

CETECOM Inc.



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Issued test report consists of 86 Pages

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FCC LISTED, REG. NO.: 101450 & RECOGNIZED BY INDUSTRY CANADA IC – 3925
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**Test report no.: EMC_319FCC22-24_2002_CT56
FCC Part 22,24 / RSS 133
(CT56)**

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1	General information
1.1	Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM Inc. does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM Inc.

TEST REPORT PREPARED BY:
EMC Engineer: Harpreet Sidhu

1.2 Testing laboratory

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1.3 Details of applicant

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Street : 16745 West Bernardo Dr.
City / Zip Code : San Diego, CA 92129
Country : U.S.A
Contact : Dr. Peter Nevermann
Telephone : (858) 521 3282
Tele-fax : (858) 521 3105
e-mail : peter.neuermann@icm.siemens.com

1.4 Application details

Date of receipt of application : 2002-07-15
Date of receipt test item : 2002-07-30
Date of test : 2002-07-30/31

1.5 Test item

Manufacturer : SIEMENS
Street Address : Suedstr. 9
City / Zip Code : 47475 Kamp-Lintfort
Country : Germany
Marketing Name : CT56
Model No. : L55 Tuna
Serial No.(IMEI) : 001002000031497
Description : [GSM 850 / PCS 1900 PCS mobile phone](#)
FCC-ID : PWX-CT56

Additional information

Frequency : 824.2MHz – 848.8MHz for GSM 850,
1850.2MHz – 1909.8MHz for PCS 1900
Type of modulation : GMSK
Number of channels : 124 for GSM-850, 299 for PCS-1900
Antenna : Embedded dual band
Power supply : Battery or charger (AC adaptor)
Output power : 31.39dBm (1.38W) maximum ERP measured in GSM-850
31.81dBm (1.52W) maximum EIRP measured in PCS-1900
Extreme vol. Limits : 3.3 VDC – 5.2 VDC
Extreme temp. Tolerance : -30 C to +50 C

1.6 Test standards

FCC Part 22,24 / RSS133 r1

Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.

2 Technical test**2.1 Summary of test results**

No deviations from the technical specification(s) were ascertained in the course of the tests Performed	
Final Verdict: (only “passed” if all single measurements are “passed”)	Passed

Technical responsibility for area of testing:

2002-08-20 EMC & Radio Lothar Schmidt (Manager)

**Date****Section****Name****Signature****Responsible for test report and project leader:**

2002-08-20 EMC & Radio Harpreet Sidhu (EMC Engineer)

**Date****Section****Name****Signature**

2.2 Test report

TEST REPORT

**Test report no.: EMC_319FCC22-24_2002_CT56
(CT56)**

TEST REPORT REFERENCE

PARAMETER TO BE MEASURED	PARAGRAPH	PAGE
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POWER OUTPUT**§ 22.913(a) / § 24.232 (b)****Summary:**

During the process of testing, the EUT was controlled via Rhode & Schwarz Universal Radio Communication tester (CMU 200) to ensure max. power transmission and proper modulation.

This paragraph contains both average, peak output powers and EIRP measurements for the EUT.(ERP for GSM-850)
In all cases, the peak output power is within the specified limits.

Method of Measurements:

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

The power was measured with R&S Spectrum Analyzer ESIB 40 (peak)

These measurements were done at 3 frequencies,

824.2 MHz, 836.6 MHz and 848.8 MHz (bottom, middle and top of operational frequency range) for GSM-850

1850.2 MHz, 1880.0 MHz and 1909.8 MHz (bottom, middle and top of operational frequency range) for PCS-1900

Conducted (GSM-850)**Limits:**

Power Step	Nominal Peak Output Power	Tolerance (dB)
0	$\leq 38.45\text{dBm}$ (7W) ERP	± 2

Power Measurements:

Conducted Average power measurements are provided by SIEMENS.

Please refer to attached document: FCC_CT56_conducted_power

(page 3, section 2.1, Siemens, "FCC sample 1" IMEI: 001002000031497)

Frequency (MHz)	Average Power (dBm)
824.2	32.2
836.6	31.9
848.8	31.6

Conducted (PCS-1900)**Limits:**

Power Step	Nominal Peak Output Power	Tolerance (dB)
0	$\leq 33\text{dBm}$ (1W) EIRP	± 2

Power Measurements:

Conducted Average power measurements are provided by SIEMENS.

Please refer to attached document: FCC_CT56_conducted_power

(page 3, section 2.2, Siemens, "FCC sample 1" IMEI: 001002000031497)

Frequency (MHz)	Average Power (dBm)
1850.2	29.4
1880.0	29.3
1909.8	29.4

EIRP / ERP Measurements

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

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

Rule Part 24.232(b) specifies that "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."

Method of Measurement:

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. A "reference path loss" is established as $P_{in} + 2.1 - P_r$.
3. The EUT is substituted for the dipole at the reference centre of the chamber. The EUT is put into CW test mode and a scan is performed to obtain the radiation pattern.
4. From the radiation pattern, the co-ordinates where the maximum antenna gain occurs is identified.
5. The EUT is then put into pulse mode at its maximum power level (Power Step 0).
6. "Gated mode" power measurements are performed with the receiving antenna placed at the coordinates determined in Step 3 to determine the output power as defined in FCC 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 (2.1 dBi) and known input power (P_{in}).
8. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.1\text{dBi}$.

ERP (GSM-850)**§22.913(a)****Limits:**

Power Step	Burst Average ERP
0	≤38.45dBm (7W)

Power Measurements:

Plots are shown on next pages

Radiated:

Frequency (MHz)	Power Step	BURST AVERAGE (dBm)	
		EIRP	ERP
824.2	0	33.49	31.39
836.6	0	33.15	31.05
848.8	0	32.07	29.97
Measurement uncertainty		±0.5 dB	

ANALYZER SETTINGS: RBW = VBW = 3MHz

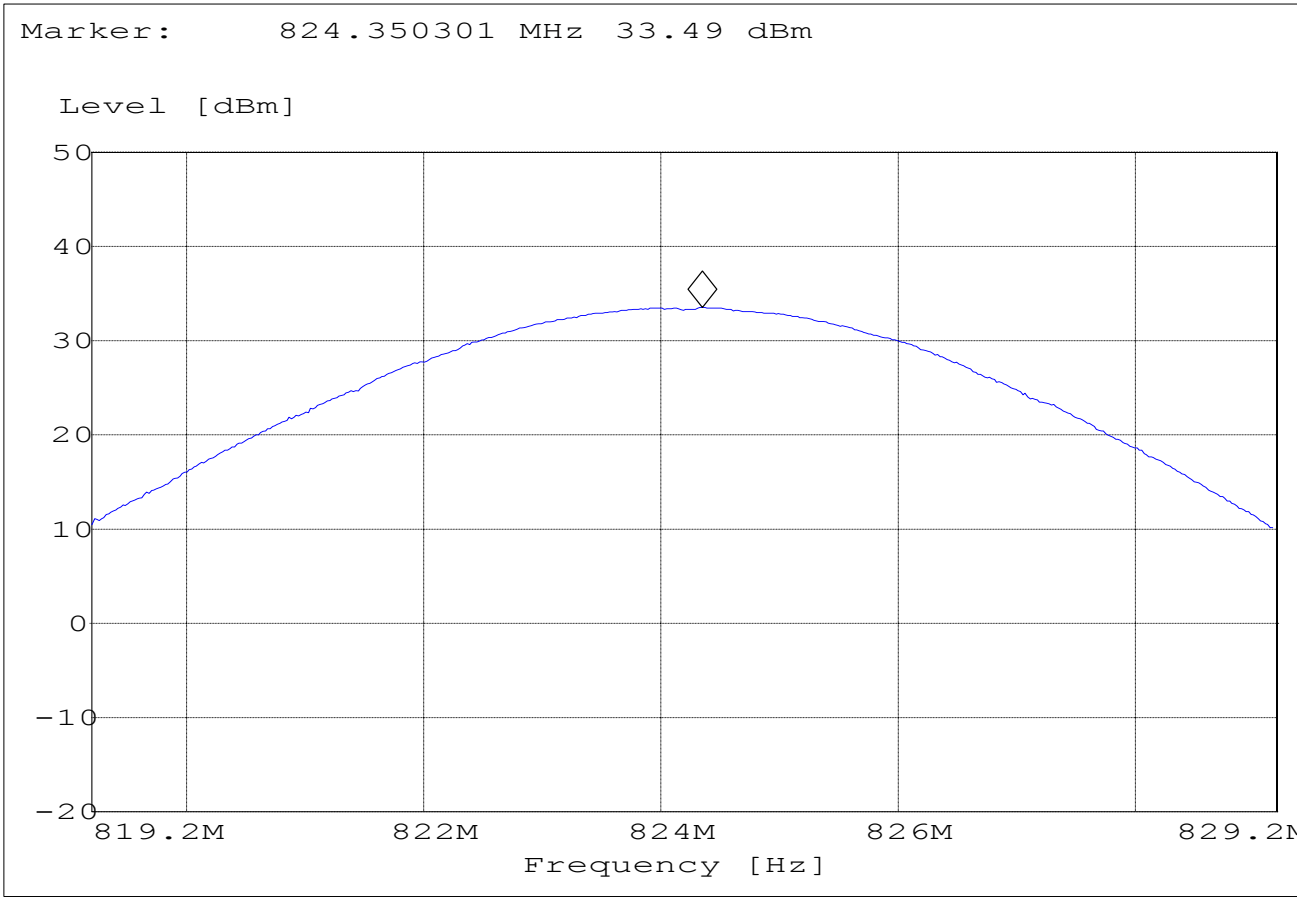
Note: The plots show EIRP measurements only.

EIRP CHANNEL 128 (GSM-850)

§22.913(a)

SWEEP TABLE: "EIRP 850 CH 128"

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
819.2 MHz	829.2 MHz	MaxPeak	Coupled	3 MHz

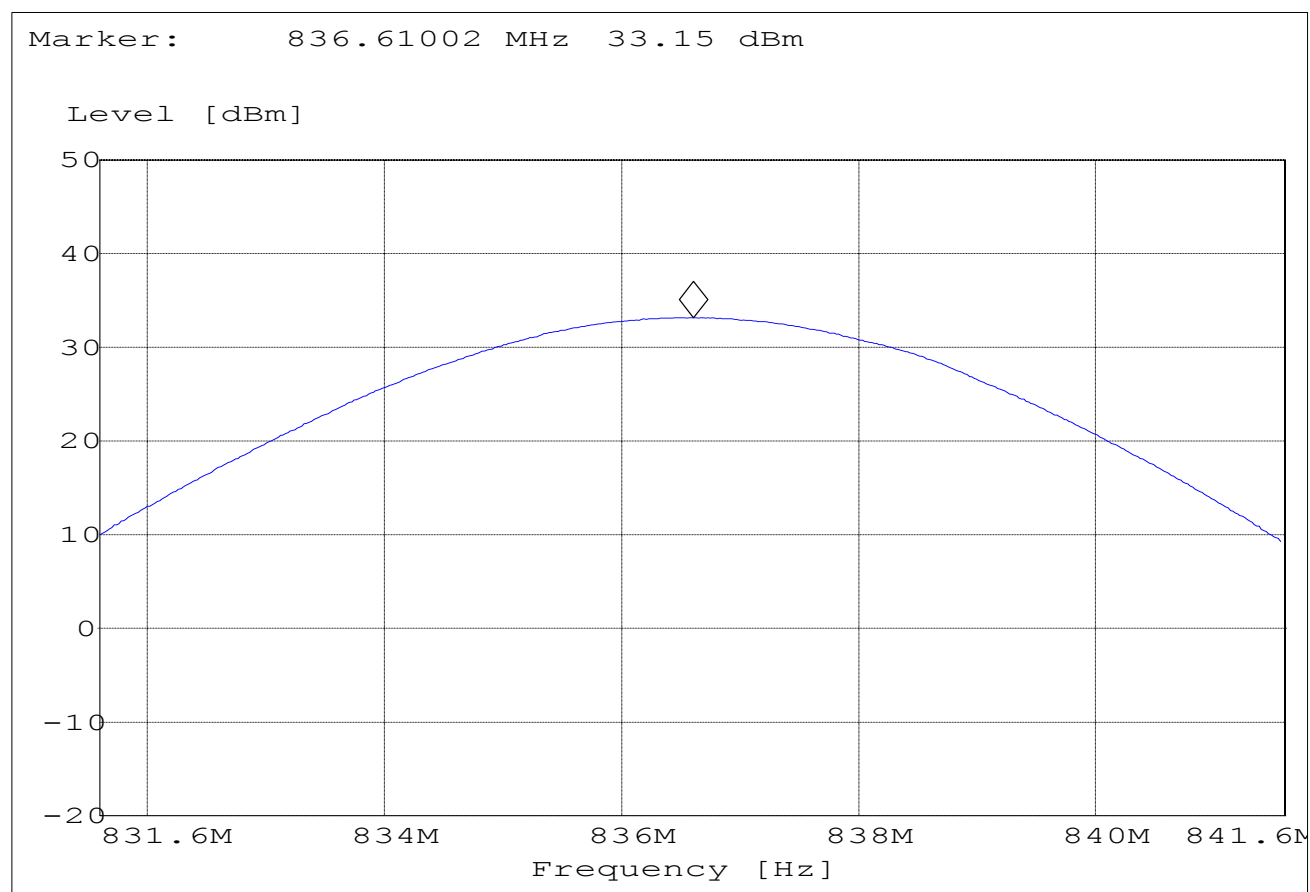


EIRP CHANNEL 190 (GSM-850)

§22.913(a)

SWEEP TABLE: "EIRP 850 CH 190"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
831.6MHz	841.6 MHz	MaxPeak	Coupled	3 MHz

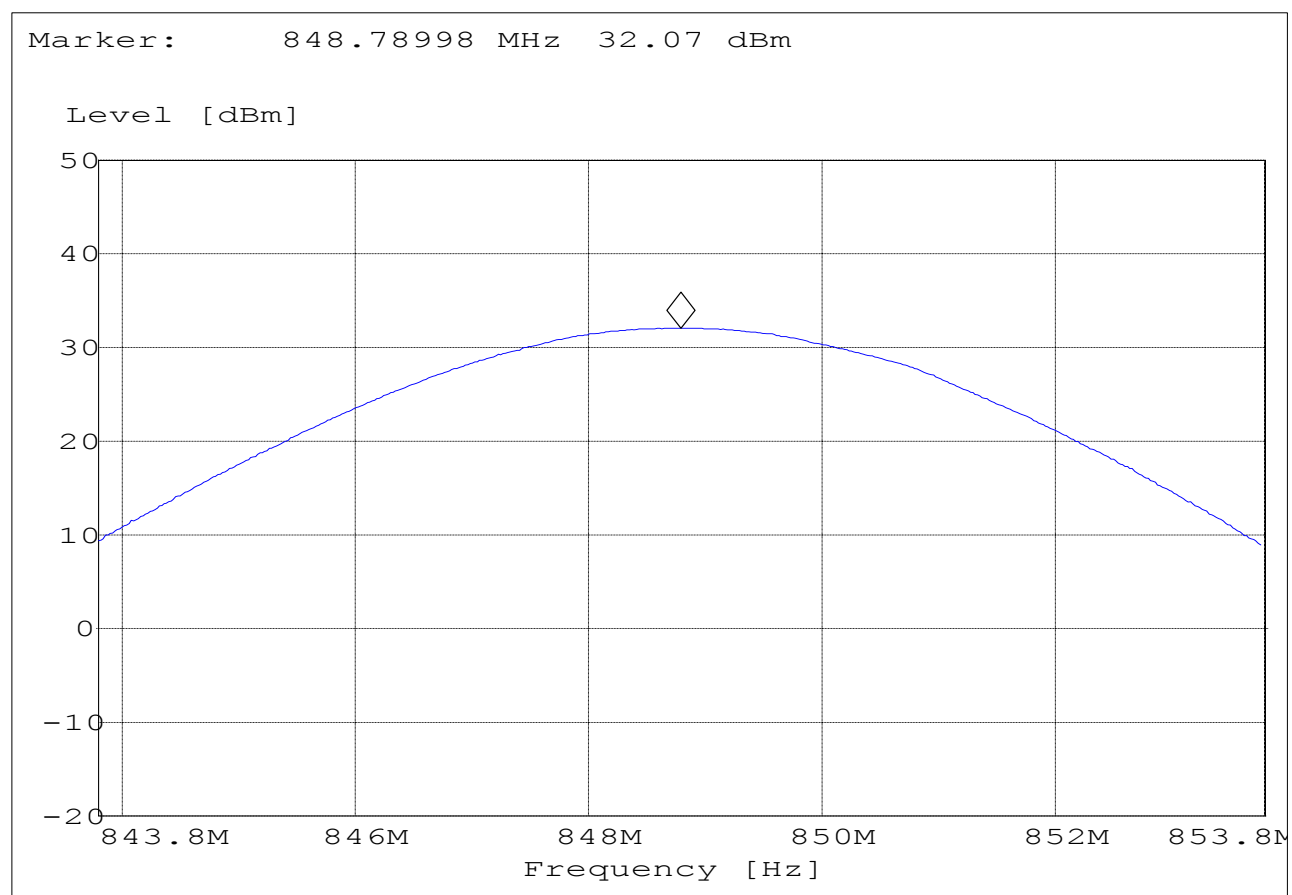


EIRP CHANNEL 251 (GSM-850)

§22.913(a)

SWEEP TABLE: "EIRP 850 CH 251"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
843.8MHz	853.8MHz	MaxPeak	Coupled	3 MHz



EIRP (PCS-1900)**§24.232(b)****Limits:**

Power Step	Burst Average EIRP
0	≤33dBm (1W)

Power Measurements:

Plots are shown on next pages

Radiated:

Frequency (MHz)	Power Step	BURST AVERAGE (dBm)	
		EIRP	ERP
1850.2	0	31.67	29.57
1880.0	0	31.81	29.71
1909.8	0	30.73	28.63
Measurement uncertainty		±0.5 dB	

ANALYZER SETTINGS: RBW = VBW = 3MHz

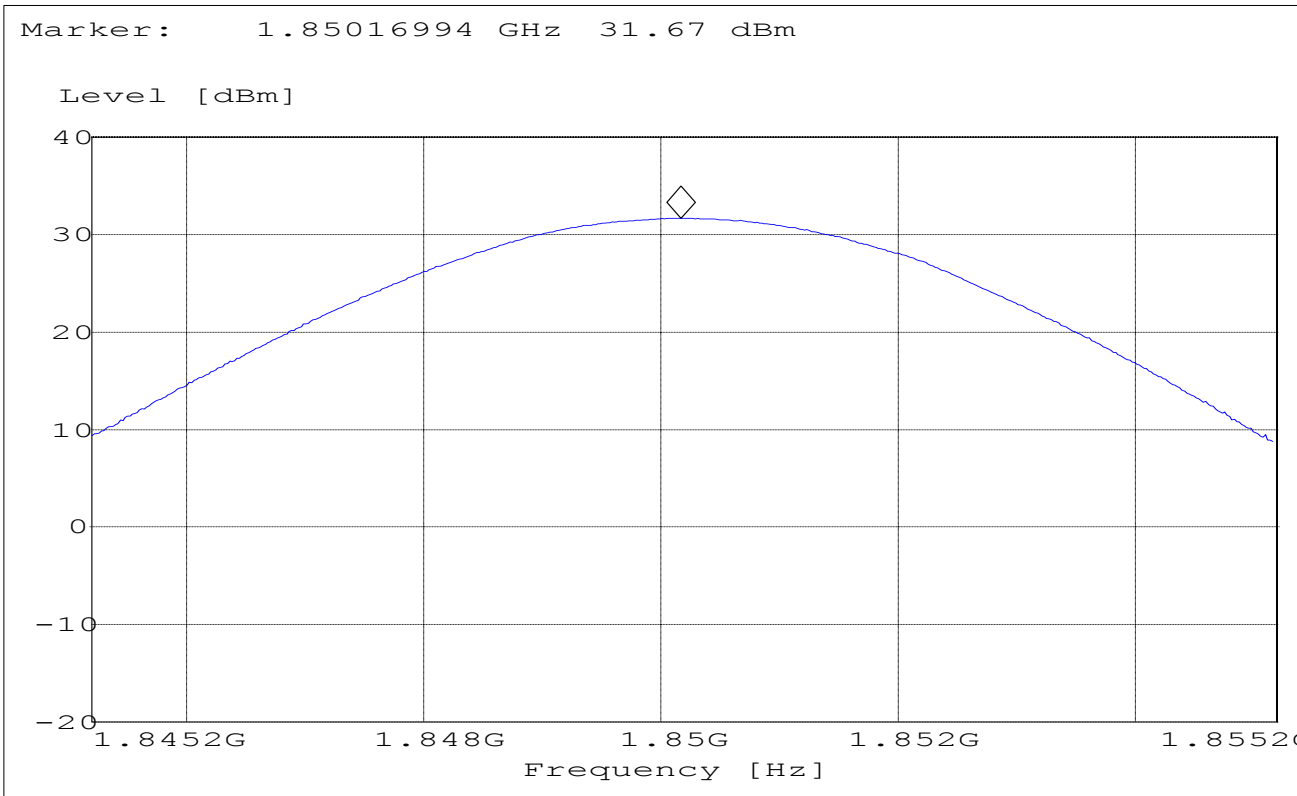
Note: The plots show EIRP measurements only.

EIRP CHANNEL 512 (PCS-1900)

§24.232(b)

SWEEP TABLE: "EIRP 1900 CH512"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1.8452 GHz	1.8552 GHz	Max Peak	Coupled	3 MHz

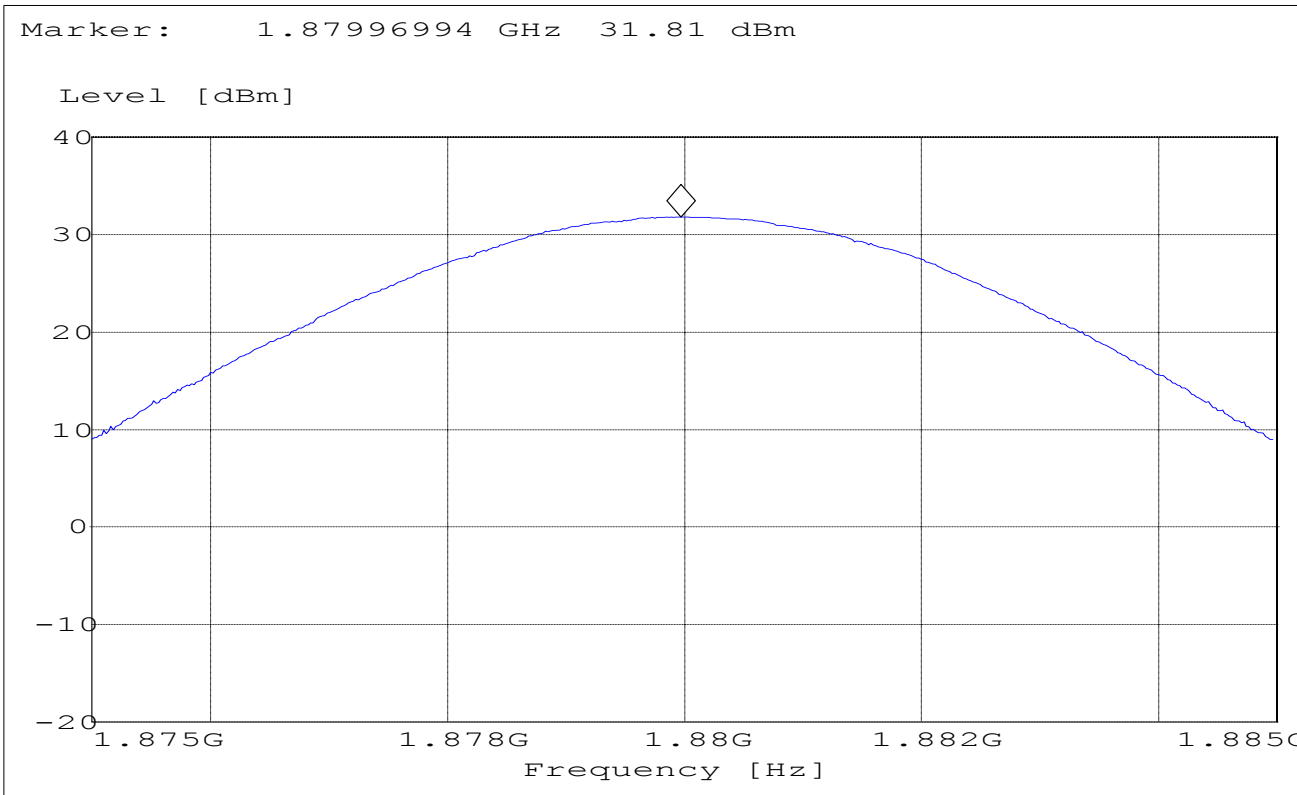


EIRP CHANNEL 661 (PCS-1900)

§24.232(b)

SWEEP TABLE: "EIRP 1900 CH661"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1.875 GHz	1.885 GHz	Max Peak	Coupled	3 MHz

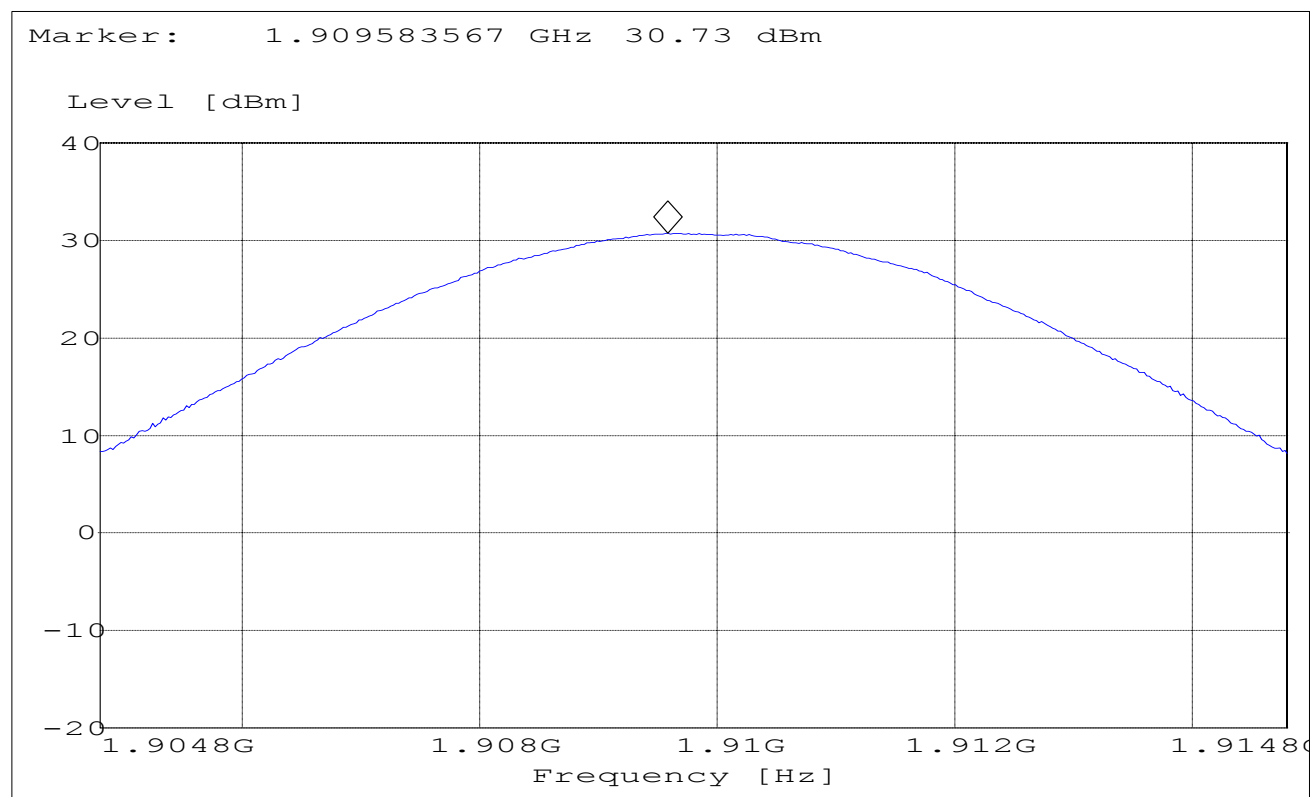


EIRP CHANNEL 810 (PCS-1900)

§24.232(b)

SWEEP TABLE: "EIRP 1900 CH810"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1.9048 GHz	1.9148 GHz	Max Peak	Coupled	3 MHz



FREQUENCY STABILITY**§ 2.1055(a)(1)(b) / § 24.235****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 a R&S CMU 200 UNIVERSAL 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 CMU 200 and in a simulated call on mid channel (190 for GSM 850 & 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 0.1 Volt 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 CMU 200 and in a simulated call on mid channel (190 for GSM 850 & 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.
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.

