



# TEST REPORT

No. 2009TAR150

for

**Nokia (China) investment CO.LTD.**

**GSM/TD mobile phone**

**Model Name: 6788**

**FCC ID : QTLRM-567**

with

**Hardware Version: 3012**

**Software Version: R4.9b**

**Issued Date: Nov 20th, 2009**

**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 MII  
Address: No 52, Huayuan beilu, Haidian District, Beijing,P.R.China  
Postal Code: 100083  
Telephone: 00861062303288  
Fax: 00861062304793

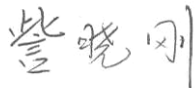
### **1.2. Testing Environment**

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

### **1.3. Project data**

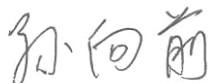
Testing Start Date: Oct 20th,2009  
Testing End Date: Nov 9th,2009

### **1.4. Signature**



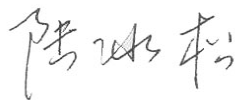
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**Zi Xiaogang**  
**(Prepared this test report)**



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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: Nokia (China) investment CO.LTD.  
Address /Post: Building 2, No.5 Donghuan Zhonglu, Beijing Economic and Technological Development Area. Beijing, 100176, P.R.China  
City: Beijing  
Postal Code: 100176  
Country: China  
Telephone: 0086 10 87111332  
Fax: 0086 10-87114664

### **2.2. Manufacturer Information**

Company Name: BYD Precision Manufacturer Co., Ltd. Beijing Branch  
Address /Post: No.1, Kechuang Dong 5 Jie, Tongzhou District Beijing, 101111, P.R. China  
City: Beijing  
Postal Code: 101111  
Country: China  
Telephone: 0086-10-58018888-71158  
Fax: 0086-10-58018888-73000

**3. Equipment Under Test (EUT) and Ancillary Equipment (AE)****3.1. About EUT**

Description	GSM/TD mobile phone
Model Name	6788
FCC ID	QTLRM-567
Frequency	PCS 1900MHz
Antenna	Internal
Power supply	Battery or Charger (AC Adaptor)
Output power	27.23 dBm maximum EIRP measured for PCS1900
Extreme vol. Limits	3.4VDC to 4.2VDC (nominal: 3.8VDC)
Extreme temp. Tolerance	-30°C to +50°C

Note: Photographs of EUT are shown in ANNEX A of this test report. 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**

EUT ID*	SN or IMEI	HW Version	SW Version
N01	860113000032672	3012	R4.9b

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

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

AE ID*	Description	SN
AE1	Battery	/
AE2	Travel Adapter	/
AE3	Headset	/

**AE1**

Model	BL-6F
Manufacturer	Nokia
Capacitance	1200mAh
Nominal Voltage	3.7V

**AE2**

Model	AC-8C
Manufacturer	Nokia
Length of DC line	120cm

**AE3**

Model	WH-102
Manufacturer	Nokia

\*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/TD 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.

Reference	Title	Version
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	V 10.1.06
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

Items	List	Clause in FCC rules	Verdict
1	Output Power	24.232(b)	P
2	Emission Limit	2.1051/24.238	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	24.238(b)	P
7	Band Edge Compliance	24.238(b)	P
8	Conducted Spurious Emission	2.1057/24.238	P

## 7. Test Equipments Utilized

NO.	NAME	TYPE	SERIES NUMBER	PRODUCER	CAL DUE DATE
1	Test Receiver	ESS	847151/015	R&S	2010-10-30
2	Test Receiver	ESI40	831564/002	R&S	2010-2-11
3	BiLog Antenna	3142B	9908-1403	EMCO	2010-1-16
4	BiLog Antenna	3142B	9908-1405	EMCO	2010-9-19
5	Signal Generator	SMT06	831285/005	R&S	2009-12-26
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	2010-3
11	Dual-Ridge Waveguide Horn Antenna	3115	9906-5831	EMCO	2010-3
12	Dual-Ridge Waveguide Horn Antenna	3116	2663	EMCO	2010-3
13	Dual-Ridge Waveguide Horn Antenna	3116	2661	EMCO	2010-3
14	Climatic chamber	PL-2G	343074	ESPEC	2010-5-15

## **ANNEX A: MEASUREMENT RESULTS**

### **A.1 OUTPUT POWER** (§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; (bottom, middle and top of operational frequency range).

#### **PCS1900**

##### **Limit**

	Power step	Nominal Peak output power (dBm)	Tolerance (dB)	Target (dB)
GSM	0	30dBm(1W)	$\pm 2$	30 $\pm$ 1
GPRS	3	30dBm(1W)	$\pm 2$	29 $\pm$ 1
EGPRS	5	26 dBm(0.4W)	$\pm 2$	26 $\pm$ 1

#### **Measurement result**

##### **GSM**

Frequency(MHz)	Power Step	Peak output power(dBm)
1850.2	0	<b>30.24</b>
1880.0	0	29.90
1909.8	0	29.68

##### **GPRS**

Frequency(MHz)	Power Step	Peak output power(dBm)
1850.2	3	<b>29.17</b>
1880.0	3	28.78
1909.8	3	28.52

##### **EGPRS**

Frequency(MHz)	Power Step	Peak output power(dBm)
1850.2	5	<b>25.67</b>
1880.0	5	25.58
1909.8	5	25.48

### 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."

#### 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:

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

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,  $ERP = EIRP - 2.15\text{dBi}$ .

**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)	Power Step	Peak EIRP(dBm)	A <sub>Rpl</sub> (dBm)	P <sub>Mea</sub> (dBm)	Polarization
1850.2	0	26.24	47.11	-20.87	Horizontal
1880.0	0	26.72	47.37	-20.65	Horizontal
1909.8	0	27.23	47.54	-20.31	Horizontal

**GPRS**

Frequency(MHz)	Power Step	Peak EIRP(dBm)	A <sub>Rpl</sub> (dBm)	P <sub>Mea</sub> (dBm)	Polarization
1850.2	3	26.11	47.11	-21.00	Horizontal
1880.0	3	26.57	47.37	-20.80	Horizontal
1909.8	3	27.06	47.54	-20.48	Horizontal

**EGPRS**

Frequency(MHz)	Power Step	Peak EIRP(dBm)	A <sub>Rpl</sub> (dBm)	P <sub>Mea</sub> (dBm)	Polarization
1850.2	5	22.99	47.11	-24.12	Horizontal
1880.0	5	22.43	47.37	-24.94	Horizontal
1909.8	5	20.99	47.54	-26.55	Horizontal

Frequency: 1909.8MHz

Peak EIRP(dBm)= P<sub>Mea</sub>(-20.31dBm)+ A<sub>Rpl</sub> (47.54dBm) = 27.23 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.

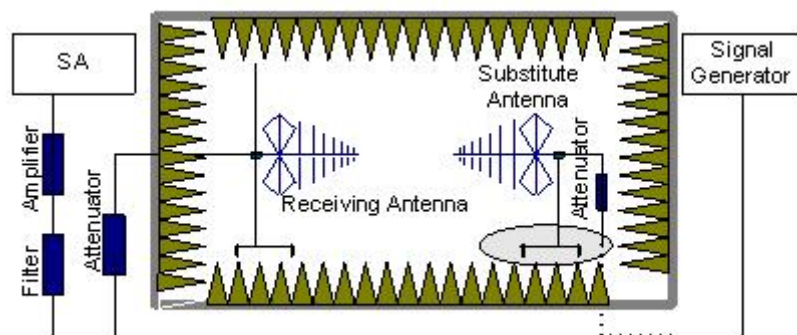
**The procedure of radiated spurious emissions is as follows:**

#### **a) Pre-calibration**

With pre-calibration method, the Radiated Spurious Emissions(RSE) is calculated as,

$$RSE = Rx \text{ (dBuV)} + CL \text{ (dB)} + SA \text{ (dB)} + Gain \text{ (dBi)} - 107 \text{ (dBuV to dBm)}$$

The SA is calibrated using following setup.



#### **b) System check**

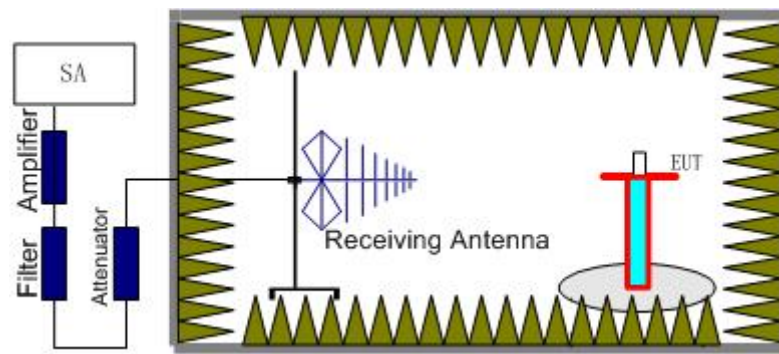
The test system should be checked before test by a standard comb signal source. The signal source put on the position, instead of the EUT. The test result should be compared with the test result before. If the test result is similar with the initial one, then the test system can work stably.

#### **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.

The pre-test is used first, and the graphic result should be appeared. Through the graphic result, the worst frequency points should be selected.

Then the substitution method is used for these frequency points.



### 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  $43 + 10 \log(P)$  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). 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:

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

**GSM Mode Channel 512/1850.2MHz**

Frequency(MHz)	Power(dBm)	A <sub>Rpl</sub> (dBm)	P <sub>Mea</sub> (dBm)	Limit (dBm)	Polarity
2004	-46.4	9.8	-56.2	-13	Vertical
3700.5	-44.3	3	-47.3	-13	Horizontal
7400.5	-43.7	8.4	-52.1	-13	Horizontal
9627	-43	12.5	-55.5	-13	Vertical
14614.8	-41.1	15.5	-56.6	-13	Vertical
17962.8	-36.3	20.3	-56.6	-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	-46.1	9.8	-55.9	-13	Vertical
7519.5	-44.4	10.1	-54.5	-13	Horizontal
9400	-42.4	11.7	-54.1	-13	Horizontal
12159	-42.4	14.2	-56.6	-13	Horizontal
14515.2	-41.1	14.7	-55.8	-13	Vertical

**GSM Mode Channel 810/1909.8MHz**

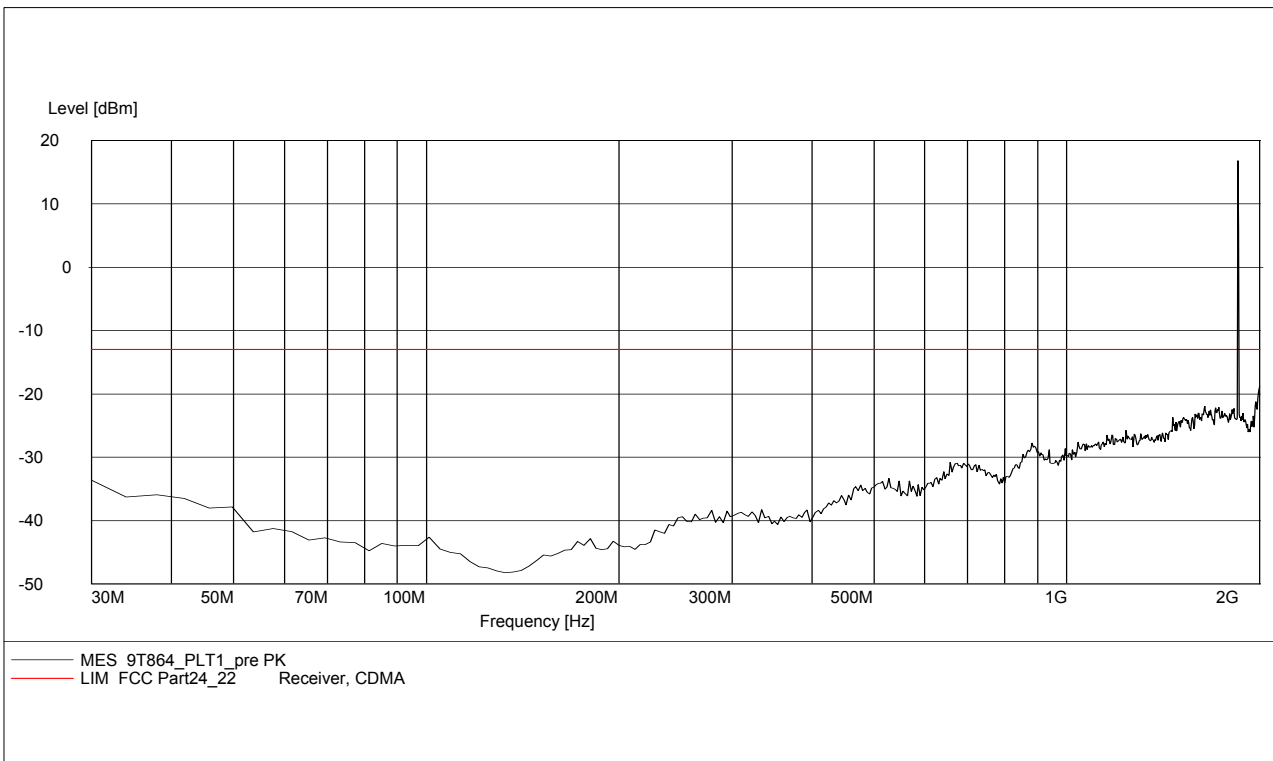
Frequency(MHz)	Power(dBm)	A <sub>Rpl</sub> (dBm)	P <sub>Mea</sub> (dBm)	Limit (dBm)	Polarity
2000	-43.6	9.6	-53.2	-13	Horizontal
3819.5	-46.9	3.5	-50.4	-13	Horizontal
7638.5	-42	8.4	-50.4	-13	Horizontal
11459	-38.7	13.8	-52.5	-13	Horizontal
12130.8	-42.2	14.5	-56.7	-13	Horizontal
14496	-41.4	14.7	-56.1	-13	Vertical

