

# Test Report

## INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 15 C and INDUSTRY CANADA REQUIREMENTS

Equipment Under Test: Dosimeter with BT LE

Type/ Model: MBD-1

Manufacturer: Mirion Technologies (RADOS) Oy  
Mustionkatu 2  
FI-20101 Turku  
FINLAND

Customer: Mirion Technologies (RADOS) Oy  
Mustionkatu 2  
FI-20101 Turku  
FINLAND

FCC Rule Part: 15.249: 2015  
IC Rule Part: RSS-247:2015

Date: 11 March 2016

Issued by:

  
Rauno Repo  
EMC/RF Specialist

11 March 2016

  
Janne Nyman  
Compliance Specialist

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## Equipment Under Test (EUT)

Dosimeter  
Type/ Model: MBD-1  
Serial Number: 2257  
FCC ID: 2AHI8-MBD-PD-1

The EUT is a dosimeter to be used around a wrist or chest. The EUT uses 2.4 GHz Low Energy Bluetooth transmission.

## Classification of the device

Fixed device	<input type="checkbox"/>
Mobile Device (Human body distance > 20cm)	<input type="checkbox"/>
Portable Device (Human body distance < 20cm)	<input checked="" type="checkbox"/>

## Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing

## Ratings and declarations

Operating Frequency Range (OFR): 2402 - 2480 MHz  
Channels: 40 channels  
Channel separation: 2 MHz  
Modulation: GFSK  
Integrated antenna gain: 1.2 dBi

## Power Supply

The EUT is an internal battery (3 V) powered device.

**Disclaimer**

*This document is issued by the Company under its General Conditions of service accessible at [http://www.sgs.com/terms and conditions.htm](http://www.sgs.com/terms_and_conditions.htm). attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.*

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*Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only. This document cannot be reproduced except in full, without prior approval of the Company*

## SUMMARY OF TESTING

Test Specification	Description of Test	Result
§15.249, a / RSS-247 5.4	Maximum Peak Radiated Output Power	PASS
RSS-GEN 6.6	99 % Occupied Bandwidth	PASS
§15.249, a /RSS-247 5.5	Unintentional Radiated Emissions	PASS

### EUT Test Conditions during Testing

The EUT was configured into the wanted channel and was in continuous transmit mode during all the tests. During the radiated measurements above 1 GHz the EUT was on 150 cm high Styrofoam table. New battery was installed before the measurements.

Before the tests the EUT was set in X, Y, Z positions to specify the position having the highest radiated emission levels. The highest levels were received when the EUT was in a position display pointing upwards.

Following channels were used during the tests:

Channel	Frequency/ MHz
Low (CH 0)	2402
Mid (CH 12)	2426
High (CH 39)	2480

### Test Facility

<input type="checkbox"/> Testing Location / address: FCC registration number: <b>90598</b>	SGS Fimko Ltd Särkiniementie 3 FI-00210, HELSINKI FINLAND
<input checked="" type="checkbox"/> Testing Location / address: FCC registration number: <b>178986</b> Industry Canada registration number: <b>8708A-2</b>	SGS Fimko Ltd Karakaarenkuja 4 FI-02610, ESPOO FINLAND

**Maximum Peak Radiated Output Power**

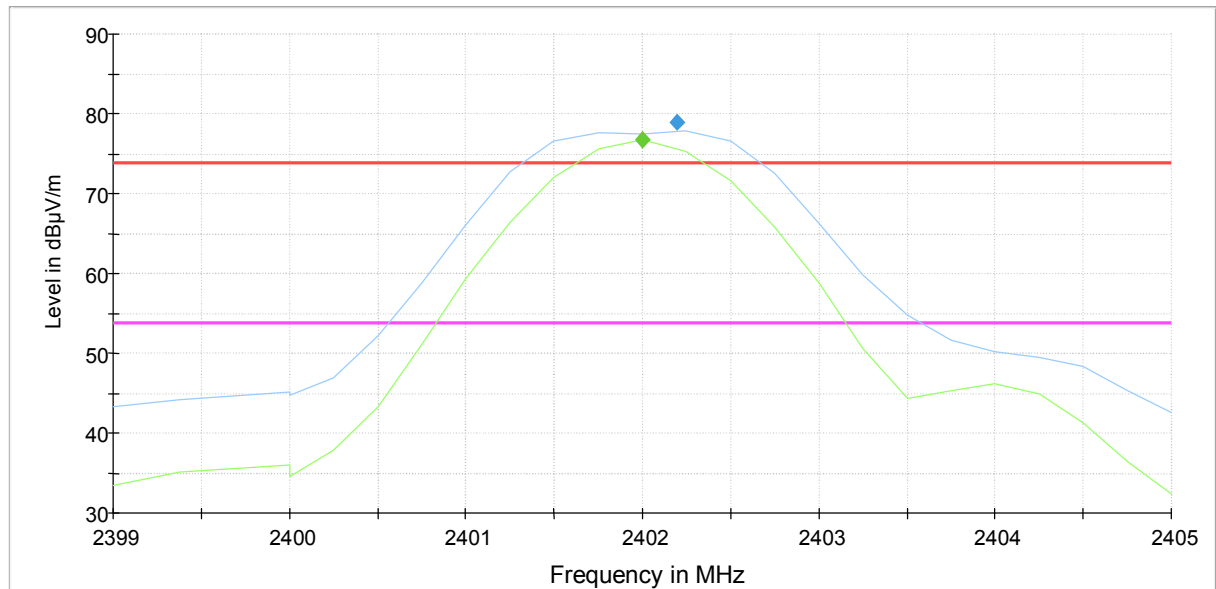
**Standard:** ANSI C63.10 (2013)  
**Tested by:** RRE  
**Date:** 8 March 2016  
**Temperature:** 22 ± 3 °C  
**Humidity:** 30 - 60 % RH  
**Measurement uncertainty** ± 4.5 dB Level of confidence 95 % (k = 2)

**FCC Rule: 15.249**

**Results:**

Channel	Radiated Power/Peak [dBµV/m]	Peak Limit [dBµV/m]	Margin [dB]	Result
Low	78.9	114.0	35.1	PASS
Mid	79.7	114.0	34.3	PASS
High	78.6	114.0	35.4	PASS

FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)

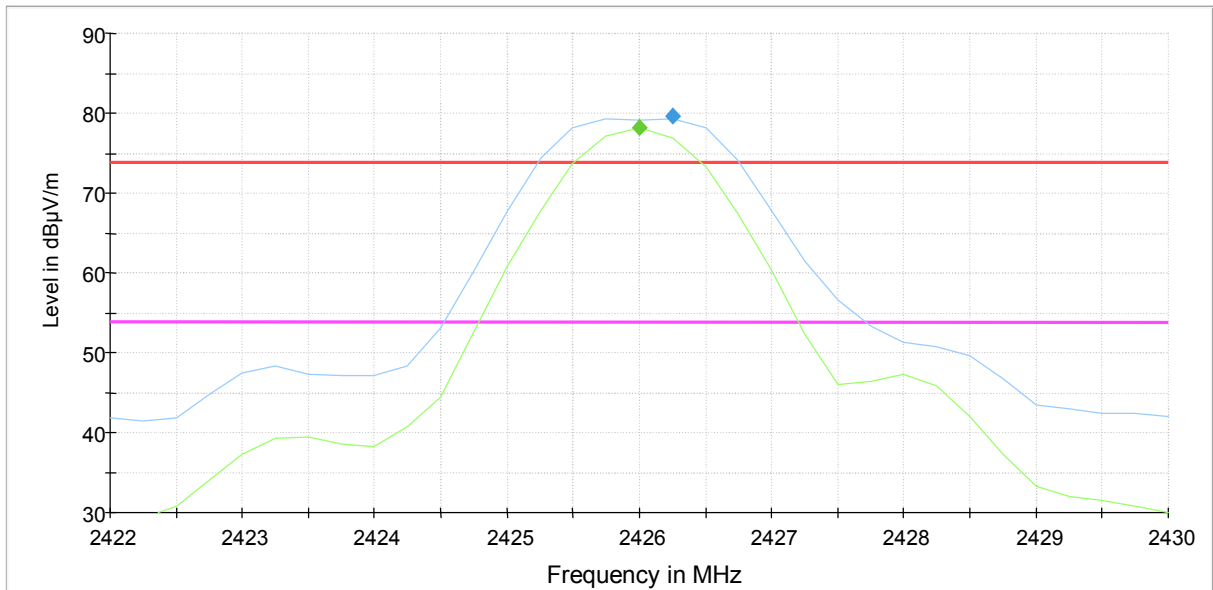


- FCC Part 15 Class B Electric Field Strength 3 m PK [..\EMI radiated\]
- FCC Part 15 Class B Electric Field Strength 3 m AV [..\EMI radiated\]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- Preview Result 2-AVG [Preview Result 2.Result:2]
- ◆ Final Result 1-PK+ [Final Result 1.Result:1]
- ◆ Final Result 2-AVG [Final Result 2.Result:1]

