



# FCC RF Test Report

**Product Name: UMTS/GPRS/GSM Mobile Phone with  
Bluetooth**

**Model Number: HUAWEI U5300**

**Report No: SYBH(Z-RF)017072011-2003**

**FCC ID: QISU5300**

**Reliability Laboratory of Huawei Technologies Co., Ltd.**

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<b>REGULATION</b>	<b>FCC CFR47 Part 2: Subpart J;</b>
	<b>FCC CFR47 Part 24: Subpart E;</b>
<b>START OF TEST</b>	<b>Jul.14, 2011</b>
<b>END OF TEST</b>	<b>Jul.17, 2011</b>
<b>Final Judgement:</b>	<b>Pass</b>

Approved By Jul.28, 2011 Chenxiaohong Chen Xiaohong  
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Reviewed By Jul.28, 2011 Xuguangyi Xuguangyi  
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# 1 Summary

The table below summarizes the measurements and results for the EUT. Detailed results and descriptions are shown in the following pages.

Table 1 Summary of results

<b>FCC Measurement Specification</b>	<b>FCC Limits Part(s)</b>	<b>Description</b>	<b>Result</b>
2.1046	27.50(d)(2)	Effective Radiated Power of Transmitter	PASS
2.1046	27.50(d)(2)	Conducted Power of Transmitter	PASS
2.1047	/	Modulation Characteristics	PASS
2.1049	/	Occupied Bandwidth	PASS
2.1051	27.53(g)	Band Edges Compliance	PASS
2.1051	27.53(g)	Spurious Emission at Antenna Terminal	PASS
2.1055	27.54	Frequency Stability	PASS



## 2 Product Description

### 2.1 Production Information

#### 2.1.1 General Description

HSUPA/HSDPA/UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth HUAWEI U5300 is subscriber equipment in the WCDMA/GSM system. The HSUPA/HSDPA/UMTS frequency band is Band II and AWS. The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only AWS band test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, HSUPA/HSDPA/UMTS and GSM/GPRS/EDGE protocol processing, voice, video, MMS service, and GPSI etc. Externally it provides micro SD card interface, earphone port(to provide voice service) and USIM card interface. It also provides Bluetooth module to synchronize data between a PC and the phone, or to exchange data with other Bluetooth devices.

#### 2.1.2 Support function and Service

The EUT support the function and service as follows:

Table 2 Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note
Data	Modulation: QPSK	TM1	WCDMA
Data	Modulation: QPSK	TM2	HSDPA
Data	Modulation: QPSK	TM3	HSUPA

Note: \* The WCDMA test condition & settings are defined in 3GPP TS 34.121 V7.5.0.

### 2.2 Modification Information

For original equipment, following table is not application.

Table 3 Modification Information

Model Number	Board/Module	Original Version	New Version	Modify Information
Not applicable				



### **3 Test Site Description**

The test site of:

***Huawei Technologies Co. Ltd.  
P.O. Box 518129  
Huawei base, bantian,  
Longgang District, Shenzhen, China***

#### **3.1 Testing Period**

The test have been performed during the period of

**Jul.14, 2011 –Jul.17, 2011**

#### **3.2 General Set up Description**

**TM1:** WCDMA Mode with QPSK Modulation

**TM2:** HSDPA Mode with QPSK Modulation

**TM3:** HSUPA Mode with QPSK Modulation



## 4 Product Description

### 4.1 Technical Characteristics

#### 4.1.1 Frequency Range

Table 4 Frequency Range

1700M Band	
Uplink band:	1710 to 1755 MHz
Downlink band:	2110 to 2155 MHz

#### 4.1.2 Channel Spacing / Separation

Table 5 Channel Spacing / Separation

WCDMA/HSPA	
Channel Raster	200k Hz
Channel spacing:	5MHz

#### 4.1.3 Type of Emission

Table 6 Type of Emission

WCDMA/HSPA	
Emission Designation:	-

According to CFR 47 (FCC) part 2, subpart C, section 2.201 and 2.202



#### 4.1.4 Environmental Requirements

Table 7 Environmental Requirements

Minimum temperature:	- 10 °C
Maximum temperature:	+ 55 °C
Relative Humidity:	5%-95%RH

#### 4.1.5 Power Source

Table 8 Power Source

AC voltage nominal:	~ 120 V
AC voltage range	~ 100 V to ~ 240 V
AC current maximal:	1A

#### 4.1.6 Tune-up Procedure

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (9).

Please reference the document Tune-up Procedure in TCF.

#### 4.1.7 Applied DC Voltages and Currents

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8).

The voltage and current in the final RF stage is:

Table 9 Applied RF Module DC Voltages and Currents

Voltage:	== +3.6~4.2V
Current:	1A According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8)



## 4.2 EUT Identification List

### 4.2.1 Board Information

Table 10 Board Information

UMTS/GPRS/GSM Mobile Phone with Bluetooth		
HUAWEI U5300		
Board and Module		
Hardware Version	Software Version	Serial Number
Ver.B	U5300CBTB208	U9V7NB1162700241

### 4.2.2 Adapter

AC/DCAdapter Model	HS-050040U6
Manufacturer	Huawei Technologies Co., Ltd.
Input Voltage	~100-240V 50/60Hz 0.2A
Output Voltage	5V  0.4A
Rated Power	2W
S/N	HKAAC0909330

### 4.2.3 Battery Technical Data

Battery Model:	HB5A2H
Rated capacity:	1150 mAh
Nominal Voltage:	 3.7 V
Charging Voltage:	 4.2 V

### 4.2.4 FCC Identification

**Grantee Code:** QIS  
**Product Code:** U5300  
**FCC Identification:** QISU5300



## 5 Main Test Instruments

Table 11 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until
Power supply	KEITHLEY	2303	1288003	Sep.27,2011
Universal Radio Communication Tester	R&S	CMU200	105822	Oct.24.2011
Wireless Communication Test set	Agilent	N4010A	MY49081592	Dec.14.2011
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	Aug.04,2011
Spectrum Analyzer	Agilent	E4440A	MY49420179	Apr.24,2012
Signal Analyzer	R&S	FSQ31	200021	Sep.27,2011
Temperature Chamber	WEISS	WKL64	24600294	Jan.03,2012
Signal generator	Agilent	E8257D	MY49281095	Jul.9.2012
Vector Signal Generator	R&S	SMU200A	104162	Sep.07,2011
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	919/1009	Dec.13.2011
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	Dec.13.2011
Horn Antenna	R & S	HF906	359287/005	May.07, 2012
Horn Antenna	R & S	HF906	359287/006	April.27, 2012
Broadband Antenna	SCHAFFNER	CBL 6112B	2536	Sep.21, 2011
Broadband Antenna	SCHAFFNER	CBL 6112B	2941	Jun.11, 2012
Horn Antenna	ETS-LINDGREN	3160	60008	Sep.20.2011
Horn Antenna	ETS-LINDGREN	3160	60006	Oct.27.2011



## 6 Transmitter Measurements

### 6.1 Effective Isotropic radiated power of Transmitter (EIRP)

#### 6.1.1 Test Conditions

Table 12 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	TM1/TM2/TM3 at Channel Bottom, Middle, Top

#### 6.1.2 Test Specifications and Limits

##### 6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and Part 27.50(d)2

##### 6.1.2.2 Supporting Standards

Table 13 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS 34.121 V7.5.0	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

##### 6.1.2.3 Limits

Compliance with Part 27.232, mobile/portable stations are limited to 1 watts EIRP peak power.  
 $W(\text{dBm}) = 10 \cdot \log(W_{\text{in mW}})$ .

Table 14 Limits

Maximum Output Power (Watts)	< 1 Watts
Maximum Output Power (dBm)	< 30 dBm

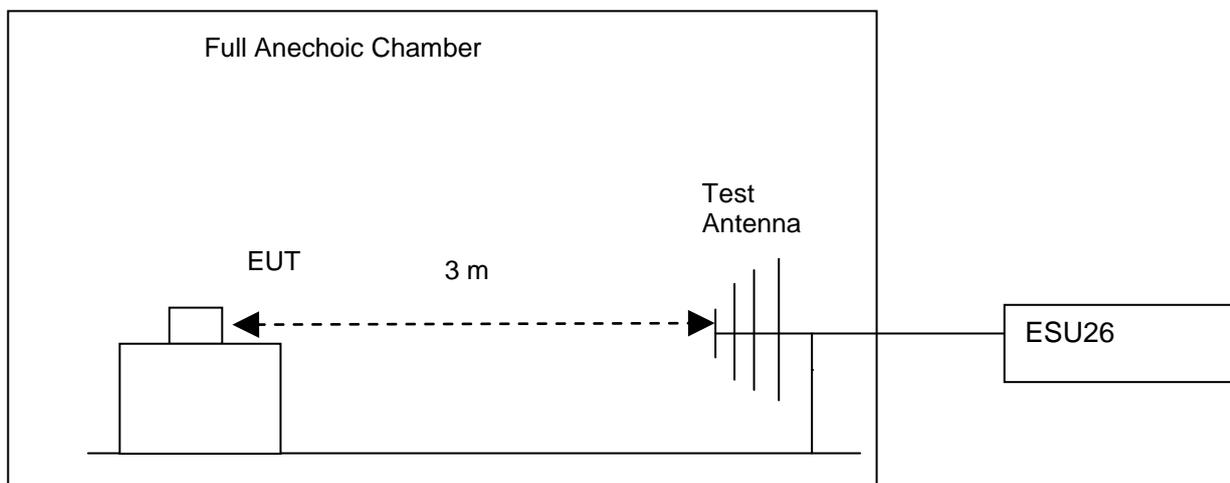
#### 6.1.3 Test Method and Setup

- (a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, EIRP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the EUT to the wireless communication tester CMU200 via the air interface. The band is set as AWS.

- (b) Test the Radiated maximum output power by the CMU200 received from test antenna.
- (c) Use substitution method to verify the maximum output power. The EUT is substituted by a dipole antenna. The dipole is connected to a signal generator. And then adjust the output level of the signal generator to get the same received power recorded in step (b) on CMU200, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

## Test setup

### Step 1: Pre-test



### Step 2: Substitution method to verify the maximum EIRP

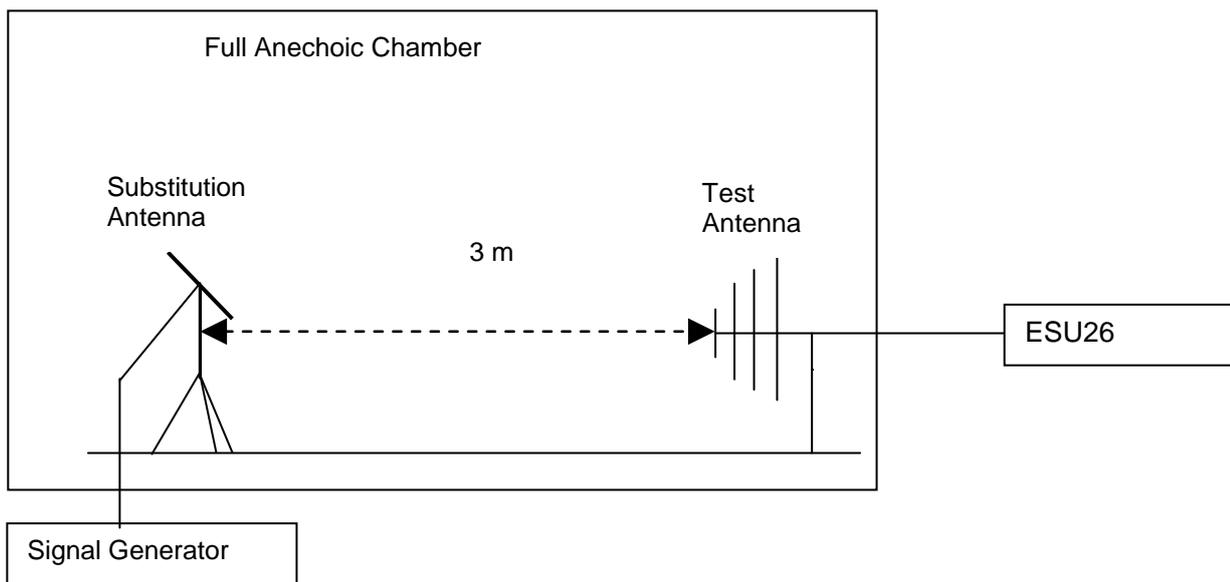


Figure 1. Test Set-up

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.

There is a constant difference of 2.15 dB between ERP and EIRP.

$EIRP (dBm) = ERP (dBm) + 2.15$  (ITU-R Recommendation SM.329-10).



## 6.1.4 Measurement Results

### 6.1.4.1 Pre-test Results

For HSDPA test mode, there are 4 sub-test for different configuration. For the sub-test 1, The channel is Middle range.

Sub-test	$\beta_c$	$\beta_d$	$\beta_d$ (SF)	$\beta_c/\beta_d$	HS	CM (dB)	MPR (dB)	Test result
1	2/15	15/15	64	2/15	4/15	0.0	0.0	22.85
2	12/15	15/15	64	12/15	24/15	1.0	0.0	22.59
3	15/15	8/15	64	15/8	30/15	1.5	0.5	22.15
4	15/15	4/15	64	15/4	30/15	1.5	0.5	22.18

For the following test, the TM2 was used for HSDPA.

For HSUPA test mode, there are 5 sub-test for different configuration. For the sub-test 1, The channel is Middle range.

