



# TEST REPORT

No. 2013TAR284

for

**TCT Mobile Limited**

**GSM dual band mobile phone**

**Model Name: Ginger US**

**Marketing Name: ALCATEL 1030A**

**FCC ID : RAD326**

with

**Hardware Version: PIO**

**Software Version: v52B**

**Issued Date: 2013-04-03**

**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. D-PL-12123-01-01***

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

***IC O.A.T.S listed: No.6629B***

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## 1. Test Laboratory

### 1.1. Testing Location

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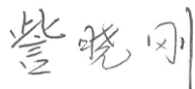
### 1.2. Testing Environment

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

### 1.3. Project data

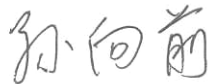
Testing Start Date: 2013-03-21  
Testing End Date: 2013-04-03

### 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: TCT Mobile Limite  
Address /Post: 5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park,  
Pudong Area Shanghai, P.R. China. 201203  
City: Shanghai  
Postal Code: 201203  
Country: China  
Telephone: 0086-21-61460890  
Fax: 0086-21-61460602

### **2.2. Manufacturer Information**

Company Name: TCT Mobile Limited  
Address /Post: 5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park,  
Pudong Area Shanghai, P.R. China. 201203  
City: Shanghai  
Postal Code: 201203  
Country: China  
Telephone: 0086-21-61460890  
Fax: 0086-21-61460602

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

#### 3.1. About EUT

Description	GSM dual band mobile phone
Model Name	Ginger US
Marketing Name	ALCATEL 1030A
FCC ID	RAD326
Frequency	GSM 850MHz; PCS 1900MHz
Antenna	Integrated
Power supply	Battery or Charger (AC Adaptor)
Output power	32.75 dBm maximum EIRP measured for PCS1900
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 MIIT 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
N05	013494000000232	PIO	v52B
N12	013494000000240	PIO	v52B

\*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		
AE1	Battery	/	/
AE2	Battery	/	/
AE3	Battery	/	/
AE4	Travel charger	/	/
AE5	Travel charger	/	/

##### AE1

Model	CAB24Q0000C1
Manufacturer	BAK
Capacitance	500mAh
Nominal voltage	3.7V

##### AE2

Model	CAB2170000C1
Manufacturer	BYD
Capacitance	500mAh
Nominal voltage	3.7V

## AE3

Model	CAB0400000C1
Manufacturer	BYD
Capacitance	500mAh
Nominal voltage	3.7V

## AE4

Model	CBA3002AG0C1
Manufacturer	BYD
Length of cable	100cm

## AE5

Model	CBA3002AG0C2
Manufacturer	Tenpao
Length of cable	100cm

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

**3.4. Normal Accessory setting**

1. Fully charged battery was used during the test;
2. A microSD card was being installed in the device during the test;

**3.5. General Description**

The Equipment Under Test (EUT) is a model of GSM dual band mobile phone with integrated antenna. It consists of 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 10.1.12
FCC Part 22	PUBLIC MOBILE SERVICES	V 10.1.12
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
KDB971168 D01	Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems	2011

## 5. LABORATORY ENVIRONMENT

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

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. =20 %, Max. = 80 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 0.5 Ω

**Fully-anechoic chamber 2** (8.6 meters×6.1 meters×3.85 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 1 Ω
Site voltage standing-wave ratio ( $S_{VSWR}$ )	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 4000 MHz

**Semi-anechoic chamber 2 / Fully-anechoic chamber 3** (10 meters×6.7 meters×6.15 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 0.5 Ω
Normalised site attenuation (NSA)	< ±3.5 dB, 3 m distance
Site voltage standing-wave ratio ( $S_{VSWR}$ )	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz



## 6. SUMMARY OF TEST RESULTS

Items	List	Clause in FCC rules	Verdict
1	Output Power	22.913(a)/24.232(c)	P
2	Emission Limit	2.1051/22.917/24.238	P
3	Conducted Emission	15.107/15.207	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	ESCI	100344	R&S	2014-03-27
2	Test Receiver	ESU26	100376	R&S	2013-11-07
3	BiLog Antenna	VULB 9163	514	Schwarzbeck	2014-11-10
4	BiLog Antenna	3117	00139065	ETS-Lindgren	2014-07-31
5	Signal Generator	SMB100A	102063	R&S	2013-04-05
6	LISN	ESH2-Z5	829991/012	R&S	2013-04-16
7	Universal Radio Communication Tester	CMU200	102228	R&S	2013-07-07
8	Universal Radio Communication Tester	E5515C	MY48361083	Agilent	2014-03-15
9	Spectrum Analyzer	E4440A	MY48250642	Agilent	2014-03-03
10	EMI Antenna	9117	177	Schwarzbeck	2013-06-28
11	EMI Antenna	VULB 9163	482	Schwarzbeck	2014-02-17
12	EMI Antenna	3117	00119024	ETS-Lindgren	2014-02-02
13	EMI Antenna	3117	00058889	ETS-Lindgren	2014-02-02
14	Signal Generator	N5183A	MY49060052	Agilent	2014-03-18
15	Climatic chamber	PL-2G	343074	ESPEC	2013-05-12

## **ANNEX A: MEASUREMENT RESULTS**

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

#### **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 output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

#### **A.1.2 Conducted**

##### **A.1.2.1 Method of Measurements**

The EUT was set up for the max output power with pseudo random data modulation. The power was measured with Rhode & Schwarz Spectrum Analyzer FSU (peak) These measurements were done at 3 frequencies, 1850.2 MHz, 1880.0MHz and 1909.8MHz for PCS1900 band;824.4MHz, 836.6MHz and 848.8MHz for GSM850 band. (bottom, middle and top of operational frequency range).

##### **A.1.2.2 Test Condition**

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

#### **GSM850**

	Power step	Nominal Peak output power (dBm)	Power & Multislot class	Operation class
GSM	5	33dBm(2W)	4	/

#### **Measurement result**

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

Frequency(MHz)	Power Step	Output power(dBm)
824.2	5	32.01
836.6	5	32.01
848.8	5	<b>32.03</b>

**PCS1900**

	Power step	Nominal Peak output power (dBm)	Power & Multislot class	Operation class
GSM	0	30dBm(1W)	1	/

**Measurement result**

**GSM (GMSK)**

Frequency(MHz)	Power Step	Output power(dBm)
1850.2	0	29.19
1880.0	0	29.31
1909.8	0	<b>29.41</b>

### A.1.3 Radiated

#### A.1.3.1 Description

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

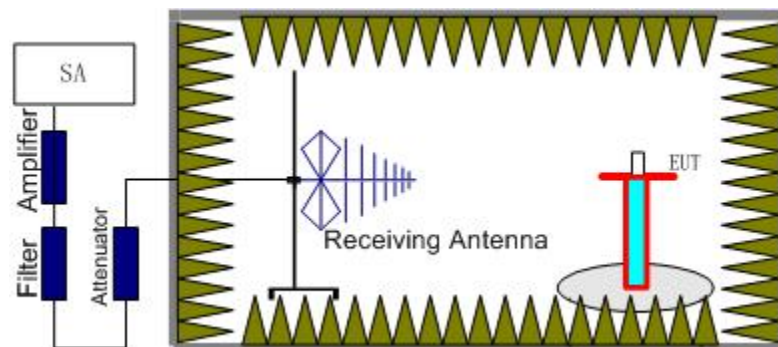
Rule Part 24.232(c) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

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

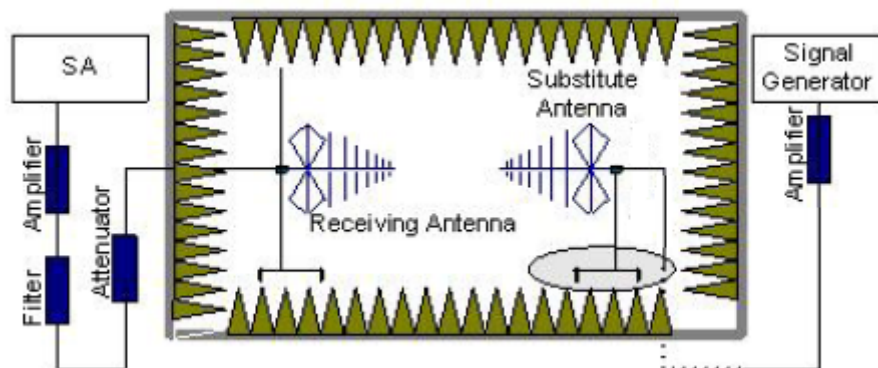
#### A.1.3.2 Method of Measurement

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

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is

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

4. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna.  
The cable loss ( $P_{cl}$ ), the Substitution Antenna Gain ( $G_a$ ) and the Amplifier Gain ( $P_{Ag}$ ) should be recorded after test.

The measurement results are obtained as described below:

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

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

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

**Limits**

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

**Measurement result**

**GSM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	Correction (dB)	ERP(dBm)	Polarization
824.20	-15.84	2.07	-53.00	0.84	2.15	32.10	H
836.60	-15.39	2.08	-53.00	0.90	2.15	32.48	H
848.80	-15.70	2.09	-53.00	0.95	2.15	32.11	H

Frequency: 836.60MHz

Peak ERP(dBm)= P<sub>Mea</sub>(-15.39dBm) - P<sub>cl</sub>(2.08dB) - P<sub>Ag</sub>(-53.00dB) - G<sub>a</sub>  
(0.90dB)-2.15dB=32.48dBm

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

**PCS1900-EIRP 24.232(b)**

**Limits**

	Power Step	Burst Peak EIRP (dBm)
GSM	0	≤33dBm (2W)

**Measurement result**

**GSM**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dB)	EIRP(dBm)	Polarization
1850.20	-18.62	3.19	-50.00	-4.56	32.75	H
1880.00	-19.10	3.11	-50.00	-4.43	32.22	H
1909.80	-18.99	3.18	-50.00	-4.30	32.13	H

Frequency: 1850.20MHz

Peak EIRP(dBm)= P<sub>Mea</sub>(-18.62dBm) - P<sub>cl</sub>(3.19dB) - P<sub>Ag</sub>(-50.00dB) - G<sub>a</sub> (-4.56dB) = 32.75dBm

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



## A.2 EMISSION LIMIT

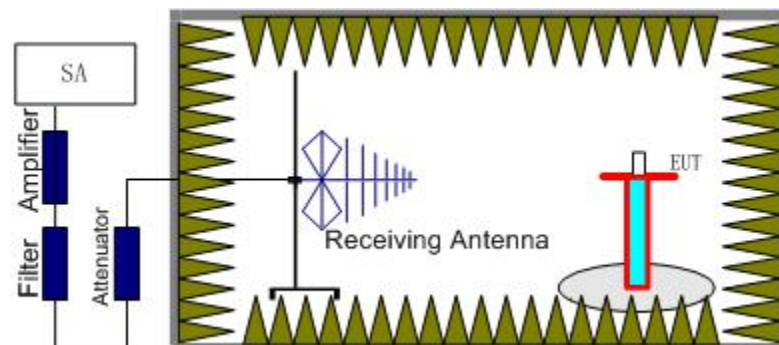
### **A.2.1 Measurement Method**

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

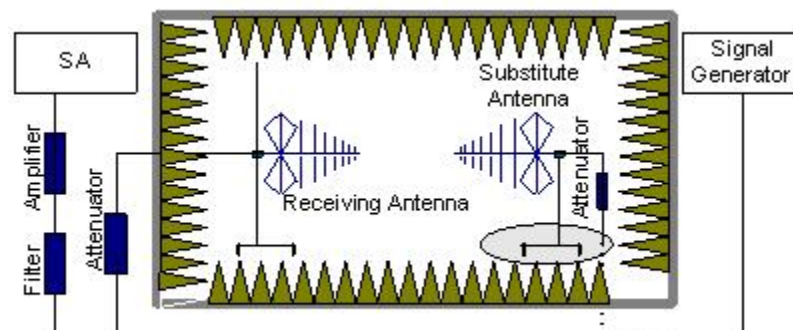
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set as outlined in Part 24.238 and Part 22.917. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the PCS1900 and GSM850.

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

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere

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

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

A amplifier should be connected in for the test.

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

The measurement results are obtained as described below:

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

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

### **A.2.2 Measurement Limit**

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

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

### **A.2.3 Measurement Results**

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the PCS (1850.2 MHz, 1880 MHz and 1909.8 MHz), GSM850 (824.2MHz, 836.6MHz, 848.8MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the PCS1900, GSM850 into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

**A.2.4 Measurement Results Table**

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

**A.2.5 Sweep Table**

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

**GSM Mode Channel 128/824.2MHz**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Polarization
1648.46	-43.78	2.91	-5.45	2.15	-43.39	-13.00	H
3296.82	-53.66	4.22	-7.41	2.15	-52.62	-13.00	H
4383.66	-61.68	4.83	-8.73	2.15	-59.93	-13.00	V
5769.20	-55.38	5.69	-10.11	2.15	-53.11	-13.00	V
7189.42	-62.68	6.42	-11.21	2.15	-60.04	-13.00	H
8055.78	-60.75	6.90	-11.93	2.15	-57.87	-13.00	H

**GSM Mode Channel 190/836.6MHz**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Polarization
1672.94	-40.87	2.97	-5.34	2.15	-40.65	-13.00	H
1949.61	-59.85	3.18	-4.12	2.15	-61.06	-13.00	H
2510.04	-46.85	3.59	-5.43	2.15	-47.16	-13.00	H
3346.05	-54.62	4.23	-7.53	2.15	-53.47	-13.00	V
5388.08	-63.50	5.45	-9.93	2.15	-61.17	-13.00	V
6861.69	-61.22	6.10	-10.96	2.15	-58.51	-13.00	H

**GSM Mode Channel 251/848.8MHz**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Polarization
1697.31	-40.64	2.95	-5.23	2.15	-40.51	-13.00	H
3394.94	-55.05	4.22	-7.65	2.15	-53.77	-13.00	V
4149.91	-63.88	4.65	-8.59	2.15	-62.09	-13.00	H
5092.45	-58.94	5.20	-9.76	2.15	-56.53	-13.00	V
5940.95	-54.56	5.52	-10.18	2.15	-52.05	-13.00	V
8876.07	-59.74	7.41	-12.50	2.15	-56.80	-13.00	V

**GSM Mode Channel 512/1850.2MHz**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit (dBm)	Polarization
3702.41	-62.48	4.44	-8.14	-58.78	-13.00	V
5547.72	-59.86	5.46	-10.02	-55.30	-13.00	V
7399.22	-61.76	6.42	-11.34	-56.84	-13.00	V
10221.62	-58.88	7.55	-12.44	-53.99	-13.00	H
11106.05	-59.98	8.43	-12.40	-56.01	-13.00	H
16655.25	-53.76	10.31	-12.40	-51.67	-13.00	H

