



# TESTREPORT

No.I14N01495-3G

for

**ZTE CORPORATION**

**4G Wireless Router**

**Model Name:MF253M**

**FCC ID:SRQ-MF253M**

with

**Hardware Version:MF253M.H01**

**Software Version: EN\_VIVO\_BR\_MF253MV1.0.0B05**

**Issued Date: 2014-12-30**

**Test Laboratory:**

**FCC 2.948 Listed: No.342690**

**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

**Test Laboratory:**

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## **REPORT HISTORY**

Report Number	Revision	Description	Issue Date
I14N01495-3G	Rev.0	1st edition	2014-12-30

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## **1. Test Laboratory**

### **1.1. Testing Location**

Company Name: CTTL ShenZhen, Telecommunication Technology Labs  
Address: No. 12 Building, Shangsha Innovation and Technology Park, Futian District  
Postal Code: 518048  
Telephone: +86(0)755-33322000  
Fax: +86(0)755-33322001

### **1.2. Testing Environment**

Normal Temperature: 15-35℃  
Relative Humidity: 20-75%

### **1.3. Project data**

Testing Start Date: 2014-12-15  
Testing End Date: 2014-12-30

### **1.4. Signature**

Huang Qiugin

(Prepared this test report)

Shen Shaoming

(Reviewed this test report)

Ma Zhiguo

Deputy Director of the laboratory

(Approved this test report)

## **2. Client Information**

### **2.1. Applicant Information**

Company Name: ZTE CORPORATION  
Address /Post: ZTE Plaza, Keji Road South, Shenzhen, China  
City: ShenZhen  
Postal Code: 518057  
Country: China  
Telephone: +86 18616587757

### **2.2. Manufacturer Information**

Company Name: ZTE CORPORATION  
Address /Post: ZTE Plaza, Keji Road South, Shenzhen, China  
City: ShenZhen  
Postal Code: 518057  
Country: China  
Telephone: +86 18616587757

### **3. Equipment Under Test (EUT) and Ancillary Equipment (AE)**

#### **3.1. About EUT**

Description	4G Wireless Router
Model Name	MF253M
Marketing Name	ZTE
FCC ID	SRQ-MF253M
Frequency	GSM850; PCS1900; WCDMA Band II; WCDMA Band V
Extreme vol. Limits	3.2VDC to 3.6VDC (nominal: 3.3VDC)
Extreme temp. Tolerance	-30°C to +50°C

#### **3.2. Internal Identification of EUT used during the test**

EUT ID*	SN or IMEI	HW Version	SW Version
N01	/	MF253M.H01	EN_VIVO_BR_MF253MV1.0.0B05

\*EUT ID: is used to identify the test sample in the lab internally.

#### **3.3. Internal Identification of AE used during the test**

AE ID*	Description	SN
AE1	Travel charger	/

AE1

Model	STC-A2O120150C55-A
Manufacturer	Ruide Electronical Industrial Co., Ltd

\*AE ID: is used to identify the test sample in the lab internally.

#### **3.4. EUT set-ups**

EUT set-up No.	Combination of EUT and AE	Remarks
Set.1	EUT1+ AE1	Charging mode

#### **4. Reference Documents**

##### **4.1. Reference Documents for testing**

The following documents listed in this section are referred for testing.

<b>Reference</b>	<b>Title</b>	<b>Version</b>
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	10-1-13 Edition
FCC Part 22	PUBLIC MOBILE SERVICES	10-1-13 Edition
ANSI/TIA-603-D	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2010
ANSI C63.4	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2003
KDB971168 D01	Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems	2011
FCC Part 15, Subpart B	Radio frequency devices	10-1-2013 Edition
FCC Part 2	Frequency Allocations and Radio Treaty Matters;General Rules and Regulations	10-1-2010 Edition

## 5. LABORATORY ENVIRONMENT

**Semi-anechoic chamber** (11.20 meters×6.10meters×5.60meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	>2MΩ
Ground system resistance	<0.5Ω
Normalised site attenuation (NSA)	<±3.5 dB, 3 m distance, from 30 to 1000 MHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz

**Control room** did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 35°C
Relative humidity	Min. =20 %, Max. = 80 %
Shielding effectiveness	> 110 dB
Electrical insulation	>2MΩ
Ground system resistance	<0.5Ω

**Conducted chamber** did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. =35 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	>2MΩ
Ground system resistance	<0.5Ω

**Fully-anechoic chamber** (11.20 meters×6.10 meters×6.60 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	>2MΩ
Ground system resistance	<0.5Ω
VoltageStandingWaveRatio (VSWR)	≤ 6 dB, from 1 to 6GHz, 3 m distance



**6. SUMMARY OF TEST RESULTS**

Abbreviations used in this clause:	
P	Pass
NA	Not applicable
F	Fail

Items	List	Clause in FCC rules	Verdict
1	Output Power	22.913(a)/24.232(b)	P
2	Emission Limit	2.1051/22.917/24.238	P
3	Conducted Emission	15.107/15.207	P
4	Frequency Stability	2.1055/24.235	P
5	Occupied Bandwidth	2.1049(h)(i)	P
6	Emission Bandwidth	22.917(b)/24.238(b)	P
7	Band Edge Compliance	22.917(b)/24.238(b)	P
8	Conducted SpuriousEmission	2.1057/22.917/24.238	P
9	PEAK-TO-AVERAGE POWER RATIO	KDB971168	P

## 7. Test Equipments Utilized

NO.	Description	TYPE	SERIES NUMBER	MANUFACTUR E	CAL DUE DATE
1	Test Receiver	ESCI	100701	R&S	2015.07.30
2	Test Receiver	ESCI	100702	R&S	2015.07.30
3	Test Receiver	FSP40	100378	R&S	2015.12.19
4	BiLog Antenna	VULB9163	9163 329	Schwarzbeck	2017.01.20
5	Horn Antenna	3117	00066577	ETS-Lindgren	2016.04.01
6	Universal Radio Communication Tester	CMU200	114544	R&S	2015.12.25
7	DC Power Source	ZUP60-14	6MY-847Z13-0002	TDK-Lambda	2015.03.09
8	LISN	ESH2-Z5	100196	R&S	2015.01.14
9	Horn Antenna	3160-09	ETS-Lindgren	00118383	2015.09.05
10	Universal Radio Communication Tester	CMU200	Rohde&Schwarz	123210	2015.01.04
11	Spectrum Analyzer	FSU	Rohde&Schwarz	101506	2015.01.04
12	Temperature Chamber	SH-241	ESPEC	92007516	2015.02.20
13	DC Power Supply	U3606A	Agilent Technologies	MY50450012	2015.11.11
14	RF Switch Matrix	OSP130	Rohde&Schwarz	100086	2015.01.04
15	Vector Signal Generator	SMU200A	Rohde&Schwarz	104800	2015.01.04
16	Signal Generator	SMF100A	Rohde&Schwarz	102406	2015.01.04

## **ANNEX A: MEASUREMENT RESULTS**

### **A.1 OUTPUT POWER**

#### **A.1.1 Summary**

During the process of testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication tester (CMU-200) to ensure max power transmission and proper modulation.

This result contains peak output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

#### **A.1.2 Conducted**

##### **A.1.2.1 Method of Measurements**

The EUT was set up for the max output power with pseudo random data modulation.

The power was measured with Rhode & Schwarz Spectrum Analyzer FSP (peak)

These measurements were done at 3 frequencies, 1852.4 MHz, 1880.0MHz and 1907.6MHz for WCDMA Band II; 826.4MHz, 836.6MHz and 846.6MHz for WCDMA Band V. (bottom, middle and top of operational frequency range).

##### **Limit**

According to FCC§2.1046.

##### **A.1.2.2 Test Condition**

RBW	VBW	Sweep Time	Span
10MHz	10MHz	800ms	50MHz

#### **WCDMA Band II**

##### **Measurement result**

WCDMA	CH	Frequency(MHz)	output power(dBm)
(Band II)	9262	1852.4	23.04
	9400	1880.0	23.14
	9538	1907.6	23.19

#### **WCDMA Band V**

##### **Measurement result**

WCDMA	CH	Frequency(MHz)	output power(dBm)
(Band V)	4132	826.4	23.55
	4183	836.6	23.51
	4233	846.6	23.02

## HSUPA

### WCDMA Band II

#### Measurement result

	CH	Frequency(MHz)	output power(dBm)
WCDMA (Band II)	9262	1852.4	22.94
	9400	1880.0	23.19
	9538	1907.6	23.07

### WCDMA Band V

#### Measurement result

	CH	Frequency(MHz)	output power(dBm)
WCDMA (Band V)	4132	826.4	23.19
	4183	836.6	23.23
	4233	846.6	22.71

## HSDPA

### WCDMA Band II

#### Measurement result

	CH	Frequency(MHz)	output power(dBm)
WCDMA (Band II)	9262	1852.4	23.35
	9400	1880.0	23.51
	9538	1907.6	23.33

### WCDMA Band V

#### Measurement result

	CH	Frequency(MHz)	output power(dBm)
WCDMA (Band V)	4132	826.4	23.97
	4183	836.6	23.91
	4233	846.6	23.43

### A.1.3 Radiated

#### A.1.3.1 Description

This is the test for the maximum radiated power from the EUT.

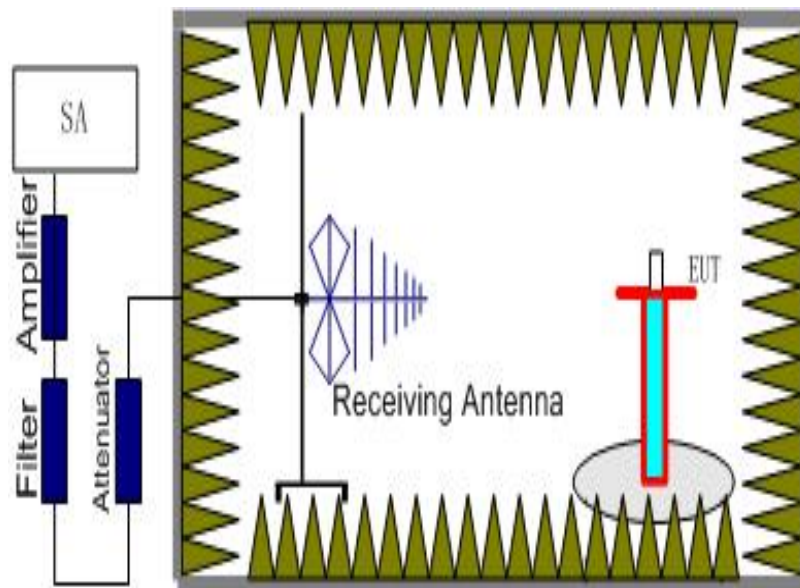
Rule Part 24.232(c) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

Rule Part 22.913(a) specifies "The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

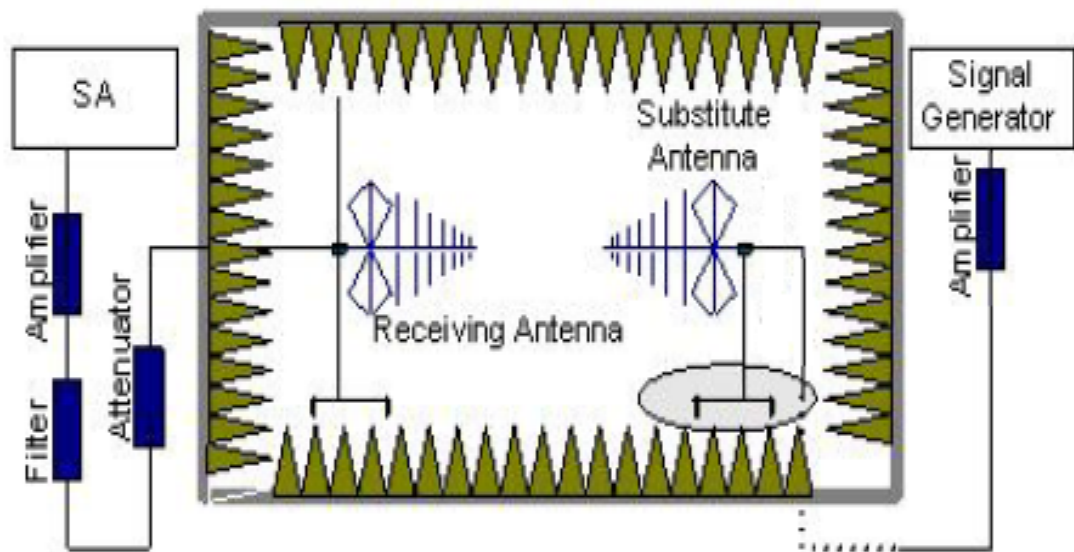
#### A.1.3.2 Method of Measurement

The measurements procedures in TIA-603D-2010 are used.

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna.  
The cable loss ( $P_{cl}$ ), the Substitution Antenna Gain ( $G_a$ ) and the Amplifier Gain ( $P_{Ag}$ ) should be recorded after test.

The measurement results are obtained as described below:

$$\text{Power(EIRP)} = P_{Mea} - P_{Ag} - P_{cl} - G_a$$

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dBi}$ .

Note: the results contains vertical part and Horizontal part

### WCDMA Band II-EIRP

#### Limits

	Burst Peak EIRP (dBm)
WCDMA Band II	≤33dBm (2W)

#### Measurement result

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	EIRP(dBm)	Polarization
1852.4	-1.15	3.13	-35.70	7.81	23.61	V
1880	-0.99	3.15	-35.60	7.80	23.66	V
1907.6	-0.97	3.18	-35.50	7.77	23.58	V

**ANALYZER SETTINGS: RBW = VBW = 5MHz**

### WCDMA Band V-ERP

#### Limits

	Burst Peak EIRP (dBm)
WCDMA Band V	≤38.45dBm

#### Measurement result

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	Correction (dB)	ERP(dBm)	Polarization
826.4	-1.96	2.07	-36.20	8.22	2.15	21.81	H
836.6	-1.21	2.08	-36.00	8.22	2.15	22.34	H
846.6	0.09	2.09	-35.90	8.21	2.15	23.54	H

**ANALYZER SETTINGS: RBW = VBW = 5MHz**

## **A.2 EMISSION LIMIT**

### **A.2.1 Measurement Method**

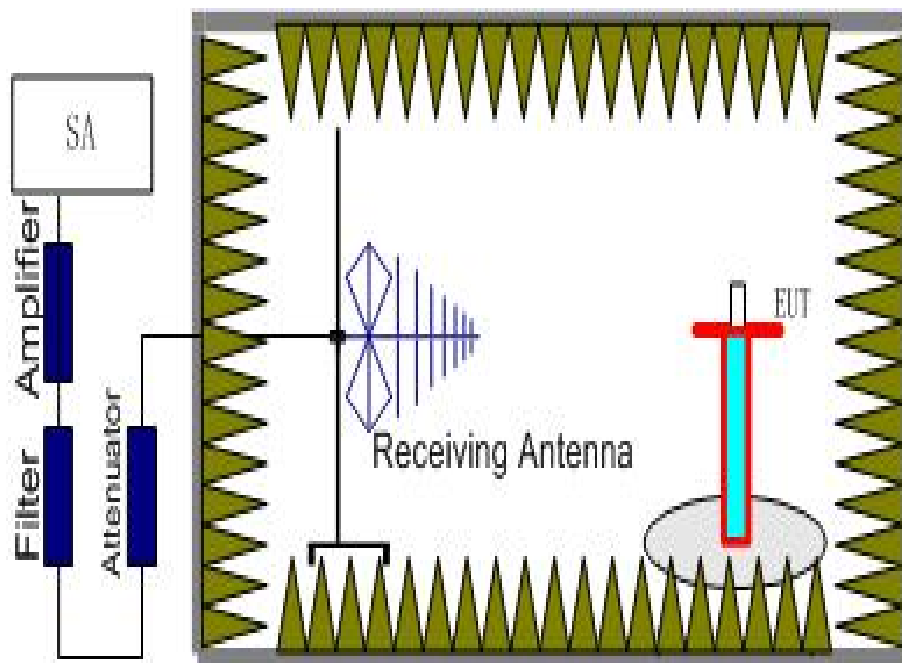
The measurements procedures in TIA-603D-2010 are used.

