



# TEST REPORT

No. 2011TAR058

for

**ZTE CORPORATION**

**HSDPA USB Stick**

**Model Name: ZTE- MF180A**

**FCC ID: Q78-MF180A**

with

**Hardware Version: dg5A**

**Software Version: EN\_ZTE\_MF180V1.0.0B02**

**Issued Date: Feb 18, 2011**

**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:**

***DAR accreditation (DIN EN ISO/IEC 17025): No. DGA-PL-114/01-02***

***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

Company Name: TMC Beijing, Telecommunication Metrology Center of MIIT  
Address: 3/F Shou Xiang Technology Building, No.51 Xueyuan Road, Hai  
Dian District, Beijing, P. R. China  
Postal Code: 100191  
Telephone: 00861062304633  
Fax: 00861062304793

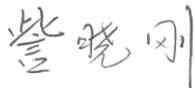
### 1.2. Testing Environment

Normal Temperature: 15-35°C  
Relative Humidity: 20-75%

### 1.3. Project data

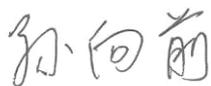
Testing Start Date: Jan 17, 2011  
Testing End Date: Feb 18, 2011

### 1.4. Signature



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**Zi Xiaogang**  
**(Prepared this test report)**



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**Sun Xiangqian**  
**(Reviewed this test report)**



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**Lu Bingsong**  
**Deputy Director of the laboratory**  
**(Approved this test report)**

## **2. Client Information**

### **2.1. Applicant Information**

Company Name: ZTE CORPORATION  
Address /Post: ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan  
District, Shenzhen, Guangdong, 518057, P.R.China  
City: Shenzhen  
Postal Code: 518057  
Country: China  
Telephone: 0086 21 68895196  
Fax: 0086 21 61460600

### **2.2. Manufacturer Information**

Company Name: ZTE CORPORATION  
Address /Post: ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan  
District, Shenzhen, Guangdong, 518057, P.R.China  
City: Shenzhen  
Postal Code: 518057  
Country: China  
Telephone: 0086 21 68895196  
Fax: 0086 21 61460600

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

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

Description	HSDPA USB Stick
Model Name	ZTE- MF180A
FCC ID	Q78-MF180A
Frequency	GSM 850MHz; PCS 1900MHz; WCDMA Band II; WCDMA Band V
Antenna	Internal
Output power	25.25 dBm maximum ERP measured for GSM850
Extreme vol. Limits	4.8VDC to 5.2VDC (nominal: 5.0VDC)
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 or IMEI</b>	<b>HW Version</b>	<b>SW Version</b>
N10	865029000000441	dg5A	EN_ZTE_MF180V1.0.0B02
N11	865029000000490	dg5A	EN_ZTE_MF180V1.0.0B02

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

#### **3.3. General Description**

The Equipment Under Test (EUT) is a model of HSDPA USB Stick with integrated antenna. Manual and specifications of the EUT were provided to fulfil the test. Samples undergoing test were selected by the Client.

## 4. Reference Documents

### 4.1. Reference Documents for testing

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

<b>Reference</b>	<b>Title</b>	<b>Version</b>
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	V 10.1.09
FCC Part 22	PUBLIC MOBILE SERVICES	V 10.1.09
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	2003

## 5. LABORATORY ENVIRONMENT

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

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 30 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω
Normalised site attenuation (NSA)	< ±3.2 dB, 10 m distance, from 30 to 1000 MHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 2000 MHz

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

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. =30 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω

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

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 30 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω

**Fully-anechoic chamber** (6.8 meters×3.08 meters×3.53 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 30 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω
Uniformity of field strength	Between 0 and 6 dB, from 80 to 2000 MHz

**6. SUMMARY OF TEST RESULTS**

<b>Items</b>	<b>List</b>	<b>Clause in FCC rules</b>	<b>Verdict</b>
1	Output Power	22.913(a)/24.232(b)	P
2	Emission Limit	2.1051/22.917/24.238	P
3	Frequency Stability	2.1055/24.235	P
4	Occupied Bandwidth	2.1049(h)(i)	P
5	Emission Bandwidth	22.917(b)/24.238(b)	P
6	Band Edge Compliance	22.917(b)/24.238(b)	P
7	Conducted Spurious Emission	2.1057/22.917/24.238	P

## 7. Test Equipments Utilized

NO.	NAME	TYPE	SERIES NUMBER	PRODUCER	CAL DUE DATE
1	Test Receiver	ESCI	100766	R&S	2011-12-06
2	Test Receiver	ESI40	831564/002	R&S	2011-07-12
3	BiLog Antenna	VULB9163	9163-175	Schwarzbeck	2011-07-05
4	BiLog Antenna	VULB9163	9163-302	Schwarzbeck	2011-07-10
5	Signal Generator	SMB100A	102063	R&S	2011-07-05
7	LISN	ESH2-Z5	829991/012	R&S	2011-07-20
8	Spectrum Analyzer	FSU26	200030	R&S	2011-12-18
9	Spectrum Analyzer	FSU46	100054	R&S	2011-10-14
10	Universal Radio Communication Tester	CMU200	100680	R&S	2011-12-23
11	Universal Radio Communication Tester	CMU200	109914	R&S	2011-07-21
12	Dual-Ridge Waveguide Horn Antenna	3117	00119024	ETS	2012-08-31
13	Dual-Ridge Waveguide Horn Antenna	3117	00119021	ETS	2013-07-09
14	Dual-Ridge Waveguide Horn Antenna	3116	2663	EMCO	2011-07-01
15	Dual-Ridge Waveguide Horn Antenna	3116	2661	EMCO	2011-07-01
16	Climatic chamber	PL-2G	343074	ESPEC	2011-12-15

## ANNEX A: MEASUREMENT RESULTS

### A.1 OUTPUT POWER (§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 (CMU-200) to ensure max power transmission and proper modulation.

This result contains peak output power and EIRP measurements for the EUT.

In all cases, output power is within the specified limits.

#### A.1.2 Conducted

##### A.1.2.1 Method of Measurements

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

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

These measurements were done at 3 frequencies, 1850.2 MHz, 1880.0MHz and 1909.8MHz for PCS1900 band;824.4MHz, 836.6MHz and 848.8MHz for GSM850 band. (bottom, middle and top of operational frequency range).

##### A.1.2.2 Test Condition

RBW	VBW	Sweep Time	Span
1MHz	1MHz	300ms	10MHz

#### GSM850

##### Limit

	Power step	Nominal Peak output power (dBm)	Target (dB)
GSM	5	33dBm(2W)	31±1
GPRS	3	33dBm(2W)	31±1
EGPRS	6	27dBm(0.5W)	26±1

#### Measurement result

##### GSM (GMSK)

Frequency(MHz)	Power Step	Peak output power(dBm)
824.2	5	31.56
836.6	5	31.52
848.8	5	31.43

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

Frequency(MHz)	Power Step	Peak output power(dBm)
824.2	3	31.47
836.6	3	31.41
848.8	3	31.35

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

Frequency(MHz)	Power Step	Peak output power(dBm)
824.2	6	<b>26.97</b>
836.6	6	26.90
848.8	6	26.80

**PCS1900**

**Limit**

	Power step	Nominal Peak output power (dBm)	Target (dB)
GSM	0	30dBm(1W)	29±1
GPRS	3	30dBm(1W)	29±1
EGPRS	5	26 dBm(0.4W)	25±1

**Measurement result**

**GSM (GMSK)**

Frequency(MHz)	Power Step	Peak output power(dBm)
1850.2	0	<b>29.86</b>
1880.0	0	29.74
1909.8	0	29.51

**GPRS (GMSK, 1Slot)**

Frequency(MHz)	Power Step	Peak output power(dBm)
1850.2	3	<b>29.38</b>
1880.0	3	29.20
1909.8	3	29.01

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

Frequency(MHz)	Power Step	Peak output power(dBm)
1850.2	5	<b>25.20</b>
1880.0	5	25.10
1909.8	5	25.07

### A.1.3 Radiated

#### A.1.3.1 Description

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

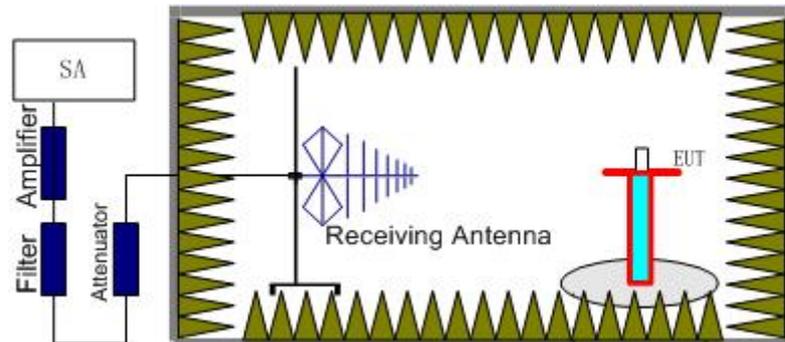
Rule Part 24.232(b) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

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

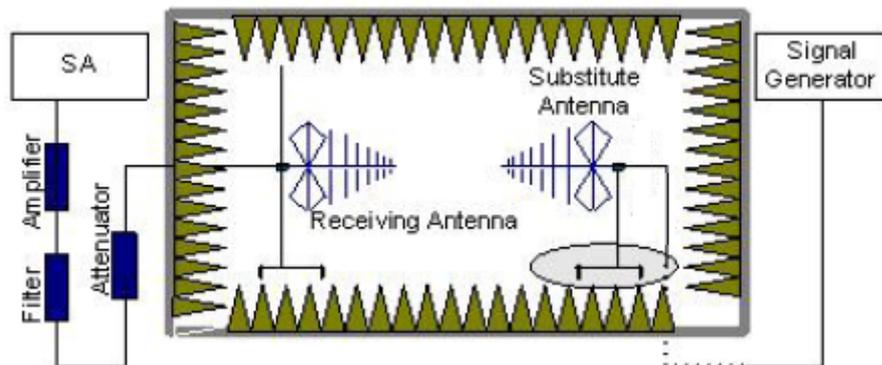
#### A.1.3.2 Method of Measurement

The measurements procedures in TIA-603C-2004 are used.

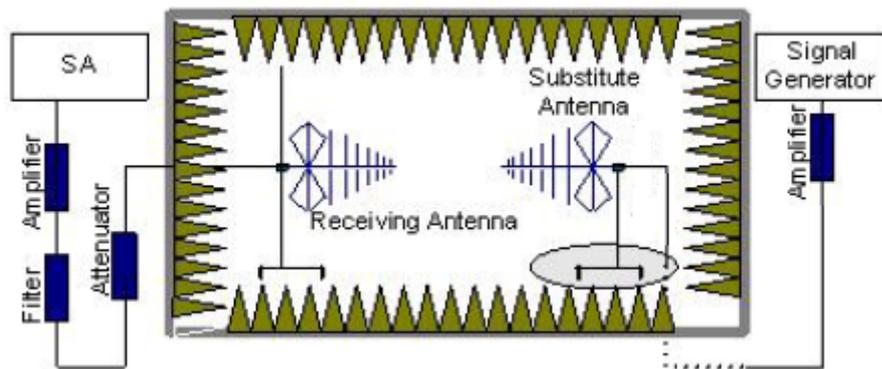
1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected 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.



**For 1900MHz working frequency test**



#### For 850MHz working frequency test

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

#### 4. For 850MHz working frequency test:

A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna.

The cable loss ( $P_{cl}$ ), the Substitution Antenna Gain ( $G_a$ ) and the Amplifier Gain ( $P_{Ag}$ ) should be recorded after test.

The measurement results are obtained as described below:

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

For 1900MHz working frequency test:

A cable should be connected between the Signal Source and the Substitution Antenna.

The cable loss ( $P_{cl}$ ) and the Substitution Antenna Gain ( $G_a$ ) should be recorded after test.

The measurement results are obtained as described below:

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

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.

6. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dBi}$ .

**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**

Frequency(MHz)	Peak ERP(dBm)	P <sub>cl</sub> (dB)	P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	Correction (dBm)	P <sub>Mea</sub> (dBm)	Polarization
824.2	23.55	-9.6	30.1	5.3	2.15	-0.1	Horizontal
836.6	24.51	-9.6	30.1	5.3	2.15	0.86	Horizontal
848.8	<b>25.25</b>	-9.6	30.1	5.3	2.15	1.6	Horizontal

**GPRS**

Frequency(MHz)	Peak ERP(dBm)	P <sub>cl</sub> (dB)	P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	Correction (dBm)	P <sub>Mea</sub> (dBm)	Polarization
824.2	24.04	-9.6	30.1	5.3	2.15	0.39	Horizontal
836.6	24.80	-9.6	30.1	5.3	2.15	1.15	Horizontal
848.8	<b>25.00</b>	-9.6	30.1	5.3	2.15	1.35	Horizontal

**EGPRS**

Frequency(MHz)	Peak ERP(dBm)	P <sub>cl</sub> (dB)	P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	Correction (dBm)	P <sub>Mea</sub> (dBm)	Polarization
824.2	19.44	-9.6	30.1	5.3	2.15	-4.21	Horizontal
836.6	19.82	-9.6	30.1	5.3	2.15	-3.83	Horizontal
848.8	<b>19.92</b>	-9.6	30.1	5.3	2.15	-3.73	Horizontal

Frequency:848.8 MHz

Peak ERP(dBm)= P<sub>Mea</sub>(1.6dBm)+ P<sub>cl</sub> (-9.6dB)+P<sub>Ag</sub>(30.1dB)+G<sub>a</sub> (5.3dB)-2.15dBm=25.25dBm

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

**PCS1900-EIRP 24.232(b)**

**Limits**

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

**Measurement result**

**GSM**

Frequency(MHz)	Peak EIRP(dBm)	P <sub>cl</sub> Cable Loss(dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Mea</sub> (dBm)	Polarization
1850.2	<b>20.08</b>	-10.9	27.5	3.48	Horizontal
1880	17.85	-10.8	27.5	1.15	Horizontal
1909.8	17.35	-11.3	27.5	1.15	Horizontal

**GPRS**

Frequency(MHz)	Peak EIRP(dBm)	P <sub>cl</sub> Cable Loss(dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Mea</sub> (dBm)	Polarization
1850.2	<b>19.95</b>	-10.9	27.5	3.35	Horizontal
1880	17.78	-10.8	27.5	1.08	Horizontal
1909.8	17.82	-11.3	27.5	1.62	Horizontal

**EGPRS**

Frequency(MHz)	Peak EIRP(dBm)	P <sub>cl</sub> Cable Loss(dB)	G <sub>a</sub> Antenna Gain(dB)	P <sub>Mea</sub> (dBm)	Polarization
1850.2	<b>16.39</b>	-10.9	27.5	-0.21	Horizontal
1880	14.46	-10.8	27.5	-2.24	Horizontal
1909.8	15.43	-11.3	27.5	-0.77	Horizontal

Frequency: 1850.2MHz

Peak EIRP(dBm)= P<sub>Mea</sub>(3.48dBm)+ P<sub>cl</sub>(-10.9dB)+G<sub>a</sub> (27.5dB) =20.08dBm

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

## **A.2 EMISSION LIMIT (§2.1051/§22.917§24.238)**

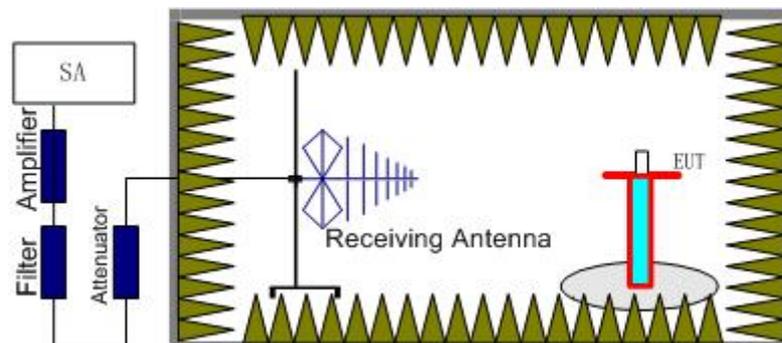
### **A.2.1 Measurement Method**

The measurement procedures in TIA-603C-2004 are used.

