FCC Test Report

FCC Part 22, 24 / RSS 132,133

FOR:

Mobile Data Terminal with integrated Wavecom Q2426-amr GSM/GPRS module.

MODEL #: S9000

Mobile Knowledge Corp.
308 Legget Drive
Kanata, Ontario, K2K 1Y6
Canada

FCC ID: VBG-MKC900XY2Z

TEST REPORT #: EMC_ MOBL2_001_07002_FCC22_24
DATE: 2007-6-29

ilac-MRA ACCREDITED Certificate # 2135.01

Bluetooth

Bluetooth Qualification Test Facility (BQTF)

CTIA Authorized Test Lab
LAB CODE 20020328-00

FCC listed: A2LA accredited

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 Assessment

The following is in compliance with the applicable criteria specified in FCC rules Parts 2, 22 and 24 of Title 47 of the Code of Federal Regulations and in compliance with the applicable criteria specified in Industry Canada rules RSS132 and RSS133.

Company	Description	Model #
Mobile Knowledge Corp.	**Mobile Data Terminal**	**S9000**

Technical responsibility for area of testing:

Date	Section	Name	Signature
2007-6-29	EMC & Radio	Lothar Schmidt (Director Regulatory and Antenna Services)	Lothar Schmidt I am approving this document

This report is prepared by:

Date	Section	Name	Signature
2007-6-29	EMC & Radio	Peter Mu (EMC Project Engineer)	I am approving this document

The test results of this test report relate exclusively to the test item specified in Identification of the Equipment under Test. The CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations 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 USA.

The test results of this test report relate exclusively to radiated measurement only. Radio module used in this product has been previously certified under its own FCC and IC ID. For results of the conducted measurement please refer to the following test reports:

G0M20304-7780-T-47

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	**CETECOM Inc.**
Department:	**EMC**
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	**+1 (408) 586 6200**
Fax:	**+1 (408) 586 6299**
Responsible Test Lab Manager:	**Lothar Schmidt**
Responsible Project Leader:	**Peter Mu**
Date of test:	**2007-3-19**

2.2 Identification of the Client

Applicant's Name:	**Mobile Knowledge Corp.**
Street Address:	**308 Legget Drive**
City/Zip Code	**Kanata/ K2K 1Y6**
Country	**Canada**
Contact Person:	**Bruce Shields**
Phone No.	**613 287 5020**
Fax:	**613 287 5021**
e-mail:	**bshields@mobile-knowledge.com**

2.3 Identification of the Manufacturer

Same as above.

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name of EUT (if not same as Model No.)	**S9000**
Description	**Mobile Data Terminal**
Model No.	**S9000**
FCC-ID	**VBG-MKC900XY2Z**
IC-ID (Industry Canada)	**N/A**
Frequency Range:	**824.2MHz – 848.8MHz for GSM 850** **1850.2MHz – 1909.8MHz for PCS 1900**
Type(s) of Modulation:	**GMSK**
Number of Channels:	**124 for GSM-850, 299 for PCS-1900**
Antenna Type:	**Radial Larsen MMCP3ESMA**
Max. Output Power:	**Conducted : Tests Conducted not by Cetecom. Report submitted separately.** **Radiated : see section 4.1.5 and 4.1.6** 33.06dBm (2.02W) @ 848.8MHz EIRP 28.79dBm (0.757W) @1880MHz

3.2 Identification of the Equipment Under Test (EUT)

EUT #	TYPE	MANF.	MODEL	SERIAL #
1	EUT	**Mobile Knowledge Corp.**	S9000	24800629SP0071

3.3 Identification of Accessory equipment

AE #	TYPE	MANF.	MODEL	SERIAL #
1	GSM Antenna	**Radial Larsen**	**MMCP3ESMA**	N/A

4 Subject of Investigation

All testing was performed on the EUT listed in Section 3. The EUT was maximized in the X,Y, Z positions , all data in this report shows the worst case between horizontal and vertical polarization for above 1GHz. The dual band antenna used has 2dBi only and is provided with a 3m cable.

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT as specified by requirements listed in FCC rules Parts 2, 22 and 24 of Title 47 of the Code of Federal Regulations and Industry Canada rules RSS132 and RSS133.

This EUT contains a FCC approved module Wavecom Q2426-amr with the FCC ID O9EQ2426-SK This report refers only to the radiated measurements. The conducted measurements are documented in test report

G0M20304-7780-T-47

5 Measurements

5.1 RF Power Output

5.1.1 FCC 2.1046 Measurements required: RF power output.

Power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on circuit elements as specified. The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

5.1.2 Limits:

5.1.2.1 FCC 22.913 (a) Effective radiated power limits.

The effective radiated power (ERP) of mobile transmitters must not exceed 7 Watts.

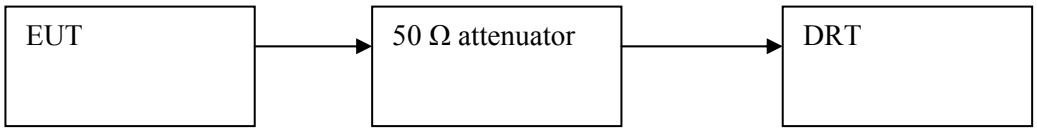
5.1.2.2 FCC 24.232 (b)(c) Power limits.

(b) Mobile/portable stations are limited to 2 Watts effective isotropic radiated power (EIRP).
(c) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms equivalent voltage. The measurement results shall be properly adjusted for any limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement over the full bandwidth of the channel.

5.1.3 Conducted Output Power Measurement procedure:

Based on TIA-603C 2004

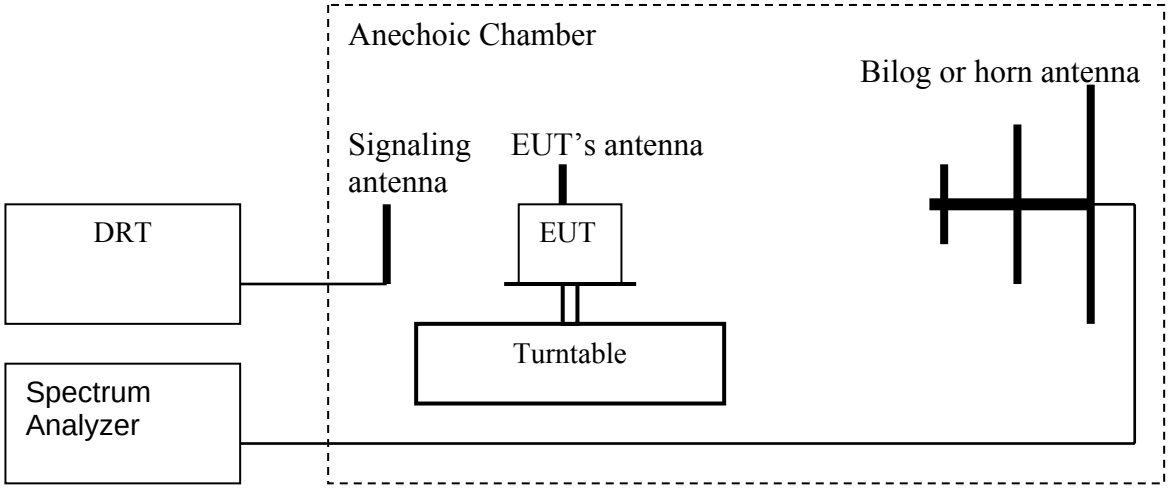
2.2.1 Conducted Carrier Output Power Rating



1. Connect the equipment as shown in the above diagram. A Digital Radiocommunication Tester (DRT) is used to enable the EUT to transmit and to measure the output power.
2. Adjust the settings of the DRT to set the EUT to its maximum power at the required channel.
3. Record the output power level measured by the DRT.
4. Correct the measured level for all losses in the RF path.
5. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

5.1.4 Radiated Output Power Measurement procedure:

Based on TIA-603C 2004
2.2.17.2 Effective Radiated Power (ERP) or Effective Isotropic Radiated Power (EIRP)



1. Connect the equipment as shown in the above diagram with the EUT's antenna in a vertical orientation.
2. Adjust the settings of the Digital Radiocommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to the channel frequency. Set the analyzer to measure peak hold with the required settings.
4. Rotate the EUT 360°. Record the peak level in dBm (**LVL**).
5. Replace the EUT with a vertically polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS)**. **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the ERP using the following equation:
   ERP (dBm) = **LVL** (dBm) + **LOSS** (dB)
8. Determine the EIRP using the following equation:
   EIRP (dBm) = **ERP** (dBm) + 2.14 (dB)
9. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band. **Spectrum analyzer settings = rbw=vbw=3MHz**

(**note:** Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4, 7 and 8 above are performed with test software.)

5.1.5 ERP Results 850 MHz band:

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

Frequency (MHz)	Effective Radiated Power (dBm)	
	GPRS	EGPRS
824.2	30.11	N/A
836.6	29.48	N/A
848.8	30.92	N/A

5.1.6 EIRP Results 1900 MHz band:

Power Control Level	Burst Peak EIRP
0	≤33dBm (2W)

Frequency (MHz)	Effective Isotropic Radiated Power (dBm)	
	GSM	EGPRS
1850.2	26.67	N/A
1880.0	28.79	N/A
1909.8	28.08	N/A

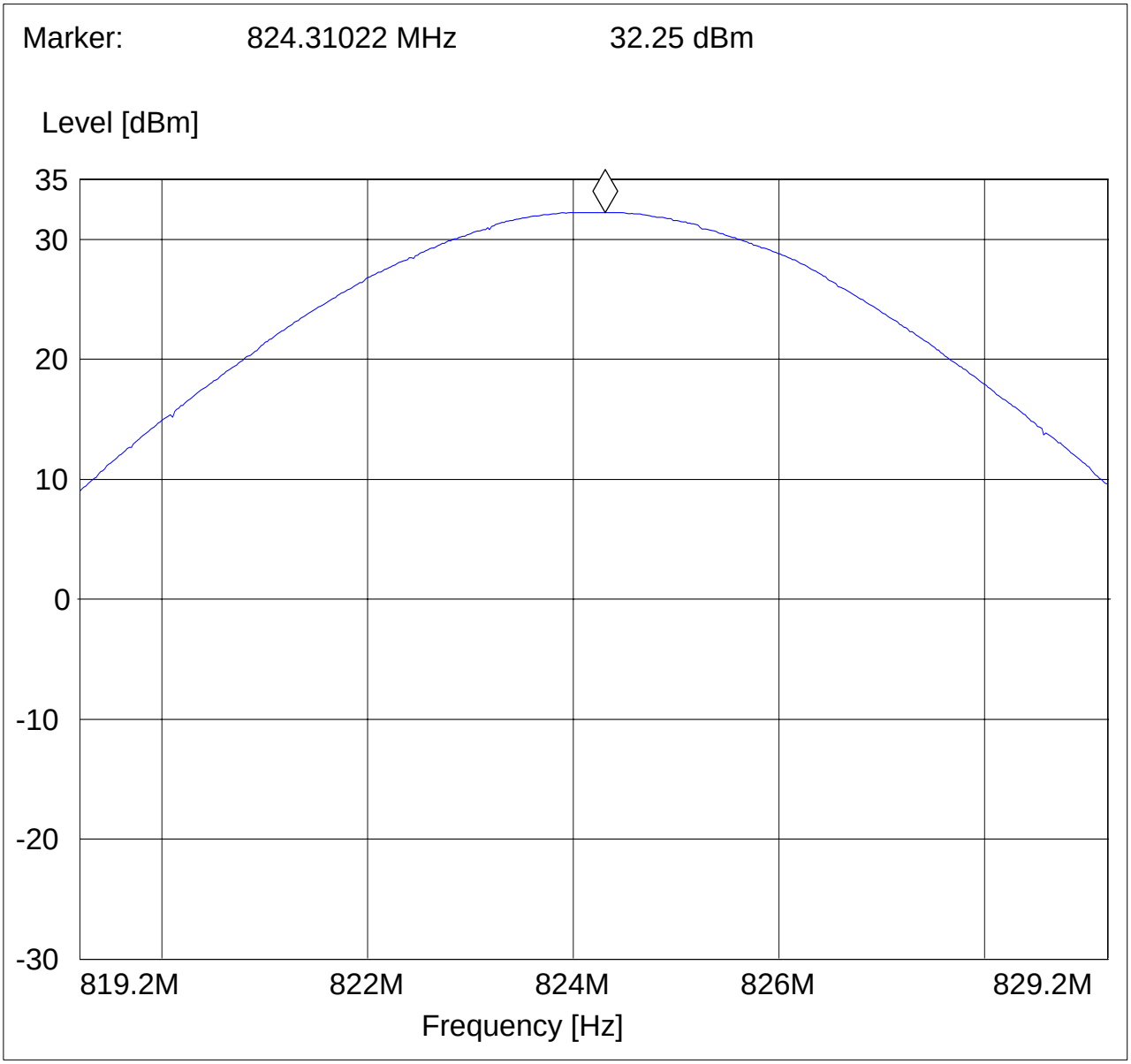
EIRP (GSM 850) **§22.913(a)**

CHANNEL 128 GPRS

EUT: 18
Customer: Mobile Knowledge
Test Mode: GPRS 850
ANT Orientation: H
EUT Orientation: V
Test Engineer: Ed
Voltage: 12v battery
Comments:

SWEEP TABLE: "EIRP 850 CH 128 H"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
819.2 MHz	829.2 MHz	MaxPeak MaxPeak	Coupled	3 MHz	DUMMY-DBM



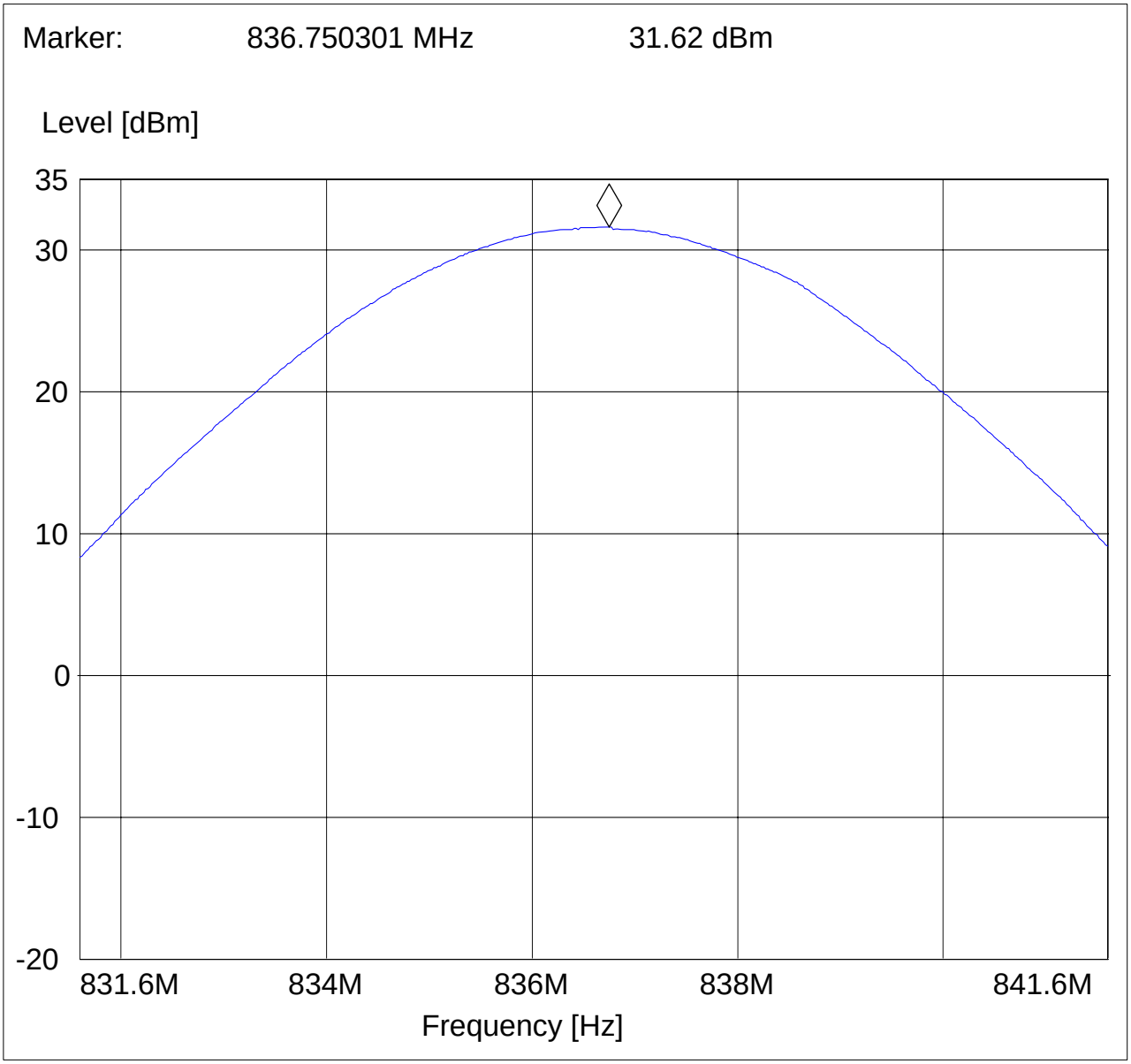
EIRP (GSM 850) **§22.913(a)**

CHANNEL 190 GPRS

EUT: 18
Customer: Mobile Knowledge
Test Mode: GPRS 850
ANT Orientation: H
EUT Orientation: V
Test Engineer: Ed
Voltage: 12v battery
Comments:

SWEEP TABLE: "EIRP 850 CH 190 H"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
831.6 MHz	841.6 MHz	MaxPeak MaxPeak	Coupled	3 MHz	DUMMY-DBM



