

Test Report

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

Equipment Under Test: USB IR-Dongle for dosimeter (BT LE)
Type/ Model: USB IR-Dongle
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)

USB IR-Dongle for dosimeter
FCC ID: 2AH18-MBD-IRLINK-1

The EUT is an USB IR-Dongle operating with a dosimeter using 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 powered from USB-port.

Peripherals

- HP Latitude PC (supplied by the customer)
- Power supply for the PC (supplied by the customer)
- Head phones
- Mouse (USB)

Disclaimer

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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
§15.207, a / RSS-GEN 8.8	Conducted Emissions on Power Supply Lines	PASS
§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. The EUT was connected to the USB port of the test PC as well as the headphones and the USB mouse. Tests were performed with 115V / 60 Hz.

During the radiated measurements above 1 GHz the EUT was on 150 cm high Styrofoam table.

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

Conducted Emissions on Power Supply Lines

Standard: ANSI C63.10 (2013)
Tested by: RRE
Date: 10 March 2016
Temperature: 22 ± 3 °C
Humidity: 30 - 60 % RH
Measurement uncertainty ± 2.9 dB Level of confidence 95 % (k = 2)

FCC Rule: 15.207

Conducted emissions were measured from PC mains port.

Results

Conducted Emission Mains FCC Part 15 Class B with ENV216

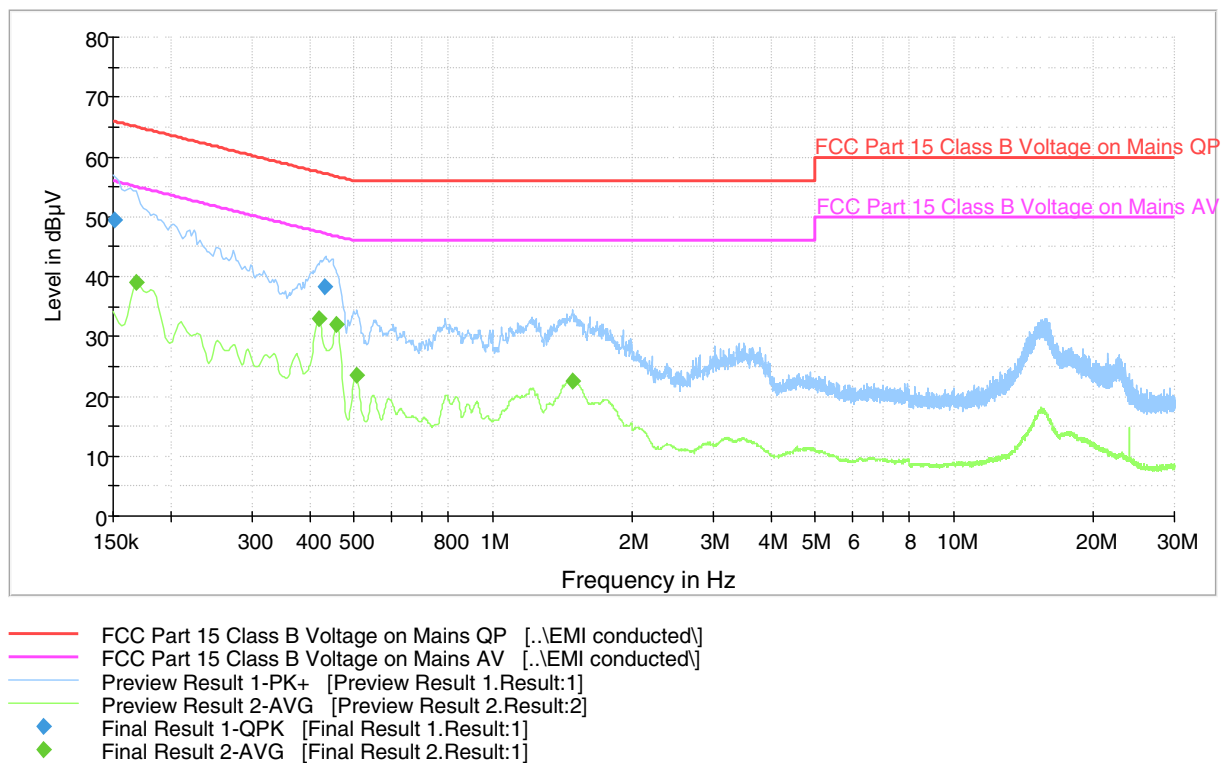


Figure 1. Conducted emission from AC power port.

Table 1. Final Quasi-Peak results

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time 15x(ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.151000	49.3	1000.0	9.000	N	10.1	16.6	65.9	-
0.431000	38.2	1000.0	9.000	N	10.3	19.0	57.2	-

Maximum Peak Conducted Output Power

Table 2. Final Average results

Frequency (MHz)	Average (dB μ V)	Meas. Time 15x(ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)	Comment
0.169000	39.2	1000.0	9.000	N	10.1	15.9	55.0	-
0.418250	33.0	1000.0	9.000	N	10.2	14.5	47.5	-
0.458250	32.0	1000.0	9.000	N	10.3	14.7	46.7	-
0.504250	23.5	1000.0	9.000	N	10.3	22.5	46.0	-
1.488500	22.5	1000.0	9.000	N	10.3	23.5	46.0	-

Maximum Peak Radiated Output Power

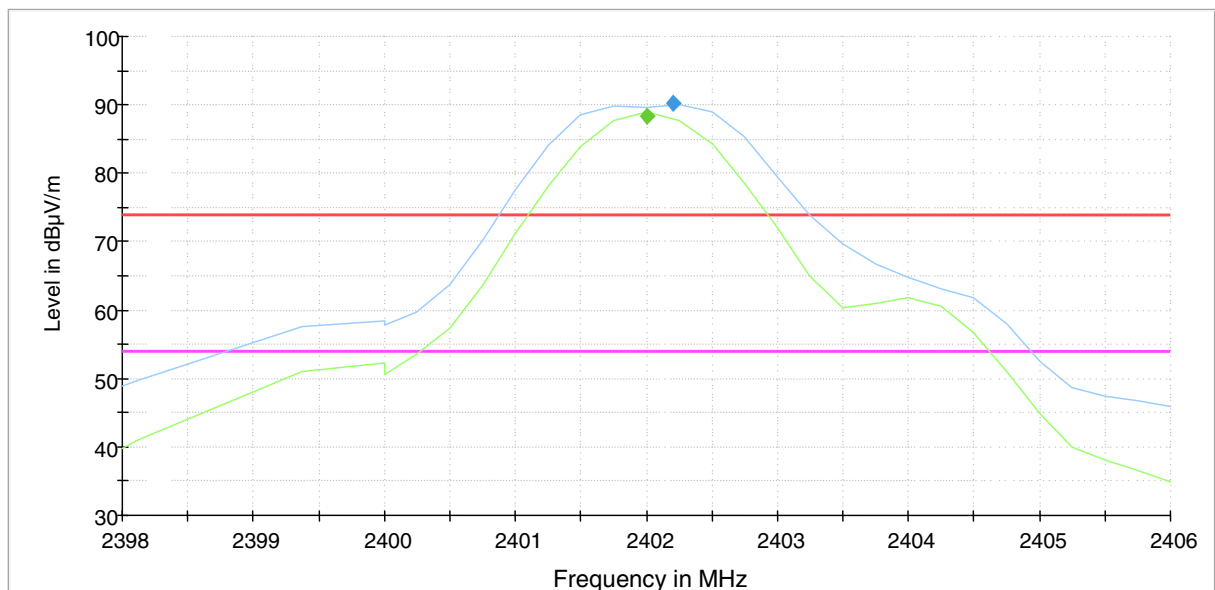
Standard: ANSI C63.10 (2013)
Tested by: RRE, PKA
Date: 9 March 2016
Temperature: 22 ± 3 °C
Humidity: 30 - 60 % RH
Measurement uncertainty ± 4.5 dB Level of confidence 95 % (k = 2)

FCC Rule: 15.249

Results:

Channel	Radiated Power/Peak [dBµV/m]	Peak Limit [dBµV/m]	Margin [dB]	Result
Low	90.0	114.0	24.0	PASS
Mid	90.2	114.0	23.8	PASS
High	86.4	114.0	27.6	PASS