**Figure 1.** Low channel.

**Maximum Peak Conducted Output Power**

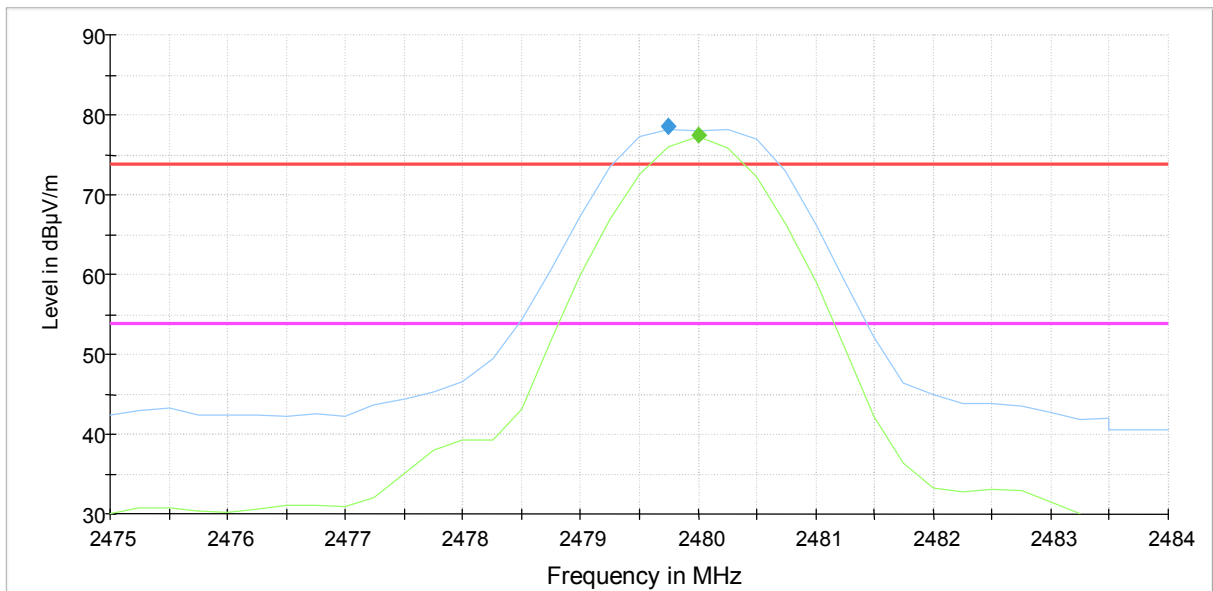
FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)



- FCC Part 15 Class B Electric Field Strength 3 m PK [..\EMI radiated\]
- FCC Part 15 Class B Electric Field Strength 3 m AV [..\EMI radiated\]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- Preview Result 2-AVG [Preview Result 2.Result:2]
- ◆ Final Result 1-PK+ [Final Result 1.Result:1]
- ◆ Final Result 2-AVG [Final Result 2.Result:1]

**Figure 2.** Mid channel.

FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)



- FCC Part 15 Class B Electric Field Strength 3 m PK [..\EMI radiated\]
- FCC Part 15 Class B Electric Field Strength 3 m AV [..\EMI radiated\]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- Preview Result 2-AVG [Preview Result 2.Result:2]
- ◆ Final Result 1-PK+ [Final Result 1.Result:1]
- ◆ Final Result 2-AVG [Final Result 2.Result:1]

**Figure 3.** High channel.

**Transmitter Radiated Emissions 30 MHz to 26.5 GHz**

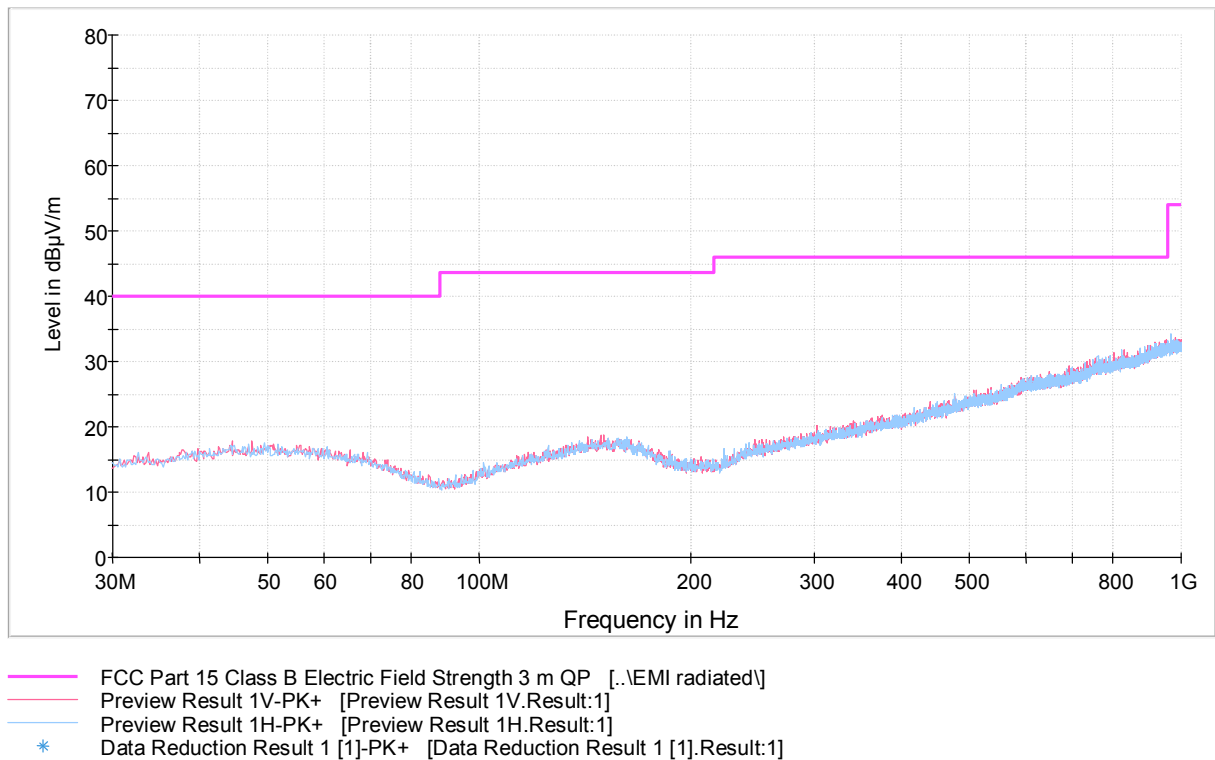
**Standard:** ANSI C63.10 (2013)  
**Tested by:** RRE, PKA  
**Date:** 8 March 2016  
**Temperature:** 22 ± 3 °C  
**Humidity:** 30 - 60 % RH  
**Measurement uncertainty** ± 4.51 dB Level of confidence 95 % (k = 2)

**FCC Rule: 15.249**

The correction factor in the final result table contains the sum of the transducers (antenna + amplifier + cables). The result value is the measured value corrected with the correction factor.