The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set as outlined in Part 24.238 and Part 24.917.

The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of WCDMA Band II and WCDMA Band V.

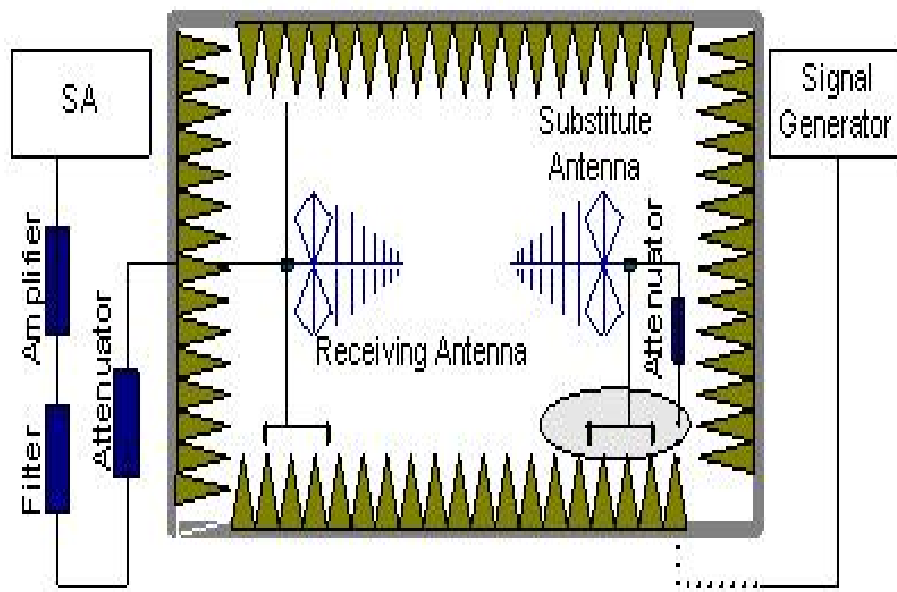
#### **The procedure of radiated spurious emissions is as follows:**

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.





In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss ( $P_{pl}$ ) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain ( $G_a$ ) should be recorded after test.

A amplifier should be connected in for the test.

The Path loss ( $P_{pl}$ ) is the summation of the cable loss and the gain of the amplifier.

The measurement results are obtained as described below:

$$\text{Power(EIRP)} = P_{Mea} - P_{pl} - G_a$$

5. Use the power meter to measure the result of power in substitute antenna. Record the result of power meter ( $P_{pm}$ ).

The measurement results are obtained as described below:

$$\text{Power(EIRP)} = P_{pm} - G_a$$

6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15 \text{ dBi}$ .

### **A.2.2 Measurement Limit**

Part 24.238 and Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10\log(P)$  dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10\log(P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

### **A.2.3 Measurement Results**

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the WCDMA Band II (1852.4 MHz, 1880.0 MHz and 1907.6 MHz) and WCDMA Band V (826.4 MHz, 836.6 MHz and 846.6 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the WCDMA Band II and WCDMA Band V into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

#### A.2.4 Measurement Results Table

Frequency	Channel	Frequency Range	Result
WCDMA Band V	Low	30MHz-10GHz	Pass
	Middle	30MHz-10GHz	Pass
	High	30MHz-10GHz	Pass
WCDMA Band II	Low	30MHz-20GHz	Pass
	Middle	30MHz-20GHz	Pass
	High	30MHz-20GHz	Pass

#### A.2.5 Sweep Table

Working Frequency	Subrange (GHz)	RBW	VBW	Sweep time (s)
WCDMA Band V	0.03~1	100KHz	300KHz	10
	1-2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~10	1 MHz	3 MHz	3
WCDMA Band II	0.03~1	100KHz	300KHz	10
	1-2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~11	1 MHz	3 MHz	3
	11~14	1 MHz	3 MHz	3
	14~18	1 MHz	3 MHz	3
	18~20	1 MHz	3 MHz	2

Note: the results contains vertical part and Horizontal part

**WCDMA BAND II Mode Channel 9262/1852.4MHz**

Frequency(MHz)	P <sub>pm</sub> (dBm)	Antenna Gain	Peak EIRP(dBm)	Limit (dBm)	Polarization
18619.25	-49.70	-15	-34.7	-13.00	H
18918.5	-49.70	-15	-34.7	-13.00	H
19123.25	-50.20	-15.3	-34.9	-13.00	V
19545	-50.20	-15.3	-34.9	-13.00	H
19786.5	-49.80	-15.3	-34.5	-13.00	H
19972	-49.90	-15.3	-34.6	-13.00	V

**WCDMA BAND II Mode Channel 9400/1880MHz**

Frequency(MHz)	P <sub>pm</sub> (dBm)	Antenna Gain	Peak EIRP(dBm)	Limit (dBm)	Polarization
18880	-49.30	-15	-34.3	-13.00	V
18951.75	-49.40	-15	-34.4	-13.00	V
19203.75	-48.70	-15	-33.7	-13.00	V
19550.25	-49.60	-15.3	-34.3	-13.00	H
19648.25	-49.40	-15.3	-34.1	-13.00	H
20000	-49.90	-15.3	-34.6	-13.00	H

**WCDMA BAND II Mode Channel 9538/1907.6MHz**

Frequency(MHz)	P <sub>pm</sub> (dBm)	Antenna Gain	Peak EIRP(dBm)	Limit (dBm)	Polarization
18386.5	-50.10	-15	-35.1	-13.00	V
18715.5	-49.60	-15	-34.6	-13.00	V
18974.5	-50.30	-15.3	-35	-13.00	H
19501.25	-49.00	-15.3	-33.7	-13.00	H
19643	-49.70	-15.3	-34.4	-13.00	V
19900.25	-49.70	-15.3	-34.4	-13.00	V

**WCDMA BAND V Mode Channel 4132/826.4MHz**

Frequency(MHz)	P <sub>pm</sub> (dBm)	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Polarization
9160.875	-50.85	-12.4	2.15	-40.6	-13.00	V
9267.125	-56.45	-12.4	2.15	-46.2	-13.00	V
9310.125	-56.55	-12.4	2.15	-46.3	-13.00	H
9441.5	-56.95	-12.4	2.15	-46.7	-13.00	V
9869.5	-56.95	-12.3	2.15	-46.8	-13.00	V
9975.25	-56.55	-12.3	2.15	-46.4	-13.00	V

**WCDMA BAND V Mode Channel 4183/836.6MHz**

Frequency(MHz)	P <sub>pm</sub> (dBm)	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Polarization
9159.75	-57.15	-12.4	2.15	-46.9	-13.00	V
9257.25	-57.05	-12.4	2.15	-46.8	-13.00	V
9326.25	-55.95	-12.4	2.15	-45.7	-13.00	V
9425.25	-56.05	-12.4	2.15	-45.8	-13.00	V
9774.5	-57.05	-12.3	2.15	-46.9	-13.00	V
9971.75	-56.95	-12.3	2.15	-46.8	-13.00	V

**WCDMA BAND V Mode Channel 4233/846.6MHz**

Frequency(MHz)	P <sub>pm</sub> (dBm)	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Polarization
9166	-56.65	-12.4	2.15	-46.4	-13.00	H
9272.875	-56.95	-12.4	2.15	-46.7	-13.00	V
9365.75	-56.85	-12.4	2.15	-46.6	-13.00	V
9480.25	-55.75	-12.4	2.15	-45.5	-13.00	V
9845.625	-56.65	-12.3	2.15	-46.5	-13.00	V
9925.5	-56.55	-12.3	2.15	-46.4	-13.00	H

### **A.3 CONDUCTED EMISSION**

The measurement procedure in ANSI C63.4-2003 is used. Conducted Emission is measured with travel charger.

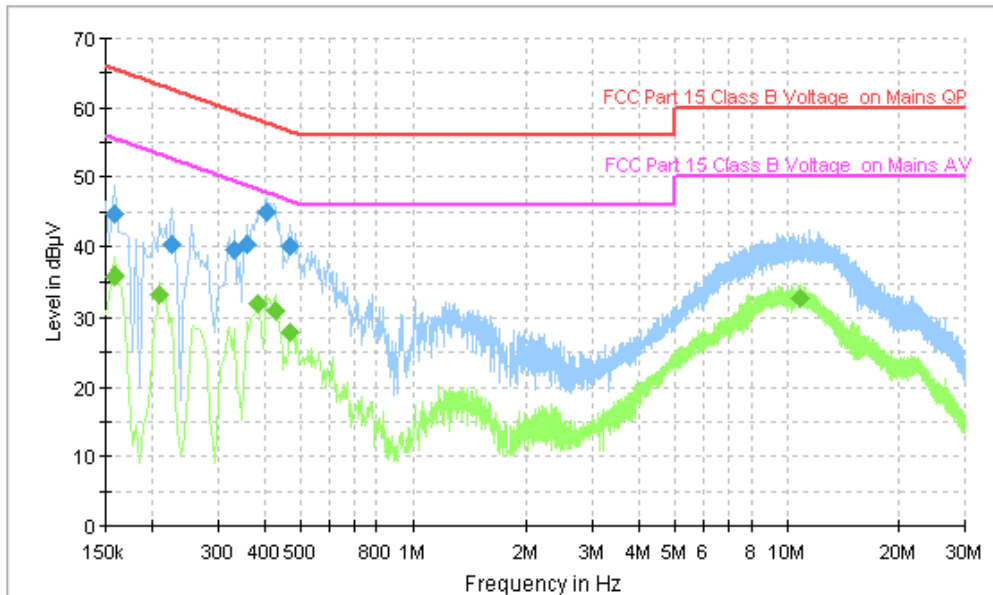
#### **A.3.1 Limit**

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi -Peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50
* Decreases with logarithm of the frequency		

### A.3.2 Measurement result

#### WCDMA Band II

ESH2-Z5 Scan-FCC



#### Final Measurement Detector 1

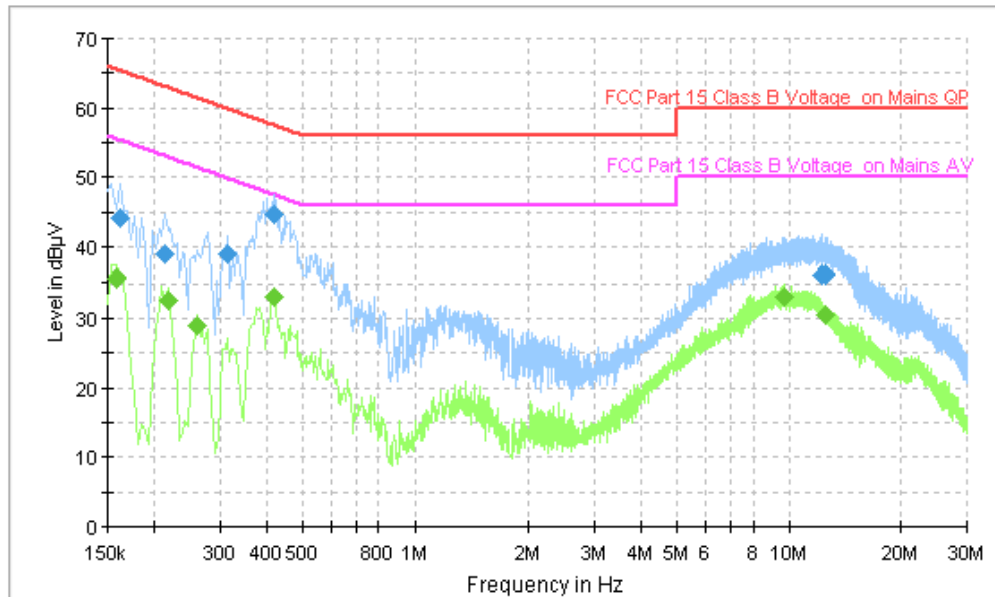
Frequency (MHz)	QuasiPeak (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.158000	44.8	FLO	L1	10.0	20.8	65.6
0.226000	40.3	FLO	N	10.0	22.3	62.6
0.334000	39.4	FLO	N	10.0	19.9	59.4
0.358000	40.2	FLO	N	10.1	18.6	58.8
0.406000	45.1	FLO	N	10.1	12.7	57.7
0.470000	40.0	FLO	N	10.1	16.6	56.5

#### Final Measurement Detector 2

Frequency (MHz)	Average (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.158000	35.9	FLO	L1	10.0	19.6	55.6
0.210000	33.4	FLO	N	10.1	19.8	53.2
0.386000	31.9	FLO	N	10.0	16.2	48.1
0.430000	31.0	FLO	N	10.1	16.2	47.3
0.470000	27.8	FLO	N	10.1	18.7	46.5
10.818000	32.9	FLO	L1	10.3	17.1	50.0

## WCDMA Band V

ESH2-Z5 Scan-FCC



### Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.162000	44.1	FLO	L1	10.0	21.2	65.4
0.214000	39.1	FLO	L1	10.0	23.9	63.0
0.314000	38.9	FLO	N	10.1	20.9	59.9
0.418000	44.7	FLO	N	10.1	12.8	57.5
12.246000	36.2	FLO	N	10.4	23.8	60.0
12.510000	36.1	FLO	N	10.5	23.9	60.0

### Final Measurement Detector 2

Frequency (MHz)	Average (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.158000	35.7	FLO	N	10.1	19.9	55.6
0.218000	32.6	FLO	N	10.0	20.3	52.9
0.262000	28.9	FLO	N	10.1	22.4	51.4
0.418000	33.0	FLO	N	10.1	14.4	47.5
9.666000	33.0	FLO	L1	10.3	17.0	50.0
12.522000	30.4	FLO	L1	10.4	19.6	50.0



## **A.4 FREQUENCY STABILITY**

### **A.4.1 Method of Measurement**

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30°C.
3. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on mid channel of WCDMA Band II and WCDMA Band V, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
5. Remeasure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments remeasuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50°C.
7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 C increments from +50°C to -30°C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

### **A.4.2 Measurement Limit**

#### **A.4.2.1 For Hand carried battery powered equipment**

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.5VDC and 4.2VDC, with a nominal voltage of 3.9VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of -10 % and +12.5 %. For the purposes of measuring frequency stability these voltage limits are to be used.

#### **A.4.2.2 For equipment powered by primary supply voltage**

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the

nominal value for other than hand carried battery equipment.

