



FCC Test Report

Test report no.: EMC_609FCC22-24_2004_MTSMC-C

FCC Part 22,24 / RSS 133

Model: MTSMC-C

FCC ID: AU792U04A22740

IC ID: 125A-0010



TTI-P-G 081/94-A0

Accredited according to **ISO/IEC 17025**



FCC listed # 101450

IC recognized # 3925

CETECOM Inc.

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

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

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

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

Table of Contents

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

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM Inc. does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM Inc.

TEST REPORT PREPARED BY:**EMC Engineer: Harpreet Sidhu****1.2 Testing laboratory**

CETECOM Inc.

411 Dixon Landing Road, Milpitas, CA-95035, USA

Phone: +1 408 586 6200

Fax: +1 408 586 6299

E-mail: lothar.schmidt@cetecomusa.comInternet: www.cetecom.com

1.3 Details of applicant

Name : Multi-Tech Systems, Inc
Street : 2205 Woodale Drive
City / Zip Code : Mounds View, MN 55112
Country : USA
Contact : Terry Boe
Telephone : +1 763-717-5506
Tele-fax : +1 763-717-5814
e-mail : tboe@multitech.com

1.4 Application details

Date of receipt test item : 2004-01-15
Date of test : 2004-01-16/20/23/27

1.5 Test item

Manufacturer : Applicant
Marketing Name : ModemModule CDMA
Model No. : MTSMC-C
Description : [850/1900 CDMA Modem](#)
FCC-ID : **AU792U04A22740**
IC-ID : **125A-0010**

Additional information

Frequency : 825.25MHz – 847.75MHz for Cellular 850,
1851.25MHz – 1908.75MHz for PCS 1900
Type of modulation : CDMA
Number of channels : 833(Cellular)/1199 (PCS)
Antenna : External
Power supply : 5 - 32VDC
Output power : 24.4dBm (275.42mW) max. ERP measured in Cellular 850
21.56dBm (143.21mW) max. EIRP measured in PCS 1900
Extreme temp. Tolerance : Lower:-30°C Upper: +70°C

1.6 Test standards

FCC Part 22,24 / RSS133 r1

Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.

The EUT (850/1900 CDMA Modem) carries pre-certified Wavecom module model# Wismo Quik Q2438 with FCC ID: O9EQ2438.

This test report covers full radiated testing as per FCC 22/24 on CDMA module.

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. Only radiated test included in this report.

Final Verdict:
(only "passed" if all single measurements are "passed")

Passed

Technical responsibility for area of testing:

2004-01-30

EMC & Radio

Lothar Schmidt
(Technical Manager)



Date

Section

Name

Signature

Responsible for test report and project leader:

2004-01-30

EMC & Radio

Harpreet Sidhu (EMC Engineer)



Date

Section

Name

Signature

2.2 Test report

TEST REPORT

Test report no.: EMC_609FCC22-24_2004_MTSMC-C

Model: MTSMC-C

TEST REPORT REFERENCE

PARAMETER TO BE MEASURED	PARAGRAPH	PAGE
POWER OUTPUT	§ 22.913(a) / § 24.232 (b)	7
EMISSION LIMITS TRANSMITTER	§2.1051 / §24.238	15
RECEIVER RADIATED EMISSIONS	§ 2.1053 / RSS-133	39
CONDUCTED EMISSIONS	§ 15.107/207	45
TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS		46

POWER OUTPUT

§ 22.913(a) / § 24.232 (b)

Summary:

During the process of testing, the EUT was controlled via Rhode & Schwarz Universal Radio Communication tester (CMU 200) to ensure max. Power transmission and proper modulation.

This paragraph contains peak output power, EIRP & ERP measurements for the EUT.
In all cases, the peak output power is within the specified limits.

Method of Measurements:

The EUT was set up for the max. Output power with pseudo random data modulation.

The power was measured with R&S Spectrum Analyzer ESIB 40 (peak)

These measurements were done at 3 frequencies,

825.25 MHz, 836.5 MHz and 847.75 MHz (bottom, middle and top of operational frequency range) for Cellular 850
1851.25 MHz, 1880.0 MHz and 1908.75 MHz (bottom, middle and top of operational frequency range) for PCS 1900

For these measurements an antenna with 0 dBi gain was used. The use of an antenna up to 3 dBi gain is possible and still having the necessary margin to the limits.

ERP (Cellular-850)

§22.913(a)

Limits:

Burst Peak ERP
≤38.45dBm (7W)

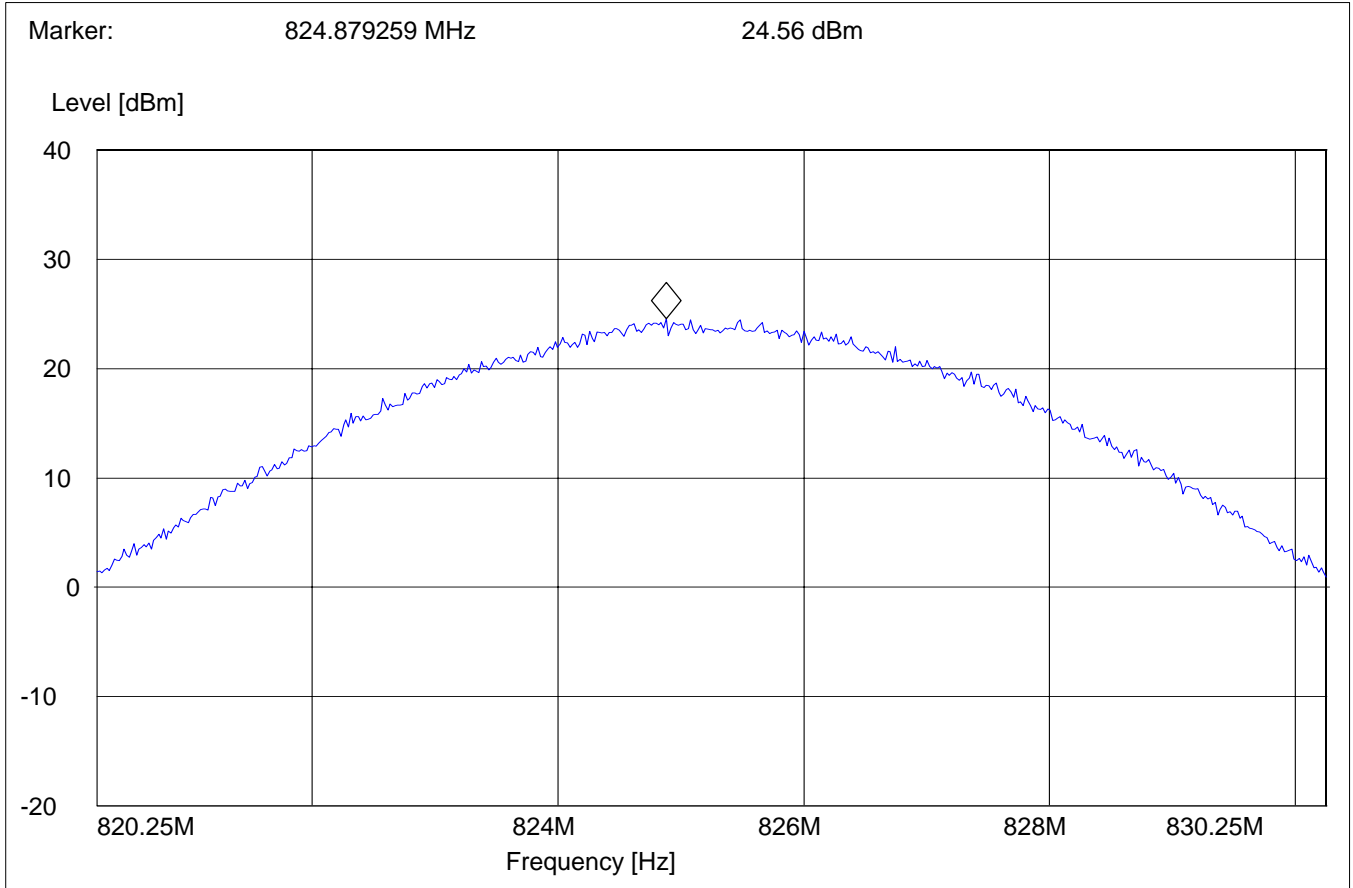
EIRP

Frequency (MHz)	Burst Peak (dBm)	
	EIRP	ERP
825.25	24.56	22.46
836.5	26.5	24.4
847.75	25.48	23.38
Measurement uncertainty	±0.5 dB	

ANALYZER SETTINGS: RBW = VBW = 3MHz

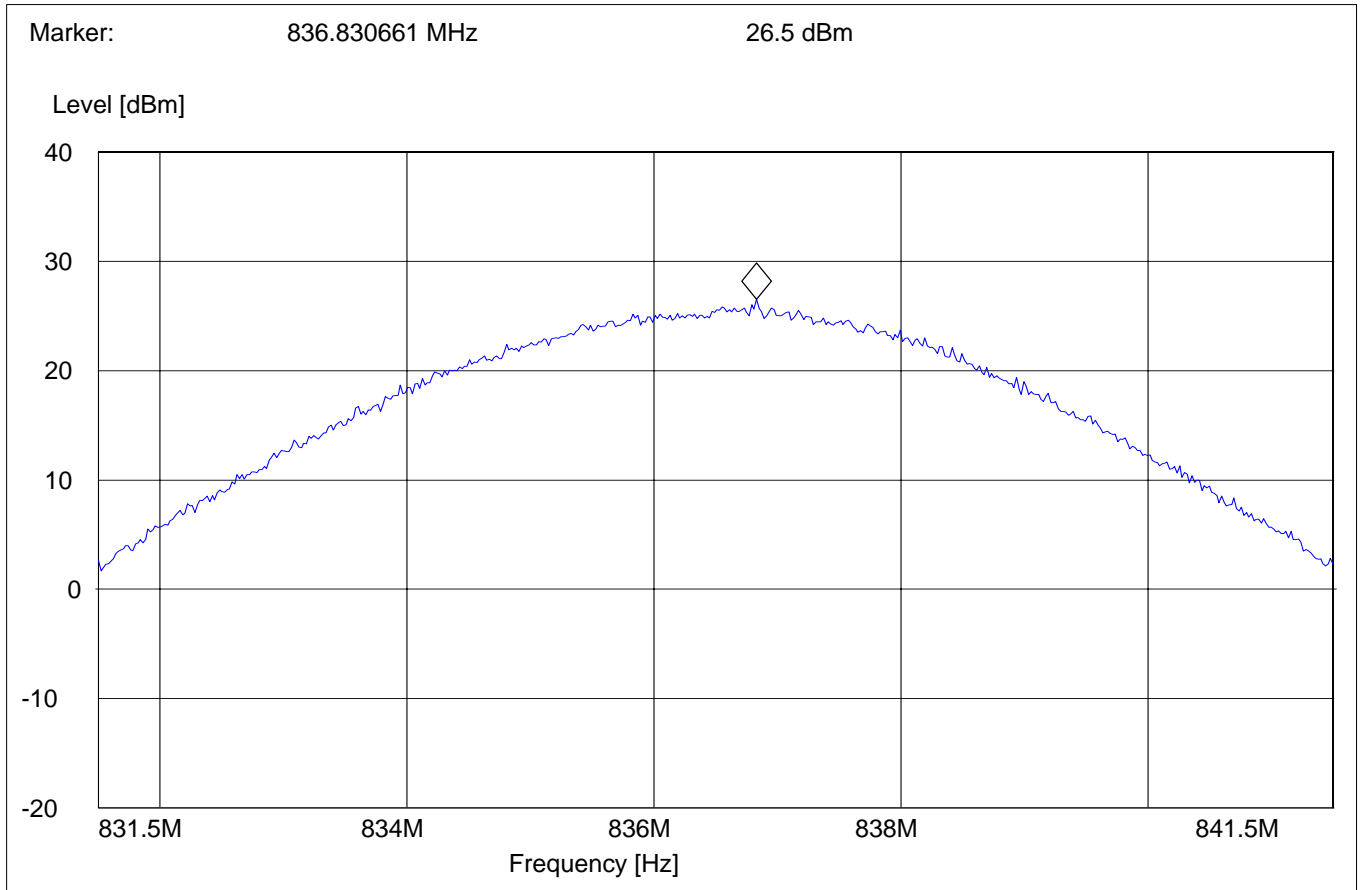
EIRP (Cellular-850)
CHANNEL 8

§22.913(a)



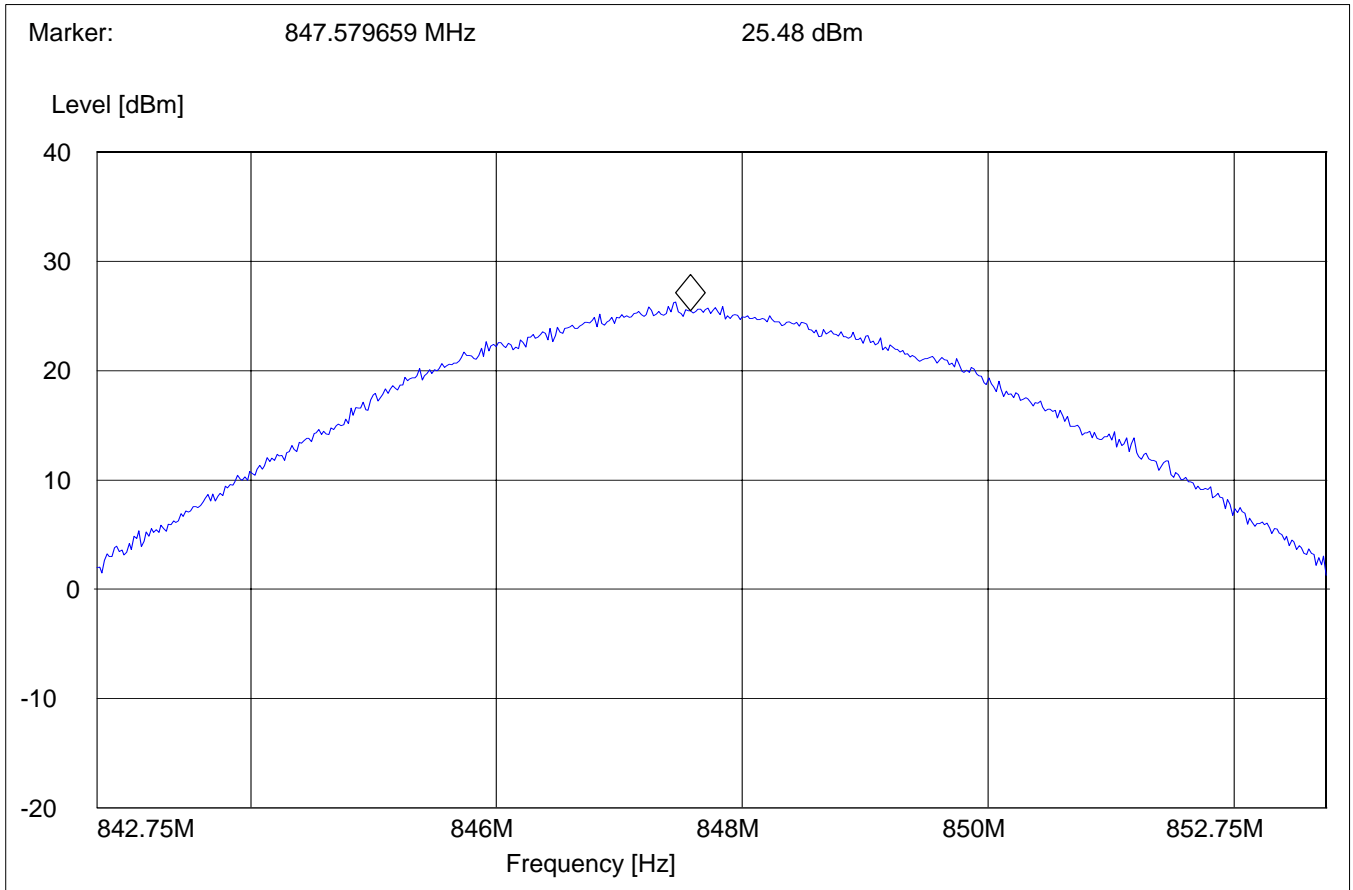
EIRP (Cellular-850)
CHANNEL 383

§22.913(a)



EIRP (Cellular-850)
CHANNEL 758

§22.913(a)



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

Burst Peak EIRP
≤33dBm (1W)

