



FCC RF Test Report

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

Model Number: HUAWEI U8651S, U8651S, Summit

**Report No: SYBH(Z-RF)002022012-2009
FCC ID:QISU8651S**

Reliability Laboratory of Huawei Technologies Co., Ltd.

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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.
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Applicant: Huawei Technologies Co., Ltd.
Address: Huawei Base, Bantian, Longgang District, Shenzhen
518129, P.R. China
Date of Receipt Test Item: Jan.10, 2012
Start Date of Test: Jan.10, 2012
End Date of Test: Jan.17, 2012

Test Result: Pass

Approved By Senior Engineer Aug.07, 2012 Dai Linjun *Dai Linjun*
Date Name Signature

Reviewed By Aug.07, 2012 Cousy Xu *Cousy XU*
Date Name Signature

Operator Aug.07, 2012 Huang Qiuliang *Huang Qiuliang*
Date Name Signature

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1 General Information

1.1 Applied Standard

Applied Rules: 47 CFR FCC Part 2:2011, Subpart J
47 CFR FCC Part 27:2011, Subpart C&L

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

HUAWEI U8651S, U8651S, U8651, Astro subscriber equipment in the WCDMA/GSM system. The HSDPA/UMTS frequency band is Band IV and Band II and Band V. The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only WCDMA BAND IV test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, HSDPA/UMTS and GSM/GPRS/EDGE protocol processing, voice, video, MMS service, GPS,AGPS and WIFI 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 use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

The difference between U8651S and U8651T is showed in the following table.

	U8651S	U8651T
GSM four bands	the same	the same
WCDMA bands	WCDMA1900/AWS/850	WCDMA1900/AWS/850
FLASH	the same	the same
PCB	the same	the same
Appearance	the difference	the difference
Bluetooth mode	the same	the same
WLAN mode	the same	the same
BT/ WLAN antenna	the same	the same
GSM/ WCDMA antenna	the same	the same
External camera	the same	the same
internal camera	the same	the same
Adapter	the same	the same
Battery	the same	the same
Chipset	the same	the same
Memory	the same	the same
Form factor	Bar type, Internal antenna	Bar type, Internal antenna
RF Parameter	The same RF Parameter in the same band	The same RF Parameter in the same band
BT RF Parameter	the same	the same
Dimension	the same	the same
Weight	the same	the same
Bluetooth	the same	the same
External camera	the same	the same

Main Frequency NV	The same NV in the same band	The same NV in the same band
BT conducted power	the same	the same
WIFI conducted power	the same	the same

So U8651S RF test data refer to U8651T RF report .

3.1.2 Board

Table 2 Board Information

HSDPA/UMTS/GPRS/GSM/EDGE Mobile Phone with Bluetooth		
HUAWEI U8651S, U8651S, Summit		
Board and Module		
Hardware Version	Software Version	Serial Number
HD4U865M	U8651S100R001USAC85B2 9	L7M7ND1270400132

3.1.3 Adapter

AC/DC Adapter Model	HW-050100U1W
Manufacturer	Huawei Technologies Co., Ltd.
Input Voltage	~100-240V 50/60Hz 0.2A
Output Voltage	5V  1A
Rated Power	5W

3.1.4 Battery

Name	Manufacture	Description
Rechargeable Li-ion	Huawei Technologies Co., Ltd.	Battery Model: HB5K1H Rated capacity: 1400mAh Nominal Voltage:  +3.7V Charging Voltage:  +4.2V



4 Test Description

4.1 Supported Frequency Range

Characteristics	Description
Downlink	1710 to 1755 MHz
Uplink	2110 to 2155 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: 4M18F9W



4.3 Antenna Gain

Antenna Gain(dBi)	0
Antenna Gain(dBd)	-2.15

4.4 Power Supply

Specification	Description
Power Supply Type	Directly Connected to DC /AC Power Supply
Input to EUT (DC power)	DC Voltage Nominal: \approx +3.7 V DC Voltage Range: \approx +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 /Subtype 0/ Subtype 1	TX	Channel 1312	Channel 1412	Channel 1513
		1712.4MHz	1732.4MHz	1752.6MHz
	RX	Channel 1537	Channel 1637	Channel 1783
		2112.4MHz	2132.4MHz	2152.6MHz

5.2 Test Modes

Test Mode	Test Modes Description
TM1	WCDMA QPSK modulation
TM2	HSDPA 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

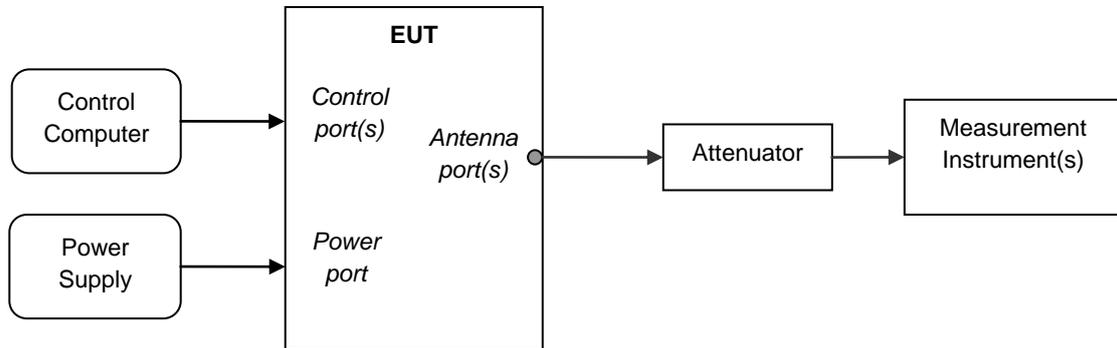
NOTE: VL= lower extreme test voltages
 VN= nominal voltage
 VH= upper extreme test voltage
 TN= normal temperature

