



# TEST REPORT

No. 2013TAR765

for

**Sony Mobile Communications AB**

**GSM/WCDMA/LTE mobile phone**

**Type: PM-0640-BV**

**FCC ID: PY7PM-0640**

with

**Hardware Version: A**

**Software Version: 14.2.A.0.78**

**Issued Date: Nov. 15<sup>th</sup>, 2013**

**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

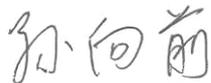
Receipt of Sample Oct. 29<sup>th</sup>, 2013  
Testing Start Date: Oct. 31<sup>st</sup>, 2013  
Testing End Date: Nov. 15<sup>th</sup>, 2013

### 1.4. Signature



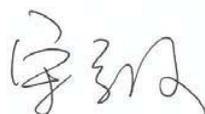
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Qu Pengfei  
(Prepared this test report)



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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 AB  
Address /Post: Mobilvägen, 22188 Lund, Sweden  
City: Lund  
Postal Code: 22188  
Country: Sweden  
Contact Person: Nilsson, Mikael  
Telephone: +46 703 227503  
Fax: +46 706 127385

### **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 1/2/4/5/8, HSDPA, HSUPA, LTE FDD bands 1/2/3/4/5/7/8/20, Bluetooth (EDR and 4.0), ANT+, WLAN ( 802.11 a/ac/b/g/n), NFC, FM, GPS mobile phone
Type	PM-0640-BV
FCC ID	PY7PM-0640
GSM Frequency Band	GSM 850/900/1800/1900
UMTS Frequency Band	FDD Band 1 / FDD Band 2/ FDD Band 4/ FDD Band 5 / FDD Band 8
LTE Frequency Band	FDD Band 1/ FDD Band 2/ FDD Band 3 / FDD Band 4 / FDD Band 5/ FDD Band 7/ FDD Band 8/ FDD Band 20
Antenna	Internal
Power supply	Battery ( charged by travel adapter or vehicle charger )
Extreme vol. Limits	3.6VDC to 4.2VDC (nominal: 4.2VDC)
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>
EUT3	CB5A1VGB2K	004402451604478	A	14.2.A.0.78
EUT5	CB5A1VGB7K	004402451604619	A	14.2.A.0.78

\*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>
#22974	Travel Charger	8512W19 200056	1C
#24009	USB Cable	123307DD003654E	1

#22974

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

#24009

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 inbuilt battery.

The EUT supports GSM 850/900/1800/1900MHz bands, WCDMA FDD band 1/2/4/5/8 and LTE FDD bands 1/2/3/4/5/7/8/20. It supports GPRS service with multi-slots class 33 and EGPRS service with multi-slots class 33. The HSDPA and HSUPA features are also supported.

It has MP3, camera, USB memory, Mobile High-Definition Link (MHL), FM radio, GPS receiver, NFC, Bluetooth (EDR and Bluetooth 4.0), ANT+, WLAN (802.11 a/ac/b/g/n) and Wi-Fi hotspot functions. For WLAN 802.11n, it supports 20MHz bandwidth on 2.4GHz band and 20MHz/40MHz bandwidths on 5GHz/5.8GHz band. For WLAN 802.11 ac, it supports 20MHz/40MHz/80MHz bandwidths.

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**

<b>EUT Set-up No.</b>	<b>Combination of EUT and AE</b>	<b>Remarks</b>
Set.3	EUT3 + #22974 + #24009	Tests with travel charger
Set.4	EUT3	ERP/EIRP/RSE tests
Set.8	EUT5	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 22	PUBLIC MOBILE SERVICES	10-1-12 Edition
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	10-1-12 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

## 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

#### GSM 850

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

#### PCS 1900

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

### 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 GSM/GPRS/EGPRS 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	2014-03-28
2.	Spectrum Analyzer	E4440A	MY48250642	Agilent	2014-03-04
3.	LISN	ESH2-Z5	829991/012	R&S	2014-04-14
4.	EMI Antenna	VULB 9163	9163-482	Schwarzbeck	2014-02-17
5.	EMI Antenna	3117	00119024	ETS-Lindgren	2014-02-02
6.	EMI Antenna	3117	00058889	ETS-Lindgren	2014-02-02
7.	EMI Antenna	VUBA 9117	177	Schwarzbeck	2014-06-29
8.	Signal Generator	N5183A	MY49060052	Agilent	2014-03-19
9.	Climatic chamber	SH-241	92003546	ESPEC	2014-05-11
10.	Universal Radio Communication Tester	CMU200	108646	R&S	2014-11-01
11.	Universal Radio Communication Tester	CMU200	116455	R&S	2014-05-19
12.	Universal Radio Communication Tester	E5515C	MY48361083	Agilent	2014-03-16

## **ANNEX A: MEASUREMENT RESULTS**

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

#### **Reference**

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

#### **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 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: 1850.2 MHz, 1880.0MHz and 1909.8MHz for PCS1900 band; 824.2MHz, 836.6MHz and 848.8MHz for GSM850 band.

#### **GSM850**

##### **Limit**

	Power step	Nominal Peak output power (dBm)	Tolerance (dB)	Target (dBm)
GSM	5	33dBm(2W)	± 2	33±1
GPRS	3	33dBm(2W)	± 2	33±1
EGPRS	6	33dBm(2W)	± 2	33±1

#### **Measurement result**

##### **GSM (GMSK)**

Frequency(MHz)	Power Step	Peak output power(dBm)
824.2	5	33.28
836.6	5	33.24
848.8	5	<b>33.36</b>

##### **GPRS (GMSK, Time Slot 1)**

Frequency(MHz)	Power Step	Peak output power(dBm)
824.2	3	33.31
836.6	3	33.27
848.8	3	<b>33.38</b>

**EGPRS (8PSK, Time Slot 1)**

Frequency(MHz)	Power Step	Peak output power(dBm)
824.2	6	28.00
836.6	6	27.98
848.8	6	<b>28.00</b>

Note: Expanded measurement uncertainty for GSM850 is  $U = 0.52$  dB,  $k = 2$ .

**PCS1900**

**Limit**

	Power step	Nominal Peak output power (dBm)	Tolerance (dB)	Target (dBm)
GSM	0	30dBm(1W)	$\pm 2$	30 $\pm$ 1
GPRS	3	30dBm(1W)	$\pm 2$	30 $\pm$ 1
EGPRS	5	30dBm(1W)	$\pm 2$	30 $\pm$ 1

**Measurement result**

**GSM (GMSK)**

Frequency(MHz)	Power Step	Peak output power(dBm)
1850.2	0	<b>30.59</b>
1880.0	0	30.48
1909.8	0	30.49

**GPRS (GMSK, Time Slot 1)**

Frequency(MHz)	Power Step	Peak output power(dBm)
1850.2	3	<b>30.60</b>
1880.0	3	30.47
1909.8	3	30.48

**EGPRS (8PSK, Time Slot 1)**

Frequency(MHz)	Power Step	Peak output power(dBm)
1850.2	5	<b>26.59</b>
1880.0	5	26.44
1909.8	5	26.45

Note: Expanded measurement uncertainty for PCS1900 is  $U = 0.83$  dB,  $k = 2$ .

### A.1.3 Radiated

#### A.1.3.1 Description

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

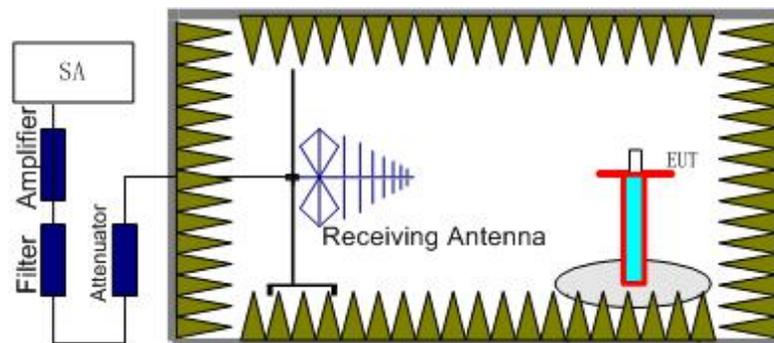
Rule Part 24.232(c) specifies "Mobile and portable stations are limited to 2 watts EIRP" and 24.232(e) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

Rule Part 22.913(a) specifies "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."

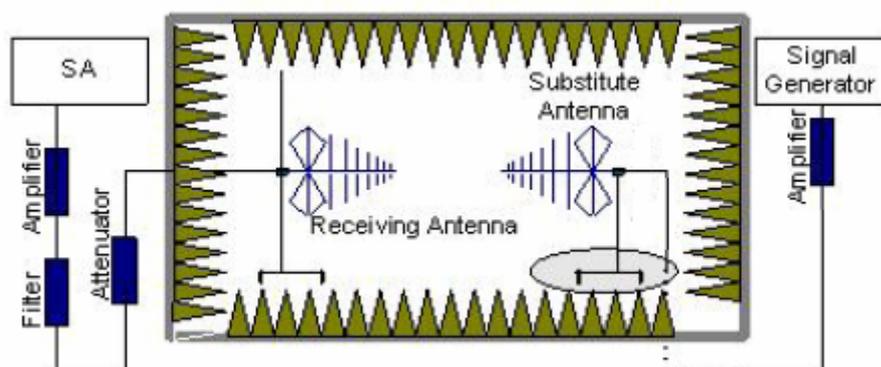
#### A.1.3.2 Method of Measurement

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.

### GSM 850- ERP 22.913(a)

#### Limits

	Power Step	Burst Peak ERP (dBm)
GSM	5	≤38.45dBm (7W)
GPRS	3	≤38.45dBm (7W)
EGPRS	6	≤38.45dBm (7W)

#### Measurement result

##### GSM (GMSK)

Frequency (MHz)	$P_{Mea}$ (dBm)	$P_{cl}$ (dB)	$P_{Ag}$ (dB)	$G_a$ (dBi)	Correction (dB)	Peak ERP(dBm)	Polarization
824.20	-19.21	2.07	-53.00	0.84	2.15	28.73	Vertical
836.60	-18.95	2.08	-53.00	0.90	2.15	28.92	Horizontal
848.80	-18.99	2.09	-53.00	0.95	2.15	28.82	Horizontal

##### GPRS (GMSK)

Frequency (MHz)	$P_{Mea}$ (dBm)	$P_{cl}$ (dB)	$P_{Ag}$ (dB)	$G_a$ (dBi)	Correction (dB)	Peak ERP(dBm)	Polarization
824.20	-19.18	2.07	-53.00	0.84	2.15	28.76	Vertical
836.60	-19.10	2.08	-53.00	0.90	2.15	28.77	Vertical
848.80	-18.75	2.09	-53.00	0.95	2.15	29.06	Vertical

##### EGPRS (8PSK)

Frequency (MHz)	$P_{Mea}$ (dBm)	$P_{cl}$ (dB)	$P_{Ag}$ (dB)	$G_a$ (dBi)	Correction (dB)	Peak ERP(dBm)	Polarization
824.20	-22.11	2.07	-53.00	0.84	2.15	25.83	Vertical
836.60	-22.26	2.08	-53.00	0.90	2.15	25.61	Vertical
848.80	-22.44	2.09	-53.00	0.95	2.15	25.37	Vertical

Sample calculation: GPRS, 848.80 MHz

$$\text{Peak ERP(dBm)} = P_{\text{Mea}}(-18.75 \text{ dBm}) - G_a(0.95 \text{ dBi}) - P_{\text{Ag}}(-53.00 \text{ dB}) - P_{\text{cl}}(2.09 \text{ dB}) - 2.15 \text{ dB} \\ = 29.06 \text{ dBm}$$

**ANALYZER SETTINGS: RBW = VBW = 3MHz**

Note: Expanded measurement uncertainty for GSM850 is  $U = 0.96\text{dB}$ ,  $k = 2$ .

### PCS1900- EIRP 24.232(c)

#### Limits

	Power Step	Burst Peak EIRP (dBm)
GSM	0	≤33dBm (2W)
GPRS	3	≤33dBm (2W)
EGPRS	5	≤33dBm (2W)

#### Measurement result

##### GSM (GMSK)

Frequency (MHz)	$P_{\text{Mea}}$ (dBm)	$P_{\text{cl}}$ (dB)	$P_{\text{Ag}}$ (dB)	$G_a$ (dBi)	Peak EIRP(dBm)	Polarization
1850.20	-22.91	3.19	-50.00	-4.56	28.46	Horizontal
1880.00	-22.78	3.11	-50.00	-4.43	28.54	Horizontal
1909.80	-20.58	3.18	-50.00	-4.30	<b>30.54</b>	Horizontal

##### GPRS (GMSK)

Frequency (MHz)	$P_{\text{Mea}}$ (dBm)	$P_{\text{cl}}$ (dB)	$P_{\text{Ag}}$ (dB)	$G_a$ (dBi)	Peak EIRP(dBm)	Polarization
1850.20	-22.89	3.19	-50.00	-4.56	28.48	Horizontal
1880.00	-22.76	3.11	-50.00	-4.43	28.56	Horizontal
1909.80	-20.58	3.18	-50.00	-4.30	<b>30.54</b>	Horizontal

##### EGPRS (8PSK)

Frequency (MHz)	$P_{\text{Mea}}$ (dBm)	$P_{\text{cl}}$ (dB)	$P_{\text{Ag}}$ (dB)	$G_a$ (dBi)	Peak EIRP(dBm)	Polarization
1850.20	-26.23	3.19	-50.00	-4.56	25.14	Horizontal
1880.00	-25.68	3.11	-50.00	-4.43	25.64	Horizontal
1909.80	-23.51	3.18	-50.00	-4.30	<b>27.61</b>	Horizontal

Sample calculation: GPRS, 1909.80 MHz

$$\text{Peak EIRP(dBm)} = P_{\text{Mea}}(-20.58 \text{ dBm}) - G_a(-4.30 \text{ dBi}) - P_{\text{Ag}}(-50.00 \text{ dB}) - P_{\text{cl}}(3.18 \text{ dB}) = 30.54 \text{ dBm}$$

**ANALYZER SETTINGS: RBW = VBW = 3MHz**

Note: Expanded measurement uncertainty for PCS1900 is  $U = 1.07 \text{ dB}$ ,  $k = 2$ .

## A.2 EMISSION LIMIT

### Reference

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

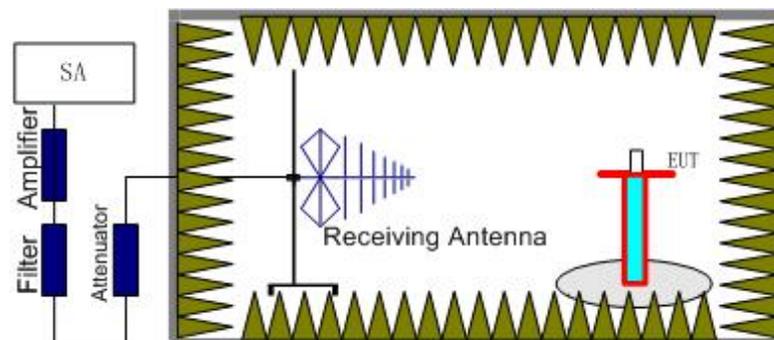
### A.2.1 Measurement Method

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

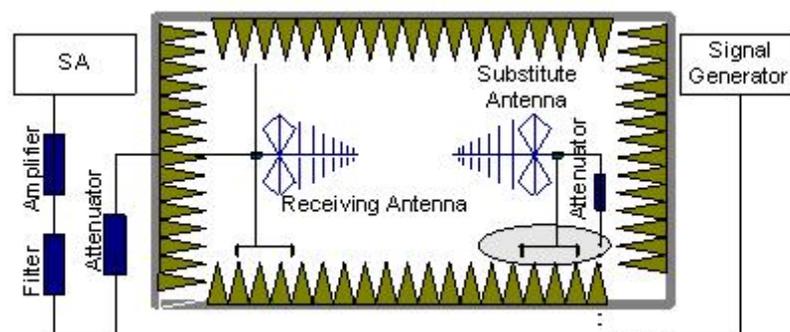
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set 1MHz as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the PCS1900 band, GSM850 band.

### 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 24.238 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 PCS band (1850.2 MHz, 1880 MHz and 1909.8 MHz), GSM850 band (824.2MHz, 836.6MHz and 848.8MHz). 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 GSM850 or PCS1900 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.

**GSM Mode Channel 128/824.2MHz**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Polarization
3254.33	-63.12	4.16	-7.31	2.15	-62.12	-13.00	Horizontal
3997.54	-63.99	4.61	-8.50	2.15	-62.25	-13.00	Vertical
4881.56	-64.34	5.16	-9.49	2.15	-62.16	-13.00	Vertical
5661.87	-61.85	5.46	-10.06	2.15	-59.40	-13.00	Horizontal
6543.19	-62.49	6.05	-10.64	2.15	-60.05	-13.00	Horizontal
7086.48	-63.72	6.47	-11.15	2.15	-61.19	-13.00	Vertical

**GSM Mode Channel 190/836.6MHz**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Polarization
1671.24	-59.35	2.98	-5.35	2.15	-59.13	-13.00	Horizontal
2507.07	-40.37	3.59	-5.42	2.15	-40.69	-13.00	Horizontal
3881.36	-63.07	4.51	-8.36	2.15	-61.37	-13.00	Horizontal
4959.86	-62.88	5.10	-9.63	2.15	-60.50	-13.00	Vertical
6068.94	-62.34	5.82	-10.26	2.15	-60.05	-13.00	Vertical
6703.33	-62.63	6.09	-10.80	2.15	-60.07	-13.00	Vertical

**GSM Mode Channel 251/848.8MHz**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Polarization
3343.20	-62.82	4.21	-7.52	2.15	-61.66	-13.00	Horizontal
4091.80	-61.62	4.73	-8.56	2.15	-59.94	-13.00	Horizontal
4890.15	-63.36	5.19	-9.50	2.15	-61.20	-13.00	Vertical
5728.68	-60.70	5.54	-10.09	2.15	-58.30	-13.00	Horizontal
7148.13	-61.32	6.37	-11.19	2.15	-58.65	-13.00	Horizontal
7839.07	-62.27	6.96	-11.74	2.15	-59.64	-13.00	Vertical

**GSM Mode Channel 512/1850.2MHz**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>pl</sub> (dB)	G <sub>a</sub> (dBi)	Peak EIRP (dBm)	Limit (dBm)	Polarity
3700.52	-51.89	4.44	-8.14	-48.19	-13.00	Horizontal
5105.04	-64.49	5.23	-9.76	-59.96	-13.00	Vertical
7143.12	-61.69	6.39	-11.19	-56.89	-13.00	Horizontal
8574.47	-61.15	7.17	-12.26	-56.06	-13.00	Horizontal
10317.33	-59.06	7.81	-12.46	-54.41	-13.00	Vertical
12854.73	-56.96	8.88	-13.13	-52.71	-13.00	Vertical

**GSM Mode Channel 661/1880.0MHz**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>pl</sub> (dB)	G <sub>a</sub> (dBi)	Peak EIRP (dBm)	Limit (dBm)	Polarity
3760.12	-53.27	4.52	-8.21	-49.58	-13.00	Horizontal
5173.35	-63.75	5.20	-9.80	-59.15	-13.00	Horizontal
7369.48	-60.72	6.42	-11.32	-55.82	-13.00	Horizontal
8755.79	-62.47	7.29	-12.40	-57.36	-13.00	Horizontal
10637.80	-58.99	8.07	-12.47	-54.59	-13.00	Vertical
12425.48	-59.28	8.67	-12.67	-55.28	-13.00	Vertical

**GSM Mode Channel 810/1909.8MHz**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>pl</sub> (dB)	G <sub>a</sub> (dBi)	Peak EIRP (dBm)	Limit (dBm)	Polarity
3819.48	-51.21	4.49	-8.28	-47.42	-13.00	Horizontal
5141.99	-63.49	5.24	-9.79	-58.94	-13.00	Vertical
7001.62	-63.12	6.27	-11.10	-58.29	-13.00	Vertical
8568.32	-60.86	7.14	-12.25	-55.75	-13.00	Vertical
10144.81	-58.76	7.90	-12.43	-54.23	-13.00	Horizontal
11337.92	-58.82	8.56	-12.40	-54.98	-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 GSM 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.

