# FCC Test Report

**Test report no.: EMC_1040FCC24_2005**

**FCC Part 22, 24 / RSS 132, 133**
**Model: SP640**

**FCC ID: SONSP640TY**
**IC ID: 5509A-SP640TY**

Deutscher Akkreditierungs Rat

*TTI-P-G 081/94-A0*

Accredited according to **ISO/IEC 17025**

Bluetooth

**Bluetooth Qualification Test Facility (BQTF)**

CTIA Authorized Test Lab
LAB CODE 20020328-00

**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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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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Internet: www.cetecom.com

## 1.3 Details of applicant

| | | |
|---|---|---|
| **Name** | : | WideRay Corp. |
| **Street** | : | 25 Kearny St 6th floor |
| **City / Zip Code** | : | San Francisco, CA 94108 |
| **Country** | : | USA |
| **Contact** | : | Gerry West |
| **Telephone** | : | +1 604 233 1105 |
| **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** | : | **SONSP640TY** |
| **IC-ID** | : | **5509A-SP640TY** |

**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 ±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***

# 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:<br>(only “passed” if all single measurements are “passed”) | **Passed** |

**Technical responsibility for area of testing:**

| Date | Section | Name | Signature |
|---|---|---|---|
| 2004-12-14 | EMC & Radio | Lothar Schmidt (Technical Manager) | |

**Responsible for test report and project leader:**

| Date | Section | Name | Signature |
|---|---|---|---|
| 2004-12-14 | EMC & Radio | Harpreet Sidhu (EMC Engineer) | |