#### A.4.3 Measurement results

##### WCDMA Band V

##### Frequency Error vs Voltage

Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
3.2	13	0.016
3.3	10	0.012
3.6	8	0.010

##### Frequency Error vs Temperature

temperature(°C)	Frequency error(Hz)	Frequency error(ppm)
-30	14	0.017
-20	10	0.012
-10	9	0.011
0	11	0.013
10	8	0.010
20	8	0.010
30	10	0.012
40	11	0.013
50	13	0.016

##### WCDMA Band II

##### Frequency Error vs Voltage

Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
3.2	12	0.006
3.3	10	0.005
3.6	7	0.004

##### Frequency Error vs Temperature

temperature(°C)	Frequency error(Hz)	Frequency error(ppm)
-30	13	0.007
-20	10	0.005
-10	11	0.006
0	9	0.005
10	10	0.005
20	6	0.003
30	8	0.004
40	10	0.005
50	12	0.006

## A.5 OCCUPIED BANDWIDTH

### A.5.1 Occupied Bandwidth Results

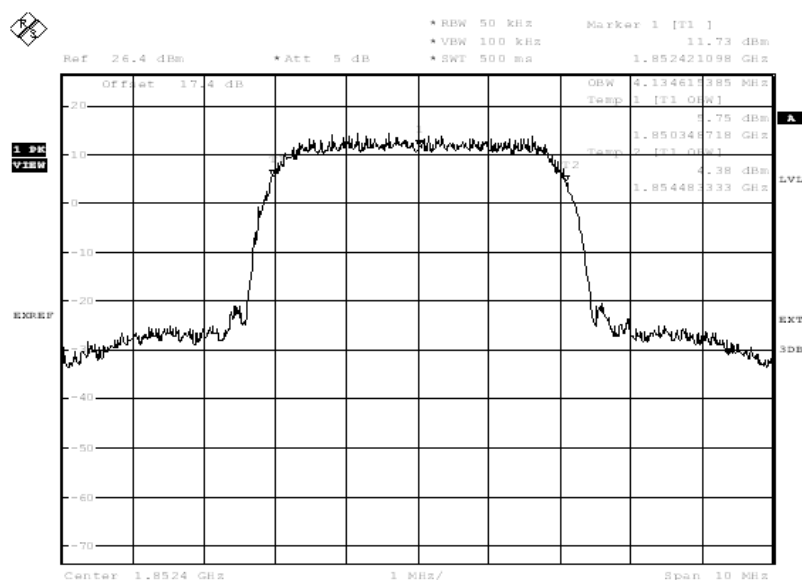
Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of WCDMA Band II and WCDMA Band V. The table below lists the measured -20dBc BW. Spectrum analyzer plots are included on the following pages.

#### WCDMA Band II(-20dBc)

Frequency(MHz)	Occupied Bandwidth (MHz)
1852.4	4.13
1880.0	4.13
1907.6	4.13

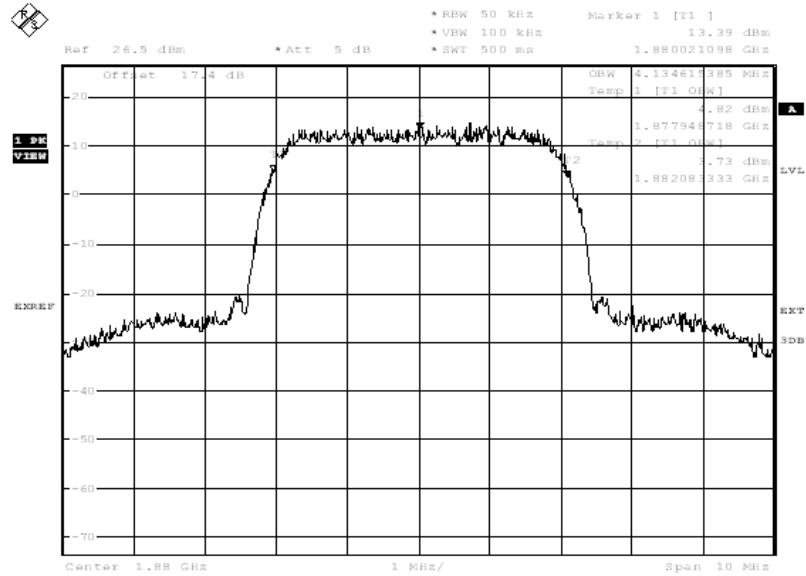
#### WCDMA Band II

##### Channel 9262-Occupied Bandwidth



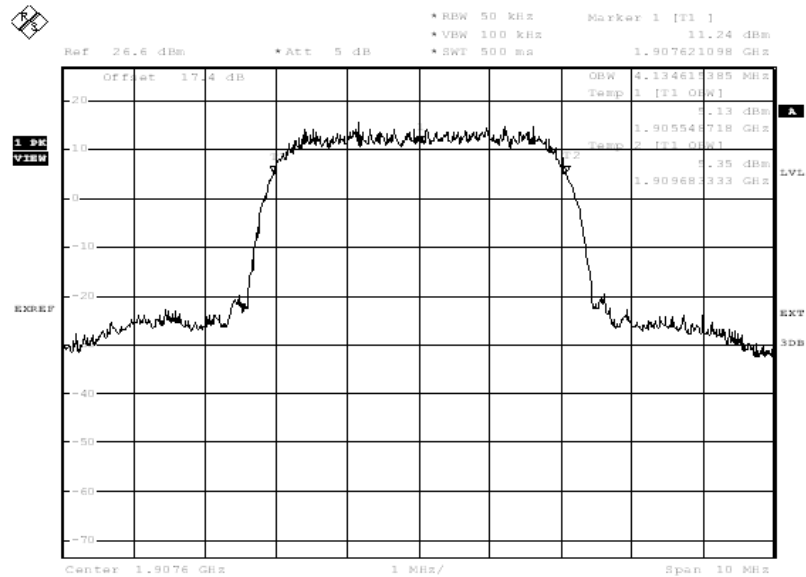
Date: 16.DEC.2014 03:44:31

### Channel 9400-Occupied Bandwidth



Date: 16.DEC.2014 03:44:58

### Channel 9538-Occupied Bandwidth



Date: 16.DEC.2014 03:45:26

Frequency(MHz)	Occupied Bandwidth ( MHz)
826.4	4.13
836.6	4.13
846.6	4.13

\* RBW 50 kHz  
 \* VBW 100 kHz  
 \* SWT 500 ms  
 Marker 1 [T1] 12.44 dBm  
 826.421098280 MHz

Ref 26.8 dBm  
 \* Att 10 dB

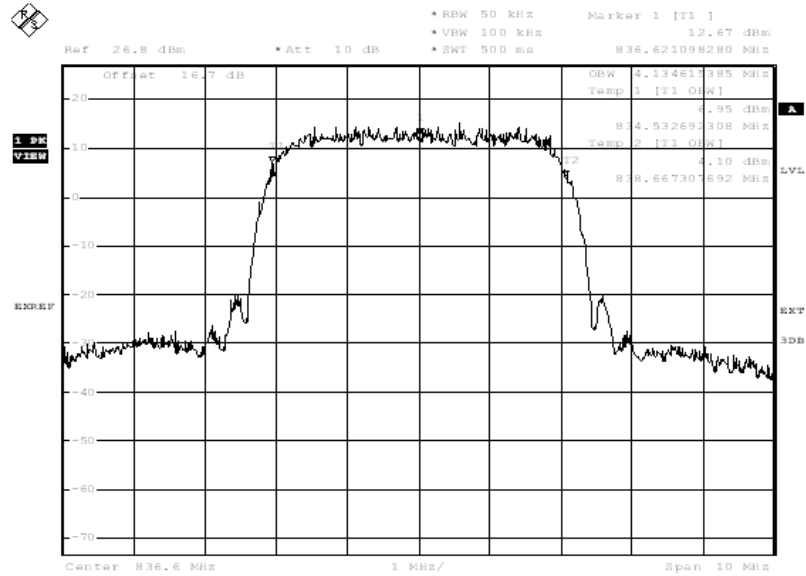
Offset 10.7 dB  
 dBm 4.134611385 MHz  
 Temp 1 [T1 ONW] 1.55 dBm  
 824.348711849 MHz  
 Temp 2 [T2 ONW] 4.00 dBm  
 828.483331333 MHz

SKEW  
 VIEW

Center 826.4 MHz  
 1 MHz/  
 Span 10 MHz

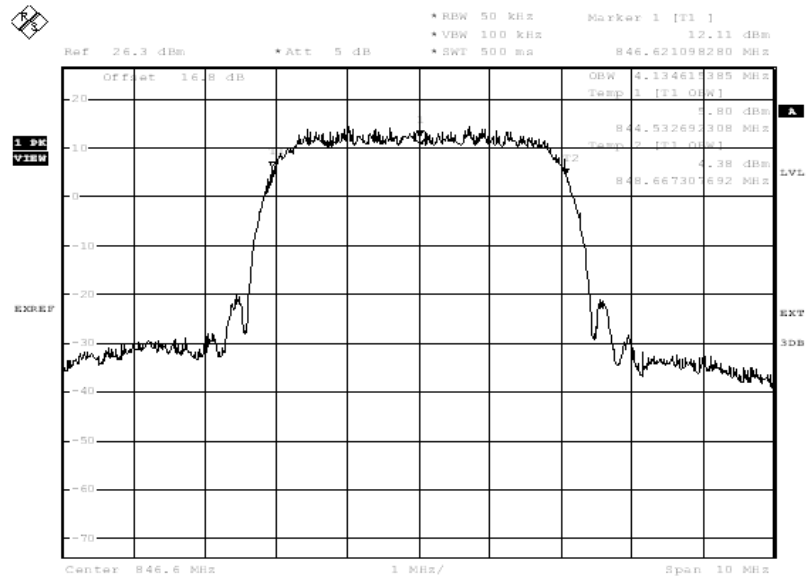
Date: 16.DEC.2014 05:13:57

### Channel 4183-Occupied Bandwidth



Date: 16.DEC.2014 05:14:25

### Channel 4233-Occupied Bandwidth



Date: 16.DEC.2014 05:14:52

## A.6 EMISSION BANDWIDTH

### A.6.1 Emission Bandwidth Results

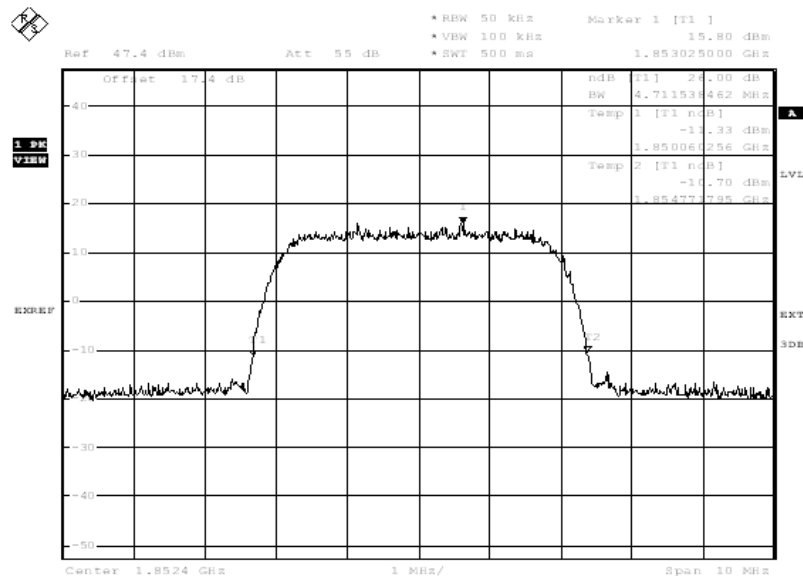
Similar to conducted emissions; Emission bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of WCDMA Band II and WCDMA Band V. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the following pages.

