CETECOM Inc.

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

Test report no.: 269FCC24/2002
FCC Part 24 / RSS 133
(Model: M46)

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: Pete Krebill

1.2 Testing laboratory

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1.3 Details of applicant

Name	**:**	**Siemens Information and Communication Mobile LLC**
Street	**:**	**16745 West Bernardo Dr., Suite 400**
City	**:**	**San Diego, CA 92127**
Country	**:**	**USA**
Contact	**:**	**Ulrich Bettin**
Telephone	**:**	**(858) 521-3328**
Tele-fax	**:**	**(858) 521-3106**
e-mail	**:**	**Ulrich.bettin@icm.siemens.com**

1.4 Application details

Date of receipt of application	:	4/10/2002
Date of receipt test item	:	4/16/2002
Date of test	:	4/16/2002 & 4/17/2002

1.5 Test item

Manufacturer	:	Siemens AG
Model No	:	M46
Description	:	Single band GSM 1900MHz mobile phone
Serial No.	:	1ME1 004999511029935

Additional information

Frequency	:	1850.2MHz – 1909.8MHz
Type of modulation	:	GMSK
Number of channels	:	298
Antenna	:	internal
Power supply	:	Battery
Output power	:	Max. EIRP (32.71 dBm / 1.87watts)
Extreme vol. Limits	:	3.6 – 4.8VDC
Extreme temp. Tolerance	:	-30 F - +50 F

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.

Technical responsibility for area of testing :

Date	Section	Name	Signature
April 24, 2002	EMC & Radio	Lothar Schmidt	

2.2 Test report

TEST REPORT

Test report no.: 269FCC24/2002
(Model: M46)

TEST REPORT REFERENCE

LIST OF MEASUREMENTS

POWER OUTPUT SUBCLAUSE § 24.232

Summary:

Limits:

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

Power Measurements:
Conducted:
Average conducted power was measured by Siemens. Please refer to attached document: EMC_M46_12.
Results shown below:

CH	dBm
512	29.8
661	29.9
810	29.9

EIRP Measurements

Description: This is the test for the maximum radiated power from the EUT.
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. The EUT is put into CW test mode and a scan is performed to obtain the radiation pattern.
4. From the radiation pattern, the co-ordinates where the maximum antenna gain occurs is identified.
5. The EUT is then put into pulse mode at its maximum power level (Power Step 0).
6. "Gated mode" power measurements are performed with the receiving antenna placed at the coordinates determined in Step 3 to determine the output power as defined in FCC Rule 24.232 (b) and (c). The "reference path loss" from Step 1 is added to this result.
7. This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.1 dBi) and known input power (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:

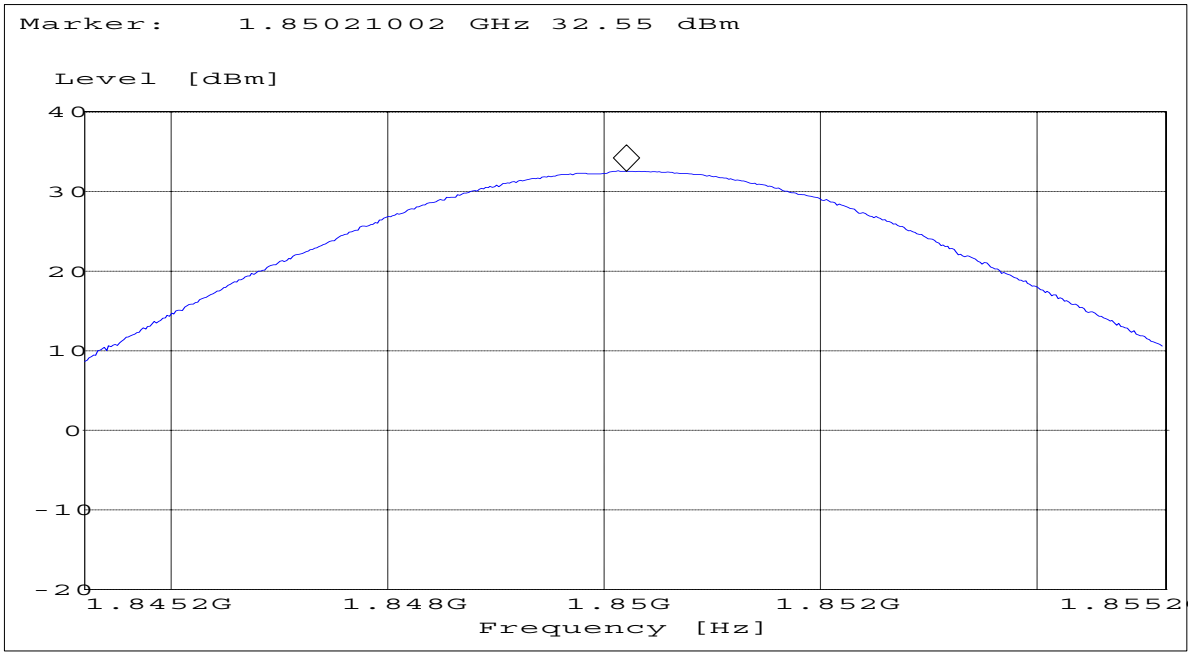
Plots are shown on next pages.

Radiated:

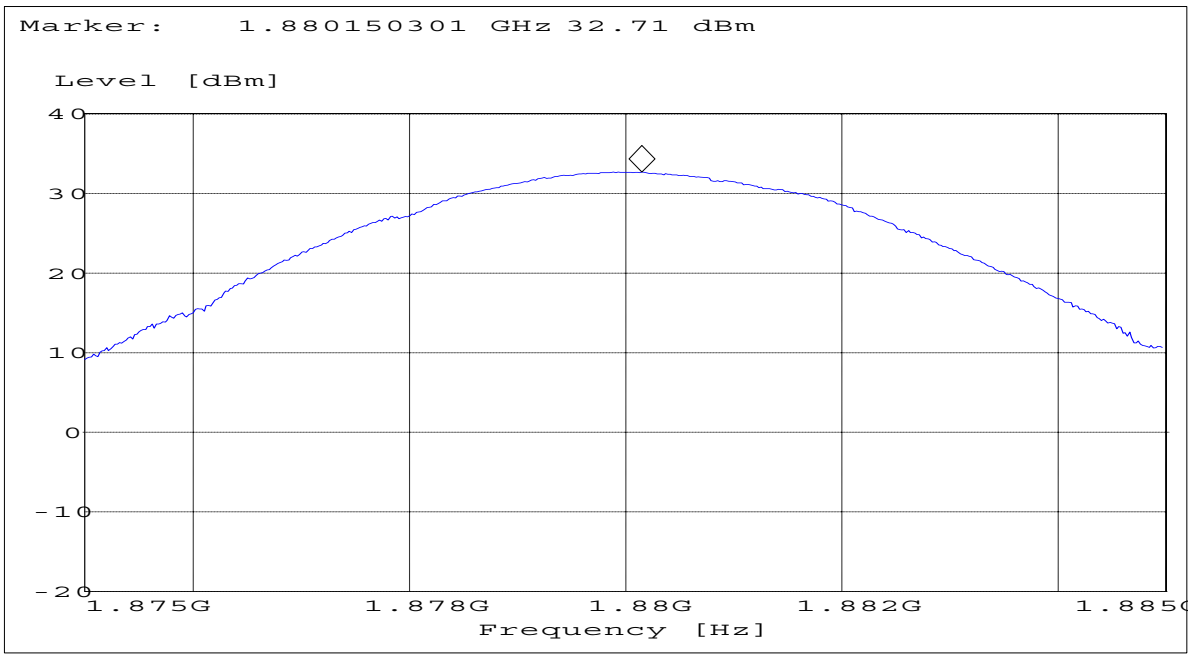
Frequency (MHz)	Power Step	BURST AVERAGE (dBm)	
		EIRP	ERP
1850.2	0	32.55	30.45
1880.0	0	32.71	30.61
1909.8	0	32.20	30.10
Measurement uncertainty	±0.5 dB		

ANALYZER SETTINGS: RBW = 3MHz VBW = 3MHz

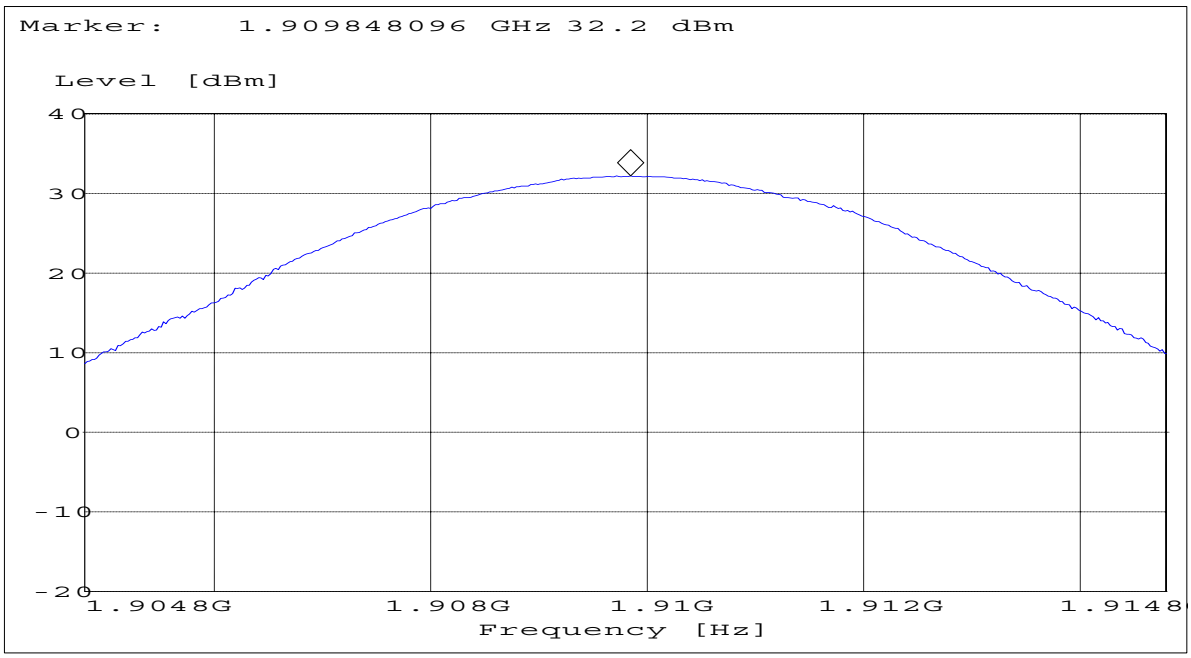
EIRP CHANNEL 512:



EIRP CHANNEL 661:



EIRP CHANNEL 810:



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 3.6 VDC and 4.8 VDC, with a nominal voltage of 3.8 VDC. For the purposes of measuring frequency stability these voltage limits are to be used. Frequency stability was also measured with the voltage varied from 4.8 VDC until the transceiver stopped operating. This occurred at 3.3 VDC.

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.

AFC FREQ ERROR vs. VOLTAGE

Voltage (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
3.6V	30	0.016
4.8V	25	0.013
V varied from 4.8V to 3.3V, at 3.3 EUT stopped functioning. Maximum error observed:	33	0.018

AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	48	0.026
-20	30	0.016
-10	14	0.007
0	22	0.012
+10	22	0.012
+20	27	0.014
+30	30	0.016
+40	26	0.014
+50	26	0.014

OCCUPIED BANDWIDTH §2.989

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 8.2 below lists the measured 99% power and -26dBC occupied bandwidths. Spectrum analyzer plots are included on the following pages.

Frequency	99% Occupied Bandwidth (KHz)	26 dBc Bandwidth (KHz)
1850.2 MHz	282.57	314.63
1880.0 MHz	268.54	312.63
1909.2 MHz	282.57	312.63

Part 24.238 (a) requires a measurement bandwidth of at least 1% of the occupied bandwidth. For 314.63 kHz, this equates to a resolution bandwidth of at least 3.2 kHz. For this testing, a resolution bandwidth 5.0 kHz was used.

