FCC Test report

Test report no.: EMC_1069_2005_FCC25

FCC Part 25 / RSS 170
Model: MBS2-LP
FCC ID: P5IMBS2LP
IC ID: 1478A-MBS2LP

Deutscher Akkreditierungs Rat DAR

TTI-P-G 081/94-A0

Accredited according to **ISO/IEC 17025**

Bluetooth

Bluetooth Qualification Test Facility (BQTF)

CTIA Authorized Testing Laboratory

FCC listed # 101450

IC recognized # 3925

***CETECOM* Inc.**

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

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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: Neelesh Raj

1.2 Testing laboratory

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Internet: www.cetecom.com

1.3 Details of applicant

Name	**:**	Wireless Matrix Corporation
Street	**:**	12369-B Sunrise Valley Drive
City / Zip Code	**:**	Reston, VA 20164
Country	**:**	USA
Contact	**:**	Darryl Strucko
Telephone	**:**	703.262.4021
Tele-fax	**:**	703.262.3085
e-mail	**:**	**Darryl.strucko@wrx-us.com**

1.4 Application details

Date of receipt test item	:	2005-10-07
Date of test	:	2005-10-10 to 2005-10-11

1.5 Test item

Manufacturer	:	Applicant
Marketing Name	:	Mobile Base Station 2 Low Profile (MBS2-LP)
Model No.	:	MBS2-LP
Description	:	Satellite, GPRS, 802.11, GPS in one unit with RS-232 and Ethernet capabilities.
FCC-ID	**:**	**P5IMBS2LP**
IC-ID	**:**	**1478A-MBS2LP**

Additional information

Frequency	:	Tx 1626.5MHz – 1660.5MHz Rx 1525MHz – 1559MHz
Type of modulation	:	QPSK
Number of channels	:	5666
Antenna	:	Planar Spiral
Power supply	:	13.6VDC Nominal voltage
Output power	:	46.7W EIRP @ 1660.5MHz
Extreme temp. Tolerance	:	Lower: -20°C Upper: +60°C

1.6 Test standards: **FCC Part 25 / CANADA RSS-170**

This test report covers full radiated testing as per FCC 25 and RSS 170 on the EUT . All conducted measurements are covered under

FCC ID: P51MBS2A

IC ID: 1478A-MB52A

REPORT#: EMC_624FCC-25_2005_SAT

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

2 Technical test

2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests Performed	
Final Verdict: (only “passed” if all single measurements are “passed”)	**Passed**

Technical responsibility for area of testing:

Date	Section	Name	Signature
2005-10-27	EMC & Radio	Lothar Schmidt (Technical Manager)	

Responsible for test report and project leader:

Date	Section	Name	Signature
2005-10-27	EMC & Radio	Neelesh Raj (EMC Engineer)	

2.2 Test report

TEST REPORT

Test report no.: EMC_1069_2005_FCC25
(Model: MBS2-LP)

TEST REPORT REFERENCE

POWER OUTPUT § 25.204

Summary:
During the process of testing, the EUT was controlled via HyperTerminal.

This paragraph contains peak conducted output power and EIRP measurements for the EUT.
In all cases, 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, 1626.5 MHz, 1643.5 MHz and 1660.5 MHz (bottom, middle and top of operational frequency range) at max peak.
Power measurements were done as per RSS170, 6.2

Limit:
(c) For angles of elevation of the horizon greater than 5° there shall be no restriction as to the equivalent isotropically radiated power transmitted by an earth station towards the horizon.
(max angle of EUT is 35 deg)

Radiated:

EIRP Measurements (peak)

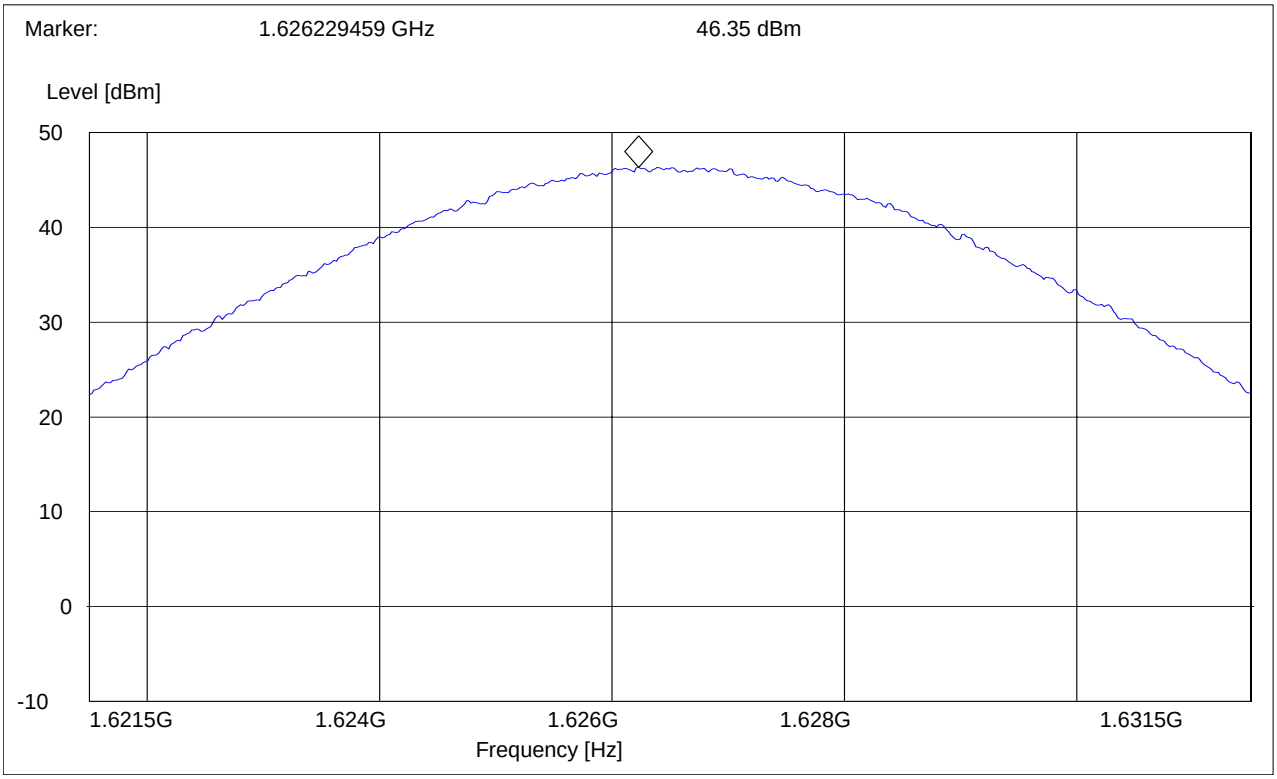
Frequency (MHz)	EIRP (dBm)
1626.5	46.35
1643.5	46.64
1660.5	46.96

ANALYZER SETTINGS: RBW = VBW = 3MHz

EIRP
Lowest Channel: 1626.5MHz

SWEEP TABLE: "EIRP SAT CH-LOW"

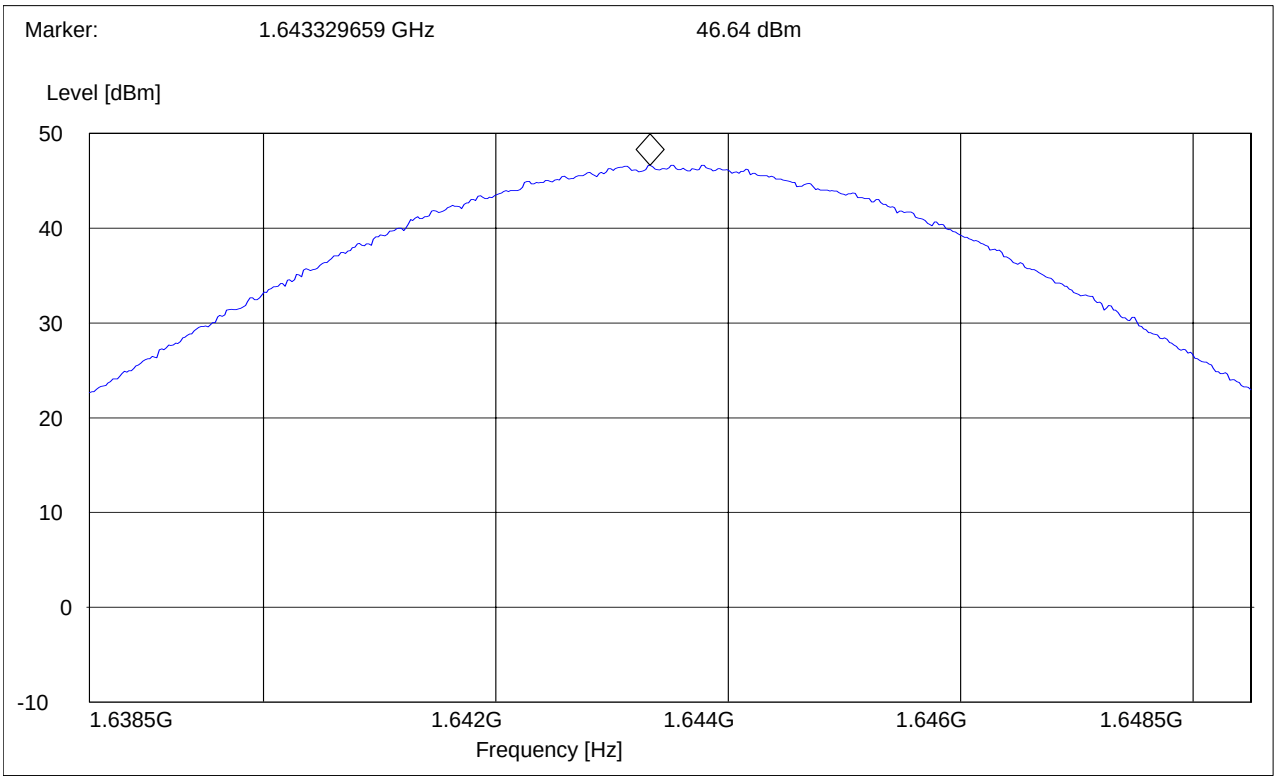
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1.6215 GHz	1.6315 GHz	Max Peak	Coupled	3 MHz