Measurement Limit:**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 3.3 VDC and 5.2 VDC, with a nominal voltage of 3.8 VDC. 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 -13.15 % and +36.84 %. For the purposes of measuring frequency stability these voltage limits are to be used.

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 to vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

FREQUENCY STABILITY (GSM-850)

AFC FREQ ERROR vs. VOLTAGE

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
3.3	-16	-0.0191
3.4	-16	-0.0191
3.5	-15	-0.0179
3.6	-14	-0.0167
3.7	-14	-0.0167
3.8	-17	-0.0203
3.9	-18	-0.0215
4.0	-16	-0.0191
4.1	-18	-0.0215
4.2	-17	-0.0203
4.3	-15	-0.0179
4.4	-19	-0.0227
4.5	-17	-0.0203
4.6	-19	-0.0227
4.7	-20	-0.0239
4.8	-18	-0.0215
4.9	-18	-0.0215
5.0	-20	-0.0239
5.1	-22	-0.0262
5.2	-23	-0.0274

AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-14	-0.0167
-20	-16	-0.0191
-10	-15	-0.018
0	-8	-0.00956
+10	-16	-0.0191
+20	-23	-0.0275
+30	-21	-0.0251
+40	-29	-0.0347
+50	-18	-0.0215

FRQUENCY STABILITY (PCS-1900)

AFC FREQ ERROR vs. VOLTAGE

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
3.3	19	0.0101
3.4	16	0.0085
3.5	20	0.0106
3.6	21	0.011
3.7	19	0.0101
3.8	17	0.00904
3.9	-17	-0.00904
4.0	20	0.0106
4.1	21	0.011
4.2	23	0.0122
4.3	17	0.00904
4.4	13	0.0069
4.5	20	0.0106
4.6	16	0.0085
4.7	17	0.00904
4.8	-21	-0.01117
4.9	22	0.0117
5.0	22	0.0117
5.1	17	0.00904
5.2	19	0.0101

AFC FREQ ERROR vs. TEMPERATURE

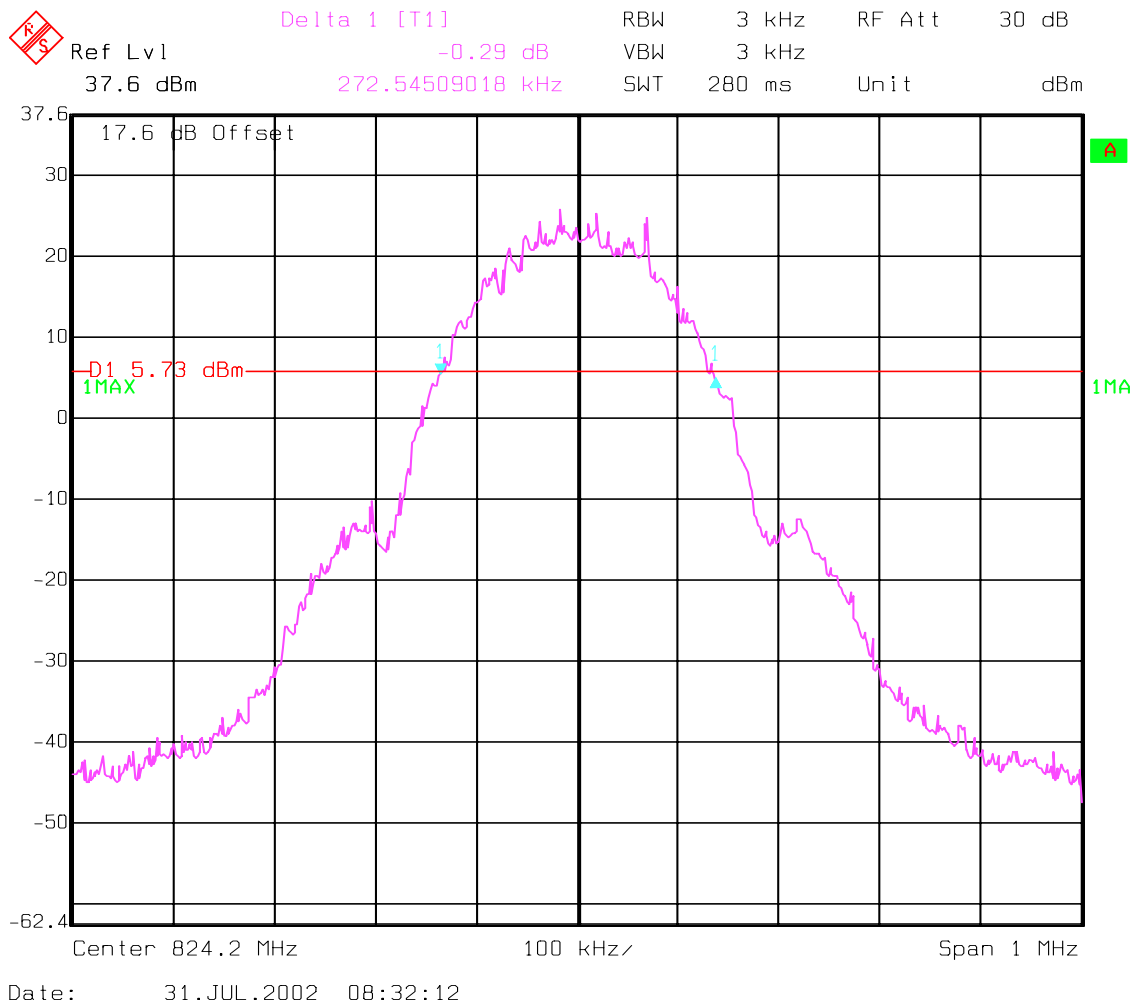
TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	15	0.0080
-20	17	0.00904
-10	-19	-0.0101
0	12	0.00638
+10	-13	-0.0069
+20	11	0.00585
+30	13	0.00692
+40	11	0.00585
+50	-30	-0.0160

OCCUPIED BANDWIDTH**§2.1049(c)(1), §24.238(a)(b)****-20dBc BANDWIDTH (GSM-850)**

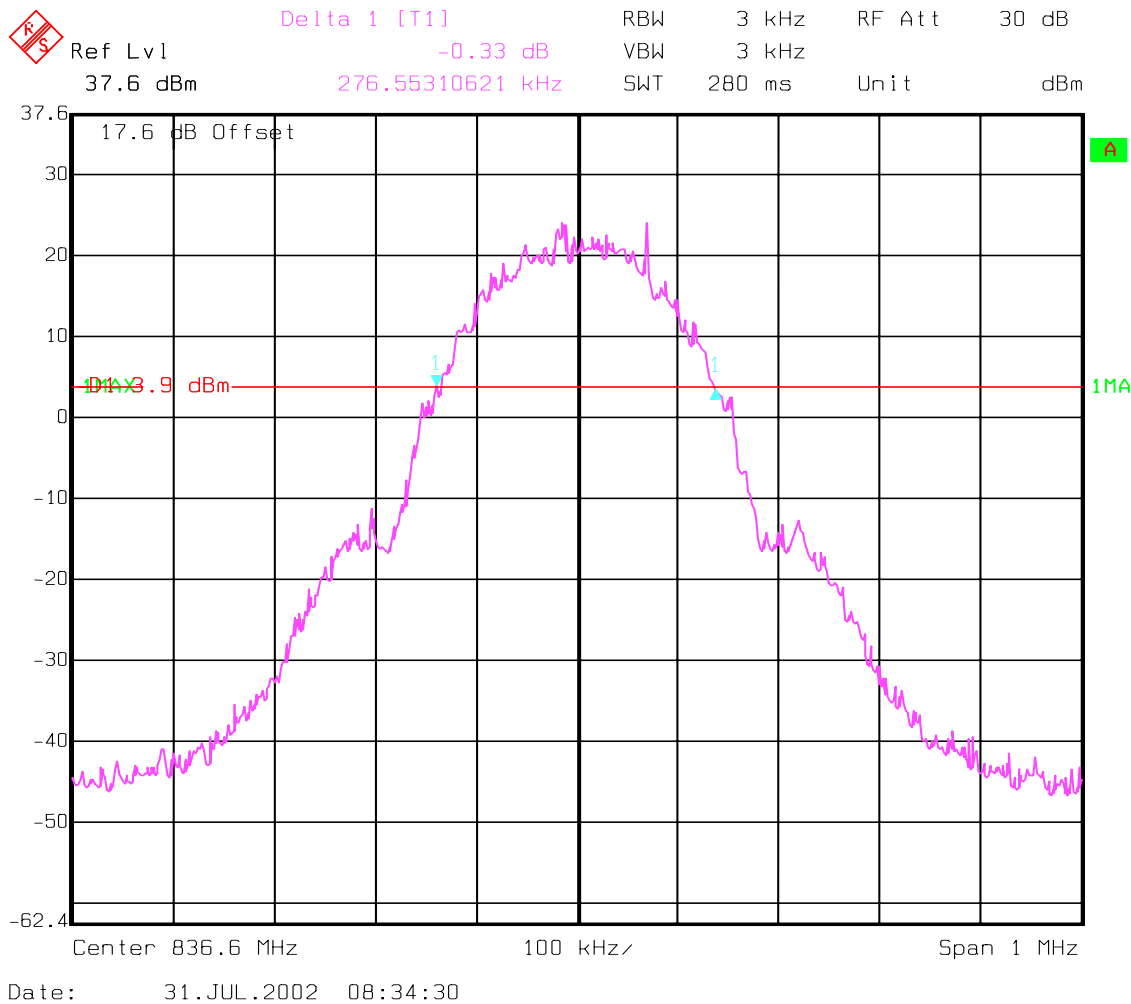
Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the GSM-850 frequency band. Table below lists the measured -20dBC occupied bandwidths. Spectrum analyzer plots are included on the following pages.

Frequency(MHz)	-20 dBc Bandwidth(kHz)
824.2MHz	272.54
836.6MHz	276.55
848.8MHz	278.55

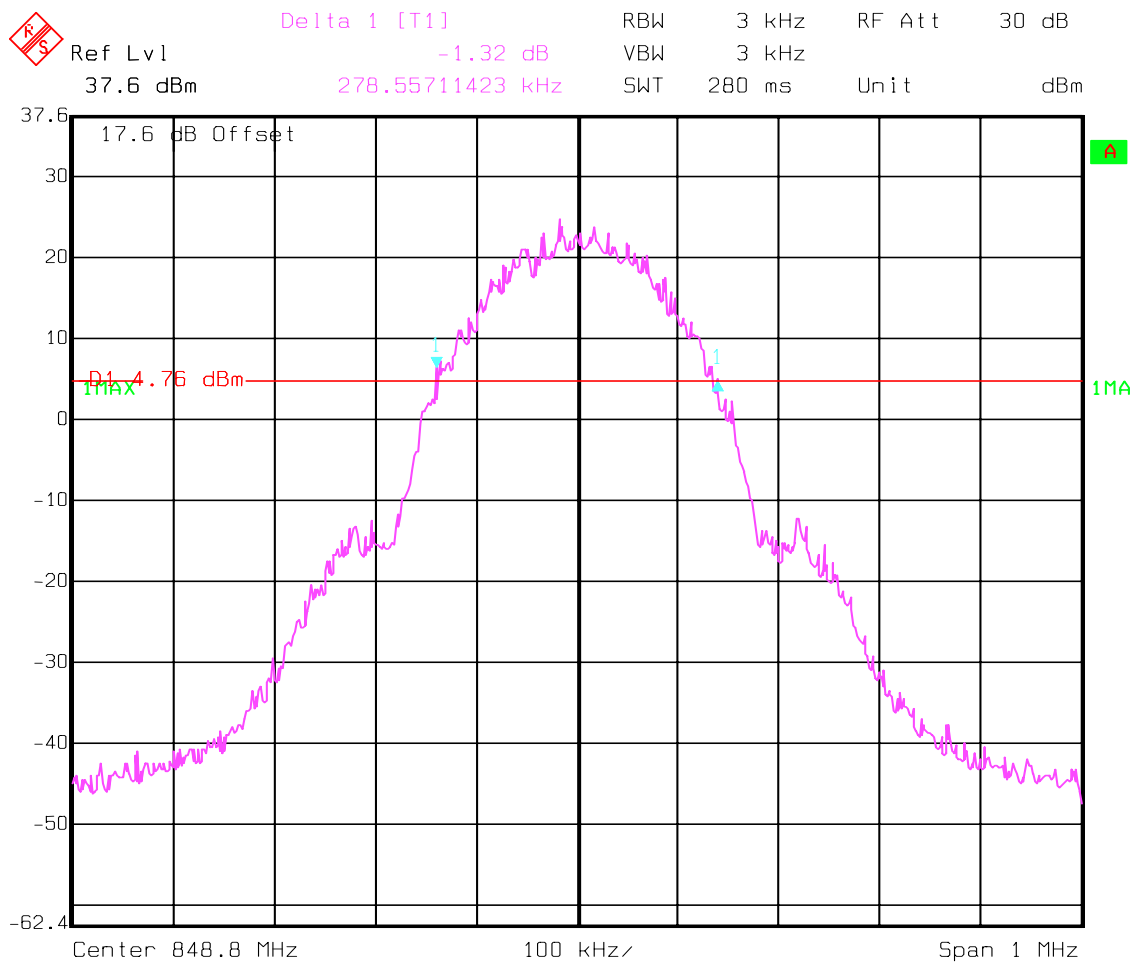
-20dBc BANDWIDTH CHANNEL 128(GSM-850)



-20dBc BANDWIDTH CHANNEL 190(GSM-850)



-20dBc BANDWIDTH CHANNEL 251(GSM-850)



Date: 31.JUL.2002 08:37:01

OCCUPIED BANDWIDTH**§2.1049(c)(1), §24.238(a)(b)****PCS-1900**

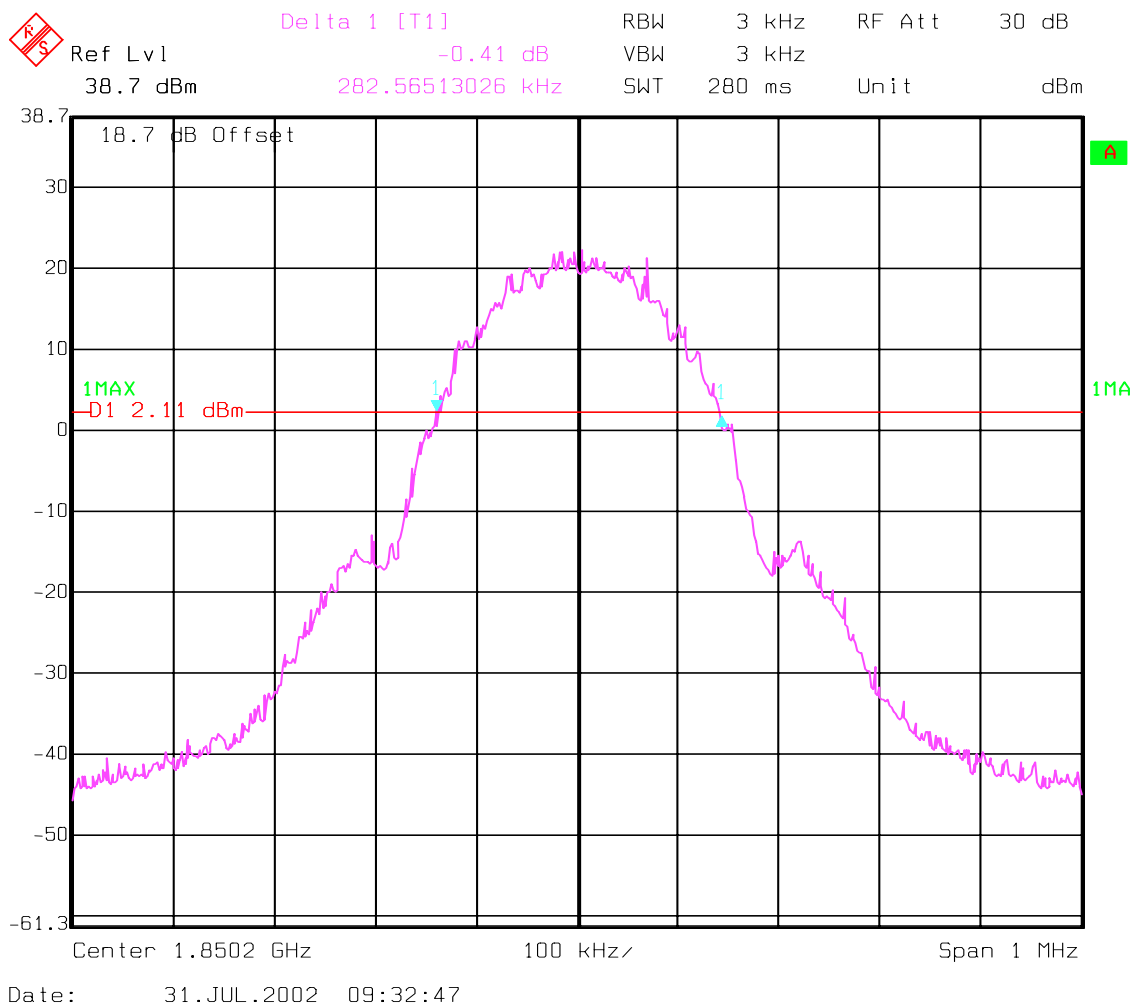
Occupied Bandwidth Results

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 PCS-1900 frequency band. Table below lists the measured 99% power(-20dBc) and -26dBc occupied bandwidths. Spectrum analyzer plots are included on the following pages.

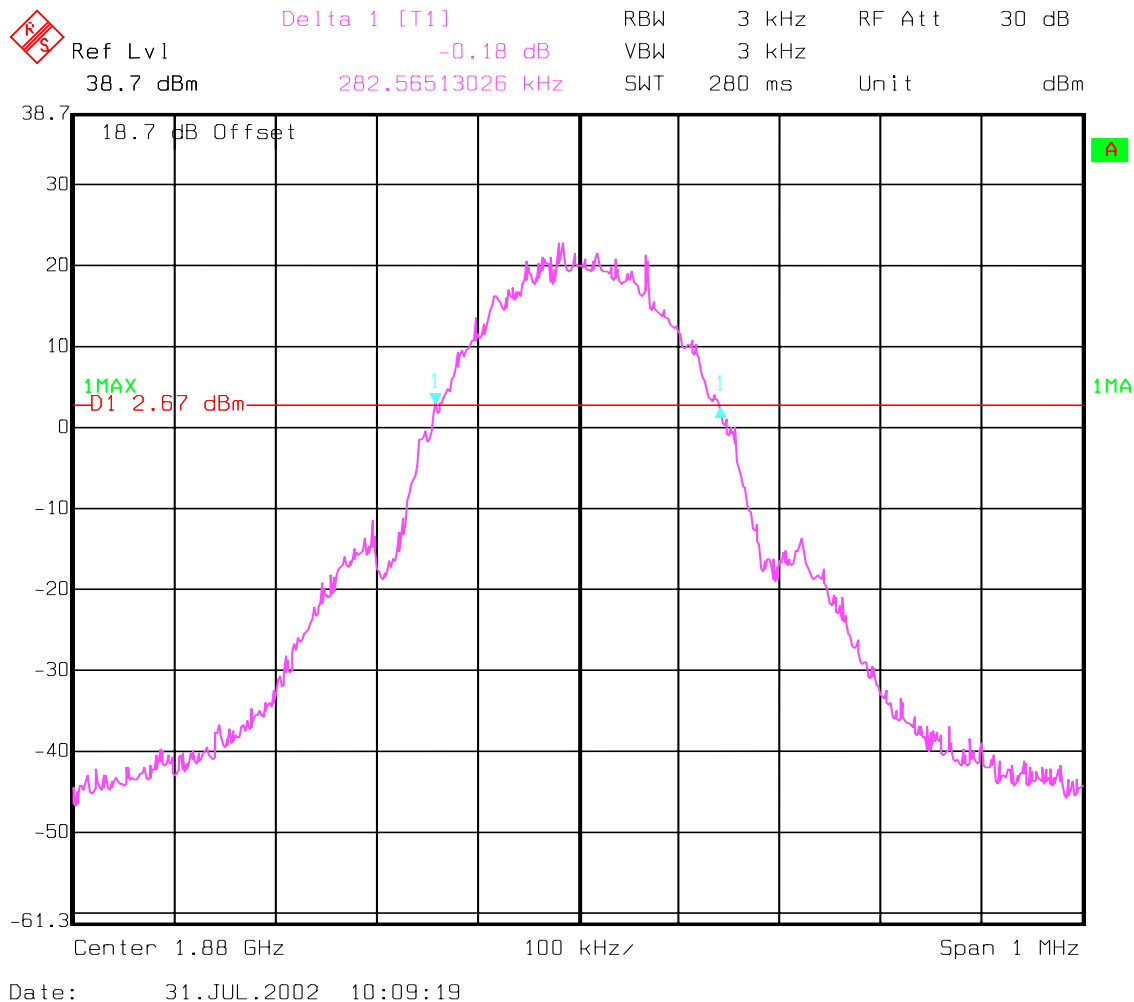
Frequency(MHz)	-20dBc BW (99% power) (kHz)	-26dBc Bandwidth (kHz)
1850.2	282.56	318.63
1880.0	282.56	316.63
1909.2	282.56	316.63

Part 24.238 (a) requires a measurement bandwidth of at least 1% of the occupied bandwidth. For 318.63 kHz, this equates to a resolution bandwidth of at least 3.5 kHz. For this testing, a resolution bandwidth 5.0 kHz was used.

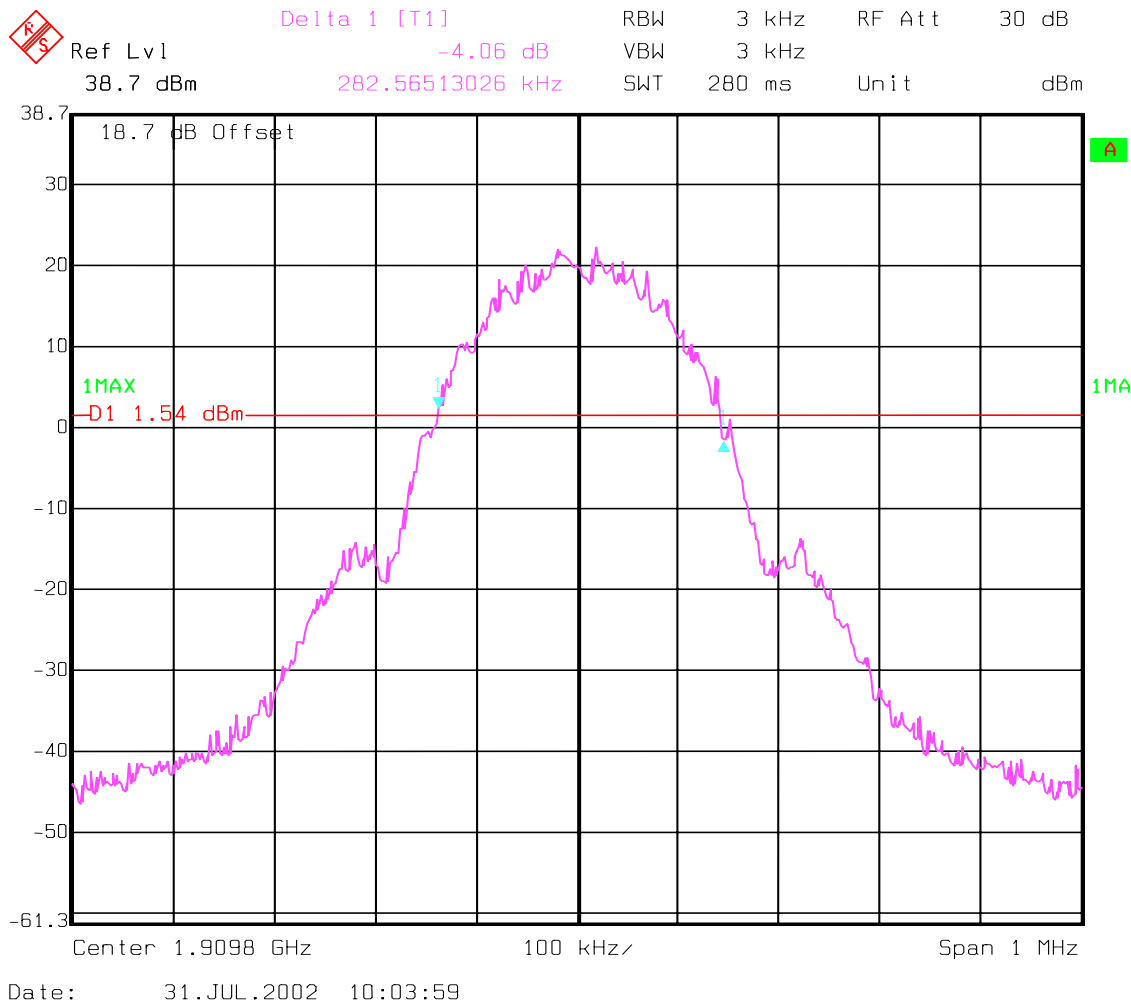
-20dBc BANDWIDTH CHANNEL 512(PCS-1900)



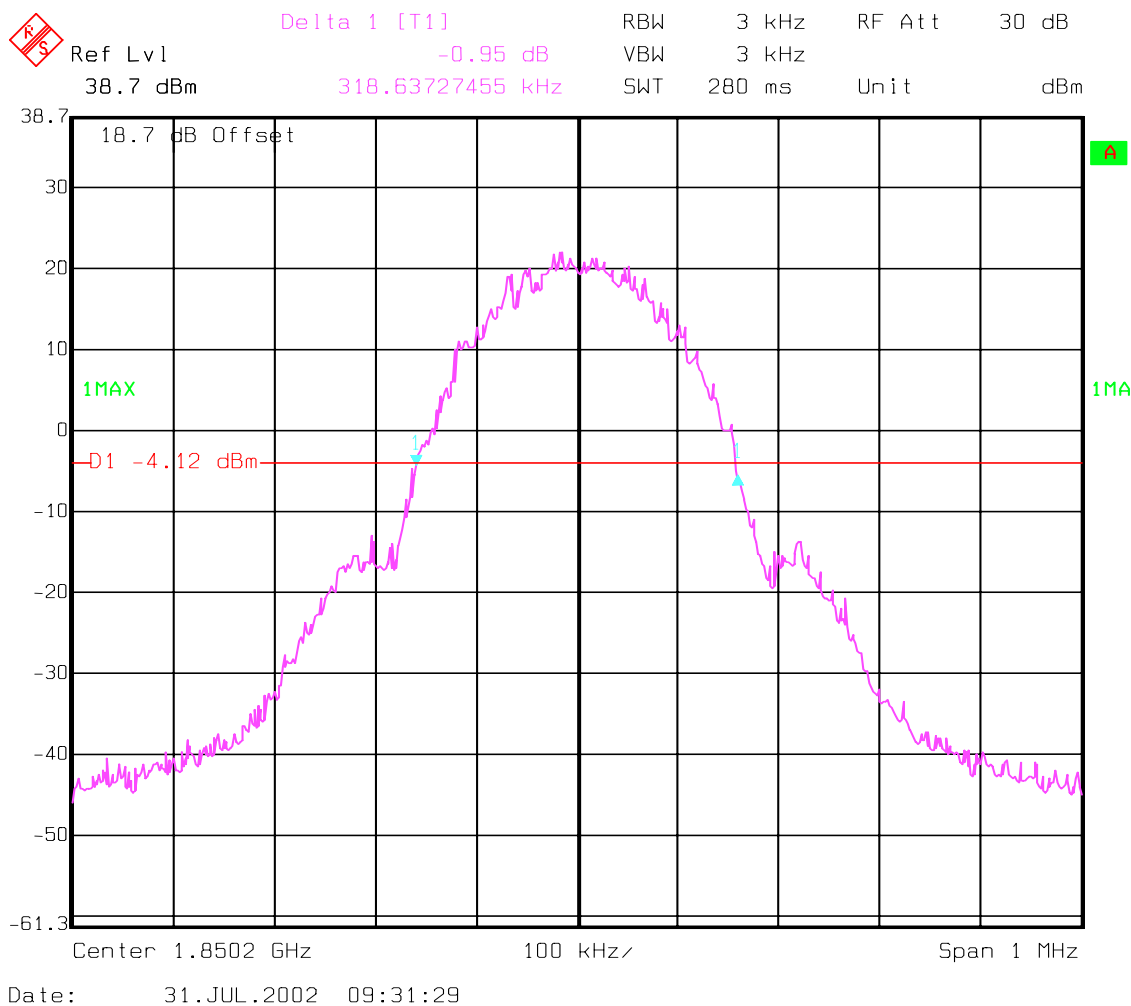
-20dBc BANDWIDTH CHANNEL 661(PCS-1900)