Sub-test	$\beta_c/\beta_d$	$\beta_{HS}$	$\beta_{ec}$	$\beta_{ed}$	$\beta_{ed}$ (SF)	$\beta_{ed}$ (Codes)	CM (dB)	MPR (dB)	Test result
1	11/15	16/15	16/15	448/75	4	1	1.0	0.0	22.41
2	6/15	12/15	12/15	94/75	4	1	3.0	2.0	21.48
3	15/9	30/15	30/15	$\beta_{ed1}$ : 47/15 $\beta_{ed2}$ : 47/15	4	2	2.0	1.0	21.54
4	2/15	2/15	2/15	56/75	4	1	3.0	2.0	21.30
5	15/15	24/15	24/15	224/25	4	1	1.0	0.0	22.28

For the following test, the TM3 was used for HSUPA.

Table 15 Measurement Results

TEST CONDITIONS	RF Output Power (EIRP)					
	Channel 1312(B) 1712.4MHz		Channel 1412(M) 1732.4MHz		Channel 1513(T) 1752.6MHz	
	dBm		dBm		dBm	
$T_{nom}$ (25 °C)/ $V_{nom}$ (3.7V)	Measured	Limit	Measured	Limit	Measured	Limit
TM1	21.36	30	21.37	30	21.33	30
TM2	20.84	30	20.85	30	20.78	30
TM3	20.66	30	20.41	30	20.29	30



### 6.1.4.2 Substitution Results

Table 16 Substitution Results

Test Mode	Freq. [MHz]	Meas . Level [dBm]	Substitutio n Antenna Type	SGP [dBm]	Substitutio n Gain [dBi]	Cabl e Loss [dB]	Substitutio n Level (EIRP) [dBm]	Llimit [dBm ]	Resul t
TM1	1712.4	21.36	Horn Ant.	17.81	4.5	1.0	21.31	30	Pass
TM1	1732.4	21.37	Horn Ant.	17.82	4.5	1.0	21.32	30	Pass
TM1	1752.6	21.33	Horn Ant.	17.56	4.8	1.0	21.36	30	Pass
TM2	1712.4	20.84	Horn Ant.	17.39	4.5	1.0	20.89	30	Pass
TM2	1732.4	20.85	Horn Ant.	17.37	4.5	1.0	20.87	30	Pass
TM2	1752.6	20.78	Horn Ant.	16.92	4.8	1.0	20.72	30	Pass
TM3	1712.4	20.76	Horn Ant.	17.11	4.5	1.0	20.61	30	Pass
TM3	1732.4	20.41	Horn Ant.	16.97	4.5	1.0	20.47	30	Pass
TM3	1752.6	20.29	Horn Ant.	16.43	4.8	1.0	20.33	30	Pass

Note: a, For get the EIRP (Effective Isotropic Radiated Power) in substitution method, the following formula should take to calculate it,

$$\text{EIRP [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBi]}$$

NOTE: SGP- Signal Generator Level

b, RBW=10kHz, VBW=300kHz, and integrated by the instrument to 5M for TM1/TM2/TM3.

### 6.1.5 Conclusion

The equipment **PASSED** the requirement of this clause.



## 6.2 Conducted Power of Transmitter

### 6.2.1 Test Conditions

Table 17 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55 %
Test Configurations:	TM1/TM2/TM3 at Channel Bottom, Middle, Top

### 6.2.2 Test Specifications and Limits

#### 6.2.2.1 Specification

CFR 47 (FCC) part 2.1047 and Part 27.50(d)(2)

#### 6.2.2.2 Supporting Standards

Table 18 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS 34.121 V7.5.0	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.2.2.3 Limits

Compliance with Part 27.232, in no any case may the peak power of a mobile station transmitter exceed 2 W. The calculated longitude EIRP by following formula:

$$EIRP(dBm) = 10 * \log (EIRP_{mW}).$$

And for conducted power, we can use Antenna Gain to calculate the limit. So the conducted power:

$$P_{cod.}(dBm) = EIRP(dBm) - Gain(dBi).$$

$$\text{and Gain (dBi)} = \text{Gain(dBd)} + 2.15dB$$

Table 19 Limits

Maximum Output Power (Watts)	< 1 Watts (30 dBm)
Antenna Gain(dBi):	-2
Maximum Conducted Output Power (dBm)	<32

### 6.2.3 Test Method and Setup

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, Conducted maximum power shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the EUT to the wireless communication tester CMU200 via the antenna connector. The band class is set as AWS.

(b) Test the Conducted maximum output power by the CMU200.

#### Test setup

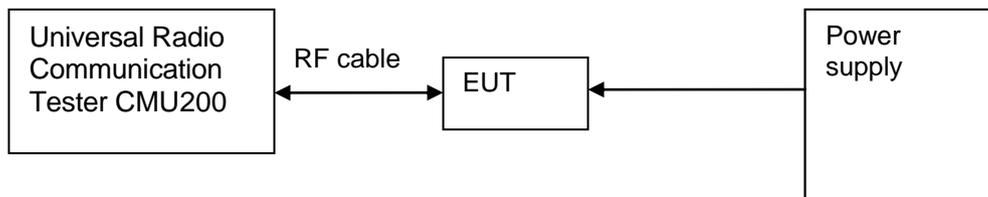


Figure 2. Test Set-up

### 6.2.4 Measurement Results

Table 20 Measurement Results

TEST CONDITIONS		RF Output Power(Conducted)					
		Channel1312(B)		Channel1412(M)		Channel1513(T)	
		1712.4MHz		1732.4MHz		1752.6MHz	
		dBm		dBm		dBm	
		Measure d	Limit	Measured	Limit	Measure d	Limit
TM1	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (3.7V)	23.36	32	23.37	32	23.33	32
TM2	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (3.7V)	22.84	32	22.85	32	22.78	32
TM3	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (3.7V)	22.66	32	22.41	32	22.29	32

### 6.2.5 Conclusion

The equipment **PASSED** the requirement of this clause.



## 6.3 Modulation Characteristics

### 6.3.1 Test Conditions

Table 21 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	52 %
Test Configurations:	TM1 at frequency Middle

### 6.3.2 Test Specifications and Limits

#### 6.3.2.1 Specification

CFR 47 (FCC) part 2.1047 and Part 27 Subpart C&L

#### 6.3.2.2 Supporting Standards

Table 22 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS 34.121 V7.5.0	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.3.2.3 Limits

No specific modulation characteristics requirement limits in part 2.1047 and part 24 subpart E.

Table 23 Limits

Limits	Not applicable
--------	----------------

### 6.3.3 Test Method and Setup

Connect the EUT to Universal Radio Communication Tester CMU200 via the antenna connector. The frequency band is set as AWS; the EUT's output is matched with 50  $\Omega$  load, test method was according to 3GPP TS 34.121. The waveform quality and constellation of the EUT Module was tested.

#### Test setup

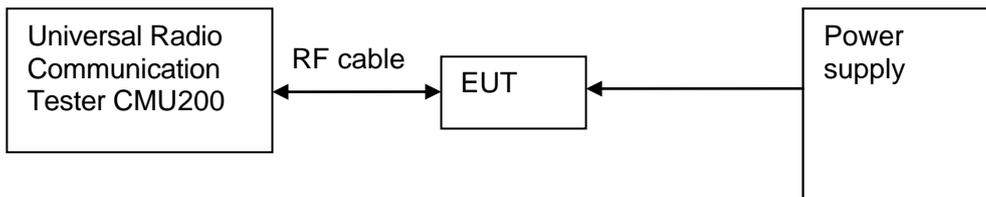


Figure 3. Test Set-up

### 6.3.4 Measurement Results

Table 24 Measurement Results

		Modulation Characteristic
TEST CONDITIONS		Channel 1412(M) 1732.4MHz
		Measured
		TM1
$T_{nom}$ (25 °C)	$V_{nom}$ (3.7V)	Refer to Appendix A

### 6.3.5 Conclusion

The equipment **PASSED** the requirement of this clause.

For the measurement results refer to appendix A.

## 6.4 Occupied Bandwidth

### 6.4.1 Test Conditions

Table 25 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55 %
Test Configurations:	TM1 at frequency Bottom, Middle, Top

### 6.4.2 Test Specifications and Limits

#### 6.4.2.1 Specification

CFR 47 (FCC) part 2.1049 and Part 27

#### 6.4.2.2 Supporting Standards

Table 26 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS 34.121 V7.5.0	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.4.2.3 Limits

No specific occupied bandwidth requirement in Part 27 Subpart C&L, but the occupied bandwidth was defined in part 2.1049: the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

Table 27 Limits

Upper /lower frequency limits	0.5% of the mean power
-------------------------------	------------------------

### 6.4.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector. The band class is set as AWS; The EUT was controlled to transmit maximum power. Measure and record the occupied bandwidth of the EUT Module by the R&S FSQ31.

The OBW, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

Refer to 47CFR part2.1049 section (g) & (h).

(g) Transmitter in which the modulating base band comprises not more than three independent channels - when modulated by the full complement of signals for which the transmitter is rated. The level of modulation for each channel should be set to that prescribed in rule parts applicable to the services for which the transmitter is intended. If specific modulation levels are not set forth in the rules, the tests should provide the manufacturer's maximum rated condition.

(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudorandom generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at discretion of the user.

For TM1 following RBW and VBW are employed:

Measurement bandwidth (RBW): 50 kHz (Resolution bandwidth)

Video bandwidth (VBW): 500 kHz

**Test Set-up**

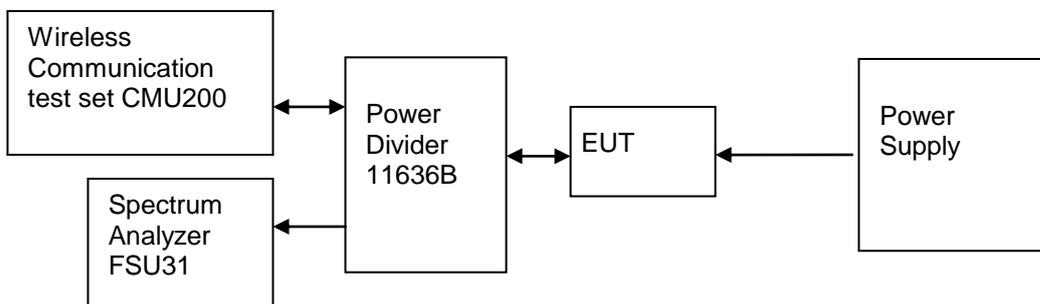


Figure 4. Test Set-up

**6.4.4 Measurement Results**

Table 28 Measurement Results

TEST CONDITIONS		Occupied Bandwidth		
		Channel1312(B)	Channel1412(M)	Channel1513(T)
Center Frequency		1712.4MHz	1732.4MHz	1752.6MHz
		Measured (MHz)	Measured (MHz)	Measured (MHz)
		TM1	TM1	TM1
T <sub>nom</sub> (25 °C) V <sub>nom</sub> (3.7V)	99%	4.17	4.15	4.15

**6.4.5 Conclusion**

The equipment **PASSED** the requirement of this clause.  
 For the measurement results refer to appendix B.



## 6.5 Band Edges Compliance

### 6.5.1 Test Conditions

Table 29 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55 %
Test Configurations:	TM1 at frequency Bottom, Top

### 6.5.2 Test Specifications and Limits

#### 6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and Part 27.53

#### 6.5.2.2 Supporting Standards

Table 30 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS 34.121 V7.5.0	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.5.2.3 Limits

Compliance with Part 27.50(d) (2), all spurious emission must be attenuated below the transmitter power by at least  $43 + 10 \log_{10} P$  (W). (Whereas P is the rated power of the EUT).

Table 31 Limits

	TM1
Rated Power:	24 dBm
Required attenuation:	$43 + 10 \log(0.25) = 37$ , 24 dBm - 37 dB
Absolute level	- 13 dBm

### 6.5.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector, the band class is set as AWS. The EUT controlled to transmit maximum power. Measure and record band edges compliance of the EUT by the R&S FSQ31.

For TM1 following RBW and VBW are employed:

Measurement bandwidth (RBW): 50 kHz (Resolution bandwidth)

Video bandwidth (VBW): 200 kHz

## Test Set-up

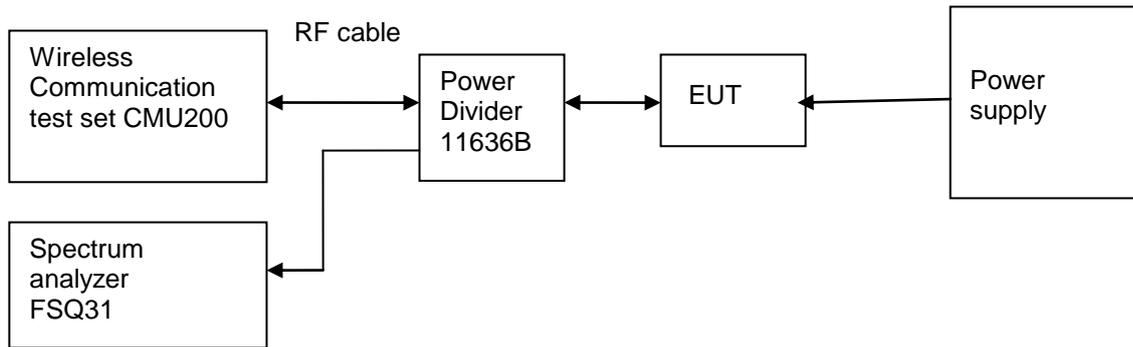


Figure 5. Test Set-up

## 6.5.4 Measurement Results

Table 32 Measurement Results outside Band Edges-- Single Carrier

Band	Frequency of Band edges [MHz]	Channel Number	Test Mode	Spurious Level measured [dBm]	FCC limit	Result
Cellular	$T_{nom}$ (25 °C), $V_{nom}$ (3.7V)					
	1712.4	1312	TM1	<-13(See appendix C)	- 13 dBm	Pass
	1752.6	1513	TM1	<-13(See appendix C)	- 13 dBm	Pass

## 6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
 For the measurement results refer to appendix C.

## 6.6 Spurious Emission at Antenna Terminal

### 6.6.1 Test Conditions

Table 33 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55 %
Test Configurations:	TM1 at frequency Bottom, Middle, Top

### 6.6.2 Test Specifications and Limits

#### 6.6.2.1 Specification

CFR 47 (FCC) part 2.1051 and Part 27.53

#### 6.6.2.2 Supporting Standards

Table 34 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS 34.121 V7.5.0	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.6.2.3 Limits

Compliance with Part 27.50(d)(2), all spurious emission must be attenuated below the transmitter power by at least  $43 + 10 \log_{10} P$ . (Whereas P is the rated power of the EUT).

