



FCC Test Report

Test report no.: EMC_662FCC15.247_2004_WLAN_7900L0P

FCC Part 15.247 for DSSS systems / CANADA RSS-210

Model: 7900L0P

FCC ID: HD57900L0P

IC: 1693B79L0P



TTI-P-G 081/94-A0

Accredited according to **ISO/IEC 17025**



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. 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.

TEST REPORT PREPARED BY:

EMC Engineer: Harpreet Sidhu

1.2 Testing laboratory

CETECOM Inc.

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Internet: www.cetecom.com

1.3 Details of applicant

Name : Hand Held Products, Inc.
Street : 700 Vision Drive
City / Zip Code : Skaneateles Falls, NY 13153
Country : U.S.A
Contact : Naveen Velagapudi
Telephone : +1 315 685 2931
Tele-fax : +1 315 685 1210
e-mail : velagapudin@hhp.com

1.4 Application details

Date of receipt test item : 2004-08-16
Date of test : 2004-08-16/17/18

1.5 Test item

Manufacturer : Applicant
Marketing Name : D7900
Model No. : **7900L0P**
Description : Hand held computer with 802.11b WLAN and BT
FCC-ID : HD57900L0P
IC ID : 1693B79L0P

Additional information

Frequency : 2412MHz – 2462MHz
Type of modulation : DSSS
Number of channels : 11
Antenna : External
Output power : 16.0dBm (0.04W) conducted peak power

1.6 Test standards: **FCC Part 15 §15.247 / CANADA RSS-210**

PROJECT OVERVIEW:

NOTE: This test report covers all radiated measurements as per FCC15.247 for WLAN module in HHP handheld computer model#7900L0P. For all conducted measurements please refer to *test report# 2L0523RUS1_WLAN_cond*

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:

2004-10-04 EMC & Radio Lothar Schmidt (Manager)

**Date****Section****Name****Signature****Responsible for test report and project leader:**

2004-10-04 EMC & Radio Harpreet Sidhu (EMC Engineer)

**Date****Section****Name****Signature**

2.2 Test report

TEST REPORT

Test report no.: EMC_662FCC15.247_2004_WLAN_7900L0P

TEST REPORT REFERENCE

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**MAXIMUM PEAK OUTPUT POWER
(Conducted)****§ 15.247 (b) (1)**

| TEST CONDITIONS | | MAXIMUM PEAK OUTPUT POWER (dBm) | | | |
|--------------------------------|------------------------|--|-------------|-------------|-------------|
| Frequency (MHz) | | 2412 | 2437 | 2462 | |
| T_{nom}(23)°C | V_{nom} | Pk | 16.0 | 16.0 | 16.0 |
| Measurement uncertainty | | ±0.5dBm | | | |

LIMIT**SUBCLAUSE § 15.247 (b) (1)**

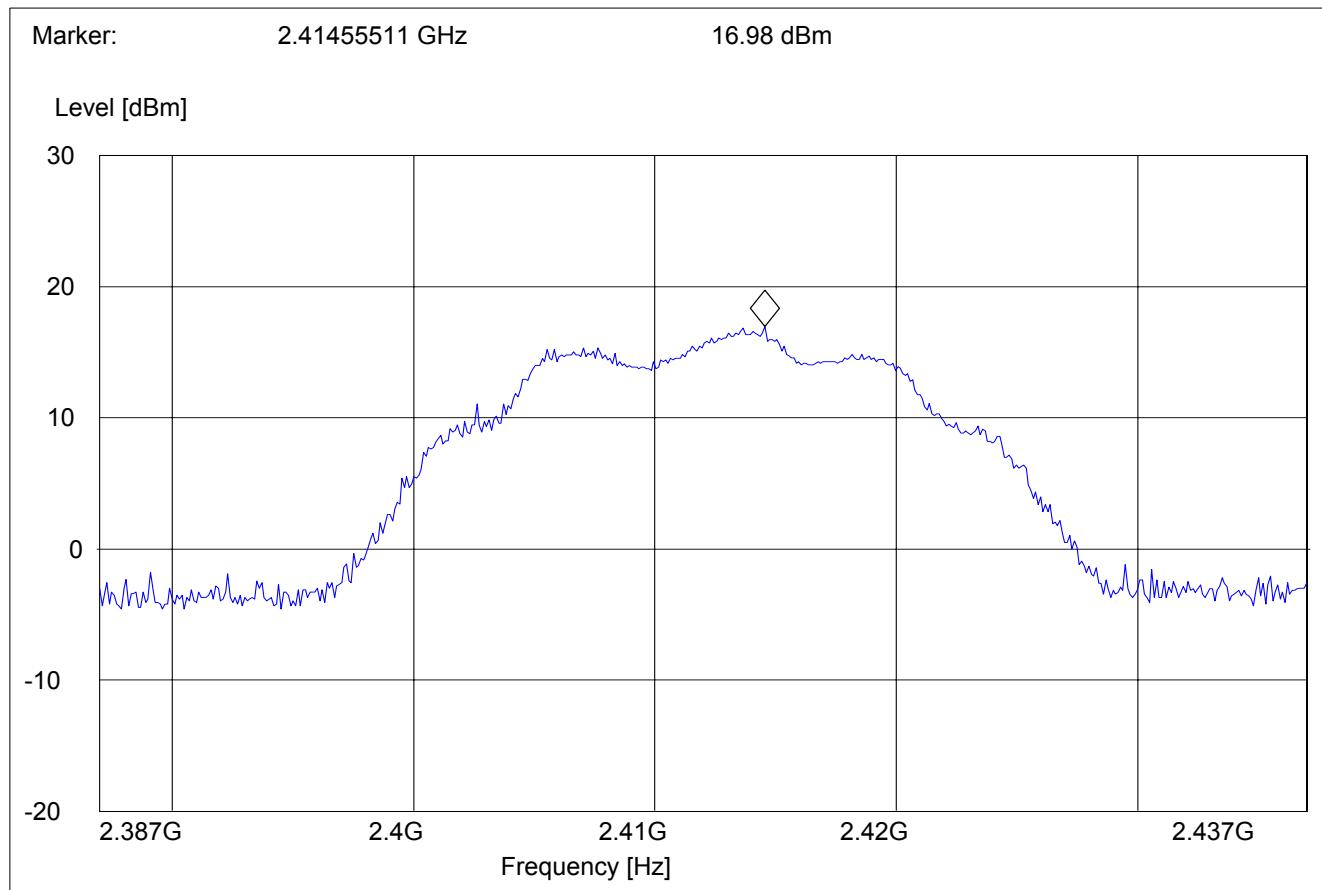
| Frequency range | RF power output |
|------------------------|-----------------------------------|
| 2400-2483.5 MHz | 1.0 Watt / 30dBm conducted |

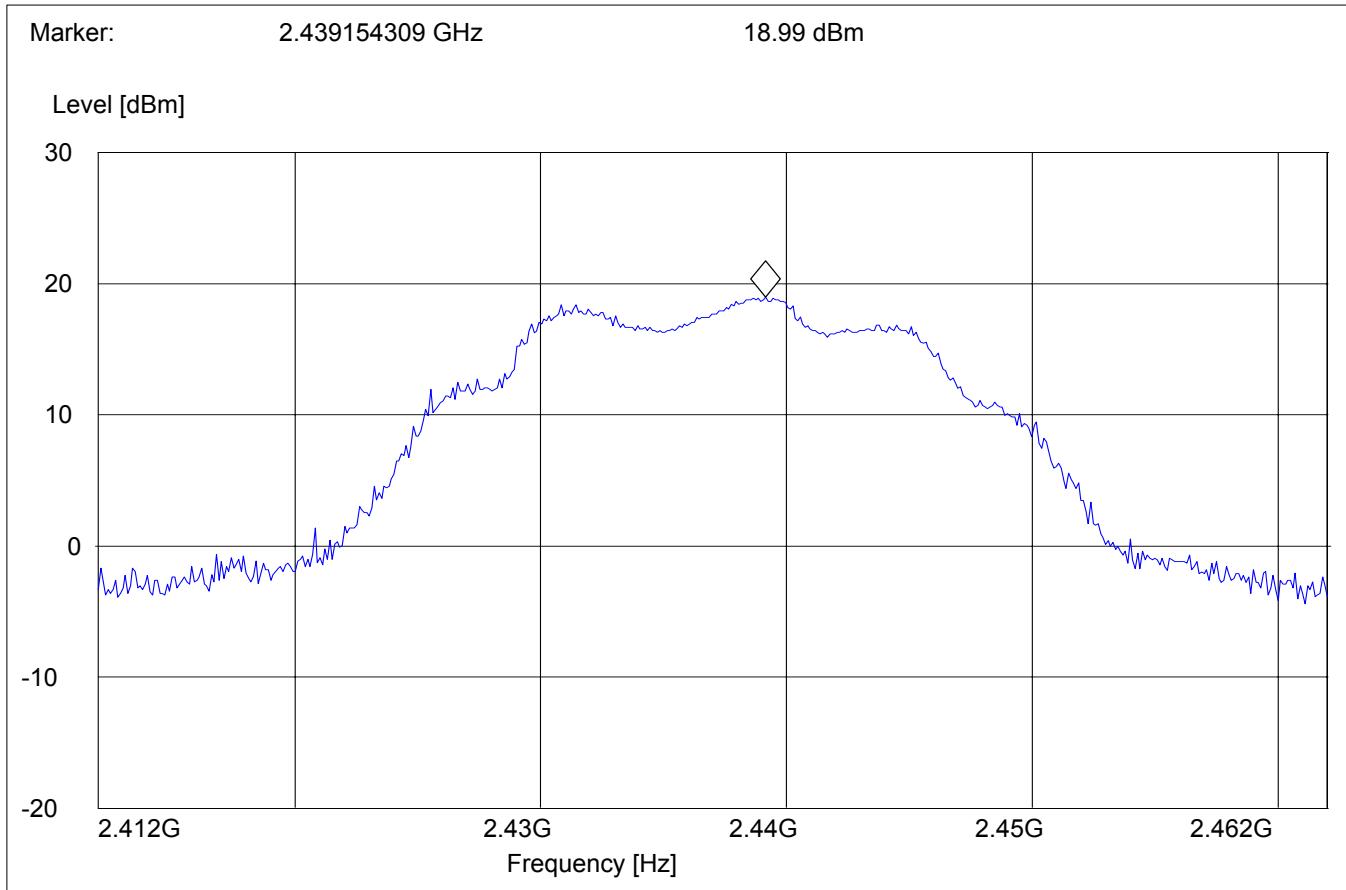
**MAXIMUM PEAK OUTPUT POWER
(RADIATED)****§ 15.247 (b) (1)****EIRP:**

