# CETECOM Inc.

**CETECOM Inc.**
411 Dixon Landing Road, Milpitas, CA-95035, USA
Phone: +1 408 586 6200 Fax: +1 408 586 6299
www.cetecom.com




# FCC Test Report

**Test report no.: EMC_405FCC15.247_2003_PP05L**
**FCC Part 15.247 for DSSS systems / CANADA RSS-210**

**EUT: WLAN Model: BCM94306MP**
**HOST: Dell Laptop Model: PP05L**

**FCC ID: QDS-BRCM1005-D**

Accredited according to **ISO/IEC 17025 by:**

Deutscher Akkreditierungs Rat DAR
**TTI-P- 081/94-A0**

CTIA Authorized Testing Laboratory

**FCC listed # 101450**

**IC recognized # 3925**


***CETECOM* Inc.**
411 Dixon Landing Road ◆ Milpitas, CA 95035 ◆ U.S.A.
Phone: + 1 (408) 586 6200 ◆ Fax: + 1 (408) 586 6299 ◆ E-mail: info@cetecomusa.com ◆ http://www.cetecom.com
*CETECOM* Inc. is a Delaware Corporation with Corporation number: 2113686
Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May

**Table of Contents**



## 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.**
**411 Dixon Landing Road, Milpitas, CA-95035, USA**
**Phone: +1 408 586 6200 Fax: +1 408 586 6299**
**E-mail: lothar.schmidt@cetecomusa.com**
**Internet: www.cetecom.com**

## 1.3 Details of applicant

| | | |
|---|---|---|
| **Name** | **:** | **Broadcom corporation** |
| **Street** | **:** | **190 Mathilda Place** |
| **City / Zip Code** | **:** | **Sunnyvale, CA 94086** |
| **Country** | **:** | **USA** |
| **Contact** | **:** | **Chris McGough** |
| **Telephone** | **:** | **408-922-5810** |
| **Tele-fax** | **:** | **408-543-3399** |
| **e-mail** | **:** | **cmcgough@broadcom.com** |

## 1.4 Application details

| | | |
|---|---|---|
| Date of receipt of application | : | 2003-02-28 |
| Date of receipt test item | : | 2003-03-03 |
| Date of test | : | 2003-03-03 |

## 1.5 Test item

| | | |
|---|---|---|
| Manufacturer | : | Applicant |
| Model No. (EUT) | : | BCM94306MP |
| Model No. (Host) | : | **Dell Laptop PC Model No: PP05L |
| Description | : | 54g wireless LAN mini PCI card in Dell Laptop |
| **FCC ID** | **:** | QDS-BRCM1005-D |

**Additional information**

| | | |
|---|---|---|
| Frequency | : | 2412MHz – 2462MHz |
| Type of modulation | : | DSSS / OFDM (orthogonal frequency division multiplexing) |
| Number of channels | : | 11 |
| Antenna | : | 2.26dBi max. gain antenna |
| Power supply | : | 3.3 VDC from Host |
| Output power | : | 25.55dBm (359mW) conducted peak power<br>**(For EIRP and Source-based time-averaged output please see page no.11)** |
| Extreme temp. Tolerance | : | 0°C to +85°C |

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

****This Laptop Model has built in Bluetooth module (FCC ID: IXMUB22111S) and the WLAN module (FCC ID: QDS-BRCM 1005)**

## 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 |
|---|---|---|---|
| 2003-03-05 | EMC & Radio | Lothar Schmidt (Manager) | |

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

| Date | Section | Name | Signature |
|---|---|---|---|
| 2003-03-05 | EMC & Radio | Harpreet Sidhu (EMC Engineer) | |

## 2.2 Test report

**TEST REPORT**

**Test report no.: EMC_405FCC15.247_2003_PP05L**

**EUT: WLAN Model: BCM94306MP**
**HOST: Dell Laptop Model: PP05L**

**FCC ID: QDS-BRCM1005-D**

**TEST REPORT REFERENCE**

**SPECTRUM BANDWIDTH OF DSSS SYSTEM §15.247(a) (2)**
**6 dB bandwidth**

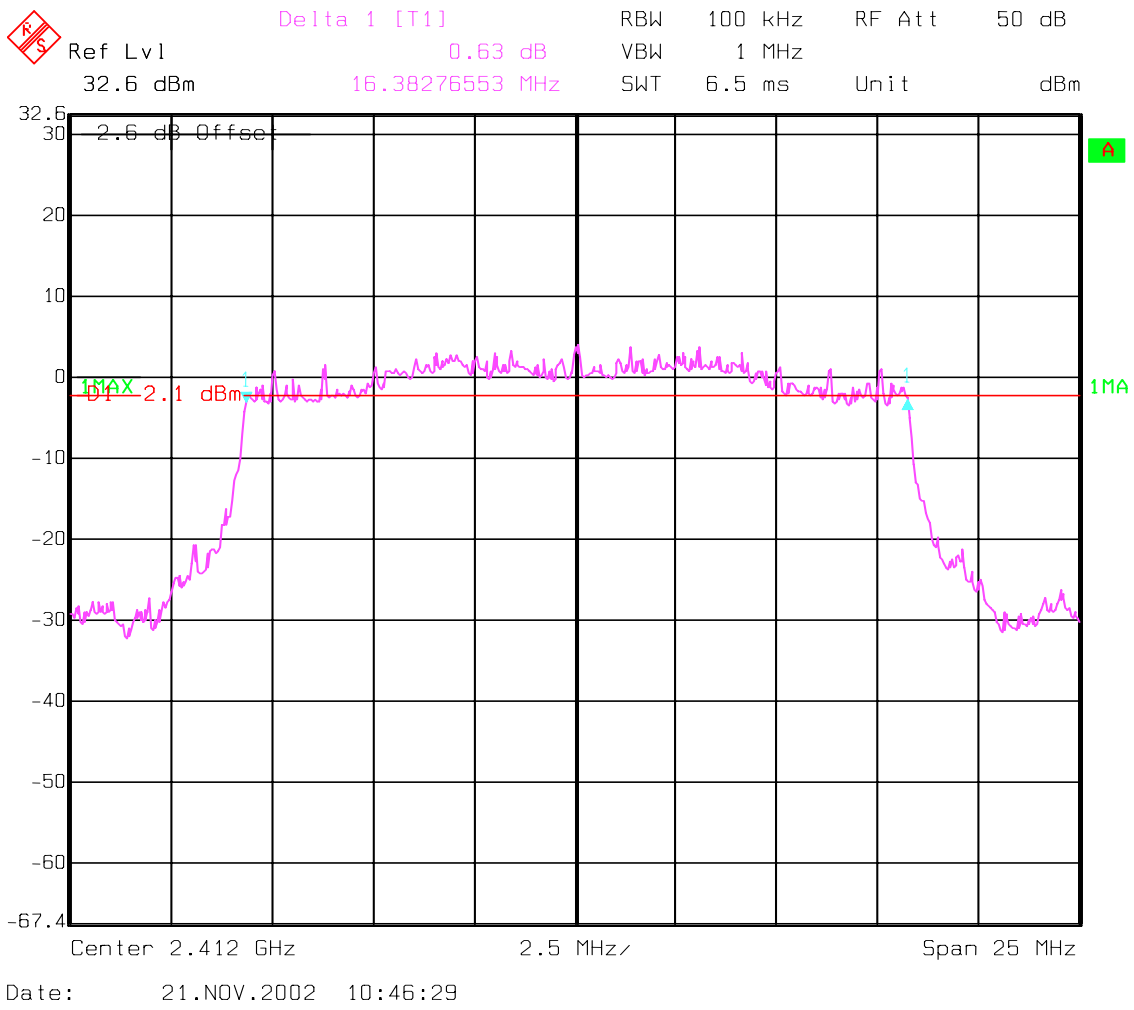
| TEST CONDITIONS | | 6 dB BANDWIDTH (MHz) | | |
|---|---|---|---|---|
| Frequency (MHz) | | 2412 | 2437 | 2462 |
| $T_{nom}$(23)°C | $V_{nom}$(3.3) VDC | 16.38 | 16.53 | 16.43 |

**LIMIT** **SUBCLAUSE §15.247(a) (2)**

| The minimum 6dB bandwidth shall be at least 500 KHz |
|---|

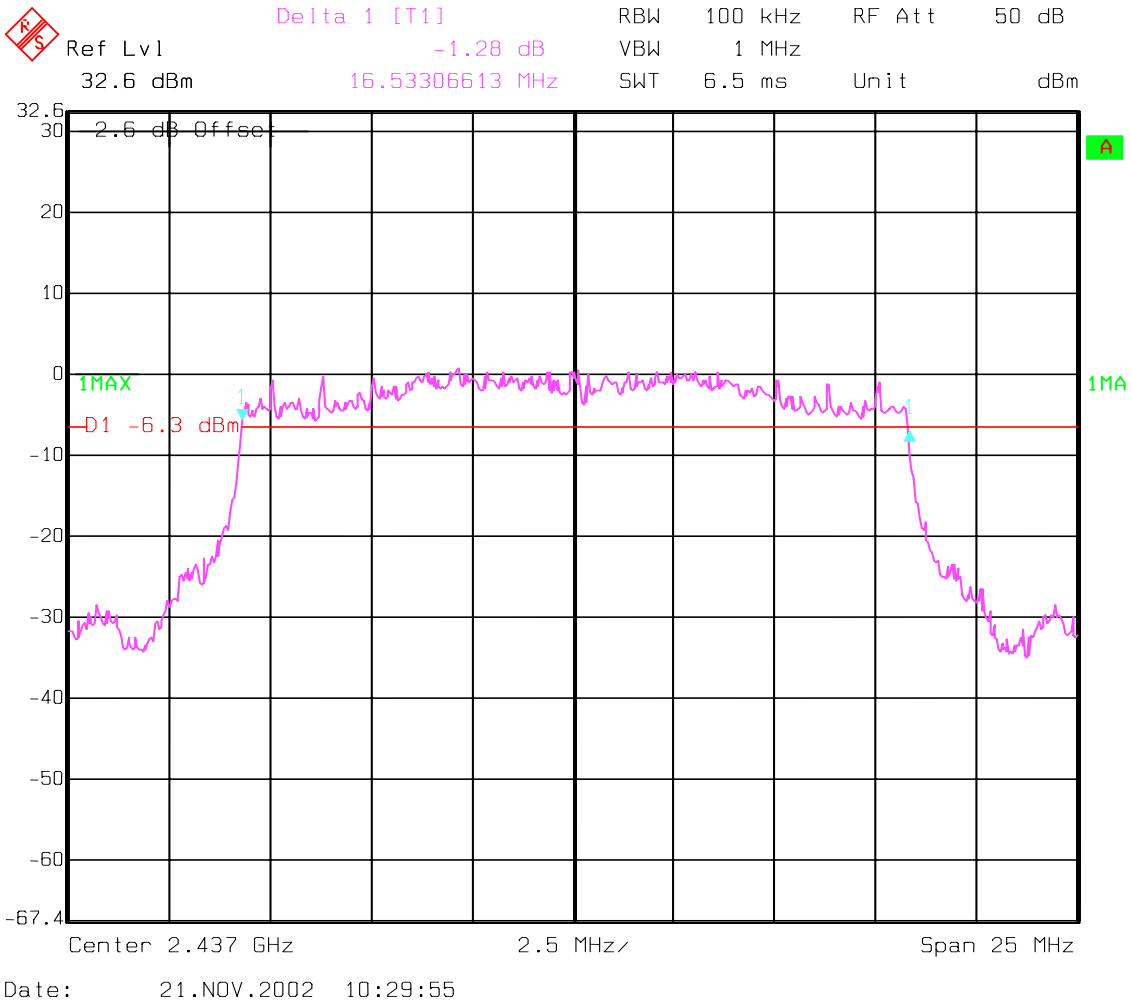
**SPECTRUM BANDWIDTH OF DSSS SYSTEM** **§15.247(a) (2)**
**6 dB bandwidth**

**Lowest Channel: 2412MHz**



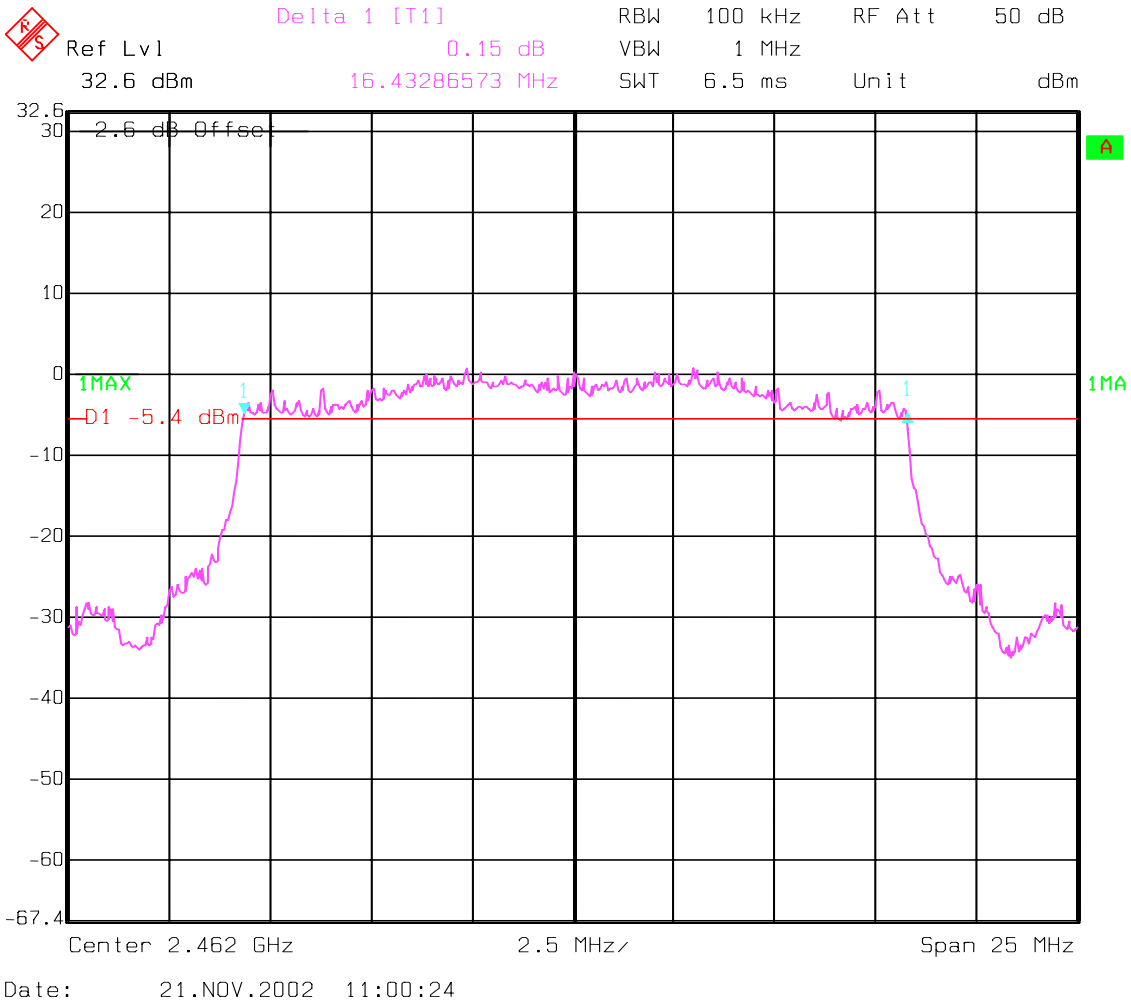
**SPECTRUM BANDWIDTH OF DSSSS SYSTEM** **§15.247(a) (2)**
**6 dB bandwidth**

**Mid Channel: 2437MHz**



**SPECTRUM BANDWIDTH OF DSSS SYSTEM** **§15.247(a) (2)**
**6 dB bandwidth**

**Highest Channel: 2462MHz**



**OUTPUT POWER** **§ 15.247 (b) (1)**

| | Low channel | Mid channel | High channel |
|---|---|---|---|
| *Conducted Peak Power | 25.55dBm | 24.48dBm | 24.11dBm |
| *Radiated Power (EIRP) | 27.81dBm | 26.74dBm | 26.37dBm |
| **Source-based time averaged output | 21.04dBm | 19.97dBm | 19.60dBm |

***For details please refer to pages 12(Conducted output power results), 16(EIRP calculation) & 17(duty cycle measurements) respectively.**

****The source-based time-averaged output power is calculated using the duty cycle (measurement result see page 17-20, These values are used to determine if the TCB route can be used)**

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

| TEST CONDITIONS | | MAXIMUM PEAK OUTPUT POWER (dBm) | | | |
|---|---|---|---|---|---|
| Frequency (MHz) | | | 2412 | 2437 | 2462 |
| $T_{nom}$(23)°C | $V_{nom}$(3.3) VDC | Pk | *25.55 | *24.48 | *24.11 |
| Measurement uncertainty | | ±0.5dBm | | | |

**RBW / VBW: 10MHz**

***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**

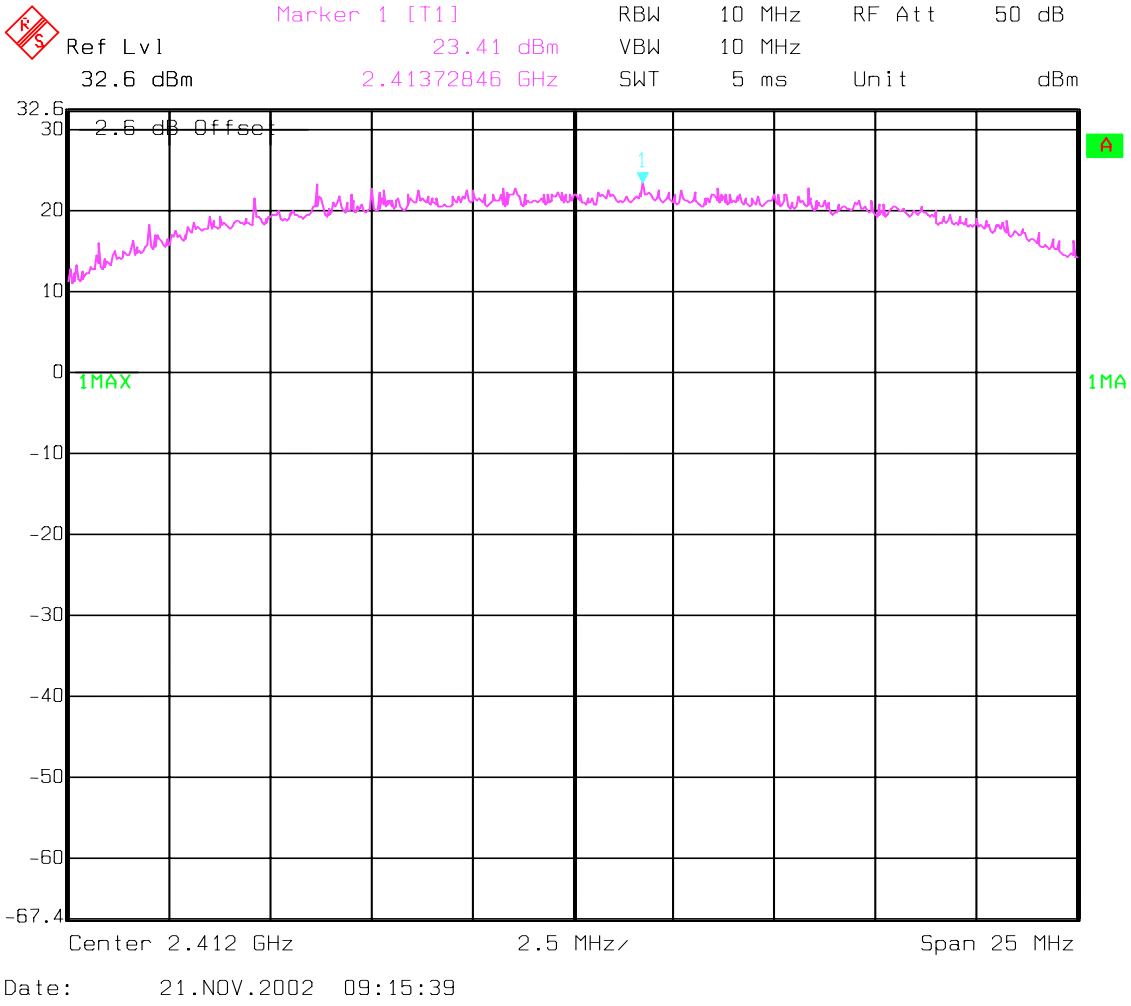
**(Therefore correction factor of 2.14, 2.18 & 2.15 is added to low, mid& high channel measurements respectively)**