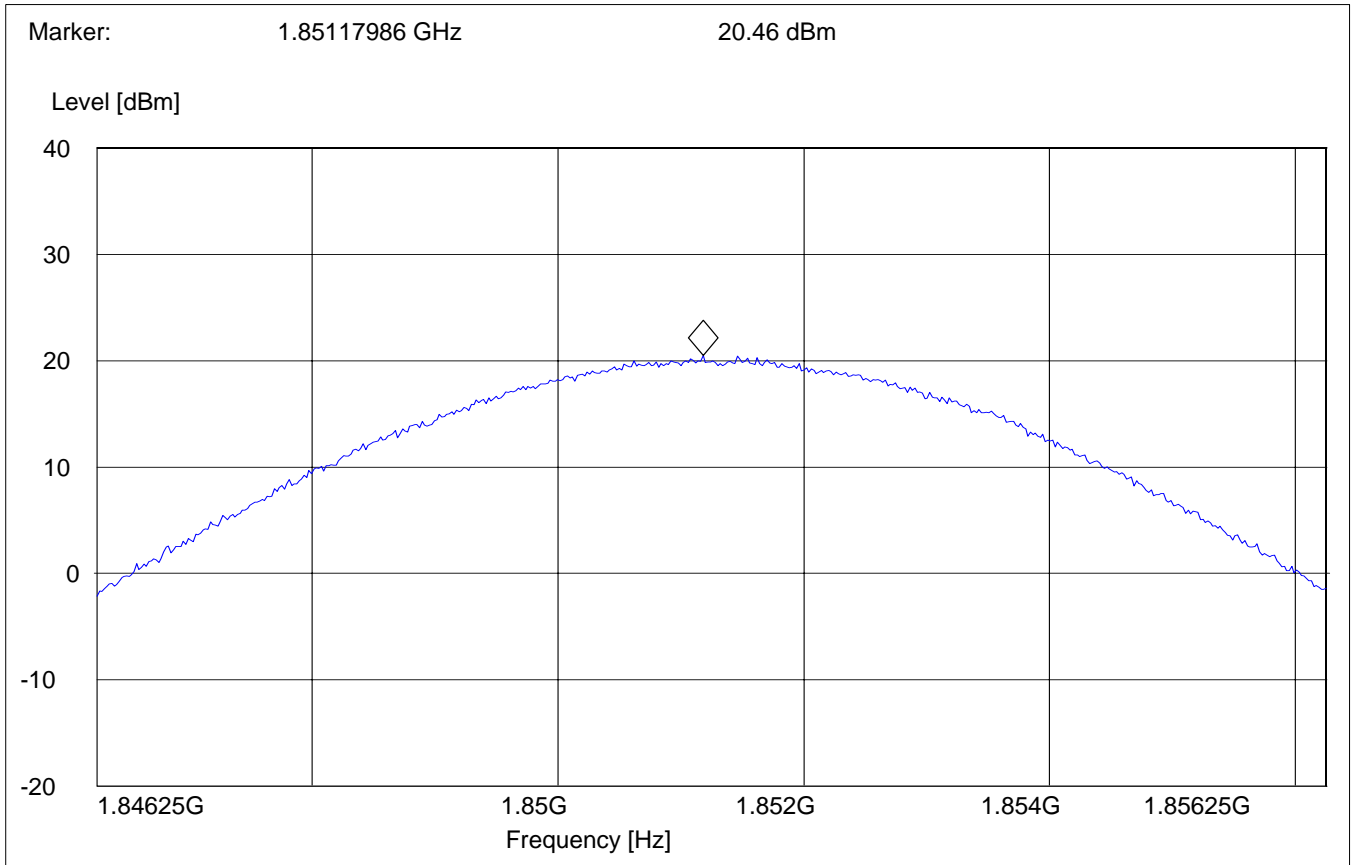
EIRP

Frequency (MHz)	Burst Peak (dBm)
	EIRP
1851.25	20.46
1880	21.56
1908.75	20.05
Measurement uncertainty	±0.5 dB

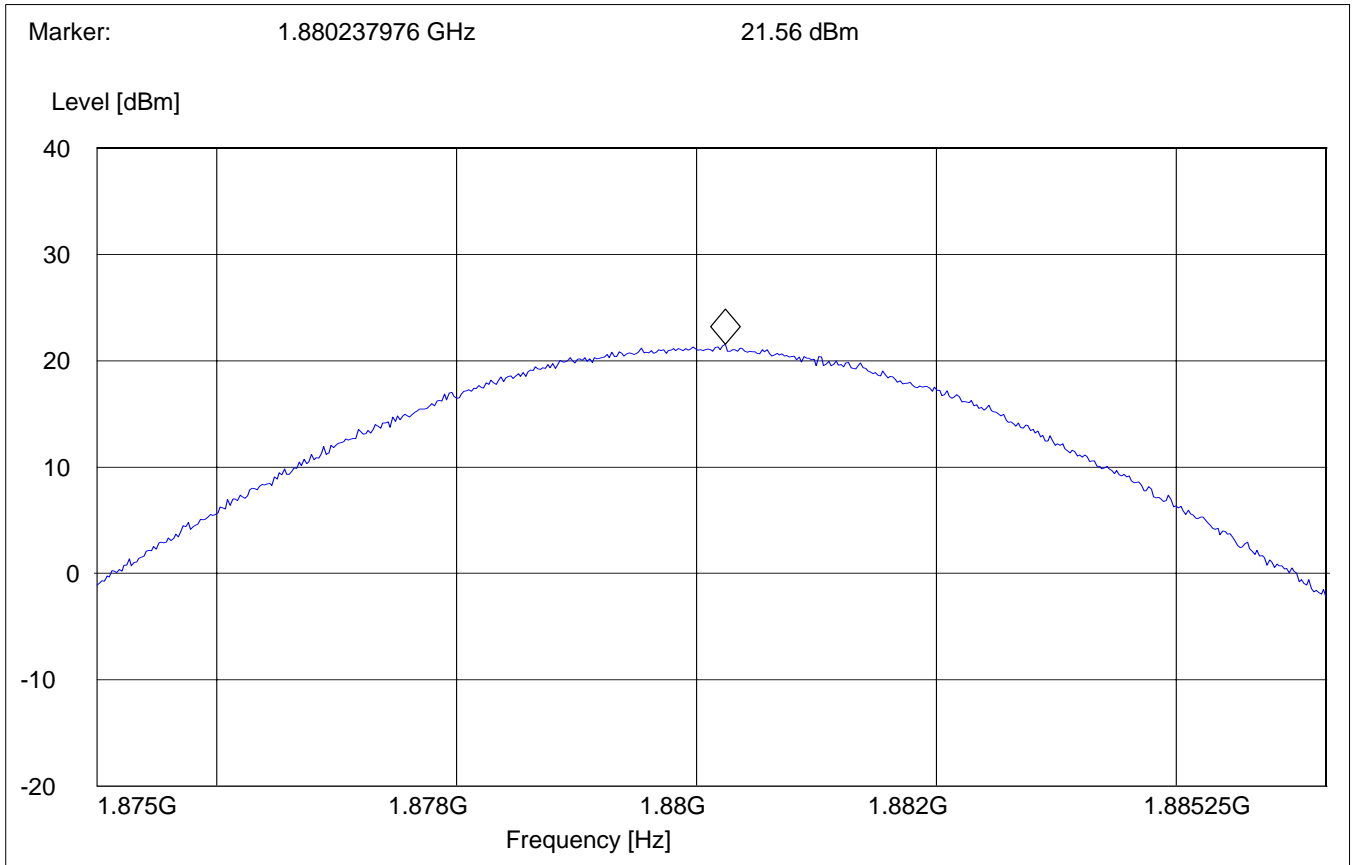
ANALYZER SETTINGS: RBW = VBW = 3MHz

EIRP (PCS-1900)
CHANNEL 25

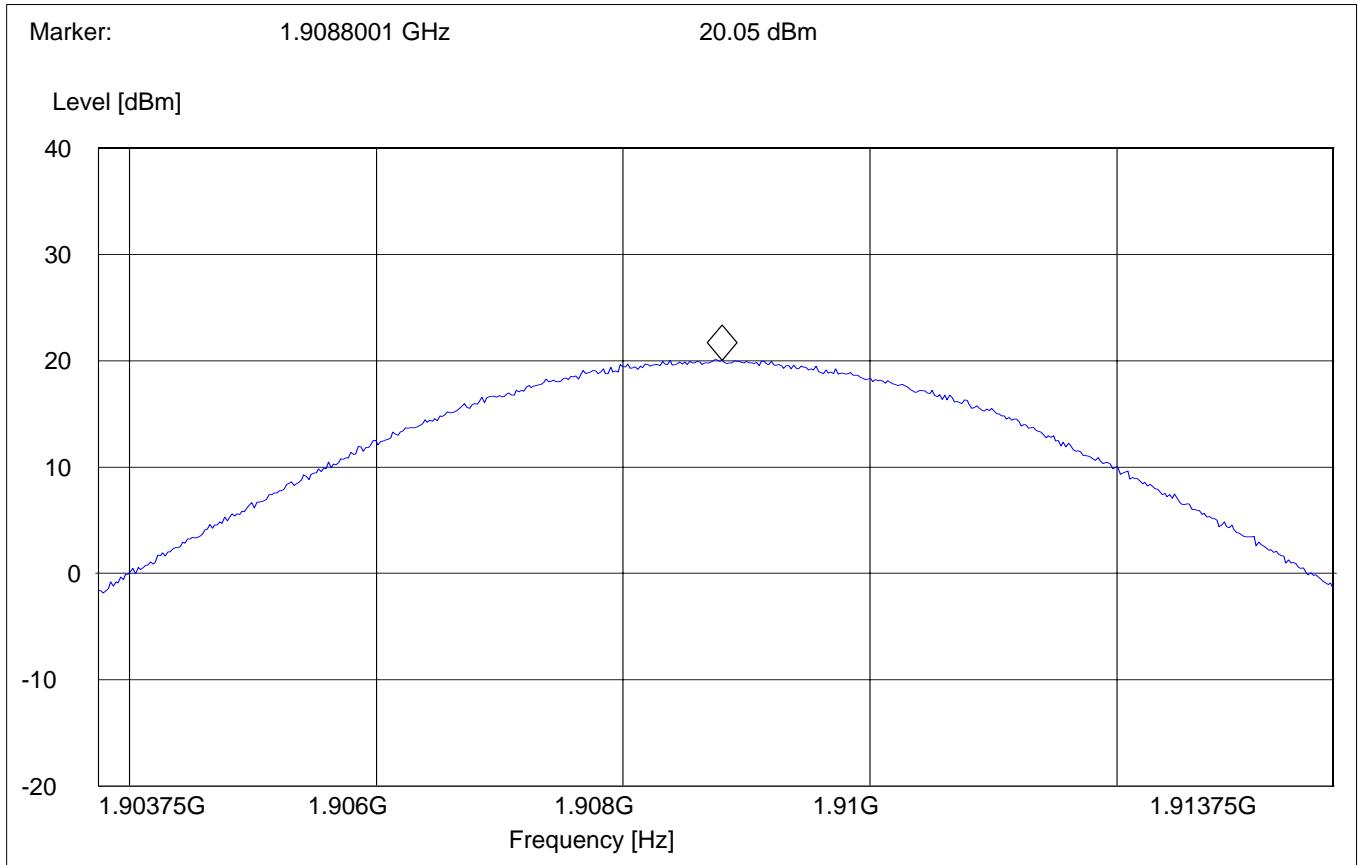
§24.232(b)



EIRP (PCS-1900) §24.232(b)
CHANNEL 600



EIRP (PCS-1900) §24.232(b)
CHANNEL 1175



EMISSION LIMITS TRANSMITTER**§2.1051 / §24.238****Measurement Procedure:**

The following steps outline the procedure used to measure the radiated emissions from the EUT. The site is constructed in accordance with ANSI C63.4 – 1992 requirements and is recognised by the FCC. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 847.75MHz for Cellular-850 & 1908.75MHz for PCS-1900. The resolution bandwidth is set as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the Cellular-850 & PCS-1900 bands.

The final Radiated emission test procedure is as follows:

- a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- b) The antenna output was terminated in a 50-ohm load.
- c) A double-ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was determined by the substitution method described for ERP measurements.

Measurement Limit:

Sec. 24.238 Emission Limits.

(a) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least $43 + 10 \log(P)$ dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10 \log(P)$ dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Measurement Results:

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the Cellular-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 Cellular-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.

RADIATED SPURIOUS EMISSIONS (Cellular -850)

Tx @ 825.25MHz: 30MHz - 1GHz

Spurious emission limit -13dBm

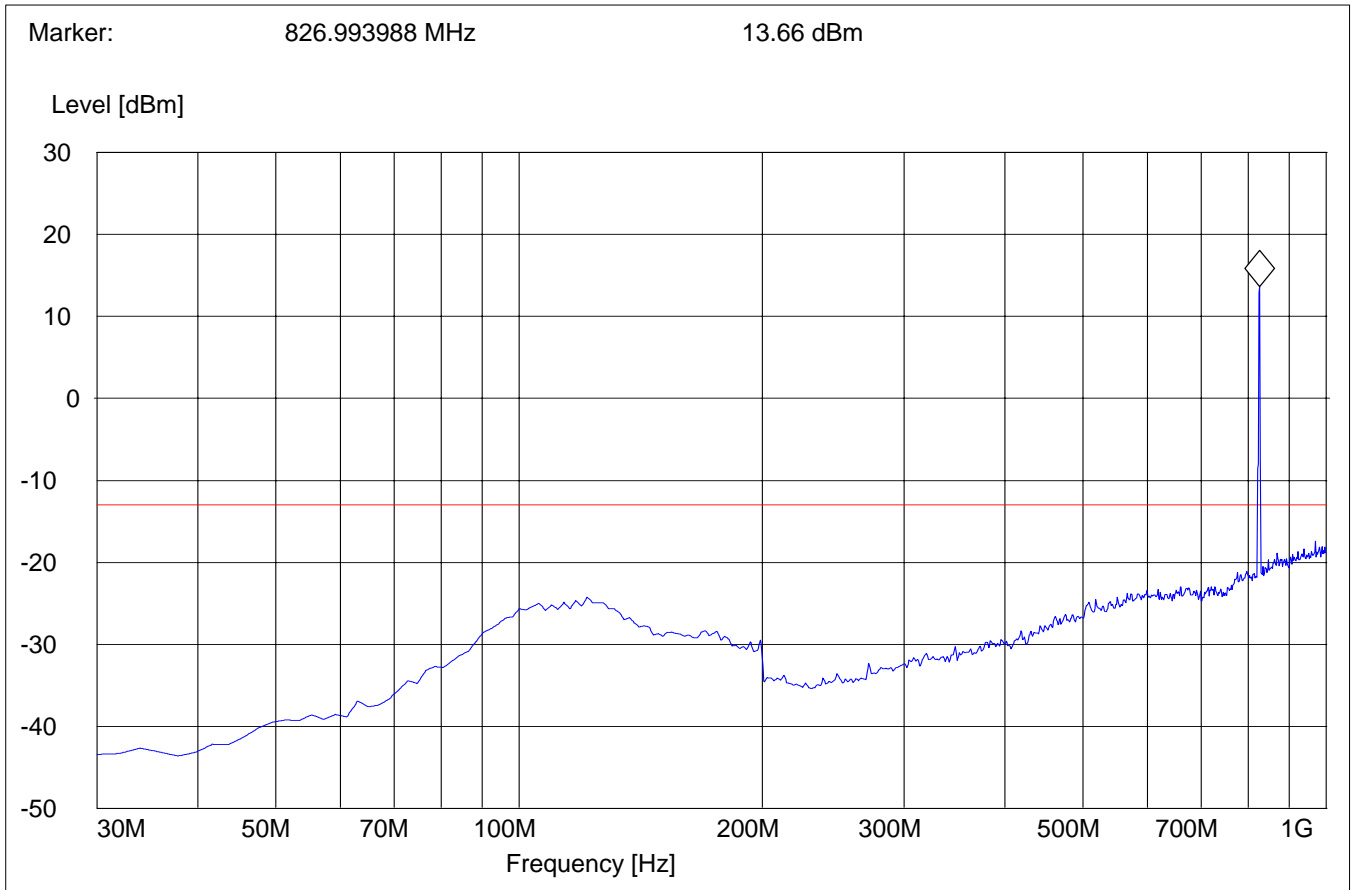
Antenna: Vertical

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

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

Note:

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



RADIATED SPURIOUS EMISSIONS (Cellular -850)**Tx @ 825.25MHz: 30MHz - 1GHz**

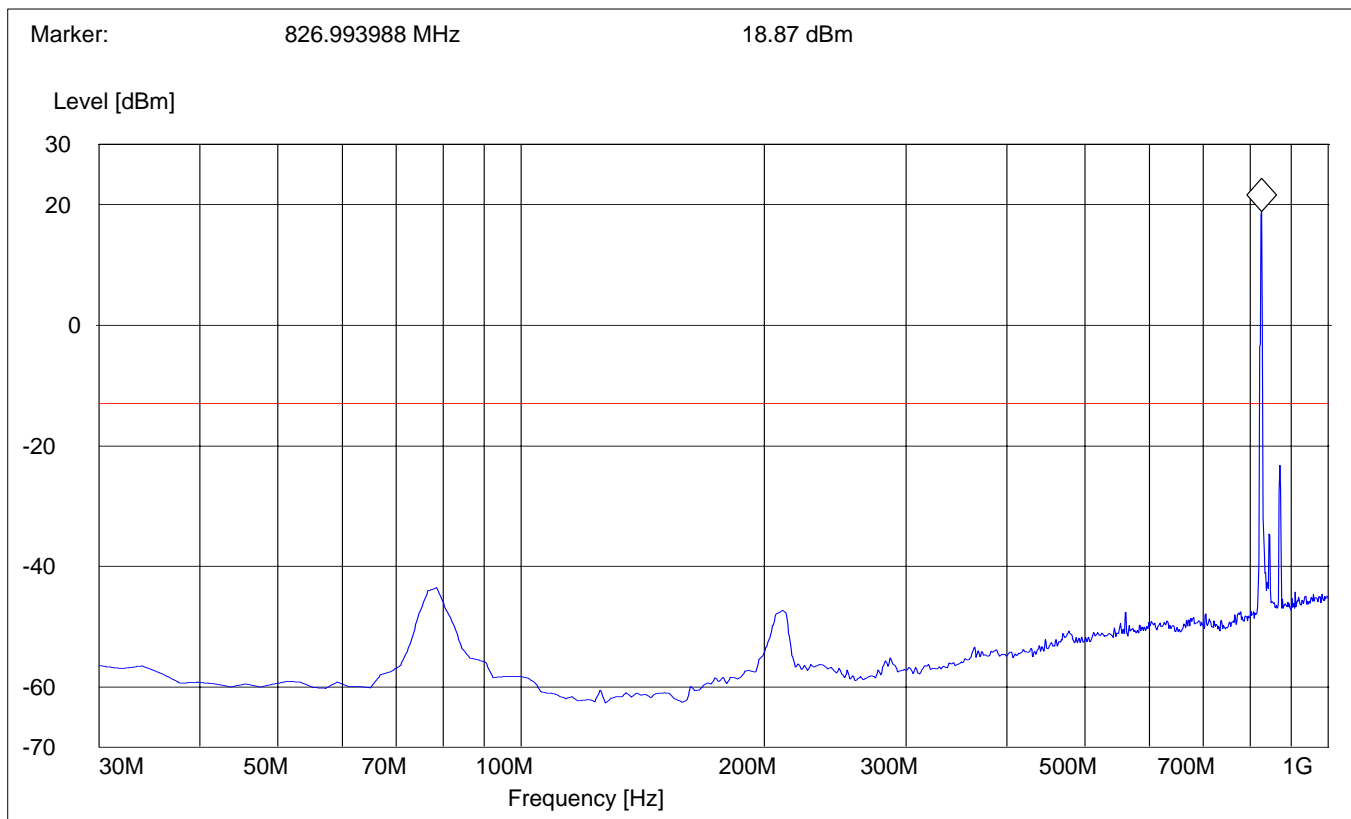
Spurious emission limit -13dBm

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

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

Note:

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

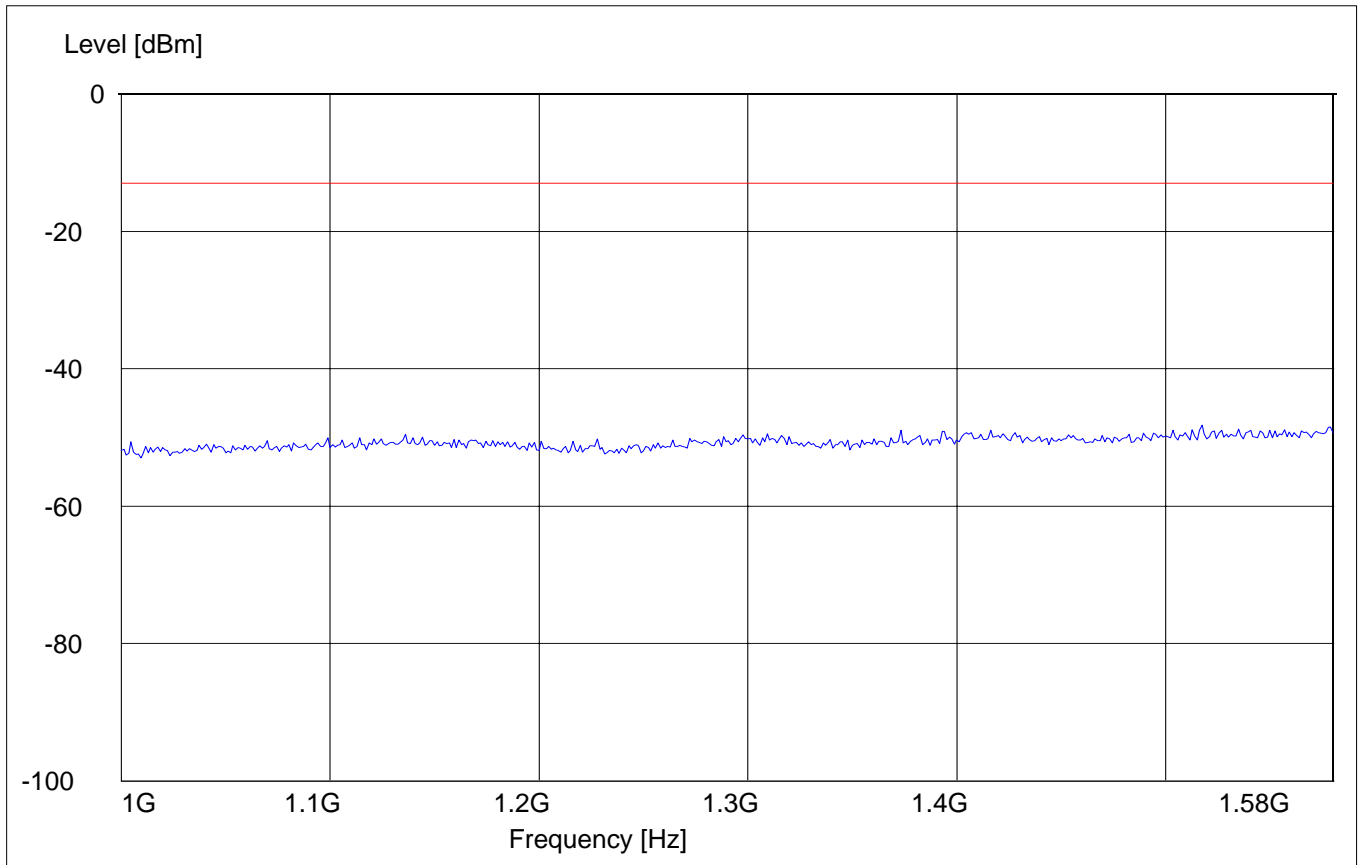


RADIATED SPURIOUS EMISSIONS (Cellular -850)**Tx @ 825.25MHz: 1GHz – 1.58GHz**

Spurious emission limit -13dBm

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

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



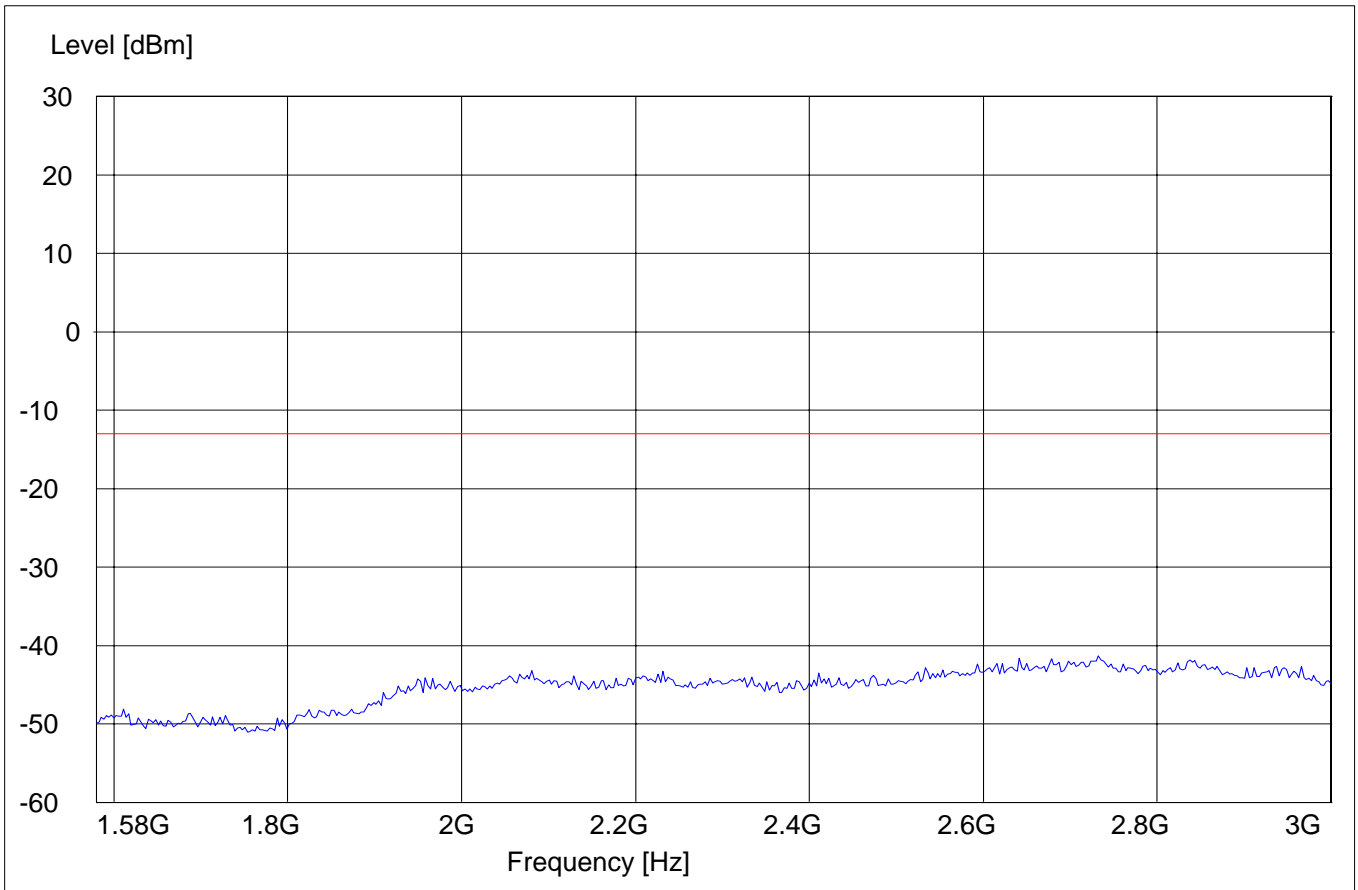
RADIATED SPURIOUS EMISSIONS (Cellular -850)

