



FCC TEST REPORT FCC 47 CFR Part 15C ISED RSS-247 Digital transmission systems operating within the 2400 – 2483.5 MHz band	
Report Reference No.	G0M-1510-5171-T-02-FC247BL-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	<div style="display: flex; justify-content: center; align-items: center;">   </div> <p style="text-align: center; margin-top: 5px;"> A2LA Accredited Testing Laboratory, Certificate No.: 1983.01 FCC Filed Test Laboratory, Reg.-No.: 96970 ISED OATS Filing assigned code: 3470A </p>
Applicant's name	Grässlin GmbH
Address	Bundesstraße 36 78112 St. Georgen GERMANY
Test specification:	
Standard.....	47 CFR Part 15C RSS-247, Issue 1, 2015-05
Test scope.....	partial Radio compliance test (C2PC)
Equipment under test (EUT):	
Product description	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model No.	Carrier Board LCD-BLE
Additional Model(s)	None
Brand Name(s)	None
Hardware version	Rev_02
Firmware / Software version	V.1.0
	FCC-ID: 2AHH7-DG IC: N/A
Test result	Passed

Possible test case verdicts:

- neither assessed nor tested : N/N
- required by standard but not appl. to test object : N/A
- required by standard but not tested : N/T
- not required by standard for the test object : N/R
- test object does meet the requirement : P (Pass)
- test object does not meet the requirement : F (Fail)

Testing:


Test Lab Temperature : 20 – 23 °C


Test Lab Humidity : 32 – 38 %

Date of receipt of test item : 2016-01-20

Date (s) of performance of tests : 2016-03-02 – 2016-03-31

Compiled by : Matthias Handrik

Tested by (+ signature) : Matthias Handrik 
 (Responsible for Test)

Approved by (+ signature) : Christian Weber 
 (Head of Lab)

Date of issue : 2016-05-26

Total number of pages : 60

General remarks:

The test results presented in this report relate only to the object tested.
The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

Additional comments:

Partial test for Class II Permissive change according to permissive change letter

Version History

Version	Issue Date	Remarks	Revised by
01	2016-05-26	Initial Release	

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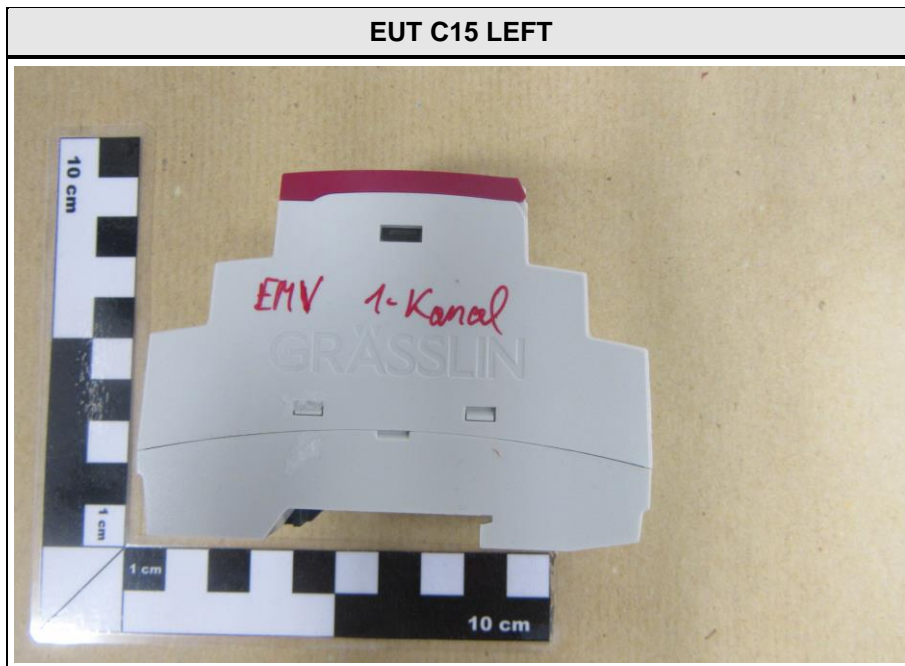
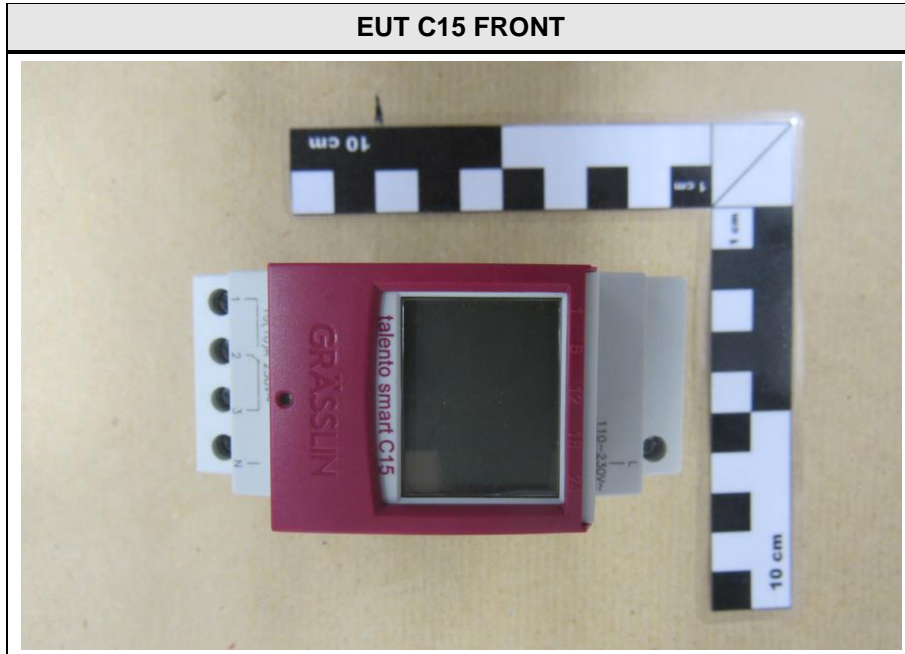
1 Equipment (Test item) Description

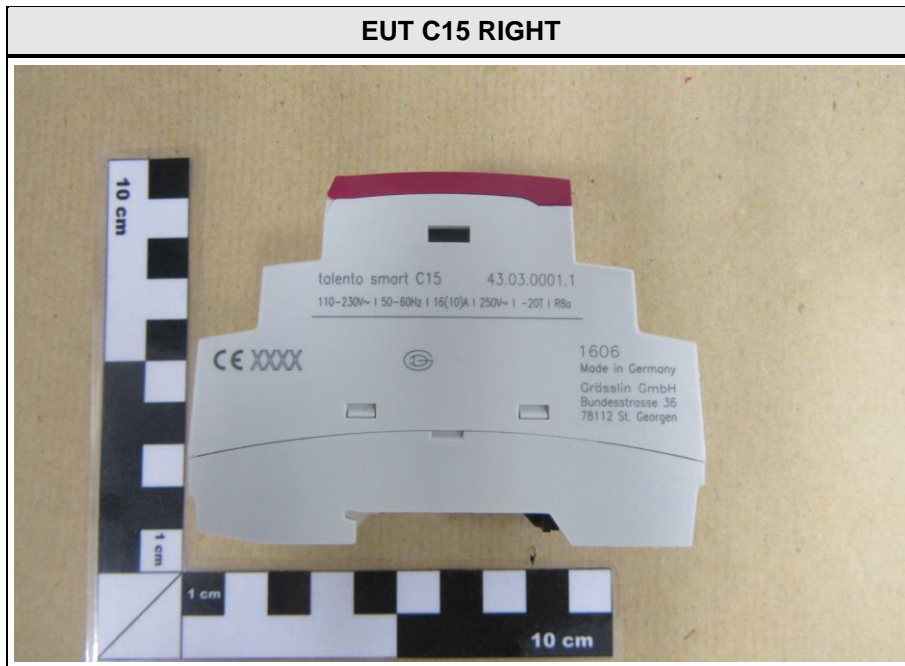
Description	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)	
Model	Carrier Board LCD-BLE	
Additional Model(s)	None	
Brand Name(s)	None	
Serial number	None	
Hardware version	Rev_02	
Software / Firmware version	V.1.0	
PMN	N/A	
HVIN	Carrier Board LCD-BLE	
FVIN	N/A	
HMN	N/A	
FCC ID	2AHH7-DG	
ISED Certification Number	N/A	
Equipment type	Radio module	
Radio type	Transceiver	
Radio technology	Bluetooth 4.2 Low Energy	
Operating frequency range	2402 - 2480 MHz	
Assigned frequency band	2400 - 2483.5 MHz	
Main test frequencies	F _{LOW}	2402 MHz
	F _{MID}	2442 MHz
	F _{HIGH}	2480 MHz
Spreading	Frequency Hopping	
Modulations	GFSK	
Number of channels	40	
Channel spacing	2MHz	
Number of antennas	1	
Antenna	Type	integrated
	Model	PCB Antenna
	Manufacturer	Graesslin
	Gain	+4.0 dBi (manufacturer declaration)
Manufacturer	Grässlin GmbH Bundesstraße 36 78112 St. Georgen GERMANY	
Power supply	V _{NOM}	120VAC
	V _{MIN}	85VAC
	V _{MAX}	253VAC
AC/DC-Adaptor	none	

Test Report No.: G0M-1510-5171-T-02-FC247BL-V01

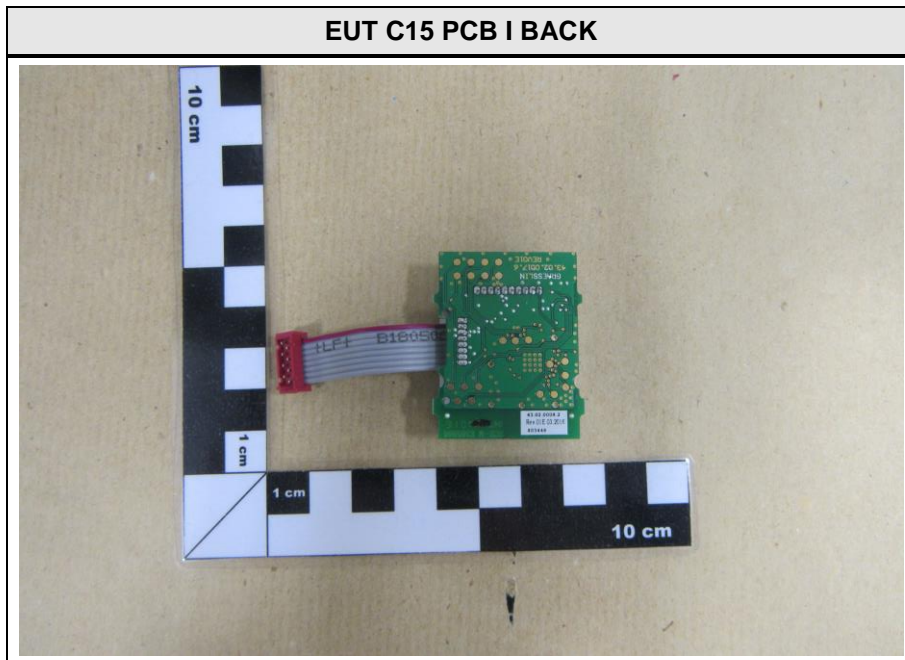
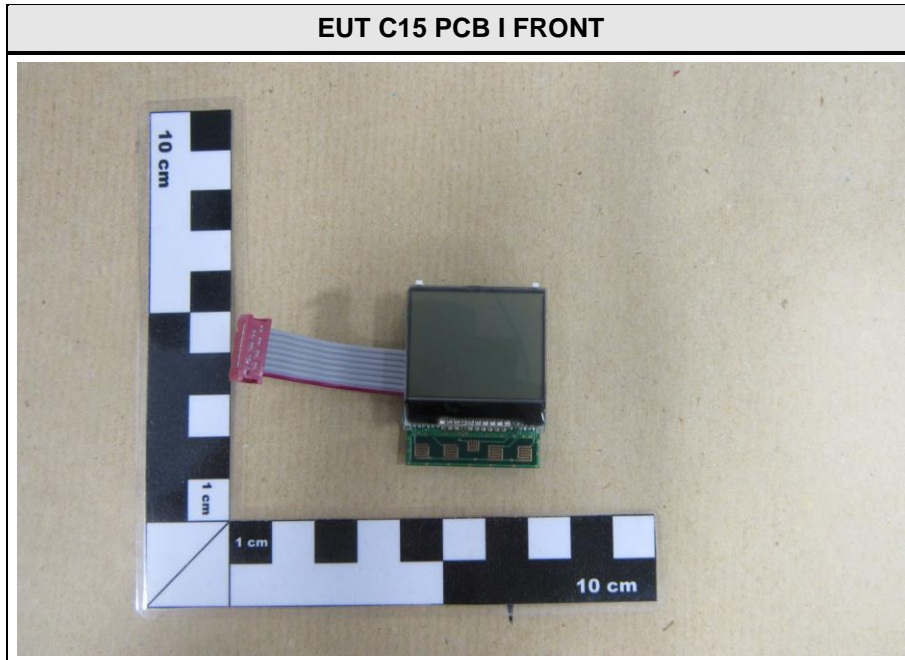
Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

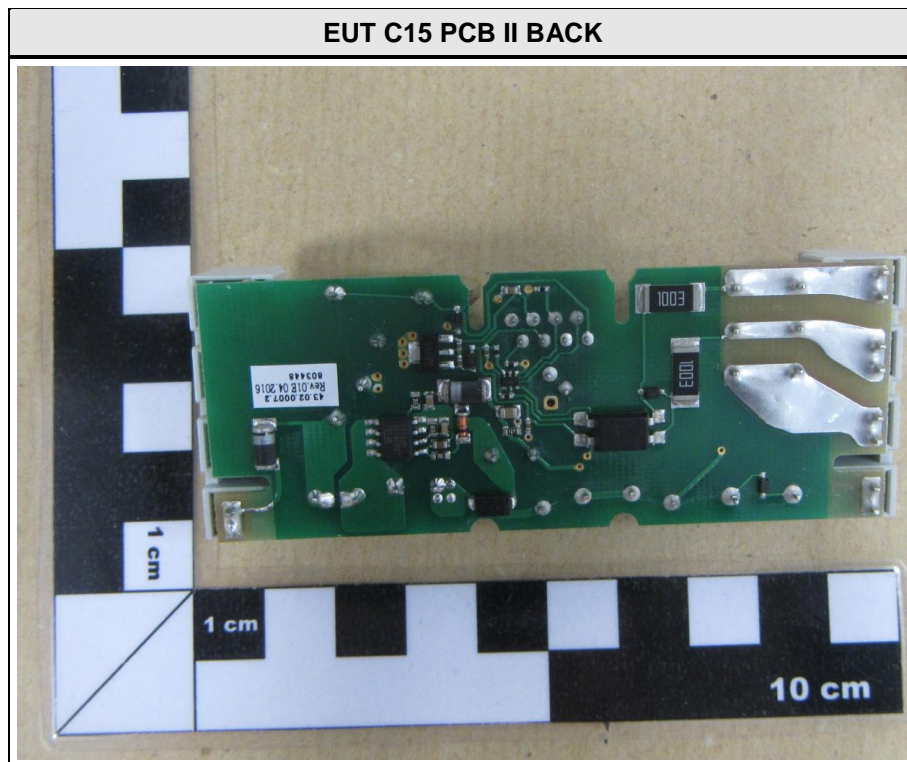
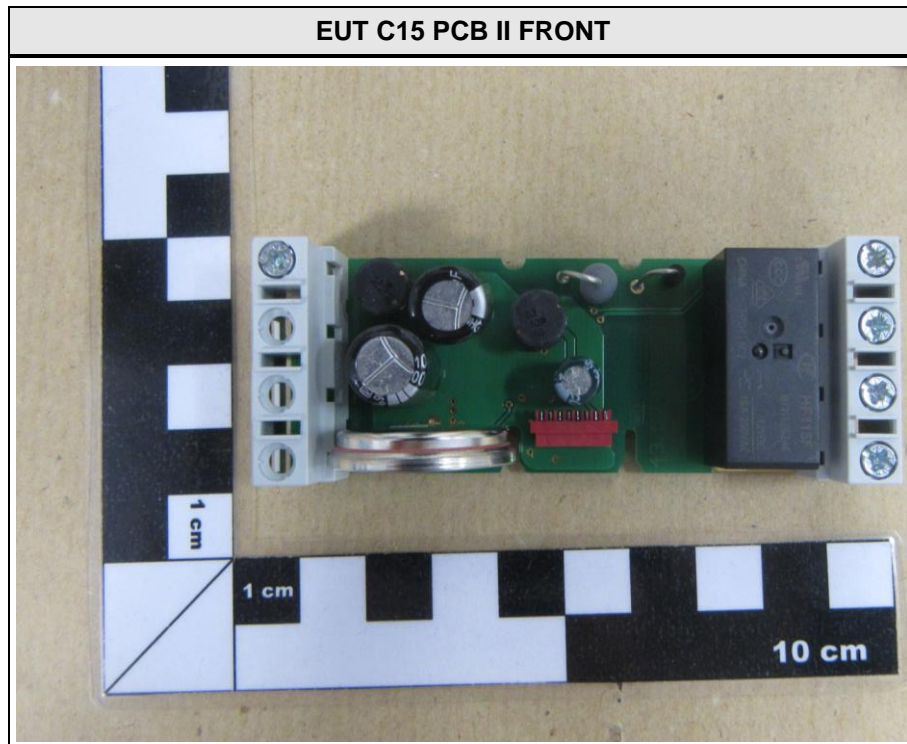
1.1 Photos – Equipment External



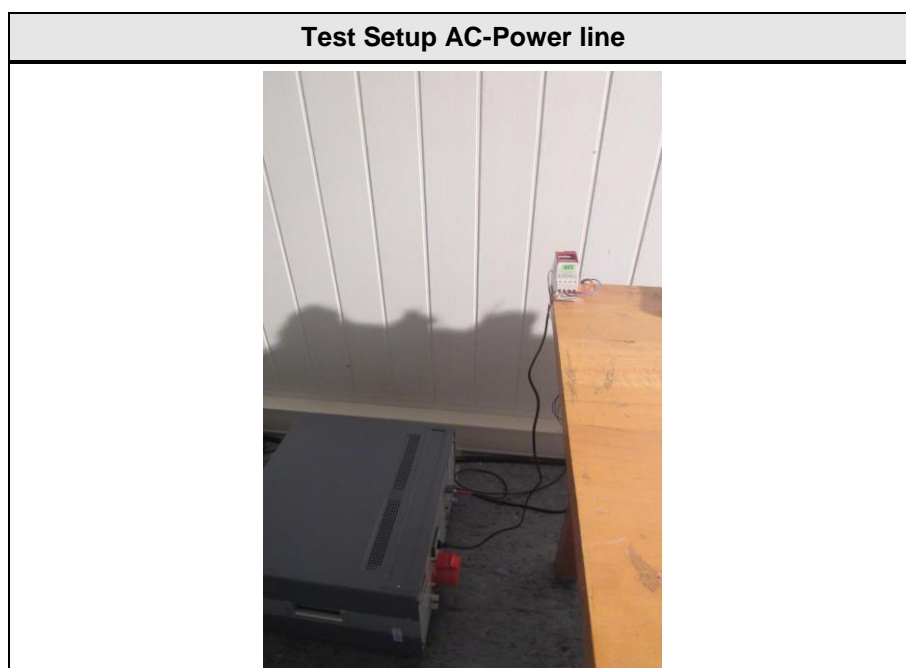
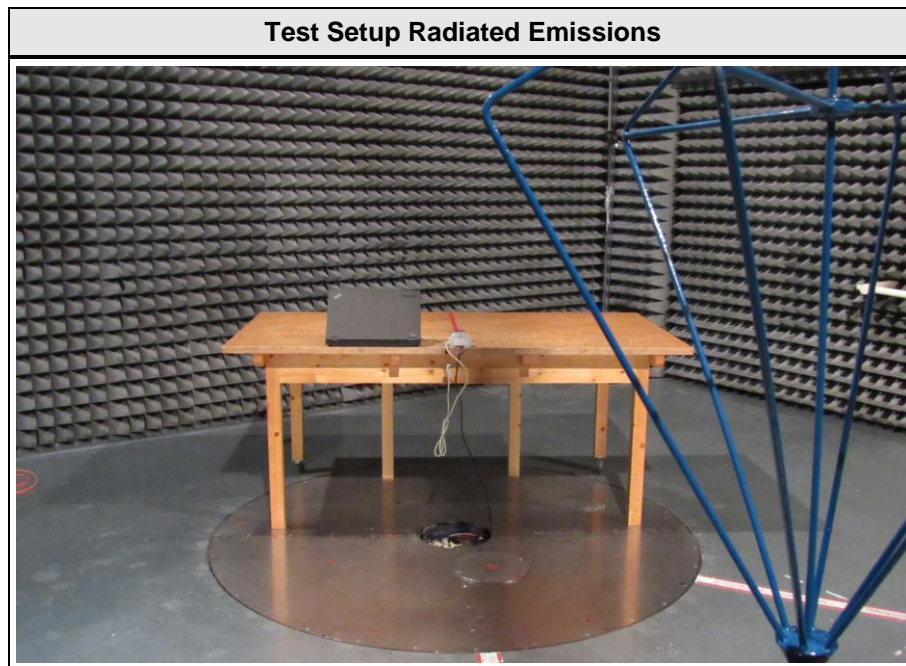