**LIMIT** **SUBCLAUSE § 15.247 (b) (1)**

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

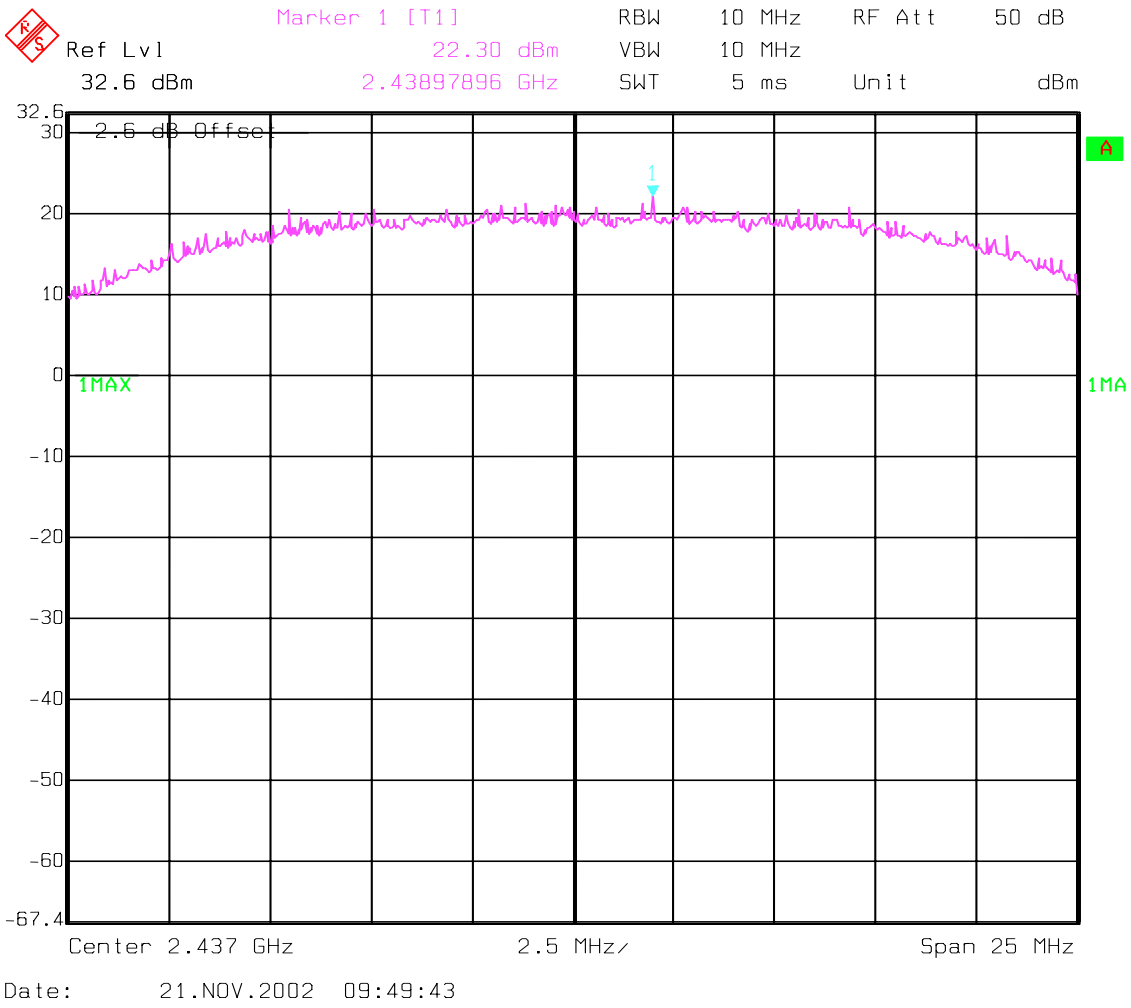
## PEAK OUTPUT POWER (CONDUCTED) §15.247 (b) (1)

**Lowest Channel: 2412MHz**



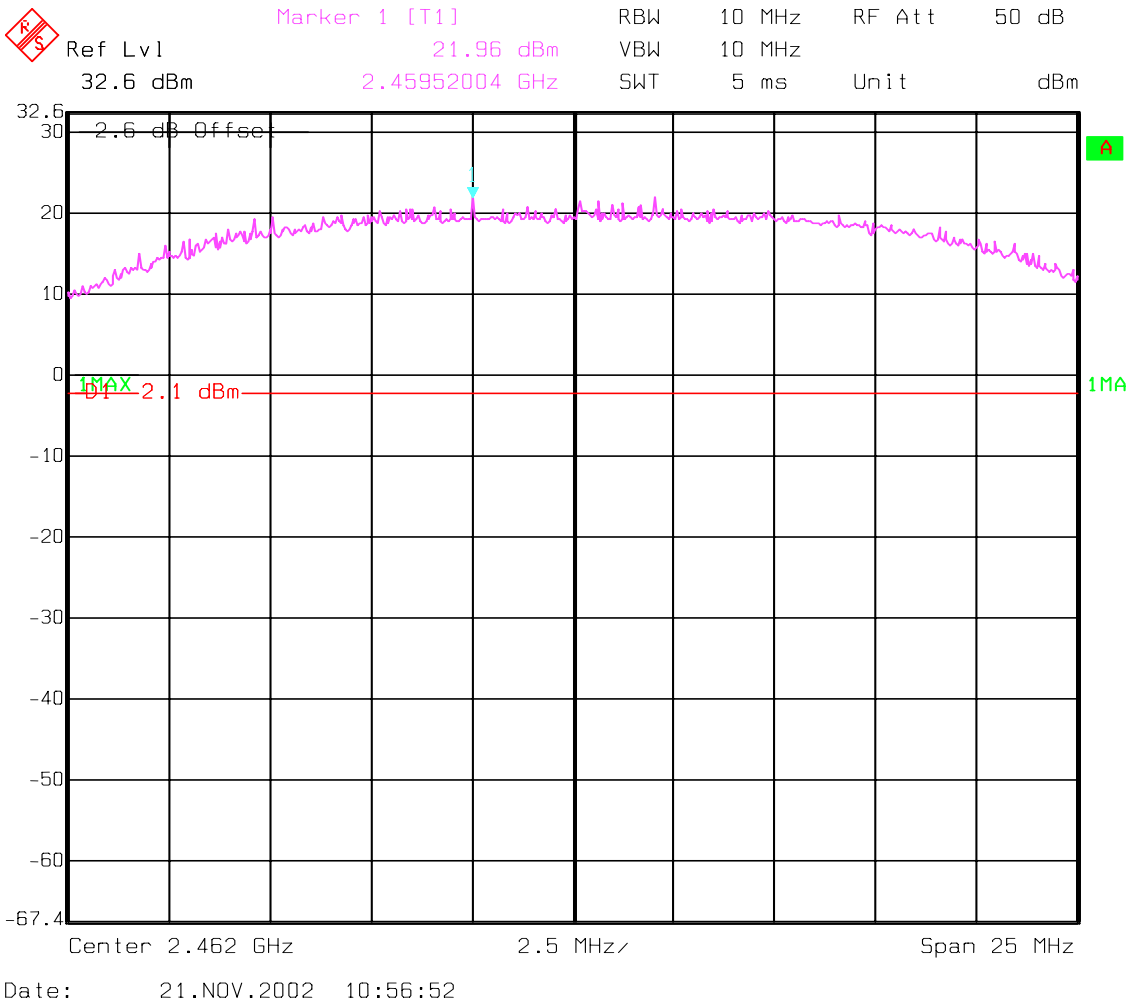
## PEAK OUTPUT POWER (CONDUCTED) §15.247 (b)

**Mid Channel: 2437MHz**



## PEAK OUTPUT POWER (CONDUCTED) §15.247 (b)

**Highest Channel: 2462MHz**



**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 | $V_{nom}$(3.3) VDC | *27.81 | *26.74 | *26.37 |
| Measurement uncertainty | | ±0.5dBm | | |

***Note: EIRP is calculated based on 2.26dBi antenna and conducted peak power measurements.**

**LIMIT** **SUBCLAUSE § 15.247 (b) (1)**

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

**SOURCE-BASED TIME-AVERAGED OUTPUT**

$Tx_{on}$ = 140.2 µs

$Tx_{on}+Tx_{off}$ = 661.32 µs

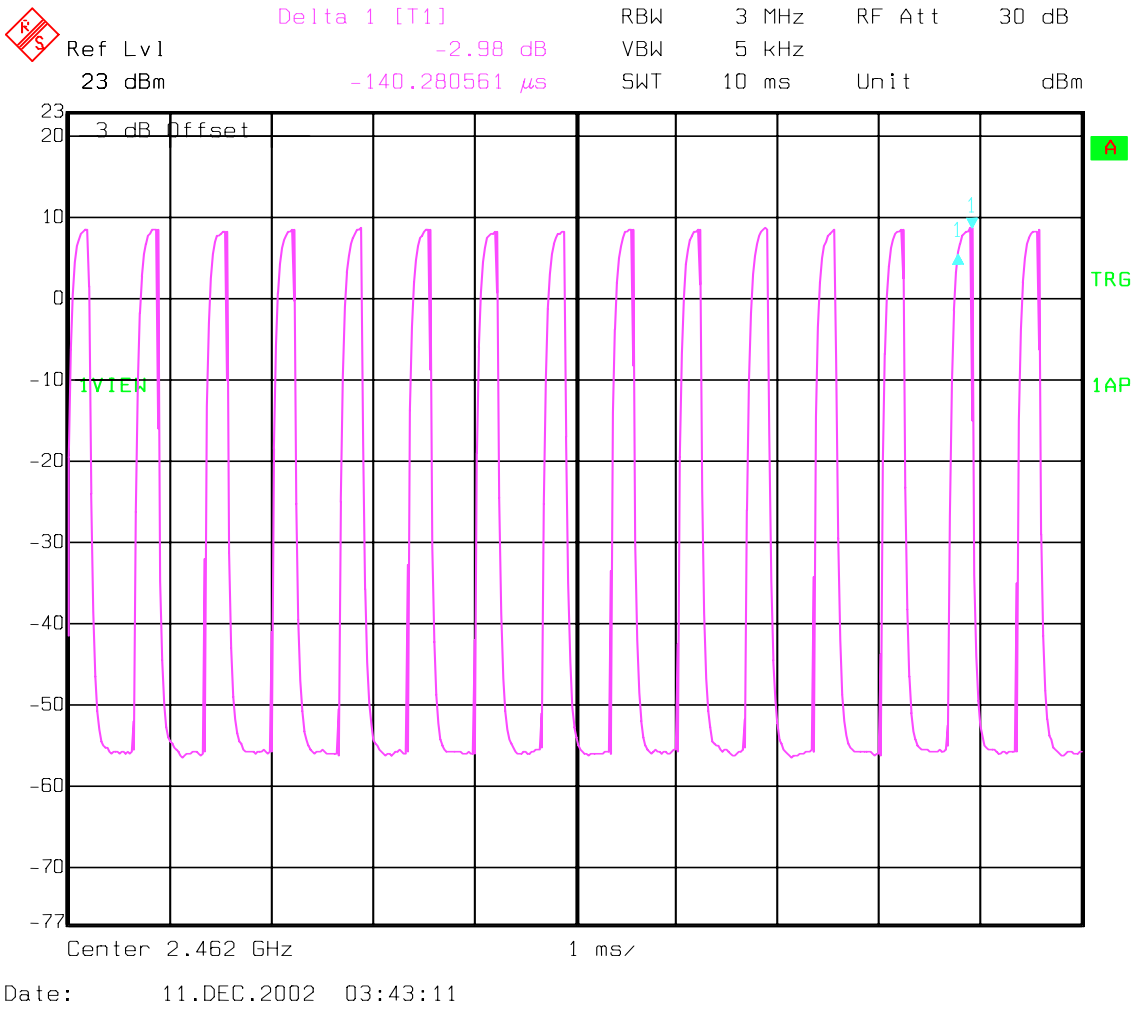
Duty factor = $Tx_{on}$ / $Tx_{on}+Tx_{off}$ = 140.2 / 661.32 = 0.21

Therefore;
(Example for Low channel)
Source-based time averaged output = Max. EIRP + 10log(duty factor)
= 27.81 – 6.77 = **21.04dBm**

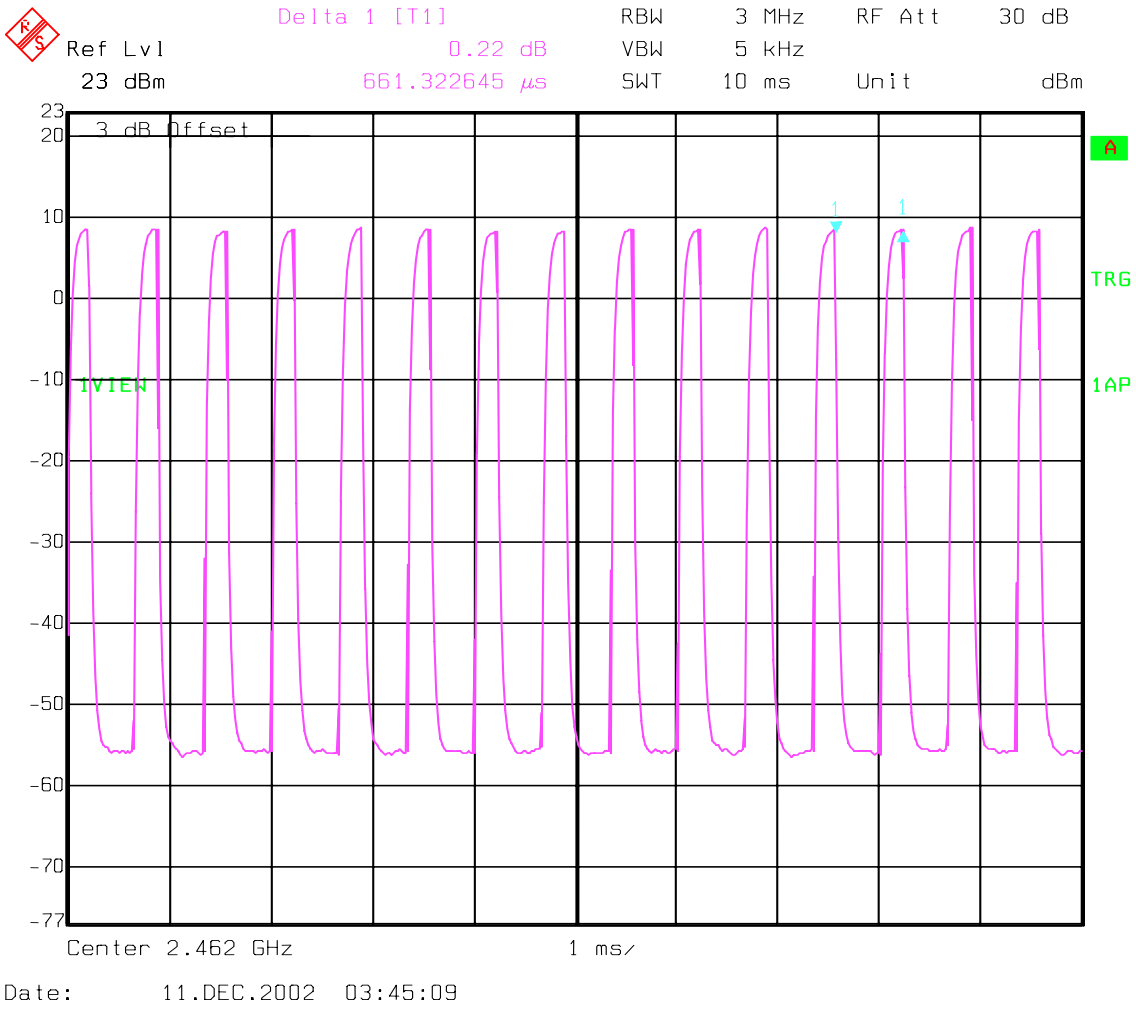
| **TEST CONDITIONS** | | **SOURCE-BASED TIME AVERAGED OUTPUT (dBm)** | | |
|---|---|---|---|---|
| **Frequency (MHz)** | | **2412** | **2437** | **2462** |
| **$T_{nom}$(23)°C** | **$V_{nom}$(3.3) VDC** | **21.04** | **19.97** | **19.60** |

Please refer to the plots on next pages

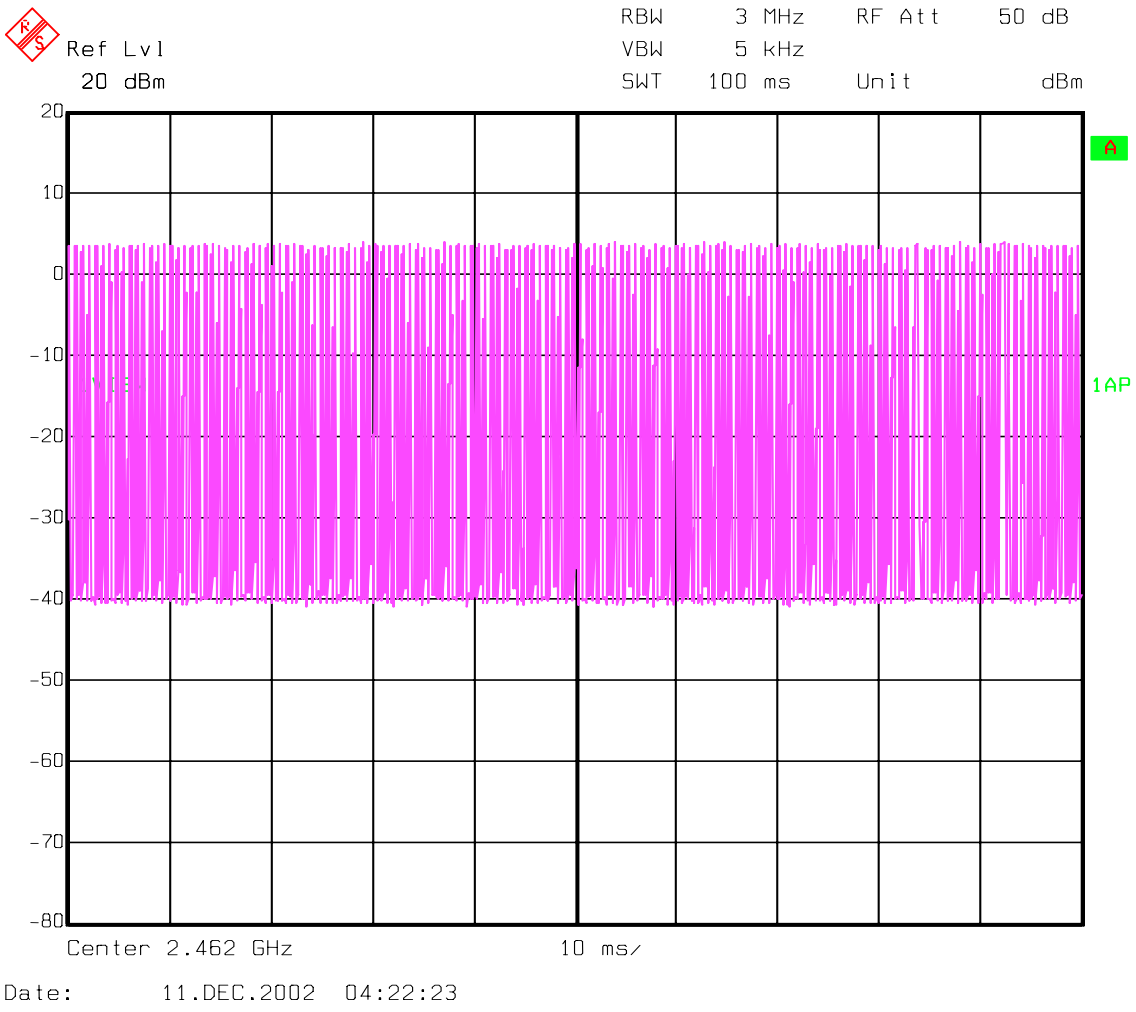
## Transmitter ON time – $Tx_{on}$



## Transmitter ON+OFF time – $Tx_{on}$ + $Tx_{off}$



## 100ms plot – to show repetition of pattern



## POWER SPECTRAL DENSITY §15.247 (d)

| TEST CONDITIONS | | POWER SPECTRAL DENSITY (dBm) | | |
|---|---|---|---|---|
| Frequency (MHz) | | 2412 | 2437 | 2462 |
| $T_{nom}$(23)°C | $V_{nom}$(3.3) VDC | -0.99 | -5.15 | -3.72 |

