



# TEST REPORT

No. 2010TAR099

for

**Motorola, Inc. (Mobile Devices Business)**

**GSM/GPRS 850/1900 dual-band mobile phone**

**Marketing Name: WX290**

**FCC ID: IHDT56LY1**

with

**Hardware Version: PIO**

**Software Version: V632**

**Issued Date: Apr 9<sup>th</sup>, 2010**

**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. DAT-P-114/01-01**

**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

Company Name: TMC Beijing, Telecommunication Metrology Center of MIIT  
Address: No 52, Huayuan beilu, Haidian District, Beijing,P.R.China  
Postal Code: 100191  
Telephone: 00861062303288  
Fax: 00861062304793

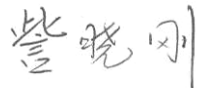
### 1.2. Testing Environment

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

### 1.3. Project data

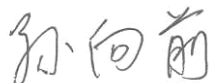
Testing Start Date: Feb 24<sup>th</sup>, 2010  
Testing End Date: Apr 5<sup>th</sup>, 2010

### 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: Motorola, Inc. (Mobile Devices Business)  
Address /Post: 600 N. US Highway 45 Libertyville, IL 60048-1286 U.S.A.  
City: Libertyville  
Postal Code: 60048-1286  
Country: U.S.A.  
Telephone: +44 (0)1926 411371  
Fax: +44 (0)1926 411371

### **2.2. Manufacturer Information**

Company Name: TCT Mobile Limited  
Address /Post: 4F, South Building, No.2966, JinKe Road, Zhangjiang High-Tech Park  
City: Shanghai  
Postal Code: 201203  
Country: P.R.China  
Telephone: 0086 2161460890  
Fax: 0086 2161460602

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

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

Description	GSM/GPRS 850/1900 dual-band mobile phone
Marketing Name	WX290
FCC ID	IHDT56LY1
Frequency	GSM 850MHz; PCS 1900MHz
Antenna	Internal
Power supply	Battery or Charger (AC Adaptor)
Output power	28.41 dBm maximum ERP measured for GSM850
Extreme vol. Limits	3.5VDC to 4.2VDC (nominal: 3.8VDC)
Extreme temp. Tolerance	-30°C to +50°C

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of Telecommunication Metrology Center of MII 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>
N12	01224600005079	PIO	V632

\*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>
AE1	Battery	/
AE2	Battery	/
AE3	Charger	/
AE4	Charger	/
AE5	Headset	/
AE6	Headset	/

##### AE1

Model	CAB3130000C1
Manufacturer	BYD
Capacitance	650mAh
Nominal Voltage	3.7V

##### AE2

Model	CAB3130010C1
Manufacturer	BYD
Capacitance	750mAh
Nominal Voltage	3.7V

## AE3

Model	CBA31B0AG0C1
Manufacturer	BYD
Length of DC line	120cm

## AE4

Model	SPN5405A
Manufacturer	ASTEC ELECTRONICS CO., LTD.
Length of DC line	120cm

## AE5

Model	CCB31B0A10C0
Manufacturer	Shunda & Juwei
Length of DC line	160cm

## AE6

Model	CCB31B0A11C0
Manufacturer	Shunda & Juwei
Length of DC line	160cm

\*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/GPRS 850/1900 dual-band mobile phone with integrated antenna. It consists of Hand Telephone Set and normal options: lithium battery, charger.

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	2009

## 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

Items	List	Clause in FCC rules	Verdict
1	Output Power	22.913(a)/24.232(b)	P
2	Emission Limit	2.1051/22.917/24.238	P
3	Conducted Emission	15.107/207	P
4	Frequency Stability	2.1055/24.235	P
5	Occupied Bandwidth	2.1049(h)(i)	P
6	Emission Bandwidth	22.917(b)/24.238(b)	P
7	Band Edge Compliance	22.917(b)/24.238(b)	P
8	Conducted 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	ESS	847151/015	R&S	2010-10-29
2	Test Receiver	ESI40	831564/002	R&S	2011-2-10
3	BiLog Antenna	3142B	9908-1403	EMCO	2011-1-15
4	BiLog Antenna	3142B	9908-1405	EMCO	2010-9-18
5	Signal Generator	SMT06	831285/005	R&S	2010-12-25
6	Signal Generator	SMP04	100070	R&S	2010-4-20
7	LISN	ESH2-Z5	829991/012	R&S	2010-8
8	Spectrum Analyzer	FSU26	200030	R&S	2010-6-18
9	Universal Radio Communication Tester	CMU200	100680	R&S	2010-8-23
10	Dual-Ridge Waveguide Horn Antenna	3115	9906-5827	EMCO	2011-3
11	Dual-Ridge Waveguide Horn Antenna	3115	9906-5831	EMCO	2011-3
12	Dual-Ridge Waveguide Horn Antenna	3116	2663	EMCO	2011-3
13	Dual-Ridge Waveguide Horn Antenna	3116	2661	EMCO	2011-3
14	Climatic chamber	PL-2G	343074	ESPEC	2010-5-15

## **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).

#### **GSM850**

##### **Limit**

	Power step	Nominal Peak output power (dBm)	Tolerance (dB)	Target (dB)
GSM	5	33dBm(2W)	± 2	32±1
GPRS	3	33dBm(2W)	± 2	32±1

#### **Measurement result**

##### **GSM**

Frequency(MHz)	Power Step	Peak output power(dBm)
824.2	5	<b>31.95</b>
836.6	5	31.84
848.8	5	31.85

##### **GPRS**

Frequency(MHz)	Power Step	Peak output power(dBm)
824.2	3	<b>32.64</b>
836.6	3	32.58
848.8	3	32.58

**PCS1900**

**Limit**

	Power step	Nominal Peak output power (dBm)	Tolerance (dB)	Target (dB)
GSM	0	30dBm(1W)	±2	29±1
GPRS	3	30dBm(1W)	±2	29±1

**Measurement result**

**GSM**

Frequency(MHz)	Power Step	Peak output power(dBm)
1850.2	0	29.75
1880.0	0	<b>29.79</b>
1909.8	0	29.77

**GPRS**

Frequency(MHz)	Power Step	Peak output power(dBm)
1850.2	3	<b>29.49</b>
1880.0	3	28.97
1909.8	3	28.62

### 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 "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. In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference centre of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power ( $P_{in}$ ) is applied to the input of the dipole, and the power received ( $P_r$ ) at the chamber's probe antenna is recorded.
2. The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established as  $A_{Rpl}=P_{in} - P_r$ . The  $A_{Rpl}$  is the attenuation of "reference path loss", and including the gain of receive antenna, the cable loss and the air loss.

The measurement results are obtained as described below:

$$\text{Power(EIRP)}=P_{\text{Mea}}+A_{\text{Rpl}}$$

3. The EUT is substituted for the dipole at the reference centre of the chamber and a scan is performed to obtain the radiation pattern.
4. From the radiation pattern, the co-ordinates where the maximum antenna gain occurs are identified.
5. The EUT is then put into continuously transmitting mode at its maximum power level.
6. Power mode measurements are performed with the receiving antenna placed at the coordinates determined in Step 3 to determine the output power as defined in Rule 24.232 (b) and (c). The "reference path loss" from Step1 is added to this result.
7. This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.15 dBi) and known input power ( $P_{in}$ ).
8. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dBi}$ .
9. The test system should be checked before test by a standard comb signal source. The signal source put on the position, instead of the EUT. The test result should be compared with the test result before. If the test result is similar with the initial one, then the test system can work stably.

**GSM 850-ERP 22.913(a)**

**Limits**

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

**Measurement result**

**GSM**

Frequency(MHz)	Power Step	Peak ERP(dBm)	A <sub>Rpl</sub> (dBm)	Correction (dBm)	P <sub>Mea</sub> (dBm)	Polarization
824.2	5	27.79	45.95	2.15	-16.00	Horizontal
836.6	5	28.05	45.98	2.15	-15.78	Horizontal
848.8	5	<b>28.41</b>	45.82	2.15	-15.26	Horizontal

**GPRS**

Frequency(MHz)	Power Step	Peak ERP(dBm)	A <sub>Rpl</sub> (dBm)	Correction (dBm)	P <sub>Mea</sub> (dBm)	Polarization
824.2	3	25.49	45.95	2.15	-18.31	Horizontal
836.6	3	25.71	45.98	2.15	-18.11	Horizontal
848.8	3	<b>26.07</b>	45.82	2.15	-17.60	Horizontal

Frequency: 848.8MHz

Peak ERP(dBm)= P<sub>Mea</sub>(-15.26dBm)+ A<sub>Rpl</sub>(45.82dBm)-2.15dBm= 28.41 dBm

**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)

**Measurement result**

**GSM**

Frequency(MHz)	Power Step	Peak EIRP(dBm)	A <sub>Rpl</sub> (dBm)	P <sub>Mea</sub> (dBm)	Polarization
1850.2	0	23.85	47.11	-23.75	Horizontal
1880.0	0	<b>23.90</b>	47.37	-24.02	Horizontal
1909.8	0	23.66	47.54	-24.56	Horizontal

**GPRS**

Frequency(MHz)	Power Step	Peak EIRP(dBm)	A <sub>Rpl</sub> (dBm)	P <sub>Mea</sub> (dBm)	Polarization
1850.2	3	23.59	47.11	-24.01	Horizontal
1880.0	3	<b>23.61</b>	47.37	-24.31	Horizontal
1909.8	3	23.35	47.54	-24.87	Horizontal

Frequency: 1880MHz

Peak EIRP(dBm)= P<sub>Mea</sub>(-24.02dBm)+ A<sub>Rpl</sub>(47.37dBm) = 23.90 dBm

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

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

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

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

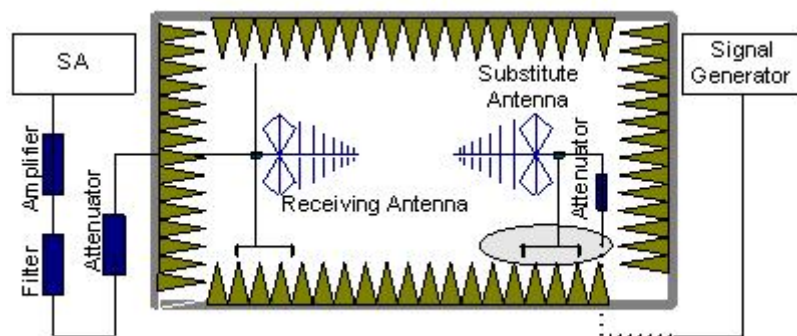
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set 1MHz as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting 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:**

a) Pre-calibration

With pre-calibration method, the Radiated Spurious Emissions(RSE) is calculated as,  
 $RSE = R_x \text{ (dBuV)} + CL \text{ (dB)} + SA \text{ (dB)} + Gain \text{ (dBi)} - 107 \text{ (dBuV to dBm)}$

The SA is calibrated using following setup.

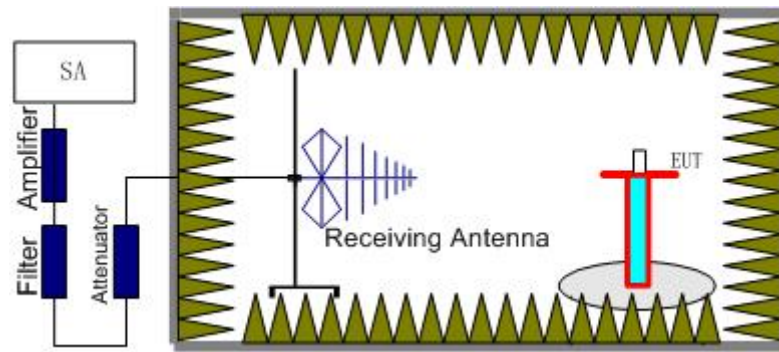


b) System check

The test system was checked before test by a standard comb signal source. The signal source put on the position, instead of the EUT. The test result should be compared with the test result before. If the test result is similar with the initial one, then the test system can work stably.

c) EUT test

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 test item 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 test item 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 and 1MHz bandwidth.



### A.2.2 Measurement Limit

Sec. 24.238 Emission Limits.

(a) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power ( $P$ , in Watts) by at least  $43+10\text{Log}(P)$  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, 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.

The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established and the  $A_{Rpl}$  is the attenuation of "reference path loss", and including the gain of receive antenna, the gain of the preamplifier, the cable loss and the air loss.

The measurement results are obtained as described below:

$$\text{Power} = P_{\text{Mea}} + A_{\text{Rpl}}$$

**A.2.4 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)	Power(dBm)	A <sub>Rpl</sub> (dBm)	P <sub>Mea</sub> (dBm)	Limit (dBm)	Polarity
1170.1	-50.1	-1.25	-48.85	-13	Horizontal
4026.7	-43.5	2.35	-45.85	-13	Horizontal
4054	-44.7	2.05	-46.75	-13	Horizontal
4121.2	-39	1.05	-40.05	-13	Horizontal
7416.7	-43.5	6.85	-50.35	-13	Horizontal
9976	-41.1	10.35	-51.45	-13	Horizontal

**GSM Mode Channel 190/836.6MHz**

Frequency(MHz)	Power(dBm)	A <sub>Rpl</sub> (dBm)	P <sub>Mea</sub> (dBm)	Limit (dBm)	Polarity
1166.2	-49.9	-0.85	-49.05	-13	Vertical
1396.6	-49.7	-1.45	-48.25	-13	Horizontal
4183	-43.7	2.55	-46.25	-13	Horizontal
5451.7	-44.3	3.15	-47.45	-13	Horizontal
7528.9	-41.4	8.15	-49.55	-13	Vertical

**GSM Mode Channel 251/848.8MHz**

Frequency(MHz)	Power(dBm)	A <sub>Rpl</sub> (dBm)	P <sub>Mea</sub> (dBm)	Limit (dBm)	Polarity
1431.1	-50.2	-2.05	-48.15	-13	Horizontal
4244.5	-43.9	2.25	-46.15	-13	Vertical
7638.4	-42.5	6.35	-48.85	-13	Vertical
9784.9	-41.2	10.05	-51.25	-13	Vertical

**GSM Mode Channel 512/1850.2MHz**

Frequency(MHz)	Power(dBm)	A <sub>Rpl</sub> (dBm)	P <sub>Mea</sub> (dBm)	Limit (dBm)	Polarity
2000.9	-44.8	9.6	-54.4	-13	Horizontal
3194.3	-44.9	3	-47.9	-13	Horizontal
12531.2	-37.7	14.6	-52.3	-13	Horizontal
14800.8	-31	15.2	-46.2	-13	Vertical
17095.2	-33.7	14.1	-47.8	-13	Vertical
17876	-30.6	16.6	-47.2	-13	Vertical

**GSM Mode Channel 661/1880.0MHz**

Frequency(MHz)	Power(dBm)	A <sub>Rpl</sub> (dBm)	P <sub>Mea</sub> (dBm)	Limit (dBm)	Polarity
2000.3	-43.7	9.8	-53.5	-13	Vertical
5640.2	-35.1	5	-40.1	-13	Horizontal
11896.7	-37.5	14.4	-51.9	-13	Vertical
15040	-29.2	14.9	-44.1	-13	Vertical
17102.4	-34	14.1	-48.1	-13	Vertical
17870	-30.8	17.1	-47.9	-13	Horizontal

**GSM Mode Channel 810/1909.8MHz**

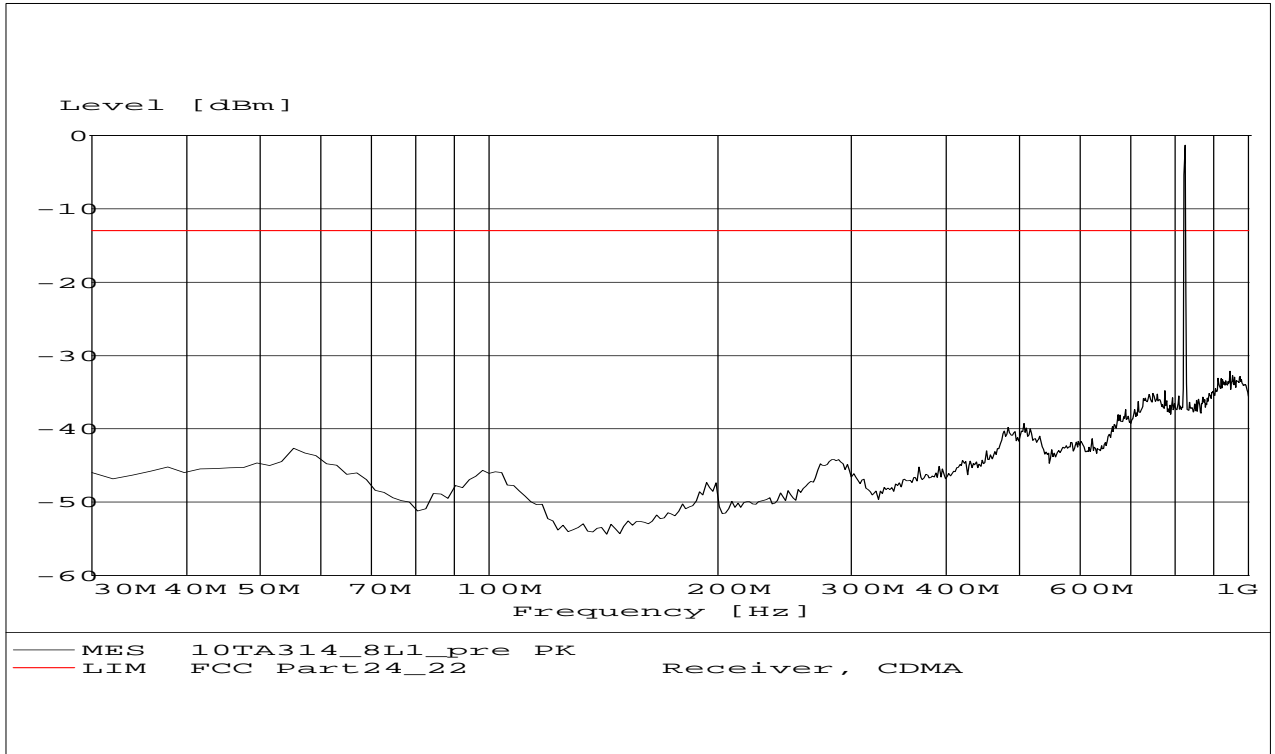
Frequency(MHz)	Power(dBm)	A <sub>Rpl</sub> (dBm)	P <sub>Mea</sub> (dBm)	Limit (dBm)	Polarity
2000.3	-37.1	9.8	-46.9	-13	Vertical
3819.8	-42.6	3.5	-46.1	-13	Horizontal
4575.8	-42.1	5.2	-47.3	-13	Horizontal
5729.6	-32.4	5.3	-37.7	-13	Horizontal
12507.2	-37.6	14.5	-52.1	-13	Vertical
15038.4	-35.1	14.9	-50	-13	Horizontal

**GSM 850**

**A.2.3.1 RADIATED SPURIOUS EMISSIONS-Channel 128: 30MHz –1GHz**

Radiated spurious emission limit :-13dBm.