1.2 Photos – Equipment internal





1.3 Photos – Test setup



1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
AE	Laptop	Lenovo	ThinkPad T540p	Type 20BF-A07R05 S/N R9-02L0T1 14/06
AE	1-Channel 230VAC Timer Switch	Grässlin GmbH	Talento Smart C15	Host with EUT integrated
<p>*Note: Use the following abbreviations: AE : Auxiliary/Associated Equipment</p>				

1.5 Test Modes

Mode #	Description	
Transmit	General conditions:	EUT powered by AC-mains and controlled by Laptop.
	Radio conditions:	Mode = standalone transmit Spreading = Hopping stopped (single hopping channel) Modulation = GFSK Data rate = 1 Mbps Bandwidth = 2 MHz Duty cycle = 100 % Power level = -4dBm
AC-Powerline	General conditions:	EUT powered by AC-mains
	Radio conditions:	Mode = Transmit Spreading = On

1.6 Test Equipment Used During Testing

Measurement Software			
Description	Manufacturer	Name	Version
EMC Test Software	Dare Instruments	Radimation	2014.1.15

Radiated spurious emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-anechoic chamber	Frankonia	AC 1	EF00062	-	-
Spectrum Analyzer	R&S	FSIQ26	EF00242	2015-04	2016-04
Biconical antenna	R&S	HK116	EF00186	2016-02	2018-02
LPD Antenna	R&S	HL 223	EF00187	2014-03	2017-03
LPD Antenna	R&S	HL 025	EF00327	2015-10	2018-10

AC powerline conducted emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
AMN	R&S	ESH2-Z5	EF00182	2014-11	2016-11
AMN	R&S	ESH3-Z5	EF00036	2014-12	2016-12
EMI Test Receiver	R&S	ESCS 30	EF00295	2015-10	2016-10

1.7 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dB μ V. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

$$\text{Reading on Analyzer (dB}\mu\text{V)} + \text{A.F. (dB)} = \text{Net field strength (dB}\mu\text{V/m)}$$

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dB μ V/m). The FCC limits are given in units of μ V/m. The following formula is used to convert the units of μ V/m to dB μ V/m:

$$\text{Limit (dB}\mu\text{V/m)} = 20 * \log (\mu\text{V/m})$$

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

$$\begin{array}{rclcl} \text{Reading} & + & \text{AF} & = & \text{Net Reading} & : & \text{Net reading - FCC limit} & = & \text{Margin} \\ 21.5 \text{ dB}\mu\text{V} & + & 26 \text{ dB} & = & 47.5 \text{ dB}\mu\text{V/m} & : & 47.5 \text{ dB}\mu\text{V/m} - 57.0 \text{ dB}\mu\text{V/m} & = & -9.5 \text{ dB} \end{array}$$

2 Result Summary

FCC 47 CFR Part 15C, ISED RSS-247				
Product Specific Standard Section	Requirement – Test	Reference Method	Result	Remarks
RSS-Gen 6.6	Occupied Bandwidth	ANSI C63.10	N/N	
FCC § 15.247(a)(2) ISED RSS-247 § 5.2	6dB Bandwidth	ANSI C63.10	N/R	
FCC § 15.247(b)(3) ISED RSS-247 § 5.4	Maximum peak conducted power	ANSI C63.10	N/T	Change end equipment
FCC § 15.247(e) ISED RSS-247 § 5.2	Power spectral density	ANSI C63.10	N/N	
47 CFR 15.207 ISED RSS-247 § 3.1	AC power line conducted emissions	ANSI C63.4	PASS	
FCC § 15.247(d) ISED RSS-247 § 5.5	Band edge compliance	ANSI C63.10	N/N	
FCC § 15.247(d) ISED RSS-247 § 5.5	Conducted spurious emissions	ANSI C63.10	N/N	
FCC § 15.247(d) FCC § 15.209 ISED RSS-247 § 5.5	Transmitter radiated spurious emissions	ANSI C63.10	PASS	
ISED RSS-247 § 3.1	Receiver radiated spurious emissions	ANSI C63.10	N/N	
Remarks:				
Test selection for Class II Permissive change according to permissive change letter				

3 Test Conditions and Results

3.1 Test Conditions and Results – AC power line conducted emissions

Power line conducted emissions acc. to FCC 47 CFR 15.207 / ISED RSS-Gen		Verdict: PASS		
Test according referenced standards	Reference Method			
	ANSI C63.4			
Fully configured sample scanned over the following frequency range	Frequency range			
	0.15 MHz to 30 MHz			
Points of Application	Application Interface			
AC Mains	LISN			
EUT test mode	AC power line			
Limits and results				
Frequency [MHz]	Quasi-Peak [dB μ V]	Result	Average [dB μ V]	Result
0.15 to 5	66 to 56*	PASS	56 to 46*	PASS
0.5 to 5	56	PASS	46	PASS
5 to 30	60	PASS	50	PASS
Comments:				
* Limit decreases linearly with the logarithm of the frequency.				

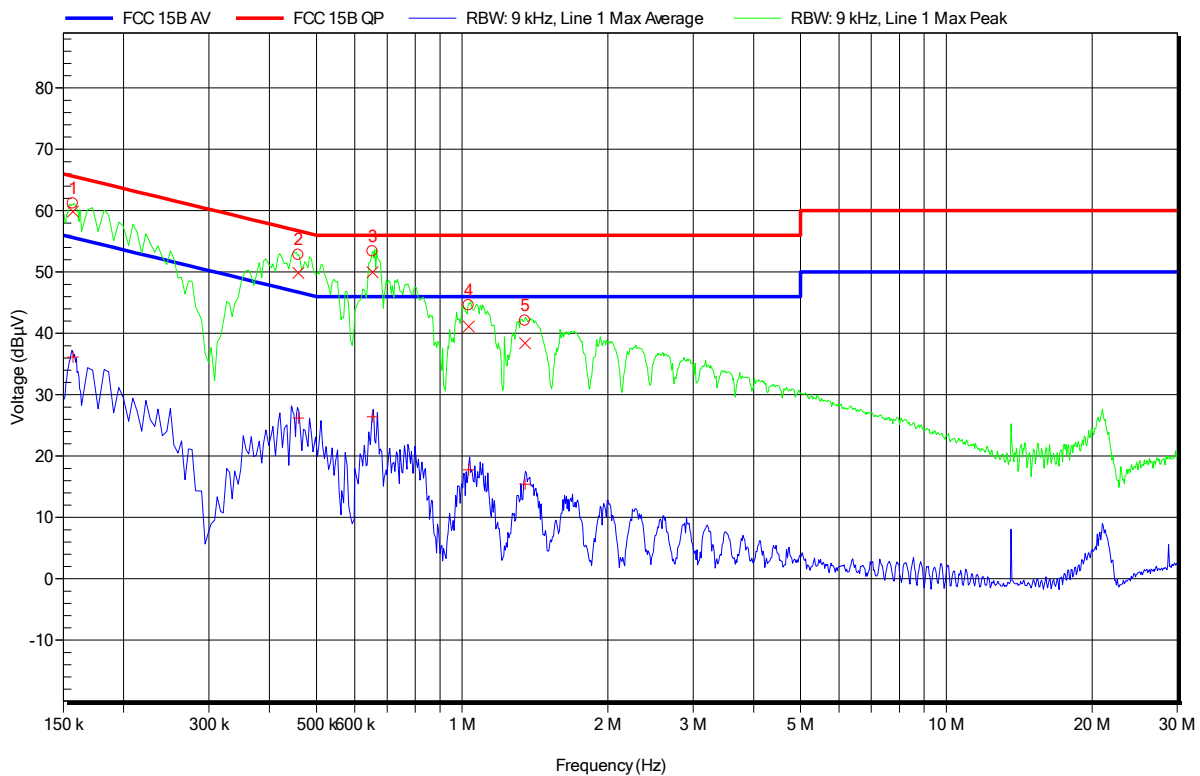
Conducted Emissions C15

EMI voltage test in the ac-mains according to FCC Part 15b

Project number: G0M-1510-5171

Applicant: Grässlin GmbH
 EUT Name: 2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
 Model: Carrier Board LCD-BLE
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Yu
 Test Conditions: Tnom: 23°C, Unom: 120V AC
 LISN: ESH2-Z5 L
 Mode: 1
 Test Date: 2016-03-09
 Note:

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Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	157.2 kHz	59.88 dBµV	65.61 dBµV	-5.73 dB	Pass
2	458.7 kHz	49.89 dBµV	56.72 dBµV	-6.83 dB	Pass
3	653.1 kHz	49.96 dBµV	56 dBµV	-6.04 dB	Pass
4	1.032 MHz	41.13 dBµV	56 dBµV	-14.87 dB	Pass
5	1.348 MHz	38.39 dBµV	56 dBµV	-17.61 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	157.2 kHz	36.13 dBµV	55.61 dBµV	-19.48 dB	Pass
2	458.7 kHz	26.22 dBµV	46.72 dBµV	-20.5 dB	Pass
3	653.1 kHz	26.43 dBµV	46 dBµV	-19.57 dB	Pass
4	1.032 MHz	17.79 dBµV	46 dBµV	-28.21 dB	Pass
5	1.348 MHz	15.43 dBµV	46 dBµV	-30.57 dB	Pass

Test Report No.: G0M-1510-5171-T-02-FC247BL-V01

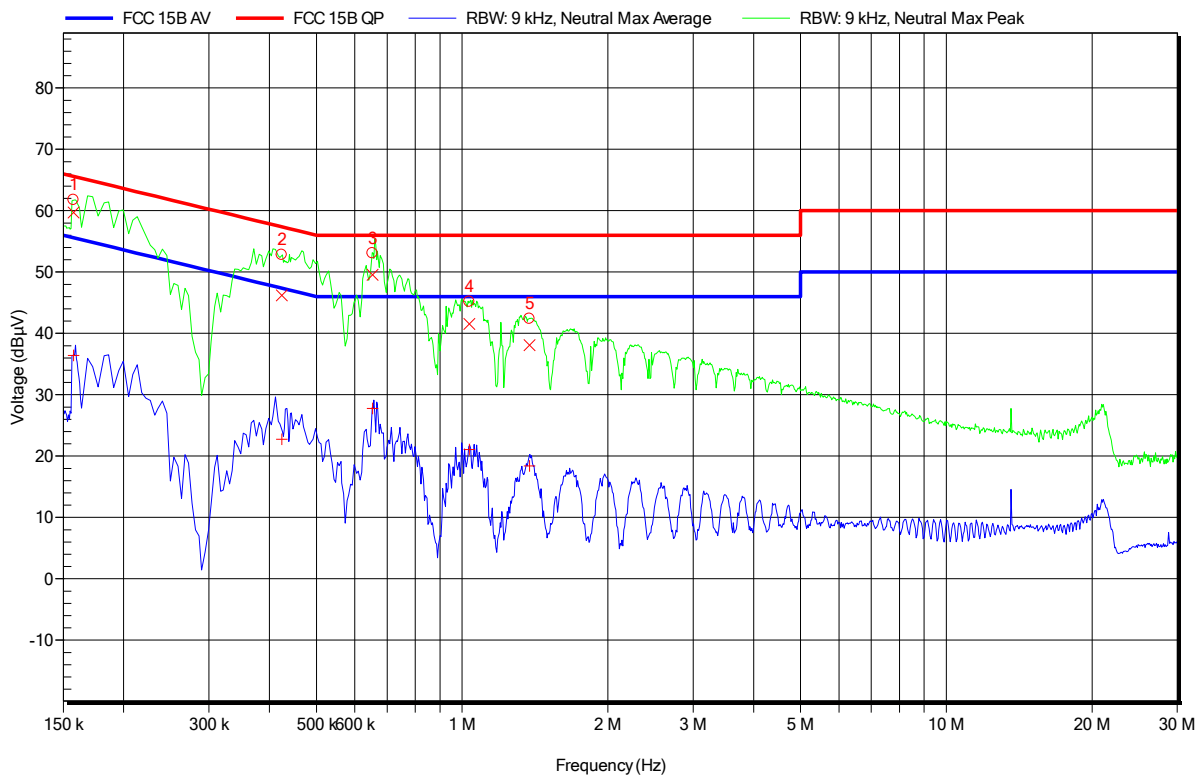
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 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Conducted Emissions C15
EMI voltage test in the ac-mains according to FCC Part 15b

Project number: G0M-1510-5171

Applicant: Grässlin GmbH
 EUT Name: 2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
 Model: Carrier Board LCD-BLE
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Yu
 Test Conditions: Tnom: 23°C, Unom: 120V AC
 LISN: ESH2-Z5 N
 Mode: 1
 Test Date: 2016-03-09
 Note:

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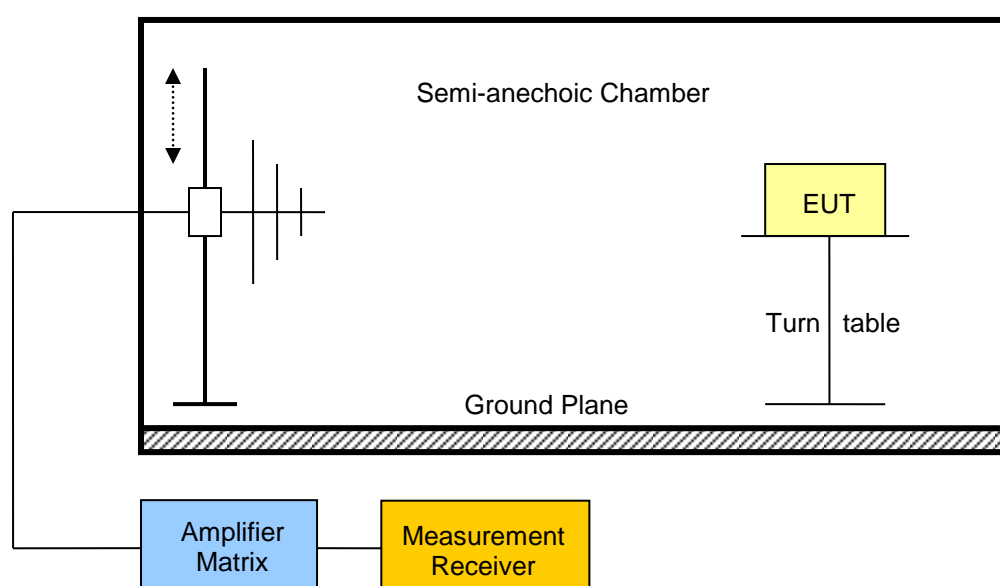
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	157.65 kHz	59.7 dBµV	65.59 dBµV	-5.89 dB	Pass
2	424.5 kHz	46.22 dBµV	57.36 dBµV	-11.14 dB	Pass
3	653.55 kHz	49.56 dBµV	56 dBµV	-6.44 dB	Pass
4	1.034 MHz	41.52 dBµV	56 dBµV	-14.48 dB	Pass
5	1.378 MHz	38.07 dBµV	56 dBµV	-17.93 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	157.65 kHz	36.4 dBµV	55.59 dBµV	-19.19 dB	Pass
2	424.5 kHz	22.74 dBµV	47.36 dBµV	-24.62 dB	Pass
3	653.55 kHz	27.78 dBµV	46 dBµV	-18.22 dB	Pass
4	1.034 MHz	21.04 dBµV	46 dBµV	-24.96 dB	Pass
5	1.378 MHz	18.4 dBµV	46 dBµV	-27.6 dB	Pass

Test Report No.: G0M-1510-5171-T-02-FC247BL-V01

 Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

3.2 Test Conditions and Results – Transmitter radiated emissions

Transmitter radiated emissions acc. to FCC 47 CFR 15.247 / ISED RSS-247				Verdict: PASS	
Test according referenced standards		Reference Method			
		FCC 15.247(d) / ISED RSS-247 5.5			
Test according to measurement reference		Reference Method			
		ANSI C63.10			
Test frequency range		Tested frequencies			
		30 MHz – 10 th Harmonic			
Limits					
Frequency range [MHz]	Detector	Limit [μ V/m]	Limit [dB μ V/m]	Limit Distance [m]	
30 – 88	Quasi-Peak	100	40	3	
88 – 216	Quasi-Peak	150	43.5	3	
216 – 960	Quasi-Peak	200	46	3	
960 – 1000	Quasi-Peak	500	54	3	
> 1000	Average	500	54	3	
<p>Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)). When average radiated emission measurements are specified, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.</p>					
Test setup					
 <p>The diagram illustrates the test setup. A Semi-anechoic Chamber is shown with a Ground Plane at the bottom. Inside the chamber, an Amplifier Matrix is connected to a Measurement Receiver. The Equipment Under Test (EUT) is placed on a Turn table. The chamber walls are lined with absorbers to minimize reflections. A vertical scale bar is shown on the left side of the chamber.</p>					

Test procedure									
1. EUT set to test mode (Communication tester is used if needed) 2. Span it set according to measurement range 3. Resolution bandwidth below 1 GHz is set according to CISPR 16 with peak/quasi-peak detector and RBW of 1 MHz with peak/average detector is used above 1 GHz 4. Markers are set to peak emission levels within restricted bands									
Test results C15									
Channel	Frequency [MHz]	Mode	Emission [MHz]	Level [dB μ V/m]	Det.	Pol.	Limit [dB μ V/m]	Limit dist. [m]*	Margin [dB]
F _{LOW}	2402	Transmit	1881.4	40.60	pk	hor	95.00	3	-54.40
F _{LOW}	2402	Transmit	1881.4	39.53	pk	ver	95.00	3	-55.47
F _{LOW}	2402	Transmit	1920.4	45.08	pk	hor	95.00	3	-49.92
F _{LOW}	2402	Transmit	1925.6	50.21	pk	ver	95.00	3	-44.79
F _{LOW}	2402	Transmit	4800	53.11	pk	hor	74.00	3	-20.89
F _{LOW}	2402	Transmit	4800	53.02	pk	ver	74.00	3	-20.98
F _{MID}	2442	Transmit	1921.2	48.47	pk	hor	95.00	3	-46.53
F _{MID}	2442	Transmit	1926.8	57.70	pk	ver	95.00	3	-37.30
F _{MID}	2442	Transmit	2547.2	53.89	pk	hor	95.00	3	-41.11
F _{MID}	2442	Transmit	2547.2	53.59	pk	ver	95.00	3	-41.41
F _{MID}	2442	Transmit	4872	52.82	pk	ver	74.00	3	-21.18
F _{MID}	2442	Transmit	4880	52.82	pk	hor	74.00	3	-21.18
F _{MID}	2442	Transmit	7320	46.83	pk	hor	74.00	3	-27.17
F _{HIGH}	2480	Transmit	2512	53.36	pk	hor	95.00	3	-41.64
F _{HIGH}	2480	Transmit	2512	53.78	pk	ver	95.00	3	-41.22
F _{HIGH}	2480	Transmit	2548	50.18	pk	hor	95.00	3	-44.82
F _{HIGH}	2480	Transmit	2548	53.04	pk	ver	95.00	3	-41.96
F _{HIGH}	2480	Transmit	4952	51.54	pk	ver	74.00	3	-22.46
F _{HIGH}	2480	Transmit	4960	51.38	pk	hor	74.00	3	-22.62
Comments: * Physical distance between EUT and measurement antenna.									