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

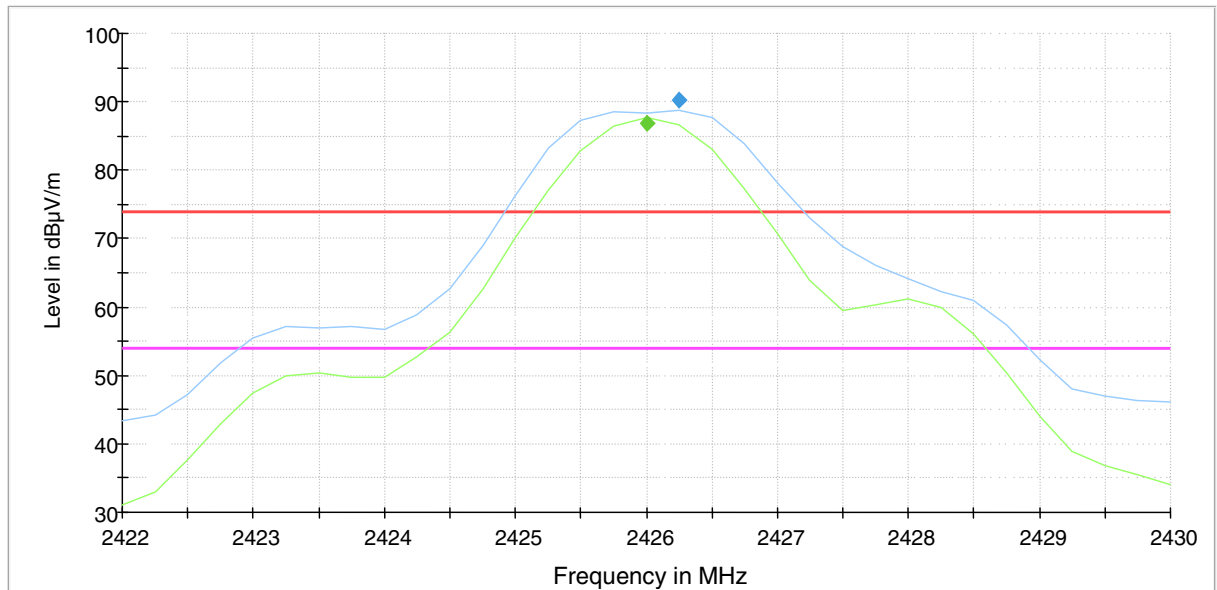


- FCC Part 15 Class B Electric Field Strength 3 m PK [..\EMI radiated\]
- FCC Part 15 Class B Electric Field Strength 3 m AV [..\EMI radiated\]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- Preview Result 2-AVG [Preview Result 2.Result:2]
- ◆ Final Result 1-PK+ [Final Result 1.Result:1]
- ◆ Final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

Figure 2. Low channel.

Maximum Peak Conducted Output Power

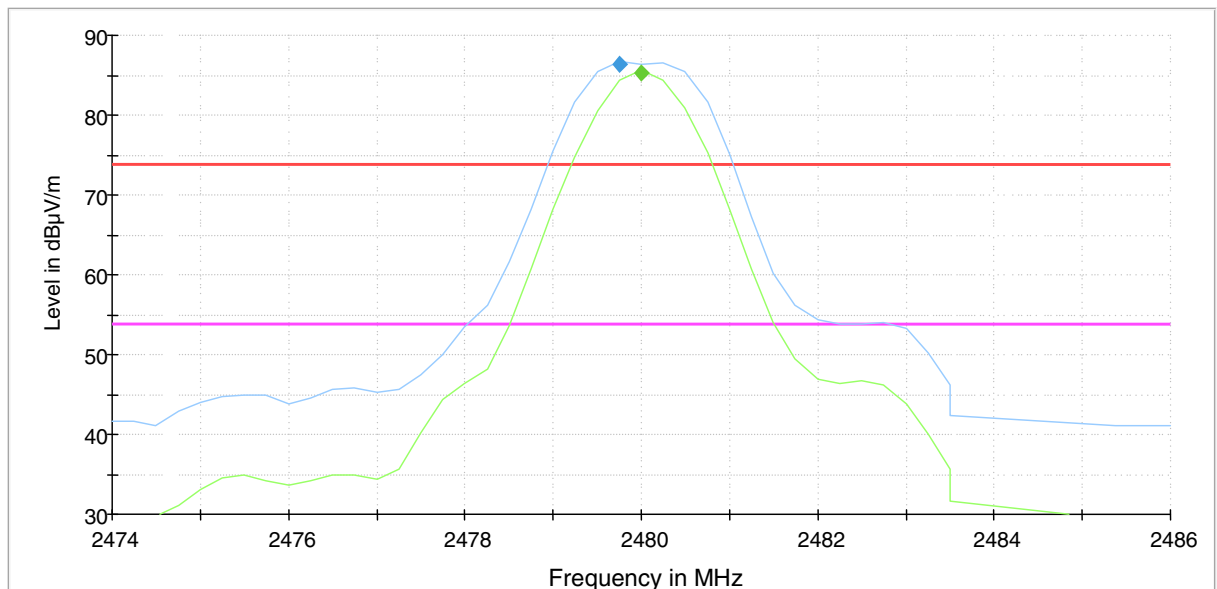
FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)



- 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 3. 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 4. 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

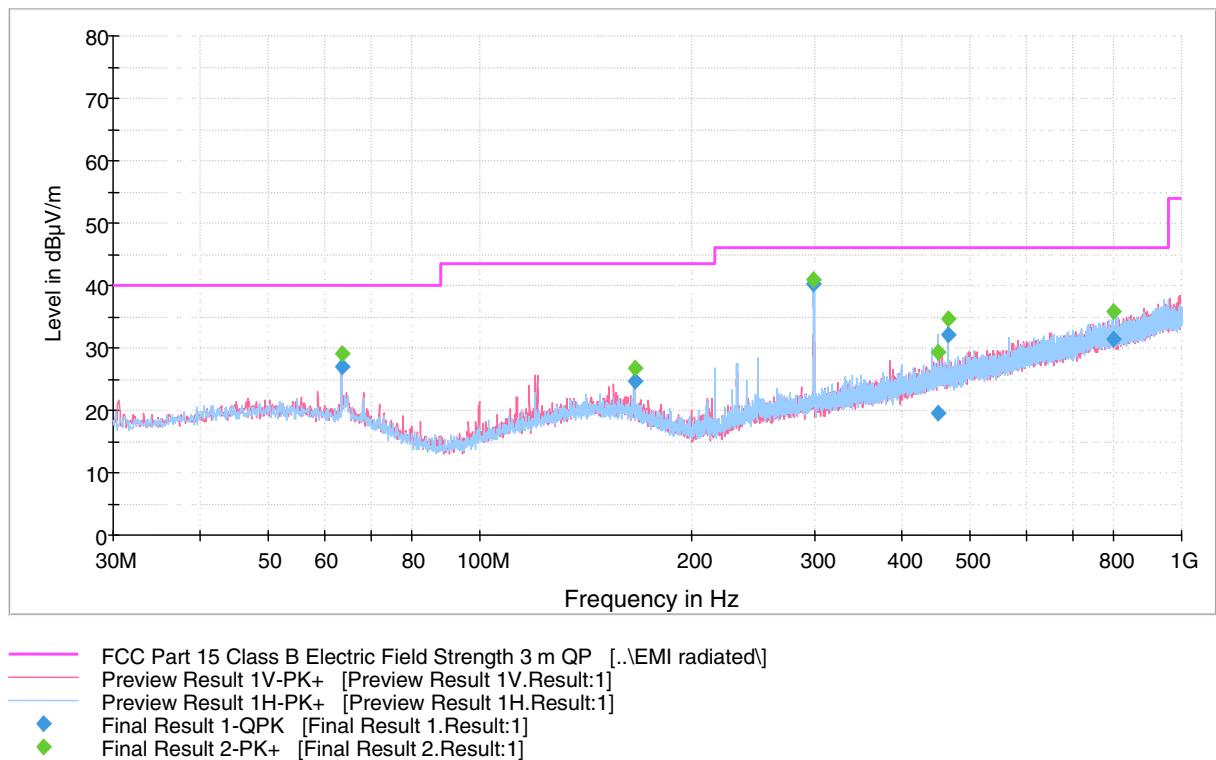


Figure 5. Measured curve with peak detector (Low channel).

