FCC Test Report

Test report no.: EMC_459FCC24-2003_907264

FCC Part 24 / RSS 133
Model: (907264)
FCC ID: Q37-TKW40815

Deutscher Akkreditierungs Rat DAR

TTI-P-G 081/94-A0

Accredited according to **ISO/IEC 17025**

Bluetooth

Bluetooth Qualification Test Facility (BQTF)

CTIA Authorized Testing Laboratory

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

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	**:**	**Thermo King Corp.**
Street	**:**	**314 West 90th Street**
City / Zip Code	**:**	**Minneapolis, MN 55420-3693**
Country	**:**	**USA**
Contact	**:**	**Eduardo Tan**
Telephone	**:**	**952-887-2289**
Tele-fax	**:**	**952-887-2371**
e-mail	**:**	**Eduardo_tan@irco.com**

1.4 Application details

Date of receipt of application	:	2003-4-10
Date of receipt test item	:	2003-4-10
Date of test	:	2003-4-10/11

1.5 Test item

Manufacturer	:	CELTRAK Ltd.
Street	:	Dunmore Rd.
City / Zip Code	:	Tuam Co. Galway
Country	:	Ireland
Model No.	:	**907264**
Description	:	GSM/GPS vehicle tracking and temperature monitoring system.
FCC-ID	:	Q37-TKW40815

Additional information

Frequency	:	1850.2MHz – 1909.8MHz for PCS 1900
Type of modulation	:	GMSK
Number of channels	:	299 for PCS 1900
Antenna	:	External (Model: Venus 900s for GSM900/1900+GPS incl. long cable)
Power supply	:	12Vdc
Output power	:	30.0dBm (1W) conducted peak power 22.33dBm (171mW) EIRP
Extreme vol. Limits	:	Lower Limit: 9Vdc Nominal Voltage: 12.Vdc Upper Limit: 30Vdc
Extreme temp. Tolerance	:	Lower Limit: -30°C Upper Limit: 70°C

1.6 Test standards

FCC Part 24 / RSS133 r1

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**

Note: The tested unit **907264** will be used in vehicular environment and no AC source is required to use the EUT. Therefore, AC mains conducted emission under **§15.207** will not be tested.

Technical responsibility for area of testing:

Date	Section	Name	Signature
2003-05-28	EMC & Radio	Lothar Schmidt (Manager)	

Responsible for test report and project leader:

Date	Section	Name	Signature
2003-05-28	EMC & Radio	Philip Kim (EMC Engineer)	

2.2 Test report

TEST REPORT

Test report no.: EMC_459FCC24-2003_907264
(Model: 907264)

TEST REPORT REFERENCE

PARAMETER TO BE MEASURED PARAGRAPH PAGE

POWER OUTPUT SUBCLAUSE § 24.232

Summary:
During the process of testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication tester (CMD-55) to ensure max. Power transmission and proper modulation.

This paragraph contains both average, peak output conducted powers and EIRP measurements in peak for the EUT.
In all cases, the peak output power is within the specified limits.

Method of Measurements:

The EUT was connected to CMD55, emulating a connection to a base station via Air link to represent a realistic operating environment.
The power was measured with R&S CMU200 for both peak and burst average conducted power.
These measurements were done at 3 frequencies, **1850.2**MHz, **1880.0**MHz and **1909.8**MHz (bottom, middle and top of operational frequency range)

Limits:

Power Class	Nominal Peak Output Power (dBm)	Tolerance (dB)
0	+30	± 2

Power Measurements:

Conducted:

Frequency (MHz)	Power Class	Peak Output Power (dBm)	Average Output Power during burst (dBm)
1850.2	0	29.5	29.4
1880.0	0	29.9	29.7
1909.8	0	30.0	29.9
Measurement uncertainty		±0.5 dB	

EIRP Measurements

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

Limits:

Power Step	Burst Average EIRP (dBm)
0	<33

Power Measurements:
Plots are shown on next pages

Radiated:

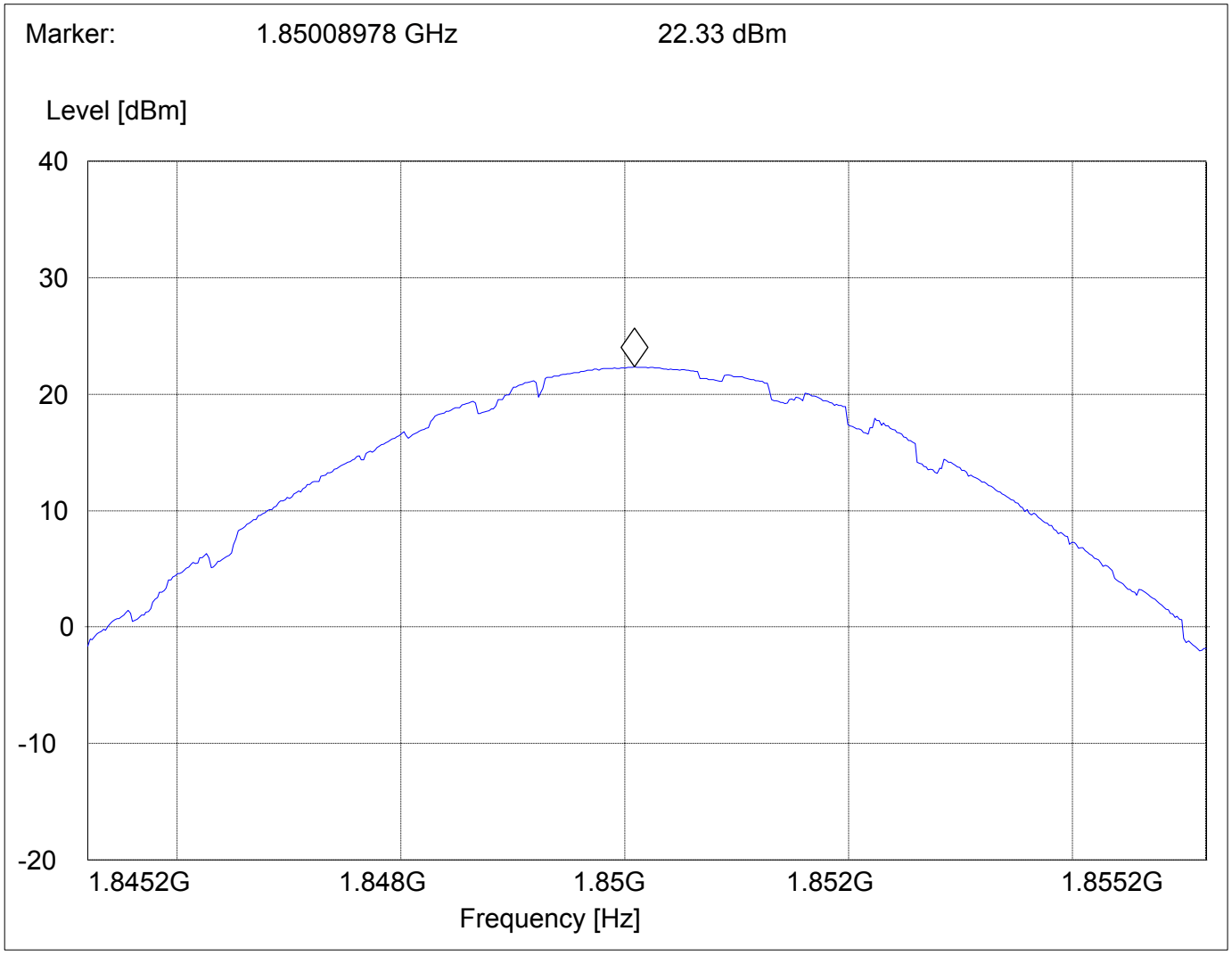
Frequency (MHz)	Power Step	BURST AVERAGE (dBm)	
		EIRP	ERP
1850.2	0	22.33	20.23
1880.0	0	21.93	19.83
1909.8	0	21.20	19.1
Measurement uncertainty	±0.5 dB		

ANALYZER SETTINGS: RBW = VBW = 3MHz

EIRP Frequency @ 1850.2MHz

SWEEP TABLE: "EIRP 1900 CH512"

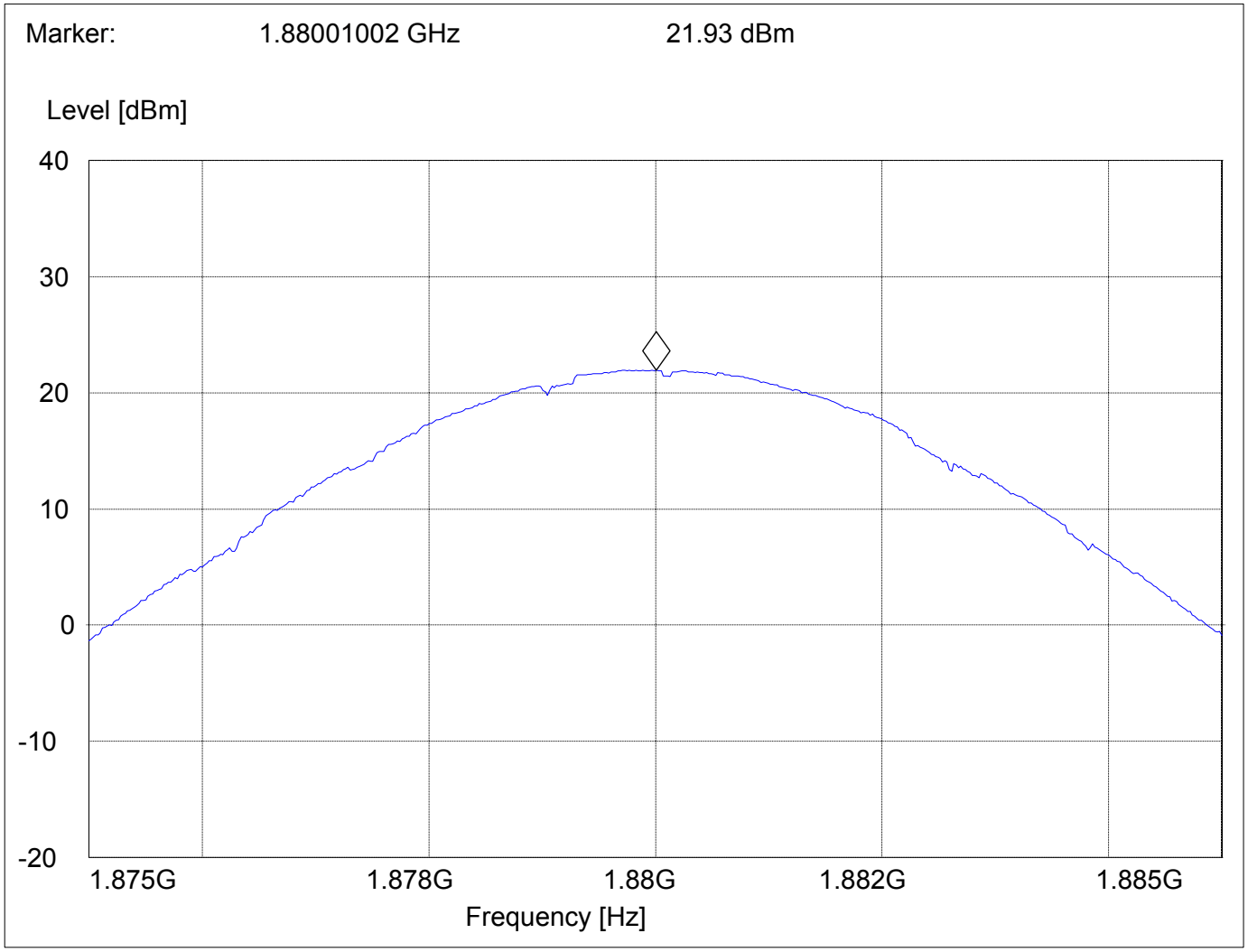
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1.8452 GHz	1.8552 GHz	Max Peak	Coupled	3 MHz



EIRP Frequency @ 1880.0MHz

SWEEP TABLE: "EIRP 1900 CH661"

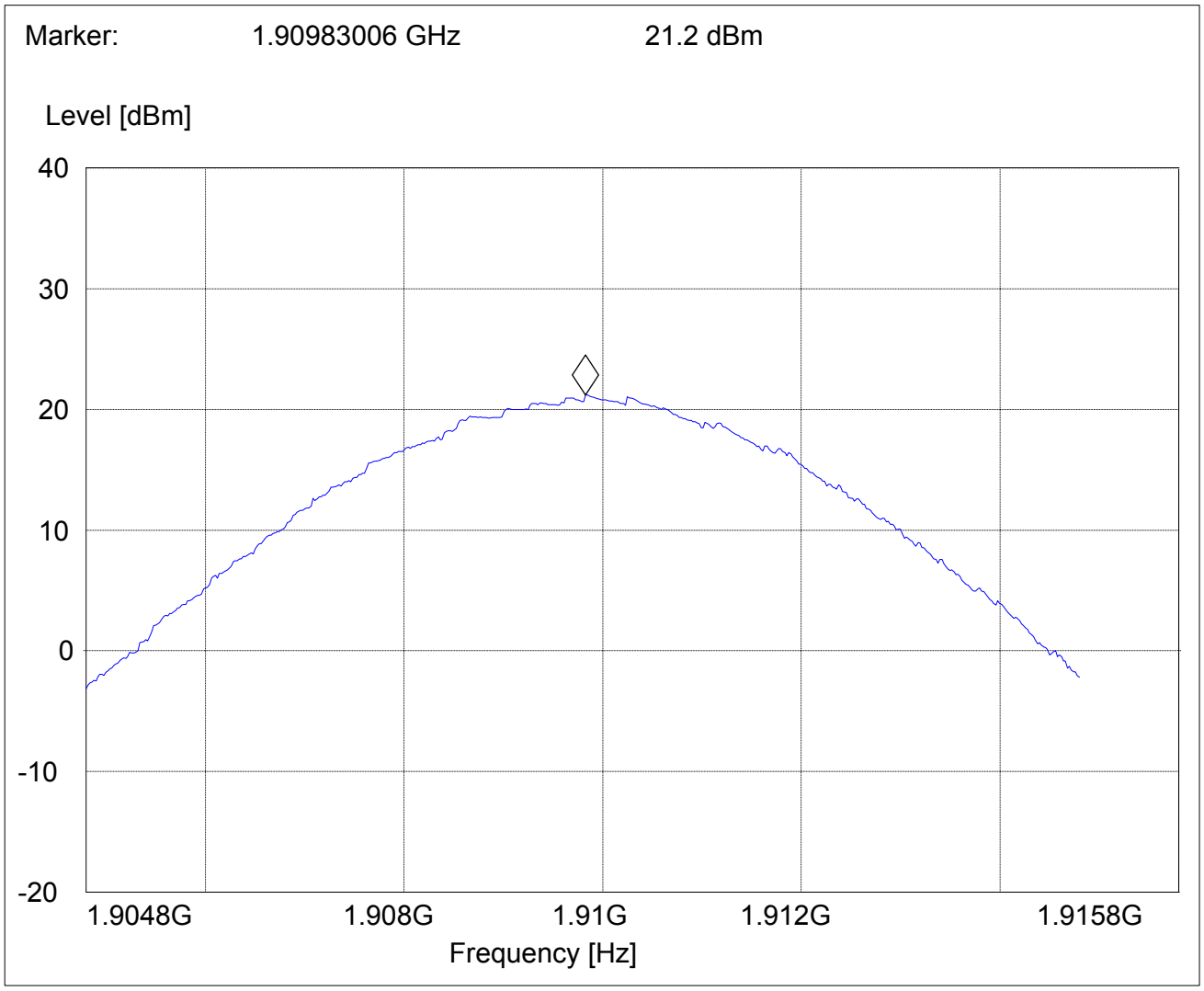
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1.875 GHz	1.885 GHz	Max Peak	Coupled	3 MHz



EIRP Frequency @ 1909.8MHz

SWEEP TABLE: "EIRP 1900 CH810"

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



FREQUENCY STABILITY SUBCLAUSE § 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 CMD 55 DIGITAL RADIO COMMUNICATION TESTER.
1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30 C.
3. With the EUT, powered via nominal voltage, connected to the CMD 55 and in a simulated call on channel 661 (centre channel), 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 CMD 55 and in a simulated call on channel 661 (centre channel), measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 C increments from +50 C to -30 C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5 C during the measurement procedure.

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 9VDC and 30VDC, with a nominal voltage of 12.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 -0.25% and +1.5%. 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 varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

AFC FREQ ERROR vs. VOLTAGE

Frequency = **1880.0**MHz

Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
9 volt	-57	-0.0303
10 volt	-36	-0.0191
11 volt	-48	-0.0255
12 volt	-47	-0.025
13 volt	-37	-0.0197
14 volt	-40	-0.0213
15 volt	-42	-0.0213
16 volt	-55	-0.0293
17 volt	-43	-0.0229
18 volt	-60	-0.0319
19 volt	-58	-0.0308
20 volt	-50	-0.0266
21 volt	-33	-0.0176
22 volt	-38	-0.0176
23 volt	-48	-0.0255
24 volt	-40	-0.0213
25 volt	-45-	-0.0239
26 volt	-25	-0.0133
27 volt	-28	-0.0149
28 volt	-30	-0.0160
29 volt	-20	-0.0106
30 volt	-37	-0.0197

AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	40	0.0213
-20	35	0.0186
-10	-25	-0.0133
0	-10	-0.0053
+10	-35	-0.0186
+20	-37	-0.0197
+30	-47	-0.0250
+40	-50	-0.0266
+50	-20	-0.0106

