RADIO REPORT

FCC 47 CFR Part 15C
ISED Canada RSS-247

Frequency hopping systems operating within the 2400 – 2483.5 MHz band

Report Reference No	G0M-1902-8046-TFC247BT-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	 DAkkS - Registration number : D-PL-12092-01-03 (ISED) ISED Testing Laboratory site: 3470A-2 DAkkS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	Panasonic Industrial Devices Europe GmbH
Address	Zeppelinstr. 19 21337 Lüneburg GERMANY
Test Specification	According to FCC/ISED rules
Standard	47 CFR Part 15C RSS-247, Issue 2, 2017-02 RSS-Gen, Issue 5, Amendment 1, 2019-03
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Bluetooth Low Energy Module
Model(s)	ENW89823A5KF
Additional Model(s)	None
Brand Name(s)	PAN1326C2
Hardware Version(s)	01
Software Version(s)	04
FCC-ID	T7V1326C2
IC	216Q-1326C2
Test Result	**PASSED**

Possible test case verdicts:		
required by standard but not tested	N/T	
not required by standard	N/R	
not applicable to EUT	N/A	
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	2019-04-18	
Report:		
Compiled by	Wilfried Treffke	
Tested by (+ signature) (Responsible for Test)	Wilfried Treffke	W. Treffke .....
Approved by (+ signature) (Head of Lab)	Christian Weber	C. Weber .....
Date of Issue	2019-08-28	
Total number of pages	139	
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:		

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2019-08-28	Initial Release	

ABBREVIATIONS AND ACRONYMS

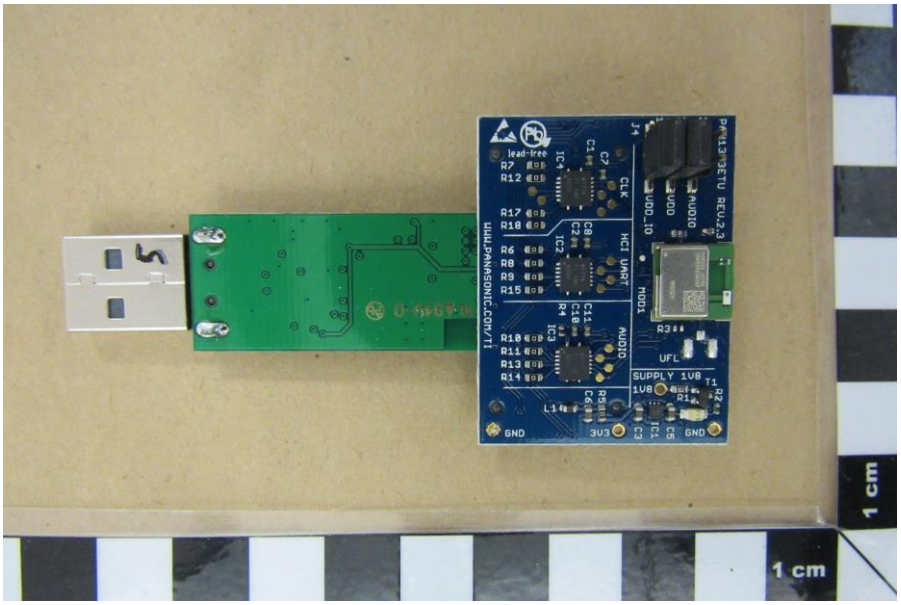
Acronyms	
Acronym	Description
BR	Bluetooth Basic Rate mode
EDR	Bluetooth Enhanced Data Rate mode
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
RBW	Resolution bandwidth
RMS	Root mean square
VBW	Video bandwidth
V_{NOM}	Nominal supply voltage

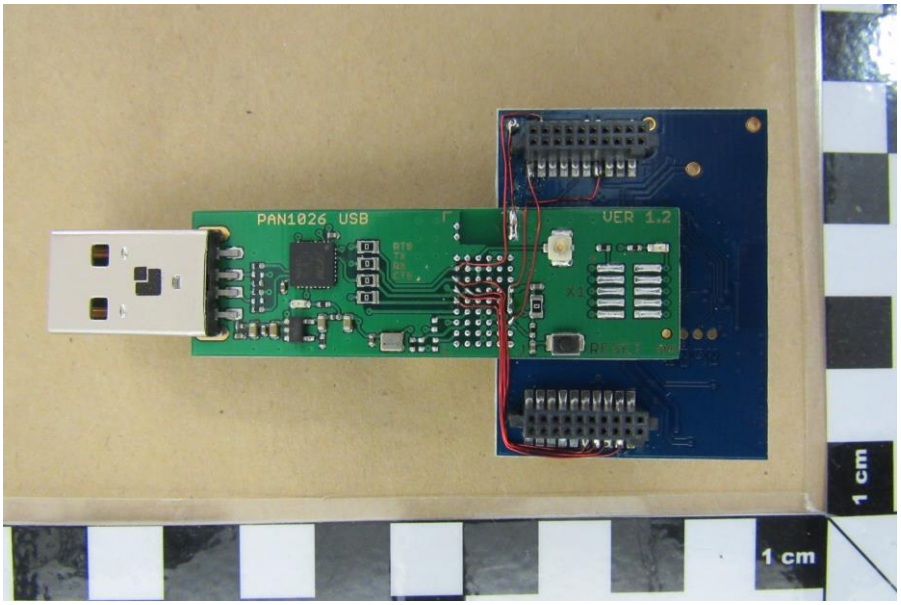
REPORT INDEX

1 Equipment (Test Item) Under Test

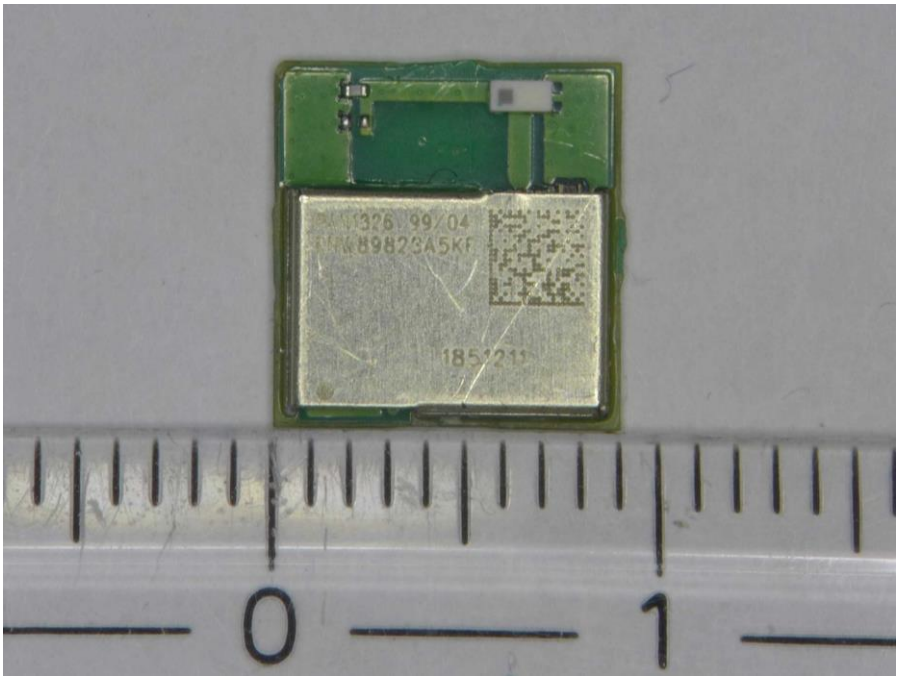
Description	Bluetooth Low Energy Module	
Model	ENW89823A5KF	
Additional Model(s)	None	
Brand Name(s)	PAN1326C2	
Serial Number(s)	None	
Hardware Version(s)	01	
Software Version(s)	04	
PMN	PAN1362C2	
HVIN	ENW89823A5KF	
FVIN	N/A	
HMN	N/A	
FCC-ID	T7V1326C2	
IC	216Q-1326C2	
Equipment type	End Product	
Radio type	Transceiver	
Assigned frequency bands	2400 - 2483.5 MHz	
Radio technology	Bluetooth	
Modulation	GFSK, PI/4-DQPSK, 8-DPSK	
Number of antenna ports	1	
Antenna	Type	Integrated
	Model	ANT016008LCS2442MA1
	Manufacturer	TDK
	Gain	1.6 dBi (customer declaration)
Supply Voltage	V_{NOM}	3.3 VDC
Operating Temperature	T_{NOM}	25 °C
AC/DC-Adaptor	Model	None
	Vendor	None
	Input	None
	Output	None
Manufacturer	Panasonic Industrial Devices Europe GmbH Zeppelinstr. 19 21337 Lüneburg GERMANY	

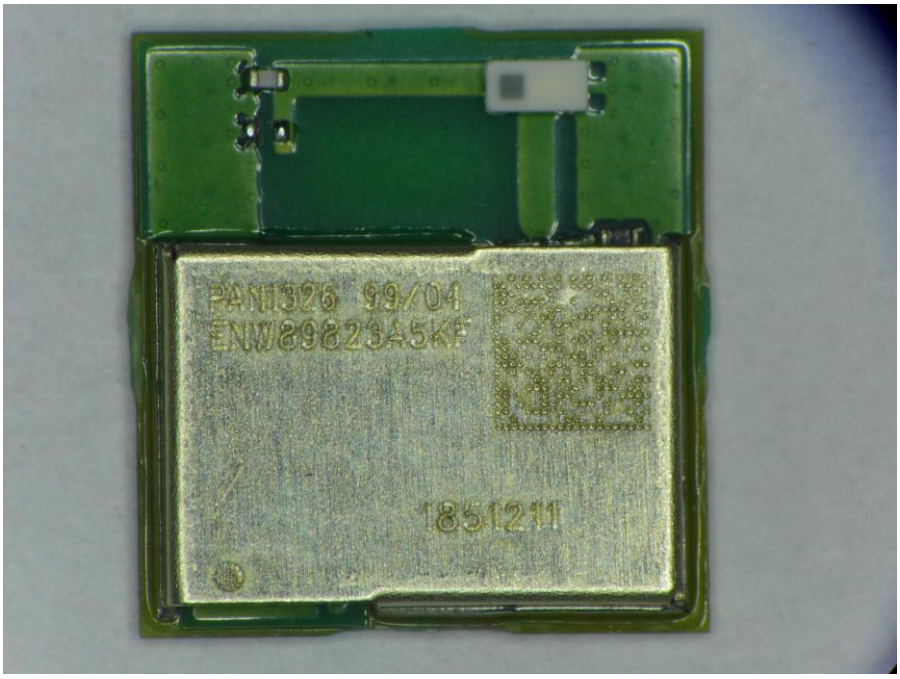
1.1 Photos – Equipment External

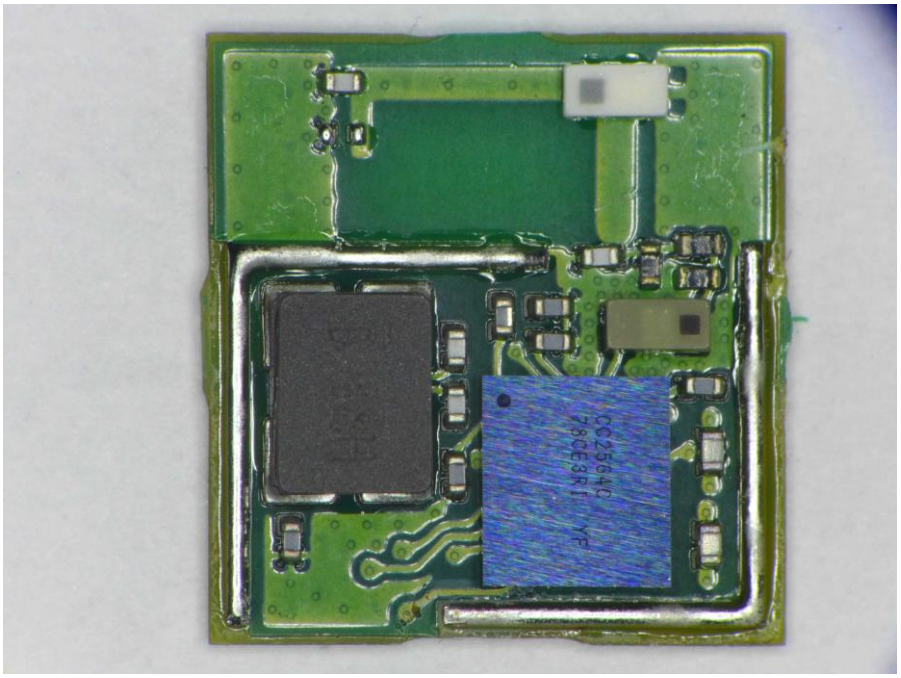
Evaluation Board with Module ENW89823A5KF, Top View


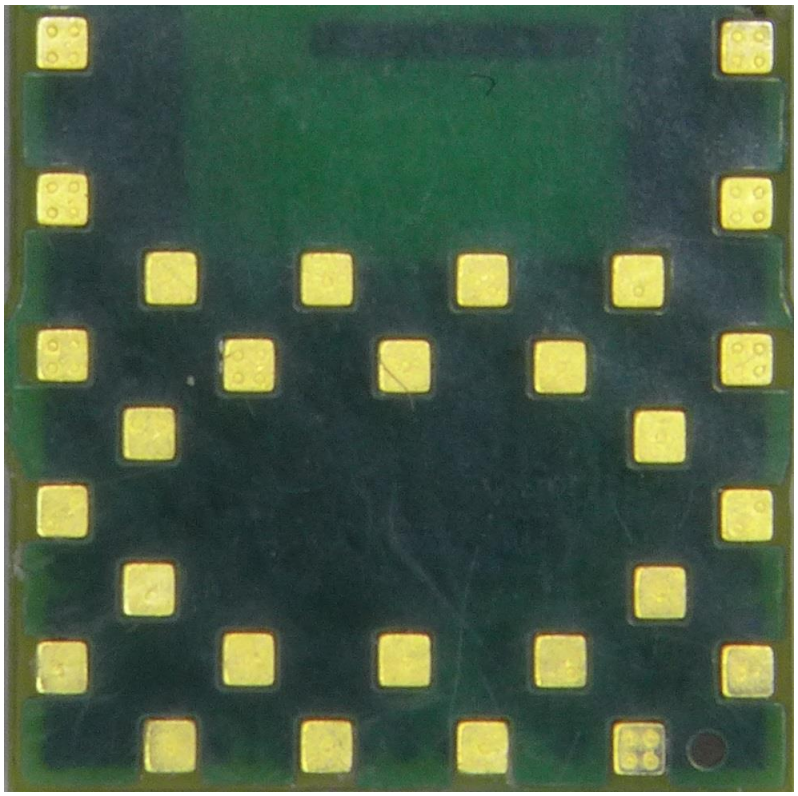
Evaluation Board with Module ENW89823A5KF, Bottom View


1.2 Photos – Equipment Internal

EUT PAN1326C2 with cover I


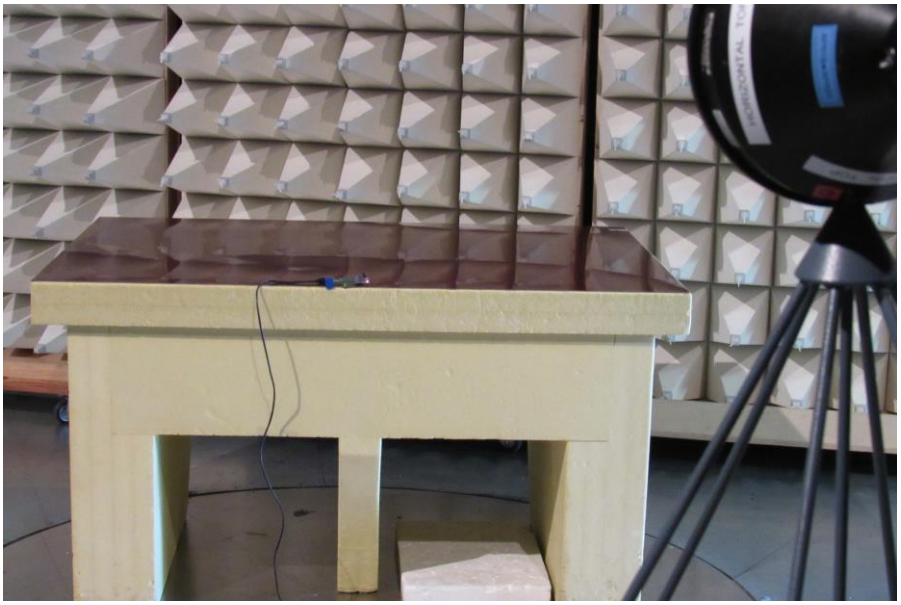
EUT PAN1326C2_with-cover II


EUT PAN1326C2 without cover


EUT PAN1326C2 backside


1.3 Photos – Test Setup

Conducted Setup


Radiated Setup


1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Laptop	Dell	Latitude E6420	S/N HPJ4R1
AE	Power Supply	Dell	FA65NE0-00	S/N RX929
SIM	Communication Tester	R&S	CBT	signaling
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment:				

1.5 Test Modes

Mode	Description
DH5 Single	Mode = Transmit Modulation = GFSK Spreading = None Packet type = DH5 Duty cycle = 78%
2-DH5 Single	Mode = Transmit Modulation = PI/4-DQPSK Spreading = None Packet type = 2-DH5 Duty cycle = 78%
3-DH5 Single	Mode = Transmit Modulation = 8-DPSK Spreading = None Packet type = 3-DH5 Duty cycle = 78%
DH5 Hopping	Mode = Transmit Modulation = GFSK Spreading = FHSS Packet type = DH5 Duty cycle = 78%
2-DH5 Hopping	Mode = Transmit Modulation = PI/4-DQPSK Spreading = FHSS Packet type = 2-DH5 Duty cycle = 78%
3-DH5 Hopping	Mode = Transmit Modulation = 8-DPSK Spreading = FHSS Packet type = 3-DH5 Duty cycle = 78%
Receive	Mode = Receive
Comment:	

1.6 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx / Rx	0	2402
F2	Tx / Rx	39	2441
F3	Tx / Rx	40	2442
F4	Tx / Rx	78	2480

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 dBµV. 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:

Reading on Analyzer (dBµV) + A.F. (dB/m) = Net field strength (dBµV/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 dBµV/m). The FCC limits are given in units of µV/m. The following formula is used to convert the units of µV/m to dBµV/m:

Limit (dBµV/m) = 20*log (µV/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:

Reading + AF	= Net Reading	:	Net reading - FCC limit	= Margin
+21.5 dBµV + 26 dB/m	= 47.5 dBµV/m	:	47.5 dBµV/m - 57.0 dBµV/m	= -9.5 dB

2 Result Summary

FCC 47 CFR Part 15C, ISED RSS-247				
Product Standard Reference	**Requirement**	**Reference Method**	**Result**	**Remarks**
ISED RSS-Gen, Issue 5 (section 6.6)	Occupied Bandwidth	ANSI C63.10-2013	N/R	Informational only
FCC § 15.247(a)(1) ISED RSS-247 § 5.1 Issue 2	20 dB Bandwidth	ANSI C63.10-2013	PASS	
FCC § 15.247(a)(1)(iii) ISED RSS-247, Issue 2 (section 5.1)	Number of hopping frequencies	ANSI C63.10-2013	PASS	
FCC § 15.247(a)(1) ISED RSS-247, Issue 2 (section 5.1)	Frequency hopping channel separation	ANSI C63.10-2013	PASS	
FCC § 15.247(a)(1)(iii) ISED RSS-247, Issue 2 (section 5.1)	Time of occupancy (Dwell time)	ANSI C63.10-2013	PASS	
FCC § 15.247(b)(1) ISED RSS-247, Issue 2 (section 5.4)	Maximum peak conducted power	ANSI C63.10-2013	PASS	
FCC § 15.207 ISED RSS-247, Issue 2 (section 3.1)	AC power line conducted emissions	ANSI C63.10-2013	PASS	
FCC § 15.247(d) ISED RSS-247, Issue 2 (section 5.5)	Band edge compliance	ANSI C63.10-2013	PASS	
FCC § 15.247(d) ISED RSS-247, Issue 2 (section 5.5)	Conducted spurious emissions	ANSI C63.10-2013	PASS	
FCC § 15.247(d) FCC § 15.209 ISED RSS-Gen, Issue 5 (section 6.13)	Transmitter radiated spurious emissions	ANSI C63.10-2013	PASS	
ISED RSS-247, Issue 2 (section 3.1)	Receiver radiated spurious emissions	ANSI C63.10-2013	PASS	
Comment:				

Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

3 Test Conditions and Results

3.1 Test Conditions and Results - Occupied bandwidth

3.1.1 Information

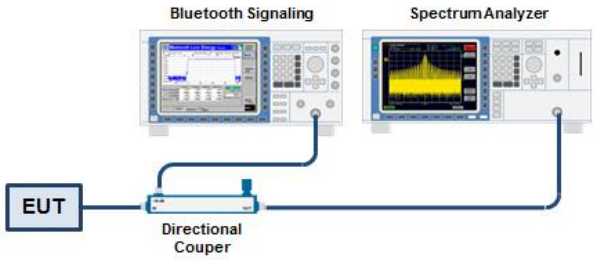
Test Information	
Reference	ISED RSS-Gen, Issue 5 (section 6.6)
Measurement Method	ANSI C63.10 6.9.3
Operator	Wilfried Treffke
Date	2019-04-25

3.1.2 Limits

Limits
None (Informational only)

3.1.3 Setup

Test Setup



3.1.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2018-12	2019-12

3.1.5 Procedure

Test Procedure

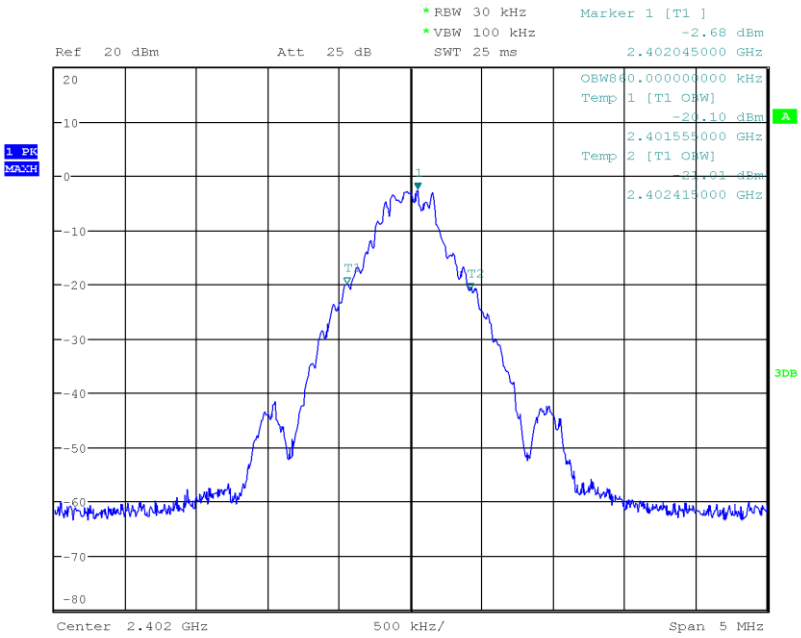
1. EUT transmitter is activated in test mode under normal conditions
2. The spectrum analyzer is set to peak detection and maximum hold with a span twice the emission spectrum
3. The resolution bandwidth is set to the range of 1 % to 5 % of the occupied bandwidth
4. The occupied bandwidth is measured with the build-in analyzer function

3.1.6 Results

Test Results		
Mode	Frequency [MHz]	Bandwidth [MHz]
DH5	2402	0.860
DH5	2441	0.860
DH5	2480	0.855
2-DH5	2402	1.195
2-DH5	2441	1.195
2-DH5	2480	1.195
3-DH5	2402	1.195
3-DH5	2441	1.200
3-DH5	2480	1.195

Occupied Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	DH5, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Occupied Bandwidth [MHz]:	0.860



Occupied Bandwidth

Project Number:	G0M-1902-8046
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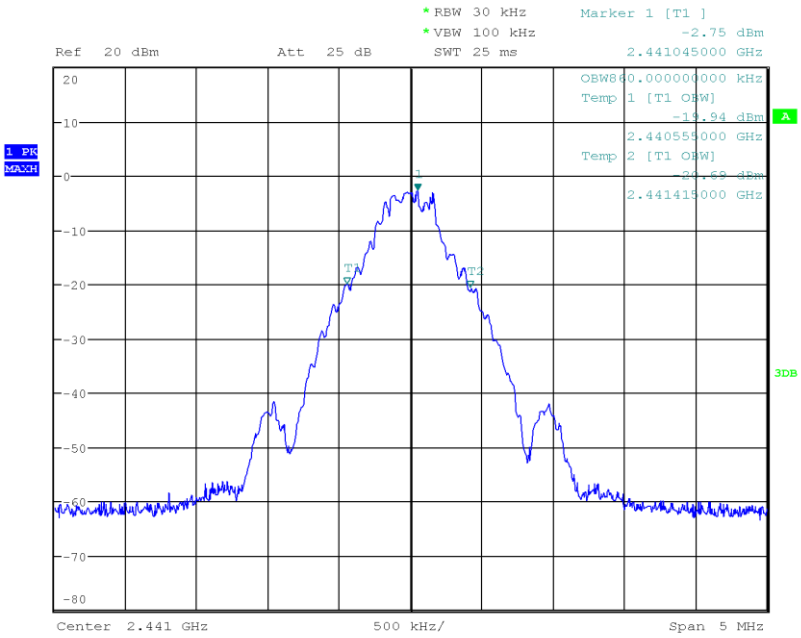
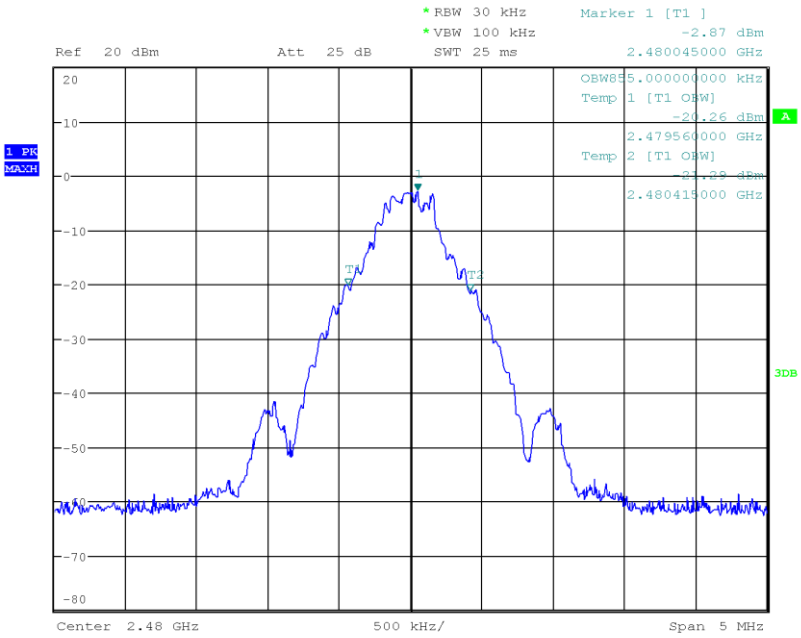
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	DH5, Channel: 39, 2441 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Occupied Bandwidth [MHz]:	0.860



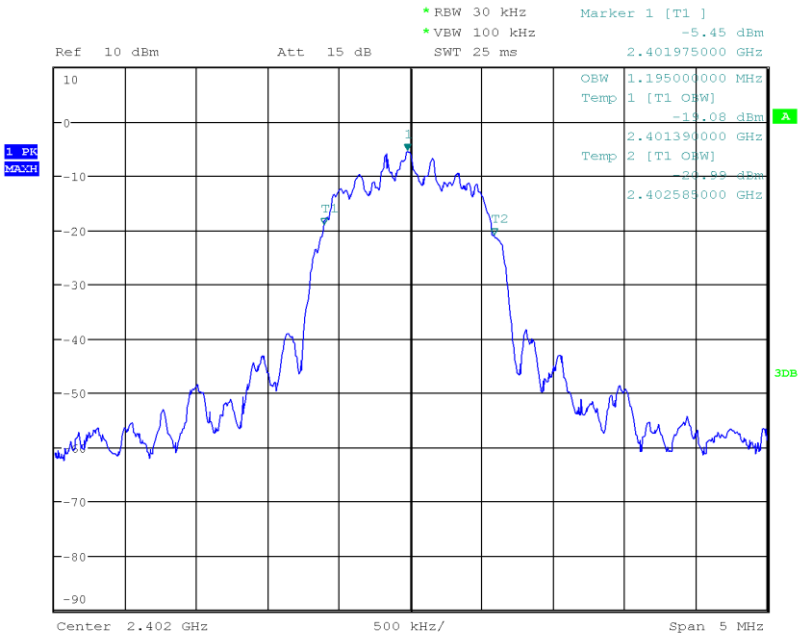
Occupied Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	DH5, Channel: 78, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Occupied Bandwidth [MHz]:	0.855



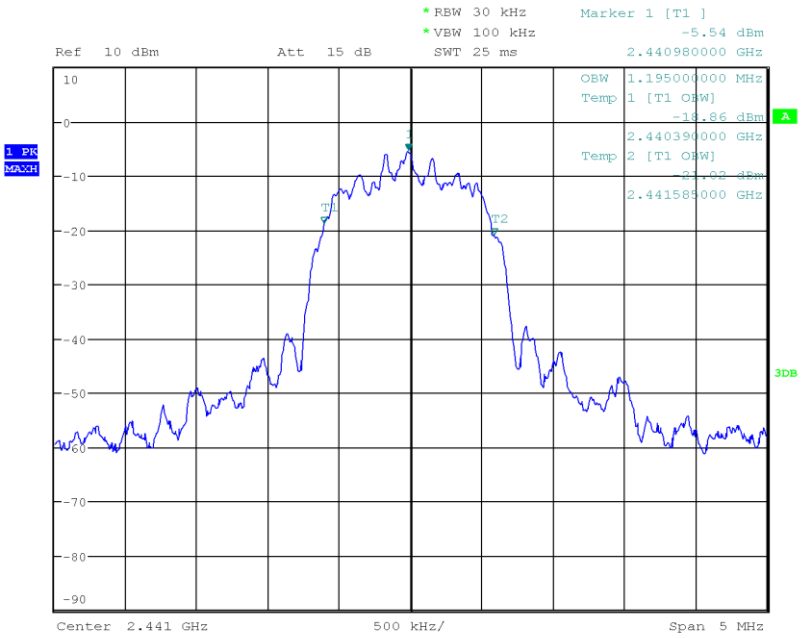
Occupied Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	2-DH5, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Occupied Bandwidth [MHz]:	1.195



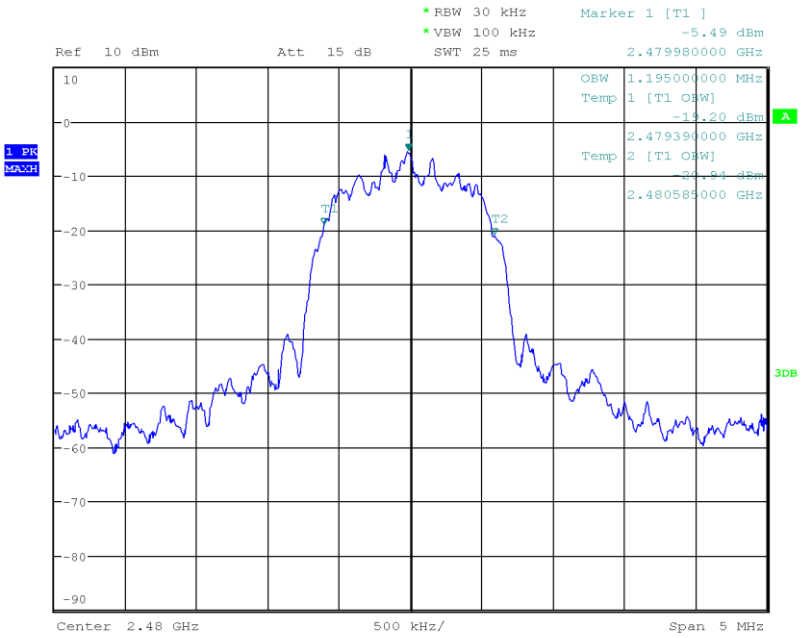
Occupied Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	2-DH5, Channel: 39, 2441 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Occupied Bandwidth [MHz]:	1.195



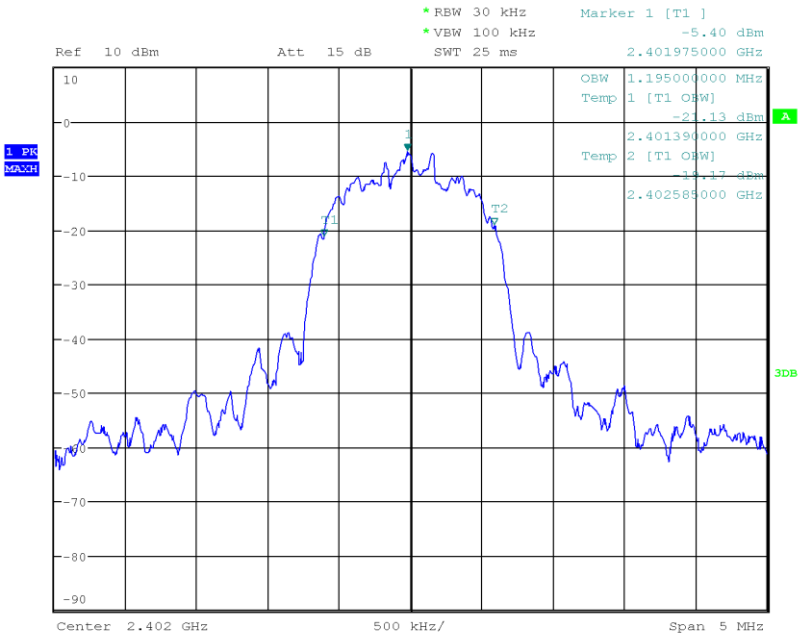
Occupied Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	2-DH5, Channel: 78, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Occupied Bandwidth [MHz]:	1.195



