CETECOM Inc.

CETECOM Inc.
411 Dixon Landing Road, Milpitas, CA-95035, USA
Phone: +1 408 586 6200 Fax: +1 408 586 6299
www.cetecom.com

FCC LISTED, REG. NO.: 101450
&
RECOGNIZED BY INDUSTRY CANADA
IC – 3925

Test report no.: EMC_382_FCC22-24_2002_S56
FCC Part 22,24 / RSS 133
(S56)
FCC ID: PWX-S56

Table of Contents

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: Philip Kim

1.2 Testing laboratory

CETECOM Inc.
411 Dixon Landing Road, Milpitas, CA-95035, USA
Phone: +1 408 586 6200 Fax: +1 408 586 6299
E-mail: lothar.schmidt@cetecomusa.com
Internet: www.cetecom.com

1.3 Details of applicant

Name	**:**	**SIEMENS Mobile LLC**
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.nevermann@icm.siemens.com**

1.4 Application details

Date of receipt of application	:	2002-11-23
Date of receipt test item	:	2002-11-23
Date of test	:	2002-11-23/11-25 through 11-26

1.5 Test item

Manufacturer	:	SIEMENS
Street Address	:	Suedstr. 9
City / Zip Code	:	47475 Kamp-Lintfort
Country	:	Germany
Marketing Name	:	S56
Model No.	:	L56 Marlin
Serial No.	:	IMEI: 001002000214036
Description	:	GSM 850 / 1900 mobile phone + Bluetooth
FCC-ID	:	PWX-S56

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	:	32.10dBm (1.62W) max. EIRP measured in GSM-850 32.12dBm (1.63W) max. EIRP measured in PCS-1900
Extreme vol. Limits	:	3.6 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:

Date	Section	Name	Signature
2002-12-18	EMC & Radio	Siegfried Lehmann (Technical Manager)	

Responsible for test report and project leader:

Date	Section	Name	Signature
2002-12-18	EMC & Radio	Philip Kim (EMC Engineer)	

2.2 Test report

TEST REPORT

Test report no.: EMC_382_FCC22-24_2002_S56
(S56)

TEST REPORT REFERENCE

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)
5	≤33dBm (2W)*	± 2

***GSM Specification – ETSI EN 300 910 V8.5.0 (2000-07) Section 4.1 { GSM05.05 Version 8.5.0 Release 1999}**

Power Measurements:

Conducted Average power measurements are provided by SIEMENS.
Please refer to attached document: FCC_S56_coducted_power
(page 3, section 2.1, Siemens S56, "FCC #2")

Frequency (MHz)	Average Power (dBm)
824.2	32.3
836.6	32.1
848.8	32.0

Conducted (PCS-1900)

Limits:

Power Step	Nominal Peak Output Power	Tolerance (dB)
0	≤30dBm (1W)*	± 2

***GSM Specification – ETSI EN 300 910 V8.5.0 (2000-07) Section 4.1 { GSM05.05 Version 8.5.0 Release 1999}**

Power Measurements:

Conducted Average power measurements are provided by SIEMENS.
Please refer to attached document: FCC_S56_coducted_power
(page 3, section 2.2, Siemens S56, "FCC #2")

Frequency (MHz)	Average Power (dBm)
1850.2	29.3
1880.0	29.1
1909.8	29.0

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 (Pin) is applied to the input of the dipole, and the power received (Pr) at the chamber's probe antenna is recorded.
2. A "reference path loss" is established as Pin + 2.1 - Pr.
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 is identified.
5. The EUT is then put into pulse mode at its maximum power level (Power Step 0 for PCS 1900 & 5 for GSM 850).
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 (Pin).
8. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.1dBi.

ERP (GSM-850) §22.913(a)

Limits:

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

Power Measurements:
Plots are shown on next pages

Radiated:

Frequency (MHz)	Power Step	BURST AVERAGE (dBm)	
		EIRP	ERP
824.2	5	30.15	28.05
836.6	5	32.10	30.00
848.8	5	31.47	29.37
Measurement uncertainty	±0.5 dB		

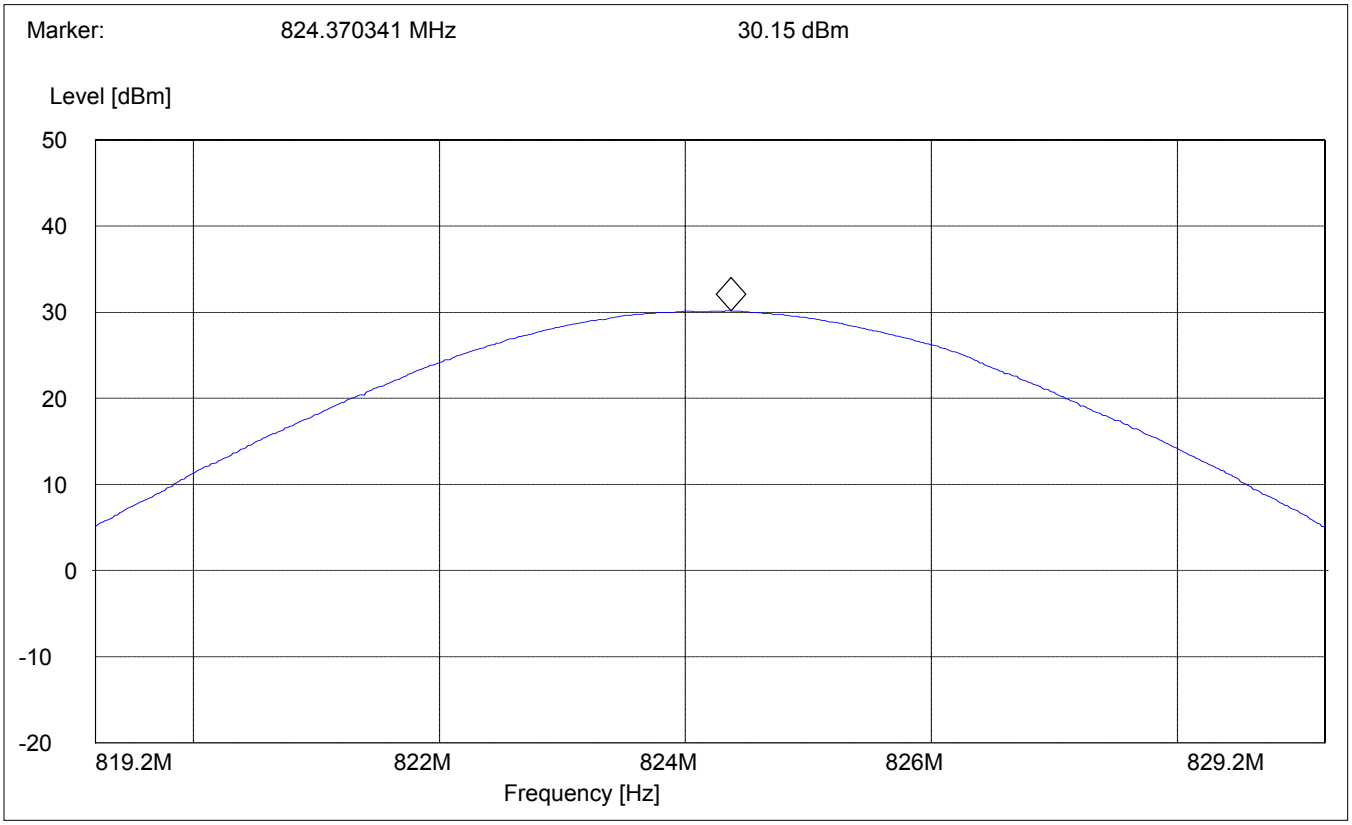
ANALYZER SETTINGS: RBW = VBW = 3MHz

Note: The plots show EIRP measurements only.

EIRP CHANNEL 128 (GSM-850) §22.913(a)

SWEEP TABLE: "EIRP 850 CH 128"

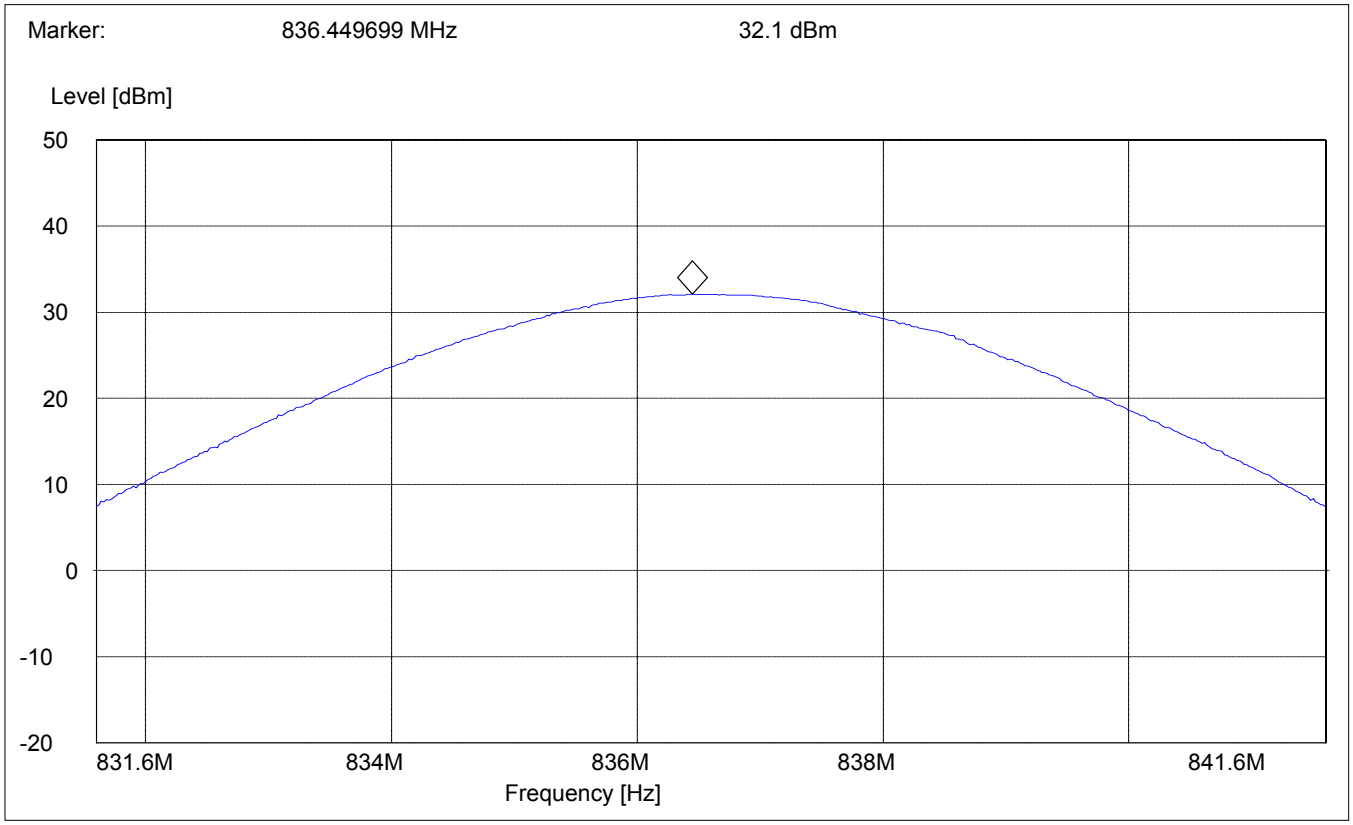
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
819.2 MHz	829.2 MHz	MaxPeak	Coupled	3 MHz



EIRP CHANNEL 190 (GSM-850) §22.913(a)

SWEEP TABLE: "EIRP 850 CH 190"

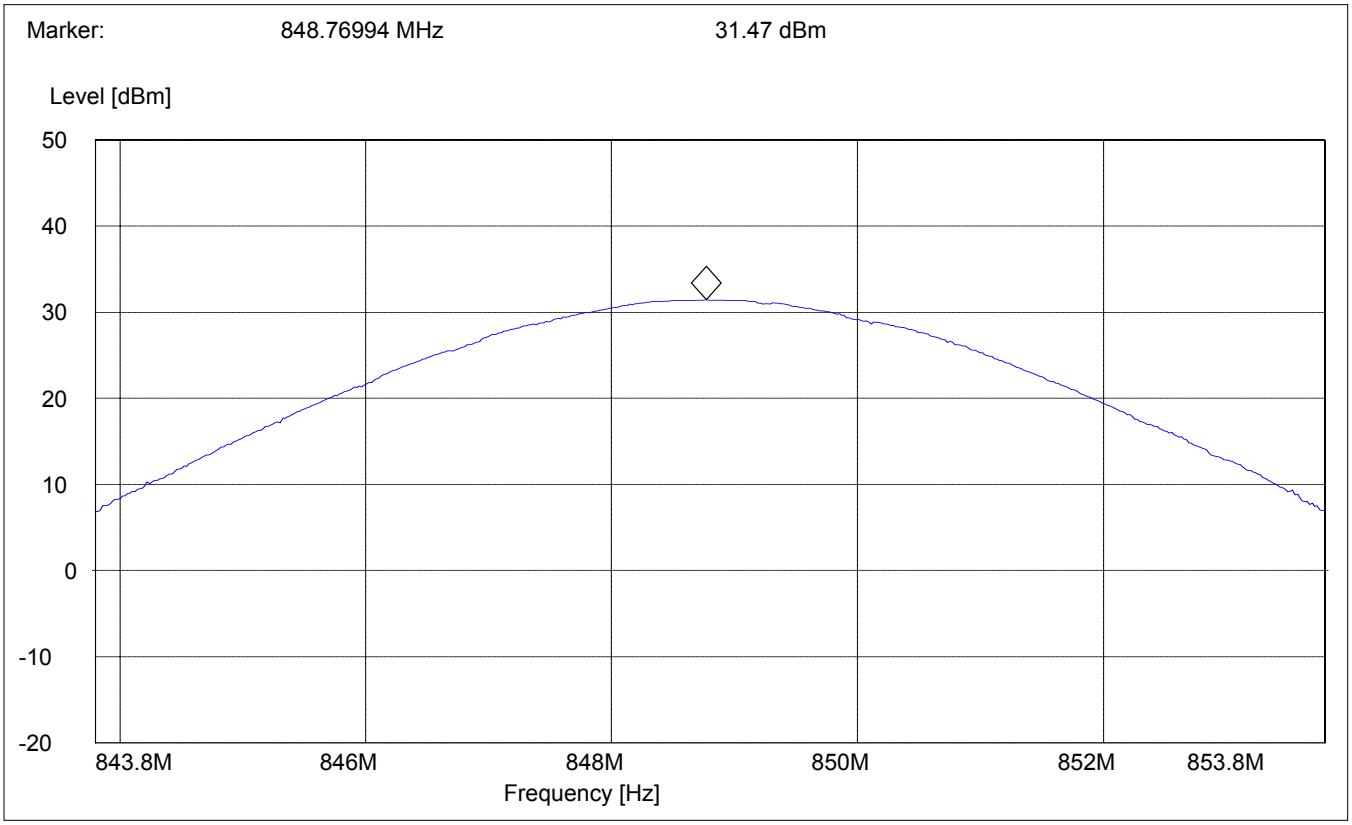
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
831.6MHz	841.6 MHz	MaxPeak	Coupled	3 MHz



EIRP CHANNEL 251 (GSM-850) §22.913(a)

SWEEP TABLE: "EIRP 850 CH 251"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
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	31.52	29.42
1880.0	0	32.12	30.02
1909.8	0	31.16	29.06
Measurement uncertainty	±0.5 dB		

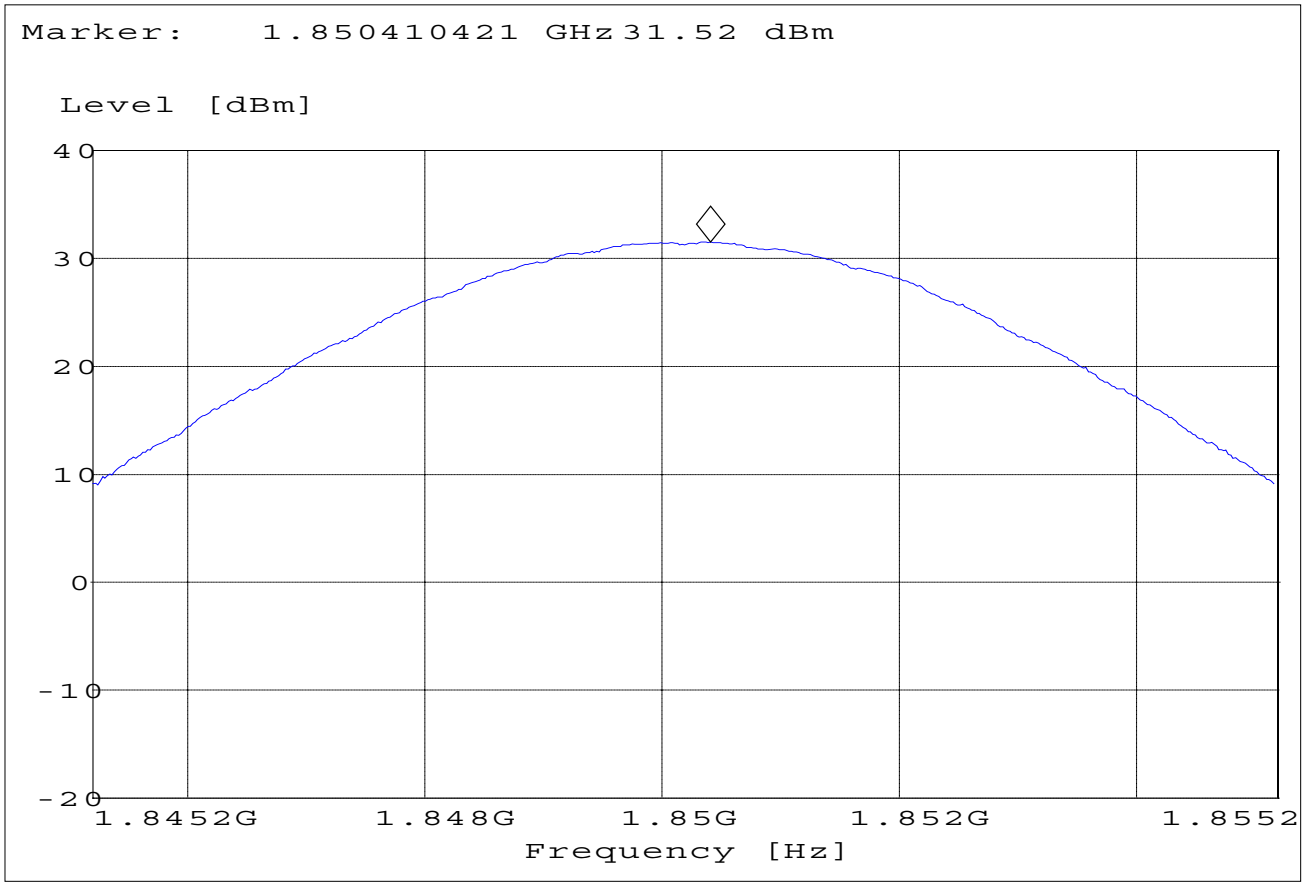
ANALYZER SETTINGS: RBW = VBW = 3MHz

Note: The plots show EIRP measurements only.

EIRP CHANNEL 512 (PCS-1900) §24.232(b)

SWEEP TABLE: "EIRP 1900 CH512"

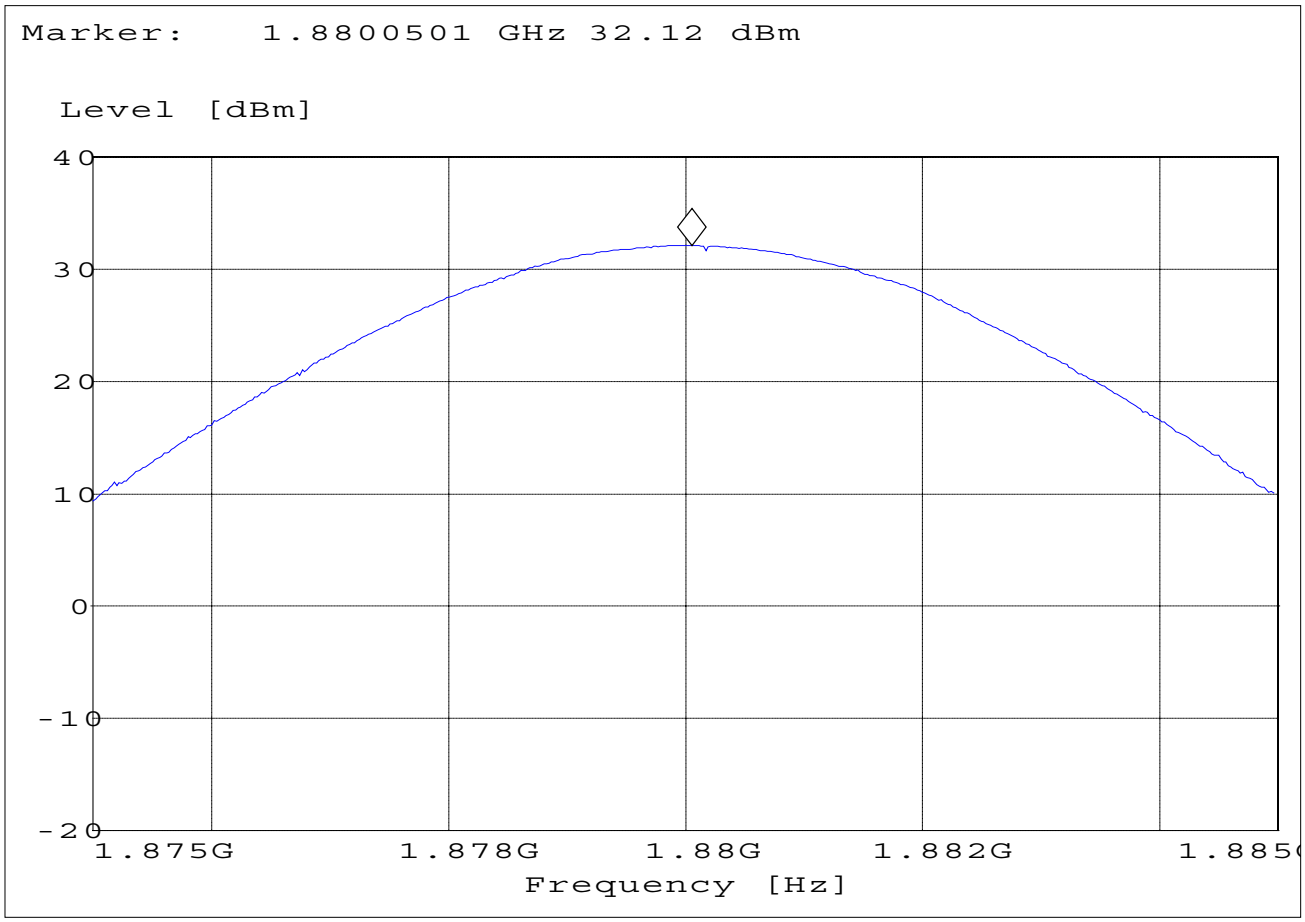
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1.8452 GHz	1.8552 GHz	Max Peak	Coupled	3 MHz



EIRP CHANNEL 661 (PCS-1900) §24.232(b)

SWEEP TABLE: "EIRP 1900 CH661"

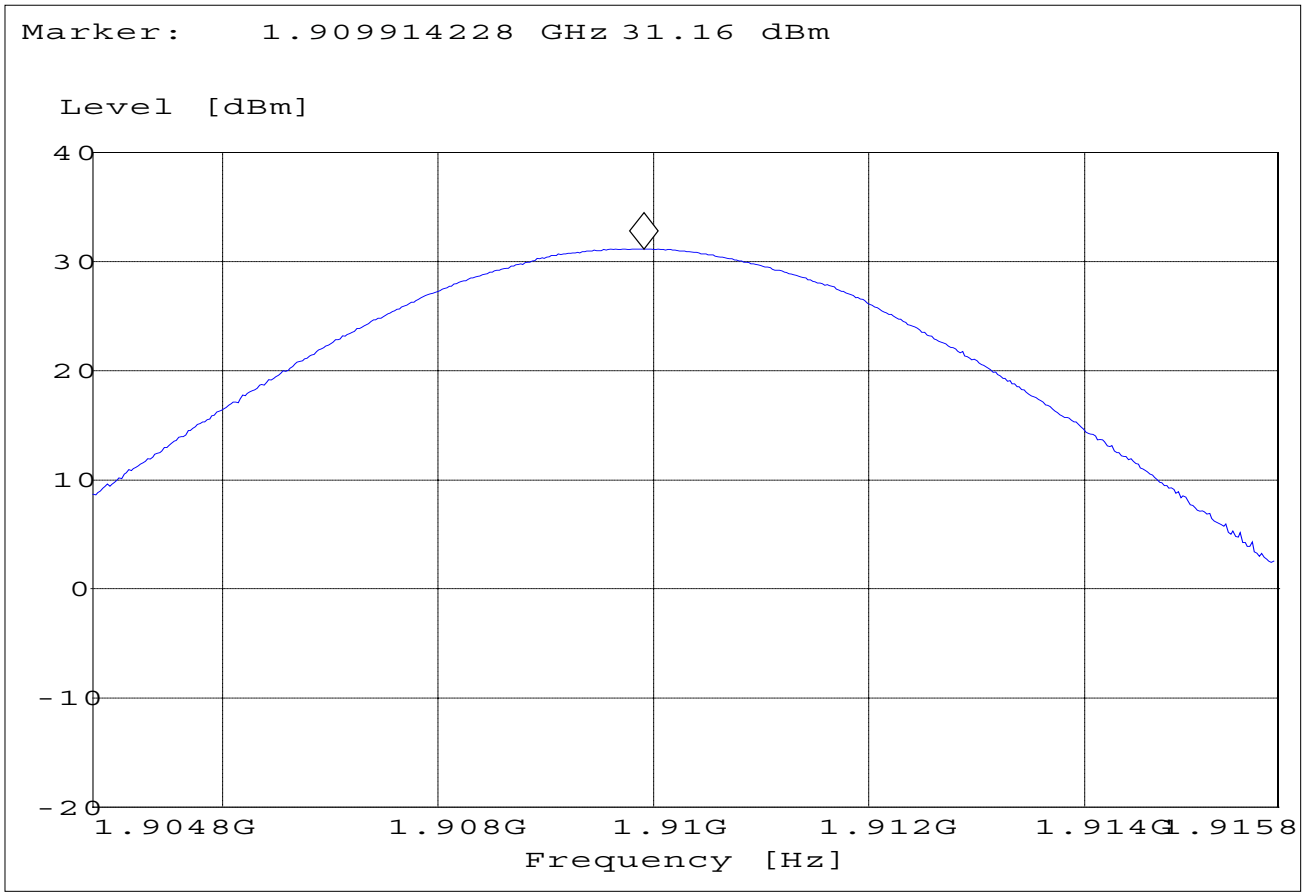
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1.875 GHz	1.885 GHz	Max Peak	Coupled	3 MHz



EIRP CHANNEL 810 (PCS-1900) §24.232(b)

SWEEP TABLE: "EIRP 1900 CH810"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1.9048 GHz	1.9158 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 0.1Volt 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 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 3.6 VDC and 5.2 VDC, 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 –5.26 % 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.

FRQUENCY STABILITY (GSM-850)

AFC FREQ ERROR vs. VOLTAGE

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
3.6	31	0.0371
3.7	26	0.0311
3.8	27	0.0323
3.9	28	0.0335
4.0	26	0.0311
4.1	25	0.0299
4.2	25	0.0299
4.3	27	0.0323
4.4	24	0.0287
4.5	23	0.0275
4.6	27	0.0323
4.7	26	0.0311
4.8	23	0.0275
4.9	25	0.0299
5.0	27	0.0323
5.1	24	0.0287
5.2	25	0.0299

AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	41	0.049008
-20	52	0.062156
-10	48	0.057375
0	35	0.041836
+10	34	0.040641
+20	34	0.040641
+30	30	0.035859
+40	27	0.032273
+50	25	0.029883

FRQUENCY STABILITY (PCS-1900)

AFC FREQ ERROR vs. VOLTAGE

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
3.6	-20	-0.0106
3.7	-20	-0.0106
3.8	-17	-0.0090
3.9	-22	-0.0117
4.0	-22	-0.0117
4.1	-20	-0.0106
4.2	-16	-0.0085
4.3	-15	-0.0080
4.4	-18	-0.0096
4.5	-24	-0.0128
4.6	-24	-0.0128
4.7	-22	-0.0117
4.8	-23	-0.0122
4.9	-20	-0.0106
5.0	-18	-0.0096
5.1	-20	-0.0106
5.2	-20	-0.0106

AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	41	0.021809
-20	23	0.012234
-10	39	0.020745
0	-15	-0.00798
+10	-36	-0.01915
+20	-36	-0.01915
+30	-28	-0.01489
+40	-27	-0.01436
+50	-32	-0.01702

OCCUPIED BANDWIDTH §2.1049(c)(1), §24.238(a)(b)

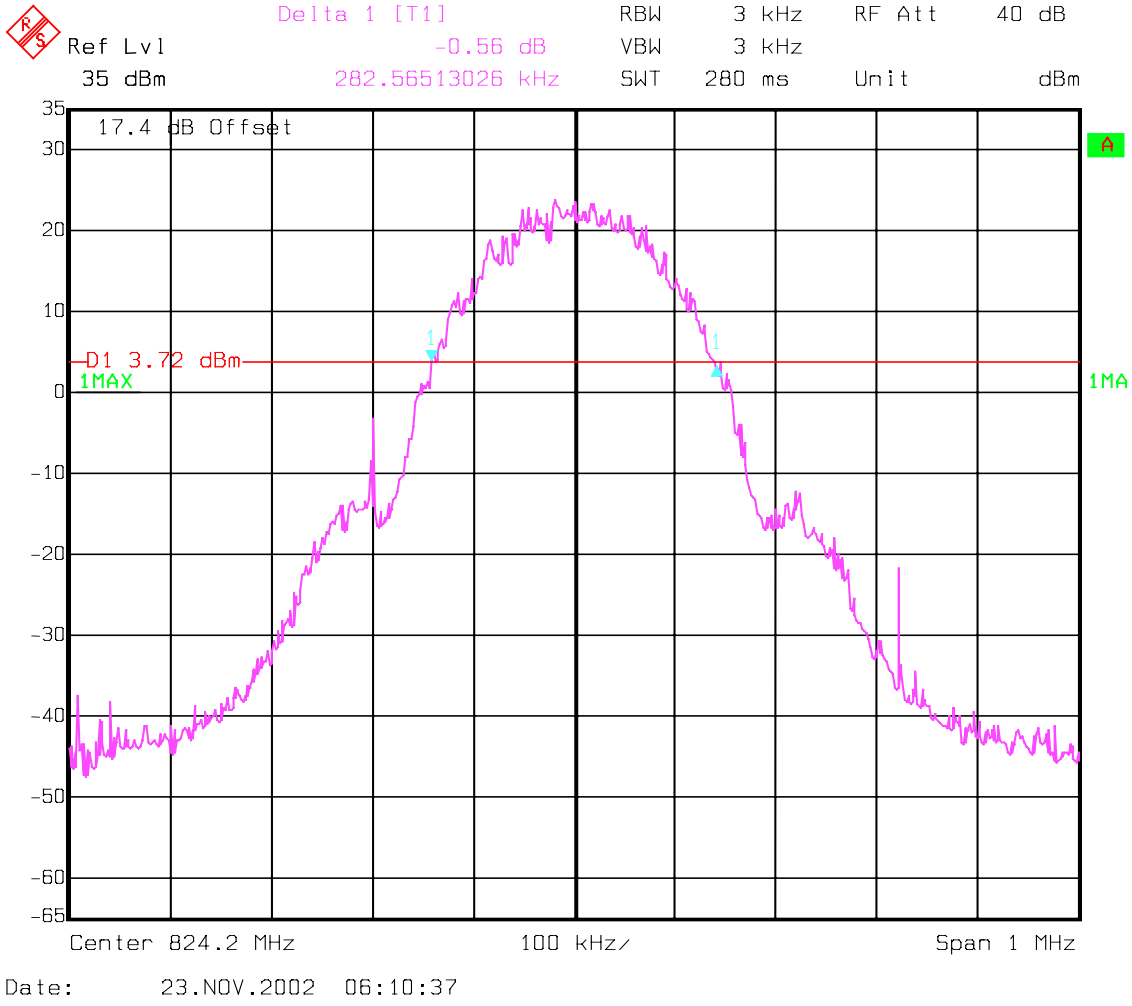
-20dBc BANDWIDTH (GSM-850)

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 analyser plots are included on the following pages.