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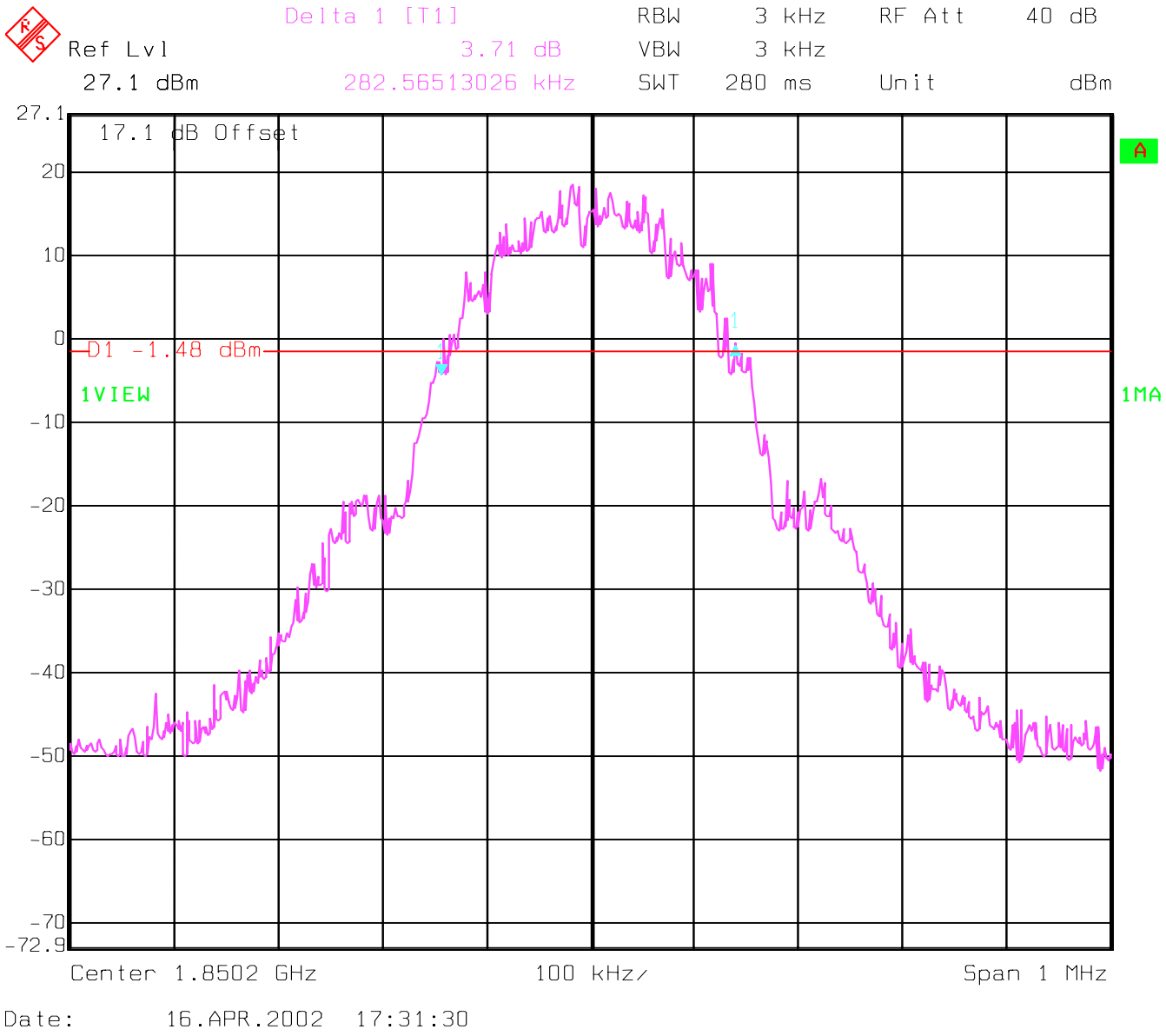
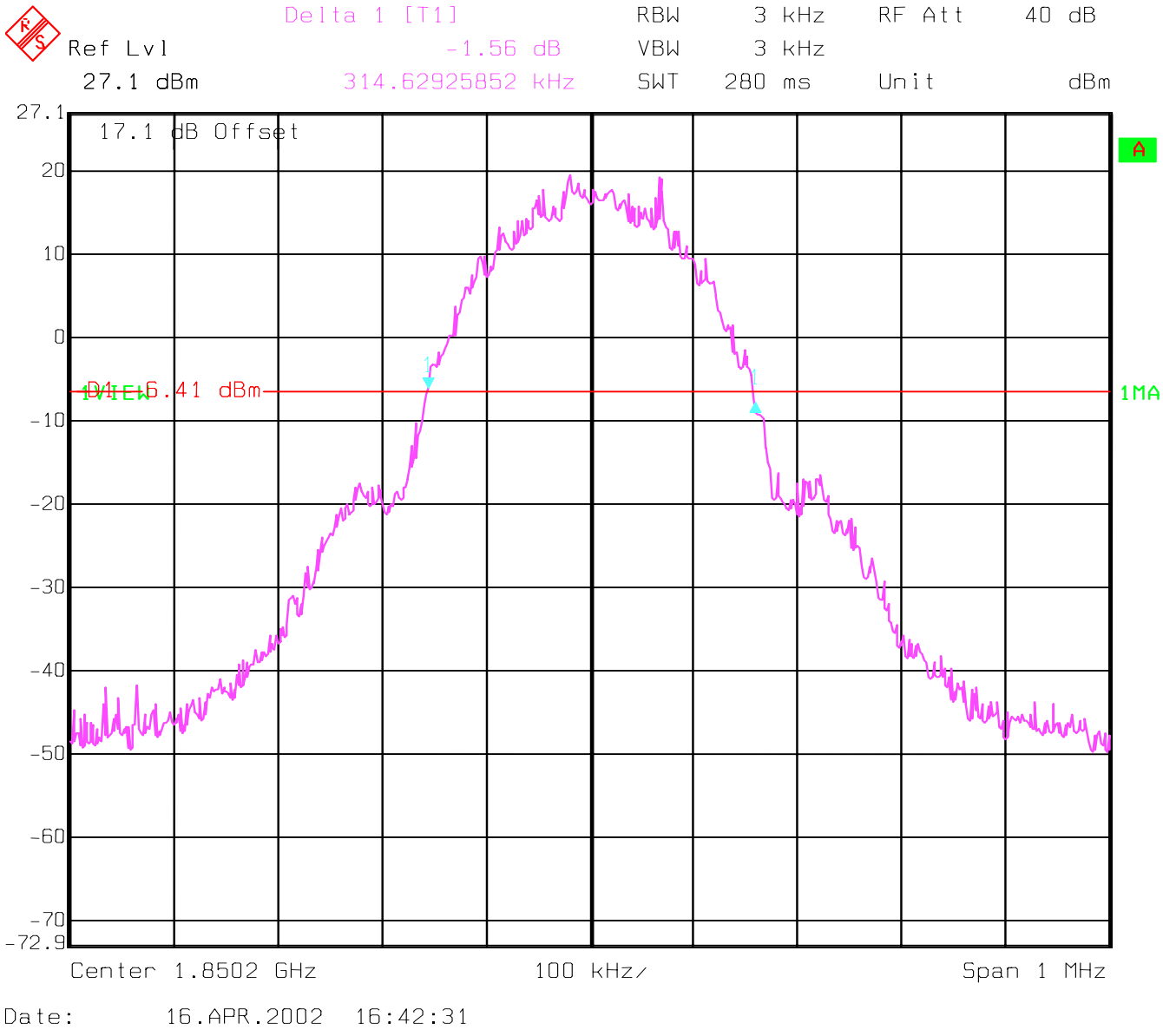
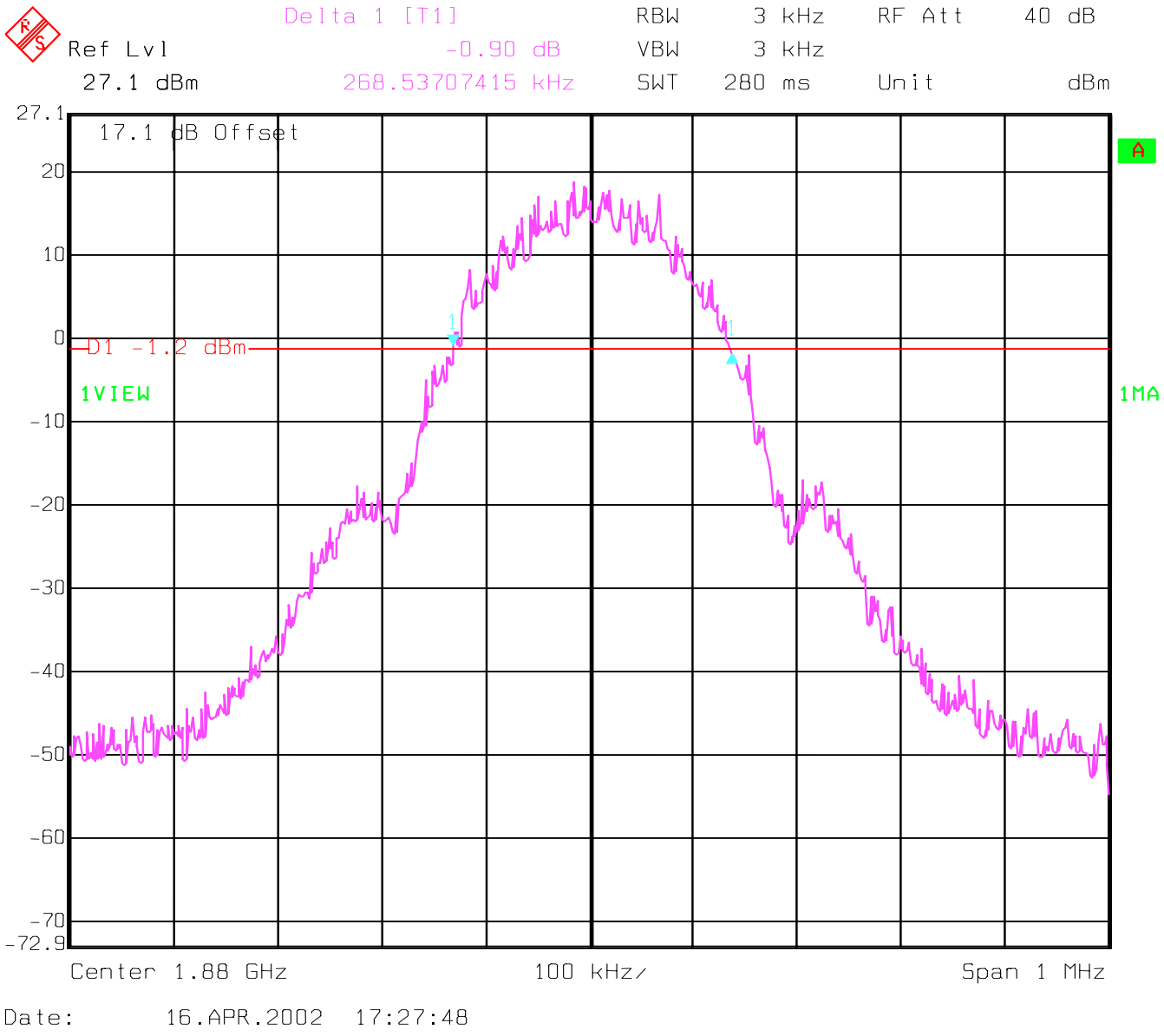
Channel 512
99% Occupied Bandwidth