#### WCDMA Band II(-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc BW)(MHz)
1852.4	4.71
1880.0	4.73
1907.6	4.73

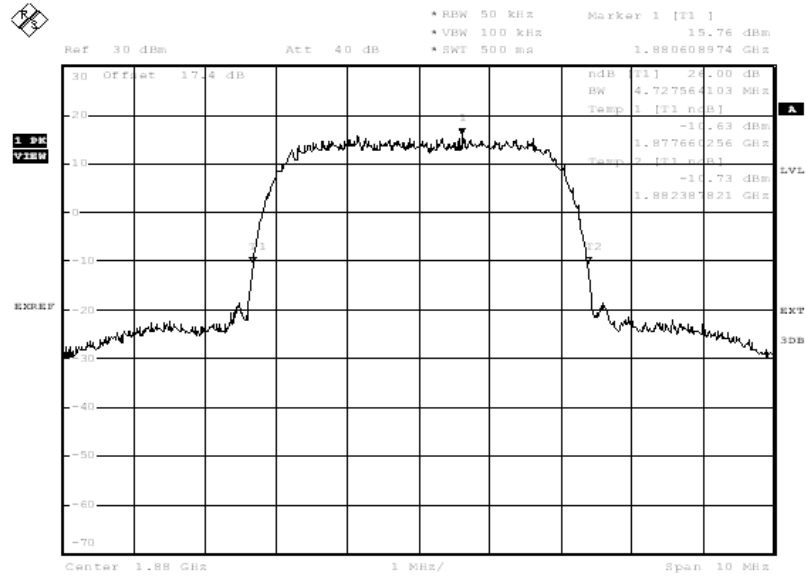
#### WCDMA Band II

##### Channel 9262-Occupied Bandwidth (-26dBc BW)



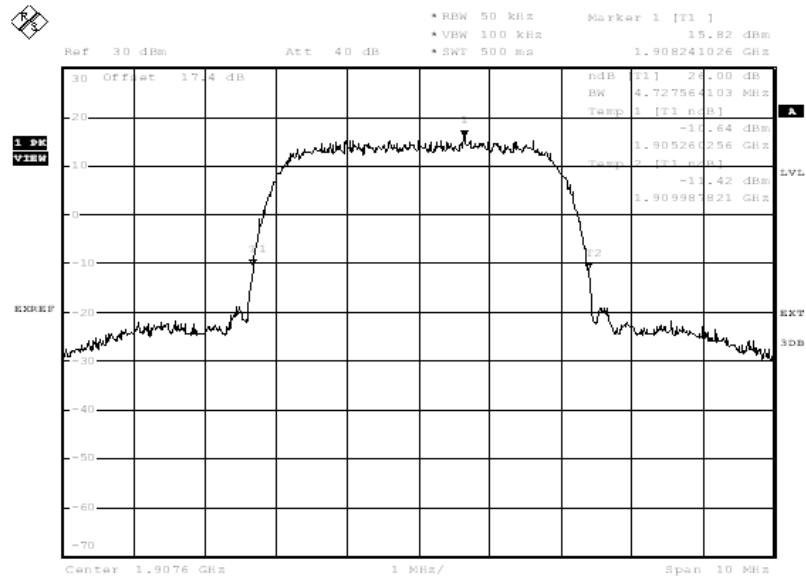
Date: 16.DEC.2014 03:46:22

### Channel 9400-Occupied Bandwidth (-26dBc BW)



Date: 16.DEC.2014 03:46:56

### Channel 9538-Occupied Bandwidth (-26dBc BW)



Date: 16.DEC.2014 03:47:29

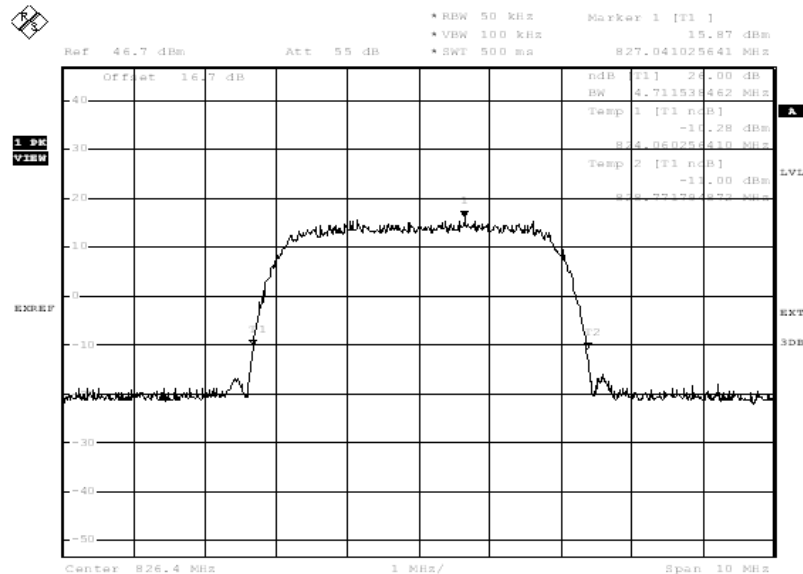


### WCDMA BandV(-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc BW)(MHz)
826.40	4.71
836.60	4.70
846.60	4.70

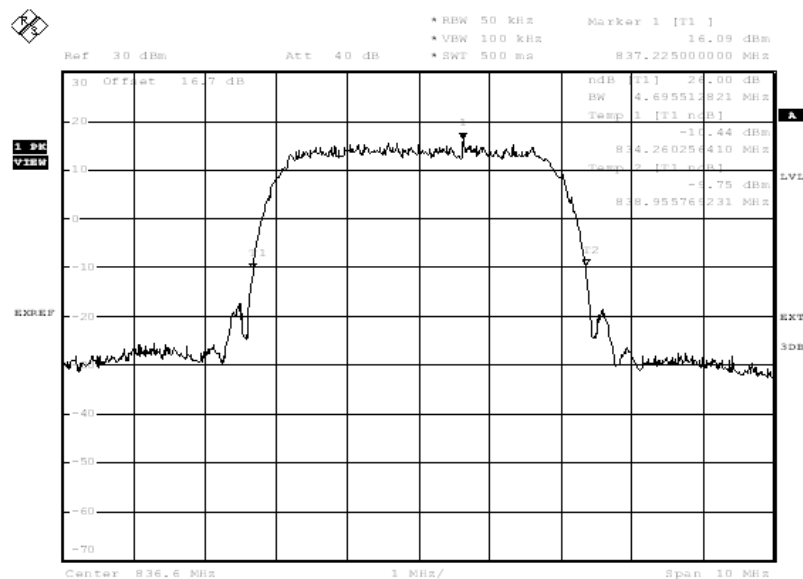
### WCDMA BandV

#### Channel 4132-Occupied Bandwidth (-26dBc BW)



Date: 16.DEC.2014 05:15:44

#### Channel 4183-Occupied Bandwidth (-26dBc BW)



Date: 16.DEC.2014 05:16:17

30.1 Offset 10.0 dB

Ref 30.1 dBm Att 40 dB

\* RBW 50 kHz \* VBW 100 kHz \* SWT 500 ms

Marker 1 [T1]

15.35 dBm

845.718589744 MHz

dBm

20

10

0

-10

-20

-30

-40

-50

-60

Center 846.6 MHz 1 MHz/ Span 10 MHz

dBm

20

10

0

-10

-20

-30

-40

-50

-60

30.1 Offset 10.0 dB

Ref 30.1 dBm Att 40 dB

\* RBW 50 kHz \* VBW 100 kHz \* SWT 500 ms

Marker 1 [T1]

15.35 dBm

845.718589744 MHz

dBm

20

10

0

-10

-20

-30

-40

-50

-60

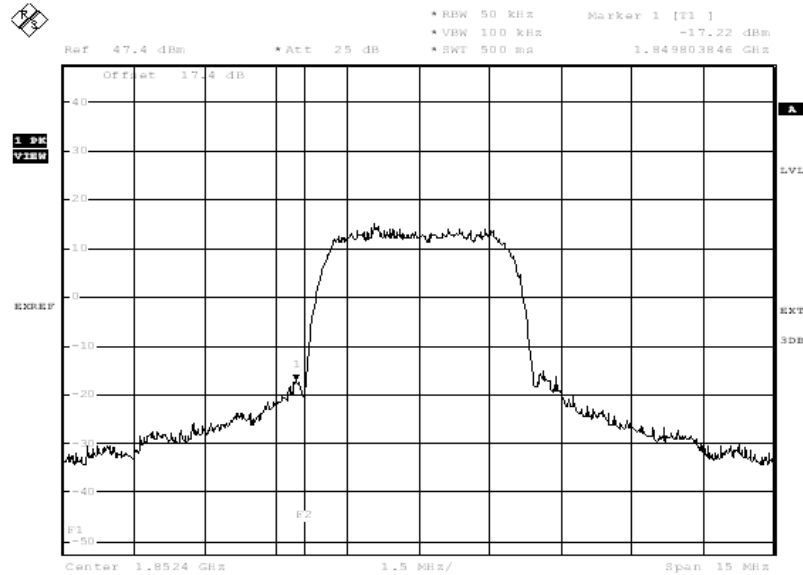
Center 846.6 MHz 1 MHz/ Span 10 MHz

Date : 16 . DEC . 2014 05 : 16 : 51

## A.7BAND EDGE COMPLIANCE

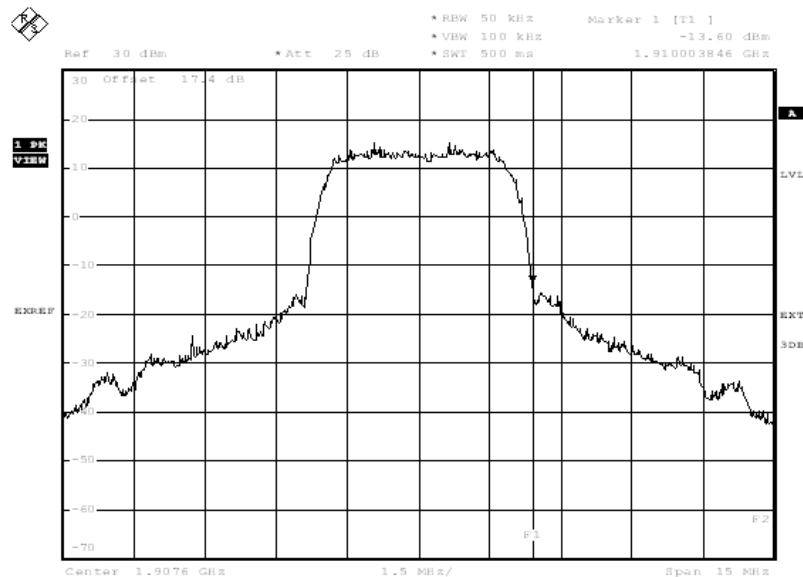
### WCDMA Band II

#### LOW BAND EDGE BLOCK-A (WCDMA Band II)-Channel 9262



Date: 16.DEC.2014 04:18:03

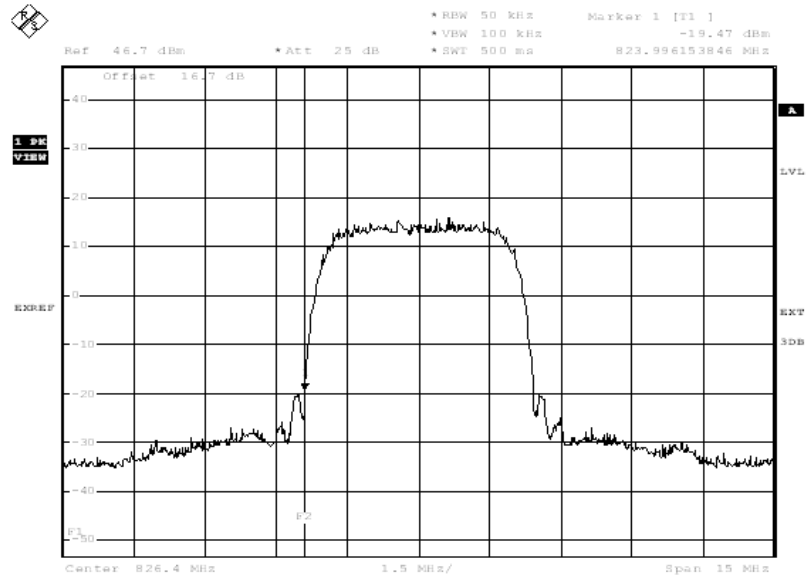
#### HIGH BAND EDGE BLOCK-C (WCDMA Band II) -Channel 9538



Date: 16.DEC.2014 04:18:28

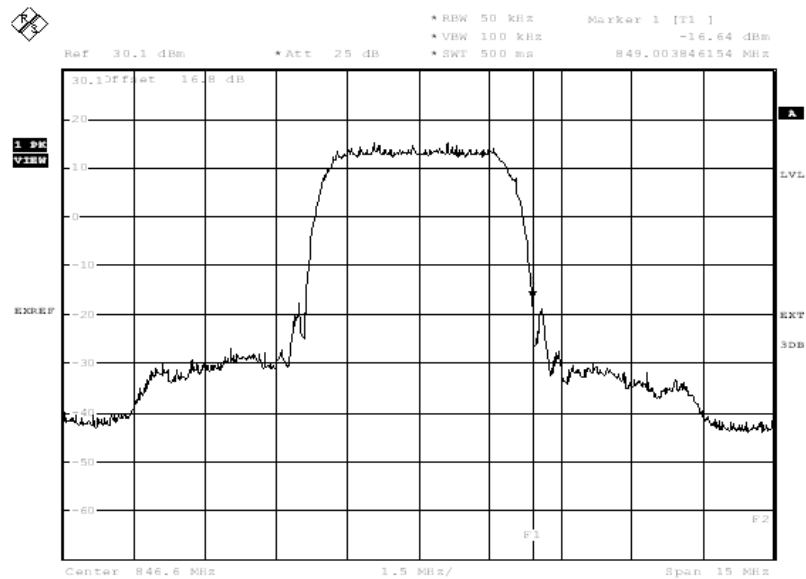
## WCDMA Band V

### LOW BAND EDGE BLOCK-A (WCDMA Band V)-Channel 4132



Date: 16.DEC.2014 05:17:32

### HIGH BAND EDGE BLOCK-C (WCDMA Band V) -Channel 4233



Date: 16.DEC.2014 05:17:57

## **A.8 CONDUCTED SPURIOUS EMISSION**

### **A.8.1 Measurement Method**

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of WCDMA Band II, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For WCDMA Band V, data taken from 30 MHz to 10GHz.
2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; If the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give a optimal sweep time according the selected span and RBW.
3. The procedure to get the conducted spurious emission is as follows:  
The trace mode is set to MaxHold to get the highest signal at each frequency;  
Wait 25 seconds;  
Get the result.
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

#### **WCDMA Band II Transmitter**

Channel	Frequency (MHz)
9262	1852.40
9400	1880.00
9538	1907.60

#### **WCDMA Band V Transmitter**

Channel	Frequency (MHz)
4132	826.40
4183	836.60
4233	846.60

### **A. 8.2 Measurement Limit**

Part 24.238 and Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

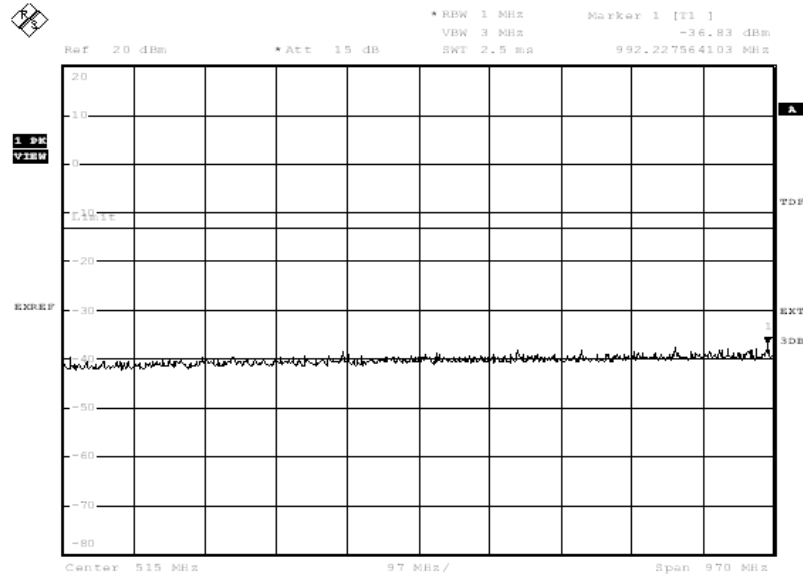
The specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

## A.8.3 Measurement result

### WCDMA Band II

#### A. 8.3.1 Channel 9262: 30MHz –1GHz

Spurious emission limit –13dBm.

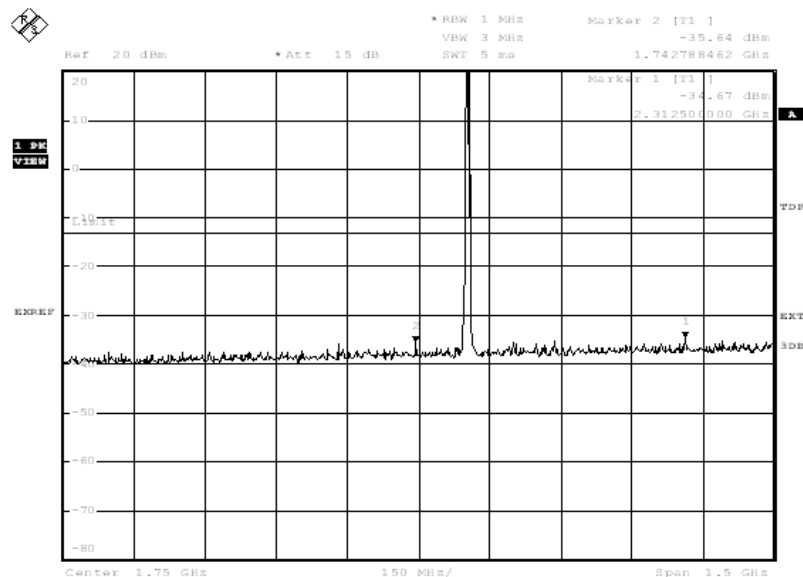


Date: 16.DEC.2014 03:49:38

#### A.8.3.2 Channel 9262: 1GHz –2.5GHz

Spurious emission limit –13dBm.

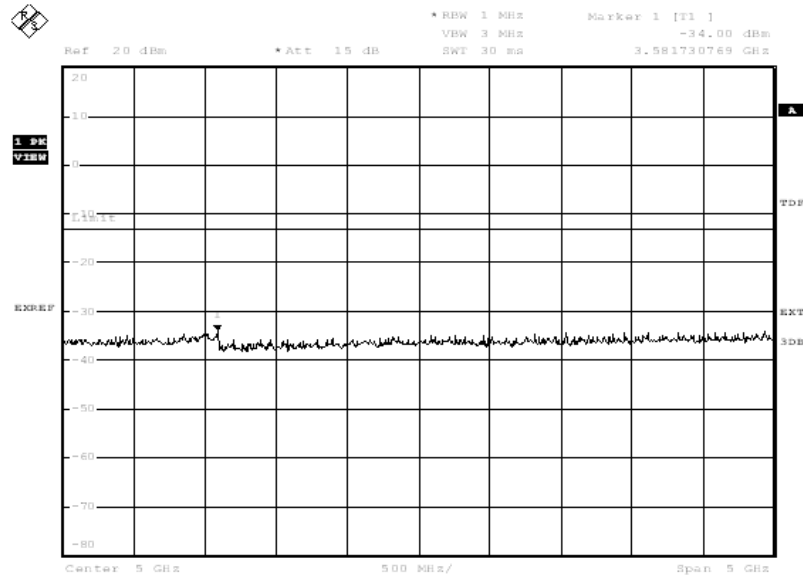
**NOTE:** peak above the limit line is the carrier frequency.



