



FCC Test Report

Test report no.: EMC_829FCC22-24_2004_X100SA_rev2

FCC Part 22, 24 / RSS 132,133

Model: (X100SA)

FCC ID: SY6X100SA



TTI-P-G 081/94-A0

Accredited according to **ISO/IEC 17025**



**Bluetooth Qualification
Test Facility
(BQTF)**



FCC listed # 101450

IC recognized # 3925

CETECOM Inc.

411 Dixon Landing Road • Milpitas, CA 95035 • U.S.A.

Phone: + 1 (408) 586 6200 • Fax: + 1 (408) 586 6299 • E-mail: info@cetecomusa.com • <http://www.cetecom.com>

CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686

Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May

Table of Contents

1	General information
1.1	Notes
1.2	Testing laboratory
1.3	Details of applicant
1.4	Application details
1.5	Test item
1.6	Test standards
2	Technical test
2.1	Summary of test results
2.2	Test report
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**

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.comInternet: www.cetecom.com

1.3 Details of applicant

Name : Bellwave Co. Ltd.
Street : 6th Flr, Kamco Yang-Jae tower, Dogok-Dong, Kanganm-Ku
City / Zip Code : Seoul, 135-270
Country : South Korea
Contact : Ju-Won Seol
Telephone : +82 2 3460 9785
Tele-fax : +82 2 3460 9736
e-mail : maru-sjw@bellwave.com

1.4 Application details

Date of receipt test item : 2004-12-30
Date of test : 2005-01-04/05

1.5 Test item

Manufacturer : Applicant
Marketing Name : X100SA
Model No. : X100SA
Description : **GSM 850/1900 Mobile Phone**
FCC ID : **SY6X100SA**

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 : Fixed Antenna
Power supply : Battery or charger (AC Adapter)
Output power : 30dBm (1W) max. ERP measured in GSM-850
28.31dBm (677.64mW) max. EIRP measured in PCS-1900
Extreme vol. Limits : Lower:3.5Vdc Upper:4.0Vdc
Extreme temp. Tolerance : Lower:-30°C Upper: +50°C

1.6 Test standards

FCC Part 22,24 / RSS132,133 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

Rev2 of this test report is modifying the FCC ID and replaces former reports.

Technical responsibility for area of testing:

2005-01-19 EMC & Radio Lothar Schmidt
(Technical Manager)



Date	Section	Name	Signature
------	---------	------	-----------

Responsible for test report and project leader:

2005-01-19 EMC & Radio Harpreet Sidhu (EMC Engineer)



Date	Section	Name	Signature
------	---------	------	-----------

2.2 Test report

TEST REPORT

Test report no.: EMC_829FCC22-24_2005_X100SA_rev2

TEST REPORT REFERENCE

PARAMETER TO BE MEASURED	PARAGRAPH	PAGE
POWER OUTPUT	§ 22.913(a) / § 24.232 (b)	7
Conducted (GSM-850)		8
Conducted (PCS-1900)		8
ERP (GSM-850)	§22.913(a)	9
EIRP (PCS-1900)	§24.232(b)	13
FREQUENCY STABILITY	§ 2.1055 / § 24.235	17
FRQUENCY STABILITY (GSM-850)		18
FRQUENCY STABILITY (GSM-1900)		19
OCCUPIED BANDWIDTH	§2.1049(h)(i)	20
-20dBc BANDWIDTH (GSM-850)		20
-20dBc BANDWIDTH (GSM-1900)		20
EMISSION BANDWIDTH	§24.238(b)	27
-26dBc BANDWIDTH (GSM-850)		27
-26dBc BANDWIDTH (GSM-1900)		27
EMISSION LIMITS TRANSMITTER	§2.1051 / §24.238	34
RESULTS OF RADIATED TESTS GSM-850:		35
RESULTS OF RADIATED TESTS PCS-1900:		45
RECEIVER RADIATED EMISSIONS	§ 2.1053 / RSS-133	63
CONDUCTED SPURIOUS EMISSIONS	§ 2.1057 / §24.238	68
CONDUCTED EMISSIONS	§ 15.107/207	76
TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS		77
BLOCK DIAGRAMS		78

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 average output power, peak output power, EIRP & ERP measurements for the EUT. 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 Control Level	Nominal Peak Output Power	Tolerance (dB)
5	$\leq 33\text{dBm (2W)}^*$	± 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:

Frequency (MHz)	Average Power during burst (dBm)
824.2	32.0
836.6	31.97
848.8	31.84

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

Power Control Level	Nominal Peak Output Power	Tolerance (dB)
0	$\leq 30\text{dBm (1W)}^*$	± 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:

Frequency (MHz)	Average Power during burst (dBm)
1850.2	28.79
1880.0	29.13
1909.8	28.54

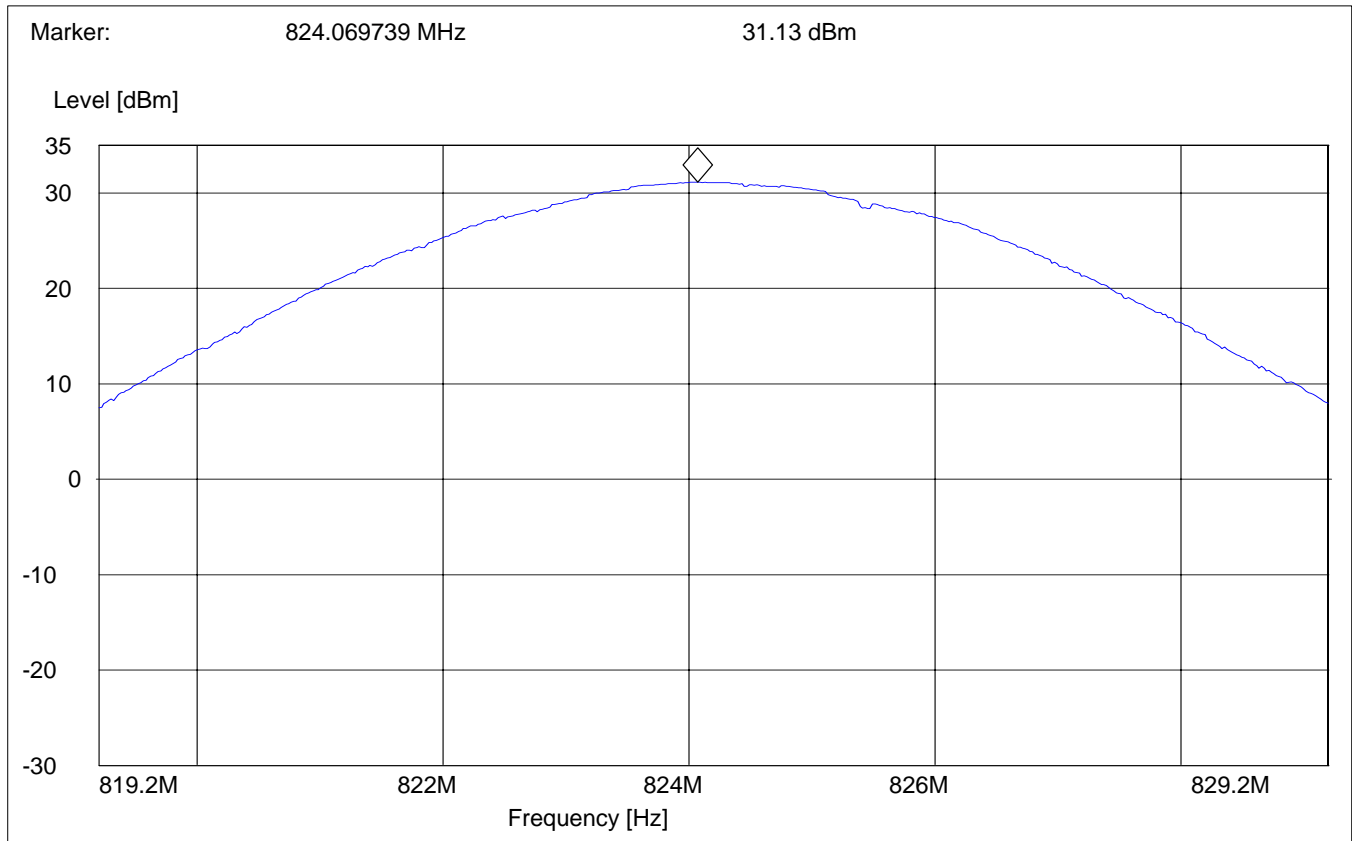
ERP (GSM-850)**§22.913(a)****Limits:**

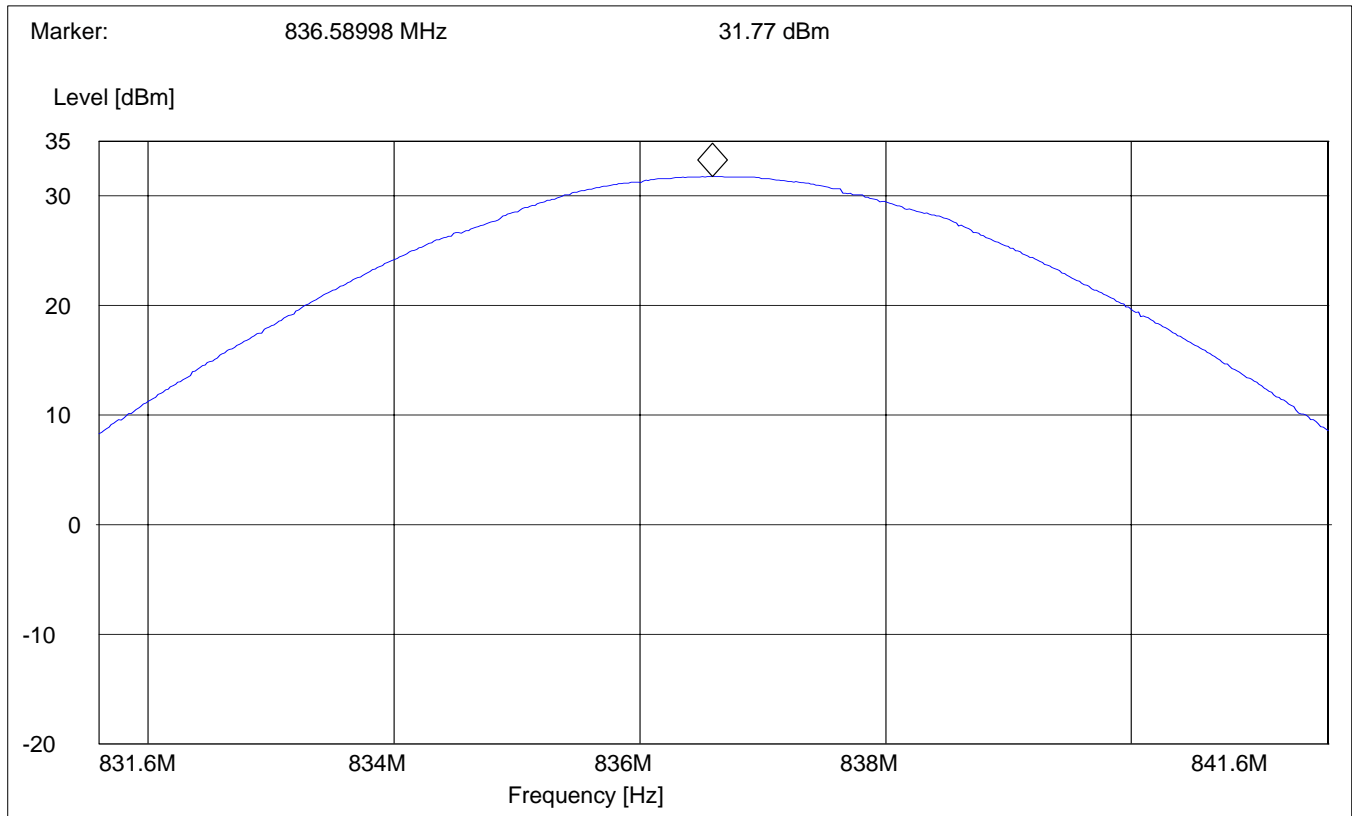
Power Control Level	Burst Peak ERP
5	≤38.45dBm (7W)

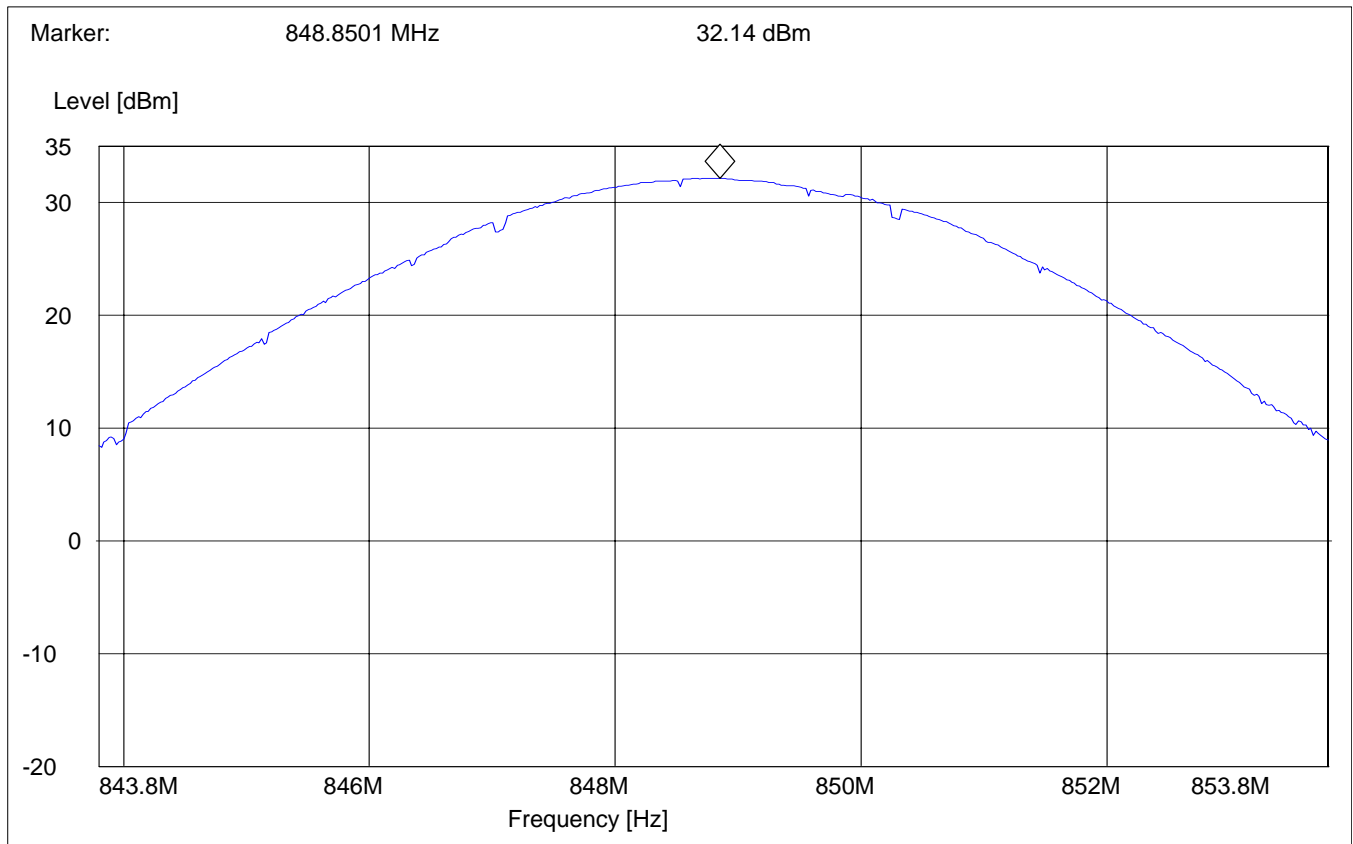
EIRP

Frequency (MHz)	Power Control Level	BURST PEAK (dBm)	
		EIRP	ERP
824.2	5	31.13	28.99
836.6	5	31.77	29.63
848.8	5	32.14	30.0
Measurement uncertainty		±0.5 dB	

ANALYZER SETTINGS: RBW = VBW = 3MHz

EIRP GSM850 @ 824.2MHz

EIRP GSM850 @ 836.6MHz

EIRP GSM850 @ 848.8MHz

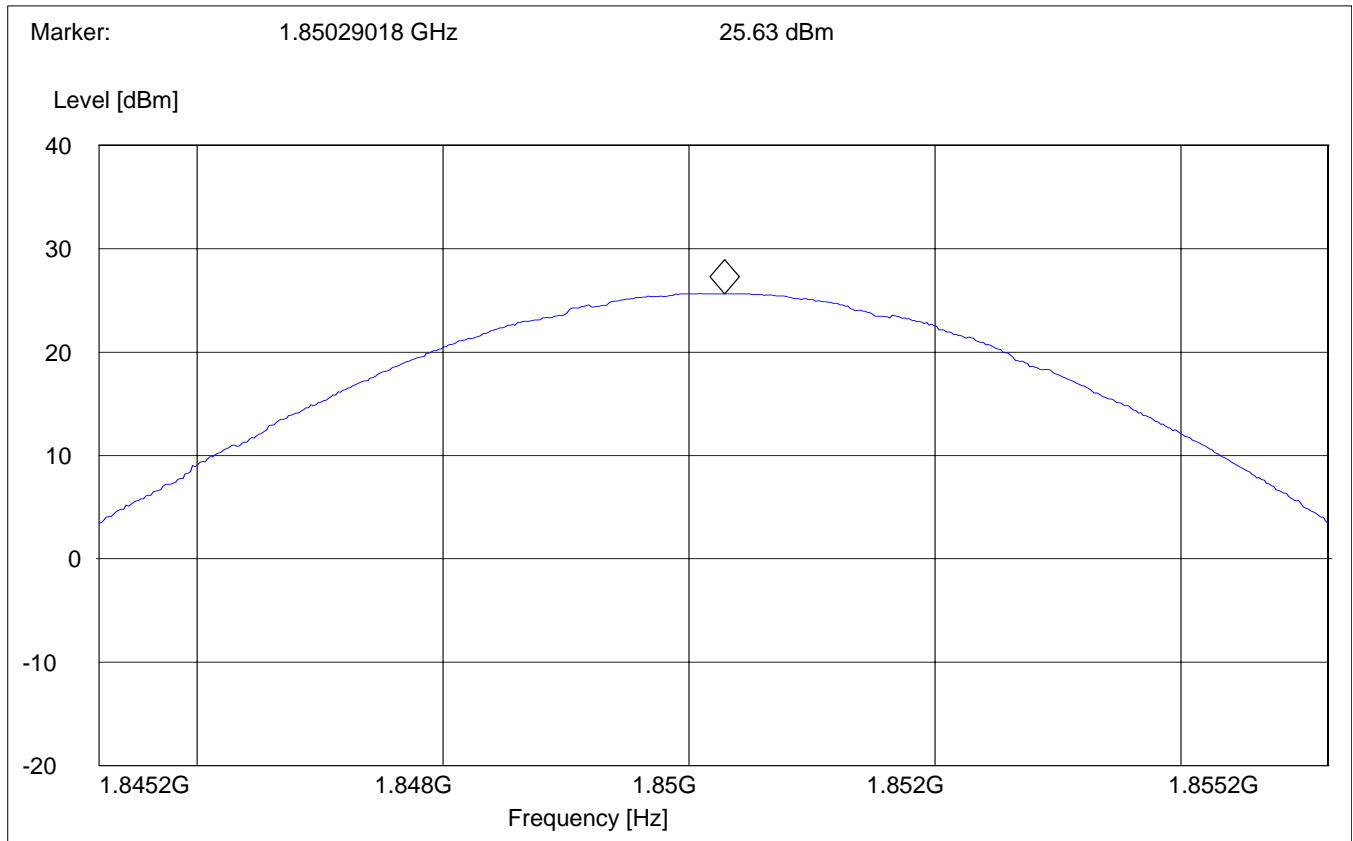
EIRP (PCS-1900)**§24.232(b)****Limits:**

Power Control Level	Burst Peak EIRP
0	≤33dBm (1W)

EIRP

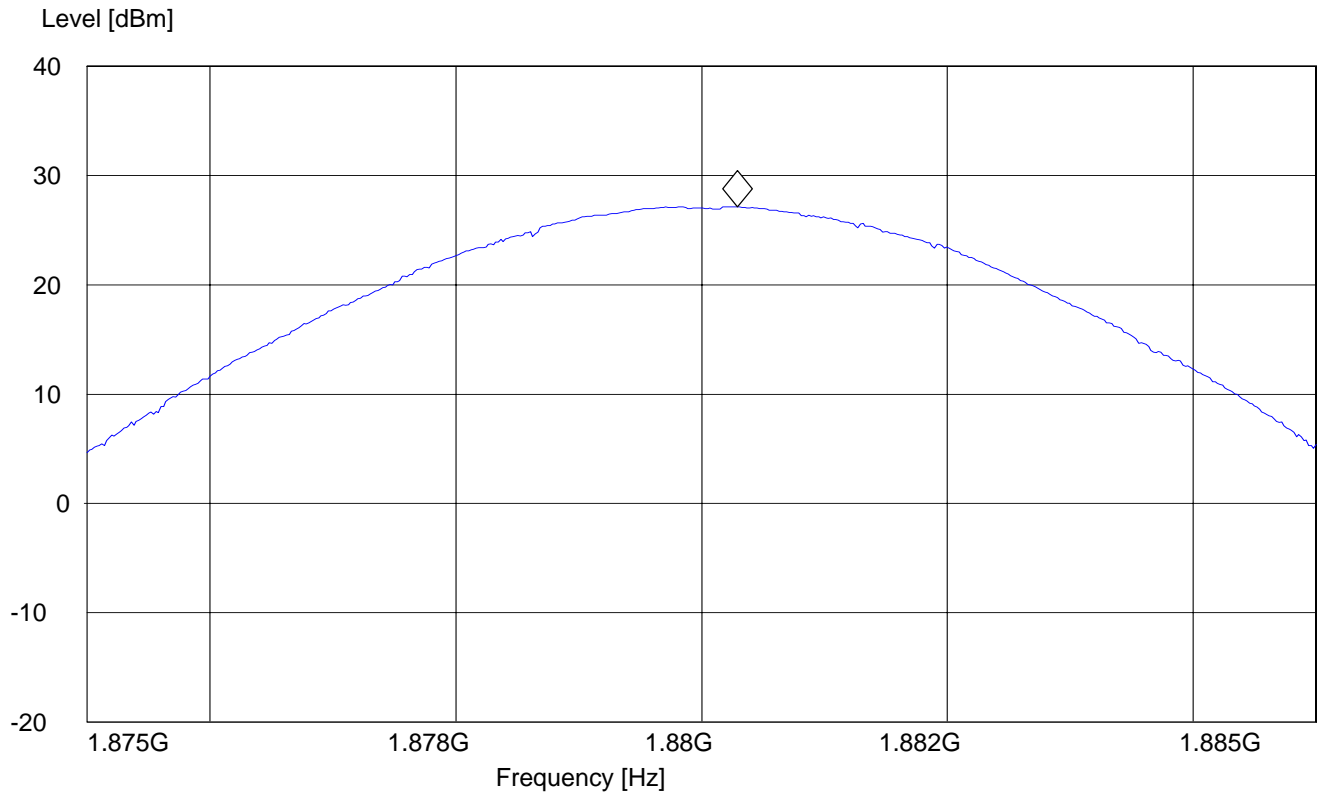
Frequency (MHz)	Power Control Level	BURST PEAK (dBm)
		EIRP
1850.2	0	25.63
1880.0	0	27.11
1909.8	0	28.31
Measurement uncertainty	±0.5 dB	

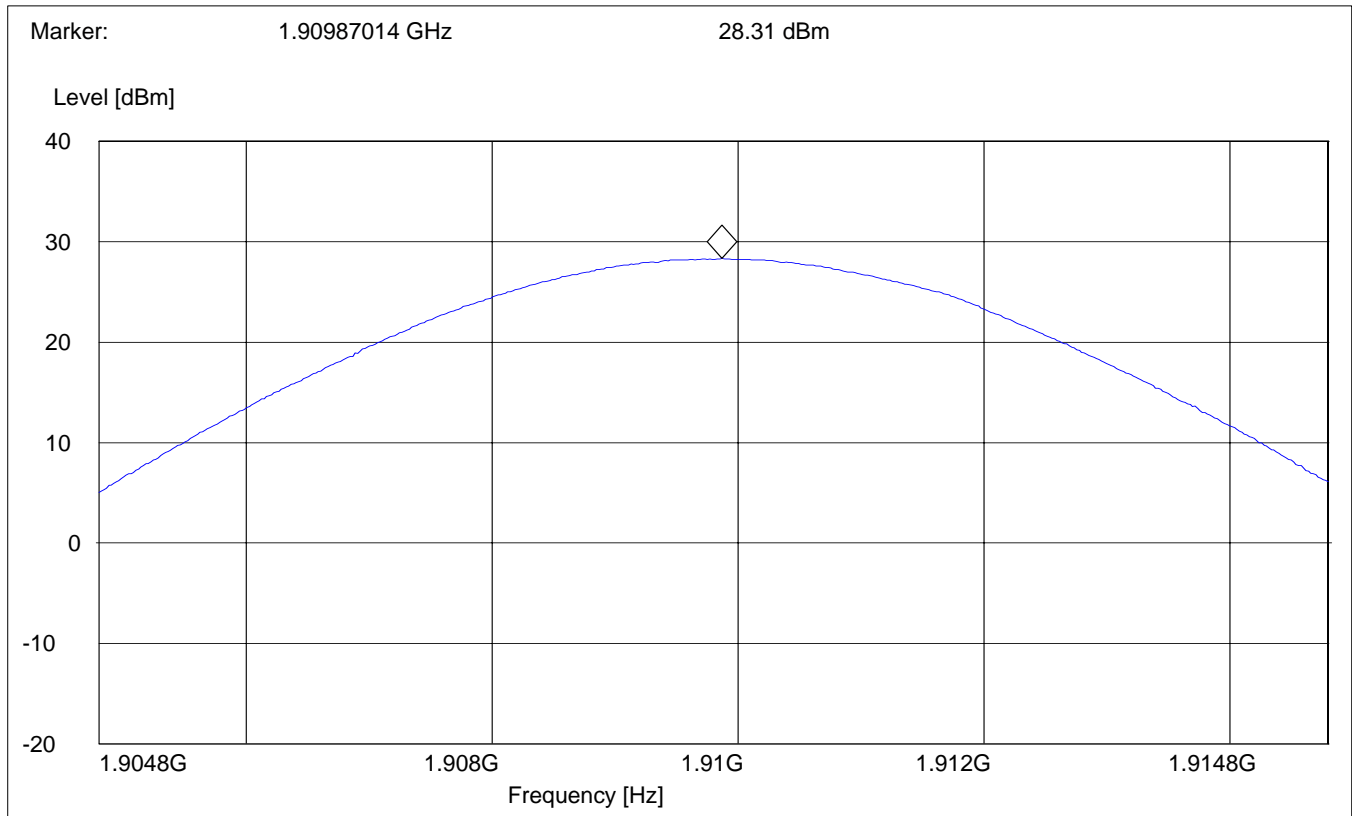
ANALYZER SETTINGS: RBW = VBW = 3MHz

EIRP GSM1900 @ 1850.2MHz

EIRP GSM1900 @ 1880MHz

Marker: 1.880290581 GHz 27.11 dBm



EIRP GSM1900 @ 1909.8MHz

FREQUENCY STABILITY**§ 2.1055 / § 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 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 3.5VDC and 4.0VDC, with a nominal voltage of 3.7VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of -2.7% and +21.62%. 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

Frequency = **836.6MHz**

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
3.5	11	0.013
4.0	11	0.013

AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-30	-0.035
-20	26	0.031
-10	30	0.035
0	22	0.026
+10	17	0.020
+20	11	0.013
+30	11	0.013
+40	23	0.027
+50	27	0.032

FRQUENCY STABILITY (GSM-1900)

AFC FREQ ERROR vs. VOLTAGE

Frequency = **1880.0** MHz

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
3.6	15	0.0079
4.5	16	0.0085

AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-39	-0.020
-20	25	0.013
-10	30	0.015
0	27	0.014
+10	19	0.010
+20	15	0.0079
+30	15	0.0079
+40	22	0.011
+50	25	0.013

OCCUPIED BANDWIDTH**§2.1049(h)(i)****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 GSM-850 & GSM-1900 frequency band. Table below lists the measured -20dBc (99%) occupied bandwidths. Spectrum analyzer plots are included on the following pages.