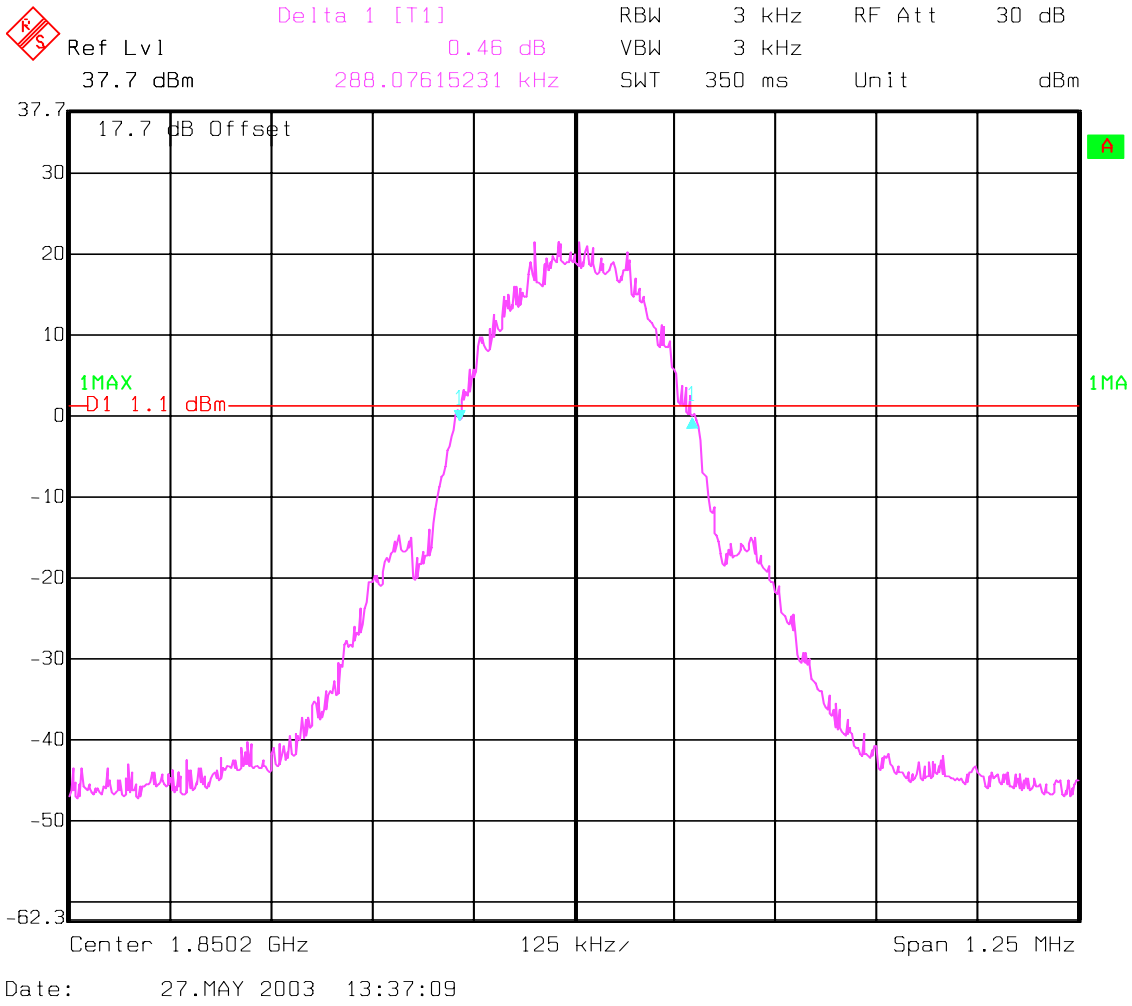
OCCUPIED BANDWIDTH §2.1049 / §24.238

Occupied Bandwidth Results

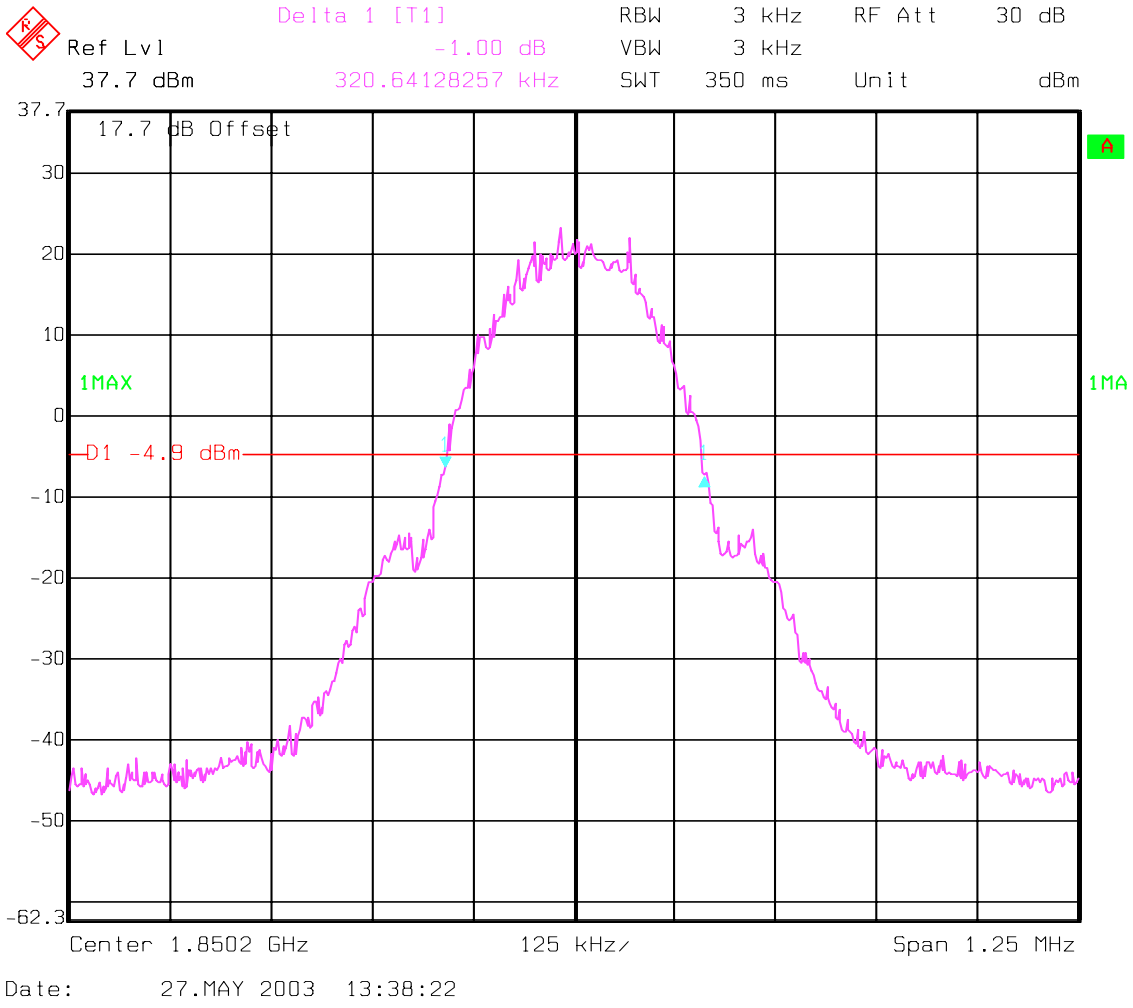
Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. Table below lists the measured –20dBc(99%) occupied bandwidth and -26dBC emission bandwidths. Spectrum analyzer plots are included on the following pages.

Frequency	-20dBc(99%) Occupied Bandwidth	-26 dBc Emission Bandwidth
1850.2MHz	288.07	320.64
1880.0MHz	285.57	318.13
1909.8MHz	288.07	318.13

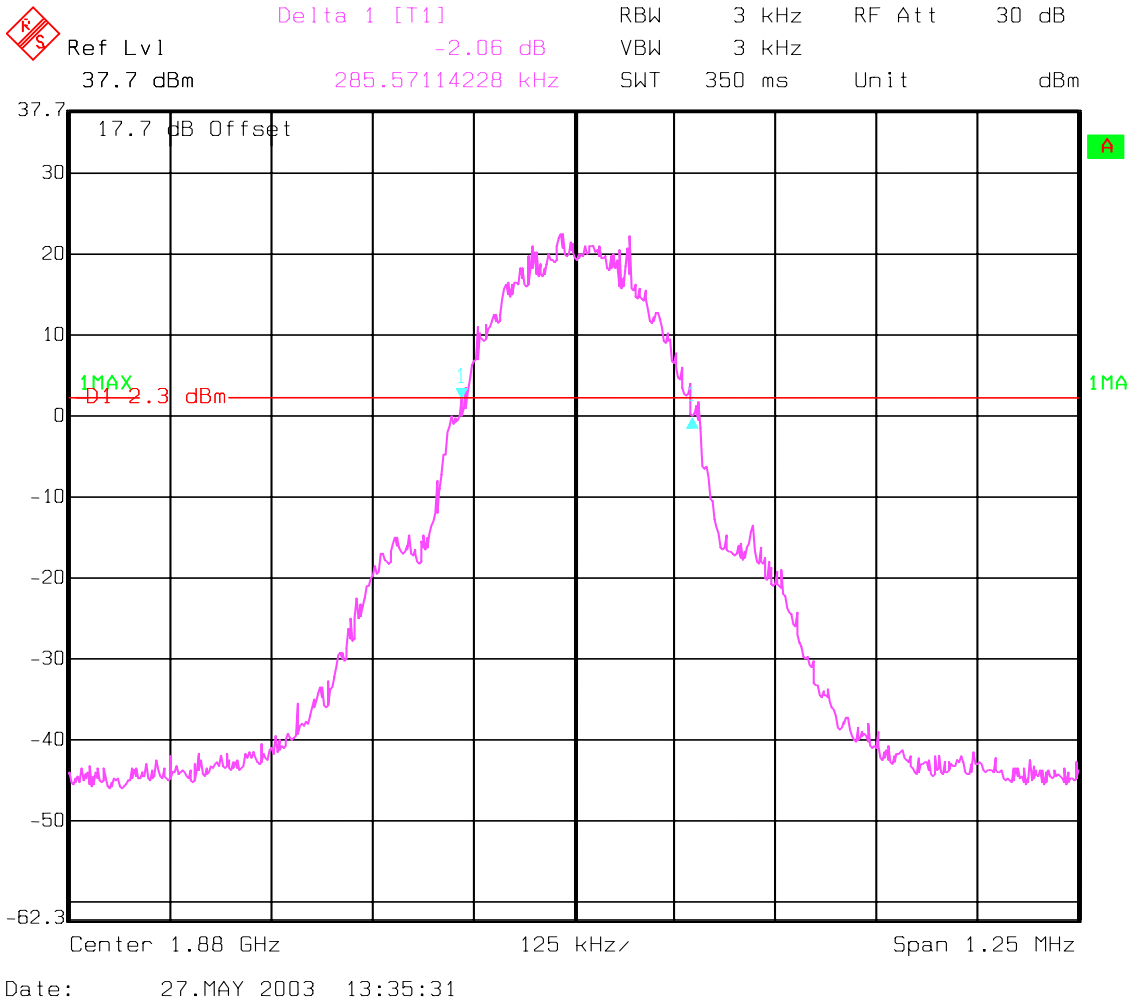
Tx Frequency 1850.2MHz
-20dBc Occupied Bandwidth



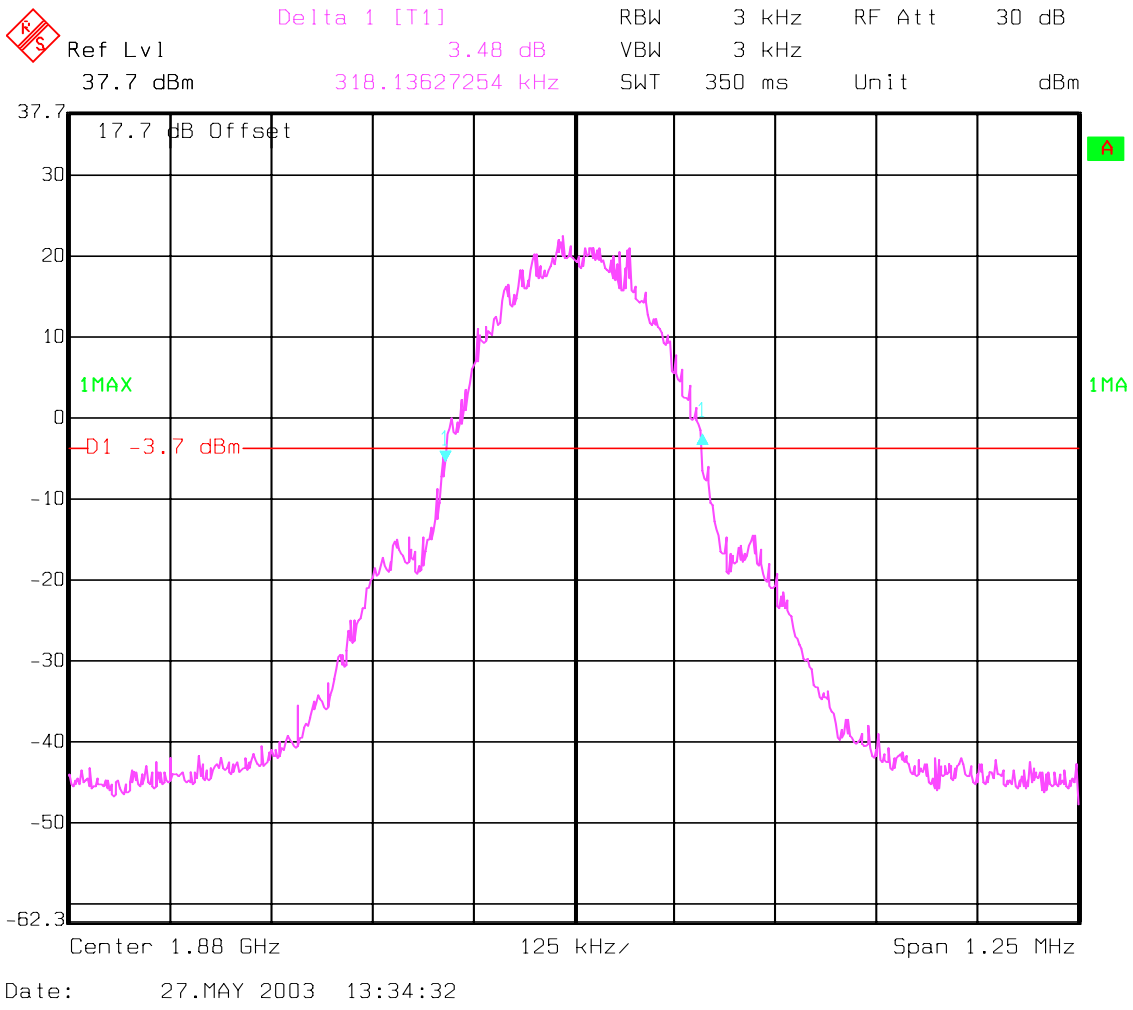
Tx Frequency 1850.2MHz
-26 dBc Emission Bandwidth



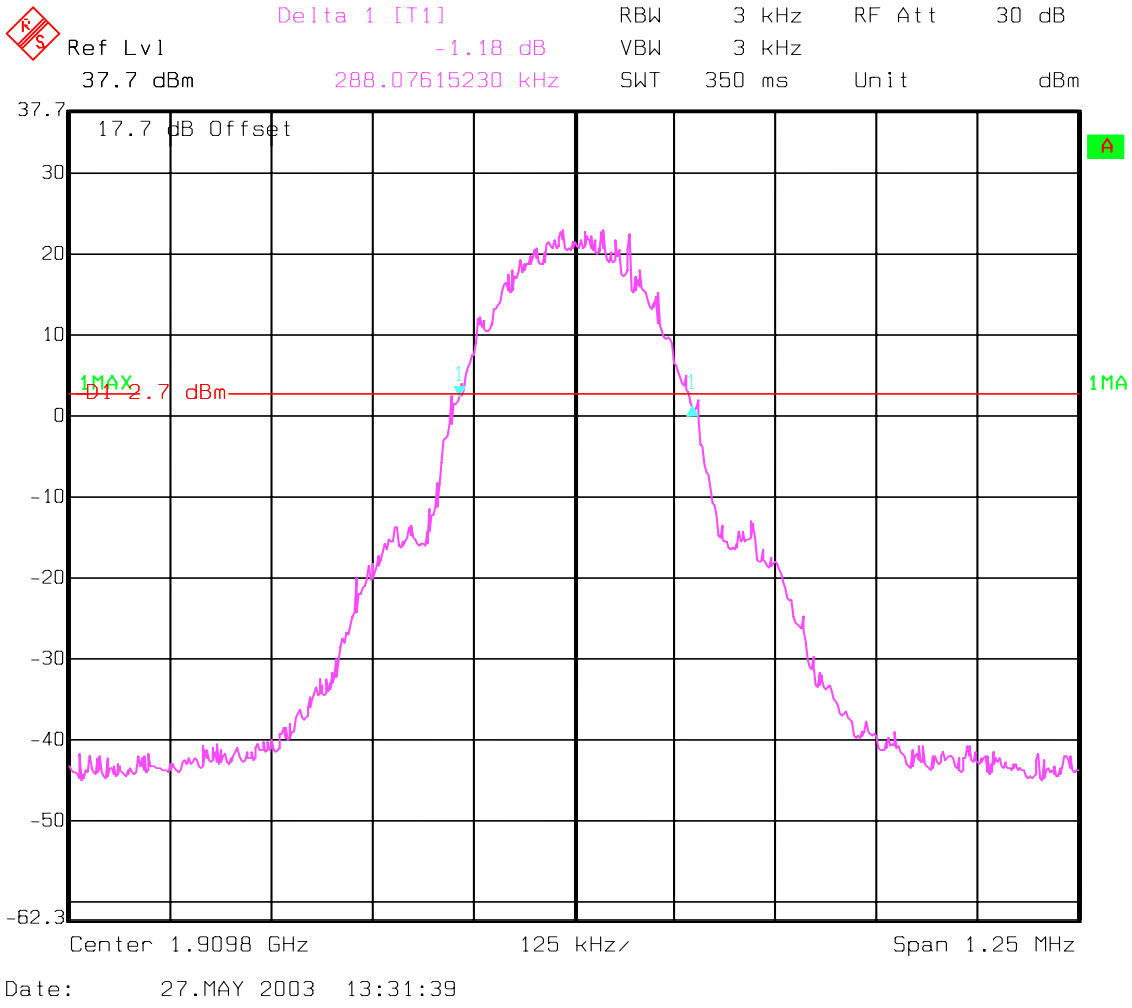
Tx Frequency 1880.0MHz
-20dBc Occupied Bandwidth



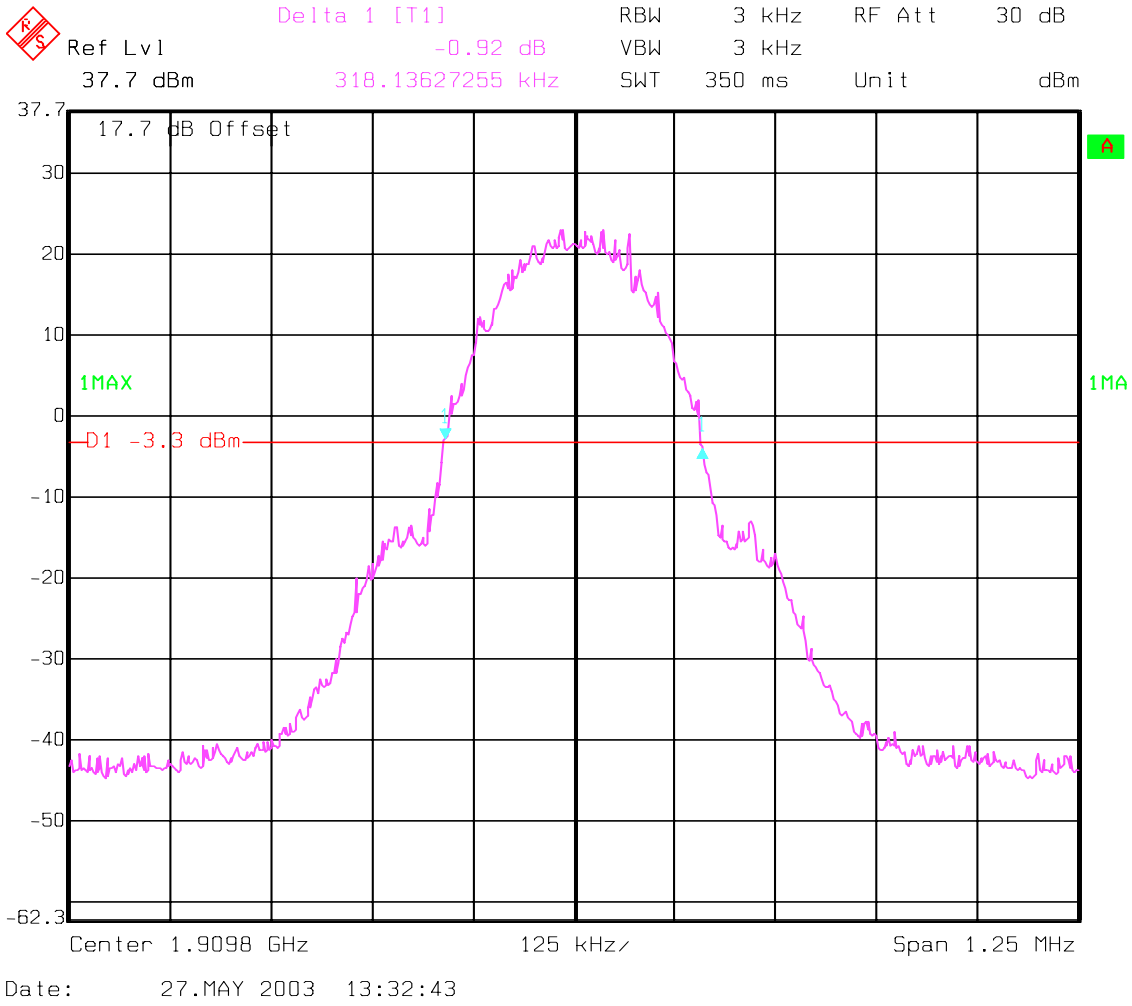
Tx Frequency 1880.0MHz
-26 dBc Emission Bandwidth



Tx Frequency 1909.8MHz
-20dBc Occupied Bandwidth



Tx Frequency 1909.8MHz
-26 dBc Emission Bandwidth



EMISSIONS LIMITS §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 1910 MHz. 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 USPCS band.

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) A double-ridged wave-guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
c) 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 EIRP 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 USPCS band (1850.2 MHz, 1880 MHz and 1909.8 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the USPCS band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

NOTE: The spurious 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 18 GHz and 19.1 GHz very short cable connections to the antenna was used to minimize the noise level.