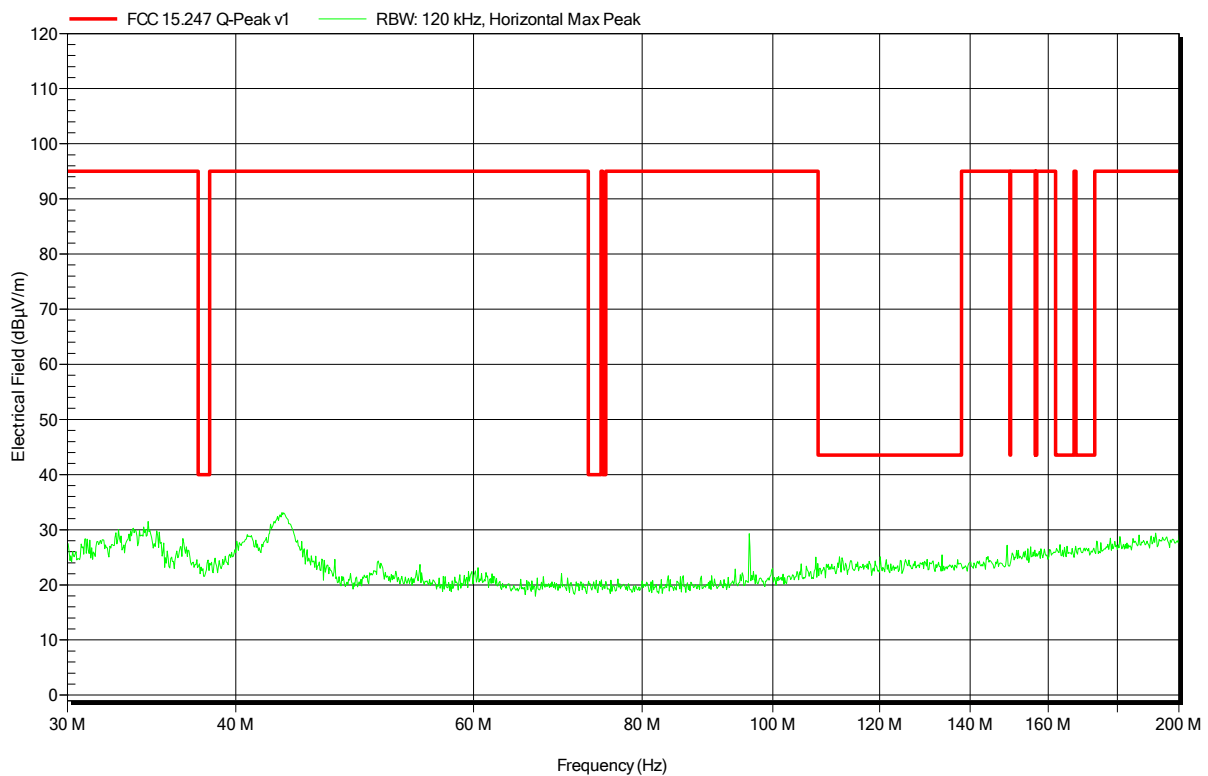
ANNEX A Transmitter radiated spurious emissions

Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; BT LE, CH.0, 2402 MHz
Test Date:	2016-03-03
Note:	Power Setting = -4 dBm, Modulated

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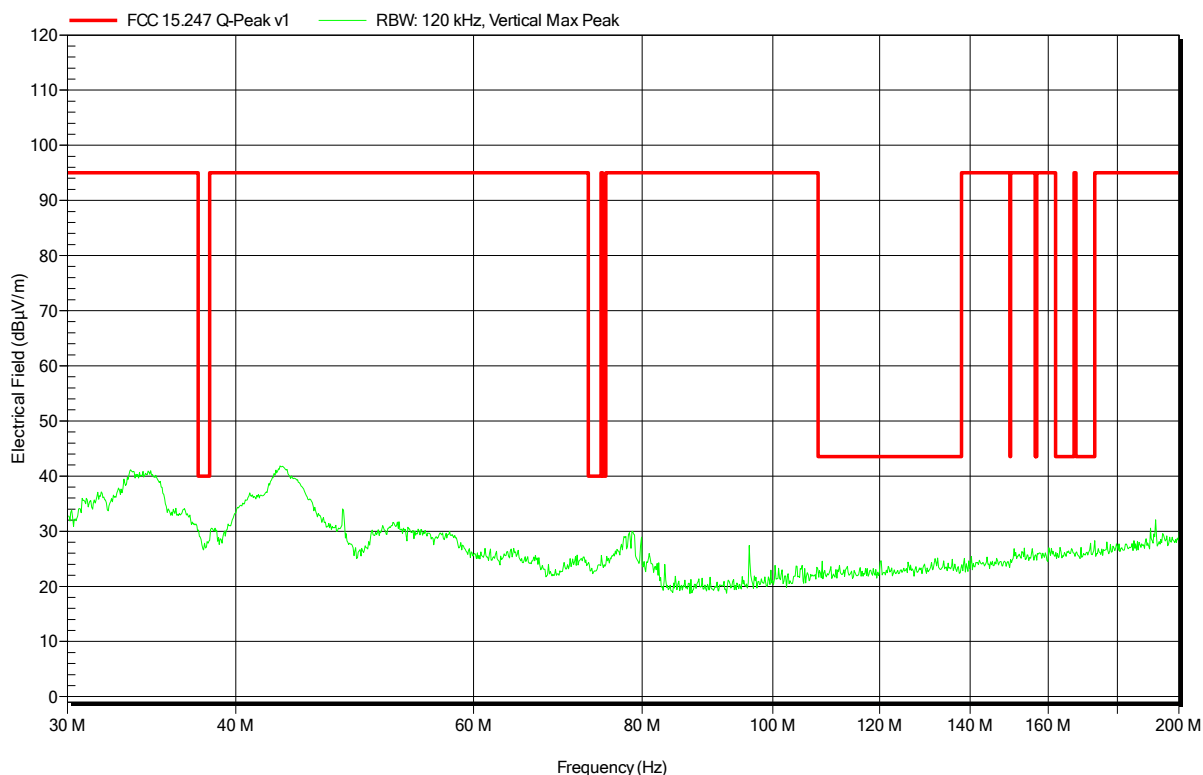


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Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; BT LE, CH.0, 2402 MHz
Test Date:	2016-03-03
Note:	Power Setting = -4 dBm, Modulated

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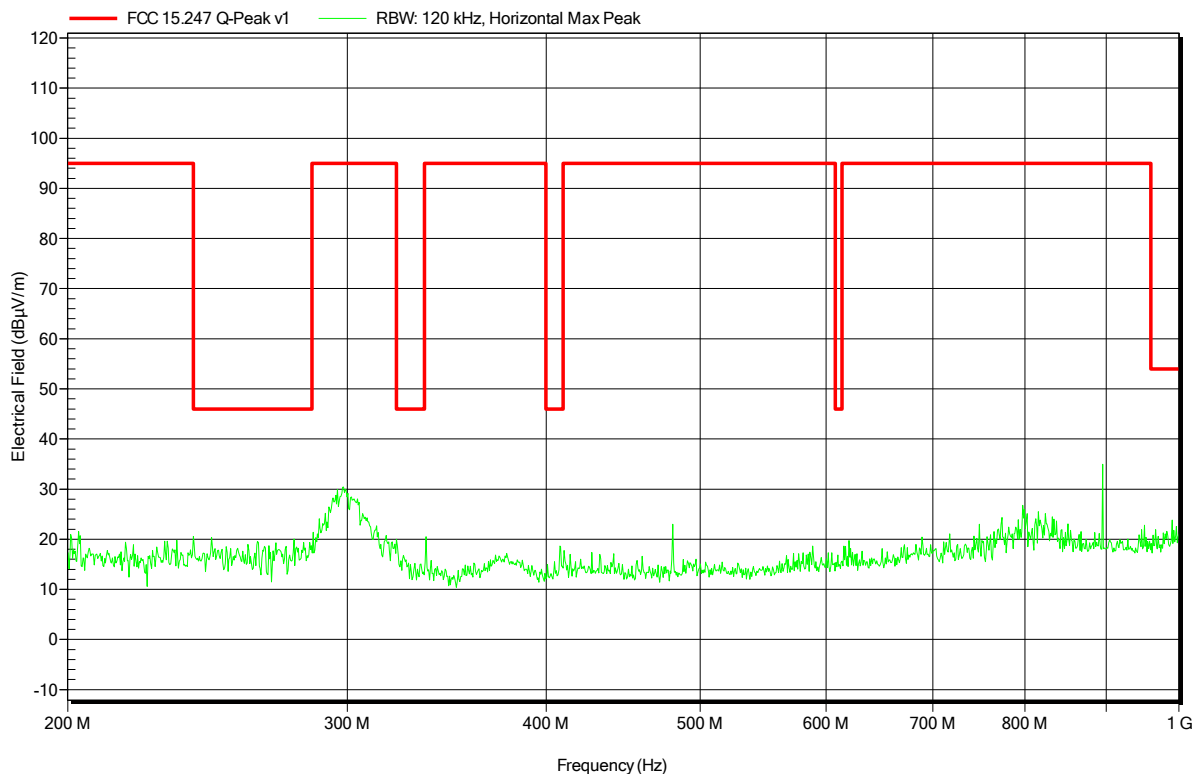


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

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EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; BT LE, CH.0, 2402 MHz
Test Date:	2016-03-03
Note:	Power Setting = -4 dBm, Modulated

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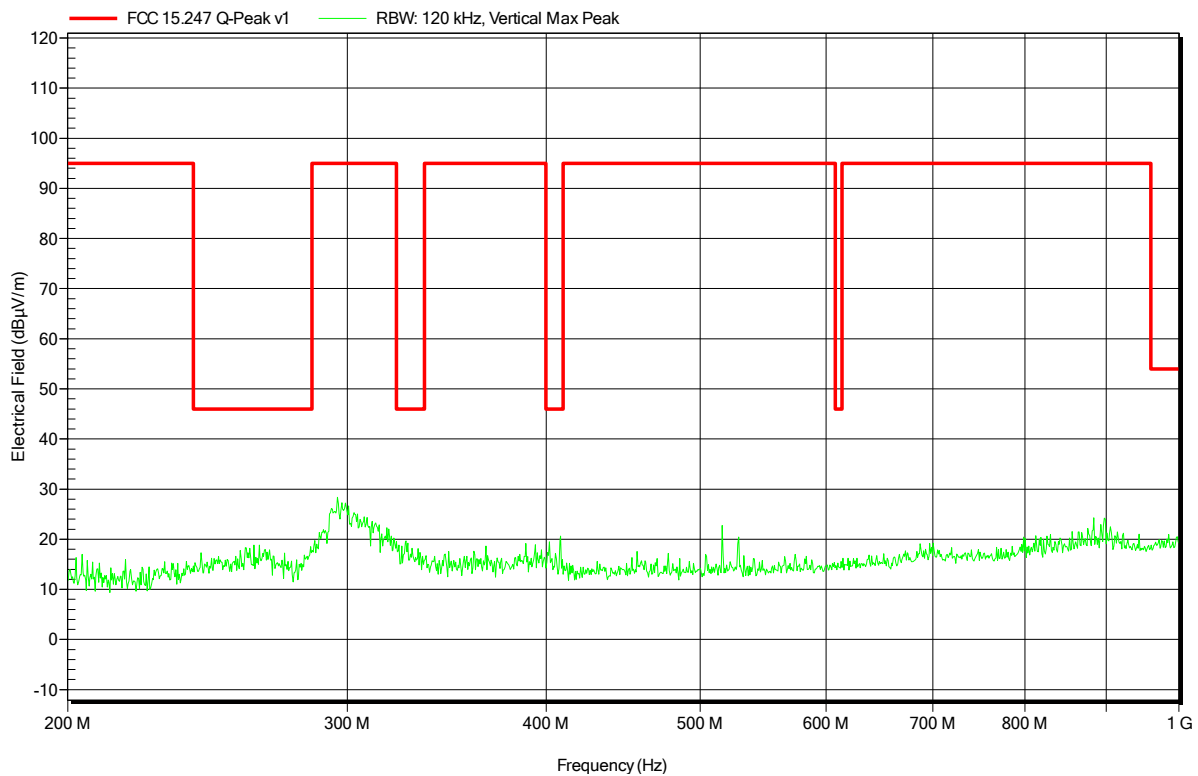


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Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; BT LE, CH.0, 2402 MHz
Test Date:	2016-03-03
Note:	Power Setting = -4 dBm, Modulated

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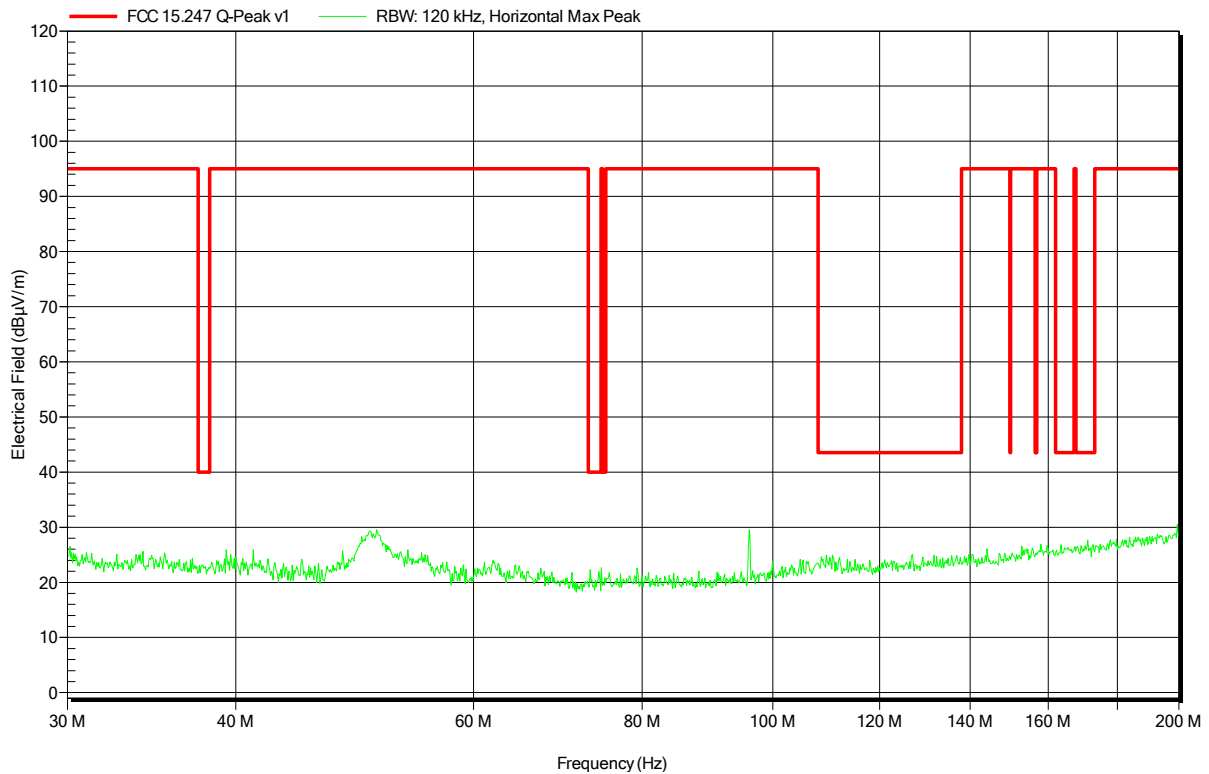


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Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; BT LE, CH.19, 2440 MHz
Test Date:	2016-03-04
Note:	Power Setting = -4 dBm, Modulated

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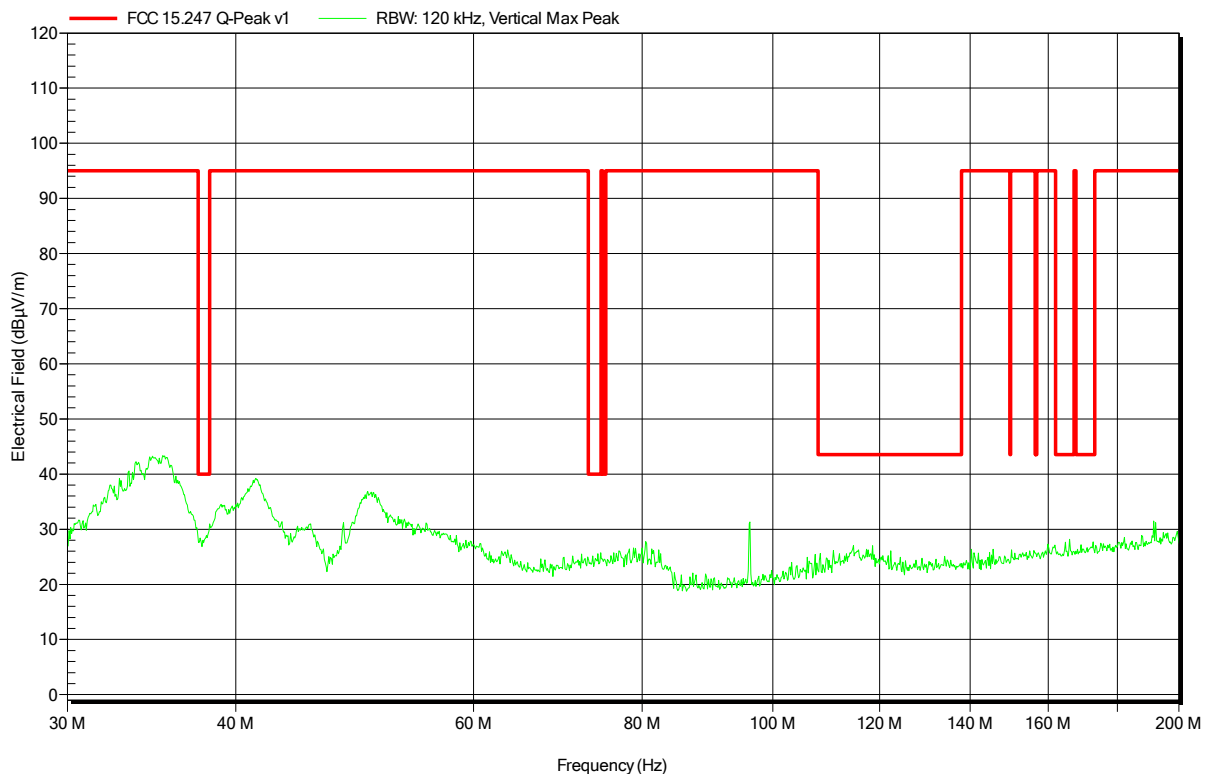


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Operator:	Mr. Weber
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Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; BT LE, CH.19, 2440 MHz
Test Date:	2016-03-04
Note:	Power Setting = -4 dBm, Modulated

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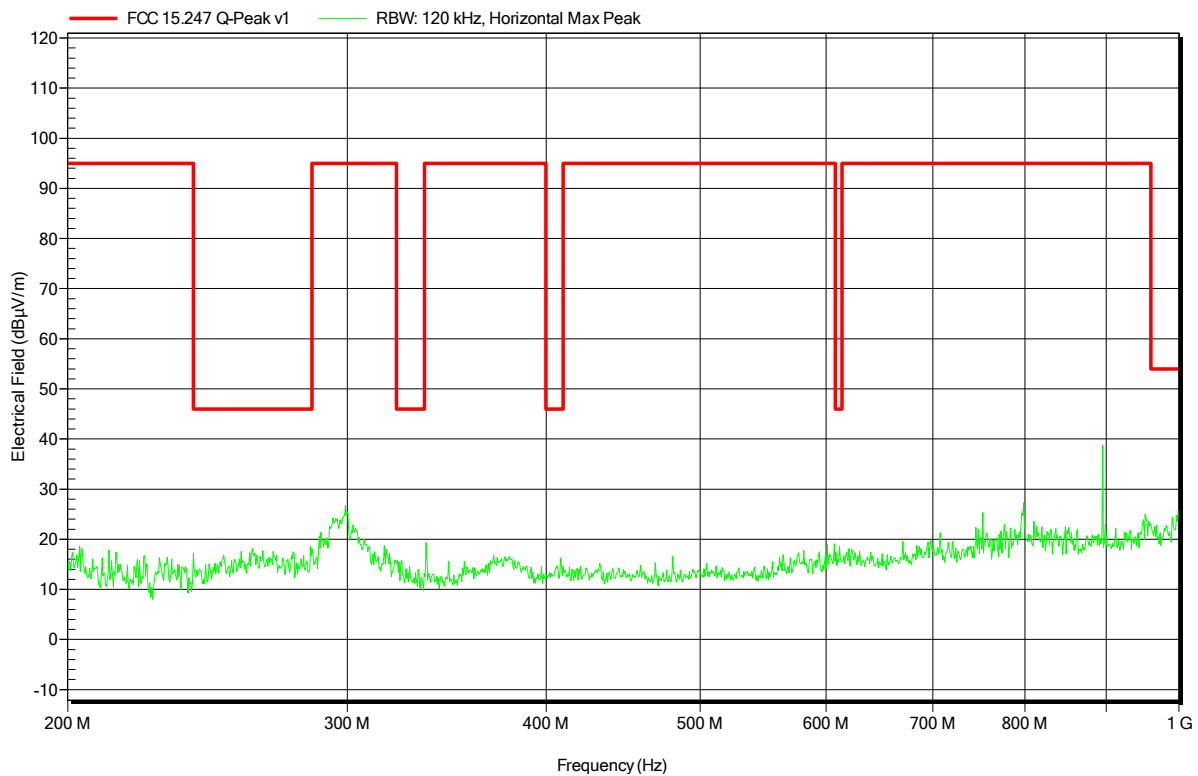