Date: 16.DEC.2014 03:50:10

### A.8.3.3 Channel 9262: 2.5GHz –7.5GHz

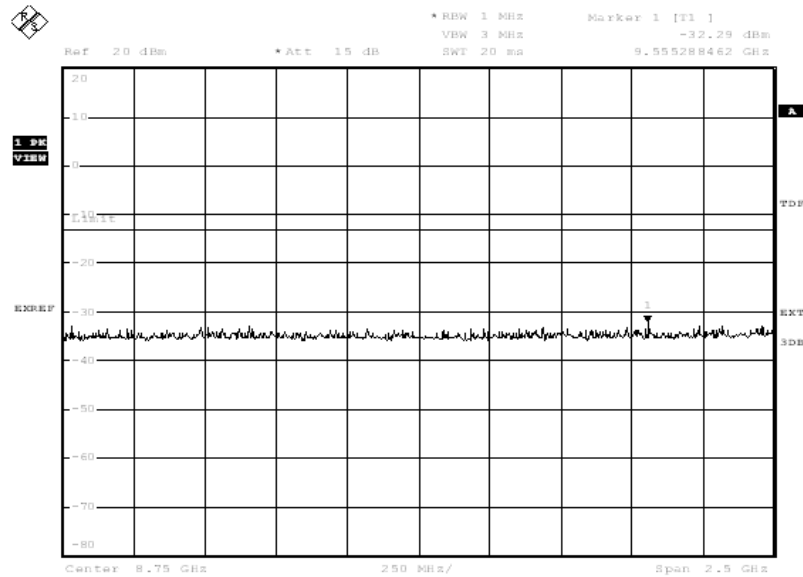
Spurious emission limit –13dBm.



Date: 16.DEC.2014 03:50:38

### A.8.3.4 Channel 9262: 7.5GHz –10GHz

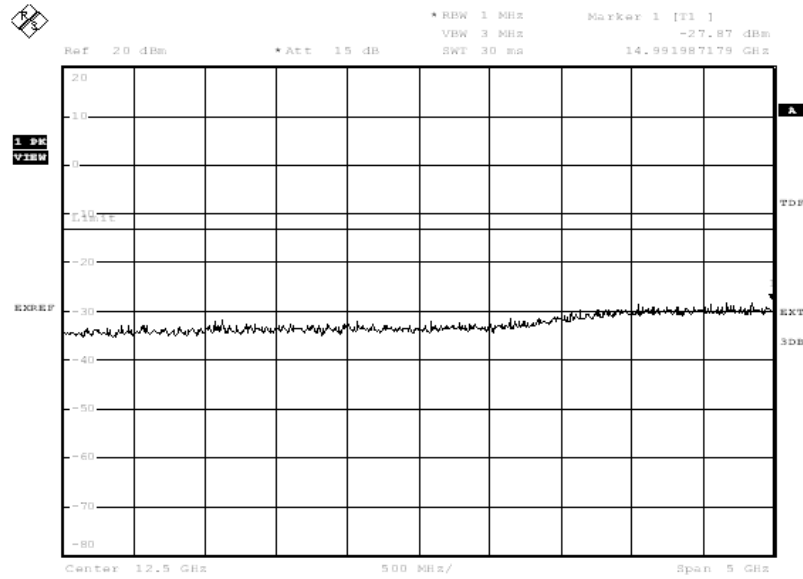
Spurious emission limit –13dBm.



Date: 16.DEC.2014 03:51:06

### A.8.3.5 Channel 9262: 10GHz –15GHz

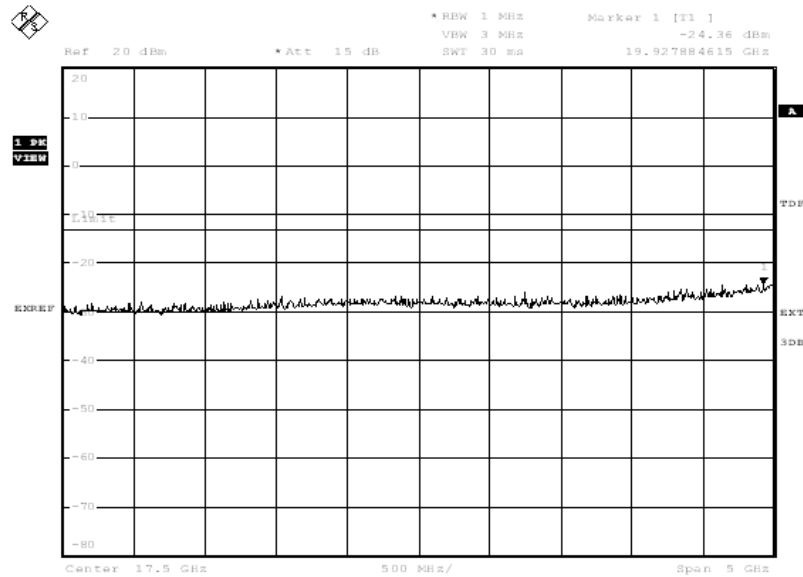
Spurious emission limit –13dBm.



Date: 16.DEC.2014 03:51:34

### A.8.3.6 Channel 9262: 15GHz –20GHz

Spurious emission limit –13dBm.

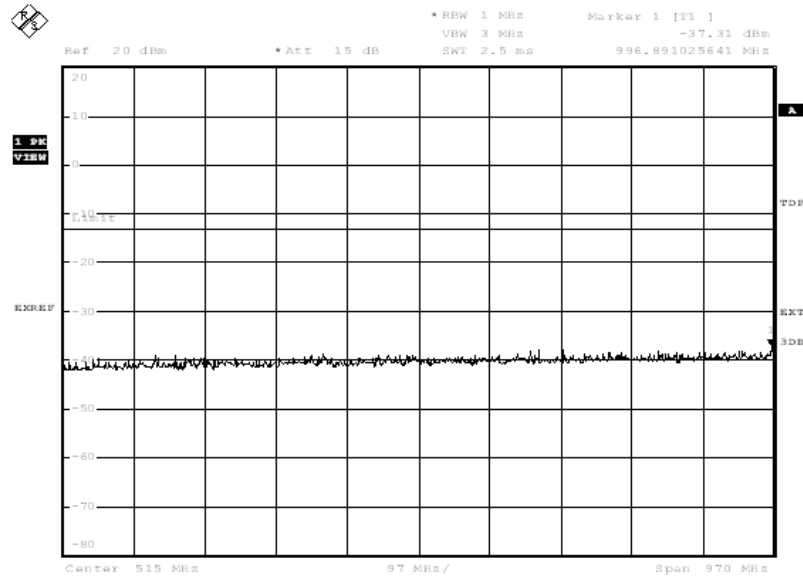


Date: 16.DEC.2014 03:52:01



### A. 8.3.7 Channel 9400: 30MHz –1GHz

Spurious emission limit –13dBm.

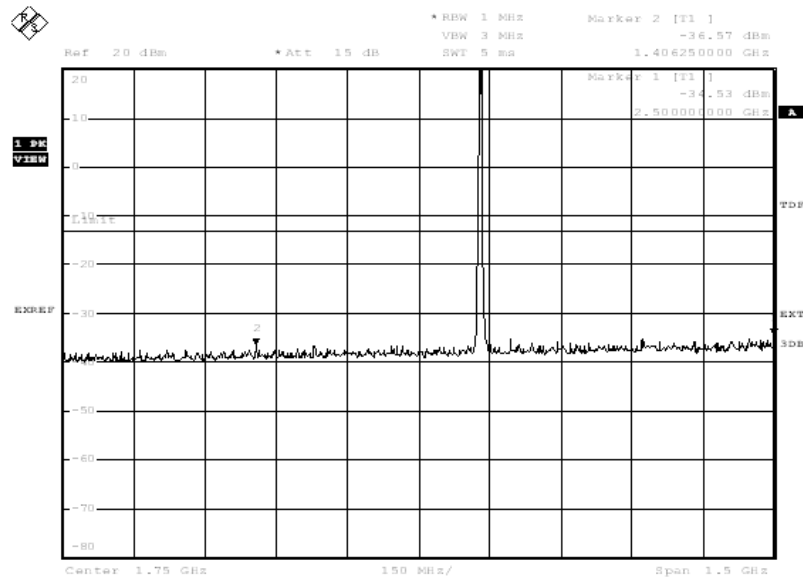


Date: 16.DEC.2014 03:52:41

### A.8.3.8 Channel 9400: 1GHz –2.5GHz

Spurious emission limit –13dBm.

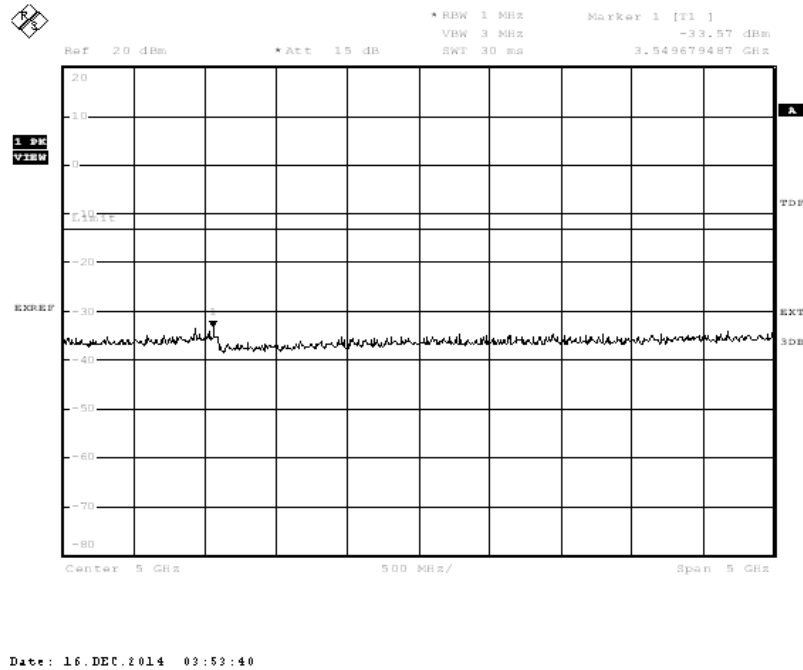
**NOTE: peak above the limit line is the carrier frequency.**



Date: 16.DEC.2014 03:53:12

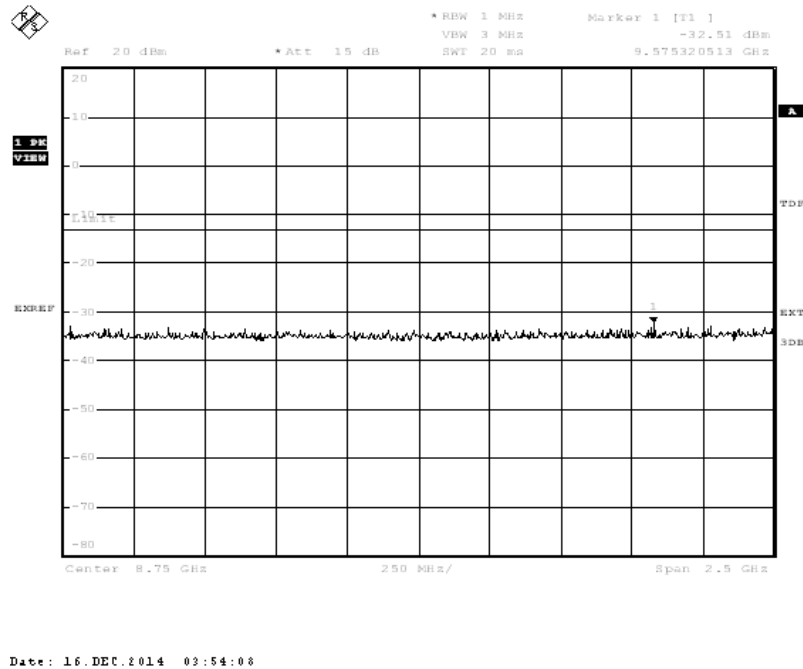
### A.8.3.9 Channel 9400: 2.5GHz –7.5GHz

Spurious emission limit –13dBm.



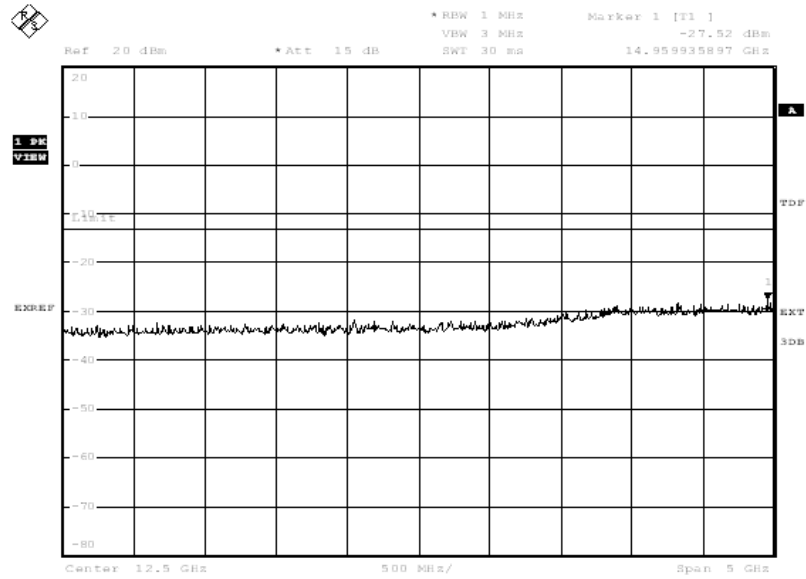
### A.8.3.10 Channel 9400: 7.5GHz –10GHz

Spurious emission limit –13dBm.



### A.8.3.11 Channel 9400: 10GHz –15GHz

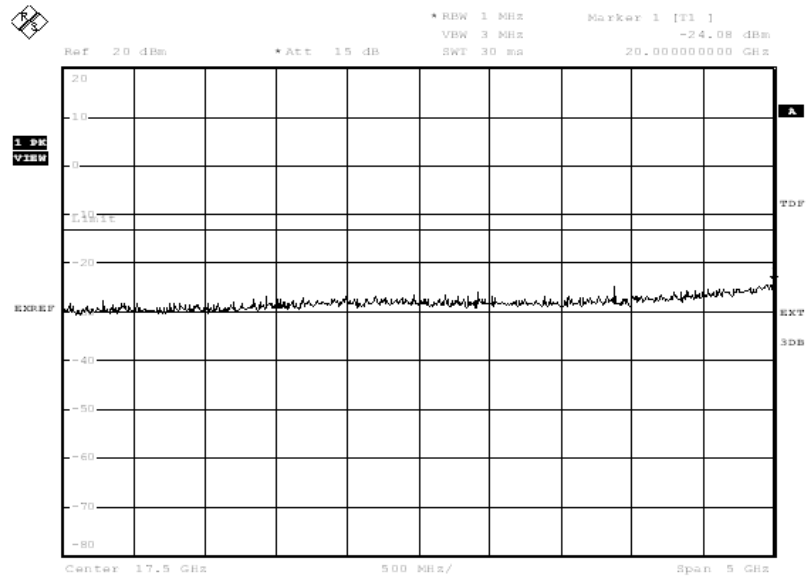
Spurious emission limit –13dBm.