EIRP
Mid Channel: 1643.5MHz

SWEEP TABLE: "EIRP SAT CH-MID"

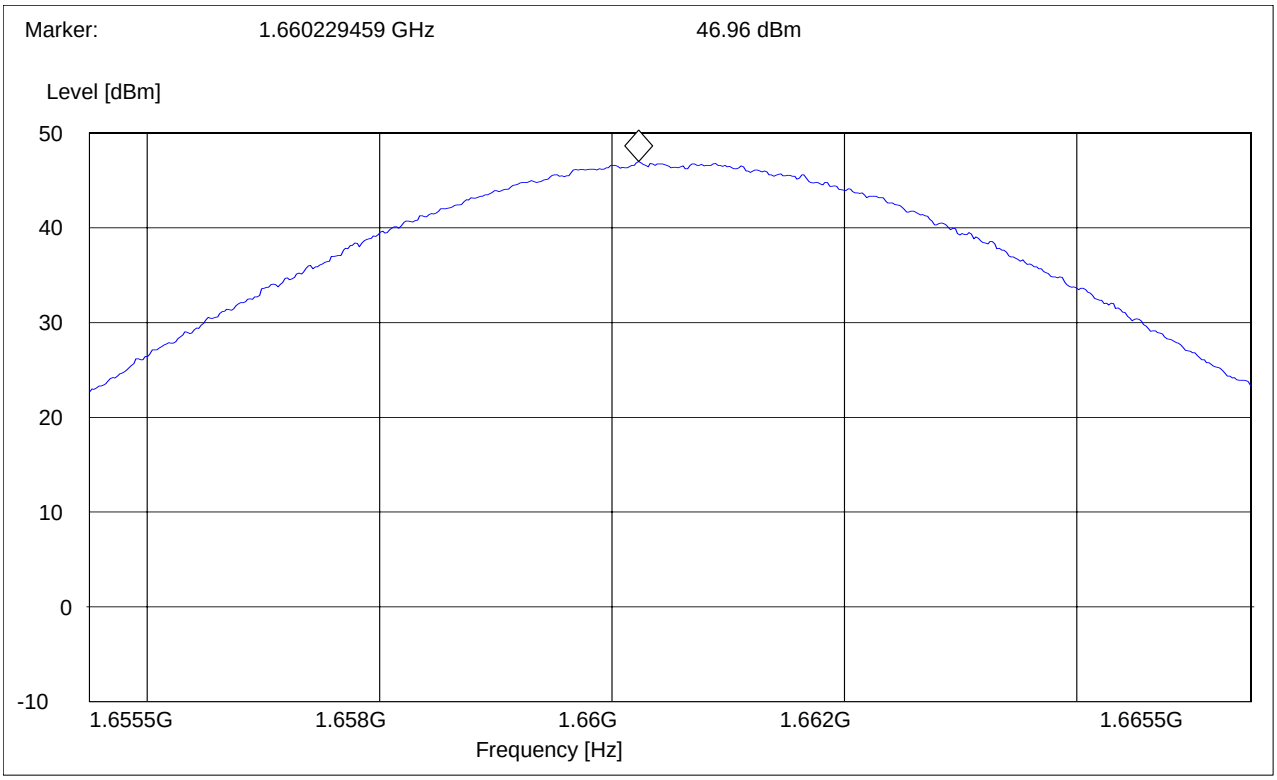
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1.6385 GHz	1.6485 GHz	Max Peak	Coupled	3 MHz



EIRP
Highest Channel: 1660.5MHz

SWEEP TABLE: "EIRP SAT CH-HIGH"

Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1.6555 GHz	1.6655 GHz	Max Peak	Coupled	3 MHz



POWER DENSITY (RADIATED) §2.1091

Measurement Procedure:
The EUT was measured at a distance of 3 meters then the receive antenna was moved closer to transmitter until maximum allowed power density was reached. An EIRP measurement was then taken and the power density calculated.

Results for 1660.5(MHz)

Far field region = 62.8cm
EIRP= 47dBm

S(far field) = PG/4πR^2

50/4π0.628^2= 10.0/10= 1.00mW/cm^2

EMISSIONS LIMITS §25.202(f)

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 1660.5 MHz. The resolution bandwidth is set as outlined in Part 25. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels.

The final Radiated emission test procedure is as follows:
a) The test item was placed on a 0. 8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
b) A double-ridged wave-guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
c) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded.

Channel	Frequency
Low	1626.5 MHz
Mid	1643.5 MHz
High	1660.5 MHz

Measurement Limit:
Sec. 25.202(f) Emission Limits.

Measurement Results:

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 3GHz and 18 GHz very short cable connections to the antenna was used to minimize the noise level.

RESULTS OF RADIATED TESTS FOR FCC-25:

Harmonic	Tx Freq.: 1626.5(MHz)	Level (dBm)	Tx Freq.: 1643.5(MHz)	Level (dBm)	Tx Freq.: 1660.5(MHz)	Level (dBm)
2	**3253**	-38.31	**3287**	-32.63	**3321**	-33.82
3	**4879.5**	-43.66	**4930.5**	-49.48	**4981.5**	-50.33
4	**6506**	-39.37	**6574**	-28.81	**6642**	-39.67
5	**8132.5**	-45.65	**8217.5**	-33.81	**8302.5**	-46.01
6	**9759**	-38.5	**9861**	-41.54	**9963**	-42.27
7	**11385.5**	-28.64	**11504.5**	-31.71	**11623.5**	-31.7
8	**13012**	-39.4	**13148**	-37.04	**13284**	-34.52
9	**14638.5**	nf	**14791.5**	nf	**13944.5**	nf
10	**16265**	nf	**16435**	nf	**16605**	nf

nf: noise floor

RADIATED SPURIOUS EMISSIONS

30MHz - 1GHz

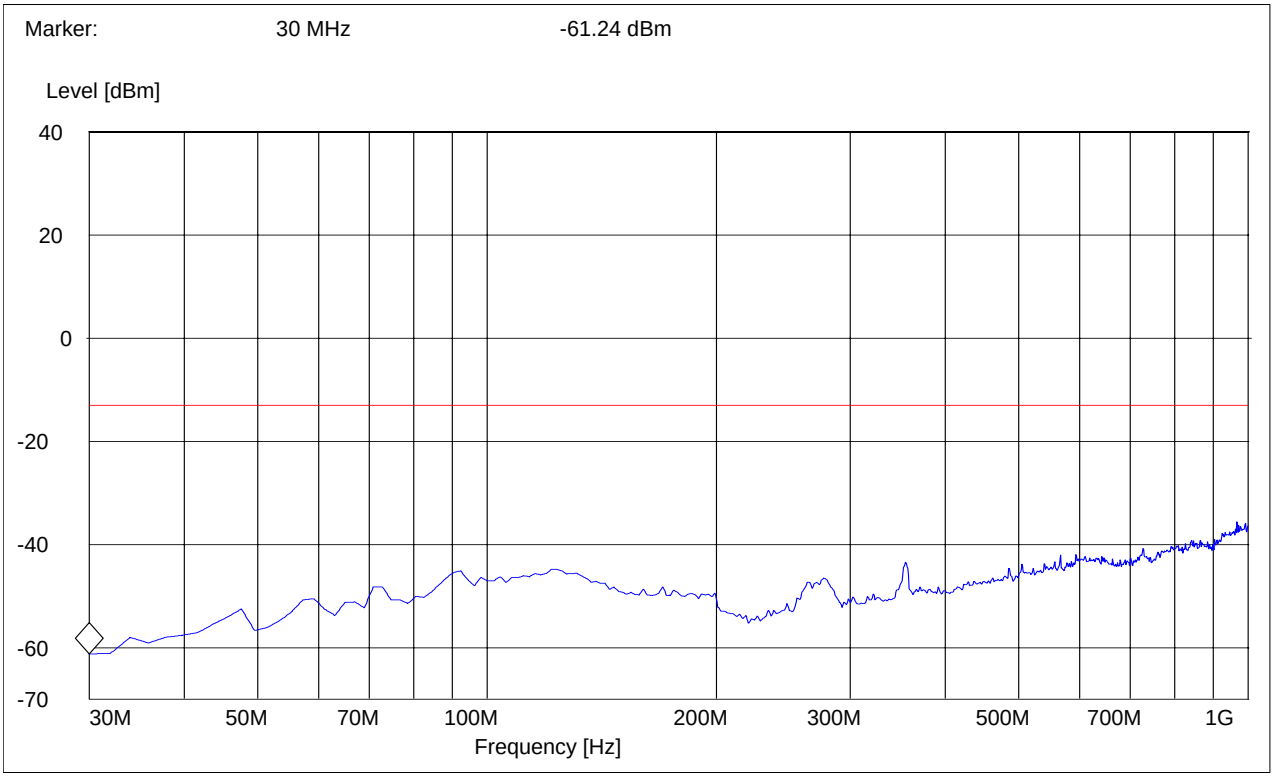
Spurious emission limit –13dBm

Antenna: vertical

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

SWEEP TABLE: "FCC 25 Spur 30M-1G"

