



FCC Test Report

Test report no.: EMC_802FCC24_2004

FCC Part 22, 24 / RSS 132, 133

Model: SP640

FCC ID: SONSP640

IC ID: 5509A-SP640



TTI-P-G 081/94-A0

Accredited according to **ISO/IEC 17025**



**Bluetooth Qualification
Test Facility
(BQTF)**



FCC listed # 101450

IC recognized # 3925

CETECOM Inc.

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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**

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1.3 Details of applicant

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Tele-fax : +1 604 233 1108
e-mail : gerry@wideray.com

1.4 Application details

Date of receipt test item : 2004-11-15
Date of test : 2004-11-15/16/22

1.5 Test item

Manufacturer : Applicant
Marketing Name : SP640
Model No. : SP640
Description : **GSM 1900 and BT Service Point**
FCC-ID : **SONSP640**
IC-ID : **5509A-SP640**

Additional information

Frequency : 1850.2MHz – 1909.8MHz for PCS 1900
Type of modulation : GMSK
Number of channels : 299 for PCS-1900
Antenna : Internal PCB
Power supply : 12VDC from AC adaptor (3.5VDC internal to BT and GSM)
Output power : 28.79dBm (756.84mW) max. EIRP measured in PCS-1900
Extreme Voltage Limits : 12VDC \pm 5%
Extreme temp. Tolerance : Lower: 0°C Upper: +50°C

1.6 Test standards

FCC Part 22,24 / RSS132,133 r1

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

The EUT (SP640) carries pre-certified Motorola GSM module with FCC ID: IHDT6AC1. This test report covers full radiated testing as per FCC 24 on EUT with GSM module. All conducted measurements are covered under test report# AC-EX06 test report
For BT test data please refer to test report# EMC_802FCC15.247_2004

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:

2004-12-14 EMC & Radio

Lothar Schmidt
(Technical Manager)



Date

Section

Name

Signature

Responsible for test report and project leader:

2004-12-14 EMC & Radio Harpreet Sidhu (EMC Engineer)



Date

Section

Name

Signature

2.2 Test report

TEST REPORT

Test report no.: EMC_802FCC24_2004

TEST REPORT REFERENCE

PARAMETER TO BE MEASURED	PARAGRAPH	PAGE
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POWER OUTPUT**§ 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 average output power, 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,

824.2 MHz, 836.6 MHz and 848.8 MHz (bottom, middle and top of operational frequency range) for GSM-850

1850.2 MHz, 1880.0 MHz and 1909.8 MHz (bottom, middle and top of operational frequency range) for PCS-1900

EIRP (PCS-1900) §24.232(b)**Limits:**

Power Control Level	Burst Peak EIRP
0	≤33dBm (1W)

EIRP

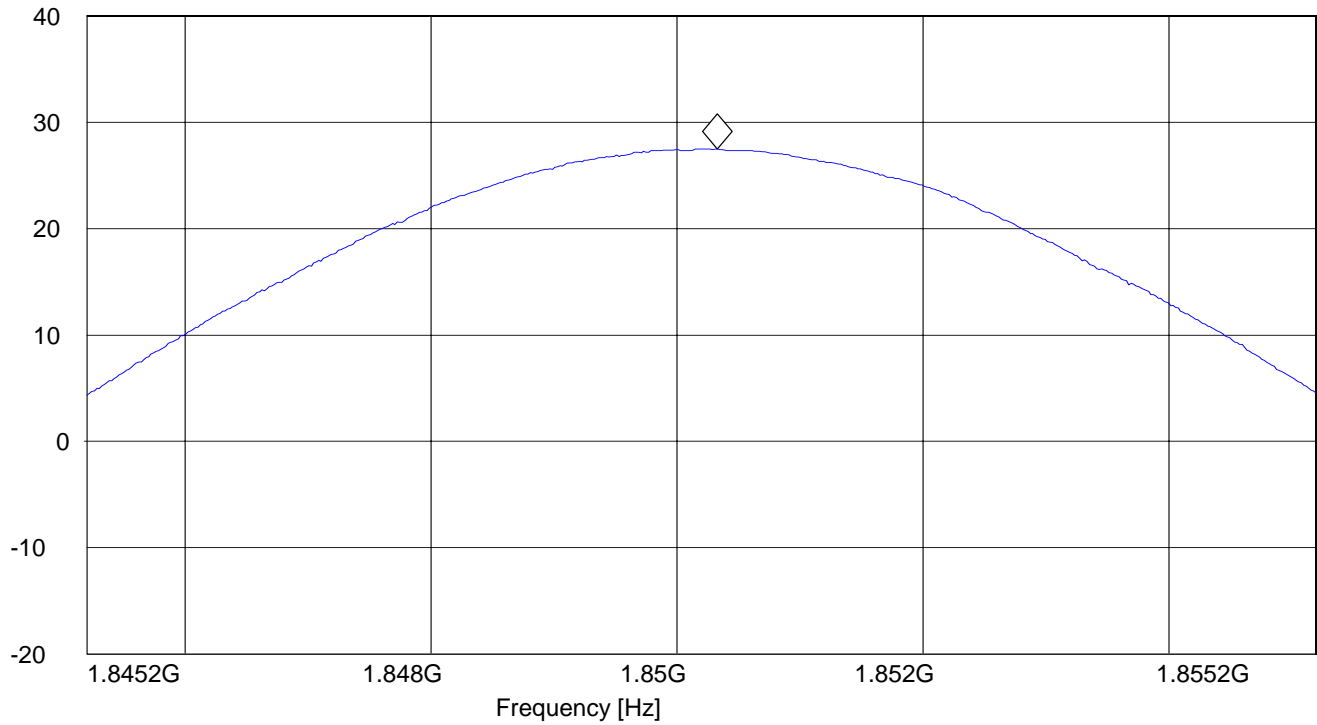
Frequency (MHz)	Power Control Level	Burst Peak (dBm)
		EIRP
1850.2	0	27.47
1880.0	0	28.79
1909.8	0	27.97
Measurement uncertainty	±0.5 dB	

ANALYZER SETTINGS: RBW = VBW = 3MHz

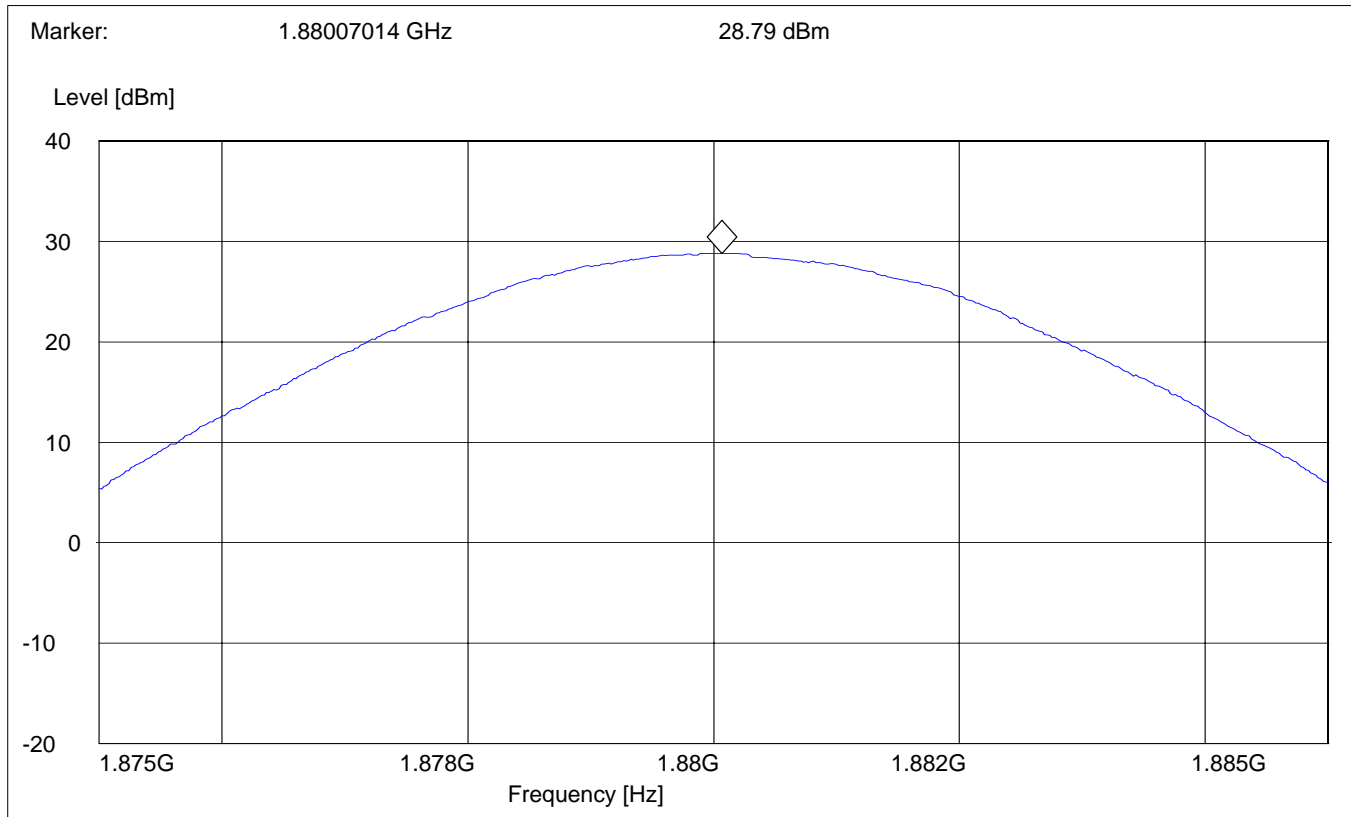
EIRP (PCS-1900)
CHANNEL 512**§24.232(b)**

Marker: 1.850330261 GHz 27.47 dBm

Level [dBm]