5.4 Test Setups

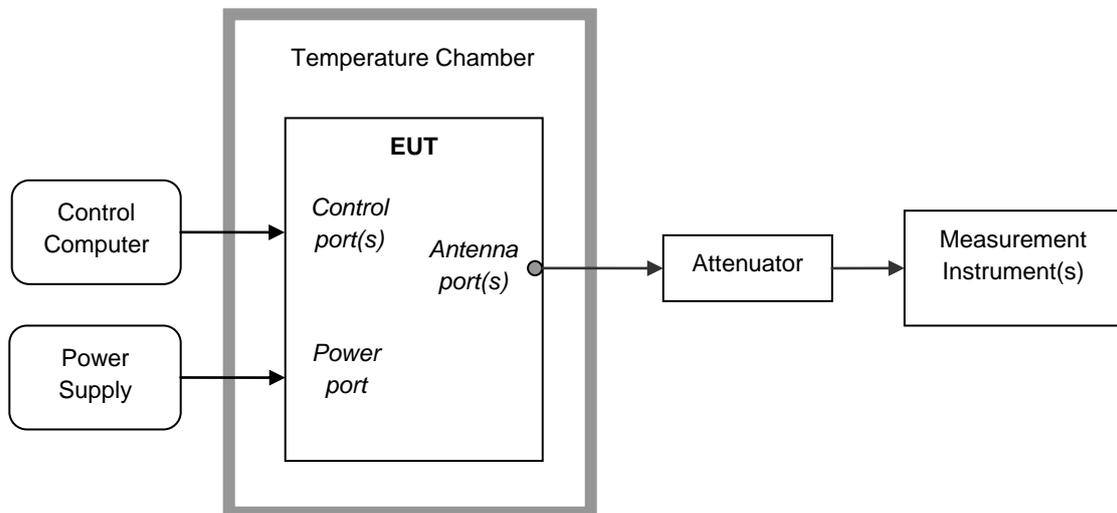
5.4.1 General Test Setup Configurations

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



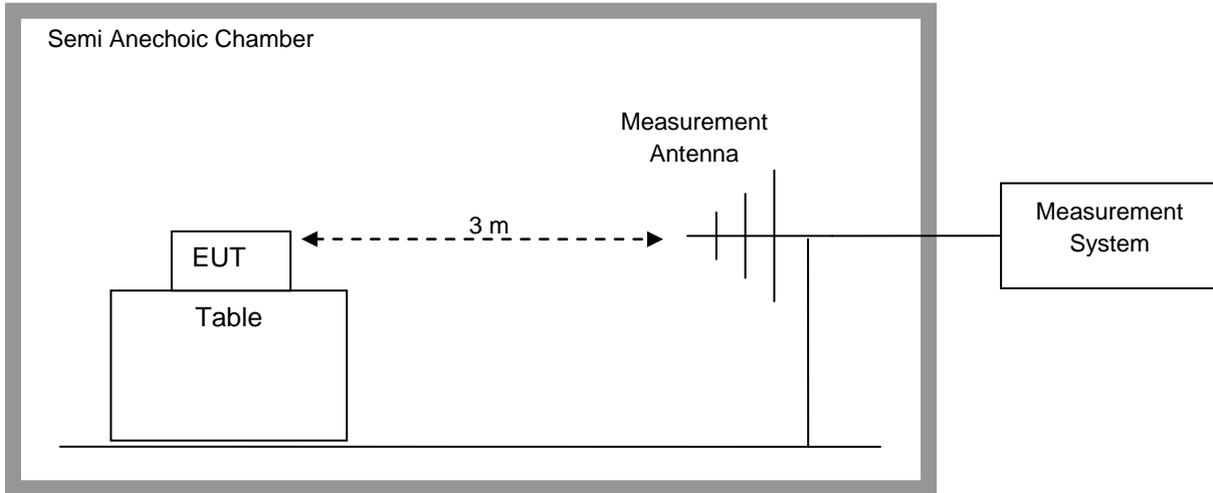
5.4.3 Test Setup 2



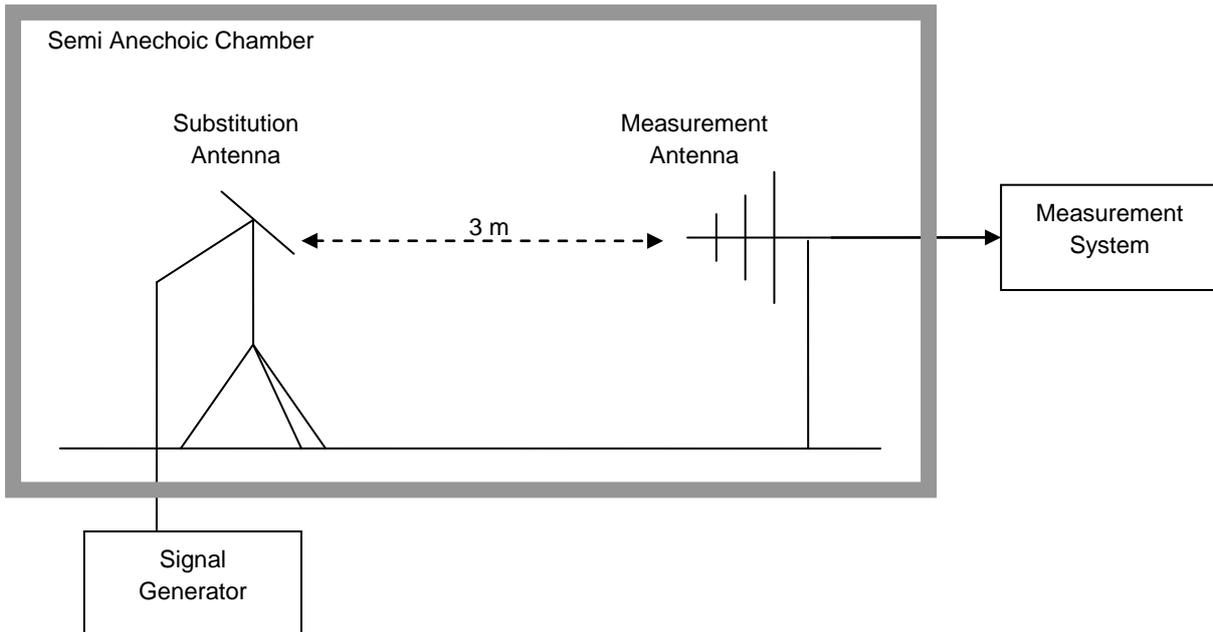
5.4.4 Test Setup 3

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/ Subtype 0/ Subtype 1
Modulation Characteristics	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	RF Channels (TX)	M
	Test Mode	TM1/ Subtype 0
Occupied Bandwidth	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	PK
	RF Channels (TX)	B, M, T
	Test Mode	TM1/TM2/ Subtype 0/ Subtype 1
Band Edges Compliance	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	RMS
	RF Channels (TX)	B, T
	Test Mode	TM1/ Subtype 0
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/ Subtype 0
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/ Subtype 0
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



Test Case	Test Conditions	
	RF Channels (TX)	M
	Test Mode	TM1/ Subtype 0

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.29.2012
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	Jan.29.2012
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 Test Setup	Appendix H

NOTE: The Appendix H only photos of Test setup,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

Table 1 Measurement Results

TEST CONDITIONS		RF Output Power (Conducted)					
		Channel 1312(B)		Channel 1412(M)		Channel 1513(T)	
		1712.4MHz		1732.4MHz		1752.6MHz	
		dBm		dBm		dBm	
T_{nom} / V_{nom}		Measured	Limit	Measured	Limit	Measured	Limit
TM1		23.15	30	23.21	30	23.17	30
TM2	Case1	22.88	30	22.98	30	23.01	30
	Case2	22.53	30	22.73	30	22.69	30
	Case3	22.03	30	22.22	30	22.26	30
	Case4	21.99	30	22.11	30	21.95	30

Peak-to-Average Ratio

Table 2 Measurement Results

TEST CONDITIONS		Channel 1312(B)		Channel 1412(M)		Channel 1513(T)	
		1712.4MHz		1732.4MHz		1752.6MHz	
		dBm		dBm		dBm	
T_{nom} / V_{nom}		Measured	Limit	Measured	Limit	Measured	Limit
TM1		2.85	13.0	3.08	13.0	2.91	13.0
TM2	Case1	2.78	13.0	2.87	13.0	2.94	13.0
	Case2	2.89	13.0	2.68	13.0	2.96	13.0
	Case3	2.94	13.0	2.68	13.0	2.91	13.0
	Case4	2.88	13.0	2.64	13.0	2.93	13.0



Test Plot of Peak-to-Average Ratio

Note: All relevant operation modes have been tested, and the worst case Plot is included in this report.

TM1/TM2



RBW 5 MHz

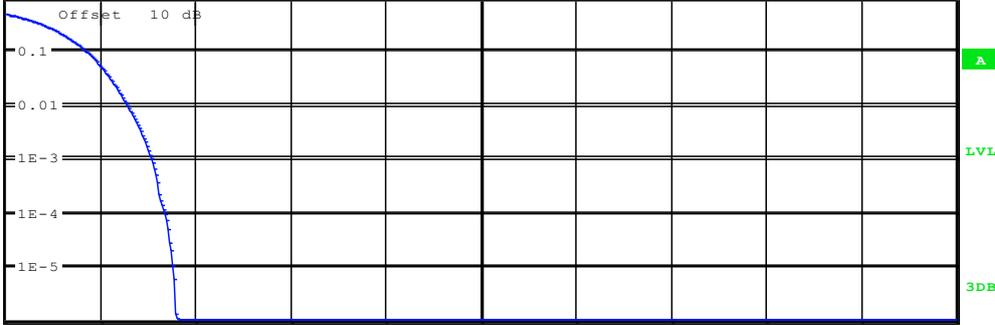
Ref 30 dBm

Att 45 dB

AQT 12.5 ms

Offset 10 dB

1 SA
CLRWR



Center 1.7324 GHz

2 dB/

Mean Pwr + 20 dB

Complementary Cumulative Distribution Function

NOF samples: 100000, Usable BW: 7.1MHz

Trace 1	
Mean	15.56 dBm
Peak	19.15 dBm
Crest	3.59 dB
10 %	1.73 dB
1 %	2.56 dB
.1 %	3.08 dB
.01 %	3.37 dB



Efficient Isotropic Radiated Power (EIRP)

Table 2 Substitution Results

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	SGP [dBm]	Substitution Gain [dBi]	Cable Loss [dB]	Substitution Level (EIRP) [dBm]	Limit [dBm]	Result
TM1	1712.4	23.15	Horn Ant.	19.68	4.5	1.0	23.18	30	Pass
TM1	1732.4	23.21	Horn Ant.	19.75	4.5	1.0	23.25	30	Pass
TM1	1752.6	23.17	Horn Ant.	19.35	4.8	1.0	23.15	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