## 2.2 Test report

**TEST REPORT**

**Test report no.: EMC_1040FCC24_2005**

## TEST REPORT REFERENCE

## 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) |

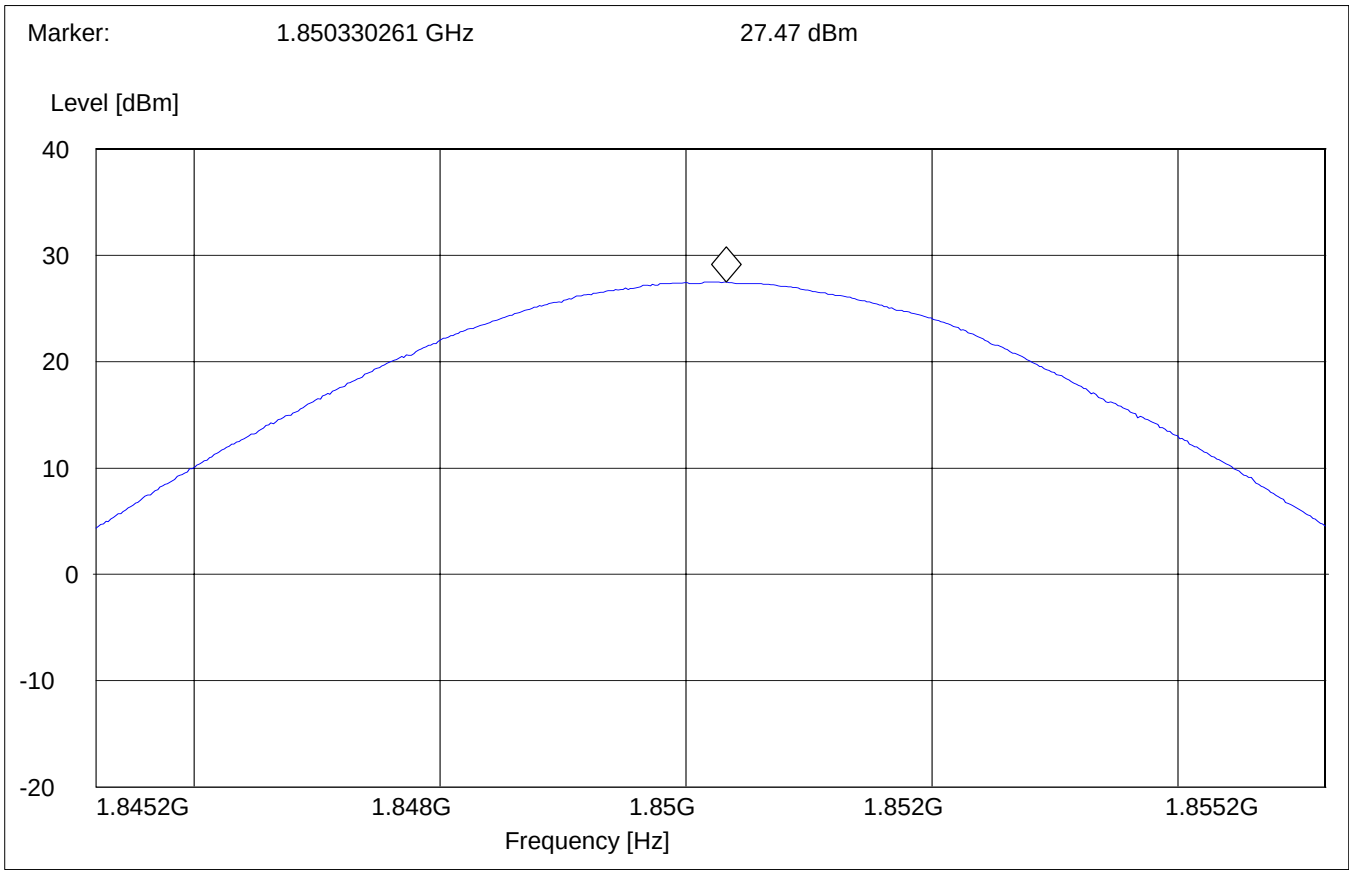
**EIRP**

| 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 | |

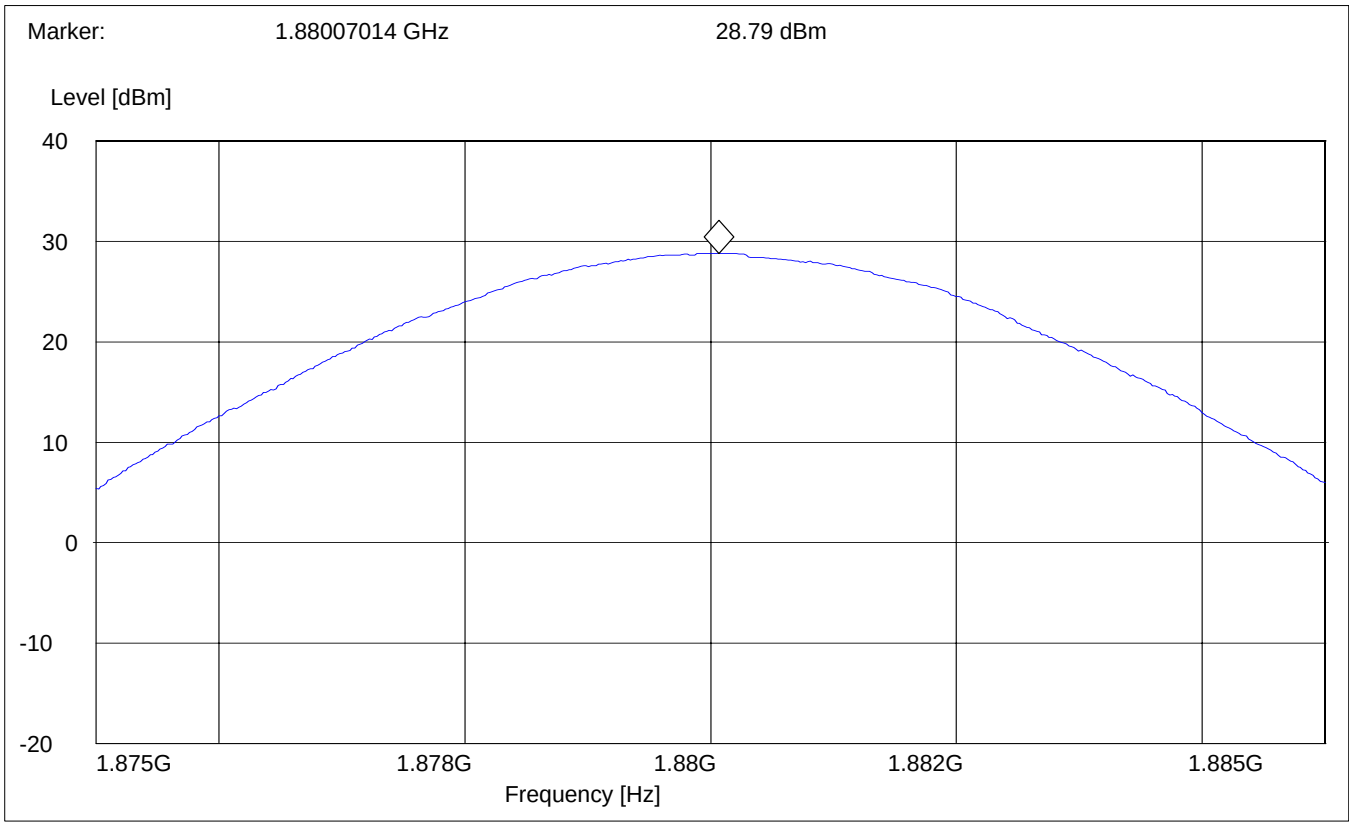
ANALYZER SETTINGS: RBW = VBW = 3MHz

## EIRP (PCS-1900) §24.232(b)

**CHANNEL 512**

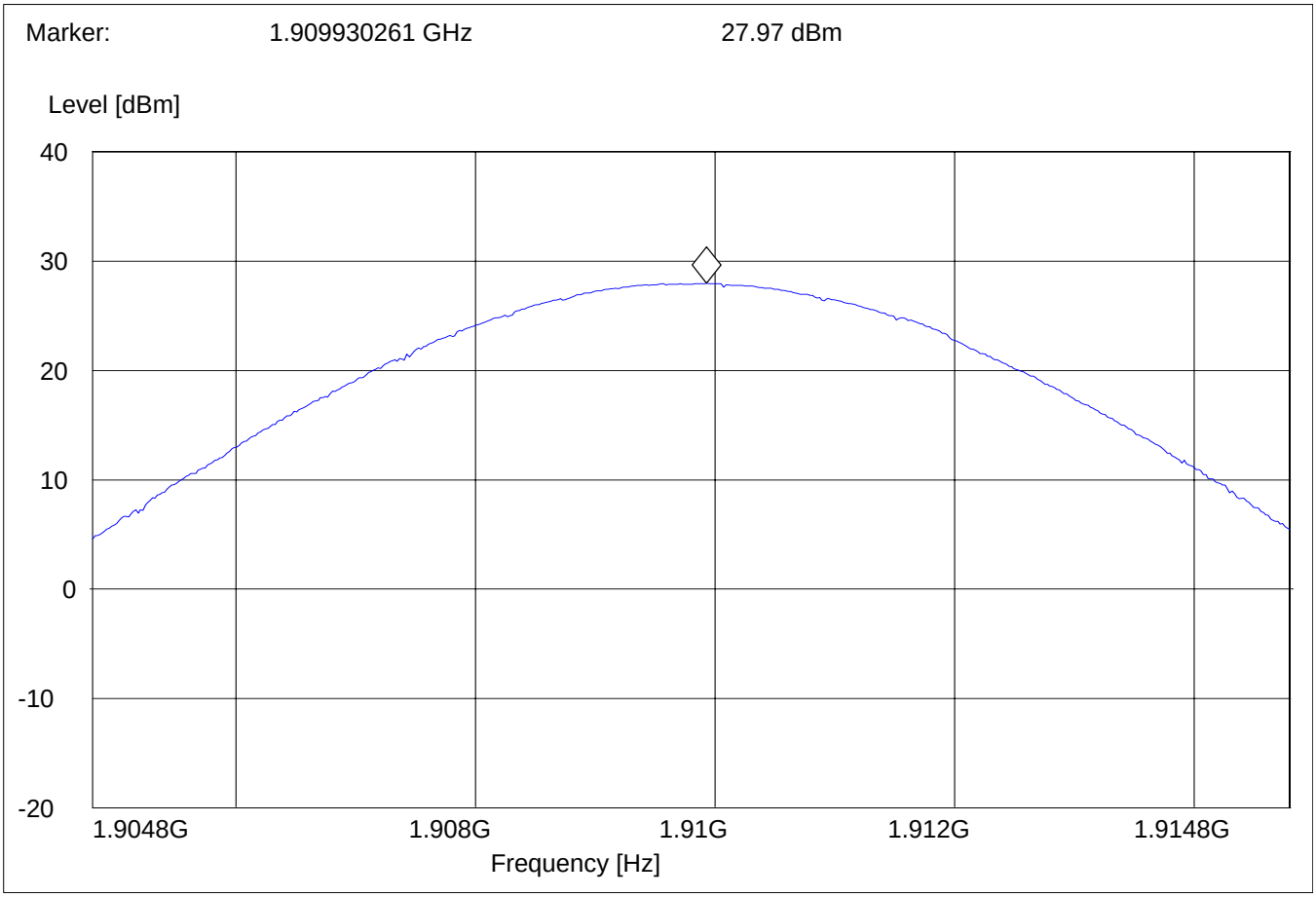


## EIRP (PCS-1900) §24.232(b)
**CHANNEL 661**



## EIRP (PCS-1900) §24.232(b)

**CHANNEL 810**



## 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+10Log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

**Measurement Results:**
Radiated emissions measurements were made only at the upper, 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

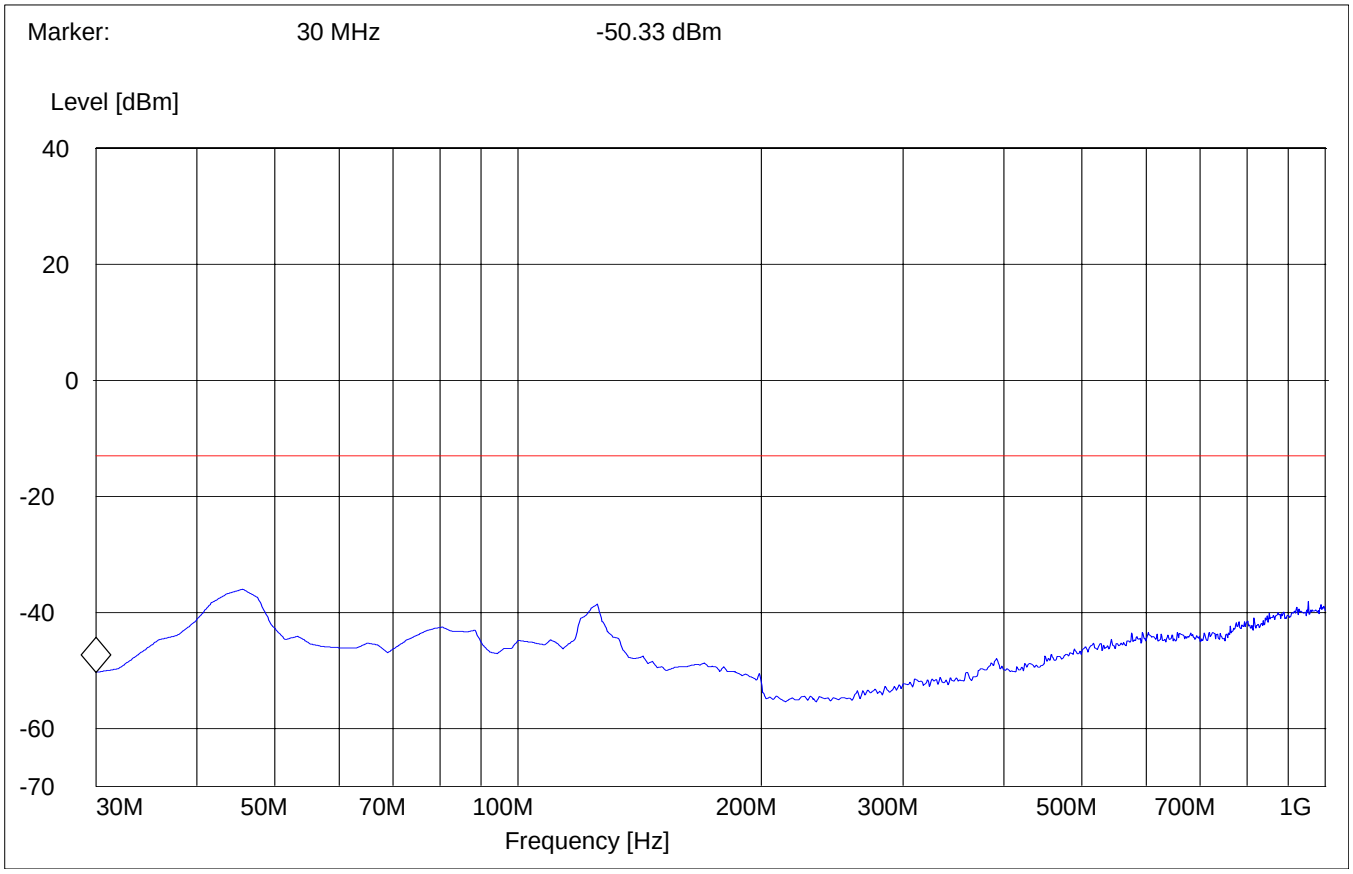
Spurious emission limit –13dBm

### Antenna: vertical

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

| *Start Frequency* | *Stop Frequency* | *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

### 30MHz - 1GHz

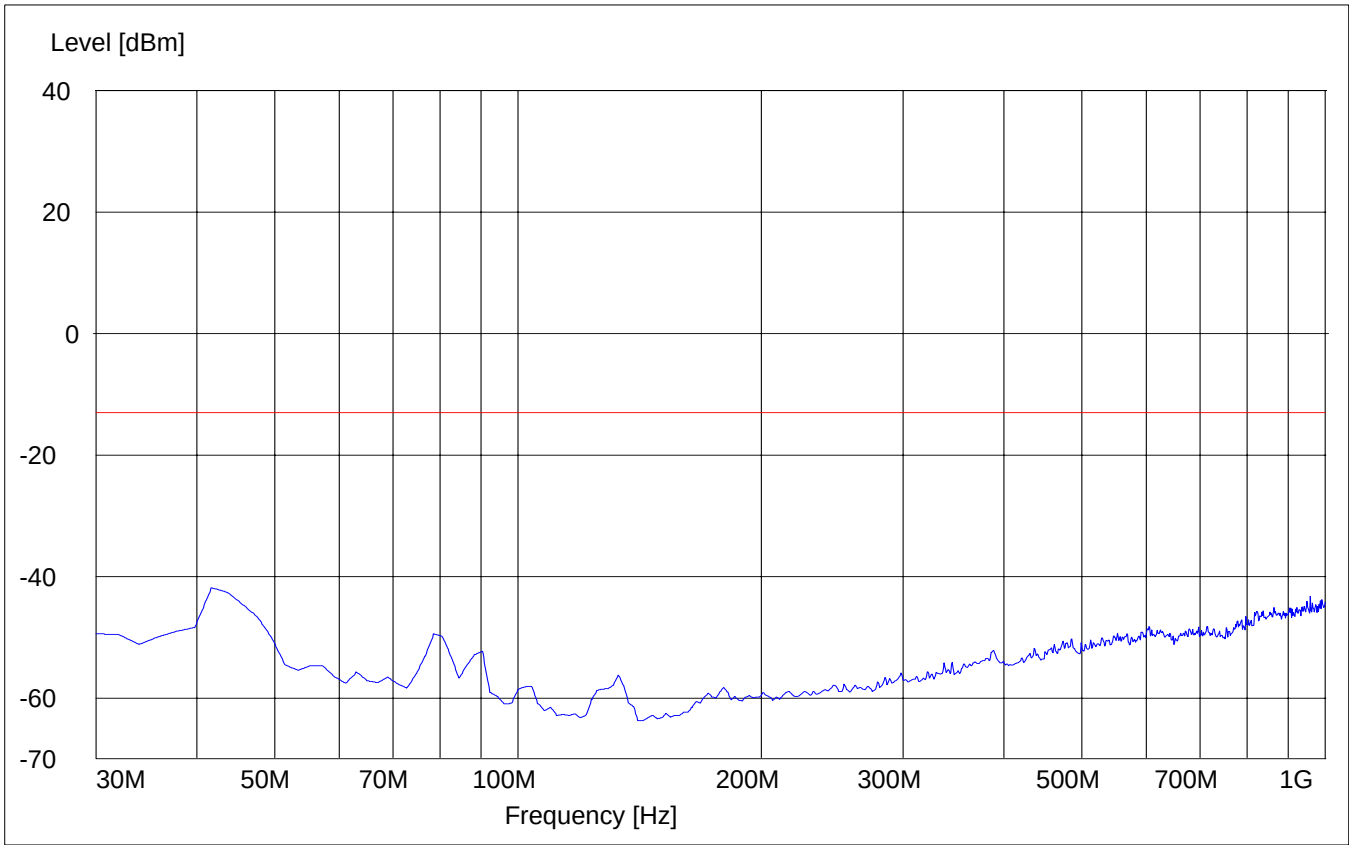
Spurious emission limit –13dBm

### Antenna: horizontal

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

| *Start Frequency* | *Stop Frequency* | *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)**