Table 35 Limits

	TM1
Rated Power:	24 dBm
Required attenuation:	$43 + 10 \log(0.25) = 37$ , 24 dBm - 37 dB
Absolute level	- 13 dBm

### 6.6.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector, the band class is set as AWS. The EUT was controlled to transmit maximum power. Measure and record the Conducted Spurious Emission of the EUT by the R&S FSQ31.

According to Part 27.50(d) (2), the defined measurement bandwidth as following:

24.238 (b) Measurement procedure: Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater.

Measurement bandwidth (RBW) for 9 kHz up to 150 kHz: 1 kHz;  
 Measurement bandwidth (RBW) for 150 kHz up to 30MHz: 10 kHz;  
 Measurement bandwidth (RBW) for 30 MHz up to 20GHz: 1MHz;

### Test Set-up

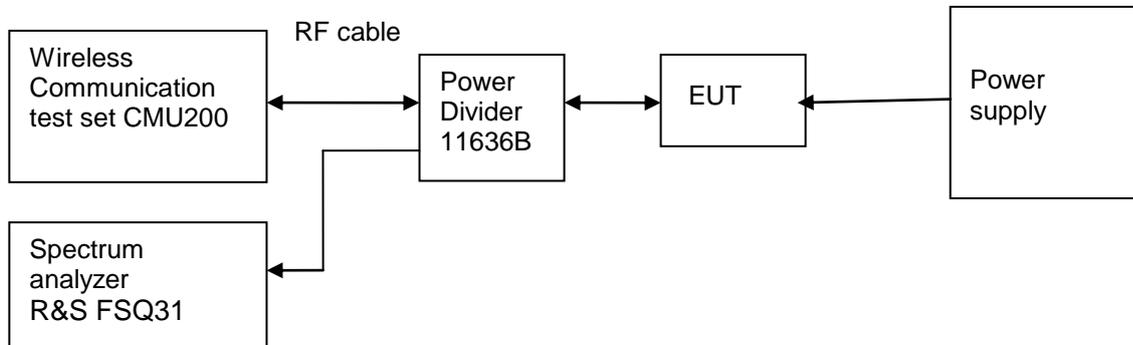


Figure 6. Test Set-up

### 6.6.4 Measurement Results

Table 36 Measurement Results

Channel Number	Test Mode	Test Range (Frequency)	Output Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel 1312(B)	TM1	9 kHz~20GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 1412(M)	TM1	9 kHz~20GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 1513(T)	TM1	9 kHz~20GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass

### 6.6.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
 For the measurement results refer to appendix D.



## 6.7 Radiated Spurious Emissions

### 6.7.1 Test Conditions

Table 37 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	TM1/TM2/TM3 at frequency Middle

### 6.7.2 Test Specifications and Limits

#### 6.7.2.1 Specification

CFR 47 (FCC) part 2.1053 and part 27.53(h)

#### 6.7.2.2 Supporting Standards

Table 38 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS 34.121 V7.5.0	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.7.2.3 Limits

Compliance with part 27.53(h), all spurious emission must be attenuated below the transmitter power by at least  $43 + 10 \log_{10} P$ . (Whereas P is the rated power of the EUT).

Table 39 Limits

Rated Power:	24 dBm
Required attenuation:	$43 + 10 \log(0.25) = 37$ , 24 dBm – 37 dB
Absolute level	- 13 dBm

### 6.7.3 Test Method and Setup

A test site fulfilling the requirements of ITU-R Recommendation SM329-11 was used. The EUT was placed on a non-conducting support in the anechoic chamber and was operated from a power source via an RF filter to avoid radiation from the power leads.

According to part 27.53, the defined measurement bandwidth as following:

27.53(h) Measurement procedure: Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1MHz or greater.

Measurement bandwidth (RBW) for 9 kHz up to 150 kHz: 1 kHz;

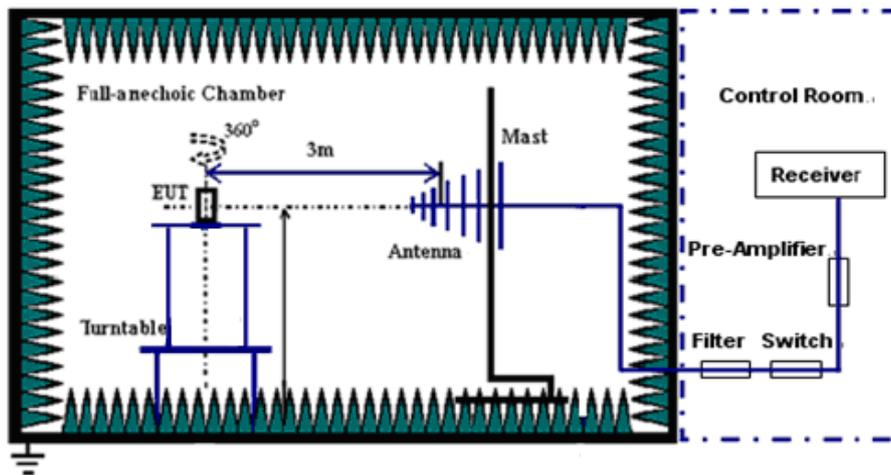
Measurement bandwidth (RBW) for 150 kHz up to 30 MHz: 10 kHz;  
Measurement bandwidth (RBW) for 30MHz up to 18GHz: 1MHz;

### Test Set-up

Step 1:

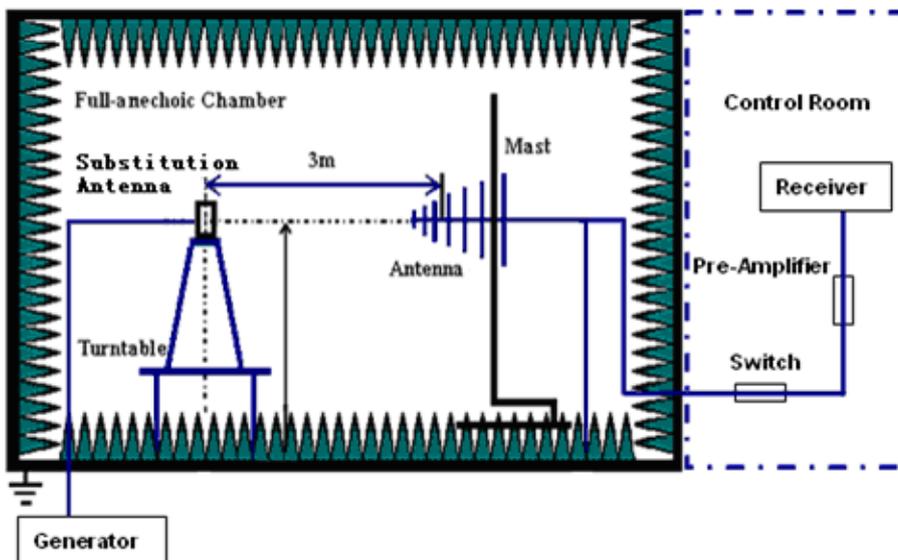
For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, EIRP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the EUT to the BTS simulator via the air interface.

Test the Radiated maximum output power by the Test Receiver from test antenna.



Step 2:

Use substitution method to verify the maximum output power. The EUT is substituted by a dipole antenna. The dipole is connected to a signal generator. And then adjust the output level of the signal generator to get the same received power recorded in step1 on Test Receiver, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.





Test should be performed in normal voltage condition.

Table 40 Substitution Results

Freq. [MHz]	Measurement Value [dBm]	Substitution Antenna Type	Gain [dBd]	Cable Loss [dB]	Signal Generator Level [dBm]	Substitution Level [dBm]	FCC limit [dBm]	Result

Note: For get the E.R.P. (Efficient Radiated Power) in substitution method, the following formula should take to calculate it,

$$\text{E.R.P. [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBd]}$$

NOTE: SGP- Signal Generator Level

#### 6.7.4 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to appendix\_E



## 6.8 Frequency Stability

### 6.8.1 Test Conditions

Table 41 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55 %
Test Configurations:	TM1 at frequency Middle

### 6.8.2 Test Specifications and Limits

#### 6.8.2.1 Specification

CFR 47 (FCC) part 2.1055 and Part 27.54

#### 6.8.2.2 Supporting Standards

Table 42 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS 34.121 V7.5.0	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

#### 6.8.2.3 Limits

No specific frequency stability requirement in part 2.1055 and Part 27.50(d)(2).

### 6.8.3 Test Method and Setup

The frequency stability shall be measured with variation of ambient temperature as follows:

- (1) From -30 ° to +50 ° centigrade for all equipment except that specified in subparagraphs (2) and (3) of paragraph 2.1055

(a) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(b) The frequency stability shall be measured with variation of primary supply voltage as follows:

- (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
- (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery

operating end point, which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(c) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment.)

The EUT can only work in such extreme voltage 3.6V and 4.2V, so here the EUT is tested in the 3.6V and 4.2V.

### **Test Set up**

Connect the EUT to the Wireless Communication test set CMU200 via the connector. Then measure the frequency error by the Wireless Communication test set CMU200. The EUT's output is matched with a 50 Ω load.

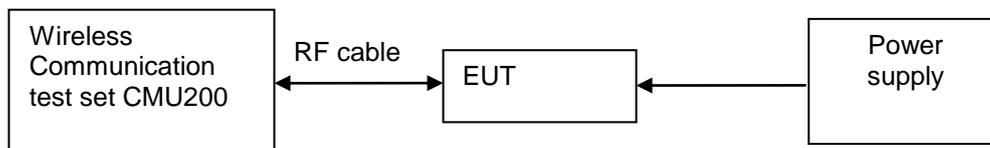


Figure 7. Test Set up

## **6.8.4 Measurement Results**

### **6.8.4.1 Measurement Results vs. Variation of Temperature**

- **TM1, 3.7V DC Channel No.1412(1732.4MHz)**

Table 43 Measurement Results vs. Variation of Temperature—TM1

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	1732.4	-10	Pass
-20 °C	1732.4	15	Pass
-10 °C	1732.4	-17	Pass
0 °C	1732.4	-6	Pass
+10 °C	1732.4	12	Pass
+20 °C	1732.4	9	Pass
+30 °C	1732.4	-13	Pass
+40 °C	1732.4	-10	Pass
+50 °C	1732.4	5	Pass



### 6.8.4.2 Measurement Results vs. Variation of Voltage

- **TM1, 25 °C ,Channel No. 1412(1732.4MHz)**

Table 44 Measurement Results vs. Variation of Voltage—TM1

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.2 V	1732.4	5	Pass
3.7 V	1732.4	-10	Pass
3.6 V	1732.4	-12	Pass

### 6.8.5 Conclusio

The equipment **PASSED** the requirement of this clause.