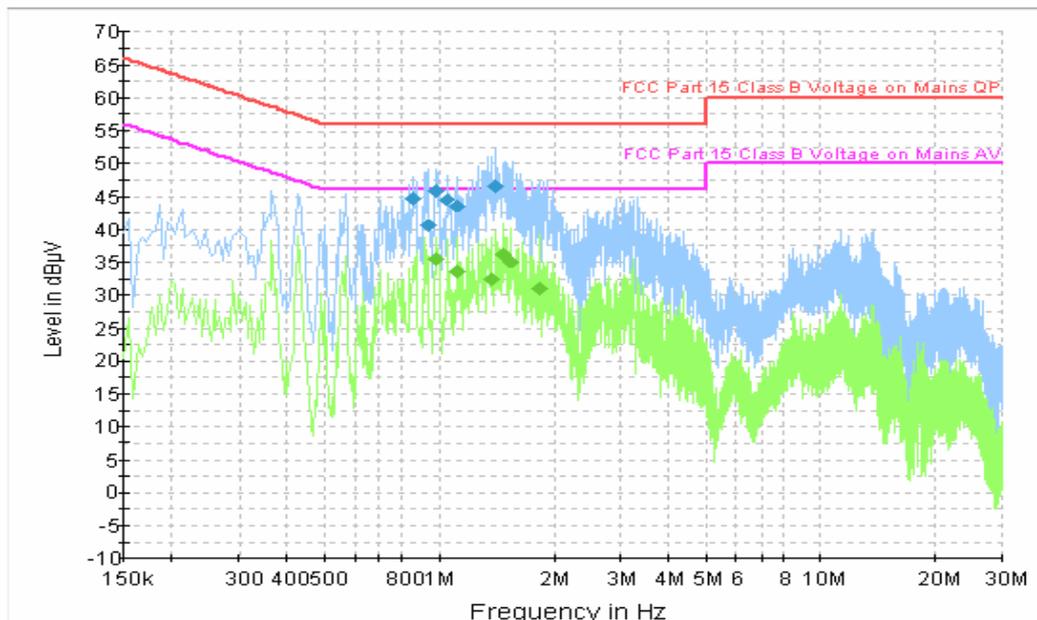
#### **A.3.1 Limit**

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**

##### **GSM850MHz**



IF bandwidth 9 kHz

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

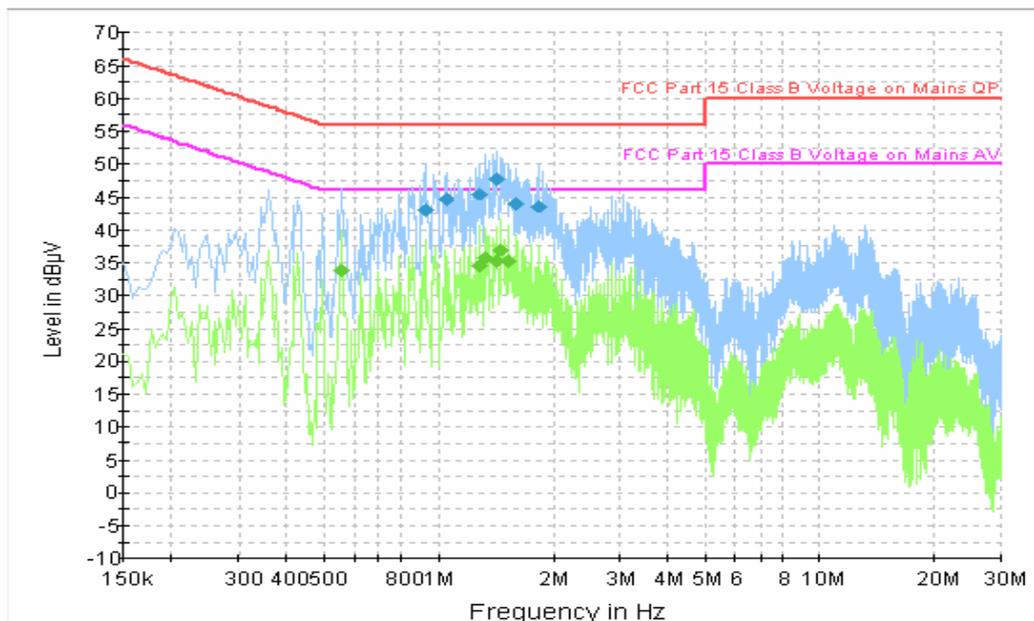
**Final Result 1**

Frequency (MHz)	QuasiPeak (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.856500	44.8	GND	L1	9.8	11.2	56.0
0.937500	40.6	GND	L1	9.7	15.4	56.0
0.982500	45.8	GND	L1	9.7	10.2	56.0
1.045500	44.5	GND	L1	9.7	11.5	56.0
1.122000	43.7	GND	L1	9.7	12.3	56.0
1.410000	46.6	GND	L1	9.7	9.4	56.0

**Final Result 2**

Frequency (MHz)	Average (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.982500	35.6	GND	L1	9.7	10.4	46.0
1.122000	33.5	GND	L1	9.7	12.5	46.0
1.369500	32.4	GND	L1	9.7	13.6	46.0
1.473000	36.3	GND	L1	9.7	9.7	46.0
1.549500	35.2	GND	L1	9.7	10.8	46.0
1.842000	31.0	GND	L1	9.7	15.0	46.0

**PCS 1900MHz**



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 (dB $\mu$ V)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.928500	43.0	GND	L1	9.7	13.0	56.0
1.050000	44.6	GND	L1	9.7	11.4	56.0
1.284000	45.5	GND	L1	9.7	10.5	56.0
1.419000	47.7	GND	L1	9.7	8.3	56.0
1.603500	43.9	GND	L1	9.7	12.1	56.0
1.846500	43.6	GND	L1	9.7	12.4	56.0

**Final Result 2**

Frequency (MHz)	Average (dB $\mu$ V)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.559500	33.7	GND	L1	9.8	12.3	46.0
1.284000	34.4	GND	L1	9.7	11.6	46.0
1.329000	35.7	GND	L1	9.7	10.3	46.0
1.419000	35.3	GND	L1	9.7	10.7	46.0
1.464000	36.9	GND	L1	9.7	9.1	46.0
1.540500	35.3	GND	L1	9.7	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 channel 661 for PCS 1900, channel 190 for GSM850 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, 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 3.6VDC and 4.2VDC, with a nominal voltage of 4.2VDC. 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 -14.3 %. For the purposes of measuring frequency stability these voltage limits are to be used.

#### A.4.3 Measurement results

##### GSM 850

Room Temperature: 24 °C

##### Frequency Error vs Voltage

Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
4.2	-5	0.006
4.2	-10	0.012
3.6	-47	0.056

##### Frequency Error vs Temperature

temperature(°C)	Frequency error(Hz)	Frequency error(ppm)
50°	-17	0.020
40°	-17	0.020
30°	21	0.025
20°	-15	0.017
10°	-38	0.046
0°	-15	0.018
- 10°	-14	0.017
- 20°	-13	0.016
- 30°	-23	0.027

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

**PCS 1900**

**Room Temperature: 24°C**

**Frequency Error vs Voltage**

Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
4.2	-26	0.014
4.2	-24	0.013
3.6	-23	0.012

**Frequency Error vs Temperature**

temperature(°C)	Frequency error(Hz)	Frequency error(ppm)
50°	-19	0.010
40°	-19	0.010
30°	-18	0.009
20°	-18	0.010
10°	-29	0.016
0°	-19	0.010
- 10°	-22	0.012
- 20°	-28	0.015
- 30°	-24	0.013

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 the US Cellular/PCS frequency bands. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the following pages.

### Measurement Parameters:

RBW = 5 kHz, VBW = 20 kHz

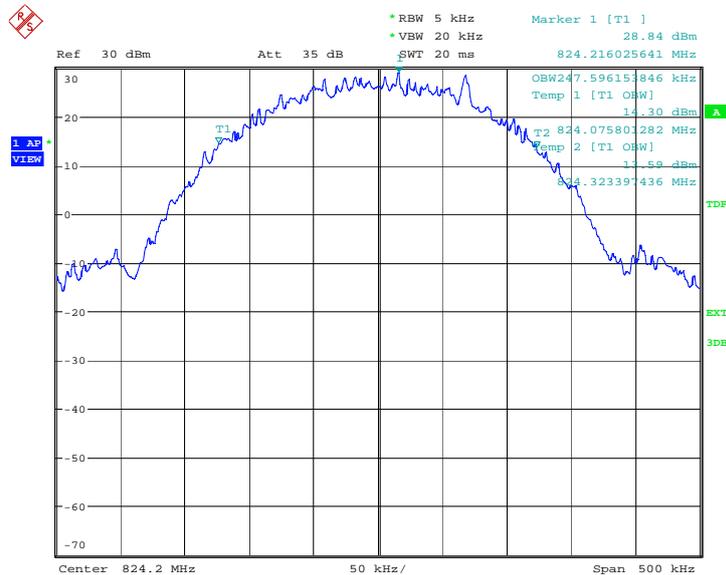
### GSM 850(99% BW)

Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)
824.2	247.596
836.6	246.795
848.8	243.590

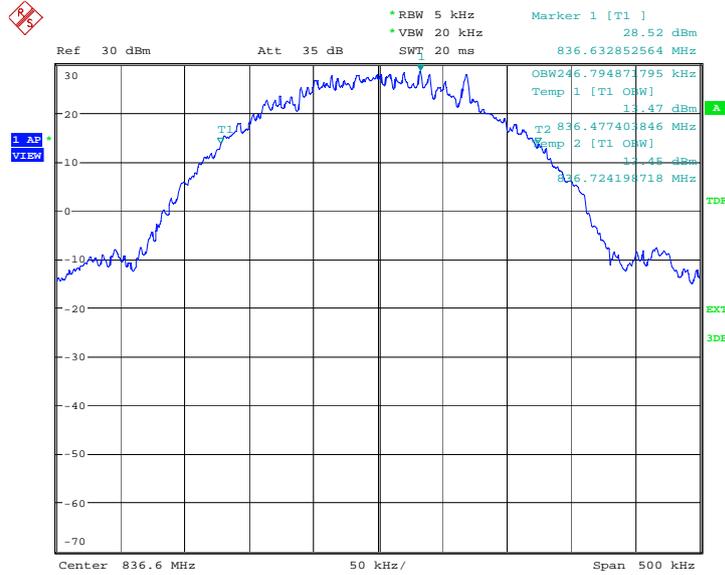
Expanded measurement uncertainty for this test item is 1.1 kHz,  $k=2$ .

### GSM 850

### Channel 128-Occupied Bandwidth (99% BW)

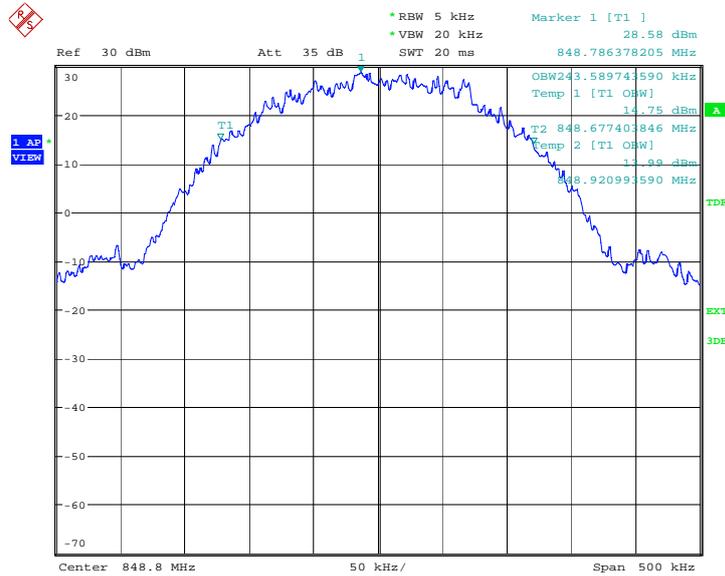


### Channel 190-Occupied Bandwidth (99% BW)



Date: 4.NOV.2013 09:47:41

### Channel 251-Occupied Bandwidth (99% BW)



Date: 4.NOV.2013 09:48:13

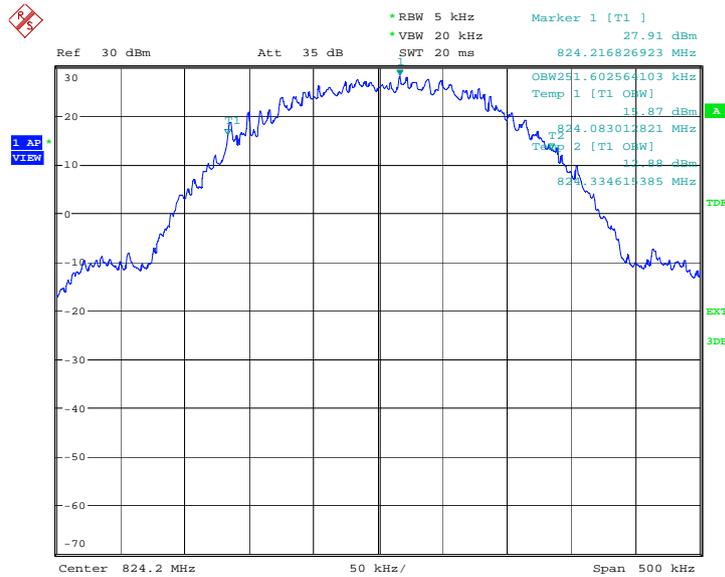
**GPRS 850(99% BW)**

Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)
824.2	251.603
836.6	242.788
848.8	246.795

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

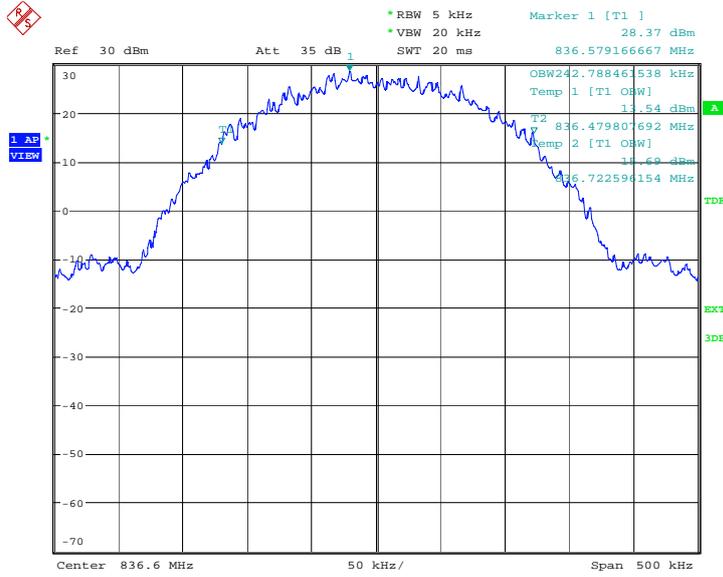
**GPRS 850**

**Channel 128-Occupied Bandwidth (99% BW)**



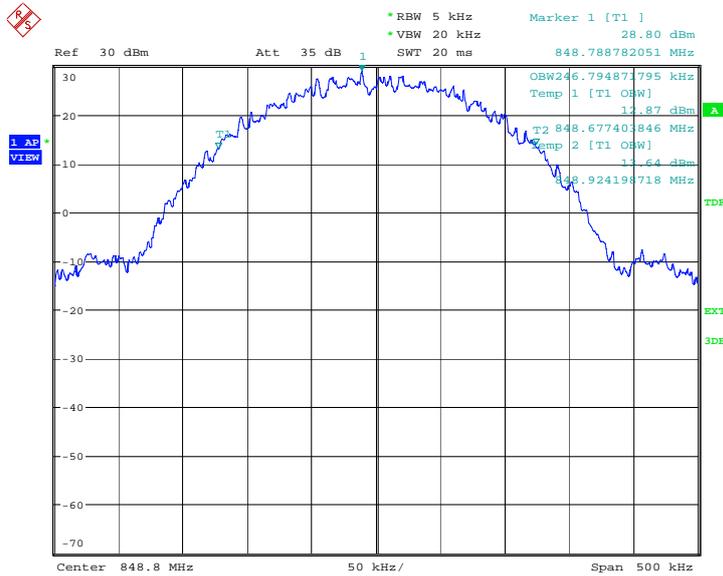
Date: 4.NOV.2013 08:55:20

### Channel 190-Occupied Bandwidth (99% BW)



Date: 4.NOV.2013 08:55:52

### Channel 251-Occupied Bandwidth (99% BW)



Date: 4.NOV.2013 08:56:24

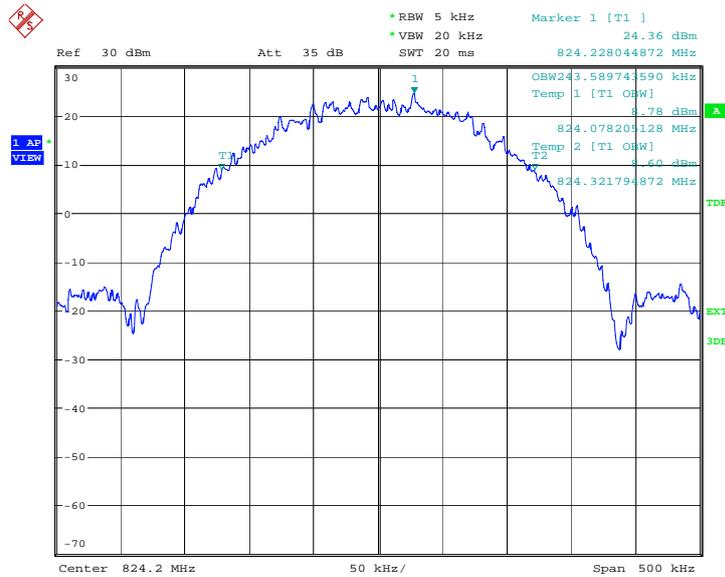
**EGPRS 850(99% BW)**

Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)
824.2	243.590
836.6	243.590
848.8	244.391

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

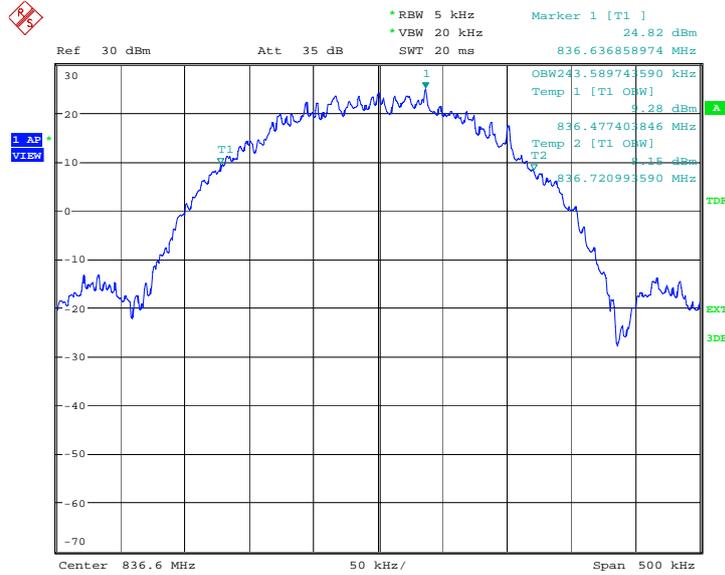
**EGPRS 850**

**Channel 128-Occupied Bandwidth (99% BW)**



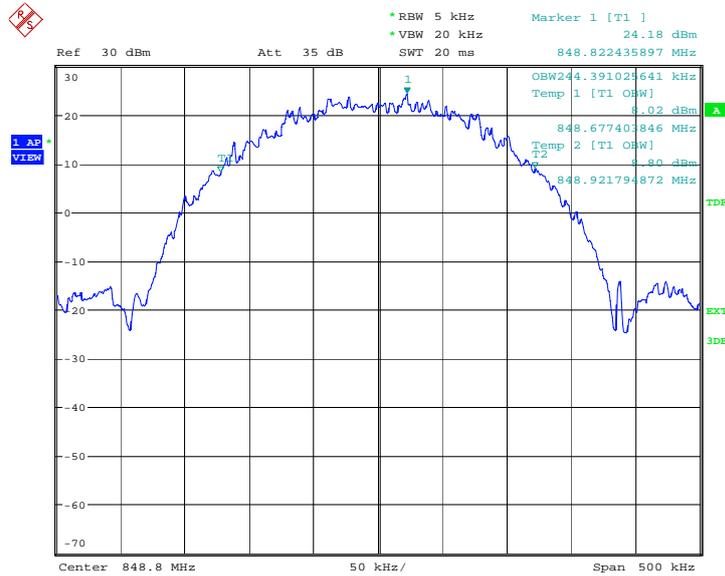
Date: 4.NOV.2013 09:22:03

### Channel 190-Occupied Bandwidth (99% BW)



Date: 4.NOV.2013 09:22:35

### Channel 251-Occupied Bandwidth (99% BW)



Date: 4.NOV.2013 09:23:07

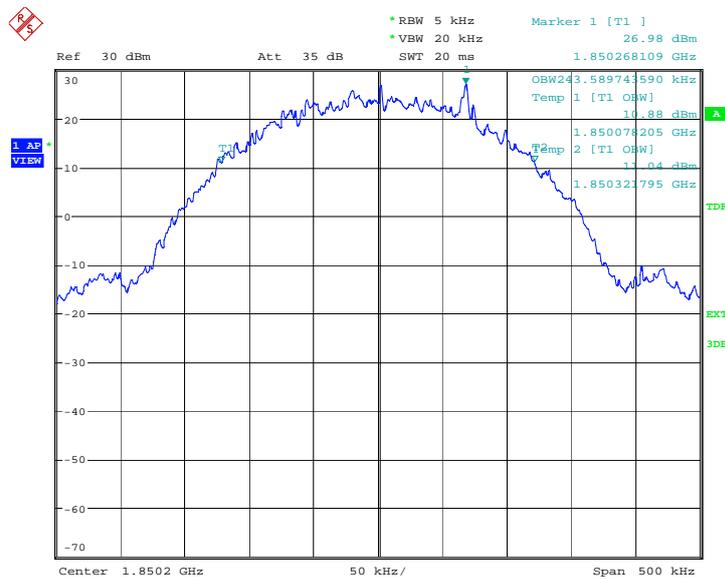
**PCS 1900(99% BW)**

Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)
1850.2	243.590
1880.0	242.788
1909.8	244.391

