



FCC Test Report

Test report no.: EMC_544FCC15.247_2003_S24-DS

FCC Part 15.247 for DSSS systems / CANADA RSS-210

EUT: Tablet PC Model: iX104
with WLAN Model: S24-DS
FCC ID: Q2GIX104-115



Accredited according to ISO/IEC 17025



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. 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
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1.3 Details of applicant

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Street : 14000 Summit Road, Suite 900
City / Zip Code : Austin, TX 78728
Country : USA
Contact : Douglas L. Fowler
Telephone : +1 512 336 7797
Tele-fax : +1 512 336 7791
e-mail : dfowler@xploretech.com

1.4 Application details

Date of receipt test item : 2003-09-02
Date of test : 2002-09-04/05

1.5 Test item

EUT Manufacturer : Applicant
WLAN Manufacturer : Symbol Technologies, Inc.
Street : 6480 Via Del Oro,
City / Zip Code : San Jose, CA 95119
Country : USA
Model No. (EUT) : iX104-GSM
Model No. (WLAN) : S24-DS
Description : 802.11b wireless LAN PCMCIA card in Tablet PC
FCC ID : Q2GIX104-115

Additional information

Frequency : 2412MHz – 2462MHz
Type of modulation : DSSS
Number of channels : 11
Antenna : Embedded
Power supply : 3.3VDC from Host
Output power : 0.135W conducted peak power
Extreme temp. Tolerance : -20°C to +60°C

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


NOTE: This test report covers only radiated testing done on Tablet PC model# iX104 with WLAN model# S24-DS. For all RF Conducted measurements on WLAN please refer to test report# J20008658d

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:

| 2003-10-06 | EMC & Radio | Siegfried Lehmann (Technical Manager) |  |
|------------|-------------|--|---|
| Date | Section | Name | Signature |

Responsible for test report and project leader:

| 2003-10-06 | EMC & Radio | Harpreet Sidhu (EMC Engineer) |  |
|------------|-------------|-------------------------------|---|
| Date | Section | Name | Signature |

2.2 Test report

TEST REPORT

Test report no.: EMC_544FCC15.247_2003_S24-DS

**EUT: Tablet PC Model: iX104
with WLAN: Model: S24-DS
FCC ID: Q2GIX104-115**

TEST REPORT REFERENCE

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**MAXIMUM PEAK OUTPUT POWER
(RADIATED)**

§ 15.247 (b) (1)

EIRP:

| TEST CONDITIONS | | MAXIMUM PEAK OUTPUT POWER (dBm) | | |
|-------------------------|------------------|---------------------------------|--------|--------|
| | | 2412 | 2437 | 2462 |
| Frequency (MHz) | | | | |
| T _{nom} (23)°C | V _{nom} | *18.12 | *18.42 | *18.11 |
| Measurement uncertainty | | ±0.5dBm | | |

*To comply with following;

RBW / VBW should be equal to or greater than the 6dB BW

All measured values are corrected by 10log (6dB BW / used BW)

(Therefore correction factor of 0.8dB was added to low, mid& high channel measurements respectively)

LIMIT

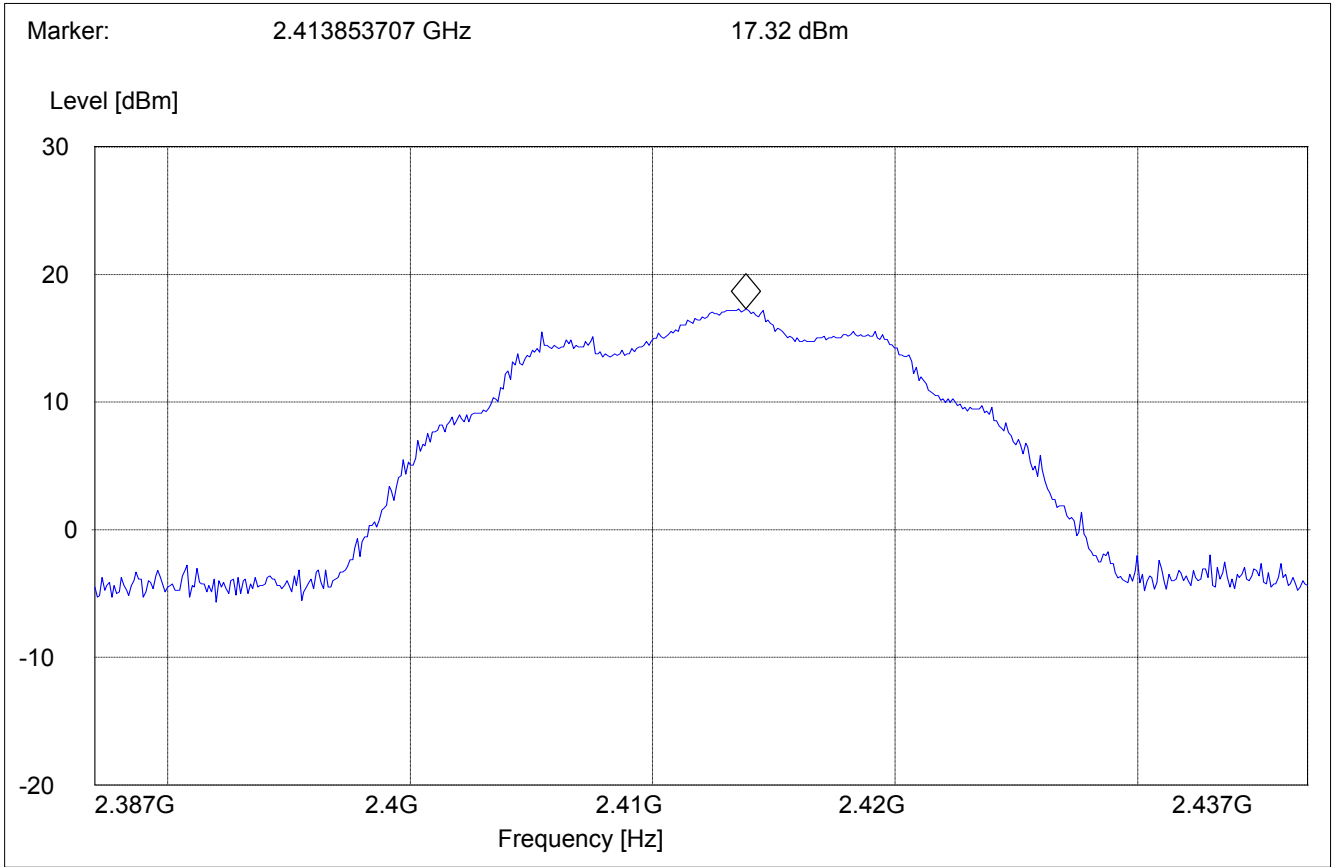
SUBCLAUSE § 15.247 (b) (1)

| Frequency range | RF power output |
|-----------------|--|
| 2400-2483.5 MHz | ≤30dBm Conducted ≤36dBm Radiated (EIRP) |

ANALYZER SETTINGS: RBW=VBW=10MHz

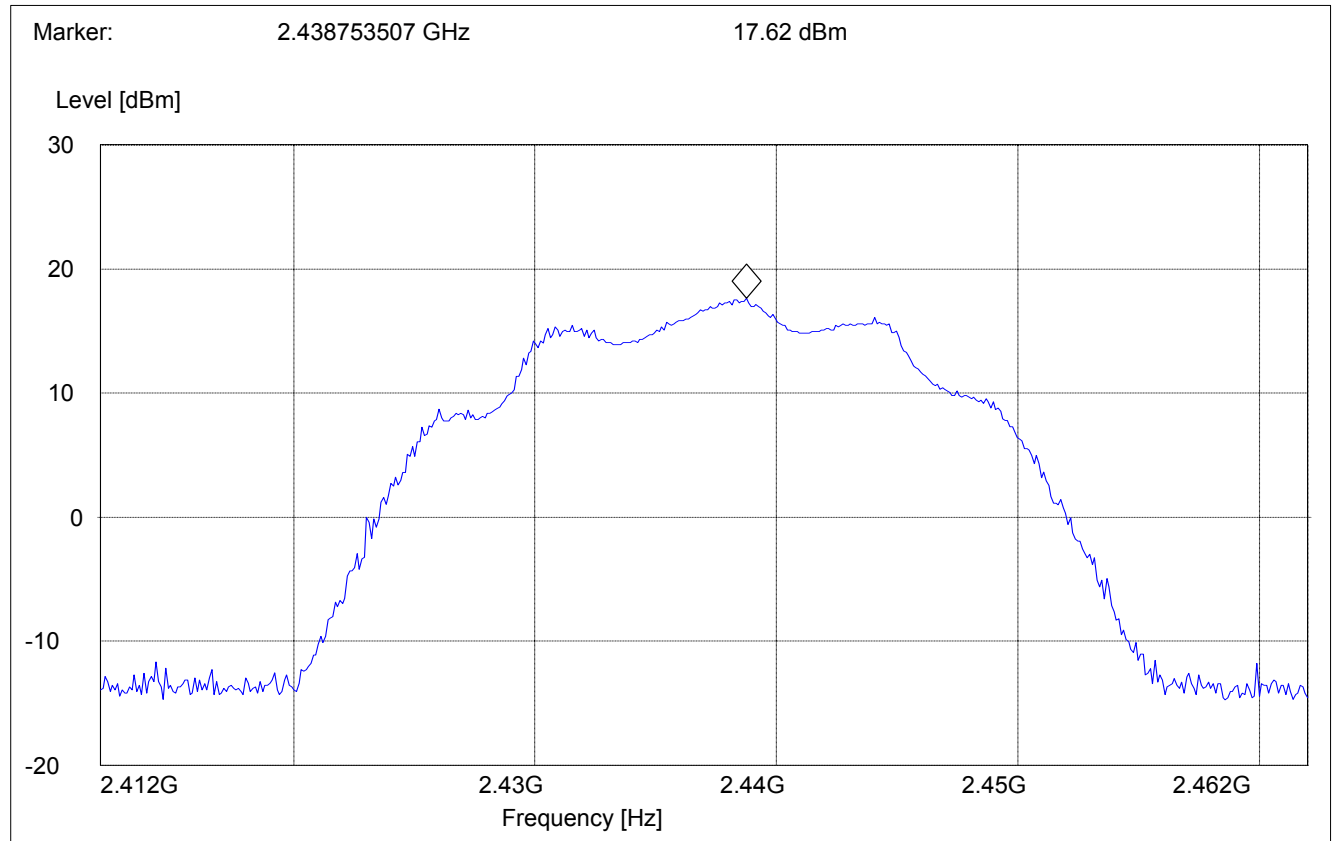
**MAXIMUM PEAK OUTPUT POWER
(RADIATED)
Low Channel (2412MHz)**

