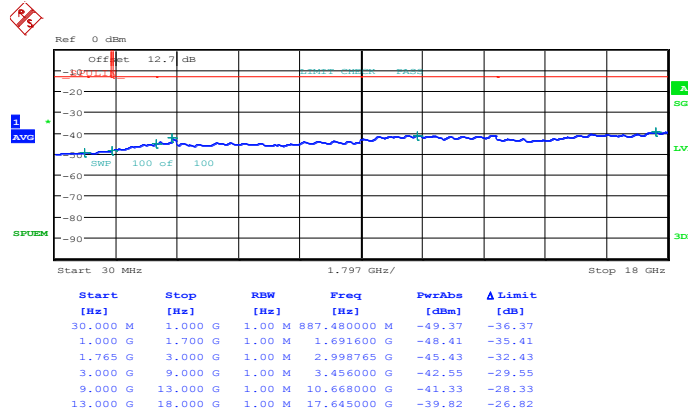




3.6.5 Test Result (Plots) of Conducted Spurious Emission

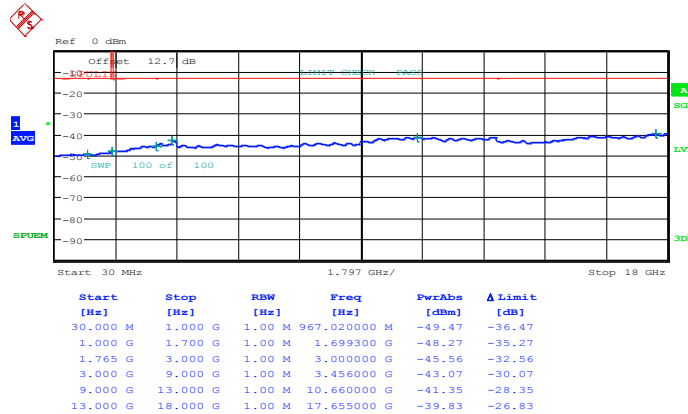
Band :	LTE Band 4	Channel :	CH20175 (Middle)
Band Width :	5MHz		

QPSK (RB Size 1, RB Offset 0)



Date: 11.JUN.2014 01:57:54

16QAM (RB Size 1, RB Offset 0)

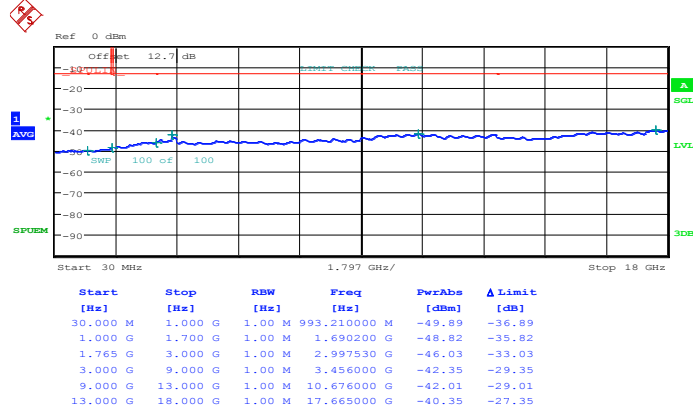


Date: 11.JUN.2014 01:58:56



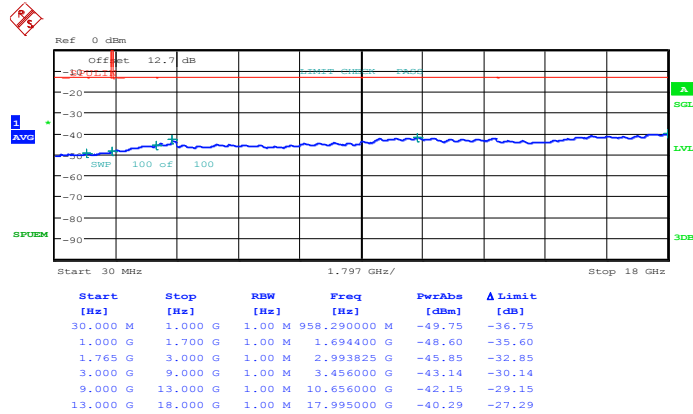
Band :	LTE Band 4	Channel :	CH20175 (Middle)
Band Width :	10MHz		