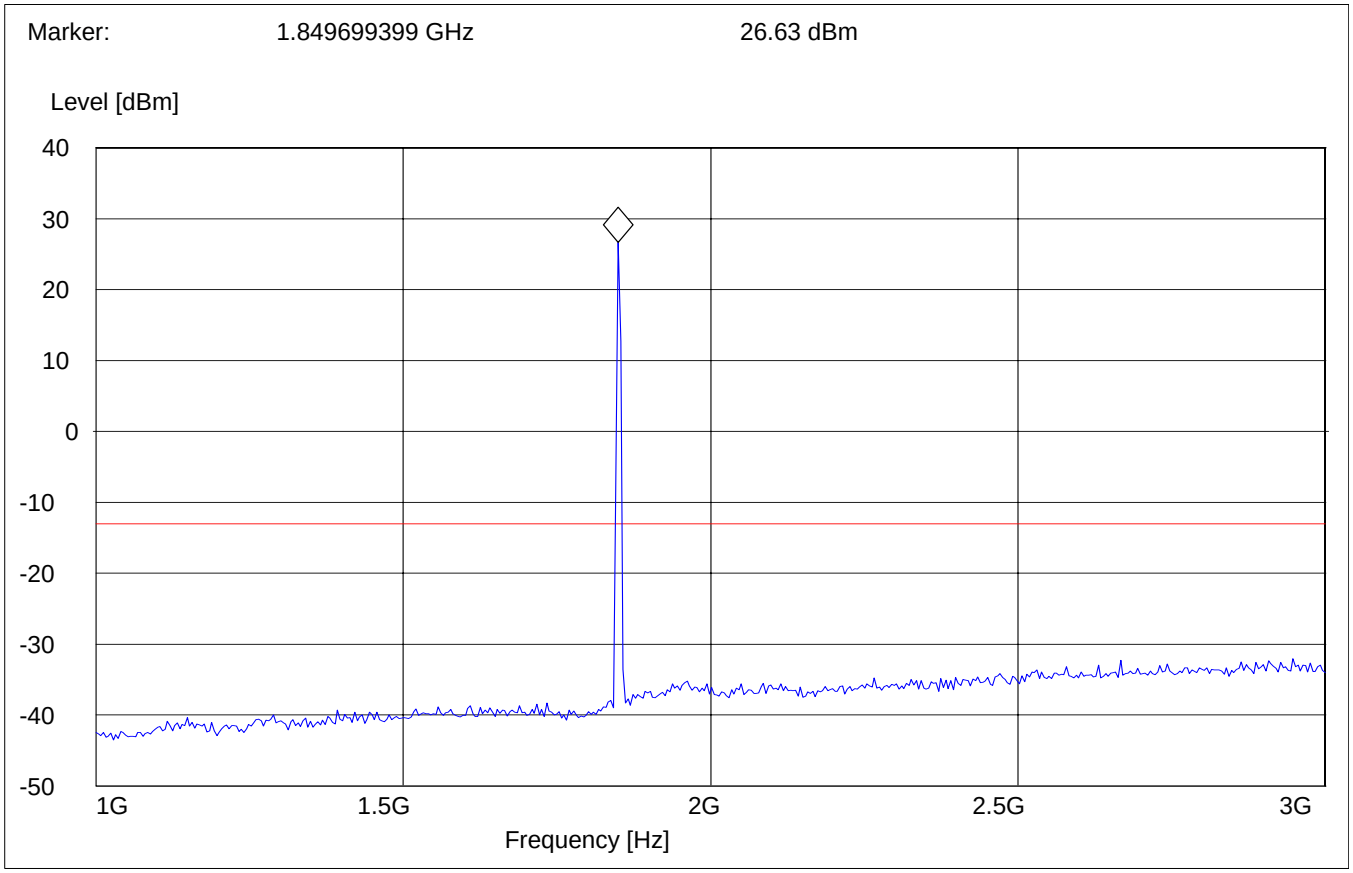
## RADIATED SPURIOUS EMISSIONS
## Tx @ 1850.2MHz: 1GHz – 3GHz

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-512.

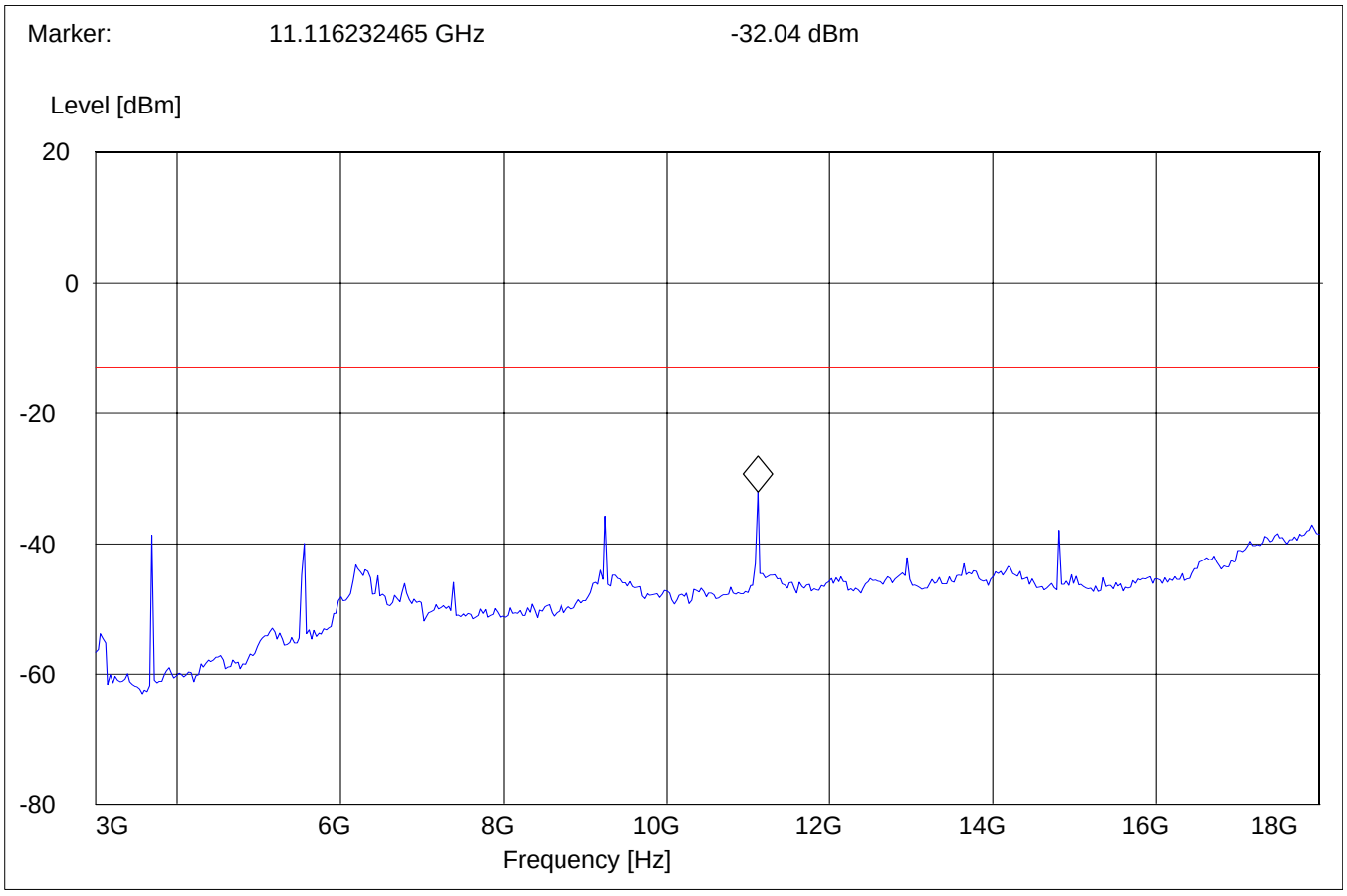


## RADIATED SPURIOUS EMISSIONS
## Tx @ 1850.2MHz: 3GHz – 18GHz

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

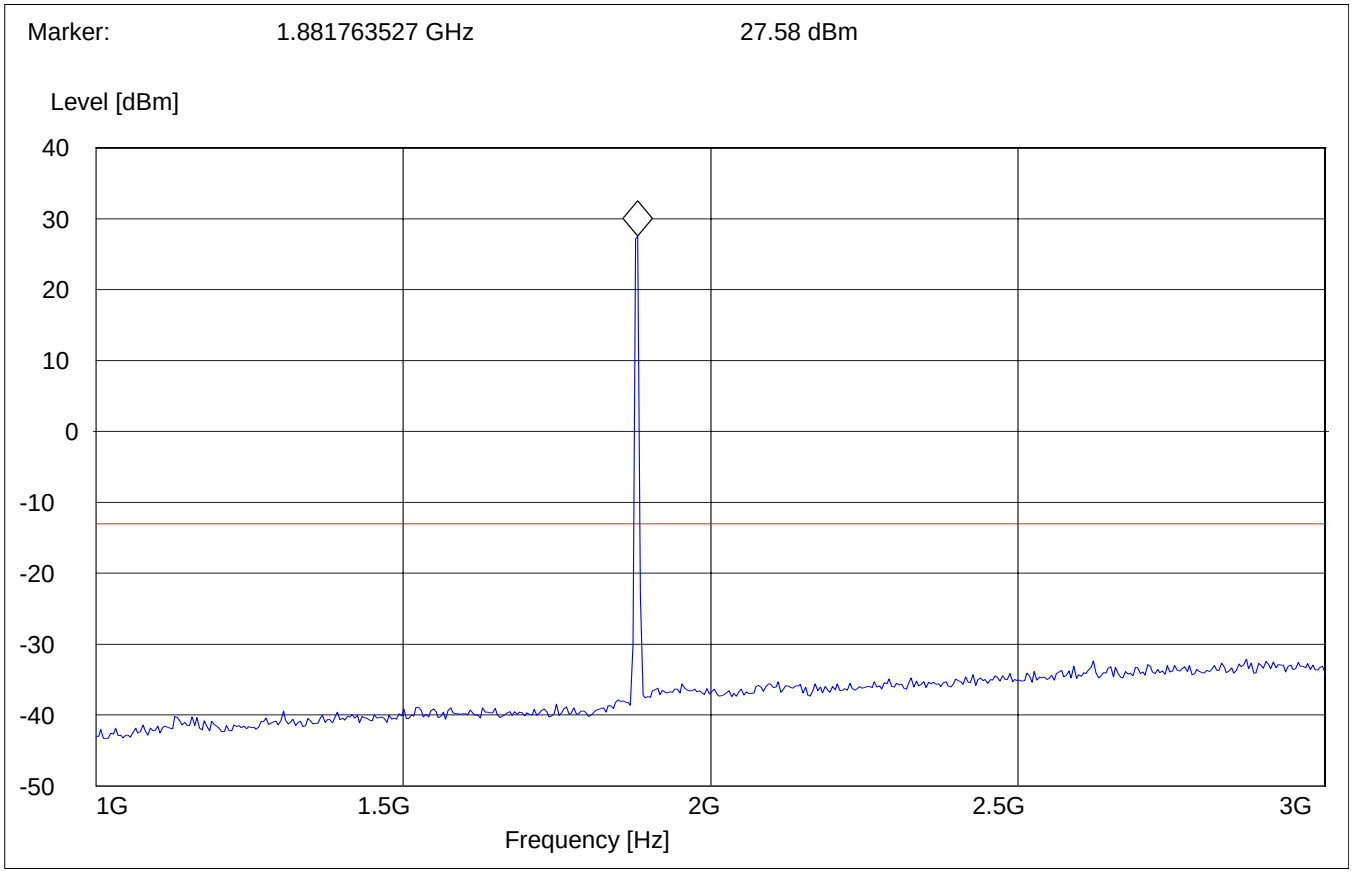
### Tx @ 1880.0MHz: 1GHz – 3GHz

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-661.

