



FCC RF Test Report

Product Name: Mobile WiFi

Model Number: E586Es-5

Report No: SYBH(Z-RF)006022012-2003

FCC ID: QIS E586ES-5

Reliability Laboratory of Huawei Technologies Co., Ltd.

Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R. China

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Notice

1. The laboratory has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS), and accreditation number: L0310.
2. The laboratory has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 97456.
3. The laboratory has been listed by industry Canada to perform electromagnetic emission measurement. The site recognition number is 6369A-2.
4. The test report is invalid if not marked with "exclusive stamp for the test report".
5. The test report is invalid if not marked with the stamps or the signatures of the persons responsible for performing, revising and approving the test report.
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7. If there is any dissidence for the test report, please file objection to the test centre within 15 days from the date of receiving the test report.
8. Normally, the test report is only responsible for the samples that have undergone the test.
9. Context of the test report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of the laboratory.



Applicant: Huawei Technologies Co., Ltd.
Address: Huawei Base, Bantian, Longgang District, Shenzhen
518129, P.R. China
Date of Receipt Test Item: Feb.08. 2012
Start Date of Test: Feb.08. 2012
End Date of Test: Feb.14. 2012

Test Result: Pass

Approved By Senior Engineer Feb.16, 2012 Dai Linjun
Date Name Signature

Reviewed By Feb.16, 2012 Cousy Xu
Date Name Signature

Operator Feb.16.2012 Huang Qiuliang
Date Name Signature

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1 General Information

1.1 Applied Standard

Applied Rules: 47 CFR FCC Part 2:2010, Subpart J
47 CFR FCC Part 27:2010, Subpart C&L
ANSI/TIA 603C:2004

1.2 Test Location

Test Location 1: Reliability Laboratory of Huawei Technologies Co., Ltd.
Address: Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R. China

1.3 Test Environment Condition

Ambient Temperature: 20 – 25 °C
Ambient Relative Humidity: 45 – 55 %
Atmospheric Pressure: 101 kPa

2 Summary

Table 1 Summary of results

Test Case	FCC Part No.	Requirements	Result
AWS Band			
Transmitter Output Power	2.1046 & 27.50(d)	Peak EIRP not exceed 1 W	Pass
Modulation Characteristics	2.1047	Digital modulation	Pass
Occupied Bandwidth	2.1049	(Not specified)	Pass
Band Edges Compliance	2.1051 & 27.53(h)	Below -13 dBm/1%*EBW, in 1 MHz range	Pass
Spurious Emission at Antenna Terminals	2.1051 & 27.53(h)	Below -13 dBm/1 kHz, 9 kHz to 150 kHz Below -13 dBm/10 kHz, 150 kHz to 30 MHz Below -13 dBm/1 MHz, 30 MHz to 10 th harmonics	Pass
Field Strength of Spurious Radiation	2.1053 & 27.53(h)	Below -13 dBm/1 MHz	Pass
Frequency Stability	2.1055 & 27.54	Stay within the authorized bands of operation	Pass

3 Product Description

3.1 Production Information

3.1.1 General Description

E586Es-5 HSPA+/2100M/1900M/AWS/850M/EDGE Quad Band is subscriber equipment in the UMTS/GSM system. E586Es-5 implement such functions as RF signal receiving/ transmitting, HSPA/WCDMA protocol processing, data service etc, and it can act as a Wi-Fi hot-point for user accessing to internet. Externally it provides USB interface (to connect to the notebook etc.), USIM card interface and Micro SD card interface. E586Es-5 has 3 internal antennas as default Wi-Fi , diversity, and main antenna.

3.1.2 Board

Table 2 Board Information

Mobile WiFi		
E586Es-5		
Board and Module		
Hardware Version	Software Version	Serial Number
CH1E586E	11.322.03.00.00	X8Z01B9211500004

3.1.3 Sub-Assembly

Sub-Assembly Name	Manufacturer	Description
AC/DC Adapter	HUAWEI	Model: HW-050100U1W Input voltage: ~100 V-240 V/50-60 Hz Output voltage:  +12 V, 1 A
USB Cable	HUAWEI	Terminal Accessory, Data Cable, USB A male to Micro USB 120cm ,Black no Braid, Can Not Meet USB2.0 standard, Terminal Dedicated

3.1.4 Battery Technical Data

Name	Manufacture	Serials number	Description
Li-ion Battery	FMT	HB4F1	Battery Model: HB4J1H Rated capacity: 1200mAh Nominal Voltage:  +3.7V Charging Voltage:  +4.2V
Li-ion Cell	SONY	US454261A8T-1530mAh	Model: US454261A8T-1530mAh Rated capacity: 1530mAh Nominal Voltage:  +3.7V Charging Voltage:  +4.2V

4 Test Description

4.1 Supported Frequency Range

Characteristics	Description
Downlink	2110-2155 MHz
Uplink	1710-1755 MHz

4.2 Transmitter / Receiver Characteristics

Characteristics	Description
System Type	UMTS
TX Output Power (per Antenna Port)	UMTS system: 24dBm;
Channel Spacing(s) / Bandwidth(s)	UMTS system: 5 MHz
Designation of Emissions	UMTS system: 4M19F9W

4.3 Antenna Gain

Antenna Gain(dBi)	-3
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4.4 Power Supply

Specification	Description
Power Supply Type	Directly Connected to DC /AC Power Supply
Input to EUT (DC power)	DC Voltage Nominal:  +3.7v DC Voltage Range:  +3.6 V to +4.2 V

5 General Test Conditions / Configurations

5.1 RF Channels under Test

Test Mode	TX / RX	RF Channel		
		Bottom (B)	Middle (M)	Top (T)
TM1/TM2/TM3	TX	Channel 1312	Channel 1412	Channel 1513
		1712.4MHz	1732.4MHz	1752.6MHz
	RX	Channel 1537	Channel 1637	Channel 1738
		2112.4MHz	2132.4MHz	2152.6MHz

5.2 Test Modes

Test Mode	Test Modes Description
TM1	WCDMA QPSK modulation
TM2	HSDPA 16QAM modulation
TM3	HAUPA 16QAM modulation

5.3 Test Environments

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	3.6V
	VN	3.7V
	VH	4.2V

NOTE: VL= lower extreme test voltages

VN= nominal voltage

VH= upper extreme test voltage

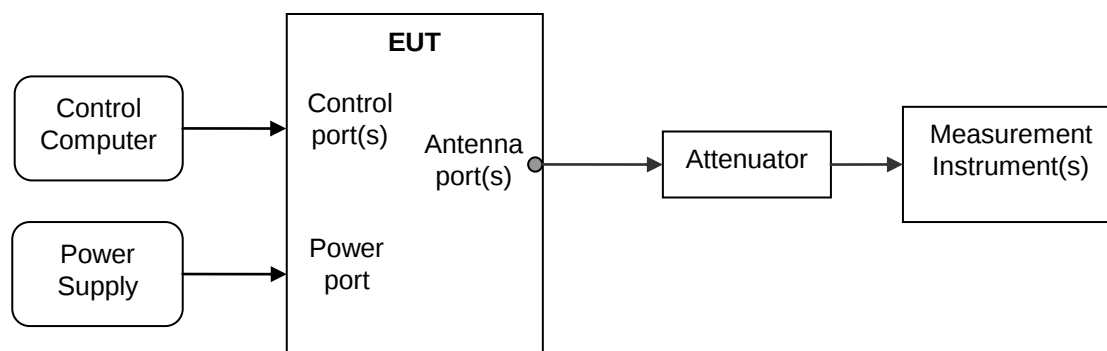
TN= normal temperature

5.4 Test Setups

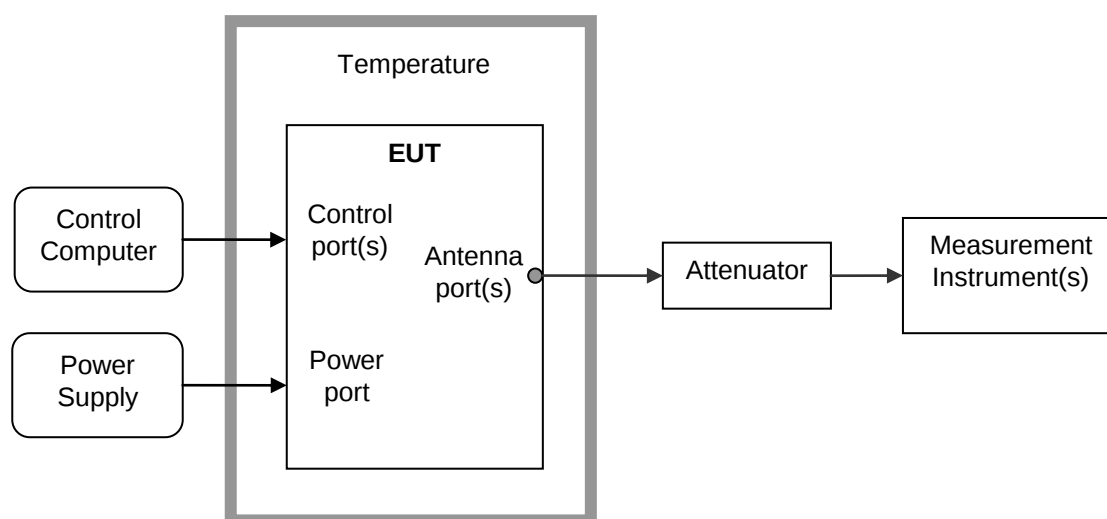
5.4.1 General Test Setup Configurations

Configuration	Description
Test Antenna Ports	Until otherwise declared, all TX tests are ONLY performed at the main Transmitter antenna port (e.g. TRXA, TXA and so on) of the EUT, and all RX tests are ONLY performed at the main Receiver antenna port (e.g. TRXA, RXA and so on) of the EUT.
Multiple RF Sources	Other than the tested RF source of the EUT, other RF source(s) are disabled or shutdown during measurements.