Date: 16.DEC.2014 03:54:36

### A.8.3.12 Channel 9400: 15GHz –20GHz

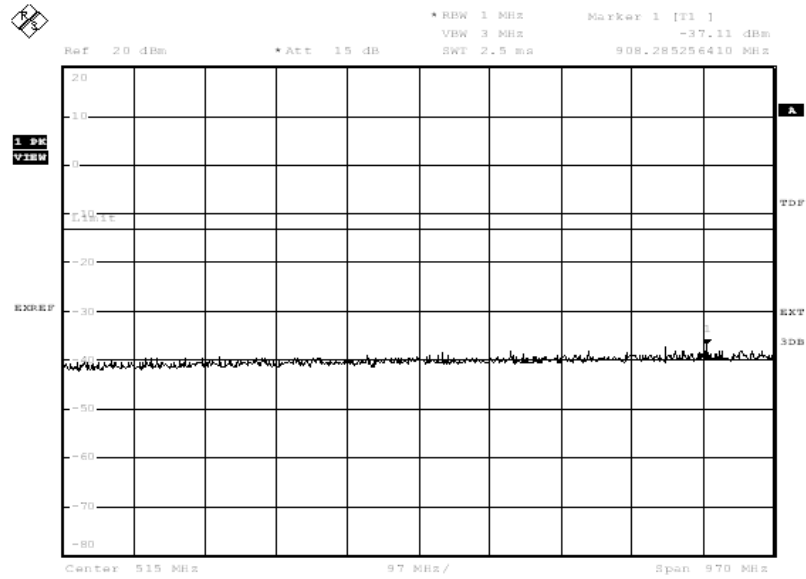
Spurious emission limit –13dBm.



Date: 16.DEC.2014 03:55:04

### A. 8.3.13 Channel 9538: 30MHz –1GHz

Spurious emission limit –13dBm.

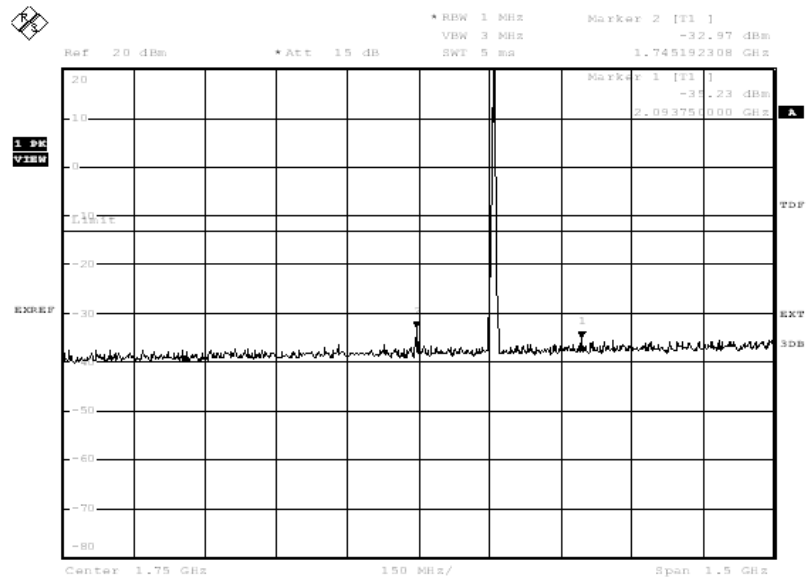


Date: 16.DEC.2014 03:55:43

### A.8.3.14 Channel 9538: 1GHz –2.5GHz

Spurious emission limit –13dBm.

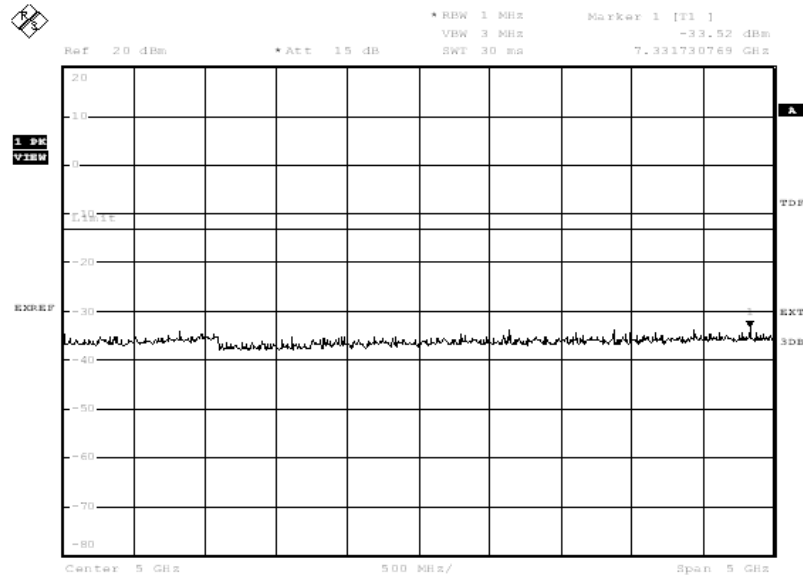
**NOTE: peak above the limit line is the carrier frequency.**



Date: 16.DEC.2014 03:56:15

### A.8.3.15 Channel 9538: 2.5GHz –7.5GHz

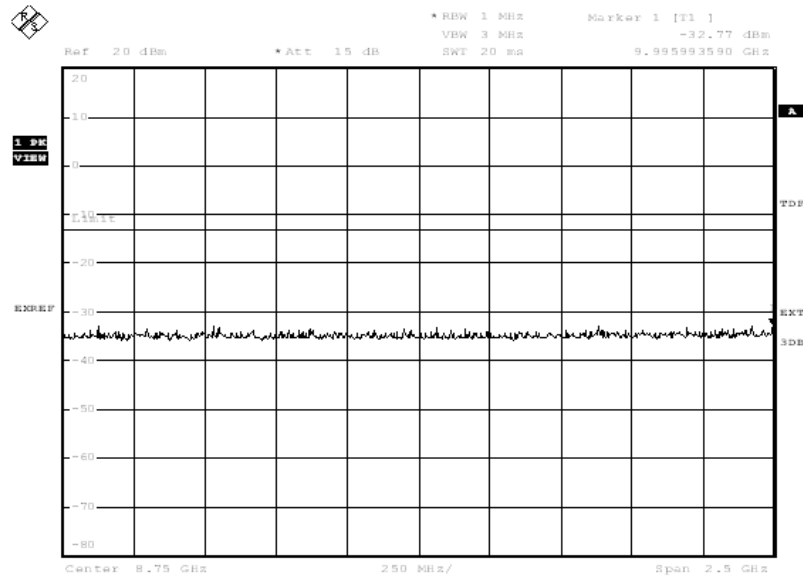
Spurious emission limit –13dBm.



Date: 16.DEC.2014 03:56:43

### A.8.3.16 Channel 9538: 7.5GHz –10GHz

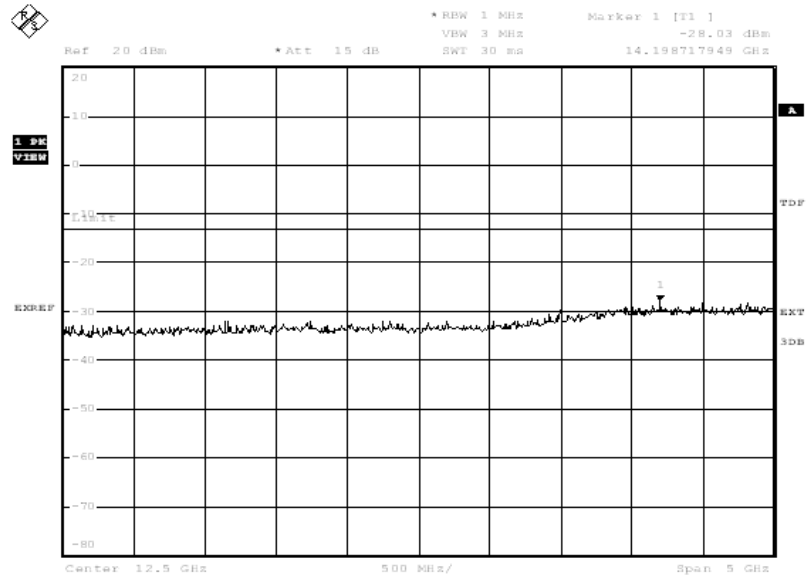
Spurious emission limit –13dBm.



Date: 16.DEC.2014 03:57:10

### A.8.3.17 Channel 9538: 10GHz –15GHz

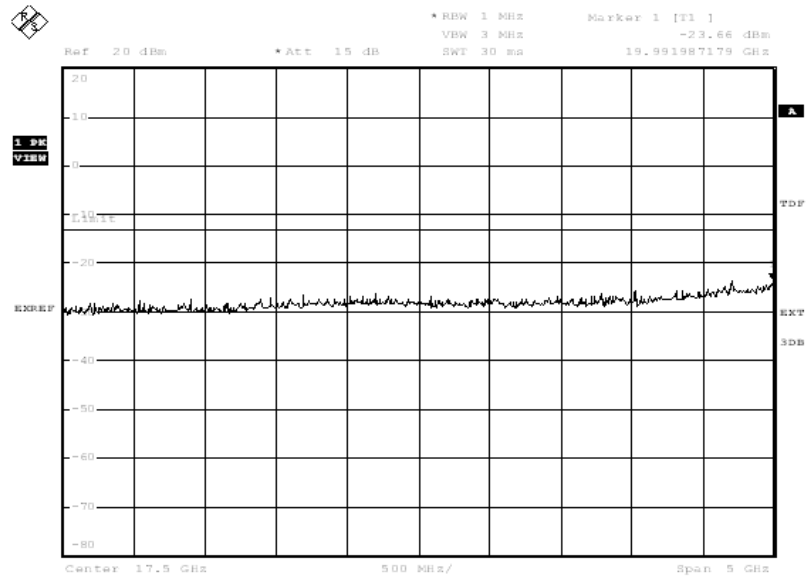
Spurious emission limit –13dBm.



Date: 16.DEC.2014 03:57:38

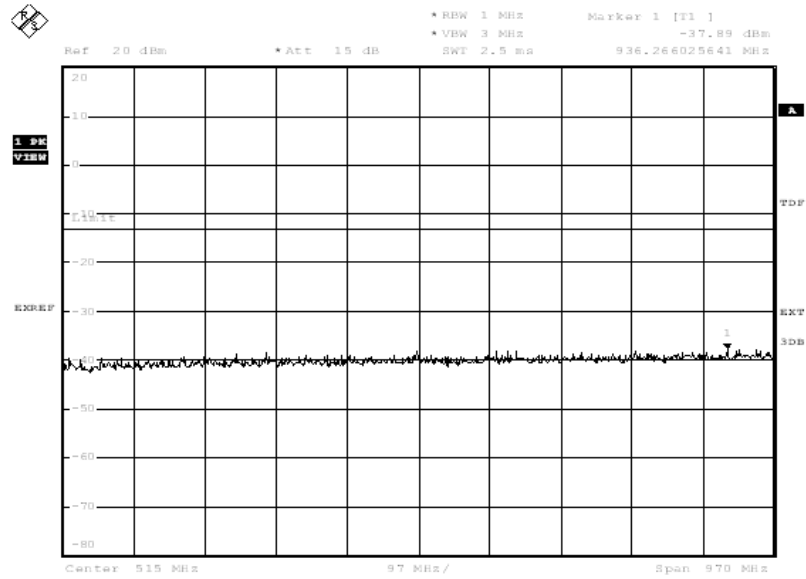
### A.8.3.18 Channel 9538: 15GHz –20GHz

Spurious emission limit –13dBm.



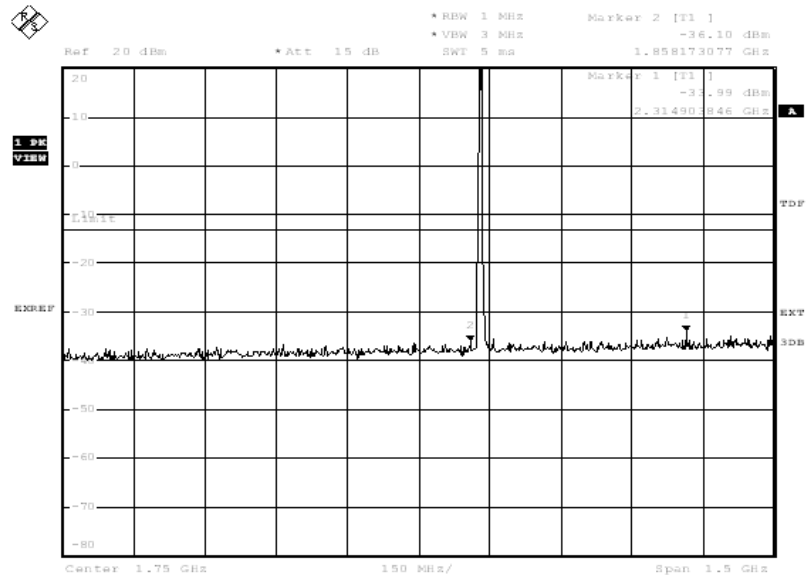
Date: 16.DEC.2014 03:58:06

**A. 8.3.19 Idle mode: 30MHz –1GHz**  
Spurious emission limit –13dBm.



Date: 16.DEC.2014 04:07:19

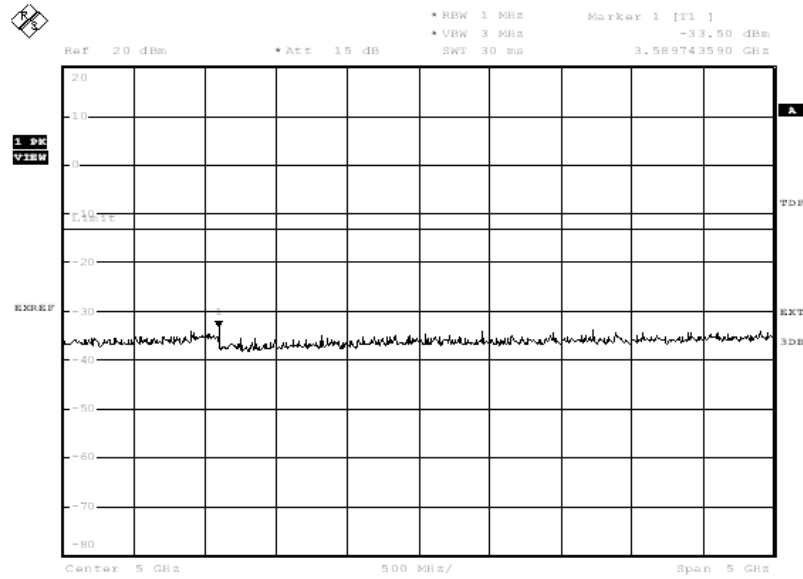
**A.8.3.20 Idle mode: 1GHz –2.5GHz**  
Spurious emission limit –13dBm.



Date: 16.DEC.2014 04:07:50

### A.8.3.21 Idle mode: 2.5GHz –7.5GHz

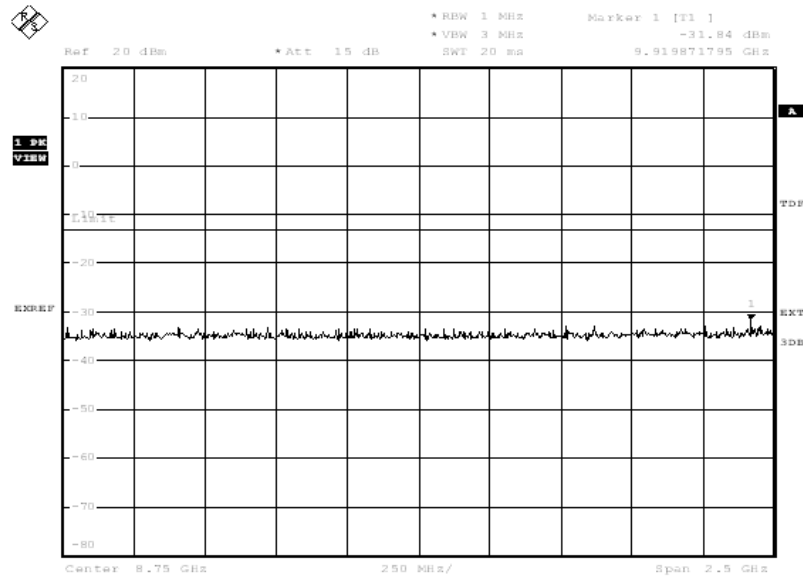
Spurious emission limit –13dBm.