**GSM Mode Channel 661/1880.0MHz**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit (dBm)	Polarization
3760.10	-37.96	4.52	-8.21	-34.27	-13.00	V
5639.91	-50.72	5.45	-10.06	-46.11	-13.00	V
7519.71	-52.10	6.81	-11.42	-47.49	-13.00	H
11279.56	-44.91	8.54	-12.40	-41.05	-13.00	V
13160.67	-49.20	9.15	-13.46	-44.89	-13.00	H
14860.38	-55.59	9.71	-13.53	-51.77	-13.00	V

**GSM Mode Channel 810/1909.8MHz**

Frequency(MHz)	P <sub>Mea</sub> (dBm)	Path Loss	Antenna Gain	Peak EIRP(dBm)	Limit (dBm)	Polarization
3819.57	-40.17	4.49	-8.28	-36.38	-13.00	V
5729.39	-51.98	5.55	-10.09	-47.44	-13.00	V
7639.33	-53.70	6.72	-11.54	-48.88	-13.00	V
9548.81	-53.78	7.79	-12.58	-48.99	-13.00	H
11458.96	-44.52	8.64	-12.40	-40.76	-13.00	V
13369.07	-52.04	9.07	-13.67	-47.44	-13.00	H

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

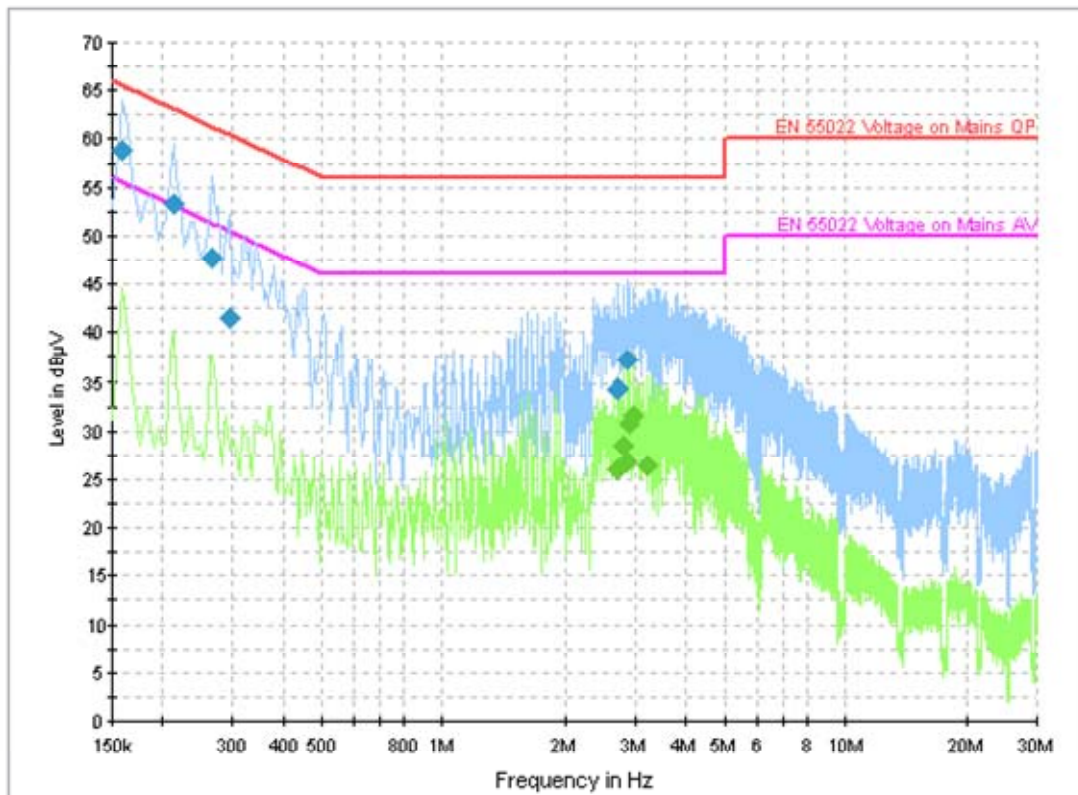
The measurement procedure in ANSI C63.4-1003 is used. Conducted Emission is measured with travel charger.

#### **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**  
**GSM850MHz –AE4**



**Final Result 1**

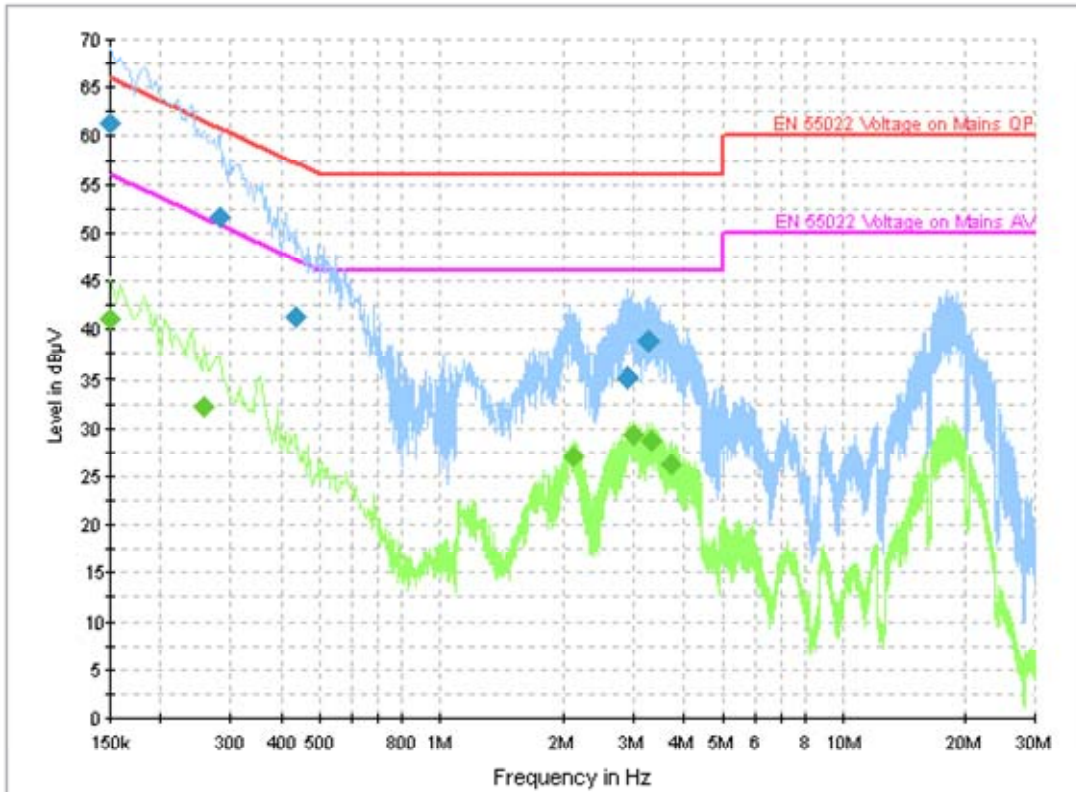
Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	58.9	GND	L1	10.0	6.7	65.5
0.213000	53.3	GND	L1	10.0	9.8	63.1
0.267000	47.8	GND	L1	10.0	13.4	61.2
0.294000	41.5	GND	L1	10.0	18.9	60.4
2.688000	34.3	GND	L1	10.0	21.7	56.0
2.845500	37.1	GND	L1	10.0	18.9	56.0

**Final Result 2**

Frequency (MHz)	Average (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.688000	26.0	GND	L1	10.0	20.0	46.0
2.796000	28.4	GND	L1	10.0	17.6	46.0
2.845500	26.8	GND	L1	10.0	19.2	46.0
2.904000	30.7	GND	L1	10.0	15.3	46.0
2.953500	31.6	GND	L1	10.0	14.4	46.0
3.187500	26.4	GND	L1	10.0	19.6	46.0



**GSM850MHz –AE5**



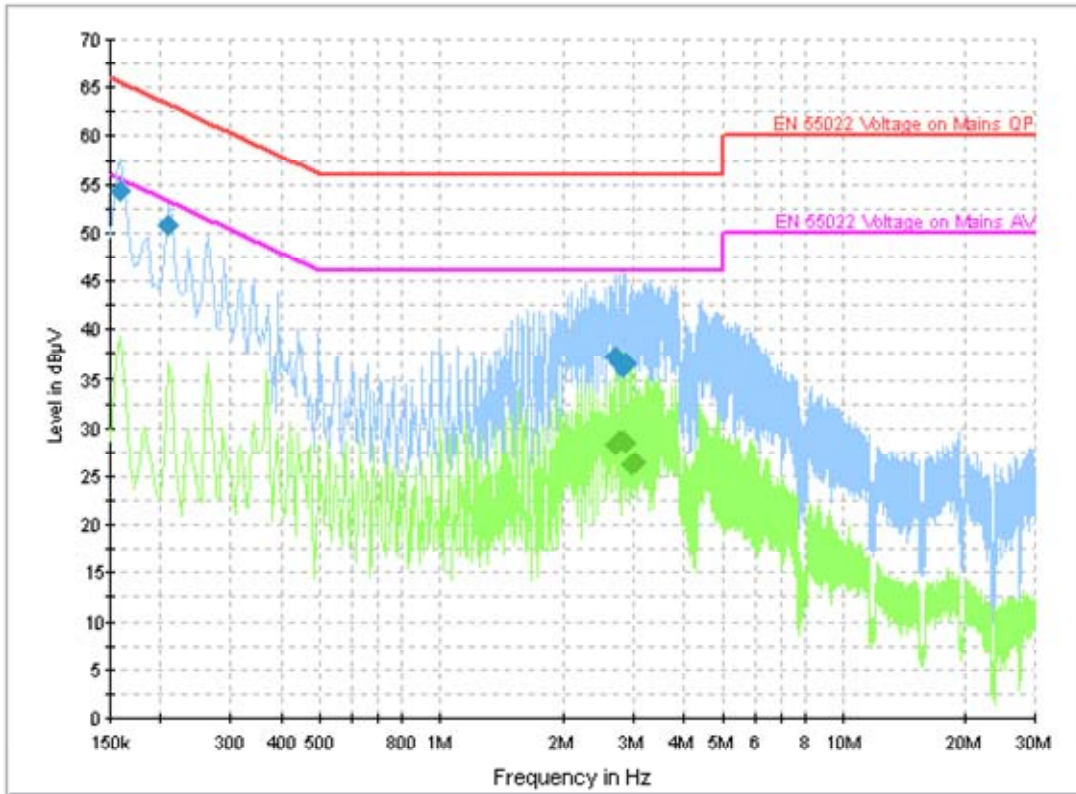
**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	61.3	GND	L1	10.0	4.7	66.0
0.280500	51.6	GND	L1	10.0	9.2	60.8
0.433500	41.3	GND	L1	10.0	15.8	57.2
2.877000	35.2	GND	L1	10.0	20.8	56.0
3.228000	38.8	GND	L1	10.0	17.2	56.0
3.273000	38.9	GND	L1	10.0	17.1	56.0

**Final Result 2**

Frequency (MHz)	Average (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	41.1	GND	L1	10.0	14.9	56.0
0.258000	32.3	GND	L1	10.0	19.2	51.5
2.121000	27.1	GND	L1	10.0	18.9	46.0
2.980500	29.3	GND	L1	10.0	16.7	46.0
3.304500	28.6	GND	L1	10.0	17.4	46.0
3.736500	26.2	GND	L1	10.0	19.8	46.0

PCS1900MHz –AE4



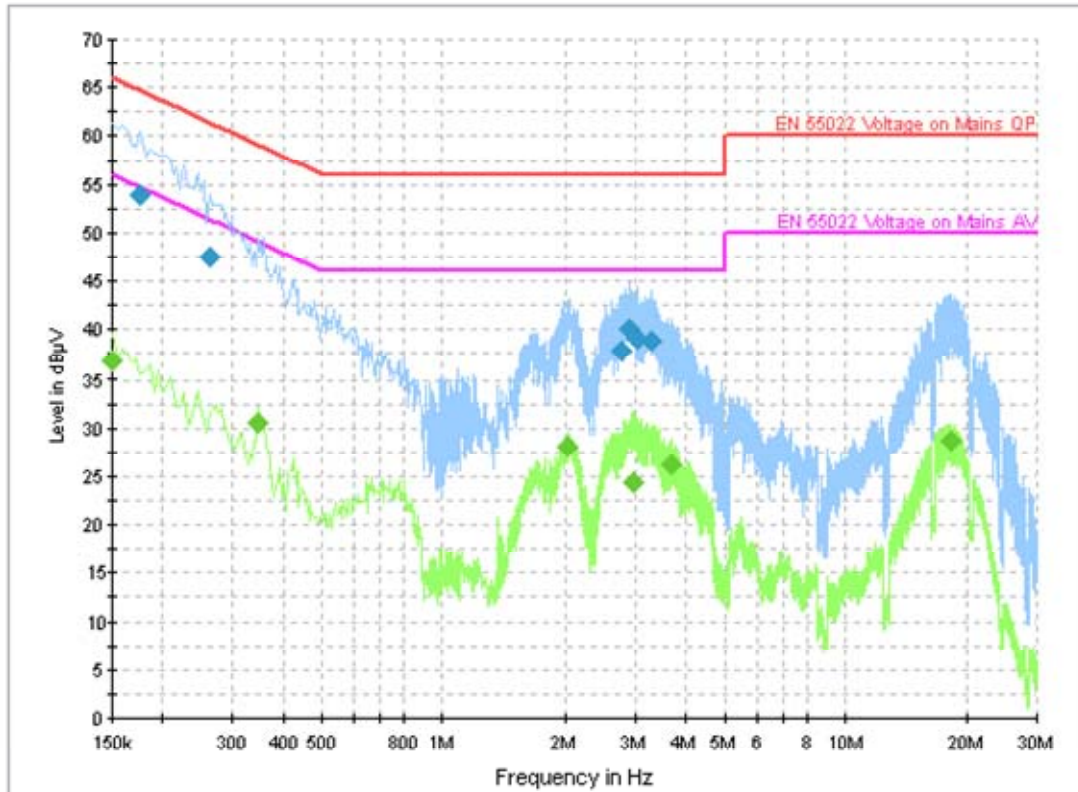
**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	54.3	GND	N	10.0	11.3	65.5
0.208500	50.9	GND	N	10.0	12.4	63.3
2.710500	37.1	GND	L1	10.0	18.9	56.0
2.760000	36.7	GND	L1	10.0	19.3	56.0
2.814000	36.3	GND	L1	10.0	19.7	56.0
2.863500	36.5	GND	L1	10.0	19.5	56.0