5.4.2 Test Setup 1



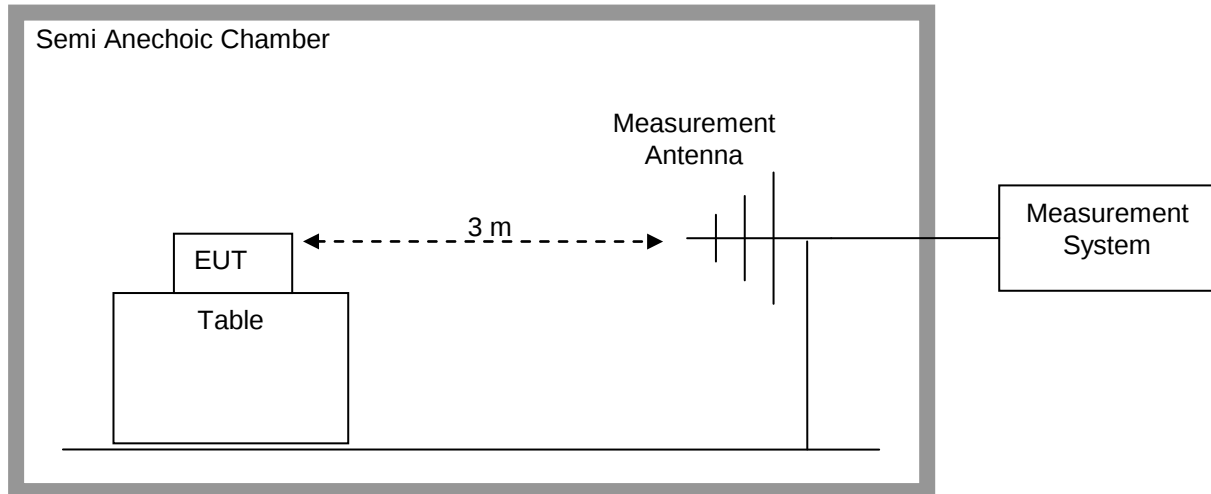
5.4.3 Test Setup 2



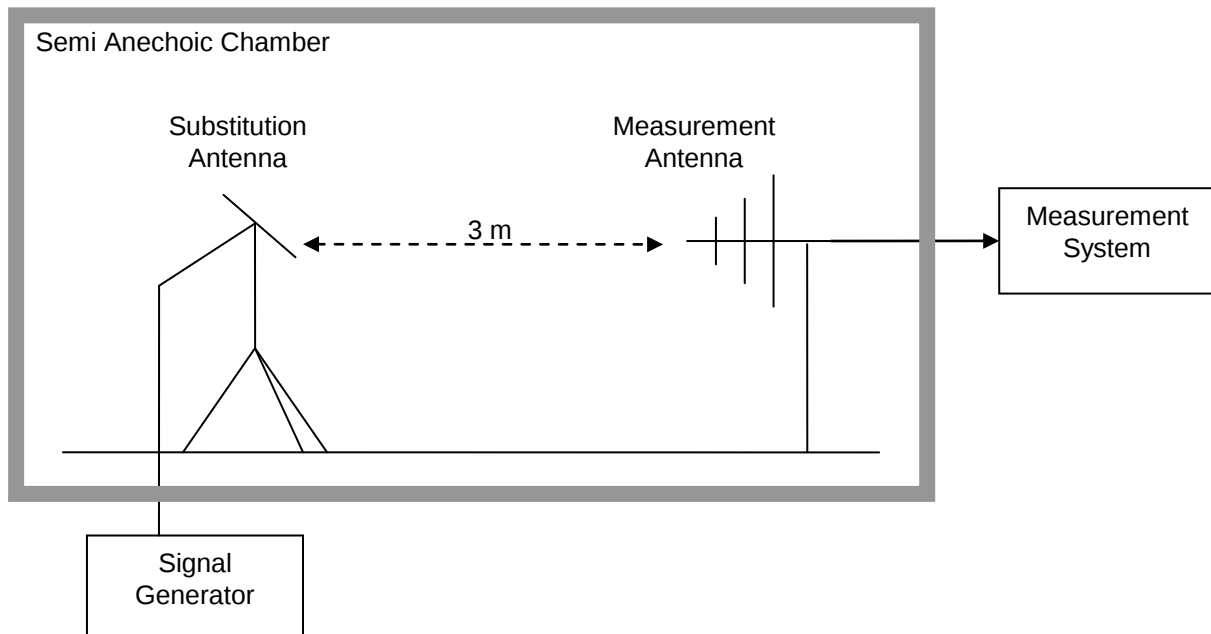
5.4.4 Test Setup 3

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

Step 1: Pre-test



Step 2: Substitution method to verify the maximum EIRP



5.5 Test Conditions

Test Case	Test Conditions	
Transmitter Output Power	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1 / Test Setup 3
	Detector	RMS
	RF Channels (TX)	B, M, T
	Test Mode	TM1/TM2/TM3
Modulation Characteristics	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	RF Channels (TX)	M
	Test Mode	TM1
Occupied Bandwidth	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	PK
	RF Channels (TX)	B, M, T
	Test Mode	TM1
Band Edges Compliance	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	RMS
	RF Channels (TX)	B, T
	Test Mode	TM1
Spurious Emission at Antenna Terminals	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	PK
	RF Channels (TX)	B, M, T
	Test Mode	TM1
Field Strength of Spurious Radiation	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 3
	Detector	PK
	RF Channels (TX)	M
	Test Mode	TM1/TM2/TM3
Frequency Stability	Test Configuration	(1) -30 °C to +50 °C with step 10 °C at Rated Voltage; (2) 85%, 100% and 115% of Rated Voltage at Ambient Temperature.
	Test Setup	Test Setup 2
	RF Channels (TX)	M



Test Case	Test Conditions	
	Test Mode	TM1

6 Main Test Instruments

Table 3 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until
Power supply	KEITHLEY	2303	1288003	Sep.27,2012
Universal Radio Communication Tester	R&S	CMU200	117341	Jan.12.2013
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	Aug.31,2012
Spectrum Analyzer	Agilent	E4440A	MY49420179	Apr.20,2012
Signal Analyzer	R&S	FSQ31	200021	Sep.27,2012
Temperature Chamber	WEISS	WKL64	24600294	Jan.03,2013
Signal generator	Agilent	E8257D	MY49281095	Jul.9.2012
Test receiver	R&S	ESU26	100150	May.29.2012
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	919/1009	Jan.29.2013
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	Jan.29.2013
Horn Antenna	R & S	HF906	100683	May.15, 2012
Horn Antenna	R & S	HF906	100684	Jul.01, 2012
Broadband Antenna	Schwarzbeck	VULB 9163	9163-357	May.15, 2012
Broadband Antenna	Schwarzbeck	VULB 9163	9163-356	May.15, 2012

7 Test Results

No.	Test Item	Test Result
1	Transmitter Output Power	Appendix A
2	Modulation Characteristics	Appendix B
3	Occupied Bandwidth	Appendix C
4	Band Edges Compliance	Appendix D
5	Spurious Emission at Antenna Terminals	Appendix E
6	Field Strength of Spurious Radiation	Appendix F
7	Frequency Stability	Appendix G
8	Photos of Field Strength of Spurious Radiation	Appendix H

NOTE: The Appendix H only photos of Field Strength of Spurious Radiation, no test data.

8 Measurement Uncertainty

For a 95% confidence level ($k=2$), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Test Item		Extended Uncertainty
Transmitter Output Power	Power (dBm)	$U=0.39$ dB
Occupied Bandwidth	Magnitude (%)	$U=0.2\%$
Band Edge Compliance	Disturbance Power (dBm)	$U=2.0$ dB
Conducted Spurious Emissions	Disturbance Power (dBm)	$U=2.0$ dB
Field Strength of Spurious Radiation	ERP (dBm)	$U=4.6$ dB (30 MHz – 1GHz) $U=3.0$ dB (above 1 GHz)
Frequency Stability	Frequency Accuracy (ppm)	$U=0.21$ ppm

-----The END-----



Appendix A

Transmitter Output Power

According to FCC Part 2.1046 & Part 27 Subpart C&L



Conducted Power of Transmitter

TEST CONDITIONS		RF Output Power (Conducted)					
		Channel1312(B)		Channel1412 (M)		Channel1513(T)	
		1712.4MHz		1732.4MHz		1752.6MHz	
		dBm		dBm		dBm	
T_{nom} / V_{nom}		Measured	Limit	Measured	Limit	Measured	Limit
TM1		22.24	30	22.23	30	21.94	30
TM2	Case1	21.72	30	21.68	30	21.14	30
	Case2	21.74	30	21.67	30	21.18	30
	Case3	20.9	30	20.86	30	20.40	30
	Case4	20.91	30	20.78	30	20.45	30
TM3	Case1	21.34	30	21.33	30	20.75	30
	Case2	18.81	30	18.82	30	18.24	30
	Case3	19.42	30	19.65	30	19.10	30
	Case4	18.72	30	18.71	30	18.20	30
	Case5	21.32	30	21.37	30	20.78	30



Effective Isotropic Radiated Power of Transmitter (EIRP)

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	SGP [dBm]	Substitution Gain [dBi]	Cable Loss [dB]	Substitution Level (EIRP)	FCC limit [dBm]	Result
							[dBm]		
TM1	1712.4	19.24	Horn Ant.	15.81	4.5	1	19.31	30	Pass
TM1	1732.4	19.23	Horn Ant.	15.78	4.5	1	19.28	30	Pass
TM1	1752.6	18.94	Horn Ant.	15.61	4.8	1	19.11	30	Pass

