



TEST REPORT

No. 2010TAR222

for

Nokia (China) Investment CO., LTD.

TD-SCDMA/GSM mobile phone

Model Name: Nokia C5-01 (RM-677)

FCC ID: QTLRM-677

with

Hardware Version: 2100

Software Version: 0.1016.C.16

Issued Date: 2010-07-01

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of TMC Beijing.

Test Laboratory:

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

FCC 2.948 Listed: No.733176

IC O.A.T.S listed: No.6629A-1

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1. Test Laboratory

1.1. Testing Location

Company Name: TMC Beijing, Telecommunication Metrology Center of MIIT
Address: No 52, Huayuan beilu, Haidian District, Beijing,P.R.China
Postal Code: 100191
Telephone: 00861062304633
Fax: 00861062304633

1.2. Testing Environment

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

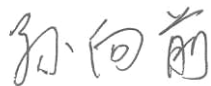
1.3. Project data

Testing Start Date: May. 24,2010
Testing End Date: Jul. 01,2010

1.4. Signature



Liu Baodian
(Prepared this test report)



Sun Xiangqian
(Reviewed this test report)



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
City: Beijing
Postal Code: 100176
Country: China
Telephone: +86-10-87111251
Fax: +86-10-87114664

2.2. Manufacturer Information

Company Name: BYD Precision Manufacturer Co., Ltd. Beijing Branch
Address /Post: No.1, Kechuang Dong 5 Jie, Tongzhou District
City: Beijing
Postal Code: 101111
Country: China
Telephone: +86-10-58018888-71158
Fax: +86-10-58018888-73000

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

3.1. About EUT

Description	TD-SCDMA/GSM mobile phone
Model Name	Nokia C5-01 (RM-677)
FCC ID	QTLRM-677
Frequency	GSM 900MHz; DCS 1800MHz; PCS 1900MHz; TD-SCDMA 2010MHz
Antenna	Internal
Power supply	Battery or Charger(AC Adaptor)
Output power	25.20 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: 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
N01	004401019682372	2100	0.1016.C.16

*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	3635639484511703003
AE2	Travel Adapter	4090499484540810192
AE3	Earphone	0694323945162602941

AE1

Model	BL-5F
Manufacturer	Nokia
Capacitance	950 mAh
Nominal Voltage	3.7 V

AE2

Model	AC-8C
Manufacturer	Nokia
Length of DC line	149 cm

AE3

Model	WH-102
Manufacturer	Nokia
Length of Cable	145 cm

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

3.4. General Description

The Equipment Under Test (EUT) is a model of GSM 900/1800/1900 tri-bands and TD-SCDMA 2010MHz mobile phone with integrated antenna. It has MP3, Camera, FM radio, USB memory and Bluetooth functions. It also supports GPRS function with multi-slots class 10 and EGPRS function with multi-slots class 10 too. It consists of Hand Telephone Set and normal options: lithium battery, charger, earphone and data cable.

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 10.1.09
FCC Part 22	PUBLIC MOBILE SERVICES	V 10.1.09
ANSI/TIA-603-C	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2004
ANSI C63.4	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2009

5. LABORATORY ENVIRONMENT

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

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

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

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

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

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

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

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

6. SUMMARY OF TEST RESULTS

Items	List	Clause in FCC rules	Verdict
1	Output Power	22.913(a)/24.232(b)	P
2	Emission Limit	2.1051/22.917/24.238	P
3	Conducted Emission	15.107/207	P
4	Frequency Stability	2.1055/24.235	P
5	Occupied Bandwidth	2.1049(h)(i)	P
6	Emission Bandwidth	22.917(b)/24.238(b)	P
7	Band Edge Compliance	22.917(b)/24.238(b)	P
8	Conducted Spurious Emission	2.1057/22.917/24.238	P

7. Test Equipments Utilized

NO.	NAME	TYPE	SERIES NUMBER	PRODUCER	CAL DUE DATE
1	Test Receiver	ESCI	100344	R&S	2011-03-11
2	Test Receiver	ESI40	831564/002	R&S	2011-02-10
3	BiLog Antenna	VULB 9163	9163 301	Schwarzbeck	2011-04-29
4	BiLog Antenna	VULB 9163	9163 235	Schwarzbeck	2010-09-19
5	Signal Generator	SMT06	831285/005	R&S	2010-12-25
6	Signal Generator	SMP04	100070	R&S	2011-04-19
7	LISN	ESH2-Z5	829991/012	R&S	2011-04-20
8	Spectrum Analyzer	FSU26	200030	R&S	2010-06-18
9	Universal Radio Communication Tester	CMU200	100680	R&S	2010-08-23
10	Dual-Ridge Waveguide Horn Antenna	3115	9906-5827	EMCO	2010-08-14
11	Dual-Ridge Waveguide Horn Antenna	3115	9906-5831	EMCO	2011-03-01
12	Dual-Ridge Waveguide Horn Antenna	3116	2663	EMCO	2011-03-01
13	Dual-Ridge Waveguide Horn Antenna	3116	2661	EMCO	2011-03-01
14	Climatic chamber	PL-2G	343074	ESPEC	2011-05-14

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 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)	± 2	30 \pm 1
GPRS	3	30dBm(1W)	± 2	30 \pm 1
EGPRS	5	26 dBm(0.4W)	± 2	26 \pm 1

Measurement result

GSM

Frequency(MHz)	Power Step	Peak output power(dBm)
1850.2	0	29.94
1880.0	0	30.24
1909.8	0	29.77

GPRS

Frequency(MHz)	Power Step	Peak output power(dBm)
1850.2	3	29.94
1880.0	3	30.23
1909.8	3	29.79

EGPRS

Frequency(MHz)	Power Step	Peak output power(dBm)
1850.2	5	25.63
1880.0	5	25.87
1909.8	5	25.52

A.1.3 Radiated

A.1.3.1 Description

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

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

Rule Part 22.913(a) specifies "Maximum ERP. The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

A.1.3.2 Method of Measurement

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

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

The measurement results are obtained as described below:

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

3. The EUT is substituted for the dipole at the reference centre of the chamber and a scan is performed to obtain the radiation pattern.
4. From the radiation pattern, the co-ordinates where the maximum antenna gain occurs are identified.
5. The EUT is then put into continuously transmitting mode at its maximum power level.
6. Power mode measurements are performed with the receiving antenna placed at the coordinates determined in Step 3 to determine the output power as defined in Rule 24.232 (b) and (c). The "reference path loss" from Step 1 is added to this result.
7. This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.15 dBi) and known input power (P_{in}).
8. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dBi}$.
9. The test system should be checked before test by a standard comb signal source. The signal source put on the position, instead of the EUT. The test result should be compared with the test result before. If the test result is similar with the initial one, then the test system can work stably.

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 _{Rpl} (dB)	P _{Mea} (dBm)	Polarization
1850.2	0	25.20	49.75	-24.55	Horizontal
1880.0	0	22.70	47.95	-25.25	Horizontal
1909.8	0	20.80	47.25	-26.45	Horizontal

GPRS

Frequency(MHz)	Power Step	Peak EIRP(dBm)	A _{Rpl} (dB)	P _{Mea} (dBm)	Polarization
1850.2	3	23.80	47.95	-24.15	Vertical
1880.0	3	23.20	47.95	-24.75	Horizontal
1909.8	3	20.90	47.25	-26.35	Horizontal

EGPRS

Frequency(MHz)	Power Step	Peak EIRP(dBm)	A _{Rpl} (dB)	P _{Mea} (dBm)	Polarization
1850.2	5	19.20	49.75	-30.55	Horizontal
1880.0	5	19.50	47.95	-28.45	Horizontal
1909.8	5	18.3	47.25	-28.95	Horizontal

Frequency: 1850.2MHz

Peak EIRP(dBm)= P_{Mea}(-24.55dBm)+ A_{Rpl} (49.75dB) = 25.20 dBm

ANALYZER SETTINGS: RBW = VBW = 3MHz

A.2 EMISSION LIMIT

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 terminal is a multi-transmitter. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to mid channels of the PCS1900 band and Wifi 802.11B to evaluate the worst case during the transmitting.

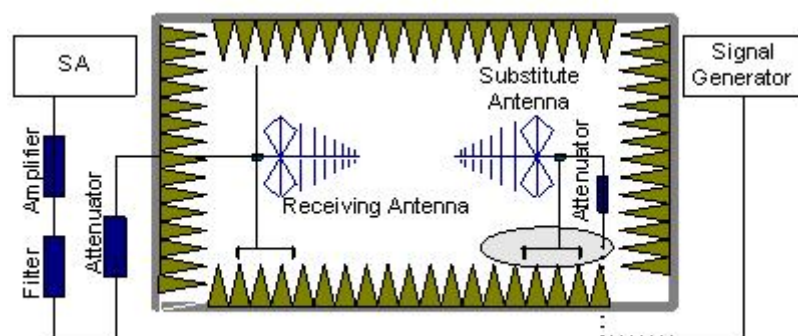
The procedure of radiated spurious emissions is as follows:

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.

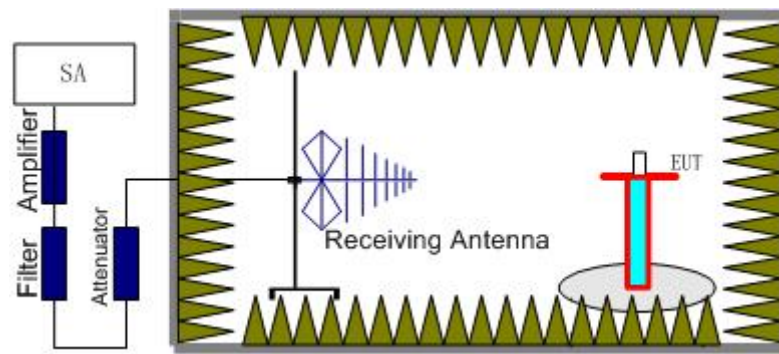


b) System check

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

c) EUT test

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



A.2.2 Measurement Limit

Sec. 24.238 Emission Limits.

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

Working Frequency	Subrange (GHz)	RBW	VBW	Sweep time (s)
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

A.2.4 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 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 _{Rpl} (dB)	P _{Mea} (dBm)	Limit (dBm)	Polarity
3700.6	-36.2	7.0	-43.2	-13	Vertical
5550.5	-38.9	8.9	-47.8	-13	Horizontal
7400.6	-39.2	11.4	-50.6	-13	Vertical
9673.1	-45.2	15.3	-60.5	-13	Horizontal
13710.2	-40.9	19.3	-60.2	-13	Vertical
15804.0	-39.0	24.0	-63.0	-13	Horizontal
17768.4	-32.8	31.9	-64.7	-13	Horizontal

GSM Mode Channel 661/1880.0MHz

Frequency(MHz)	Power(dBm)	A _{Rpl} (dB)	P _{Mea} (dBm)	Limit (dBm)	Polarity
3760.0	-37.0	6.9	-43.9	-13	Vertical
5639.3	-42.2	8.8	-51.0	-13	Vertical
7520.0	-39.2	11.7	-50.9	-13	Vertical
9400.1	-44.2	14.3	-58.5	-13	Horizontal
9917.9	-45.8	14.8	-60.6	-13	Vertical
15749.2	-39.1	23.9	-63.0	-13	Horizontal
17708.4	-31.9	32.7	-64.6	-13	Horizontal

GSM Mode Channel 810/1909.8MHz

Frequency(MHz)	Power(dBm)	A _{Rpl} (dB)	P _{Mea} (dBm)	Limit (dBm)	Polarity
3819.6	-41.2	6.7	-47.9	-13	Horizontal
5730.5	-45.6	9.1	-54.7	-13	Vertical
7639.4	-39.4	12.5	-51.9	-13	Vertical
9860.6	-45.2	15.1	-60.3	-13	Horizontal
15838.4	-38.5	23.9	-62.4	-13	Vertical
17761.6	-31.9	32.2	-64.1	-13	Vertical

EGPRS Mode Channel 512/1850.2MHz

Frequency(MHz)	Power(dBm)	A _{Rpl} (dB)	P _{Mea} (dBm)	Limit (dBm)	Polarity
3700.0	-38.3	7.1	-45.4	-13	Horizontal
3700.4	-42.3	7.1	-49.4	-13	Horizontal
5551.1	-37.0	8.9	-45.9	-13	Horizontal
7630.1	-46.1	12.4	-58.5	-13	Vertical
9863.6	-45.9	15.2	-61.1	-13	Vertical
15510.4	-38.6	24.3	-62.9	-13	Vertical
17773.2	-32.2	32.1	-64.3	-13	Vertical

EGPRS Mode Channel 661/1880.0MHz

Frequency(MHz)	Power(dBm)	A _{Rpl} (dB)	P _{Mea} (dBm)	Limit (dBm)	Polarity
3760.2	-38.7	6.9	-45.6	-13	Horizontal
7550.3	-46.7	11.9	-58.6	-13	Horizontal
9717.8	-45.8	15.6	-61.4	-13	Vertical
15728.0	-38.9	23.9	-62.8	-13	Vertical
17765.6	-32.1	32.2	-64.3	-13	Vertical