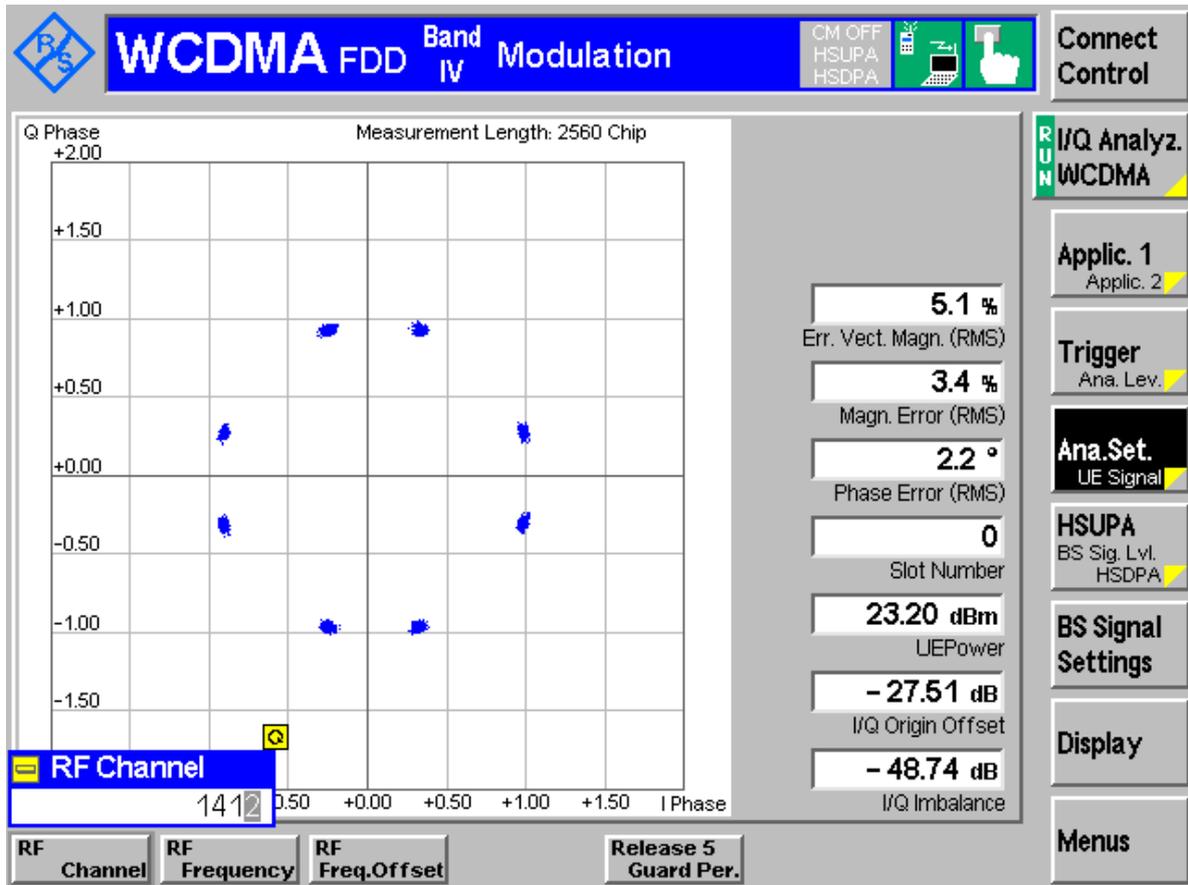
Appendix B

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

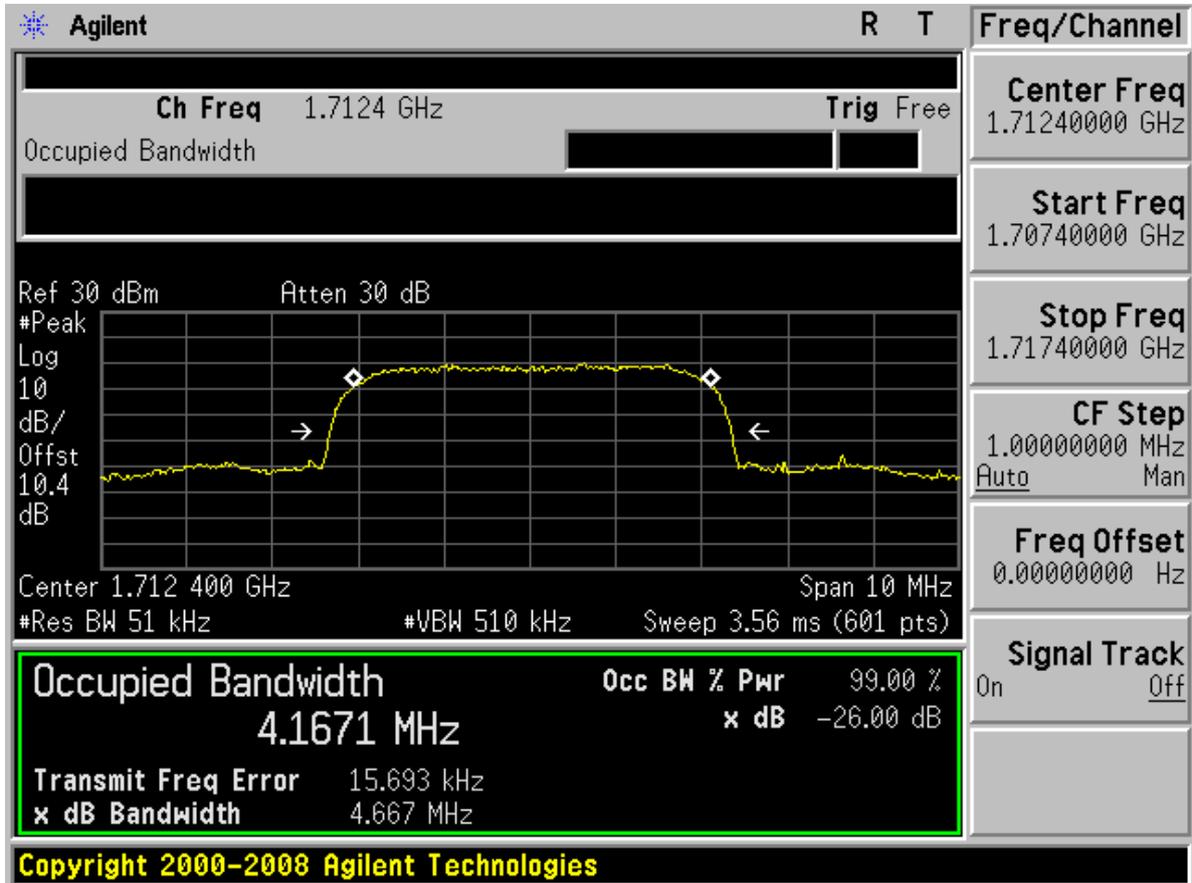


Result Table
Table 1 Measurement Results

Test Mode	RF Channel	Occupied Bandwidth [MHz]	-26dB BW [MHz]	Verdict
TM1	1312	4.17	4.67	Pass
	1412	4.18	4.65	Pass
	1513	4.18	4.66	Pass

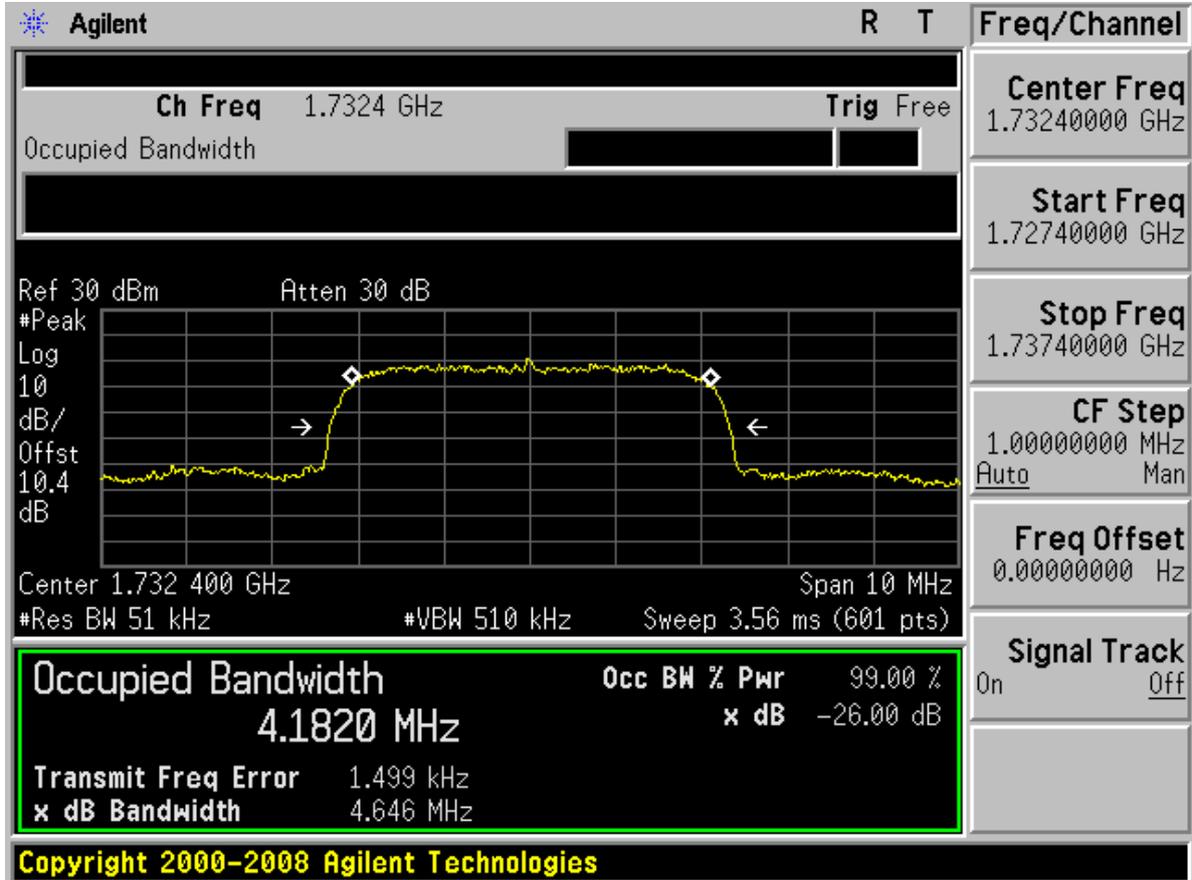


TM1: WCDMA Channel 1312



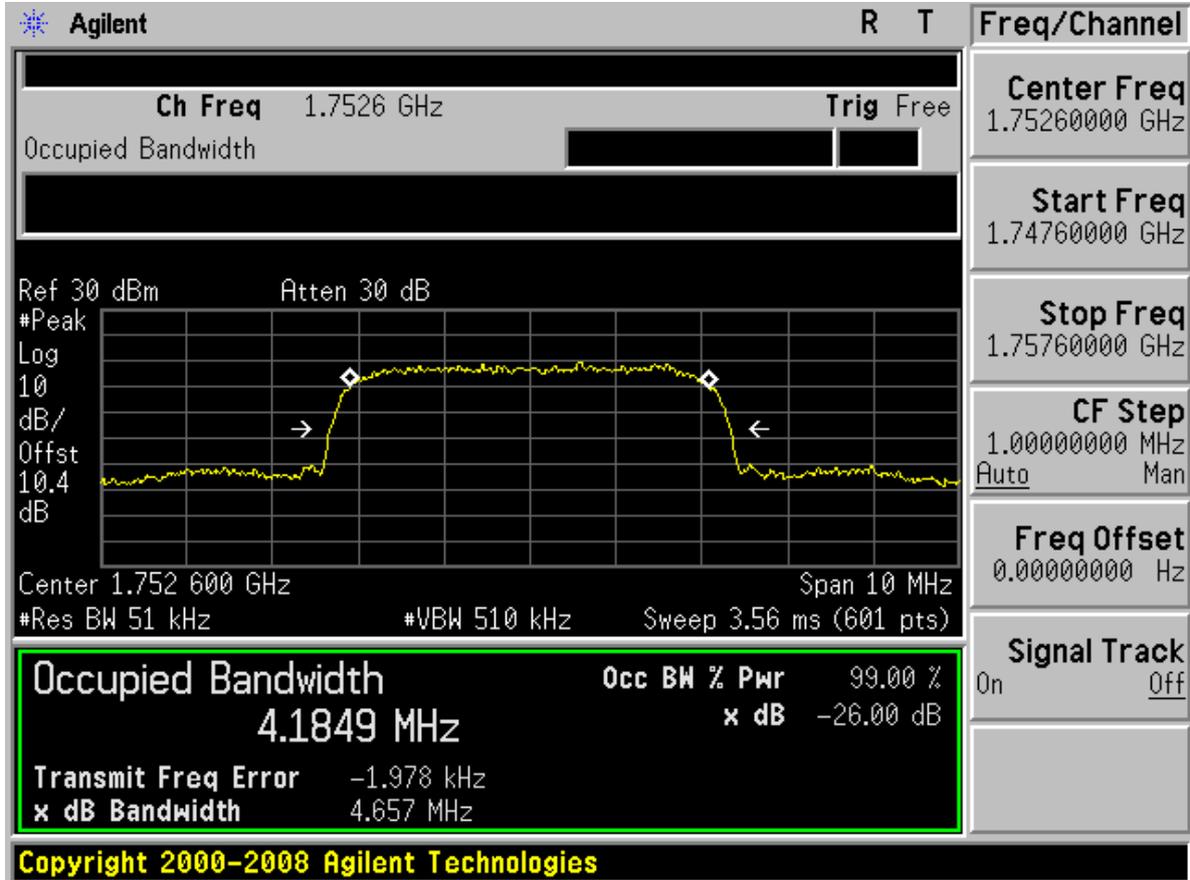


Channel 1412





Channel 1513



The END



Appendix D

Band Edges Compliance

According to FCC Part 2.1051 & Part 27 Subpart C&L
& RSS-139



26dB Occupied Bandwidth

Note: All relevant operation modes have been tested, and the widest case data is included in this table.