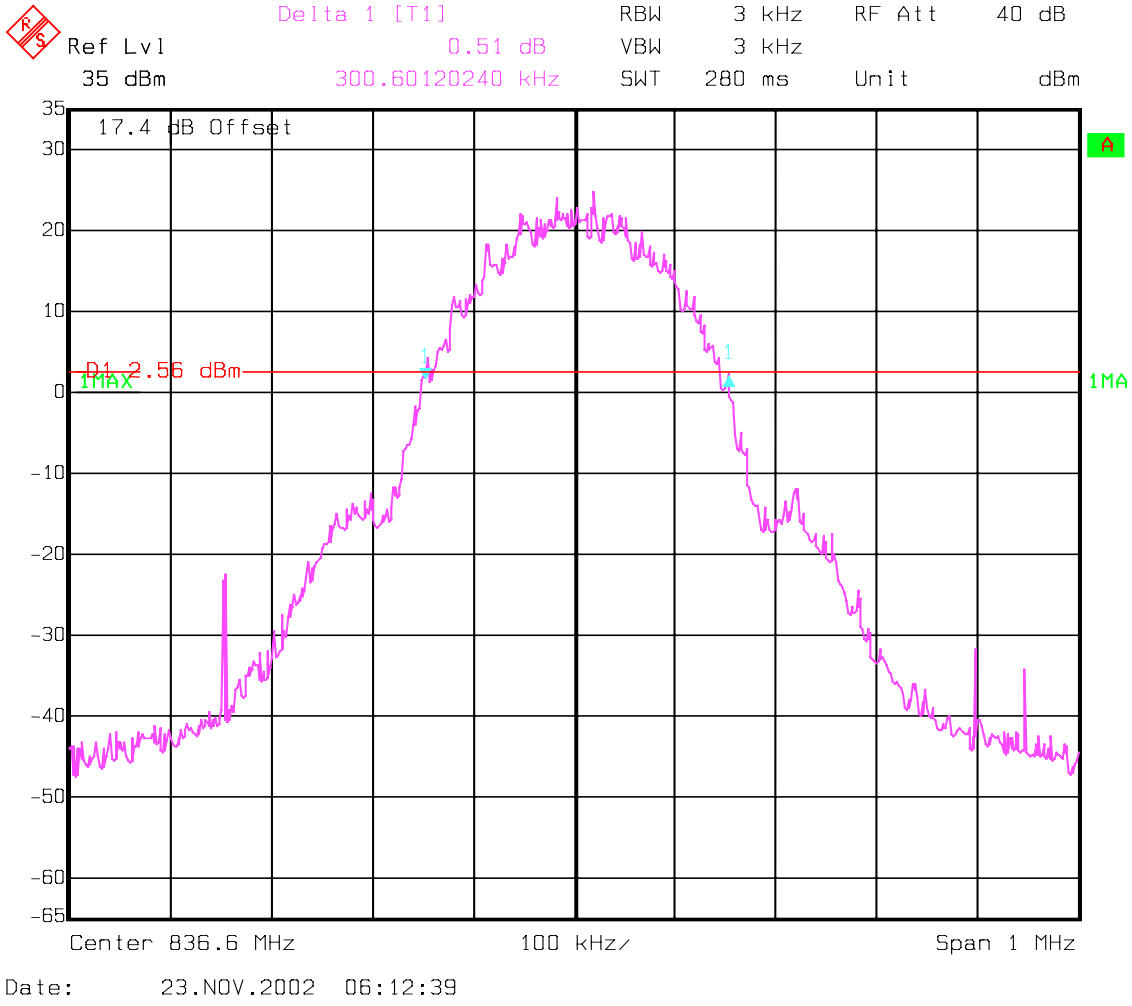
Frequency(MHz)	-20 dBc Bandwidth(kHz)
824.2MHz	282.56
836.6MHz	300.6
848.8MHz	286.57

.

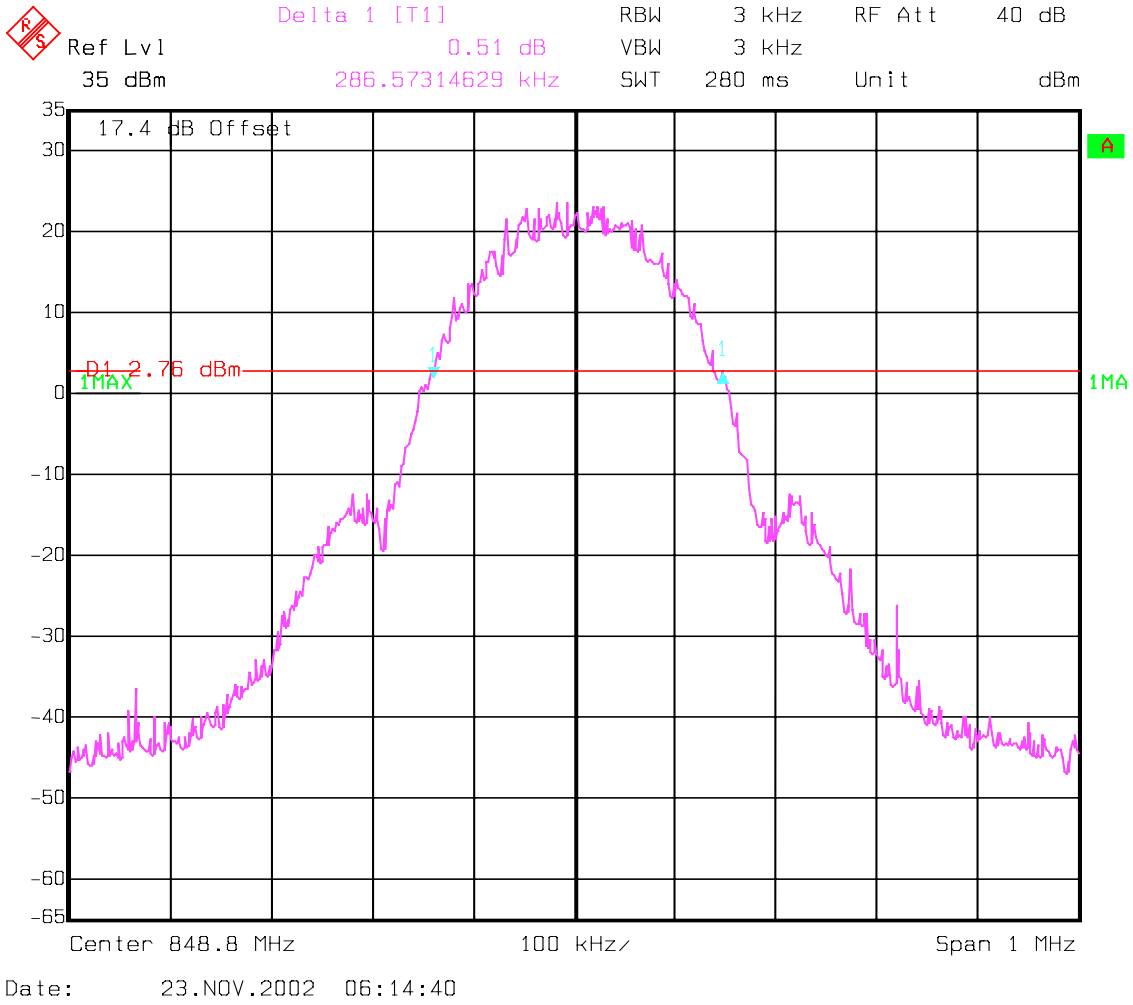
-20dBc BANDWIDTH CHANNEL 128(GSM-850)



-20dBc BANDWIDTH CHANNEL 190(GSM-850)



-20dBc BANDWIDTH CHANNEL 251(GSM-850)



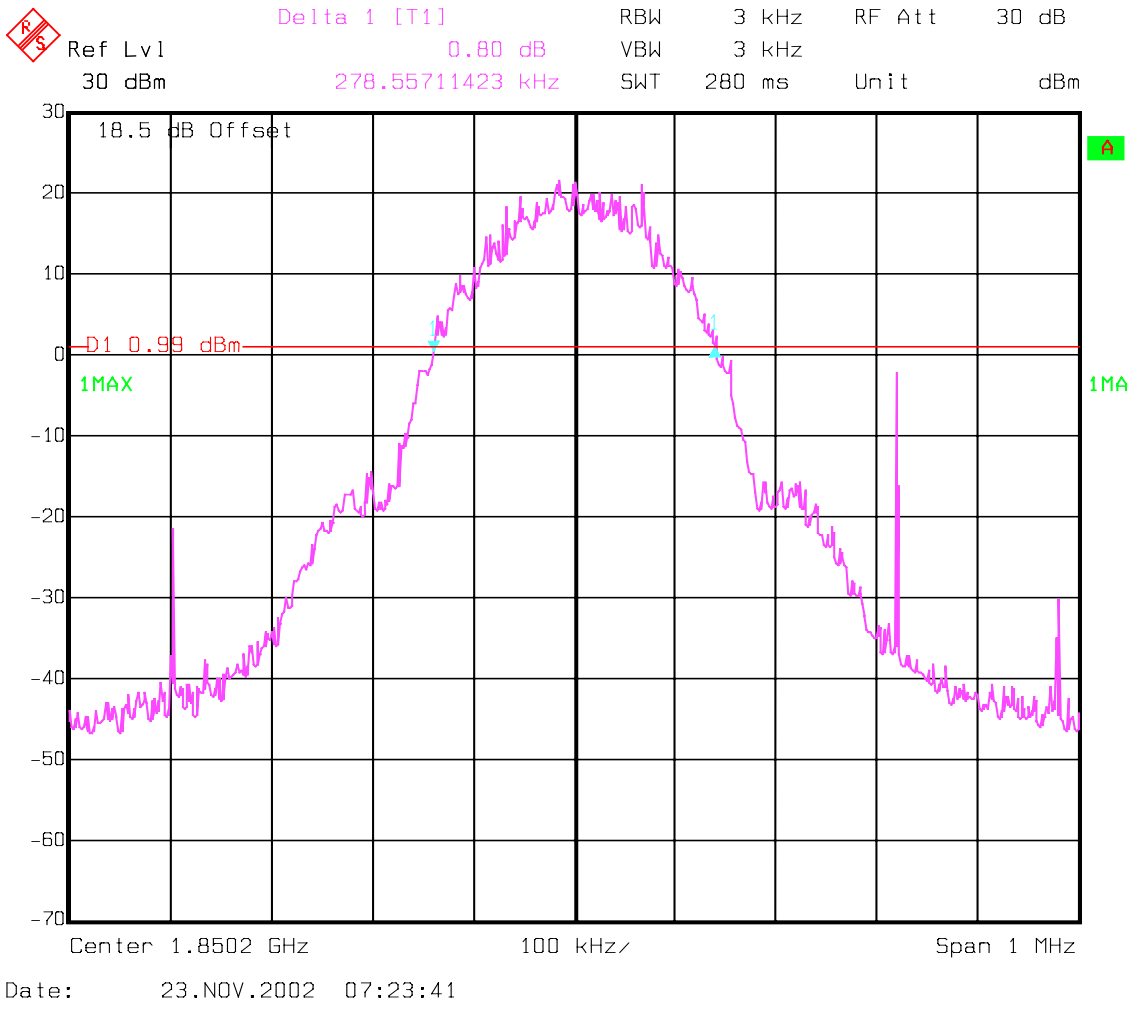
OCCUPIED BANDWIDTH §2.1049(c)(1), §24.238(a)(b)

PCS-1900

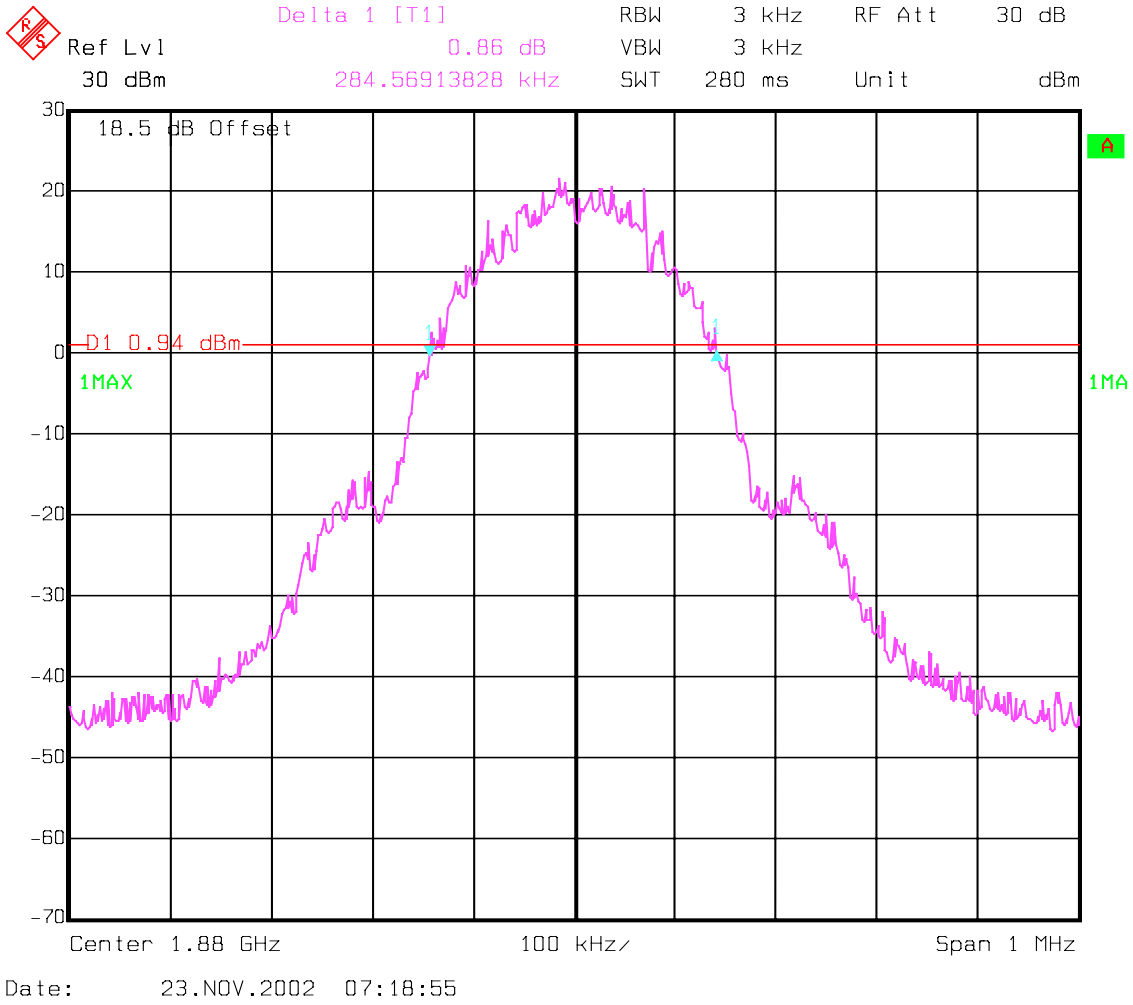
Occupied Bandwidth Results
Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the PCS-1900 frequency band. Table below lists the measured 99% 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	278.56	314.63
1880.0	284.57	314.63
1909.2	292.59	318.64

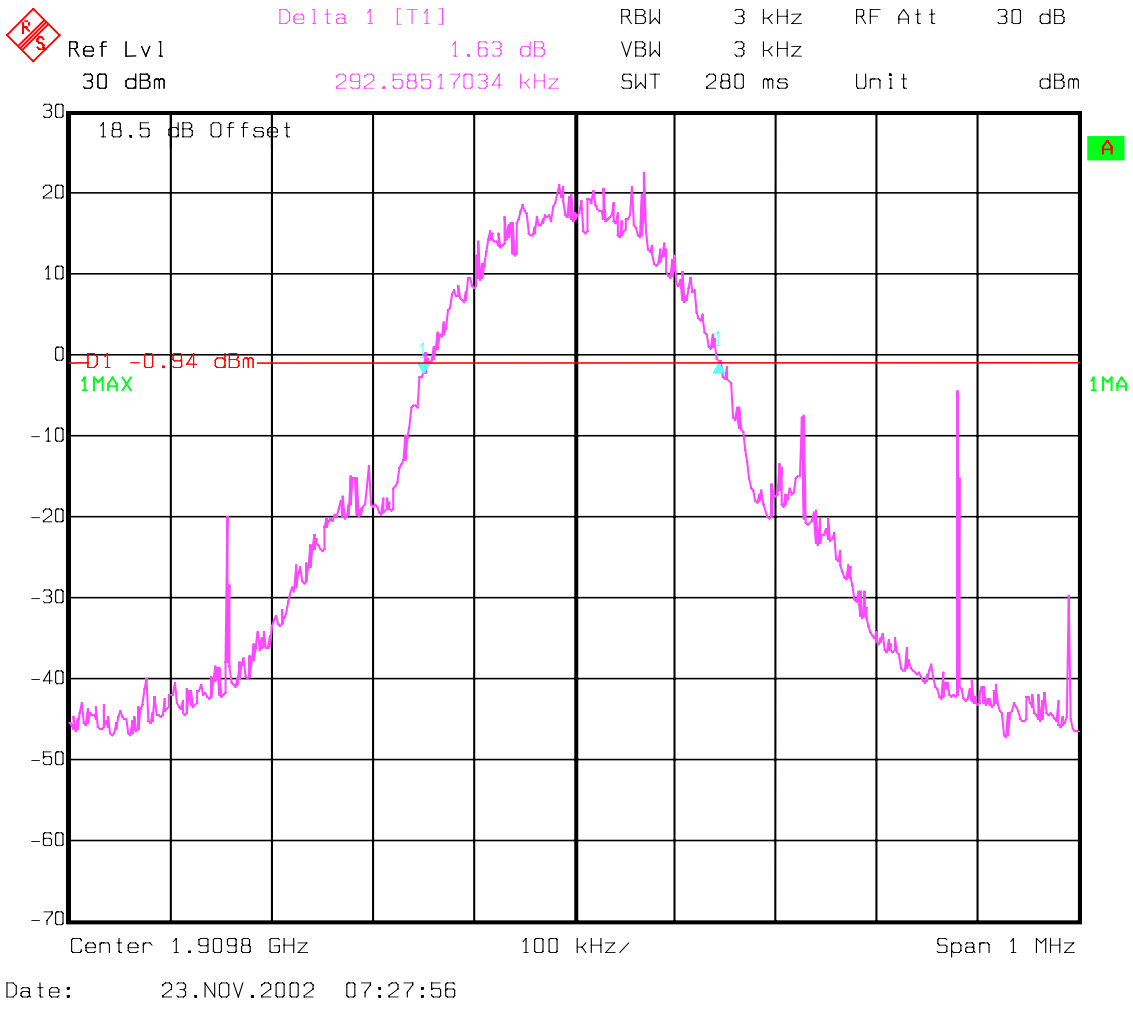
-20dBc BANDWIDTH CHANNEL 512(PCS-1900)



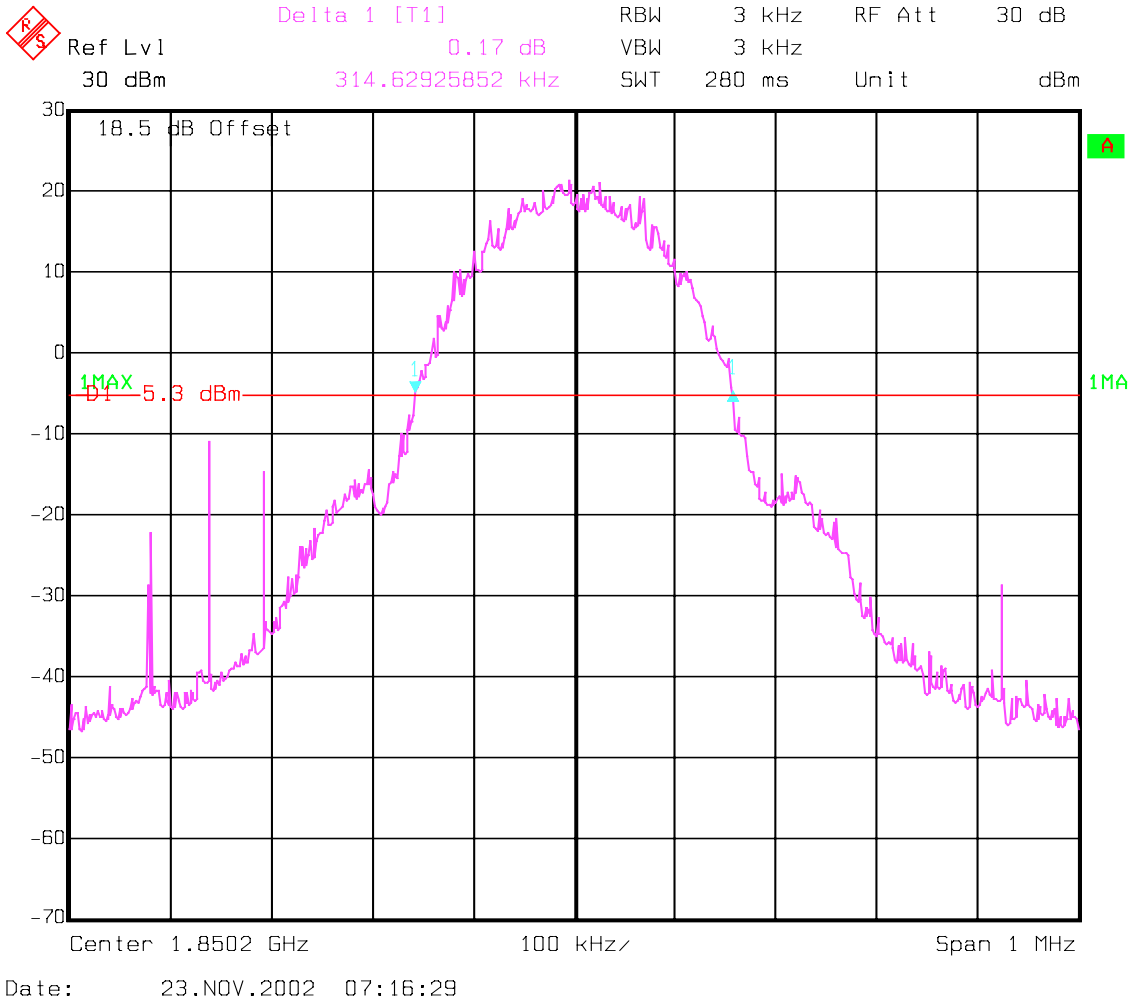
-20dBc BANDWIDTH CHANNEL 661(PCS-1900)



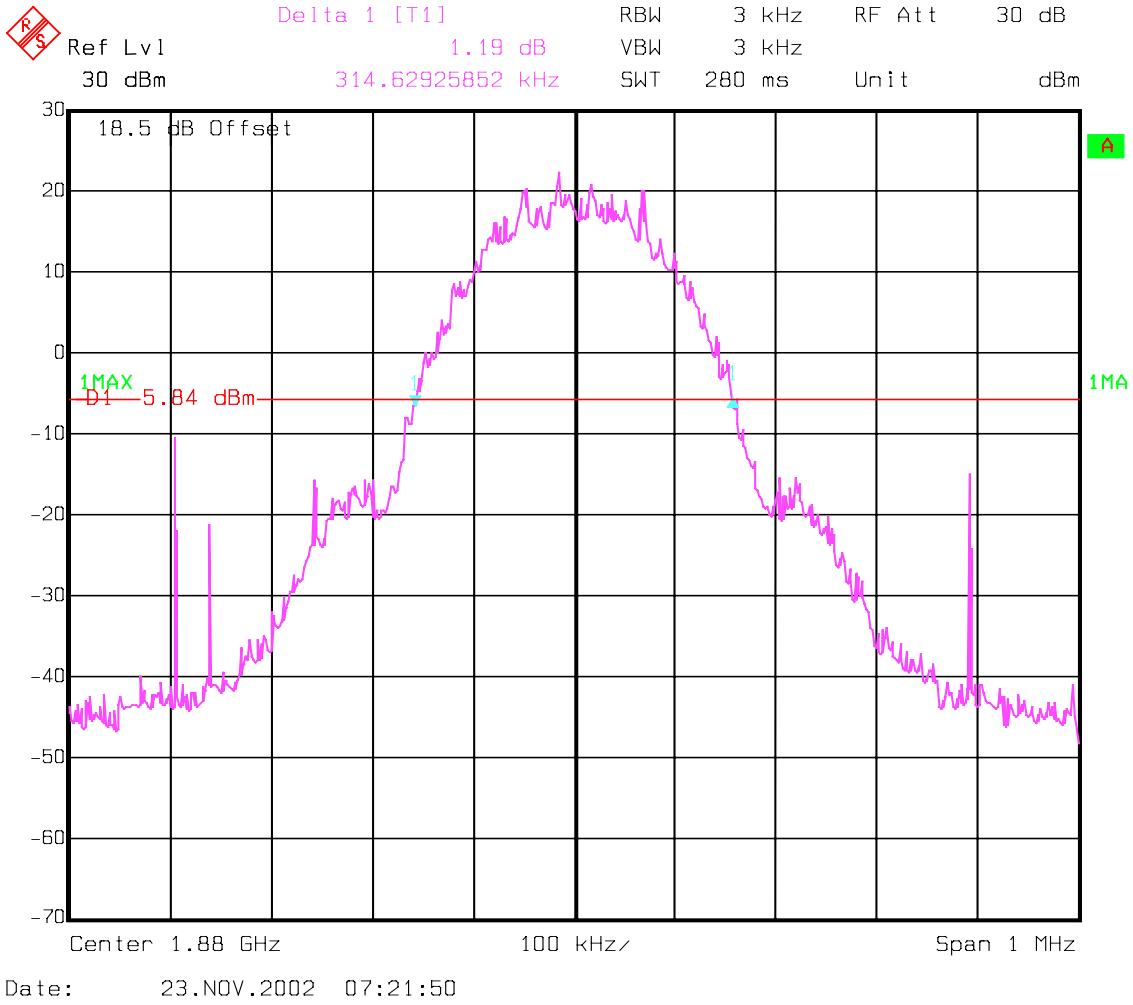
-20dBc BANDWIDTH CHANNEL 810(PCS-1900)