EGPRS Mode Channel 810/1909.8MHz

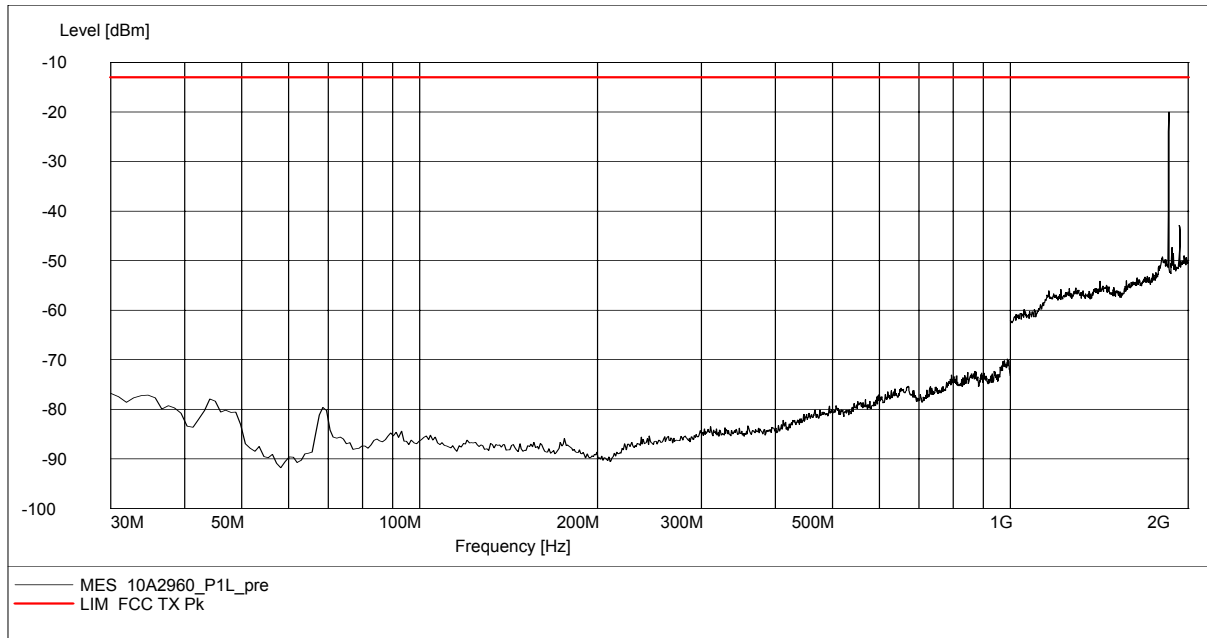
Frequency(MHz)	Power(dBm)	A _{Rpl} (dB)	P _{Mea} (dBm)	Limit (dBm)	Polarity
3819.6	-43.2	6.7	-49.9	-13	Horizontal
5729.3	-43.0	9.1	-52.1	-13	Vertical
7639.7	-44.1	12.5	-56.6	-13	Vertical
9977.6	-45.5	14.4	-59.9	-13	Vertical
15443.2	-38.8	24.0	-62.8	-13	Horizontal
17756.0	-32.4	32.1	-64.5	-13	Horizontal

PCS 1900 (GSM Mode)

A.2.4.1 RADIATED SPURIOUS EMISSIONS-Channel 512: 30MHz – 2GHz

Radiated spurious emission limit :-13dBm.

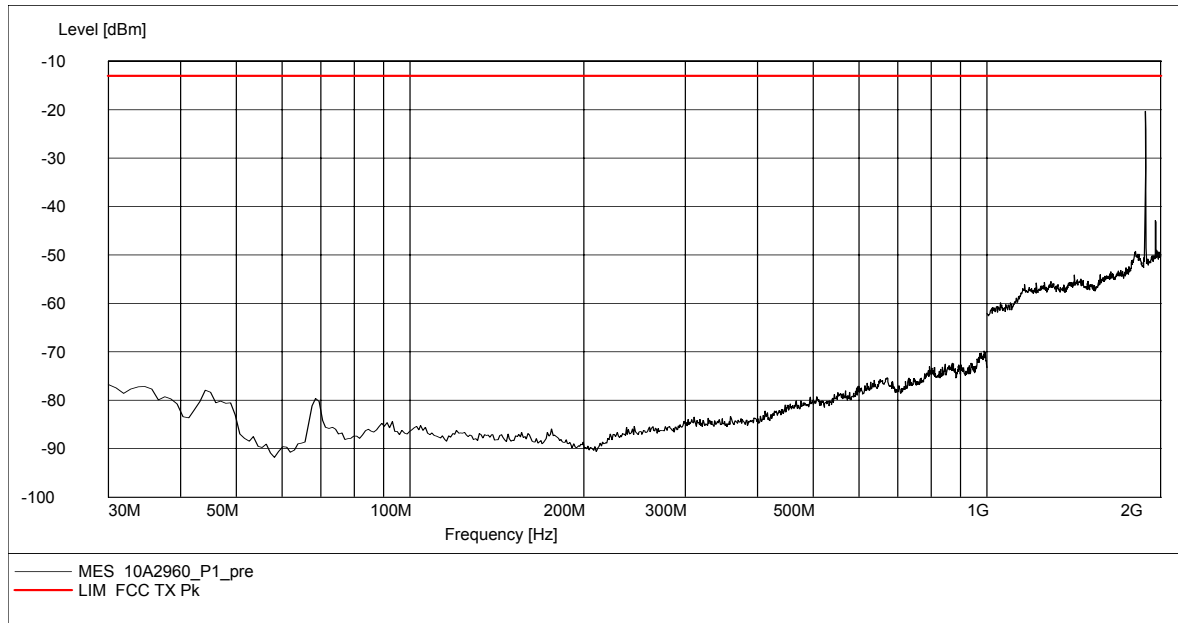
NOTE: peak above the limit line is the Carrier frequency @ ch-512



A.2.4.2 RADIATED SPURIOUS EMISSIONS-Channel 661: 30MHz – 2GHz

Radiated spurious emission limit :-13dBm.

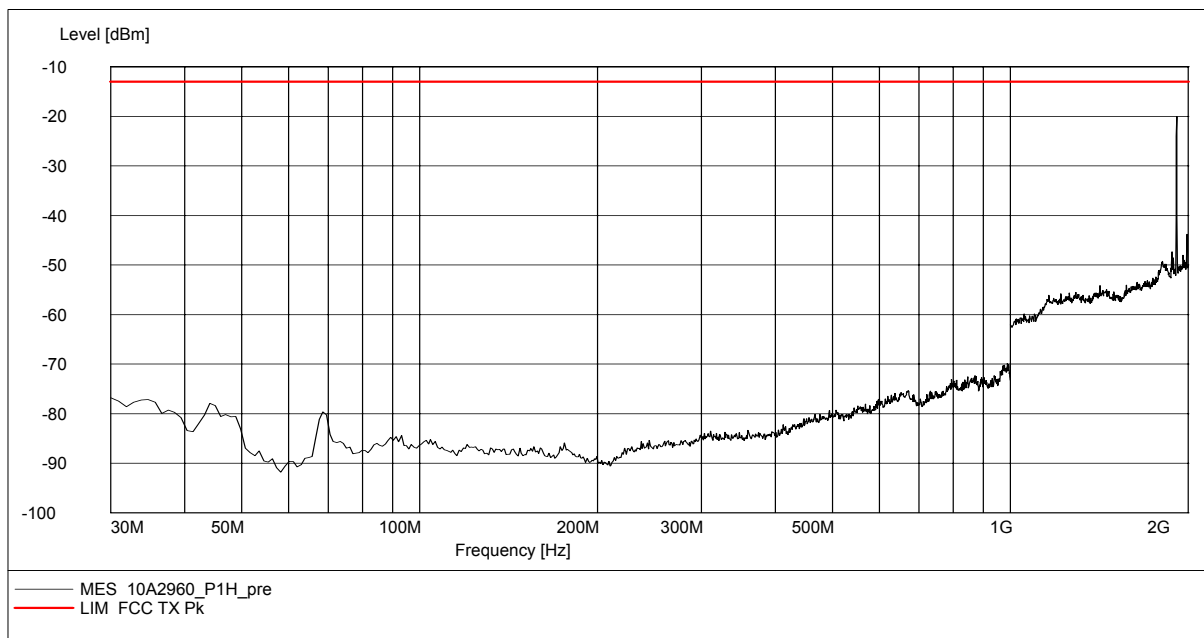
NOTE: peak above the limit line is the Carrier frequency @ ch-661



A.2.4.3 RADIATED SPURIOUS EMISSIONS-Channel 810: 30MHz – 2GHz

Radiated spurious emission limit :-13dBm.

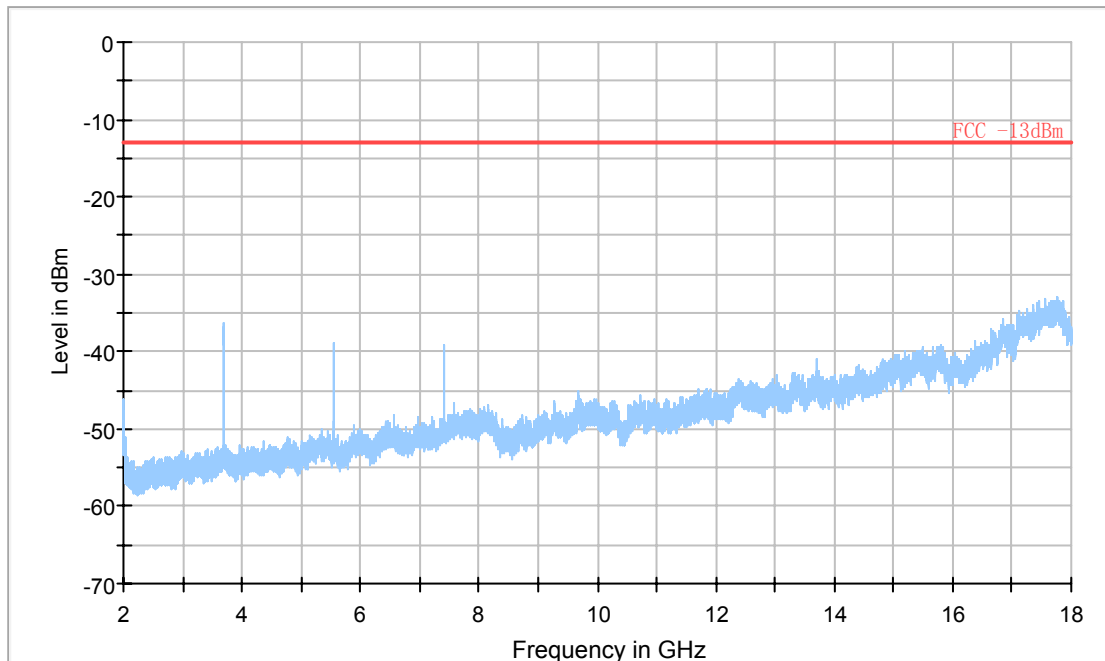
NOTE: peak above the limit line is the Carrier frequency @ ch-810



A.2.4.4 RADIATED SPURIOUS EMISSIONS-Channel 512: 2GHz – 18GHz

Radiated spurious emission limit :-13dBm.

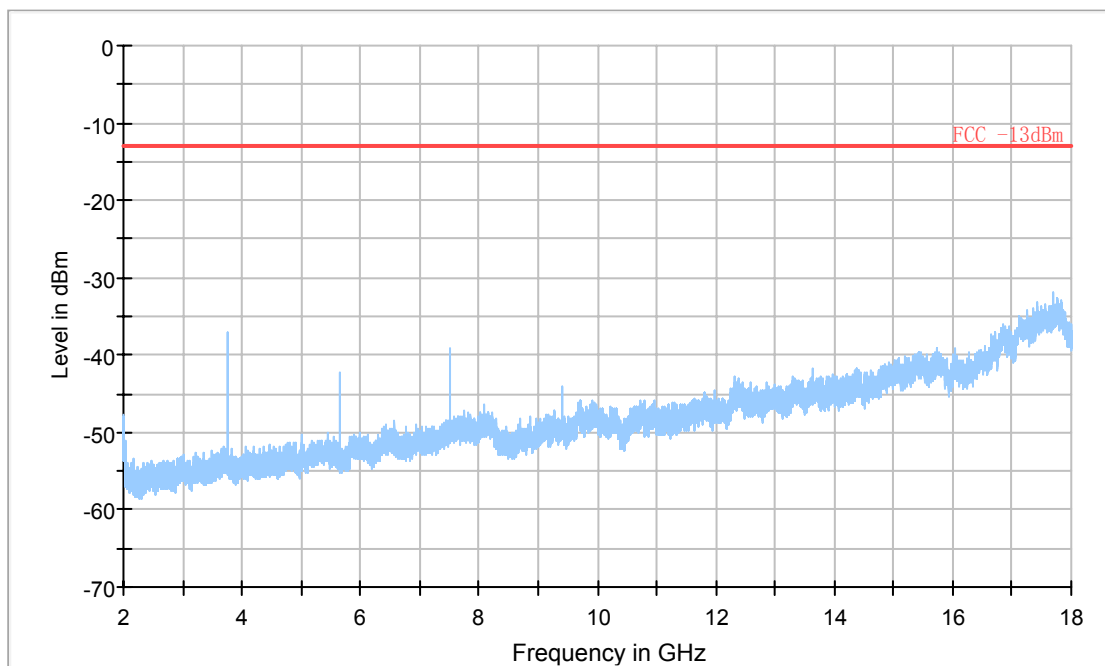
FCC24 2-18 GHz



A.2.4.5 RADIATED SPURIOUS EMISSIONS-Channel 661: 2GHz – 18GHz

Radiated spurious emission limit :-13dBm.