## 7 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Table 45 System Measurement Uncertainty

Items		Extended Uncertainty
Effective Radiated Power of Transmitter	EIRP (dBm)	U=3dB; k=2
Band Width	Magnitude (%)	U=0.2%; k=2
Band Edge Compliance	Disturbance Power (dBm)	U=2.0dB; k=2
Conducted Spurious Emission at Antenna Terminal	Disturbance Power (dBm)	U=2.0dB; k=2
Frequency Stability	Frequency Accuracy(ppm)	U=0.21ppm; k=2



## 8 Appendices

Appendix A	Measurement Results Modulation Characteristics
Appendix B	Measurement Results Occupied Bandwidth
Appendix C	Measurement Results Band Edges
Appendix D	Measurement Results Spurious Emission at Antenna Terminal
Appendix E	Measurement Results Radiated Spurious Emissions
Appendix F	Photos of Radiated Spurious Emissions



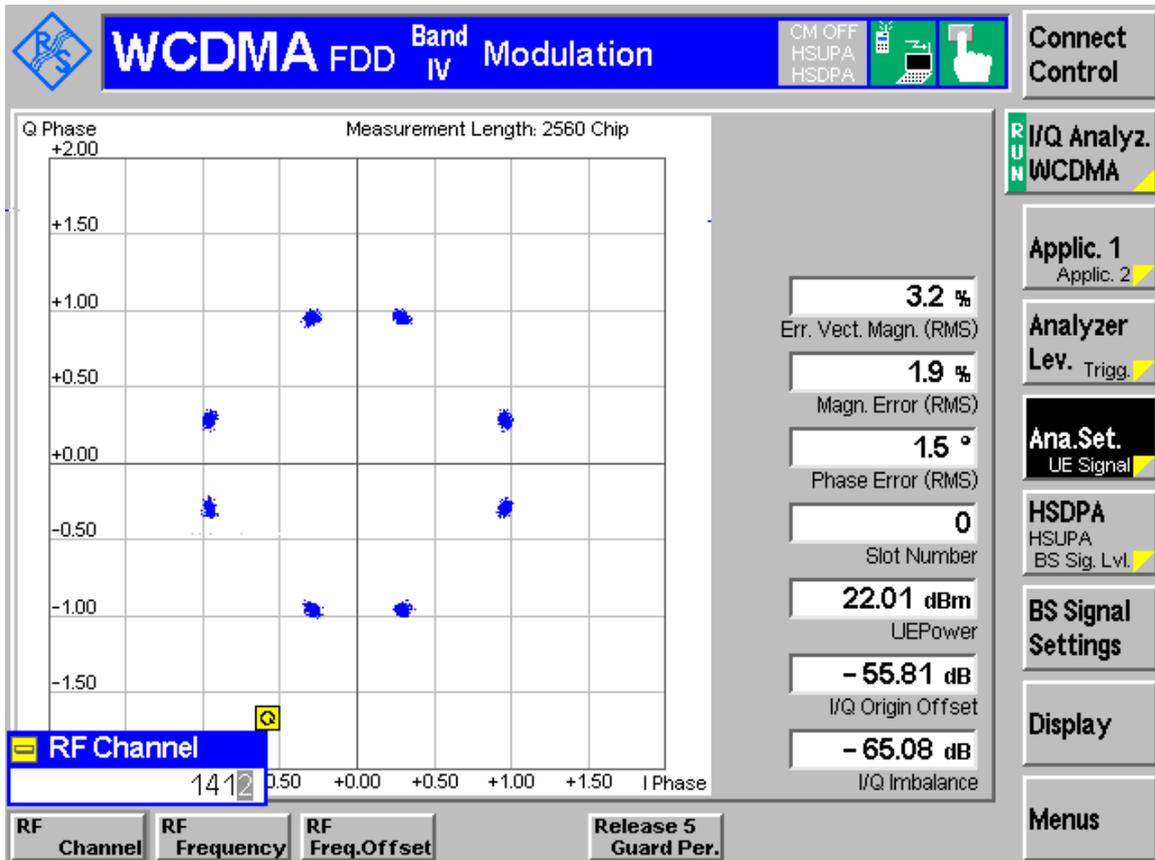
# Appendix A

## Modulation Characteristics

According to FCC Part 2.1047 & Part 27 Subpart C&L



# TM1: WCDMA Channel 1412





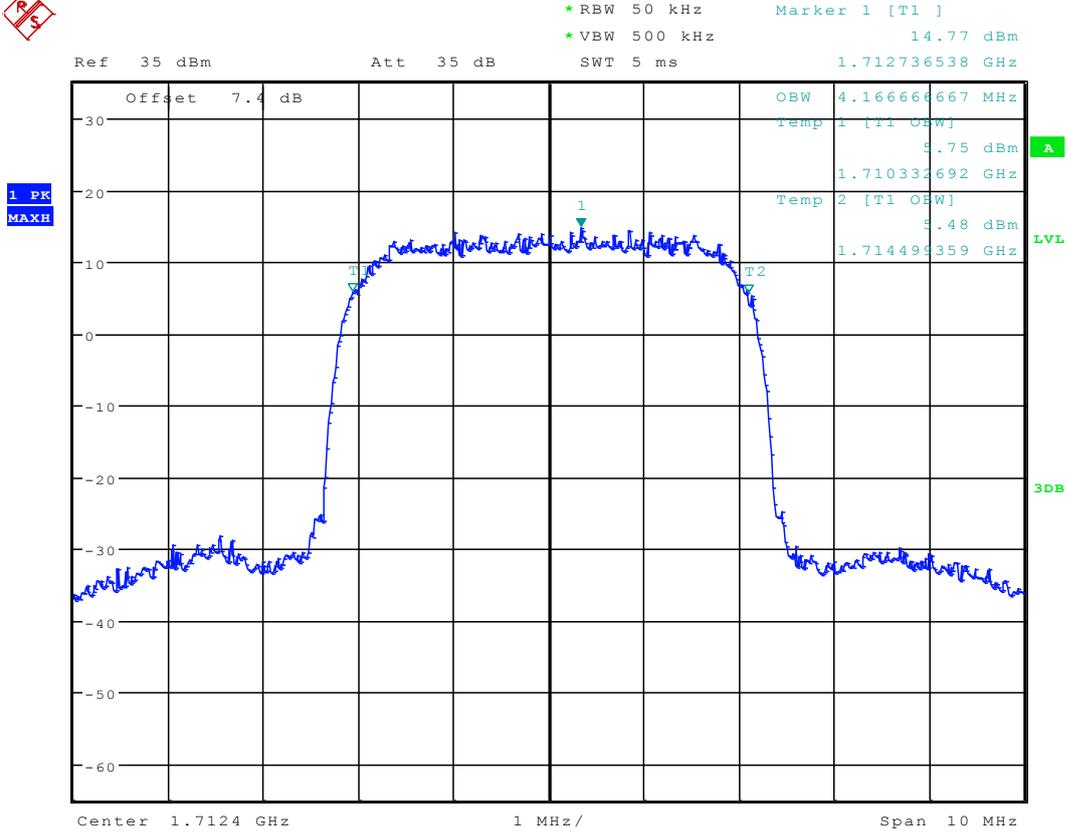
## **Appendix B**

# Occupied Bandwidth

According to FCC Part 2.1049 & Part 27 Subpart C&L

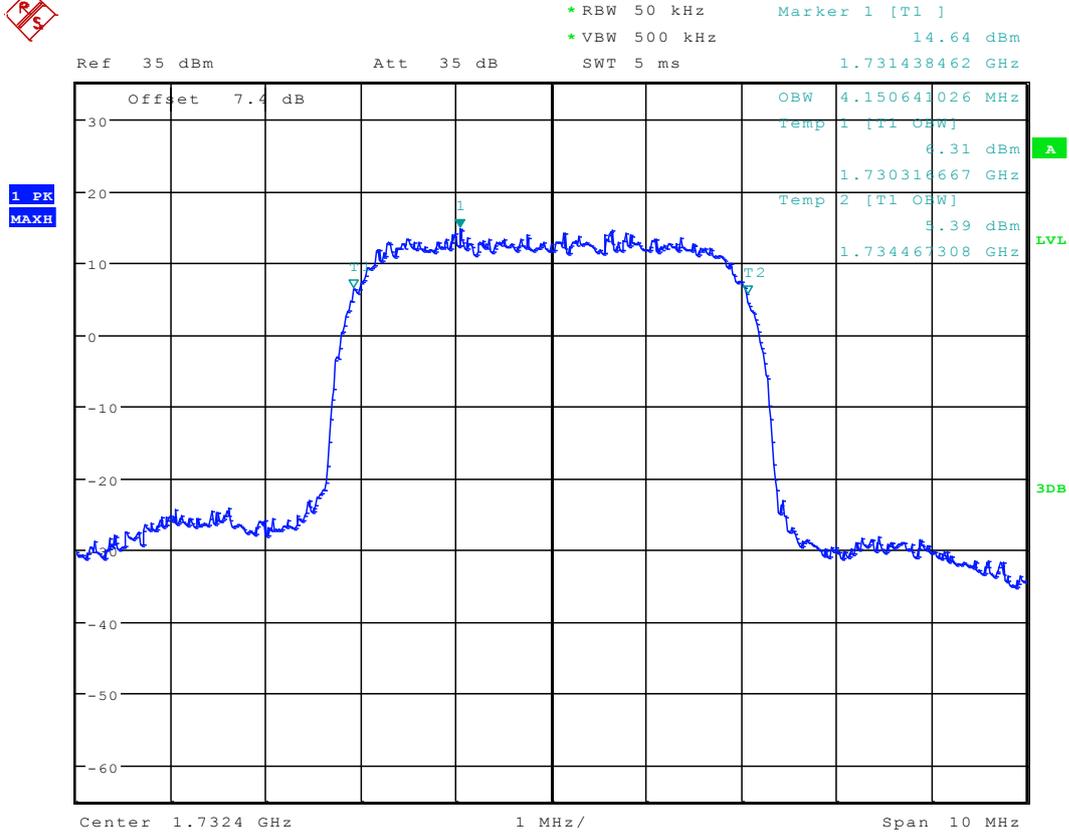


# TM1:WCDMA Channel 1312





# Channel 1412

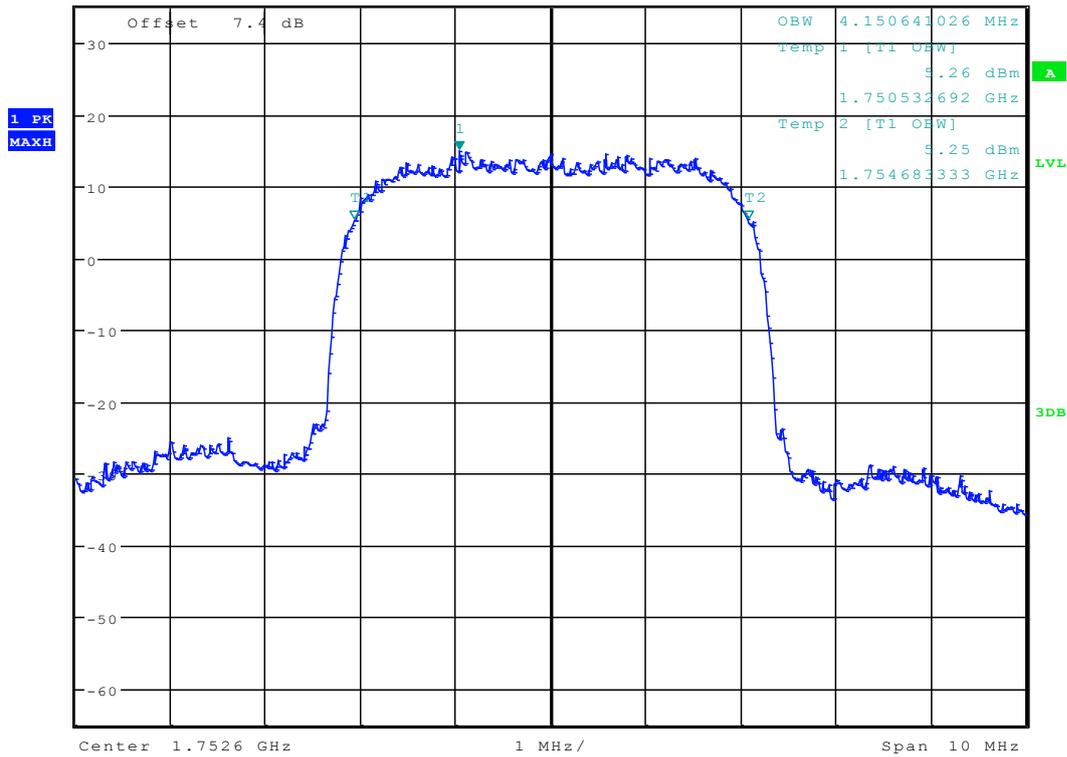




# Channel 1513



\*RBW 50 kHz      Marker 1 [T1]      15.03 dBm  
 \*VBW 500 kHz  
 Ref 35 dBm      Att 35 dB      SWT 5 ms      1.751638462 GHz





# **Appendix C**

## **Band Edges Compliance**

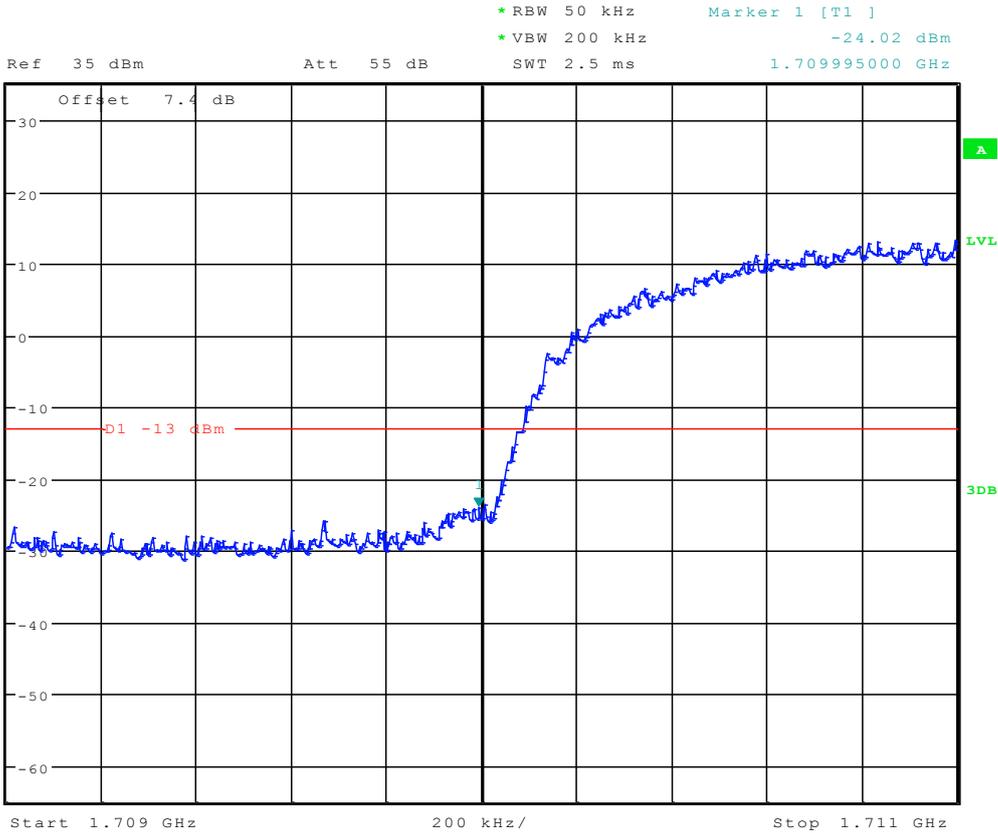
According to FCC Part 2.1051 & Part 27 Subpart C&L