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

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

b, SGP=Signal Generator Level

-----The END-----



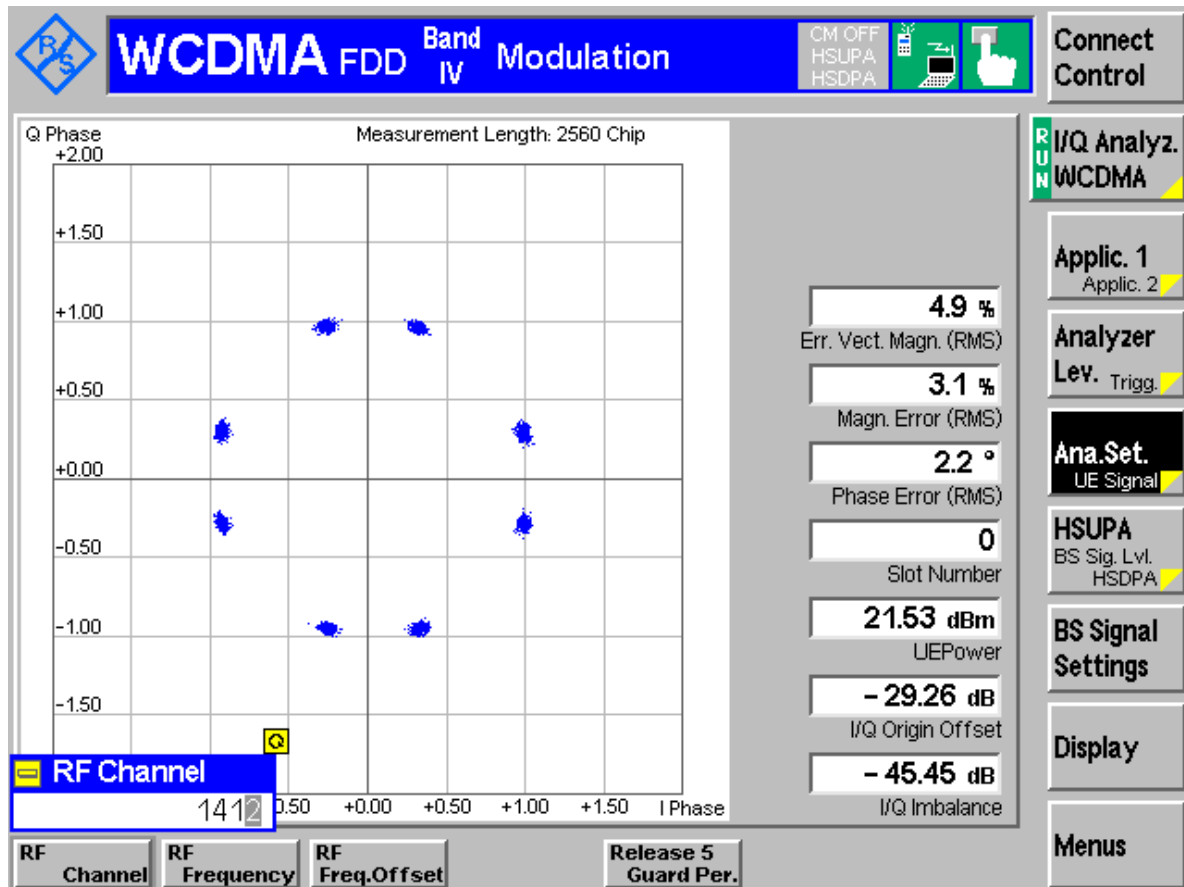
Appendix B

Modulation Characteristics

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



TM1: WCDMA Channel 1412



-----The END-----



Appendix C

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



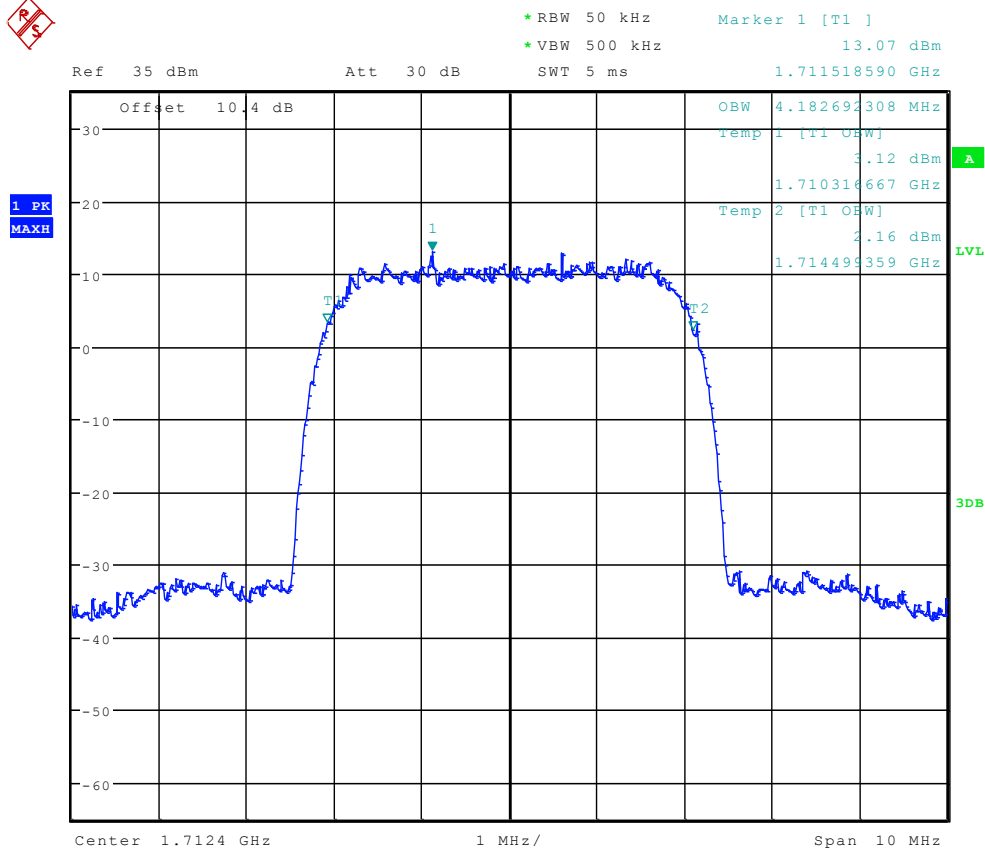
Result Table

Table 1 Measurement Results

Test Mode	RF Channel	Occupied Bandwidth [MHz]	Verdict
TM1	1312	4.183	Pass
	1412	4.167	Pass
	1513	4.167	Pass