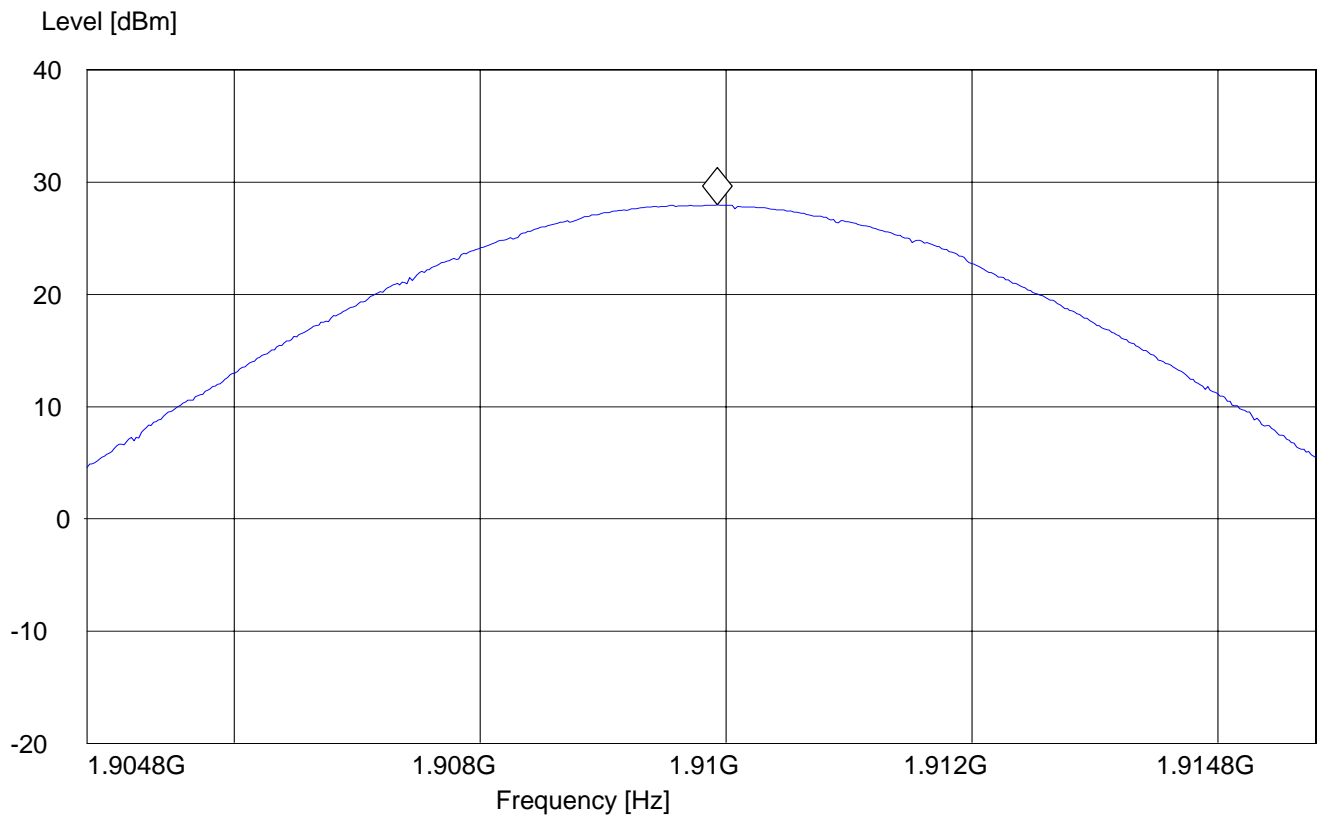


EIRP (PCS-1900) §24.232(b)
CHANNEL 661



EIRP (PCS-1900) §24.232(b)
CHANNEL 810

Marker: 1.909930261 GHz 27.97 dBm



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 – 2003 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 848.8MHz for GSM-850 & 1910 MHz 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 GSM-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 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.

RESULTS OF RADIATED TESTS PCS-1900:

nf=noise floor

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	-38.68	3760	-34.93	3819.6	-31.24
3	5550.6	-39.90	5640	-40.83	5729.4	-38.07
4	7400.8	-45.85	7520	-37.22	7639.2	-37.06
5	9251	-35.72	9400	-36.04	9549	-35.46
6	11101.2	-32.04	11280	-26.28	11458.8	-28.97
7	12951.4	-42.10	13160	-45.28	13368.6	-37.69
8	14801.6	-37.89	15040	-37.06	15278.4	-38.93
9	16651.8	-42.49	16920	-42.13	17188.2	-40.30
10	18502	-32.81	18800	-34.11	19098	-34.19