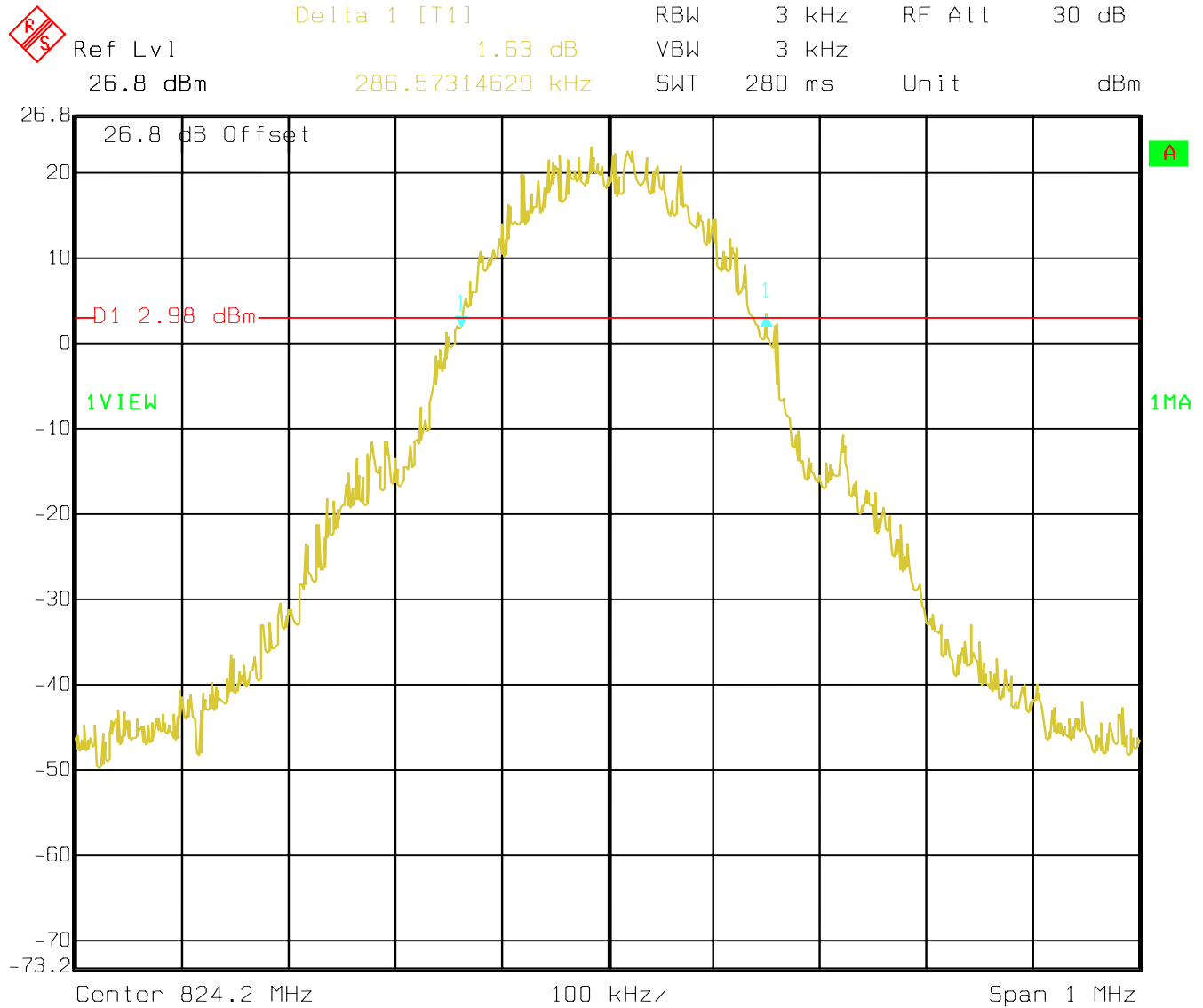
-20dBc BANDWIDTH (GSM-850)

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

-20dBc BANDWIDTH (GSM-1900)

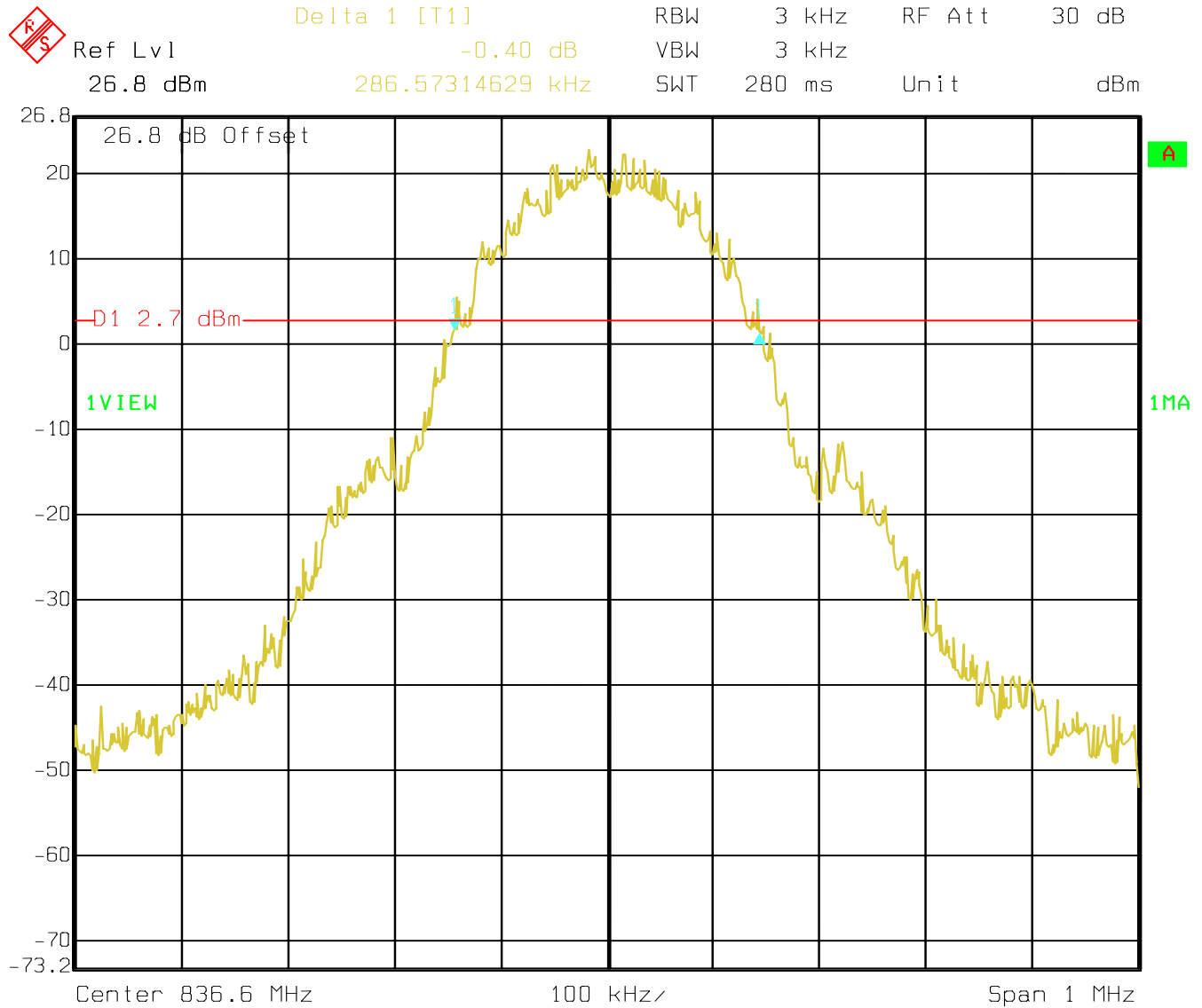
Frequency (MHz)	-20dBc Bandwidth (kHz)
1850.2	302.60
1880	284.56
1909.8	280.56

-20dBc BANDWIDTH CHANNEL 128(GSM-850)



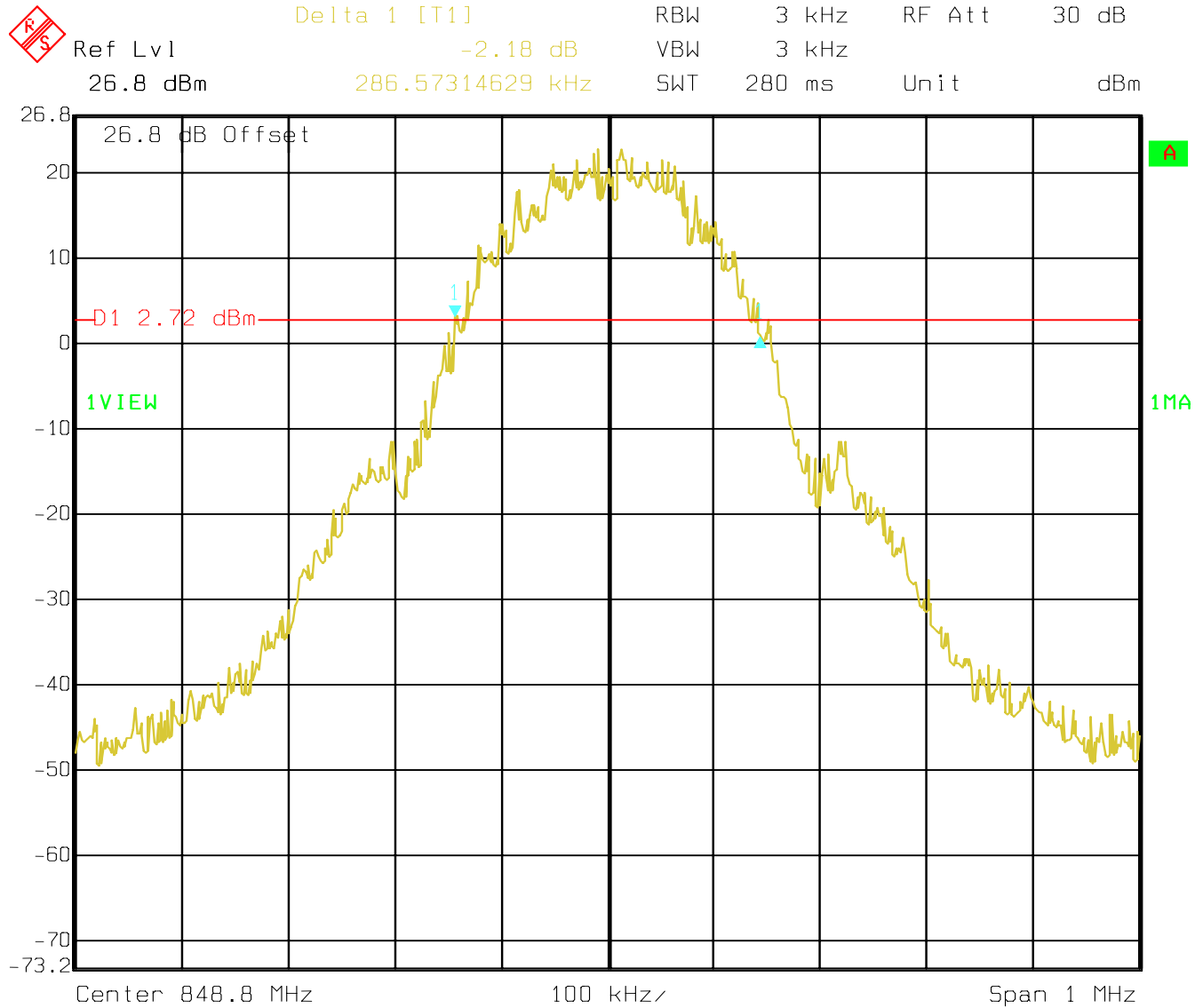
Date: 05.JAN.2005 12:46:16

-20dBc BANDWIDTH CHANNEL 190(GSM-850)



Date: 05.JAN.2005 12:48:22

-20dBc BANDWIDTH CHANNEL 251(GSM-850)

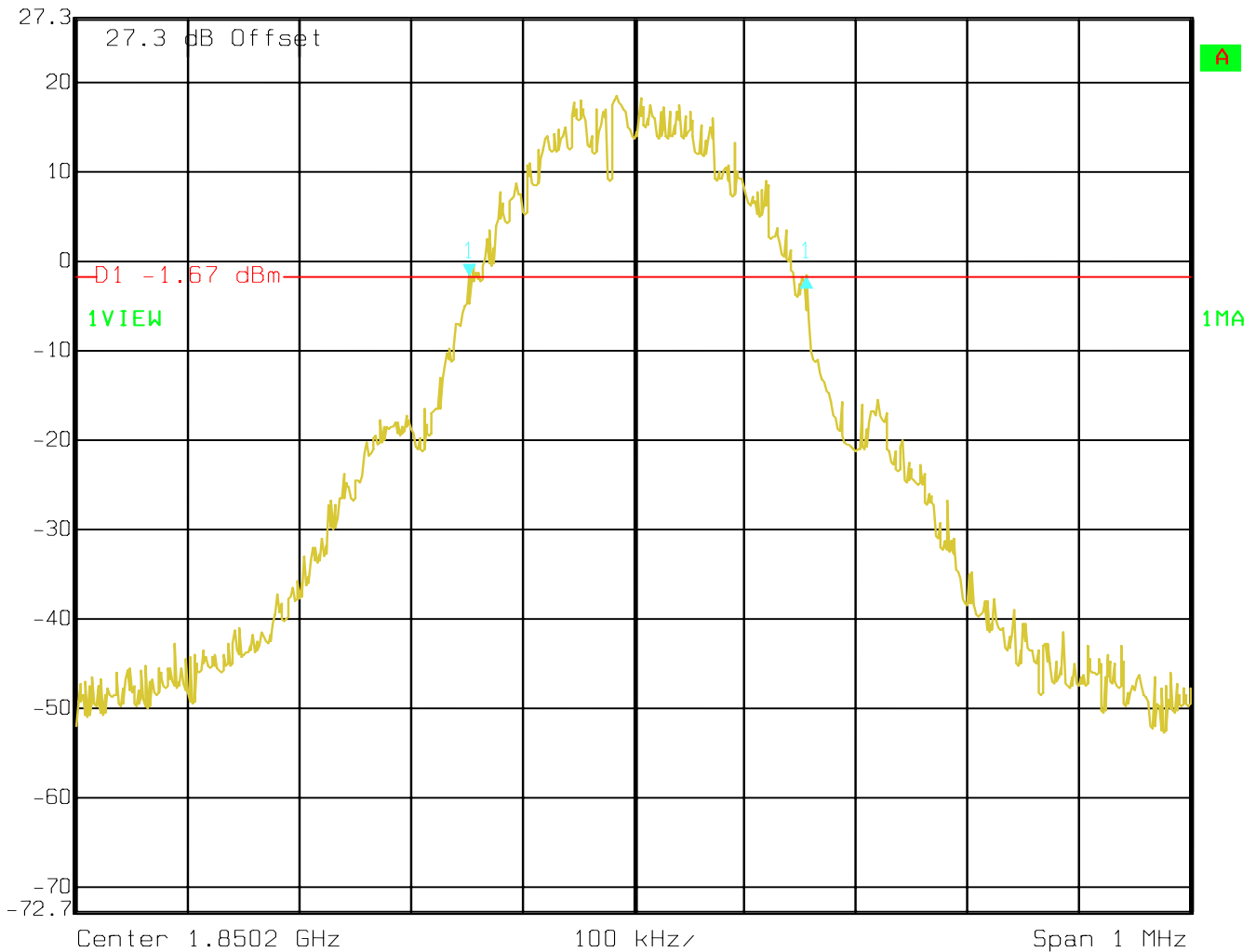


Date: 05.JAN.2005 12:50:28

-20dBc BANDWIDTH CHANNEL 512(GSM-1900)



Delta 1 [T1] RBW 3 kHz RF Att 30 dB
 Ref Lvl 0.05 dB VBW 3 kHz
 27.3 dBm 302.60521042 kHz SWT 280 ms Unit dBm

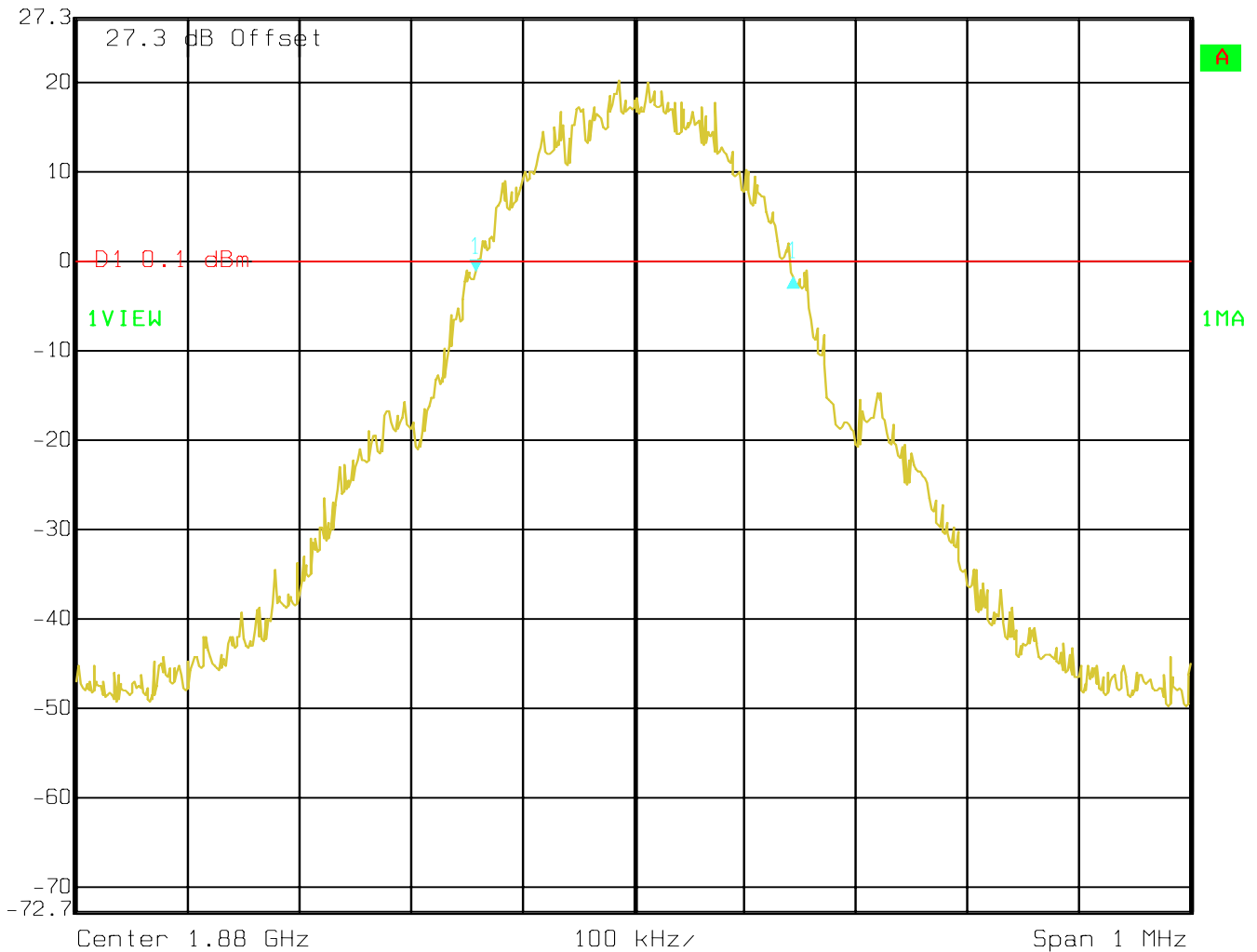


Date: 05.JAN.2005 13:11:24

-20dBc BANDWIDTH CHANNEL 661(GSM-1900)

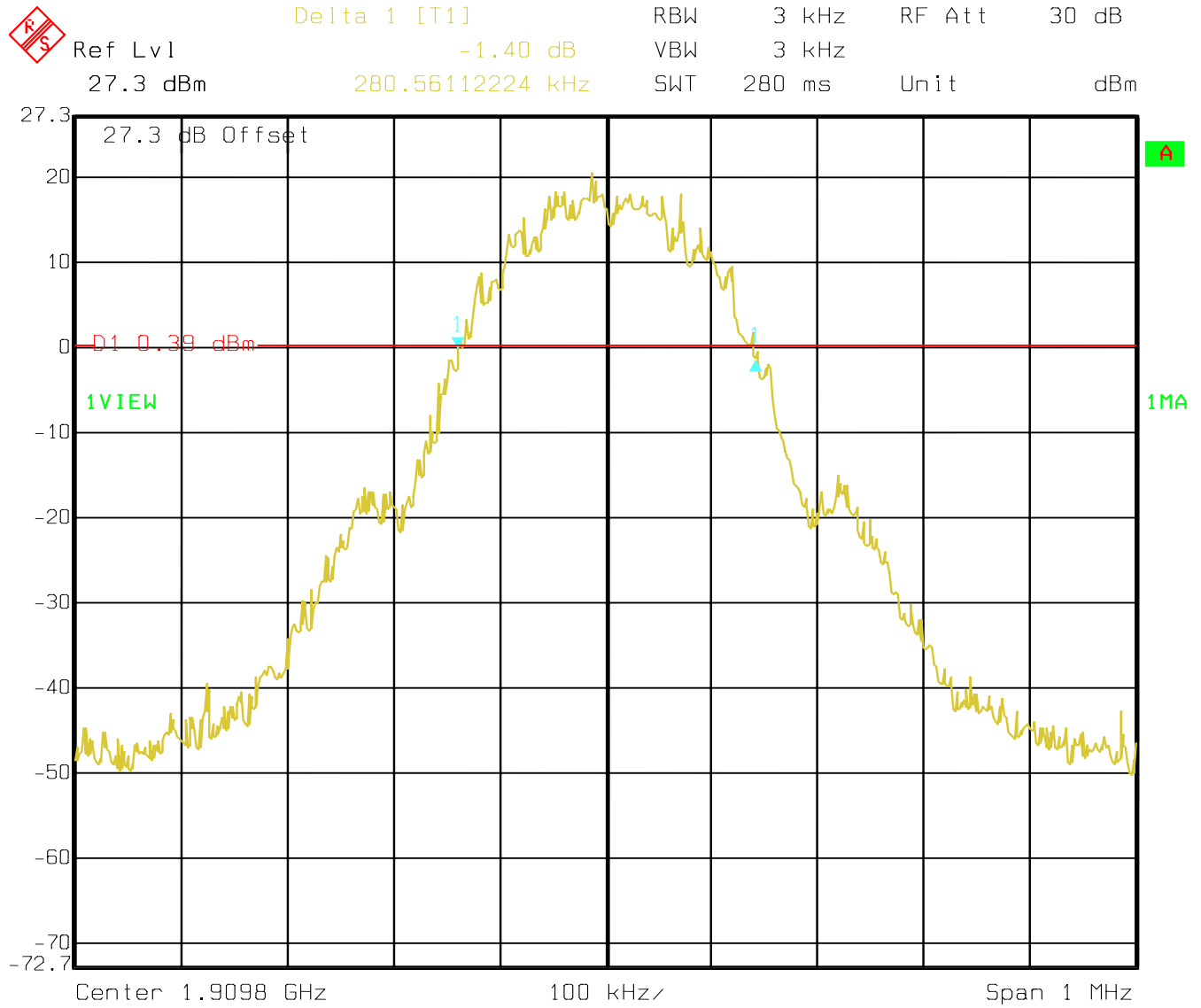


Delta 1 [T1] RBW 3 kHz RF Att 30 dB
 Ref Lvl -0.45 dB VBW 3 kHz
 27.3 dBm 284.56913828 kHz SWT 280 ms Unit dBm



Date: 05.JAN.2005 13:13:44

-20dBc BANDWIDTH CHANNEL 810(GSM-1900)



Date: 05.JAN.2005 13:15:59

EMISSION BANDWIDTH**§24.238(b)****Emission Bandwidth Results**

Similar to conducted emissions; Emission bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of GSM-850 & GSM-1900 frequency band. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the following pages.

-26dBc BANDWIDTH (GSM-850)

Frequency (MHz)	-26 dBc Bandwidth (kHz)
824.2	324.64
836.6	324.64
848.8	322.68

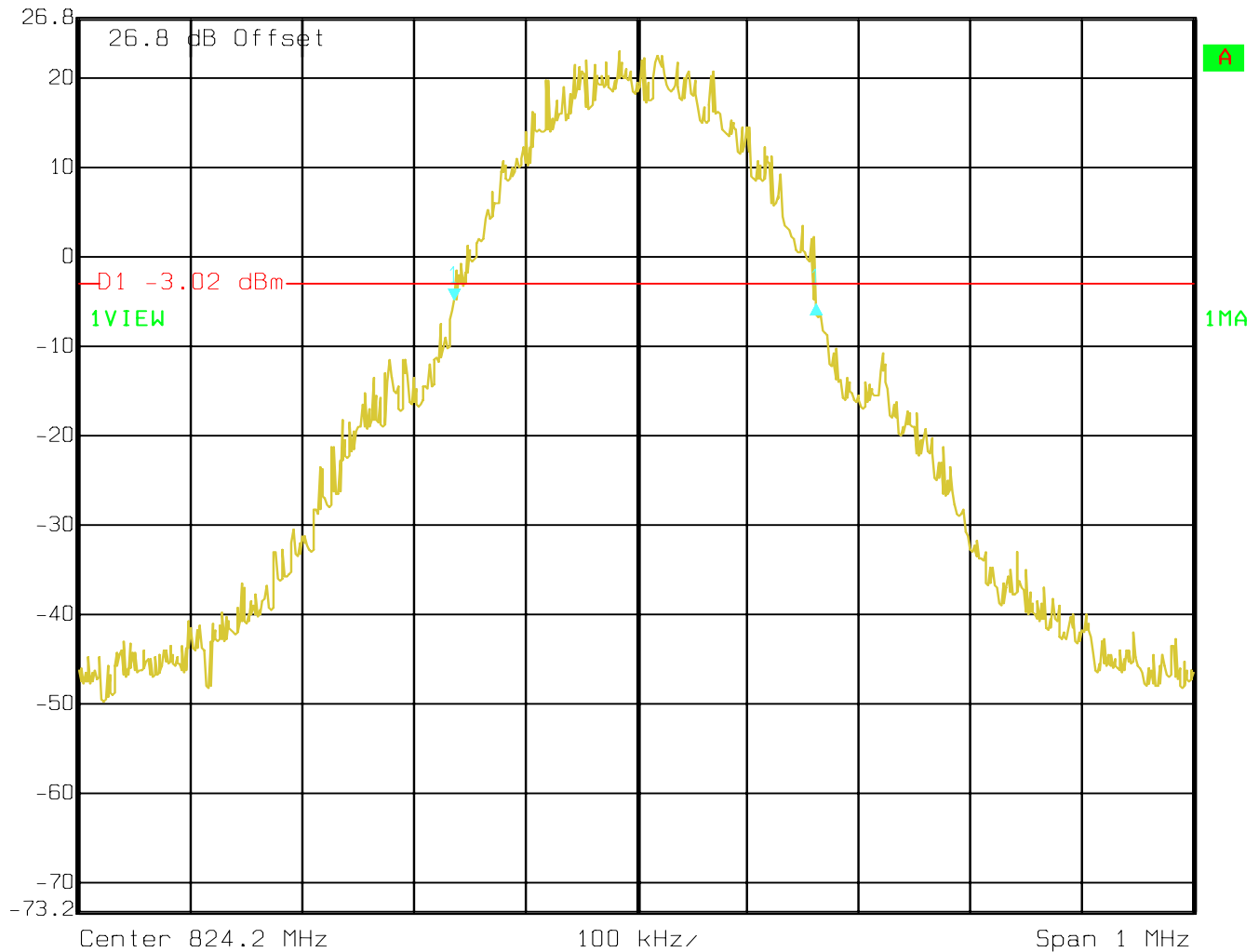
-26dBc BANDWIDTH (GSM-1900)

Frequency (MHz)	-26 dBc Bandwidth (kHz)
1850.2	320.64
1880	324.64
1909.8	316.63

-26dBc BANDWIDTH CHANNEL 128(GSM-850)