§ 15.247 (b) (1)



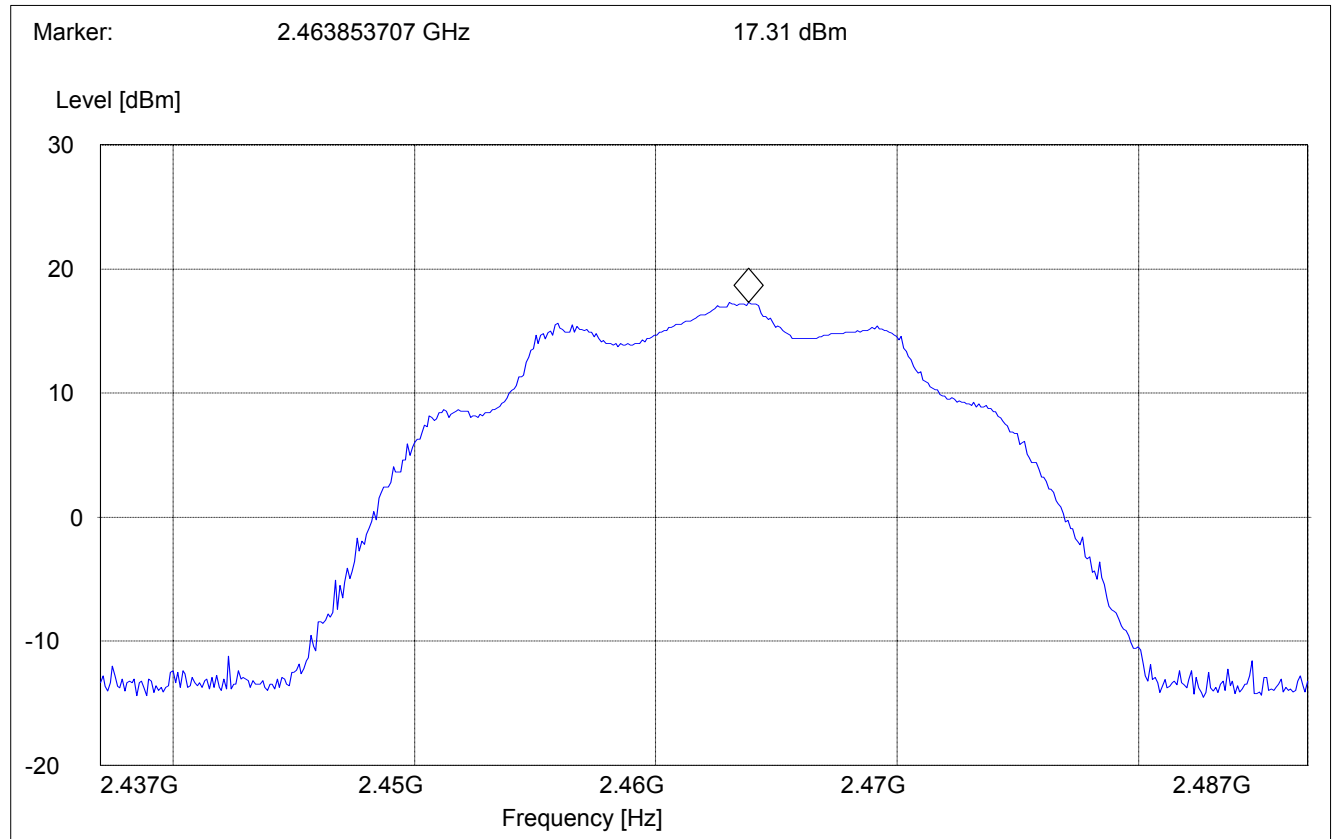
**MAXIMUM PEAK OUTPUT POWER
(RADIATED)
Mid Channel (2437MHz)**

§ 15.247 (b) (1)



**MAXIMUM PEAK OUTPUT POWER
(RADIATED)
High Channel (2462MHz)**

§ 15.247 (b) (1)