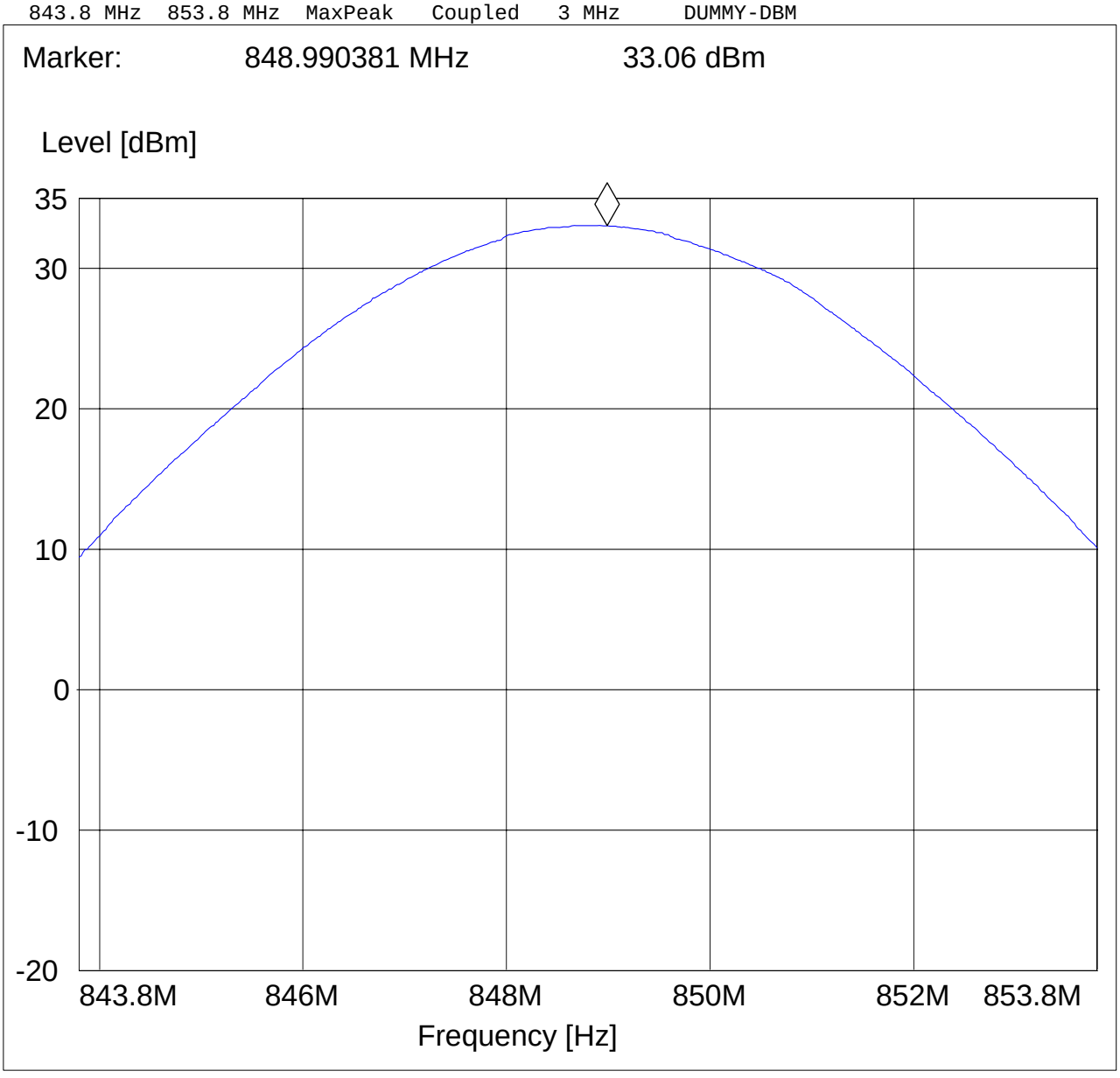
EIRP (GSM 850) **§22.913(a)**

CHANNEL 251 GPRS

EUT: 18
Customer: Mobile Knowledge
Test Mode: GPRS 850
ANT Orientation: H
EUT Orientation: V
Test Engineer: Ed
Voltage: 12v battery
Comments:

SWEEP TABLE: "EIRP 850 CH 251 H"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
843.8 MHz	853.8 MHz	MaxPeak	Coupled	3 MHz	DUMMY-DBM



EIRP (PCS-1900) **§24.232(b)**

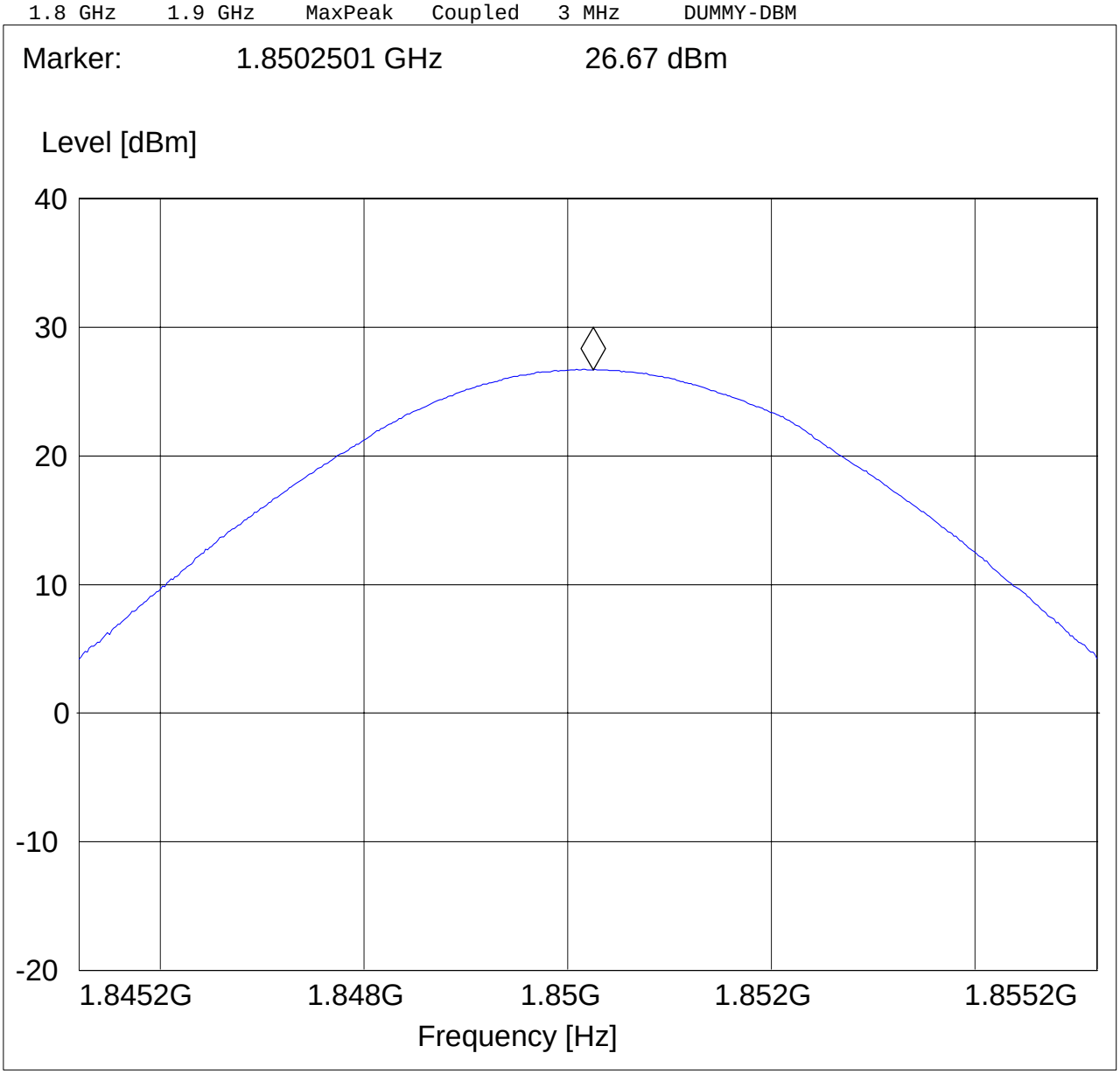
CHANNEL 512 GPRS

EUT: 18
Customer: Mobile Knowledge
Test Mode: GPRS 1900 CH 512
ANT Orientation: V
EUT Orientation: V
Test Engineer: Satya Radhakrishna
Voltage: 12v battery
Comments:

SWEEP TABLE: "EIRP 1900 CH512"

Short Description: EIRP PCS 1900 for channel-512

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
1.8 GHz	1.9 GHz	MaxPeak	Coupled	3 MHz	DUMMY-DBM



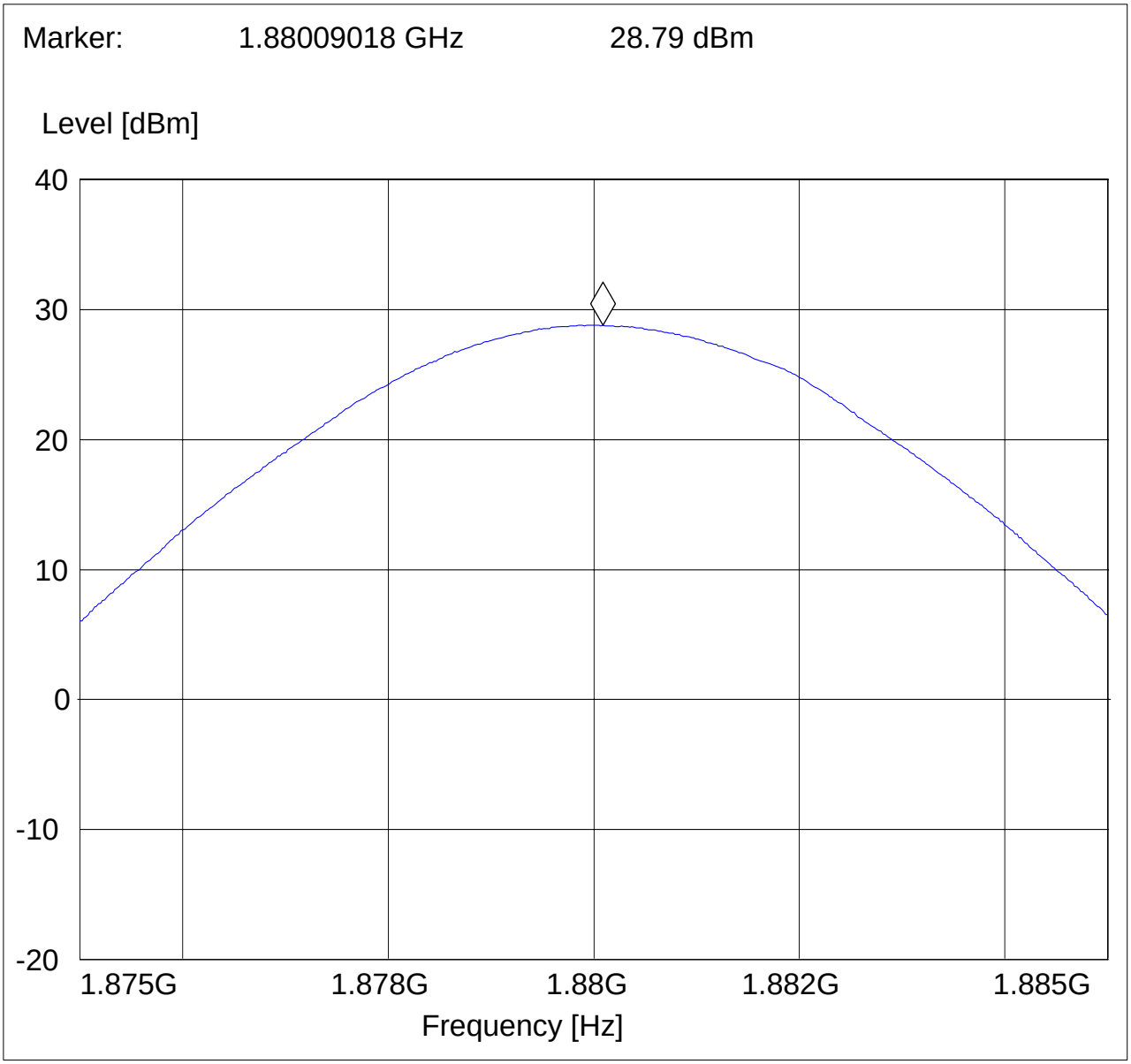
EIRP (PCS-1900)
CHANNEL 661 GPRS

EUT: 18
Customer: Mobile Knowledge
Test Mode: GPRS 1900 CH661
ANT Orientation: V
EUT Orientation: V
Test Engineer: Satya Radhakrishna
Voltage: 12v battery
Comments:

SWEEP TABLE: "EIRP 1900 CH661"

Short Description: EIRP PCS 1900 for channel-661

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
1.9 GHz	1.9 GHz	MaxPeak MaxPeak	Coupled	3 MHz	DUMMY-DBM



EIRP (PCS-1900) **§24.232(b)**

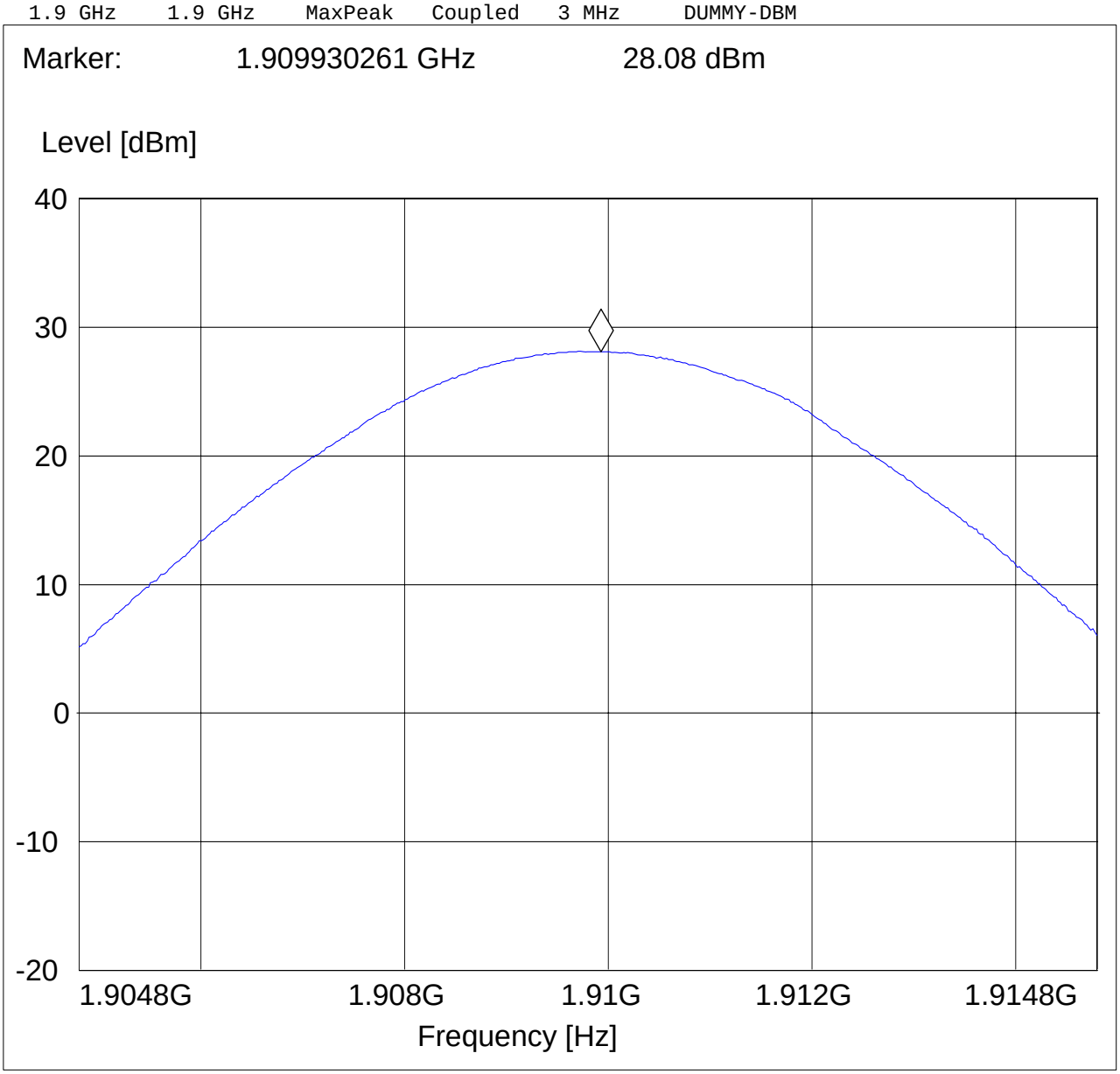
CHANNEL 810 GPRS

EUT: 18
Customer: Mobile Knowledge
Test Mode: GPRS 1900 CH 810
ANT Orientation: V
EUT Orientation: V
Test Engineer: Satya Radhakrishna
Voltage: 12v battery
Comments:

SWEEP TABLE: "EIRP 1900 CH810"

Short Description: EIRP PCS 1900 for channel-810

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
1.9 GHz	1.9 GHz	MaxPeak	Coupled	3 MHz	DUMMY-DBM

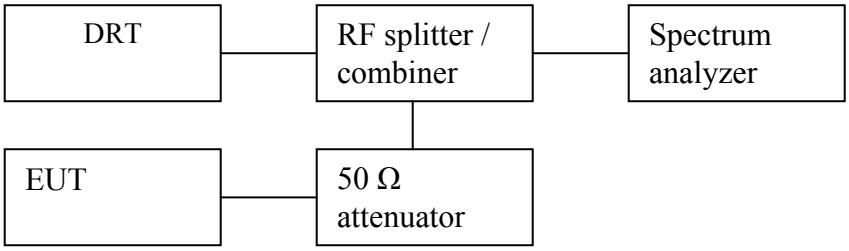


5.2 Occupied Bandwidth/Emission Bandwidth

5.2.1 FCC 2.1049 Measurements required: Occupied bandwidth

The occupied bandwidth, that is the frequency bandwidth such that below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable.
(h) Transmitters employing digital modulation techniques-when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated.