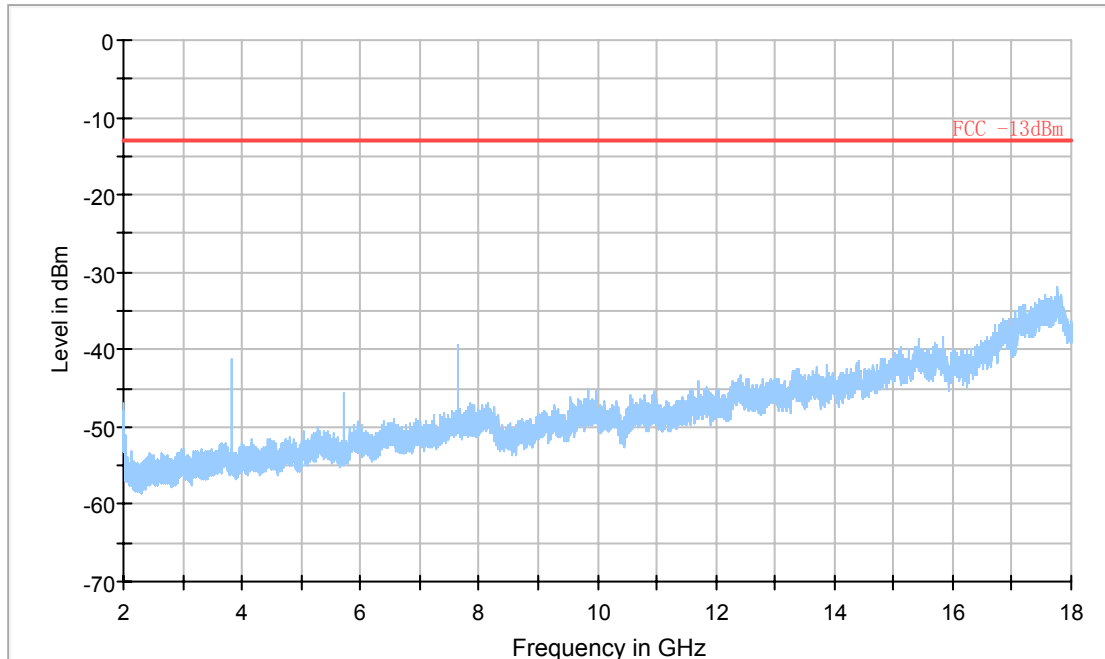
FCC24 2-18 GHz



A.2.4.6 RADIATED SPURIOUS EMISSIONS-Channel 810: 2GHz – 18GHz

Radiated spurious emission limit :-13dBm.

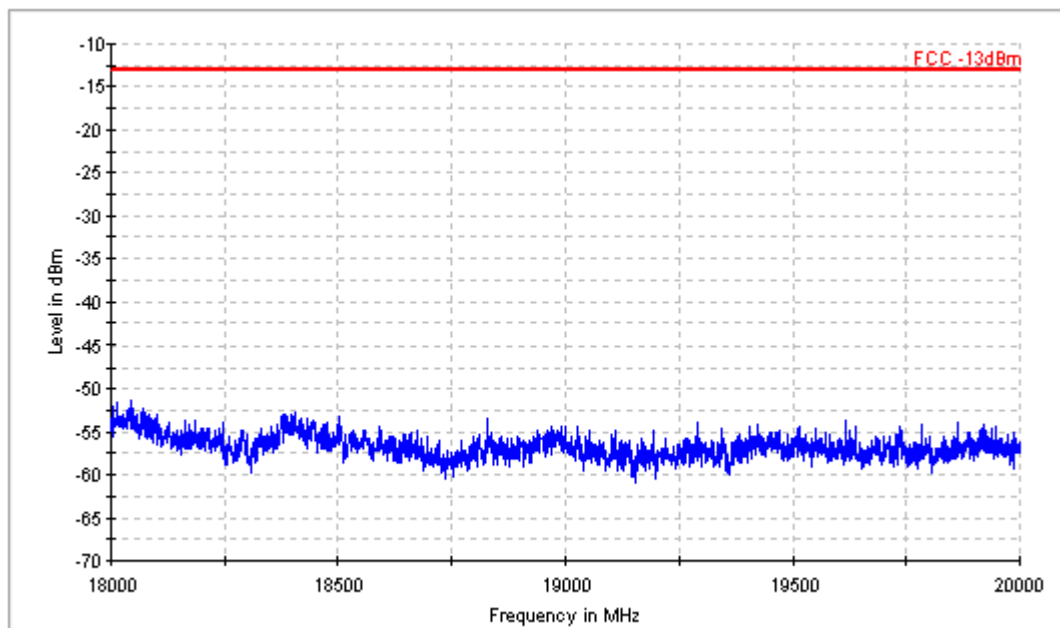
FCC24 2-18 GHz



A.2.4.7 Radiated spurious emission (18GHz-20GHz)

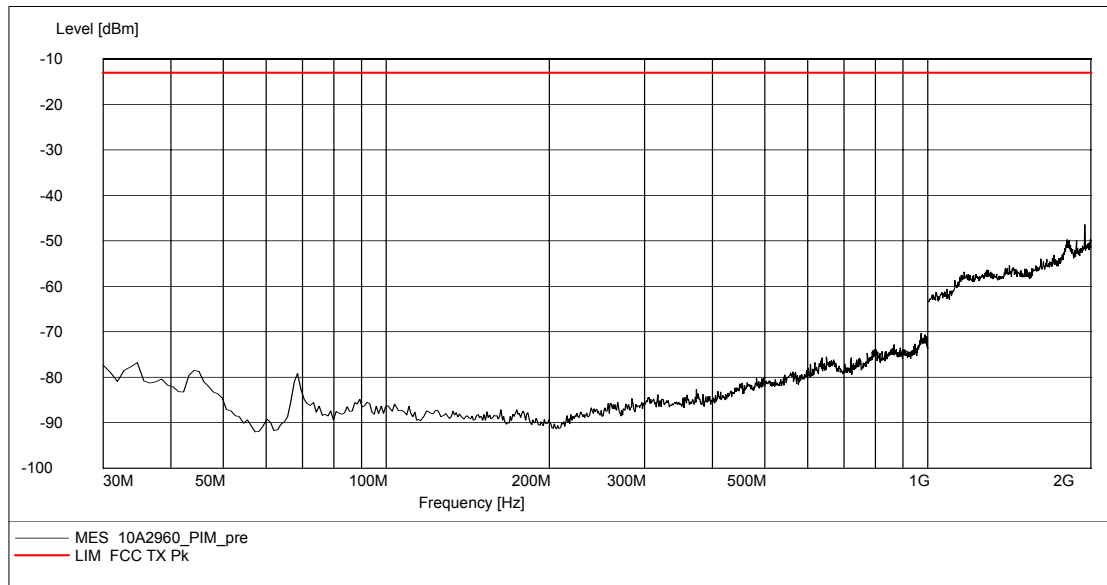
Radiated spurious emission limit :-13dBm.

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



A.2.4.8 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 30MHz – 2GHz

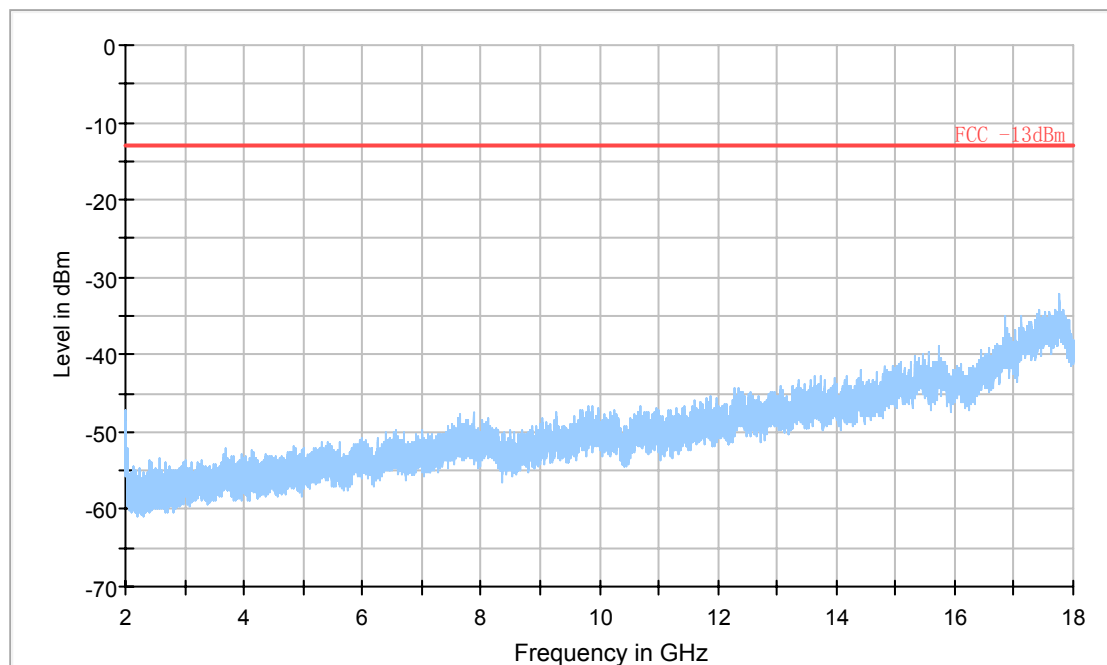
Radiated spurious emission limit :-13dBm.



A.2.4.9 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 2GHz – 18GHz

Radiated spurious emission limit :-13dBm.

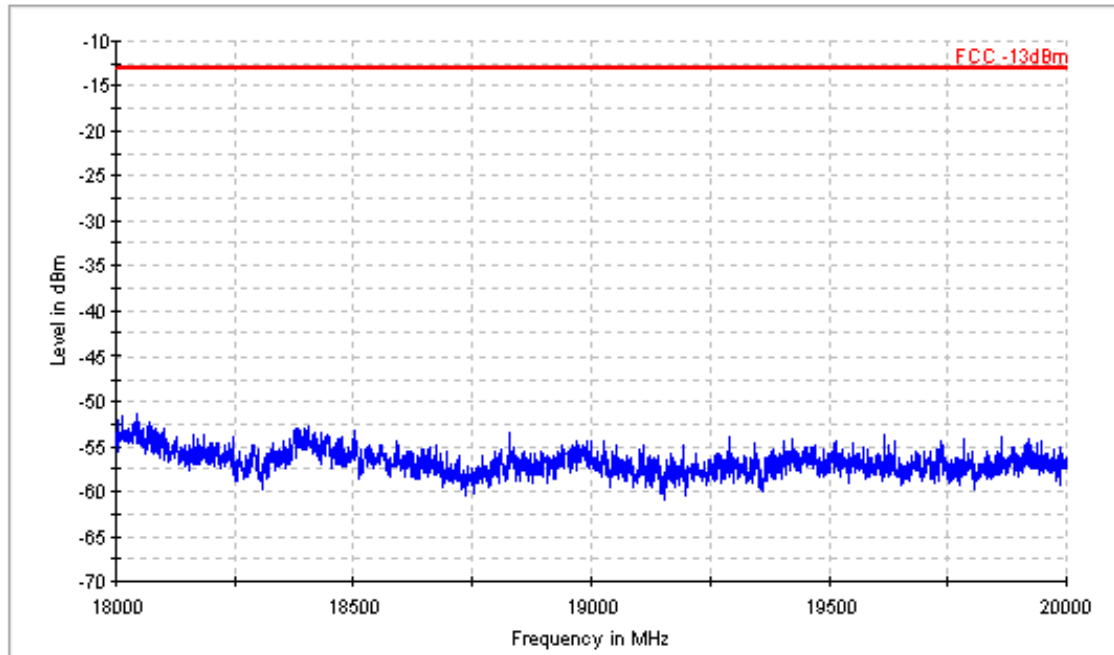
FCC24 2-18 GHz



A.2.4.10 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 18GHz – 20GHz

Radiated spurious emission limit :-13dBm.

Note: It is same as the noise floor.

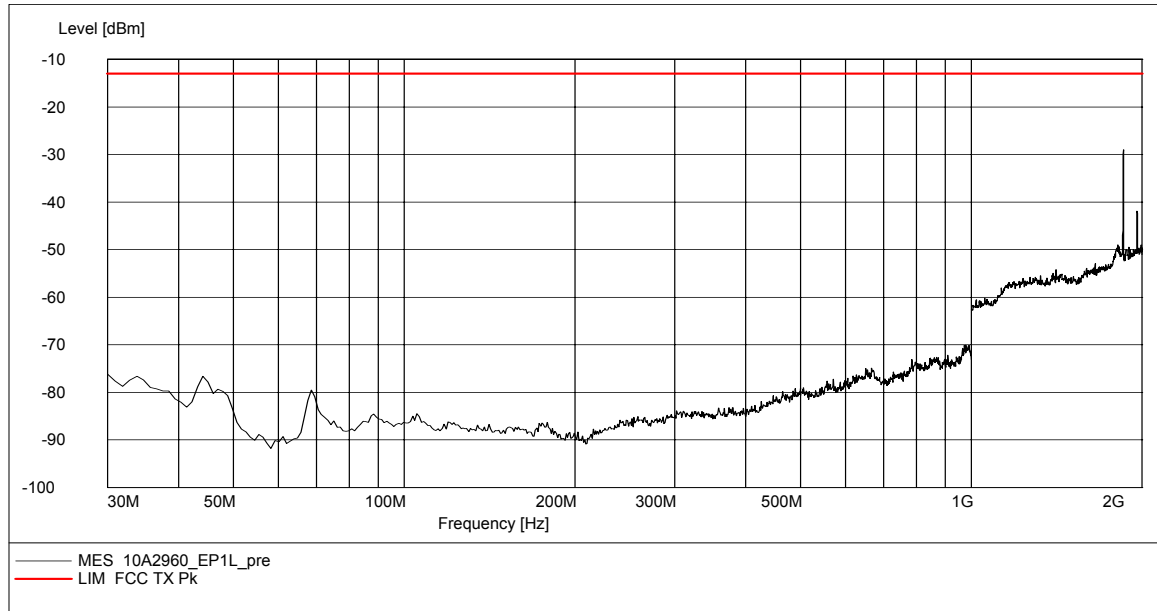


PCS 1900 (EGPRS Mode)

A.2.4.11 RADIATED SPURIOUS EMISSIONS-Channel 512: 30MHz – 2GHz

Radiated spurious emission limit :-13dBm.