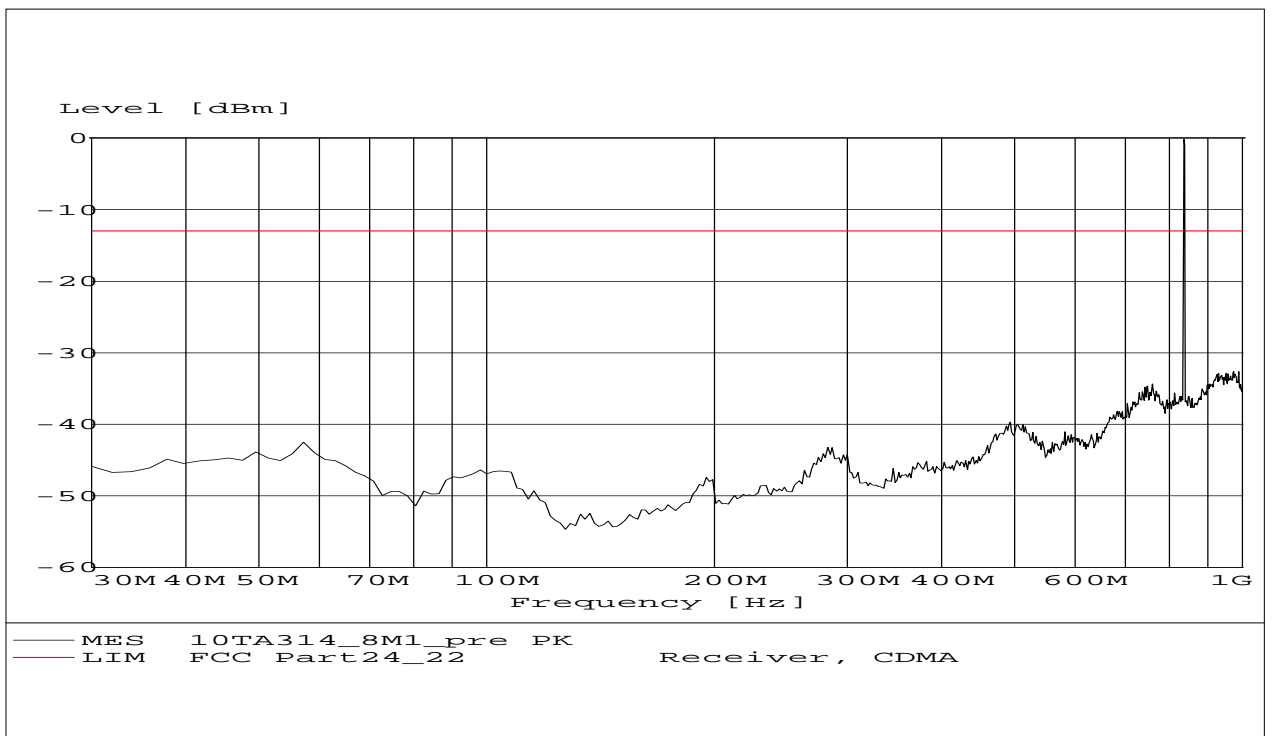
**NOTE: peak above the limit line is the Carrier frequency @ ch-128**



**A.2.3.2 RADIATED SPURIOUS EMISSIONS-Channel 190: 30MHz – 1GHz**

Radiated spurious emission limit :-13dBm.

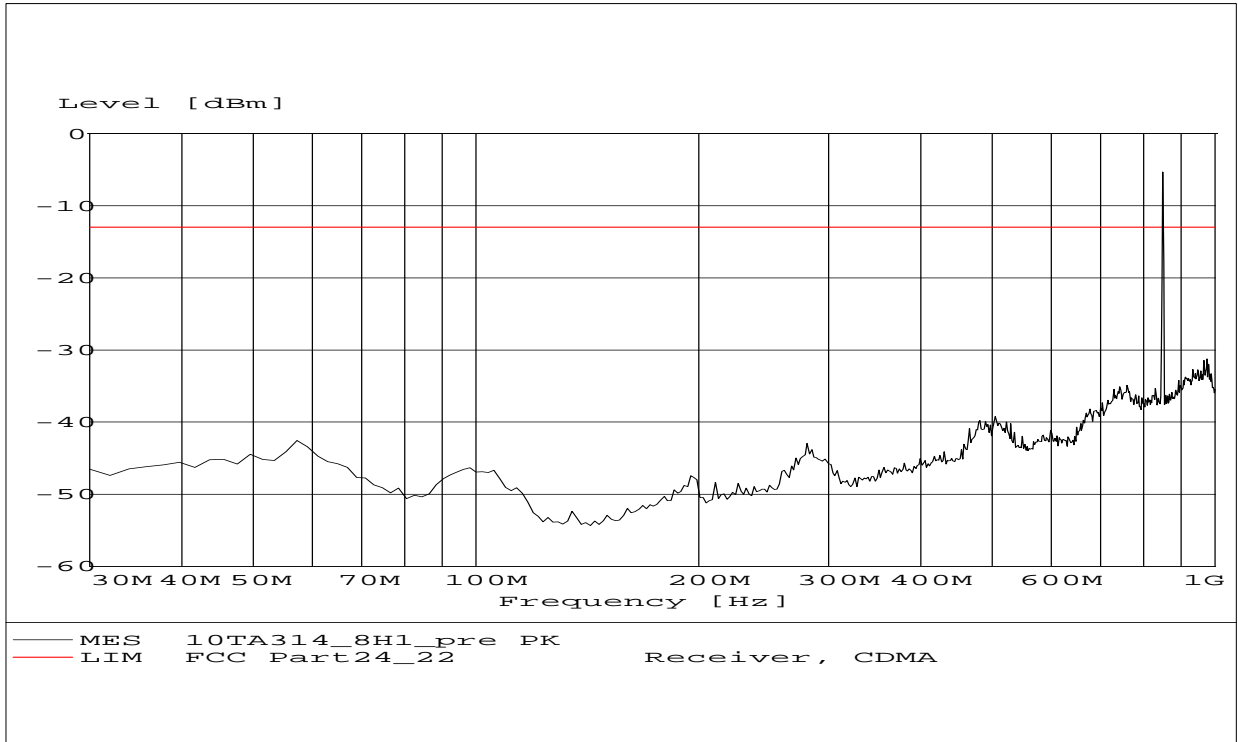
**NOTE: peak above the limit line is the Carrier frequency @ ch-190**



**A.2.3.3 RADIATED SPURIOUS EMISSIONS-Channel 251: 30MHz – 1GHz**

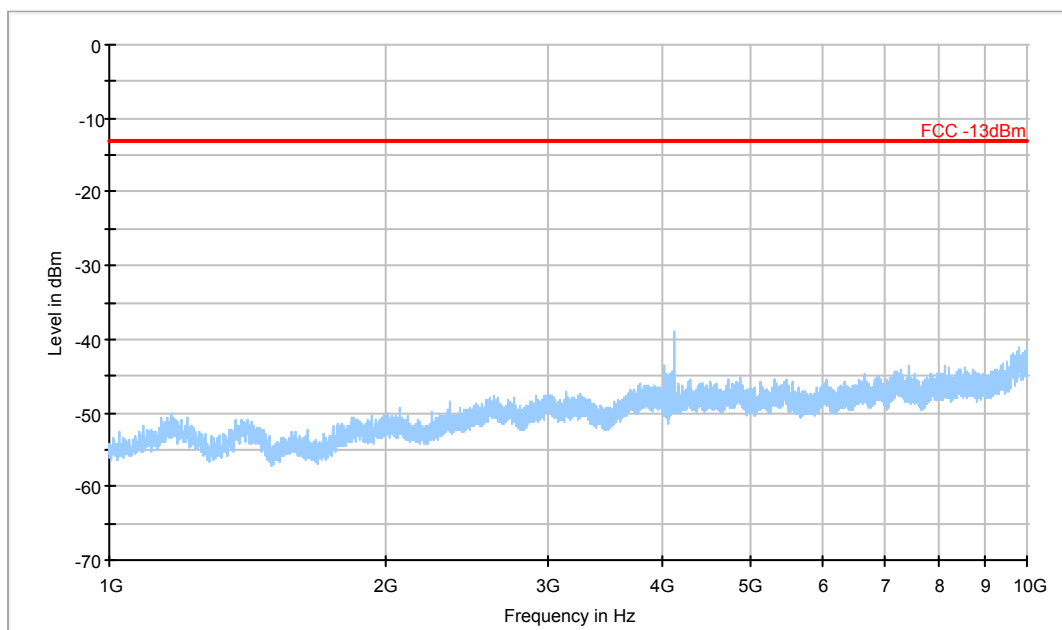
Radiated spurious emission limit :-13dBm.

NOTE: peak above the limit line is the Carrier frequency @ ch-251



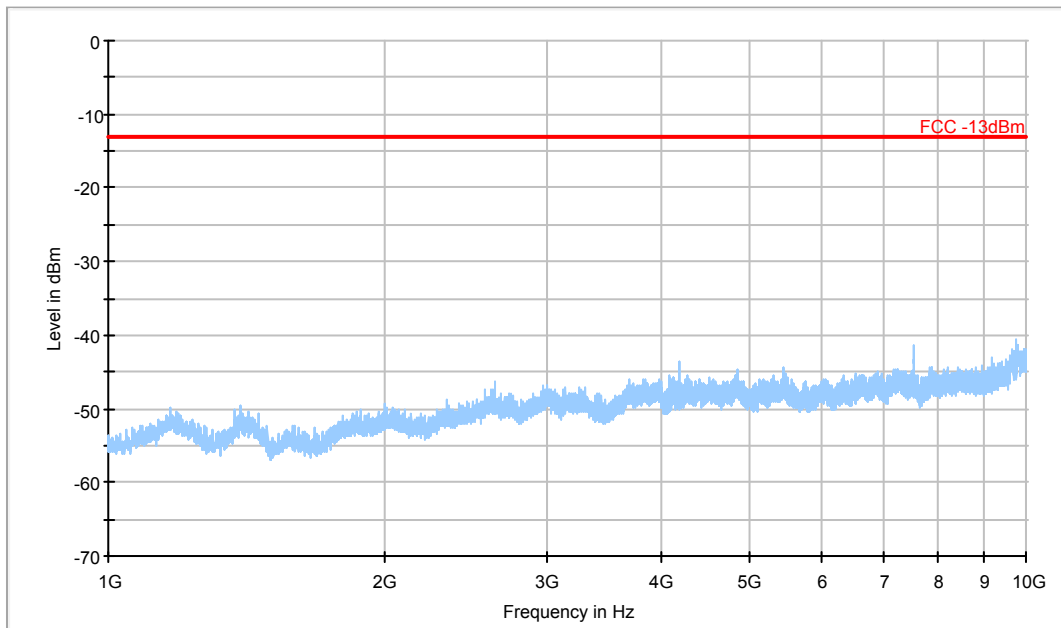
**A.2.3.4 RADIATED SPURIOUS EMISSIONS-Channel 128: 1GHz – 10GHz**

Radiated spurious emission limit :-13dBm.



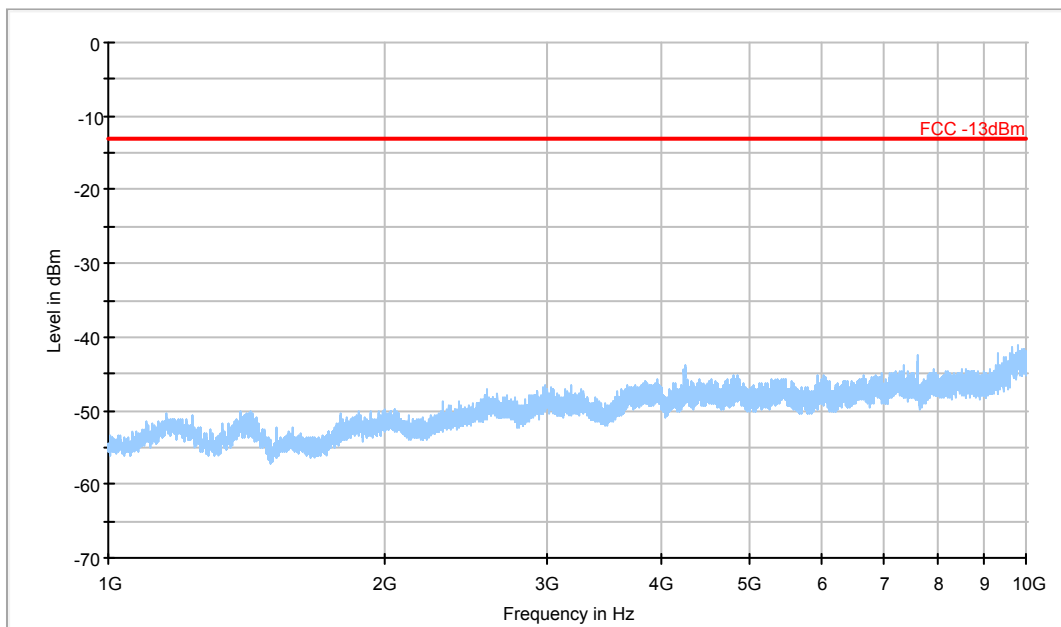
— FCC -13dBm — Preview Measurement Detector 1

**A.2.3.5 RADIATED SPURIOUS EMISSIONS-Channel 190: 1GHz – 10GHz**  
Radiated spurious emission limit :-13dBm.



— FCC -13dBm      — Preview Measurement Detector 1

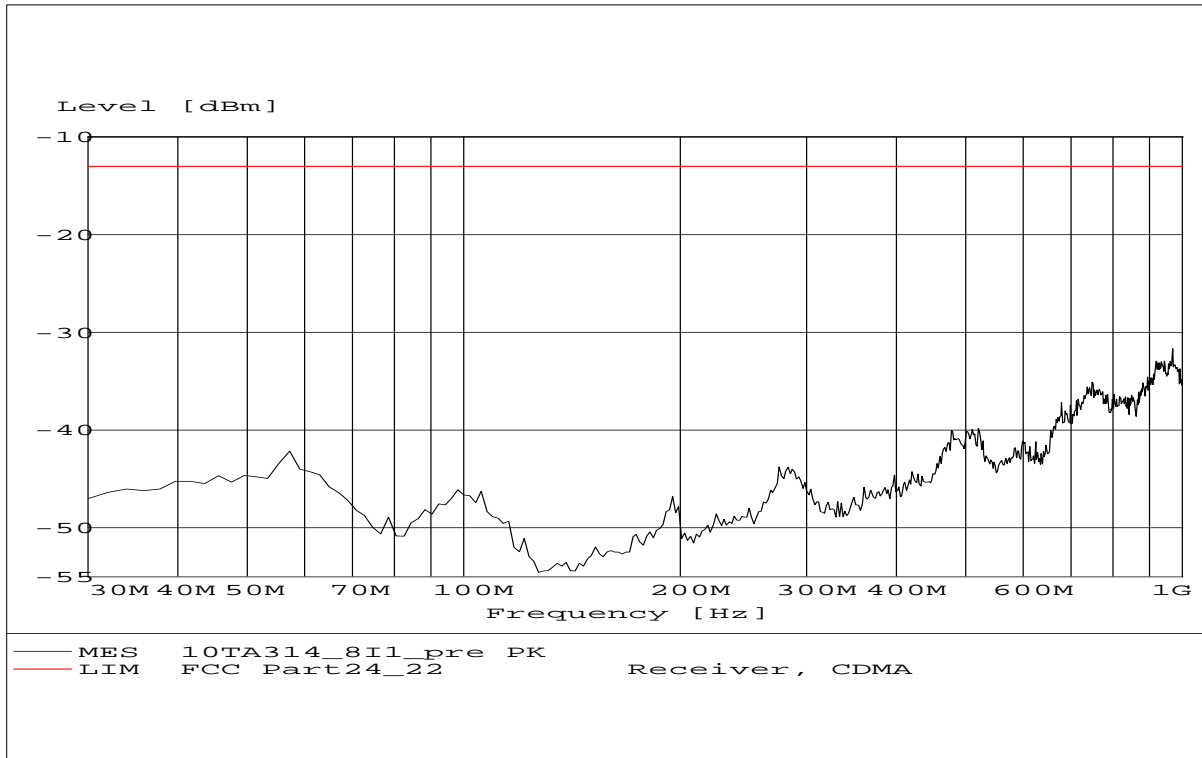
**A.2.3.6 RADIATED SPURIOUS EMISSIONS-Channel 251: 1GHz – 10GHz**  
Radiated spurious emission limit :-13dBm.



— FCC -13dBm      — Preview Measurement Detector 1

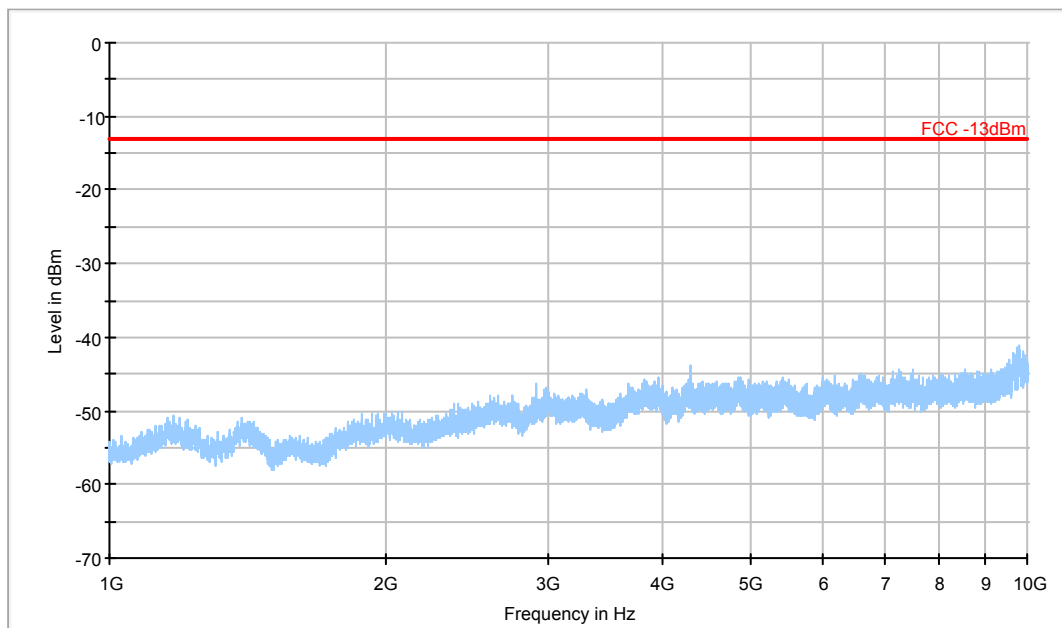
**A.2.3.7 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 30MHz – 1GHz**

Radiated spurious emission limit :-13dBm.