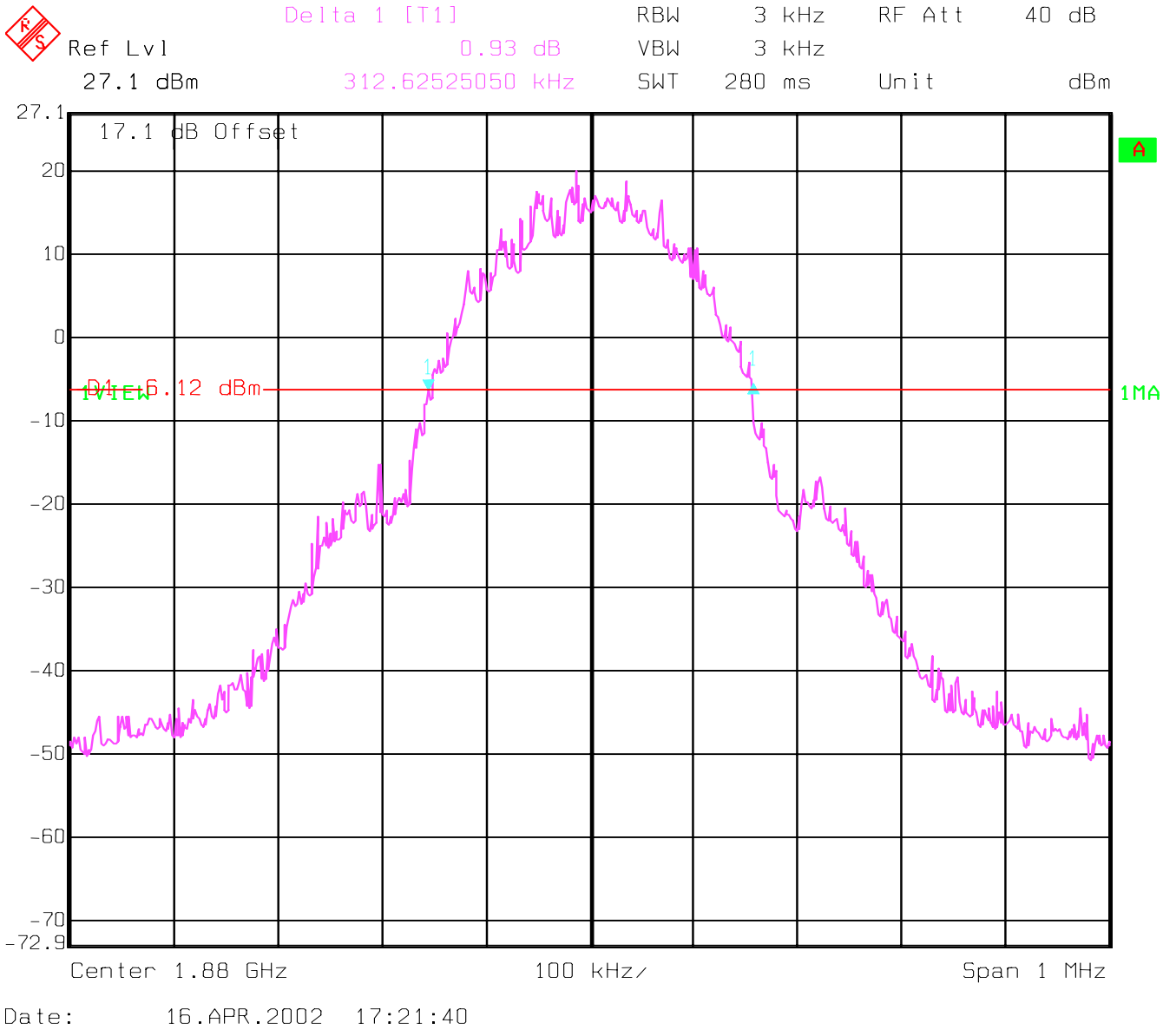
Channel 512
26 dBc Bandwidth



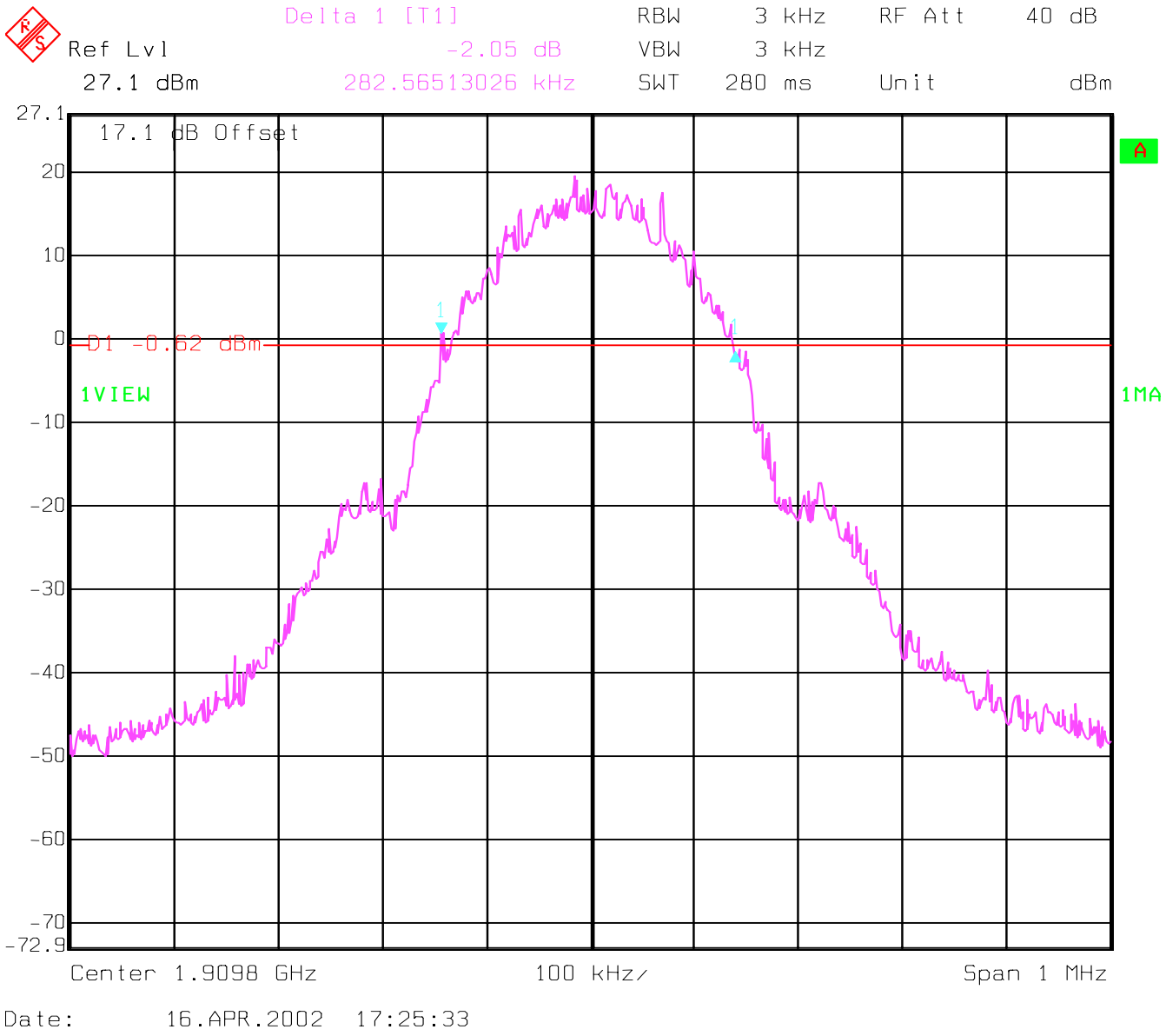
Channel 661
99% Occupied Bandwidth



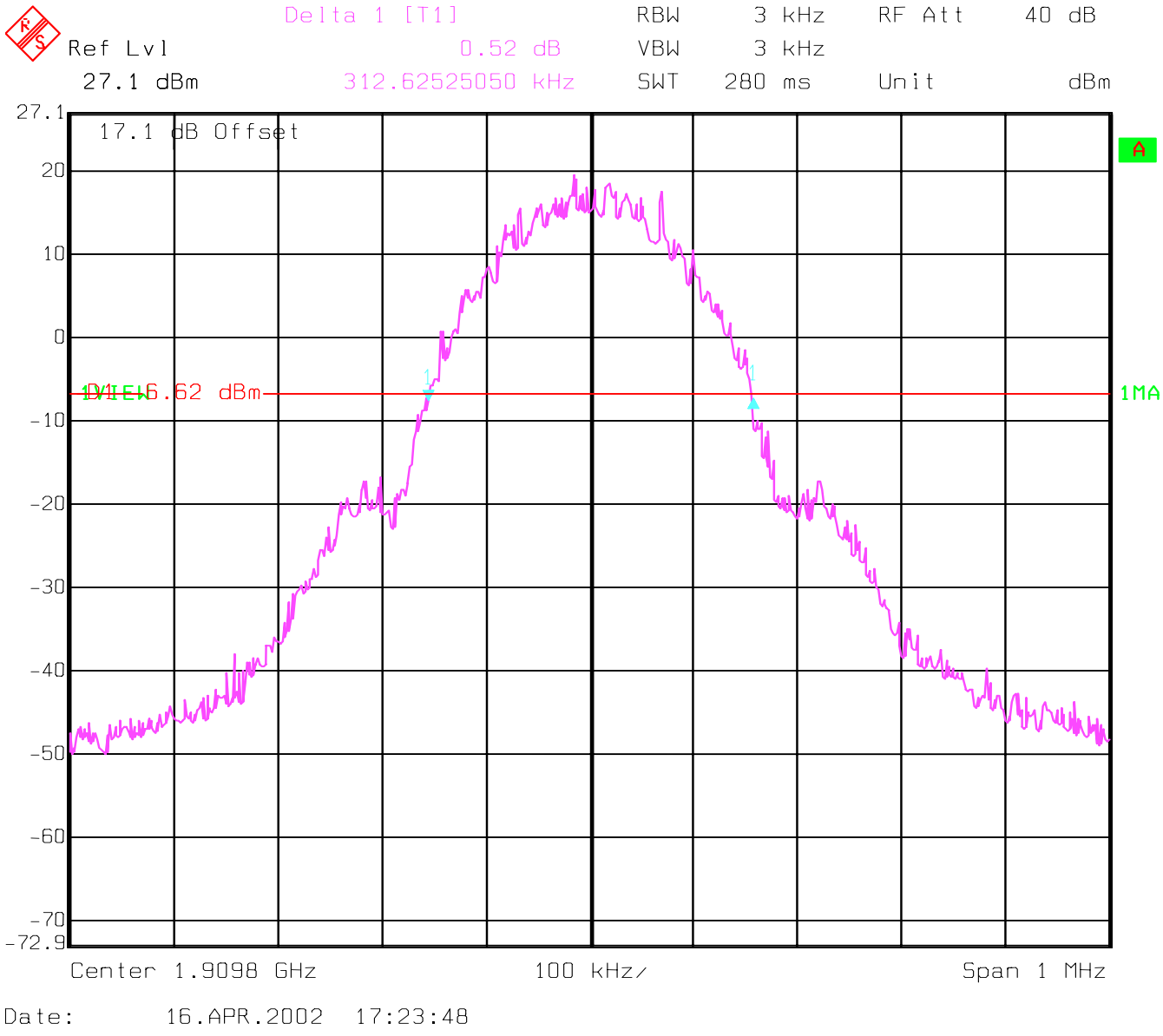
Channel 661
26 dBc Bandwidth



Channel 810
99% Occupied Bandwidth



Channel 810
26 dBc 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) 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, center, and lower carrier frequencies of the USPCS band (1850.2 MHz, 1879.8 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.

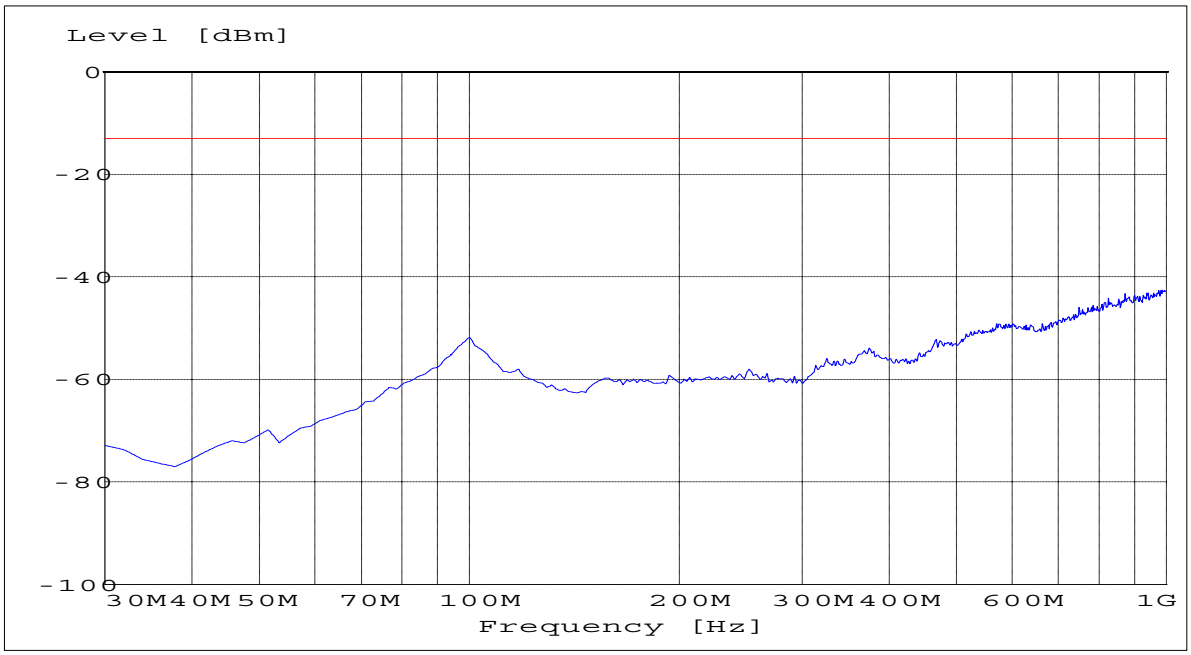
NOTE: The spurious emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 18 GHz and 19.1 GHz very short cable connections to the antenna was used to minimize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

RESULTS OF RADIATED TESTS FOR FCC-24:

Harmonics	Tx ch-512 Freq. (MHz)	Level (dBm)	Tx ch-661 Freq. (MHz)	Level (dBm)	Tx ch-810 Freq. (MHz)	Level (dBm)
2	3700.4	-51.35	3760	-48.58	3819.6	-26.82
3	5550.6	-48.70	5640	-46.12	5729.4	-31.6
4	7400.8	-41.86	7520	-42.33	7639.2	-42.41
5	9251	-38.10	9400	-37.96	9549	-38.10
6	11101.2	-38.87	11280	-38.47	11458.8	-38.67
7	12951.4	-35.36	13160	-36.22	13368.6	-36.12
8	14801.6	-33.13	15040	-34.02	15278.4	-34.21
9	16651.8	-28.01	16920	-28.46	17188.2	-28.21
10	18502	-28.28	18800	-30.04	19098	-30.10

RADIATED SPURIOUS EMISSIONS

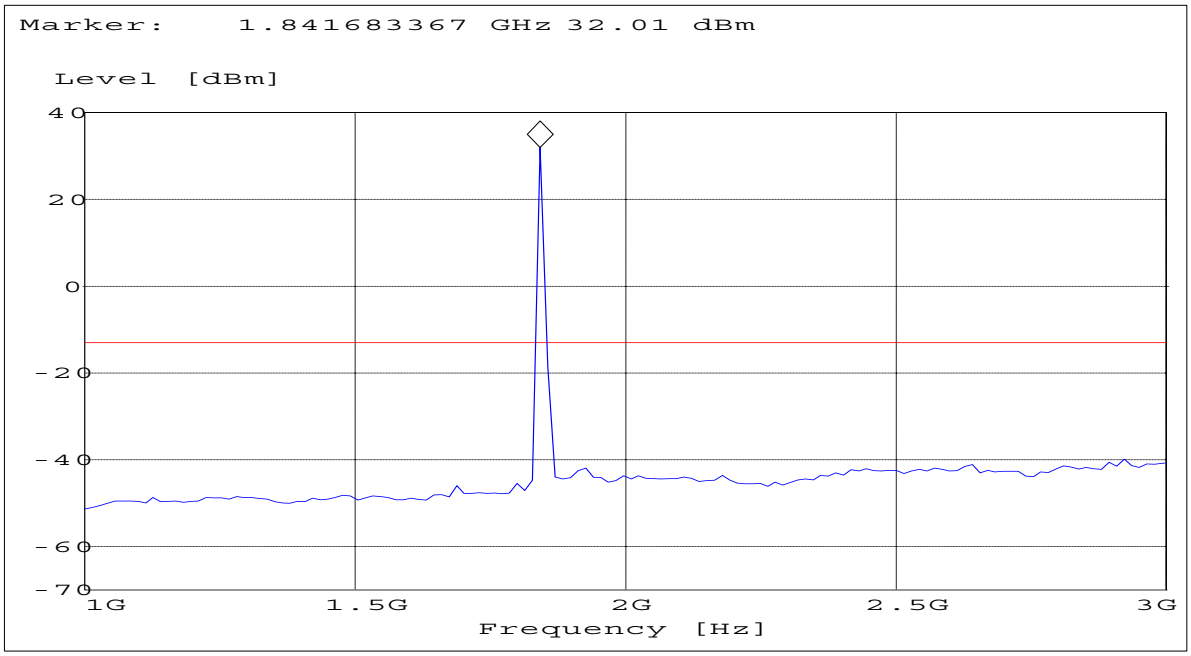
Channel 512 : 30MHz - 1GHz



RADIATED SPURIOUS EMISSIONS

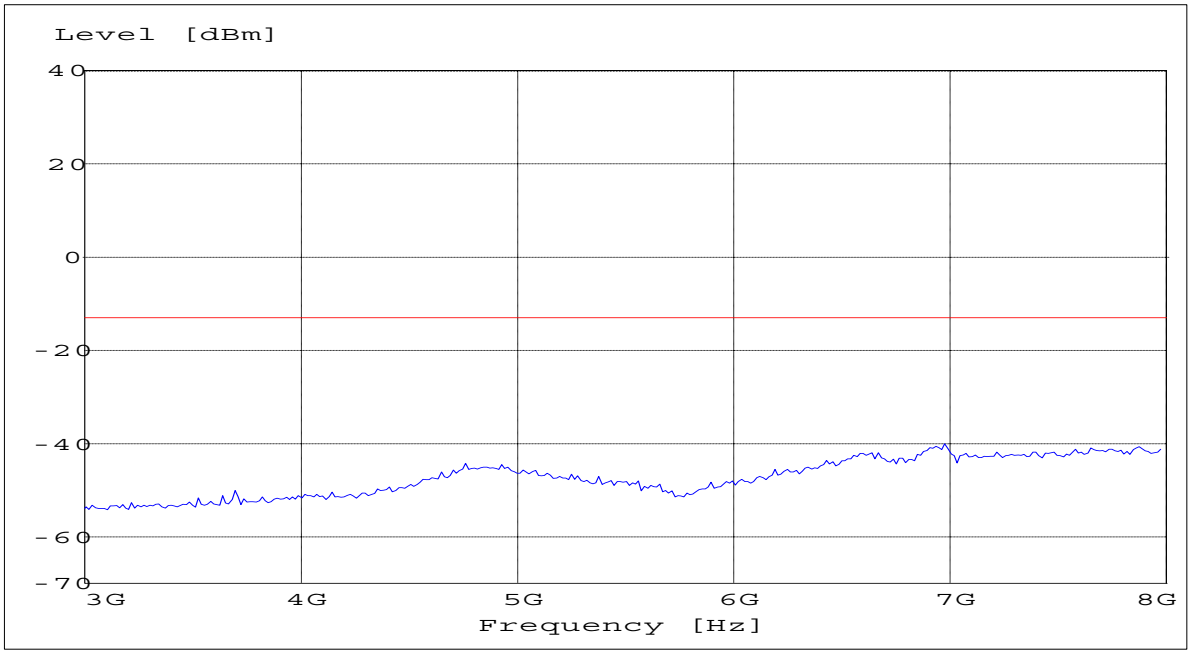
Channel 512 : 1GHz – 3GHz

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.