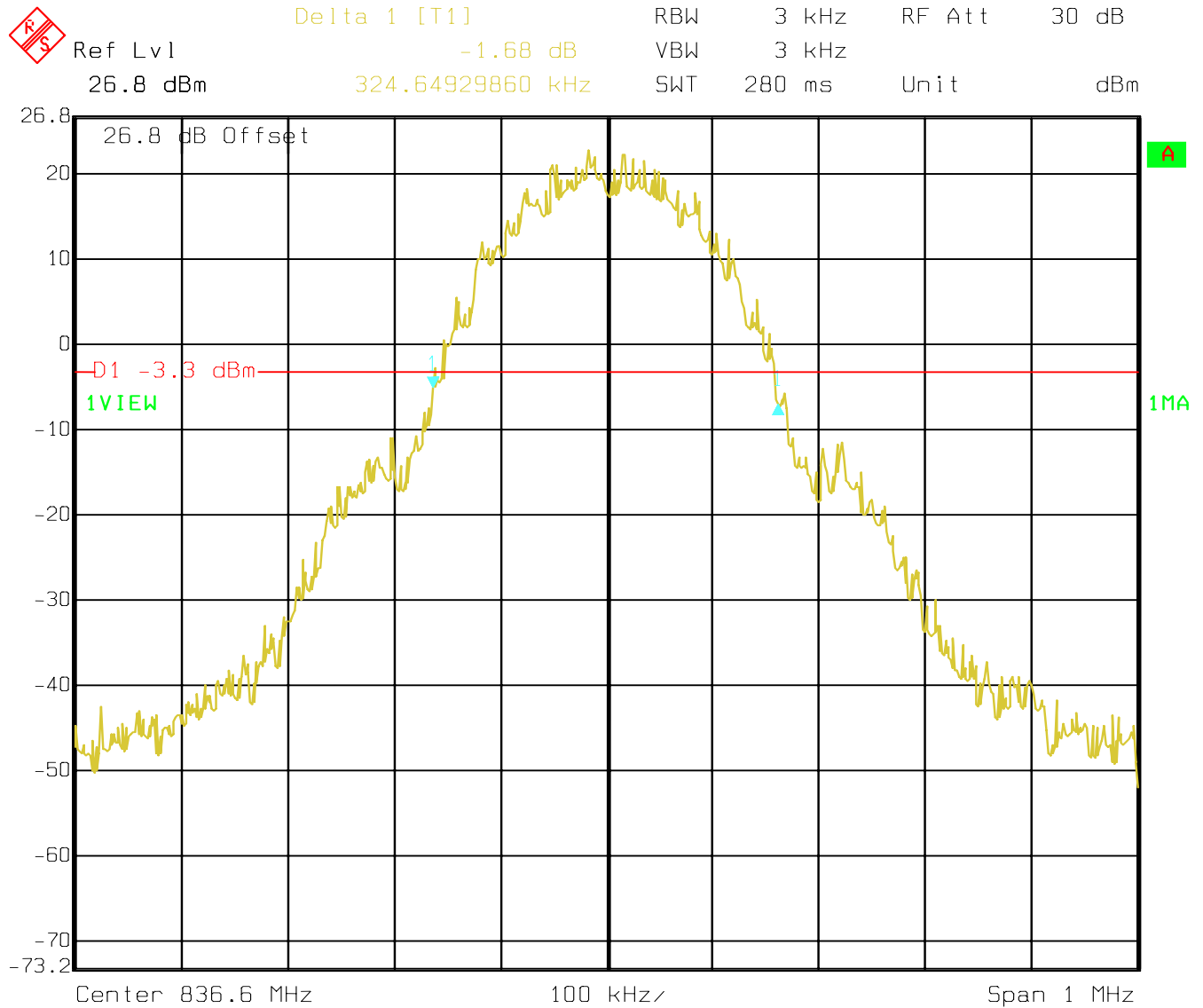


Delta 1 [T1] RBW 3 kHz RF Att 30 dB
 Ref Lvl -0.34 dB VBW 3 kHz
 26.8 dBm 324.64929860 kHz SWT 280 ms Unit dBm



Date: 05.JAN.2005 12:47:12

-26dBc BANDWIDTH CHANNEL 190(GSM-850)

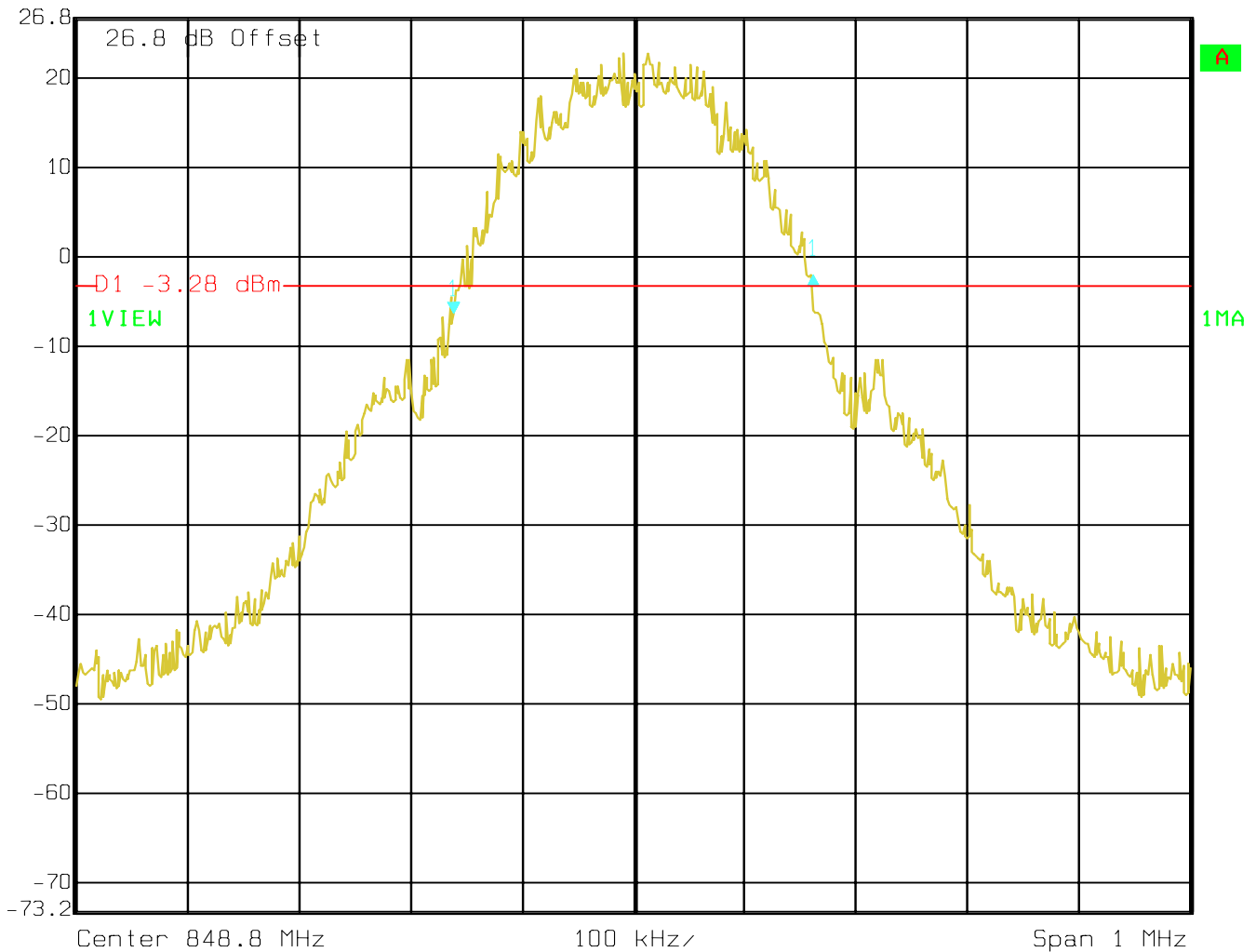


Date: 05.JAN.2005 12:49:10

-26dBc BANDWIDTH CHANNEL 251(GSM-850)

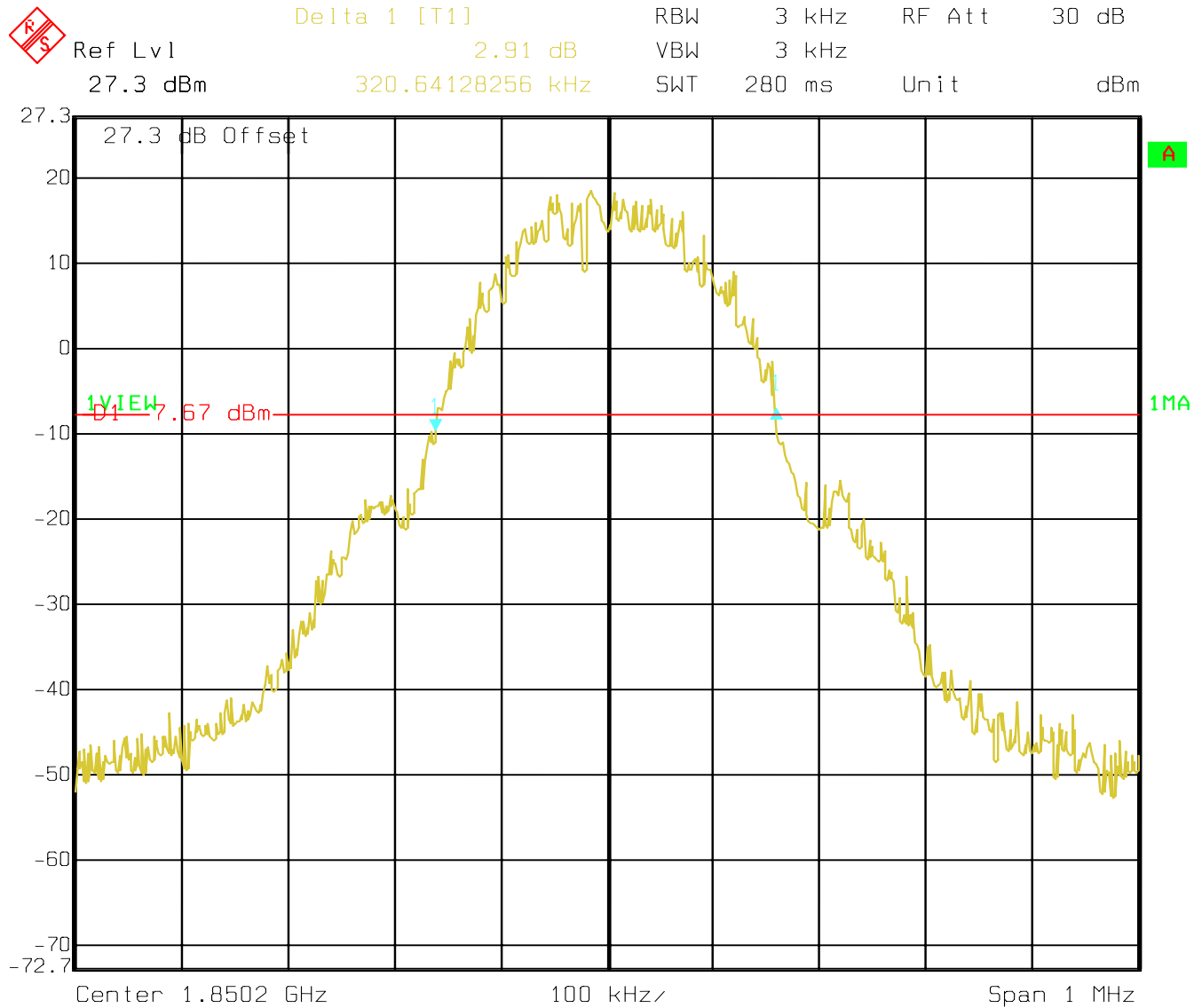


Delta 1 [T1] RBW 3 kHz RF Att 30 dB
 Ref Lvl 4.47 dB VBW 3 kHz
 26.8 dBm 322.64529058 kHz SWT 280 ms Unit dBm



Date: 05.JAN.2005 12:51:39

-26dBc BANDWIDTH CHANNEL 512(GSM-1900)

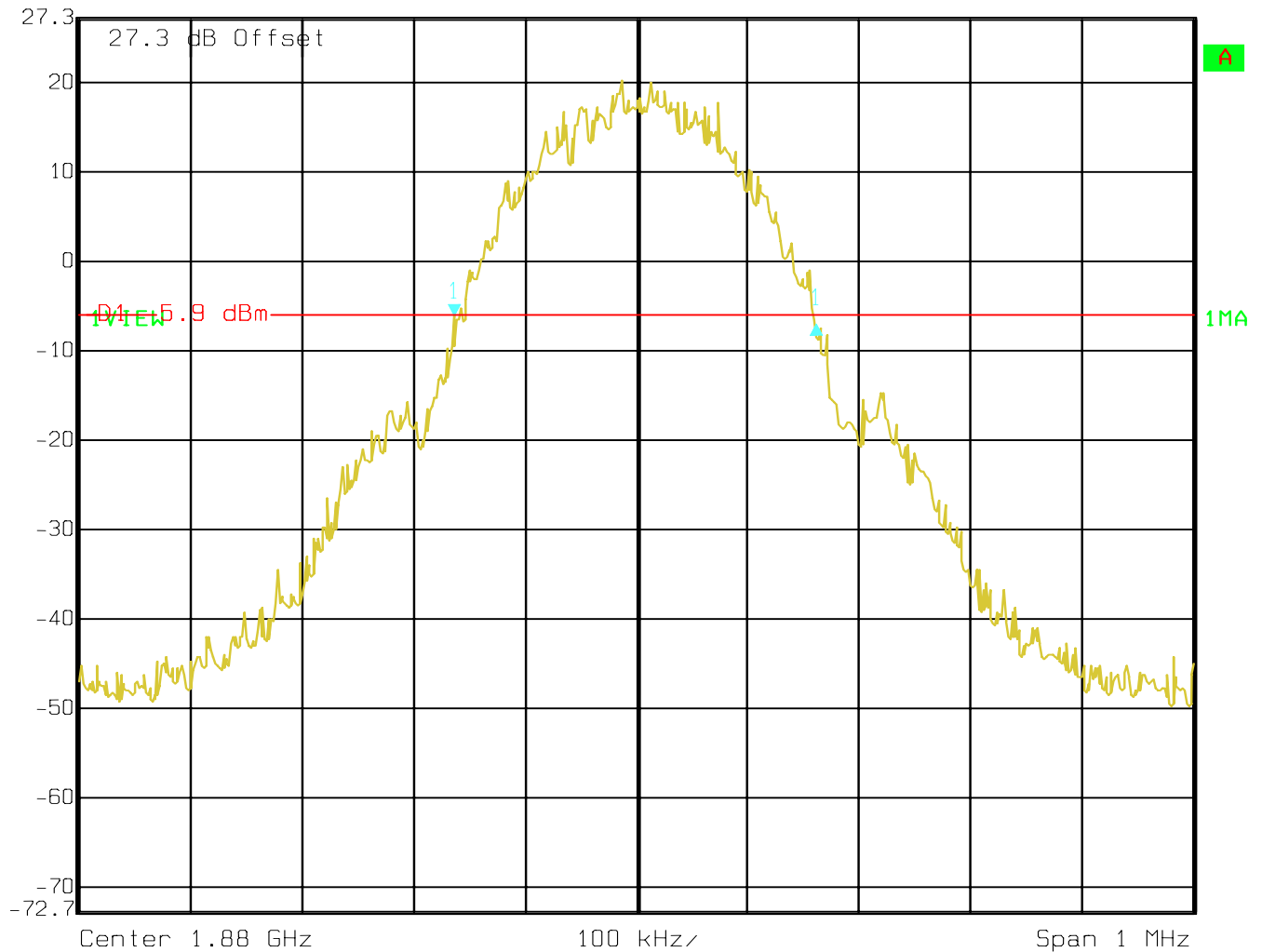


Date: 05.JAN.2005 13:12:09

-26dBc BANDWIDTH CHANNEL 661(GSM-1900)

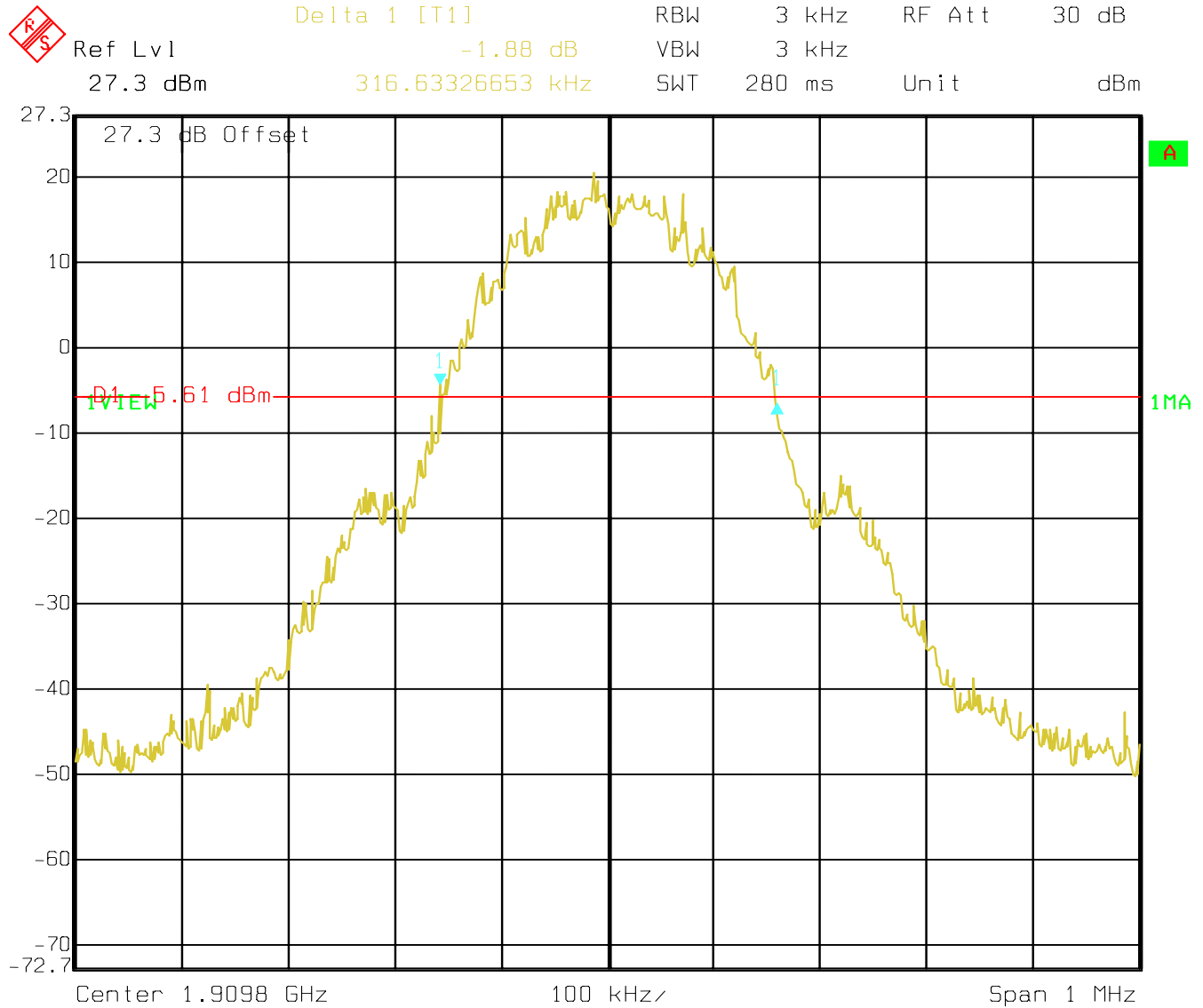


Delta 1 [T1] RBW 3 kHz RF Att 30 dB
 Ref Lvl -0.84 dB VBW 3 kHz
 27.3 dBm 324.64929860 kHz SWT 280 ms Unit dBm



Date: 05.JAN.2005 13:14:23

-26dBc BANDWIDTH CHANNEL 810(GSM-1900)



Date: 05.JAN.2005 13:16:35

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 – 2004 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 wave guide 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	1648.4	nf	1673.2	nf	1697.6	nf
3	2472.6	nf	2509.8	nf	2546.4	nf
4	3296.8	-57.2	3346.4	-58.41	3395.2	-54.65
5	4121	-55.91	4183	-58.34	4244	-57.24
6	4945.2	-52.7	5019.6	nf	5092.8	nf
7	5769.4	-49.81	5856.2	nf	5941.6	nf
8	6593.6	nf	6692.8	nf	6790.4	nf
9	7417.8	nf	7529.4	nf	7639.2	nf
10	8242	nf	8366	nf	8488	nf

RADIATED SPURIOUS EMISSIONS (GSM-850)**30MHz - 1GHz**

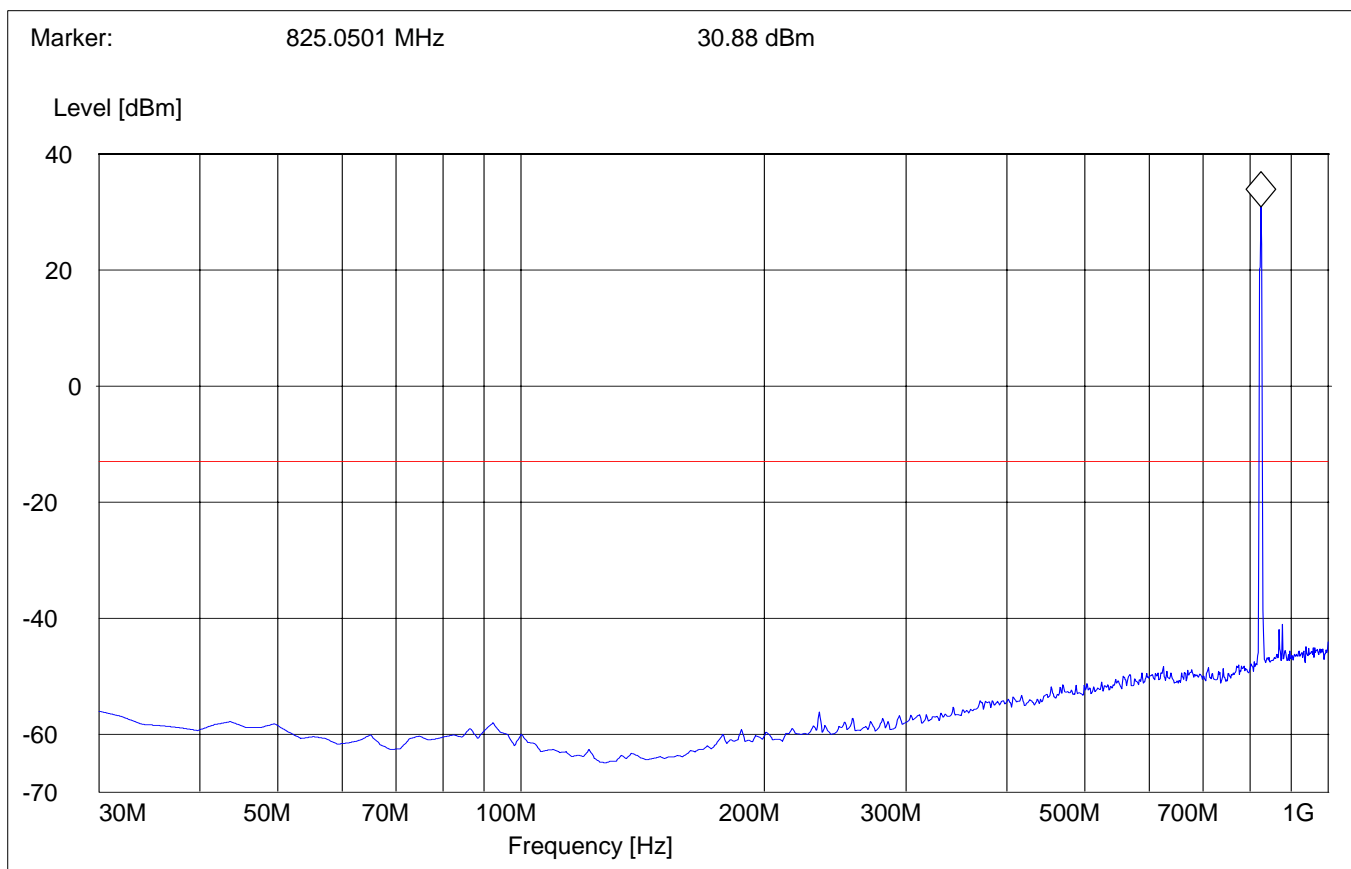
Spurious emission limit -13dBm

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

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

Note:

1. The peak above the limit line is the carrier freq. at ch-128.
2. This plot is valid for low, mid & high channels (worst-case plot for both polarities)



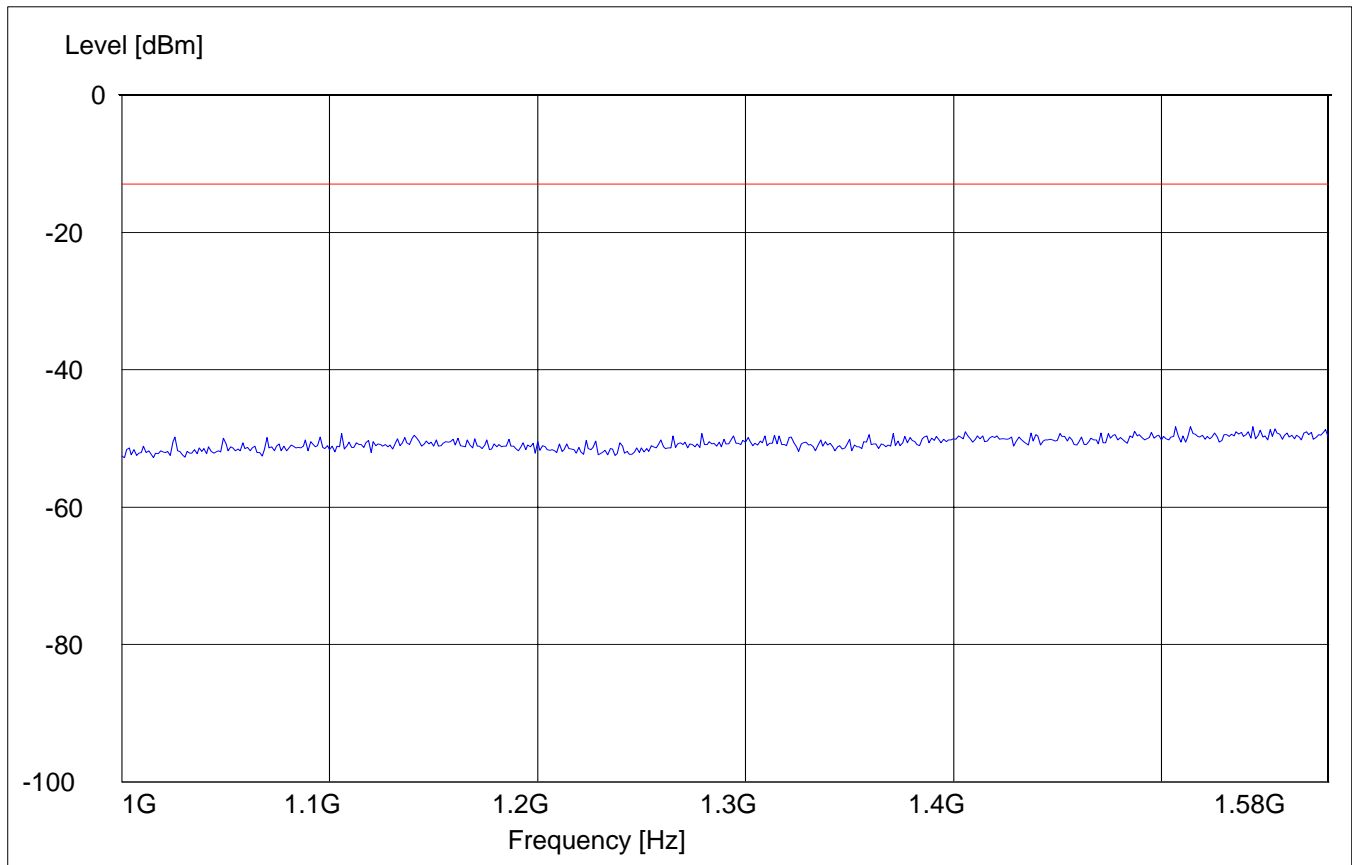
RADIATED SPURIOUS EMISSIONS (GSM-850)