**A.2.3.8 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 1GHz – 10GHz**

Radiated spurious emission limit :-13dBm.



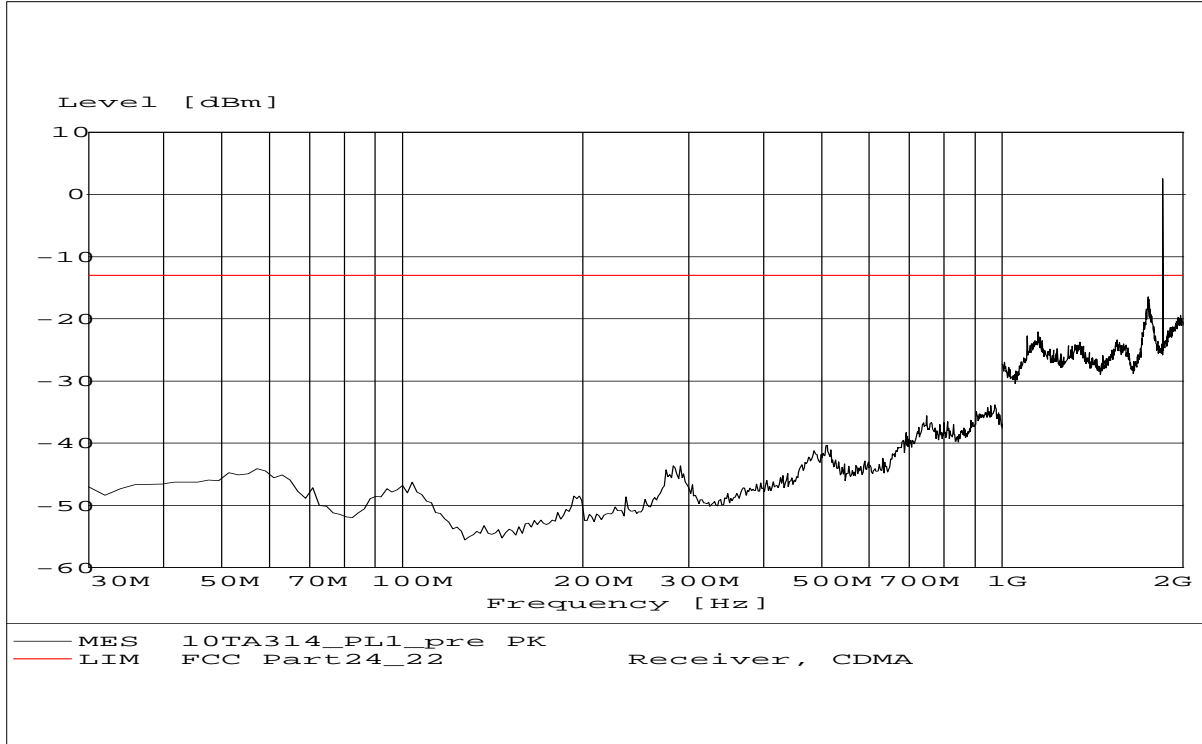
— FCC -13dBm — Preview Measurement Detector 1

PCS 1900

A.2.3.9 RADIATED SPURIOUS EMISSIONS-Channel 512: 30MHz – 2GHz

Radiated spurious emission limit :-13dBm.

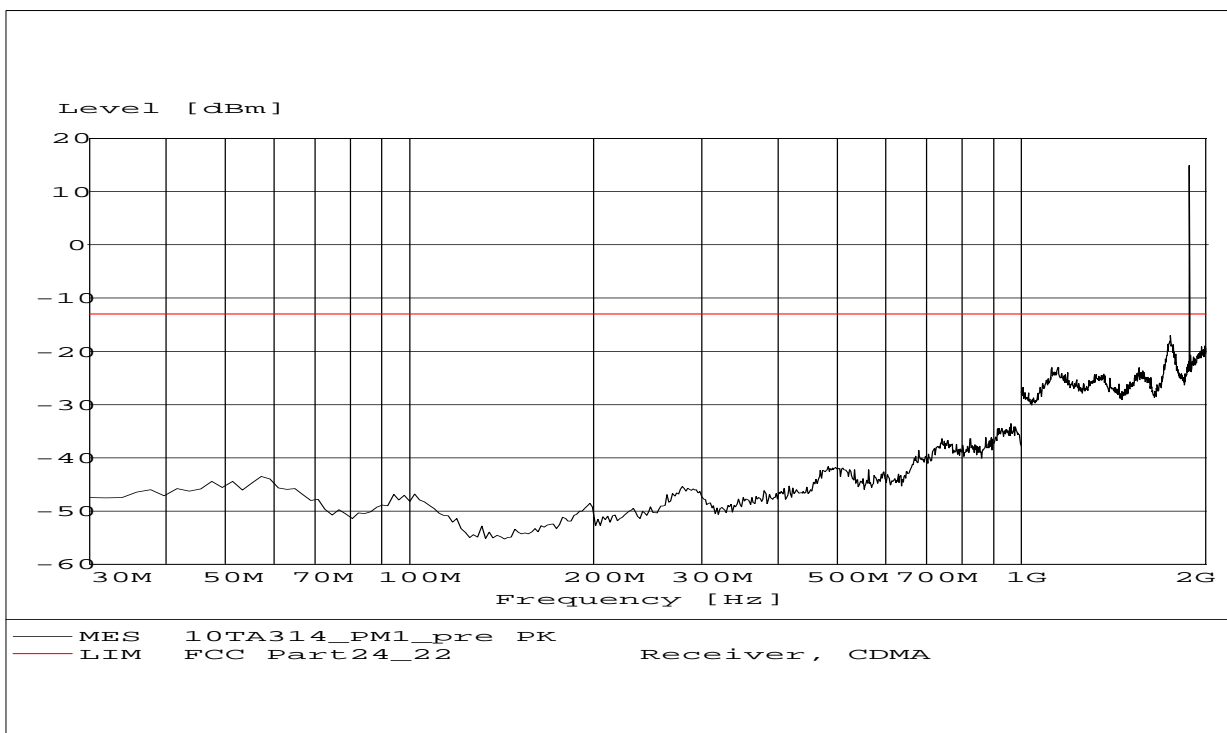
NOTE: peak above the limit line is the Carrier frequency @ ch-512



A.2.3.10 RADIATED SPURIOUS EMISSIONS-Channel 661: 30MHz – 2GHz

Radiated spurious emission limit :-13dBm.

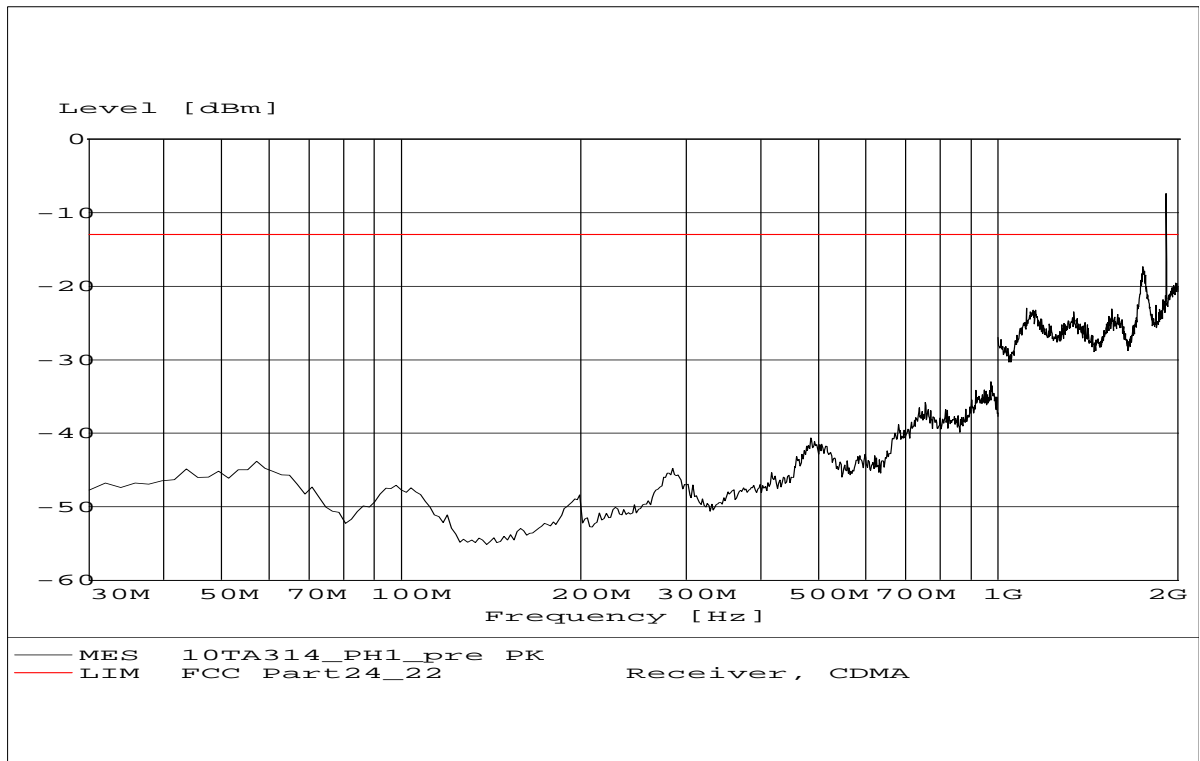
NOTE: peak above the limit line is the Carrier frequency @ ch-661



**A.2.3.11 RADIATED SPURIOUS EMISSIONS-Channel 810: 30MHz – 2GHz**

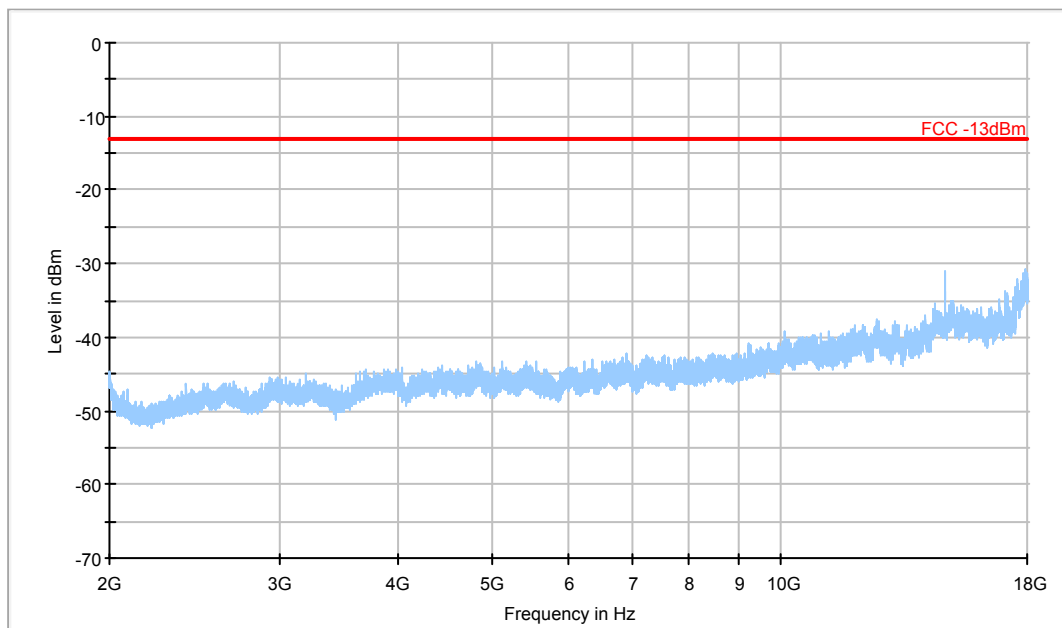
Radiated spurious emission limit :-13dBm.

NOTE: peak above the limit line is the Carrier frequency @ ch-810

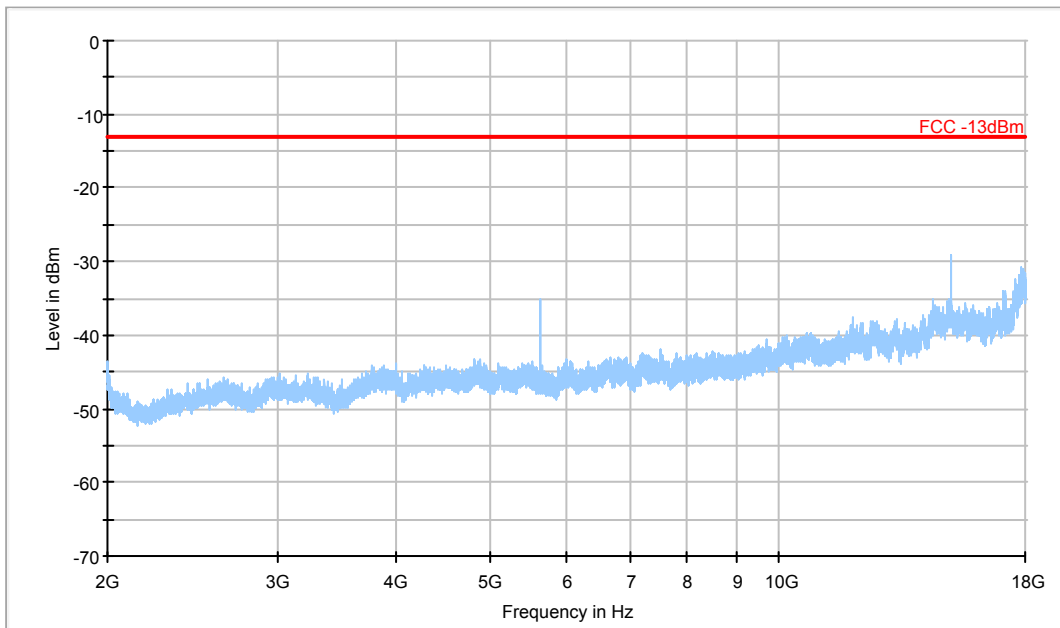


**A.2.3.12 RADIATED SPURIOUS EMISSIONS-Channel 512: 2GHz – 18GHz**

Radiated spurious emission limit :-13dBm.

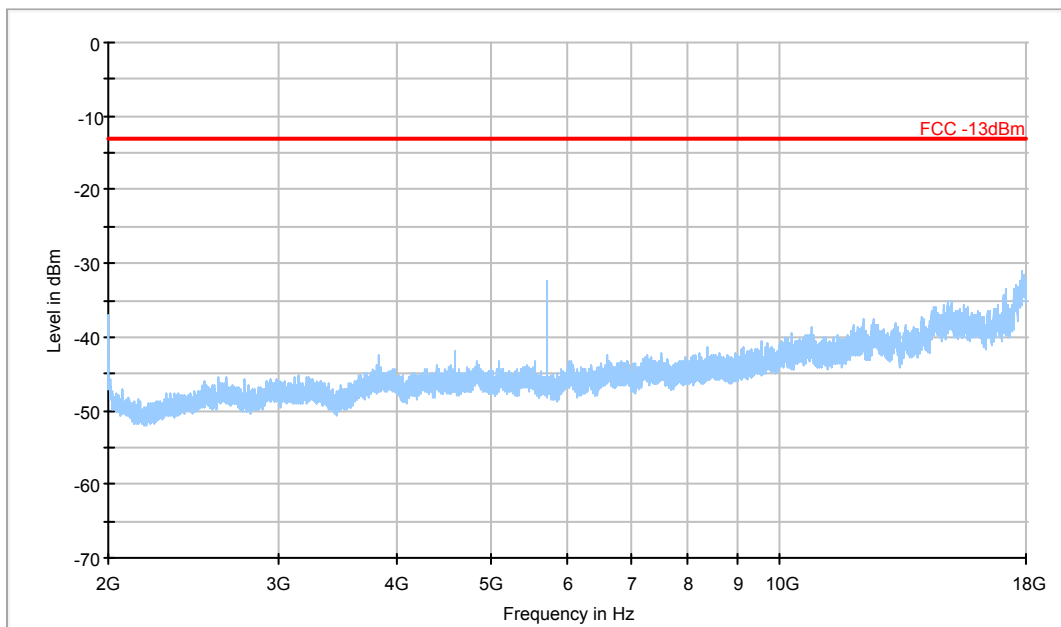


**A.2.3.13 RADIATED SPURIOUS EMISSIONS-Channel 661: 2GHz – 18GHz**  
Radiated spurious emission limit :-13dBm.



— FCC -13dBm    — Preview Measurement Detector 1

**A.2.3.14 RADIATED SPURIOUS EMISSIONS-Channel 810: 2GHz – 18GHz**  
Radiated spurious emission limit :-13dBm.

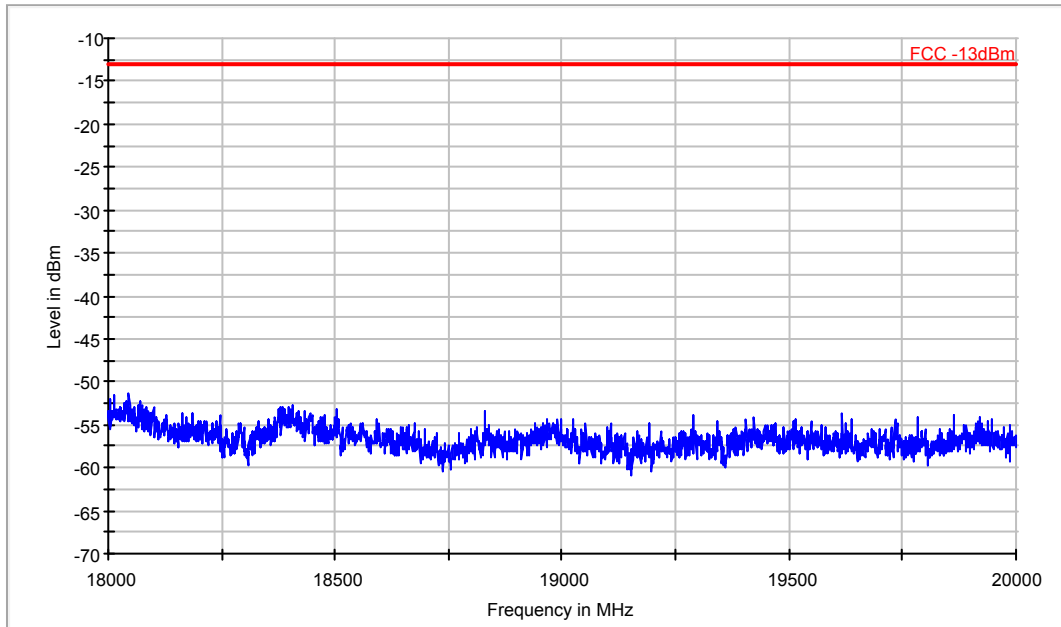


— FCC -13dBm    — Preview Measurement Detector 1

**A.2.3.15 Radiated spurious emission (18GHz-20GHz)**

Radiated spurious emission limit :-13dBm.

