



# TEST REPORT

**No. I14Z46714-EMC02**

**for**

**Sony Mobile Communications Inc.**

**GSM/WCDMA/LTE Mobile Phone**

**FCC ID: PY7PM-0820**

**with**

**Hardware Version: A**

**Software Version: 19.2.A.0.138**

**Issued Date: Jun. 18<sup>th</sup>, 2014**

**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 TMC Beijing.

**Test Laboratory:**

***DAkks accreditation (DIN EN ISO/IEC 17025): No. D-PL-12123-01-01***

***FCC 2.948 Listed: No.733176***

***IC O.A.T.S listed: No.6629A-1***

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## 1. Test Laboratory

### 1.1. Testing Location

#### Location A

Company Name: TMC Beijing, Telecommunication Metrology Center of MIIT  
Address: No 52, Huayuan Bei Road, Haidian District, Beijing, P.R. China  
Postal Code: 100191

#### Location B

Company Name: TMC Beijing, Telecommunication Metrology Center of MIIT  
Address: Building Shouxiang, No.51, Xueyuan Road, Haidian District, Beijing, China  
Postal Code: 100191

### 1.2. Testing Environment

Normal Temperature: 15-35°C  
Relative Humidity: 20-75%  
Air pressure 980 - 1040 hPa

The climatic requirements above are general exclude the special requirements for dedicated test environments listed in section 5 and some specific test cases in other parts of this report.

### 1.3. Project data

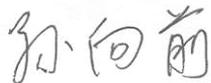
Receipt of Sample May. 29<sup>th</sup>, 2014  
Testing Start Date: May. 30<sup>th</sup>, 2014  
Testing End Date: Jun. 13<sup>th</sup>, 2014

### 1.4. Signature



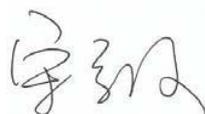
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Qu Pengfei  
(Prepared this test report)



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Sun Xiangqian  
(Reviewed this test report)



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Song Chongwen  
(Approved this test report)

## **2. Client Information**

### **2.1. Applicant Information**

Company Name: Sony Mobile Communications (China) Co. Ltd  
Address /Post: Sony Mobile R&D Center, No. 16, Guangshun South Street,  
Chaoyang District  
City: Beijing  
Postal Code: 100102  
Country: China  
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### **2.2. Manufacturer Information**

Company Name: Sony Mobile Communications Inc.  
Address /Post: 1-8-15 Konan, Minato-ku, Tokyo, 108-0075, Japan  
City: Tokyo  
Postal Code: 108-0075  
Country: Japan

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

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

Description	GSM 850/900/1800/1900 quad bands, GPRS, EDGE, WCDMA FDD bands 1/2/5/8, HSDPA, HSUPA, LTE FDD bands 1/3/7/8/28 Bluetooth (EDR and BLE), ANT+, WLAN ( 802.11 b/g/n), NFC, FM, GPS mobile phone
FCC ID	PY7PM-0820
GSM Frequency Band	GSM 850/900/1800/1900
UMTS Frequency Band	FDD Band 1 / FDD Band 2 / FDD Band 5 / FDD Band 8
LTE Frequency Band	FDD Band 1 / FDD Band 3 / FDD Band 7 / FDD Band 8 / FDD Band 28
Antenna	Internal
Power supply	Battery ( charged by travel adapter or vehicle charger )
Extreme vol. Limits	3.6VDC to 4.2VDC (nominal: 3.8VDC)
Extreme temp. Tolerance	-30°C to +50°C

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of Telecommunication Metrology Center of MIIT of People's Republic of China.

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

<b>EUT ID*</b>	<b>SN</b>	<b>IMEI</b>	<b>HW Version</b>	<b>SW Version</b>
EUT8	CB5A1ZDQPP	004402452817731	A	19.2.A.0.138
#25018	CB5A1ZDQQX	00440245-281875-4	A	19.2.A.0.189
#25043	CB5A1ZDQND	00440245-281795-4	A	19.2.A.0.189
#25070	CB5A1ZDRLF	00440245-281793-9	A	19.2.A.0.189

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

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

<b>AE ID*</b>	<b>Description</b>	<b>SN</b>	<b>Revision</b>
AE12	Travel Charger	32301286SEM0600.1	1C
AE10	USB Cable	/	1
#23086	Travel Charger	8512W32101941	RTL
#24004	USB Cable	123307D400366C8	RTL

AE12

Commercial name	EP880
Type	AC-0400-EU
Manufacturer	SALCOMP
Length of cable	98.5 cm (length of USB cable)

AE10

Commercial name EC801  
Type AI-0401  
Manufacturer Sony Mobile  
Length of cable 98.5 cm

#23086

Commercial name EP880  
Type AC-0400-EU  
Manufacturer SALCOMP  
Length of cable 98.5 cm (length of USB cable)

#24004

Commercial name EC801  
Type AI-0401  
Manufacturer Sony Mobile  
Length of cable 98.5 cm

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

### 3.4. General Description

The Equipment Under Test (EUT) is a model of GSM/WCDMA/LTE Mobile Phone with integrated antenna and embedded battery.

The EUT supports GSM 850/900/1800/1900MHz bands, WCDMA FDD bands 1/2/5/8 and LTE FDD bands 1/3/7/8/28. It supports GPRS service with multi-slots class 33 and EGPRS service with multi-slots class 33. The HSDPA (Cat 24) and HSUPA (Cat 6) features are also supported.

It has MP3, camera, USB memory, FM radio, GPS receiver, NFC, Bluetooth (EDR, BLE), ANT+, WLAN (802.11 b/g/n) and Wi-Fi hotspot functions. For WLAN 802.11n, it supports 20MHz bandwidth on both 2.4GHz band.

It consists of normal options: USB cable and travel charger.

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the client.

### 3.5. EUT set-ups

EUT Set-up No.	Combination of EUT and AE	Remarks
Set.7	EUT8 + AE12 + AE10	1900MHz Tests with travel charger
Set.8	EUT8	1900MHz ERP/EIRP/RSE tests
		1900MHz Conducted RF tests
Set.14	#25018+#23086+#24004	850MHz Tests with travel charger
Set.15	#25070	850MHz ERP/EIRP/RSE tests
Set.16	#25043	850MHz Conducted RF tests

## 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 15	Radio frequency devices	10-1-13 Edition
FCC Part 22	PUBLIC MOBILE SERVICES	10-1-13 Edition
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	10-1-13 Edition
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	10-1-13 Edition
ANSI/TIA-603-C	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2004
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	2009
KDB 971168 D01	Measurement Guidance for Certification of Licensed Digital Transmitters	v02r01

## 5. LABORATORY ENVIRONMENT

**Semi-anechoic chamber SAC-1** (23 meters×17meters×10meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4Ω
Normalised site attenuation (NSA)	< ± 4 dB, 3m/10m distance, from 30 to 1000 MHz
Site voltage standing-wave ratio ( $S_{VSWR}$ )	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz

**Fully-anechoic chamber FAC-3** (9 meters×6.5 meters×4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4 Ω
Site voltage standing-wave ratio ( $S_{VSWR}$ )	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 4000 MHz

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

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4 Ω

## 6. SUMMARY OF TEST RESULTS

### 6.1. Summary of test results

Abbreviations used in this clause:		
Verdict Column	P	Pass
	F	Fail
	NA	Not applicable
	NM	Not measured
Location Column	A/B/C/D	The test is performed in test location A, B, C or D which are described in section 1.1 of this report

#### WCDMA Band II

Items	Test Name	Clause in FCC rules	Section in this report	Verdict	Test Location
1	Output Power	24.232(c)	5.4	A.1	P
2	Emission Limit	24.238(a), 2.1051	5.5	A.2	P
3	Conducted Emission	15.107/207	7.2.2	A.3	P
4	Frequency Stability	24.235, 2.1055	5.3	A.4	P
5	Occupied Bandwidth	2.1049(h)(i)	5.5	A.5	P
6	Emission Bandwidth	24.238(a)	5.5	A.6	P
7	Band Edge Compliance	24.238(a)	5.5	A.7	P
8	Conducted Spurious Emission	24.238(a), 2.1057	5.5	A.8	P

#### WCDMA Band V

Items	Test Name	Clause in FCC rules	Section in this report	Verdict	Test Location
1	Output Power	22.913(a)	5.4	A.1	P
2	Emission Limit	22.917, 2.1051	5.5	A.2	P
3	Conducted Emission	15.107/207	7.2.2	A.3	P
4	Frequency Stability	22.355, 2.1055	5.3	A.4	P
5	Occupied Bandwidth	2.1049(h)(i)	5.5	A.5	P
6	Emission Bandwidth	22.917(b)	5.5	A.6	P
7	Band Edge Compliance	22.917(b)	5.5	A.7	P
8	Conducted Spurious Emission	22.917, 2.1057	5.5	A.8	P

### 6.2. Statements

The test cases listed in section 6.1 of this report for the EUT specified in section 3 were performed by TMC according to the standards or reference documents in section 4.1

The EUT met all applicable requirements of the standards or reference documents in section 4.1. This report only deals with the WCDMA functions among the features described in section 3.

## 7. Test Equipments Utilized

NO.	Description	TYPE	SERIES NUMBER	MANUFACTURE	CAL DUE DATE
1.	Test Receiver	ESCI	100344	R&S	2015-03-03
2.	Spectrum Analyzer	E4440A	MY48250642	Agilent	2015-02-27
3.	LISN	ESH2-Z5	829991/012	R&S	2015-04-14
4.	EMI Antenna	VULB 9163	9163-235	Schwarzbeck	2014-09-28
5.	EMI Antenna	3117	00058889	ETS-Lindgren	2014-12-20
6.	EMI Antenna	3117	00119024	ETS-Lindgren	2016-01-20
7.	EMI Antenna	9117	177	Schwarzbeck	2014-06-29
8.	Signal Generator	N5183A	MY49060052	Agilent	2015-03-02
9.	Power Amplifier	5S1G4	0341863	AR	2016-03-01
10.	Universal Radio Communication Tester	E5515C	MY48361083	Agilent	2015-02-27
11.	Universal Radio Communication Tester	E5515C	MY48363198	Agilent	2014-07-07
12.	Universal Radio Communication Tester	CMW500	143008	R&S	2014-12-09

## **ANNEX A: MEASUREMENT RESULTS**

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

#### **Reference**

FCC: CFR Part 22.913(a), 24.232(b).

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

During the process of testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication tester (CMU200) to ensure max power transmission and proper modulation.

This result contains peak output power and ERP/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 spectrum analyzer's peak detector.

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

##### **A.1.2.2 Measurement result**

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

	Channel number	Frequency(MHz)	output power(dBm)
WCDMA (Band II)	9262	1852.4	23.44
	9400	1880.0	23.34
	9538	1907.6	<b>23.47</b>

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

	Channel number	Frequency(MHz)	output power(dBm)
WCDMA (Band V)	4132	826.4	<b>24.87</b>
	4183	836.6	24.80
	4233	846.6	24.73

### A.1.3 Radiated

#### A.1.3.1 Description

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

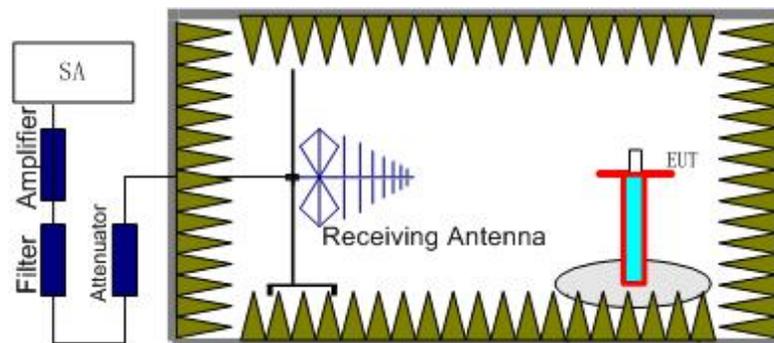
Rule Part 22.913(a) specifies "Maximum ERP. The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

Rule Part 24.232(b) 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."

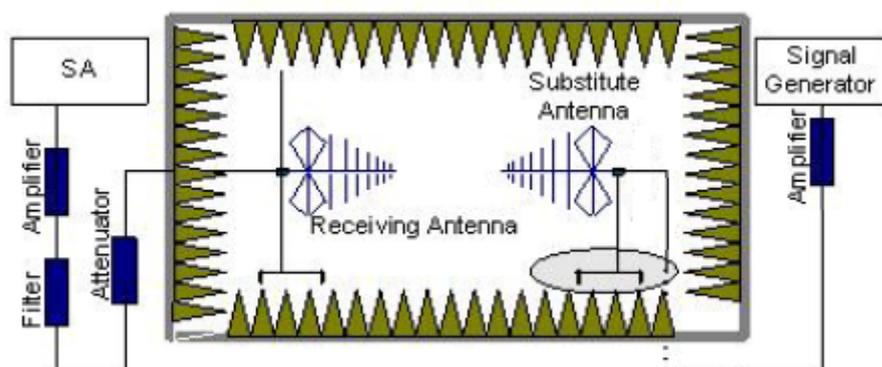
#### A.1.3.2 Method of Measurement

The measurements procedures in TIA-603C-2004 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, a 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. Adjust the level of the signal generator output until the value of the receiver reaches 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. An amplifier should be connected to the Signal Source output port. And the cable should be connected 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:  
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 (Unit dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15.

For test layout photo, please refer to Pic.1 in Annex B.

### WCDMA Band II- EIRP

#### Limits

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

#### Measurement result

Frequency (MHz)	$P_{Mea}$ (dBm)	$P_{cl}$ (dB)	$P_{Ag}$ (dB)	$G_a$ (dBi)	Peak EIRP(dBm)	Polarization
1852.40	-28.60	3.18	-50.00	-4.55	22.77	Horizontal
1880.00	-27.45	3.11	-50.00	-4.43	<b>23.87</b>	Horizontal
1907.60	-27.36	3.18	-50.00	-4.31	23.77	Horizontal

Sample calculation: 1880.0MHz

$$\text{Peak EIRP (dBm)} = P_{Mea}(-27.45\text{dBm}) - G_a(-4.43\text{dBi}) - P_{Ag}(-50.00\text{ dB}) - P_{cl}(3.11\text{dB})$$

$$= 23.87\text{ dBm}$$

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

Note: Expanded measurement uncertainty for WCDMA Band II is  $U = 1.07\text{dB}$ ,  $k = 2$ .

**WCDMA Band V- ERP**

**Limits**

Band	Peak ERP (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> (dBi)	Correction (dB)	Peak ERP(dBm)	Polarization
826.4	-24.69	2.07	-53.00	0.85	2.15	23.24	Horizontal
836.6	-25.15	2.08	-53.00	0.90	2.15	22.72	Horizontal
846.6	-24.37	2.09	-53.00	0.94	2.15	<b>23.45</b>	Horizontal

Sample calculation: 846.6MHz

$$\begin{aligned} \text{Peak EIRP (dBm)} &= P_{\text{Mea}}(-24.37\text{dBm}) - G_a(0.94\text{dBi}) - P_{\text{Ag}}(-53.00\text{dB}) - P_{\text{cl}}(2.09\text{dB}) \\ &= 25.60 \text{ dBm} \end{aligned}$$

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

Note: Expanded measurement uncertainty for WCDMA Band V is  $U = 0.96 \text{ dB}$ ,  $k=2$ .

## A.2 EMISSION LIMIT

### Reference

FCC: CFR 2.1051, Part 22.917(a), 24.238(a).

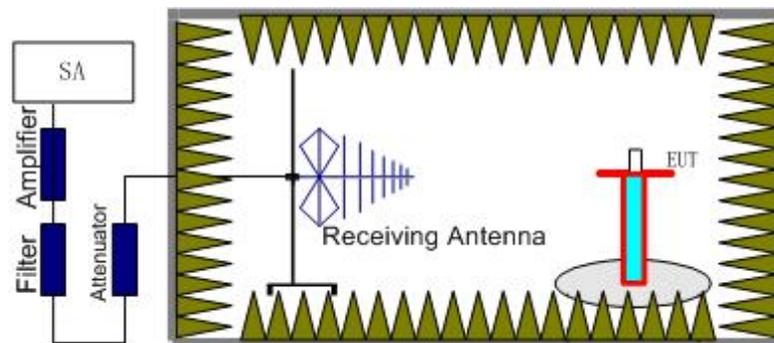
### A.2.1 Measurement Method

The measurements procedures in TIA-603C-2004 are used. This measurement is carried out in fully-anechoic chamber 3.