## PCS 1900

### A.2.3.1 RADIATED SPURIOUS EMISSIONS-Channel 512: 30MHz – 2GHz

Radiated spurious emission limit :-13dBm.

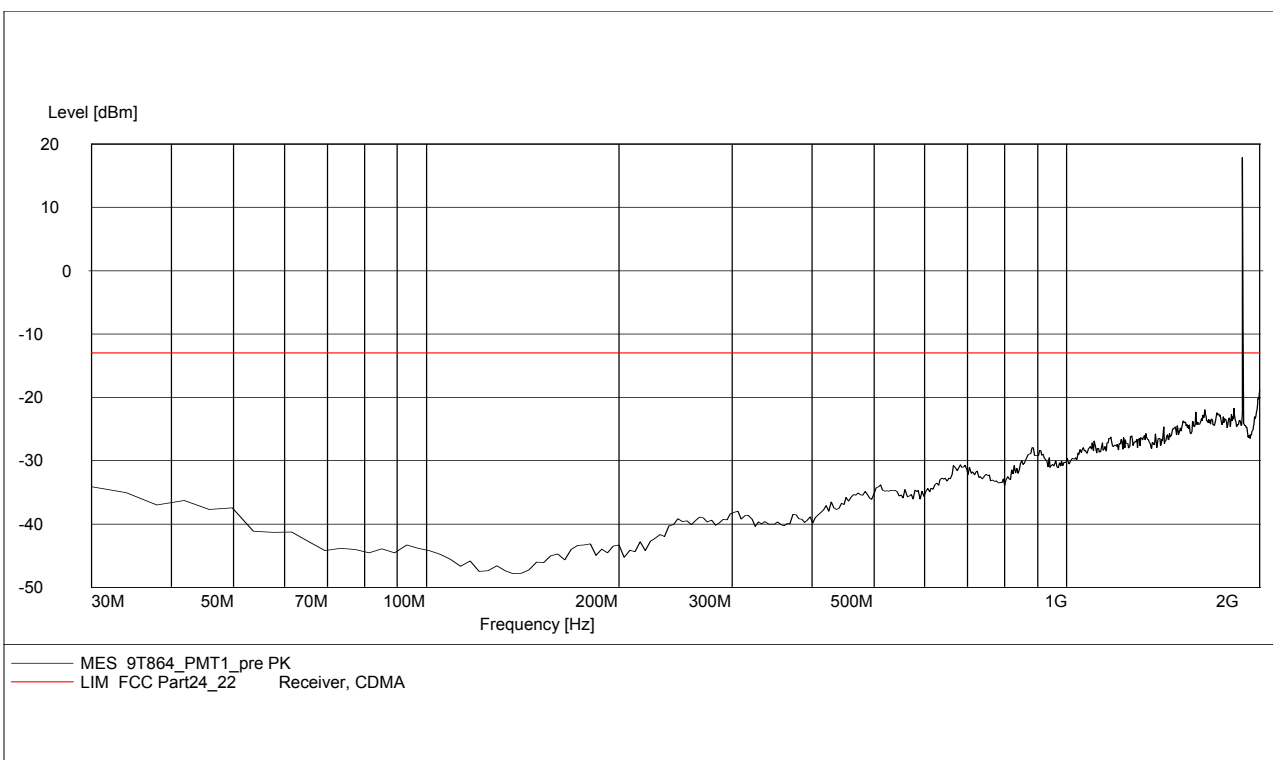
NOTE: peak above the limit line is the Carrier frequency @ ch-512



### A.2.3.2 RADIATED SPURIOUS EMISSIONS-Channel 661: 30MHz – 2GHz

Radiated spurious emission limit :-13dBm.

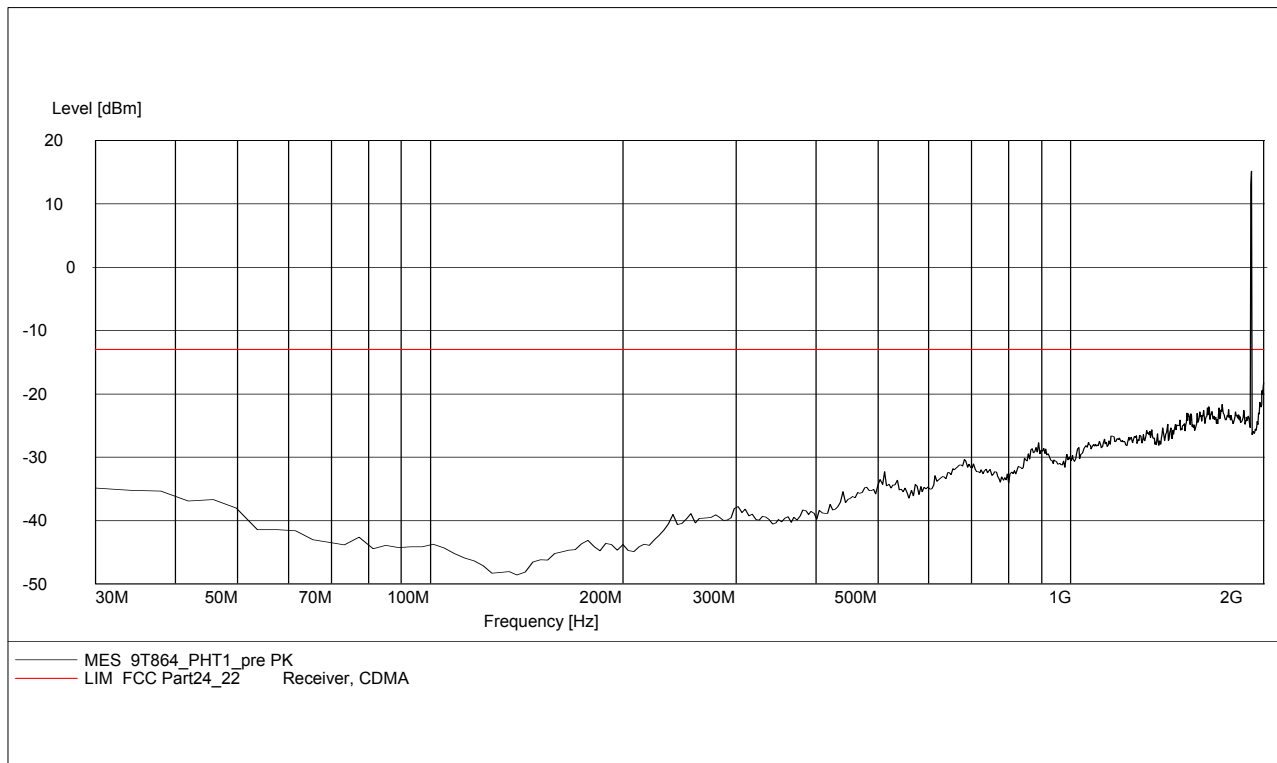
NOTE: peak above the limit line is the Carrier frequency @ ch-661



### A.2.3.3 RADIATED SPURIOUS EMISSIONS-Channel 810: 30MHz – 2GHz

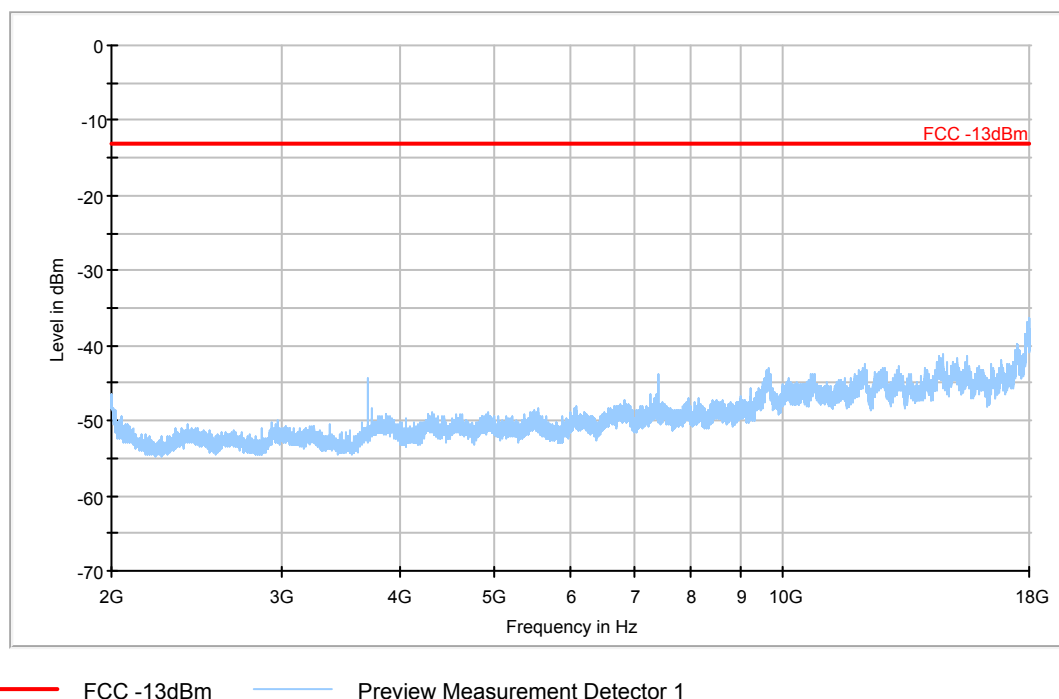
Radiated spurious emission limit :-13dBm.

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



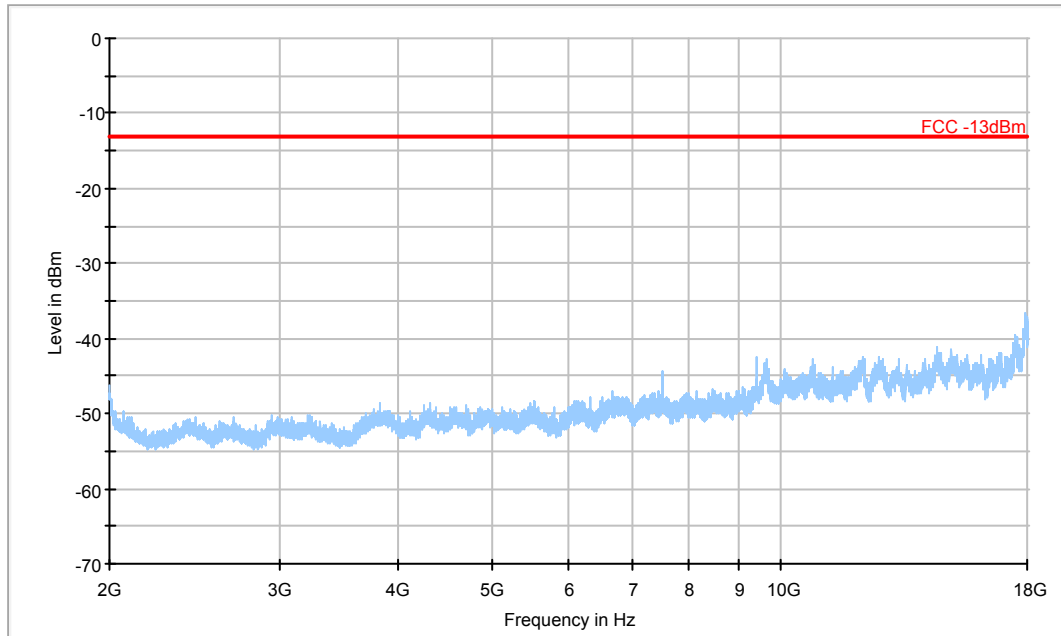
### A.2.3.4 RADIATED SPURIOUS EMISSIONS-Channel 512: 2GHz – 18GHz

Radiated spurious emission limit :-13dBm.