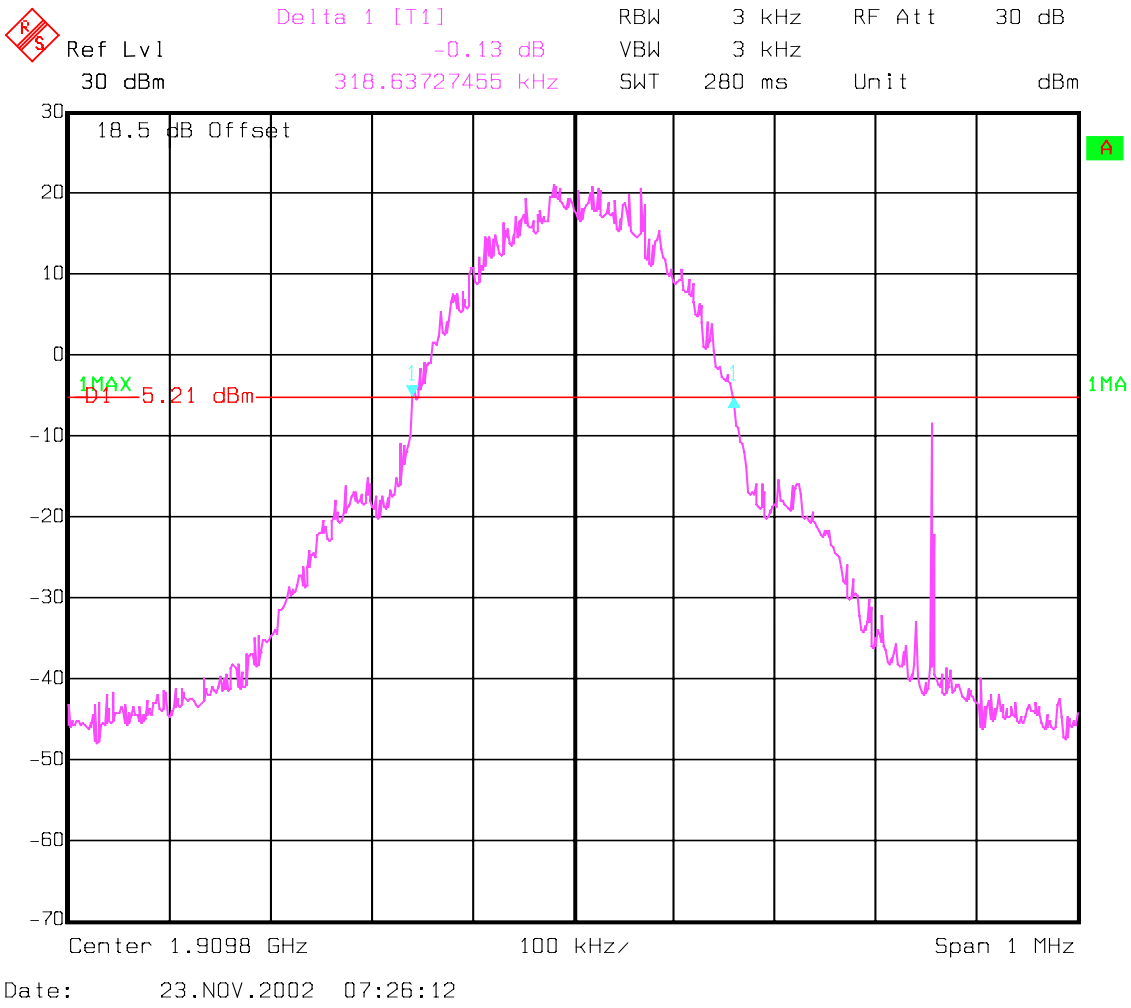
-26dBc BANDWIDTH CHANNEL 512(PCS-1900)



-26dBc BANDWIDTH CHANNEL 661(PCS-1900)



-26dBc BANDWIDTH CHANNEL 810(PCS-1900)



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+10Log(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**	-28.43	**1673.2**	-28.75	**1697.6**	-32.15
3	**2472.6**	-39.39	**2509.8**	-38.53	**2546.4**	-34.53
4	**3296.8**	-36.58	**3346.4**	-35.11	**3395.2**	-35.85
5	**4121**	-35.05	**4183**	-35.31	**4244**	-34.53
6	**4945.2**	-28.94	**5019.6**	-27.56	**5092.8**	-27.36
7	**5769.4**	-28.33	**5856.2**	-27.81	**5941.6**	-26.10
8	**6593.6**	-20.88	**6692.8**	-17.92	**6790.4**	-18.47
9	**7417.8**	-21.95	**7529.4**	-21.71	**7639.2**	-21.36
10	**8242**	-20.55	**8366**	-21.03	**8488**	-21.43

RADIATED SPURIOUS EMISSIONS (GSM-850)

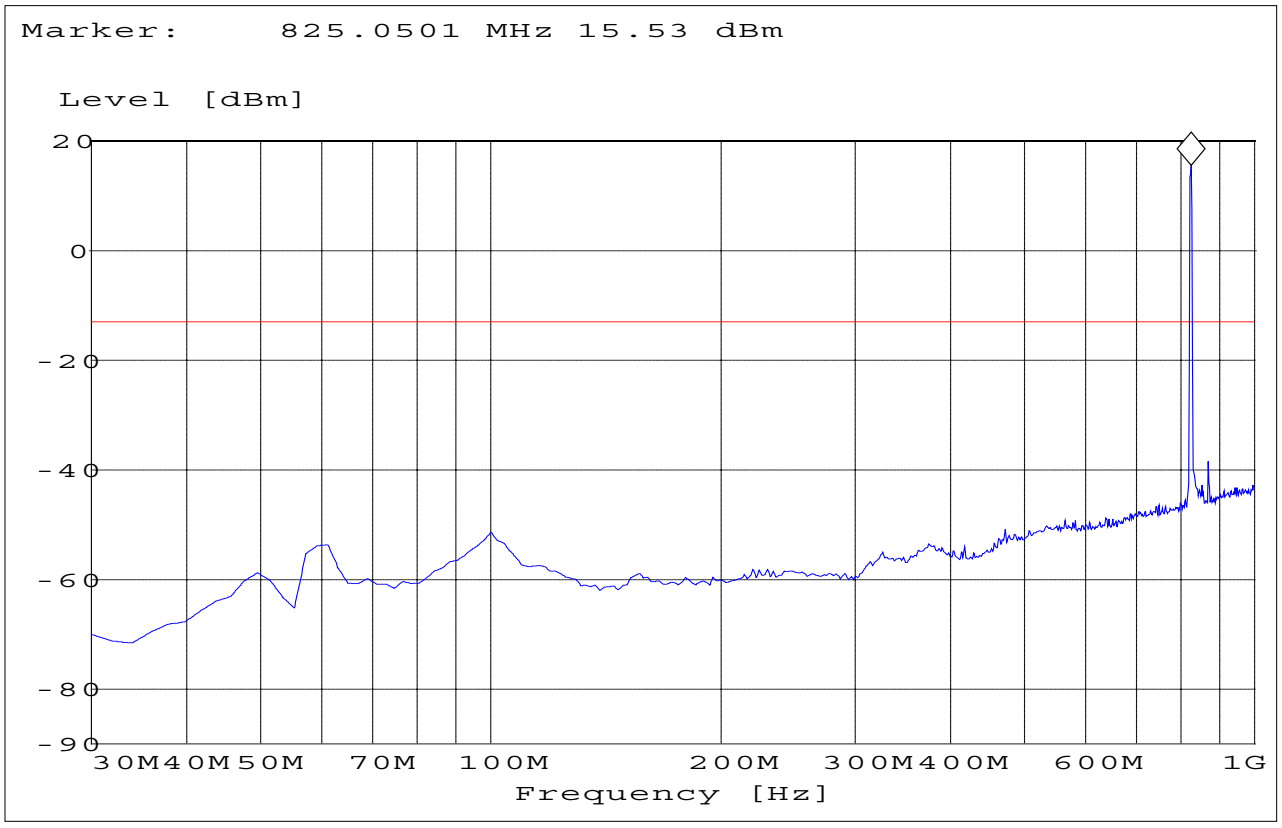
Channel 128: 30MHz - 1GHz

Spurious emission limit –13dBm

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

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

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



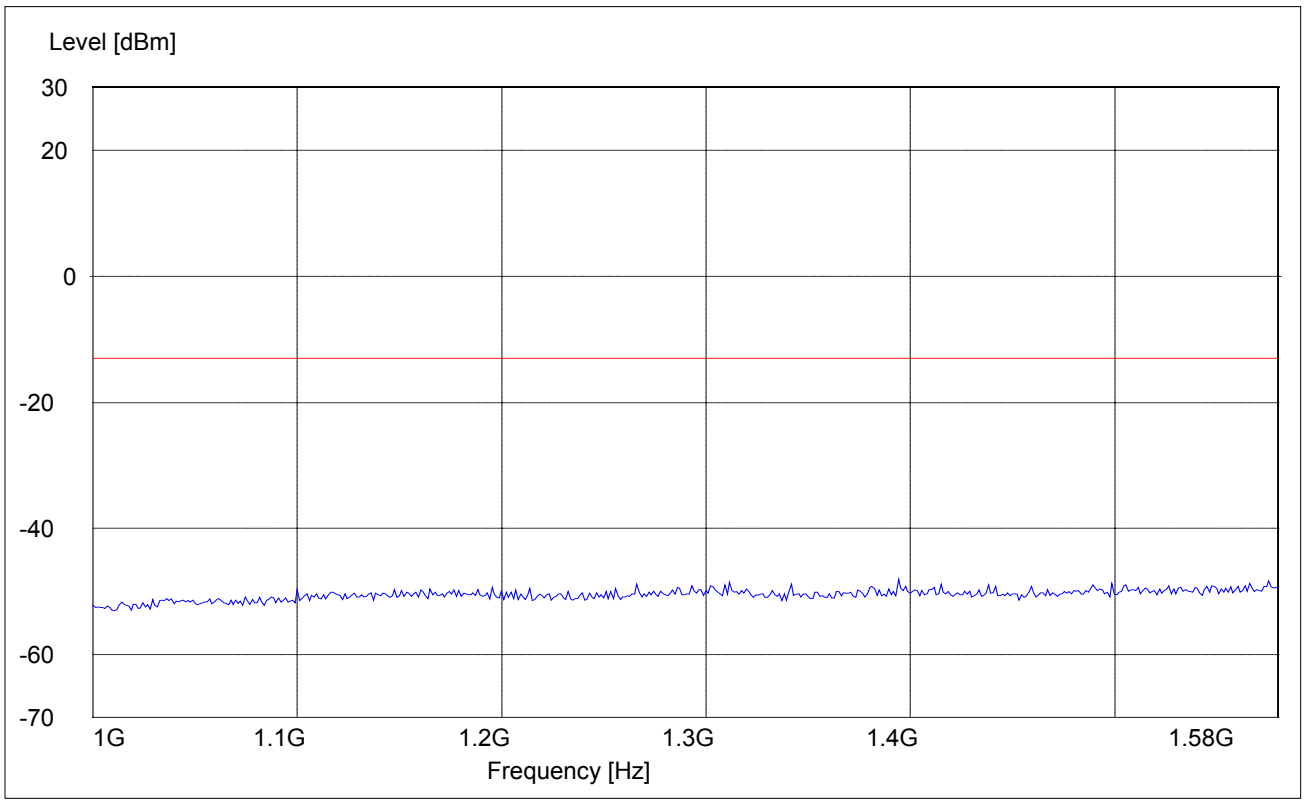
RADIATED SPURIOUS EMISSIONS (GSM-850)

Channel 128: 1GHz – 1.58GHz

Spurious emission limit –13dBm

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

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



RADIATED SPURIOUS EMISSIONS (GSM-850)

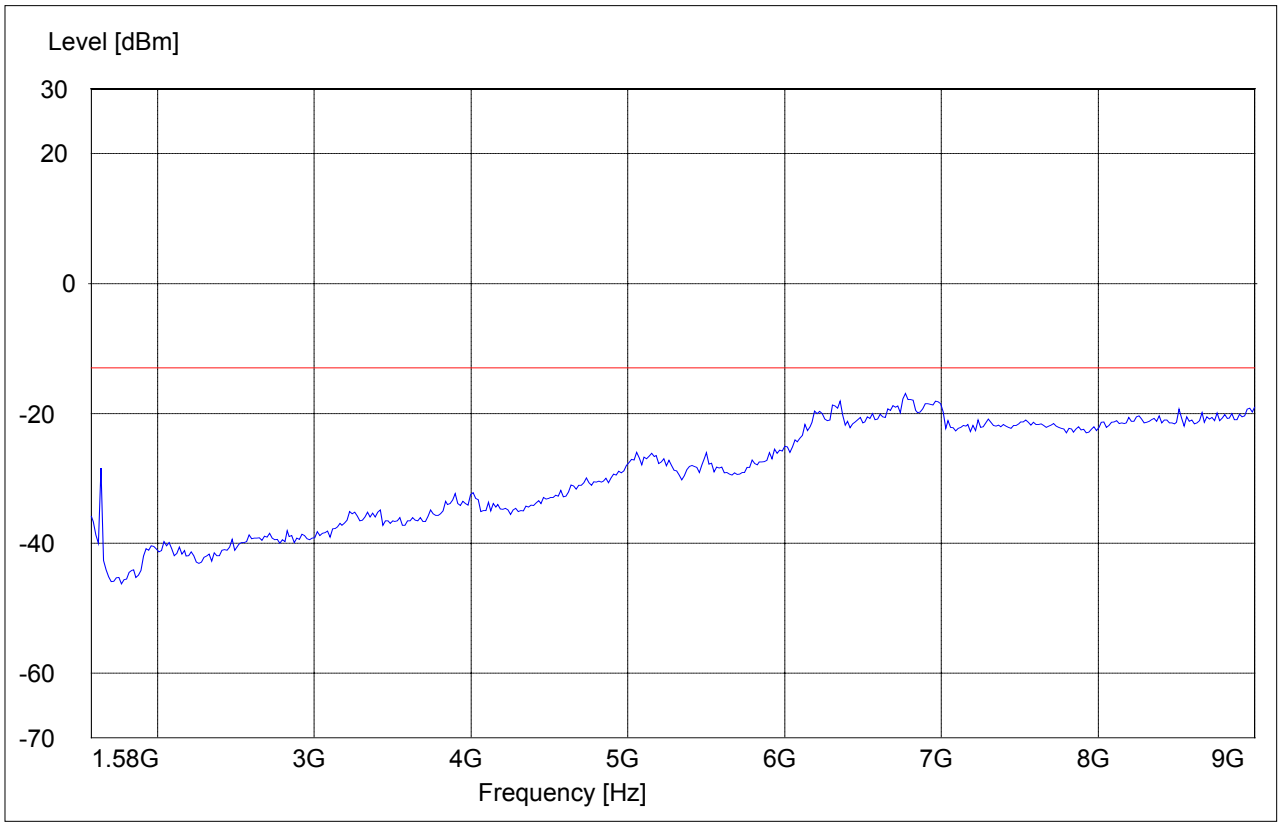
Channel 128: 1.58GHz – 9GHz

Spurious emission limit –13dBm

NOTE: The Bluetooth transmitter is off.

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

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



RADIATED SPURIOUS EMISSIONS (GSM-850)

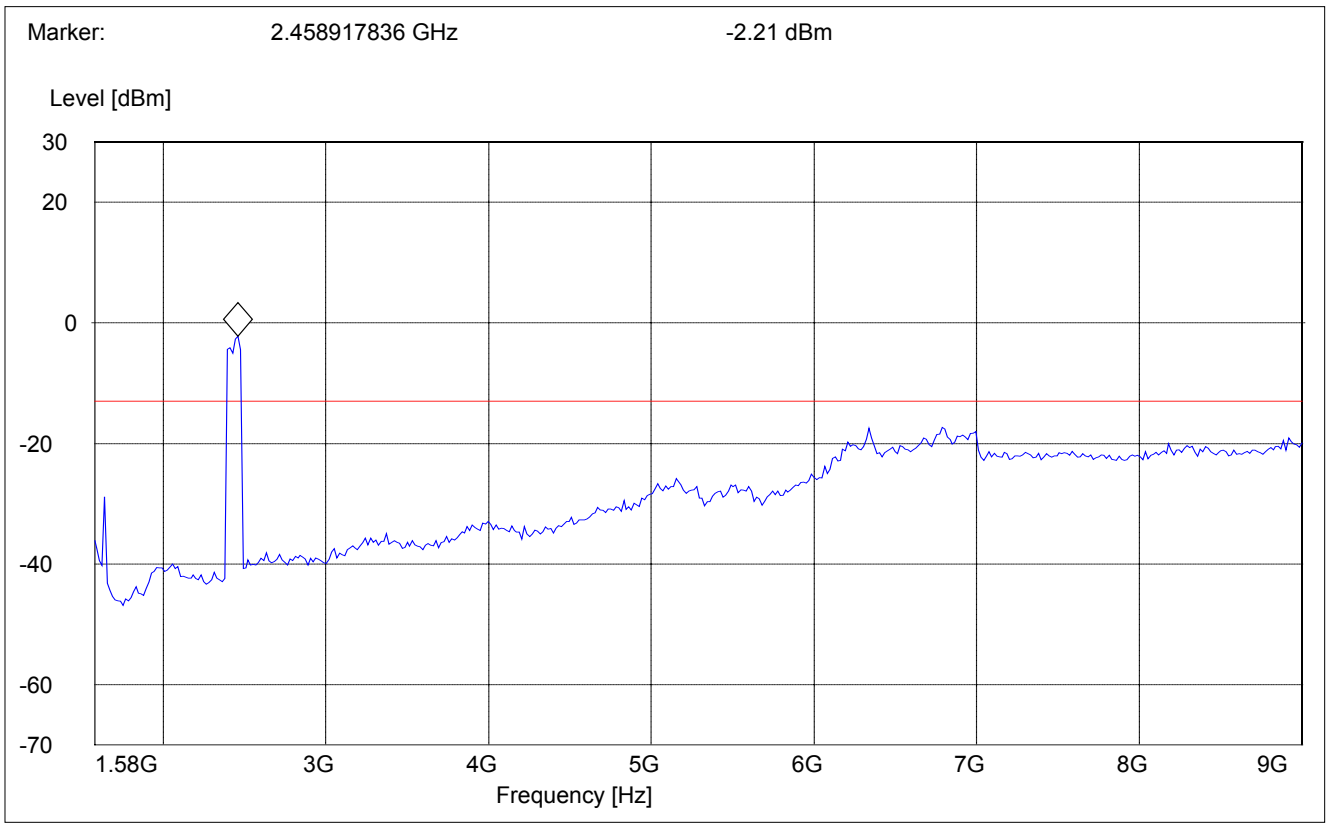
Channel 128: 1.58GHz – 9GHz

Spurious emission limit –13dBm

NOTE: Frequency out of spec is BT transmitter in hopping mode

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

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



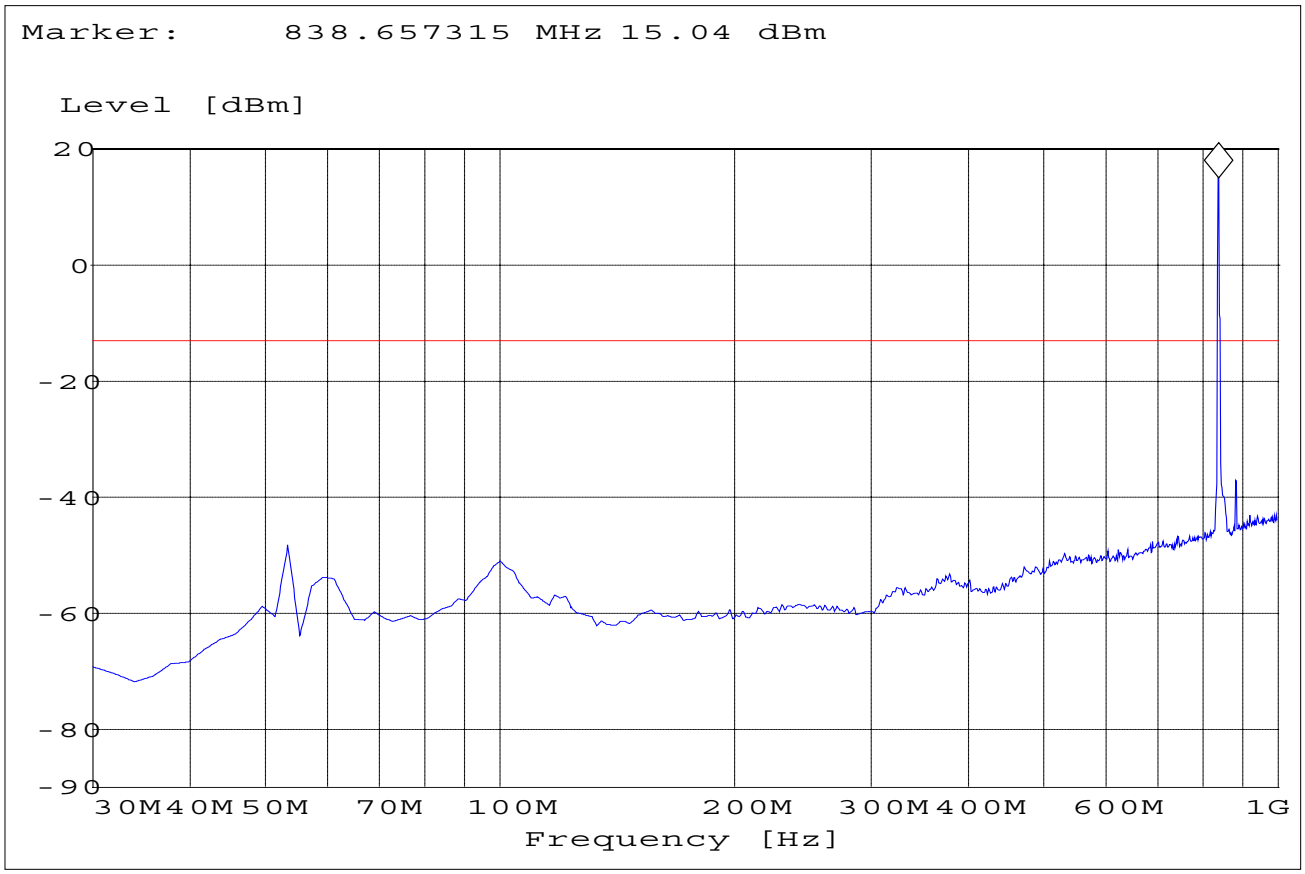
RADIATED SPURIOUS EMISSIONS (GSM-850)
Channel 190: 30MHz - 1GHz

Spurious emission limit –13dBm

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

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

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

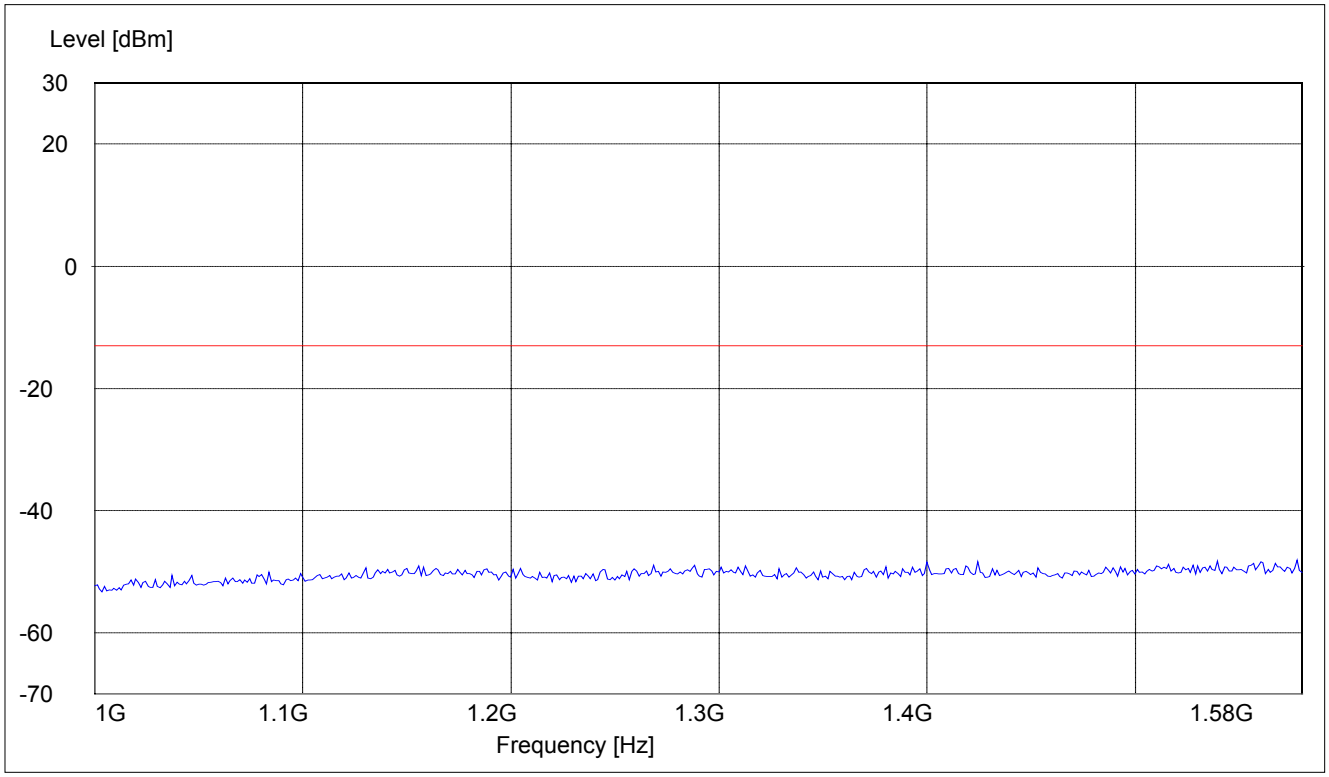


RADIATED SPURIOUS EMISSIONS (GSM-850)
Channel 190: 1GHz – 1.58GHz

Spurious emission limit –13dBm

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

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



RADIATED SPURIOUS EMISSIONS (GSM-850)

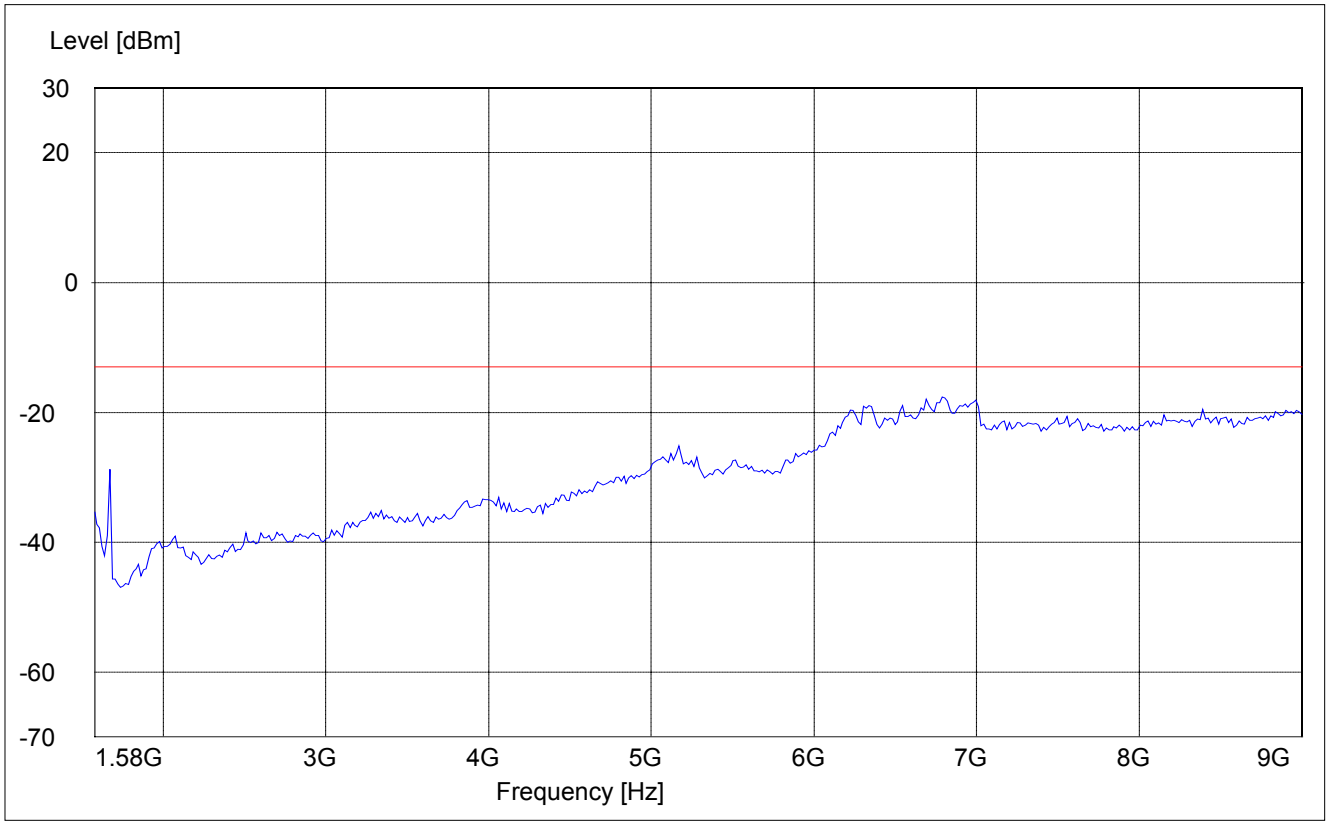
Channel 190: 1.58GHz – 9GHz

Spurious emission limit –13dBm

NOTE: The Bluetooth transmitter is off.