QPSK (RB Size 1, RB Offset 0)



Date: 12.JUN.2014 19:21:51

16QAM (RB Size 1, RB Offset 0)

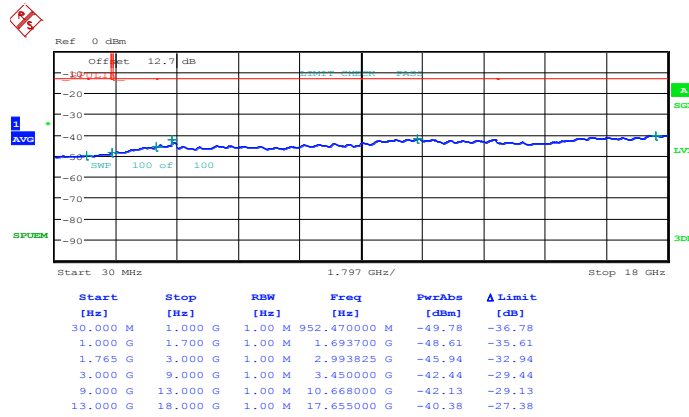


Date: 12.JUN.2014 19:22:51



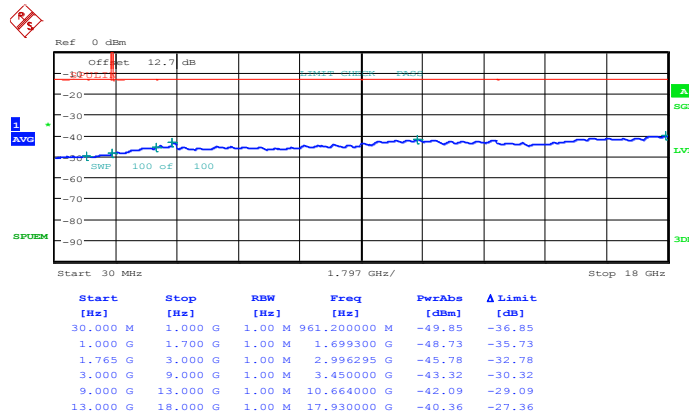
Band :	LTE Band 4	Channel :	CH20175 (Middle)
Band Width :	15MHz		

QPSK (RB Size 1, RB Offset 0)



Date: 12.JUN.2014 19:37:20

16QAM (RB Size 1, RB Offset 0)