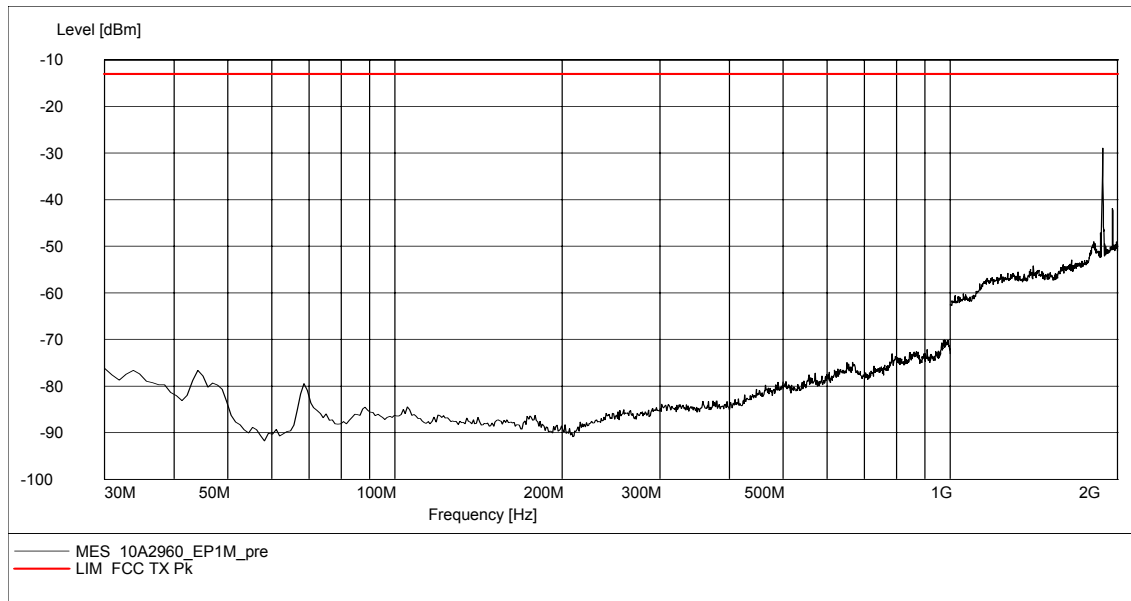
NOTE: peak above the limit line is the Carrier frequency @ ch-512



A.2.4.12 RADIATED SPURIOUS EMISSIONS-Channel 661: 30MHz – 2GHz

Radiated spurious emission limit :-13dBm.

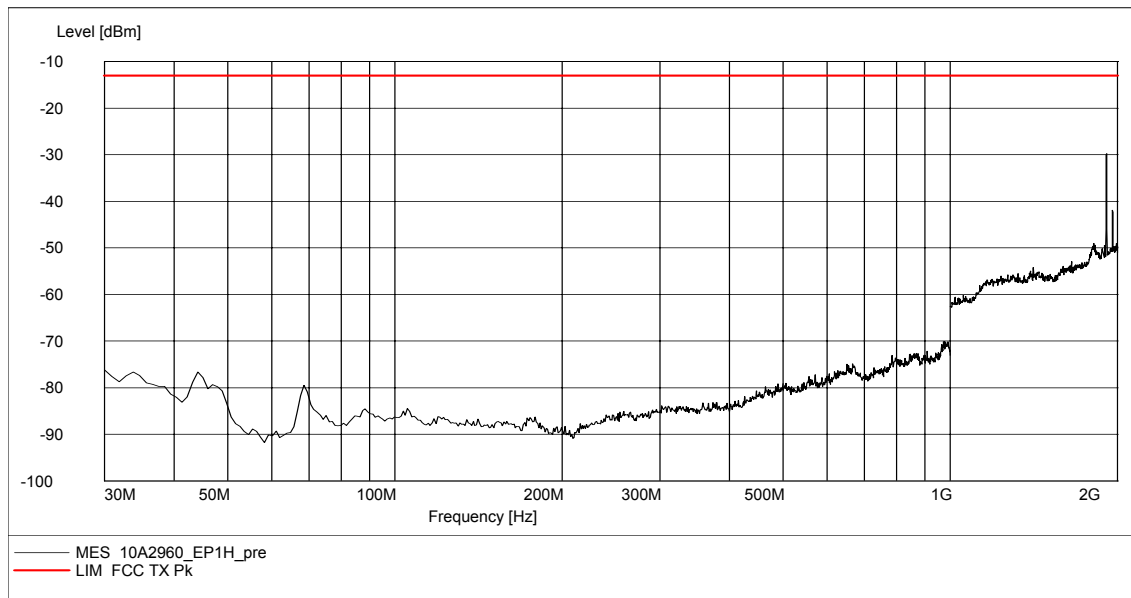
NOTE: peak above the limit line is the Carrier frequency @ ch-661



A.2.4.13 RADIATED SPURIOUS EMISSIONS-Channel 810: 30MHz – 2GHz

Radiated spurious emission limit :-13dBm.

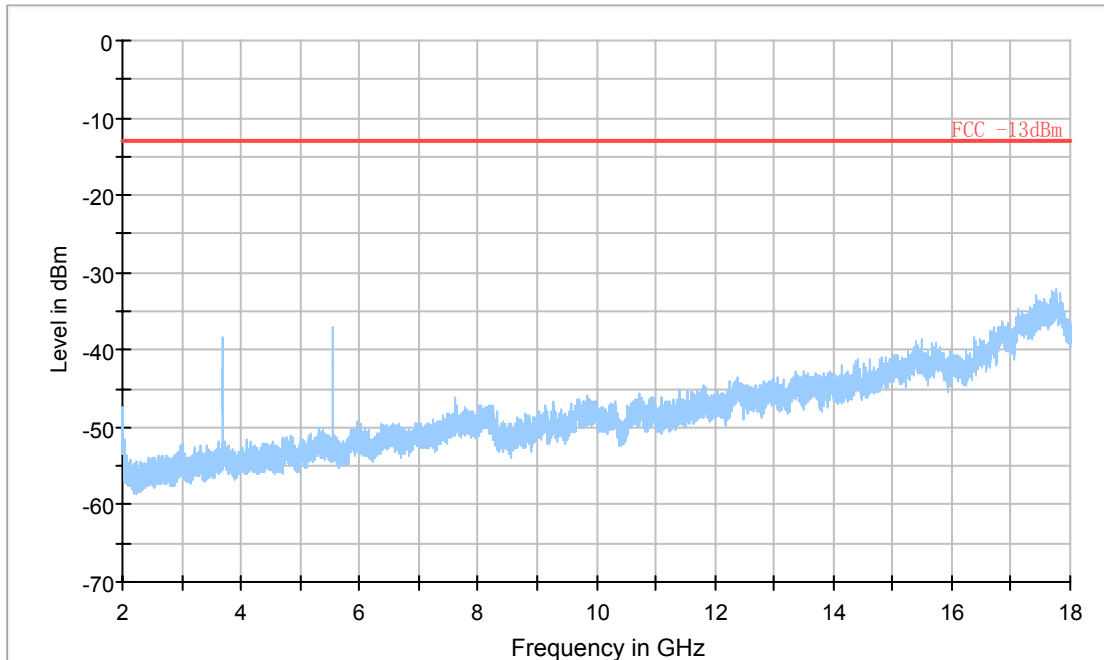
NOTE: peak above the limit line is the Carrier frequency @ ch-810



A.2.4.14 RADIATED SPURIOUS EMISSIONS-Channel 512: 2GHz – 18GHz

Radiated spurious emission limit :-13dBm.

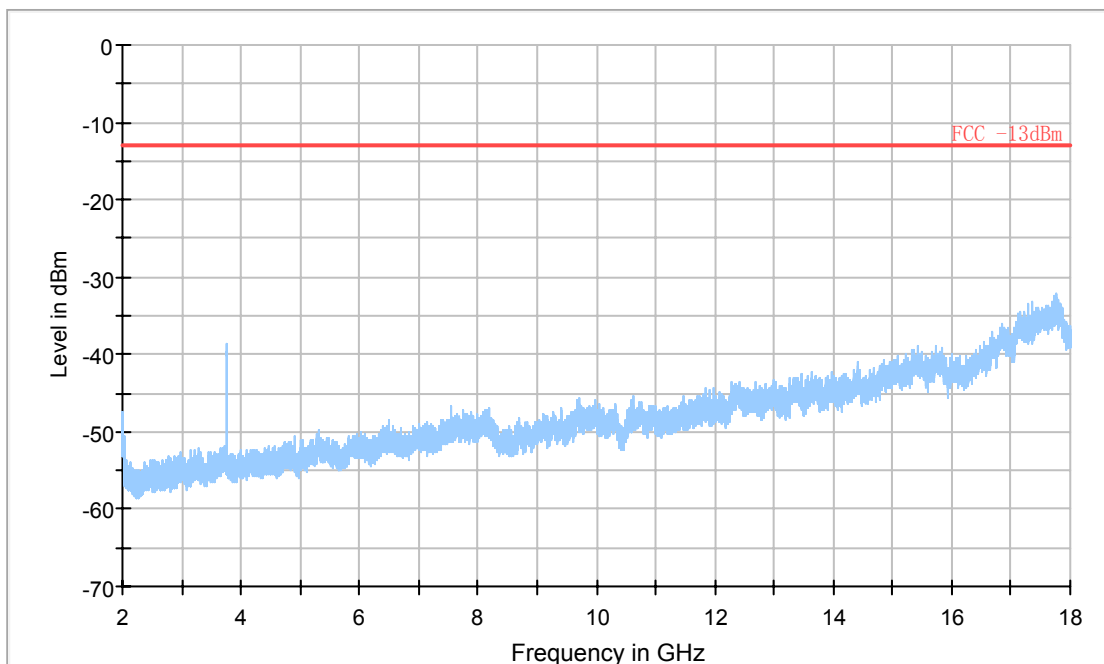
FCC24 2-18 GHz



A.2.4.15 RADIATED SPURIOUS EMISSIONS-Channel 661: 2GHz – 18GHz

Radiated spurious emission limit :-13dBm.

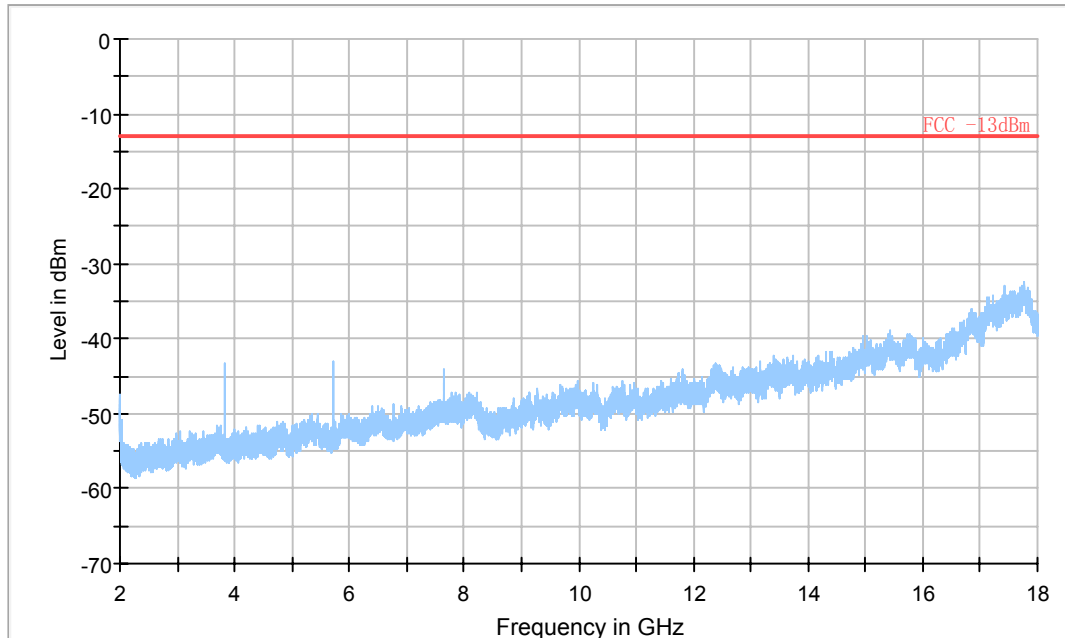
FCC24 2-18 GHz



A.2.4.16 RADIATED SPURIOUS EMISSIONS-Channel 810: 2GHz – 18GHz

Radiated spurious emission limit :-13dBm.

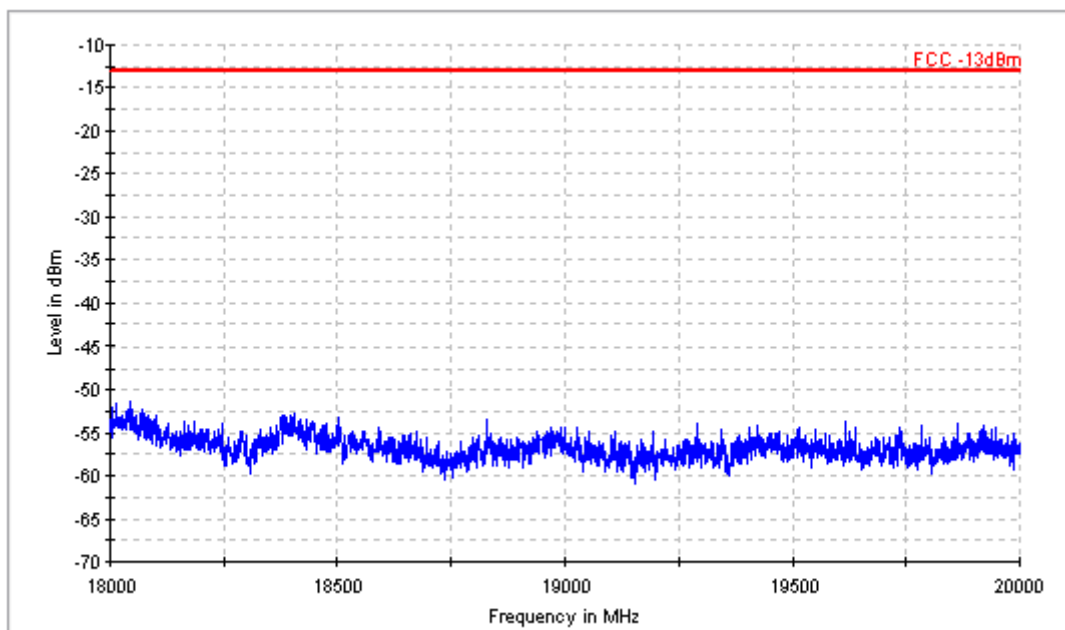
FCC24 2-18 GHz



A.2.4.17 Radiated spurious emission (18GHz-20GHz)