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

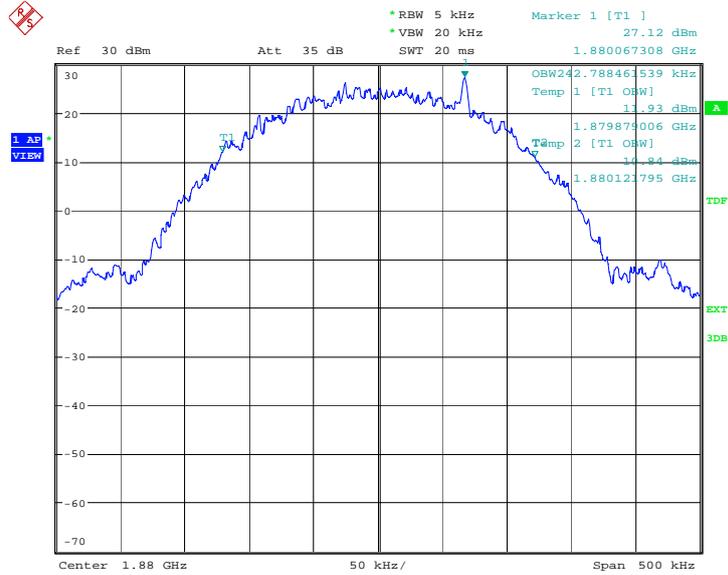
**PCS 1900**

**Channel 512-Occupied Bandwidth (99% BW)**



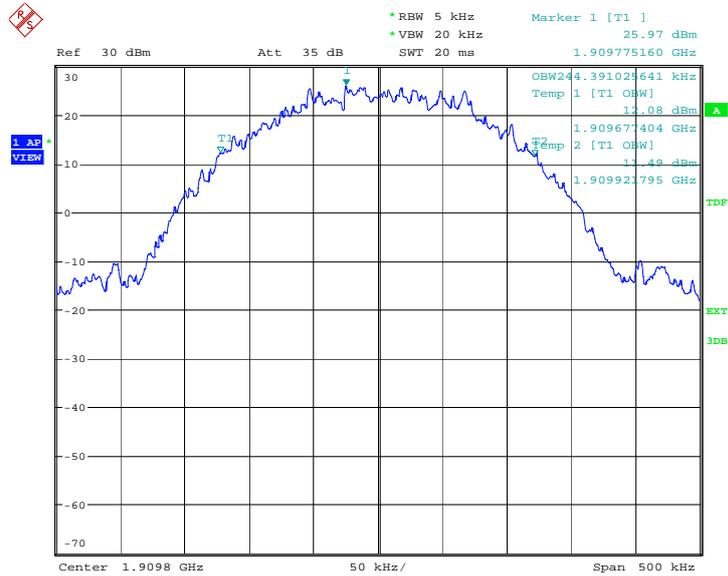
Date: 4.NOV.2013 10:04:35

### Channel 661-Occupied Bandwidth (99% BW)



Date: 4.NOV.2013 10:05:07

### Channel 810-Occupied Bandwidth (99% BW)



Date: 4.NOV.2013 10:05:39

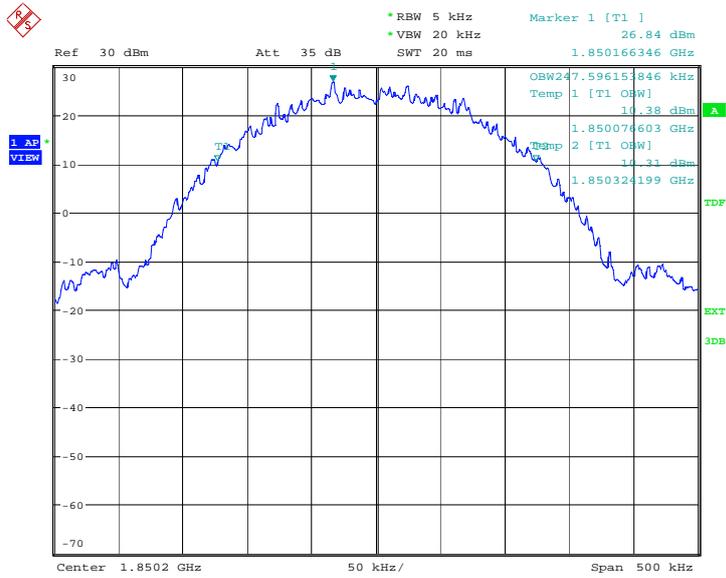
**GPRS 1900(99% BW)**

Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)
1850.2	247.596
1880.0	241.987
1909.8	245.192

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

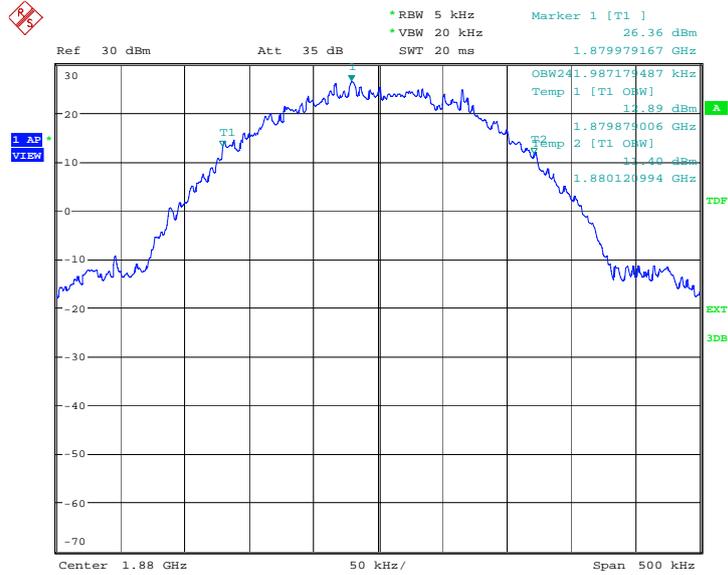
**GPRS 1900**

**Channel 512-Occupied Bandwidth 99% BW)**



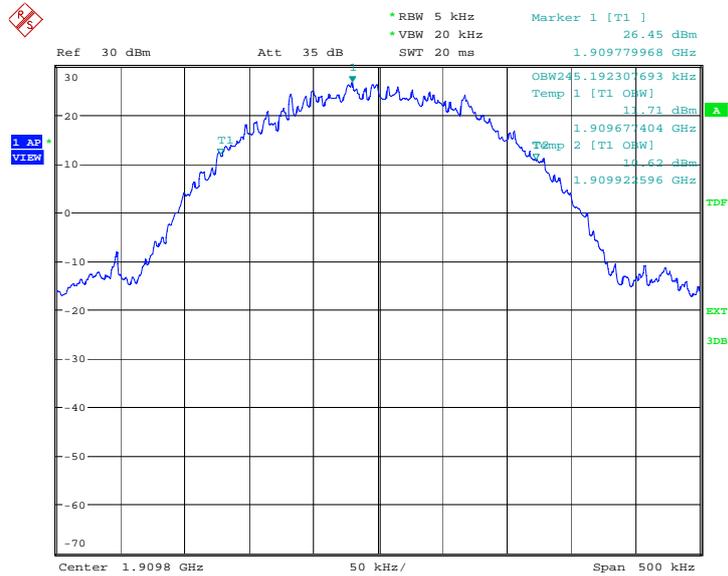
Date: 4.NOV.2013 09:11:35

### Channel 661-Occupied Bandwidth (99% BW)



Date: 4.NOV.2013 09:12:07

### Channel 810-Occupied Bandwidth (99% BW)



Date: 4.NOV.2013 09:12:40

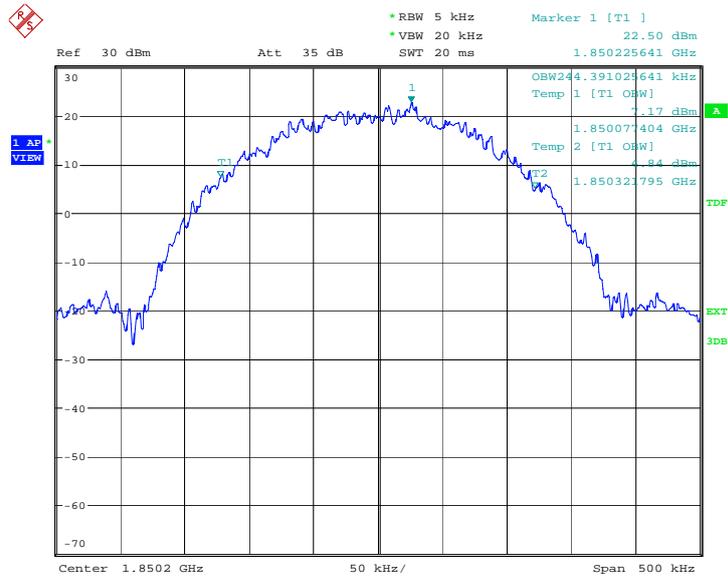
**EGPRS 1900(99% BW)**

Frequency(MHz)	Occupied Bandwidth (99% BW)( kHz)
1850.2	244.391
1880.0	244.391
1909.8	243.590

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

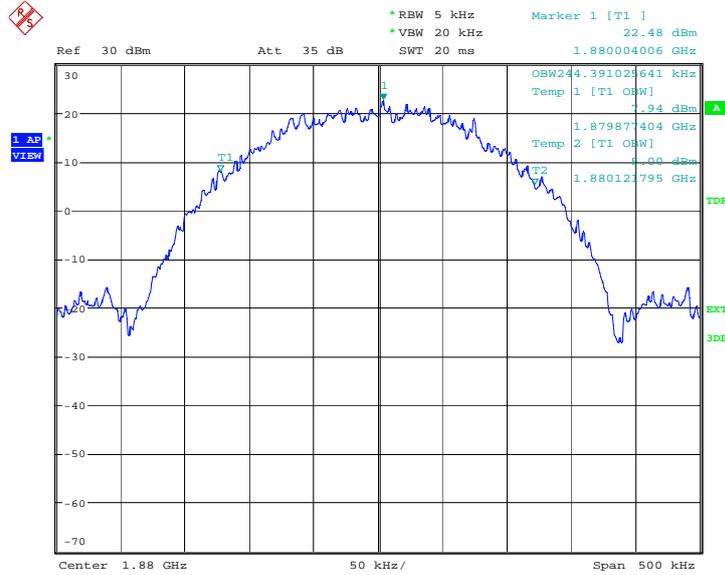
**EGPRS 1900**

**Channel 512-Occupied Bandwidth (99% BW)**



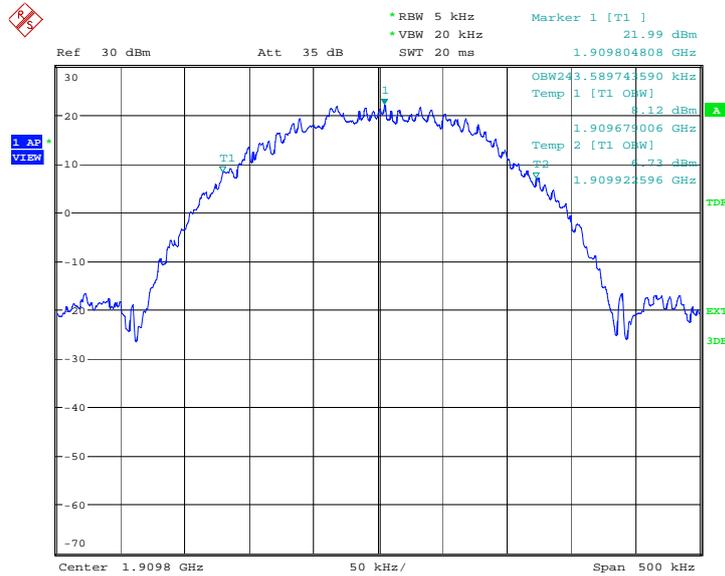
Date: 4.NOV.2013 09:33:29

### Channel 661-Occupied Bandwidth (99% BW)



Date: 4.NOV.2013 09:34:01

### Channel 810-Occupied Bandwidth (99% BW)



Date: 4.NOV.2013 09:34:34

## A.6 EMISSION BANDWIDTH

### Reference

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

### 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 the PCS1900 band and GSM850 band. Table below lists the measured 100% BW. Spectrum analyzer plots are included on the following pages.

### Measurement Parameters:

RBW = 5 kHz, VBW = 20 kHz

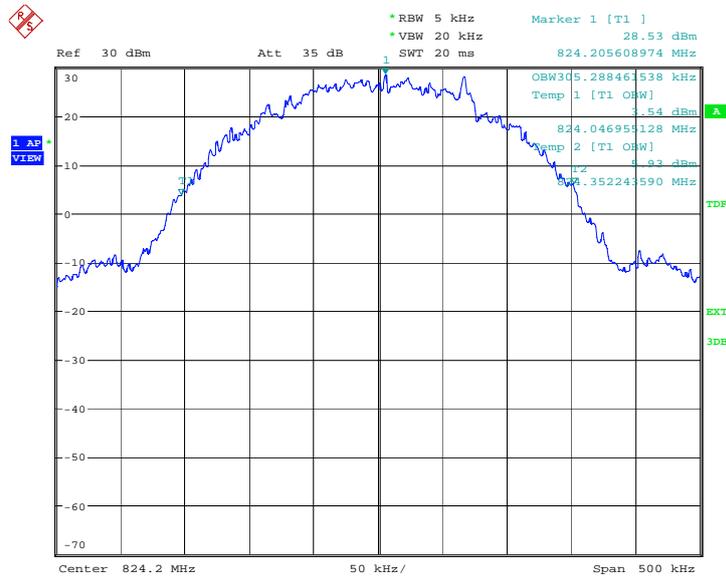
### GSM 850(100% BW)

Frequency(MHz)	Occupied Bandwidth (100% BW)( kHz)
824.2	305.288
836.6	306.090
848.8	306.891

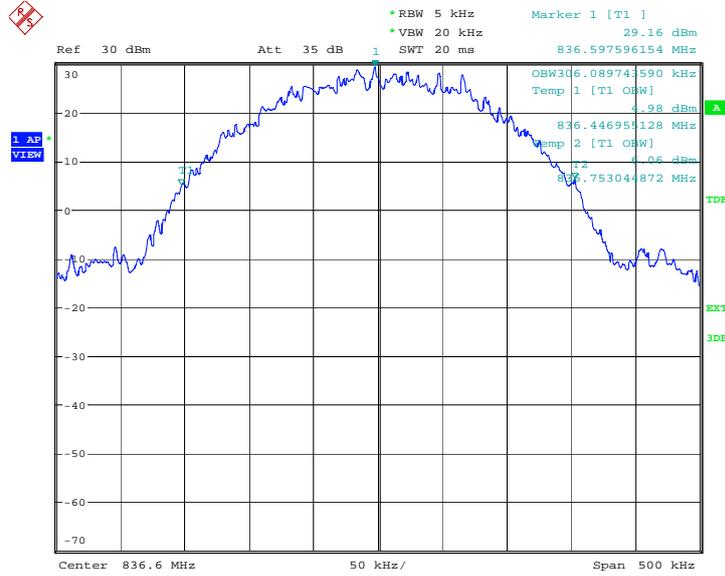
Expanded measurement uncertainty for this test item is 1.1 kHz, k=2

### GSM 850

### Channel 128-Occupied Bandwidth (100% BW)

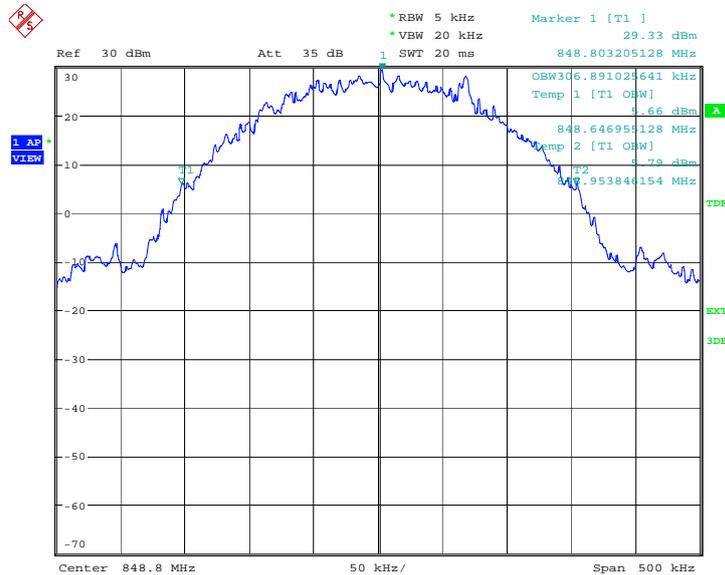


### Channel 190-Occupied Bandwidth (100% BW)



Date: 4.NOV.2013 09:49:19

### Channel 251-Occupied Bandwidth (100% BW)



Date: 4.NOV.2013 09:49:51

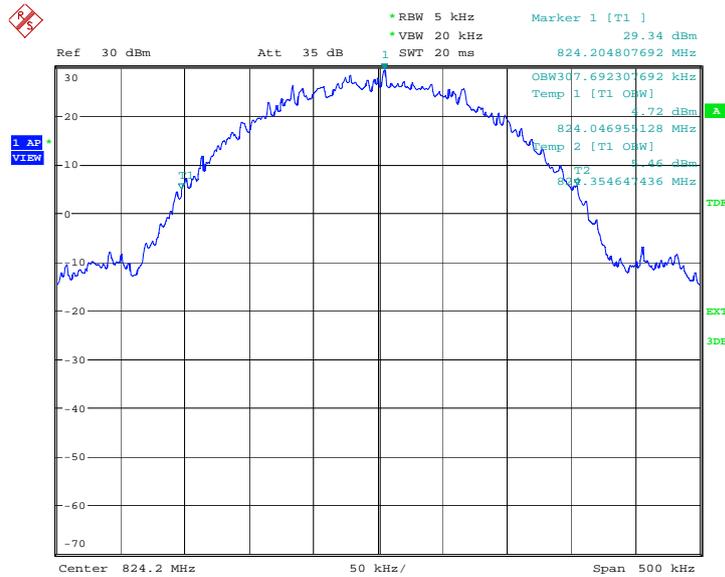
**GPRS 850(100% BW)**

Frequency(MHz)	Occupied Bandwidth (100% BW)( kHz)
824.2	307.692
836.6	305.288
848.8	306.090