**Final Result 2**

Frequency (MHz)	Average (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.710500	28.4	GND	L1	10.0	17.6	46.0
2.760000	28.6	GND	L1	10.0	17.4	46.0
2.814000	28.6	GND	L1	10.0	17.4	46.0
2.863500	28.6	GND	L1	10.0	17.4	46.0
2.971500	26.3	GND	L1	10.0	19.7	46.0
3.021000	26.3	GND	L1	10.0	19.7	46.0

PCS1900MHz –AE5



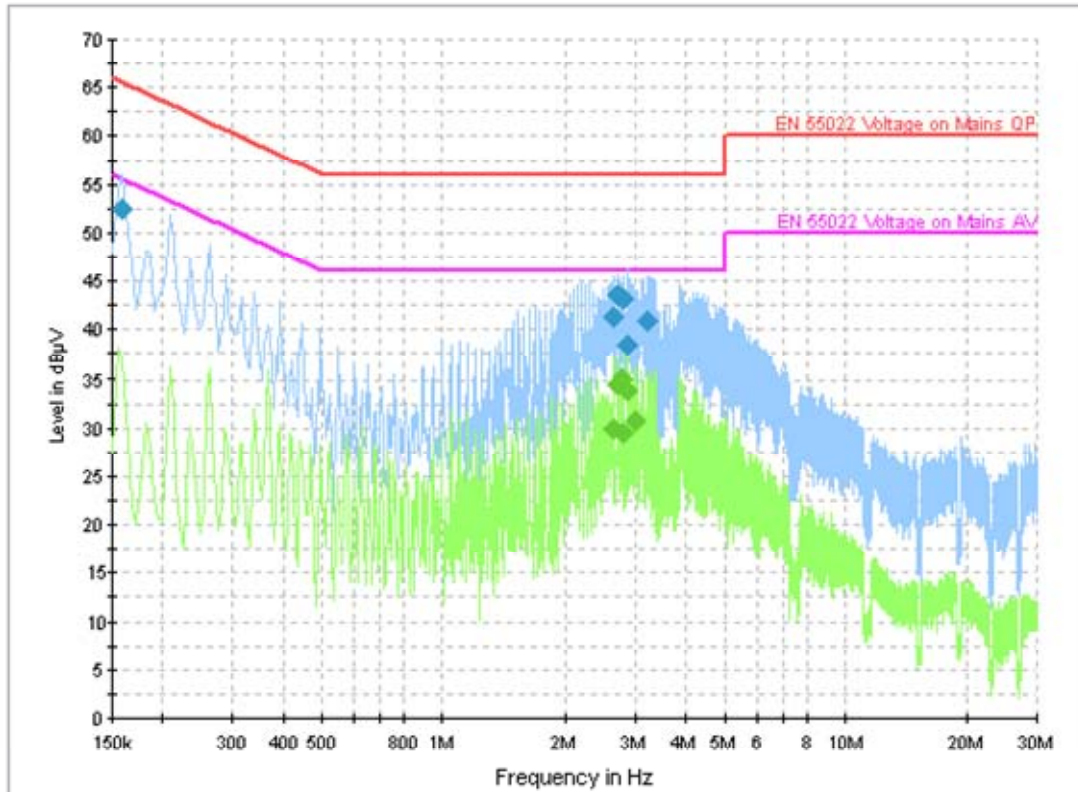
**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.177000	53.8	GND	L1	10.0	10.8	64.6
0.262500	47.5	GND	L1	10.0	13.8	61.4
2.760000	37.8	GND	L1	10.0	18.2	56.0
2.890500	40.1	GND	L1	10.0	15.9	56.0
3.016500	39.1	GND	L1	10.0	16.9	56.0
3.268500	38.7	GND	L1	10.0	17.3	56.0

**Final Result 2**

Frequency (MHz)	Average (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	36.7	GND	L1	10.0	19.3	56.0
0.348000	30.5	GND	L1	10.0	18.5	49.0
2.017500	28.1	GND	L1	10.0	17.9	46.0
2.967000	24.3	GND	L1	10.0	21.7	46.0
3.682500	26.2	GND	L1	10.0	19.8	46.0
18.348000	28.6	GND	L1	9.7	21.4	50.0

MP3



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	52.5	GND	L1	10.0	13.0	65.5
2.643000	41.3	GND	L1	10.0	14.7	56.0
2.692500	43.6	GND	L1	10.0	12.4	56.0
2.800500	43.1	GND	L1	10.0	12.9	56.0
2.850000	38.3	GND	L1	10.0	17.7	56.0
3.192000	40.8	GND	L1	10.0	15.2	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.643000	29.9	GND	L1	10.0	16.1	46.0
2.692500	34.5	GND	L1	10.0	11.5	46.0
2.746500	34.8	GND	L1	10.0	11.2	46.0
2.800500	29.5	GND	L1	10.0	16.5	46.0
2.850000	33.9	GND	L1	10.0	12.1	46.0
3.007500	30.7	GND	L1	10.0	15.3	46.0

## **A.4 FREQUENCY STABILITY**

### **A.4.1 Method of Measurement**

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a "call mode". This is accomplished with the use of R&S CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30°C.
3. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on mid channel of PCS 1900 and 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 3.7VDC. 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)
3.7	13	0.015
4.2	19	0.022
3.5	-21	0.026

##### Frequency Error vs Temperature

temperature(°C)	Frequency error(Hz)	Frequency error(ppm)
50	13	0.016
40	15	0.018
30	13	0.016
20	14	0.016
10	-22	0.026
0	13	0.016
- 10	15	0.018
- 20	16	0.020
- 30	24	0.028

##### PCS 1900

##### Frequency Error vs Voltage

Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
3.7	33	0.018
4.2	27	0.014
3.5	29	0.015

##### Frequency Error vs Temperature

temperature(°C)	Frequency error(Hz)	Frequency error(ppm)
50	34	0.018
40	33	0.018
30	41	0.022
20	39	0.021
10	34	0.018
0	34	0.018
- 10	36	0.019
- 20	49	0.026
- 30	34	0.018

## A.5 OCCUPIED BANDWIDTH

### A.5.1 Occupied Bandwidth Results

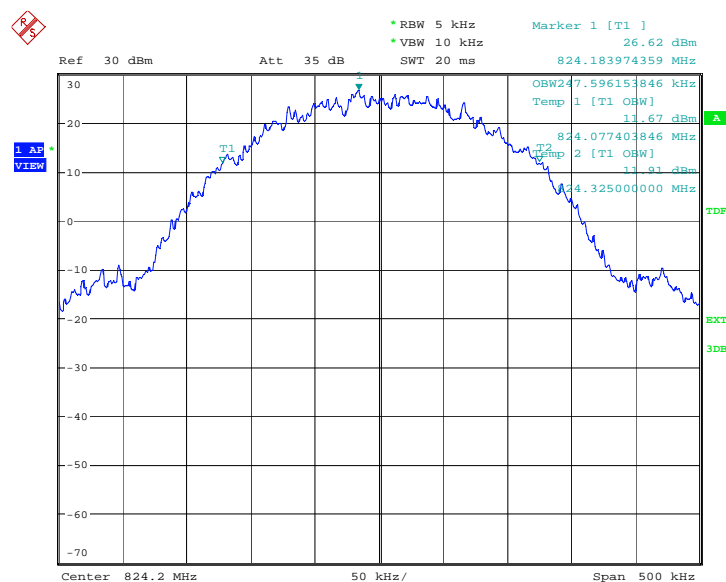
Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of PCS1900 band and GSM850 band. The table below lists the measured -20dBc BW. Spectrum analyzer plots are included on the following pages.

#### GSM 850(-20dBc)

Frequency(MHz)	Occupied Bandwidth (-20dBc BW)( kHz)
824.2	247.596
836.6	243.590
848.8	244.391

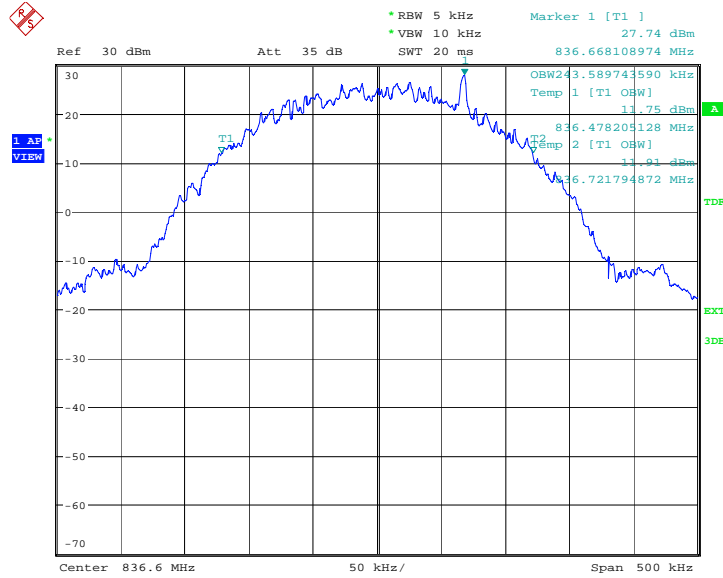
#### GSM 850

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



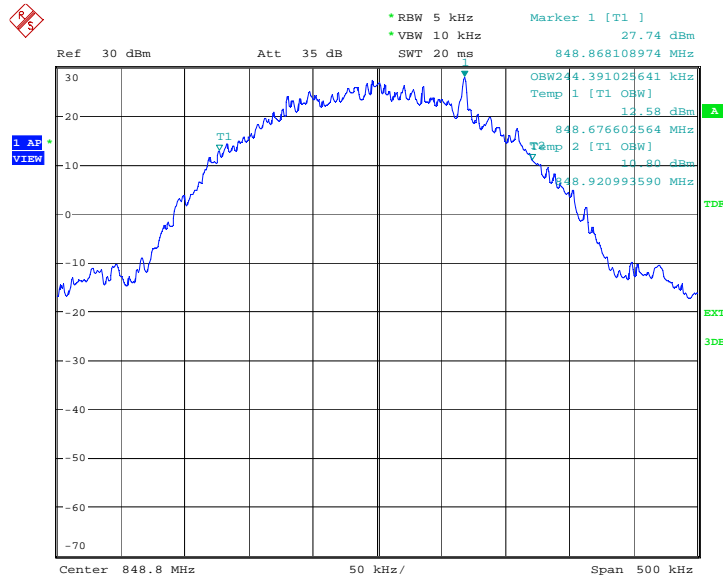
Date: 3.APR.2013 05:21:48

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



Date: 3.APR.2013 05:22:20

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



Date: 3.APR.2013 05:22:52

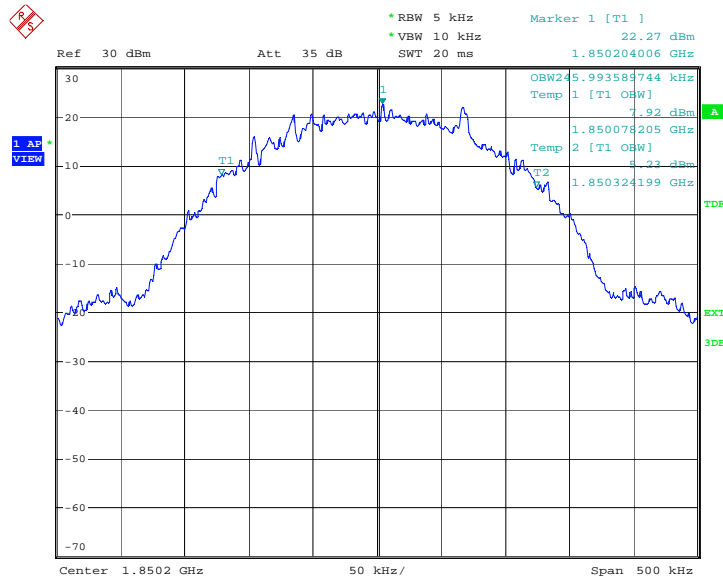


**PCS 1900(-20dBc)**

Frequency(MHz)	Occupied Bandwidth (-20dBc BW)( kHz)
1850.2	245.994
1880.0	243.590
1909.8	244.391

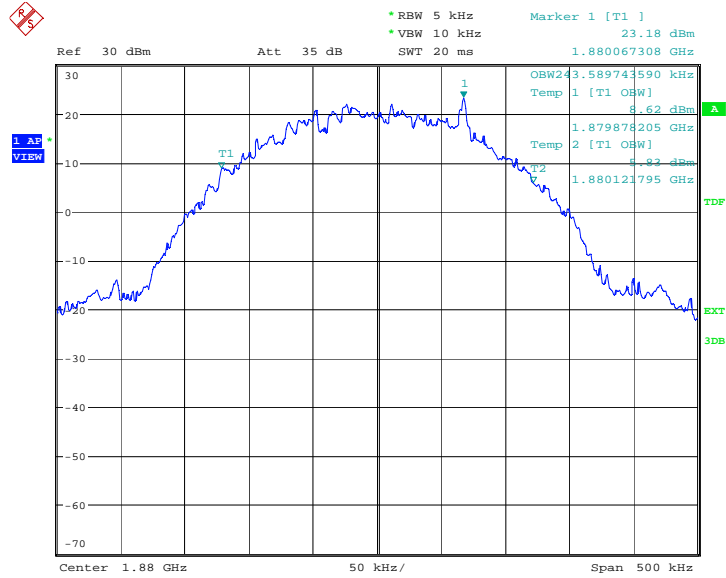
**PCS 1900**

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



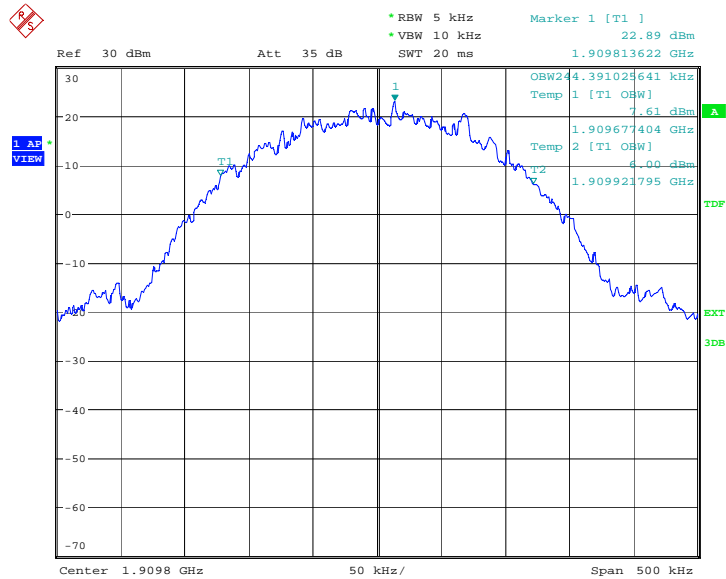
Date: 3.APR.2013 05:39:55

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



Date: 3.APR.2013 05:40:27

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



Date: 3.APR.2013 05:40:59

## A.6 EMISSION BANDWIDTH

### A.6.1 Emission Bandwidth Results

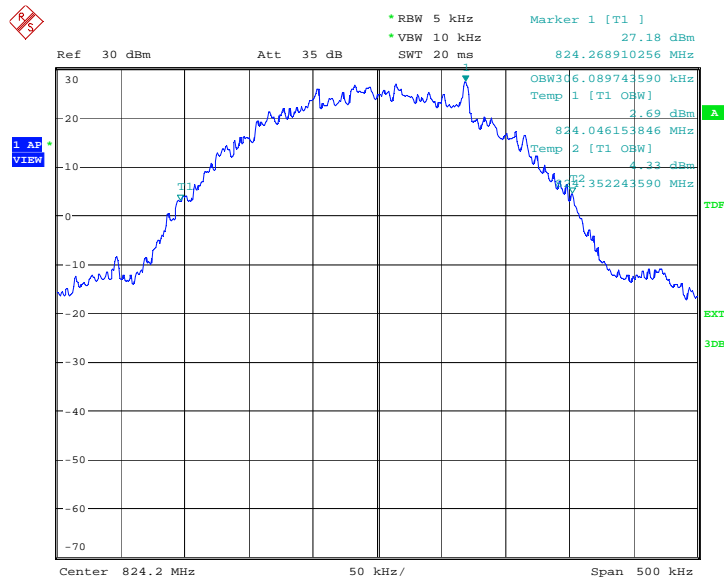
Similar to conducted emissions; Emission bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of PCS1900 band and GSM850 band. Table below lists the measured -26dBc BW. Spectrum analyzer plots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