#### A.2.3.5 RADIATED SPURIOUS EMISSIONS-Channel 661: 2GHz – 18GHz

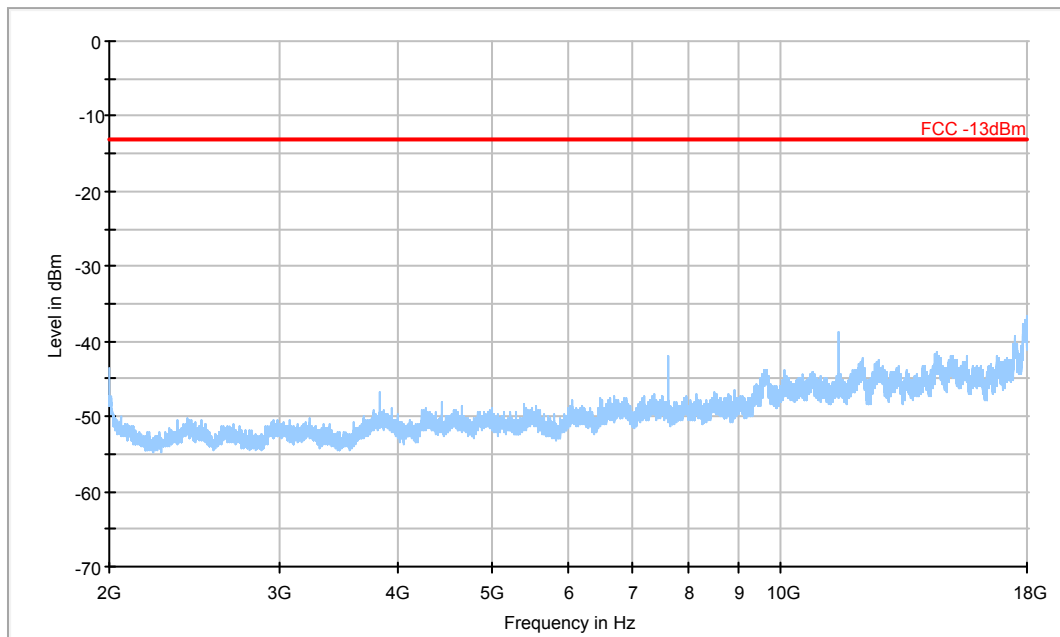
Radiated spurious emission limit :-13dBm.



— FCC -13dBm      — Preview Measurement Detector 1

#### A.2.3.6 RADIATED SPURIOUS EMISSIONS-Channel 810: 2GHz – 18GHz

Radiated spurious emission limit :-13dBm.

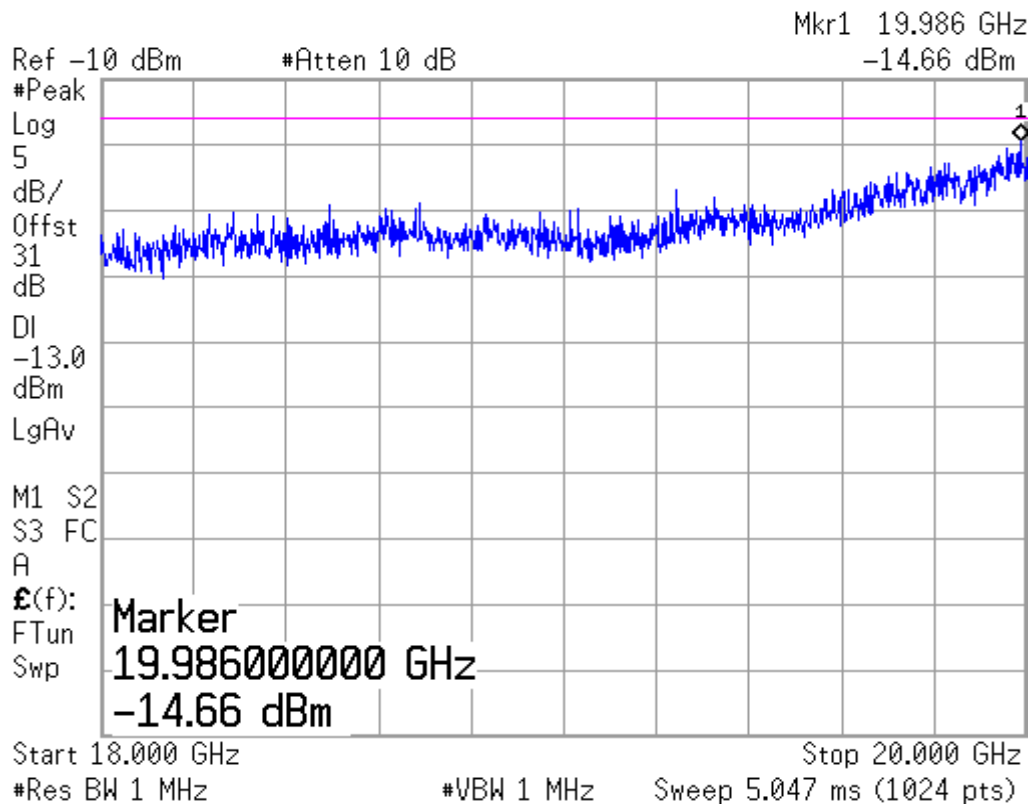


— FCC -13dBm      — Preview Measurement Detector 1

### A.2.3.7 Radiated spurious emission (18GHz-20GHz)

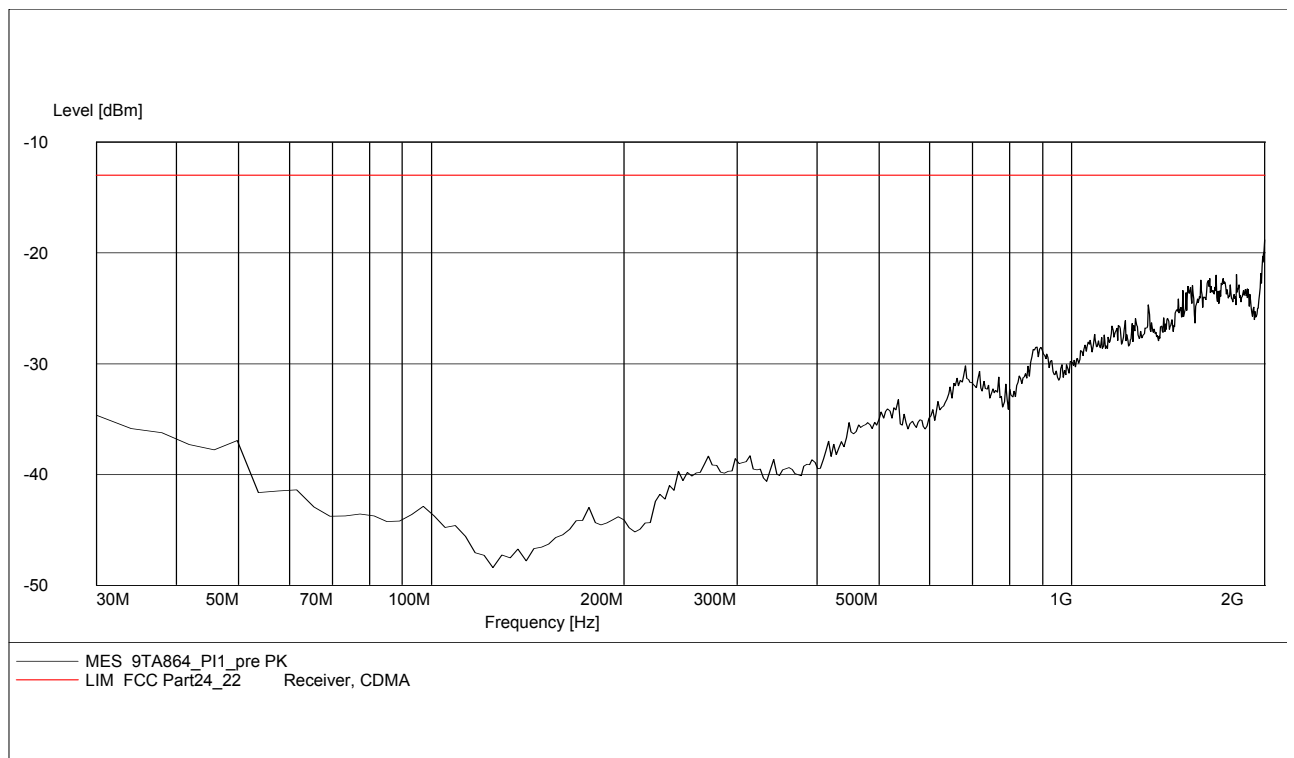
Radiated spurious emission limit :-13dBm.

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



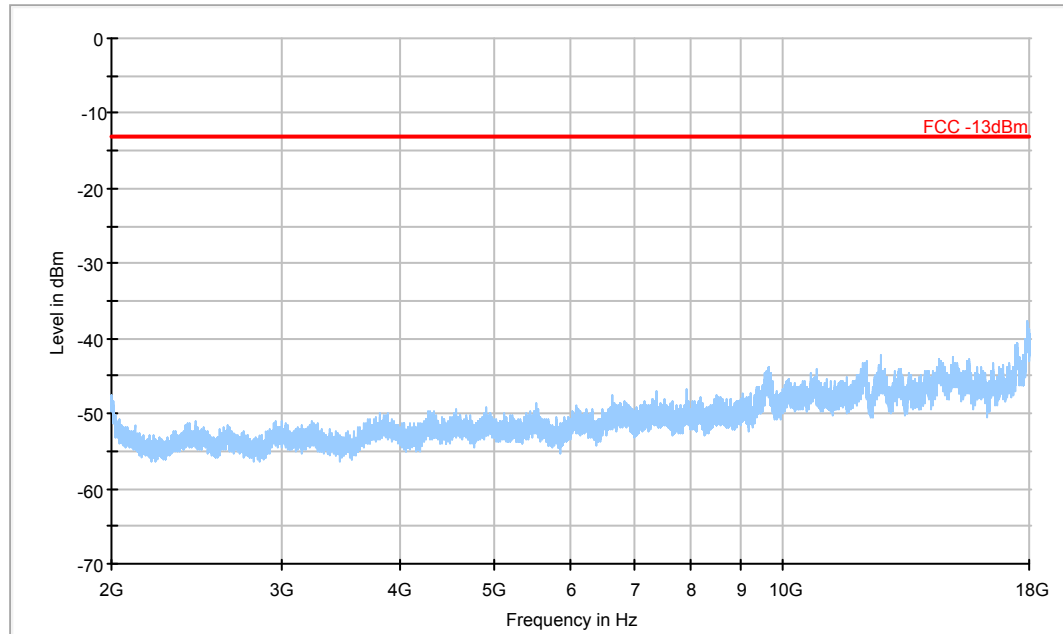
### A.2.3.8 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 30MHz – 2GHz

Radiated spurious emission limit :-13dBm.



### A.2.3.9 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 2GHz – 18GHz

Radiated spurious emission limit :-13dBm.