Tx @ 825.25MHz: 1.58GHz – 3GHz

Spurious emission limit –13dBm

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

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

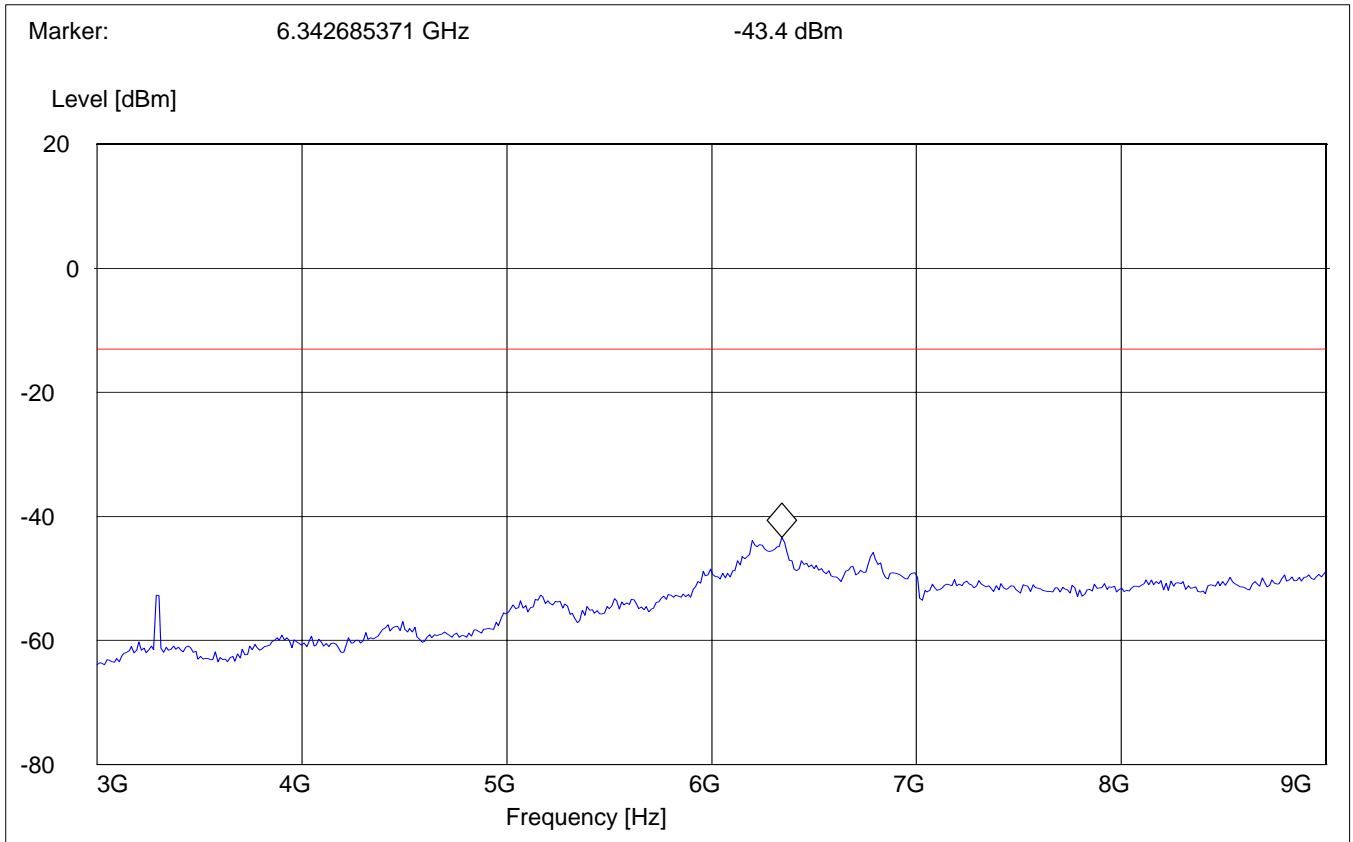


RADIATED SPURIOUS EMISSIONS (Cellular -850)**Tx @ 825.25MHz: 3GHz – 9GHz**

Spurious emission limit –13dBm

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

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

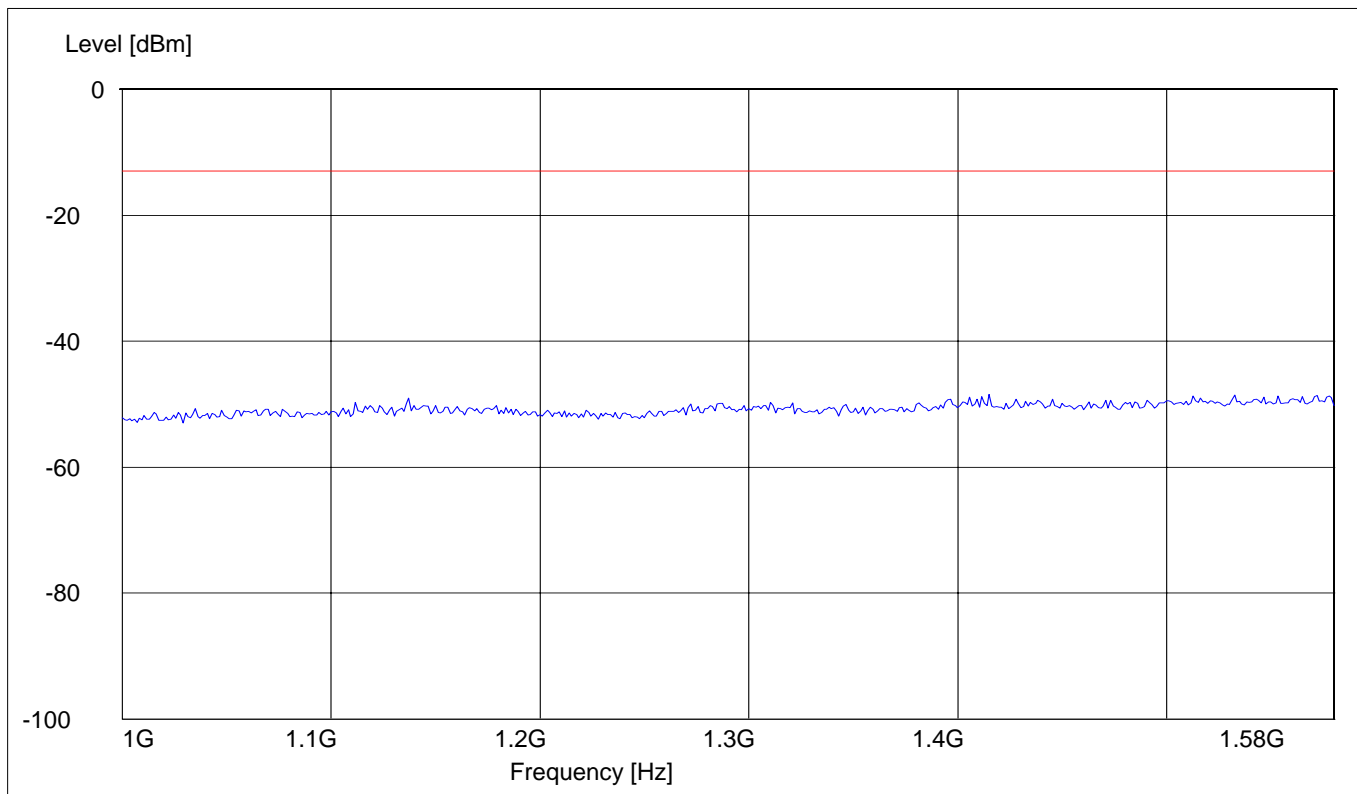


RADIATED SPURIOUS EMISSIONS (Cellular -850)**Tx @ 836.5MHz: 1GHz – 1.58GHz**

Spurious emission limit -13dBm

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

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

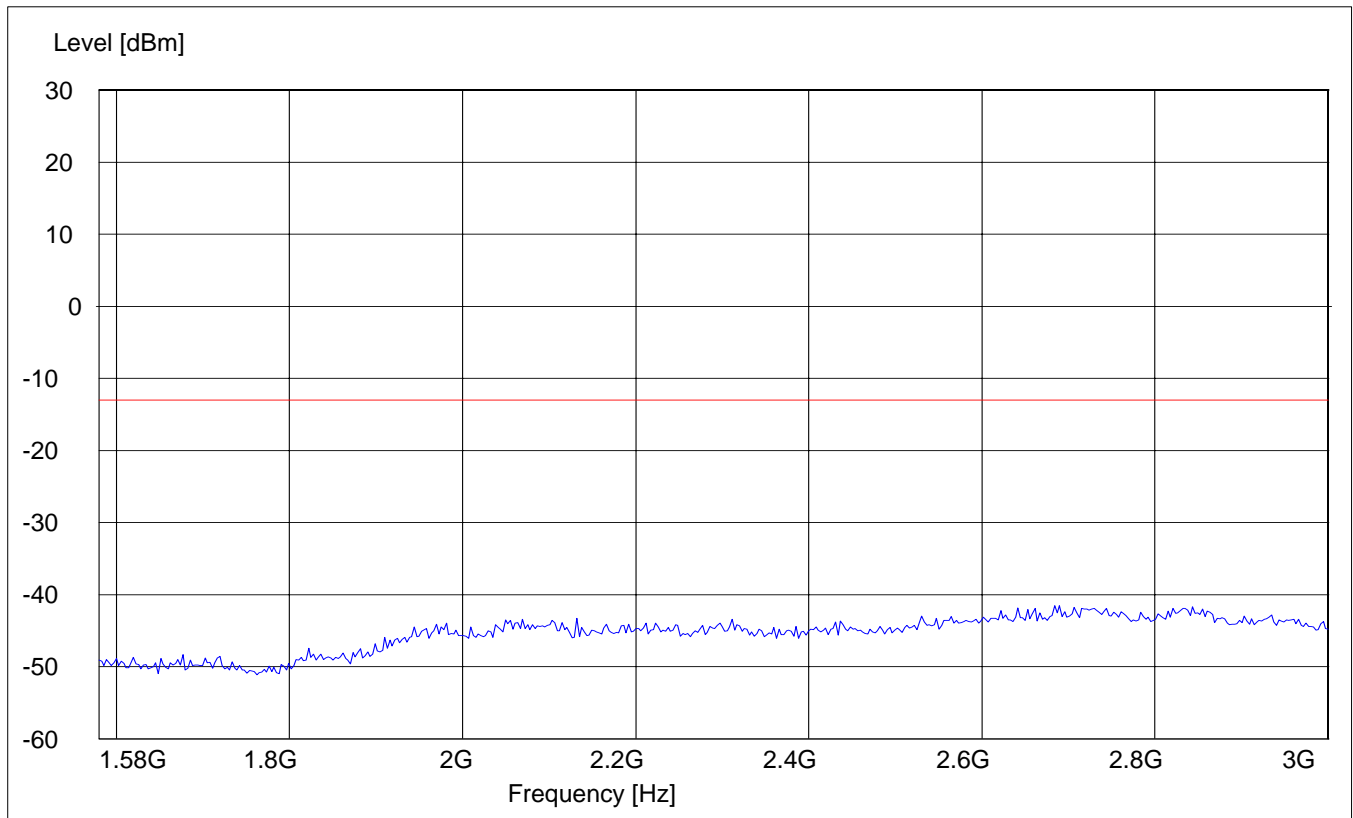


RADIATED SPURIOUS EMISSIONS (Cellular -850)**Tx @ 836.5MHz: 1.58GHz – 3GHz**

Spurious emission limit –13dBm

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

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

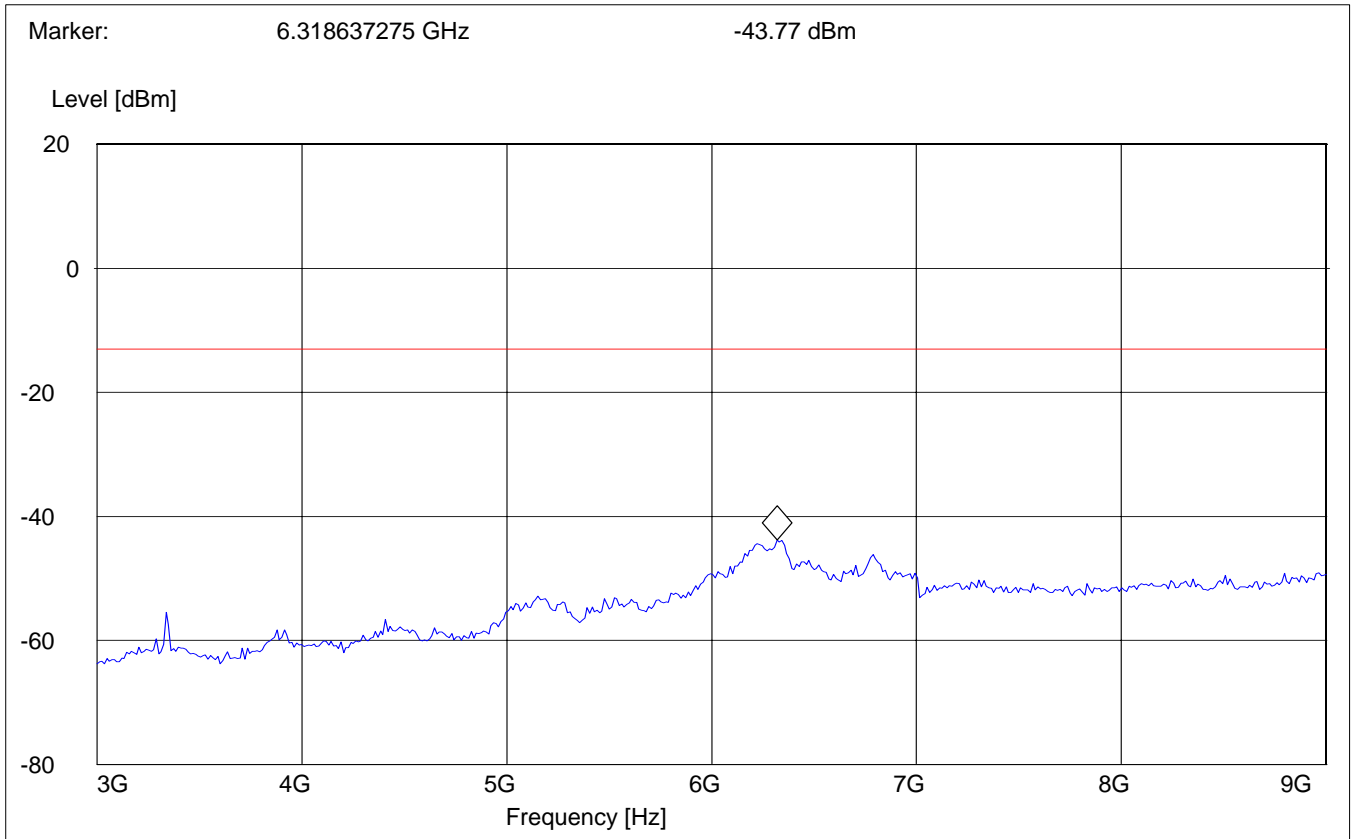


RADIATED SPURIOUS EMISSIONS (Cellular -850)**Tx @ 836.5MHz: 3GHz – 9GHz**

Spurious emission limit –13dBm

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

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

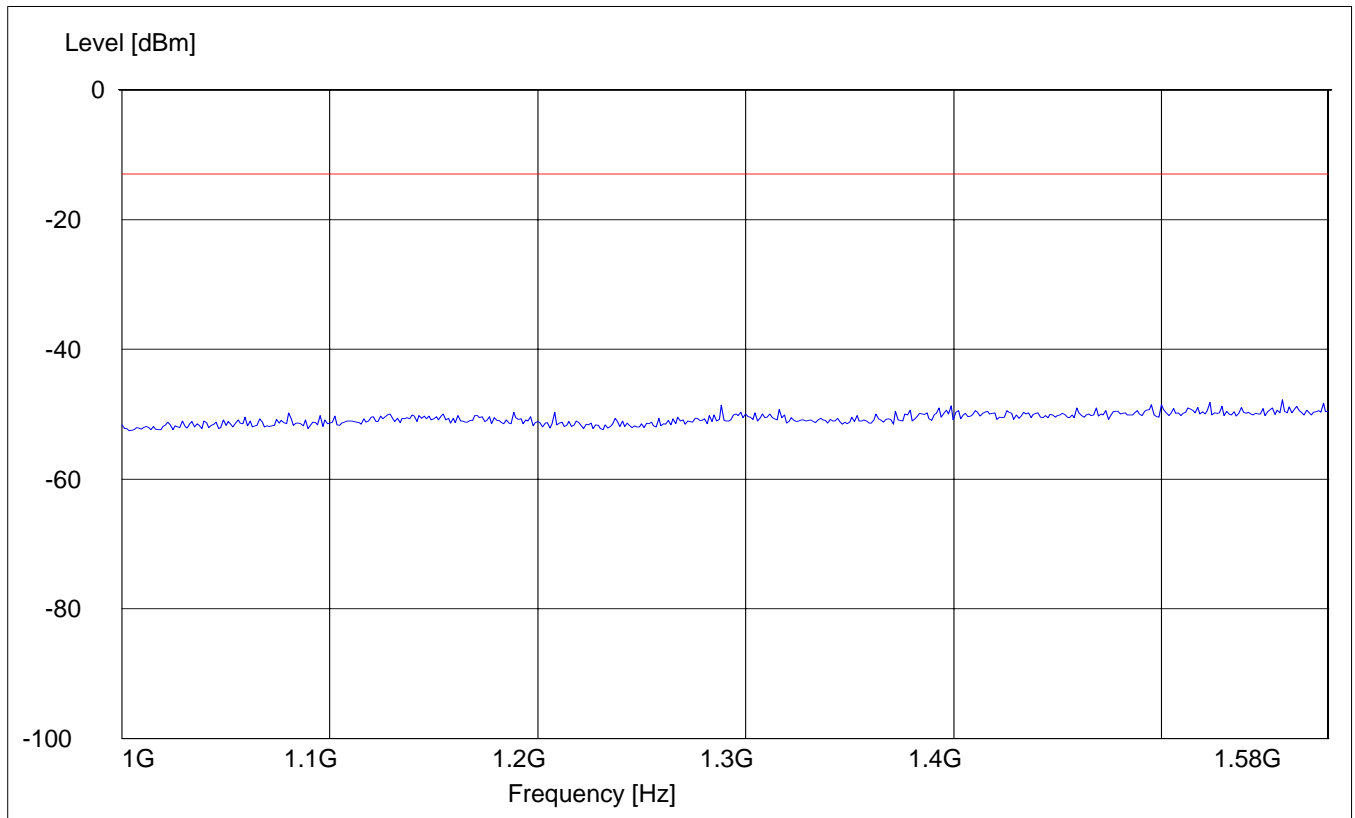


RADIATED SPURIOUS EMISSIONS (Cellular -850)**Tx @ 847.75MHz: 1GHz – 1.58GHz**

Spurious emission limit -13dBm

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

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

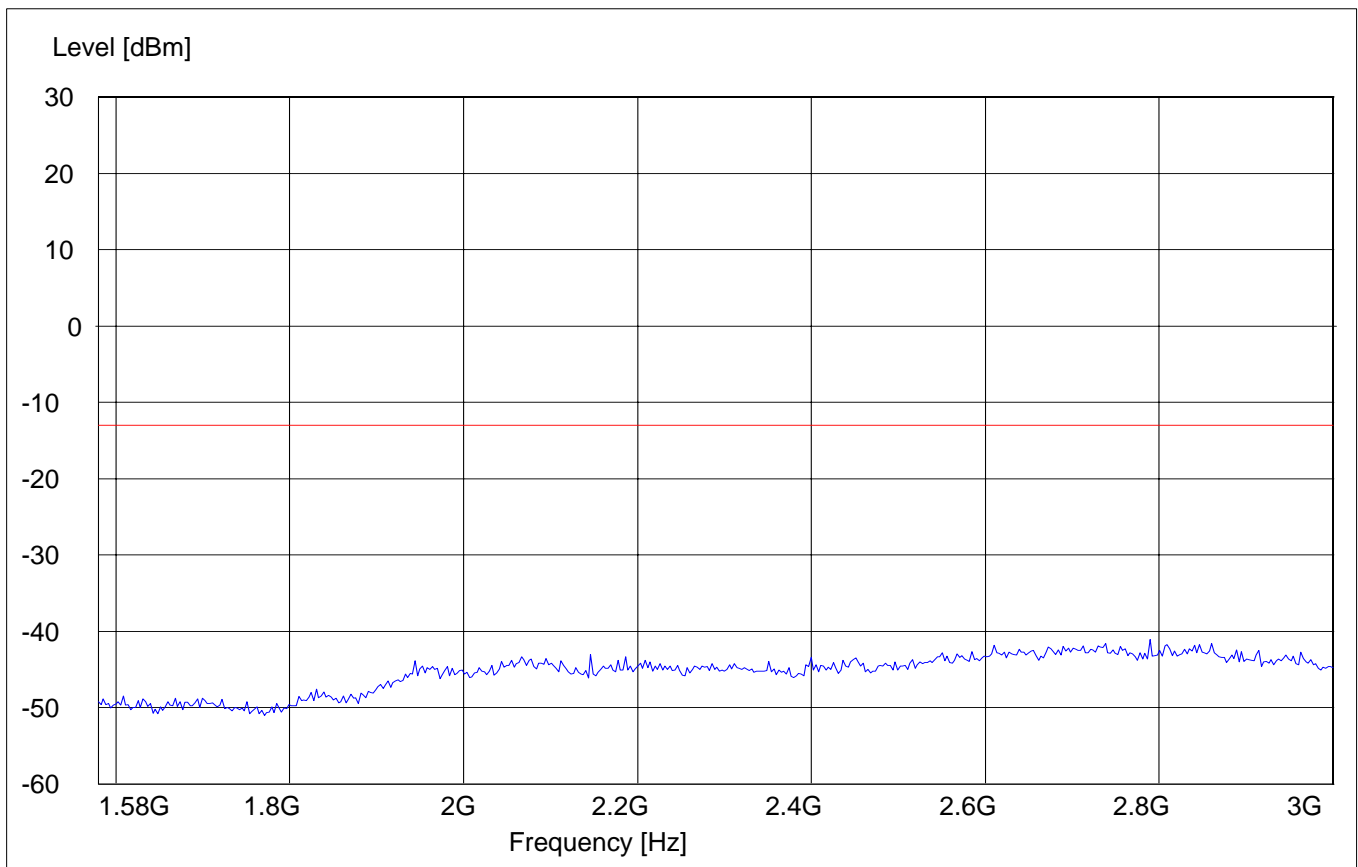


RADIATED SPURIOUS EMISSIONS (Cellular -850)**Tx @ 847.75MHz: 1.58GHz – 3GHz**

Spurious emission limit –13dBm

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

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

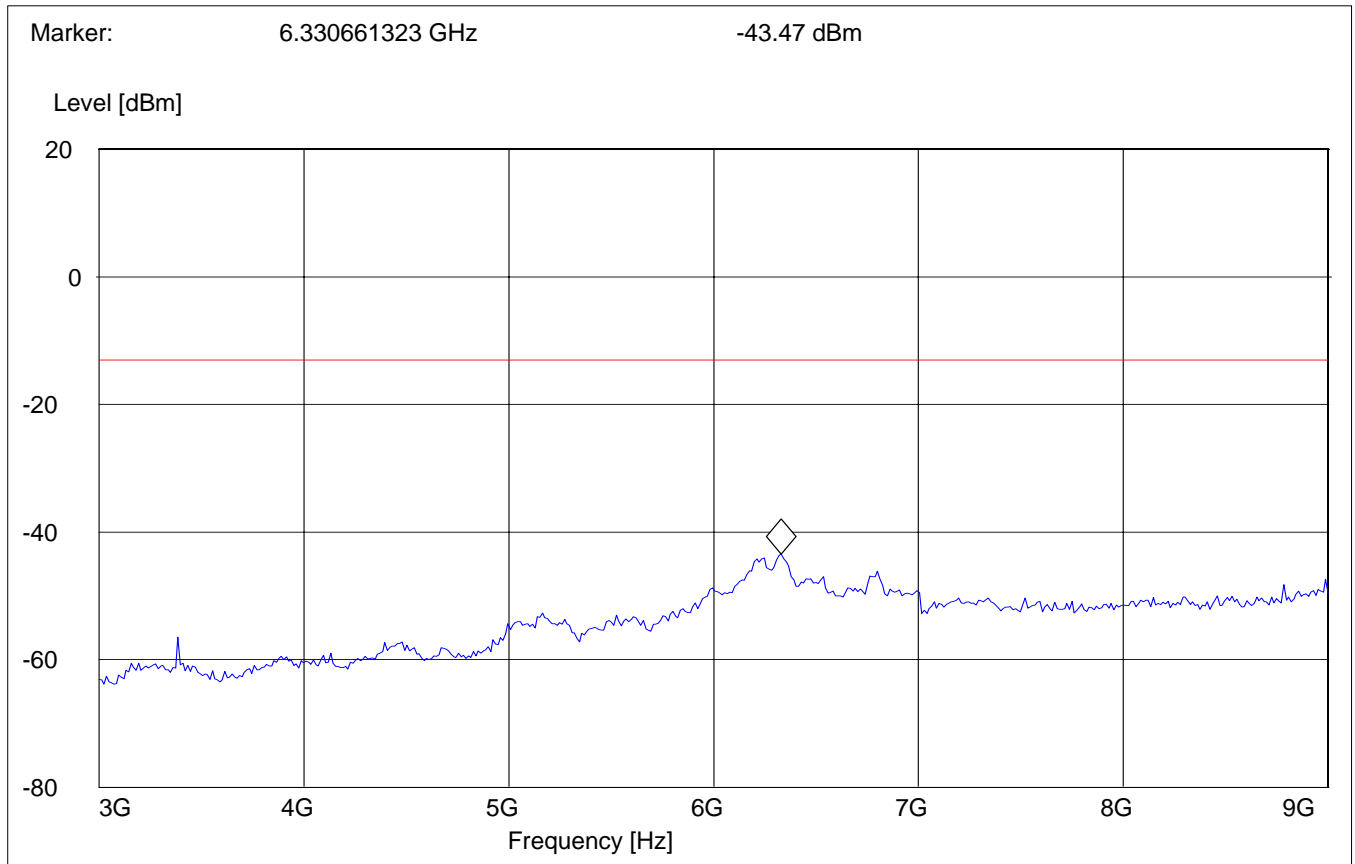


RADIATED SPURIOUS EMISSIONS (Cellular -850)**Tx @ 847.75MHz: 3GHz – 9GHz**

Spurious emission limit -13dBm

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

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



RESULTS OF RADIATED TESTS PCS-1900:

RADIATED SPURIOUS EMISSIONS

Tx @ 1851.25MHz: 30MHz - 1GHz

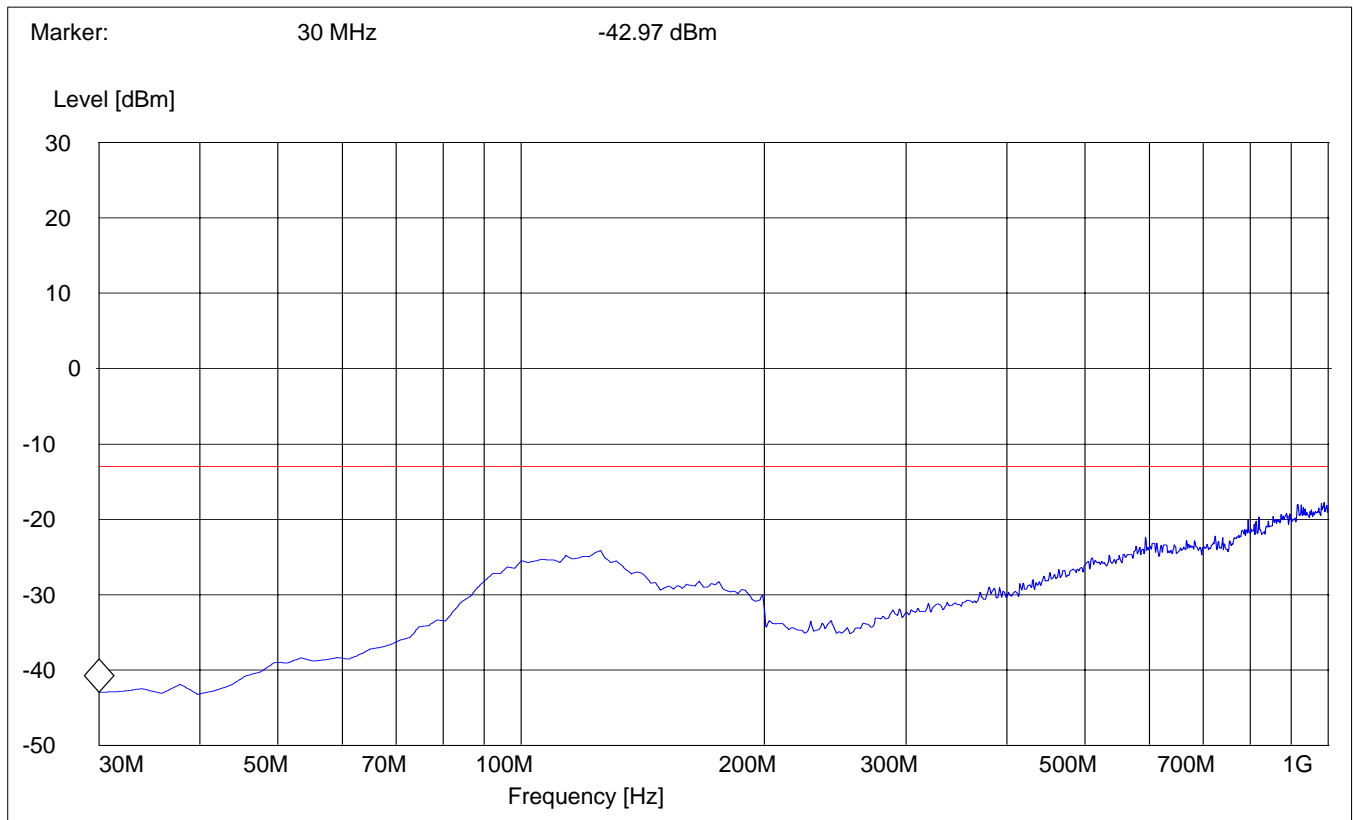
Spurious emission limit -13dBm

Worst-case plot for both polarities

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

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

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



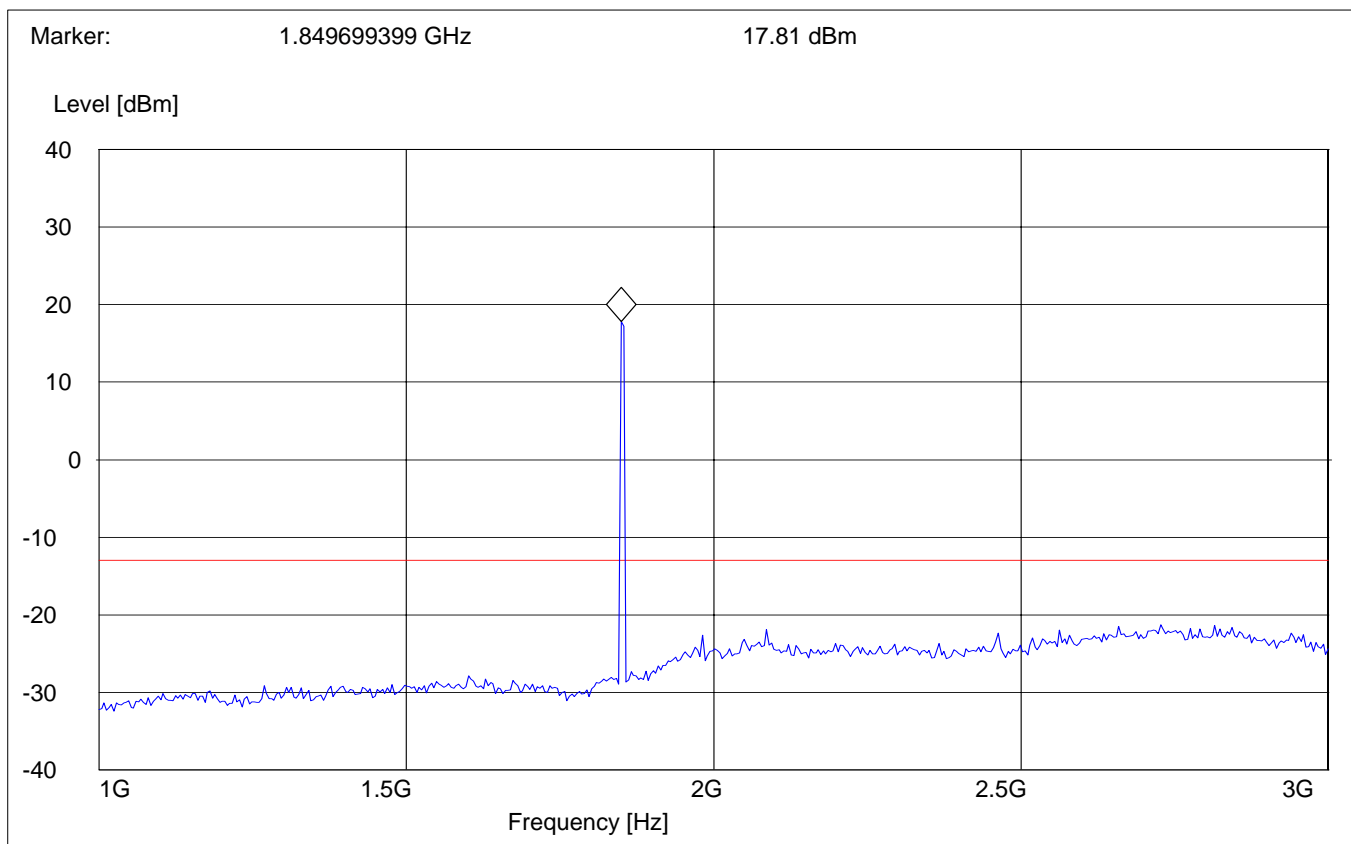
RADIATED SPURIOUS EMISSIONS**Tx @ 1851.25MHz: 1GHz – 3GHz**

Spurious emission limit -13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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

Note: The peak above the limit line is the carrier freq. at ch-25.

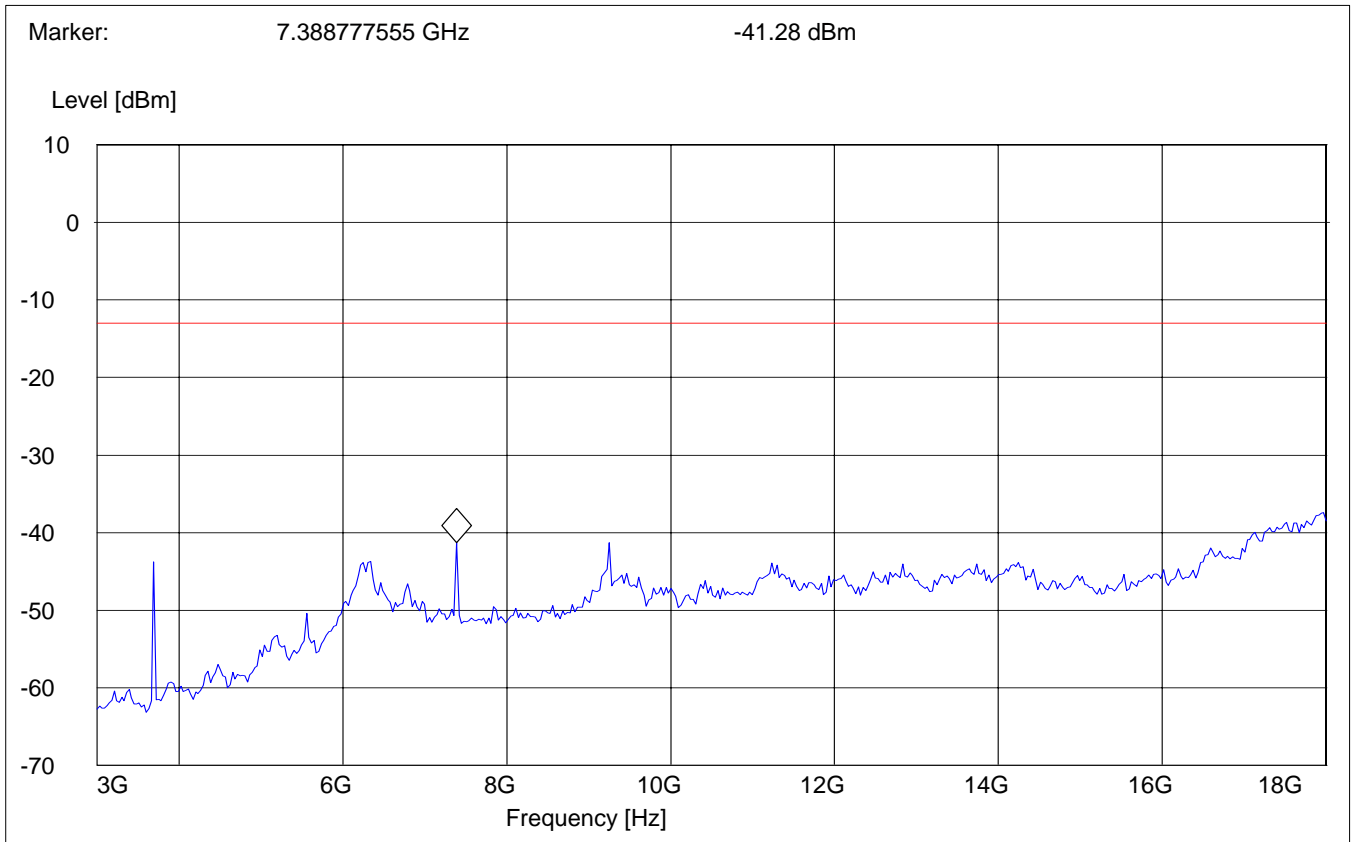


RADIATED SPURIOUS EMISSIONS**Tx @ 1851.25MHz: 3GHz – 18GHz**

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



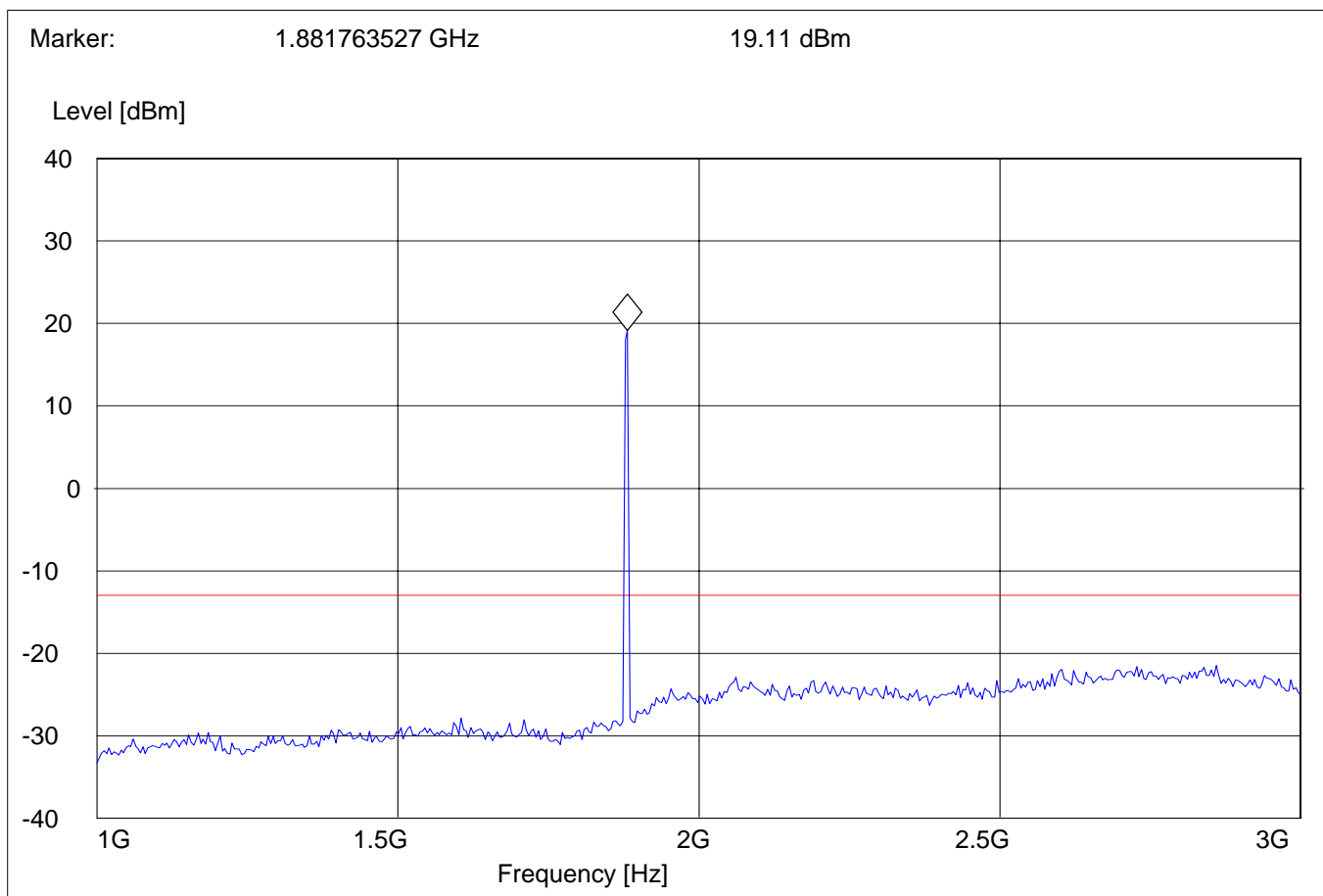
RADIATED SPURIOUS EMISSIONS**Tx @ 1880MHz: 1GHz – 3GHz**

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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

Note: The peak above the limit line is the carrier freq. at ch-600.