Tx @ 824.2MHz: 1GHz – 1.58GHz

Spurious emission limit –13dBm

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

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



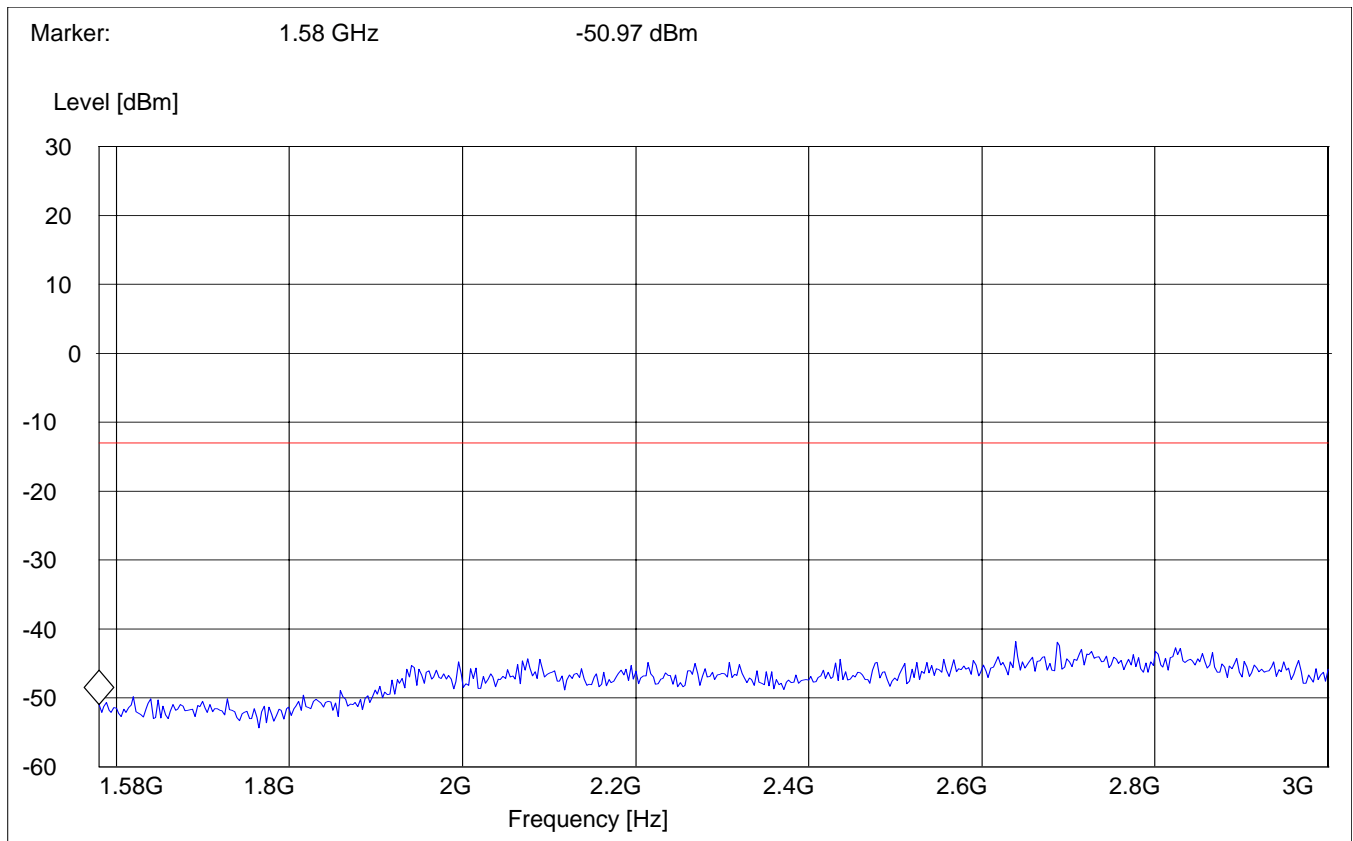
RADIATED SPURIOUS EMISSIONS (GSM-850)

Tx @ 824.2MHz: 1.58GHz – 3GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 1.58-3G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1.58GHz	3GHz	Max Peak	Coupled	1 MHz



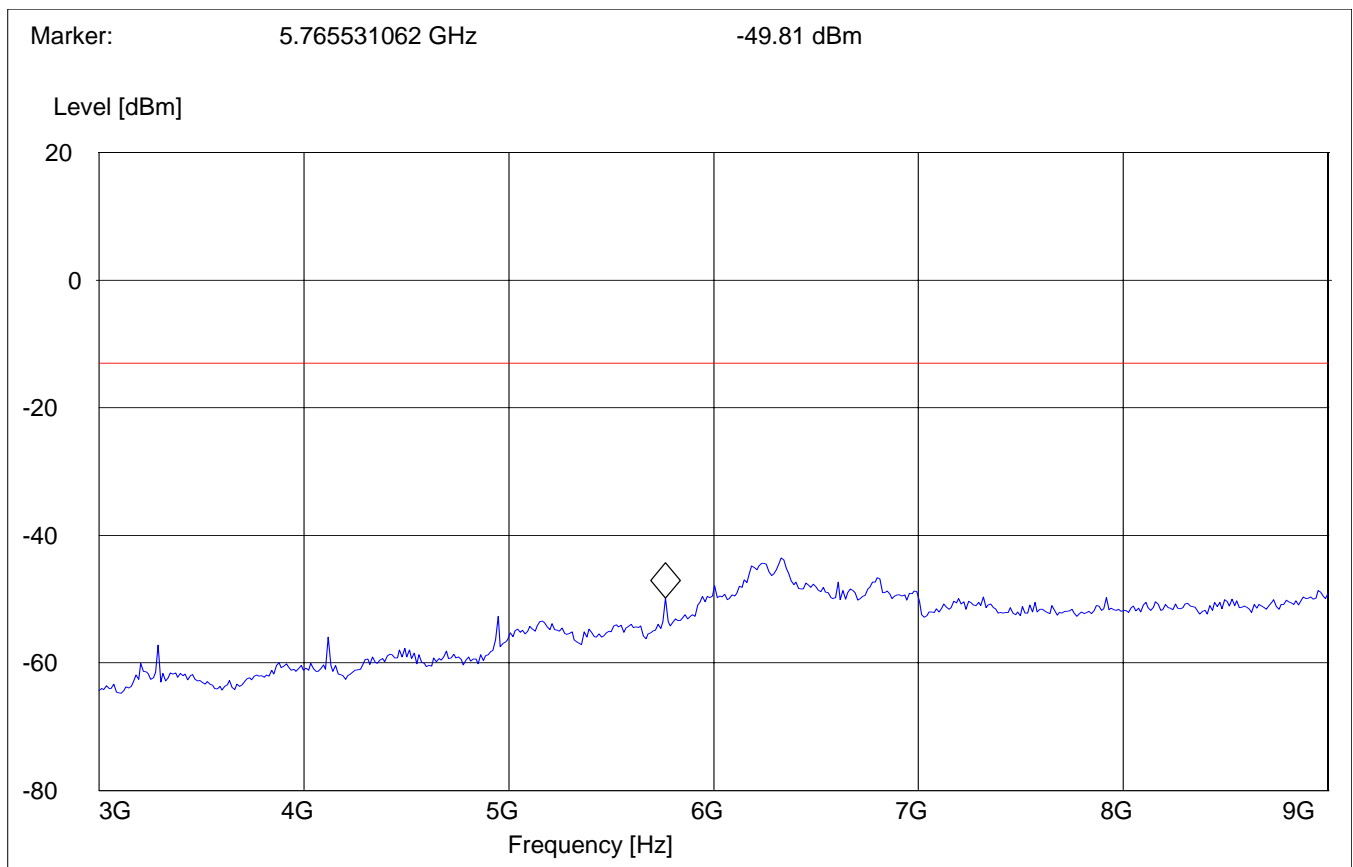
RADIATED SPURIOUS EMISSIONS (GSM-850)

Tx @ 824.2MHz: 3GHz – 9GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 3-9G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
3GHz	9GHz	Max Peak	Coupled	1 MHz



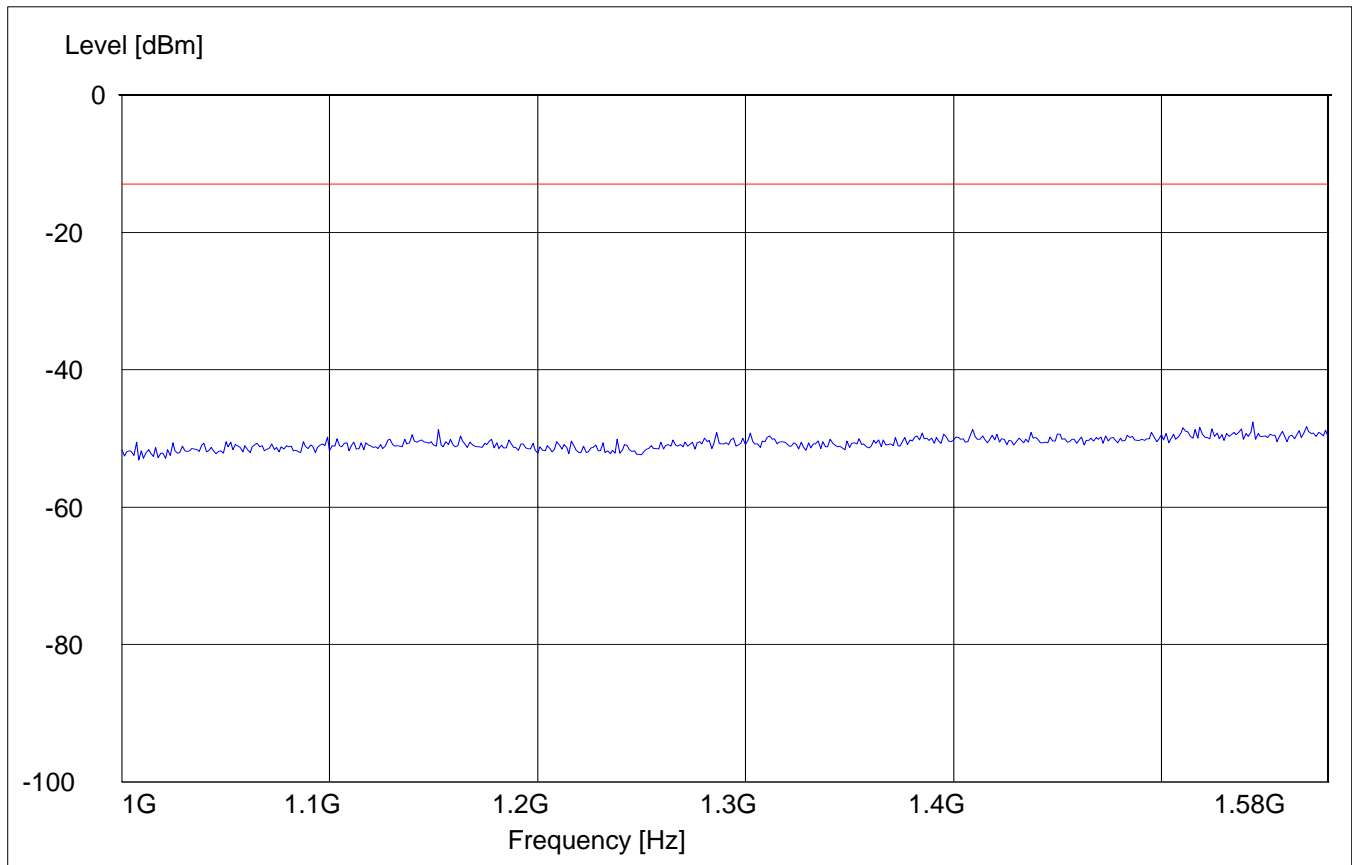
RADIATED SPURIOUS EMISSIONS (GSM-850)

Tx @ 836.6MHz: 1GHz – 1.58GHz

Spurious emission limit –13dBm

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

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



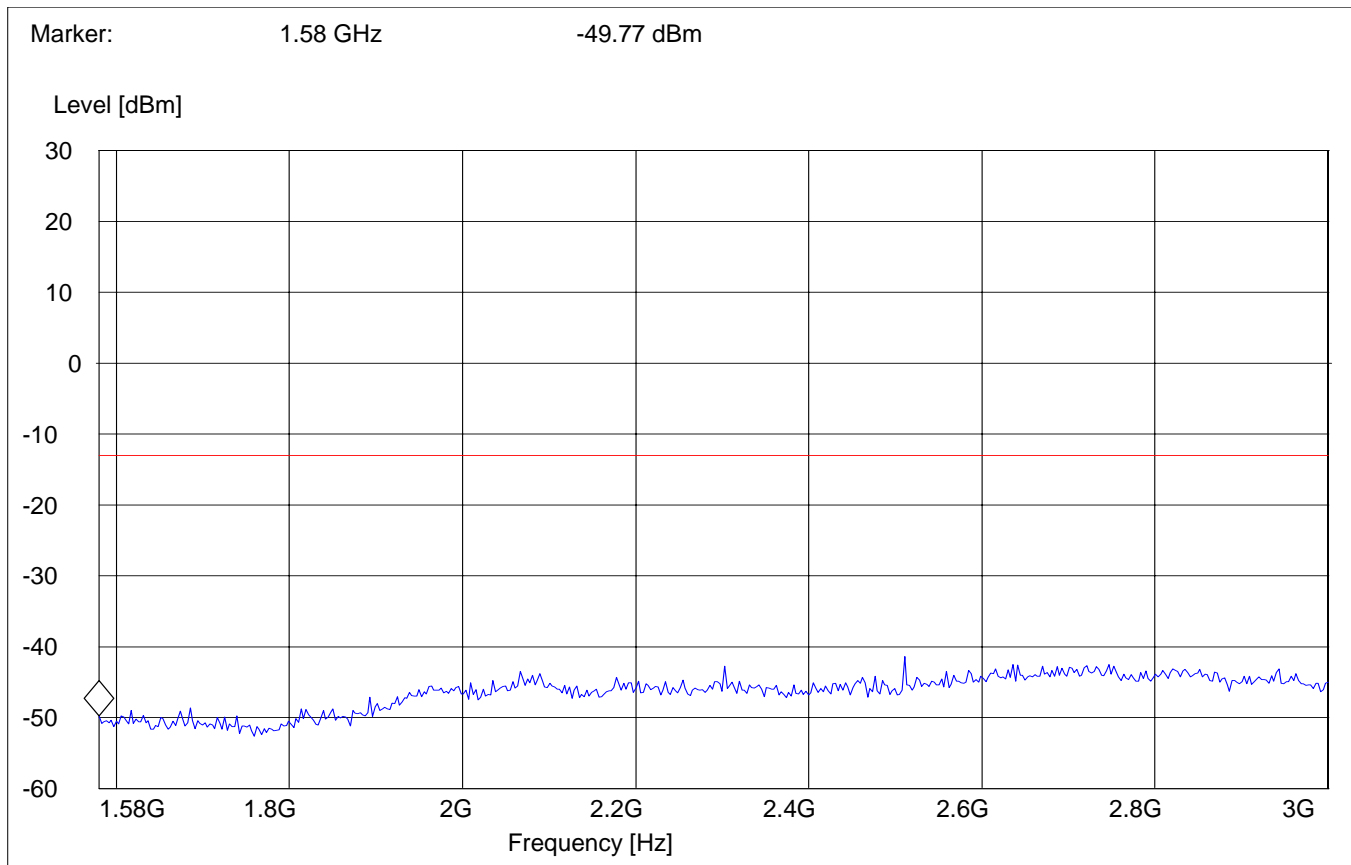
RADIATED SPURIOUS EMISSIONS (GSM-850)

Tx @ 836.6MHz: 1.58GHz – 3GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 1.58-3G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1.58GHz	3GHz	Max Peak	Coupled	1 MHz



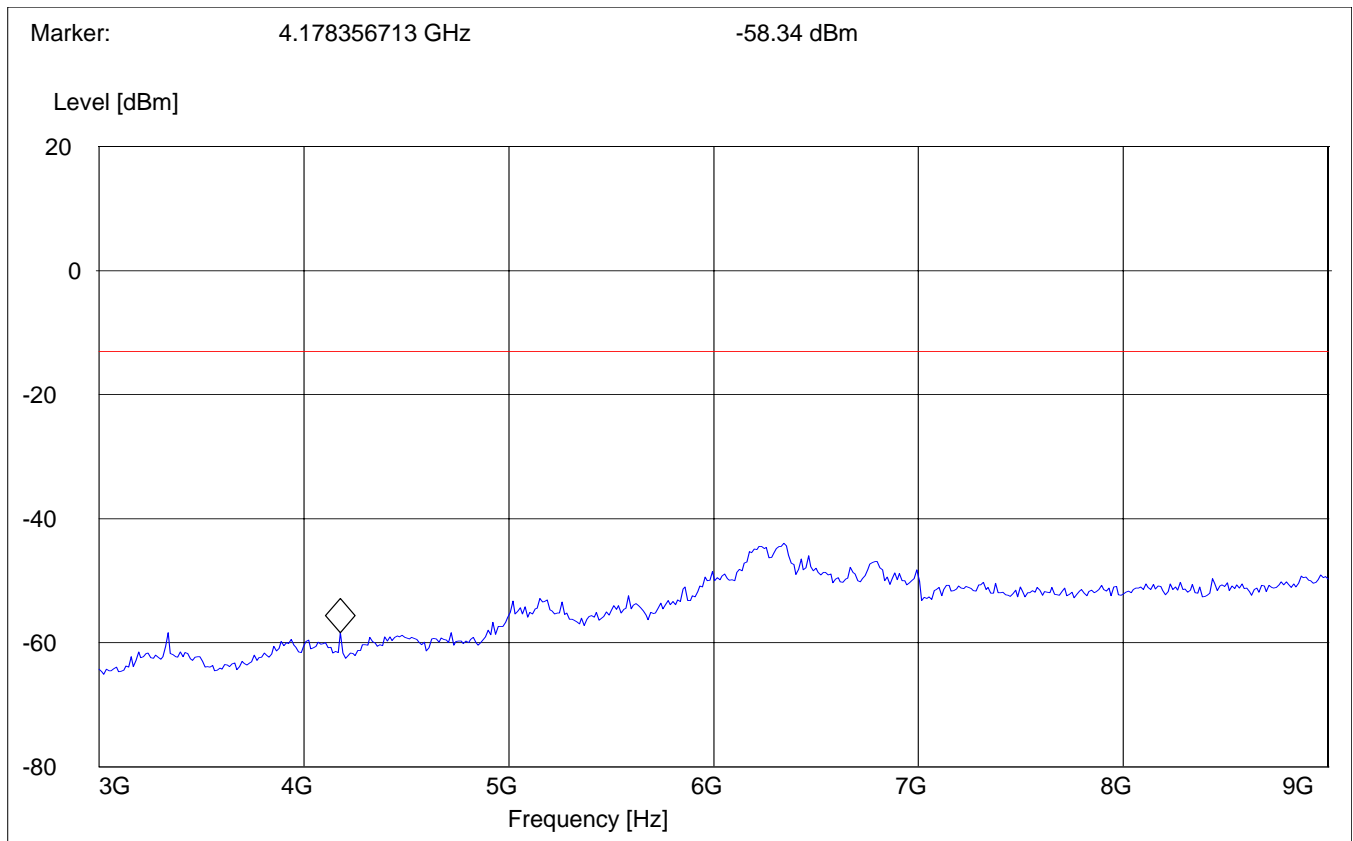
RADIATED SPURIOUS EMISSIONS (GSM-850)

Tx @ 836.6MHz: 3GHz – 9GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 3-9G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
3GHz	9GHz	Max Peak	Coupled	1 MHz



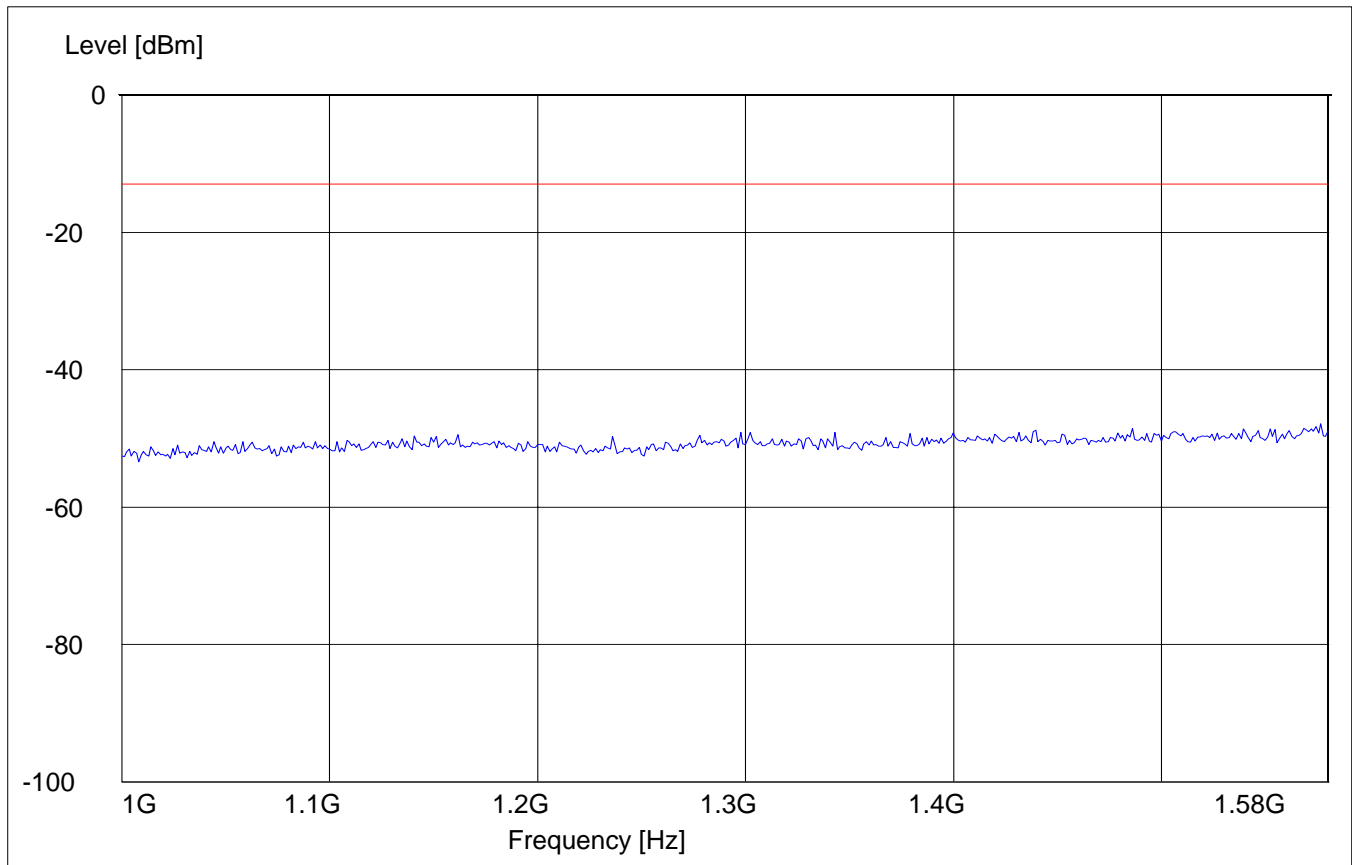
RADIATED SPURIOUS EMISSIONS (GSM-850)

Tx @ 848.8MHz: 1GHz – 1.58GHz

Spurious emission limit –13dBm

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

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



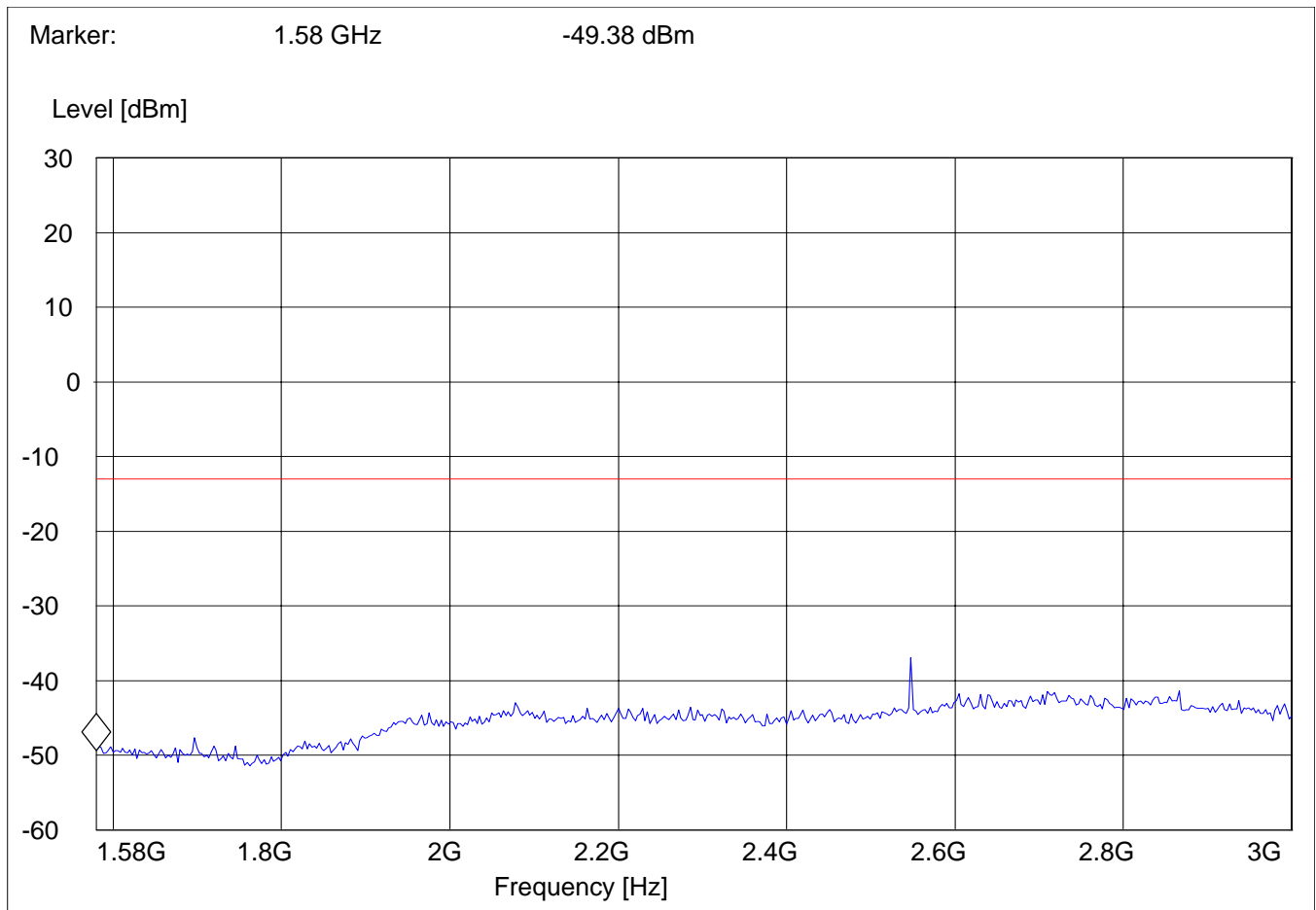
RADIATED SPURIOUS EMISSIONS (GSM-850)

Tx @ 848.8MHz: 1.58GHz – 3GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 1.58-3G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1.58GHz	3GHz	Max Peak	Coupled	1 MHz

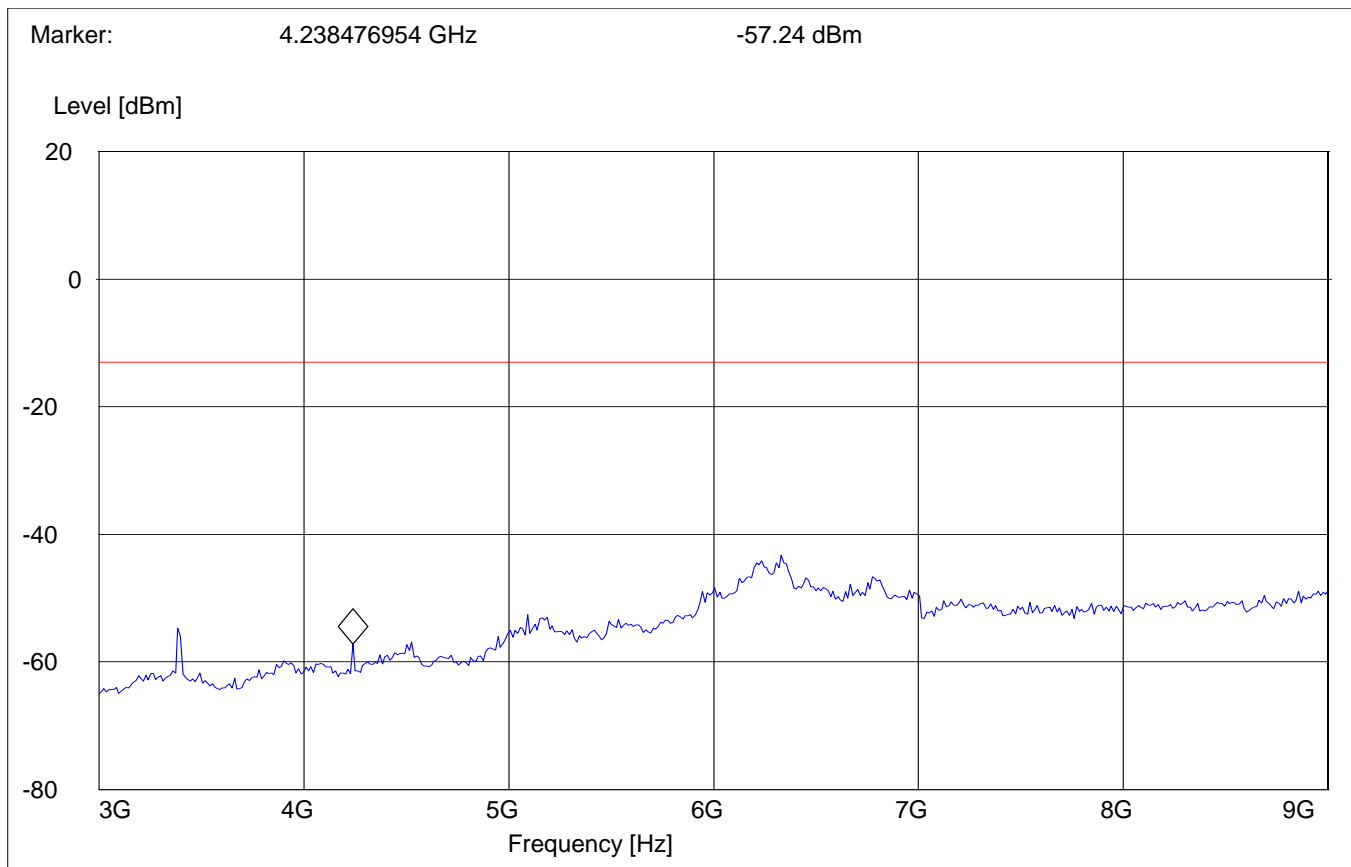


RADIATED SPURIOUS EMISSIONS (GSM-850)**Tx @ 848.8MHz: 3GHz – 9GHz**

Spurious emission limit –13dBm

SWEEP TABLE: "FCC 22 Spur 3-9G"