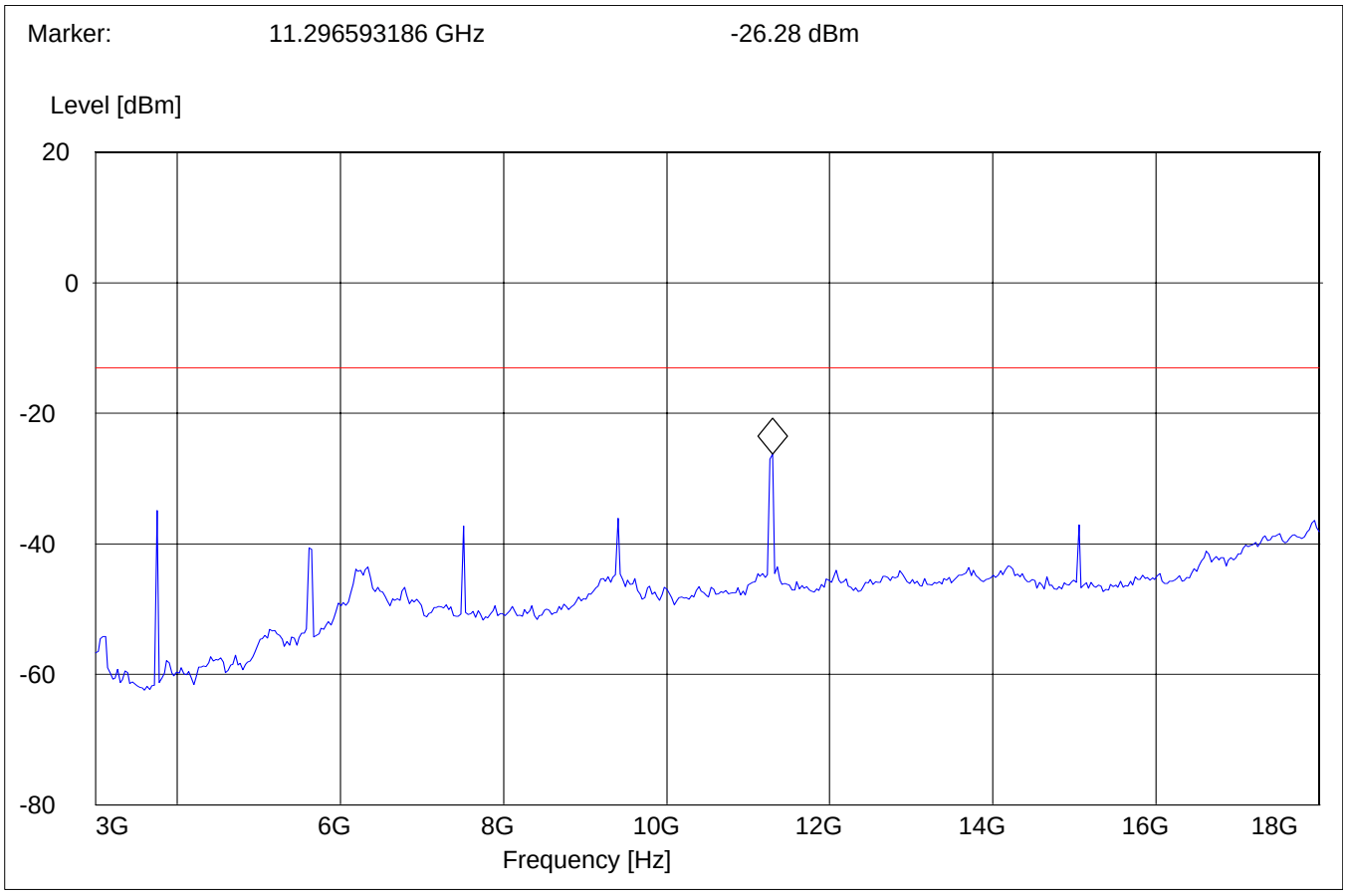


## RADIATED SPURIOUS EMISSIONS
## Tx @ 1880.0MHz: 3GHz – 18GHz

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

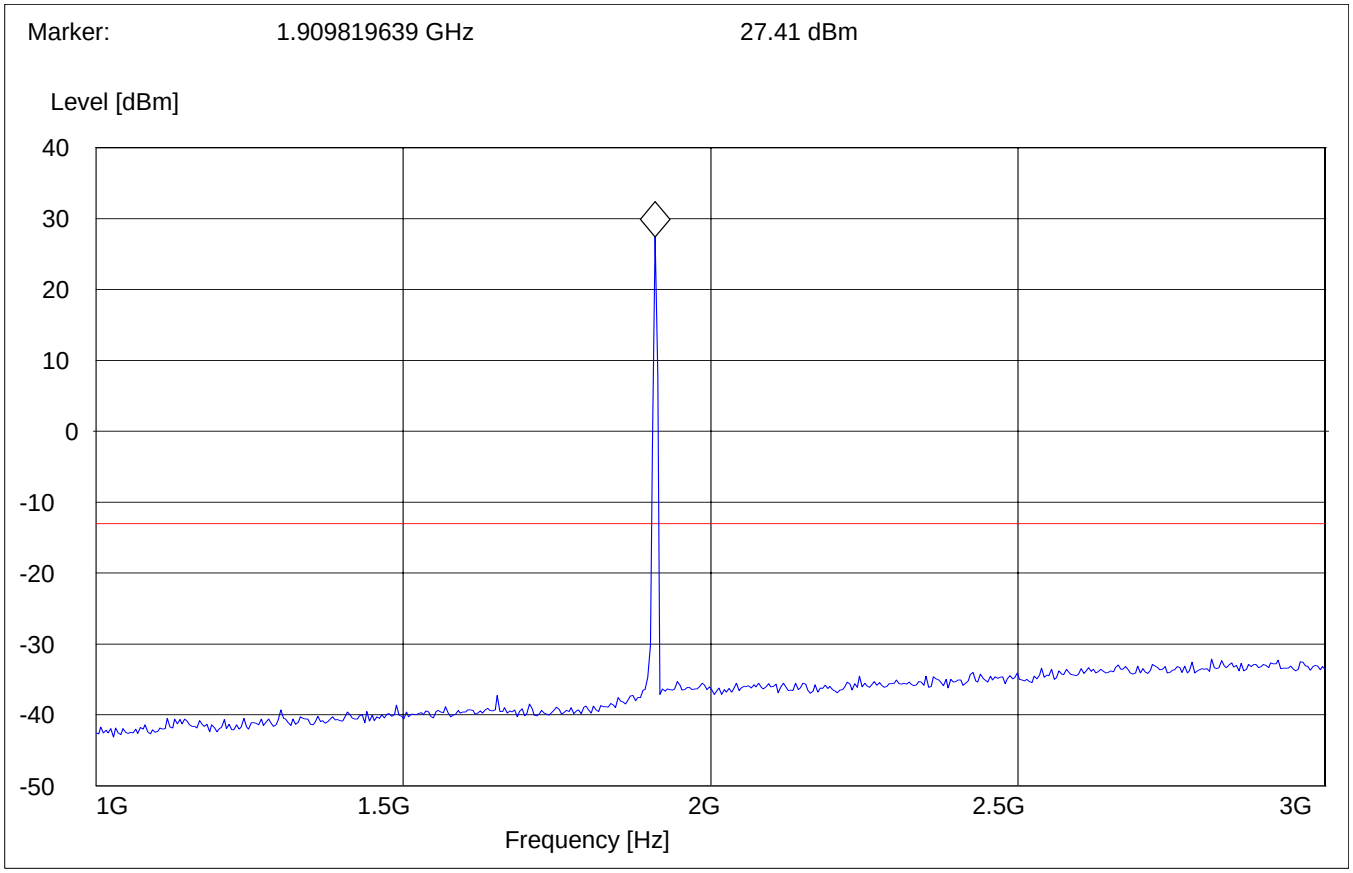
### Tx @ 1909.8MHz: 1GHz – 3GHz

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-810.