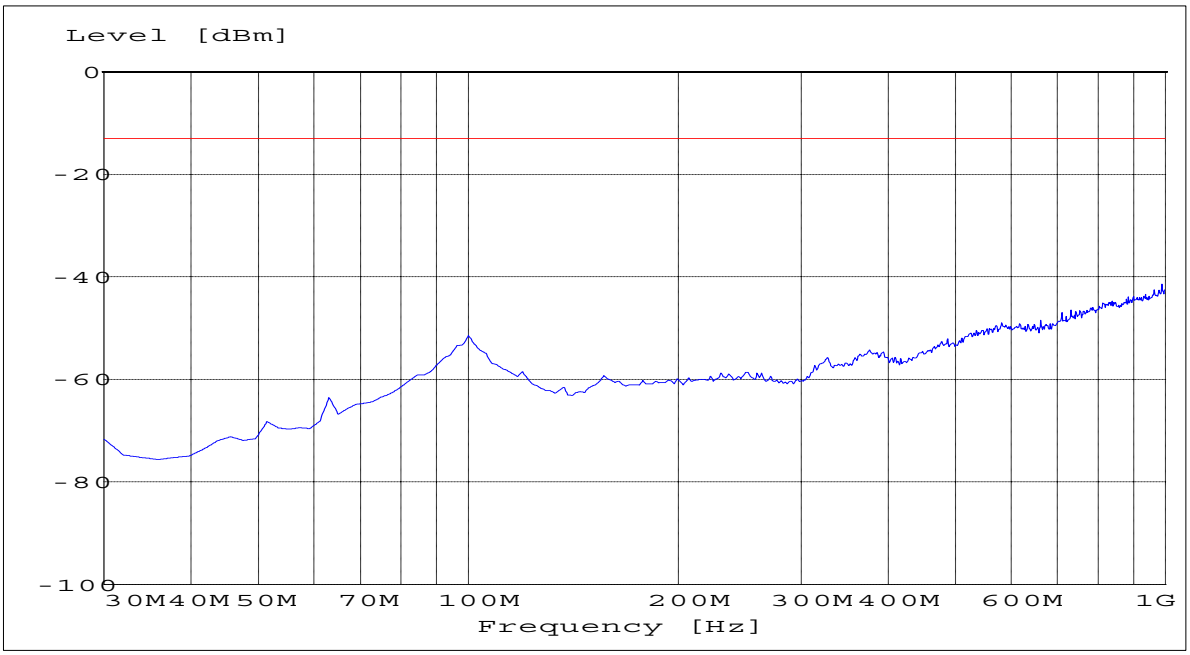
RADIATED SPURIOUS EMISSIONS

Channel 512 : 3GHz – 8GHz



RADIATED SPURIOUS EMISSIONS

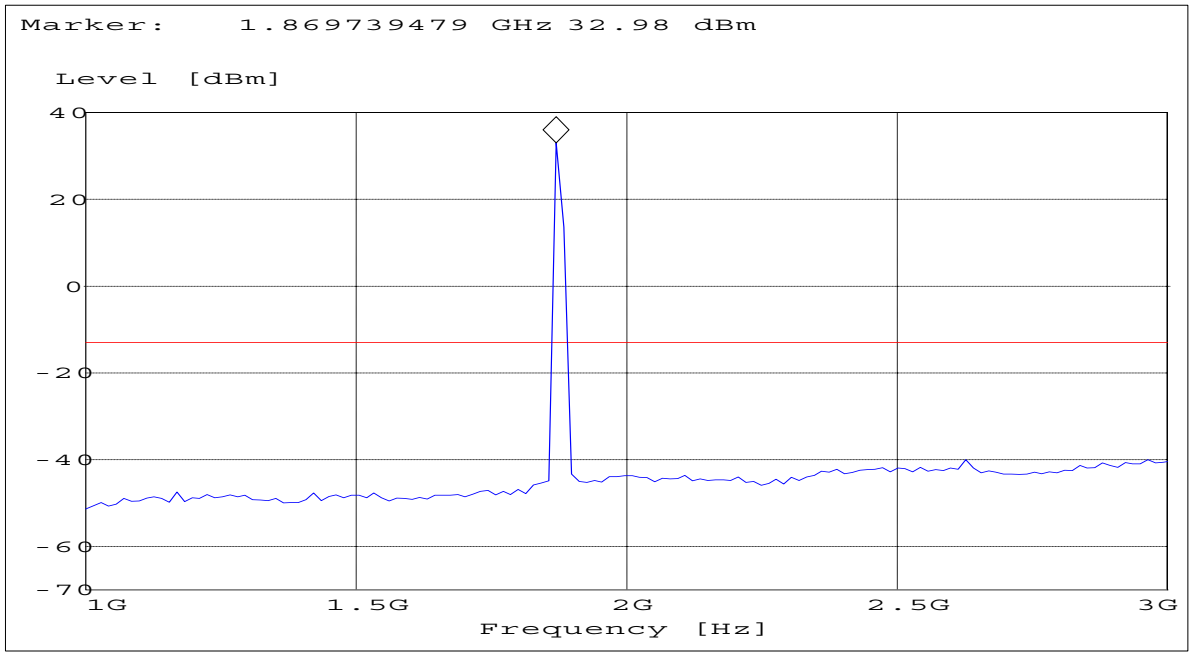
Channel 661: 30MHz –1GHz



RADIATED SPURIOUS EMISSIONS

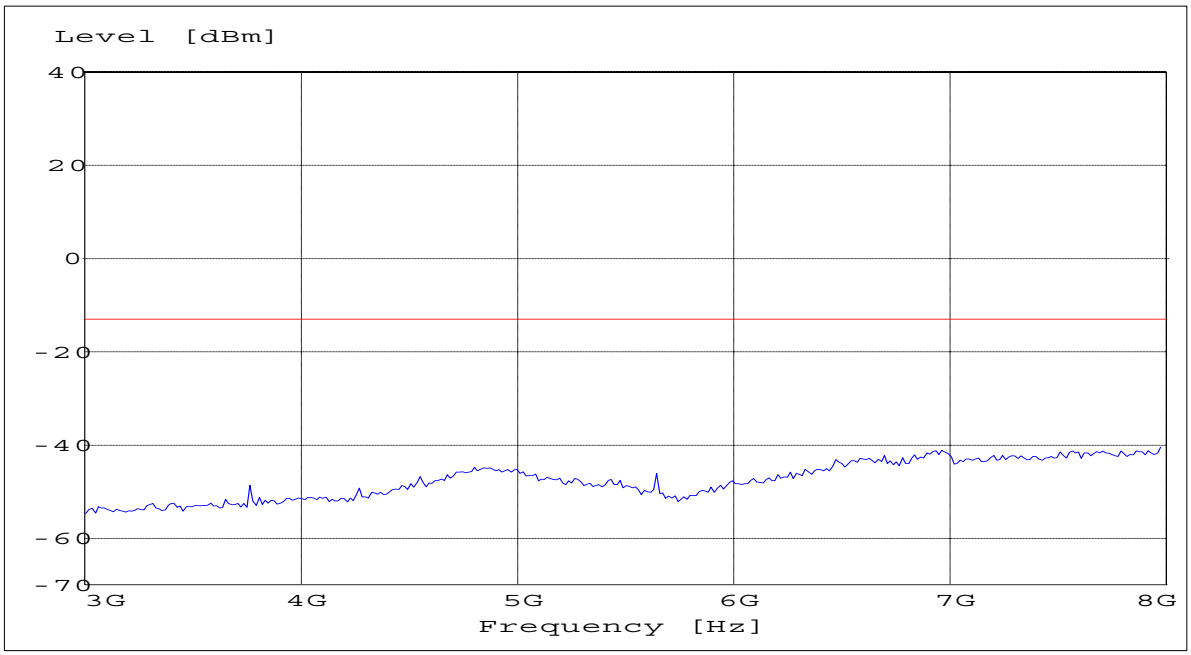
Channel 661: 1GHz – 3GHz

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.



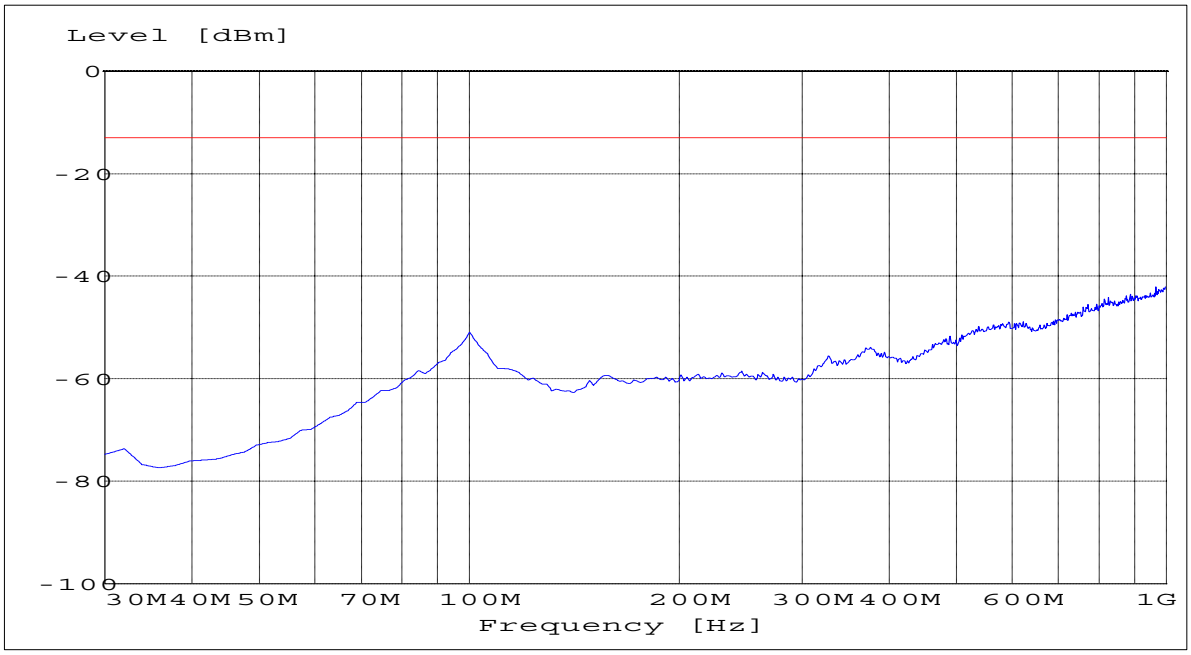
RADIATED SPURIOUS EMISSIONS

Channel 661: 3GHz – 8GHz



RADIATED SPURIOUS EMISSIONS

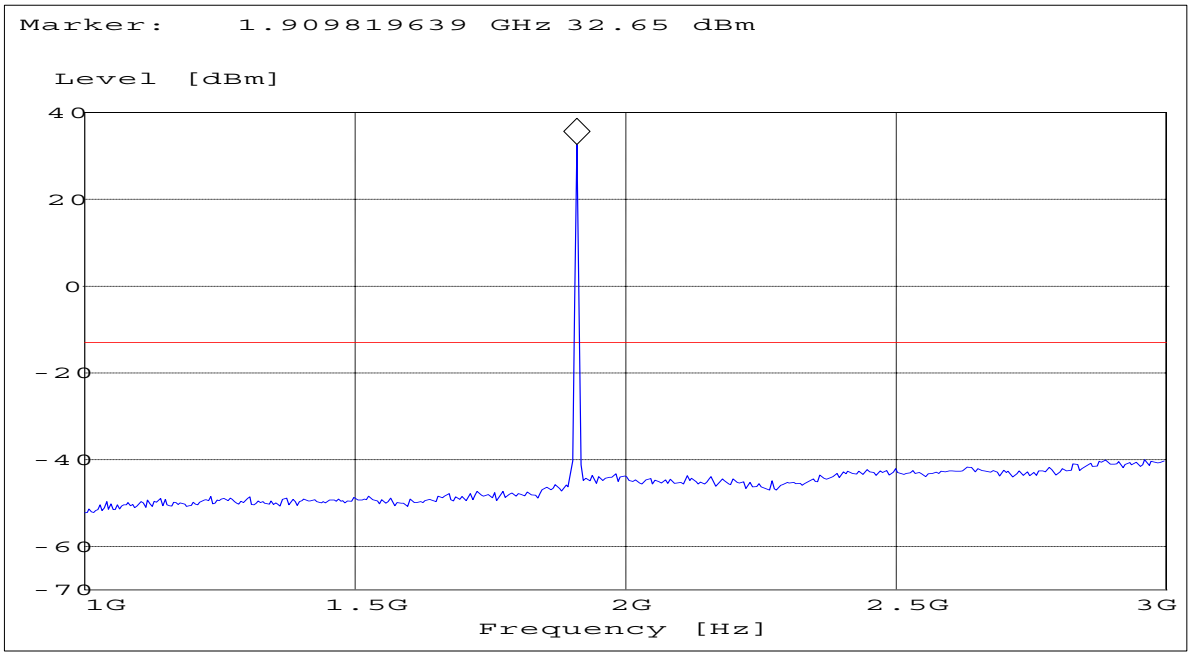
Channel 810: 30MHz –1GHz



RADIATED SPURIOUS EMISSIONS

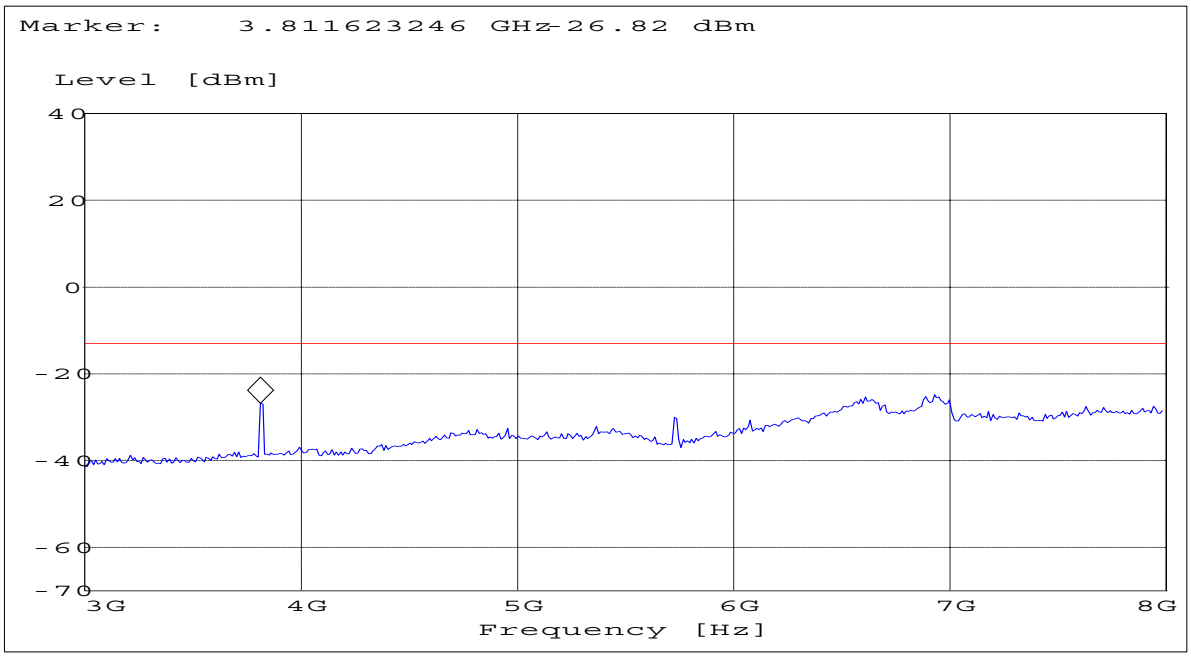
Channel 810: 1GHz – 8GHz

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.