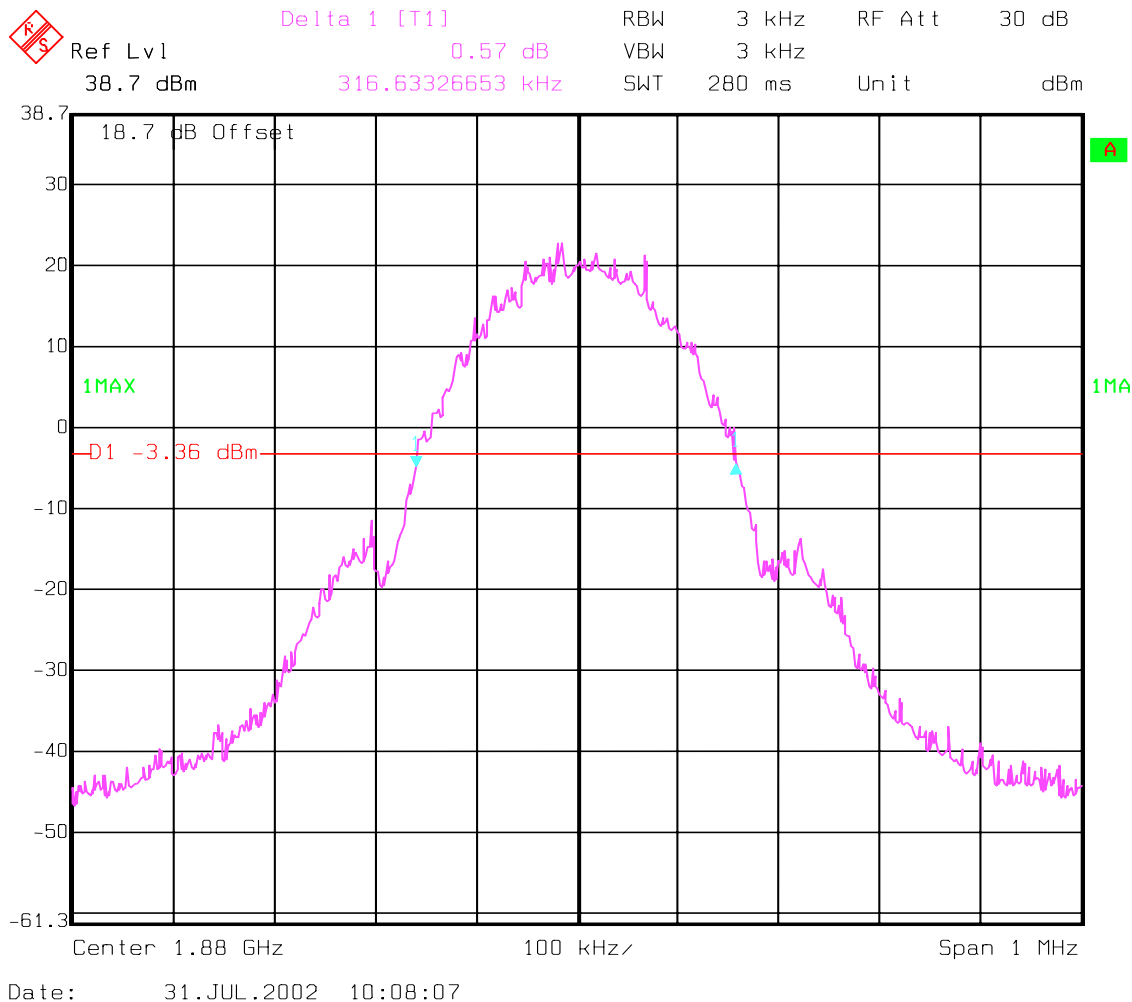
-20dBc BANDWIDTH CHANNEL 810(PCS-1900)



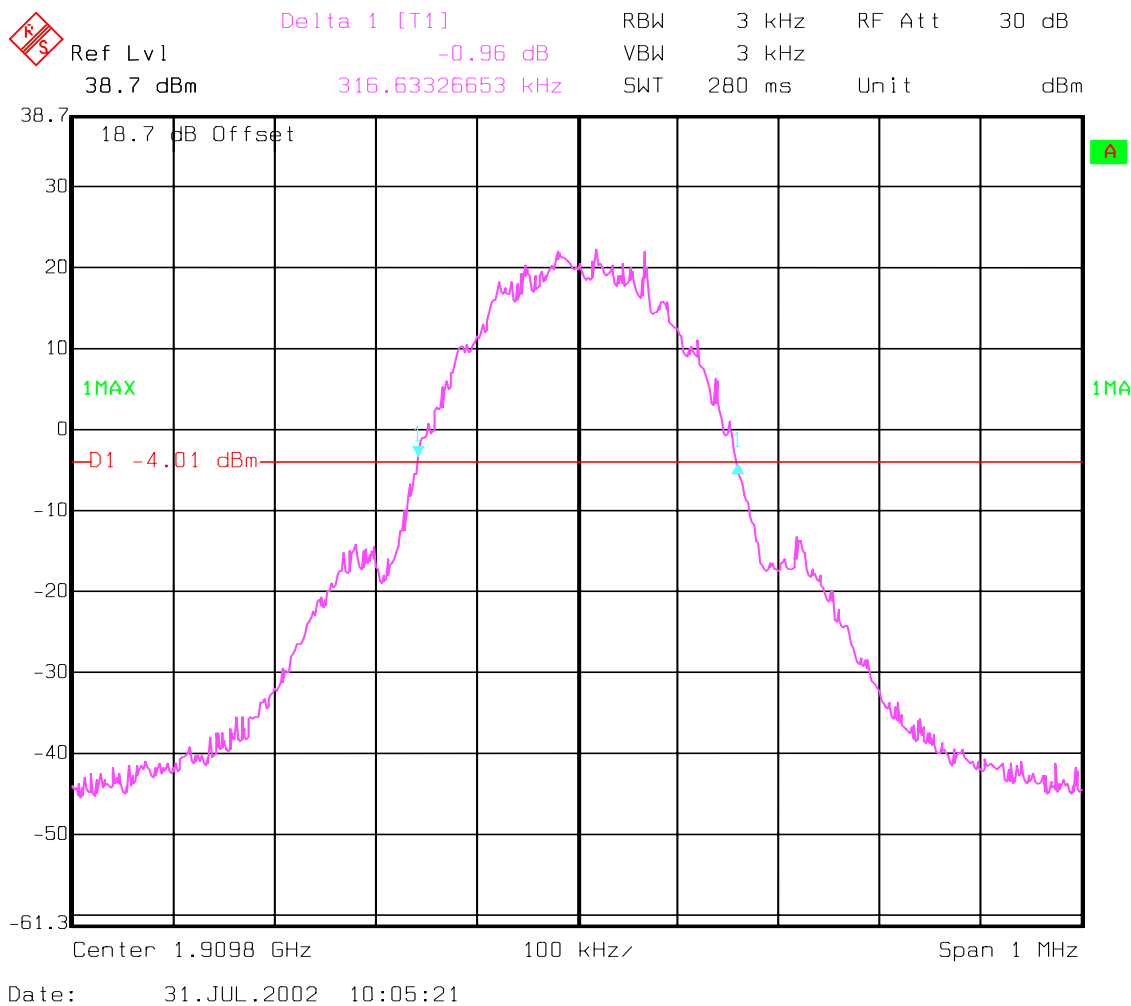
-26dBc BANDWIDTH CHANNEL 512(PCS-1900)



-26dBc BANDWIDTH CHANNEL 661(PCS-1900)



-26dBc BANDWIDTH CHANNEL 810(PCS-1900)



MOBILE EMISSIONS IN BASE FREQUENCY**§22.917(f)**

Frequency(MHz)	Limit(dBm)
869 - 894	-80

These measurements are provided by SIEMENS.

Please refer to attached document: **FCC_CT56_Noise_in_Rx**

EMISSION LIMITS TRANSMITTER**§2.1051 / §24.238****Measurement Procedure:**

The following steps outline the procedure used to measure the radiated emissions from the EUT. The site is constructed in accordance with ANSI C63.4 – 1992 requirements and is recognised by the FCC. 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 848.8MHz for GSM-850 & 1910 MHz for PCS-1900. The resolution bandwidth is set 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 GSM-850 & PCS-1900 bands.

The final Radiated emission test procedure is as follows:

- a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- b) The antenna output was terminated in a 50 ohm load.
- c) A double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. 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. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was determined by the substitution method described for ERP measurements.

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.

Measurement Results:

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the GSM-850 & PCS-1900 bands. 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 GSM-850 & PCS-1900 band into any of the other blocks respectively. 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.

RESULTS OF RADIATED TESTS GSM-850:

Harmonics	Tx ch-128 Freq. (MHz)	Level (dBm)	Tx ch-190 Freq. (MHz)	Level (dBm)	Tx ch-251 Freq. (MHz)	Level (dBm)
2	1648.04	-36.49	1673.2	-38.89	1697.6	-41.91
3	2472.6	-40.82	2509.8	-40.23	2546.4	-39.67
4	3296.8	-35.47	3346.4	-35.77	3395.2	-36.05
5	4121	-34.80	4183	-34.16	4244	-34.60
6	4945.2	-29.30	5019.6	-27.07	5092.8	-27.21
7	5769.4	-29.08	5856.2	-27.20	5941.6	-26.01
8	6593.6	-20.22	6692.8	-18.67	6790.4	-17.84
9	7417.8	-21.84	7529.4	-21.90	7639.2	-22.03
10	8242	-20.86	8366	-21.73	8488	-21.11

RADIATED SPURIOUS EMISSIONS (GSM-850)

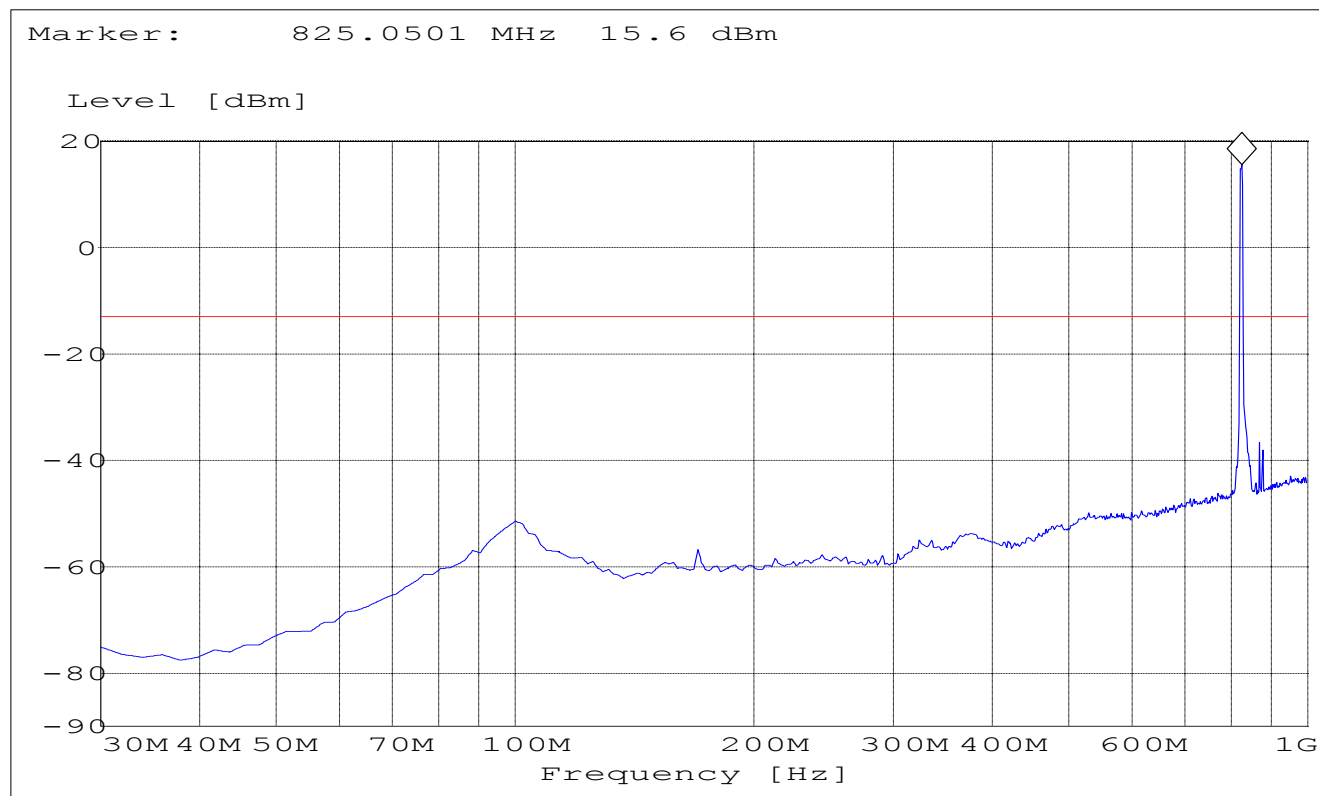
Channel 128: 30MHz - 1GHz

Spurious emission limit -13dBm

SWEEP TABLE: "FCC 22 Spur 30M-1G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
30MHz	1GHz	Max Peak	Coupled	1 MHz

Note: The peak above the limit line is the carrier freq. at ch-128.

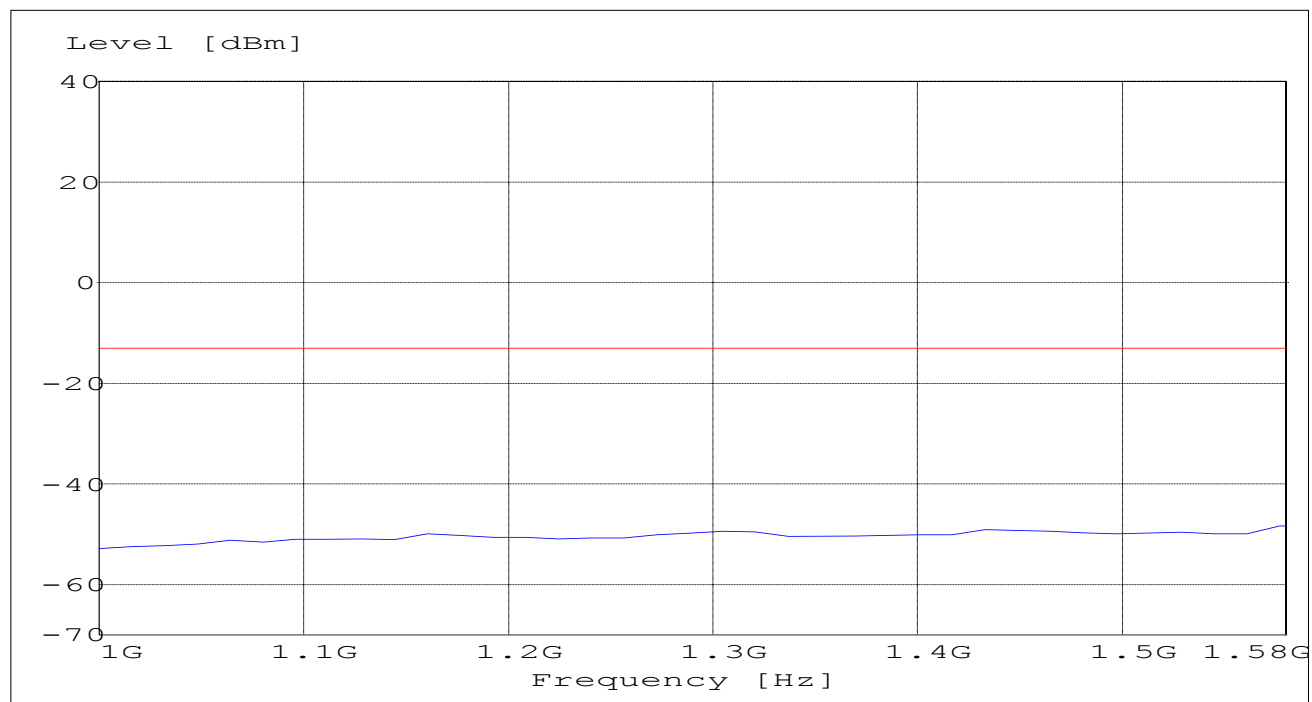


RADIATED SPURIOUS EMISSIONS (GSM-850)**Channel 128: 1GHz – 1.58GHz**

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 1-1.58G"

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
1GHz	1.58GHz	Max Peak	Coupled	1 MHz



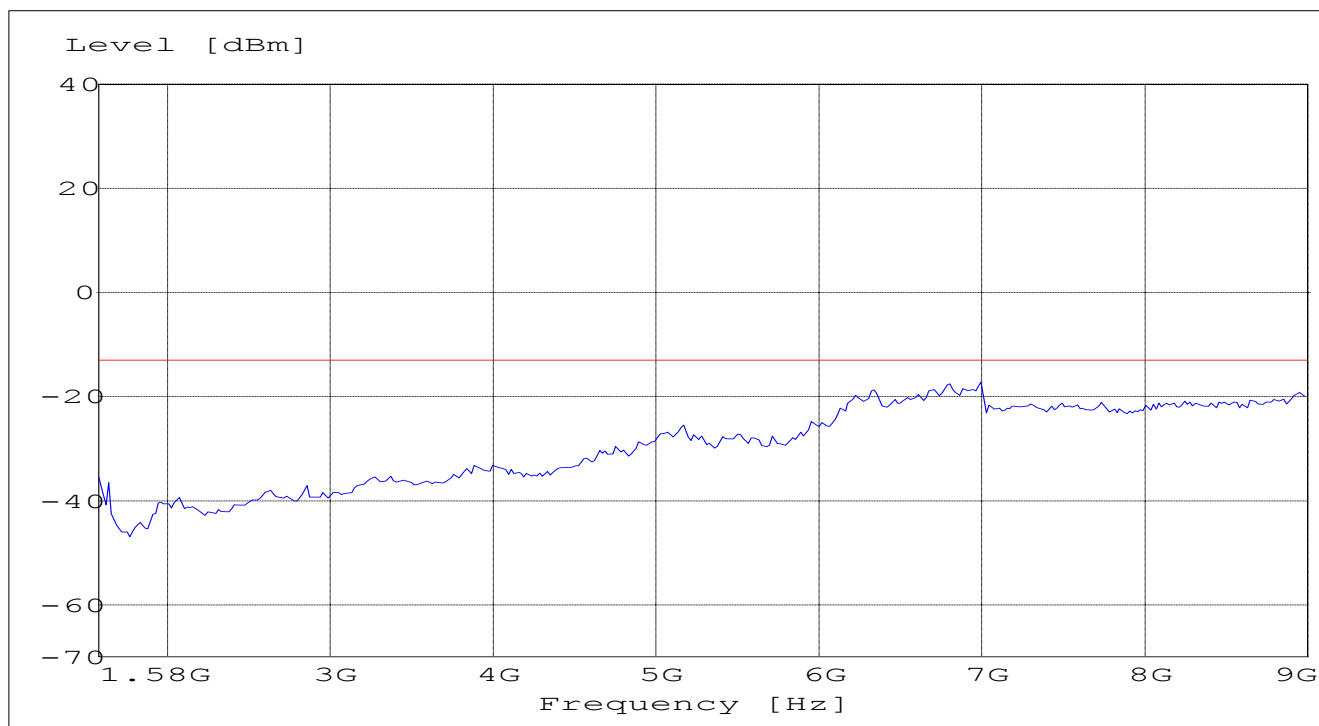
RADIATED SPURIOUS EMISSIONS (GSM-850)

Channel 128: 1.58GHz – 9GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 1.58-9G"

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
1.58GHz	9GHz	Max Peak	Coupled	1 MHz



RADIATED SPURIOUS EMISSIONS (GSM-850)

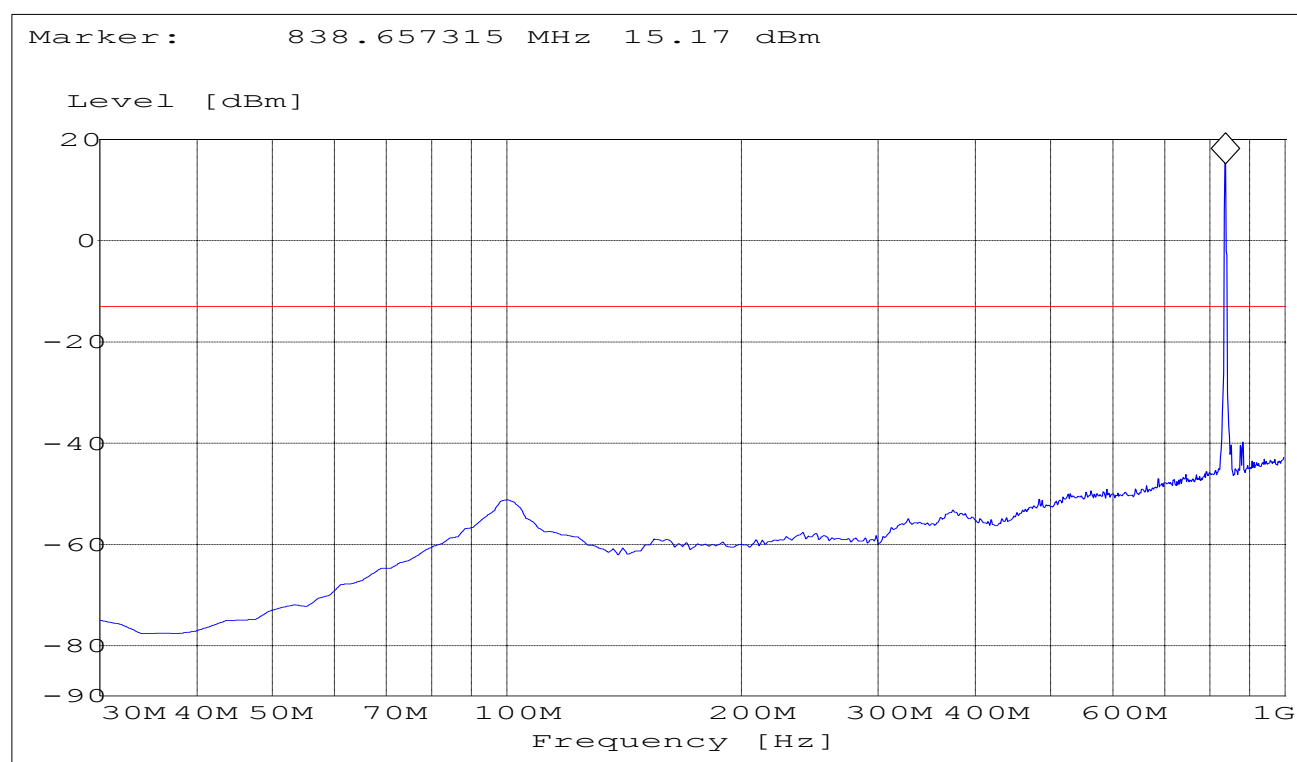
Channel 190: 30MHz - 1GHz

Spurious emission limit -13dBm

SWEEP TABLE: "FCC 22 Spur 30M-1G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
30MHz	1GHz	Max Peak	Coupled	1 MHz

Note: The peak above the limit line is the carrier freq. at ch-190.



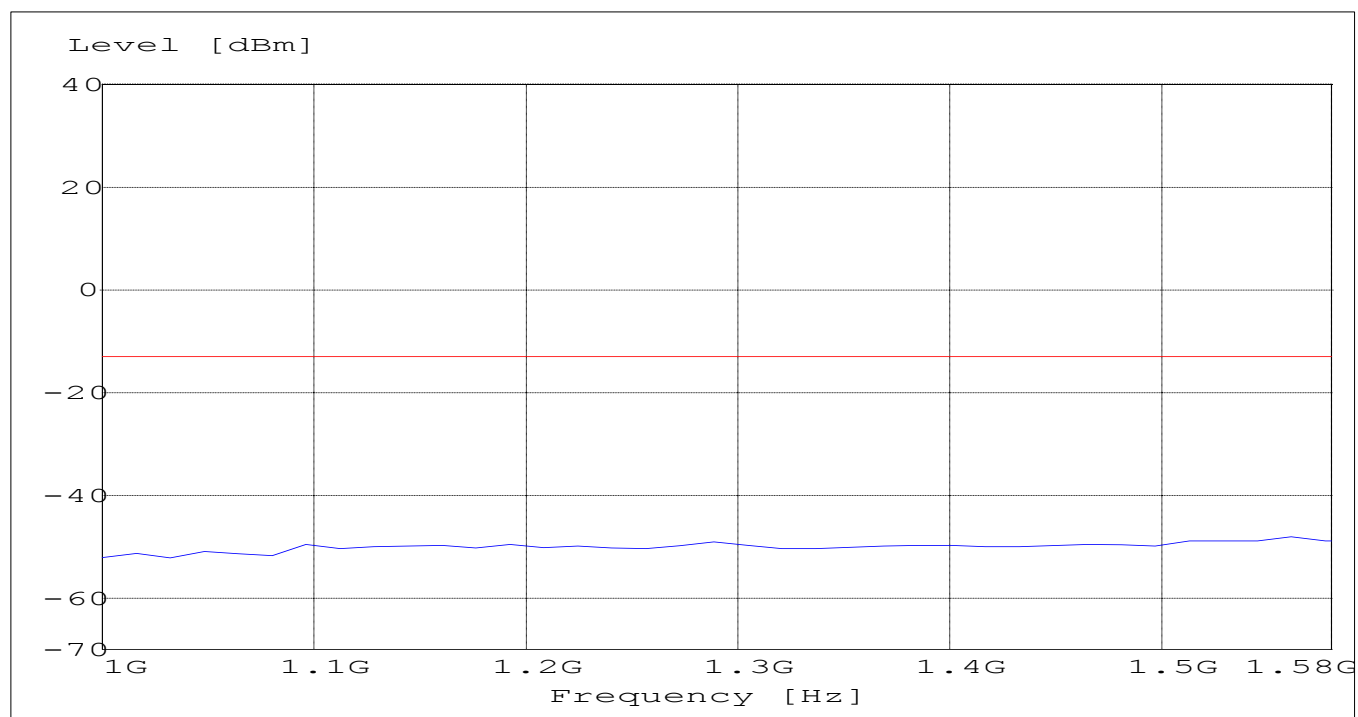
RADIATED SPURIOUS EMISSIONS (GSM-850)

Channel 190: 1GHz – 1.58GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 1-1.58G"

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
1GHz	1.58GHz	Max Peak	Coupled	1 MHz



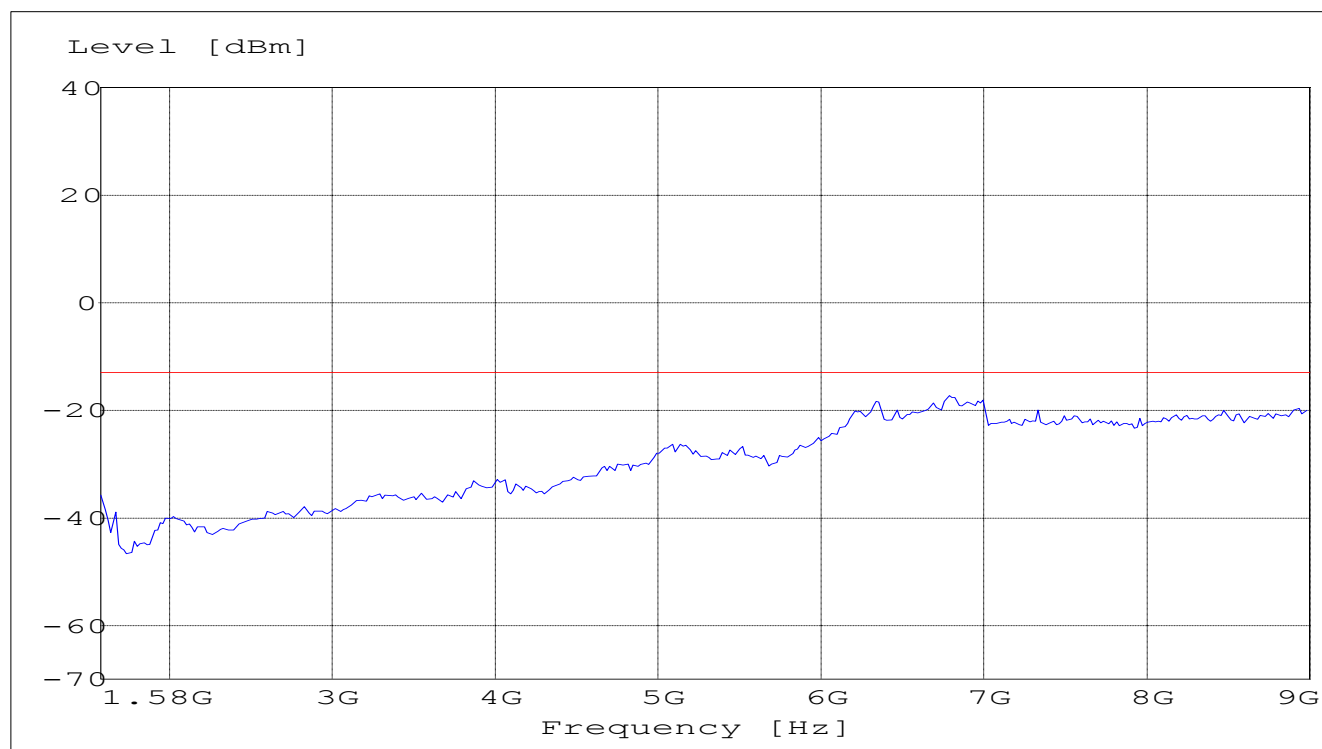
RADIATED SPURIOUS EMISSIONS (GSM-850)