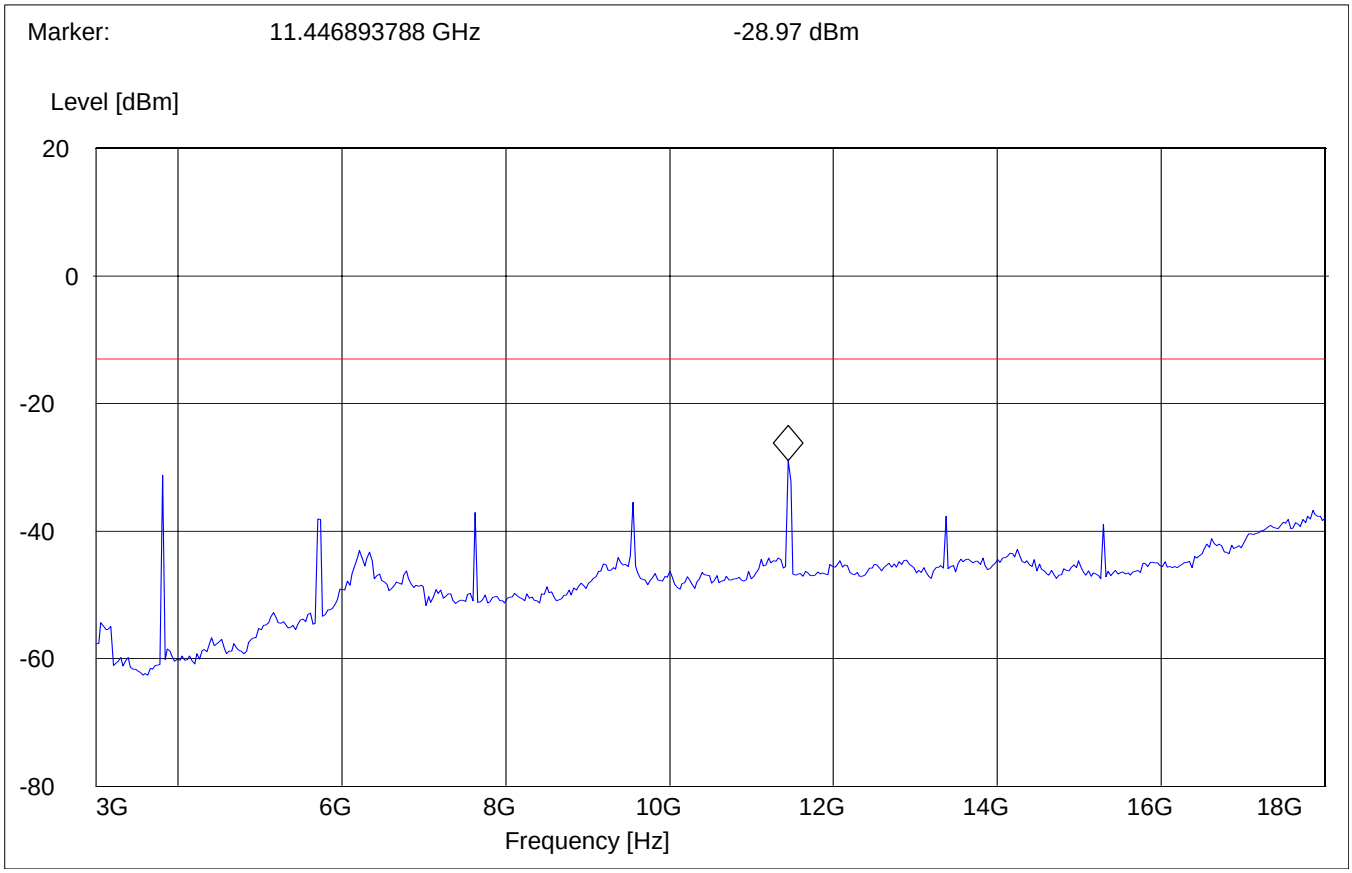


## RADIATED SPURIOUS EMISSIONS
## Tx @ 1909.8MHz: 3GHz – 18GHz

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 |



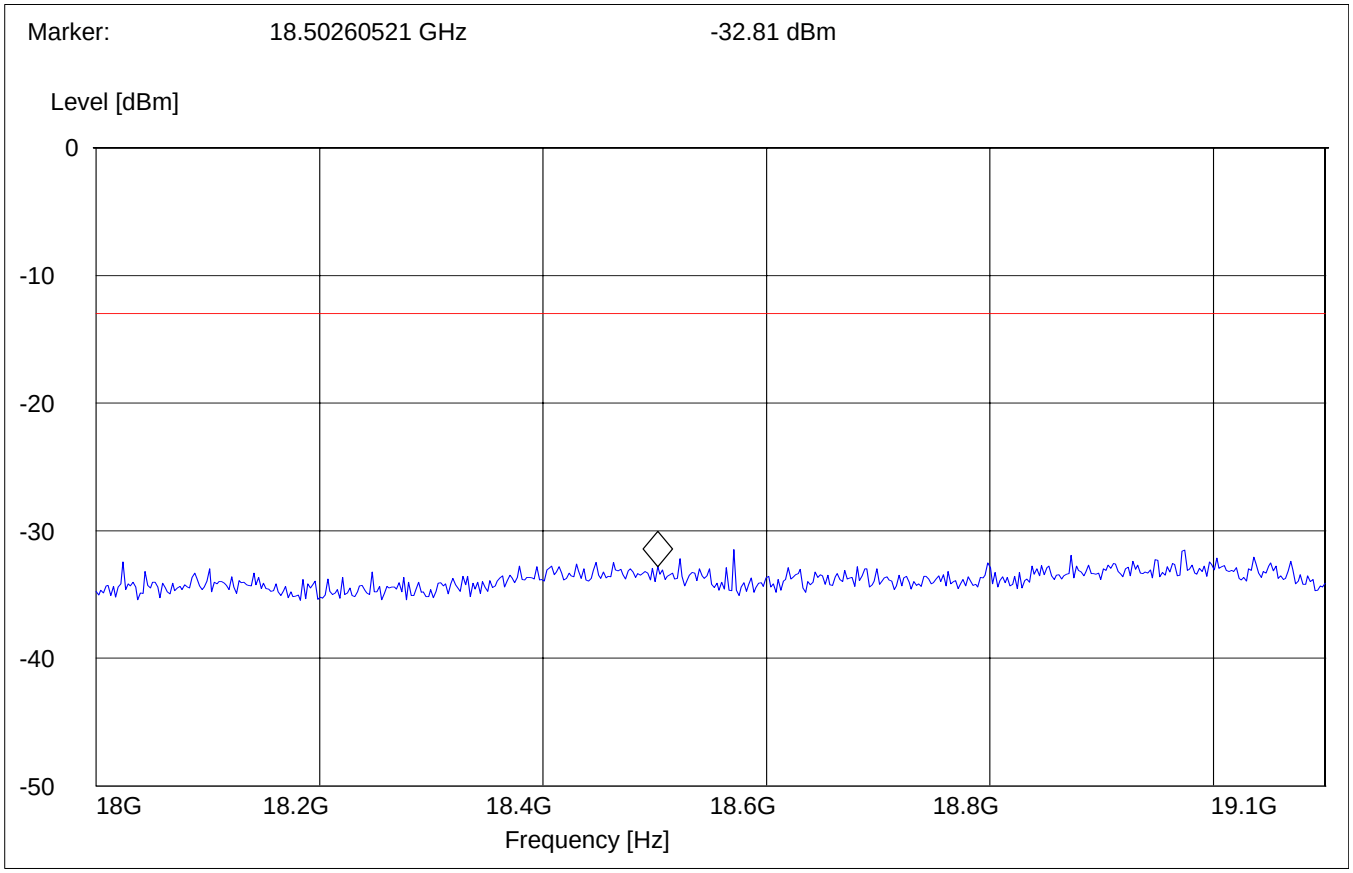
## RADIATED SPURIOUS EMISSIONS
## 18GHz – 19.1GHz

Spurious emission limit –13dBm

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

| *Start Frequency* | *Stop Frequency* | *Detector* | *Meas. Time* | *RBW/VBW* |
|---|---|---|---|---|
| 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)