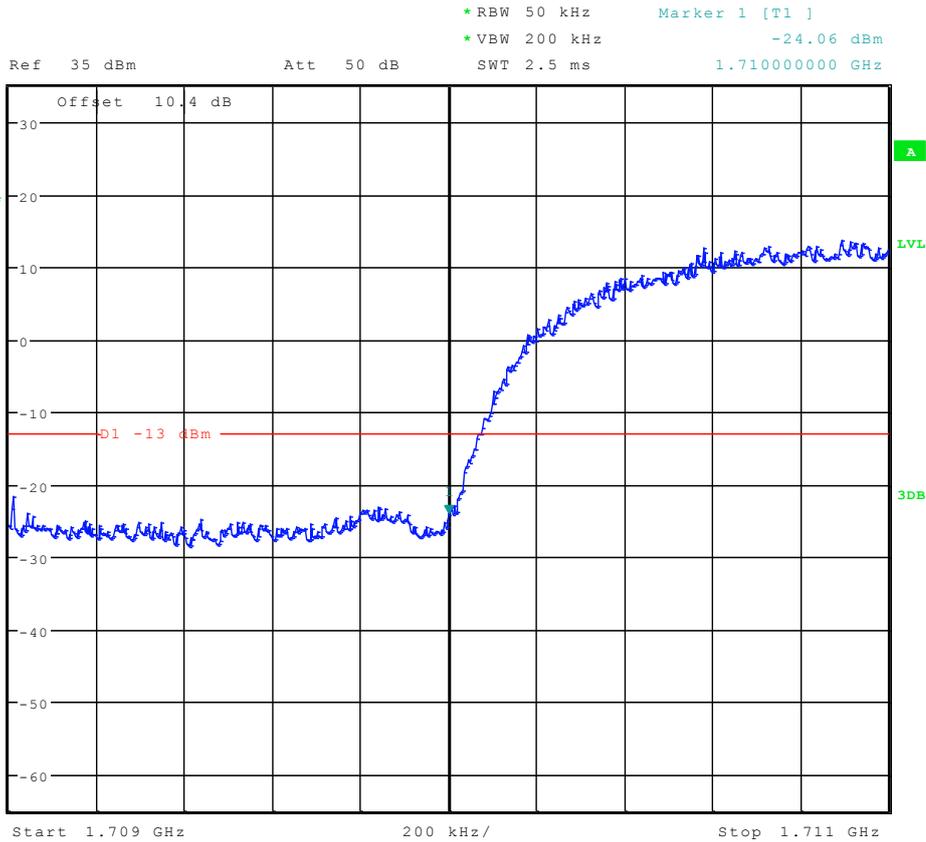
Mode	-26dB BW [MHz]	RBW to Measure Band Edge [kHz]
TM1/TM2	4.67	≥ 4.67 , used 5



TM1: WCDMA

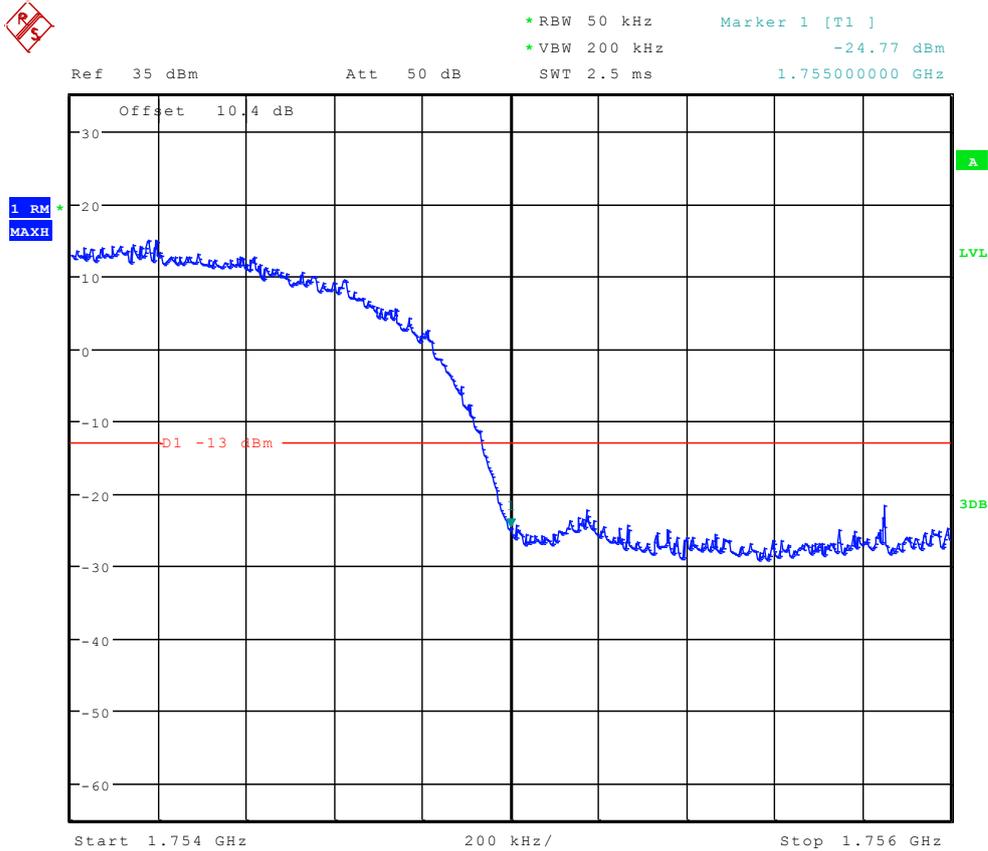
Left Edge

Channel 1312





Right Edge Channel 1513



The END



Appendix E

Spurious Emission at Antenna Terminal

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

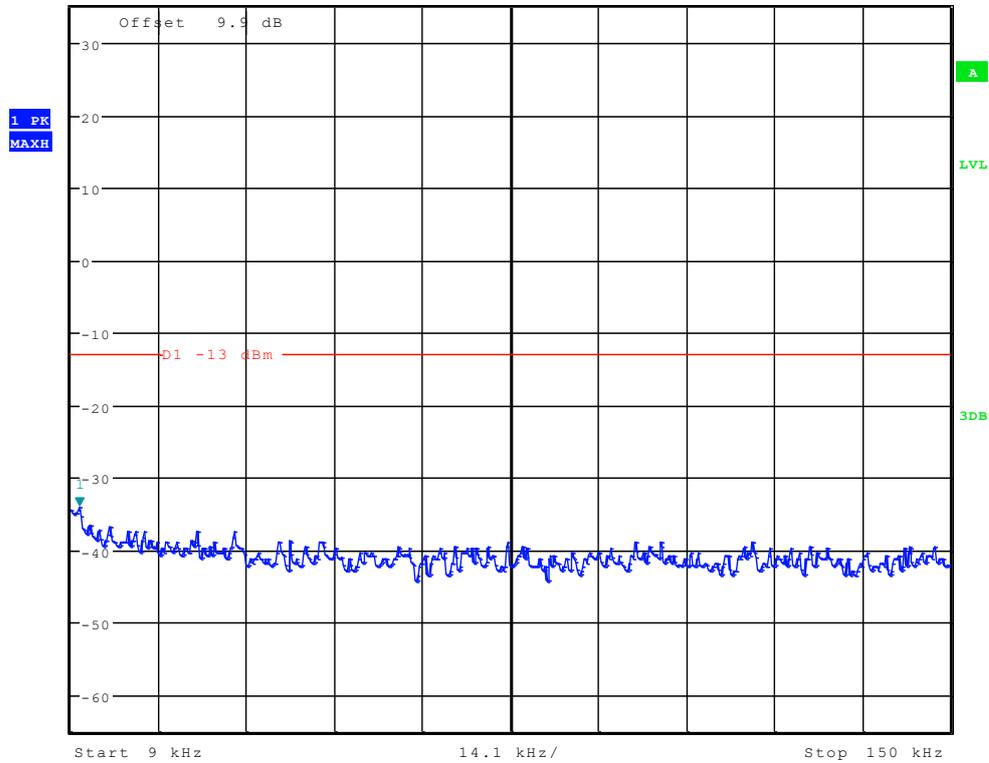


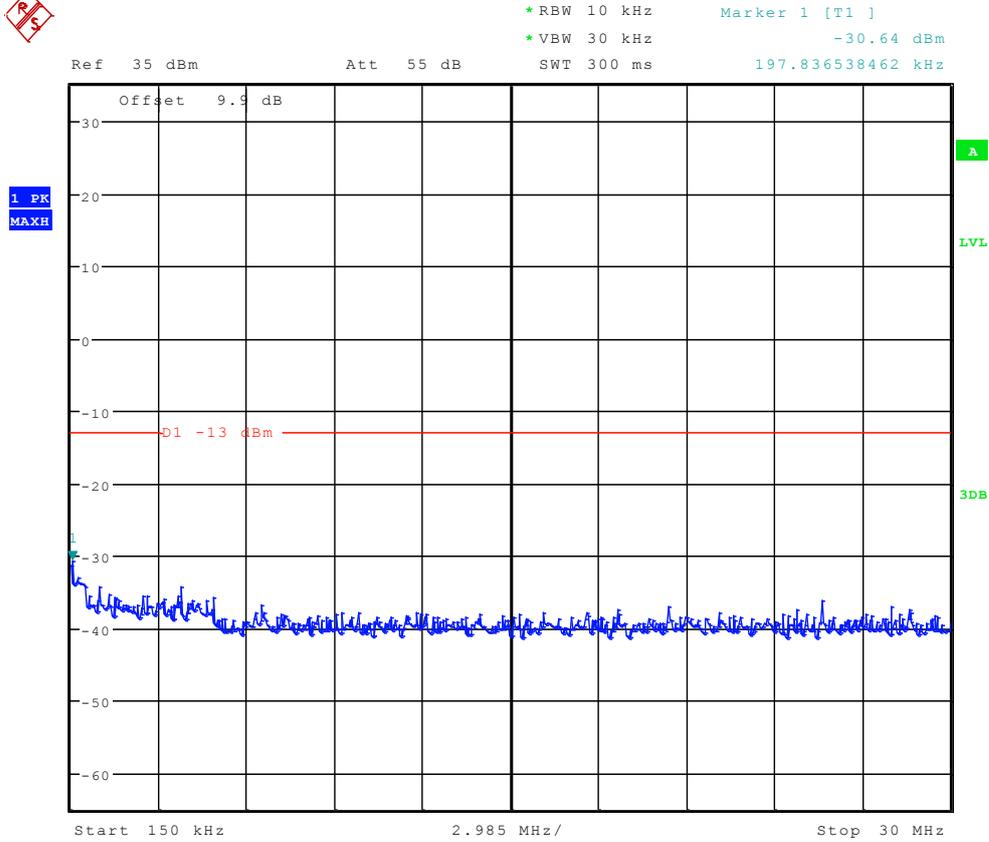
TM1: WCDMA

Channel 1312



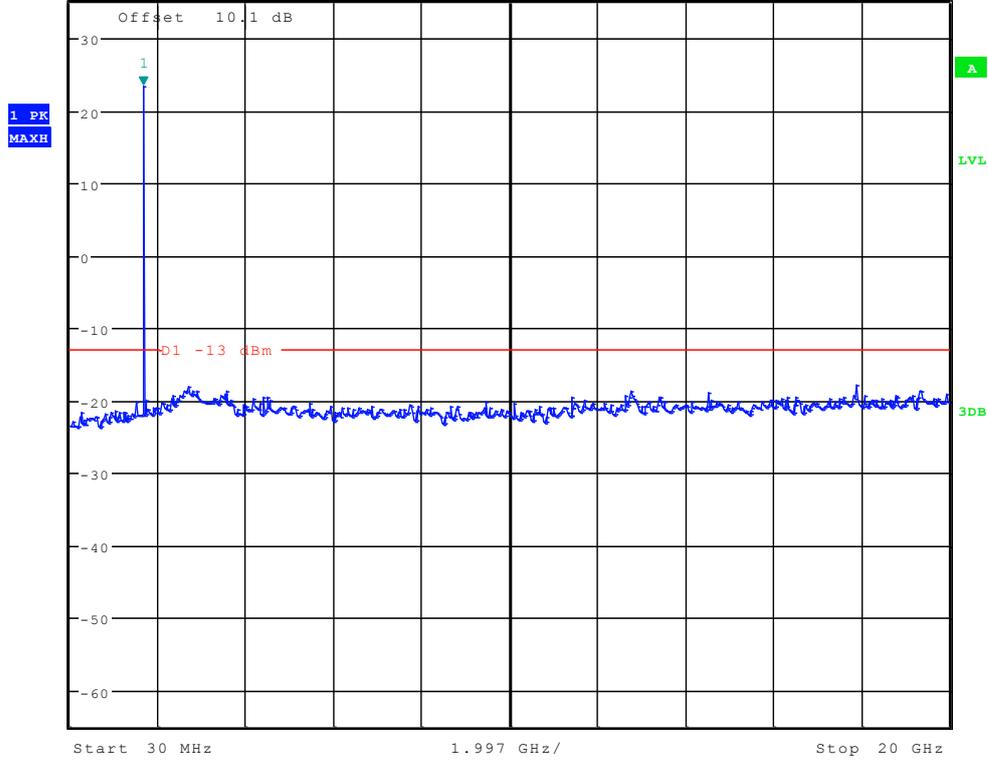
Ref 35 dBm Att 55 dB SWT 145 ms Marker 1 [T1] -33.92 dBm
*RBW 1 kHz
*VBW 10 kHz 10.355769231 kHz