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; BT LE, CH.19, 2440 MHz
Test Date:	2016-03-03
Note:	Power Setting = -4 dBm, Modulated

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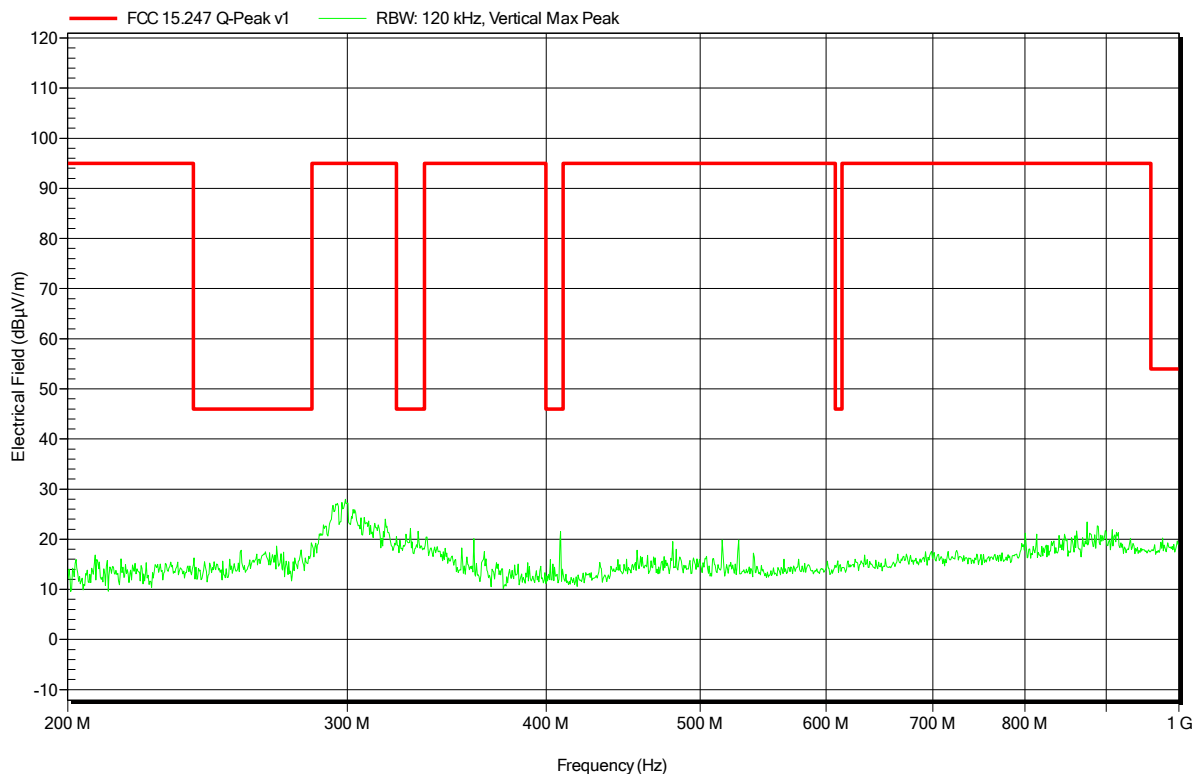


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; BT LE, CH.19, 2440 MHz
Test Date:	2016-03-03
Note:	Power Setting = -4 dBm, Modulated

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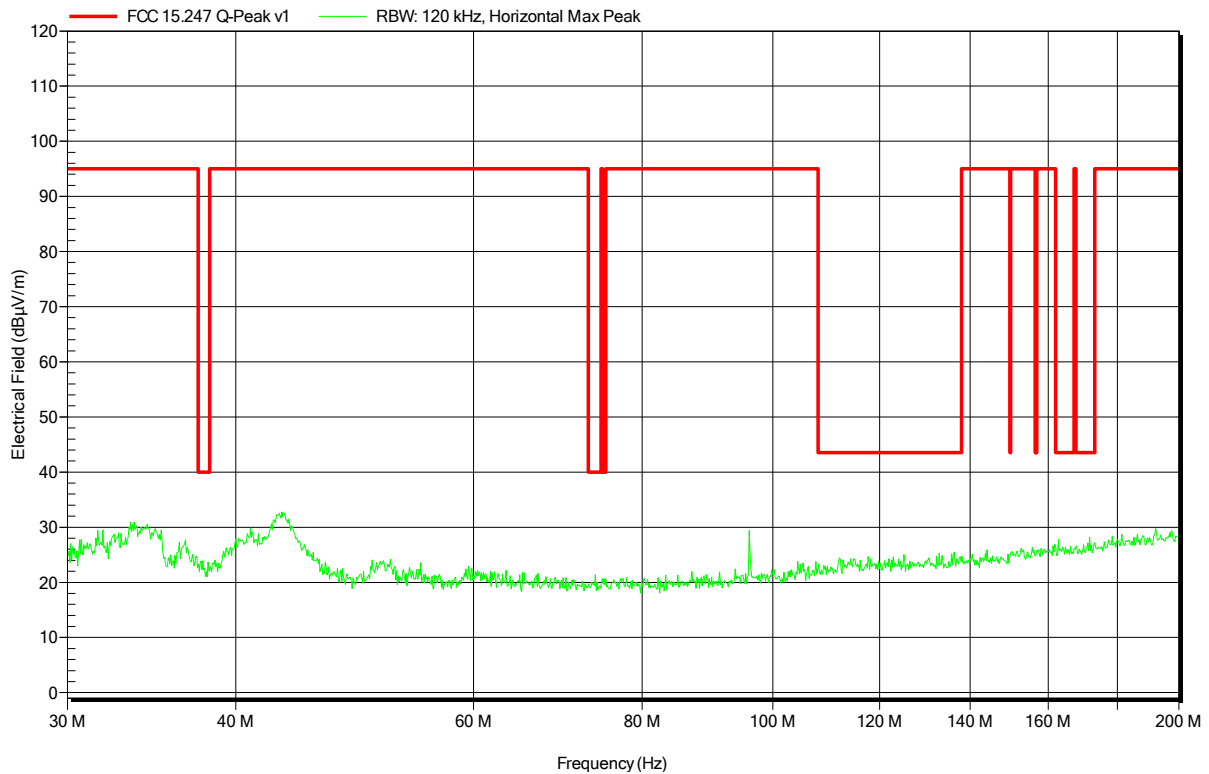


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; BT LE, CH.39, 2480 MHz
Test Date:	2016-03-03
Note:	Power Setting = -4 dBm, Modulated

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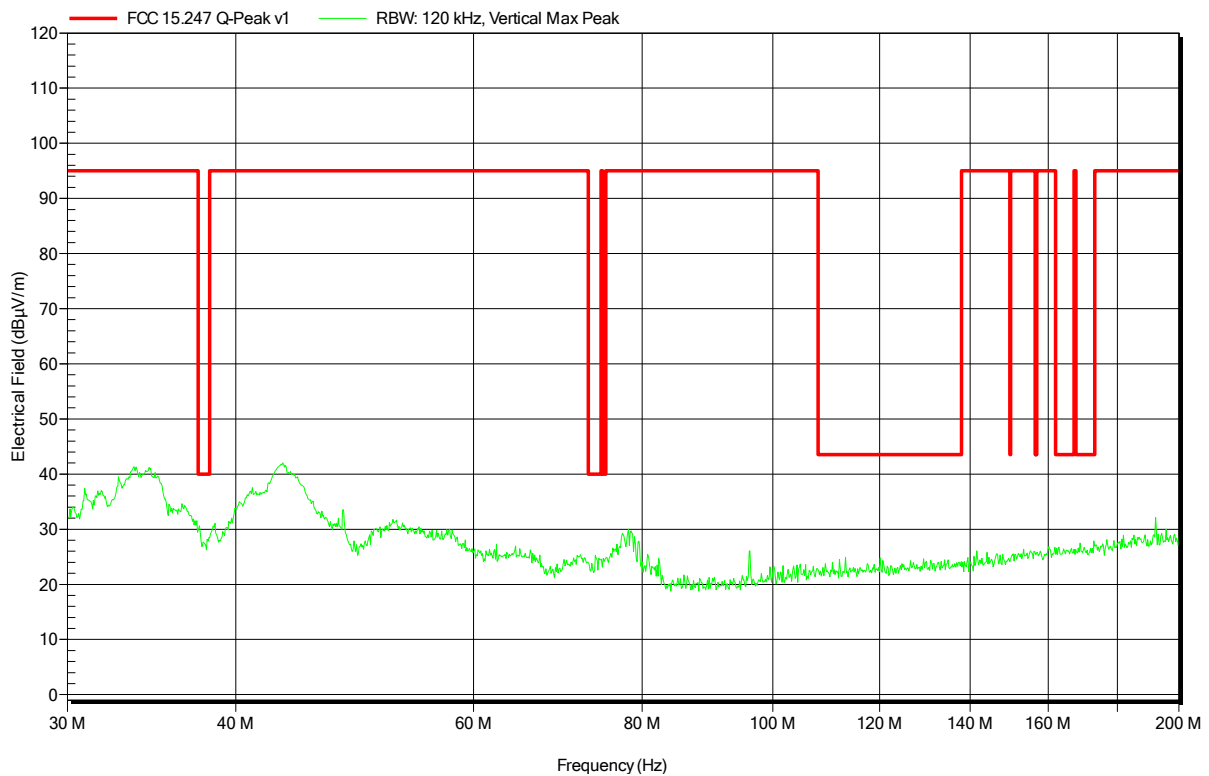


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; BT LE, CH.39, 2480 MHz
Test Date:	2016-03-03
Note:	Power Setting = -4 dBm, Modulated

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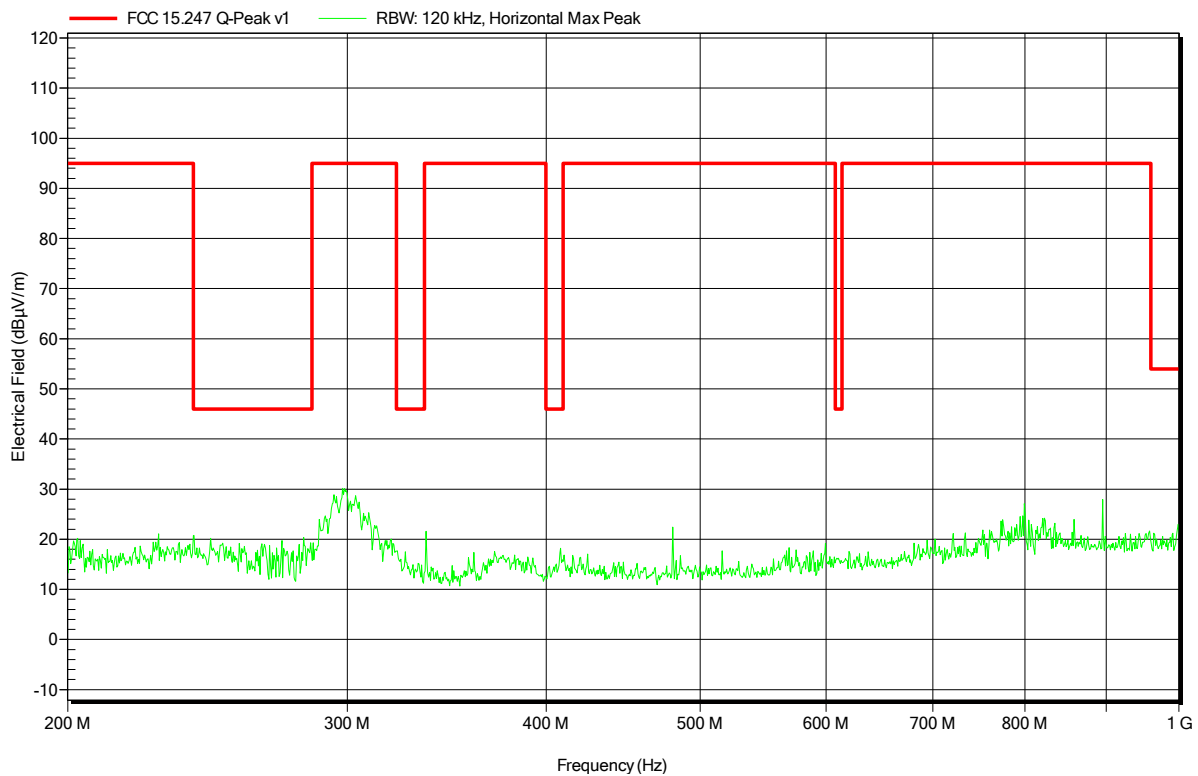


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; BT LE, CH.39, 2480 MHz
Test Date:	2016-03-03
Note:	Power Setting = -4 dBm, Modulated

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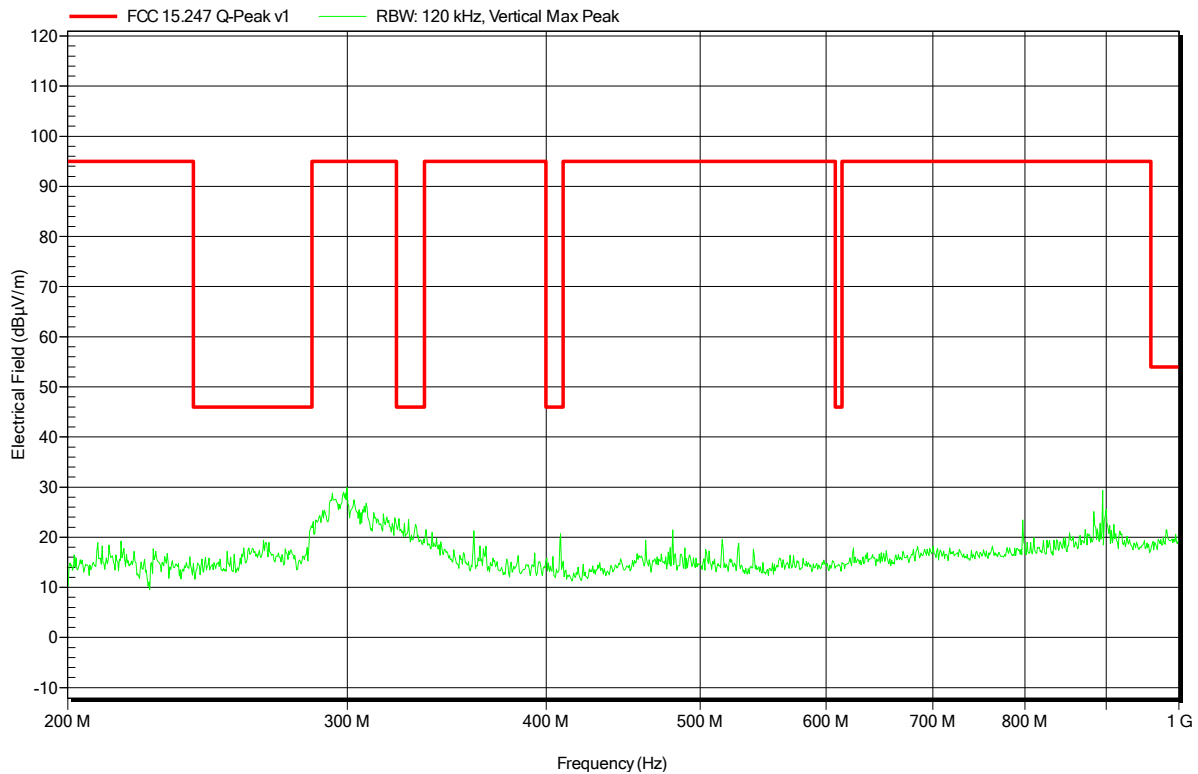


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; BT LE, CH.39, 2480 MHz
Test Date:	2016-03-03
Note:	Power Setting = -4 dBm, Modulated

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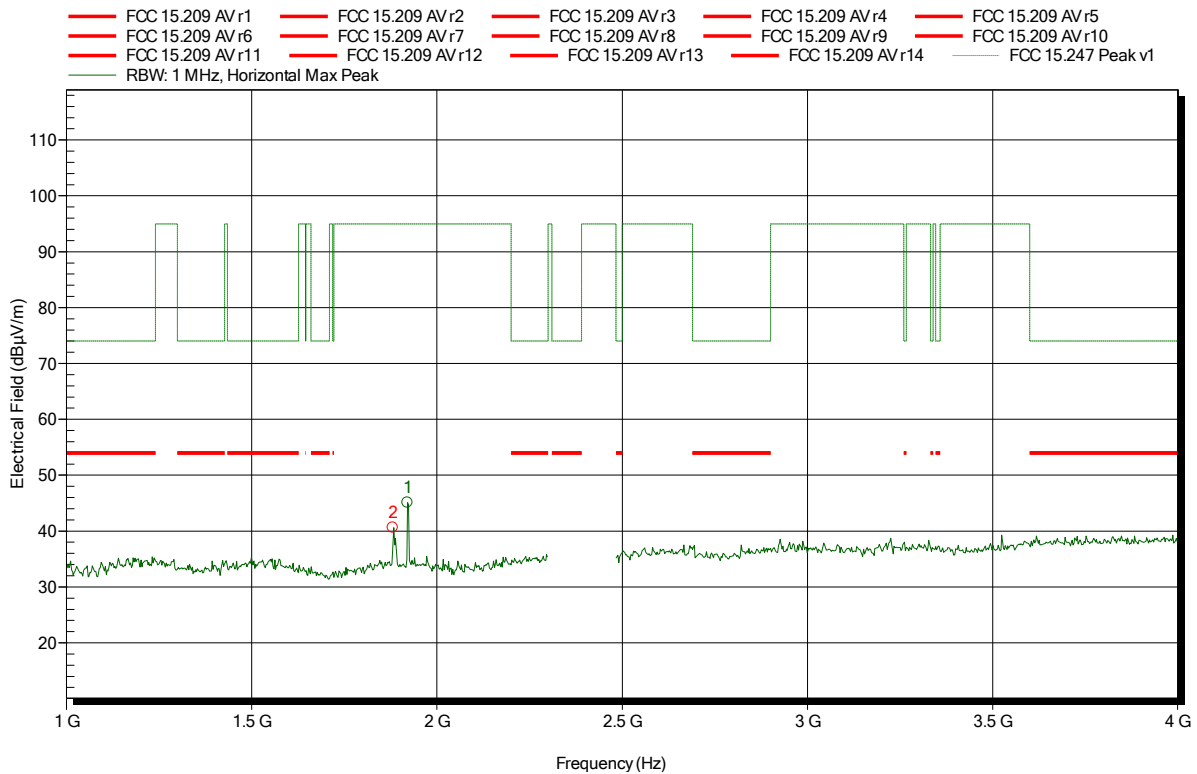


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant: Grässlin GmbH
 EUT Name: 2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
 Model: Carrier Board LCD-BLE
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 21°C, Vnom: 120 VAC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3 m
 Mode: TX; BT LE, CH.0, 2402 MHz
 Test Date: 2016-03-02
 Note: Power Setting = -4 dBm, Modulated

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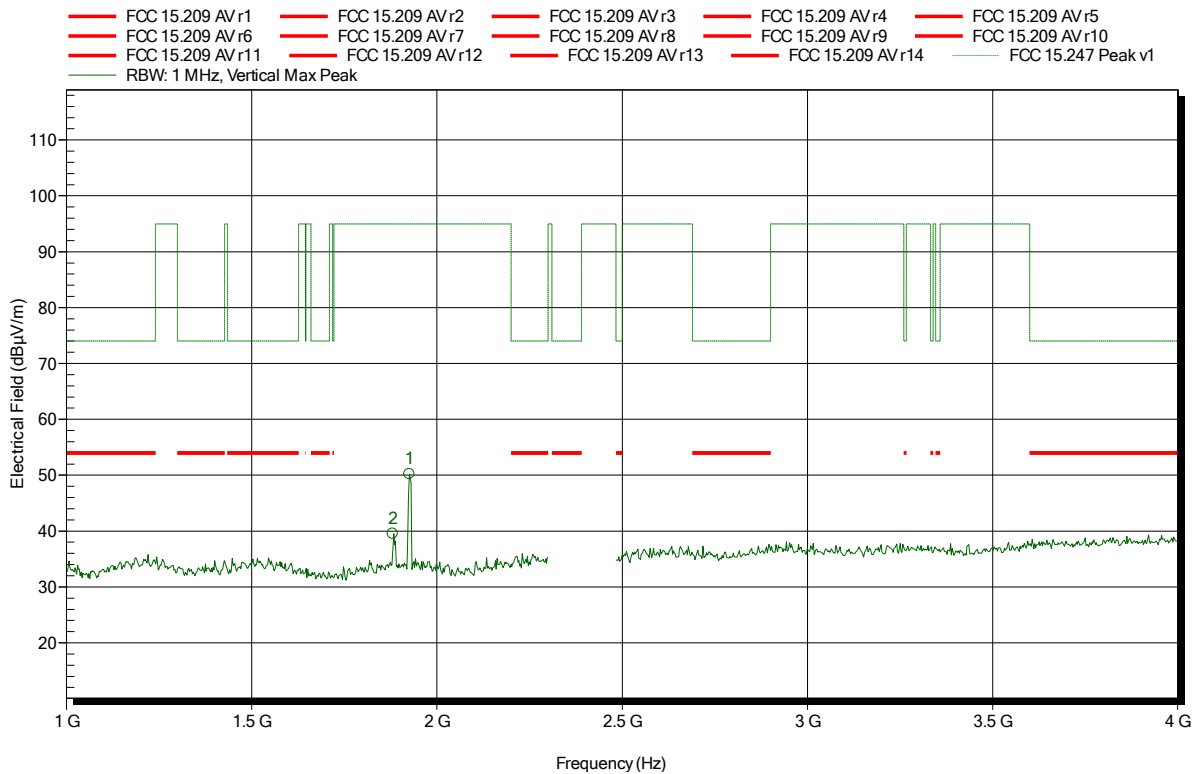
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
1.8814 GHz	40.6 dBµV/m	95 dBµV/m	-54.4 dB	Pass
1.9204 GHz	45.08 dBµV/m	95 dBµV/m	-49.92 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant: Grässlin GmbH
 EUT Name: 2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
 Model: Carrier Board LCD-BLE
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 21°C, Vnom: 120 VAC
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3 m
 Mode: TX; BT LE, CH.0, 2402 MHz
 Test Date: 2016-03-02
 Note: Power Setting = -4 dBm, Modulated