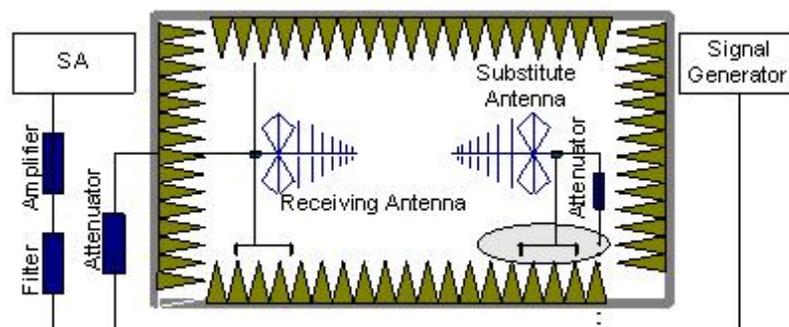
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set 1MHz as outlined in Part 22.917 and Part 24.238 . The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of WCDMA Band II, 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, a 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. Adjust the level of the signal generator output until the value of the receiver reaches 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.

An 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. This value is EIRP since the measurement is calibrated using an antenna of known gain (unit: dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15dB$ .

### A.2.2 Measurement Limit

Part 22.917(a), 24.238(a) specifies 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, 1880.0MHz and 1907.6MHz), WCDMA Band V (826.4MHz, 836.6MHz and 846.6MHz). 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, 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.

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

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>pl</sub> (dB)	G <sub>a</sub> (dBi)	Peak EIRP (dBm)	Limit (dBm)	Polarity
3703.02	-50.34	4.43	-8.14	-46.63	-13.00	Horizontal
4932.69	-58.65	5.13	-9.58	-54.20	-13.00	Horizontal
6841.35	-56.43	6.17	-10.94	-51.66	-13.00	Vertical
8575.52	-58.48	7.18	-12.26	-53.40	-13.00	Vertical
9794.23	-56.72	7.74	-12.48	-51.98	-13.00	Horizontal
13741.53	-52.50	9.07	-13.90	-47.67	-13.00	Horizontal

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

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>pl</sub> (dB)	G <sub>a</sub> (dBi)	Peak EIRP (dBm)	Limit (dBm)	Polarity
5005.22	-46.20	5.17	-9.70	-41.67	-13.00	Horizontal
6634.30	-59.03	6.08	-10.73	-54.38	-13.00	Horizontal
8183.55	-58.64	6.83	-12.01	-53.46	-13.00	Horizontal
11833.23	-54.41	8.73	-12.47	-50.67	-13.00	Horizontal
13574.99	-49.97	9.22	-13.83	-45.36	-13.00	Vertical
13592.09	-51.42	9.21	-13.84	-46.79	-13.00	Horizontal

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

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>pl</sub> (dB)	G <sub>a</sub> (dBi)	Peak EIRP (dBm)	Limit (dBm)	Polarity
3817.59	-51.69	4.49	-8.28	-47.90	-13.00	Horizontal
5848.62	-56.17	5.71	-10.14	-51.74	-13.00	Vertical
8368.40	-60.22	7.34	-12.12	-55.44	-13.00	Vertical
10612.76	-55.99	8.38	-12.48	-51.89	-13.00	Vertical
12895.81	-53.04	8.63	-13.17	-48.50	-13.00	Vertical
14001.76	-51.23	9.27	-14.00	-46.50	-13.00	Vertical

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

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Polarization
1685.41	-62.35	2.96	-5.28	2.15	-62.18	-13.00	Vertical
2842.51	-54.75	3.84	-6.29	2.15	-54.45	-13.00	Vertical
3310.25	-49.30	4.15	-7.44	2.15	-48.16	-13.00	Vertical
4125.49	-52.28	4.68	-8.58	2.15	-50.53	-13.00	Horizontal
4968.91	-51.01	5.11	-9.64	2.15	-48.63	-13.00	Vertical
5772.11	-49.67	5.68	-10.11	2.15	-47.39	-13.00	Vertical

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

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Polarization
1675.81	-51.18	2.97	-5.33	2.15	-50.97	-13.00	Horizontal
2507.86	-52.53	3.59	-5.42	2.15	-52.85	-13.00	Vertical
3340.54	-53.90	4.20	-7.52	2.15	-52.73	-13.00	Vertical
4174.76	-53.47	4.70	-8.60	2.15	-51.72	-13.00	Horizontal
5019.27	-50.68	5.16	-9.71	2.15	-48.28	-13.00	Horizontal
5864.80	-49.01	5.64	-10.15	2.15	-46.65	-13.00	Vertical

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

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Polarization
1690.78	-50.83	2.95	-5.26	2.15	-50.67	-13.00	Horizontal
2542.16	-52.74	3.62	-5.51	2.15	-53.00	-13.00	Vertical
3392.13	-51.89	4.23	-7.64	2.15	-50.63	-13.00	Horizontal
4227.78	-52.83	4.68	-8.64	2.15	-51.02	-13.00	Vertical
5078.77	-51.18	5.20	-9.75	2.15	-48.78	-13.00	Vertical
5919.12	-49.80	5.57	-10.17	2.15	-47.35	-13.00	Horizontal

Note: Expanded measurement uncertainty for this test item is  $U = 4.2$  dB,  $k = 2$ .

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

#### **Reference**

FCC: CFR Part 15.107/207

The measurement procedure in ANSI C63.4-2009 is used. Conducted Emission is measured with travel charger. The EUT is working under WCDMA 850/1900MHz traffic mode which is the worst case of conducted emission measurement.

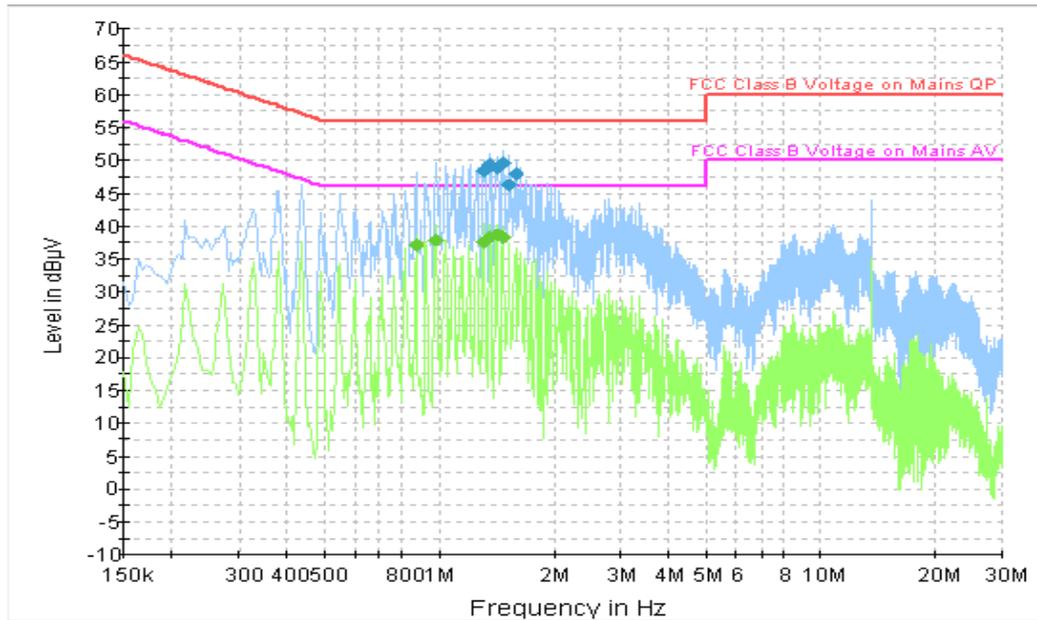
For test layout photo, please refer to Pic.2 in Annex B.

#### **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**



IF bandwidth 9 kHz

Note: The graphic result above is the maximum of the measurements for both phase line and neutral line.

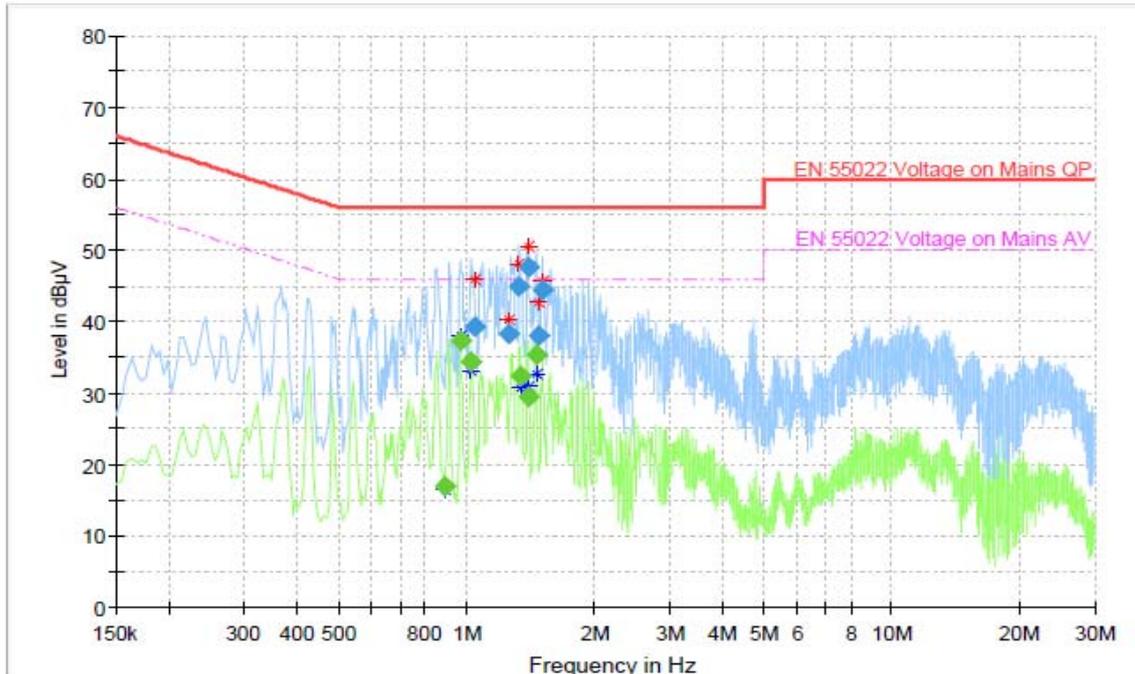
**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
1.311000	48.4	GND	L1	9.7	7.6	56.0
1.365000	49.4	GND	L1	9.7	6.6	56.0
1.419000	48.8	GND	L1	9.7	7.2	56.0
1.477500	49.7	GND	L1	9.7	6.3	56.0
1.527000	46.3	GND	L1	9.7	9.7	56.0
1.585500	47.9	GND	L1	9.7	8.1	56.0

**Final Result 2**

Frequency (MHz)	Average (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.874500	37.2	GND	L1	9.7	8.8	46.0
0.982500	37.9	GND	L1	9.7	8.1	46.0
1.306500	37.5	GND	L1	9.7	8.5	46.0
1.365000	38.2	GND	L1	9.7	7.8	46.0
1.419000	38.6	GND	L1	9.7	7.4	46.0
1.477500	38.2	GND	L1	9.7	7.8	46.0

**WCDMA Band V**



IF bandwidth 9 kHz

Note: The graphic result above is the maximum of the measurements for both phase line and neutral line.

 =PK value in pre-measurement

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
1.042788	39.4	GND	L1	10.1	16.6	56.0
1.263173	38.2	GND	L1	10.1	17.8	56.0
1.333644	45.0	GND	L1	10.1	11.0	56.0
1.394596	47.6	GND	L1	10.1	8.4	56.0
1.471154	38.0	GND	L1	10.1	18.0	56.0
1.502971	44.5	GND	L1	10.1	11.5	56.0

**Final Result 2**

Frequency (MHz)	Average (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.886558	17.0	GND	L1	10.1	29.0	46.0
0.968856	37.3	GND	L1	10.1	8.7	46.0
1.028365	34.4	GND	L1	10.1	11.6	46.0
1.347519	32.3	GND	L1	10.1	13.7	46.0
1.405442	29.4	GND	L1	10.1	16.6	46.0
1.456442	35.3	GND	L1	10.1	10.7	46.0

Note: The maximum value of expanded measurement uncertainty for this test item is  $U = 2.9$  dB,  $k=2$ .

## **A.4 FREQUENCY STABILITY**

### **Reference**

FCC: CFR Part 2.1055, 22.355, 24.235.

### **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 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 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 1.5 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**

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. 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 3.6VDC and 4.2VDC, with a nominal voltage of 3.8VDC. 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 from -5.4% to 10.8%. For the purposes of measuring frequency stability these voltage limits are to be used.

### A.4.3 Measurement results

#### WCDMA Band II

Room Temperature: 24 °C

#### Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)	Frequency error (ppm)
3.6	7	0.004
4.2	9	0.005
3.8	6	0.003

#### Frequency Error vs Temperature

Temperature (°C)	Frequency error (Hz)	Frequency error (ppm)
50°	6	0.003
40°	10	0.005
30°	6	0.003
20°	10	0.005
10°	7	0.004
0°	7	0.004
- 10°	10	0.005
- 20°	7	0.004
- 30°	6	0.003

#### WCDMA Band V

Room Temperature: 24°C

#### Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)	Frequency error (ppm)
3.6	-2	0.002
4.2	-2	0.002
3.8	0	0.000

#### Frequency Error vs Temperature

Temperature (°C)	Frequency error (Hz)	Frequency error (ppm)
50°	13	0.015
40°	10	0.012
30°	6	0.007
20°	4	0.005
10°	0	0.000
0°	0	0.000
- 10°	2	0.002
- 20°	5	0.006
- 30°	10	0.012

Expanded measurement uncertainty for this test item is 10 Hz,  $k = 2$ .

## A.5 OCCUPIED BANDWIDTH

### Reference

FCC: CFR Part 2.1049(h)(i)

### A.5.1 Occupied Bandwidth Results

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, WCDMA Band V. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the following pages.