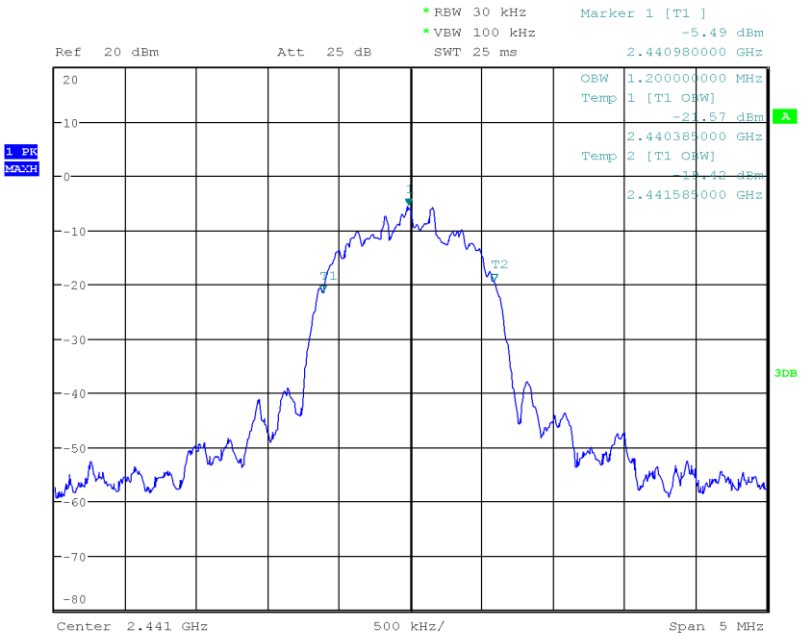
Occupied Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	3-DH5, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Occupied Bandwidth [MHz]:	1.195



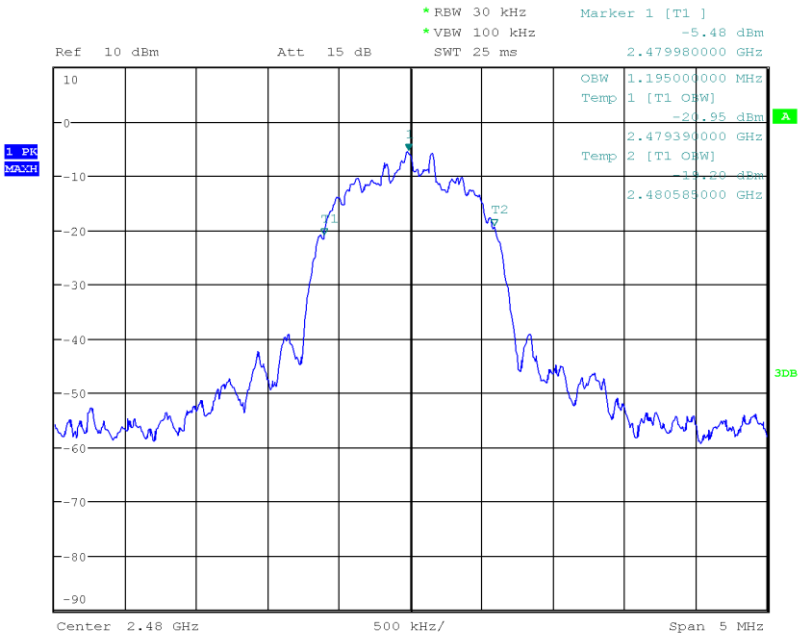
Occupied Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	3-DH5, Channel: 39, 2441 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Occupied Bandwidth [MHz]:	1.200



Occupied Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	3-DH5, Channel: 78, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Occupied Bandwidth [MHz]:	1.195



3.2 Test Conditions and Results - 20 dB bandwidth

3.2.1 Information

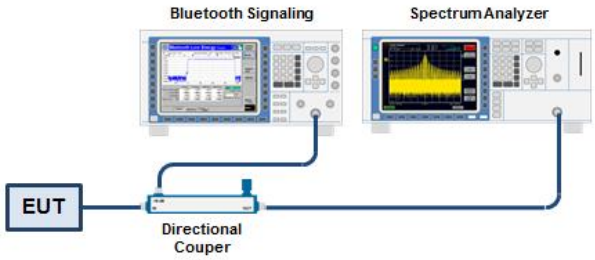
Test Information	
Reference	FCC 15.247(a)(1) / ISED RSS-247 5.1
Measurement Method	ANSI C63.10 6.9.2
Operator	Wilfried Treffke
Date	2019-04-25

3.2.2 Limits

Limits
None (Informational only)

3.2.3 Setup

Test Setup



3.2.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2018-12	2019-12

3.2.5 Procedure

Test Procedure

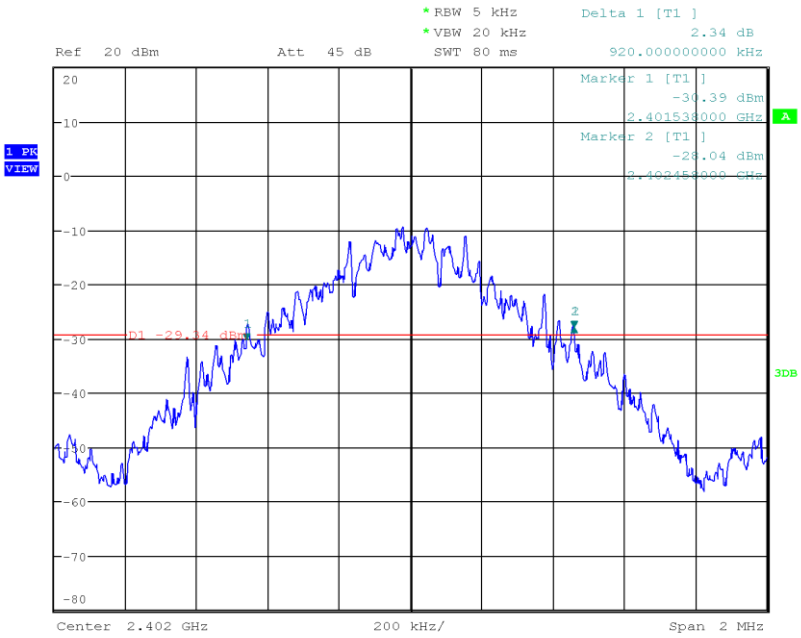
1. EUT set to test mode (Communication tester is used if needed)
2. Span set to at least twice the emission spectrum
3. Detector set to peak and max hold
4. Envelope peak value of emission spectrum is selected
5. Marker on envelope of spectrum is set to level of -20 dB to the left of the peak
6. Marker on envelope of spectrum is set to level of -20 dB to the right of the peak
7. 20dB Bandwidth is determined by marker frequency separation

3.2.6 Results

Test Results		
Mode	Frequency [MHz]	Bandwidth [MHz]
DH5	2402	0.920
DH5	2441	0.922
DH5	2480	0.922
2-DH5	2402	1.314
2-DH5	2441	1.314
2-DH5	2480	1.318
3-DH5	2402	1.310
3-DH5	2441	1.310
3-DH5	2480	1.310

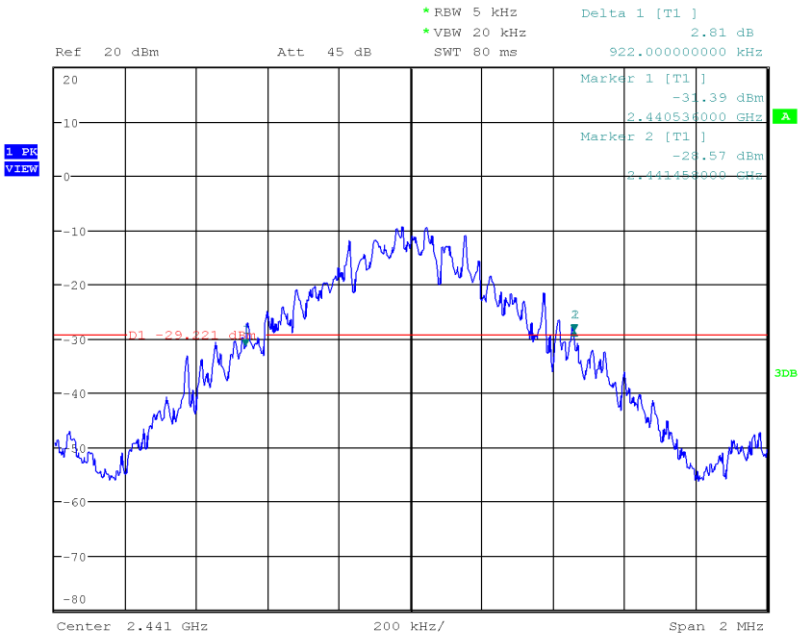
20 dB Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.2
Operational Mode:	DH5, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	W. Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Lower Frequency [MHz]:	2401.538
Upper Frequency [MHz]:	2402.458
20 dB Bandwidth [MHz]:	0.920



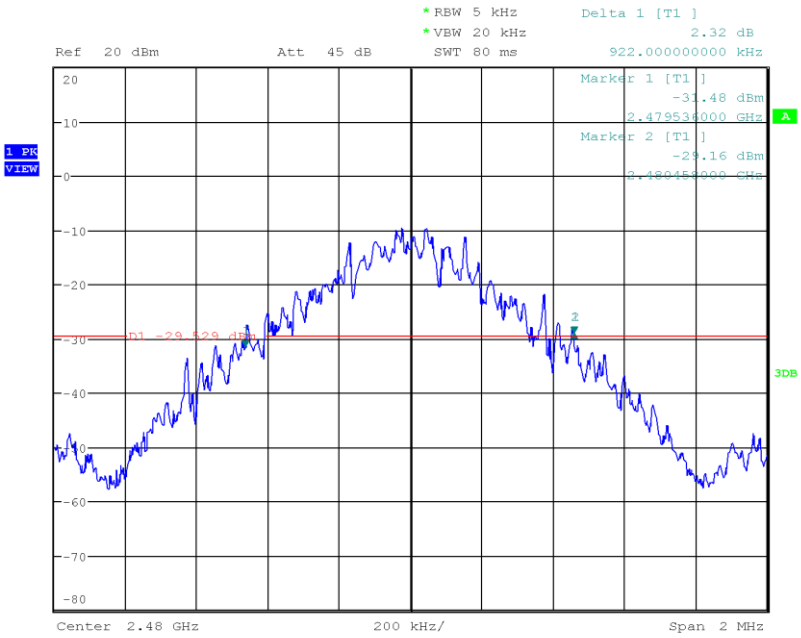
20 dB Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.2
Operational Mode:	DH5, Channel: 39, 2441 MHz
Operating Conditions:	Tnom/Vnom
Operator:	W. Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Lower Frequency [MHz]:	2440.536
Upper Frequency [MHz]:	2441.458
20 dB Bandwidth [MHz]:	0.922



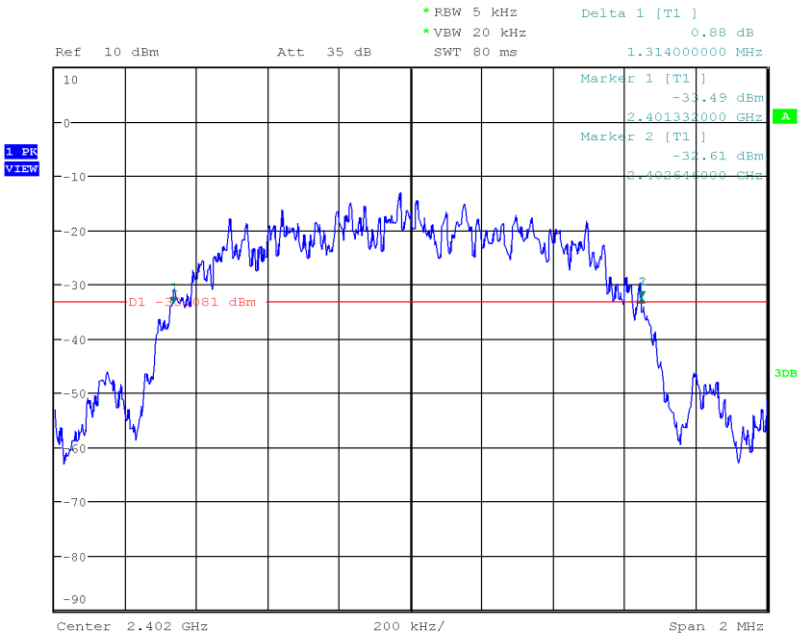
20 dB Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.2
Operational Mode:	DH5, Channel: 78, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	W. Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Lower Frequency [MHz]:	2479.536
Upper Frequency [MHz]:	2480.458
20 dB Bandwidth [MHz]:	0.922



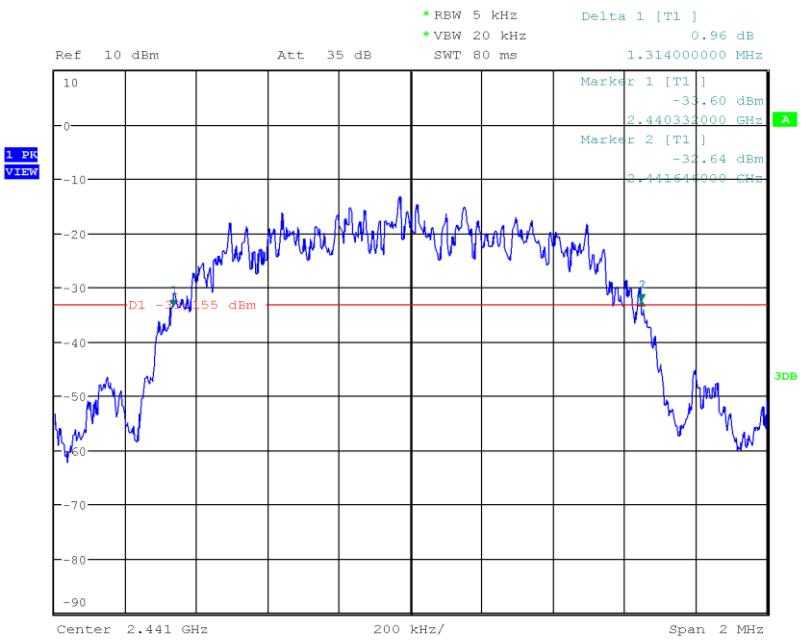
20 dB Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.2
Operational Mode:	2-DH5, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	W. Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Lower Frequency [MHz]:	2401.332
Upper Frequency [MHz]:	2402.646
20 dB Bandwidth [MHz]:	1.314



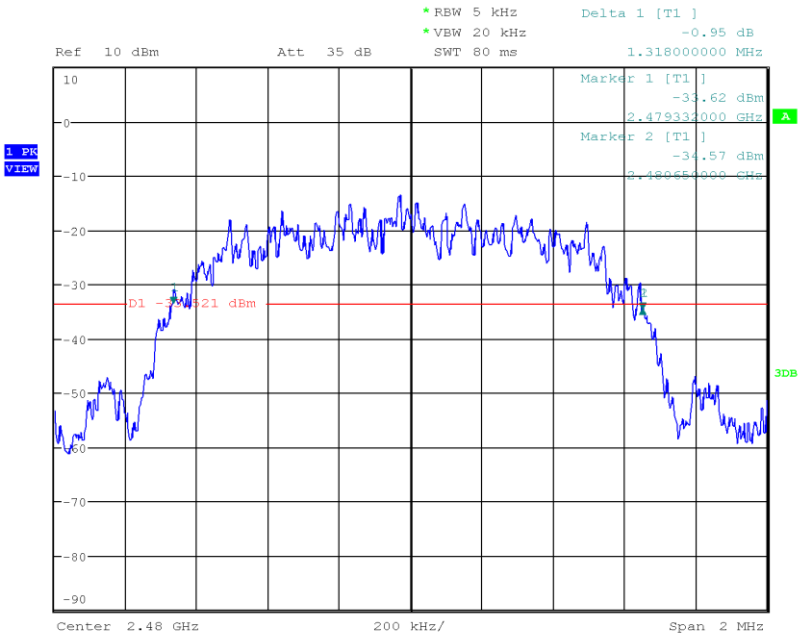
20 dB Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.2
Operational Mode:	2-DH5, Channel: 39, 2441 MHz
Operating Conditions:	Tnom/Vnom
Operator:	W. Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Lower Frequency [MHz]:	2440.332
Upper Frequency [MHz]:	2441.646
20 dB Bandwidth [MHz]:	1.314



20 dB Bandwidth

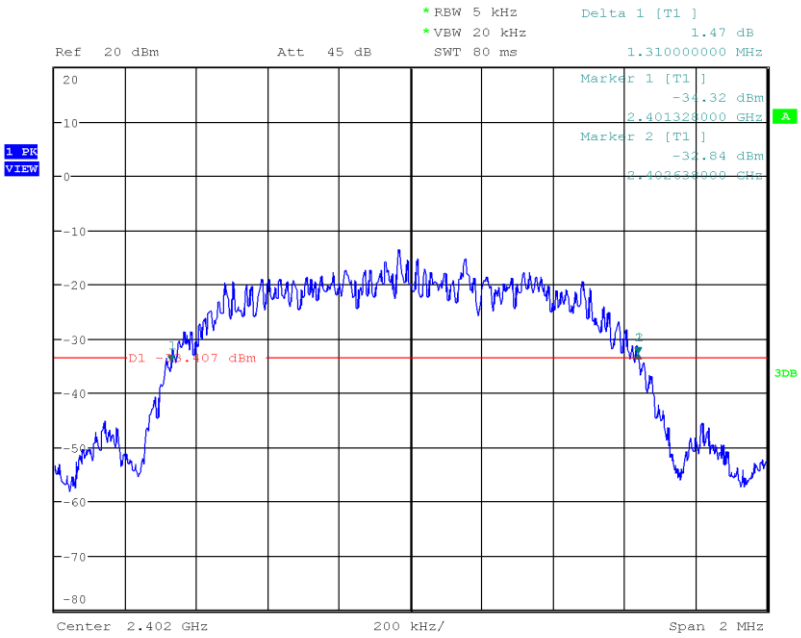
Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.2
Operational Mode:	2-DH5, Channel: 78, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	W. Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Lower Frequency [MHz]:	2479.332
Upper Frequency [MHz]:	2480.650
20 dB Bandwidth [MHz]:	1.318



Date: 25.APR.2019 05:03:53

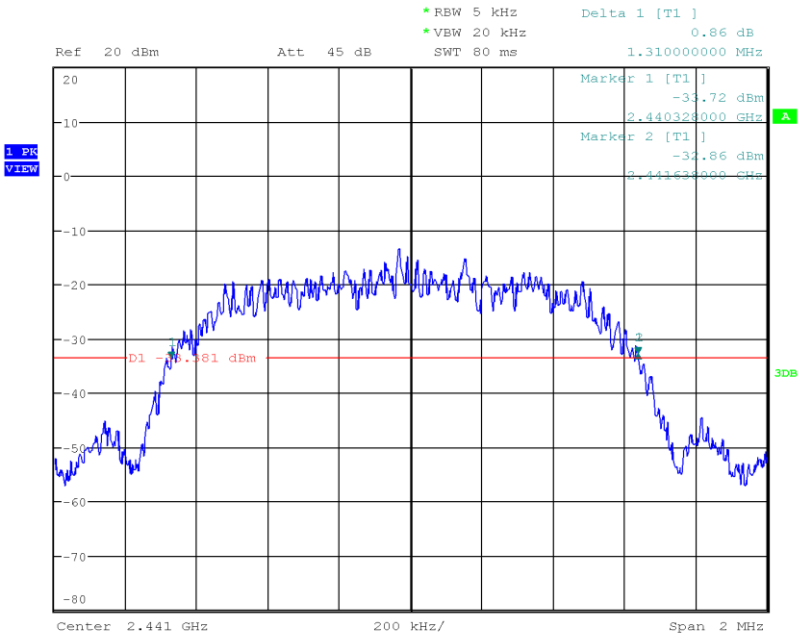
20 dB Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.2
Operational Mode:	3-DH5, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	W. Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Lower Frequency [MHz]:	2401.328
Upper Frequency [MHz]:	2402.638
20 dB Bandwidth [MHz]:	1.310



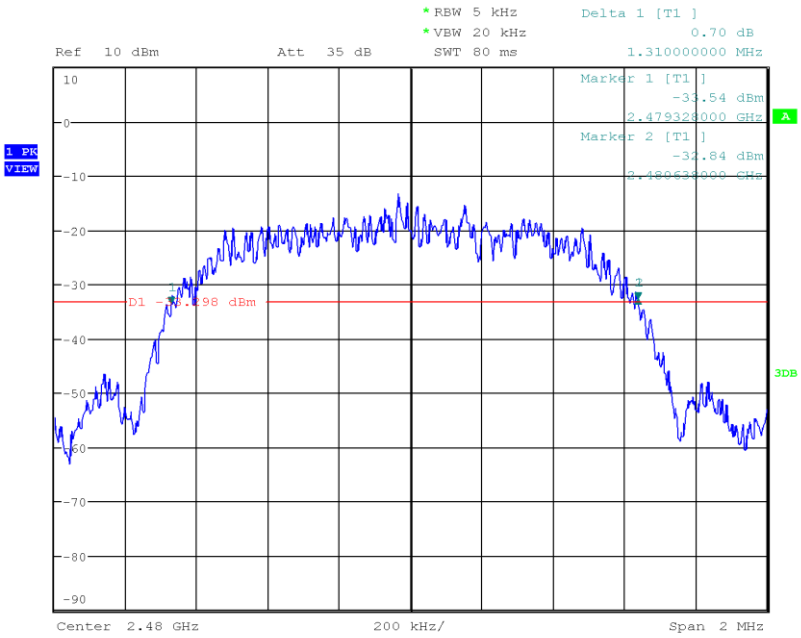
20 dB Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.2
Operational Mode:	3-DH5, Channel: 39, 2441 MHz
Operating Conditions:	Tnom/Vnom
Operator:	W. Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Lower Frequency [MHz]:	2440.328
Upper Frequency [MHz]:	2441.638
20 dB Bandwidth [MHz]:	1.310



20 dB Bandwidth

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.2
Operational Mode:	3-DH5, Channel: 78, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	W. Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Lower Frequency [MHz]:	2479.328
Upper Frequency [MHz]:	2480.638
20 dB Bandwidth [MHz]:	1.310



3.3 Test Conditions and Results - Number of hopping frequencies

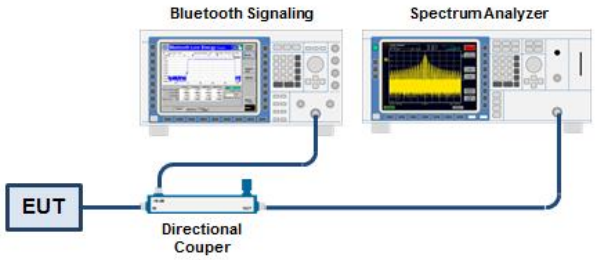
3.3.1 Information

Test Information	
Reference	FCC § 15.247(a)(1)(iii); ISED RSS-247, Issue 2 (section 5.1)
Measurement Method	ANSI C63.10 7.8.3
Operator	Wilfried Treffke
Date	2019-04-25

3.3.2 Limits

Limits
≥ 15

3.3.3 Setup

Test Setup


3.3.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2018-12	2019-12

3.3.5 Procedure

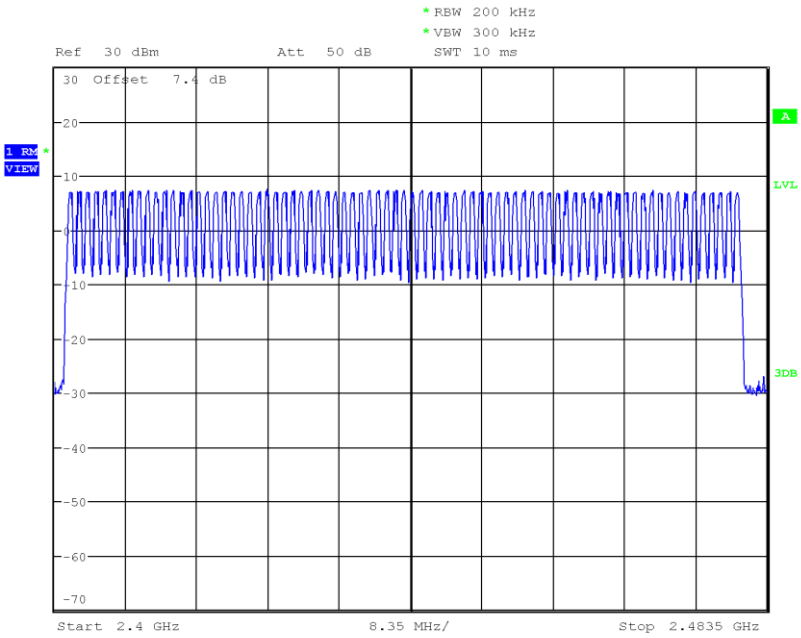
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set to measurement frequency range 3. Detector set to peak and max hold 4. Resolution bandwidth is set small enough to resolve hopping channel emission spectra 5. The number of peaks is counted to determine number of hopping frequencies

3.3.6 Results

Test Results		
Number of hopping frequencies	Limit	Verdict
79	15	PASS

Number of hopping frequencies

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.27 (a)(1)(iii)
Reference Method:	ANSI C63.10:2013 7.8.3
Operational Mode:	Bluetooth, DH5, Hopping Mode
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Number of Hopping Channels:	79



3.4 Test Conditions and Results - Frequency hopping channel separation

3.4.1 Information

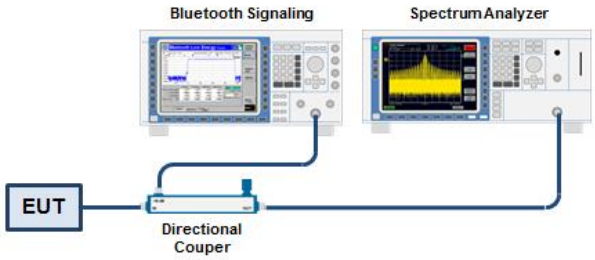
Test Information	
Reference	FCC § 15.247(a)(1); ISED RSS-247, Issue 2 (section 5.1)
Measurement Method	ANSI C63.10 7.8.4
Operator	Wilfried Treffke
Date	2019-04-25

3.4.2 Limits

Limit
≥ 25 kHz or ⅔ of 20 dB bandwidth

3.4.3 Setup

Test Setup



3.4.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2018-12	2019-12

3.4.5 Procedure

Test Procedure

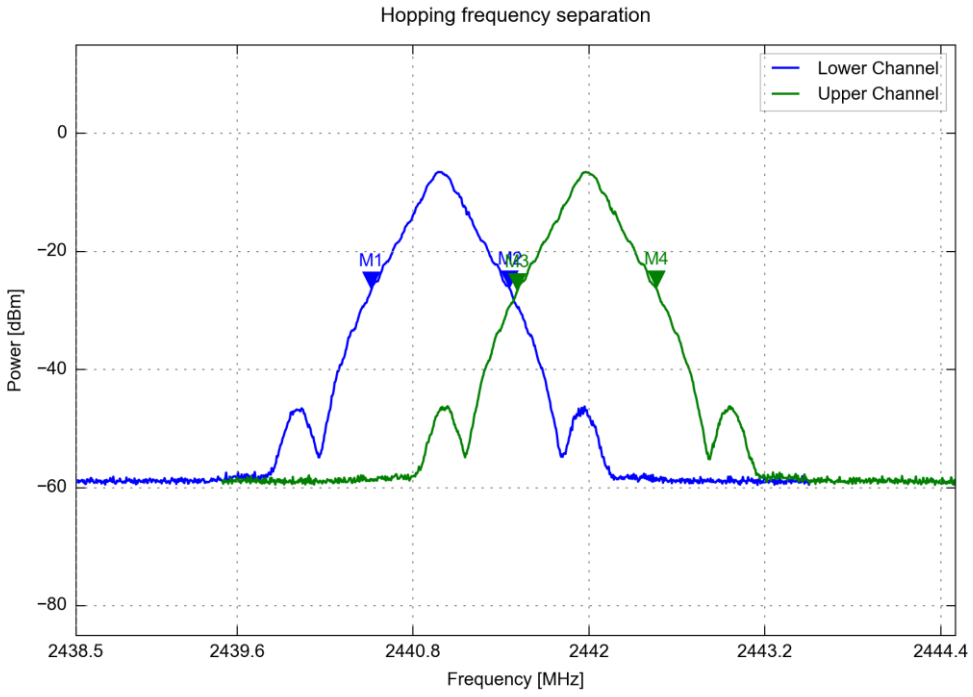
1. EUT set to test mode (Communication tester is used if needed)
2. Span set to measurement frequency range
3. Detector set to peak and max hold
4. Resolution bandwidth is set small enough to resolve hopping channel emission spectra
5. The two adjacent channel peaks are marked
6. Channel separation is determined from frequency separation of markers

3.4.6 Results

Test Results		
Channel separation [kHz]	Limit [kHz]	Verdict
997	≥ ⅔ · 997 = 664.67	PASS

Hopping frequency separation

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247(a)(1)
Reference Method:	ANSI C63.10:2013 7.8.2
Operational Mode:	Bluetooth, DH5, Channels: 2441 + 2442 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Lower Frequency (M1) [MHz]:	2440.515
Upper Frequency (M2) [MHz]:	2441.460
Lower Frequency (M3) [MHz]:	2441.510
Upper Frequency (M4) [MHz]:	2442.460
Lower center Frequency [MHz]:	2440.988
Upper center Frequency [MHz]:	2441.985
Hopping Frequency Separation [MHz]:	0.997



3.5 Test Conditions and Results - Time of occupancy (Dwell time)

3.5.1 Information

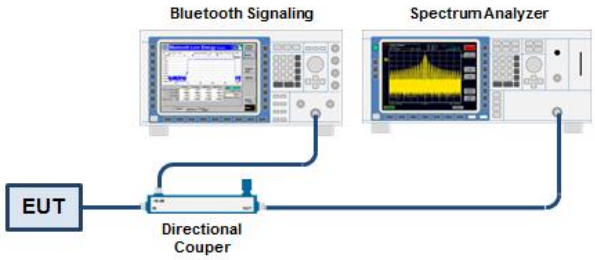
Test Information	
Reference	FCC § 15.247(a)(1)(iii); ISED RSS-247, Issue 2 (section 5.1)
Measurement Method	ANSI C63.10 7.8.2
Operator	Wilfried Treffke
Date	2019-04-25

3.5.2 Limits

Limits
≤ 0.4 s within 0.4 s · Number of hopping channels

3.5.3 Setup

Test Setup



3.5.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2018-12	2019-12

3.5.5 Procedure

Test Procedure

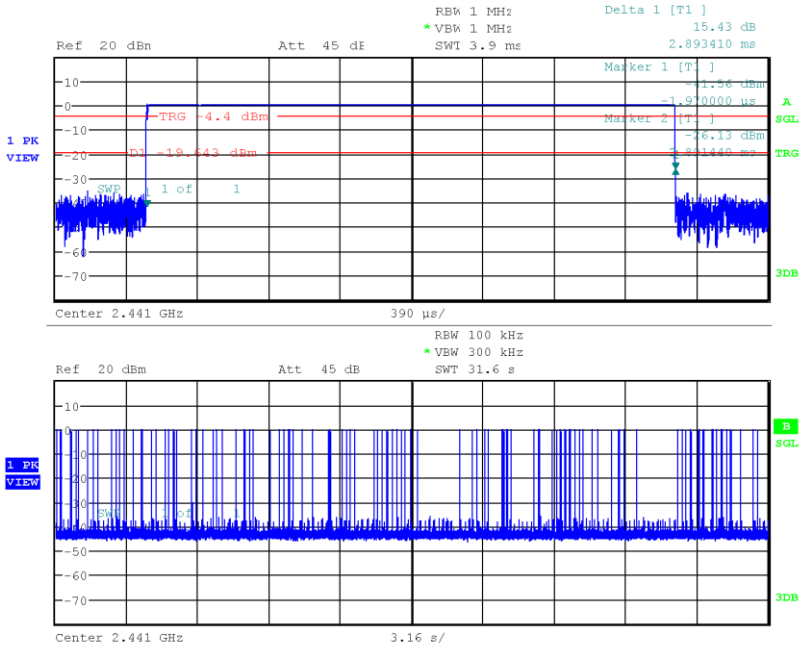
1. EUT set to test hopping mode (Communication tester is used if needed)
2. Analyzer span is set to zero span
3. Detector set to peak and max hold
4. RBW is set to 100 kHz and VBW to 300 kHz
5. The sweep time is set to capture one single dwell time
6. Trigger is set to video trigger
7. A marker is set to the start and end positions of the burst
8. The dwell time is determined from the marker difference
9. Another sweep is initiated without trigger and sweep time set to the observation time
10. The number of hops is counted
11. The total time of occupancy is calculated from the dwell time per hop multiplied by the number of hops