5.2.2 Occupied / emission bandwidth measurement procedure:



1. Connect the equipment as shown in the above diagram.
2. Adjust the settings of the Digital Radiocommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to measure the 99% (-20 dB) occupied bandwidth. Record the value.
4. Set the spectrum analyzer to measure the 99.5% (-26 dB) emission bandwidth. Record the value.
5. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

5.2.3 Occupied / Emission bandwidth results 850 MHz band:

The test results of this test report relate exclusively to radiated measurement only. Radio module used in this product has been previously certified under its own FCC and IC ID. For results of the conducted measurement please refer to the following test reports:

G0M20304-7780-T-47

5.3 Frequency Stability

5.3.1 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 3.2VDC and 4.5VDC, 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.

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 & 4183 for FDD5 & 661 for PCS-1900&9400 for FDD2), 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 & 4183 for FDD5 & 661 for PCS-1900&9400 for FDD2), 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.

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.

5.3.2 FREQUENCY STABILITY (GSM-850)

Some of the test results in this report are extracted from conducted test report for the GSM radio module. Radio module used in this product has been previously certified under its own FCC and IC ID. For results of the conducted measurement please refer to the following test reports:

G0M20304-7780-T-47

5.3.3 FREQUENCY STABILITY (PCS-1900)

Some of the test results in this report are extracted from conducted test report for the GSM radio module. Radio module used in this product has been previously certified under its own FCC and IC ID. For results of the conducted measurement please refer to the following test reports:

G0M20304-7780-T-47

5.4 Spurious Emissions Conducted

5.4.1 FCC 2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in FCC 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

5.4.2 Limits:

5.4.2.1 FCC 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

(a) *Out of band emissions*. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

5.4.2.2 FCC 24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

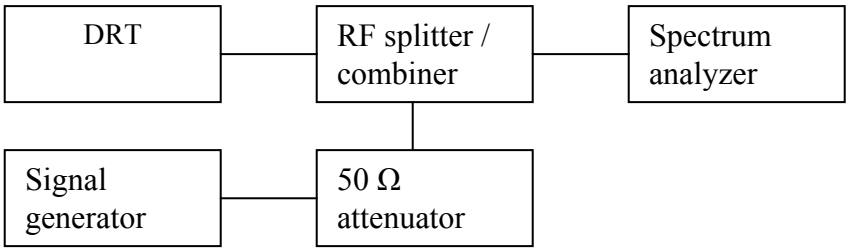
(a) *Out of band emissions*. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the

transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

5.4.3 Conducted out of band emissions measurement procedure:

Based on TIA-603C 2004
2.2.13 Unwanted Emissions: Conducted Spurious



1. Connect the equipment as shown in the above diagram.
2. Set the spectrum analyzer to measure peak hold with the required settings.
3. Set the signal generator to a known output power and record the path loss in dB (**LOSS)** for frequencies up to the tenth harmonic of the EUT's carrier frequency. **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
4. Replace the signal generator with the EUT.
5. Adjust the settings of the Digital Radiocommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
6. Set the spectrum analyzer to measure peak hold with the required settings. Offset the spectrum analyzer reference level by the path loss measured above.
7. Measure and record all spurious emissions up to the tenth harmonic of the carrier frequency.
8. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.
9. If necessary steps 6 and 7 may be performed with the spectrum analyzer set to average detector.

(**note:** Step 3 above is performed prior to testing and **LOSS** is recorded by test software. Steps 2, 6, and 7 above are performed with test software.)

The test results of this test report relate exclusively to radiated measurement only. Radio module used in this product has been previously certified under its own FCC and IC ID. For results of the conducted measurement please refer to the following test reports:

G0M20304-7780-T-47

5.5 Spurious Emissions Radiated

5.5.1 FCC 2.1053 Measurements required: Field strength of spurious radiation.

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission.

5.5.2 Limits:

5.5.2.1 FCC 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

(a) *Out of band emissions*. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

5.5.2.2 FCC 24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(a) *Out of band emissions*. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

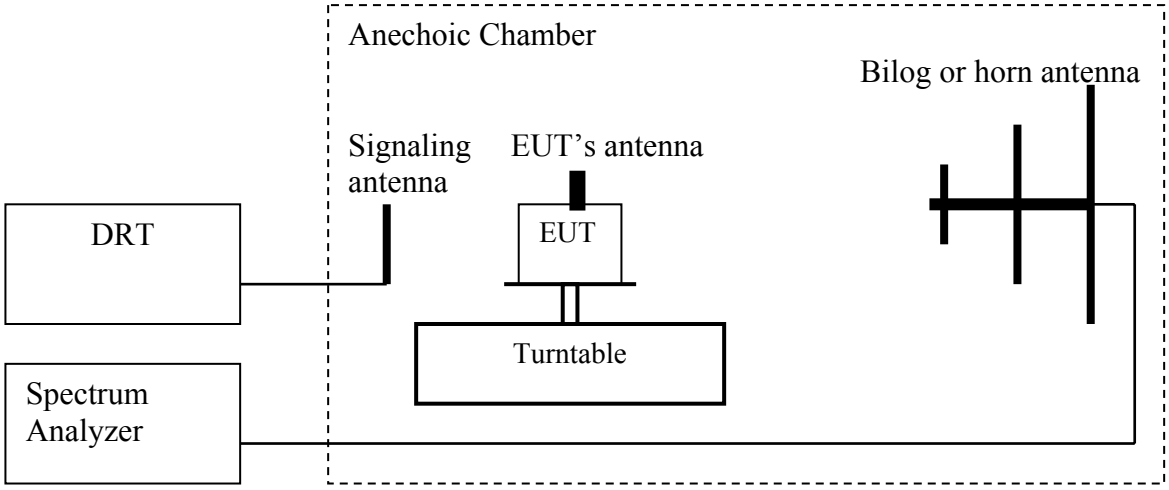
(b) Measurement procedure. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required

measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

5.5.3 Radiated out of band measurement procedure:

Based on TIA-603C 2004

2.2.12 Unwanted emissions: Radiated Spurious



1. Connect the equipment as shown in the above diagram with the EUT's antenna in a horizontal orientation.
2. Adjust the settings of the Digital Radiocommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to measure peak hold with the required settings.
4. Place the measurement antenna in a horizontal orientation. Rotate the EUT 360°. Raise the measurement antenna up to 4 meters in 0.5 meters increments and rotate the EUT 360° at each height to maximize all emissions. Measure and record all spurious emissions (**LVL**) up to the tenth harmonic of the carrier frequency.
5. Replace the EUT with a horizontally polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS)**. **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the level of spurious emissions using the following equation: **Spurious** (dBm) = **LVL** (dBm) + **LOSS** (dB):
8. Repeat steps 4, 5 and 6 with all antennas vertically polarized.
9. Determine the level of spurious emissions using the following equation: **Spurious** (dBm) = **LVL** (dBm) + **LOSS** (dB):
10. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

(**note:** Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4 and 7 above are performed with test software.)

Spectrum analyzer settings:
Res B/W: 1 MHz
Vid B/W: 1 MHz

Measurement Survey:

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.

5.5.4 Radiated out of band emissions results on EUT:

5.5.4.1 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**	NF	**3346.4**	NF	**3395.2**	NF
5	**4121**	NF	**4183**	NF	**4244**	NF
6	**4945.2**	NF	**5019.6**	NF	**5092.8**	NF
7	**5769.4**	NF	**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
NF = NOISE FLOOR						

5.5.4.2 RADIATED SPURIOUS EMISSIONS (GSM-850)

TX: 30MHz - 1GHz Antenna: vertical

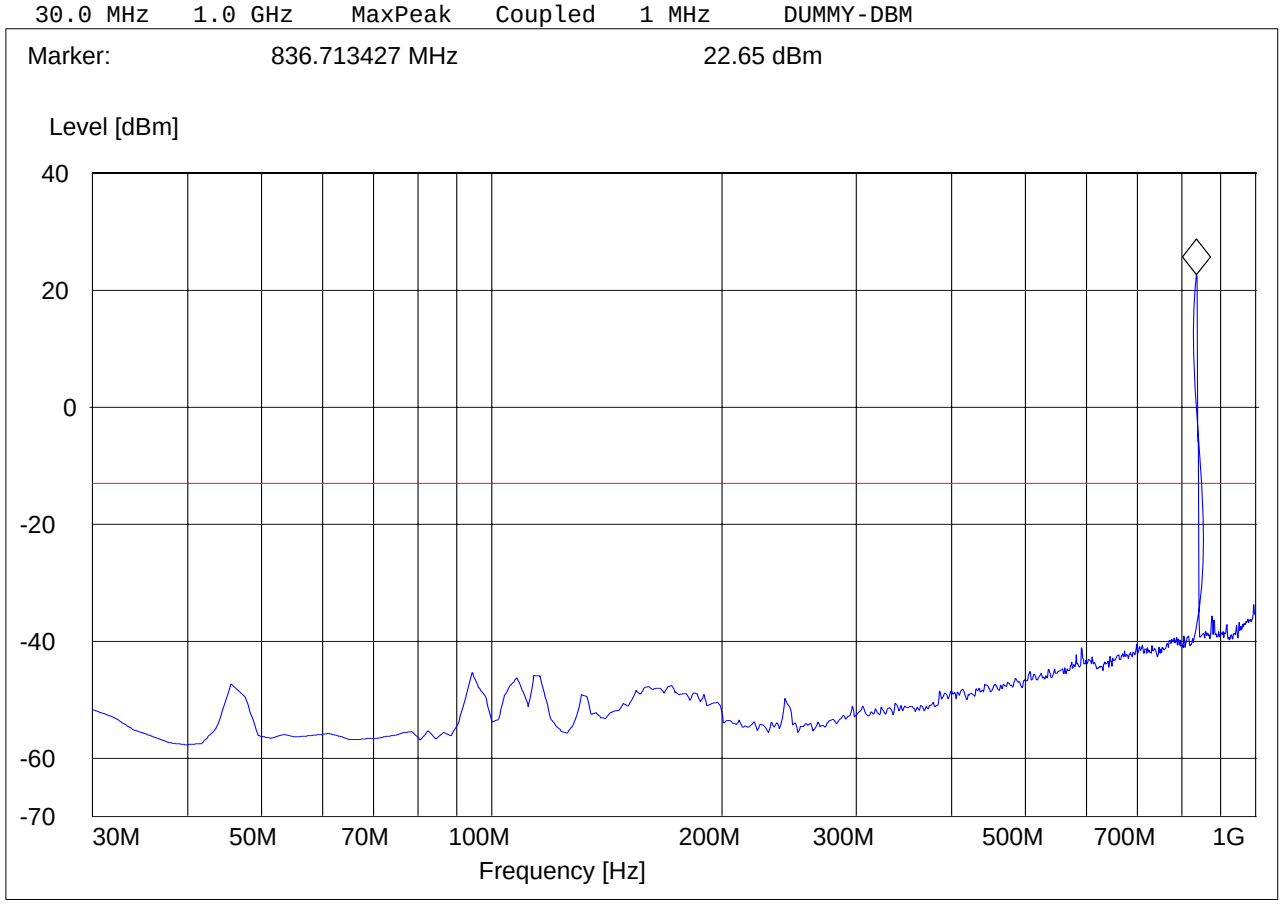
Spurious emission limit –13dBm

Note:

1.The peak above the limit line is the carrier freq.

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

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 850
ANT Orientation:  V
EUT Orientation:  V
Test Engineer:    Ed
Voltage:          12v battery
Comments:
SWEEP TABLE: "FCC 24 Spur 30M-1G_V"

  Short Description:            FCC 24 30MHz-1GHz
  Start      Stop       Detector  Meas.     IF        Transducer
  Frequency  Frequency             Time      Bandw.
  30.0 MHz   1.0 GHz    MaxPeak   Coupled   1 MHz     DUMMY-DBM
```



RADIATED SPURIOUS EMISSIONS (GSM-850)
TX: 30MHz - 1GHz Antenna: horizontal
Spurious emission limit –13dBm
Note:

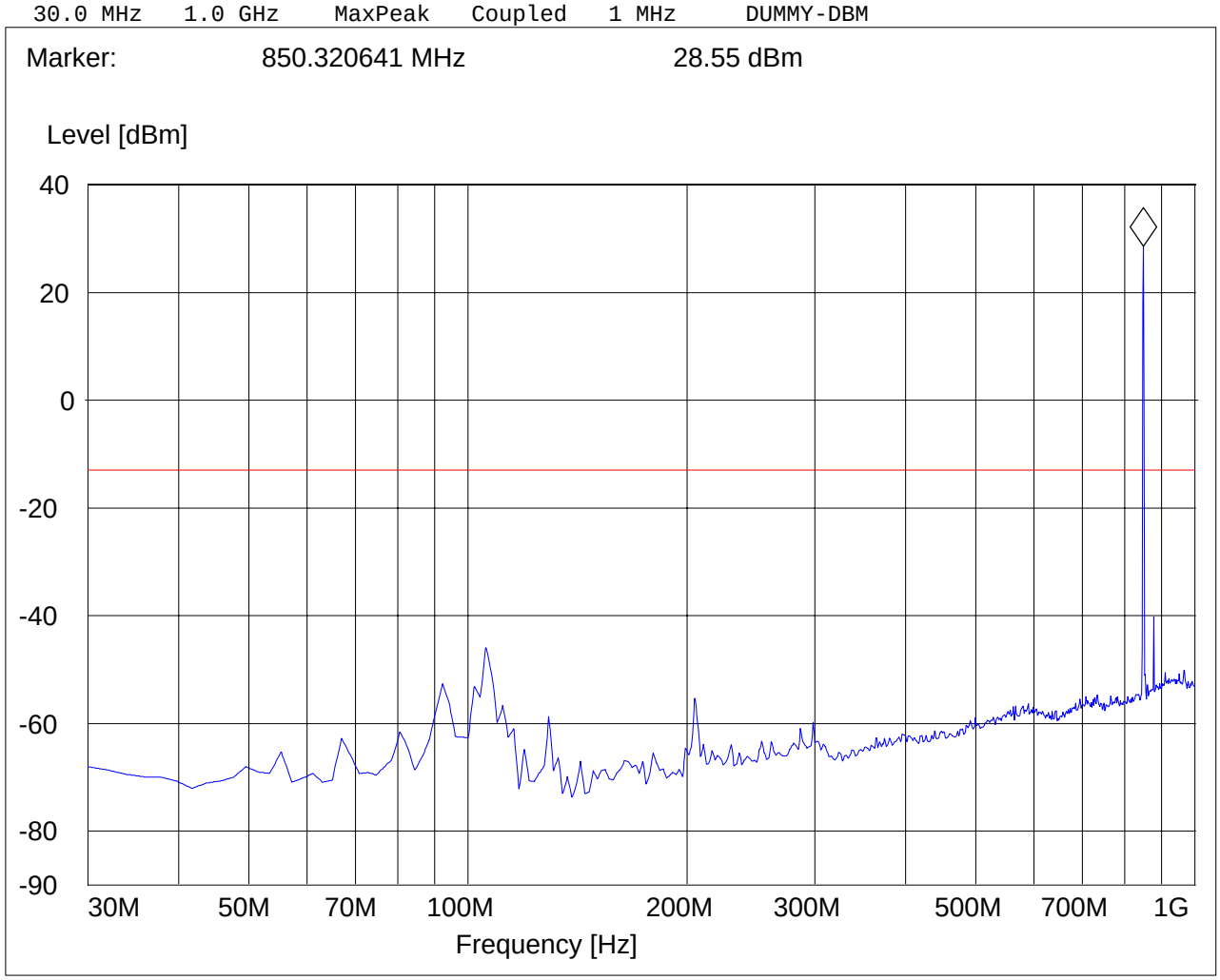
1.The peak above the limit line is the carrier freq.

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

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 850
ANT Orientation:  H
EUT Orientation:  V
Test Engineer:    Ed
Voltage:          12v battery
Comments:
```