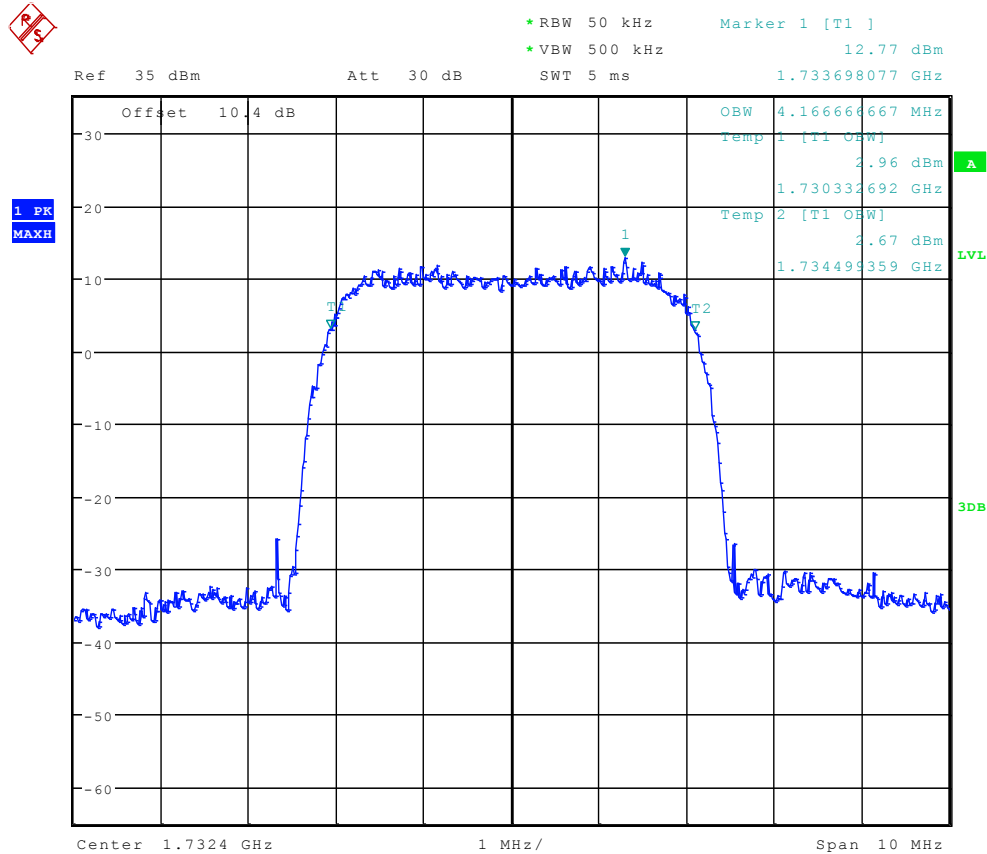
TM1: WCDMA Channel 1312



Date: 10.FEB.2012 17:39:17



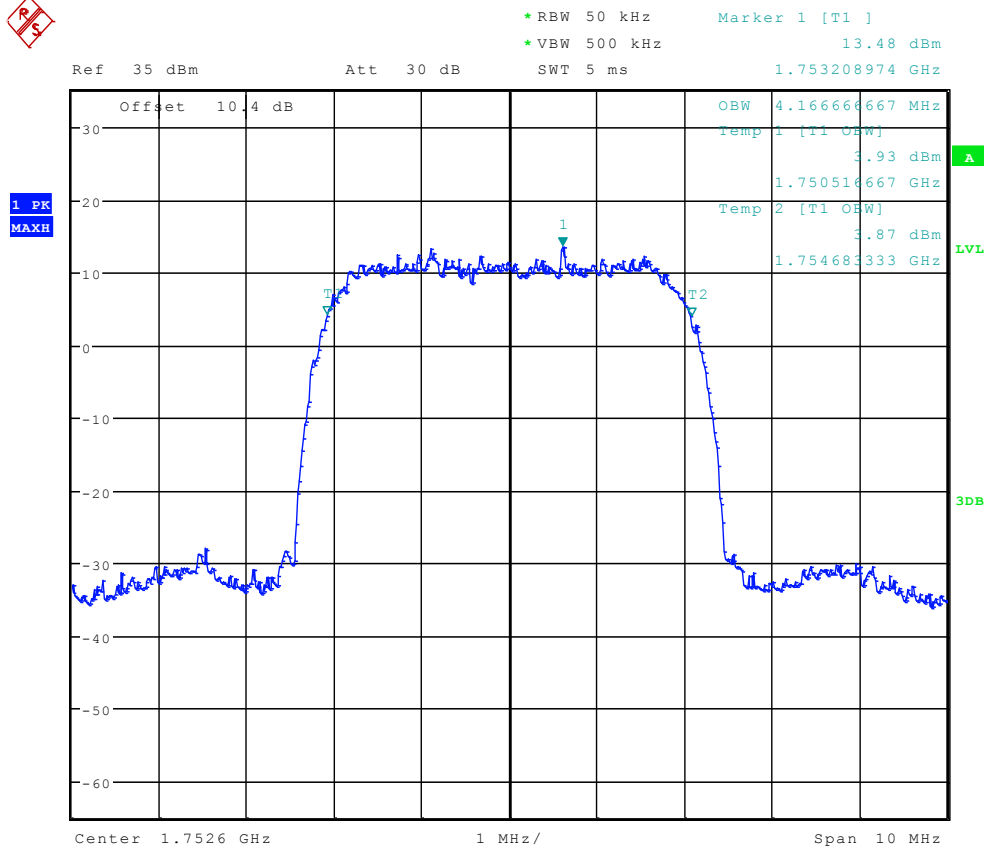
Channel 1412



Date: 10.FEB.2012 17:39:31



Channel 1513



Date: 10.FEB.2012 17:40:48

-----The END-----

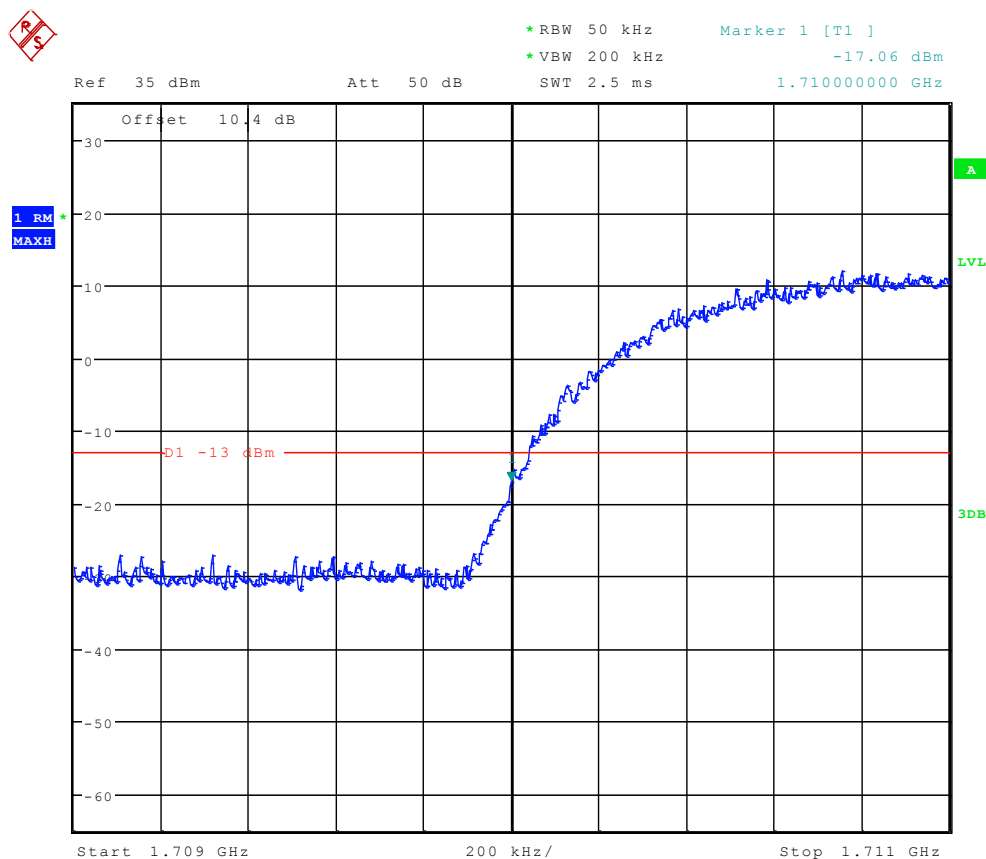


Appendix D

Band Edges Compliance

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

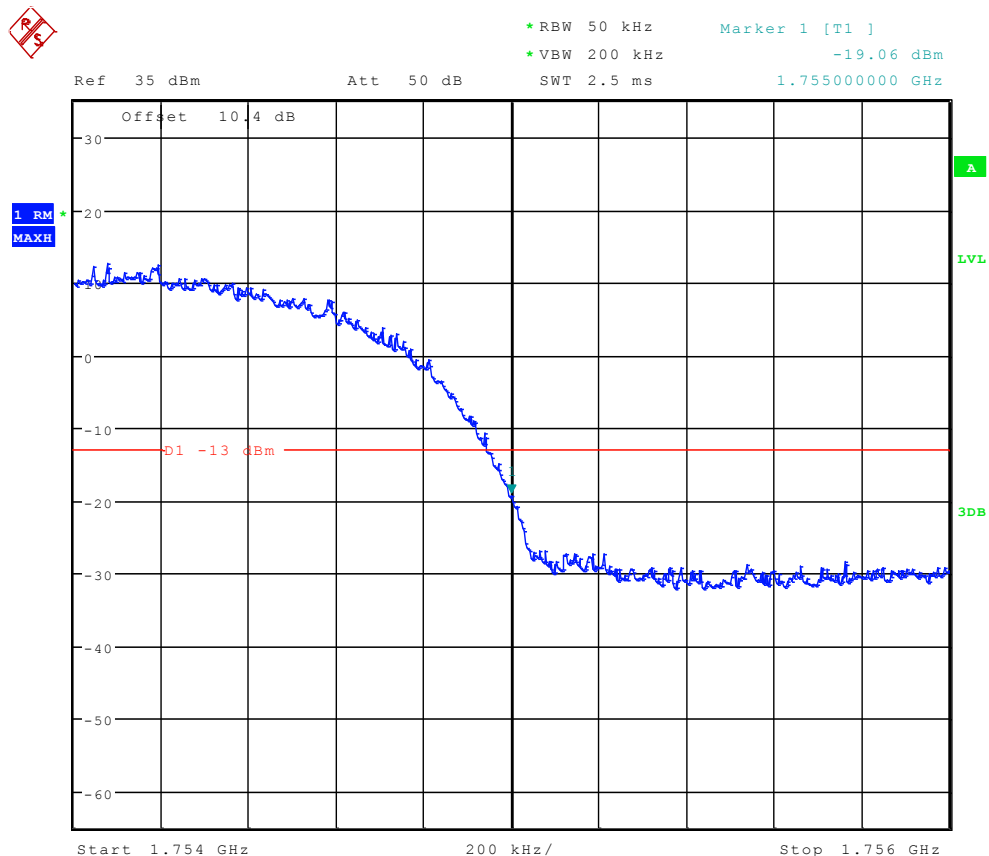
TM1: WCDMA
Left Edge
Channel 1312



Date: 10.FEB.2012 17:41:02



Right Edge Channel 1513



Date: 10.FEB.2012 17:41:16