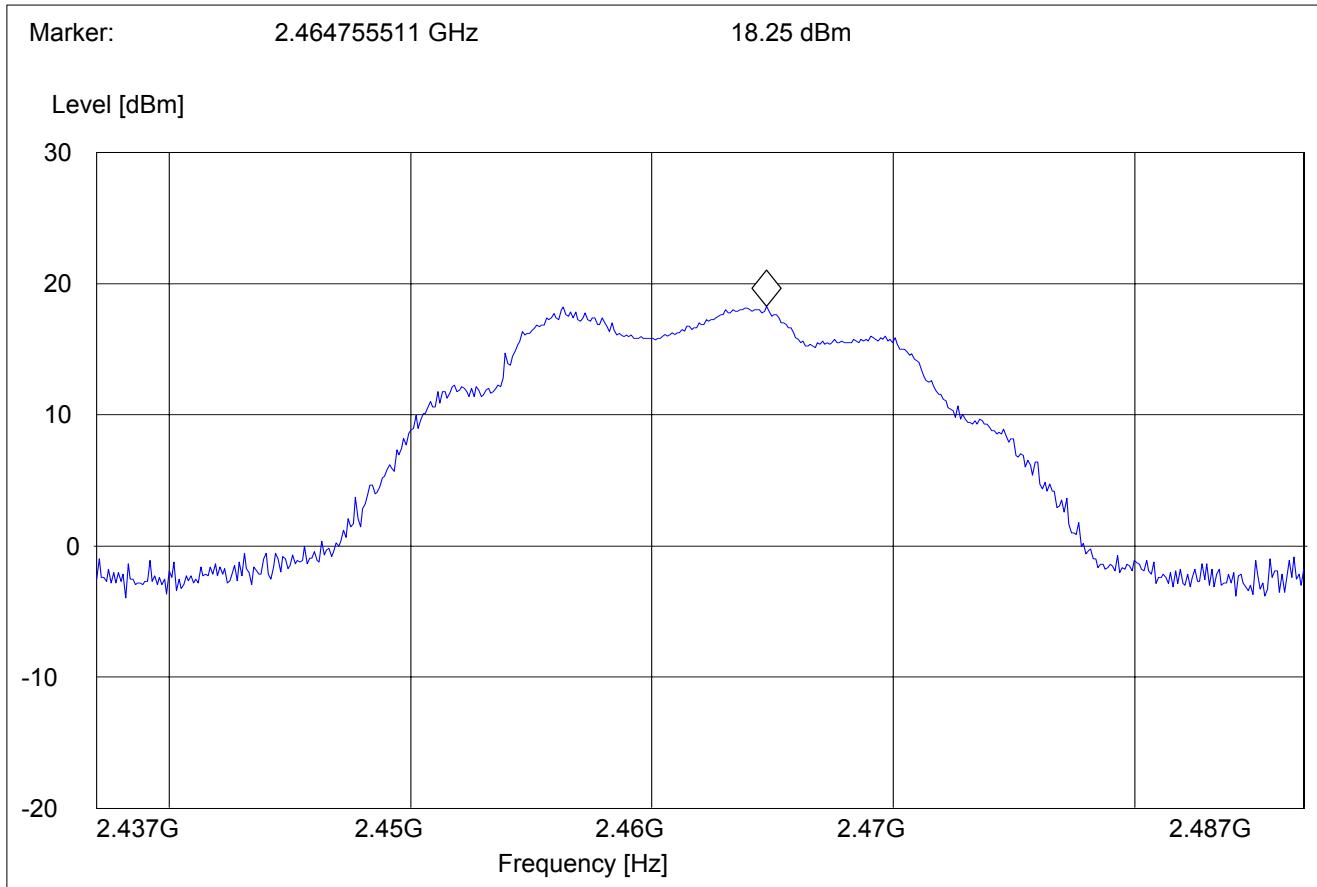
| TEST CONDITIONS | | MAXIMUM PEAK OUTPUT POWER (dBm) | | |
|-------------------------|------------------|---------------------------------|-------|-------|
| Frequency (MHz) | | 2412 | 2437 | 2462 |
| T _{nom} (23)°C | V _{nom} | 16.98 | 18.99 | 18.25 |
| Measurement uncertainty | | ±0.5dBm | | |

LIMIT**SUBCLAUSE § 15.247 (b) (1)**

| Frequency range | RF power output |
|-----------------|--------------------|
| 2400-2483.5 MHz | 30dBm on Conducted |

EIRP: 2412MHz

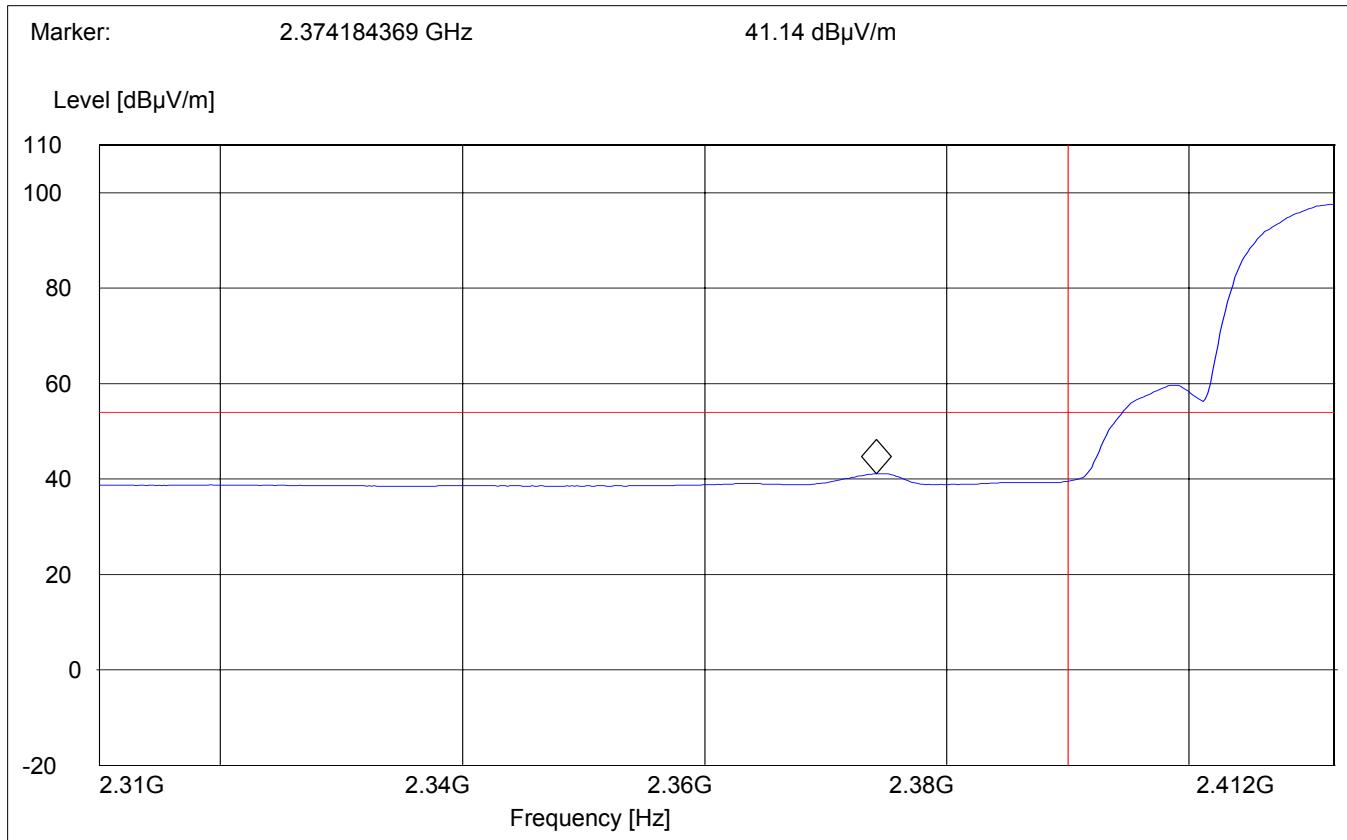
EIRP: 2437MHz

EIRP: 2462MHz

BAND EDGE COMPLIANCE**§15.247 (c)****Low frequency section (spurious in the restricted band 2310 – 2390 MHz)****(Average measurement)**

Operating condition : Tx at 2412MHz
SWEEP TABLE : "FCC15.247 LBE_AVG"
Limit Line : 54dB μ V

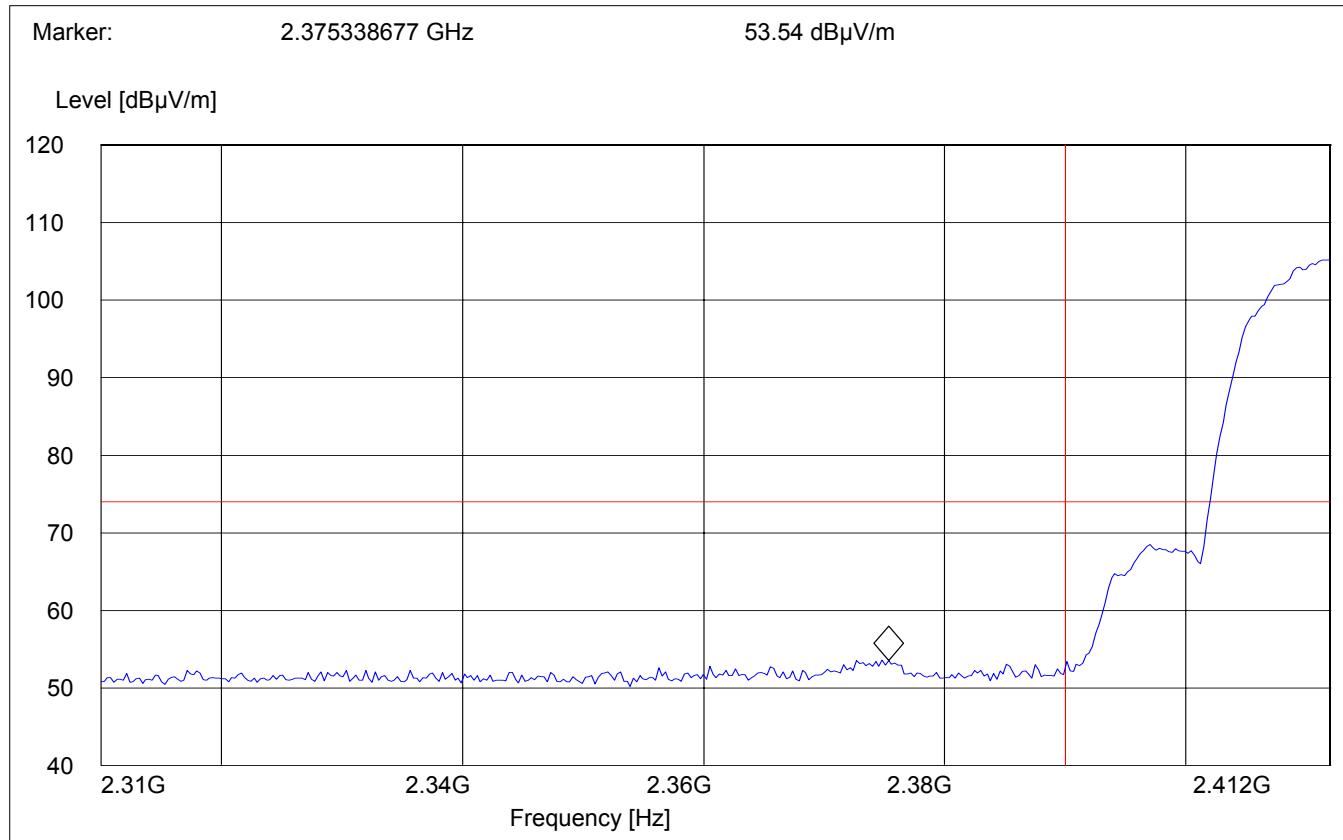
| Start Frequency | Stop Frequency | Detector | Meas. | RBW | VBW | Transducer |
|-----------------|----------------|----------|---------|-------|------|-----------------|
| 2.31 GHz | 2.412 GHz | Time | Bandw. | 1 MHz | 10Hz | #326 horn (dBi) |
| | | MaxPeak | Coupled | | | |



BAND EDGE COMPLIANCE**§15.247 (c)****Low frequency section (spurious in the restricted band 2310 – 2390 MHz)****(Peak measurement)**

Operating condition : Tx at 2412MHz
SWEEP TABLE : "FCC15.247 LBE_Pk"
Limit Line : 74dB μ V