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
3GHz	9GHz	Max Peak	Coupled	1 MHz



RESULTS OF RADIATED TESTS PCS-1900:

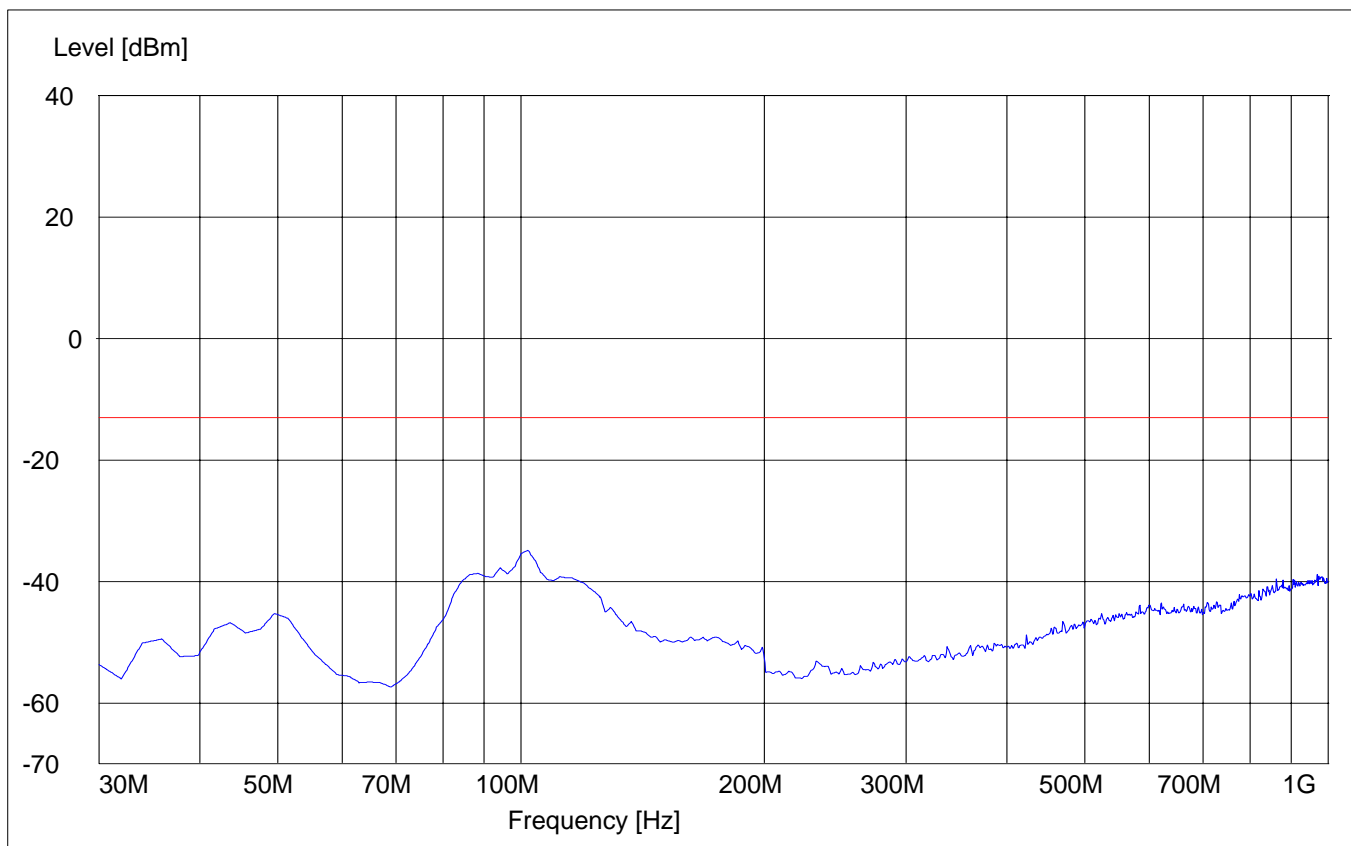
Harmonic	Tx ch-512 Freq.(MHz)	Level (dBm)	Tx ch-661 Freq. (MHz)	Level (dBm)	Tx ch-810 Freq. (MHz)	Level (dBm)
2	3700.4	-52.25	3760	-46.33	3819.6	-44.88
3	5550.6	nf	5640	nf	5729.4	nf
4	7400.8	-37.5	7520	-33.24	7639.2	-36.6
5	9251		9400	nf	9549	nf
6	11101.2	-34.95	11280	nf	11458.8	nf
7	12951.4	nf	13160	nf	13368.6	nf
8	14801.6	nf	15040	nf	15278.4	nf
9	16651.8	nf	16920	nf	17188.2	nf
10	18502	nf	18800	nf	19098	nf

RADIATED SPURIOUS EMISSIONS**30MHz - 1GHz**

Spurious emission limit -13dBm

Antenna: vertical***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

Note: This plot is valid for low, mid & high channels (worst-case plot for both polarities)

RADIATED SPURIOUS EMISSIONS

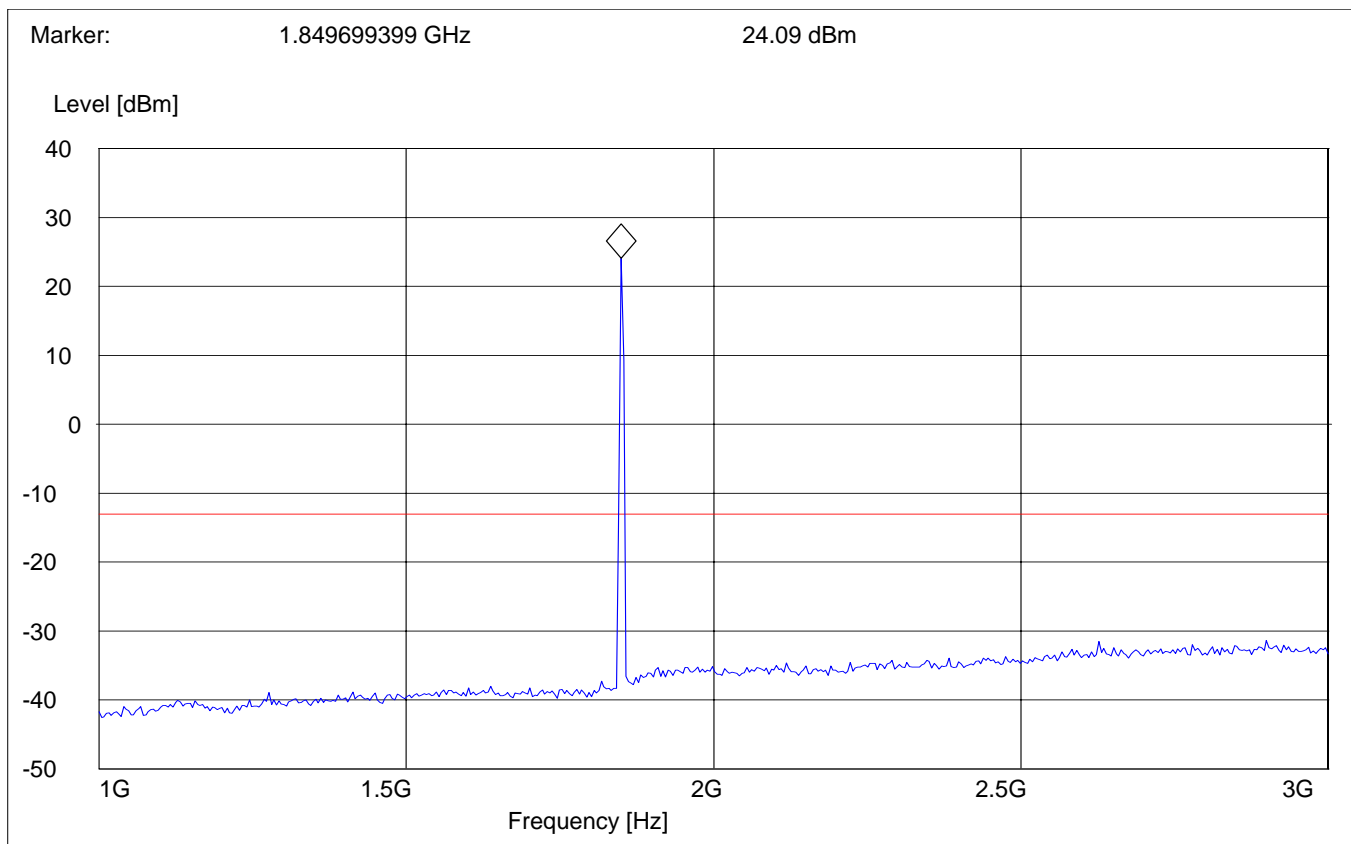
Tx @ 1850.2MHz: 1GHz – 3GHz

Spurious emission limit -13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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

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

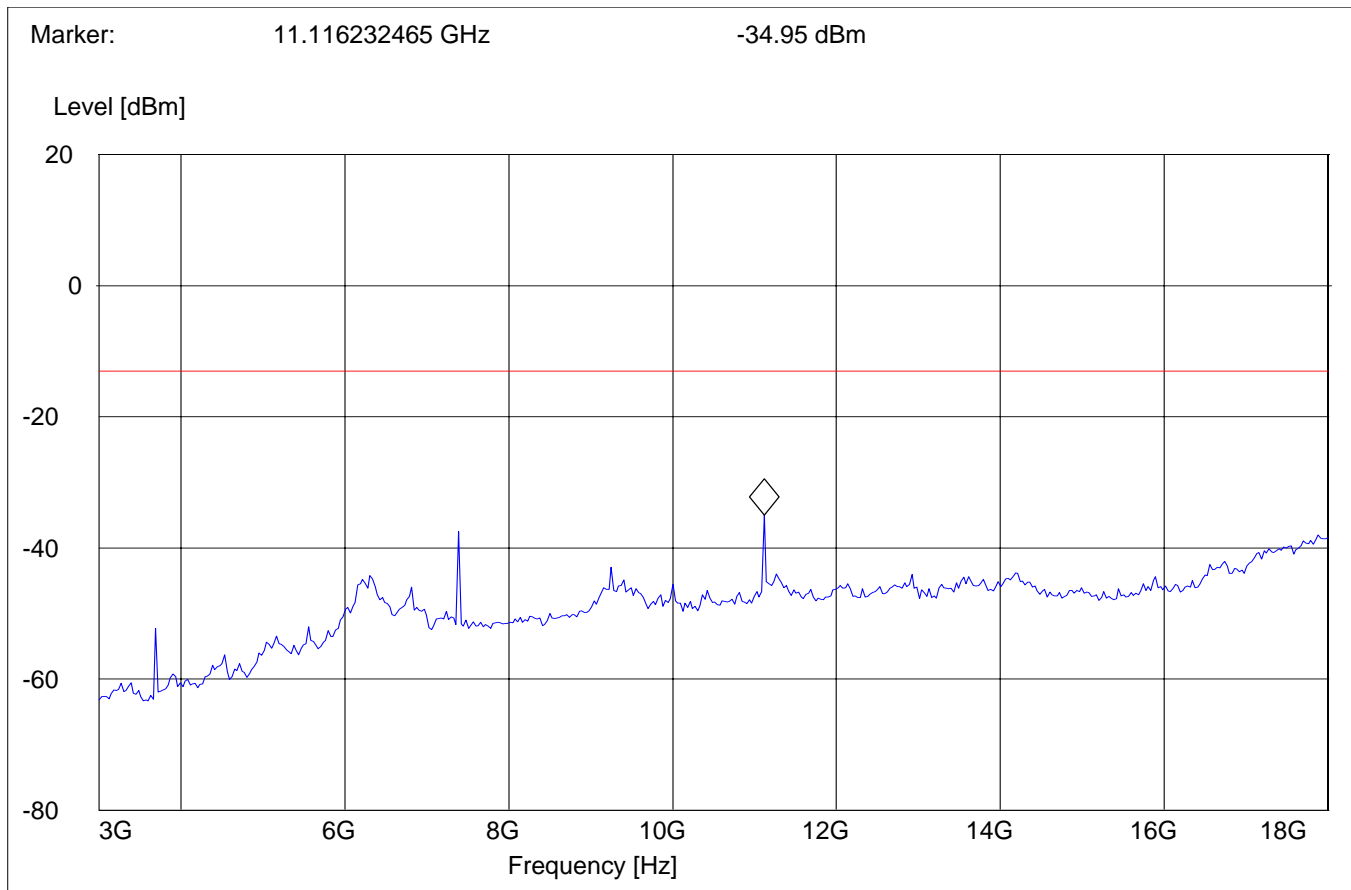


RADIATED SPURIOUS EMISSIONS**Tx @ 1850.2MHz: 3GHz – 18GHz**

Spurious emission limit -13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

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



RADIATED SPURIOUS EMISSIONS

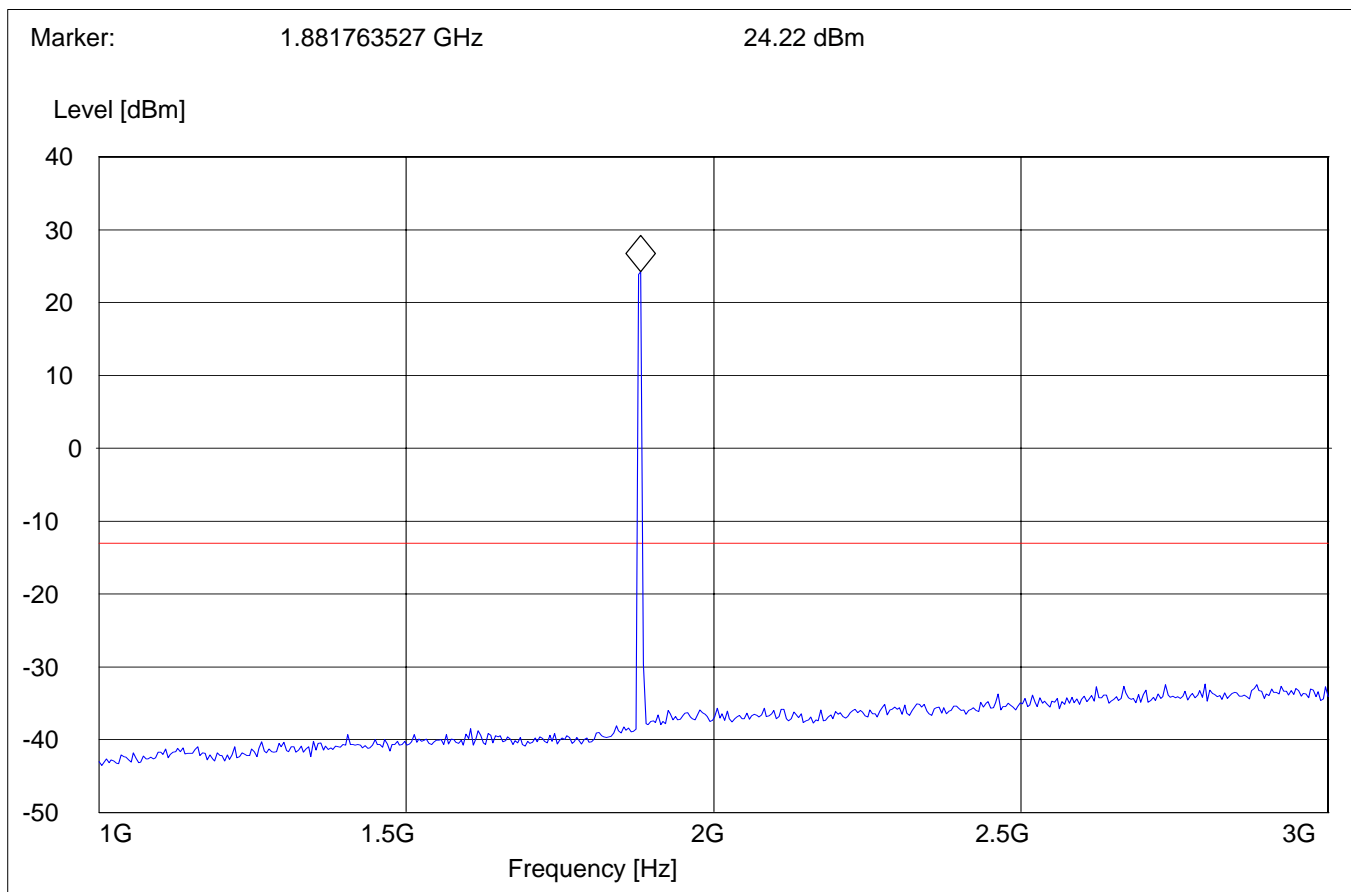
Tx @ 1880.0MHz: 1GHz – 3GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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

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



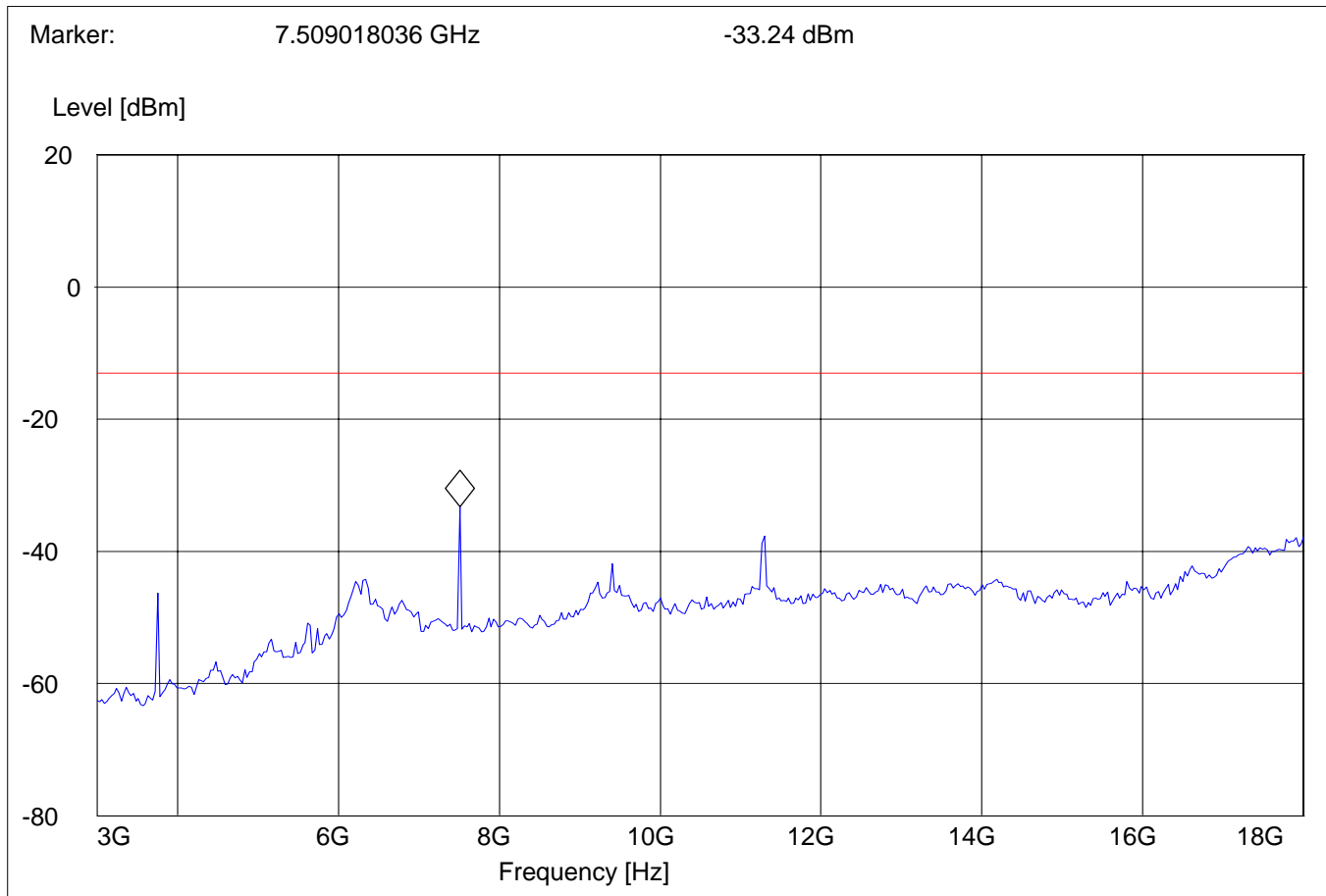
RADIATED SPURIOUS EMISSIONS

Tx @ 1880.0MHz: 3GHz – 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

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



RADIATED SPURIOUS EMISSIONS

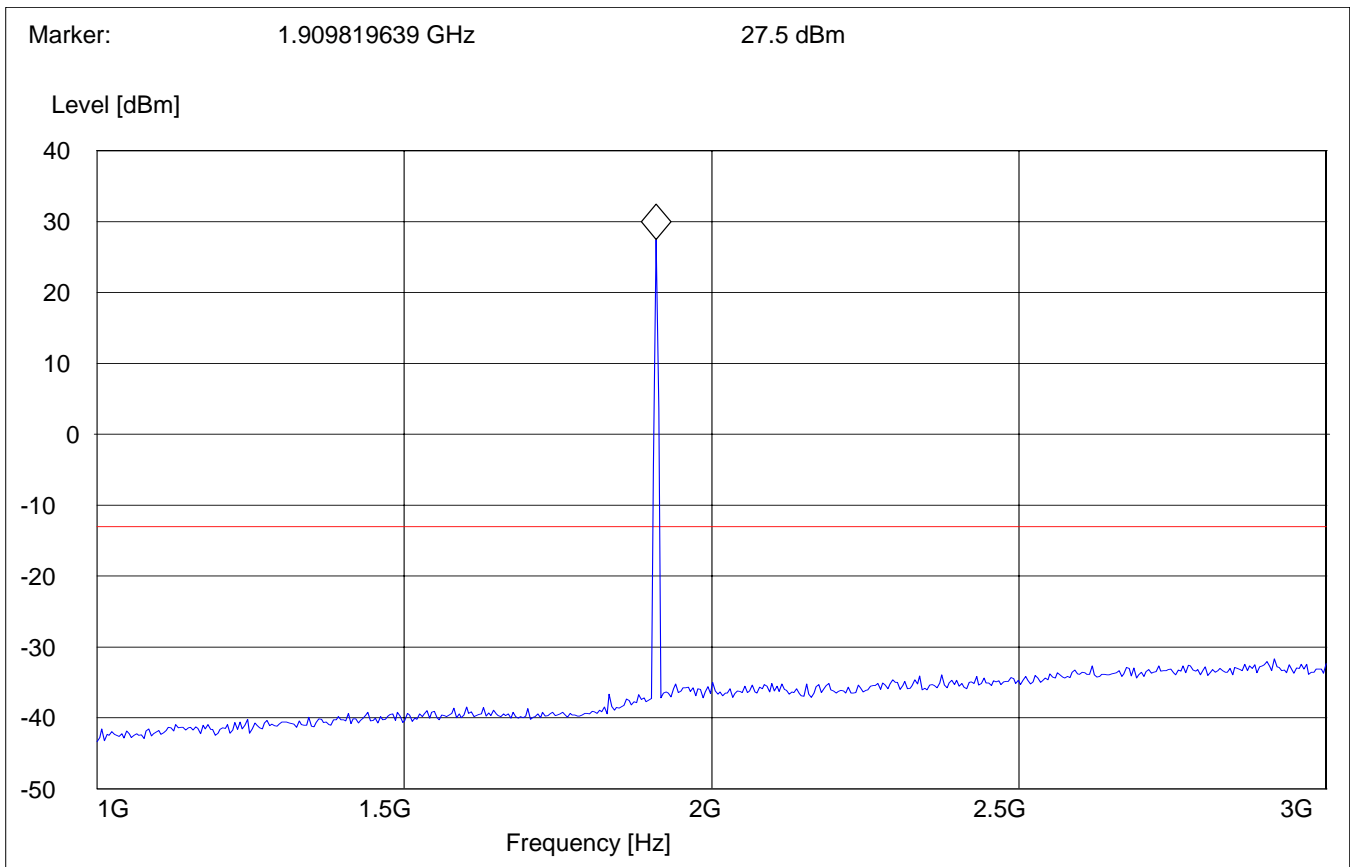
Tx @ 1909.8MHz: 1GHz – 3GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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