-----The END-----



Appendix E

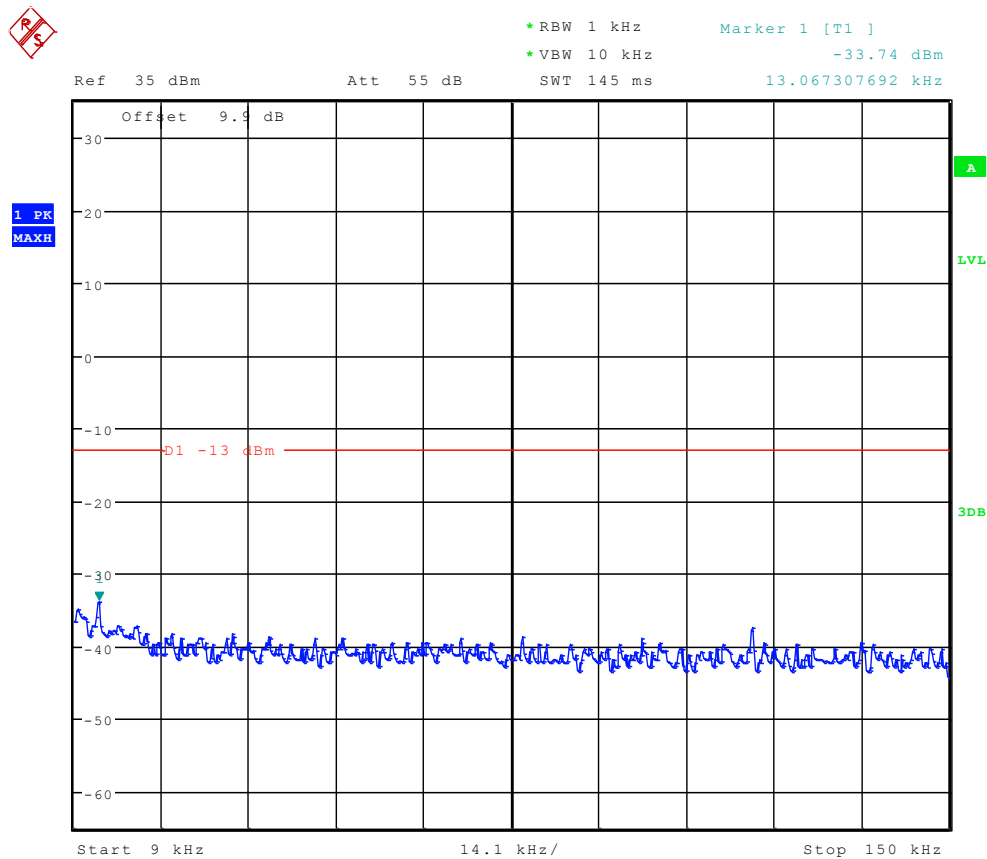
Spurious Emission at Antenna Terminal

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

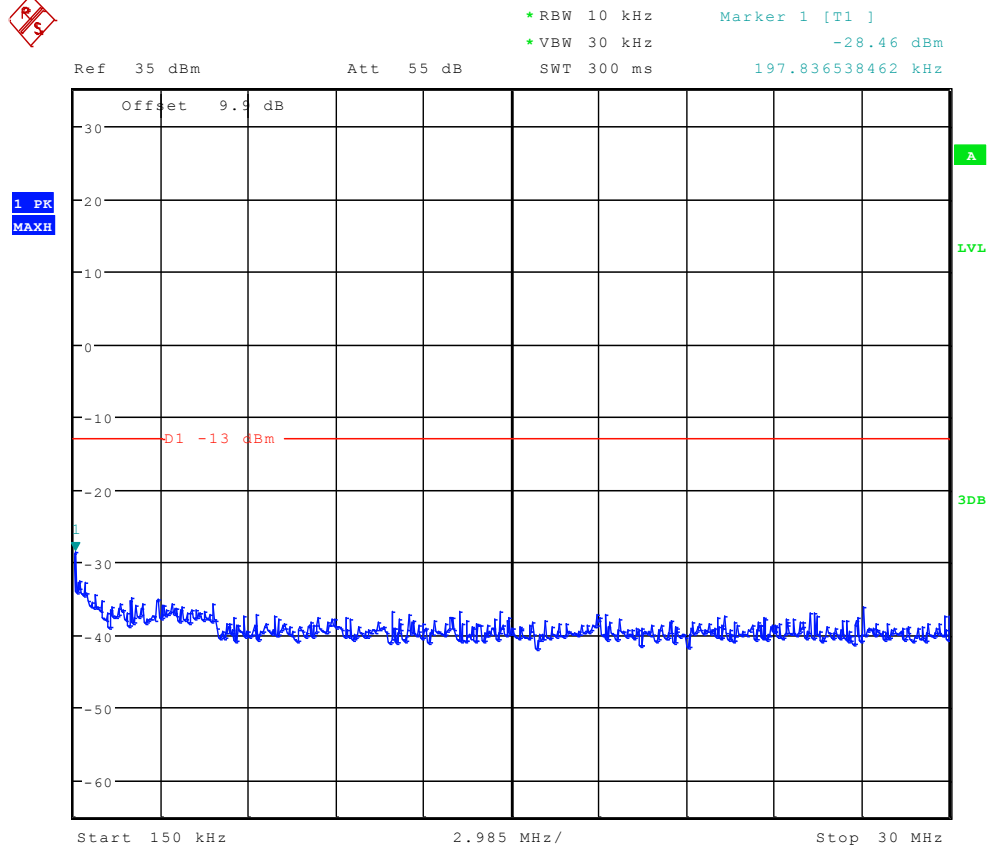


TM1: WCDMA

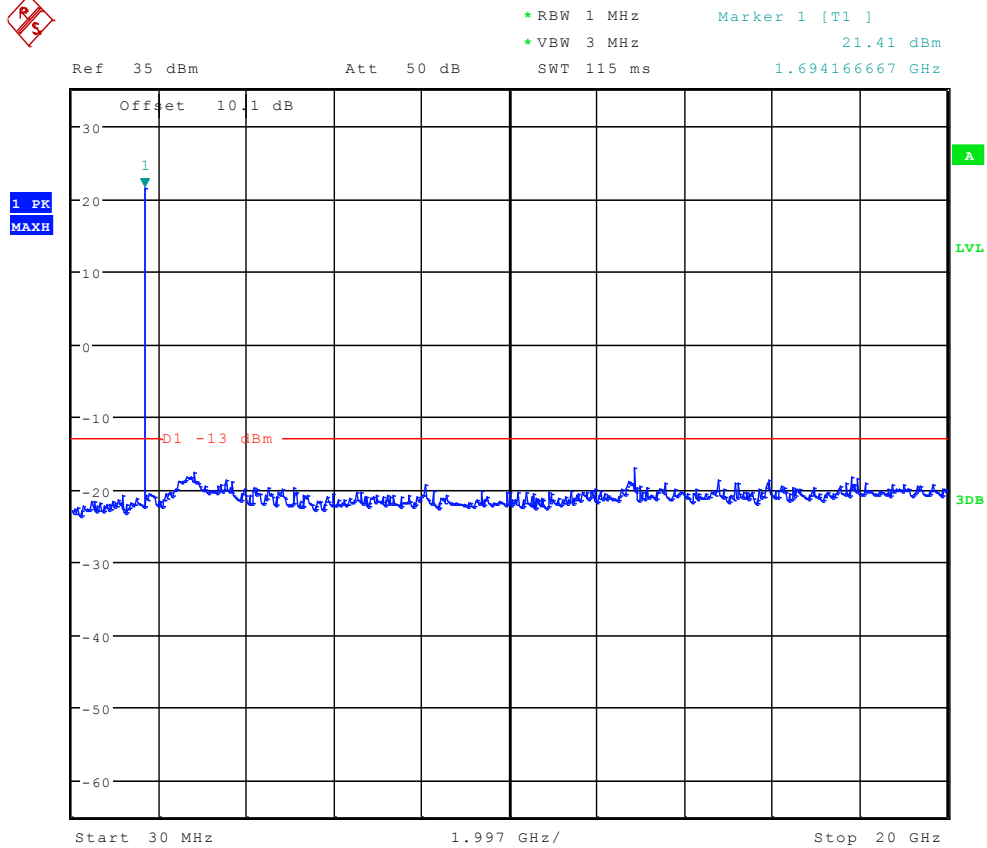
Channel 1312



Date: 10.FEB.2012 17:41:31



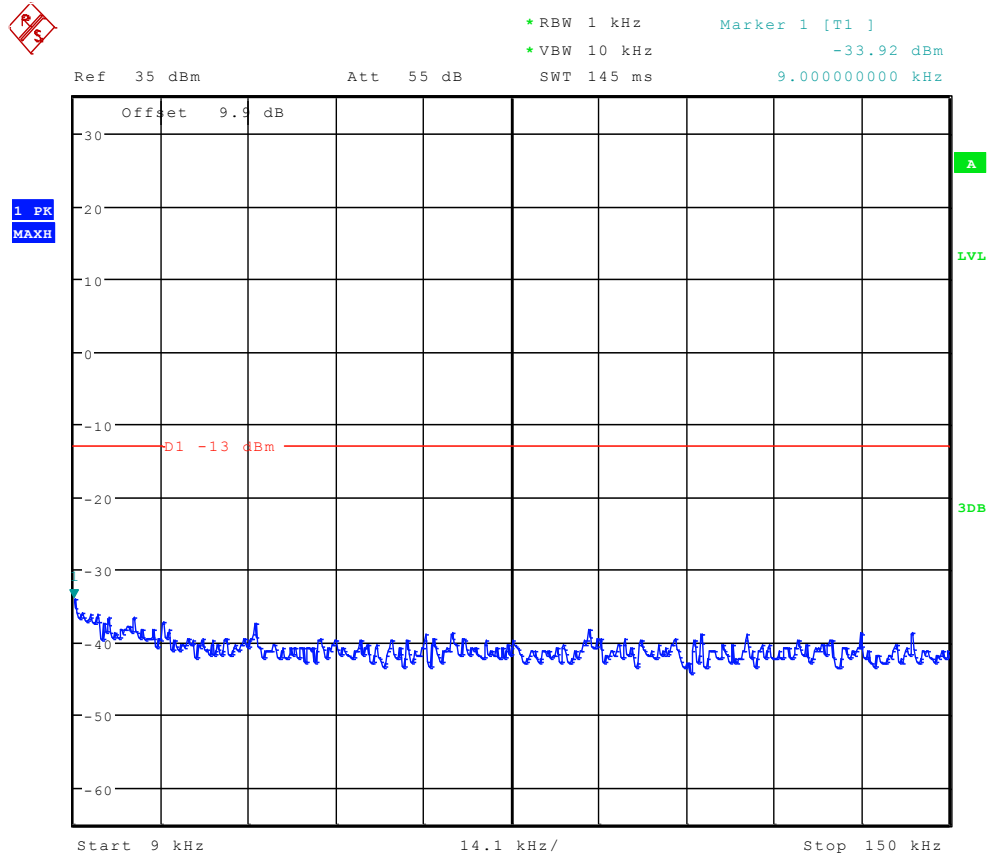
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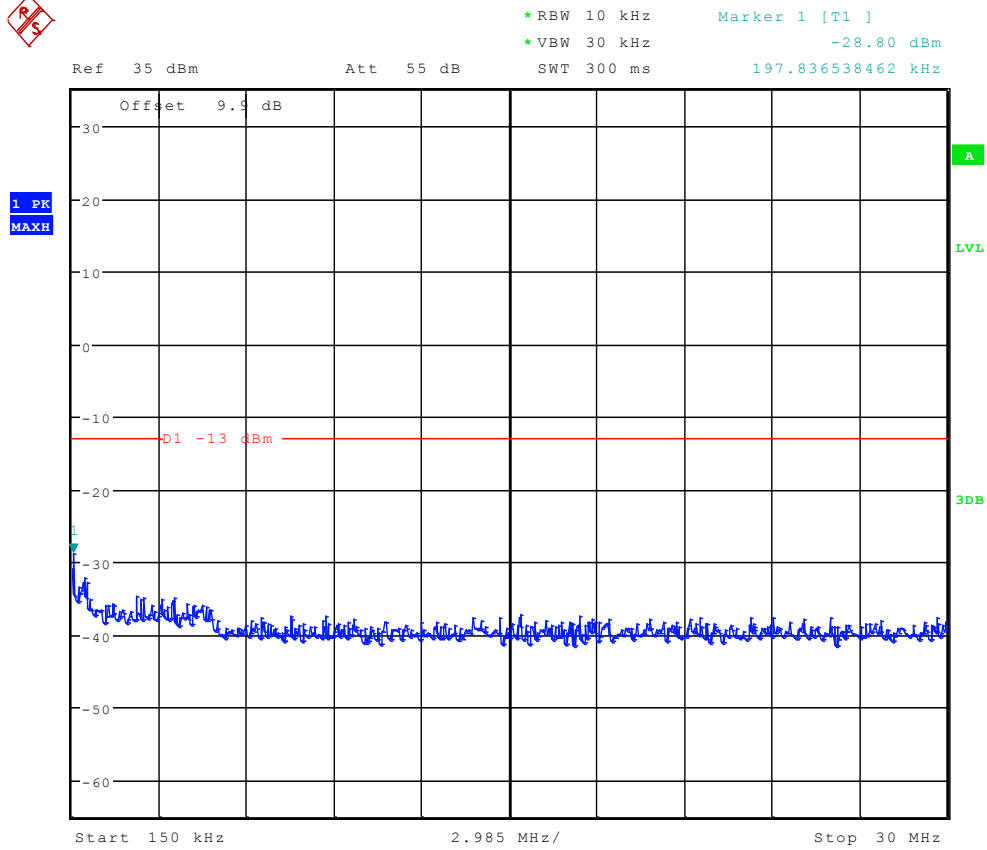
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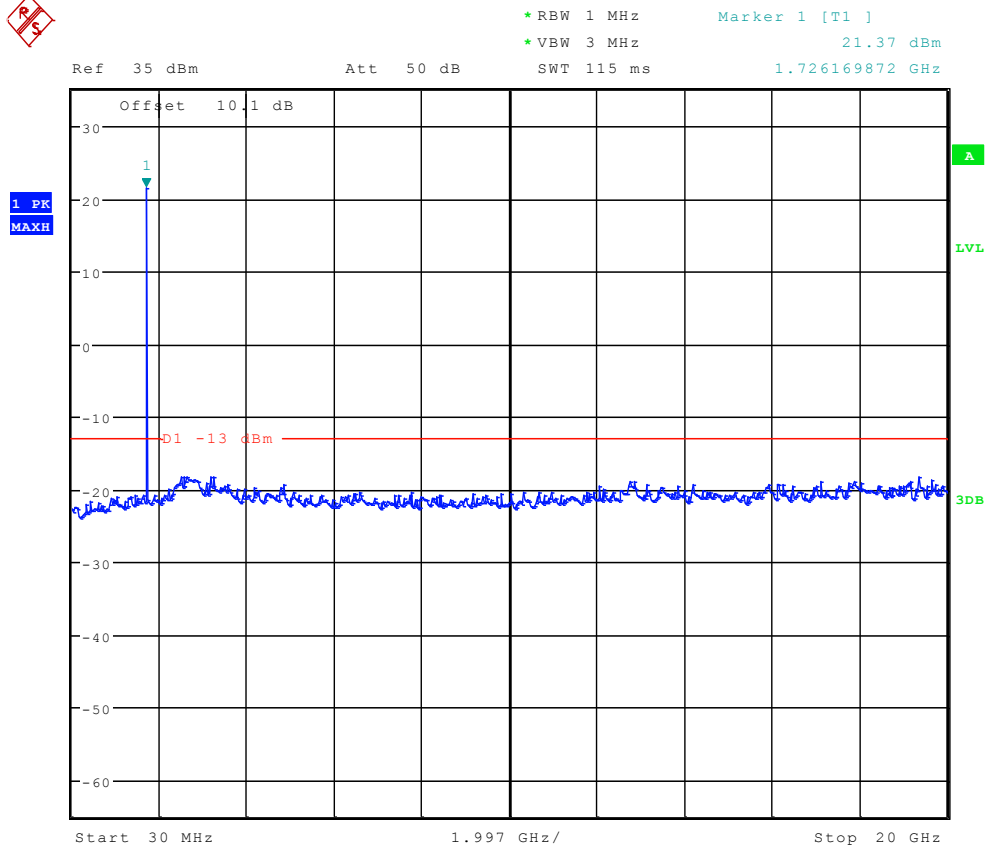
Channel 1412