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

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



RADIATED SPURIOUS EMISSIONS (GSM-850)

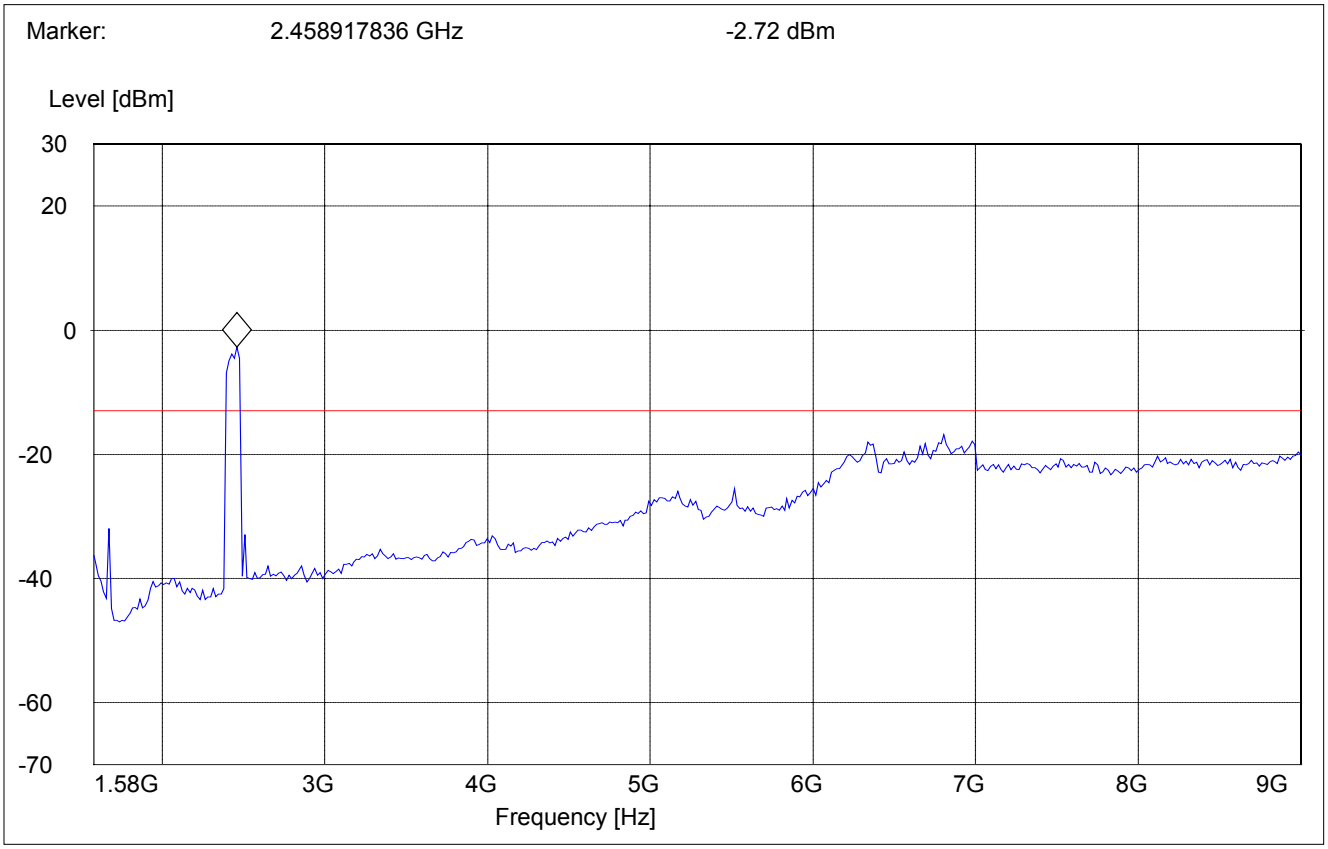
Channel 190: 1.58GHz – 9GHz

Spurious emission limit –13dBm

NOTE: Frequency out of spec is BT transmitter in hopping mode

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

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



RADIATED SPURIOUS EMISSIONS (GSM-850)

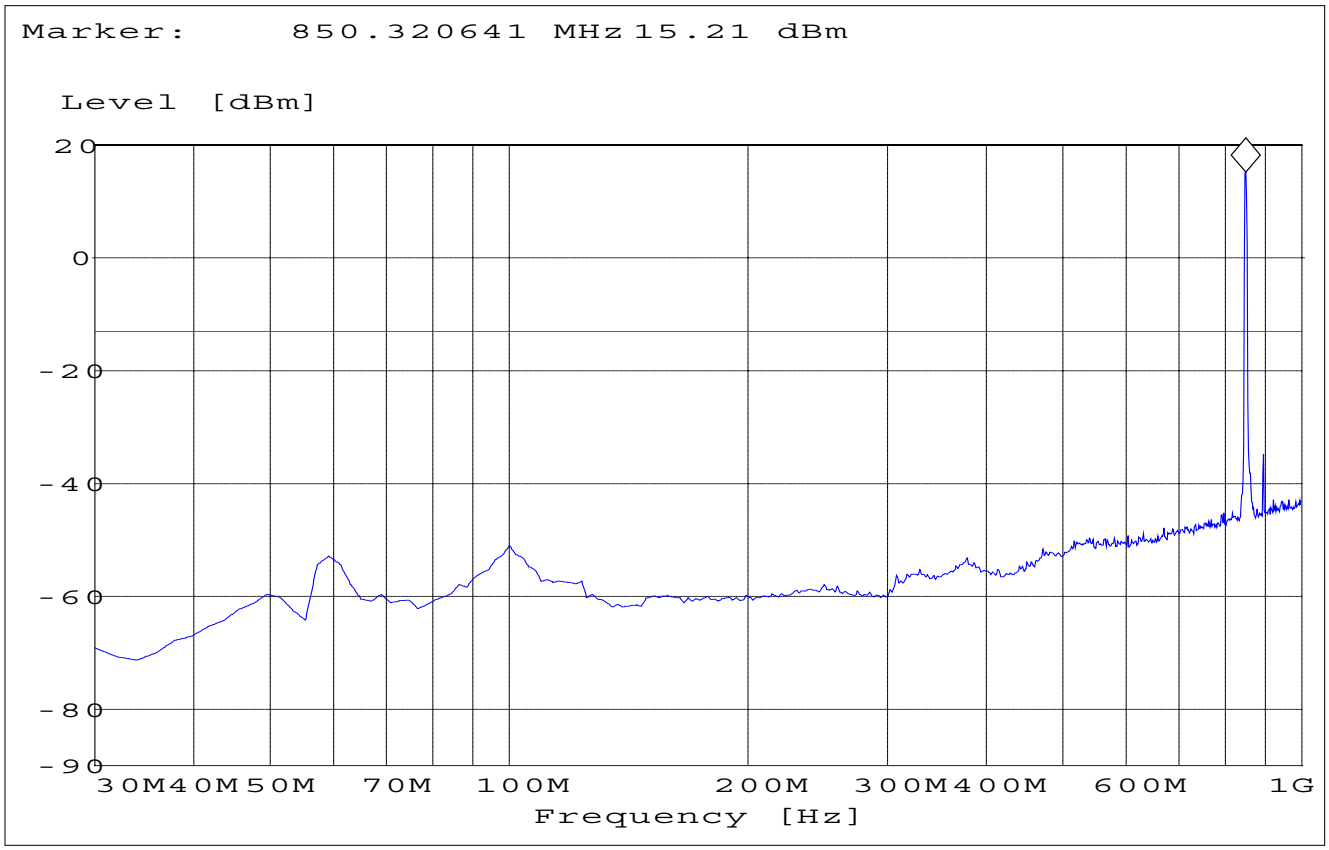
Channel 251: 30MHz - 1GHz

Spurious emission limit –13dBm

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

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

Note: The peak above the limit line is the carrier freq. at ch-252



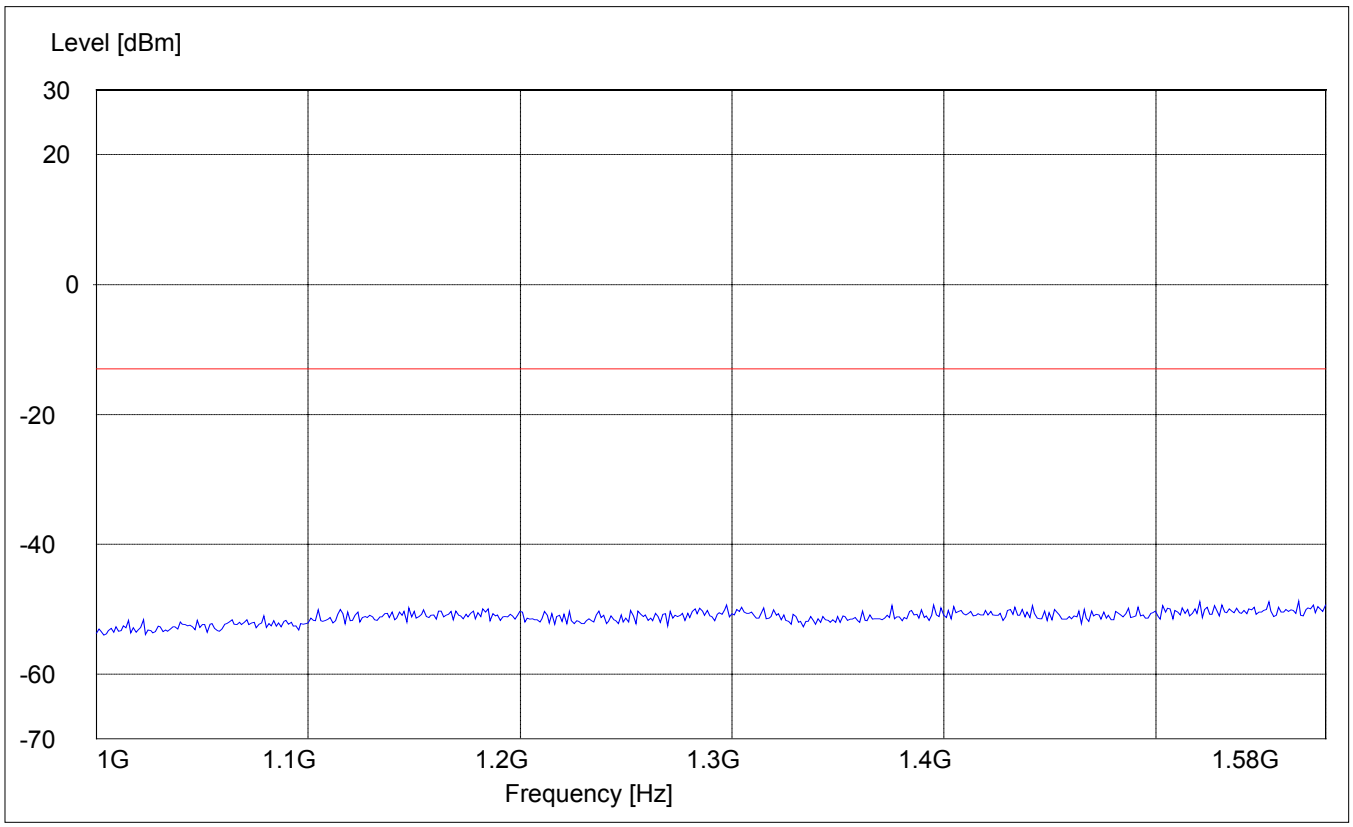
RADIATED SPURIOUS EMISSIONS (GSM-850)

Channel 251: 1GHz – 1.58GHz

Spurious emission limit –13dBm

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

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



RADIATED SPURIOUS EMISSIONS (GSM-850)

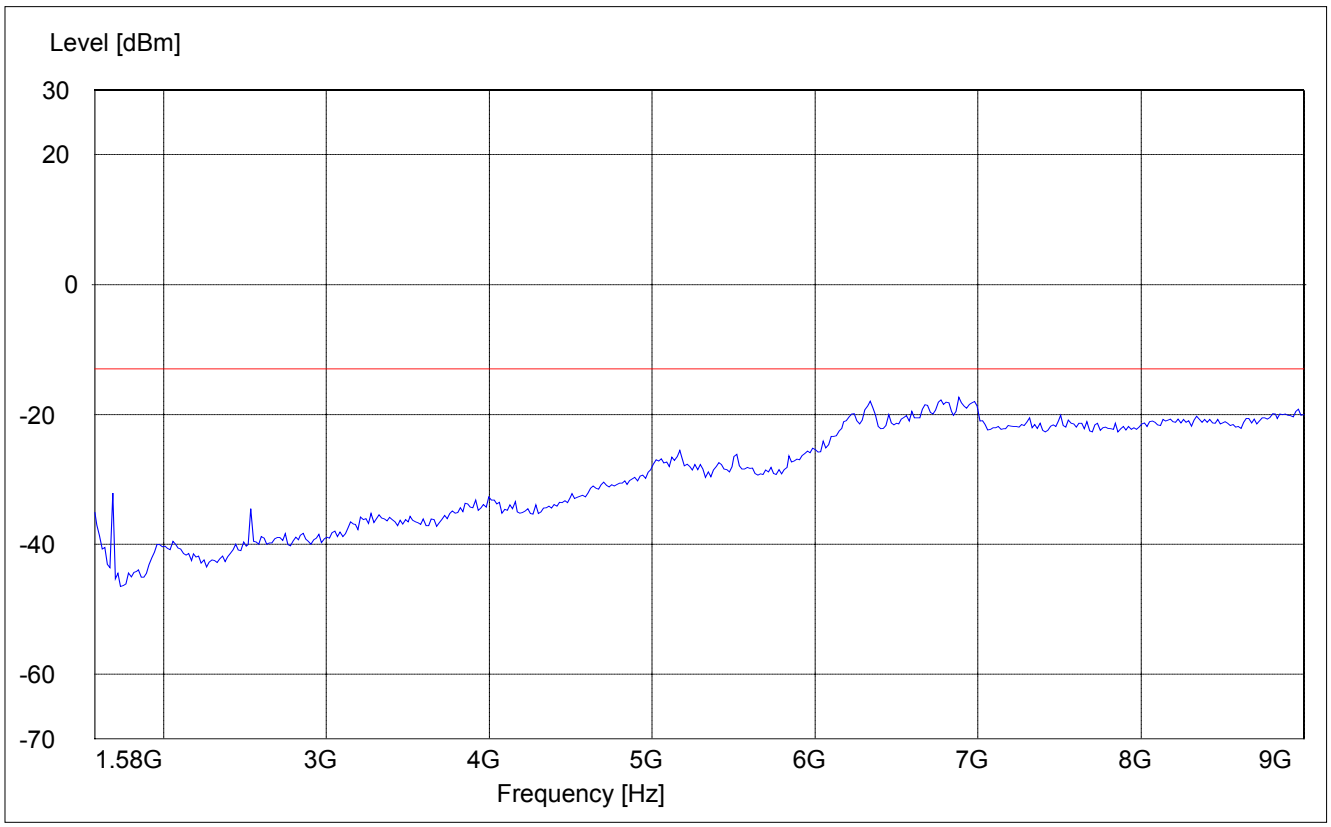
Channel 251: 1.58GHz – 9GHz

Spurious emission limit –13dBm

NOTE: The Bluetooth transmitter is off.

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

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



RADIATED SPURIOUS EMISSIONS (GSM-850)

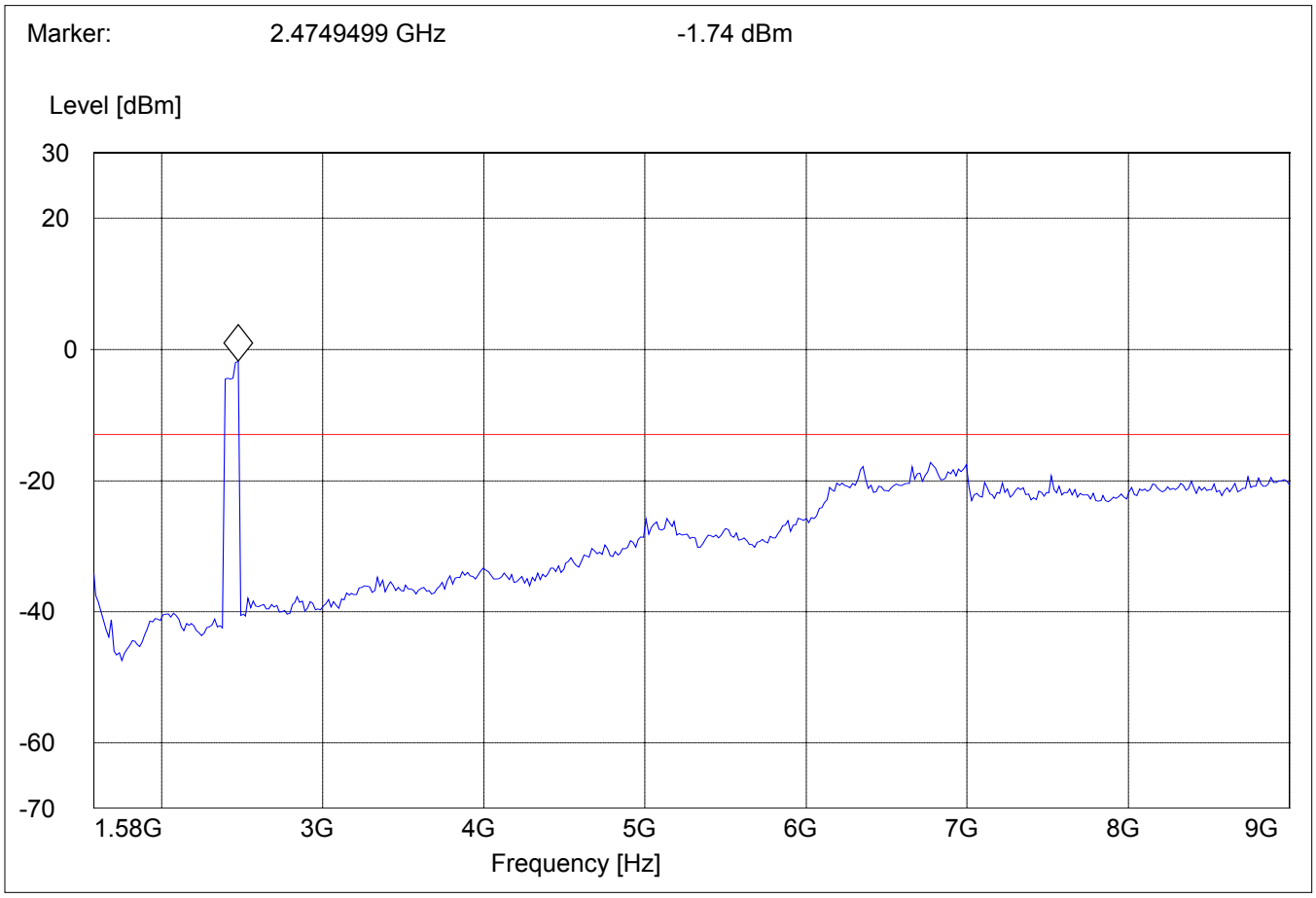
Channel 251: 1.58GHz – 9GHz

Spurious emission limit –13dBm

NOTE: Frequency out of spec is BT transmitter in hopping mode

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

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



RESULTS OF RADIATED TESTS PCS-1900:

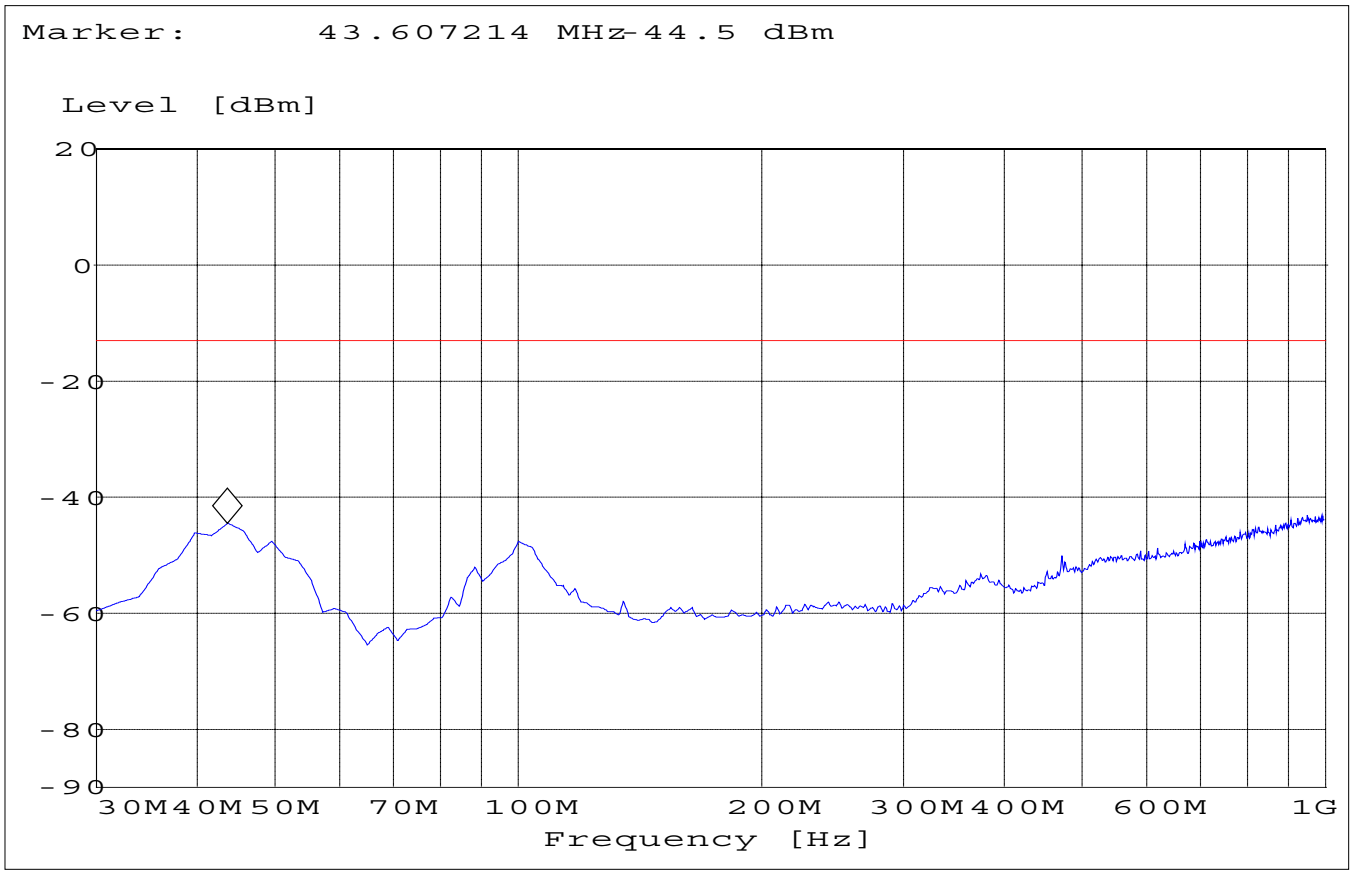
Harmonic	Tx ch-512 Freq.(MHz)	Level (dBm)	Tx ch-661 Freq. (MHz)	Level (dBm)	Tx ch-810 Freq. (MHz)	Level (dBm)
2	**3700.4**	-36.88	**3760**	-35.23	**3819.6**	-34.96
3	**5550.6**	-28.19	**5640**	-29.84	**5729.4**	-21.71
4	**7400.8**	-22.21	**7520**	-21.32	**7639.2**	-22.93
5	**9251**	-23.33	**9400**	-22.38	**9549**	-23.21
6	**11101.2**	-23.22	**11280**	-22.88	**11458.8**	-20.92
7	**12951.4**	-19.32	**13160**	-19.59	**13368.6**	-18.95
8	**14801.6**	-17.41	**15040**	-17.34	**15278.4**	-17.56
9	**16651.8**	-15.77	**16920**	-14.54	**17188.2**	-15.21
10	**18502**	-19.76	**18800**	-18.16	**19098**	-18.96

RADIATED SPURIOUS EMISSIONS
Channel 512 : 30MHz - 1GHz

Spurious emission limit –13dBm

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

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



RADIATED SPURIOUS EMISSIONS

Channel 512 : 1GHz – 3GHz

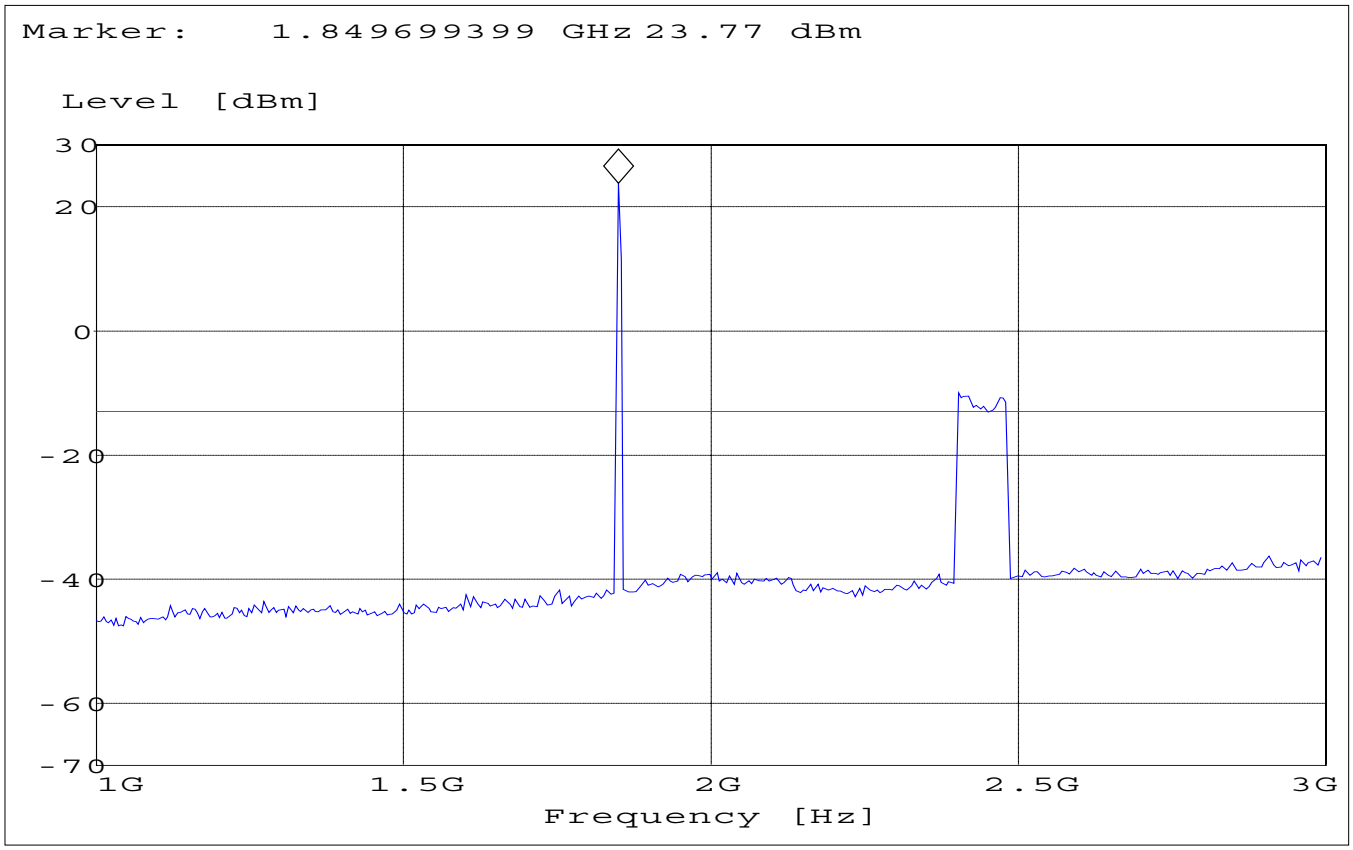
Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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

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.

NOTE: Frequency out of spec is BT transmitter in hopping mode

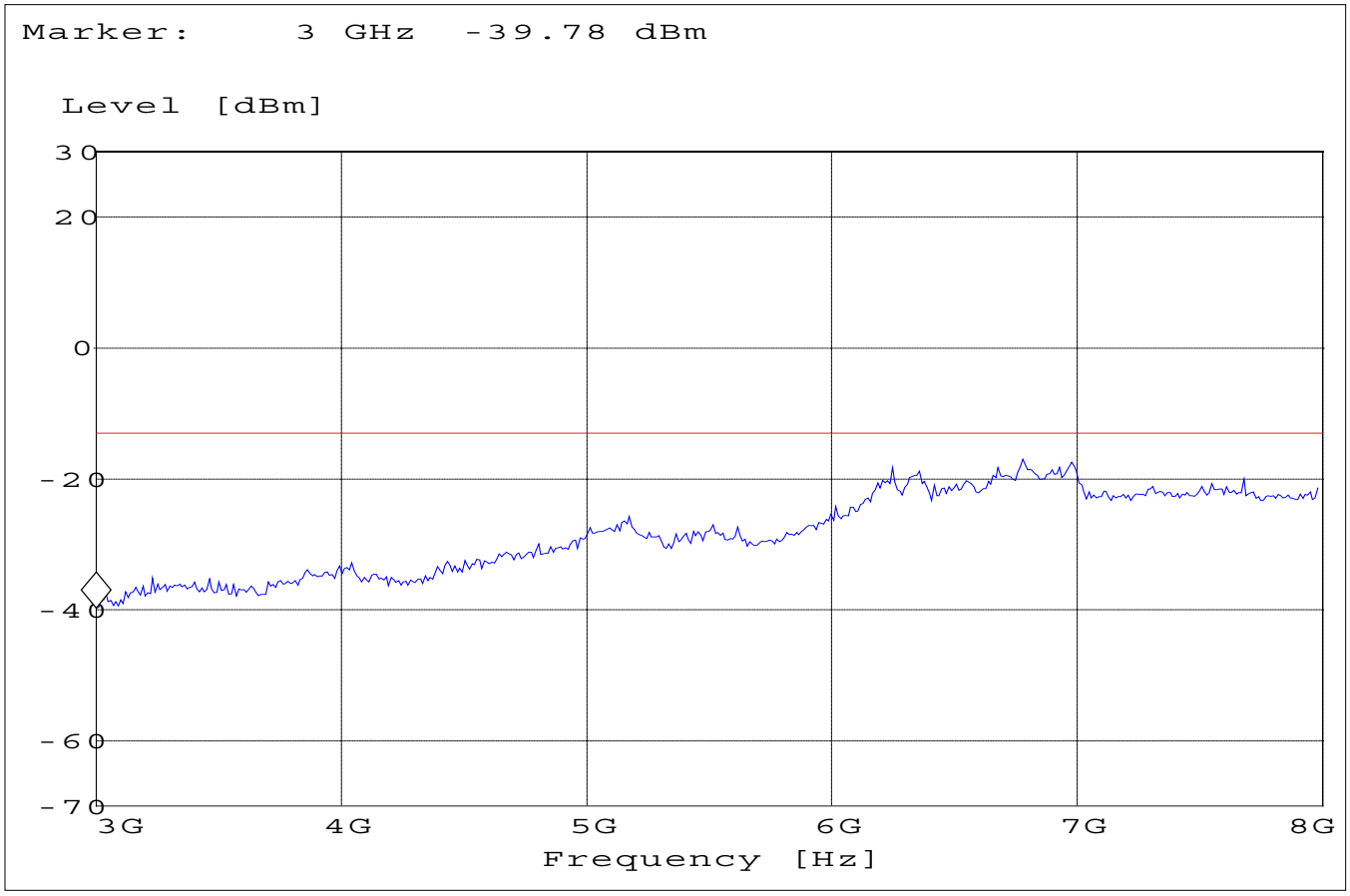


RADIATED SPURIOUS EMISSIONS
Channel 512 : 3GHz – 8GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-8G"