**Test results**

FCC Part 15 Class B Spurious Emission 30-1000MHz 3m



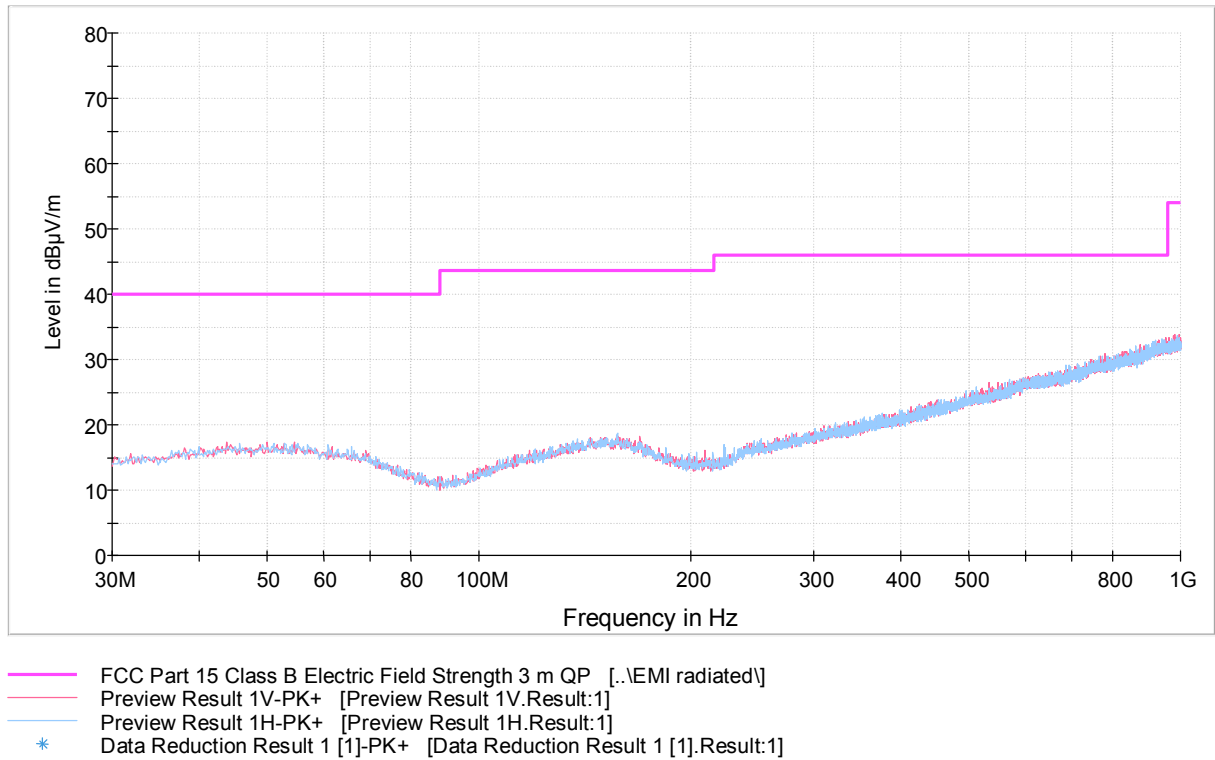
**Figure 4.** Measured curve with peak detector (Low channel).

Final measurements were not performed because no peaks were detected above the noise floor.



**Transmitter Radiated Emissions 30 MHz to 26.5 GHz**

FCC Part 15 Class B Spurious Emission 30-1000MHz 3m

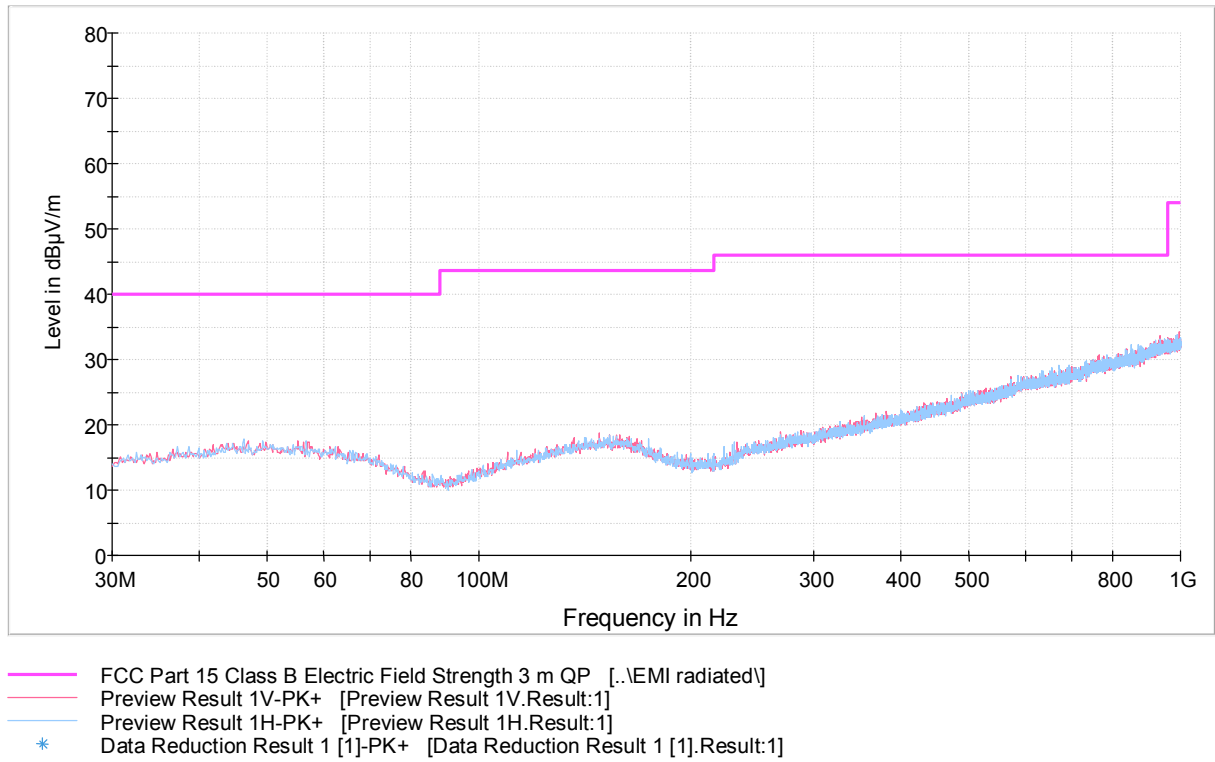


**Figure 5.** Measured curve with peak detector (Mid channel).

Final measurements were not performed because no peaks were detected above the noise floor.

**Transmitter Radiated Emissions 30 MHz to 26.5 GHz**

FCC Part 15 Class B Spurious Emission 30-1000MHz 3m

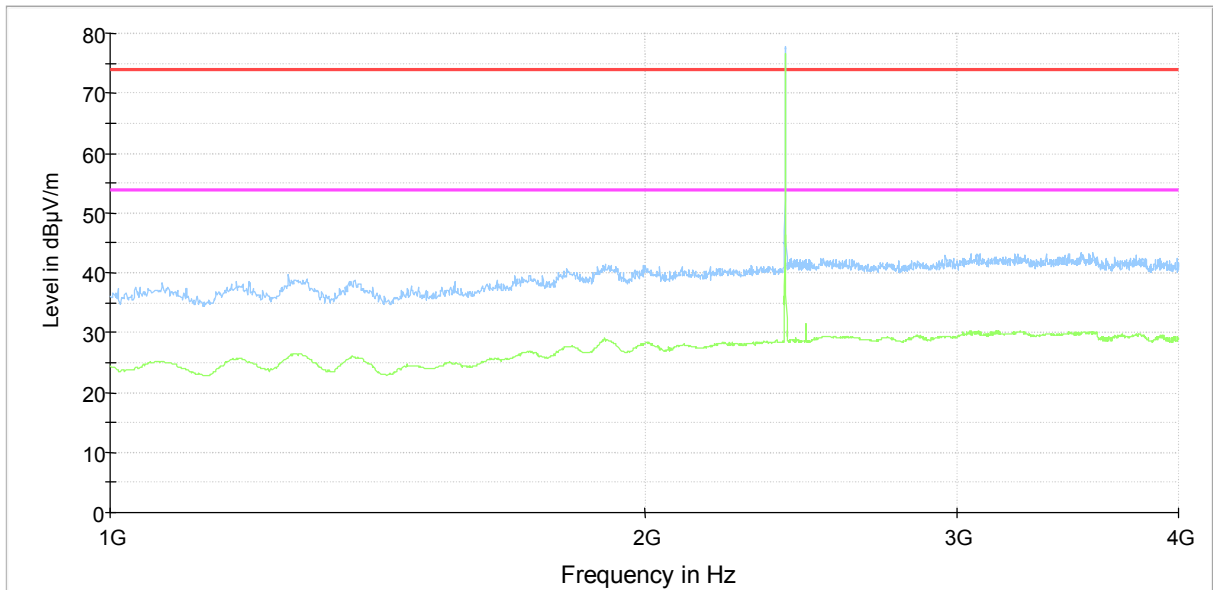


**Figure 6.** Measured curve with peak detector (High channel).

Final measurements were not performed because no peaks were detected above the noise floor.