#### Measurement Parameters:

RBW = 50 kHz, VBW = 100 kHz

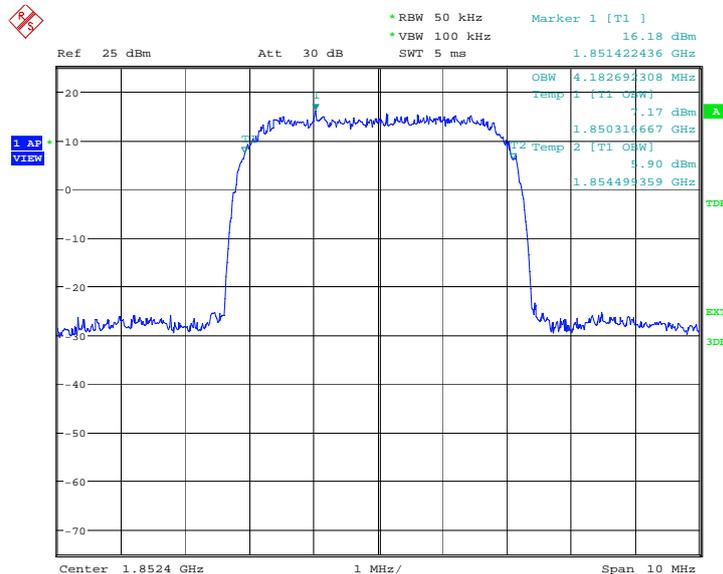
WCDMA Band II (99% BW) per FCC rules

Frequency(MHz)	Occupied Bandwidth (99% BW)( MHz)
1852.4	4.183
1880.0	4.183
1907.6	4.183

Expanded measurement uncertainty for this test item is 1.1 kHz, k=2

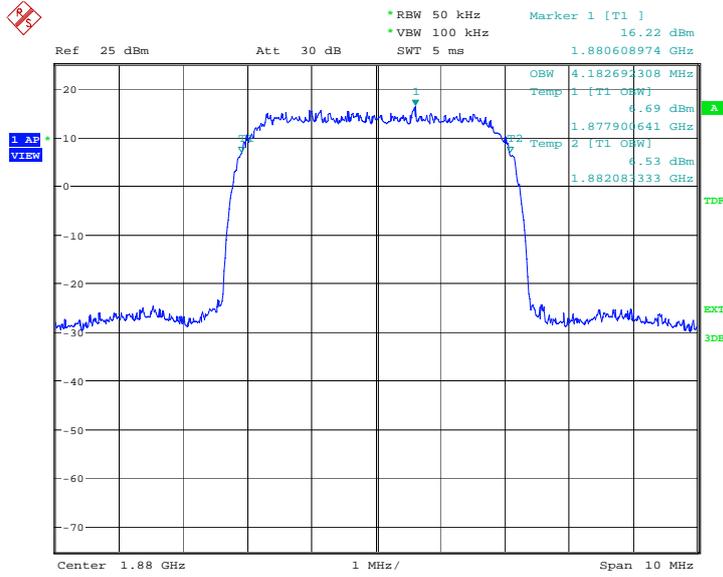
### WCDMA Band II

#### Channel 9262-Occupied Bandwidth (99% BW)



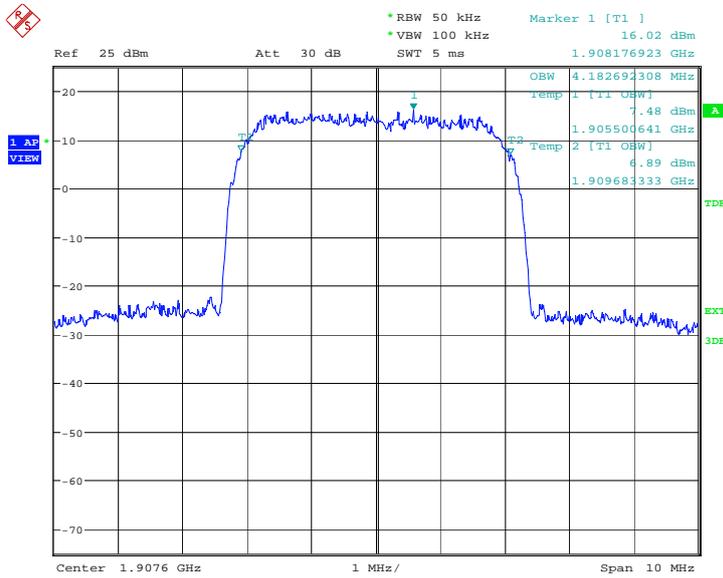
Date: 10.JUN.2014 13:24:25

### Channel 9400-Occupied Bandwidth (99% BW)



Date: 10.JUN.2014 13:25:00

### Channel 9538-Occupied Bandwidth (99% BW)



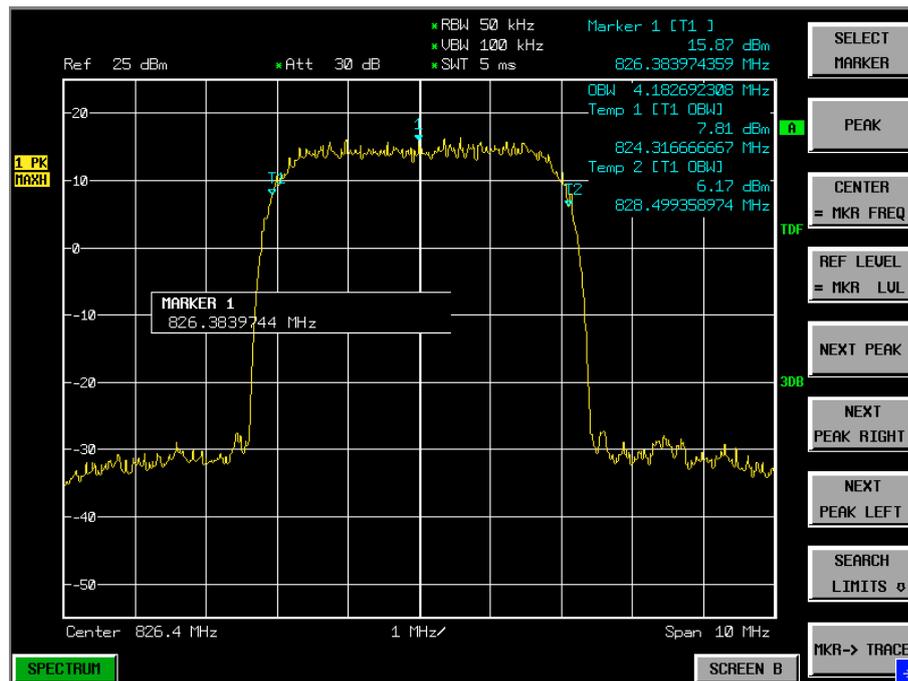
Date: 10.JUN.2014 13:25:34

**WCDMA Band V (99% BW) per FCC rules**

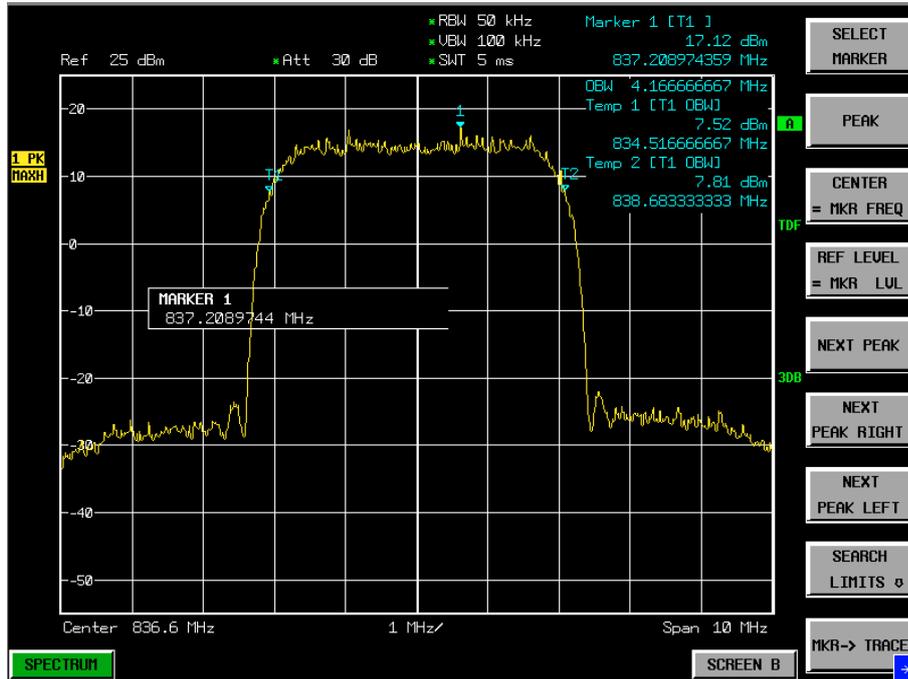
Frequency(MHz)	Occupied Bandwidth (99% BW)( MHz)
826.4	4.182
836.6	4.166
846.6	4.198

**WCDMA Band V**

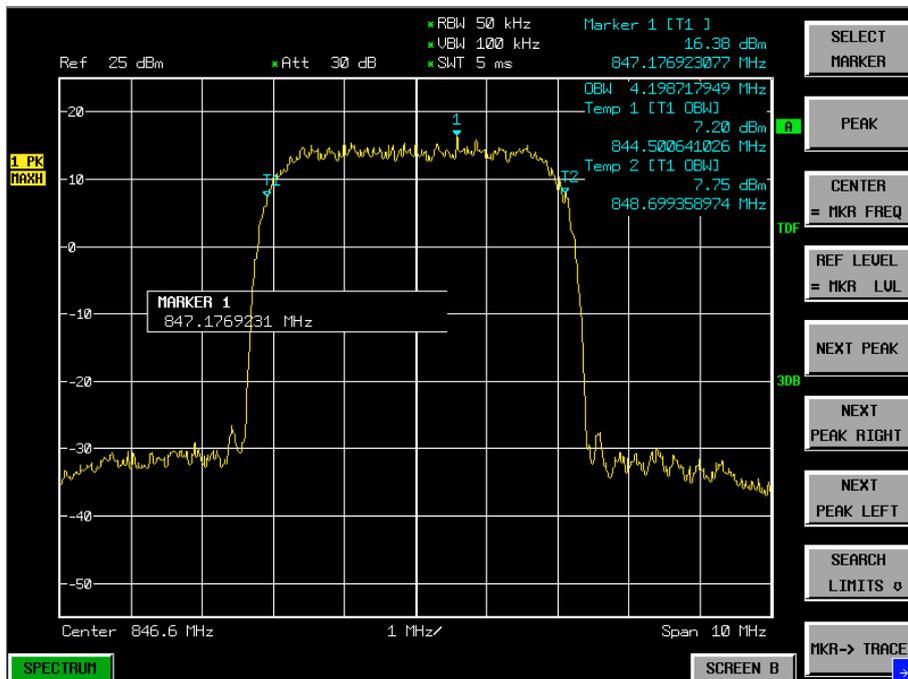
**Channel 4132-Occupied Bandwidth (99% BW)**



**Channel 4183-Occupied Bandwidth (99% BW)**



**Channel 4233-Occupied Bandwidth (99% BW)**



## A.6 EMISSION BANDWIDTH

### Reference

FCC: CFR Part 22.917(b), 24.238(a).

### A.6.1 Emission Bandwidth Results

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, WCDMA Band V. Table below lists the measured 100% BW. Spectrum analyzer plots are included on the following pages.

#### Measurement Parameters:

RBW = 50 kHz, VBW = 100 kHz

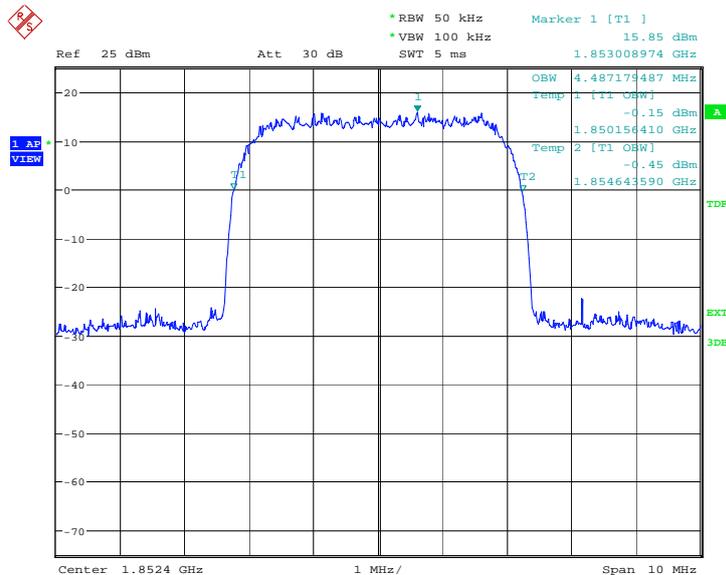
#### WCDMA Band II (100% BW)

Frequency(MHz)	Occupied Bandwidth (100% BW)( MHz)
1852.4	4.487
1880.0	4.471
1907.6	4.487

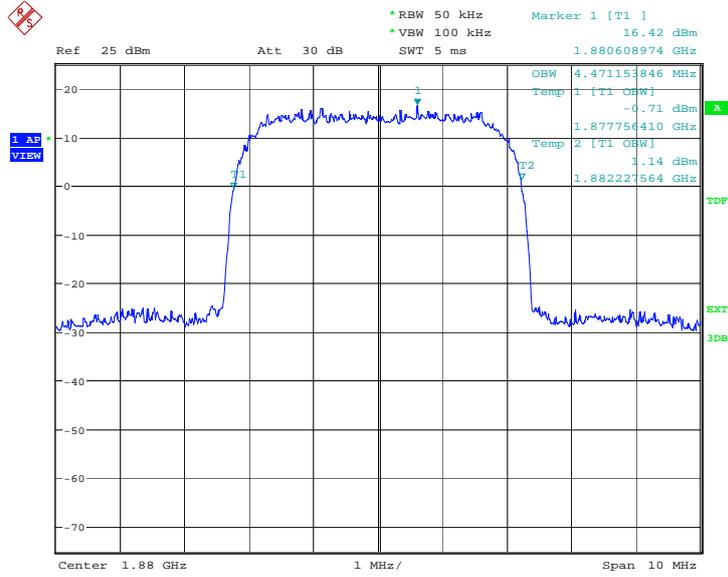
Expanded measurement uncertainty for this test item is 1.1 kHz, k=2.

#### WCDMA Band II

#### Channel 9262-Occupied Bandwidth (100% BW)

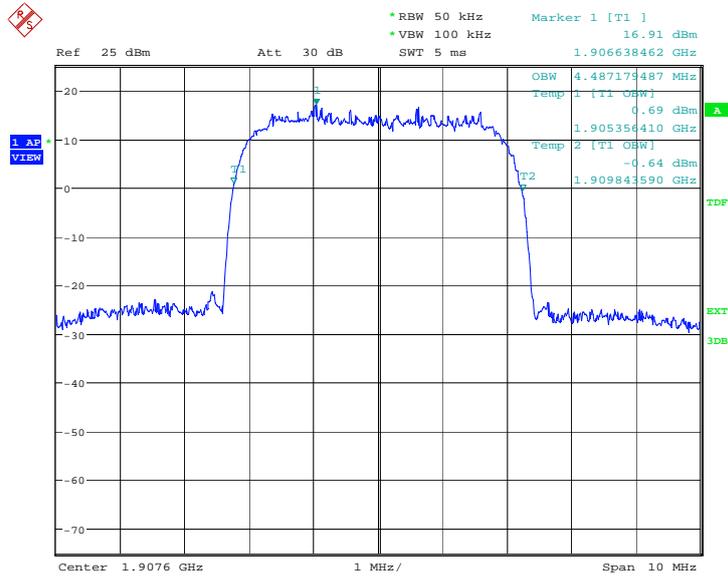


### Channel 9400-Occupied Bandwidth (100% BW)



Date: 10.JUN.2014 13:26:45

### Channel 9538-Occupied Bandwidth (100% BW)



Date: 10.JUN.2014 13:27:19

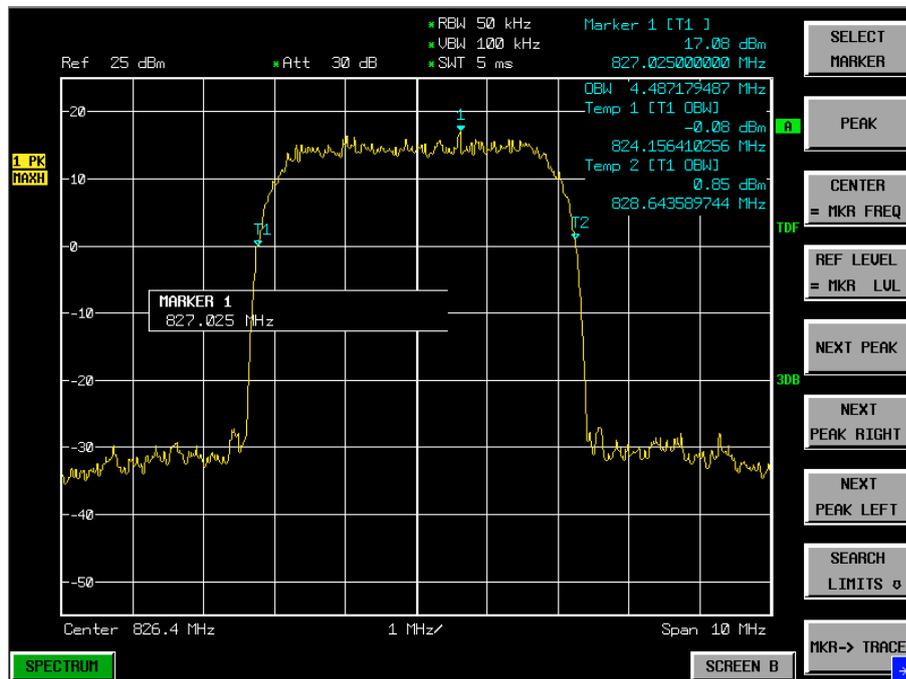
**WCDMA Band V (100% BW)**

Frequency(MHz)	Occupied Bandwidth (100% BW)( MHz)
826.40	4.487
836.60	4.487
846.60	4.503