RADIATED SPURIOUS EMISSIONS

30MHz - 1GHz

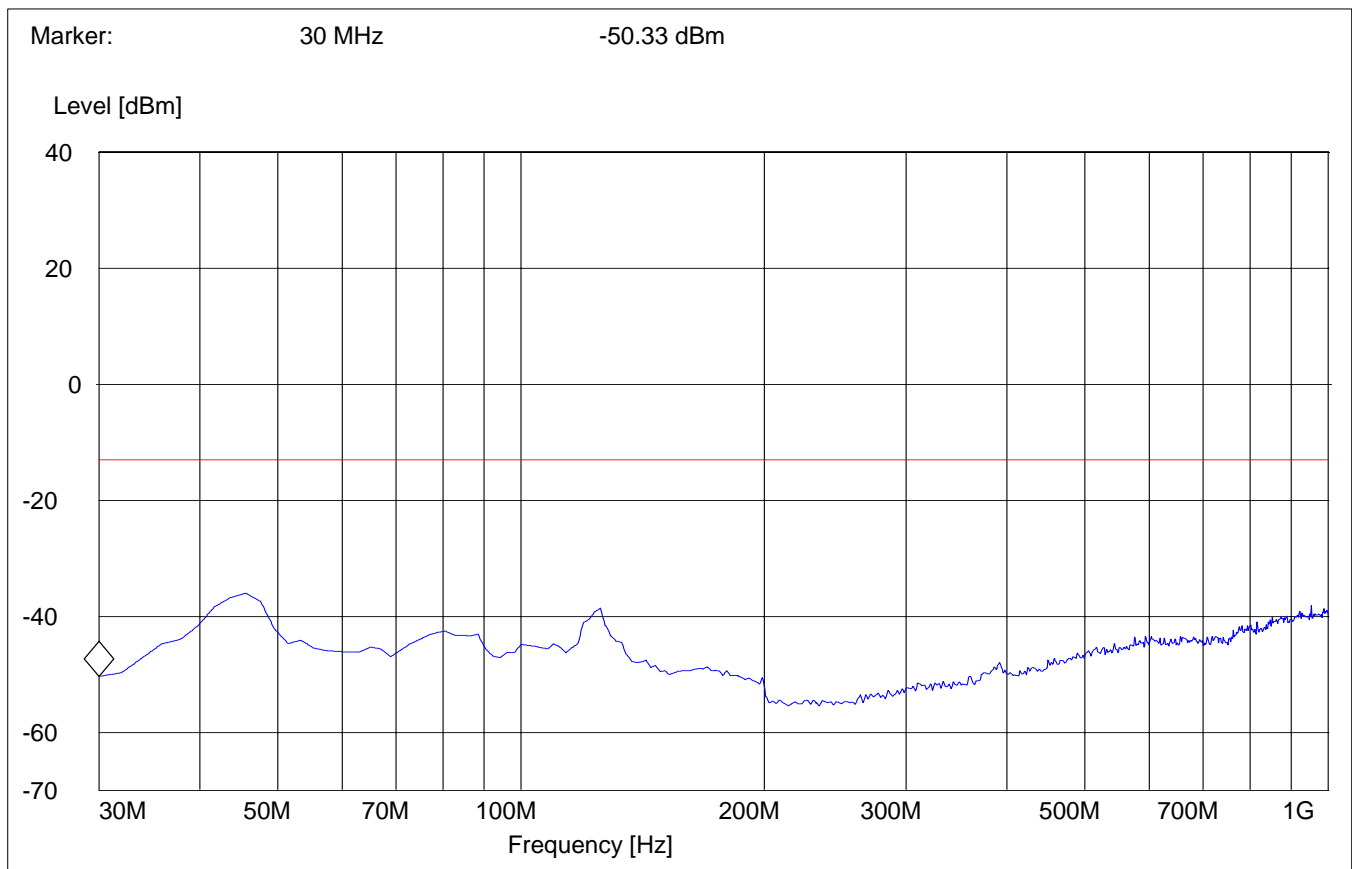
Spurious emission limit -13dBm

Antenna: vertical

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

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

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



RADIATED SPURIOUS EMISSIONS

30MHz - 1GHz

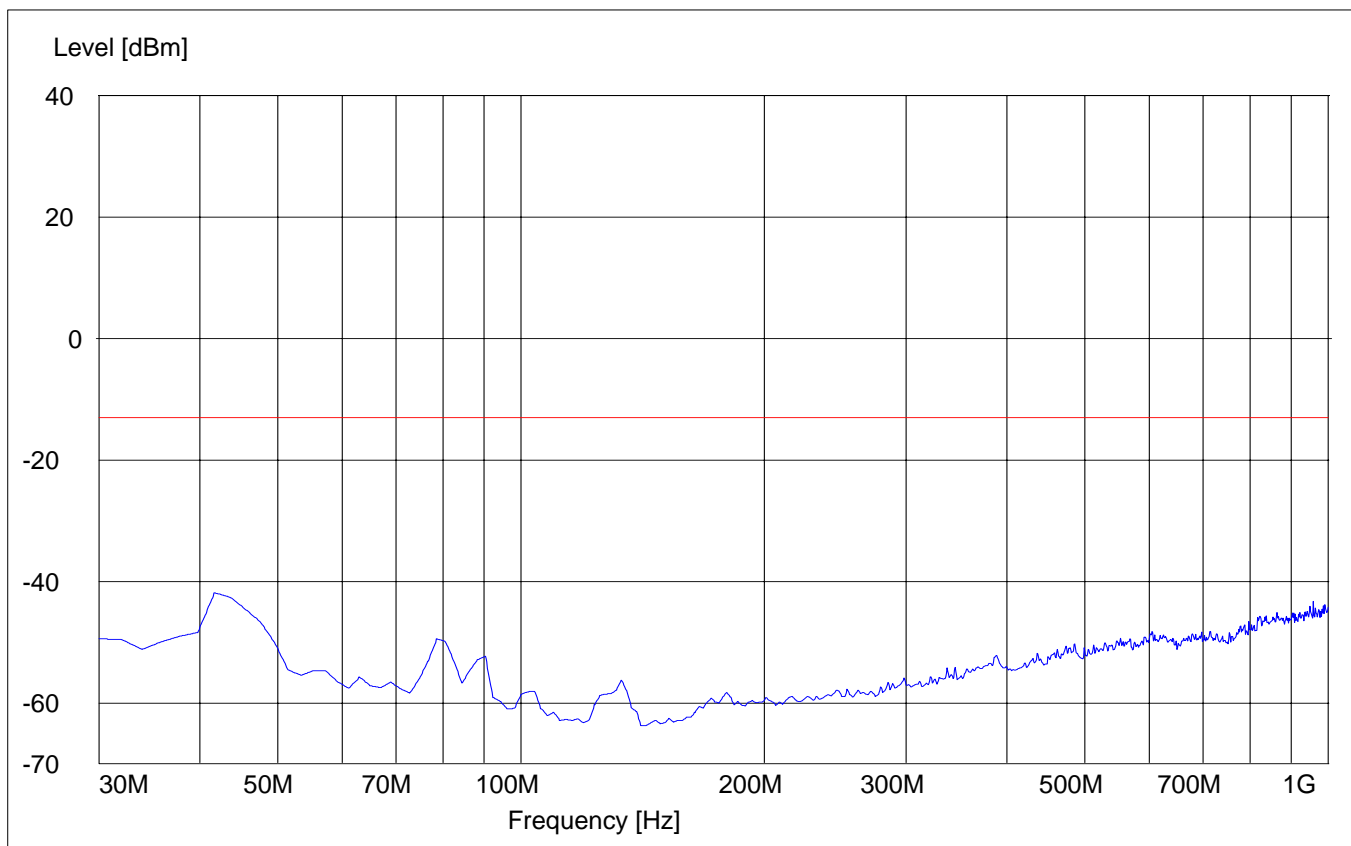
Spurious emission limit -13dBm

Antenna: horizontal

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

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

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



RADIATED SPURIOUS EMISSIONS

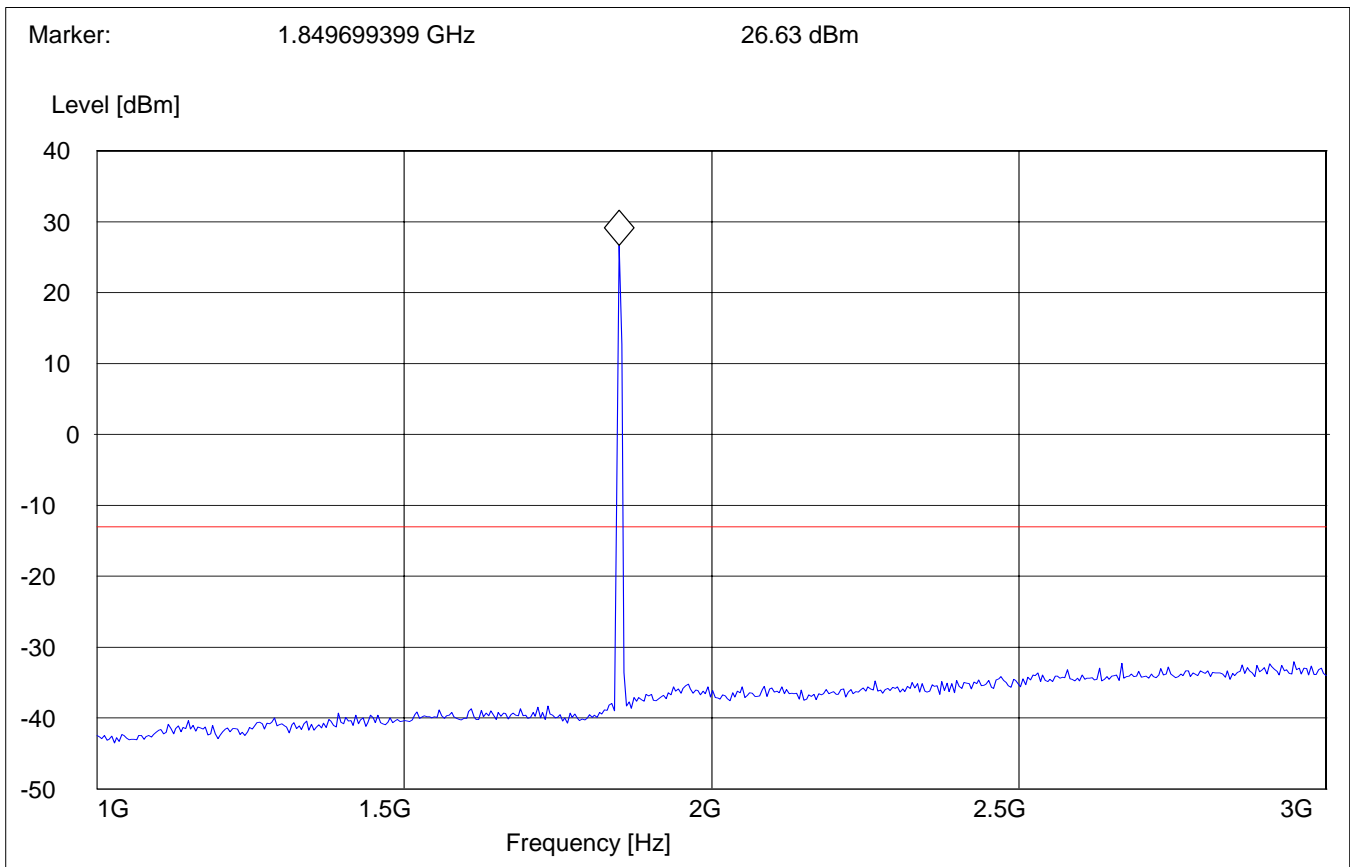
Tx @ 1850.2MHz: 1GHz – 3GHz

Spurious emission limit -13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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

Note: The peak above the limit line is the carrier freq. at ch-512.

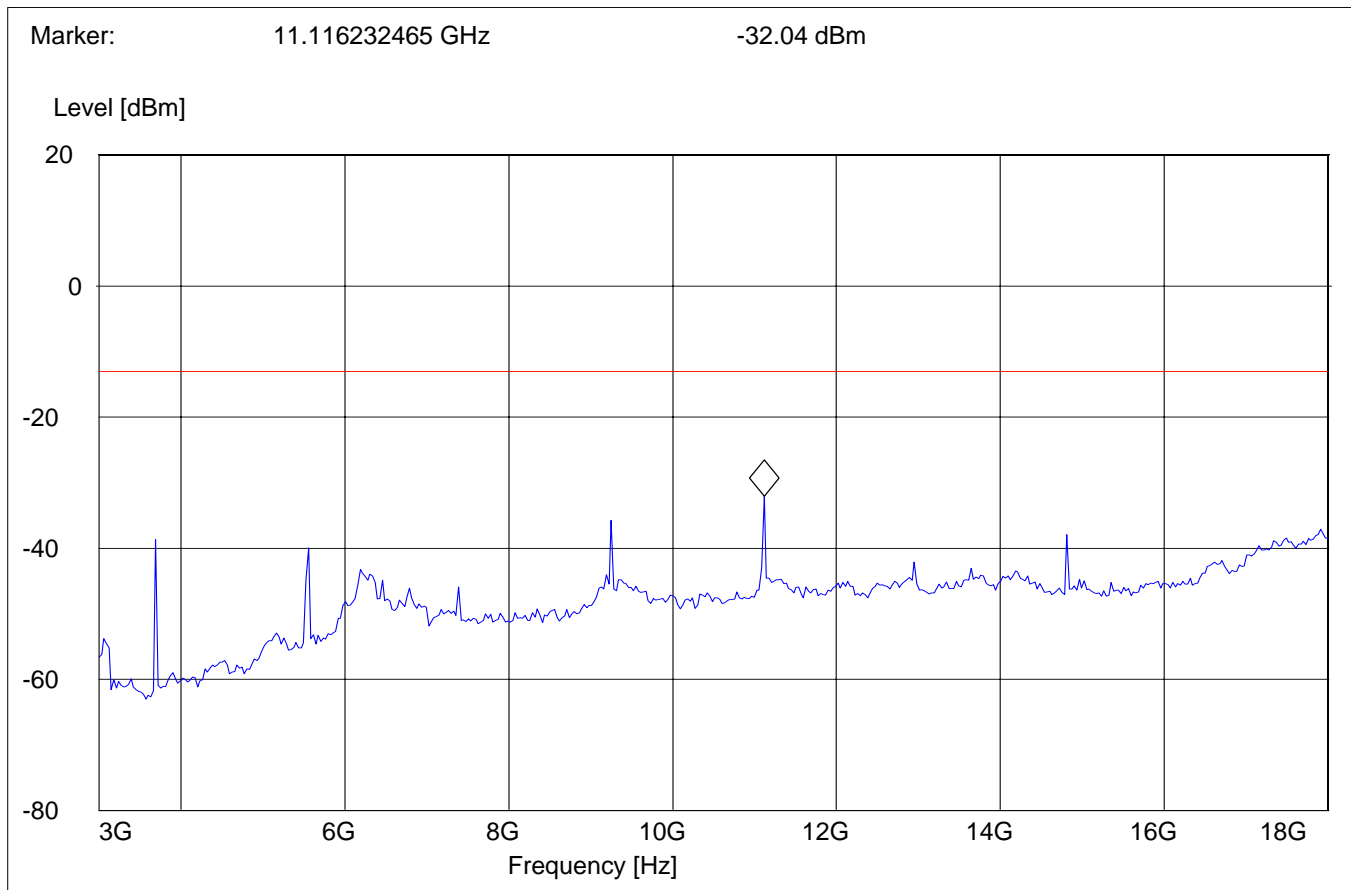


RADIATED SPURIOUS EMISSIONS**Tx @ 1850.2MHz: 3GHz – 18GHz**

Spurious emission limit -13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

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



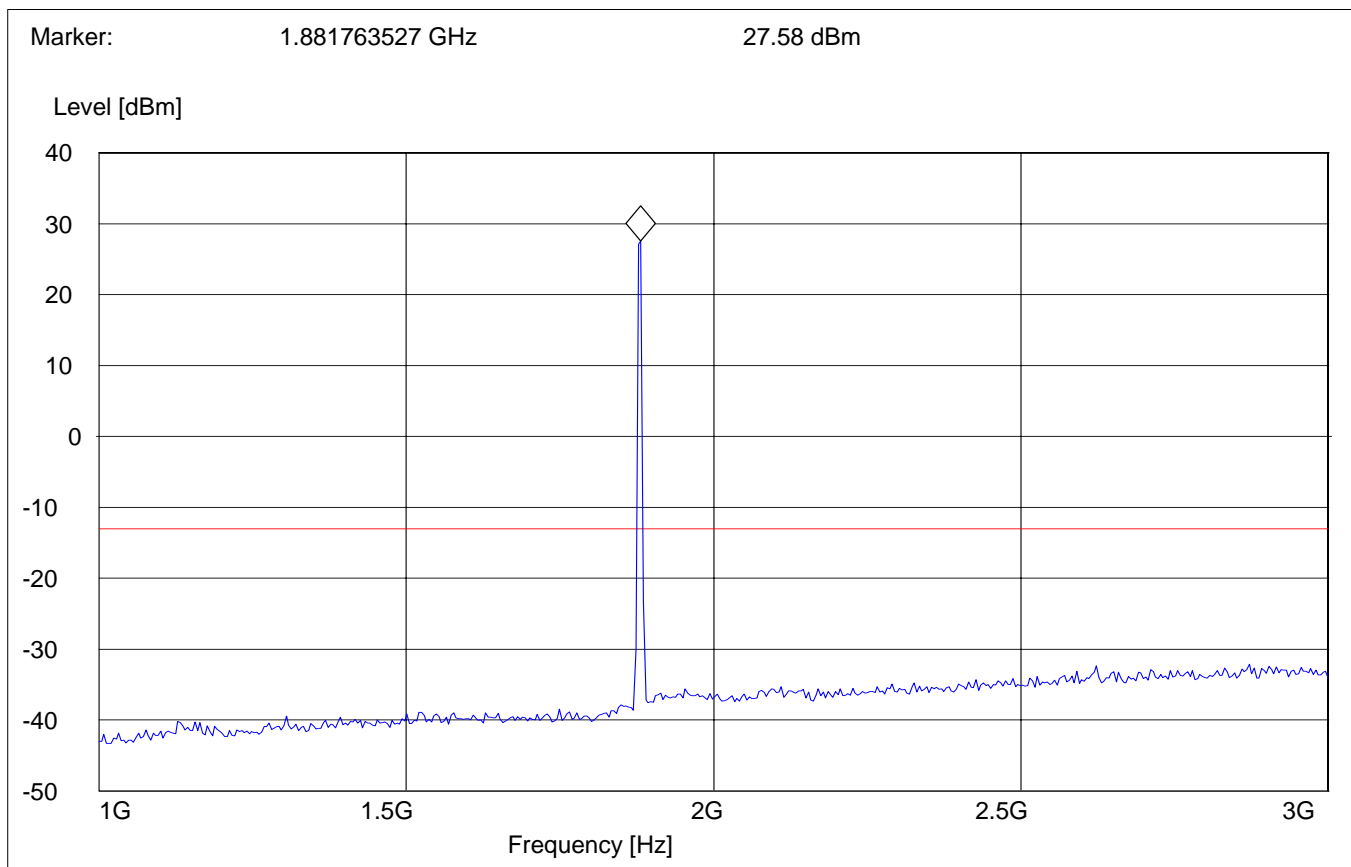
RADIATED SPURIOUS EMISSIONS**Tx @ 1880.0MHz: 1GHz – 3GHz**