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



RADIATED SPURIOUS EMISSIONS

30MHz - 1GHz

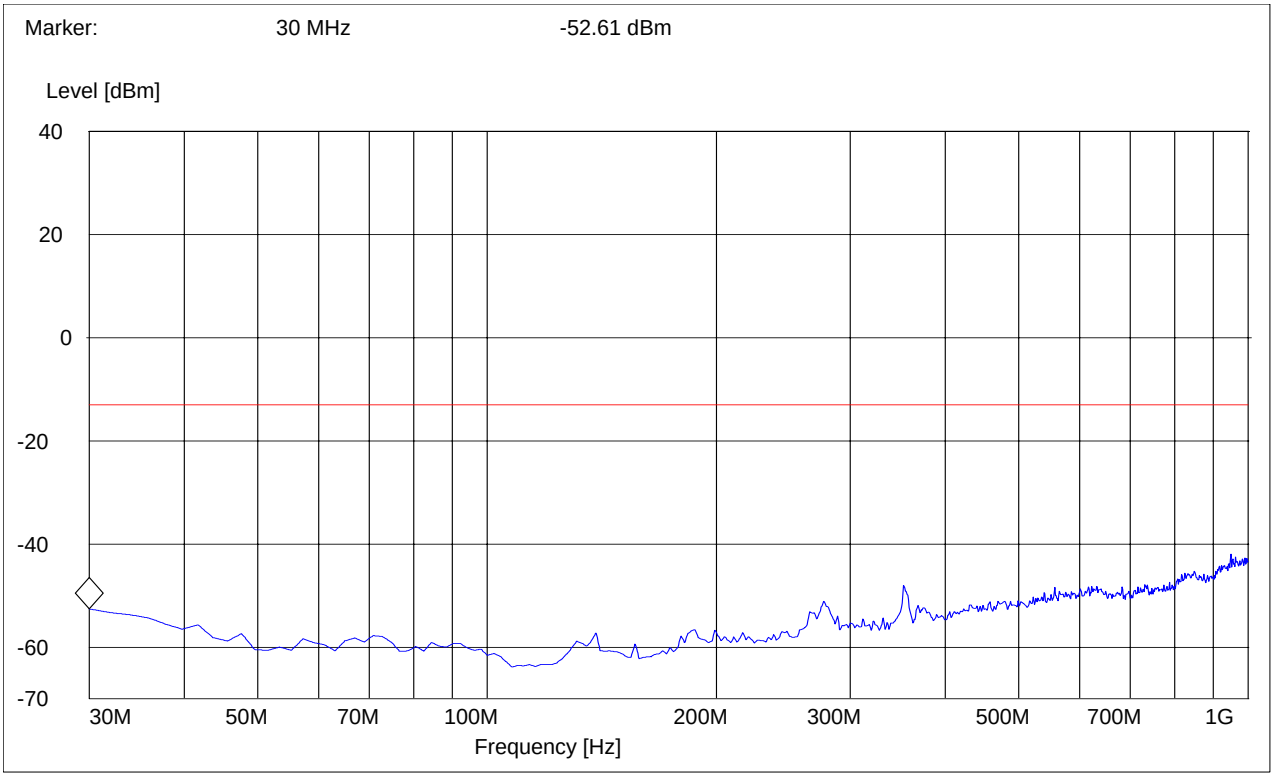
Spurious emission limit –13dBm

Antenna: horizontal

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

SWEEP TABLE: "FCC 25 Spur 30M-1G"

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



RADIATED SPURIOUS EMISSIONS

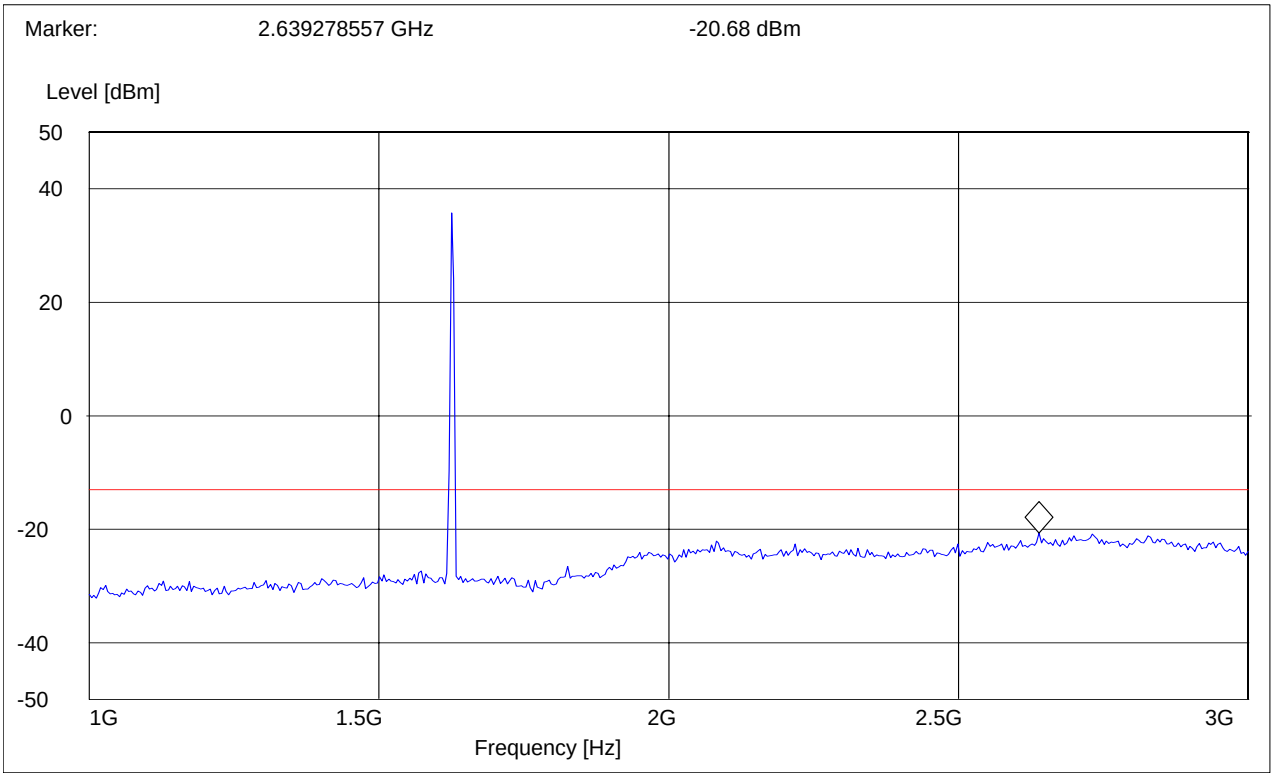
Lowest Channel (1626.5MHz):1GHz - 3GHz

Spurious emission limit –13dBm

NOTE: peak above the limit line is the Carrier frequency @ low channel

SWEEP TABLE: "FCC Spuri 1-3G"