RADIATED SPURIOUS EMISSIONS

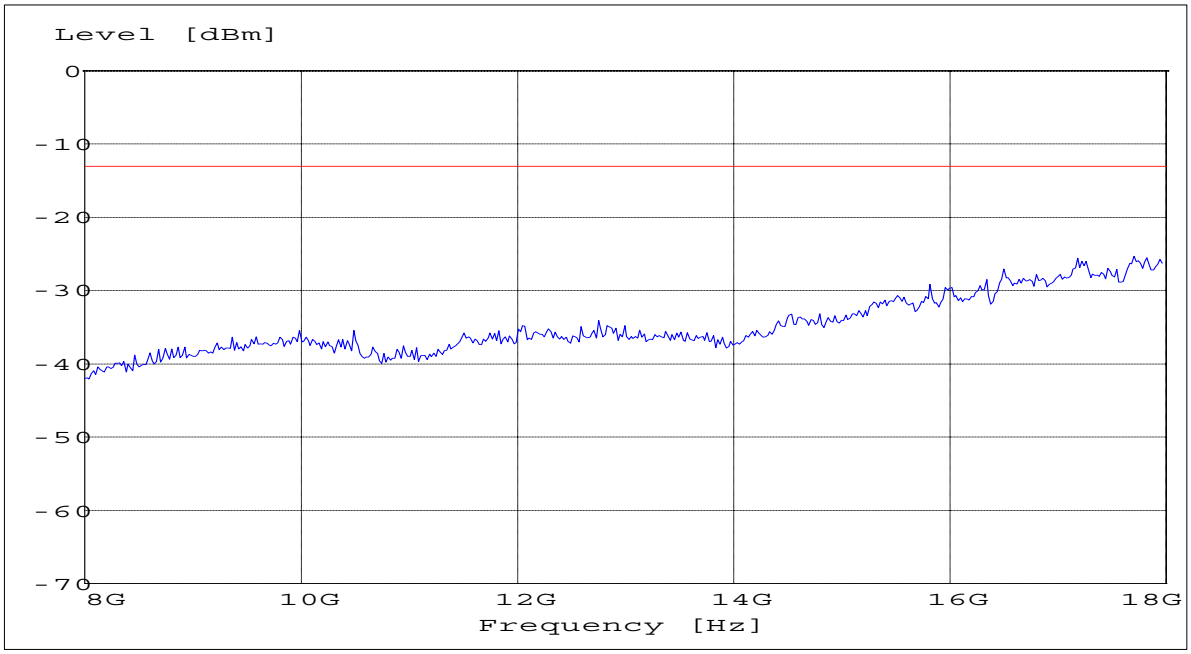
Channel 810: 3GHz – 8GHz



RADIATED SPURIOUS EMISSIONS

8GHz – 18GHz

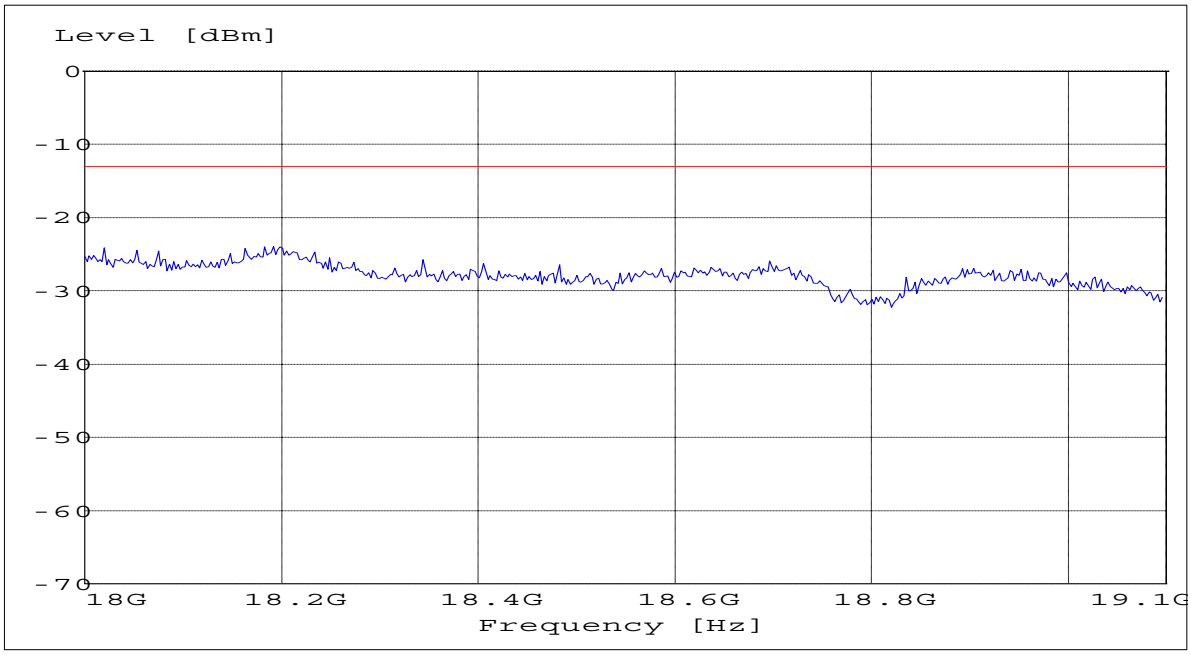
(NOTE: This plot is valid for all three channels)