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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

Note: The peak above the limit line is the carrier freq. at ch-661.



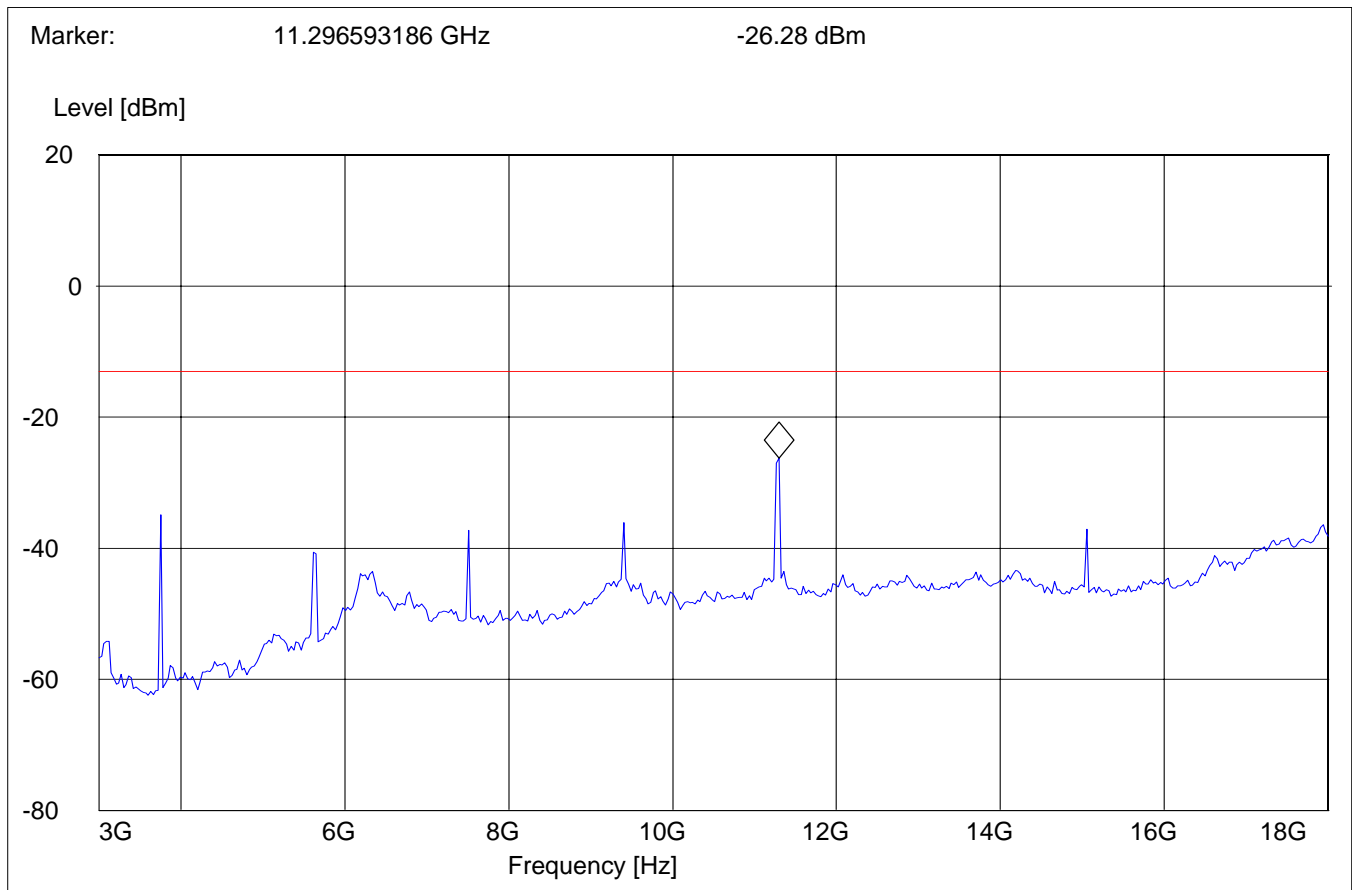
RADIATED SPURIOUS EMISSIONS

Tx @ 1880.0MHz: 3GHz – 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

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



RADIATED SPURIOUS EMISSIONS

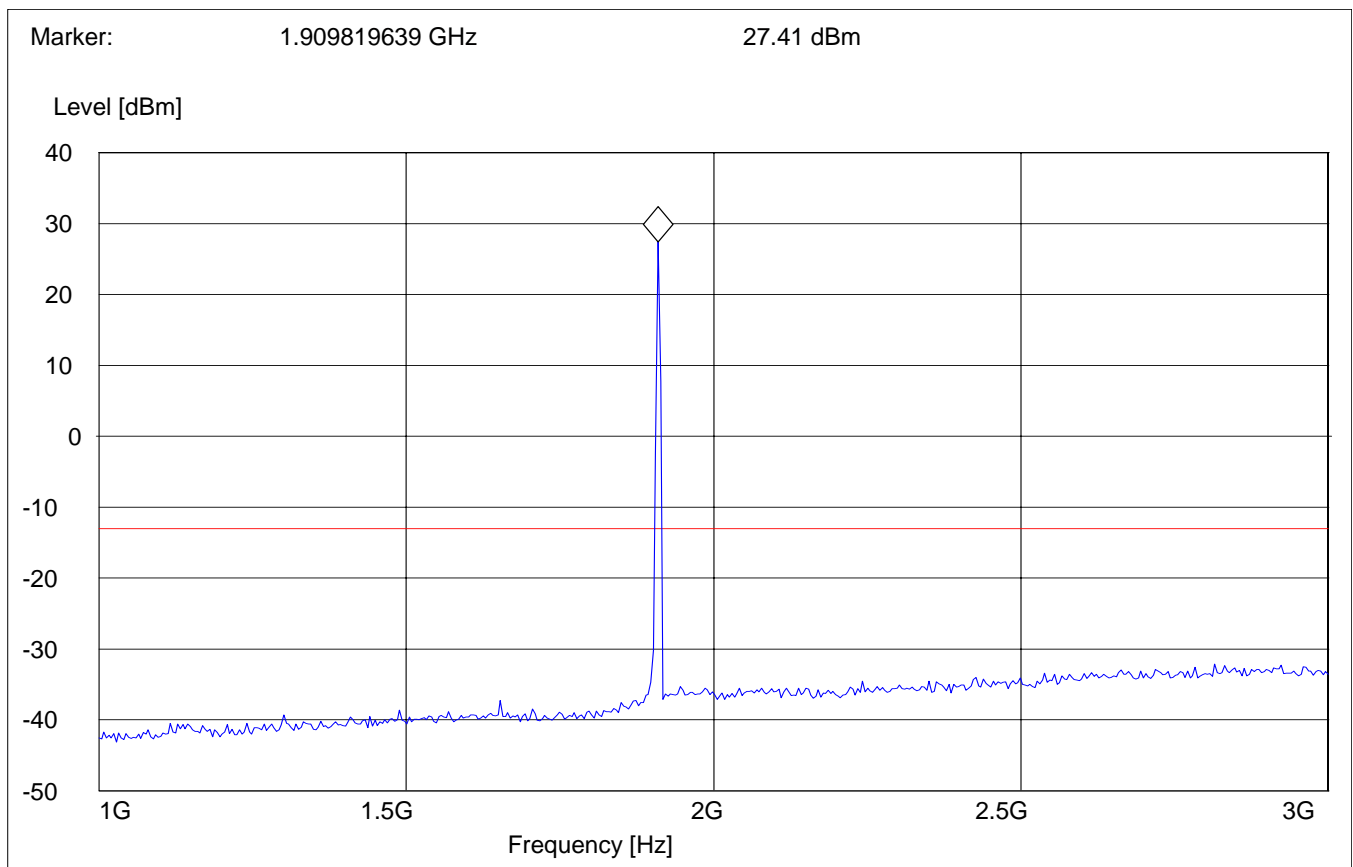
Tx @ 1909.8MHz: 1GHz – 3GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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

Note: The peak above the limit line is the carrier freq. at ch-810.