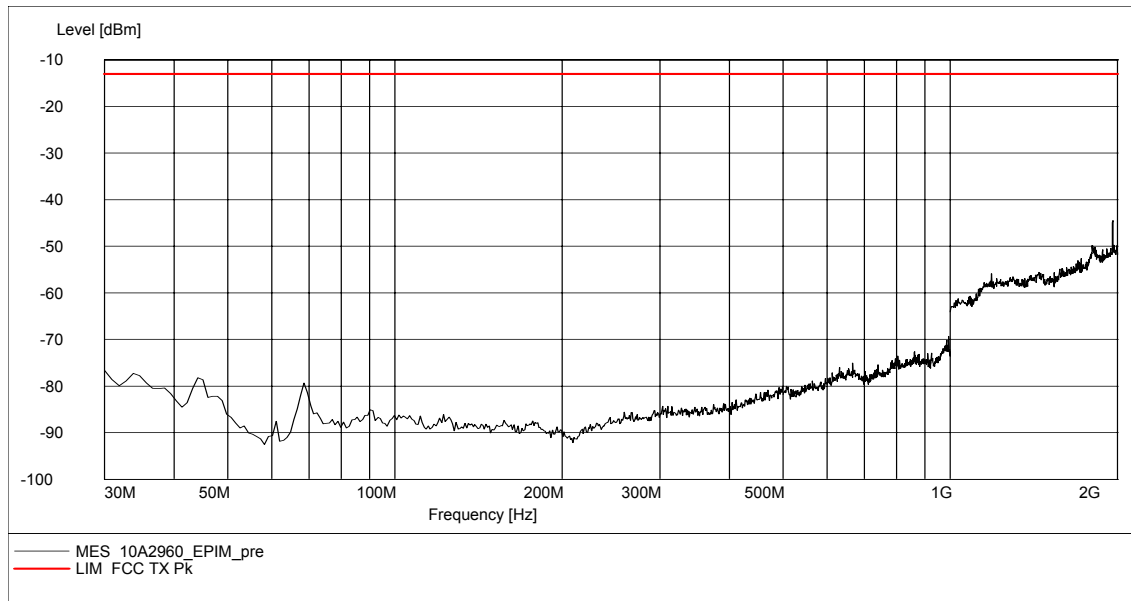
Radiated spurious emission limit :-13dBm.

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



A.2.4.18 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 30MHz – 2GHz

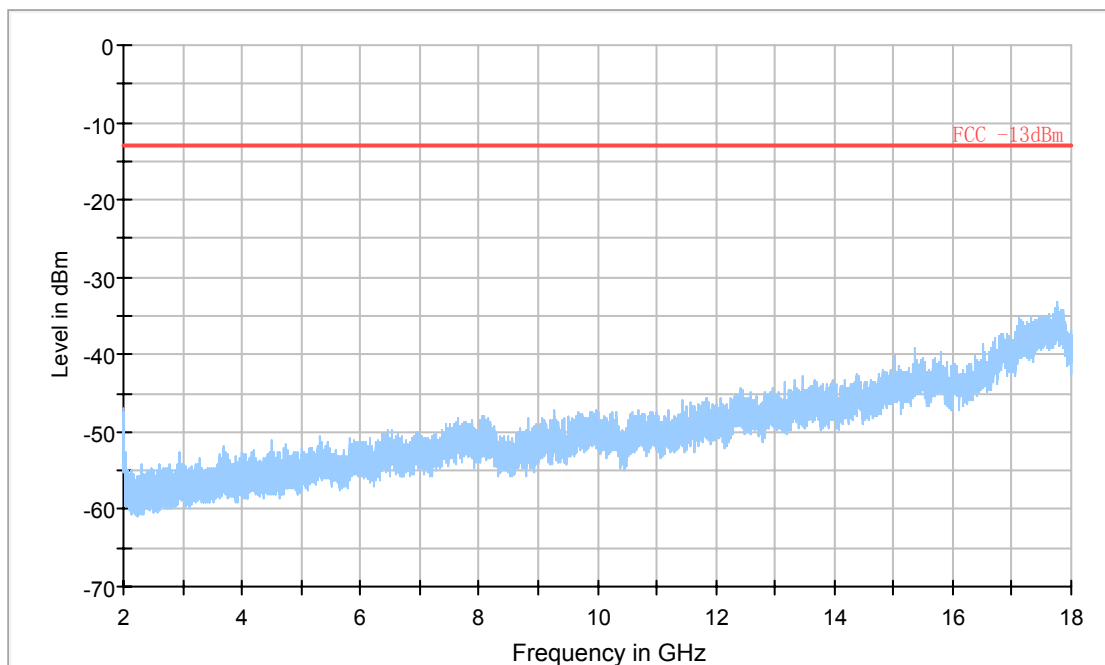
Radiated spurious emission limit :-13dBm.



A.2.4.19 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 2GHz – 18GHz

Radiated spurious emission limit :-13dBm.

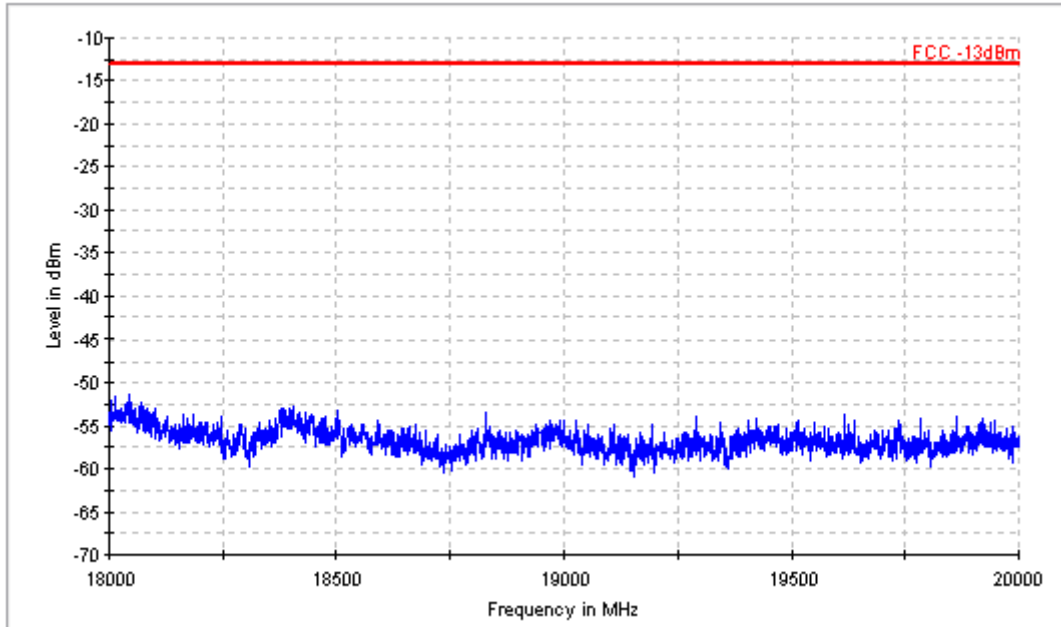
FCC24 2-18 GHz



A.2.4.20 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 18GHz – 20GHz

Radiated spurious emission limit :-13dBm.

Note: It is same as the noise floor.



A.3 CONDUCTED EMISSION (§15.107§15.207)

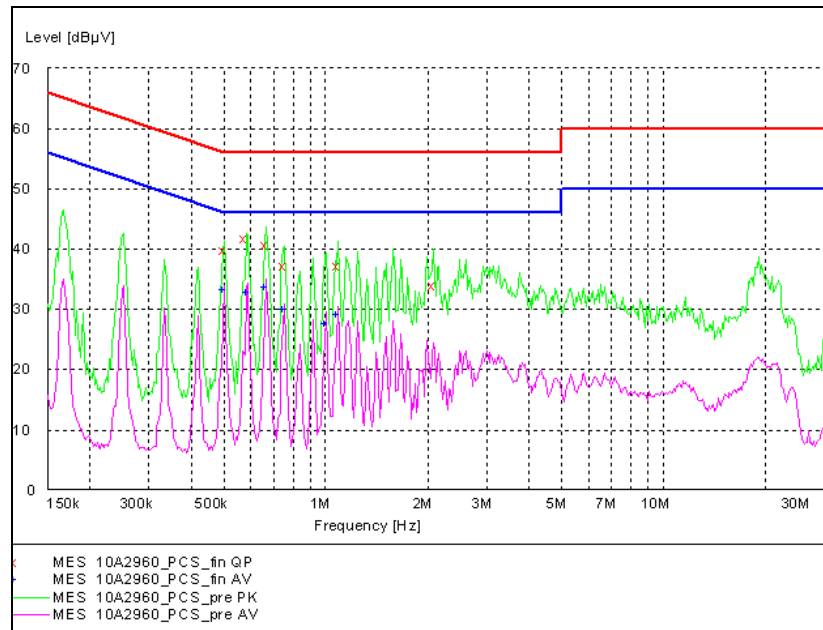
The measurement procedure in ANSI C63.4-2009 is used. Conducted Emission is measured with travel charger.

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: "10A2960_PCS_fin QP"

Frequency MHz	Level dBμV	Transd dB	Reading dBμV	Limit dBμV	Margin dB	Line	PE
0.500009	39.70	10.1	29.6	56	16.3	L1	GND
0.580494	41.70	10.1	31.6	56	14.3	L1	GND
0.667263	40.60	10.1	30.5	56	15.4	L1	GND
0.751889	37.30	10.1	27.2	56	18.7	L1	GND
1.086537	37.20	10.1	27.1	56	18.8	L1	GND
2.081208	33.90	10.1	23.8	56	22.1	L1	FLO

MEASUREMENT RESULT: "10A2960_PCS_fin AV"

Frequency MHz	Level dBμV	Transd dB	Reading dBμV	Limit dBμV	Margin dB	Line	PE
0.500009	33.20	10.1	23.1	46	12.8	L1	GND
0.586299	32.90	10.1	22.8	46	13.1	L1	GND
0.667263	33.80	10.1	23.7	46	12.2	L1	GND
0.751889	30.00	10.1	19.9	46	16.0	L1	GND
1.003399	27.70	10.1	17.6	46	18.3	L1	GND
1.086537	29.30	10.1	19.2	46	16.7	L1	GND

Sample calculation (frequency 0.500009MHz for average detector):

$$V_{\text{MEAS}} = V_{\text{READING}} (23.10 \text{ dB}\mu\text{V}) + A_{\text{CORR}} (10.1\text{dB}) = 33.20 \text{ dB}\mu\text{V}$$

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

A.4.2 Measurement Limit

A.4.2.1 For Hand carried battery powered equipment

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

A.4.2.2 For equipment powered by primary supply voltage

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section

2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

A.4.3 Measurement results

PCS 1900

Frequency Error vs Voltage

Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
3.5	18	0.010
3.8	16	0.008
4.2	16	0.008

Frequency Error vs Temperature

temperature(°C)	Frequency error(Hz)	Frequency error(ppm)
-30	18	0.010
-20	18	0.010
-10	21	0.011
0	21	0.011
10	16	0.008
20	21	0.011
30	18	0.021
40	16	0.008
50	16	0.008

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

A.5.1 Occupied Bandwidth Results

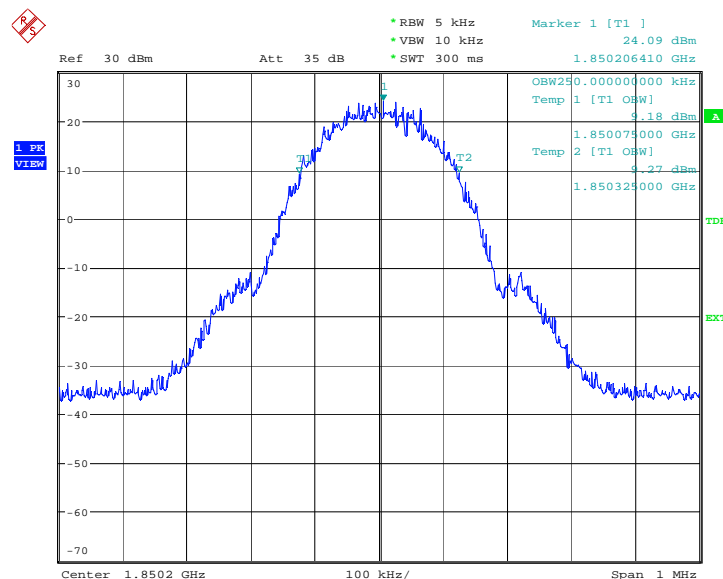
Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. The table below lists the measured -20dBc BW (99%). Spectrum analyzer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

PCS 1900(99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)
1850.2	250.000
1880.0	248.397
1909.8	251.602

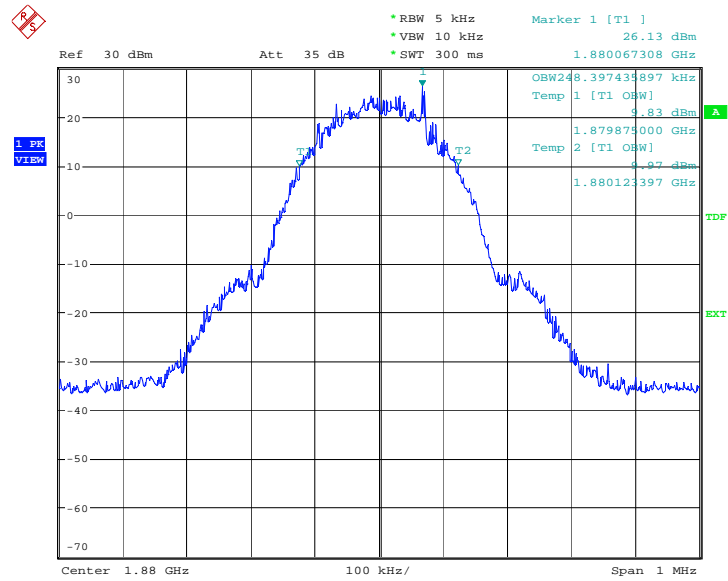
PCS 1900

Channel 512-Occupied Bandwidth (99%)