*RBW 1 MHz Marker 1 [T1]
 *VBW 3 MHz 23.40 dBm
 Ref 35 dBm Att 50 dB SWT 115 ms 1.694166667 GHz

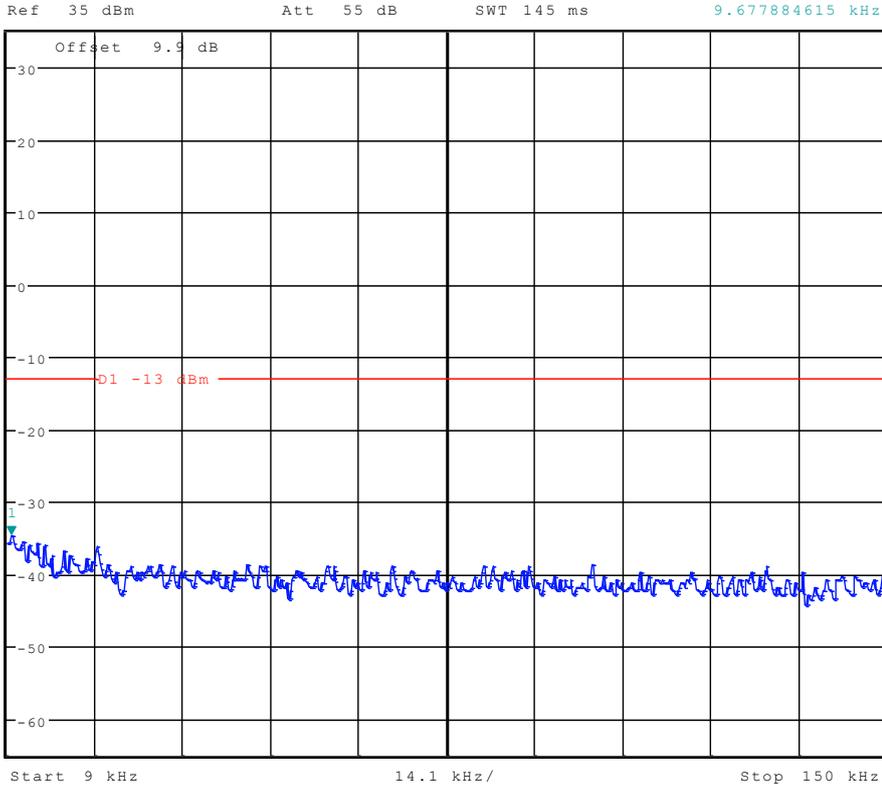


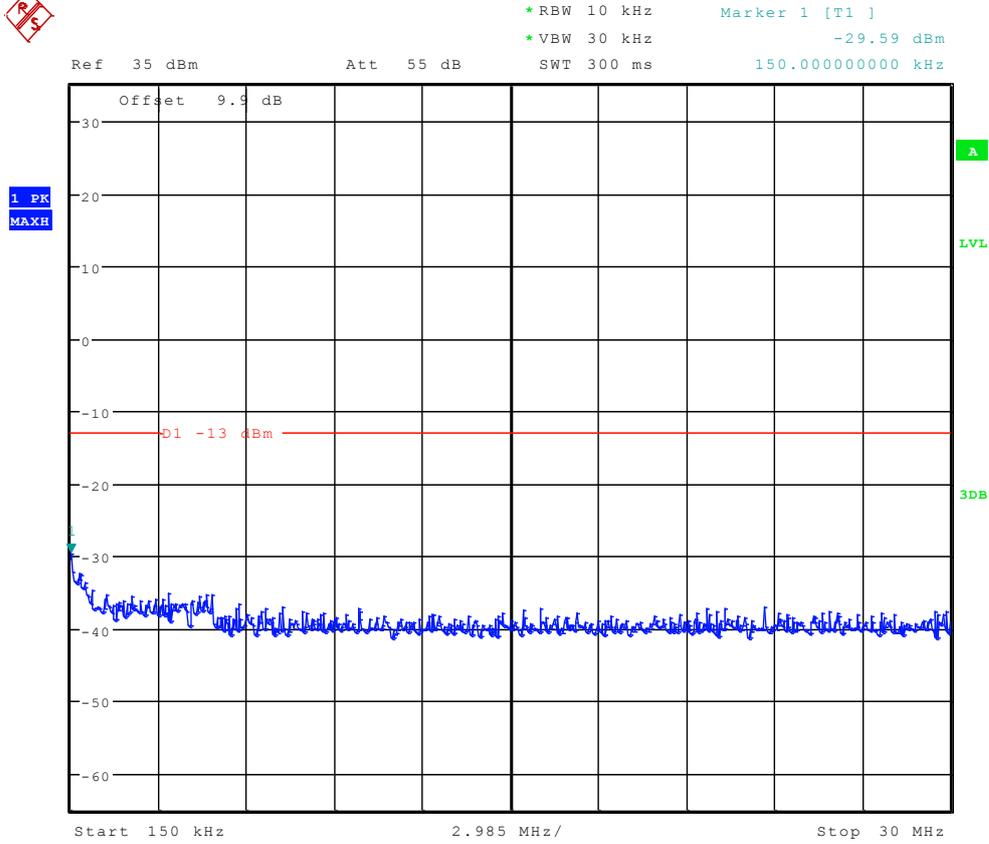


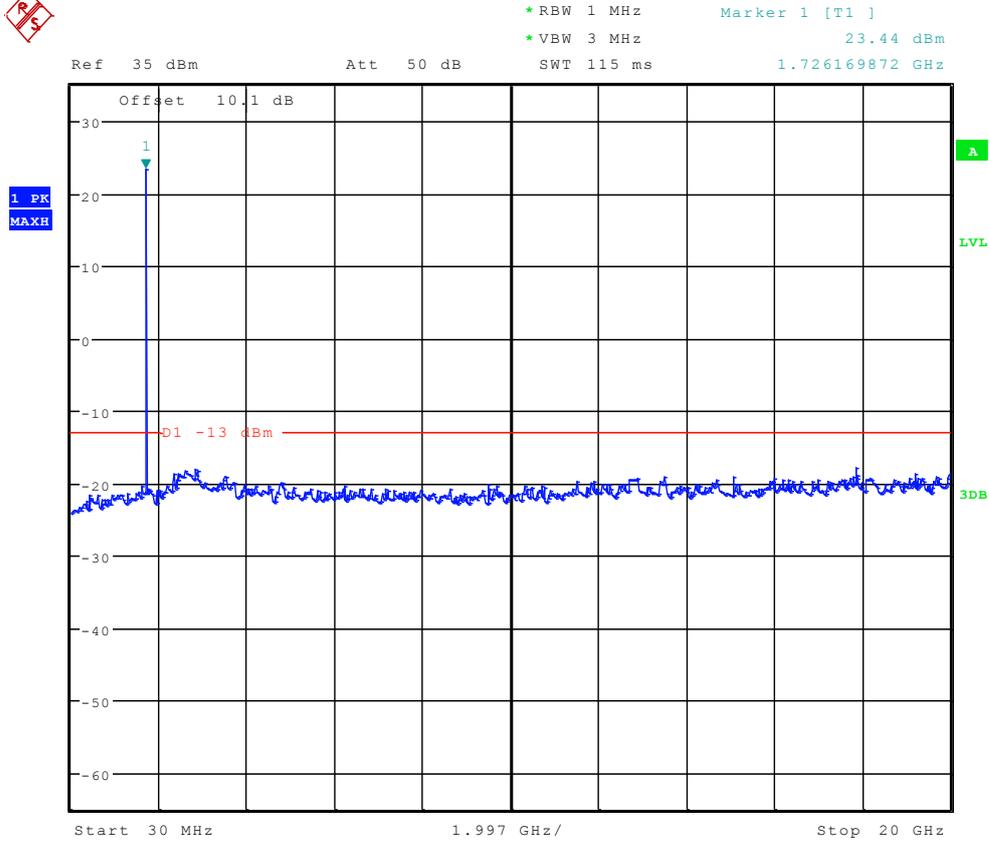
Channel 1412



*RBW 1 kHz Marker 1 [T1]
*VBW 10 kHz -34.67 dBm
9.677884615 kHz





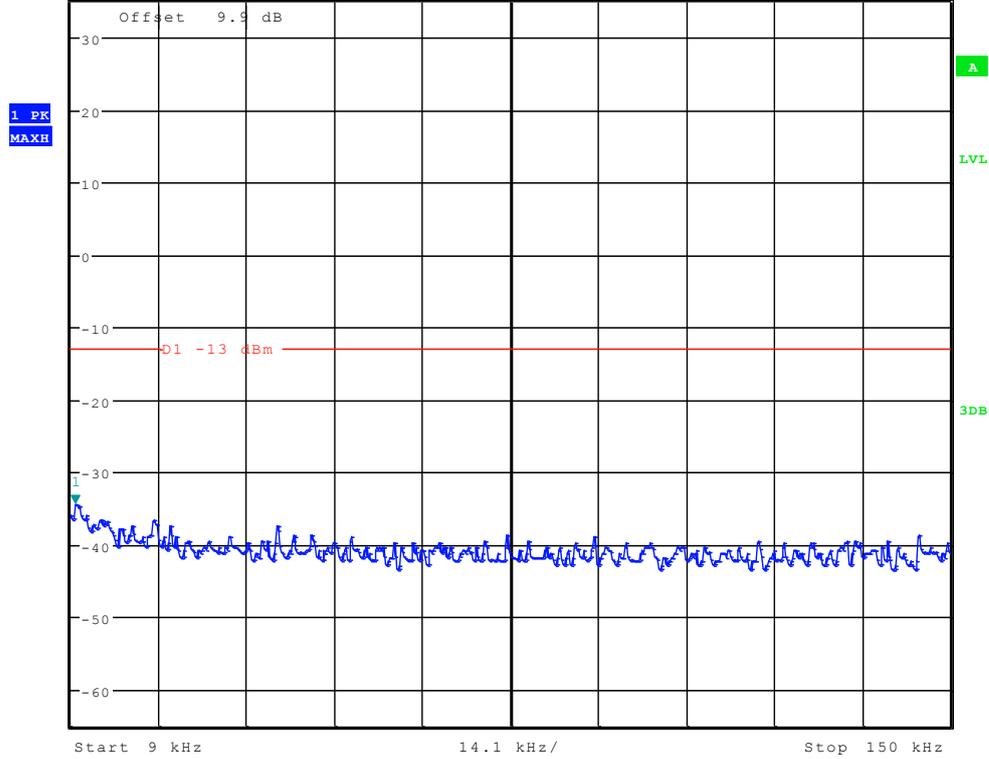


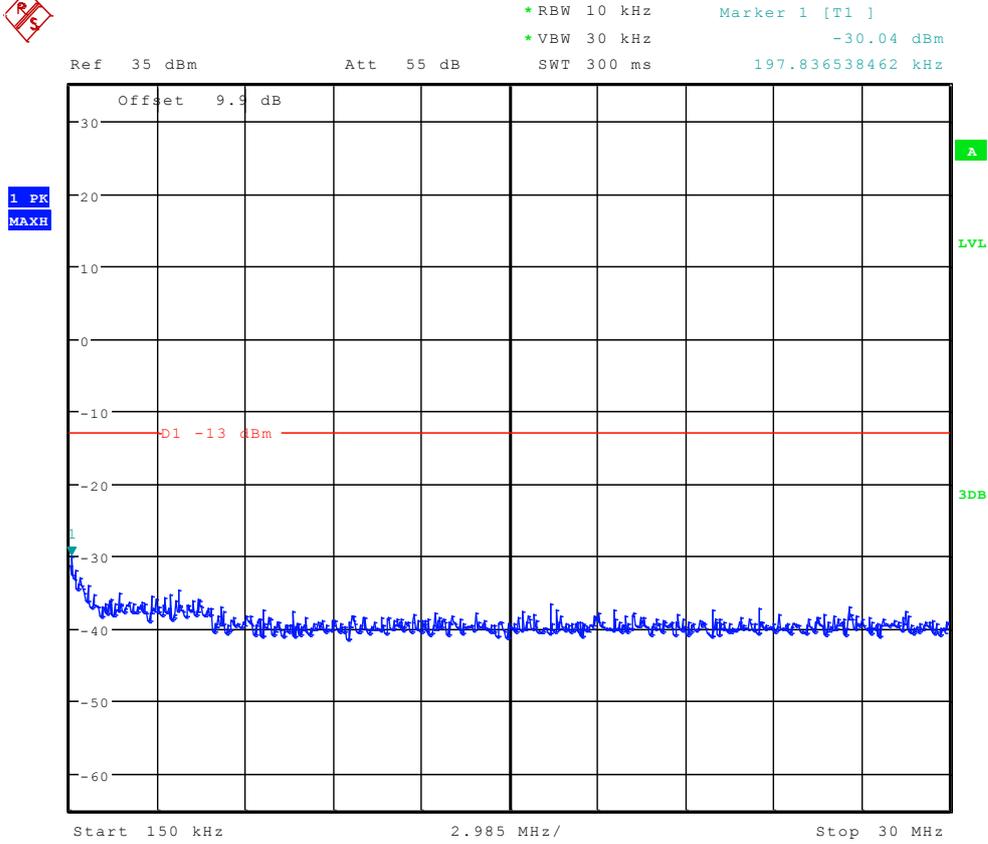