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



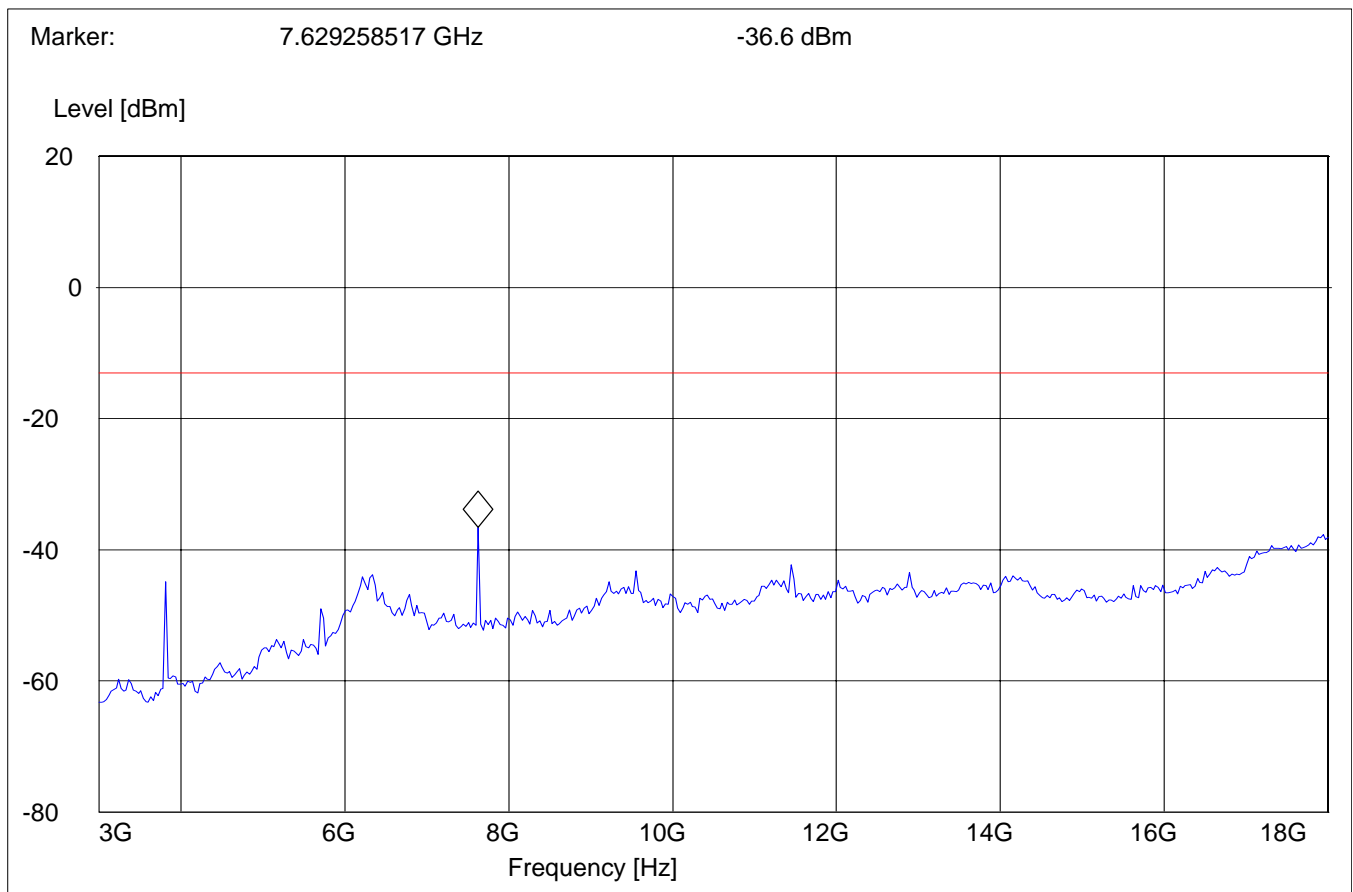
RADIATED SPURIOUS EMISSIONS

Tx @ 1909.8MHz: 3GHz – 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

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



RADIATED SPURIOUS EMISSIONS

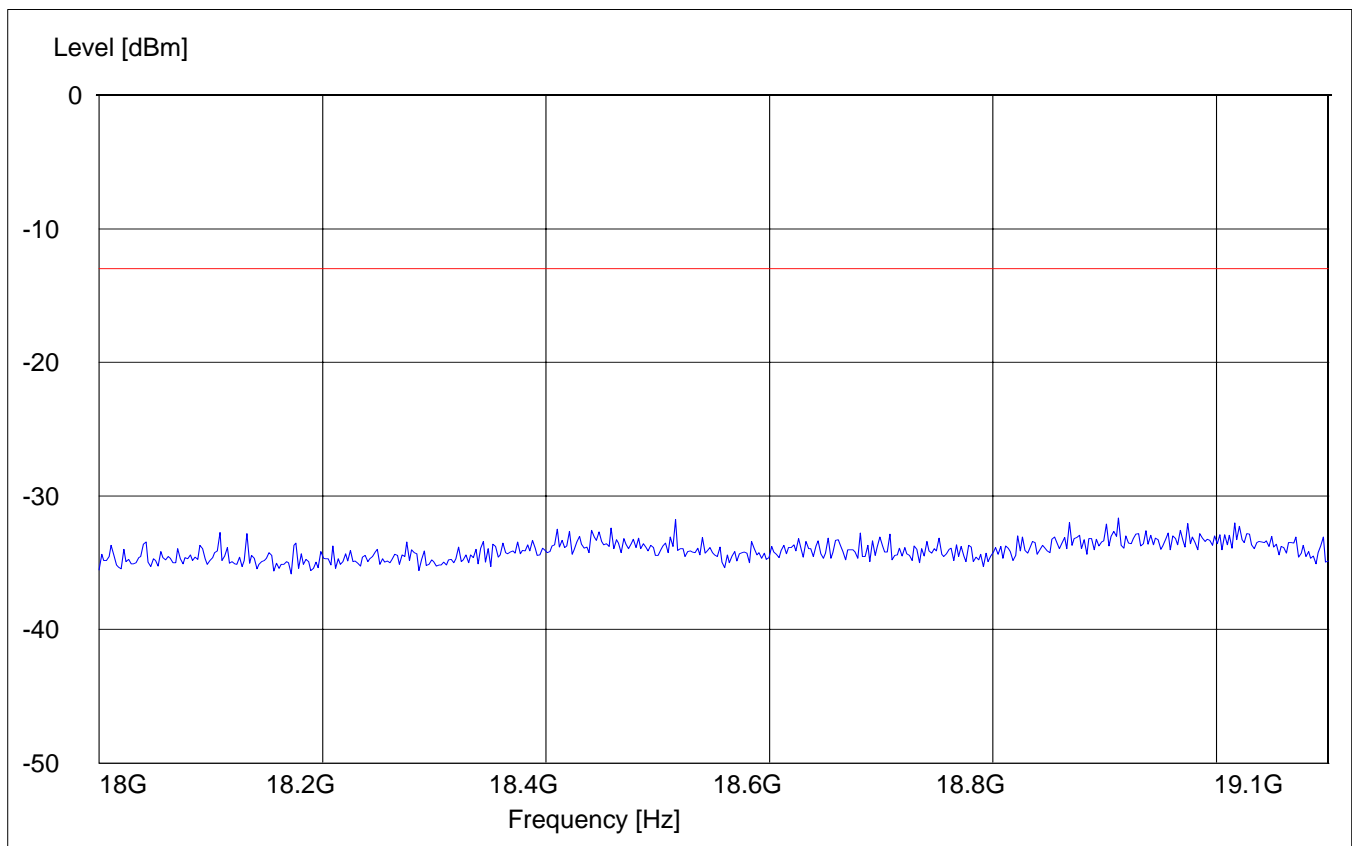
18GHz – 19.1GHz

Spurious emission limit –13dBm

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

Note: This plot is valid for low, mid & high channels (worst-case plot)

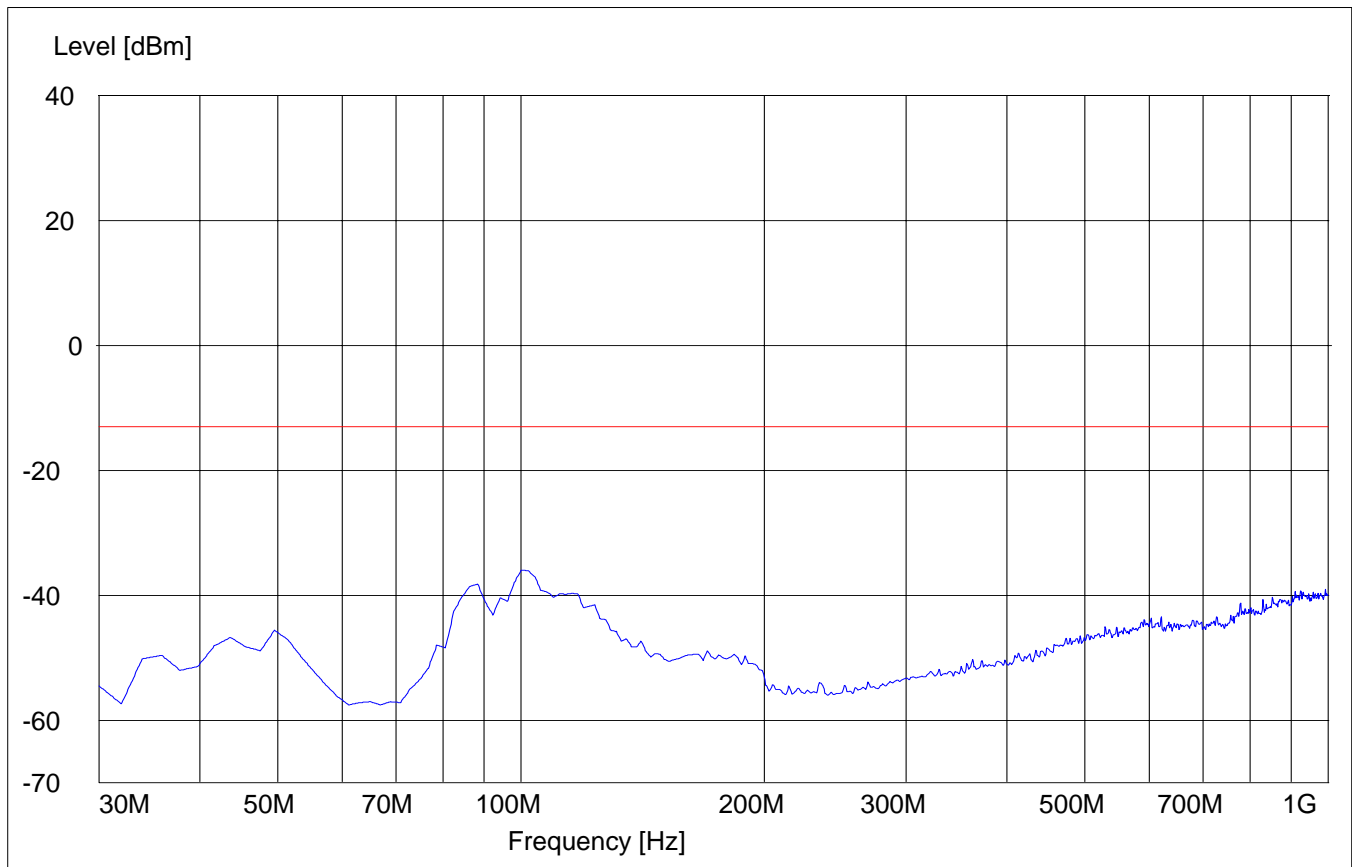


RADIATED SPURIOUS EMISSIONS**EUT in Idle Mode: 30MHz – 1GHz**

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



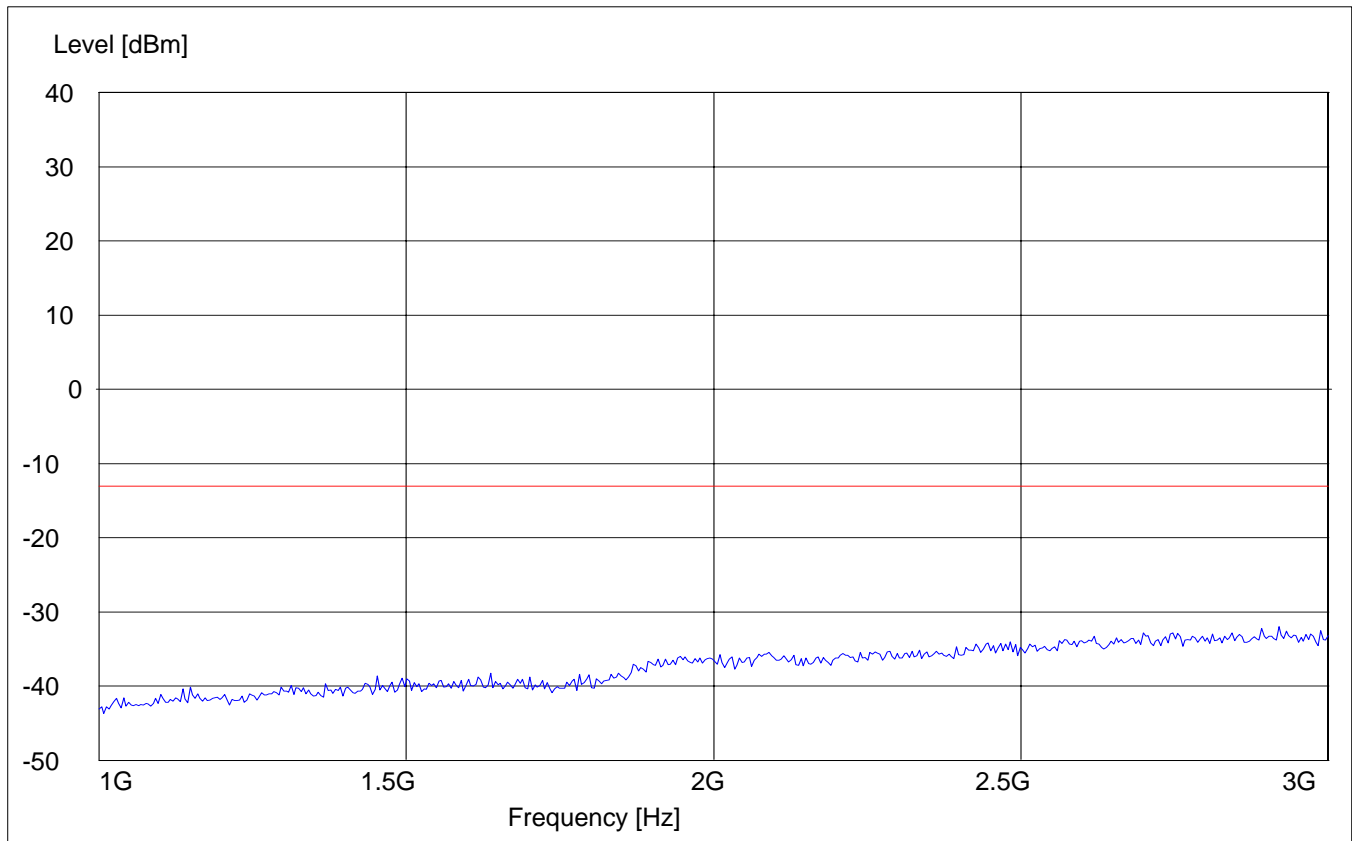
RADIATED SPURIOUS EMISSIONS

EUT in Idle Mode: 1GHz – 3GHz

Spurious emission limit –13dBm

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



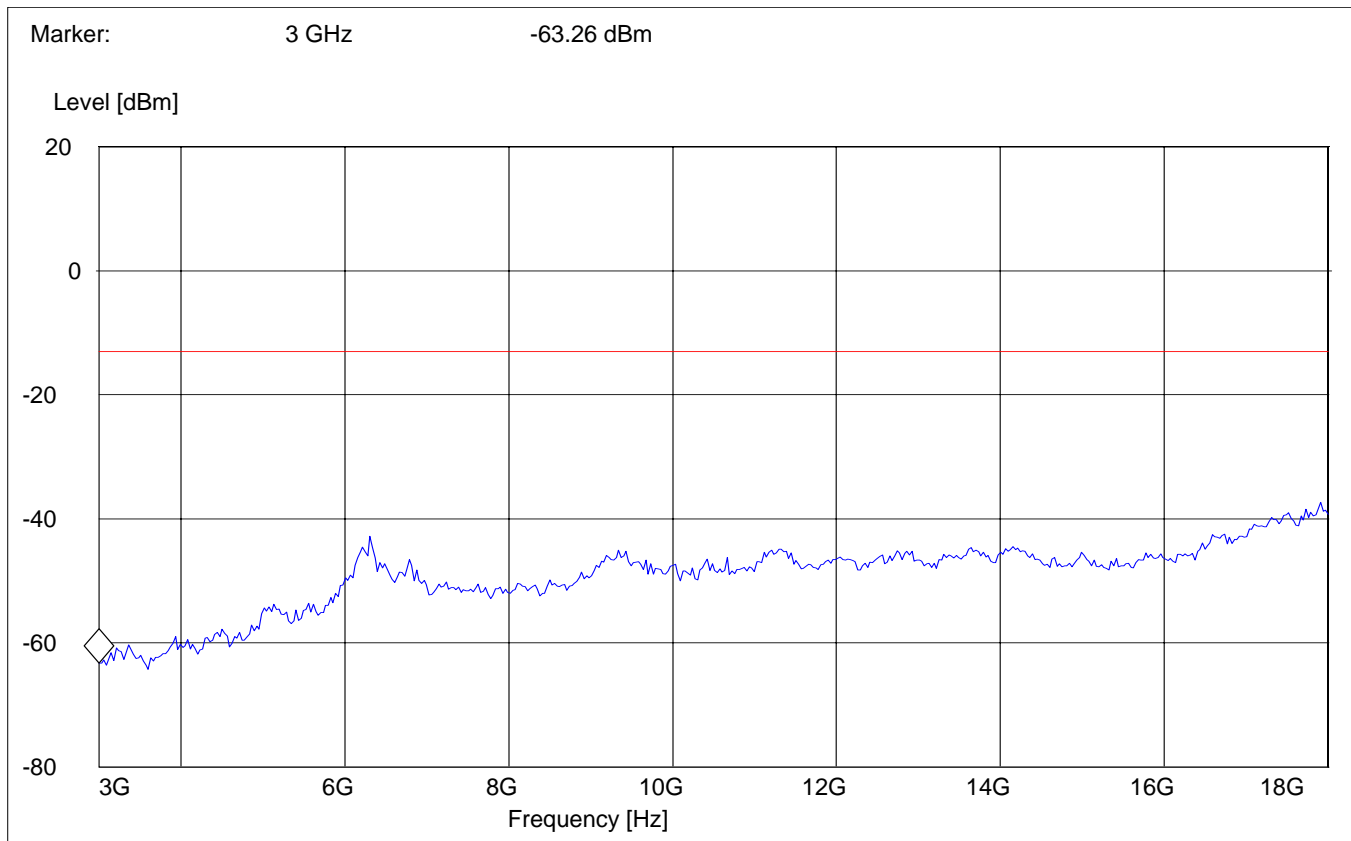
RADIATED SPURIOUS EMISSIONS

EUT in Idle Mode: 3GHz – 18GHz

Spurious emission limit –13dBm

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

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



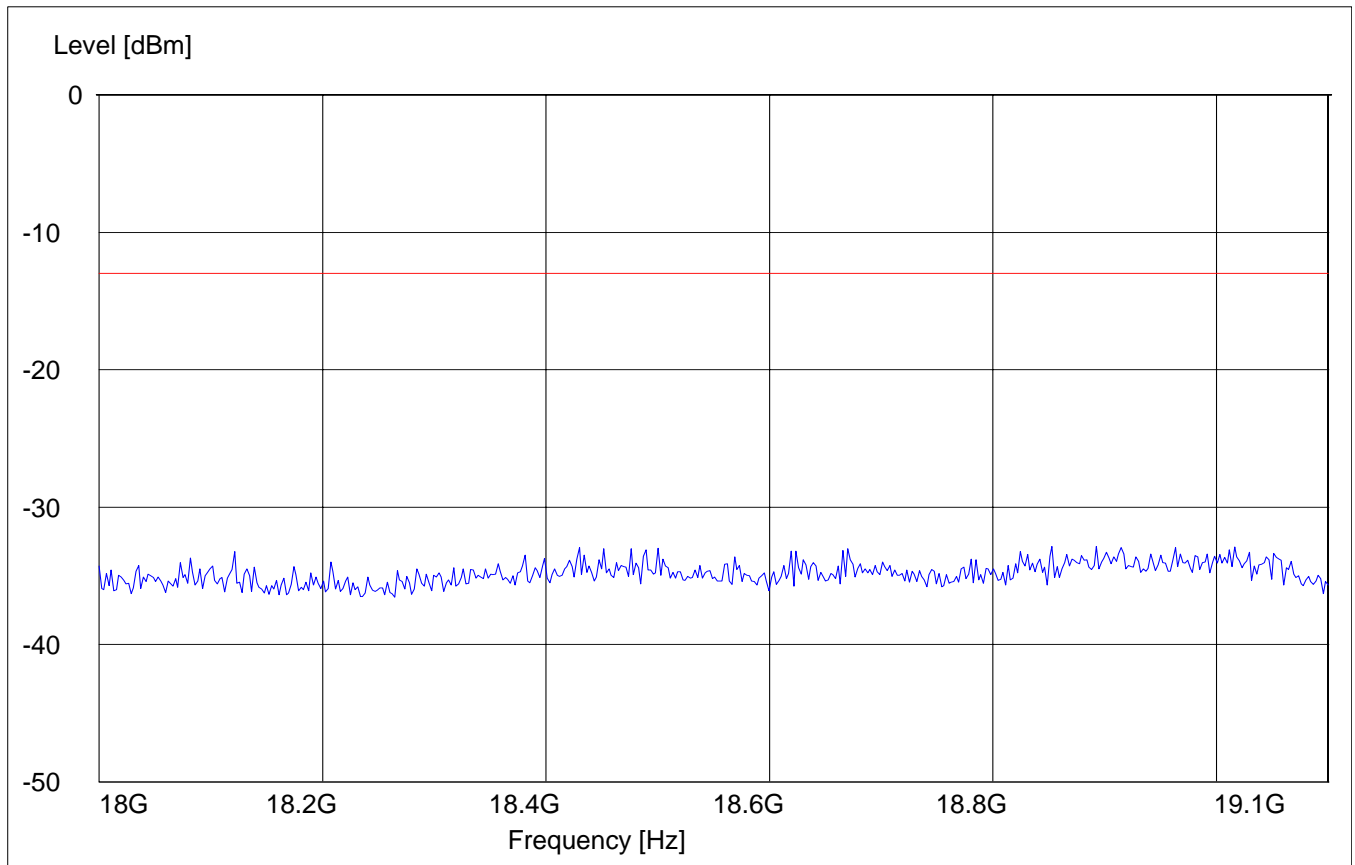
RADIATED SPURIOUS EMISSIONS

EUT in Idle Mode: 18GHz – 19.1GHz

Spurious emission limit –13dBm

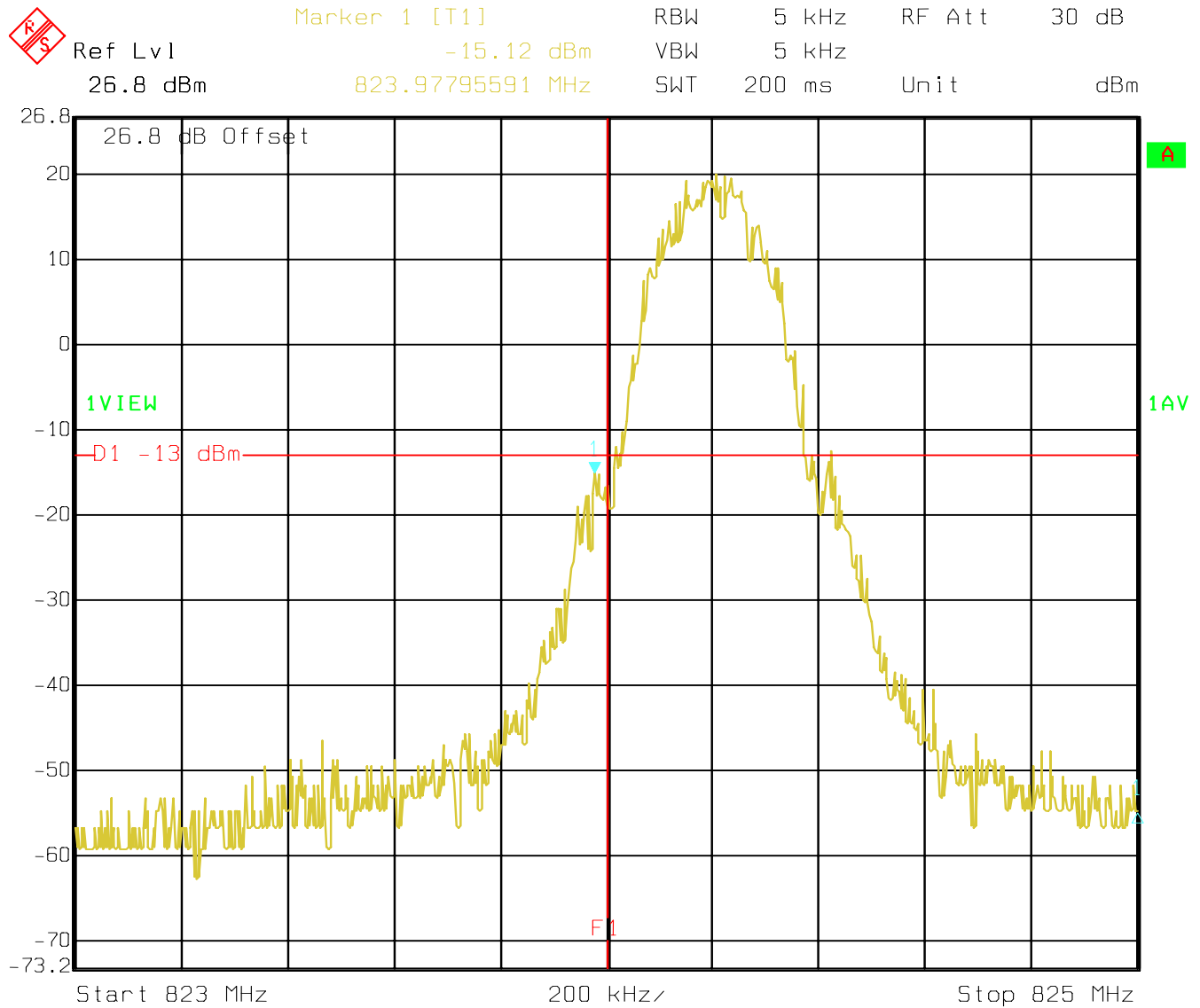
SWEEP TABLE: "FCC 24 spuri 18-19.1G"

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



LOW BAND EDGE BLOCK-1 (A* Low + A) (GSM-850) (Conducted)

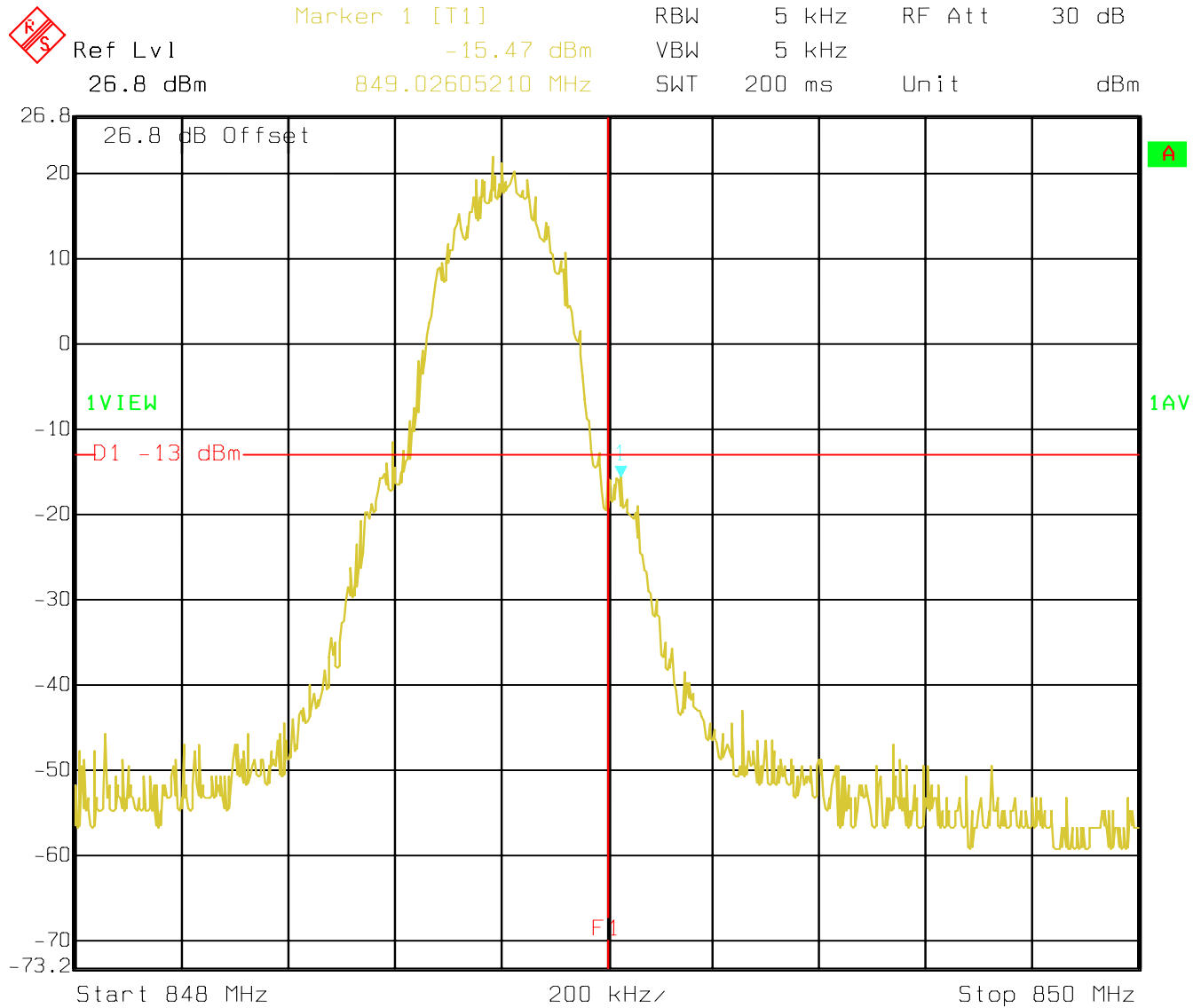
§2.1049, §22.917(b)



Date: 05.JAN.2005 12:53:59

HIGH BAND EDGE BLOCK-4 (B*) (GSM-850) (Conducted)