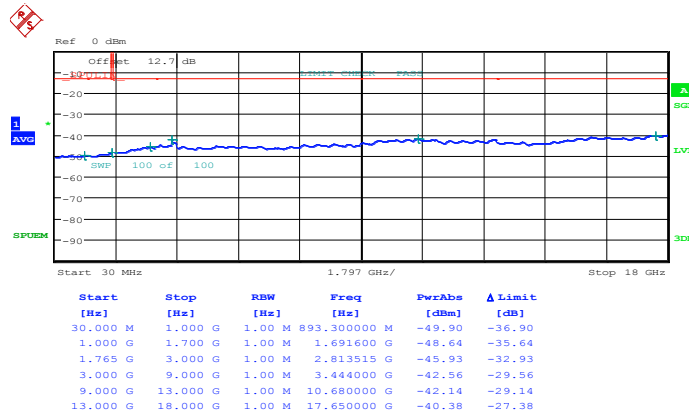


Date: 12.JUN.2014 19:38:20



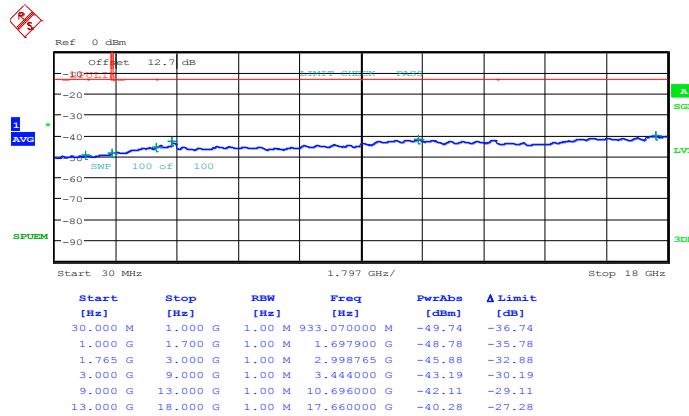
Band :	LTE Band 4	Channel :	CH20175 (Middle)
Band Width :	20MHz		

QPSK (RB Size 1, RB Offset 0)



Date: 12.JUN.2014 19:52:49

16QAM (RB Size 1, RB Offset 0)

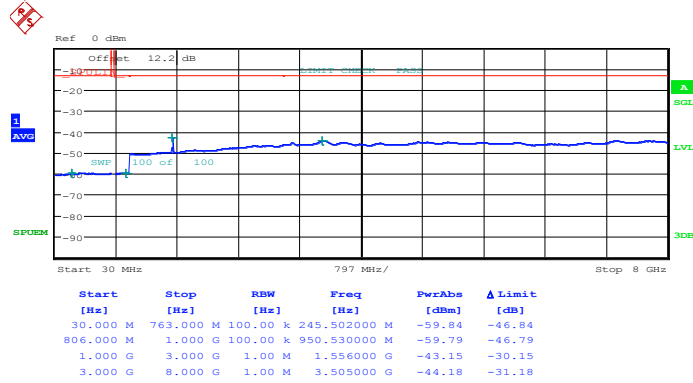


Date: 12.JUN.2014 19:53:49



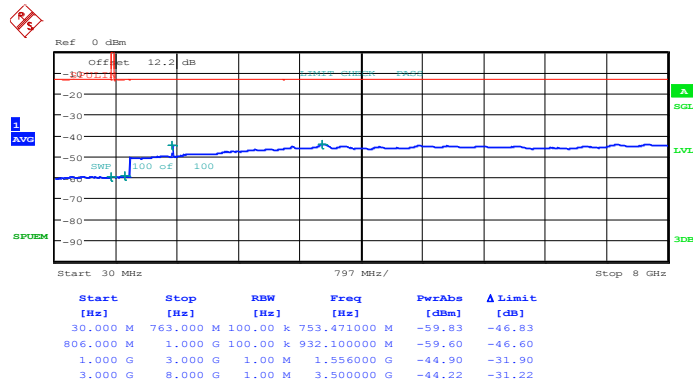
Band :	LTE Band 13	Channel :	CH23230 (Middle)
Band Width :	10MHz		

QPSK (RB Size 1, RB Offset 0)



Date: 12.JUN.2014 20:12:31

16QAM (RB Size 1, RB Offset 0)



Date: 12.JUN.2014 20:15:59



3.7 Radiated Spurious Emission Measurement

3.7.1 Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI / TIA / EIA-603-C-2004. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB.