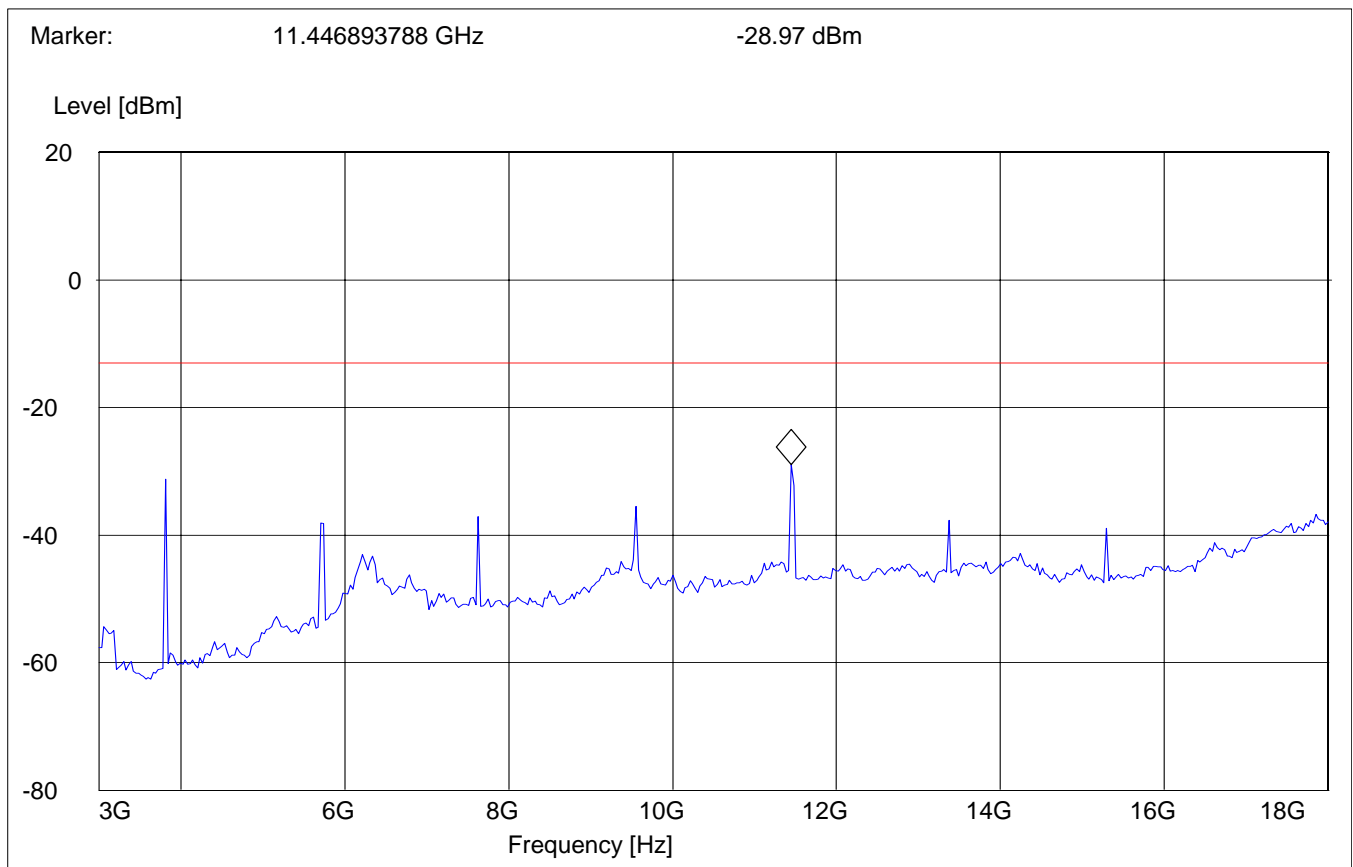
RADIATED SPURIOUS EMISSIONS

Tx @ 1909.8MHz: 3GHz – 18GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 3-18G"

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



RADIATED SPURIOUS EMISSIONS

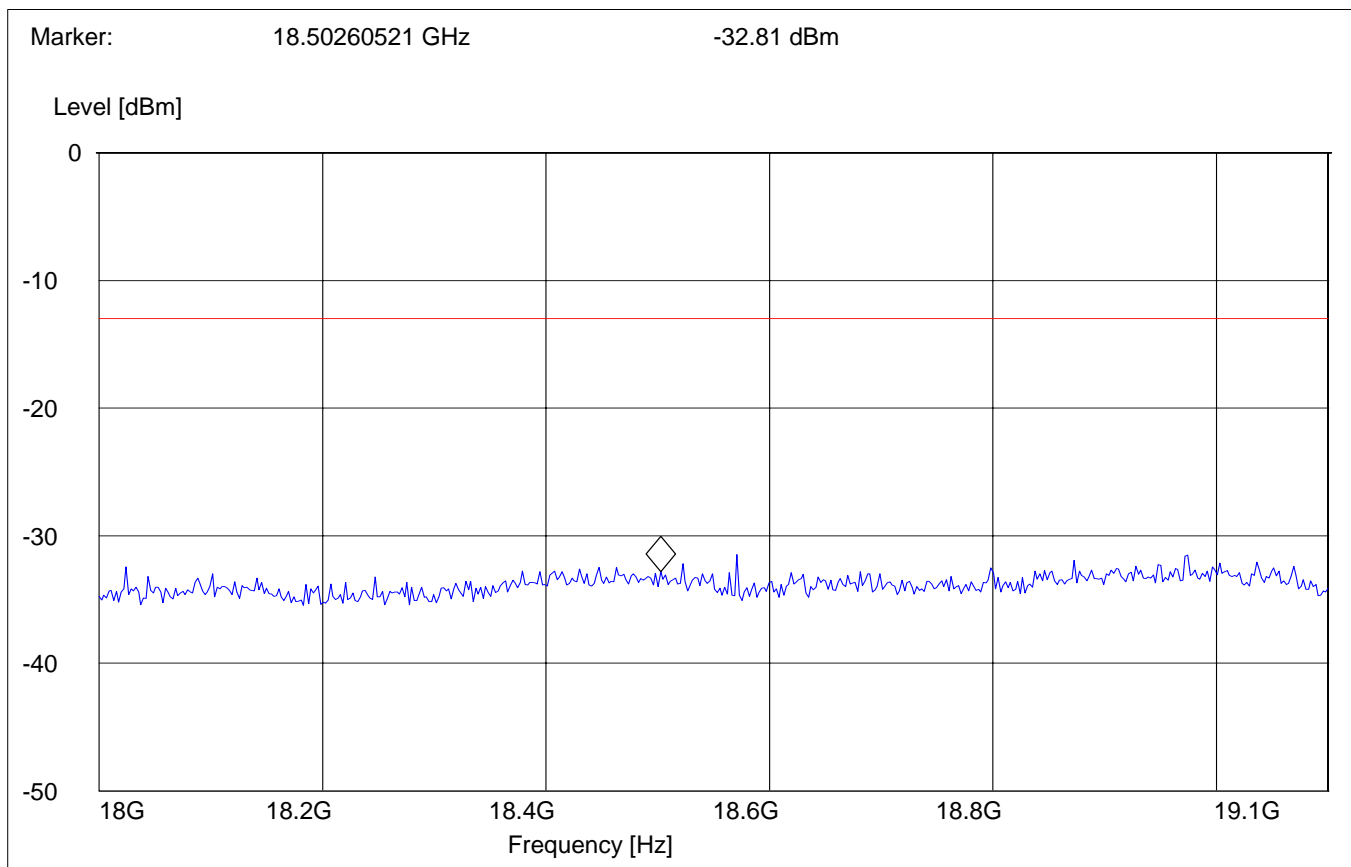
18GHz – 19.1GHz

Spurious emission limit –13dBm

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

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
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)

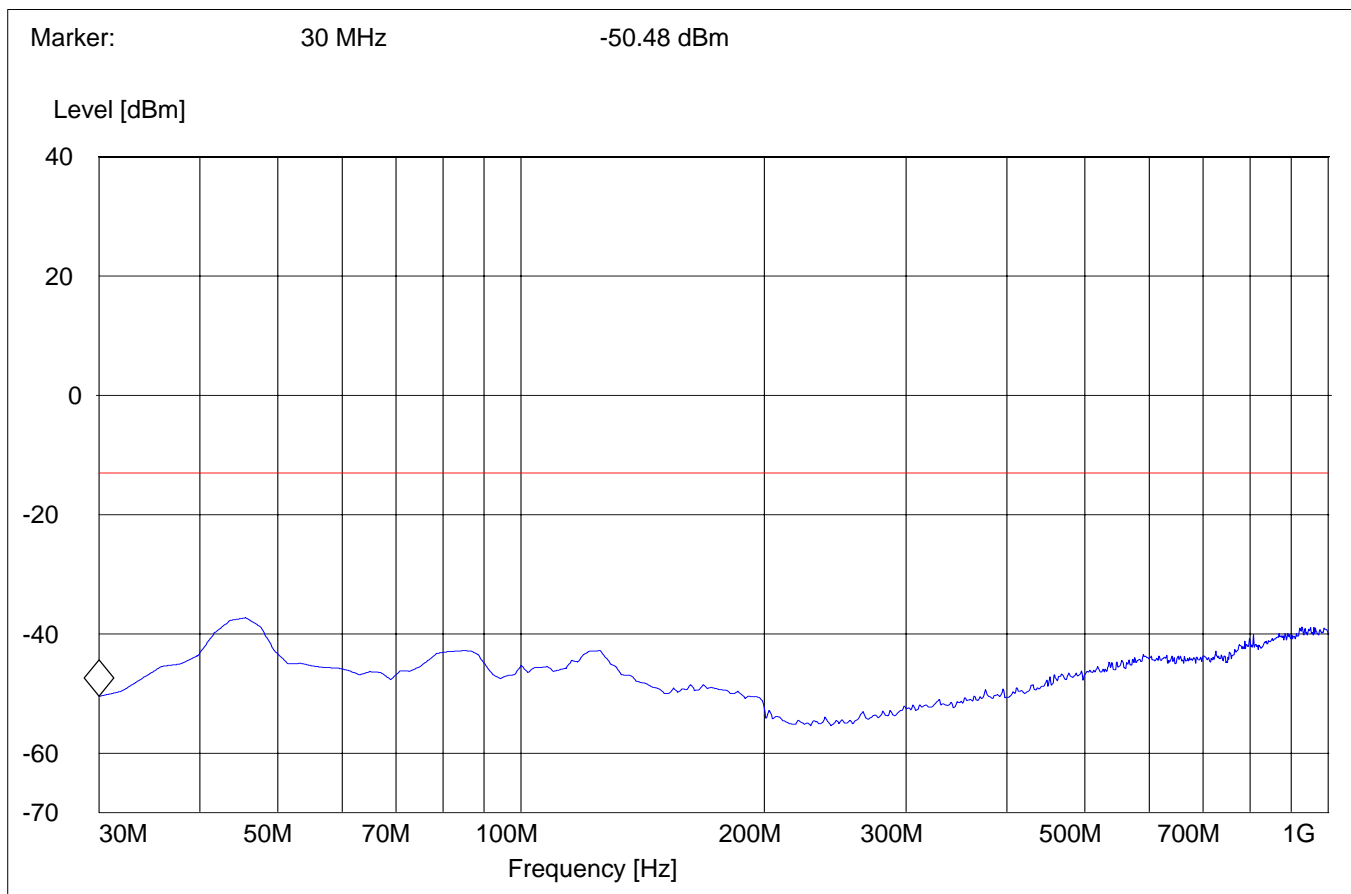
EUT in Idle Mode: 30MHz – 1GHz

Spurious emission limit –13dBm

Note: This plot is valid for both polarities (worst-case plot)