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



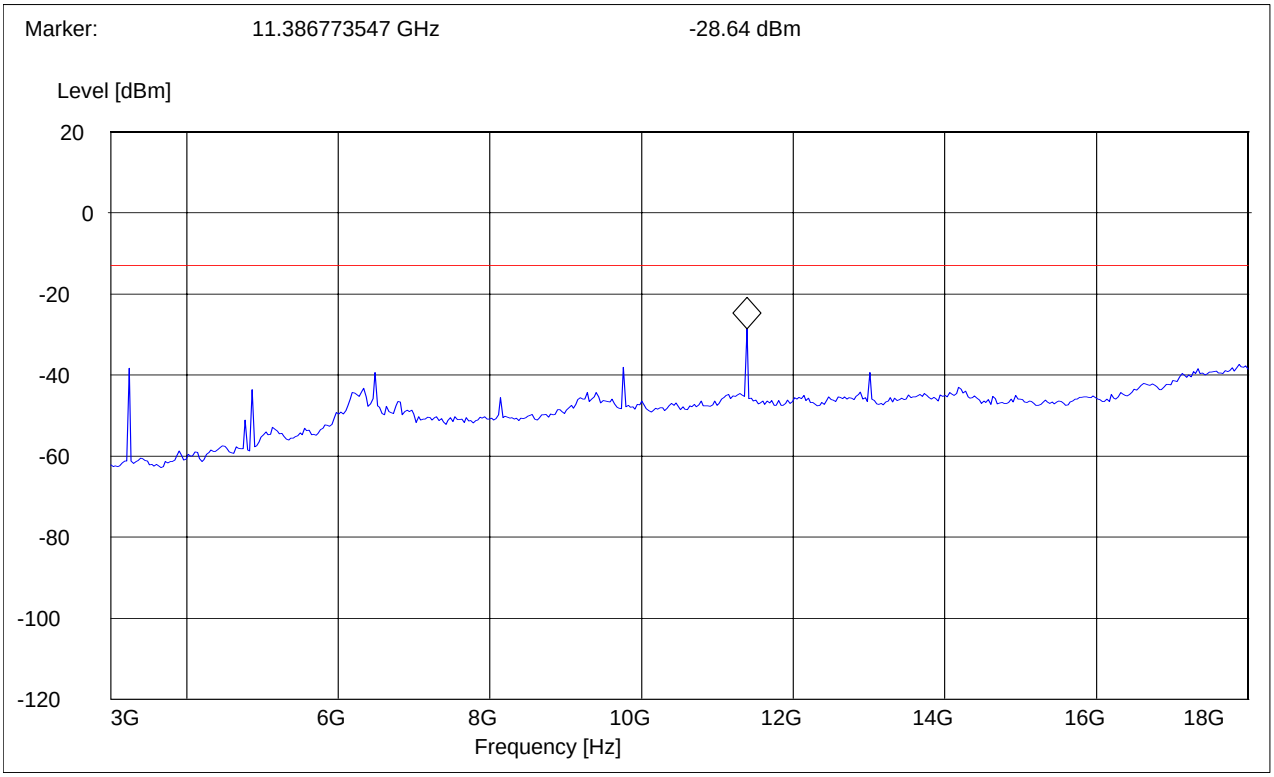
RADIATED SPURIOUS EMISSIONS

Lowest Channel (1626.5MHz):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



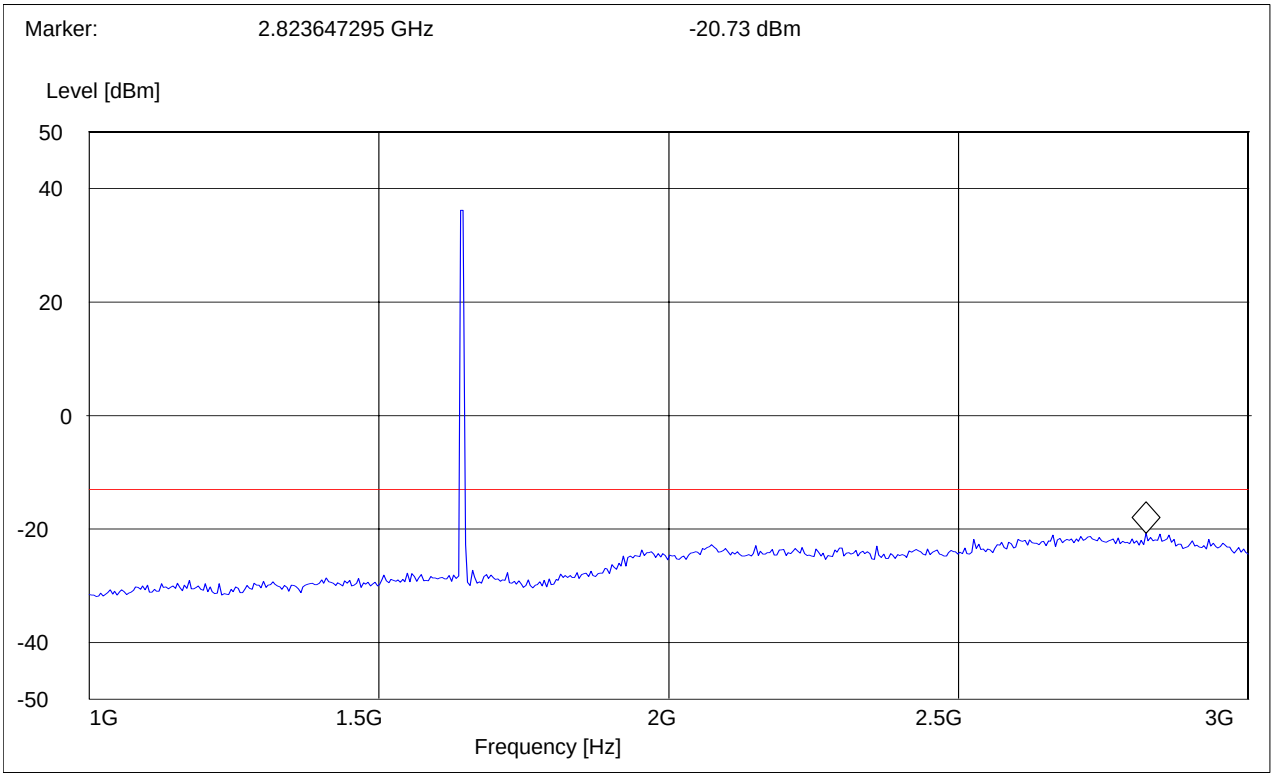
RADIATED SPURIOUS EMISSIONS
Mid Channel (1643.5MHz):1GHz - 3GHz

Spurious emission limit –13dBm

NOTE: peak above the limit line is the Carrier frequency @ mid channel

SWEEP TABLE: "FCC Spuri 1-3G"