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

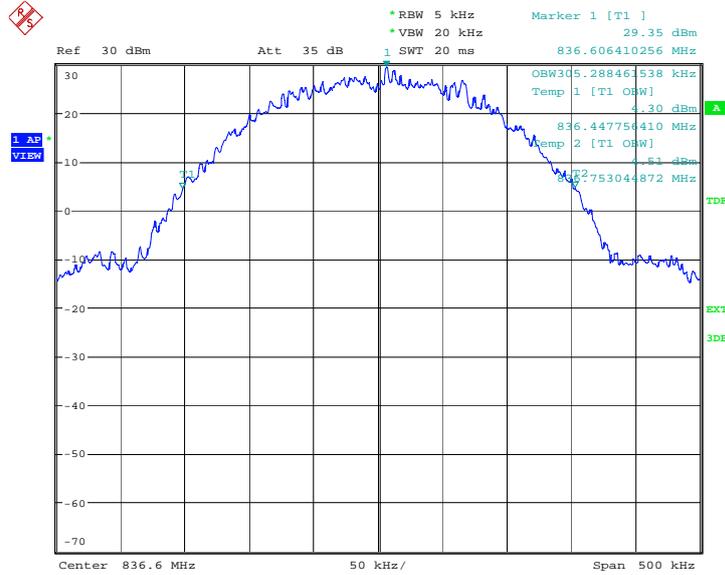
**GPRS 850**

**Channel 128-Occupied Bandwidth (100% BW)**



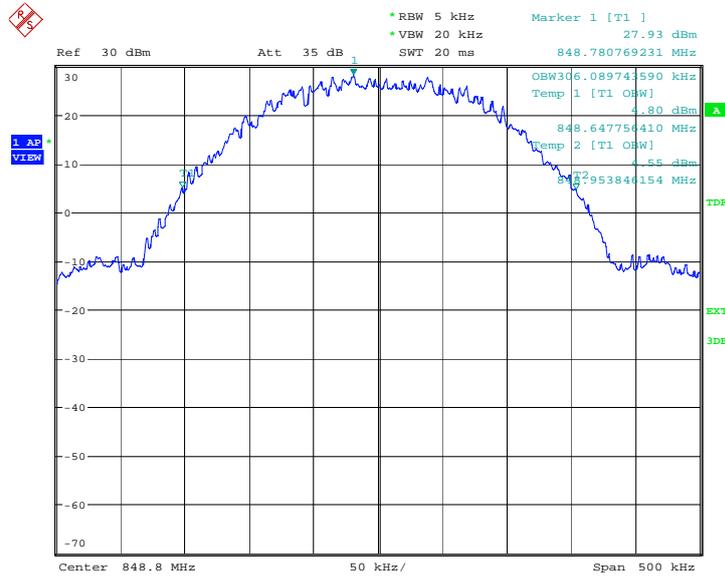
Date: 4.NOV.2013 08:56:58

### Channel 190-Occupied Bandwidth (100% BW)



Date: 4.NOV.2013 08:57:30

### Channel 251-Occupied Bandwidth (100% BW)



Date: 4.NOV.2013 08:58:02

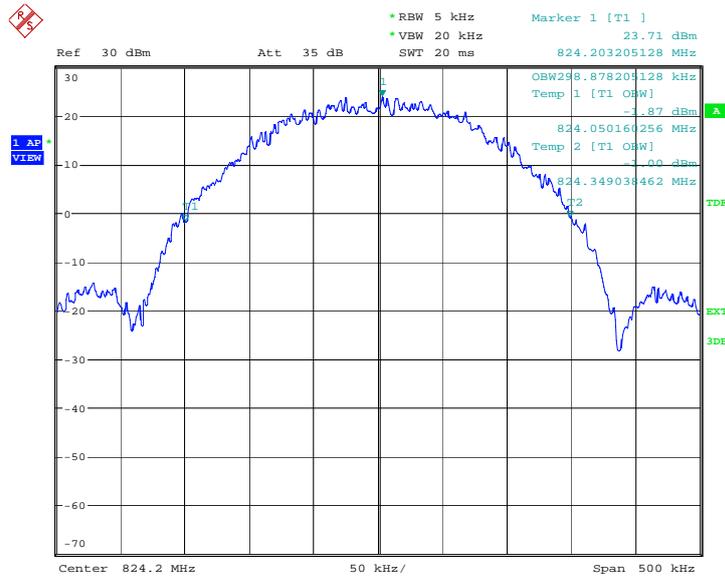
**EGPRS 850(100%)**

Frequency(MHz)	Occupied Bandwidth (100% BW)( kHz)
824.2	298.878
836.6	301.282
848.8	298.077

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

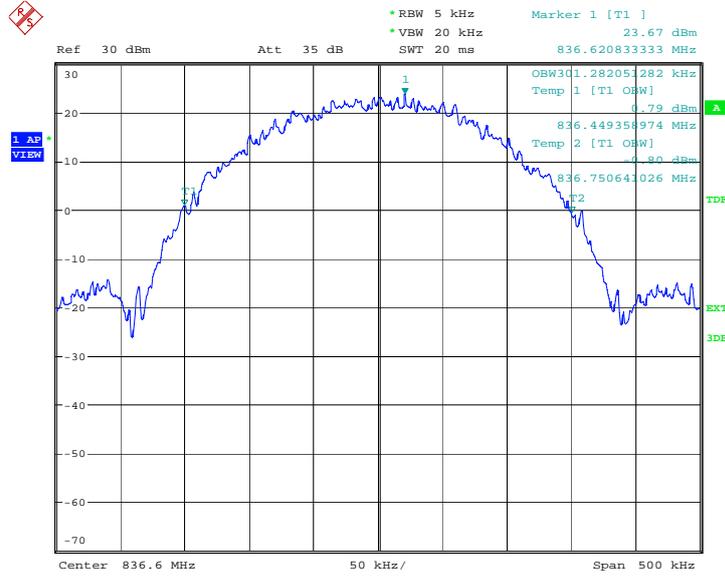
**EGPRS 850**

**Channel 128-Occupied Bandwidth (100% BW)**



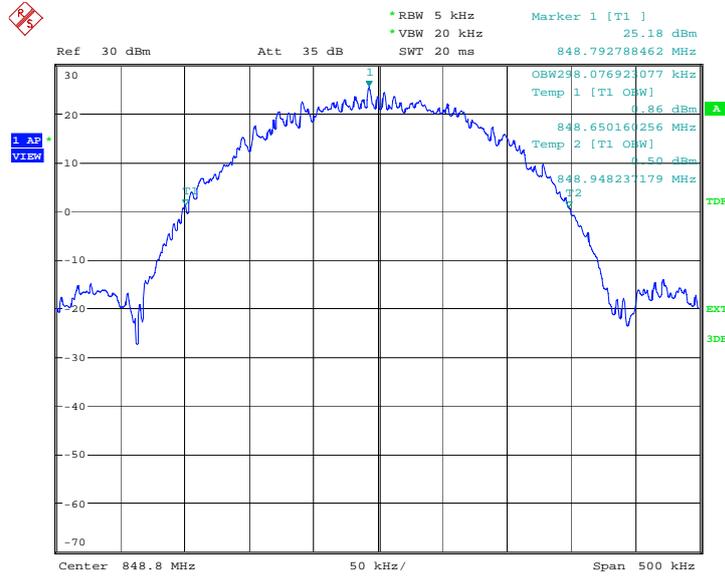
Date: 4.NOV.2013 09:23:41

### Channel 190-Occupied Bandwidth (100% BW)



Date: 4.NOV.2013 09:24:13

### Channel 251-Occupied Bandwidth (100% BW)



Date: 4.NOV.2013 09:24:45

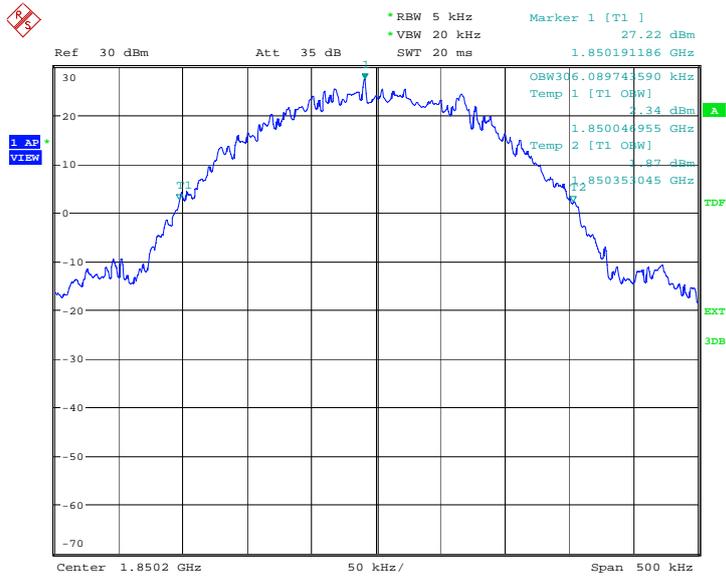
**PCS 1900(100% BW)**

Frequency(MHz)	Occupied Bandwidth (100% BW)( kHz)
1850.2	306.090
1880.0	306.090
1909.8	306.090

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

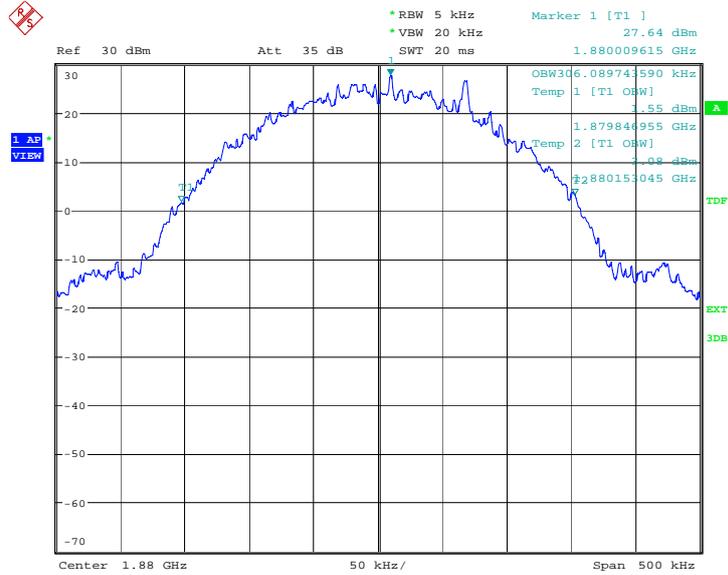
**PCS 1900**

**Channel 512-Occupied Bandwidth (100% BW)**



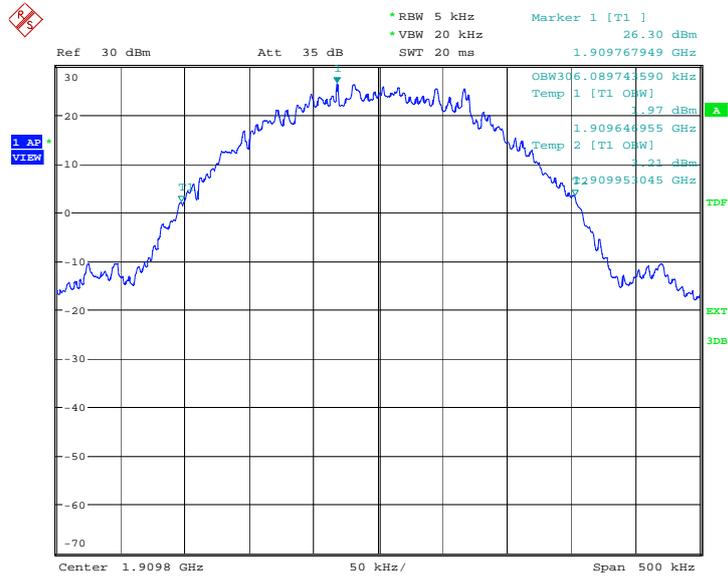
Date: 4.NOV.2013 10:06:13

### Channel 661-Occupied Bandwidth (100% BW)



Date: 4.NOV.2013 10:06:45

### Channel 810-Occupied Bandwidth (100% BW)



Date: 4.NOV.2013 10:07:17

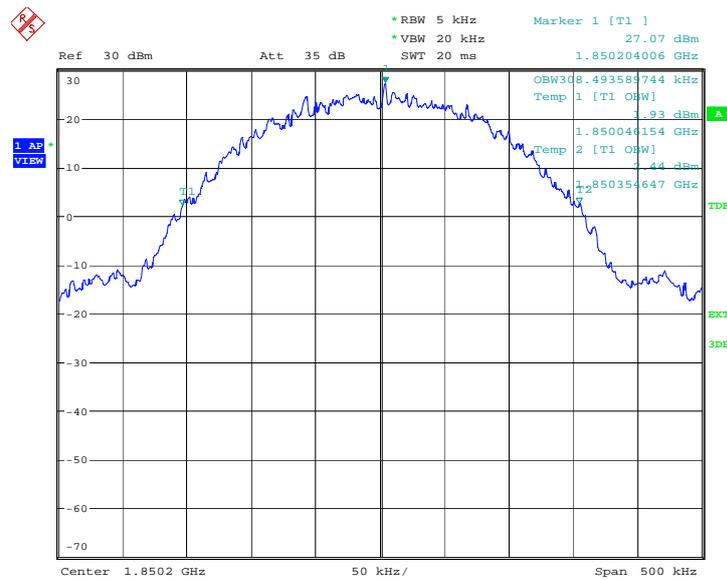
**GPRS 1900(100%)**

Frequency(MHz)	Occupied Bandwidth (100% BW)( kHz)
1850.2	308.494
1880.0	306.891
1909.8	305.288

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

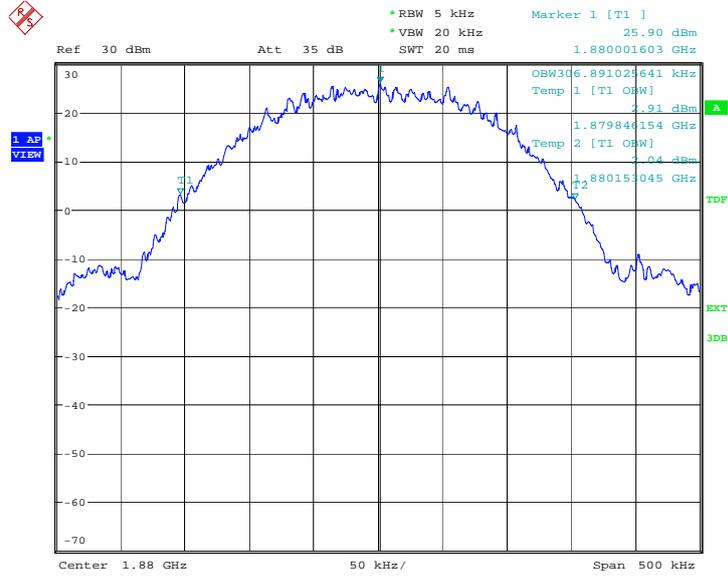
**GPRS 1900**

**Channel 512-Occupied Bandwidth (100% BW)**



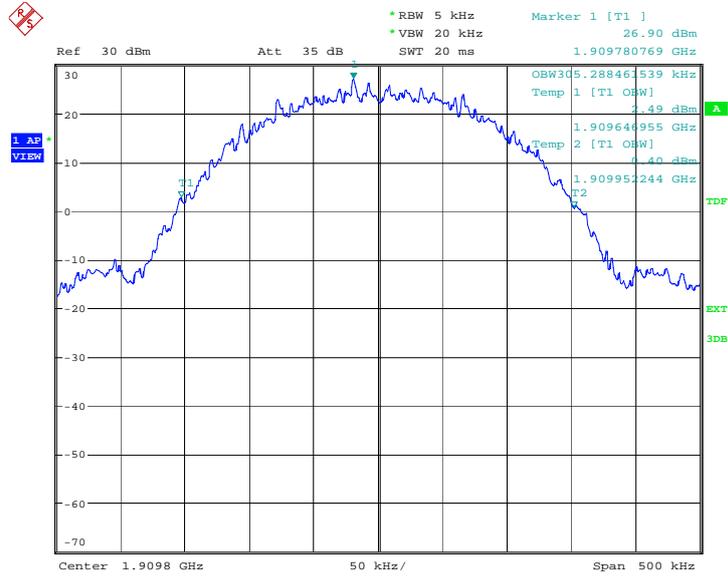
Date: 4.NOV.2013 09:13:13

### Channel 661-Occupied Bandwidth (100% BW)



Date: 4.NOV.2013 09:13:45

### Channel 810-Occupied Bandwidth (100% BW)



Date: 4.NOV.2013 09:14:17

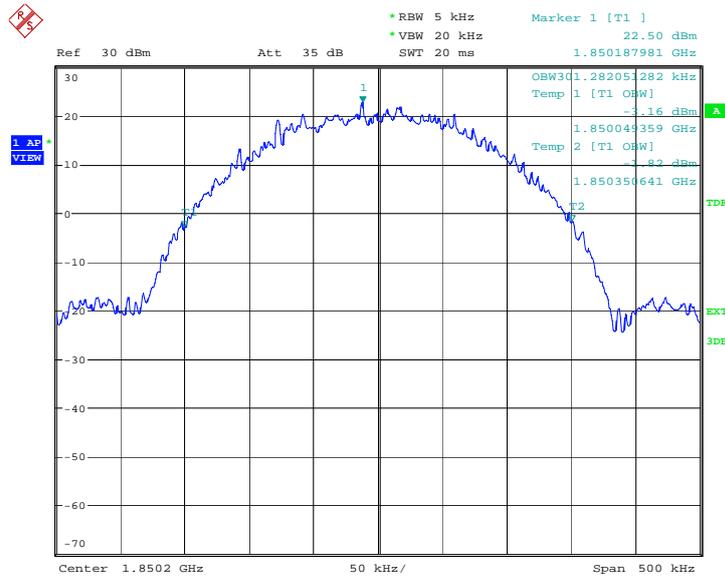
**EGPRS 1900(100% BW)**

Frequency(MHz)	Occupied Bandwidth (100% BW)( kHz)
1850.2	301.282
1880.0	298.077
1909.8	299.679