3.5.6 Results

Test Results					
Observation Period [s]	Number of Hops	Dwell time per Hop [s]	Time of occupancy [s]	Limit [s]	Margin [s]
31.6	109	0.002893	0.315	0.4	0.085

Time of occupancy

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Method:	ANSI C63.10:2013 7.8.4
Operational Mode:	DH5, Hopping mode
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Dwell Time per Hop [ms]:	2.893
Number of Hops:	109
Time of occupancy [s]:	0.315



Date: 25.APR.2019 05:29:14

3.6 Test Conditions and Results - Maximum peak conducted output power

3.6.1 Information

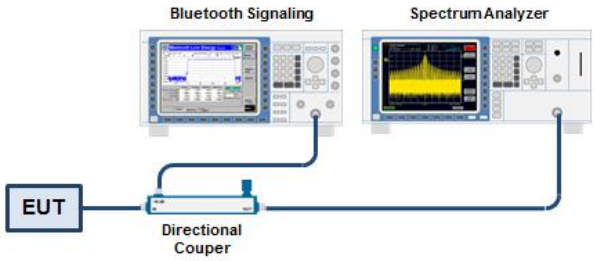
Test Information	
Reference	FCC § 15.247(b)(1); ISED RSS-247, Issue 2 (section 5.4)
Measurement Method	ANSI C63.10 7.8.5
Operator	Wilfried Treffke
Date	2019-04-25

3.6.2 Limits

Limits	
Condition	Power
Number of hopping channels ≥ 75	1 W (30 dBm)
75 > Number of hopping channels ≥ 15	0.125 W (21 dBm)
The conducted output power limit specified above is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in the table, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	

3.6.3 Setup

Test Setup



3.6.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2018-12	2019-12

3.6.5 Procedure

Test Procedure

1. EUT set to test mode (Communication tester is used if needed)
2. Analyzer resolution bandwidth is set ≥ DTS bandwidth
3. Detector set to peak and max hold
4. Sweep time is set to auto
5. After the trace has stabilized a marker is set to peak of envelope

3.6.6 Results

Test Results - DH5				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2402	7.87	0.0061	1.0	PASS
2441	7.90	0.0062	1.0	PASS
2480	7.76	0.0060	1.0	PASS

Test Results - 2-DH5				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2402	7.29	0.0054	1.0	PASS
2441	7.28	0.0053	1.0	PASS
2480	7.15	0.0052	1.0	PASS

Test Results - 3-DH5				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2402	7.87	0.0061	1.0	PASS
2441	7.87	0.0061	1.0	PASS
2480	7.71	0.0059	1.0	PASS

3.7 Test Conditions and Results - AC powerline conducted emissions

3.7.1 Information

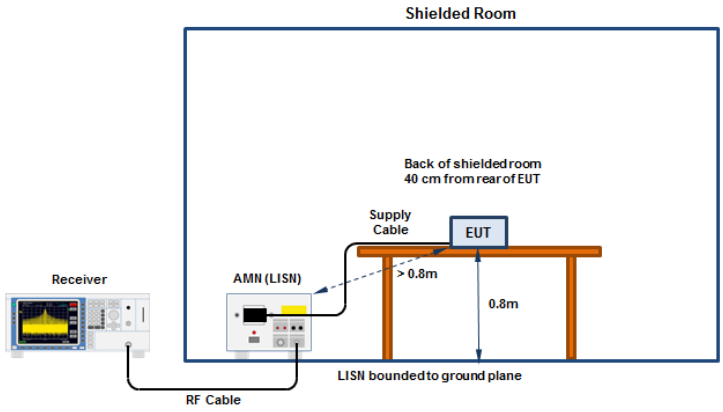
Test Information	
Reference	FCC § 15.207; ISED RSS-247, Issue 2 (section 3.1)
Measurement Method	ANSI C63.10 6.2
Operator	Wilfried Treffke
Date	2019-04-26

3.7.2 Limits

Limits		
Frequency [MHz]	Quasi-Peak [dBµV]	Average [dBµV]
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5	56	46
5 - 30	60	50
* Limit decreases linearly with the logarithm of the frequency		

3.7.3 Setup

Test Setup



3.7.4 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2016.1.10

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Receiver	R&S	ESU 26	EF00241	2017-07	2019-07
LISN	R&S	ESH3-Z5	EF00036	2017-01	2019-07

EMI voltage test in the ac-mains according to FCC part 15 C

Project number: G0M-1902-8046

Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 24°C, Unom: 120 VAC
LISN:	ESH3-Z5 (L)
Mode:	BT; DH5; hopping
Test Date:	2019-04-26
Note:	

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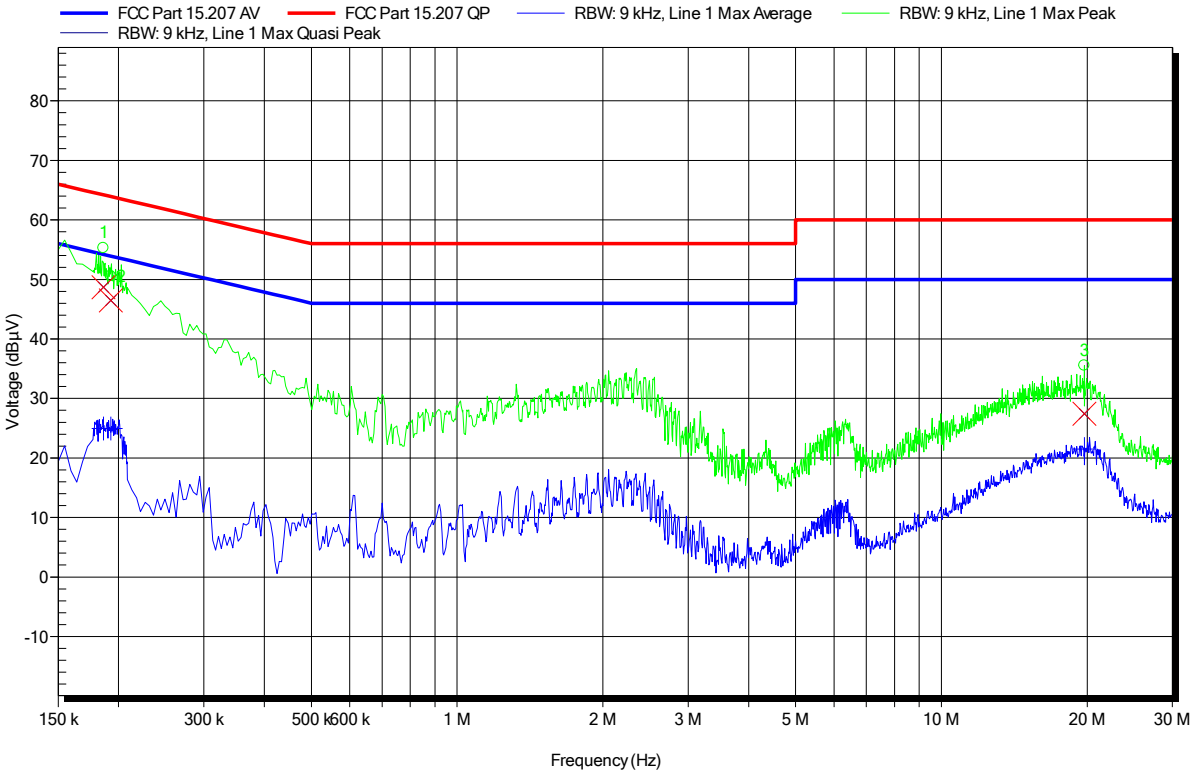

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	186 kHz	48.67 dBµV	64.21 dBµV	-15.54 dB	Pass
2	192.75 kHz	46.47 dBµV	63.92 dBµV	-17.45 dB	Pass
3	19.728 MHz	27.45 dBµV	60 dBµV	-32.55 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	186 kHz	24.95 dBµV	54.21 dBµV	-29.26 dB	Pass
2	192.75 kHz	24.94 dBµV	53.92 dBµV	-28.97 dB	Pass
3	19.728 MHz	21.48 dBµV	50 dBµV	-28.52 dB	Pass

EMI voltage test in the ac-mains according to FCC part 15 C

Project number: G0M-1902-8046

Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 24°C, Unom: 120 VAC
LISN:	ESH3-Z5 (N)
Mode:	BT; DH5; hopping
Test Date:	2019-04-26
Note:	

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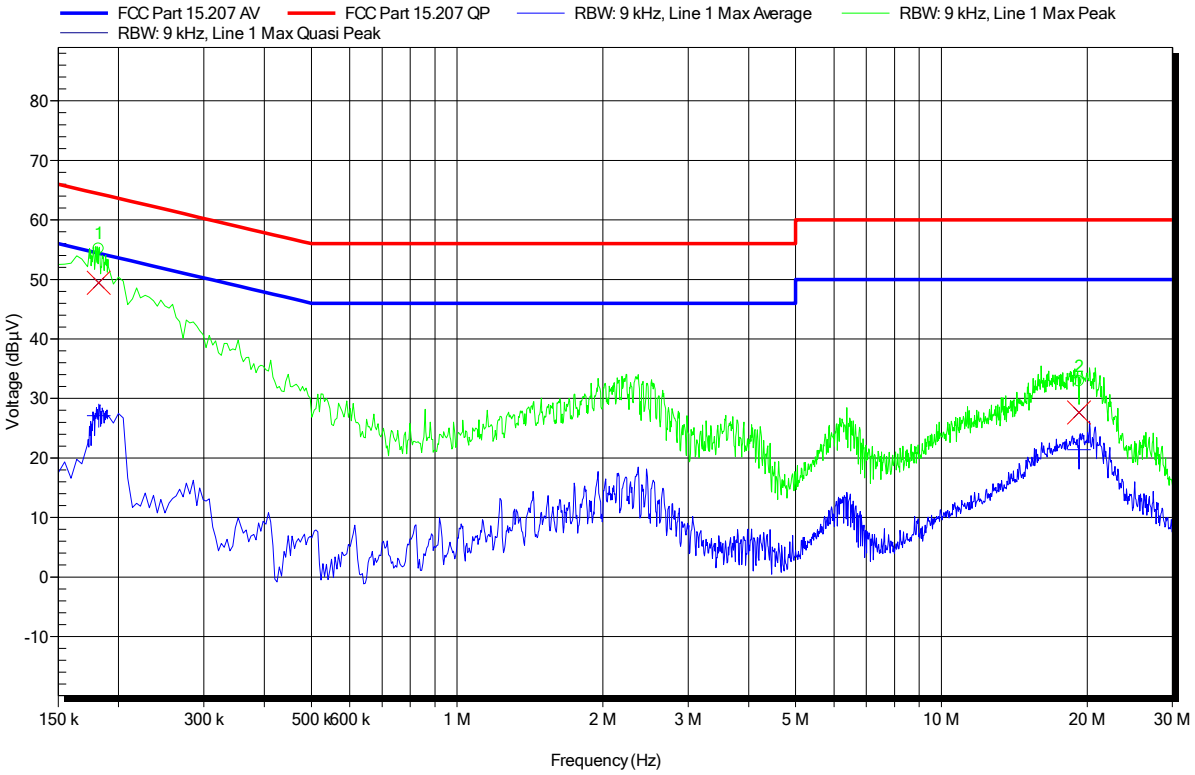


Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	181.95 kHz	49.42 dBµV	64.4 dBµV	-14.97 dB	Pass
2	19.223 MHz	27.63 dBµV	60 dBµV	-32.37 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	181.95 kHz	27.13 dBµV	54.4 dBµV	-27.27 dB	Pass
2	19.223 MHz	21.41 dBµV	50 dBµV	-28.59 dB	Pass

3.8 Test Conditions and Results - Band-edge compliance

3.8.1 Information

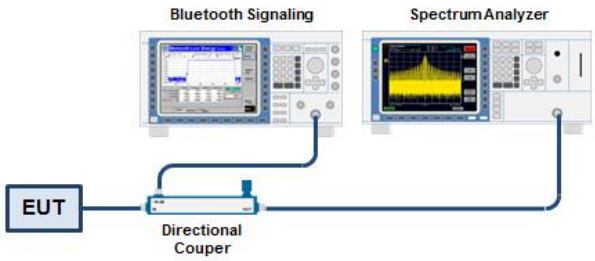
Test Information	
Reference	FCC § 15.247(d); ISED RSS-247, Issue 2 (section 5.5)
Measurement Method	ANSI C63.10 6.10
Operator	Wilfried Treffke
Date	2019-04-25

3.8.2 Limits

Limits	
Power Measurement	Out-of-band attenuation [dB]
Peak	20
RMS	30

3.8.3 Setup

Test Setup



3.8.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2018-12	2019-12

3.8.5 Procedure

Test Procedure

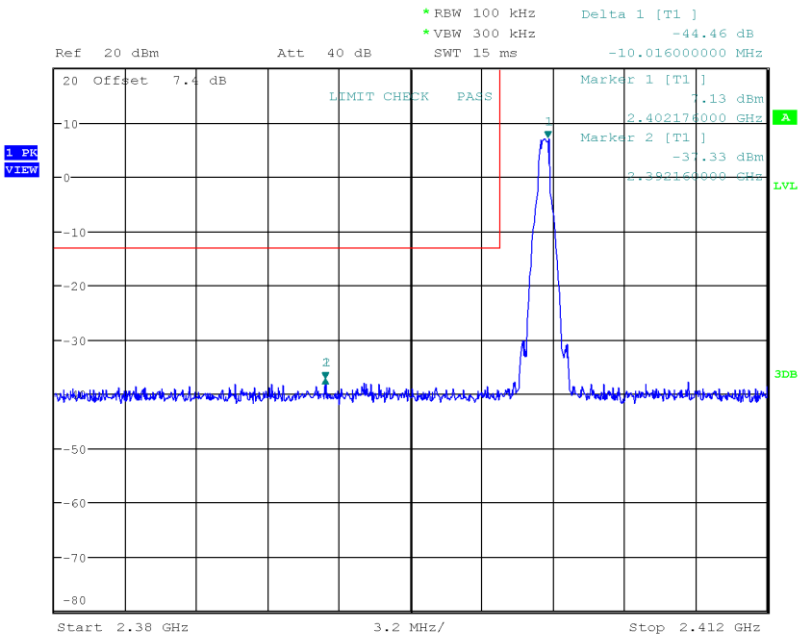
1. EUT set to test mode (Communication tester is used if needed)
2. Span set around lower band edge and detector is set to peak and max hold
3. Resolution bandwidth is set to 100 kHz
4. Markers are set to peak emission levels within frequency band and outside frequency band
5. Band edge attenuation is determined from level difference

3.8.6 Results

Test Results				
Mode	Channel [MHz]	Out-of-band Attenuation [dB]	Limit [dB]	Verdict
DH5 single	2402	-44.46	-20	PASS
DH5 single	2480	-44.18	-20	PASS
2-DH5 single	2402	-42.52	-20	PASS
2-DH5 single	2480	-41.36	-20	PASS
3-DH5 single	2402	-42.10	-20	PASS
3-DH5 single	2480	-41.72	-20	PASS
DH5 hopping	2402	-44.15	-20	PASS
DH5 hopping	2480	-44.16	-20	PASS
2-DH5 hopping	2402	-42.45	-20	PASS
2-DH5 hopping	2480	-40.99	-20	PASS
3-DH5 hopping	2402	-41.88	-20	PASS
3-DH5 hopping	2480	-41.55	-20	PASS

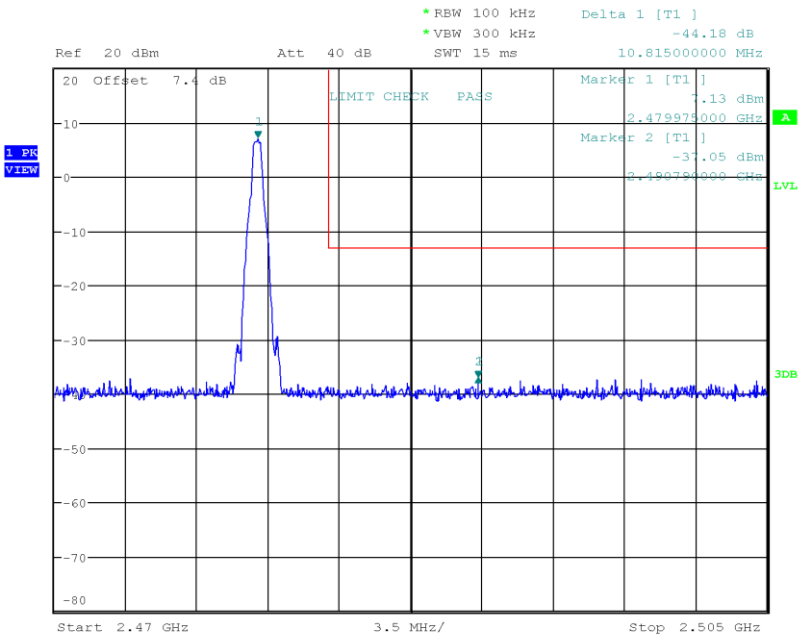
Band-edge Compliance

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operational Mode:	DH5, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Band-edge	Lower
In-band Frequency [MHz]:	2402.176
Max. in-band Level [dBm/100 kHz]:	7.13
Out-of-band Frequency [MHz]:	2392.16
Max. out-of-band Level [dBm/100 kHz]:	-37.332
Attenuation [dB]:	-44.46



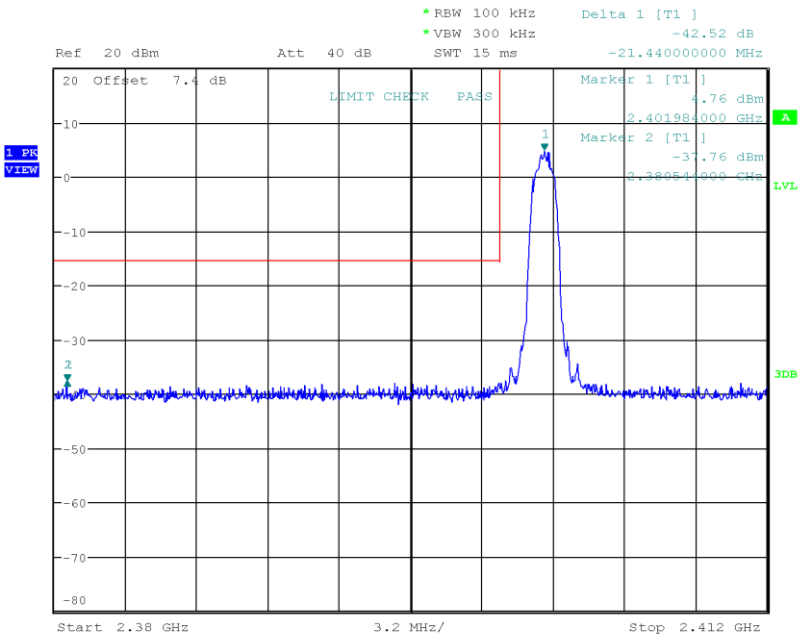
Band-edge Compliance

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operational Mode:	DH5, Channel: 78, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Band-edge	Upper
In-band Frequency [MHz]:	2479.975
Max. in-band Level [dBm/100 kHz]:	7.127
Out-of-band Frequency [MHz]:	2490.79
Max. out-of-band Level [dBm/100 kHz]:	-37.054
Attenuation [dB]:	-44.18



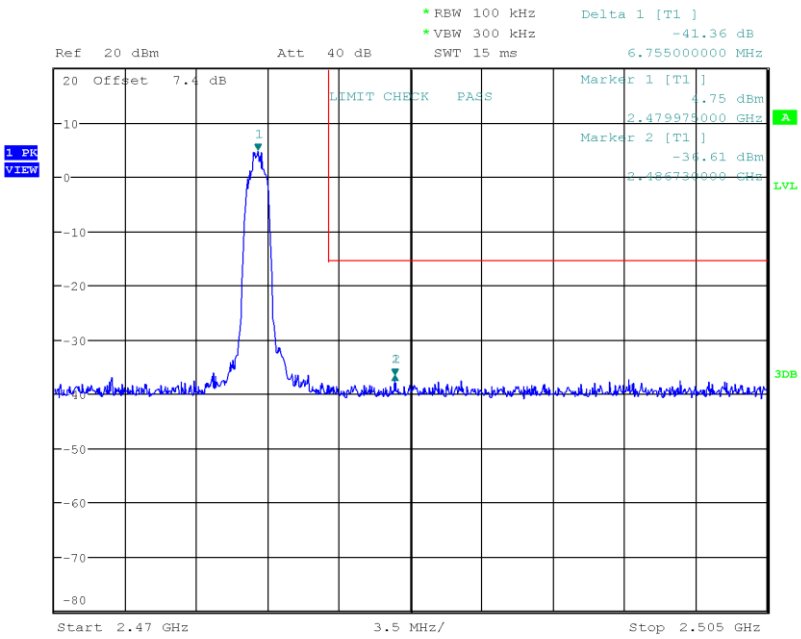
Band-edge Compliance

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operational Mode:	2-DH5, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Band-edge	Lower
In-band Frequency [MHz]:	2401.984
Max. in-band Level [dBm/100 kHz]:	4.763
Out-of-band Frequency [MHz]:	2380.544
Max. out-of-band Level [dBm/100 kHz]:	-37.759
Attenuation [dB]:	-42.52



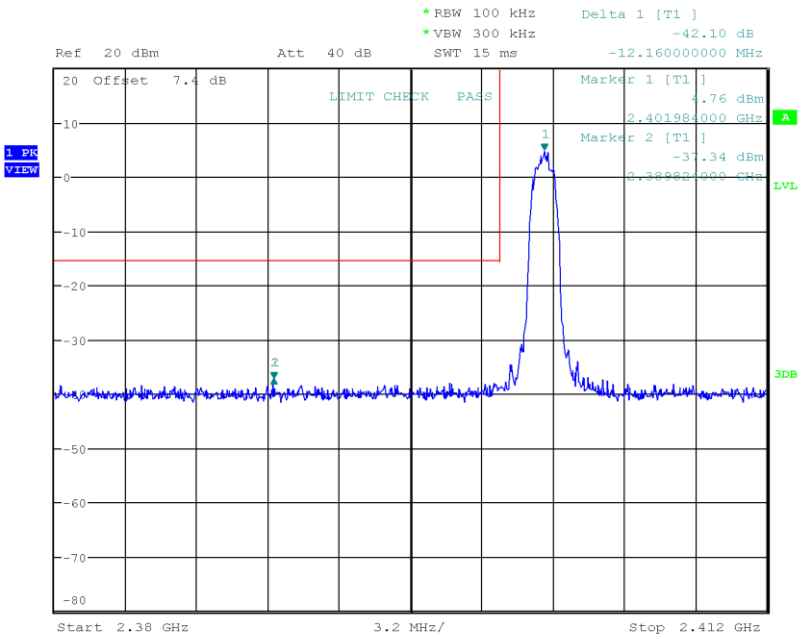
Band-edge Compliance

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operational Mode:	2-DH5, Channel: 78, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Band-edge	Upper
In-band Frequency [MHz]:	2479.975
Max. in-band Level [dBm/100 kHz]:	4.747
Out-of-band Frequency [MHz]:	2486.73
Max. out-of-band Level [dBm/100 kHz]:	-36.609
Attenuation [dB]:	-41.36



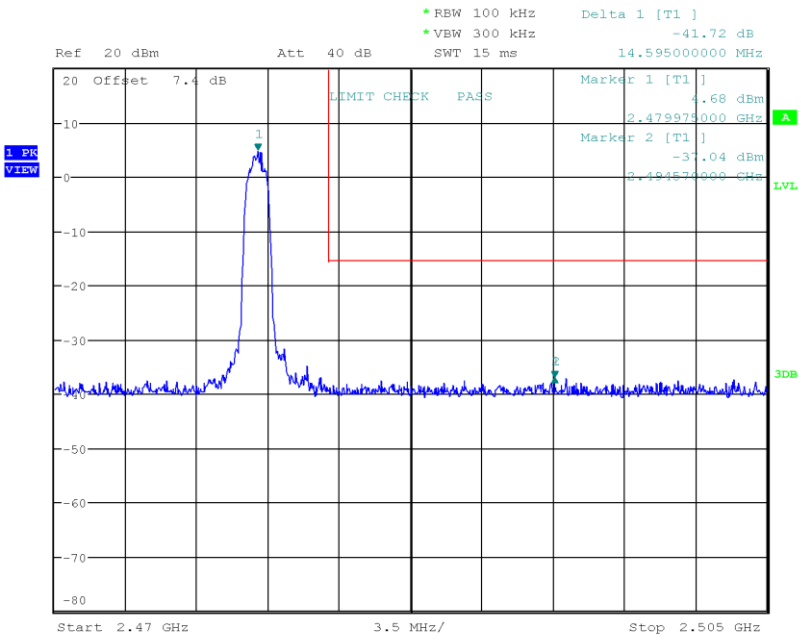
Band-edge Compliance

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operational Mode:	3-DH5, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Band-edge	Lower
In-band Frequency [MHz]:	2401.984
Max. in-band Level [dBm/100 kHz]:	4.758
Out-of-band Frequency [MHz]:	2389.824
Max. out-of-band Level [dBm/100 kHz]:	-37.338
Attenuation [dB]:	-42.1



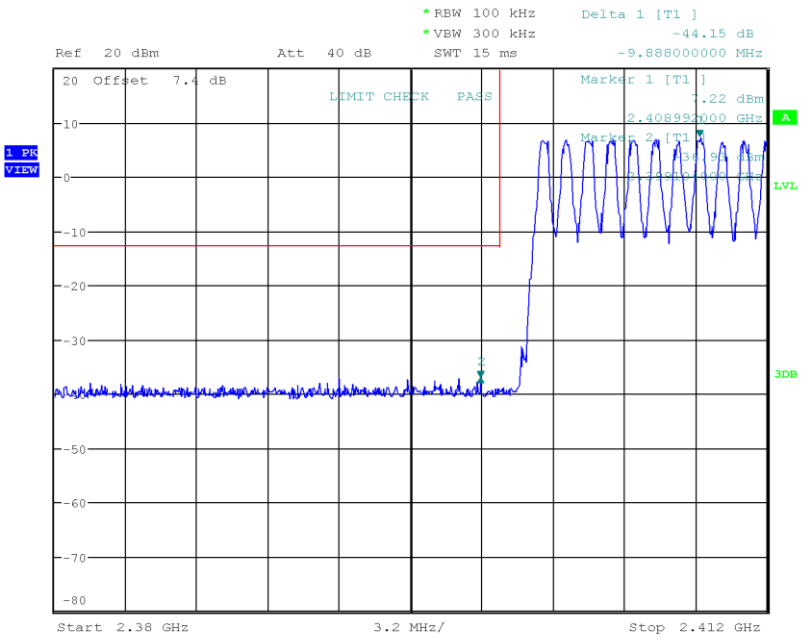
Band-edge Compliance

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operational Mode:	3-DH5, Channel: 78, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Band-edge	Upper
In-band Frequency [MHz]:	2479.975
Max. in-band Level [dBm/100 kHz]:	4.681
Out-of-band Frequency [MHz]:	2494.57
Max. out-of-band Level [dBm/100 kHz]:	-37.038
Attenuation [dB]:	-41.72



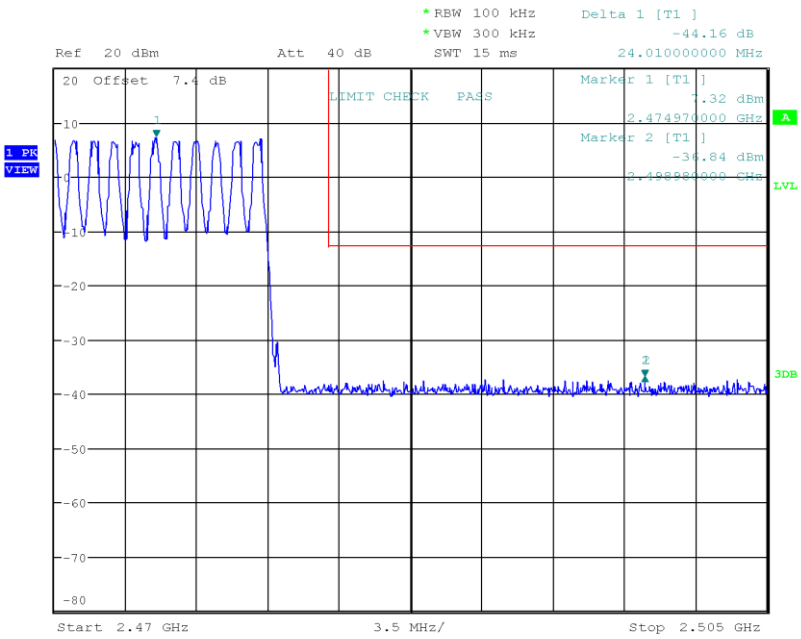
Band-edge Compliance

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operational Mode:	DH5, Hopping
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Band-edge	Lower
In-band Frequency [MHz]:	2408.992
Max. in-band Level [dBm/100 kHz]:	7.221
Out-of-band Frequency [MHz]:	2399.104
Max. out-of-band Level [dBm/100 kHz]:	-36.933
Attenuation [dB]:	-44.15



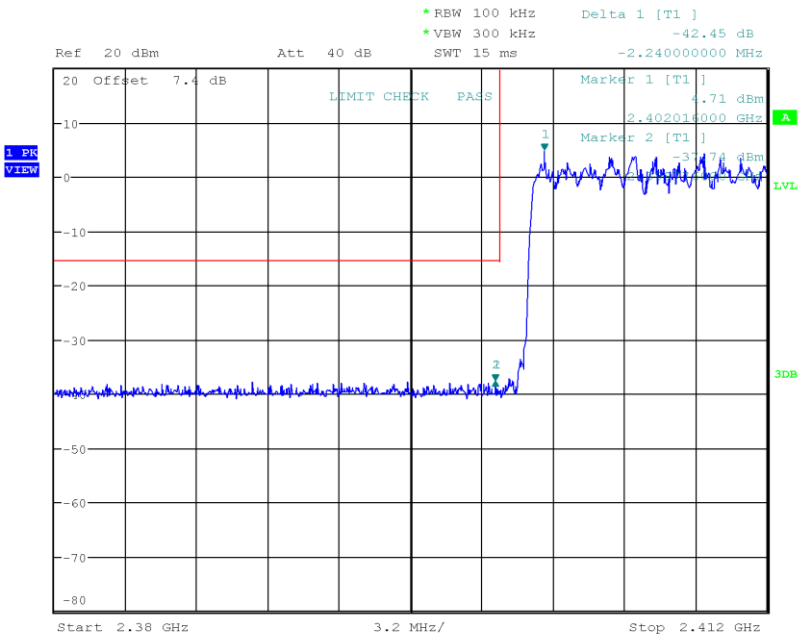
Band-edge Compliance

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operational Mode:	DH5, Hopping
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Band-edge	Upper
In-band Frequency [MHz]:	2474.97
Max. in-band Level [dBm/100 kHz]:	7.322
Out-of-band Frequency [MHz]:	2498.98
Max. out-of-band Level [dBm/100 kHz]:	-36.838
Attenuation [dB]:	-44.16



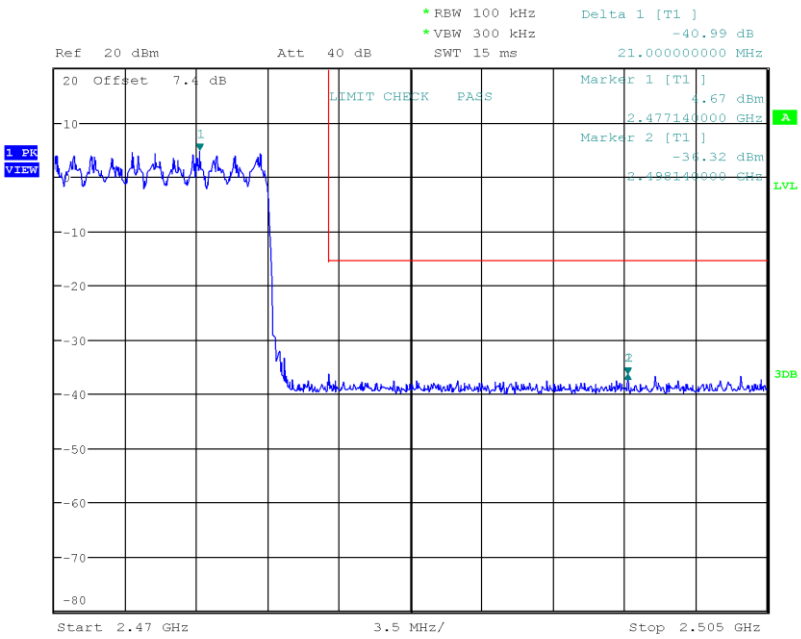
Band-edge Compliance

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operational Mode:	2-DH5, Hopping
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Band-edge	Lower
In-band Frequency [MHz]:	2402.016
Max. in-band Level [dBm/100 kHz]:	4.709
Out-of-band Frequency [MHz]:	2399.776
Max. out-of-band Level [dBm/100 kHz]:	-37.737
Attenuation [dB]:	-42.45