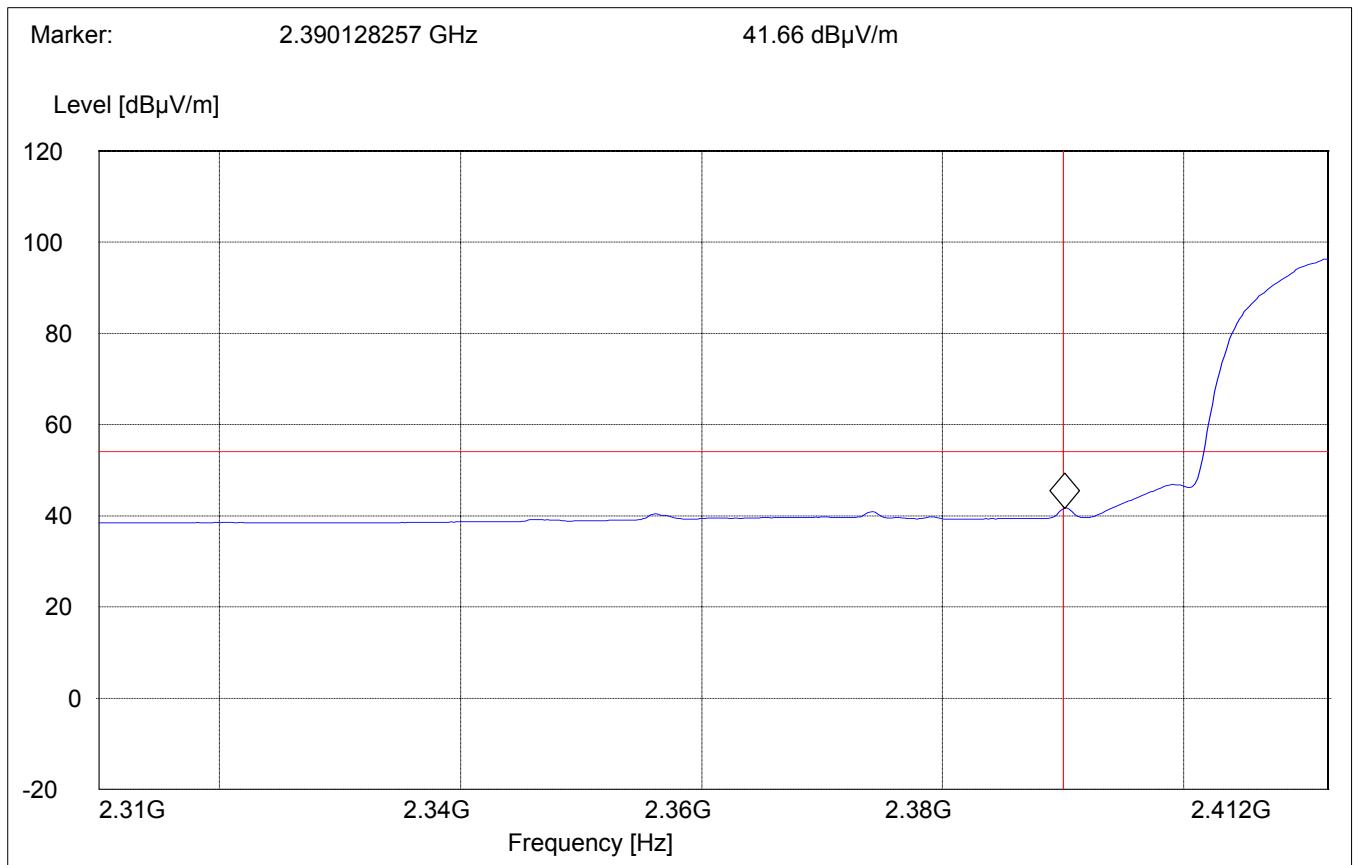
BAND EDGE COMPLIANCE

§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 : 54dBμV

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



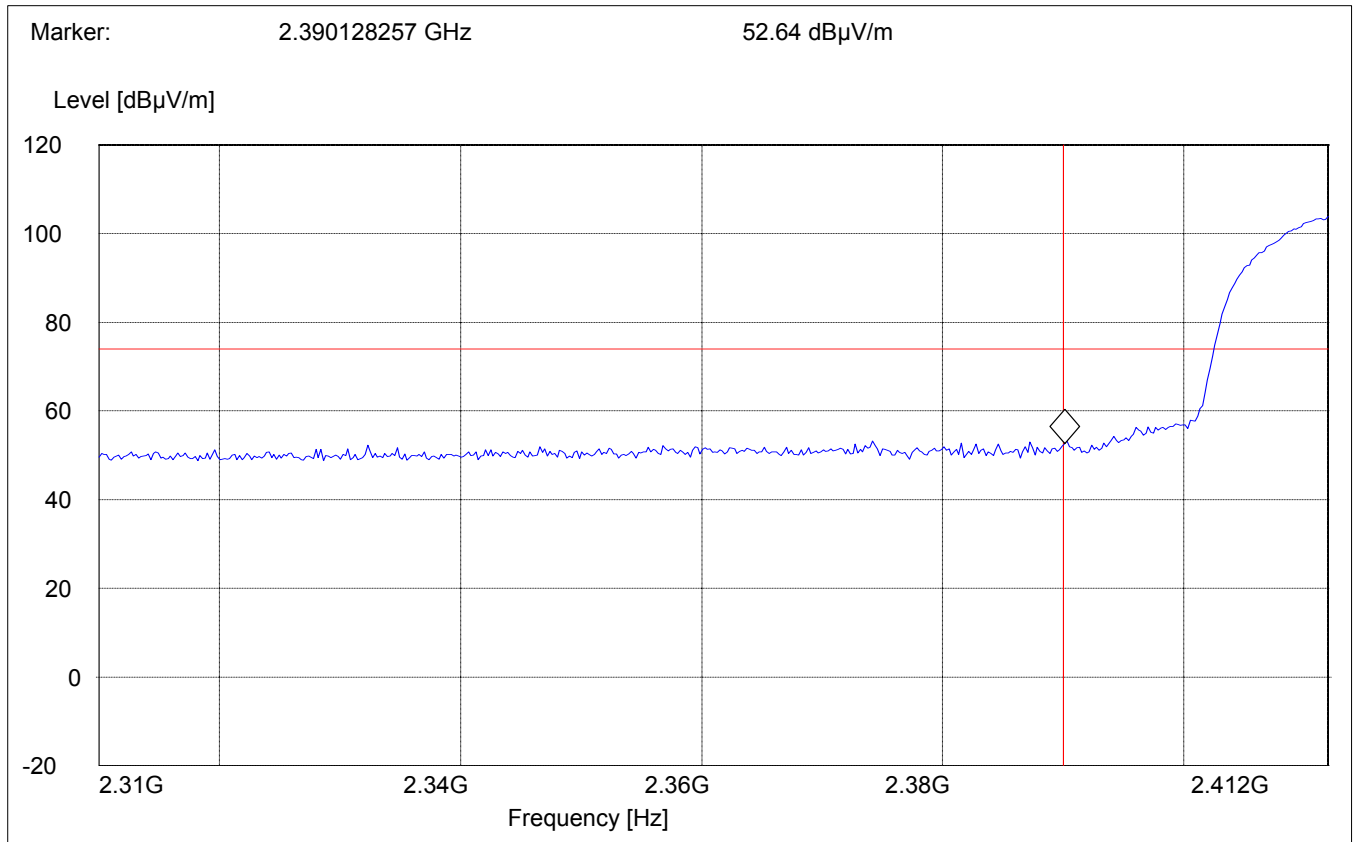
BAND EDGE COMPLIANCE

§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 : 74dBμV

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



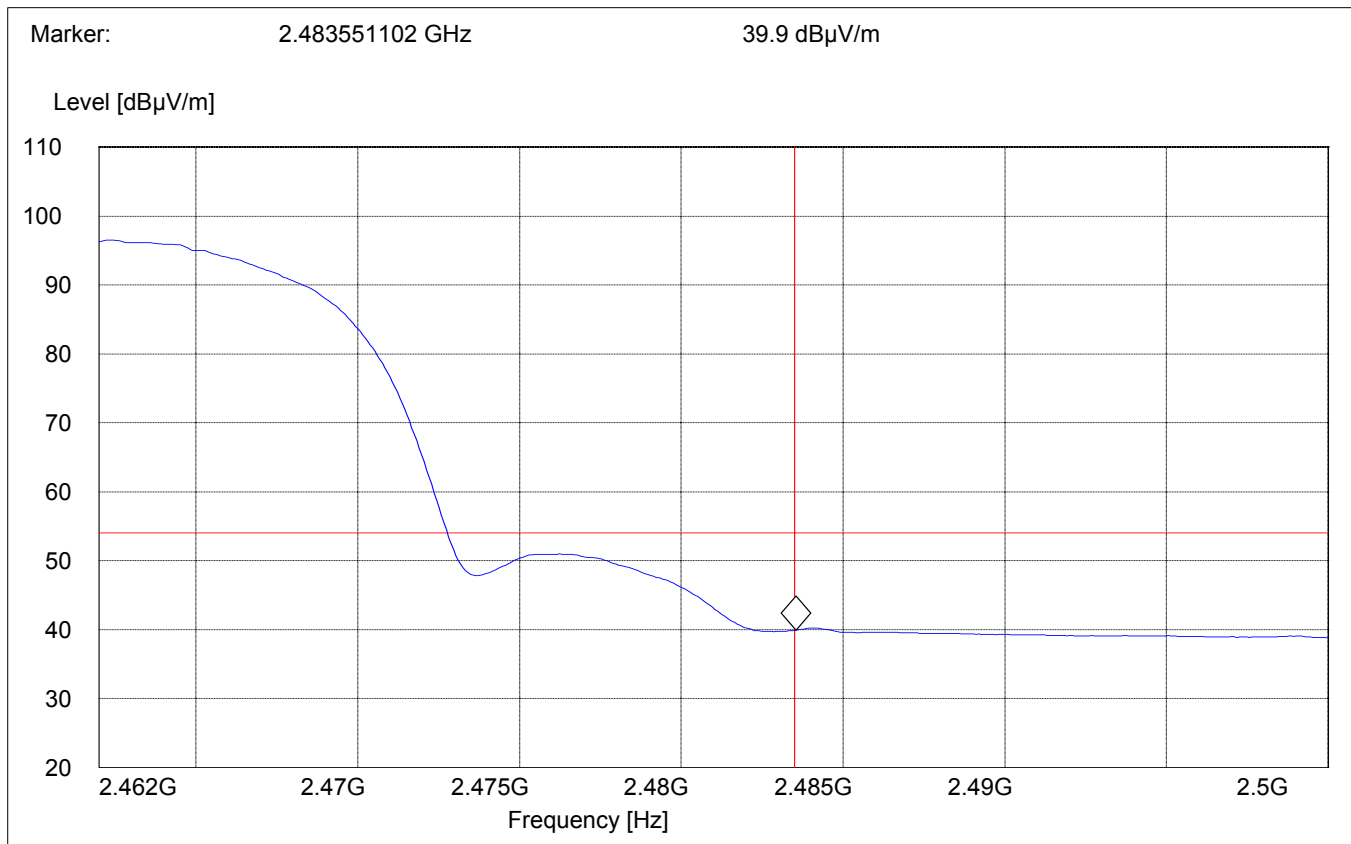
BAND EDGE COMPLIANCE

§15.247 (c)

**High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)
(Average measurement)**

Operating condition : Tx at 2472MHz
 SWEEP TABLE : "FCC15.247 HBE_AVG"
 Limit Line : 54dBμV

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



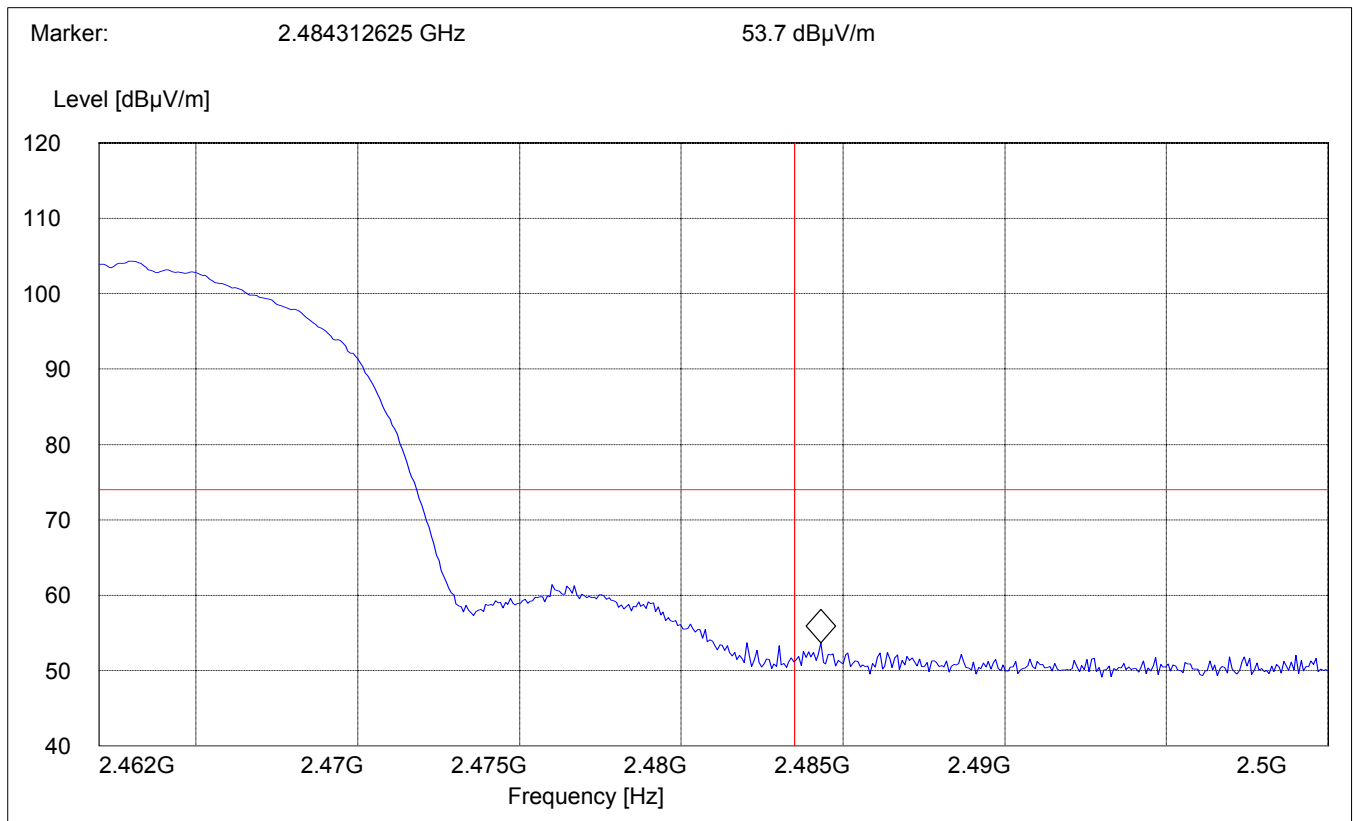
BAND EDGE COMPLIANCE

§15.247 (c)

**High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)
(Peak measurement)**

Operating condition : Tx at 2472MHz
 SWEEP TABLE : "FCC15.247 HBE_PK"
 Limit Line : 74dBμV

| 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 25 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)