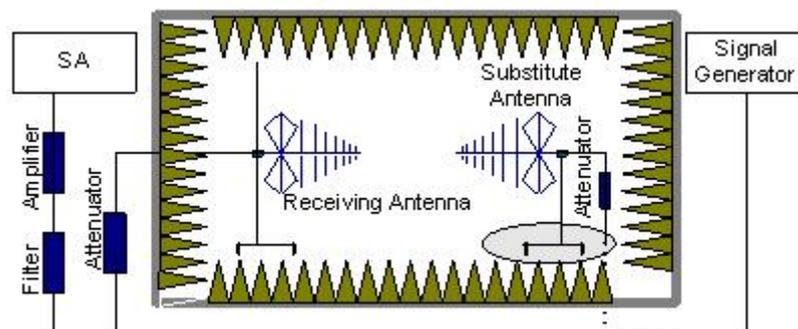
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set as outlined in Part 24.238 and Part 22.917. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the PCS1900 band and 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, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere

with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

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

A amplifier should be connected in for the test.

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

The measurement results are obtained as described below:

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

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

### A.2.2 Measurement Limit

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

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

### A.2.3 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the PCS1900 band (1850.2 MHz, 1880 MHz and 1909.8 MHz) and GSM850 band (824.2MHz, 836.6MHz, 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 PCS1900 ,GSM850 into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

**A.2.4 Measurement Results Table**

Frequency	Channel	Frequency Range	Result
GSM 850MHz	Low	30MHz-10GHz	Pass
	Middle	30MHz-10GHz	Pass
	High	30MHz-10GHz	Pass
GSM 1900MHz	Low	30MHz-20GHz	Pass
	Middle	30MHz-20GHz	Pass
	High	30MHz-20GHz	Pass

**A.2.5 Sweep Table**

Working Frequency	Subrange (GHz)	RBW	VBW	Sweep time (s)
850MHz	0.03~1	100KHz	300KHz	10
	1-2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~10	1 MHz	3 MHz	3
1900MHz	0.03~1	100KHz	300KHz	10
	1-2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~11	1 MHz	3 MHz	3
	11~14	1 MHz	3 MHz	3
	14~18	1 MHz	3 MHz	3
	18~20	1 MHz	3 MHz	2

**GSM Mode Channel 128/824.2MHz**

Frequency(MHz)	Peak ERP(dBm)	Path Loss	Antenna Gain	Correction	P <sub>Mea</sub> (dBm)	Limit (dBm)	Polarization
				(dBm)			
1105.4	-53.5452	-40.1	24.7	2.15	-35.9952	-13	V
1107.6	-53.4302	-40.1	24.7	2.15	-35.8802	-13	V
1108.8	-53.5091	-40.1	24.7	2.15	-35.9591	-13	V
1109.85	-53.8451	-40.1	24.7	2.15	-36.2951	-13	V
1328.5	-52.0017	-40	24.7	2.15	-34.5517	-13	H
2472.45	-46.9953	-42.6	27.5	2.15	-29.7453	-13	H

**GSM Mode Channel 190/836.6MHz**

Frequency(MHz)	Peak ERP(dBm)	Path Loss	Antenna Gain	Correction	P <sub>Mea</sub> (dBm)	Limit (dBm)	Polarization
				(dBm)			
1105.7	-53.2985	-40.1	24.7	2.15	-35.7485	-13	V
1107.5	-53.7944	-40.1	24.7	2.15	-36.2444	-13	V
1108.45	-53.0169	-40.1	24.7	2.15	-35.4669	-13	V
1109	-53.821	-40.1	24.7	2.15	-36.271	-13	V
1109.75	-53.4942	-40.1	24.7	2.15	-35.9442	-13	V
1248.15	-53.1481	-39.8	24.7	2.15	-35.8981	-13	H

**GSM Mode Channel 251/848.8MHz**

Frequency(MHz)	Peak ERP(dBm)	Path Loss	Antenna Gain	Correction	P <sub>Mea</sub> (dBm)	Limit (dBm)	Polarization
				(dBm)			
1065.75	-54.6639	-40.2	24.7	2.15	-37.0139	-13	V
1105.8	-53.5188	-40.1	24.7	2.15	-35.9688	-13	V
1108.2	-52.9789	-40.1	24.7	2.15	-35.4289	-13	V
1110.15	-52.642	-40	24.7	2.15	-35.192	-13	V
1326.85	-52.8822	-40	24.7	2.15	-35.4322	-13	H
5330.8	-47.9639	-42.4	34	2.15	-37.4139	-13	H

**GSM Mode Channel 512/1850.2MHz**

Frequency(MHz)	Peak EIRP(dBm)	Path Loss	Antenna Gain	P <sub>Mea</sub> (dBm)	Limit (dBm)	Polarization
2001	-43.651	-41.2	27.5	-29.951	-13	H
5303.9	-46.9744	-42.2	34	-38.7744	-13	V
8200.7	-43.3903	-44.5	37.5	-36.3903	-13	H
9928.4	-42.5132	-45.3	38.7	-35.9132	-13	V
17766.4	-28.5997	-51.6	44.7	-21.6997	-13	H

**GSM Mode Channel 661/1880.0MHz**

Frequency(MHz)	Peak EIRP(dBm)	Path Loss	Antenna Gain	P <sub>Mea</sub> (dBm)	Limit (dBm)	Polarization
2001	-43.6086	-41.2	27.5	-29.9086	-13	V
2673.2	-47.0938	-42.5	29.2	-33.7938	-13	V
5210.9	-47.1757	-43.5	34	-37.6757	-13	V
7779.5	-43.5946	-45	37.4	-35.9946	-13	H
9867.5	-42.1549	-45.9	38.7	-34.9549	-13	H
15257.6	-34.6537	-49.6	39.4	-24.4537	-13	V

**GSM Mode Channel 810/1909.8MHz**

Frequency(MHz)	Peak EIRP(dBm)	Path Loss	Antenna Gain	P <sub>Mea</sub> (dBm)	Limit (dBm)	Polarization
2000.8	-39.8788	-41.2	27.5	-26.1788	-13	H
2494.2	-47.577	-42.6	27.5	-32.477	-13	V
5025.2	-46.9973	-42.2	34	-38.7973	-13	V
8161.4	-43.7892	-44.6	37.5	-36.6892	-13	H
15738.4	-35.3274	-50.3	38.2	-23.2274	-13	V
17548.4	-28.5961	-50.8	44.7	-22.4961	-13	V

### **A.3 FREQUENCY STABILITY**     **(§2.1055/§24.235)**

#### **A.3.1 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 1/2 hours at each temperature, unpowered, before making measurements.
5. Remeasure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments remeasuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50°C.
7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 C increments from +50°C to -30°C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

#### **A.3.2 Measurement Limit**

##### **A.3.2.1 For Hand carried battery powered equipment**

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 4.8VDC and 5.2VDC, with a nominal voltage of 5VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of -10 % and +12.5 %. For the purposes of measuring frequency stability these voltage limits are to be used.

##### **A.3.2.2 For equipment powered by primary supply voltage**

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the

fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

### A.3.3 Measurement results

#### GSM 850

##### Frequency Error vs Voltage

Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
4.8	-12	0.013
5	-17	0.018
5.2	-20	0.021

##### Frequency Error vs Temperature

temperature(°C)	Frequency error(Hz)	Frequency error(ppm)
-30	-25	0.026
-20	-22	0.023
-10	-20	0.021
0	-19	0.020
10	-17	0.018
20	-17	0.018
30	-17	0.018
40	-15	0.016
50	-12	0.013

#### PCS 1900

##### Frequency Error vs Voltage

Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
4.8	-11	0.012
5	-13	0.014
5.2	-18	0.019

##### Frequency Error vs Temperature

temperature(°C)	Frequency error(Hz)	Frequency error(ppm)
-30	-23	0.025
-20	-20	0.022
-10	-18	0.019
0	-15	0.016
10	-13	0.014
20	-13	0.014
30	-13	0.014
40	-15	0.016
50	-18	0.019

## A.4 OCCUPIED BANDWIDTH (§2.1049(h)(i))

### A.4.1 Occupied Bandwidth Results

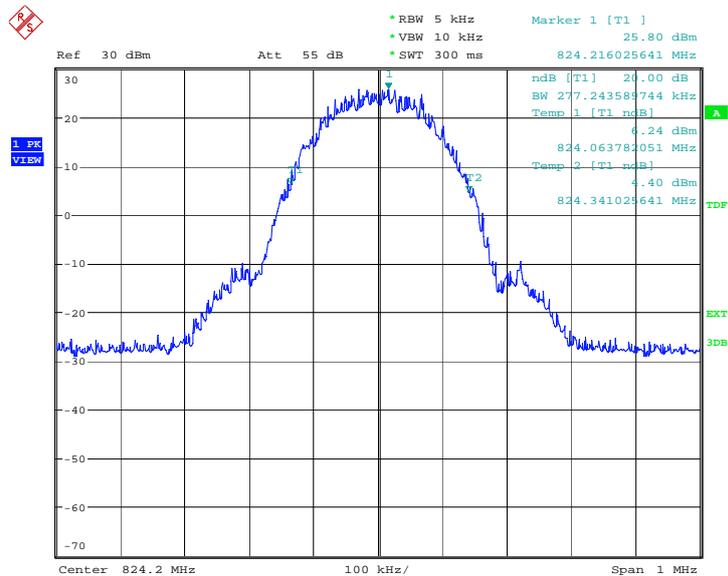
Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. The table below lists the measured -20dBc BW. Spectrum analyzer plots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

#### GSM 850(-20dBc)

Frequency(MHz)	Occupied Bandwidth (-20dBc)( kHz)
824.2	277.244
836.6	259.615
848.8	270.833

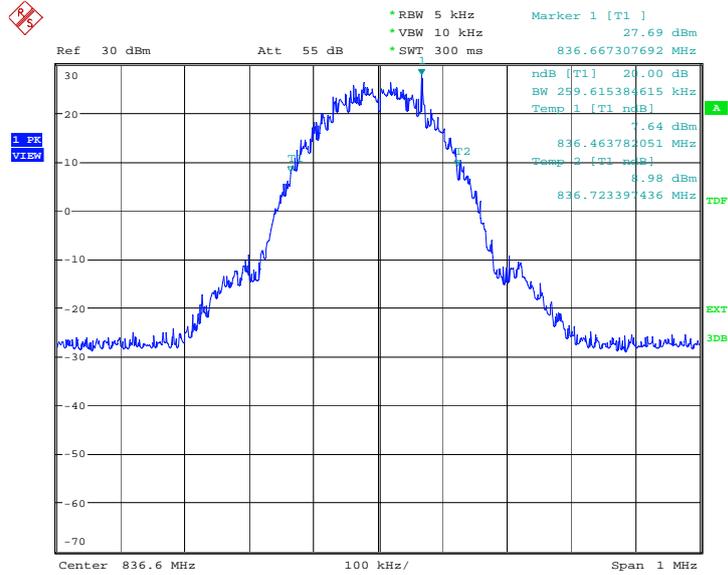
#### GSM 850

#### Channel 128-Occupied Bandwidth (-20dBc BW)



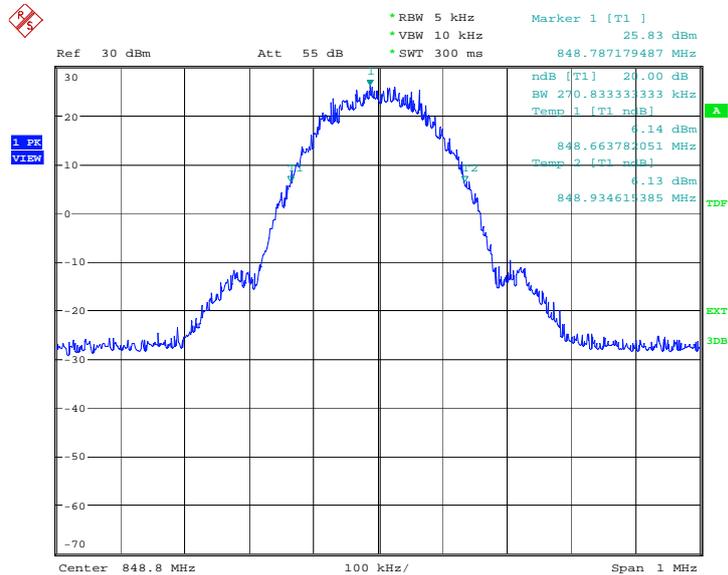
Date: 15.FEB.2011 07:24:53

### Channel 190-Occupied Bandwidth (-20dBc BW)



Date: 15.FEB.2011 07:25:21

### Channel 251-Occupied Bandwidth (-20dBc BW)



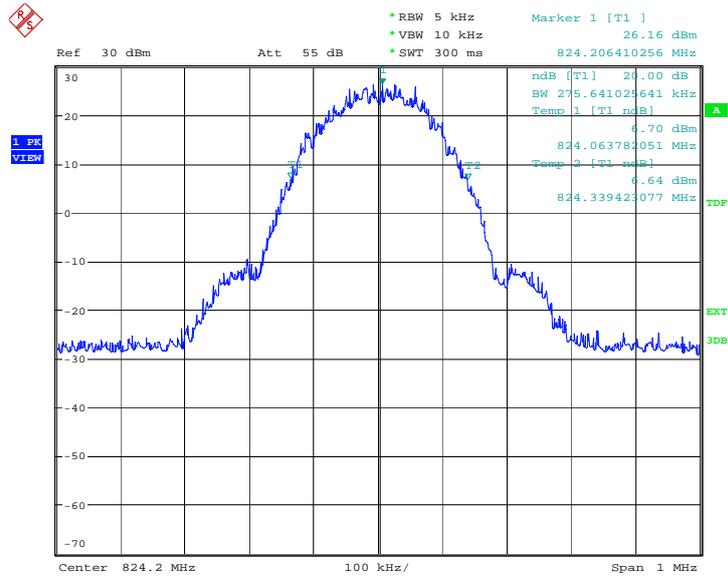
Date: 15.FEB.2011 07:25:48

**GPRS 850(-20dBc)**

Frequency(MHz)	Occupied Bandwidth (-20dBc)( kHz)
824.2	275.641
836.6	275.641
848.8	270.833