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

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



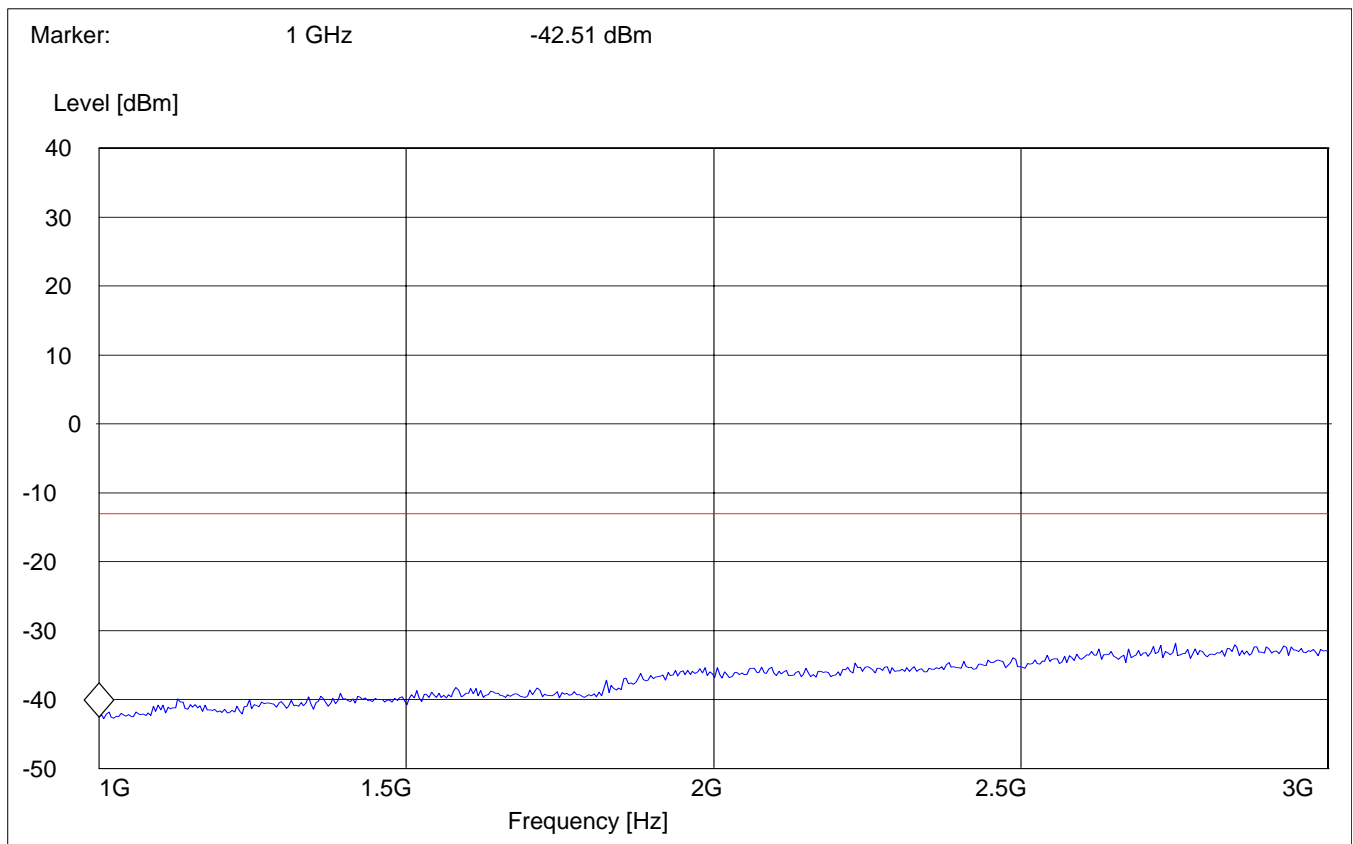
RADIATED SPURIOUS EMISSIONS (IDLE MODE)

EUT in Idle Mode: 1GHz – 3GHz

Spurious emission limit –13dBm

SWEEP TABLE: "FCC Spuri 1-3G"

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



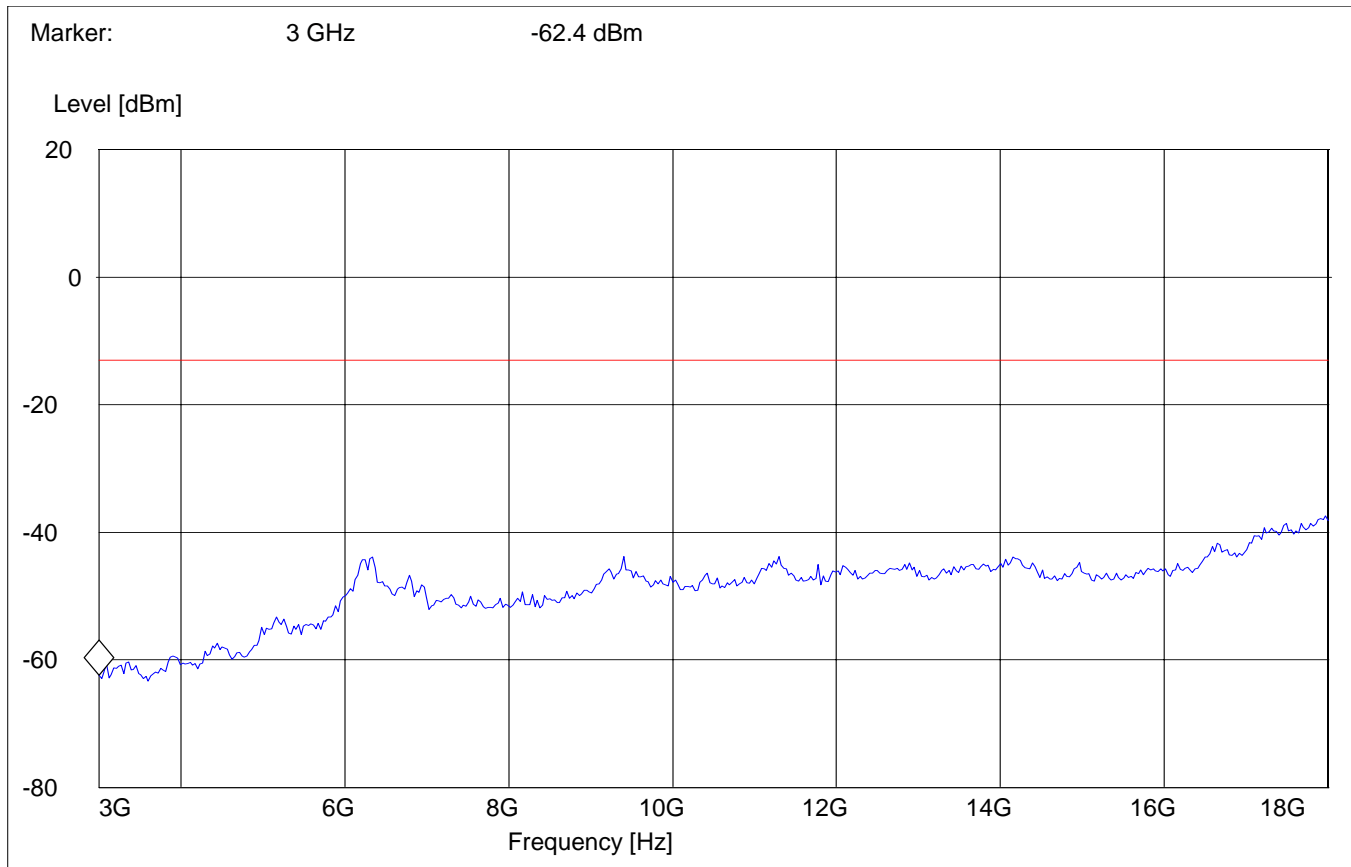
RADIATED SPURIOUS EMISSIONS (IDLE MODE)

EUT in Idle Mode: 3GHz – 18GHz

Spurious emission limit –13dBm

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

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



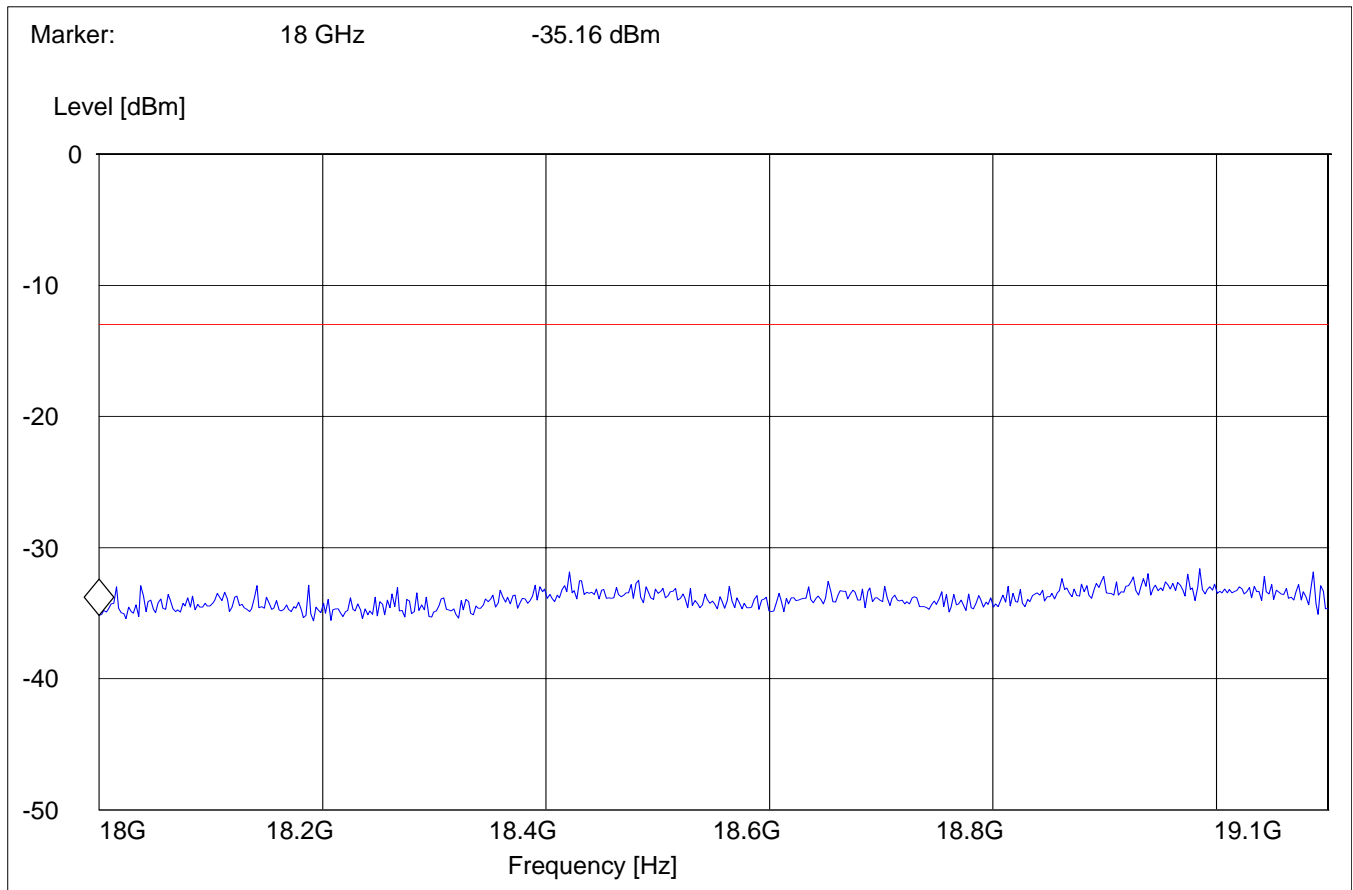
RADIATED SPURIOUS EMISSIONS (IDLE MODE)

EUT in Idle Mode: 18GHz – 19.1GHz

Spurious emission limit –13dBm

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

Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency	Time		
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 3GHz and 26.5GHz very short cable connections to the antenna was used to minimize the noise level.