#### GSM 850(-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc BW)( kHz)
824.2	306.090
836.6	302.885
848.8	306.090

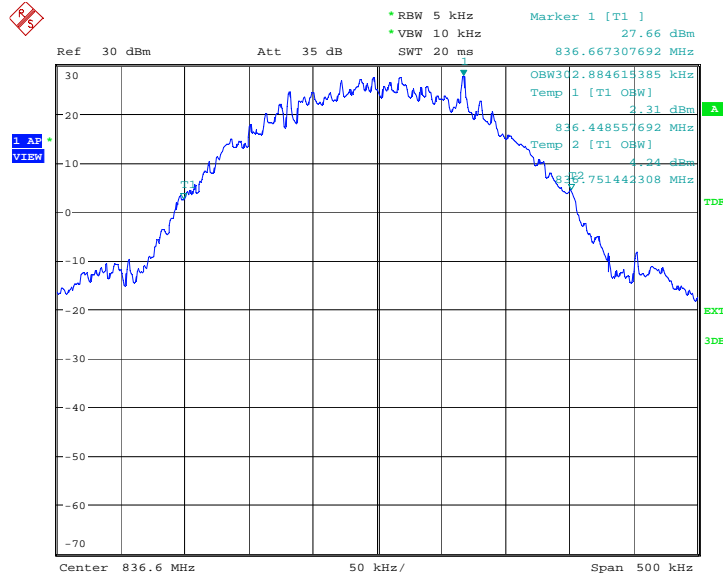
#### GSM 850

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



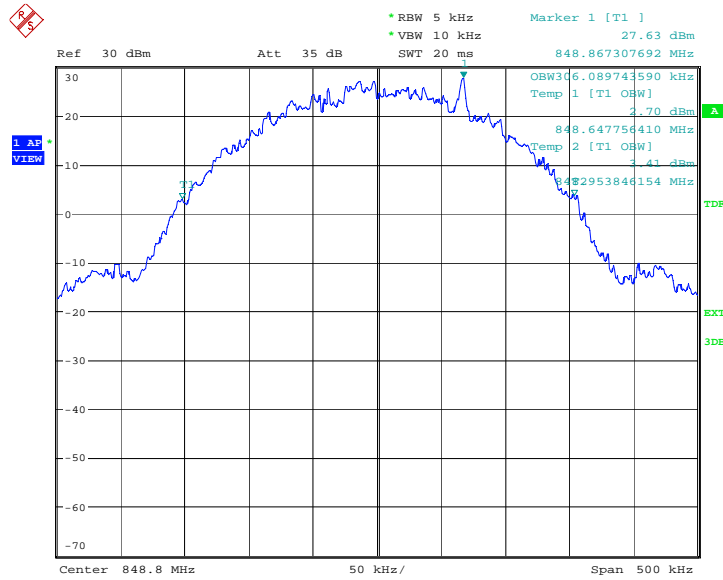
Date: 3.APR.2013 05:23:26

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



Date: 3.APR.2013 05:23:58

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



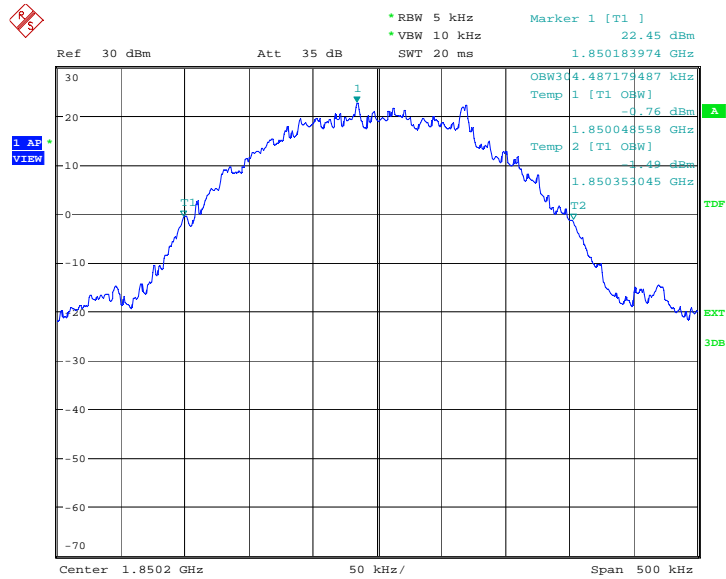
Date: 3.APR.2013 05:24:30

**PCS 1900(-26dBc)**

Frequency(MHz)	Occupied Bandwidth (-26dBc BW)( kHz)
1850.2	304.487
1880.0	305.288
1909.8	310.096

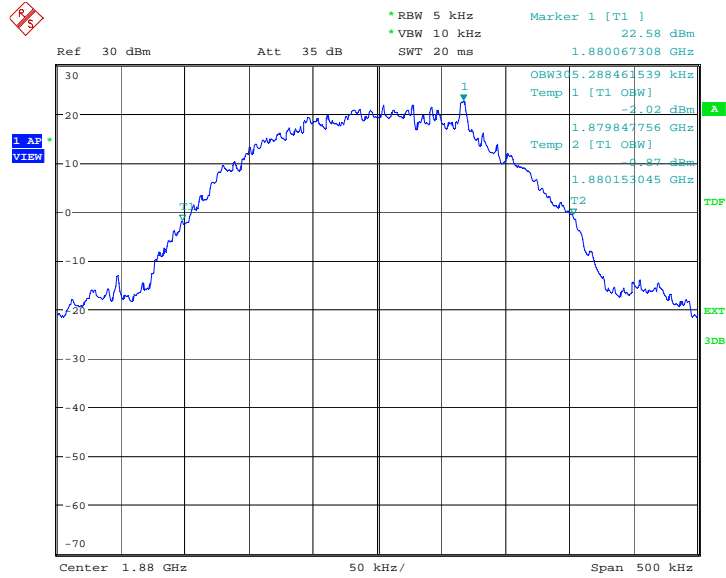
**PCS 1900**

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



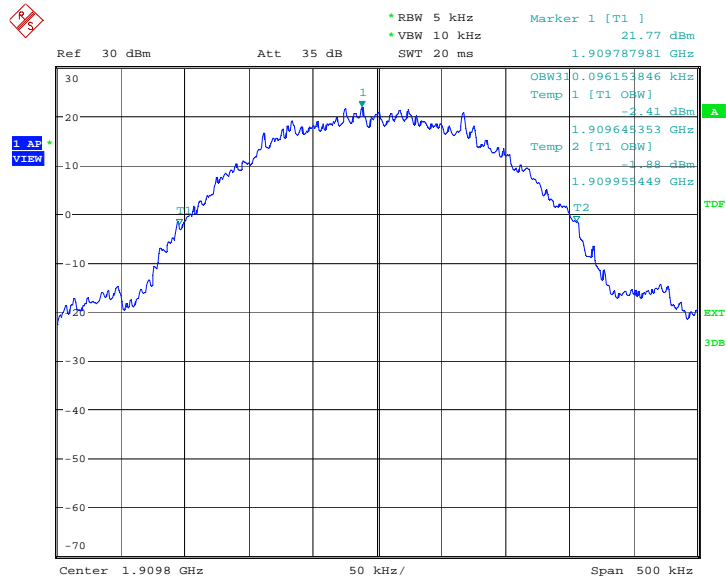
Date: 3.APR.2013 05:41:33

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



Date: 3.APR.2013 05:42:05

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

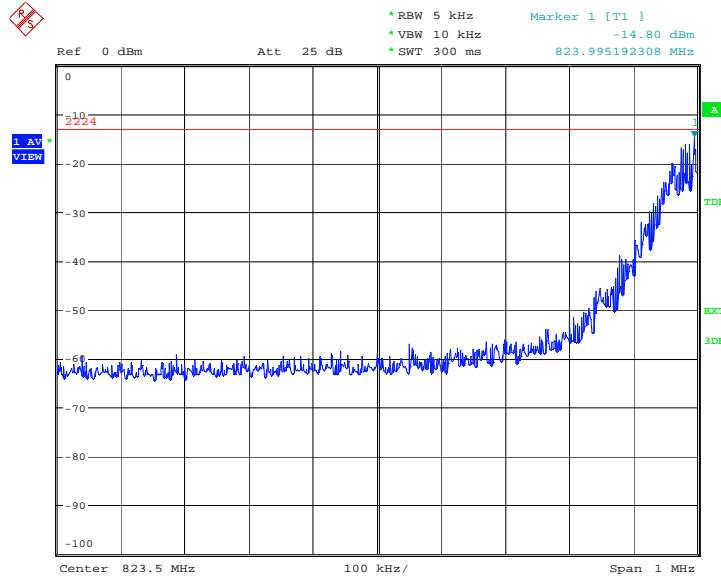


Date: 3.APR.2013 05:42:37

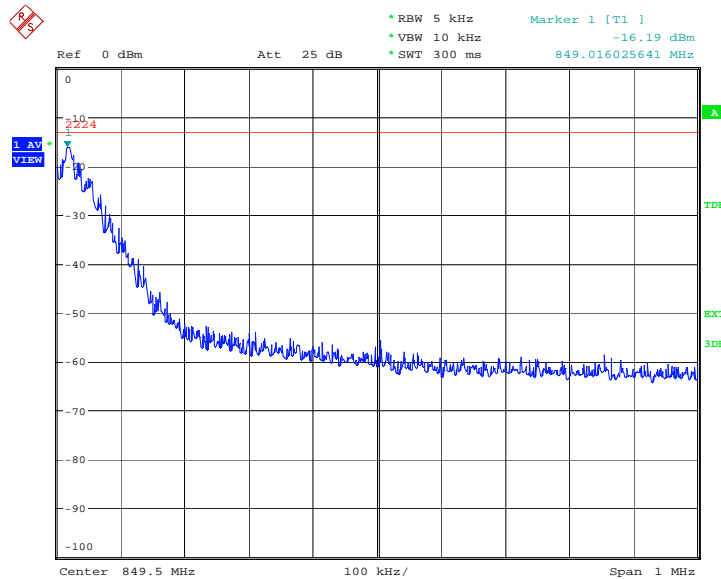
## A.7 BAND EDGE COMPLIANCE

### GSM 850

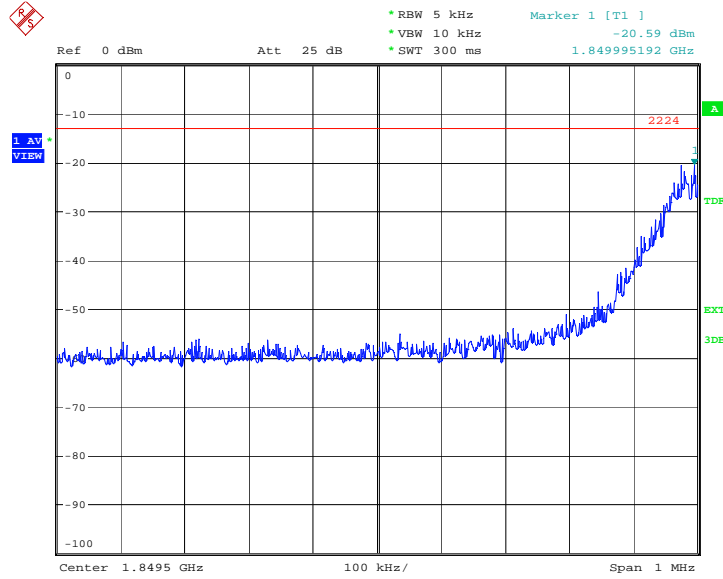
#### LOW BAND EDGE BLOCK-A (GSM850)-Channel 128



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

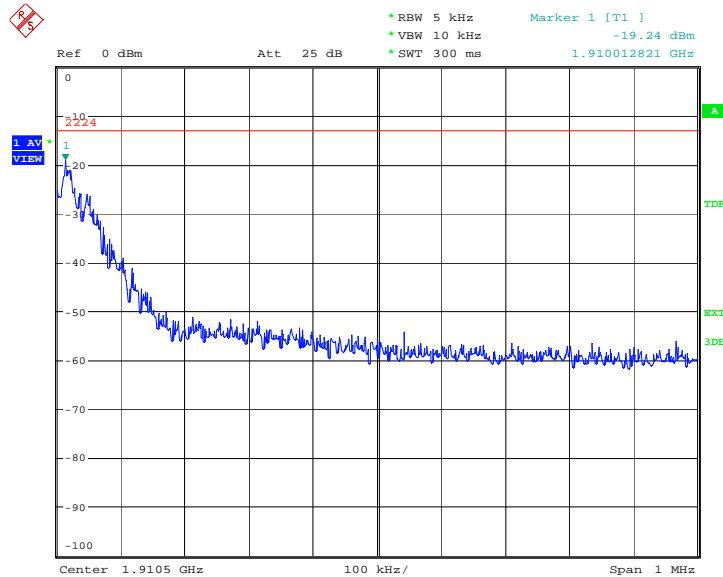


**PCS 1900**  
**LOW BAND EDGE BLOCK-A (PCS-1900)-Channel 512**



Date: 3.APR.2013 05:42:50

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



Date: 3.APR.2013 05:43:04



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

### **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 10 GHz.
2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; If the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give a optimal sweep time according the selected span and RBW.
3. The procedure to get the conducted spurious emission is as follows:  
The trace mode is set to MaxHold to get the highest signal at each frequency;  
Wait 25 seconds;  
Get the result.
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