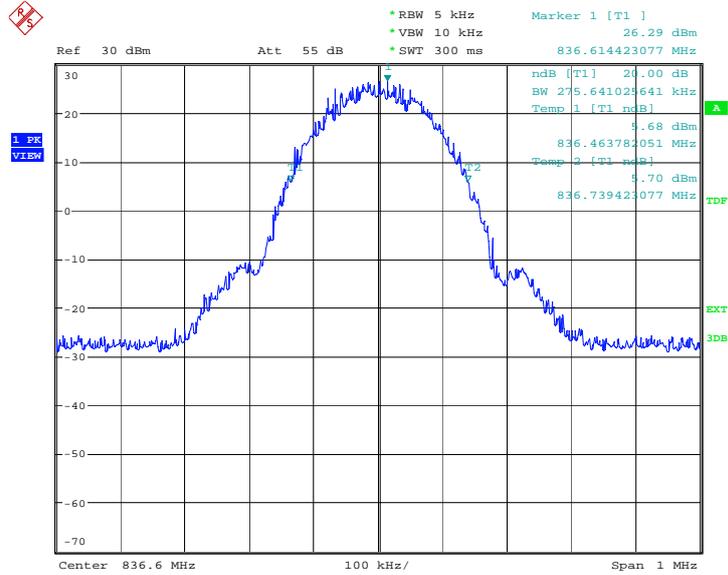
**GPRS 850**

**Channel 128-Occupied Bandwidth (-20dBc BW)**



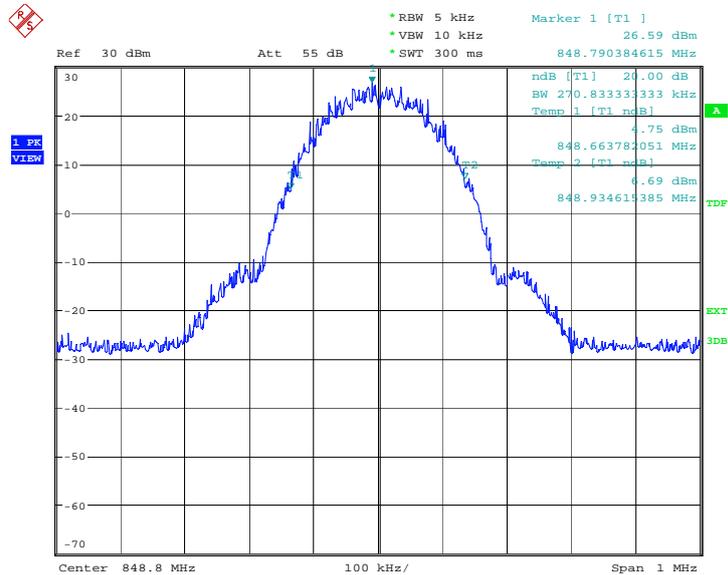
Date: 15.FEB.2011 05:59:45

### Channel 190-Occupied Bandwidth (-20dBc BW)



Date: 15.FEB.2011 06:00:12

### Channel 251-Occupied Bandwidth (-20dBc BW)



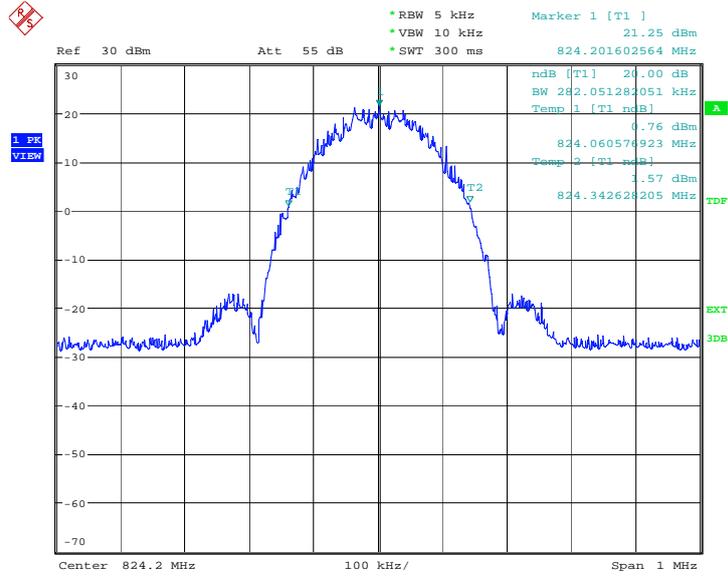
Date: 15.FEB.2011 06:00:39

**EGPRS 850(-20dBc)**

Frequency(MHz)	Occupied Bandwidth (-20dBc)( kHz)
824.2	282.051
836.6	272.436
848.8	278.846

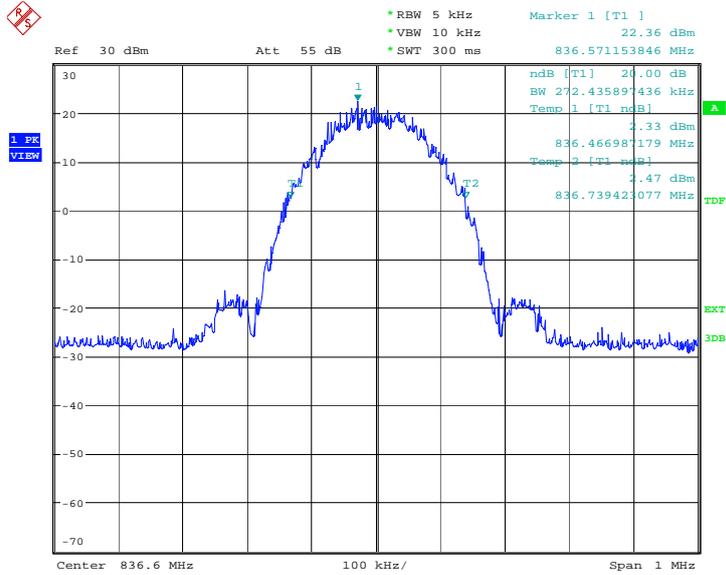
**EGPRS 850**

**Channel 128-Occupied Bandwidth (-20dBc BW)**



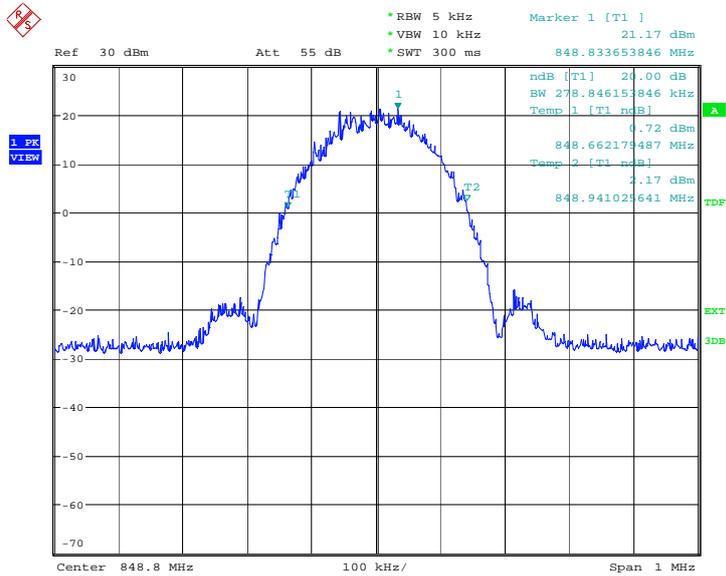
Date: 15.FEB.2011 06:18:06

### Channel 190-Occupied Bandwidth (-20dBc BW)



Date: 15.FEB.2011 06:18:33

### Channel 251-Occupied Bandwidth (-20dBc BW)



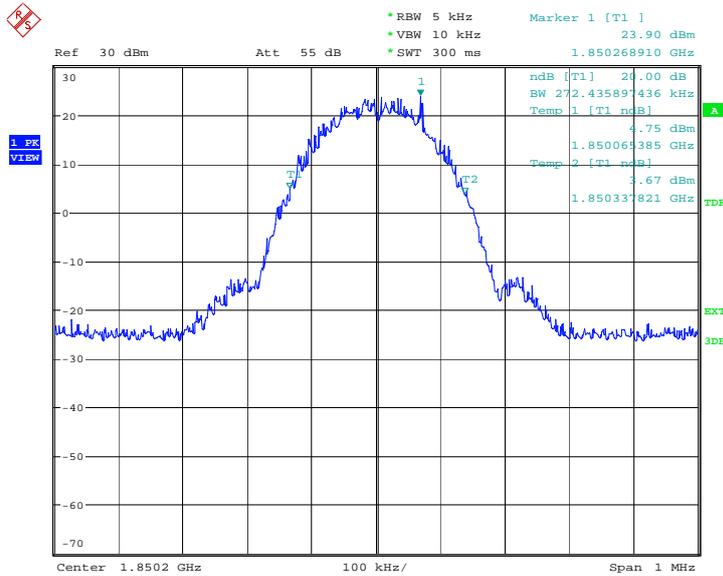
Date: 15.FEB.2011 06:19:00

**PCS 1900(-20dBc)**

Frequency(MHz)	Occupied Bandwidth (-20dBc)( kHz)
1850.2	272.436
1880.0	275.641
1909.8	269.231

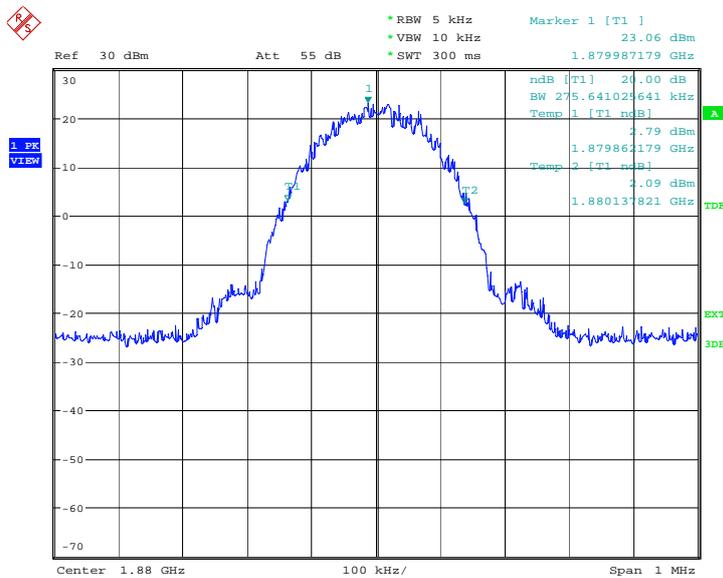
**PCS 1900**

**Channel 512-Occupied Bandwidth (-20dBc BW)**



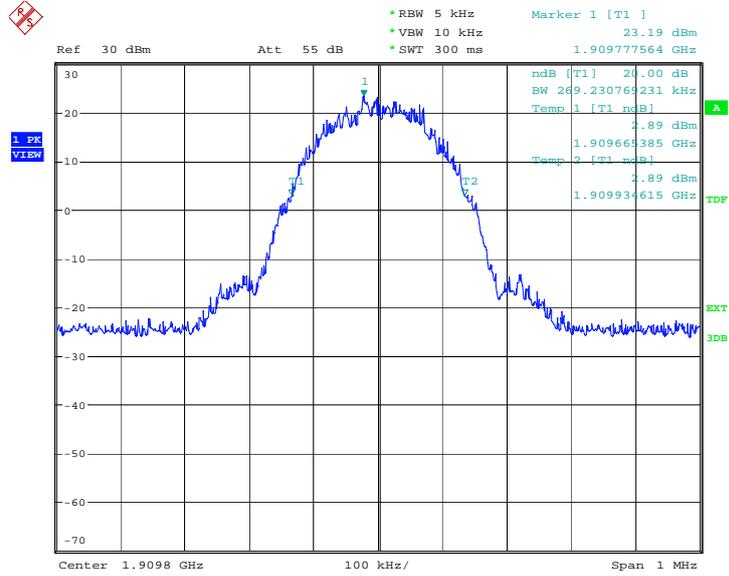
Date: 15.FEB.2011 07:39:09

**Channel 661-Occupied Bandwidth (-20dBc BW)**



Date: 15.FEB.2011 07:39:36

### Channel 810-Occupied Bandwidth (-20dBc BW)



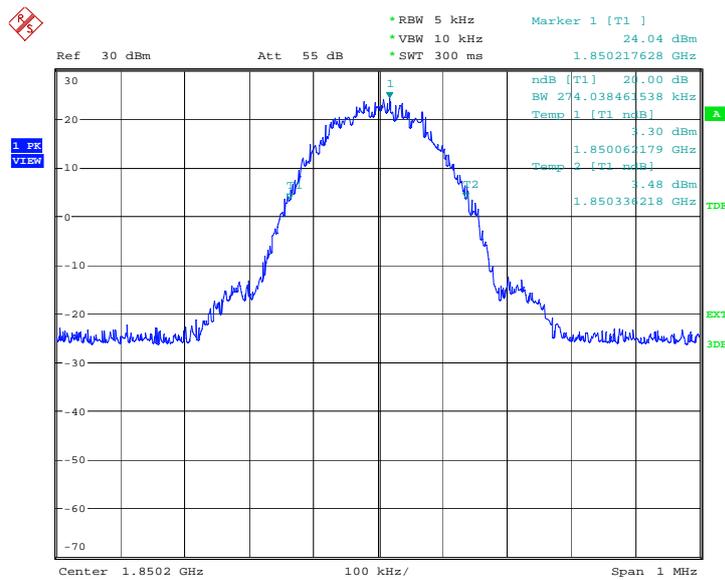
Date: 15.FEB.2011 07:40:04

**GPRS 1900(-20dBc)**

Frequency(MHz)	Occupied Bandwidth (-20dBc)( kHz)
1850.2	274.038
1880.0	277.244
1909.8	275.641