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

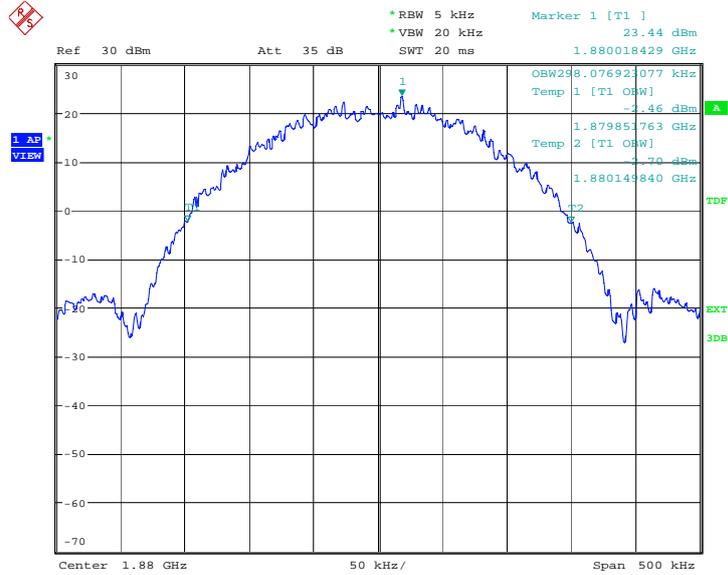
**EGPRS 1900**

**Channel 512-Occupied Bandwidth (100% BW)**



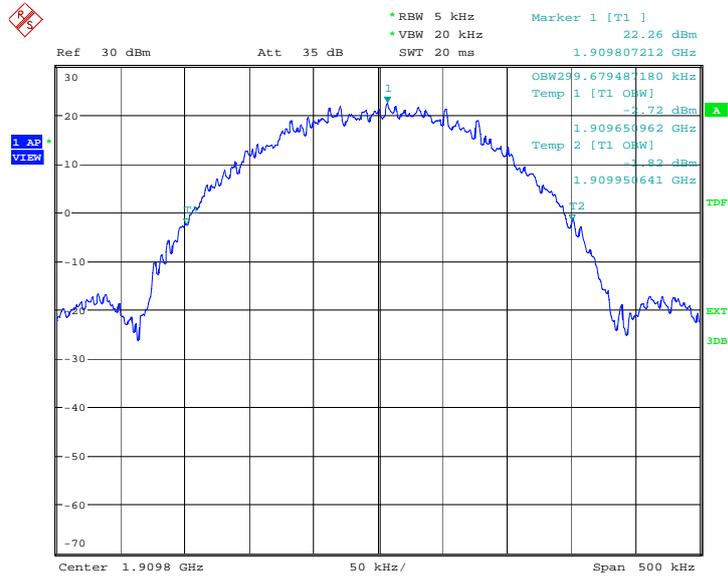
Date: 4.NOV.2013 09:35:07

### Channel 661-Occupied Bandwidth (100% BW)



Date: 4.NOV.2013 09:35:39

### Channel 810-Occupied Bandwidth (100% BW)



Date: 4.NOV.2013 09:36:12

## A.7 BAND EDGE COMPLIANCE

### Reference

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

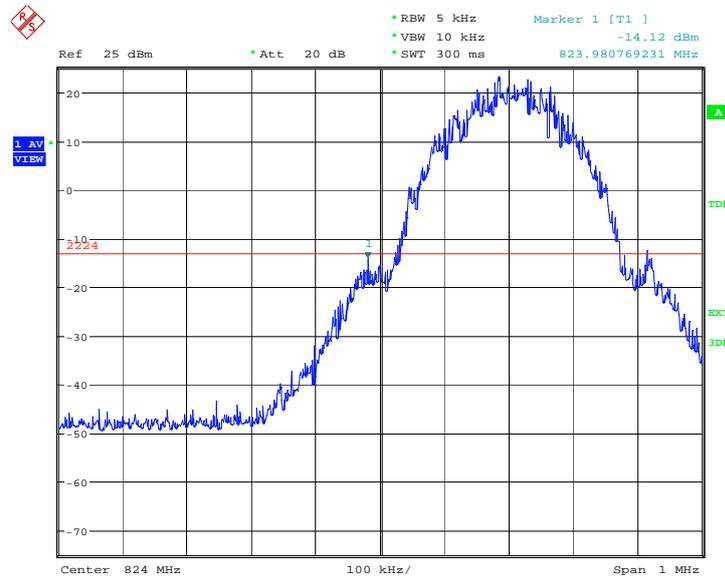
### A.7.1 Measurement limit

On any frequency outside frequency band of the US Cellular/PCS 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

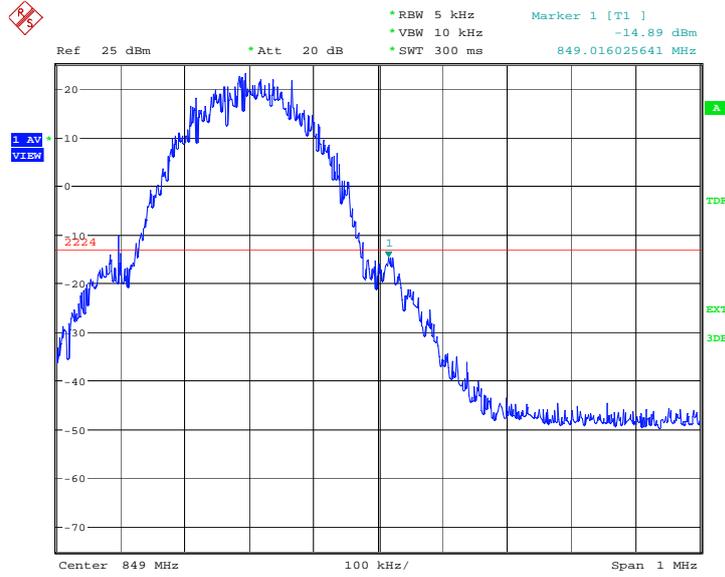
#### GSM 850

#### LOW BAND EDGE BLOCK-A (GSM850)-Channel 128



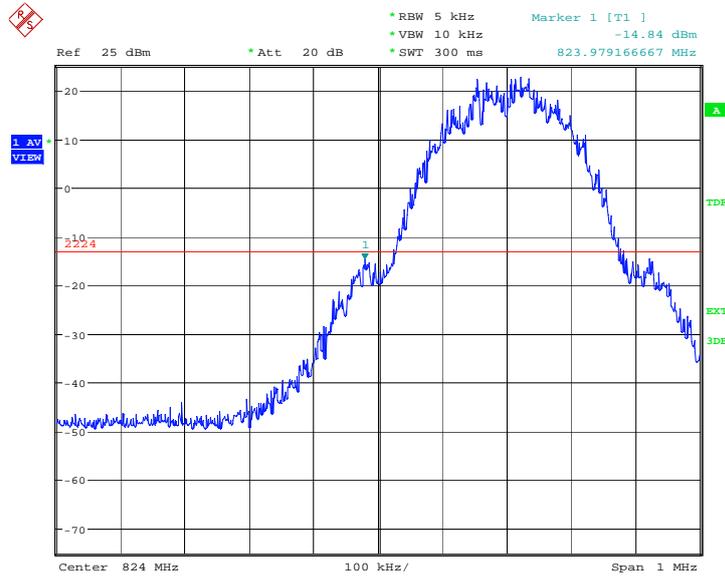
Date: 4.NOV.2013 09:50:05

### HIGH BAND EDGE BLOCK-C (GSM850) –Channel 251



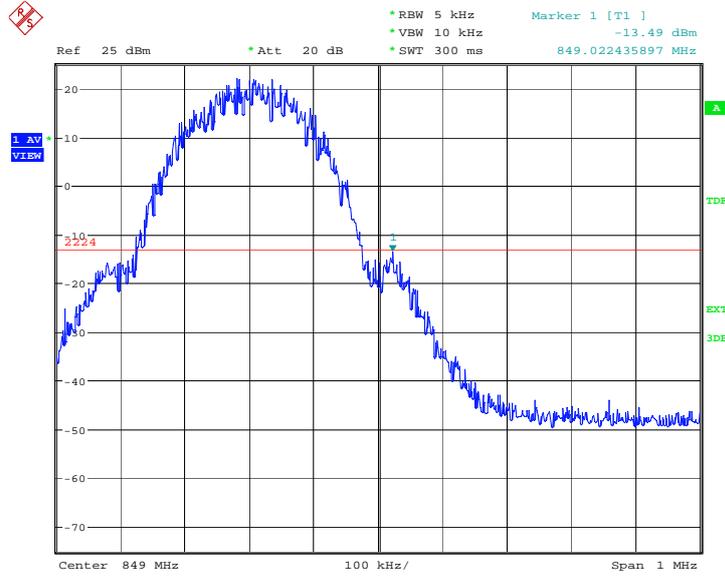
Date: 4.NOV.2013 09:50:19

### GPRS 850 LOW BAND EDGE BLOCK-A (GSM850)-Channel 128



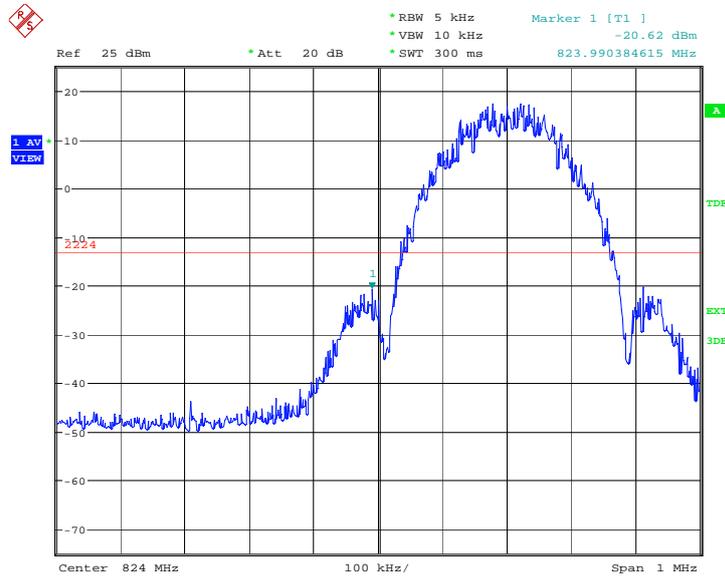
Date: 4.NOV.2013 08:58:17

### HIGH BAND EDGE BLOCK-C (GSM850) –Channel 251



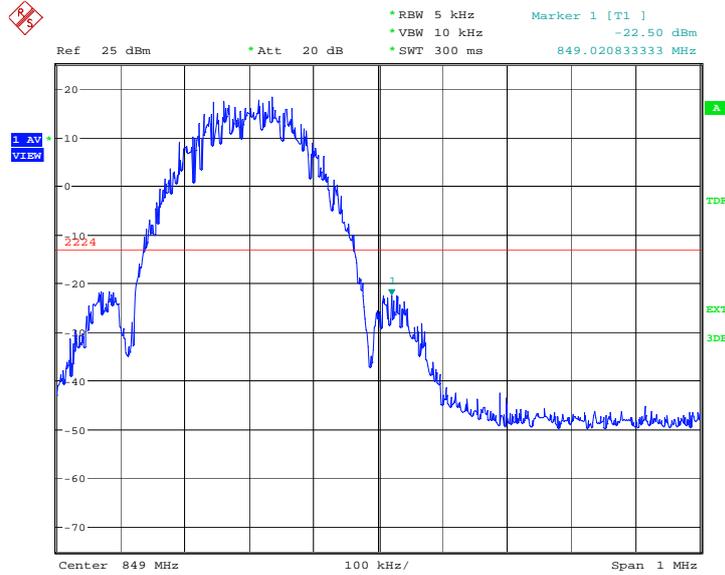
Date: 4.NOV.2013 08:58:31

### EGPRS 850-8PSK LOW BAND EDGE BLOCK-A (GSM850)-Channel 128



Date: 4.NOV.2013 09:24:59

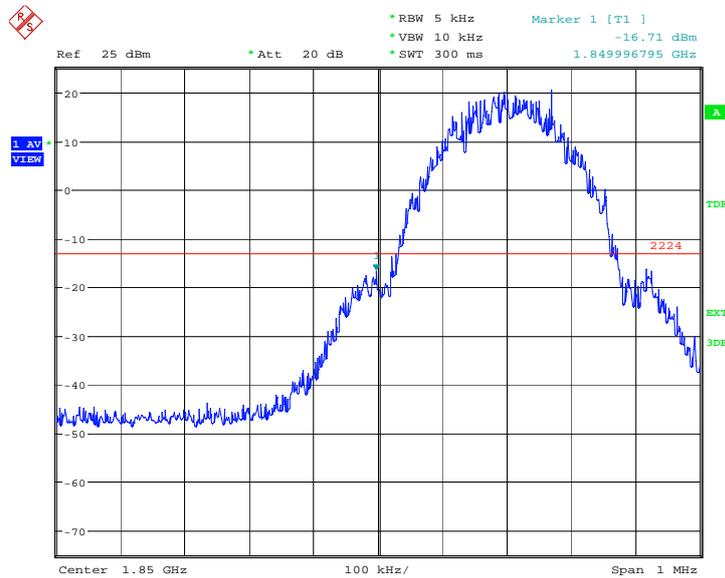
### HIGH BAND EDGE BLOCK-C (GSM850) –Channel 251



Date: 4.NOV.2013 09:25:13

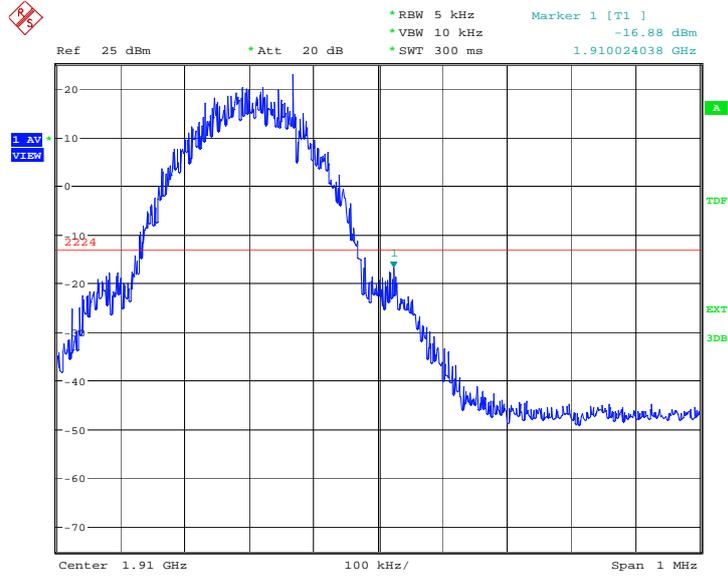
### PCS 1900

### LOW BAND EDGE BLOCK-A (PCS-1900)-Channel 512



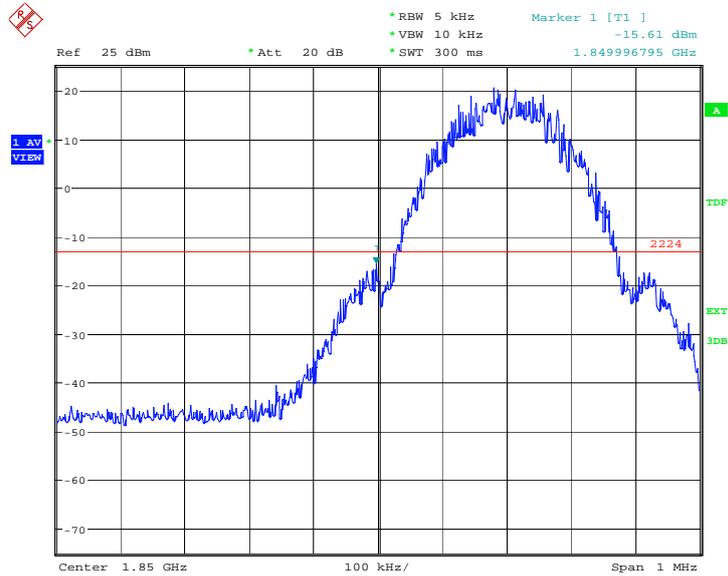
Date: 4.NOV.2013 10:07:31

### HIGH BAND EDGE BLOCK-C (PCS-1900) –Channel 810



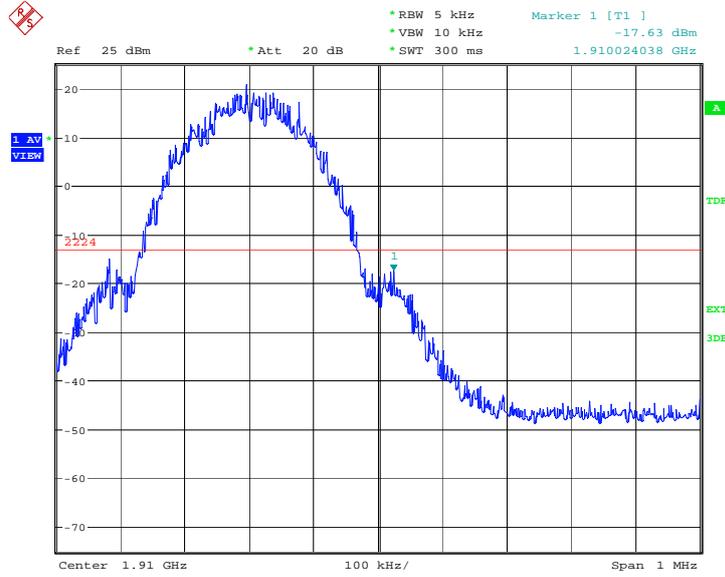
Date: 4.NOV.2013 10:07:45

### GPRS 1900 LOW BAND EDGE BLOCK-A (PCS-1900)-Channel 512



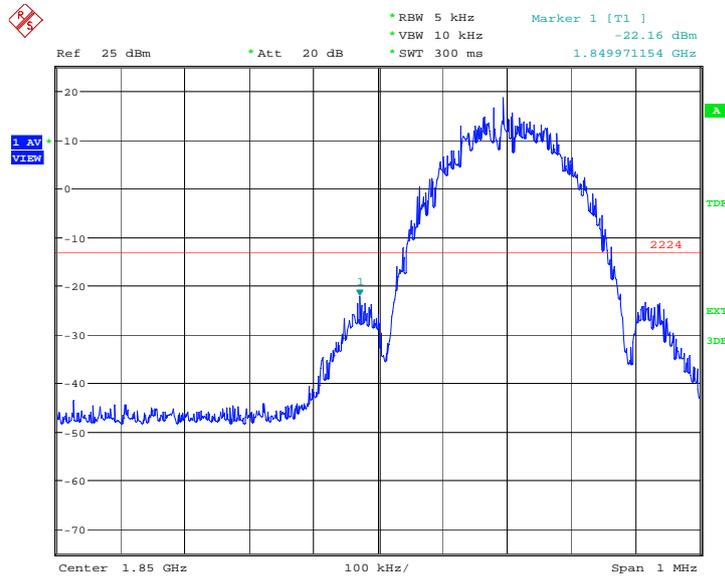
Date: 4.NOV.2013 09:14:31

### HIGH BAND EDGE BLOCK-C (PCS-1900) –Channel 810



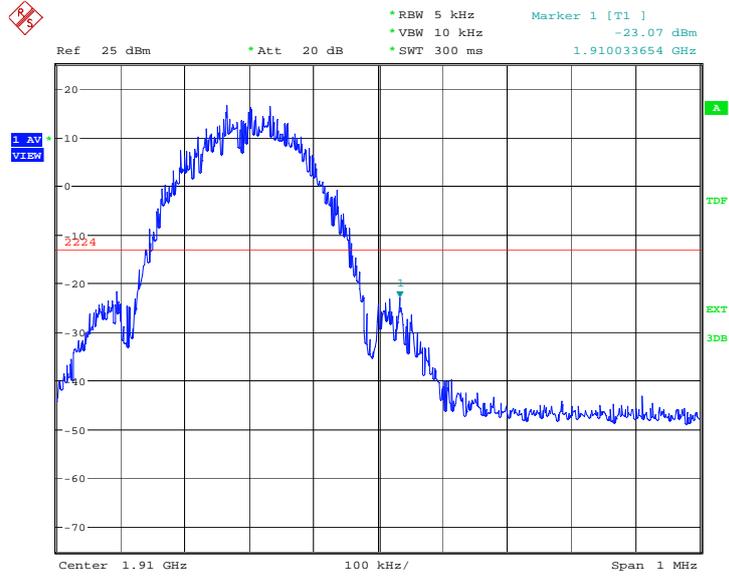
Date: 4.NOV.2013 09:14:45

### EGPRS 1900-8PSK LOW BAND EDGE BLOCK-A (PCS-1900)-Channel 512



Date: 4.NOV.2013 09:36:26

### HIGH BAND EDGE BLOCK-C (PCS-1900) –Channel 810



Date: 4.NOV.2013 09:36:39

## A.8 CONDUCTED SPURIOUS EMISSION

### Reference

FCC: CFR Part 2.1057, 22.917, 24.238.

### 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 PCS1900 band, this equates to a frequency range of 30 MHz to 19.1 GHz, data are taken from 30 MHz to 20 GHz. For GSM850, 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.