RESULTS OF RADIATED TESTS FOR FCC-24:

Harmonic	Tx 1850.2 Freq.(MHz)	Level (dBm)	Tx 1880.0 Freq. (MHz)	Level (dBm)	Tx 1909.8 Freq. (MHz)	Level (dBm)
2	3700.4	-34.20	3760	-23.65	3819.6	-22.47
3	5550.6	-42.68	5640	-37.54	5729.4	-37.07
4	7400.8	-42.72	7520	-43.29	7639.2	-39.42
5	9251	-37.42	9400	-36.90	9549	-38.42
6	11101.2	-36.66	11280	-35.29	11458.8	-36.25
7	12951.4	-37.56	13160	-38.81	13368.6	-38.54
8	14801.6	-38.57	15040	-37.75	15278.4	-38.60
9	16651.8	-34.48	16920	-35.36	17188.2	-32.03
10	18502	-32.16	18800	-34.44	19098	-33.66

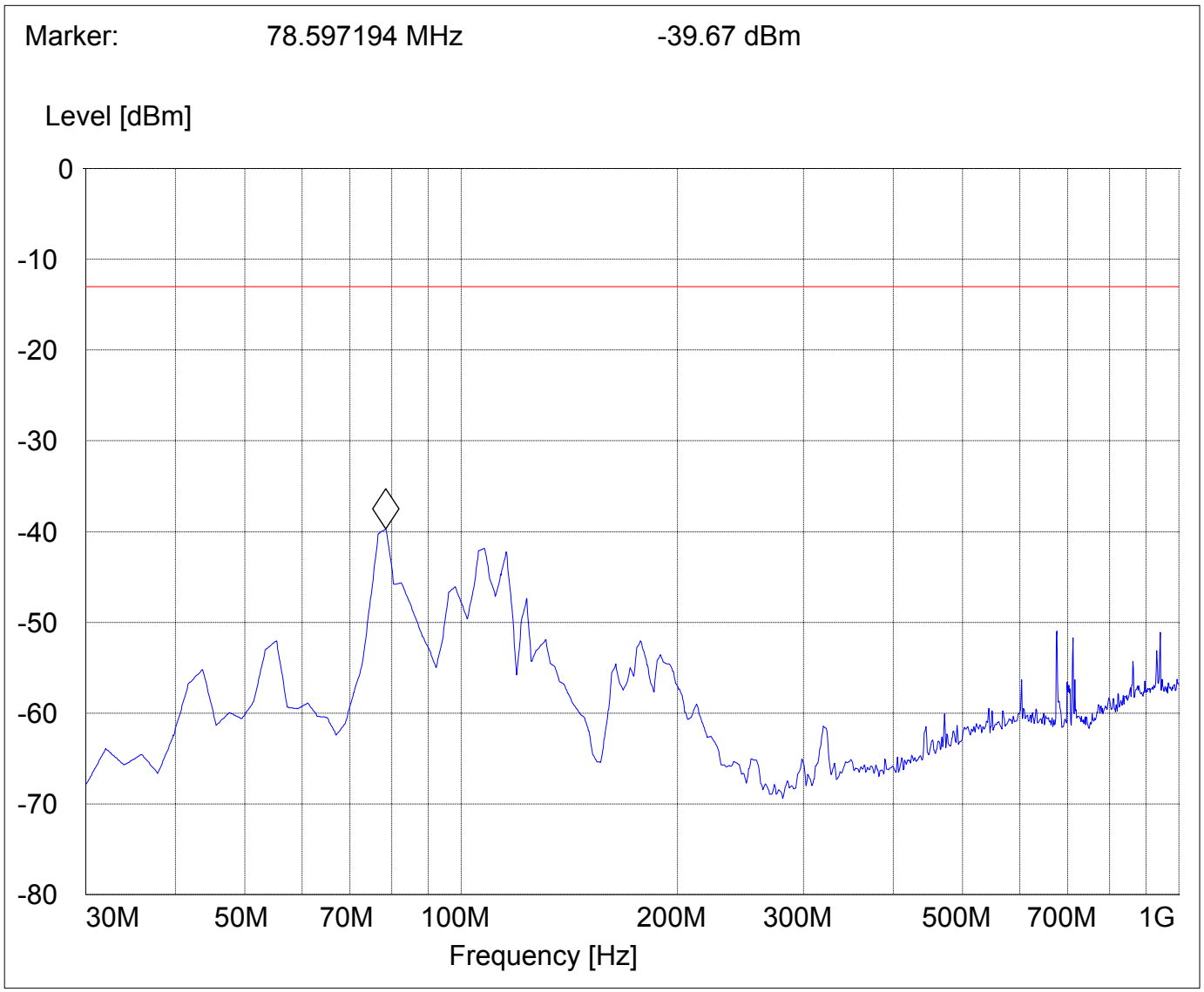
RADIATED SPURIOUS EMISSIONS

Tx Frequency 1850.2MHz: 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

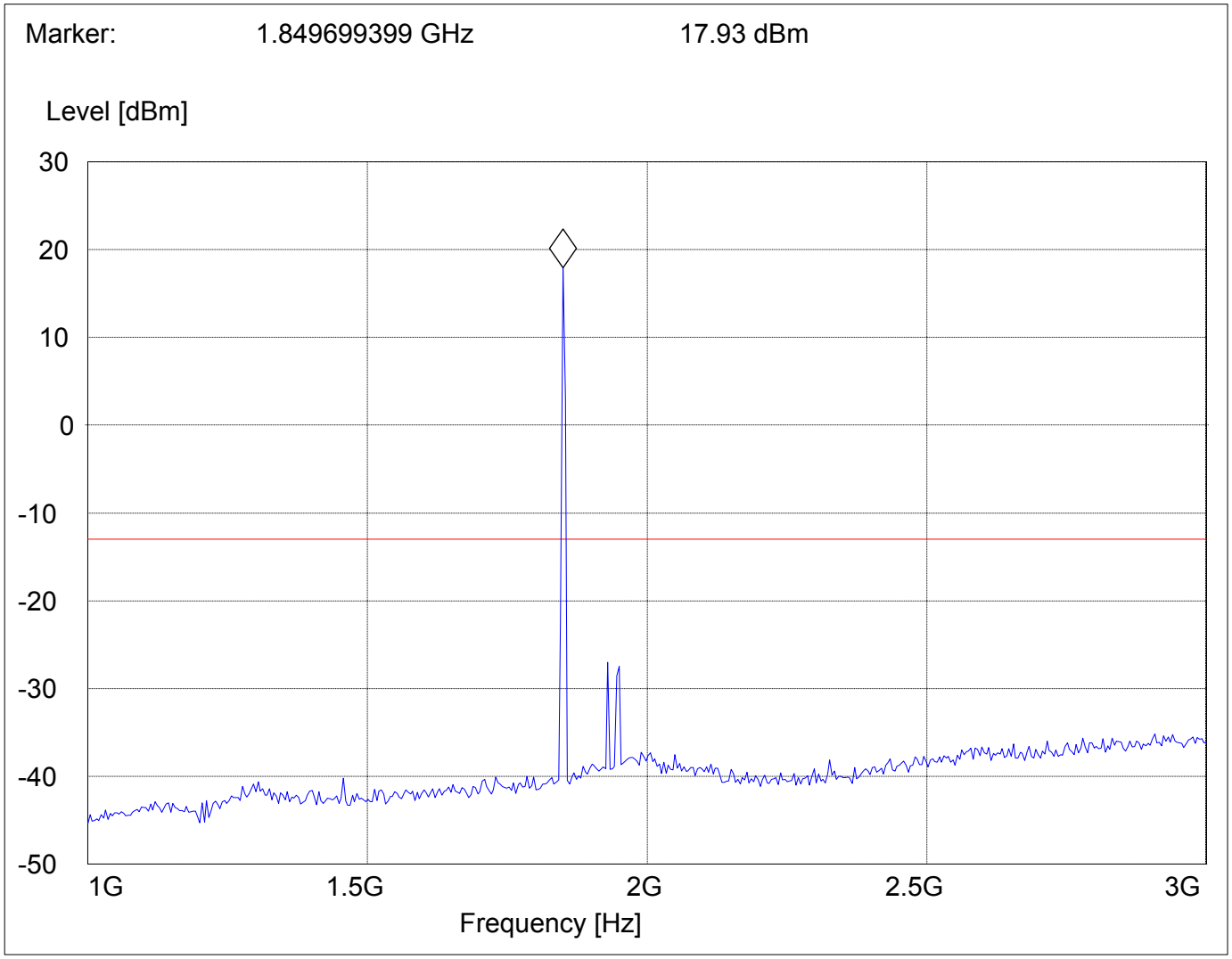
Tx Frequency 1850.2MHz: 1GHz – 3GHz

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



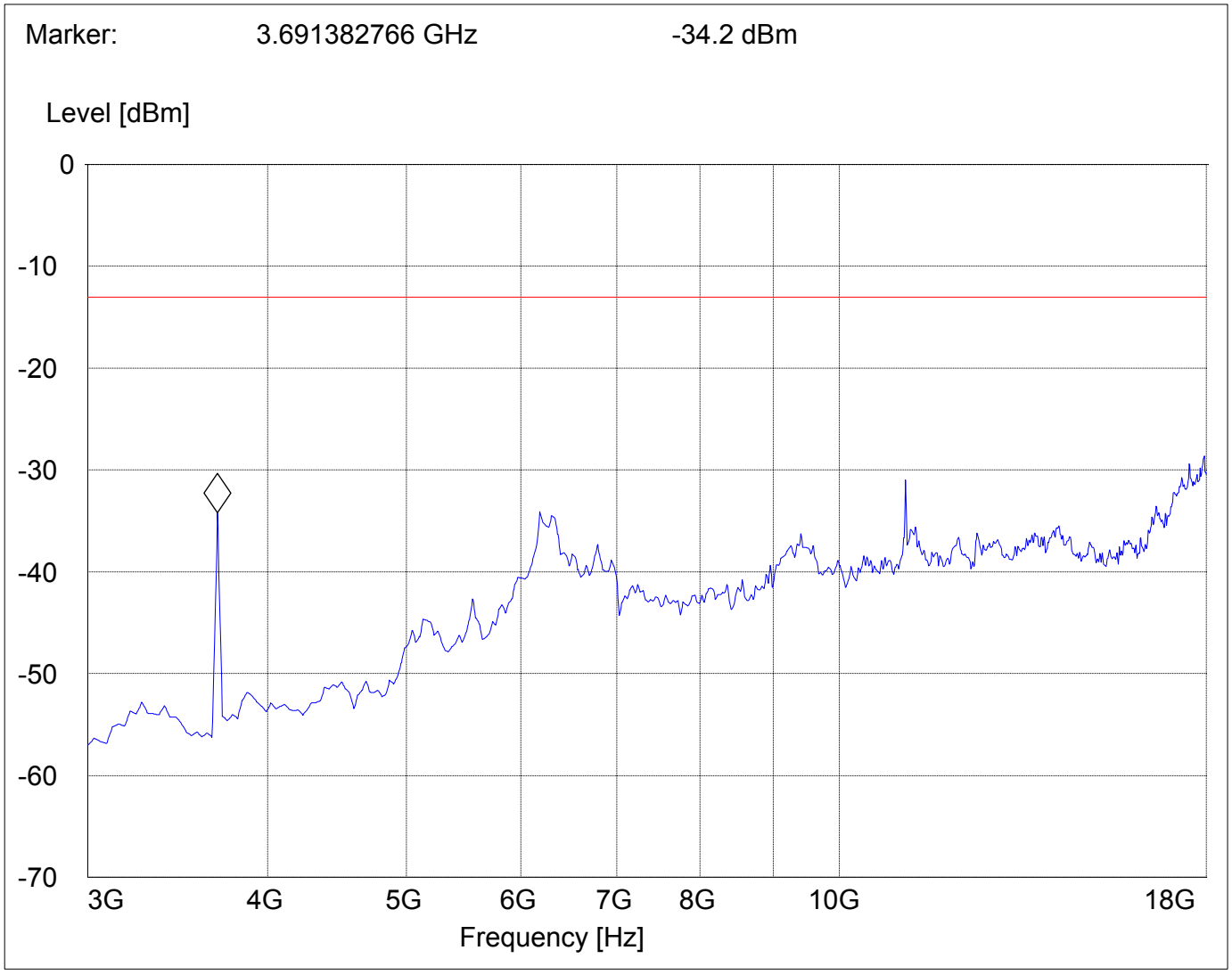
RADIATED SPURIOUS EMISSIONS

Tx Frequency 1850.2MHz: 3GHz – 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

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



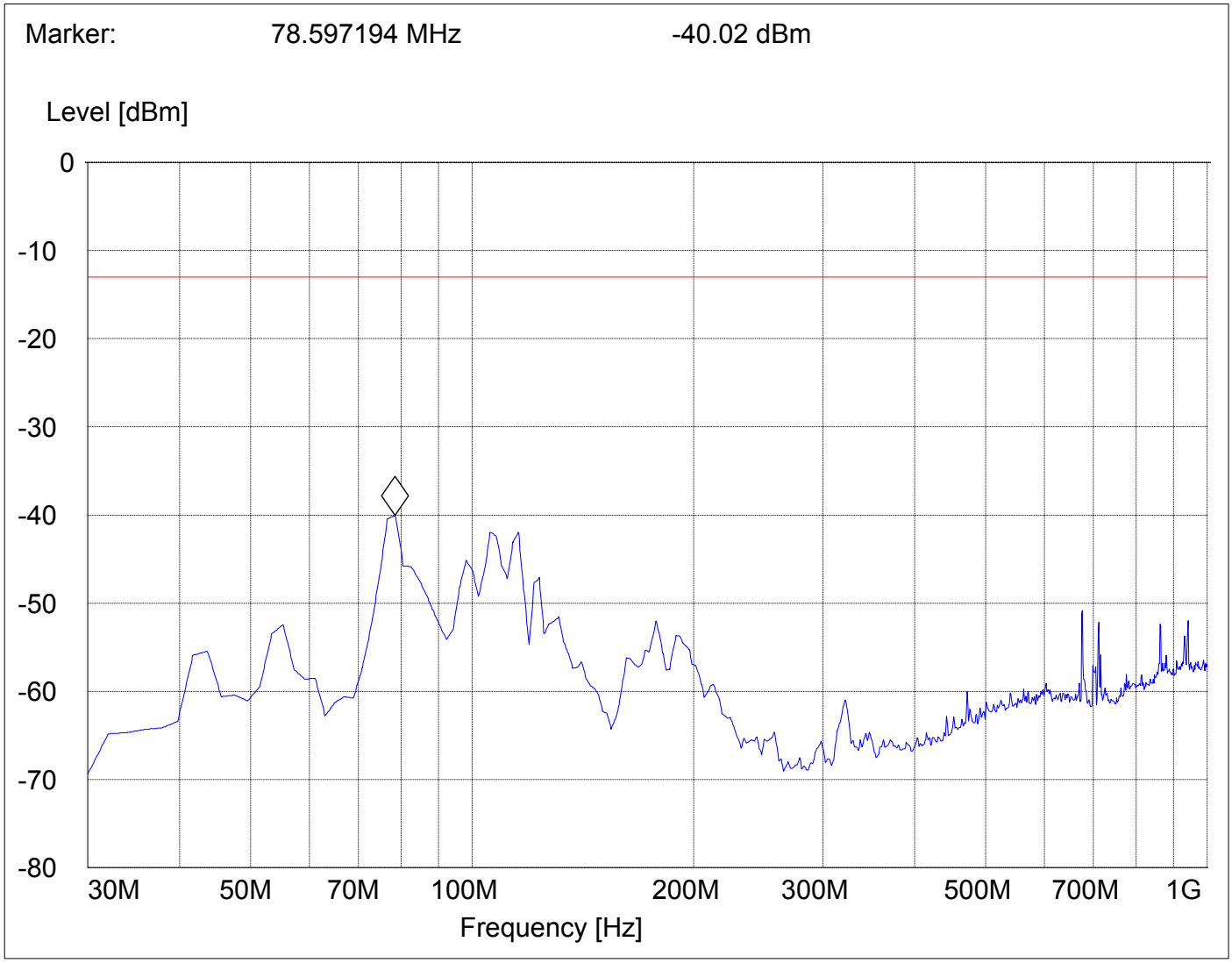
RADIATED SPURIOUS EMISSIONS

Tx Frequency 1880.0MHz: 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

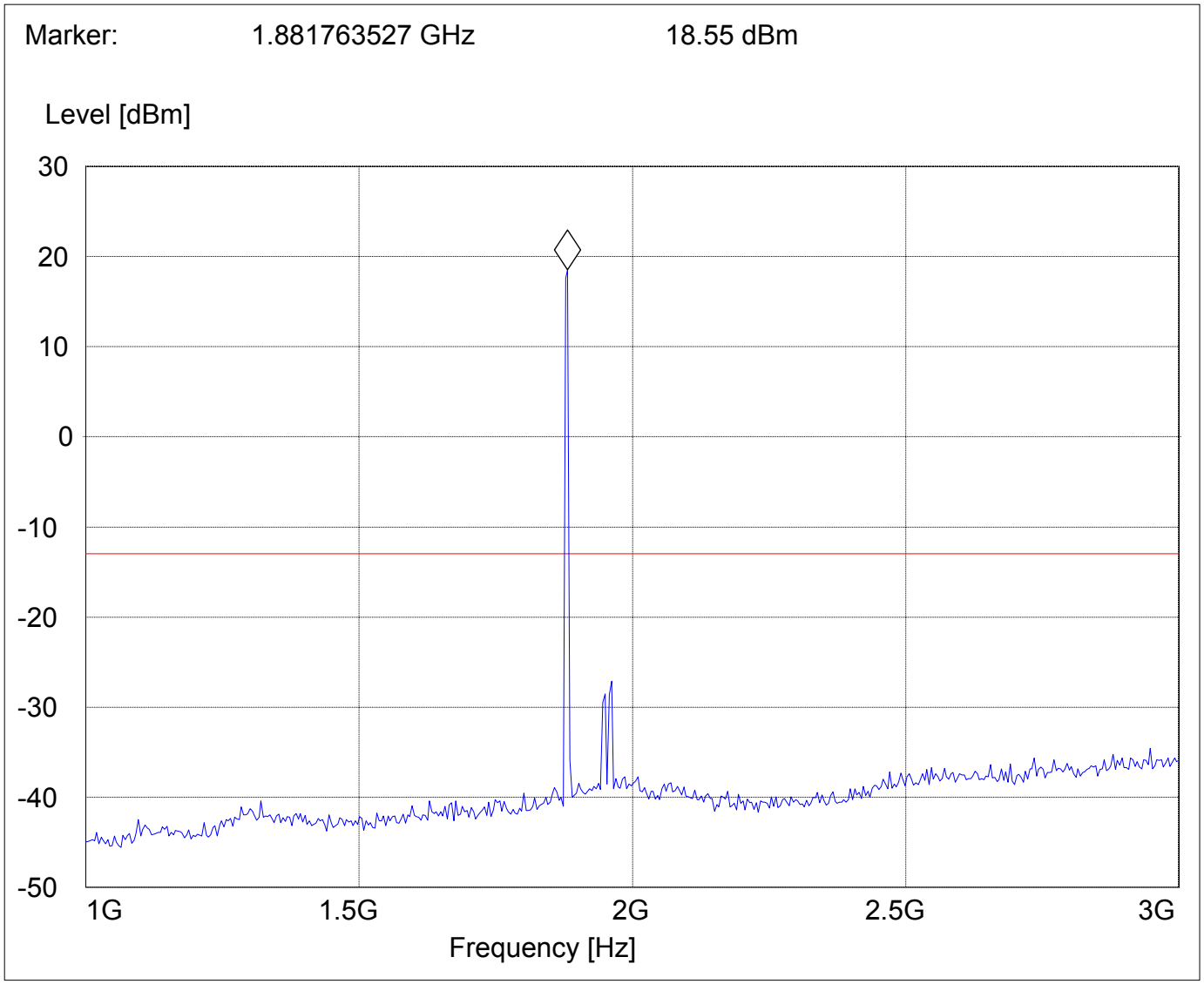
Tx Frequency 1880.0MHz: 1GHz – 3GHz

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



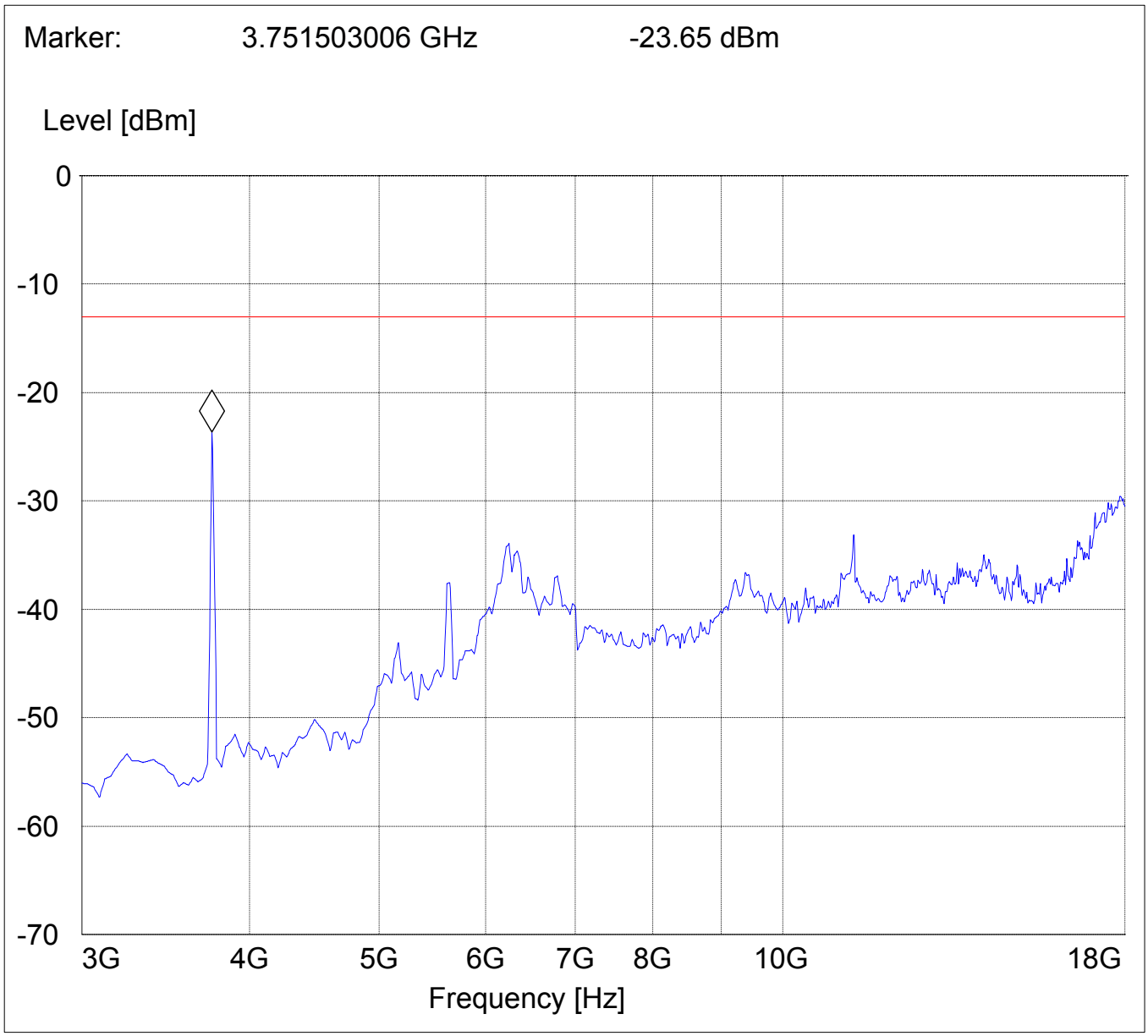
RADIATED SPURIOUS EMISSIONS

Tx Frequency 1880.0MHz: 3GHz – 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