**Transmitter Radiated Emissions 30 MHz to 26.5 GHz**

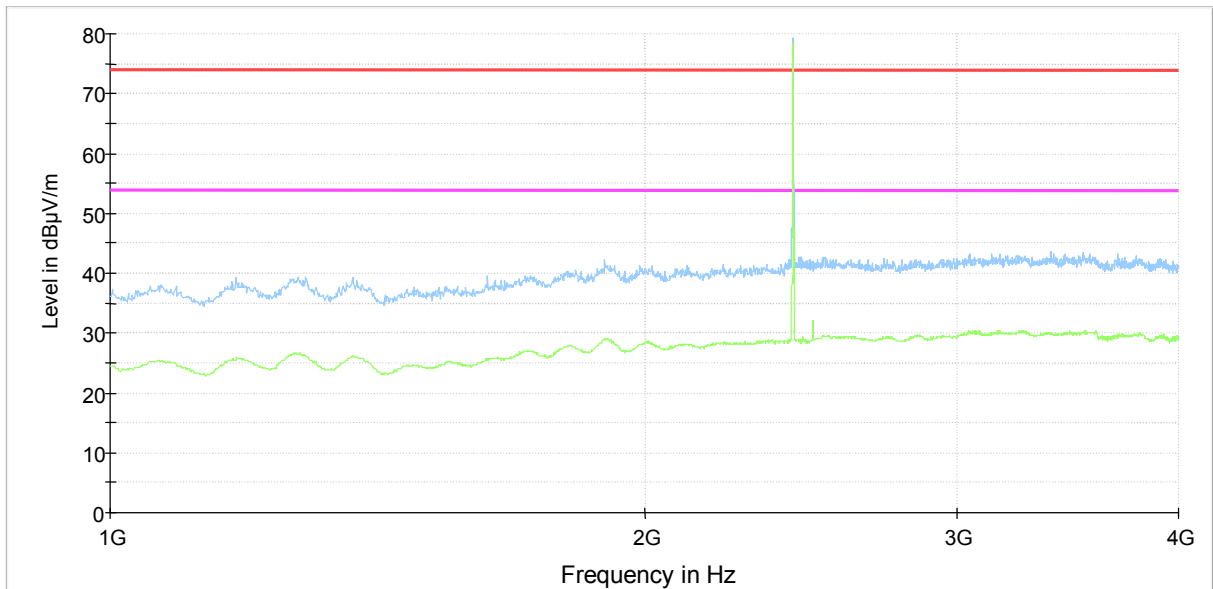
FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)



- FCC Part 15 Class B Electric Field Strength 3 m PK [..\EMI radiated\]
- FCC Part 15 Class B Electric Field Strength 3 m AV [..\EMI radiated\]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- Preview Result 2-AVG [Preview Result 2.Result:2]
- ◆ Final Result 1-PK+ [Final Result 1.Result:1]
- ◆ Final Result 2-AVG [Final Result 2.Result:1]

**Figure 7.** Measured curve with peak and average detectors (Low channel).

FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)

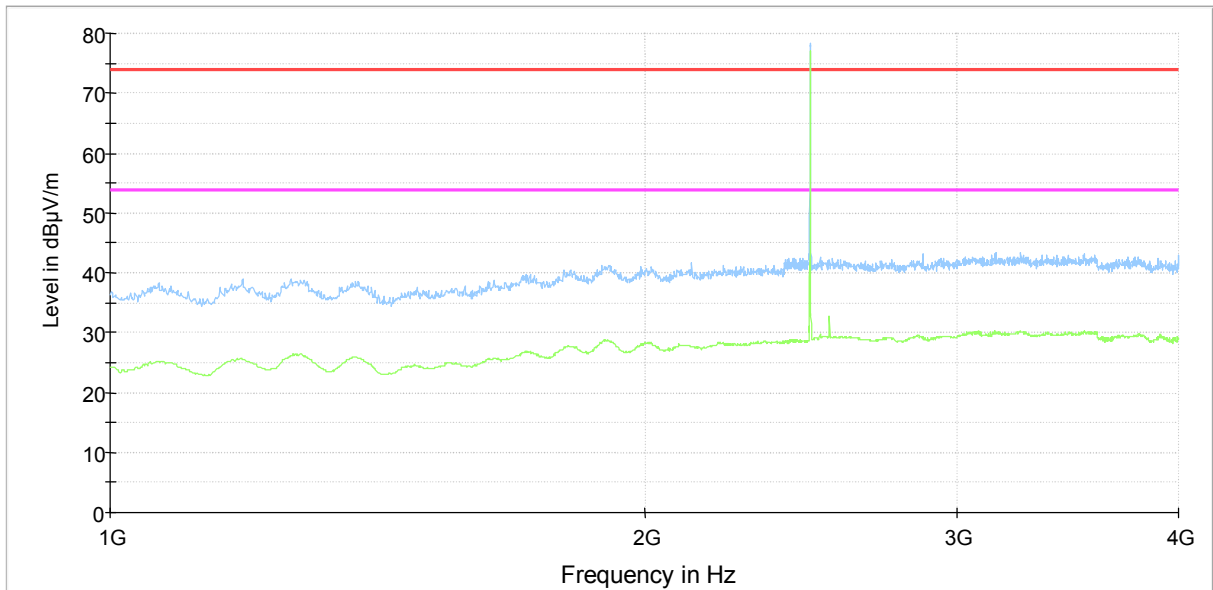


- FCC Part 15 Class B Electric Field Strength 3 m PK [..\EMI radiated\]
- FCC Part 15 Class B Electric Field Strength 3 m AV [..\EMI radiated\]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- Preview Result 2-AVG [Preview Result 2.Result:2]
- ◆ Final Result 1-PK+ [Final Result 1.Result:1]
- ◆ Final Result 2-AVG [Final Result 2.Result:1]

**Figure 8.** Measured curve with peak and average detectors (Mid channel).

**Transmitter Radiated Emissions 30 MHz to 26.5 GHz**

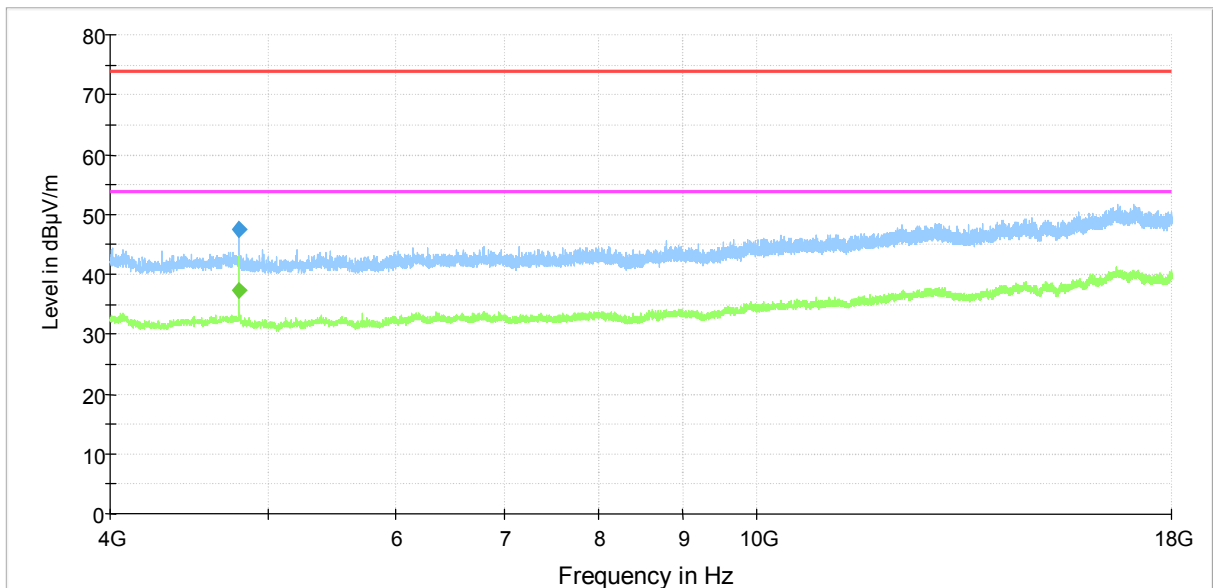
FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)



- FCC Part 15 Class B Electric Field Strength 3 m PK [..\EMI radiated\]
- FCC Part 15 Class B Electric Field Strength 3 m AV [..\EMI radiated\]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- Preview Result 2-AVG [Preview Result 2.Result:2]
- ◆ Final Result 1-PK+ [Final Result 1.Result:1]
- ◆ Final Result 2-AVG [Final Result 2.Result:1]