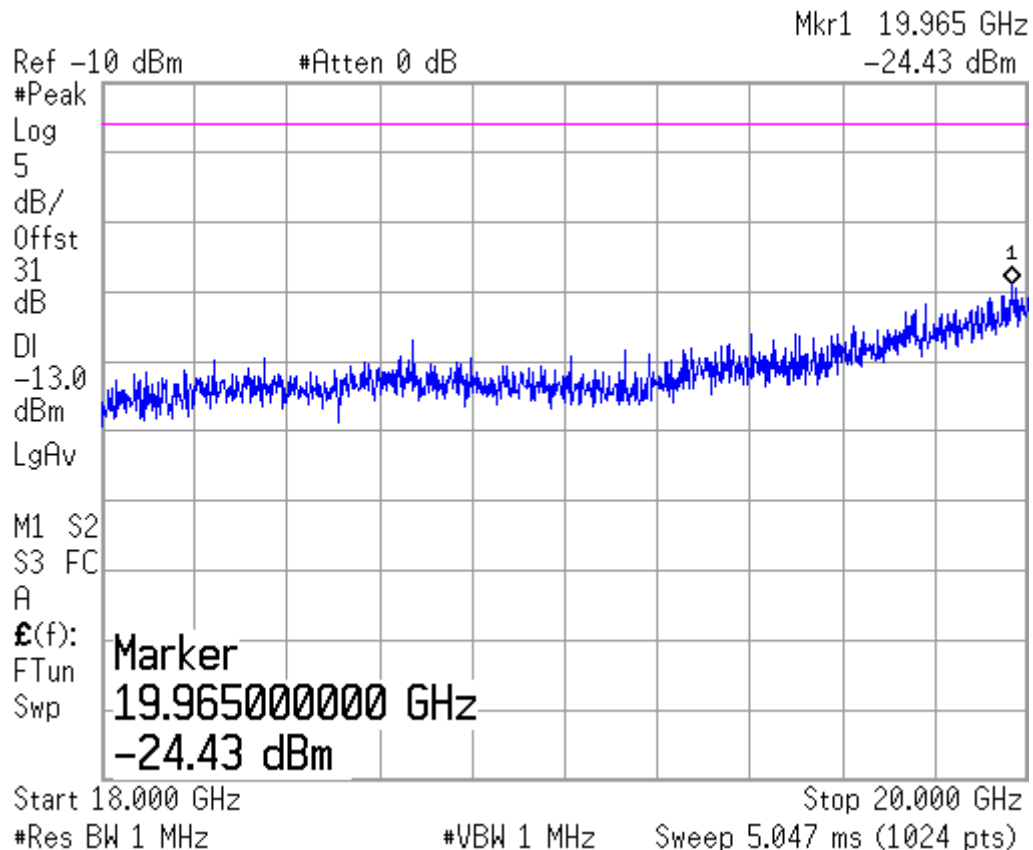


— FCC -13dBm      — Preview Measurement Detector 1

### A.2.3.10 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 18GHz – 20GHz

Radiated spurious emission limit :-13dBm.

Note: It is same as the floor noise.



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

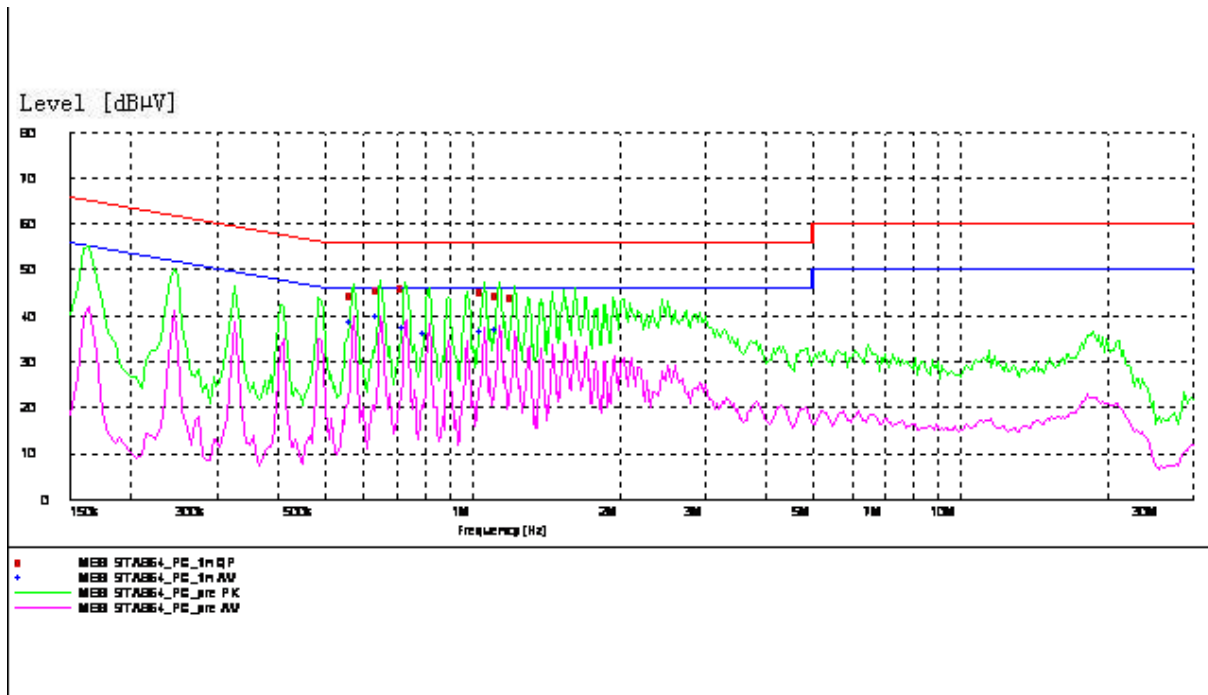
The measurement procedure in ANSI C63.4-1003 is used. Conducted Emission is measured with travel charger.

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

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	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

PCS1900MHz



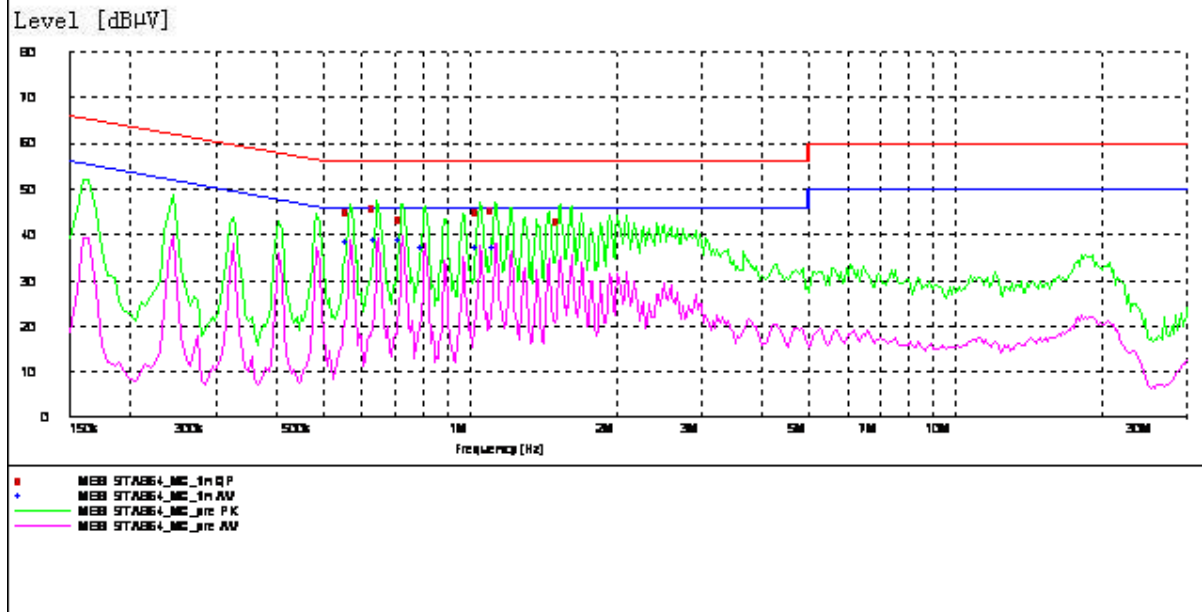
## MEASUREMENT RESULT: "9TA864\_PC\_fin QP"

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBμV	dB	dBμV	dB		
0.570000	44.50	10.1	56	11.5	L1	GND
0.650000	45.80	10.1	56	10.2	L1	GND
0.730000	45.90	10.1	56	10.1	L1	GND
1.055000	45.20	10.1	56	10.8	L1	GND
1.140000	44.30	10.1	56	11.7	L1	GND
1.220000	43.90	10.1	56	12.1	L1	GND

## MEASUREMENT RESULT: "9TA864\_PC\_fin AV"

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBμV	dB	dBμV	dB		
0.570000	38.80	10.1	46	7.2	L1	GND
0.650000	40.00	10.1	46	6.0	L1	GND
0.735000	37.40	10.1	46	8.6	L1	GND
0.815000	36.10	10.1	46	9.9	L1	GND
1.055000	36.40	10.1	46	9.6	L1	FLO
1.140000	37.10	10.1	46	8.9	L1	GND

### MP3



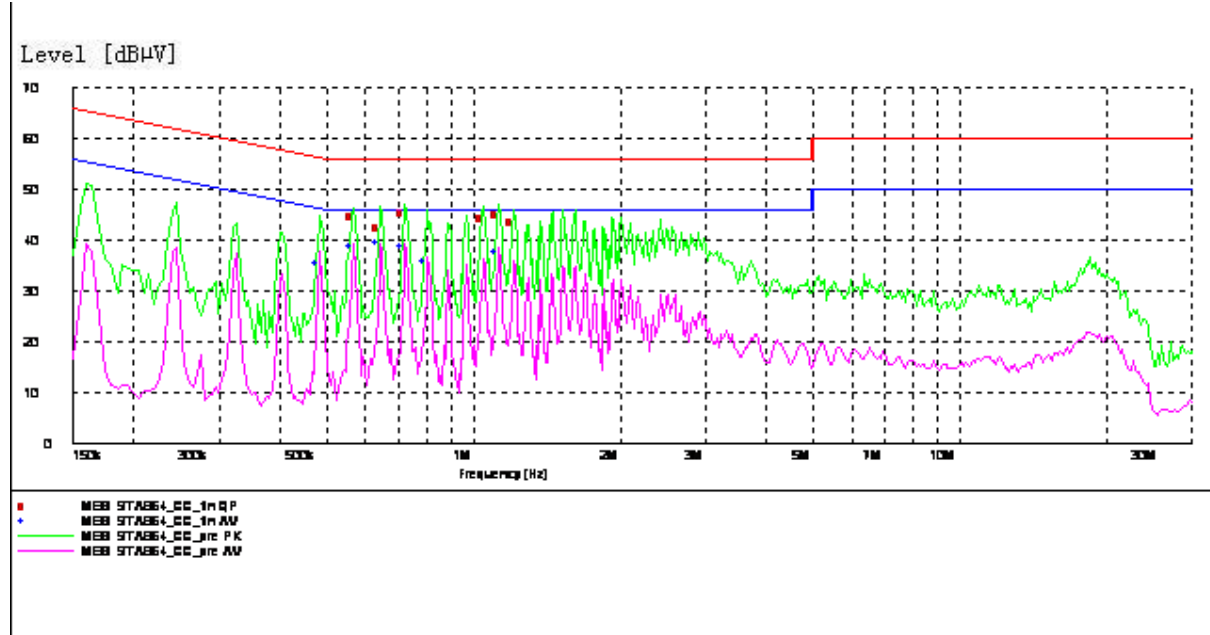
### MEASUREMENT RESULT: "9TA864\_MC\_fin QP"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.565000	45.20	10.1	56	10.8	L1	GND
0.645000	45.70	10.1	56	10.3	L1	GND
0.730000	43.40	10.1	56	12.6	L1	FLO
1.050000	45.20	10.1	56	10.8	L1	GND
1.130000	45.50	10.1	56	10.5	L1	GND
1.535000	43.10	10.1	56	12.9	L1	FLO

### MEASUREMENT RESULT: "9TA864\_MC\_fin AV"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.565000	38.40	10.1	46	7.6	L1	GND
0.650000	38.60	10.1	46	7.4	L1	GND
0.730000	38.90	10.1	46	7.1	L1	GND
0.810000	37.00	10.1	46	9.0	L1	GND
1.050000	37.00	10.1	46	9.0	L1	GND
1.135000	37.10	10.1	46	8.9	L1	GND