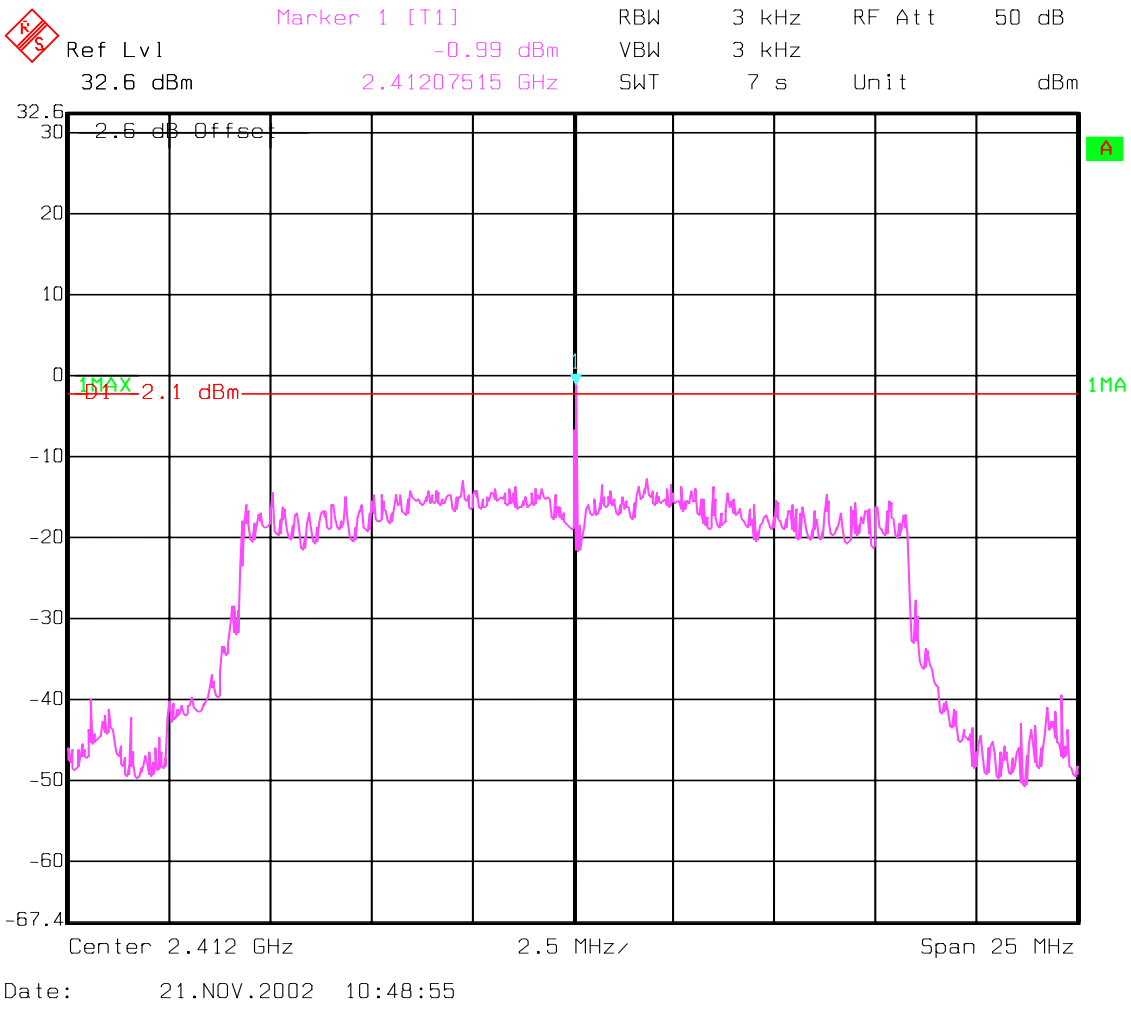
**LIMIT** **SUBCLAUSE §15.247(d)**

| The peak power spectral density shall not be greater than 8dBm in any 3 kHz band |
|---|

**ANALYZER SETTINGS: RBW=3KHz, VBW=3KHz**

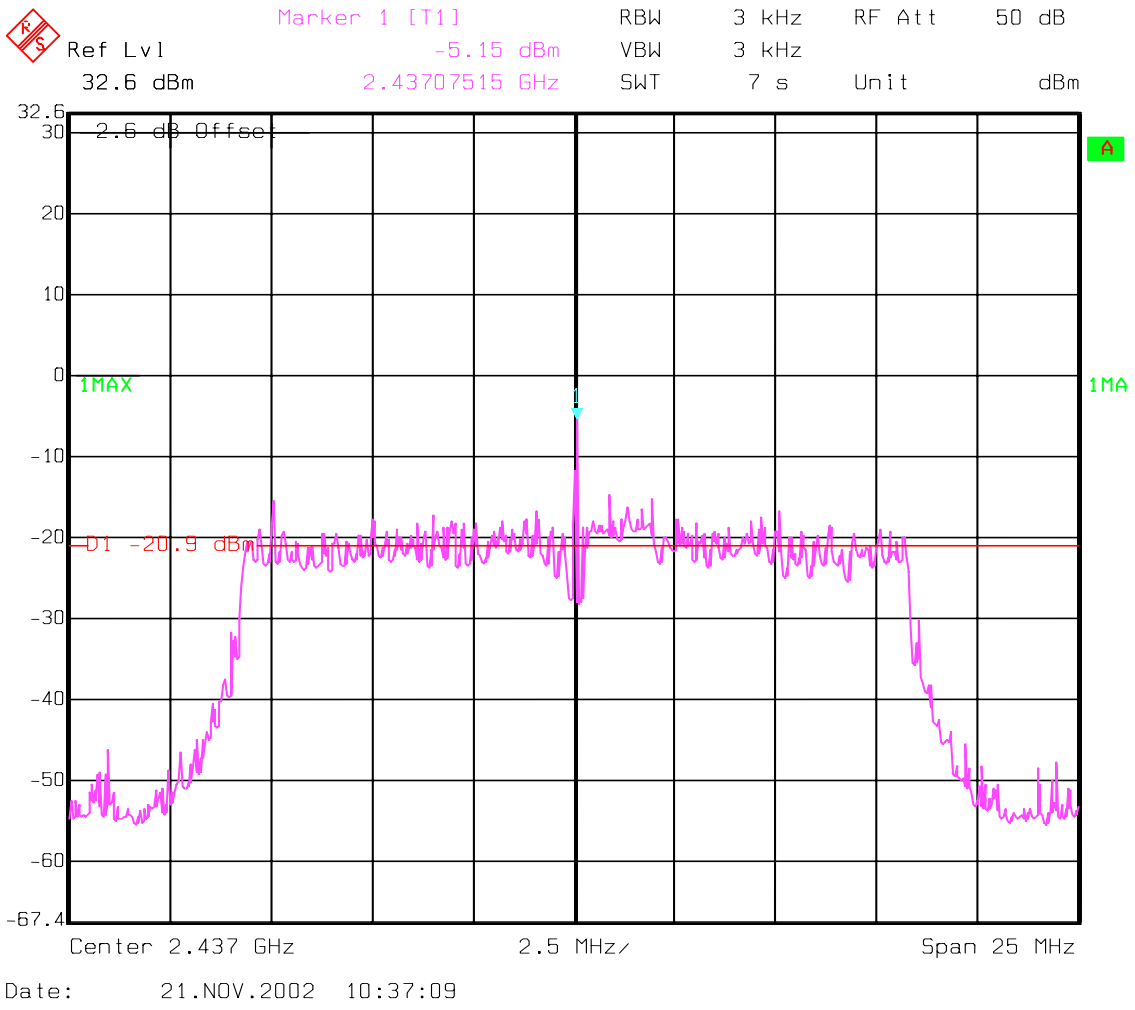
## POWER SPECTRAL DENSITY §15.247(d)

**Lowest Channel: 2412MHz**



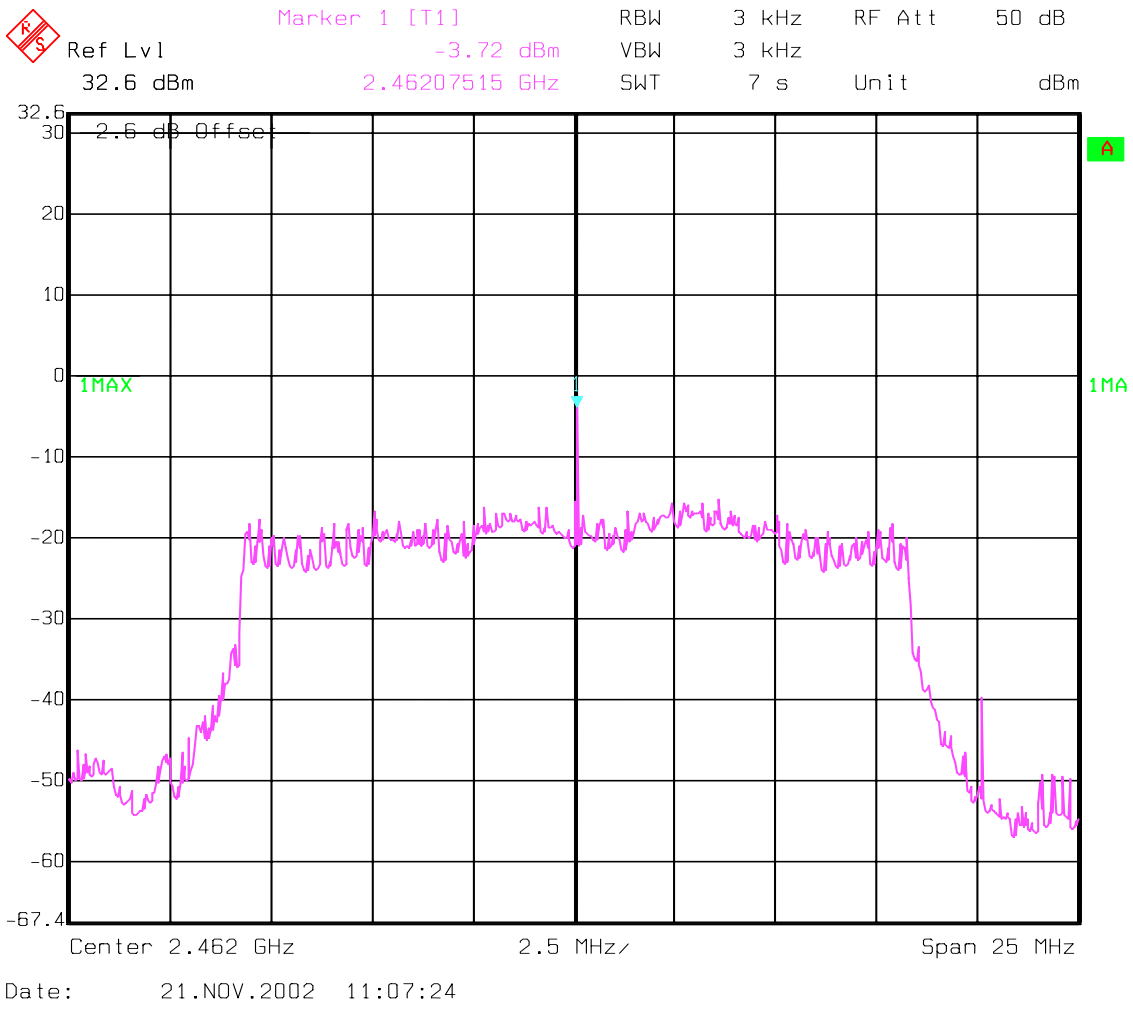
## POWER SPECTRAL DENSITY §15.247(d)

**Mid Channel: 2437MHz**



## POWER SPECTRAL DENSITY §15.247(d)

**Highest Channel: 2462MHz**



**POWER SPECTRAL DENSITY** **RSS-210**

| TEST CONDITIONS | | POWER SPECTRAL DENSITY (dBm/MHz) | | |
|---|---|---|---|---|
| Frequency (MHz) | | 2412 | 2437 | 2462 |
| $T_{nom}$(23)°C | $V_{nom}$(3.3) VDC | *11.77 | *8.91 | *8.57 |