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



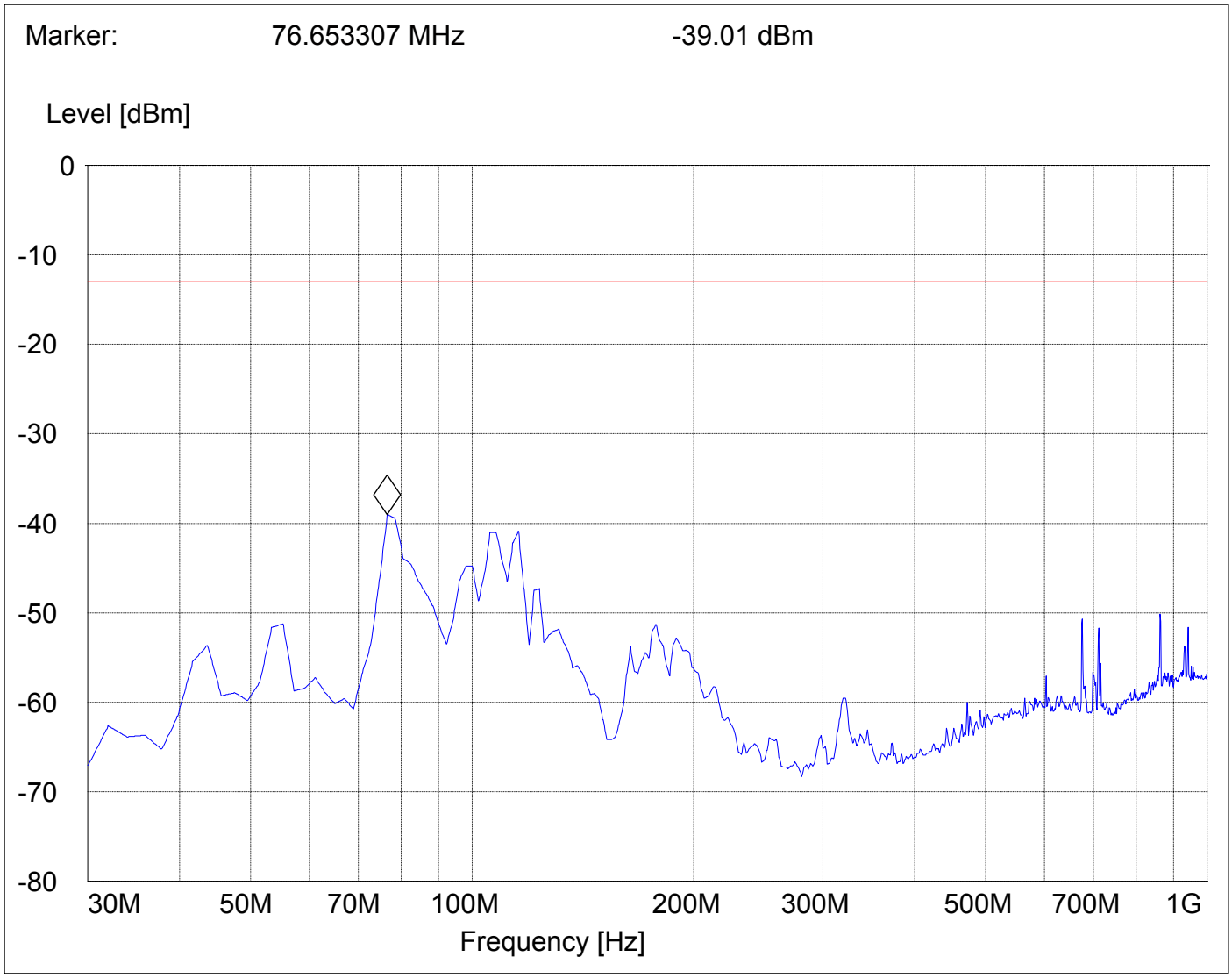
RADIATED SPURIOUS EMISSIONS

Tx Frequency 1909.8MHz: 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



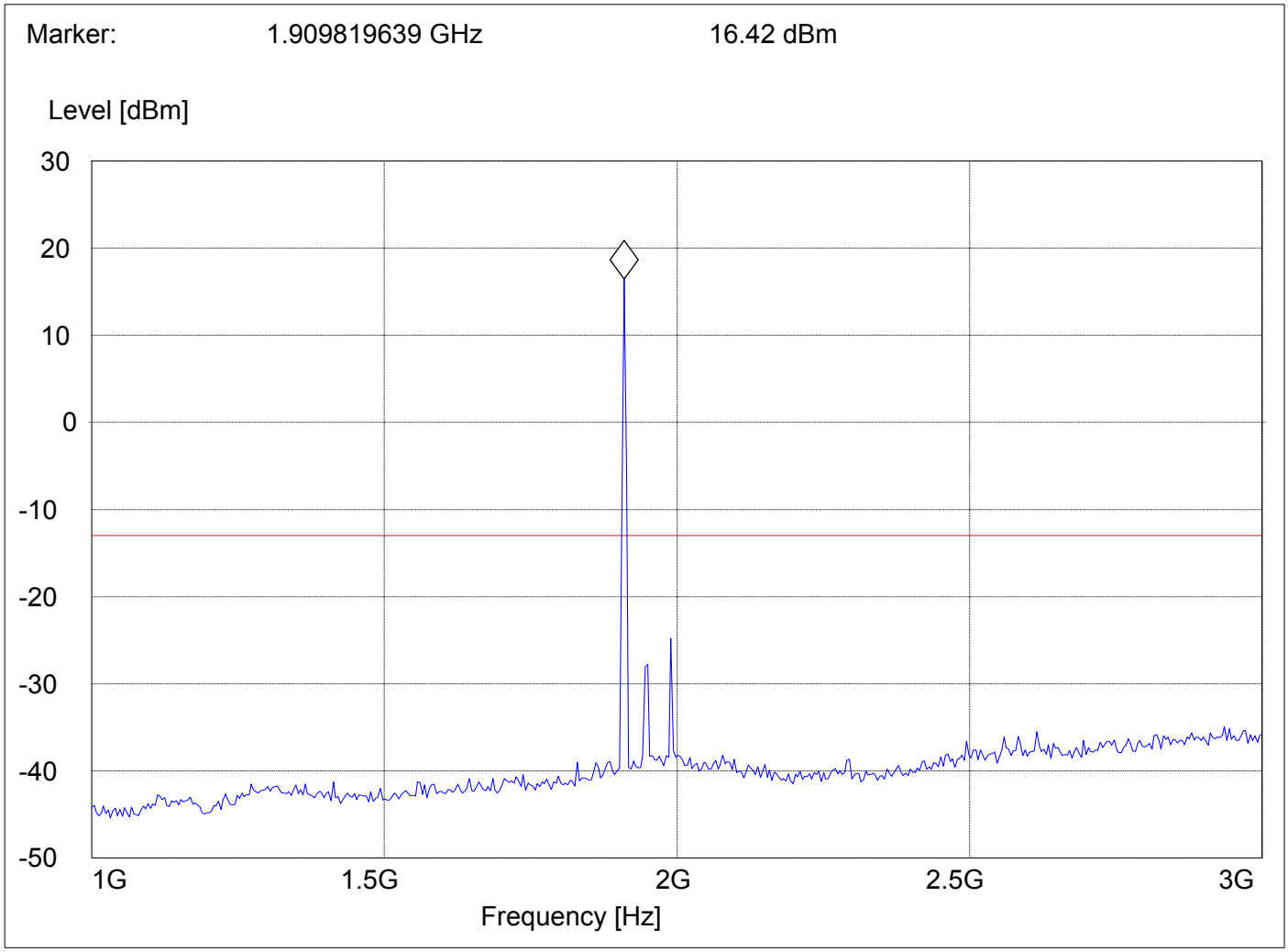
RADIATED SPURIOUS EMISSIONS
Tx Frequency 1909.8MHz: 1GHz – 3GHz

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



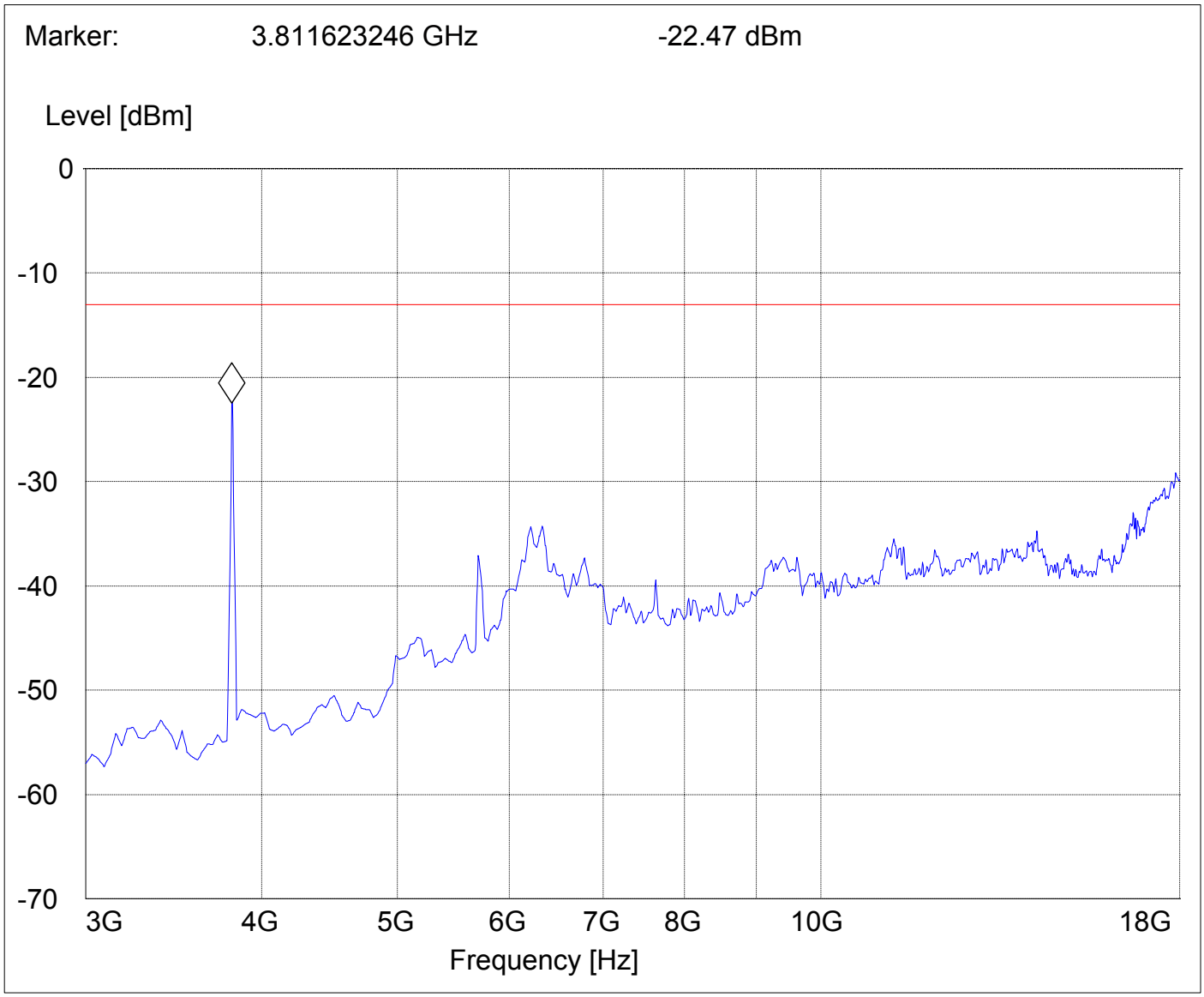
RADIATED SPURIOUS EMISSIONS

Tx Frequency 1909.8MHz: 3GHz – 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

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



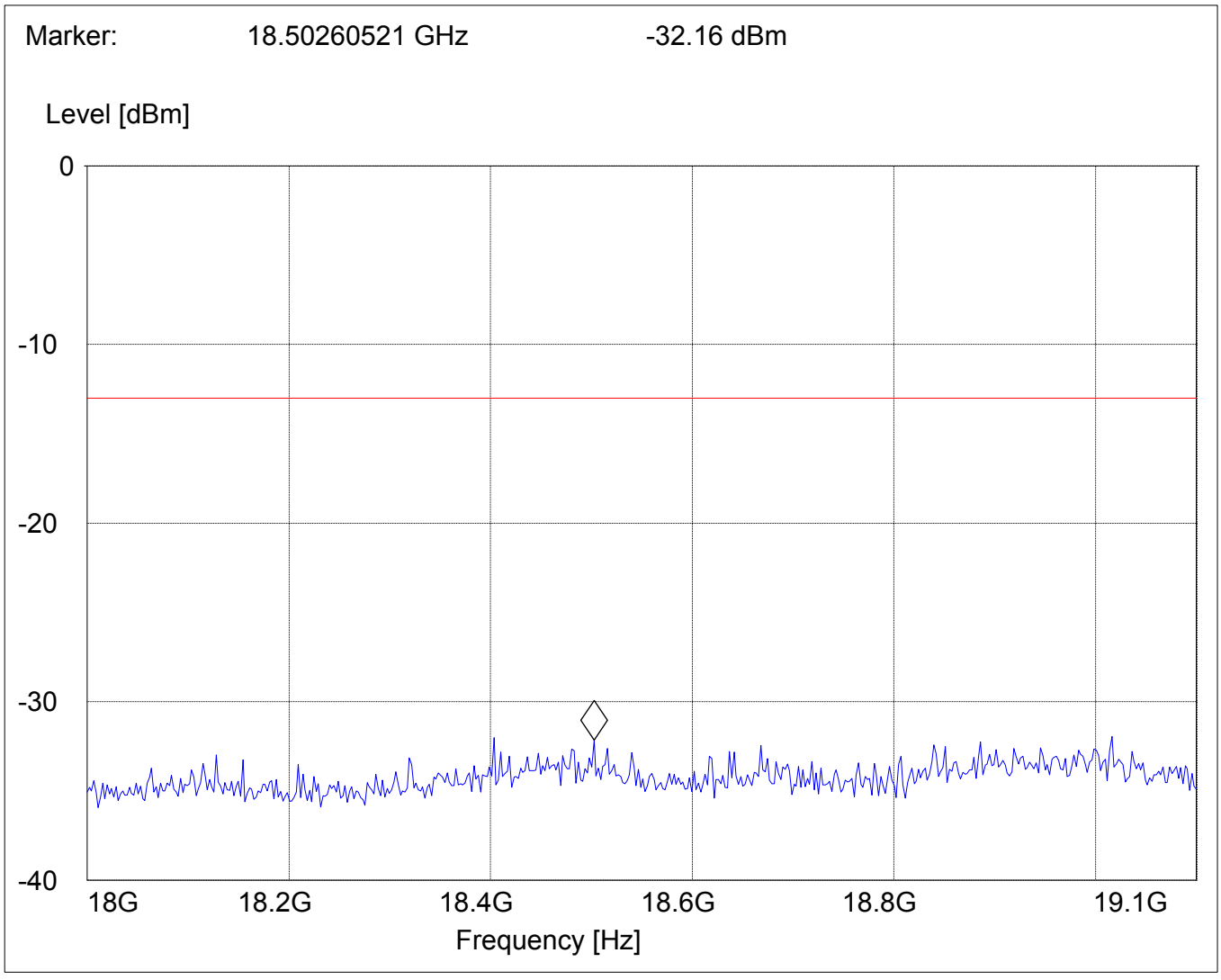
RADIATED SPURIOUS EMISSIONS
18GHz – 19.1GHz