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

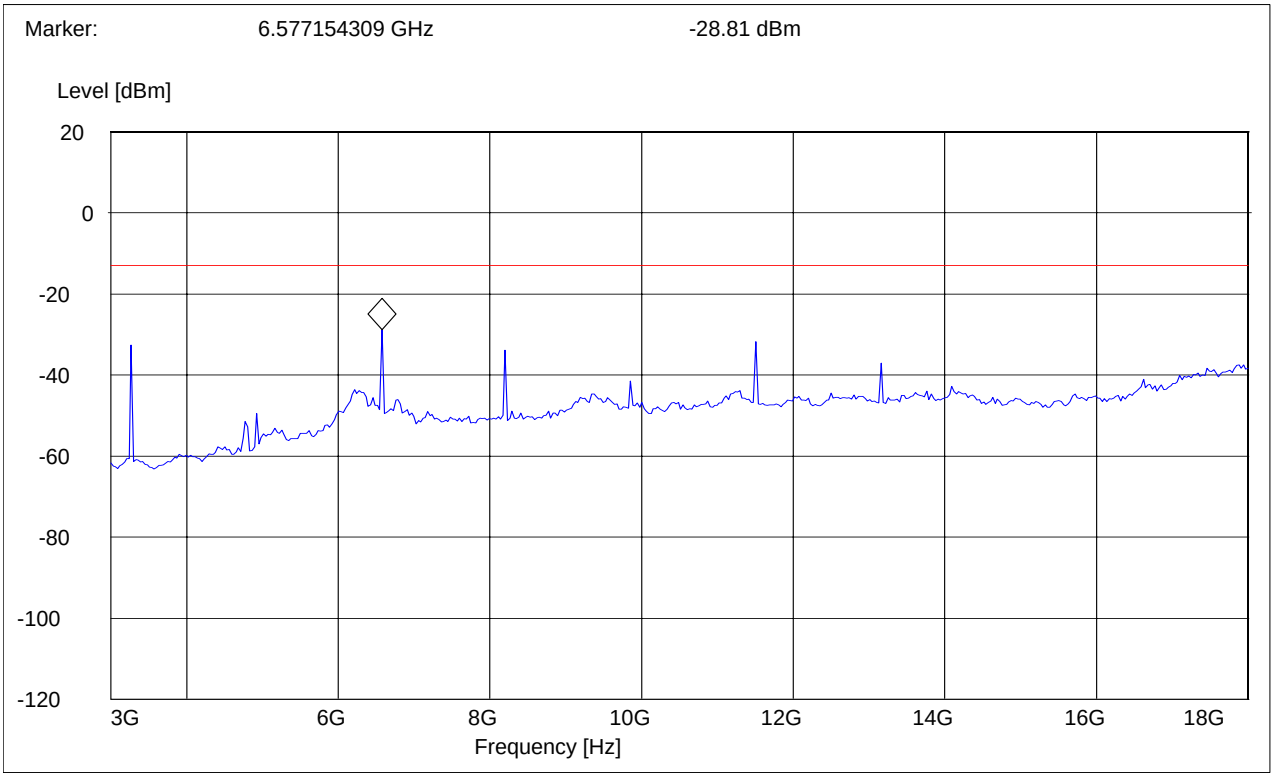


RADIATED SPURIOUS EMISSIONS
Mid Channel (1643.5MHz):3GHz - 18GHz

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



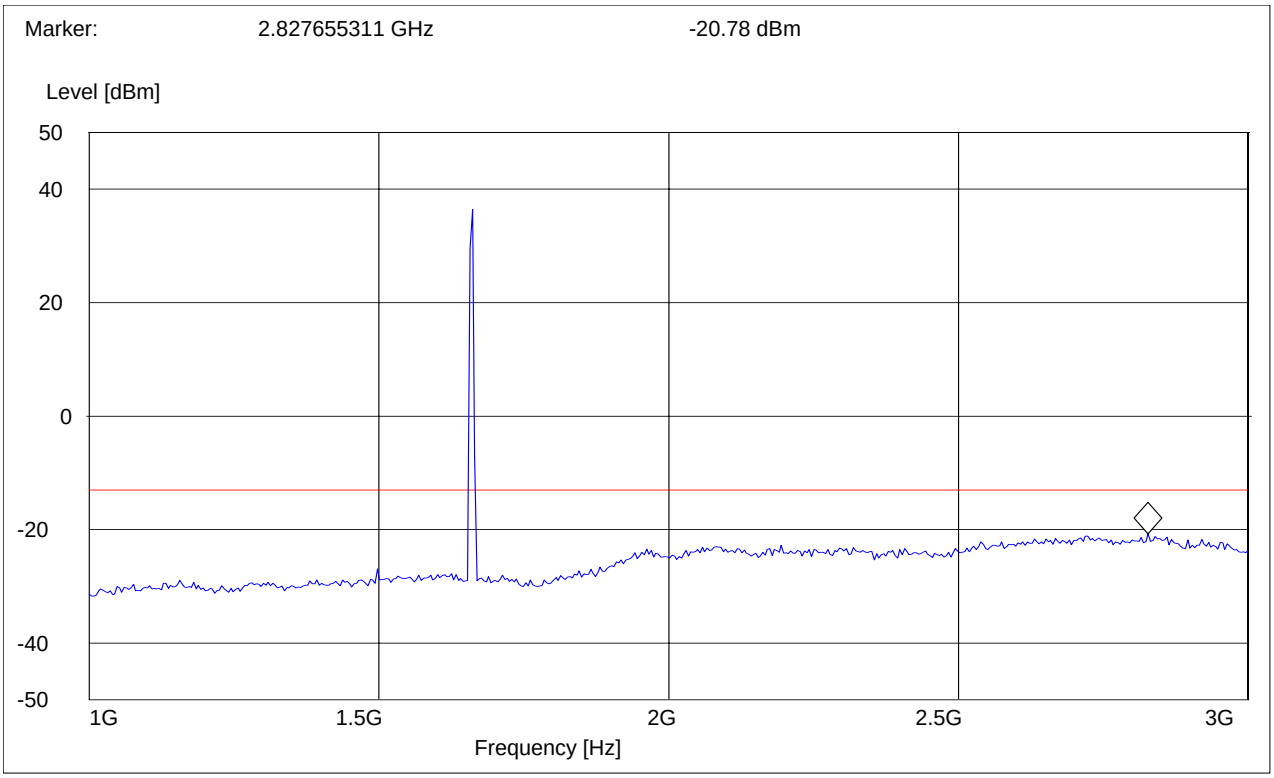
RADIATED SPURIOUS EMISSIONS
Highest Channel (1660.5MHz):1GHz - 3GHz

Spurious emission limit –13dBm

NOTE: marked peak above the limit line is the Carrier frequency @ high channel

SWEEP TABLE: "FCC Spuri 1-3G"

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

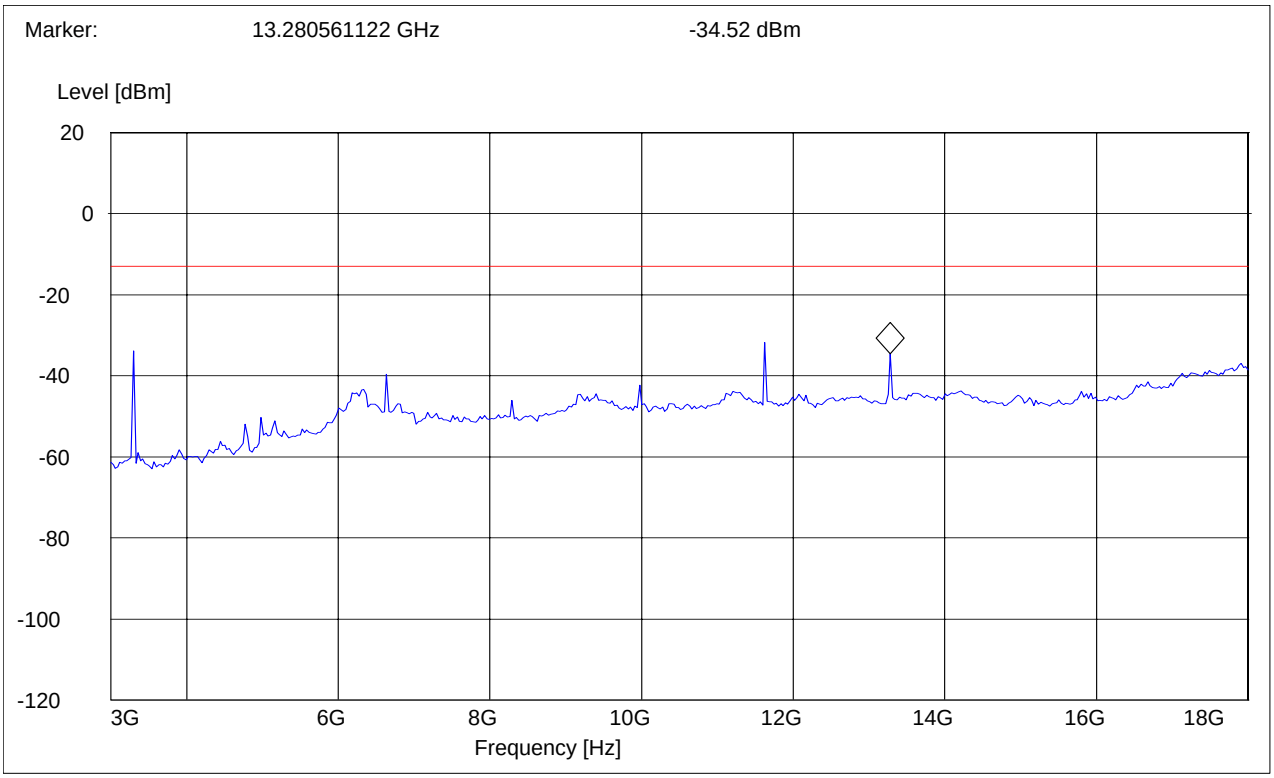


RADIATED SPURIOUS EMISSIONS
Highest Channel (1660.5MHz):3GHz - 18GHz

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



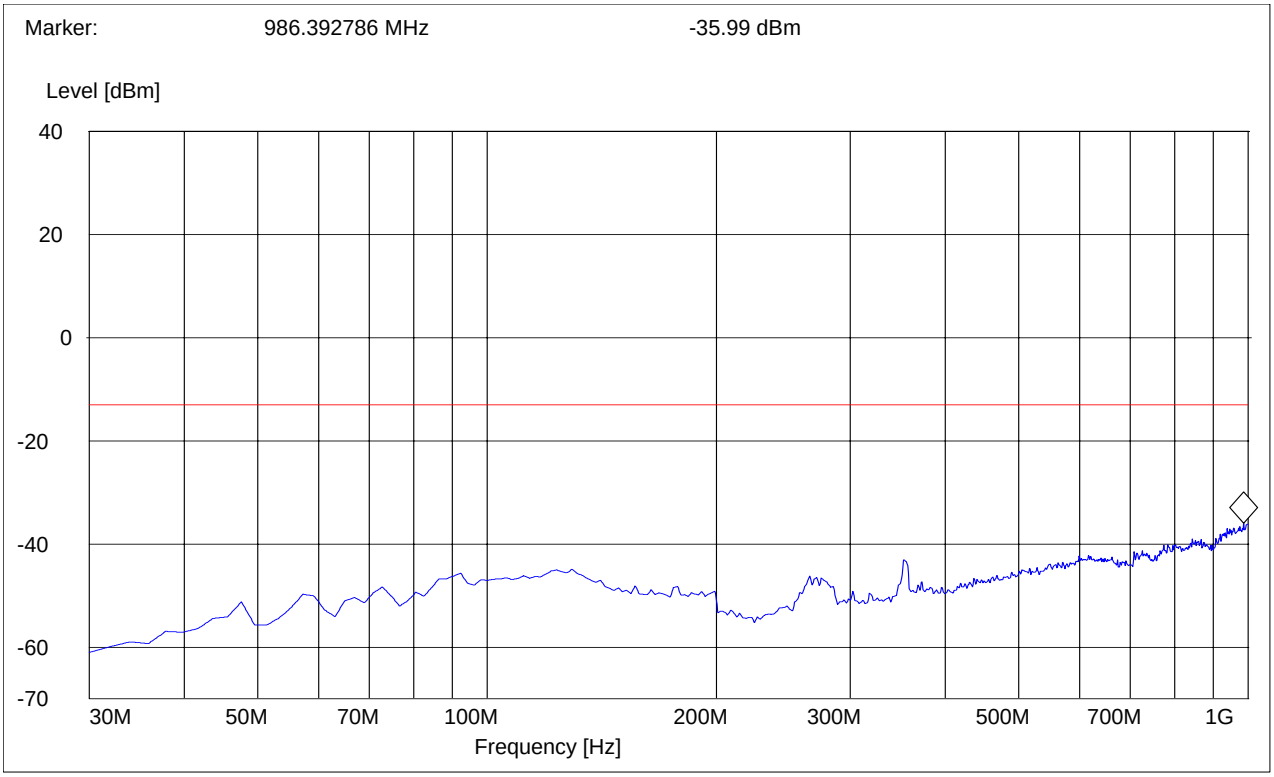
RADIATED SPURIOUS EMISSIONS
EUT in Idle Mode: 30MHz – 1GHz