**Figure 9.** Measured curve with peak and average detectors (High channel).

FCC Part 15 Class B Spurious Emission 4-18GHz 3m



- FCC Part 15 Class B Electric Field Strength 3 m PK [..\EMI radiated\]
- FCC Part 15 Class B Electric Field Strength 3 m AV [..\EMI radiated\]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- Preview Result 2-AVG [Preview Result 2.Result:2]
- ◆ Final Result 1-PK+ [Final Result 1.Result:1]
- ◆ Final Result 2-AVG [Final Result 2.Result:1]

**Figure 10.** Measured curve with peak and average detectors (Low channel).

**Transmitter Radiated Emissions 30 MHz to 26.5 GHz**

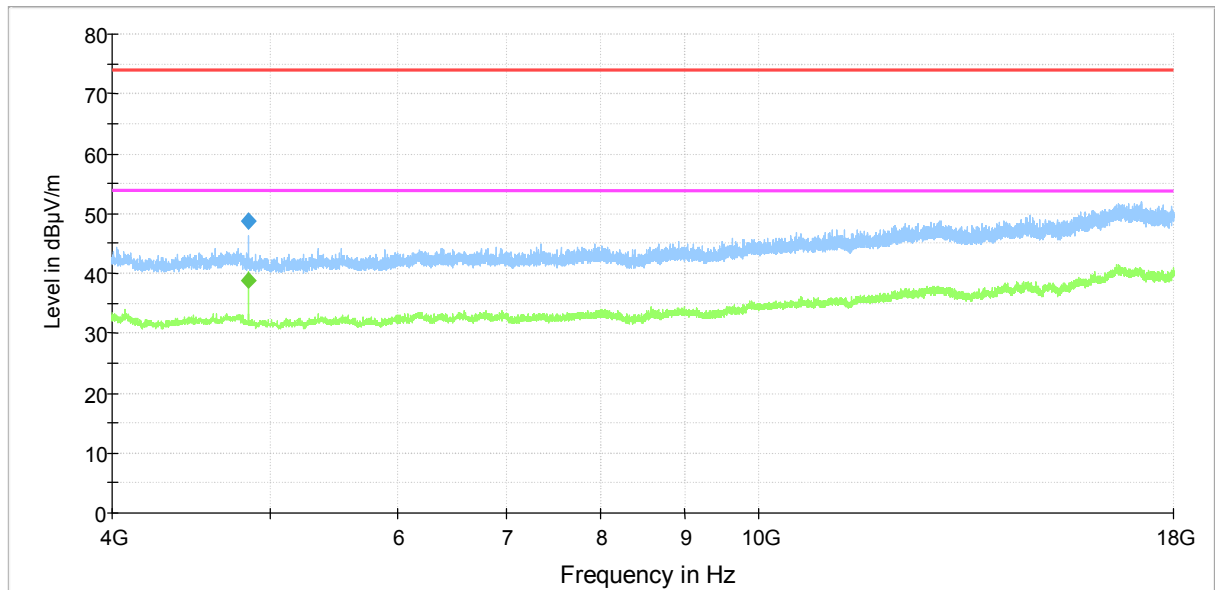
**Table 1.** Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4805.900000	47.5	1000.0	1000.000	196.0	H	314.0	10.3	26.4	73.9	-

**Table 2.** Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4805.900000	37.4	1000.0	1000.000	194.0	H	308.0	10.3	16.5	53.9	-

FCC Part 15 Class B Spurious Emission 4-18GHz 3m



- FCC Part 15 Class B Electric Field Strength 3 m PK [.\EMI radiated\]
- FCC Part 15 Class B Electric Field Strength 3 m AV [.\EMI radiated\]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- Preview Result 2-AVG [Preview Result 2.Result:2]
- ◆ Final Result 1-PK+ [Final Result 1.Result:1]
- ◆ Final Result 2-AVG [Final Result 2.Result:1]

**Figure 11.** Measured curve with peak and average detectors (Mid channel).

**Table 3.** Final Max Peak results.

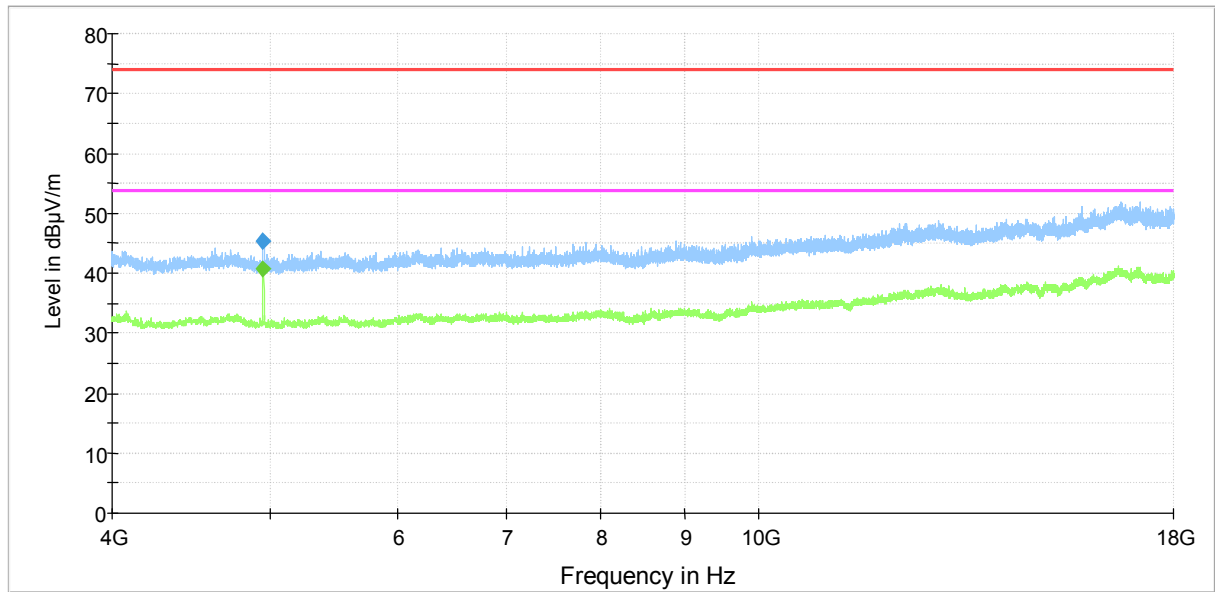
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4854.100000	48.8	1000.0	1000.000	100.0	H	315.0	10.2	25.1	73.9	-

**Table 4.** Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4854.000000	38.7	1000.0	1000.000	204.0	H	167.0	10.2	15.2	53.9	-

**Transmitter Radiated Emissions 30 MHz to 26.5 GHz**

FCC Part 15 Class B Spurious Emission 4-18GHz 3m



- FCC Part 15 Class B Electric Field Strength 3 m PK [..\EMI radiated\]
- FCC Part 15 Class B Electric Field Strength 3 m AV [..\EMI radiated\]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- Preview Result 2-AVG [Preview Result 2.Result:2]
- ◆ Final Result 1-PK+ [Final Result 1.Result:1]
- ◆ Final Result 2-AVG [Final Result 2.Result:1]