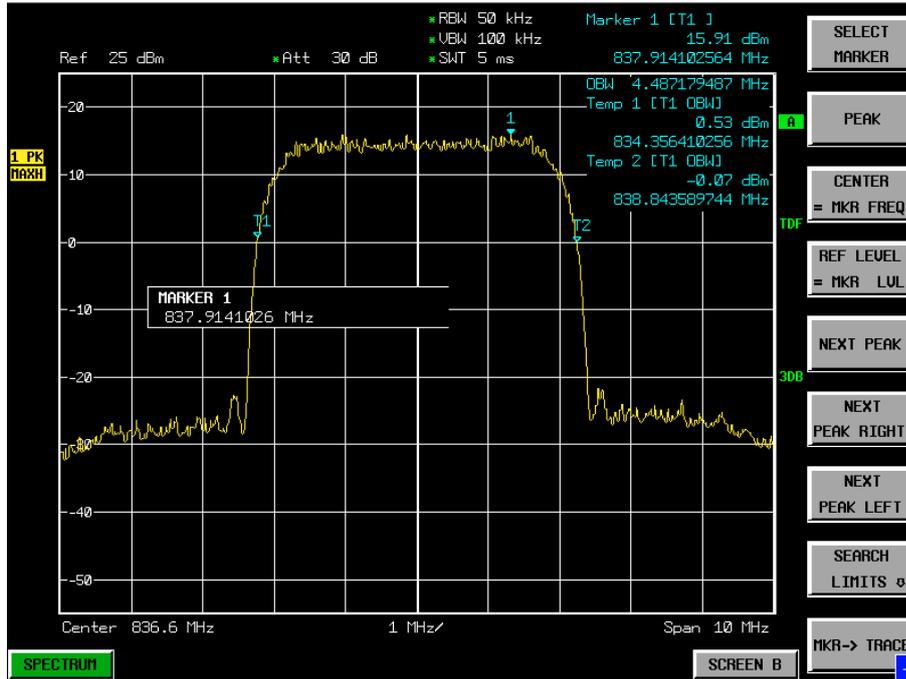
Expanded measurement uncertainty for this test item is 1.1 kHz, k=2.

**WCDMA Band V**

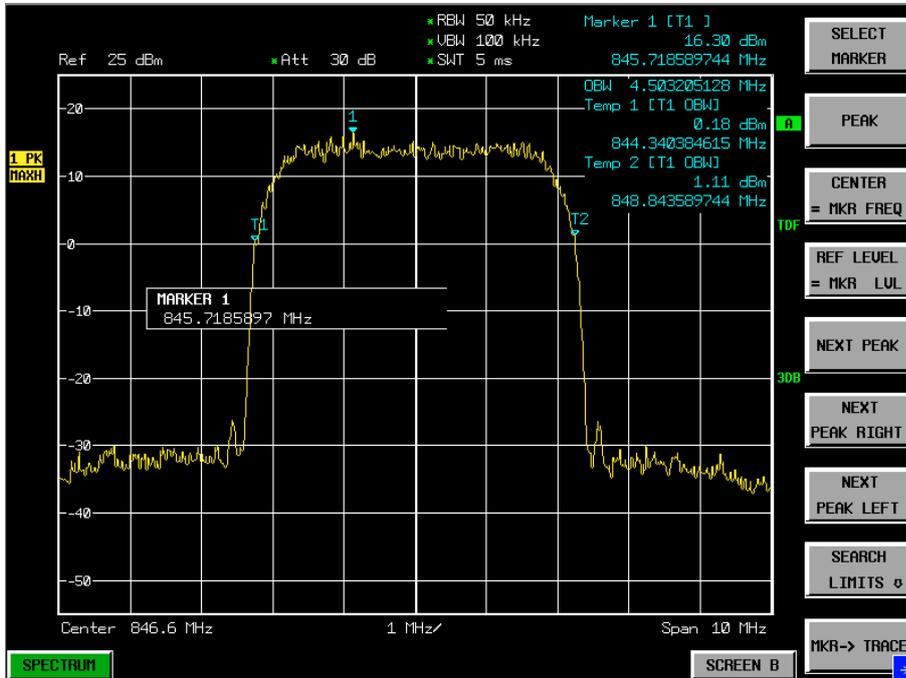
**Channel 4132-Occupied Bandwidth (100% BW)**



Channel 4183-Occupied Bandwidth (100% BW)



Channel 4233-Occupied Bandwidth (100% BW)



## A.7 BAND EDGE COMPLIANCE

### Reference

FCC: CFR Part 22.917(b), 24.238(a).

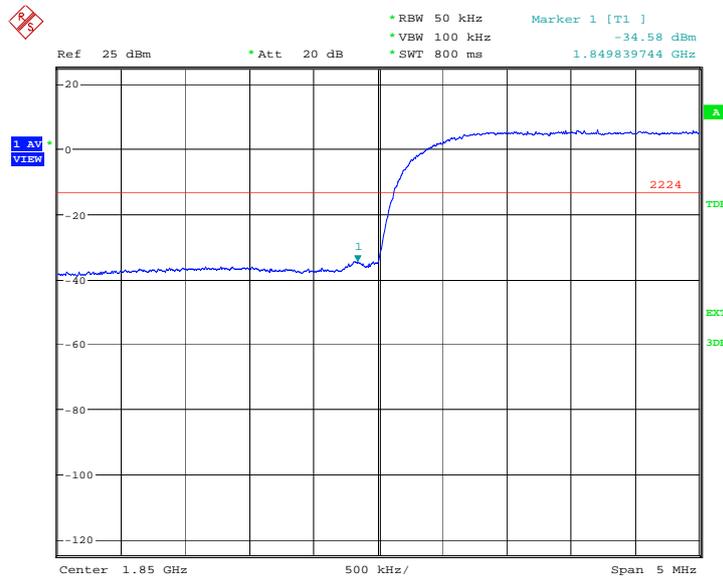
#### A.7.1 Measurement limit

On any frequency outside frequency band of the US Cellular spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least  $43 + 10 \log(P)$  dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

#### A.7.2 Measurement result

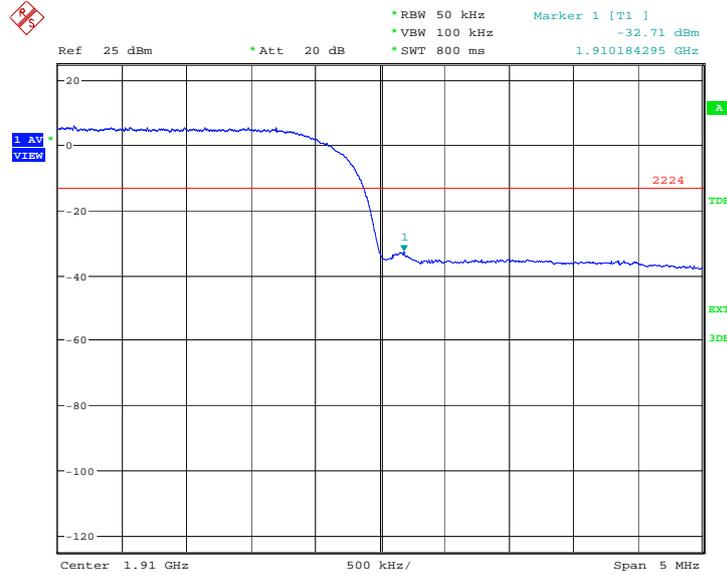
##### WCDMA Band II

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



Date: 10.JUN.2014 13:27:36

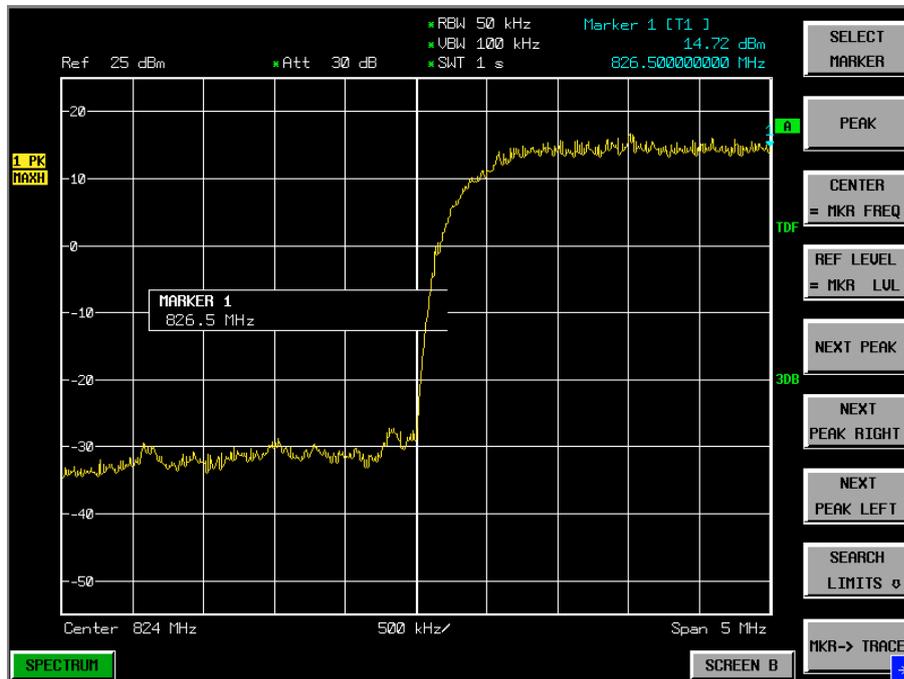
### HIGH BAND EDGE BLOCK-C (WCDMA Band II) –Channel 9538



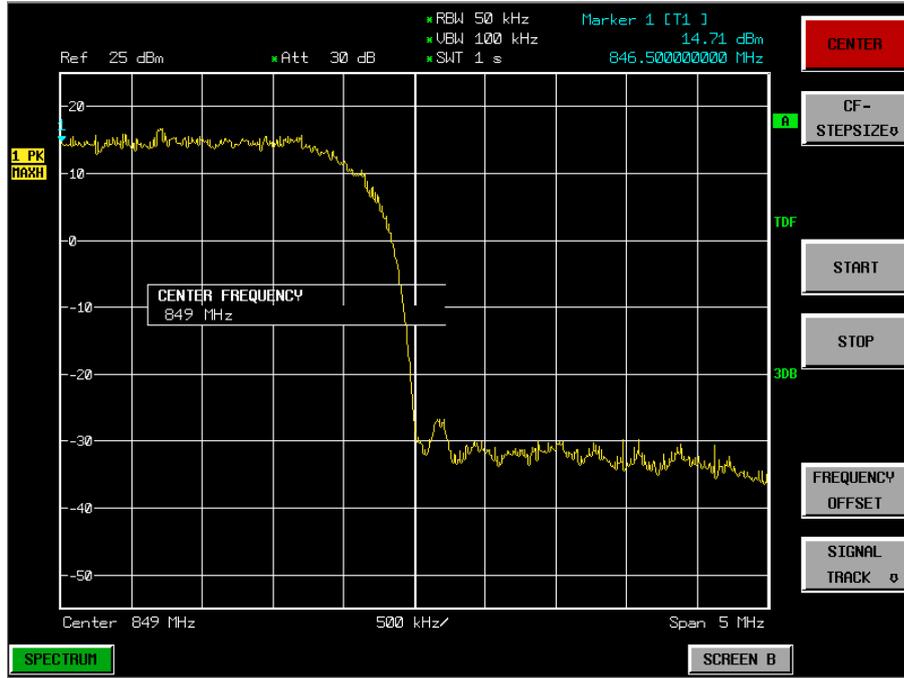
Date: 10.JUN.2014 13:27:52

### WCDMA Band V

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



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



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

### **Reference**

FCC: CFR Part 2.1057, 22.917, 24.238(a).

### **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 WCDMA Band II, this equates to a frequency range of 30 MHz to 19.1 GHz, data are taken from 30 MHz to 20 GHz. For WCDMA Band V, data are taken from 30 MHz to 10 GHz.
2. 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 22.917 and Part 24.238 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.

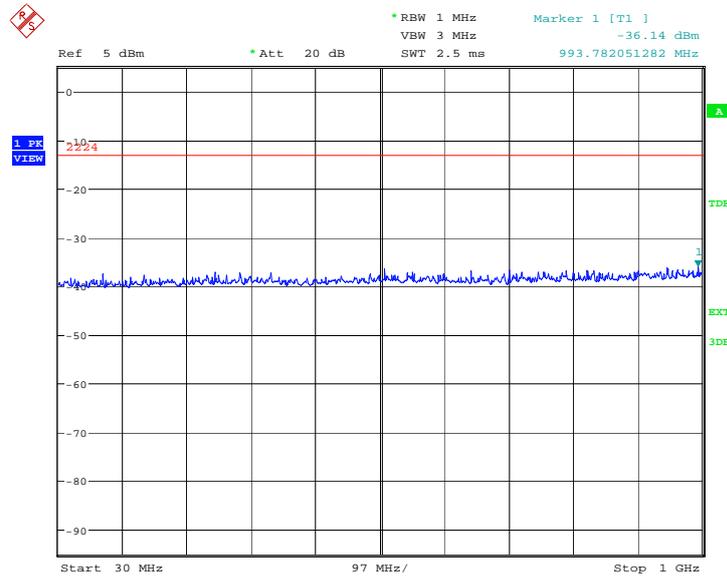
### **A. 8.3 Measurement result**

Measurement Uncertainty: 0.3dB

**WCDMA Band II**

**A.8.3.1 Channel 9262: 30MHz –1GHz**

Spurious emission limit –13dBm.

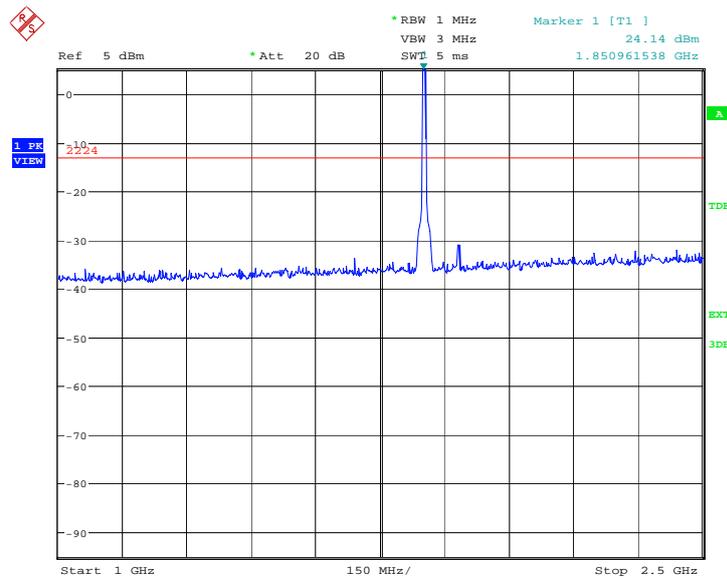


Date: 10.JUN.2014 13:30:16

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

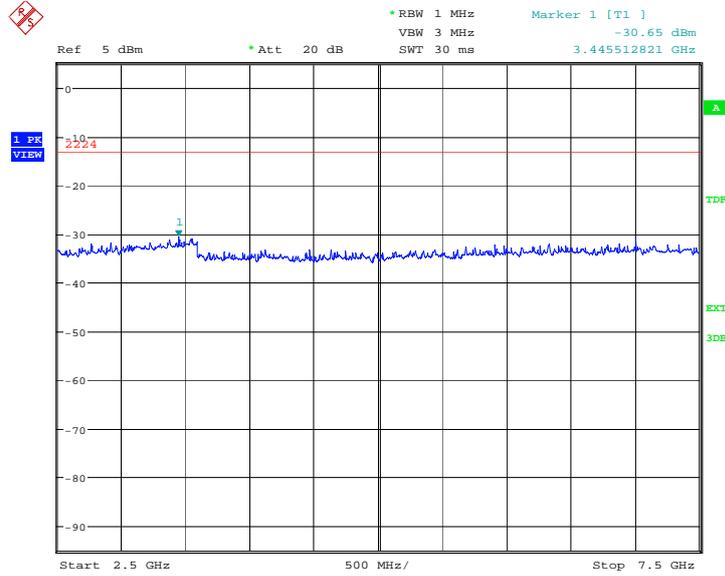
Spurious emission limit –13dBm.