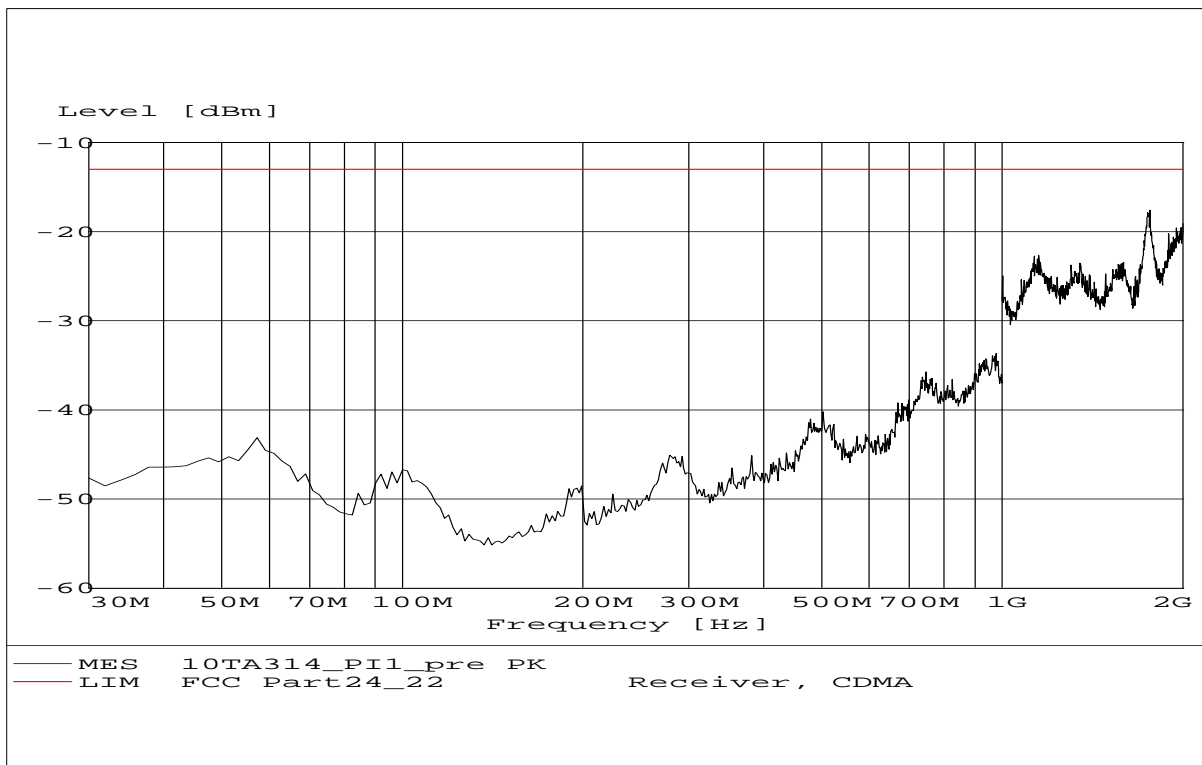
Note: This plot is valid for low, mid & high channels. It is same as the floor noise.



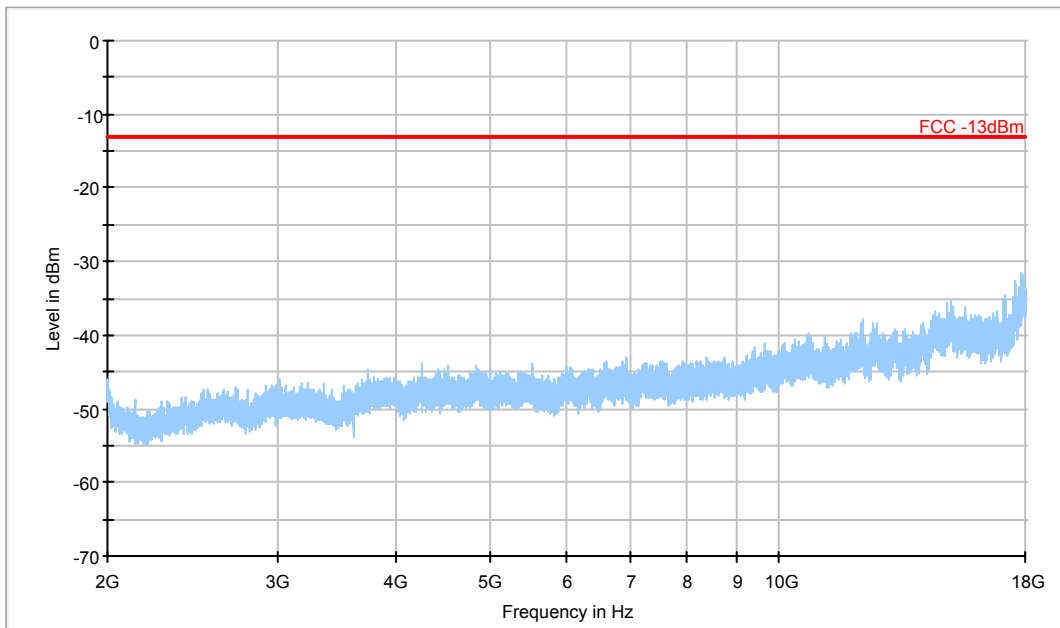
— Preview Measurement Detector 1      — FCC -13dBm

**A.2.3.16 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 30MHz – 2GHz**

Radiated spurious emission limit :-13dBm.



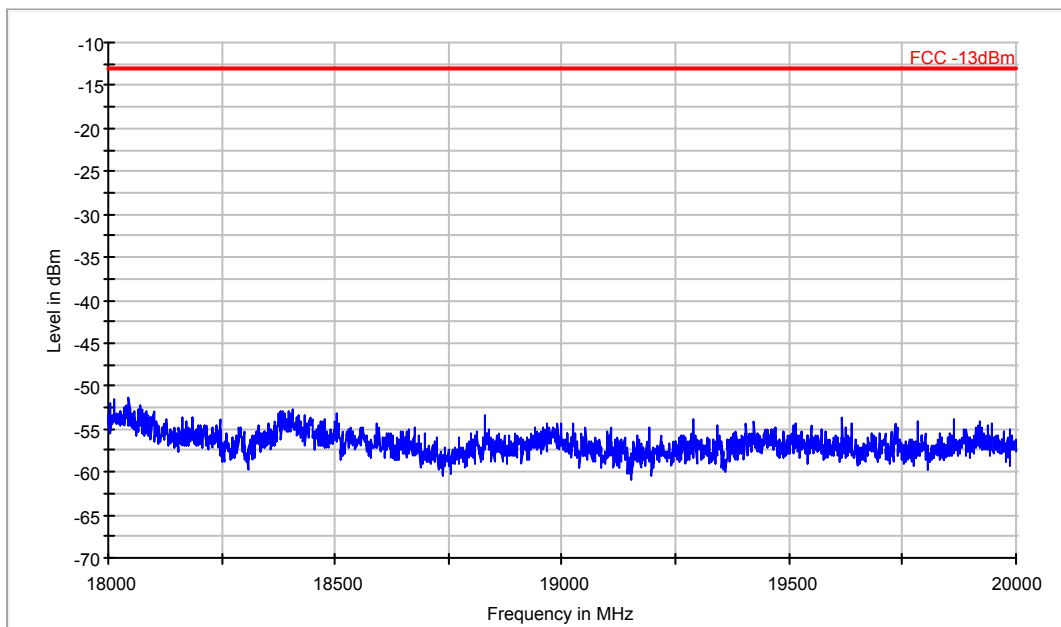
**A.2.3.17 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 2GHz – 18GHz**  
Radiated spurious emission limit :-13dBm.



— FCC -13dBm      — Preview Measurement Detector 1

**A.2.3.18 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 18GHz – 20GHz**  
Radiated spurious emission limit :-13dBm.

Note: It is same as the floor noise.



— Preview Measurement Detector 1      — FCC -13dBm

### A.3 CONDUCTED EMISSION (§15.107§15.207)

The measurement procedure in ANSI C63.4-1003 is used. Conducted Emission is measured with travel charger.

#### A.3.1 Limit

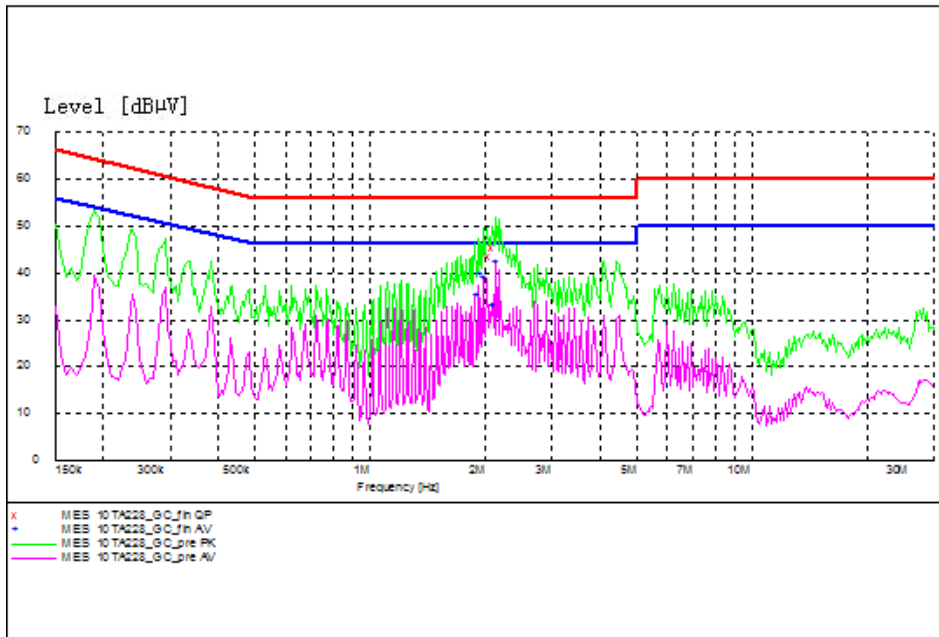
Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi -Peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

\* Decreases with logarithm of the frequency

#### A.3.2 Measurement result

##### AE3

##### GSM850MHz



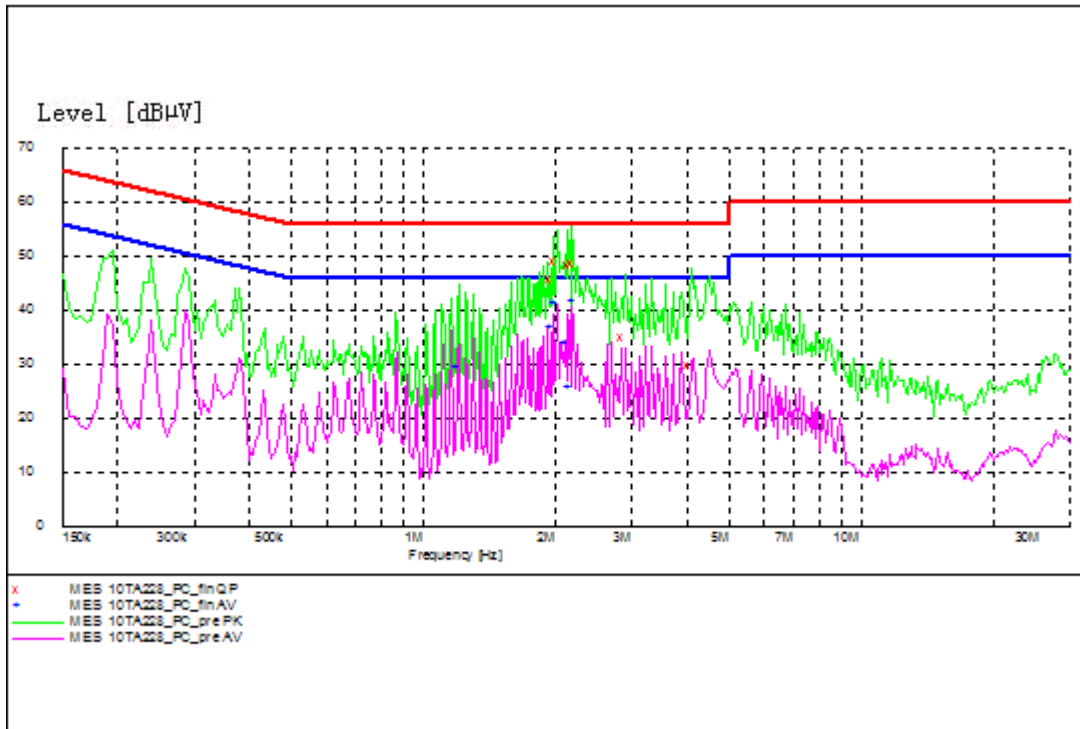
#### MEASUREMENT RESULT: "10TA228\_GC\_fin QP"

Frequency MHz	Level dB $\mu$ V	Transd	Limit dB	Margin dB $\mu$ V	Line dB	PE
2.081208	43.10	10.1	56	12.9	L1	GND
2.123040	45.00	10.1	56	11.0	N	GND

#### MEASUREMENT RESULT: "10TA228\_GC\_fin AV"

Frequency MHz	Level dB $\mu$ V	Transd	Limit dB	Margin dB $\mu$ V	Line dB	PE
1.930000	35.20	10.1	46	10.8	L1	GND
1.975000	39.40	10.1	46	6.6	L1	GND
2.020000	38.70	10.1	46	7.3	L1	GND
2.123040	33.00	10.1	46	13.0	L1	GND
2.165713	42.00	10.1	46	4.0	L1	GND

PCS 1900MHz



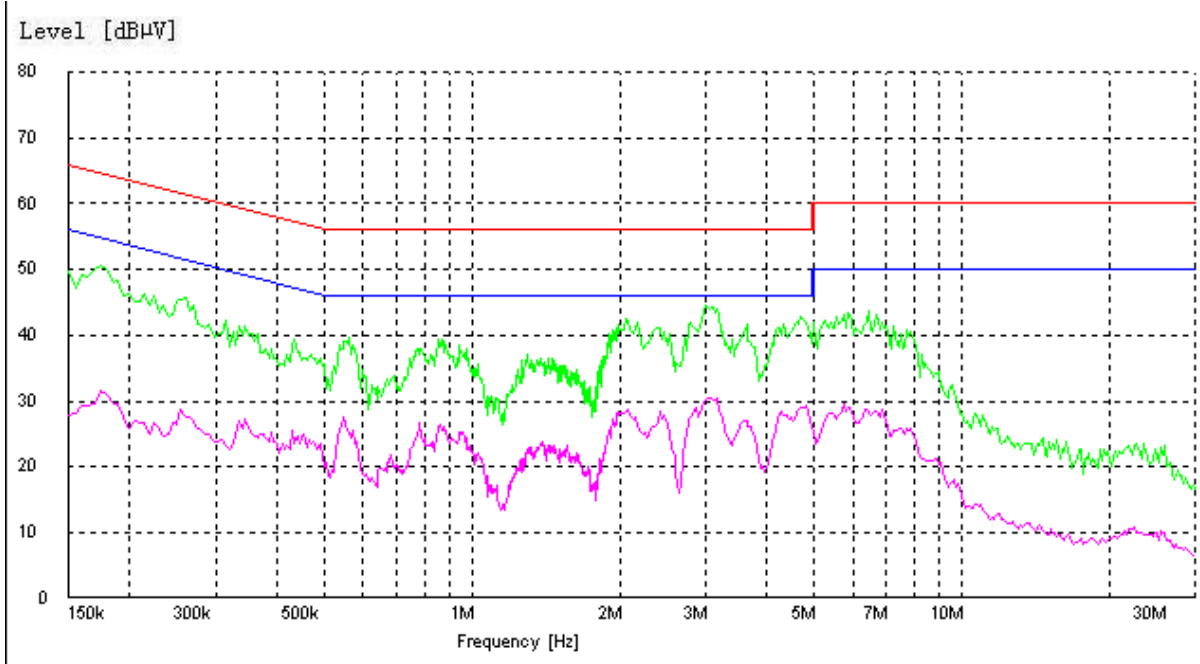
**MEASUREMENT RESULT: "10TA228\_PC\_fin QP"**

Frequency MHz	Level dBμV	Transd	Limit dB	Margin dBμV	Line dB	PE
1.975000	45.60	10.1	56	10.4	L1	FLO
2.020000	49.00	10.1	56	7.0	L1	GND
2.165713	48.30	10.1	56	7.7	L1	GND
2.209244	48.70	10.1	56	7.3	L1	GND
2.890153	34.90	10.1	56	21.1	L1	GND
4.094199	29.70	10.2	56	26.3	N	GND