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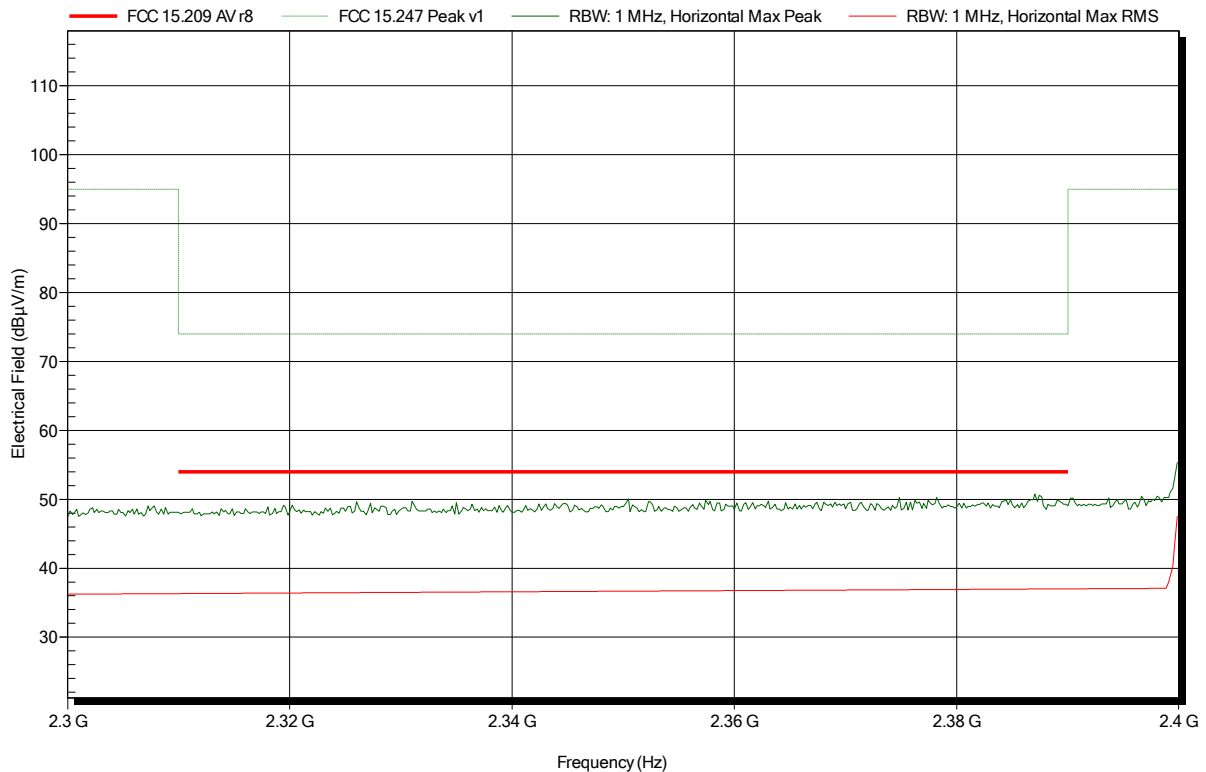
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
1.8814 GHz	39.53 dBµV/m	95 dBµV/m	-55.47 dB	Pass
1.9256 GHz	50.21 dBµV/m	95 dBµV/m	-44.79 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.0, 2402 MHz
Test Date:	2016-03-02
Note:	lower bandedge
Power Setting =	-4 dBm, Modulated

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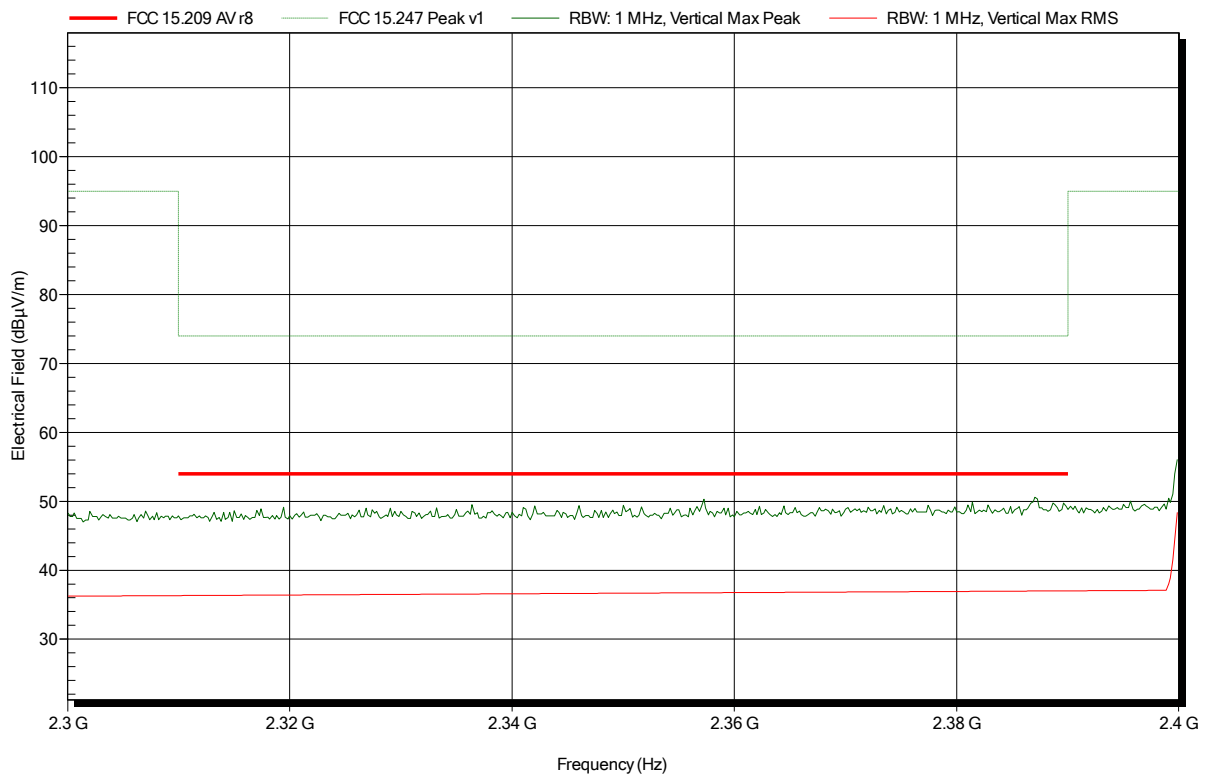


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.0, 2402 MHz
Test Date:	2016-03-02
Note:	lower bandedge
Power Setting =	-4 dBm, Modulated

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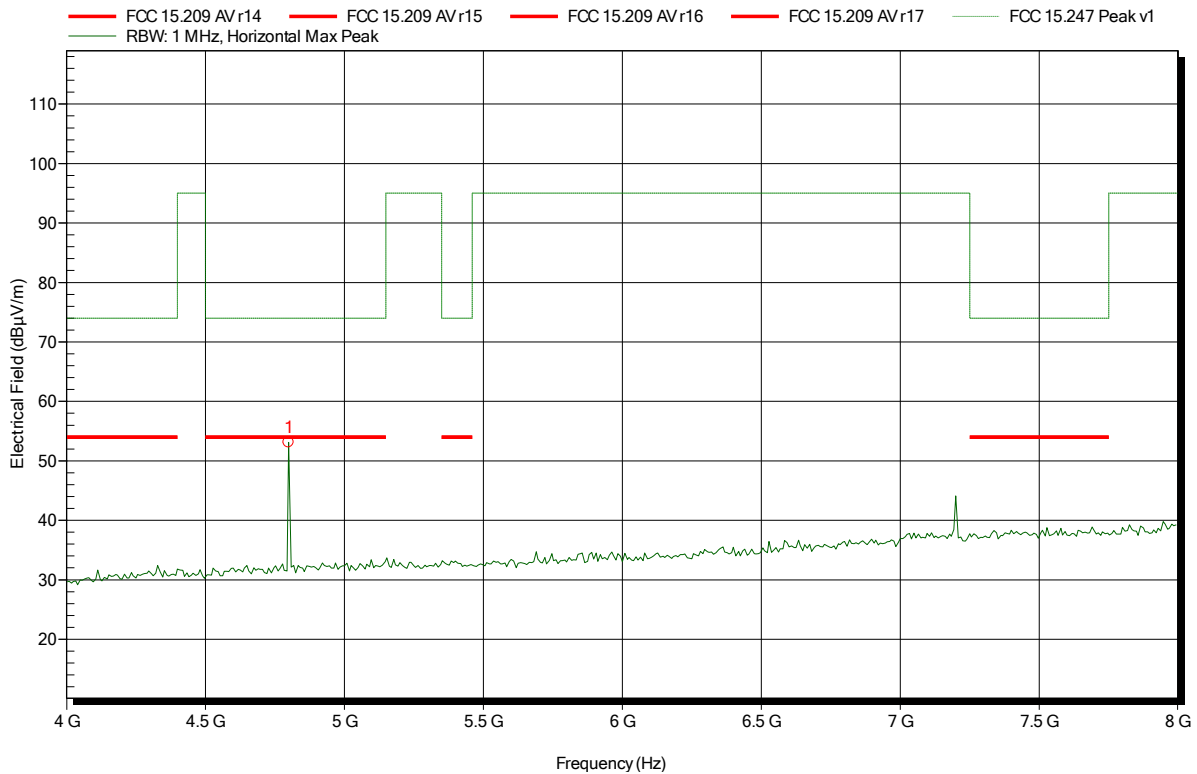


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant: Grässlin GmbH
 EUT Name: 2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
 Model: Carrier Board LCD-BLE
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 21°C, Vnom: 120 VAC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT LE, CH.0, 2402 MHz
 Test Date: 2016-03-02
 Note: Power Setting = -4 dBm, Modulated

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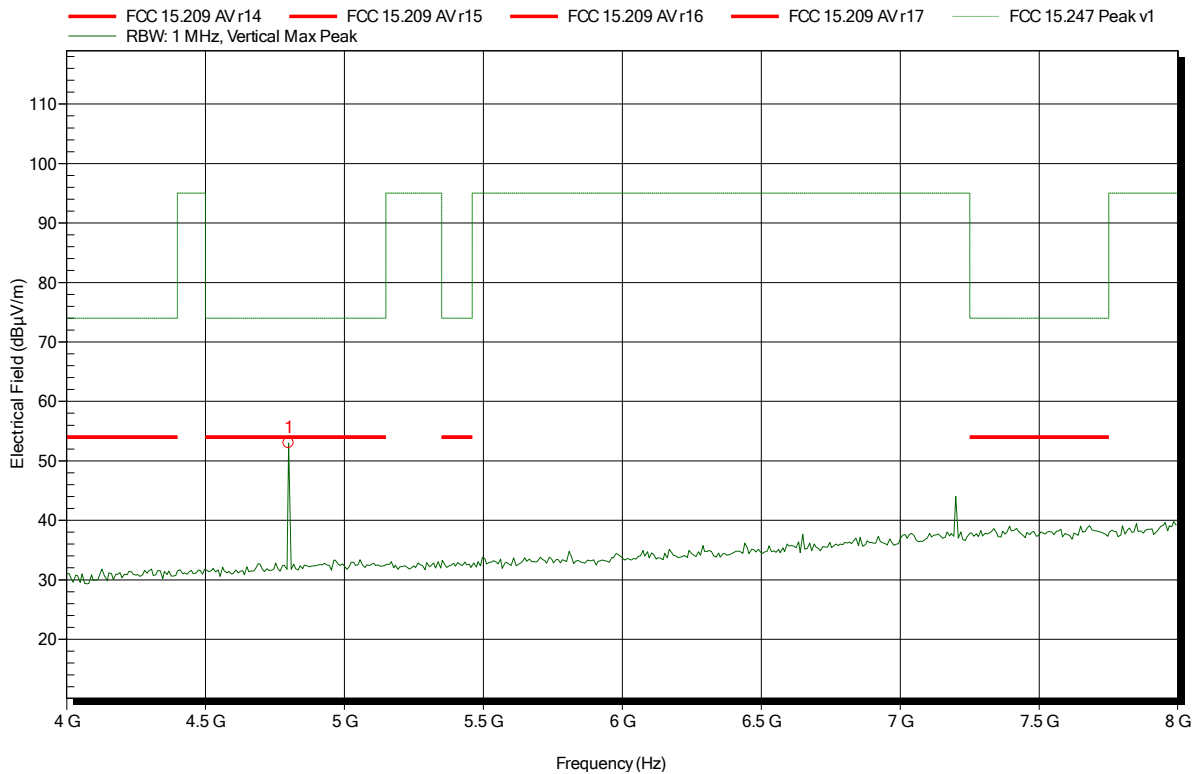
Frequency	Peak	Peak Limit	Peak Difference	Status
4.8 GHz	53.11 dBµV/m	74 dBµV/m	-20.89 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant: Grässlin GmbH
 EUT Name: 2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
 Model: Carrier Board LCD-BLE
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 21°C, Vnom: 120 VAC
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT LE, CH.0, 2402 MHz
 Test Date: 2016-03-02
 Note: Power Setting = -4 dBm, Modulated

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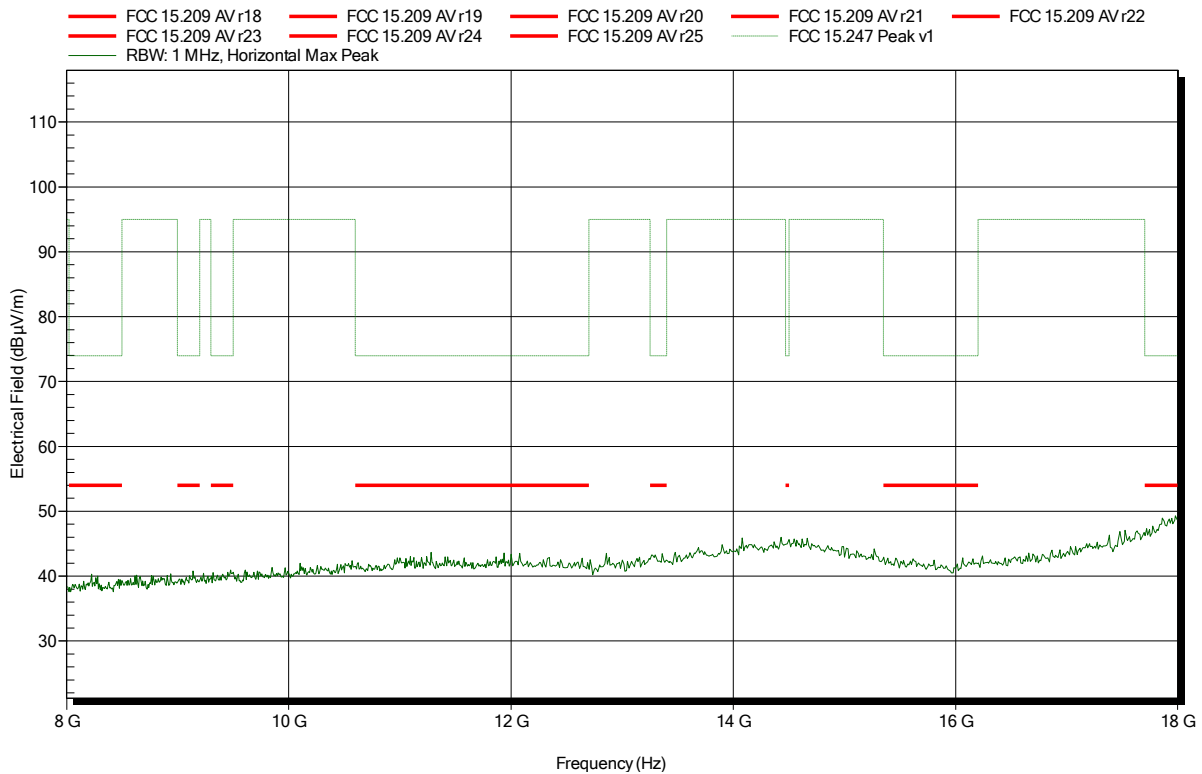
Frequency	Peak	Peak Limit	Peak Difference	Status
4.8 GHz	53.02 dBµV/m	74 dBµV/m	-20.98 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.0, 2402 MHz
Test Date:	2016-03-02
Note:	Power Setting = -4 dBm, Modulated

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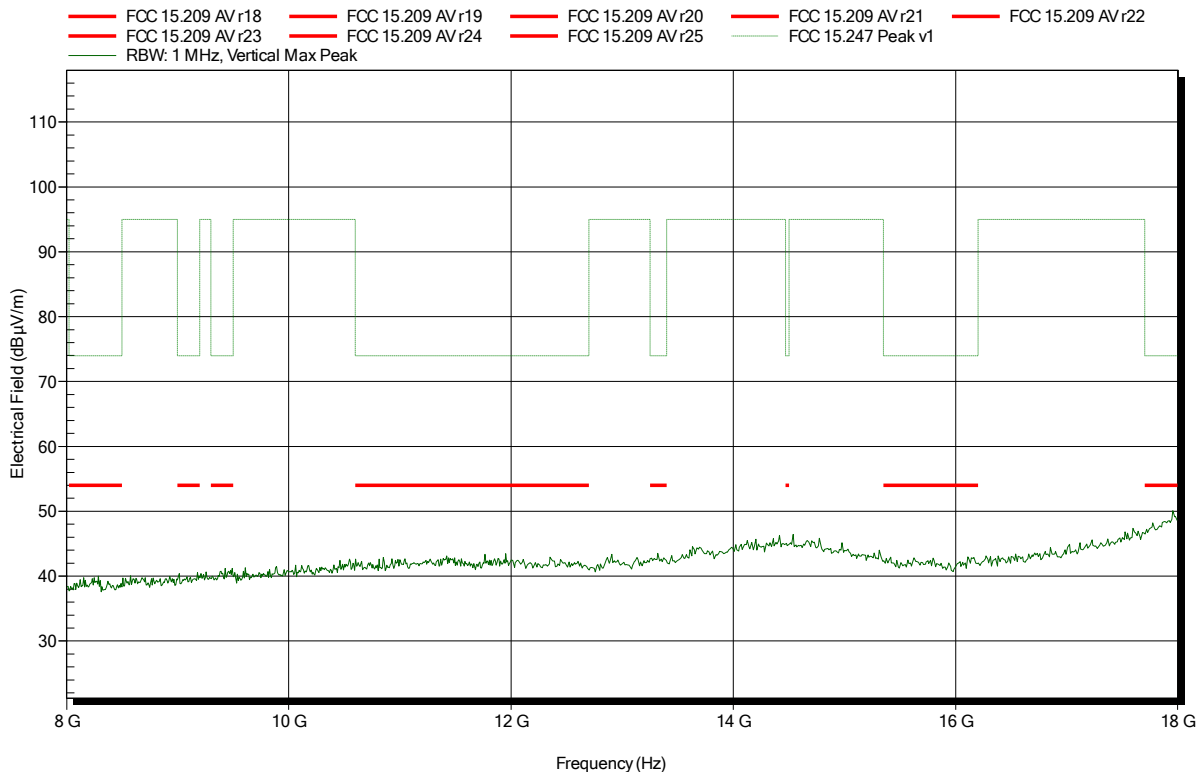