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



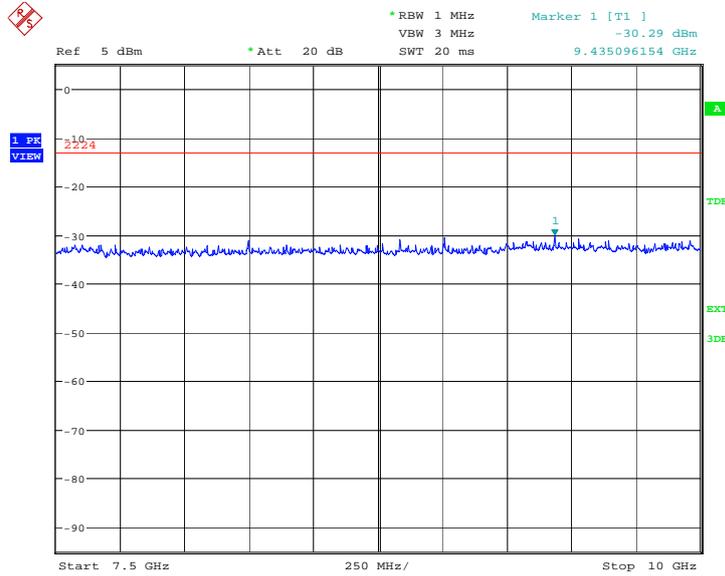
Date: 10.JUN.2014 13:30:45

**A.8.3.3 Channel 9262: 2.5GHz –7.5GHz**  
Spurious emission limit –13dBm.



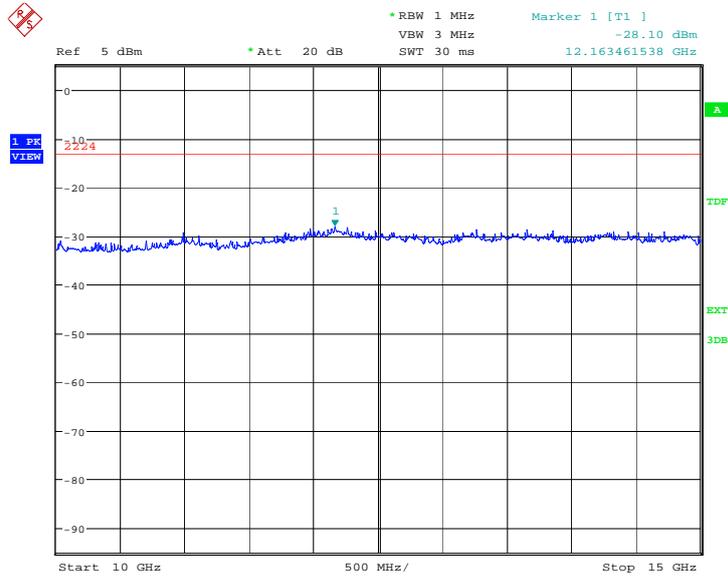
Date: 10.JUN.2014 13:31:13

**A.8.3.4 Channel 9262: 7.5GHz –10GHz**  
Spurious emission limit –13dBm.



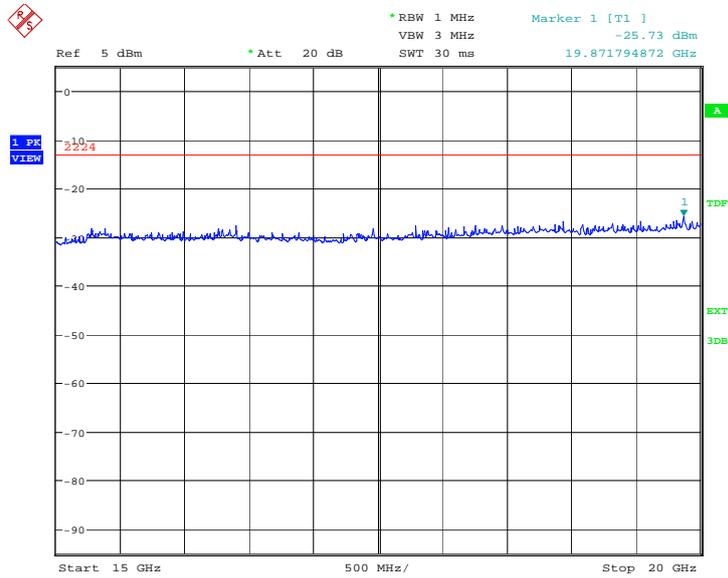
Date: 10.JUN.2014 13:31:41

**A.8.3.5 Channel 9262: 10GHz –15GHz**  
Spurious emission limit –13dBm.



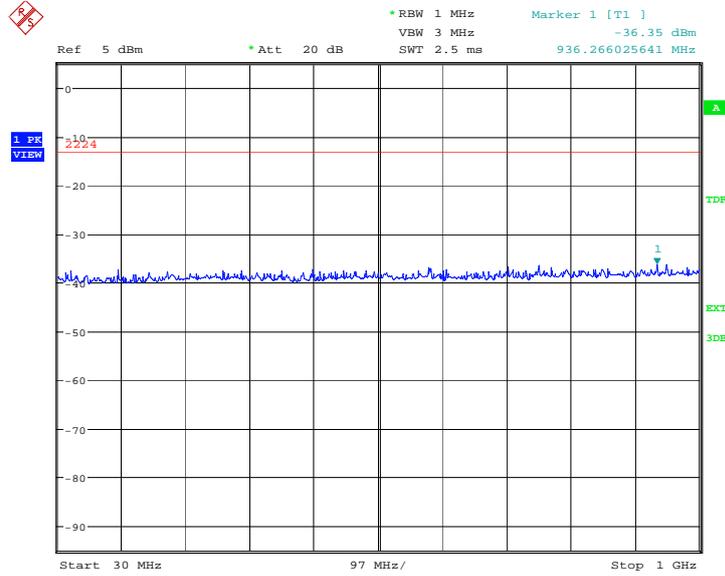
Date: 10.JUN.2014 13:32:09

**A.8.3.6 Channel 9262: 15GHz –20GHz**  
Spurious emission limit –13dBm.



Date: 10.JUN.2014 13:32:37

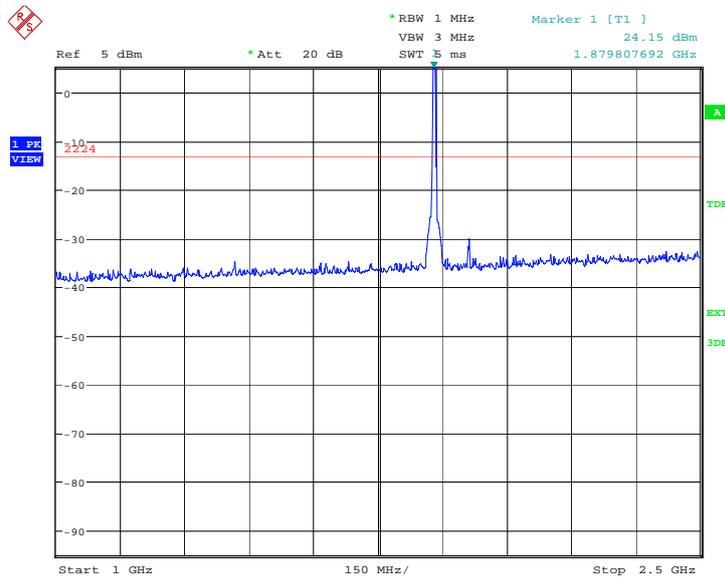
**A.8.3.7 Channel 9400: 30MHz –1GHz**  
Spurious emission limit –13dBm.



Date: 10.JUN.2014 13:33:08

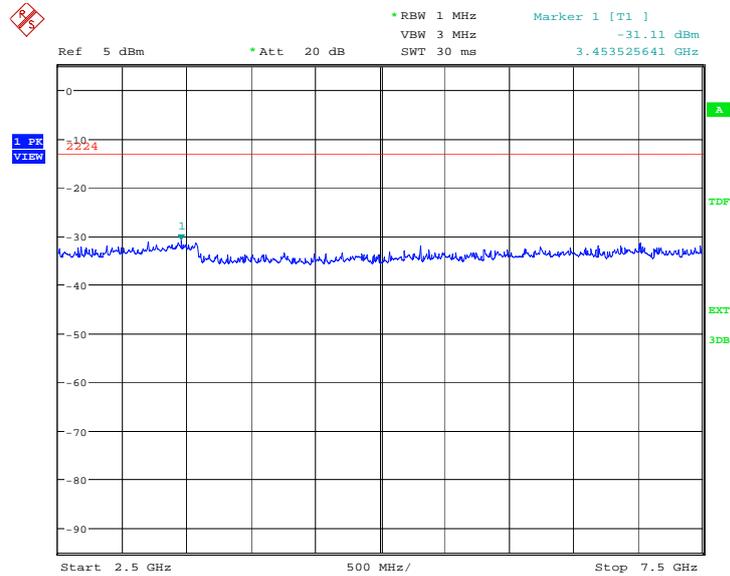
**A.8.3.8 Channel 9400: 1GHz –2.5GHz**  
Spurious emission limit –13dBm.

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



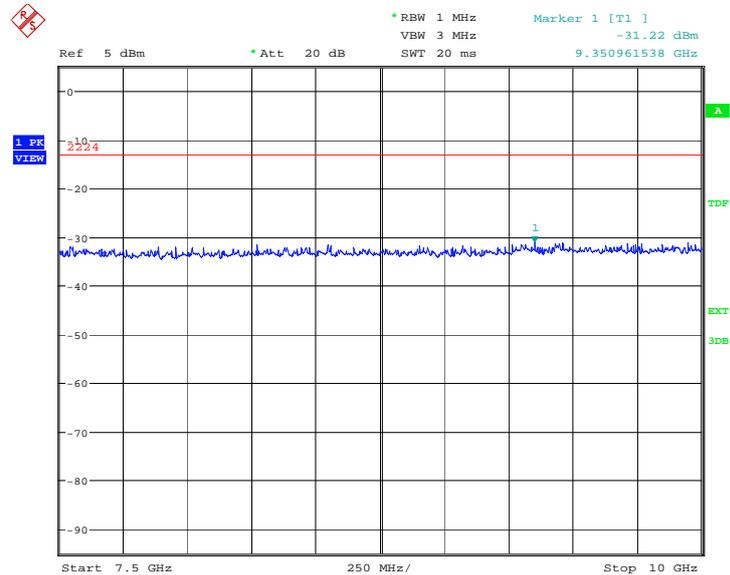
Date: 10.JUN.2014 13:33:36

**A.8.3.9 Channel 9400: 2.5GHz –7.5GHz**  
Spurious emission limit –13dBm.



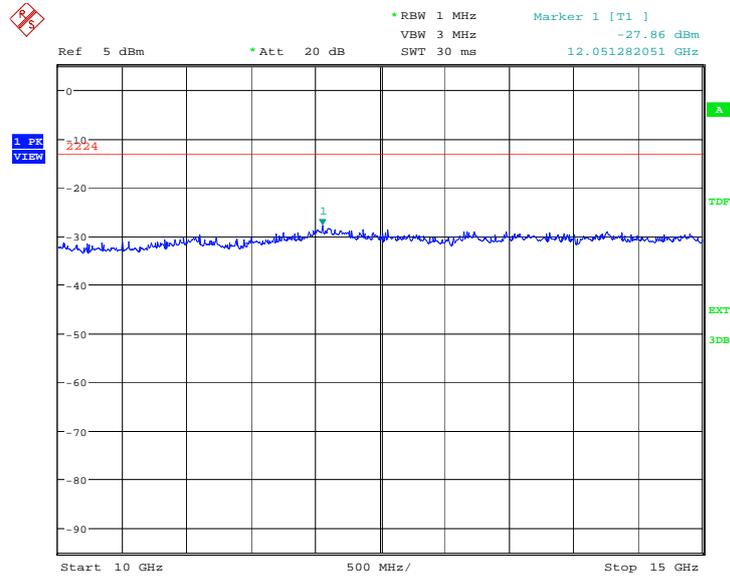
Date: 10.JUN.2014 13:34:04

**A.8.3.10 Channel 9400: 7.5GHz –10GHz**  
Spurious emission limit –13dBm.



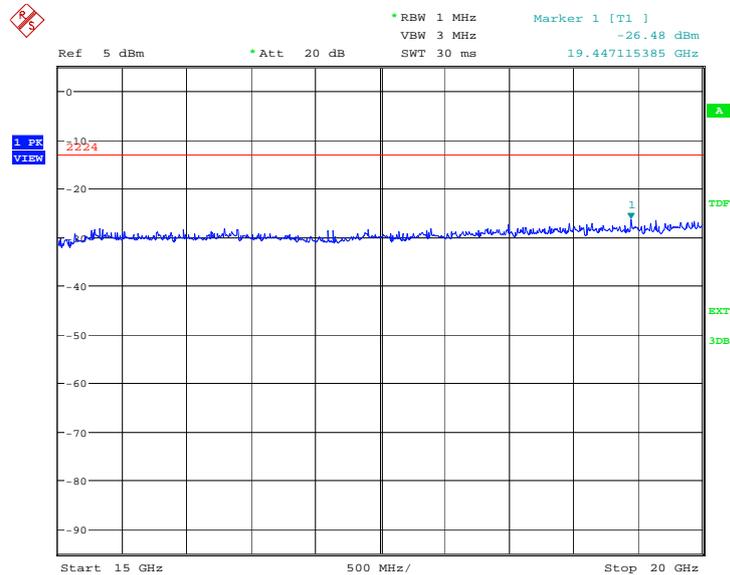
Date: 10.JUN.2014 13:34:33

**A.8.3.11 Channel 9400: 10GHz –15GHz**  
Spurious emission limit –13dBm.



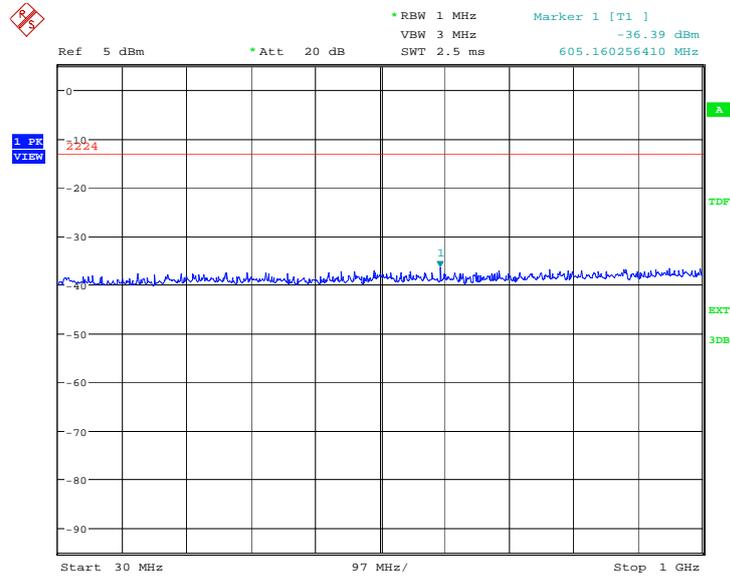
Date: 10.JUN.2014 13:35:01

**A.8.3.12 Channel 9400: 15GHz –20GHz**  
Spurious emission limit –13dBm.



Date: 10.JUN.2014 13:35:29

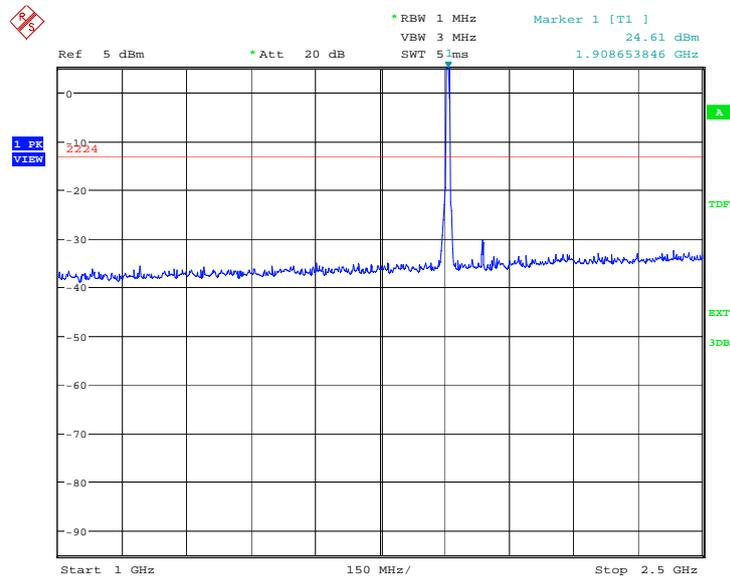
**A.8.3.13 Channel 9538: 30MHz –1GHz**  
Spurious emission limit –13dBm.