# TM1:WCDMA

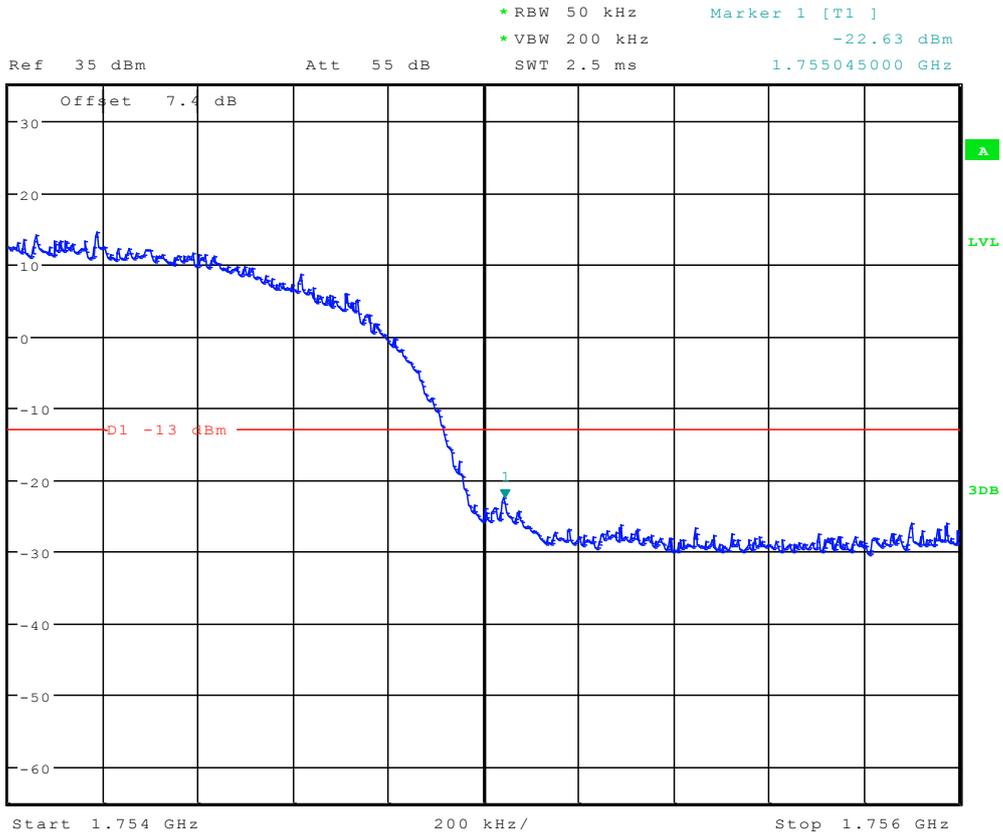
## Left Edge

### Channel 1312





## Right Edge Channel 1513





## **Appendix D**

# Spurious Emission at Antenna Terminal

According to FCC Part 2.1051 & Part 27 Subpart C&L

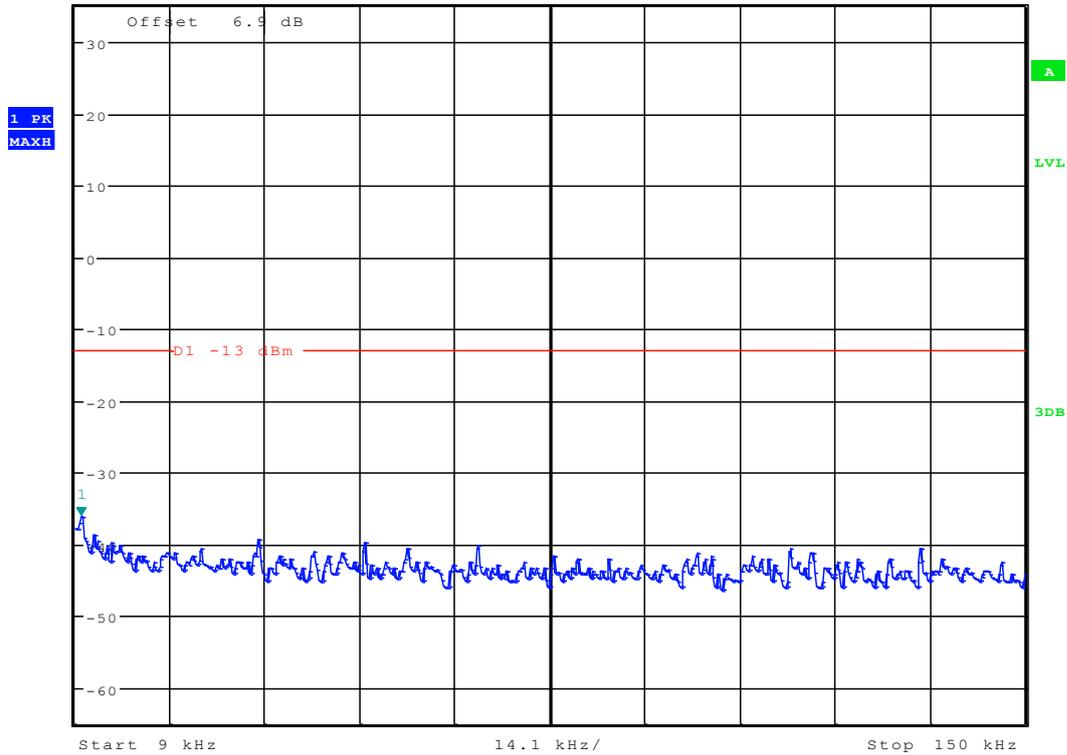


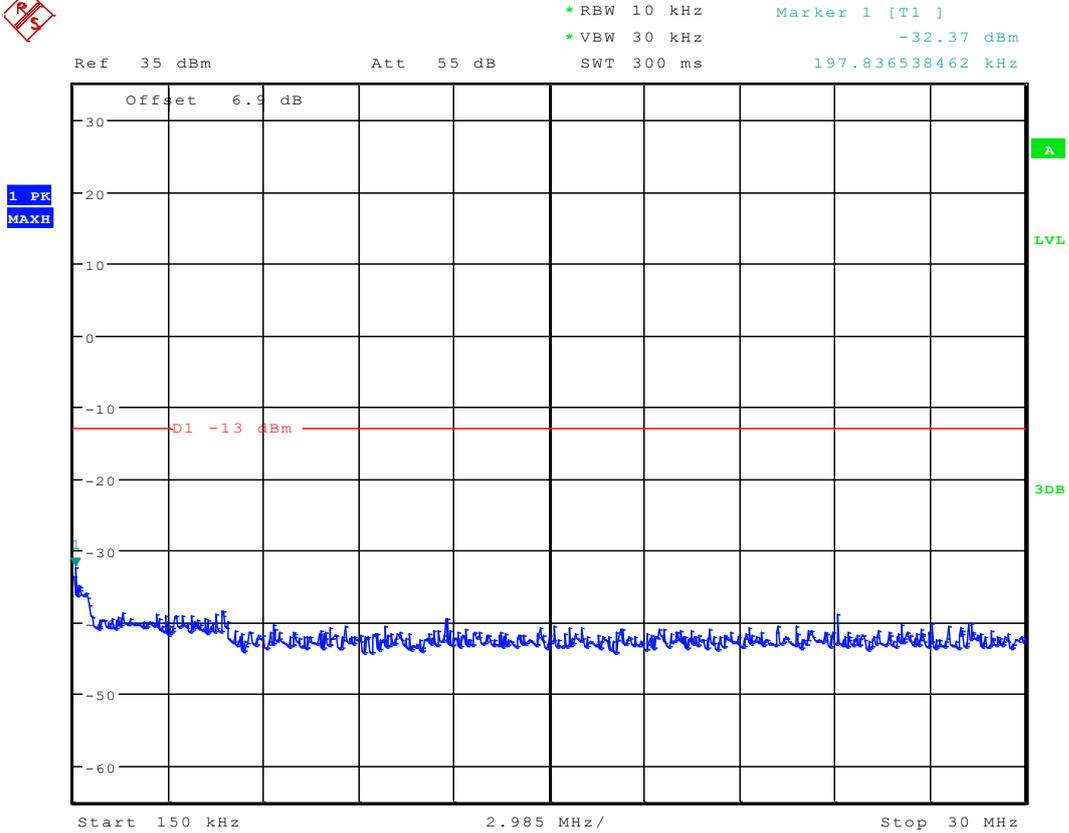
# TM1:WCDMA

## Channel 1312



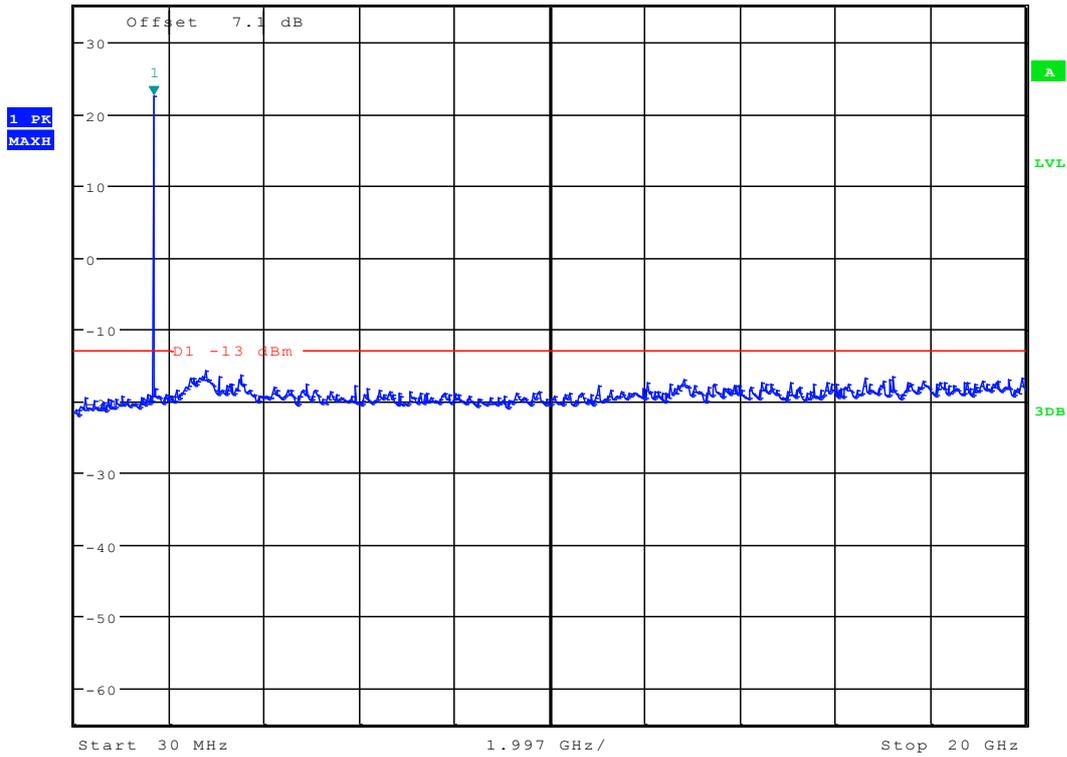
\* RBW 1 kHz      Marker 1 [T1 ]  
\* VBW 10 kHz      -36.06 dBm  
Ref 35 dBm      Att 55 dB      SWT 145 ms      9.903846154 kHz