***Correction factor of 60dBm is added to convert measured values from dBm/Hz to dBm/MHz**

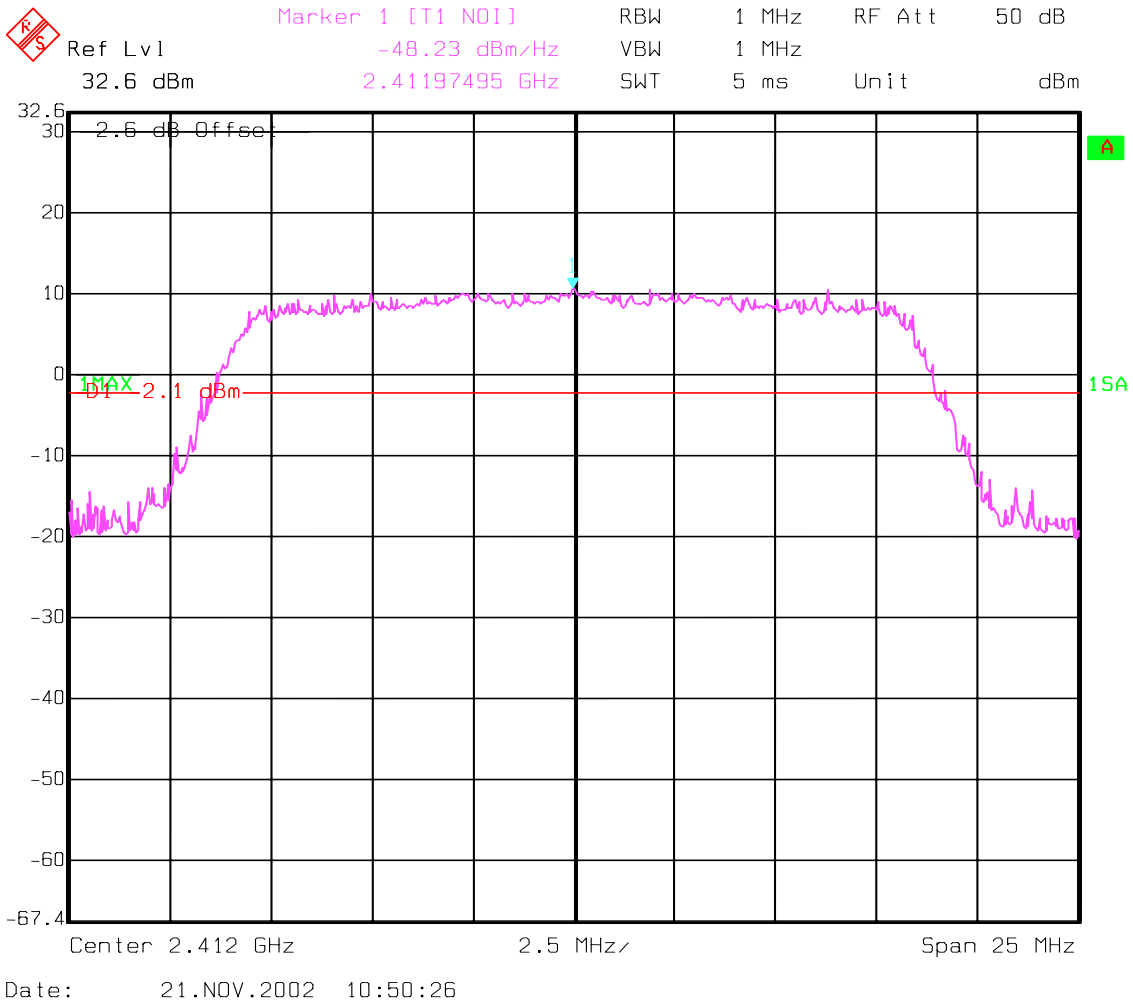
**LIMIT** **RSS-210**

| The peak power spectral density shall be ≤ 50mW/MHz (17dBm/MHz) |
|---|

**ANALYZER SETTINGS: RBW=1MHz, VBW=1MHz**

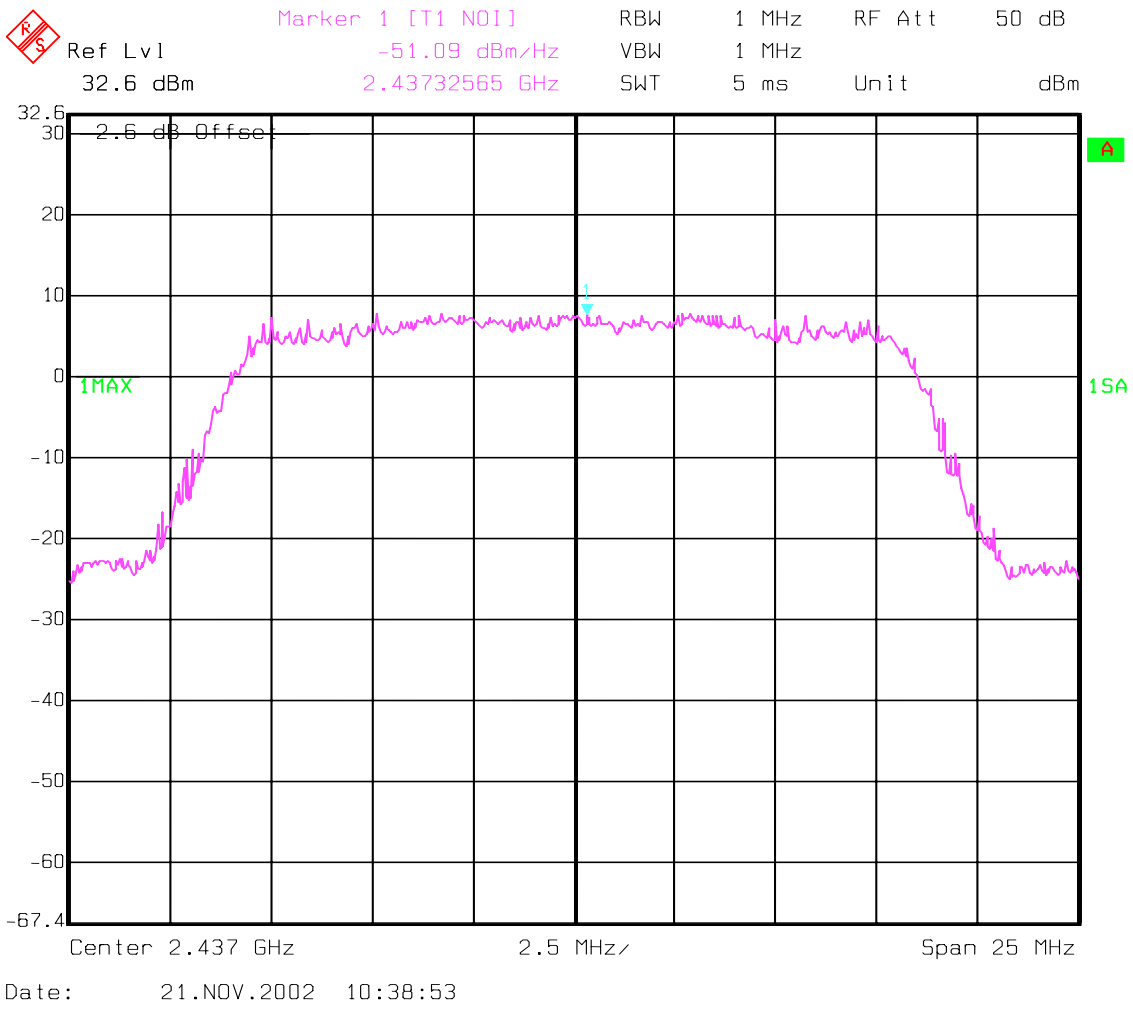
**POWER SPECTRAL DENSITY** **RSS-210**

**Lowest Channel: 2412MHz**



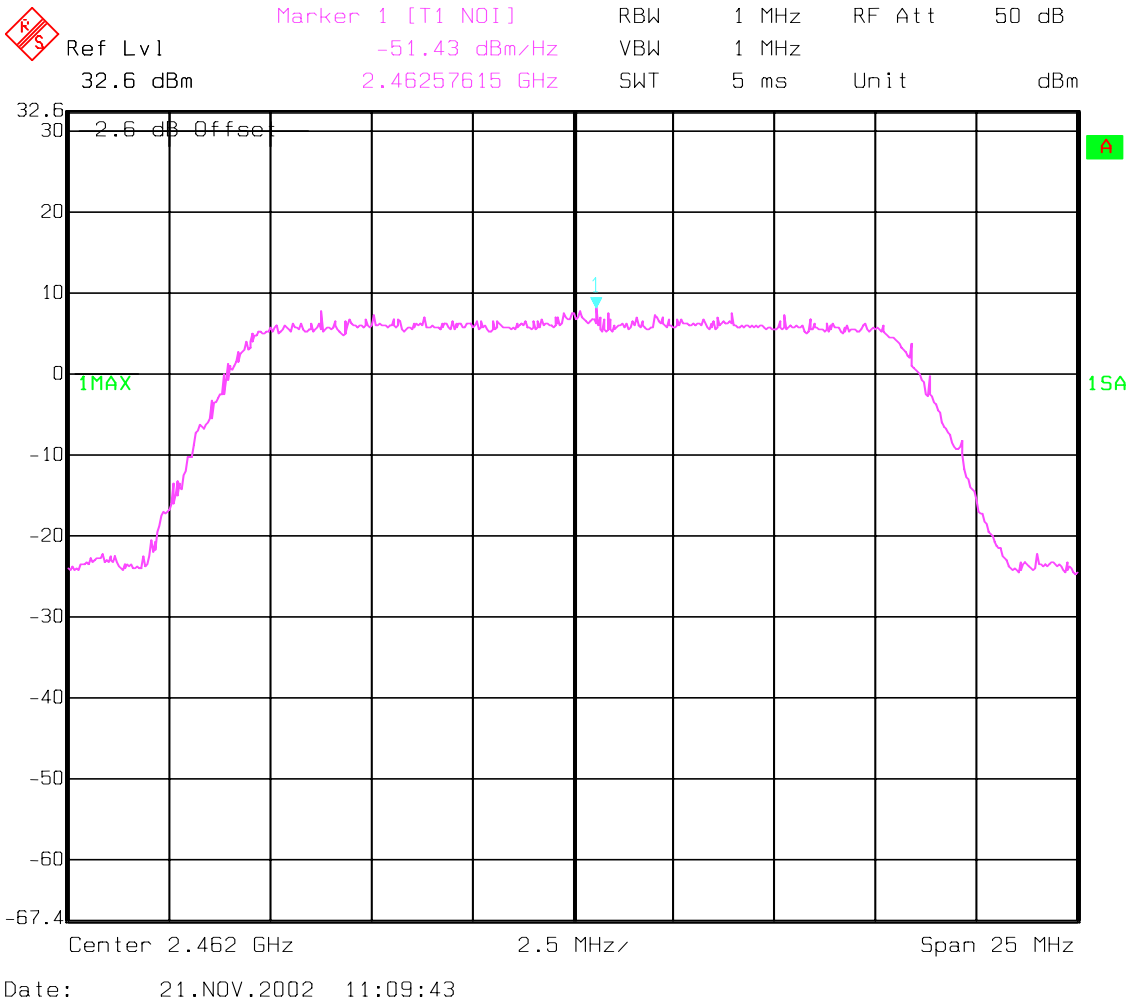
**POWER SPECTRAL DENSITY** **RSS-210**

**Mid Channel: 2437MHz**



**POWER SPECTRAL DENSITY** **RSS-210**

**Highest Channel: 2462MHz**

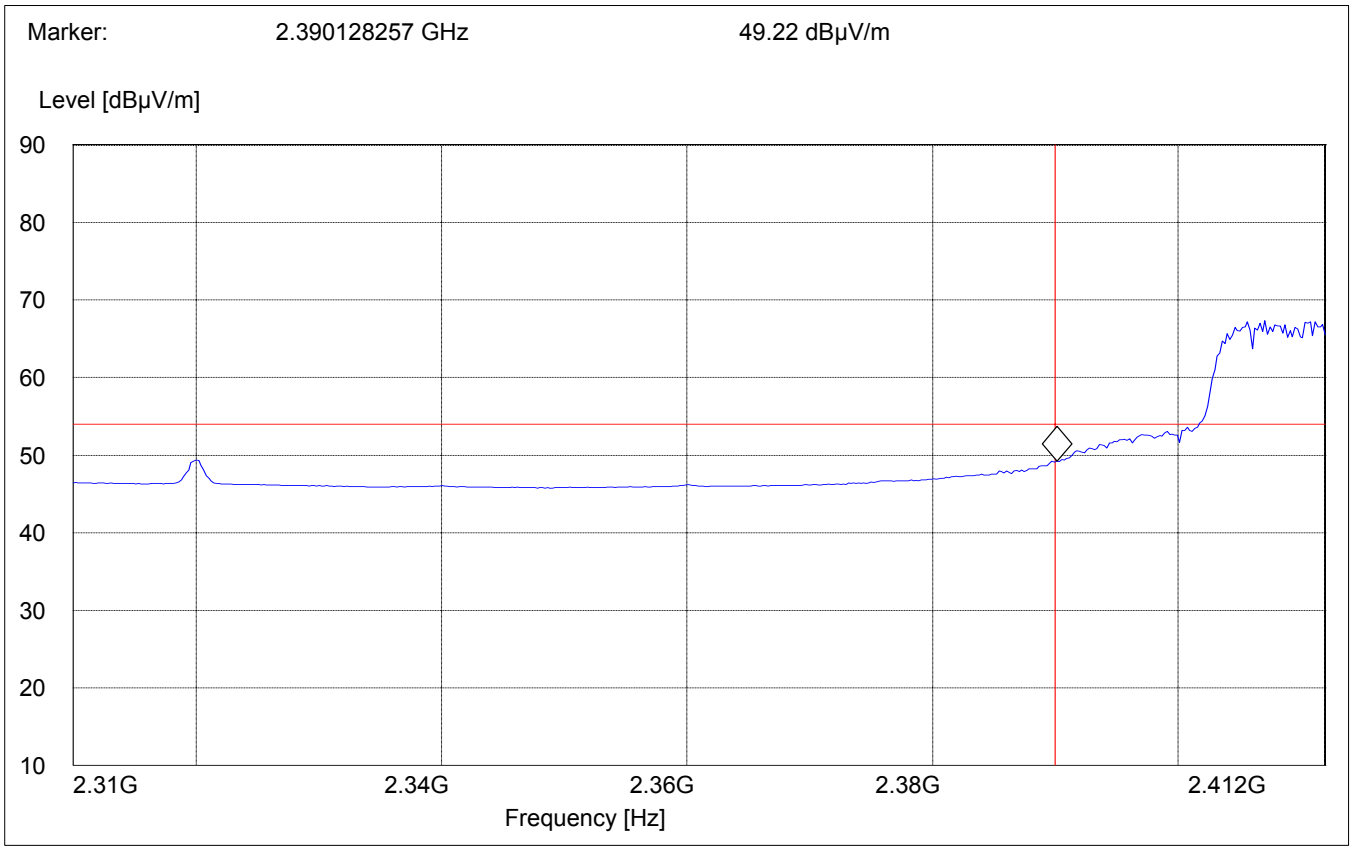


## BAND EDGE COMPLIANCE §15.247 (c)

### 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 : 54dBµV

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

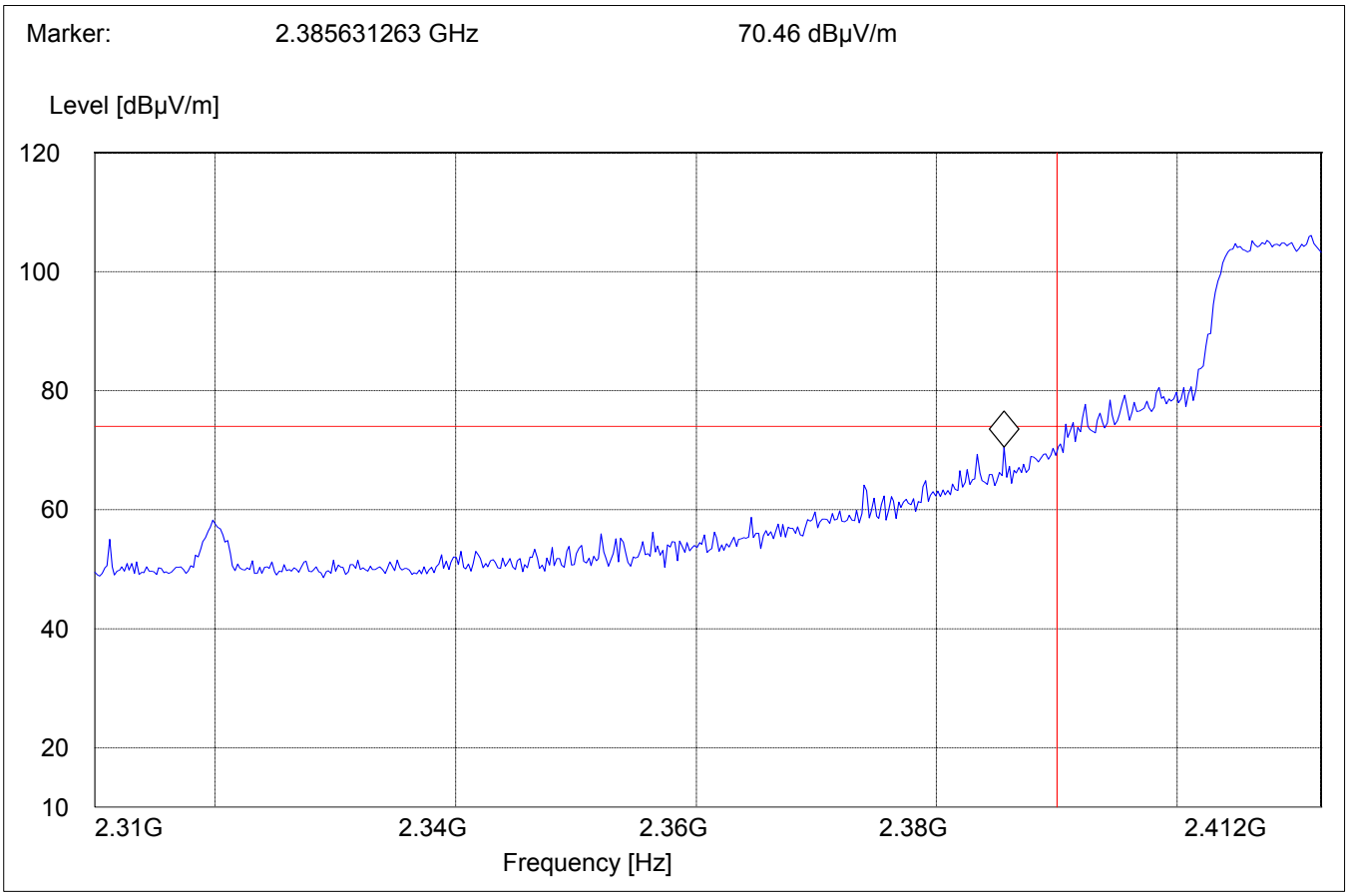


## BAND EDGE COMPLIANCE §15.247 (c)

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

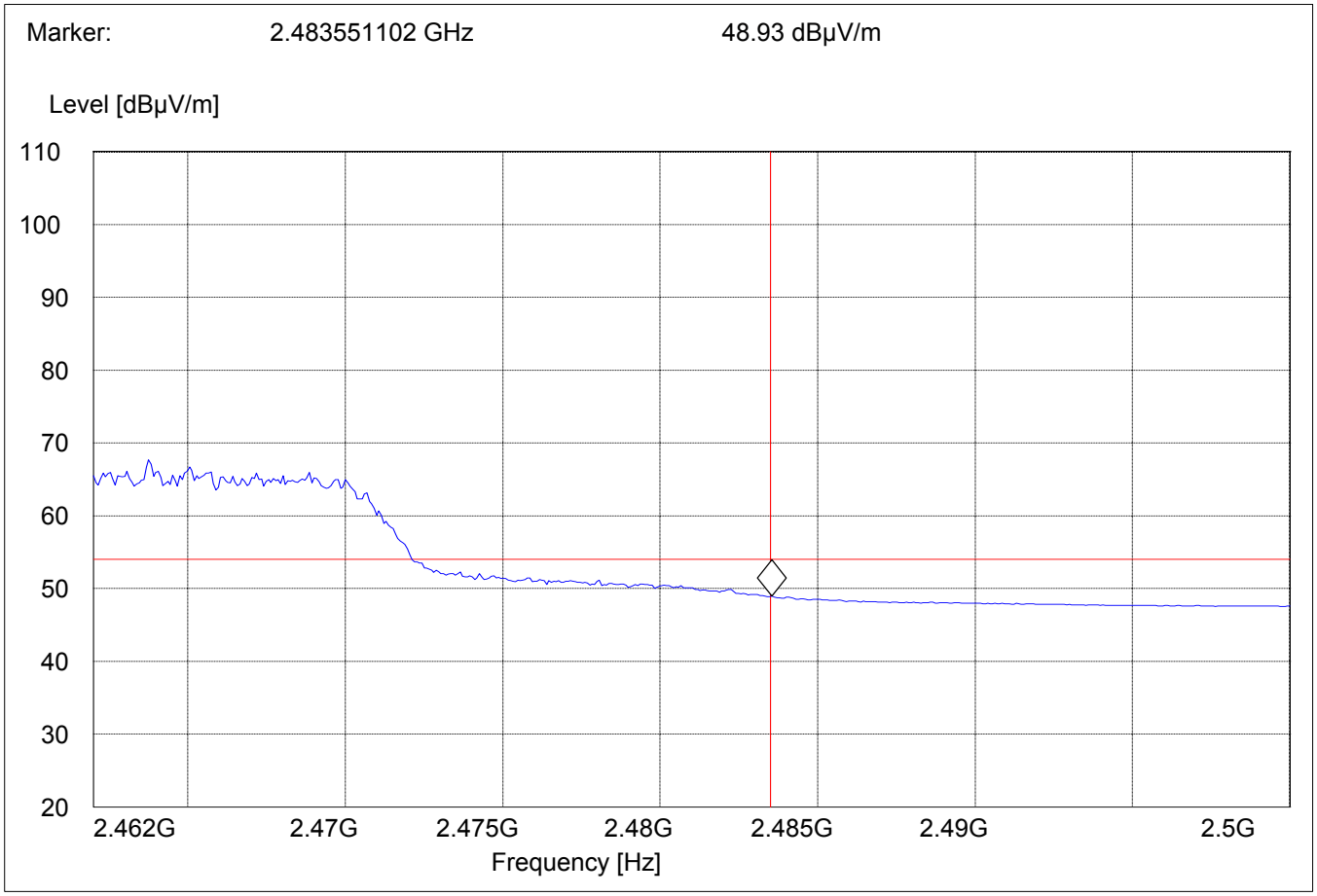


## BAND EDGE COMPLIANCE §15.247 (c)

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

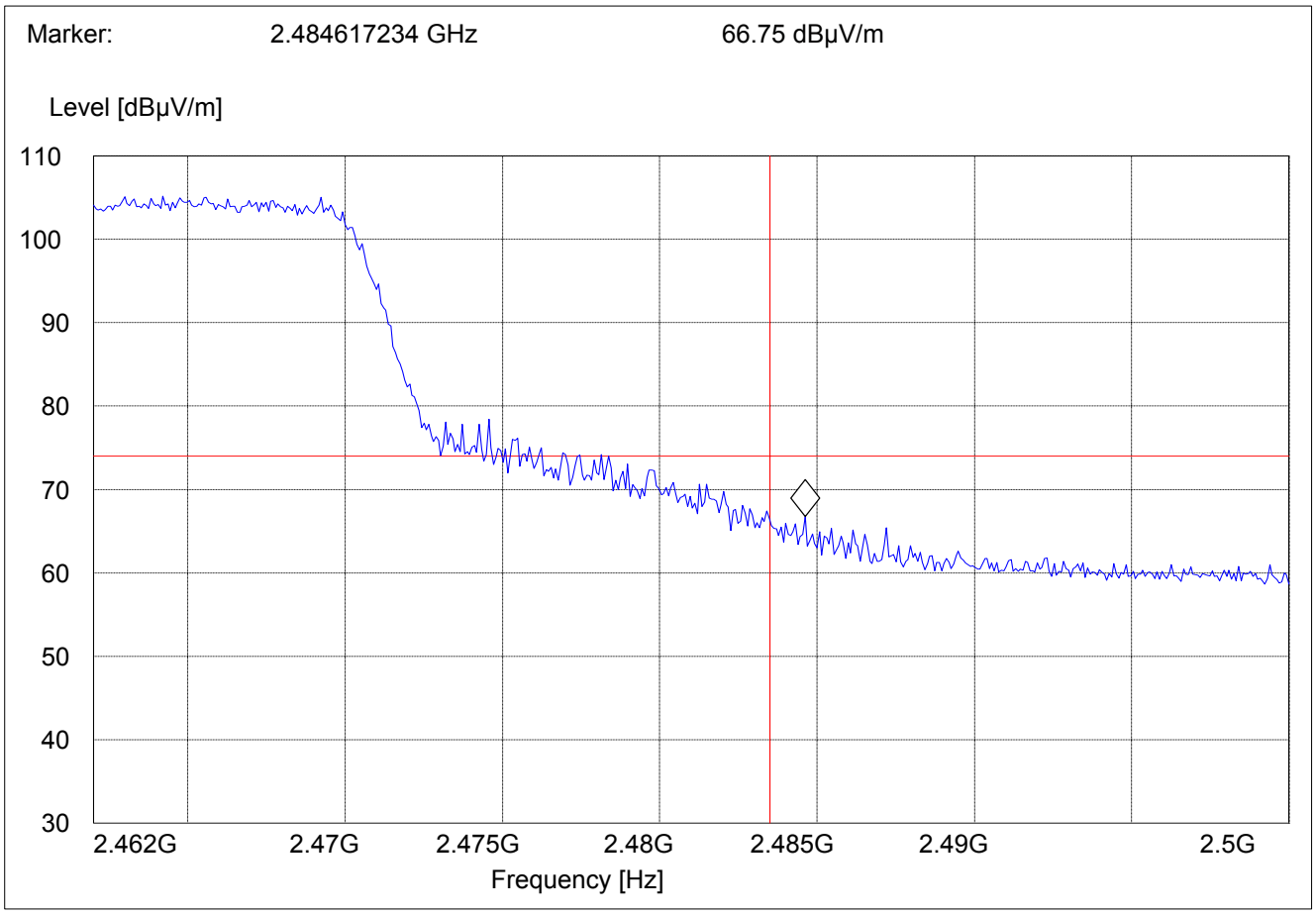


## BAND EDGE COMPLIANCE §15.247 (c)

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

Operating condition : Tx at 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** **§ 15.247 (c) (1)**
**Transmitter (Conducted)**
**LIMITS**

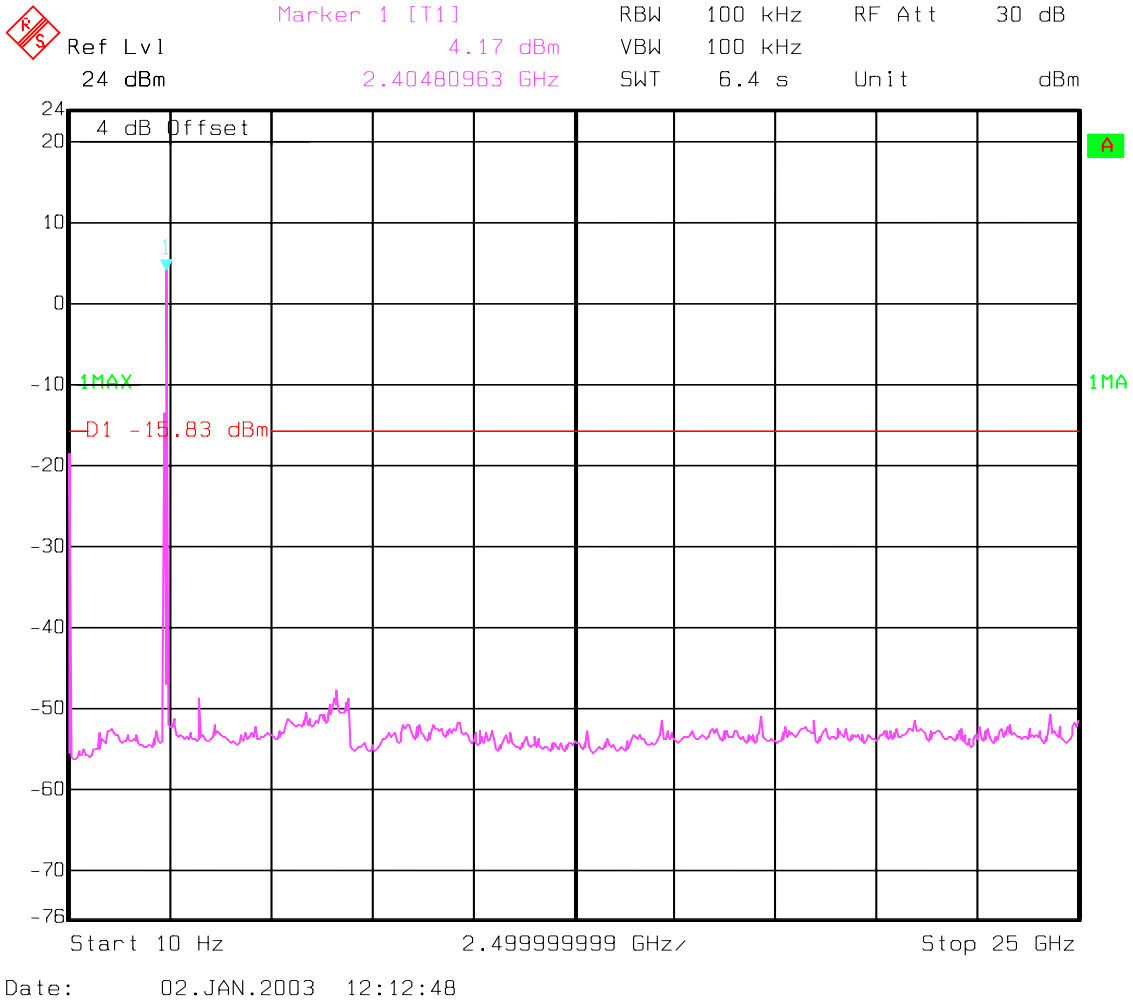
| |
|---|
| **In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions, which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see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