**Figure 12.** Measured curve with peak and average detectors (High channel).

**Table 5.** Final Max Peak results.

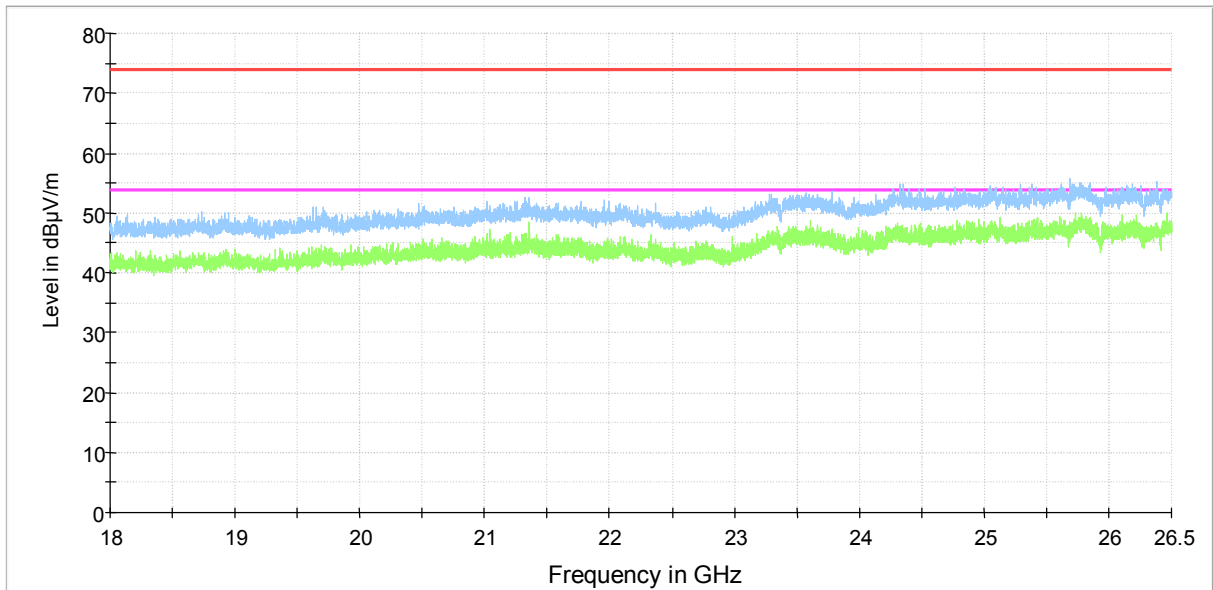
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4958.000000	45.3	1000.0	1000.000	259.0	V	227.0	10.2	28.6	73.9	-

**Table 6.** Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4958.000000	42.0	1000.0	1000.000	204.0	H	298.0	10.2	23.5	53.9	-

**Transmitter Radiated Emissions 30 MHz to 26.5 GHz**

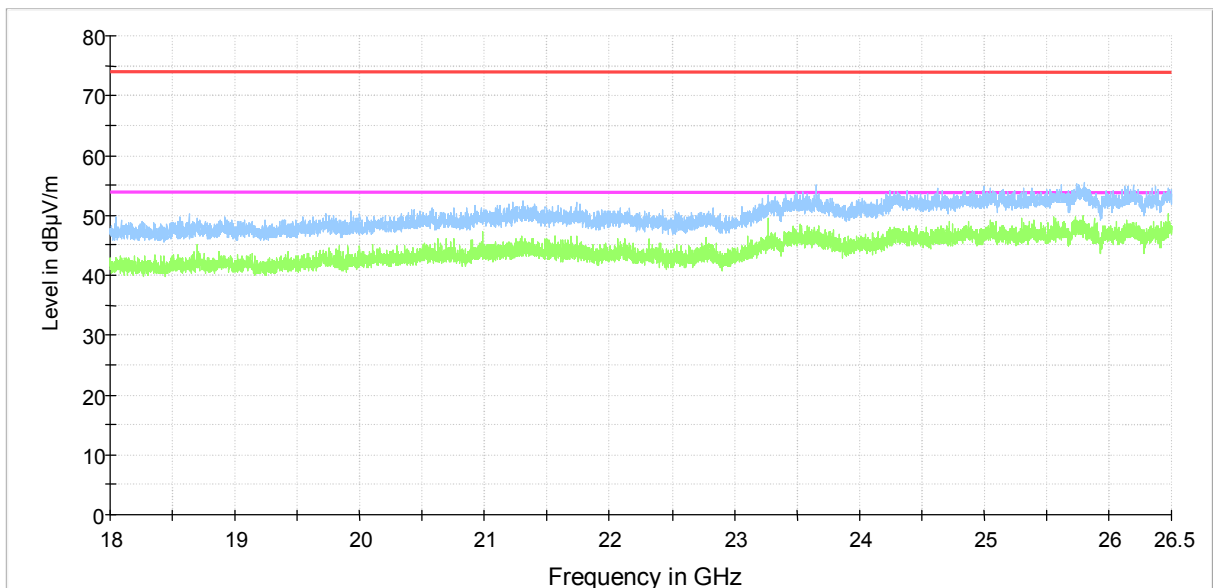
FCC Part 15 Class B Spurious Emission 18-26.5GHz 3m



- FCC Part 15 Class B Electric Field Strength 3 m PK [..\EMI radiated\]
- FCC Part 15 Class B Electric Field Strength 3 m AV [..\EMI radiated\]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- Preview Result 2-AVG [Preview Result 2.Result:2]
- \* Data Reduction Result 1 [1]-PK+ [Data Reduction Result 1 [1].Result:1]
- \* Data Reduction Result 2 [1]-AVG [Data Reduction Result 2 [1].Result:2]

**Figure 13.** Measured curve with peak and average detectors (Low channel).

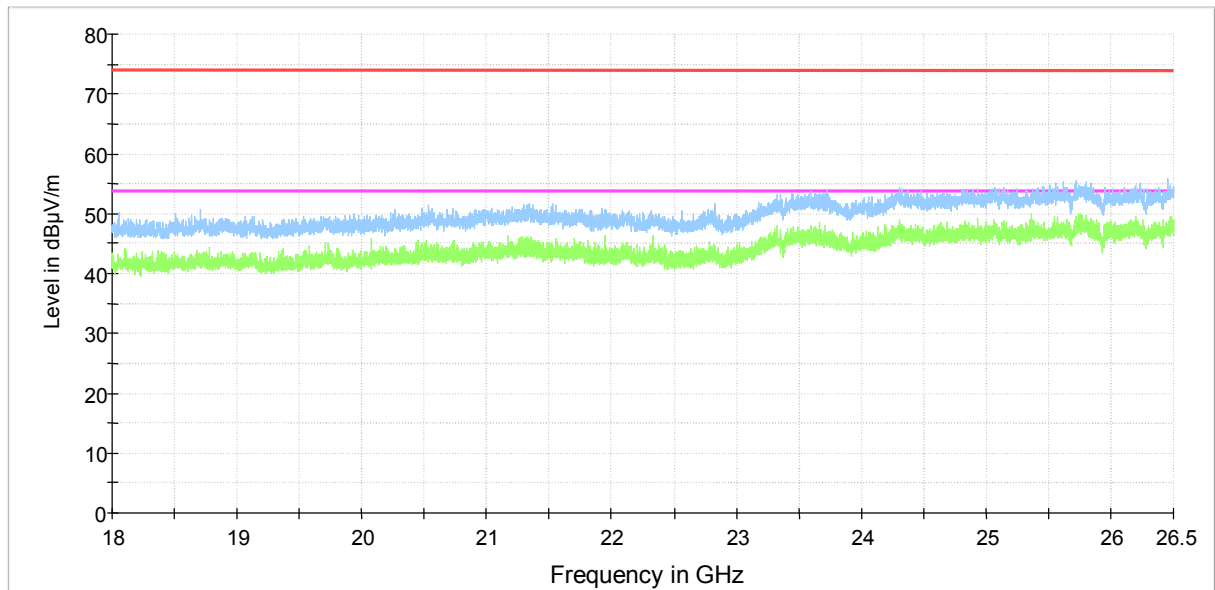
FCC Part 15 Class B Spurious Emission 18-26.5GHz 3m



- FCC Part 15 Class B Electric Field Strength 3 m PK [..\EMI radiated\]
- FCC Part 15 Class B Electric Field Strength 3 m AV [..\EMI radiated\]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- Preview Result 2-AVG [Preview Result 2.Result:2]
- \* Data Reduction Result 1 [1]-PK+ [Data Reduction Result 1 [1].Result:1]
- \* Data Reduction Result 2 [1]-AVG [Data Reduction Result 2 [1].Result:2]

**Figure 14.** Measured curve with peak and average detectors (Mid channel).

FCC Part 15 Class B Spurious Emission 18-26.5GHz 3m



- FCC Part 15 Class B Electric Field Strength 3 m PK [.\EMI radiated\]
- FCC Part 15 Class B Electric Field Strength 3 m AV [.\EMI radiated\]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- Preview Result 2-AVG [Preview Result 2.Result:2]
- \* Data Reduction Result 1 [1]-PK+ [Data Reduction Result 1 [1].Result:1]
- \* Data Reduction Result 2 [1]-AVG [Data Reduction Result 2 [1].Result:2]

**Figure 15.** Measured curve with peak and average detectors (High channel).



Radiated Band Edge Measurement results

FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)