## Camera



### MEASUREMENT RESULT: "9TA864\_CC\_fin QP"

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBμV	dB	dBμV	dB		
0.565000	44.90	10.1	56	11.1	L1	GND
0.640000	42.80	10.1	56	13.2	L1	GND
0.725000	45.70	10.1	56	10.3	L1	GND
1.045000	44.50	10.1	56	11.5	L1	GND
1.130000	45.20	10.1	56	10.8	L1	GND
1.210000	43.80	10.1	56	12.2	L1	GND

### MEASUREMENT RESULT: "9TA864\_CC\_fin AV"

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBμV	dB	dBμV	dB		
0.485000	35.80	10.1	46	10.4	L1	GND
0.565000	38.90	10.1	46	7.1	L1	GND
0.645000	39.70	10.1	46	6.3	L1	GND
0.725000	38.80	10.1	46	7.2	L1	GND
0.805000	36.10	10.1	46	9.9	L1	GND
1.130000	37.70	10.1	46	8.3	L1	GND

## **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, 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 0.1V 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 3.4VDC 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

##### PCS 1900

##### Frequency Error vs Voltage

Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
3.4	-23	0.012
3.8	-22	0.012
4.2	-25	0.013

##### Frequency Error vs Temperature

temperature(°C)	Frequency error(Hz)	Frequency error(ppm)
-30	-48	0.026
-20	-45	0.024
-10	-37	0.020
0	-27	0.015
10	-22	0.012
20	-23	0.012
30	-29	0.015
40	-35	0.019
50	-44	0.023

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

### **A.5.1 Occupied Bandwidth Results**

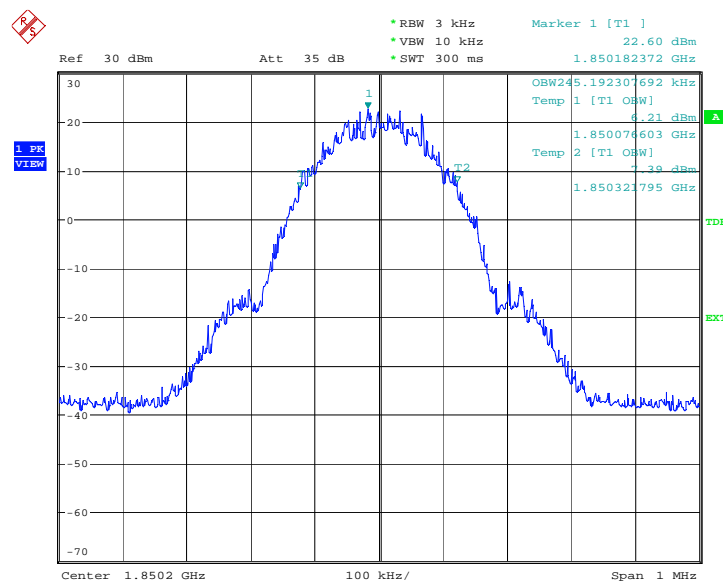
Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. The table below lists the measured -20dBc BW (99%). Spectrum analyzer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

#### **PCS 1900(99%)**

Frequency(MHz)	Occupied Bandwidth (99%)( kHz)
1850.2	245.192
1880.0	246.794
1909.8	245.192

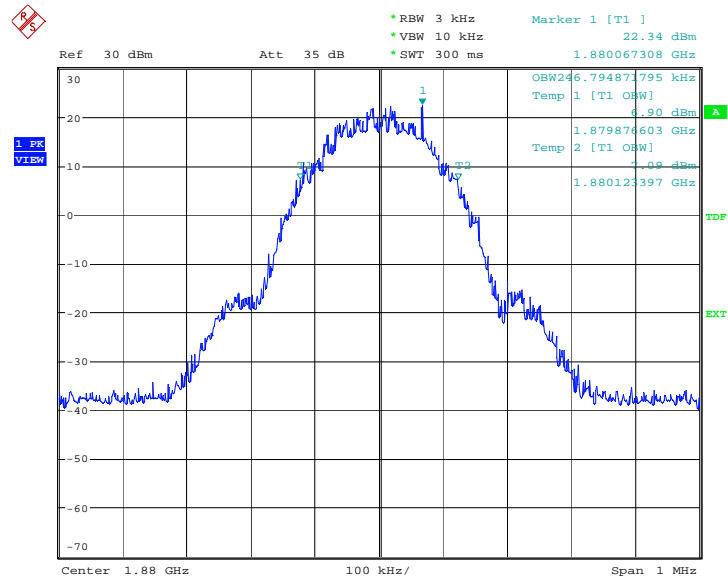
#### **PCS 1900**

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



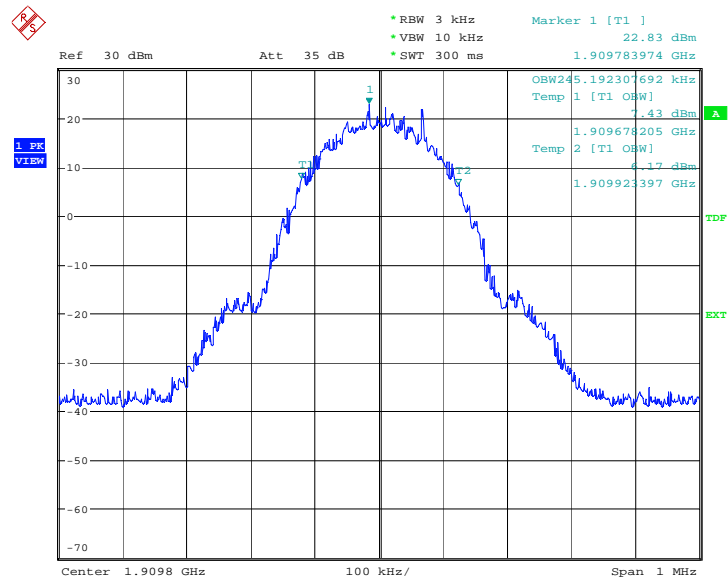
Date: 11.AUG.2009 04:07:34

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



Date: 11.AUG.2009 04:08:06

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



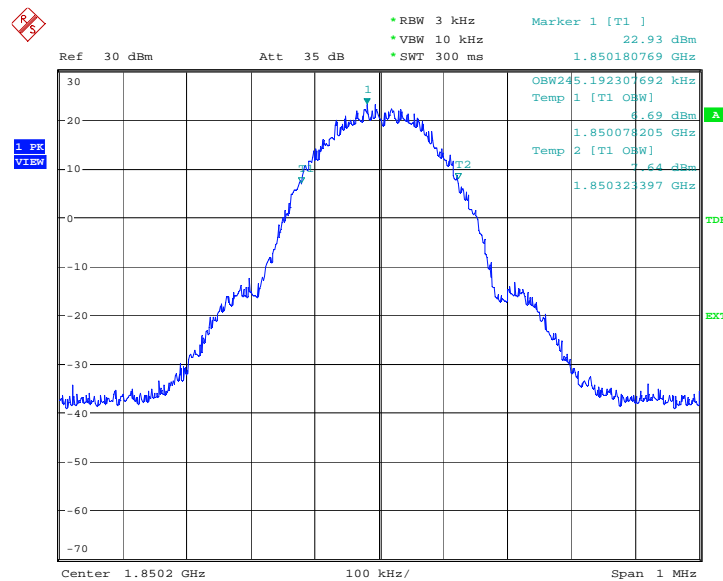
Date: 11.AUG.2009 04:08:38

### GPRS 1900(99%)

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

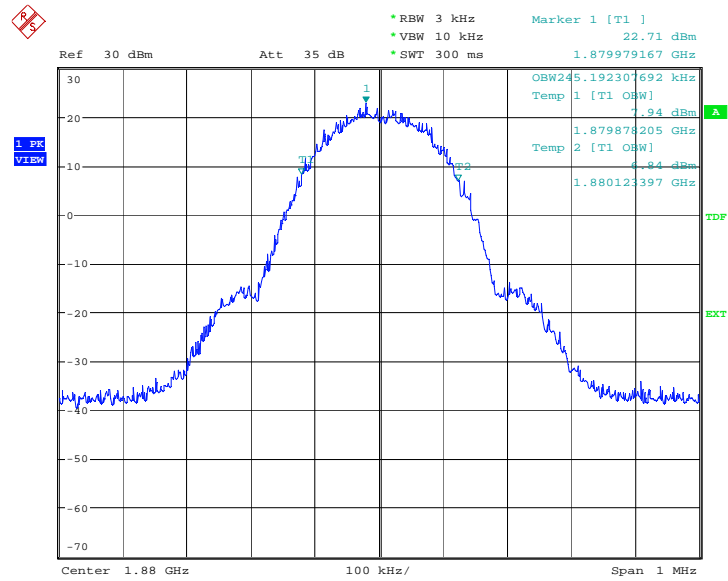
### GPRS 1900

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



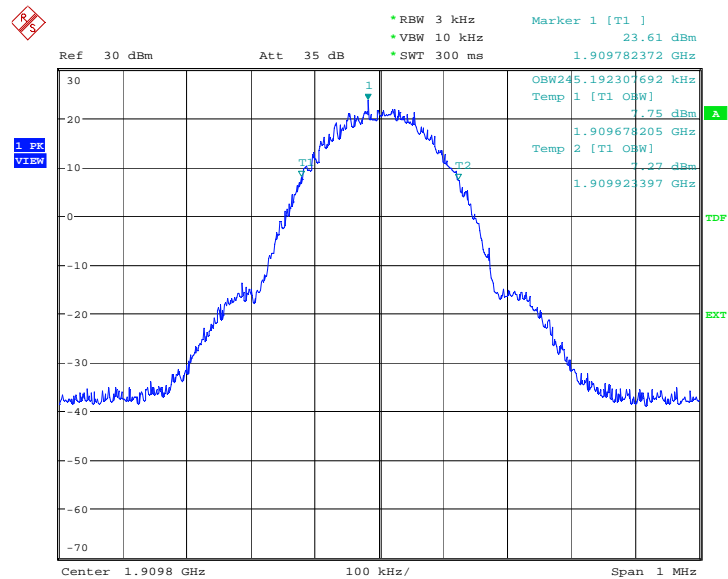
Date: 11.AUG.2009 04:50:47

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



Date: 11.AUG.2009 04:51:19

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



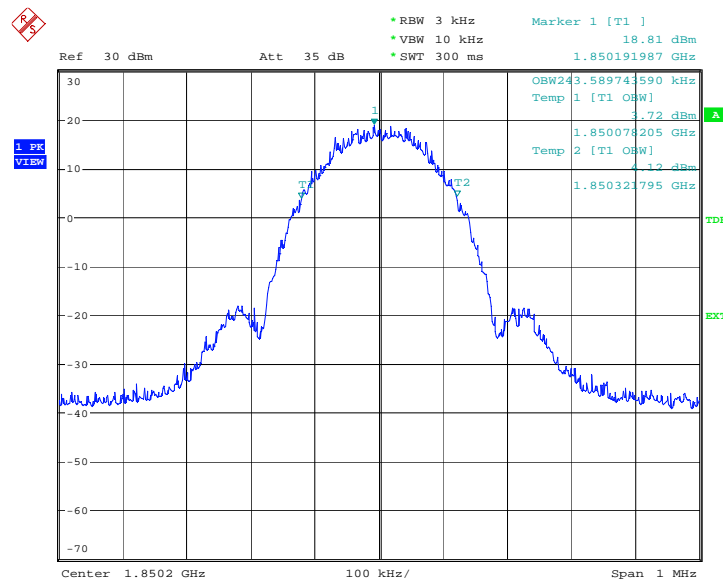
Date: 11.AUG.2009 04:51:51

### EGPRS 1900(99%)

Frequency(MHz)	Occupied Bandwidth (99%)( kHz)
1850.2	243.589
1880.0	245.192
1909.8	243.589