Channel 190: 1.58GHz – 9GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 1.58-9G"

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
1.58GHz	9GHz	Max Peak	Coupled	1 MHz



RADIATED SPURIOUS EMISSIONS (GSM-850)

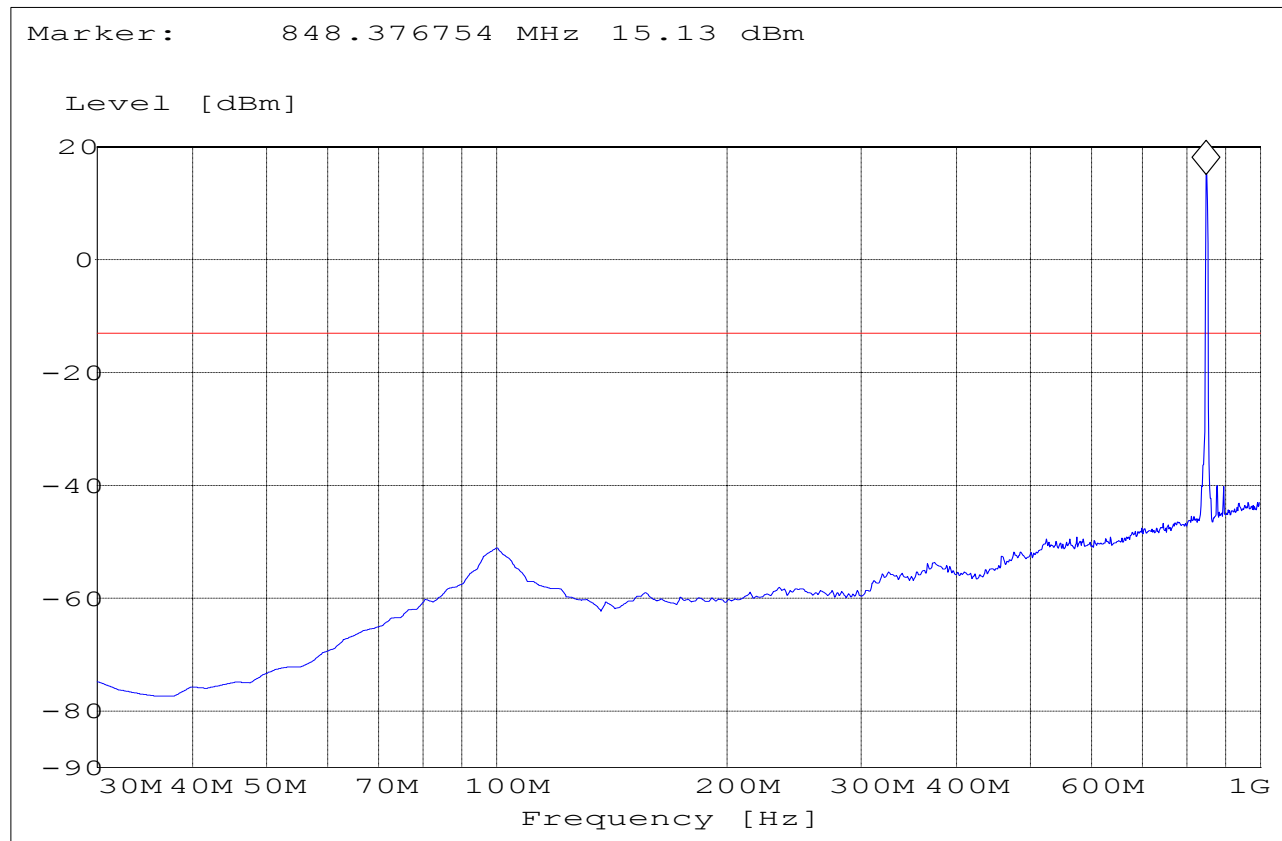
Channel 251: 30MHz - 1GHz

Spurious emission limit -13dBm

SWEEP TABLE: "FCC 22 Spur 30M-1G"

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
30MHz	1GHz	Max Peak	Coupled	1 MHz

Note: The peak above the limit line is the carrier freq. at ch-251.



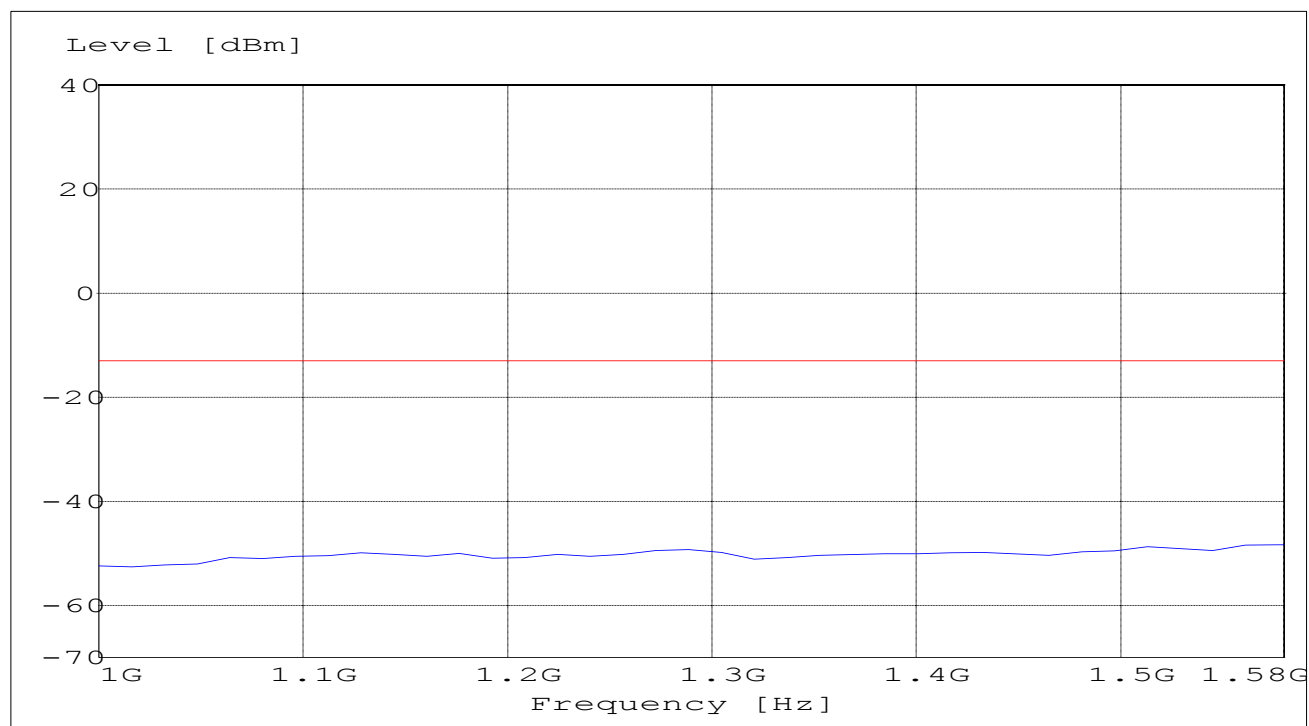
RADIATED SPURIOUS EMISSIONS (GSM-850)

Channel 251: 1GHz – 1.58GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 1-1.58G"

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
1GHz	1.58GHz	Max Peak	Coupled	1 MHz



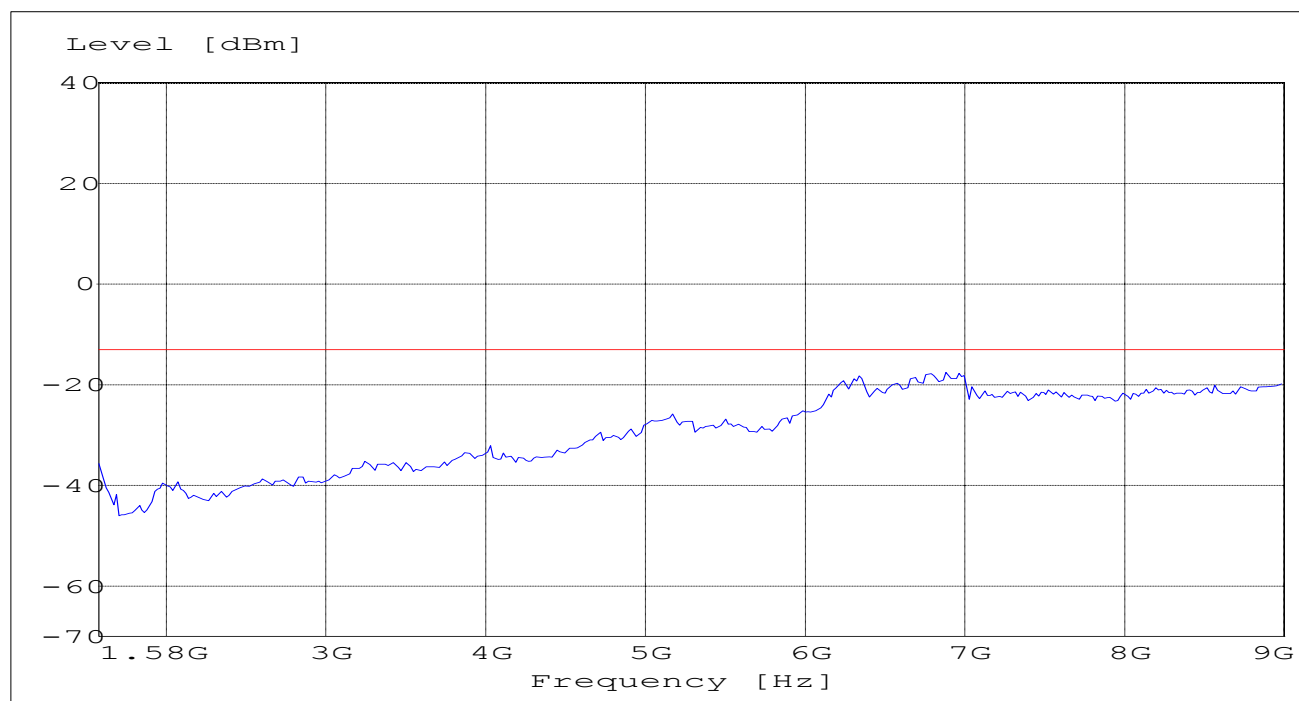
RADIATED SPURIOUS EMISSIONS (GSM-850)

Channel 251: 1.58GHz – 9GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 1.58-9G"

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
1.58GHz	9GHz	Max Peak	Coupled	1 MHz



RESULTS OF RADIATED TESTS PCS-1900:

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	-36.23	3760	-36.34	3819.6	-31.08
3	5550.6	-27.78	5640	-29.73	5729.4	-29.86
4	7400.8	-22.67	7520	-22.34	7639.2	-22.74
5	9251	-23.39	9400	-23.48	9549	-23.03
6	11101.2	-22.82	11280	-22.30	11458.8	-21.76
7	12951.4	-19.48	13160	-19.57	13368.6	-18.91
8	14801.6	-17.83	15040	-18.08	15278.4	-17.67
9	16651.8	-16.15	16920	-15.21	17188.2	-15.16
10	18502	-19.81	18800	-21.22	19098	-21.59

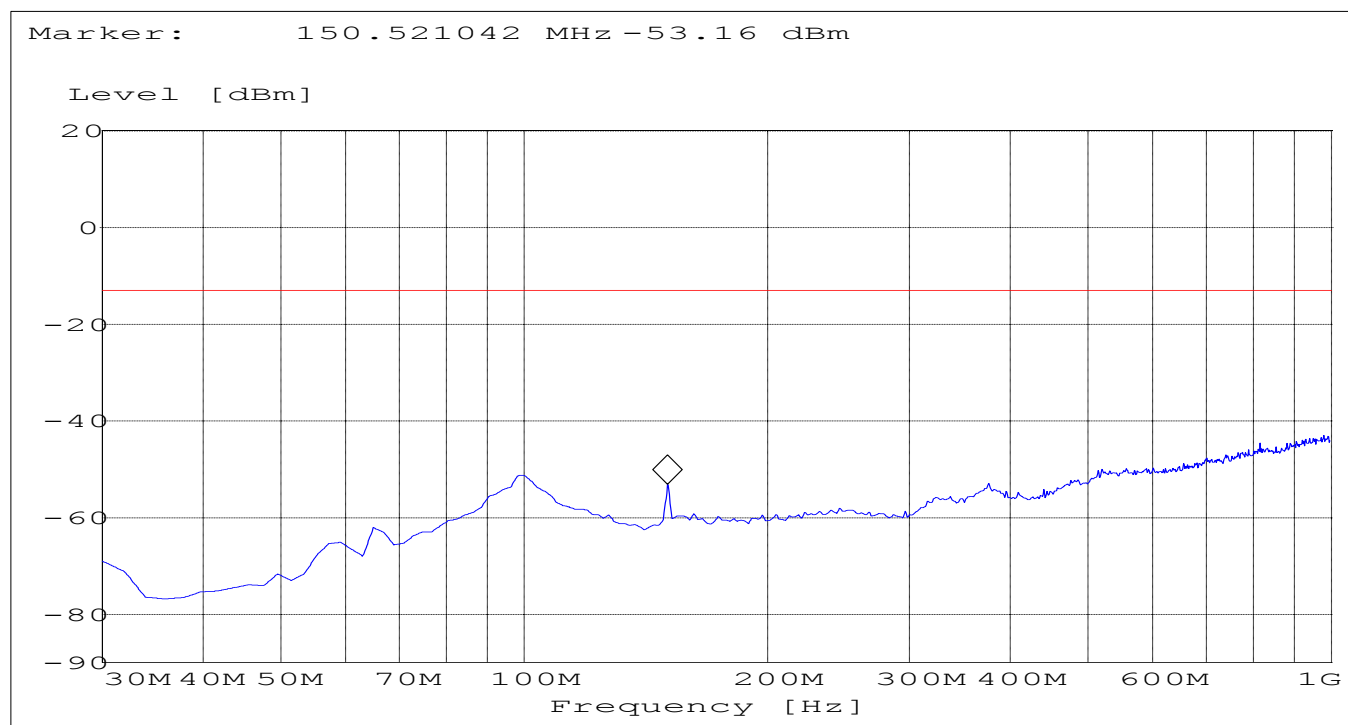
RADIATED SPURIOUS EMISSIONS

Channel 512 : 30MHz - 1GHz

Spurious emission limit -13dBm

SWEEP TABLE: "FCC 24 Spur 30M-1G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
30MHz	1GHz	Max Peak	Coupled	1 MHz



RADIATED SPURIOUS EMISSIONS

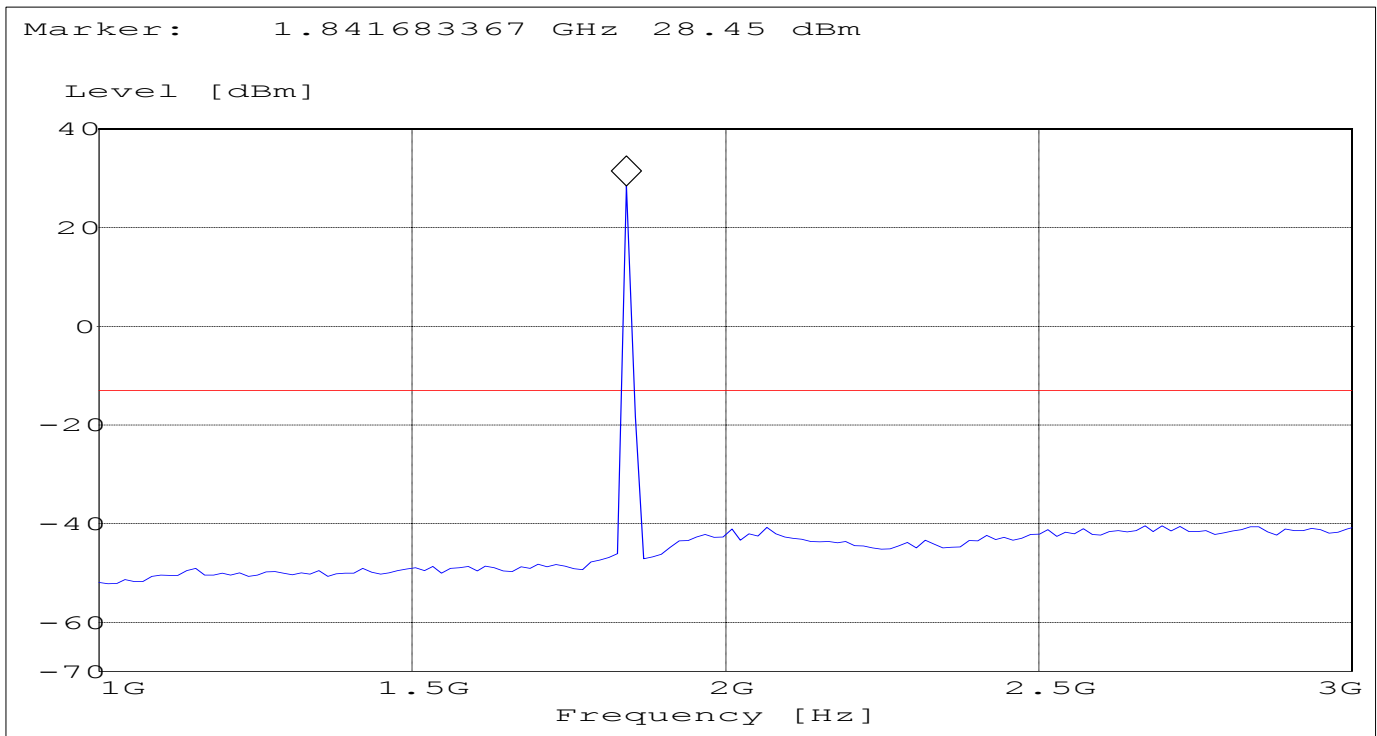
Channel 512 : 1GHz – 3GHz

Spurious emission limit –13dBm

NOTE: peak above the limit line is the Carrier frequency. Frequency resolution is not fine enough to show the exact frequency of the carrier, refer to plots under EIRP.

SWEEP TABLE: "FCC Spuri 1-3G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1GHz	3GHz	Max Peak	Coupled	1 MHz



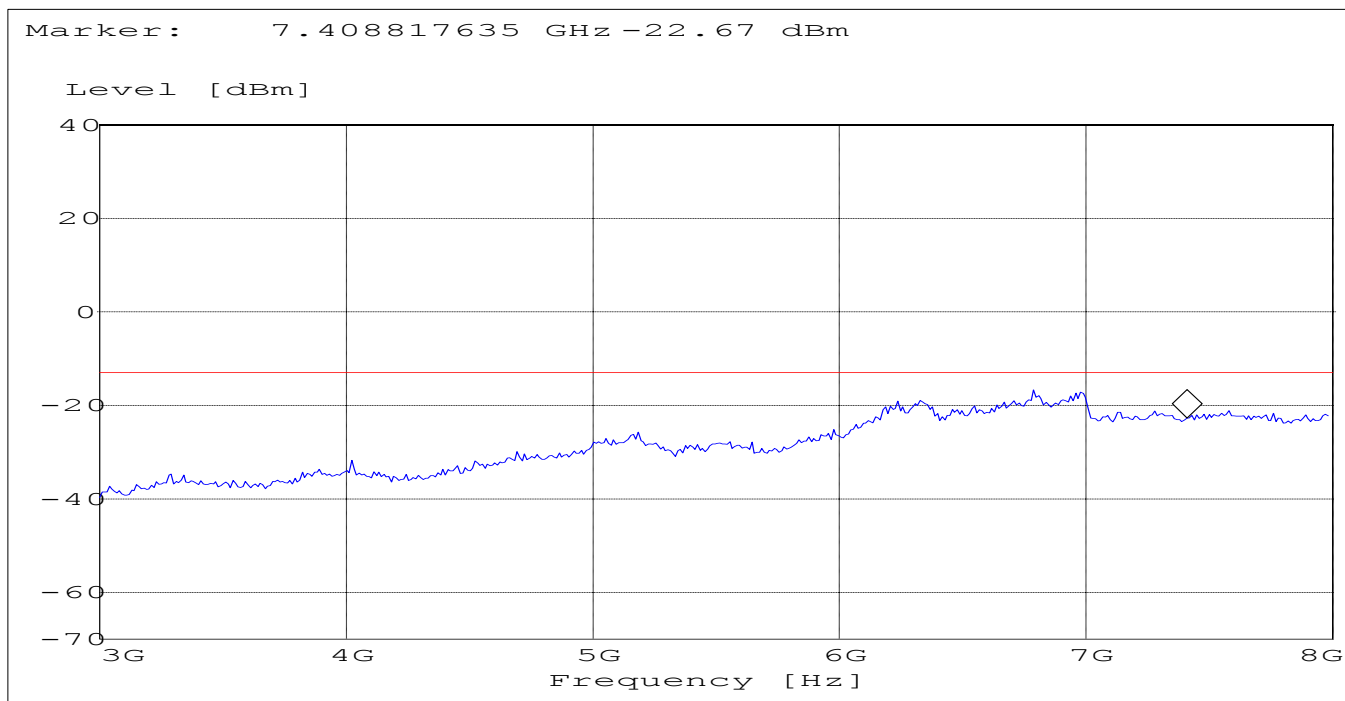
RADIATED SPURIOUS EMISSIONS

Channel 512 : 3GHz – 8GHz

Spurious emission limit -13dBm

SWEEP TABLE: "FCC Spuri 3-8G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
3GHz	8GHz	Max Peak	Coupled	1 MHz



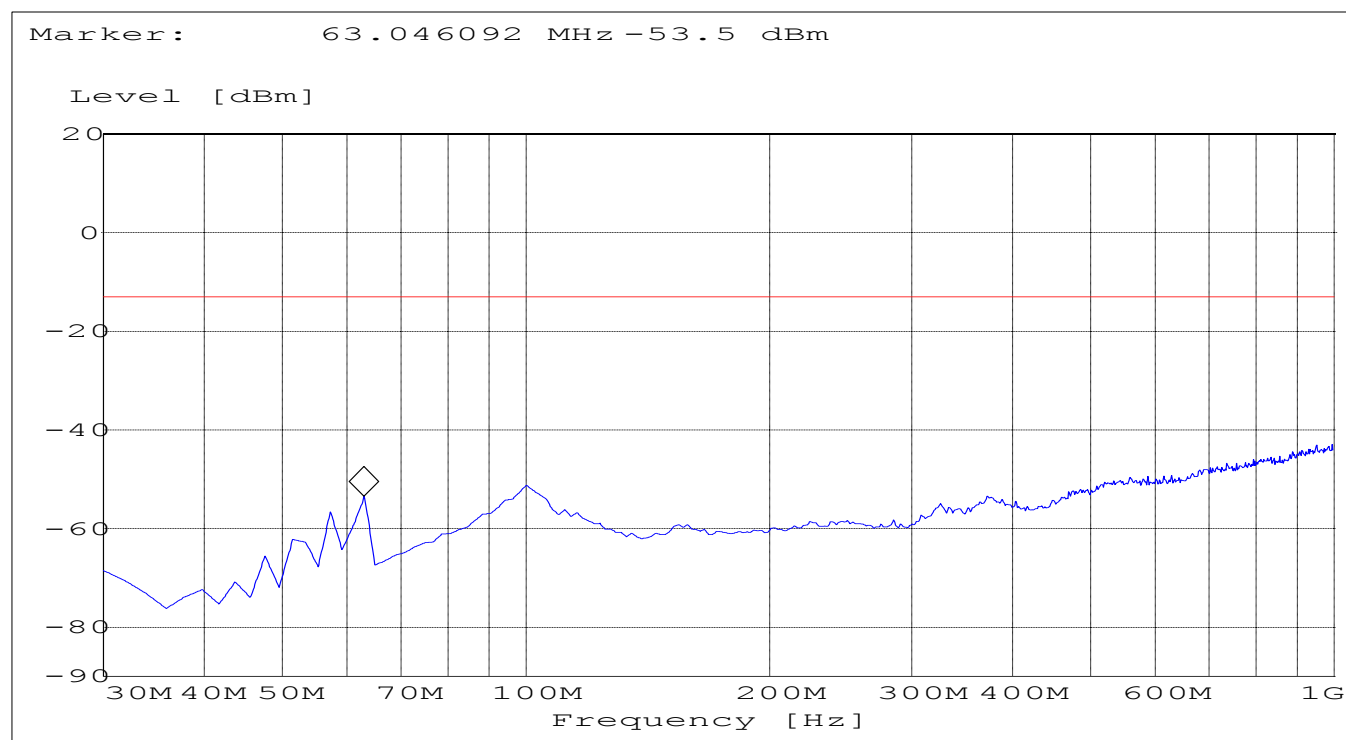
RADIATED SPURIOUS EMISSIONS

Channel 661: 30MHz –1GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 24 Spur 30M-1G"

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
30MHz	1GHz	Max Peak	Coupled	1 MHz



RADIATED SPURIOUS EMISSIONS

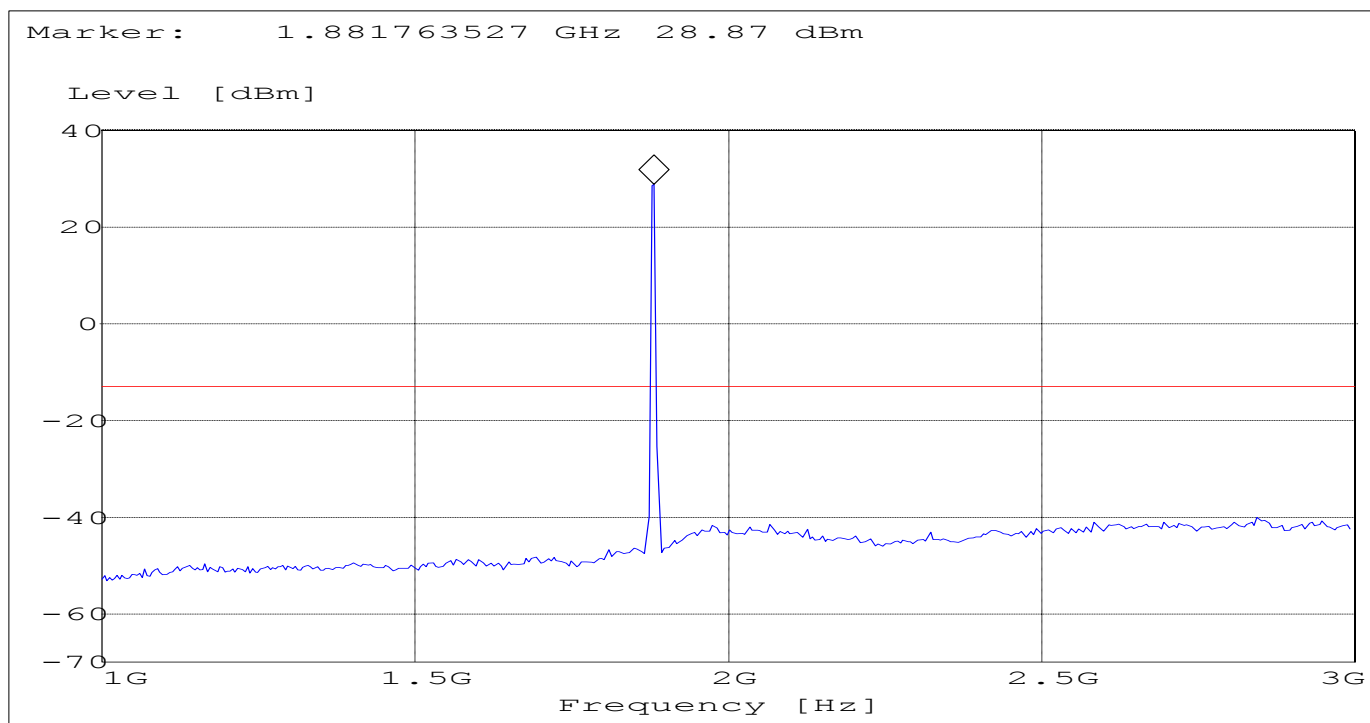
Channel 661: 1GHz – 3GHz

Spurious emission limit –13dBm

NOTE: peak above the limit line is the Carrier frequency. Frequency resolution is not fine enough to show the exact frequency of the carrier, refer to plots under EIRP.