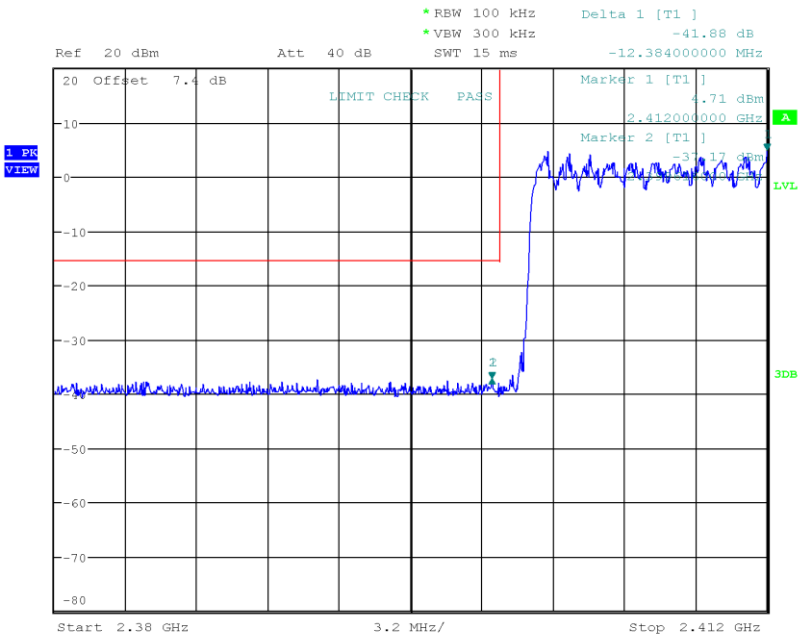
Band-edge Compliance

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operational Mode:	2-DH5, Hopping
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Band-edge	Upper
In-band Frequency [MHz]:	2477.14
Max. in-band Level [dBm/100 kHz]:	4.673
Out-of-band Frequency [MHz]:	2498.14
Max. out-of-band Level [dBm/100 kHz]:	-36.321
Attenuation [dB]:	-40.99



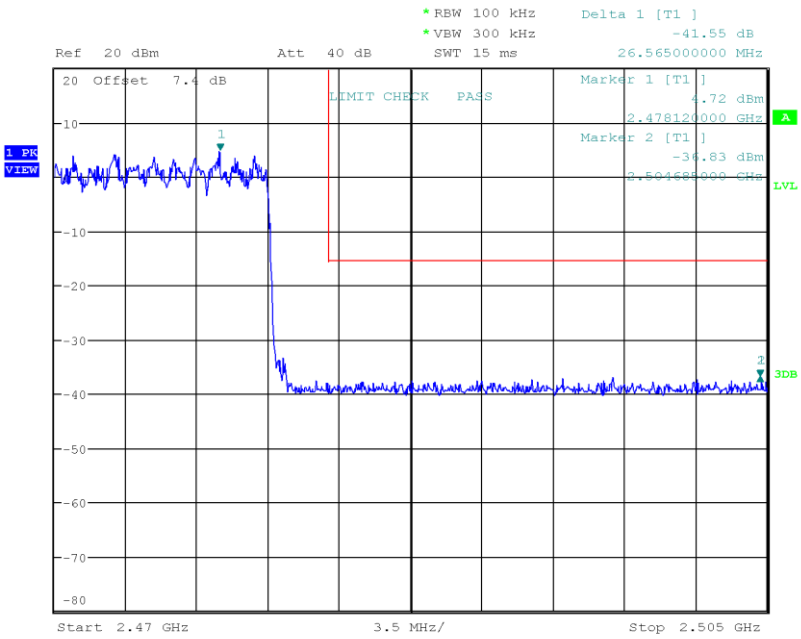
Band-edge Compliance

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operational Mode:	3-DH5, Hopping
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Band-edge	Lower
In-band Frequency [MHz]:	2412.0
Max. in-band Level [dBm/100 kHz]:	4.709
Out-of-band Frequency [MHz]:	2399.616
Max. out-of-band Level [dBm/100 kHz]:	-37.173
Attenuation [dB]:	-41.88



Band-edge Compliance

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operational Mode:	3-DH5, Hopping
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Band-edge	Upper
In-band Frequency [MHz]:	2478.12
Max. in-band Level [dBm/100 kHz]:	4.722
Out-of-band Frequency [MHz]:	2504.685
Max. out-of-band Level [dBm/100 kHz]:	-36.831
Attenuation [dB]:	-41.55



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3.9 Test Conditions and Results - Conducted spurious emissions

3.9.1 Information

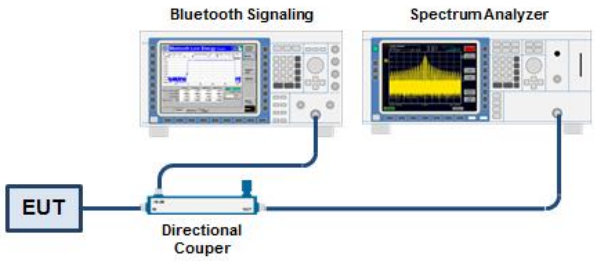
Test Information	
Reference	FCC § 15.247(d); ISED RSS-247, Issue 2 (section 5.5)
Measurement Method	ANSI C63.10 6.10
Operator	Wilfried Treffke
Date	2019-04-25

3.9.2 Limits

Limits	
Power Measurement	Out-of-band attenuation [dB]
Peak	20
RMS	30

3.9.3 Setup

Test Setup



3.9.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2018-12	2019-12

3.9.5 Procedure

Test Procedure

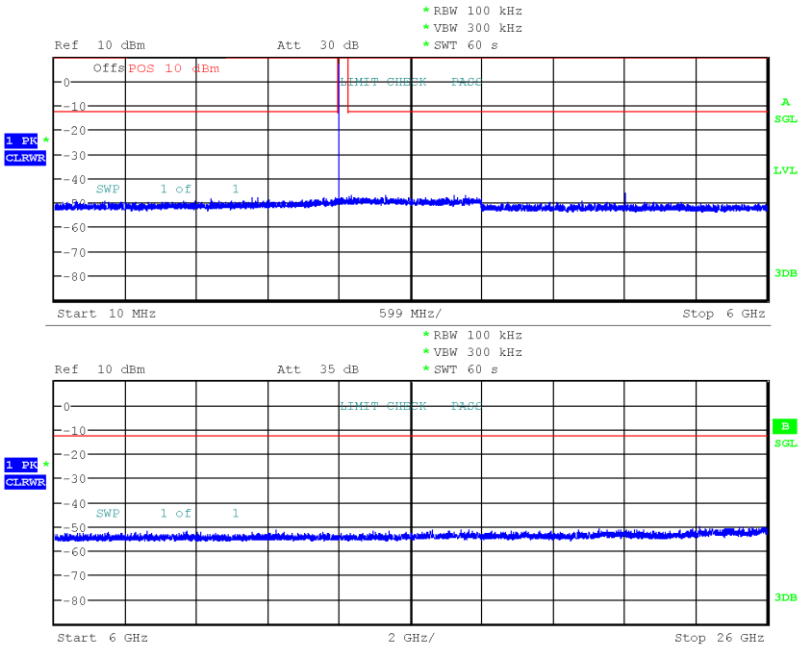
1. EUT set to test mode (Communication tester is used if needed)
2. Span set around lower band edge and detector is set to peak and max hold
3. Resolution bandwidth is set to 100 kHz
4. Markers are set to peak emission levels within frequency band and outside frequency band
5. Band edge attenuation is determined from level difference

3.9.6 Results

Test Results		
Mode	Channel [MHz]	Verdict
DH5	2402	PASS
DH5	2441	PASS
DH5	2480	PASS
2-DH5	2402	PASS
2-DH5	2441	PASS
2-DH5	2480	PASS
3-DH5	2402	PASS
3-DH5	2441	PASS
3-DH5	2480	PASS

Conducted Spurious Emissions

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.8
Operational Mode:	DH5, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Max. in-band Frequency [MHz]:	2402.0
Max. in-band Level [dBm/100 kHz]:	7.3
Out-of-band Limit [dBm/100 kHz]:	-12.7



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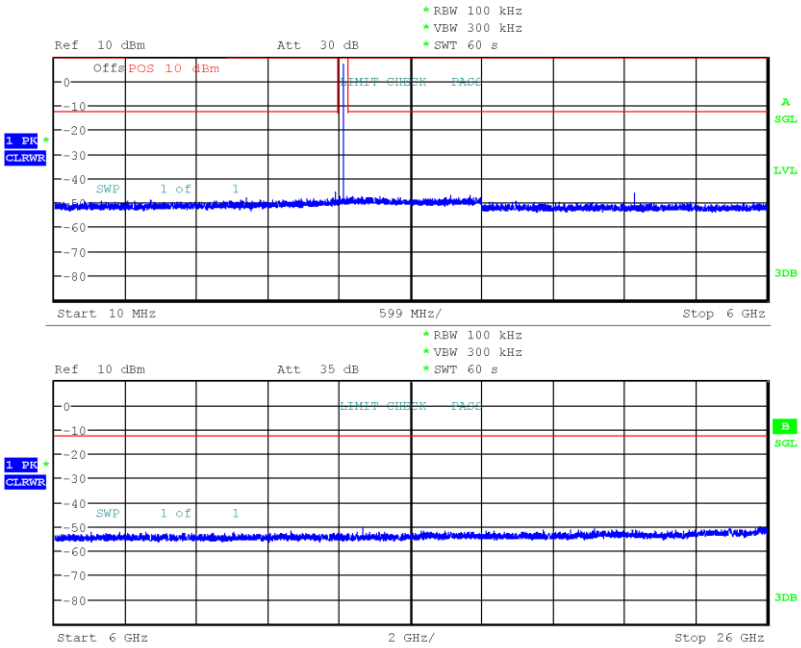
Conducted Spurious Emissions

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.8
Operational Mode:	DH5, Channel: 39, 2441 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Max. in-band Frequency [MHz]:	2441.0
Max. in-band Level [dBm/100 kHz]:	7.4
Out-of-band Limit [dBm/100 kHz]:	-12.6



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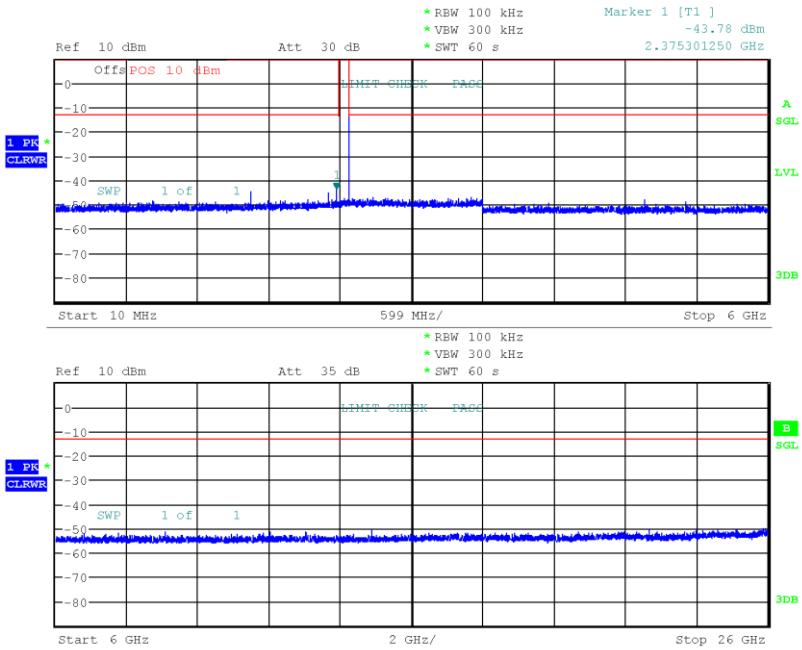
Conducted Spurious Emissions

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.8
Operational Mode:	DH5, Channel: 78, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Max. in-band Frequency [MHz]:	2480.0
Max. in-band Level [dBm/100 kHz]:	7.0
Out-of-band Limit [dBm/100 kHz]:	-13.0



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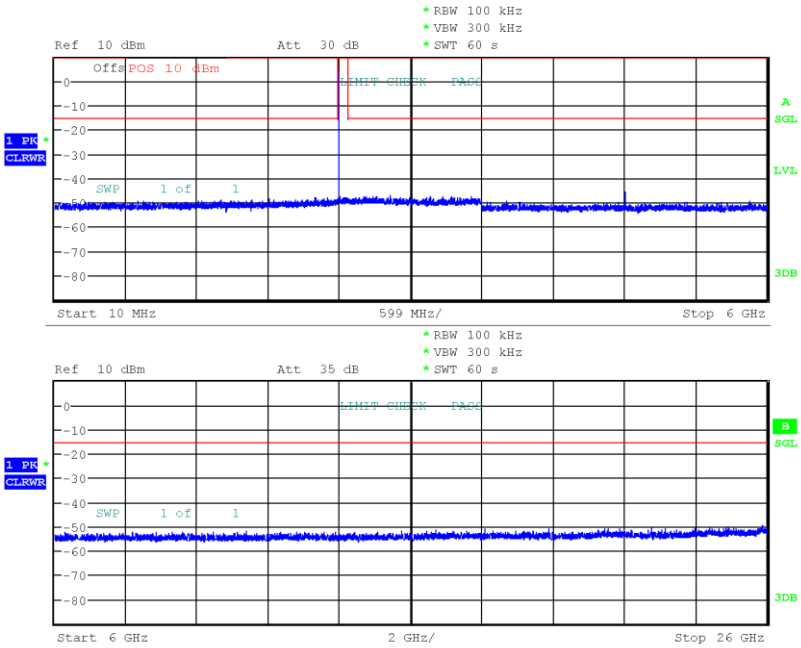
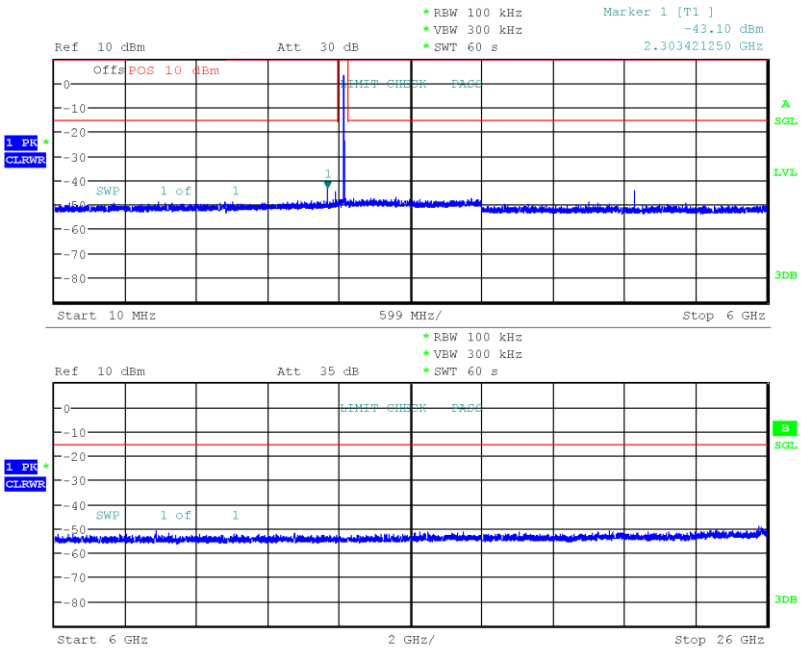
Conducted Spurious Emissions

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.8
Operational Mode:	2-DH5, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Max. in-band Frequency [MHz]:	2402.0
Max. in-band Level [dBm/100 kHz]:	4.8
Out-of-band Limit [dBm/100 kHz]:	-15.2



Conducted Spurious Emissions

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.8
Operational Mode:	2-DH5, Channel: 39, 2441 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Max. in-band Frequency [MHz]:	2441.0
Max. in-band Level [dBm/100 kHz]:	4.7
Out-of-band Limit [dBm/100 kHz]:	-15.3



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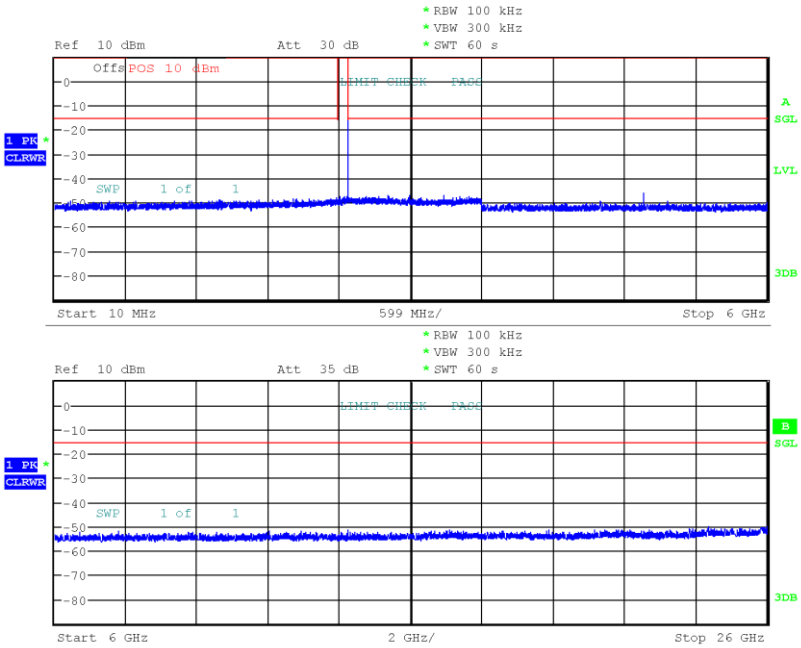
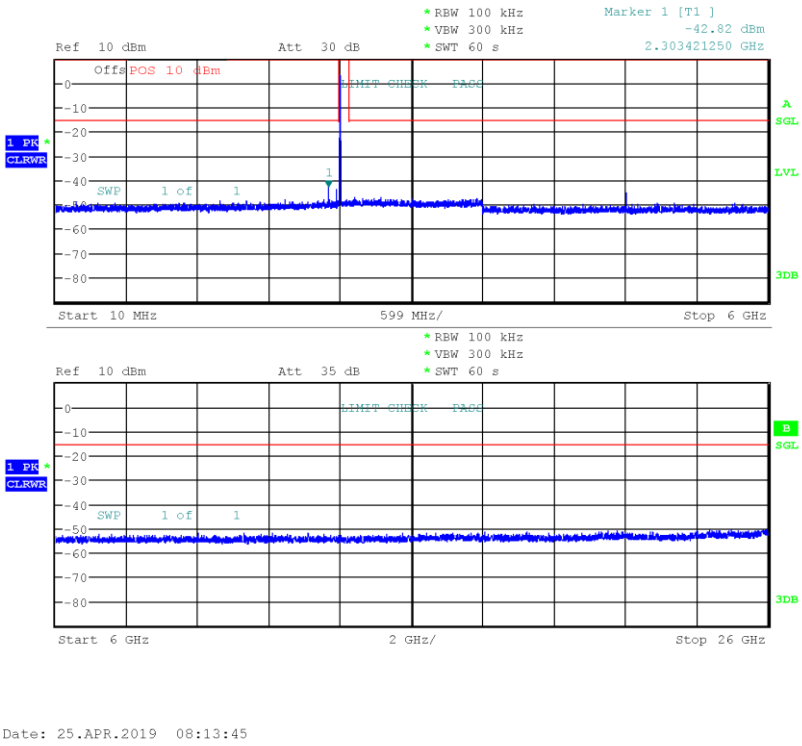
Conducted Spurious Emissions

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.8
Operational Mode:	2-DH5, Channel: 78, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Max. in-band Frequency [MHz]:	2480.0
Max. in-band Level [dBm/100 kHz]:	4.8
Out-of-band Limit [dBm/100 kHz]:	-15.2



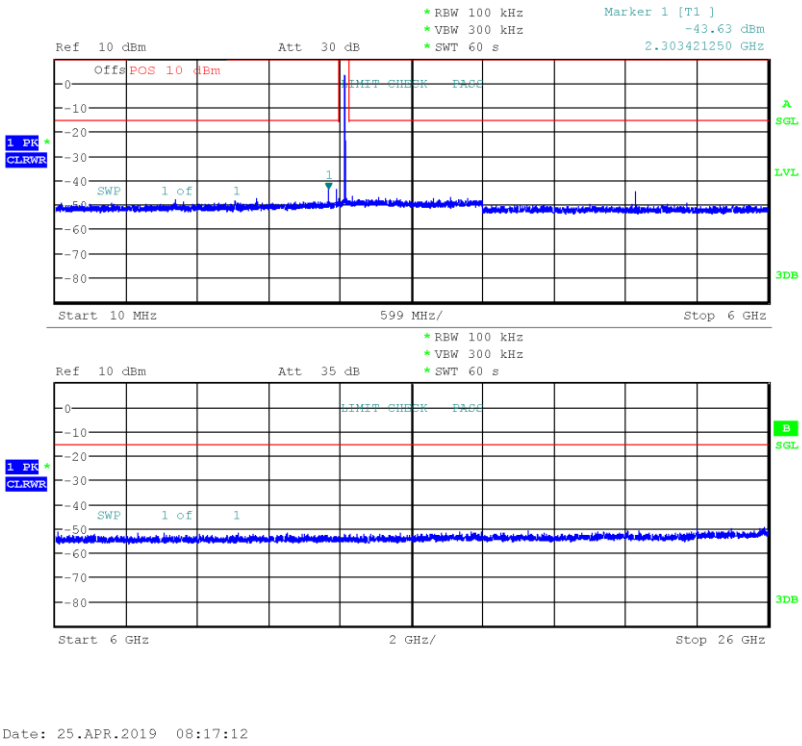
Conducted Spurious Emissions

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.8
Operational Mode:	3-DH5, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Max. in-band Frequency [MHz]:	2402.1
Max. in-band Level [dBm/100 kHz]:	4.8
Out-of-band Limit [dBm/100 kHz]:	-15.2



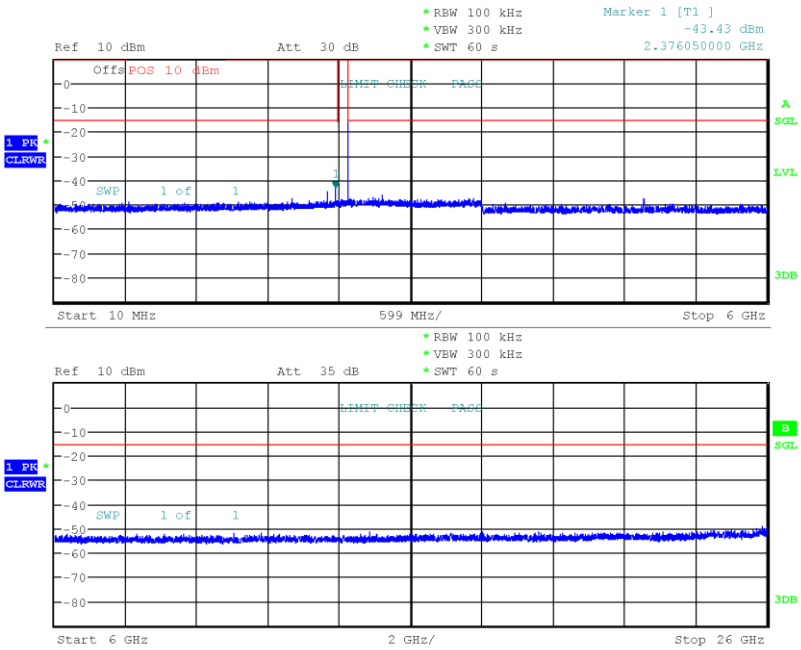
Conducted Spurious Emissions

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.8
Operational Mode:	3-DH5, Channel: 39, 2441 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Max. in-band Frequency [MHz]:	2441.0
Max. in-band Level [dBm/100 kHz]:	4.8
Out-of-band Limit [dBm/100 kHz]:	-15.2



Conducted Spurious Emissions

Project Number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Sample ID:	23051
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.8
Operational Mode:	3-DH5, Channel: 78, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-04-25
Max. in-band Frequency [MHz]:	2480.1
Max. in-band Level [dBm/100 kHz]:	4.8
Out-of-band Limit [dBm/100 kHz]:	-15.2



Date: 25.APR.2019 08:21:30

3.10 Test Conditions and Results - Transmitter radiated emissions

3.10.1 Information

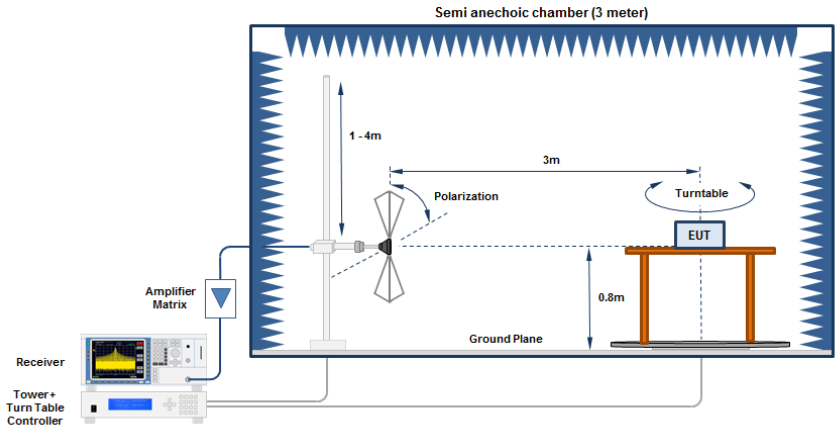
Test Information	
Reference	FCC § 15.247(d); FCC § 15.209; ISED RSS-Gen, Issue 5 (section 6.13)
Measurement Method	ANSI C63.10 6.4, 6.5, 6.6
Operator	Wilfried Treffke
Date	2019-04-25

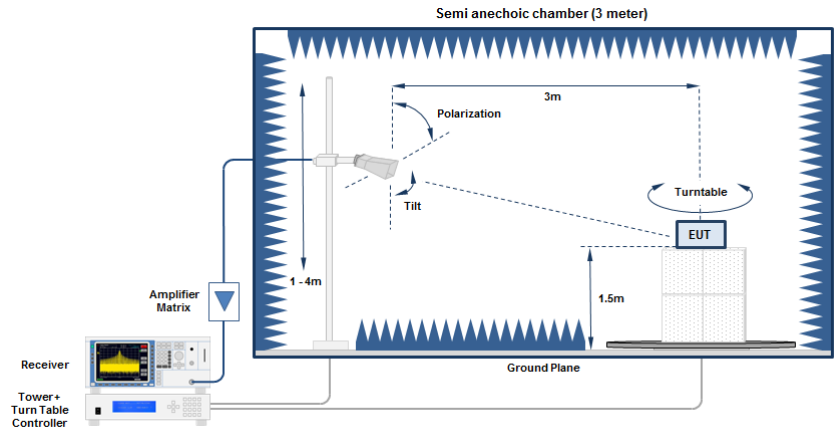
3.10.2 Limits

Limits			
Frequency [MHz]	Detector	Field strength [µV/m]	Measurement distance [m]
0.009 - 0.09	Average	2400/F[kHz]	300
0.09 - 0.110	Quasi-Peak	2400/F[kHz]	300
0.110 - 0.490	Average	2400/F[kHz]	300
0.490 - 1.705	Quasi-Peak	24000/F[kHz]	30
1.705 - 30.0	Quasi-Peak	30	30
30 - 88	Quasi-Peak	100	3
88 - 216	Quasi-Peak	150	3
216 - 960	Quasi-Peak	200	3
960 - 1000	Quasi-Peak	500	3
>1000	Average	500	3

3.10.3 Setup

Test Setup 30 - 1000 MHz



Test Setup > 1 GHz


3.10.4 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2015.2.4

Test Equipment 30 - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Measurement Receiver	R&S	ESU 26	EF00887	2018-08	2019-08
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2018-08	2019-08
Antenna	R&S	VULB 9162	EF00978	2016-11	2019-11
Antenna	R&S	HK 116	EF00203	2018-06	2020-06
Antenna	R&S	HL 223	EF00187	2016-05	2019-05

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2018-08	2019-08
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2016-09	2019-09
Antenna	Amplifier Research	AT4560	EF01152	2018-10	2019-10

3.10.5 Procedure

Test Procedure < 30 MHz
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground 2. EUT set to test mode 3. The EUT is rotated through 360° 4. The emissions are measured with peak detector and max hold 5. All significant emissions are measured again using the corresponding final detector

Test Procedure 30 - 1000 MHz
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground
2. EUT set to test mode
3. The receiver is set to peak detection with max hold
4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m
5. All significant emissions are measured again using the corresponding final detector

Test Procedure > 1 GHz
1. EUT is placed on a non conducting support at the center of a turn table 1.5 m above the ground
2. EUT set to test mode
3. The receiver is set to peak detection with max hold
4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m
5. All significant emissions are measured again using the corresponding final detector

3.10.6 Results

Test Results - DH5						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
2402	2325	56.74	pk	hor	74.00	-17.26
2402	2325	38.81	RMS	hor	54.00	-15.19
2402	2376.9	55.84	pk	hor	74.00	-18.16
2402	2376.9	38.64	RMS	hor	54.00	-15.36
2441	2325.6	55.66	pk	hor	74.00	-18.34
2441	2325.6	40.77	RMS	hor	54.00	-13.23
2441	7322	54.83	pk	ver	74.00	-19.17
2441	7322	52.99	RMS	ver	54.00	-01.01
2441	7323	50.91	pk	hor	74.00	-23.09
2441	7323	48.76	RMS	hor	54.00	-05.24
2480	2483.5	52.02	pk	hor	74.00	-21.98
2480	2483.5	39.46	RMS	hor	54.00	-14.54
2480	4960	47.17	pk	ver	74.00	-26.83
2480	4960	44.90	RMS	ver	54.00	-09.10
2480	4962	47.18	pk	hor	74.00	-26.82
2480	7439	51.06	pk	ver	74.00	-22.94
2480	7439	48.64	RMS	ver	54.00	-05.36

Test Results - 3-DH5						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
2402	2327.9	55.02	pk	hor	74.00	-18.98
2402	2327.9	38.48	RMS	hor	54.00	-15.52
2402	2376.9	53.00	pk	hor	74.00	-21.00
2402	2376.9	38.63	RMS	hor	54.00	-15.37
2441	2327.9	55.09	pk	hor	74.00	-18.91
2441	2327.9	26.53	RMS	hor	54.00	-27.47
2441	2370.2	46.61	pk	hor	74.00	-27.39
2441	2370.2	20.51	RMS	hor	54.00	-33.49
2441	2389.6	40.63	pk	hor	74.00	-33.37
2441	2389.6	26.45	RMS	hor	54.00	-27.55
2441	7322	50.22	pk	hor	74.00	-23.78
2441	7322	46.83	RMS	hor	54.00	-07.17
2441	7323	54.30	pk	ver	74.00	-19.70
2441	7323	52.35	RMS	ver	54.00	-01.65
2480	2328	53.72	pk	hor	74.00	-20.28
2480	2328	26.98	RMS	hor	54.00	-27.02
2480	2483.5	58.72	pk	hor	74.00	-15.28
2480	2483.5	43.96	RMS	hor	54.00	-10.04
2480	4960	46.43	pk	hor	74.00	-27.57
2480	4960	38.18	RMS	hor	54.00	-15.82
2480	7439	51.43	pk	ver	74.00	-22.57
2480	7439	48.95	RMS	ver	54.00	-05.05
Comment	Test mode selection for 2-DH5 and 3-DH5 is based on pre-compliance measurement of output power. The operational modes with the highest output power (3-DH5) was selected for compliance tests. Only plots containing spurious emission are shown in this annex. All missing plots only contain noise.					