#### **GSM850 Transmitter**

Channel	Frequency (MHz)
128	824.2
190	836.6
251	848.8

#### **PCS1900 Transmitter**

Channel	Frequency (MHz)
512	1850.2
661	1880.0
810	1909.8

### **A. 8.2 Measurement Limit**

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

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

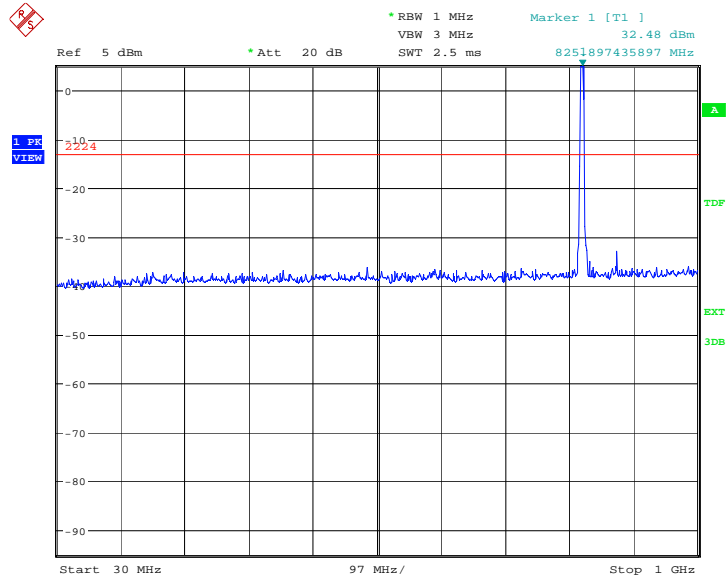
### A. 8.3 Measurement result

#### GSM850

##### A.8.3.1 Channel 128: 30MHz – 1GHz

Spurious emission limit –13dBm.

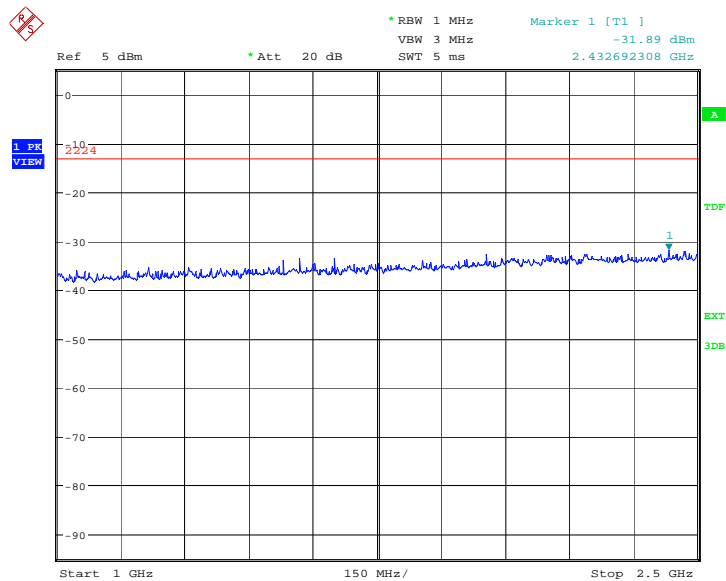
**NOTE: peak above the limit line is the carrier frequency.**



Date: 3.APR.2013 05:25:27

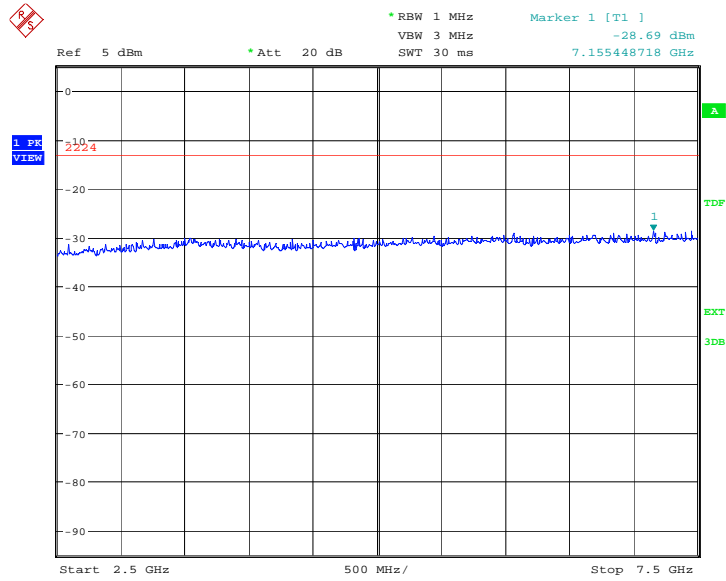
##### A.8.3.2 Channel 128: 1GHz – 2.5GHz

Spurious emission limit –13dBm.



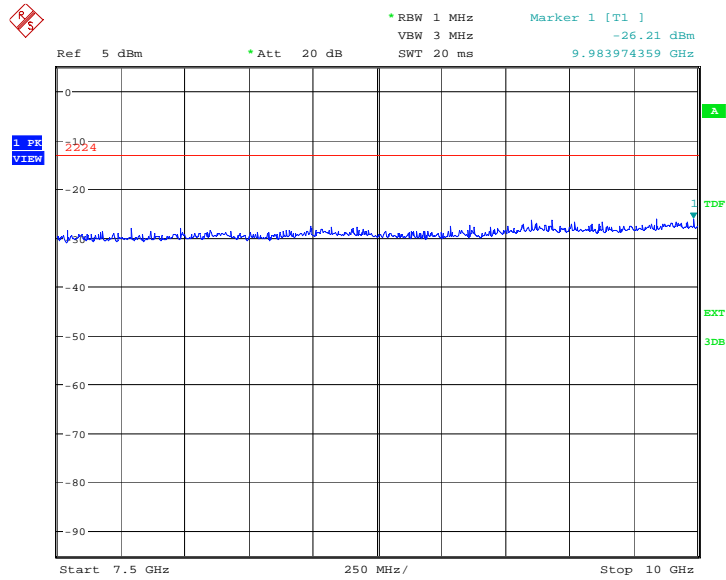
Date: 3.APR.2013 05:25:55

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



Date: 3.APR.2013 05:26:23

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

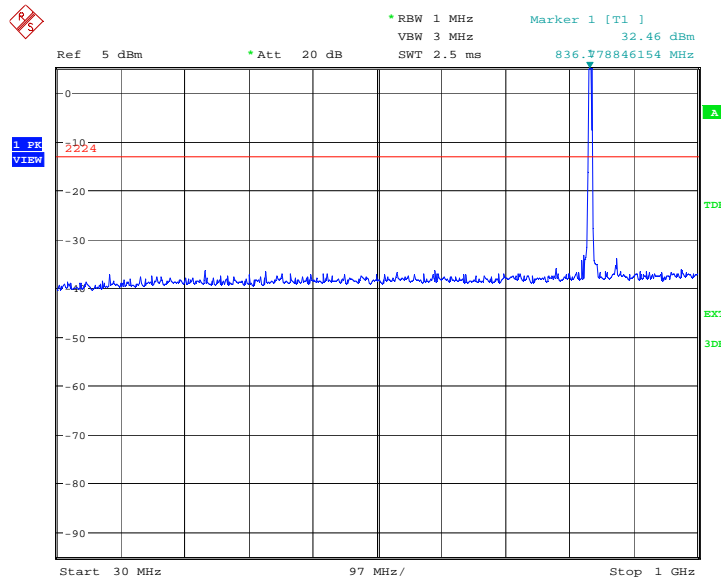


Date: 3.APR.2013 05:26:51

### A.8.3.5 Channel 190: 30MHz – 1GHz

Spurious emission limit –13dBm

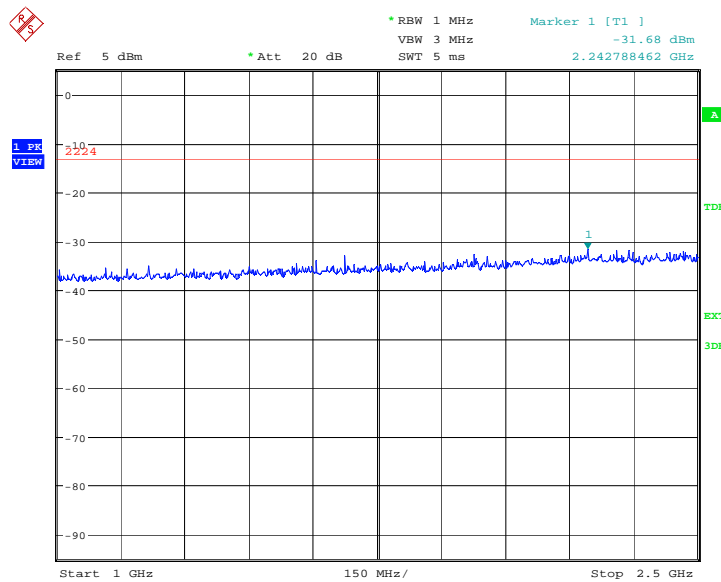
**NOTE: peak above the limit line is the carrier frequency.**



Date: 3.APR.2013 05:27:20

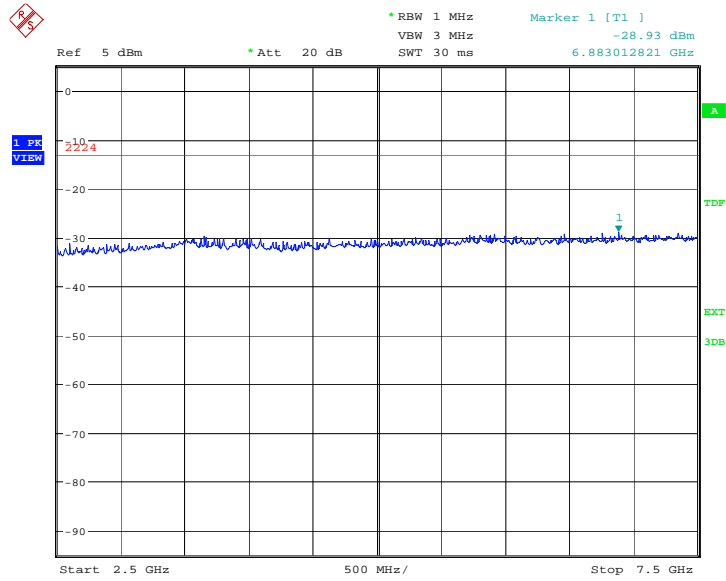
### A.8.3.6 Channel 190: 1GHz –2.5GHz

Spurious emission limit –13dBm



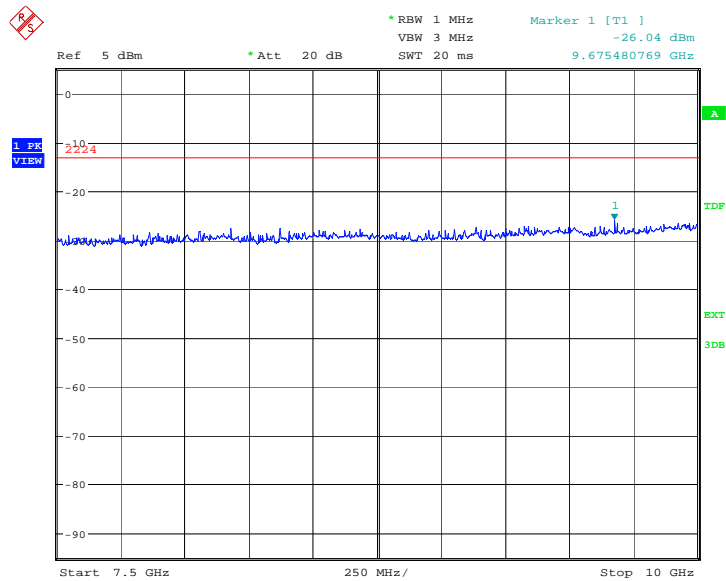
Date: 3.APR.2013 05:27:48

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



Date: 3.APR.2013 05:28:16

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

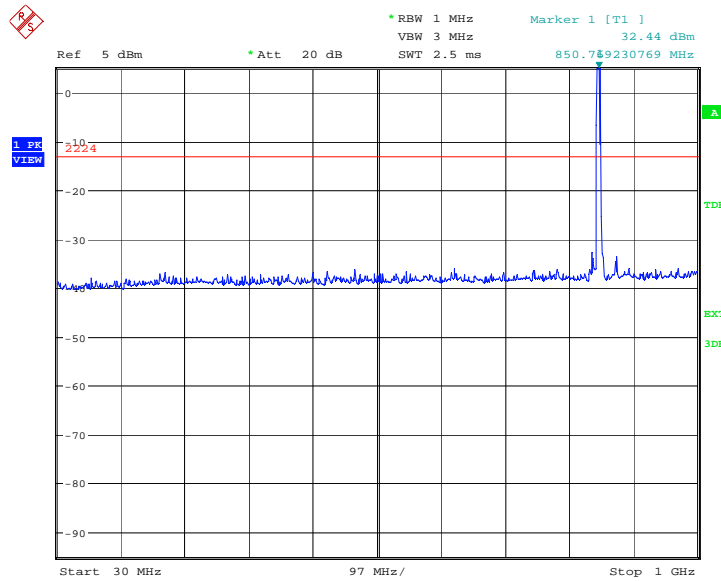


Date: 3.APR.2013 05:28:44

### A.8.3.9 Channel 251: 30MHz – 1GHz

Spurious emission limit –13dBm.