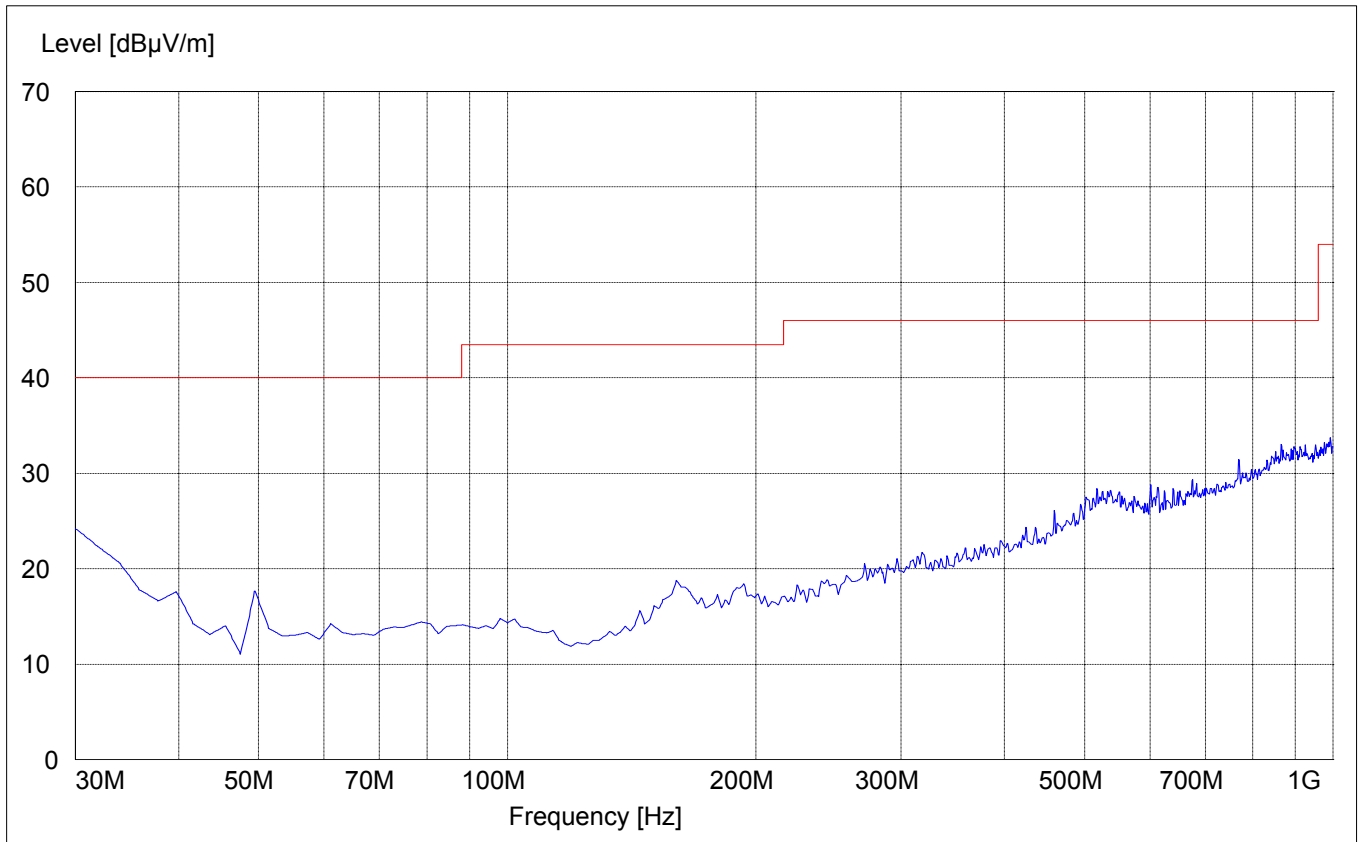
| Transmit at Lowest channel Frequency 2412MHz | | | |
|--|-----------------------|-------------------|----------------|
| Frequency (MHz) | Level (dBµV/m) | | |
| | Peak | Quasi-Peak | Average |
| SEE PLOTS | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Transmit at Middle channel Frequency 2437MHz | | | |
| Frequency (MHz) | Level (dBµV/m) | | |
| | Peak | Quasi-Peak | Average |
| SEE PLOTS | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Transmit at Highest channel Frequency 2462MHz | | | |
| Frequency (MHz) | Level (dBµV/m) | | |
| | Peak | Quasi-Peak | Average |
| SEE PLOTS | | | |
| | | | |
| | | | |
| | | | |
| | | | |

EMISSION LIMITATIONS - Radiated (Transmitter)
Lowest Channel (2412MHz): 30MHz – 1GHz

§ 15.247 (c) (1)

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

| SWEEP TABLE: | | "BT Spuri hi 30-1G" | | | |
|--------------|---------|---------------------|------------|---------|------------|
| Start | Stop | Detector | Meas. Time | RBW | Transducer |
| 30.0 MHz | 1.0 GHz | MaxPeak | Coupled | 100 kHz | 3141-#1186 |



EMISSION LIMITATIONS - Radiated (Transmitter)
Lowest Channel (2412MHz): 1GHz – 3GHz

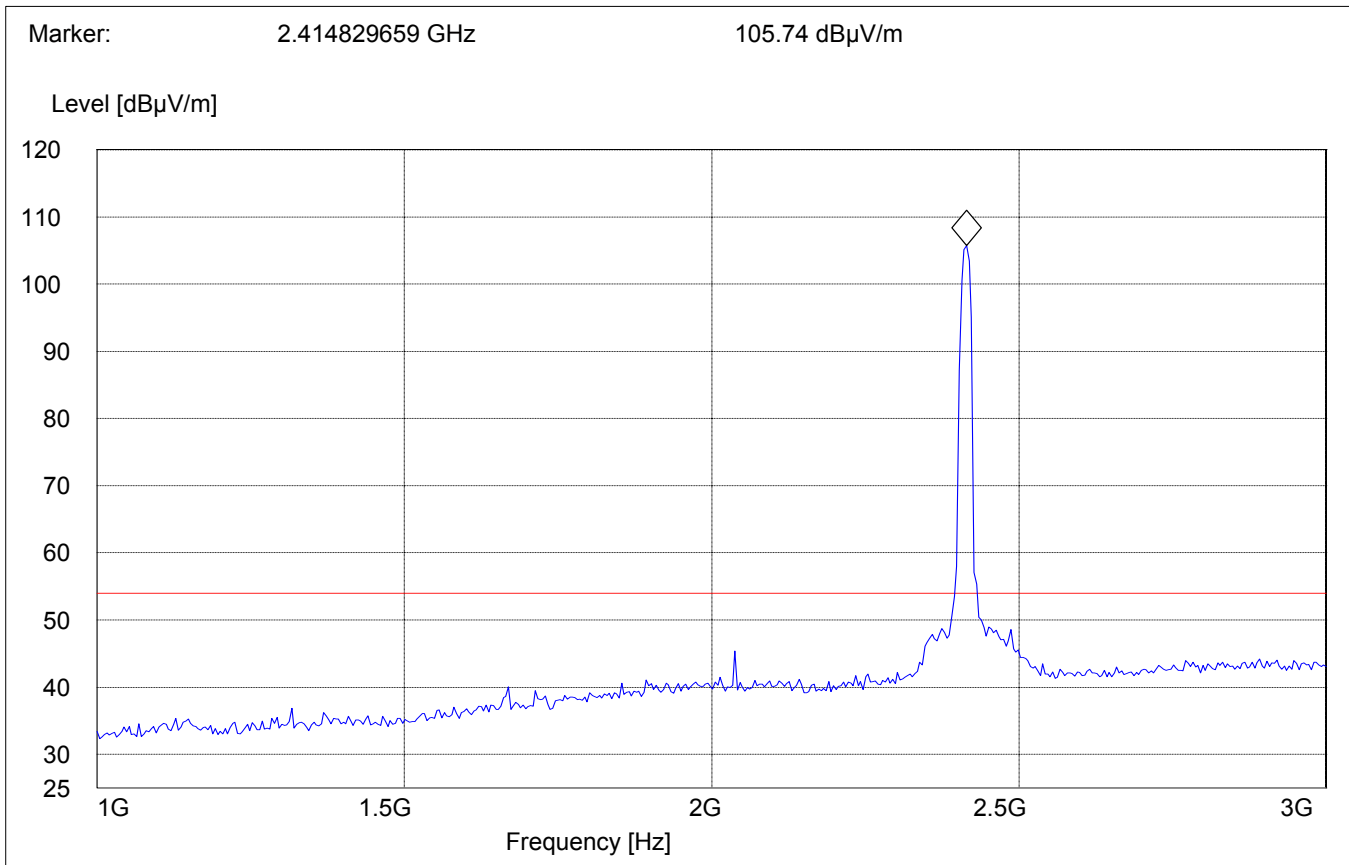
§ 15.247 (c) (1)

Note: The peak above the limit line is the carrier freq.

SWEEP TABLE:

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

"BT Spuri hi 1-3G"

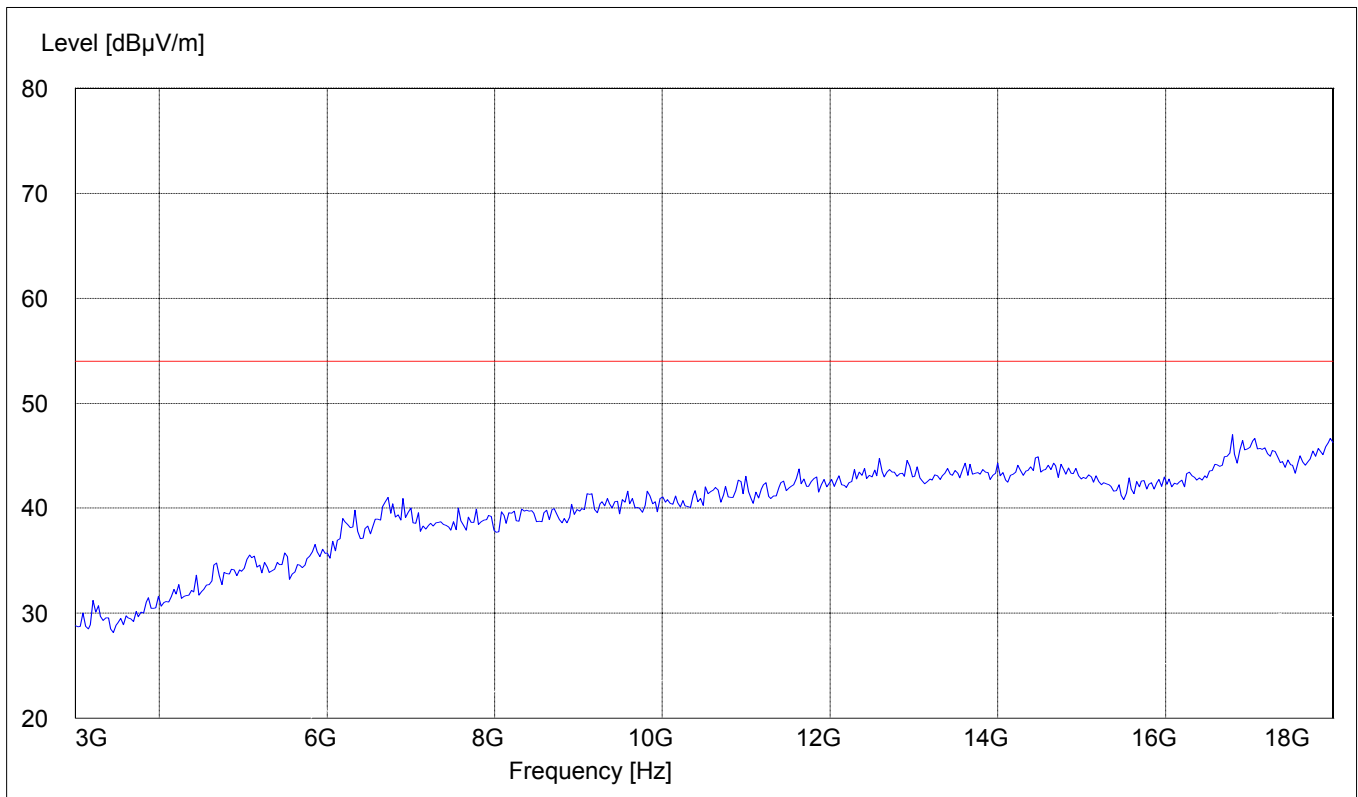


EMISSION LIMITATIONS - Radiated (Transmitter)
Lowest Channel (2412MHz): 3GHz – 18GHz