For LTE Band 13

For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

3.7.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

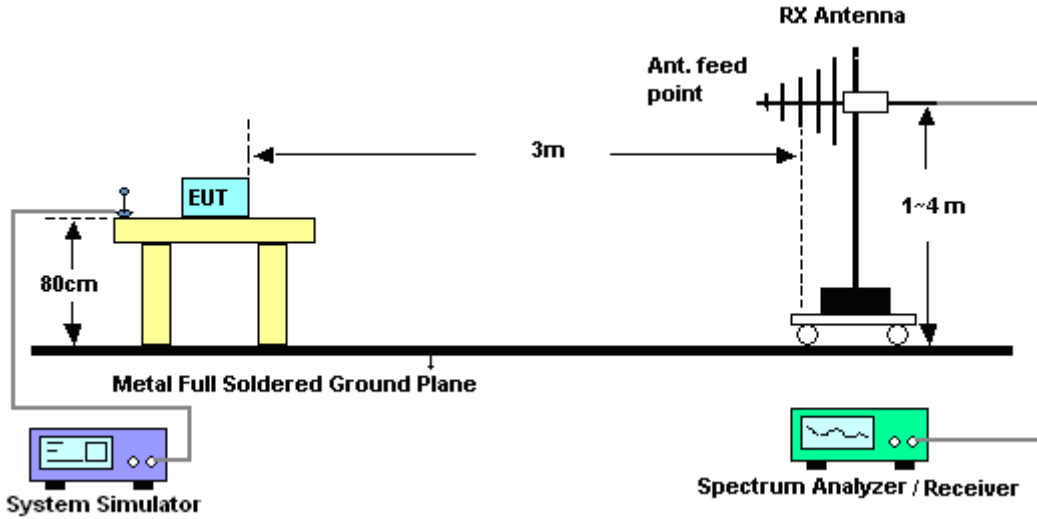
3.7.3 Test Procedures

1. The EUT was placed on a rotatable wooden table with 0.8 meter above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

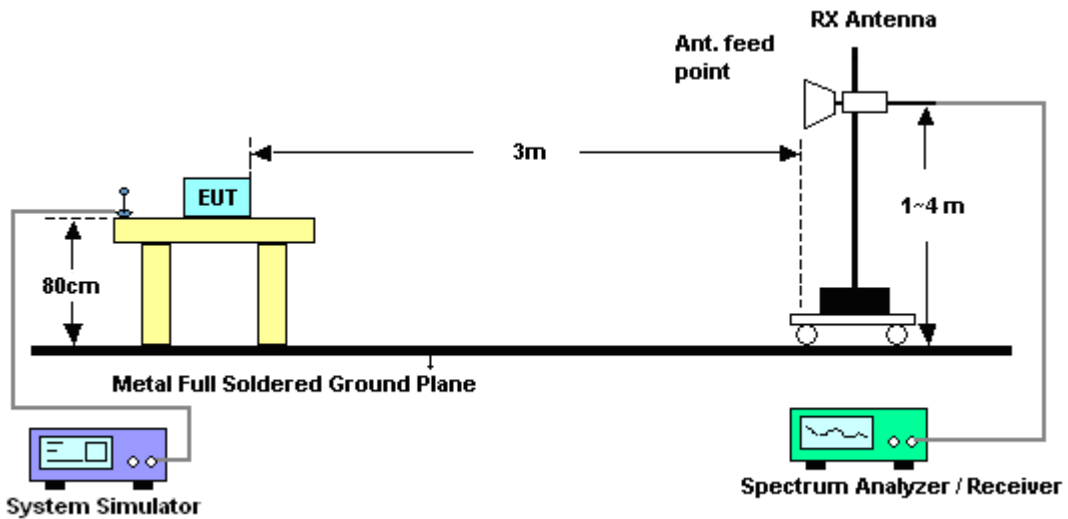
The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)
= $P(W) - [43 + 10\log(P)]$ (dB)
= $[30 + 10\log(P)]$ (dBm) - $[43 + 10\log(P)]$ (dB)
= -13 dBm.