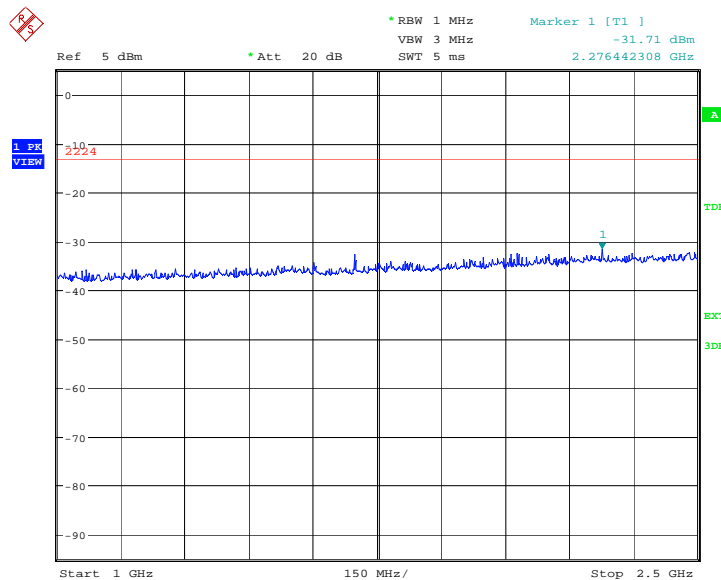
**NOTE: peak above the limit line is the carrier frequency.**



Date: 3.APR.2013 05:29:13

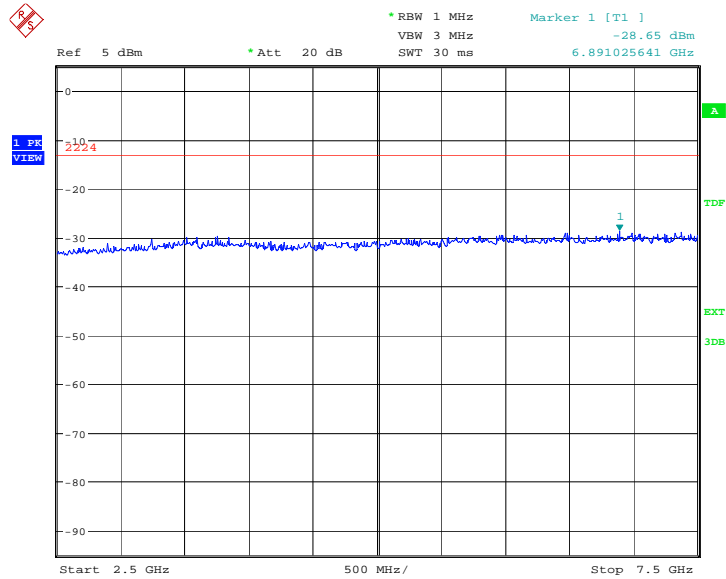
### A.8.3.10 Channel 251: 1GHz – 2.5GHz

Spurious emission limit –13dBm.



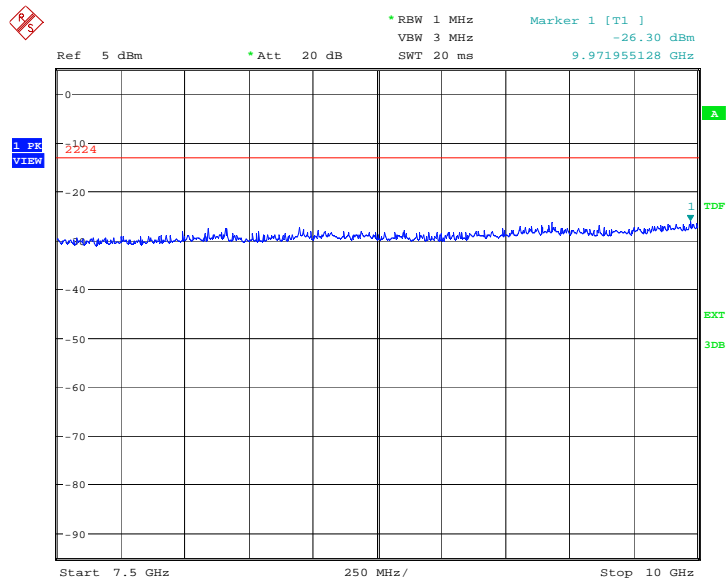
Date: 3.APR.2013 05:29:41

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



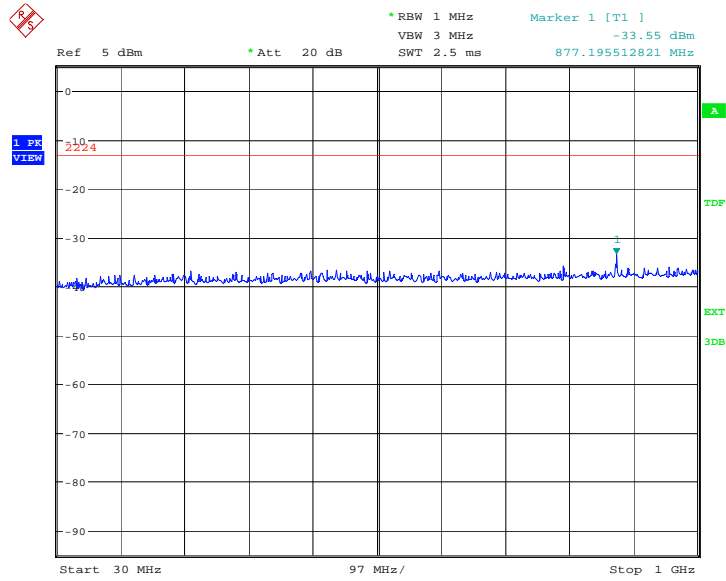
Date: 3.APR.2013 05:30:09

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



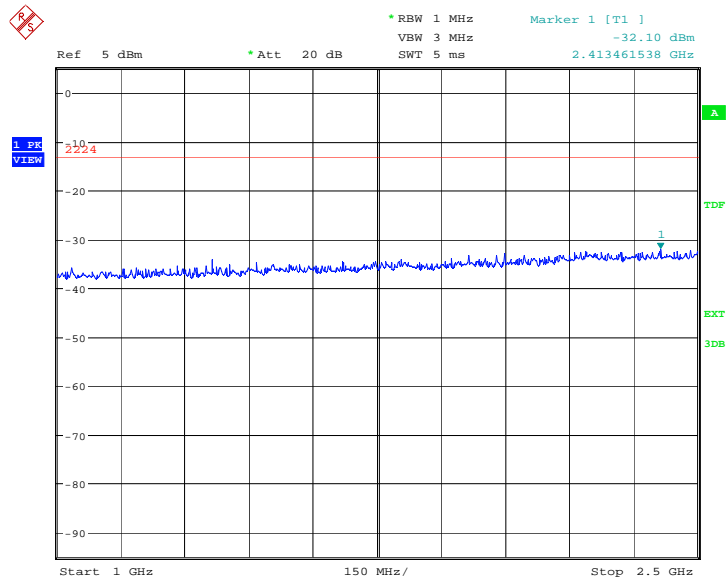
Date: 3.APR.2013 05:30:37

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



Date: 3.APR.2013 05:31:06

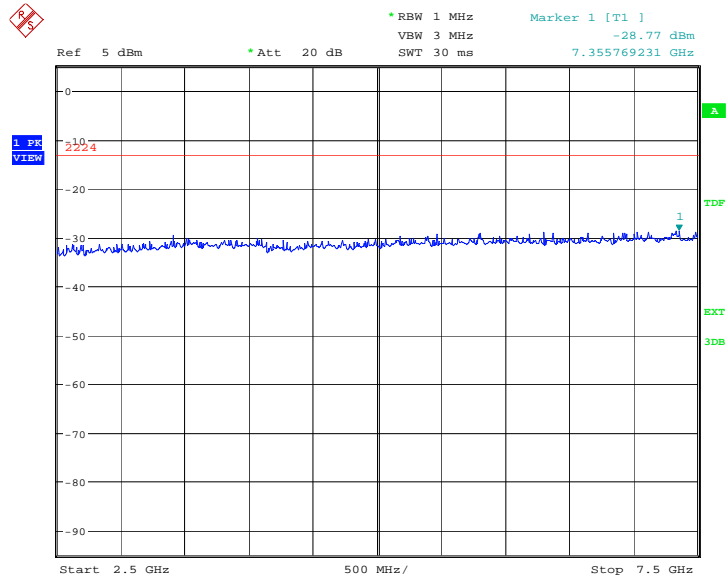
**A.8.3.14 Idle mode: 1GHz – 2.5GHz**  
Spurious emission limit –13dBm.



Date: 3.APR.2013 05:31:34

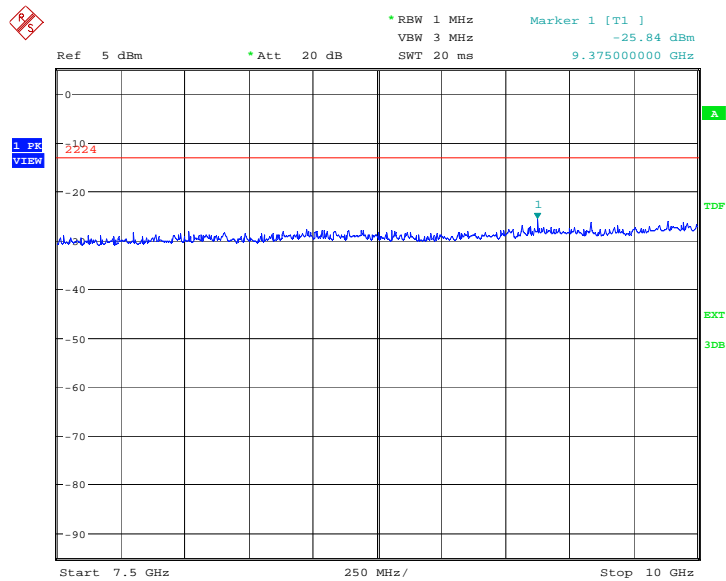


**A.8.3.15 Idle mode: 2.5GHz – 7.5GHz**  
Spurious emission limit –13dBm.



Date: 3.APR.2013 05:32:02

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

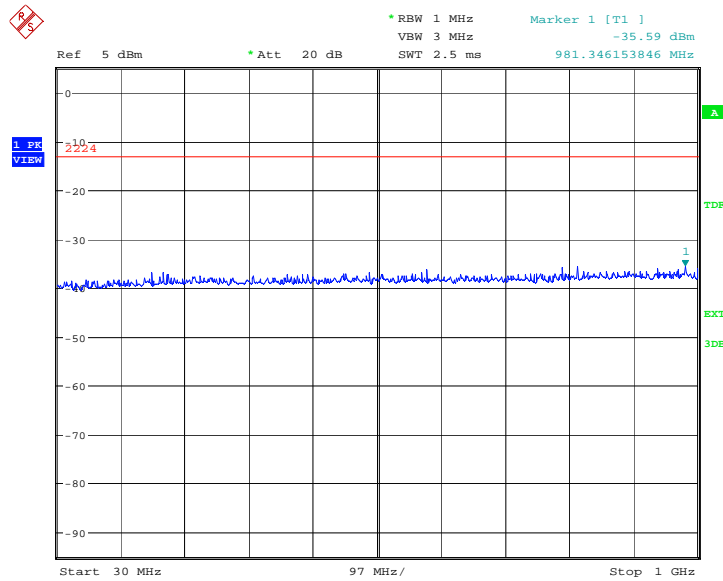


Date: 3.APR.2013 05:32:30

**PCS1900**

**A.8.3.17 Channel 512: 30MHz – 1GHz**

Spurious emission limit –13dBm.

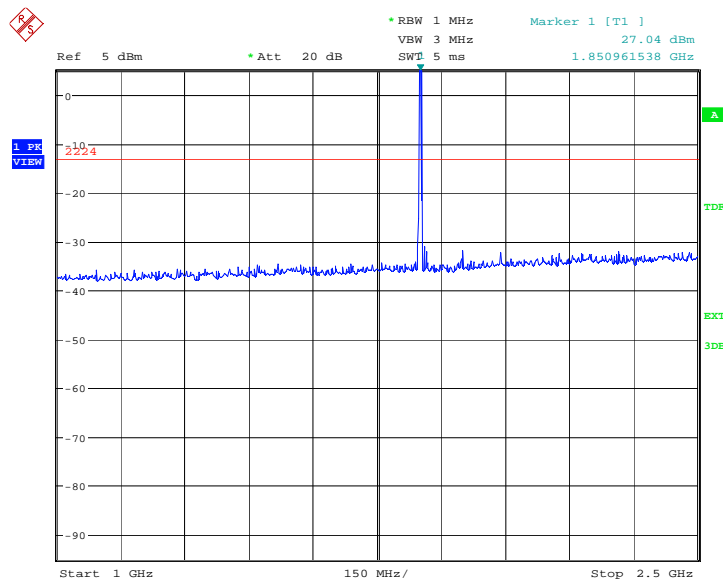


Date: 3.APR.2013 05:43:33

**A.8.3.18 Channel 512: 1GHz – 2.5GHz**

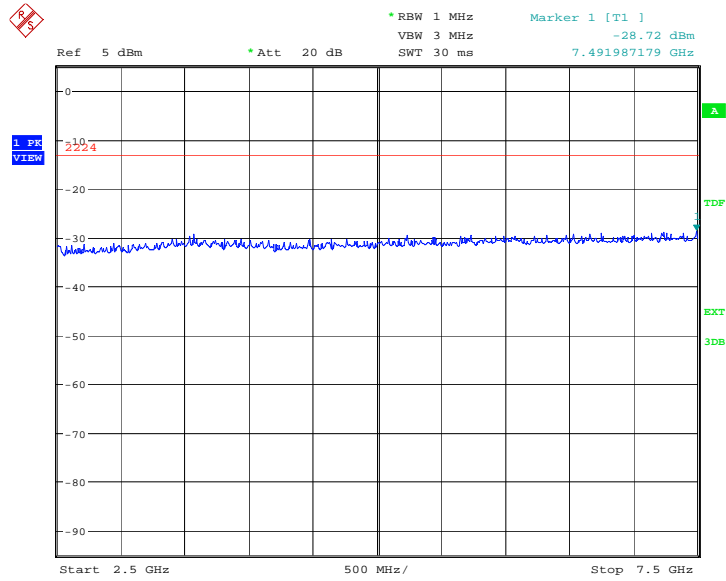
Spurious emission limit –13dBm.