Table 3. Final Quasi-Peak results

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time 15x(ms)	BW (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
63.505000	27.0	1000.0	120.000	100.0	V	62.0	13.4	13.0	40.0	-
166.274000	24.7	1000.0	120.000	100.0	V	0.0	14.3	18.8	43.5	-
298.750000	40.2	1000.0	120.000	100.0	H	25.0	15.3	5.8	46.0	-
449.306000	19.6	1000.0	120.000	249.0	H	110.0	19.2	26.4	46.0	-
465.627000	32.2	1000.0	120.000	100.0	V	197.0	19.5	13.8	46.0	-
798.200000	31.4	1000.0	120.000	100.0	H	274.0	25.5	14.6	46.0	-

Transmitter Radiated Emissions 30 MHz to 26.5 GHz

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

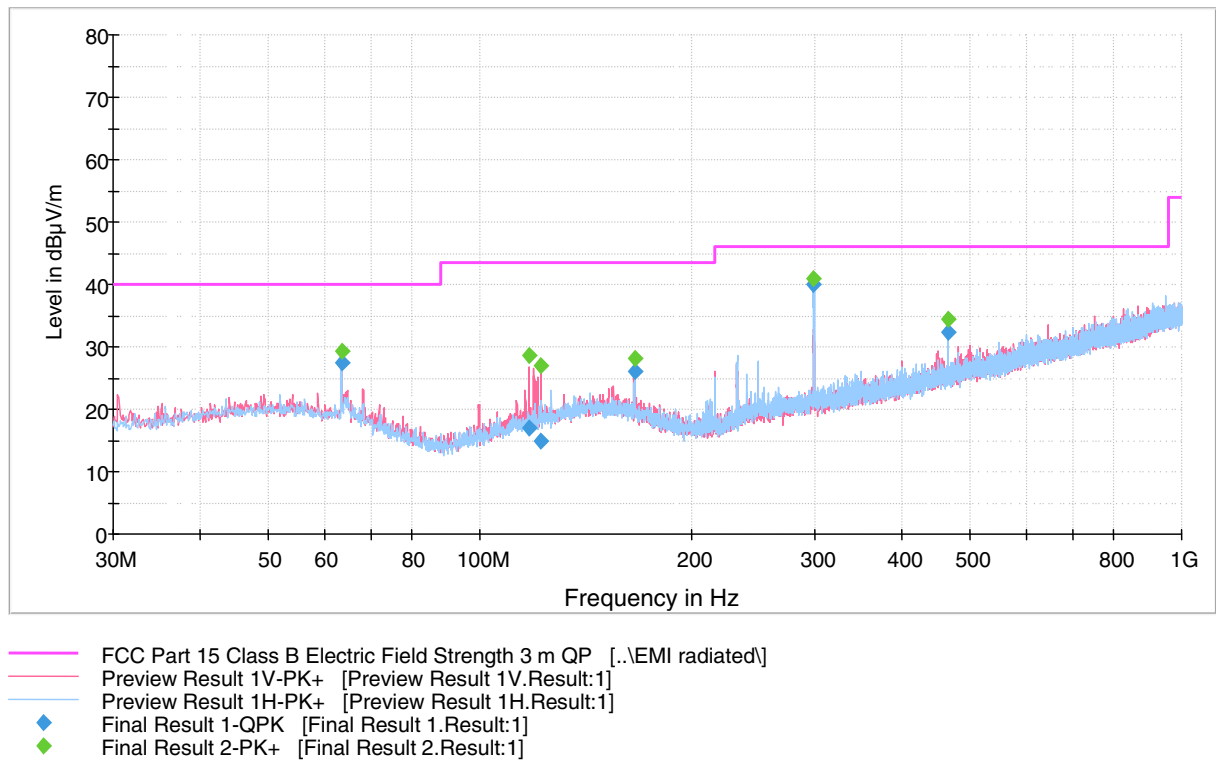


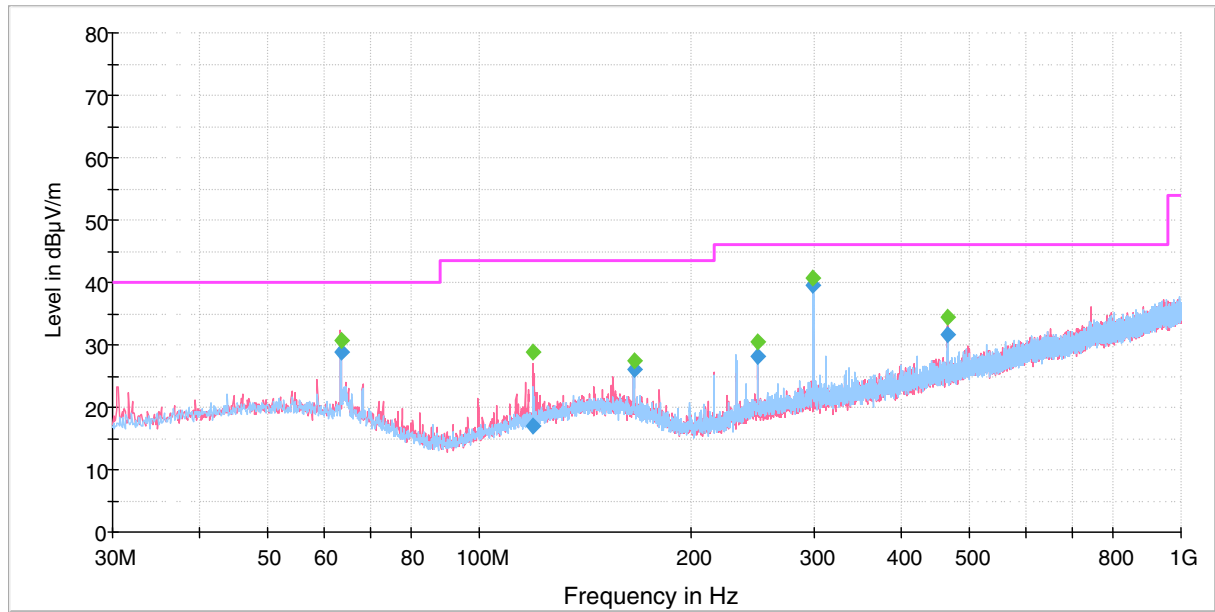
Figure 6. Measured curve with peak detector (Mid channel).

Table 4. Final Quasi-Peak results

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time 15x(ms)	BW (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
63.505000	27.5	1000.0	120.000	100.0	V	76.0	13.4	12.5	40.0	-
117.768000	17.0	1000.0	120.000	120.0	V	230.0	12.2	26.5	43.5	-
122.247000	14.8	1000.0	120.000	100.0	V	269.0	12.6	28.7	43.5	-
166.277000	26.1	1000.0	120.000	100.0	V	0.0	14.3	17.4	43.5	-
299.312000	40.0	1000.0	120.000	100.0	H	28.0	15.3	6.0	46.0	-
464.688000	32.2	1000.0	120.000	100.0	V	193.0	19.4	13.8	46.0	-

Transmitter Radiated Emissions 30 MHz to 26.5 GHz

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



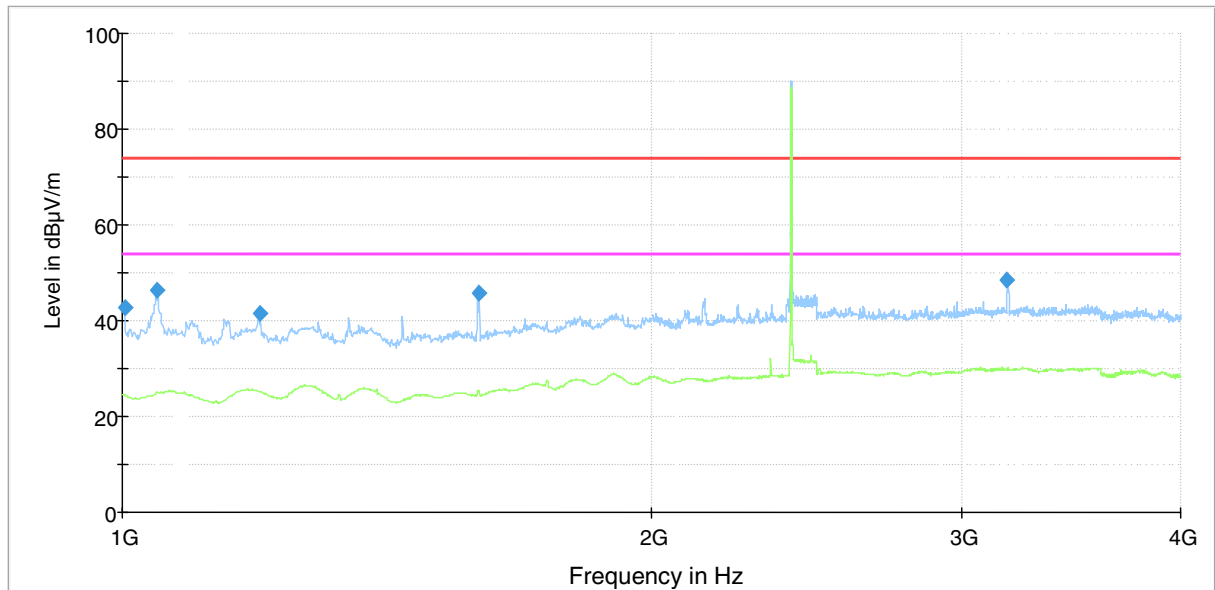
- FCC Part 15 Class B Electric Field Strength 3 m QP [..\EMI radiated]
- Preview Result 1V-PK+ [Preview Result 1V.Result:1]
- Preview Result 1H-PK+ [Preview Result 1H.Result:1]
- ◆ Final Result 1-QPK [Final Result 1.Result:1]
- ◆ Final Result 2-PK+ [Final Result 2.Result:1]