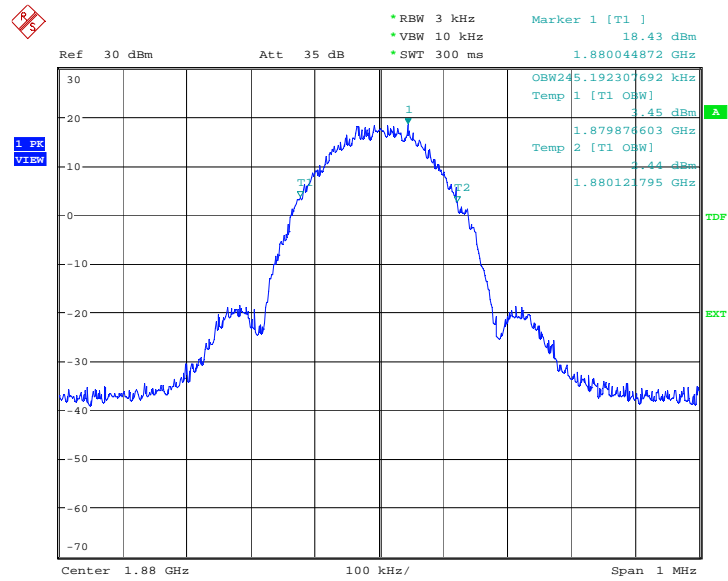
### EGPRS 1900

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



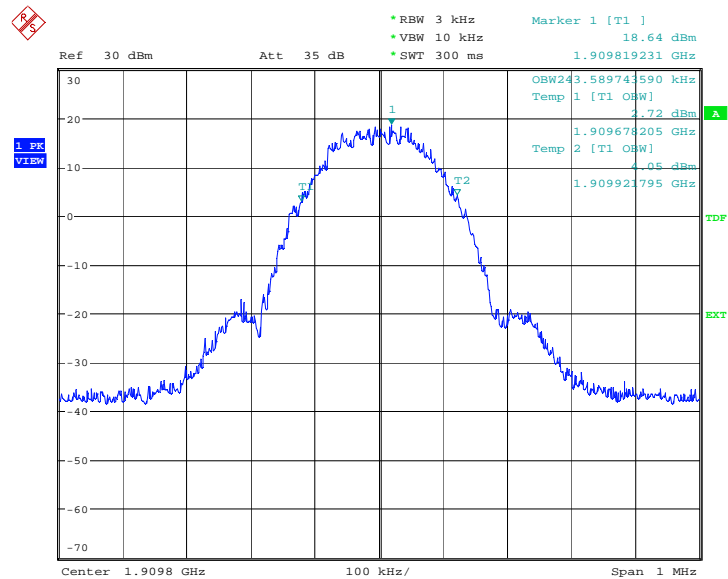
Date: 11.AUG.2009 05:02:16

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



Date: 11.AUG.2009 05:02:49

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



Date: 11.AUG.2009 05:03:22

## **A.6 EMISSION BANDWIDTH** (§24.238(b))

### **A.6.1 Emission Bandwidth Results**

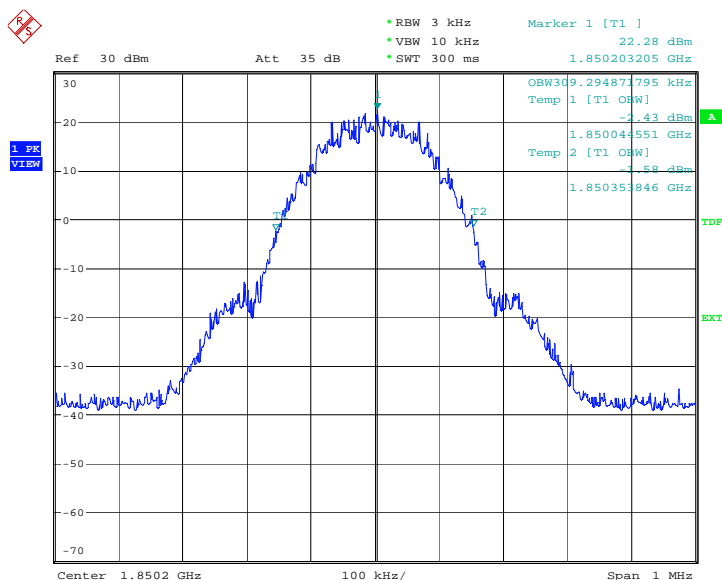
Similar to conducted emissions; Emission bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the PCS1900 band. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included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

#### **PCS 1900(-26dBc)**

Frequency(MHz)	Occupied Bandwidth (-26dBc BW)( kHz)
1850.2	309.294
1880.0	309.294
1909.8	309.294

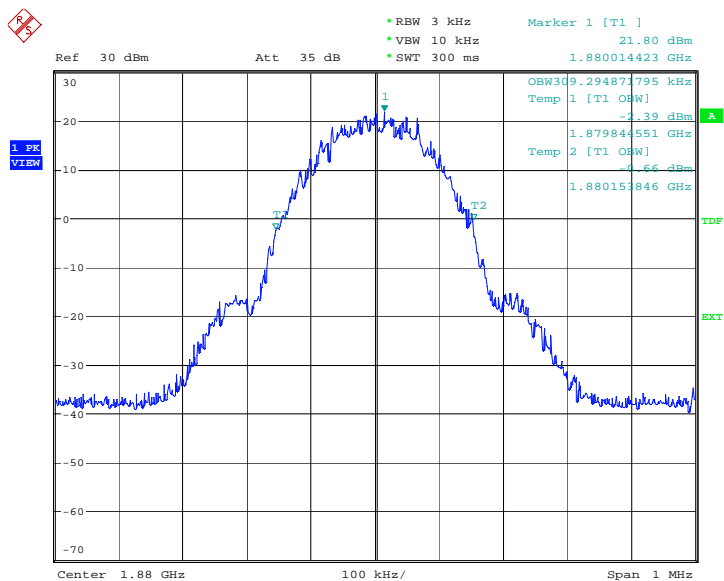
#### **PCS 1900**

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



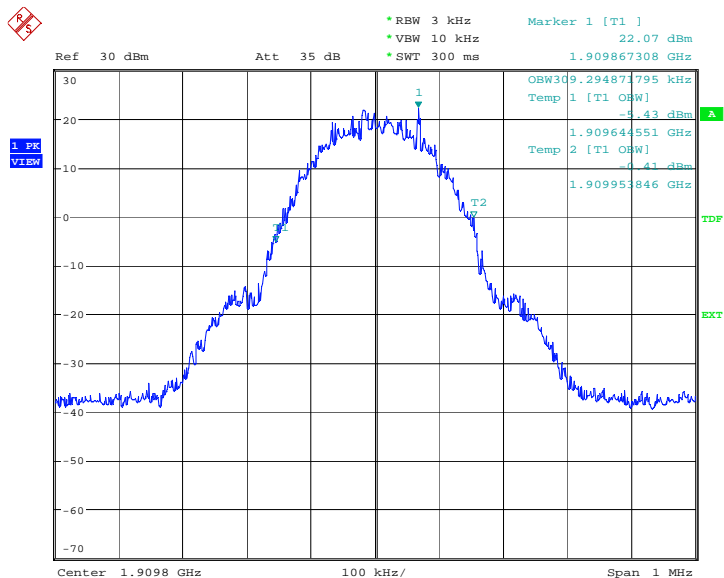
Date: 11.AUG.2009 04:09:12

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



Date: 11.AUG.2009 04:09:44

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



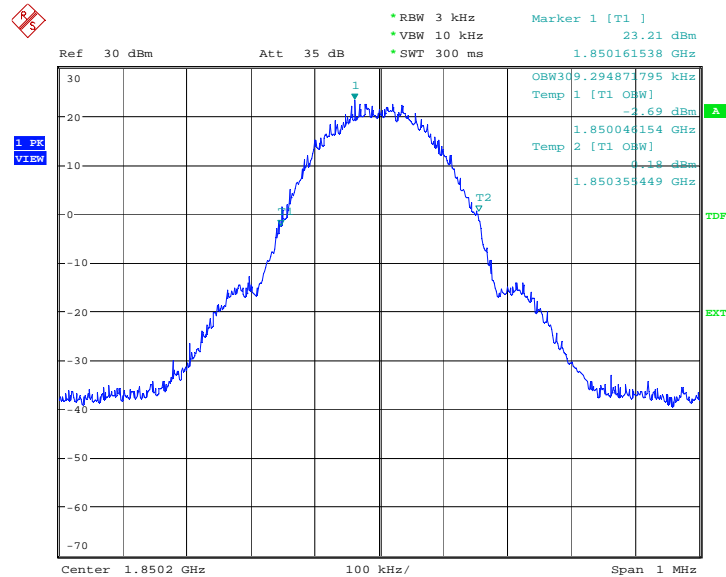
Date: 11.AUG.2009 04:10:16

### GPRS 1900(-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc BW)( kHz)
1850.2	309.294
1880.0	310.897
1909.8	307.692