SWEEP TABLE: "FCC Spuri 1-3G"

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
1GHz	3GHz	Max Peak	Coupled	1 MHz



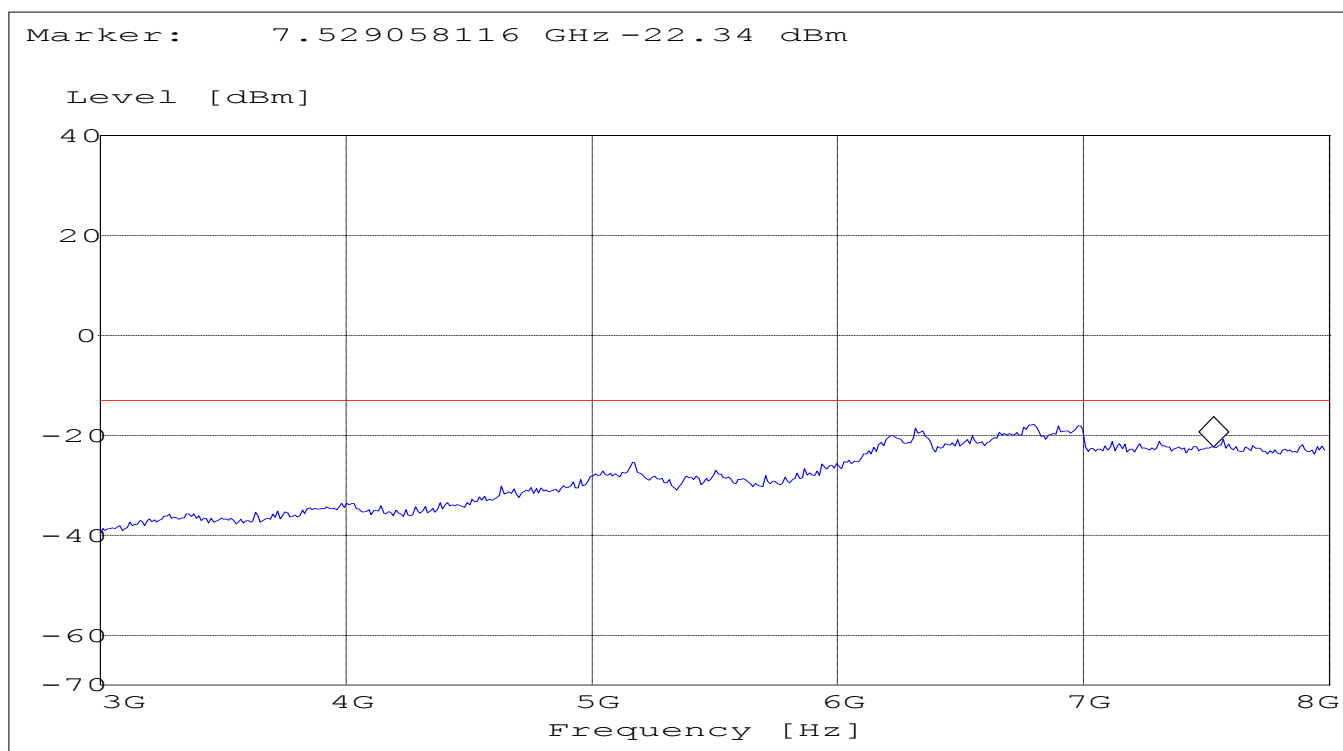
RADIATED SPURIOUS EMISSIONS

Channel 661: 3GHz – 8GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-8G"

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
3GHz	8GHz	Max Peak	Coupled	1 MHz



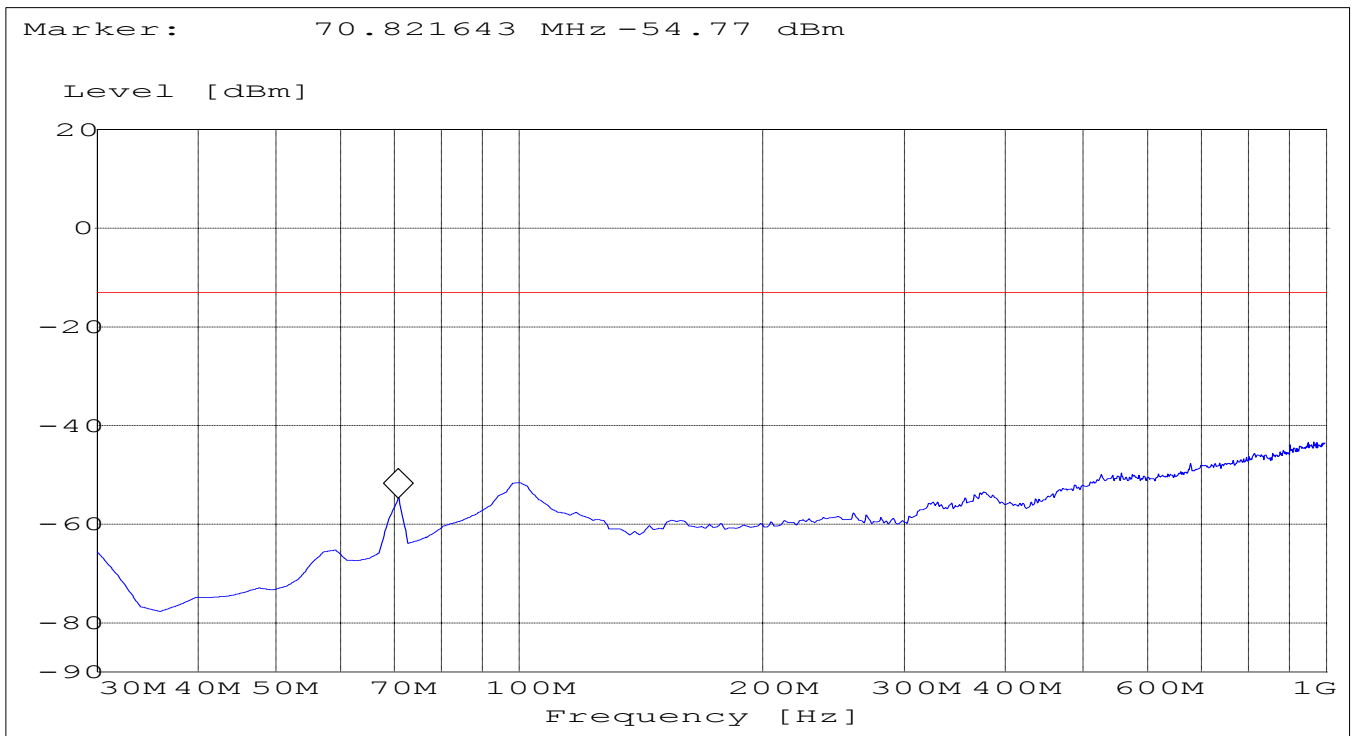
RADIATED SPURIOUS EMISSIONS

Channel 810: 30MHz – 1GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 24 Spur 30M-1G"

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
30MHz	1GHz	Max Peak	Coupled	1 MHz



RADIATED SPURIOUS EMISSIONS

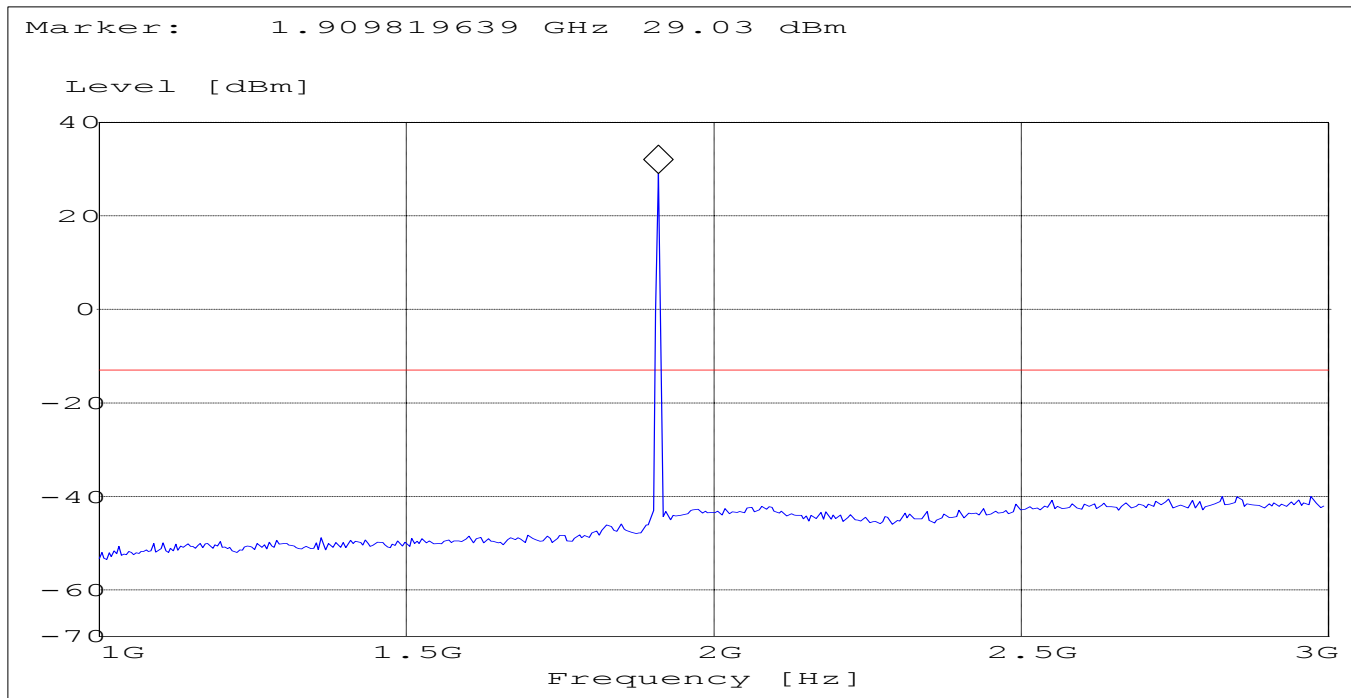
Channel 810: 1GHz – 3GHz

Spurious emission limit –13dBm

NOTE: peak above the limit line is the Carrier frequency. Frequency resolution is not fine enough to show the exact frequency of the carrier, refer to plots under EIRP.

SWEEP TABLE: "FCC Spuri 1-3G"

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
1GHz	3GHz	Max Peak	Coupled	1 MHz



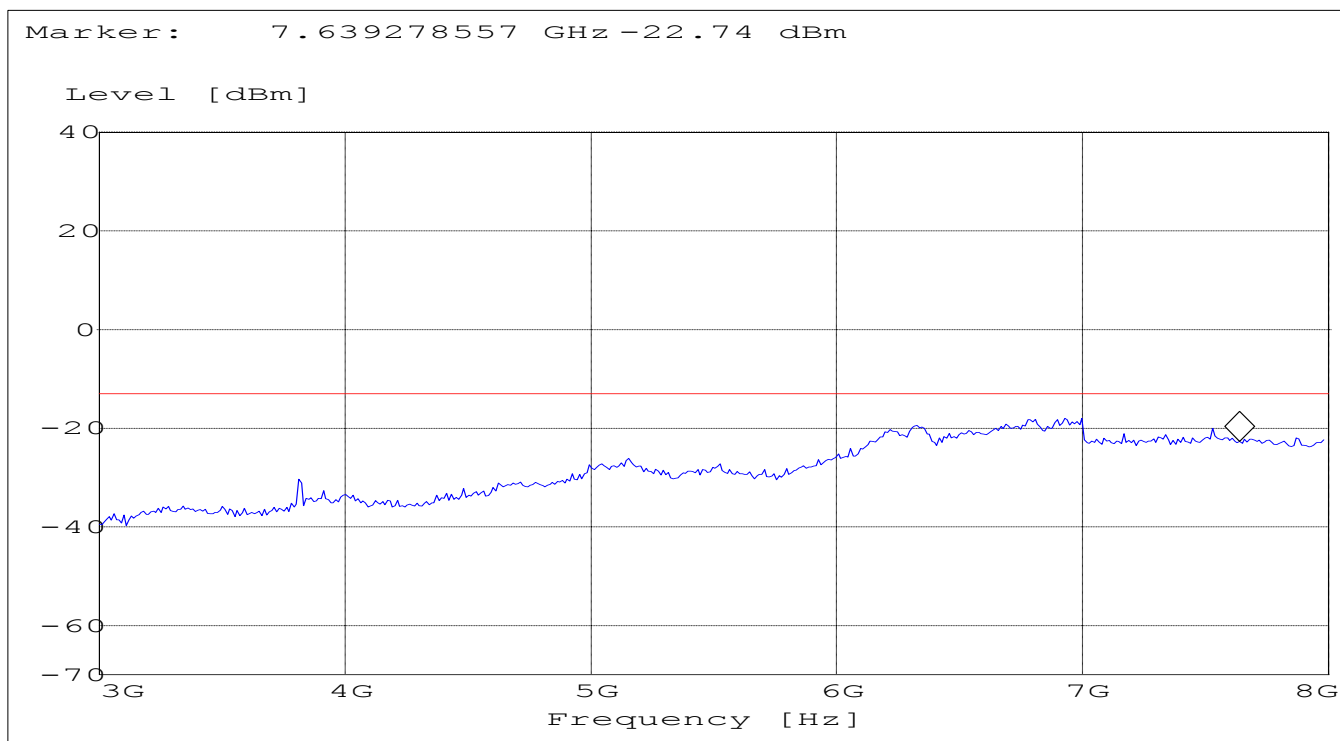
RADIATED SPURIOUS EMISSIONS

Channel 810: 3GHz – 8GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-8G"

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
3GHz	8GHz	Max Peak	Coupled	1 MHz



RADIATED SPURIOUS EMISSIONS

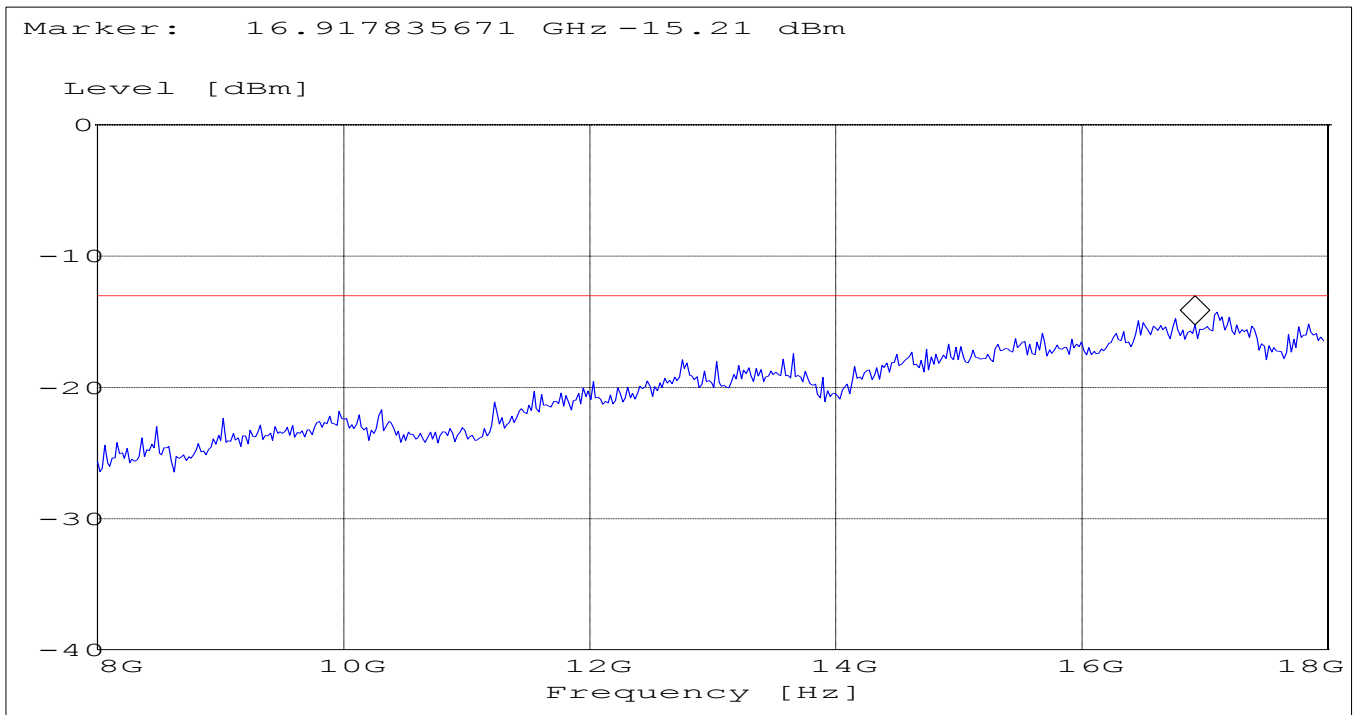
8GHz – 18GHz

Spurious emission limit –13dBm

(NOTE: This plot is valid for all three channels)

SWEEP TABLE: "FCC 24 spuri 8-18G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
8GHz	18GHz	Max Peak	Coupled	1 MHz



RADIATED SPURIOUS EMISSIONS

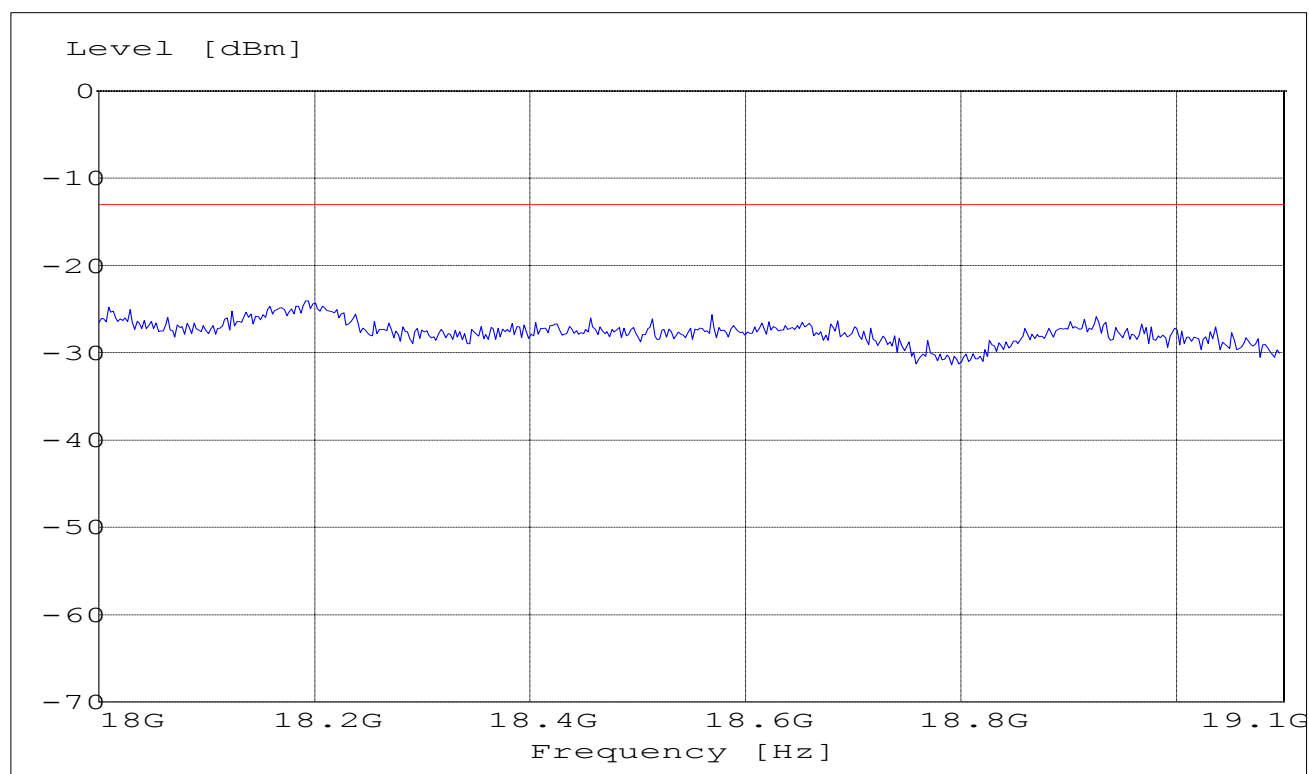
18GHz – 19.1GHz

Spurious emission limit –13dBm

(NOTE: This plot is valid for all three channels)

SWEEP TABLE: "FCC 24 spuri 18-19.1G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
18GHz	19.1GHz	Max Peak	Coupled	1 MHz



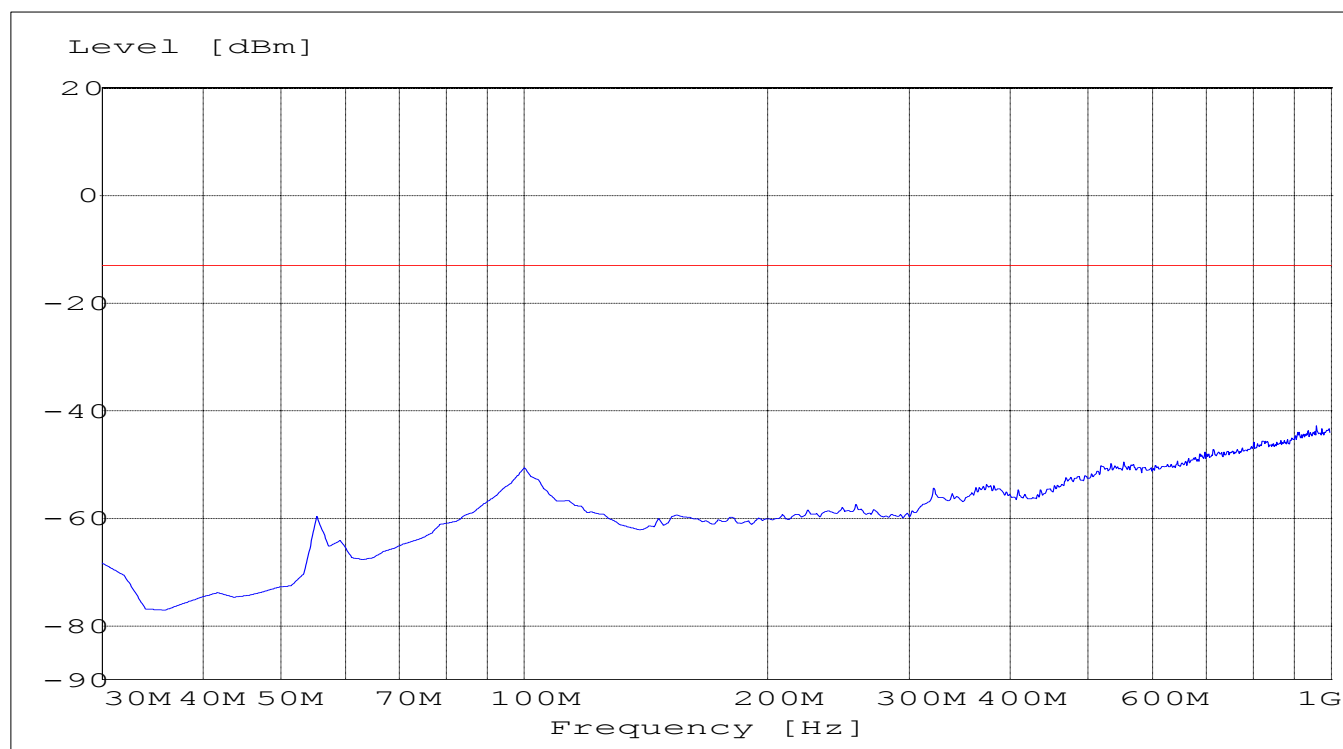
RADIATED SPURIOUS EMISSIONS

EUT in Idle Mode: 30MHz – 1GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 24 Spur 30M-1G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
30MHz	1GHz	Max Peak	Coupled	1 MHz



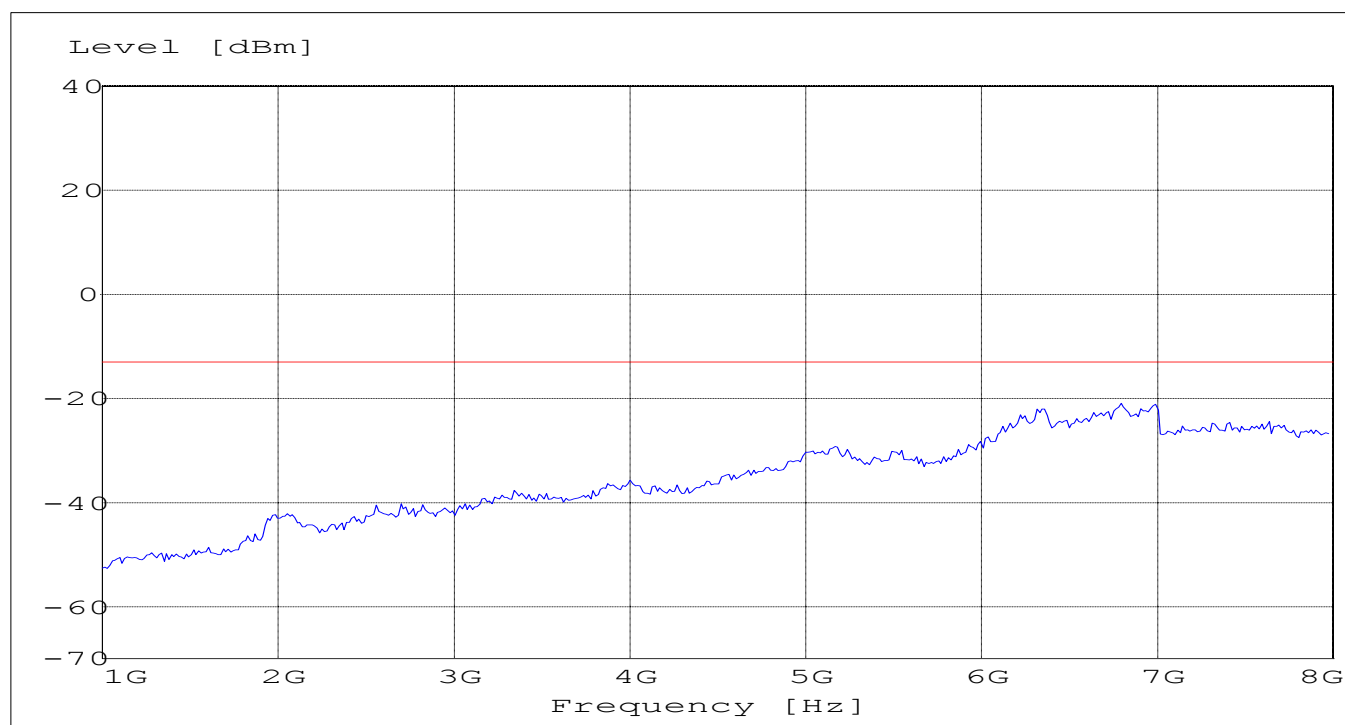
RADIATED SPURIOUS EMISSIONS

EUT in Idle Mode: 1GHz – 8GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-8G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1GHz	8GHz	Max Peak	Coupled	1 MHz



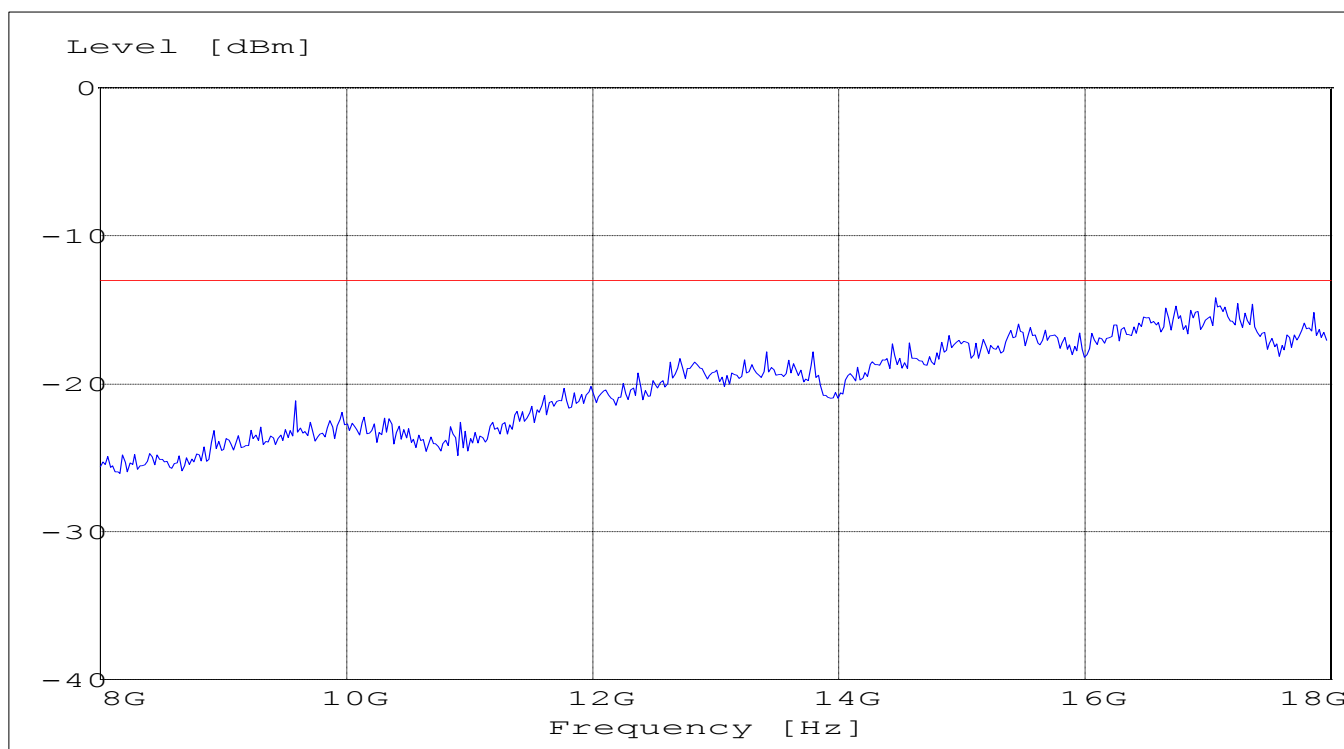
RADIATED SPURIOUS EMISSIONS

EUT in Idle Mode: 8GHz – 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 24 spuri 8-18G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
8GHz	18GHz	Max Peak	Coupled	1 MHz