Figure 7. Measured curve with peak detector (High channel).

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time 15x(ms)	BW (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
63.505000	29.0	1000.0	120.000	100.0	V	85.0	13.4	11.0	40.0	-
119.243000	17.0	1000.0	120.000	100.0	V	302.0	12.3	26.5	43.5	-
166.274000	26.1	1000.0	120.000	100.0	V	13.0	14.3	17.4	43.5	-
249.429000	28.1	1000.0	120.000	100.0	H	257.0	13.5	17.9	46.0	-
298.732000	39.5	1000.0	120.000	100.0	H	25.0	15.3	6.5	46.0	-
465.607000	31.5	1000.0	120.000	100.0	V	213.0	19.5	14.5	46.0	-

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]

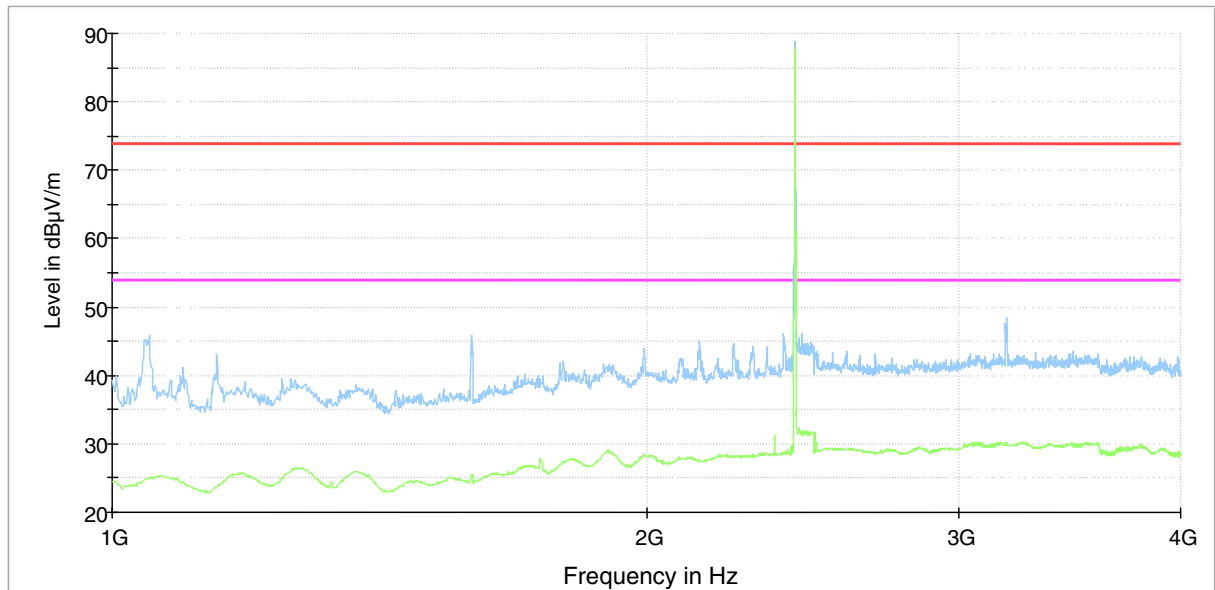
Figure 8. Measured curve with peak and average detectors (Low channel).

Table 5. Final Max Peak results

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time 15x(ms)	BW (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
1003.200000	42.9	1000.0	1000.000	151.0	H	335.0	-4.1	31.0	73.9	-
1047.425000	46.3	1000.0	1000.000	219.0	V	247.0	-4.7	27.6	73.9	-
1198.525000	41.6	1000.0	1000.000	196.0	V	168.0	-3.4	32.3	73.9	-
1595.075000	45.6	1000.0	1000.000	151.0	H	105.0	-2.0	28.3	73.9	-
3186.525000	48.4	1000.0	1000.000	202.0	V	355.0	6.0	25.5	73.9	-

Transmitter Radiated Emissions 30 MHz to 26.5 GHz

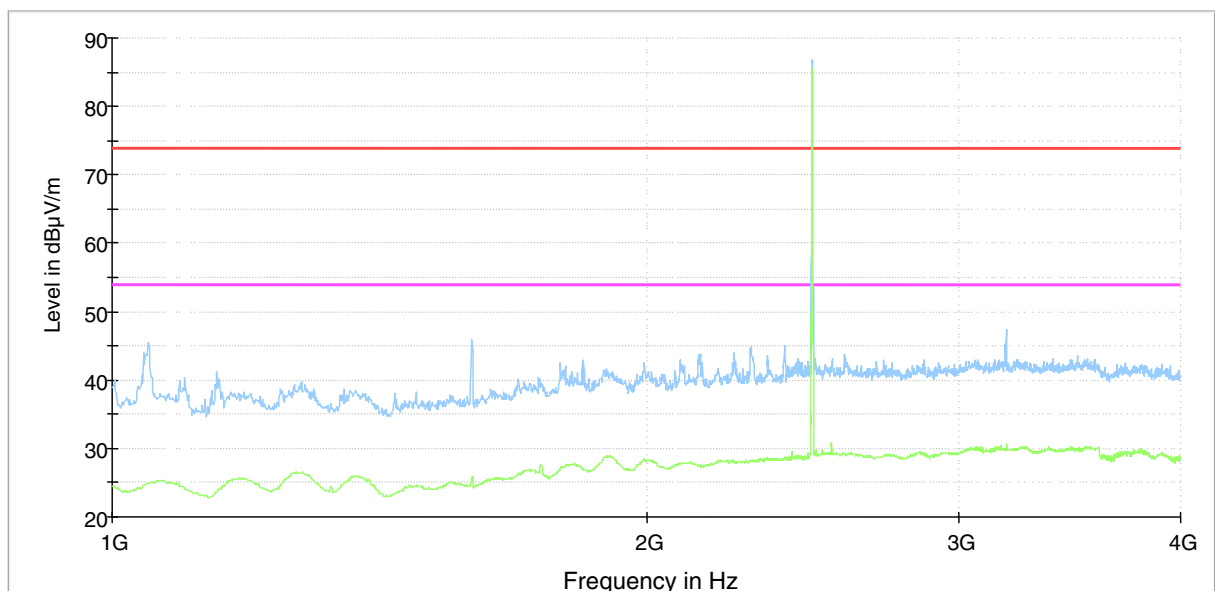
FCC Part 15 Class B Spurious Emission 1-4GHz 3m (optimized 2.4 GHz TX)



- 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 (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 10. Measured curve with peak and average detectors (High channel).