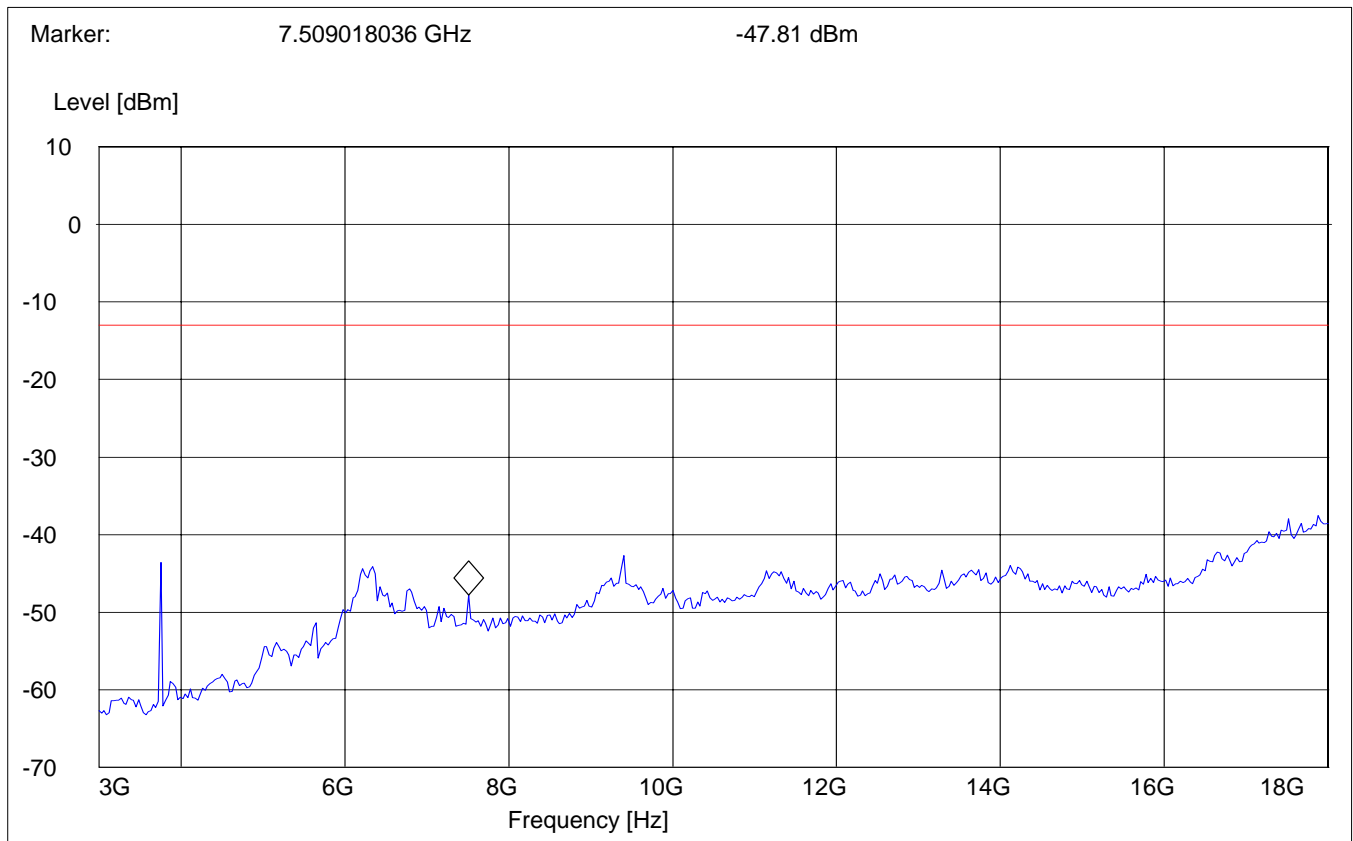


RADIATED SPURIOUS EMISSIONS**Tx @ 1880MHz: 3GHz – 18GHz**

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



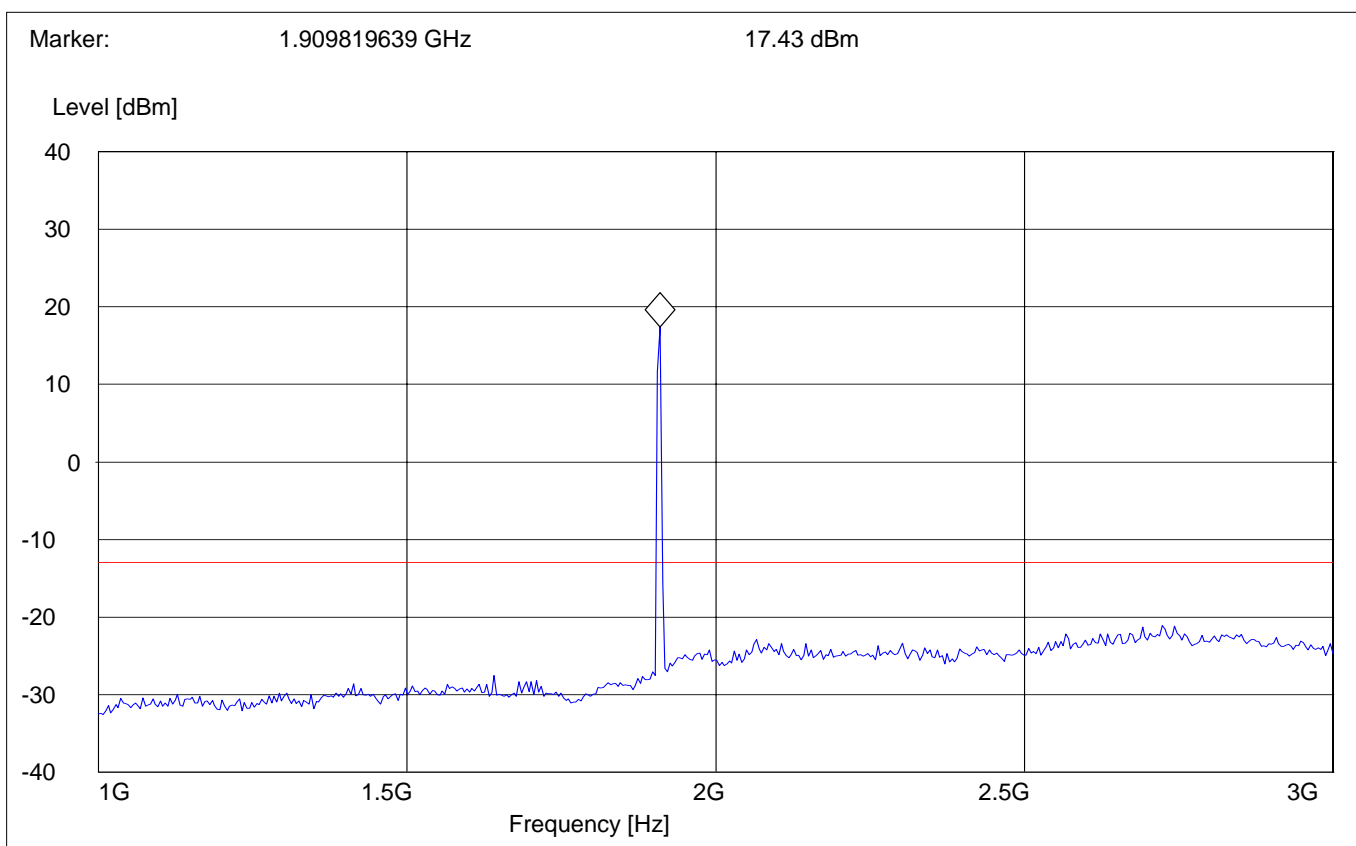
RADIATED SPURIOUS EMISSIONS**Tx @ 1908.75MHz: 1GHz – 3GHz**

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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

Note: The peak above the limit line is the carrier freq. at ch-1175.



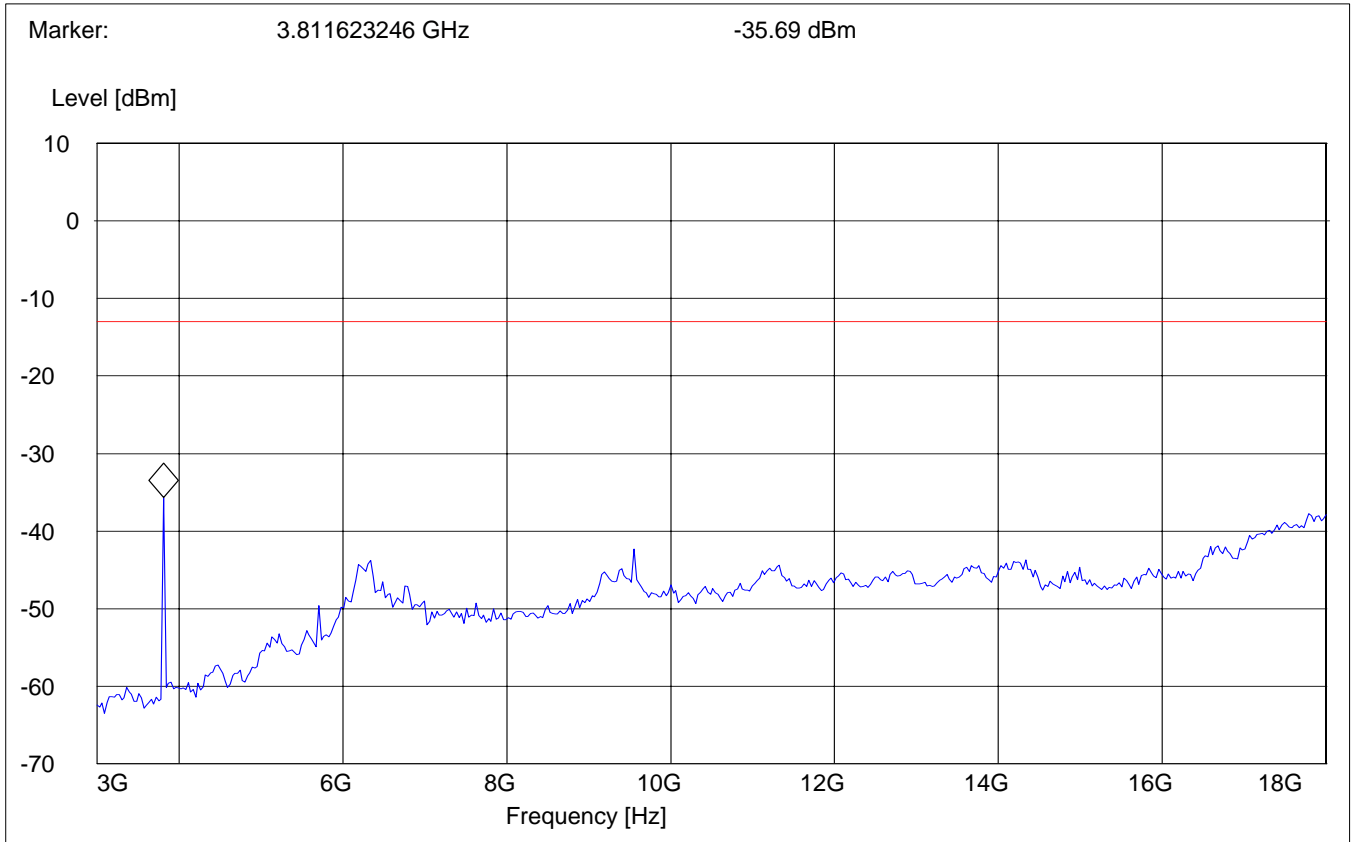
RADIATED SPURIOUS EMISSIONS

Tx @ 1908.75MHz: 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

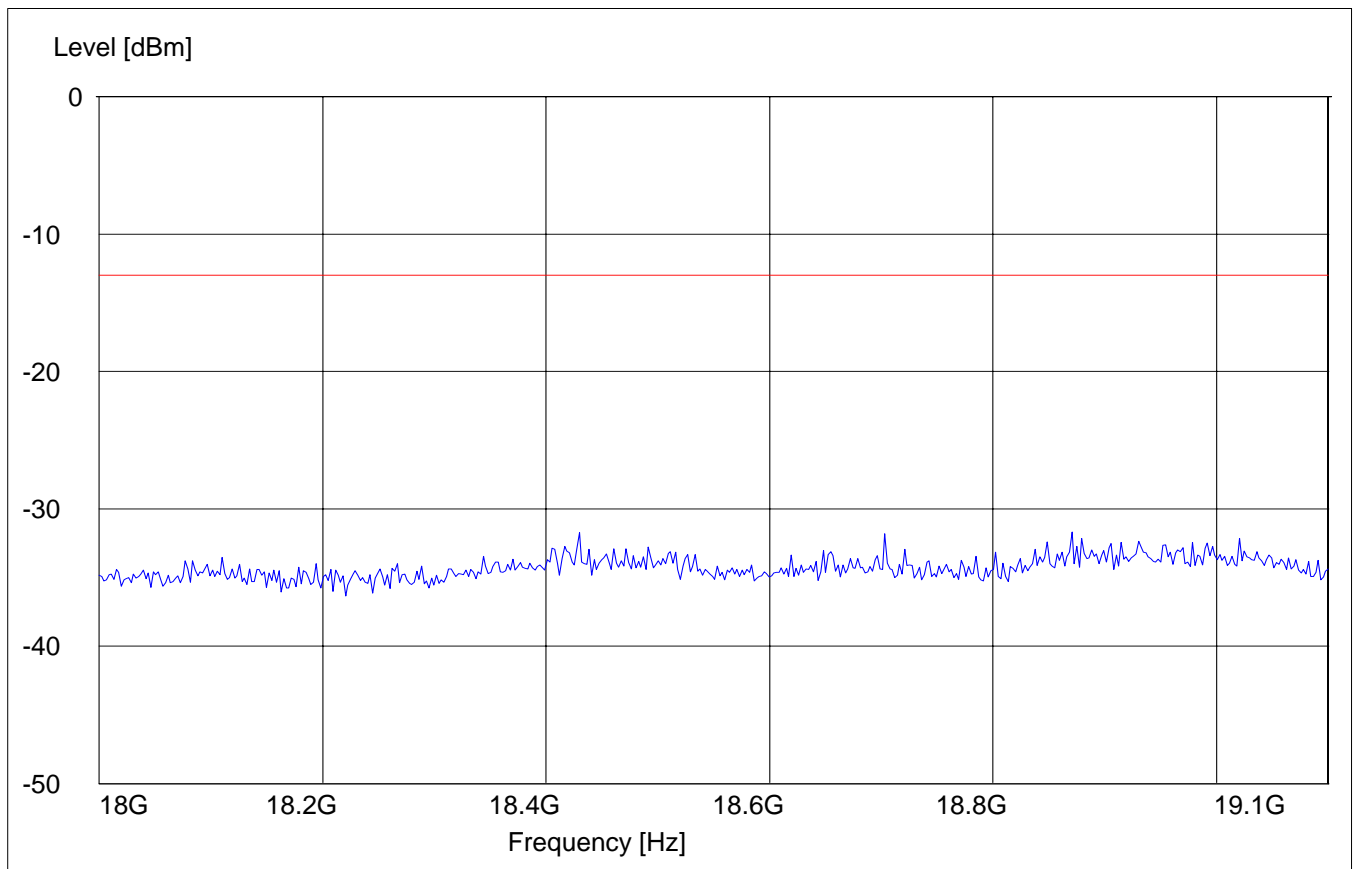


RADIATED SPURIOUS EMISSIONS**18GHz – 19.1GHz**

Spurious emission limit –13dBm

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

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

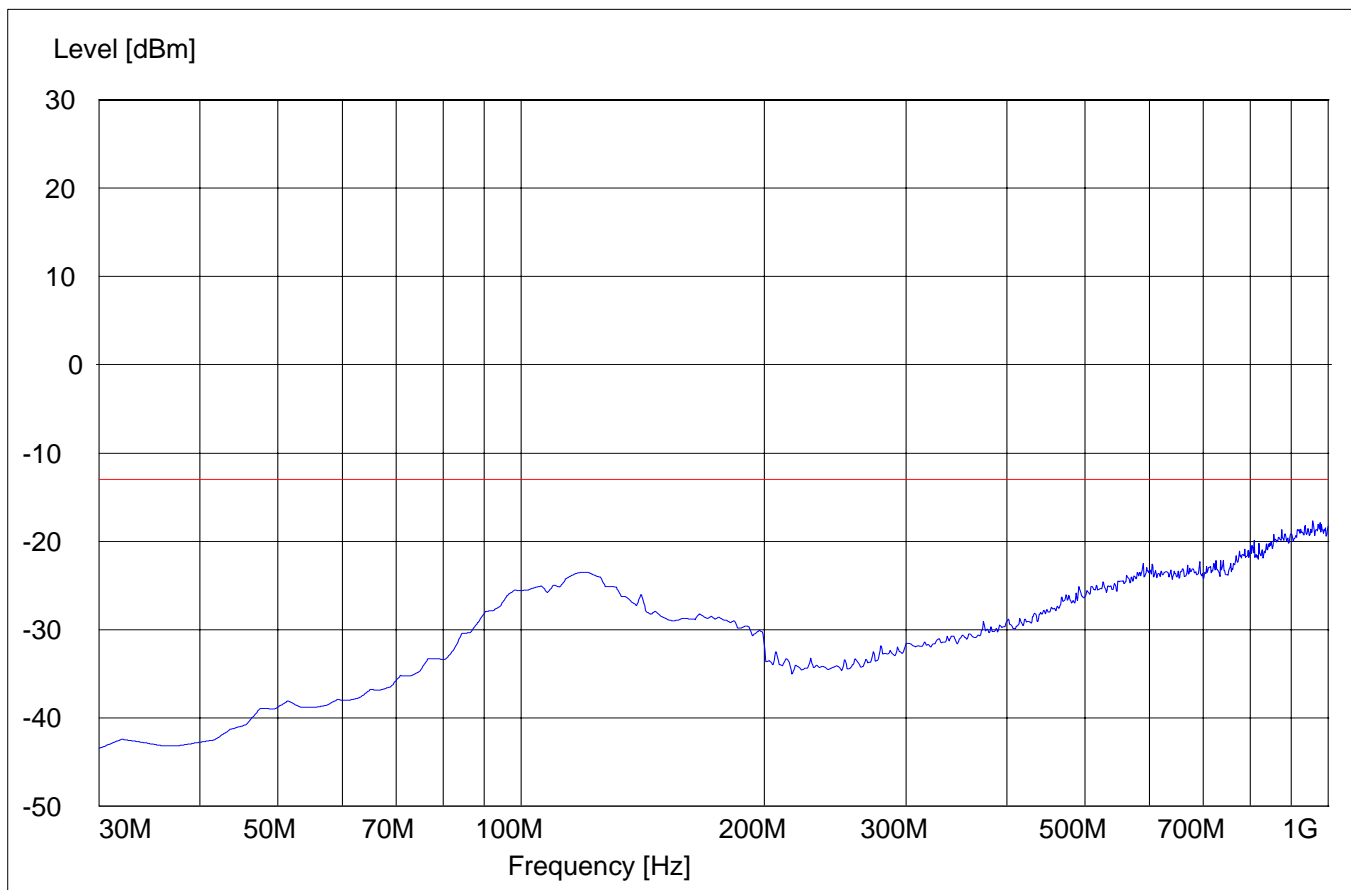
Note: This plot is valid for low, mid & high channels (worst-case plot)