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

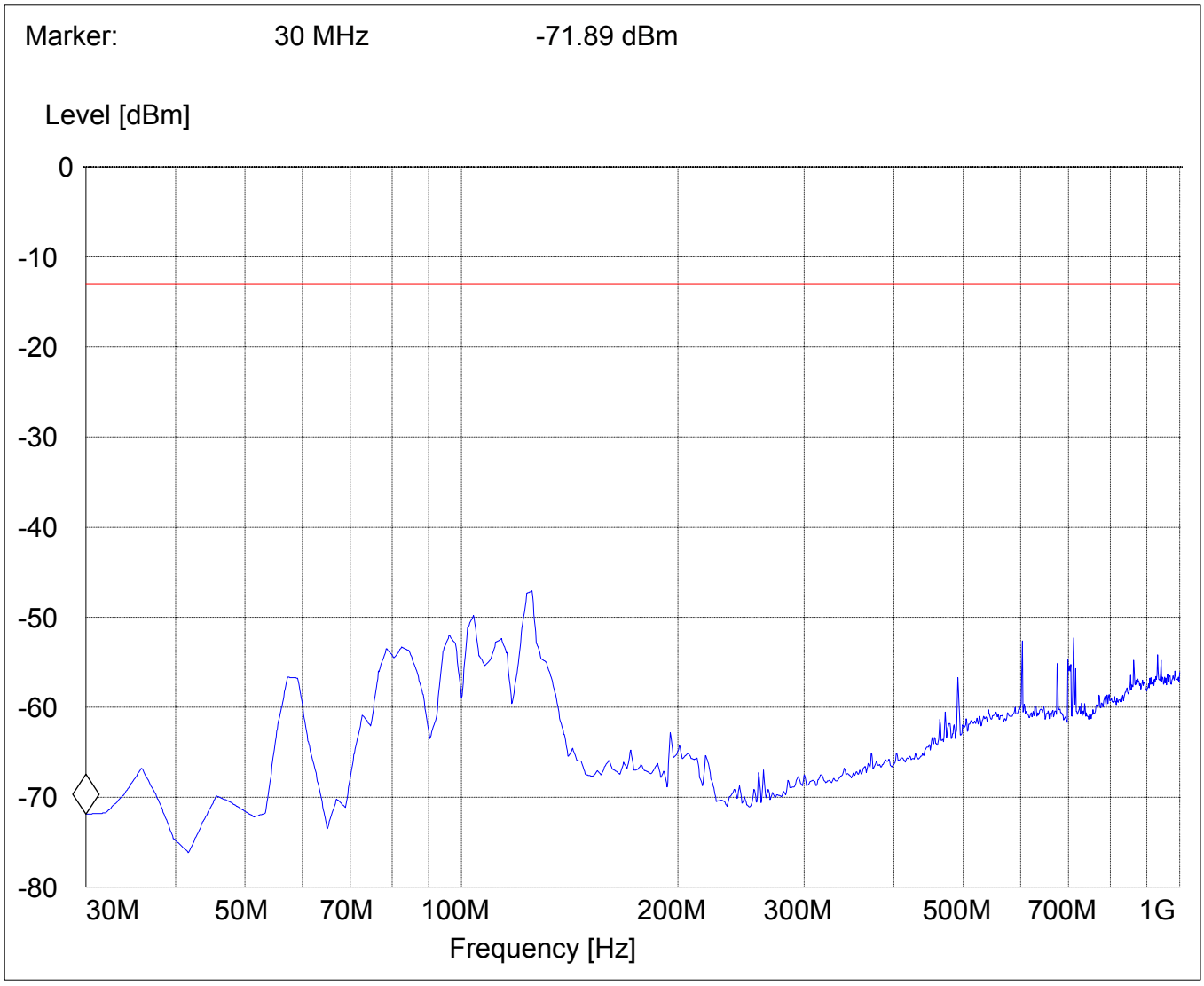


RADIATED SPURIOUS EMISSIONS
EUT in Idle Mode: 30MHz – 1GHz

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

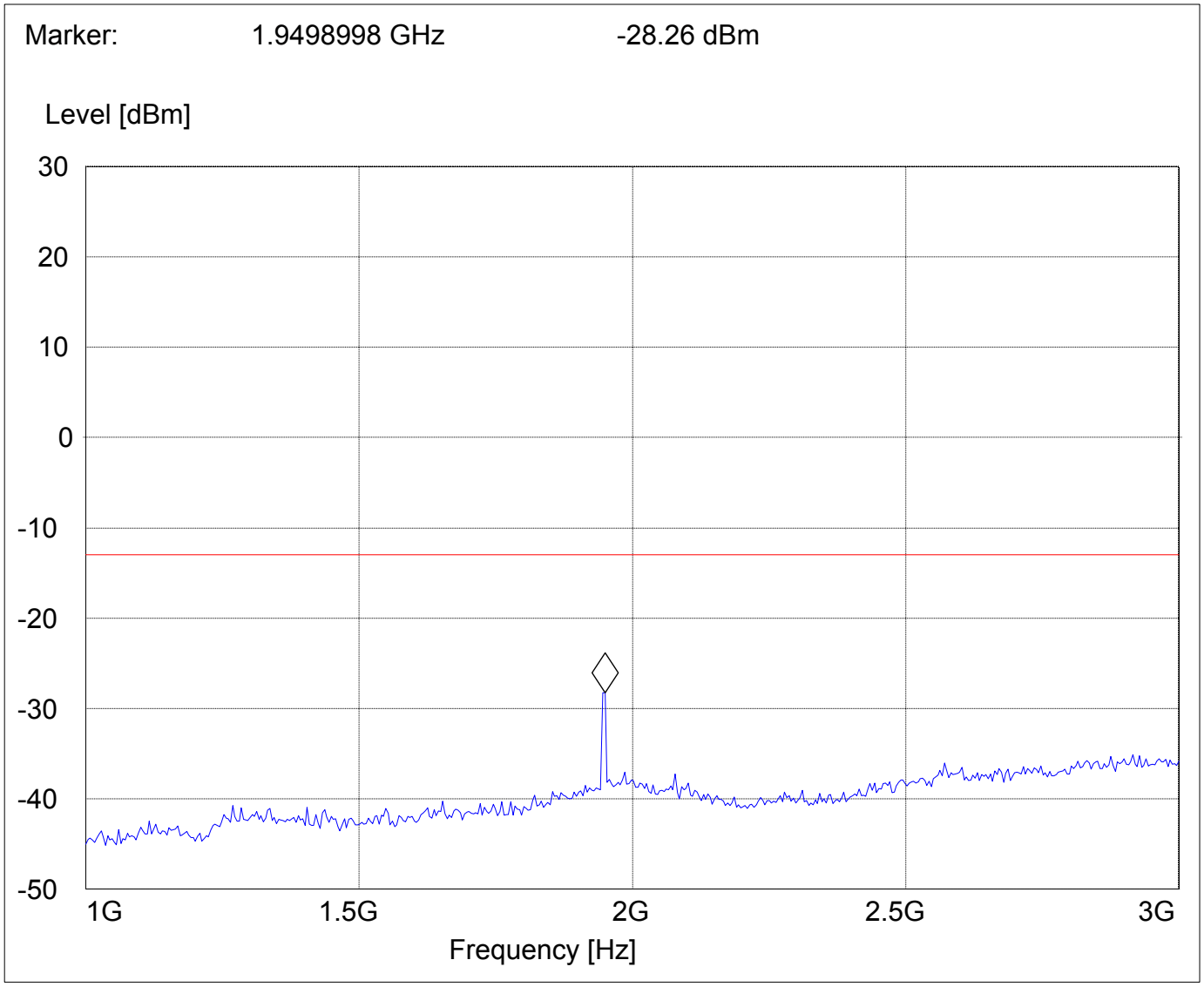


RADIATED SPURIOUS EMISSIONS
EUT in Idle Mode: 1GHz – 3GHz

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

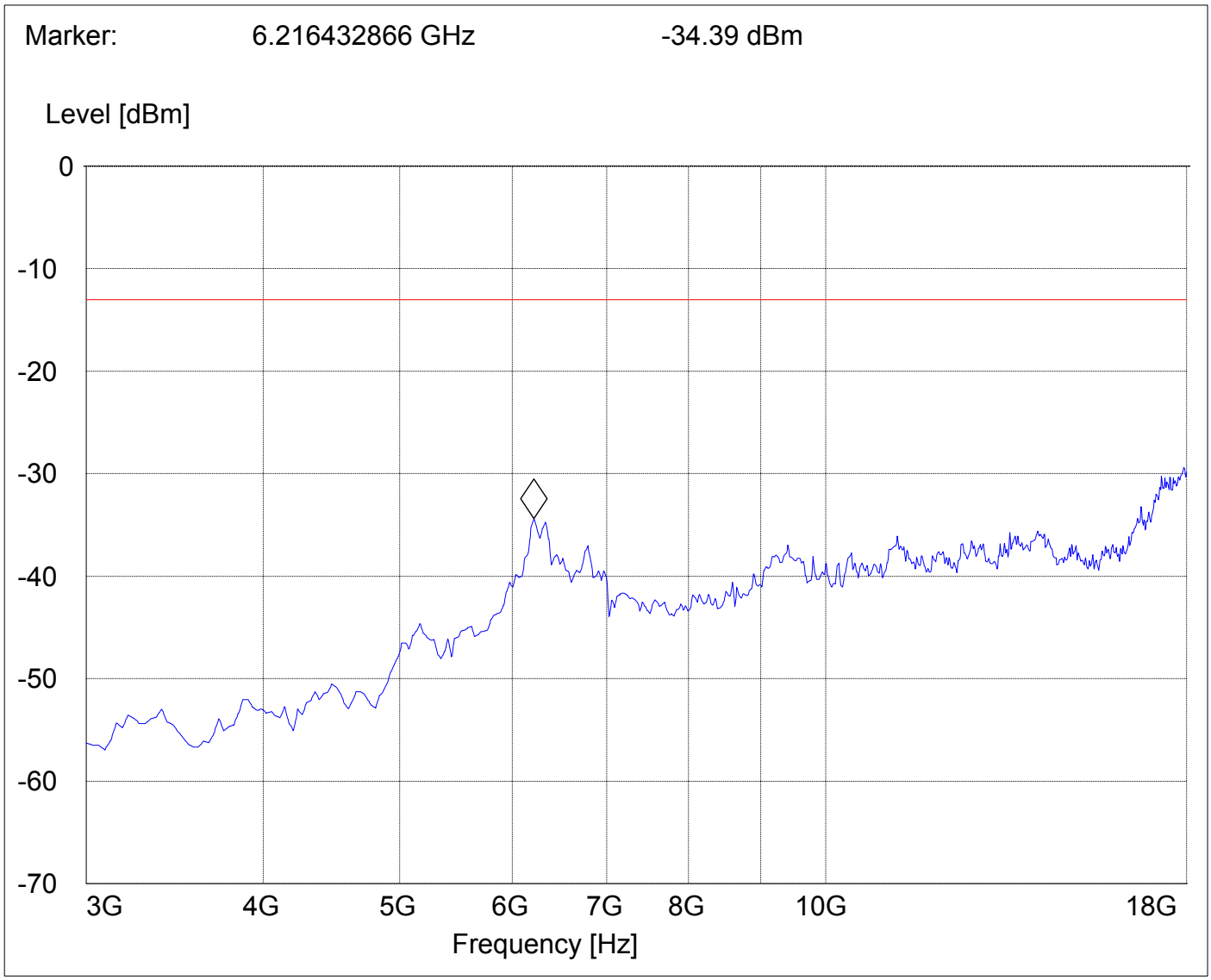


RADIATED SPURIOUS EMISSIONS
EUT in Idle Mode: 3GHz – 18GHz

Spurious emission limit –13dBm

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

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

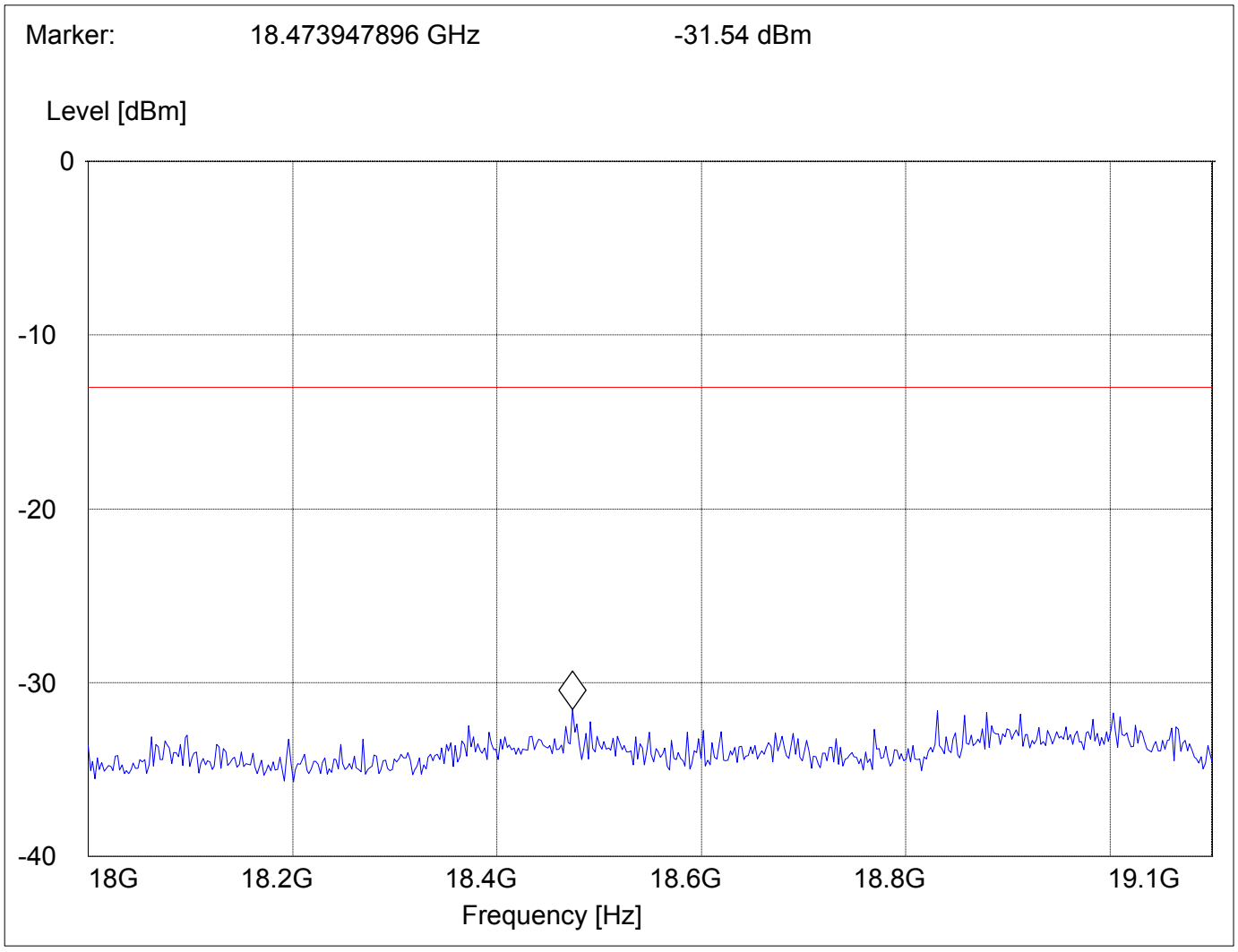


RADIATED SPURIOUS EMISSIONS
EUT in Idle Mode: 18GHz – 19.1GHz

Spurious emission limit –13dBm

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

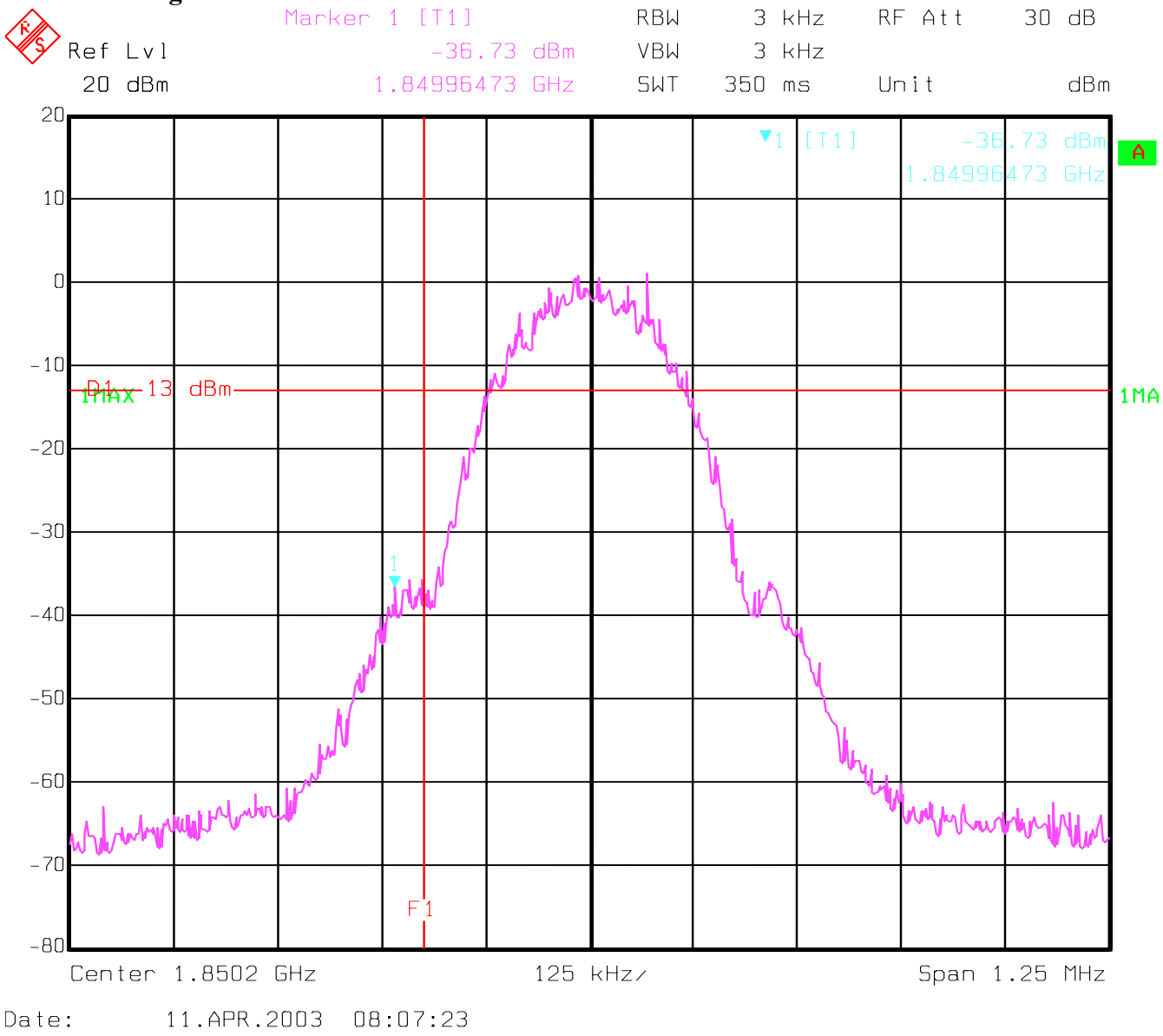
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
18GHz	19.1GHz	Max Peak	Coupled	1 MHz



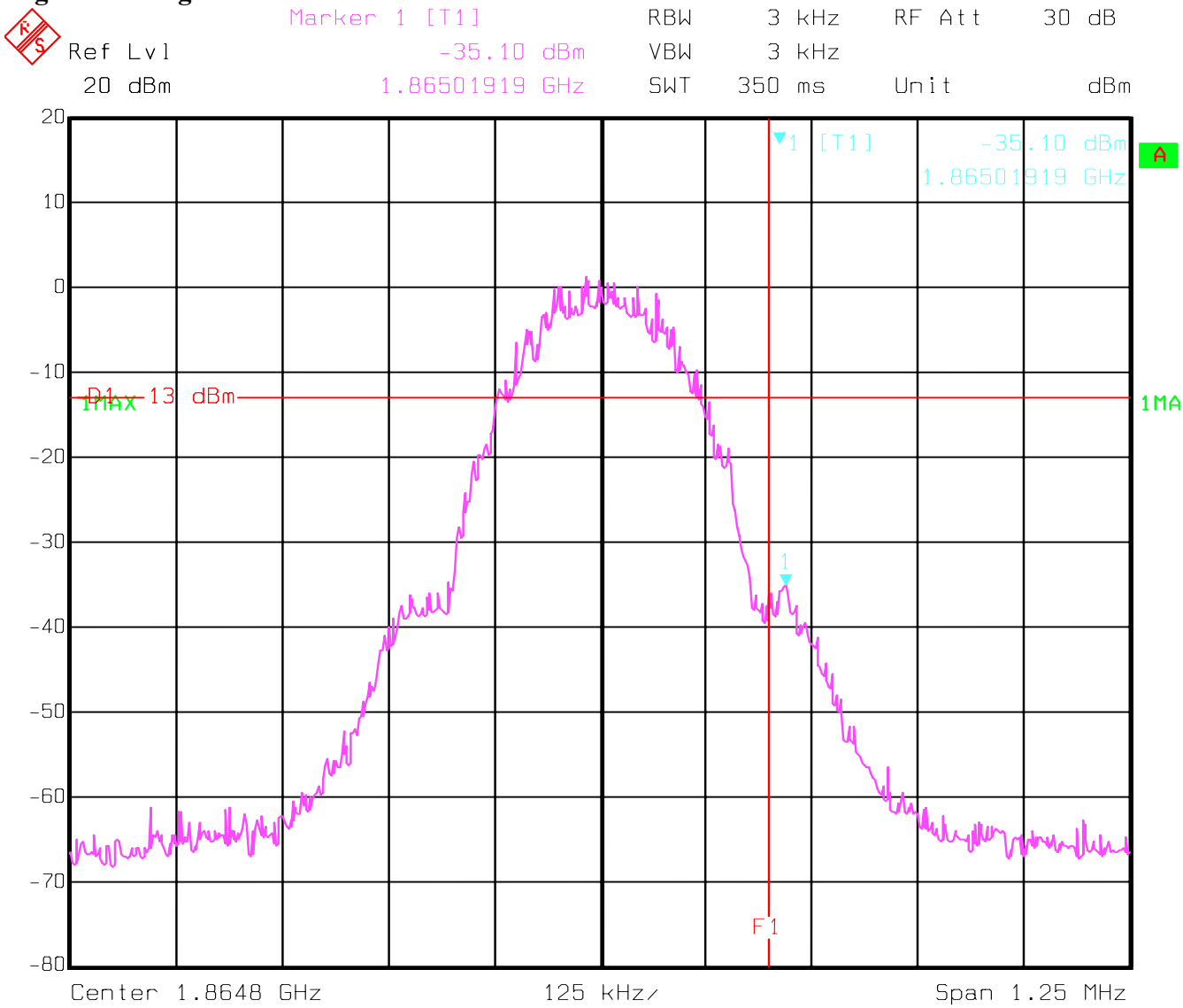
BAND EDGE Block A (PCS-1900) **§2.1049(c)(1), §24.238(a)(b)**

(Conducted)

Low Band Edge



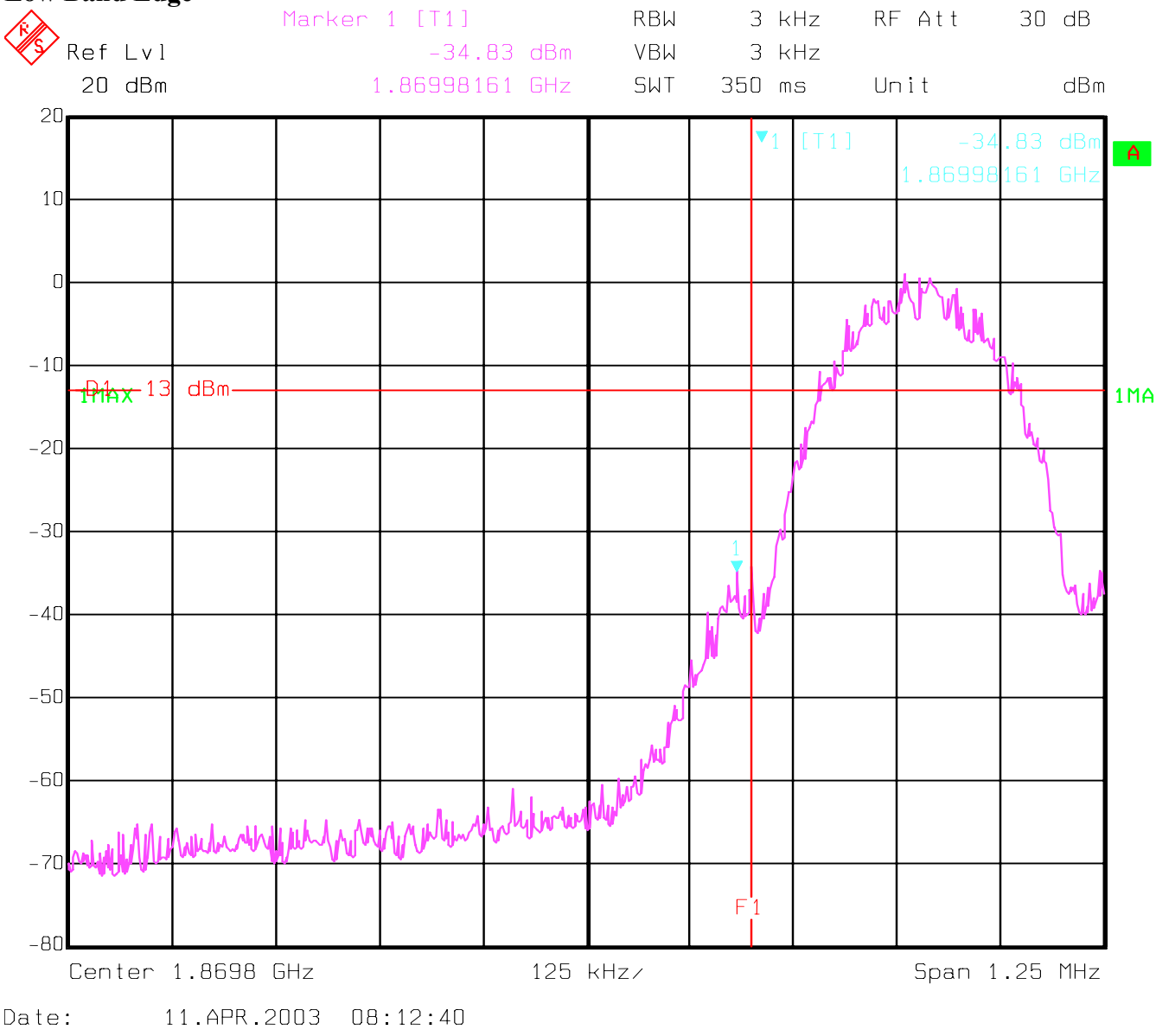
BAND EDGE Block A (PCS-1900) **§2.1049(c)(1), §24.238(a)(b)**
(Conducted)
High Band Edge