§ 15.247 (c) (1)

SWEEP TABLE: "BT Spuri hi 3-18G"

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



EMISSION LIMITATIONS - Radiated (Transmitter)
Mid Channel (2437MHz): 1GHz – 3GHz

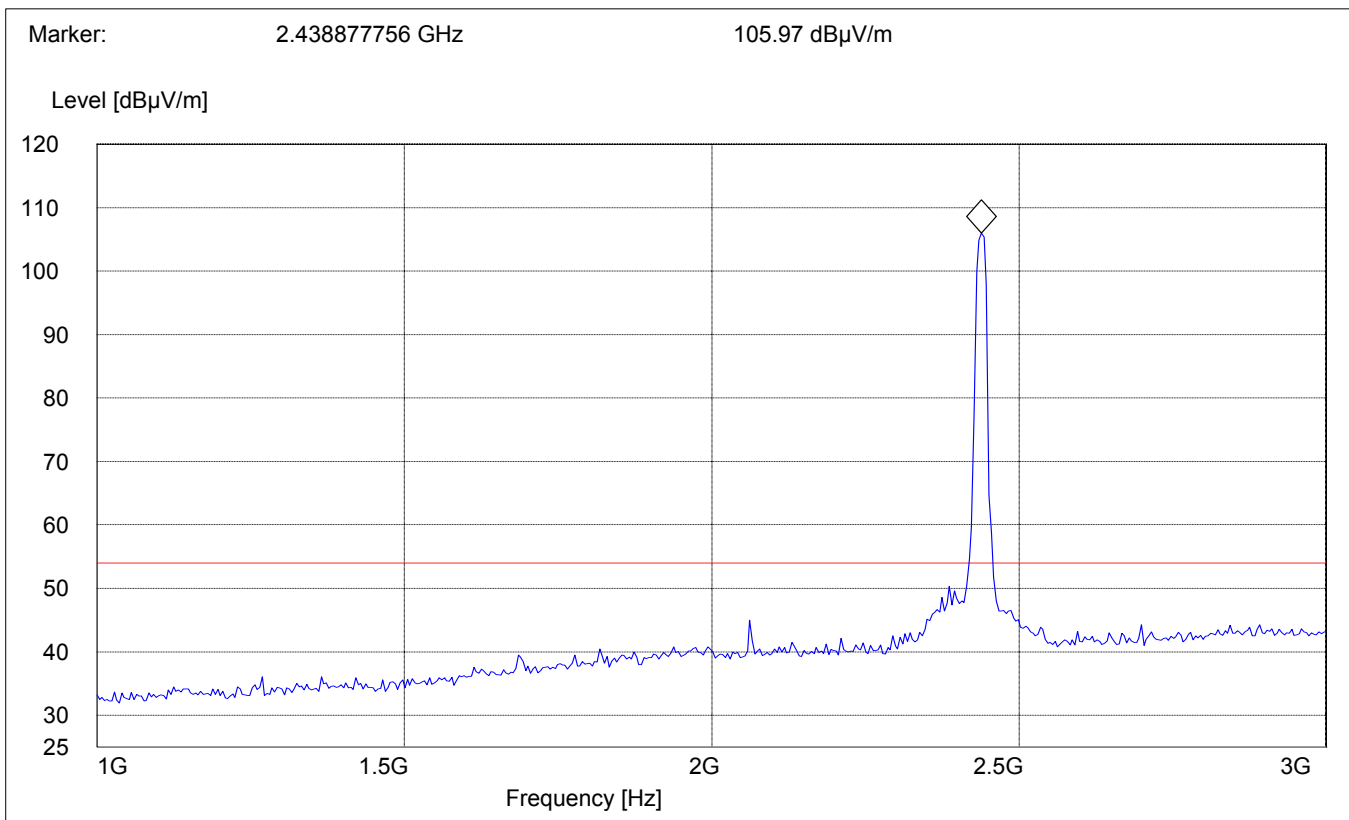
§ 15.247 (c) (1)

Note: The peak above the limit line is the carrier freq.

SWEEP TABLE:

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

"BT Spuri hi 1-3G"

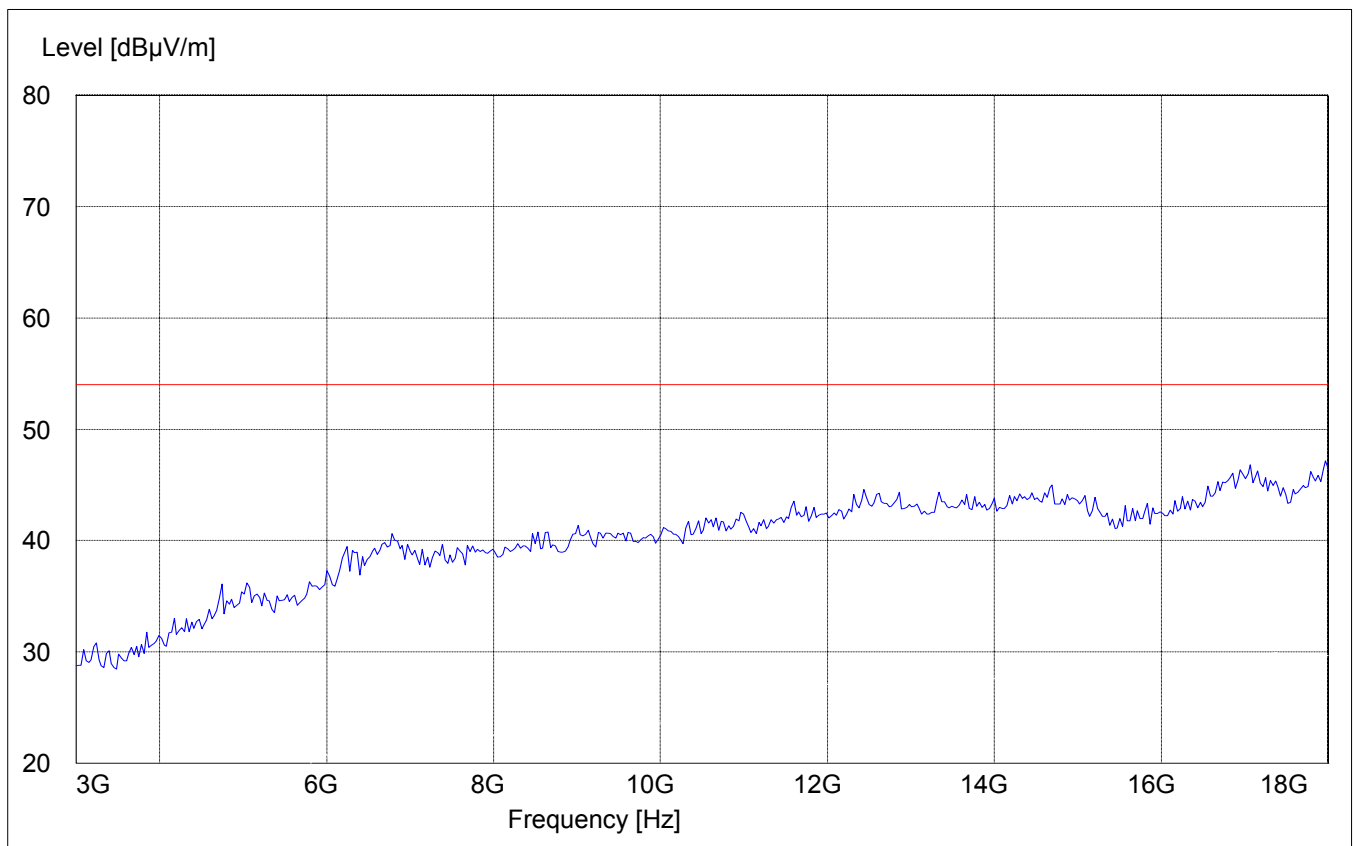


EMISSION LIMITATIONS - Radiated (Transmitter)
Mid Channel (2437MHz): 3GHz – 18GHz

§ 15.247 (c) (1)

SWEEP TABLE: "BT Spuri hi 3-18G"

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



EMISSION LIMITATIONS - Radiated (Transmitter)
Highest Channel (2462MHz): 1GHz – 3GHz

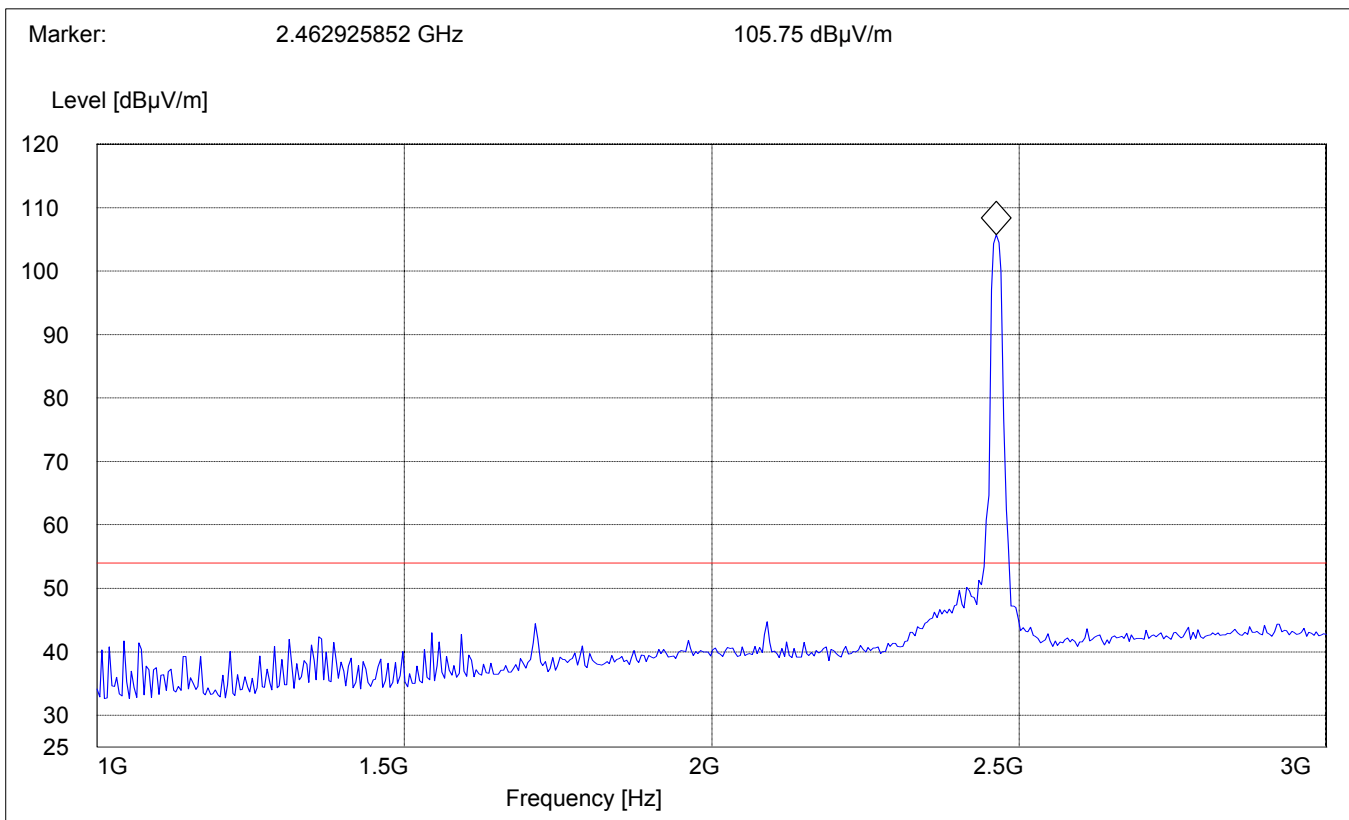
§ 15.247 (c) (1)