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

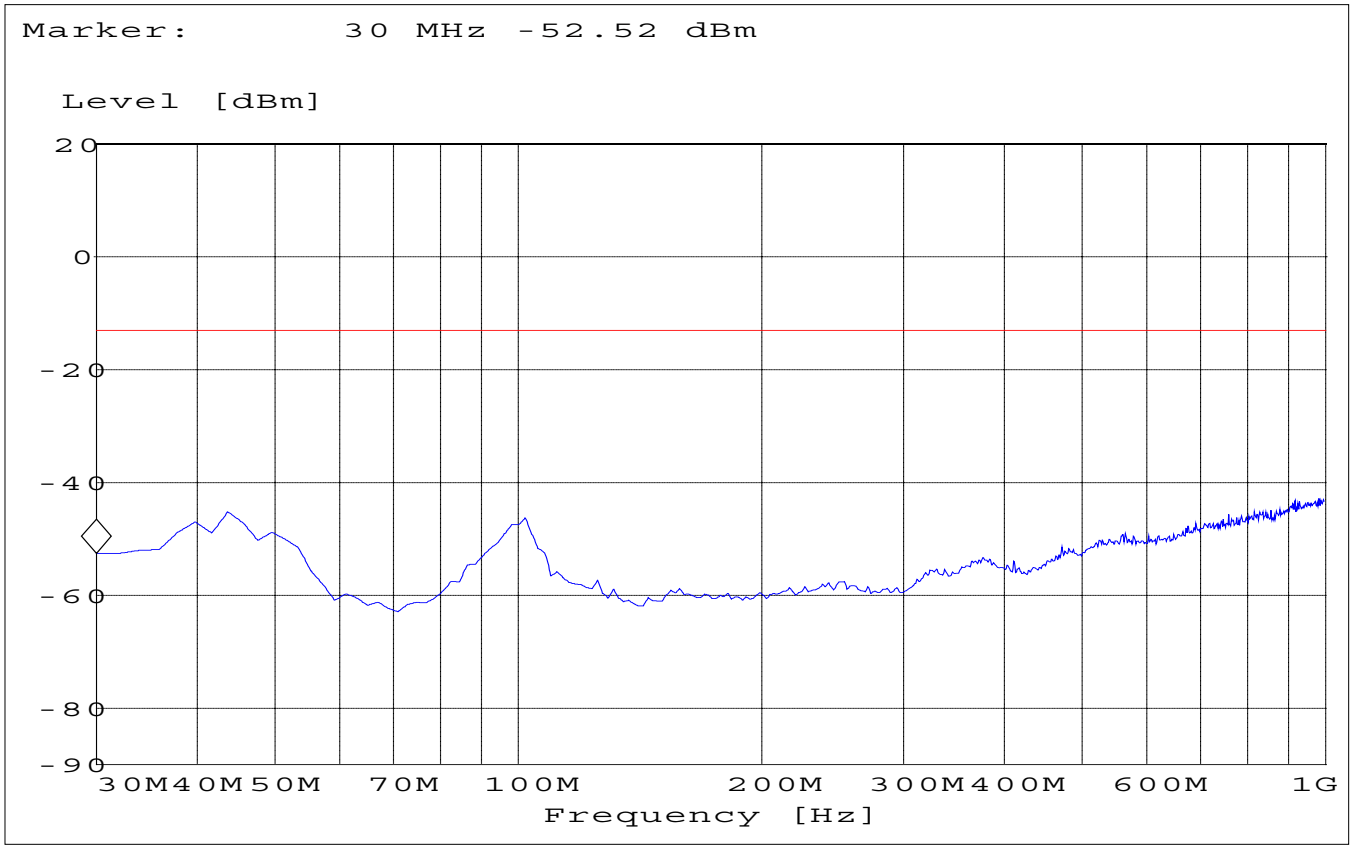


RADIATED SPURIOUS EMISSIONS
Channel 661: 30MHz –1GHz

Spurious emission limit –13dBm

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

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



RADIATED SPURIOUS EMISSIONS

Channel 661: 1GHz – 3GHz

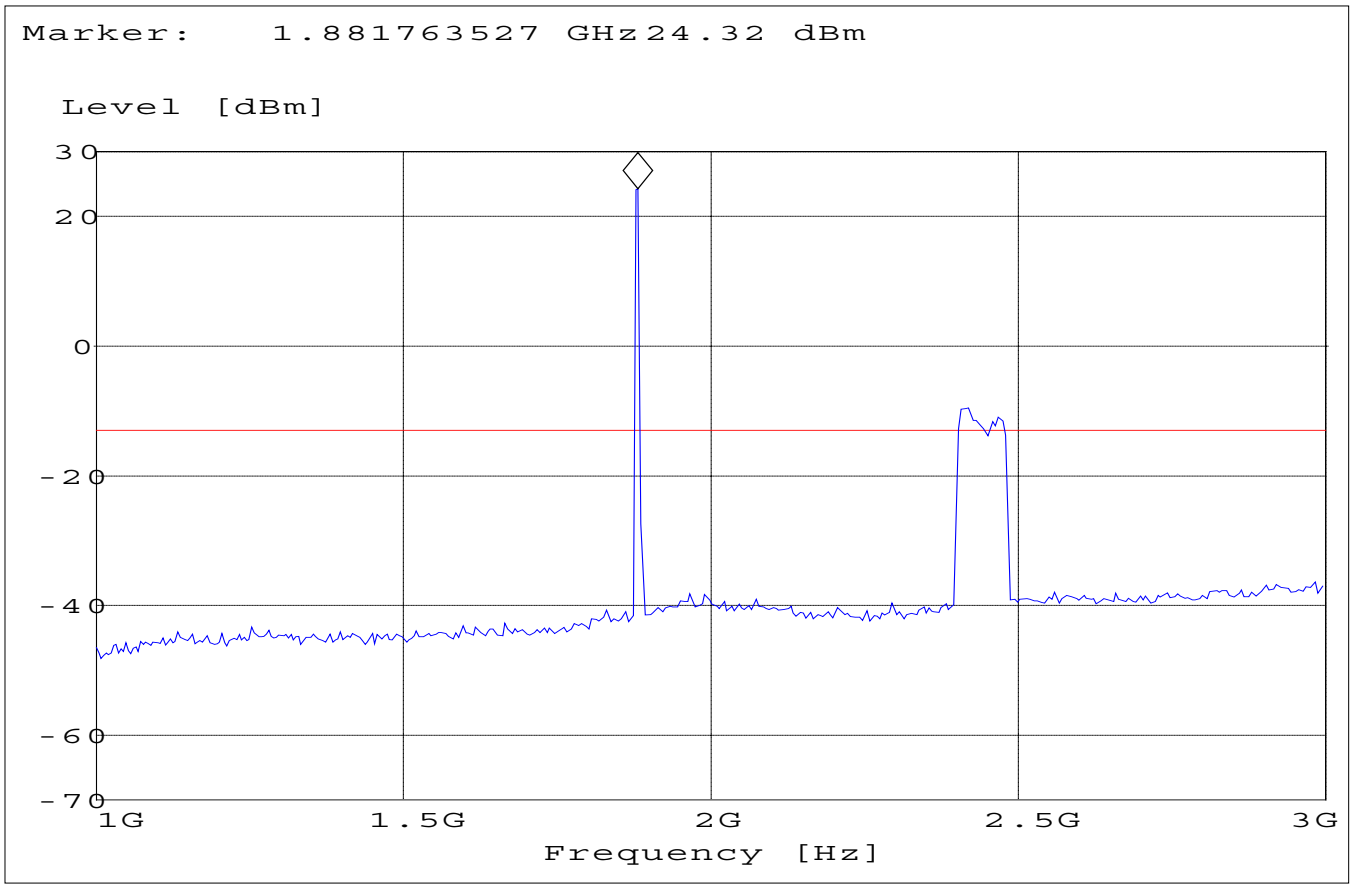
Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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

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.

NOTE: Frequency out of spec is BT transmitter in hopping mode

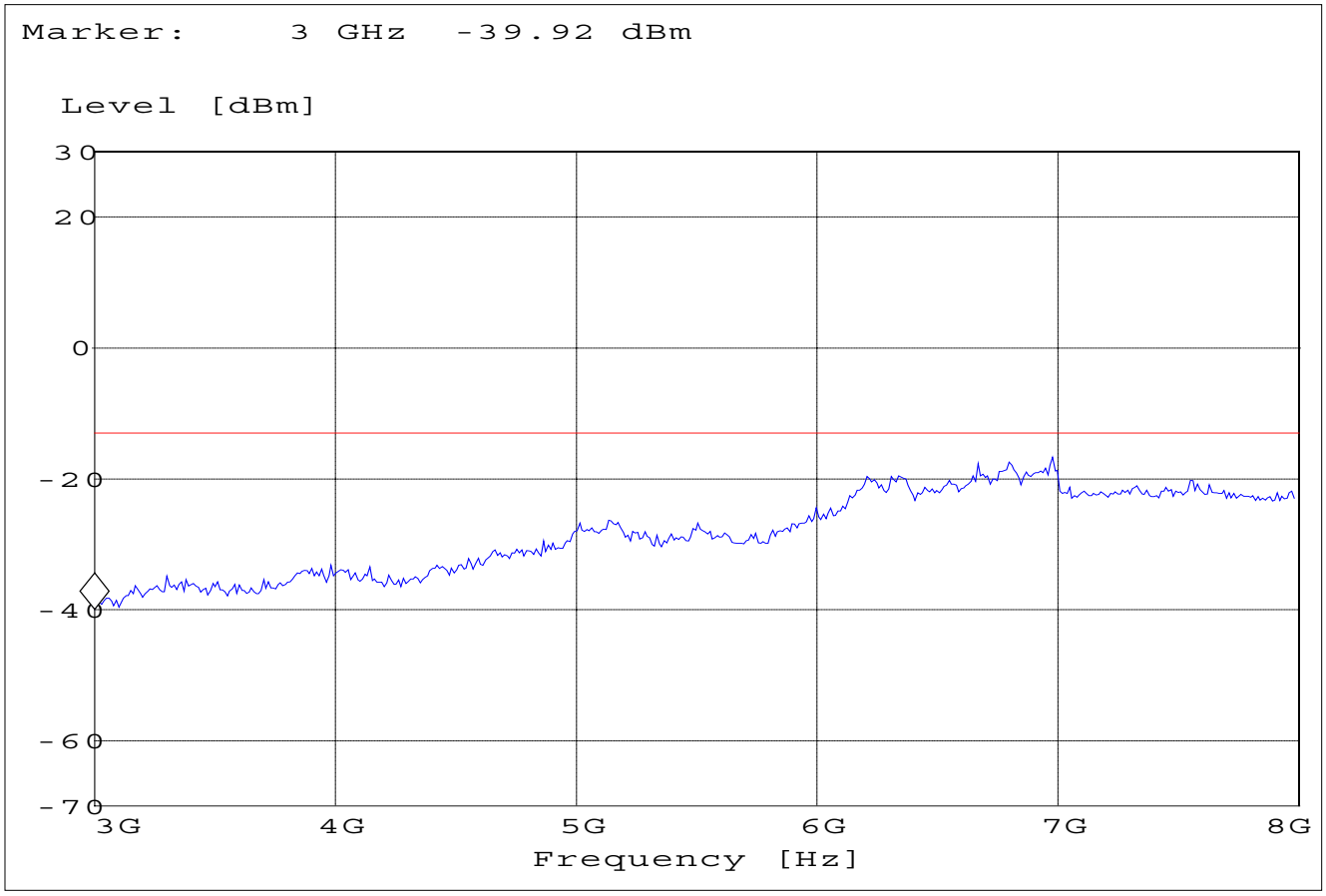


RADIATED SPURIOUS EMISSIONS
Channel 661: 3GHz – 8GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-8G"

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

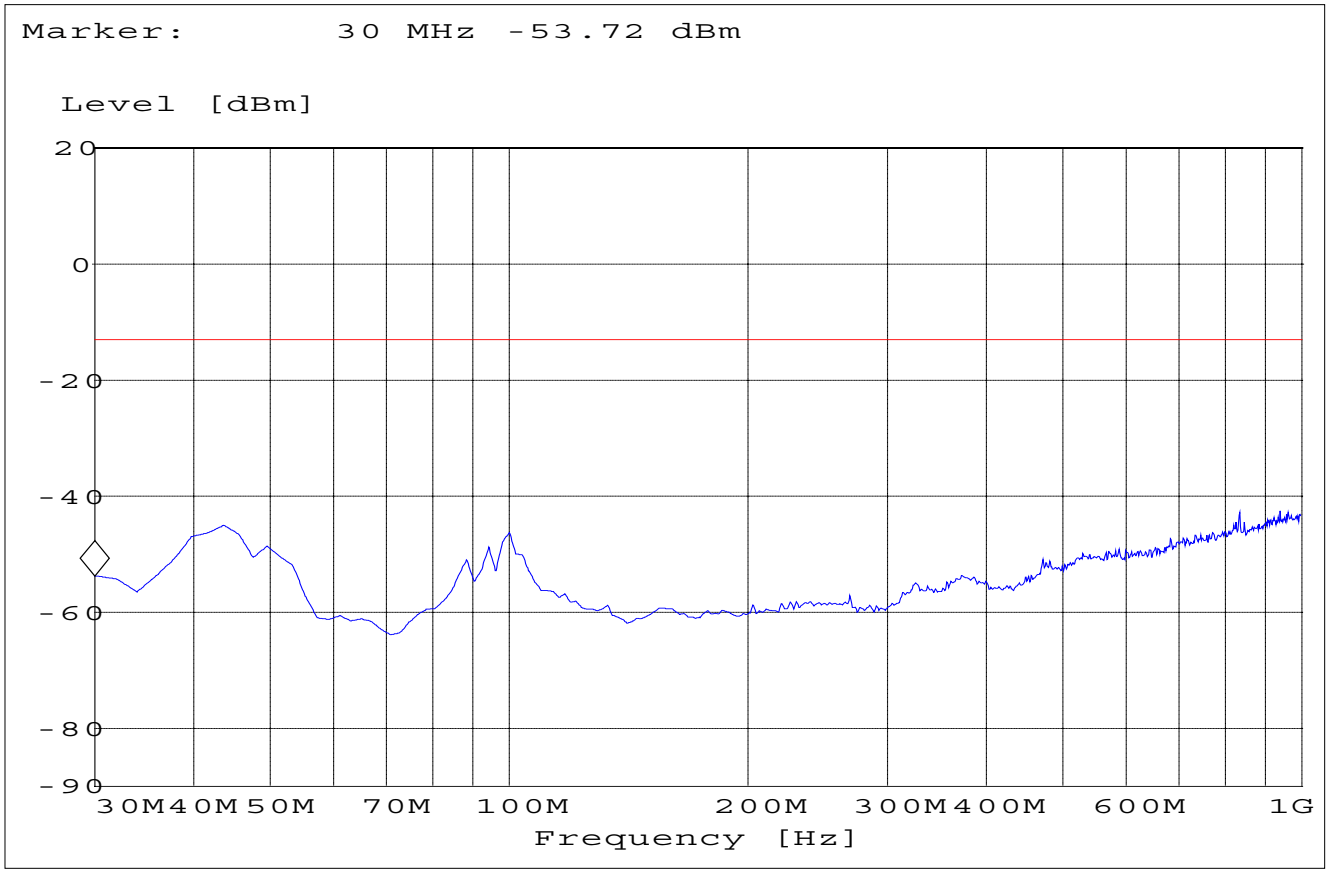


RADIATED SPURIOUS EMISSIONS
Channel 810: 30MHz – 1GHz

Spurious emission limit –13dBm

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

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



RADIATED SPURIOUS EMISSIONS
Channel 810: 1GHz – 3GHz

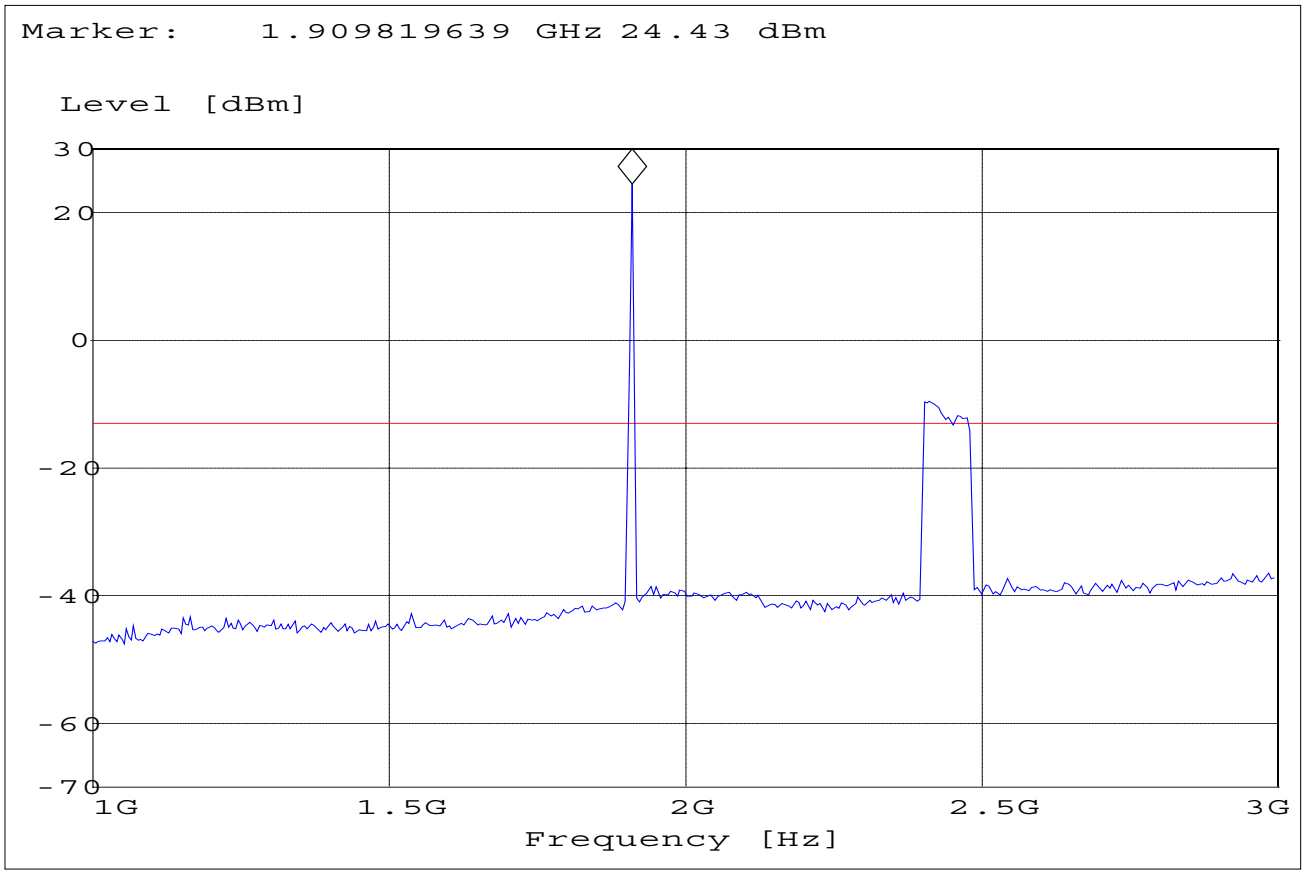
Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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

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.

NOTE: Frequency out of spec is BT transmitter in hopping mode

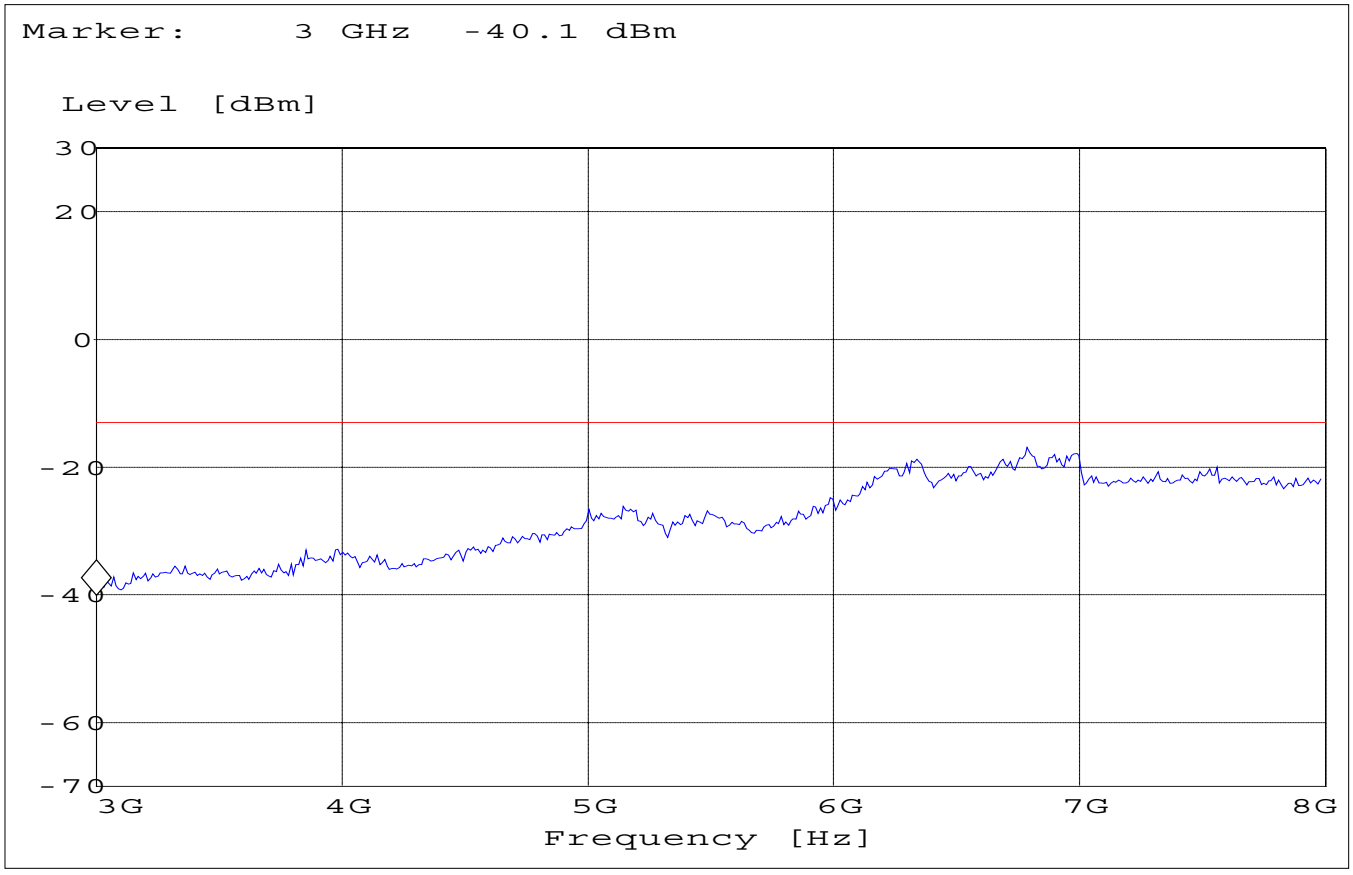


RADIATED SPURIOUS EMISSIONS
Channel 810: 3GHz – 8GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-8G"

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



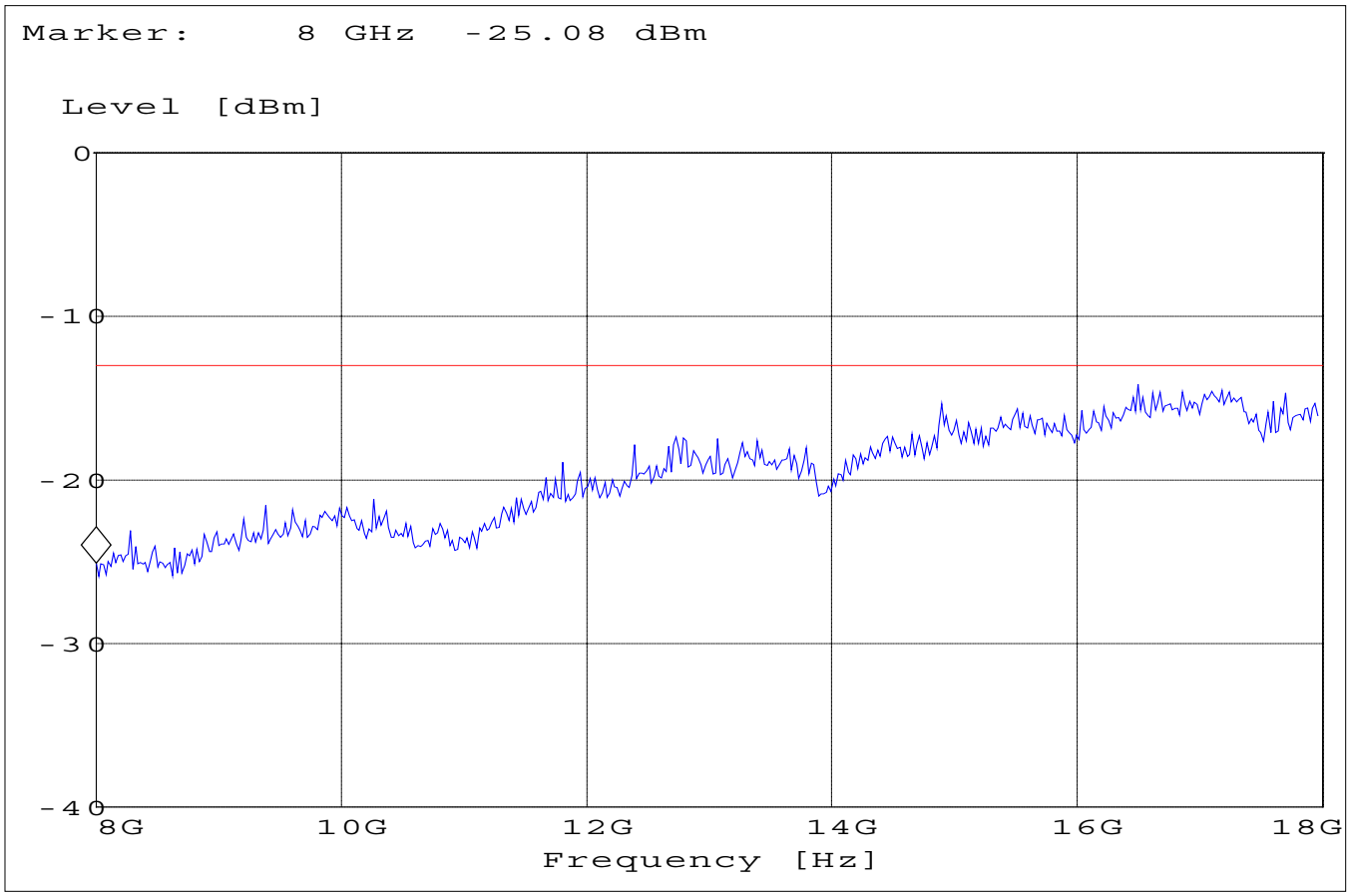
RADIATED SPURIOUS EMISSIONS
8GHz – 18GHz

Spurious emission limit –13dBm

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

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

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



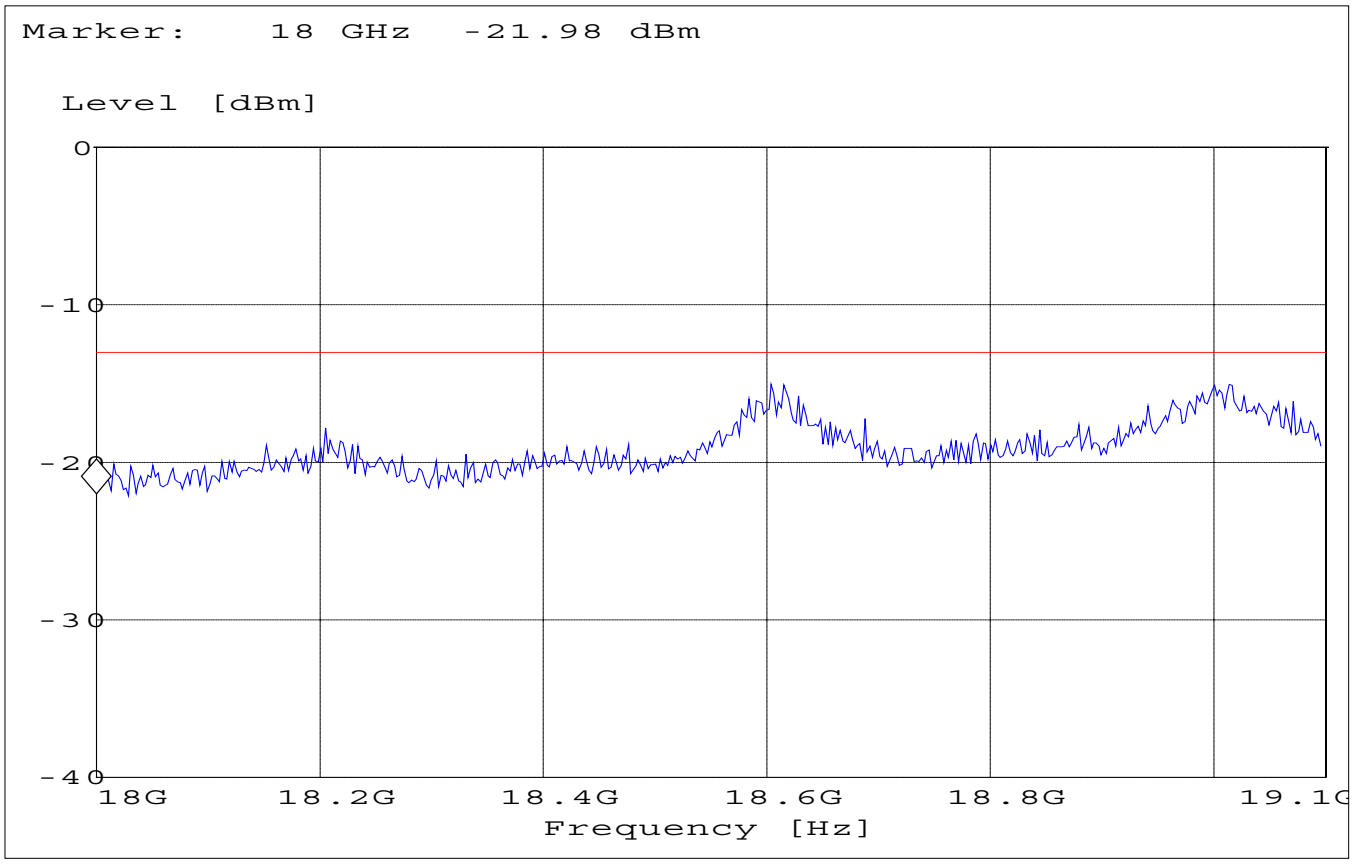
RADIATED SPURIOUS EMISSIONS
18GHz – 19.1GHz