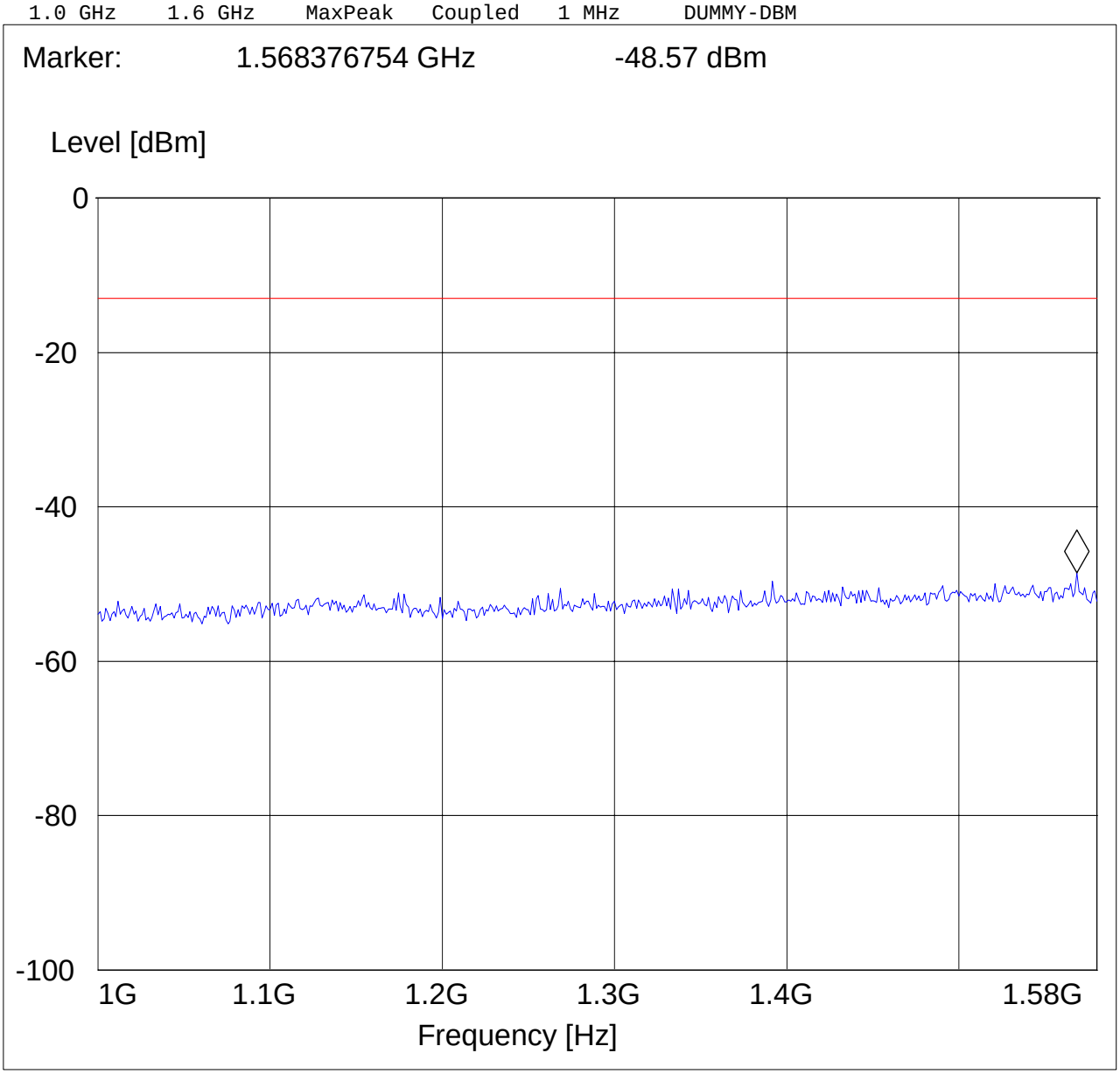
SWEEP TABLE: "FCC 24 Spur 30M-1G_H"

```
  Short Description:            FCC 24 30MHz-1GHz
  Start      Stop       Detector  Meas.     IF        Transducer
  Frequency  Frequency            Time      Bandw.
  30.0 MHz   1.0 GHz    MaxPeak   Coupled   1 MHz     DUMMY-DBM
```



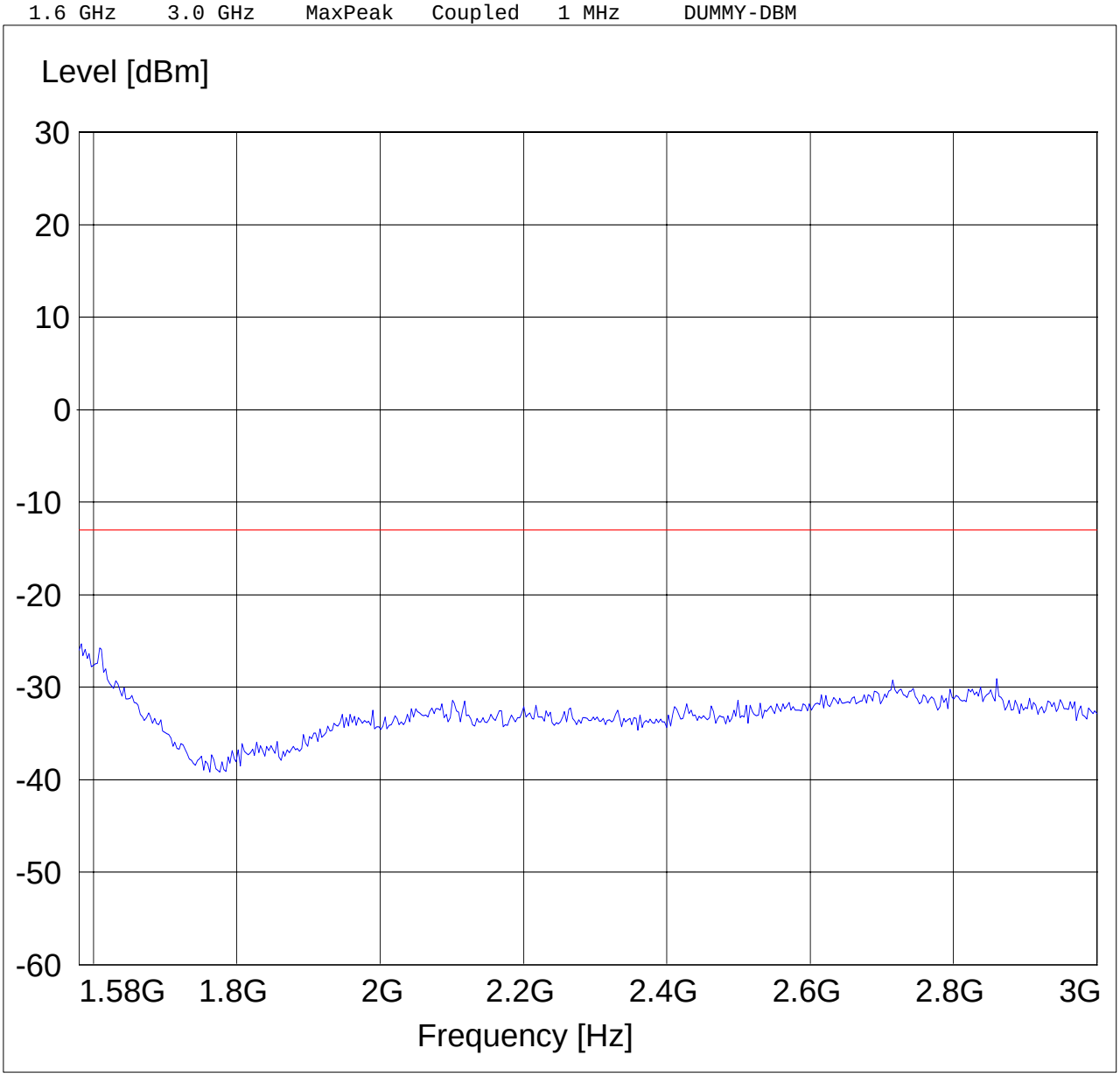
RADIATED SPURIOUS EMISSIONS (GSM-850)
Tx @ 824.2MHz: 1GHz – 1.58GHz
Spurious emission limit –13dBm

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 850
ANT Orientation:  V
EUT Orientation:  V
Test Engineer:    Ed
Voltage:          12v battery
Comments:
SWEEP TABLE: "FCC 22Spuri  1-1.58G"

  Short Description:            FCC  24 1GHz-8GHz
  Start      Stop       Detector  Meas.     IF        Transducer
  Frequency  Frequency             Time      Bandw.
  1.0 GHz    1.6 GHz    MaxPeak   Coupled   1 MHz     DUMMY-DBM
```



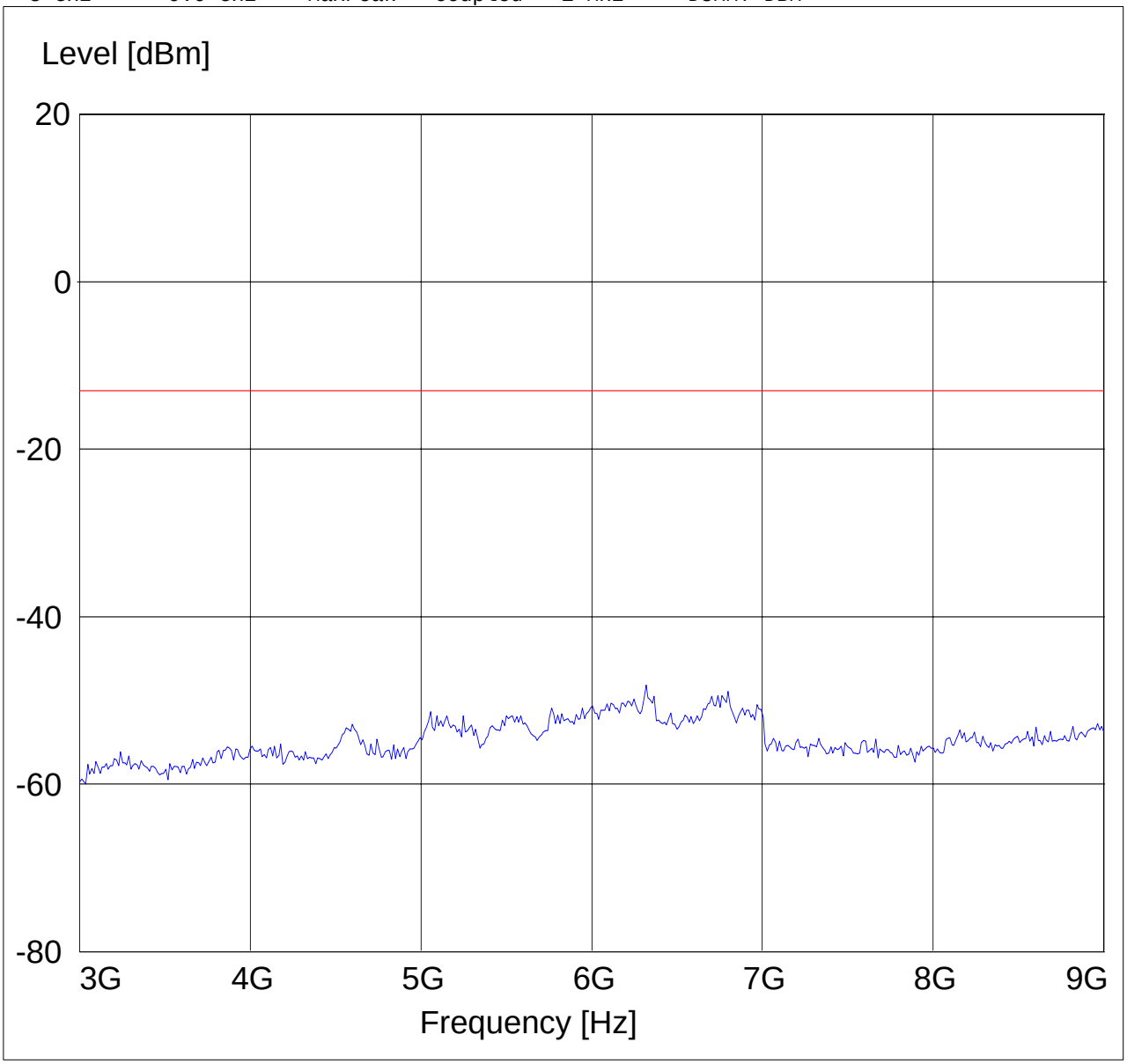
RADIATED SPURIOUS EMISSIONS (GSM-850)
Tx @ 824.2MHz: 1.58GHz – 3GHz
Spurious emission limit –13dBm

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 850
ANT Orientation:  V
EUT Orientation:  V
Test Engineer:    Ed
Voltage:          12v battery
Comments:     SWEEP TABLE: "FCC 22Spuri 1.58-3G"

  Short Description:            FCC  24 1GHz-8GHz
  Start      Stop       Detector  Meas.     IF        Transducer
  Frequency  Frequency             Time      Bandw.
  1.6 GHz    3.0 GHz    MaxPeak   Coupled   1 MHz     DUMMY-DBM
```



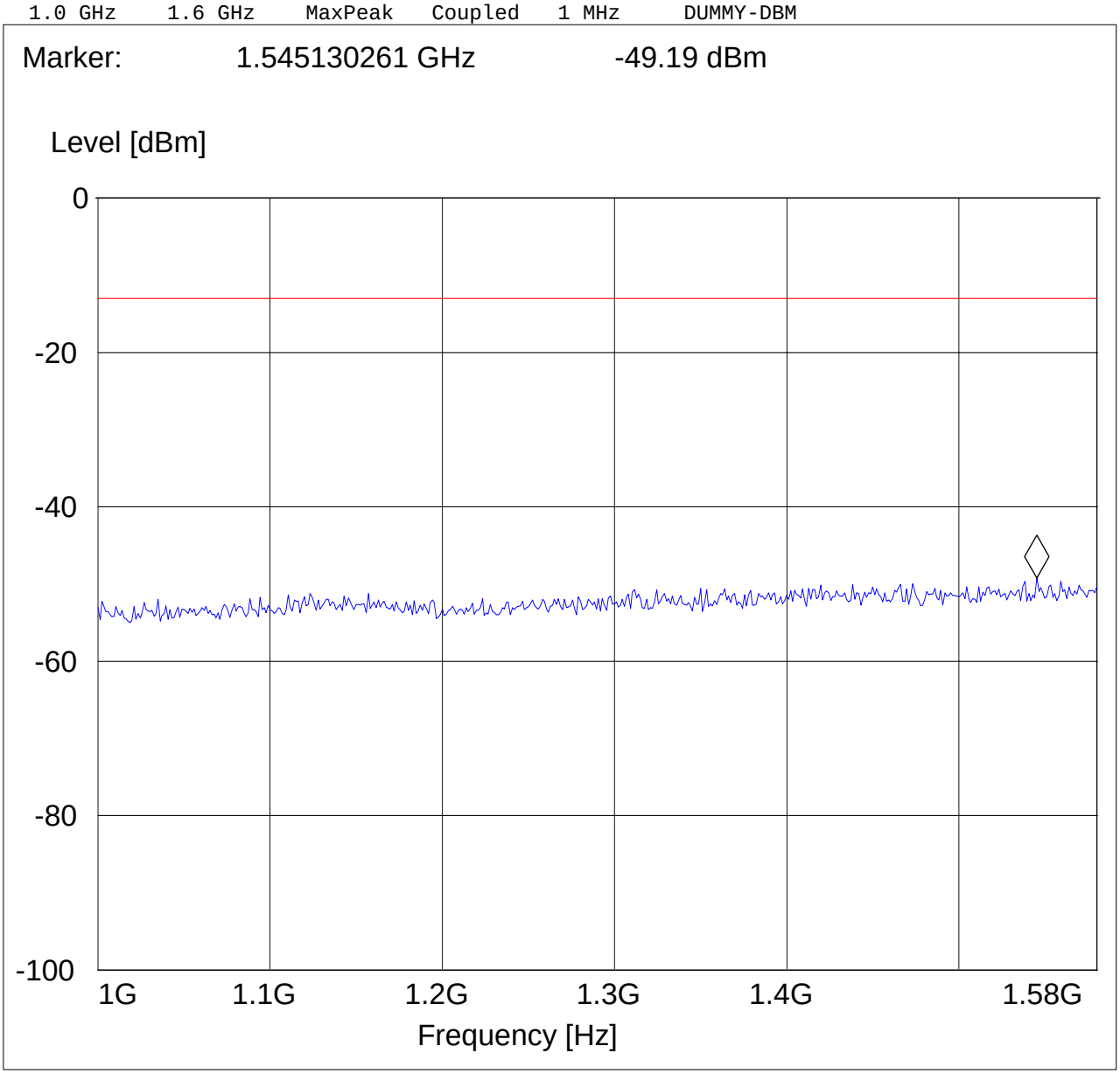
RADIATED SPURIOUS EMISSIONS (GSM-850)
Tx @ 824.2MHz: 3GHz – 9GHz

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 850
ANT Orientation:  V
EUT Orientation:  V
Test Engineer:    Ed
Voltage:          12v battery
Comments:     SWEEP TABLE: "FCC 22Spuri 3-9G"