Spurious emission limit –13dBm

Antenna: vertical

SWEEP TABLE: "FCC 25 Spur 30M-1G"

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



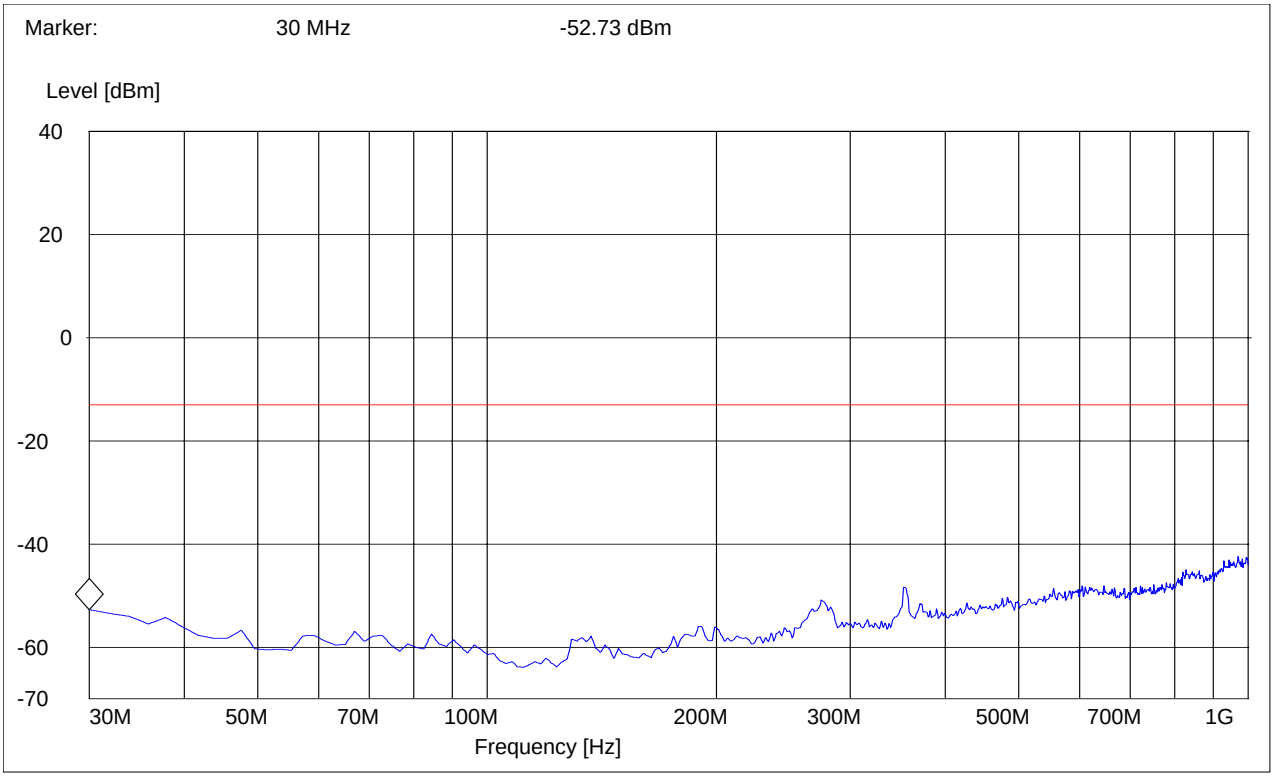
RADIATED SPURIOUS EMISSIONS
EUT in Idle Mode: 30MHz – 1GHz

Spurious emission limit –13dBm

Antenna: horizontal

SWEEP TABLE: "FCC 25 Spur 30M-1G"

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

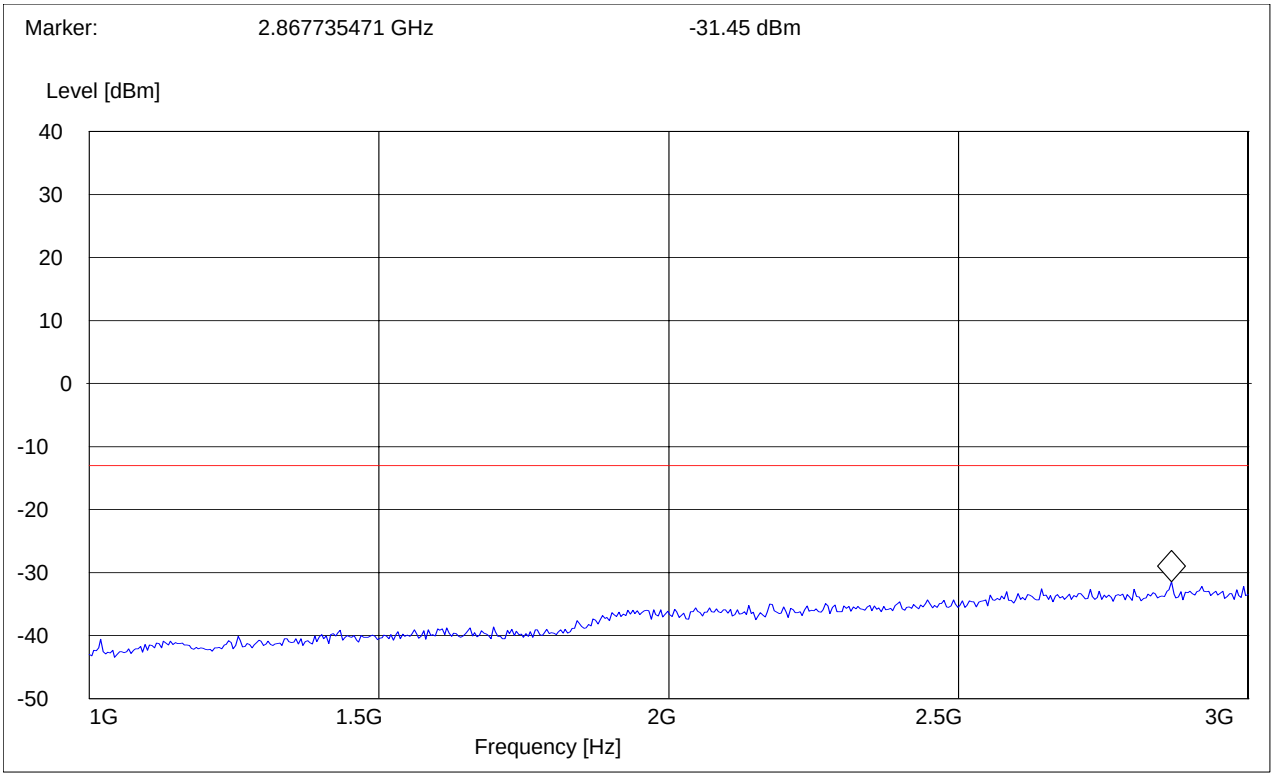


RADIATED SPURIOUS EMISSIONS
EUT in Idle Mode: 1GHz – 3GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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