#### GSM850 Transmitter

Channel	Frequency (MHz)
128	824.2
190	836.6
251	848.8

#### PCS1900 Transmitter

Channel	Frequency (MHz)
512	1850.2
661	1880.0
810	1909.8

### 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**

**Measurement Uncertainty: 0.3dB**

**GSM850**

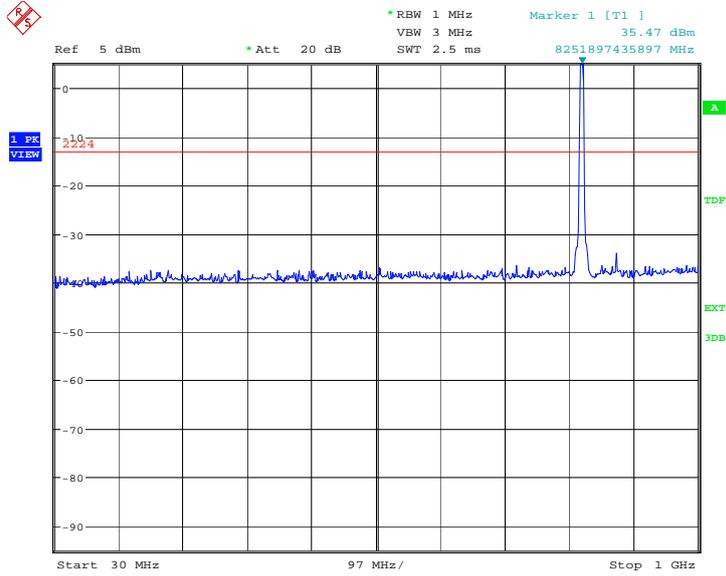
Harmonic	Tx ch. 128 Freq. (MHz)	Level (dBm)	Tx ch. 190 Freq. (MHz)	Level (dBm)	Tx ch. 251 Freq. (MHz)	Level (dBm)
2	1648.4	-29.71	1673.2	-30.25	1697.6	-29.99
3	2472.6	nf	2509.8	nf	2546.4	nf
4	3296.8	nf	3346.4	nf	3395.2	nf
5	4121	nf	4183	nf	4244	nf
6	4945.2	nf	5019.6	nf	5092.8	nf
7	5769.4	nf	5856.2	nf	5941.6	nf
8	6593.6	nf	6692.8	nf	6790.4	nf
9	7417.8	nf	7529.4	nf	7639.2	nf
10	8242	nf	8366	nf	8488	nf
nf: Noise floor						

**GSM850**

**A.8.3.1 Channel 128: 30MHz – 1GHz**

Spurious emission limit –13dBm.

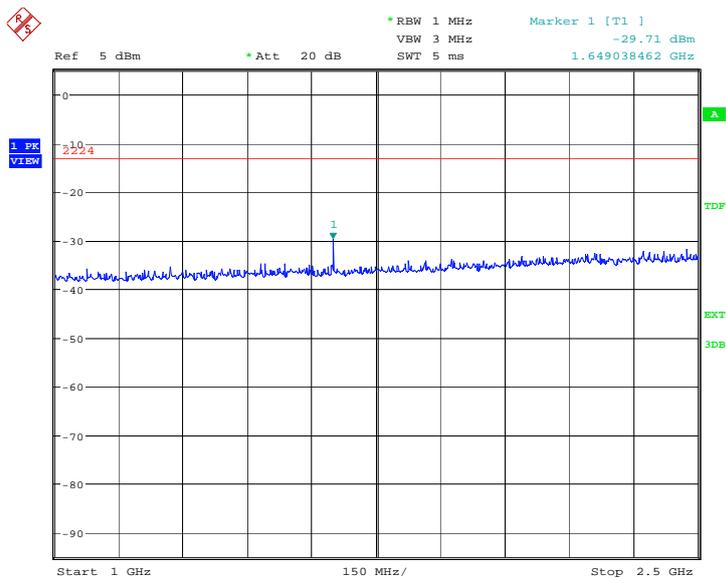
**NOTE: peak above the limit line is the carrier frequency.**



Date: 4.NOV.2013 09:52:26

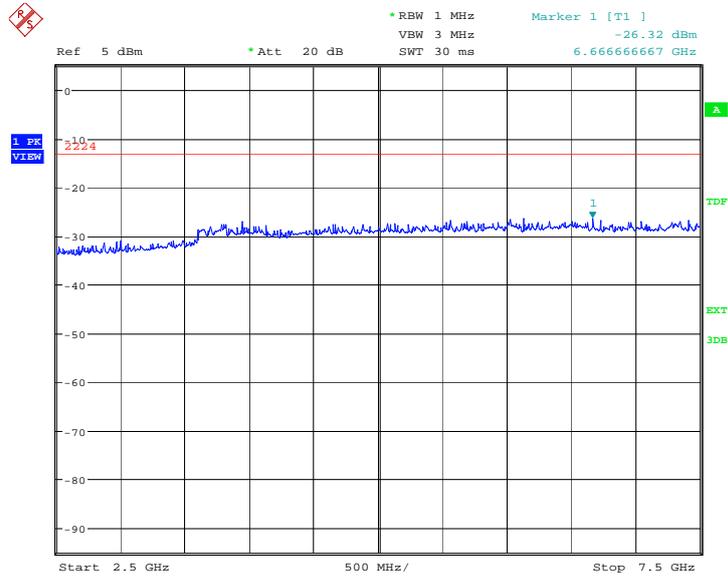
**A.8.3.2 Channel 128: 1GHz – 2.5GHz**

Spurious emission limit –13dBm.



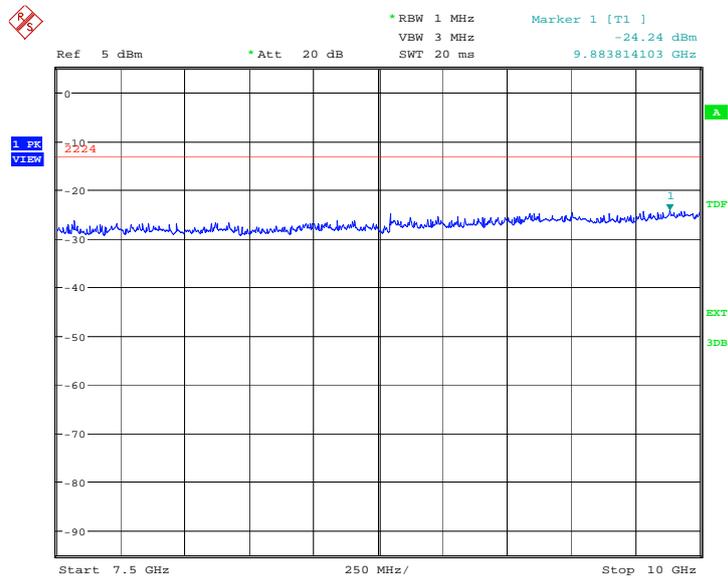
Date: 4.NOV.2013 09:52:54

**A.8.3.3 Channel 128: 2.5GHz – 7.5GHz**  
Spurious emission limit –13dBm.



Date: 4.NOV.2013 09:53:22

**A.8.3.4 Channel 128: 7.5GHz –10GHz**  
Spurious emission limit –13dBm.

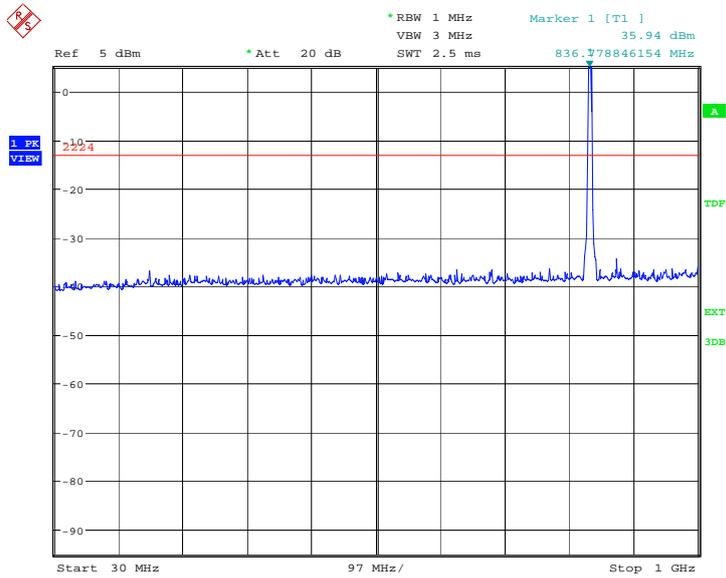


Date: 4.NOV.2013 09:53:50

### A.8.3.5 Channel 190: 30MHz – 1GHz

Spurious emission limit –13dBm

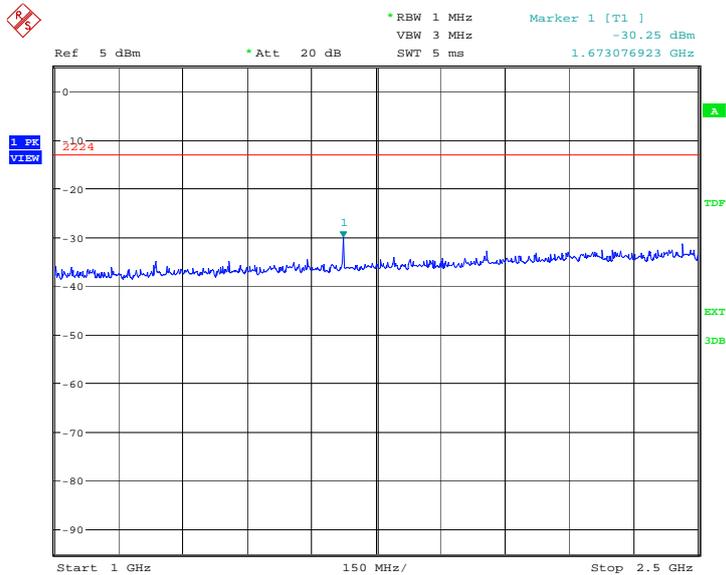
**NOTE: peak above the limit line is the carrier frequency.**



Date: 4.NOV.2013 09:54:19

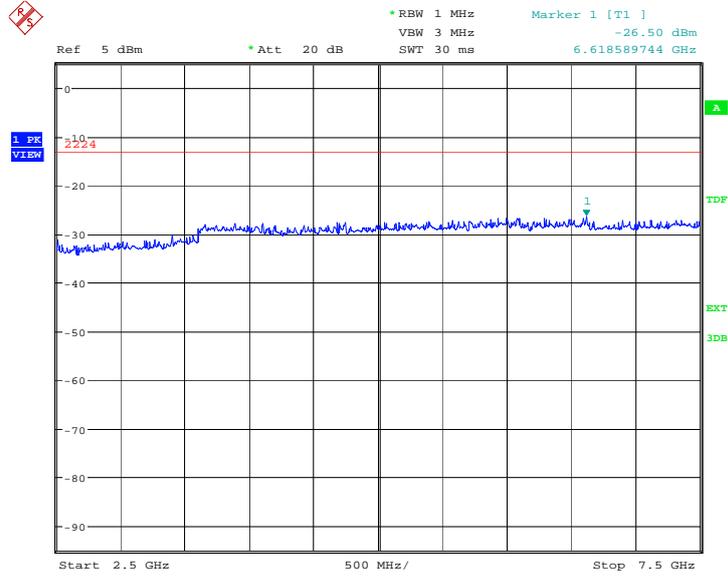
### A.8.3.6 Channel 190: 1GHz –2.5GHz

Spurious emission limit –13dBm



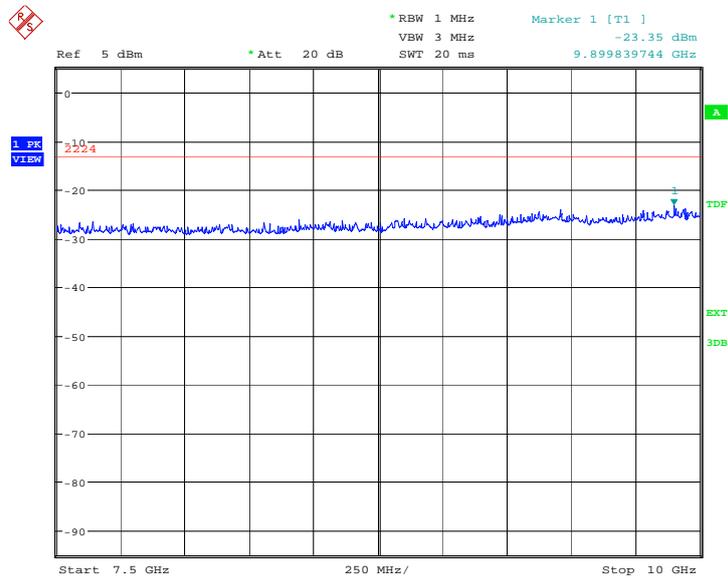
Date: 4.NOV.2013 09:54:47

**A.8.3.7 Channel 190: 2.5GHz –7.5GHz**  
Spurious emission limit –13dBm



Date: 4.NOV.2013 09:55:15

**A.8.3.8 Channel 190: 7.5GHz –10GHz**  
Spurious emission limit –13dBm

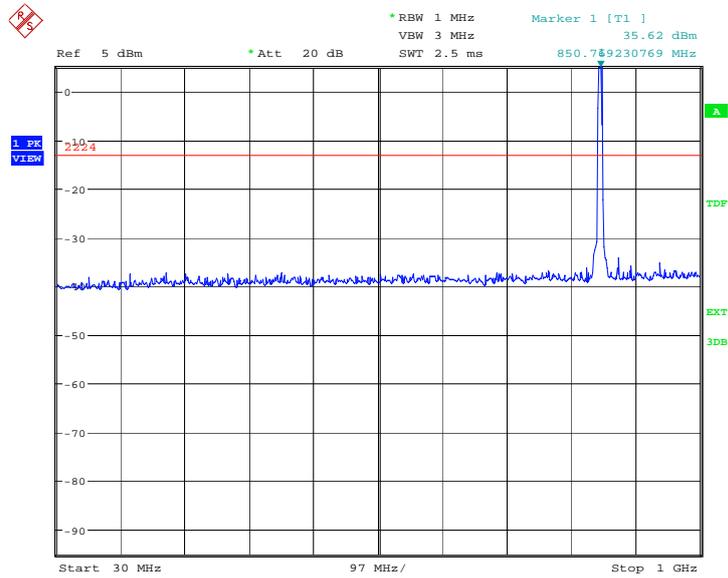


Date: 4.NOV.2013 09:55:43

### A.8.3.9 Channel 251: 30MHz – 1GHz

Spurious emission limit –13dBm.

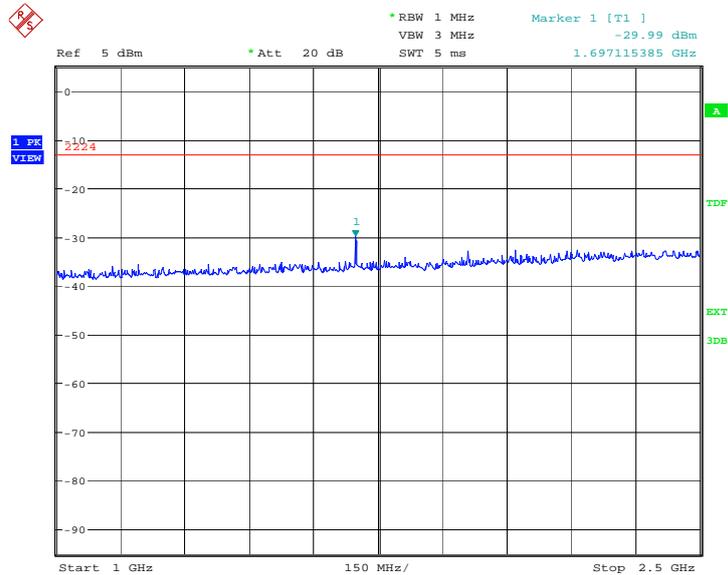
**NOTE: peak above the limit line is the carrier frequency.**



Date: 4.NOV.2013 09:56:12

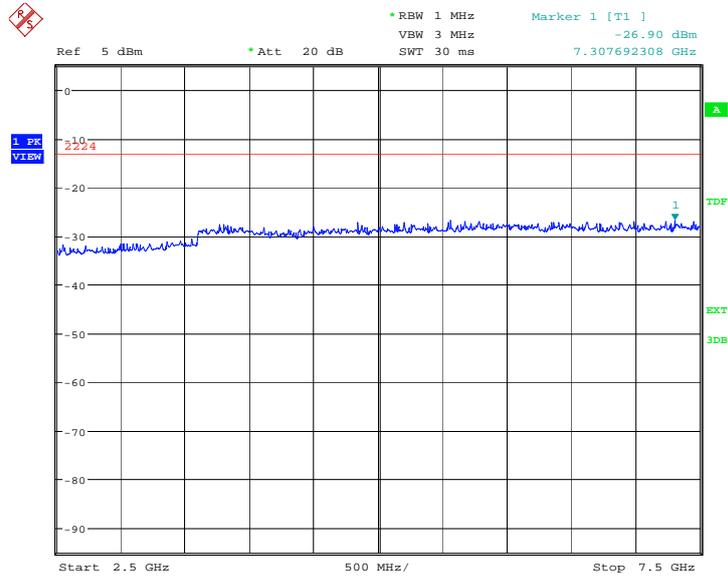
### A.8.3.10 Channel 251: 1GHz – 2.5GHz

Spurious emission limit –13dBm.