  Short Description:            FCC  24 1GHz-8GHz
  Start       Stop        Detector  Meas.      IF         Transducer
  Frequency   Frequency             Time       Bandw.
  3 GHz       9.0 GHz     MaxPeak   Coupled    1 MHz      DUMMY-DBM
```



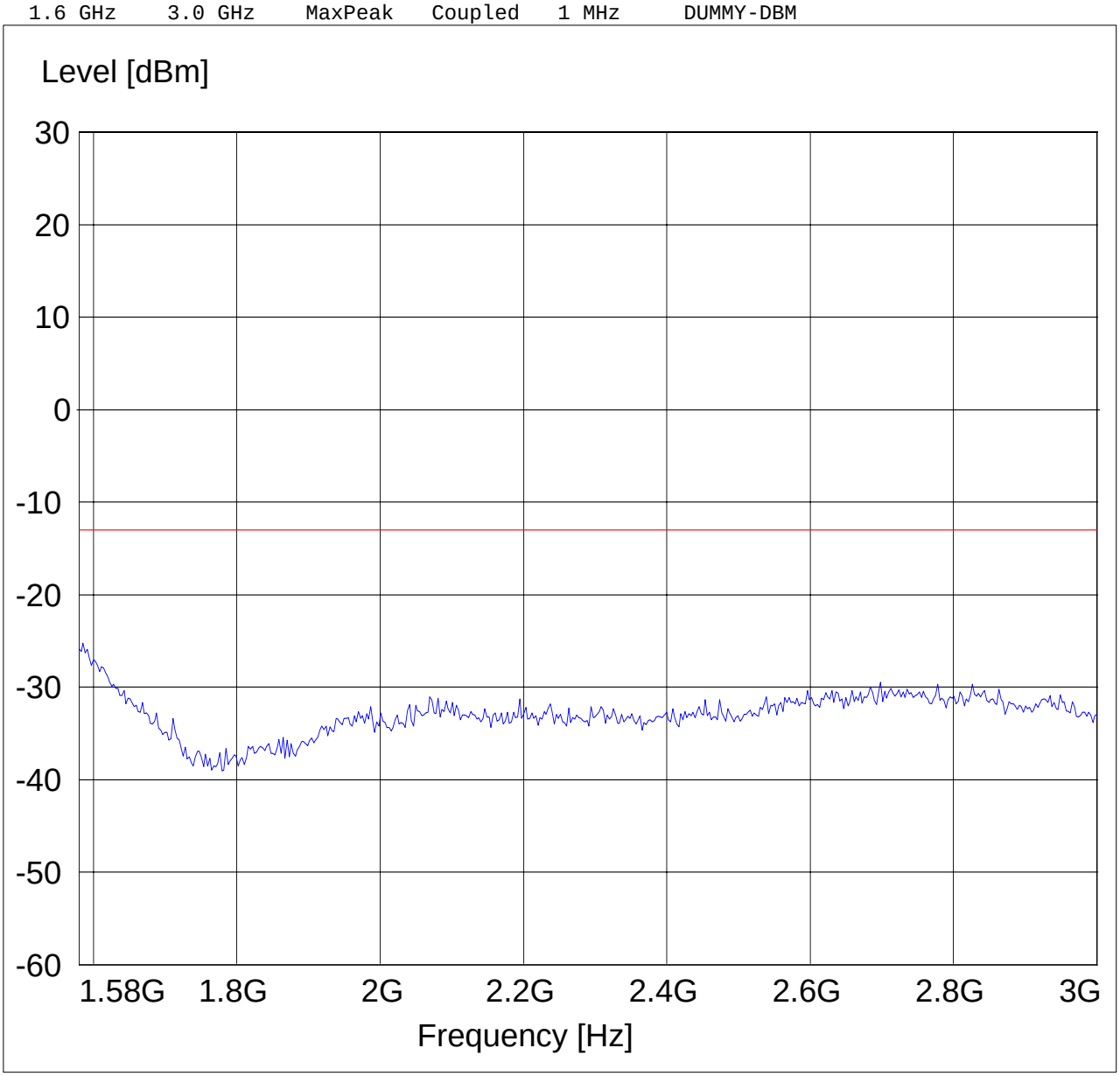
RADIATED SPURIOUS EMISSIONS (GSM-850)
Tx @ 836.6MHz: 1GHz – 1.58GHz
Spurious emission limit –13dBm

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 850
ANT Orientation:  V
EUT Orientation:  V
Test Engineer:    Ed
Voltage:          12v battery
Comments:
SWEEP TABLE: "FCC 22Spuri  1-1.58G"

  Short Description:            FCC  24 1GHz-8GHz
  Start      Stop       Detector  Meas.     IF        Transducer
  Frequency  Frequency            Time      Bandw.
  1.0 GHz    1.6 GHz    MaxPeak   Coupled   1 MHz     DUMMY-DBM
```



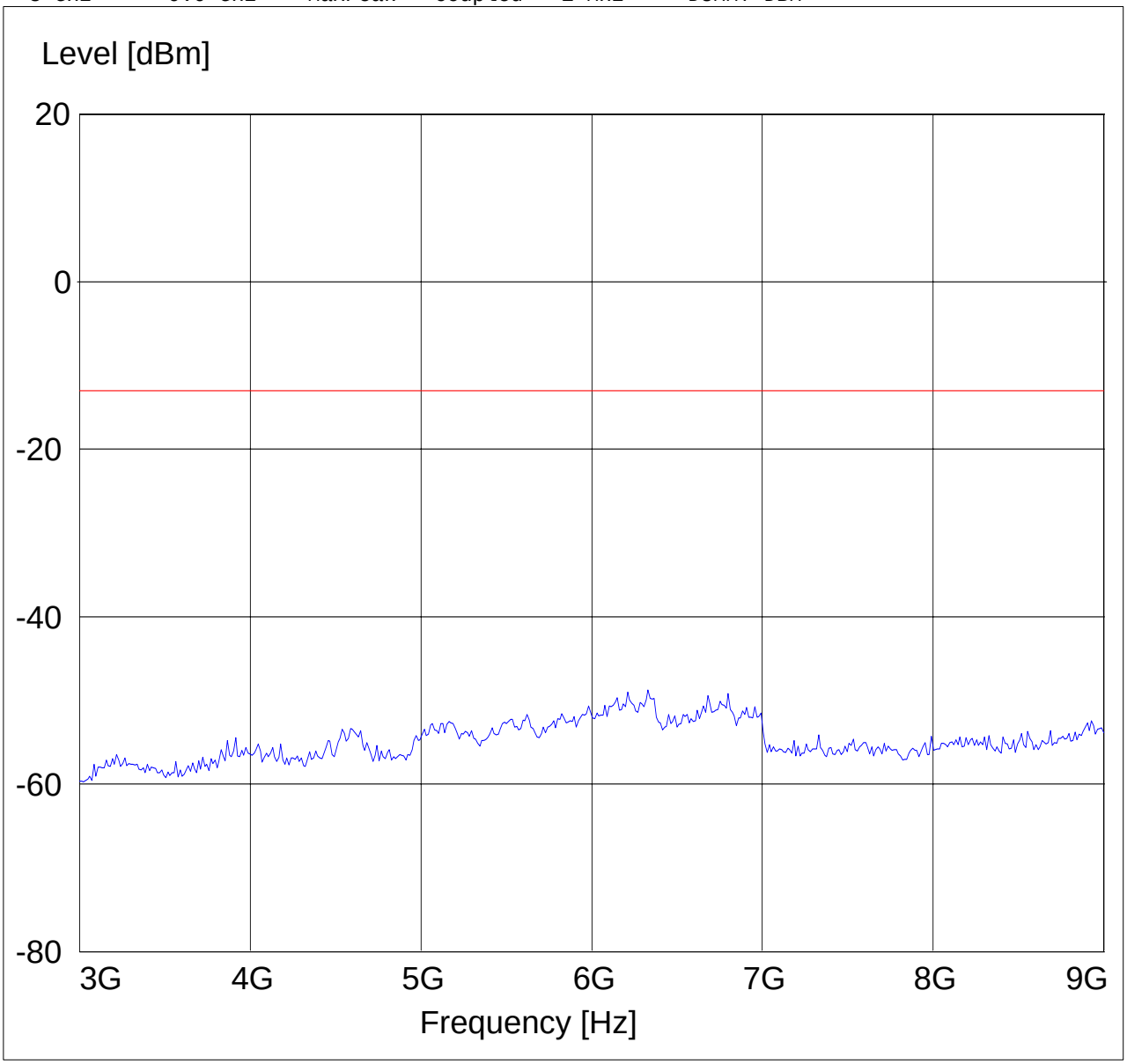
RADIATED SPURIOUS EMISSIONS (GSM-850)
Tx @836.6MHz: 1.58GHz – 3GHz
Spurious emission limit –13dBm

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 850
ANT Orientation:  V
EUT Orientation:  V
Test Engineer:    Ed
Voltage:          12v battery
Comments:     SWEEP TABLE: "FCC 22Spuri 1.58-3G"

  Short Description:            FCC  24 1GHz-8GHz
  Start       Stop        Detector  Meas.      IF         Transducer
  Frequency   Frequency             Time       Bandw.
  1.6 GHz     3.0 GHz     MaxPeak   Coupled    1 MHz      DUMMY-DBM
```



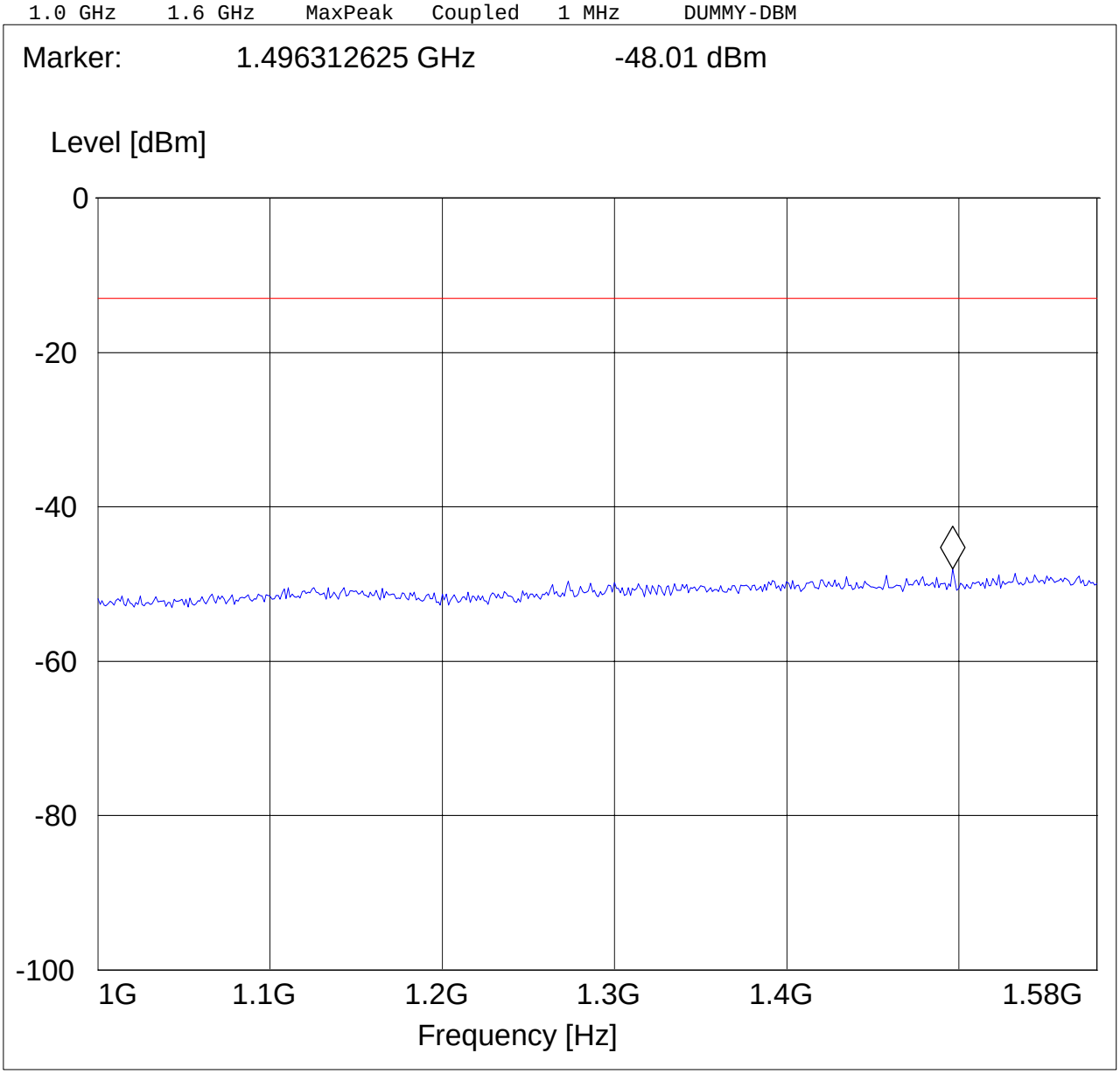
RADIATED SPURIOUS EMISSIONS (GSM-850)
Tx @ 836.6MHz: 3GHz – 9GHz

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 850
ANT Orientation:  V
EUT Orientation:  V
Test Engineer:    Ed
Voltage:          12v battery
Comments:     SWEEP TABLE: "FCC 22Spuri 3-9G"

  Short Description:            FCC  24 1GHz-8GHz
  Start       Stop        Detector  Meas.      IF         Transducer
  Frequency   Frequency             Time       Bandw.
  3 GHz       9.0 GHz     MaxPeak   Coupled    1 MHz      DUMMY-DBM
```



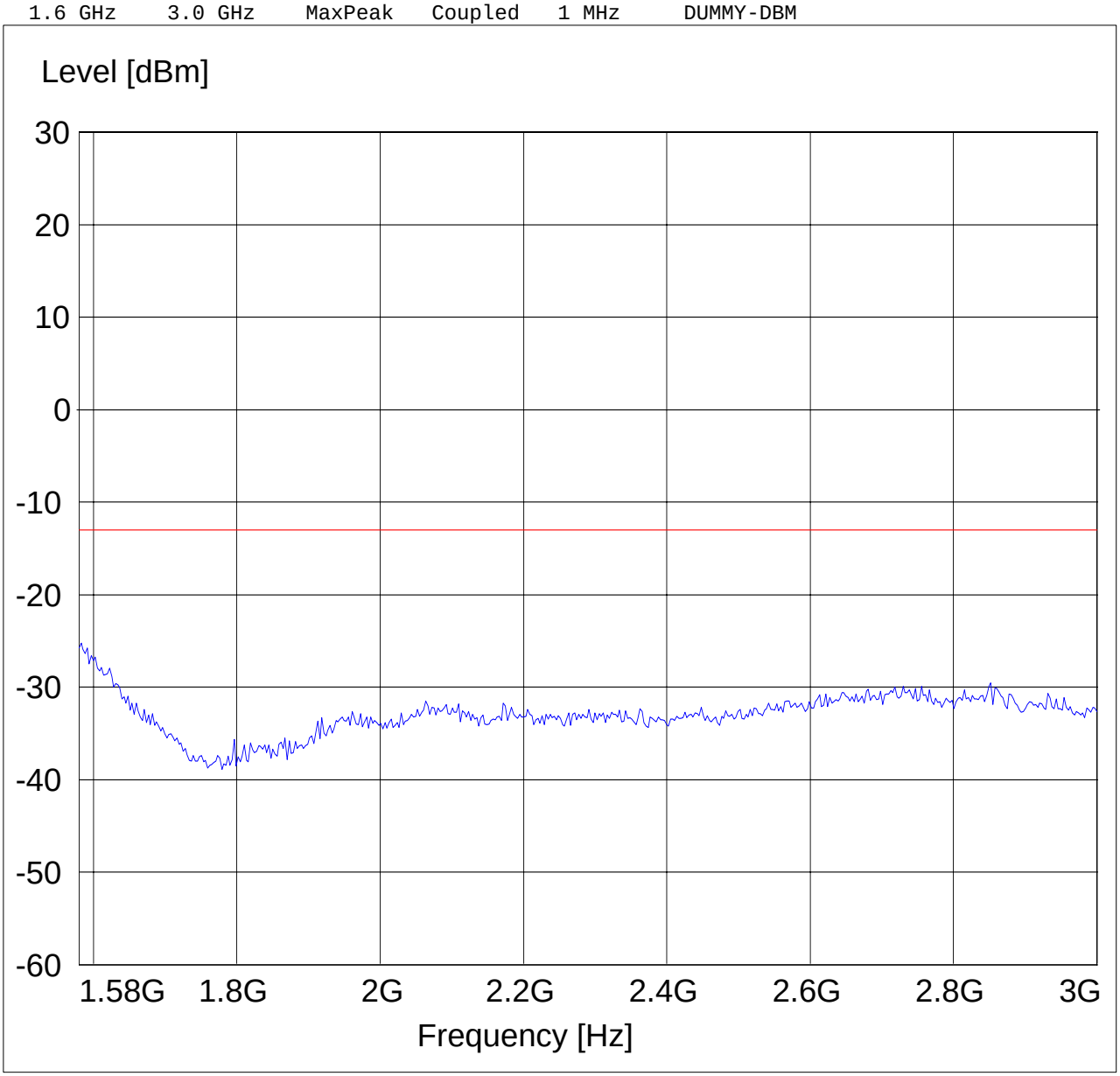
RADIATED SPURIOUS EMISSIONS (GSM-850)
Tx @ 848.8MHz: 1GHz – 1.58GHz
Spurious emission limit –13dBm

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 850
ANT Orientation:  V
EUT Orientation:  V
Test Engineer:    Ed
Voltage:          12v battery
Comments:
SWEEP TABLE: "FCC 22Spuri  1-1.58G"