**NOTE: Frequency resolution is not fine enough to show the exact frequency of the carrier.**

## EMISSION LIMITATIONS - Conducted (Transmitter) § 15.247 (c) (1)

### Lowest Channel (2412MHz): 10MHz - 25GHz

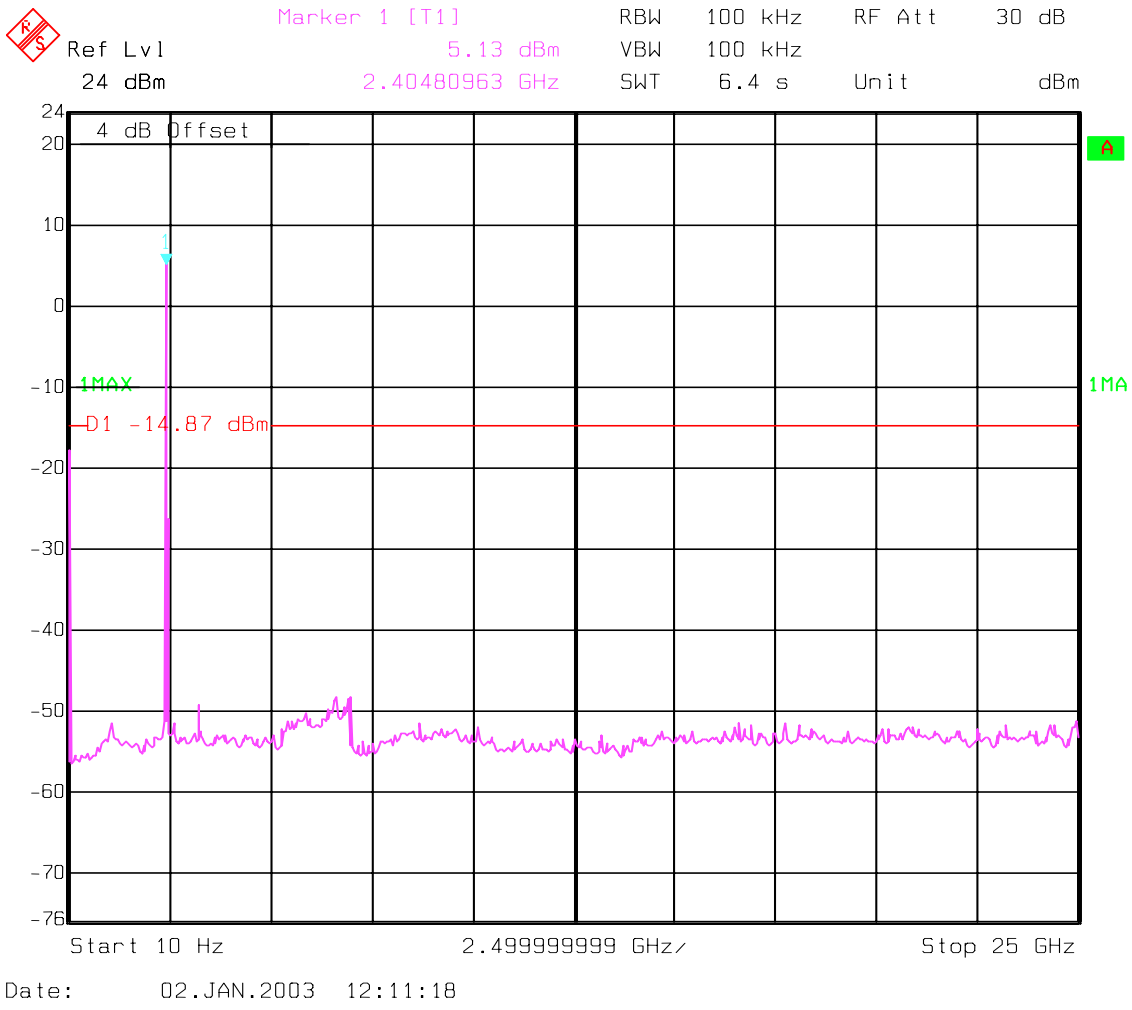
**NOTE: The peak above the limit line is the carrier frequency.**



## EMISSION LIMITATIONS - Conducted (Transmitter) § 15.247 (c) (1)

### Mid Channel (2437MHz): 10MHz - 25GHz

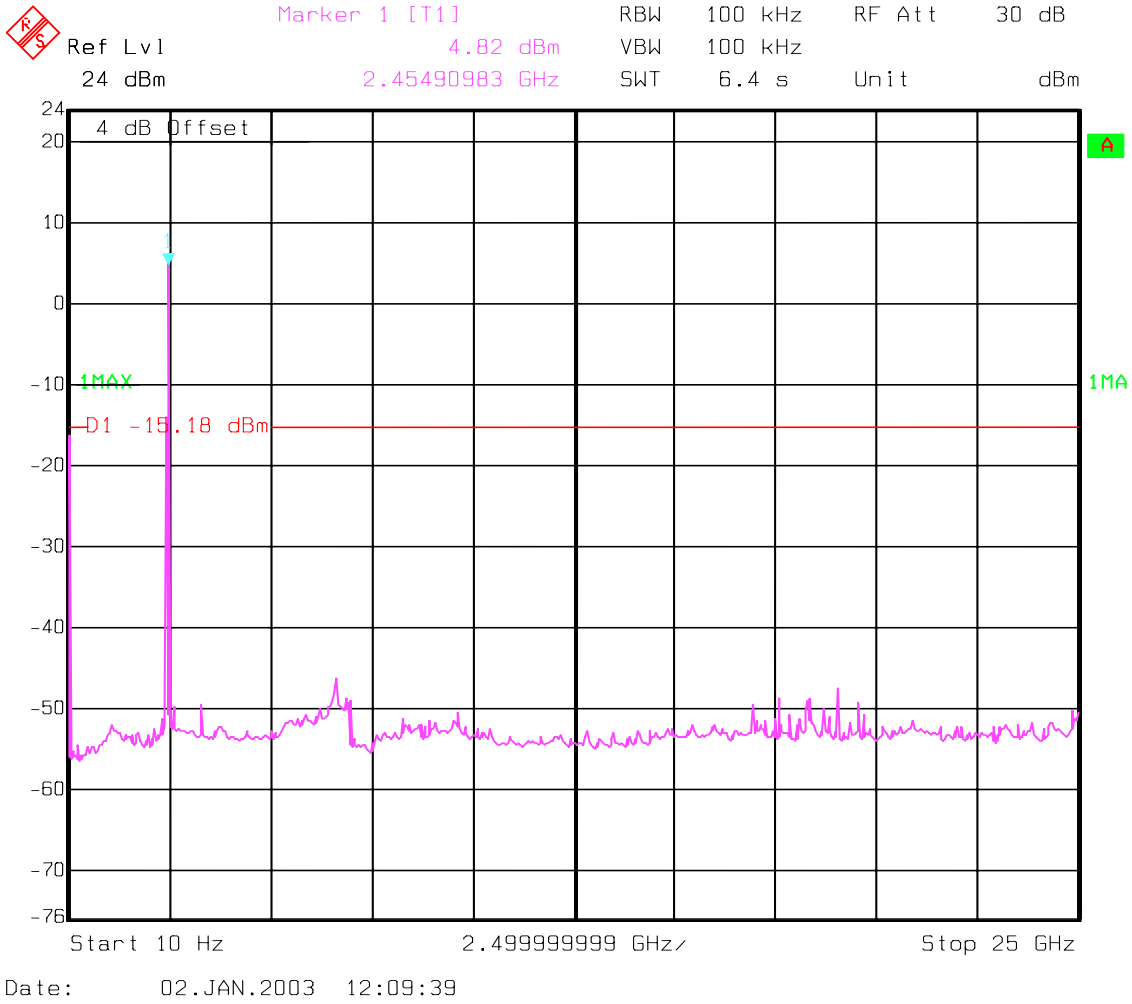
**NOTE: The peak above the limit line is the carrier frequency.**



## EMISSION LIMITATIONS - Conducted (Transmitter) § 15.247 (c) (1)

### Highest Channel (2462MHz): 10MHz - 25GHz

**NOTE: The peak above the limit line is the carrier frequency.**



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

**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)**

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

| Transmit at Lowest channel Frequency 2402MHz | | | |
|---|---|---|---|
| Frequency (MHz) | Level (dBµV/m) | | |
| | Peak | Quasi-Peak | Average |
| 30 | 38.52 | 36.04 | |
| | | | |
| | | | |
| **Transmit at Middle channel Frequency 2440MHz** | | | |
| Frequency (MHz) | Level (dBµV/m) | | |
| | Peak | Quasi-Peak | Average |
| 30 | 39.04 | 36.66 | |
| | | | |
| | | | |
| **Transmit at Highest channel Frequency 2480MHz** | | | |
| Frequency (MHz) | Level (dBµV/m) | | |
| | Peak | Quasi-Peak | Average |
| 30 | 38.67 | 36.35 | |
| | | | |
| | | | |

**EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)**
**Lowest Channel (2412MHz): 30MHz – 1GHz**
**Plot shows peak measurement**

**(Bluetooth Module Tx @ High channel)**

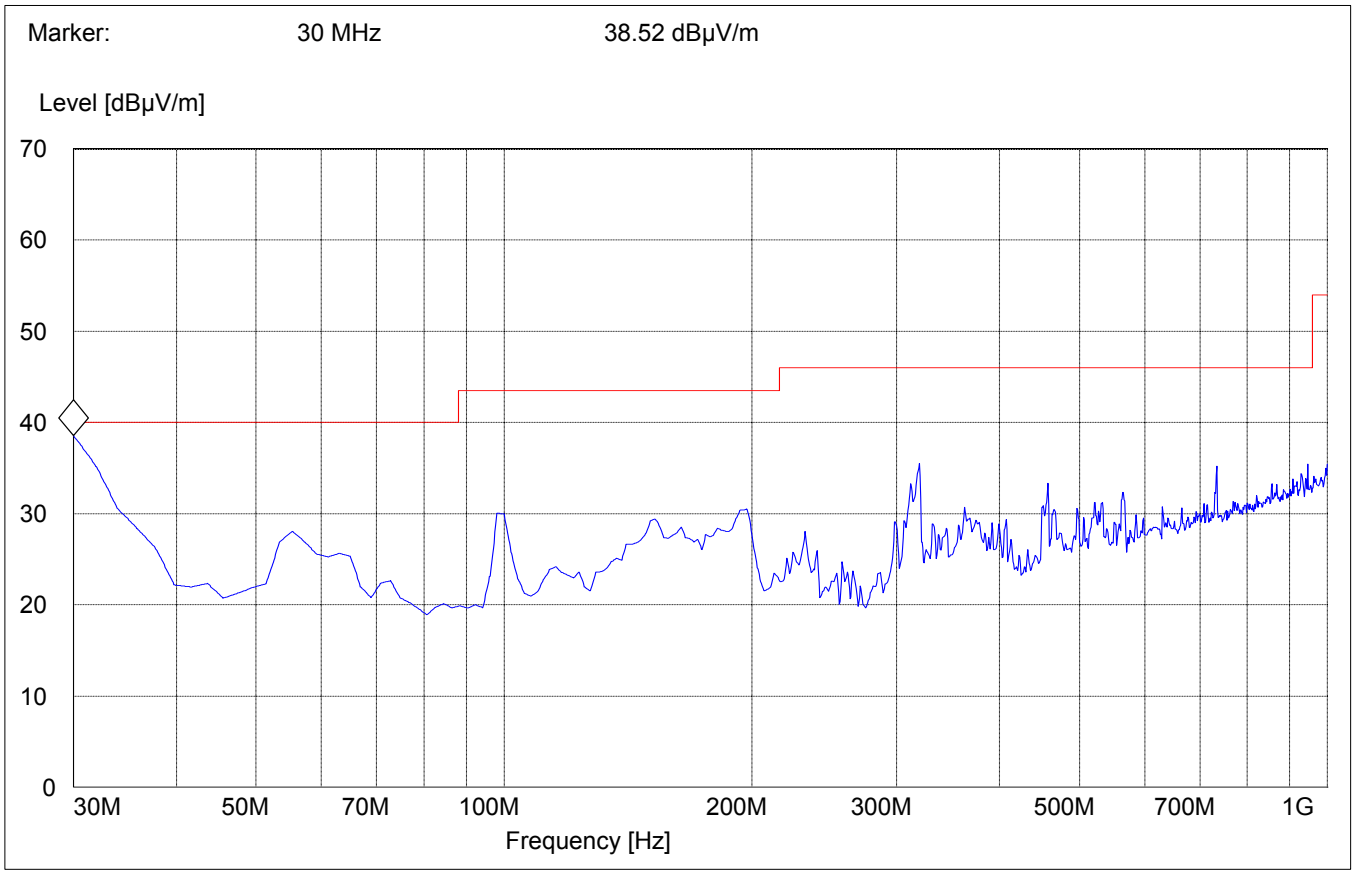
**The BT module & WLAN (BCM94306MP) were set to Tx in following manner throughout all radiated measurements. This is valid for all the three channels.**

| | | | |
|---|---|---|---|
| **WLAN** | **Low ch** | **Mid ch** | **High ch** |
| **Bluetooth** | **High ch** | **Low ch** | **Mid ch** |

SWEEP TABLE: "BT Spuri hi 30-1G"
Short Description: Bluetooth 30MHz-1GHz

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

| Freq. | Pk (dBµV/m) | QPk (dBµV/m) |
|---|---|---|
| 30 | 38.52 | 36.04 |

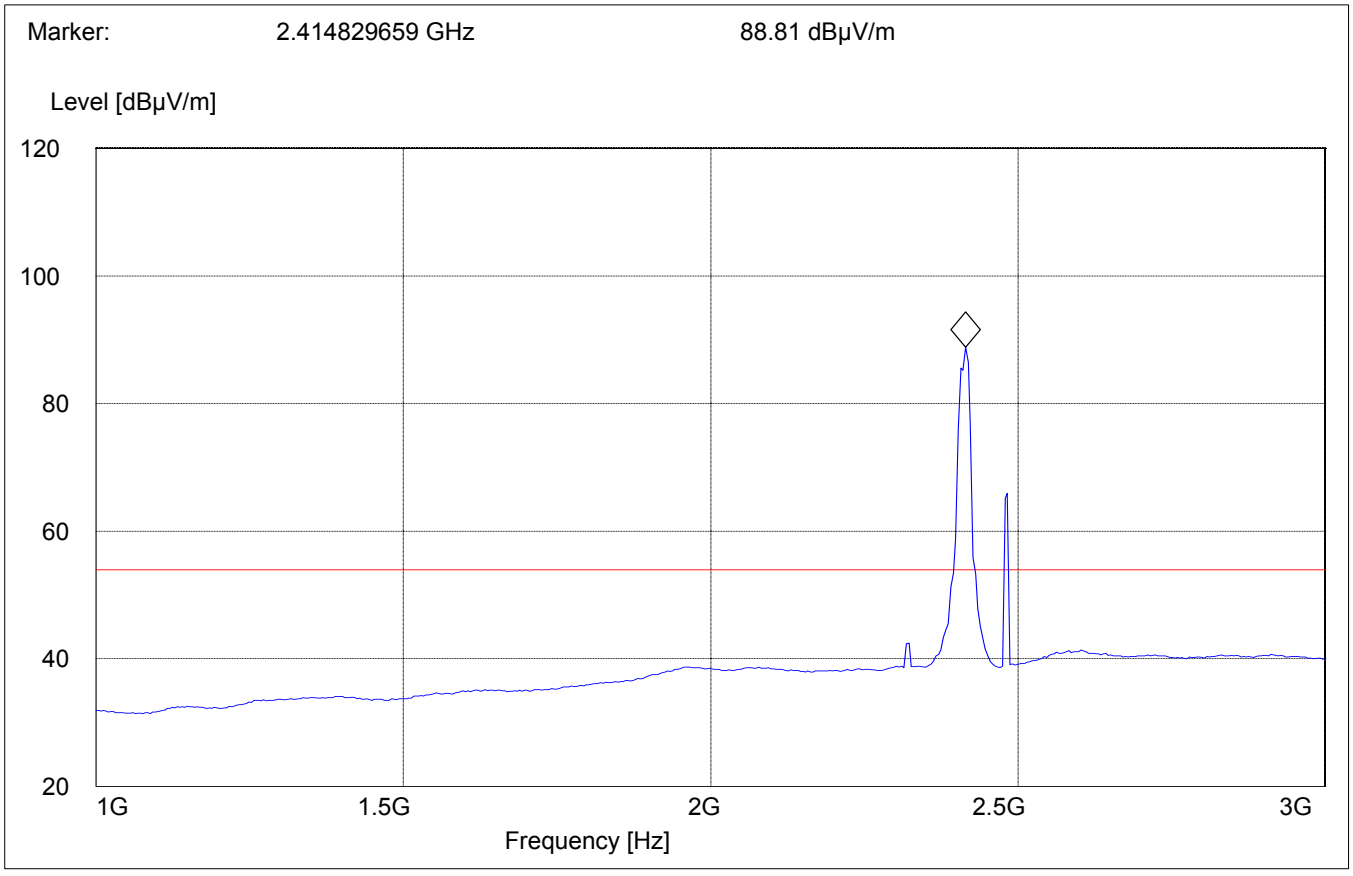


## EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)
## Lowest Channel (2412MHz): 1GHz – 3GHz
## Average Measurement with VBW=10Hz

### (Bluetooth Module Tx @ High channel)

| | | | | | | |
|---|---|---|---|---|---|---|
| SWEEP TABLE: | | "BT Spuri hi 1-3G" | | | | |
| Short Description: | | Bluetooth Spurious 1-3GHz | | | | |
| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW | VBW | Transducer |
| 1.0 GHz | 3.0 GHz | MaxPeak | Coupled | 1 MHz | 10Hz | #326 horn (dBi) |

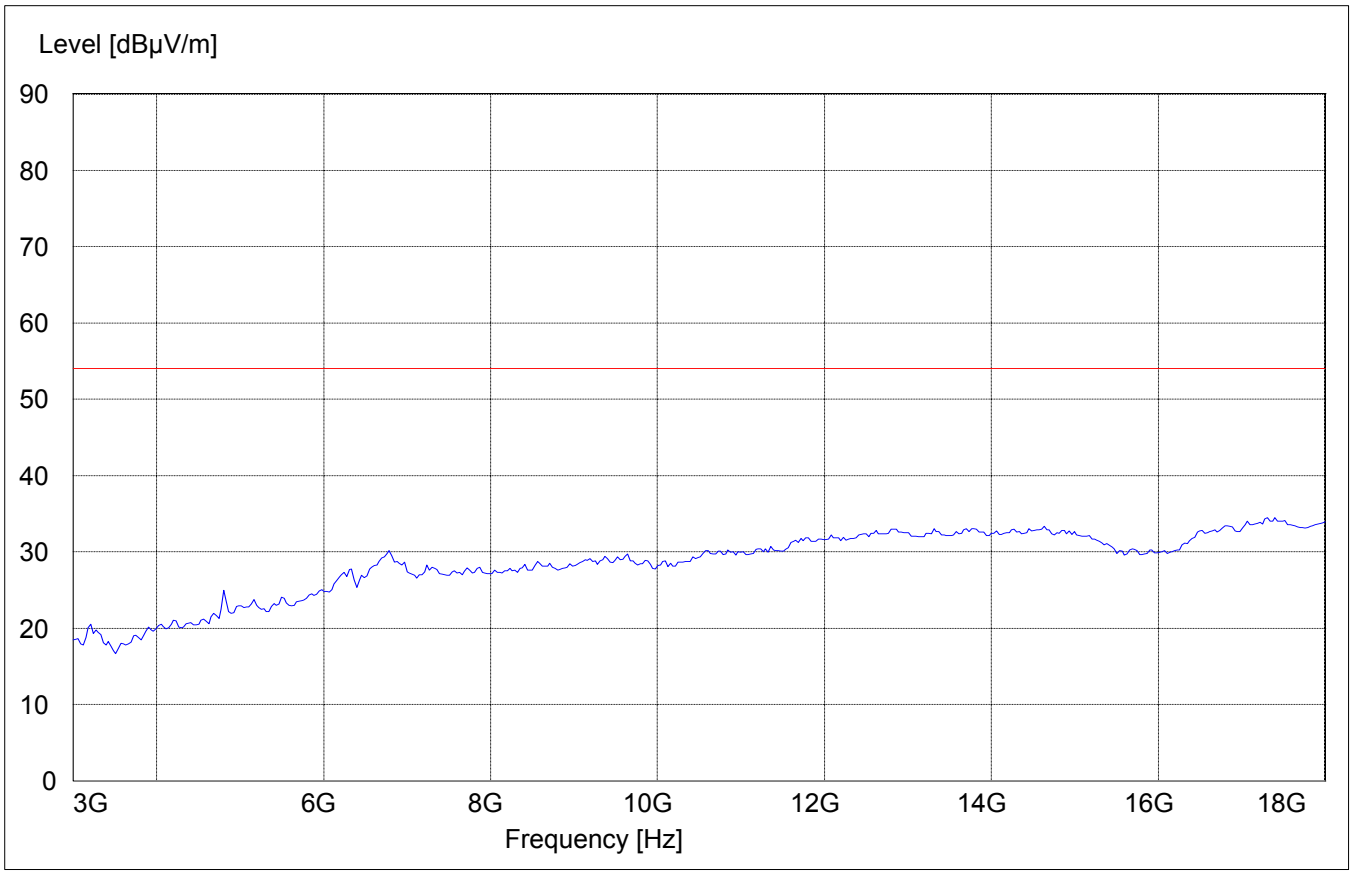
**NOTE: The marked peak is WLAN @ Low channel and other peak above the limit line is BT @ high channel.**