3.11 Test Conditions and Results - Receiver radiated emissions

3.11.1 Information

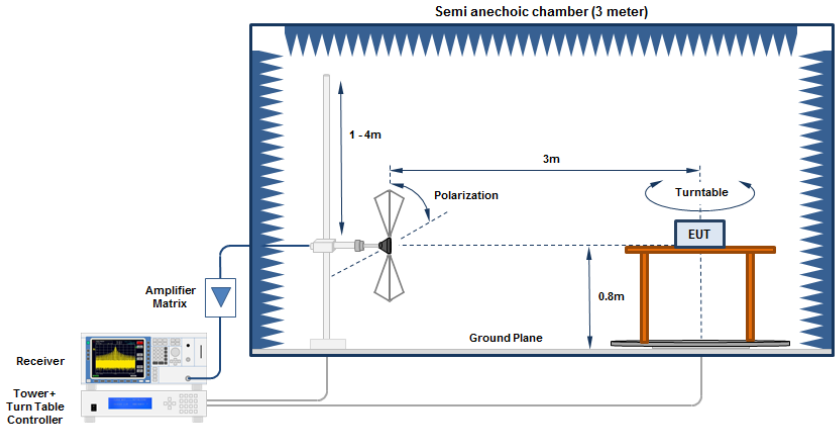
Test Information	
Reference	ISED RSS-247, Issue 2 (section 3.1)
Measurement Method	ANSI C63.10 6.5, 6.6
Operator	Wilfried Treffke
Date	2019-04-26

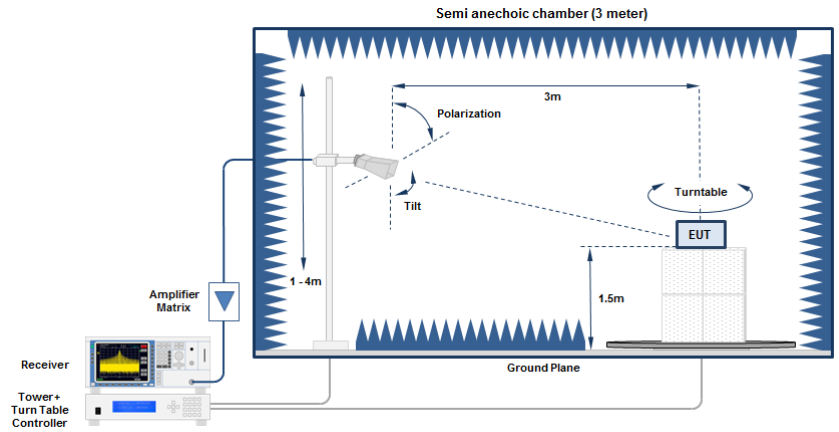
3.11.2 Limits

Limits			
Frequency [MHz]	Detector	Field strength [dBµV/m]	Measurement distance [m]
30 - 88	Quasi-Peak	100	3
88 - 216	Quasi-Peak	150	3
216 - 960	Quasi-Peak	200	3
960 - 1000	Quasi-Peak	500	3
>1000	Average	500	3

3.11.3 Setup

Test Setup 30 - 1000 MHz



Test Setup > 1 GHz


3.11.4 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2015.2.4

Test Equipment 30 - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Measurement Receiver	R&S	ESU 26	EF00887	2018-08	2019-08
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2018-08	2019-08
Antenna	R&S	VULB 9162	EF00978	2016-11	2019-11
Antenna	R&S	HK 116	EF00203	2018-06	2020-06
Antenna	R&S	HL 223	EF00187	2016-05	2019-05

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2018-08	2019-08
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2016-09	2019-09
Antenna	Amplifier Research	AT4560	EF01152	2018-10	2019-10

3.11.5 Procedure

Test Procedure 30 - 1000 MHz
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground 2. EUT set to test mode 3. The receiver is set to peak detection with max hold 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m 5. All significant emissions are measured again using the corresponding final detector

Test Procedure > 1 GHz
1. EUT is placed on a non conducting support at the center of a turn table 1.5 m above the ground 2. EUT set to test mode 3. The receiver is set to peak detection with max hold 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m 5. All significant emissions are measured again using the corresponding final detector

3.11.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
2402 - 2480	3625	29.89	pk	ver	53.98	-24.09
2402 - 2480	6385	37.41	pk	hor	53.98	-16.57

ANNEX A Transmitter spurious emissions

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; BT; DH5; 2402 MHz
Test Date:	2019-04-26
Note:	

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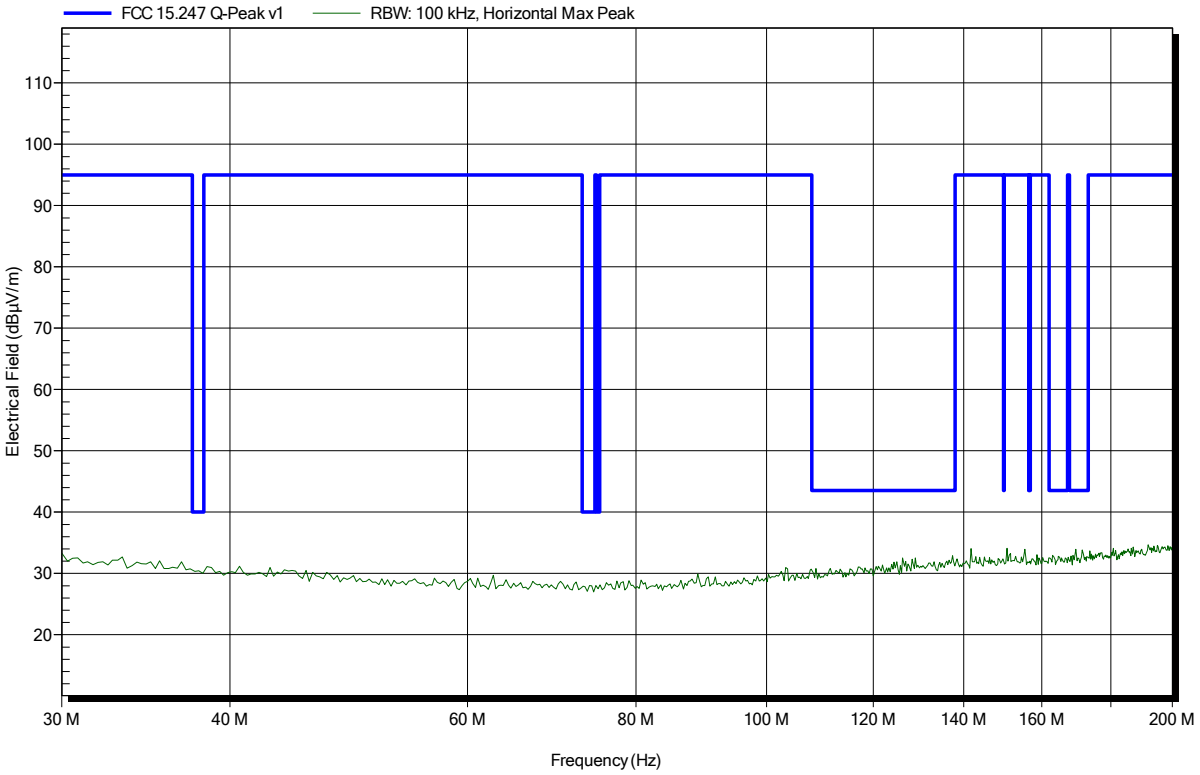

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; BT; DH5; 2402 MHz
Test Date:	2019-04-26
Note:	

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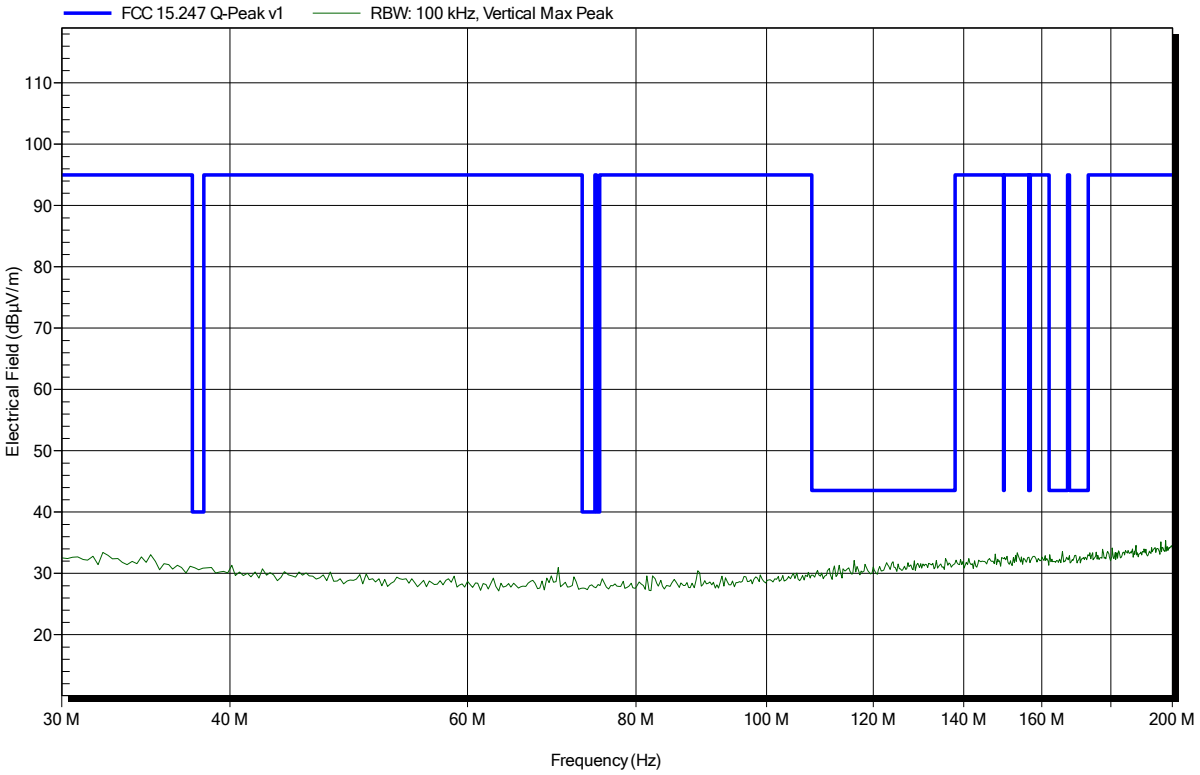

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; BT; DH5; 2402 MHz
Test Date:	2019-04-26
Note:	

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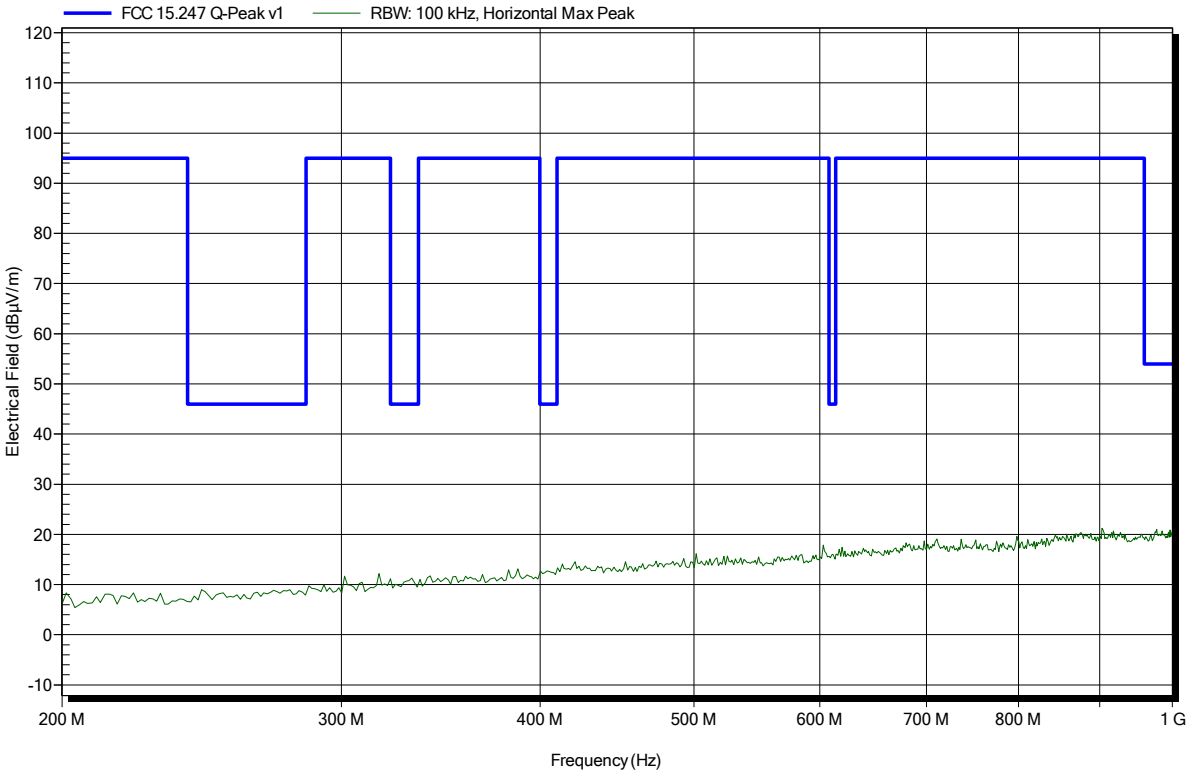

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; BT; DH5; 2402 MHz
Test Date:	2019-04-26
Note:	

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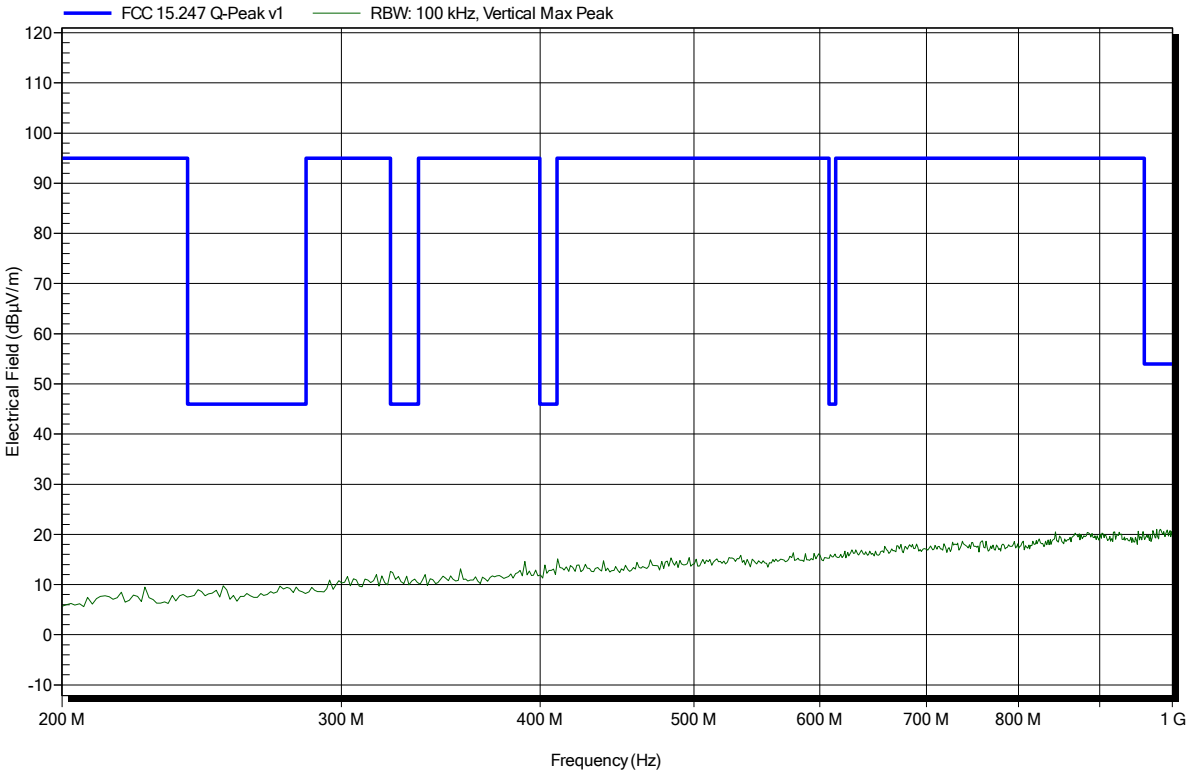

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2402 MHz
Test Date:	2019-04-25
Note:	

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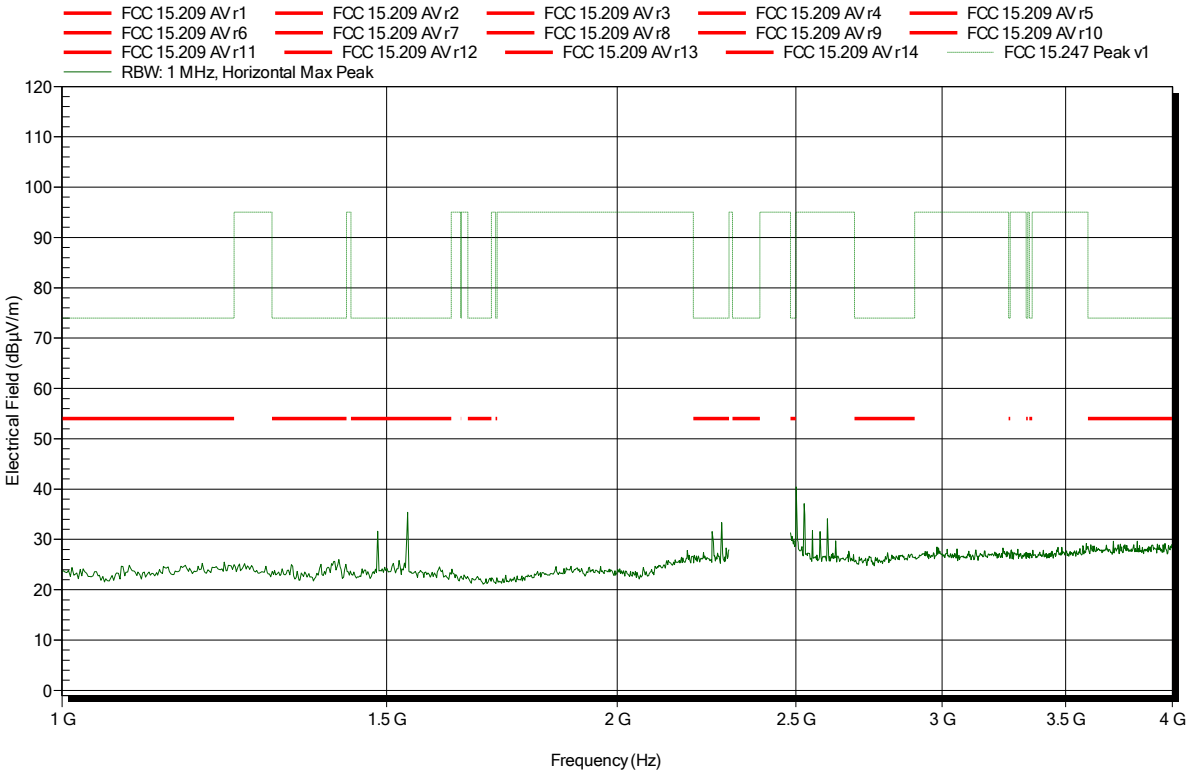

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2402 MHz
Test Date:	2019-04-25
Note:	

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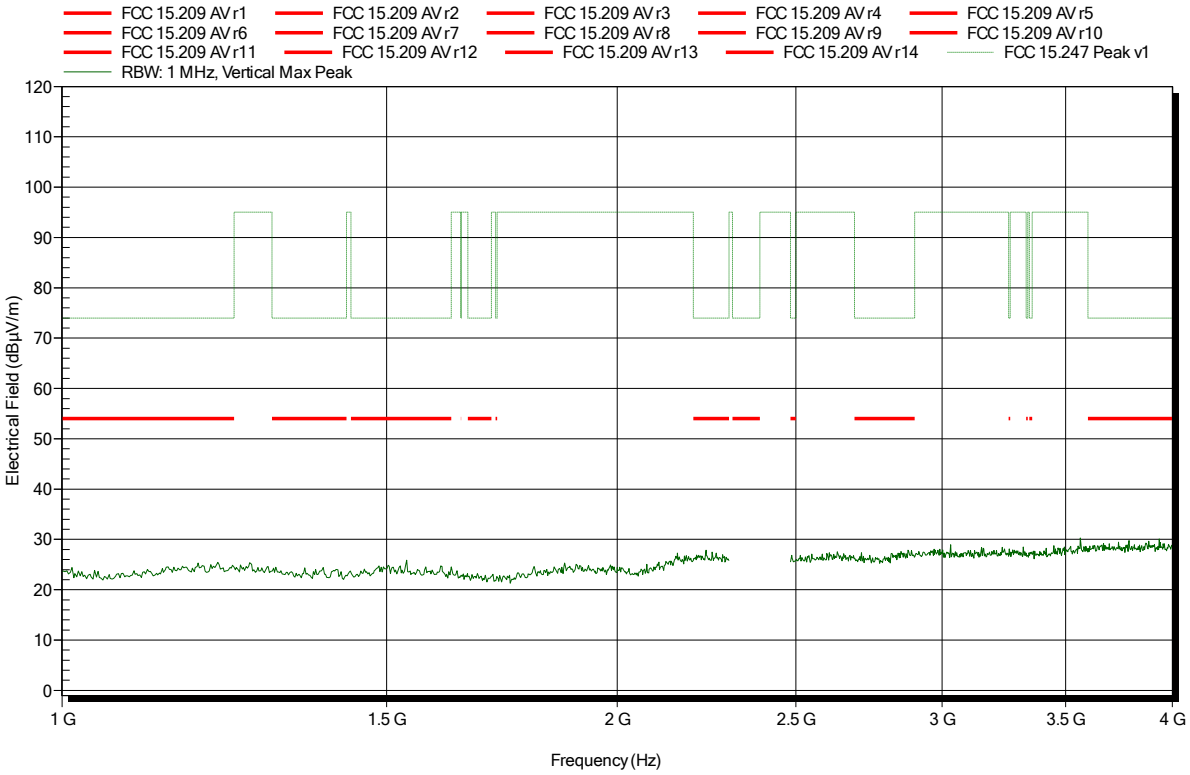

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2402 MHz
Test Date:	2019-04-25
Note:	lower bandedge

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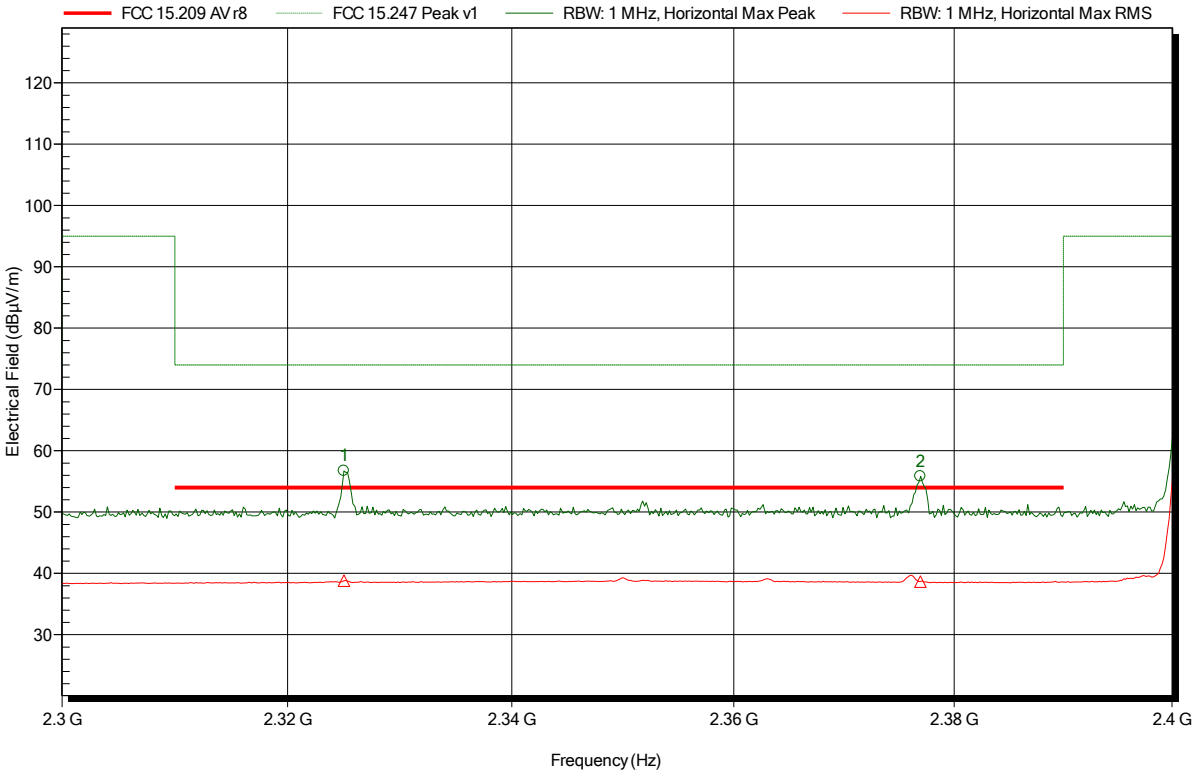

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.325 GHz	56.74 dBµV/m	74 dBµV/m	-17.26 dB	Pass
2.3769 GHz	55.84 dBµV/m	74 dBµV/m	-18.16 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
2.325 GHz	38.81 dBµV/m	54 dBµV/m	-15.19 dB	Pass
2.3769 GHz	38.64 dBµV/m	54 dBµV/m	-15.36 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2402 MHz
Test Date:	2019-04-25
Note:	lower bandedge

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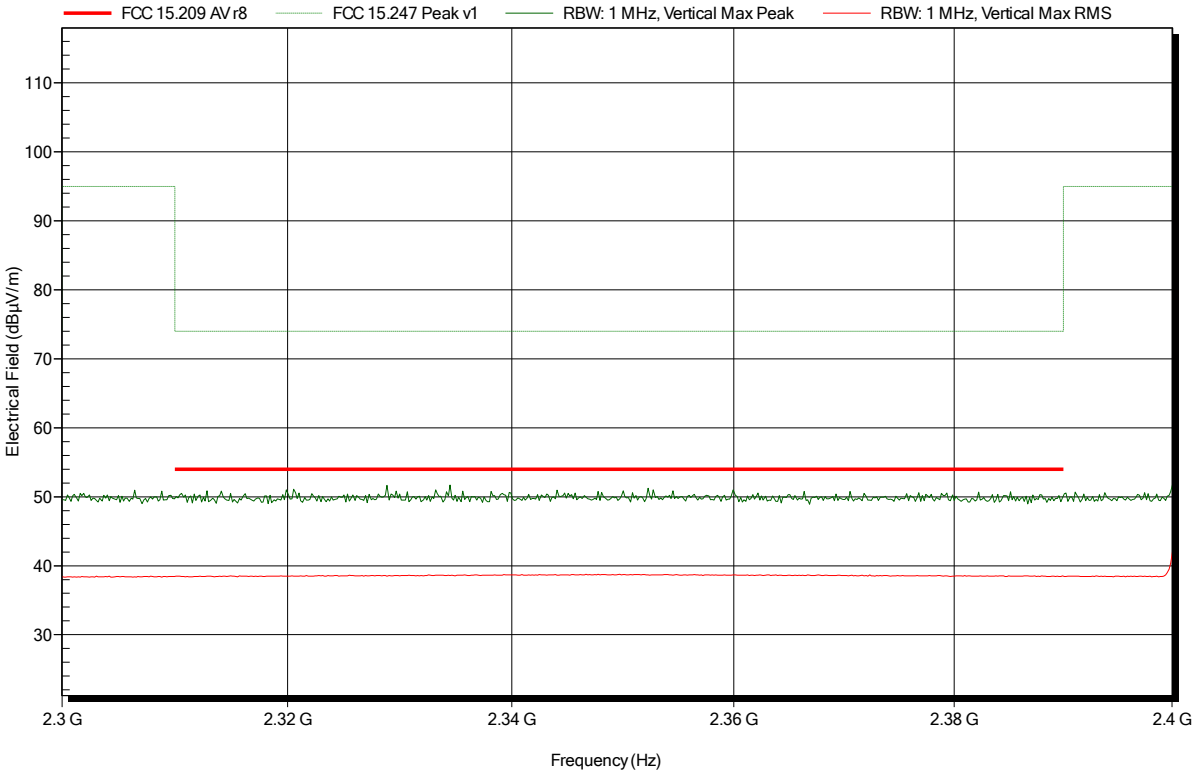

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2402 MHz
Test Date:	2019-04-25
Note:	

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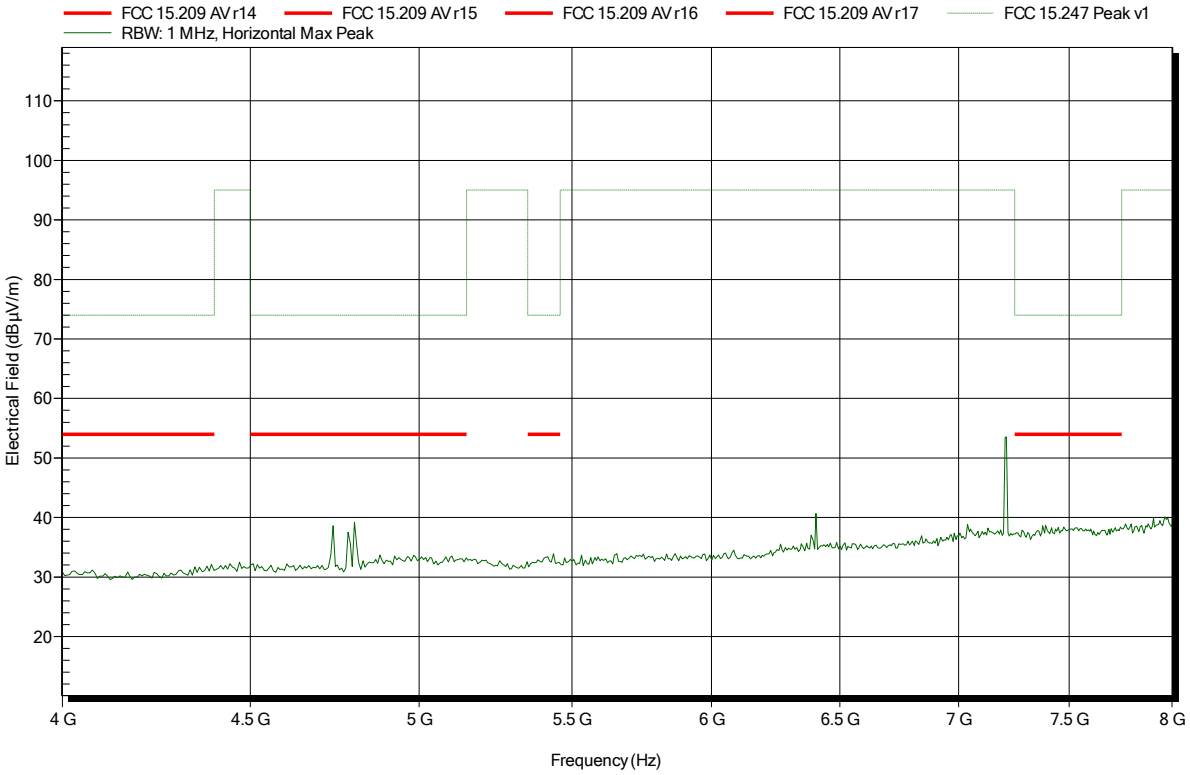

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2402 MHz
Test Date:	2019-04-25
Note:	

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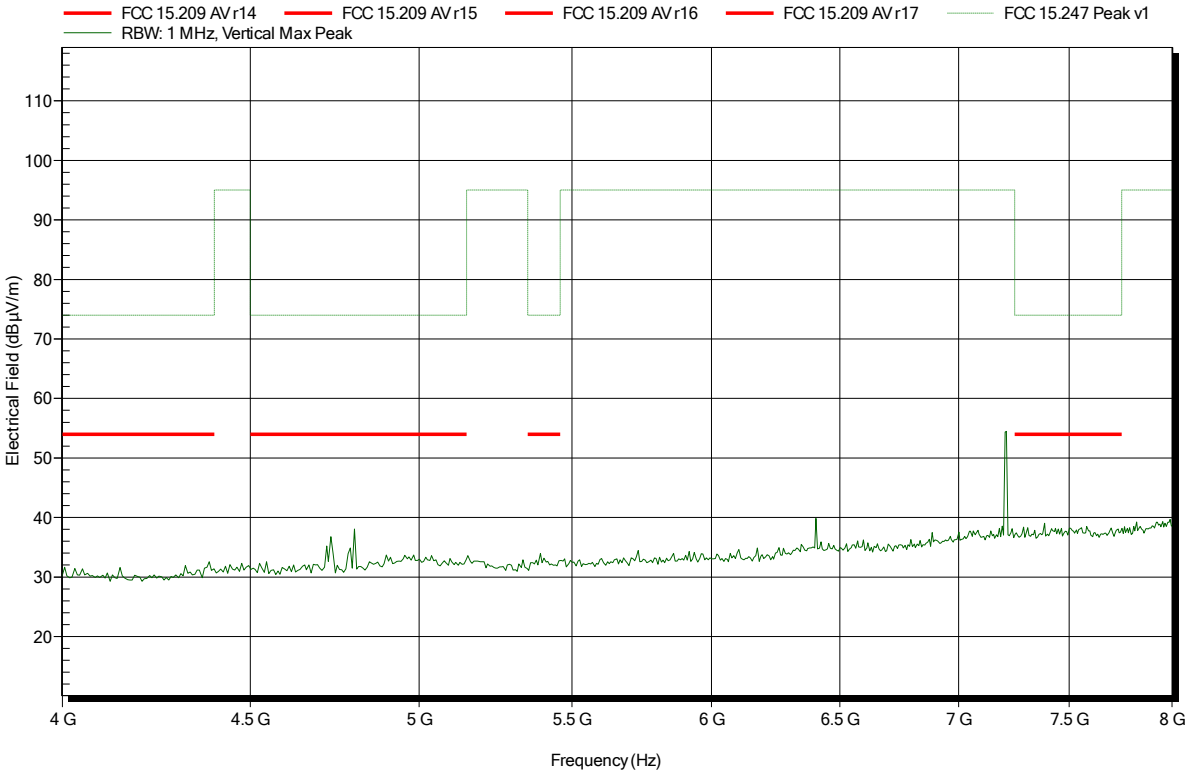

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2402 MHz
Test Date:	2019-04-25
Note:	