**MEASUREMENT RESULT: "10TA228\_PC\_fin AV"**

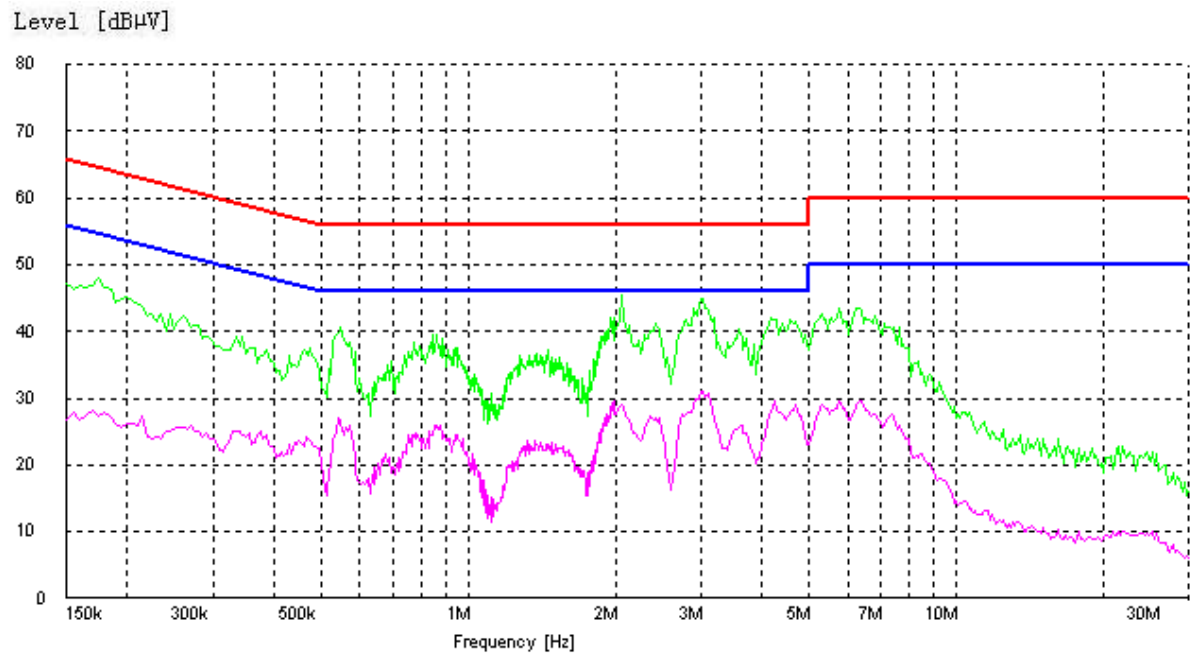
Frequency MHz	Level dBμV	Transd	Limit dB	Margin dBμV	Line dB	PE
1.205000	29.20	10.1	46	16.8	N	GND
1.975000	36.80	10.1	46	9.2	L1	FLO
2.020000	41.30	10.1	46	4.7	L1	GND
2.123040	33.60	10.1	46	12.4	L1	GND
2.165713	25.50	10.1	46	20.5	L1	FLO
2.209244	41.50	10.1	46	4.5	L1	GND

**AE4**  
**GSM850MHz**



- MES 10TA314\_GC\_pre PK
- MES 10TA314\_GC\_pre AV
- LIM EN 55022 V QP Voltage QP Limit
- LIM EN 55022 V AV Voltage AV Limit

**PCS 1900MHz**



- MES 10TA314\_PC\_pre PK
- MES 10TA314\_PC\_pre AV
- LIM EN 55022 V QP Voltage QP Limit
- LIM EN 55022 V AV Voltage AV Limit

## **A.4 FREQUENCY STABILITY (§2.1055/§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 1/2 hours at each temperature, unpowered, before making measurements.
5. Remeasure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments remeasuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50°C.
7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 C increments from +50°C to -30°C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

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

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

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.5VDC and 4.2VDC, with a nominal voltage of 3.8VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of -10 % and +12.5 %. For the purposes of measuring frequency stability these voltage limits are to be used.

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

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

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

#### A.4.3 Measurement results

##### GSM 850

##### Frequency Error vs Voltage

Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
3.5	-30	0.036
3.8	-31	0.037
4.2	-31	0.037

##### Frequency Error vs Temperature

temperature(°C)	Frequency error(Hz)	Frequency error(ppm)
-30	-38	0.045
-20	-36	0.043
-10	-31	0.037
0	-27	0.032
10	-22	0.026
20	-20	0.024
30	-24	0.028
40	-30	0.036
50	-35	0.042

##### PCS 1900

##### Frequency Error vs Voltage

Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
3.5	-58	0.031
3.8	-53	0.028
4.2	-42	0.022

##### Frequency Error vs Temperature

temperature(°C)	Frequency error(Hz)	Frequency error(ppm)
-30	-62	0.034
-20	-53	0.028
-10	-42	0.022
0	-35	0.019
10	-32	0.017
20	-31	0.016
30	-34	0.018
40	-45	0.024
50	-58	0.031

## A.5 OCCUPIED BANDWIDTH (§2.1049(h)(i))

### A.5.1 Occupied Bandwidth Results

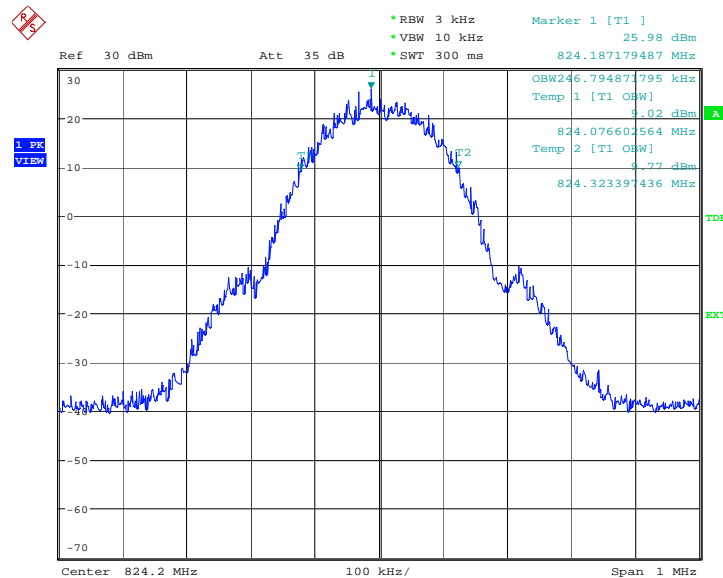
Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. The table below lists the measured -20dBc BW (99%). Spectrum analyzer plots are included on the following pages.

#### GSM 850(99%)

Frequency(MHz)	Occupied Bandwidth (99%)( kHz)
824.2	246.795
836.6	248.397
848.8	251.603

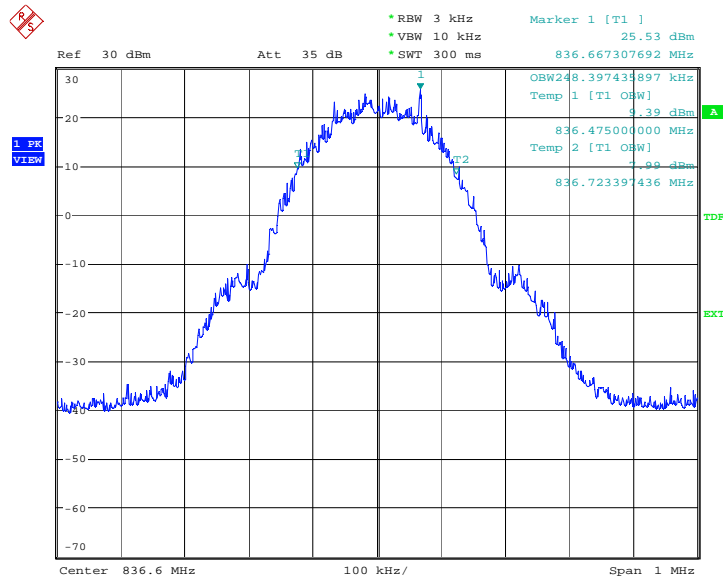
#### GSM 850

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



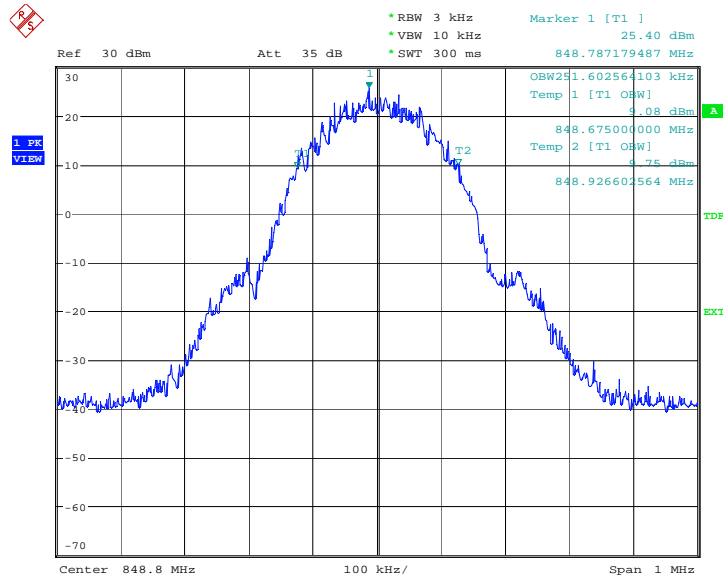
Date: 24.FEB.2010 05:43:52

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



Date: 24.FEB.2010 05:44:24

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



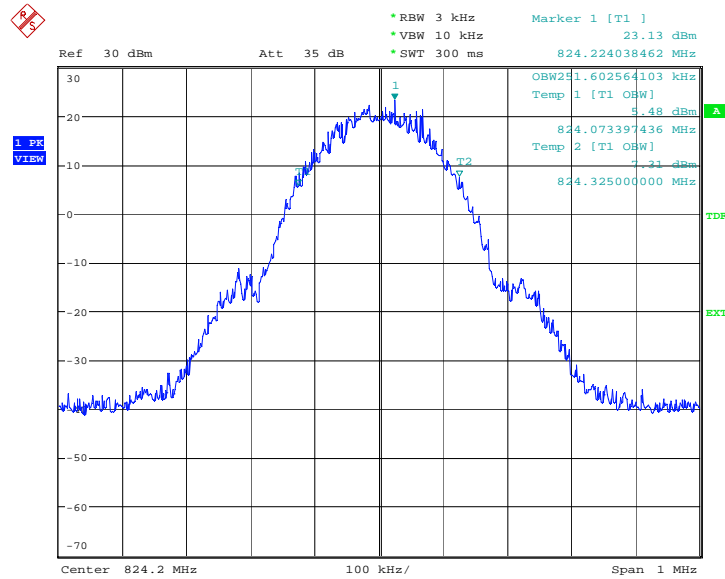
Date: 24.FEB.2010 05:44:56

**GPRS 850(99%)**

Frequency(MHz)	Occupied Bandwidth (99%)( kHz)
824.2	251.602
836.6	250.000
848.8	245.192

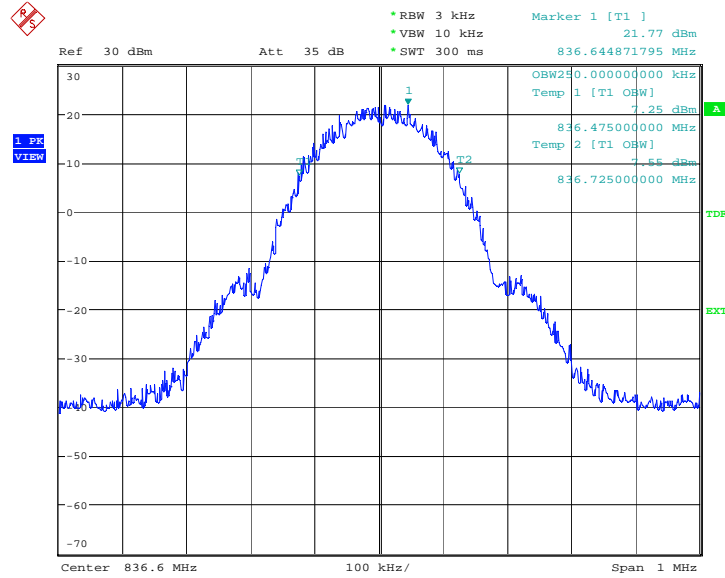
**GPRS 850**

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



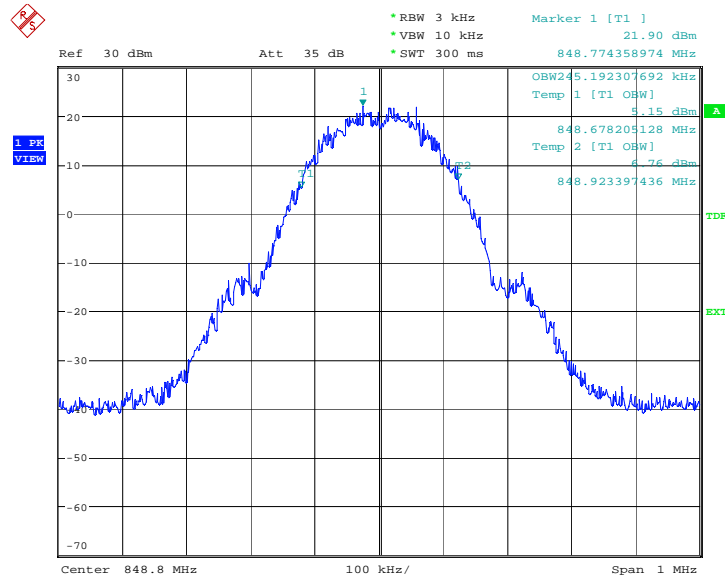
Date: 2.APR.2010 08:29:45

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



Date: 2.APR.2010 08:30:03

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

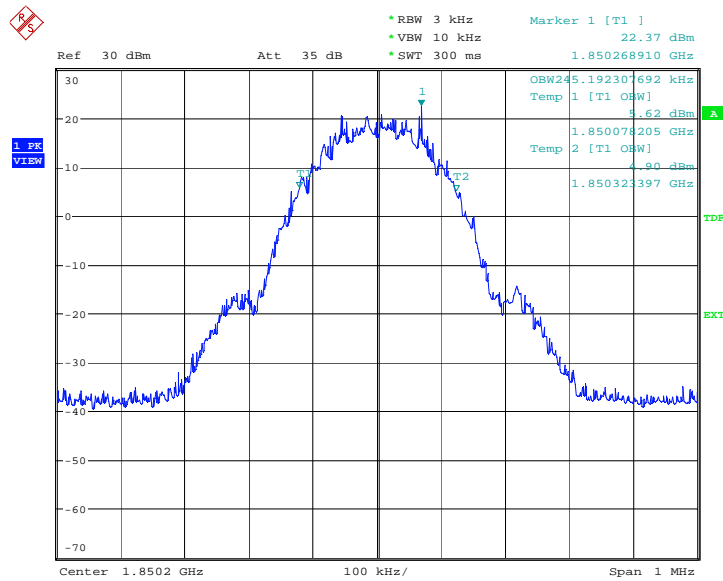


Date: 2.APR.2010 08:30:20

**PCS 1900(99%)**

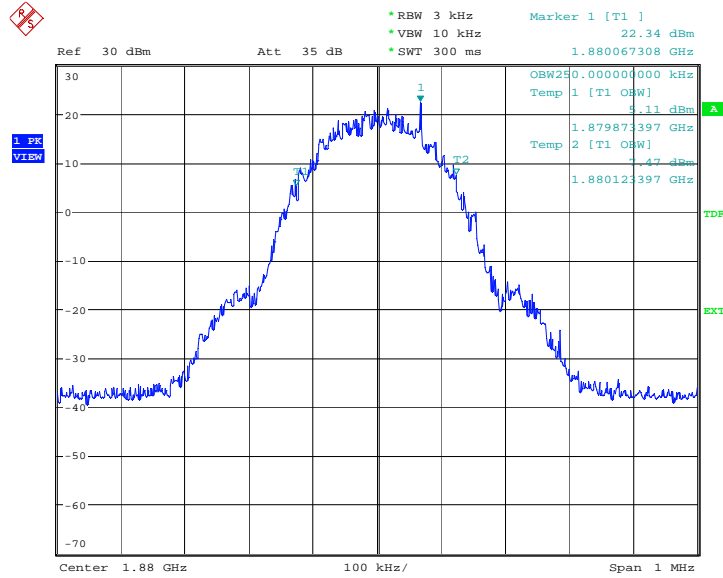
Frequency(MHz)	Occupied Bandwidth (99%)( kHz)
1850.2	245.192
1880.0	250.000
1909.8	248.397

**PCS 1900  
Channel 512-Occupied Bandwidth (99%)**



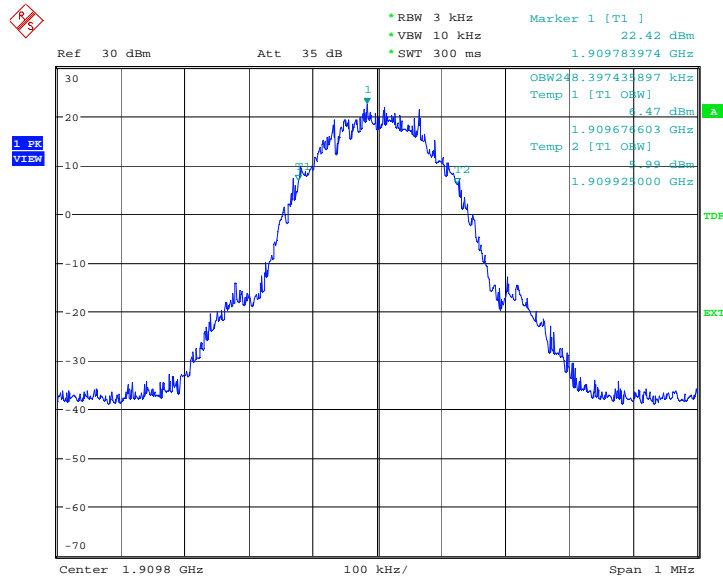
Date: 24.FEB.2010 06:03:42

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



Date: 24.FEB.2010 06:04:14

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



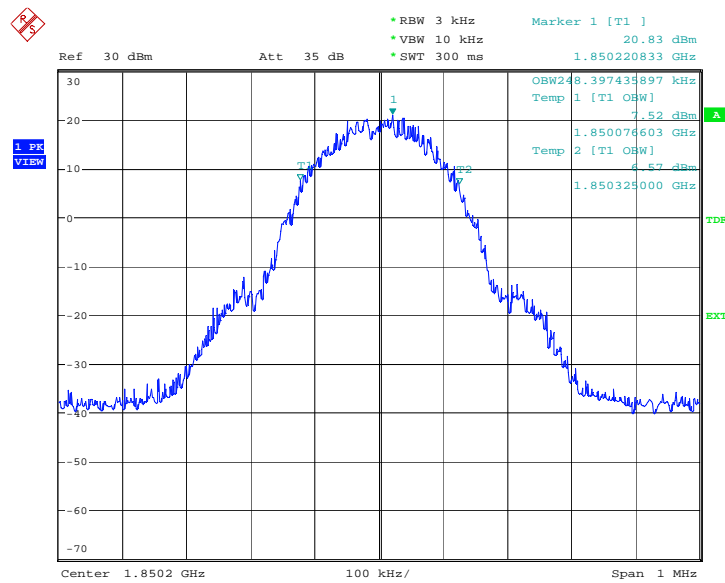
Date: 24.FEB.2010 06:04:46

**GPRS 1900(99%)**

Frequency(MHz)	Occupied Bandwidth (99%)( kHz)
1850.2	248.397
1880.0	248.397
1909.8	248.397