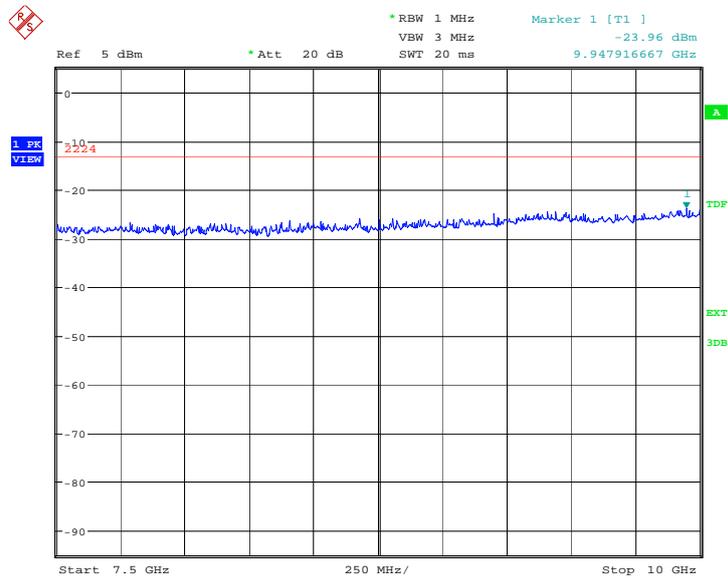
Date: 4.NOV.2013 09:56:40

**A.8.3.11 Channel 251:2.5GHz – 7.5GHz**  
Spurious emission limit –13dBm.



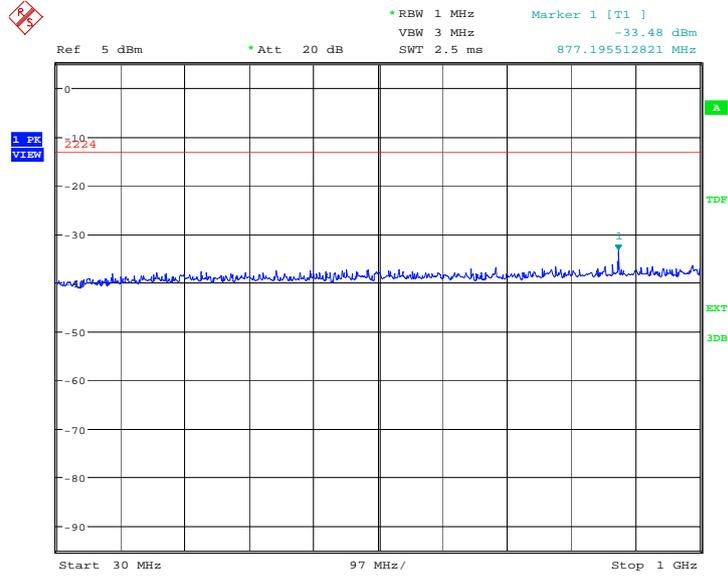
Date: 4.NOV.2013 09:57:08

**A.8.3.12 Channel 251: 7.5GHz – 10GHz**  
Spurious emission limit –13dBm.



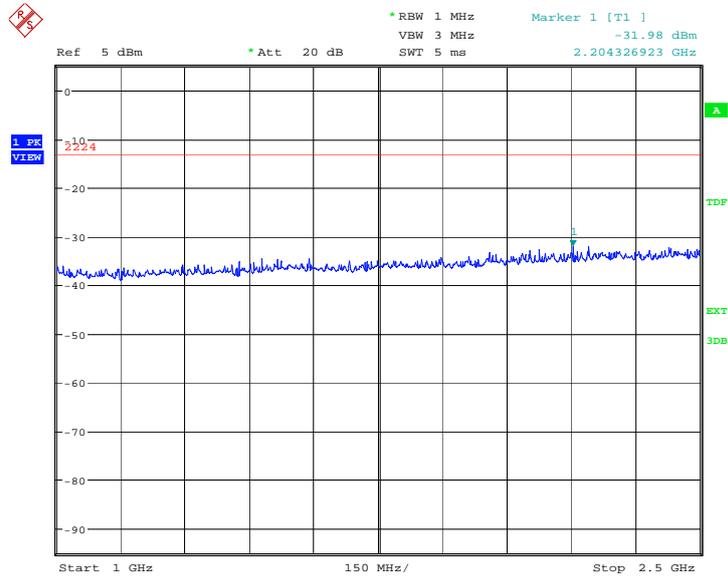
Date: 4.NOV.2013 09:57:36

**A.8.3.13 Idle mode: 30MHz – 1GHz**  
Spurious emission limit –13dBm.



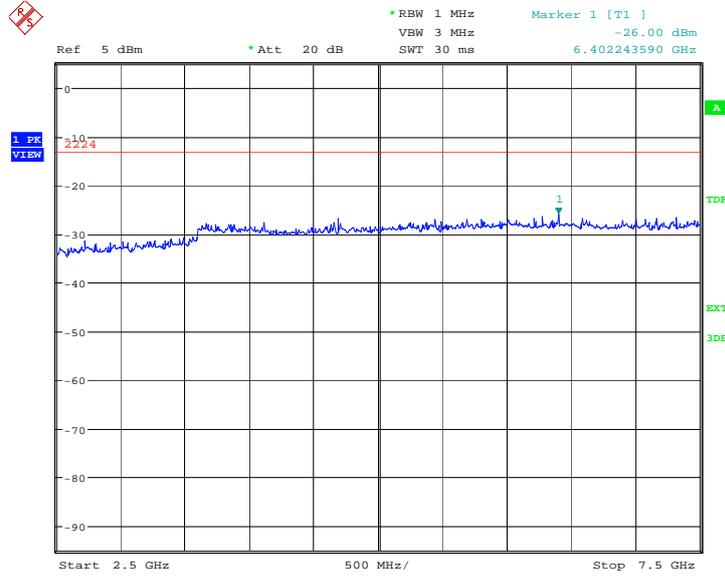
Date: 4.NOV.2013 09:58:05

**A.8.3.14 Idle mode: 1GHz – 2.5GHz**  
Spurious emission limit –13dBm.



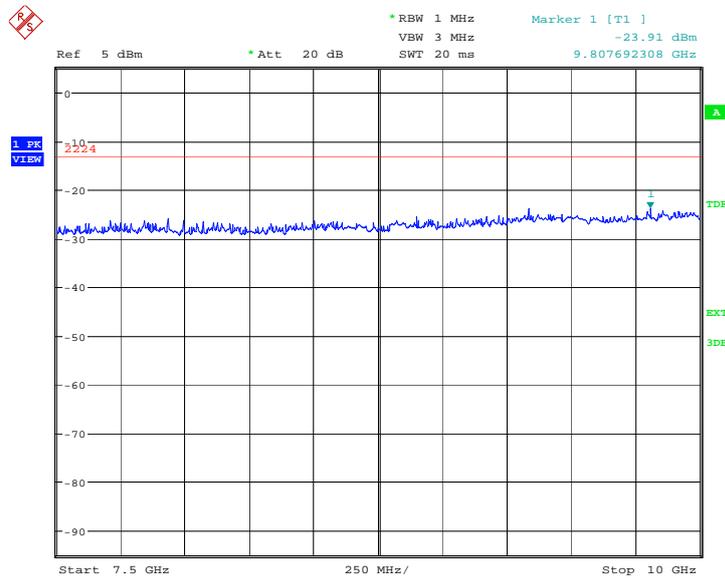
Date: 4.NOV.2013 09:58:33

**A.8.3.15 Idle mode: 2.5GHz – 7.5GHz**  
Spurious emission limit –13dBm.



Date: 4.NOV.2013 09:59:01

**A.8.3.16 Idle mode: 7.5GHz – 10GHz**  
Spurious emission limit –13dBm.



Date: 4.NOV.2013 09:59:29

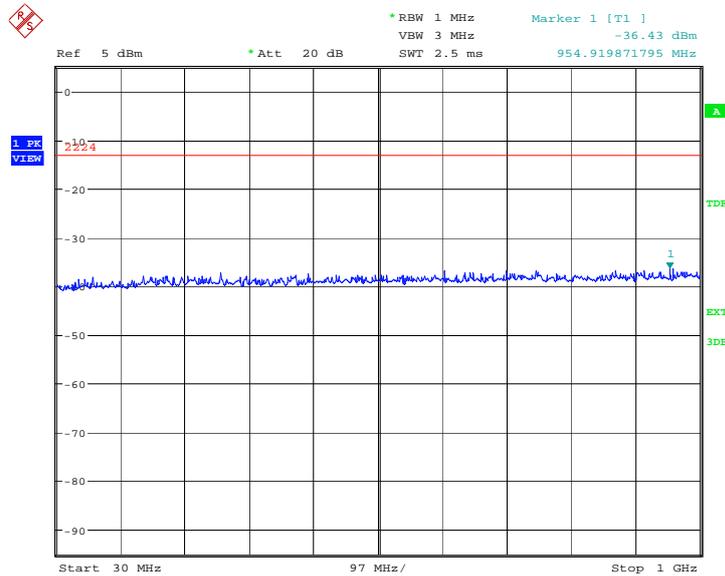
**PCS1900**

Harmonic	Tx ch. 512 Freq. (MHz)	Level (dBm)	Tx ch. 661 Freq. (MHz)	Level (dBm)	Tx ch. 810 Freq. (MHz)	Level (dBm)
2	3700.4	nf	3760	nf	3819.6	nf
3	5550.6	nf	5640	nf	5729.4	nf
4	7400.8	nf	7520	nf	7639.2	nf
5	9251.0	nf	9400	nf	9549.0	nf
6	11101.2	nf	11280	nf	11458.8	nf
7	12951.4	nf	13160	nf	13368.6	nf
8	14801.6	nf	15040	nf	15278.4	nf
9	16651.8	nf	16920	nf	17188.2	nf
10	18502.0	nf	18800	nf	19098.0	nf
nf: Noise floor						

PCS1900

A.8.3.17 Channel 512: 30MHz – 1GHz

Spurious emission limit –13dBm.

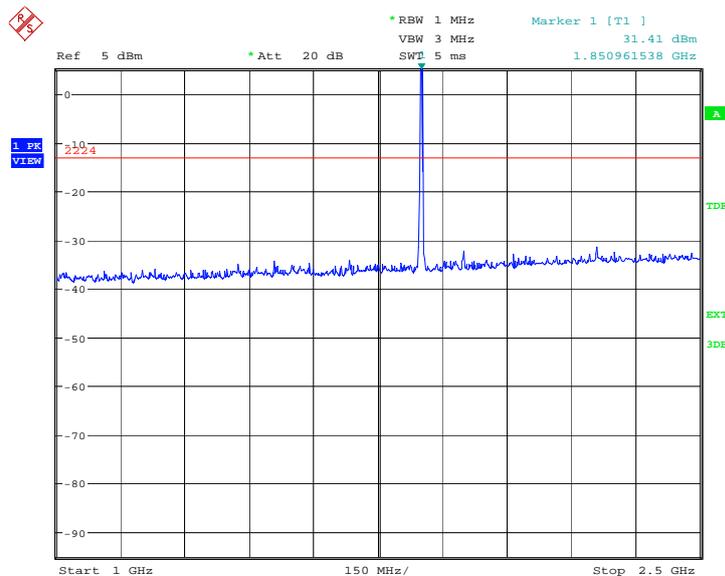


Date: 4.NOV.2013 10:09:52

A.8.3.18 Channel 512: 1GHz – 2.5GHz

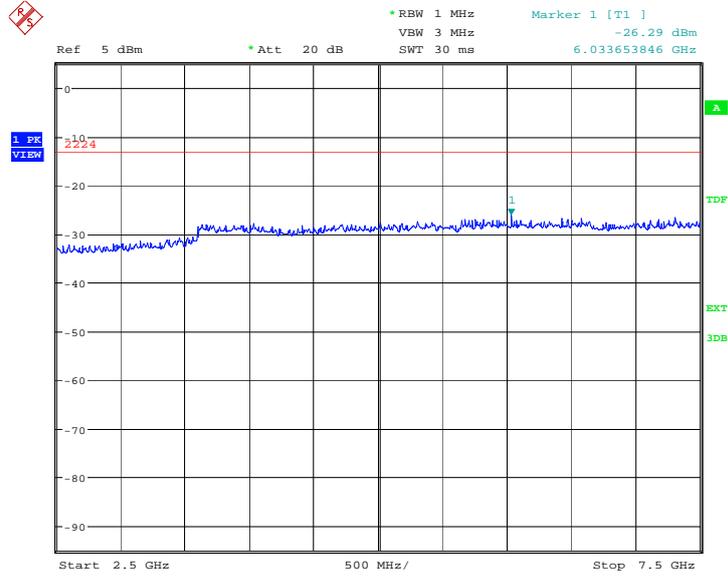
Spurious emission limit –13dBm.

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



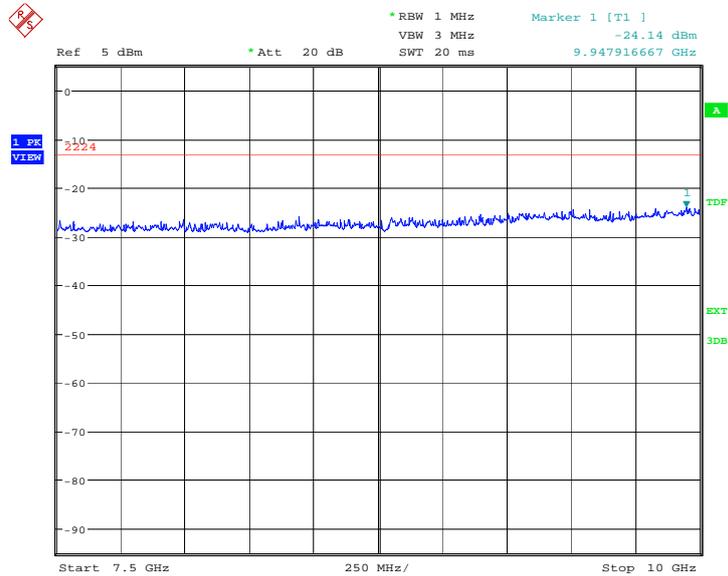
Date: 4.NOV.2013 10:10:20

**A.8.3.19 Channel 512: 2.5GHz – 7.5GHz**  
Spurious emission limit –13dBm.



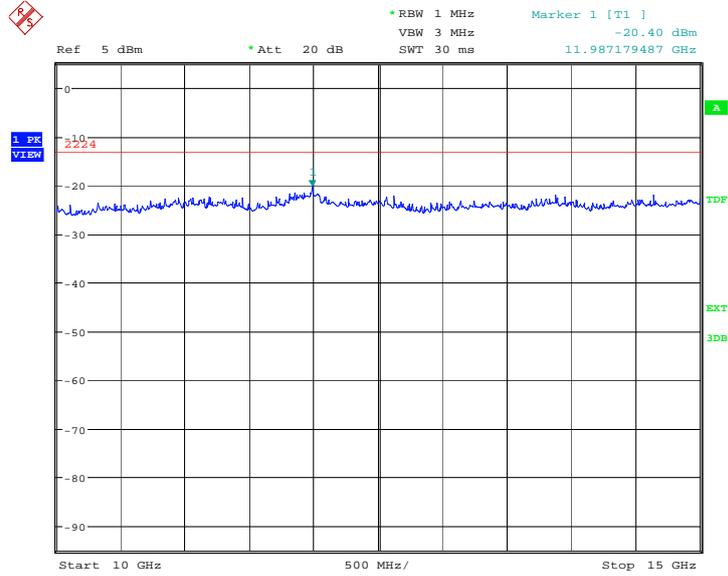
Date: 4.NOV.2013 10:10:48

**A.8.3.20 Channel 512: 7.5GHz –10GHz**  
Spurious emission limit –13dBm.



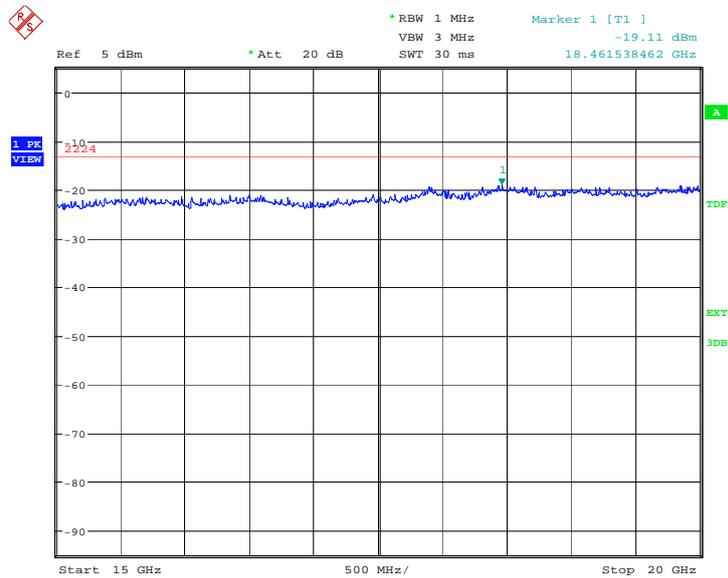
Date: 4.NOV.2013 10:11:16

**A.8.3.21 Channel 512: 10GHz –15GHz**  
Spurious emission limit –13dBm.



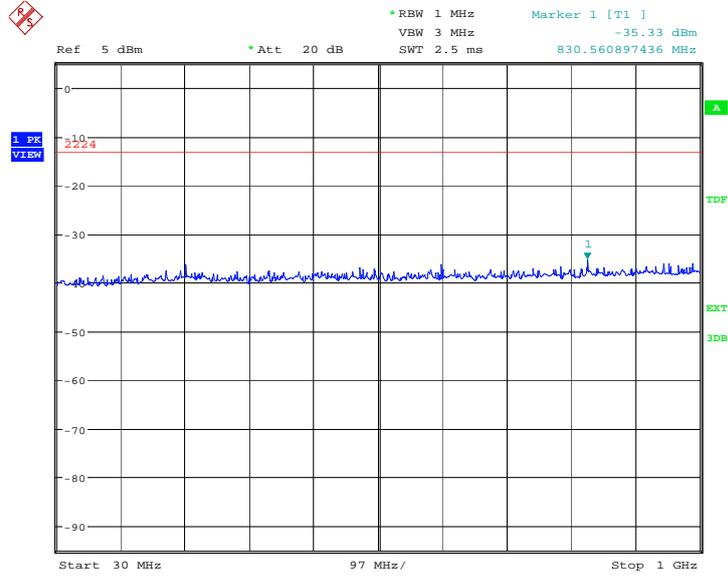
Date: 4.NOV.2013 10:11:44

**A.8.3.22 Channel 512: 15GHz –20GHz**  
Spurious emission limit –13dBm.



Date: 4.NOV.2013 10:12:13

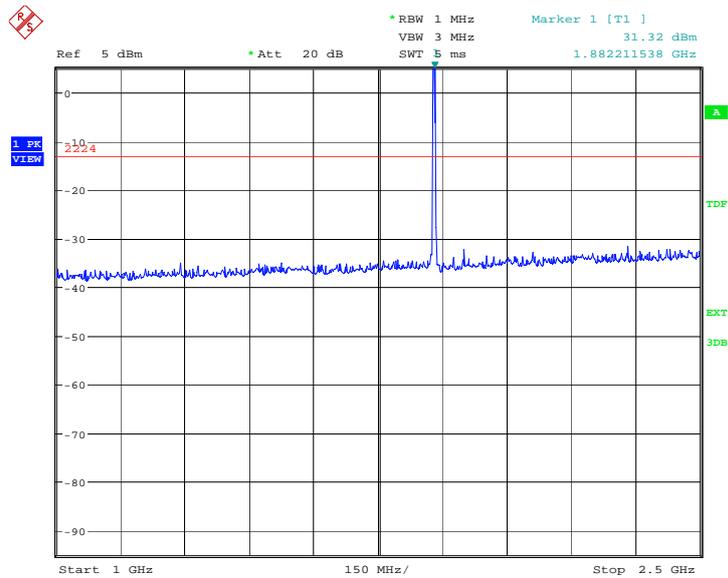
**A.8.3.23 Channel 661: 30MHz – 1GHz**  
Spurious emission limit –13dBm



Date: 4.NOV.2013 10:12:41

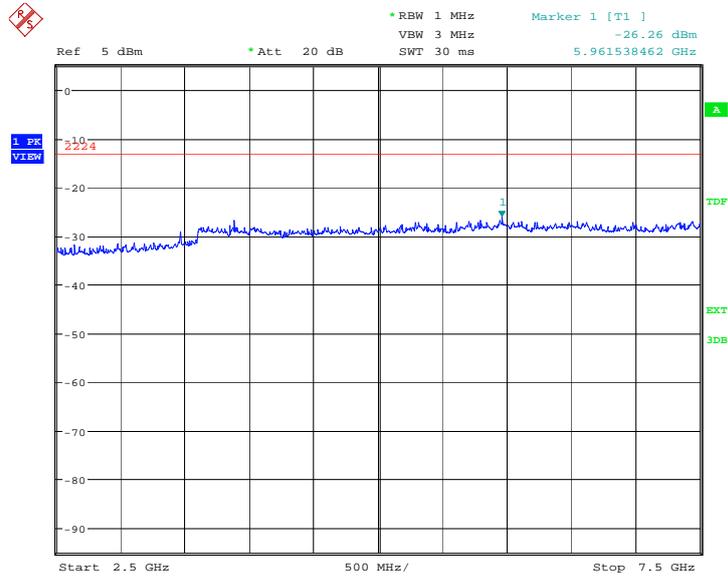
**A.8.3.24 Channel 661: 1GHz – 2.5GHz**  
Spurious emission limit –13dBm