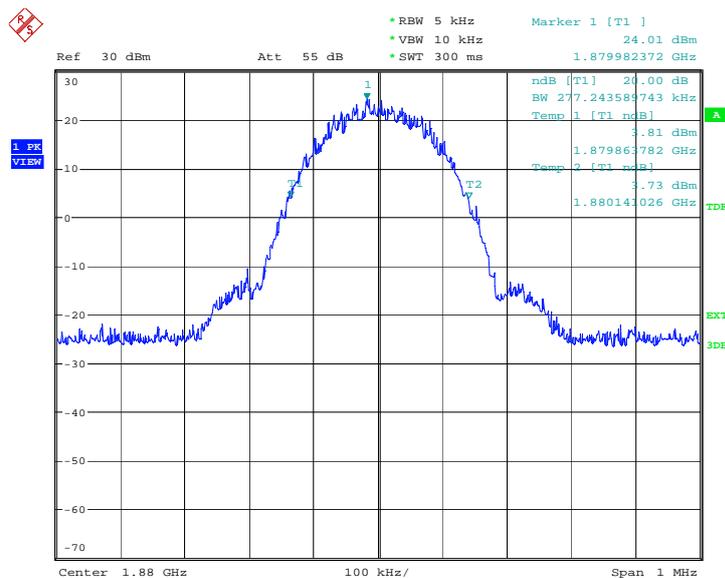
**GPRS 1900**

**Channel 512-Occupied Bandwidth -20dBc BW)**



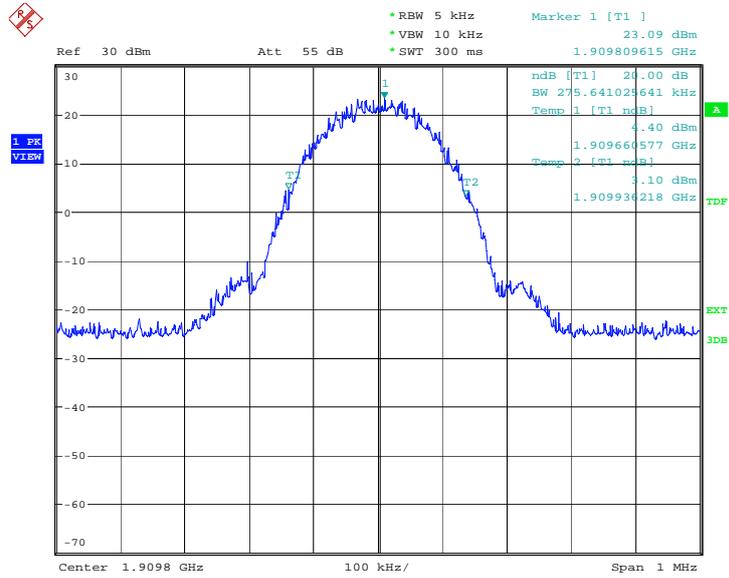
Date: 15.FEB.2011 06:09:00

**Channel 661-Occupied Bandwidth (-20dBc BW)**



Date: 15.FEB.2011 06:09:27

### Channel 810-Occupied Bandwidth (-20dBc BW)



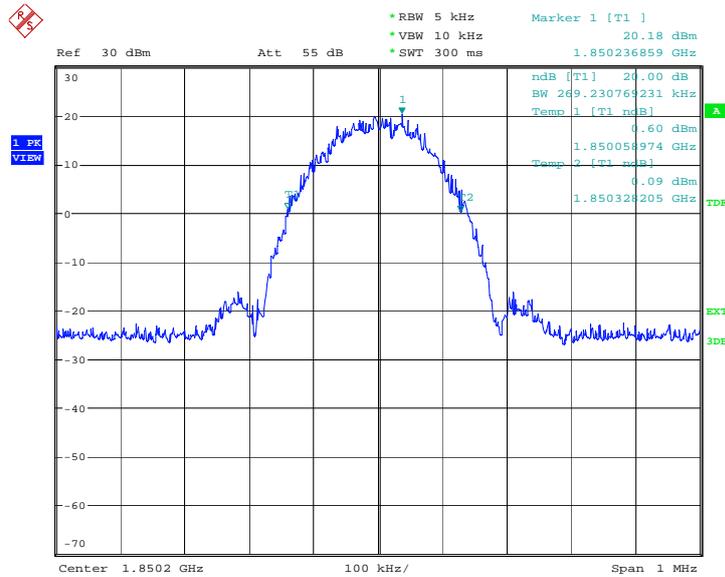
Date: 15.FEB.2011 06:09:54

**EGPRS 1900(-20dBc)**

Frequency(MHz)	Occupied Bandwidth (-20dBc)( kHz)
1850.2	269.231
1880.0	277.244
1909.8	280.449

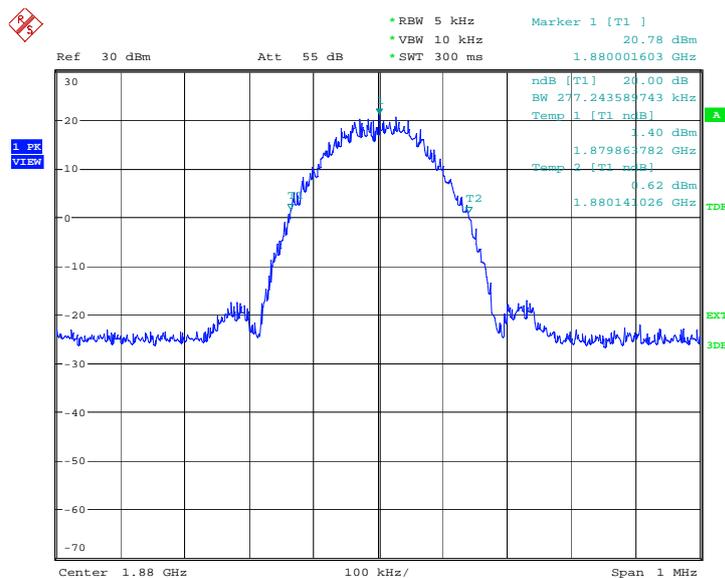
**EGPRS 1900**

**Channel 512-Occupied Bandwidth (-20dBc BW)**



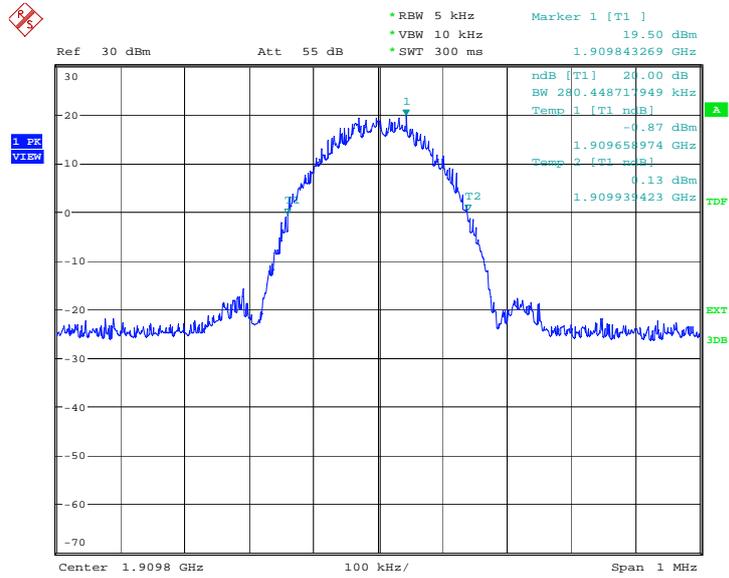
Date: 15.FEB.2011 06:28:17

**Channel 661-Occupied Bandwidth (-20dBc BW)**



Date: 15.FEB.2011 06:28:44

### Channel 810-Occupied Bandwidth (-20dBc BW)



Date: 15.FEB.2011 06:29:12

## A.5 EMISSION BANDWIDTH (§22.917(b)/§24.238(b))

### A.5.1 Emission Bandwidth Results

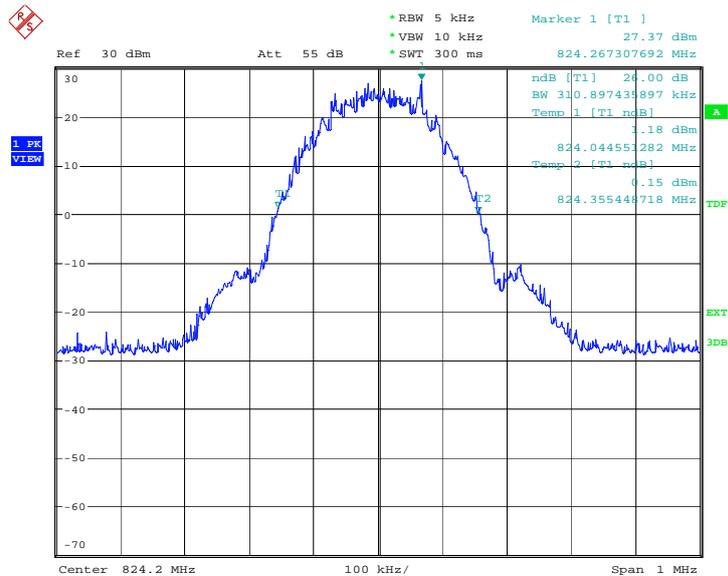
Similar to conducted emissions; Emission bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the PCS1900 band and GSM850 band. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the following pages.

#### GSM 850(-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)
824.2	310.897
836.6	310.897
848.8	312.500

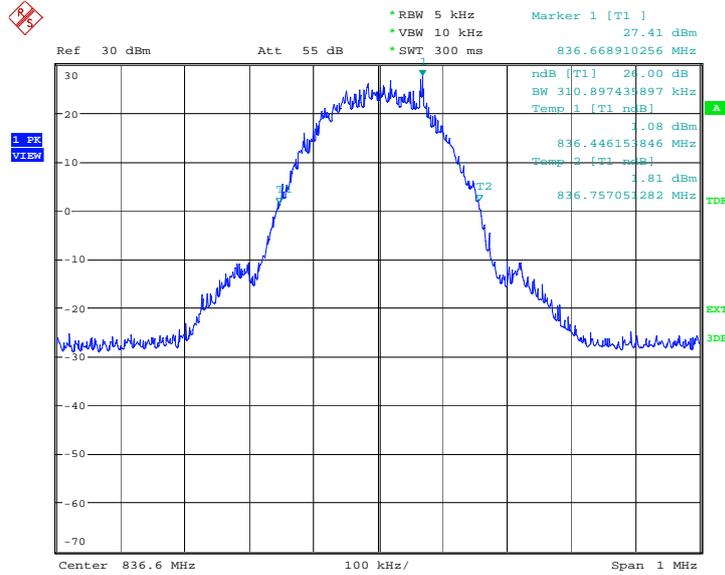
#### GSM 850

#### Channel 128-Occupied Bandwidth (-26dBc BW)



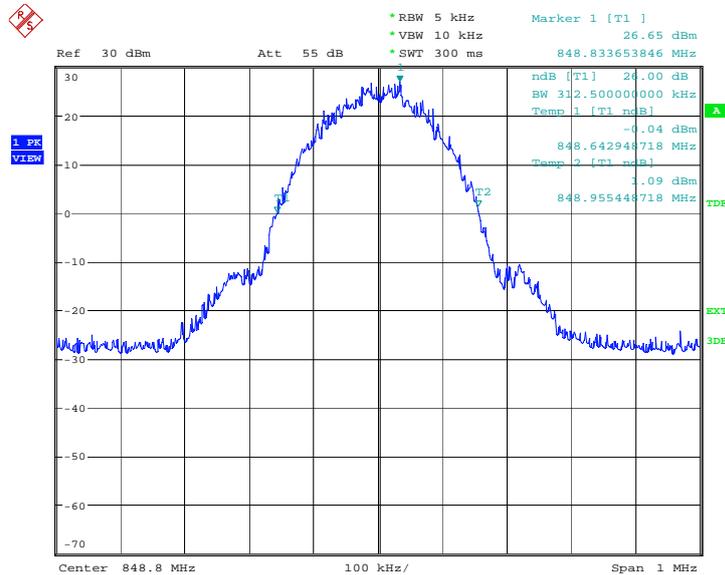
Date: 15.FEB.2011 07:26:16

### Channel 190-Occupied Bandwidth (-26dBc BW)



Date: 15.FEB.2011 07:26:44

### Channel 251-Occupied Bandwidth (-26dBc BW)



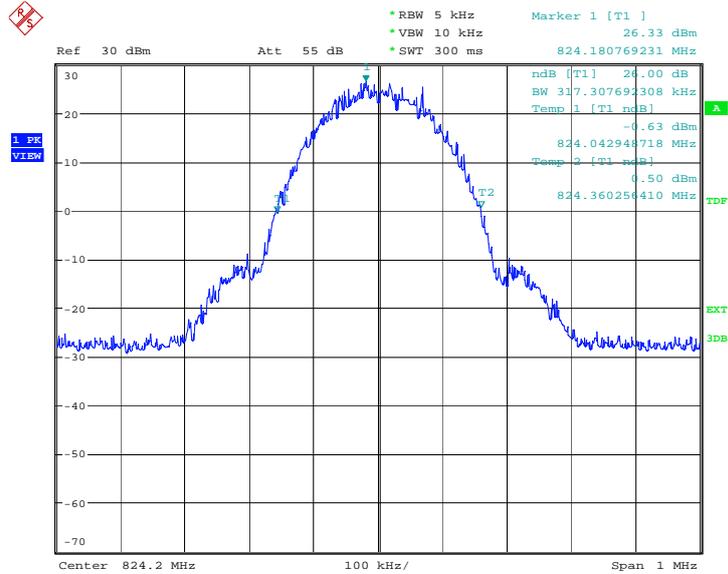
Date: 15.FEB.2011 07:27:11

**GPRS 850(-26dBc)**

Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)
824.2	317.308
836.6	314.103
848.8	318.910

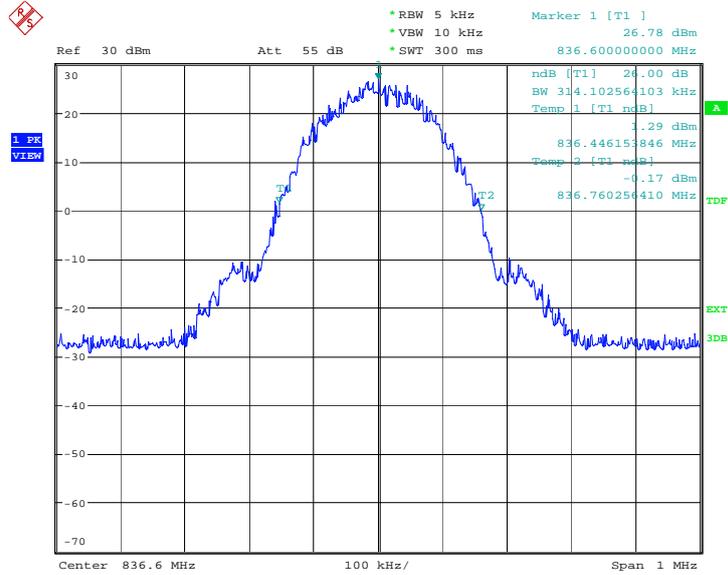
**GPRS 850**

**Channel 128-Occupied Bandwidth (-26dBc BW)**



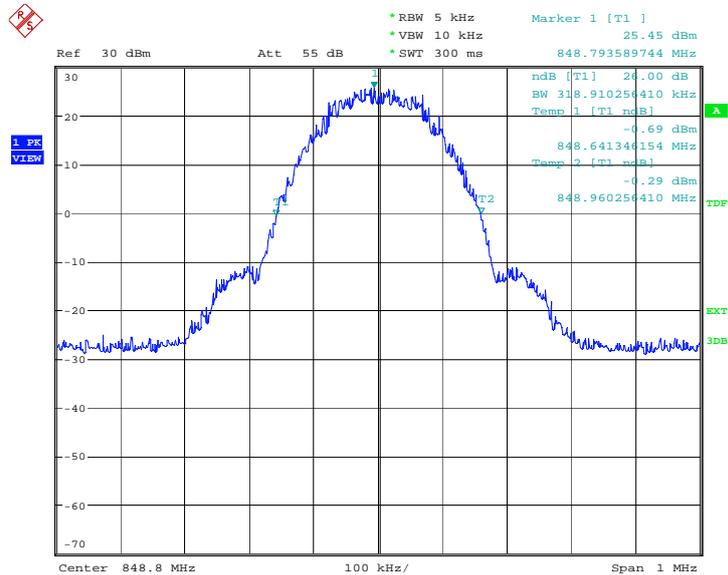
Date: 15.FEB.2011 06:01:08

### Channel 190-Occupied Bandwidth (-26dBc BW)



Date: 15.FEB.2011 06:01:35

### Channel 251-Occupied Bandwidth (-26dBc BW)



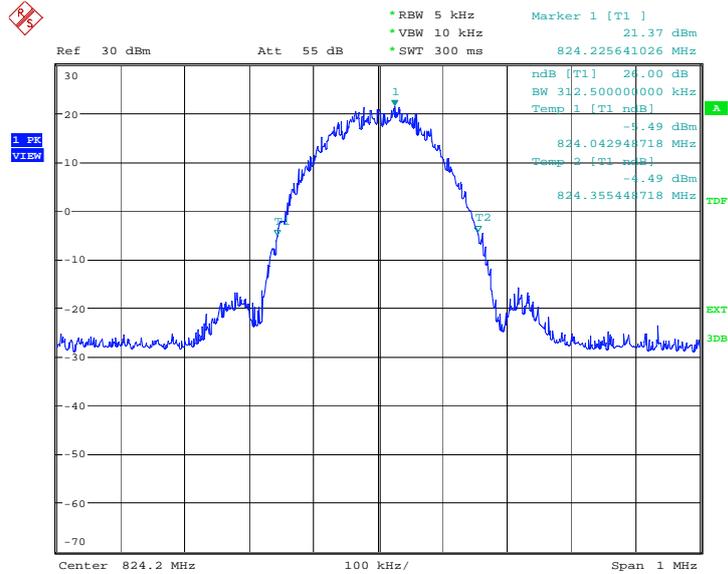
Date: 15.FEB.2011 06:02:02

**EGPRS 850(-26dBc)**

Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)
824.2	312.500
836.6	304.487
848.8	307.692