**EMISSION LIMITATIONS - Radiated (Transmitter)** **§ 15.247 (c) (1)**
**Lowest Channel (2412MHz): 3GHz – 18GHz**
**Average Measurement with VBW=10Hz**

**(Bluetooth Module Tx @ High channel)**

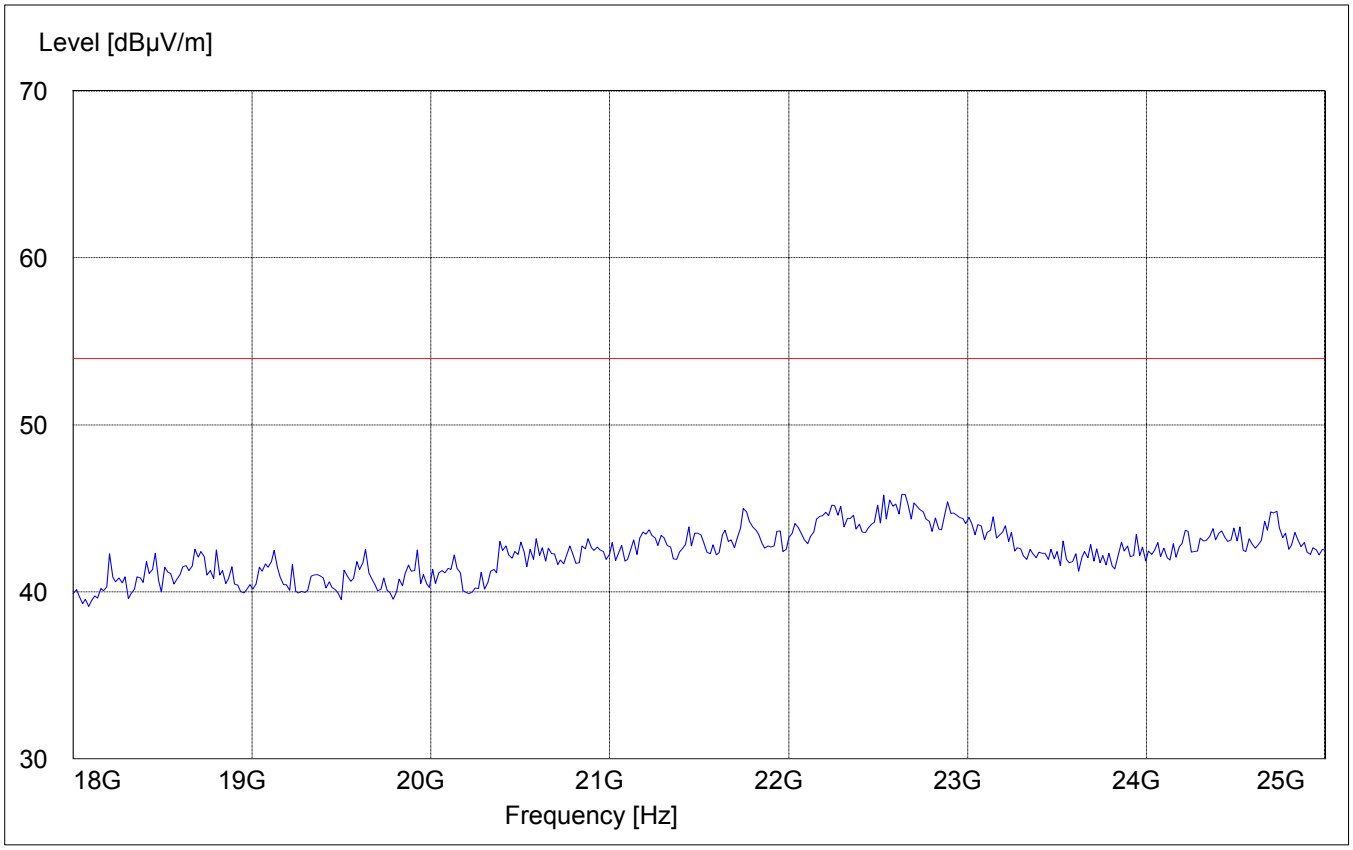
| | | | | | | |
|---|---|---|---|---|---|---|
| SWEEP TABLE: | | "BT Spuri hi 3-18G" | | | | |
| Short Description: | | Bluetooth Spurious 3-18GHz | | | | |
| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW | VBW | Transducer |
| 3.0 GHz | 18.0 GHz | MaxPeak | Coupled | 1 MHz | 10Hz | #326 horn (dBi) |



## EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)
## Lowest Channel (2412MHz): 18GHz – 25GHz

### (Bluetooth Module Tx @ High channel)

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

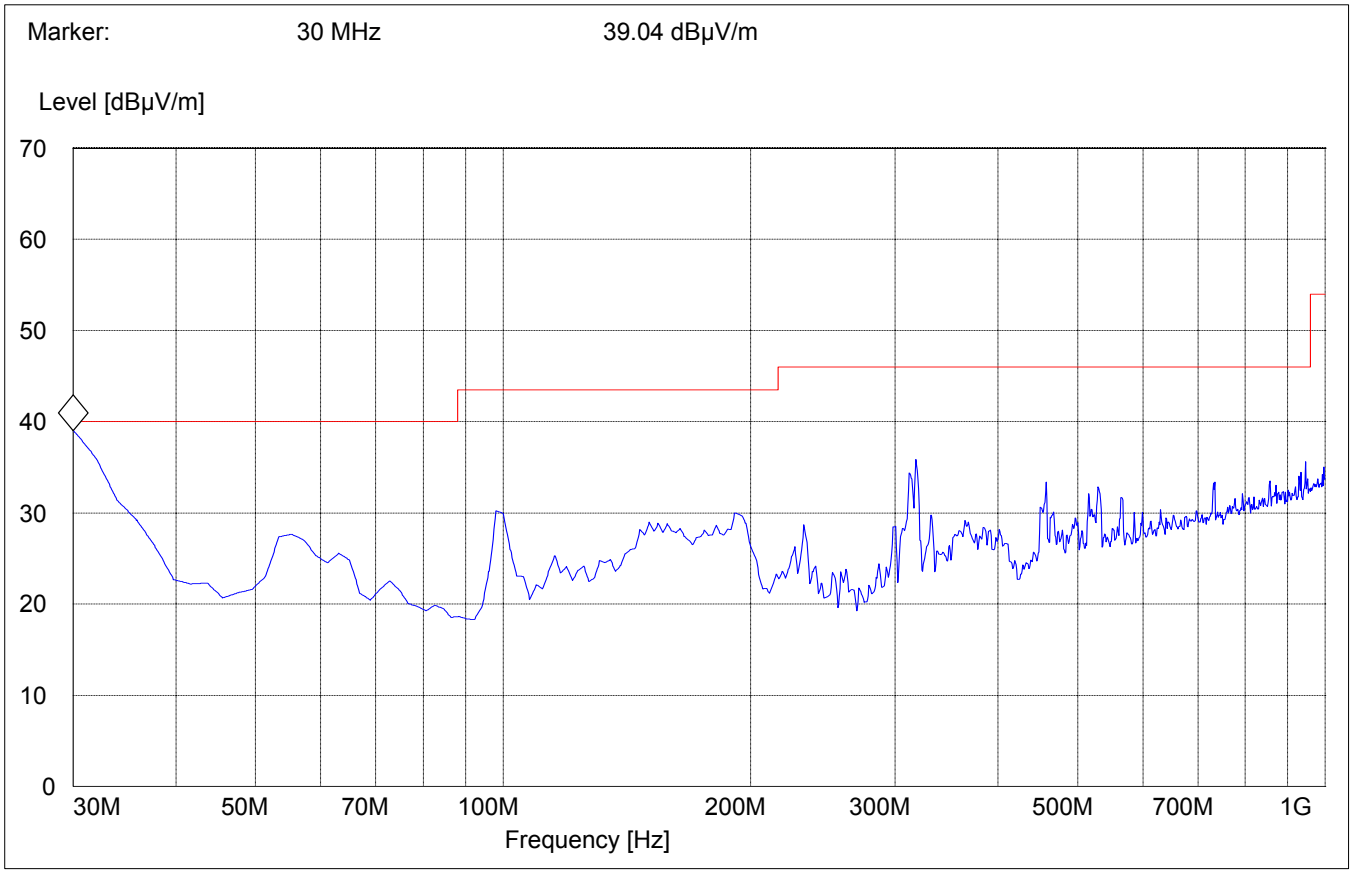


**EMISSION LIMITATIONS - Radiated (Transmitter)** **§ 15.247 (c) (1)**
**Mid Channel (2437MHz): 30MHz – 1GHz**
**Plot shows peak measurement**

**(Bluetooth Module Tx @ Low channel)**

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

| Freq. | Pk (dBµV/m) | QPk (dBµV/m) |
|---|---|---|
| 30 | 39.04 | 36.66 |

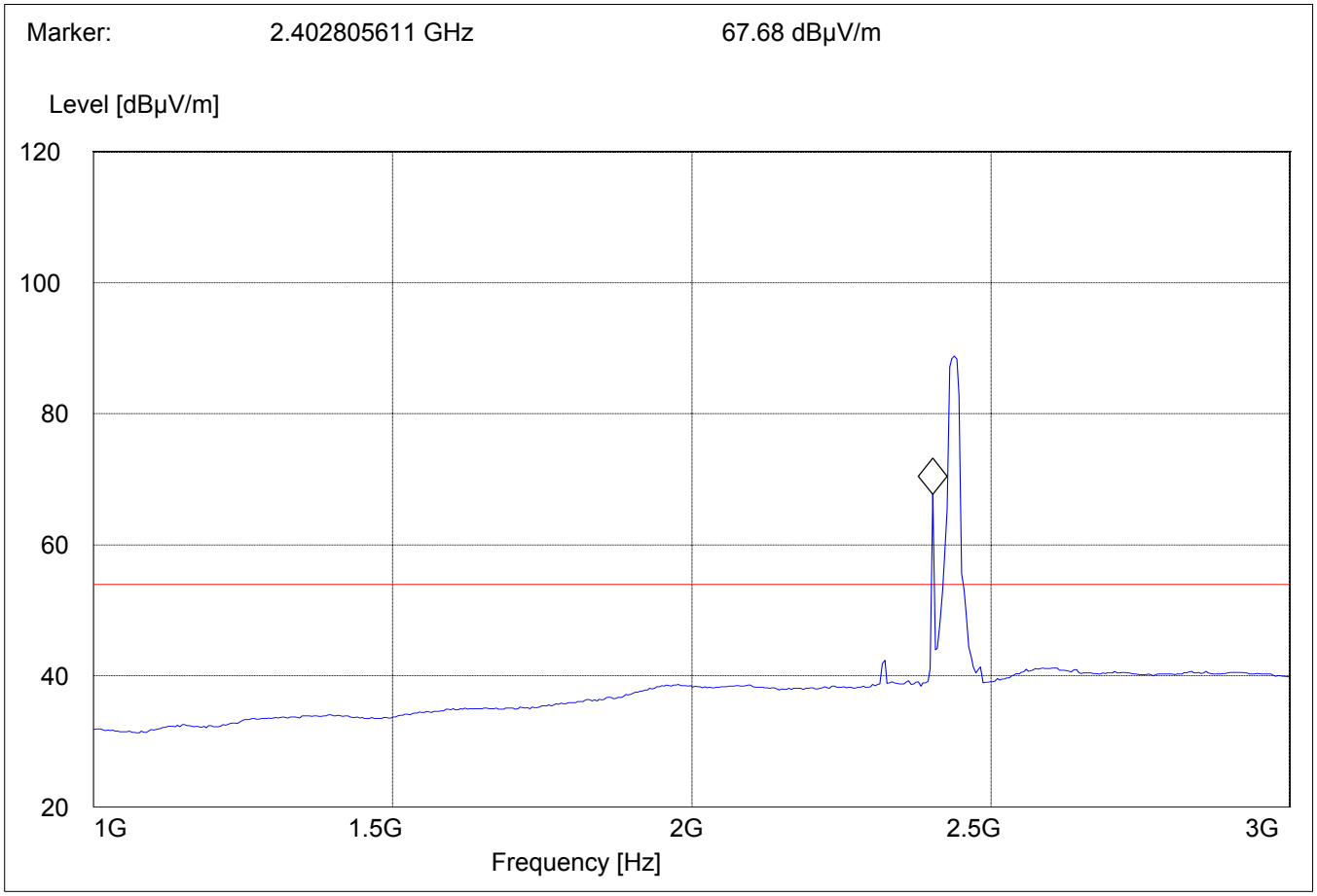


**EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)**
**Mid Channel (2437MHz): 1GHz – 3GHz**
**Average Measurement with VBW=10Hz**

**(Bluetooth Module Tx @ Low channel)**

| | | | | | | |
|---|---|---|---|---|---|---|
| SWEEP TABLE: | | "BT Spuri hi 1-3G" | | | | |
| Short Description: | | Bluetooth Spurious 1-3GHz | | | | |
| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW | VBW | Transducer |
| 1.0 GHz | 3.0 GHz | MaxPeak | Coupled | 1 MHz | 10Hz | #326 horn (dBi) |

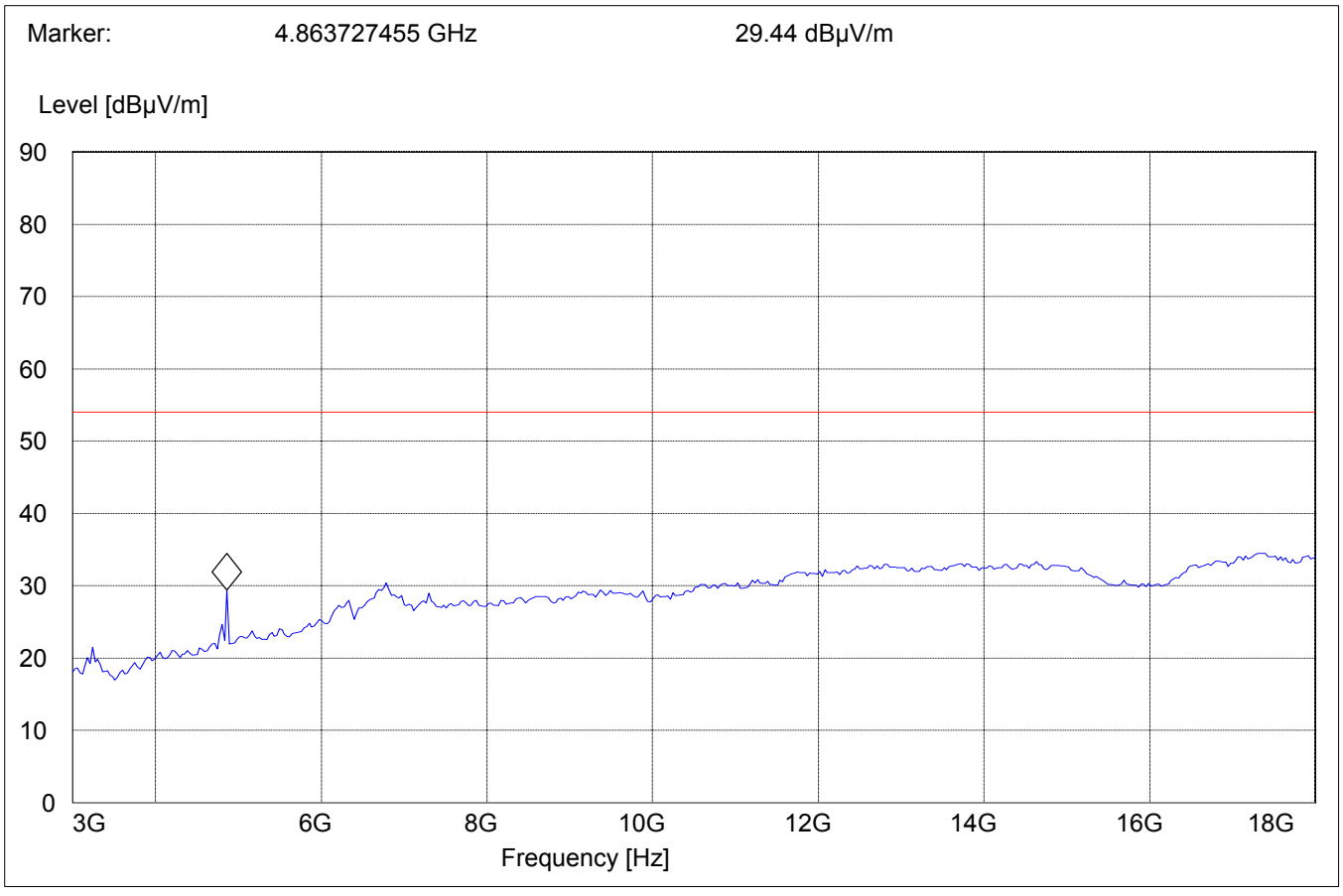
**Note: The marked peak is BT @ Low ch and other peak above the limit line is WLAN @ mid. Channel.**



**EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)**
**Mid Channel (2437MHz): 3GHz – 18GHz**
**Average Measurement with VBW=10Hz**

**(Bluetooth Module Tx @ Low channel)**

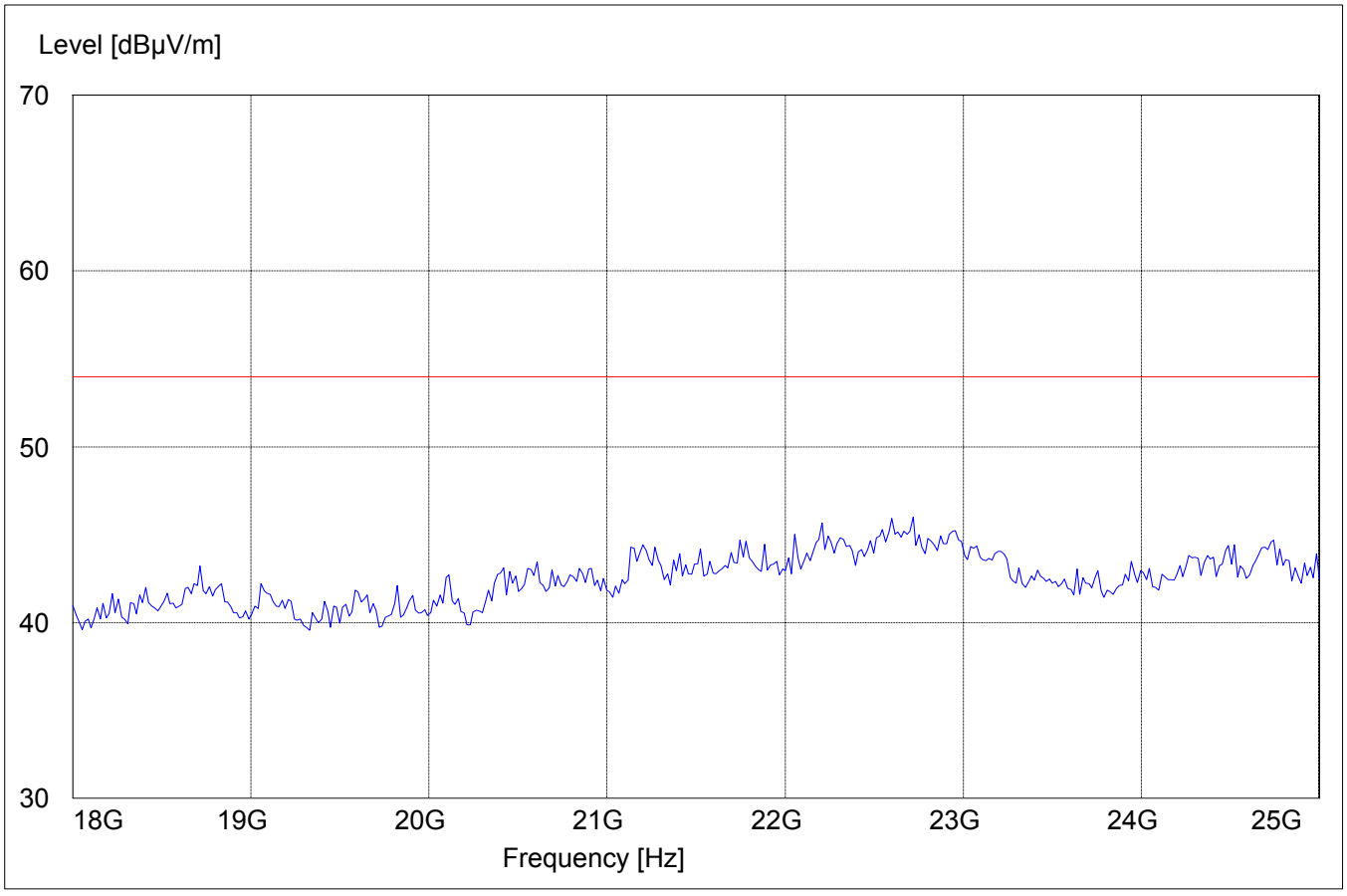
| | | | | | | |
|---|---|---|---|---|---|---|
| SWEEP TABLE: | | "BT Spuri hi 3-18G" | | | | |
| Short Description: | | Bluetooth Spurious 3-18GHz | | | | |
| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW | VBW | Transducer |
| 3.0 GHz | 18.0 GHz | MaxPeak | Coupled | 1 MHz | 10Hz | #326 horn (dBi) |



## EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)
## Mid Channel (2437MHz): 18GHz – 25GHz

### (Bluetooth Module Tx @ Low channel)

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

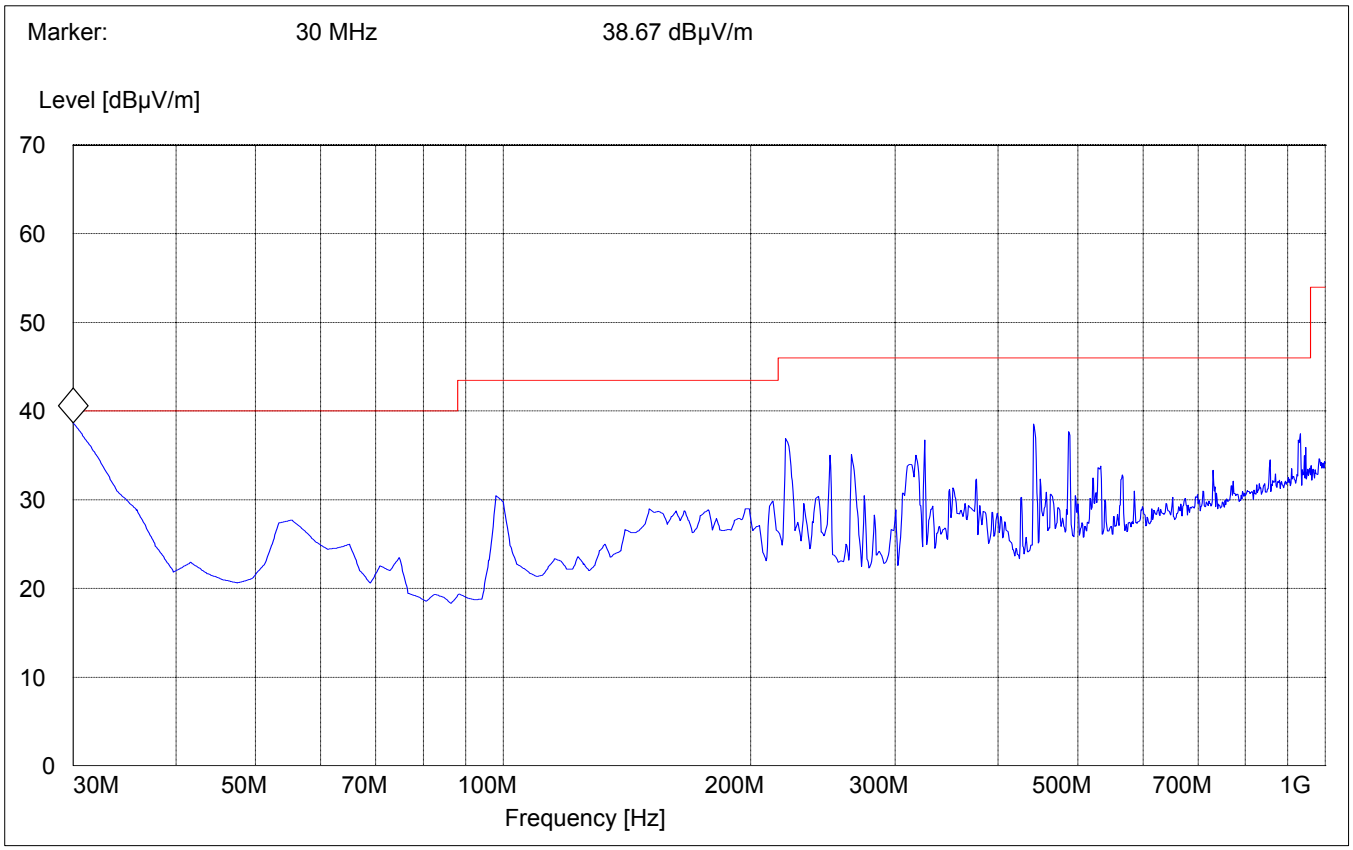


**EMISSION LIMITATIONS - Radiated (Transmitter)** **§ 15.247 (c) (1)**
**Highest Channel (2462MHz): 30MHz – 1GHz**
**Plot shows peak measurement**

**(Bluetooth Module Tx @ Mid channel)**

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

| Freq. | Pk (dBµV/m) | QPk (dBµV/m) |
|---|---|---|
| 30 | 38.67 | 36.35 |

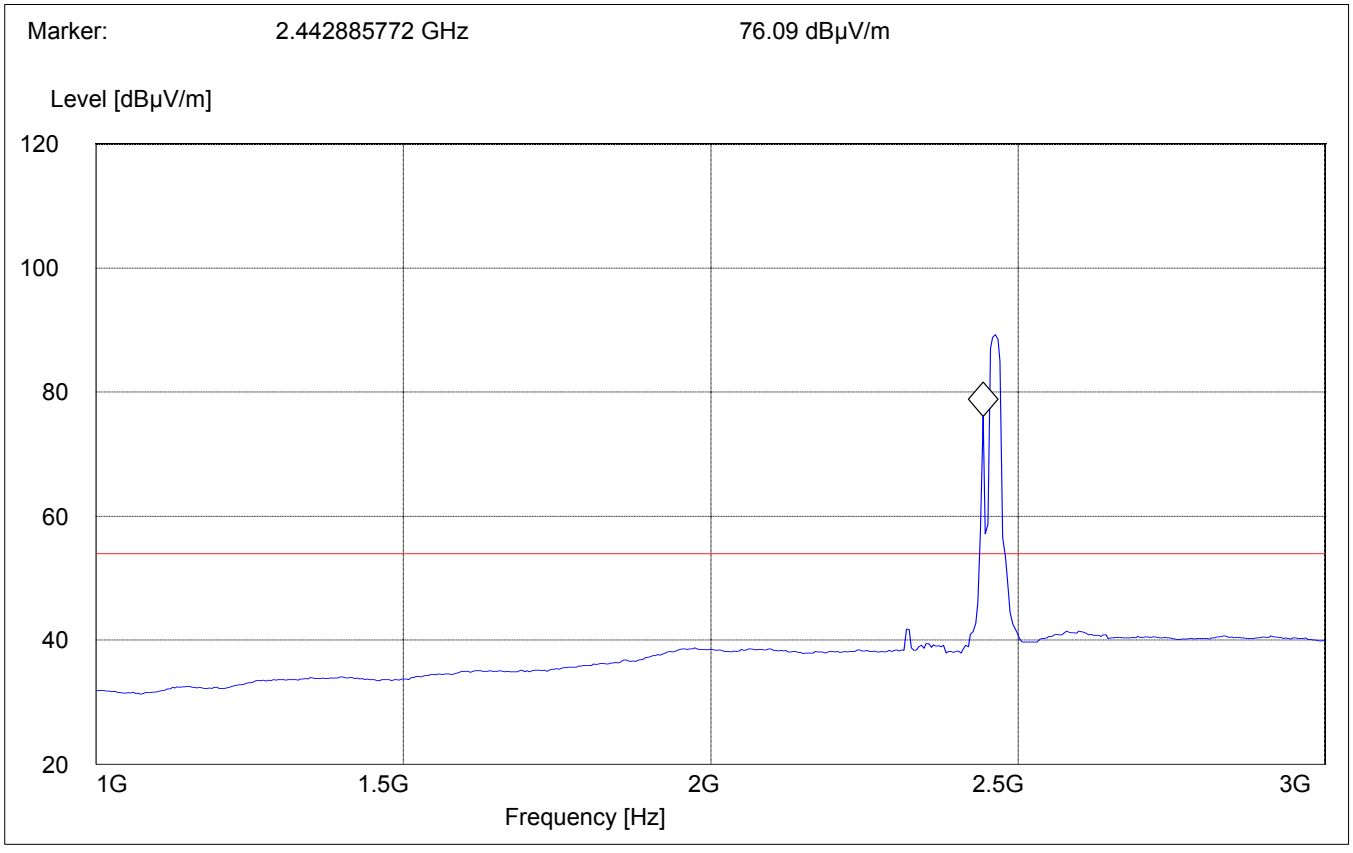


## EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)
## Highest Channel (2462MHz): 1GHz – 3GHz
## Average Measurement with VBW=10Hz

### (Bluetooth Module Tx @ Mid channel)

| | | | | | | |
|---|---|---|---|---|---|---|
| SWEEP TABLE: | | "BT Spuri hi 1-3G" | | | | |
| Short Description: | | Bluetooth Spurious 1-3GHz | | | | |
| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW | VBW | Transducer |
| 1.0 GHz | 3.0 GHz | MaxPeak | Coupled | 1 MHz | 10Hz | #326 horn (dBi) |

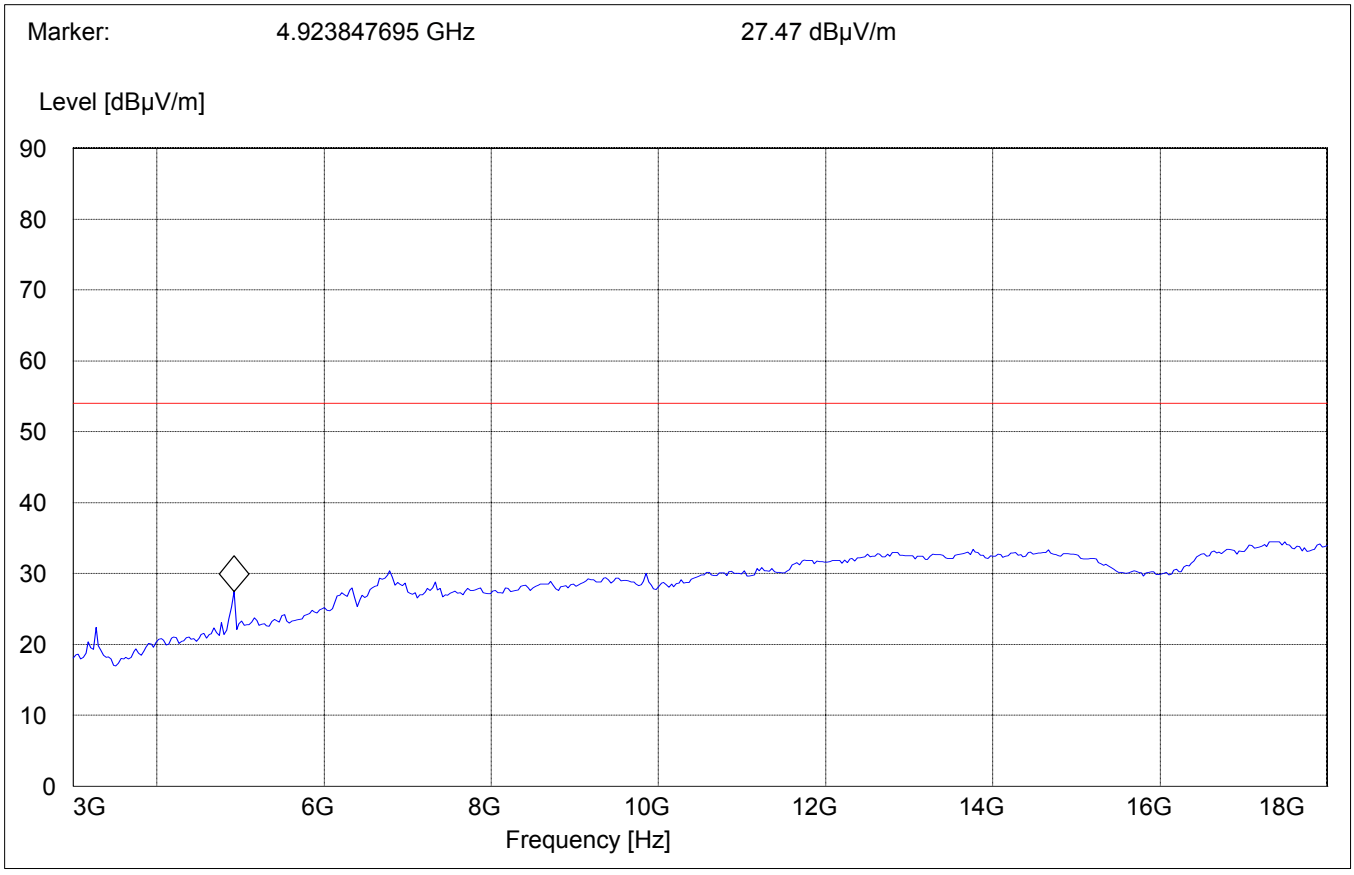
**Note: The marked peak is BT @ Mid ch and other peak above the limit line is WLAN @ High Channel.**



**EMISSION LIMITATIONS - Radiated (Transmitter)** **§ 15.247 (c) (1)**
**Highest Channel (2462MHz): 3GHz – 18GHz**
**Average Measurement with VBW=10Hz**

**(Bluetooth Module Tx @ Mid channel)**

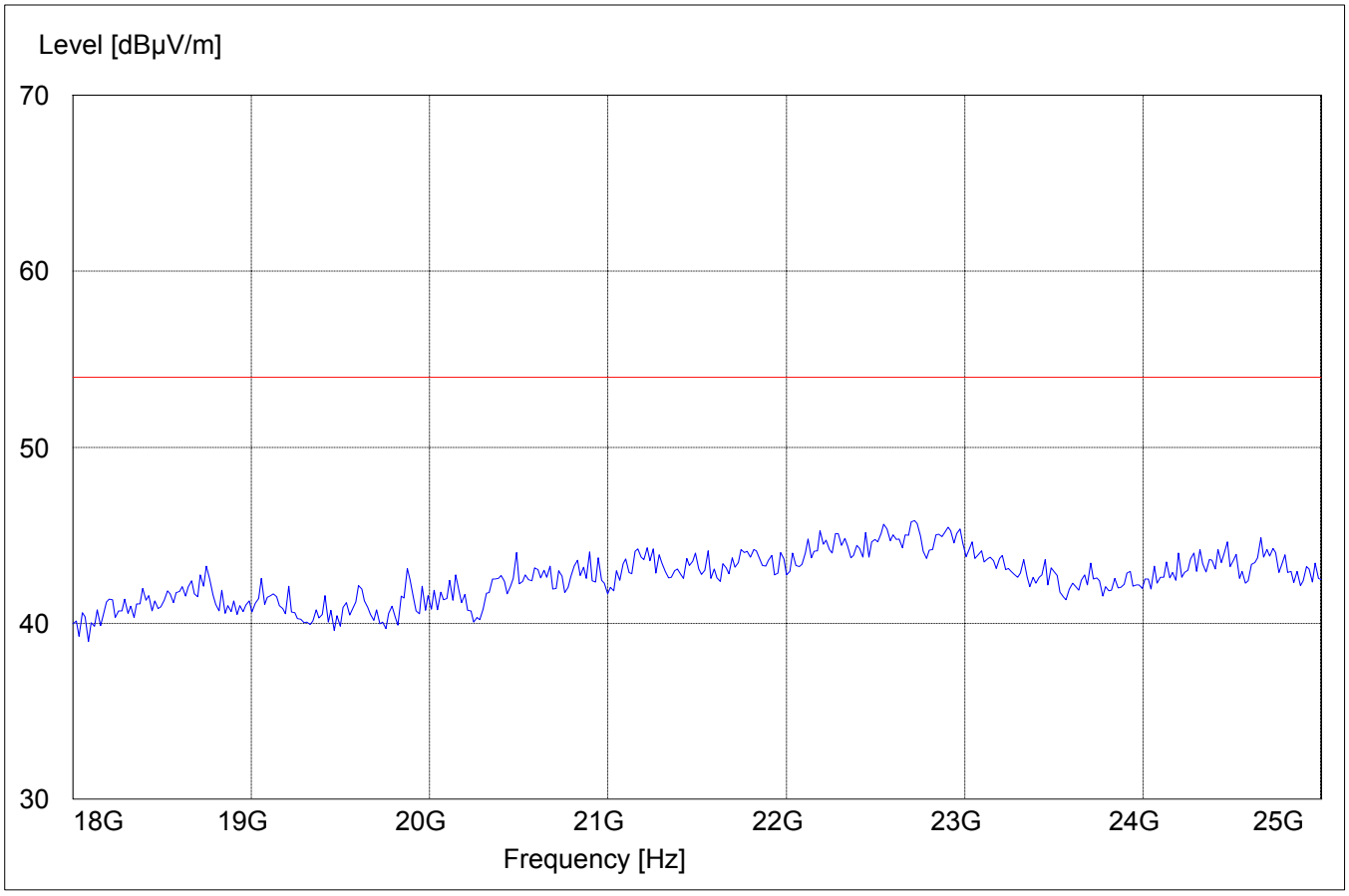
| | | | | | | |
|---|---|---|---|---|---|---|
| SWEEP TABLE: | | "BT Spuri hi 3-18G" | | | | |
| Short Description: | | Bluetooth Spurious 3-18GHz | | | | |
| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW | VBW | Transducer |
| 3.0 GHz | 18.0 GHz | MaxPeak | Coupled | 1 MHz | 10Hz | #326 horn (dBi) |



## EMISSION LIMITATIONS - Radiated (Transmitter) § 15.247 (c) (1)
## Highest Channel (2462MHz): 18GHz – 25GHz

### (Bluetooth Module Tx @ Mid channel)

| | | | | | |
|---|---|---|---|---|---|
| SWEEP TABLE: | | "BT Spuri hi 18-25G" | | | |
| Short Description: | | Bluetooth Spurious 18-25GHz | | | |
| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW VBW | Transducer |
| 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"***

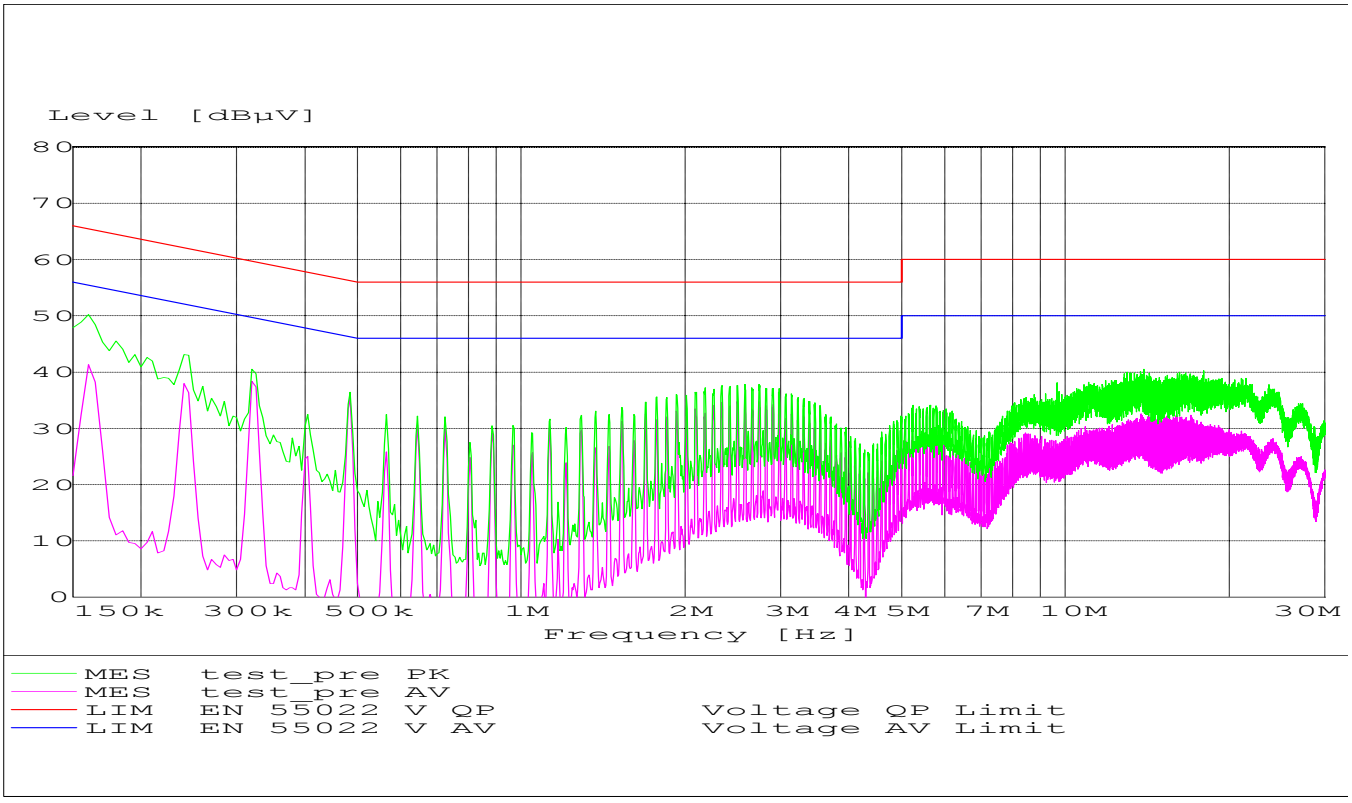
| | | | | | |
|---|---|---|---|---|---|
| Short Description: | | EN 55022 for 150KHz-30MHz | | | |
| Start Frequency | Stop Frequency | Detector | Meas Time | IF Bandw. | Transducer |
| 150.0 kHz | 30.0 MHz | MaxPeak | Coupled | 10 kHz | None |