Date: 10.FEB.2012 17:41:45



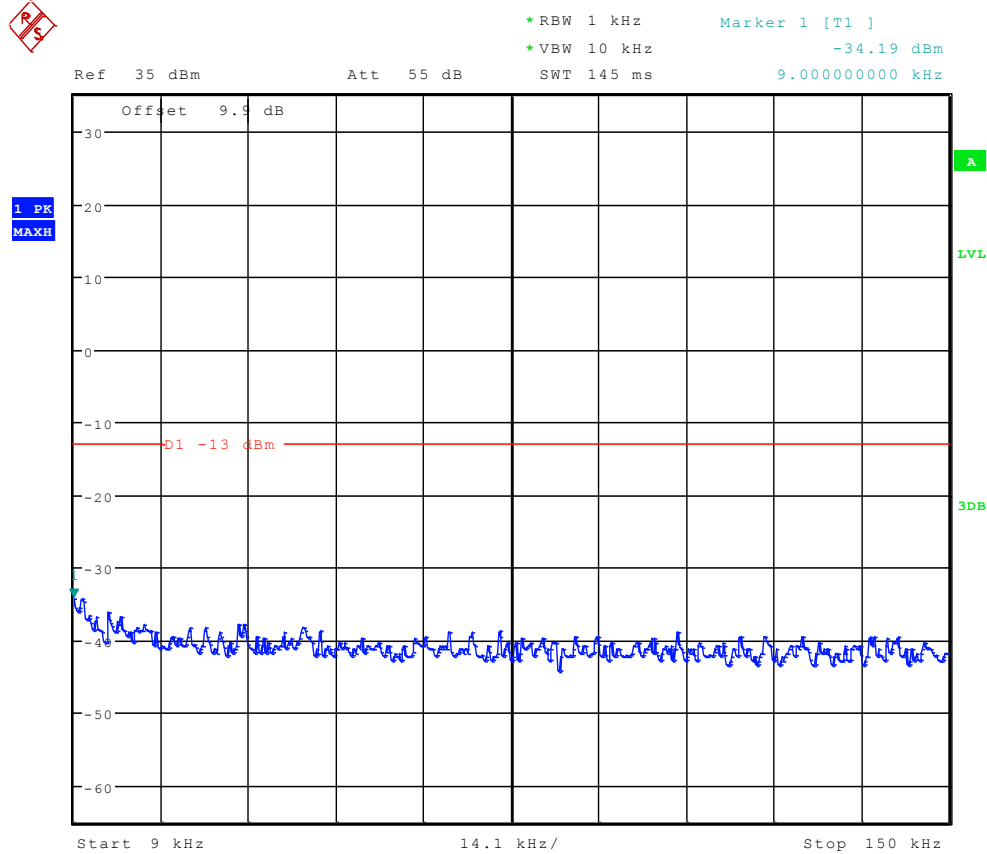
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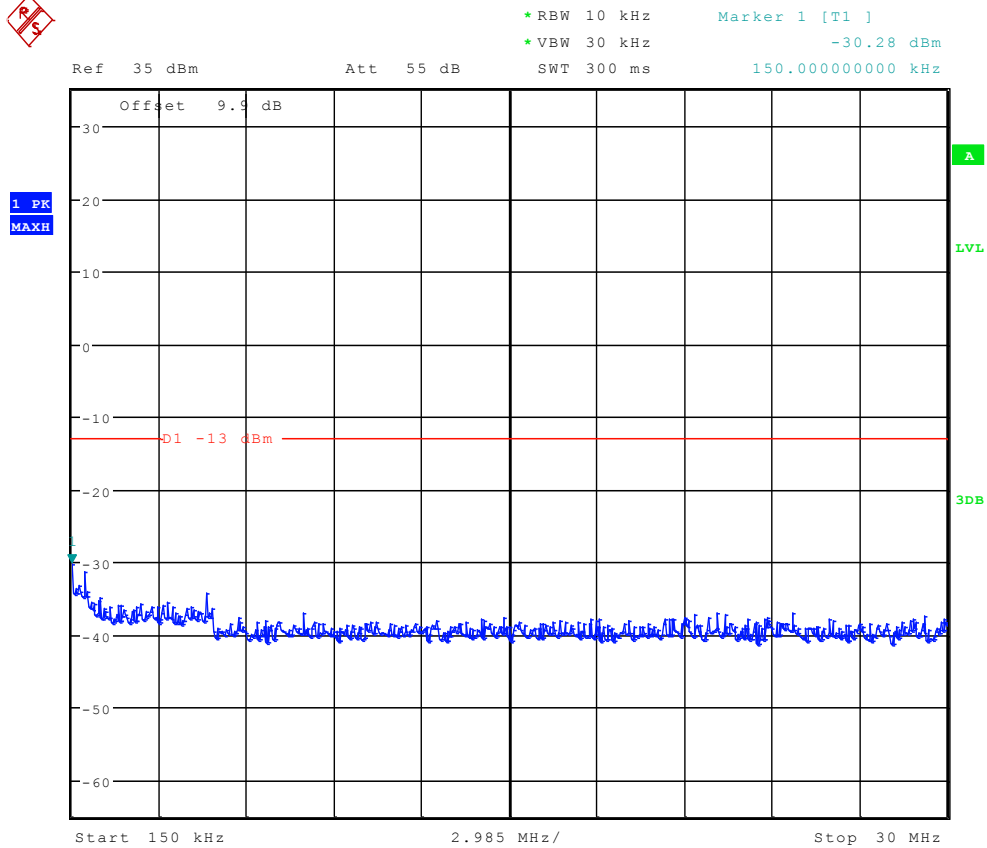
Date: 10.FEB.2012 17:43:13