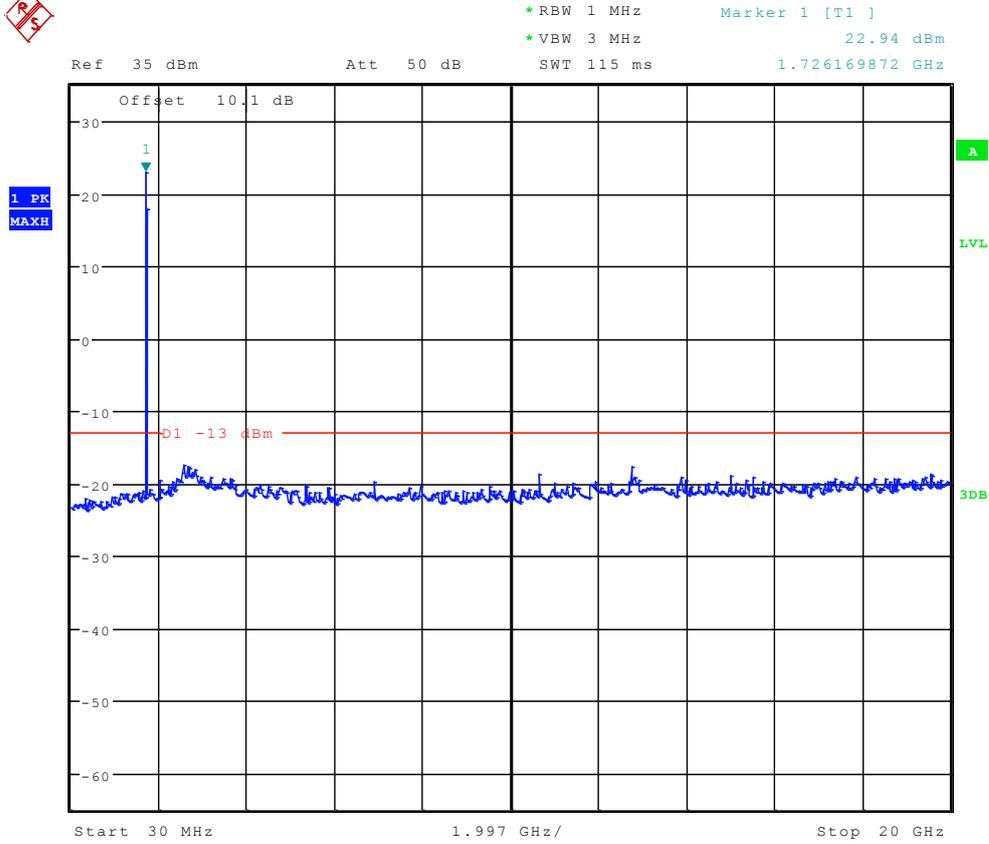
Channel 1513



* RBW 1 kHz Marker 1 [T1]
* VBW 10 kHz -34.38 dBm
Ref 35 dBm Att 55 dB SWT 145 ms 9.677884615 kHz







The END



Appendix F

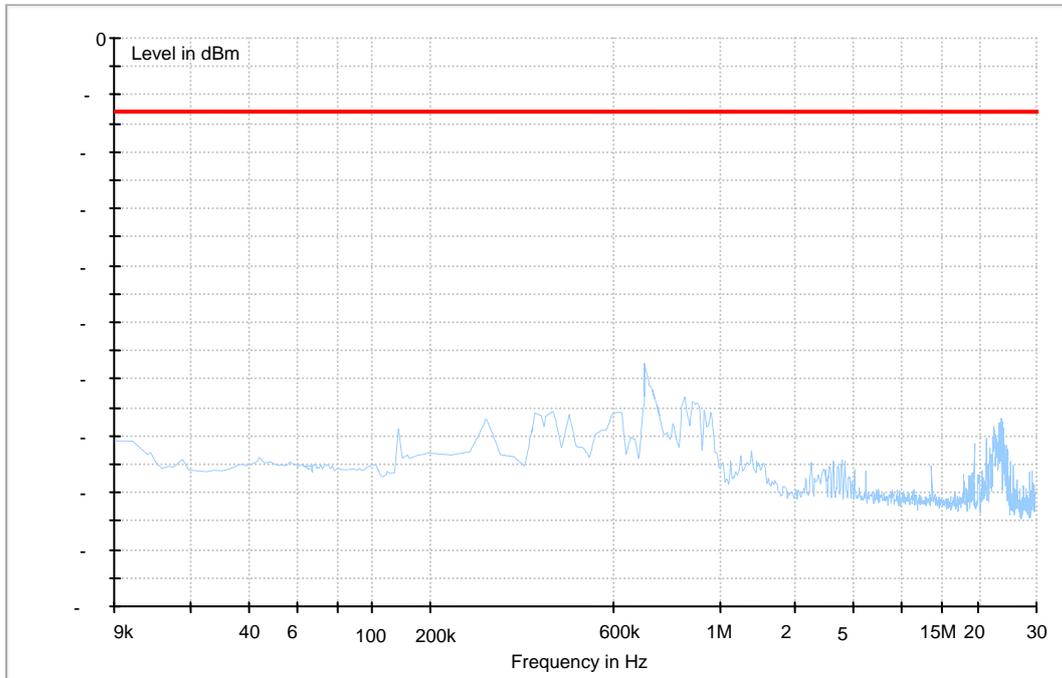
Field Strength of Spurious Emissions

According to FCC Part 2.1053& Part 27.53(g)



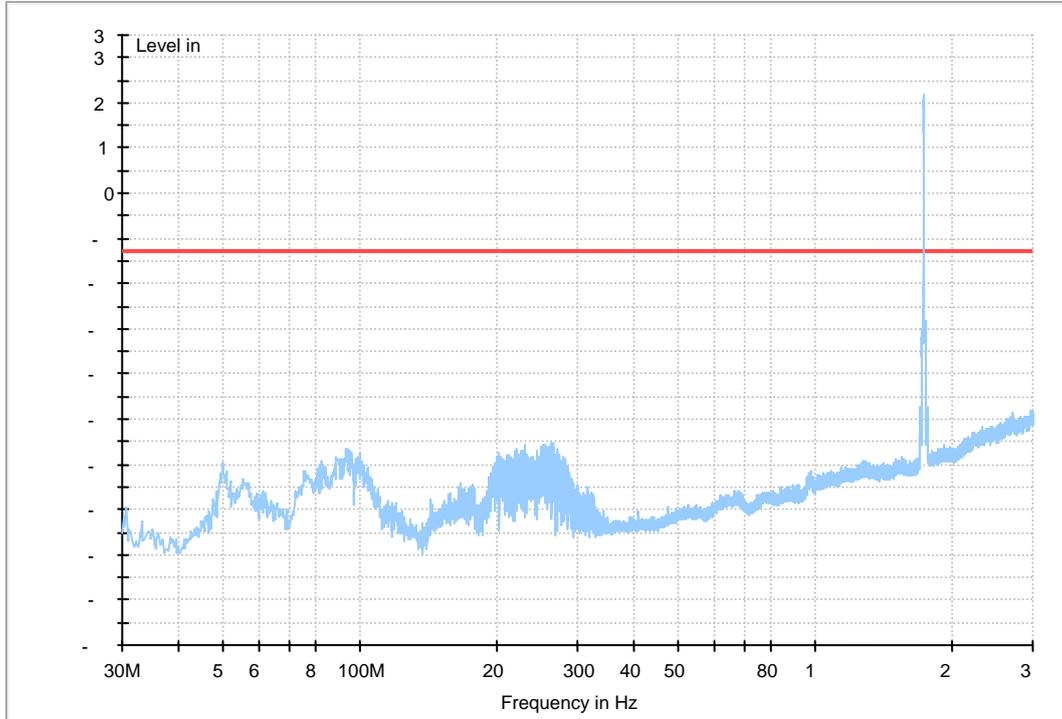
WCDMA AWS

Traffic Mode (9kHz-30MHz)