  Short Description:            FCC  24 1GHz-8GHz
  Start      Stop       Detector  Meas.     IF        Transducer
  Frequency  Frequency            Time      Bandw.
  1.0 GHz    1.6 GHz    MaxPeak   Coupled   1 MHz     DUMMY-DBM
```



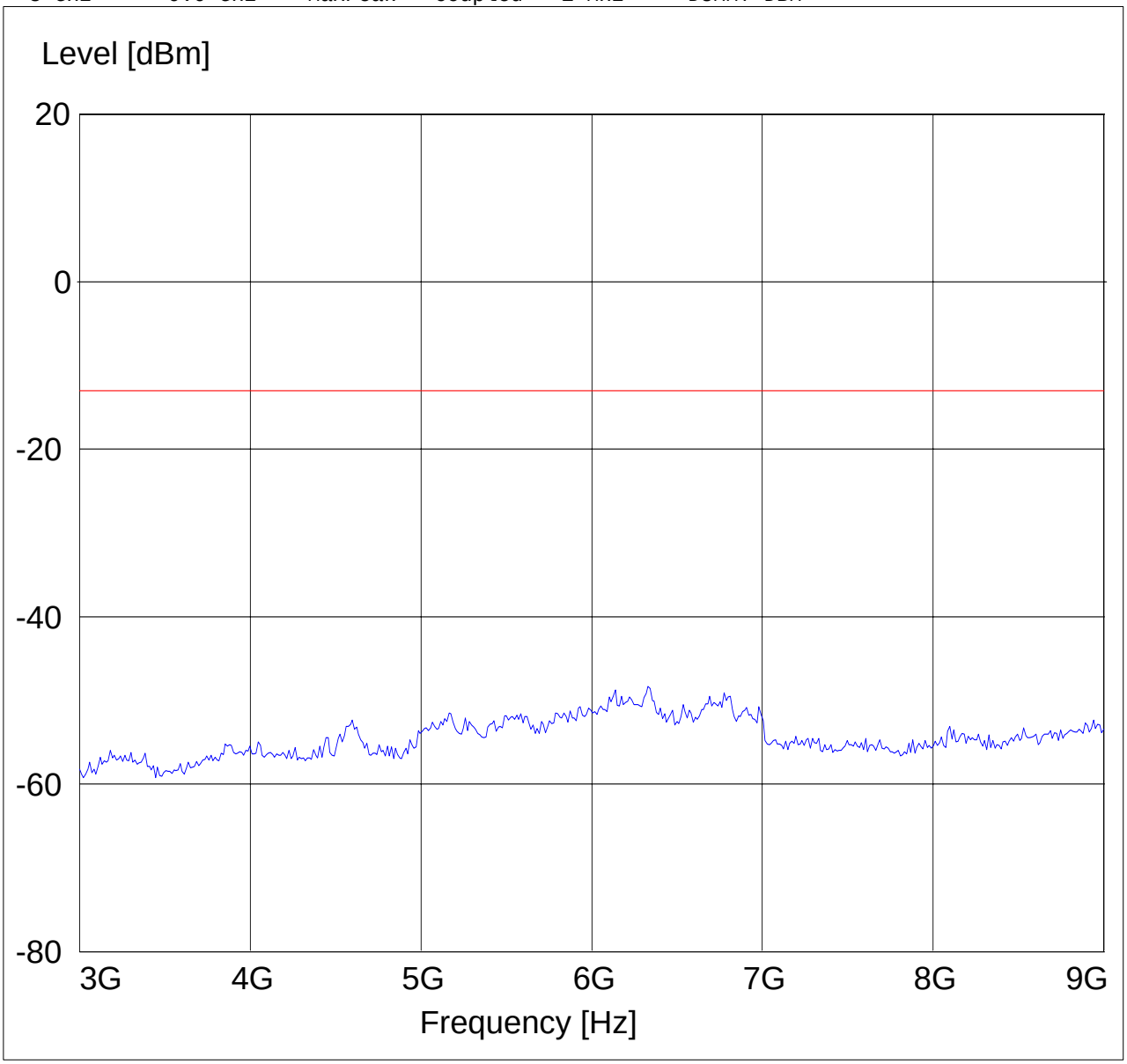
RADIATED SPURIOUS EMISSIONS (GSM-850)
Tx @848.8MHz: 1.58GHz – 3GHz
Spurious emission limit –13dBm

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 850
ANT Orientation:  V
EUT Orientation:  V
Test Engineer:    Ed
Voltage:          12v battery
Comments:     SWEEP TABLE: "FCC 22Spuri 1.58-3G"

  Short Description:            FCC  24 1GHz-8GHz
  Start       Stop        Detector  Meas.      IF         Transducer
  Frequency   Frequency             Time       Bandw.
  1.6 GHz     3.0 GHz     MaxPeak   Coupled    1 MHz      DUMMY-DBM
```



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

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 850
ANT Orientation:  V
EUT Orientation:  V
Test Engineer:    Ed
Voltage:          12v battery
Comments:     SWEEP TABLE: "FCC 22Spuri 3-9G"

  Short Description:            FCC  24 1GHz-8GHz
  Start       Stop        Detector  Meas.      IF         Transducer
  Frequency   Frequency             Time       Bandw.
  3 GHz       9.0 GHz     MaxPeak   Coupled    1 MHz      DUMMY-DBM
```



5.5.4.3 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**	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
NF = NOISE FLOOR						

5.5.4.4 RADIATED SPURIOUS EMISSIONS(PCS 1900)

TX: 30MHz - 1GHz Antenna: vertical

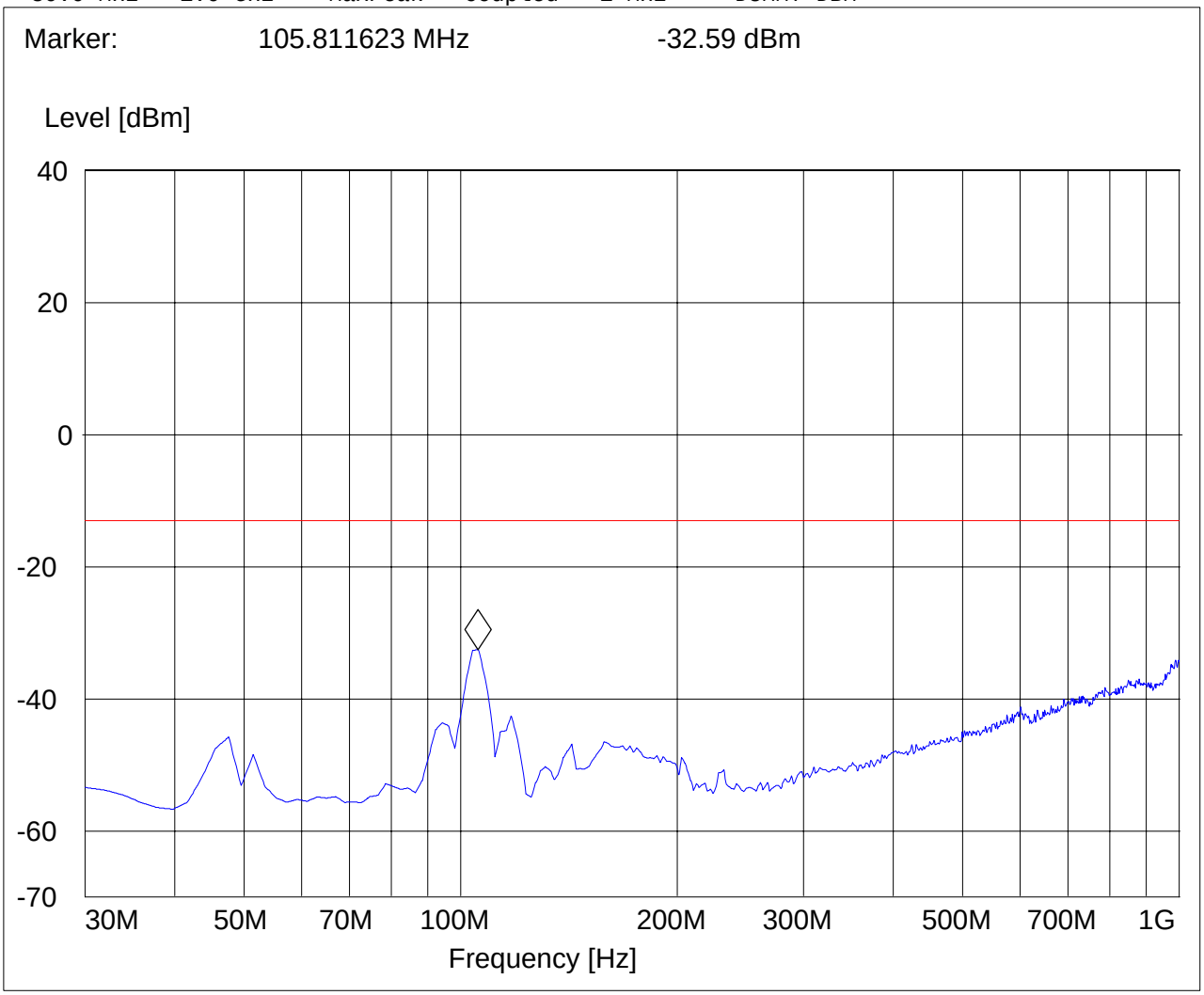
Spurious emission limit –13dBm

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

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 1900 CH 810
ANT Orientation:  V
EUT Orientation:  V
Test Engineer:    Satya Radhakrishna
Voltage:          12V Battery
Comments:
```

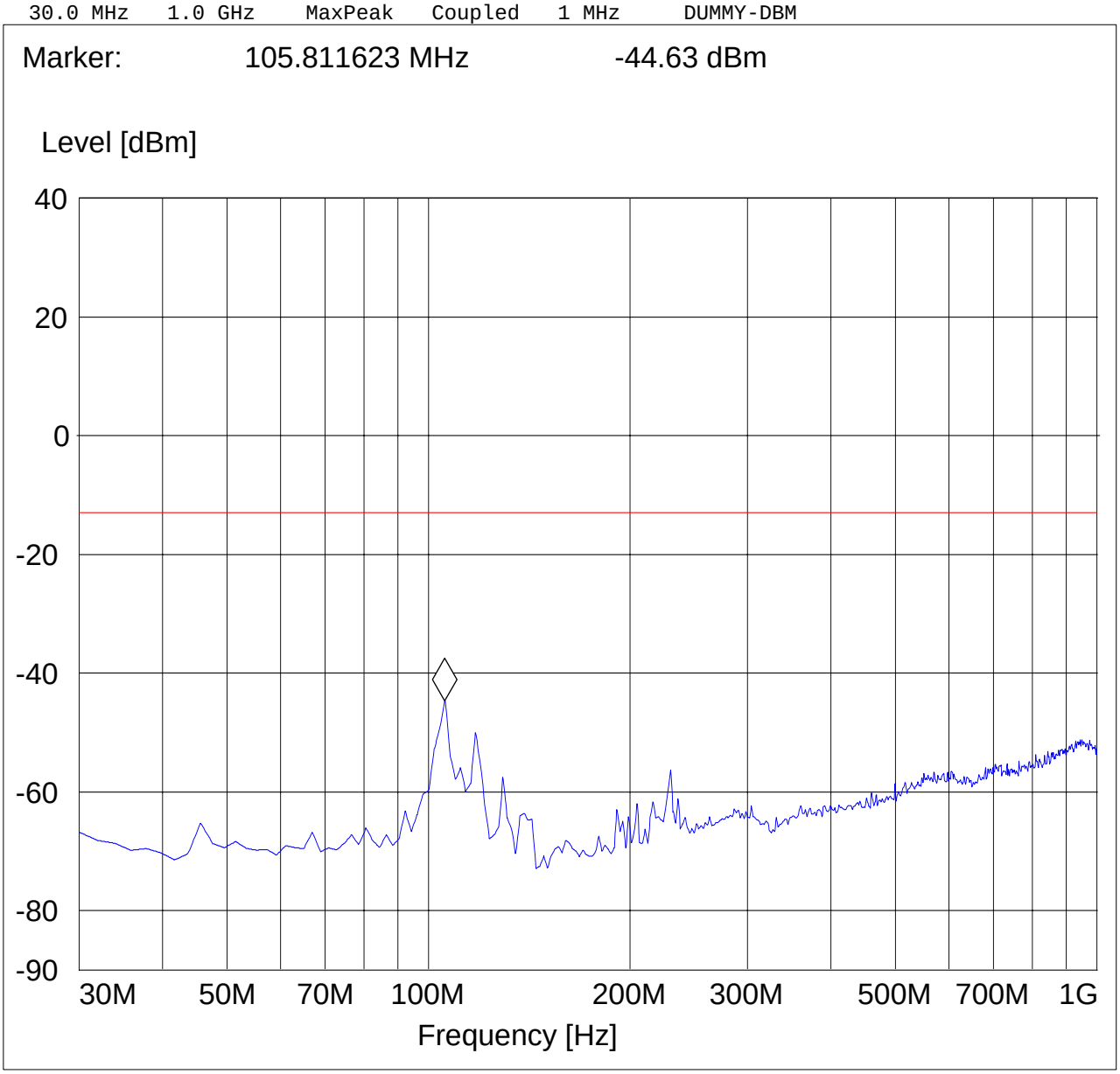
SWEEP TABLE: "FCC 24 Spur 30M-1G_V"

```
  Short Description:            FCC 24 30MHz-1GHz
  Start      Stop       Detector  Meas.     IF         Transducer
  Frequency  Frequency            Time      Bandw.
  30.0 MHz   1.0 GHz    MaxPeak   Coupled   1 MHz      DUMMY-DBM
```



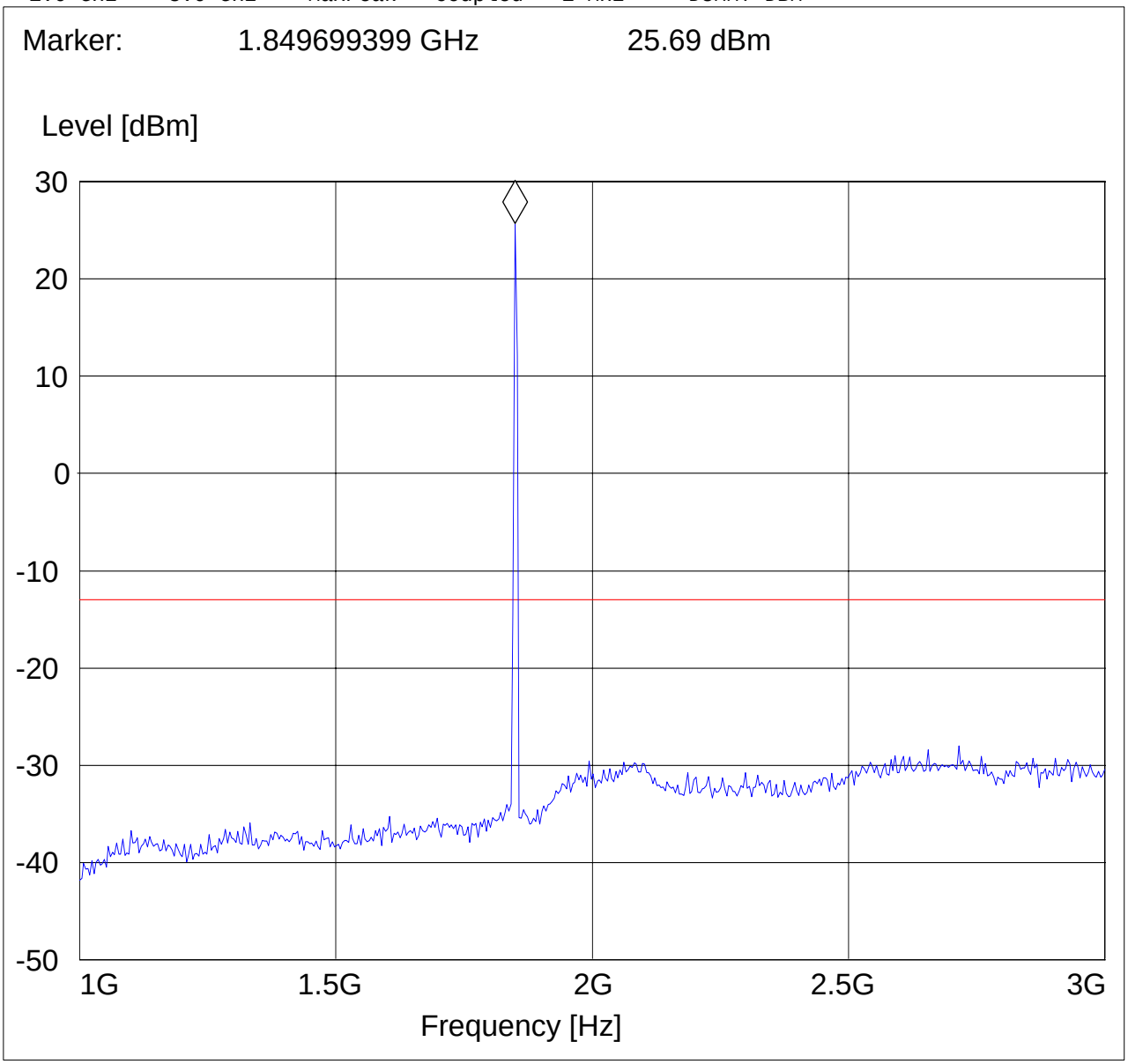
TX: 30MHz - 1GHz Antenna: horizontal
Spurious emission limit –13dBm
Note: This plot is valid for low, mid & high channels (worst-case plot)

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 1900 CH 810
ANT Orientation:  H
EUT Orientation:  V
Test Engineer:    Satya Radhakrishna
Voltage:          12V Battery
Comments:
SWEEP TABLE: "FCC 24 Spur 30M-1G_H"

  Short Description:            FCC 24 30MHz-1GHz
  Start      Stop       Detector  Meas.     IF        Transducer
  Frequency  Frequency             Time      Bandw.
  30.0 MHz   1.0 GHz    MaxPeak   Coupled   1 MHz     DUMMY-DBM
```



RADIATED SPURIOUS EMISSIONS(PCS 1900)
Tx @ 1850.2MHz: 1GHz – 3GHz
Note: The peak above the limit line is the carrier freq. at ch-512.

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 1900 CH 512
ANT Orientation:  V
EUT Orientation:  V
Test Engineer:    Satya Radhakrishna
Voltage:          12V Battery
Comments:       Marker placed on uplink
SWEEP TABLE: "FCC 24Spuri  1-3G"

  Short Description:            FCC  24 1GHz-8GHz
  Start      Stop       Detector  Meas.     IF        Transducer
  Frequency  Frequency             Time      Bandw.
  1.0 GHz    3.0 GHz    MaxPeak   Coupled   1 MHz     DUMMY-DBM
```