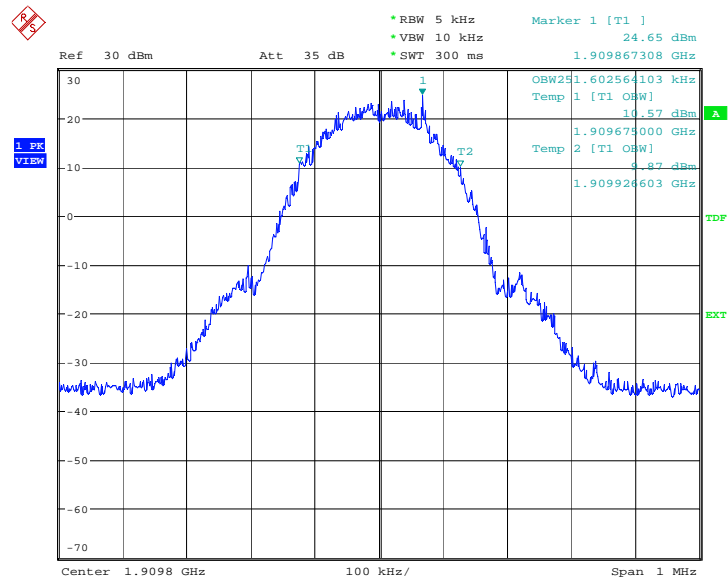
Date: 1.JUL.2010 06:37:30

Channel 661-Occupied Bandwidth (99%)



Date: 1.JUL.2010 06:37:57

Channel 810-Occupied Bandwidth (99%)



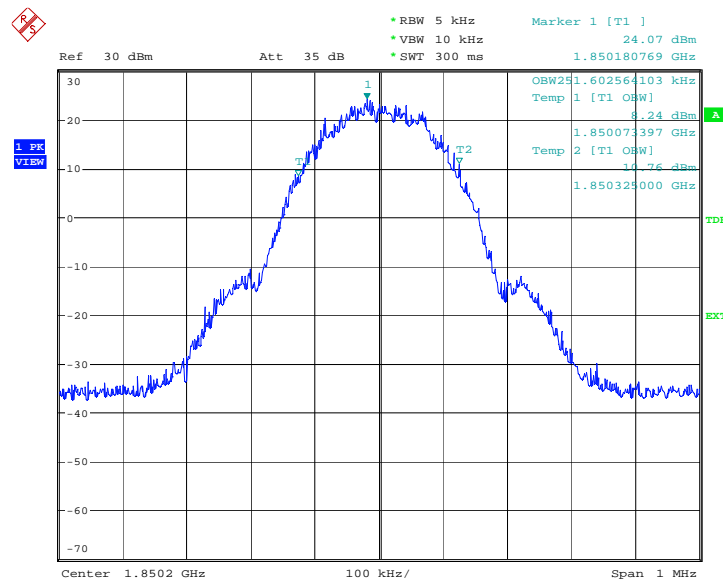
Date: 1.JUL.2010 06:38:24

GPRS 1900(99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)
1850.2	251.602
1880.0	248.397
1909.8	248.397

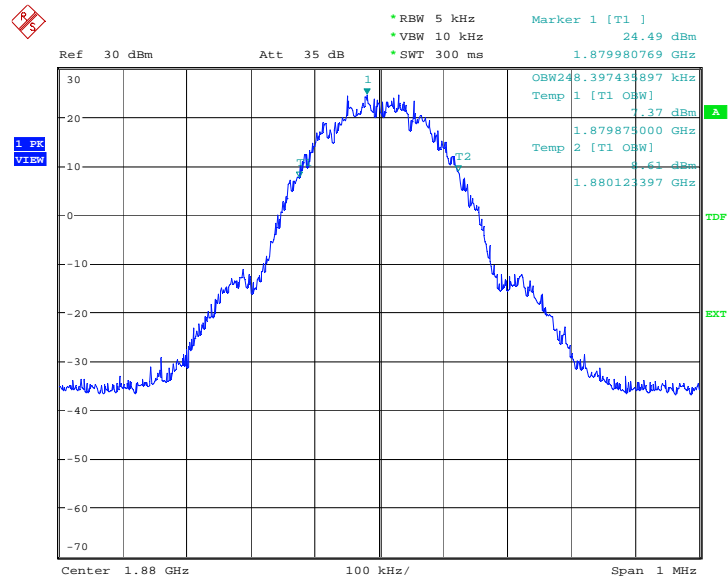
GPRS 1900

Channel 512-Occupied Bandwidth (99%)



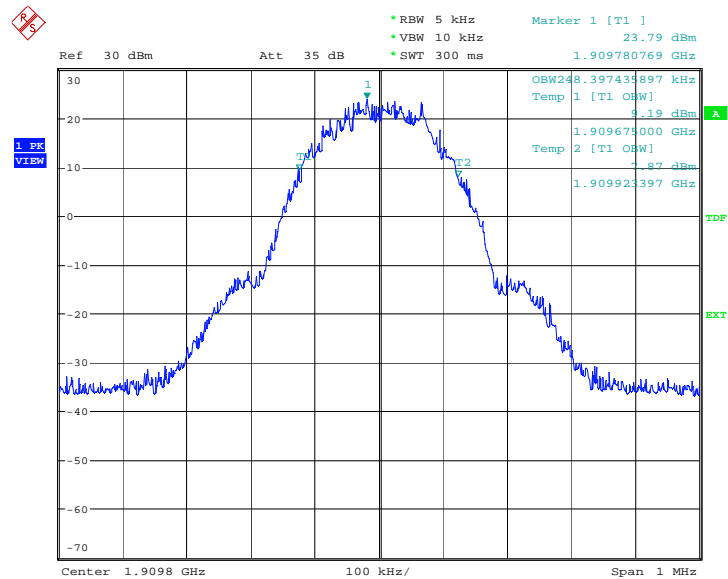
Date: 1.JUL.2010 06:43:53

Channel 661-Occupied Bandwidth (99%)



Date: 1.JUL.2010 06:44:19

Channel 810-Occupied Bandwidth (99%)



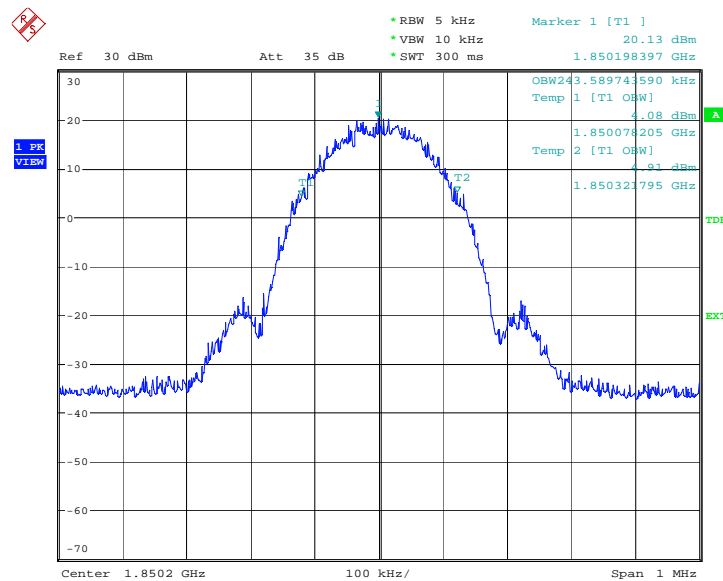
Date: 1.JUL.2010 06:44:46

EGPRS 1900(99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)
1850.2	243.589
1880.0	243.589
1909.8	241.987

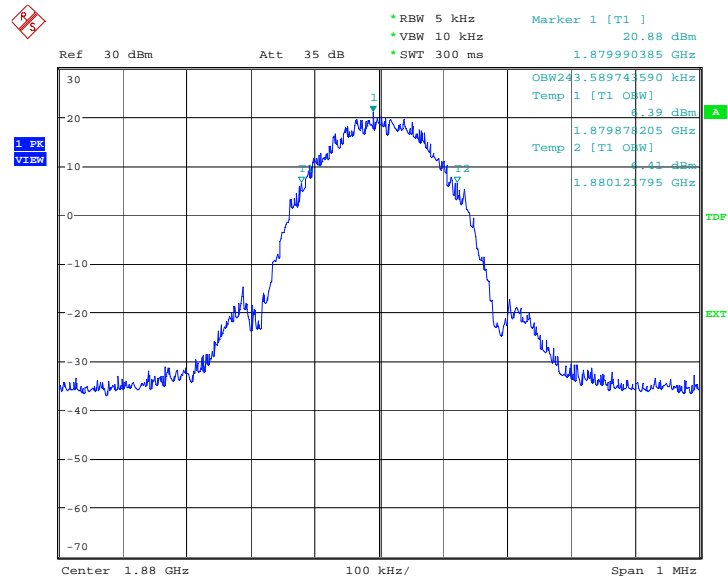
EGPRS 1900

Channel 512-Occupied Bandwidth (99%)



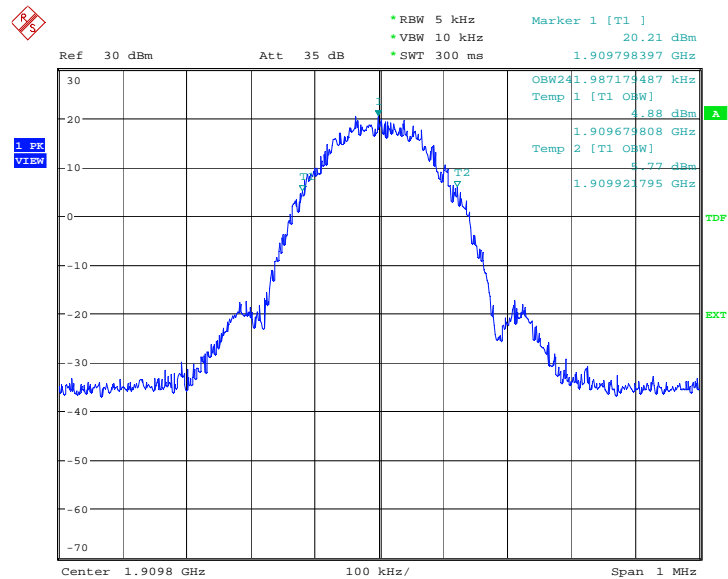
Date: 1.JUL.2010 06:48:51

Channel 661-Occupied Bandwidth (99%)



Date: 1.JUL.2010 06:49:18

Channel 810-Occupied Bandwidth (99%)



Date: 1.JUL.2010 06:49:45

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

A.6.1 Emission Bandwidth Results

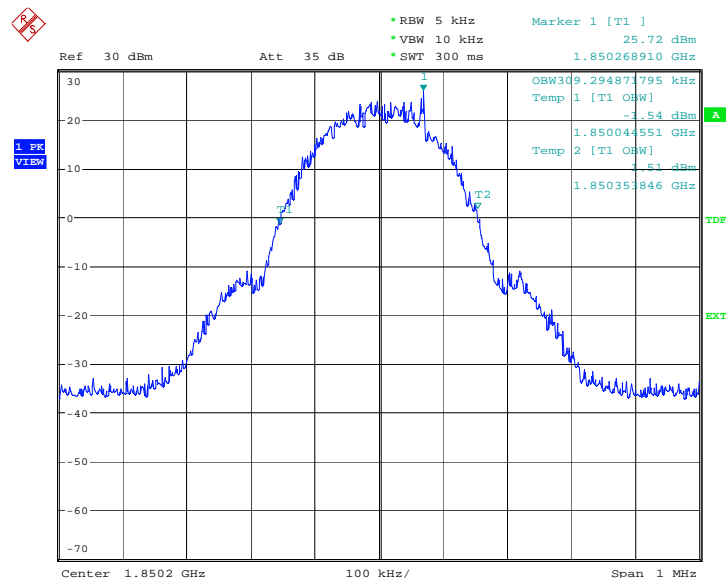
Similar to conducted emissions; Emission bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the PCS1900 band. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included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

PCS 1900(-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc BW)(kHz)
1850.2	309.294
1880.0	312.500
1909.8	310.897

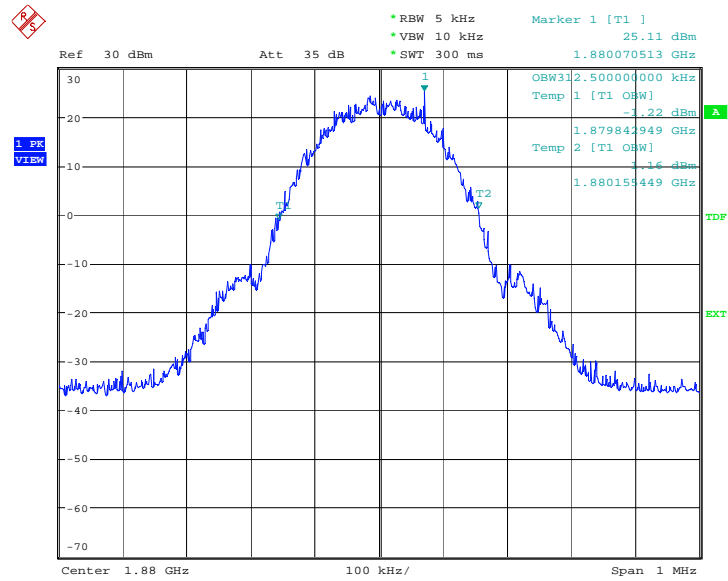
PCS 1900

Channel 512-Occupied Bandwidth (-26dBc BW)