3.7.4 Test Setup

For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





3.7.5 Test Result of Field Strength of Spurious Radiated

Band :	LTE Band 4				Temperature :	23~25°C			
Test Mode :	5MHz QPSK RB Size 1 Offset 0				Relative Humidity :	44~48%			
Test Engineer :	Eric Shih				Polarization :	Horizontal			
Remark :	Spurious emissions within 30-10th harmonic were found more than 20dB below limit line.								
Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3461	-53.61	-13	-40.61	-67.7	-57.44	4.48	8.31	H	Pass
5190	-50.36	-13	-37.36	-68.92	-55.00	5.332	9.98	H	Pass
6921	-42.97	-13	-29.97	-68.82	-48.21	6.1	11.34	H	Pass
13844	-35.54	-13	-22.54	-69.07	-41.59	8.14	14.19	H	Pass

Band :	LTE Band 4				Temperature :	23~25°C			
Test Mode :	5MHz QPSK RB Size 1 Offset 0				Relative Humidity :	44~48%			
Test Engineer :	Eric Shih				Polarization :	Vertical			
Remark :	Spurious emissions within 30-10th harmonic were found more than 20dB below limit line.								
Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3461	-52.61	-13	-39.61	-67.92	-56.44	4.48	8.31	V	Pass
5190	-49.93	-13	-36.93	-68.54	-54.57	5.332	9.98	V	Pass
6921	-43.60	-13	-30.60	-68.65	-48.84	6.1	11.34	V	Pass
13844	-35.52	-13	-22.52	-67.53	-41.57	8.14	14.19	V	Pass



Band :	LTE Band 4				Temperature :	23~25°C			
Test Mode :	10MHz QPSK RB Size 1 Offset 0				Relative Humidity :	44~48%			
Test Engineer :	Eric Shih				Polarization :	Horizontal			
Remark :	Spurious emissions within 30-10th harmonic were found more than 20dB below limit line.								
Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3456	-53.38	-13	-40.38	-67.43	-57.21	4.48	8.31	H	Pass
5184	-50.91	-13	-37.91	-69.41	-55.55	5.332	9.98	H	Pass
6912	-43.19	-13	-30.19	-69.06	-48.43	6.1	11.34	H	Pass
13824	-36.58	-13	-23.58	-70.15	-42.63	8.14	14.19	H	Pass

Band :	LTE Band 4				Temperature :	23~25°C			
Test Mode :	10MHz QPSK RB Size 1 Offset 0				Relative Humidity :	44~48%			
Test Engineer :	Eric Shih				Polarization :	Vertical			
Remark :	Spurious emissions within 30-10th harmonic were found more than 20dB below limit line.								
Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3456	-52.98	-13	-39.98	-68.32	-56.81	4.48	8.31	V	Pass
5184	-50.40	-13	-37.40	-68.95	-55.04	5.332	9.98	V	Pass
6912	-43.61	-13	-30.61	-68.67	-48.85	6.1	11.34	V	Pass
13824	-37.12	-13	-24.12	-69.12	-43.17	8.14	14.19	V	Pass



Band :	LTE Band 4		Temperature :	23~25°C					
Test Mode :	15MHz QPSK RB Size 1 Offset 0		Relative Humidity :	44~48%					
Test Engineer :	Eric Shih		Polarization :	Horizontal					
Remark :	Spurious emissions within 30-10th harmonic were found more than 20dB below limit line.								
Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3452	-53.96	-13	-40.96	-68.01	-57.79	4.48	8.31	H	Pass
5178	-50.82	-13	-37.82	-69.31	-55.46	5.332	9.98	H	Pass
6904	-43.51	-13	-30.51	-69.28	-48.75	6.1	11.34	H	Pass
13808	-35.58	-13	-22.58	-69.11	-41.63	8.14	14.19	H	Pass

Band :	LTE Band 4		Temperature :	23~25°C					
Test Mode :	15MHz QPSK RB Size 1 Offset 0		Relative Humidity :	44~48%					
Test Engineer :	Eric Shih		Polarization :	Vertical					
Remark :	Spurious emissions within 30-10th harmonic were found more than 20dB below limit line.								
Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3452	-53.18	-13	-40.18	-68.52	-57.01	4.48	8.31	V	Pass
5178	-50.47	-13	-37.47	-69.01	-55.11	5.332	9.98	V	Pass
6904	-44.01	-13	-31.01	-69.01	-49.25	6.1	11.34	V	Pass
13808	-37.78	-13	-24.78	-69.74	-43.83	8.14	14.19	V	Pass