Date: 10.JUN.2014 13:36:00

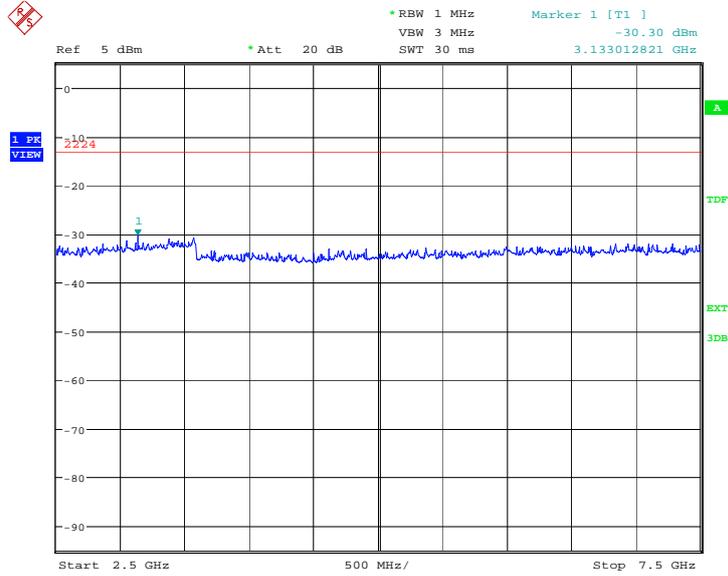
**A.8.3.14 Channel 9538: 1GHz –2.5GHz**  
Spurious emission limit –13dBm.