Note: The peak above the limit line is the carrier freq.

SWEEP TABLE:

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

"BT Spuri hi 1-3G"



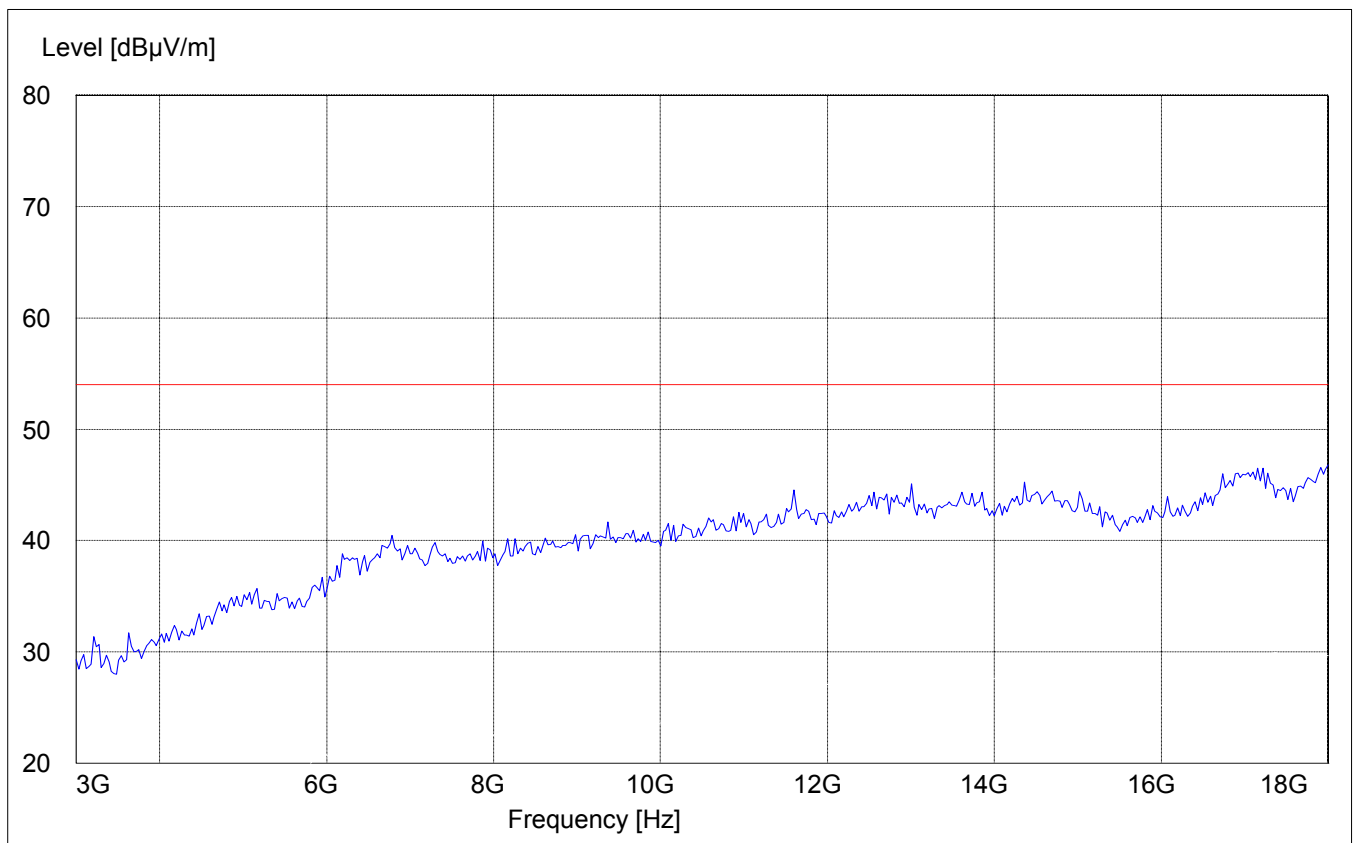
EMISSION LIMITATIONS - Radiated (Transmitter)
Highest Channel (2462MHz): 3GHz – 18GHz

§ 15.247 (c) (1)

SWEEP TABLE:

"BT Spuri hi 3-18G"

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



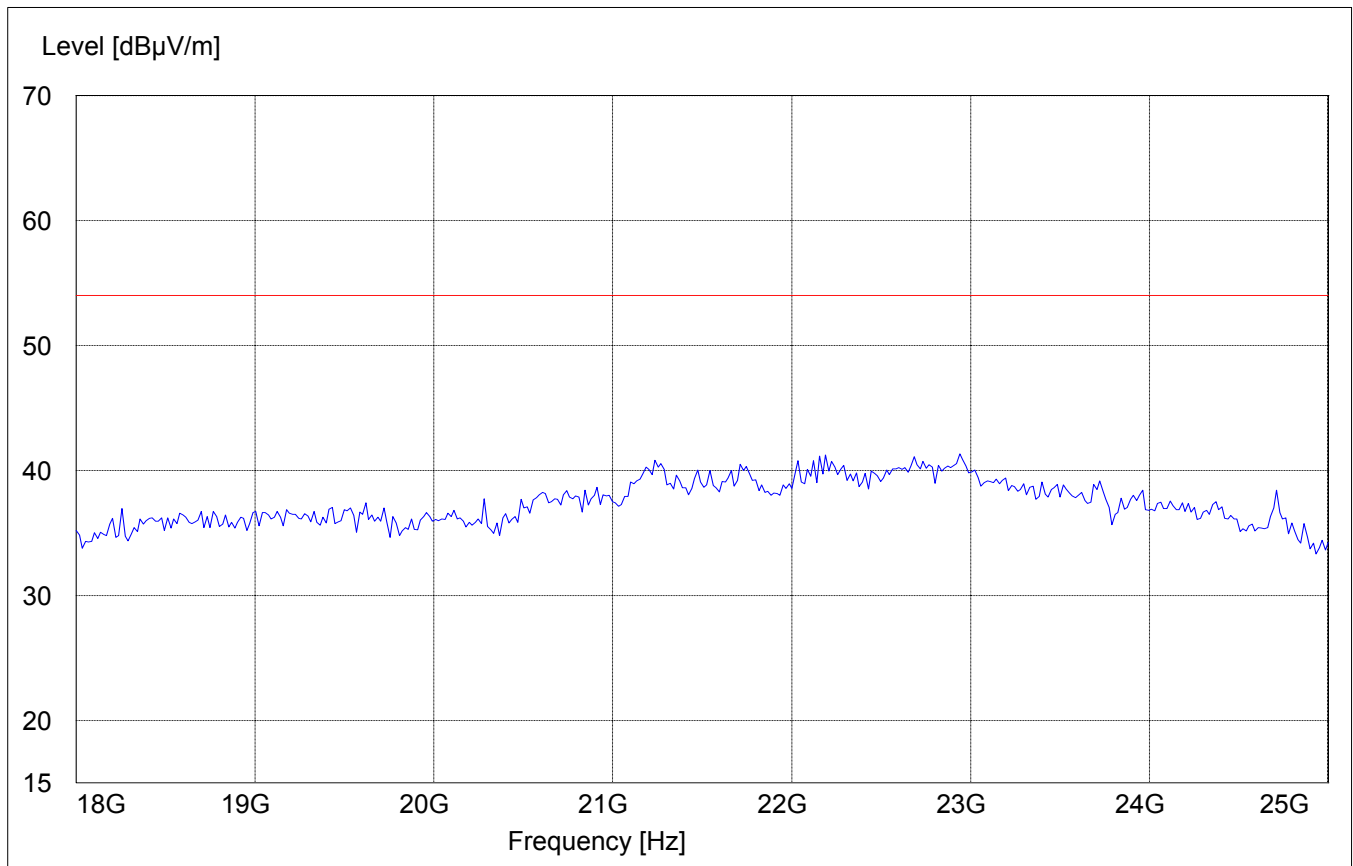
EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

18GHz – 25GHz

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

| SWEEP TABLE: | | "BT Spuri hi 18-25G" | | | |
|--------------|-----------|----------------------|---------|-------|-----------------|
| Start | Stop | Detector | Meas. | RBW | Transducer |
| Frequency | Frequency | Time | Bandw. | VBW | |
| 18 GHz | 25 GHz | MaxPeak | Coupled | 1 MHz | #326 horn (dBi) |



CONDUCTED EMISSIONS

§ 15.107/207

Measured with AC/DC power adapter

SWEEP TABLE: "55022 cond"

| | | | | | |
|--------------------|-----------|---------------------------|---------|--------|------------|
| Short Description: | | EN 55022 for 150KHz-30MHz | | | |
| Start | Stop | Detector | Meas | IF | Transducer |
| Frequency | Frequency | | Time | Bandw. | |
| 150.0 kHz | 30.0 MHz | MaxPeak | Coupled | 10 kHz | None |