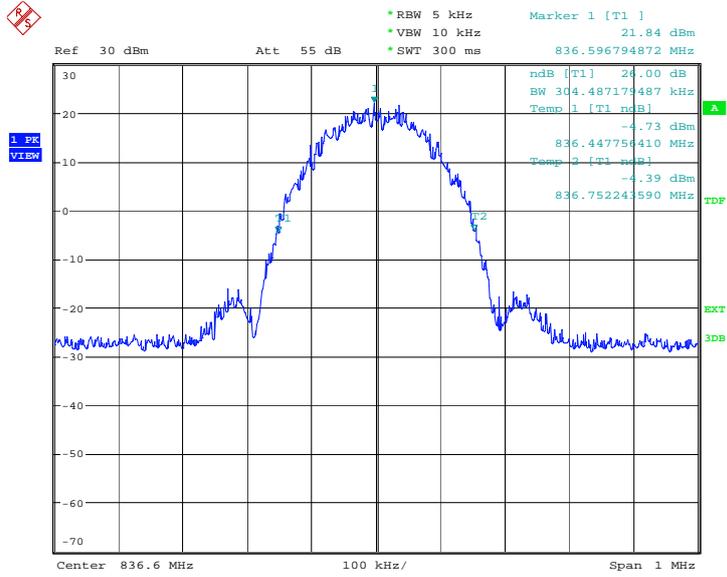
**EGPRS 850**

**Channel 128-Occupied Bandwidth (-26dBc BW)**



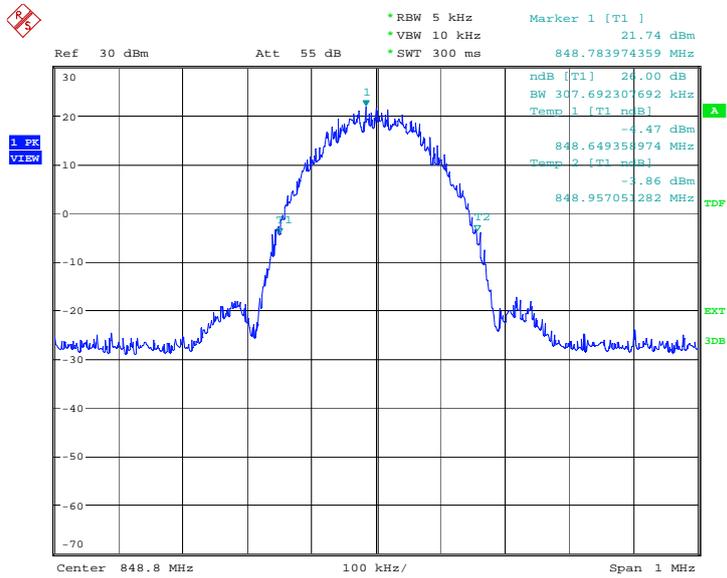
Date: 15.FEB.2011 06:19:29

### Channel 190-Occupied Bandwidth (-26dBc BW)



Date: 15.FEB.2011 06:19:56

### Channel 251-Occupied Bandwidth (-26dBc BW)



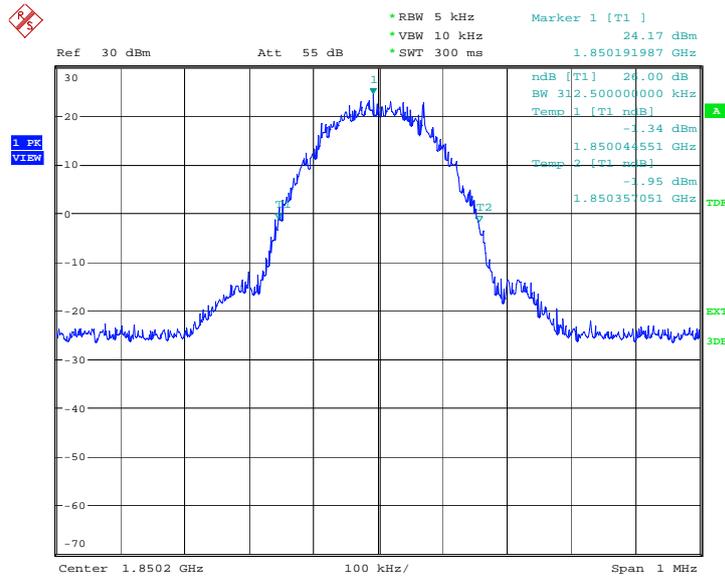
Date: 15.FEB.2011 06:20:23

**PCS 1900(-26dBc)**

Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)
1850.2	312.500
1880.0	310.897
1909.8	315.705

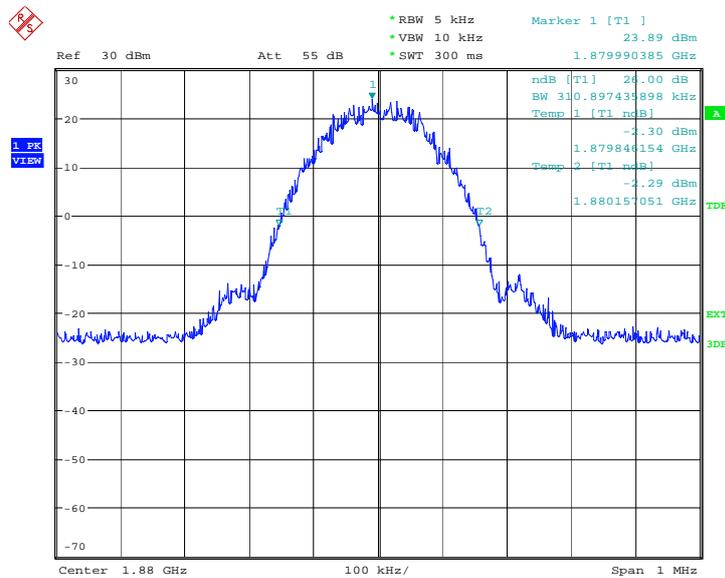
**PCS 1900**

**Channel 512-Occupied Bandwidth (-26dBc BW)**



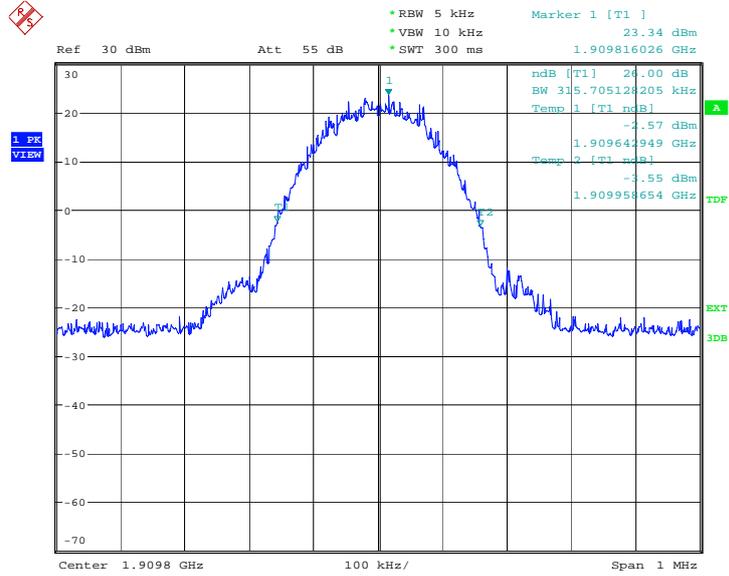
Date: 15.FEB.2011 07:40:32

**Channel 661-Occupied Bandwidth (-26dBc BW)**



Date: 15.FEB.2011 07:40:59

### Channel 810-Occupied Bandwidth (-26dBc BW)



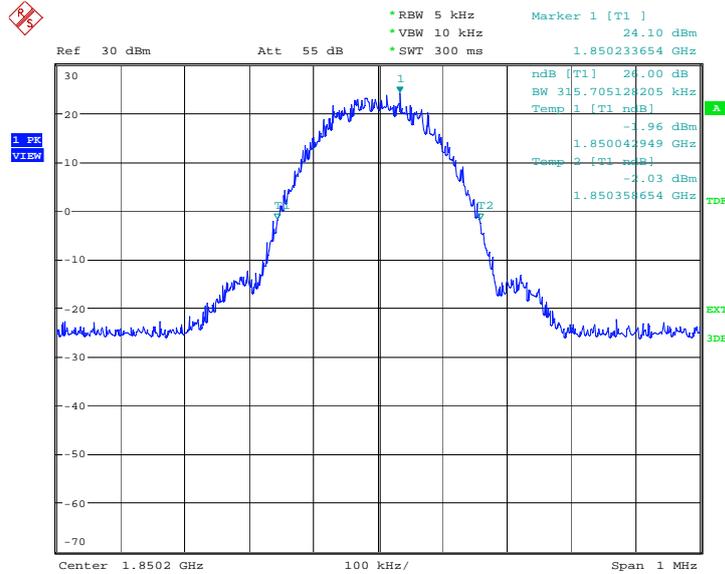
Date: 15.FEB.2011 07:41:27

**GPRS 1900(-26dBc)**

Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)
1850.2	315.705
1880.0	315.705
1909.8	317.308

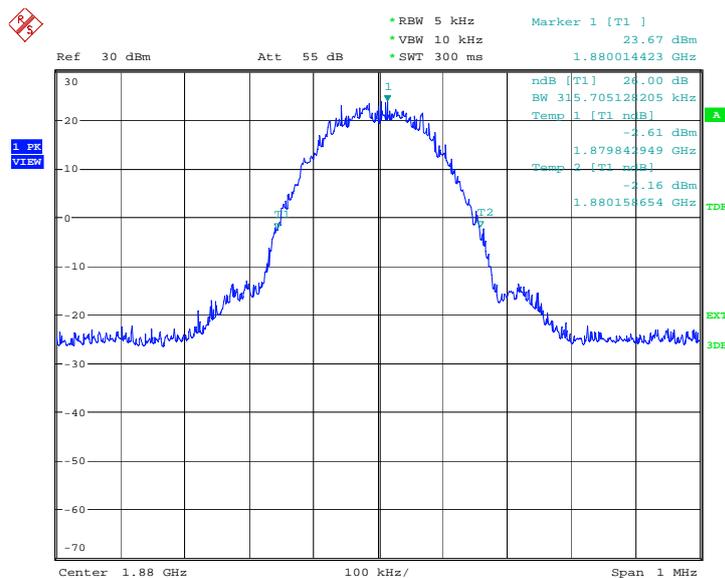
**GPRS 1900**

**Channel 512-Occupied Bandwidth (-26dBc BW)**



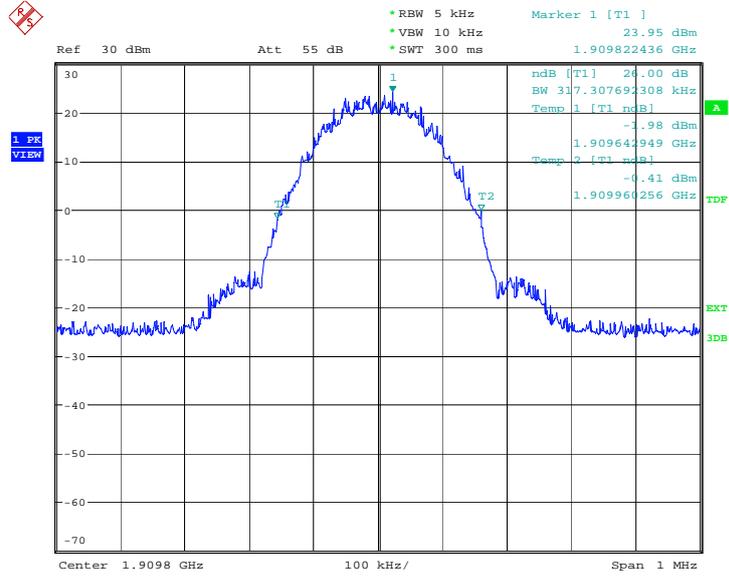
Date: 15.FEB.2011 06:10:23

**Channel 661-Occupied Bandwidth (-26dBc BW)**



Date: 15.FEB.2011 06:10:50

### Channel 810-Occupied Bandwidth (-26dBc BW)



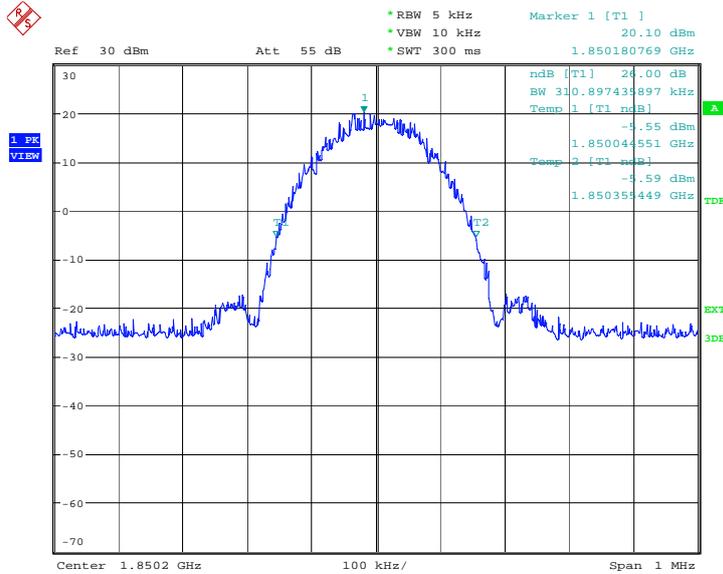
Date: 15.FEB.2011 06:11:17

**EGPRS 1900(-26dBc)**

Frequency(MHz)	Occupied Bandwidth (-26dBc)( kHz)
1850.2	310.897
1880.0	304.487
1909.8	304.487