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

RECEIVER RADIATED EMISSIONS

EUT in Idle Mode: 30MHz – 1GHz

AC Adaptor: Supplied by Anoma, with a cable integrating a Fair-Rite 2643540002 ferrite.

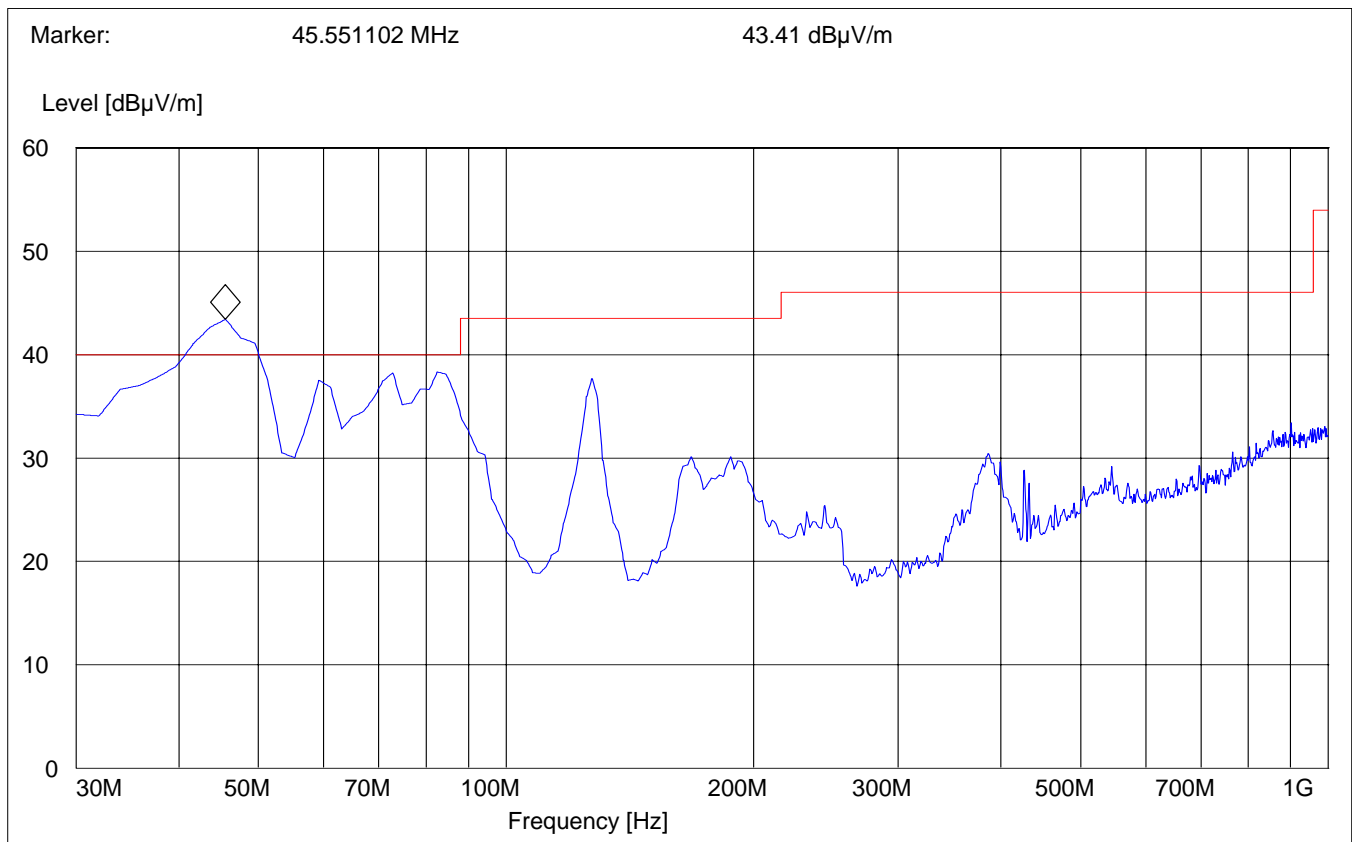
Antenna: vertical

SWEEP TABLE: "FCCSpur 30M-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>	
30MHz	1GHz	Max Peak	Coupled	100KHz

Note: This plot is valid for both polarities (worst-case plot)

Freq.(MHz)	Pk(dBuV/m)	QPk(dBuV/m)
45.55	43.41	39.79

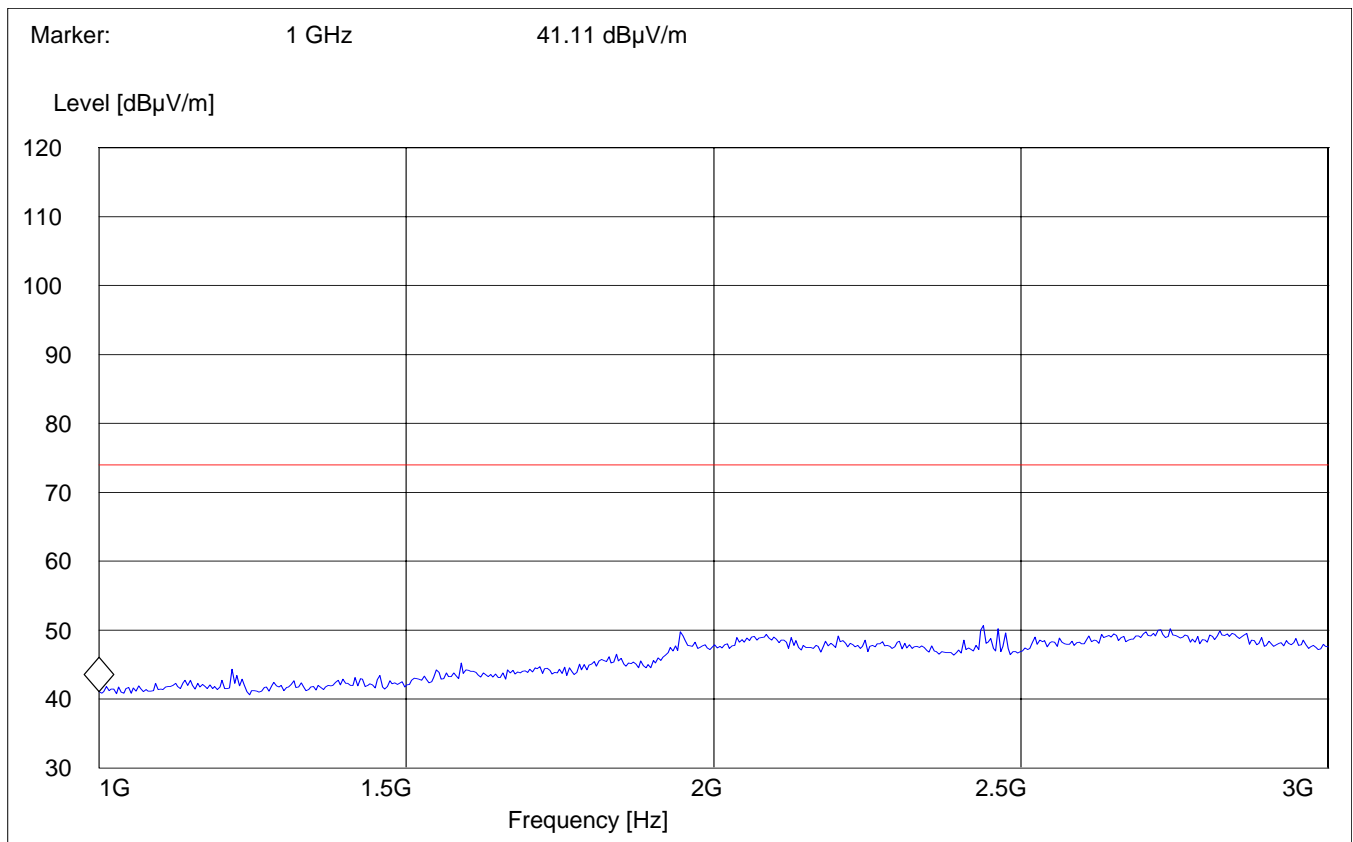


RECEIVER RADIATED EMISSIONS EUT in Idle Mode: 1GHz – 3GHz

Note: marked peak is downlink from the base station

SWEEP TABLE: "FCC Spuri 1-3G"