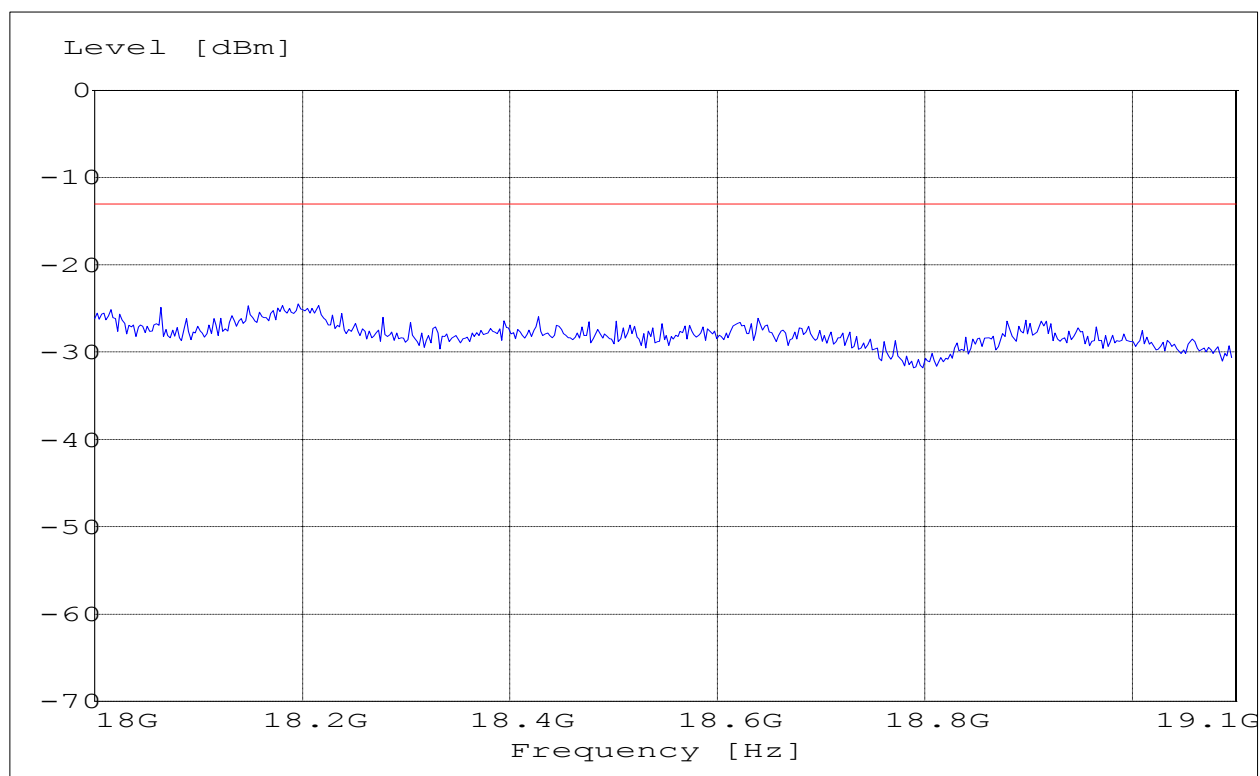
RADIATED SPURIOUS EMISSIONS

EUT in Idle Mode: 18GHz – 19.1GHz

Spurious emission limit –13dBm

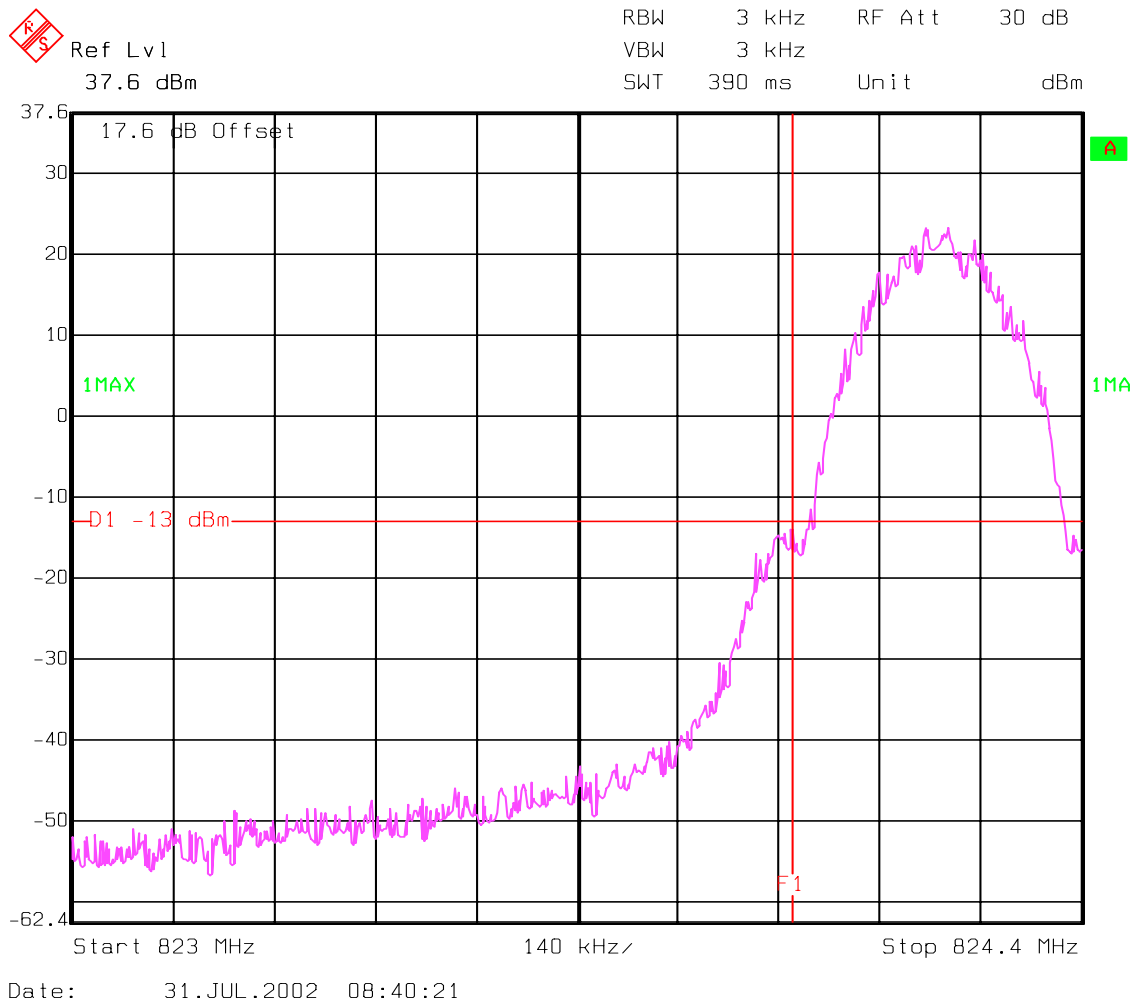
SWEEP TABLE: "FCC 24 spuri 18-19.1G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
18GHz	19.1GHz	Max Peak	Coupled	1 MHz



LOWER BAND EDGE (GSM 850)
(Conducted)

§2.1049(c)(1), §24.238(a)(b)



17.6 dB Offset

1MAX

D1 -13 dBm

F1

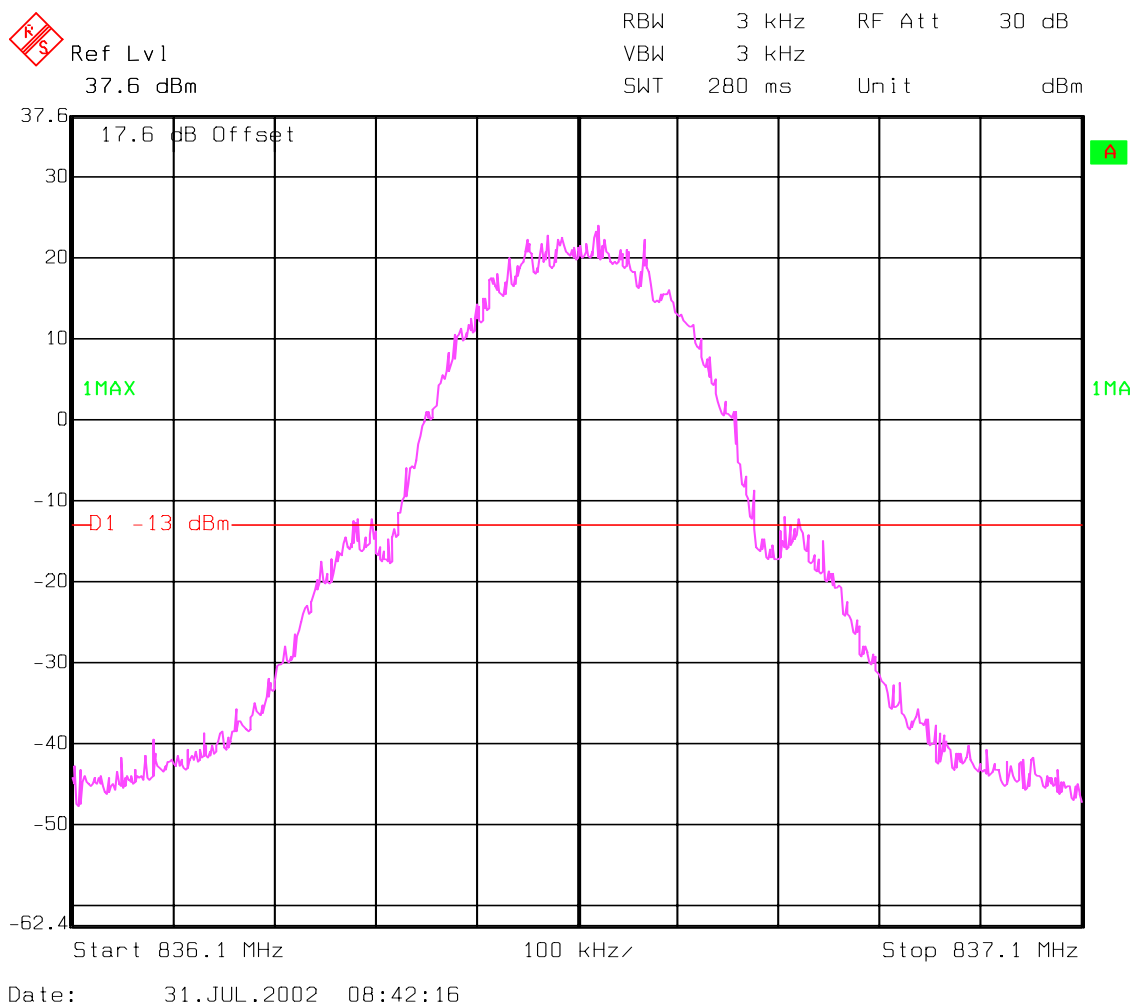
IMA

Start 823 MHz 140 kHz/ Stop 824.4 MHz

Date: 31.JUL.2002 08:40:21

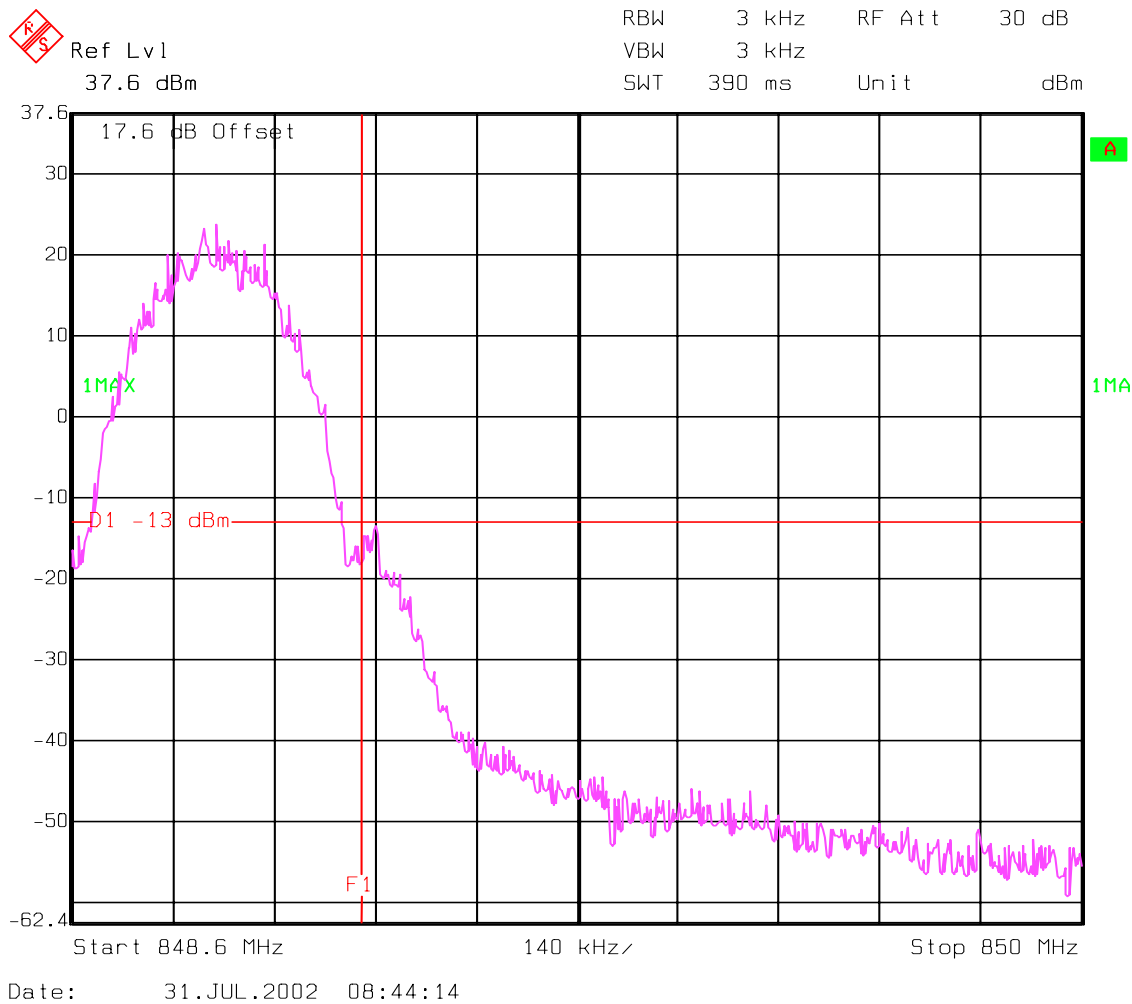
MID BAND EDGE (GSM 850)
(Conducted)

§2.1049(c)(1), §24.238(a)(b)



HIGH BAND EDGE (GSM 850)
(Conducted)

§2.1049(c)(1), §24.238(a)(b)



17.6 dB Offset

1MAX

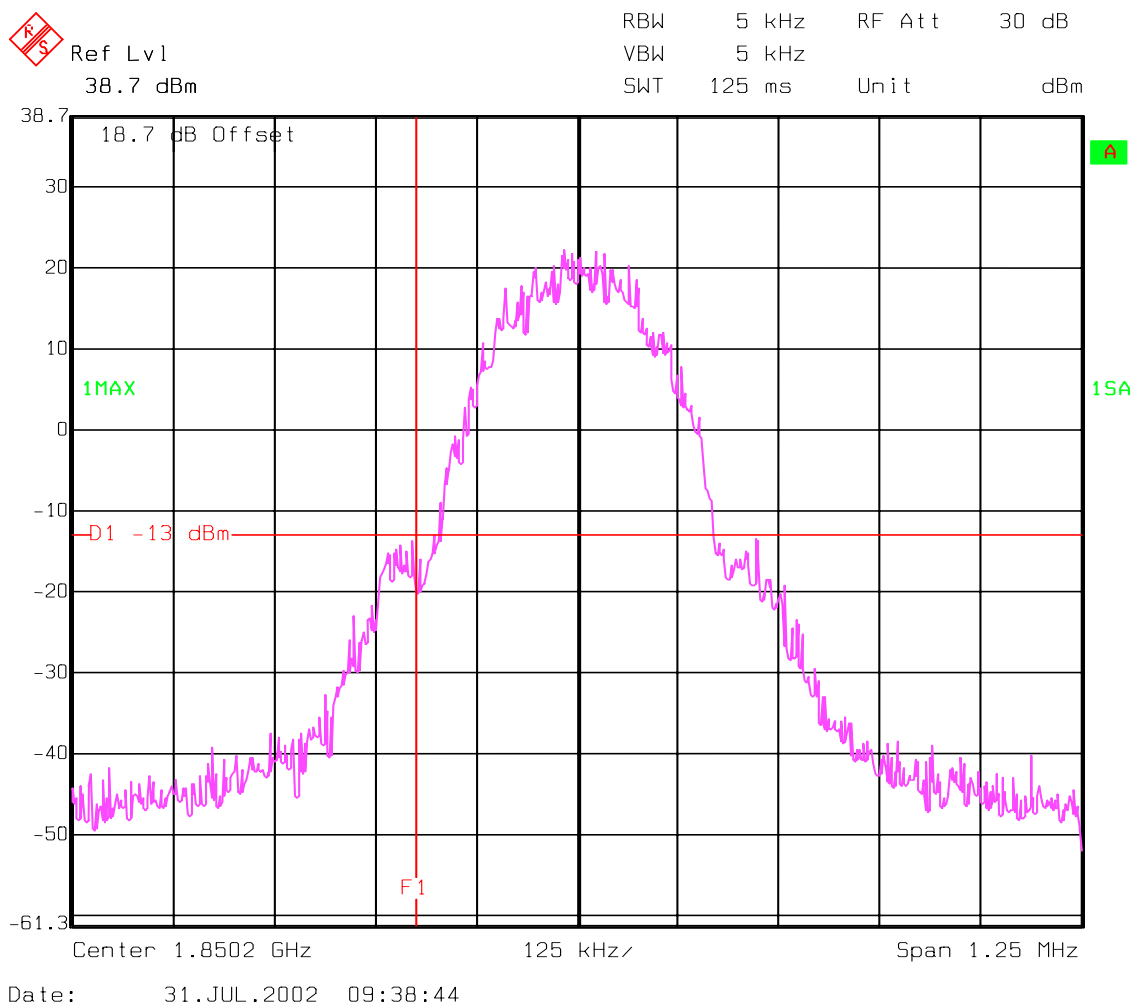
D1 -13 dBm

F1

1MA

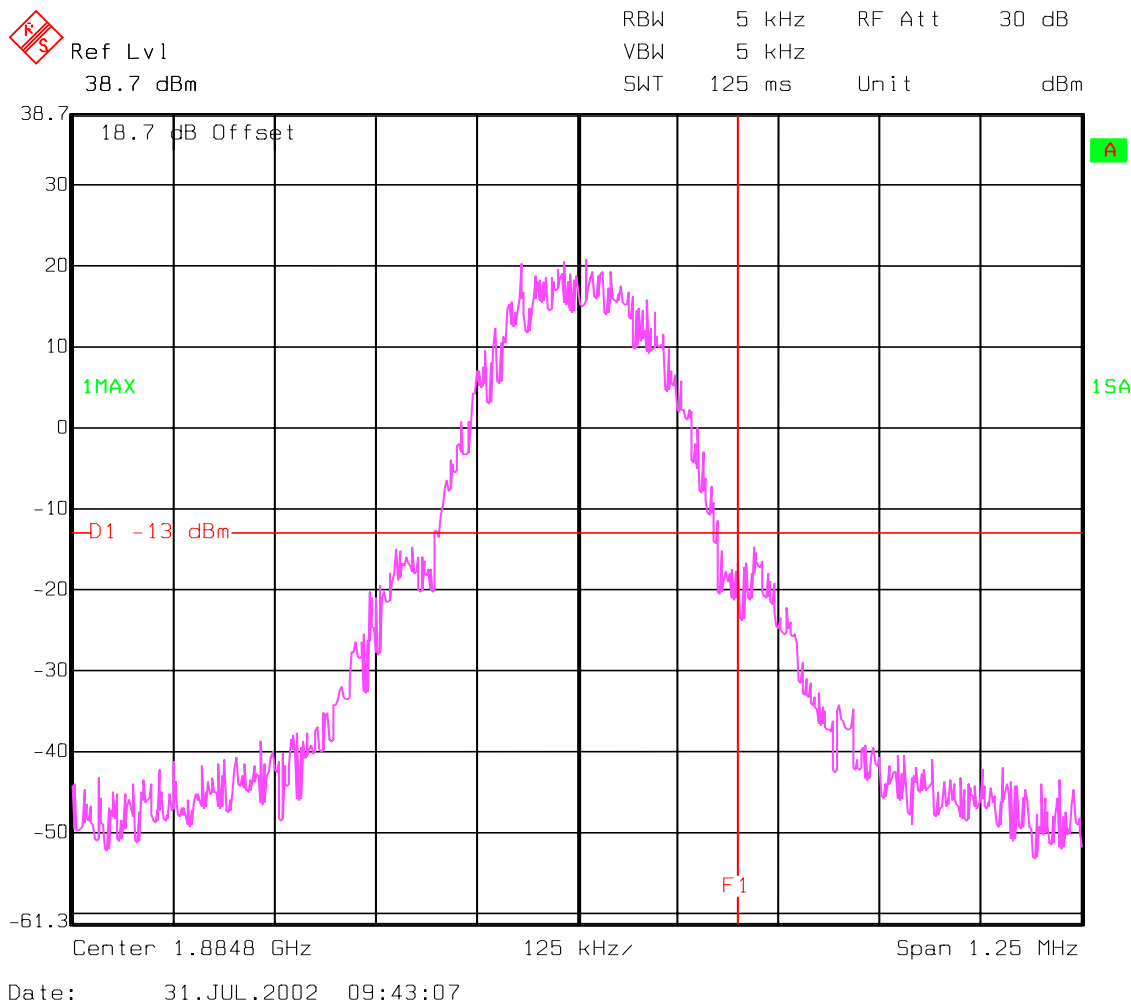
LOW BAND EDGE (PCS-1900)
(Conducted)

§2.1049(c)(1), §24.238(a)(b)



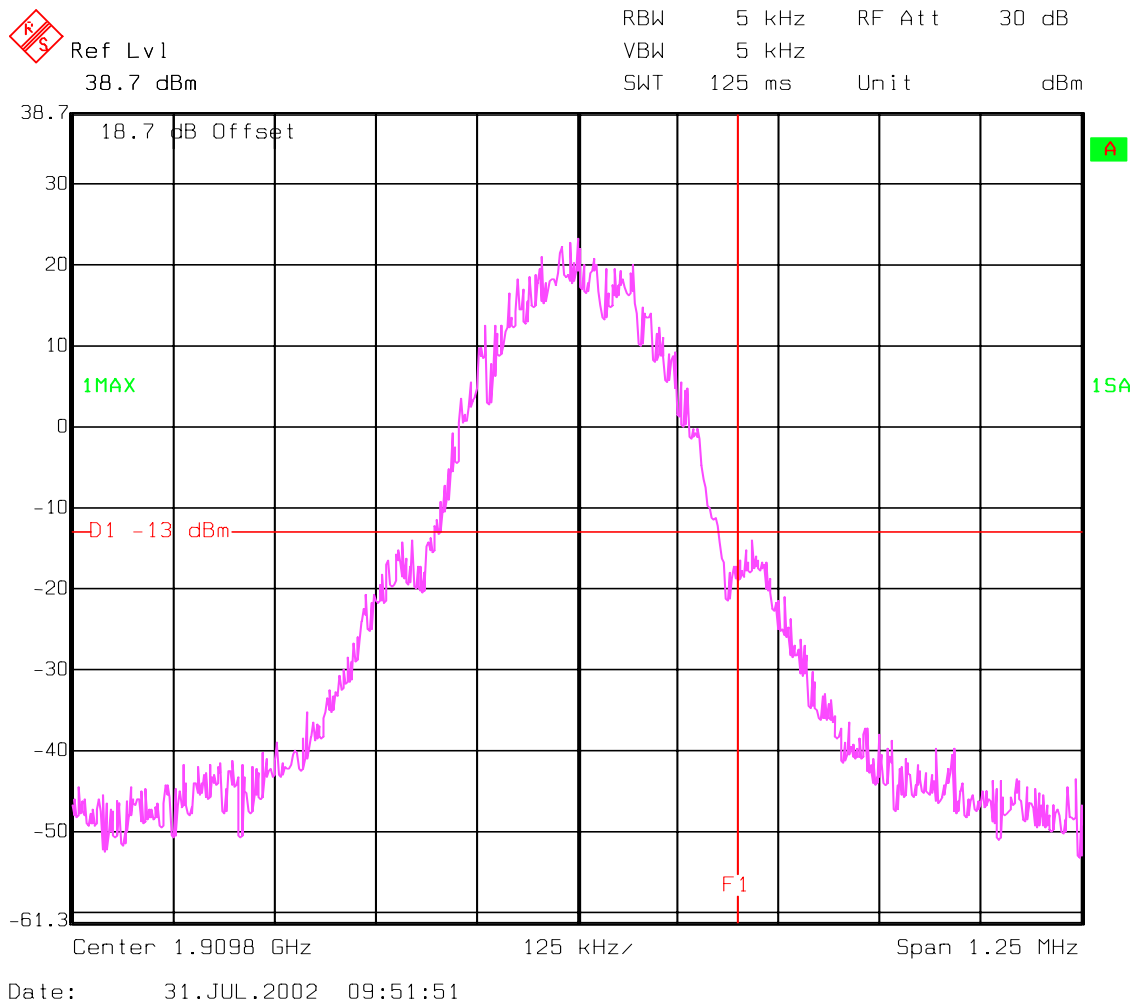
MID BAND EDGE (PCS-1900)
(Conducted)

§2.1049(c)(1), §24.238(a)(b)



HIGH BAND EDGE (PCS-1900)
(Conducted)

§2.1049(c)(1), §24.238(a)(b)



RECEIVER RADIATED EMISSIONS**§ 2.1053 / RSS-133**

NOTE: The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 18GHz and 19.1GHz very short cable connections to the antenna was used to minimize the noise level.