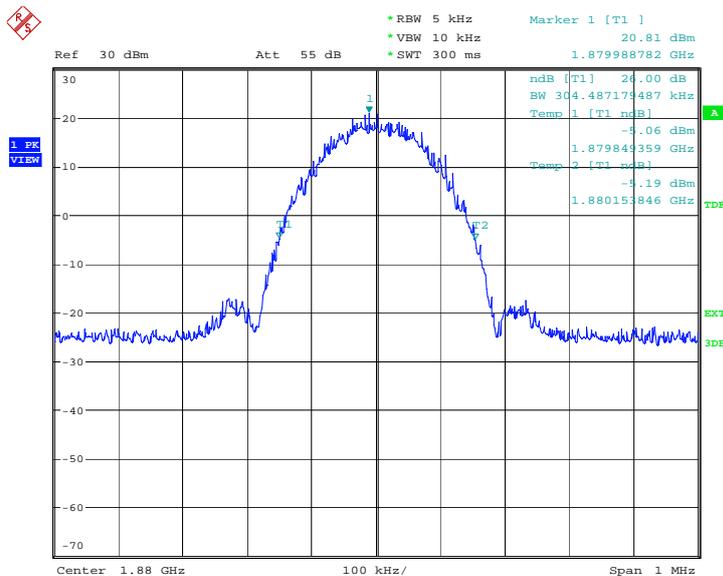
**EGPRS 1900**

**Channel 512-Occupied Bandwidth (-26dBc BW)**



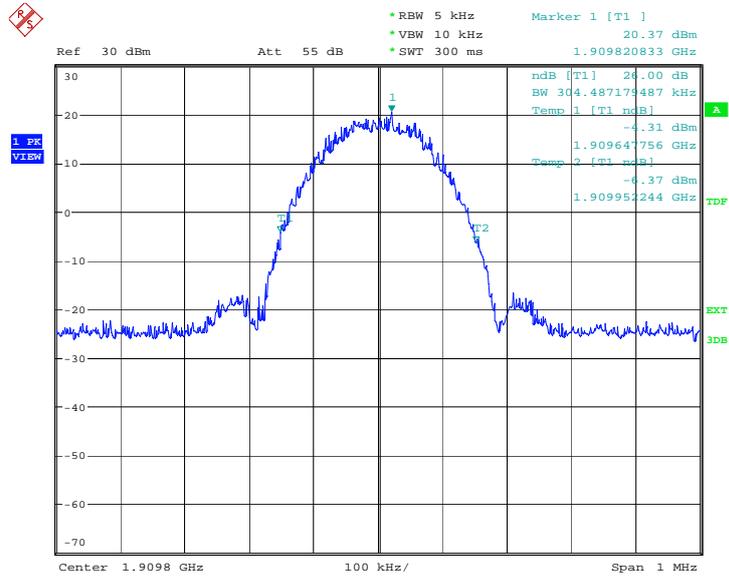
Date: 15.FEB.2011 06:29:40

**Channel 661-Occupied Bandwidth (-26dBc BW)**



Date: 15.FEB.2011 06:30:07

### Channel 810-Occupied Bandwidth (-26dBc BW)

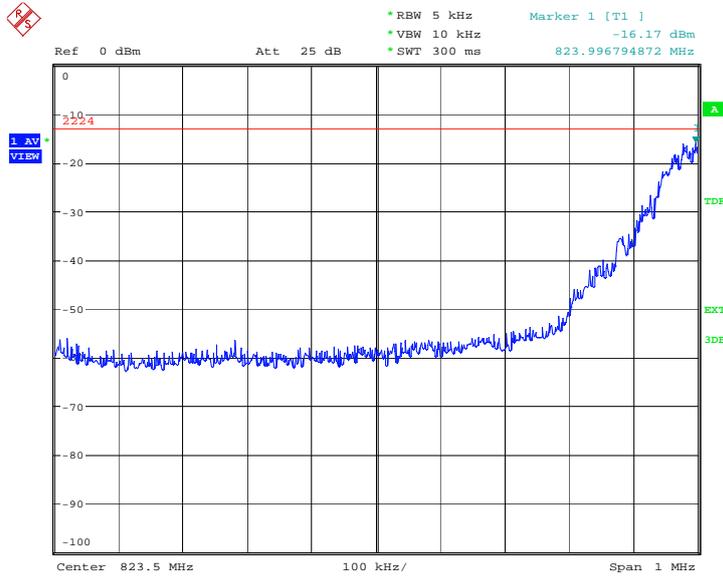


Date: 15.FEB.2011 06:30:35

**A.6 BAND EDGE COMPLIANCE (§22.917(b)/§24.238(b))**

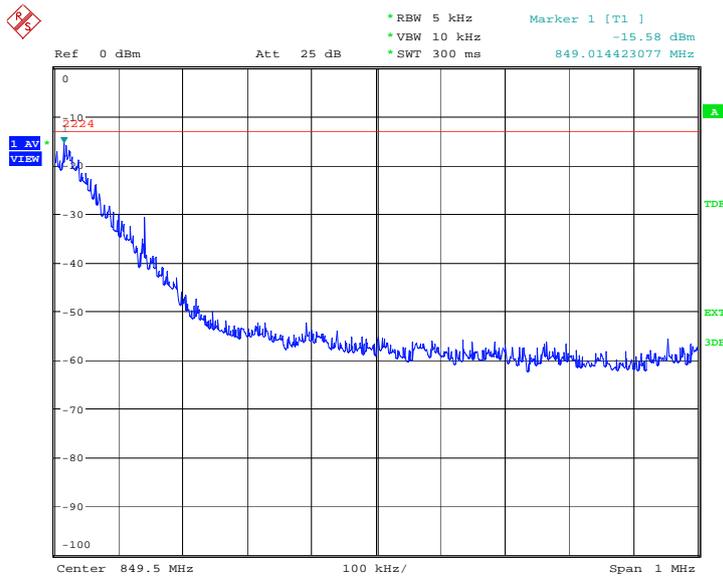
**GSM 850**

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



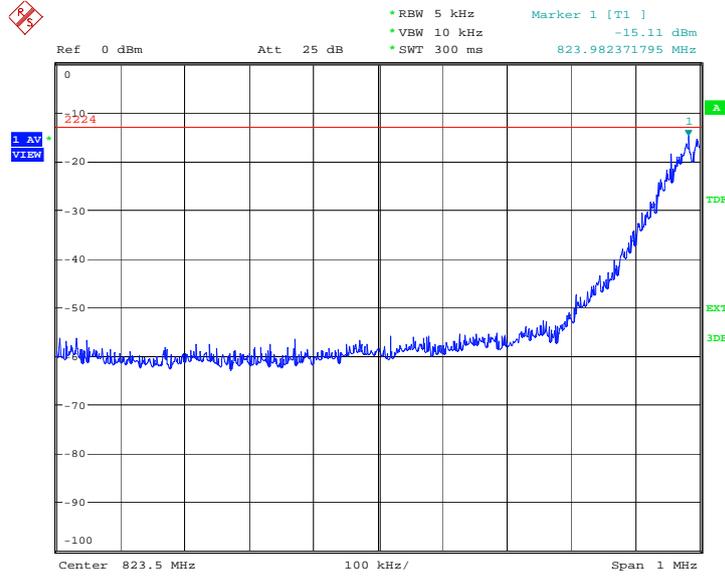
Date: 15.FEB.2011 07:27:40

**HIGH BAND EDGE BLOCK-C (GSM850) -Channel 251**



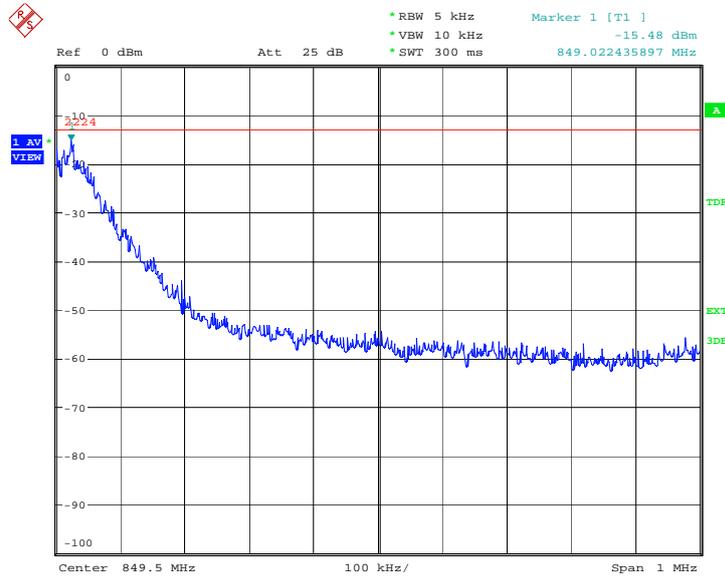
Date: 15.FEB.2011 07:28:09

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



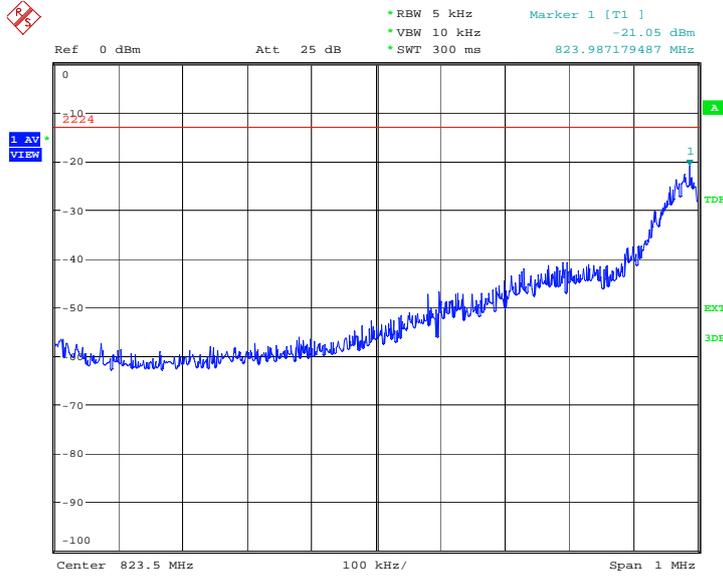
Date: 15.FEB.2011 06:02:31

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



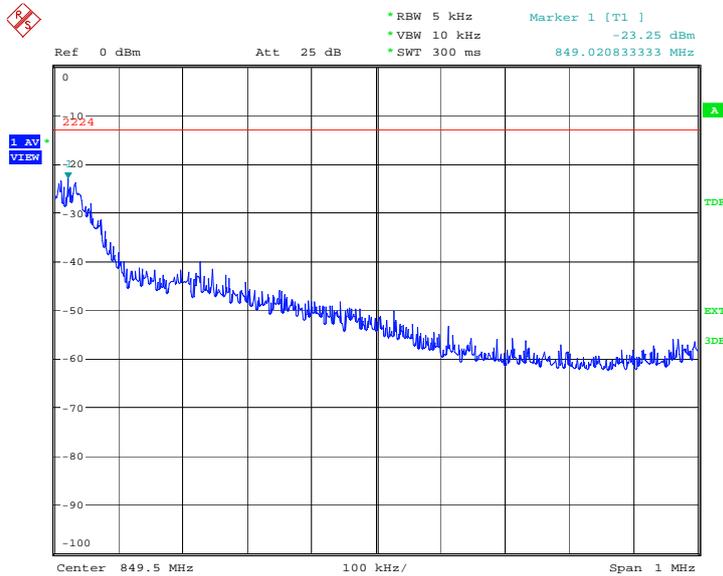
Date: 15.FEB.2011 06:03:00

**EGPRS 850**  
**LOW BAND EDGE BLOCK-A (GSM850)-Channel 128**



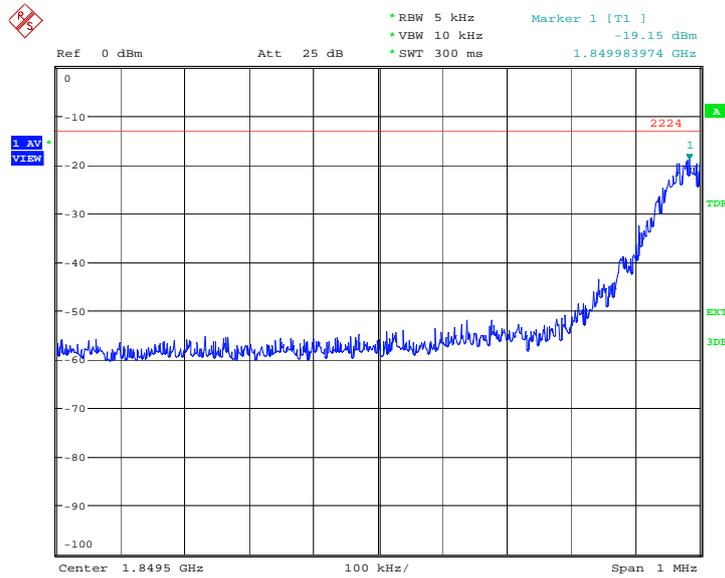
Date: 15.FEB.2011 06:20:52

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



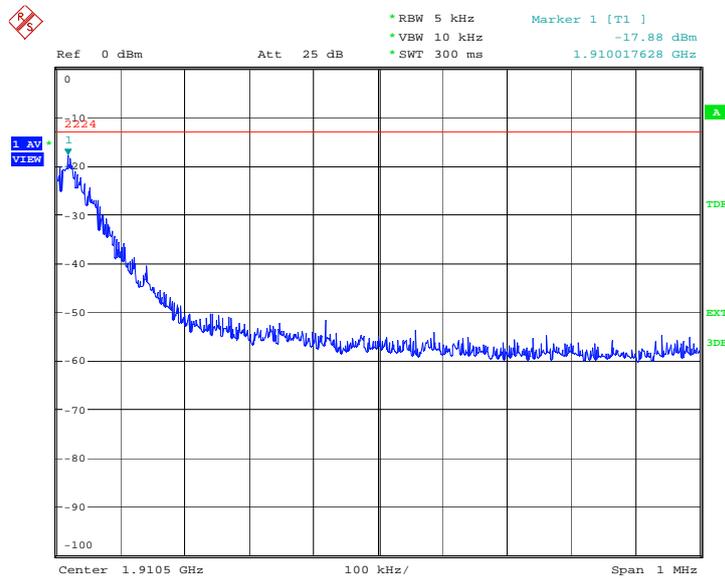
Date: 15.FEB.2011 06:21:21

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



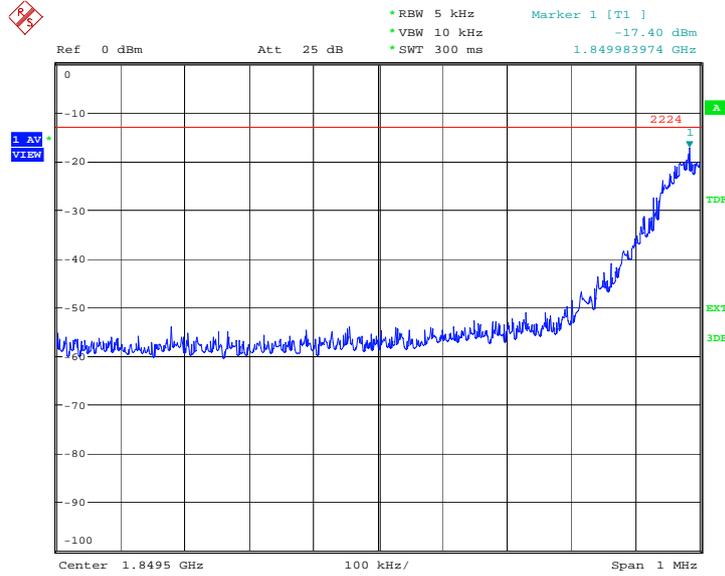
Date: 15.FEB.2011 07:41:55

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



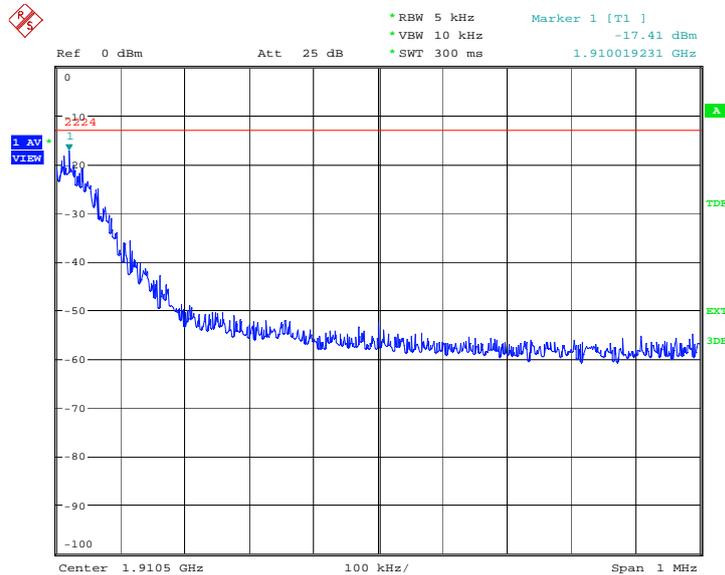
Date: 15.FEB.2011 07:42:24

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



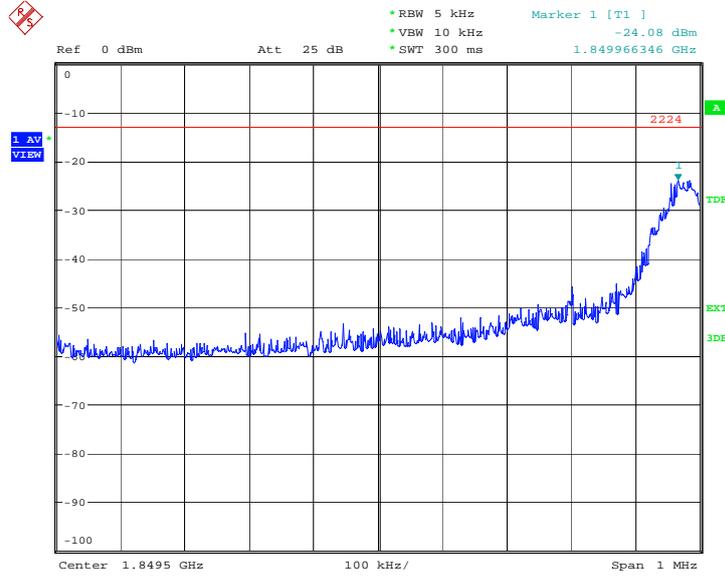
Date: 15.FEB.2011 06:11:46

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



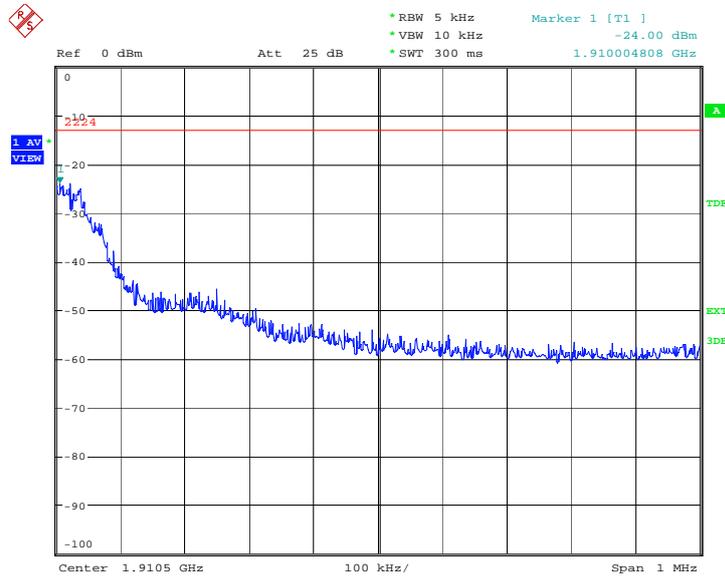
Date: 15.FEB.2011 06:12:15

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



Date: 15.FEB.2011 06:31:04

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