RADIATED SPURIOUS EMISSIONS

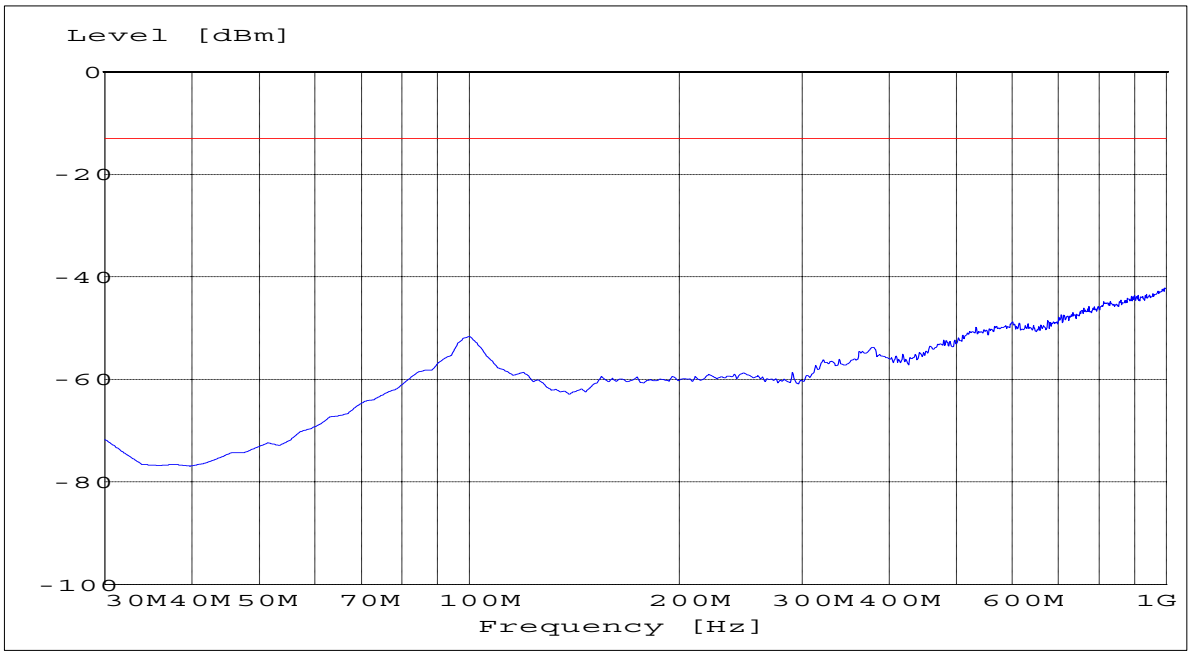
18GHz – 19.1GHz

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



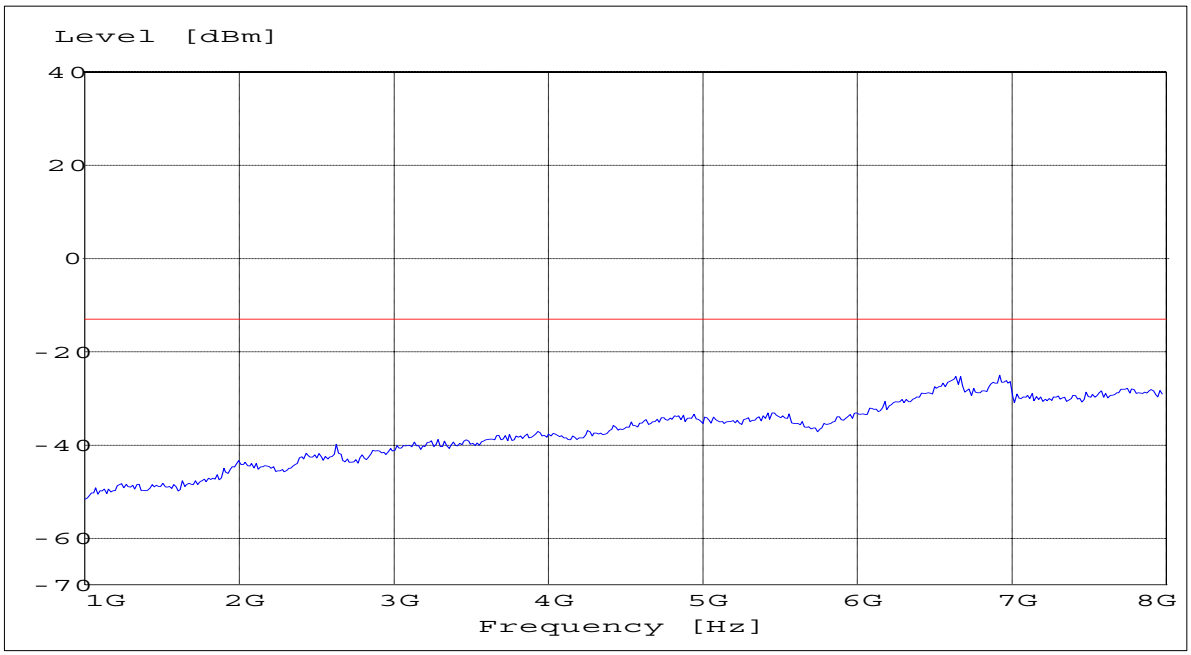
RADIATED SPURIOUS EMISSIONS

EUT in Idle Mode: 30MHz – 1GHz



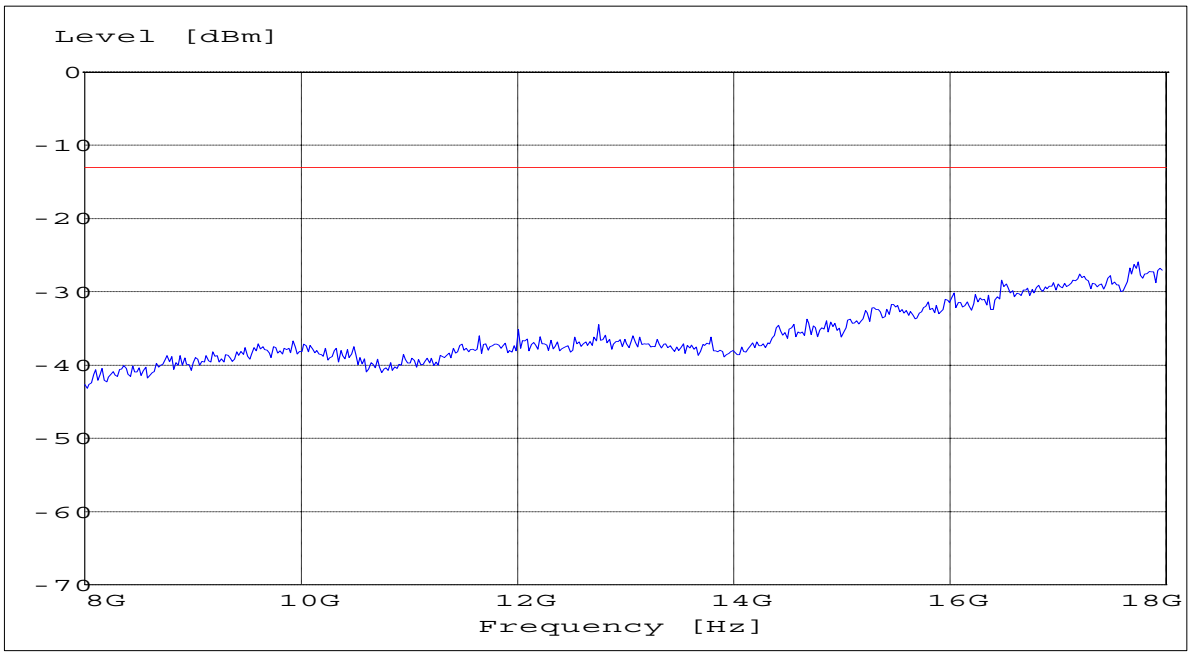
RADIATED SPURIOUS EMISSIONS

EUT in Idle Mode: 1GHz – 8GHz



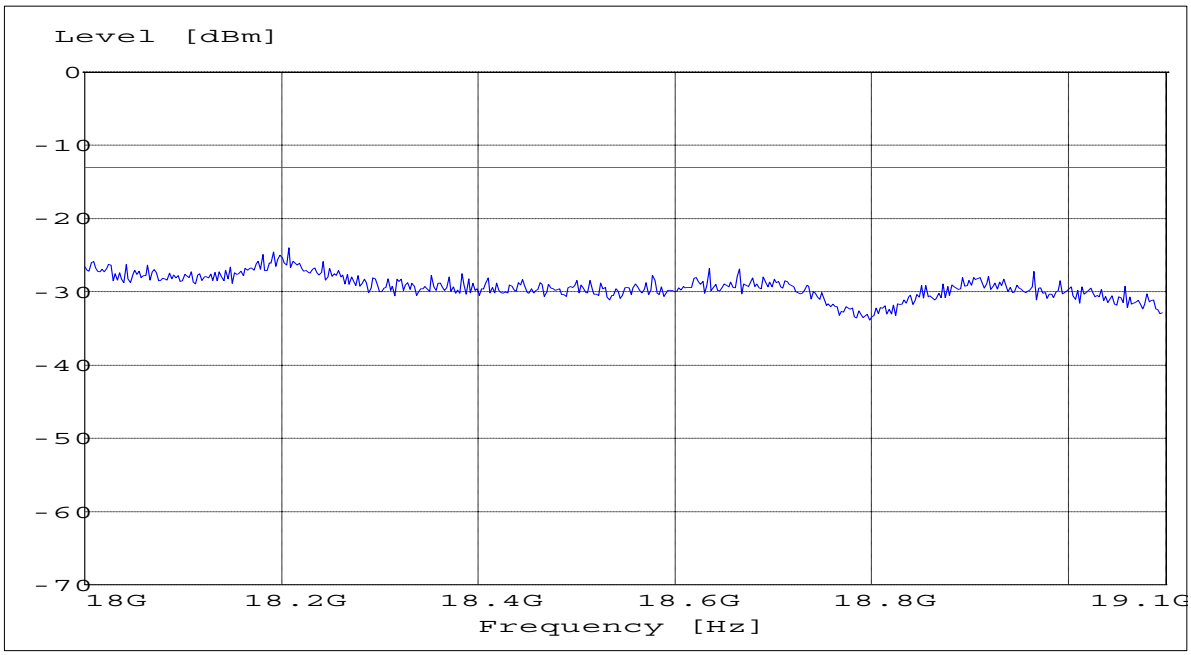
RADIATED SPURIOUS EMISSIONS

EUT in Idle Mode: 8GHz – 18GHz

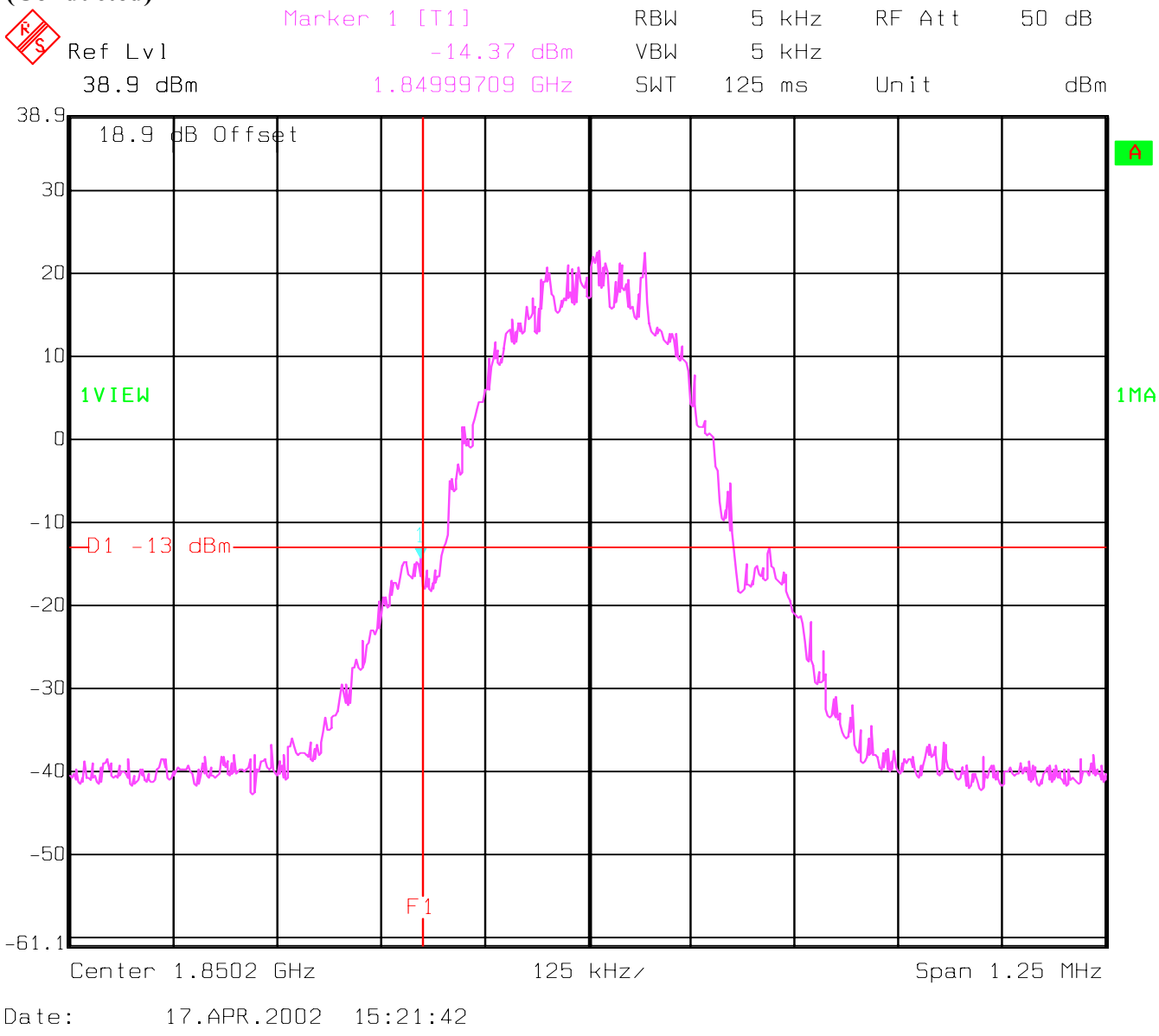


RADIATED SPURIOUS EMISSIONS

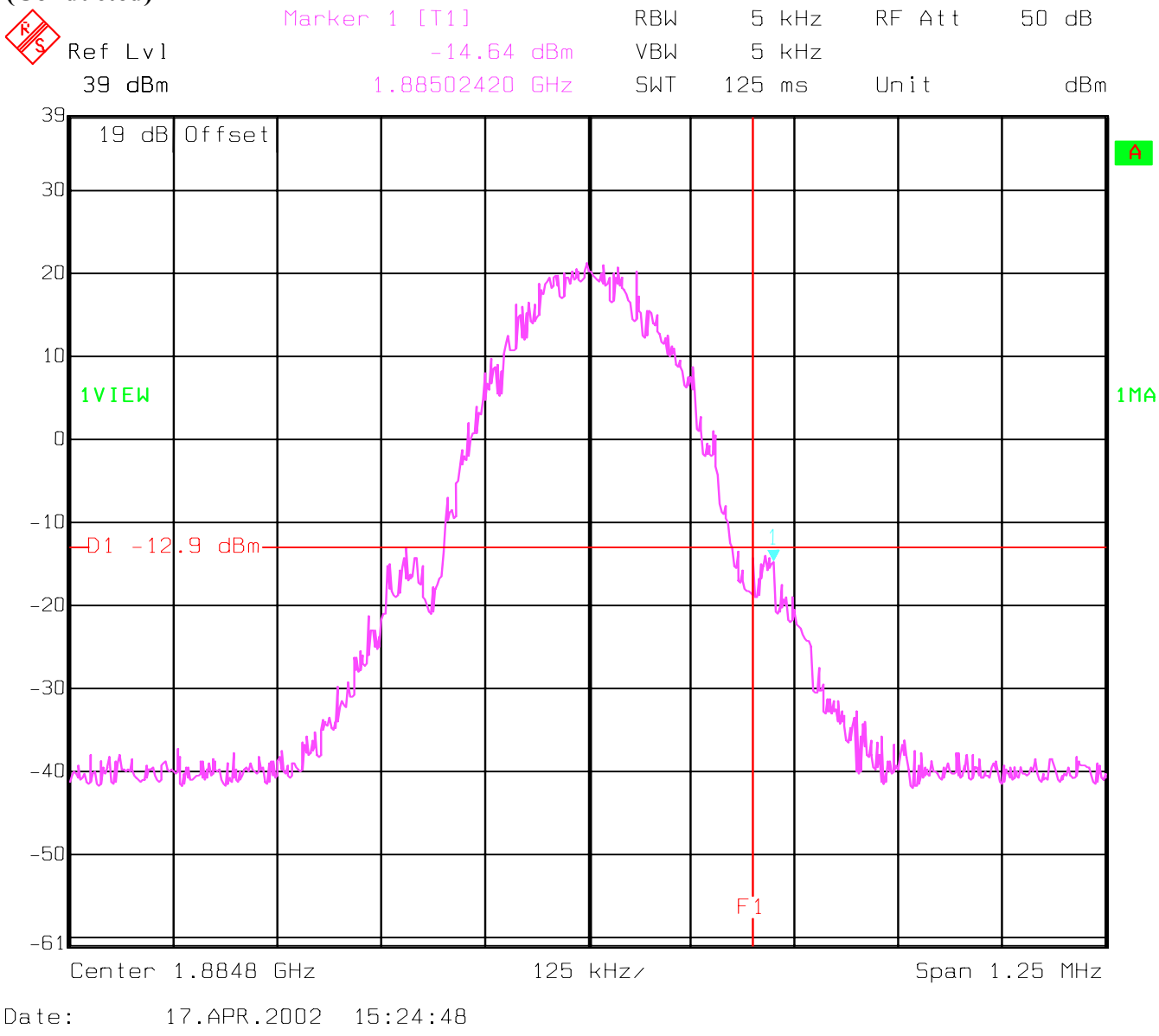
EUT in Idle Mode: 18GHz – 19.1GHz



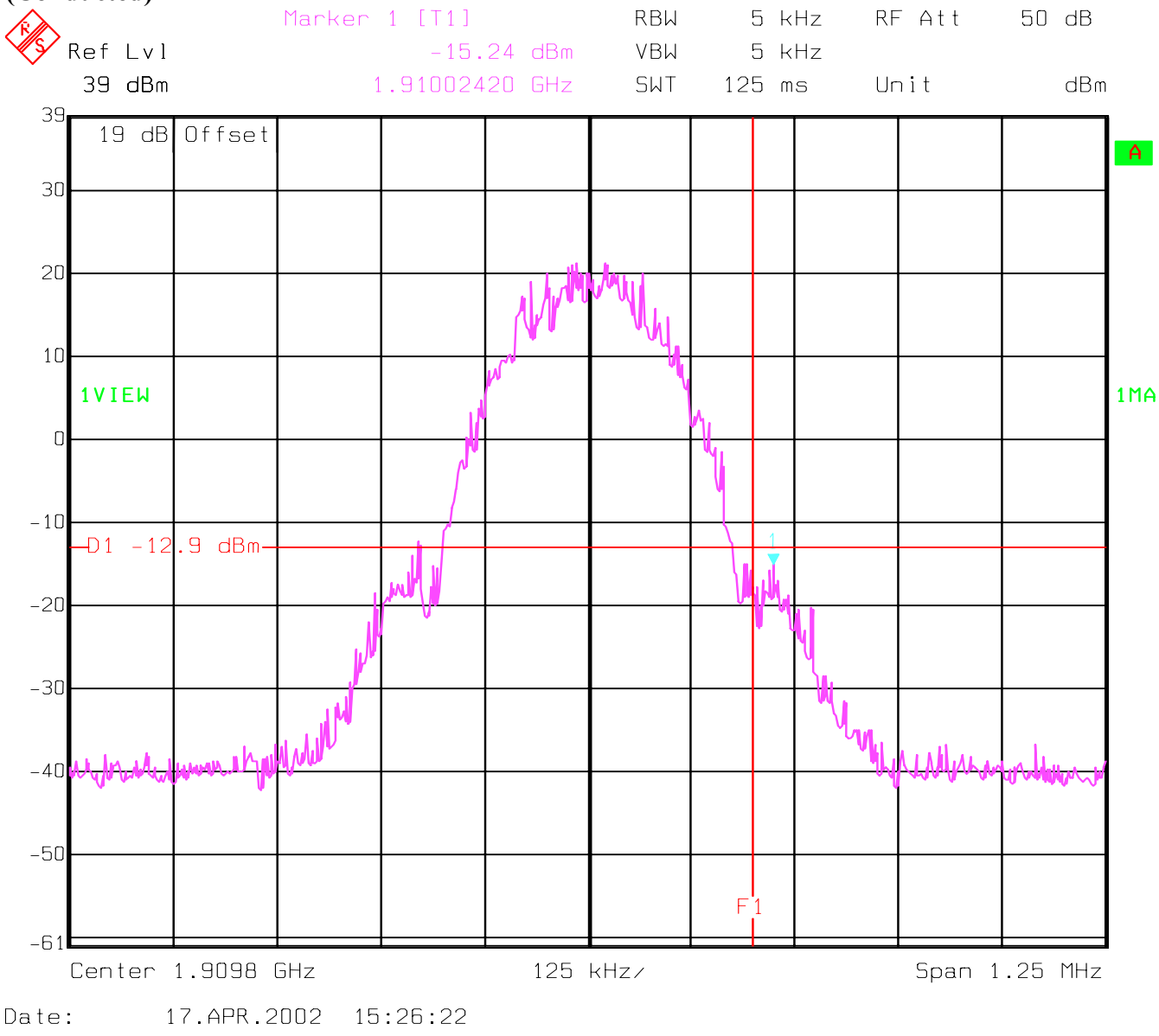
Lower Band Edge:
(Conducted)



Middle Band Edge:
(Conducted)



Higher Band Edge:
(Conducted)



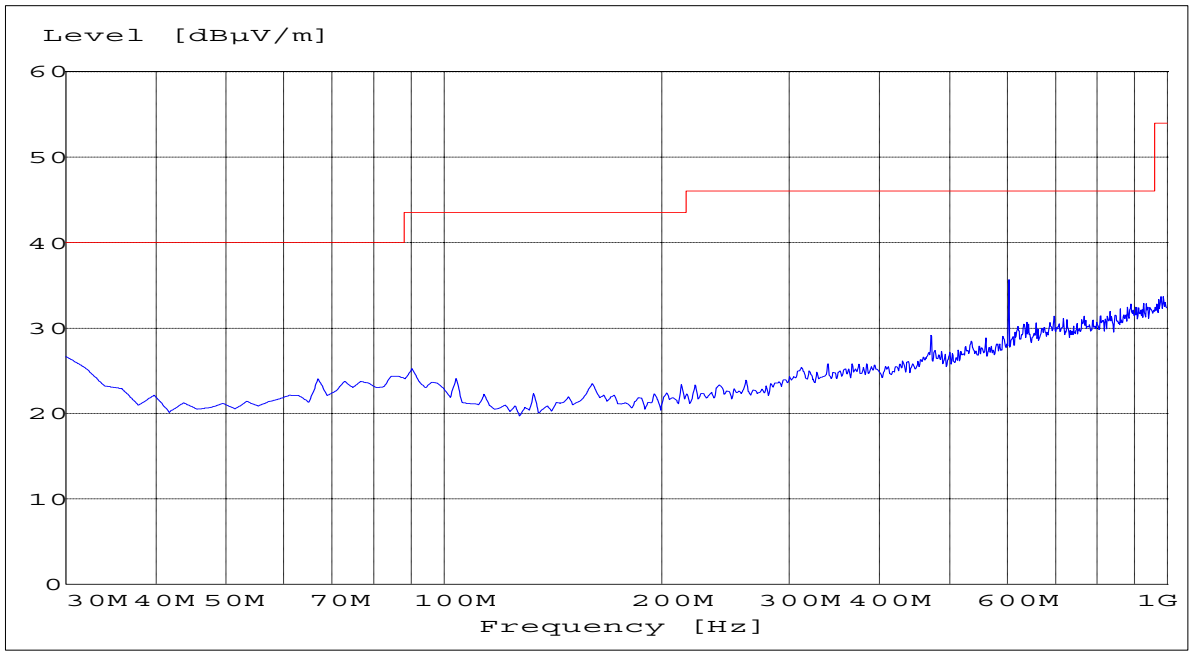
RECEIVER RADIATED EMISSIONS **SUBCLAUSE § 15.209**

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.