Date: 16.DEC.2014 04:08:18

### A.8.3.22 Idle mode: 7.5GHz –10GHz

Spurious emission limit –13dBm.

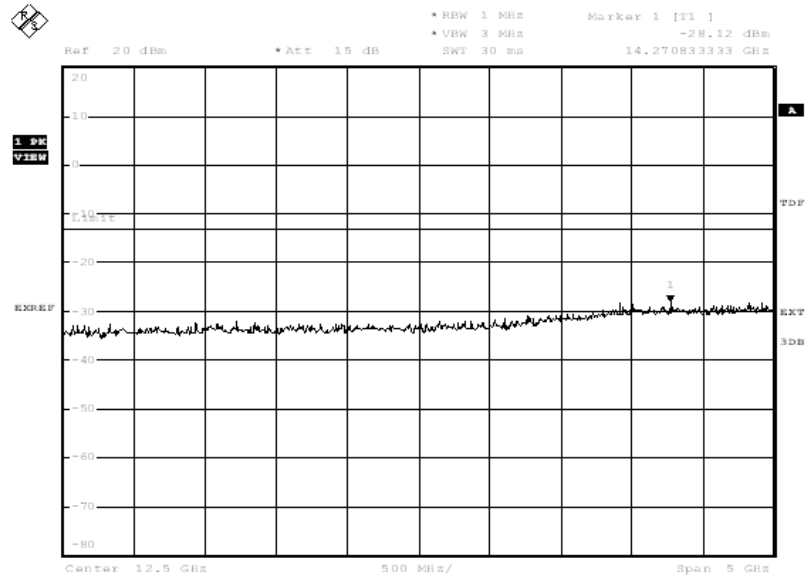


Date: 16.DEC.2014 04:08:46



### A.8.3.23 Idle mode: 10GHz –15GHz

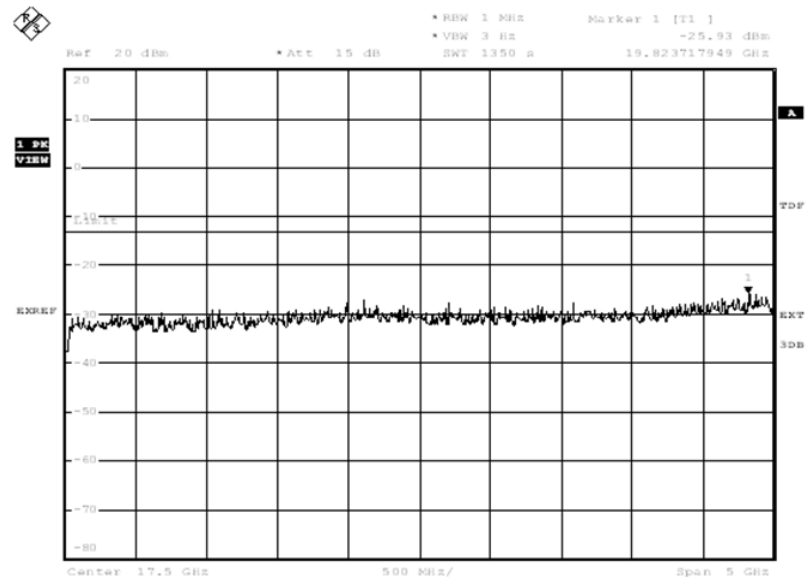
Spurious emission limit –13dBm.



Date: 16.DEC.2014 04:09:14

### A.8.3.24 Idle mode: 15GHz –20GHz

Spurious emission limit –13dBm.



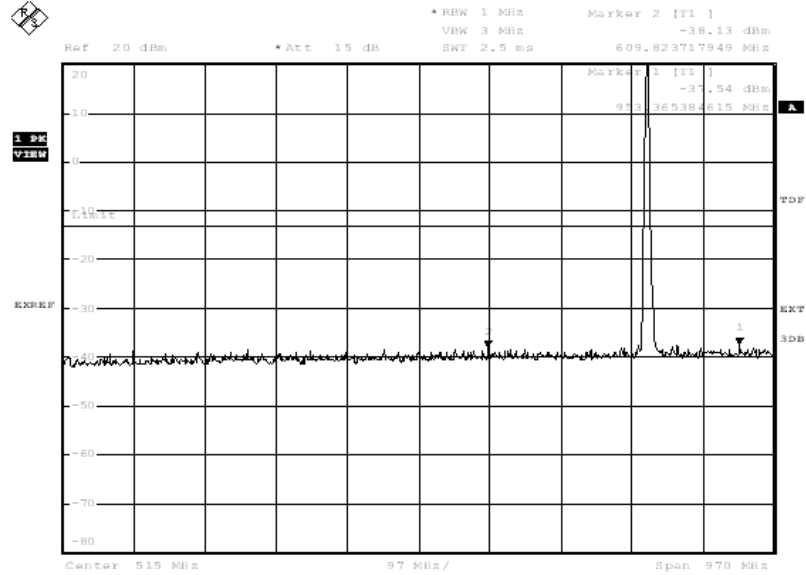
Date: 16.DEC.2014 04:09:42

## WCDMA Band V

### A. 8.3.25 Channel 4132: 30MHz –1GHz

Spurious emission limit –13dBm.

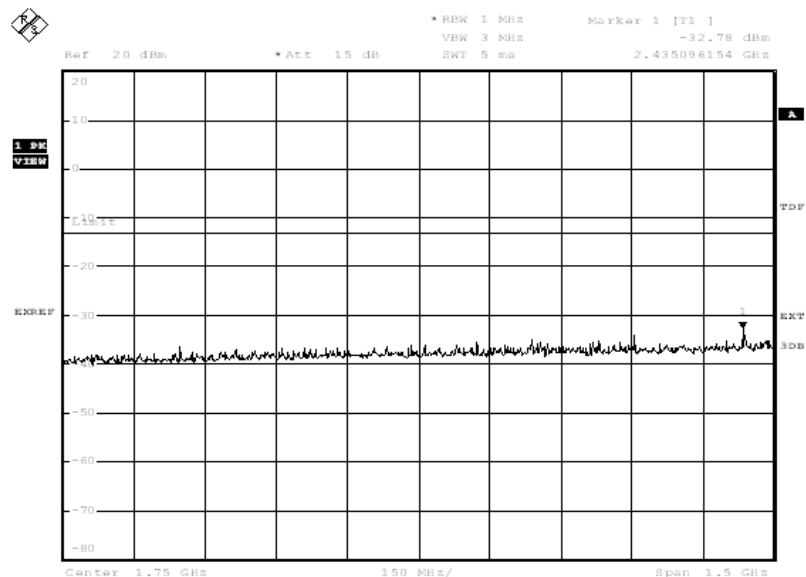
**NOTE: peak above the limit line is the carrier frequency.**



Date: 16.DEC.2014 05:18:52

### A. 8.3.26 Channel 4132: 1GHz – 2.5GHz

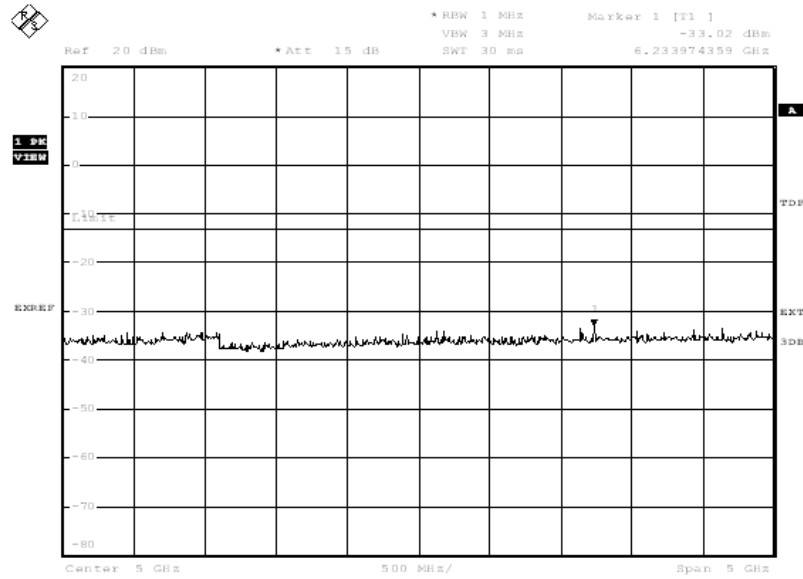
Spurious emission limit –13dBm.



Date: 16.DEC.2014 05:19:21

### A. 8.3.27 Channel 4132: 2.5GHz –7.5GHz

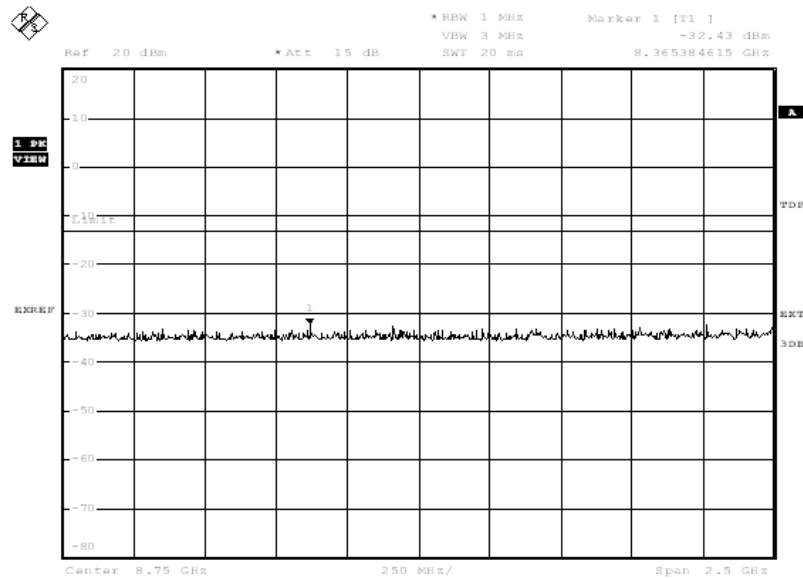
Spurious emission limit –13dBm.



Date: 16.DEC.2014 05:19:49

### A. 8.3.28 Channel 4132: 7.5GHz – 10GHz

Spurious emission limit –13dBm.

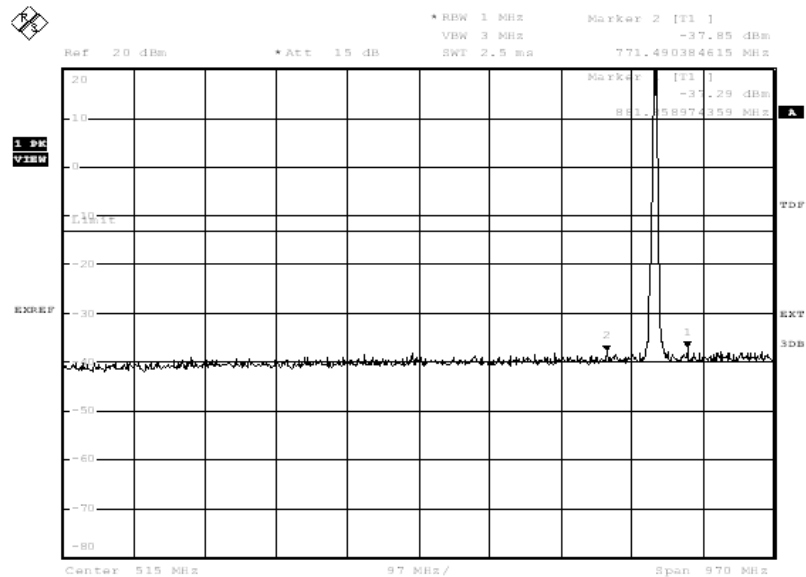


Date: 16.DEC.2014 05:20:17

### A. 8.3.29 Channel 4183: 30MHz –1GHz

Spurious emission limit –13dBm.

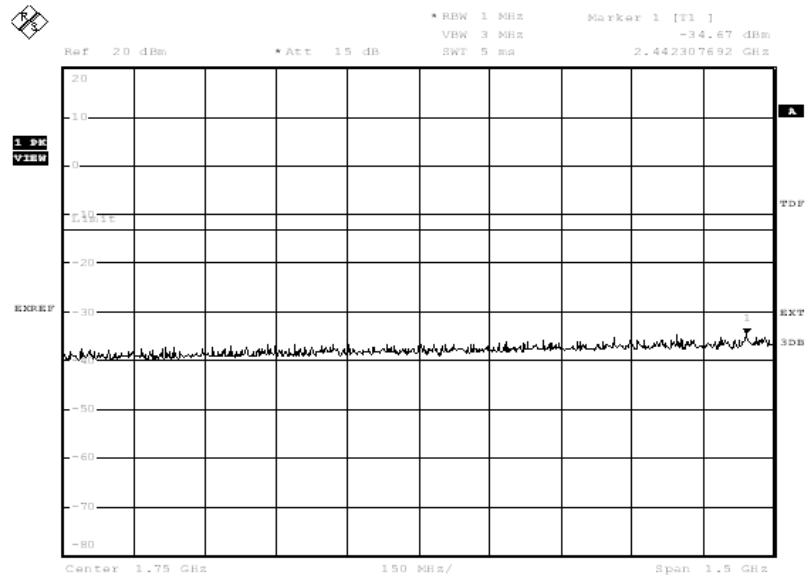
**NOTE:** peak above the limit line is the carrier frequency.



Date: 16.DEC.2014 05:21:00

### A.8.3.30 Channel 4183: 1GHz – 2.5GHz

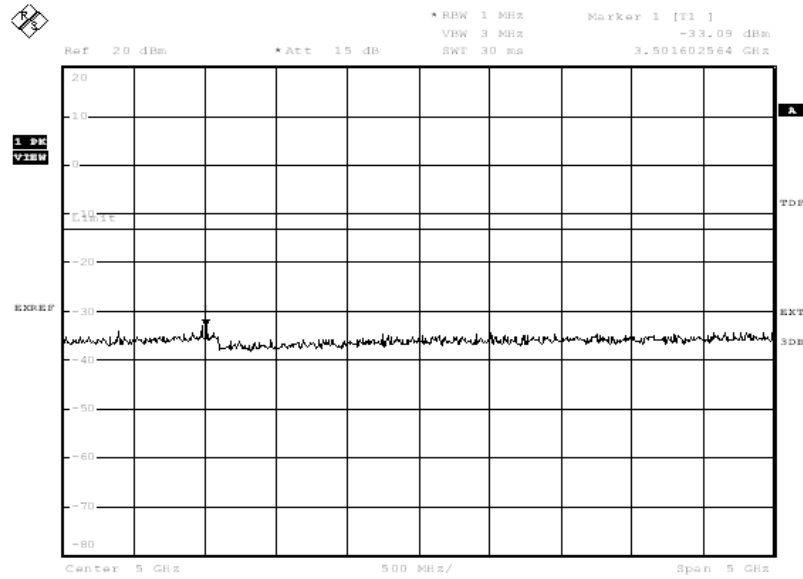
Spurious emission limit –13dBm.