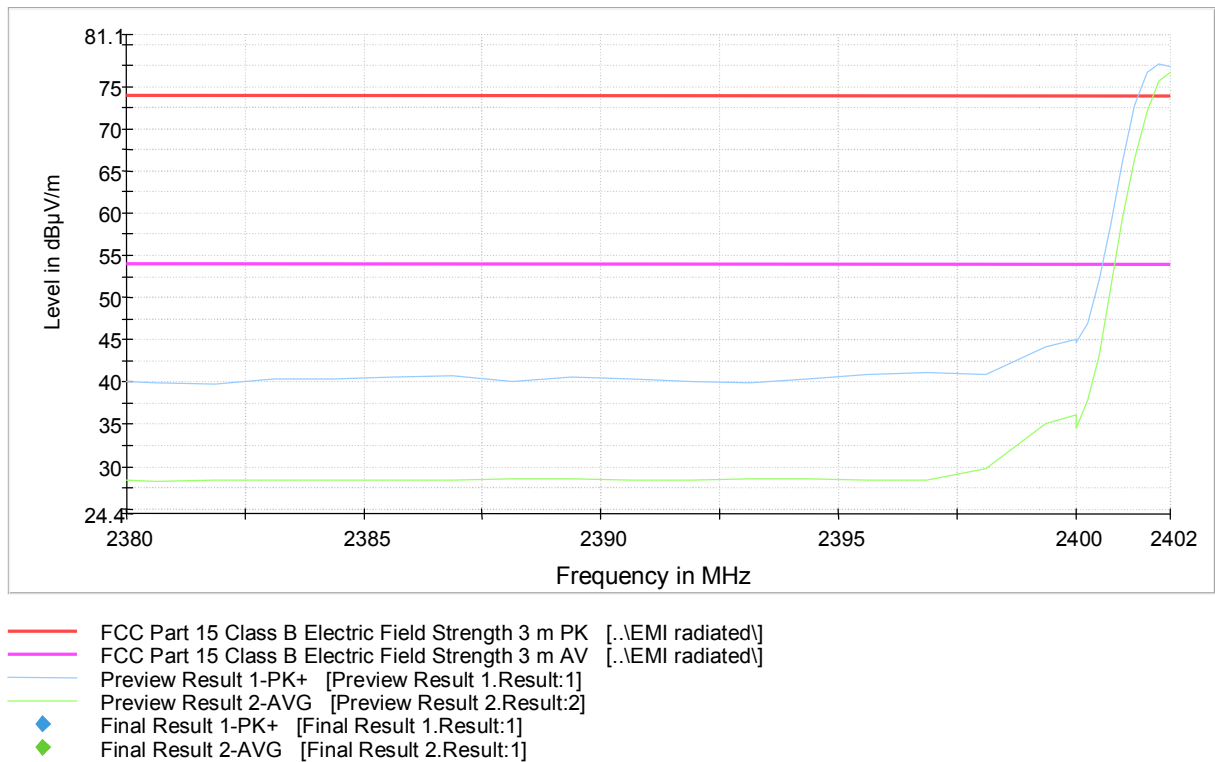


Figure 16. Low channel band edge.

FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)

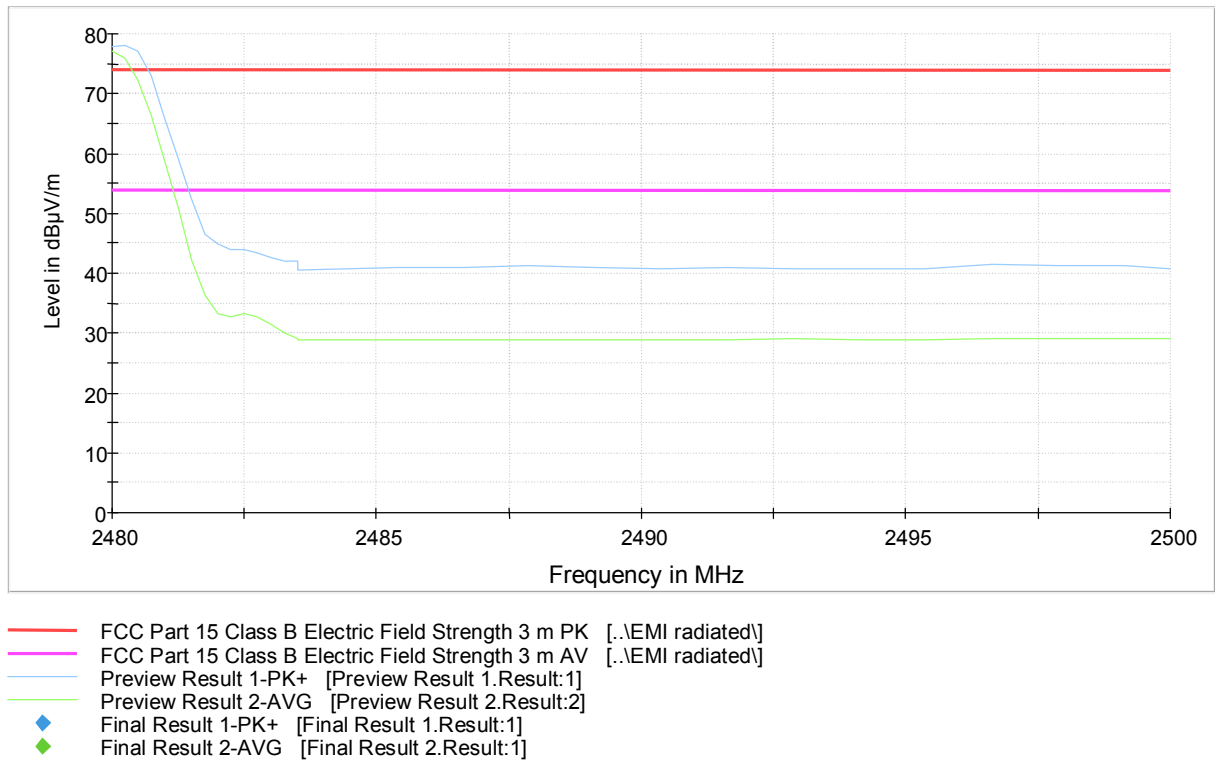


Figure 17. High channel band edge.

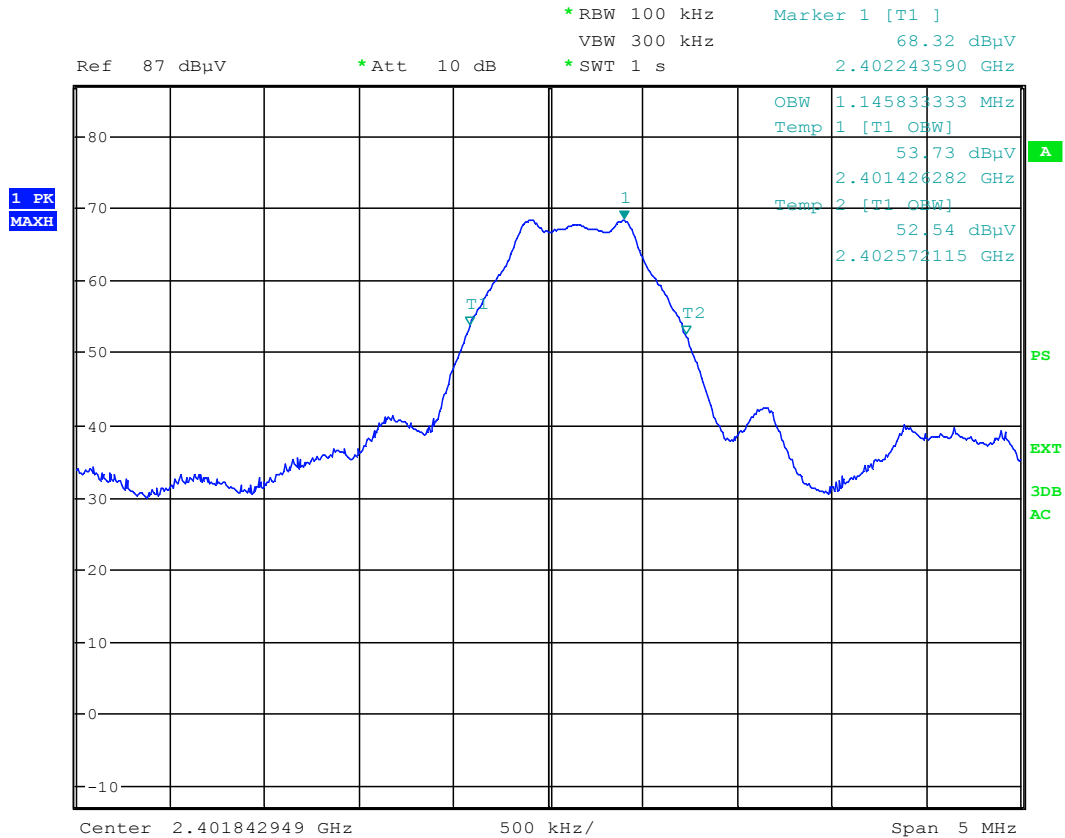
### 99% Occupied Bandwidth

**Standard:** RSS-GEN (2014)  
**Tested by:** RRE  
**Date:** 8 March 2016  
**Temperature:** 22 ± 3 °C  
**Humidity:** 30 - 60 % RH