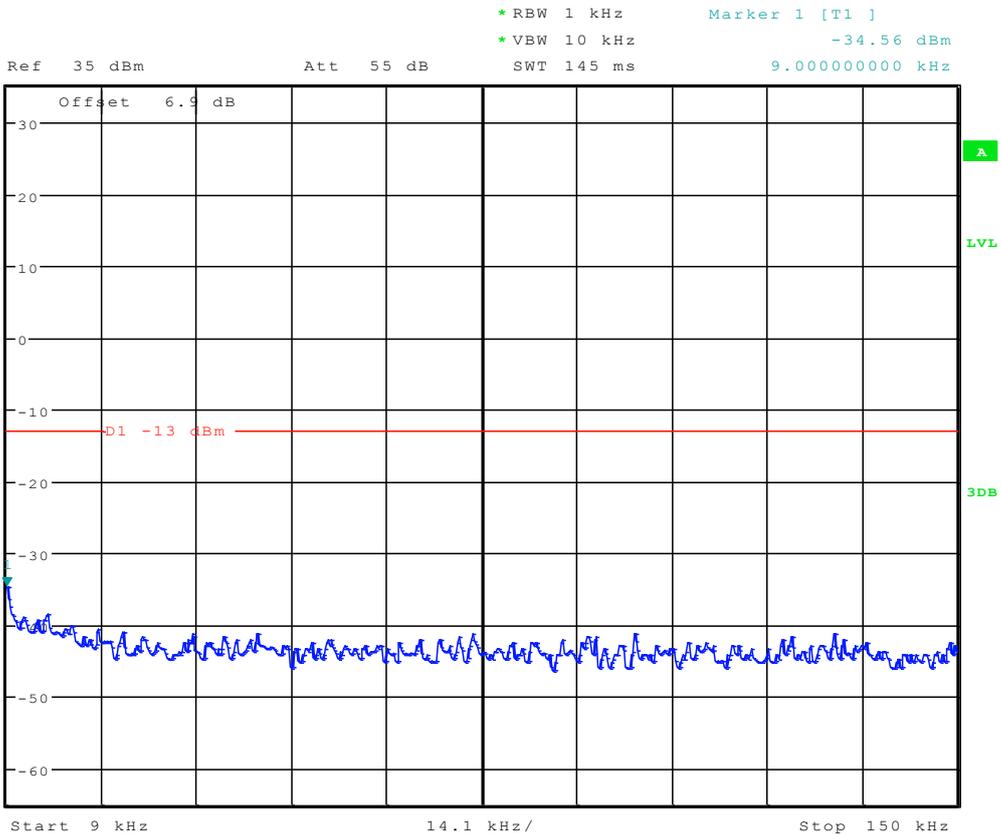


\*RBW 1 MHz      Marker 1 [T1 ]  
\*VBW 3 MHz      22.53 dBm  
Ref 35 dBm      Att 55 dB      SWT 115 ms      1.694166667 GHz



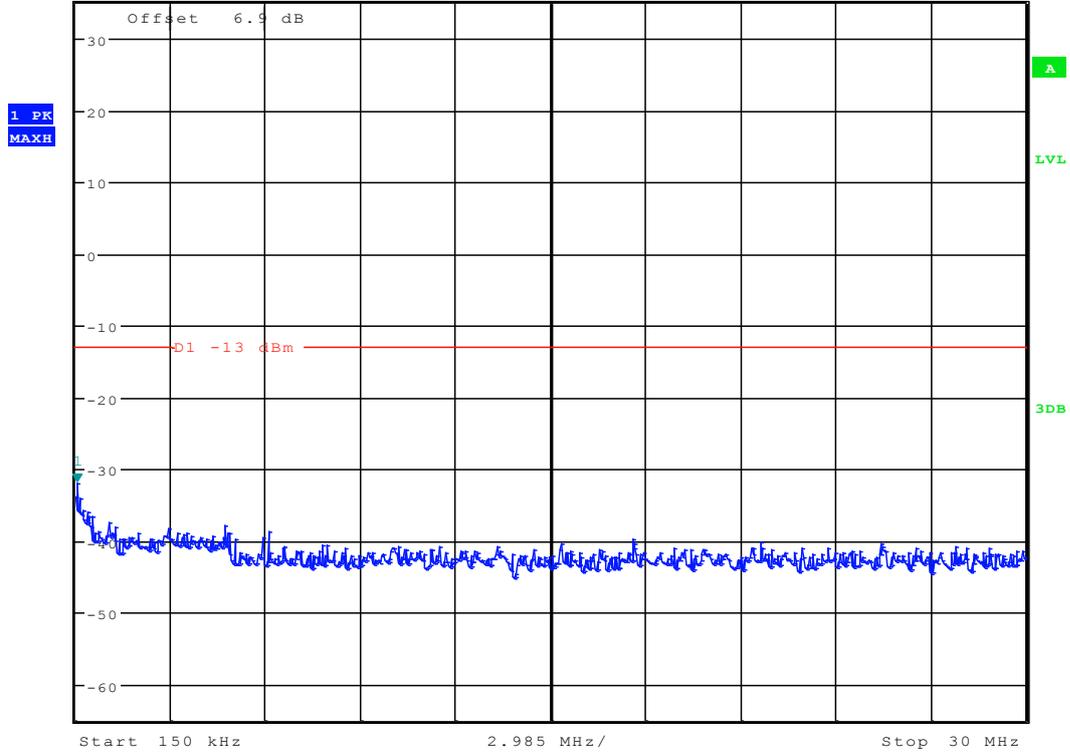


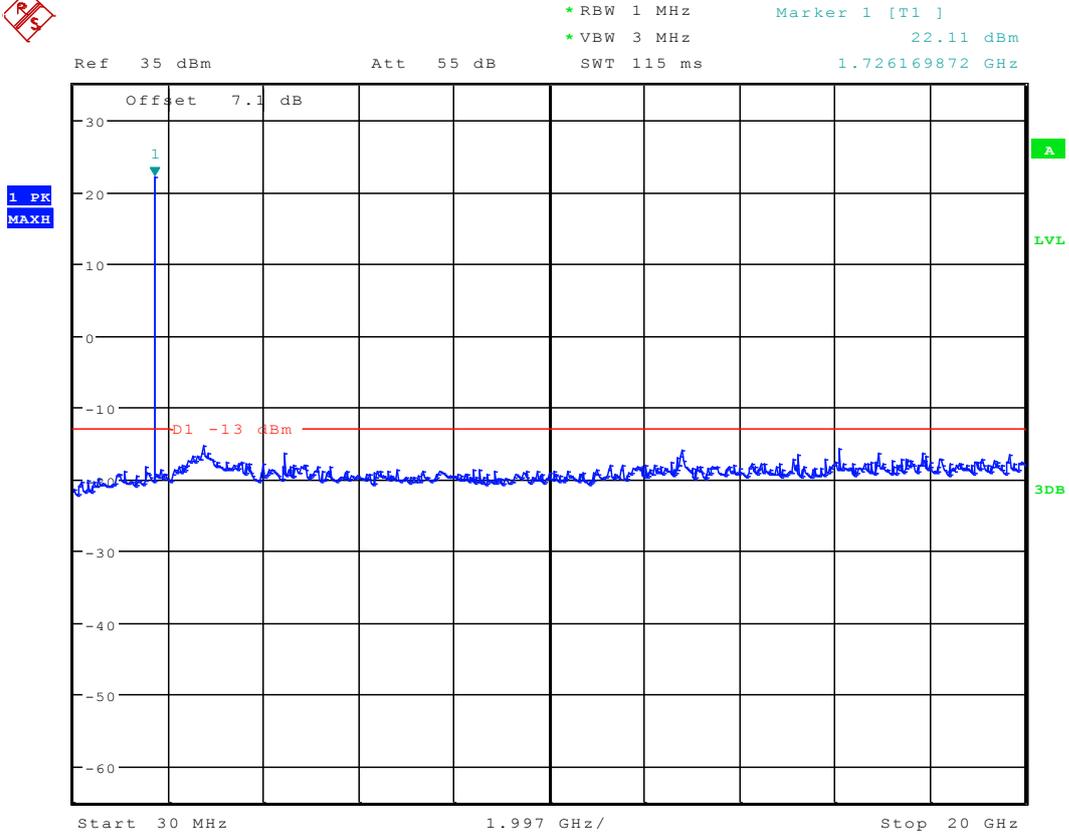
# Channel 1412





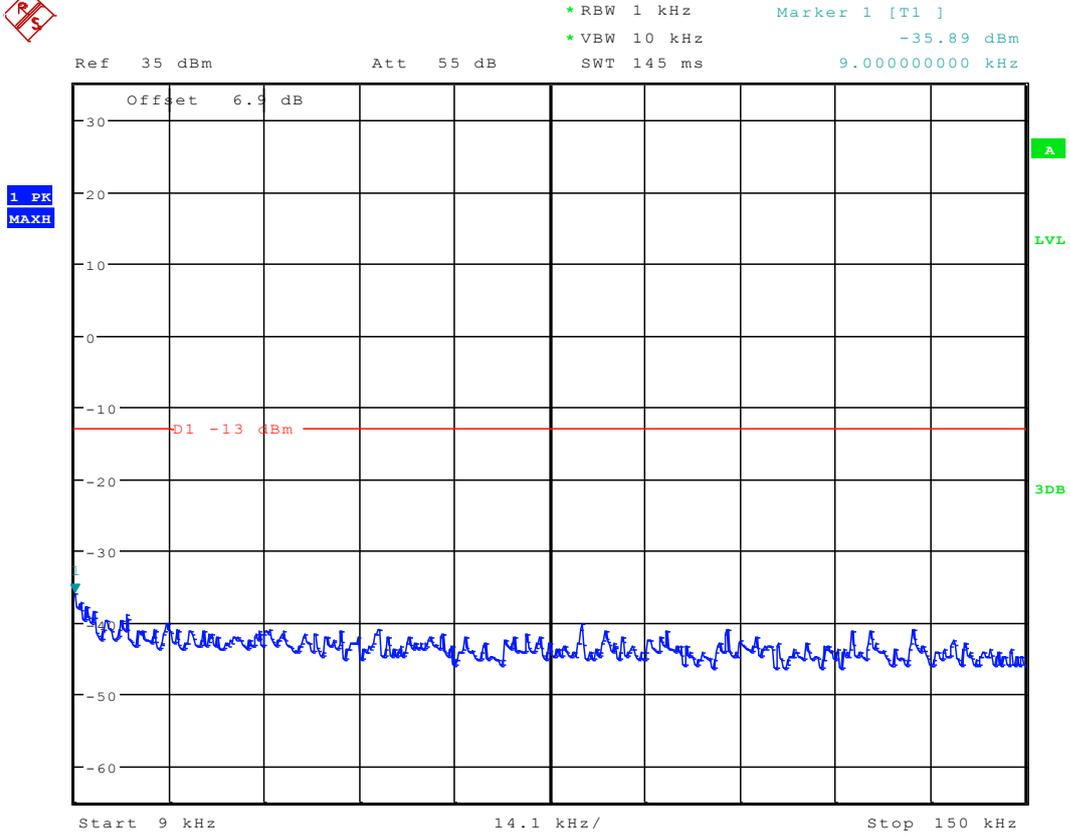
Ref 35 dBm Att 55 dB SWT 300 ms  
\* RBW 10 kHz \* VBW 30 kHz  
Marker 1 [T1 ] -31.90 dBm  
197.836538462 kHz