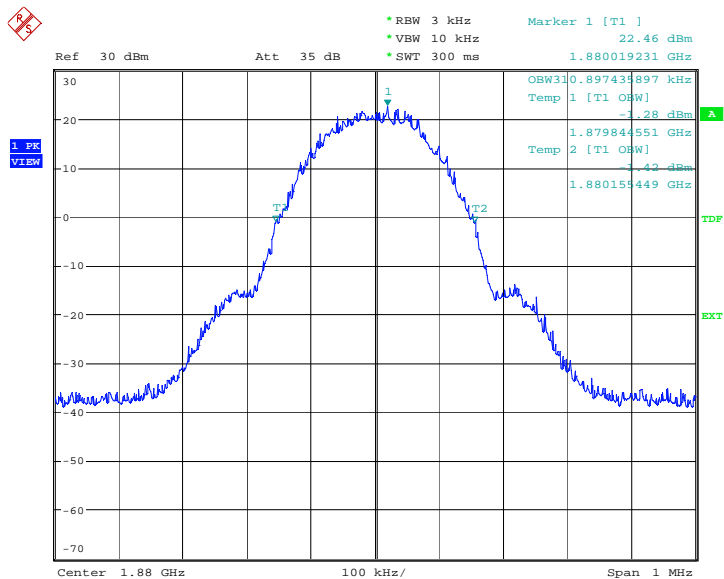
### GPRS 1900

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



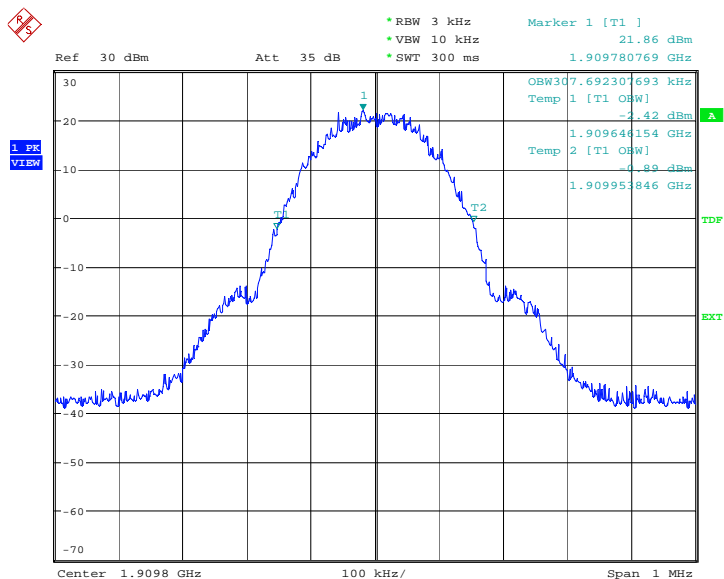
Date: 11.AUG.2009 04:52:25

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



Date: 11.AUG.2009 04:52:57

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



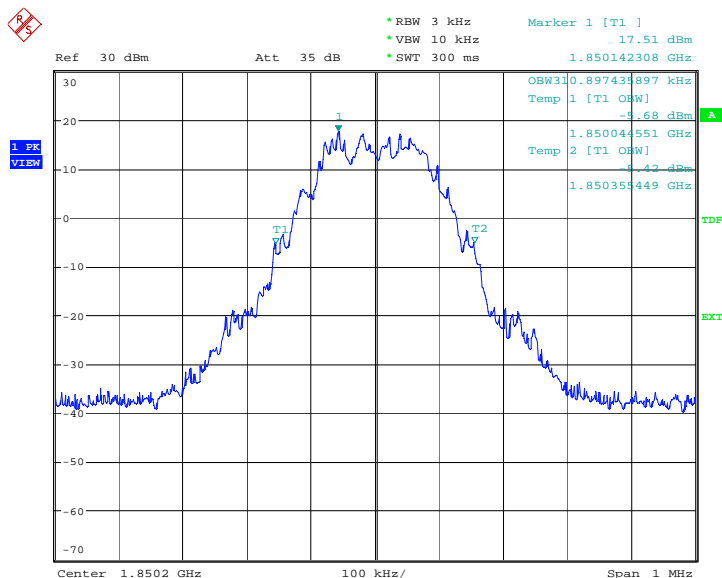
Date: 11.AUG.2009 04:53:29

### EGPRS 1900(-26dBc)

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

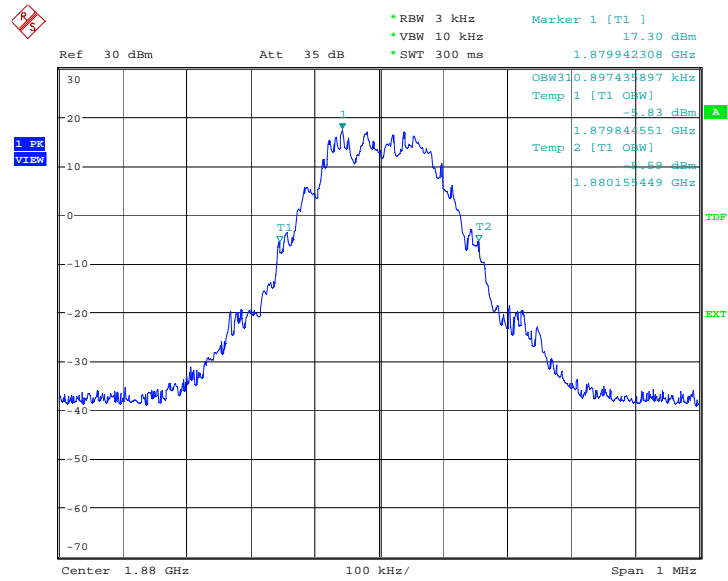
### EGPRS 1900

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



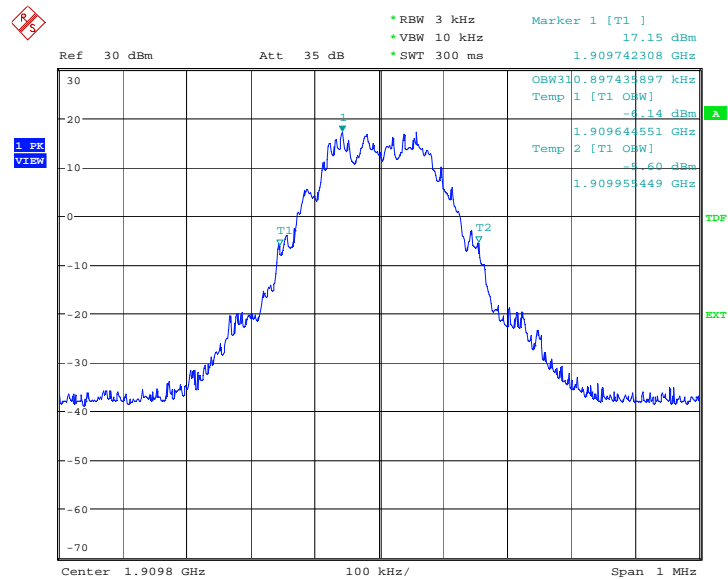
Date: 11.AUG.2009 05:03:57

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



Date: 11.AUG.2009 05:04:29

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

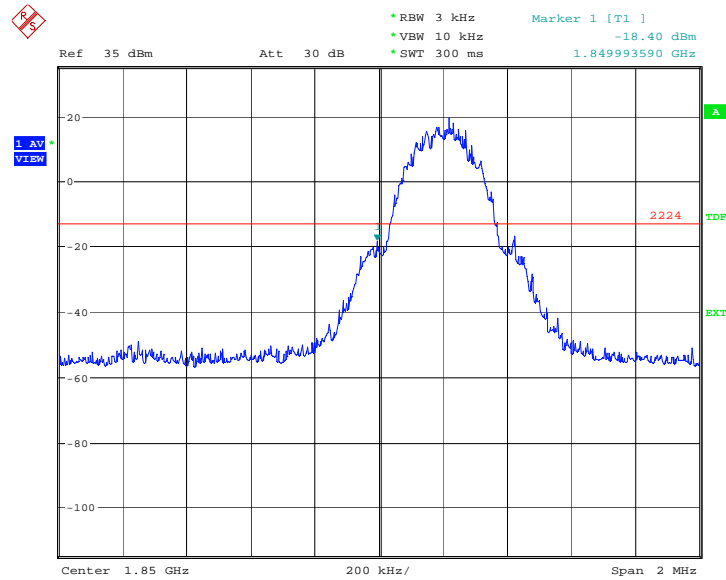


Date: 11.AUG.2009 05:05:01

## A.7 BAND EDGE COMPLIANCE (§24.238(b))

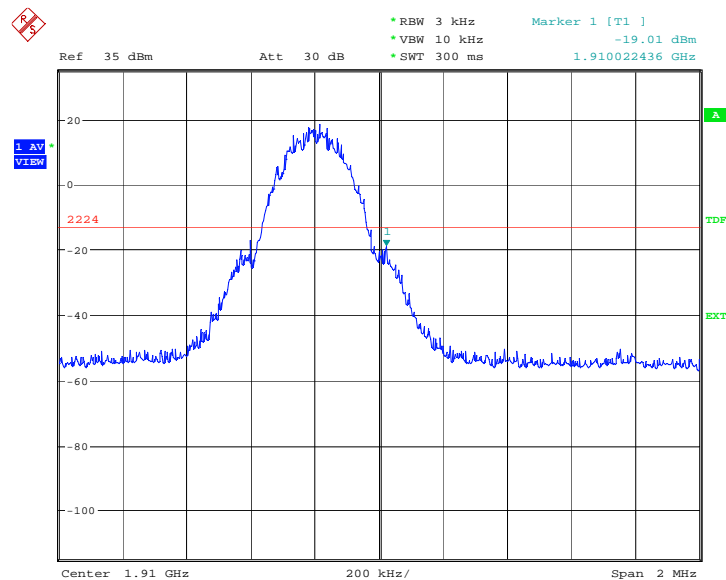
PCS 1900

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



Date: 11.AUG.2009 04:17:23

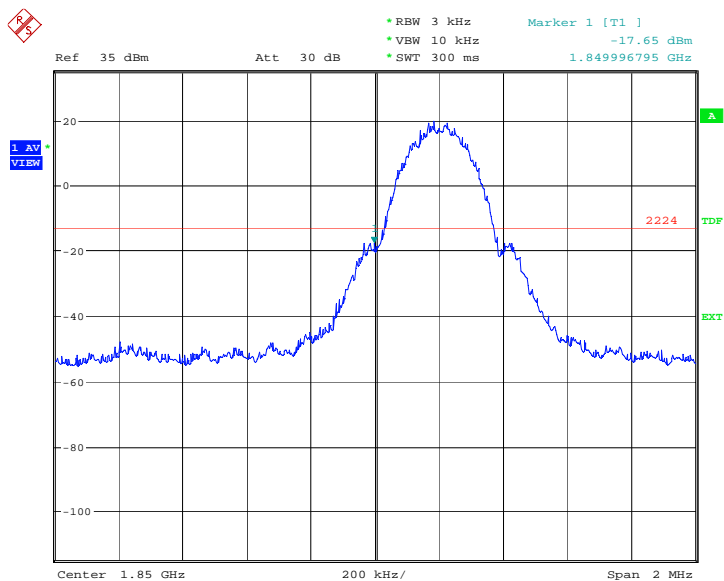
HIGH BAND EDGE BLOCK-C (PCS-1900) -Channel 810



Date: 11.AUG.2009 04:17:57

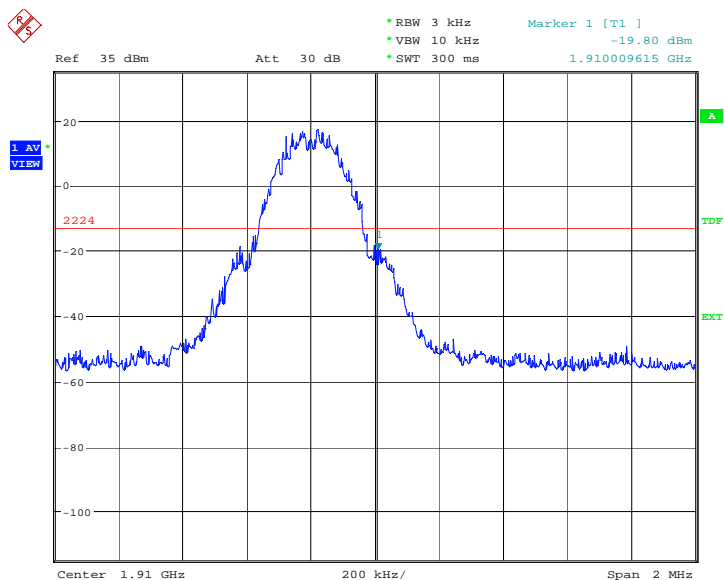
## GPRS 1900

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



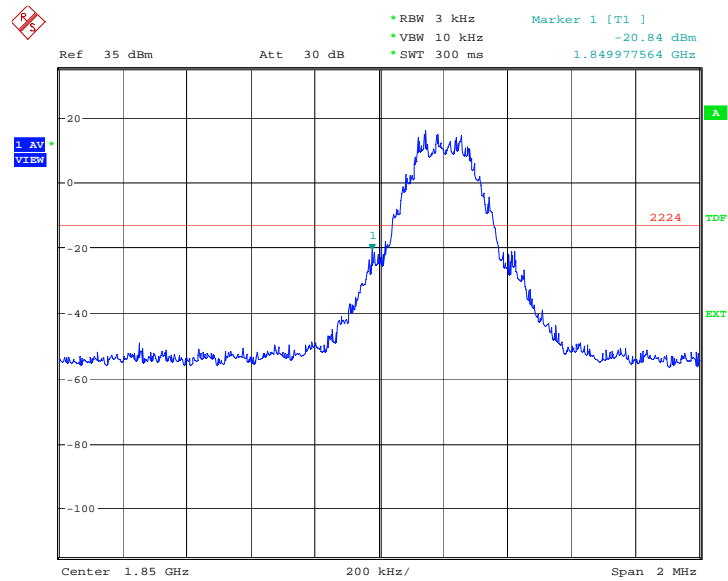
Date: 11.AUG.2009 04:57:16

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



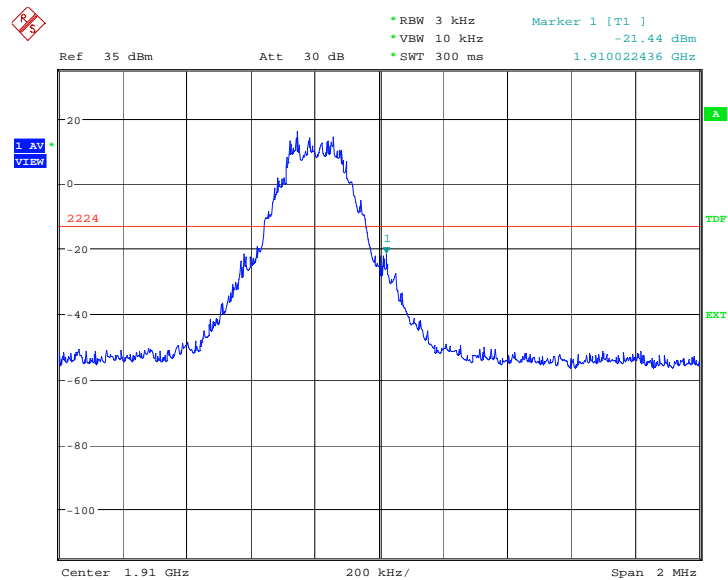
Date: 11.AUG.2009 04:57:50

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



Date: 11.AUG.2009 05:08:50

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



Date: 11.AUG.2009 05:09:24

**A.8 CONDUCTED SPURIOUS EMISSION** (§2.1057/§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.
2. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

**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

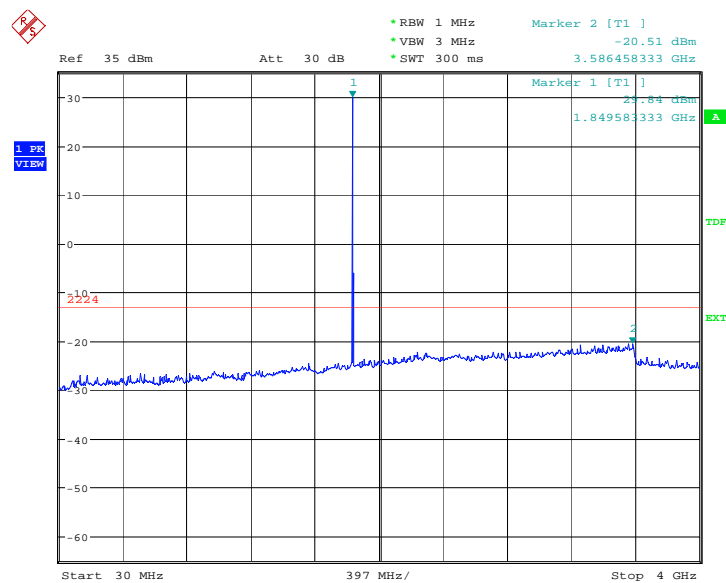
#### PCS1900

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. 8.3.1 Channel 512: 30MHz – 4GHz

Spurious emission limit –13dBm.