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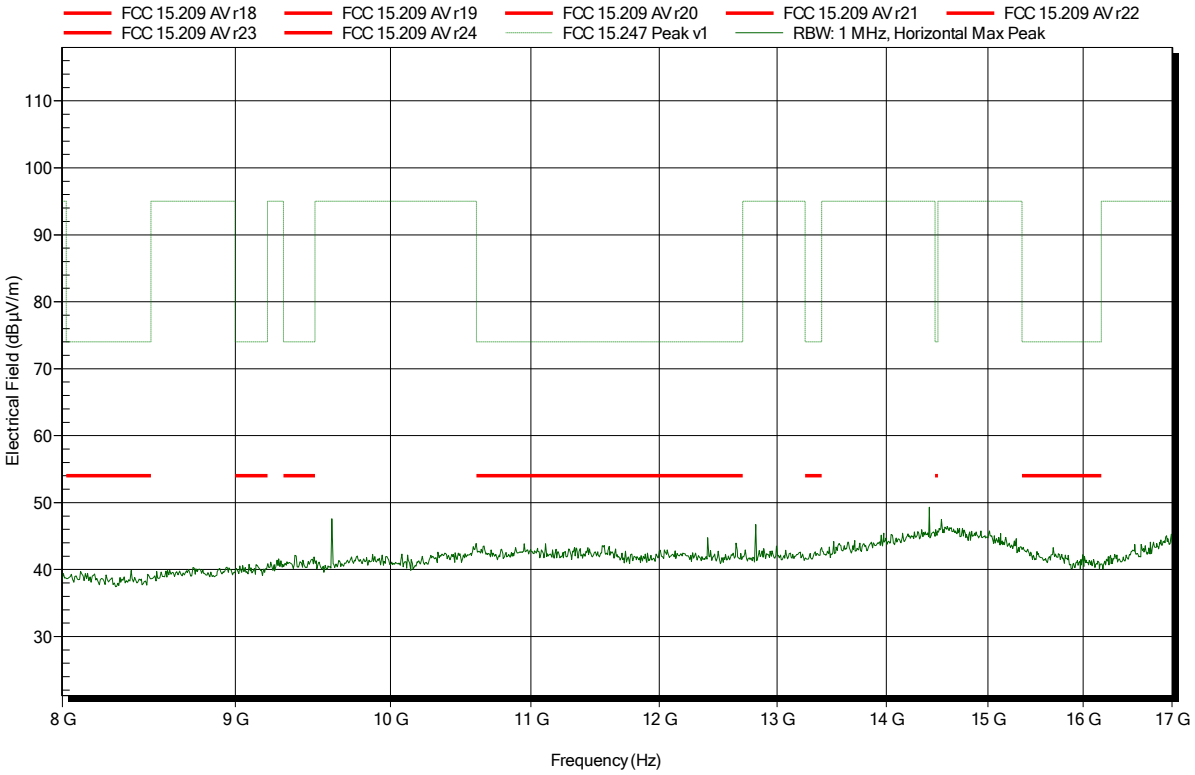

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2402 MHz
Test Date:	2019-04-25
Note:	

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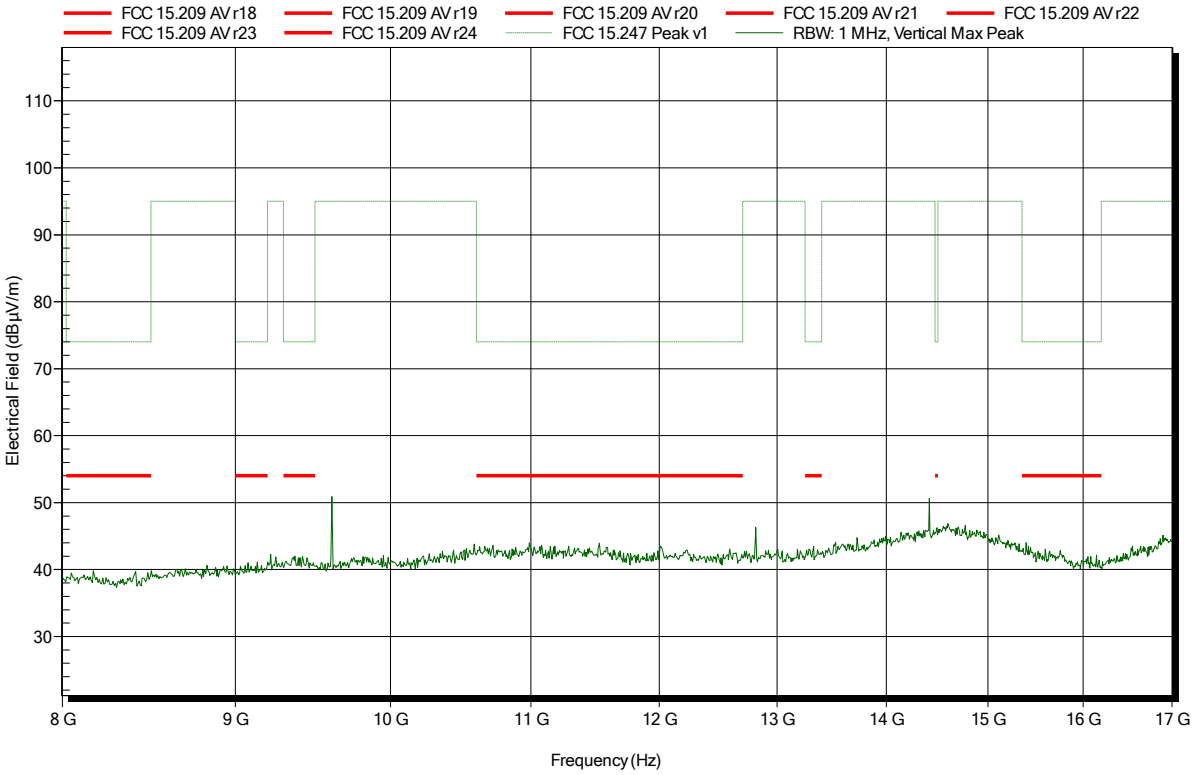

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Amplifier Research AT4560, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2402 MHz
Test Date:	2019-04-25
Note:	

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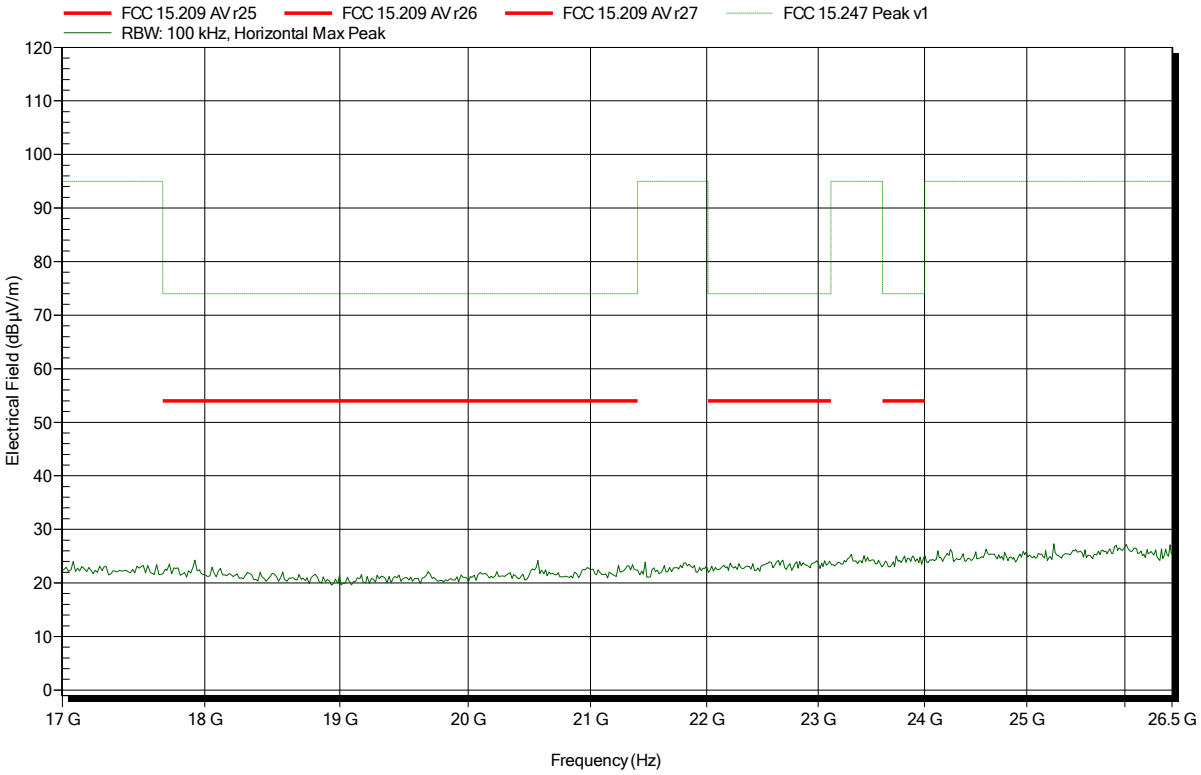

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Amplifier Research AT4560, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2402 MHz
Test Date:	2019-04-25
Note:	

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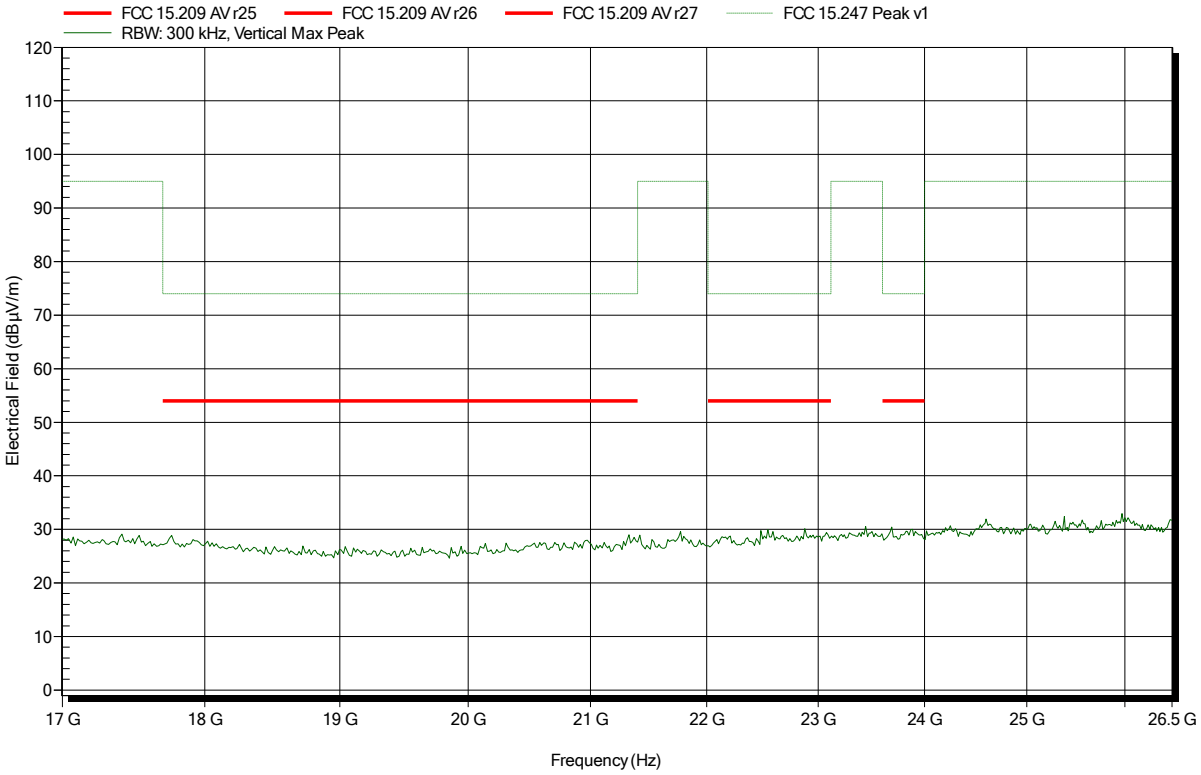

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2441 MHz
Test Date:	2019-04-25
Note:	

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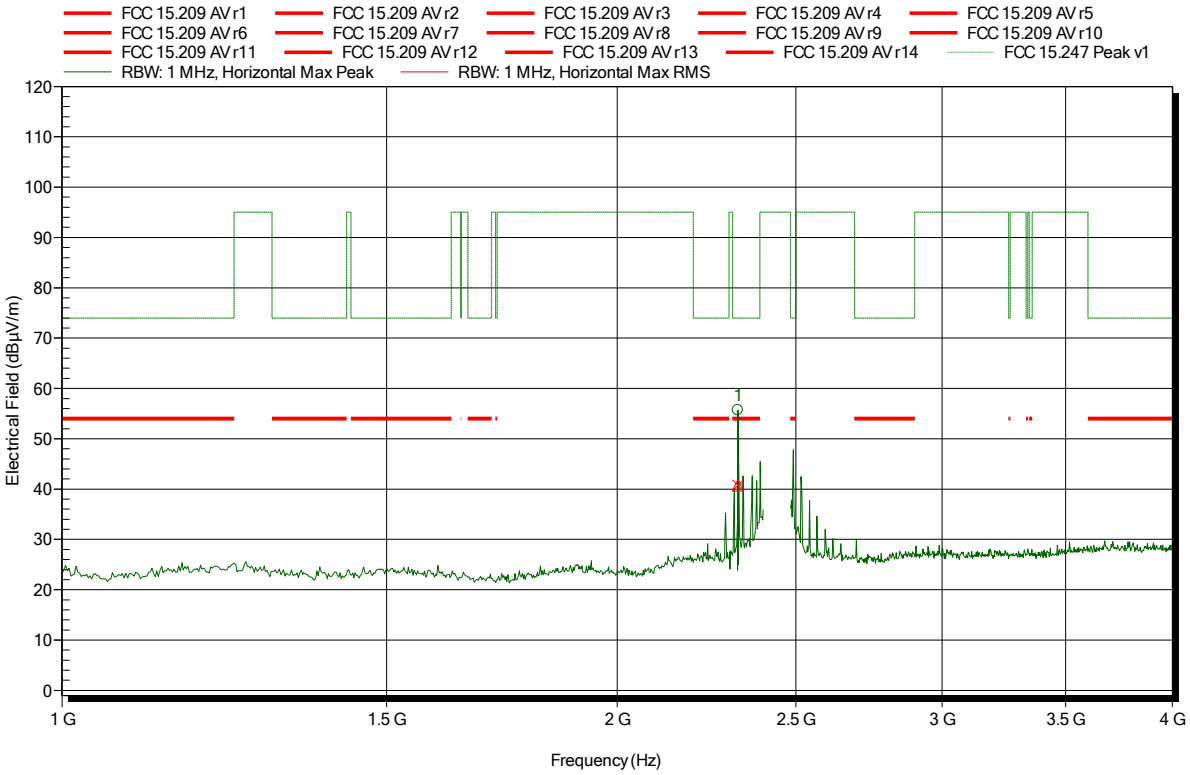

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.3256 GHz	55.66 dBµV/m	74 dBµV/m	-18.34 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
2.3256 GHz	40.77 dBµV/m	54 dBµV/m	-13.23 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2441 MHz
Test Date:	2019-04-25
Note:	

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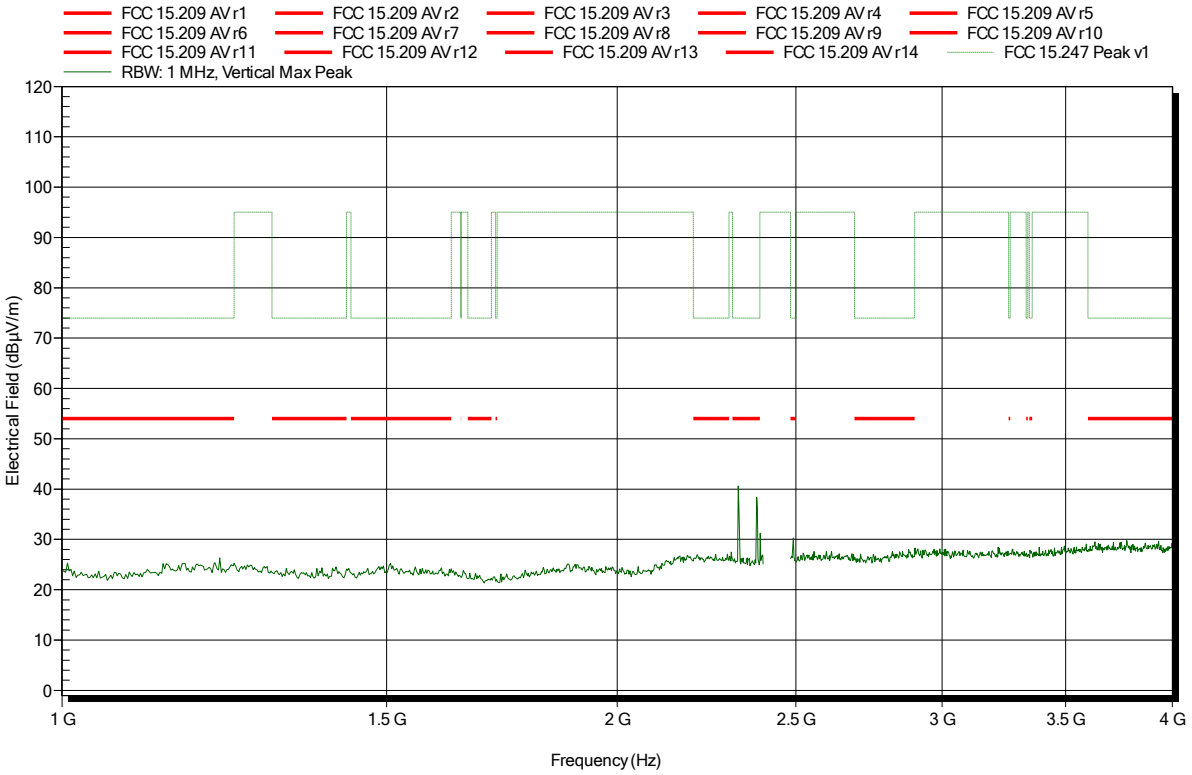

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2441 MHz
Test Date:	2019-04-25
Note:	

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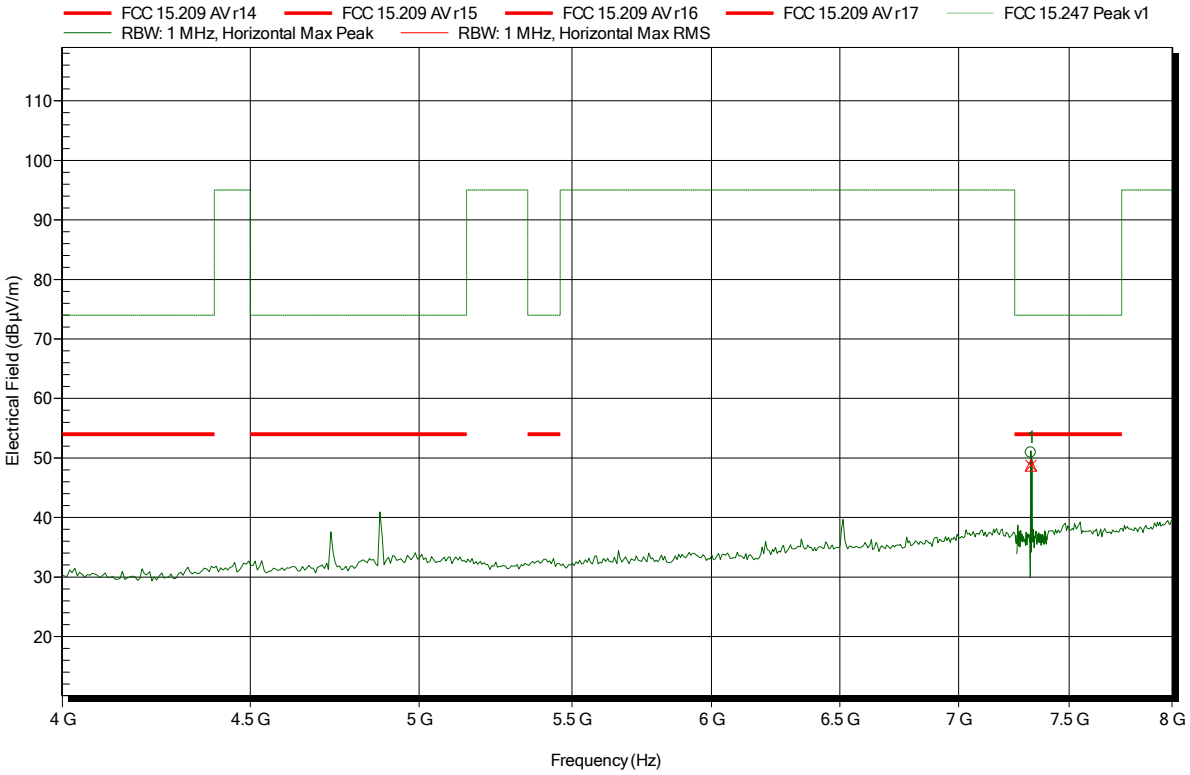

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
7.323 GHz	50.91 dBµV/m	74 dBµV/m	-23.09 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
7.323 GHz	48.76 dBµV/m	54 dBµV/m	-5.24 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2441 MHz
Test Date:	2019-04-25
Note:	

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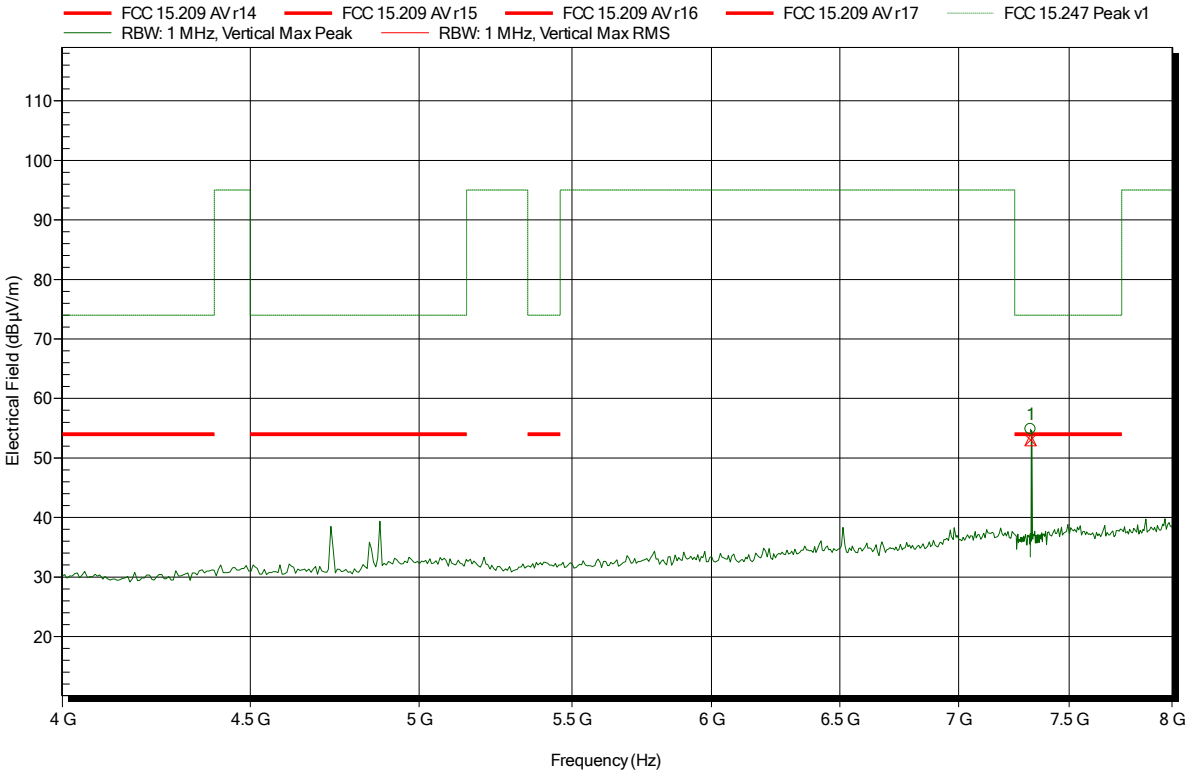

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
7.322 GHz	54.83 dBµV/m	74 dBµV/m	-19.17 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
7.322 GHz	52.99 dBµV/m	54 dBµV/m	-1.01 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2441 MHz
Test Date:	2019-04-25
Note:	

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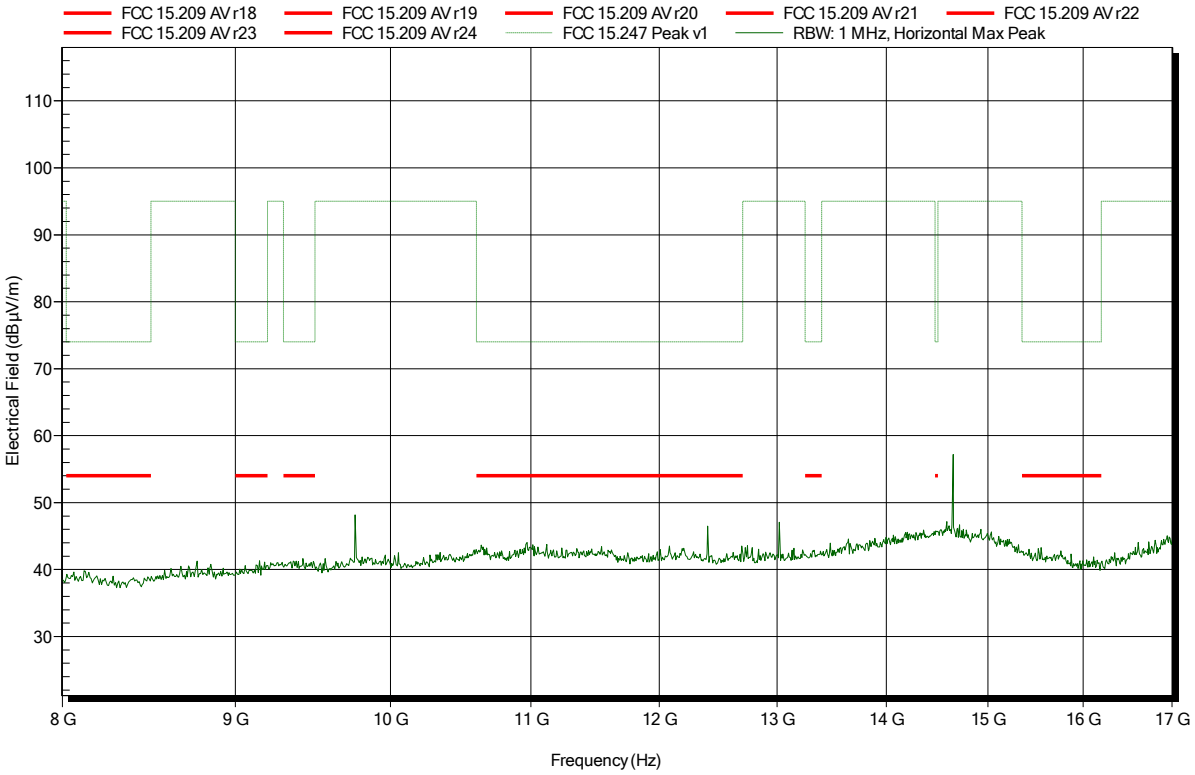

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2441 MHz
Test Date:	2019-04-25
Note:	

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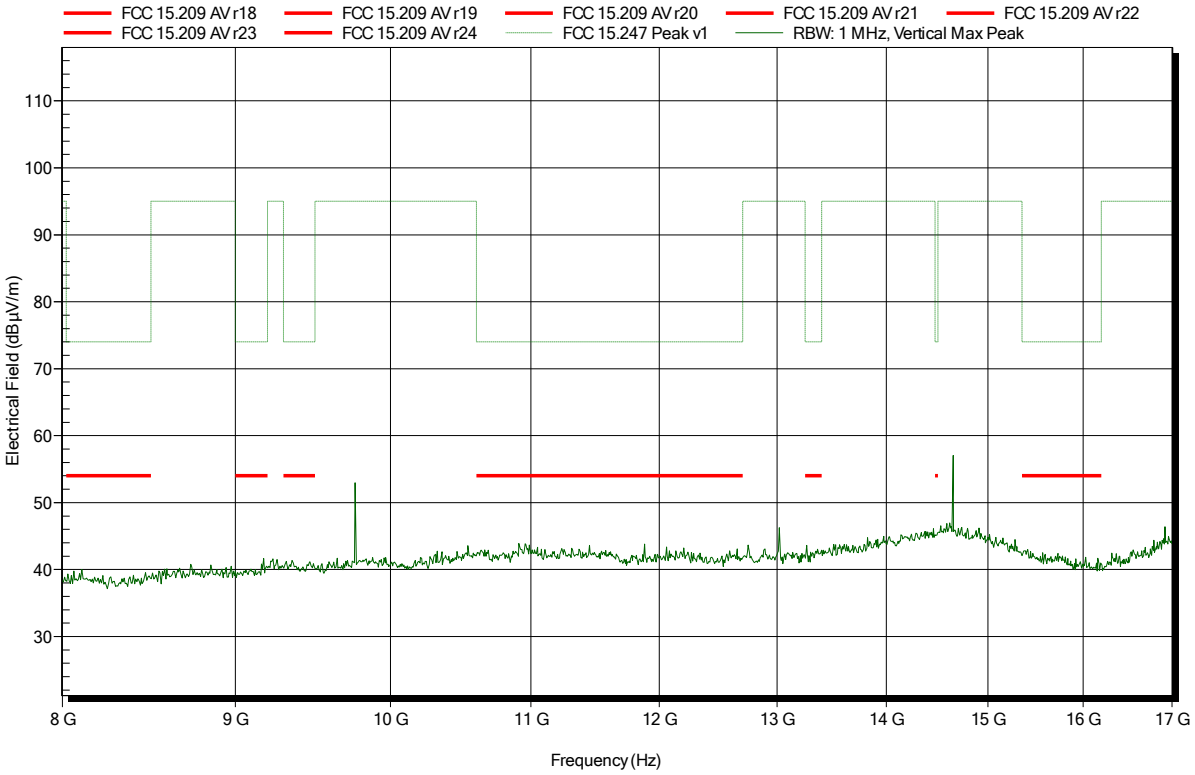

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Amplifier Research AT4560, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2441 MHz
Test Date:	2019-04-25
Note:	

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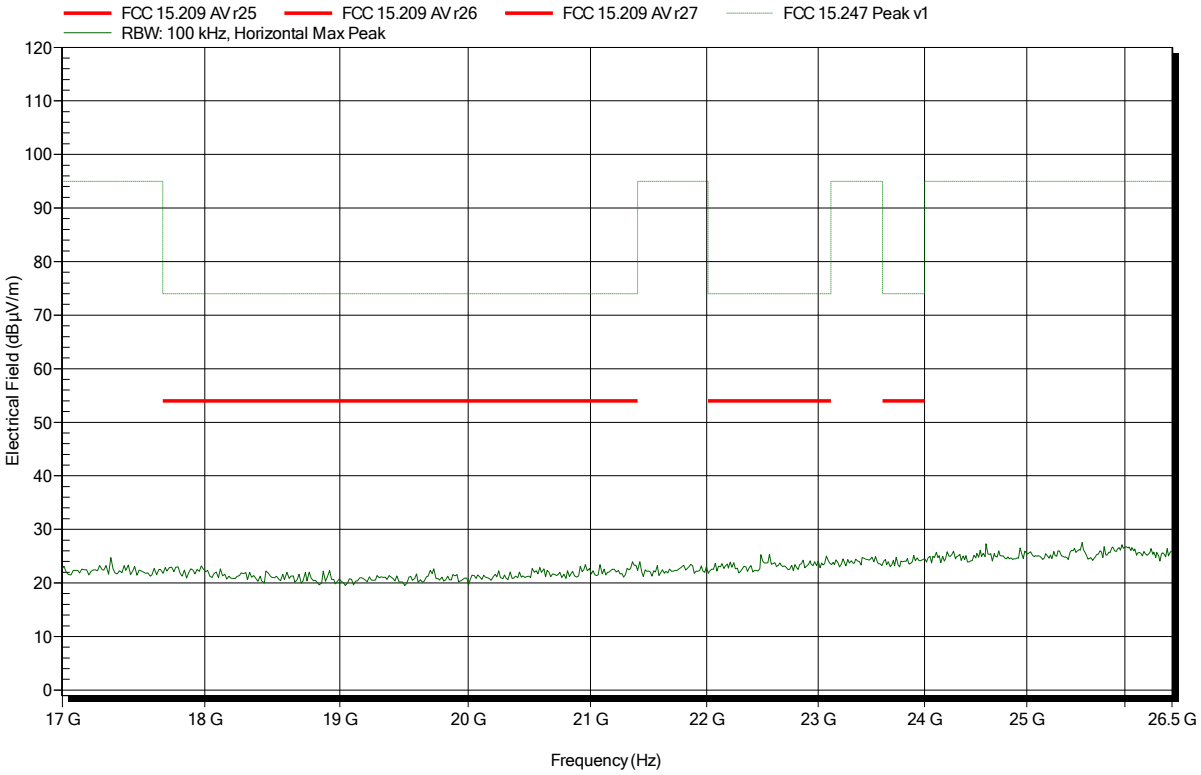

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Amplifier Research AT4560, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2441 MHz
Test Date:	2019-04-25
Note:	