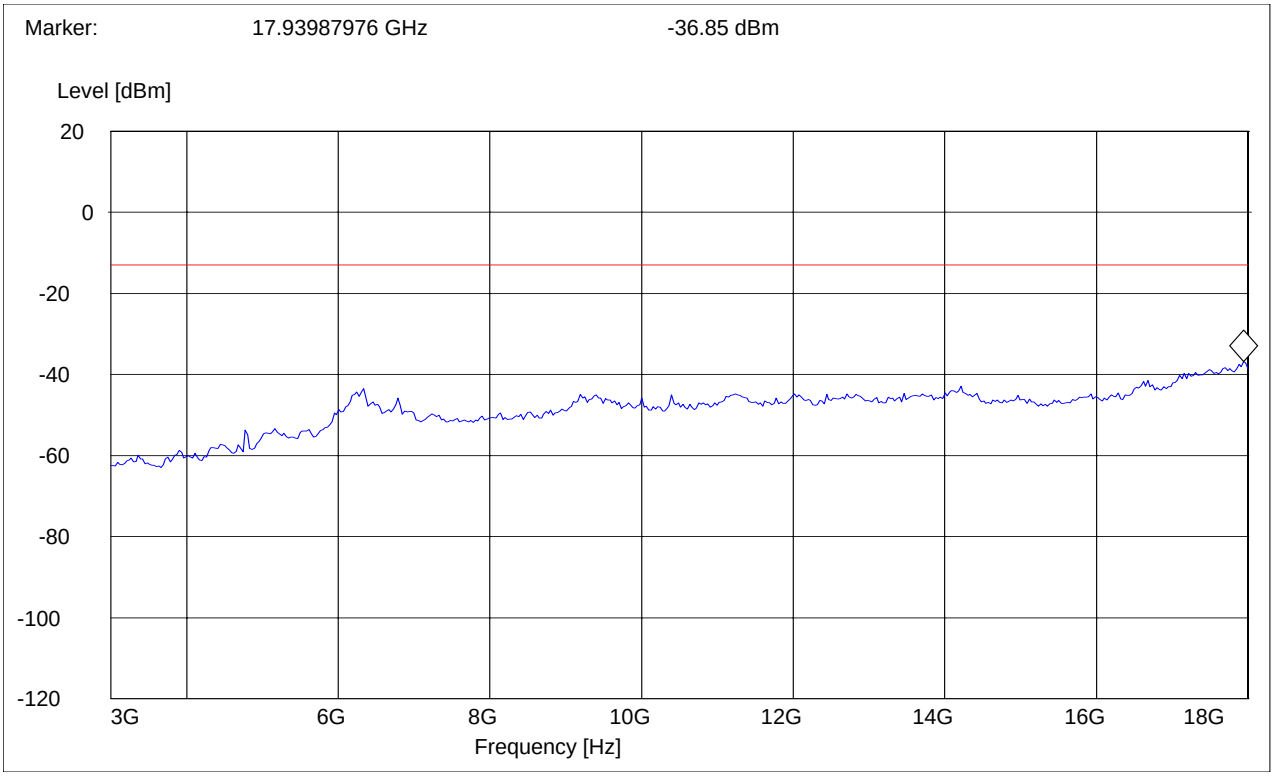


RADIATED SPURIOUS EMISSIONS
EUT in Idle Mode: 3GHz – 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC spuri 3-18G"

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



RECEIVER RADIATED EMISSIONS § 15.209

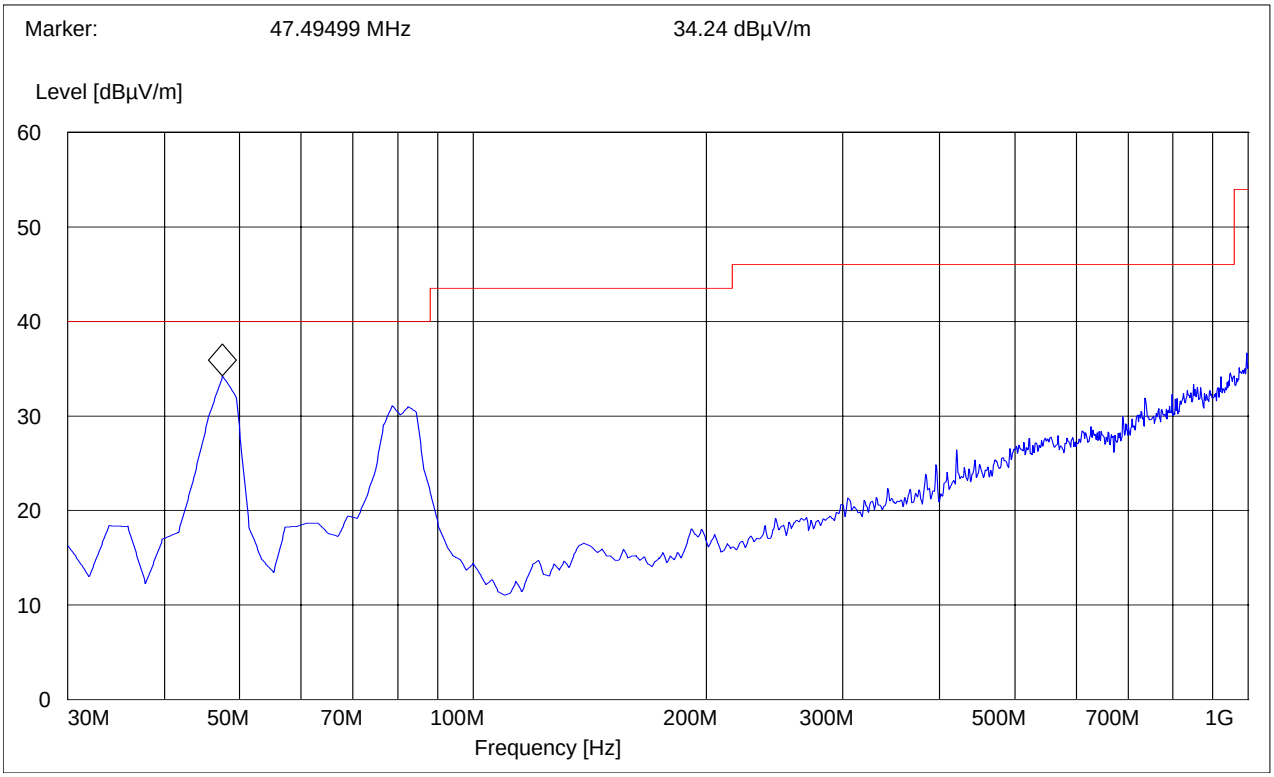
NOTE: The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3GHz and 18GHz very short cable connections to the antenna was used to minimize the 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

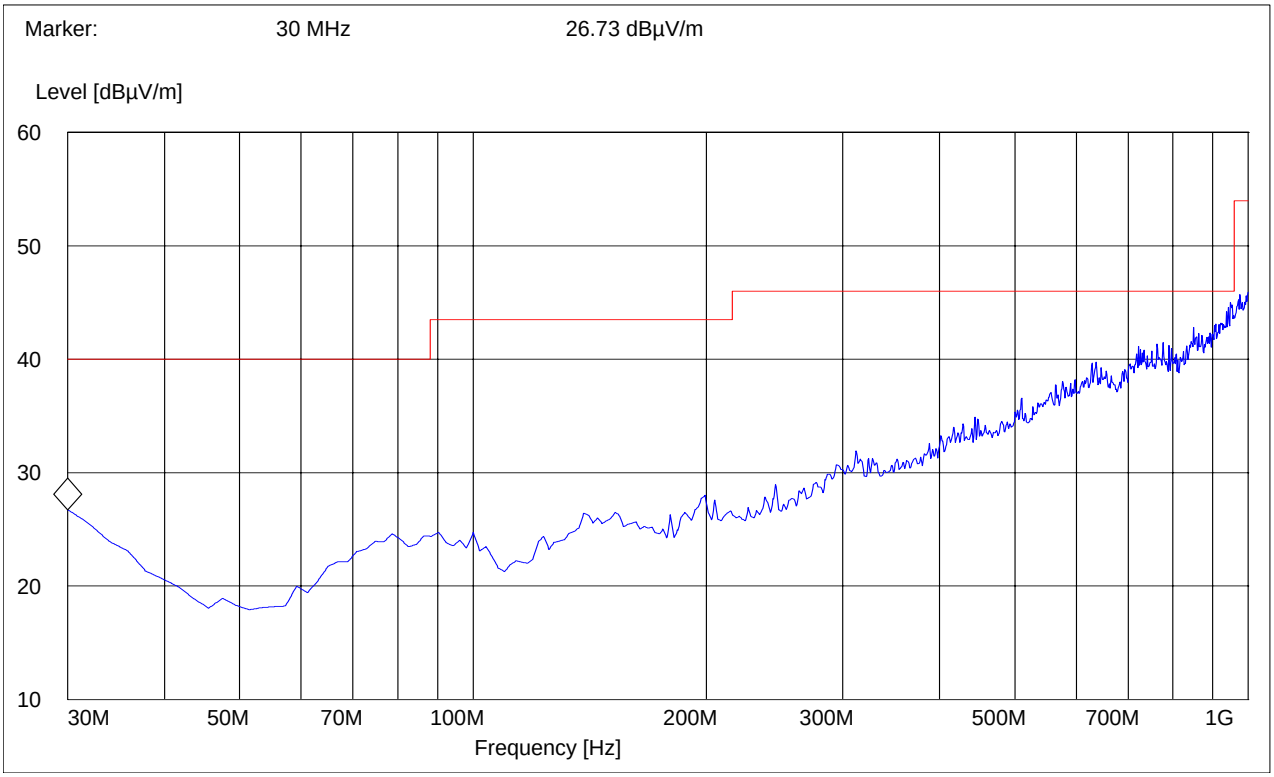
RECEIVER RADIATED EMISSIONS
EUT in Rx Mode: 30MHz – 1GHz
Antenna: vertical
SWEEP TABLE: "FCC 15 Spur 30M-1G"

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



RECEIVER RADIATED EMISSIONS
EUT in Rx Mode: 30MHz – 1GHz
Antenna: horizontal
SWEEP TABLE: "FCC 15 Spur 30M-1G"