Date: 15.FEB.2011 06:31:33

**A.7 CONDUCTED SPURIOUS EMISSION (§2.1057/§22.917/§24.238)**

**A.7.1 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 taken from 30 MHz to 20 GHz. For GSM850, data taken from 30 MHz to 9 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

**ANALYZER SETTINGS**

Working Frequency	Subrange (GHz)	RBW	VBW	Sweep time (ms)
850MHz	0.03~4	1MHz	3MHz	300
	1-10	1MHz	3MHz	300
1900MHz	0.03~4	1MHz	3MHz	300
	1-20	1MHz	3MHz	300

**A. 7.2 Measurement Limit**

Sec. 24.238 Emission Limits.

(a) On any frequency outside frequency band of the USPCS 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. 7.3 Measurement result**  
**GSM850**

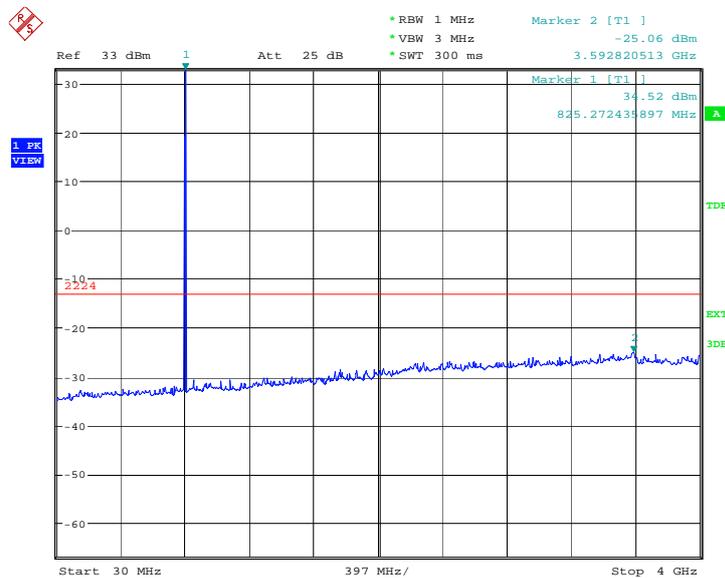
Harmonic	Tx ch. 128 Freq. (MHz)	Level (dBm)	Tx ch. 190 Freq. (MHz)	Level (dBm)	Tx ch. Freq. (MHz) 251	Level (dBm)
2	1648.4	nf	1673.2	nf	1697.6	nf
3	2472.6	nf	2509.8	nf	2546.4	nf
4	3296.8	nf	3346.4	nf	3395.2	nf
5	4121	nf	4183	nf	4244	nf
6	4945.2	nf	5019.6	nf	5092.8	nf
7	5769.4	nf	5856.2	nf	5941.6	nf
8	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

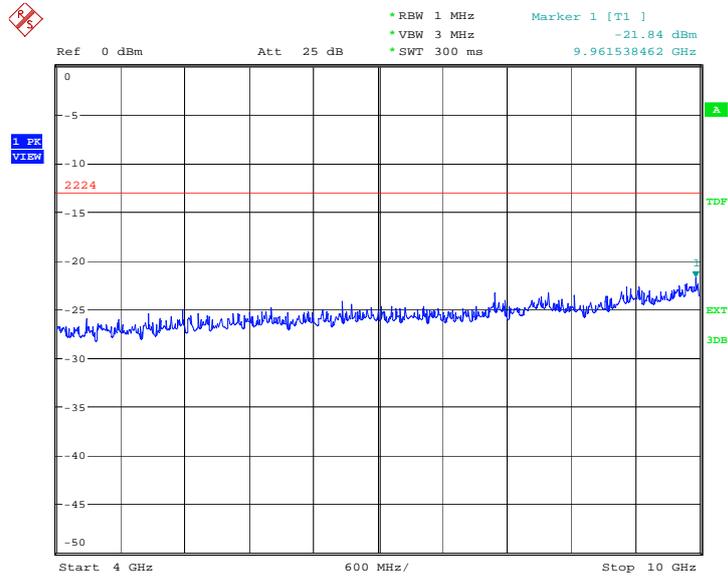
**A.7.3.1 Channel 128: 30MHz – 4GHz**

Spurious emission limit –13dBm.

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



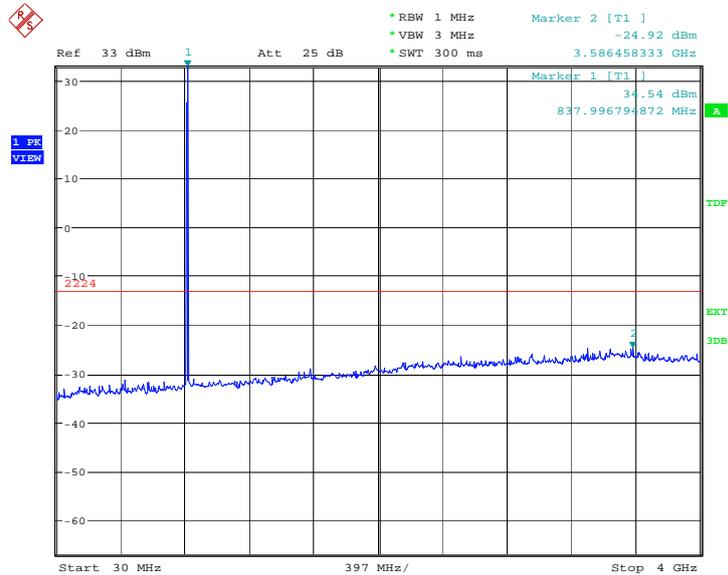
**A.7.3.2 Channel 128: 4GHz – 10GHz**  
Spurious emission limit –13dBm.



Date: 15.FEB.2011 07:29:06

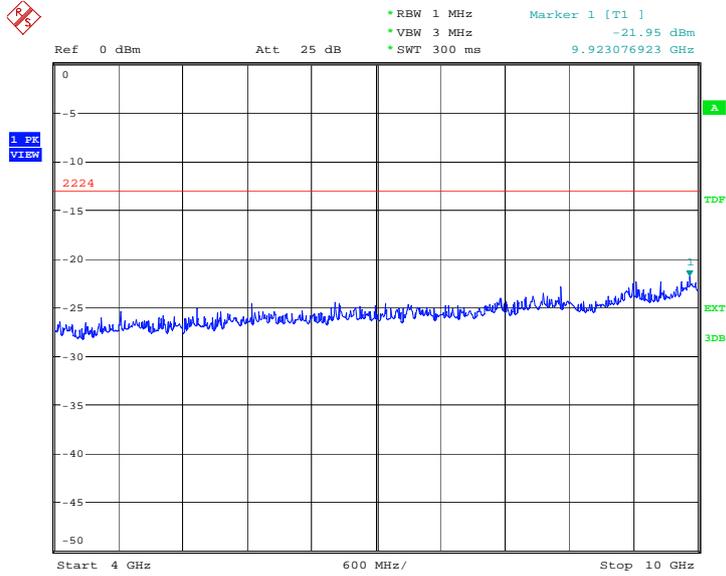
**A.7.3.3 Channel 190: 30MHz – 4GHz**  
Spurious emission limit –13dBm

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



Date: 15.FEB.2011 07:29:35

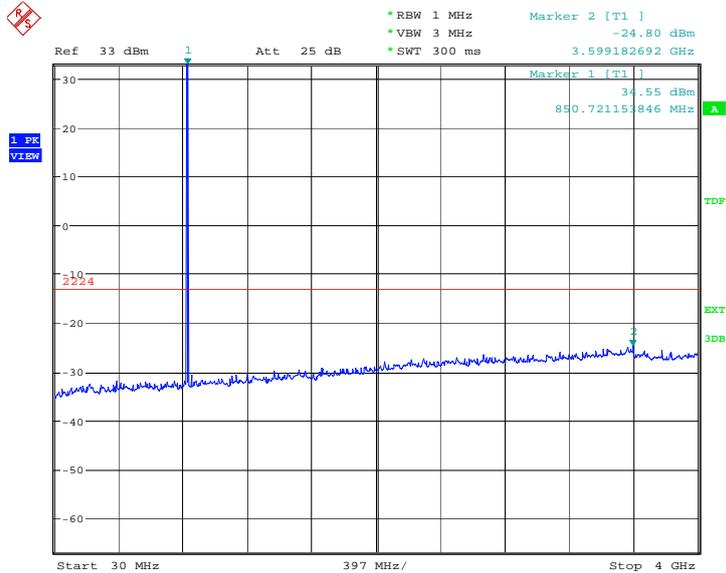
**A.7.3.4 Channel 190: 4GHz –10GHz**  
Spurious emission limit –13dBm



Date: 15.FEB.2011 07:30:03

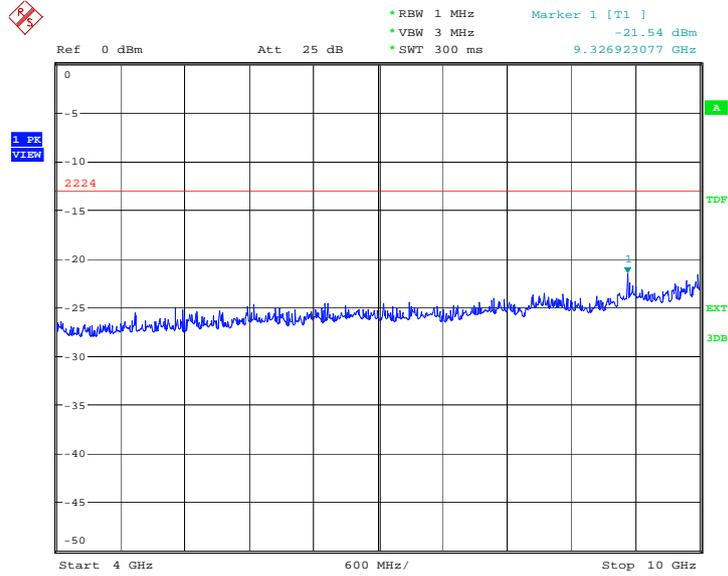
**A.7.3.5 Channel 251: 30MHz – 4GHz**  
Spurious emission limit –13dBm.