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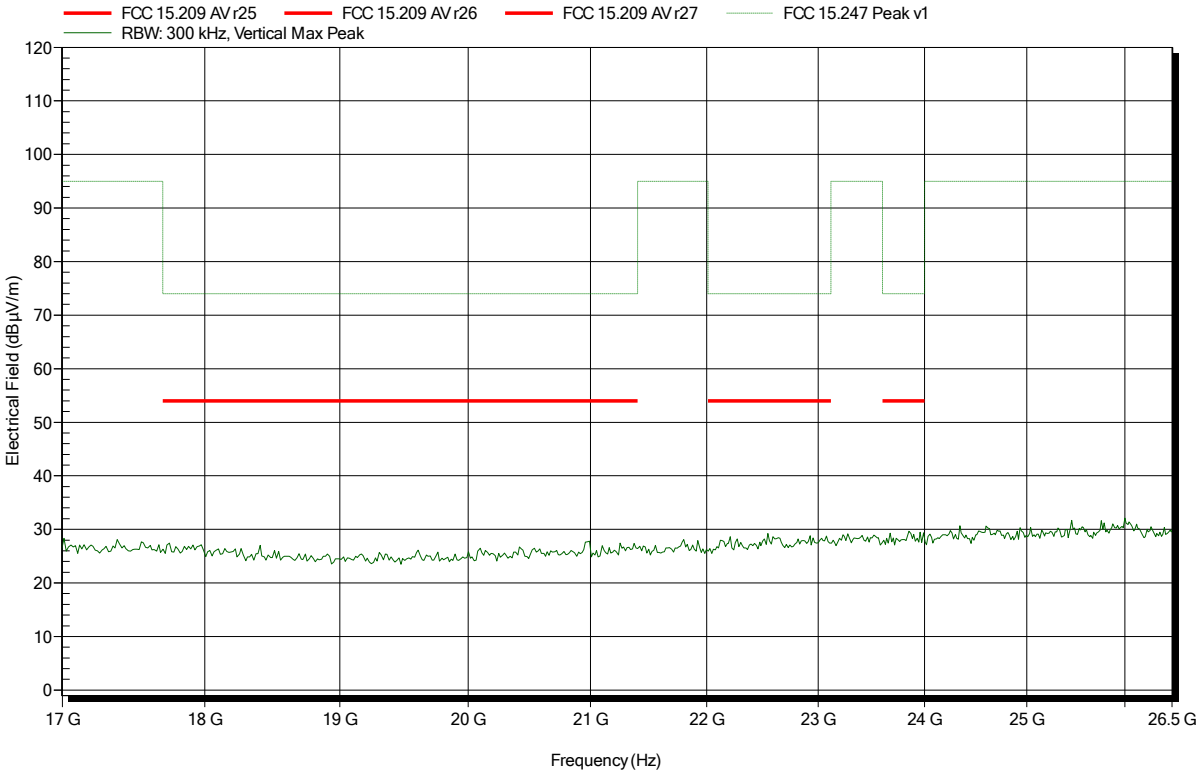

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2480 MHz
Test Date:	2019-04-25
Note:	

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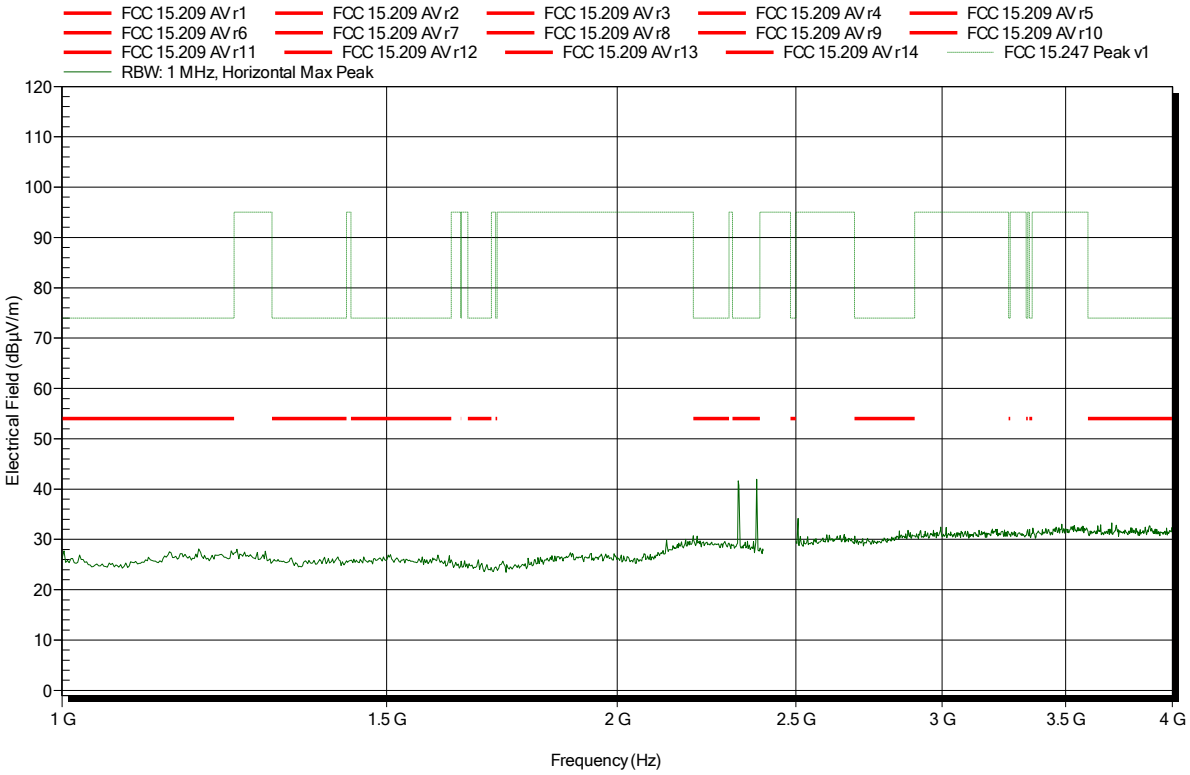

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2480 MHz
Test Date:	2019-04-25
Note:	

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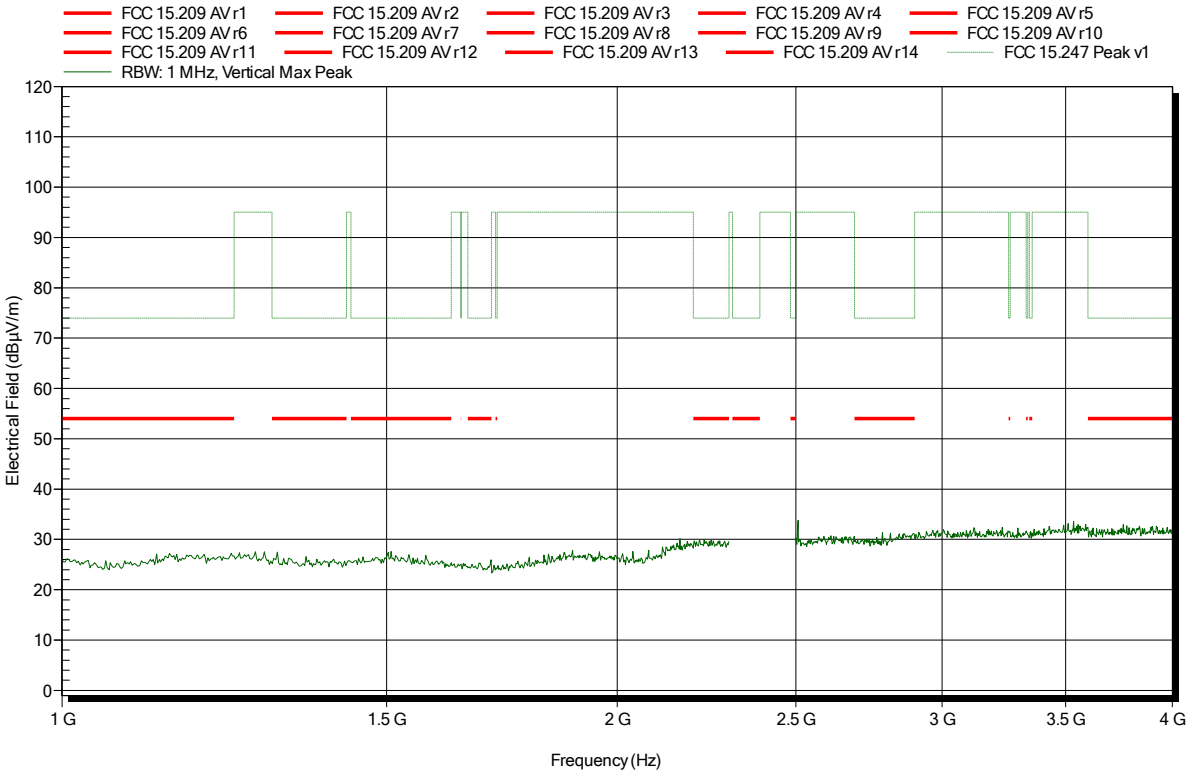

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2480 MHz
Test Date:	2019-04-25
Note:	upper bandedge

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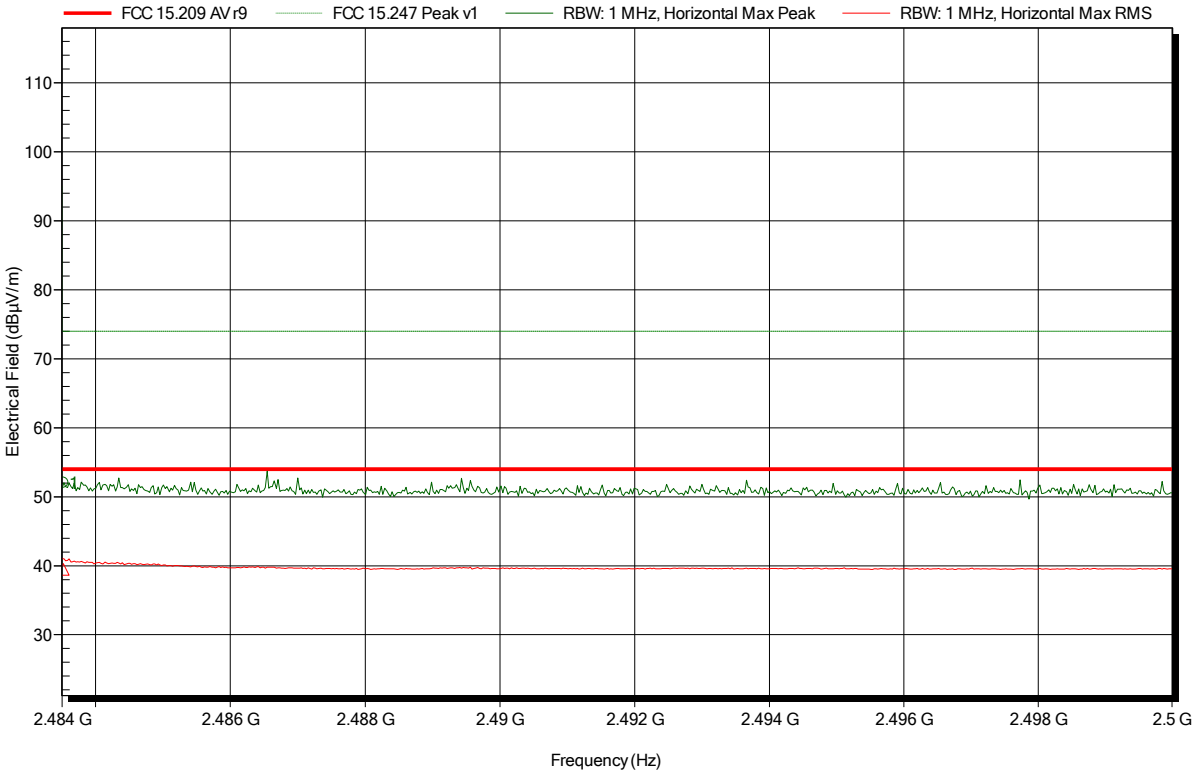

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.4835 GHz	52.02 dBµV/m	74 dBµV/m	-21.98 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
2.4835 GHz	39.46 dBµV/m	54 dBµV/m	-14.54 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2480 MHz
Test Date:	2019-04-25
Note:	upper bandedge

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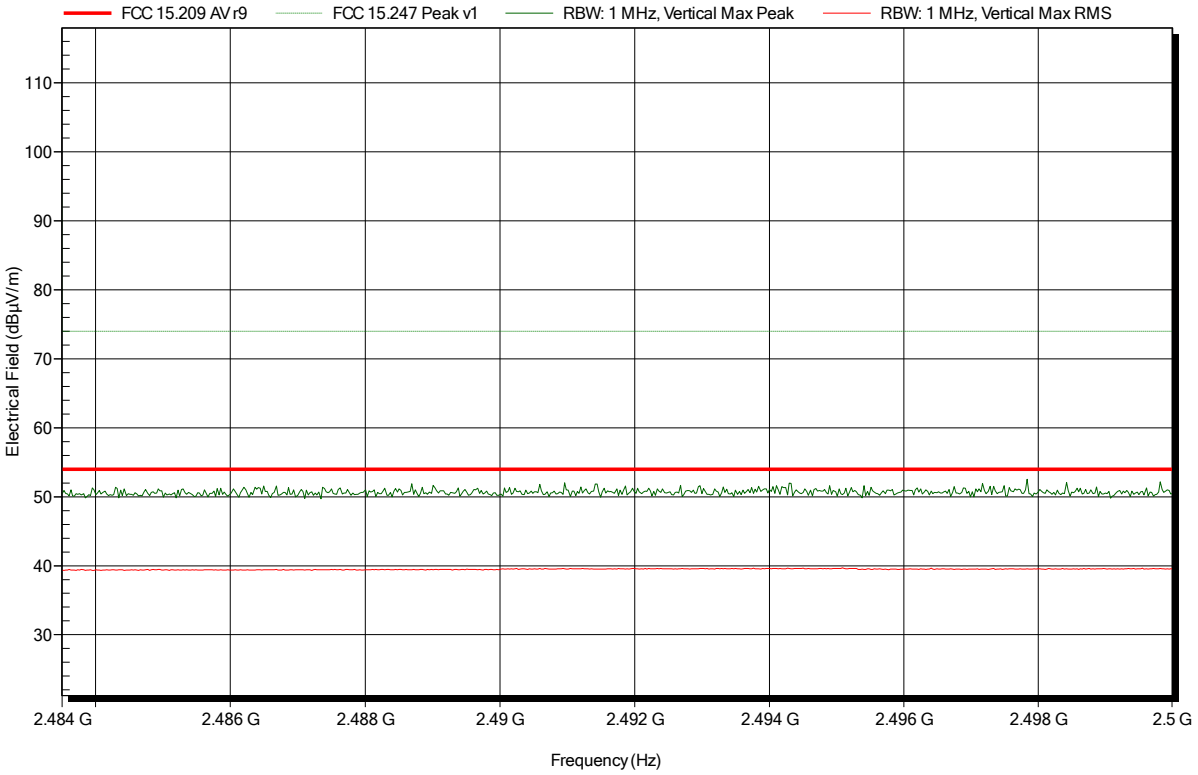

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2480 MHz
Test Date:	2019-04-25
Note:	

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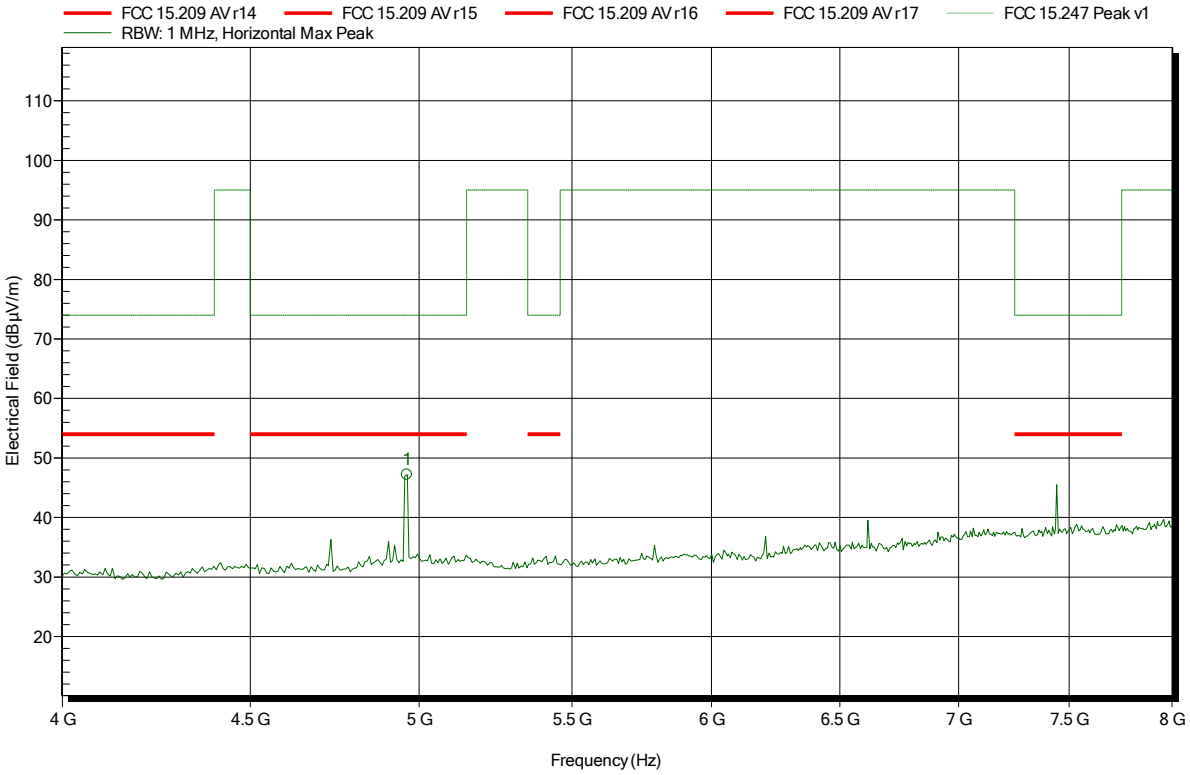

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.962 GHz	47.18 dBµV/m	74 dBµV/m	-26.82 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2480 MHz
Test Date:	2019-04-25
Note:	

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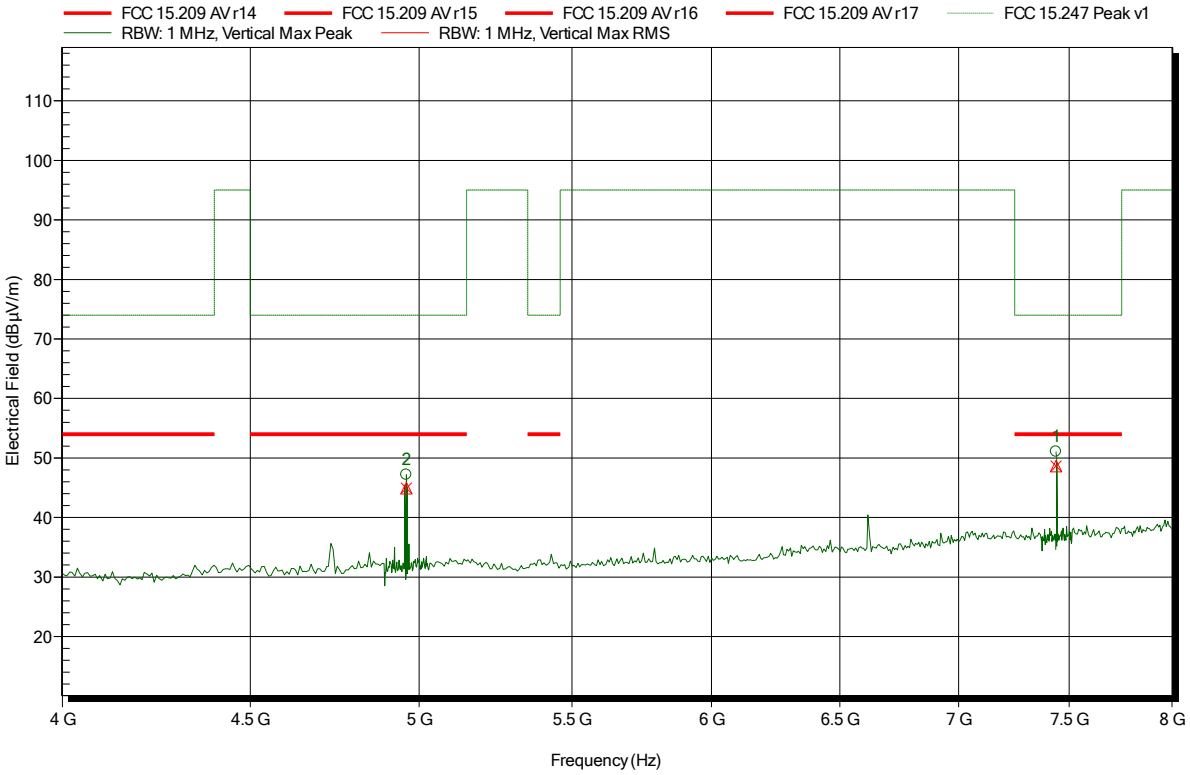

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.96 GHz	47.17 dBµV/m	74 dBµV/m	-26.83 dB	Pass
7.439 GHz	51.06 dBµV/m	74 dBµV/m	-22.94 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
4.96 GHz	44.9 dBµV/m	54 dBµV/m	-9.1 dB	Pass
7.439 GHz	48.64 dBµV/m	54 dBµV/m	-5.36 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2480 MHz
Test Date:	2019-04-25
Note:	

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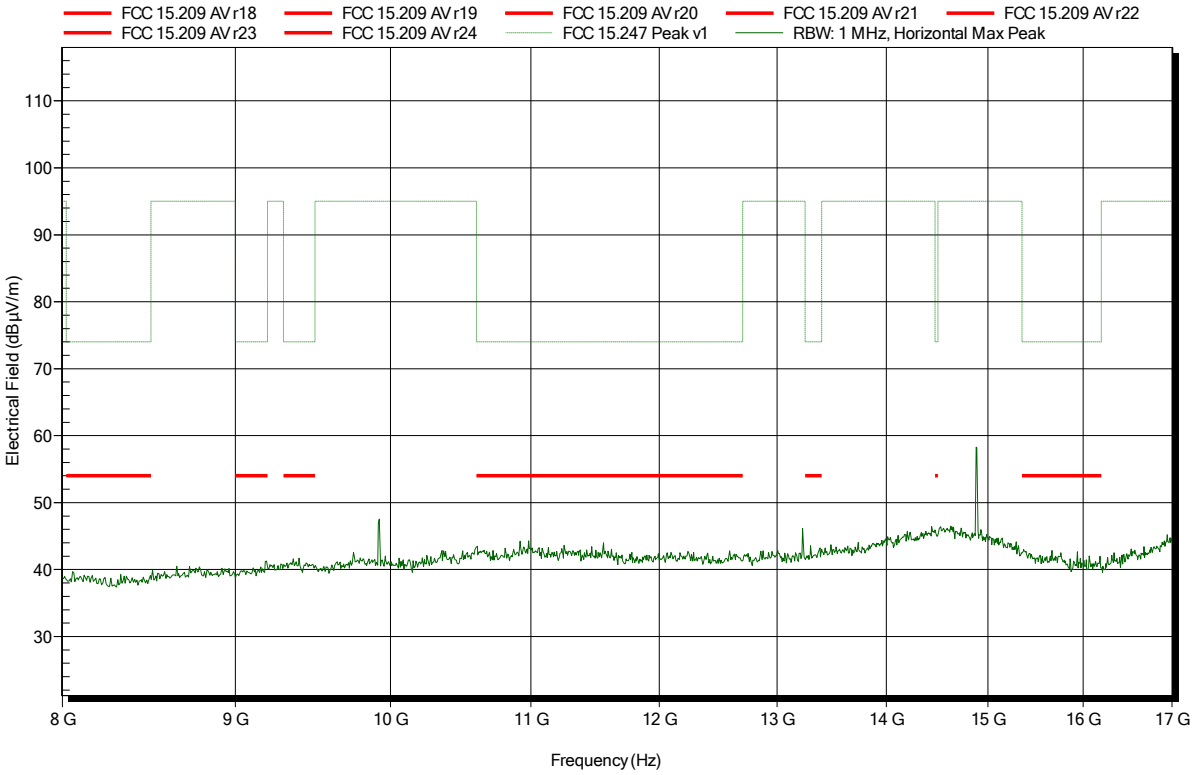

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2480 MHz
Test Date:	2019-04-25
Note:	

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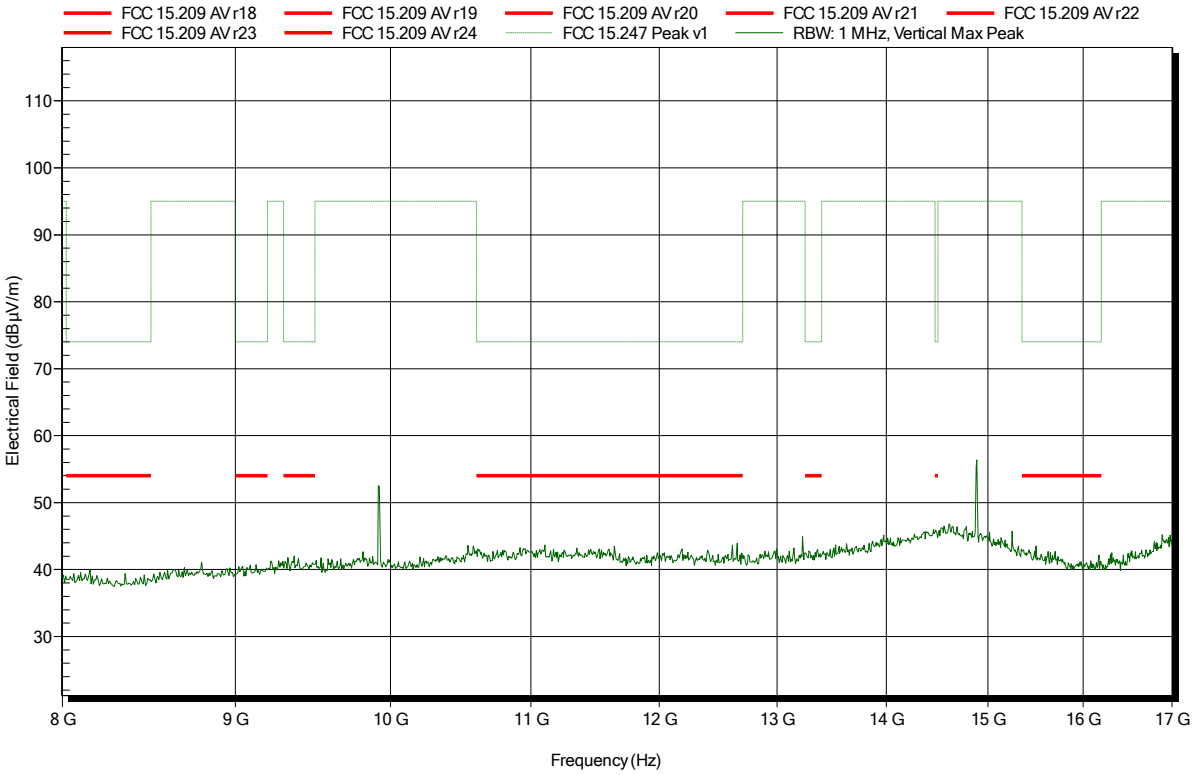

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Amplifier Research AT4560, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2480 MHz
Test Date:	2019-04-25
Note:	

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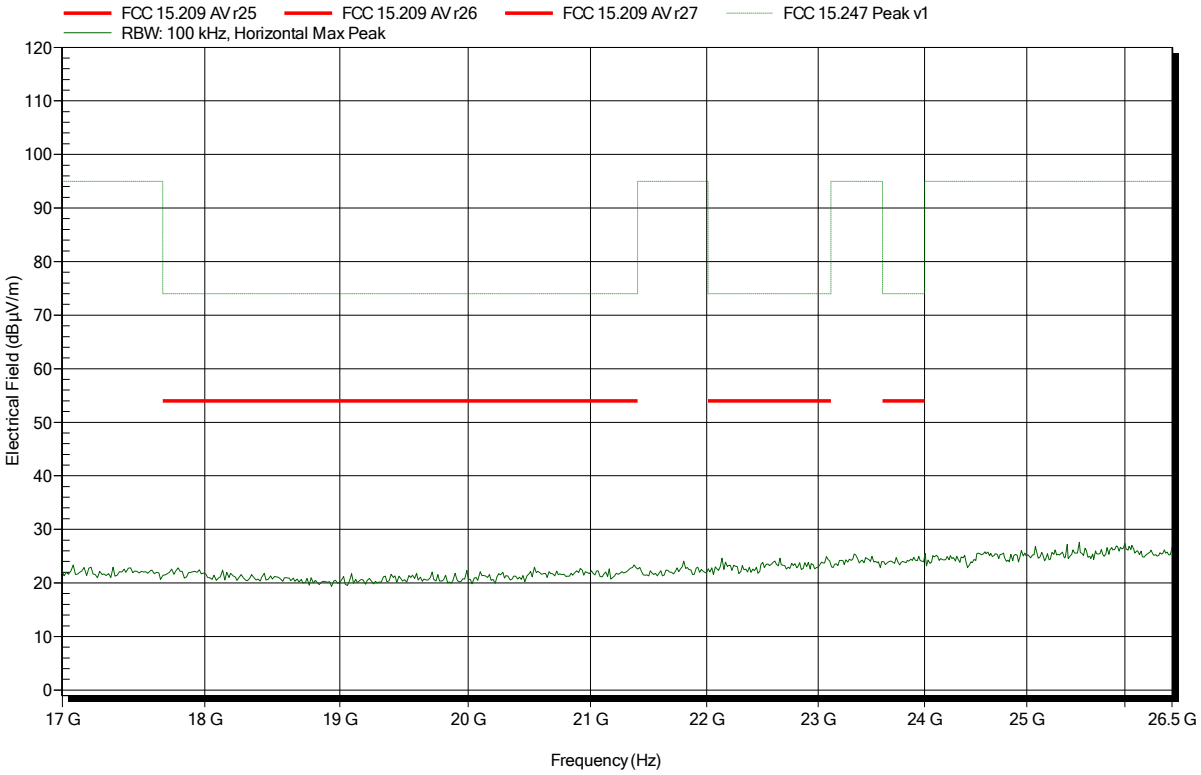

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Amplifier Research AT4560, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; DH5; 2480 MHz
Test Date:	2019-04-25
Note:	

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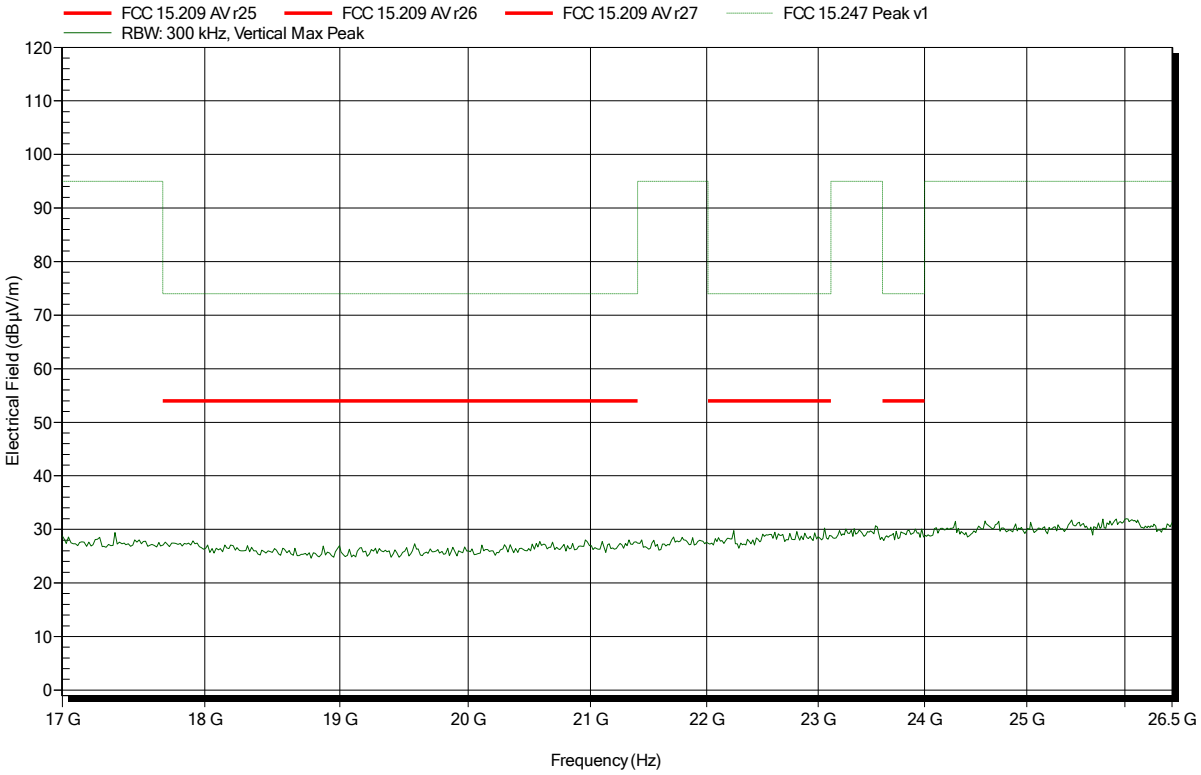

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2402 MHz
Test Date:	2019-04-26
Note:	