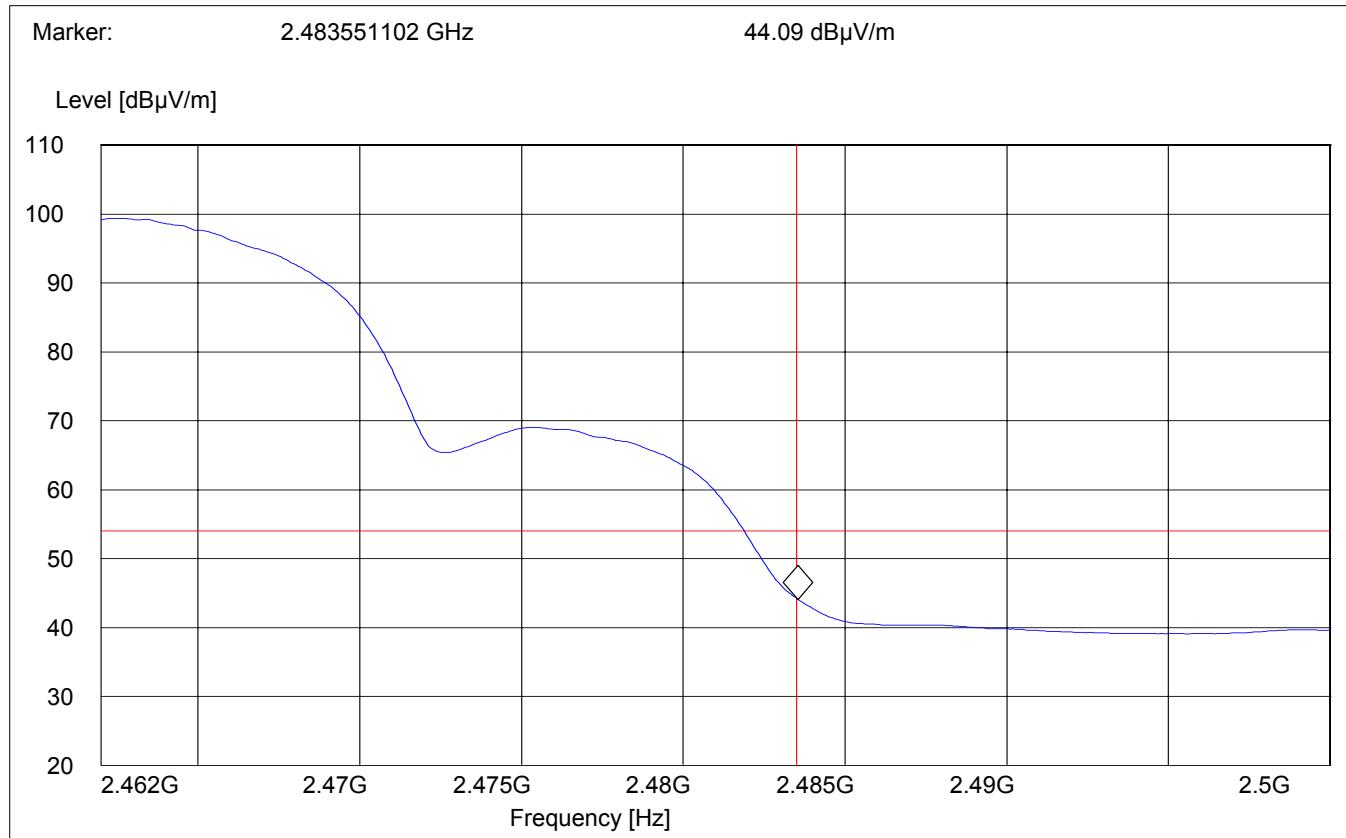
| Start Frequency | Stop Frequency | Detector | Meas. | RBW | VBW | Transducer |
|-----------------|----------------|----------|---------|-------|------|-----------------|
| 2.31 GHz | 2.412 GHz | Time | Bandw. | 1 MHz | 1MHz | #326 horn (dBi) |
| | | MaxPeak | Coupled | | | |



BAND EDGE COMPLIANCE**§15.247 (c)****High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)****(Average measurement)**

Operating condition : Tx at 2462MHz
SWEEP TABLE : "FCC15.247 HBE_AVG"
Limit Line : 54dB μ V

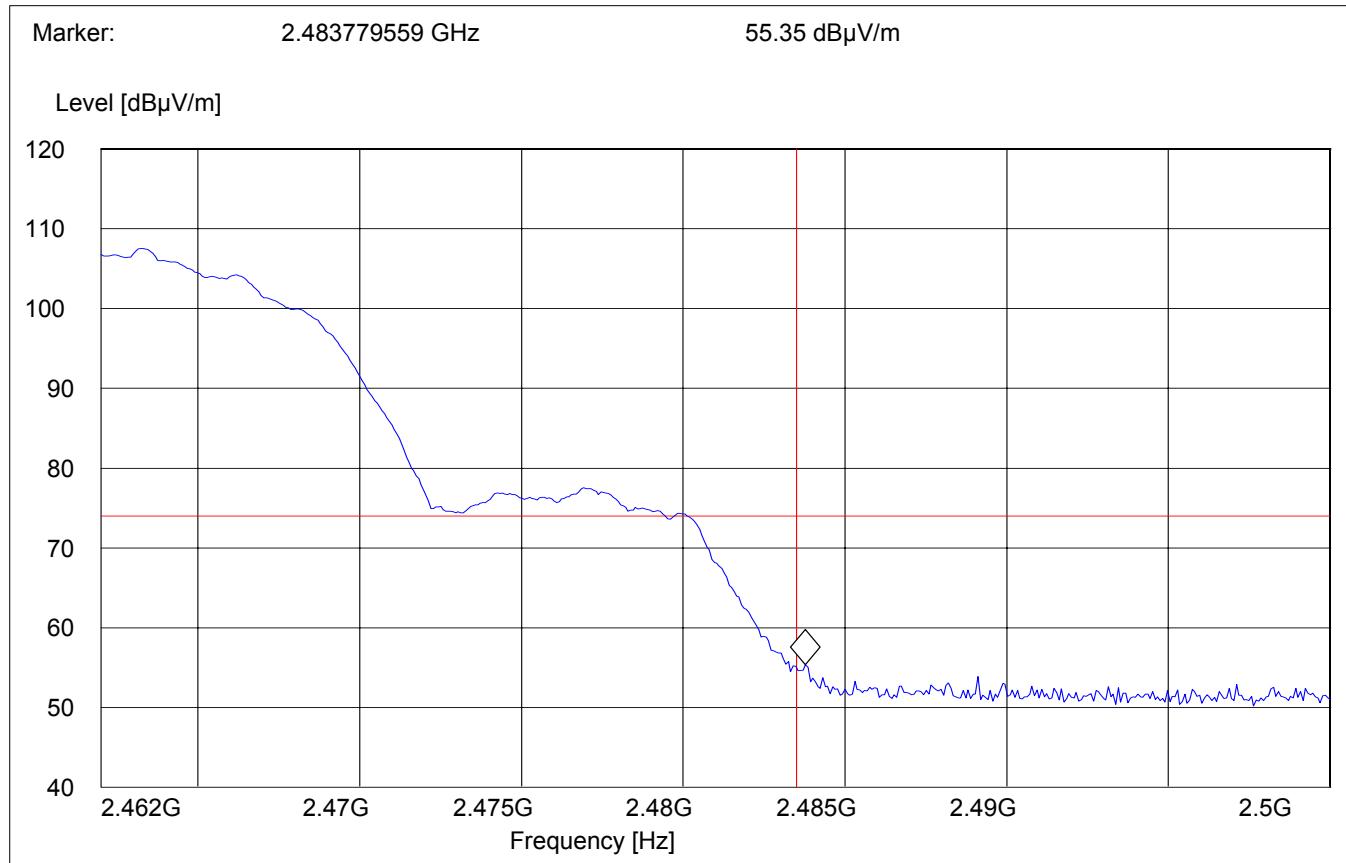
| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW | VBW | Transducer |
|-----------------|----------------|---------------|--------------|-------|------|-----------------|
| 2.462 GHz | 2.5 GHz | MaxPeak | Coupled | 1 MHz | 10Hz | #326 horn (dBi) |



BAND EDGE COMPLIANCE**§15.247 (c)****High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)
(Peak measurement)**

Operating condition : Tx at 2462MHz
SWEEP TABLE : "FCC15.247 HBE_PK"
Limit Line : 74dB μ V

| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW | VBW | Transducer |
|-----------------|----------------|---------------|--------------|-------|------|-----------------|
| 2.462 GHz | 2.5 GHz | MaxPeak | Coupled | 1 MHz | 1MHz | #326 horn (dBi) |



**EMISSION LIMITATIONS
Transmitter (Radiated)****§ 15.247 (c) (1)****LIMITS**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions, which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

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 3 and 26.5 GHz very short cable connections to the antenna was used to minimize the noise level.

2. All measurements are done in peak mode unless specified with the plots.

Results for the radiated measurements below 30MHz according § 15.33

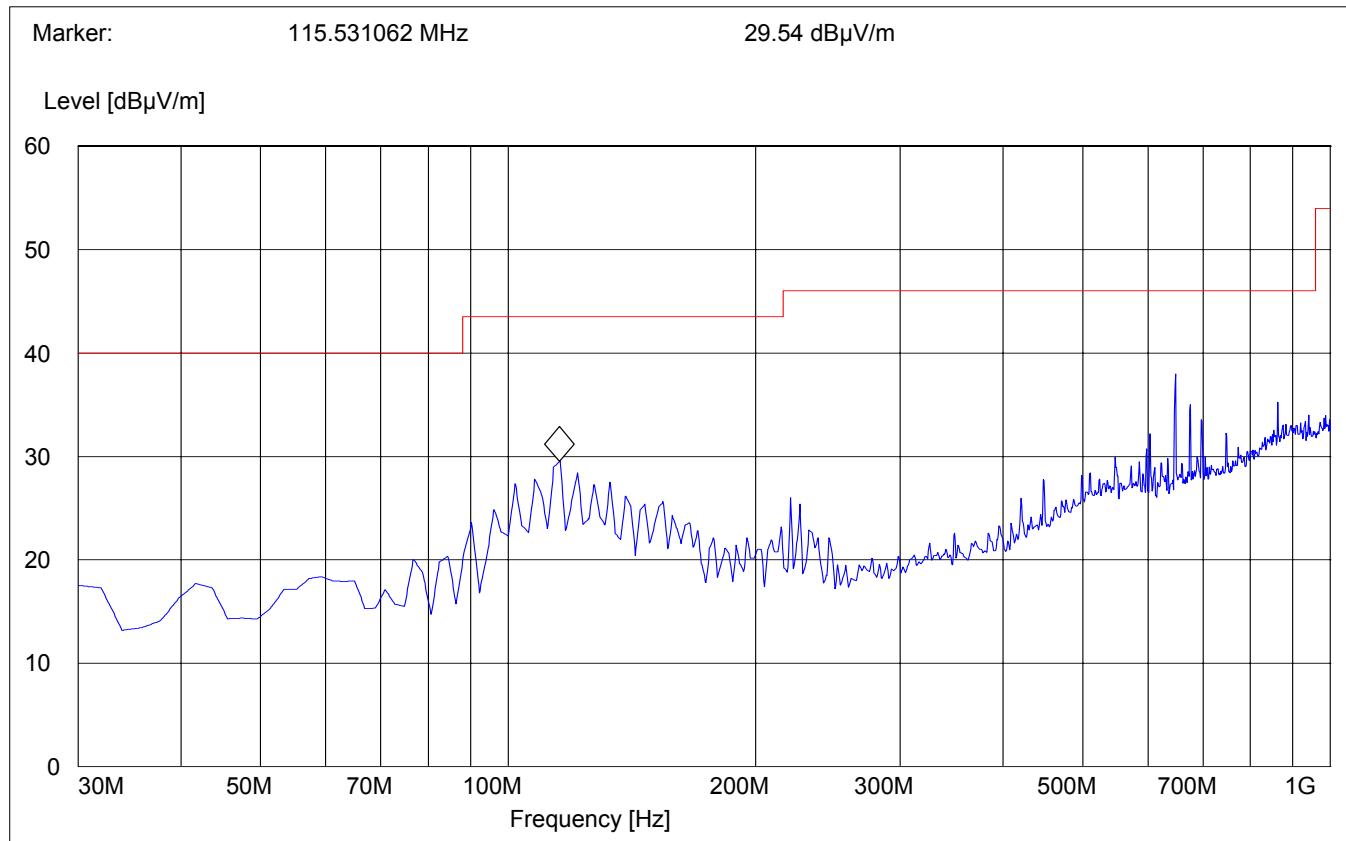
| Frequency | Measured values | Remarks |
|--------------|---------------------------------------|---|
| 9KHz – 30MHz | No emissions found, caused by the EUT | This is valid for all the tested channels |

EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)**

| Transmit at Lowest channel Frequency 2412MHz | | | |
|--|--------------------------------------|-------------------|----------------|
| Frequency (MHz) | Level (dBμV/m) | | |
| | Peak | Quasi-Peak | Average |
| 4815 | 39.94 | | |
| 9653 | 44.39 | | |
| | | | |
| | | | |
| | | | |
| Transmit at Middle channel Frequency 2437MHz | | | |
| Frequency (MHz) | Level (dBμV/m) | | |
| | Peak | Quasi-Peak | Average |
| 4849 | 41.77 | | 28.16 |
| 7302 | 55.35 | | 43.91 |
| | | | |
| | | | |
| Transmit at Highest channel Frequency 2462MHz | | | |
| Frequency (MHz) | Level (dBμV/m) | | |
| | Peak | Quasi-Peak | Average |
| 4917 | 44.77 | | 29.41 |
| 7370 | 56.10 | | 43.17 |
| 9857 | 44.43 | | |
| | | | |

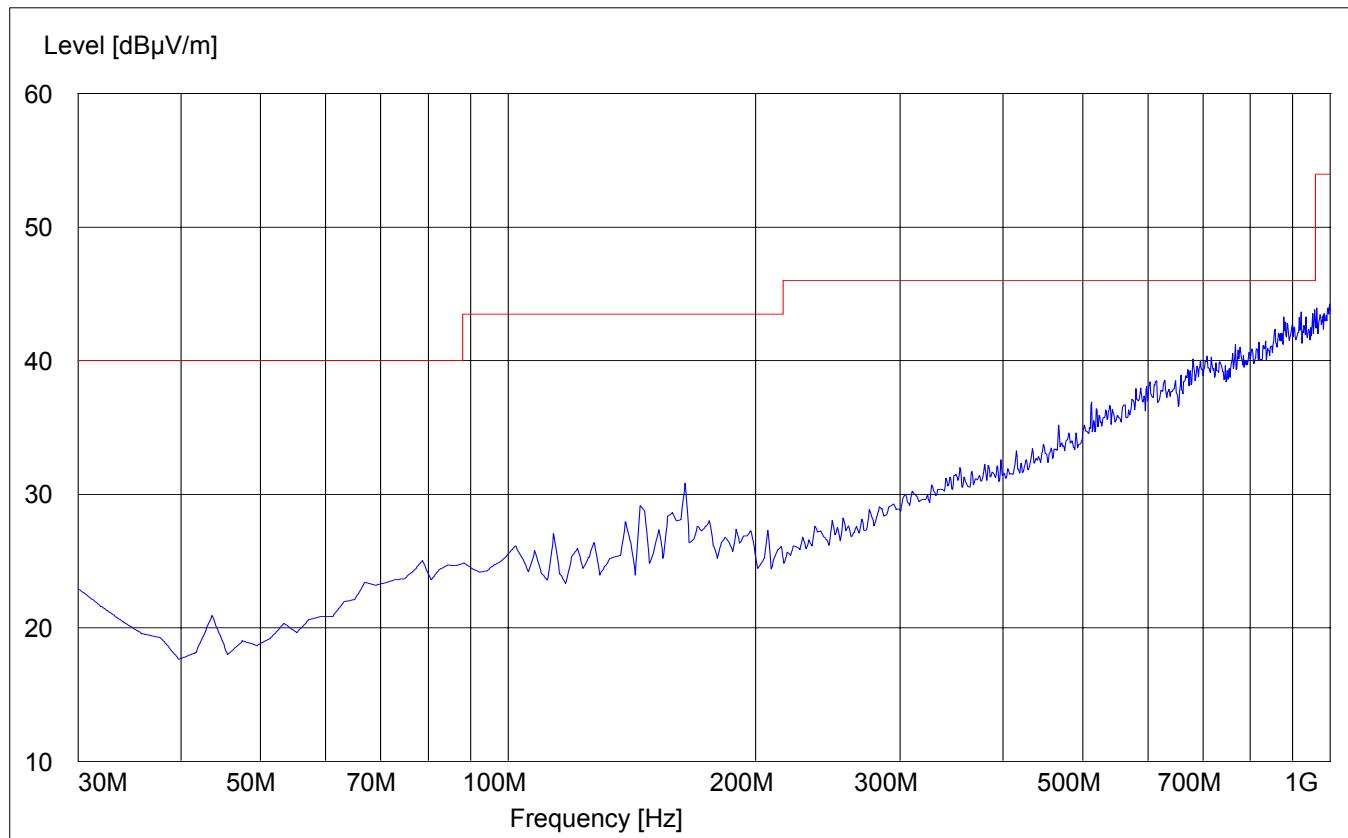
EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)****Lowest Channel (2412MHz): 30MHz – 1GHz****Antenna: Vertical****Note: This plot is valid for low, mid, high channels (worst-case plot)****SWEEP TABLE: "Spuri hi 30-1G"**

| Start Frequency | Stop Frequency | Detector | Meas. | RBW | Transducer |
|-----------------|----------------|----------|---------|---------|------------|
| 30.0 MHz | 1.0 GHz | MaxPeak | Coupled | 100 kHz | 3141-#1186 |



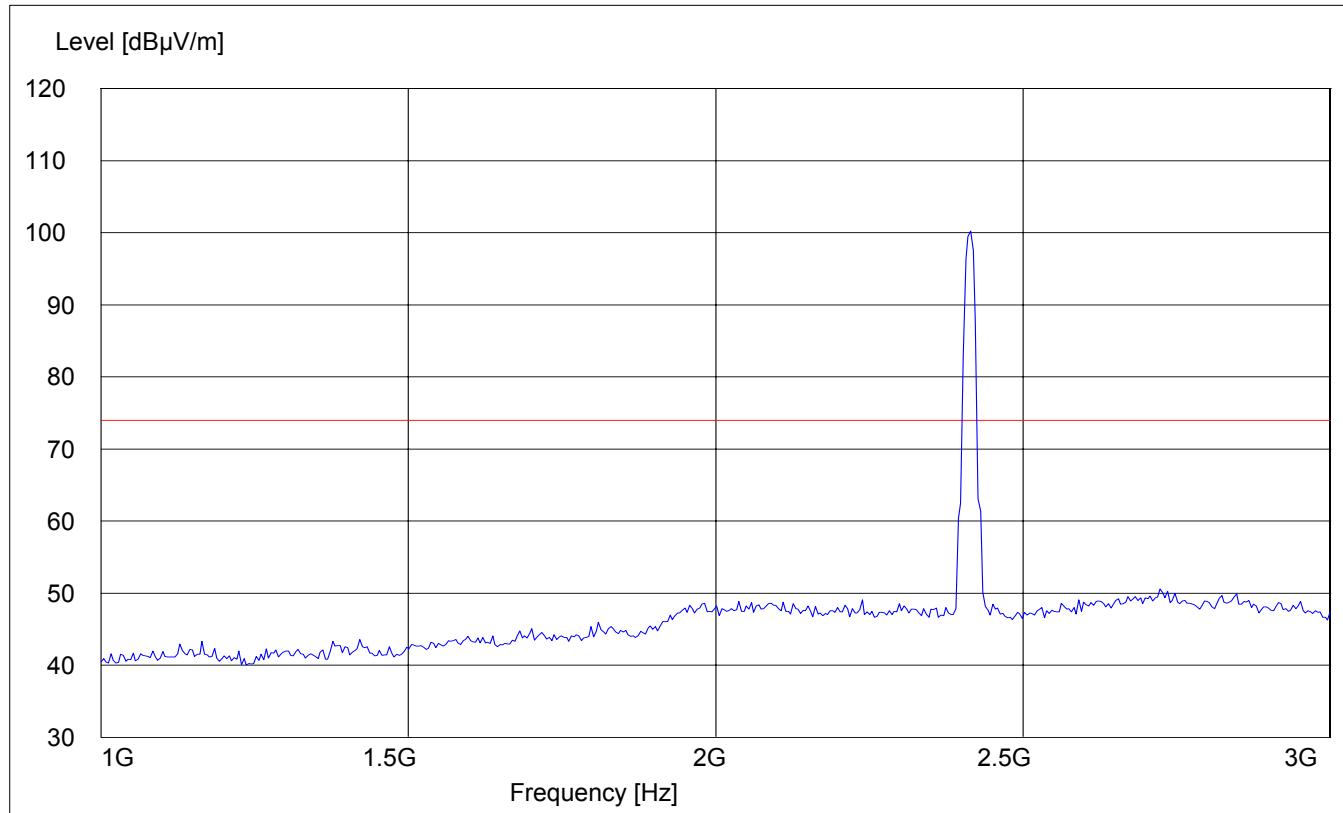
EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)****Lowest Channel (2412MHz): 30MHz – 1GHz****Antenna: Horizontal****Note: This plot is valid for low, mid, high channels (worst-case plot)****SWEEP TABLE:****"Spuri hi 30-1G"**

| Start Frequency | Stop Frequency | Detector | Meas. | RBW | Transducer |
|-----------------|----------------|----------|---------|---------|------------|
| 30.0 MHz | 1.0 GHz | MaxPeak | Coupled | 100 kHz | 3141-#1186 |



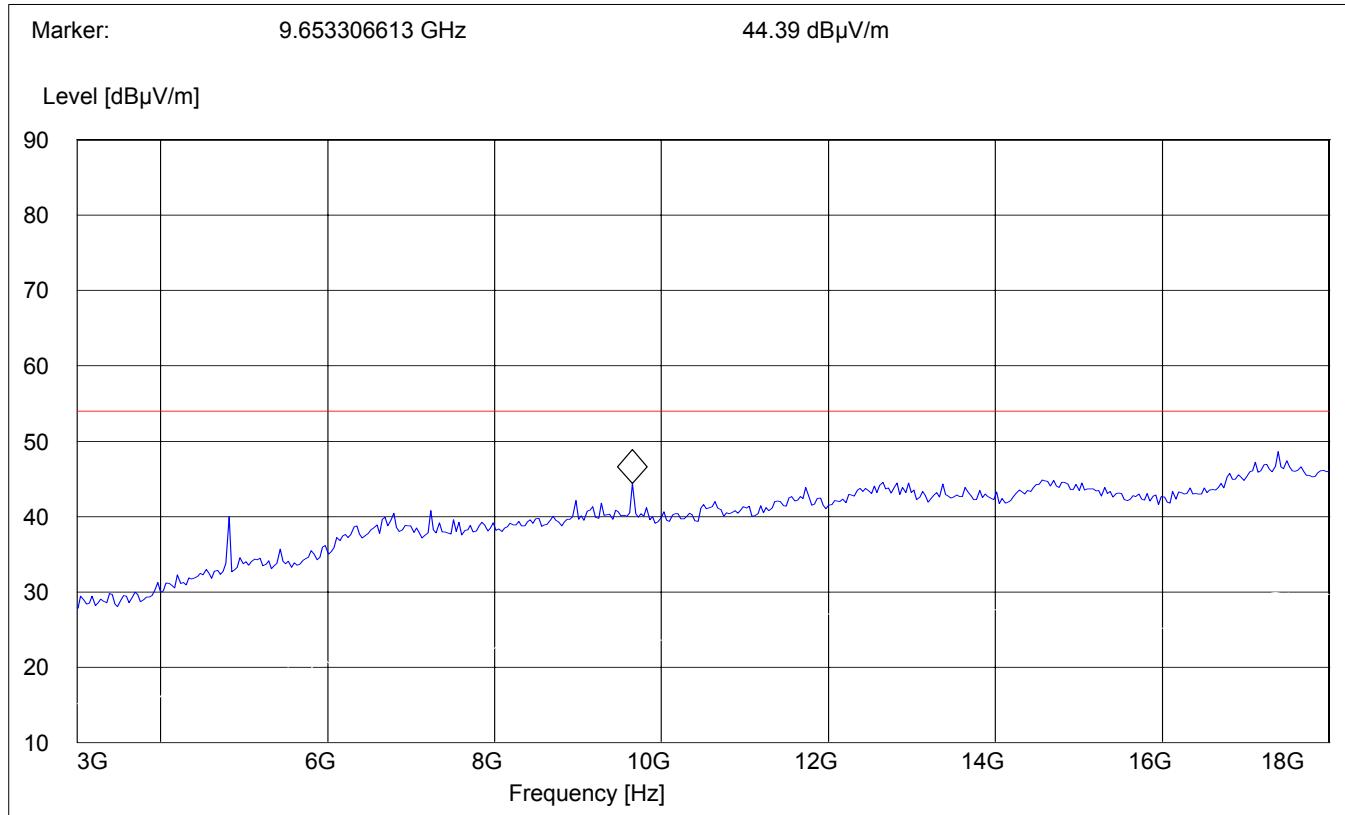
EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)****Lowest Channel (2412MHz): 1GHz – 3GHz****Note: Peak above the limit line is the carrier freq.****SWEEP TABLE:****"Spuri hi 1-3G"**

| Start Frequency | Stop Frequency | Detector | Meas. | RBW | VBW | Transducer |
|-----------------|----------------|--------------|----------------|-------|------|-----------------|
| 1.0 GHz | 3.0 GHz | Time MaxPeak | Bandw. Coupled | 1 MHz | 10Hz | #326 horn (dBi) |