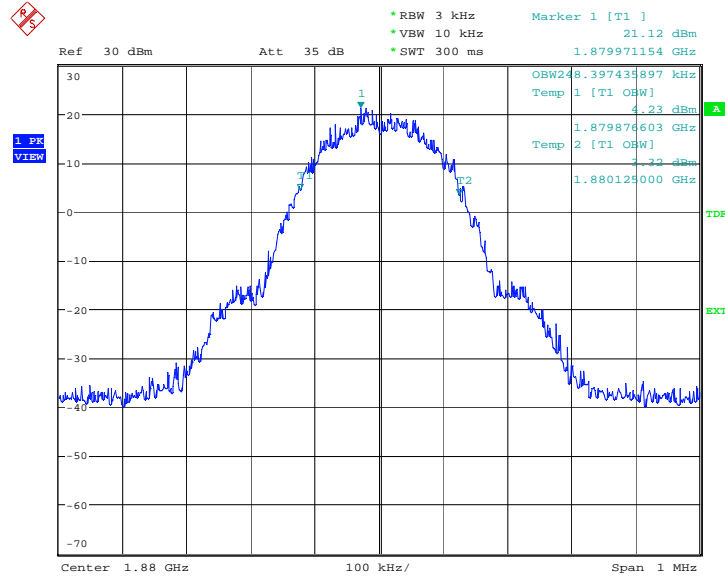
**GPRS 1900**

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



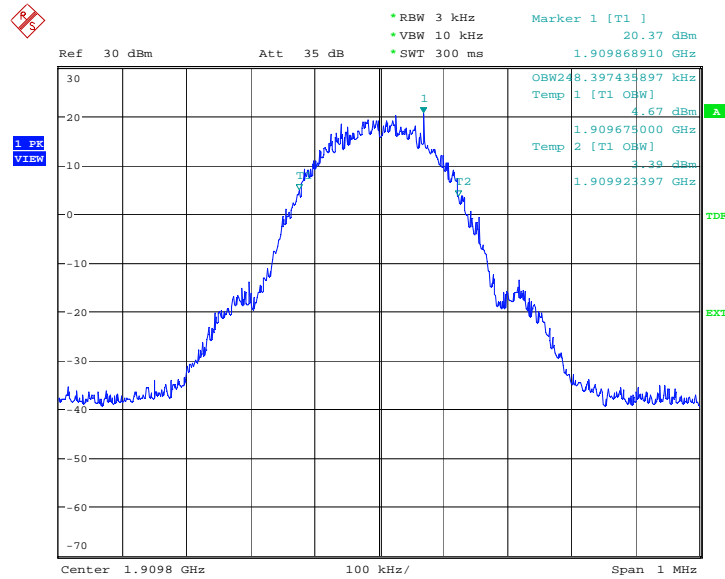
Date: 2.APR.2010 08:36:34

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



Date: 2.APR.2010 08:36:51

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



Date: 2.APR.2010 08:37:08

## A.6 EMISSION BANDWIDTH (§22.917(b)/§24.238(b))

### A.6.1 Emission Bandwidth Results

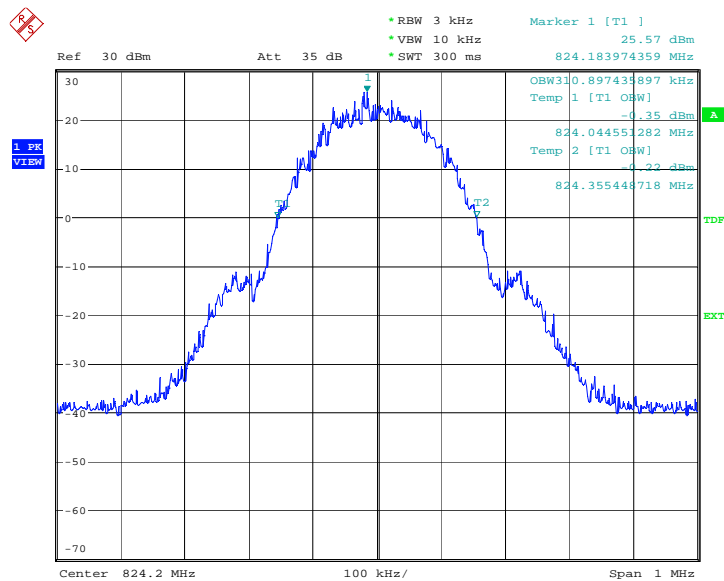
Similar to conducted emissions; Emission bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the PCS1900 band and GSM850 band. Table below lists the measured -26dBc BW. Spectrum analyzer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

#### GSM 850(-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc BW)( kHz)
824.2	310.897
836.6	309.295
848.8	307.692

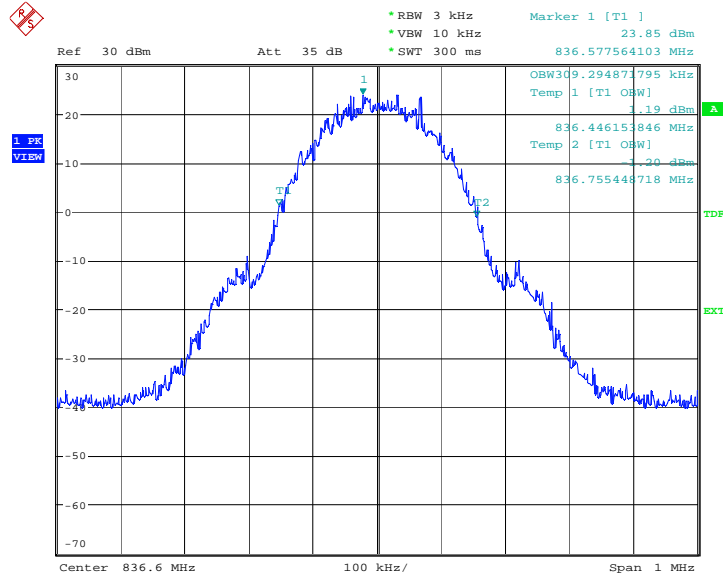
#### GSM 850

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



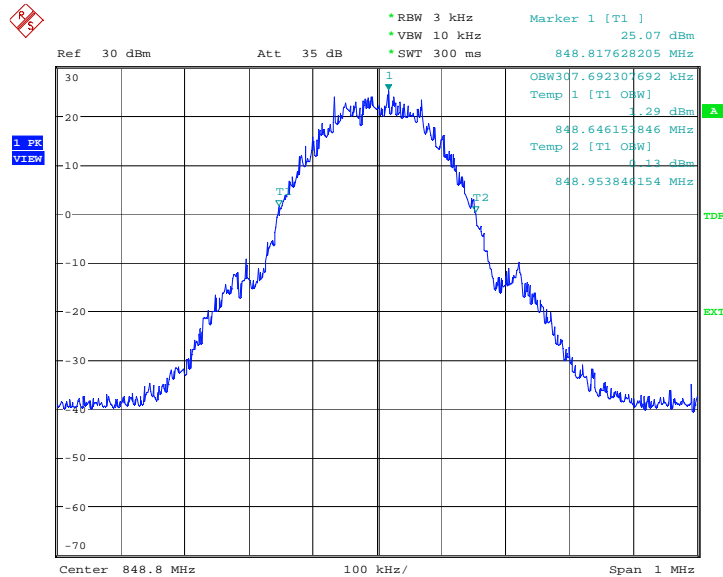
Date: 24.FEB.2010 05:45:30

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



Date: 24.FEB.2010 05:46:02

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



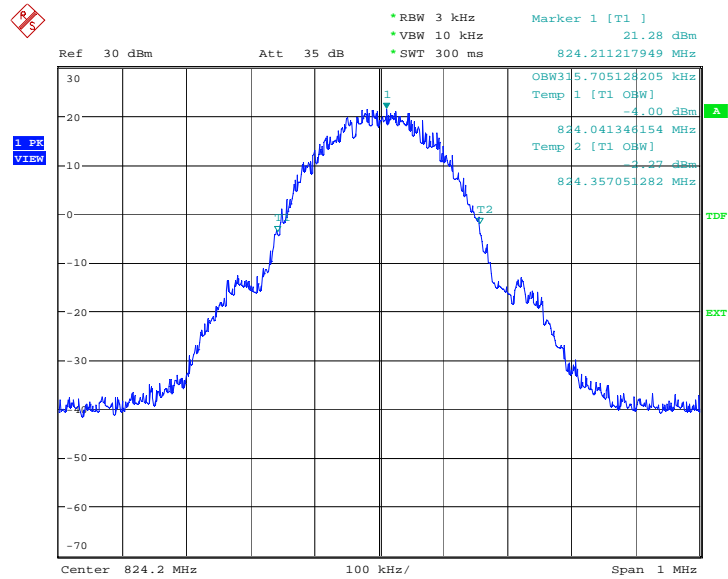
Date: 24.FEB.2010 05:46:34

**GPRS 850(-26dBc)**

Frequency(MHz)	Occupied Bandwidth (-26dBc BW)( kHz)
824.2	315.705
836.6	314.102
848.8	314.102

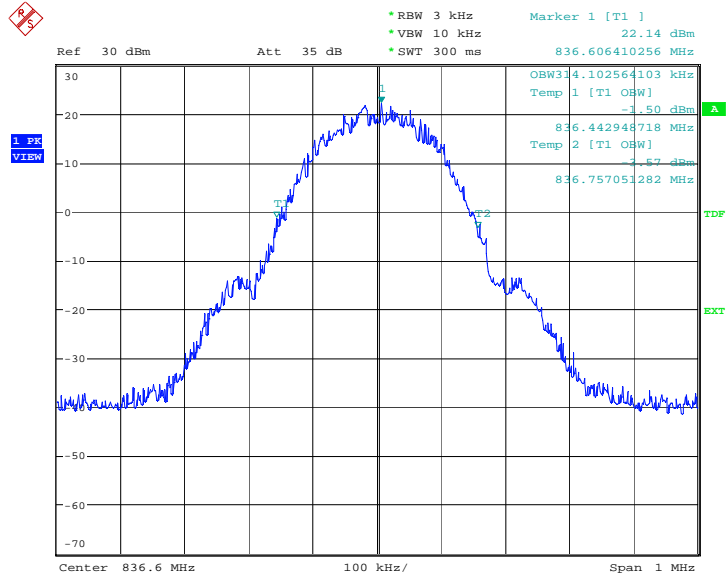
**GPRS 850**

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



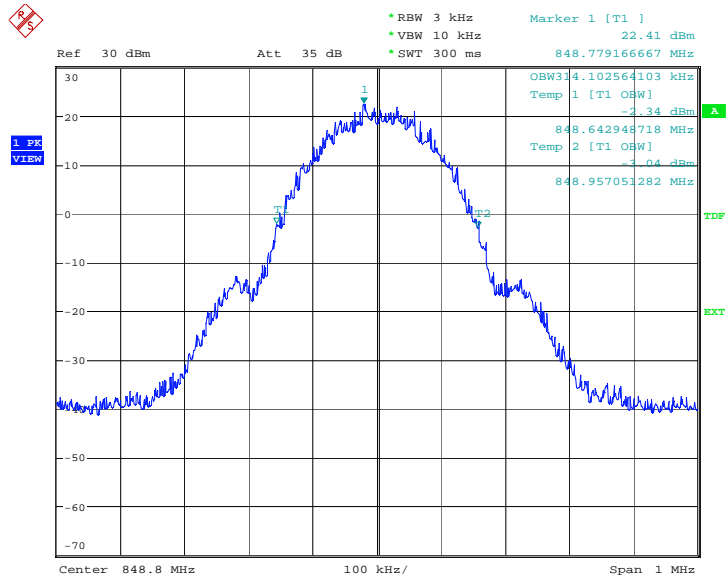
Date: 2.APR.2010 08:30:39

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



Date: 2.APR.2010 08:30:56

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



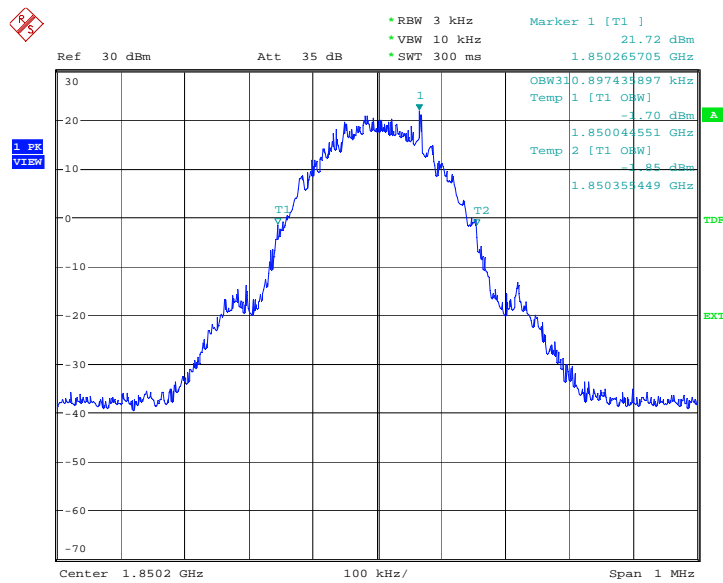
Date: 2.APR.2010 08:31:13

**PCS 1900(-26dBc)**

Frequency(MHz)	Occupied Bandwidth (-26dBc BW)( kHz)
1850.2	310.897
1880.0	312.500
1909.8	309.295