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.0, 2402 MHz
Test Date:	2016-03-02
Note:	Power Setting = -4 dBm, Modulated

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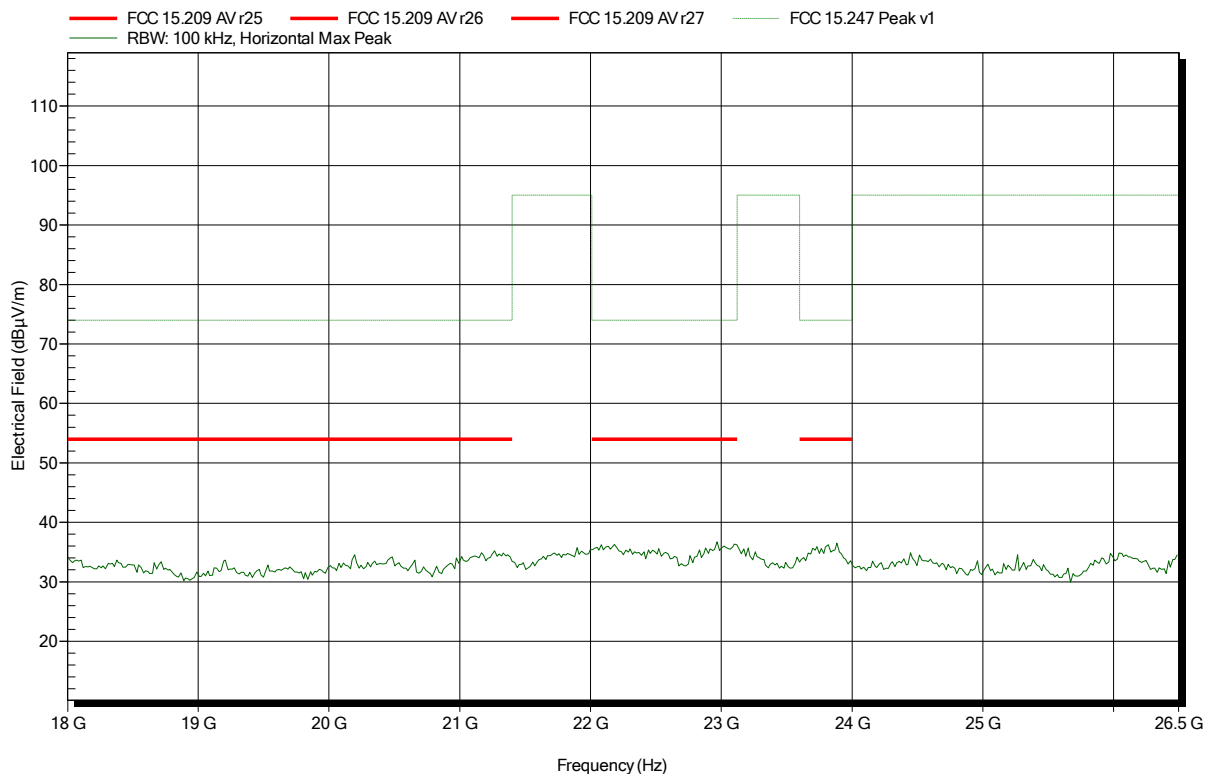


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Configurable Antenna, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.0, 2402 MHz
Test Date:	2016-03-02
Note:	Power Setting = -4 dBm, Modulated

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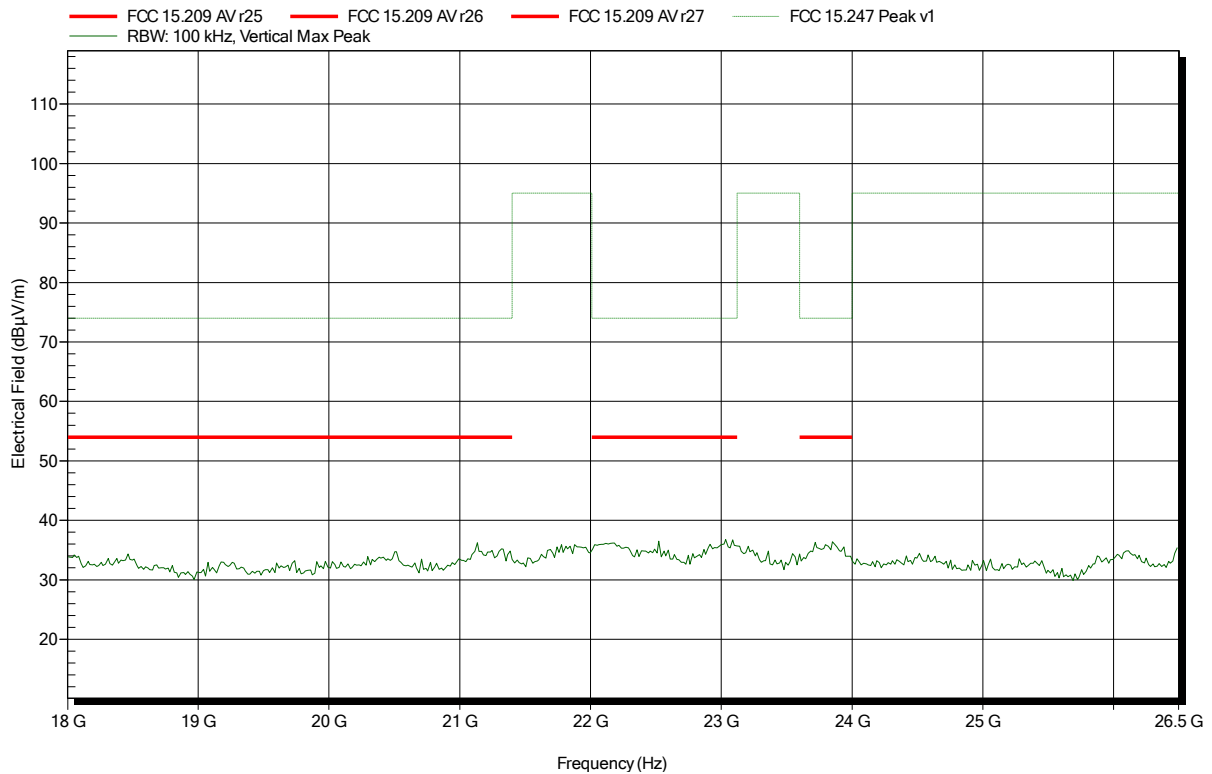


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Configurable Antenna, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.0, 2402 MHz
Test Date:	2016-03-02
Note:	Power Setting = -4 dBm, Modulated

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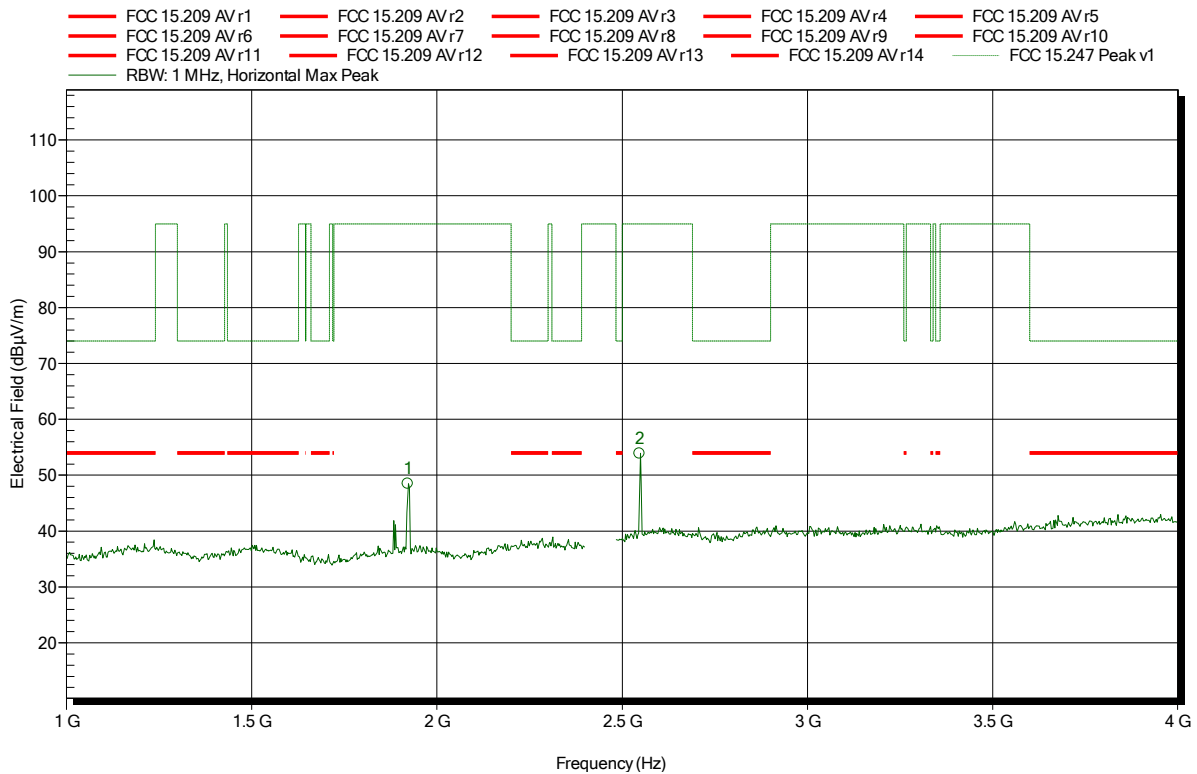


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant: Grässlin GmbH
 EUT Name: 2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
 Model: Carrier Board LCD-BLE
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 21°C, Vnom: 120 VAC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3 m
 Mode: TX; BT LE, CH.19, 2440 MHz
 Test Date: 2016-03-02
 Note: Power Setting = -4 dBm, Modulated

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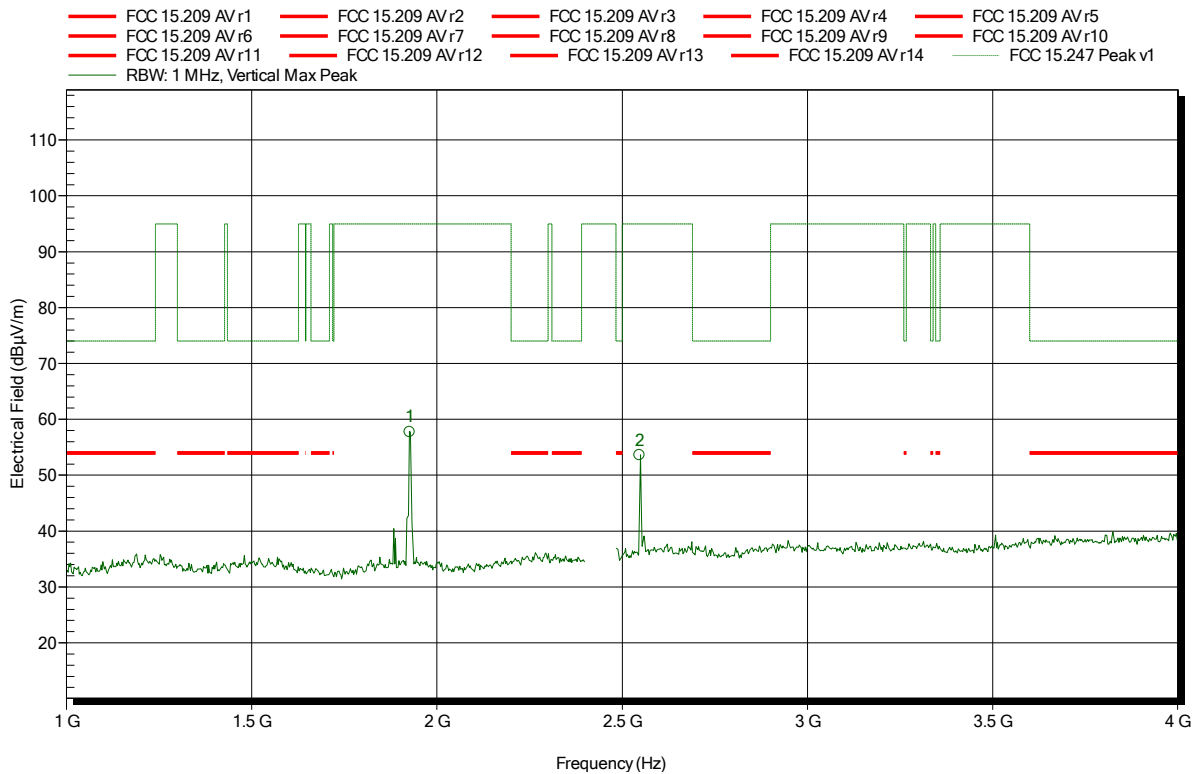
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
1.9212 GHz	48.47 dBµV/m	95 dBµV/m	-46.53 dB	Pass
2.5472 GHz	53.89 dBµV/m	95 dBµV/m	-41.11 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant: Grässlin GmbH
 EUT Name: 2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
 Model: Carrier Board LCD-BLE
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 21°C, Vnom: 120 VAC
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3 m
 Mode: TX; BT LE, CH.19, 2440 MHz
 Test Date: 2016-03-02
 Note: Power Setting = -4 dBm, Modulated

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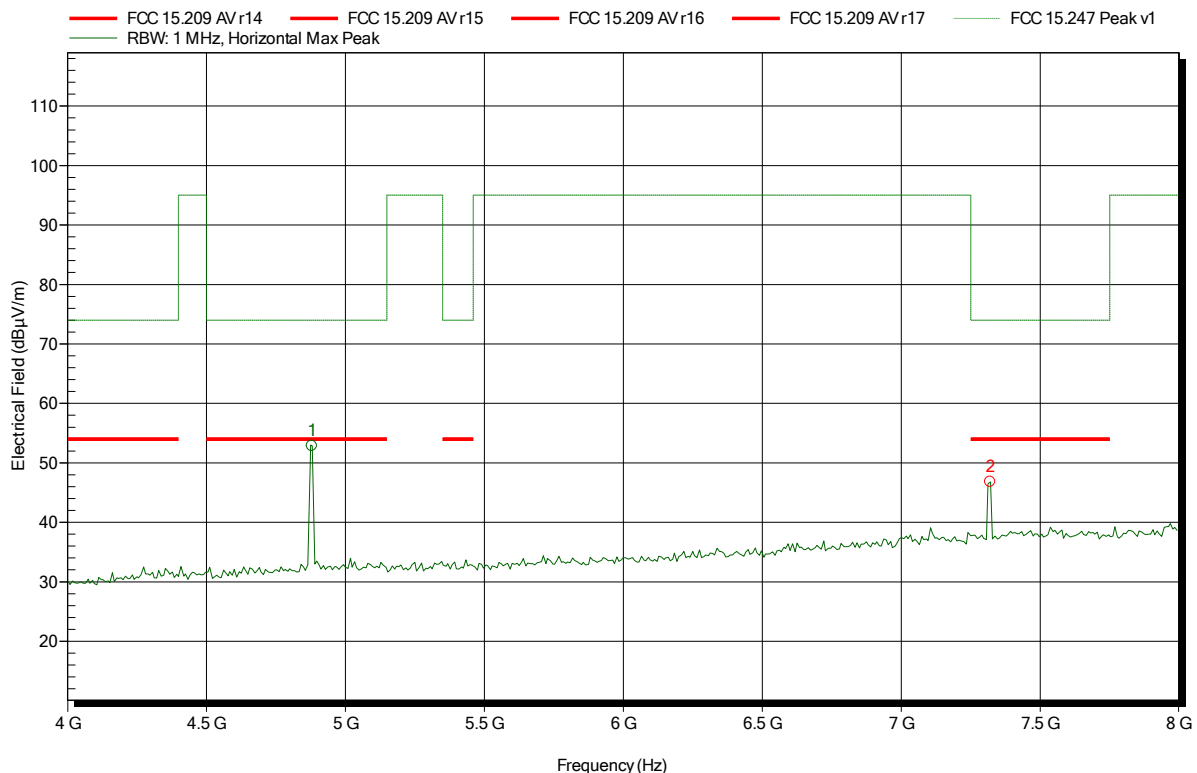
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
1.9268 GHz	57.7 dBµV/m	95 dBµV/m	-37.3 dB	Pass
2.5472 GHz	53.59 dBµV/m	95 dBµV/m	-41.41 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant: Grässlin GmbH
 EUT Name: 2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
 Model: Carrier Board LCD-BLE
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 21°C, Vnom: 120 VAC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT LE, CH.19, 2440 MHz
 Test Date: 2016-03-02
 Note: Power Setting = -4 dBm, Modulated

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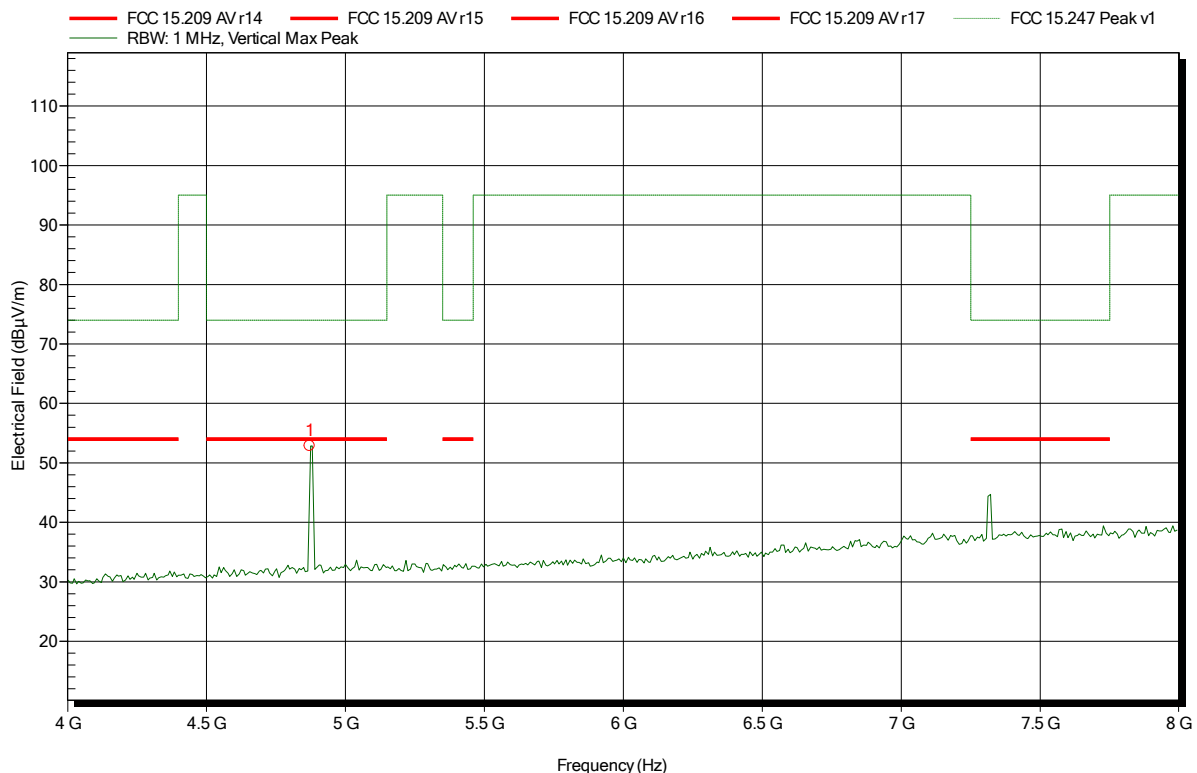
Frequency	Peak	Peak Limit	Peak Difference	Status
4.88 GHz	52.82 dBµV/m	74 dBµV/m	-21.18 dB	Pass
7.32 GHz	46.83 dBµV/m	74 dBµV/m	-27.17 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant: Grässlin GmbH
 EUT Name: 2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
 Model: Carrier Board LCD-BLE
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 21°C, Vnom: 120 VAC
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT LE, CH.19, 2440 MHz
 Test Date: 2016-03-02
 Note: Power Setting = -4 dBm, Modulated