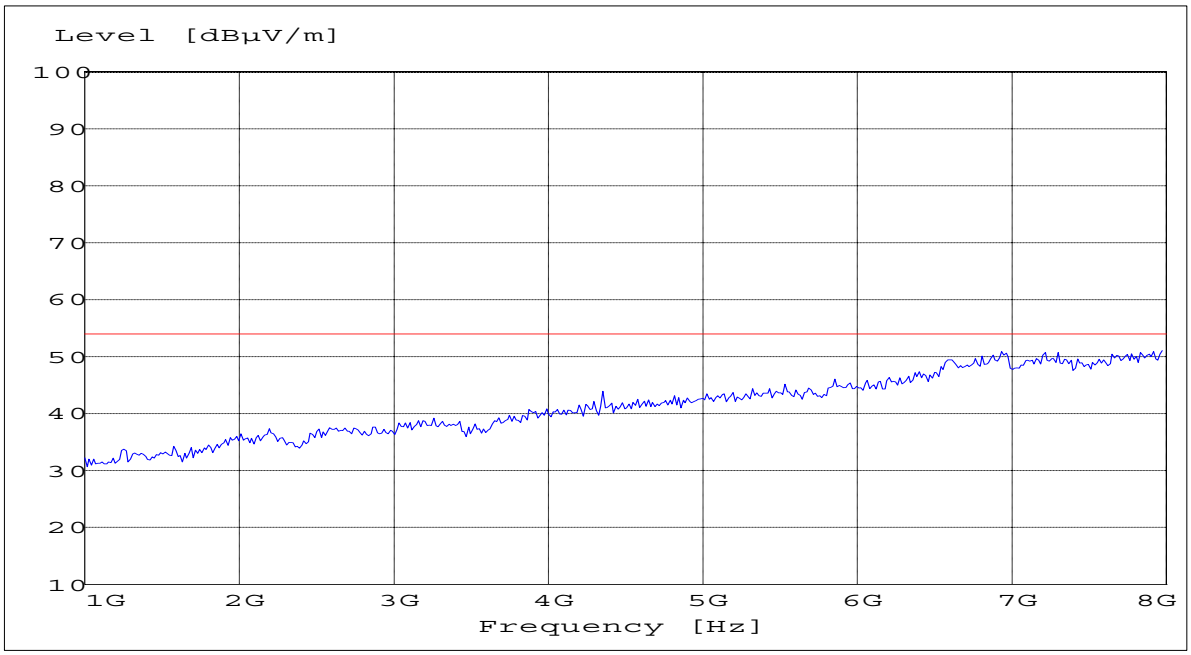
Limits **SUBCLAUSE § 15.209**

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

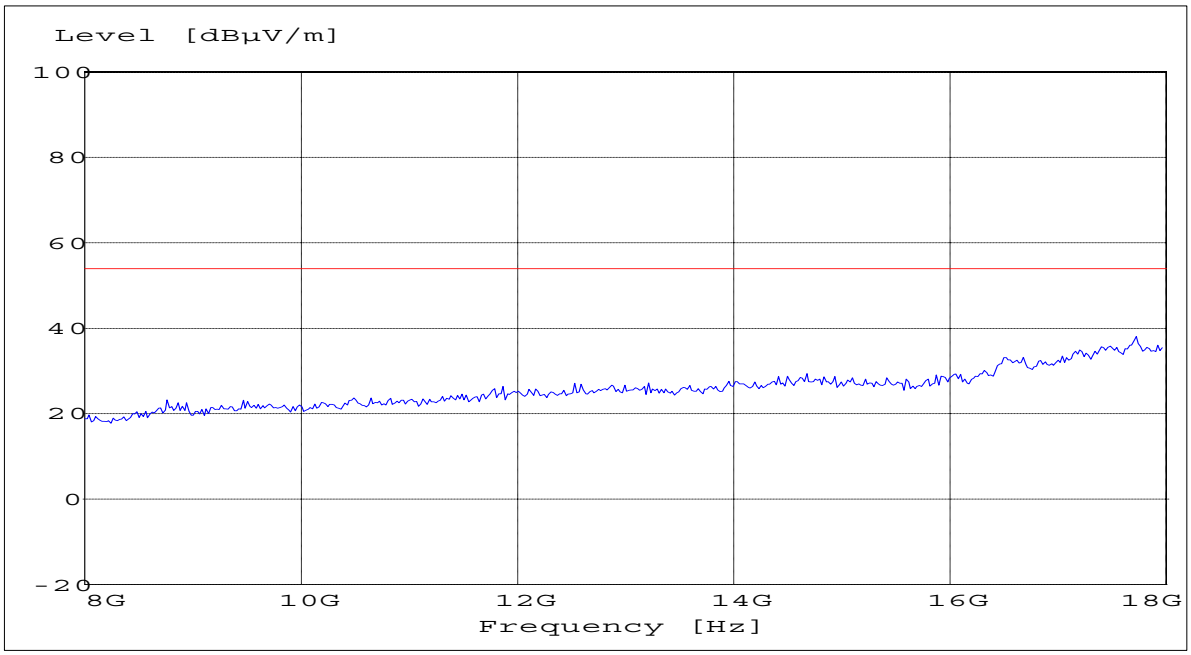
RECEIVER RADIATED EMISSIONS
EUT in Idle Mode: 30MHz – 1GHz



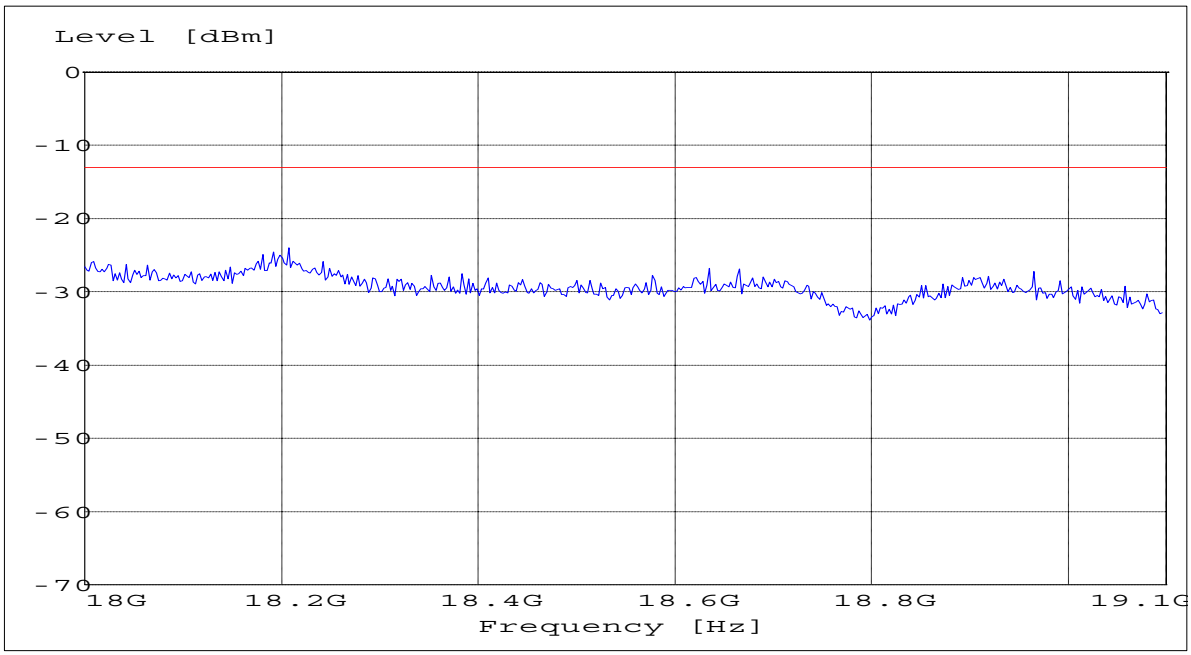
RECEIVER RADIATED EMISSIONS
EUT in Idle Mode: 1GHz – 8GHz



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



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

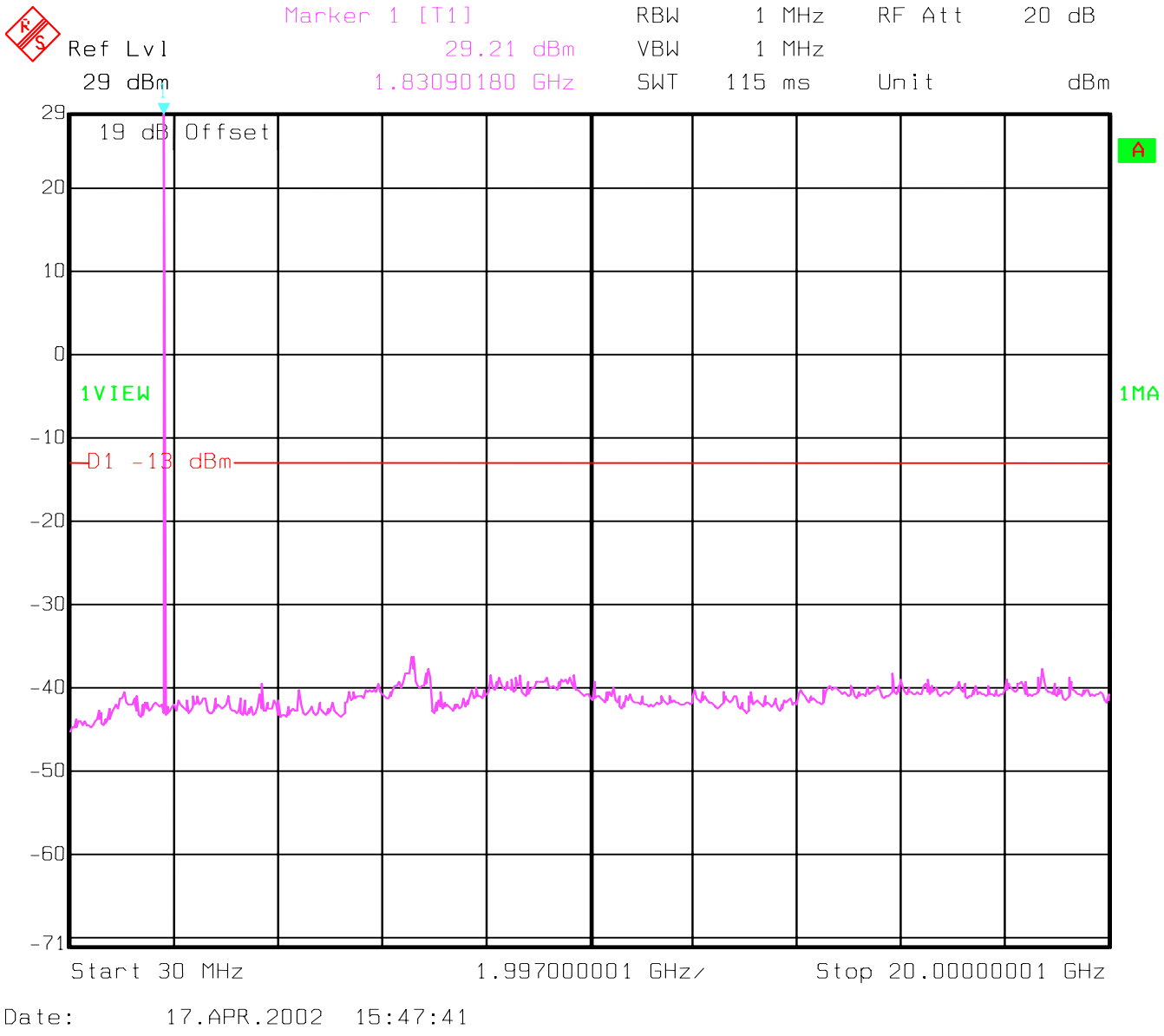


CONDUCTED SPURIOUS EMISSIONS

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.

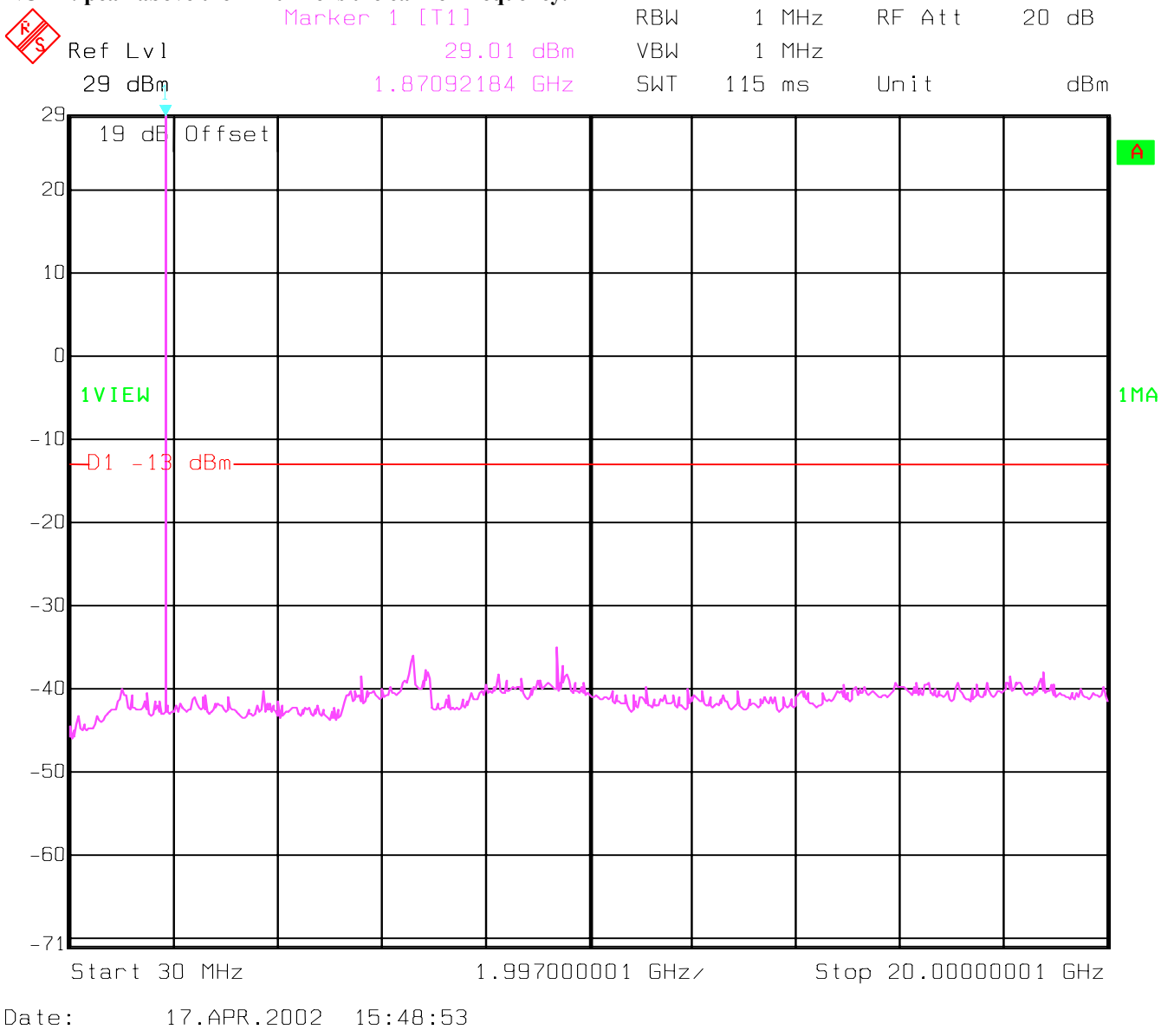
CONDUCTED SPURIOUS EMISSIONS
Channel 512:30MHz – 20GHz
NOTE: peak above the limit line is the carrier frequency.