Band :	LTE Band 4						Temperature :	23~25°C	
Test Mode :	20MHz QPSK RB Size 1 Offset 0						Relative Humidity :	44~48%	
Test Engineer :	Eric Shih						Polarization :	Horizontal	
Remark :	Spurious emissions within 30-10th harmonic were found more than 20dB below limit line.								
Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3447	-54.39	-13	-41.39	-68.45	-58.22	4.48	8.31	H	Pass
5172	-50.82	-13	-37.82	-69.24	-55.46	5.332	9.98	H	Pass
6895	-42.31	-13	-29.31	-68.09	-47.55	6.1	11.34	H	Pass
13792	-35.60	-13	-22.60	-69.06	-41.65	8.14	14.19	H	Pass

Band :	LTE Band 4						Temperature :	23~25°C	
Test Mode :	20MHz QPSK RB Size 1 Offset 0						Relative Humidity :	44~48%	
Test Engineer :	Eric Shih						Polarization :	Vertical	
Remark :	Spurious emissions within 30-10th harmonic were found more than 20dB below limit line.								
Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3447	-52.32	-13	-39.32	-67.65	-56.15	4.48	8.31	V	Pass
5172	-50.24	-13	-37.24	-68.72	-54.88	5.332	9.98	V	Pass
6895	-42.89	-13	-29.89	-67.87	-48.13	6.1	11.34	V	Pass
13792	-36.01	-13	-23.01	-68.01	-42.06	8.14	14.19	V	Pass



Band :	LTE Band 13				Temperature :	23~25°C			
Test Mode :	10MHz QPSK RB Size 1 Offset 0				Relative Humidity :	44~48%			
Test Engineer :	Eric Shih				Polarization :	Horizontal			
Remark :	Spurious emissions within 30-10th harmonic were found more than 20dB below limit line.								
Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1554	-57.87	-13	-44.87	-65.76	-59.7	1.51	5.49	H	Pass
1608	-56.94	-42.15	-14.79	-65.86	-58.9	1.54	5.65	H	Pass
2331	-54.38	-13	-41.38	-66.48	-56.3	1.98	6.05	H	Pass
3108	-53.78	-13	-40.78	-67.12	-56.8	2.39	7.56	H	Pass

Band :	LTE Band 13				Temperature :	23~25°C			
Test Mode :	10MHz QPSK RB Size 1 Offset 0				Relative Humidity :	44~48%			
Test Engineer :	Eric Shih				Polarization :	Vertical			
Remark :	Spurious emissions within 30-10th harmonic were found more than 20dB below limit line.								
Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1554	-56.67	-13	-43.67	-66.84	-58.5	1.51	5.49	V	Pass
1600	-54.94	-42.15	-12.79	-65.74	-56.9	1.54	5.65	V	Pass
2331	-53.58	-13	-40.58	-67.13	-55.5	1.98	6.05	V	Pass
3108	-52.18	-13	-39.18	-67.61	-55.2	2.39	7.56	V	Pass

3.8 Frequency Stability Measurement

3.8.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ ($\pm 2.5\text{ppm}$) of the center frequency.

3.8.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

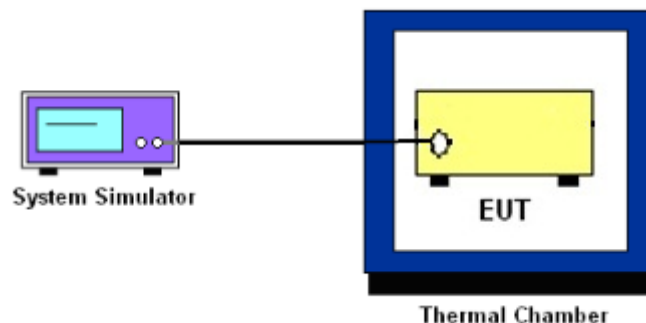
3.8.3 Test Procedures for Temperature Variation

1. The EUT was set up in the thermal chamber and connected with the system simulator.
2. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
3. With power OFF, the temperature was raised in 10°C step up to 50°C . The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

3.8.4 Test Procedures for Voltage Variation

1. The EUT was placed in a temperature chamber at $25\pm 5^{\circ}\text{C}$ and connected with the system simulator.
2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
3. The variation in frequency was measured for the worst case.