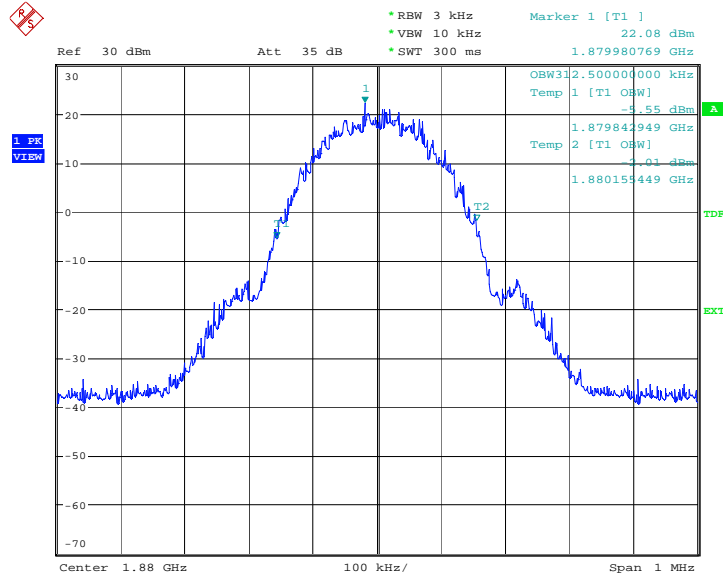
**PCS 1900**

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



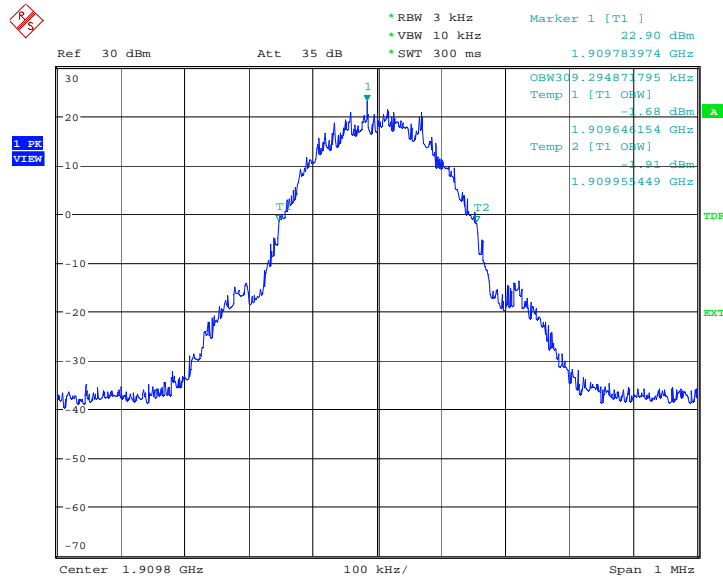
Date: 24.FEB.2010 06:05:19

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



Date: 24.FEB.2010 06:05:52

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



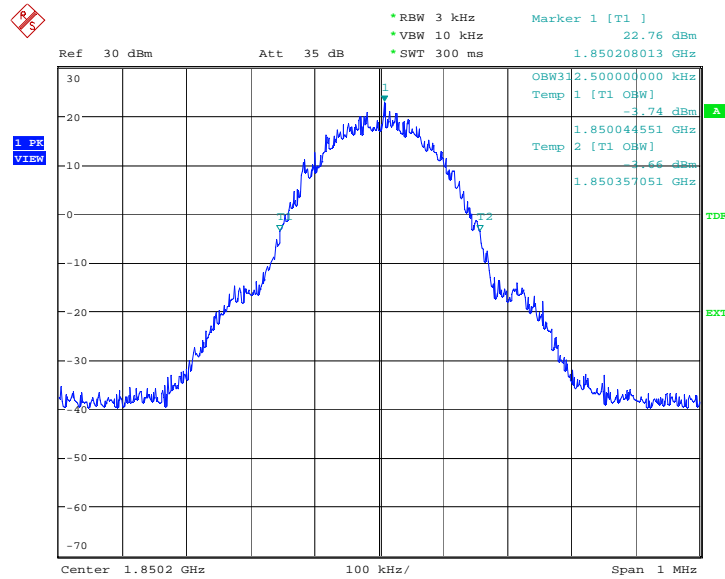
Date: 24.FEB.2010 06:06:24

**GPRS 1900(-26dBc)**

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

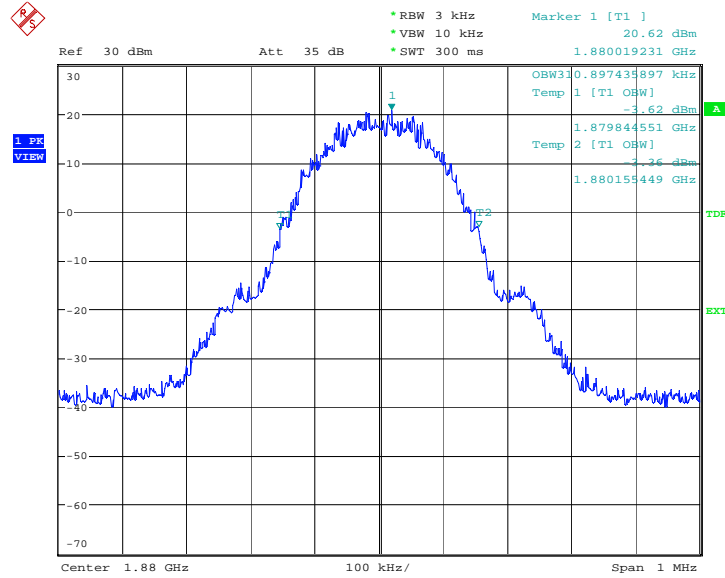
**GPRS 1900**

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



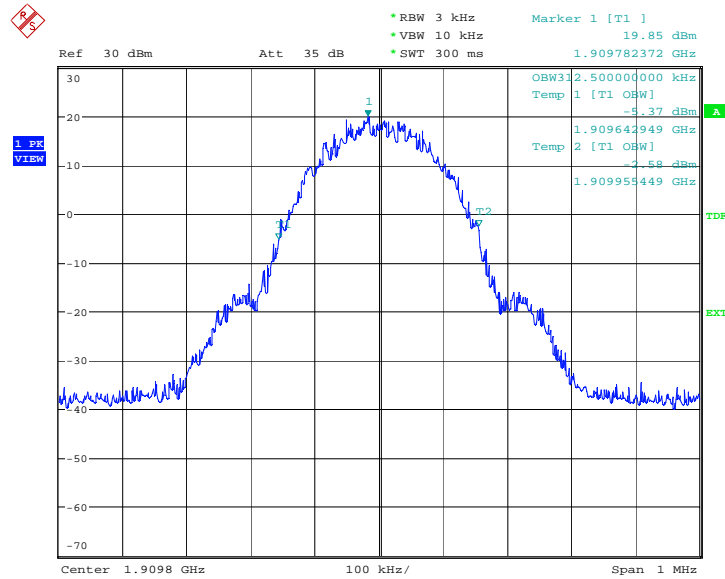
Date: 2.APR.2010 08:37:27

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



Date: 2.APR.2010 08:37:44

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

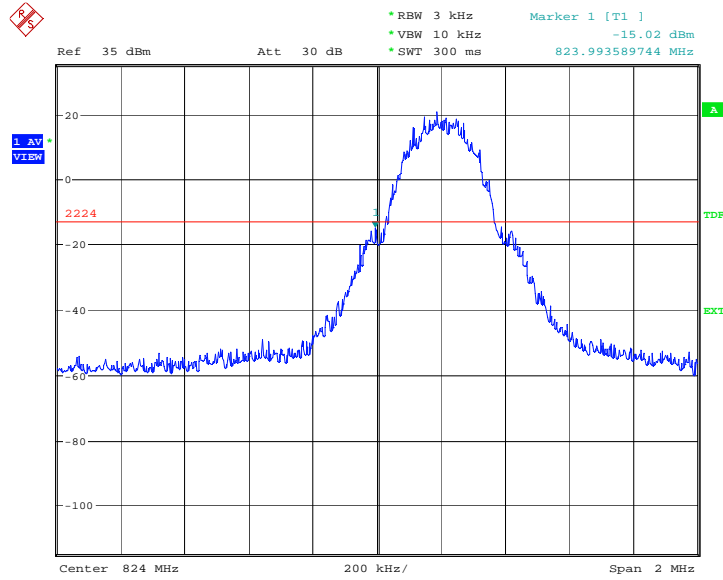


Date: 2.APR.2010 08:38:01

**A.7 BAND EDGE COMPLIANCE (§22.917(b)/§24.238(b))**

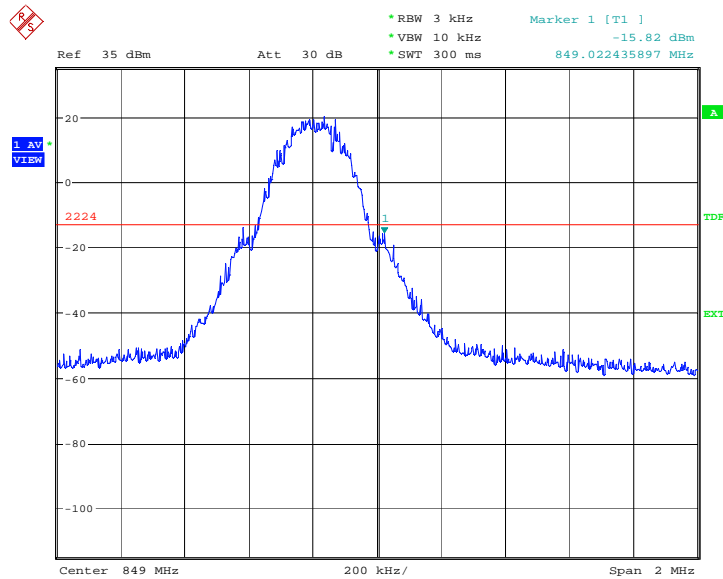
**GSM 850**

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



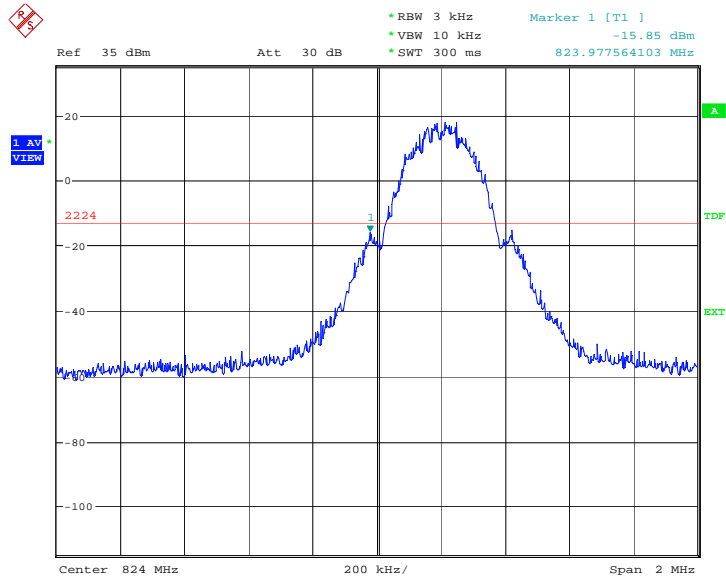
Date: 24.FEB.2010 05:59:50

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



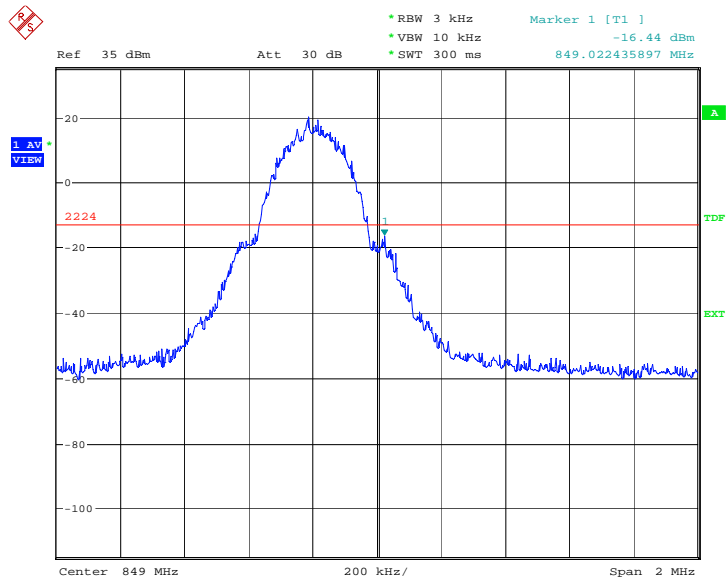
Date: 24.FEB.2010 05:54:13

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



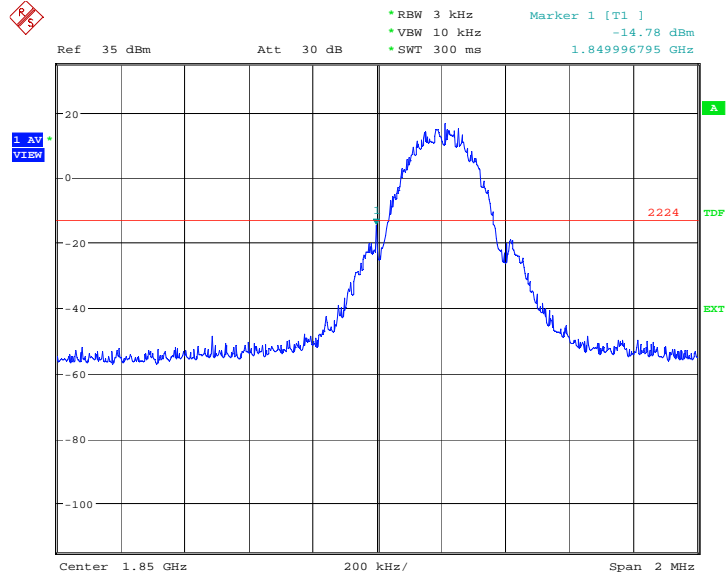
Date: 2.APR.2010 08:33:14

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



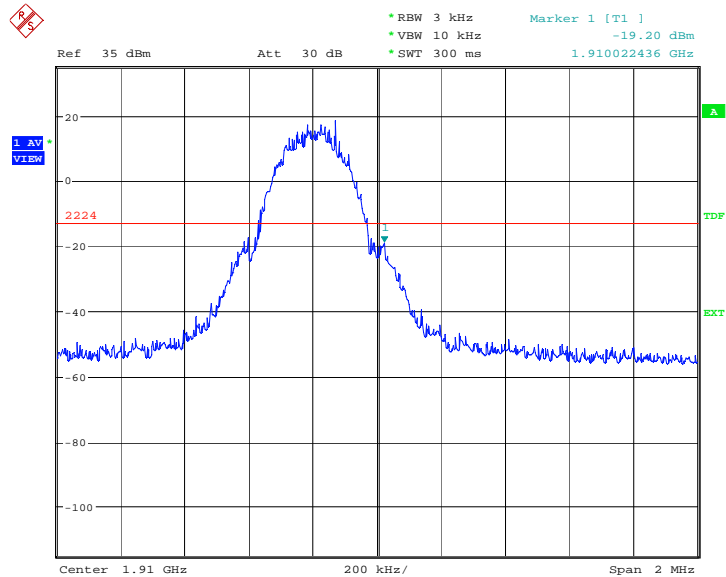
Date: 2.APR.2010 08:33:33

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



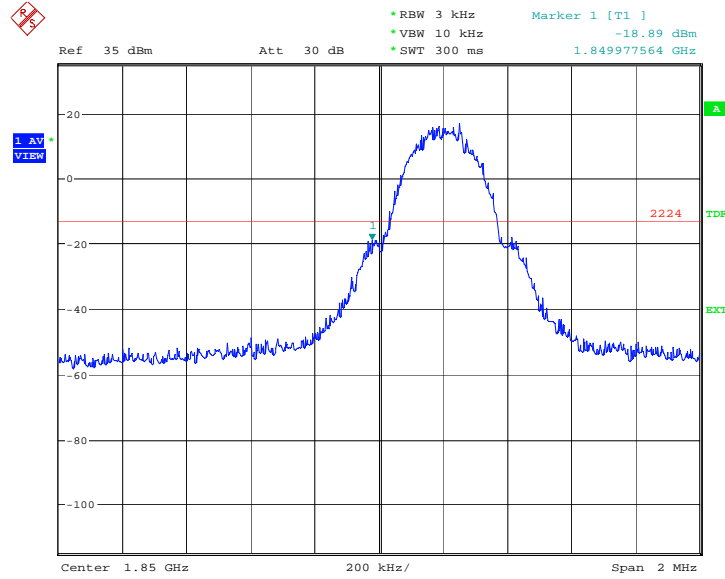
Date: 24.FEB.2010 06:13:30

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



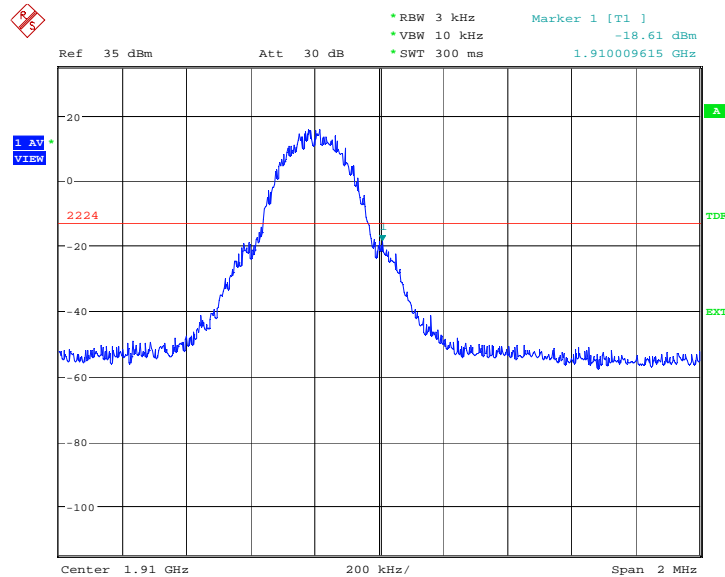
Date: 24.FEB.2010 06:14:04

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



Date: 2.APR.2010 08:40:02

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



Date: 2.APR.2010 08:40:21

**A.8 CONDUCTED SPURIOUS EMISSION (§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 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

**A. 8.2 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. 8.3 Measurement result**  
**GSM850**

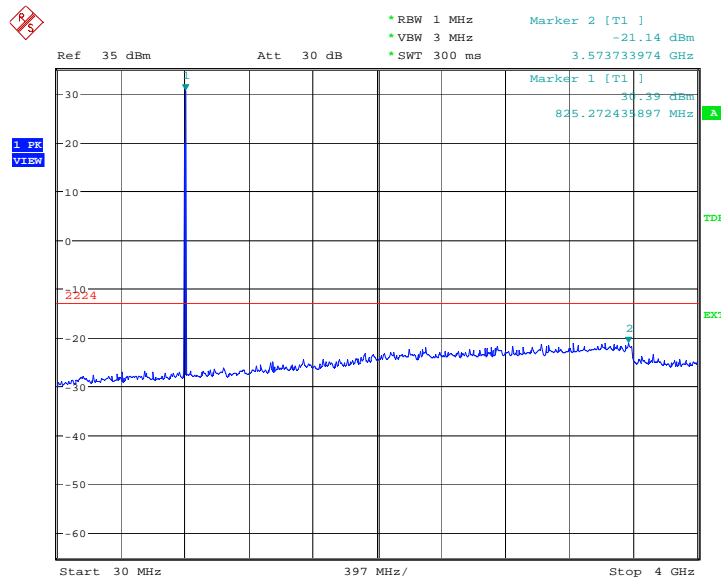
Harmonic	Tx ch. 128 Freq. (MHz)	Level (dBm)	Tx ch. 190 Freq. (MHz)	Level (dBm)	Tx ch. Freq. (MHz) 251	Level (dBm)
2	1648.4	nf	1673.2	nf	1697.6	nf
3	2472.6	nf	2509.8	nf	2546.4	nf
4	3296.8	nf	3346.4	nf	3395.2	nf
5	4121	nf	4183	nf	4244	nf
6	4945.2	nf	5019.6	nf	5092.8	nf
7	5769.4	nf	5856.2	nf	5941.6	nf
8	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.8.3.1 Channel 128: 30MHz – 4GHz**

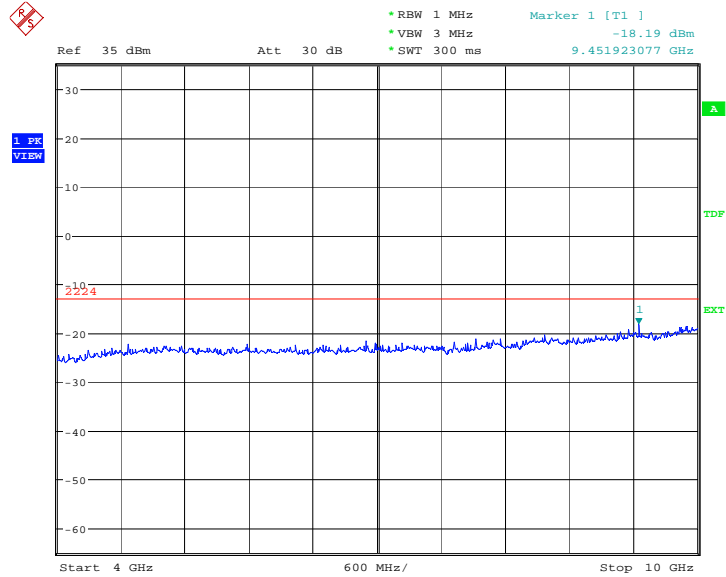
Spurious emission limit –13dBm.

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



Date: 24.FEB.2010 05:50:20

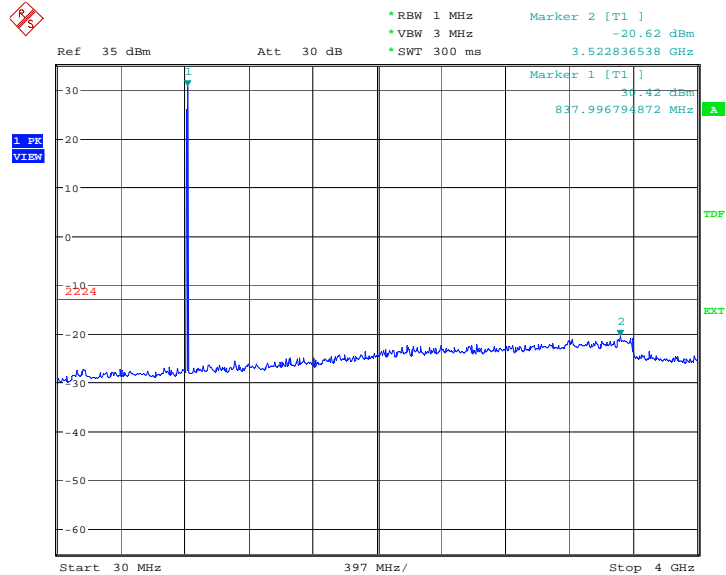
**A.8.3.2 Channel 128: 4GHz – 10GHz**  
Spurious emission limit –13dBm.