Transmitter Radiated Emissions 30 MHz to 26.5 GHz

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

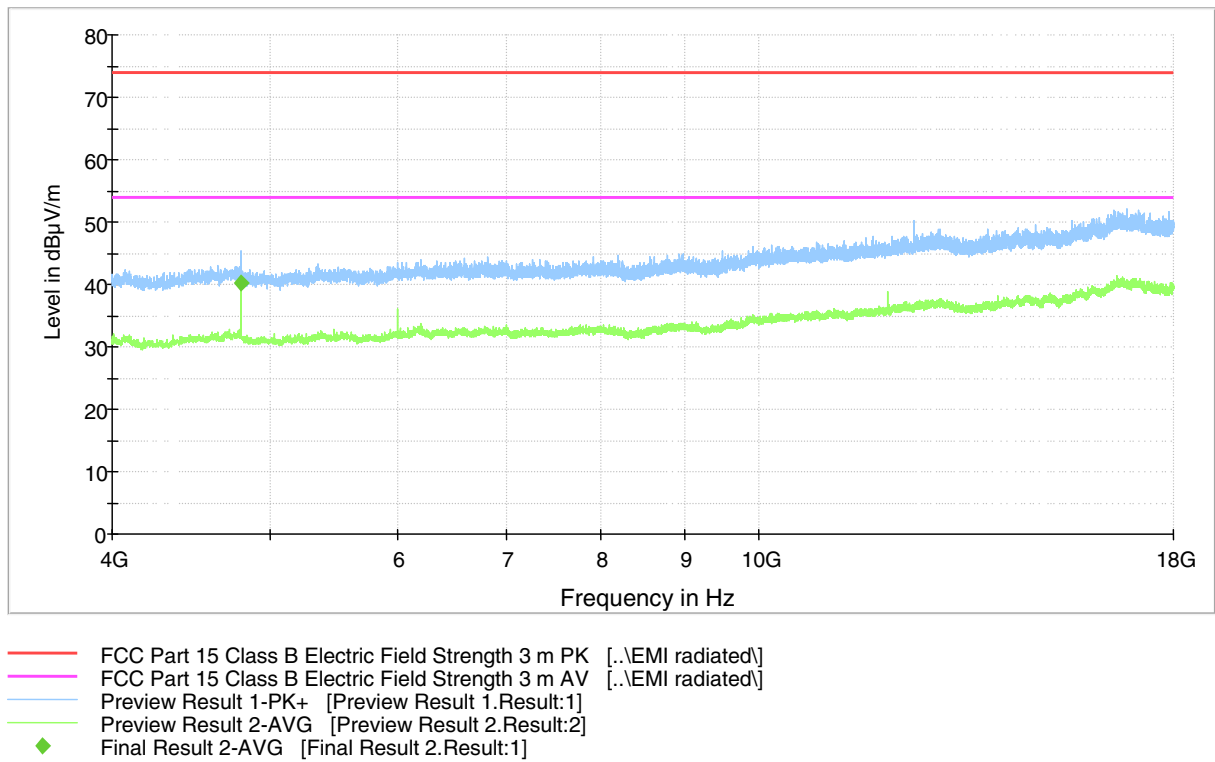


Figure 11. Measured curve with peak and average detectors (Low channel).

Table 6. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time 15x(ms)	BW (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4806.100000	40.0	1000.0	1000.000	230.0	V	296.0	9.5	13.9	53.9	-

Transmitter Radiated Emissions 30 MHz to 26.5 GHz

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

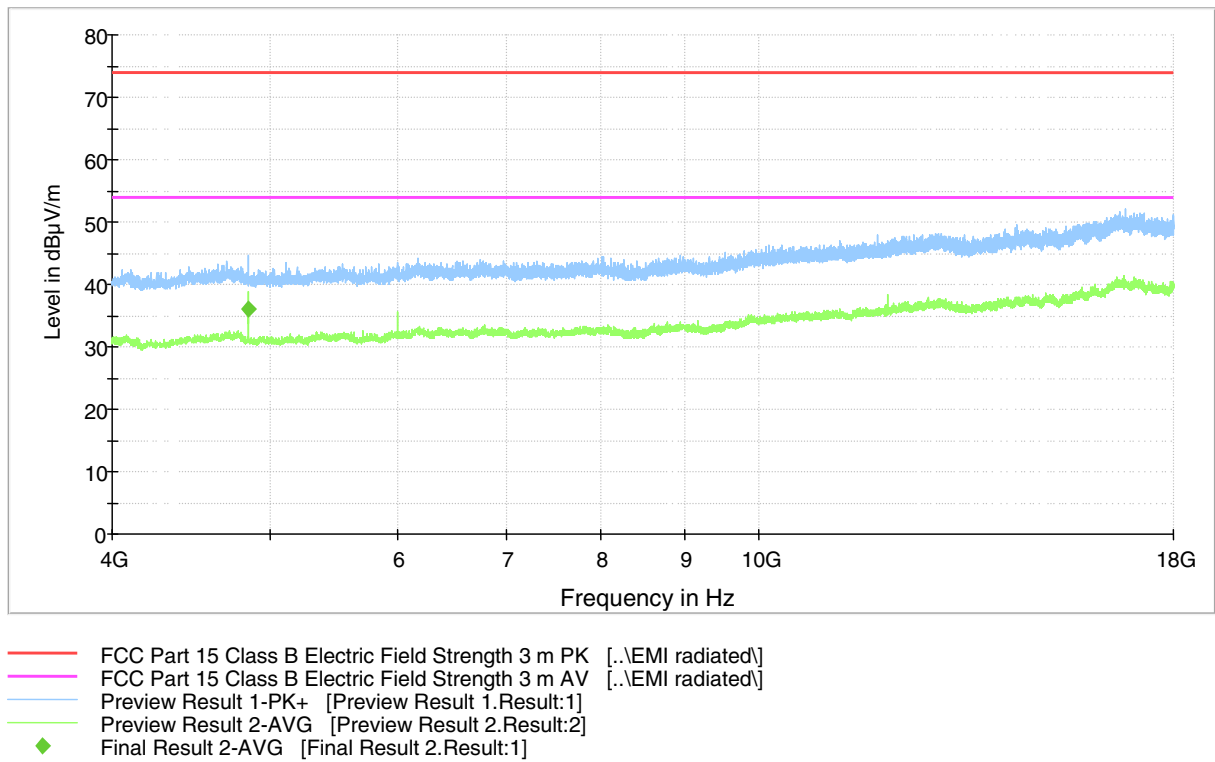


Figure 12. Measured curve with peak and average detectors (Mid channel).

Table 7. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time 15x(ms)	BW (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4854.000000	36.0	1000.0	1000.000	246.0	V	296.0	9.5	17.9	53.9	-