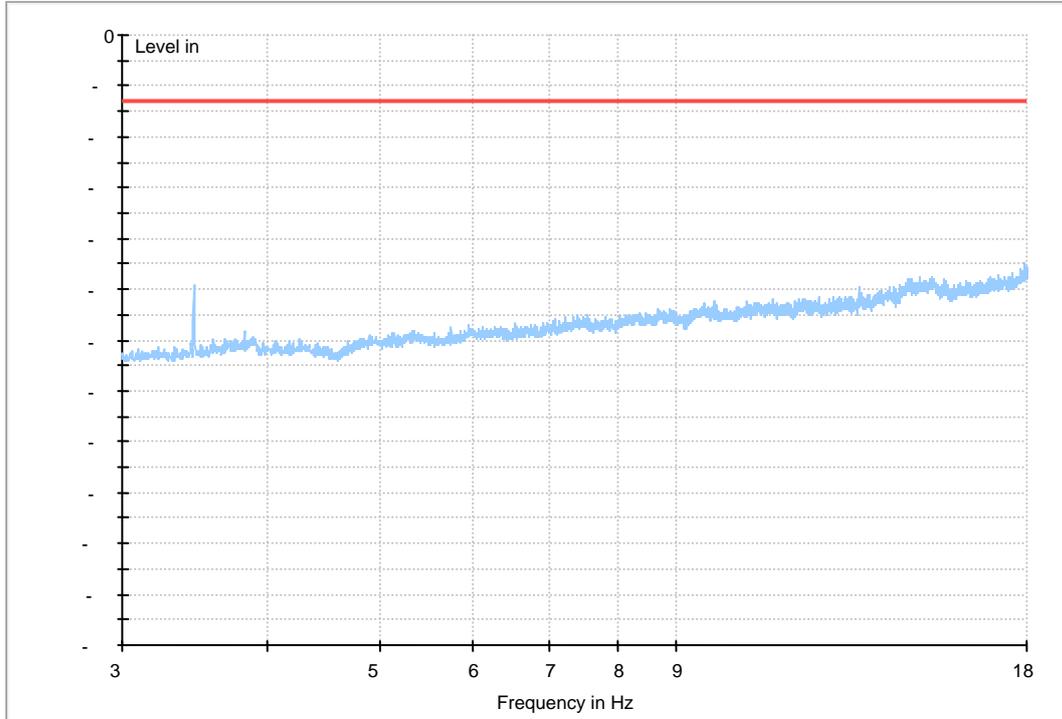


Traffic Mode (30MHz-3GHz)





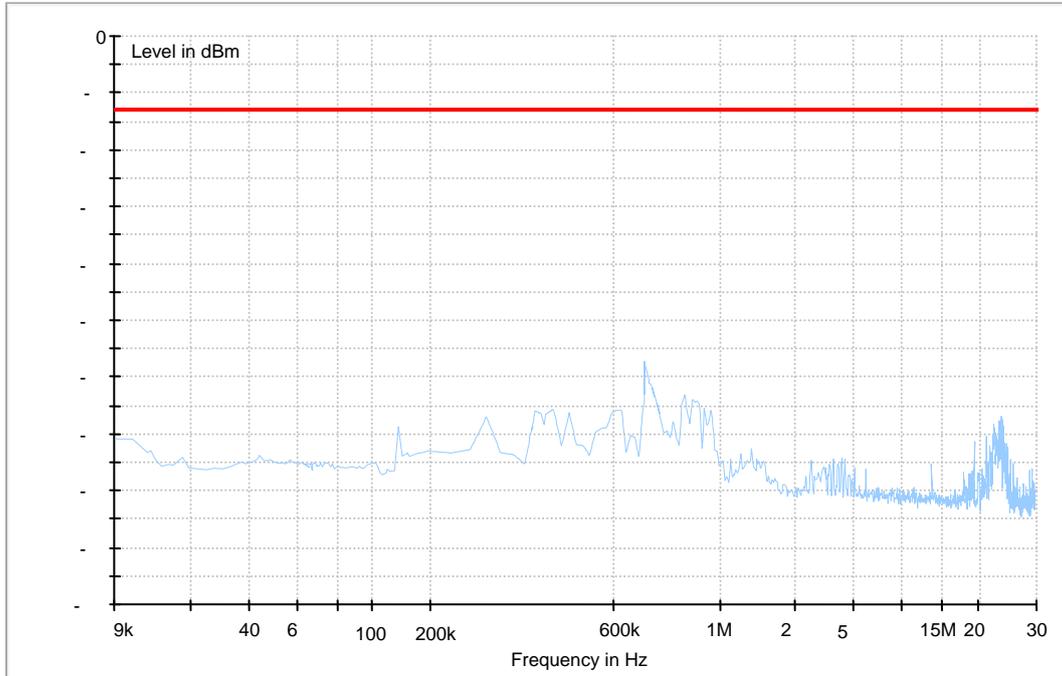
Traffic Mode (3GHz-18GHz)





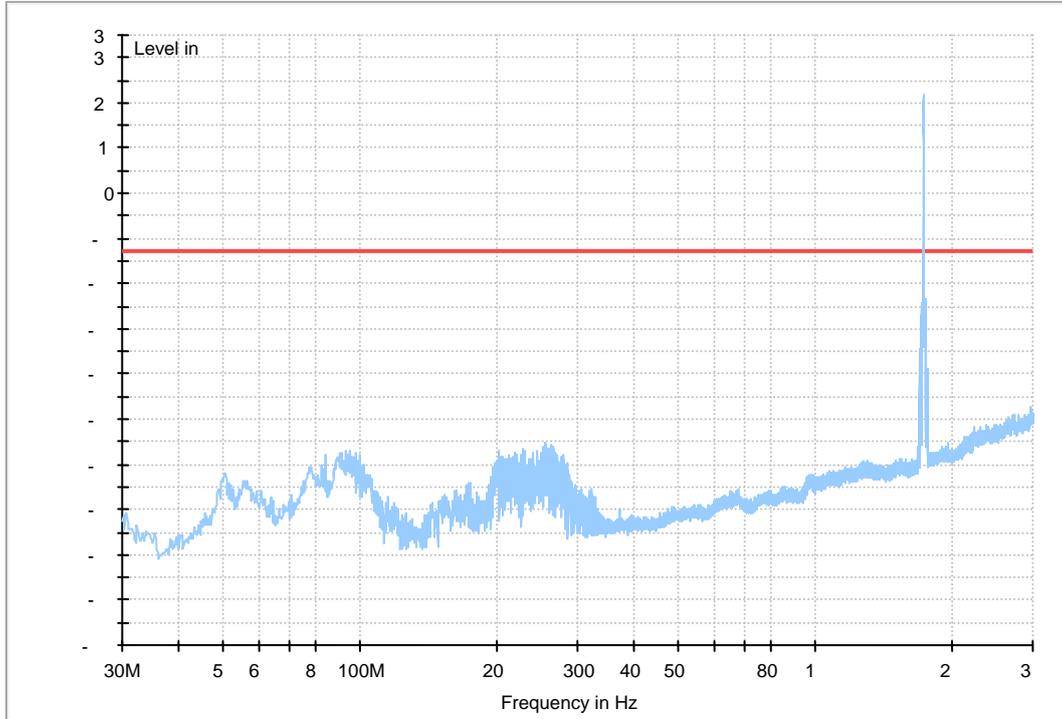
HSDPA AWS

Traffic Mode (9kHz-30MHz)



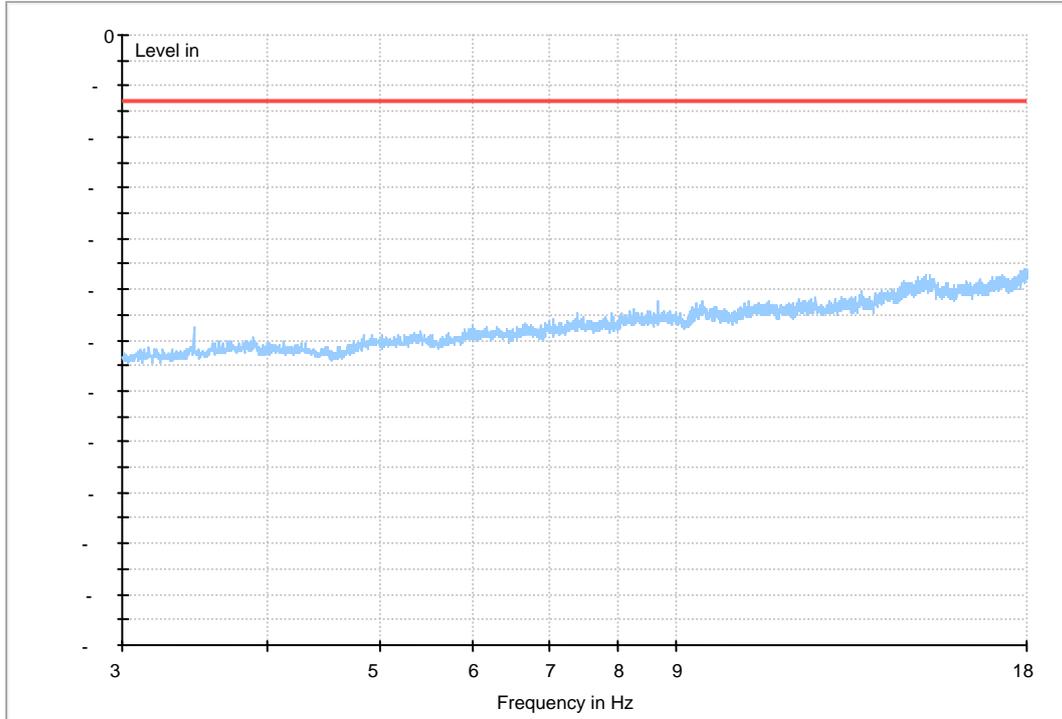


Traffic Mode (30MHz-3GHz)