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



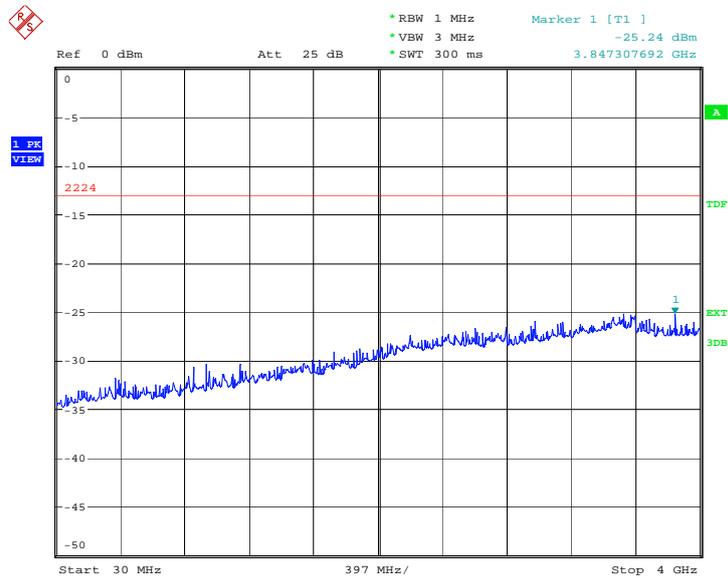
Date: 15.FEB.2011 07:30:32

**A.7.3.6 Channel 251: 4GHz – 10GHz**  
Spurious emission limit –13dBm.



Date: 15.FEB.2011 07:31:01

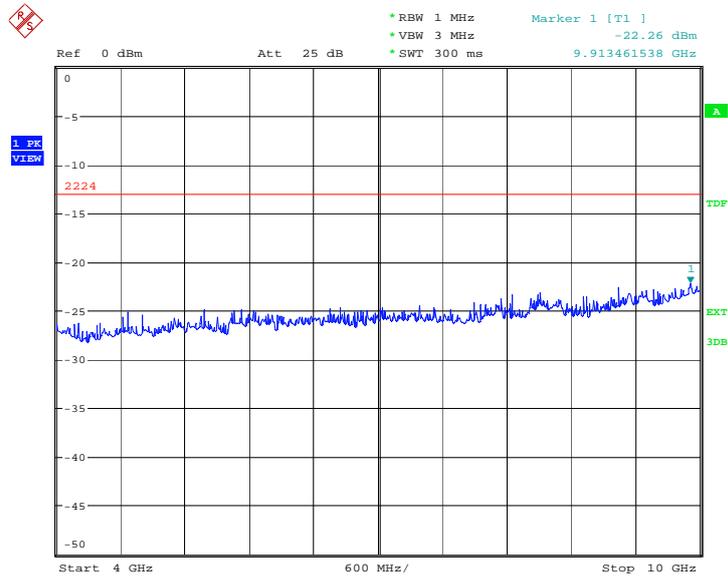
**A.7.3.7 Idle mode: 30MHz – 4GHz**  
Spurious emission limit –13dBm.



Date: 15.FEB.2011 07:31:29

### A.7.3.8 Idle mode: 4GHz – 10GHz

Spurious emission limit -13dBm.



Date: 15.FEB.2011 07:31:58

**PCS1900**

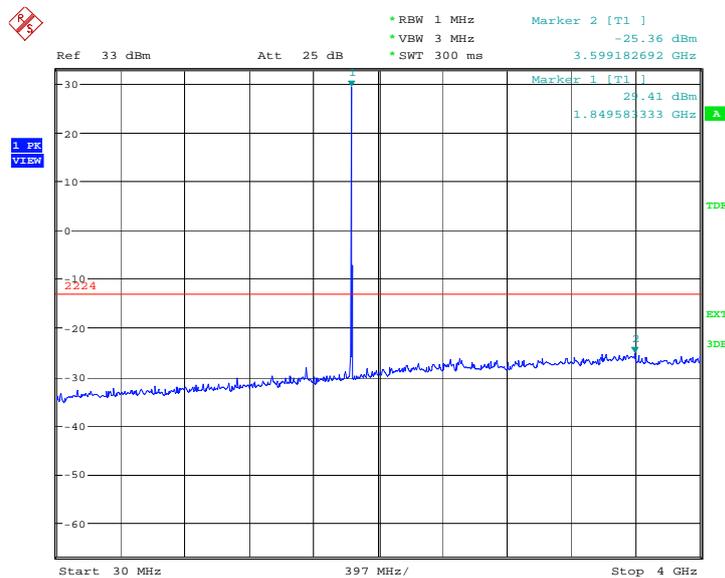
Harmonic	Tx ch. 512 Freq. (MHz)	Level (dBm)	Tx ch. 661 Freq. (MHz)	Level (dBm)	Tx ch. 810 Freq. (MHz)	Level (dBm)
2	3700.4	nf	3760	nf	3819.6	nf
3	5550.6	nf	5640	nf	5729.4	nf
4	7400.8	nf	7520	nf	7639.2	nf
5	9251.0	nf	9400	nf	9549.0	nf
6	11101.2	nf	11280	nf	11458.8	nf
7	12951.4	nf	13160	nf	13368.6	nf
8	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

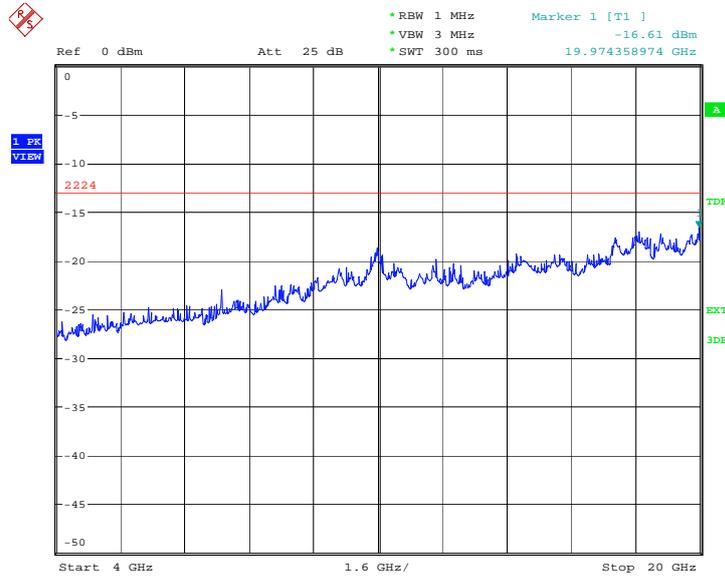
**A.7.3.9 Channel 512: 30MHz – 4GHz**

Spurious emission limit –13dBm.

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



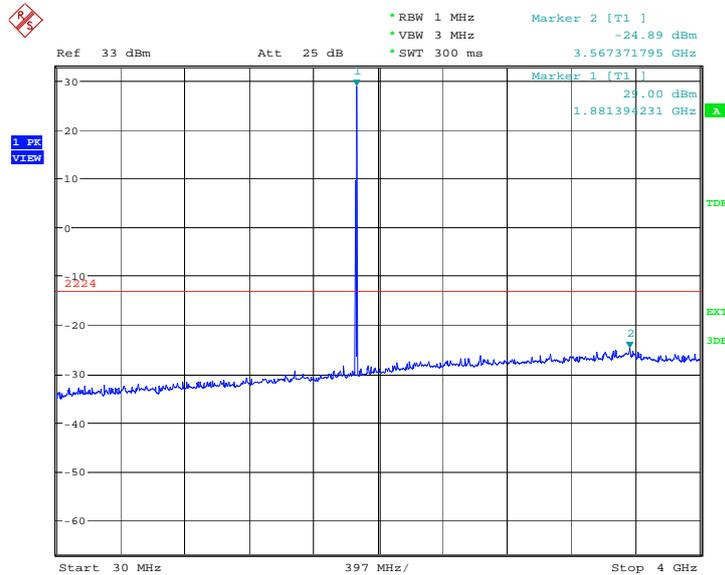
**A.7.3.10 Channel 512: 4GHz – 20GHz**  
Spurious emission limit –13dBm.



Date: 15.FEB.2011 07:43:21

**A.7.3.11 Channel 661: 30MHz – 4GHz**  
Spurious emission limit –13dBm

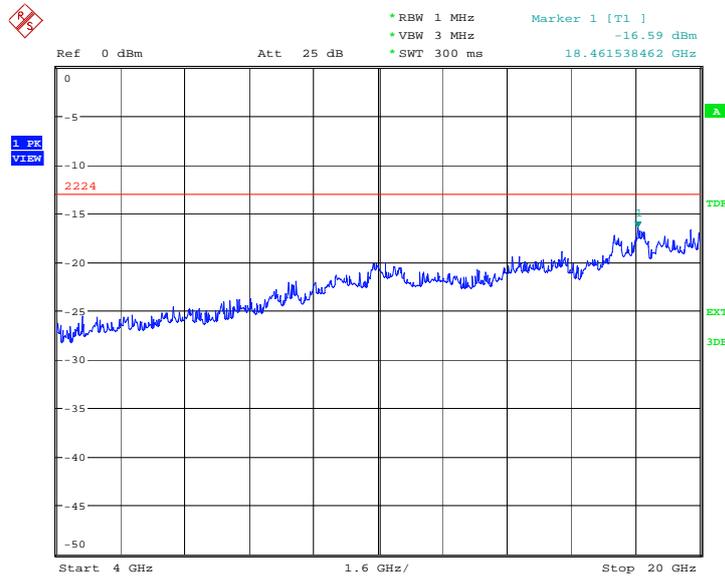
**NOTE: peak above the limit line is the carrier frequency.**



Date: 15.FEB.2011 07:43:50

### A.7.3.12 Channel 661: 4GHz –20GHz

Spurious emission limit –13dBm

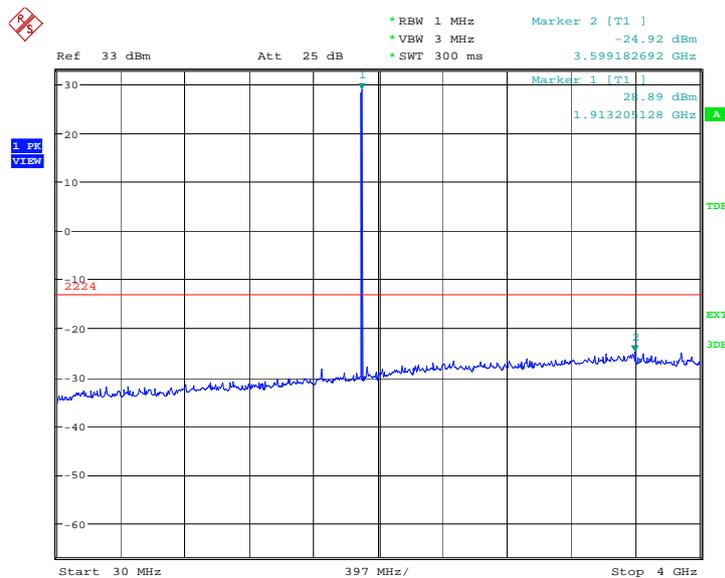


Date: 15.FEB.2011 07:44:18

### A.7.3.13 Channel 810: 30MHz – 4GHz

Spurious emission limit –13dBm.

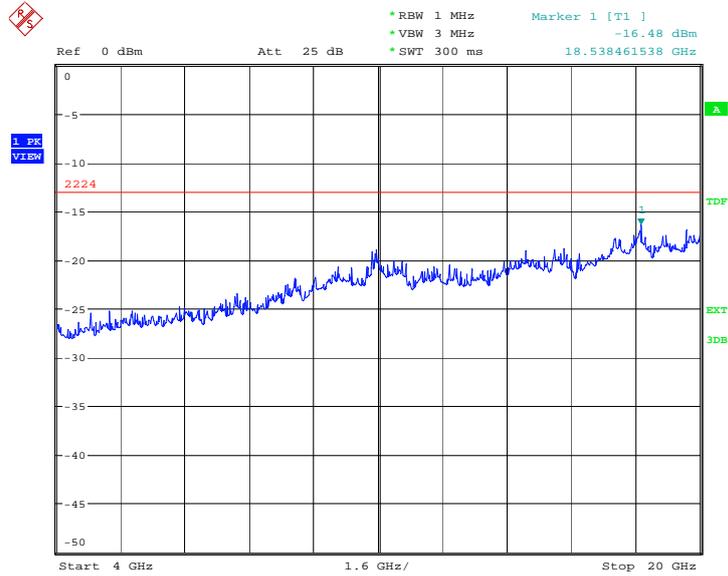
**NOTE: peak above the limit line is the carrier frequency.**



Date: 15.FEB.2011 07:44:47

### A.7.3.14 Channel 810: 4GHz – 20GHz

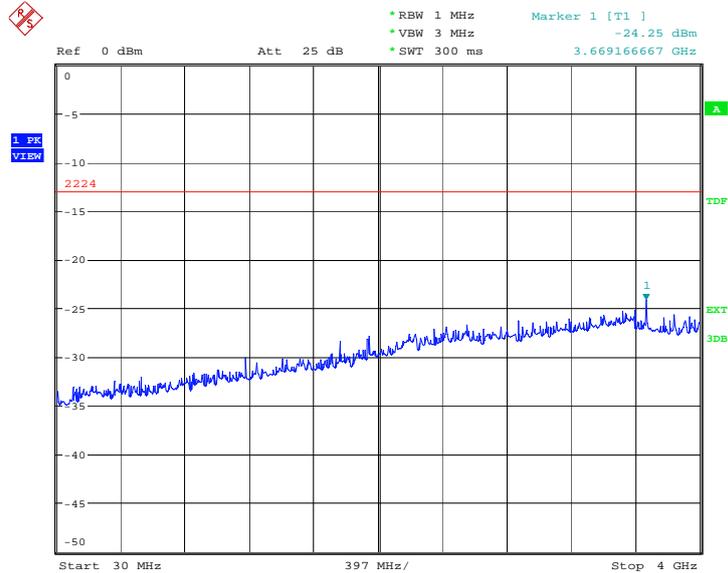
Spurious emission limit –13dBm.



Date: 15.FEB.2011 07:45:15

### A.7.3.15 Idle mode: 30MHz – 4GHz

Spurious emission limit –13dBm.



Date: 15.FEB.2011 07:45:44