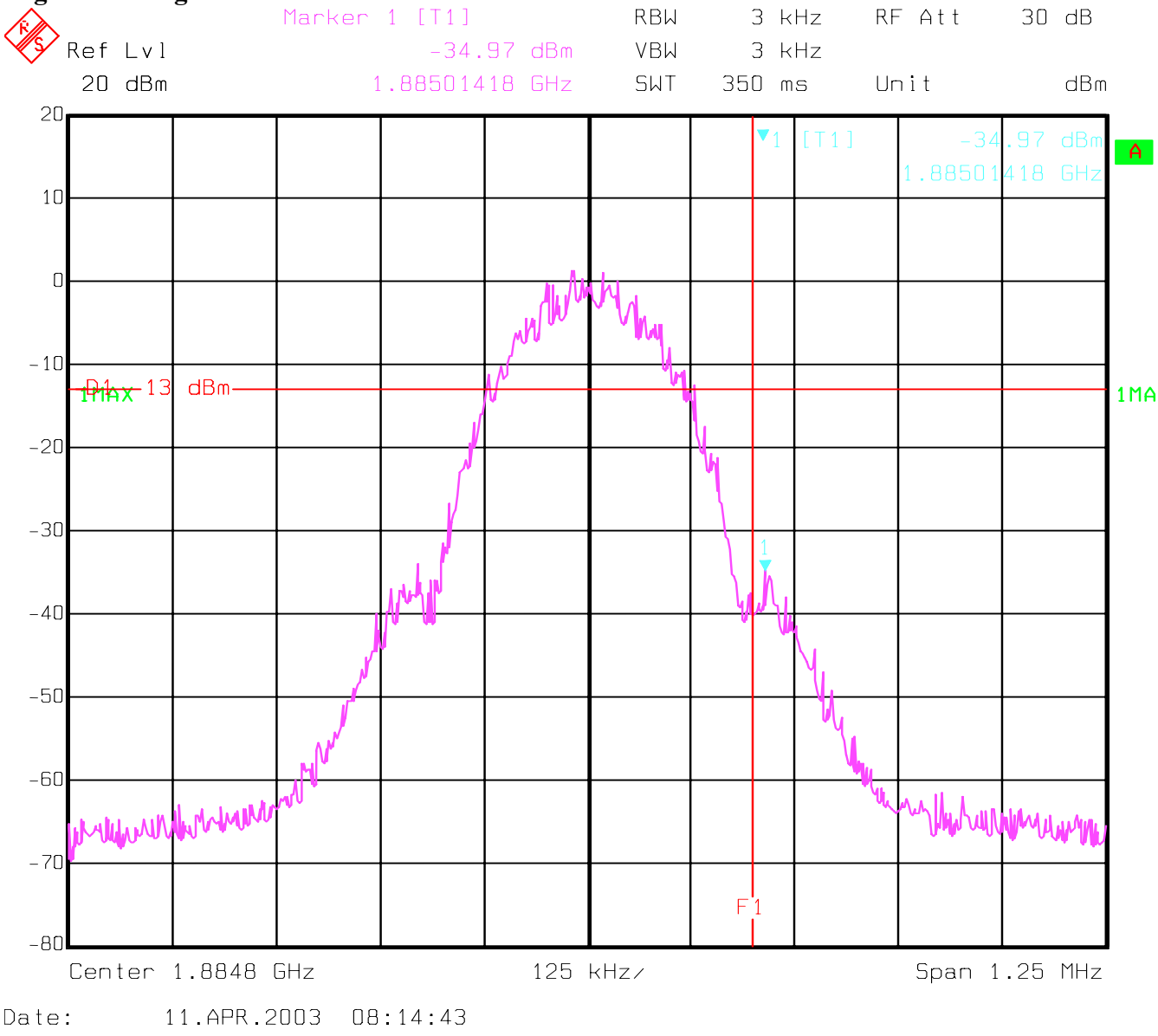
BAND EDGE Block B (PCS-1900) **§2.1049(c)(1), §24.238(a)(b)**

(Conducted)

Low Band Edge



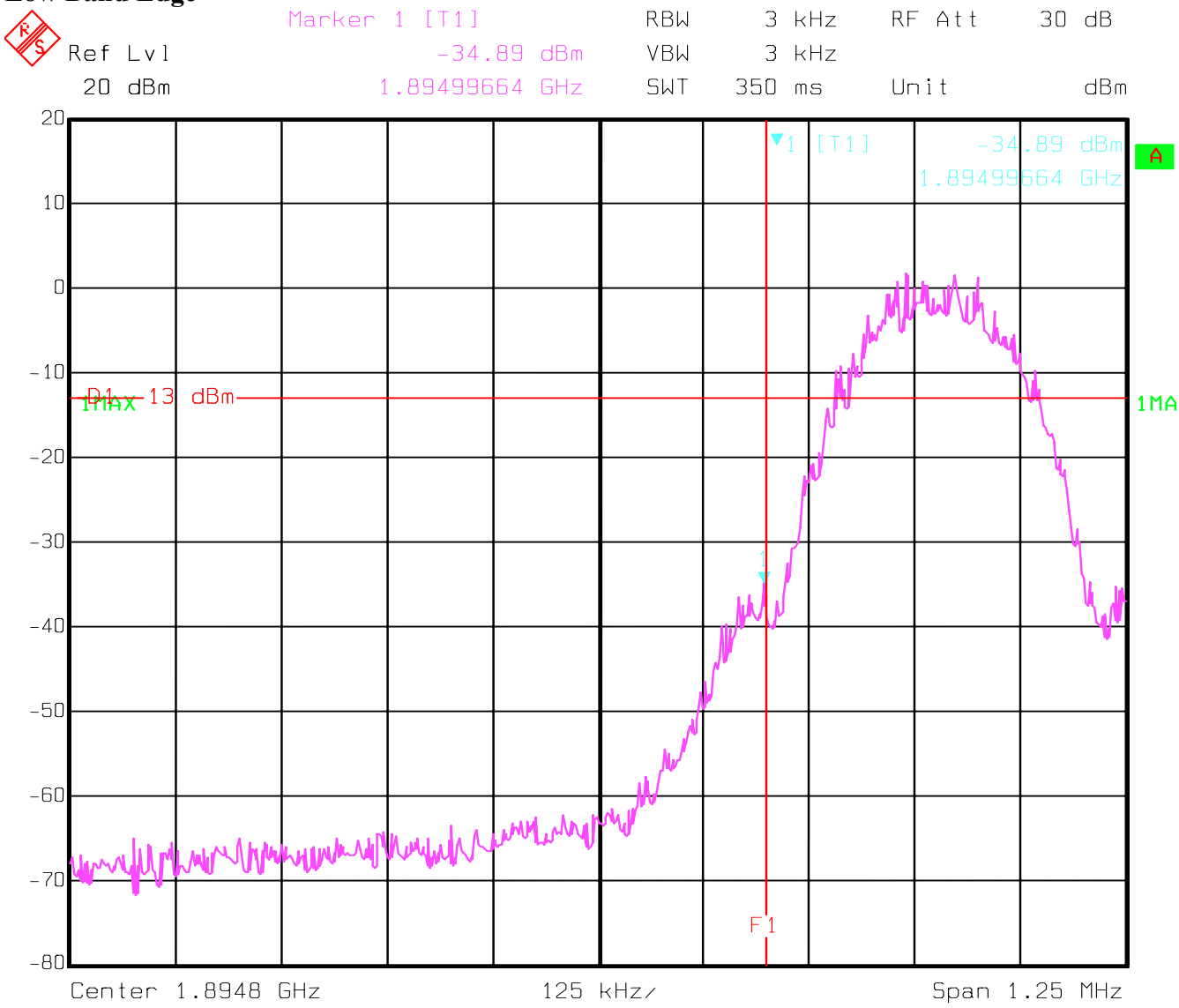
BAND EDGE Block B (PCS-1900) **§2.1049(c)(1), §24.238(a)(b)**
(Conducted)
High Band Edge



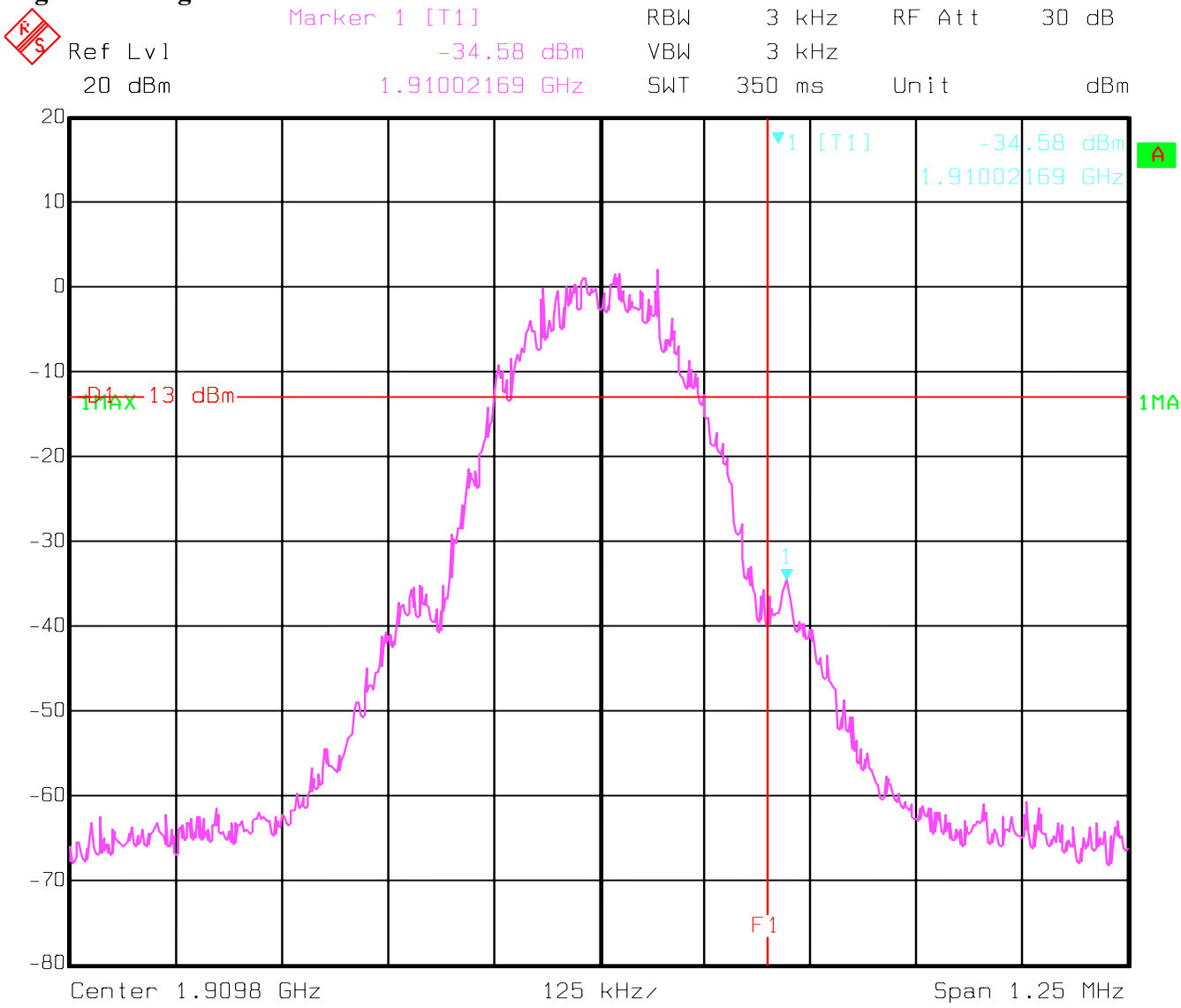
BAND EDGE Block C (PCS-1900) **§2.1049(c)(1), §24.238(a)(b)**

(Conducted)

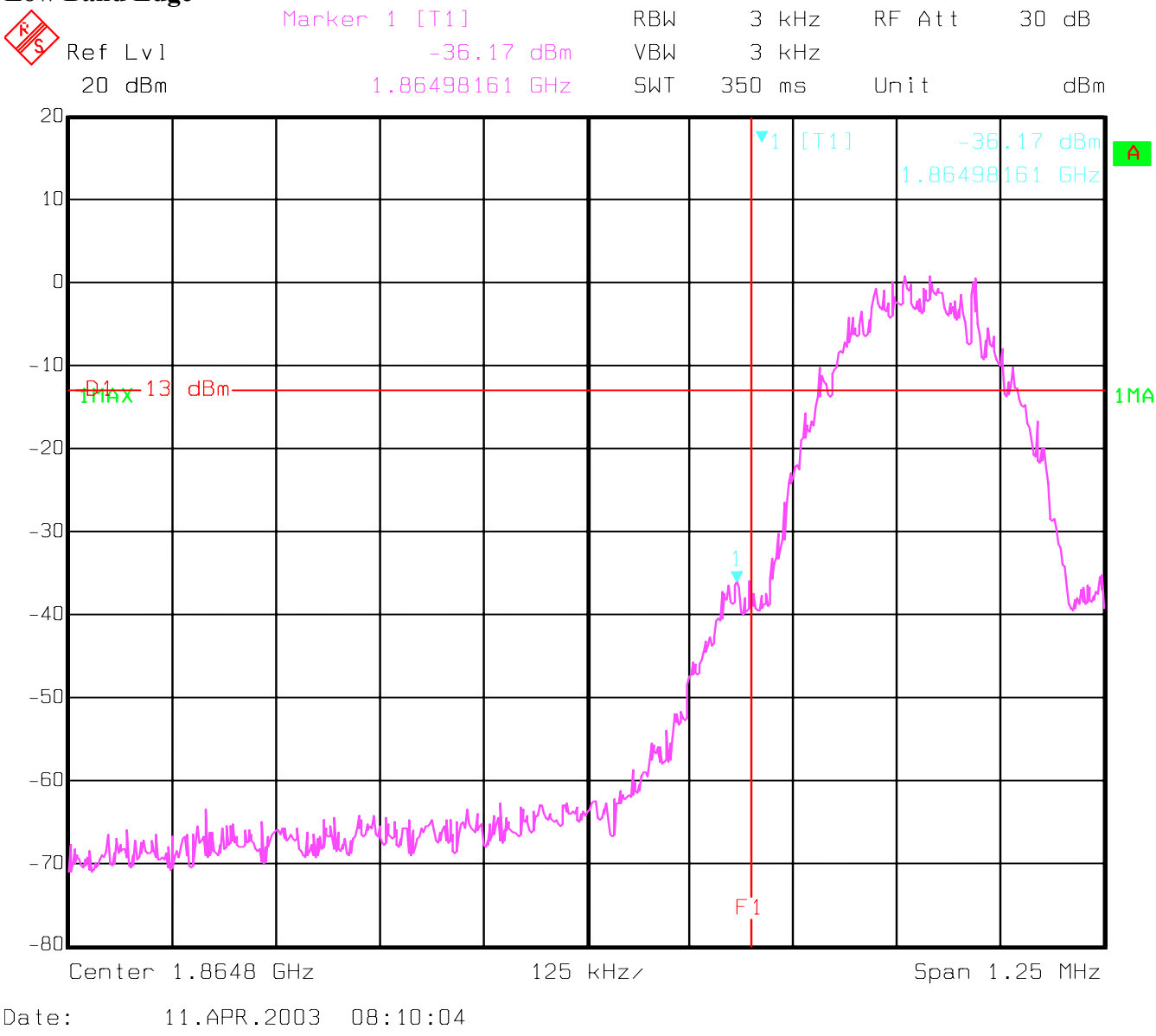
Low Band Edge



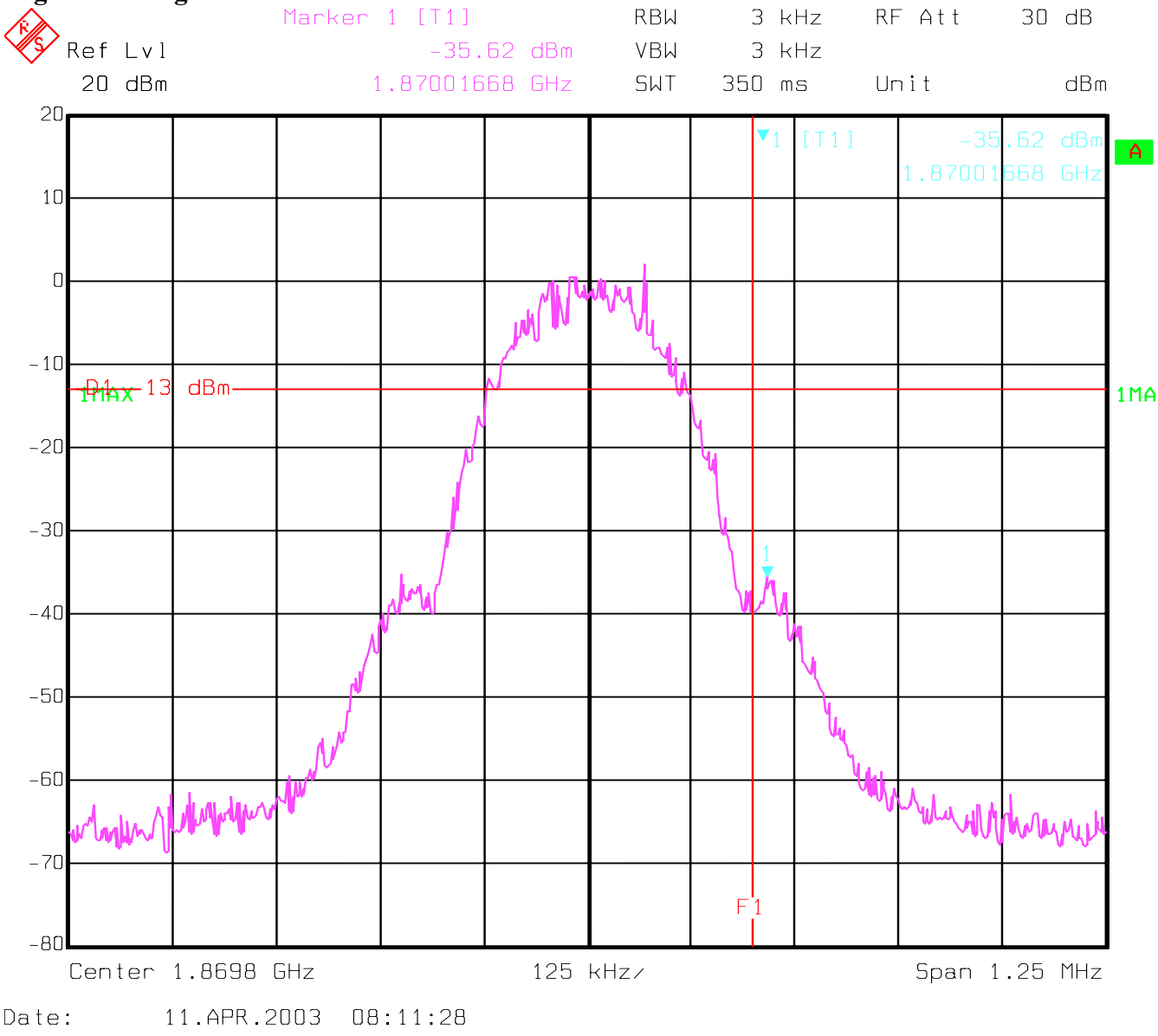
BAND EDGE Block C (PCS-1900) **§2.1049(c)(1), §24.238(a)(b)**
(Conducted)
High Band Edge