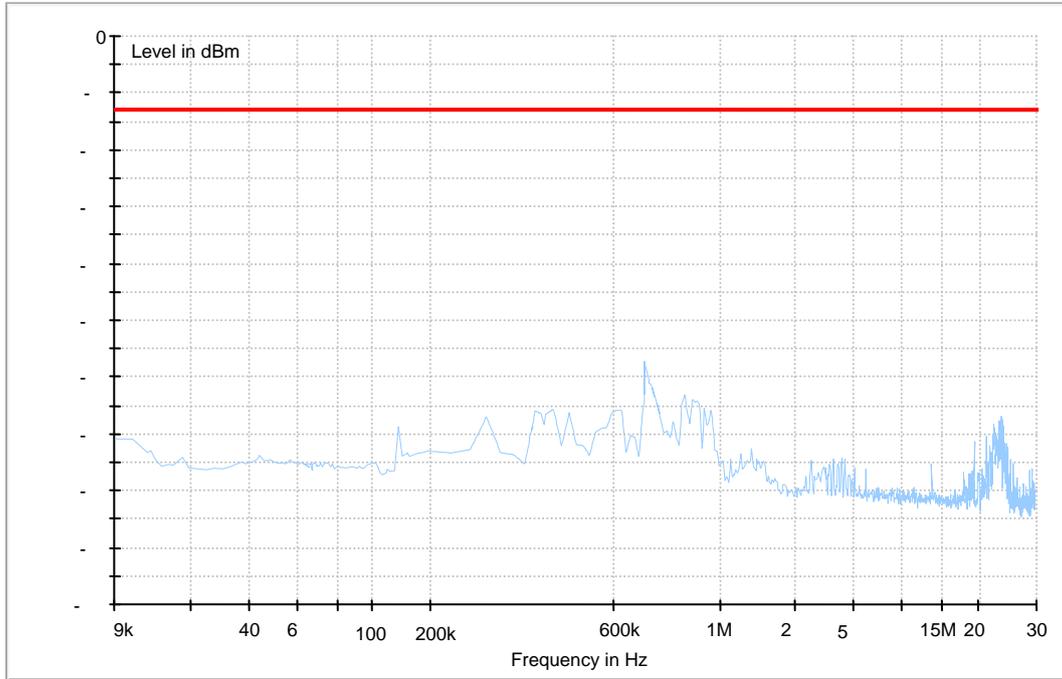
Traffic Mode (3GHz-18GHz)





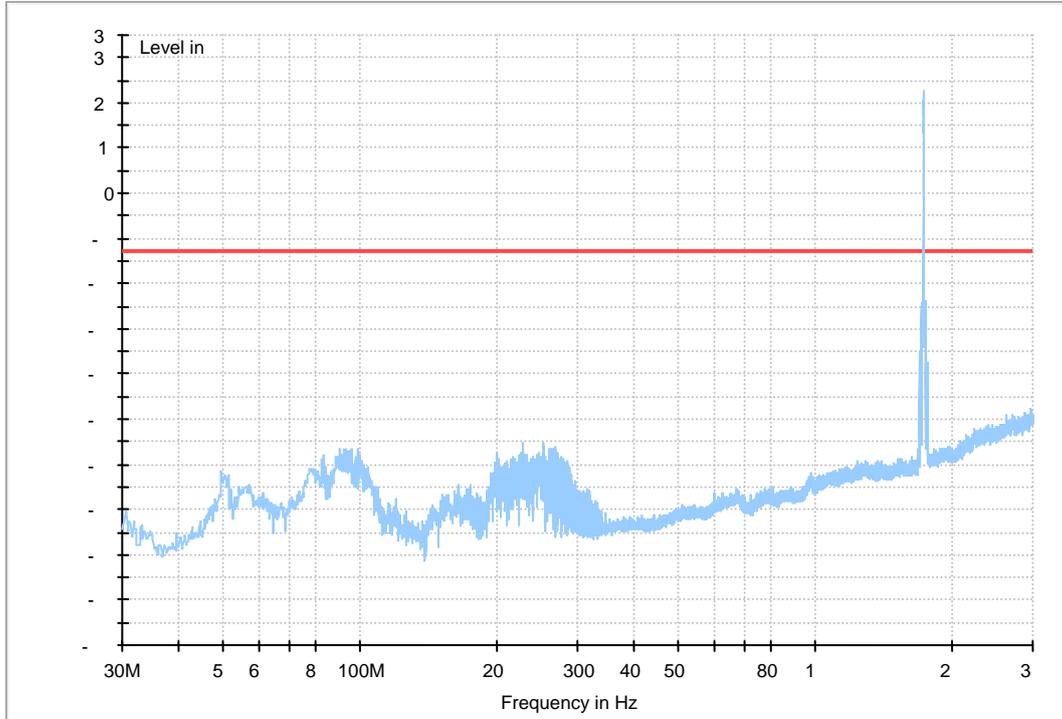
HSUPA AWS

Traffic Mode (9kHz-30MHz)



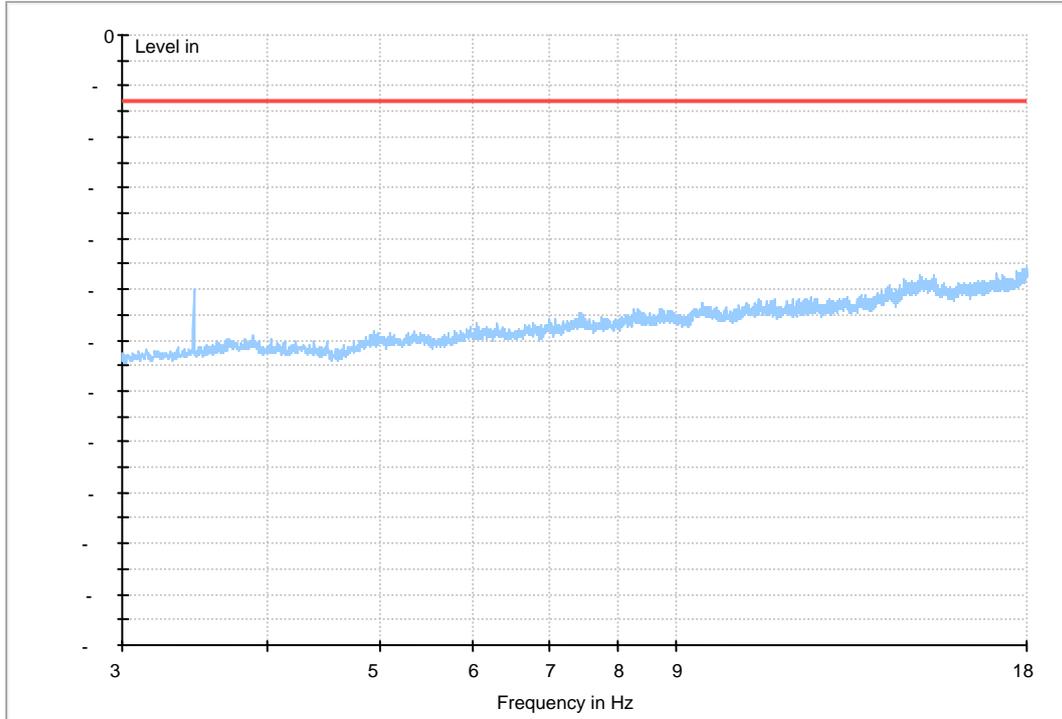


Traffic Mode (30MHz-3GHz)





Traffic Mode (3GHz-18GHz)



The END



Appendix G

Frequency Stability

According to FCC Part 2.1055& Part 27 Subpart C&L



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	15	0.0087	---	±2.5	Pass
			-20 °C	-14	-0.0081	---	±2.5	Pass
			-10 °C	18	0.0104	---	±2.5	Pass
			0 °C	9	0.0052	---	±2.5	Pass
			10 °C	13	0.0075	---	±2.5	Pass
			20 °C	-17	-0.0098	---	±2.5	Pass
			30 °C	19	0.0110	---	±2.5	Pass
			40 °C	-18	-0.0104	---	±2.5	Pass
			50 °C	10	0.0058	---	±2.5	Pass
TM 2	M	100%	-30 °C	15	0.0087	---	±2.5	Pass
			-20 °C	-8	-0.0046	---	±2.5	Pass
			-10 °C	-16	-0.0092	---	±2.5	Pass
			0 °C	10	0.0058	---	±2.5	Pass
			10 °C	-13	-0.0075	---	±2.5	Pass
			20 °C	-8	-0.0046	---	±2.5	Pass
			30 °C	-15	-0.0087	---	±2.5	Pass
			40 °C	-12	-0.0069	---	±2.5	Pass
			50 °C	16	0.0092	---	±2.5	Pass
Subtype 0	M	100%	-30 °C	8	0.0046	---	±2.5	Pass
			-20 °C	12	0.0069	---	±2.5	Pass
			-10 °C	-15	-0.0087	---	±2.5	Pass
			0 °C	17	0.0098	---	±2.5	Pass
			10 °C	-14	-0.0081	---	±2.5	Pass
			20 °C	-13	-0.0075	---	±2.5	Pass
			30 °C	11	0.0063	---	±2.5	Pass
			40 °C	-10	-0.0058	---	±2.5	Pass
			50 °C	-9	-0.0052	---	±2.5	Pass
Subtype 1	M	100%	-30 °C	17	0.0098	---	±2.5	Pass
			-20 °C	-15	-0.0087	---	±2.5	Pass
			-10 °C	-11	-0.0063	---	±2.5	Pass
			0 °C	14	0.0081	---	±2.5	Pass
			10 °C	13	0.0075	---	±2.5	Pass
			20 °C	-17	-0.0098	---	±2.5	Pass
			30 °C	18	0.0104	---	±2.5	Pass
			40 °C	8	0.0046	---	±2.5	Pass
			50 °C	-10	-0.0058	---	±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	VL	18	0.0104	---	±2.5	Pass
			VN	-15	-0.0087	---	±2.5	Pass
			VH	14	0.0081	---	±2.5	Pass
TM 2	M	20 °C	VL	-16	-0.0092	---	±2.5	Pass
			VN	18	0.0104	---	±2.5	Pass
			VH	-17	-0.0098	---	±2.5	Pass
Subtype 0	M	20 °C	VL	17	0.0098	---	±2.5	Pass
			VN	-11	-0.0063	---	±2.5	Pass
			VH	13	0.0075	---	±2.5	Pass
Subtype 1	M	20 °C	VL	19	0.0110	---	±2.5	Pass
			VN	15	0.0087	---	±2.5	Pass
			VH	-13	-0.0075	---	±2.5	Pass

The END