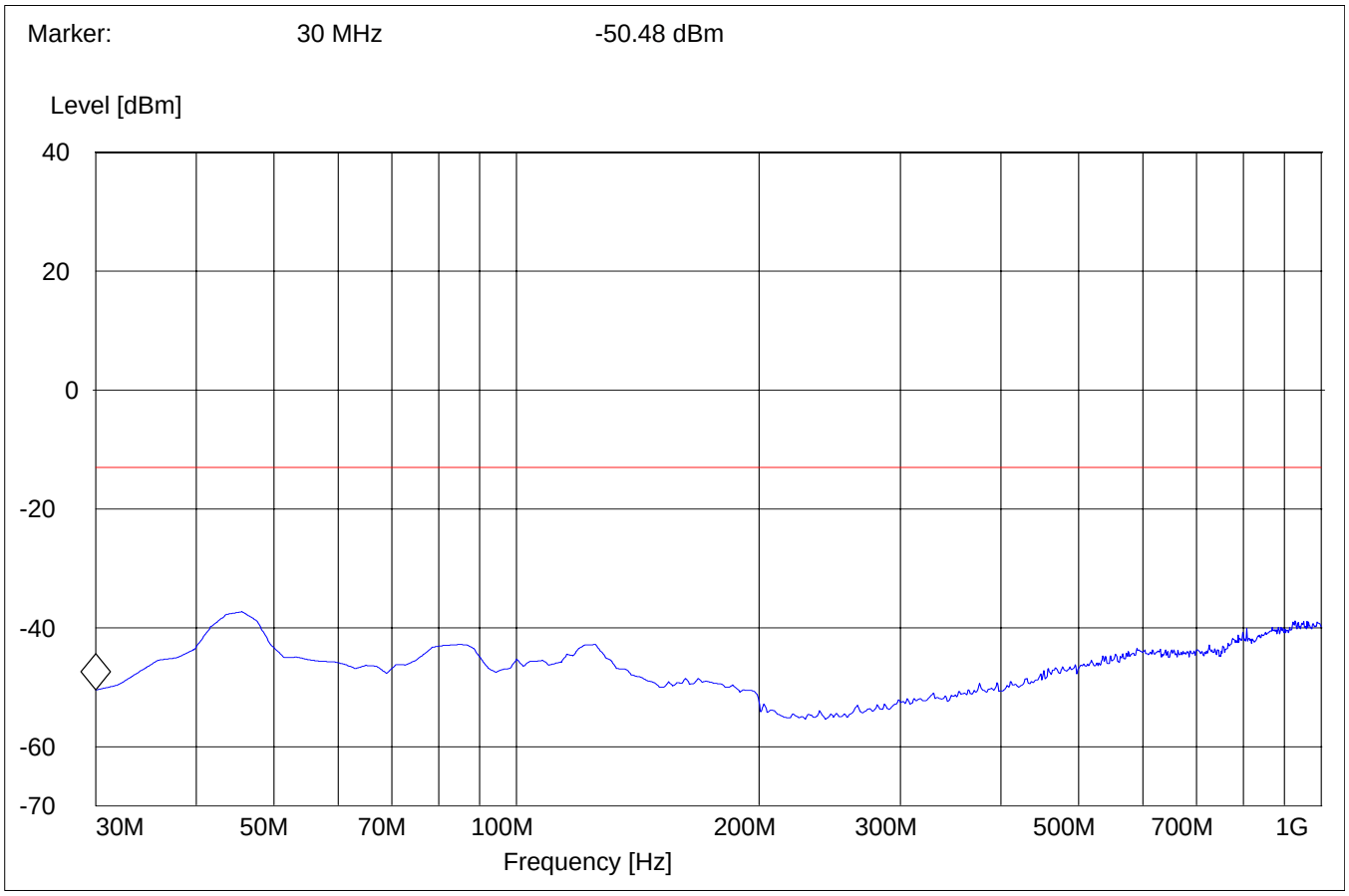
### EUT in Idle Mode: 30MHz – 1GHz

Spurious emission limit –13dBm

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

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

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



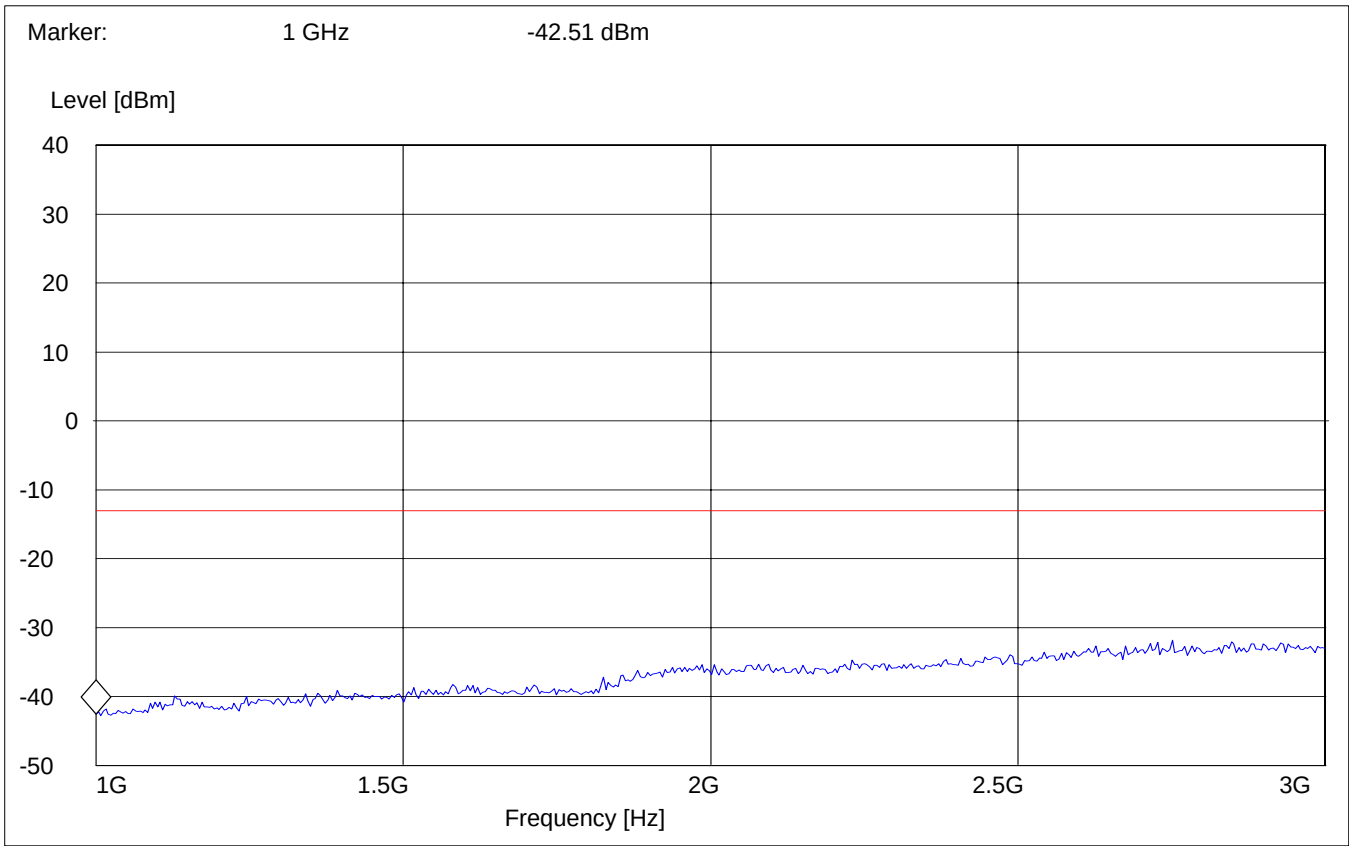
## RADIATED SPURIOUS EMISSIONS (IDLE MODE)

## EUT in Idle Mode: 1GHz – 3GHz

Spurious emission limit –13dBm

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

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



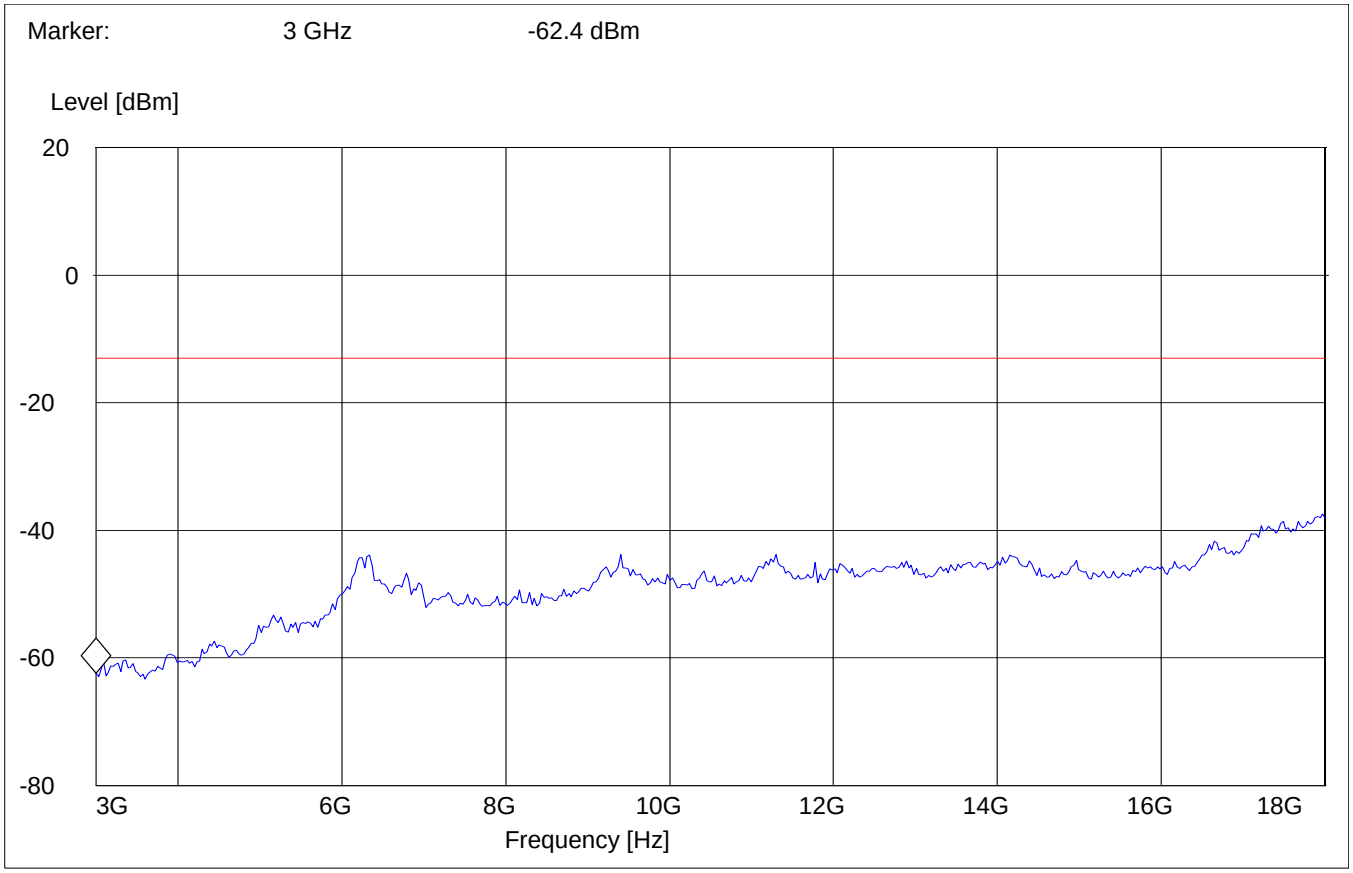
## RADIATED SPURIOUS EMISSIONS (IDLE MODE)

## EUT in Idle Mode: 3GHz – 18GHz

Spurious emission limit –13dBm

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

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

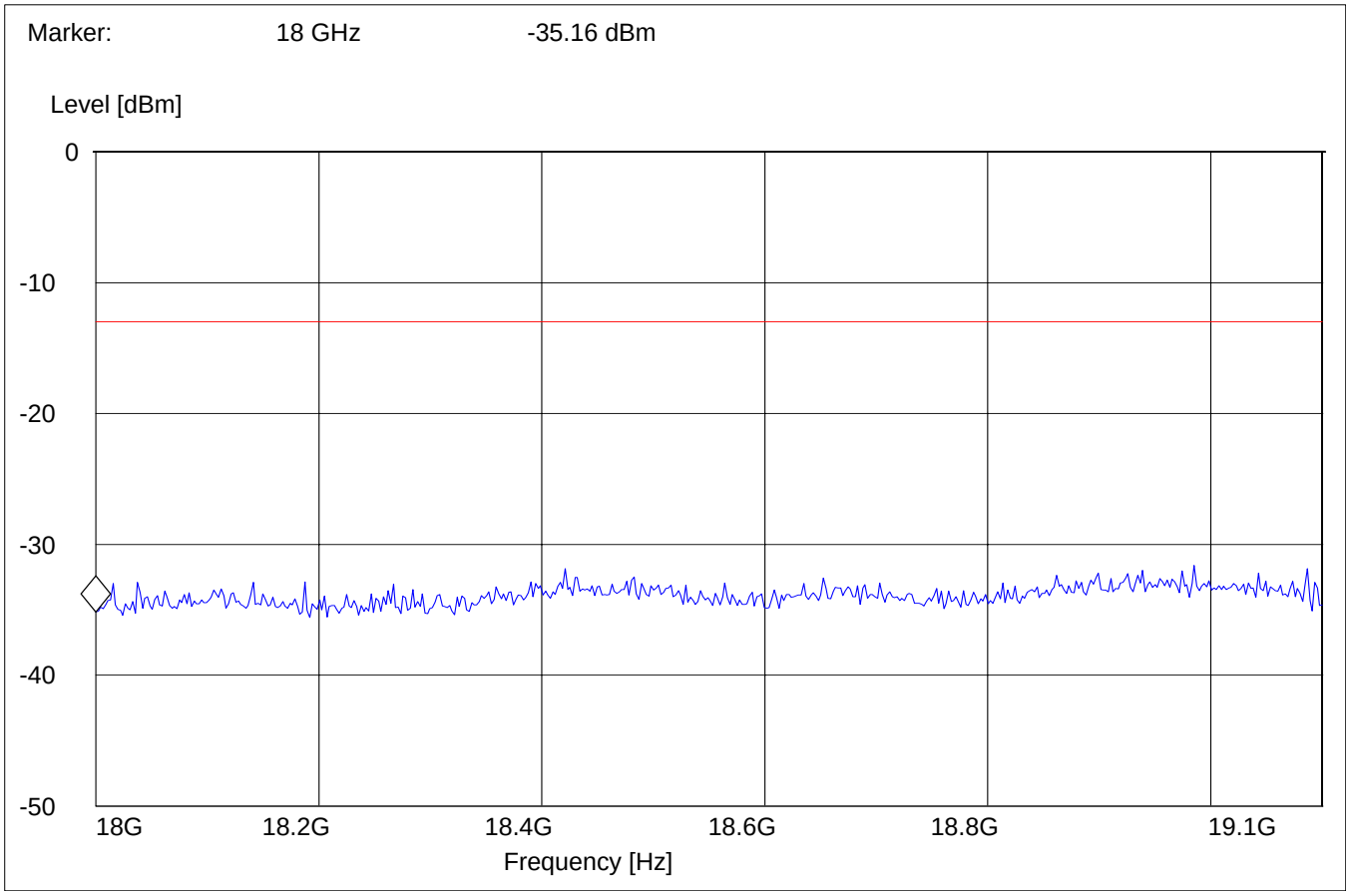


## RADIATED SPURIOUS EMISSIONS (IDLE MODE)
## EUT in Idle Mode: 18GHz – 19.1GHz

Spurious emission limit –13dBm

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

| *Start 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 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.