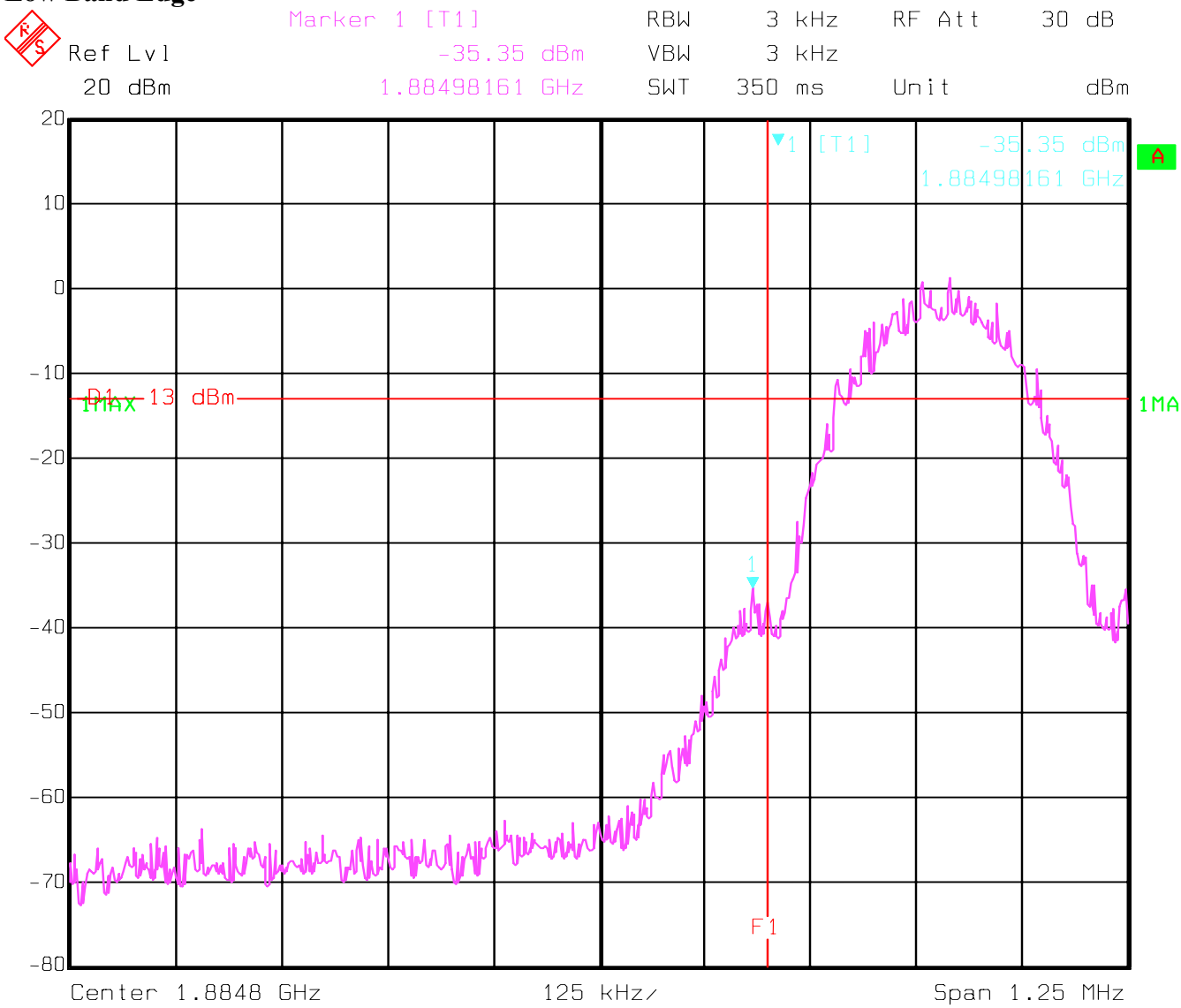
BAND EDGE Block D (PCS-1900) **§2.1049(c)(1), §24.238(a)(b)**
(Conducted)
Low Band Edge



BAND EDGE Block D (PCS-1900) **§2.1049(c)(1), §24.238(a)(b)**
(Conducted)
High Band Edge



BAND EDGE Block E (PCS-1900) **§2.1049(c)(1), §24.238(a)(b)**
(Conducted)
Low Band Edge

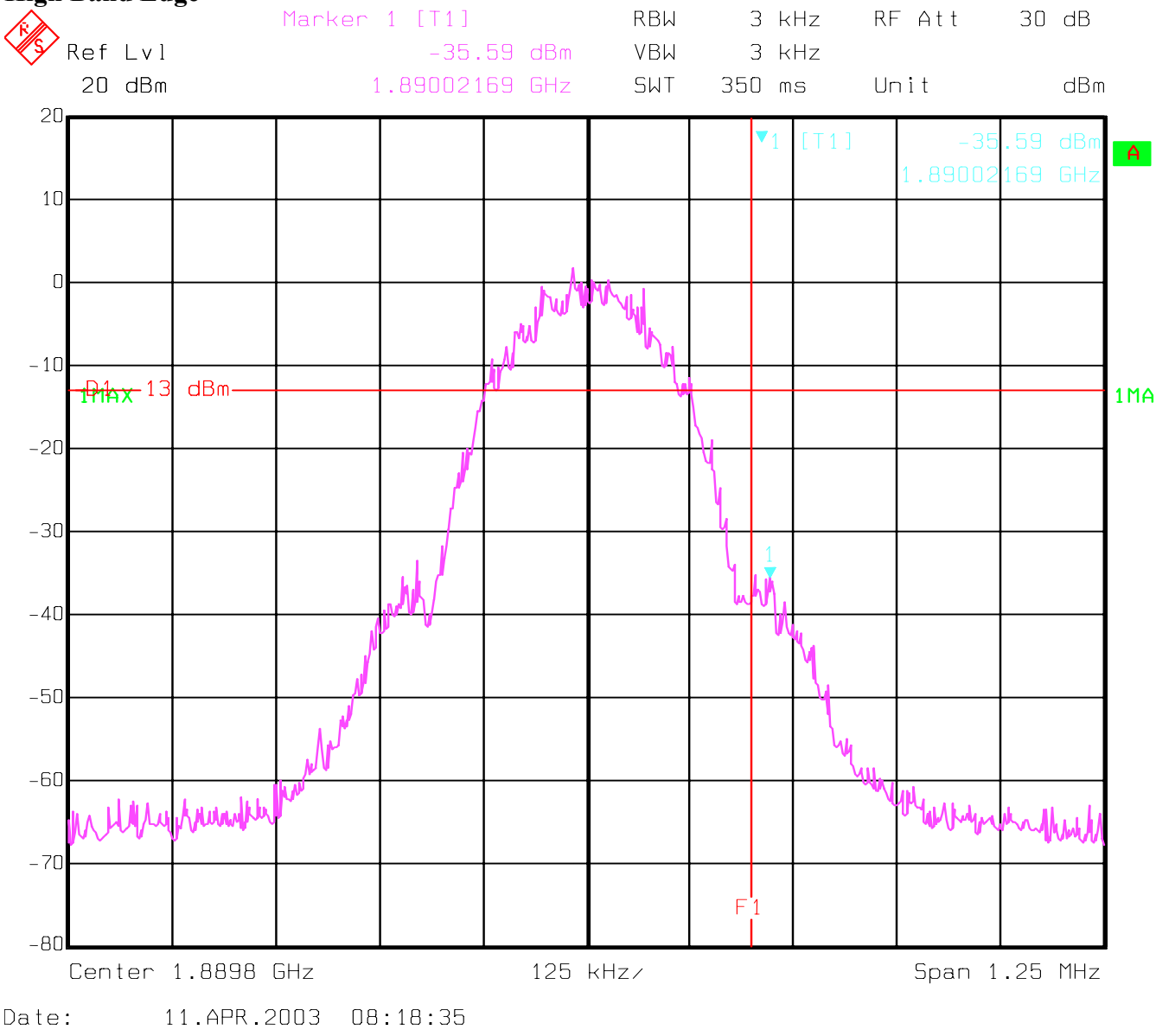


Date: 11.APR.2003 08:16:43

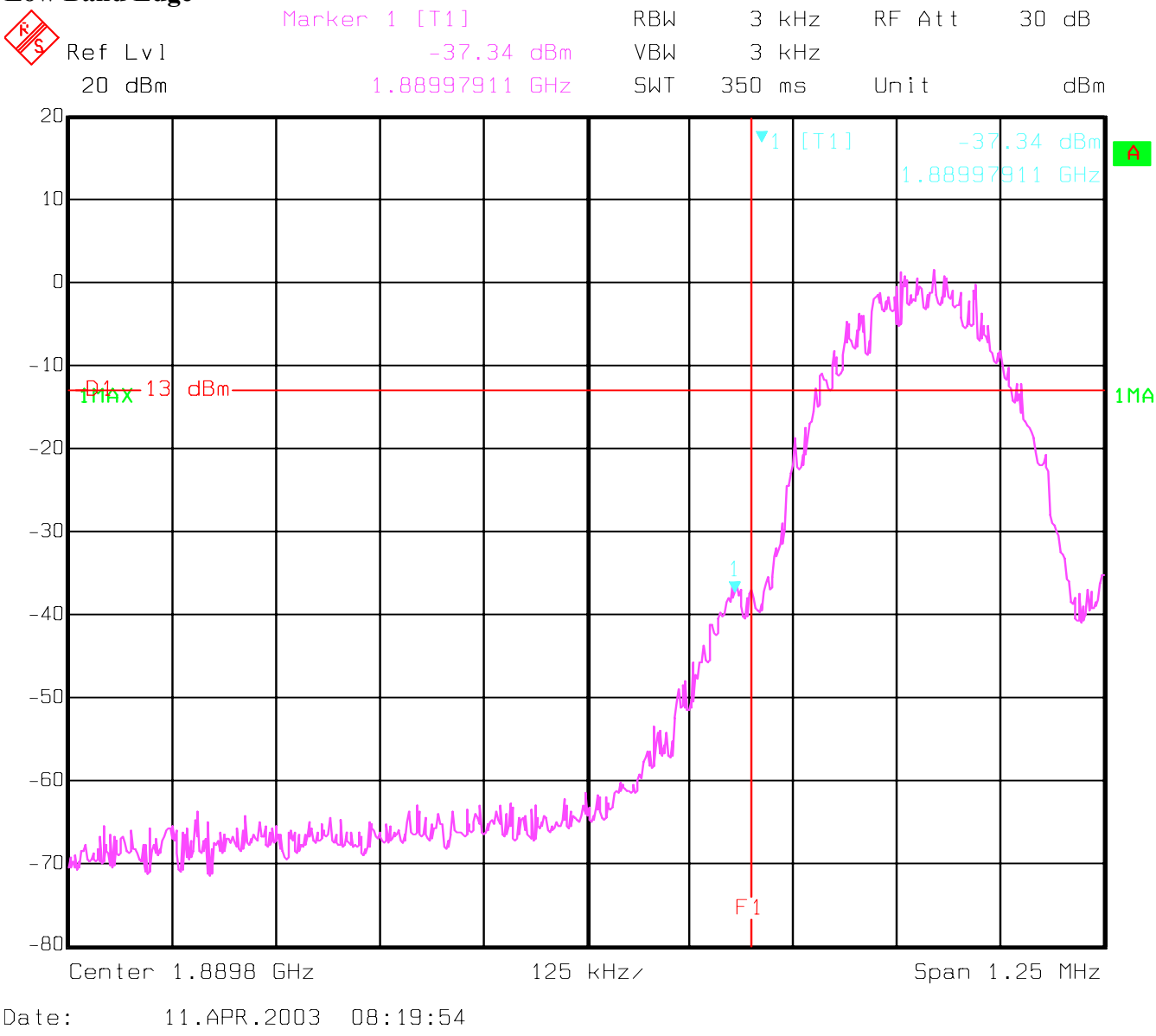
BAND EDGE Block E (PCS-1900) **§2.1049(c)(1), §24.238(a)(b)**

(Conducted)

High Band Edge



BAND EDGE Block F (PCS-1900) **§2.1049(c)(1), §24.238(a)(b)**
(Conducted)
Low Band Edge



BAND EDGE Block F (PCS-1900) **§2.1049(c)(1), §24.238(a)(b)**
(Conducted)
Low Band Edge

RECEIVER RADIATED EMISSIONS SUBCLAUSE § 15.209/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.

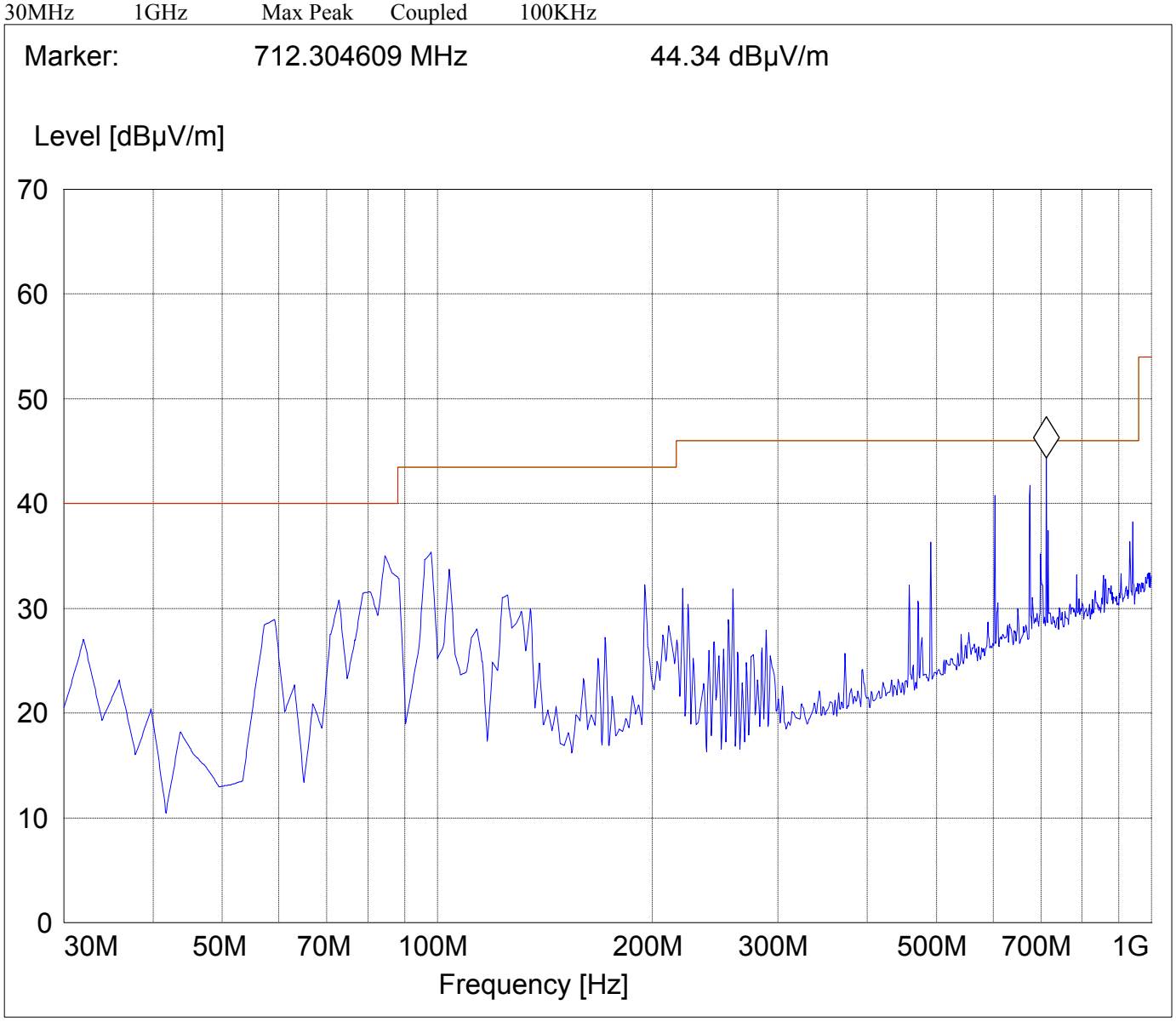
Limits **SUBCLAUSE § 15.209**

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

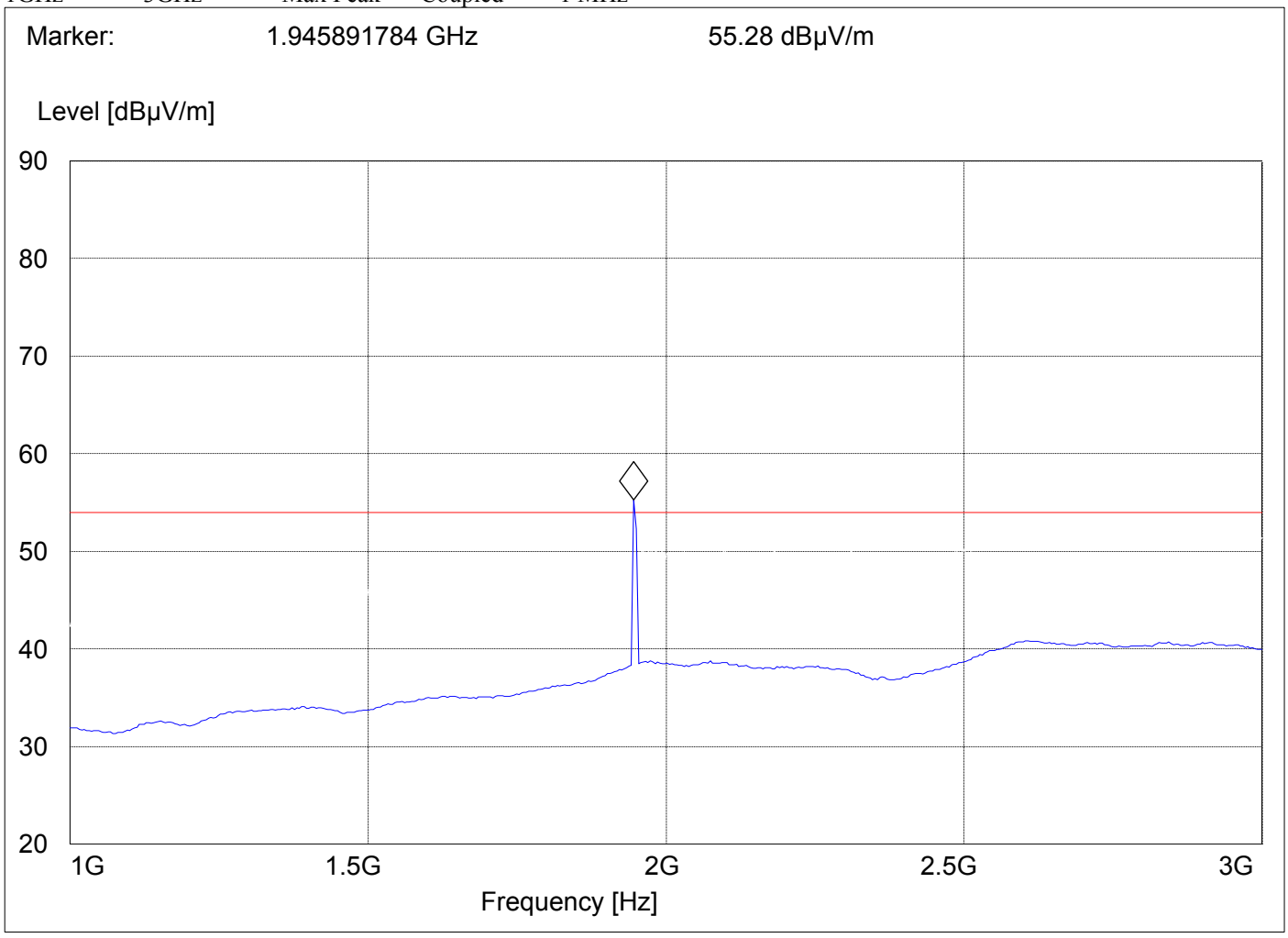


RECEIVER RADIATED EMISSIONS
EUT in Idle Mode: 1GHz – 3GHz

Note: Marked frequency is the downlink from the base station.