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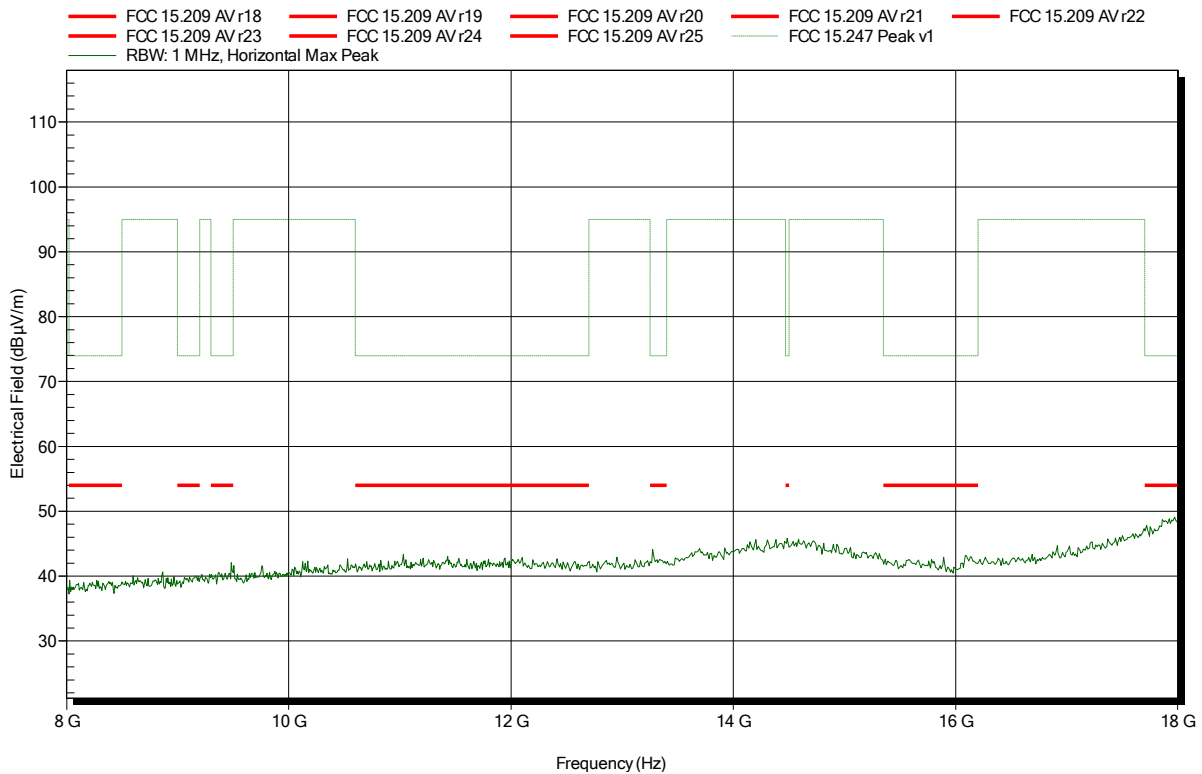
Frequency	Peak	Peak Limit	Peak Difference	Status
4.872 GHz	52.82 dBµV/m	74 dBµV/m	-21.18 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.19, 2440 MHz
Test Date:	2016-03-02
Note:	Power Setting = -4 dBm, Modulated

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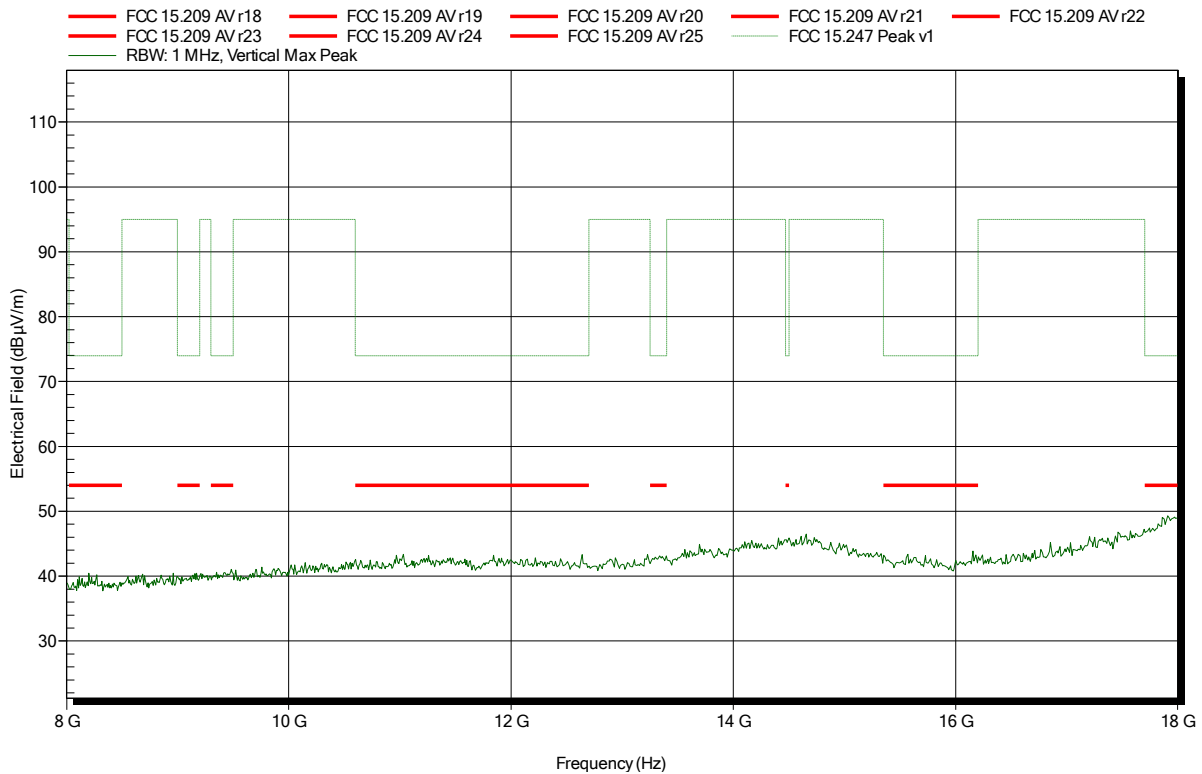


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.19, 2440 MHz
Test Date:	2016-03-02
Note:	Power Setting = -4 dBm, Modulated

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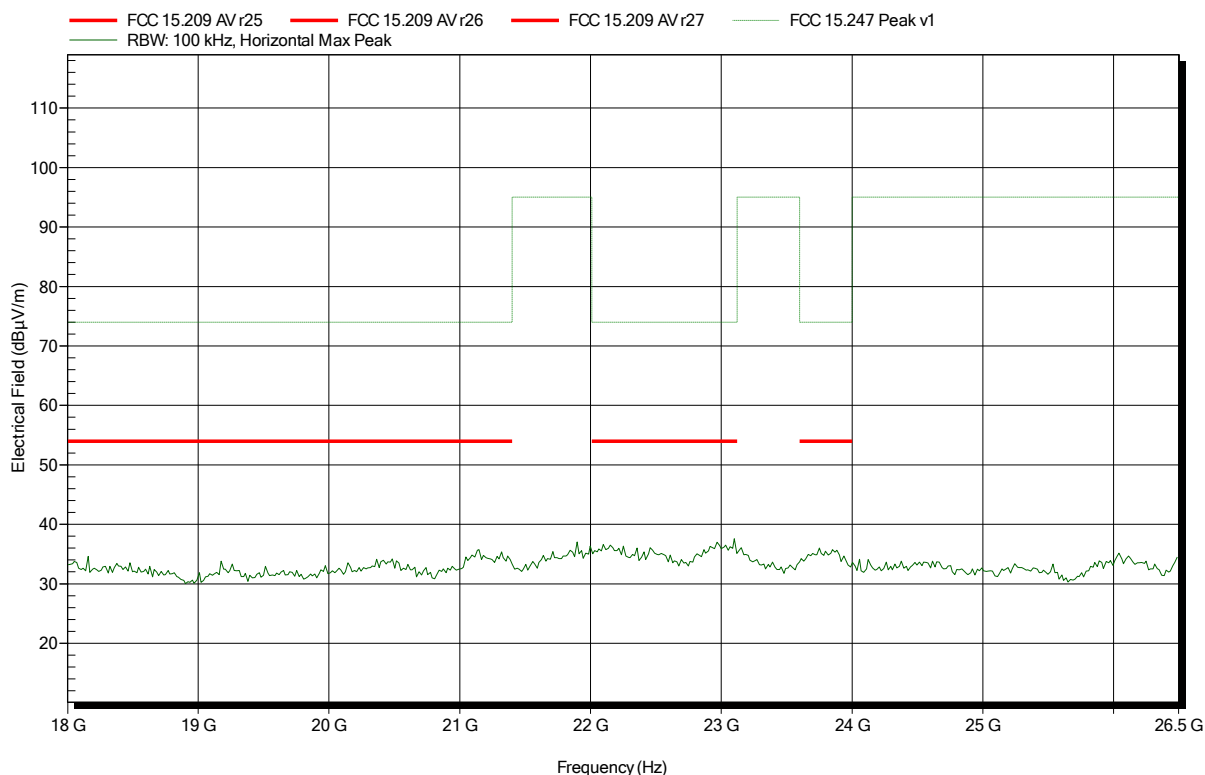


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Configurable Antenna, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.19, 2440 MHz
Test Date:	2016-03-02
Note:	Power Setting = -4 dBm, Modulated

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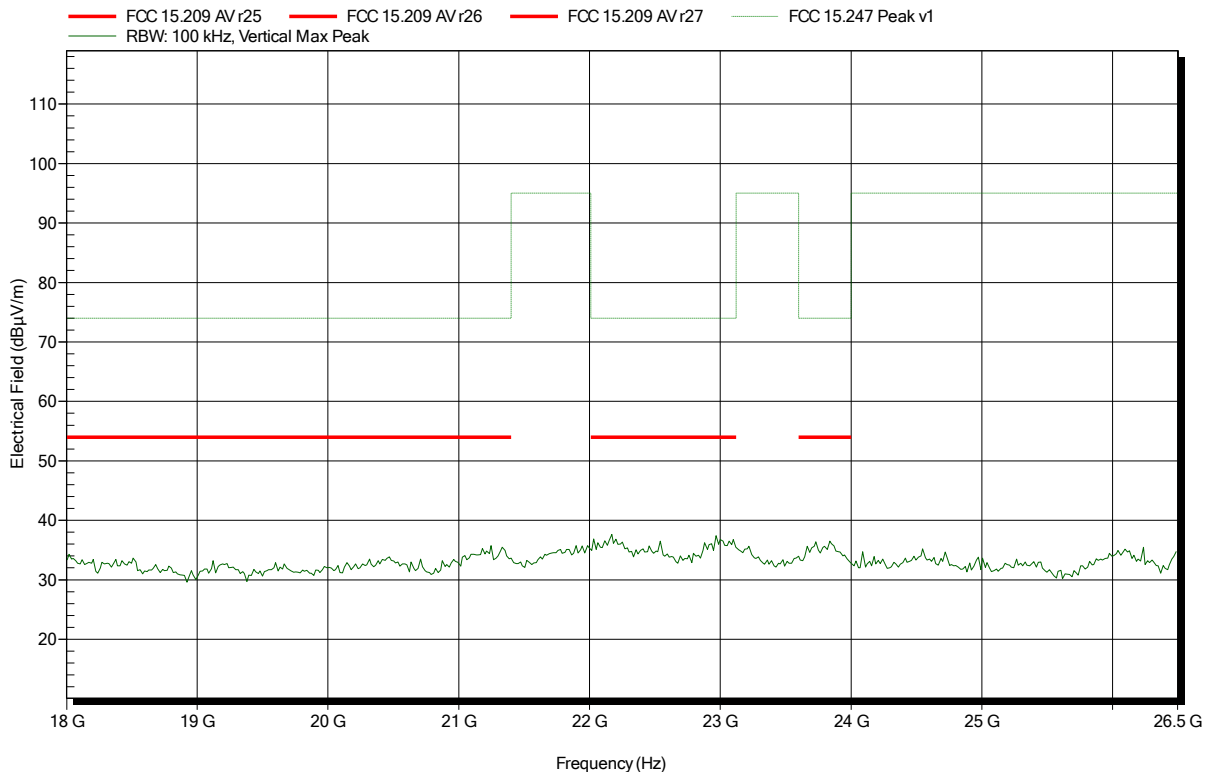


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Configurable Antenna, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.19, 2440 MHz
Test Date:	2016-03-02
Note:	Power Setting = -4 dBm, Modulated

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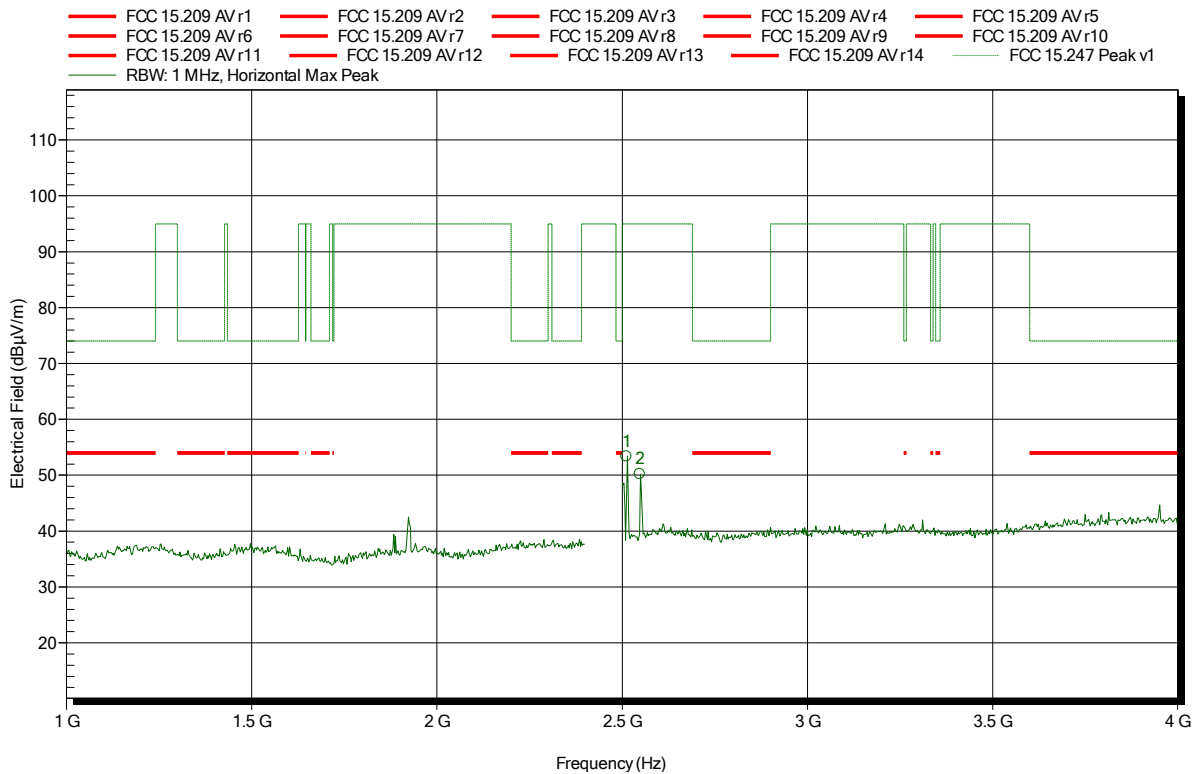


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant: Grässlin GmbH
 EUT Name: 2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
 Model: Carrier Board LCD-BLE
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 21°C, Vnom: 120 VAC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3 m
 Mode: TX; BT LE, CH.39, 2480 MHz
 Test Date: 2016-03-02
 Note: Power Setting = -4 dBm, Modulated

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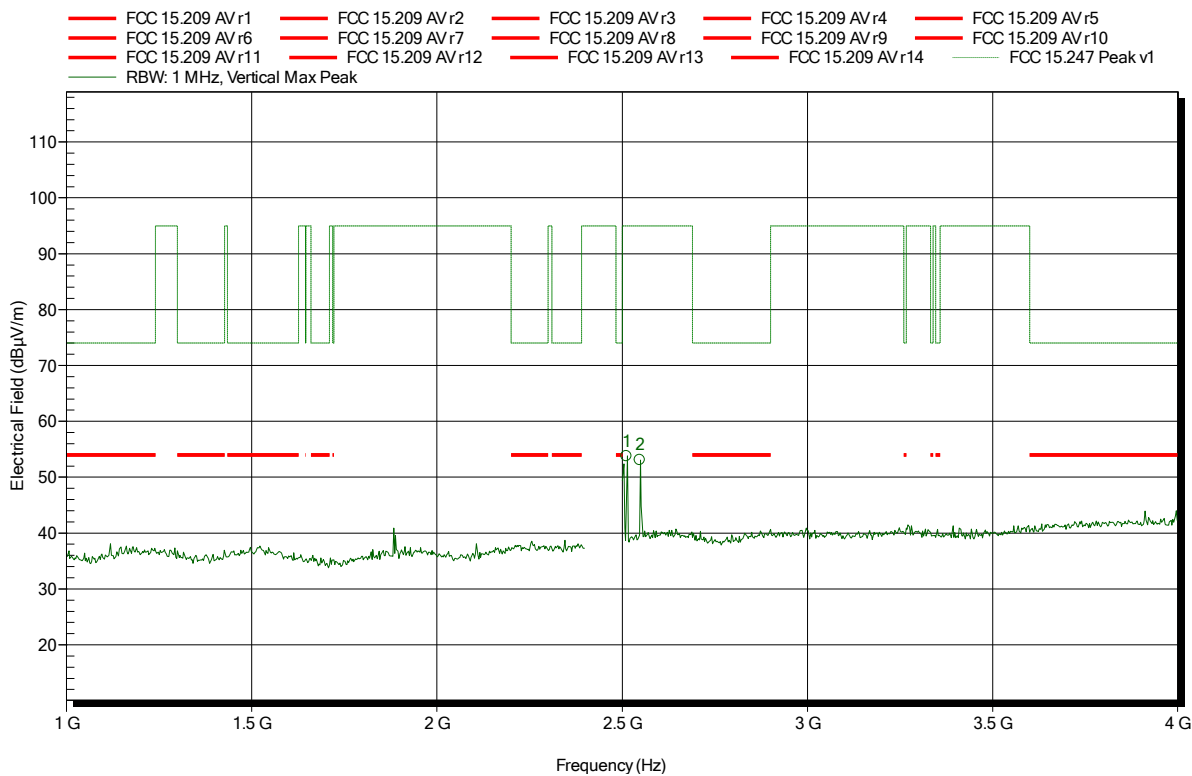
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.512 GHz	53.36 dBµV/m	95 dBµV/m	-41.64 dB	Pass
2.548 GHz	50.18 dBµV/m	95 dBµV/m	-44.82 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant: Grässlin GmbH
 EUT Name: 2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
 Model: Carrier Board LCD-BLE
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 21°C, Vnom: 120 VAC
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3 m
 Mode: TX; BT LE, CH.39, 2480 MHz
 Test Date: 2016-03-02
 Note: Power Setting = -4 dBm, Modulated

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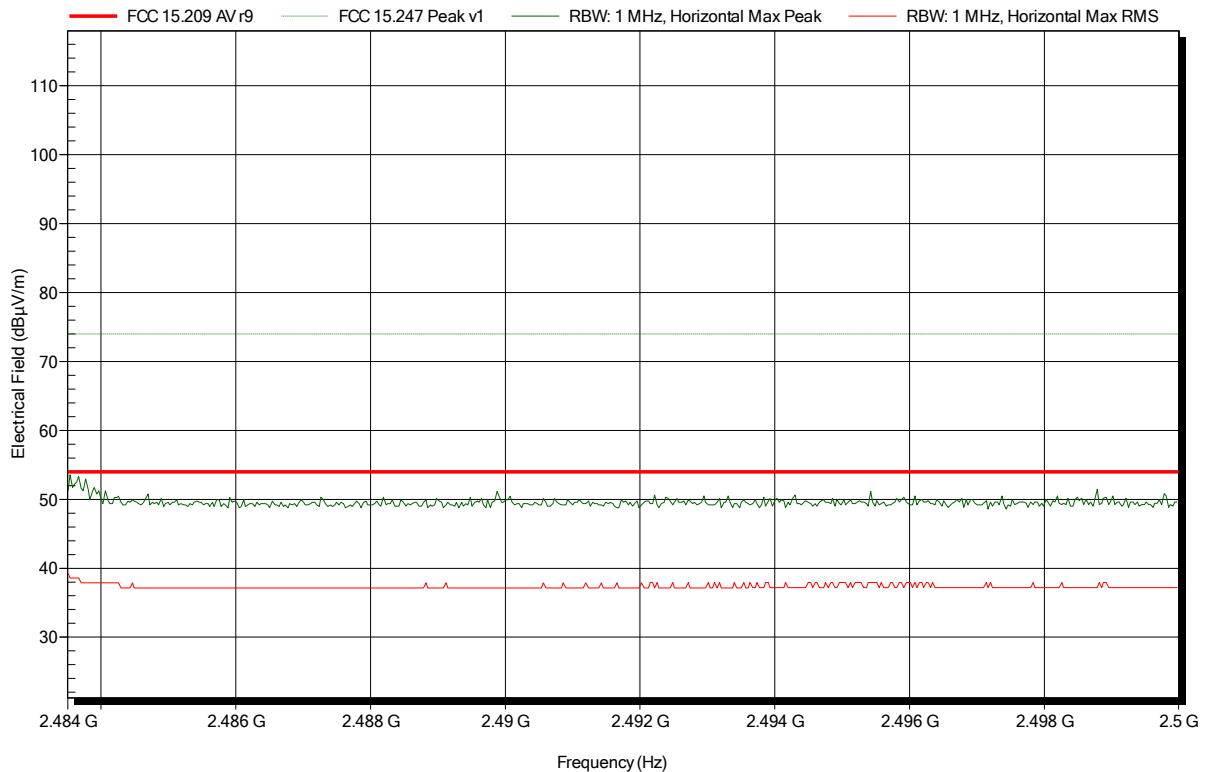
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.512 GHz	53.78 dBµV/m	95 dBµV/m	-41.22 dB	Pass
2.548 GHz	53.04 dBµV/m	95 dBµV/m	-41.96 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.39, 2480 MHz
Test Date:	2016-03-02
Note:	upper bandedge
Power Setting =	-4 dBm, Modulated