Spurious emission limit –13dBm

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

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

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

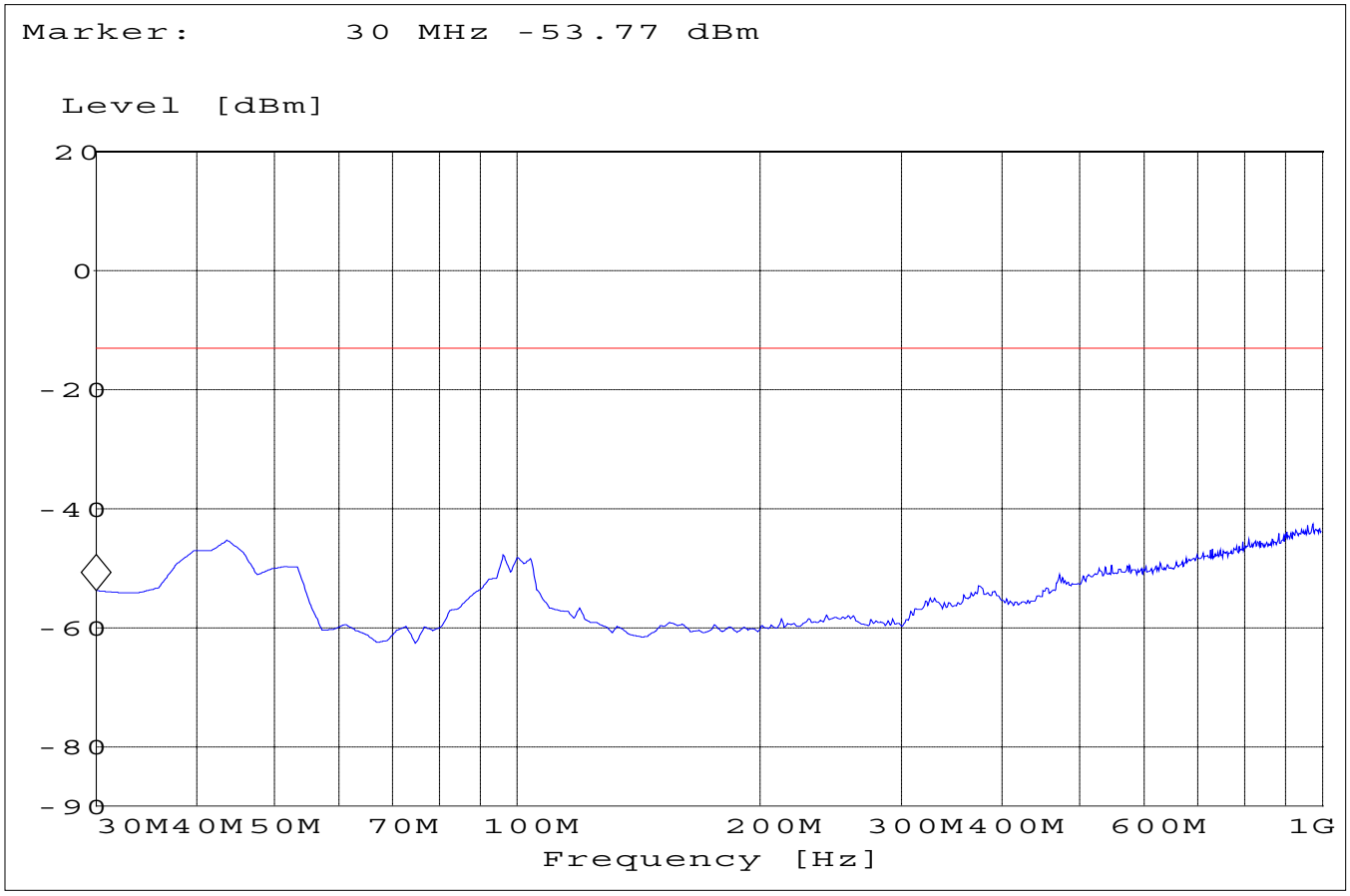


RADIATED SPURIOUS EMISSIONS
EUT in Idle Mode: 30MHz – 1GHz

Spurious emission limit –13dBm

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

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



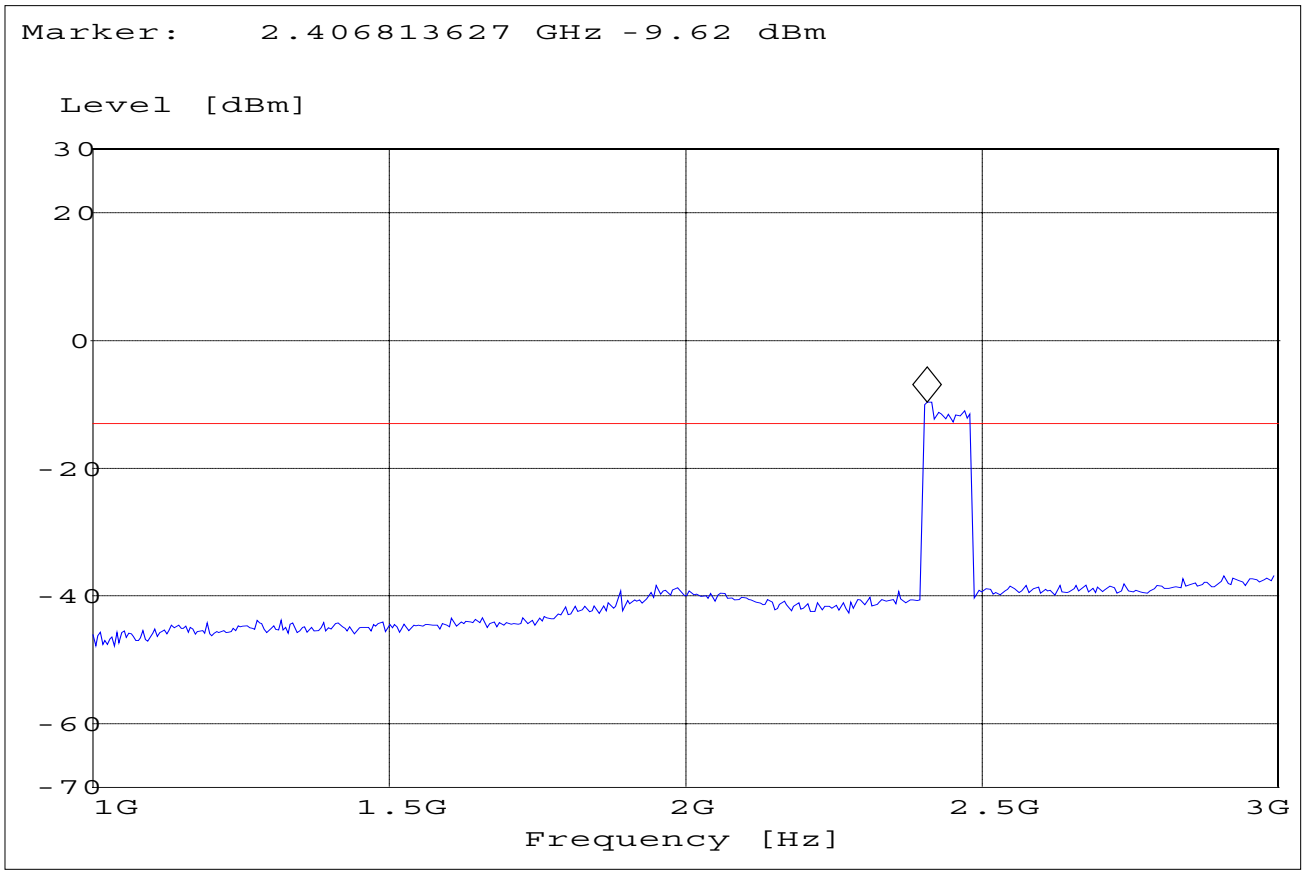
RADIATED SPURIOUS EMISSIONS
EUT in Idle Mode: 1GHz – 3GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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

NOTE: Frequency out of spec is BT transmitter in hopping mode

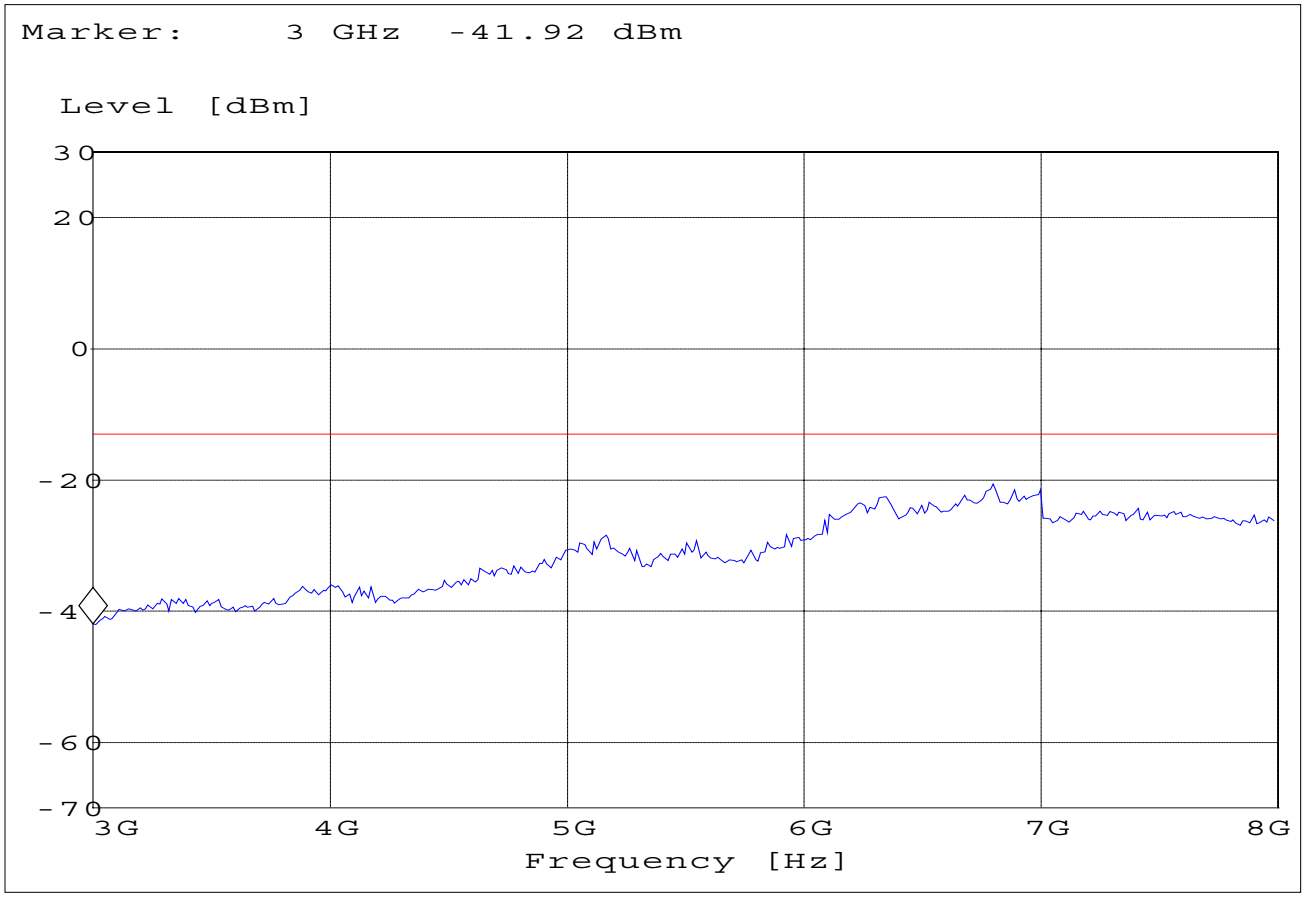


RADIATED SPURIOUS EMISSIONS
EUT in Idle Mode: 3GHz – 8GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-8G"

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

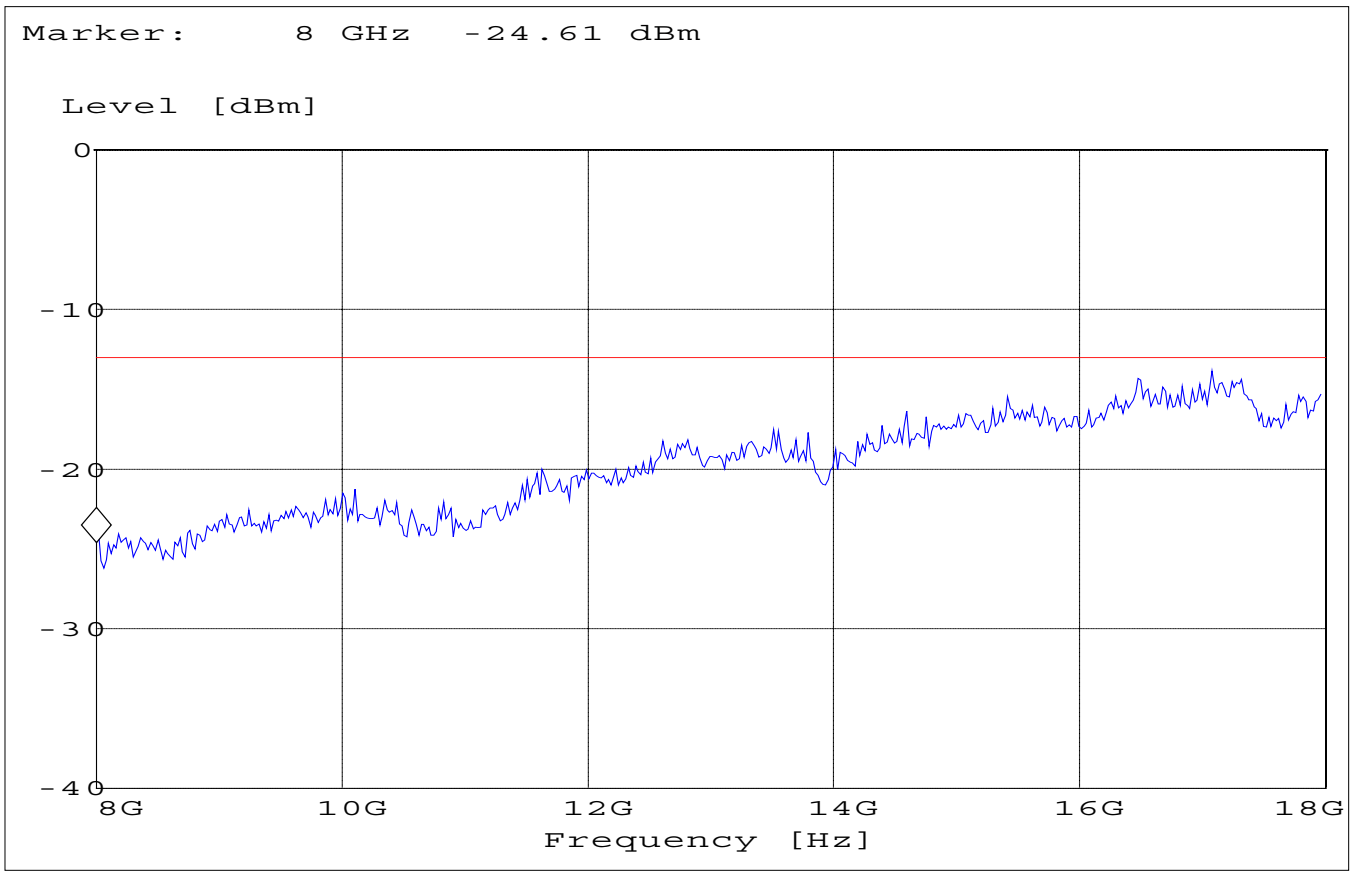


RADIATED SPURIOUS EMISSIONS
EUT in Idle Mode: 8GHz – 18GHz

Spurious emission limit –13dBm

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

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

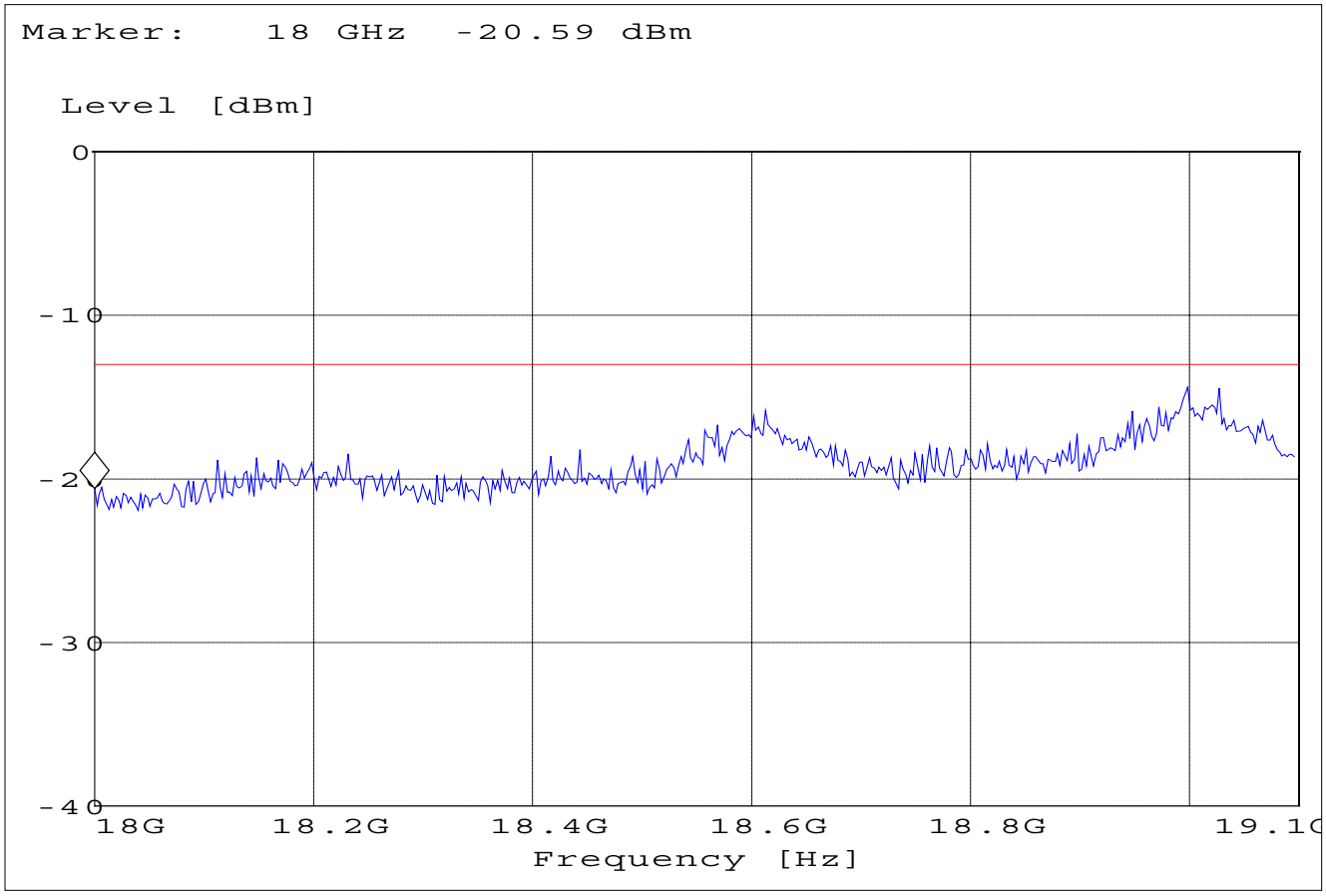


RADIATED SPURIOUS EMISSIONS
EUT in Idle Mode: 18GHz – 19.1GHz

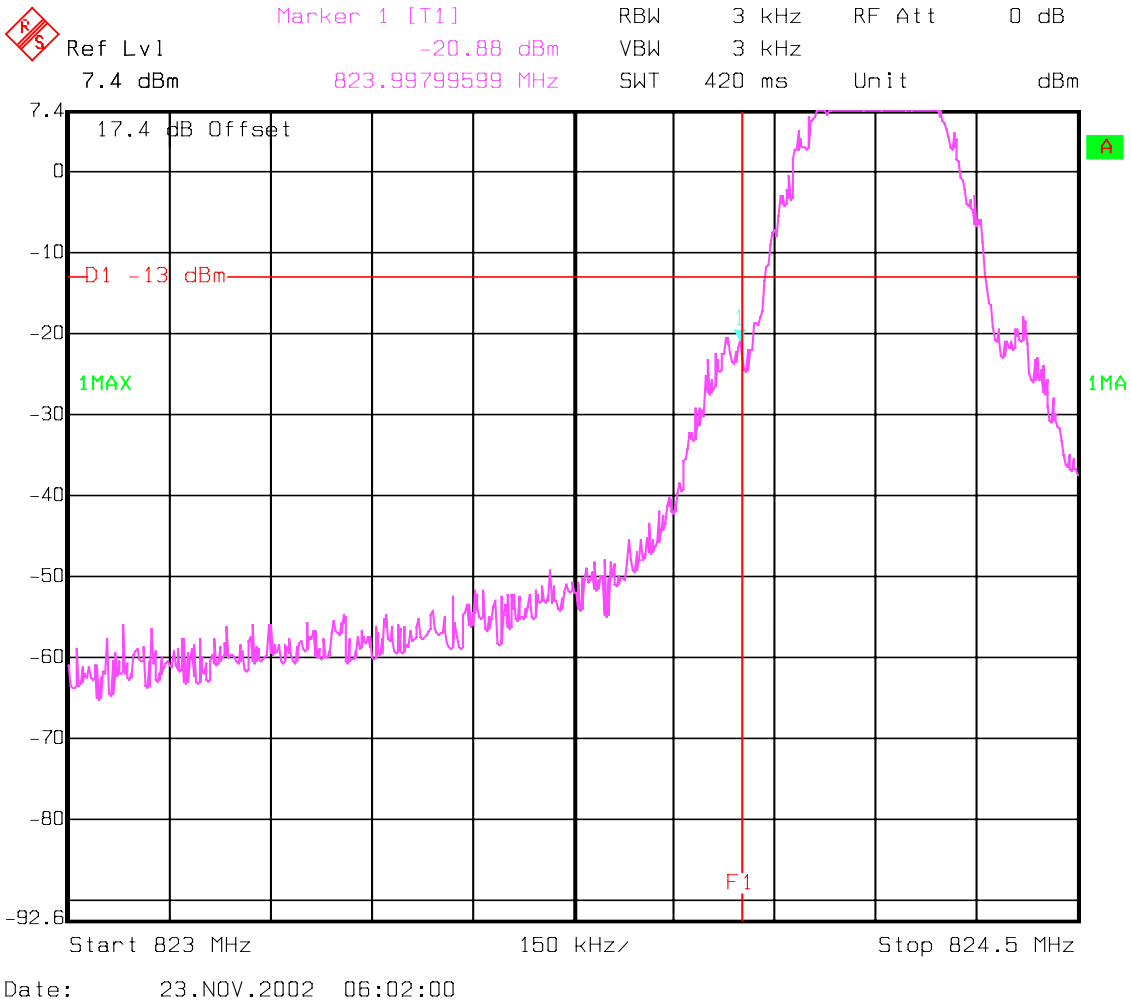
Spurious emission limit –13dBm

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

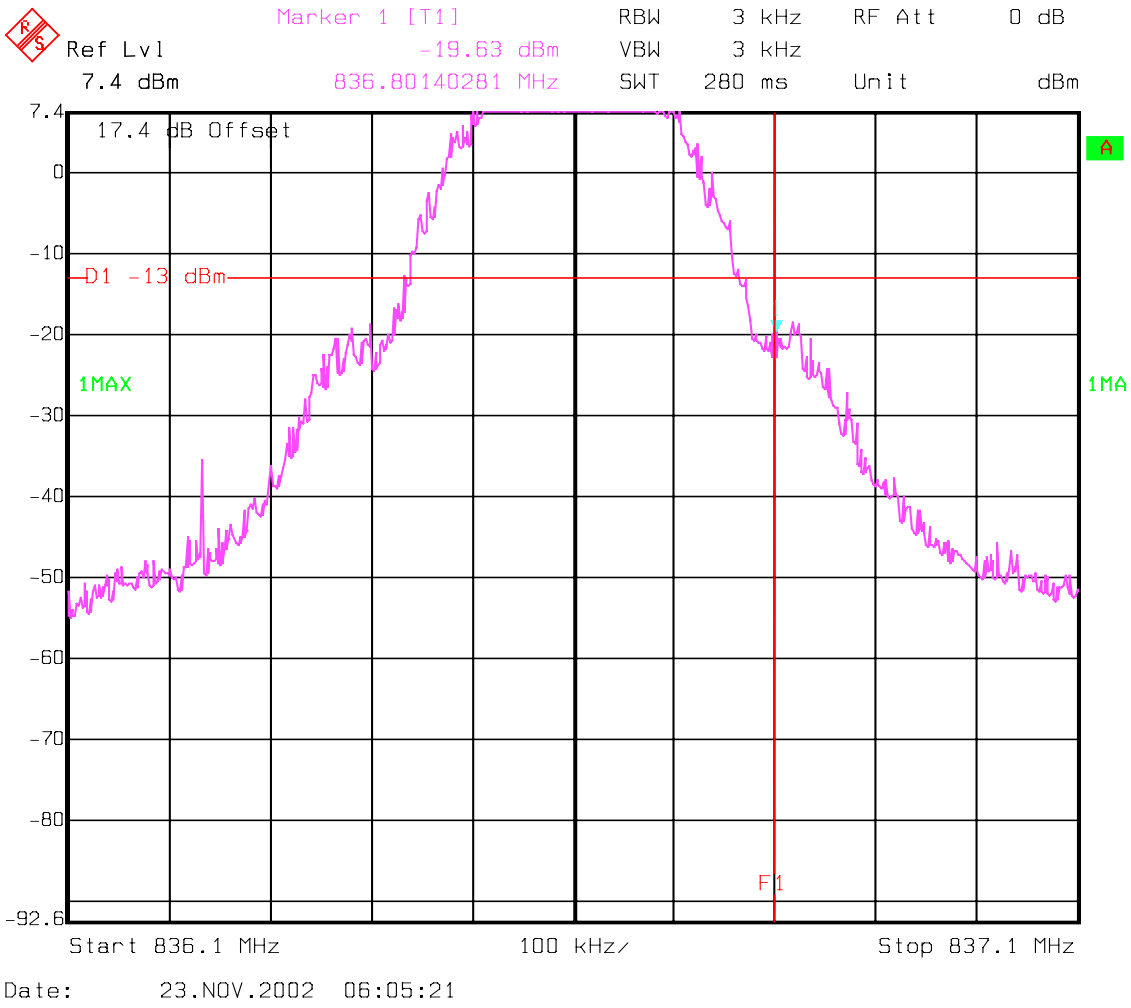
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
18GHz	19.1GHz	Max Peak	Coupled	1 MHz



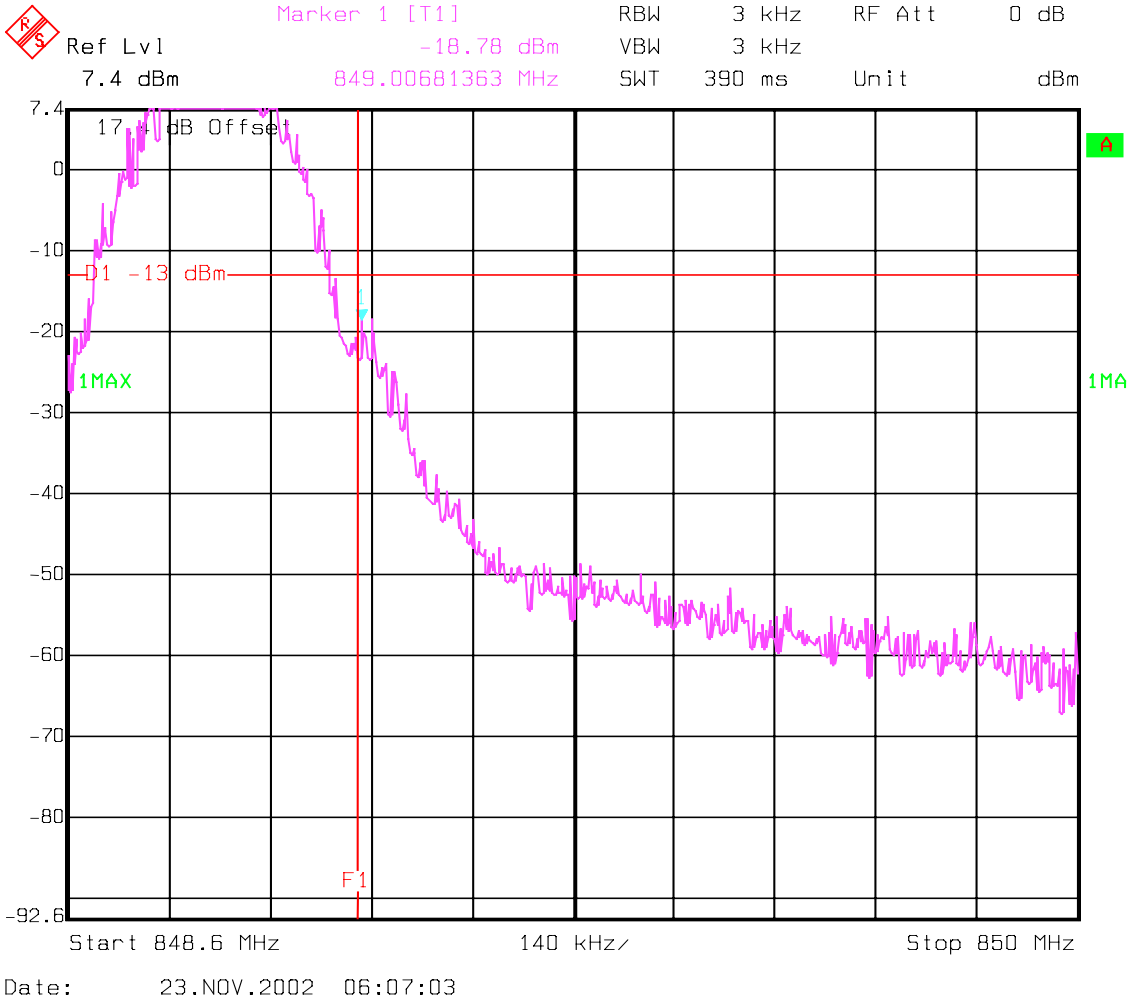
LOWER BAND EDGE (GSM 850) **§2.1049(c)(1), §24.238(a)(b)**
(Conducted)