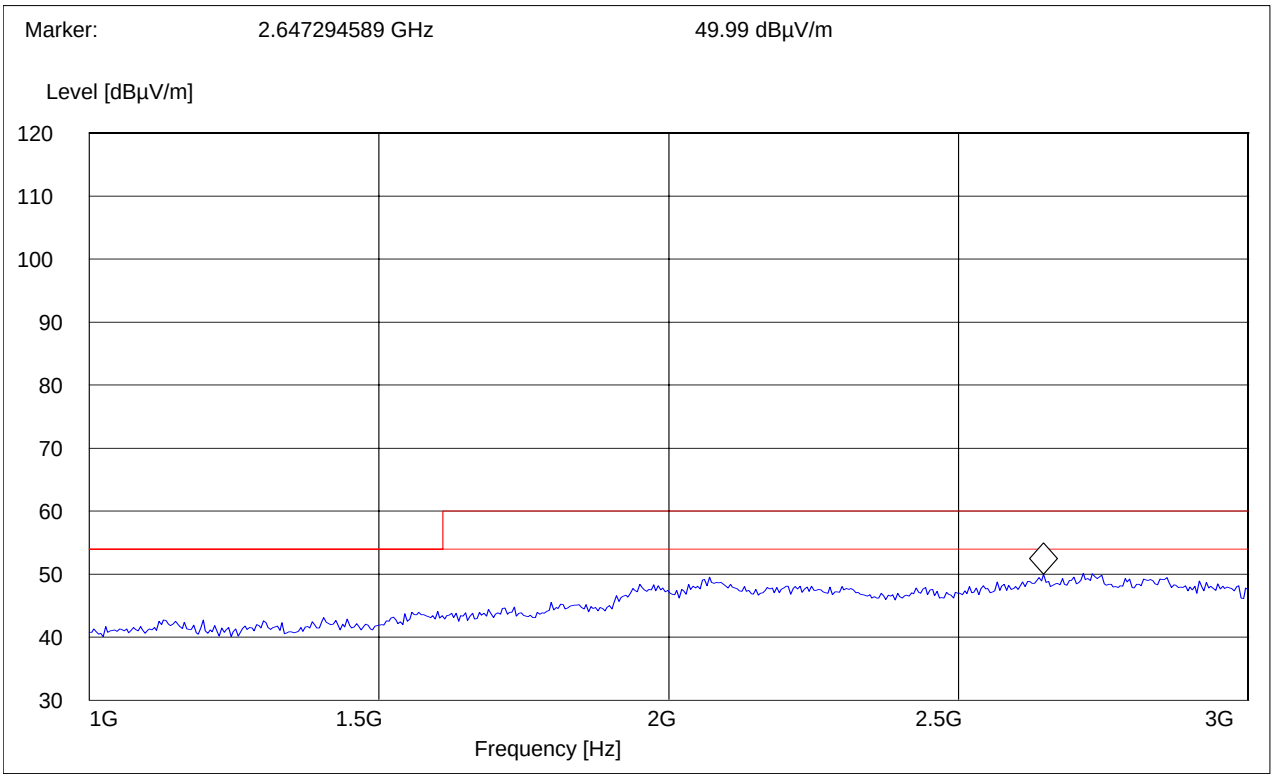
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
30MHz	1GHz	Max Peak	Coupled	100KHz



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

SWEEP TABLE: "FCC 15 Spuri 1-3G"

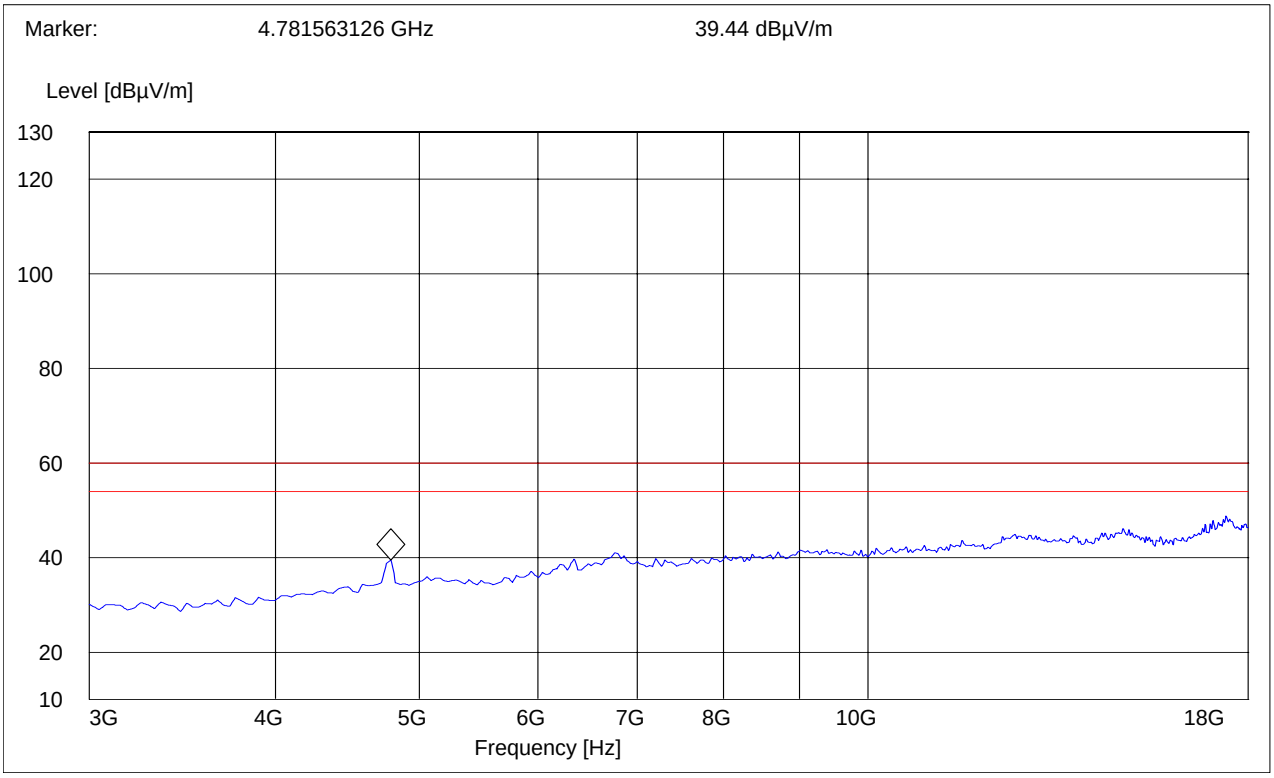
Start Frequency	*Stop Frequency*	*Detector*	*Meas. Time*	*RBW/VBW*
1GHz	3GHz	Max Peak	Coupled	1 MHz



RECEIVER RADIATED EMISSIONS
EUT in Rx 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



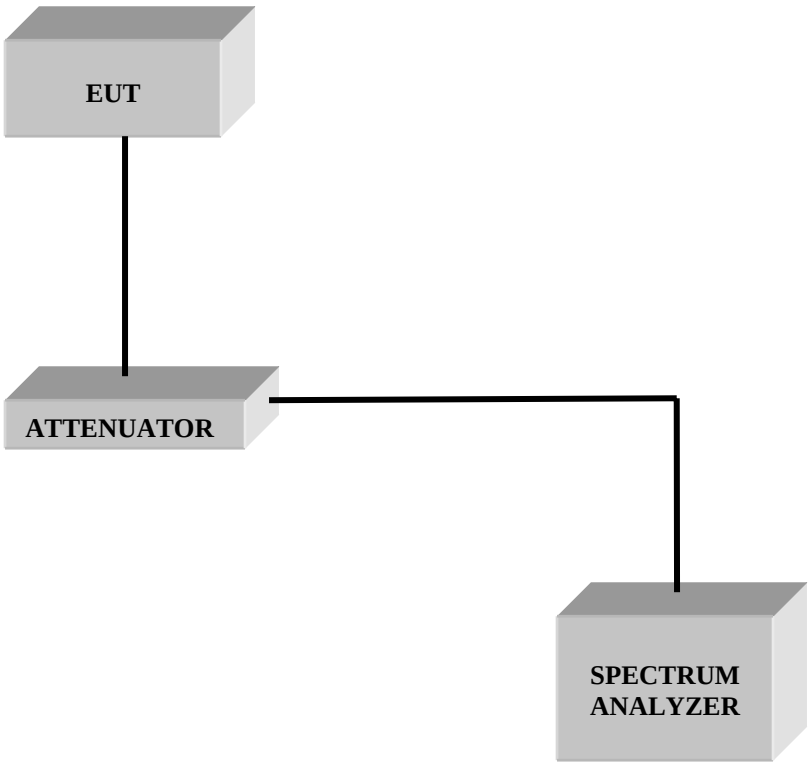
AC LINE CONDUCTED EMISSIONS **§ 15.107/207**

This measurement is not applicable for 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

BLOCK DIAGRAMS
Conducted Testing



Radiated Testing