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



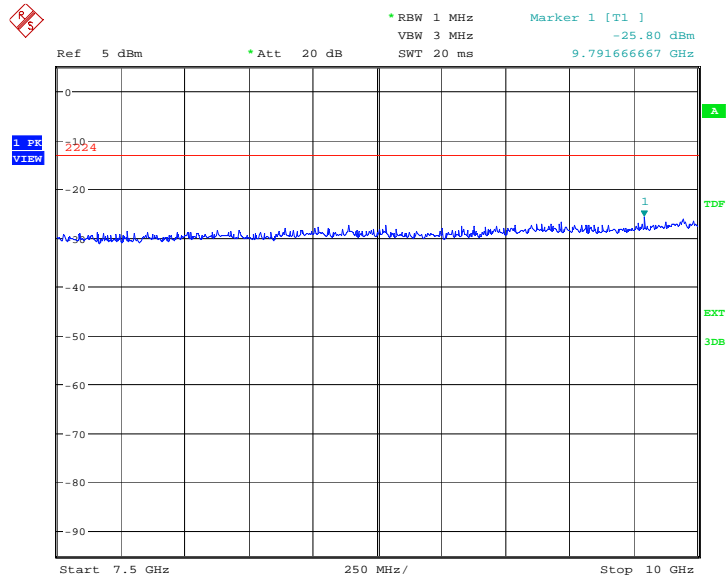
Date: 3.APR.2013 05:44:01

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



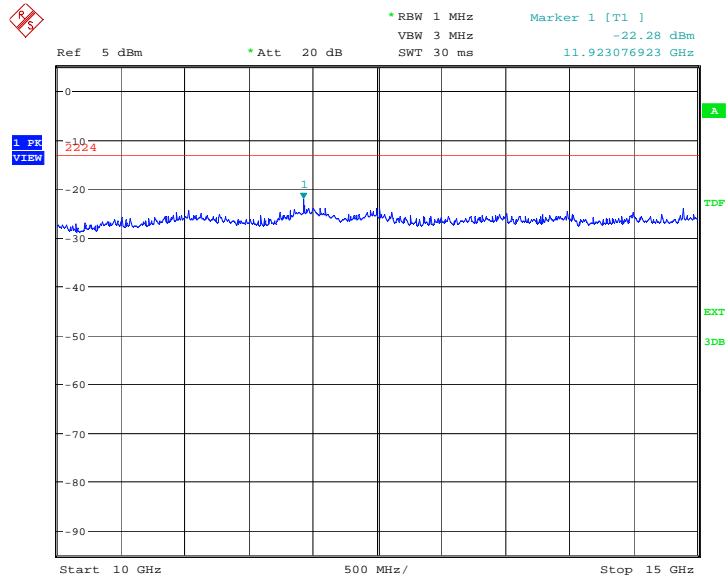
Date: 3.APR.2013 05:44:29

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



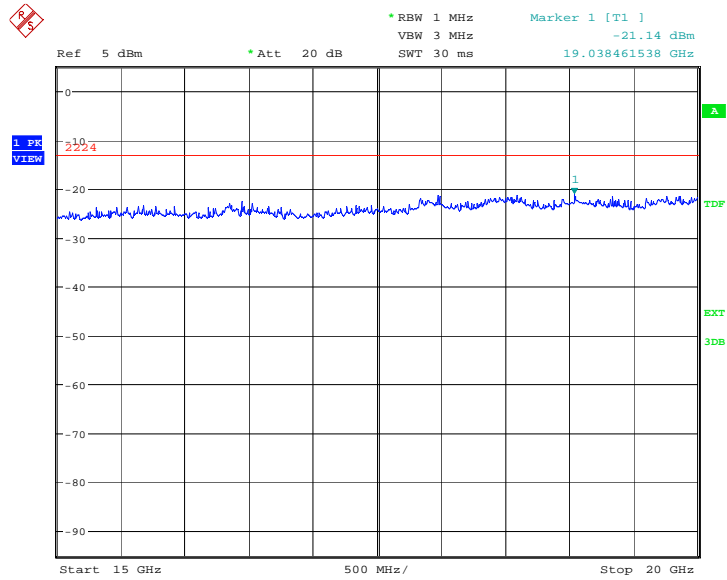
Date: 3.APR.2013 05:44:57

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



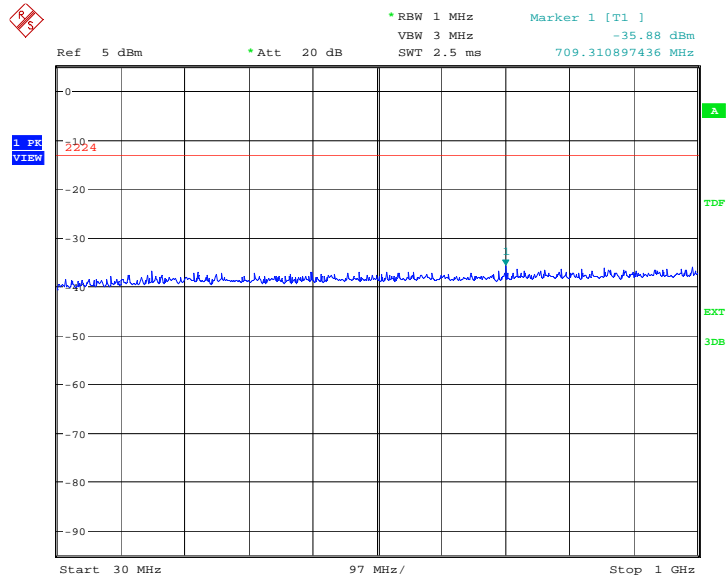
Date: 3.APR.2013 05:45:25

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



Date: 3.APR.2013 05:45:53

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

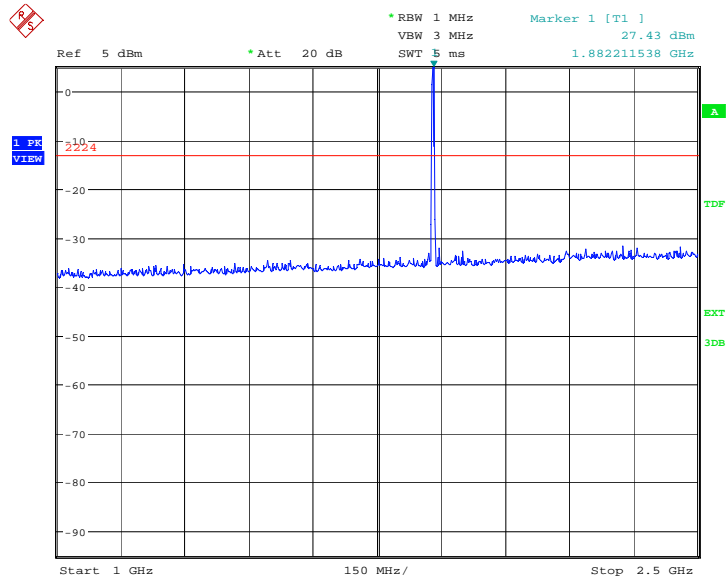


Date: 3.APR.2013 05:46:22

**A.8.3.24 Channel 661: 1GHz –2.5GHz**

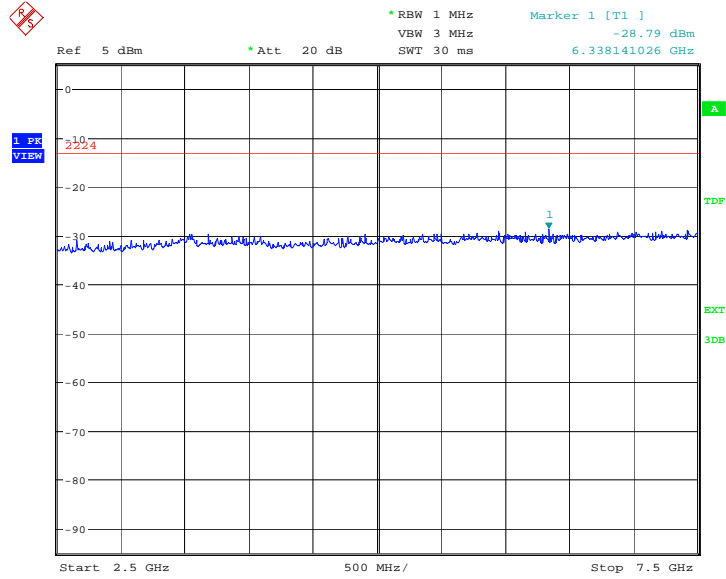
Spurious emission limit –13dBm

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



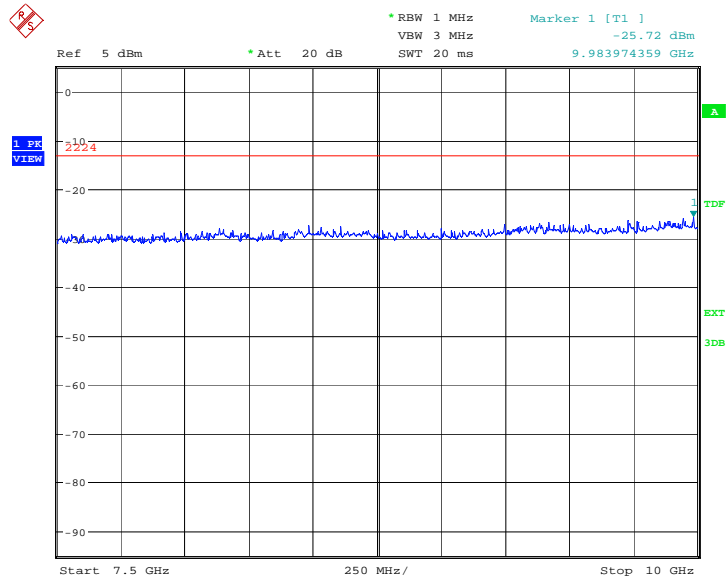
Date: 3.APR.2013 05:46:50

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



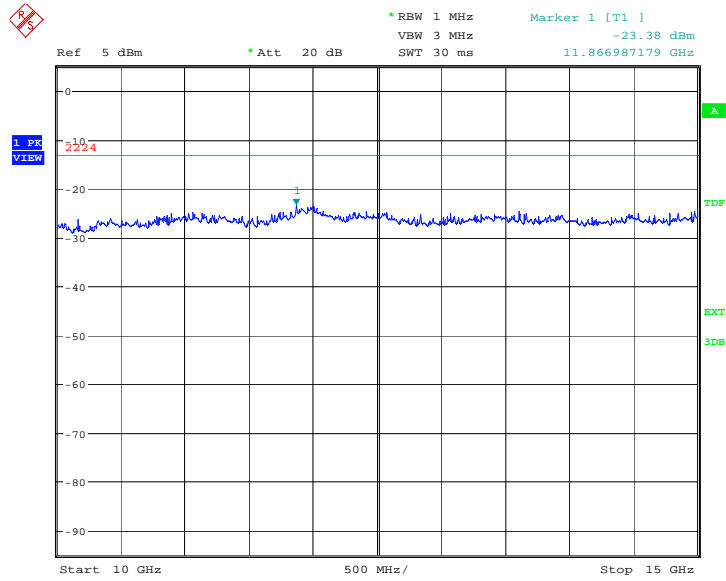
Date: 3.APR.2013 05:47:19

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



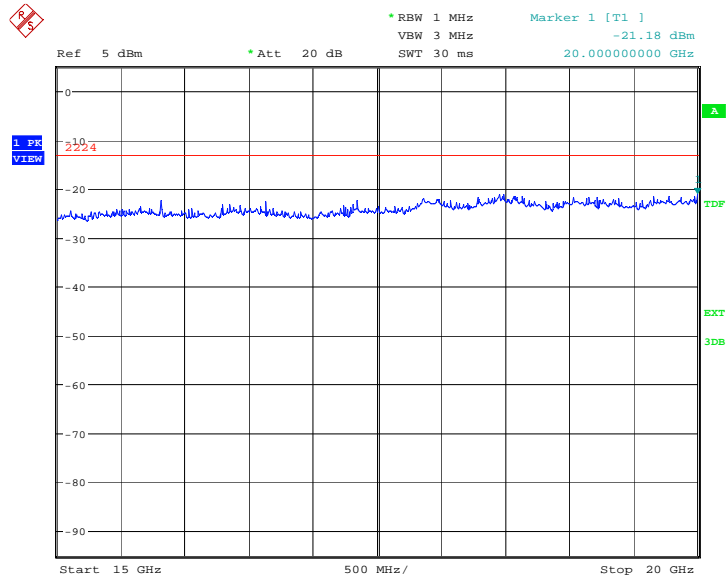
Date: 3.APR.2013 05:47:47

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



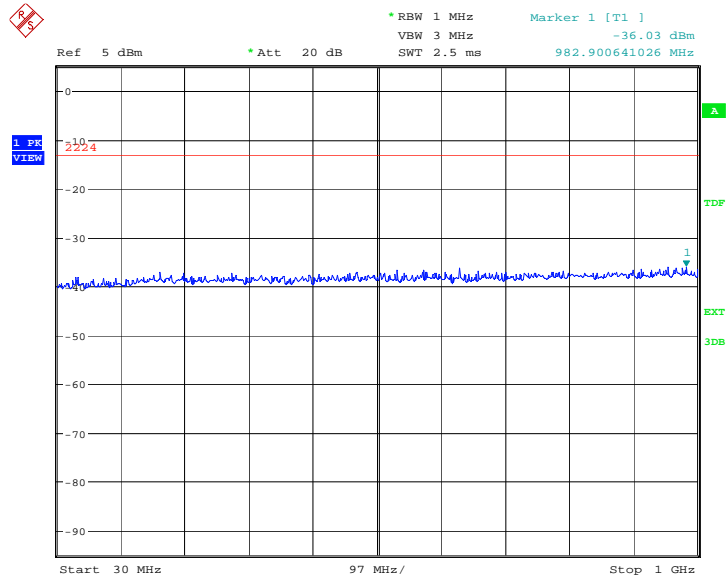
Date: 3.APR.2013 05:48:15

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



Date: 3.APR.2013 05:48:43

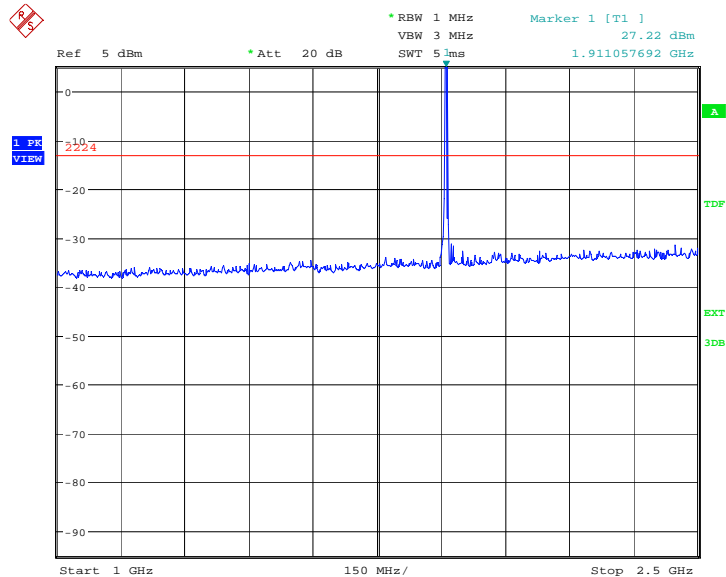
**A.8.3.29 Channel 810: 30MHz – 1GHz**  
Spurious emission limit –13dBm.