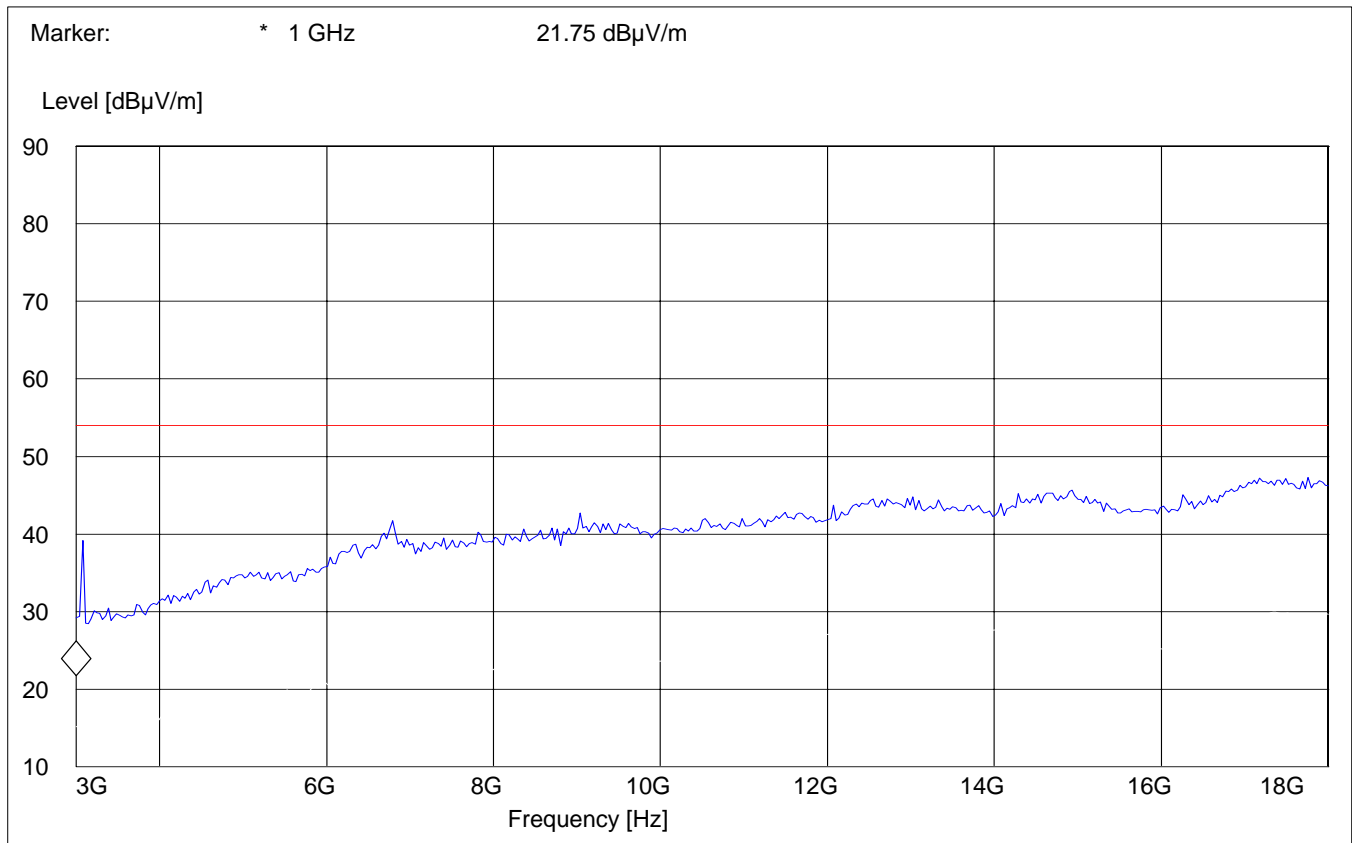
Start	Stop	Detector	Meas.	RBW/VBW
Frequency	Frequency		Time	
1GHz	3GHz	Max Peak	Coupled	1 MHz



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

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

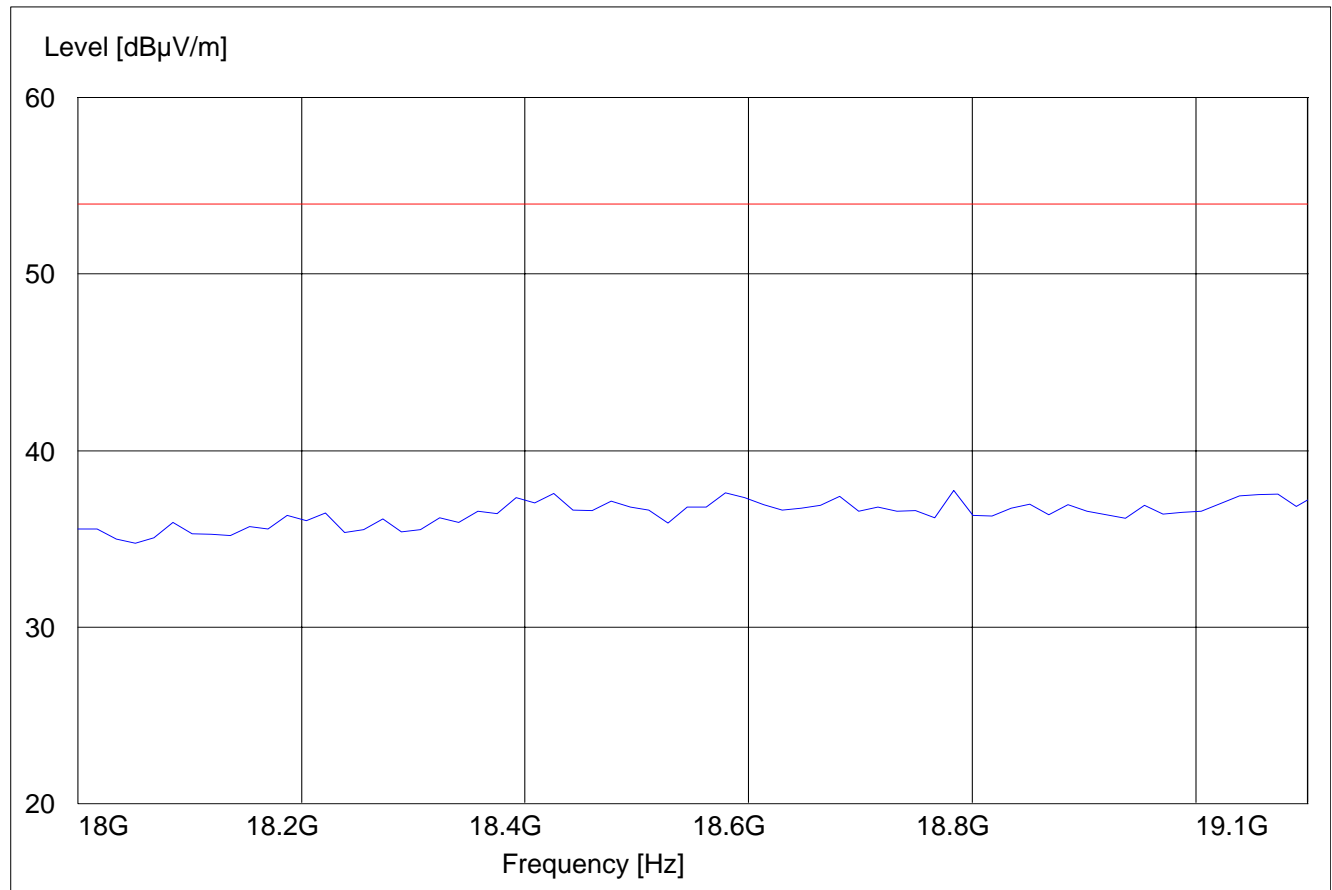
<i>Start</i>	<i>Stop</i>	<i>Detector</i>	<i>Meas.</i>	<i>RBW/VBW</i>
<i>Frequency</i>	<i>Frequency</i>		<i>Time</i>	
3GHz	18GHz	Max Peak	Coupled	1 MHz



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

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

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



CONDUCTED EMISSIONS

§ 15.107/207

Measured with AC/DC power adapter plugged in LISN

Technical specification: 15.107 / 15.207 (Revised as of August 20, 2002)

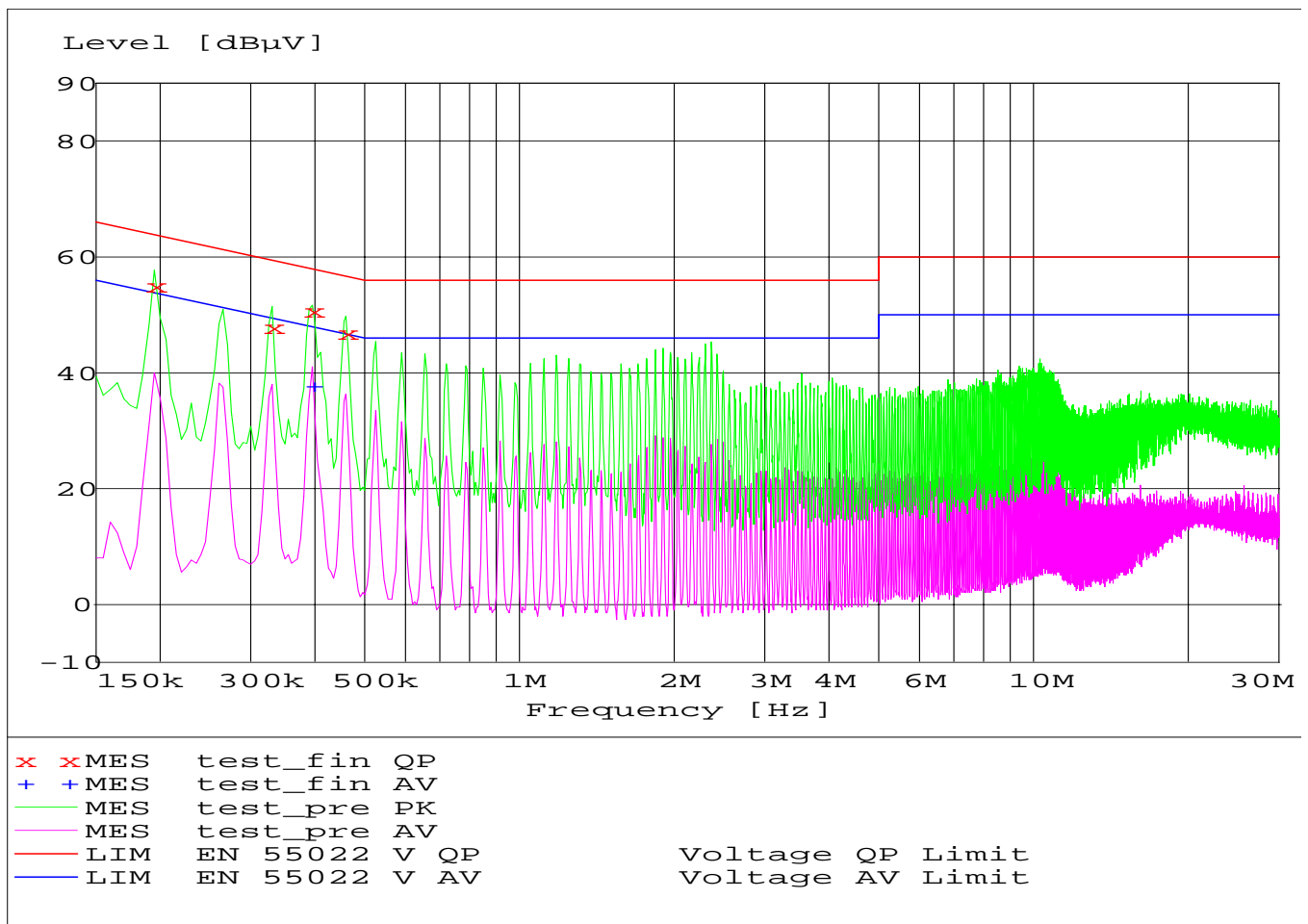
Limit

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



MEASUREMENT RESULT: "test_fin QP"

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBµV	dB	dBµV	dB		
0.195000	55.00	0.0	64	8.9	L1	GND
0.330000	47.80	0.0	60	11.7	N	GND
0.395000	50.80	0.0	58	7.2	L1	GND
0.460000	46.90	0.0	57	9.8	L1	GND

MEASUREMENT RESULT: "test_fin AV"

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBµV	dB	dBµV	dB		
0.395000	37.80	0.0	48	10.2	N	GND

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
Radiated Testing**ANECHOIC CHAMBER**