Limits**SUBCLAUSE § 15.209**

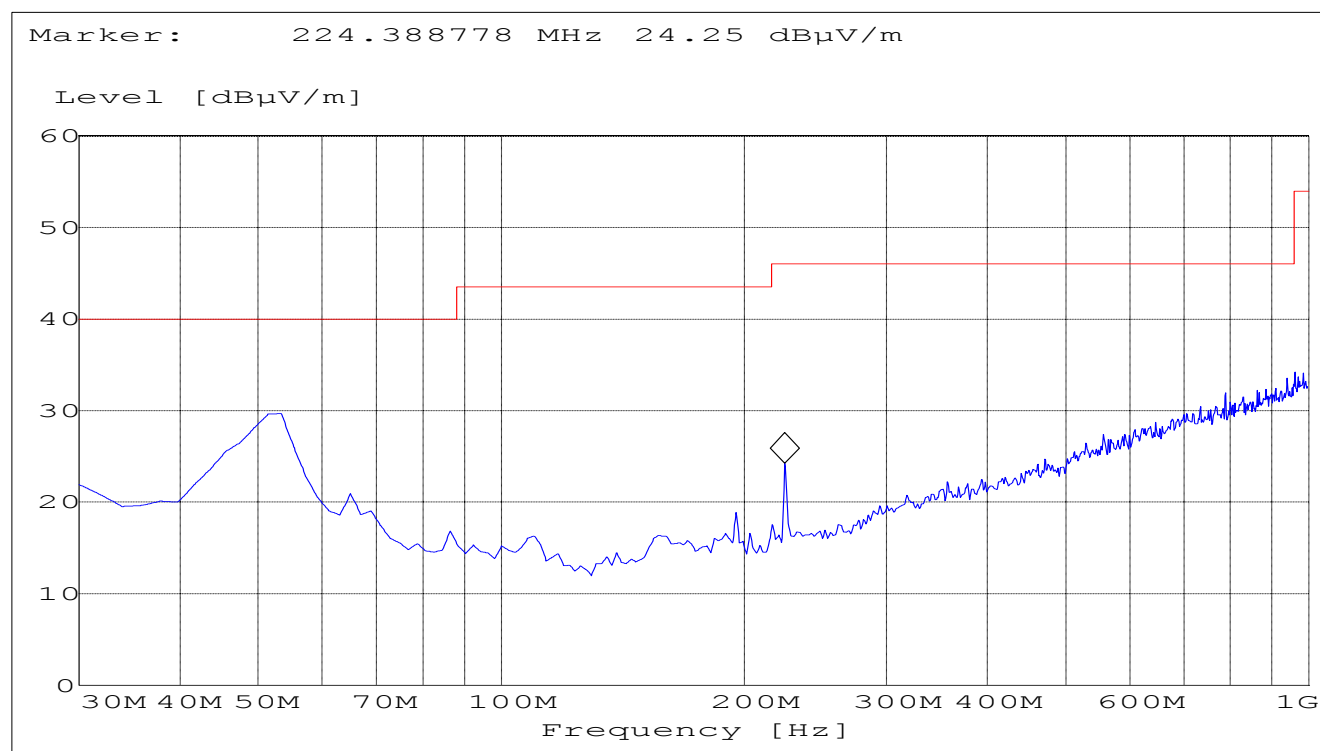
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

RECEIVER RADIATED EMISSIONS

EUT in Idle Mode: 30MHz – 1GHz

SWEEP TABLE: "FCC 24 Spur 30M-1G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
30MHz	1GHz	Max Peak	Coupled	100KHz

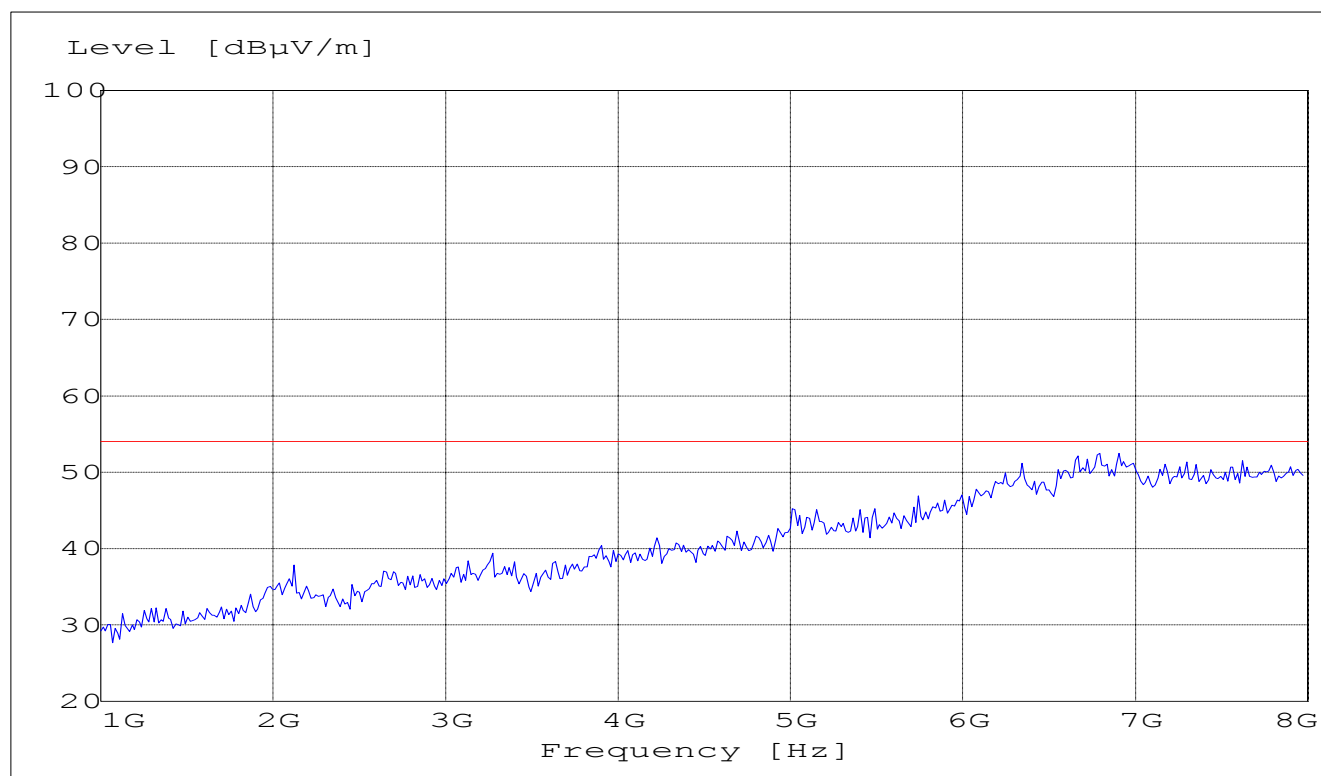


RECEIVER RADIATED EMISSIONS

EUT in Idle Mode: 1GHz – 8GHz

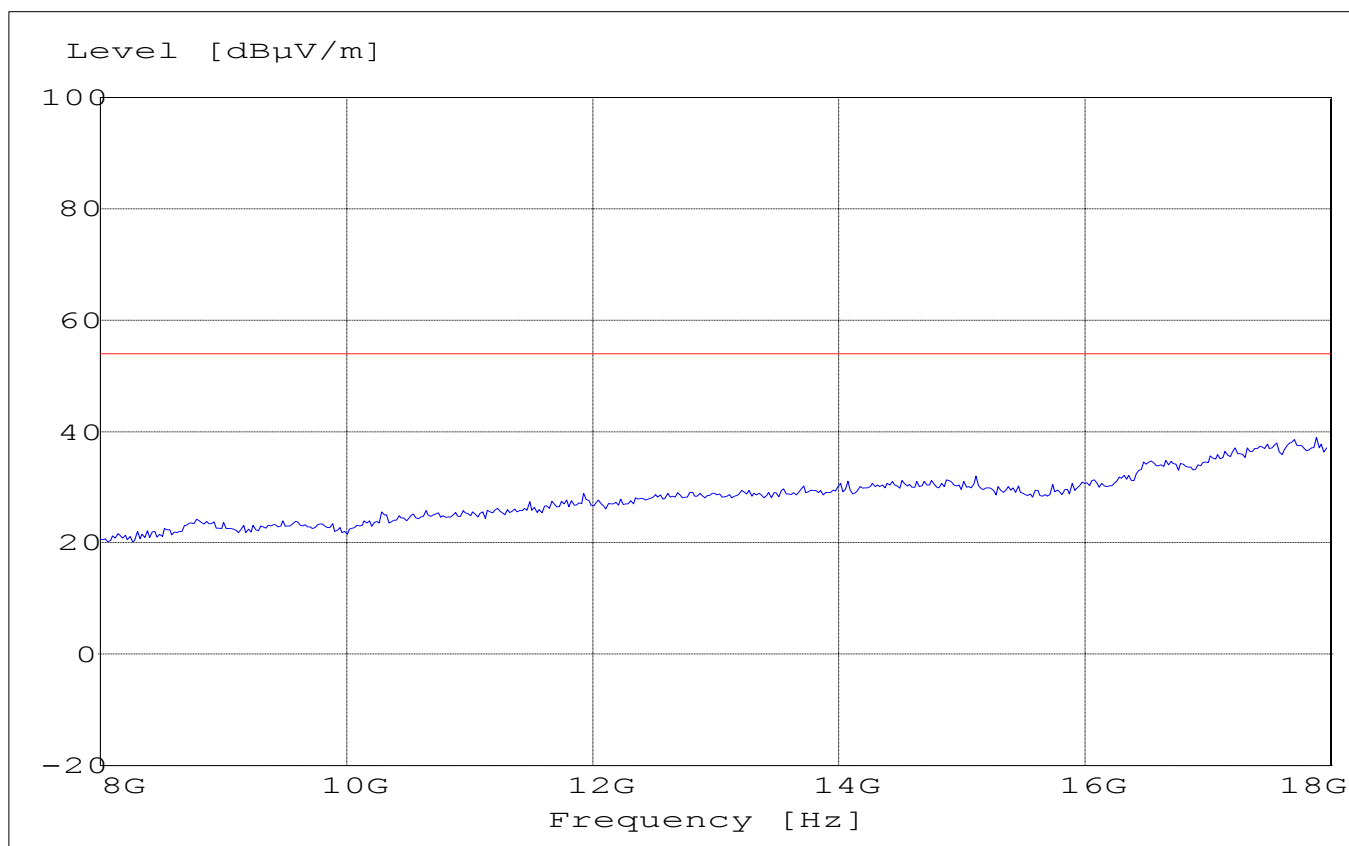
SWEEP TABLE: "FCC Spuri 1-8G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1GHz	8GHz	Max Peak	Coupled	1 MHz



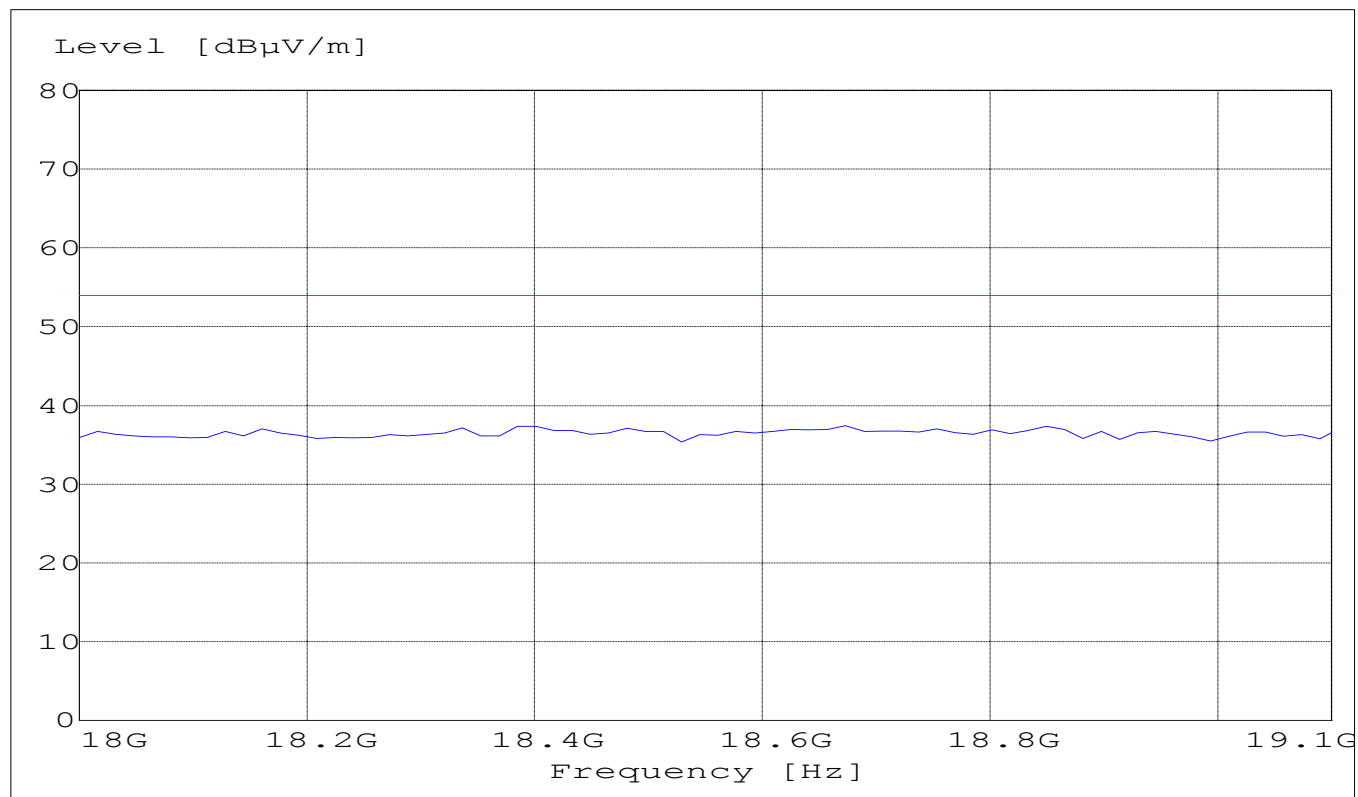
RECEIVER RADIATED EMISSIONS**EUT in Idle Mode: 8GHz – 18GHz*****SWEEP TABLE: "FCC 24 spuri 8-18G"***

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
8GHz	18GHz	Max Peak	Coupled	1 MHz



RECEIVER RADIATED EMISSIONS**EUT in Idle Mode: 18GHz – 19.1GHz*****SWEEP TABLE: "FCC 24 spuri 18-19.1G"***

<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
18GHz	19.1GHz	Max Peak	Coupled	1 MHz



CONDUCTED SPURIOUS EMISSIONS**§ 2.1057 / §24.238****Measurement Procedure:**

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 under test, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz for PCS-1900 and 30MHz – 9GHz for GSM-850.

2. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

GSM-850 Transmitter

Channel	Frequency
128	824.2 MHz
190	836.6 MHz
251	848.8 MHz

PCS-1900 Transmitter

Channel	Frequency
512	1850.2 MHz
661	1880.0 MHz
810	1909.8 MHz

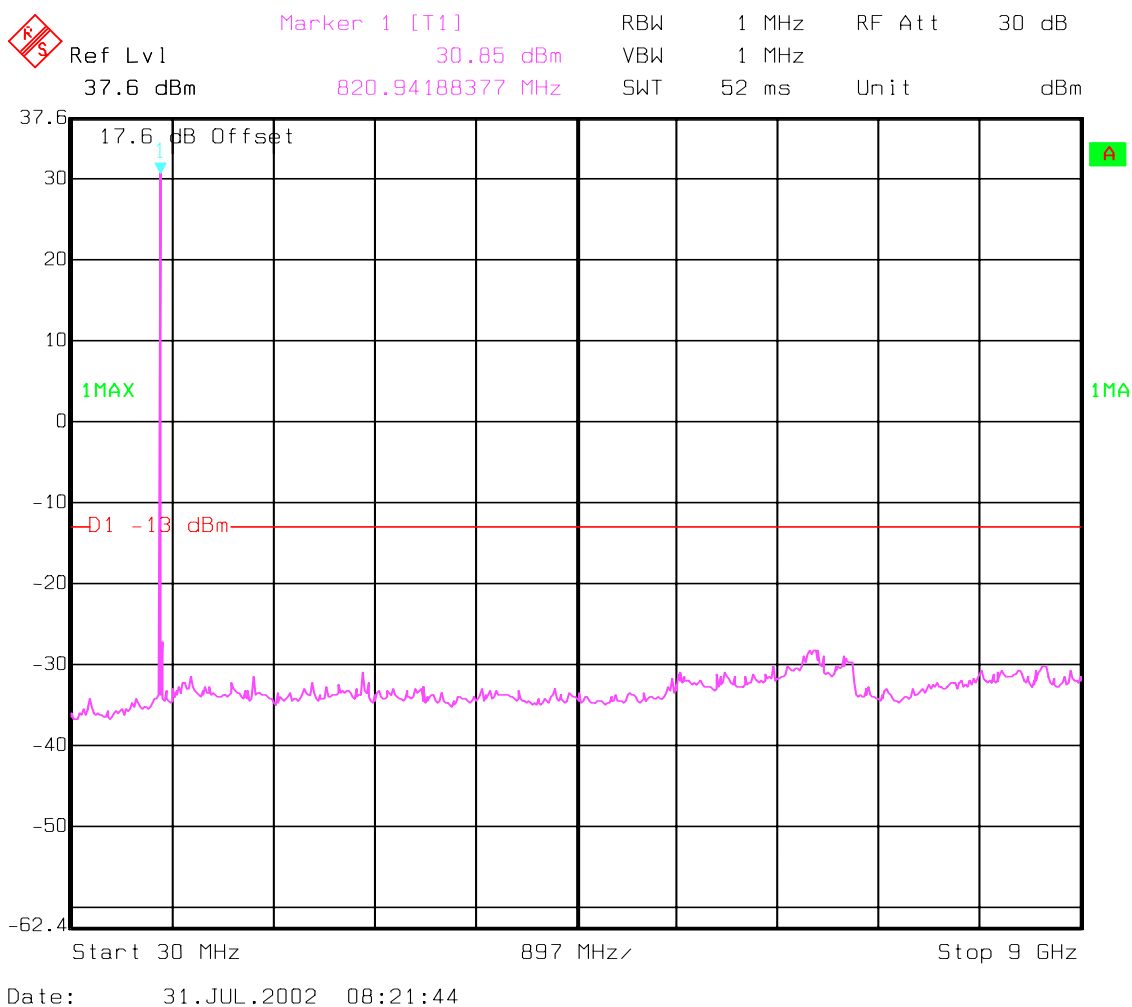
Measurement Limit:

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 0dBm, this becomes a constant specification limit of -13 dBm.

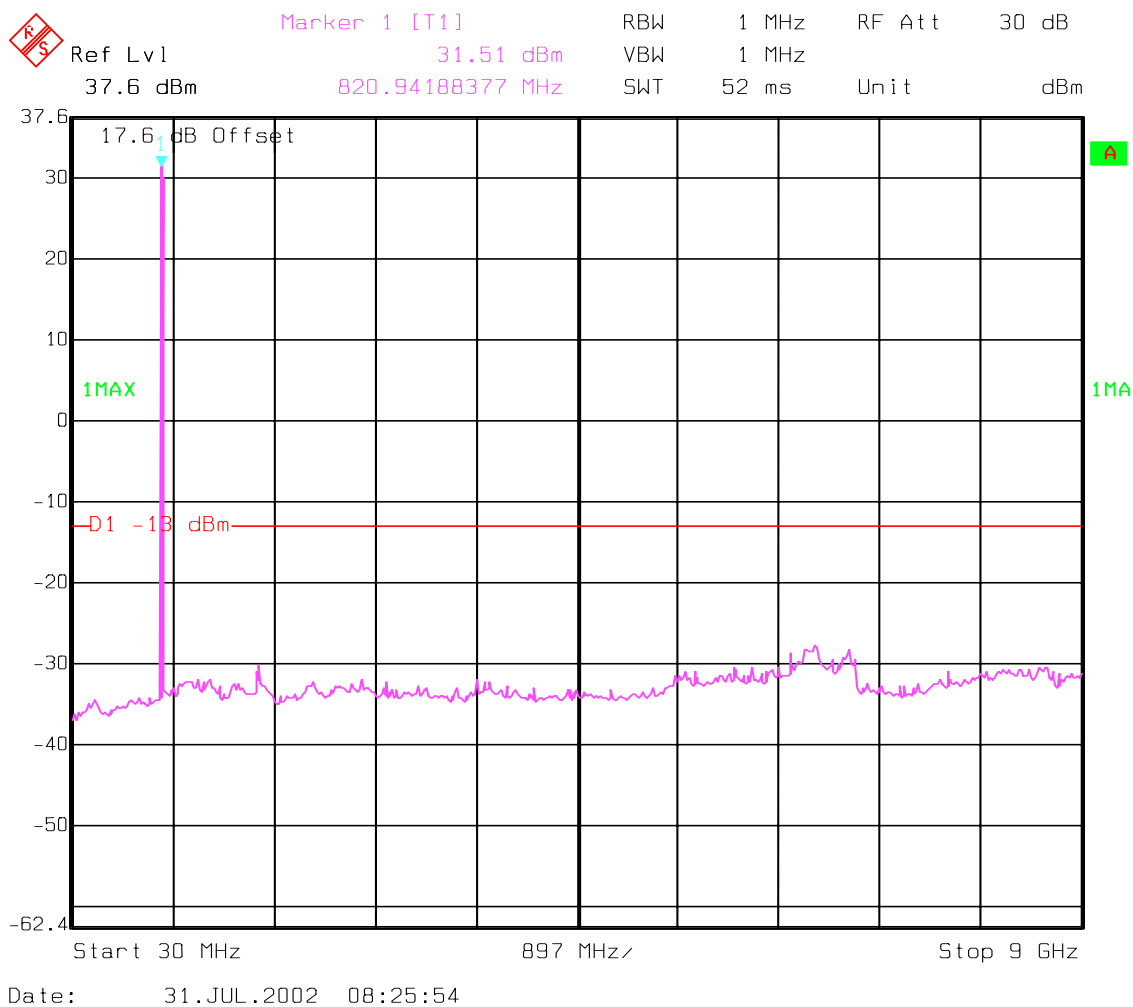
CONDUCTED SPURIOUS EMISSIONS CHANNEL 128 (GSM-850) 30MHz – 9GHz

Note: The peak above the limit line is the carrier freq. at ch-128.

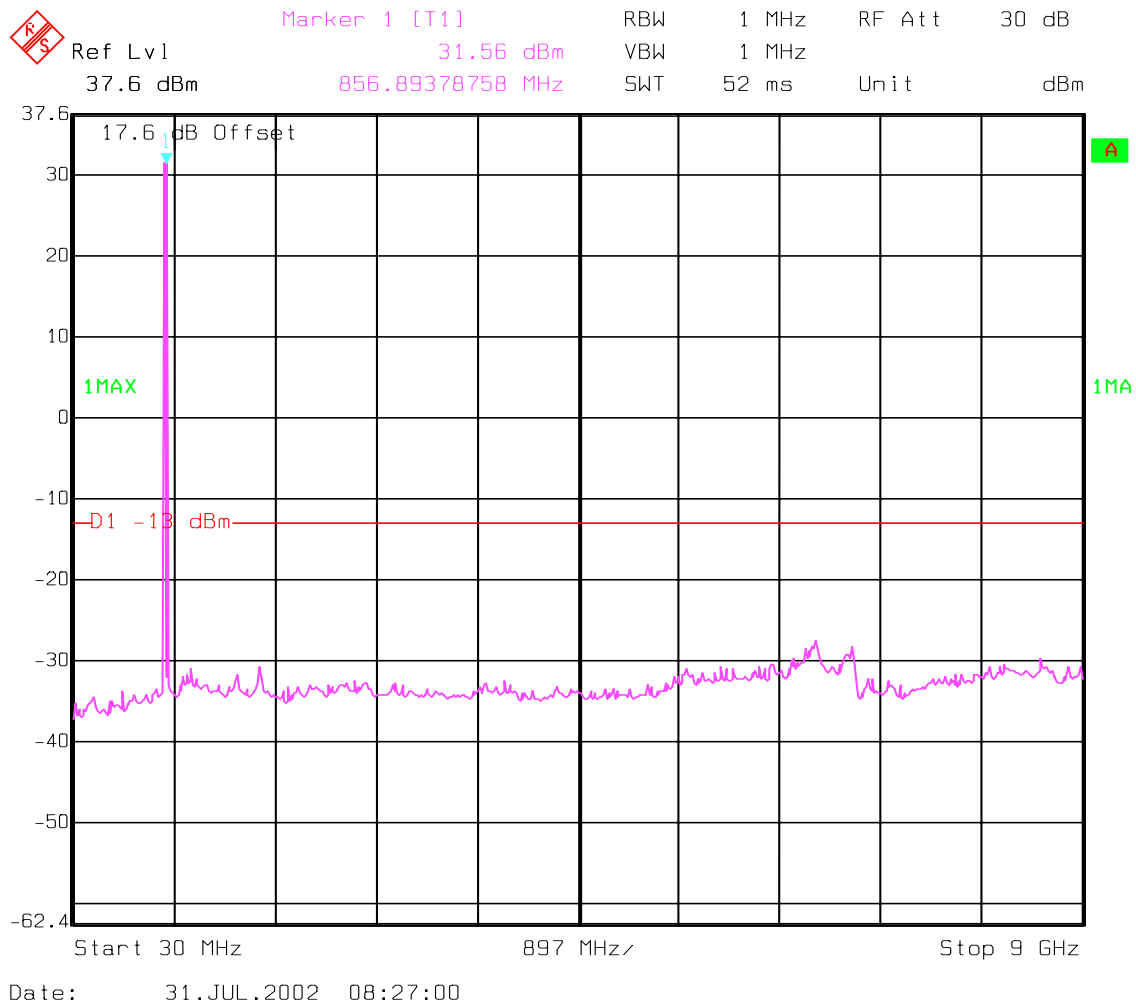


CONDUCTED SPURIOUS EMISSIONS CHANNEL 190 (GSM-850) 30MHz – 9GHz

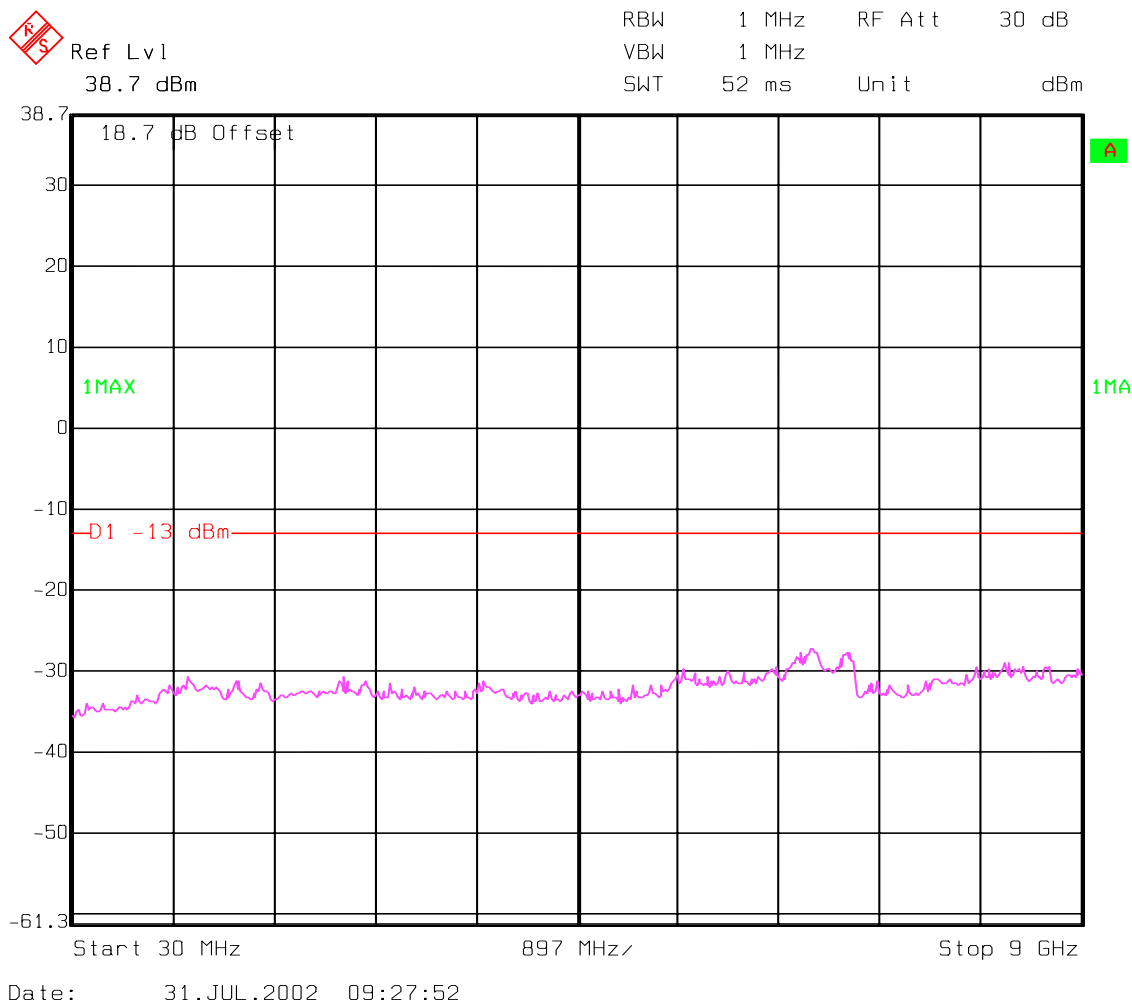
Note: The peak above the limit line is the carrier freq. at ch-190.



Note: The peak above the limit line is the carrier freq. at ch-251.