RADIATED SPURIOUS EMISSIONS (IDLE MODE)**EUT in Idle Mode: 30MHz – 1GHz**

Spurious emission limit –13dBm

Worst-case plot for both polarities**SWEEP TABLE: "FCC 24 Spur 30M-1G"**

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

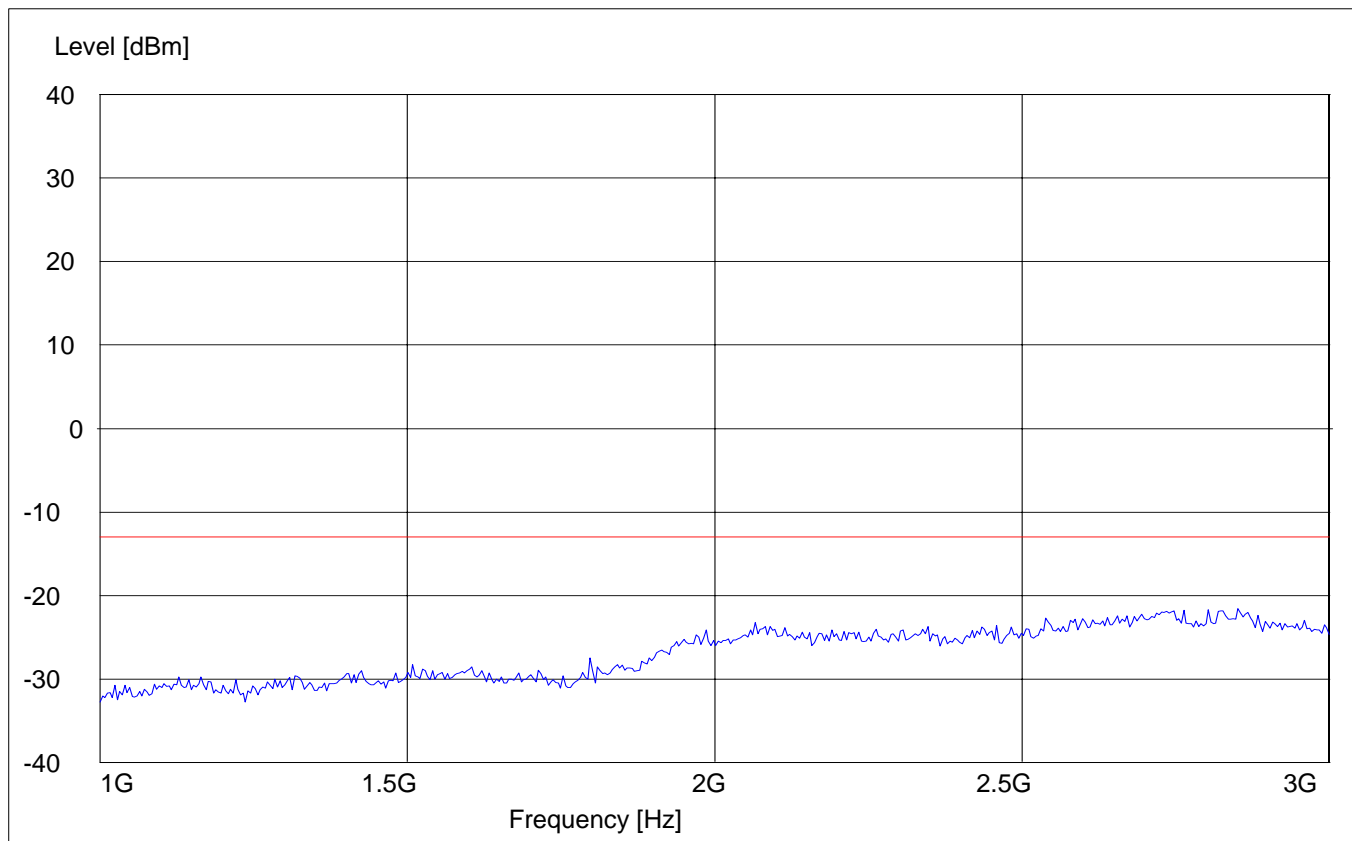


RADIATED SPURIOUS EMISSIONS**EUT in Idle Mode: 1GHz – 3GHz**

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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

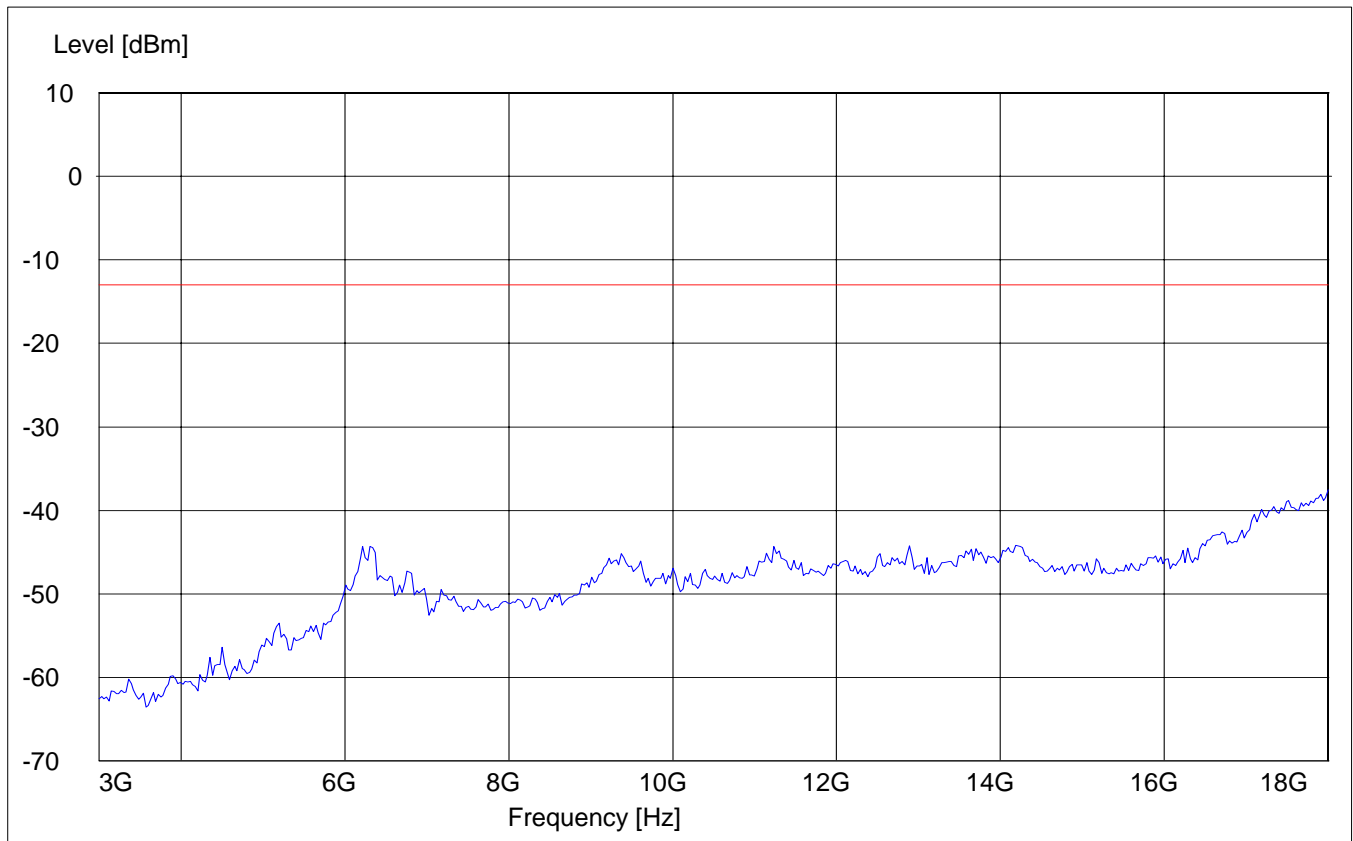


RADIATED SPURIOUS EMISSIONS**EUT in Idle Mode: 3GHz – 18GHz**

Spurious emission limit –13dBm

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

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

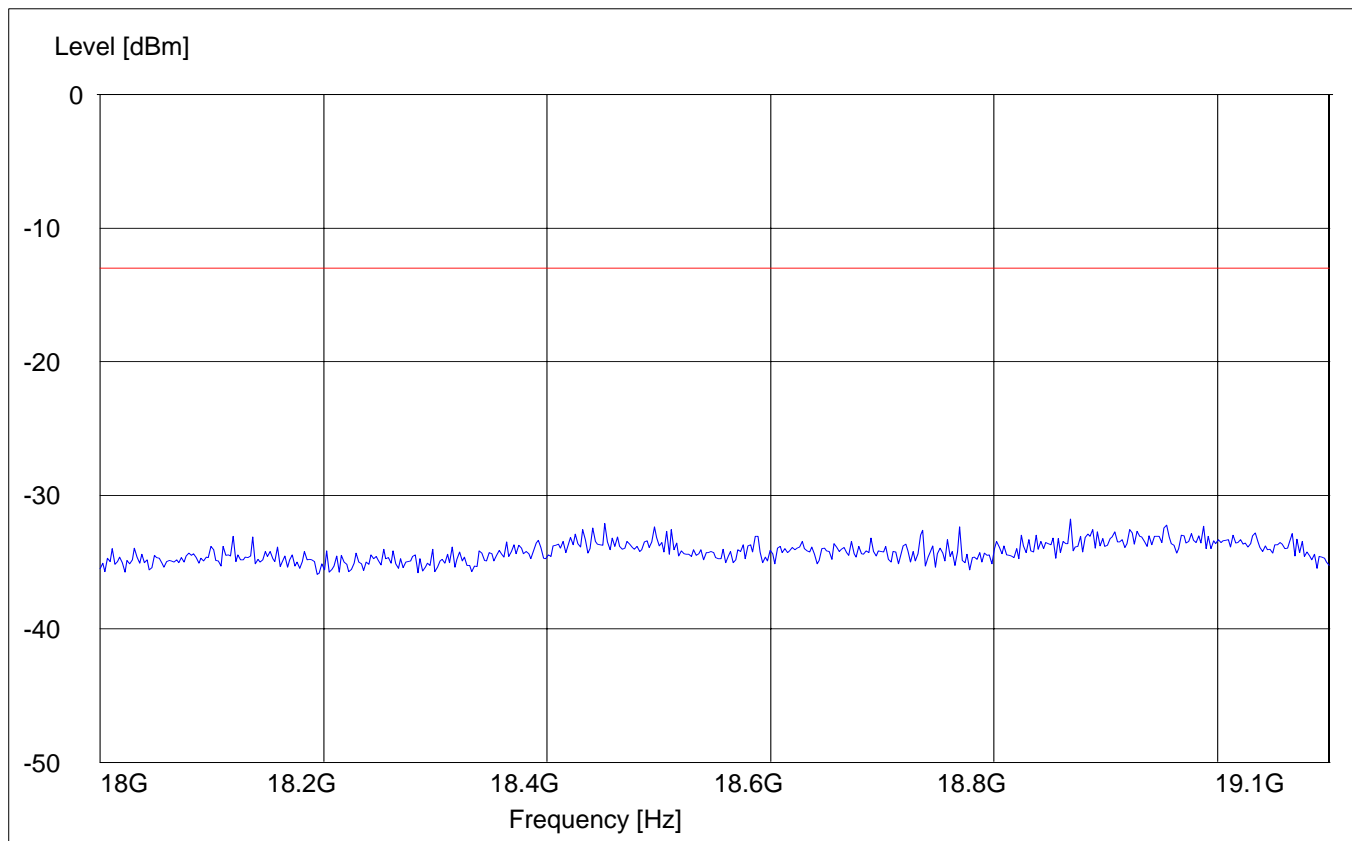


RADIATED SPURIOUS EMISSIONS**EUT in Idle Mode: 18GHz – 19.1GHz**

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



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

1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 18GHz and 26.5GHz very short cable connections to the antenna was used to minimize the noise level.
2. Receiver radiated emissions were done on both 850/1900 bands, but only worst-case plots are submitted in the test reports.

Limits**SUBCLAUSE § 15.209**

Frequency (MHz)	Field strength ($\mu\text{V}/\text{m}$)	Measurement distance (m)
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

RECEIVER RADIATED EMISSIONS

EUT in Idle Mode: 30MHz – 1GHz

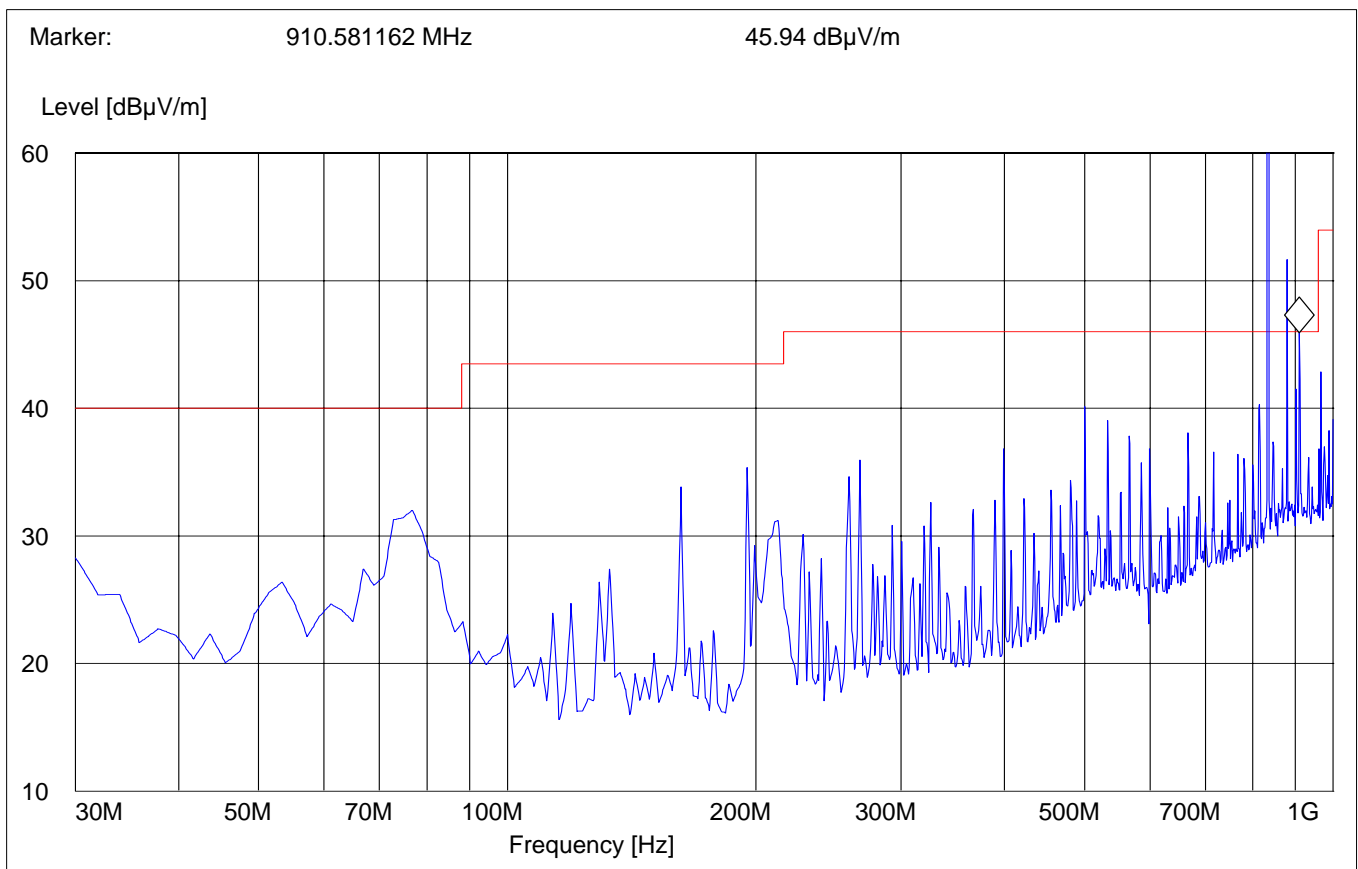
Antenna: Vertical

Note:

1. The peaks above the limit line are from the base station (RF freq. FWD & RF freq. REV respectively)
2. QP level @ the marked freq. is 5.94 dB lower

SWEEP TABLE: "FCC 15 Spur 30M-1G"

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



RECEIVER RADIATED EMISSIONS

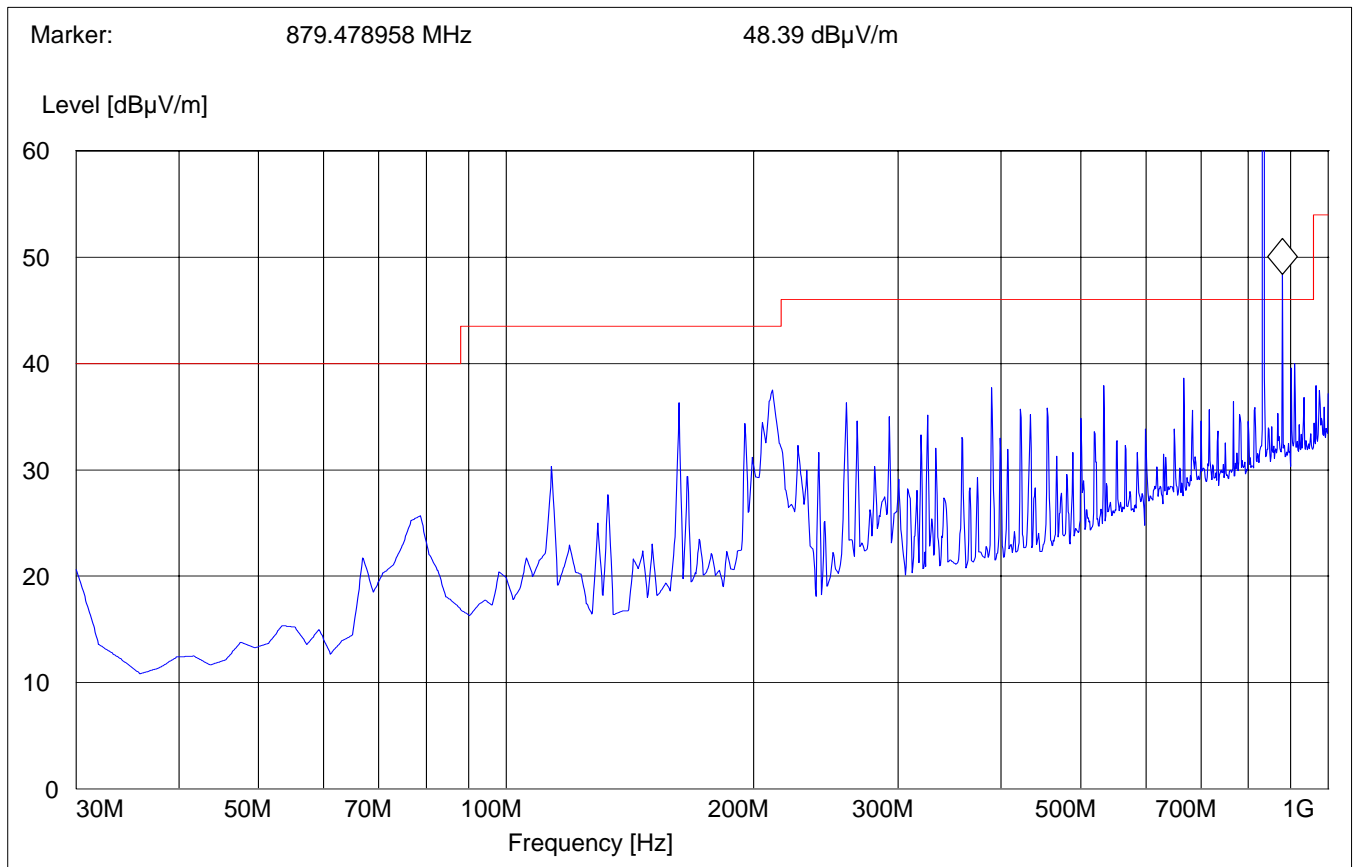
EUT in Idle Mode: 30MHz – 1GHz

Antenna: Horizontal

Note: The peaks above the limit line are from the base station (RF freq. FWD & RF freq. REV respectively)

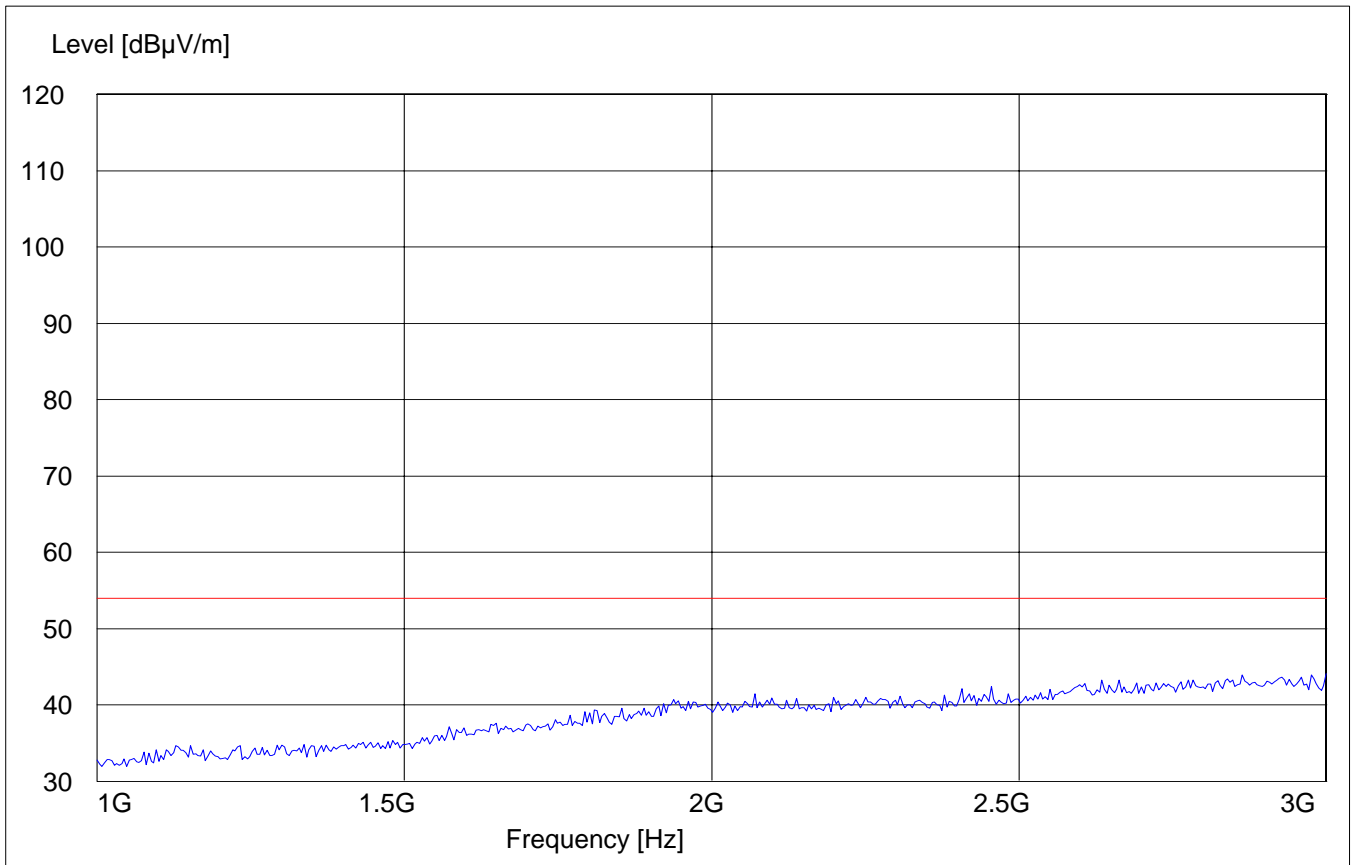
SWEEP TABLE: "FCC 15 Spur 30M-1G"

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



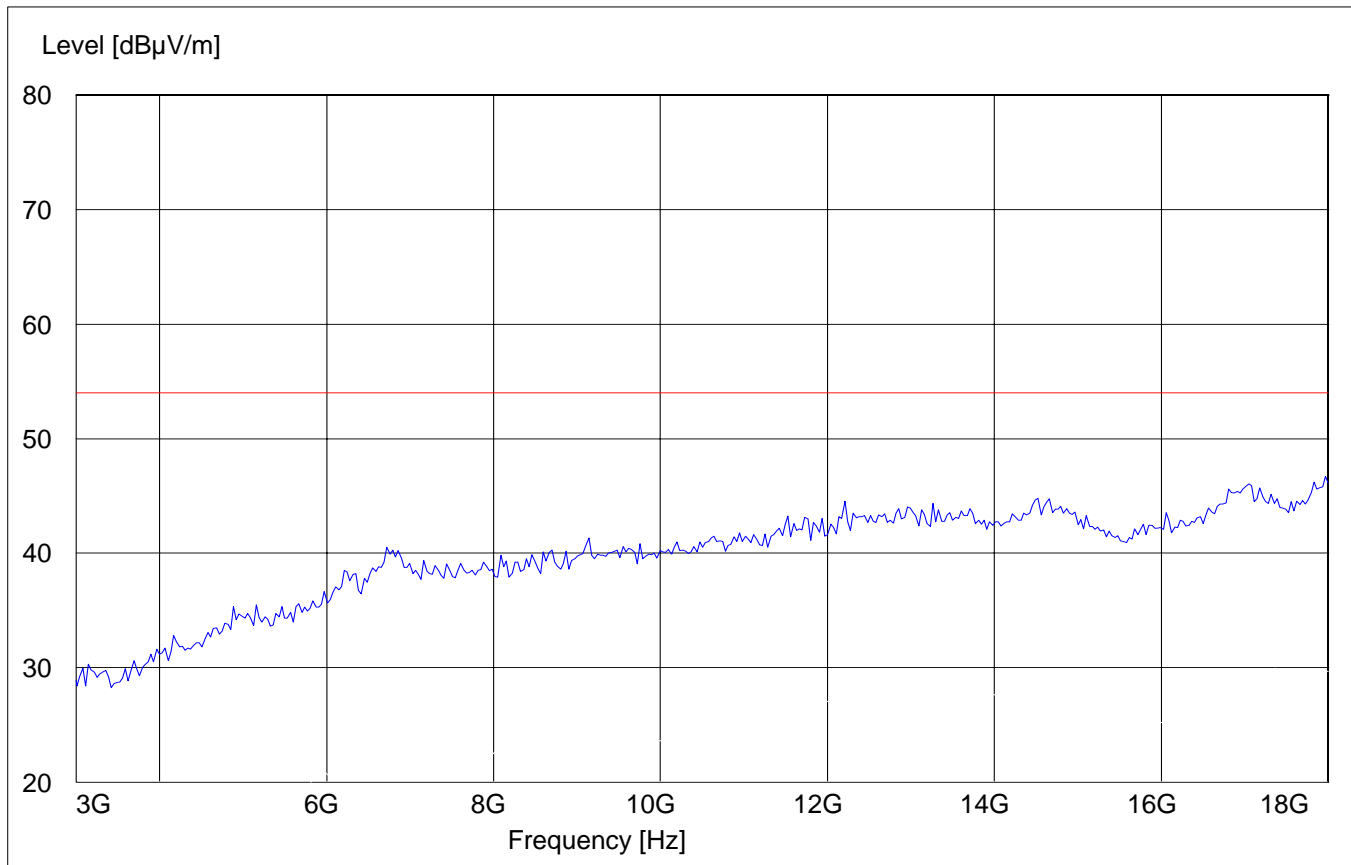
RECEIVER RADIATED EMISSIONS
EUT in Idle Mode: 1GHz – 3GHz**SWEEP TABLE: "FCC 15 Spuri 1-3G"**

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



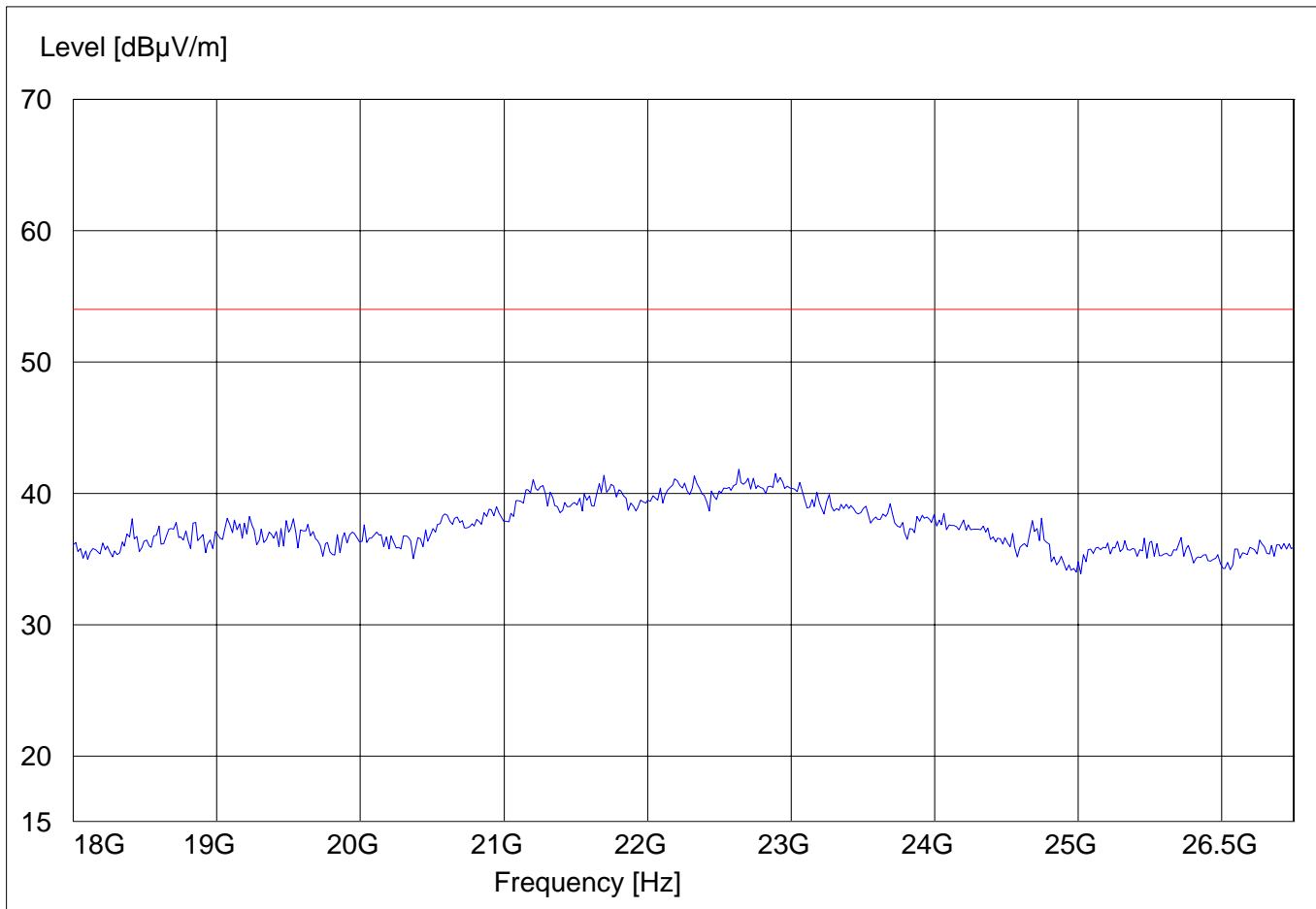
RECEIVER RADIATED EMISSIONS
EUT in Idle Mode: 3GHz – 18GHz**SWEEP TABLE: "FCC 15 spuri 3-18G"**

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



RECEIVER RADIATED EMISSIONS
EUT in Idle Mode: 18GHz – 26.5GHz**SWEEP TABLE: "FCC 15 spuri 18-26.5G"**

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW/VBW
18GHz	26.5GHz	Max Peak	Coupled	1 MHz



CONDUCTED EMISSIONS

§ 15.107/207

This test is not applicable for this EUT

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

Radiated Testing

ANECHOIC CHAMBER