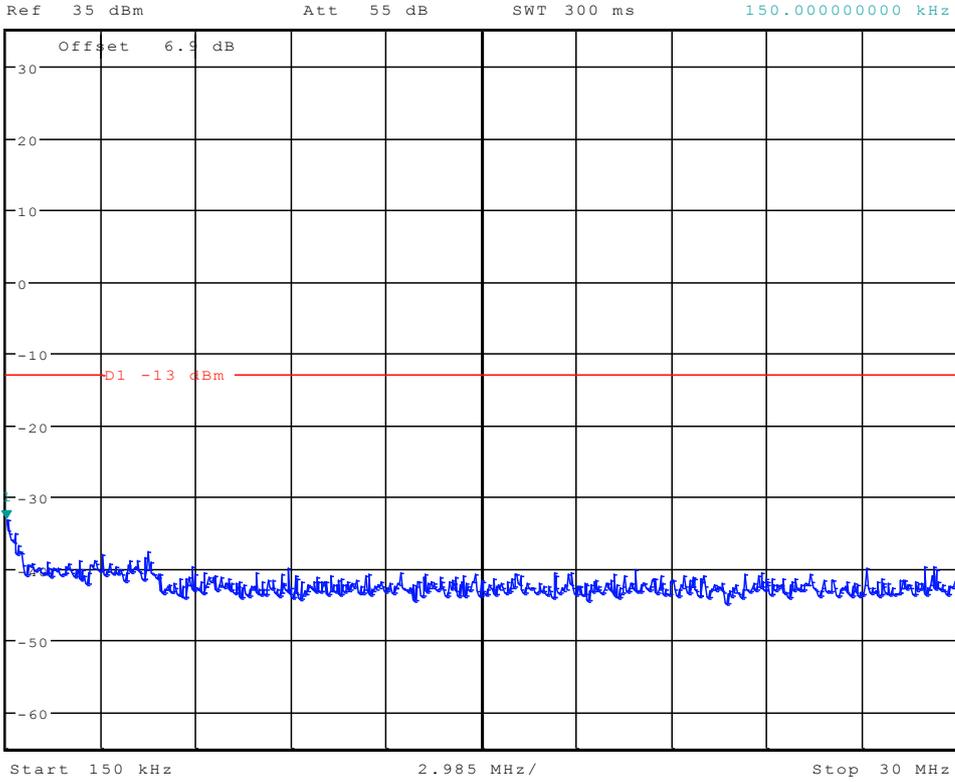


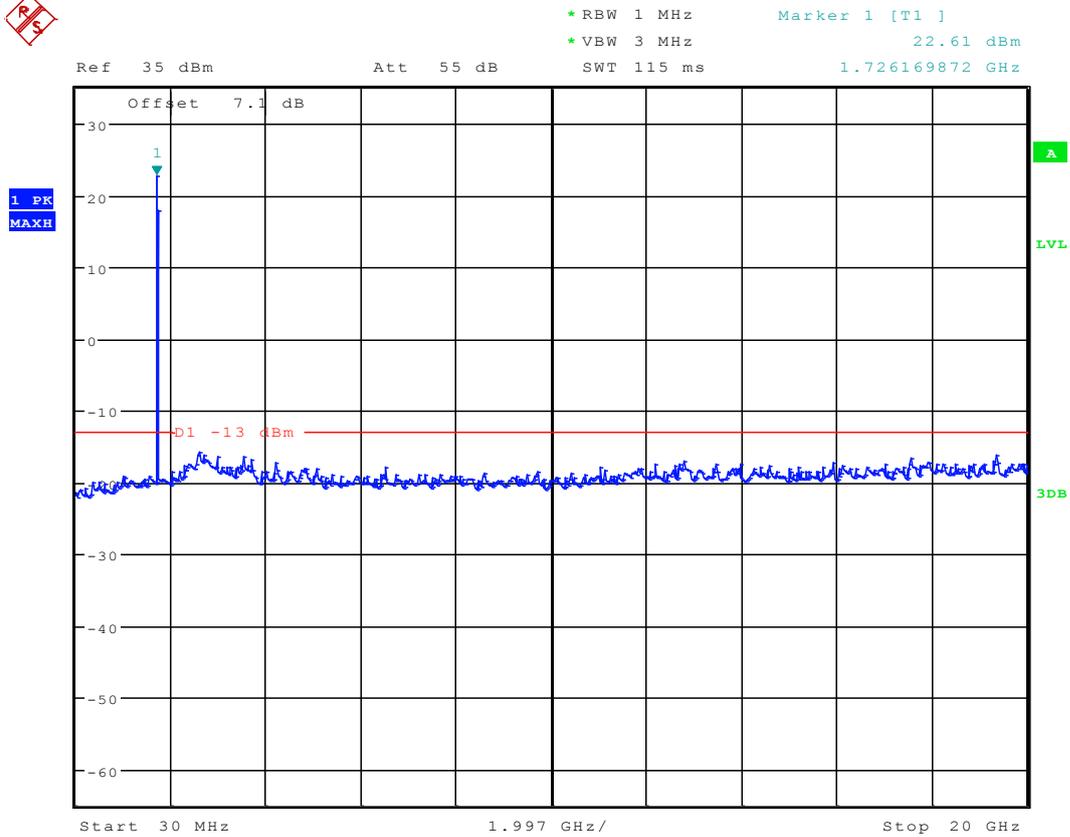
# Channel 1513





\* RBW 10 kHz      Marker 1 [T1 ]  
\* VBW 30 kHz      -33.10 dBm  
SWT 300 ms      150.00000000 kHz







# Appendix E

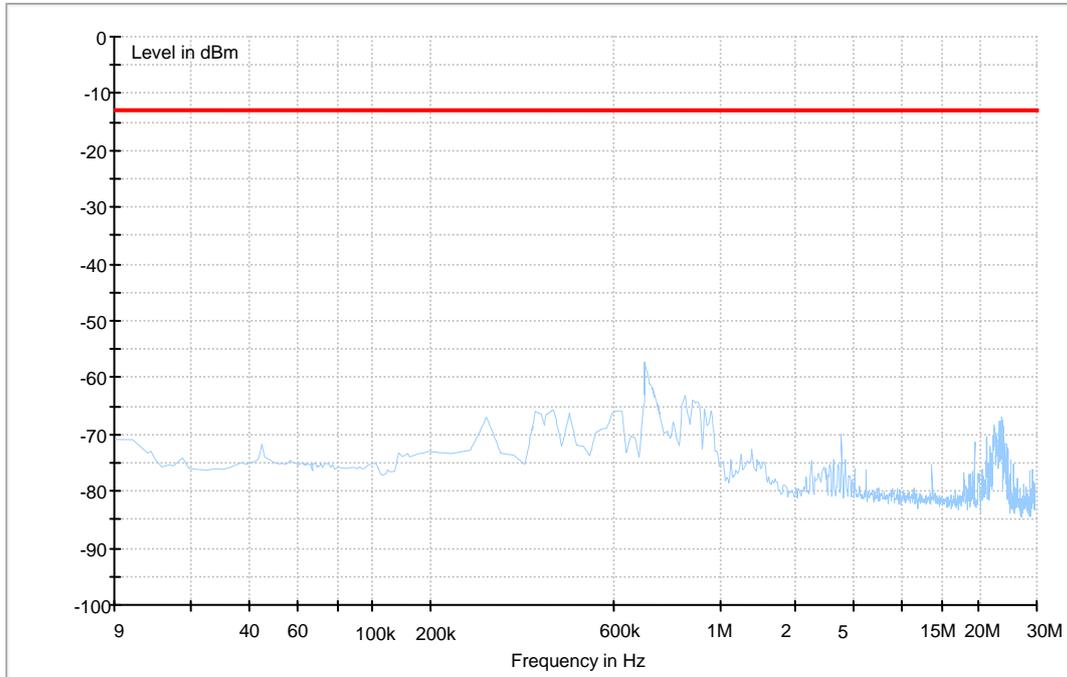
## Radiated spurious emission

According to FCC Part 2.1053& Part 27 Subpart C&L



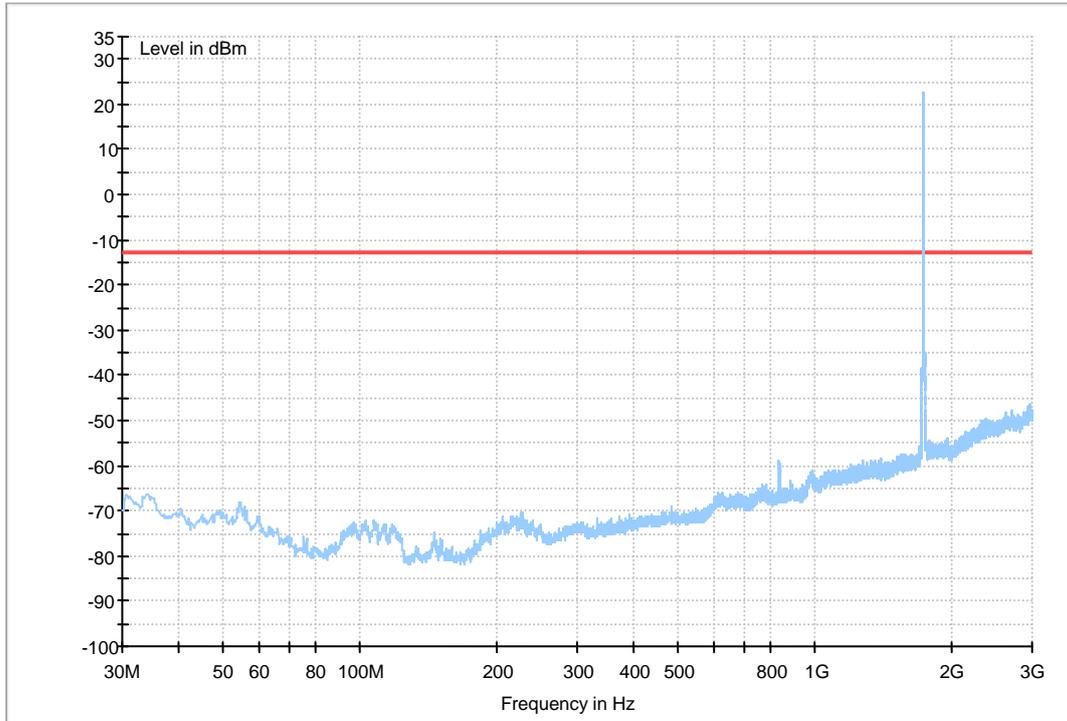
## WCDMA 1700

Traffic Mode (9kHz-30MHz)





Traffic Mode (30MHz-3GHz)

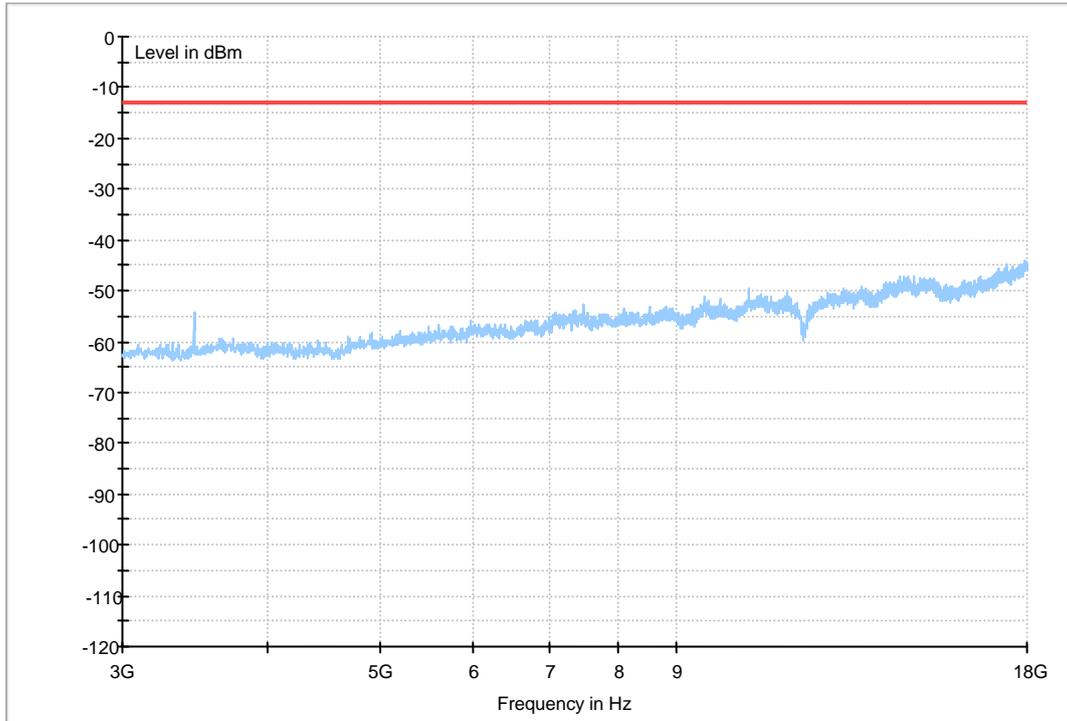




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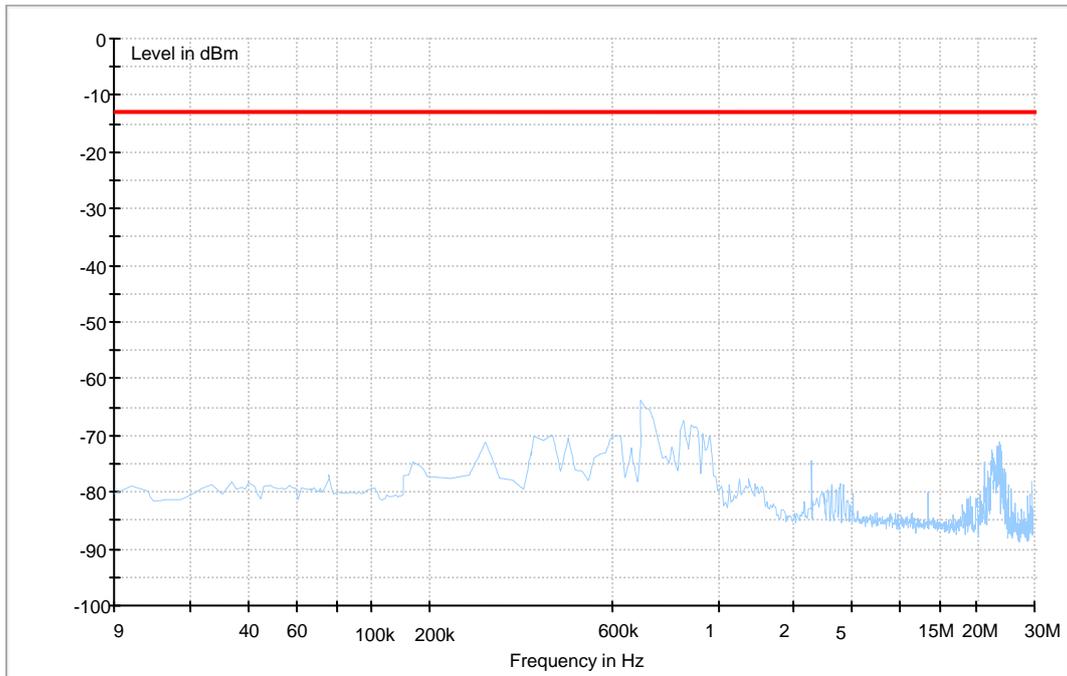
### Traffic Mode (3GHz-18GHz)





## HSDPA 1700

Traffic Mode (9kHz-30MHz)