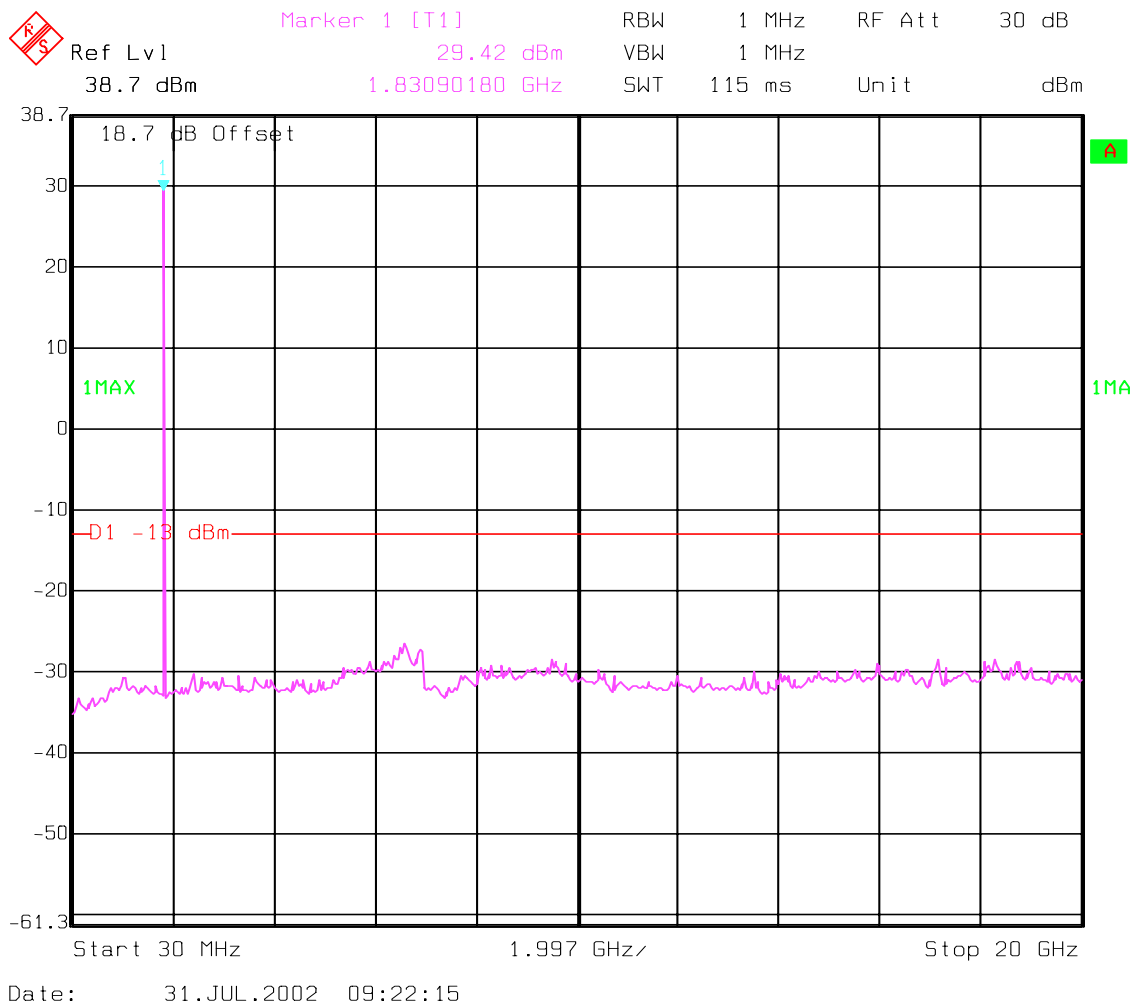


CONDUCTED SPURIOUS EMISSIONS
Idle Mode (GSM-850)
30MHz – 9GHz



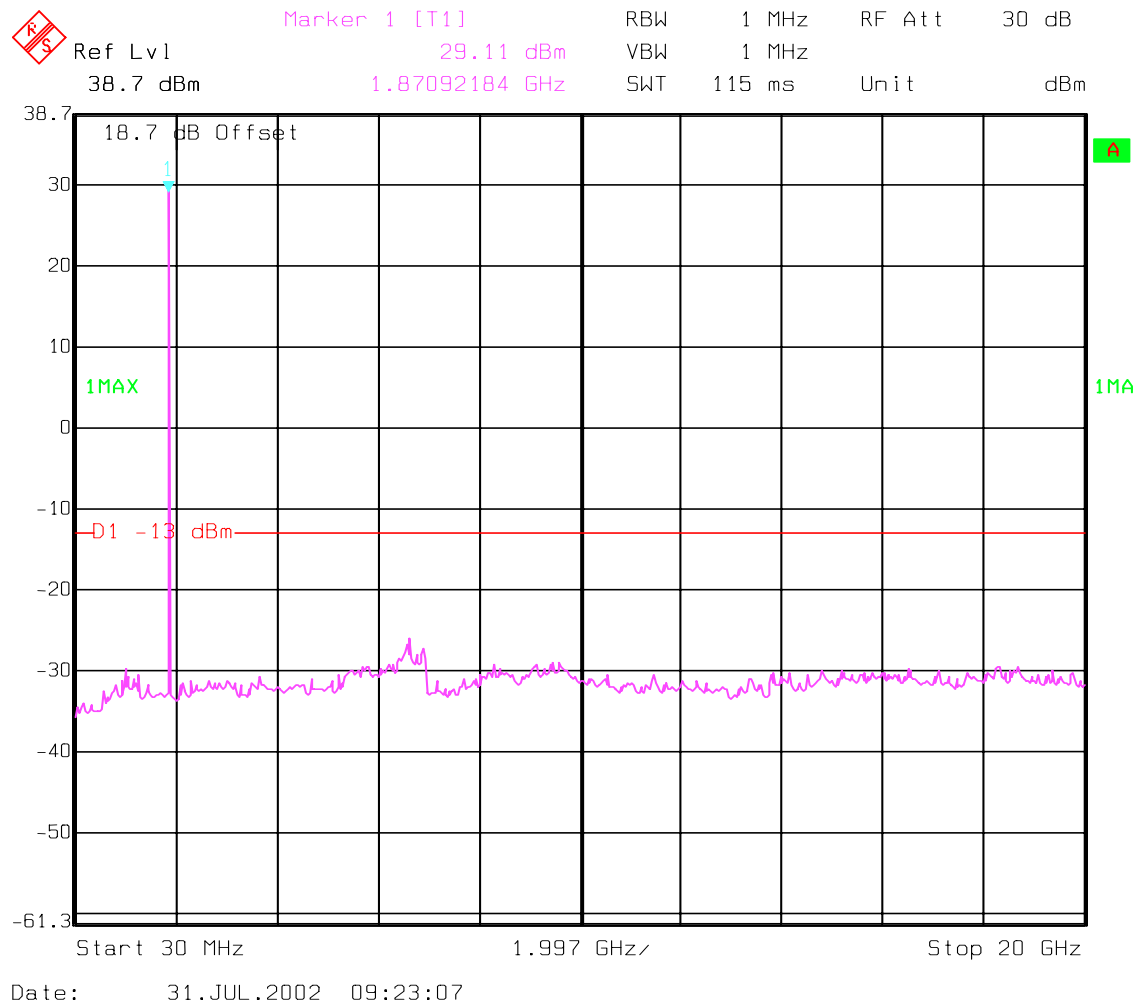
CONDUCTED SPURIOUS EMISSIONS
CHANNEL 512 (PCS-1900)
30MHz – 20GHz

Note: The peak above the limit line is the carrier freq. at ch-512.



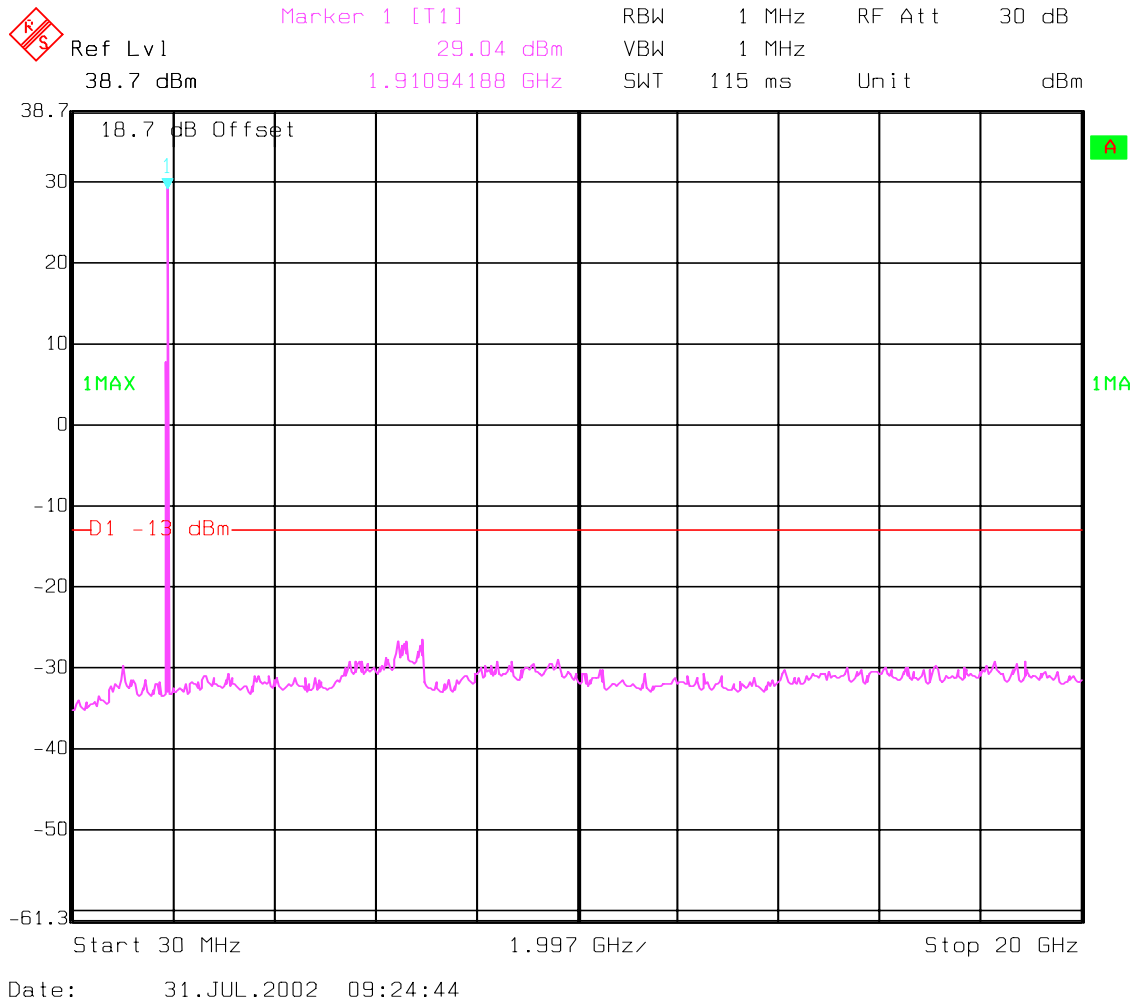
CONDUCTED SPURIOUS EMISSIONS
CHANNEL 661 (PCS-1900)
30MHz – 20GHz

Note: The peak above the limit line is the carrier freq. at ch-661.

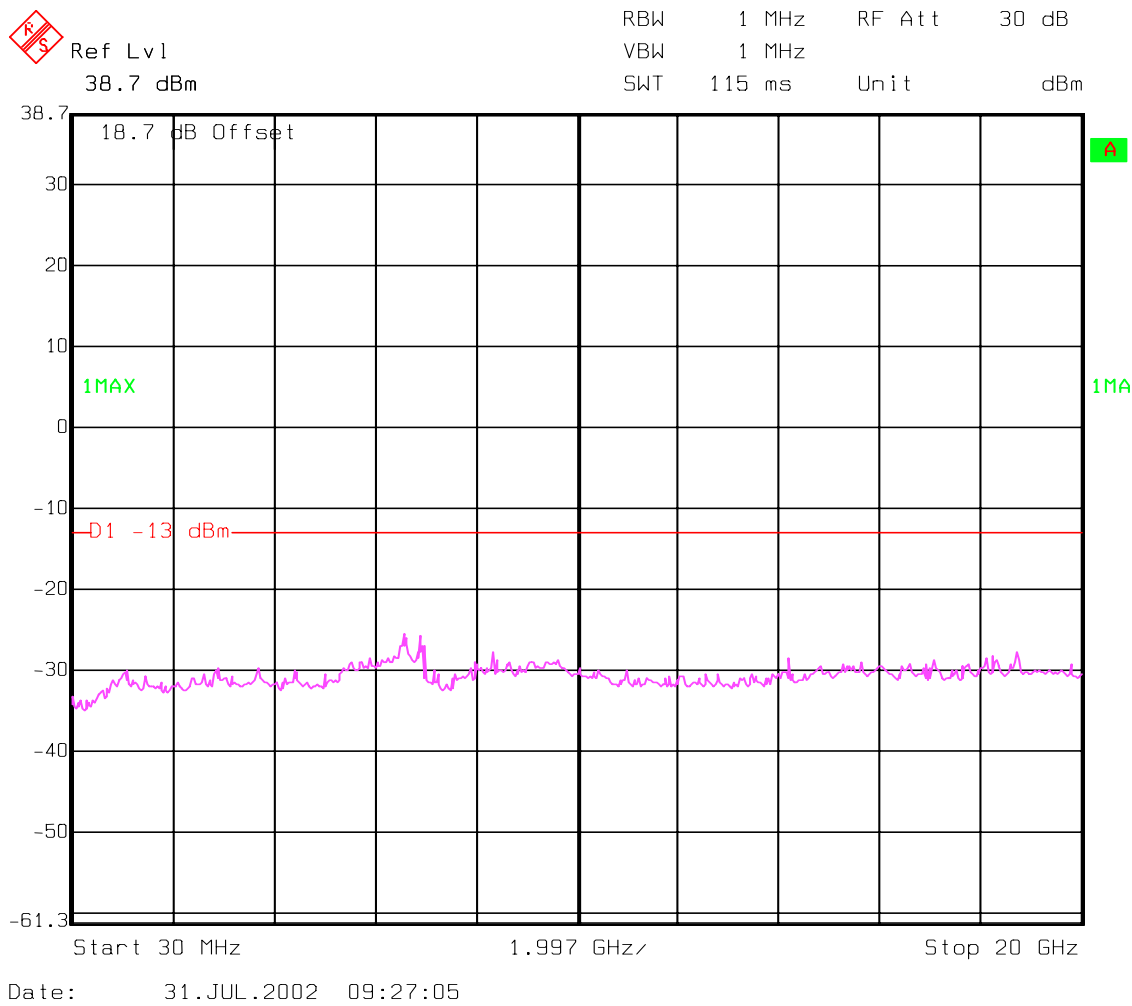


CONDUCTED SPURIOUS EMISSIONS CHANNEL 810 (PCS-1900) 30MHz – 20GHz

Note: The peak above the limit line is the carrier freq. at ch-810.



CONDUCTED SPURIOUS EMISSIONS
Idle Mode (PCS-1900)
30MHz – 20GHz



CONDUCTED EMISSIONS

§ 15.107/207

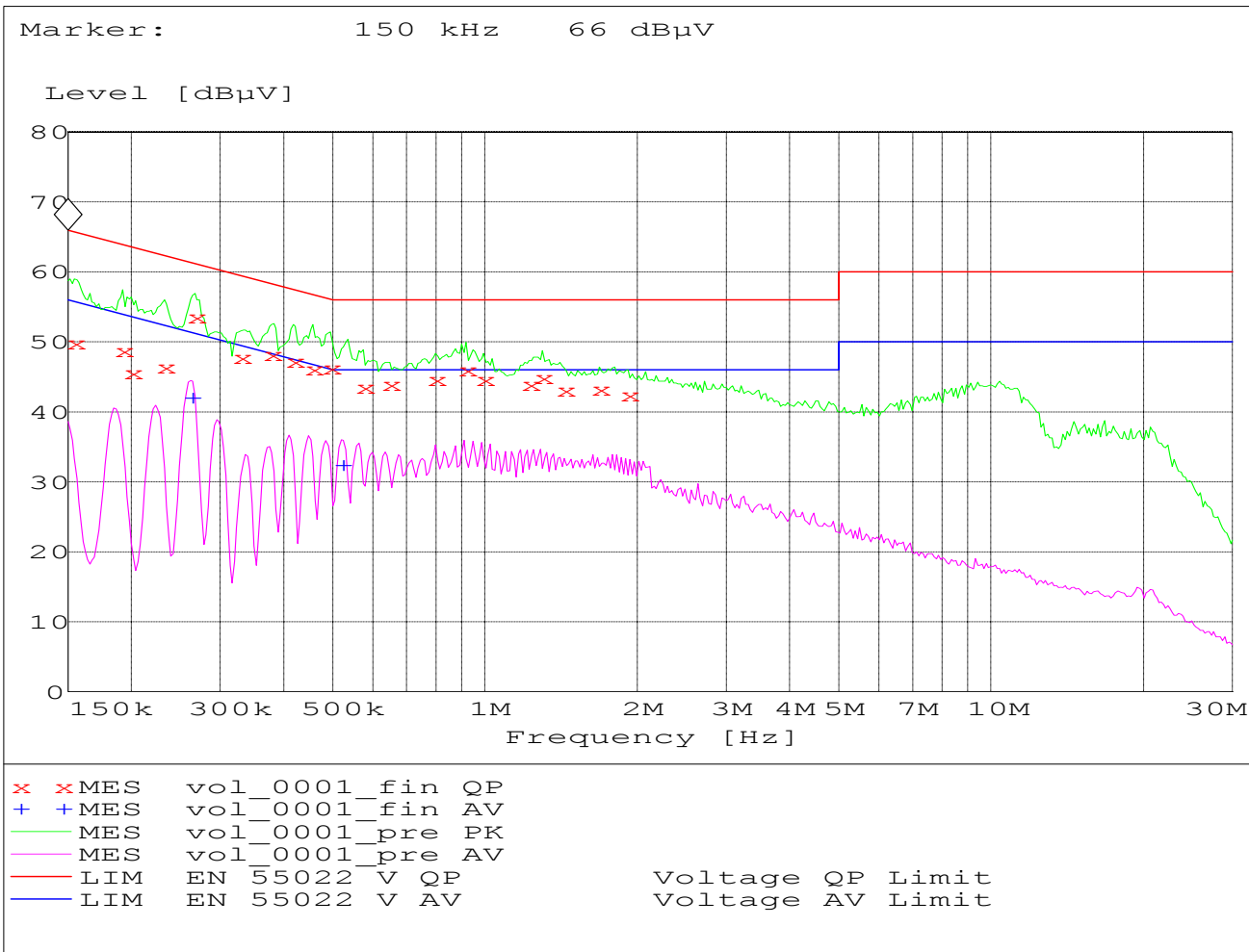
Measured with AC/DC power adapter - DA2-3101US-(L)

Technical specification : 15.107 / 15.207 (Revised as of October 1, 1991)

Limit

0.45 to 30 MHz	250 µV / 47.96 dBµV
ANALYZER SETTINGS: RBW = 10KHz VBW = 10KHz	

Note: This measurement is carried out according to guidelines of FCC 02-157
(Limit: CISPR 22 class-B)



MEASUREMENT RESULT: "vol_0001_fin QP"

7/30/02 4:21PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.154545	49.80	0.0	66	16.0	2	---
0.192365	48.80	0.0	64	15.2	2	---
0.200176	45.60	0.0	64	18.1	1	---
0.232398	46.50	0.0	62	15.8	2	---
0.267135	53.60	0.0	61	7.6	1	---
0.329215	47.80	0.0	60	11.7	1	---
0.378424	48.30	0.0	58	10.0	1	---
0.418016	47.20	0.0	58	10.3	2	---
0.457178	46.20	0.0	57	10.5	2	---
0.495058	46.30	0.0	56	9.8	2	---
0.574747	43.50	0.0	56	12.5	1	---
0.647639	43.90	0.0	56	12.1	2	---
0.798145	44.60	0.0	56	11.4	2	---
0.917448	46.10	0.0	56	9.9	1	---
0.993464	44.70	0.0	56	11.3	1	---
1.224337	44.00	0.0	56	12.0	1	---
1.299659	45.00	0.0	56	11.0	2	---
1.435632	43.20	0.0	56	12.8	2	---
1.683391	43.30	0.0	56	12.7	2	---
1.915856	42.50	0.0	56	13.5	1	---

MEASUREMENT RESULT: "vol_0001_fin AV"

7/30/02 4:21PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.261871	42.00	0.0	51	9.4	1	---
0.520311	32.40	0.0	46	13.6	1	---

Measured with AC/DC power adapter – C39280-Z4-C388-2

Technical specification : 15.107 / 15.207 (Revised as of October 1, 1991)

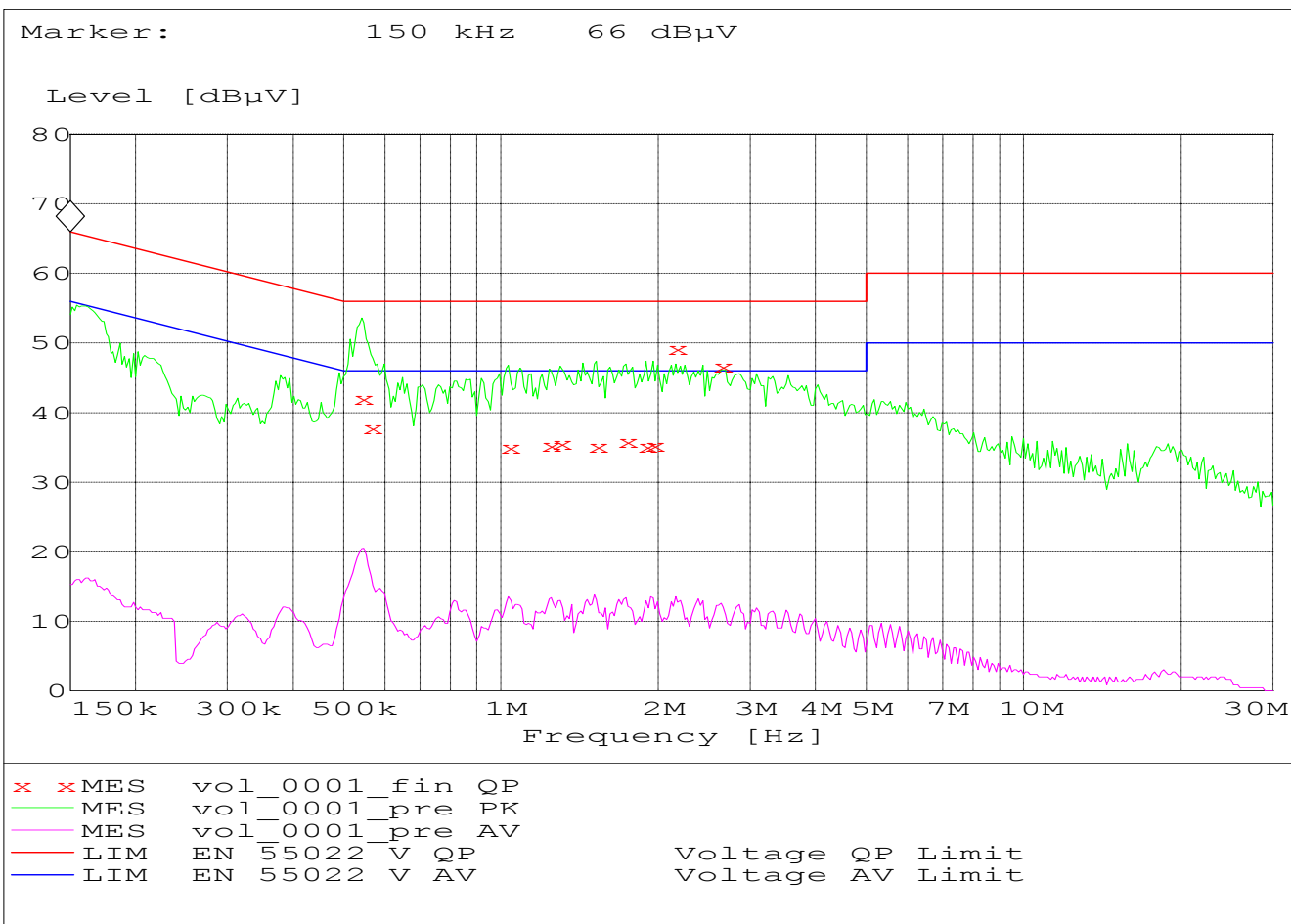
Limit

0.45 to 30 MHz	250 μ V / 47.96 dB μ V
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ANALYZER SETTINGS: RBW = 10KHz

VBW = 10KHz

Note: This measurement is carried out according to guidelines of FCC 02-157
(Limit: CISPR 22 class-B)



MEASUREMENT RESULT: "vol_0001_fin QP"

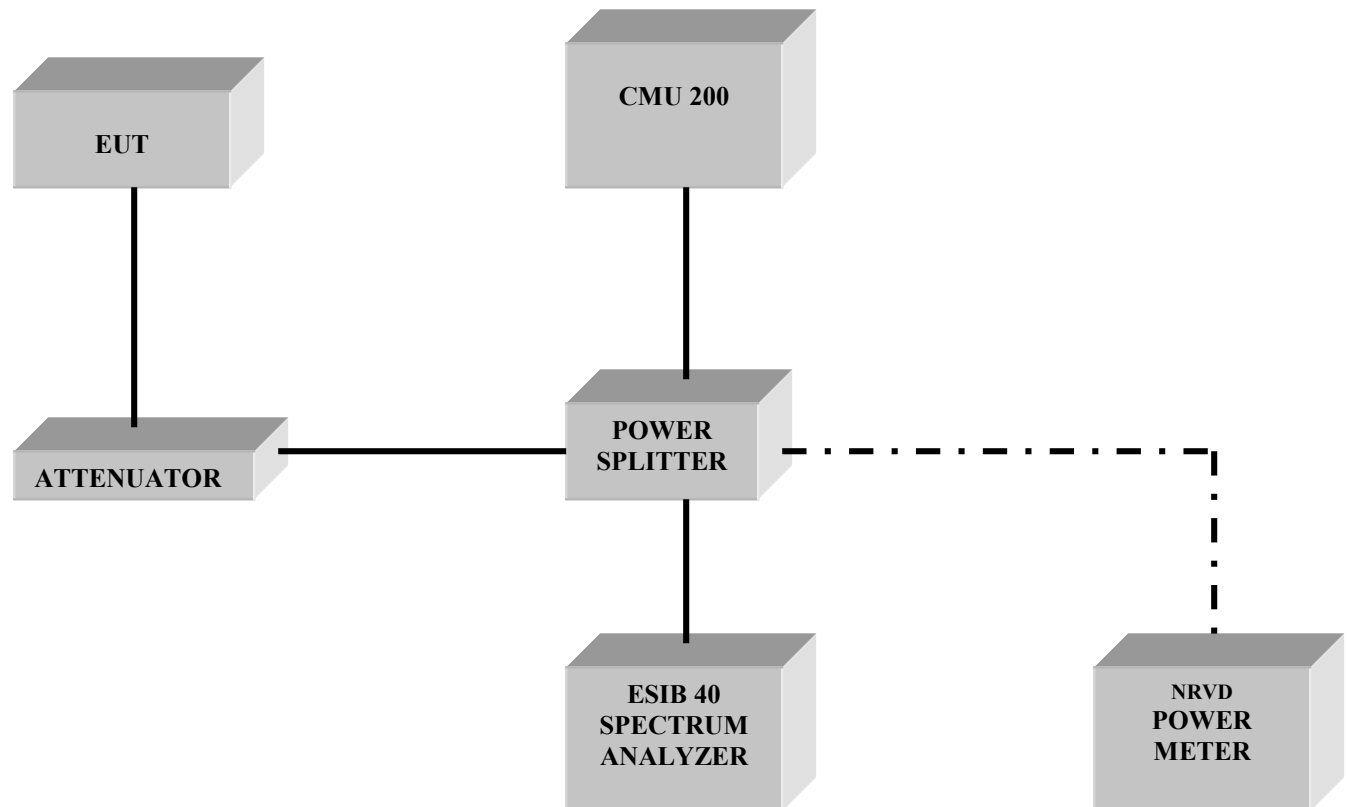
7/30/02 4:48PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.541438	42.10	0.0	56	13.9	2	---
0.563422	37.80	0.0	56	18.2	2	---
1.033803	35.00	0.0	56	21.0	1	---
1.236581	35.30	0.0	56	20.7	2	---
1.299659	35.60	0.0	56	20.4	2	---
1.523952	35.20	0.0	56	20.8	2	---
1.734400	35.90	0.0	56	20.1	1	---
1.896887	35.20	0.0	56	20.8	1	---
1.954365	35.30	0.0	56	20.7	1	---
2.158835	49.30	0.0	56	6.7	1	---
2.634188	46.70	0.0	56	9.3	1	---

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	826880/010
03	Signal Generator	SMY02	Rohde & Schwarz	836878/011
04	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02
05	Power Amplifier	250W1000	Amplifier Research	300031
06	Biconilog Antenna	3141	EMCO	0005-1186
07	Horn Antenna	SAS-200/571	AH Systems	325
08	Power Splitter	11667B	Hewlett Packard	645348
09	Climatic Chamber	VT4004	Votch	G1115
10	Pre-Amplifier	JS4-00102600	Miteq	00616
11	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807
12	Universal Radio Comm. Tester	CMU 200	Rohde & Schwarz	832221/06

BLOCK DIAGRAMS
Conducted Testing



Radiated Testing

ANECHOIC CHAMBER