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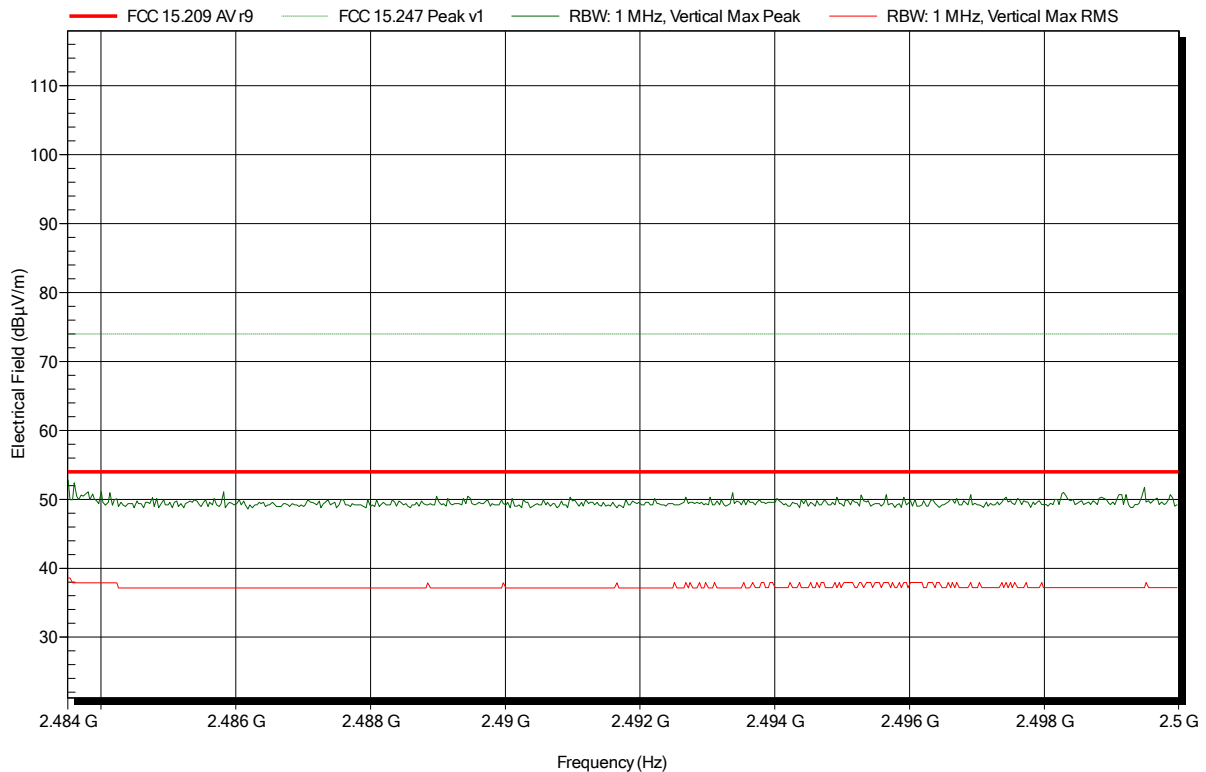


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.39, 2480 MHz
Test Date:	2016-03-02
Note:	upper bandedge
Power Setting =	-4 dBm, Modulated

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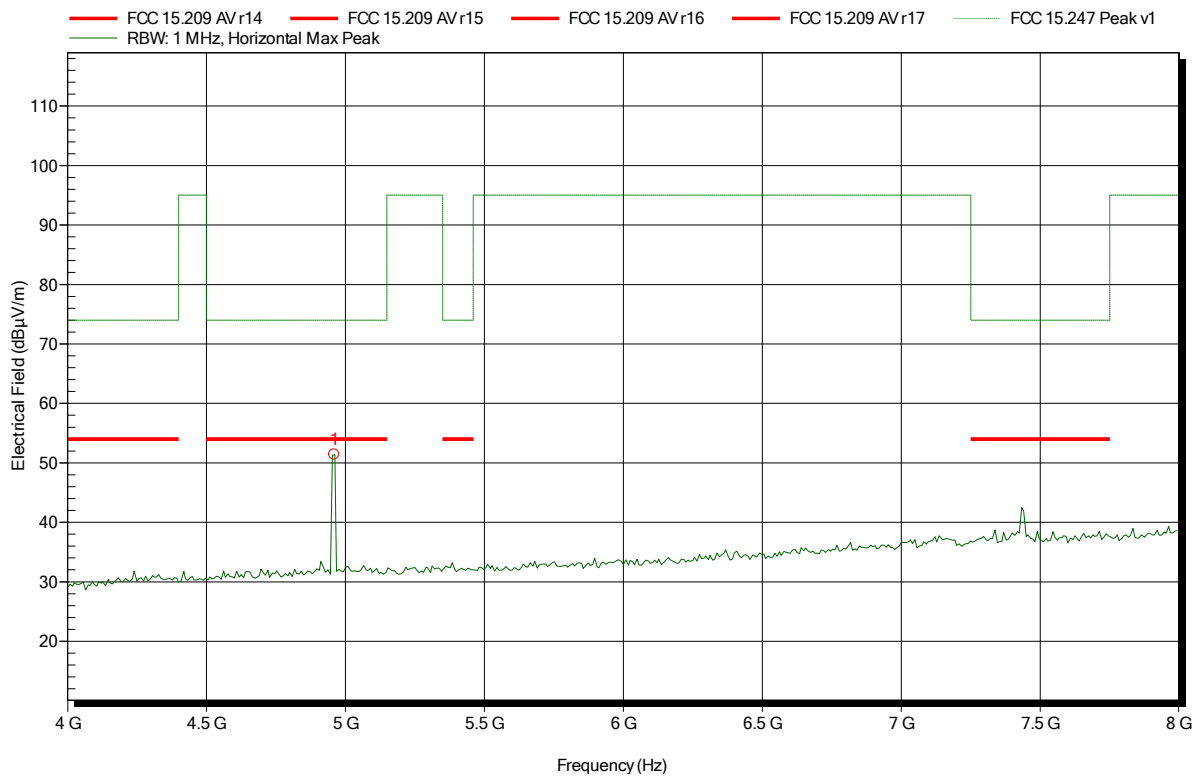


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant: Grässlin GmbH
 EUT Name: 2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
 Model: Carrier Board LCD-BLE
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 21°C, Vnom: 120 VAC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT LE, CH.39, 2480 MHz
 Test Date: 2016-03-02
 Note: Power Setting = -4 dBm, Modulated

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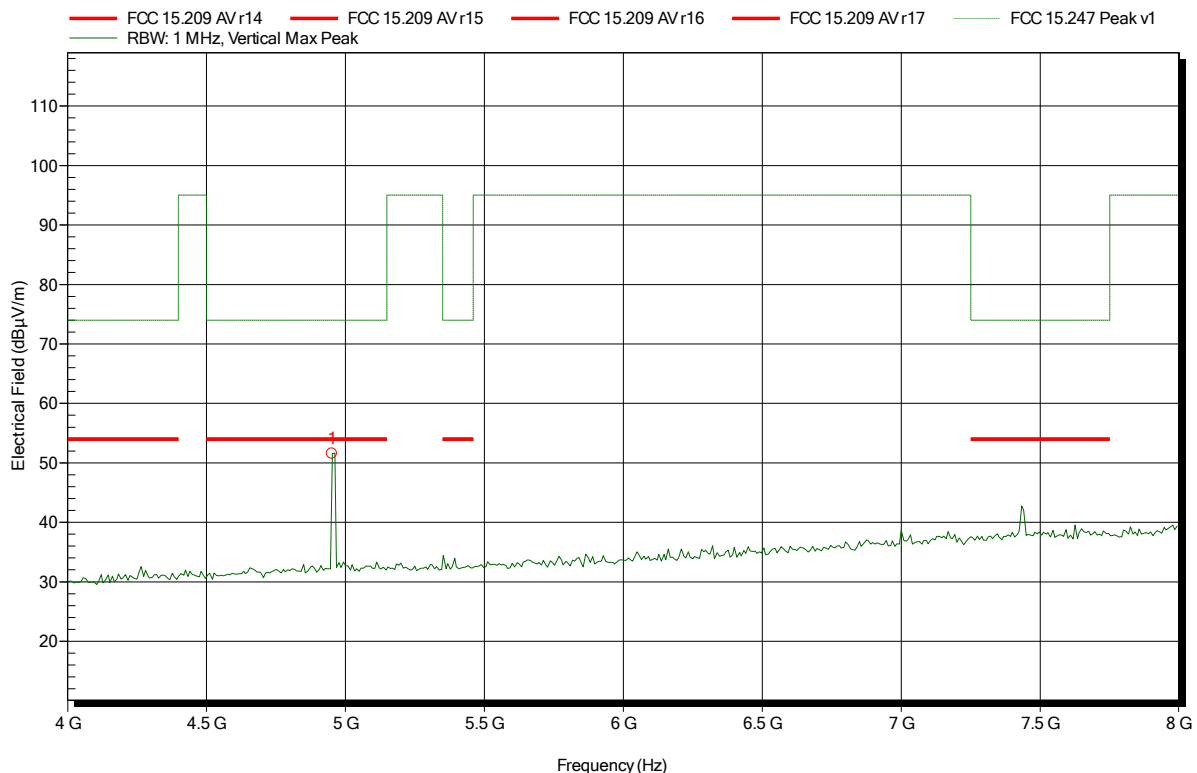
Frequency	Peak	Peak Limit	Peak Difference	Status
4.96 GHz	51.38 dBµV/m	74 dBµV/m	-22.62 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant: Grässlin GmbH
 EUT Name: 2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
 Model: Carrier Board LCD-BLE
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 21°C, Vnom: 120 VAC
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT LE, CH.39, 2480 MHz
 Test Date: 2016-03-02
 Note: Power Setting = -4 dBm, Modulated

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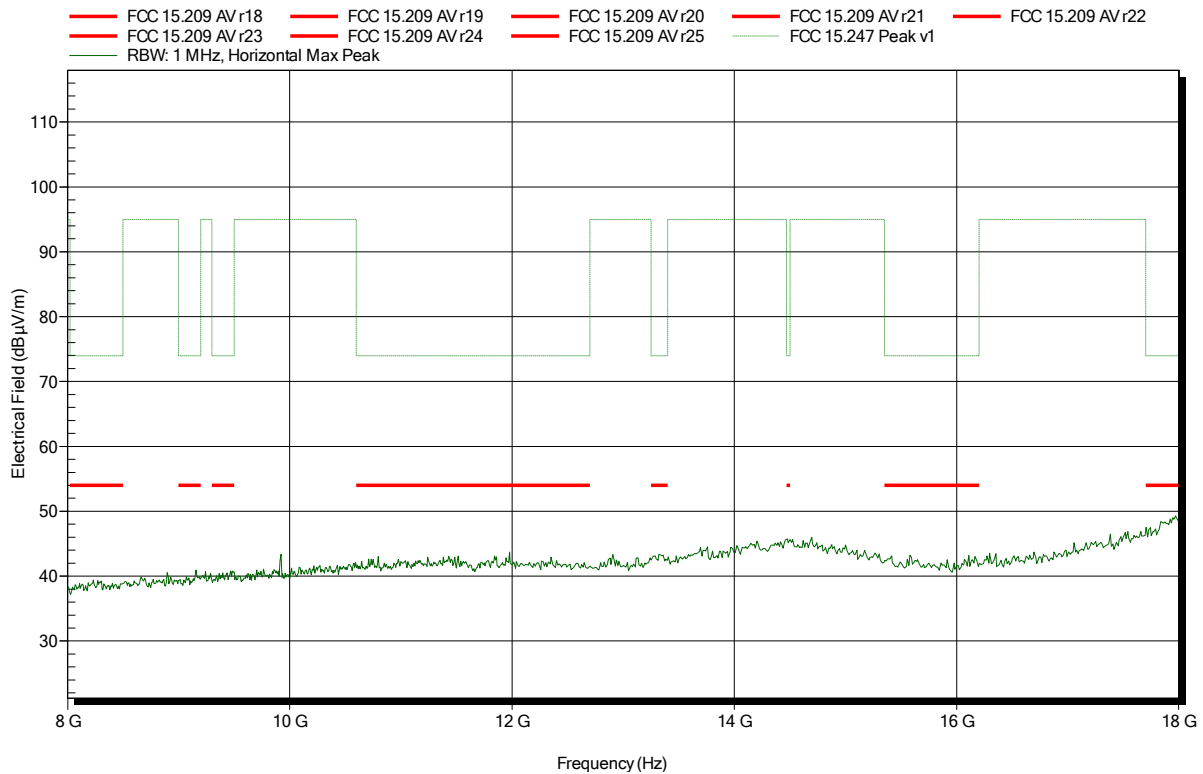
Frequency	Peak	Peak Limit	Peak Difference	Status
4.952 GHz	51.54 dBµV/m	74 dBµV/m	-22.46 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.39, 2480 MHz
Test Date:	2016-03-02
Note:	Power Setting = -4 dBm, Modulated

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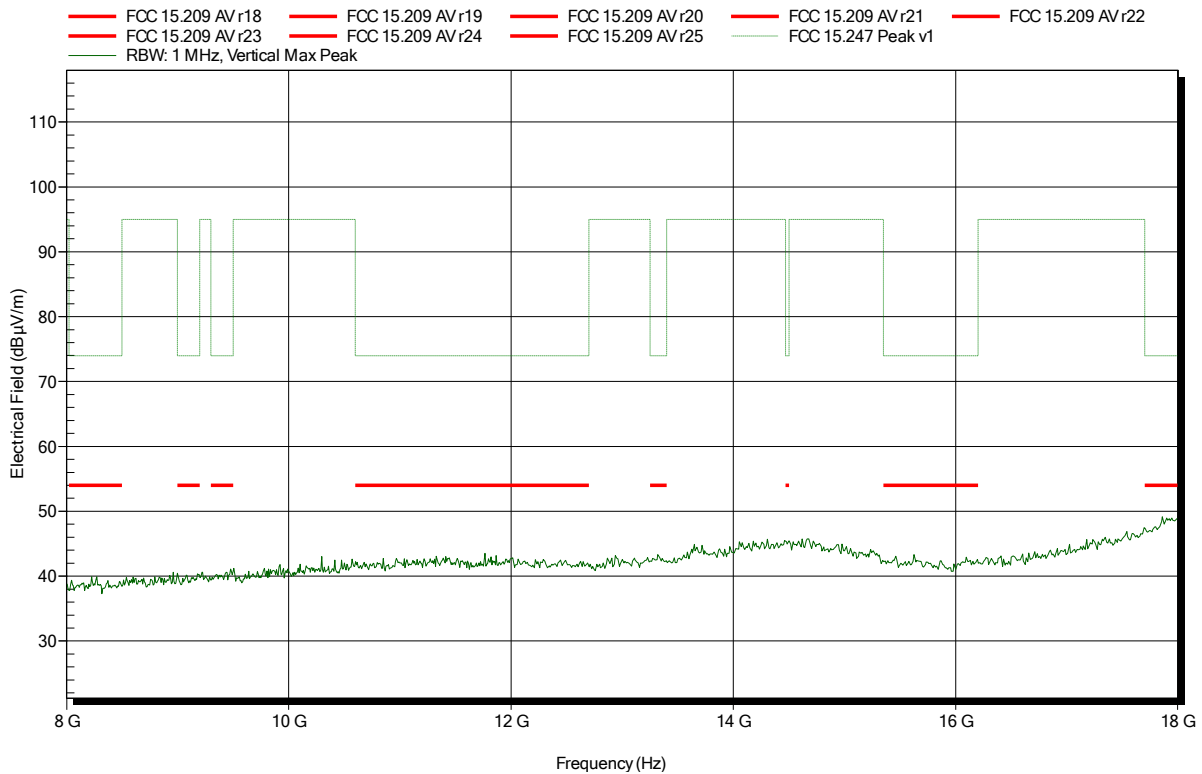


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.39, 2480 MHz
Test Date:	2016-03-02
Note:	Power Setting = -4 dBm, Modulated

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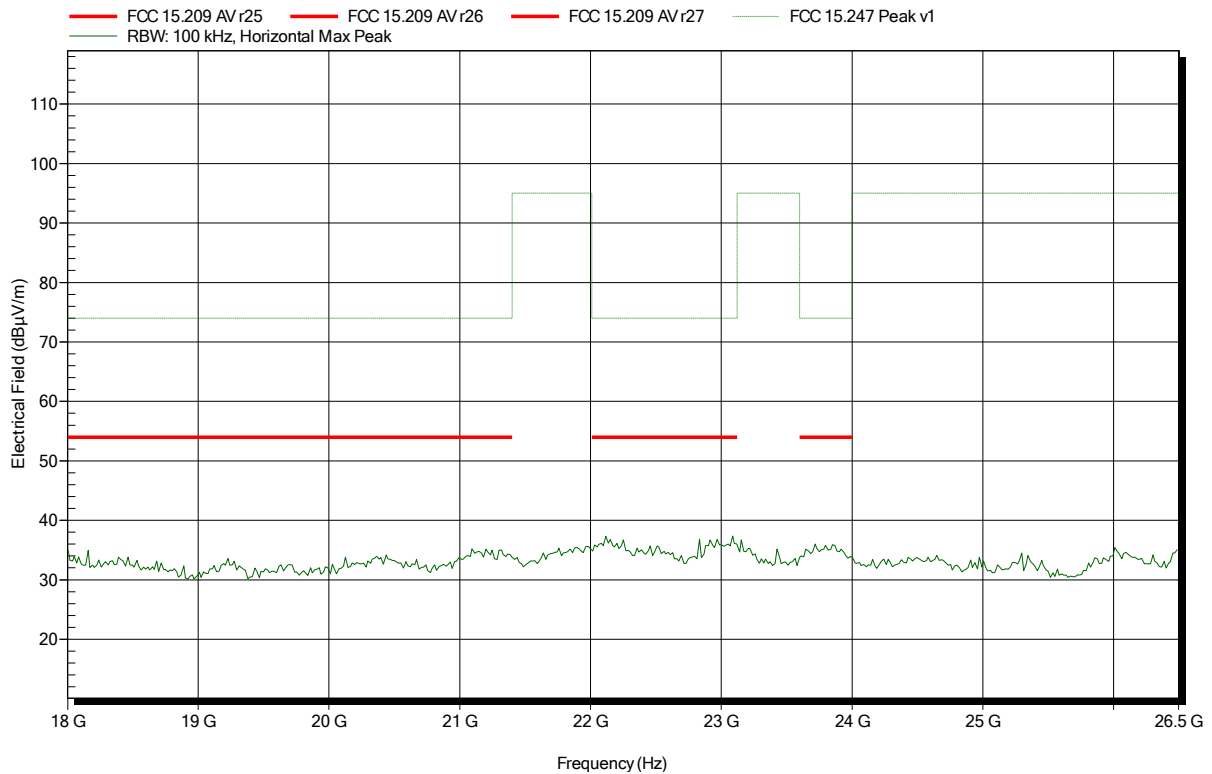


Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Configurable Antenna, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.39, 2480 MHz
Test Date:	2016-03-02
Note:	Power Setting = -4 dBm, Modulated

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Spurious emissions according to FCC 15.247

Project number: G0M-1510-5171

Applicant:	Grässlin GmbH
EUT Name:	2,4GHz BLE (Bluetooth Low Energy) Module (with LCD, Keypad, LCD Glas)
Model:	Carrier Board LCD-BLE
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 21°C, Vnom: 120 VAC
Antenna:	Configurable Antenna, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT LE, CH.39, 2480 MHz
Test Date:	2016-03-02
Note:	Power Setting = -4 dBm, Modulated

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