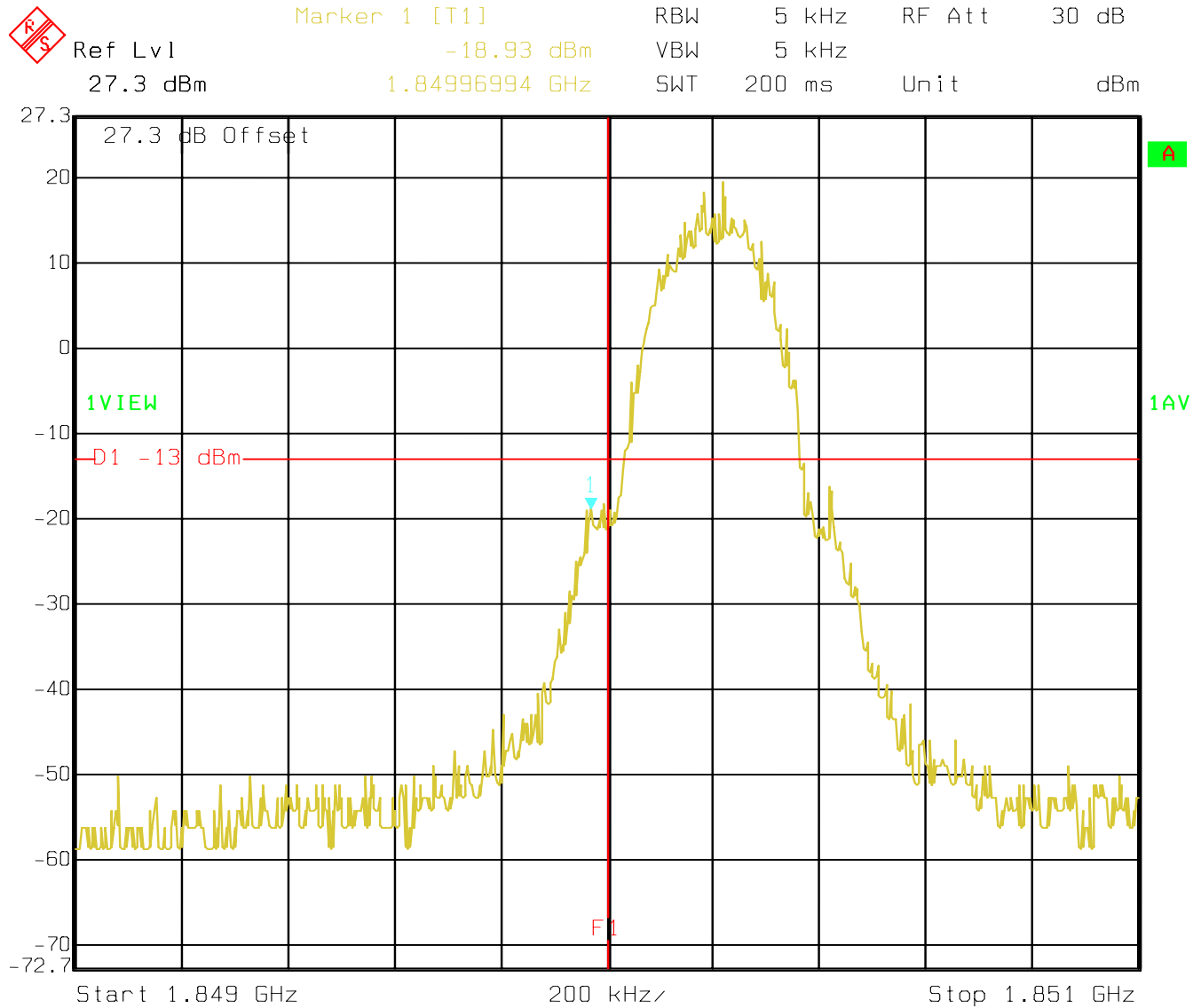
§2.1049, §22.917(b)



Date: 05.JAN.2005 12:55:48

LOW BAND EDGE BLOCK-A (PCS-1900) (Conducted)

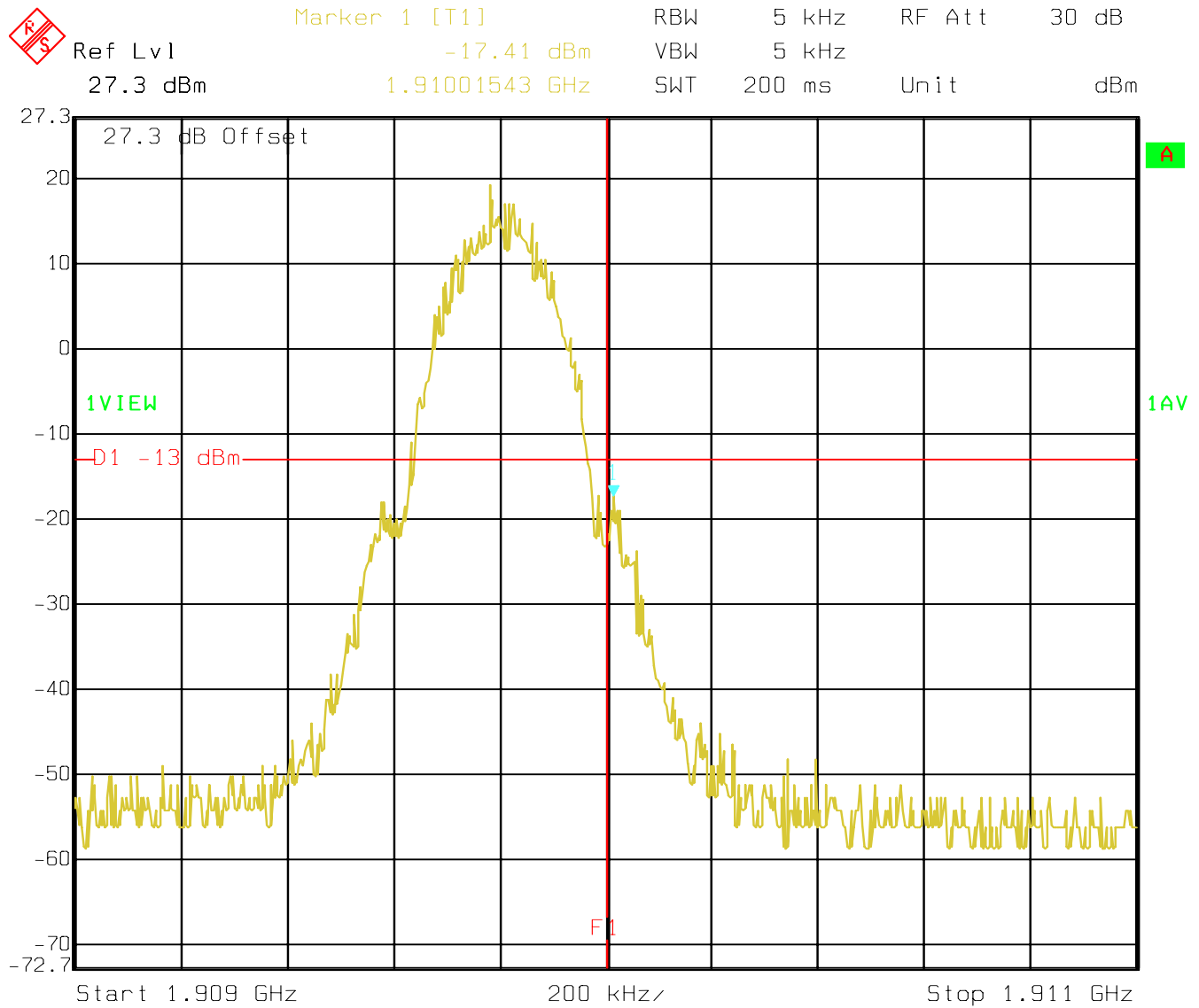
§2.1049, §22.917(b)



Date: 05.JAN.2005 13:19:21

**HIGH BAND EDGE BLOCK-C (PCS-1900)
(Conducted)**

§2.1049, §24.238 (a)(b)



Date: 05.JAN.2005 13:18:02

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

1. 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.
2. Receiver spurious emissions are valid for both 850 & 1900 bands (worst-case plots)

Limits**SUBCLAUSE § 15.209**

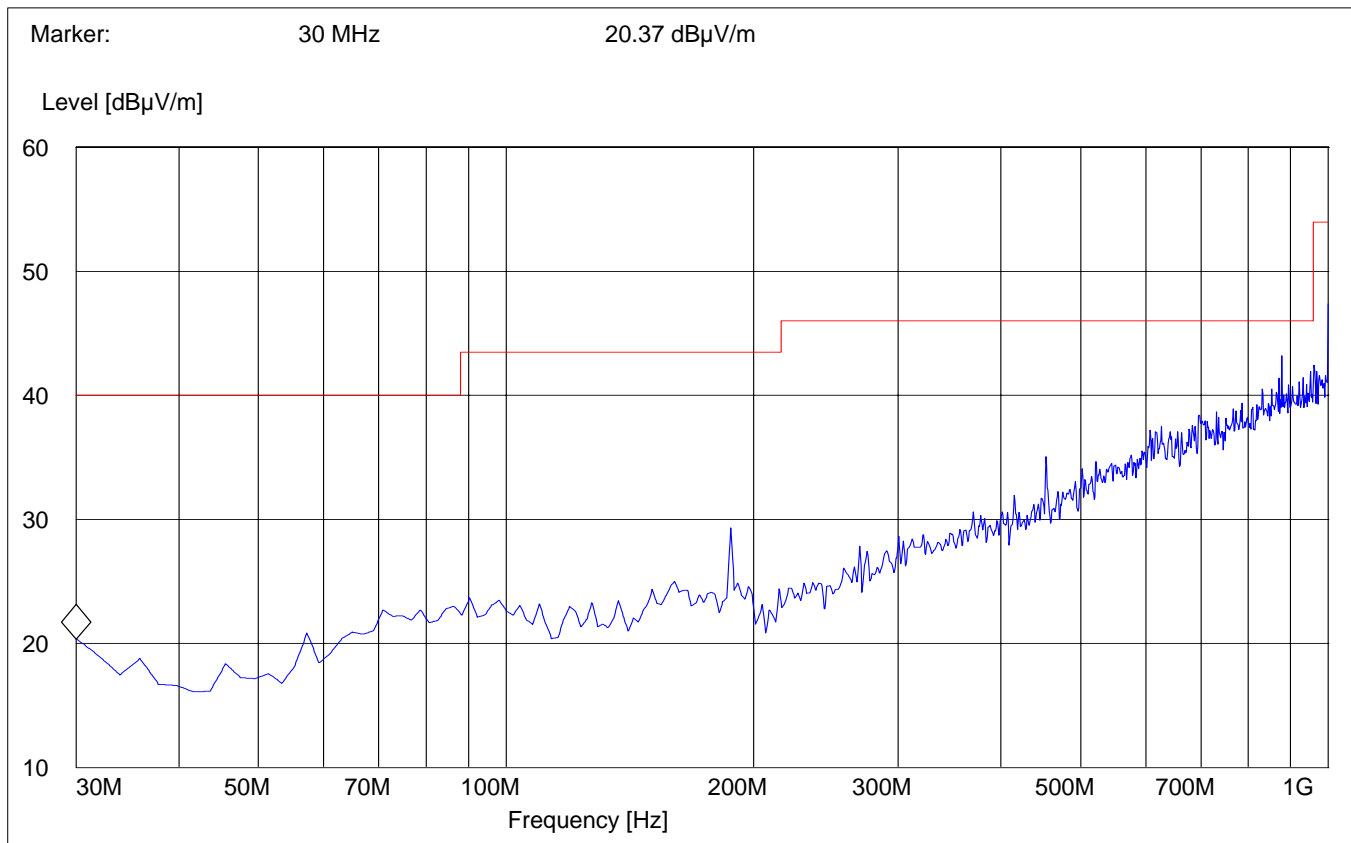
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

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

Antenna: vertical

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

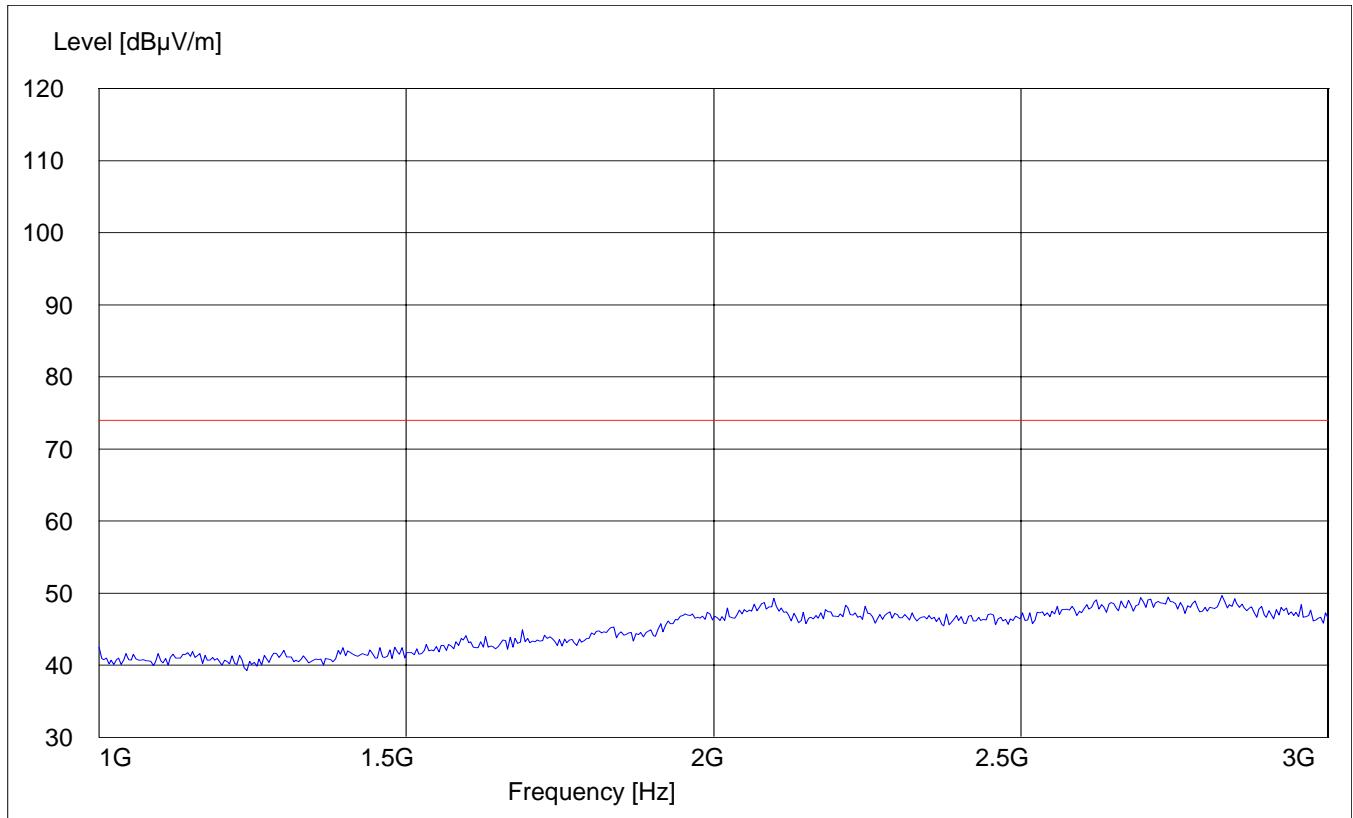
Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
30MHz	1GHz	Max Peak	Coupled	100KHz



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

SWEEP TABLE: "FCC Spuri 1-3G"

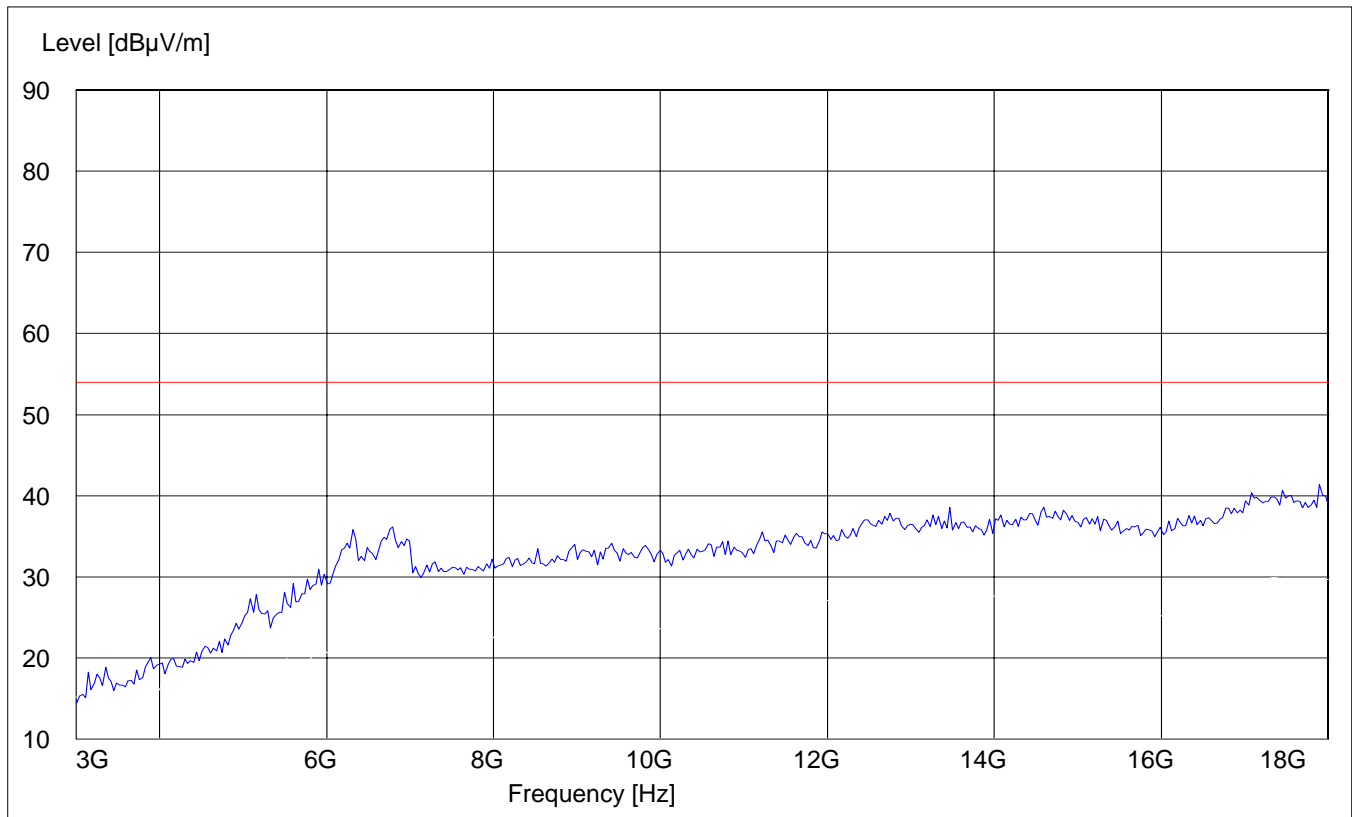
<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
1GHz	3GHz	Max Peak	Coupled	1 MHz



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

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

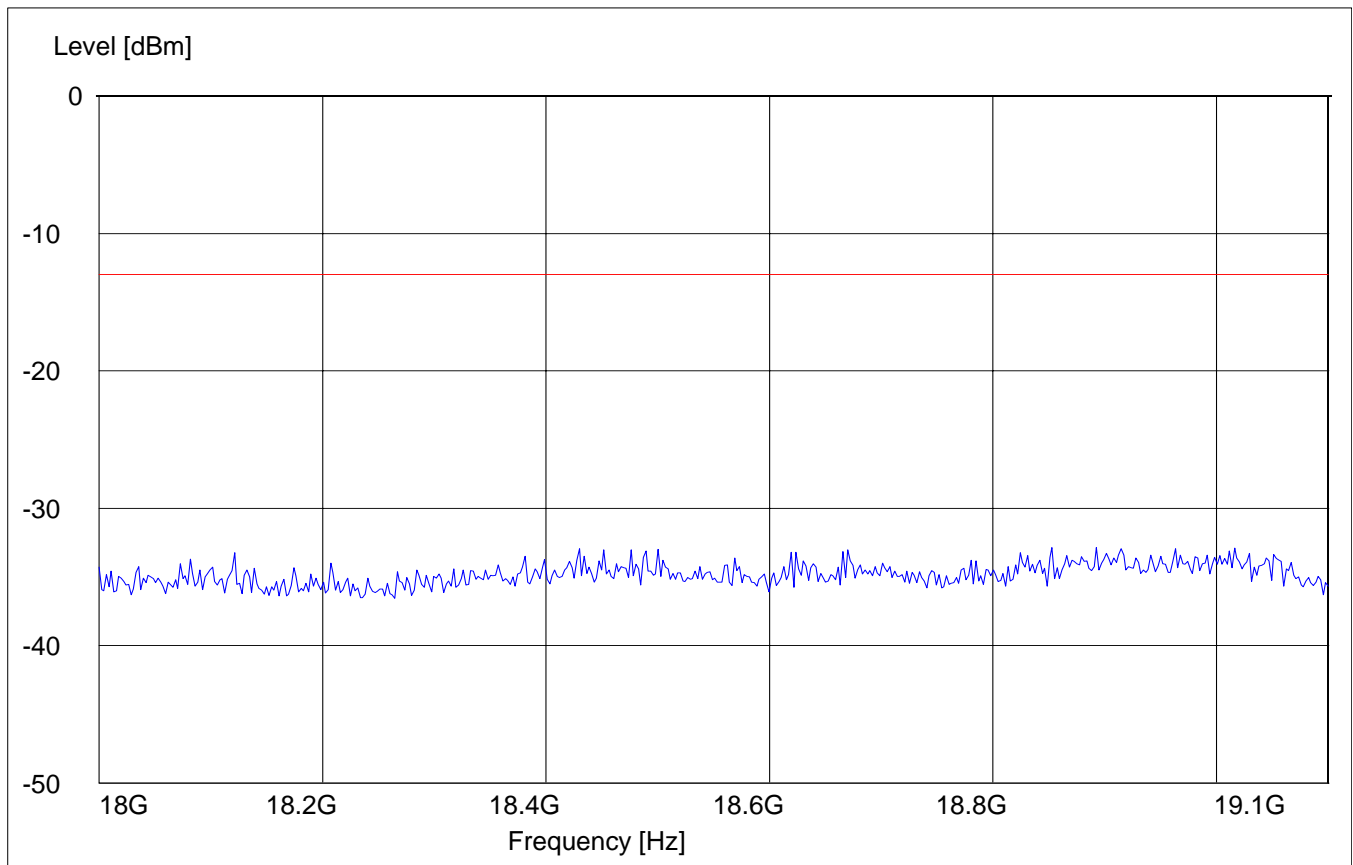
<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
3GHz	18GHz	Max Peak	Coupled	1 MHz



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 30 MHz – 9 GHz 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

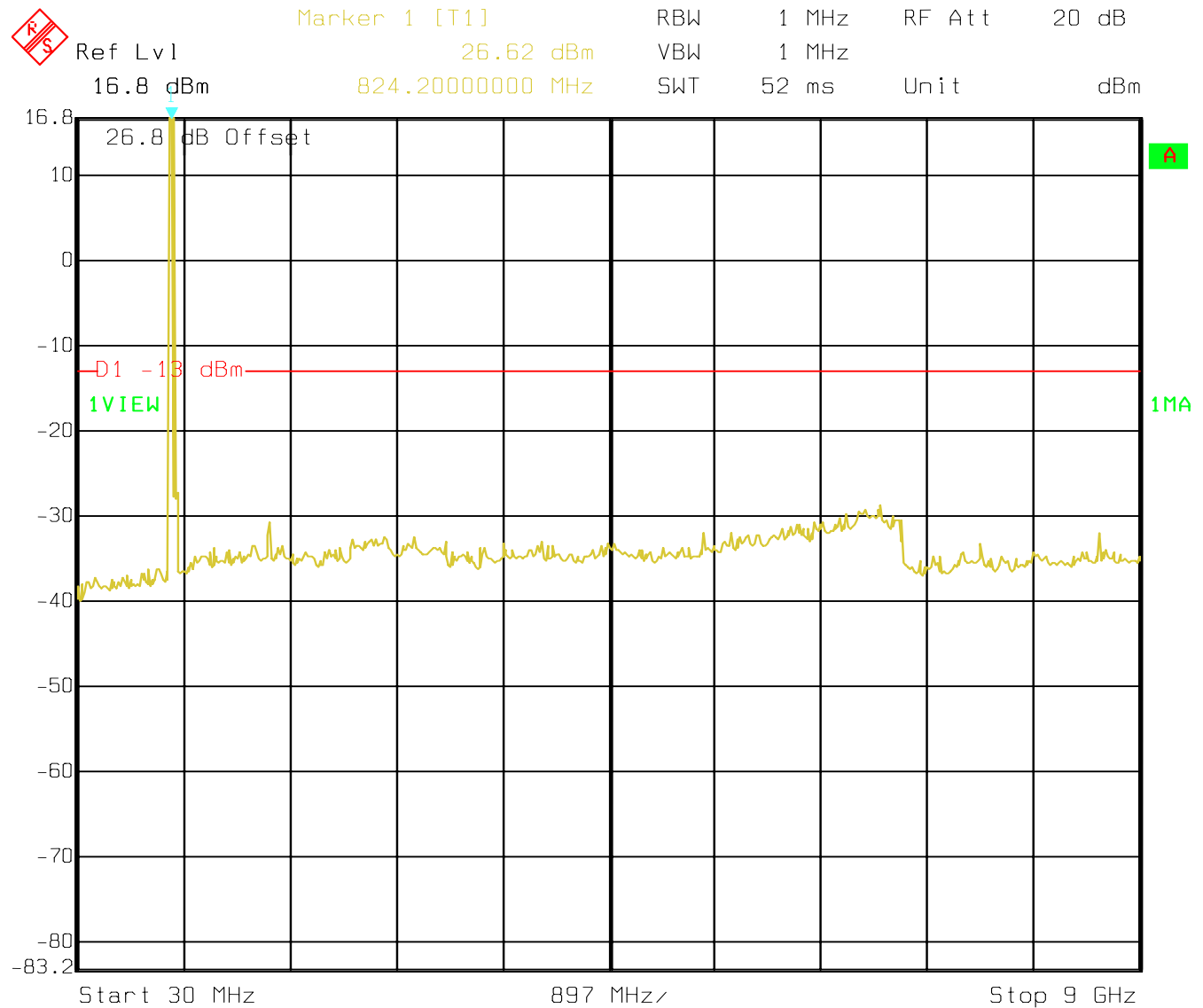
Measurement Limit:

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

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

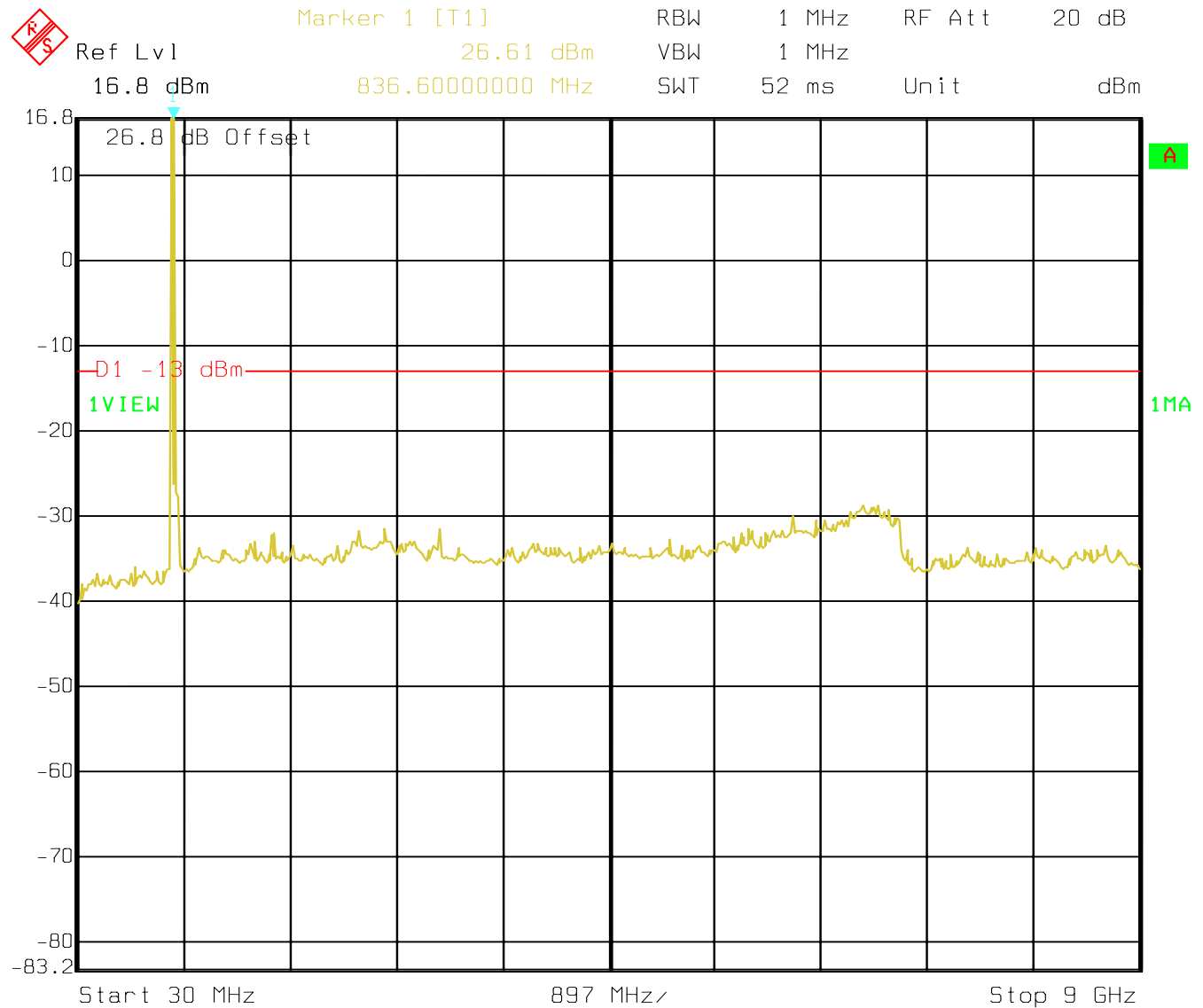
Note: The peak above the limit line is the carrier freq. at ch-128.