Transmitter Radiated Emissions 30 MHz to 26.5 GHz

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

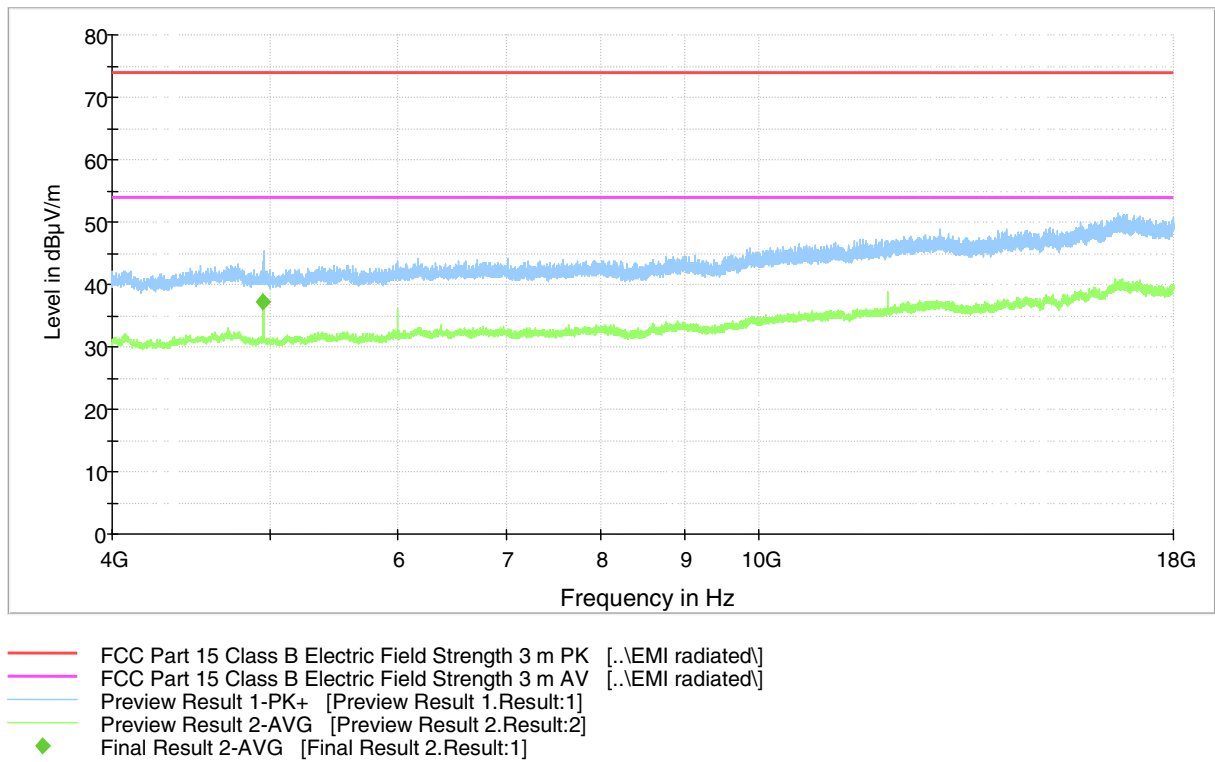


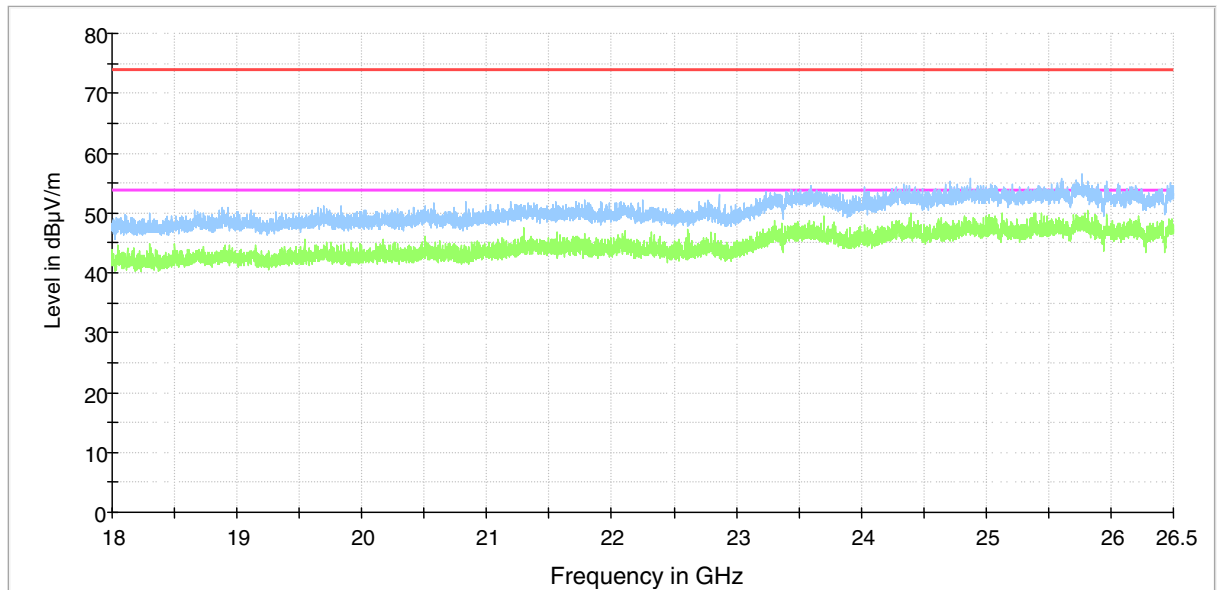
Figure 13. Measured curve with peak and average detectors (High channel).

Table 8. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time 15x(ms)	BW (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4958.000000	37.3	1000.0	1000.000	283.0	V	338.0	9.5	16.6	53.9	-

Transmitter Radiated Emissions 30 MHz to 26.5 GHz

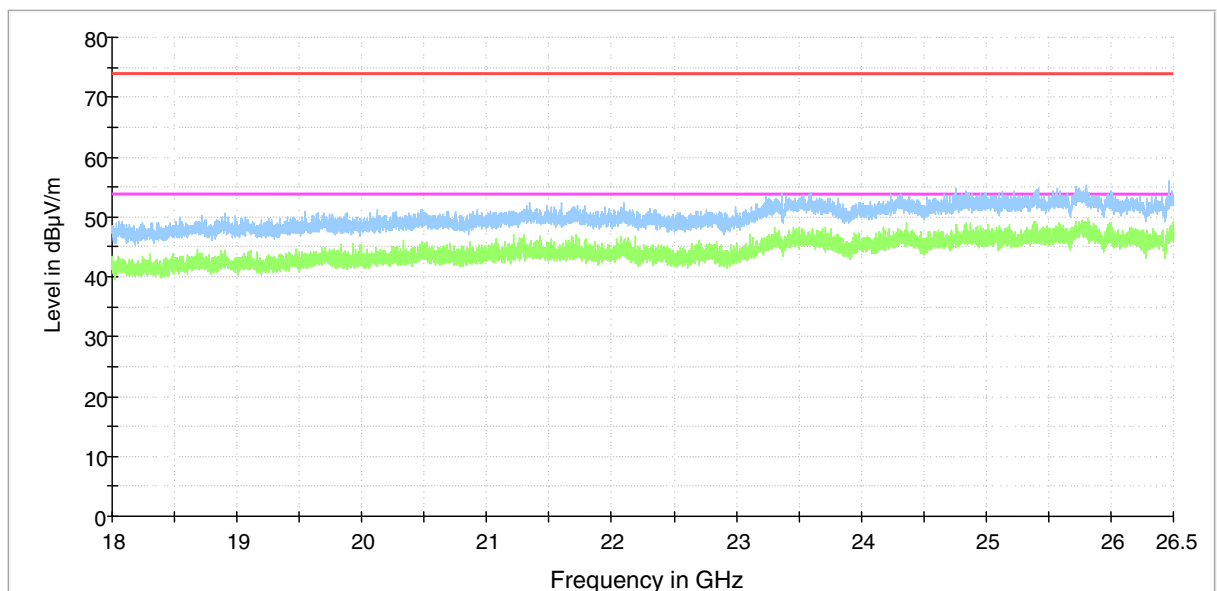
FCC Part 15 Class B Spurious Emission 18-26.5GHz 3m



- 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 14. Measured curve with peak and average detectors (Low channel).

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

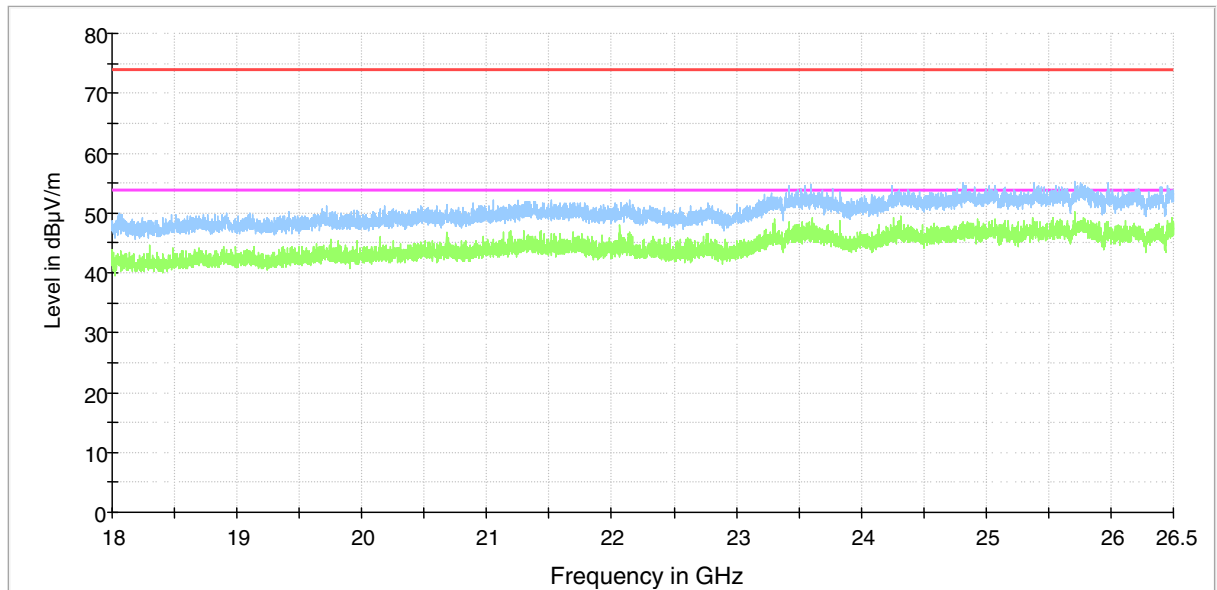


- FCC Part 15 Class B Electric Field Strength 3 m PK [..\EMI radiated\]
- FCC Part 15 Class B Electric Field Strength 3 m AV [..\EMI radiated\]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- Preview Result 2-AVG [Preview Result 2.Result:2]
- * Data Reduction Result 1 [1]-PK+ [Data Reduction Result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

Figure 15. 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 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 16. Measured curve with peak and average detectors (High channel).