3.8.5 Test Setup





3.8.6 Test Result of Temperature Variation

Band :	LTE Band 4 (QPSK)	Limit (ppm) :	2.5
Temperature (°C)	BW 10MHz		Result
	Deviation (ppm)		
50	0.0038		PASS
40	0.0025		
30	0.0042		
20(Ref.)	0.0000		
10	0.0067		
0	0.0002		
-10	0.0009		
-20	0.0046		
-30	0.0050		

Band :	LTE Band 13 (QPSK)	Limit (ppm) :	2.5
Temperature (°C)	BW 10MHz		Result
	Deviation (ppm)		
50	0.0017		PASS
40	0.0029		
30	0.0055		
20(Ref.)	0.0000		
10	0.0014		
0	0.0032		
-10	0.0010		
-20	0.0022		
-30	0.0023		



3.8.7 Test Result of Voltage Variation

Band	Bandwidth	Voltage (Volt)	Deviation (ppm)	Limit (ppm)	Result
LTE Band 4	10M	4.35	0.0039	2.5	PASS
		Normal	0.0028		
		3.60	0.0002		
LTE Band 13	10M	4.35	0.0041	2.5	PASS
		Normal	0.0023		
		3.60	0.0009		

Remark:

- 1. Normal Voltage = 3.80V.
- 2. The manufacturer declared that the EUT could work properly between voltage 3.60V ~ 4.35V.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 09, 2014	Jun. 11, 2014~ Jun. 12, 2014	Jun. 08, 2015	Conducted (TH02-HY)
Thermal Chamber	Ten Billion	TTH-D3SP	TBN-930701	N/A	Jul. 19, 2013	Jun. 11, 2014~ Jun. 12, 2014	Jul. 18, 2014	Conducted (TH02-HY)
LTE Base Station	Anritsu	MT8820C	6201026480	30MHz~2.7GHz SISO	Jan. 07, 2014	Jun. 11, 2014~ Jun. 12, 2014	Jan. 06, 2015	Conducted (TH02-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV30	101749	10Hz ~ 30GHz	Feb. 10, 2014	Jul. 11, 2014~ Jul. 12, 2014	Feb. 09, 2015	Radiation (03CH07-HY)
Bilog Antenna	Schaffner	CBL6111C	2726	30MHz ~ 1GHz	Oct. 10, 2013	Jul. 11, 2014~ Jul. 12, 2014	Oct. 09, 2014	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	75962	1GHz~18GHz	Aug. 22, 2013	Jul. 11, 2014~ Jul. 12, 2014	Aug. 21, 2014	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10 MHz ~ 1000MHz	Mar. 17, 2014	Jul. 11, 2014~ Jul. 12, 2014	Mar. 16, 2015	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1 GHz~26.5 GHz	Nov. 29, 2013	Jul. 11, 2014~ Jul. 12, 2014	Nov. 28, 2014	Radiation (03CH07-HY)
Turn Table	ChainTek	ChainTek 3000	N/A	0 ~ 360 degree	N/A	Jul. 11, 2014~ Jul. 12, 2014	N/A	Radiation (03CH07-HY)
Antenna Mast	ChainTek	M-400-0	114/8000604	N/A	N/A	Jul. 11, 2014~ Jul. 12, 2014	N/A	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBEC K	BBHA 9170	BBHA91702 51	15GHz- 40GHz	Oct. 03, 2013	Jul. 11, 2014~ Jul. 12, 2014	Oct. 02, 2014	Radiation (03CH07-HY)



5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.50
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