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

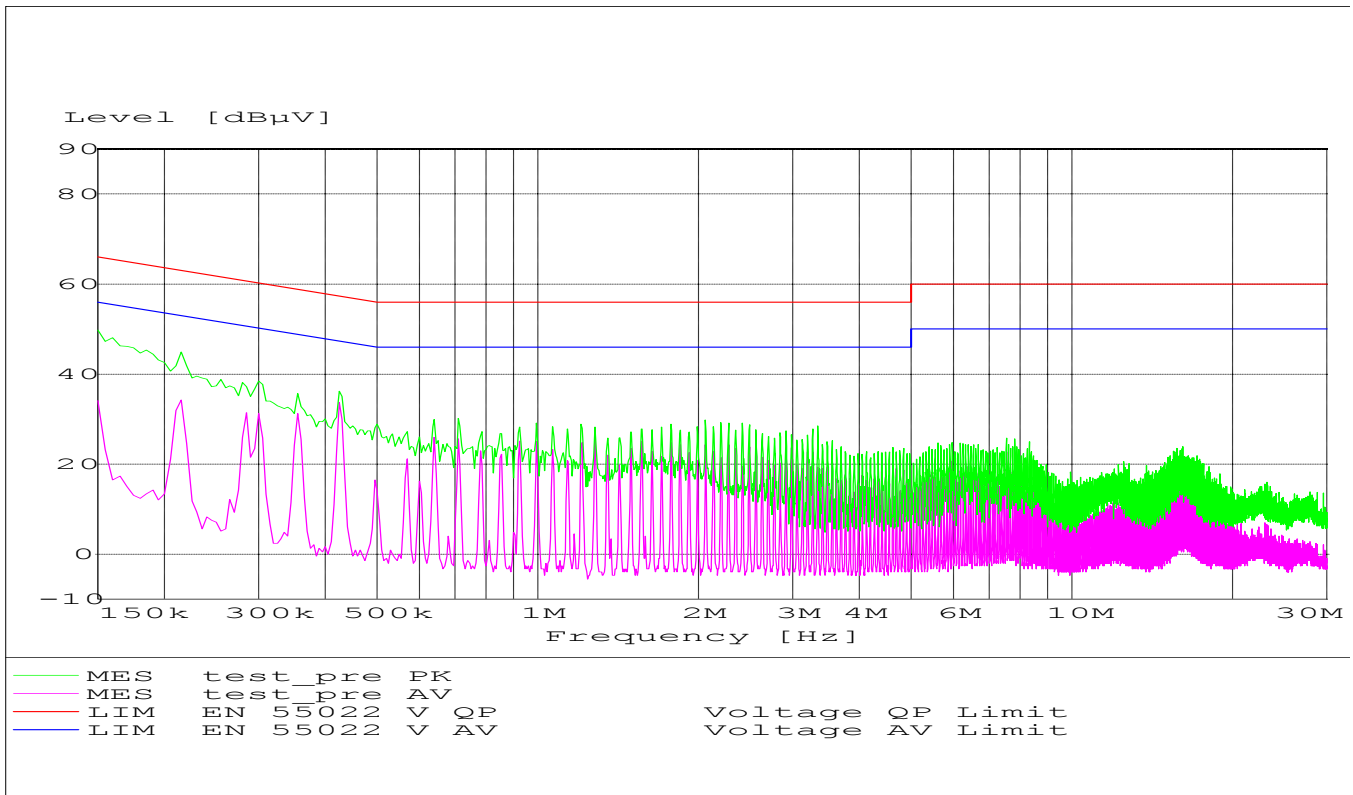
Limit

| Frequency of Emission (MHz) | Conducted Limit (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



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

| 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 |

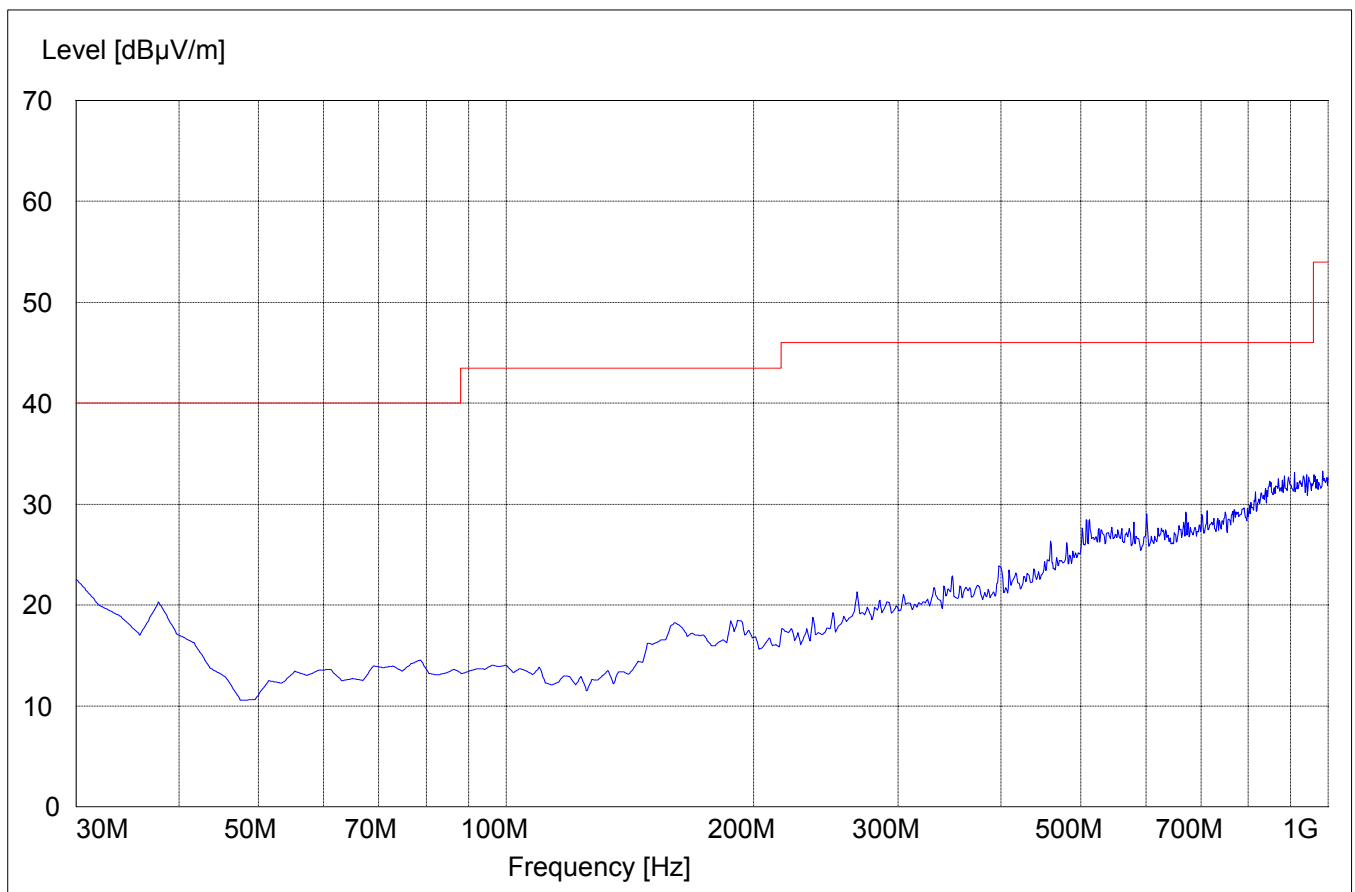
NOTE:

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 25 GHz very short cable connections to the antenna was used to minimize the noise level.

RECEIVER SPURIOUS RADIATION
30MHz – 1GHz

§ 15.209

| SWEEP TABLE: | | "BT Spuri hi 30-1G" | | | |
|--------------|---------|---------------------|------------|---------|------------|
| Start | Stop | Detector | Meas. Time | RBW | Transducer |
| 30.0 MHz | 1.0 GHz | MaxPeak | Coupled | 100 kHz | 3141-#1186 |



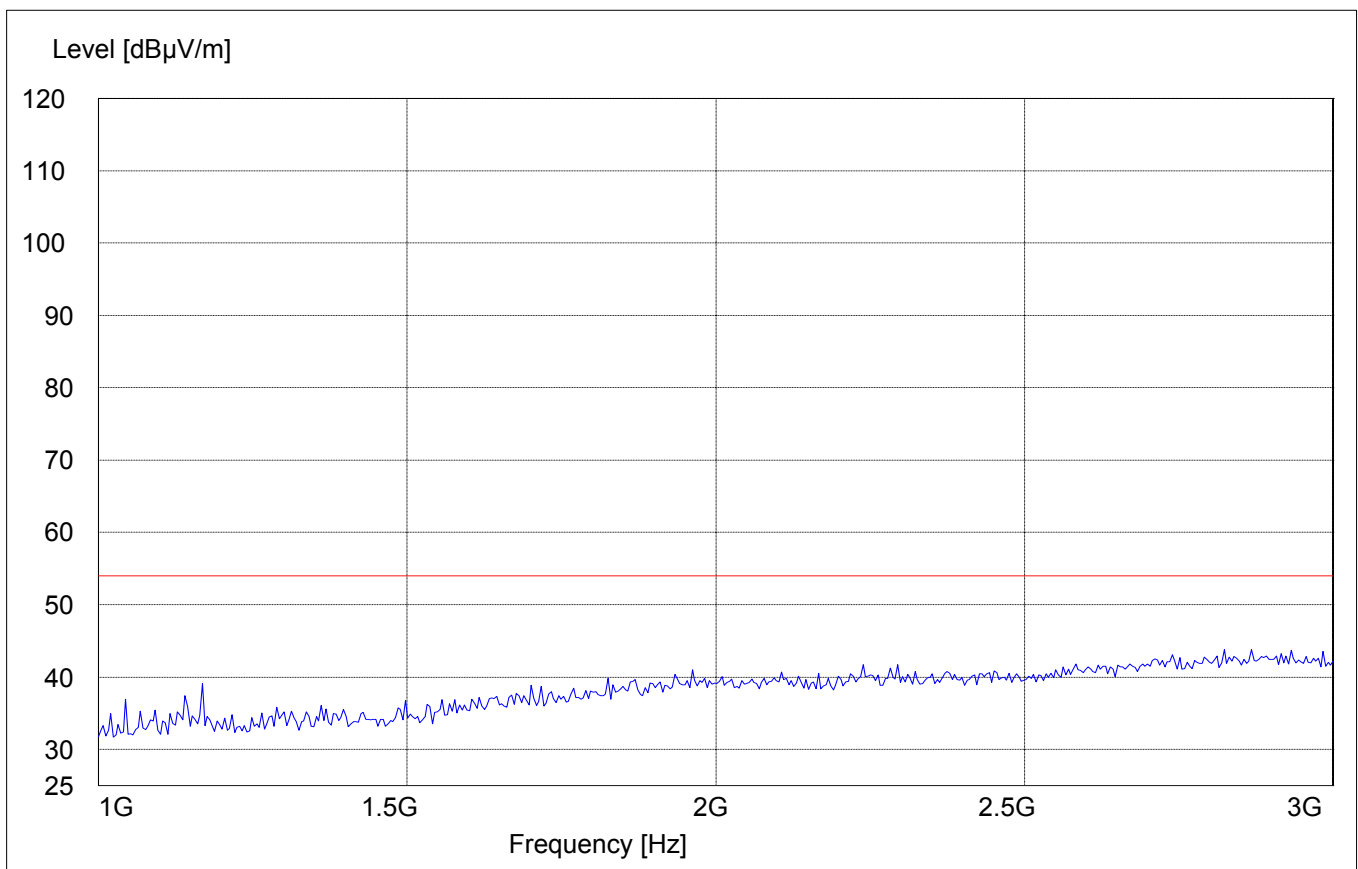
RECEIVER SPURIOUS RADIATION
1GHz – 3GHz

§ 15.209

SWEEP TABLE:

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

"BT Spuri hi 1-3G"

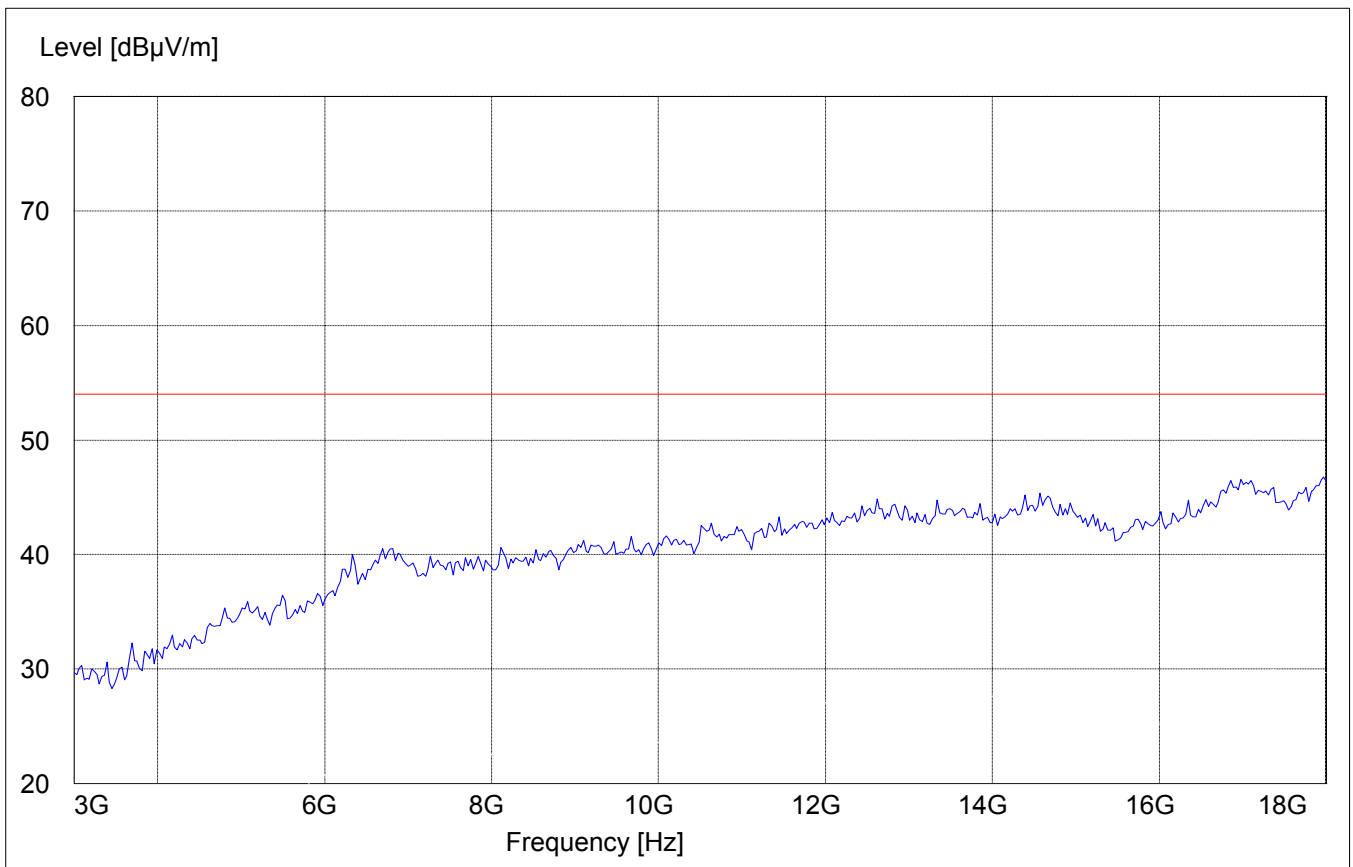


RECEIVER SPURIOUS RADIATION
3GHz – 18GHz

§ 15.209

SWEEP TABLE: "BT 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) |

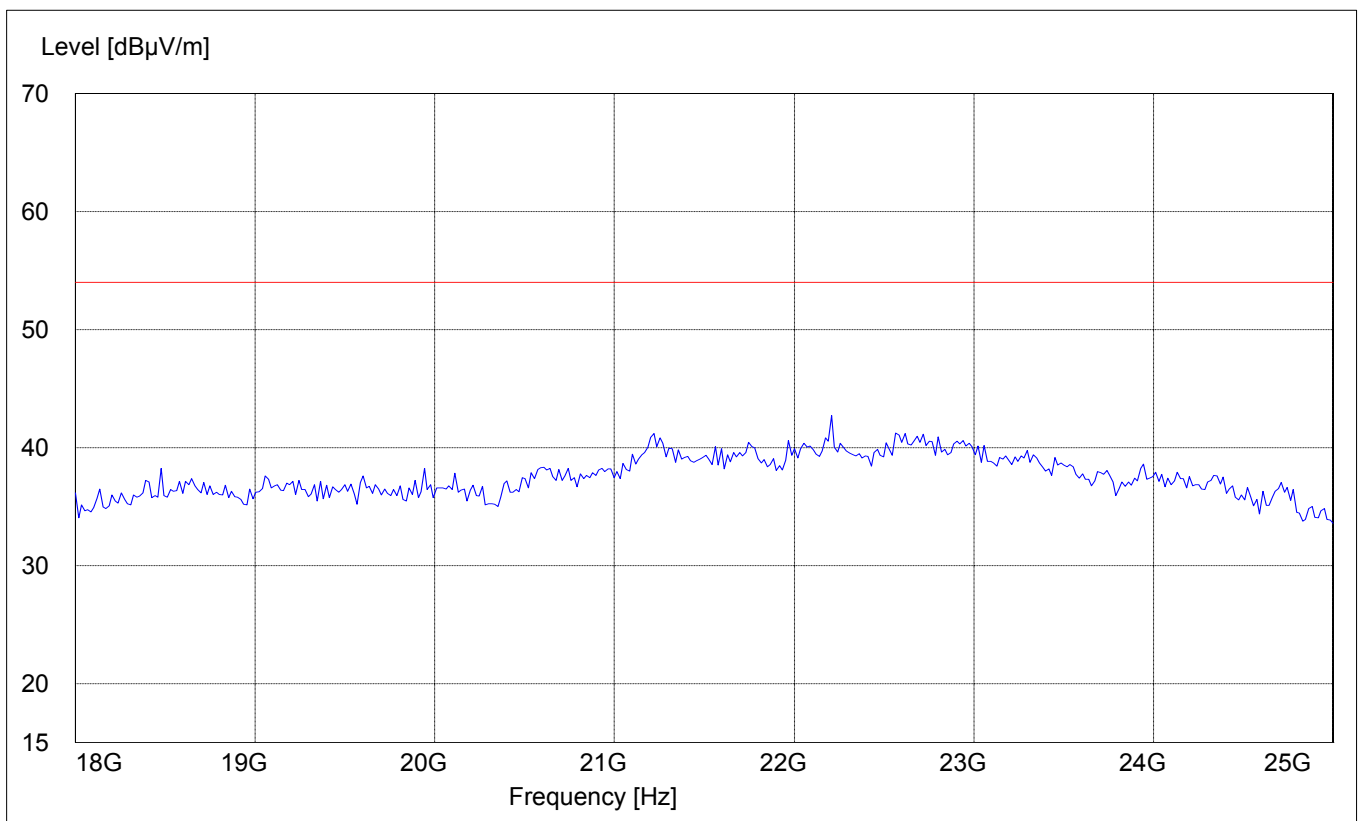


RECEIVER SPURIOUS RADIATION
18GHz – 25GHz

§ 15.209

SWEEP TABLE: "BT Spuri hi 18-25G"

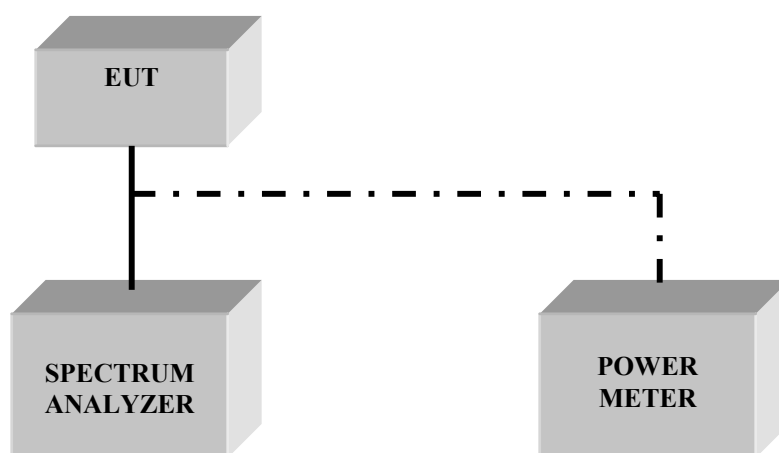
| Start | Stop | Detector | Meas. | RBW | Transducer |
|-----------|-----------|----------|---------|-------|-----------------|
| Frequency | Frequency | Time | Bandw. | VBW | |
| 18 GHz | 25 GHz | MaxPeak | Coupled | 1 MHz | #141 horn (dBi) |



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
Conducted Testing



Radiated Testing

ANECHOIC CHAMBER