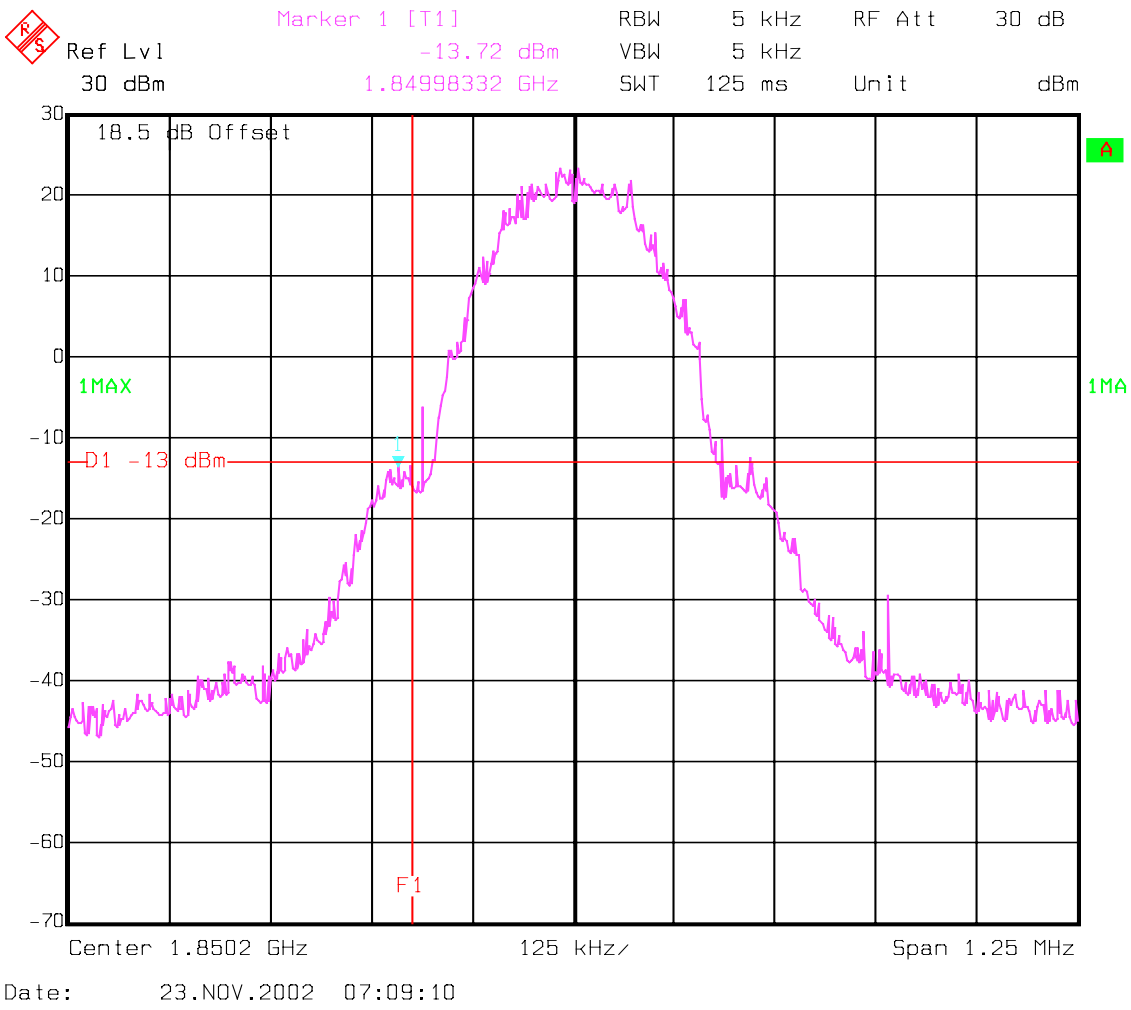
MID BAND EDGE (GSM 850) **§2.1049(c)(1), §24.238(a)(b)**
(Conducted)



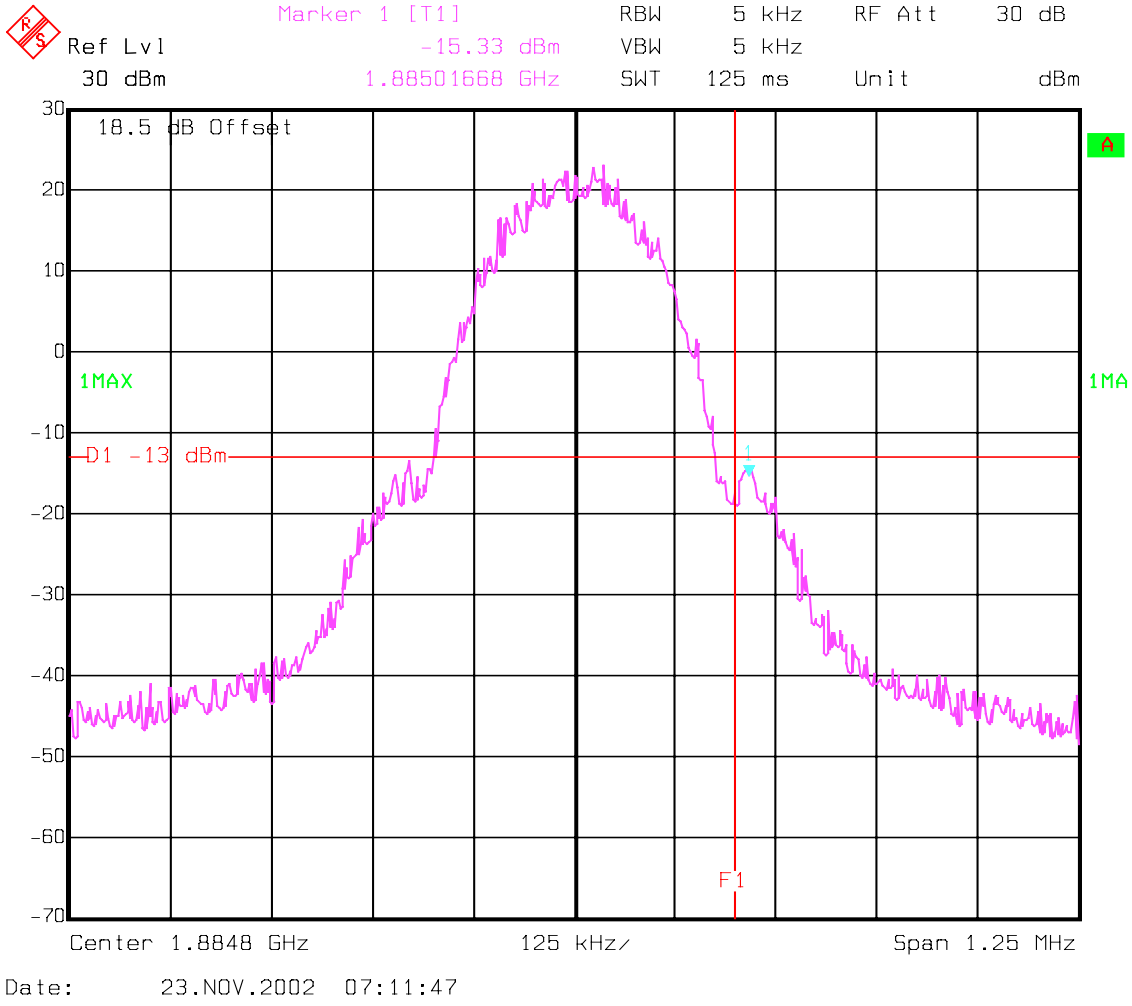
HIGH BAND EDGE (GSM 850) **§2.1049(c)(1), §24.238(a)(b)**
(Conducted)



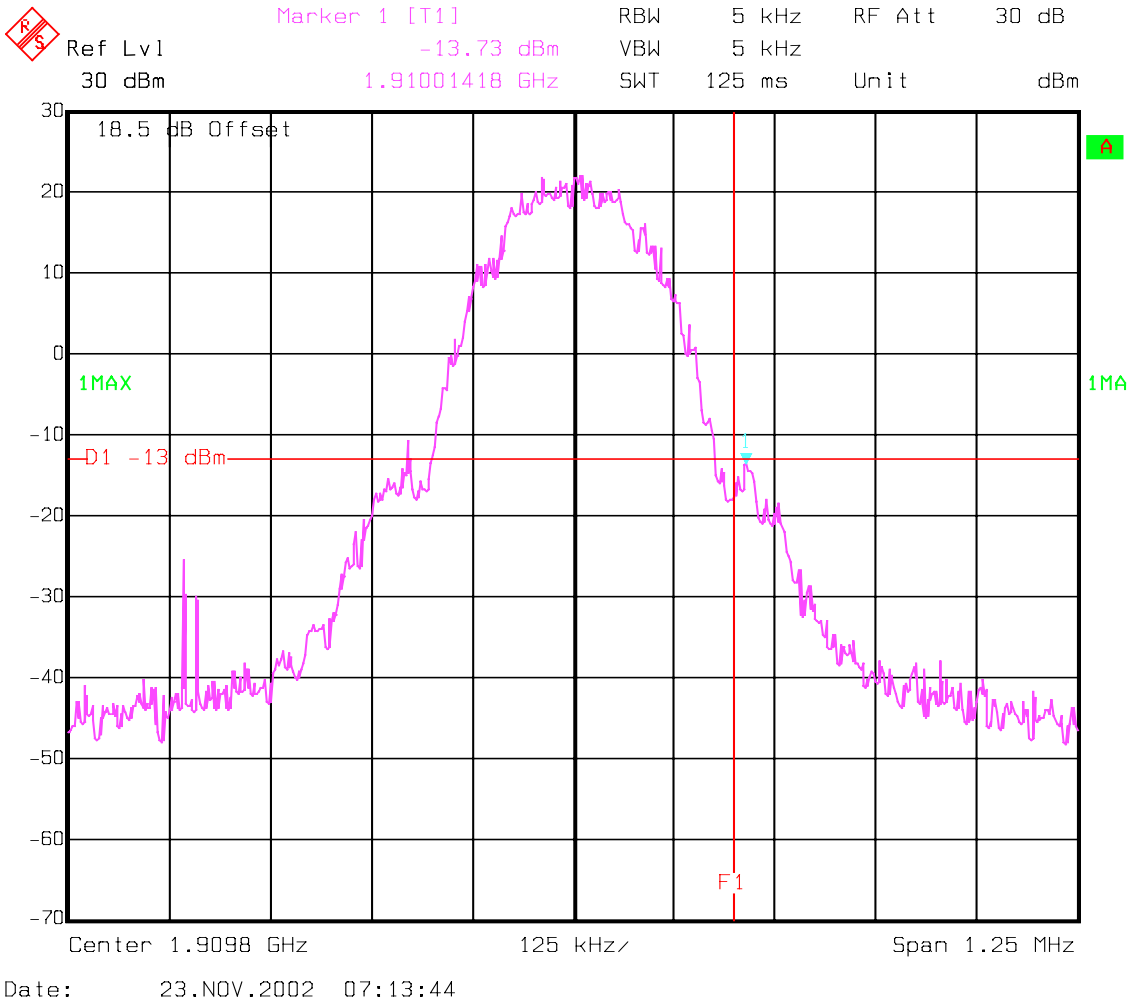
LOW BAND EDGE (PCS-1900) §2.1049(c)(1), §24.238(a)(b)
(Conducted)



MID BAND EDGE (PCS-1900) **§2.1049(c)(1), §24.238(a)(b)**
(Conducted)



HIGH BAND EDGE (PCS-1900) **§2.1049(c)(1), §24.238(a)(b)**
(Conducted)



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.

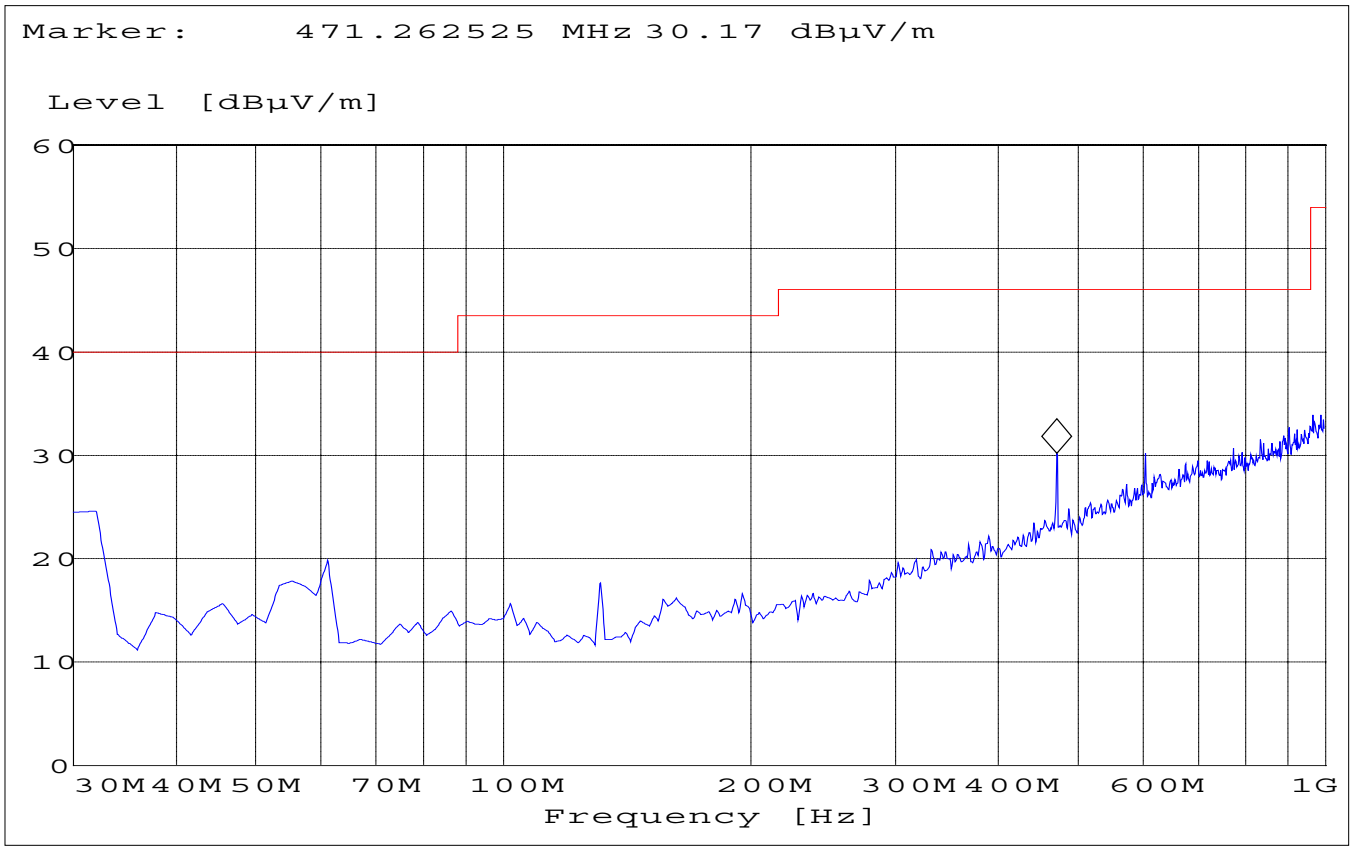
Limits **SUBCLAUSE § 15.209**

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"

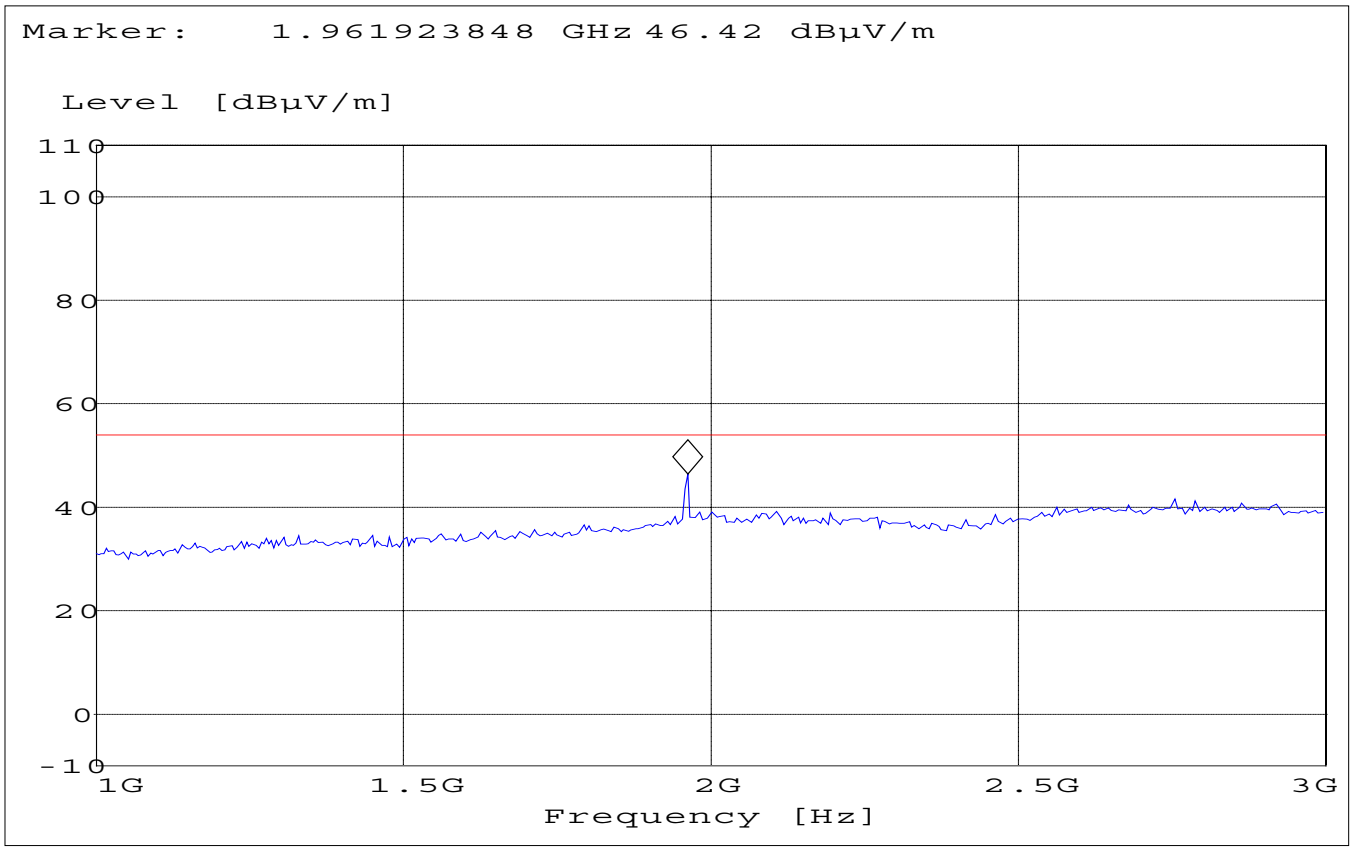
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
30MHz	1GHz	Max Peak	Coupled	100KHz



RECEIVER RADIATED EMISSIONS
EUT in Idle Mode: 1GHz – 3GHz

SWEEP TABLE: "FCC Spuri 1-3G"

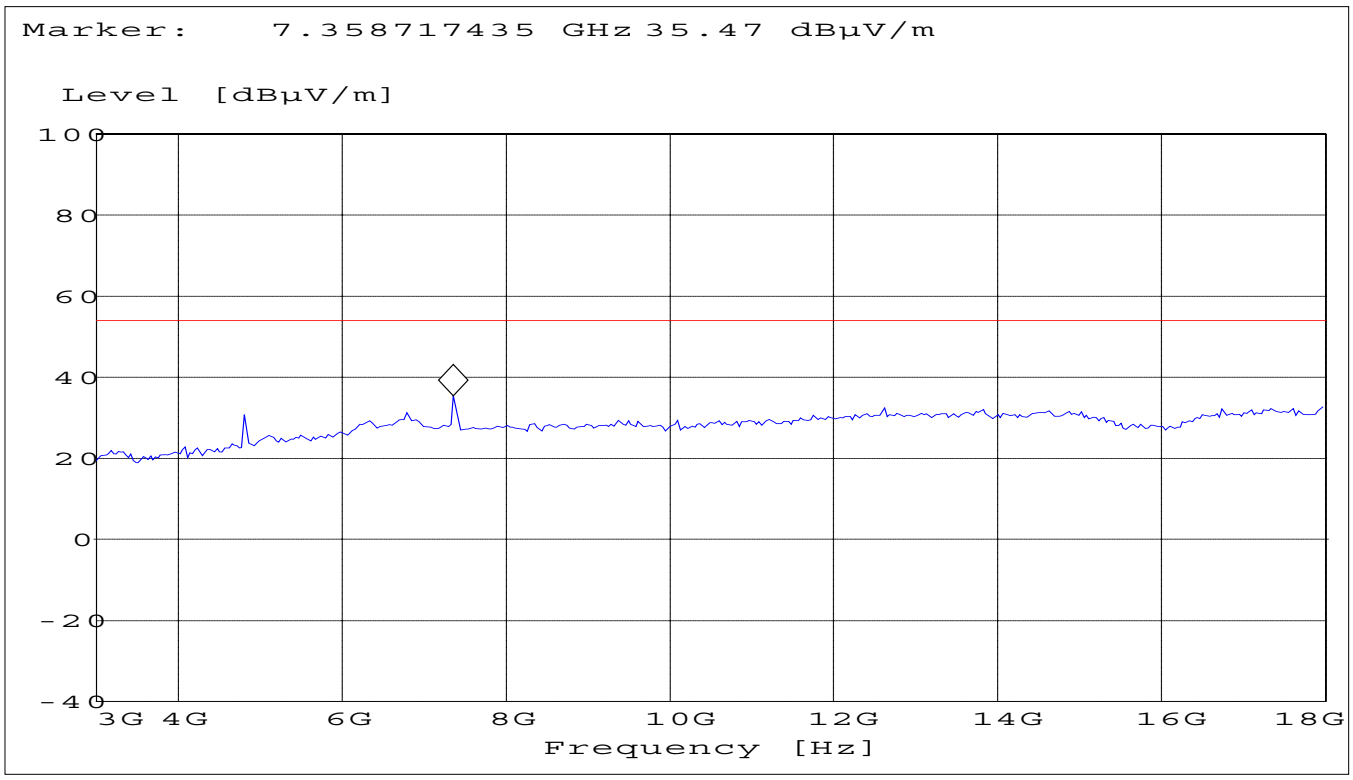
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1GHz	3GHz	Max Peak	Coupled	1 MHz



RECEIVER RADIATED EMISSIONS
EUT in Idle Mode: 3GHz – 18GHz

SWEEP TABLE: "FCC 24 spuri 3-18G"

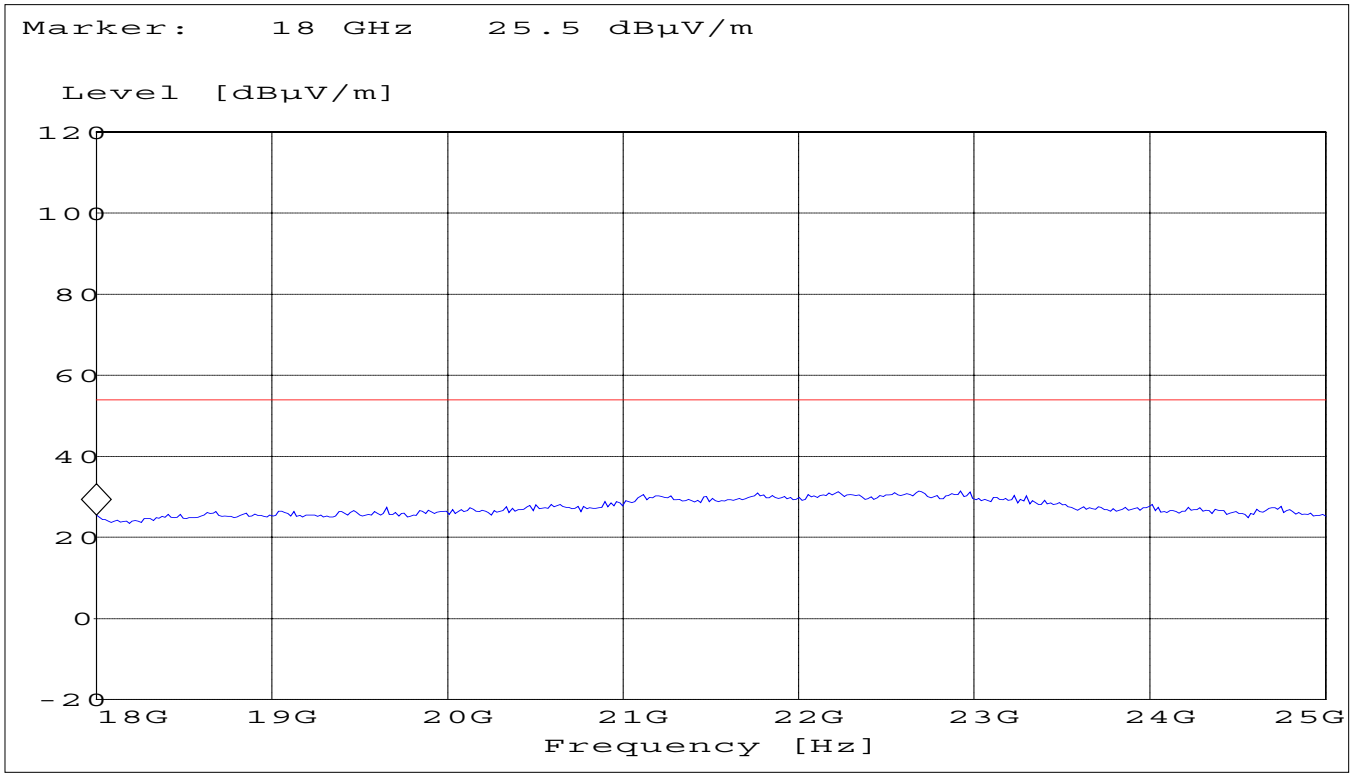
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
3GHz	18GHz	Max Peak	Coupled	1 MHz



RECEIVER RADIATED EMISSIONS
EUT in Idle Mode: 18GHz – 25GHz

SWEEP TABLE: "FCC 24 spuri 18-25G"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
18GHz	25GHz	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 and30MHz – 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

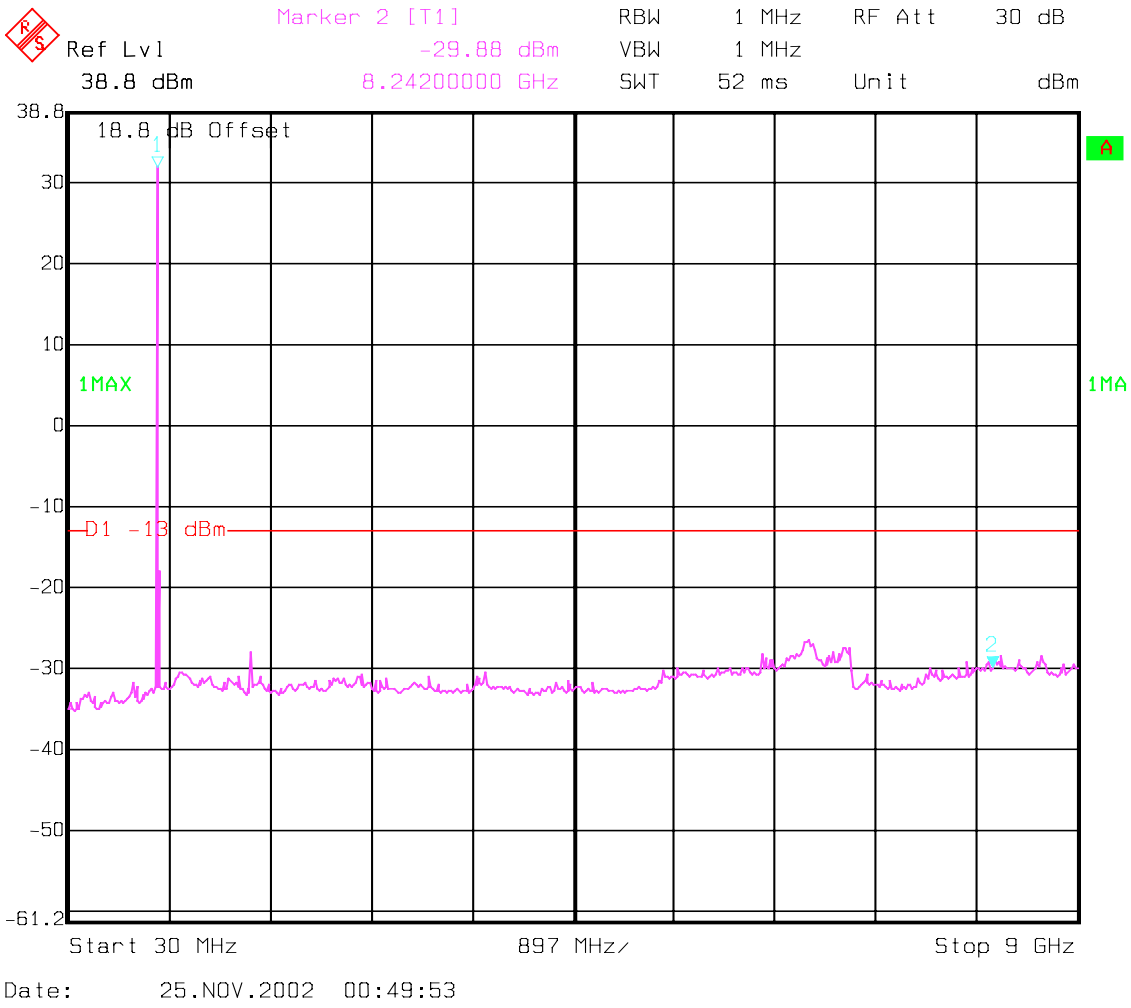
PCS-1900 Transmitter

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+10Log(P) dB. For all power levels +30 dBm to 0dBm, this becomes a constant specification limit of -13 dBm.