Transmitter Radiated Emissions 30 MHz to 26.5 GHz

Radiated Band Edge Measurement results

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

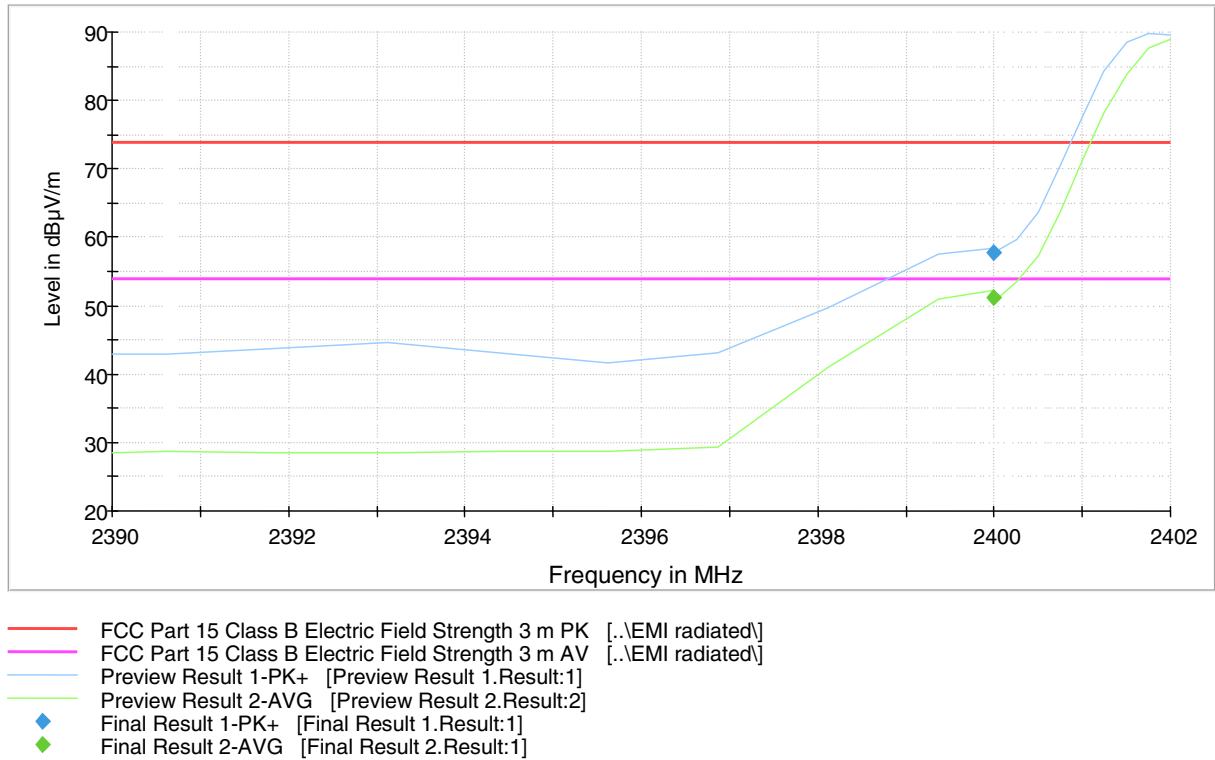


Figure 17. Low channel band edge.

Table 9. Final peak results

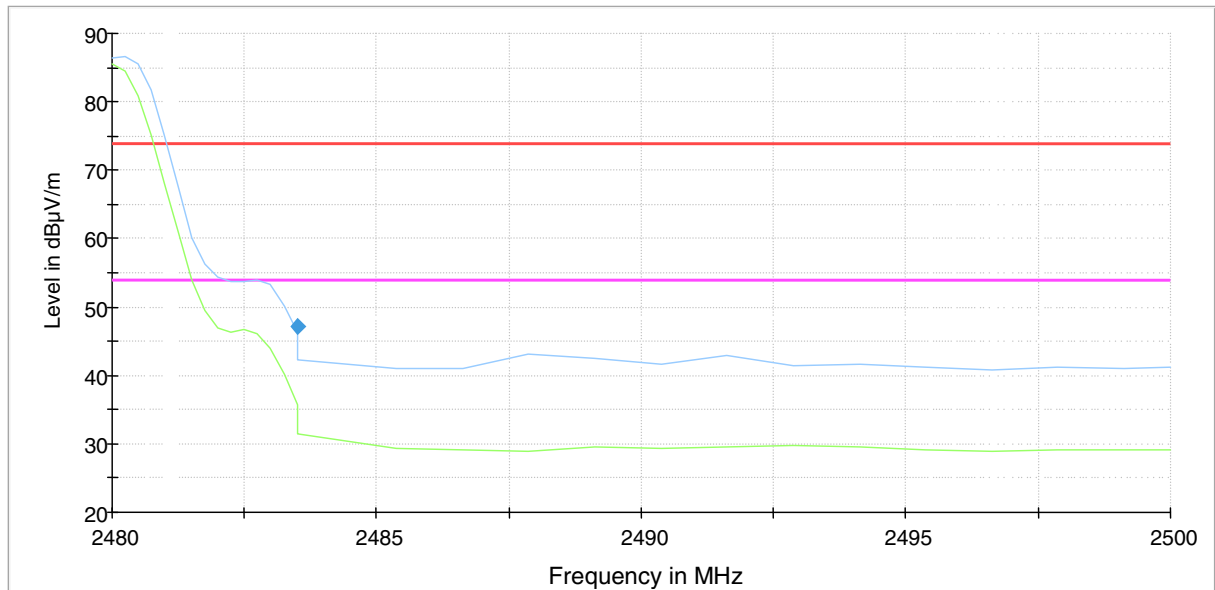
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time 15x(ms)	BW (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2400.000000	57.7	1000.0	1000.0	151.0	H	240.0	4.1	16.2	73.9	-

Table 10. Final average results

Frequency (MHz)	Average (dBµV/m)	Meas. Time 15x(ms)	BW (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2400.000000	51.2	1000.0	1000.0	151.0	H	239.0	4.1	2.7	53.9	-

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 18. High channel band edge.

Table 11. Final Peak results

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time 15x(ms)	BW (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2483.500000	47.2	1000.0	1000.0	179.0	H	183.0	4.4	26.7	73.9	-