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

**Limit**

| Frequency of Emission (MHz) | Conducted Limit (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 (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 |

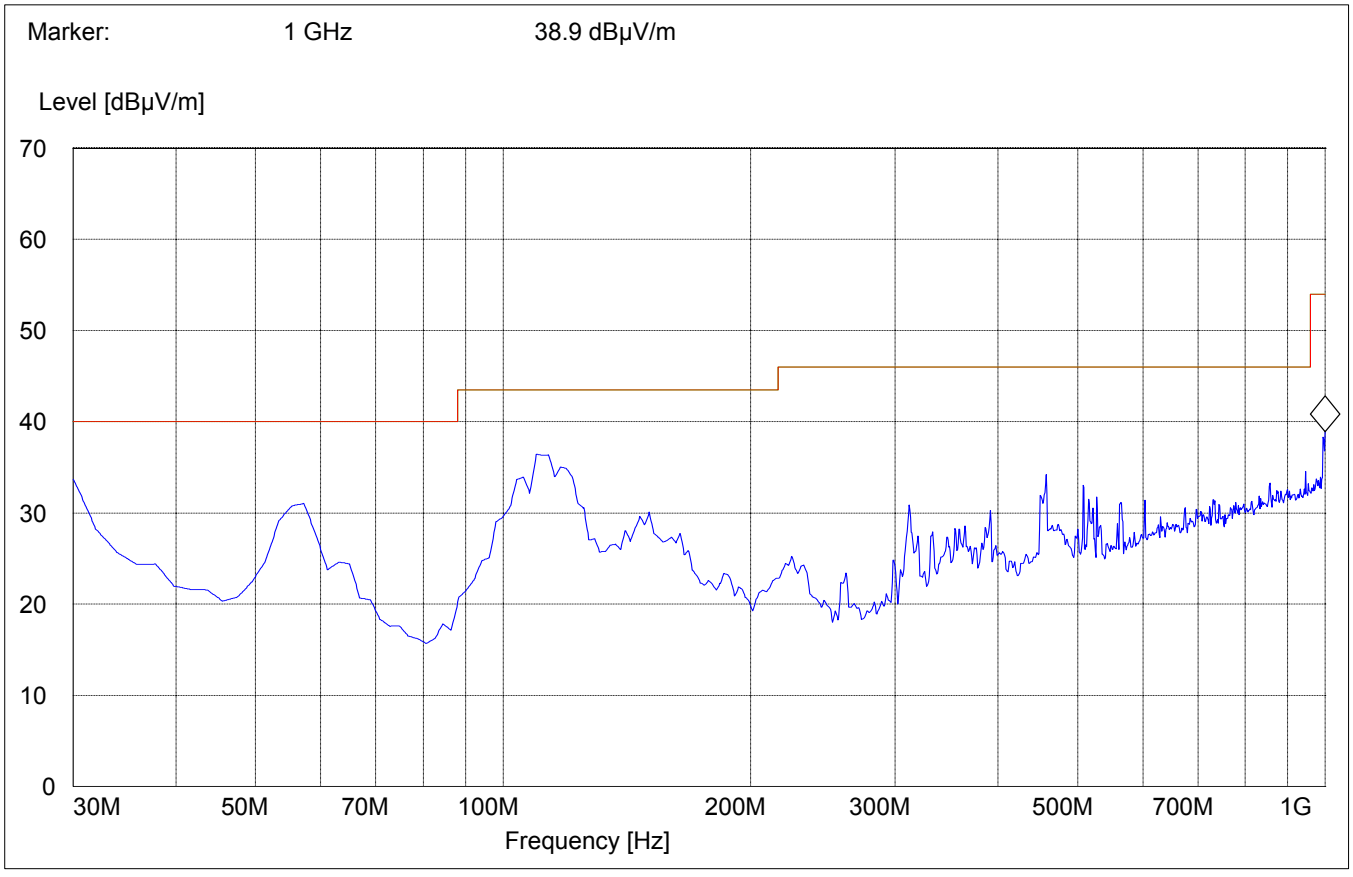
**NOTE:**
**The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 25 GHz very short cable connections to the antenna was used to minimize the noise level.**

## RECEIVER SPURIOUS RADIATION § 15.209
## 30MHz – 1GHz

**(Both WLAN & BT set to Rx mode)**

SWEEP TABLE: "BT Spuri hi 30-1G"
Short Description: Bluetooth 30MHz-1GHz

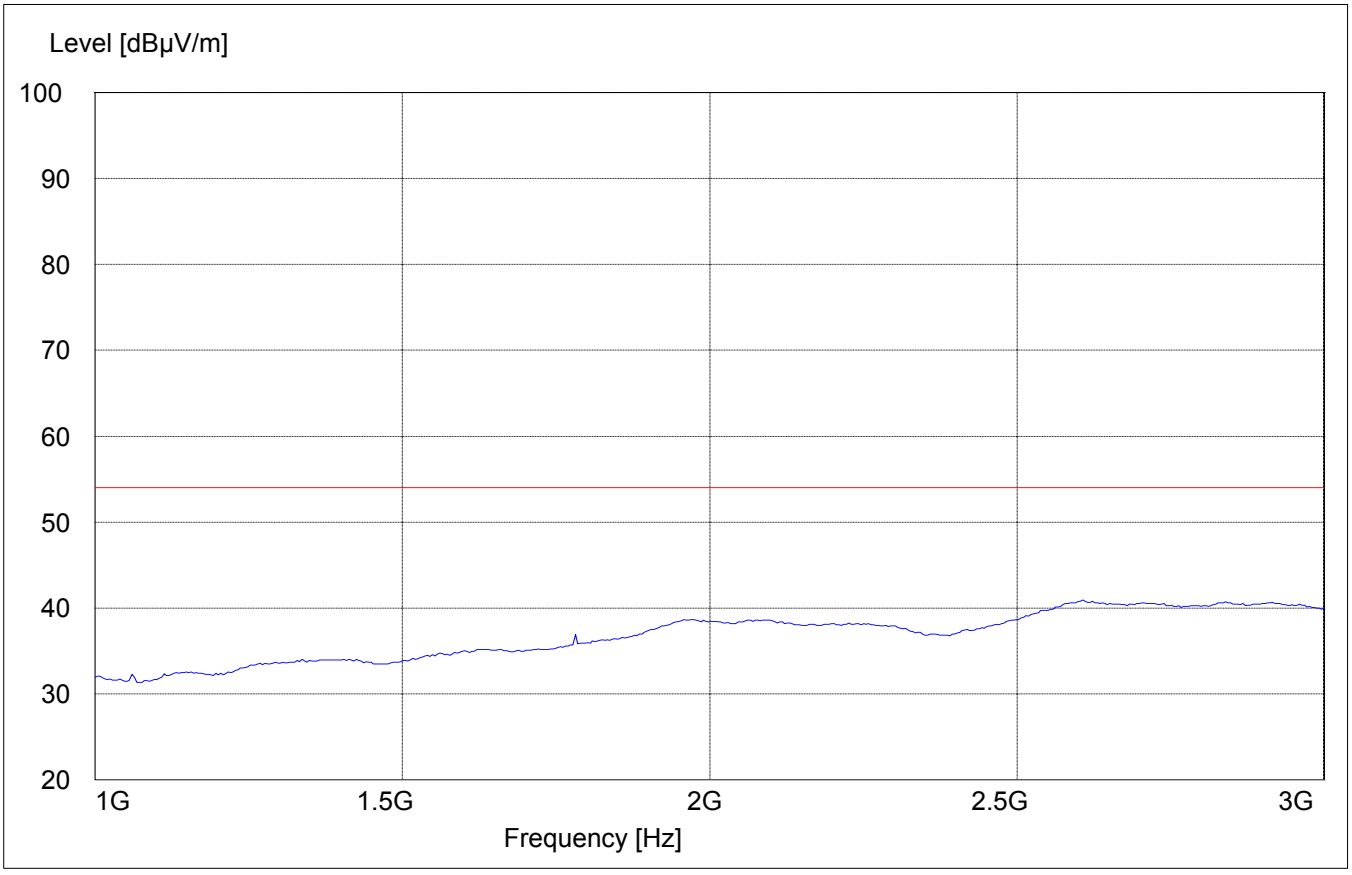
| Start Frequency | Stop Frequency | Detector | Meas. Time | RBW VBW | Transducer |
|---|---|---|---|---|---|
| 30.0 MHz | 1.0 GHz | MaxPeak | Coupled | 100 kHz | 3141-#1186 |



**RECEIVER SPURIOUS RADIATION § 15.209**
**1GHz – 3GHz**
**Average Measurement with VBW=10Hz**

**(Both WLAN & BT set to Rx mode)**

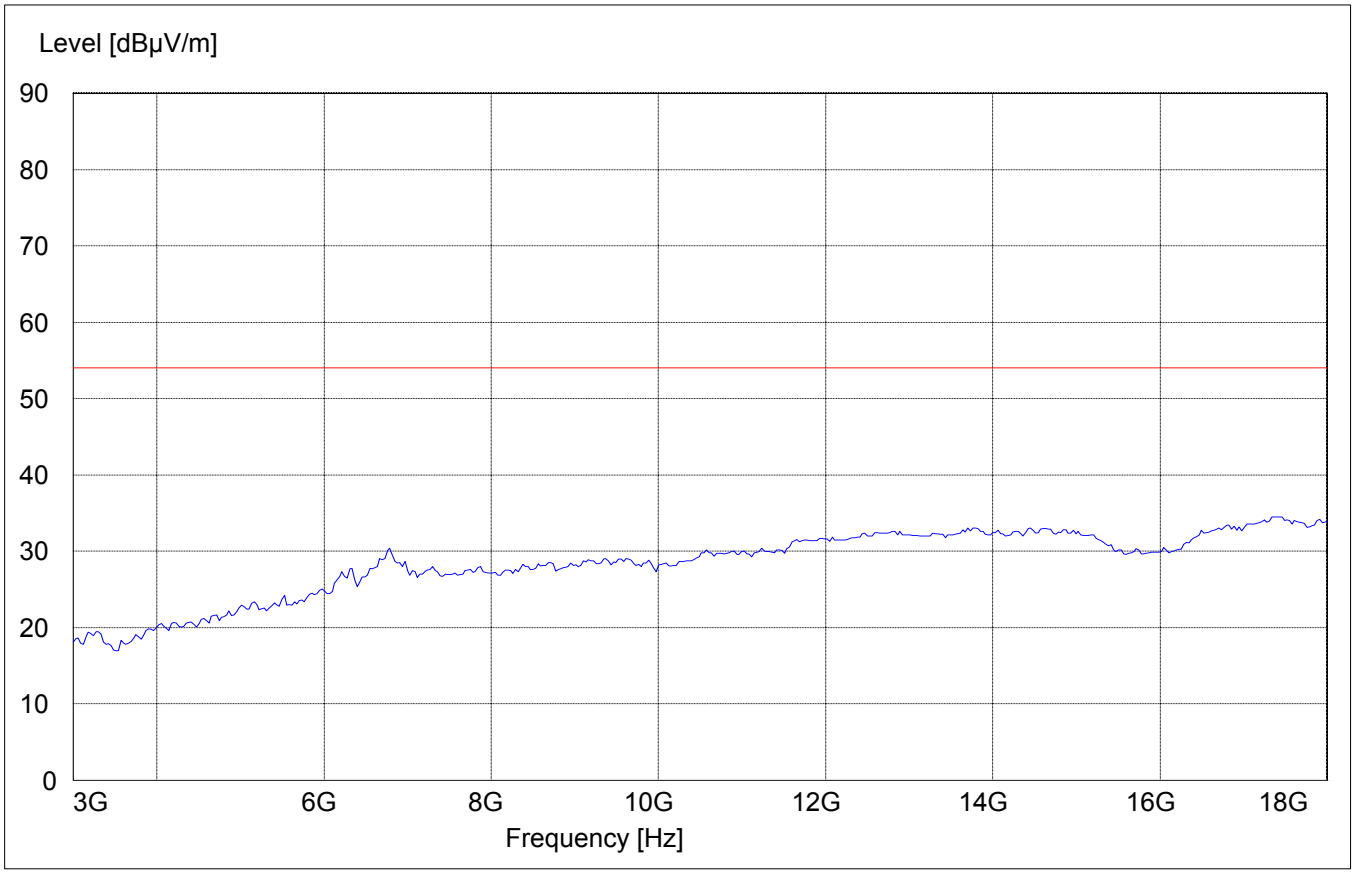
| | | | | | | |
|---|---|---|---|---|---|---|
| SWEEP TABLE: | | "BT Spuri hi 1-3G" | | | | |
| Short Description: | | Bluetooth Spurious 1-3GHz | | | | |
| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW | VBW | Transducer |
| 1.0 GHz | 3.0 GHz | MaxPeak | Coupled | 1 MHz | 10Hz | #326 horn (dBi) |



## RECEIVER SPURIOUS RADIATION § 15.209
## 3GHz – 18GHz

**(Both WLAN & BT set to Rx mode)**

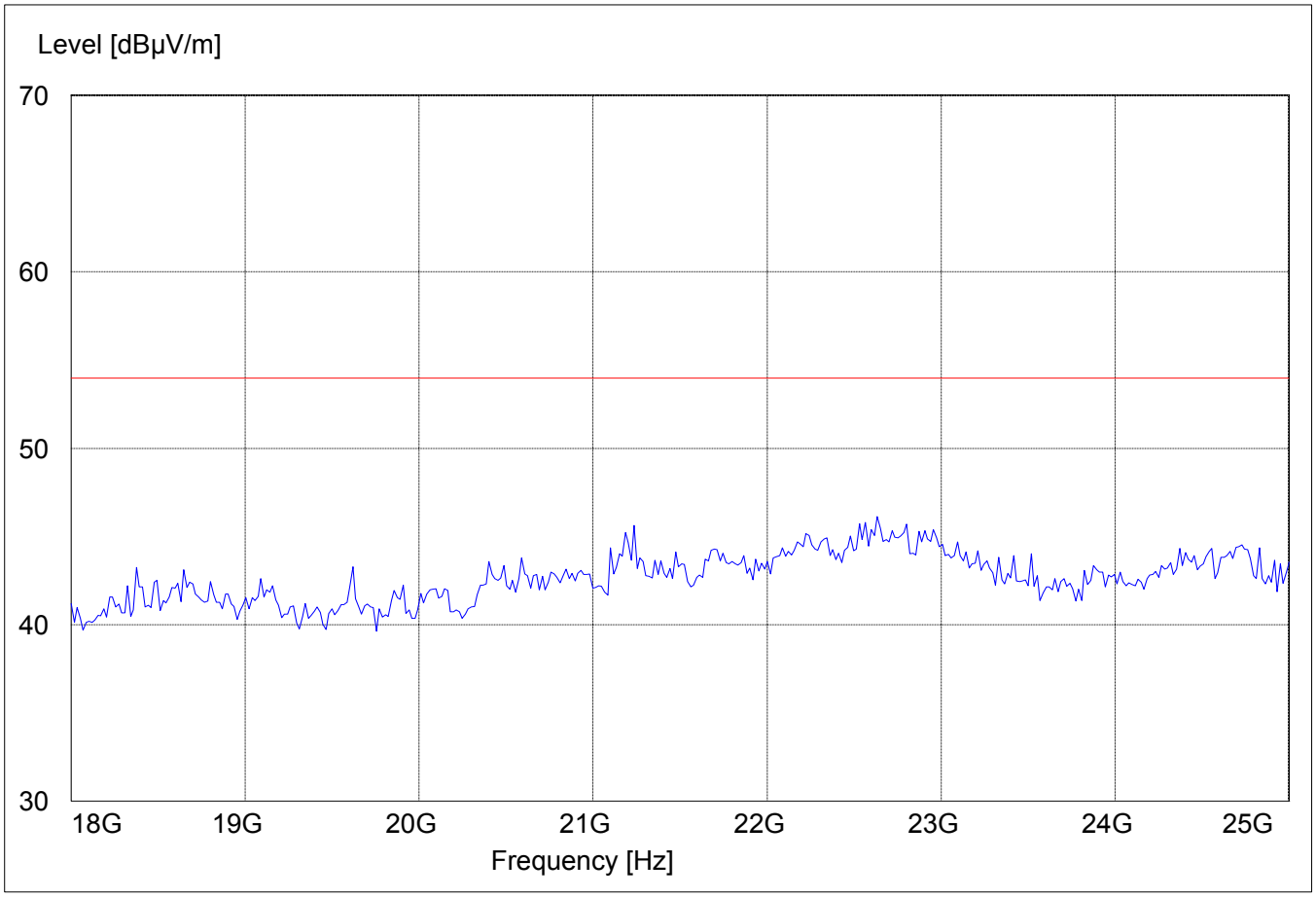
| | | | | | |
|---|---|---|---|---|---|
| SWEEP TABLE: | | "BT Spuri hi 3-18G" | | | |
| Short Description: | | Bluetooth Spurious 3-18GHz | | | |
| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW VBW | Transducer |
| 3.0 GHz | 18 GHz | MaxPeak | Coupled | 1 MHz | #326 horn (dBi)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



**RECEIVER SPURIOUS RADIATION** **§ 15.209**
**18GHz – 25GHz**

**(Both WLAN & BT set to Rx mode)**

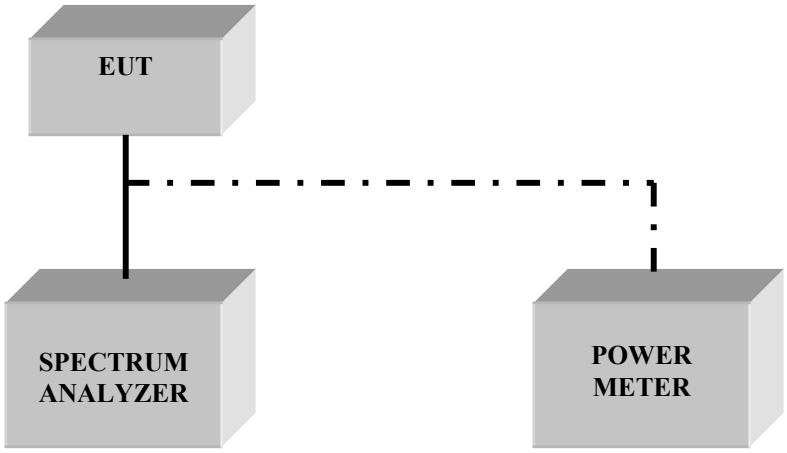
| | | | | | |
|---|---|---|---|---|---|
| SWEEP TABLE: | | "BT Spuri hi 18-25G" | | | |
| Short Description: | | Bluetooth Spurious 18-25GHz | | | |
| Start Frequency | Stop Frequency | Detector Time | Meas. Bandw. | RBW VBW | Transducer |
| 18 GHz | 25 GHz | MaxPeak | Coupled | 1 MHz | #141 horn (dBi) |



## 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** | Signal Generator | SMY02 | Rohde & Schwarz | 836878/011 |
| **04** | Power-Meter | EPM-442A | Hewlett Packard | GB37170232 |
| **05** | Power Amplifier | 250W1000 | Amplifier Research | 300031 |
| **06** | Biconilog Antenna | 3141 | EMCO | 0005-1186 |
| **07** | Horn Antenna | SAS-200/571 | AH Systems | 325 |
| **08** | Power Splitter | 11667B | Hewlett Packard | 645348 |
| **09** | Climatic Chamber | VT4004 | Votch | G1115 |
| **10** | Pre-Amplifier | JS4-00102600 | Miteq | 00616 |
| **11** | 2-3GHz band reject filter | BRM50701 | Microtronics | NA |
| **12** | Power Sensor | URV5-Z2 | Rohde & Schwarz | DE30807 |

**BLOCK DIAGRAMS**
**Conducted Testing**



## Radiated Testing