Date: 24.FEB.2010 05:50:53

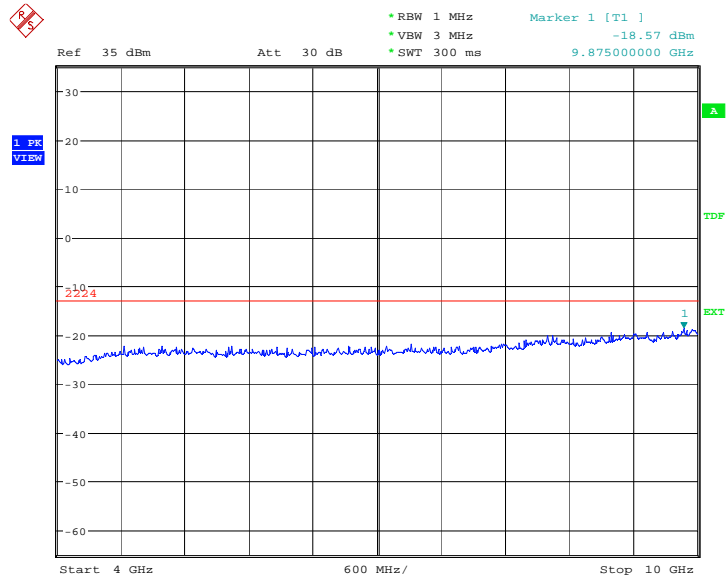
**A.8.3.3 Channel 190: 30MHz – 4GHz**  
Spurious emission limit –13dBm

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



Date: 24.FEB.2010 05:51:26

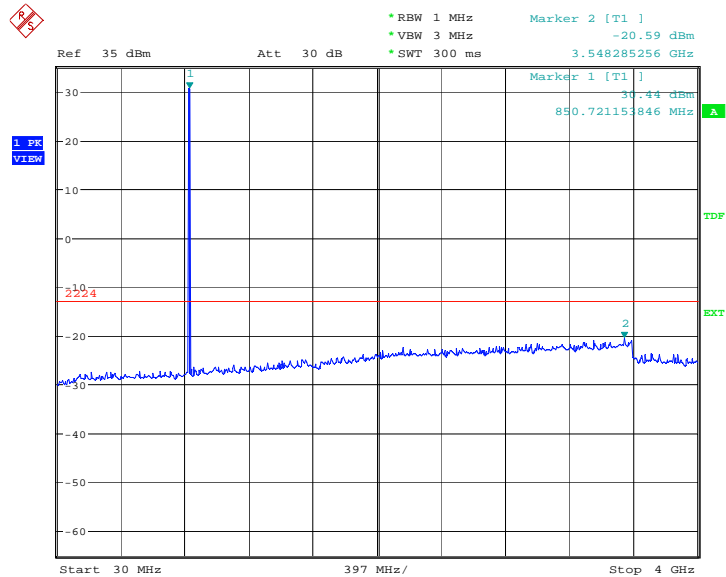
**A.8.3.4 Channel 190: 4GHz –10GHz**  
Spurious emission limit –13dBm



Date: 24.FEB.2010 05:51:59

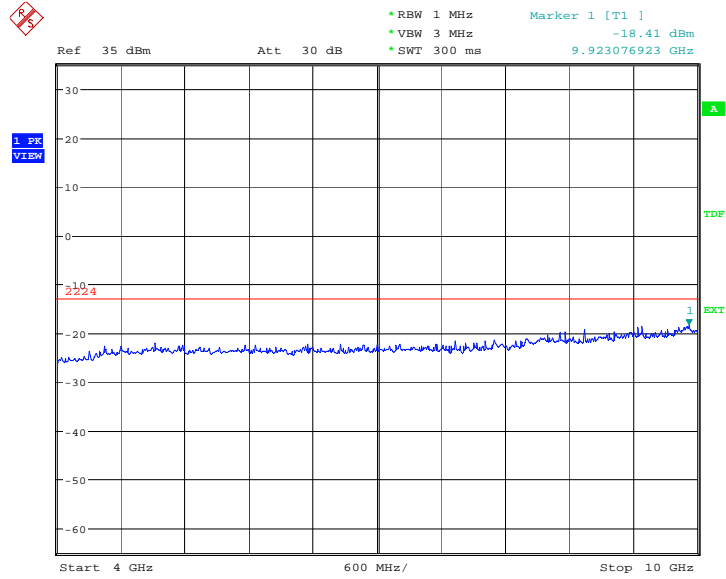
**A.8.3.5 Channel 251: 30MHz – 4GHz**  
Spurious emission limit –13dBm.

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



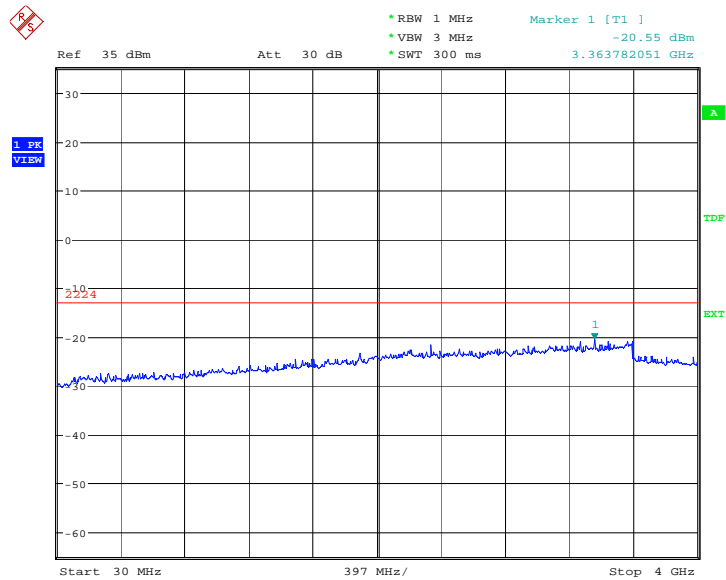
Date: 24.FEB.2010 05:52:33

**A.8.3.6 Channel 251: 4GHz – 10GHz**  
Spurious emission limit –13dBm.



Date: 24.FEB.2010 05:53:06

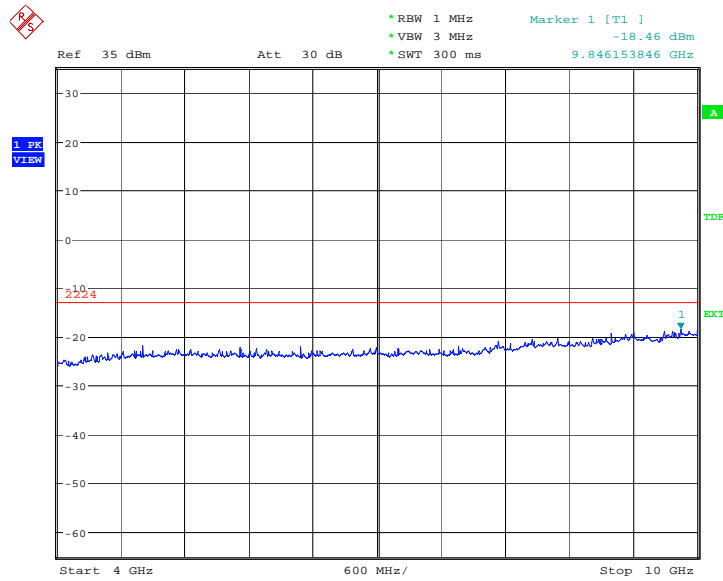
**A.8.3.7 Idle mode: 30MHz – 4GHz**  
Spurious emission limit –13dBm.



Date: 24.FEB.2010 05:54:47

### A.8.3.8 Idle mode: 4GHz – 10GHz

Spurious emission limit -13dBm.



Date: 24.FEB.2010 05:55:20

**PCS1900**

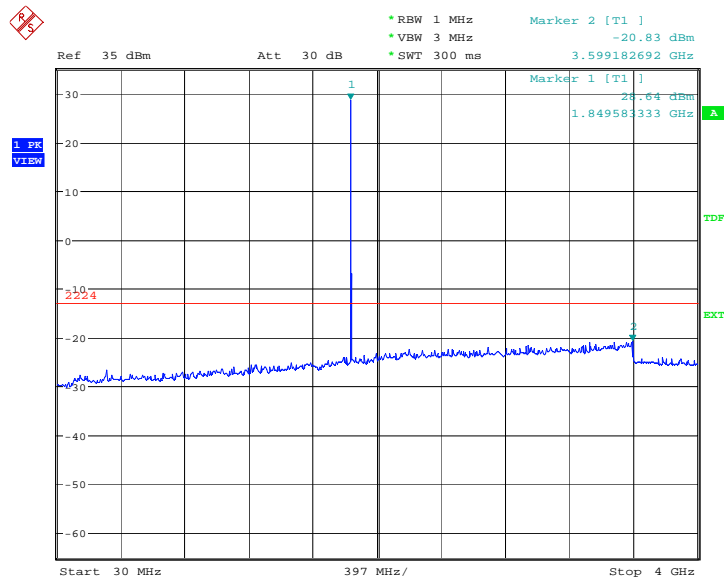
Harmonic	Tx ch. 512 Freq. (MHz)	Level (dBm)	Tx ch. 661 Freq. (MHz)	Level (dBm)	Tx ch. 810 Freq. (MHz)	Level (dBm)
2	3700.4	nf	3760	nf	3819.6	nf
3	5550.6	nf	5640	nf	5729.4	nf
4	7400.8	nf	7520	nf	7639.2	nf
5	9251.0	nf	9400	nf	9549.0	nf
6	11101.2	nf	11280	nf	11458.8	nf
7	12951.4	nf	13160	nf	13368.6	nf
8	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. 8.3.9 Channel 512: 30MHz – 4GHz**

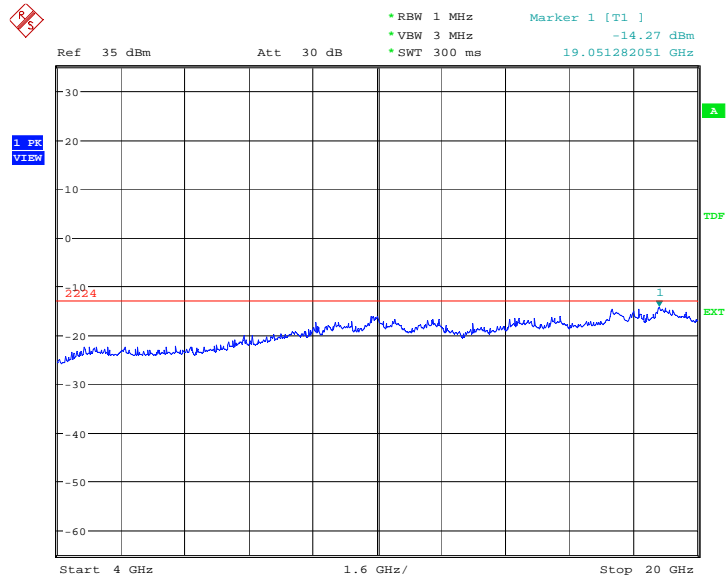
Spurious emission limit –13dBm.

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



Date: 24.FEB.2010 06:10:10

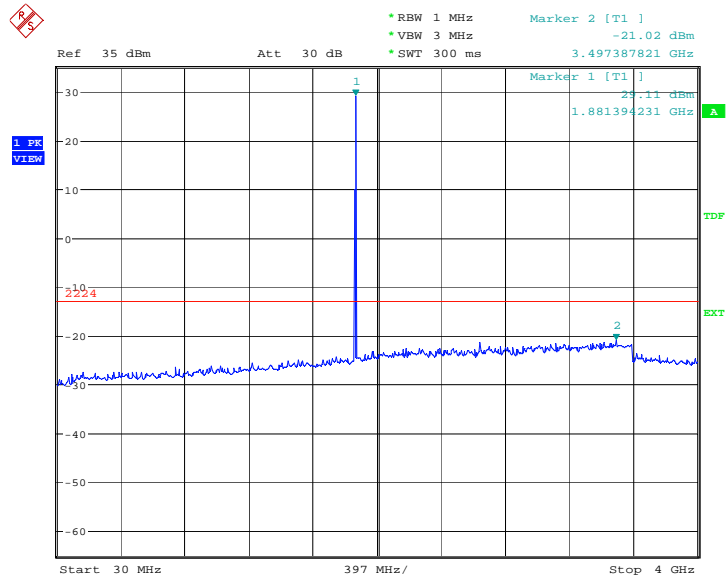
**A. 8.3.10 Channel 512: 4GHz – 20GHz**  
Spurious emission limit –13dBm.



Date: 24.FEB.2010 06:10:43

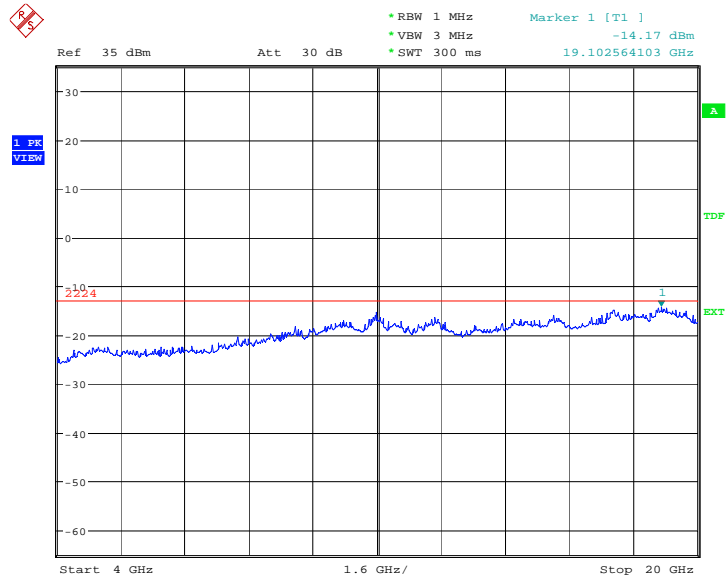
**A. 8.3.11 Channel 661: 30MHz – 4GHz**  
Spurious emission limit –13dBm

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



Date: 24.FEB.2010 06:11:17

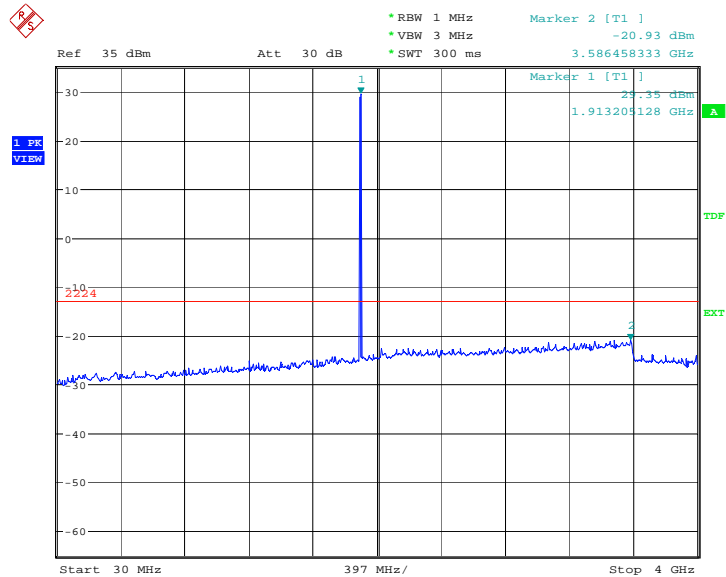
**A. 8.3.12 Channel 661: 4GHz –20GHz**  
Spurious emission limit –13dBm



Date: 24.FEB.2010 06:11:50

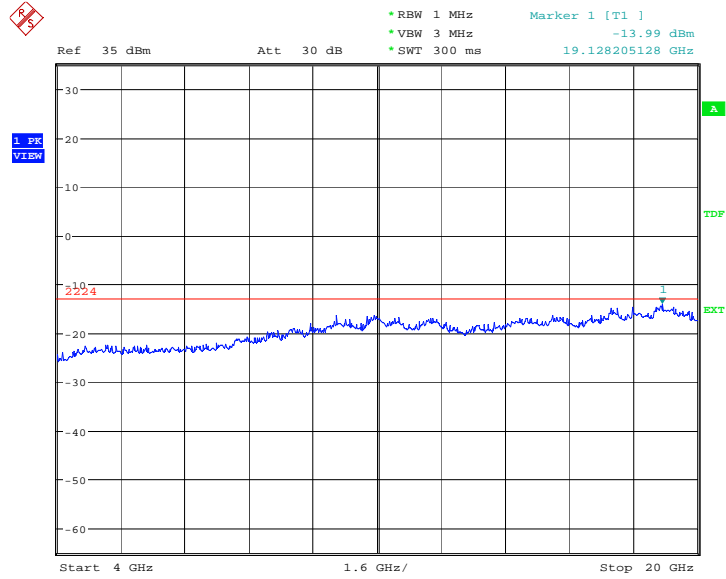
**A. 8.3.13 Channel 810: 30MHz – 4GHz**  
Spurious emission limit –13dBm.

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



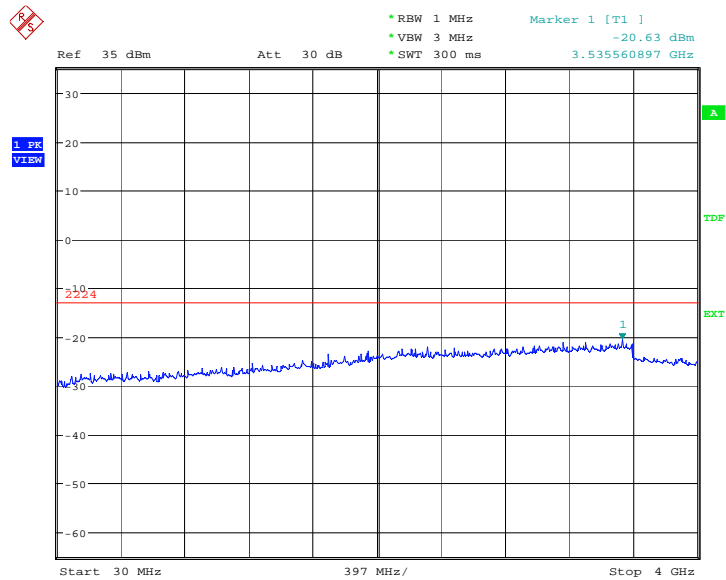
Date: 24.FEB.2010 06:12:23

**A. 8.3.14 Channel 810: 4GHz – 20GHz**  
Spurious emission limit –13dBm.



Date: 24.FEB.2010 06:12:56

**A.8.3.15 Idle mode: 30MHz – 4GHz**  
Spurious emission limit –13dBm.



Date: 24.FEB.2010 06:14:37