Date: 05.JAN.2005 12:44:25

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

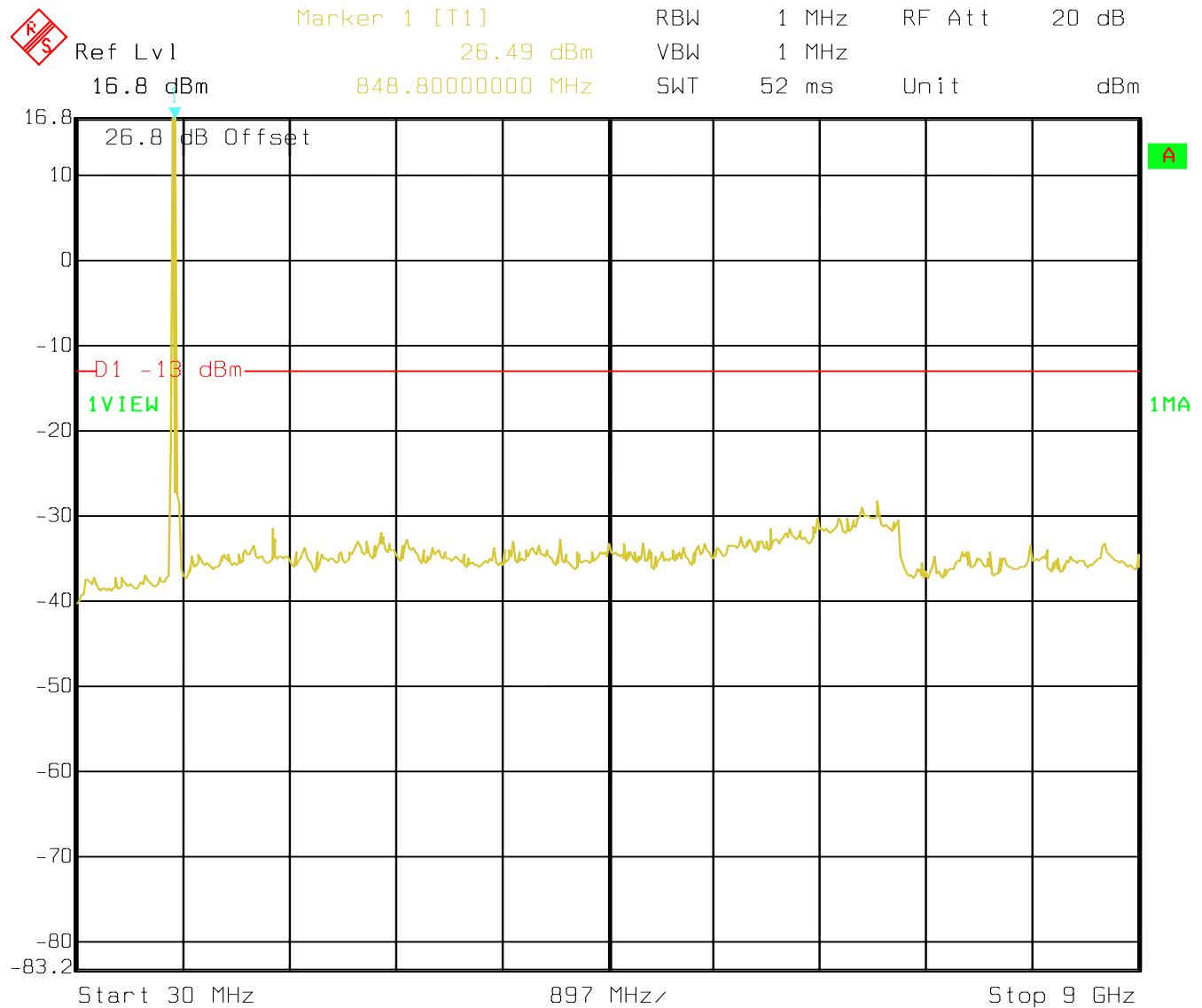
Note: The peak above the limit line is the carrier freq. at ch-190.



Date: 05.JAN.2005 12:43:52

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

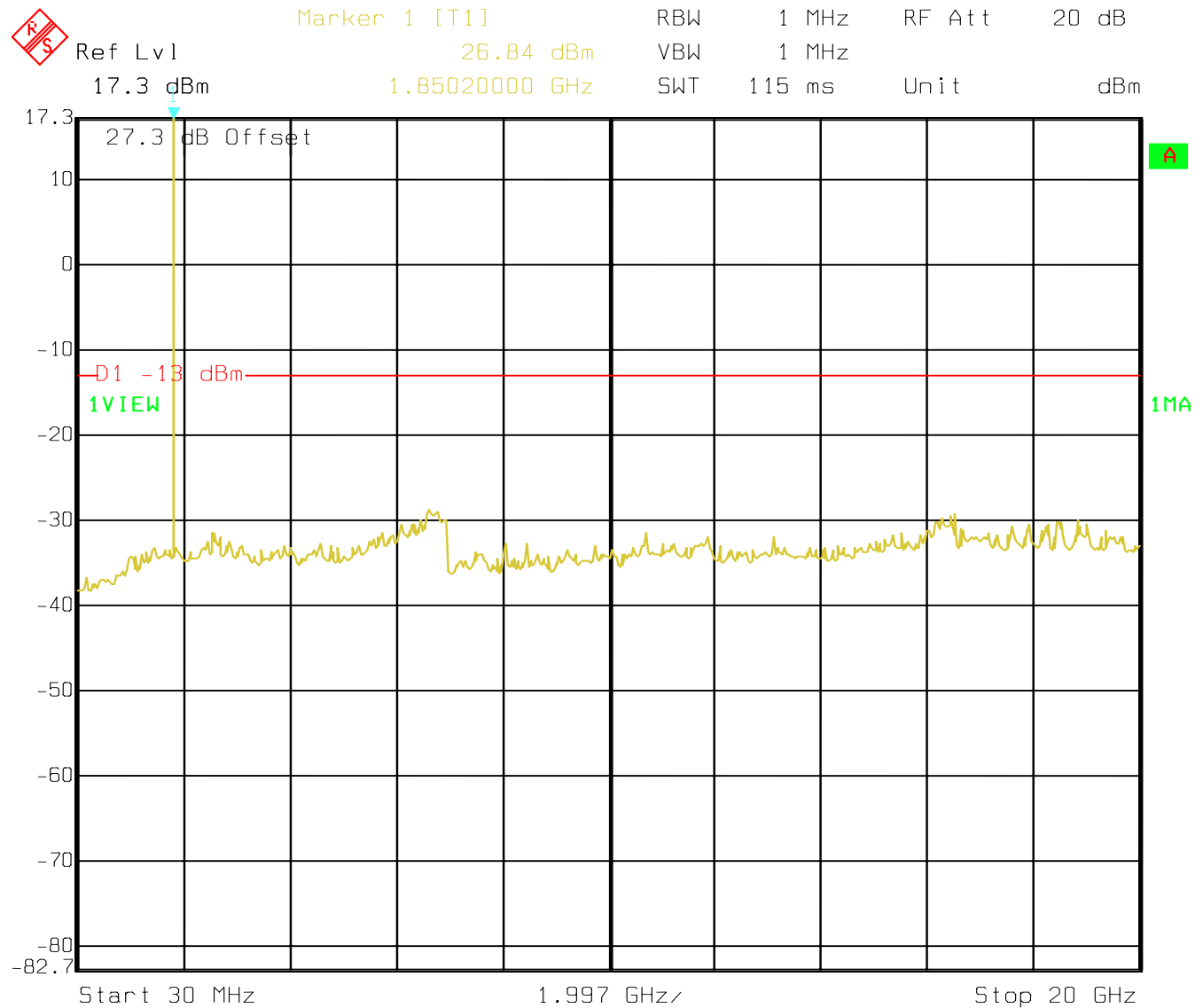
Note: The peak above the limit line is the carrier freq. at ch-251.



Date: 05.JAN.2005 12:43:14

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

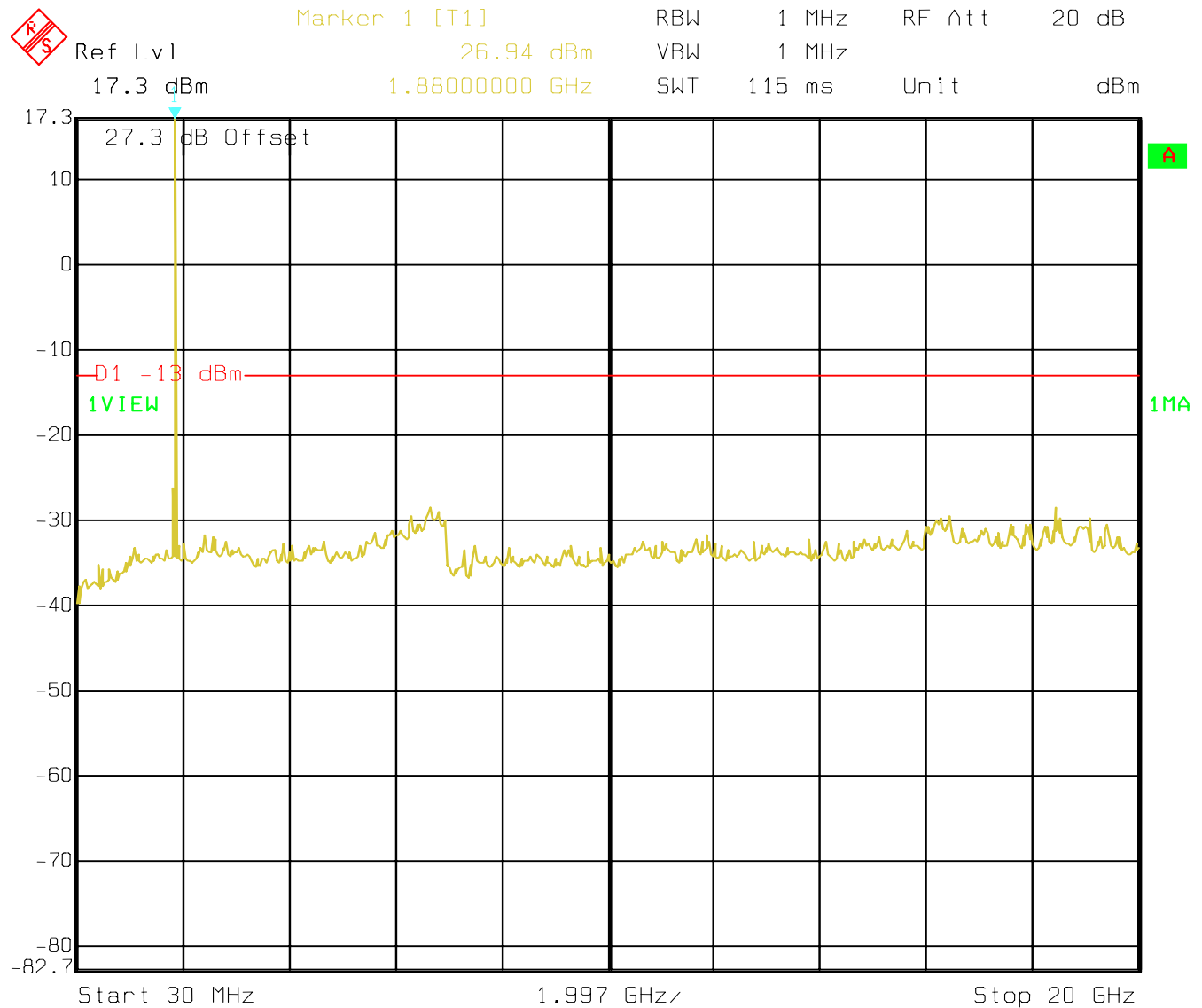
Note: The peak above the limit line is the carrier freq. at ch-512.



Date: 05.JAN.2005 13:09:53

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

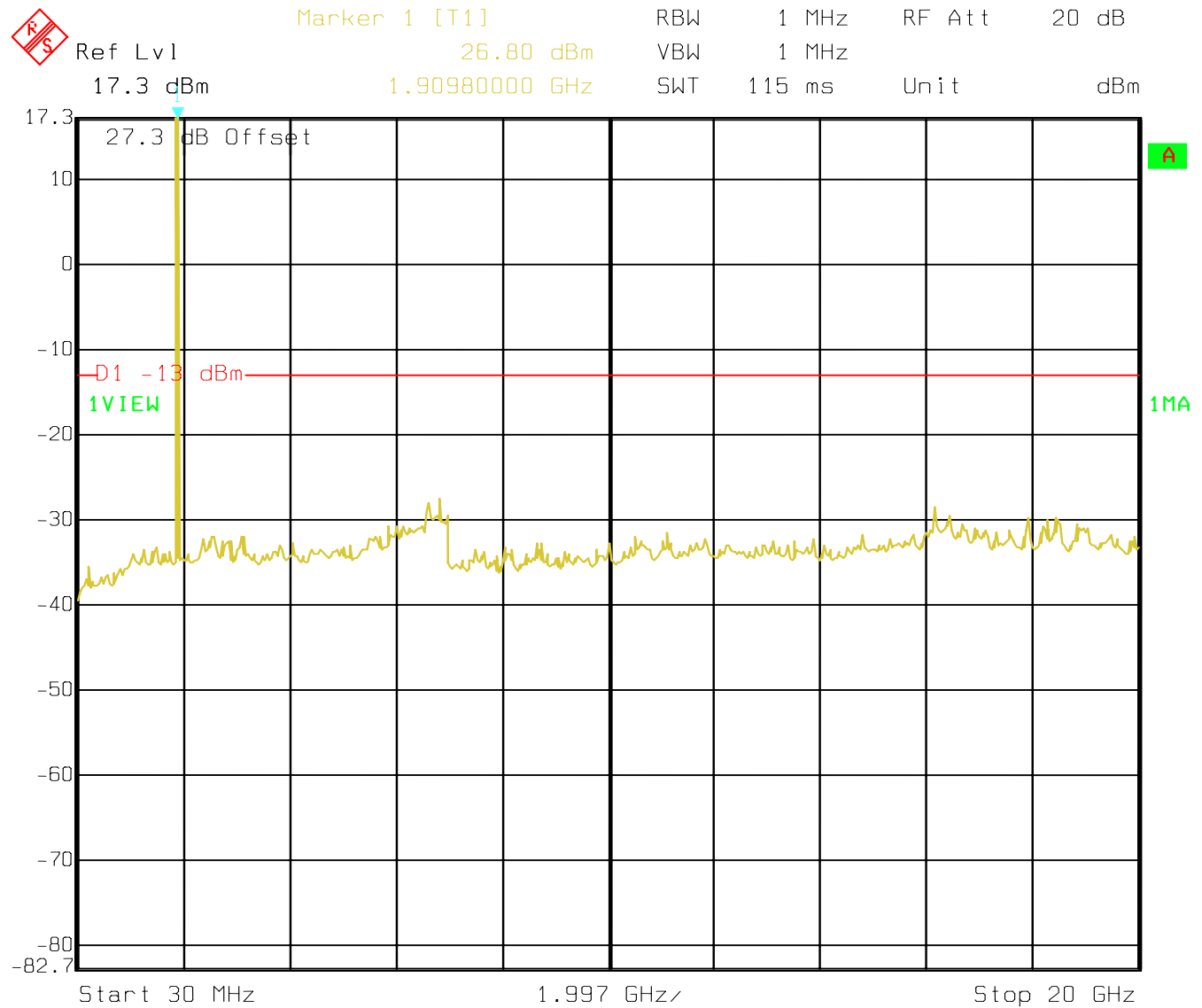
Note: The peak above the limit line is the carrier freq. at ch-661.



Date: 05.JAN.2005 13:09:24

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

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



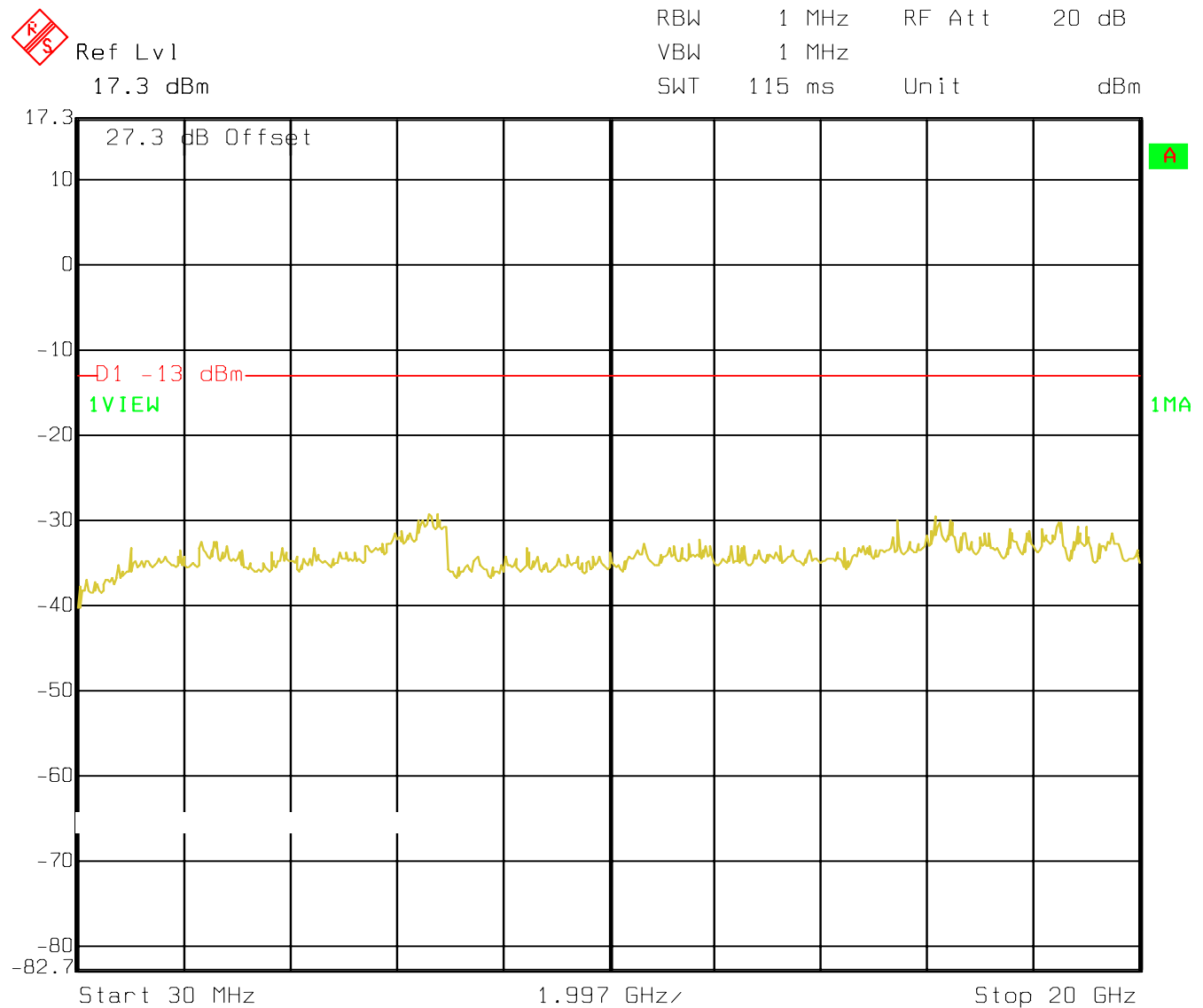
Date: 05.JAN.2005 13:08:53

CONDUCTED SPURIOUS EMISSIONS

Idle Mode

30MHz – 20GHz

Note: This plot is valid for both GSM-850/1900 bands. (Worst-case plot)



Date: 05.JAN.2005 13:03:54

CONDUCTED EMISSIONS

§ 15.107/207

Measured with AC/DC power adapter

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

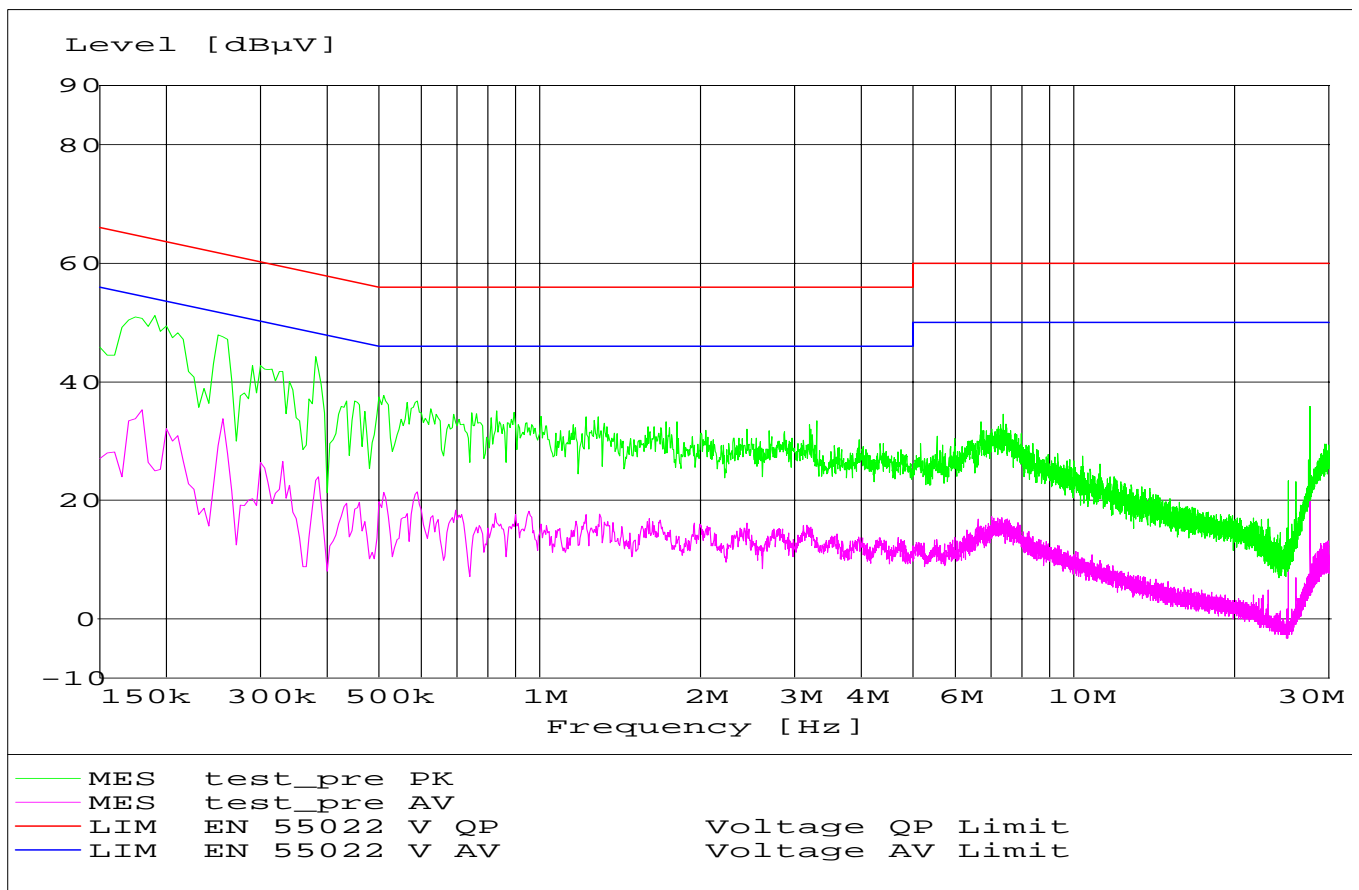
Limit

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

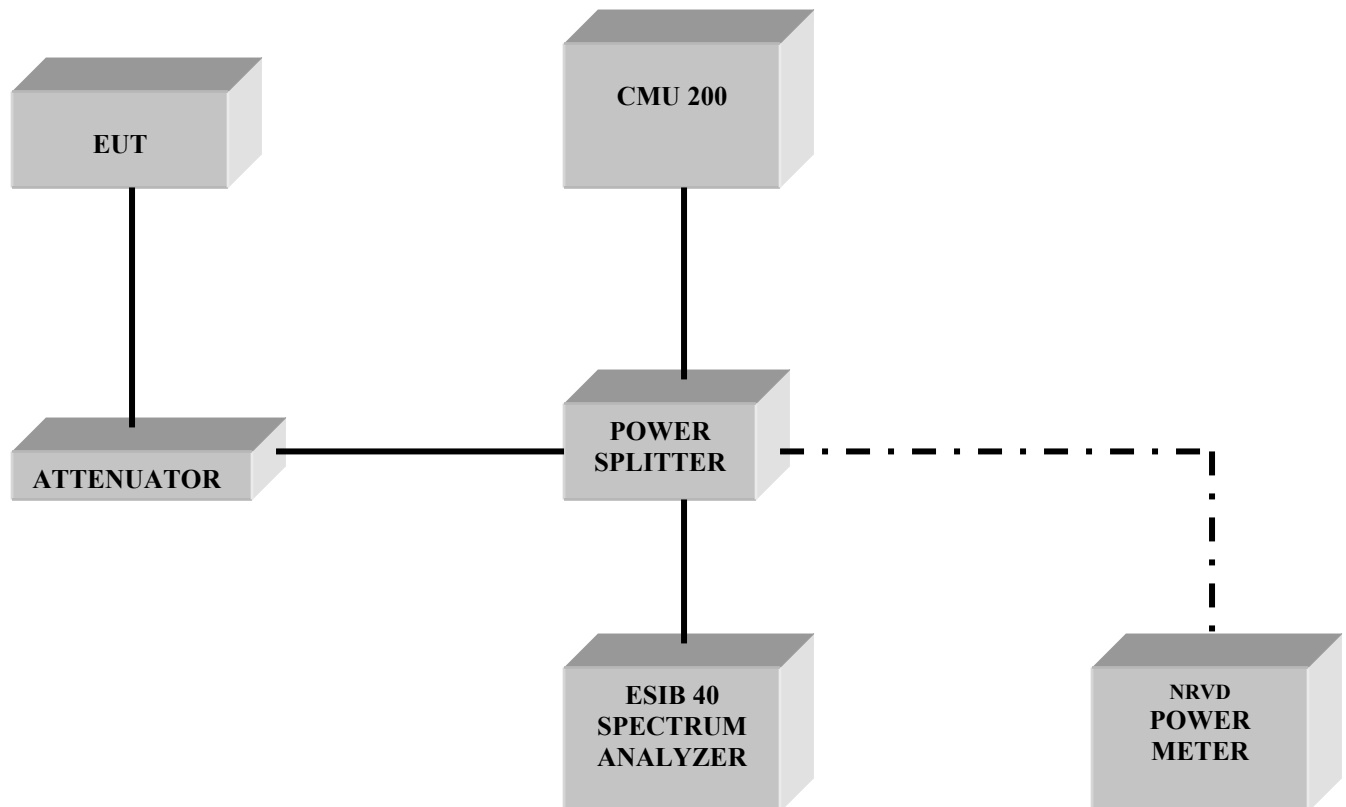
ANALYZER SETTINGS: RBW = 10KHz

VBW = 10KHz



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	Biconilog Antenna	3141	EMCO	0005-1186
06	Horn Antenna (1-18GHz)	SAS-200/571	AH Systems	325
07	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240
08	Power Splitter	11667B	Hewlett Packard	645348
09	Climatic Chamber	VT4004	Voltsch	G1115
10	High Pass Filter	5HC2700	Trilithic Inc.	9926013
11	High Pass Filter	4HC1600	Trilithic Inc.	9922307
12	Pre-Amplifier	JS4-00102600	Miteq	00616
13	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807
14	Digital Radio Comm. Tester	CMD-55	Rohde & Schwarz	847958/008
15	Universal Radio Comm. Tester	CMU 200	Rohde & Schwarz	832221/06

BLOCK DIAGRAMS**Conducted Testing**

Radiated Testing**ANECHOIC CHAMBER**