Date: 16.DEC.2014 05:21:28

### A. 8.3.31 Channel 4183: 2.5GHz –7.5GHz

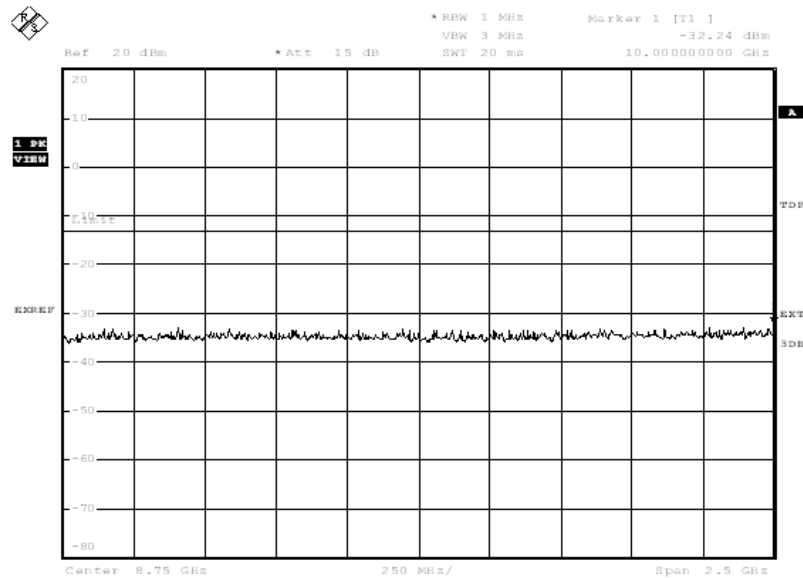
Spurious emission limit –13dBm.



Date: 16.DEC.2014 05:21:56

### A. 8.3.32 Channel 4183: 7.5GHz – 10GHz

Spurious emission limit –13dBm.

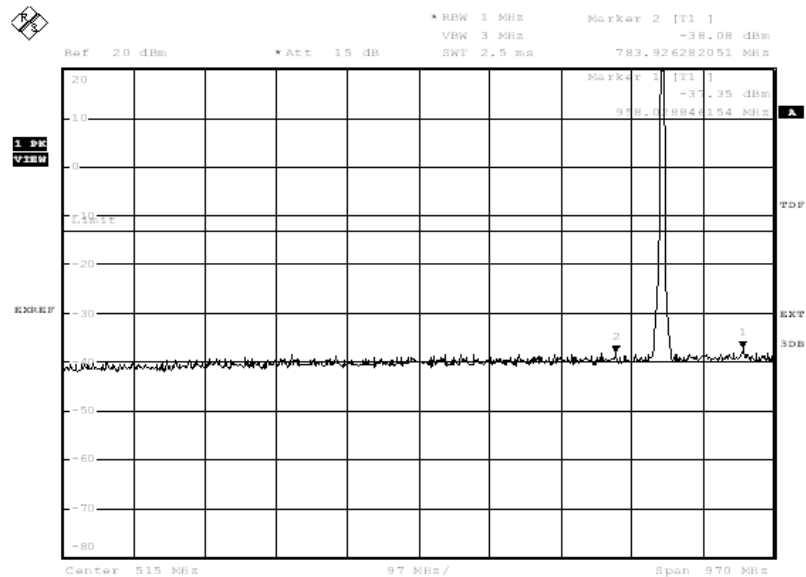


Date: 16.DEC.2014 05:22:24

### A. 8.3.33 Channel 4233: 30MHz –1GHz

Spurious emission limit –13dBm.

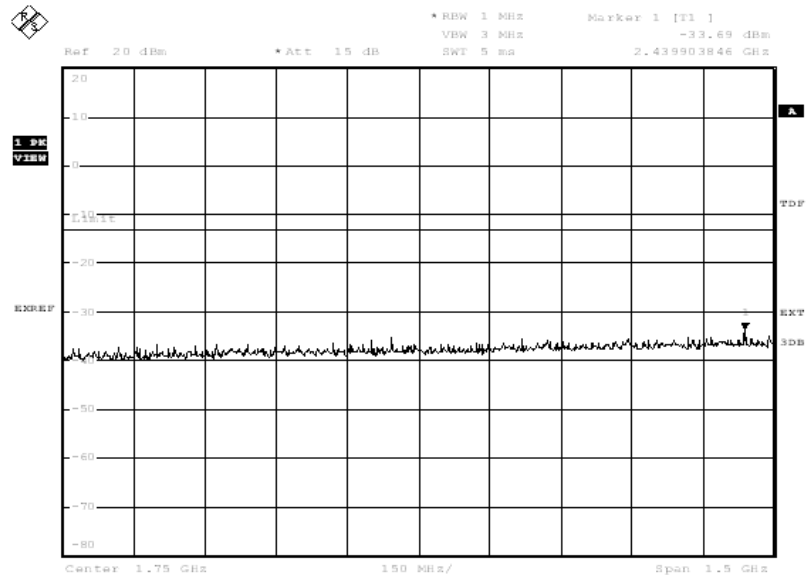
**NOTE:** peak above the limit line is the carrier frequency.



Date: 16.DEC.2014 05:23:07

### A. 8.3.34 Channel 4233: 1GHz – 2.5GHz

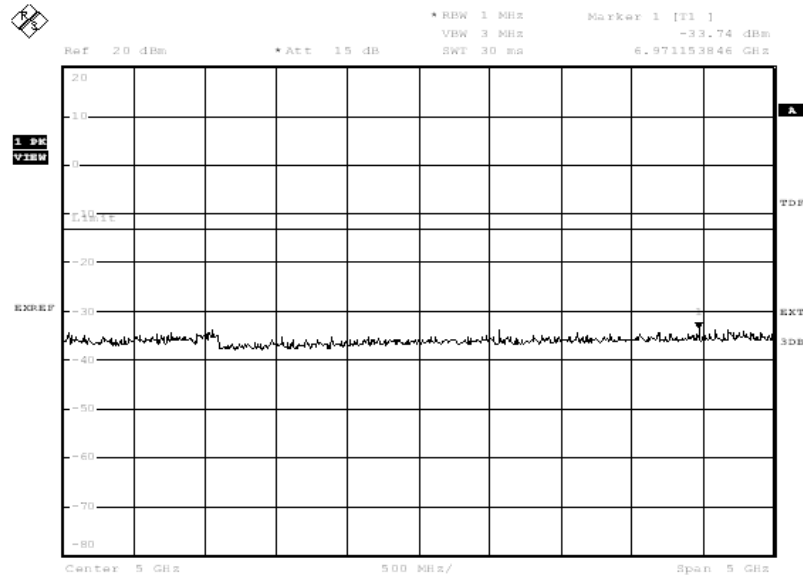
Spurious emission limit –13dBm.



Date: 16.DEC.2014 05:23:34

### A. 8.3.35 Channel 4233: 2.5GHz –7.5GHz

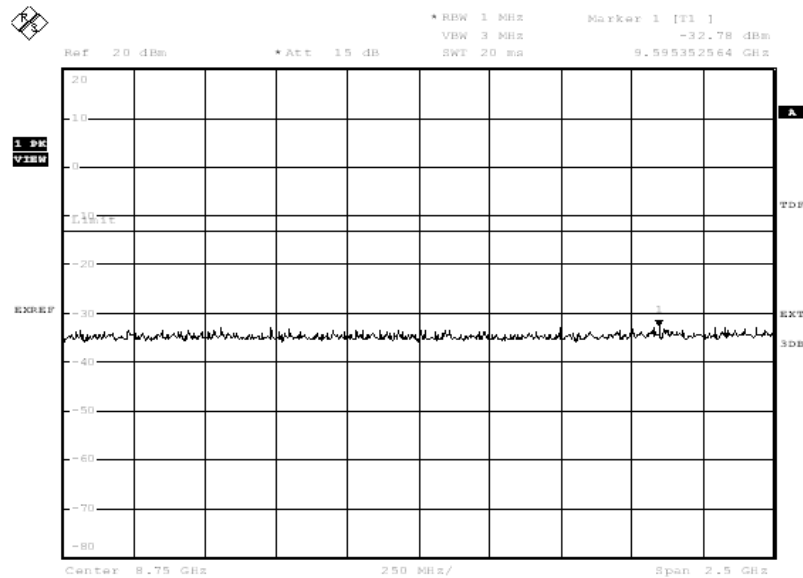
Spurious emission limit –13dBm.



Date: 16.DEC.2014 05:24:02

### A. 8.3.36 Channel 4233: 7.5GHz – 10GHz

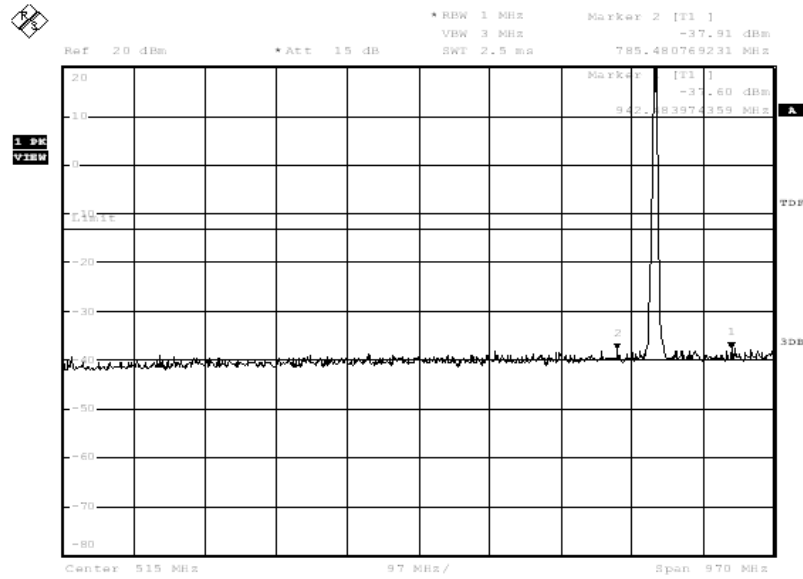
Spurious emission limit –13dBm.



Date: 16.DEC.2014 05:24:30

### A. 8.3.37 Idle mode: 30MHz – 1GHz

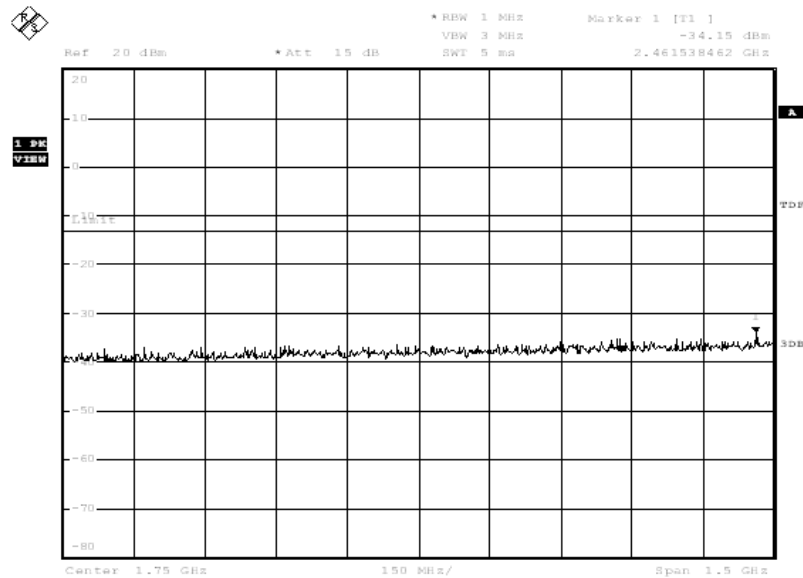
Spurious emission limit -13dBm.



Date: 18.DEC.2014 03:30:31

### A.8.3.38 Idle mode: 1GHz – 2.5GHz

Spurious emission limit -13dBm.

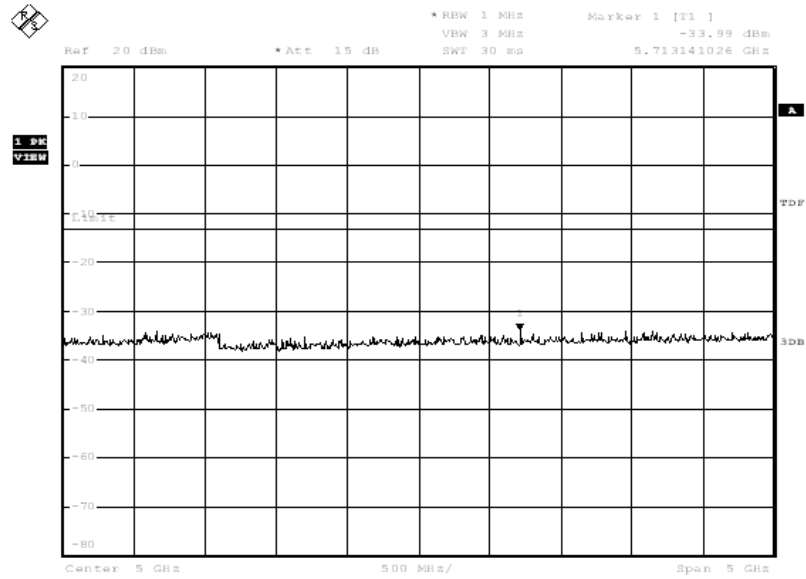


Date: 18.DEC.2014 03:30:59



### A.8.3.39 Idle mode: 2.5GHz – 7.5GHz

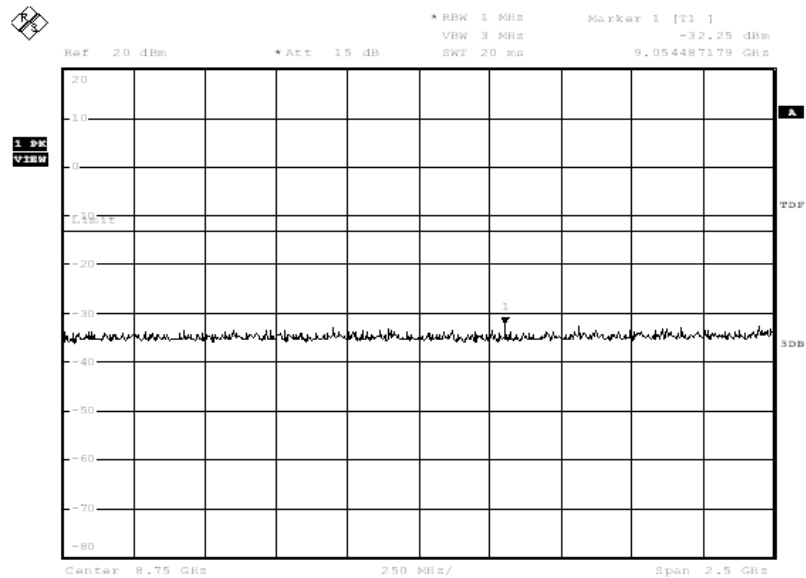
Spurious emission limit -13dBm.



Date: 18.DEC.2014 03:31:27

### A.8.3.40 Idle mode: 7.5GHz – 10GHz

Spurious emission limit -13dBm.



Date: 18.DEC.2014 03:31:55

**A.9PEAK-TO-AVERAGEPOWERRATIO****A.9.1 Measurement description**

According to KDB971168, the transmitter's peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

The parameter of spectrum analyzer: RBW = 10MHz, detector = sample, No. of sample = 500,000

**A.9.2 Measurement results****Frequency Error vs Temperature**

	Frequency(MHz)	PAPR(dB)
BAND V	836.60	1.73
BAND II	1880.00	2.86

\*\*\*END OF REPORT\*\*\*