SWEEP TABLE: "FCC Spuri 1-3G"

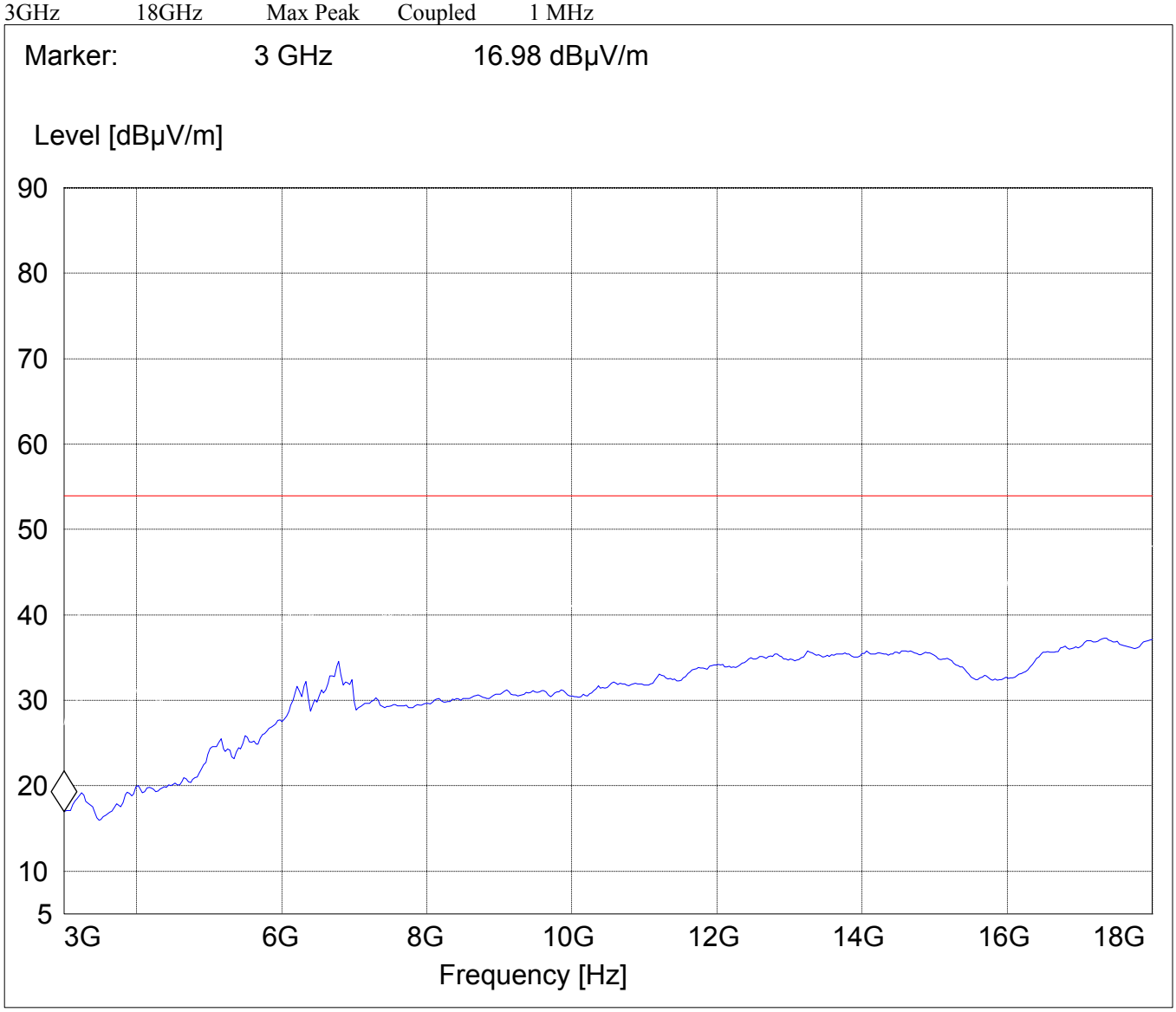
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1GHz	3GHz	Max Peak	Coupled	1 MHz



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

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

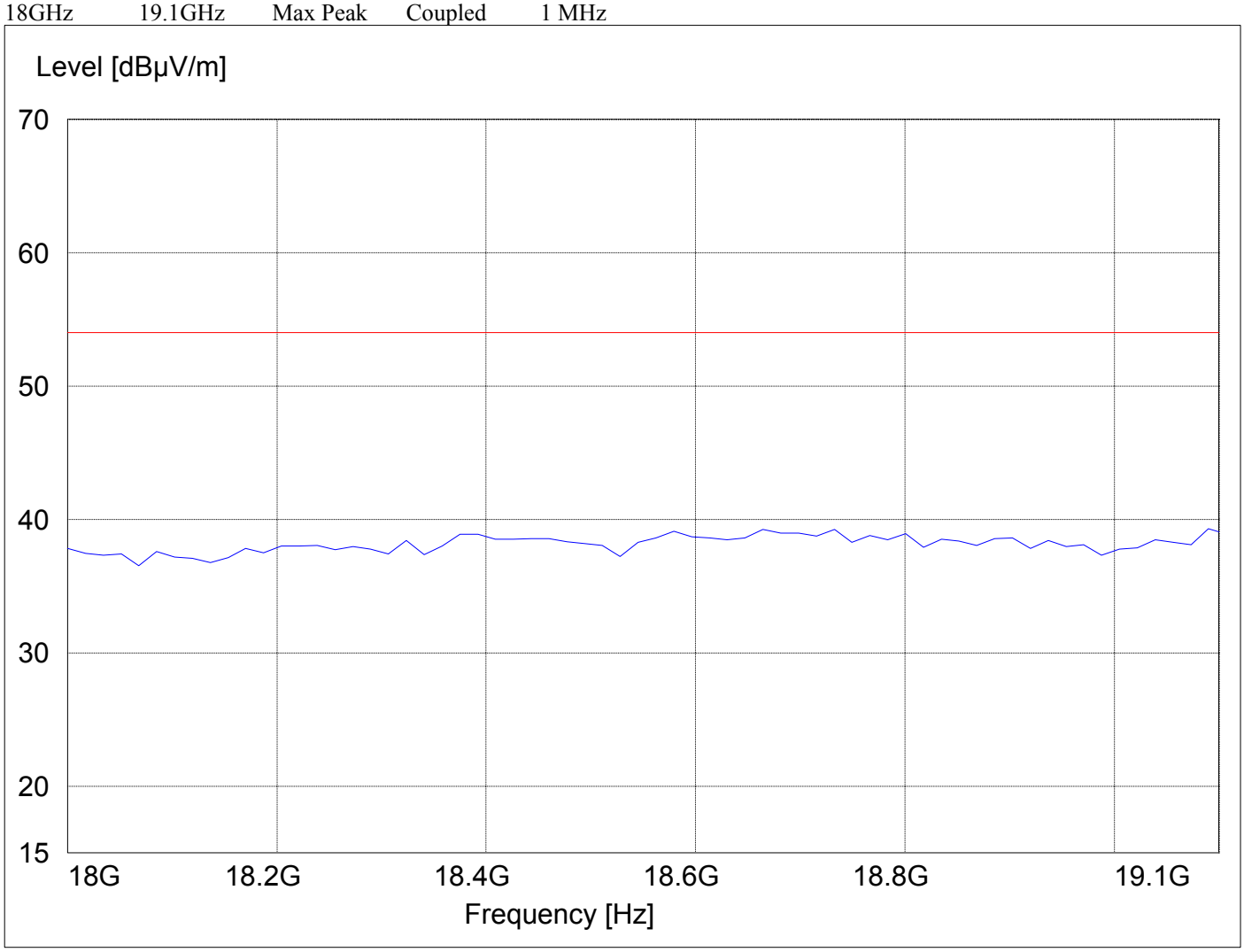
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
3GHz	18GHz	Max Peak	Coupled	1 MHz



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

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



CONDUCTED SPURIOUS EMISSIONS

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

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

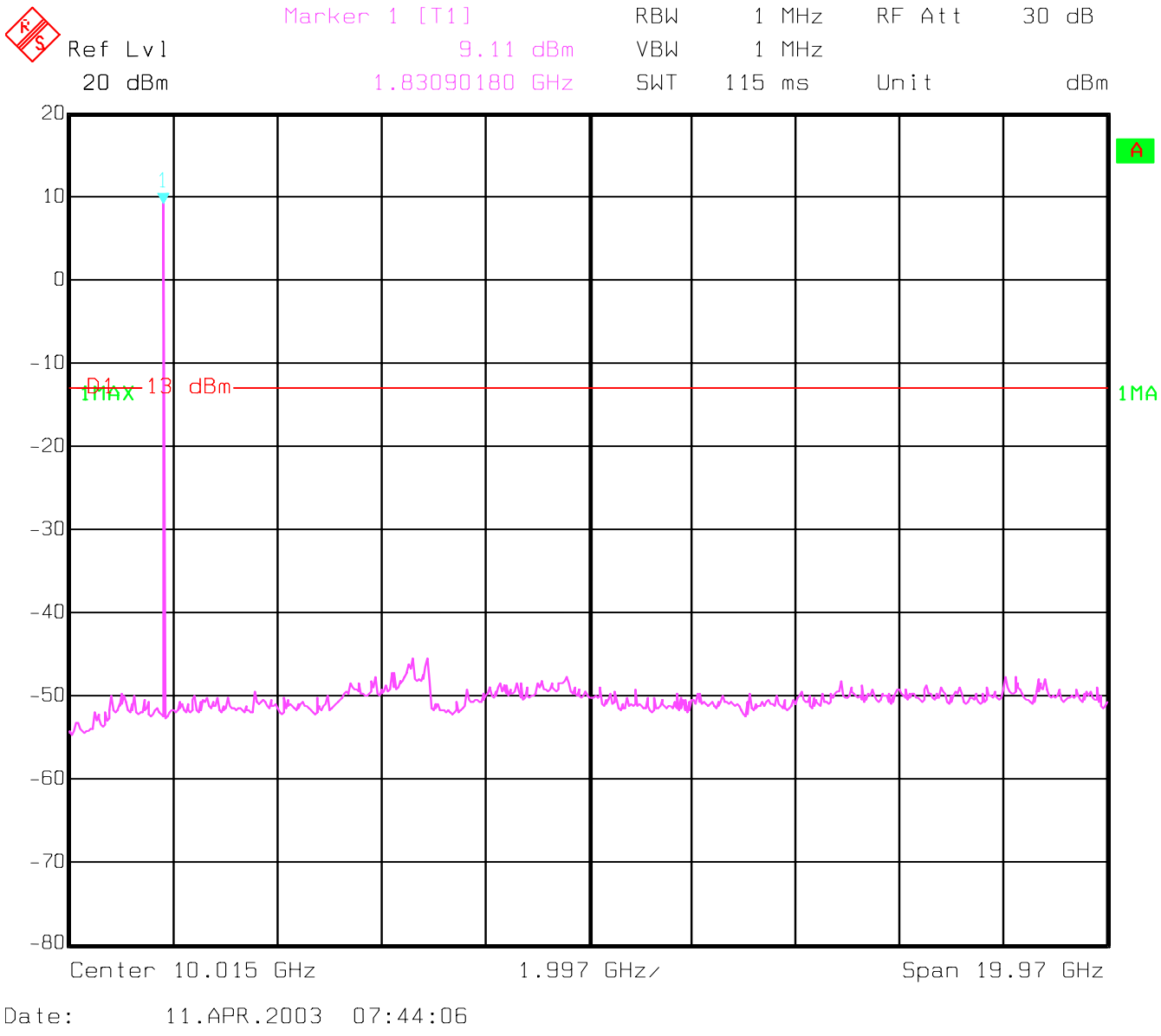
Harmonic	**Tx 1850.2 Freq.(MHz)**	**Level (dBm)**	**Tx 1880.0 Freq. (MHz)**	**Level (dBm)**	**Tx 1909.8 Freq. (MHz)**	**Level (dBm)**
2	3700.4	nf	3760	nf	3819.6	nf
3	5550.6	nf	5640	nf	5729.4	nf
4	7400.8	nf	7520	nf	7639.2	nf
5	9251	nf	9400	nf	9549	nf
6	11101.2	nf	11280	nf	11458.8	nf
7	12951.4	nf	13160	nf	13368.6	nf
8	14801.6	nf	15040	nf	15278.4	nf
9	16651.8	nf	16920	nf	17188.2	nf
10	18502	nf	18800	nf	19098	nf
NOTE: nf=noise floor						

CONDUCTED SPURIOUS EMISSIONS

Tx Frequency 1850.2MHz: 30MHz – 20GHz

Spurious emission limit –13dBm

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

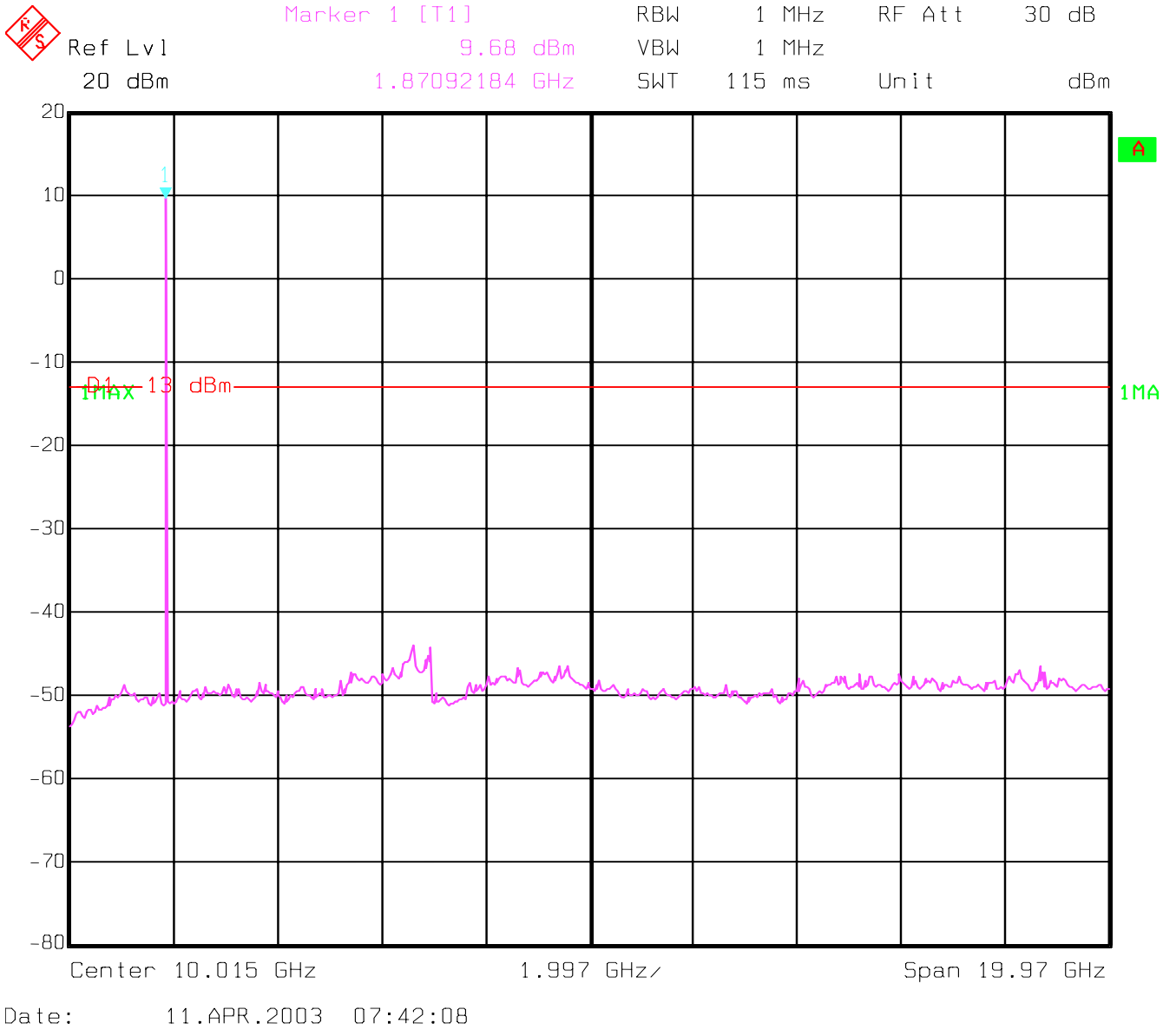


CONDUCTED SPURIOUS EMISSIONS

Tx Frequency 1880.0MHz: 30MHz – 20GHz

Spurious emission limit –13dBm

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

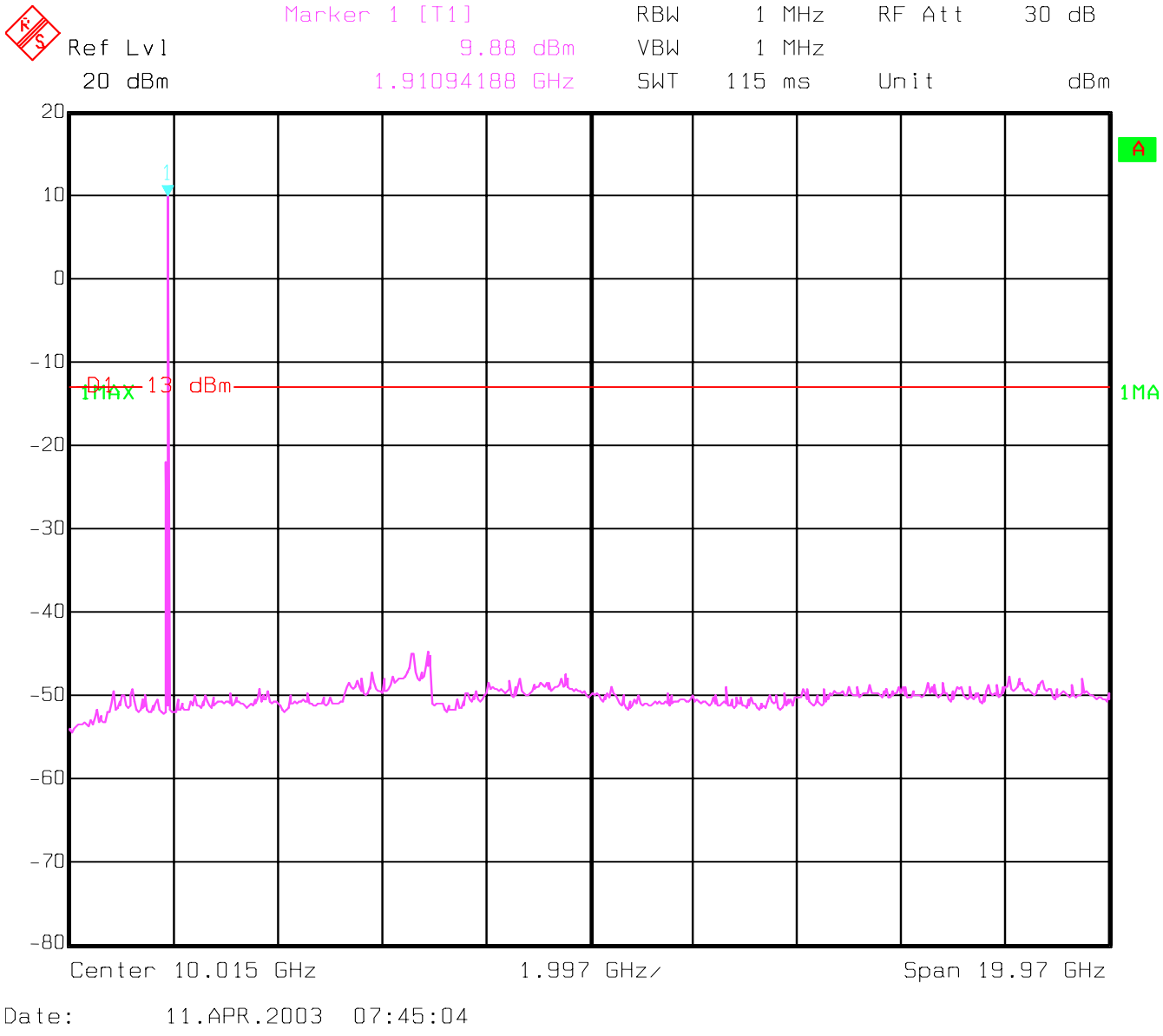


CONDUCTED SPURIOUS EMISSIONS

Tx Frequency 1909.8MHz: 30MHz – 20GHz

Spurious emission limit –13dBm

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

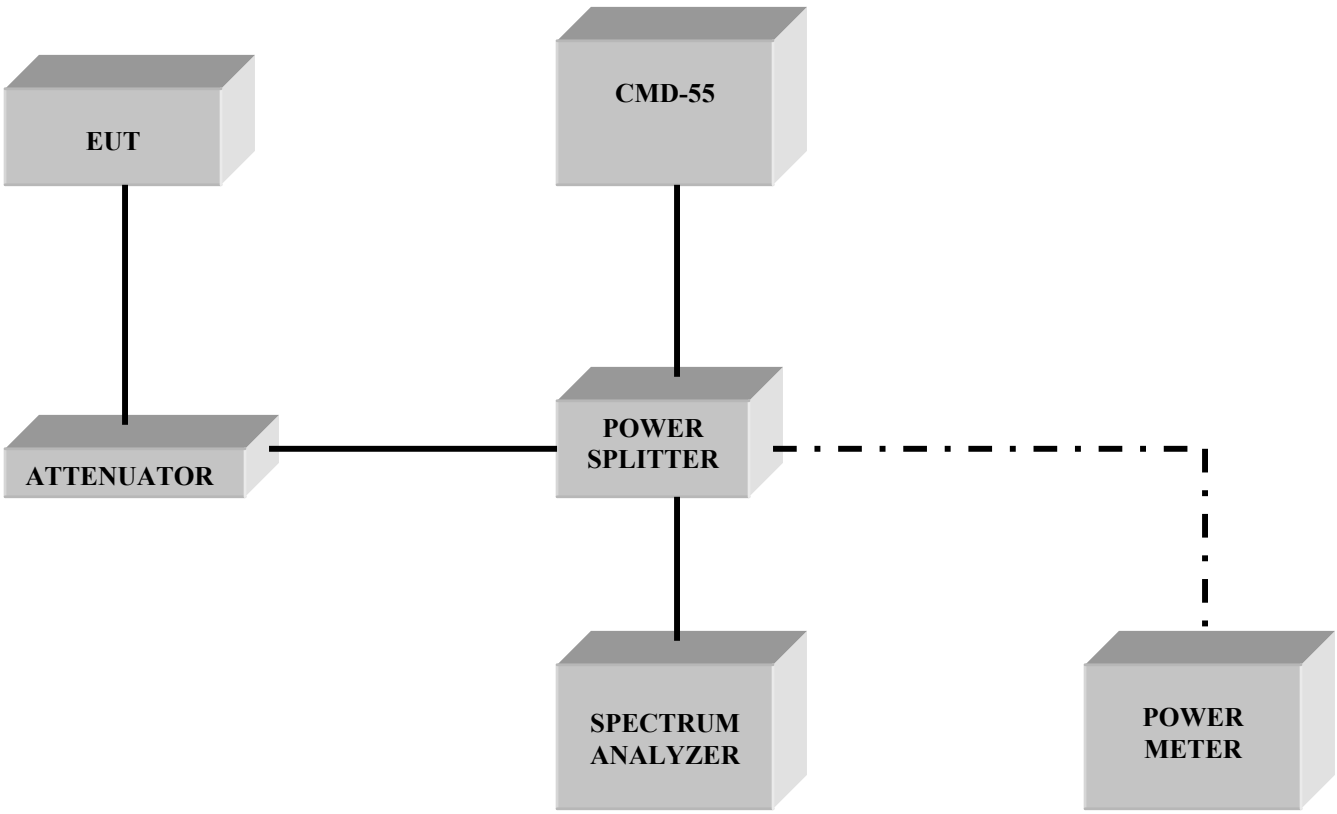


TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

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