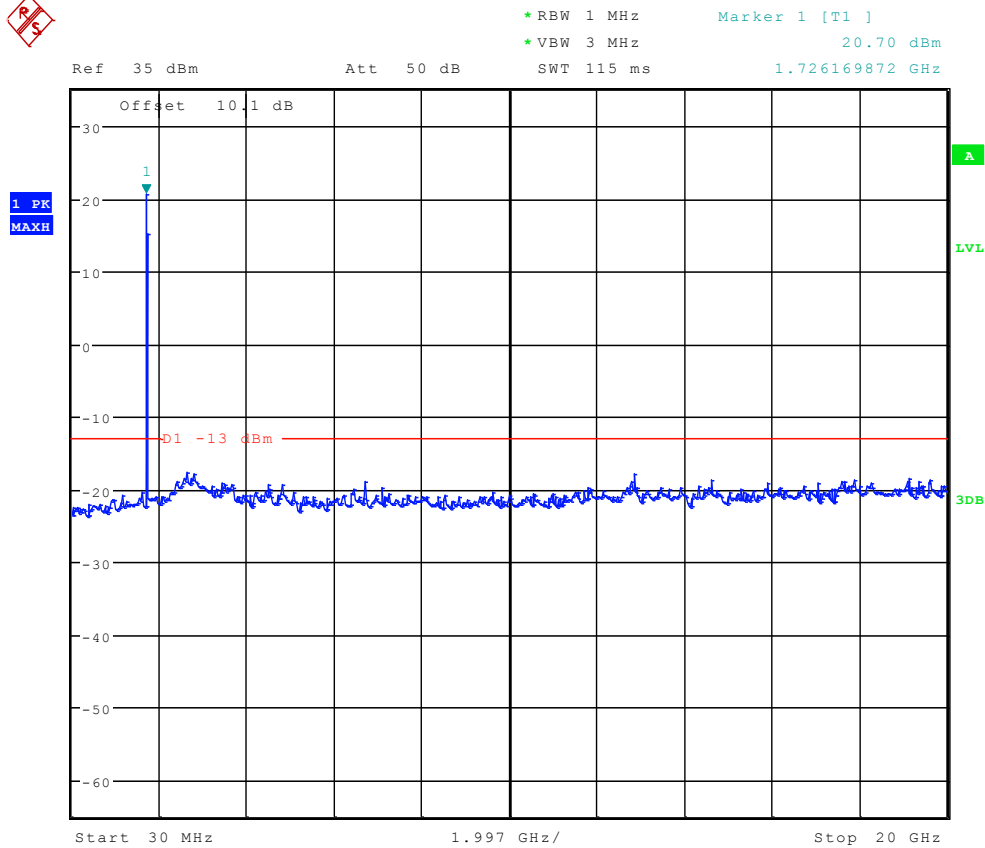
Channel 1513



Date: 10.FEB.2012 17:42:00



Date: 10.FEB.2012 17:42:44



Date: 10.FEB.2012 17:43:28

-----The END-----



Appendix F

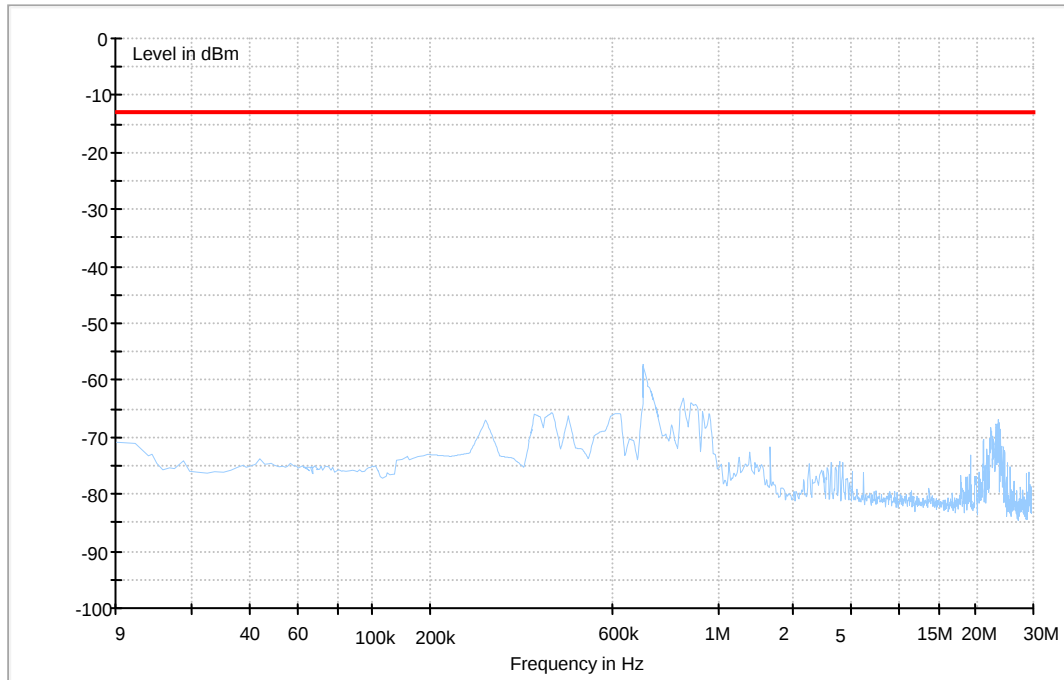
Radiated spurious emission

According to FCC Part 2.1053& Part 22.917



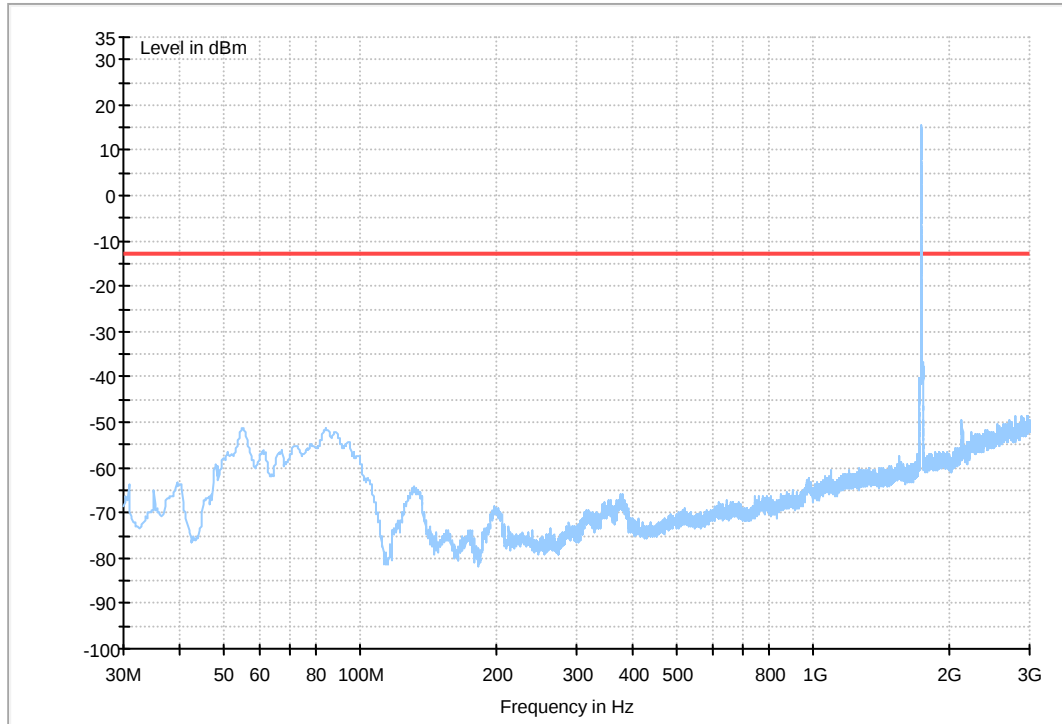
WCDMA AWS

Traffic Mode (9kHz-30MHz)



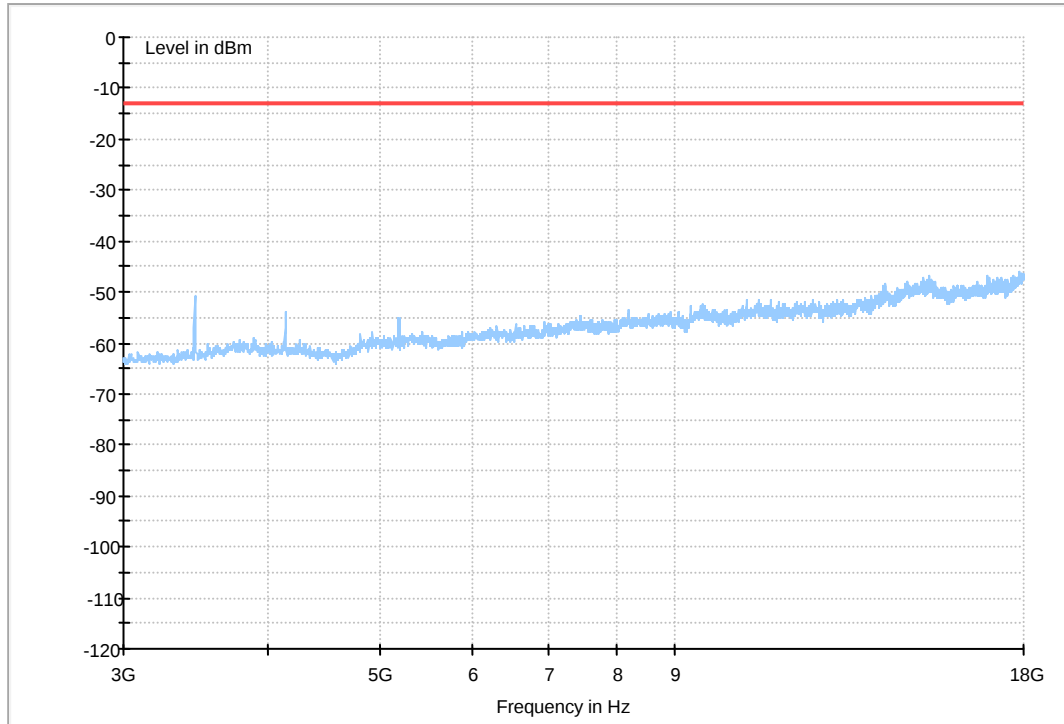


Traffic Mode (30MHz-3GHz)





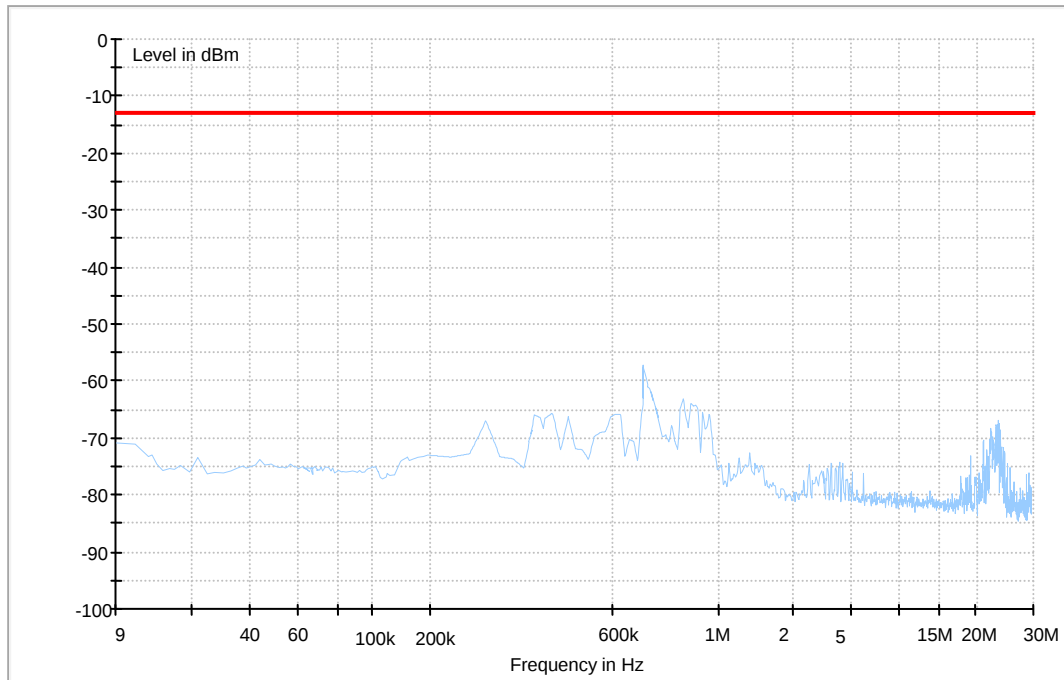
Traffic Mode (3GHz-18GHz)





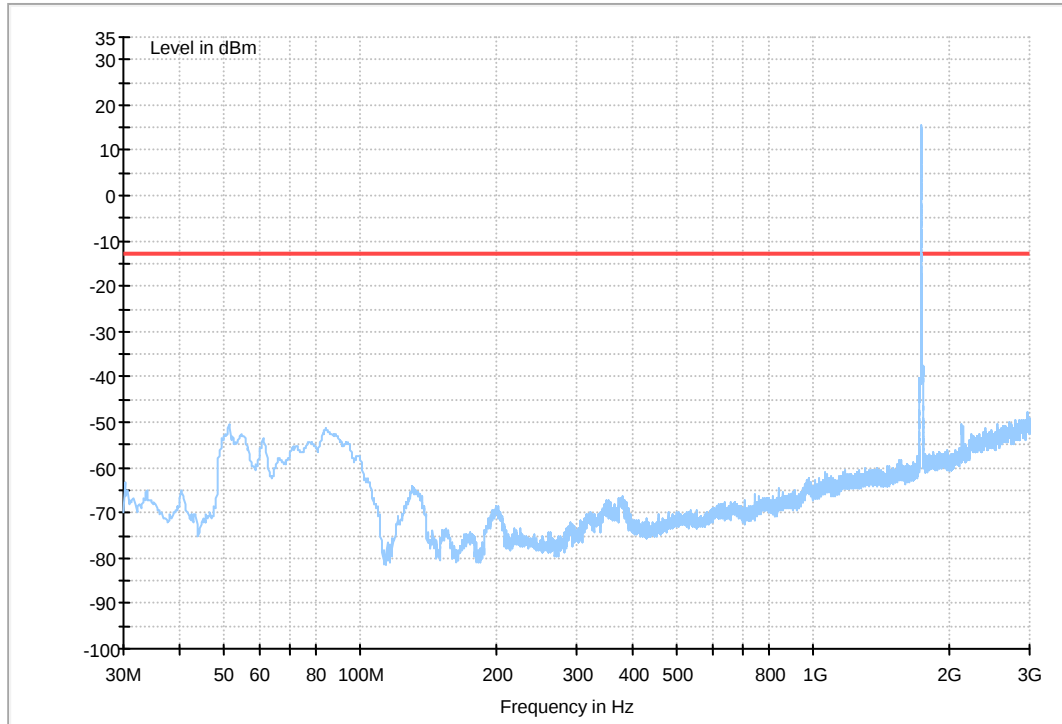
HSUPA AWS

Traffic Mode (9kHz-30MHz)