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



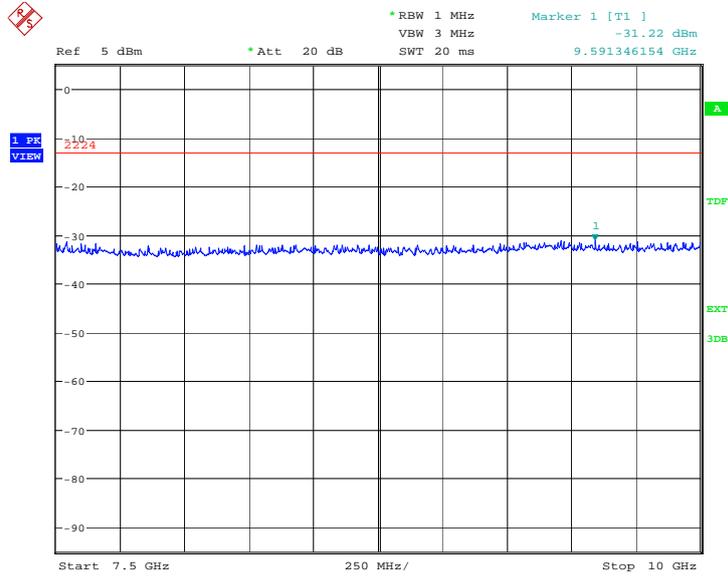
Date: 10.JUN.2014 13:36:28

**A.8.3.15 Channel 9538: 2.5GHz –7.5GHz**  
Spurious emission limit –13dBm.



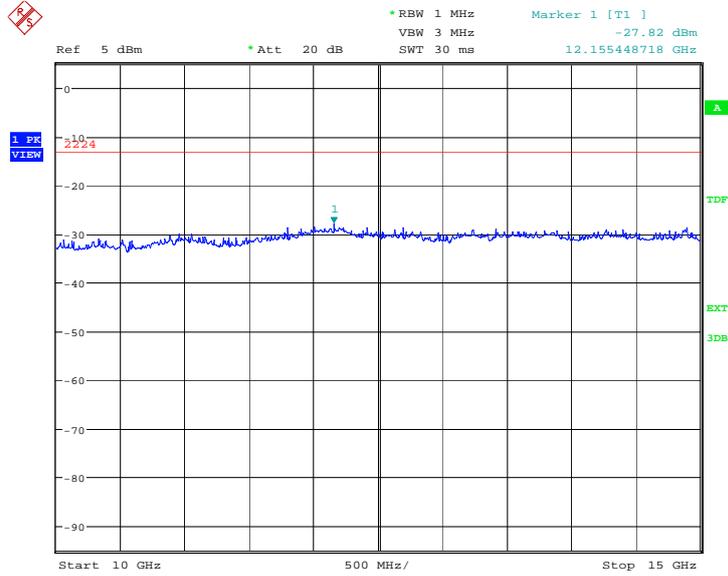
Date: 10.JUN.2014 13:36:56

**A.8.3.16 Channel 9538: 7.5GHz –10GHz**  
Spurious emission limit –13dBm.



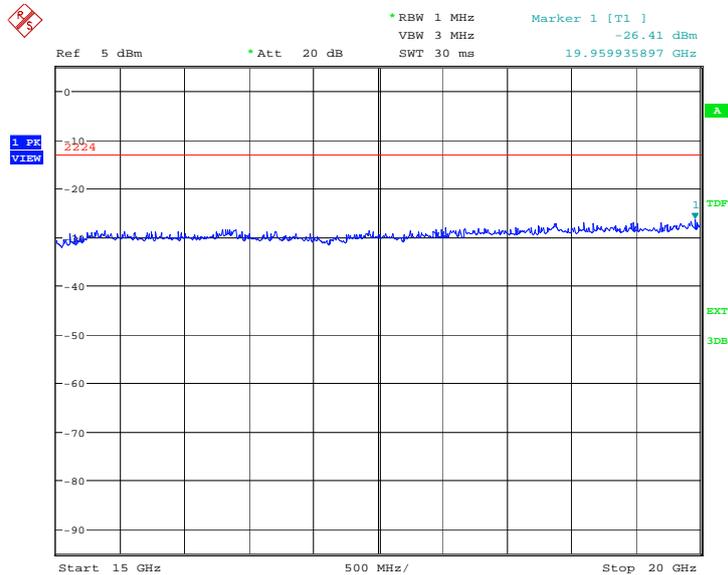
Date: 10.JUN.2014 13:37:25

**A.8.3.17 Channel 9538: 10GHz –15GHz**  
Spurious emission limit –13dBm.



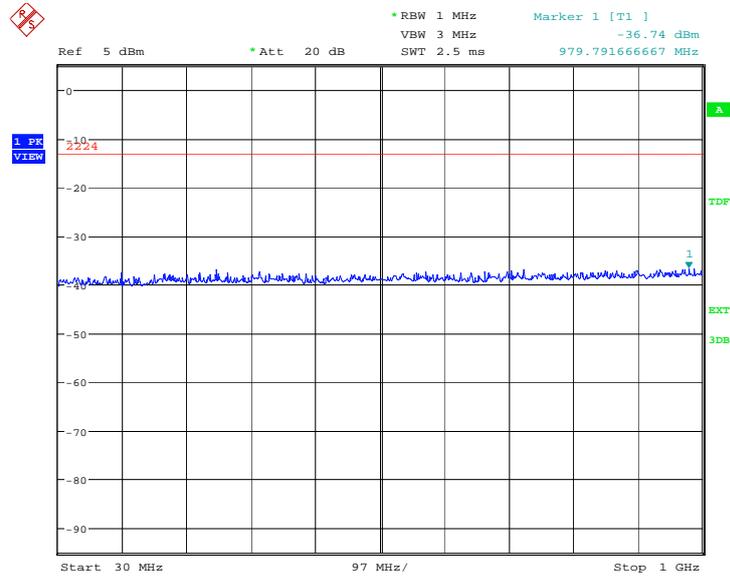
Date: 10.JUN.2014 13:37:53

**A.8.3.18 Channel 9538: 15GHz –20GHz**  
Spurious emission limit –13dBm.



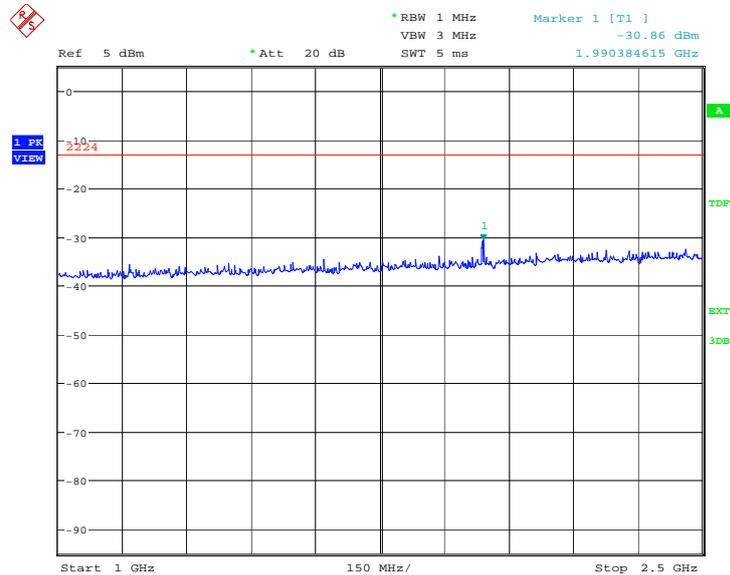
Date: 10.JUN.2014 13:38:21

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



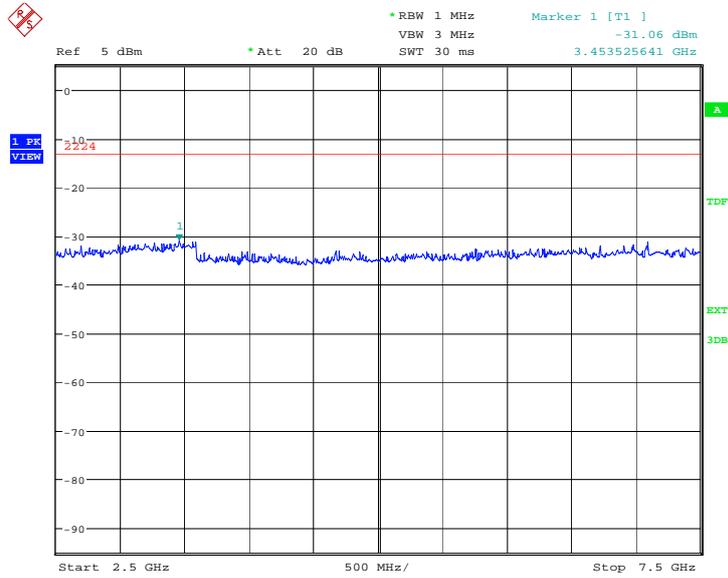
Date: 10.JUN.2014 13:38:50

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



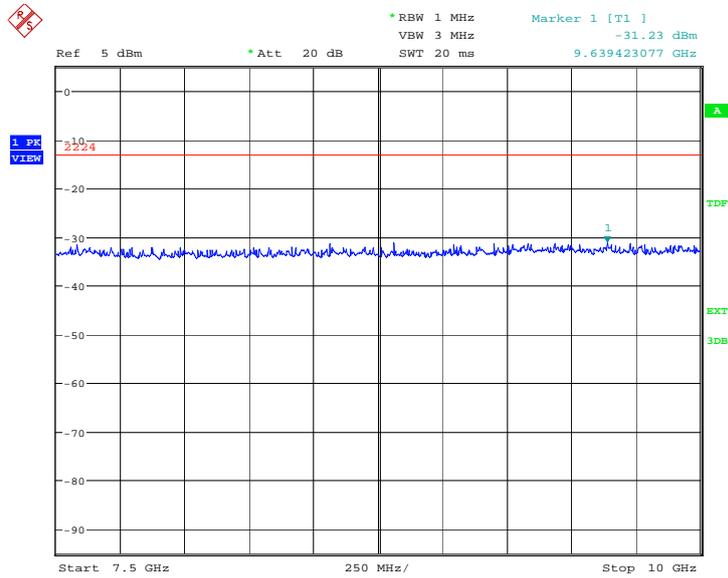
Date: 10.JUN.2014 13:39:18

**A.8.3.21 Idle mode: 2.5GHz –7.5GHz**  
Spurious emission limit –13dBm.



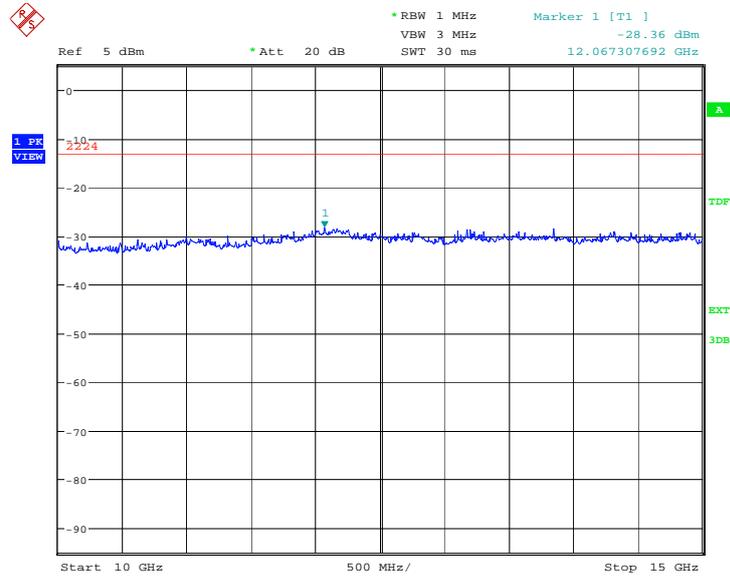
Date: 10.JUN.2014 13:39:46

**A.8.3.22 Idle mode: 7.5GHz –10GHz**  
Spurious emission limit –13dBm.



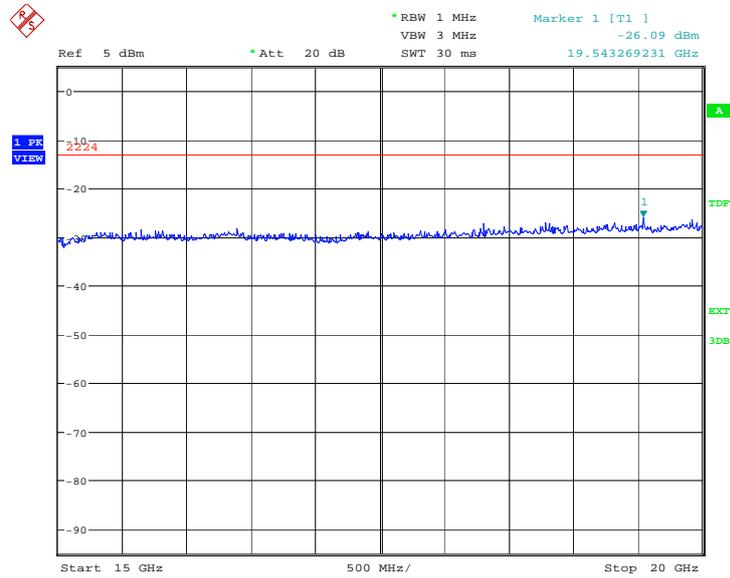
Date: 10.JUN.2014 13:40:14

**A.8.3.23 Idle mode: 10GHz –15GHz**  
Spurious emission limit –13dBm.



Date: 10.JUN.2014 13:40:43

**A.8.3.24 Idle mode: 15GHz –20GHz**  
Spurious emission limit –13dBm.



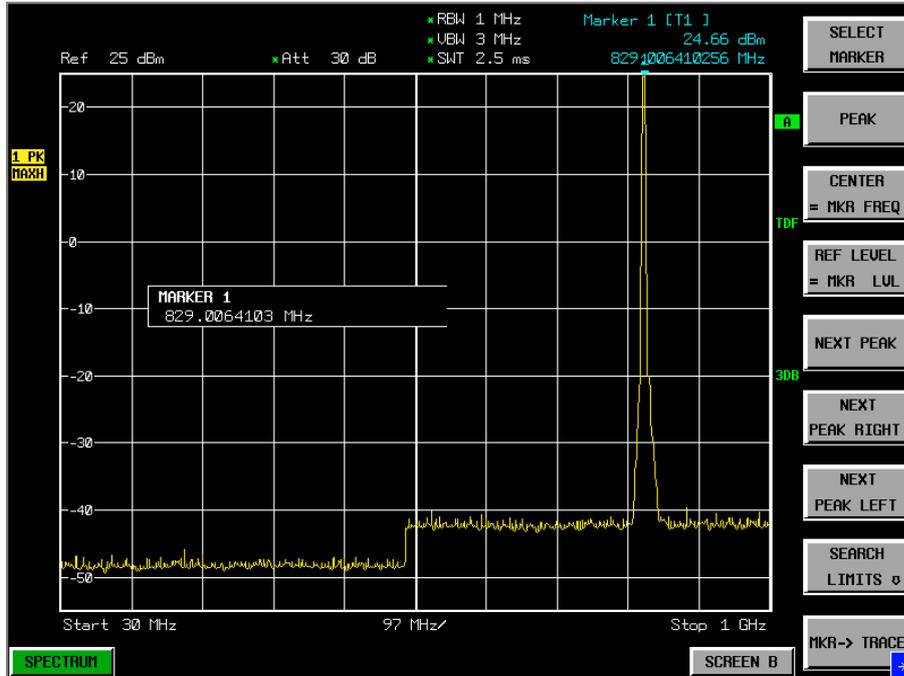
Date: 10.JUN.2014 13:41:11

WCDMA Band V

A.8.3.25 Channel 4132: 30MHz –1GHz

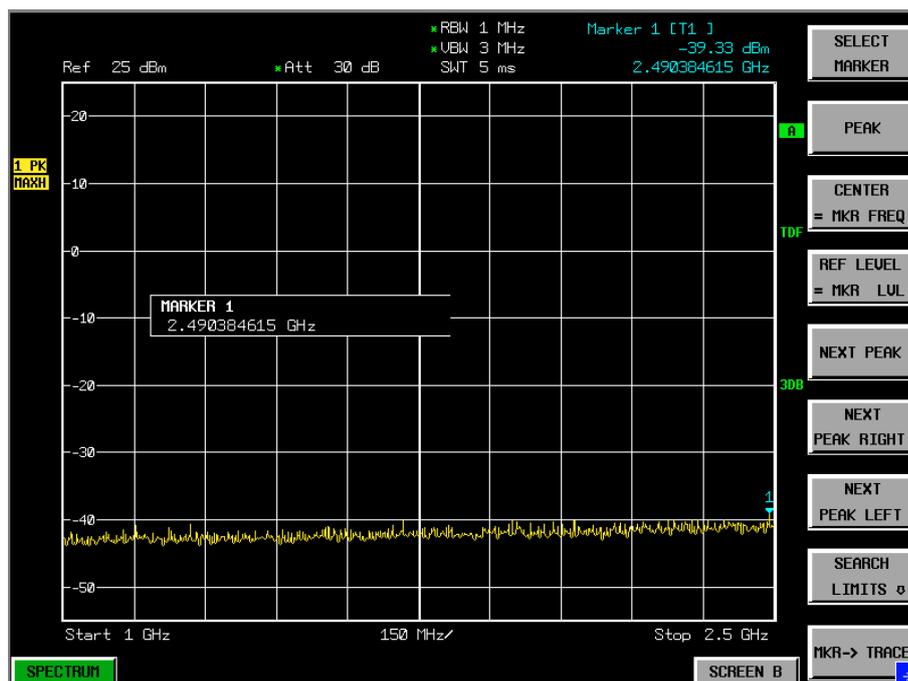
Spurious emission limit –13dBm.

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



A.8.3.26 Channel 4132: 1GHz – 2.5GHz

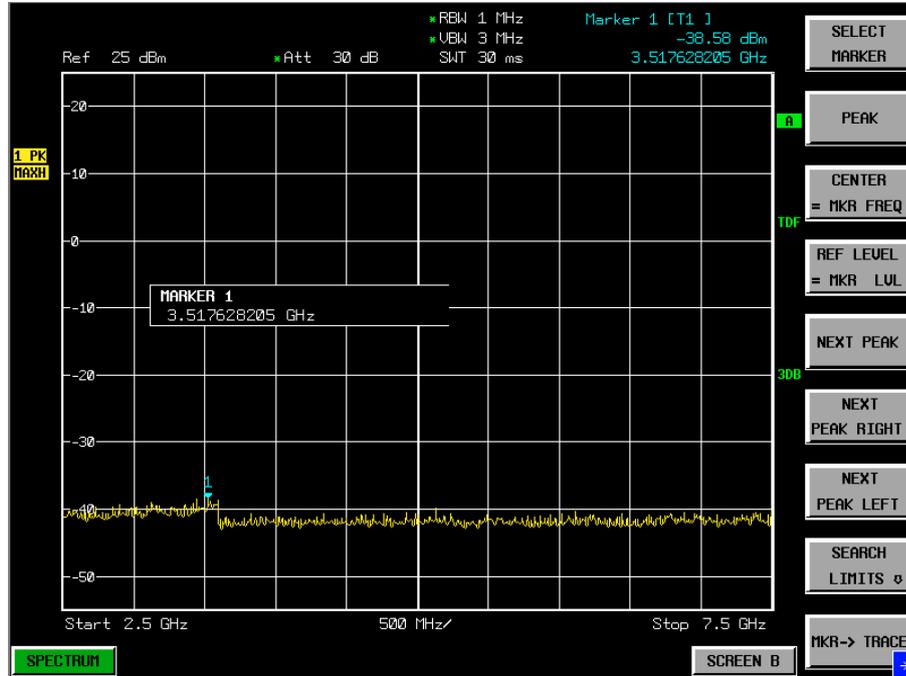
Spurious emission limit –13dBm.



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

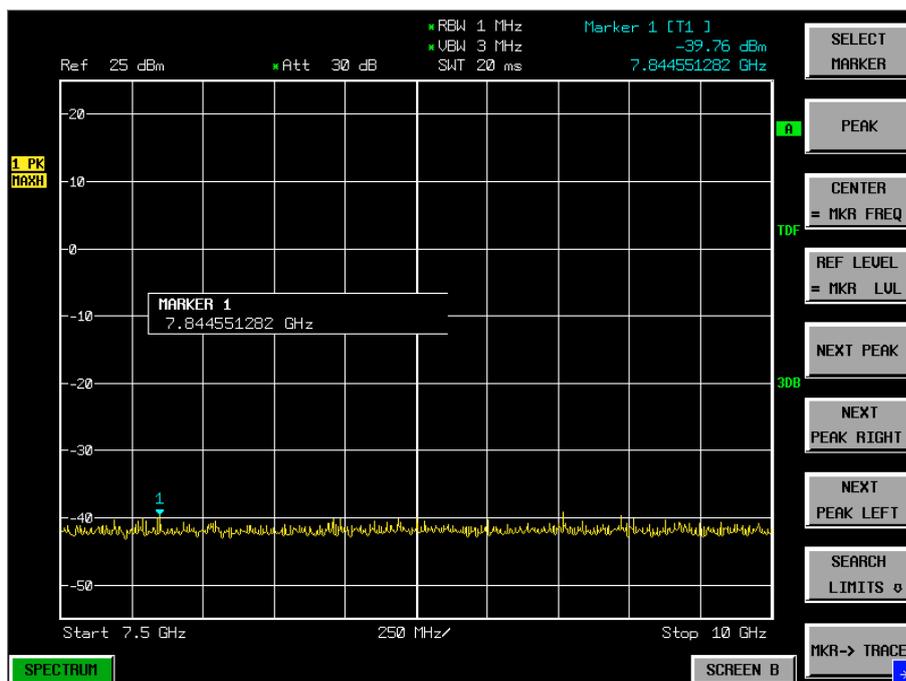
Spurious emission limit –13dBm.

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



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

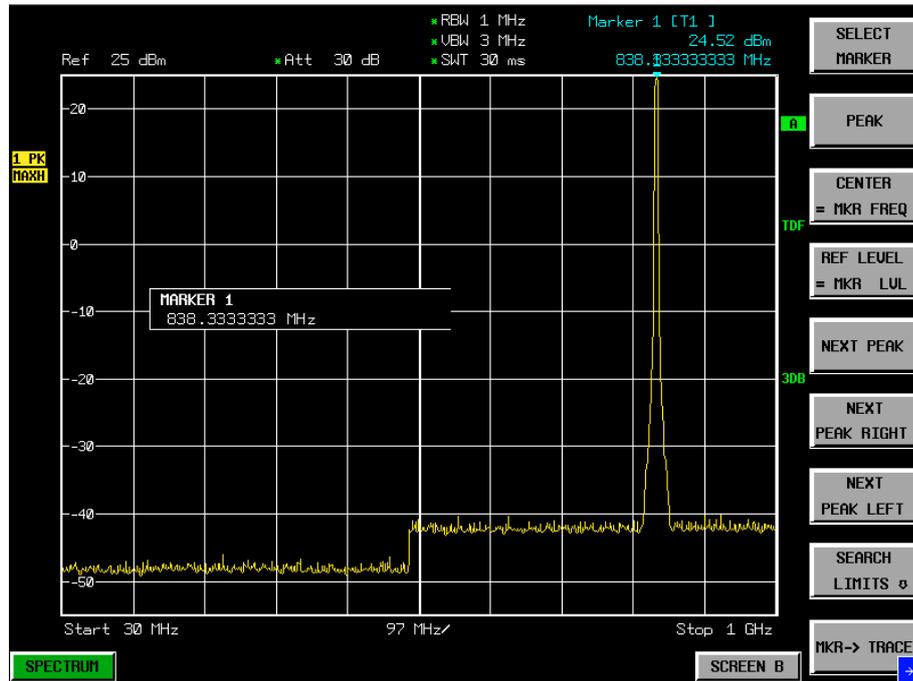
Spurious emission limit –13dBm.



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

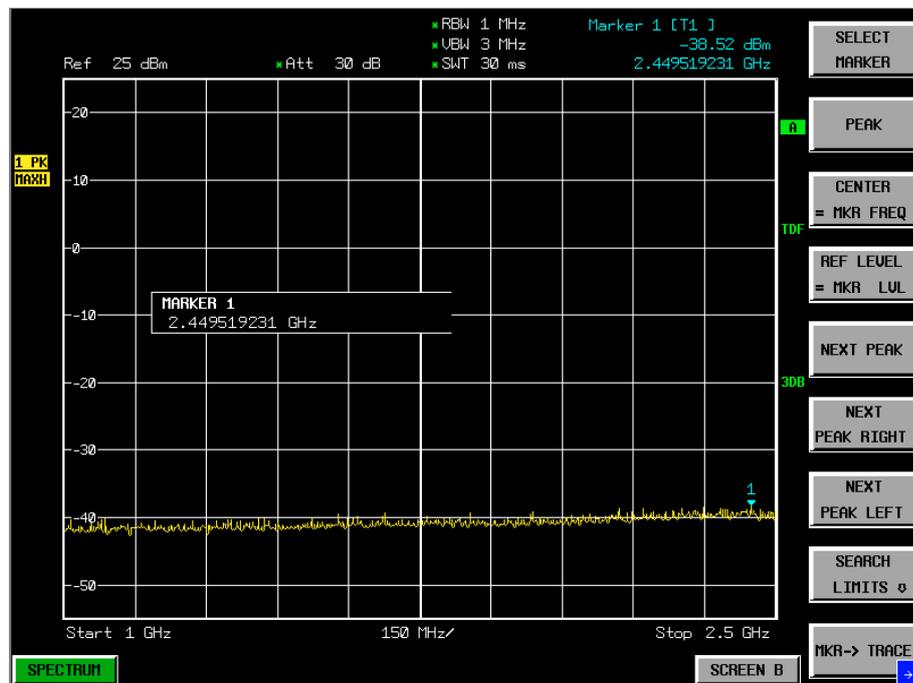
Spurious emission limit –13dBm.

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



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

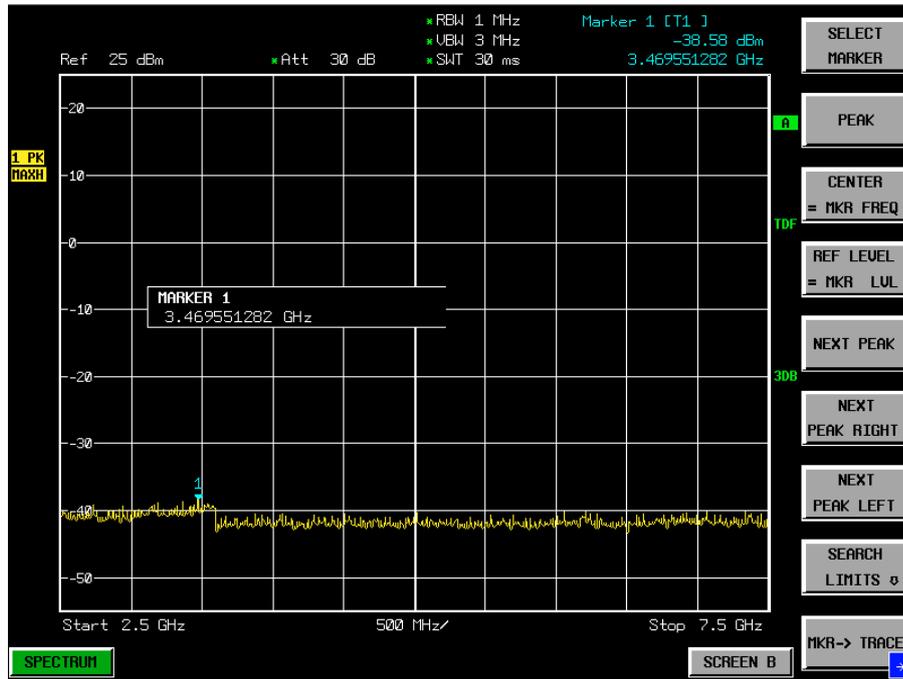
Spurious emission limit –13dBm.