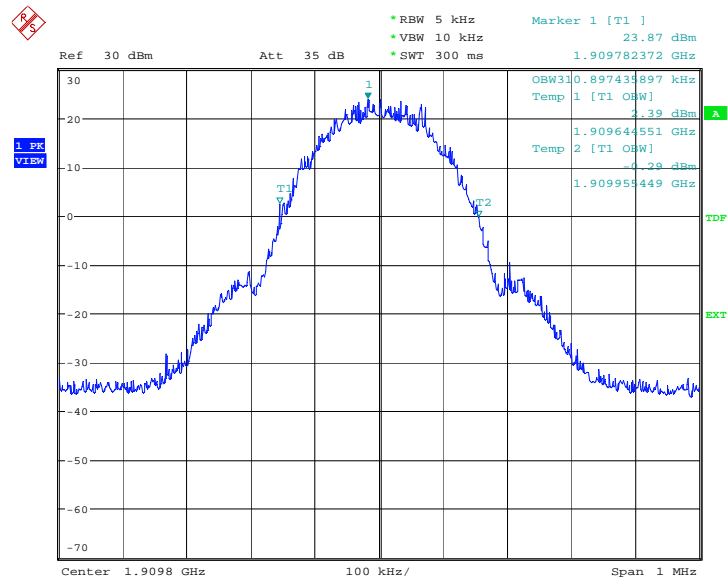
Date: 1.JUL.2010 06:38:53

Channel 661-Occupied Bandwidth (-26dBc BW)



Date: 1.JUL.2010 06:39:20

Channel 810-Occupied Bandwidth (-26dBc BW)



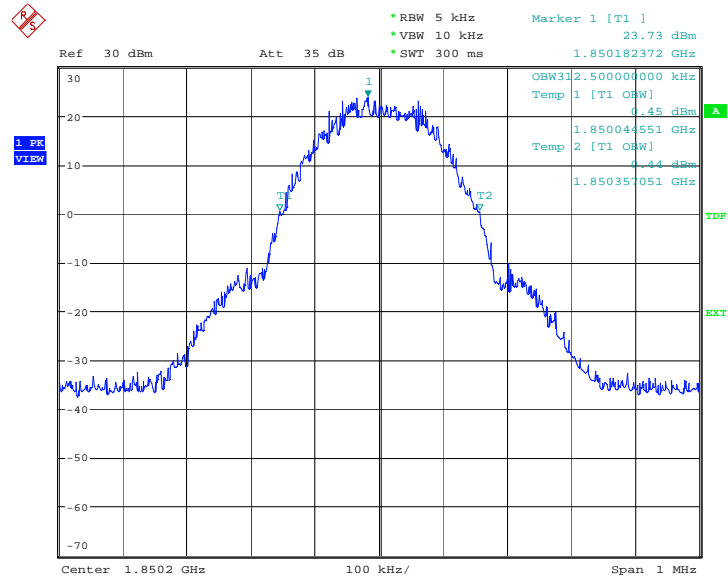
Date: 1.JUL.2010 06:39:47

GPRS 1900(-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc BW)(kHz)
1850.2	312.500
1880.0	314.102
1909.8	314.102

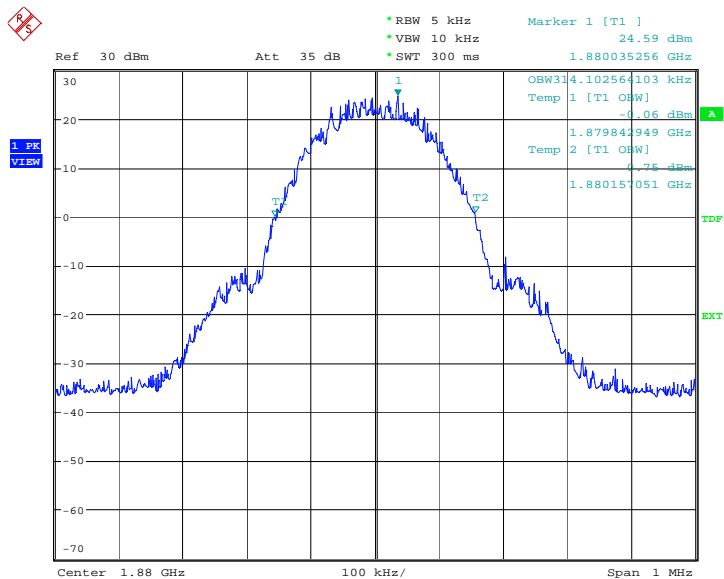
GPRS 1900

Channel 512-Occupied Bandwidth (-26dBc BW)



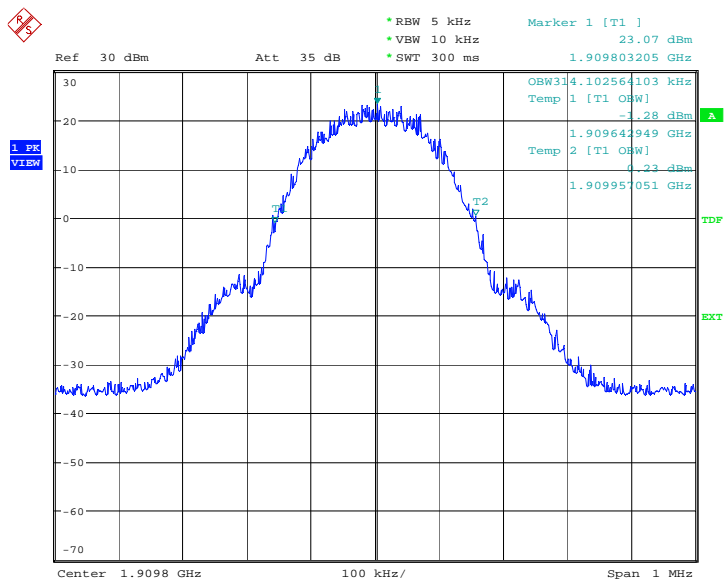
Date: 1.JUL.2010 06:45:14

Channel 661-Occupied Bandwidth (-26dBc BW)



Date: 1.JUL.2010 06:45:41

Channel 810-Occupied Bandwidth (-26dBc BW)



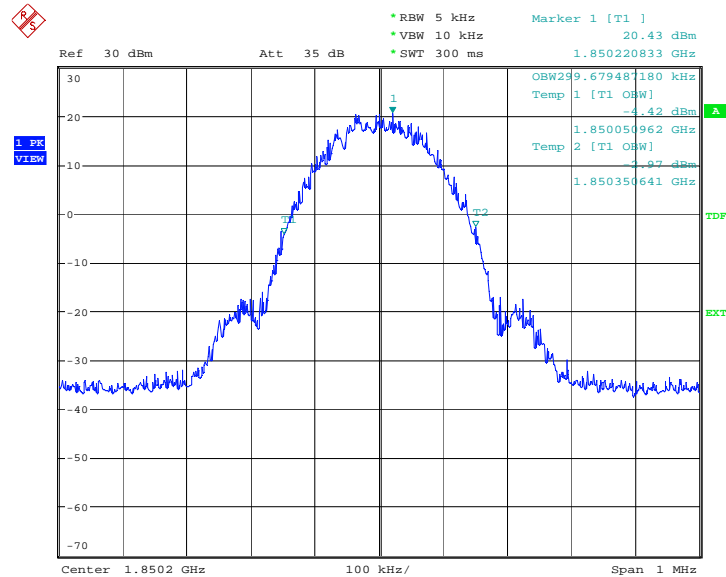
Date: 1.JUL.2010 06:46:08

EGPRS 1900(-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc BW)(kHz)
1850.2	299.679
1880.0	298.076
1909.8	299.679

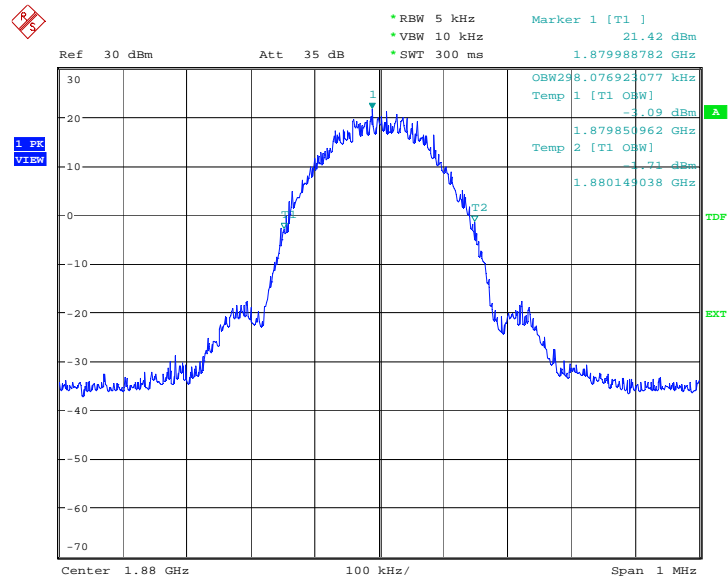
EGPRS 1900

Channel 512-Occupied Bandwidth (-26dBc BW)



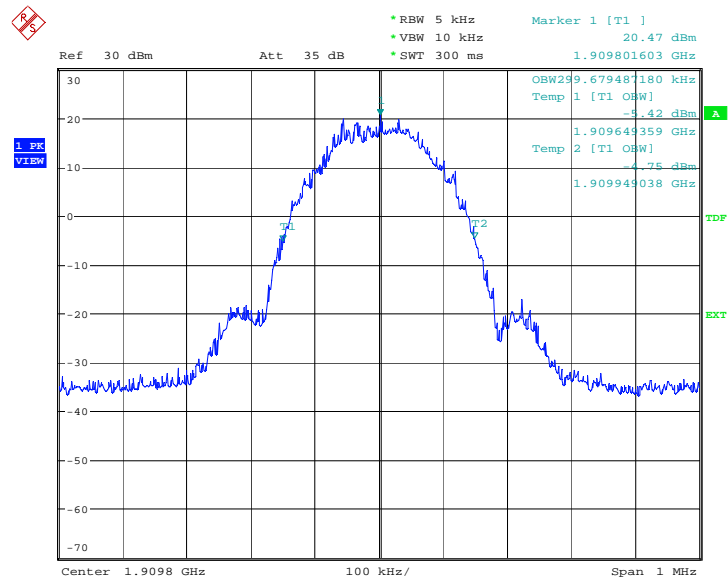
Date: 1.JUL.2010 06:50:13

Channel 661-Occupied Bandwidth (-26dBc BW)



Date: 1.JUL.2010 06:50:40

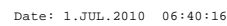
Channel 810-Occupied Bandwidth (-26dBc BW)



Date: 1.JUL.2010 06:51:07

PCS 1900

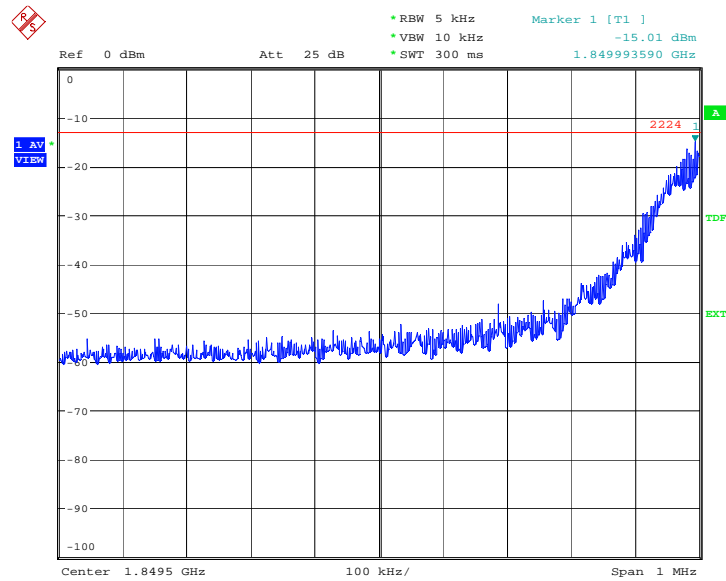
LOW BAND EDGE BLOCK-A (PCS-1900)-Channel 512