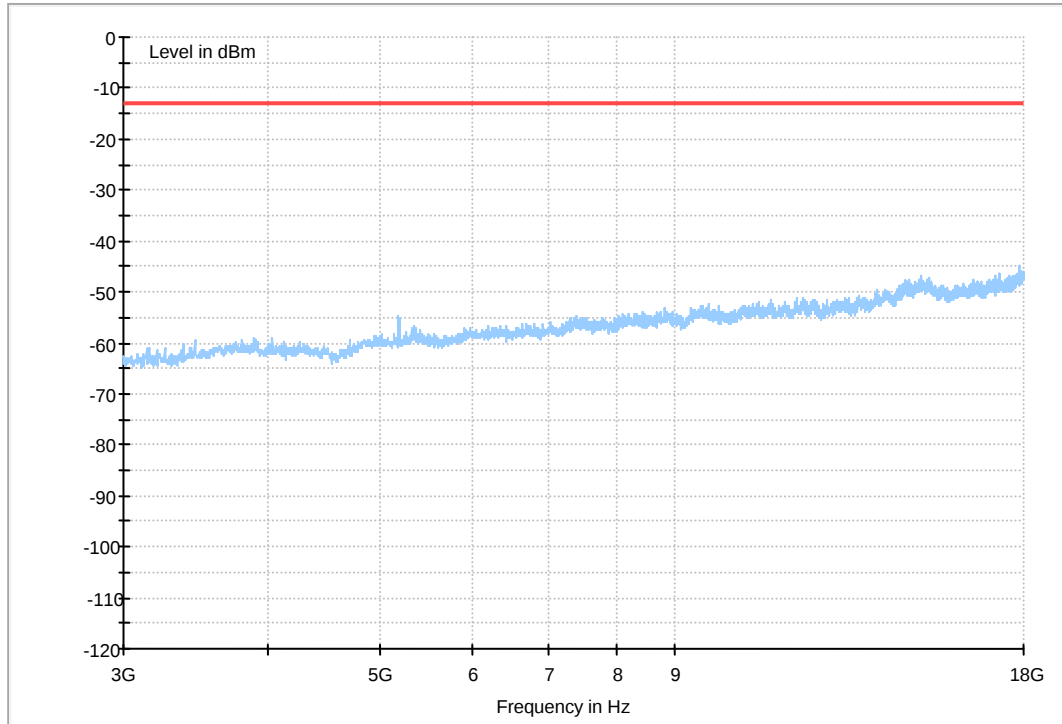


Traffic Mode (30MHz-3GHz)





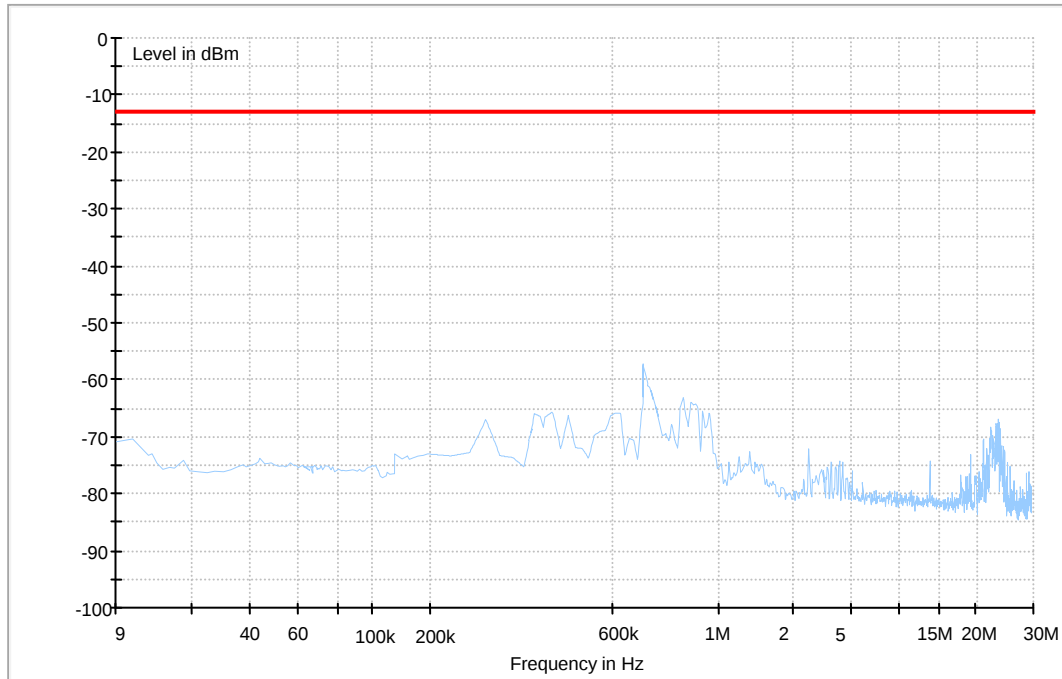
Traffic Mode (3GHz-18GHz)





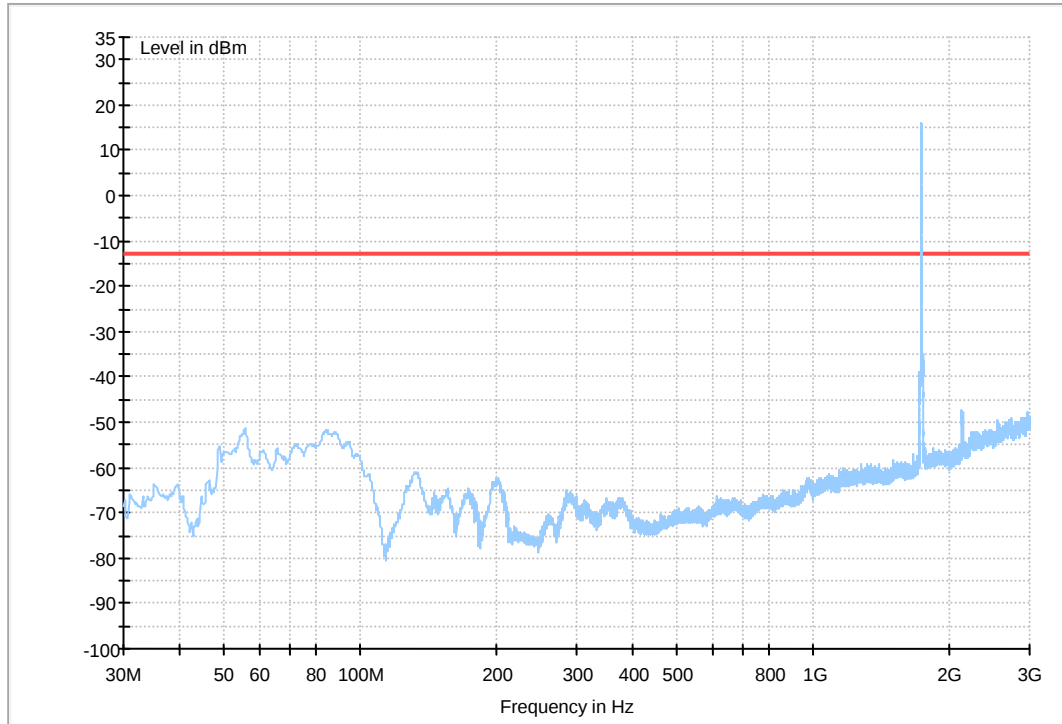
HSDPA AWS

Traffic Mode (9kHz-30MHz)



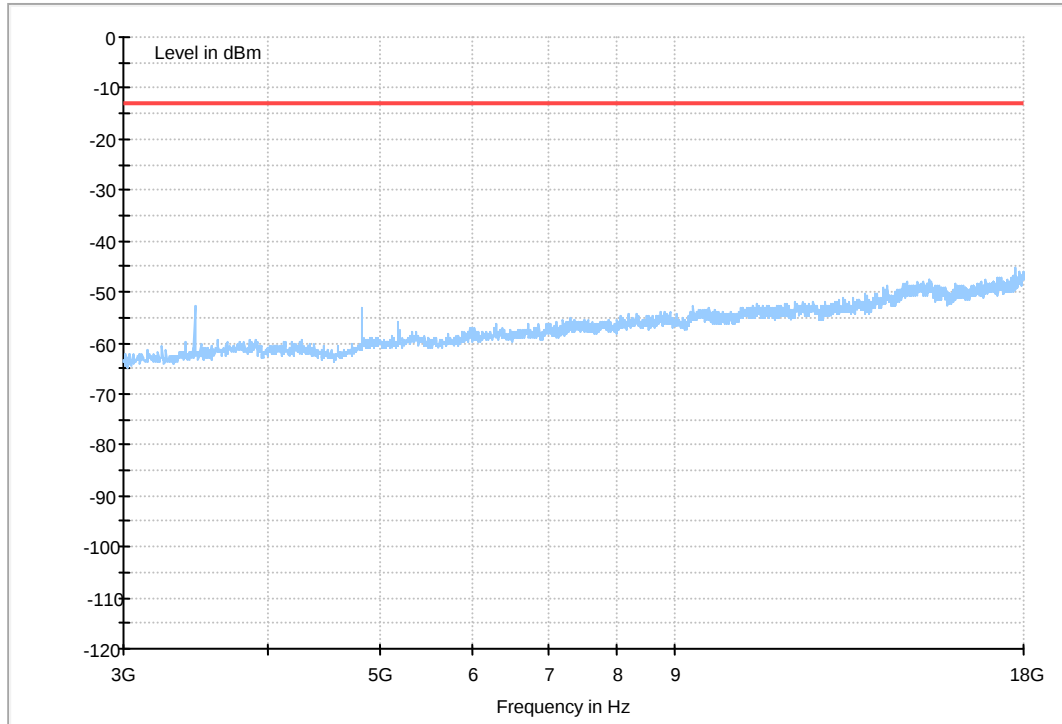


Traffic Mode (30MHz-3GHz)





Traffic Mode (3GHz-18GHz)





Appendix G

Frequency Stability

According to FCC Part 2.1055 & Part 27.54



Frequency Error vs. Temperature:

Test Mode	RF Ch.	Volt.	Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Freq. vs. 20 °C [ppm]	Limit [ppm]	Verdict
TM 1	M	100%	-30 °C	12	0.007	---	±2.5	Pass
			-20 °C	15	0.009	---	±2.5	Pass
			-10 °C	-9	-0.005	---	±2.5	Pass
			0 °C	-13	-0.008	---	±2.5	Pass
			10 °C	16	0.009	---	±2.5	Pass
			20 °C	10	0.006	---	±2.5	Pass
			30 °C	17	0.010	---	±2.5	Pass
			40 °C	-12	-0.007	---	±2.5	Pass
			50 °C	13	0.008	---	±2.5	Pass



Frequency Error vs. Voltage:

Test Mode	RF Ch.	Temp.	Volt.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Freq. vs. 20 °C [ppm]	Limit [ppm]	Verdict
TM 1	M	20 °C	85 %	-12	-0.007	---	±2.5	Pass
			100 %	-11	-0.006	---	±2.5	Pass
			115 %	15	0.009	---	±2.5	Pass

-----The END-----
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