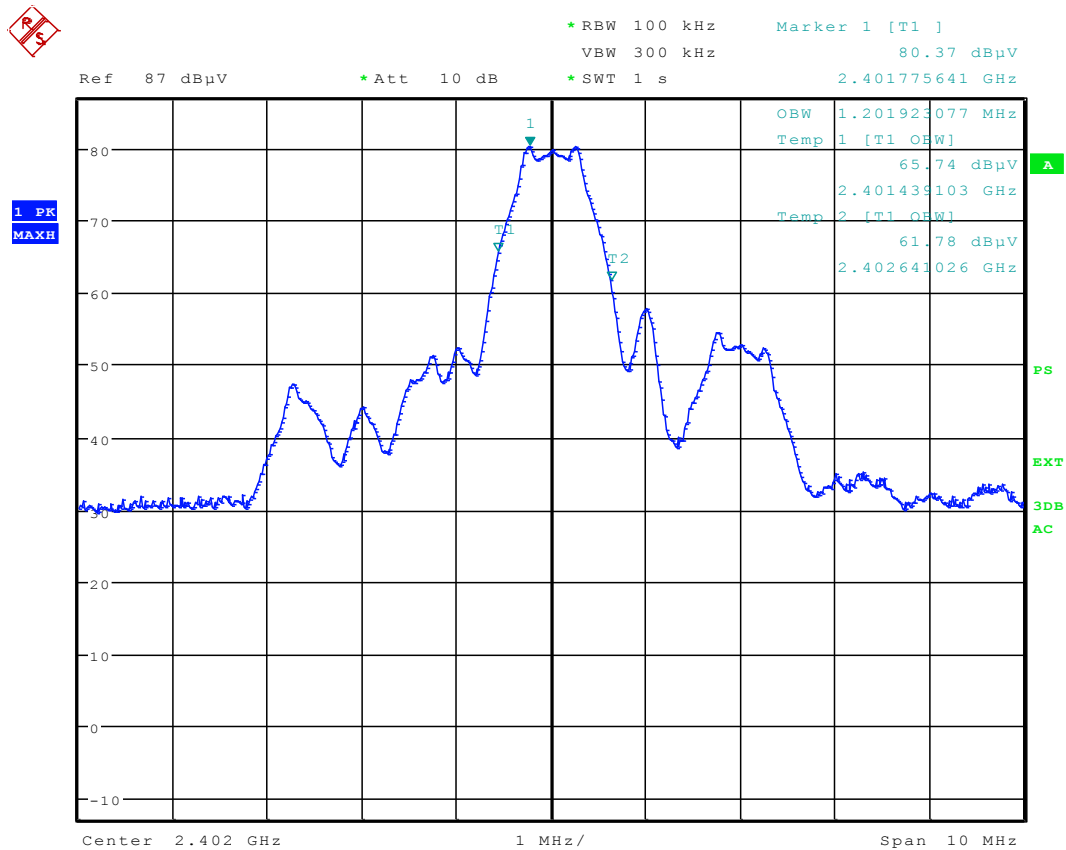
99% Occupied Bandwidth

Standard: RSS-GEN (2014)
Tested by: RRE
Date: 10 March 2016
Temperature: 22 ± 3 °C
Humidity: 30 - 60 % RH

RSS-GEN 6.6

Table 12. 99 % OBW test results.

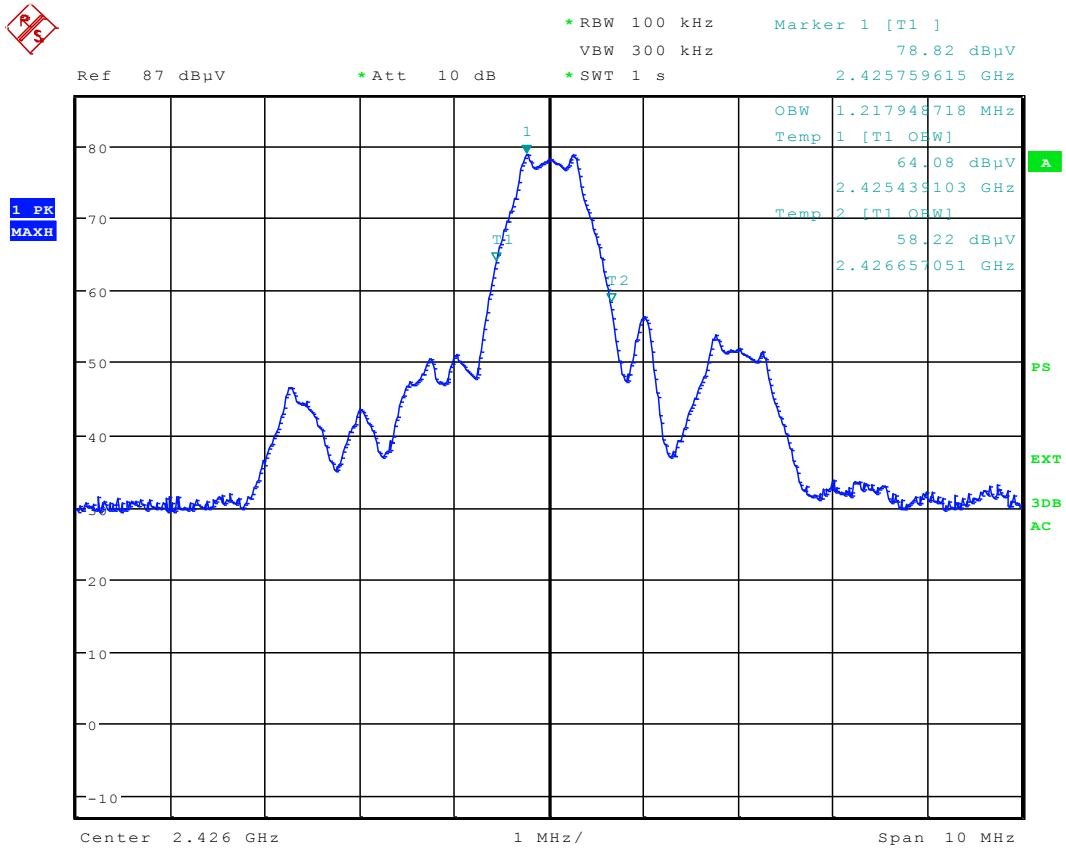
Channel	Limit	99 % BW [MHz]	Result
Low	-	1.201923077	PASS
Mid	-	1.217948718	PASS
High	-	1.137820513	PASS



Date: 10.MAR.2016 03:28:56

Figure 19. 99 % OBW. Low channel.

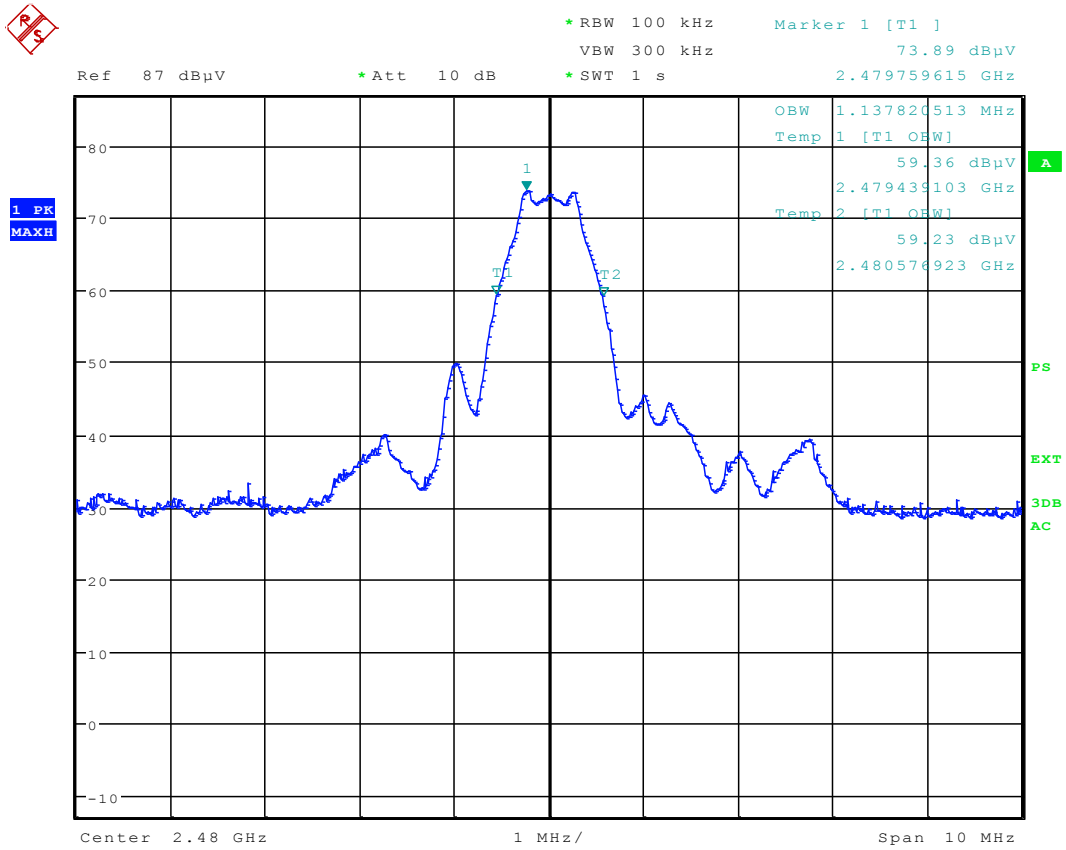
Transmitter Radiated Emissions 30 MHz to 26.5 GHz



Date: 10.MAR.2016 03:34:55

Figure 20. 99 % OBW. Mid channel.

Transmitter Radiated Emissions 30 MHz to 26.5 GHz



Date: 10.MAR.2016 03:40:00

Figure 21. 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
LISN	ROHDE & SCHWARZ	ENV216	101466	9611	2017-02-24