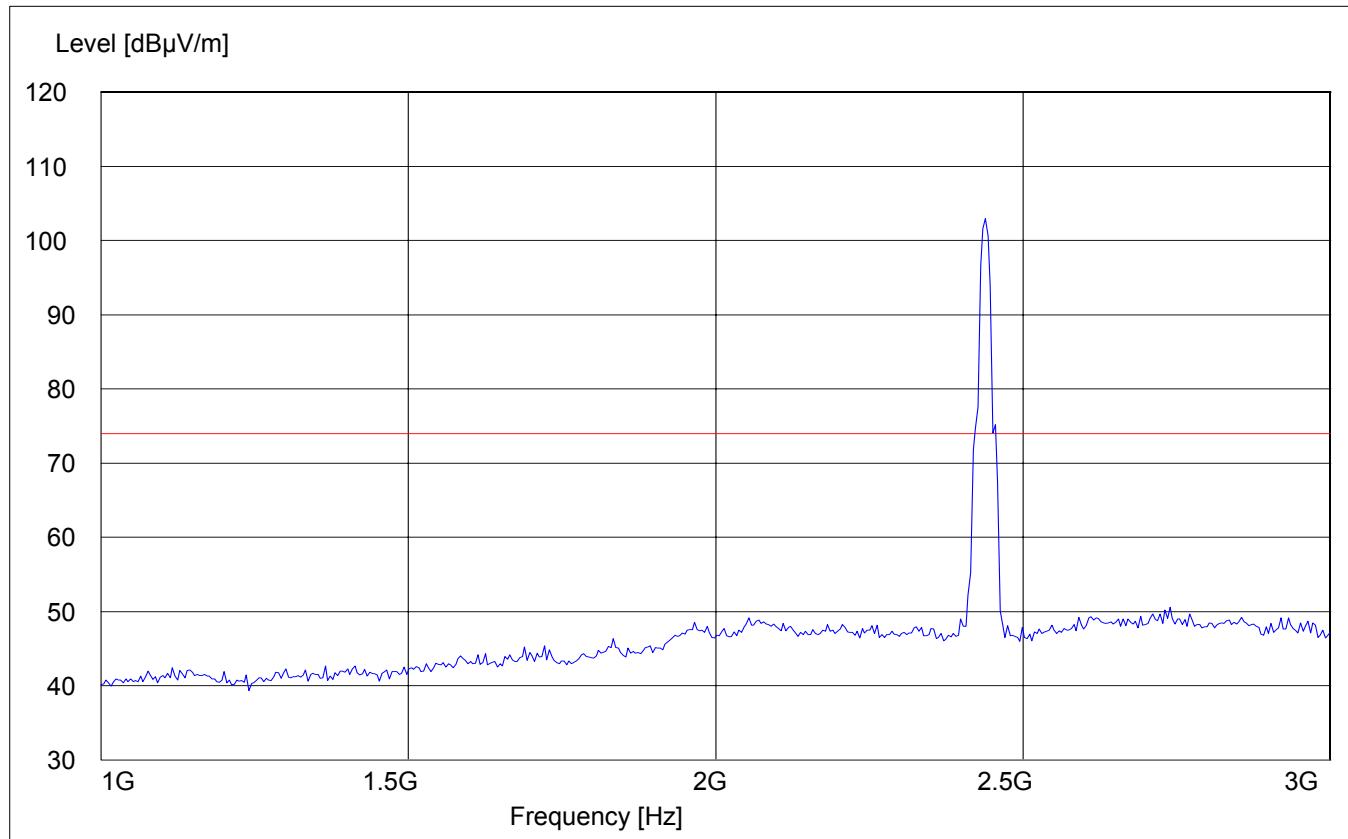
EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)****Lowest Channel (2412MHz): 3GHz – 18GHz****SWEEP TABLE: "Spuri hi 3-18G"**

| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW | Transducer |
|-----------------|----------------|---------------|--------------|-------|-----------------|
| 3.0 GHz | 18.0 GHz | MaxPeak | Coupled | 1 MHz | #326 horn (dBi) |



EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)****Mid Channel (2437MHz): 1GHz – 3GHz****Note: The peak above the limit line is the carrier freq.**

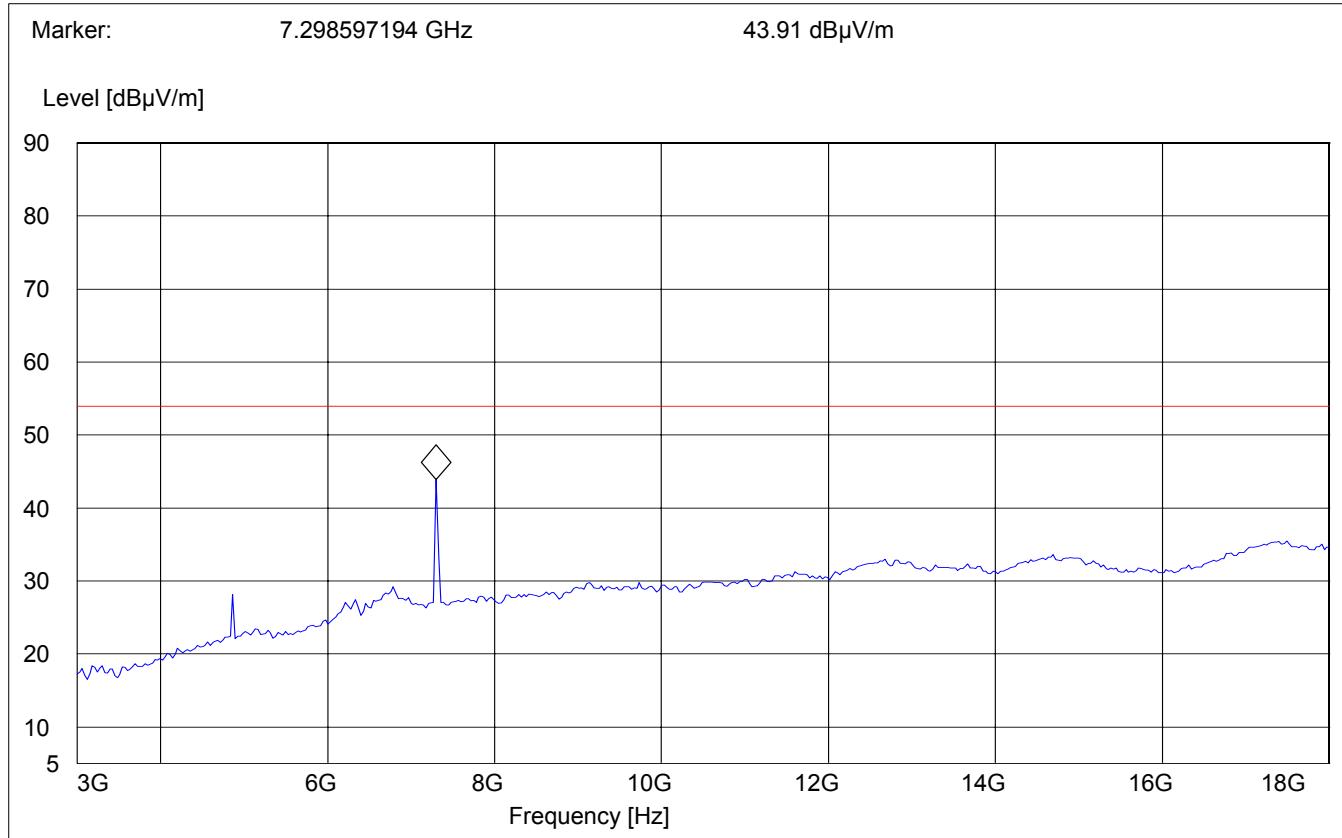
SWEEP TABLE: "Spuri hi 1-3G"
Start Stop Detector Meas. RBW Transducer
Frequency Frequency Time Bandw. VBW
1.0 GHz 3.0 GHz MaxPeak Coupled 1 MHz #326 horn (dBi)



EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)****Mid Channel (2437MHz): 3GHz – 18GHz****Average Measurement**

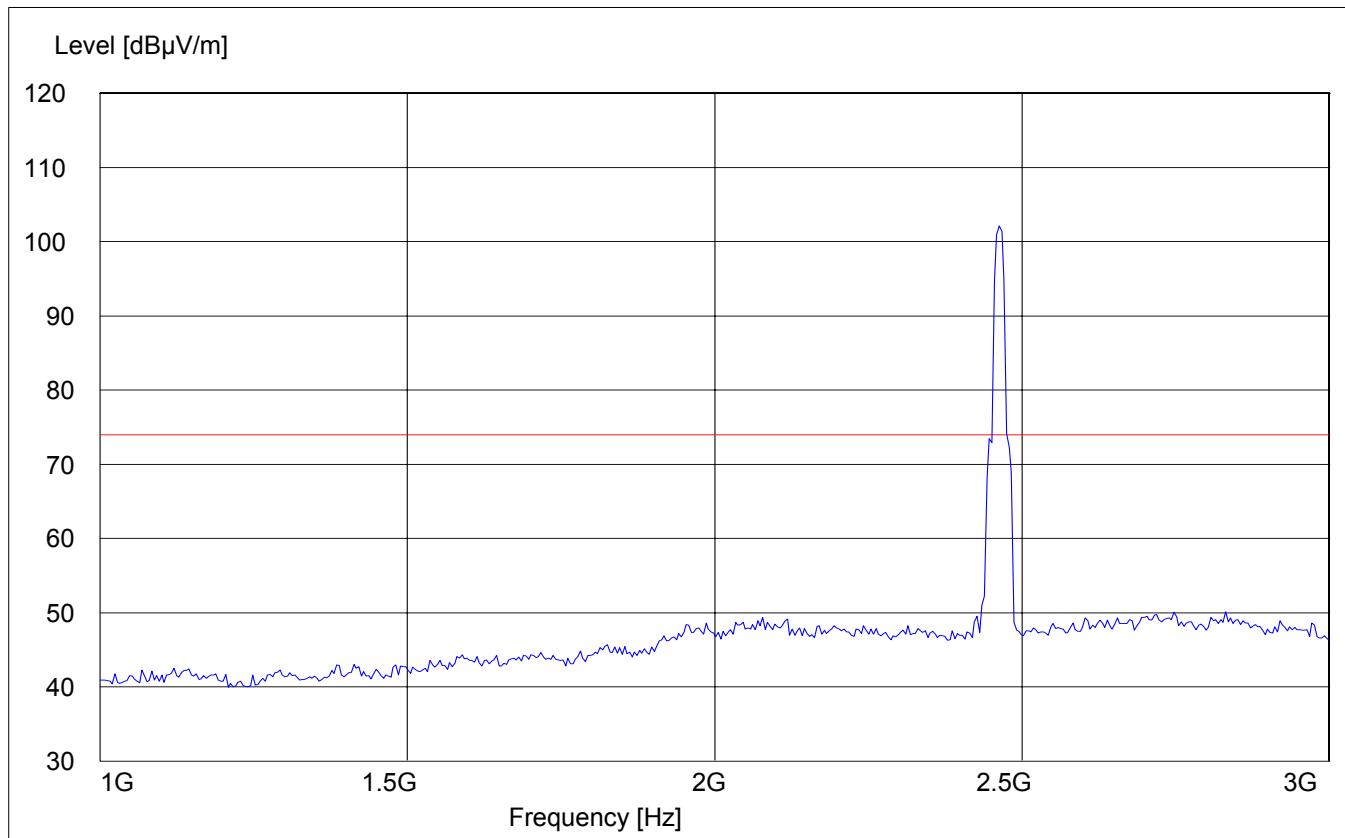
SWEEP TABLE: "Spuri hi 3-18G"

| Start Frequency | Stop Frequency | Detector | Meas. | RBW | Transducer |
|-----------------|----------------|----------|---------|-------|-----------------|
| 3.0 GHz | 18.0 GHz | MaxPeak | Coupled | 1 MHz | #326 horn (dBi) |



EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)****Highest Channel (2462MHz): 1GHz – 3GHz****Note: The peak above the limit line is the carrier freq.****SWEEP TABLE:****"Spuri hi 1-3G"**

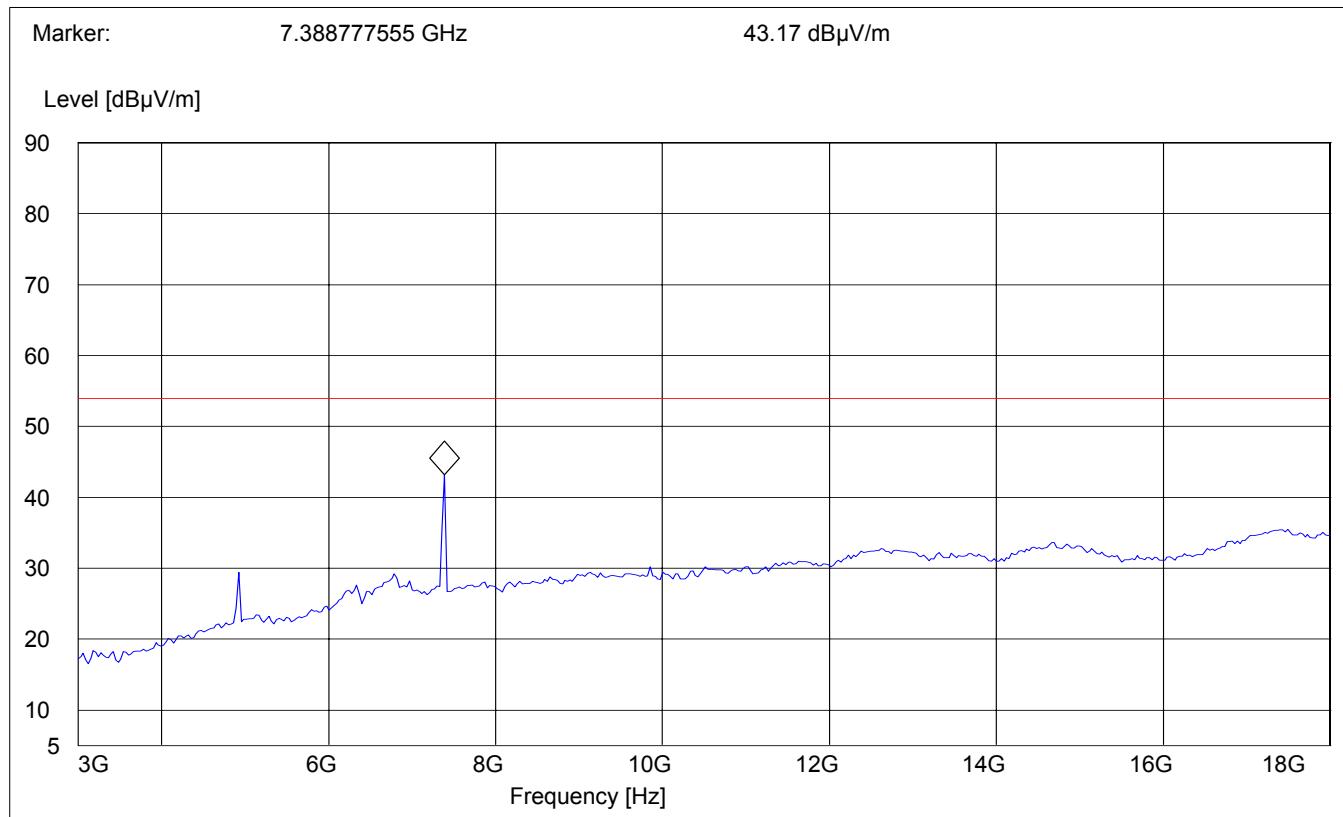
| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW | Transducer |
|-----------------|----------------|---------------|--------------|-------|-----------------|
| 1.0 GHz | 3.0 GHz | MaxPeak | Coupled | 1 MHz | #326 horn (dBi) |



EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)****Highest Channel (2462MHz): 3GHz – 18GHz****Average Measurement**

SWEEP TABLE: "Spuri hi 3-18G"

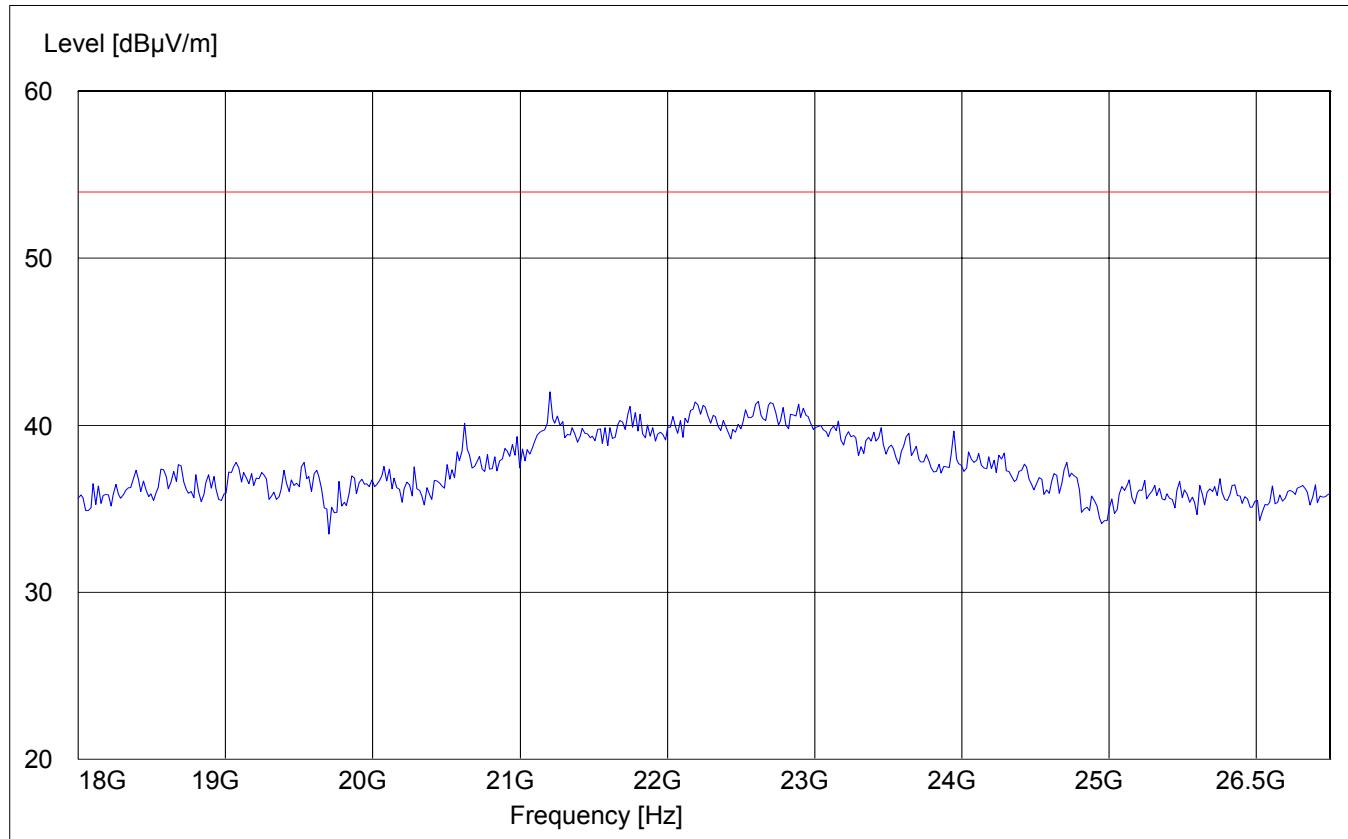
| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW | VBW | Transducer |
|-----------------|----------------|---------------|--------------|-------|------|-----------------|
| 3.0 GHz | 18.0 GHz | MaxPeak | Coupled | 1 MHz | 10Hz | #326 horn (dBi) |



EMISSION LIMITATIONS - Radiated (Transmitter)**§ 15.247 (c) (1)****18GHz – 26.5GHz****Note: This plot is valid for low, mid, high channels (worst-case plot)**

SWEEP TABLE: "Spuri hi 18-26.5G"

| Start Frequency | Stop Frequency | Detector | Meas. | RBW | Transducer |
|-----------------|----------------|----------|---------|-------|-----------------|
| 18 GHz | 26.5 GHz | Time | Bandw. | VBW | #326 horn (dBi) |
| | | MaxPeak | Coupled | 1 MHz | |



CONDUCTED EMISSIONS**§ 15.107/207****Measured with AC/DC power adapter*****SWEEP TABLE: "55022 cond"***

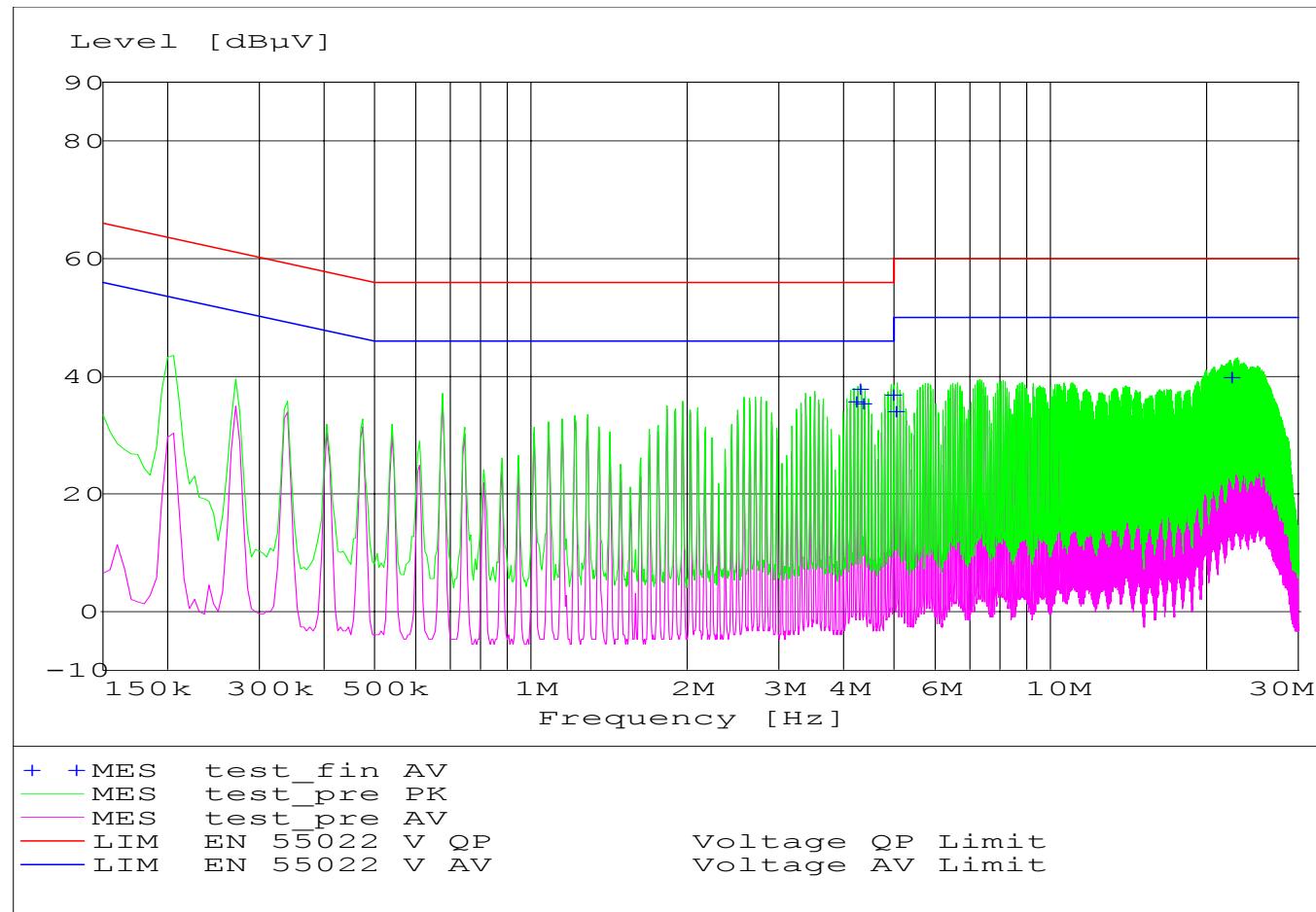
Short Description: EN 55022 for 150KHz-30MHz

| Start Frequency | Stop Frequency | Detector | Meas | IF | Transducer |
|-----------------|----------------|----------|---------|--------|------------|
| 150.0 kHz | 30.0 MHz | MaxPeak | Coupled | 10 kHz | None |