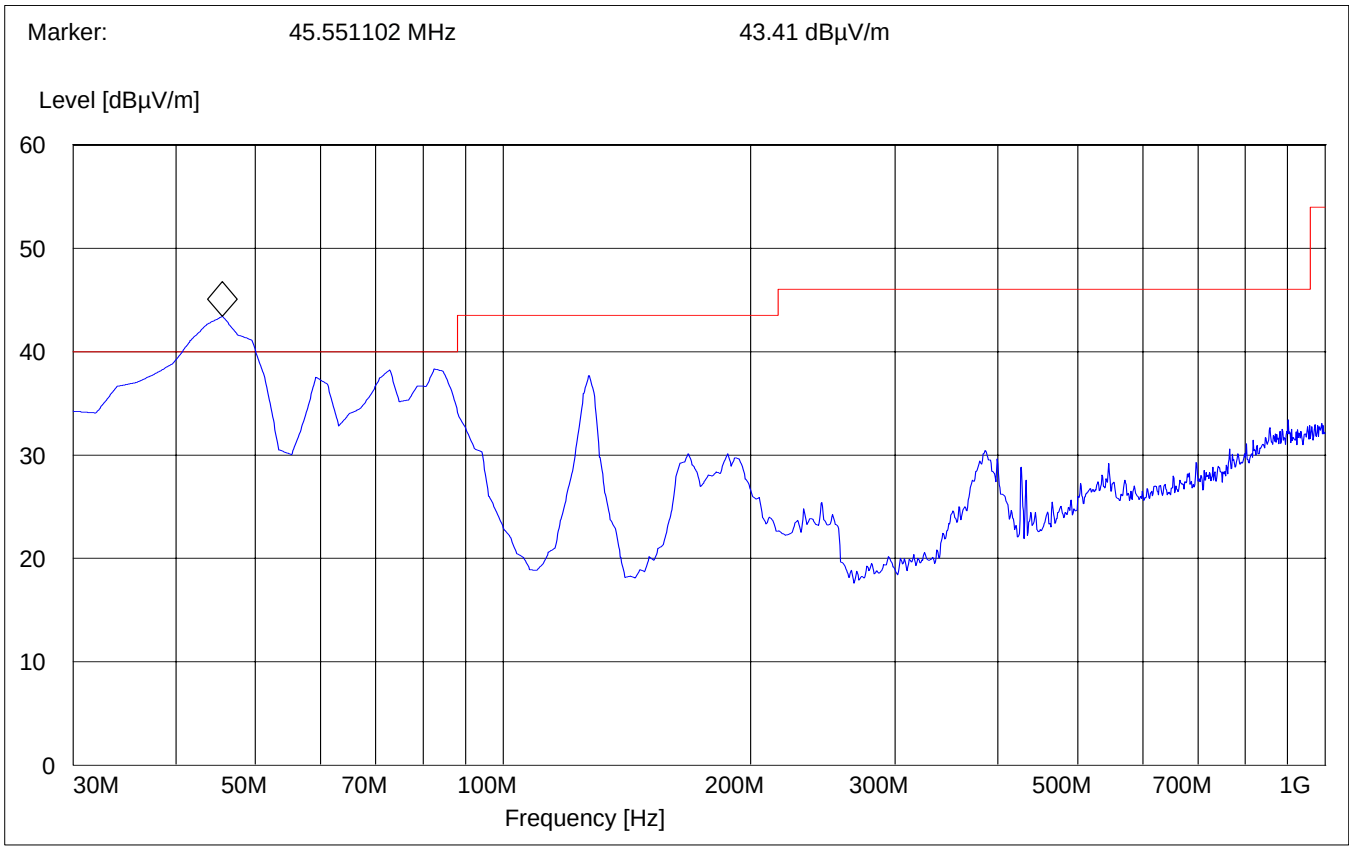
**Antenna: vertical**

**SWEEP TABLE: "FCCSpur 30M-1G"**

| *Start Frequency* | *Stop Frequency* | *Detector* | *Meas. Time* | *RBW/VBW* |
|---|---|---|---|---|
| 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** |