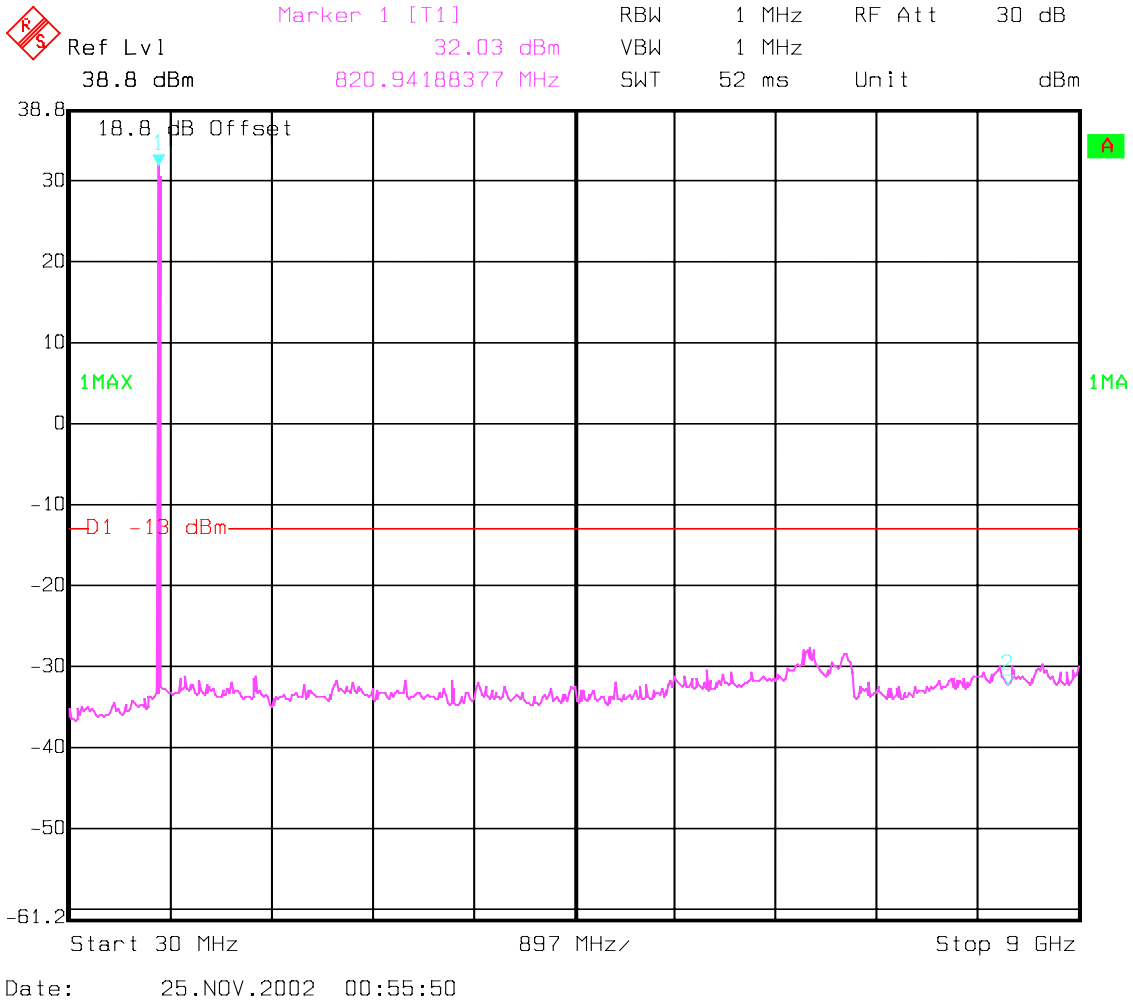
CONDUCTED SPURIOUS EMISSIONS
CHANNEL 128 (GSM-850)
30MHz – 9GHz

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



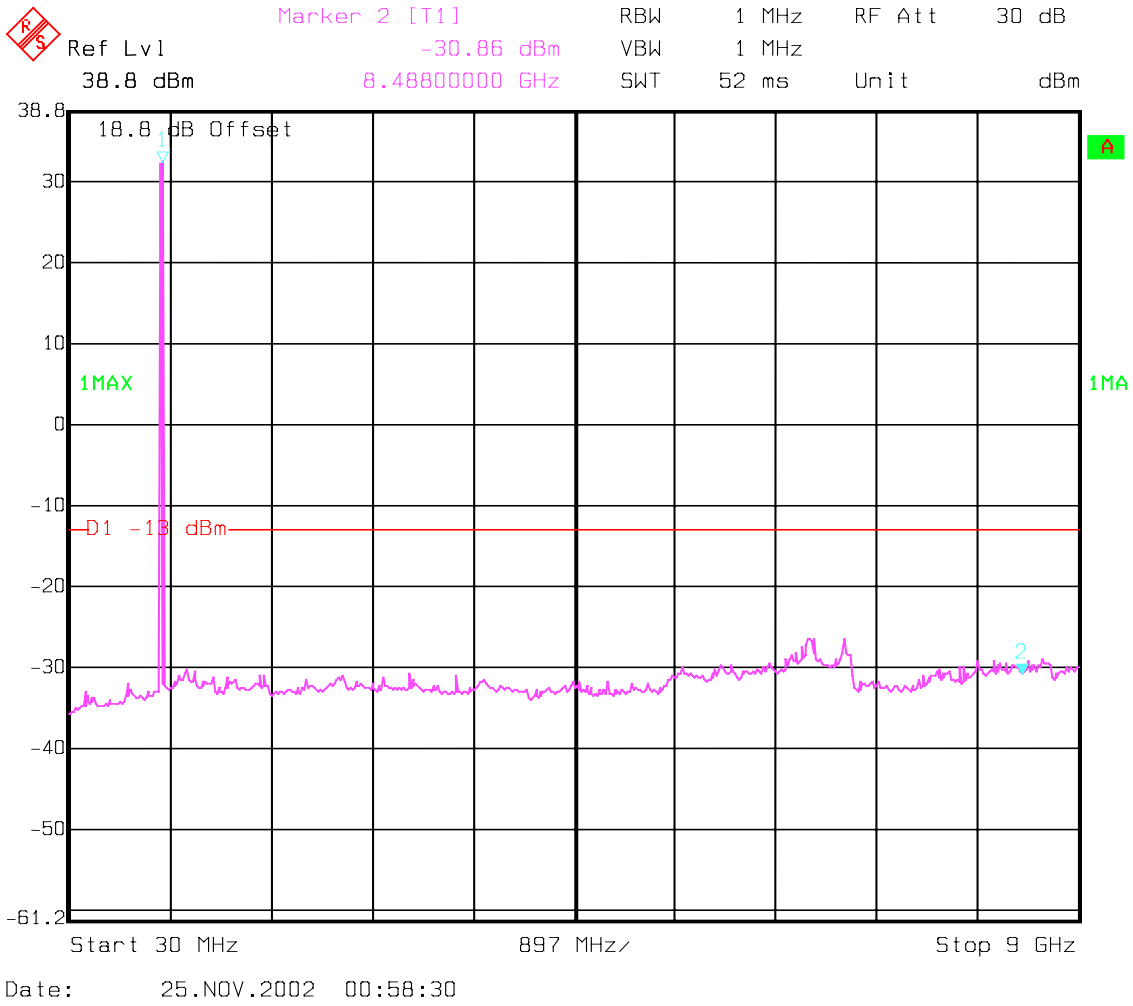
CONDUCTED SPURIOUS EMISSIONS
CHANNEL 190 (GSM-850)
30MHz – 9GHz

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



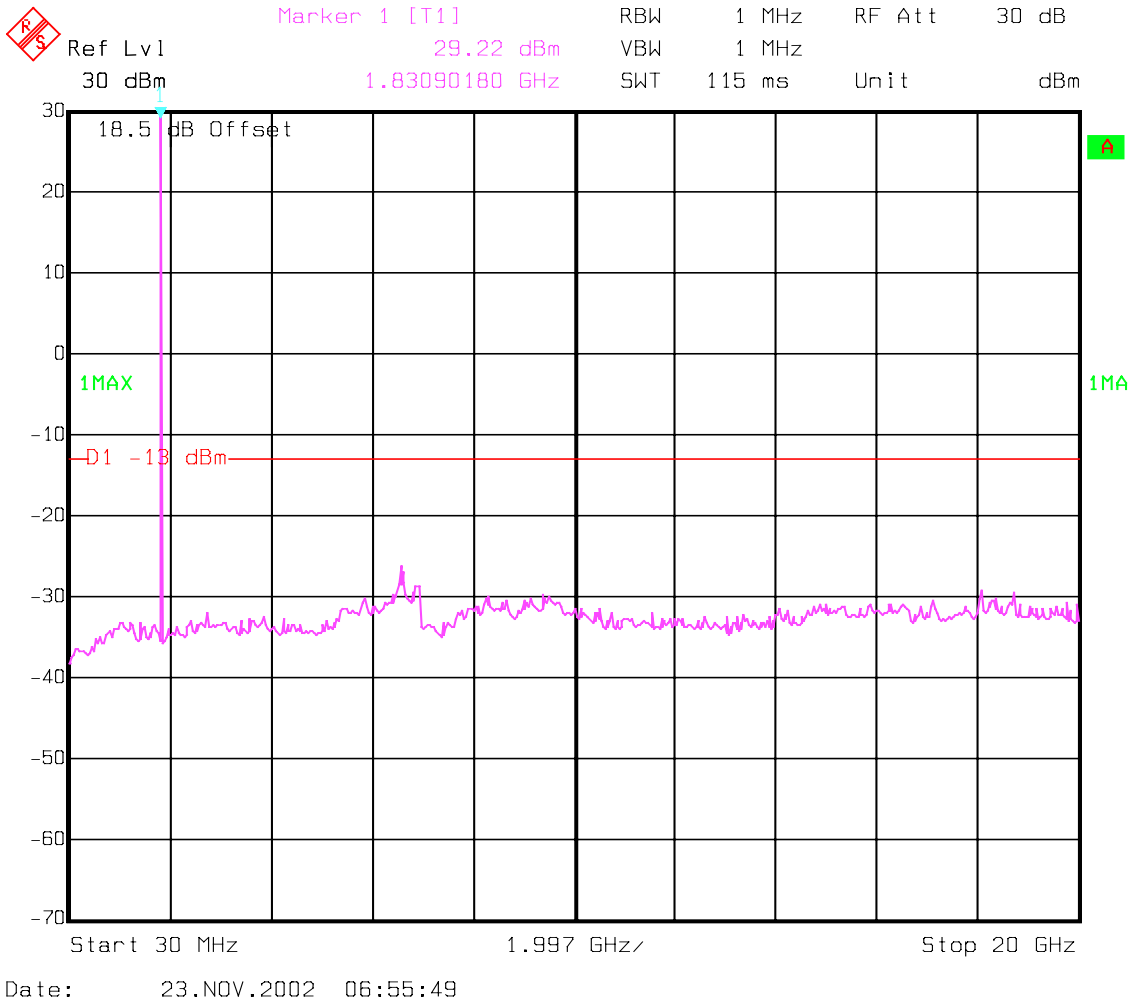
CONDUCTED SPURIOUS EMISSIONS
CHANNEL 251 (GSM-850)
30MHz – 9GHz

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



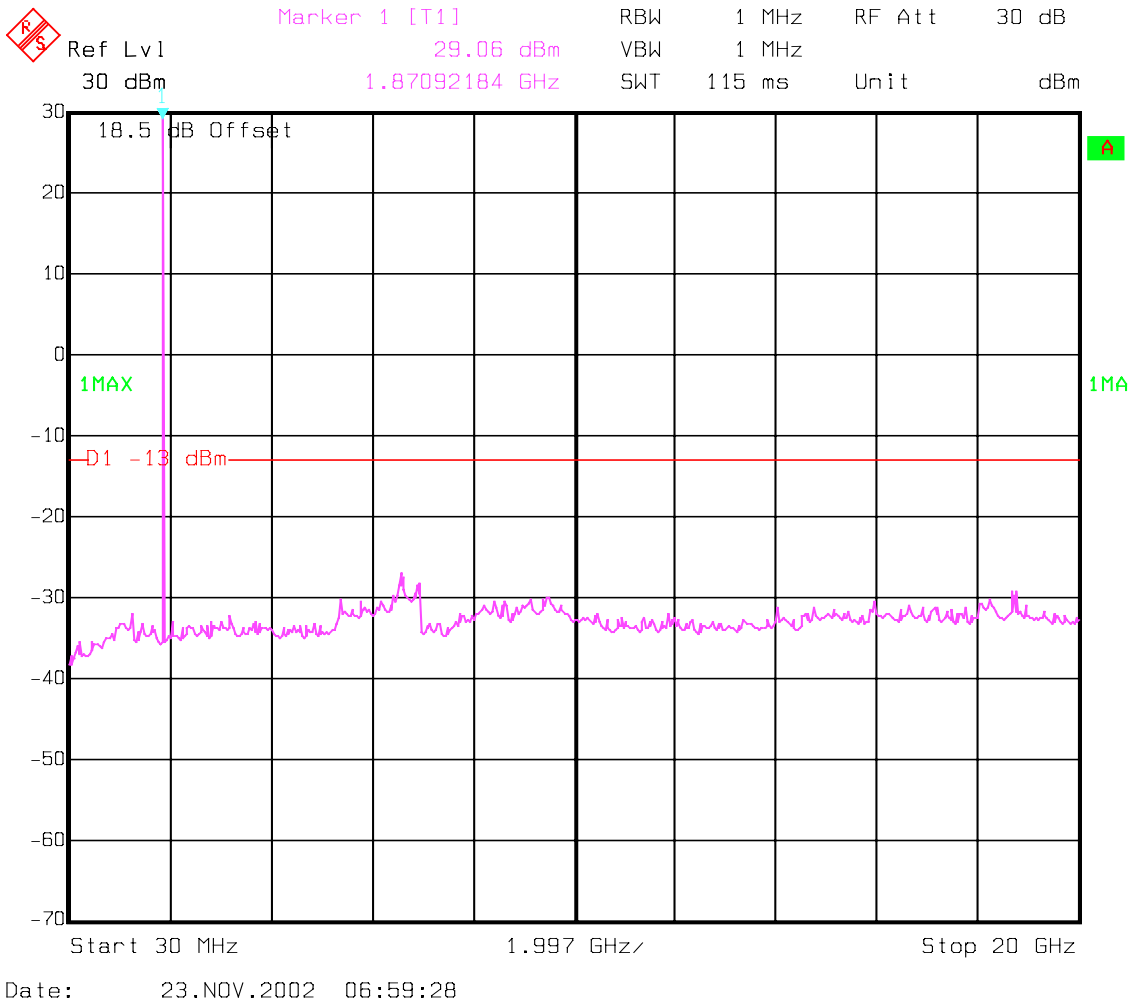
CONDUCTED SPURIOUS EMISSIONS
CHANNEL 512 (PCS-1900)
30MHz – 20GHz

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



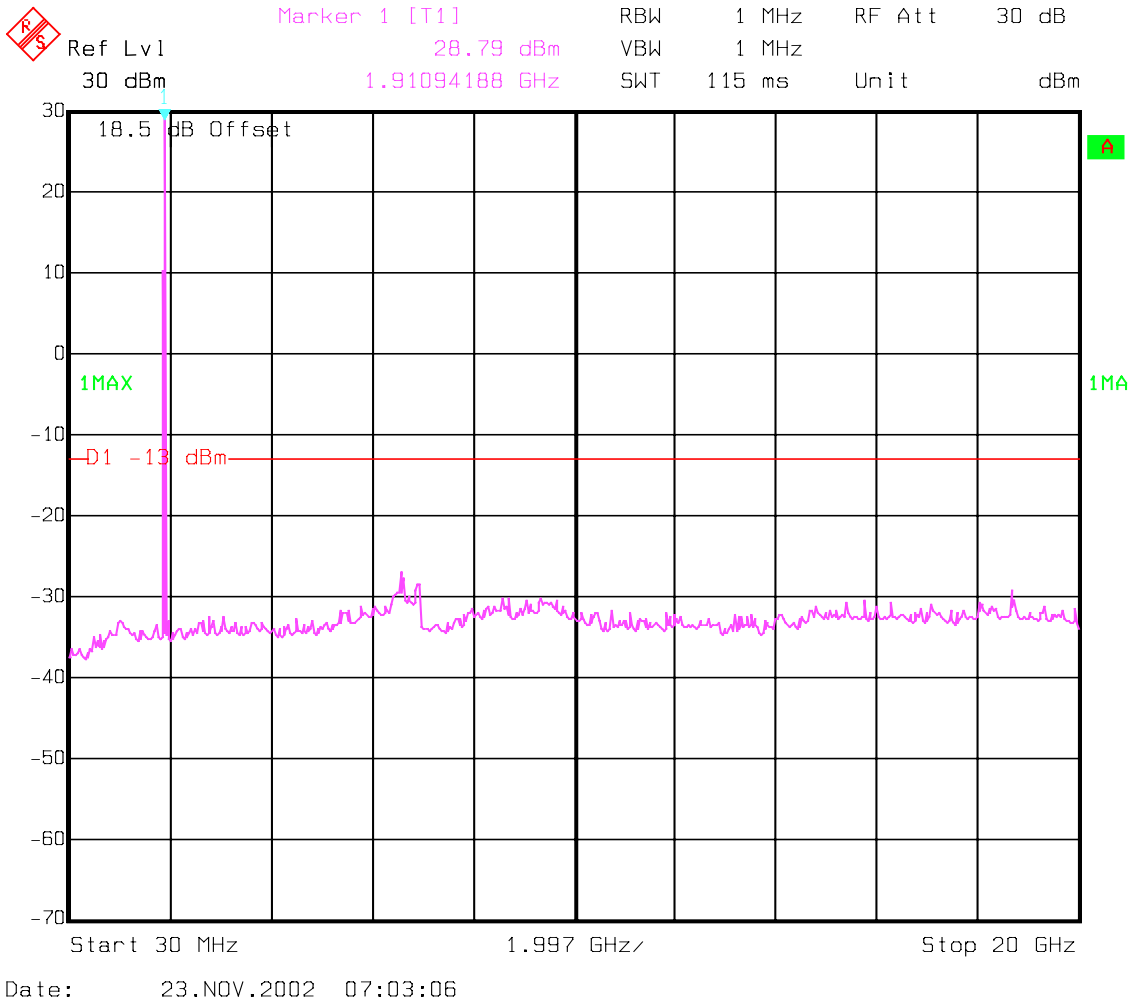
CONDUCTED SPURIOUS EMISSIONS
CHANNEL 661 (PCS-1900)
30MHz – 20GHz

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

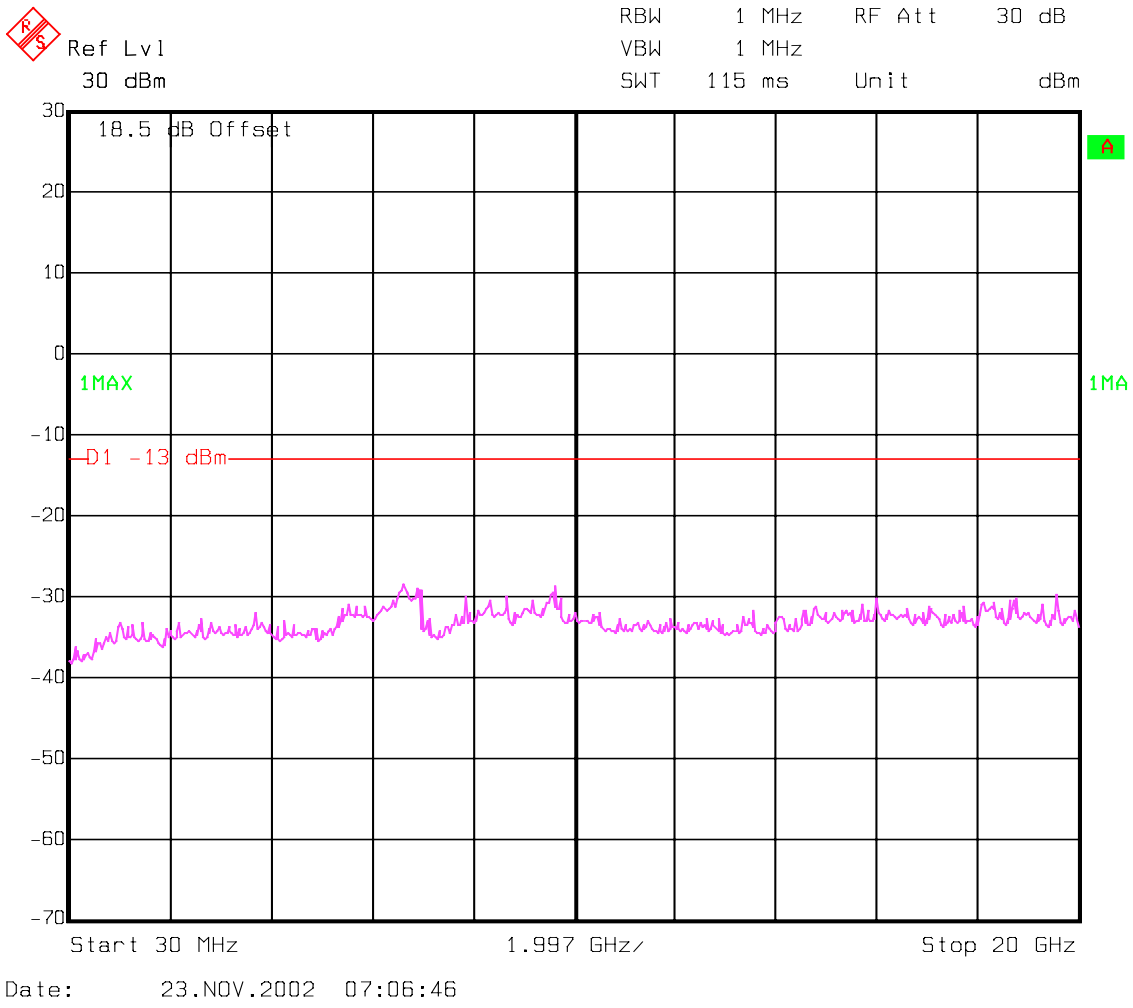


CONDUCTED SPURIOUS EMISSIONS
CHANNEL 810 (PCS-1900)
30MHz – 20GHz

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



CONDUCTED SPURIOUS EMISSIONS
Idle Mode
30MHz – 20GHz



CONDUCTED EMISSIONS **§ 15.107/207**

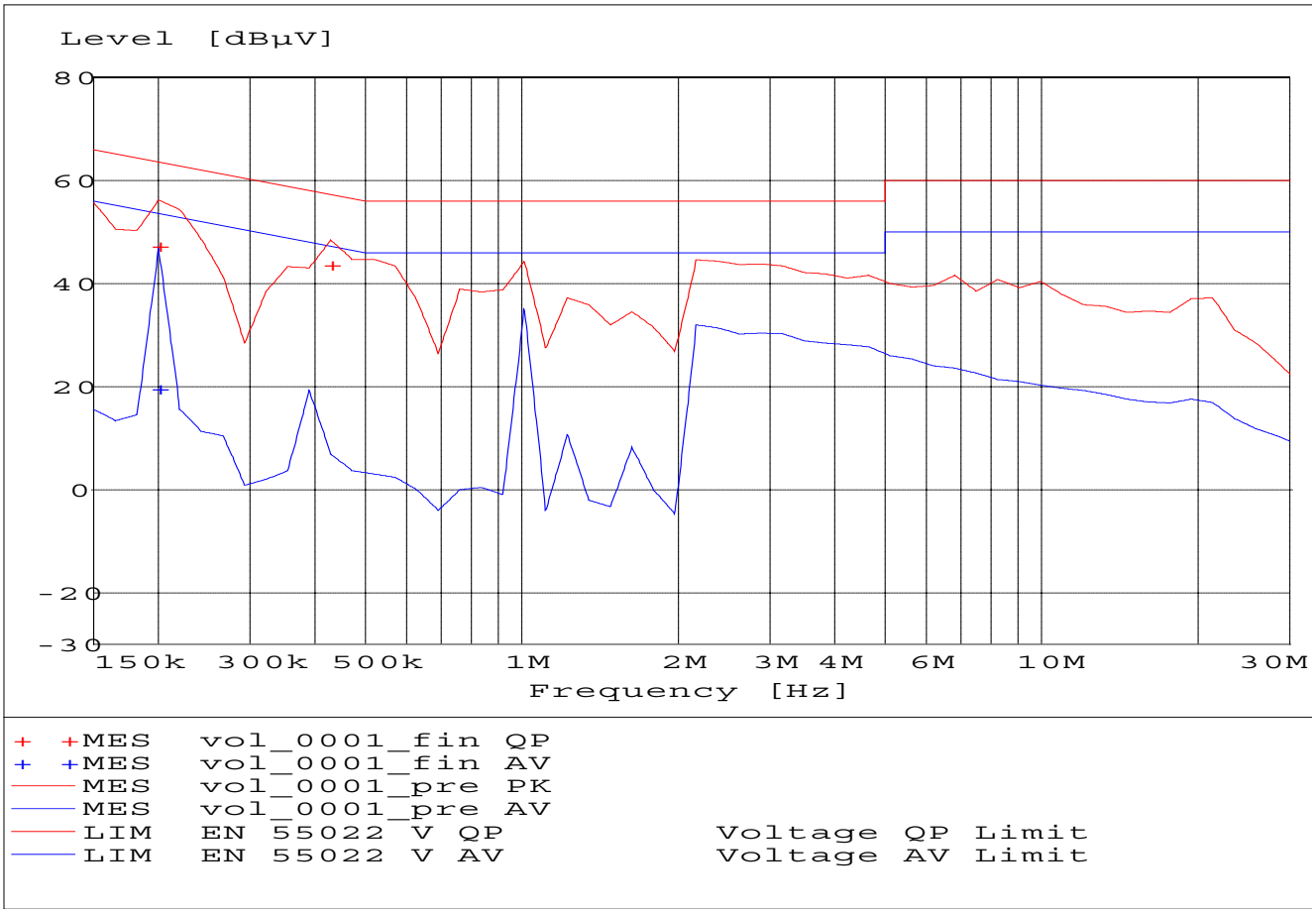
Measured with AC/DC power adapter

Technical specification : 15.107 / 15.207 (Revised as of August 20, 2002)

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		

ANALYZER SETTINGS: RBW = 10KHz VBW = 10KHz



MEASUREMENT RESULT: "vol_0001_fin QP"

11/26/02 7:31PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.199650	47.50	0.0	64	16.1	1	---
0.427968	43.80	0.0	57	13.5	2	---

MEASUREMENT RESULT: "vol_0001_fin AV"

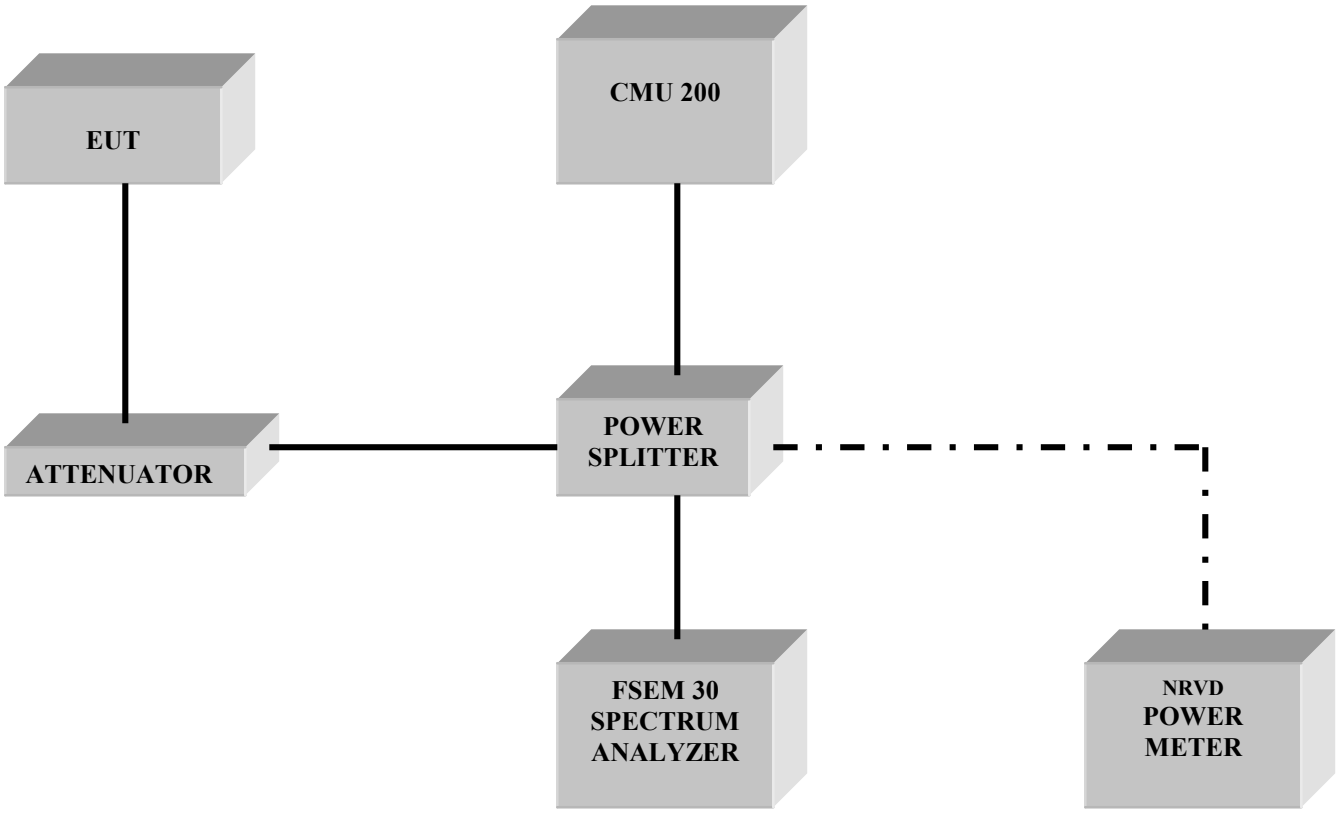
11/26/02 7:31PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.199650	19.90	0.0	54	33.8	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 Amlifier	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	101821
13	2-3GHz band reject filter	BRM50701	Microtronics	NA
14	Universal Radio Comm. Tester	CMD 55	Rohde & Schwarz	847958/008

BLOCK DIAGRAMS
Conducted Testing



Radiated Testing