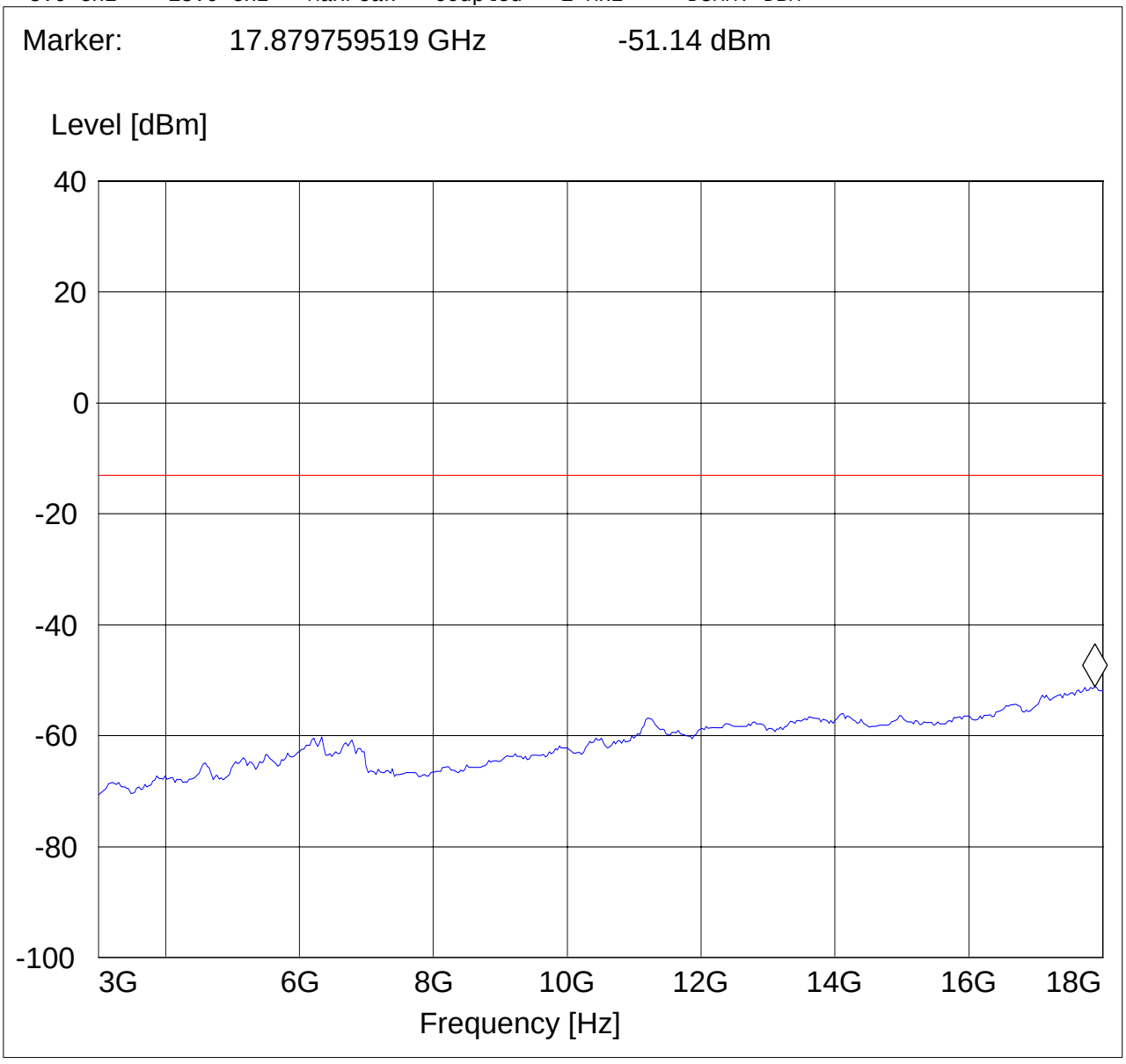
RADIATED SPURIOUS EMISSIONS(PCS 1900)

Tx @ 1850.2MHz: 3GHz – 18GHz

EUT: 18
Customer: Mobile Knowledge
Test Mode: GPRS 1900 CH 512
ANT Orientation: V
EUT Orientation: V
Test Engineer: Satya Radhakrishna
Voltage: 12V Battery
Comments:

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

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	DUMMY-DBM



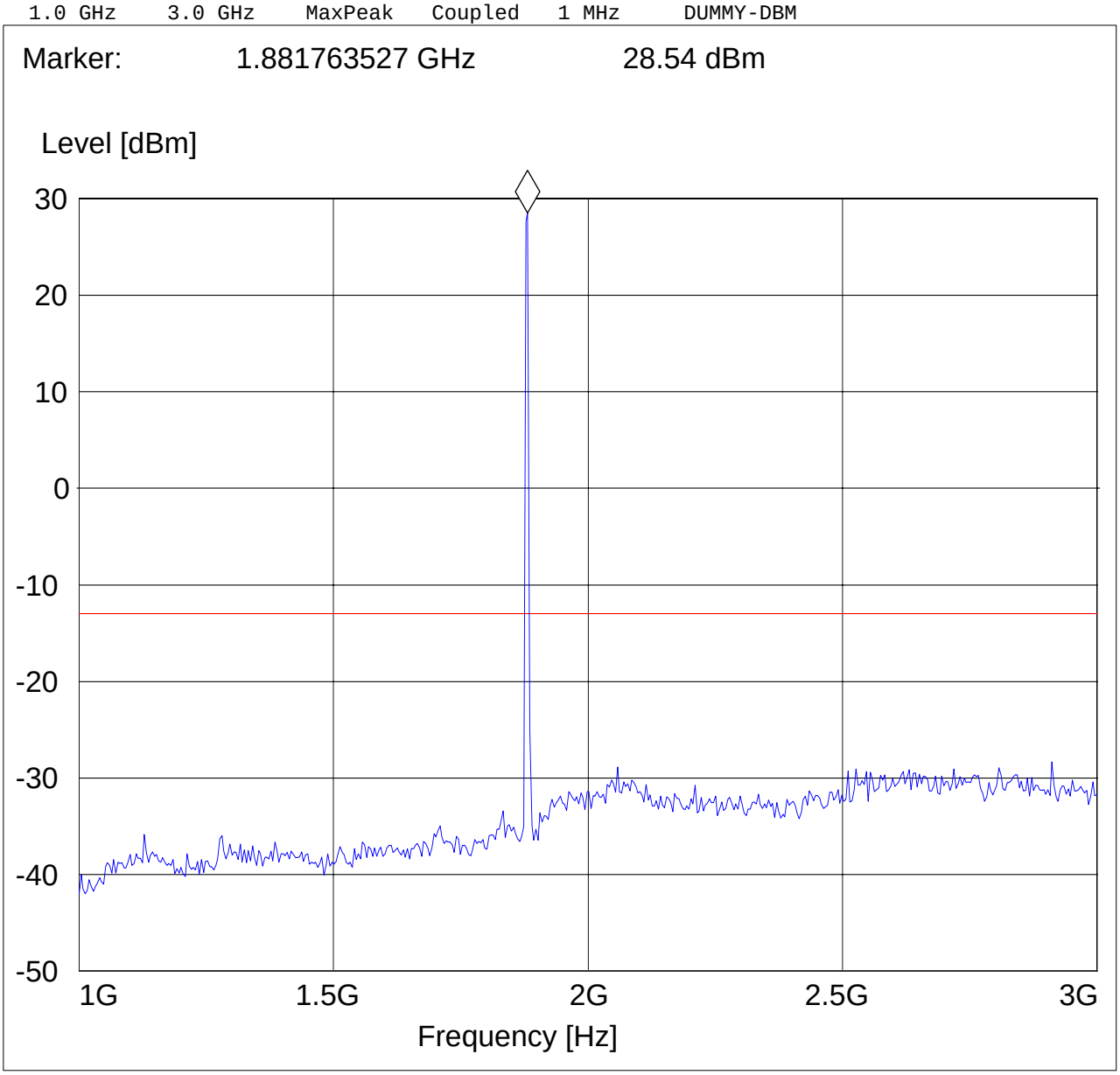
RADIATED SPURIOUS EMISSIONS(PCS 1900)

Tx @ 1880.0MHz: 1GHz – 3GHz
Note: The peak above/close to the limit line is the carrier freq. at ch-661.

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 1900 CH 661
ANT Orientation:  V
EUT Orientation:  V
Test Engineer:    Satya Radhakrishna
Voltage:          12V Battery
Comments:
```

SWEEP TABLE: "FCC 24Spuri 1-3G"

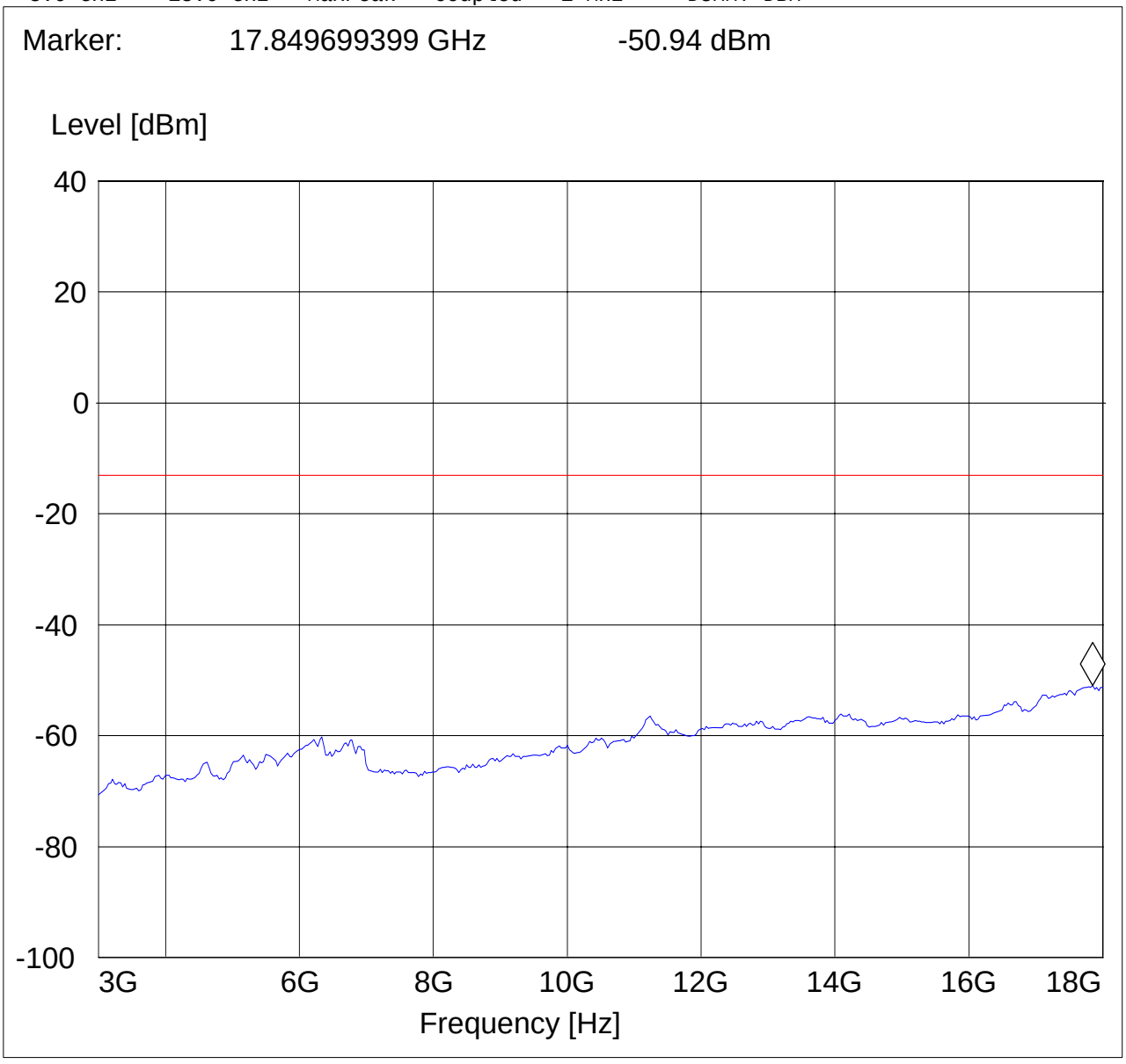
```
Short Description:            FCC  24 1GHz-8GHz
Start      Stop       Detector  Meas.     IF        Transducer
Frequency  Frequency            Time      Bandw.
1.0 GHz    3.0 GHz    MaxPeak   Coupled   1 MHz     DUMMY-DBM
```



RADIATED SPURIOUS EMISSIONS(PCS 1900)
Tx @ 1880.0MHz: 3GHz – 18GHz

EUT: 18
Customer: Mobile Knowledge
Test Mode: GPRS 1900 CH 661
ANT Orientation: V
EUT Orientation: V
Test Engineer: Satya Radhakrishna
Voltage: 12V Battery
Comments:
SWEEP TABLE: "FCC 24Spuri 3-18G"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	DUMMY-DBM

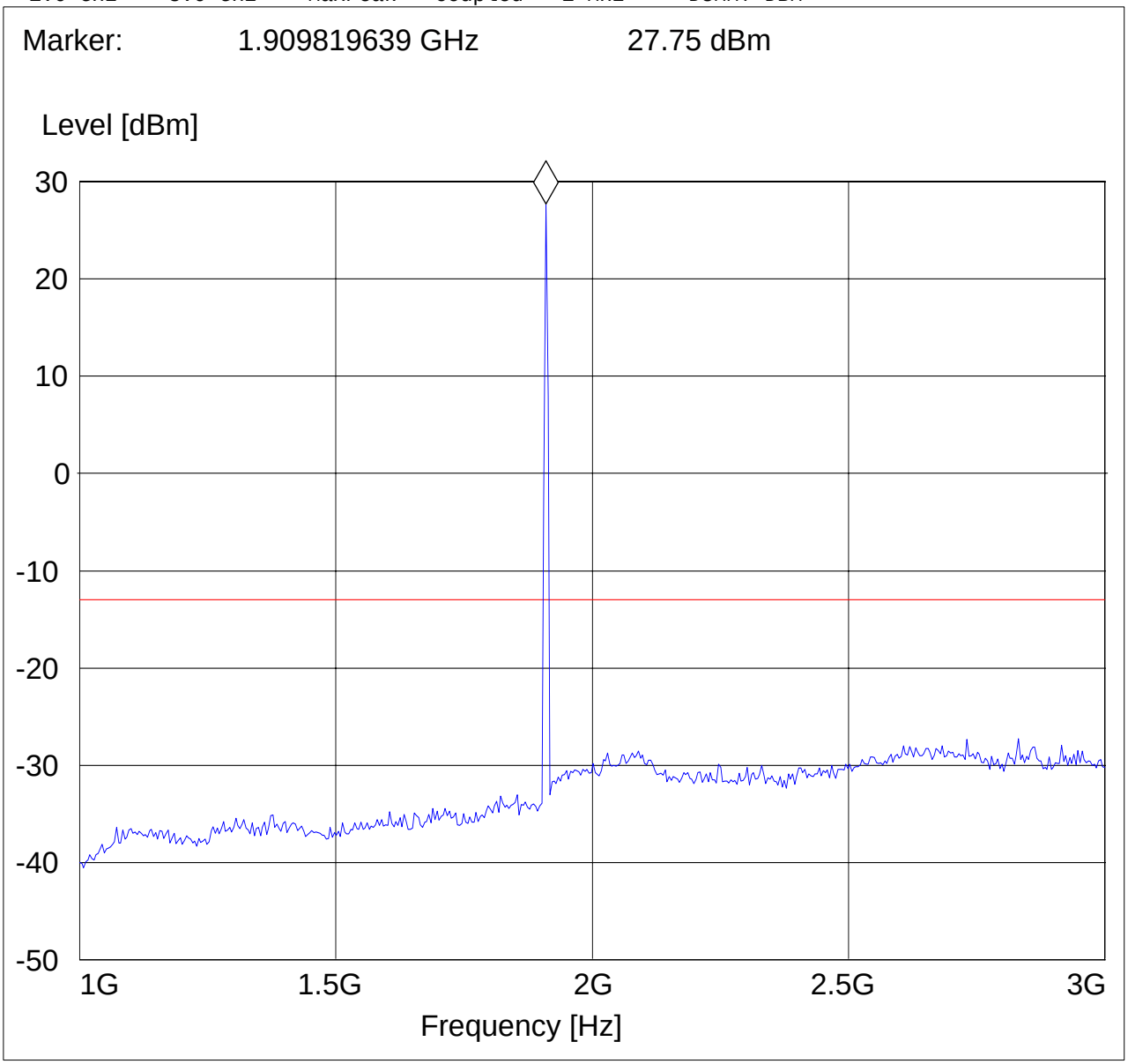


RADIATED SPURIOUS EMISSIONS(PCS 1900)
Tx @ 1909.8MHz: 1GHz – 3GHz
Note: The peak above the limit line is the carrier freq. at ch-810.

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 1900 CH 810
ANT Orientation:  V
EUT Orientation:  V
Test Engineer:    Satya Radhakrishna
Voltage:          12v battery
Comments:         Peak marked is the uplink
```

SWEEP TABLE: "FCC 24Spuri 1-3G"

```
Short Description:            FCC  24 1GHz-8GHz
Start      Stop       Detector  Meas.     IF        Transducer
Frequency  Frequency            Time      Bandw.
1.0 GHz    3.0 GHz    MaxPeak   Coupled   1 MHz     DUMMY-DBM
```