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



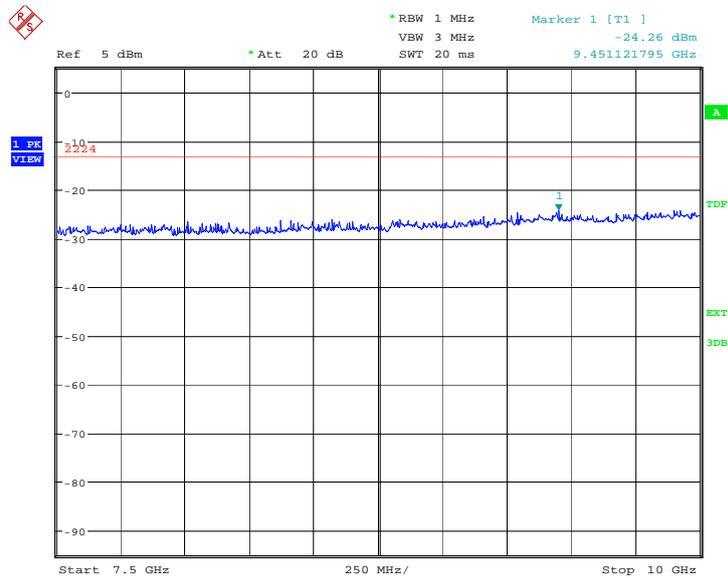
Date: 4.NOV.2013 10:13:09

**A.8.3.25 Channel 661: 2.5GHz –7.5GHz**  
Spurious emission limit –13dBm



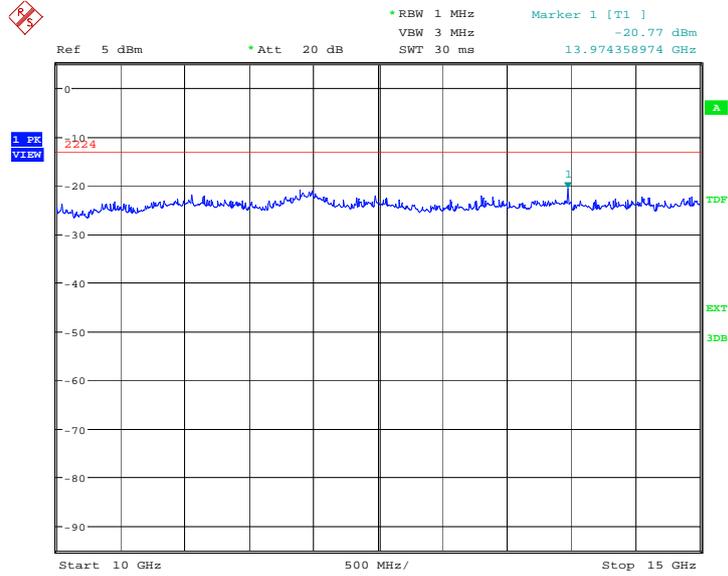
Date: 4.NOV.2013 10:13:38

**A.8.3.26 Channel 661: 7.5GHz –10GHz**  
Spurious emission limit –13dBm



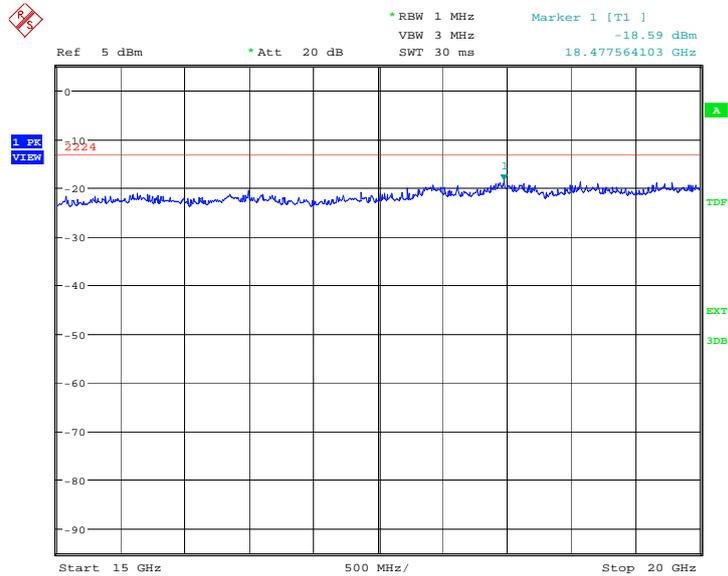
Date: 4.NOV.2013 10:14:06

**A.8.3.27 Channel 661: 10GHz –15GHz**  
Spurious emission limit –13dBm.



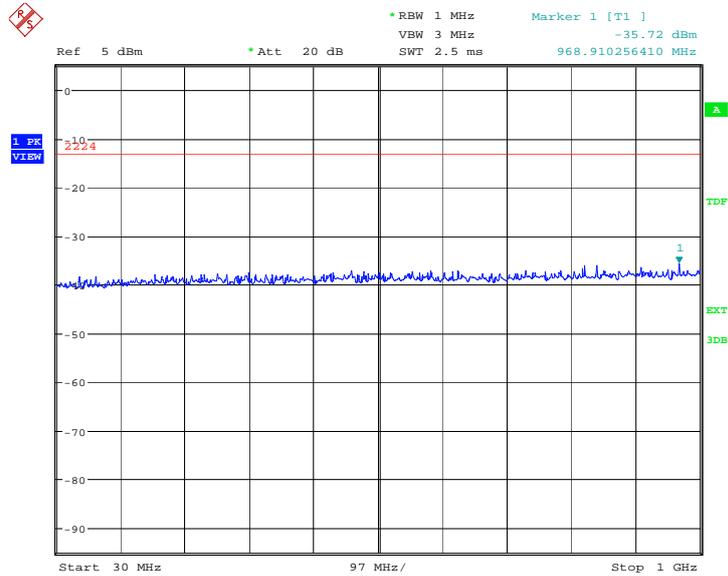
Date: 4.NOV.2013 10:14:33

**A.8.3.28 Channel 661: 15GHz –20GHz**  
Spurious emission limit –13dBm.



Date: 4.NOV.2013 10:15:01

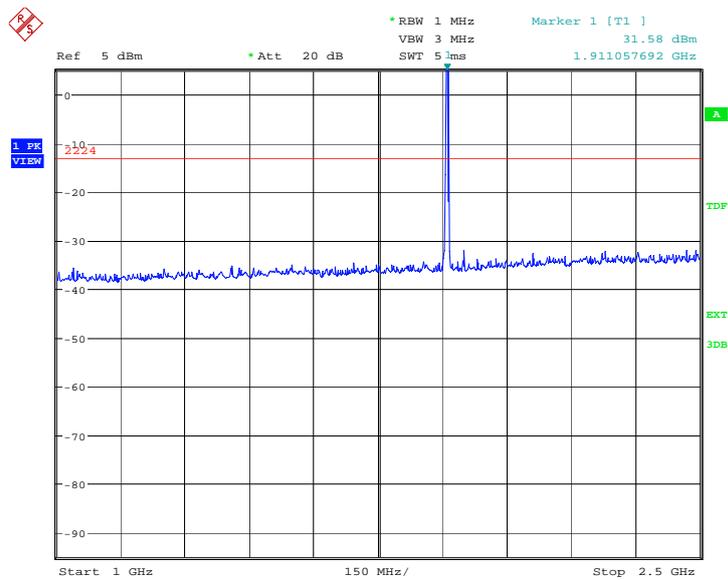
**A.8.3.29 Channel 810: 30MHz – 1GHz**  
Spurious emission limit –13dBm.



Date: 4.NOV.2013 10:15:30

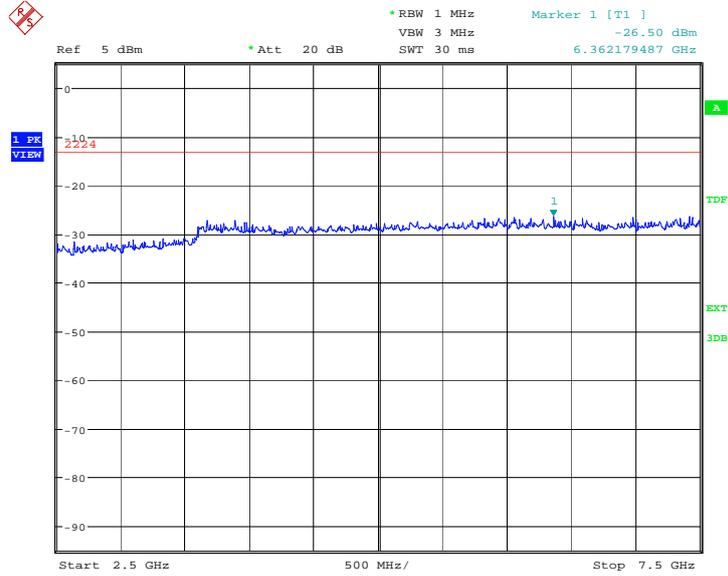
**A.8.3.30 Channel 810: 1GHz – 2.5GHz**  
Spurious emission limit –13dBm.

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



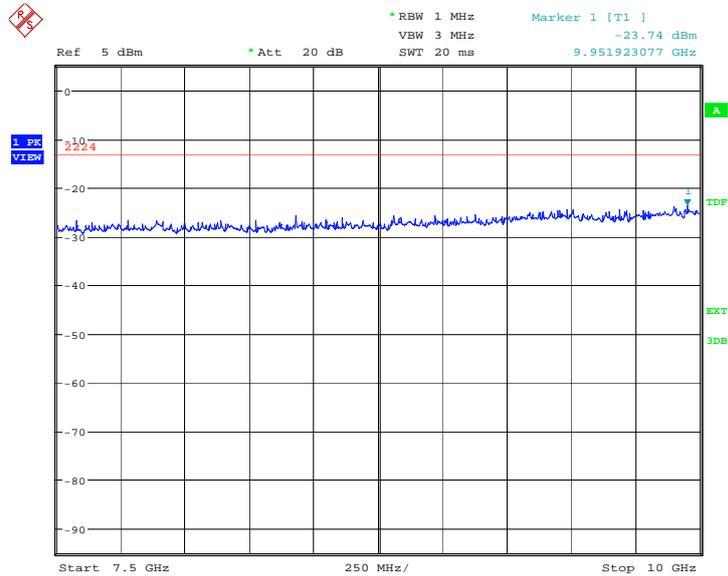
Date: 4.NOV.2013 10:15:58

**A.8.3.31 Channel 810: 2.5GHz – 7.5GHz**  
Spurious emission limit –13dBm.



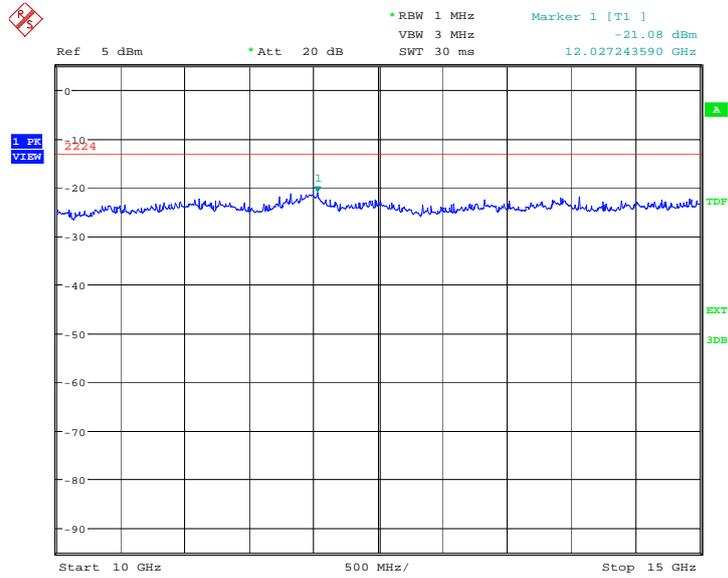
Date: 4.NOV.2013 10:16:27

**A.8.3.32 Channel 810: 7.5GHz – 10GHz**  
Spurious emission limit –13dBm.



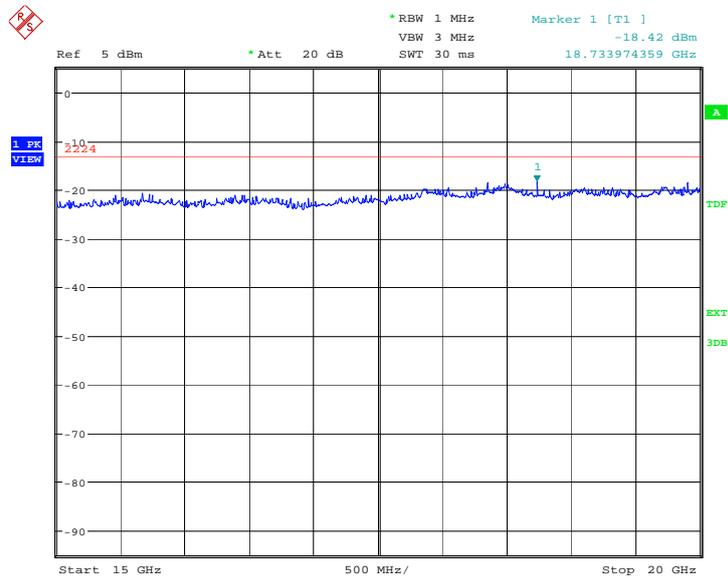
Date: 4.NOV.2013 10:16:55

**A.8.3.33 Channel 810: 10GHz –15GHz**  
Spurious emission limit –13dBm.



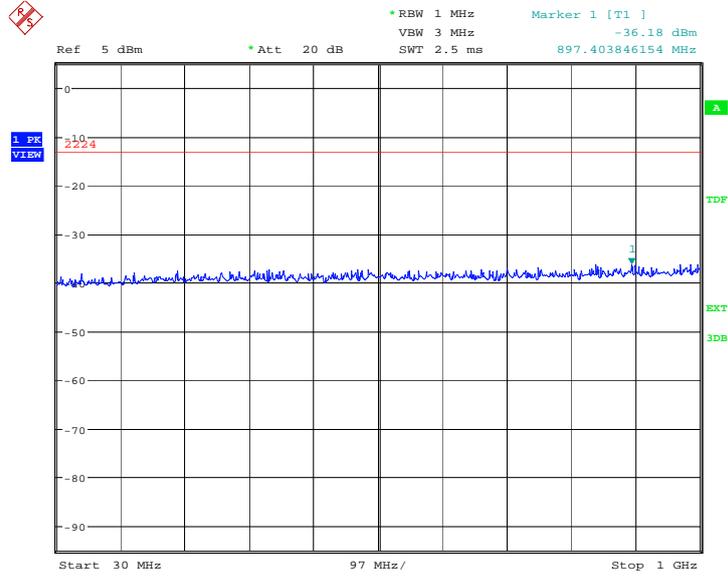
Date: 4.NOV.2013 10:17:23

**A.8.3.34 Channel 810: 15GHz –20GHz**  
Spurious emission limit –13dBm.



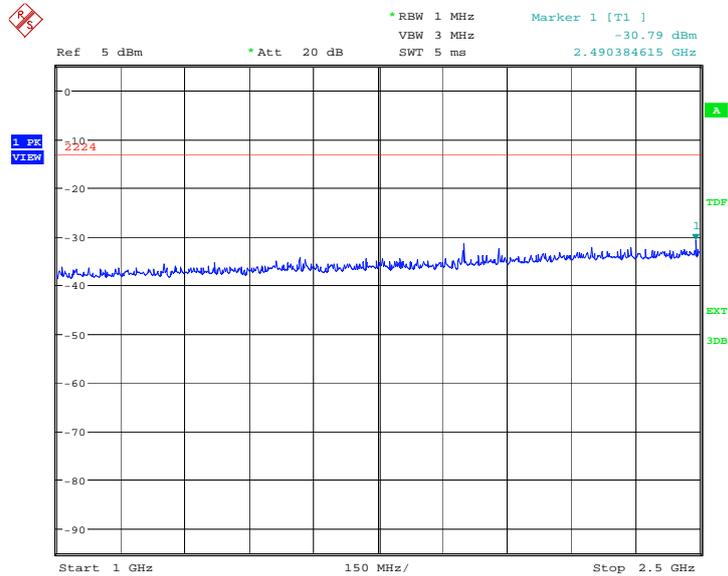
Date: 4.NOV.2013 10:17:51

**A.8.3.35 Idle mode: 30MHz – 1GHz**  
Spurious emission limit –13dBm.



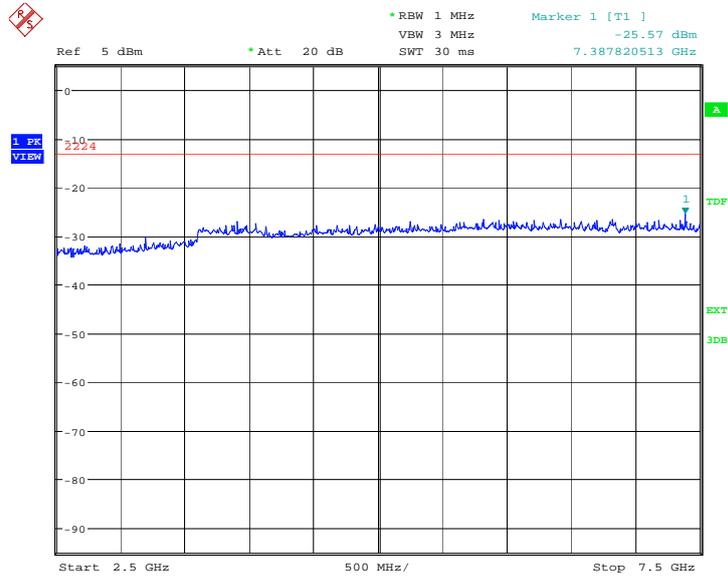
Date: 4.NOV.2013 10:18:20

**A.8.3.36 Idle mode: 1GHz – 2.5GHz**  
Spurious emission limit –13dBm.



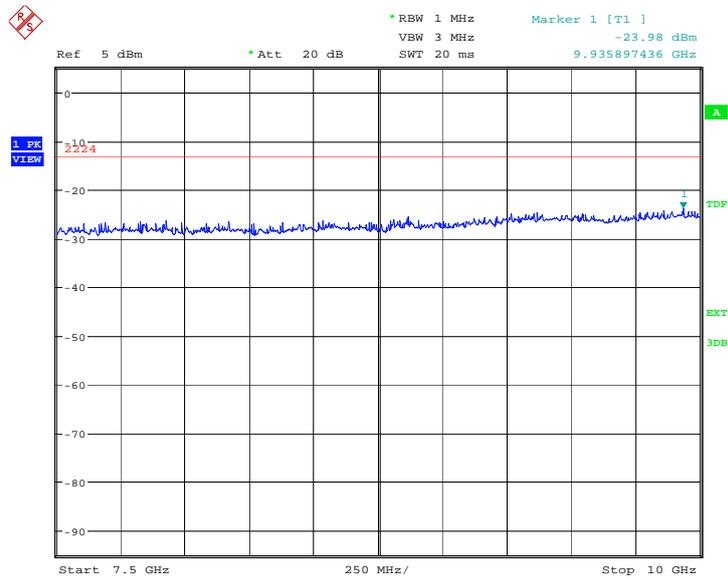
Date: 4.NOV.2013 10:18:48

**A.8.3.37 Idle mode: 2.5GHz – 7.5GHz**  
Spurious emission limit –13dBm.



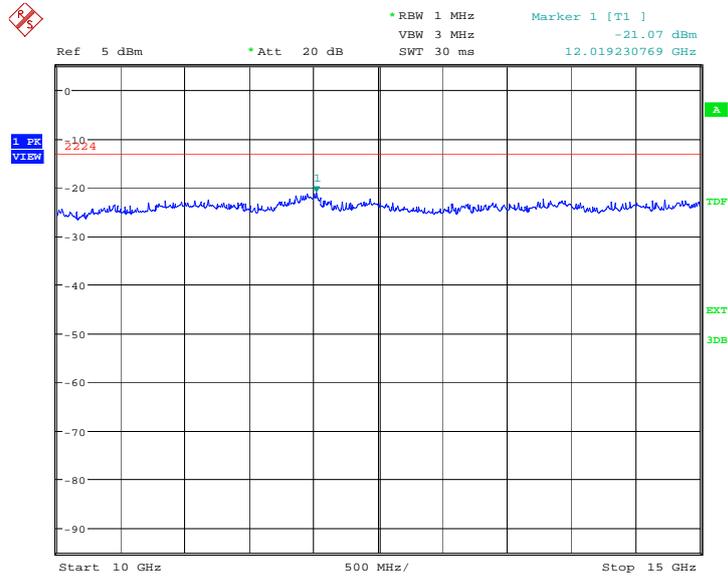
Date: 4.NOV.2013 10:19:16

**A.8.3.38 Idle mode: 7.5GHz – 10GHz**  
Spurious emission limit –13dBm.



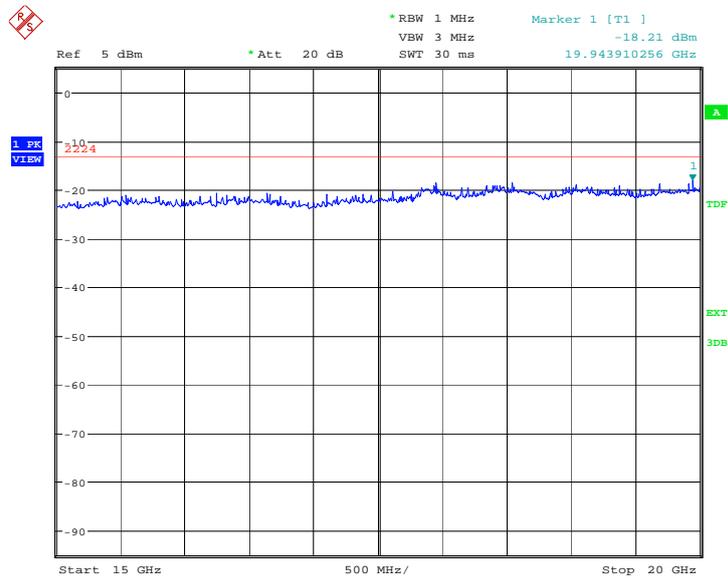
Date: 4.NOV.2013 10:19:44

**A.8.3.39 Idle mode: 10GHz –15GHz**  
Spurious emission limit –13dBm.



Date: 4.NOV.2013 10:20:12

**A.8.3.40 IDLE mode: 15GHz –20GHz**  
Spurious emission limit –13dBm.



Date: 4.NOV.2013 10:20:40