Date: 1.JUL.2010 06:40:44

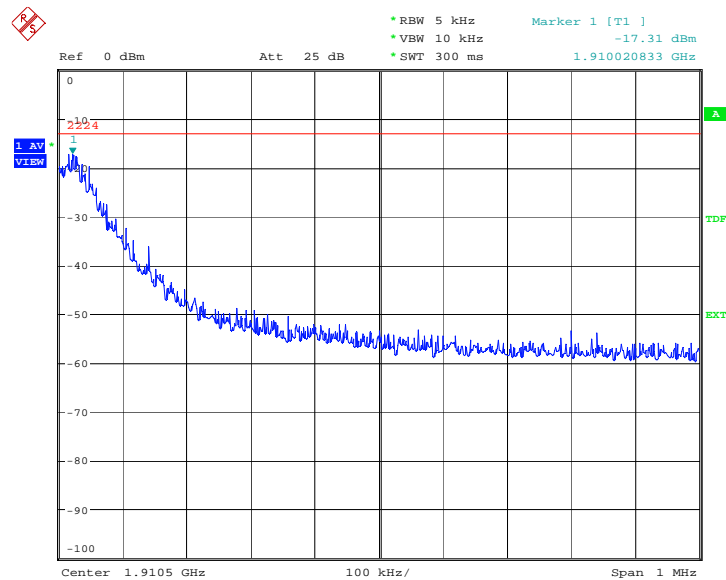
GPRS 1900

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



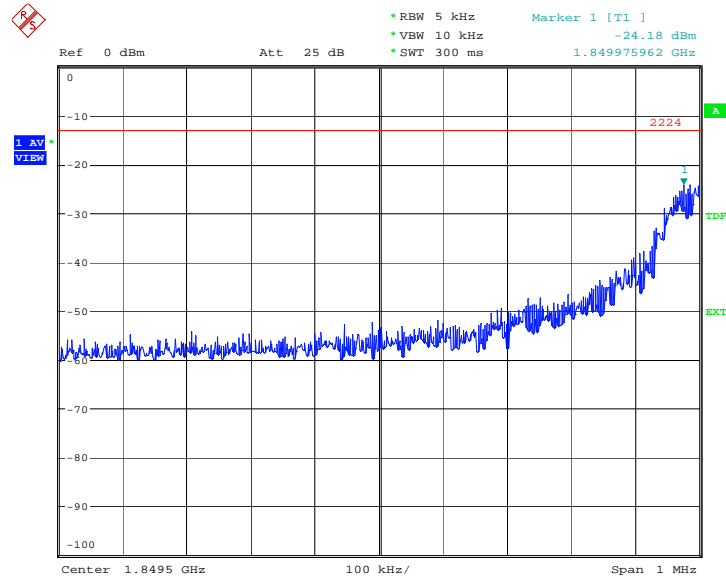
Date: 1.JUL.2010 06:46:36

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



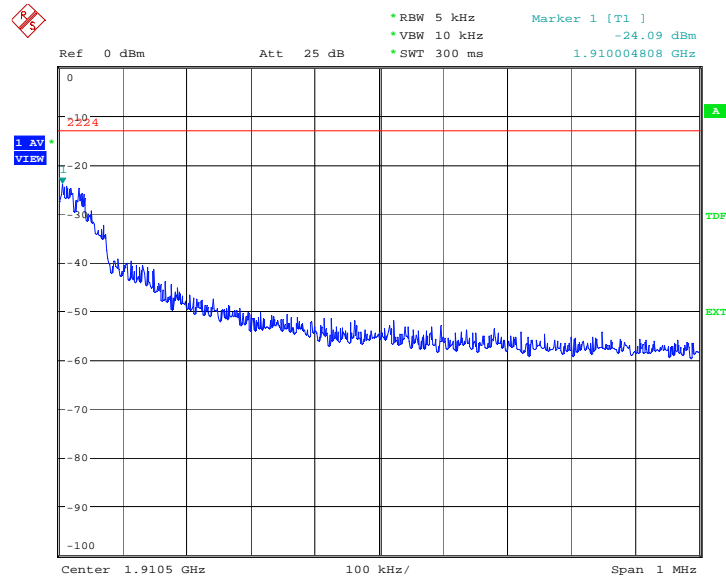
Date: 1.JUL.2010 06:47:05

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



Date: 1.JUL.2010 06:51:36

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



Date: 1.JUL.2010 06:52:04

A.8 CONDUCTED SPURIOUS EMISSION (§2.1057/§22.917/§24.238)

A.8.1 Measurement Method

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of PCS1900 band, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz.
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

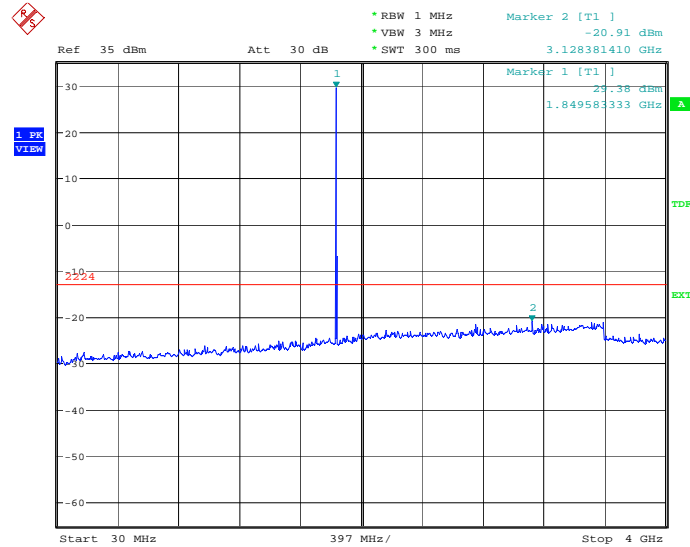
PCS1900

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.

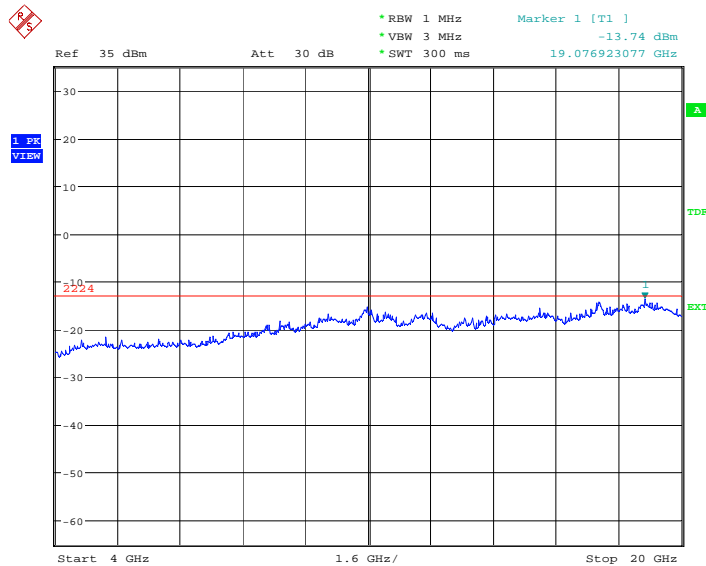
NOTE: peak above the limit line is the carrier frequency.



Date: 7.JUN.2010 01:45:14

A. 8.3.2 Channel 512: 4GHz – 20GHz

Spurious emission limit –13dBm.

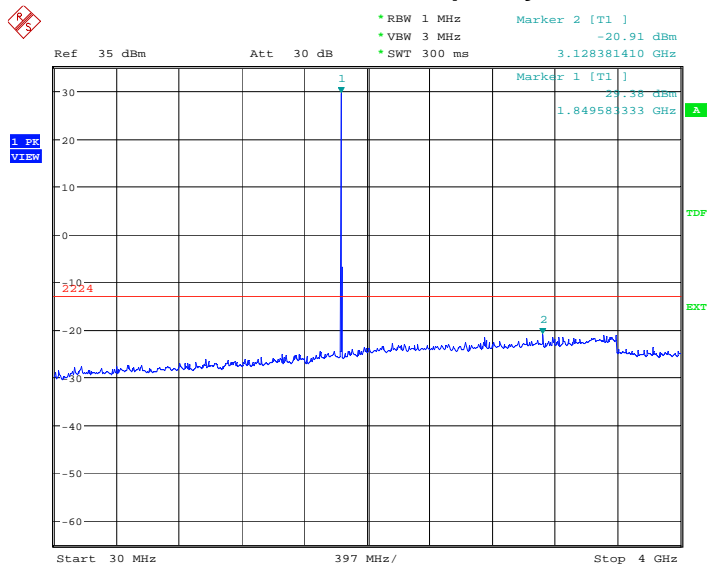


Date: 7.JUN.2010 01:45:42

A. 8.3.3 Channel 661: 30MHz – 4GHz

Spurious emission limit –13dBm

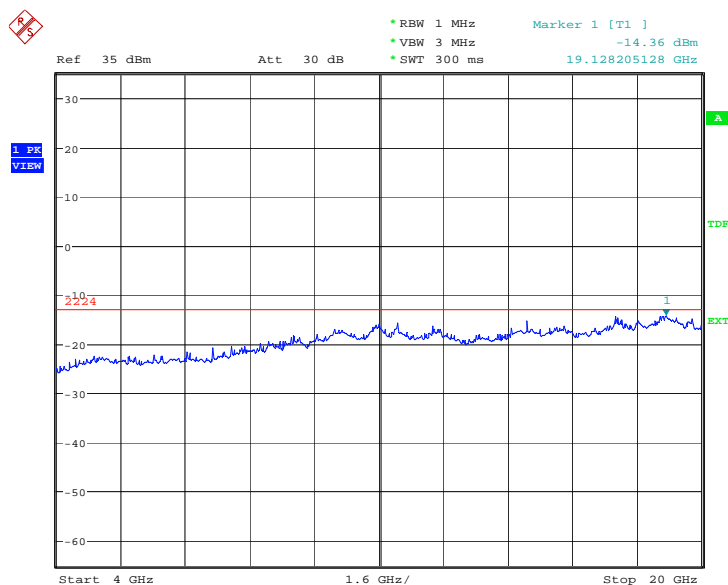
NOTE: peak above the limit line is the carrier frequency.



Date: 7.JUN.2010 01:45:14

A. 8.3.4 Channel 661: 4GHz –20GHz

Spurious emission limit –13dBm

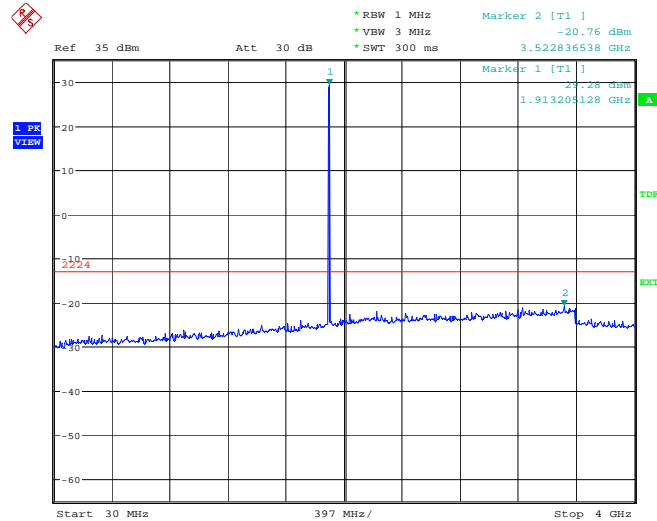


Date: 7.JUN.2010 01:46:39

A. 8.3.5 Channel 810: 30MHz – 4GHz

Spurious emission limit –13dBm.

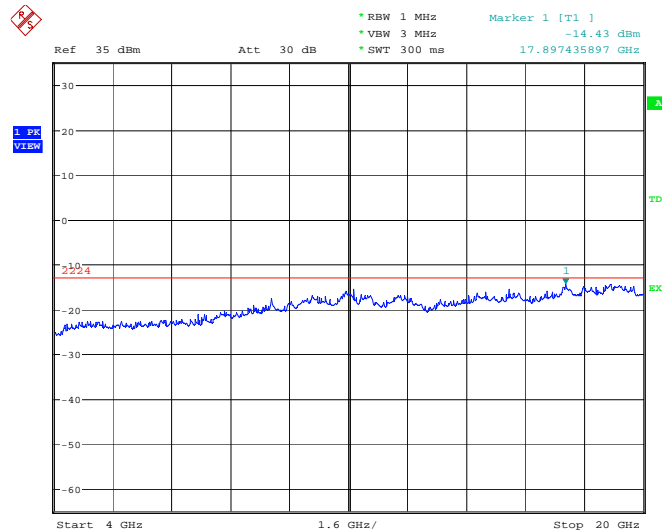
NOTE: peak above the limit line is the carrier frequency.



Date: 7.JUN.2010 01:47:07

A. 8.3.6 Channel 810: 4GHz – 20GHz

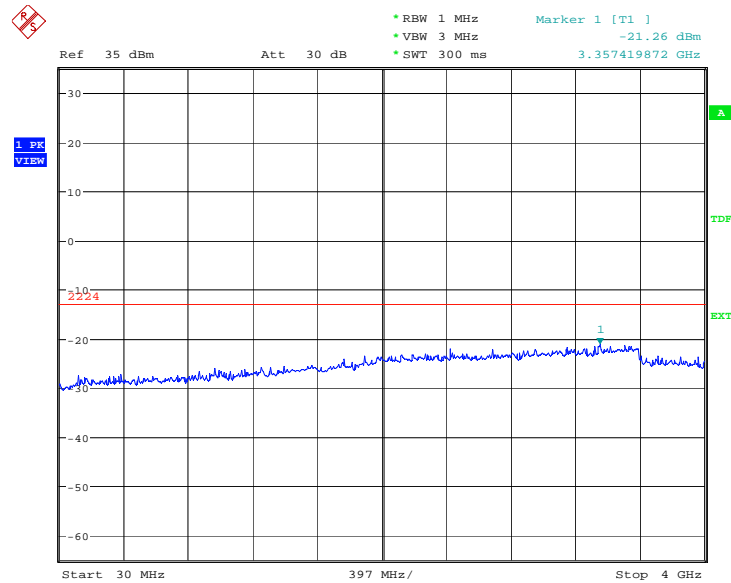
Spurious emission limit –13dBm.



Date: 7.JUN.2010 01:47:36

A. 8.3.7 Idle mode: 30MHz – 4GHz

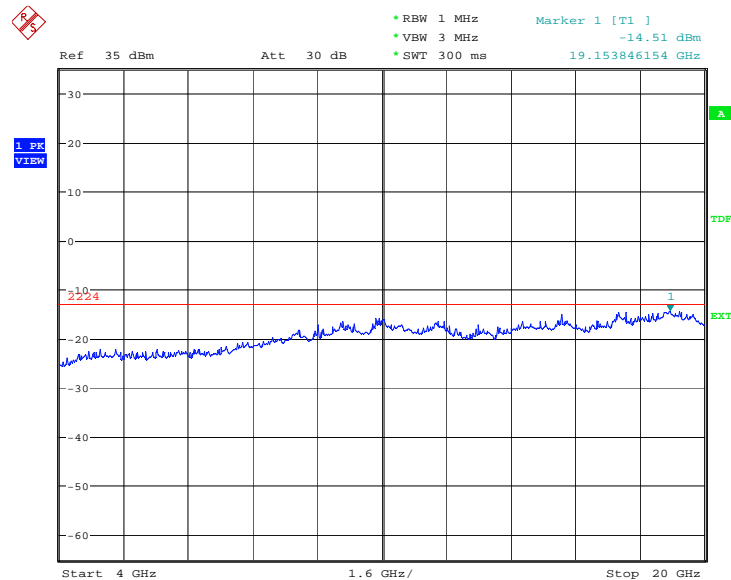
Spurious emission limit -13dBm.



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A. 8.3.8 Idle mode: 4GHz – 20GHz

Spurious emission limit -13dBm.



Date: 7.JUN.2010 01:48:32

END OF REPORT