Date: 3.APR.2013 05:49:12

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

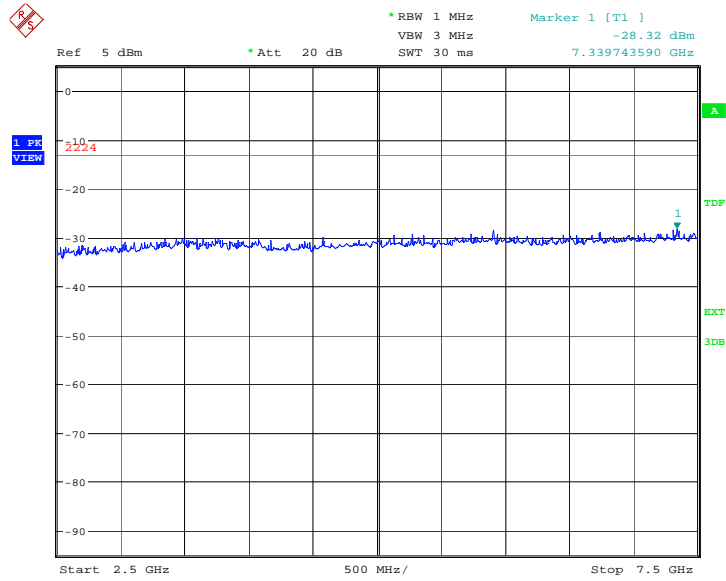
**NOTE: peak above the limit line is the carrier frequency.**



Date: 3.APR.2013 05:49:40

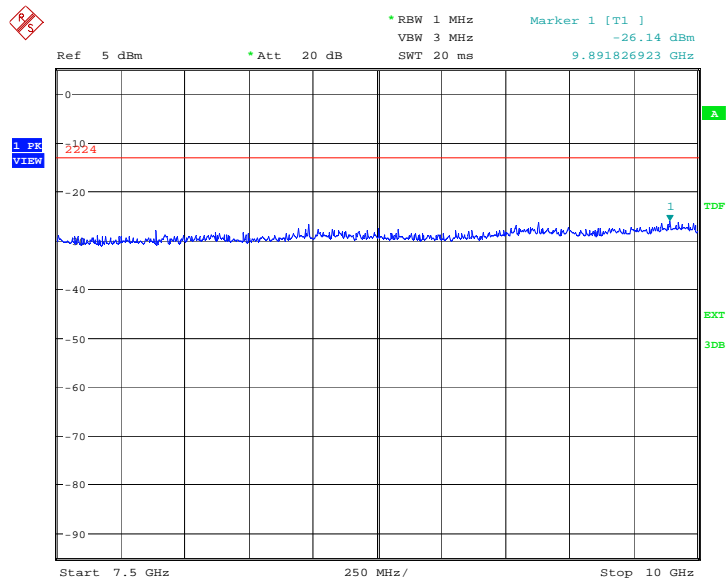


**A.8.3.31 Channel 810:2.5GHz – 7.5GHz**  
Spurious emission limit –13dBm.



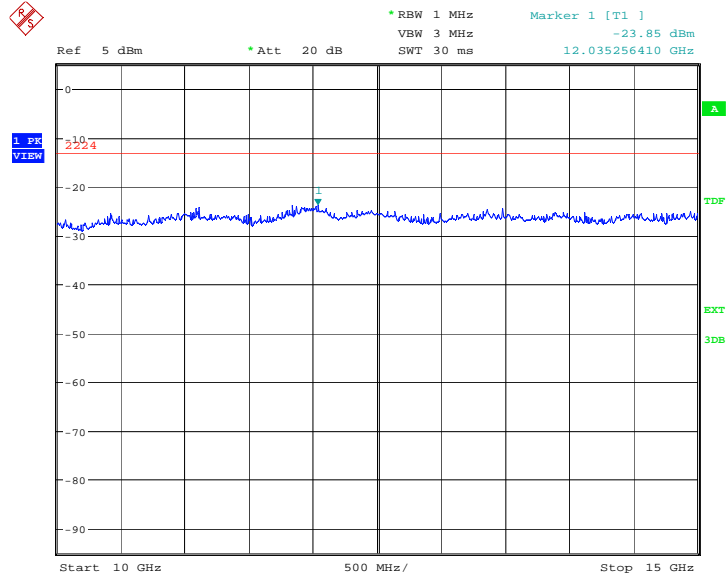
Date: 3.APR.2013 05:50:08

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



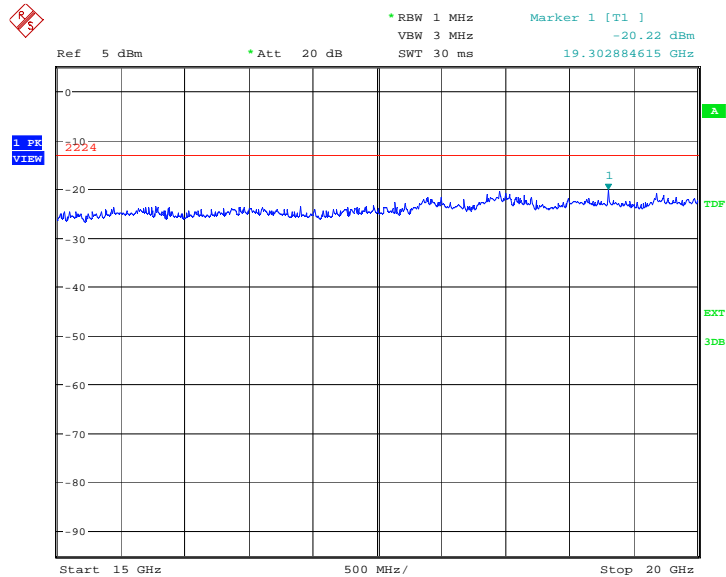
Date: 3.APR.2013 05:50:36

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



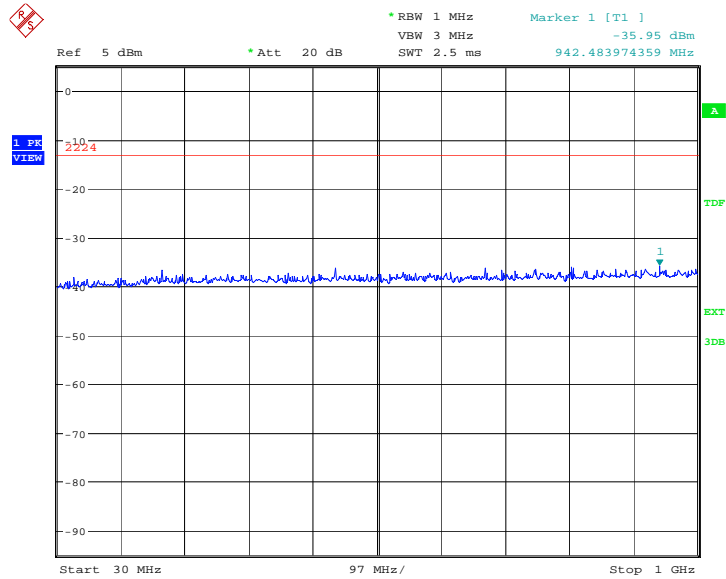
Date: 3.APR.2013 05:51:04

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



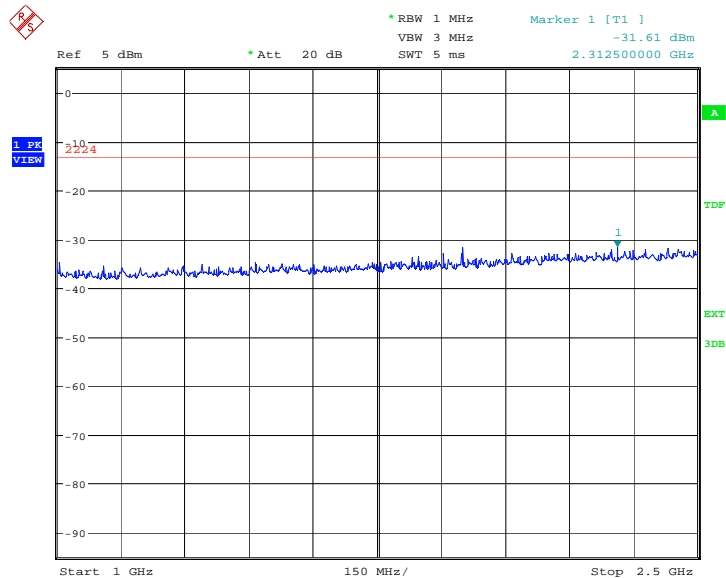
Date: 3.APR.2013 05:51:32

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



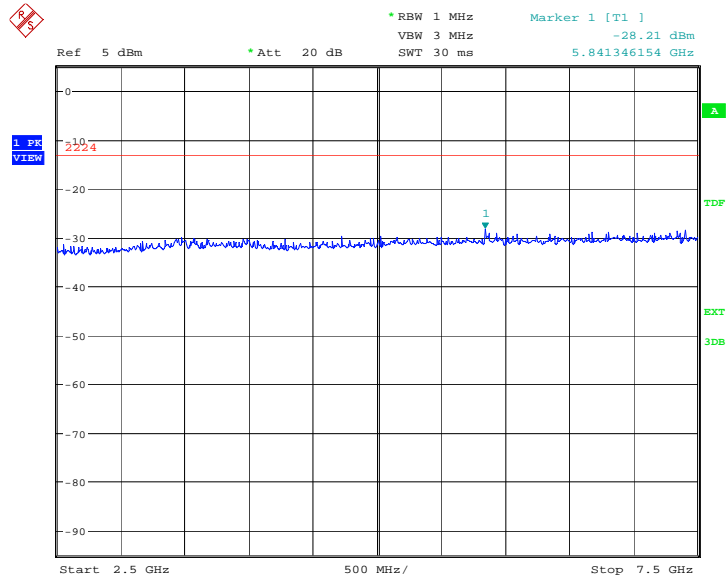
Date: 3.APR.2013 05:52:01

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



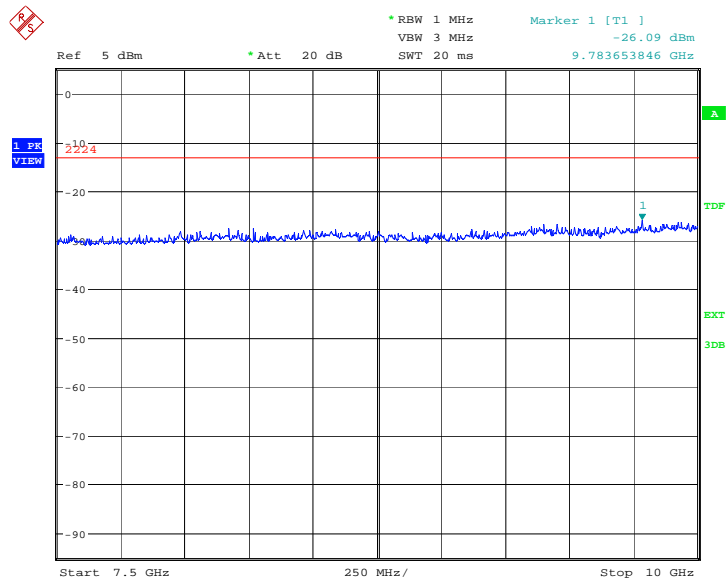
Date: 3.APR.2013 05:52:29

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



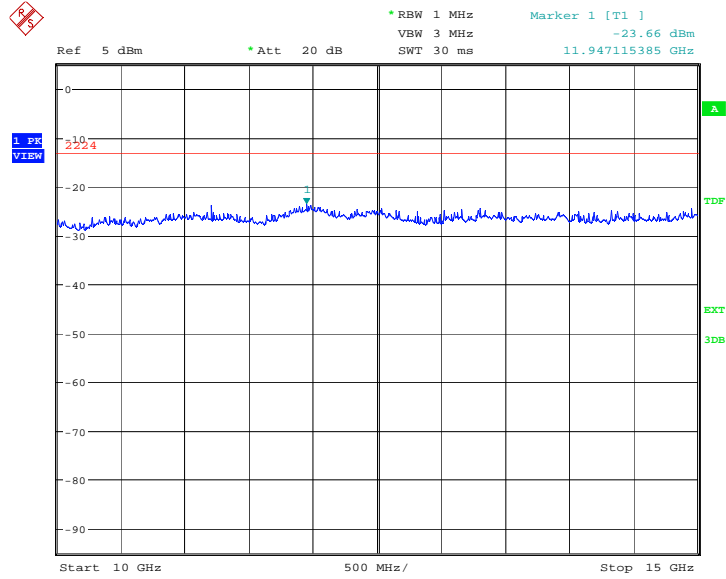
Date: 3.APR.2013 05:52:57

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



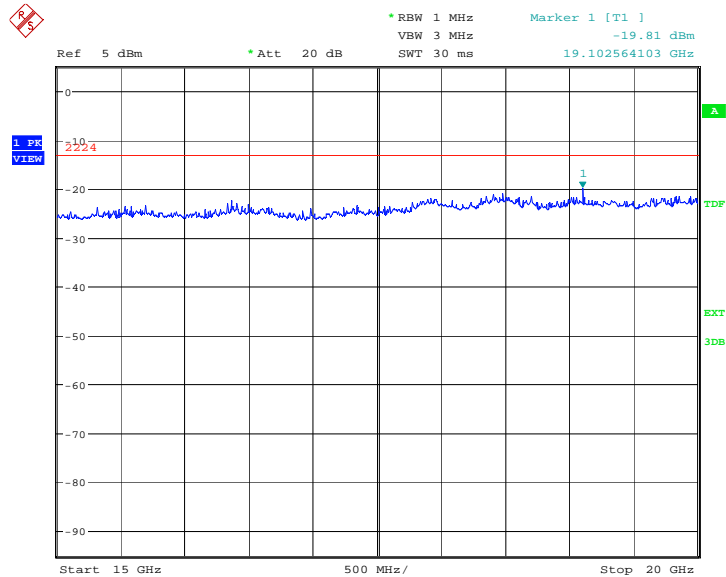
Date: 3.APR.2013 05:53:25

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



Date: 3.APR.2013 05:53:53

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



Date: 3.APR.2013 05:54:22

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