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

| Frequency of Emission (MHz) | Conducted Limit (dB μ V) | |
|-----------------------------|------------------------------|-----------|
| | 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 AV"

| Frequency MHz | Level dB μ V | Transd dB | Limit dB μ V | Margin dB | Line | PE |
|------------------|---------------------|--------------|---------------------|--------------|------|-----|
| 4.190000 | 35.80 | 0.0 | 46 | 10.2 | N | GND |
| 4.260000 | 37.90 | 0.0 | 46 | 8.1 | N | GND |
| 4.325000 | 35.40 | 0.0 | 46 | 10.6 | N | GND |
| 4.935000 | 36.90 | 0.0 | 46 | 9.1 | N | GND |
| 5.000000 | 34.00 | 0.0 | 46 | 12.0 | N | GND |
| 22.110000 | 39.90 | 0.0 | 50 | 10.1 | N | GND |

RECEIVER SPURIOUS RADIATION**§ 15.209****Limits**

| Frequency (MHz) | Field strength (μ V/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 |

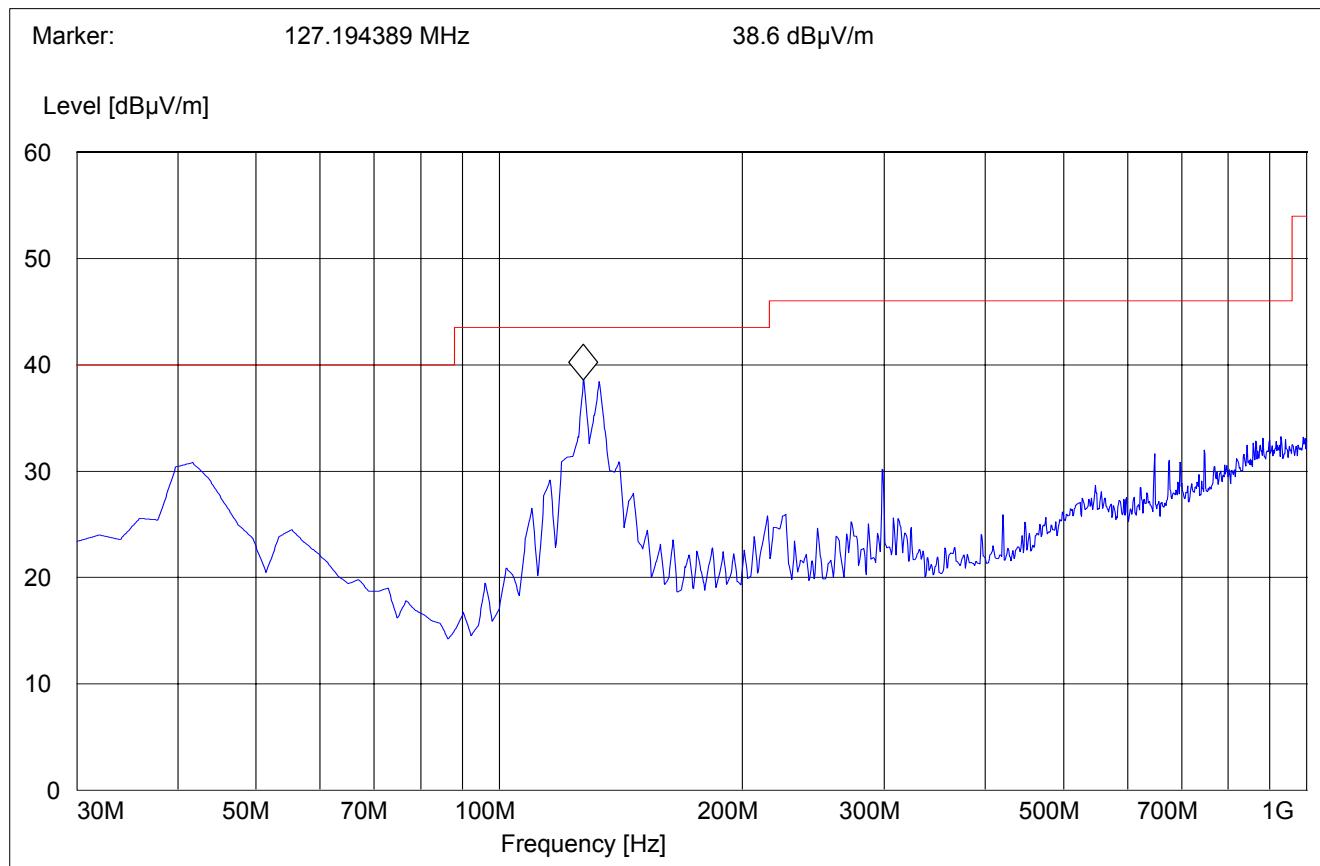
NOTE:

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 3 and 26.5 GHz very short cable connections to the antenna was used to minimize the noise level.

RECEIVER SPURIOUS RADIATION**§ 15.209****30MHz – 1GHz****Antenna: vertical**

SWEEP TABLE: "Spuri hi 30-1G"

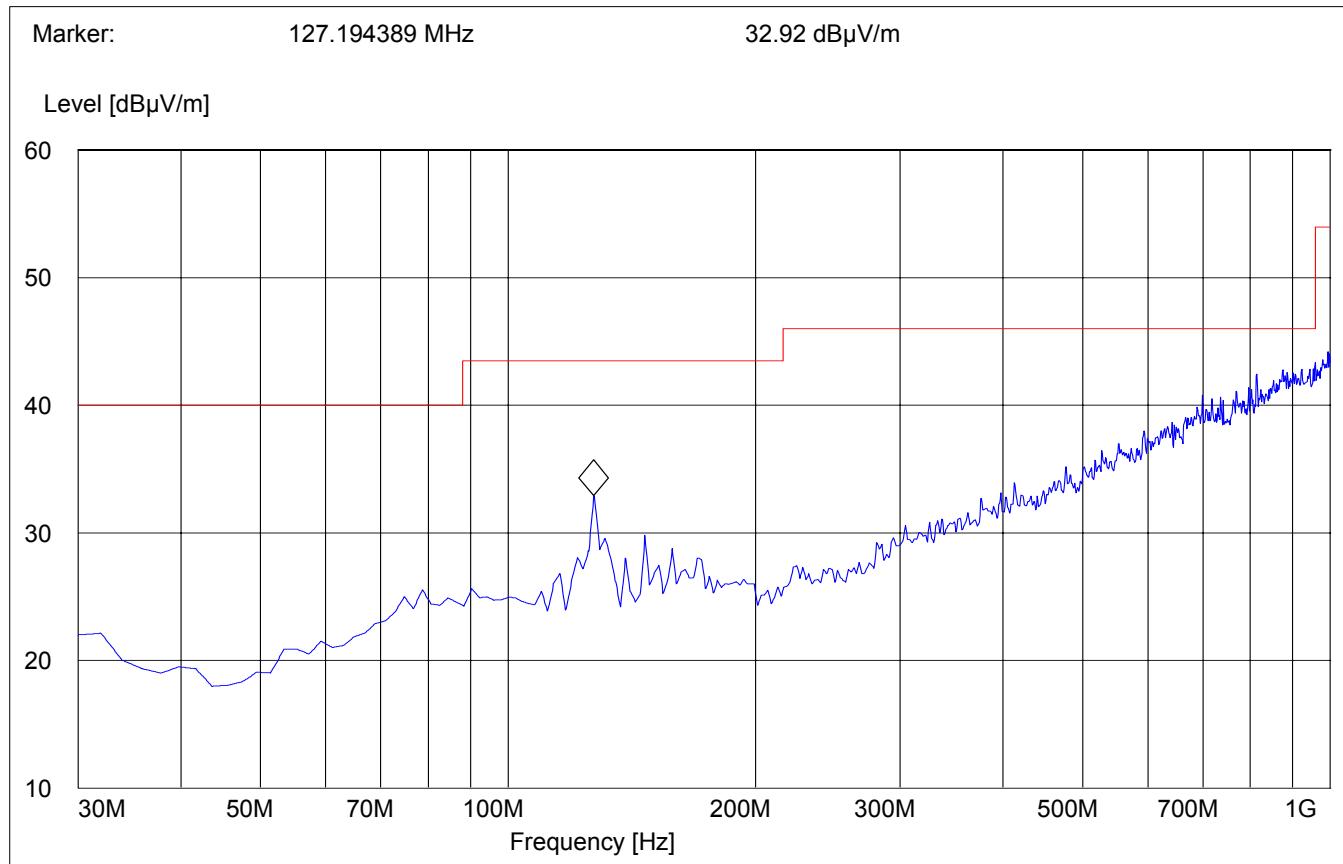
| Start Frequency | Stop Frequency | Detector | Meas. | RBW | Transducer |
|-----------------|----------------|----------|---------|---------|------------|
| 30.0 MHz | 1.0 GHz | MaxPeak | Coupled | 100 kHz | 3141-#1186 |