### RSS-GEN 6.6

**Table 7.** 99 % OBW test results.

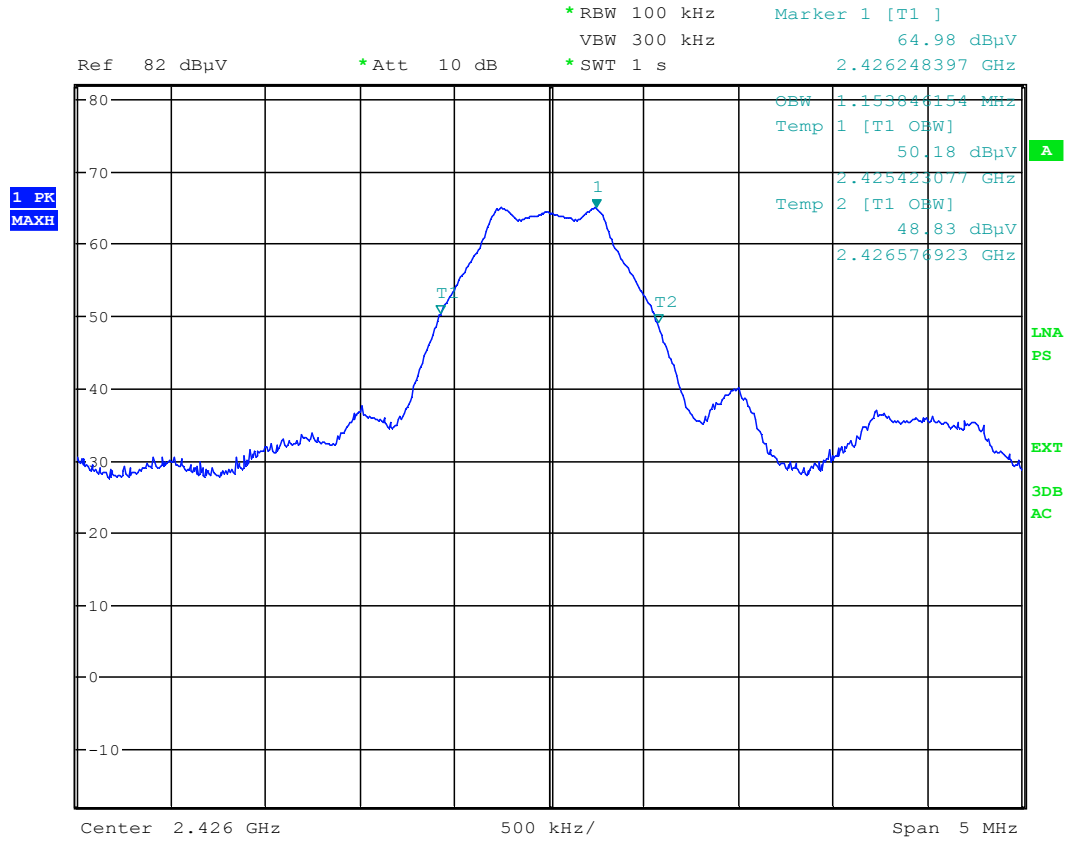
Channel	Limit	99 % BW [MHz]	Result
Low	-	1.145833333	PASS
Mid	-	1.153846154	PASS
High	-	1.137820513	PASS



Date: 8.MAR.2016 23:47:29

**Figure 18.** 99 % OBW. Low channel.

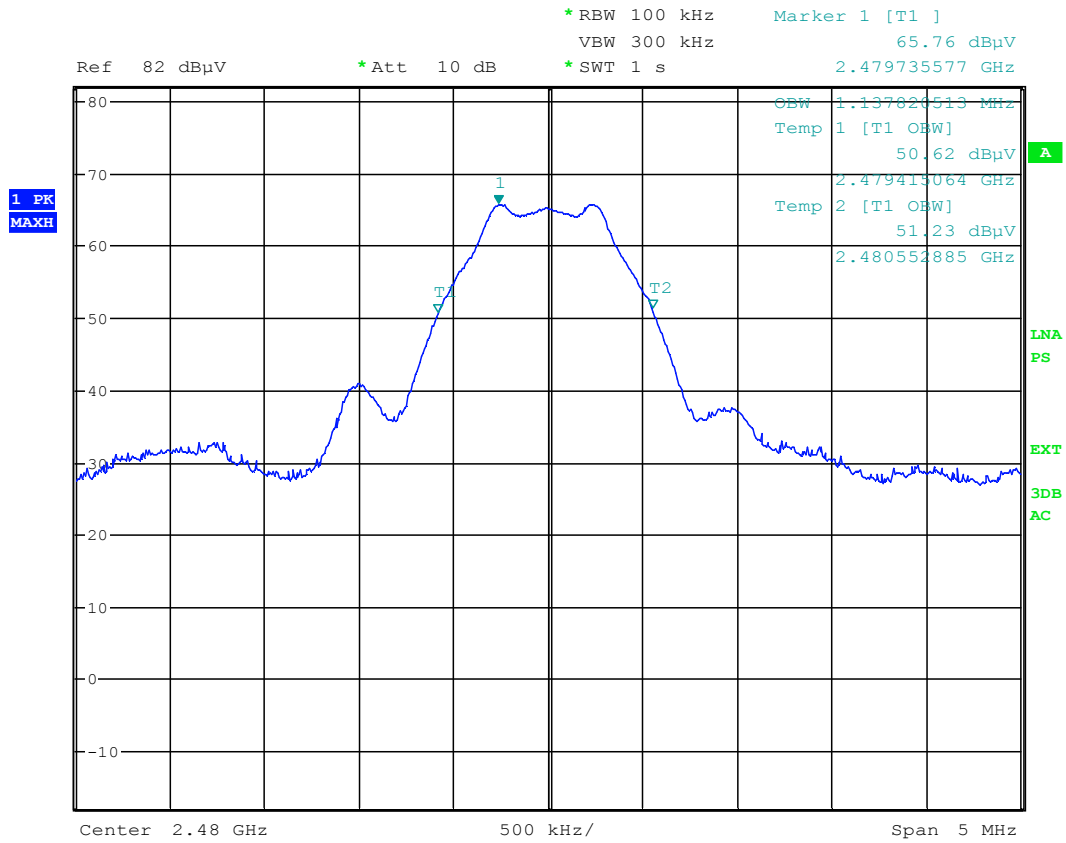
## Transmitter Radiated Emissions 30 MHz to 26.5 GHz



Date: 9.MAR.2016 00:03:52

**Figure 19.** 99 % OBW. Mid channel.

## Transmitter Radiated Emissions 30 MHz to 26.5 GHz



Date: 9.MAR.2016 00:00:15

**Figure 20.** 99 % OBW. High channel.

**LIST OF TEST EQUIPMENT**

Equipment	Manufacturer	Type	Serial no	Inv.no	Cal. due (yyyy-mm-dd)
TEST RECEIVER	ROHDE & SCHWARZ	ESU 26	100185	8453	2016-07-01
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	-	-
ANTENNA (30-1000 MHz)	SCHWARZBECK	VULB 9168	8168-503	8911	2016-05-04
ANTENNA MAST	DEISEL	MA240	240/455	5017	-
TURNTABLE	DEISEL	DS430	-	5015	-
CONTROLLER	COMTEST	HD100	100/457	5018	-
ANTENNA (1-18 GHz)	EMCO	3117	00086191	9569	2017-03-03
ANTENNA (18-26.5 GHz)	EMCO	3160- 09	030232-022	7294	-
PREAMPLIFIER (0.5-26GHz)	HP	83017A	3950M00102	5226	2017-02-03
HIGH PASS FILTER	WAINWRIGHT	WHKX4.0/18G-10SS	10	-	2017-01-17