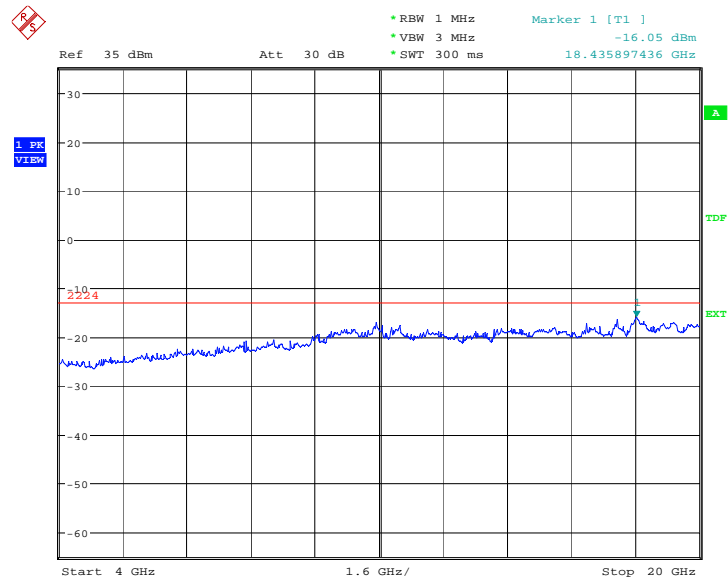
**NOTE:** peak above the limit line is the carrier frequency.



Date: 11.AUG.2009 04:14:03

### A. 8.3.2 Channel 512: 4GHz – 20GHz

Spurious emission limit –13dBm.

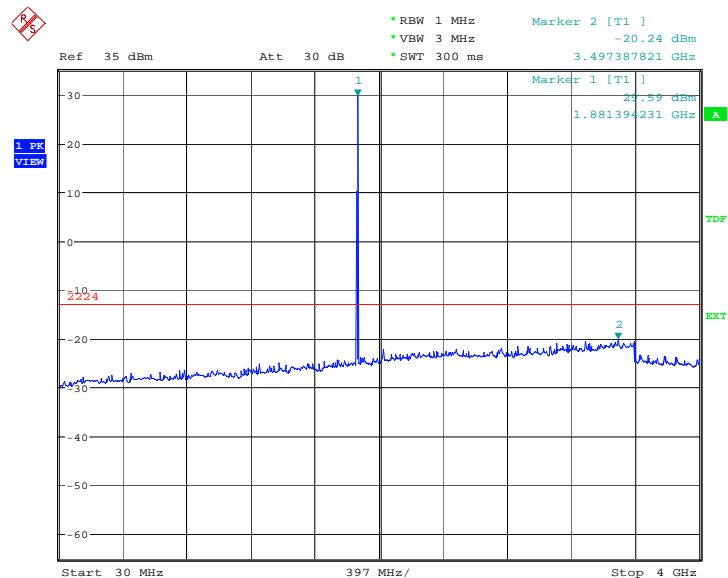


Date: 11.AUG.2009 04:14:36

### A. 8.3.3 Channel 661: 30MHz – 4GHz

Spurious emission limit –13dBm

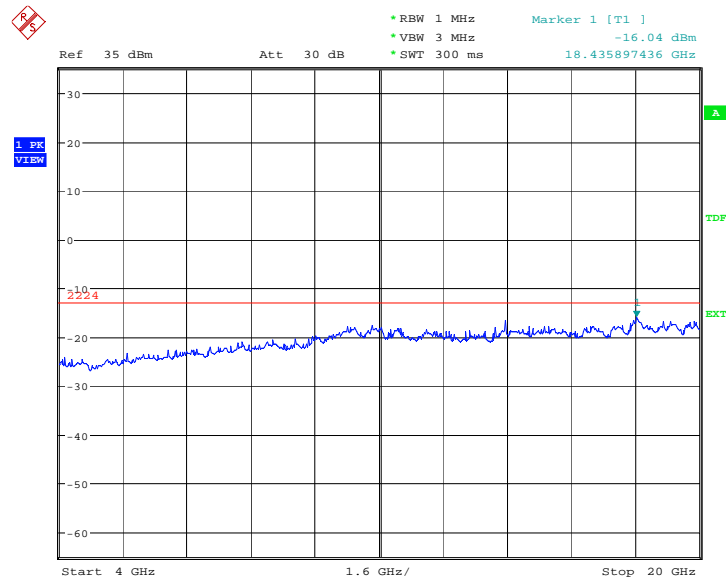
**NOTE: peak above the limit line is the carrier frequency.**



Date: 11.AUG.2009 04:15:10

### A. 8.3.4 Channel 661: 4GHz –20GHz

Spurious emission limit –13dBm

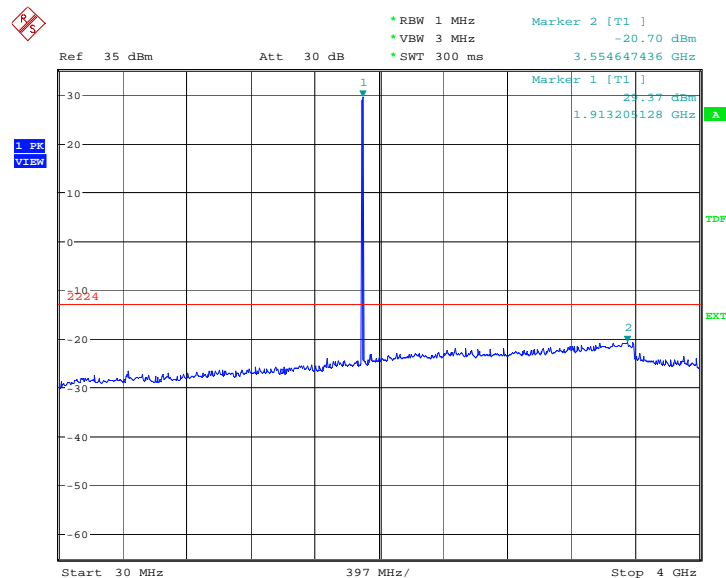


Date: 11.AUG.2009 04:15:43

### A. 8.3.5 Channel 810: 30MHz – 4GHz

Spurious emission limit –13dBm.

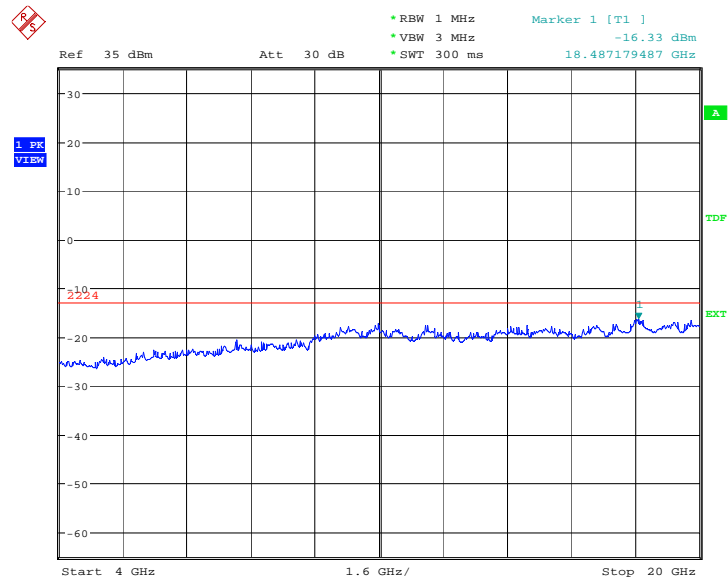
**NOTE: peak above the limit line is the carrier frequency.**



Date: 11.AUG.2009 04:16:16

### A. 8.3.6 Channel 810: 4GHz – 20GHz

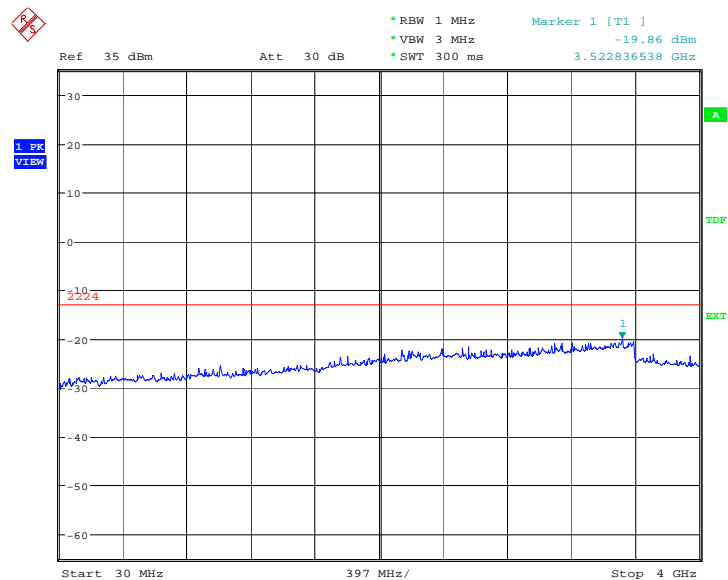
Spurious emission limit –13dBm.



Date: 11.AUG.2009 04:16:50

### A. 8.3.7 Idle mode: 30MHz – 4GHz

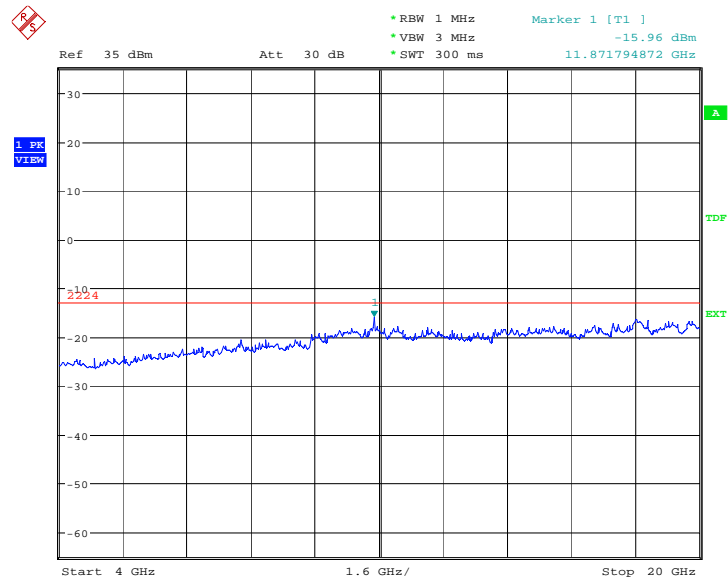
Spurious emission limit –13dBm.



Date: 11.AUG.2009 04:18:31

### A. 8.3.8 Idle mode: 4GHz – 20GHz

Spurious emission limit -13dBm.



Date: 11.AUG.2009 04:19:04

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