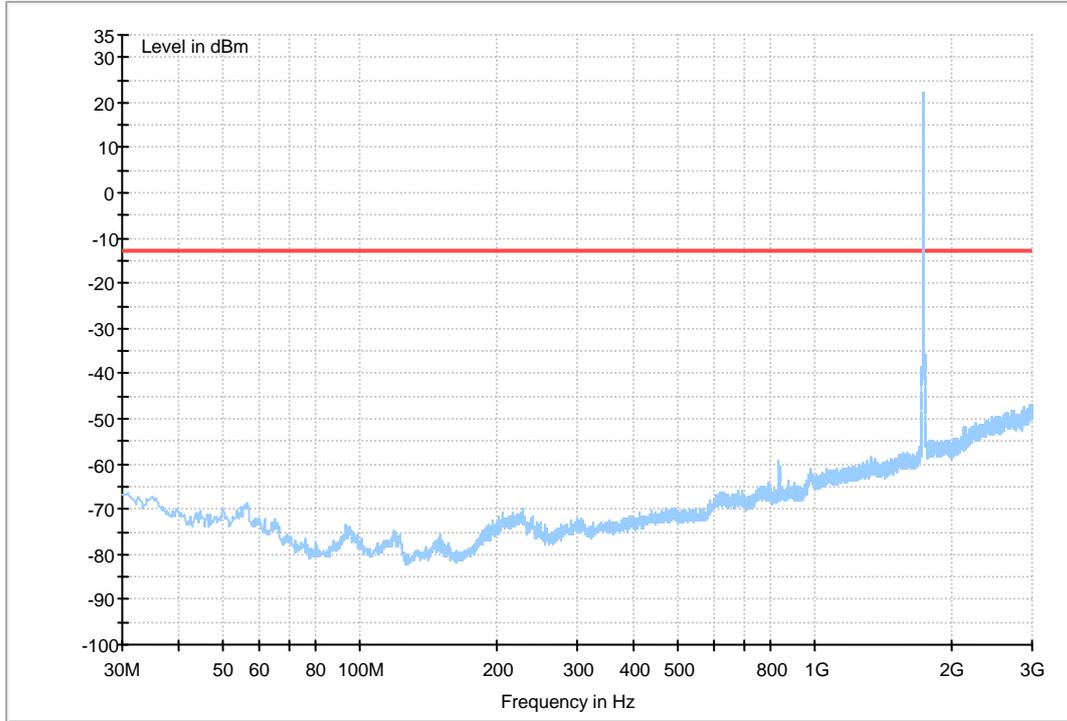




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### Traffic Mode (30MHz-3GHz)

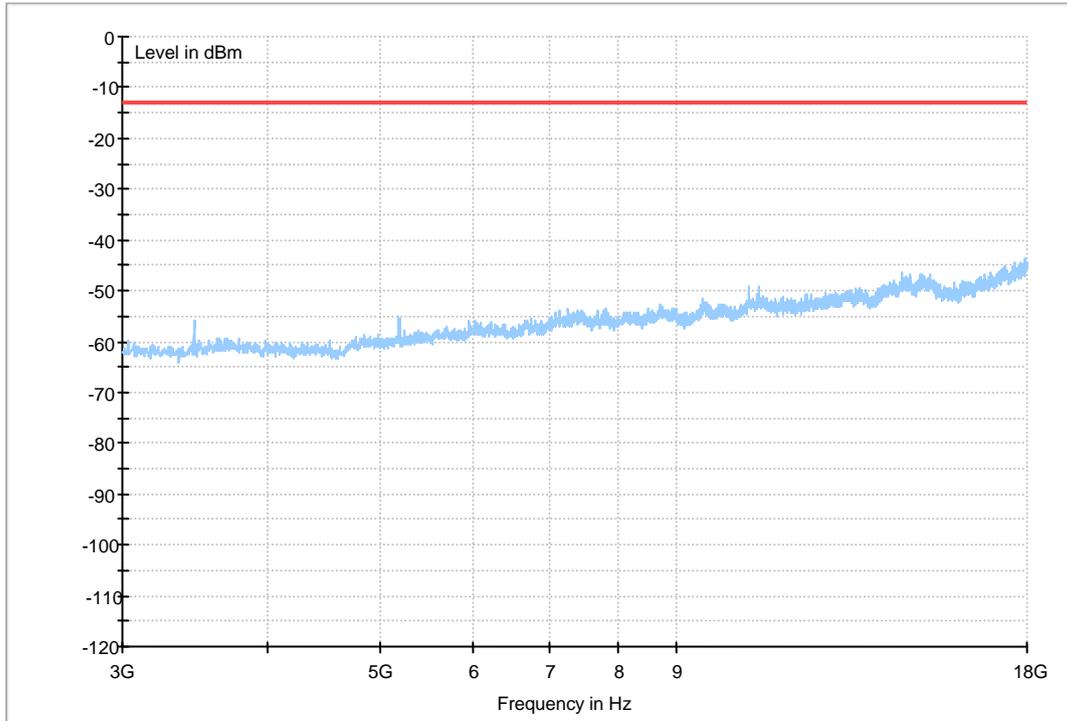




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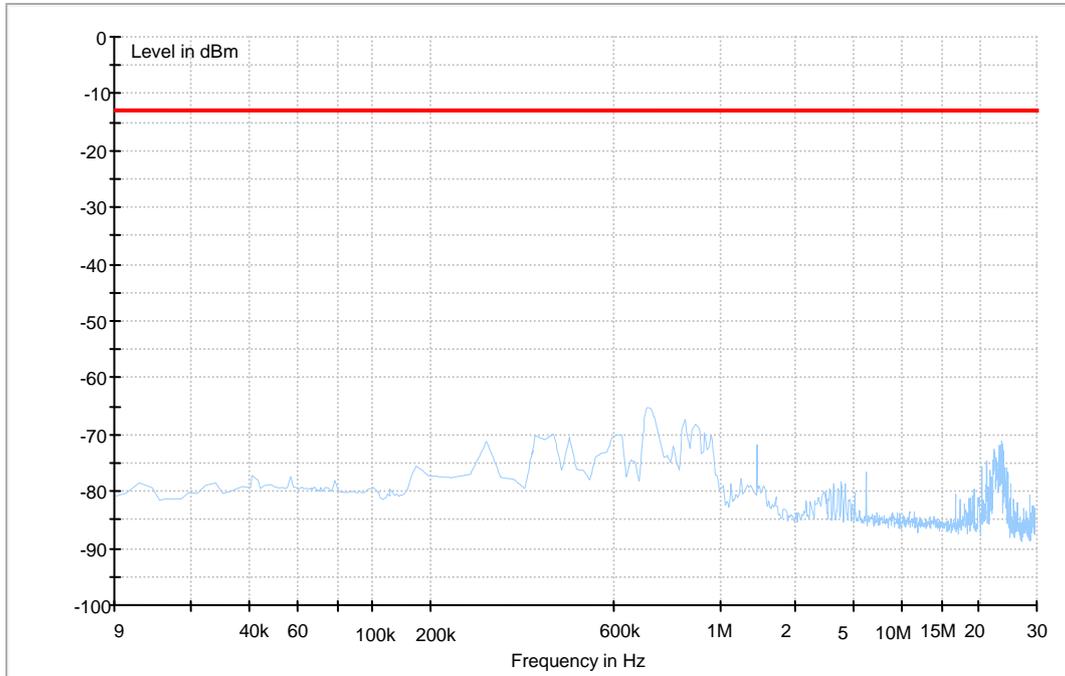
### Traffic Mode (3GHz-18GHz)





## HSUPA 1700

Traffic Mode (9kHz-30MHz)

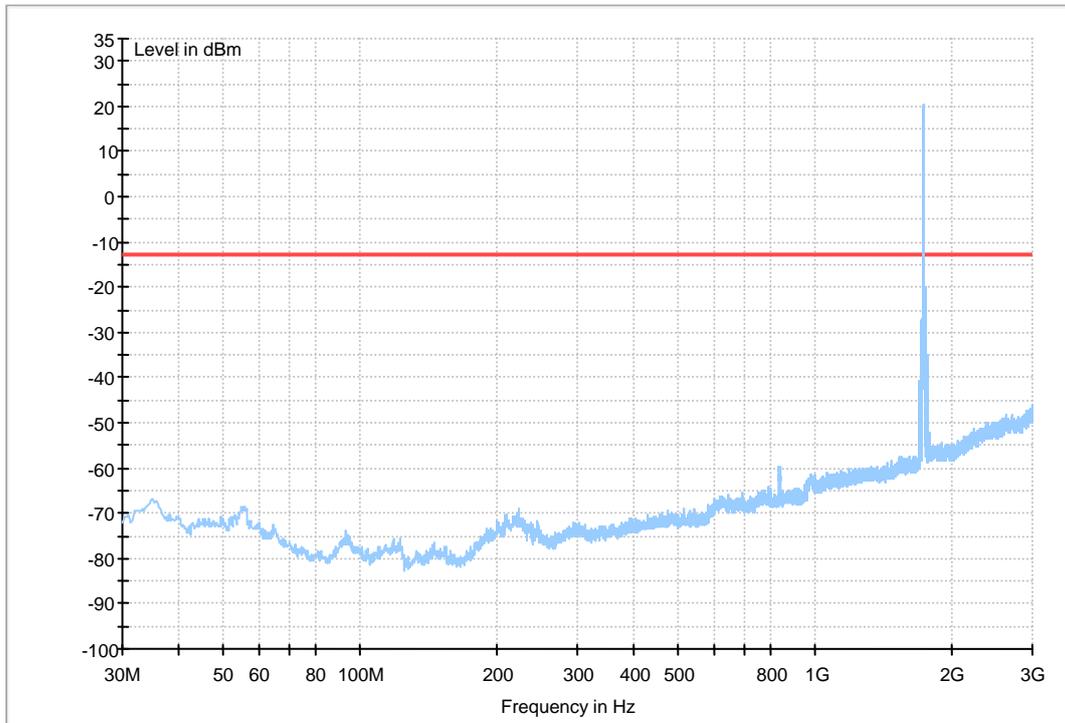




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### Traffic Mode (30MHz-3GHz)

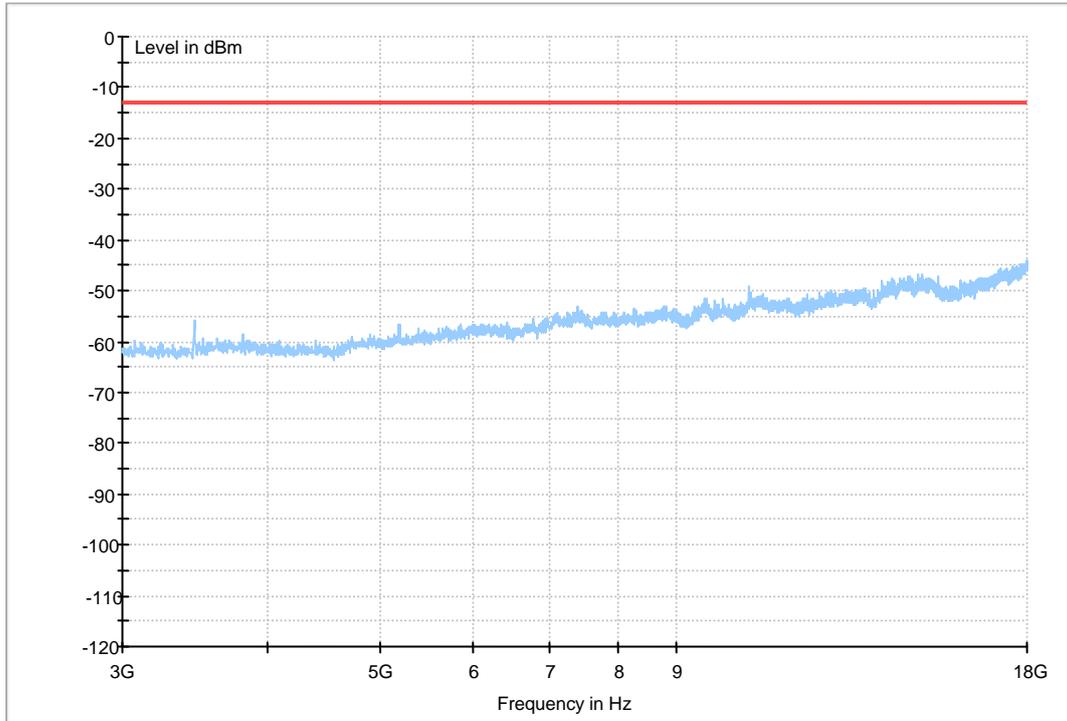




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### Traffic Mode (3GHz-18GHz)





## **Appendix F**

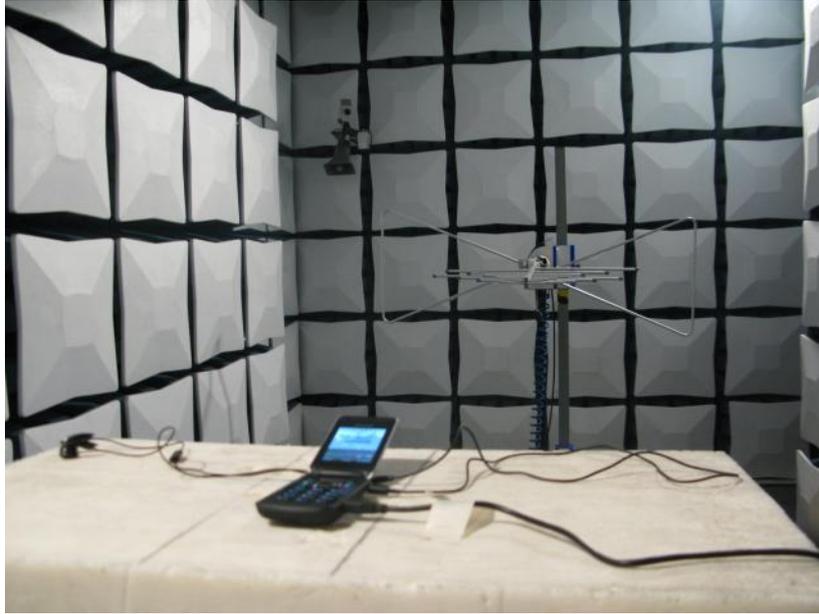
# Photos of Radiated Spurious Emissions



# Photos of Test Setup



## 1 Radiated Spurious Emissions



Radiated Spurious Emission (below 3GHz)



Radiated Spurious Emission (3GHz to18GHz)