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

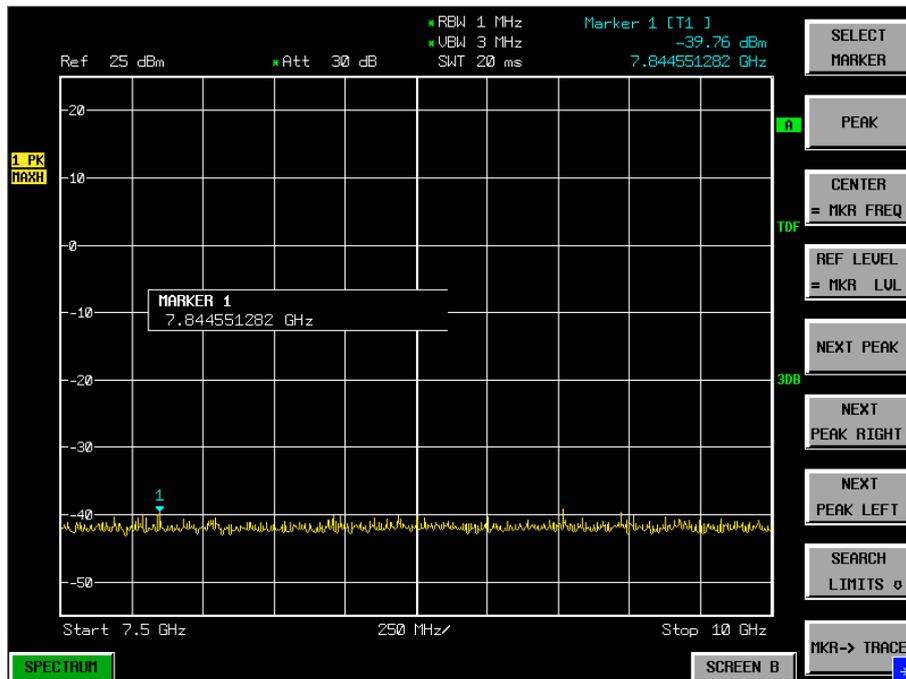
Spurious emission limit –13dBm.

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



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

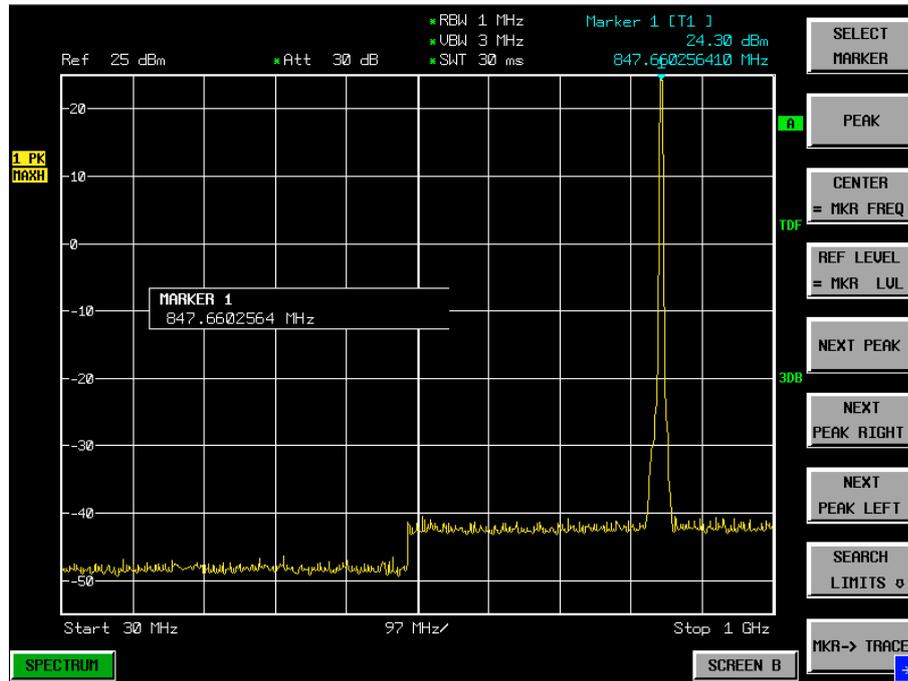
Spurious emission limit –13dBm.



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

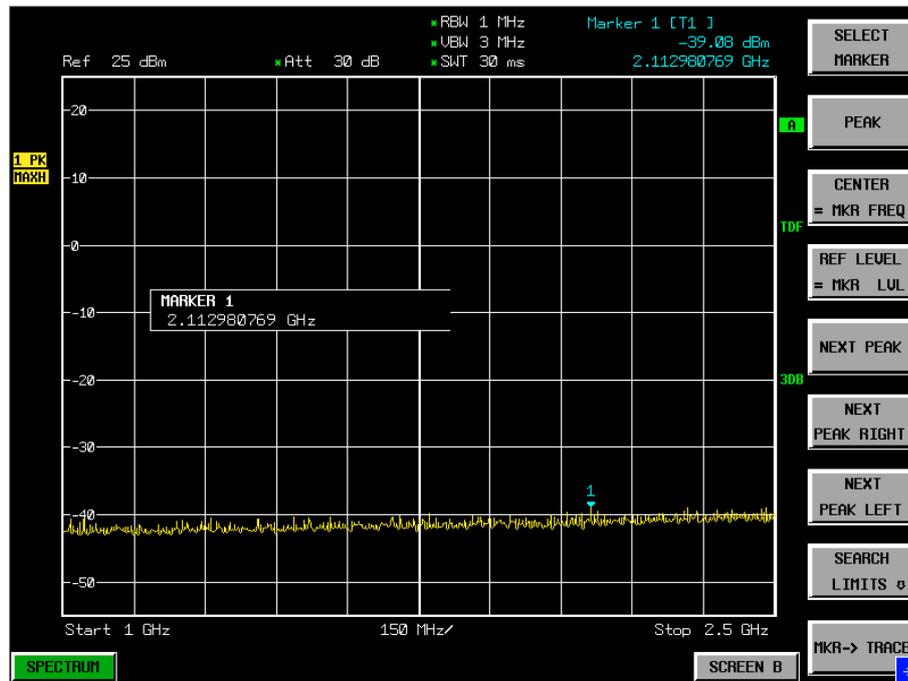
Spurious emission limit –13dBm.

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



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

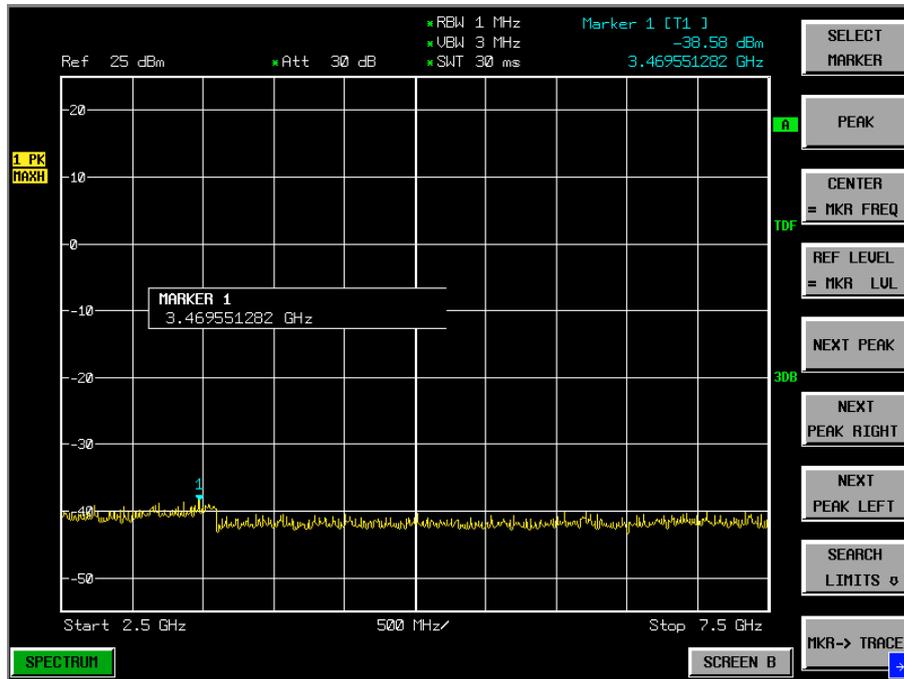
Spurious emission limit –13dBm.



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

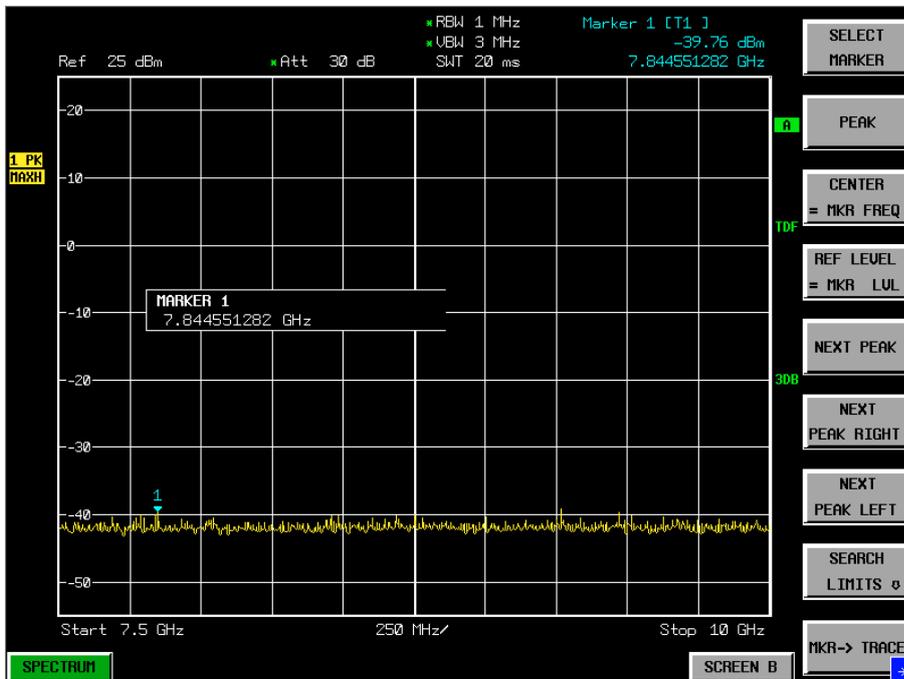
Spurious emission limit –13dBm.

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

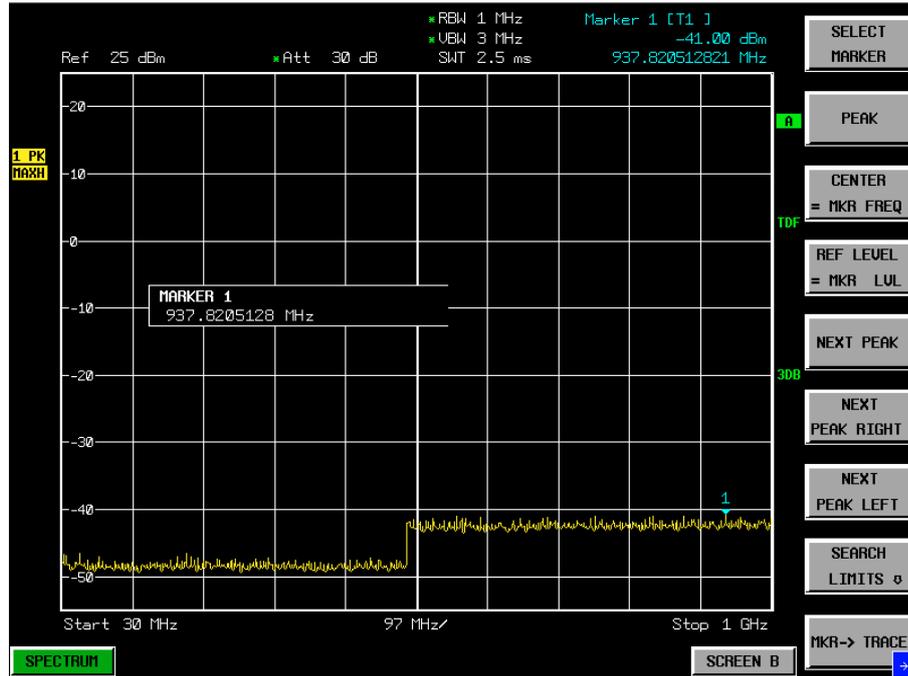


**A.8.3.36 Channel 4233: 7.5GHz – 10GHz**

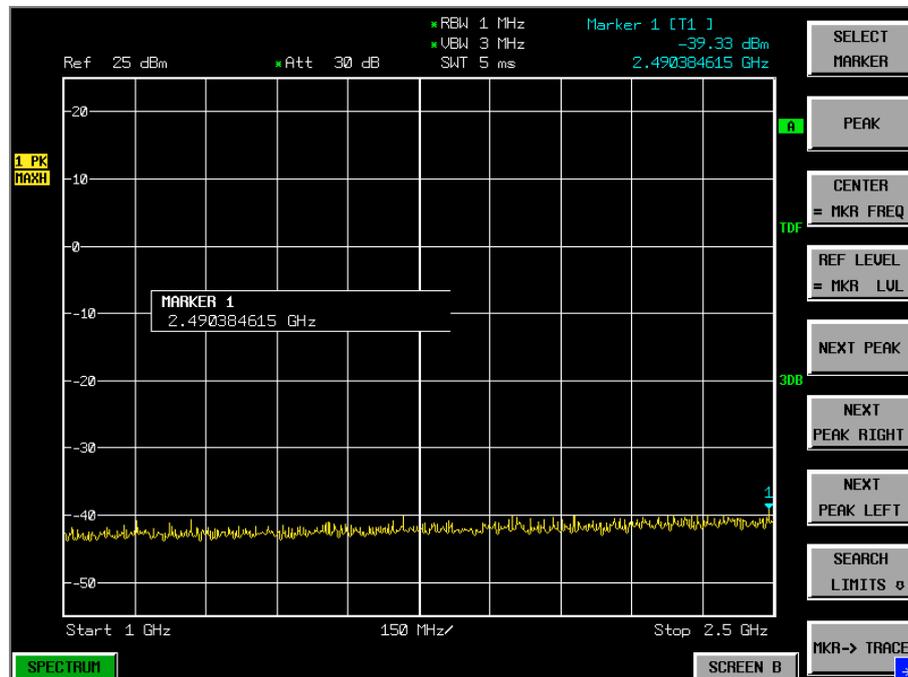
Spurious emission limit –13dBm.



**A.8.3.37 Idle mode: 30MHz – 1GHz**  
Spurious emission limit -13dBm.

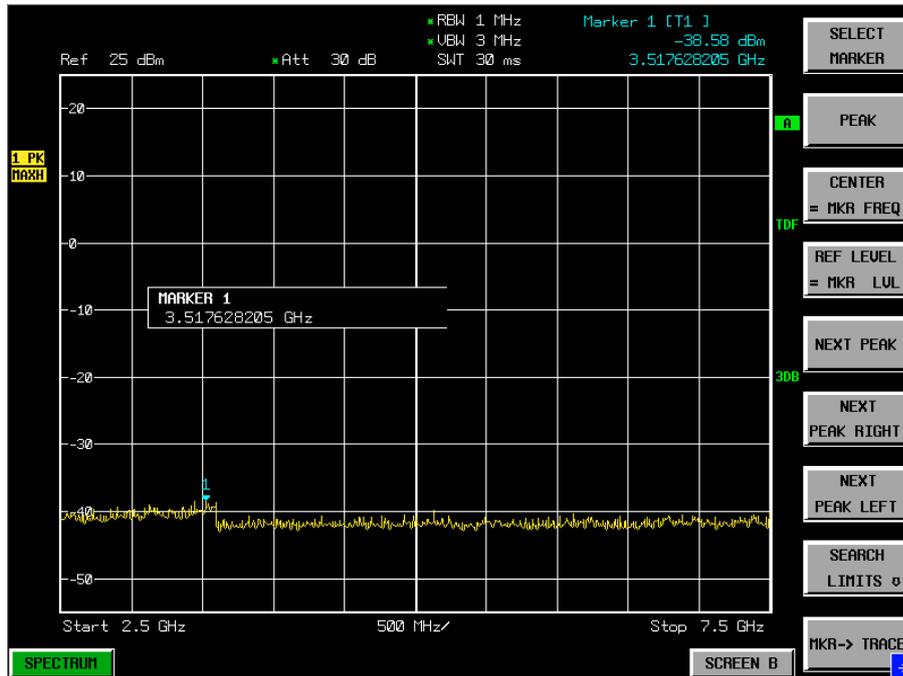


**A.8.3.38 Idle mode: 1GHz – 2.5GHz**  
Spurious emission limit -13dBm.



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

Spurious emission limit -13dBm.



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

Spurious emission limit -13dBm.