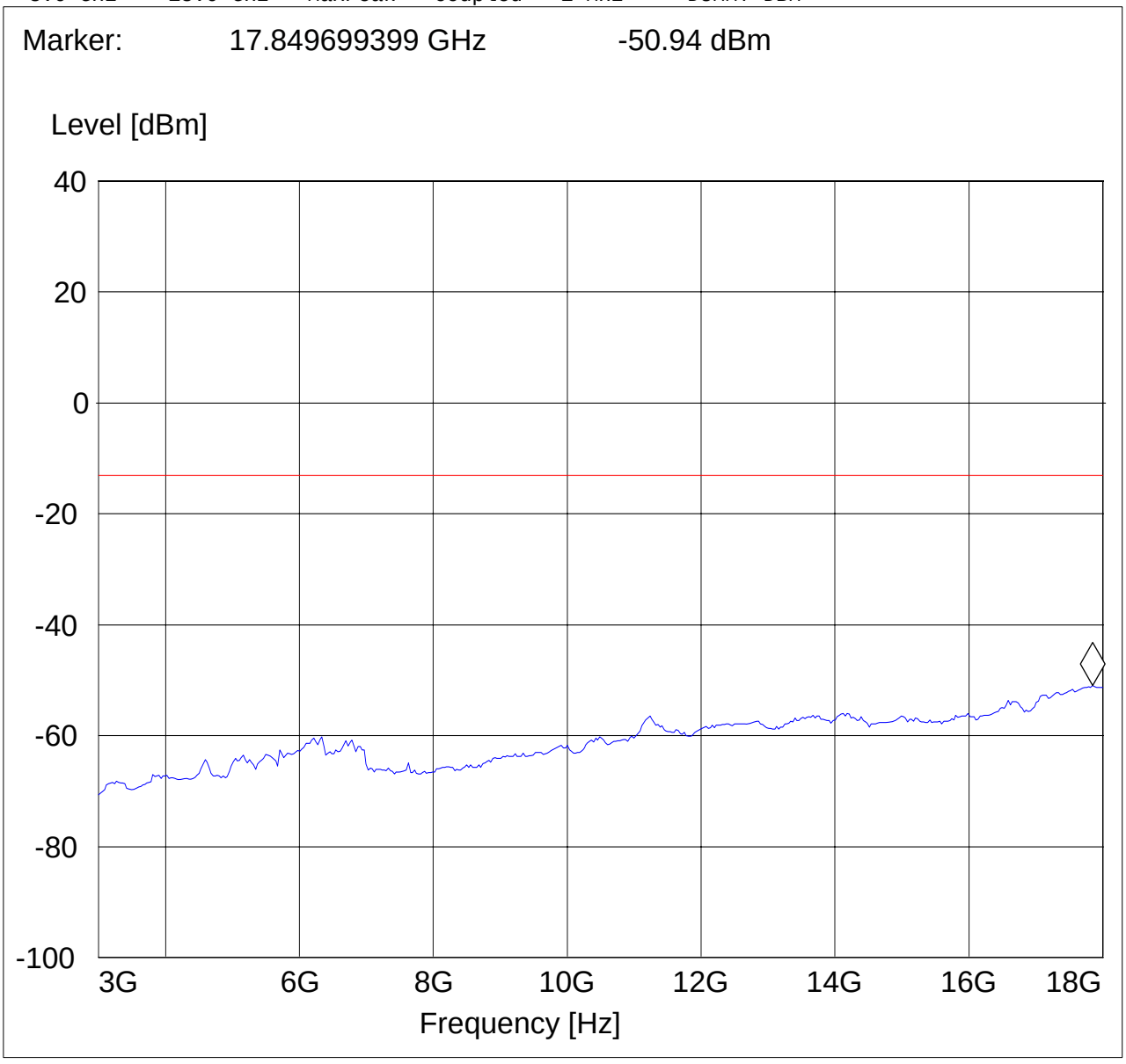


RADIATED SPURIOUS EMISSIONS(PCS 1900)
Tx @ 1909.8MHz: 3GHz – 18GHz

EUT: 18
Customer: Mobile Knowledge
Test Mode: GPRS 1900 CH 810
ANT Orientation: V
EUT Orientation: V
Test Engineer: Satya Radhakrishna
Voltage: 12V Battery
Comments:

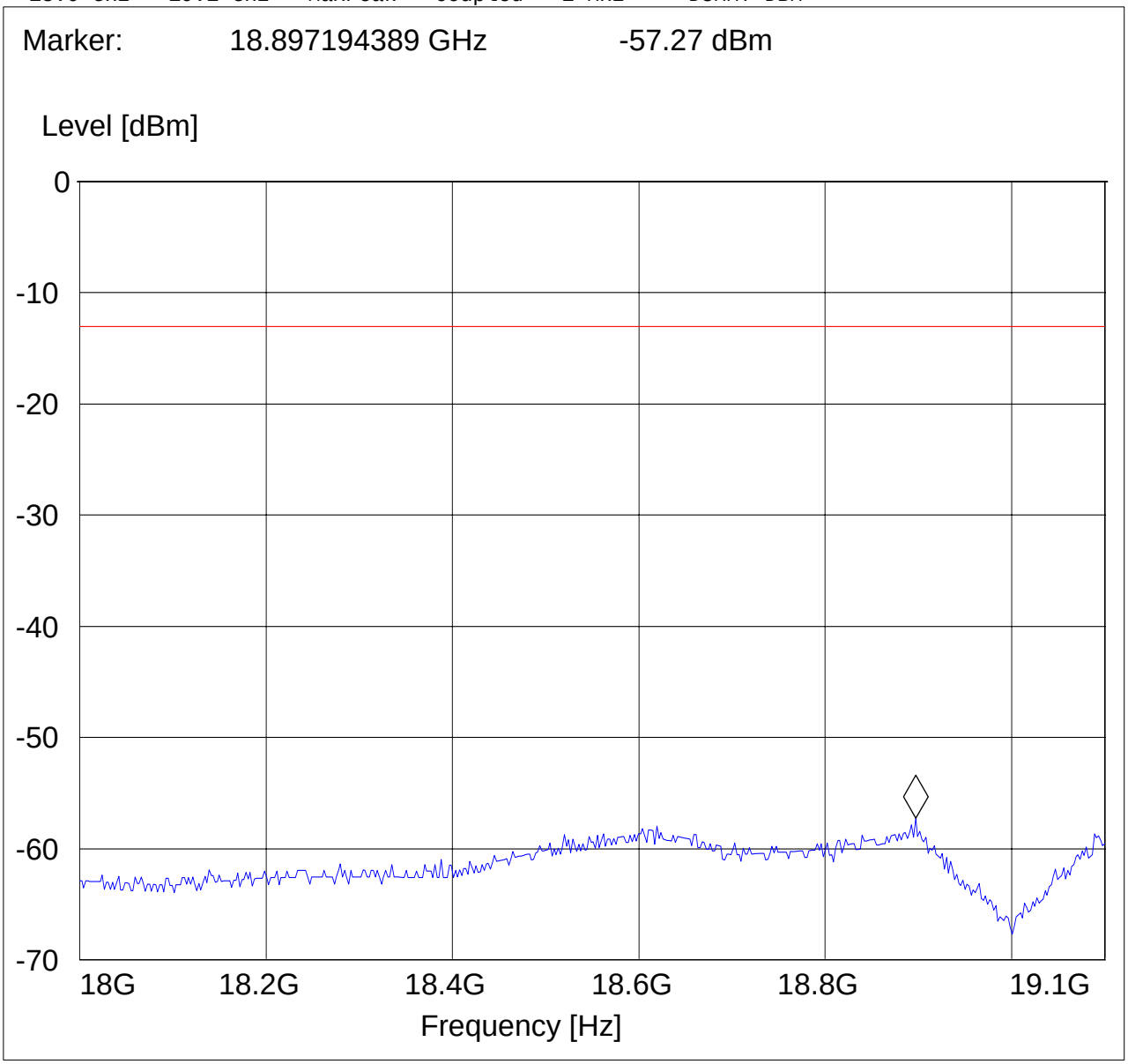
SWEEP TABLE: "FCC 24Spuri 3-18G"

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	DUMMY-DBM



RADIATED SPURIOUS EMISSIONS(PCS 1900)
18GHz – 19.1GHz
Note: This plot is valid for low, mid & high channels (worst-case plot)

```
EUT:              18
Customer:         Mobile Knowledge
Test Mode:        GPRS 1900 CH 810
ANT Orientation:  V
EUT Orientation:  V
Test Engineer:    Satya Radhakrishna
Voltage:          12V Battery
Comments:
SWEEP TABLE: "FCC 24spuri 18-19.1G"

  Short Description:              FCC 24 18GHz-19.1GHz
  Start      Stop       Detector  Meas.     IF        Transducer
  Frequency  Frequency             Time      Bandw.
  18.0 GHz   19.1 GHz   MaxPeak   Coupled   1 MHz     DUMMY-DBM
```



5.6 RECEIVER RADIATED EMISSIONS § 2.1053 / RSS-132 & 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 3GHz and 26.5GHz very short cable connections to the antenna was used to minimize the noise level.**

5.6.1 Limits SUBCLAUSE § RSS-133

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

5.6.2 Receiver Spurious Emission Test Results

No test conducted.

5.7 AC POWER LINE CONDUCTED EMISSIONS § 15.107/207

LIMITS

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

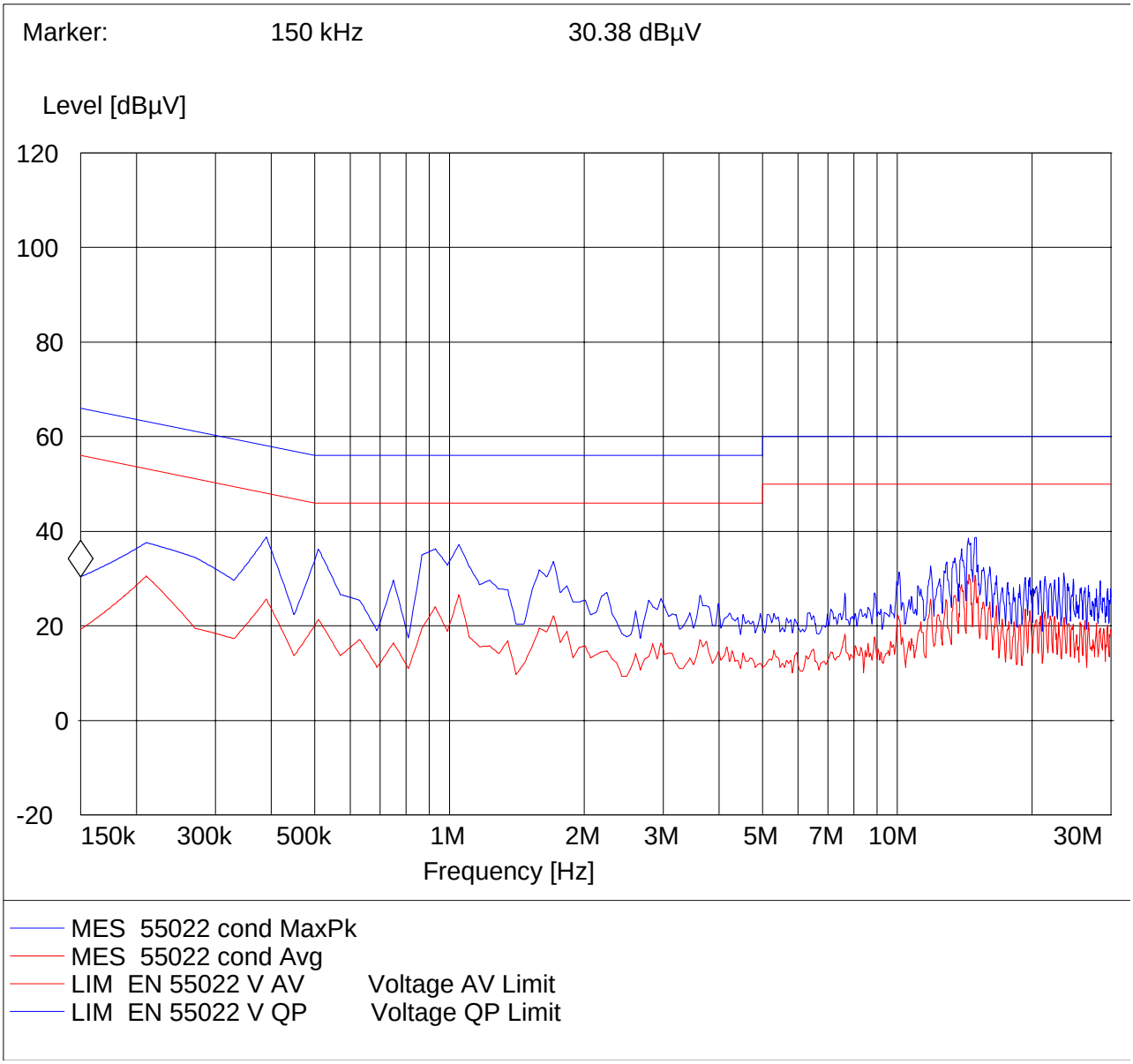
CONDUCTED EMISSION

EUT: 24800629SP0071
Manufacturer: Mobile Knowledge
Operating Condition: GSM850 TX
Test Site: CETECOM USA. MILPITAS
Operator: PETER MU
Test Specification: 55022 Conducted Emissions
Comment:

SWEEP TABLE: "55022 cond"

Short Description: EN 55022 for 150KHz-30MHz
Unit: dBµV

Detector: Mode:



6 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No	Instrument/Ancillary	Type	Manufacturer	Serial No.	Cal Due	Interval
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2008	1 year
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	100017	August 2008	1 year
03	Signal Generator	SMY02	Rohde & Schwarz	836878/011	May 2008	1 year
04	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02	May 2008	1 year
05	Biconilog Antenna	3141	EMCO	0005-1186	June 2008	1 year
06	Horn Antenna (1-18GHz)	SAS-200/571	AH Systems	325	June 2008	1 year
07	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240	June 2008	1 year
08	Power Splitter	11667B	Hewlett Packard	645348	n/a	n/a
09	Climatic Chamber	VT4004	Voltsch	G1115	May 2008	1 year
10	High Pass Filter	5HC2700	Trilithic Inc.	9926013	n/a	n/a
11	High Pass Filter	4HC1600	Trilithic Inc.	9922307	n/a	n/a
12	Pre-Amplifier	JS4-00102600	Miteq	00616	May 2008	1 year
13	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807	May 2008	1 year
14	Digital Radio Comm. Tester	CMD-55	Rohde & Schwarz	847958/008	May 2008	1 year
15	Universal Radio Comm. Tester	CMU 200	Rohde & Schwarz	832221/06	May 2008	1 year
16	LISN	ESH3-Z5	Rohde & Schwarz	836679/003	May 2008	1 year
17	Loop Antenna	6512	EMCO	00049838	July 2008	2 years

7 References

Title 47—Telecommunication, CHAPTER I--FEDERAL COMMUNICATIONS COMMISSION,
PART 2--FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS October 1**,** 2001.

Title 47—Telecommunication, CHAPTER I--FEDERAL COMMUNICATIONS COMMISSION,
PART 22 PUBLIC MOBILE SERVICES October 1, 1998.

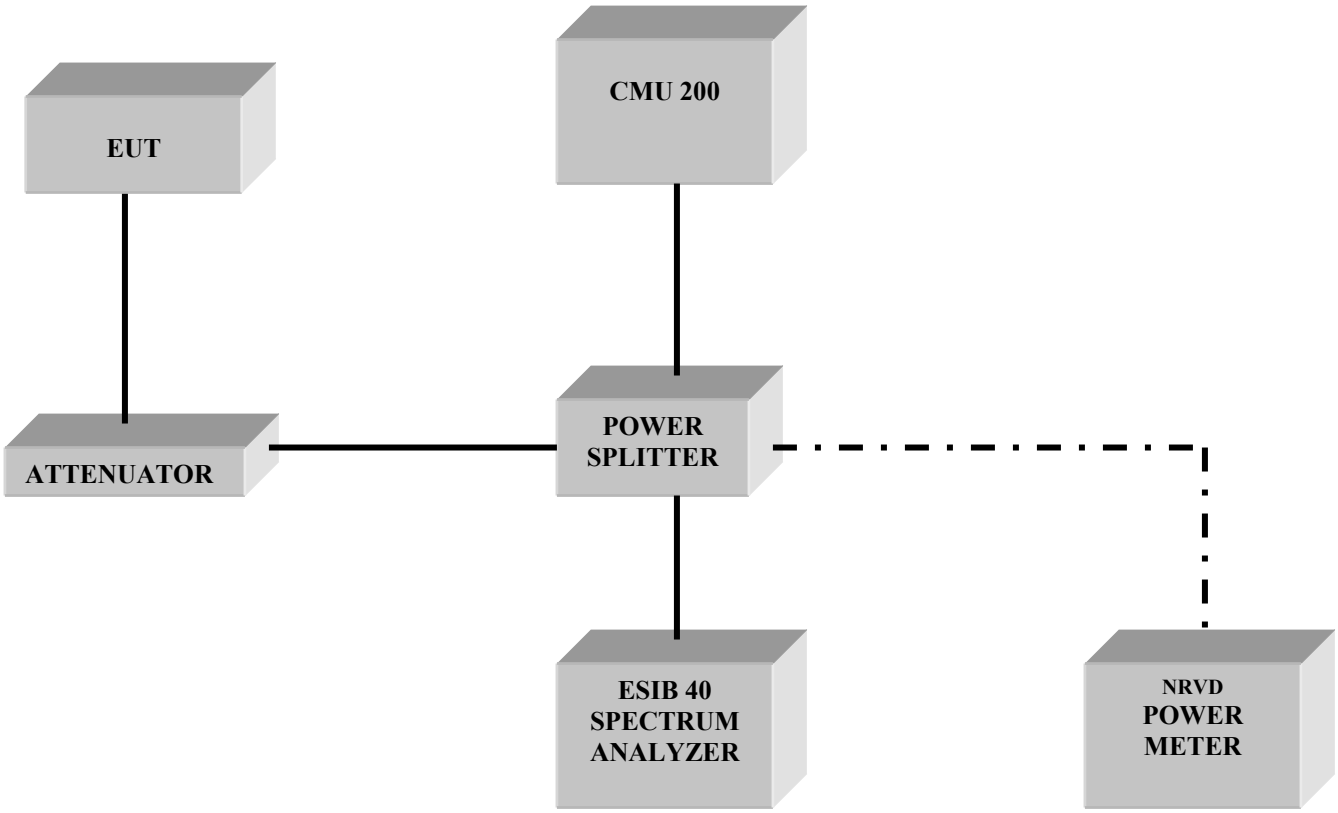
FCC Report and order 02-229 September 24, 2002.

Title 47—Telecommunication, CHAPTER I--FEDERAL COMMUNICATIONS COMMISSION,
PART 24 PERSONAL COMMUNICATIONS SERVICES October 1, 1998.

ANSI / TIA-603-C-2004 Land Mobile FM or PM Communications Equipment Measurement and Performance Standard November 7, 2002.

8 BLOCK DIAGRAMS

Conducted Testing



Radiated Testing