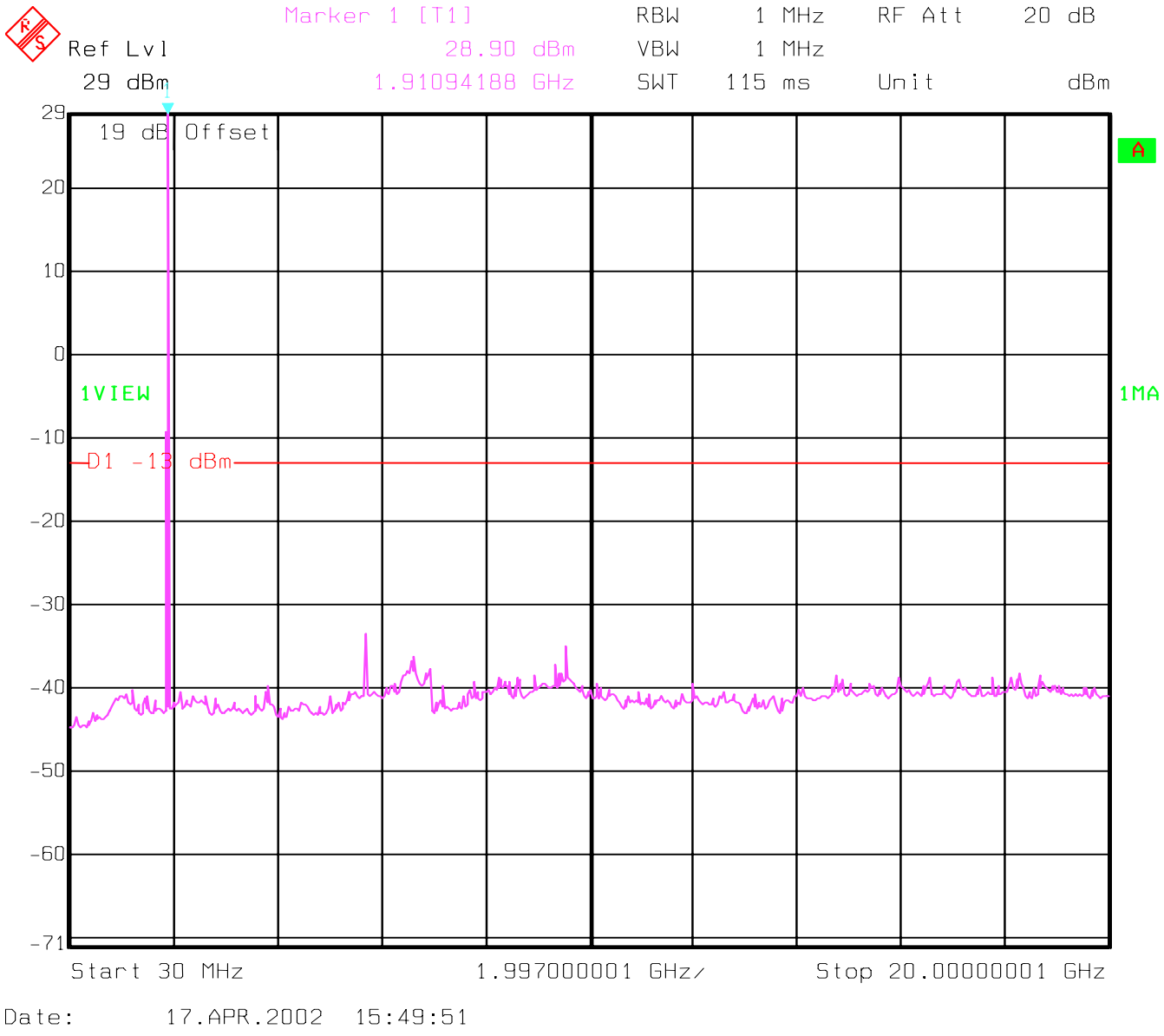
CONDUCTED SPURIOUS EMISSIONS

Channel 661: 30MHz – 20GHz

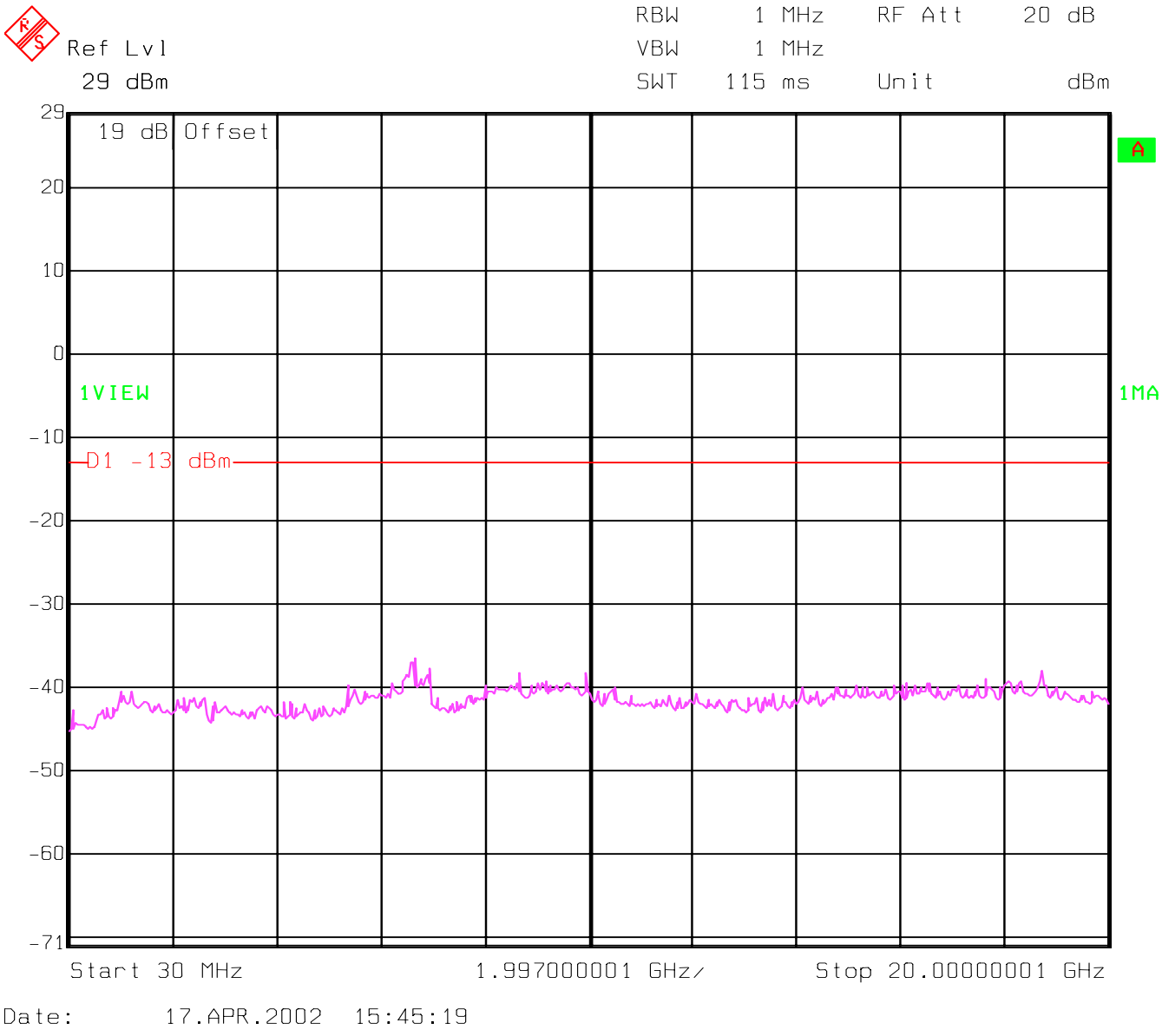
NOTE: peak above the limit line is the carrier frequency.



CONDUCTED SPURIOUS EMISSIONS
Channel 810: 30MHz – 20GHz
NOTE: peak above the limit line is the carrier frequency.



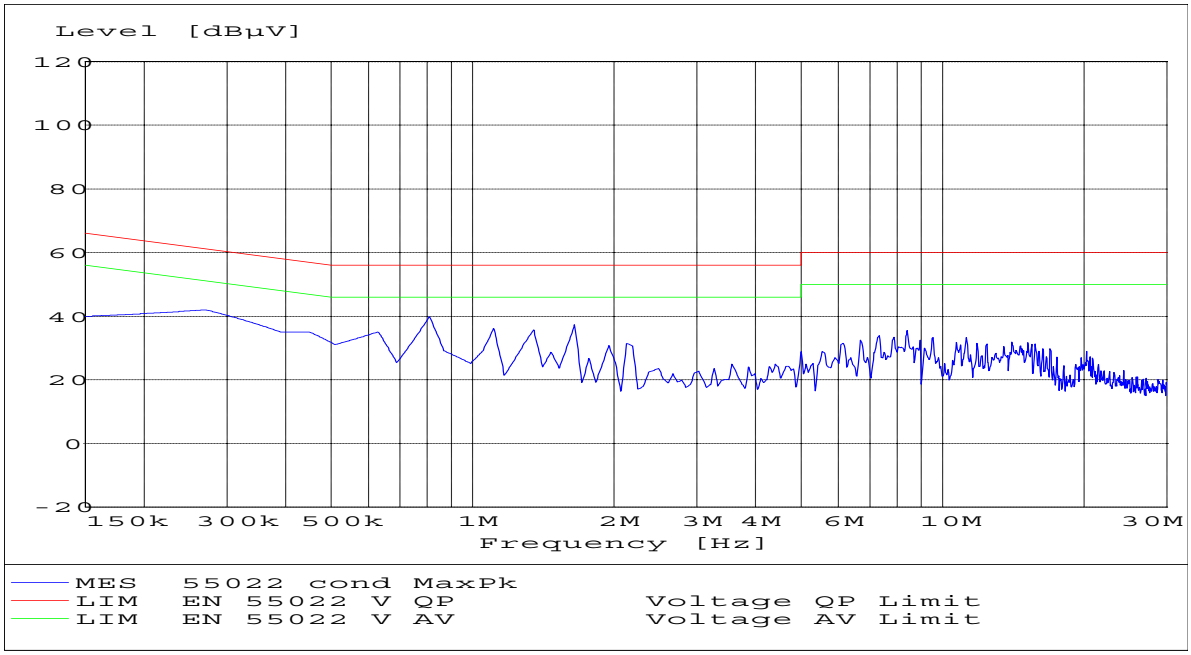
CONDUCTED SPURIOUS EMISSIONS
EUT in Idle Mode: 30MHz – 20GHz



Conducted emissions § 15.107/207

Measured with AC/DC power adapter plugged in LISN

Phase: Line

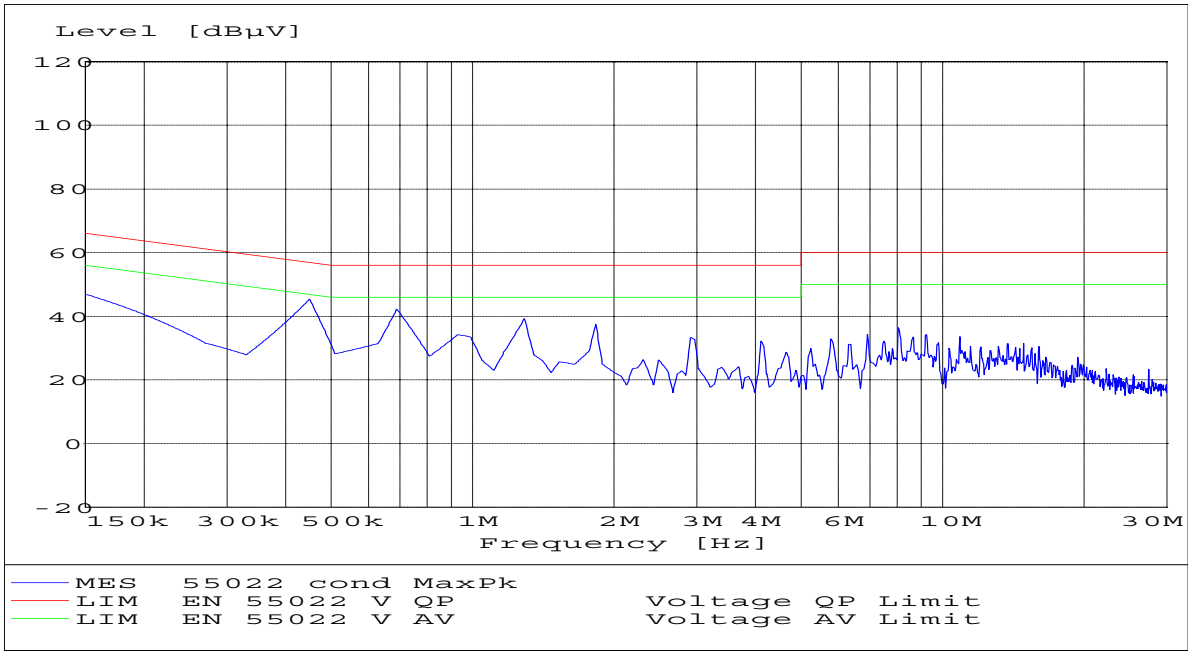


Technical specification: 15.107 / 15.207 (Revised as of October 1, 1991)
Limit

0.45 to 30 MHz	250 µV / 47.96dBµV

ANALYZER SETTINGS: RBW = 10KHz VBW = 10KHz

Phase: Neutral



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

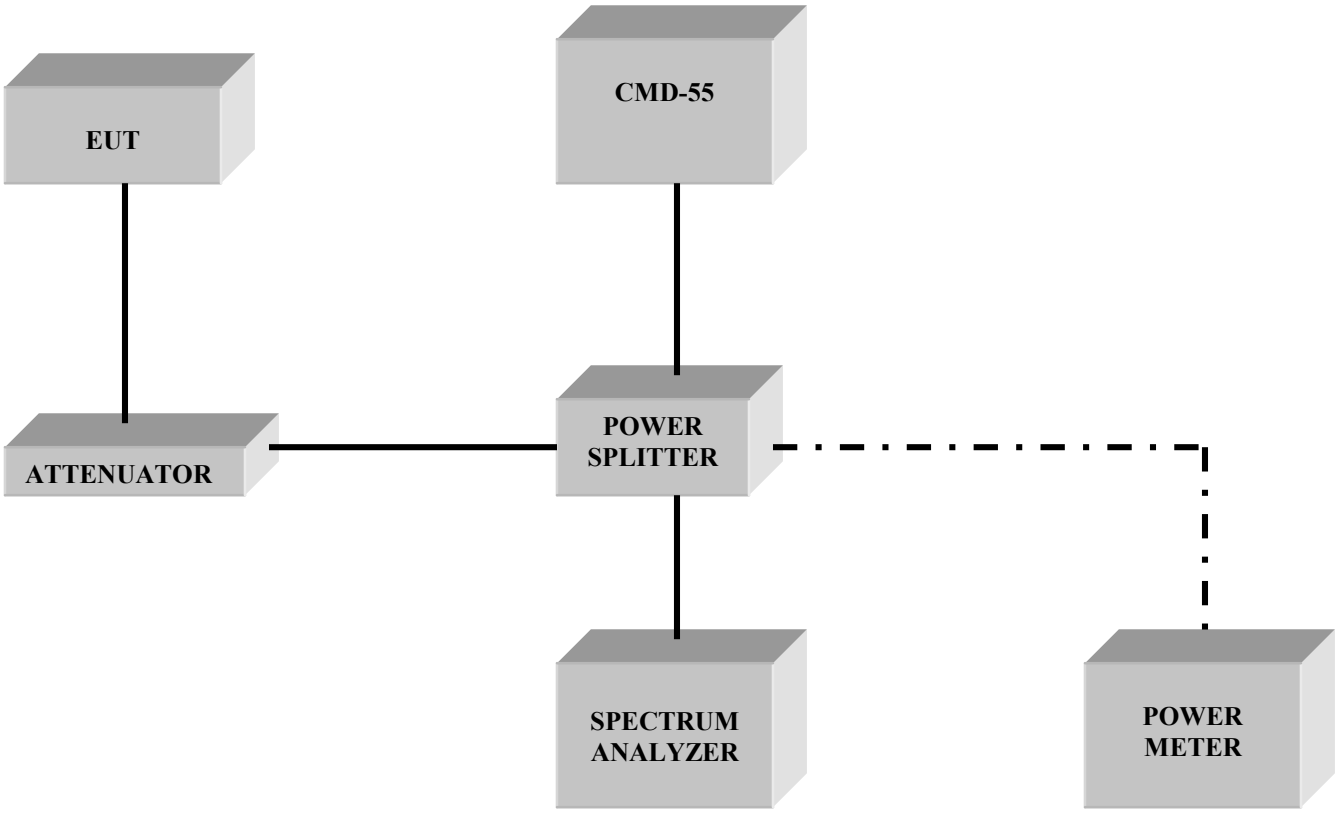
0.45 to 30 MHz	250 µV / 47.96 dBµV

ANALYZER SETTINGS: RBW = 10KHz VBW = 10KHz

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	826880/010
02	Signal Generator	SMY02	Rohde & Schwarz	836878/011
03	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02
04	Power Amlifier	250W1000	Amplifier Research	300031
05	Biconilog Antenna	3141	EMCO	0005-1186
06	Horn Antenna	SAS-200/571	AH Systems	325
07	Power Splitter	11667B	Hewlett Packard	645348
08	Climatic Chamber	VT4004	Votch	G1115
09	Pre-Amplifier	JS4-00102600	Miteq	00616
10	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807
11	Digital Radio Comm. Tester	CMD-55	Rohde & Schwarz	847958/008

BLOCK DIAGRAM – Conducted Measurements



BLOCK DIAGRAM – Radiated Measurements