RECEIVER SPURIOUS RADIATION**§ 15.209****30MHz – 1GHz****Antenna: horizontal**

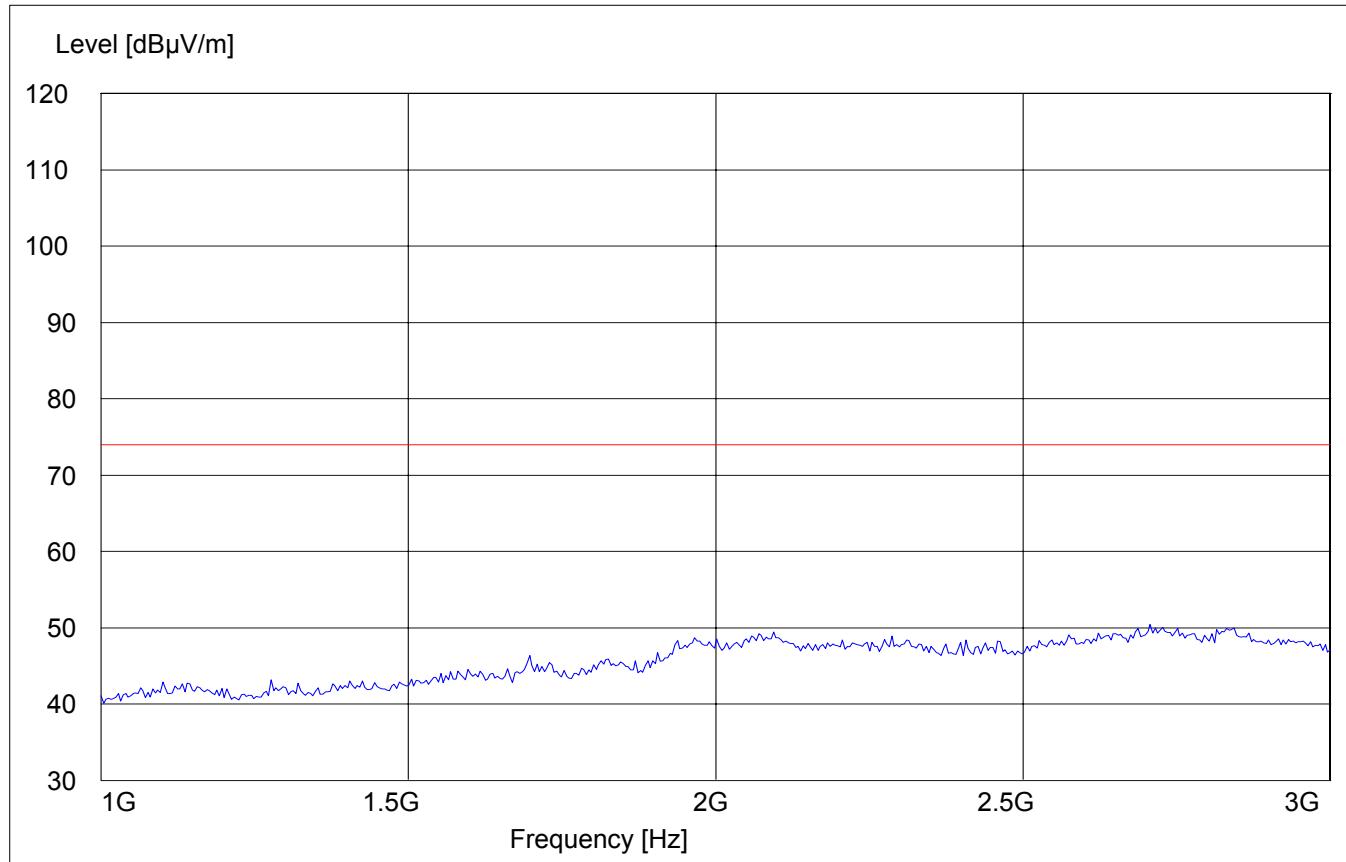
SWEEP TABLE: "Spuri hi 30-1G"

| Start Frequency | Stop Frequency | Detector | Meas. | RBW | Transducer |
|-----------------|----------------|----------|---------|---------|------------|
| 30.0 MHz | 1.0 GHz | MaxPeak | Coupled | 100 kHz | 3141-#1186 |



**RECEIVER SPURIOUS RADIATION
1GHz – 3GHz****§ 15.209**

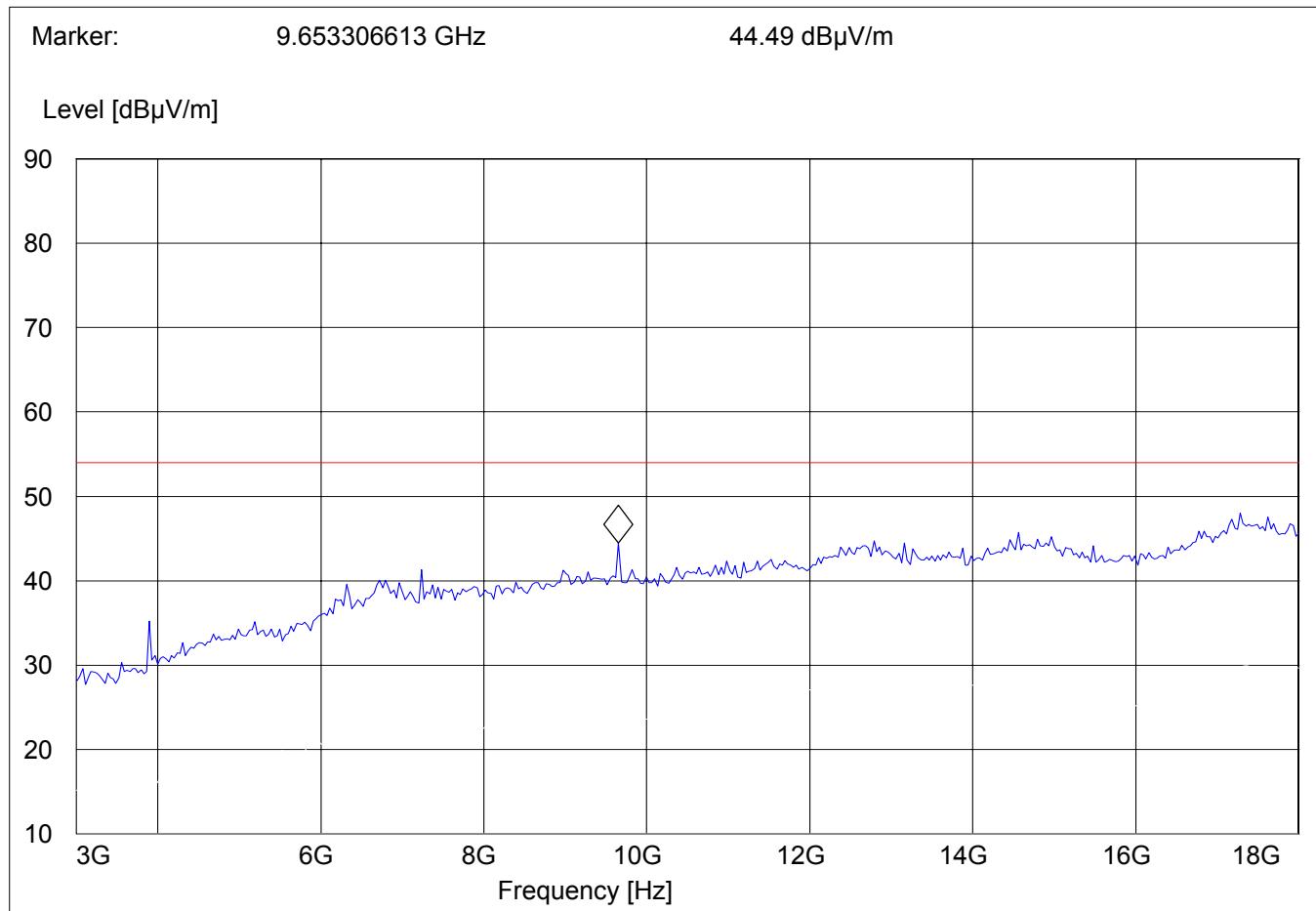
| SWEEP TABLE: | | "Spuri hi 1-3G" | | | | |
|-----------------|----------------|-----------------|----------------|-------|------|-----------------|
| Start Frequency | Stop Frequency | Detector | Meas. | RBW | VBW | Transducer |
| 1.0 GHz | 3.0 GHz | Time MaxPeak | Bandw. Coupled | 1 MHz | 1MHz | #326 horn (dBi) |



RECEIVER SPURIOUS RADIATION 3GHz – 18GHz

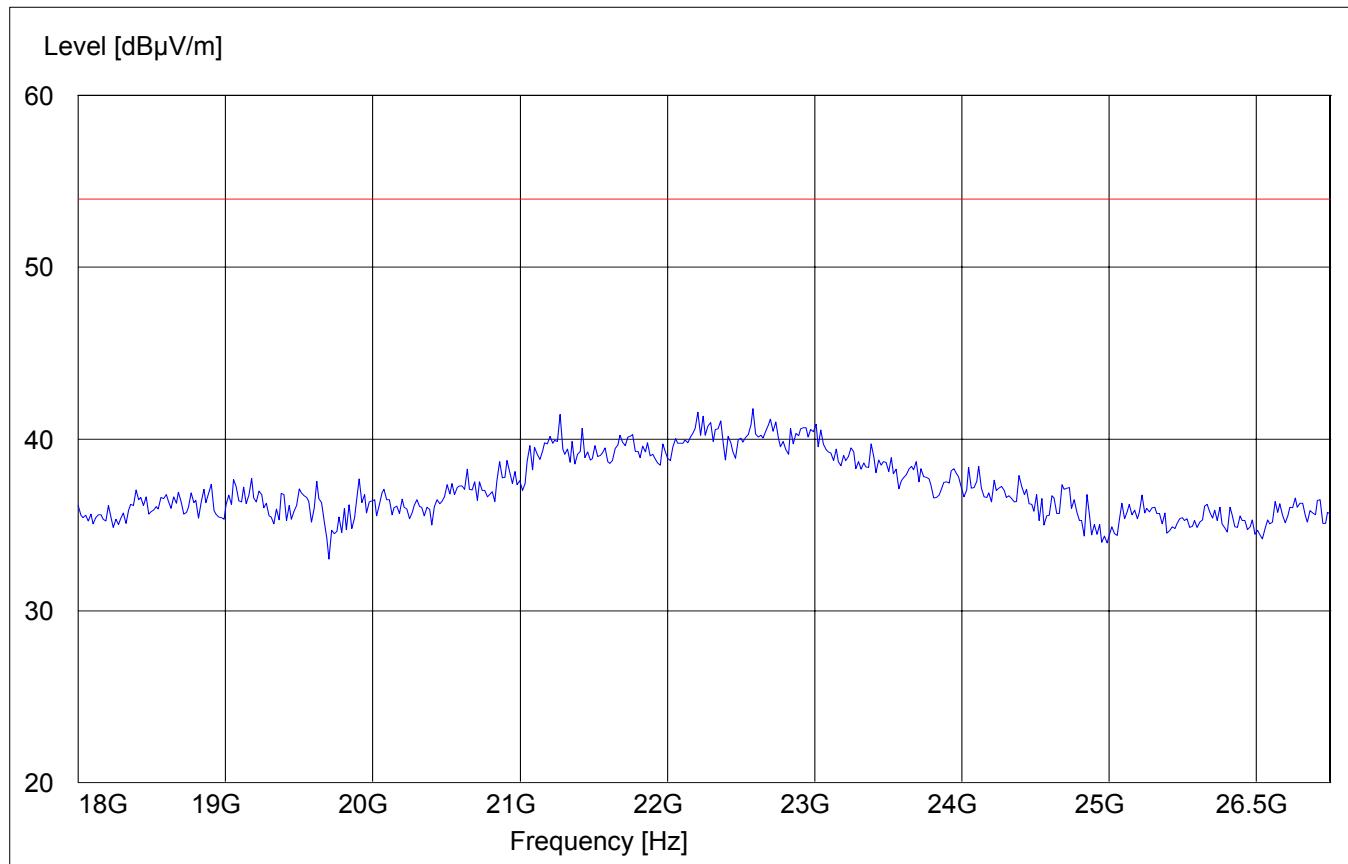
§ 15.209

| SWEEP TABLE: | | "Spuri hi 3-18G" | | | |
|--------------|-----------|------------------|---------|-------|-----------------|
| Start | Stop | Detector | Meas. | RBW | Transducer |
| Frequency | Frequency | Time | Bandw. | VBW | |
| 3.0 GHz | 18 GHz | MaxPeak | Coupled | 1 MHz | #326 horn (dBi) |



**RECEIVER SPURIOUS RADIATION
18GHz – 26.5GHz****§ 15.209**

SWEEP TABLE: "Spuri hi 18-26.5G"
Start Stop Detector Meas. RBW Transducer
Frequency Frequency Time Bandw. VBW
18 GHz 26.5 GHz MaxPeak Coupled 1 MHz #141 horn (dBi)



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 | Biconilog Antenna | 3141 | EMCO | 0005-1186 |
| 04 | Horn Antenna (700M-18GHz) | SAS-200/571 | AH Systems | 325 |
| 05 | Horn Antenna (18-26.5GHz) | 3160-09 | EMCO | 1240 |
| 06 | 2-3GHz Band reject filter | BRM50701 | Microtronics | 6 |
| 07 | Power-Meter | NRVD | Rohde & Schwarz | 0857.8008.02 |
| 08 | Pre-Amplifier | TS-ANA | Rohde & Schwarz | -- |
| 09 | Pre-Amplifier | JS4-00102600 | Miteq | 00616 |

BLOCK DIAGRAMS

Radiated Testing

ANECHOIC CHAMBER