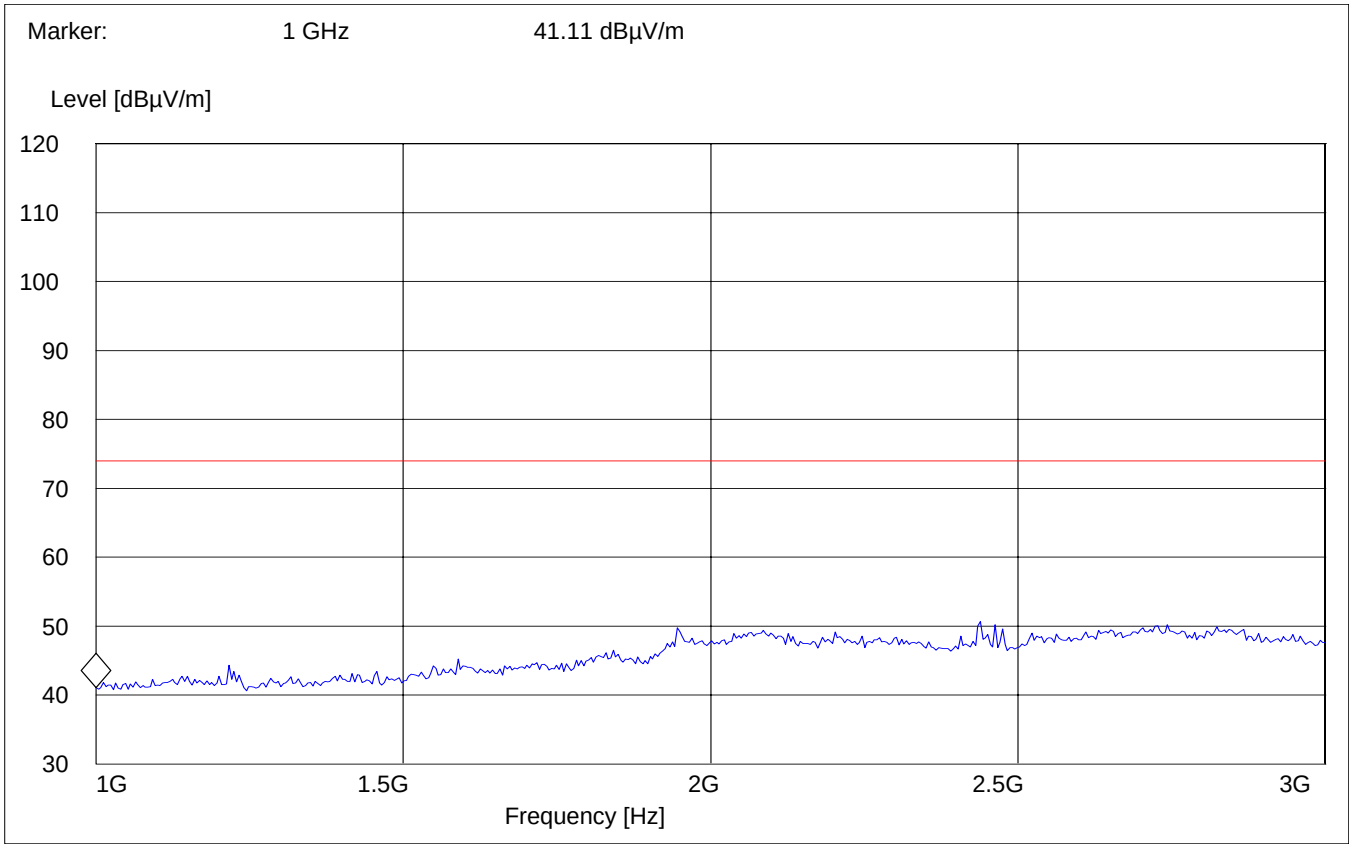


## RECEIVER RADIATED EMISSIONS
## EUT in Idle Mode: 1GHz – 3GHz

**Note: marked peak is downlink from the base station**

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

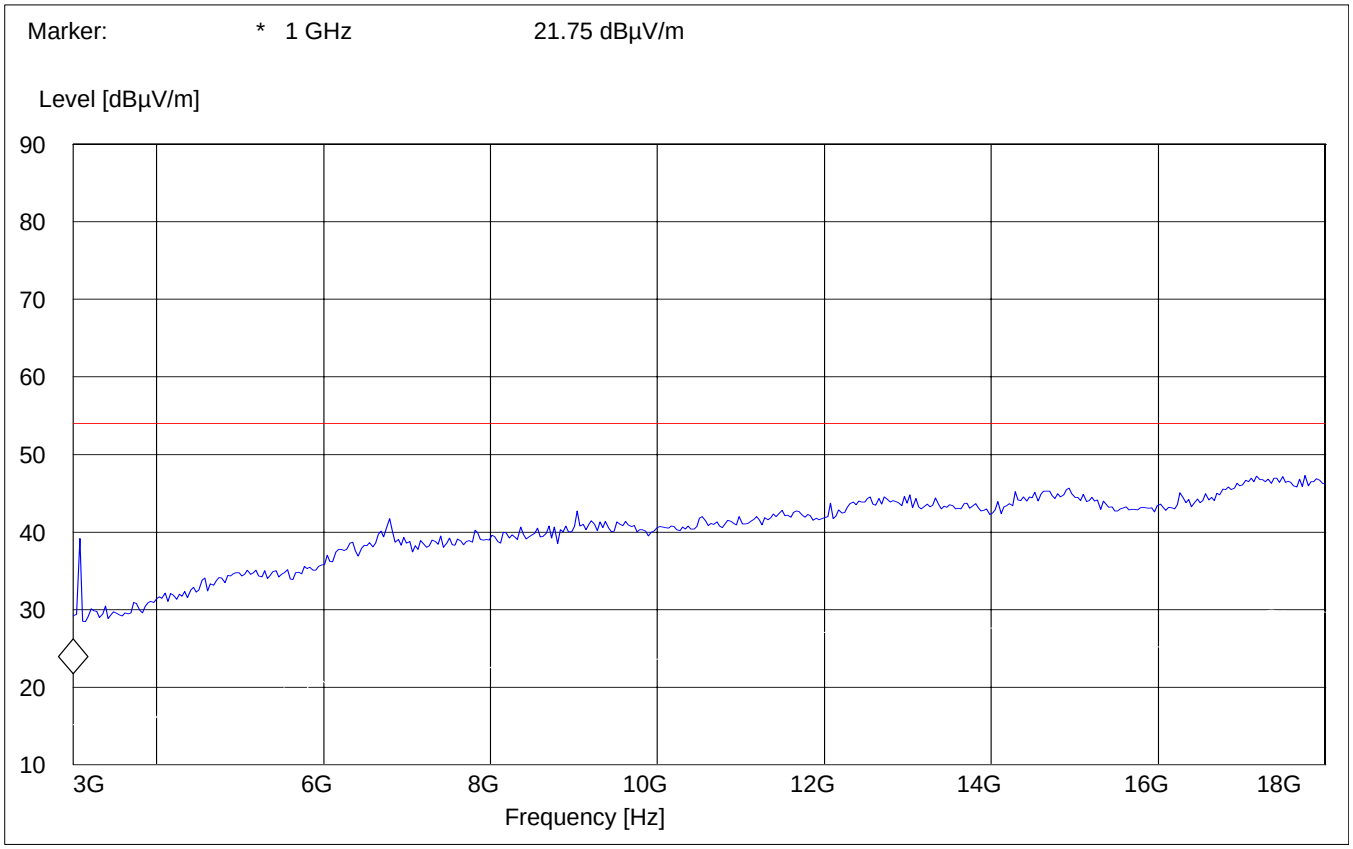
| *Start Frequency* | *Stop Frequency* | *Detector* | *Meas. Time* | *RBW/VBW* |
|---|---|---|---|---|
| 1GHz | 3GHz | Max Peak | Coupled | 1 MHz |



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

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

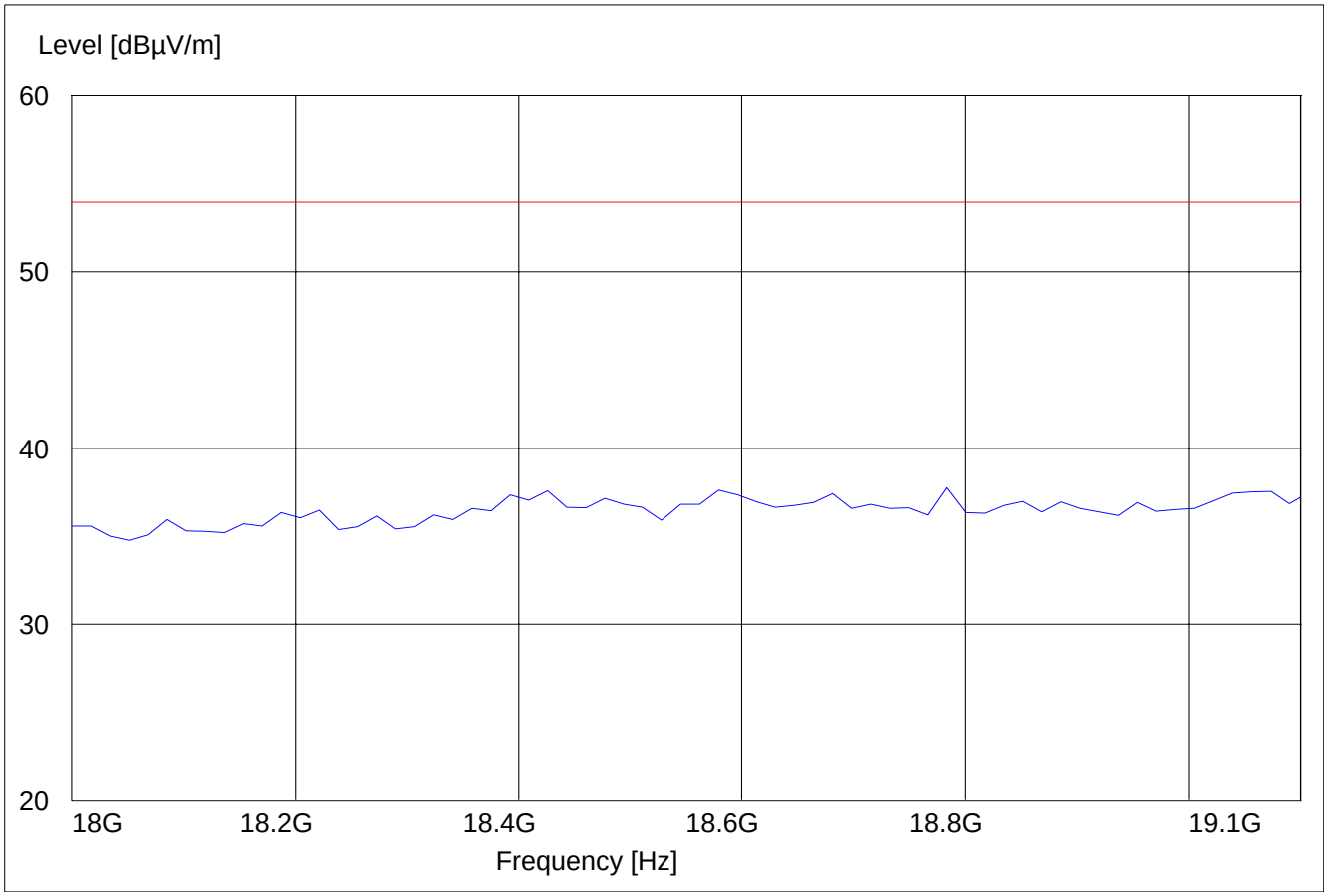
| *Start Frequency* | *Stop Frequency* | *Detector* | *Meas. Time* | *RBW/VBW* |
|---|---|---|---|---|
| 3GHz | 18GHz | Max Peak | Coupled | 1 MHz |



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

***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 |



**CONDUCTED EMISSIONS** **§ 15.107/207**

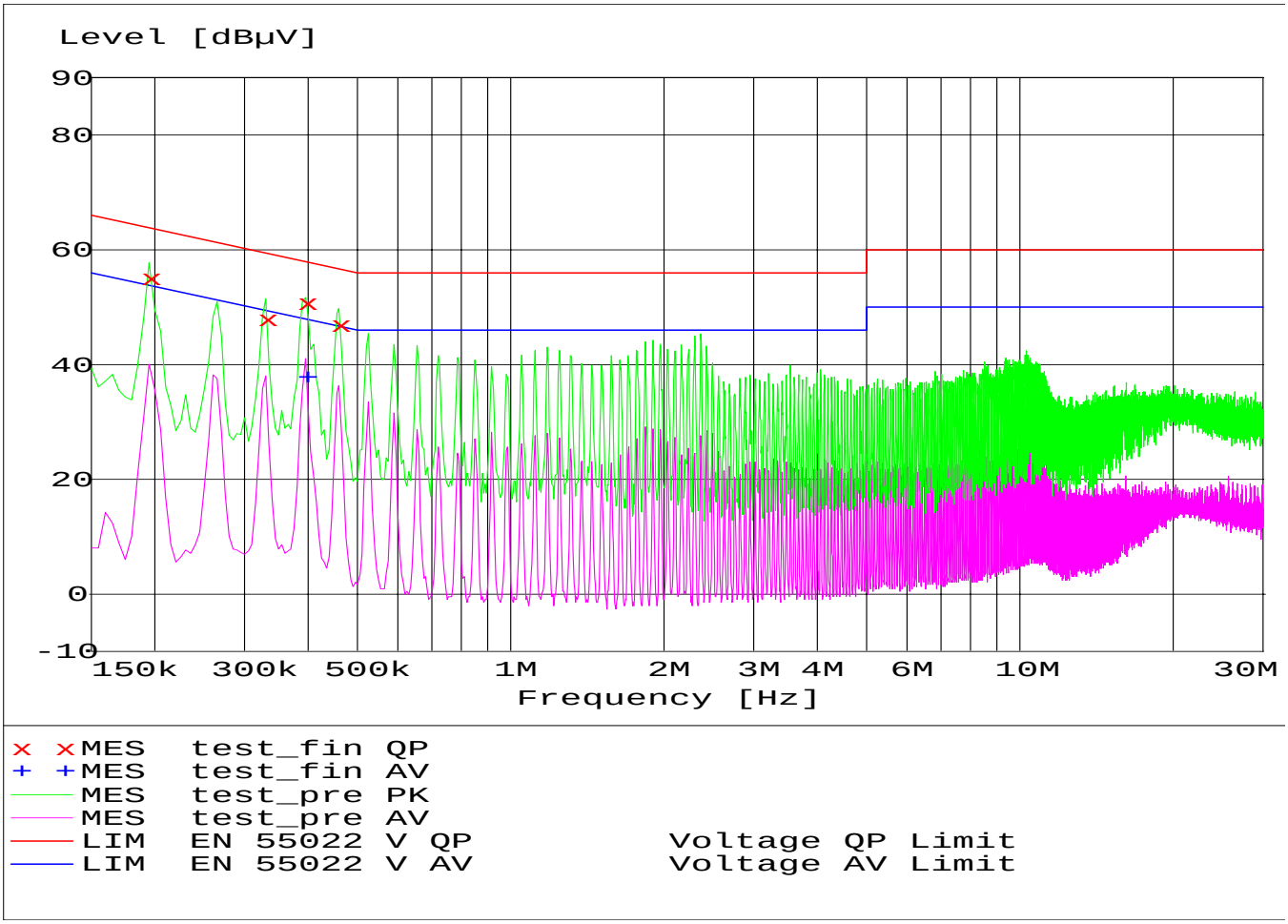
**Measured with AC/DC power adapter plugged in LISN**

**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 MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Line | PE |
|---|---|---|---|---|---|---|
| 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 MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Line | PE |
|---|---|---|---|---|---|---|
| 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