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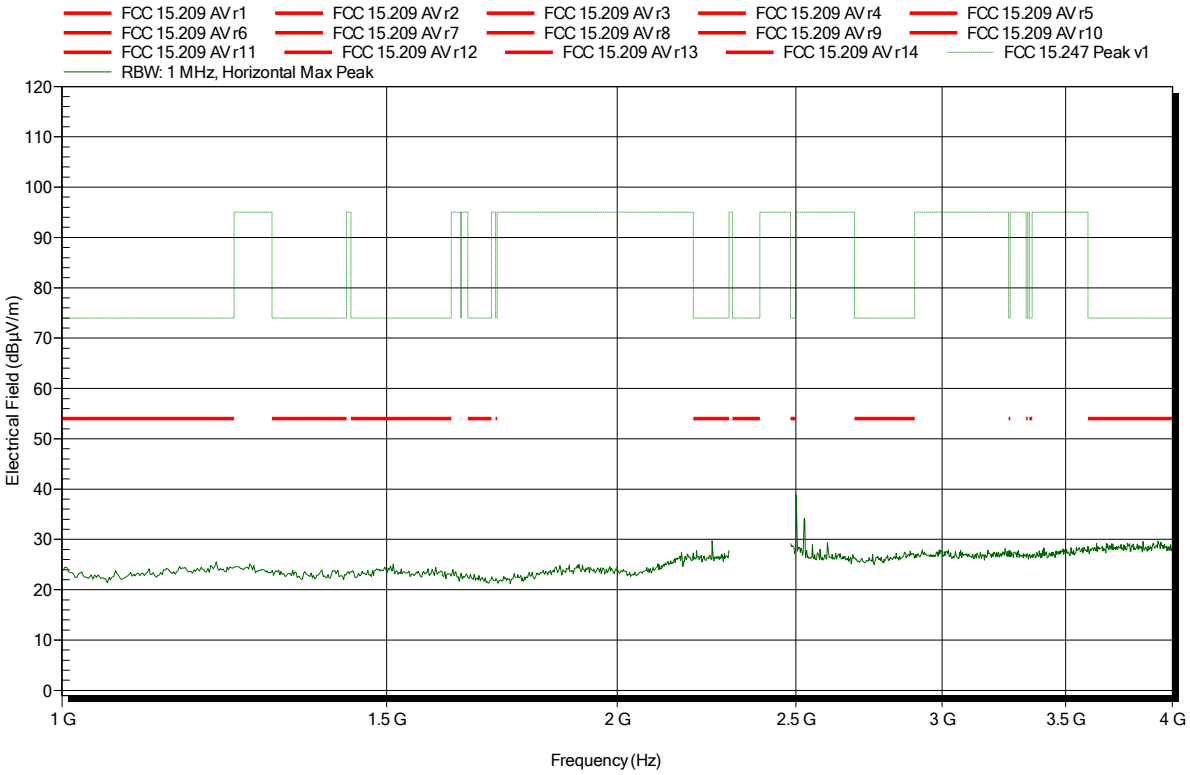

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2402 MHz
Test Date:	2019-04-26
Note:	

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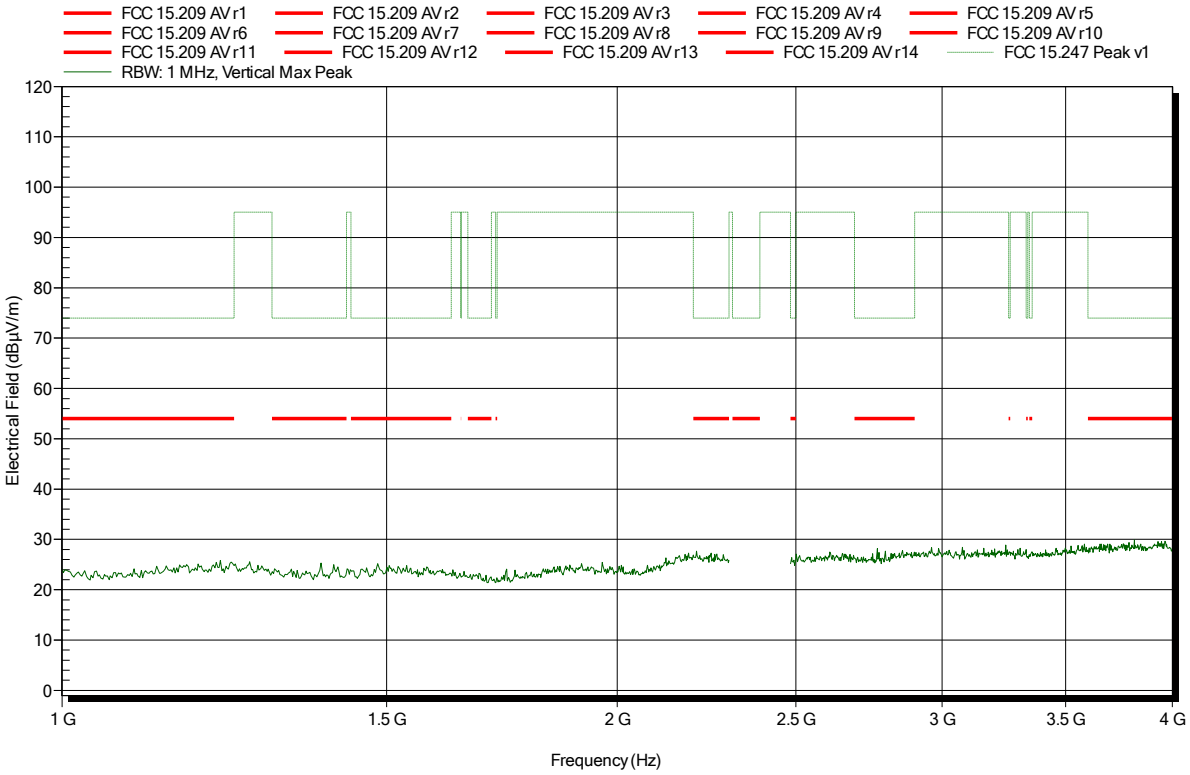

Spurious emissions according to FCC 47 e-CFR §15.247

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Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2402 MHz
Test Date:	2019-04-26
Note:	lower bandedge

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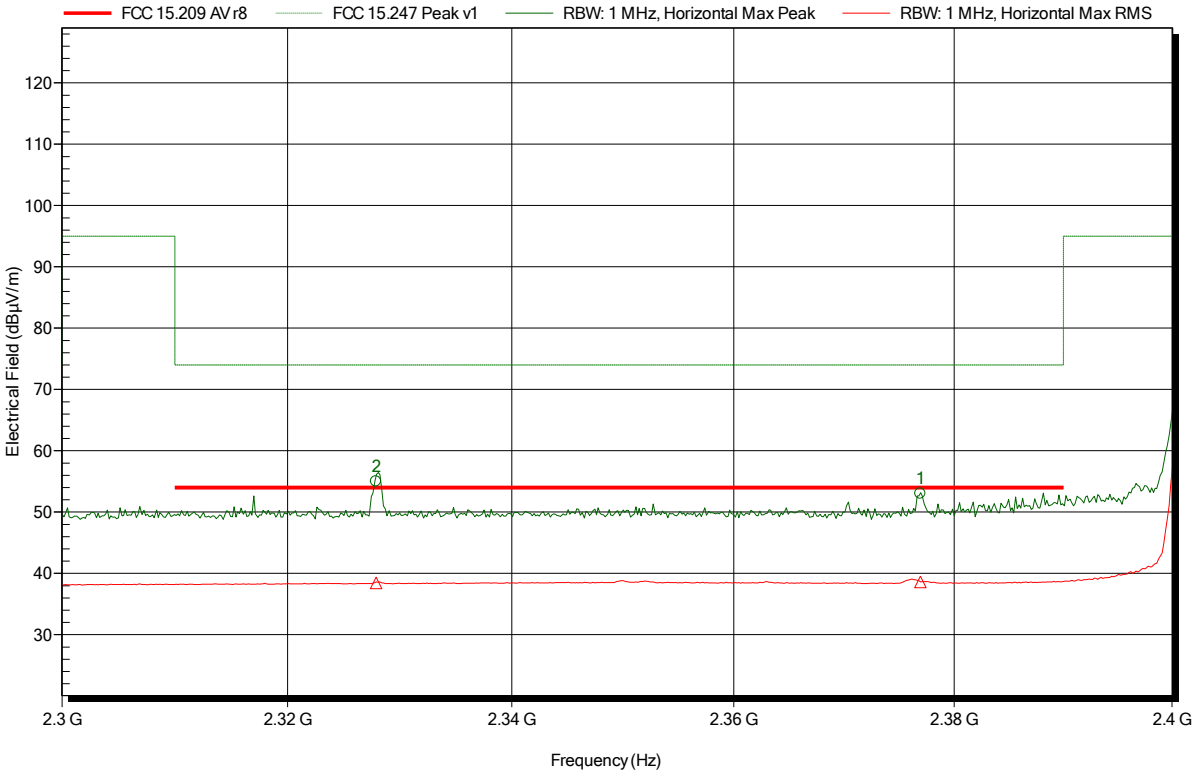

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.3279 GHz	55.02 dBµV/m	74 dBµV/m	-18.98 dB	Pass
2.3769 GHz	53 dBµV/m	74 dBµV/m	-21 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
2.3279 GHz	38.48 dBµV/m	54 dBµV/m	-15.52 dB	Pass
2.3769 GHz	38.63 dBµV/m	54 dBµV/m	-15.37 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2402 MHz
Test Date:	2019-04-26
Note:	lower bandedge

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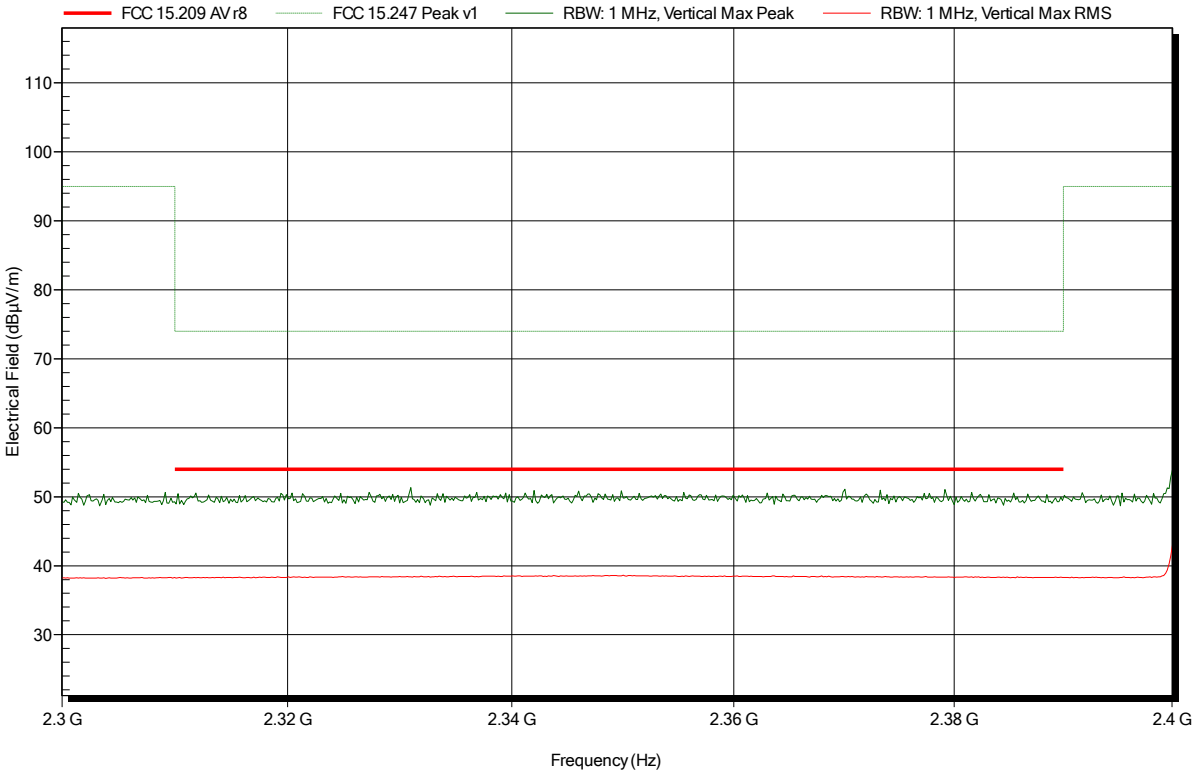

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2402 MHz
Test Date:	2019-04-26
Note:	

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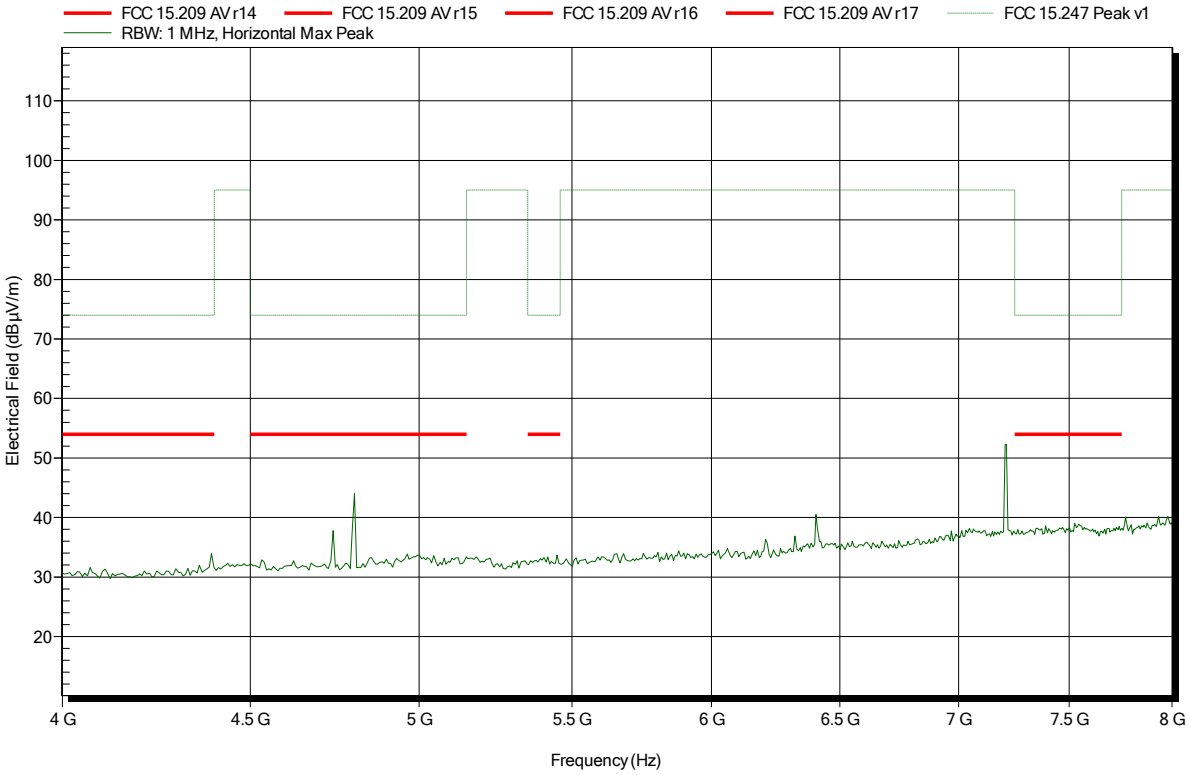

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2402 MHz
Test Date:	2019-04-26
Note:	

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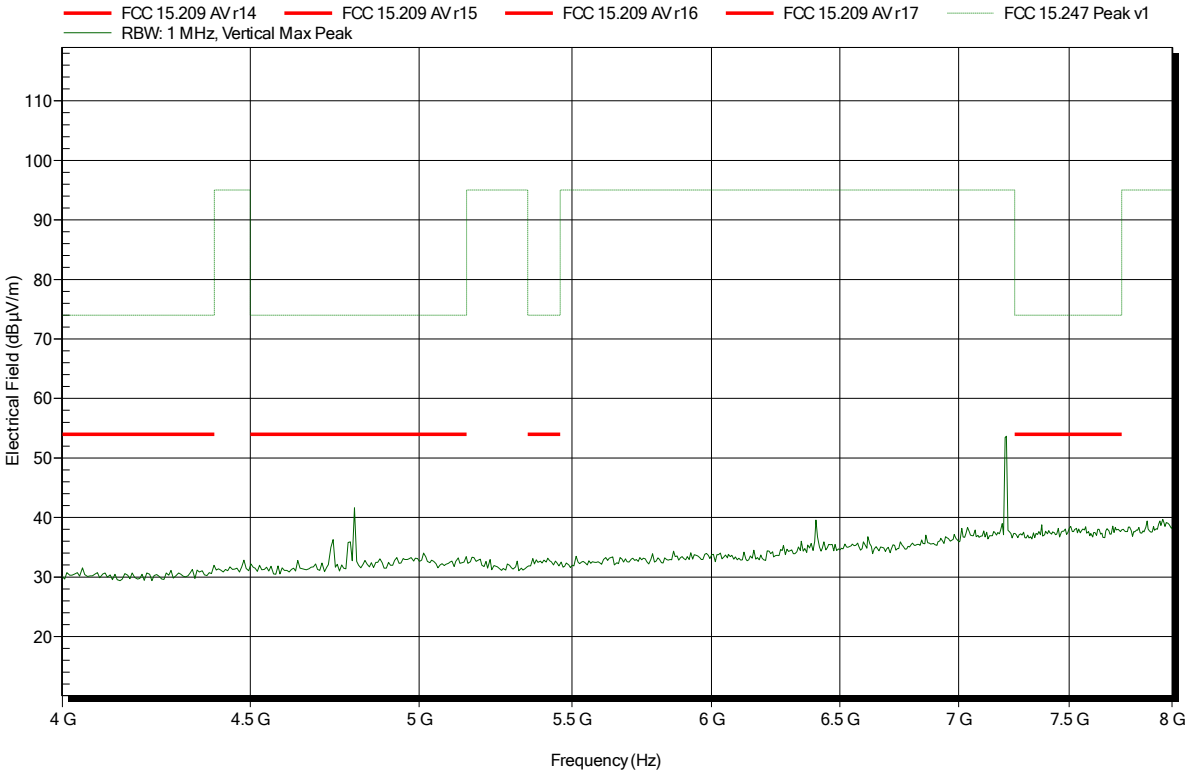

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2441 MHz
Test Date:	2019-04-26
Note:	

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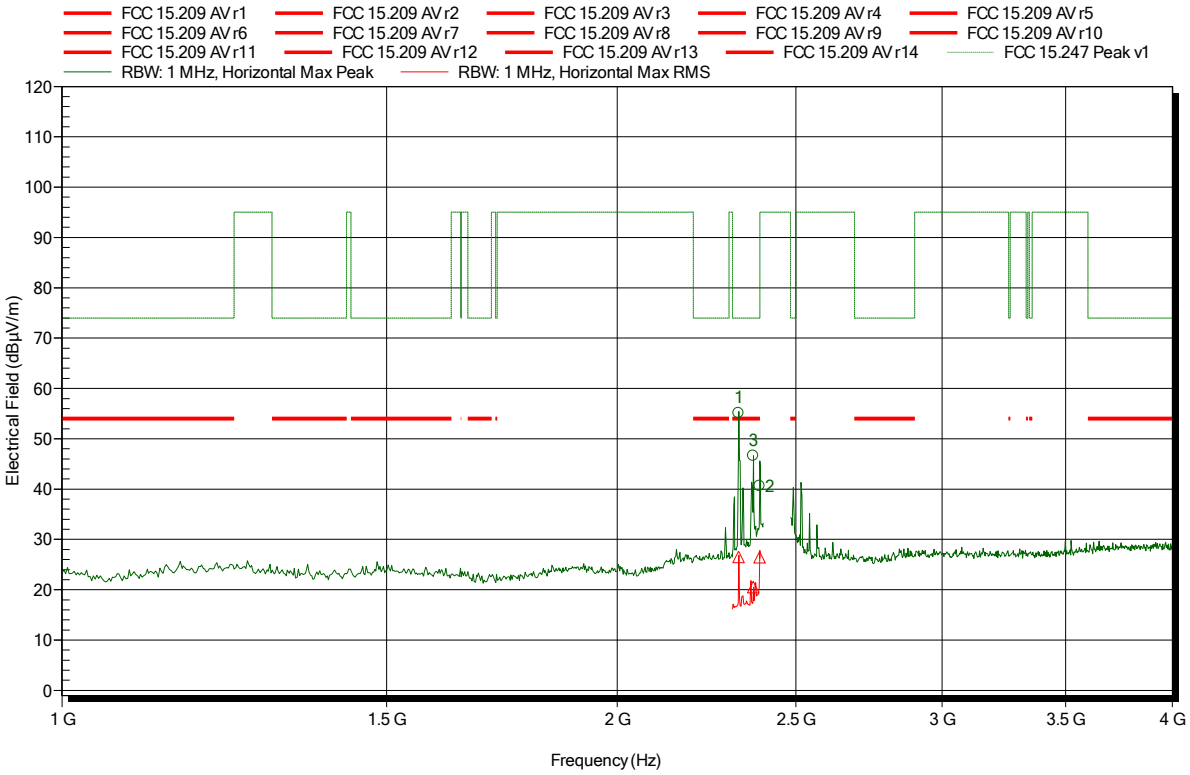

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.3279 GHz	55.09 dBµV/m	74 dBµV/m	-18.91 dB	Pass
2.3702 GHz	46.61 dBµV/m	74 dBµV/m	-27.39 dB	Pass
2.3896 GHz	40.63 dBµV/m	74 dBµV/m	-33.37 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
2.3279 GHz	26.53 dBµV/m	54 dBµV/m	-27.47 dB	Pass
2.3702 GHz	20.51 dBµV/m	54 dBµV/m	-33.49 dB	Pass
2.3896 GHz	26.45 dBµV/m	54 dBµV/m	-27.55 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2441 MHz
Test Date:	2019-04-26
Note:	

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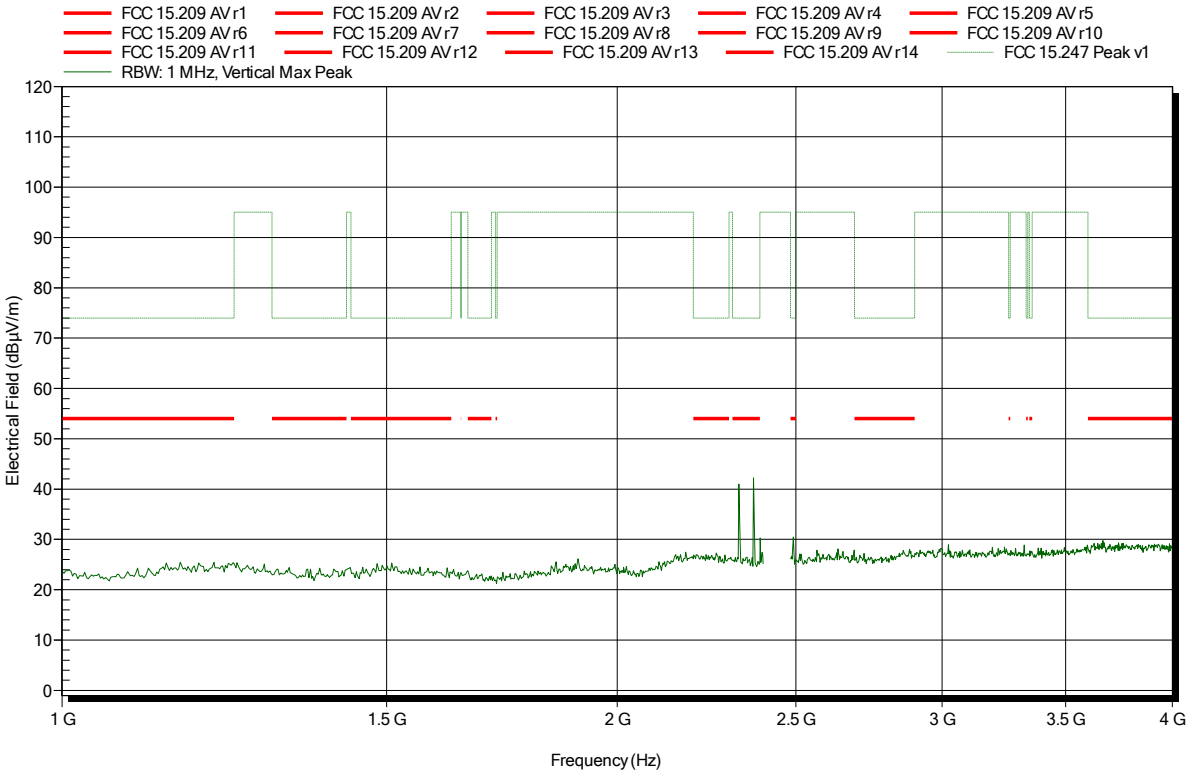

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2441 MHz
Test Date:	2019-04-26
Note:	

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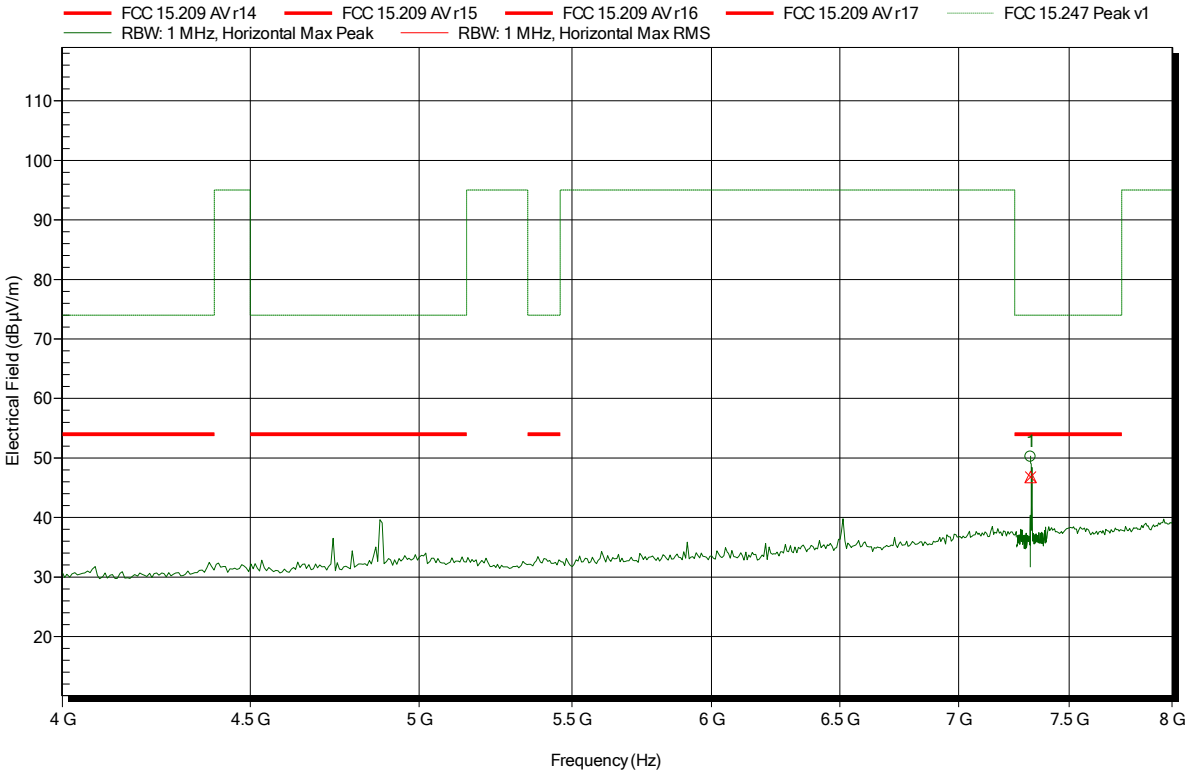

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
7.322 GHz	50.22 dBµV/m	74 dBµV/m	-23.78 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
7.322 GHz	46.83 dBµV/m	54 dBµV/m	-7.17 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2441 MHz
Test Date:	2019-04-26
Note:	

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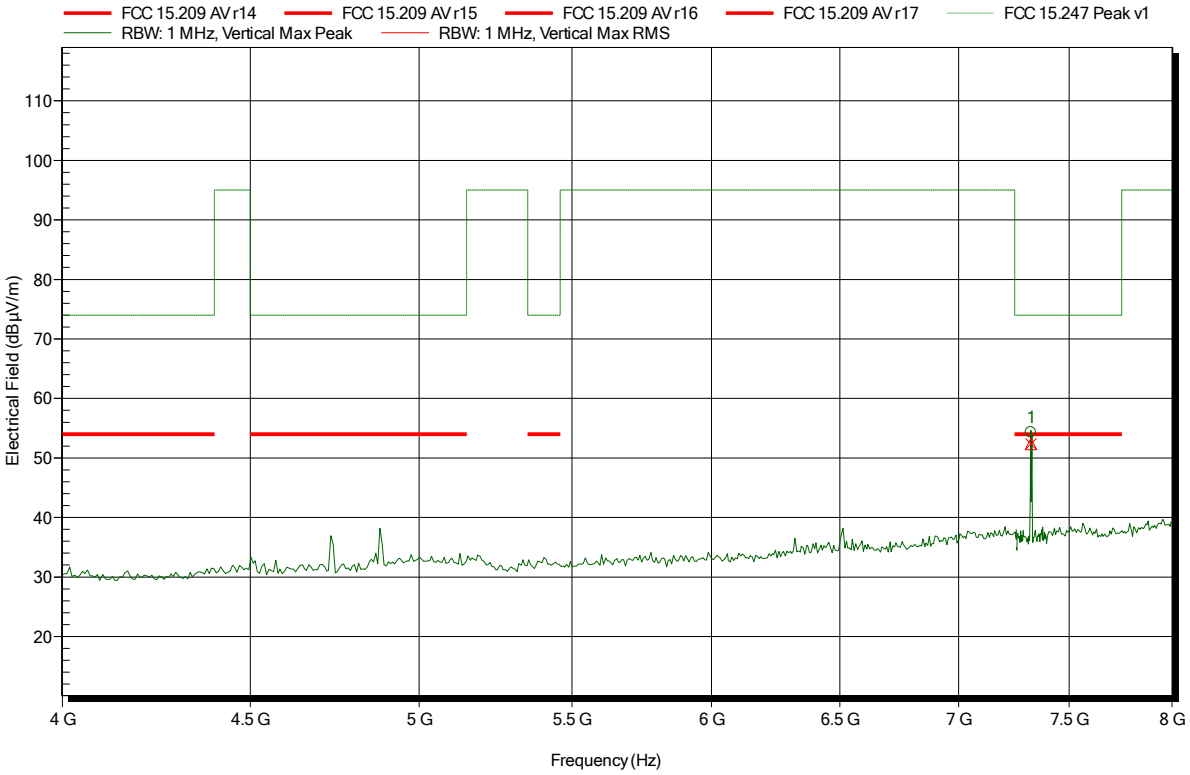

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
7.323 GHz	54.3 dBµV/m	74 dBµV/m	-19.7 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
7.323 GHz	52.35 dBµV/m	54 dBµV/m	-1.65 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2480 MHz
Test Date:	2019-04-26
Note:	

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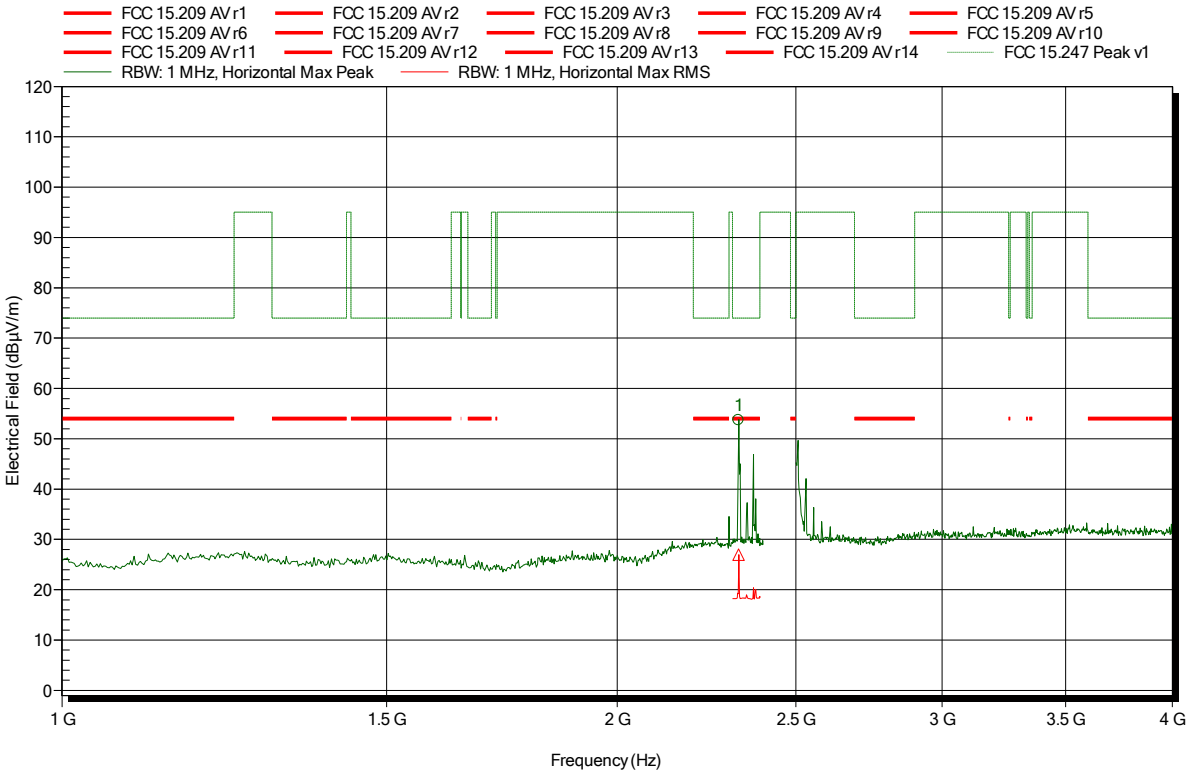

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.328 GHz	53.72 dBµV/m	74 dBµV/m	-20.28 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
2.328 GHz	26.98 dBµV/m	54 dBµV/m	-27.02 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2480 MHz
Test Date:	2019-04-26
Note:	

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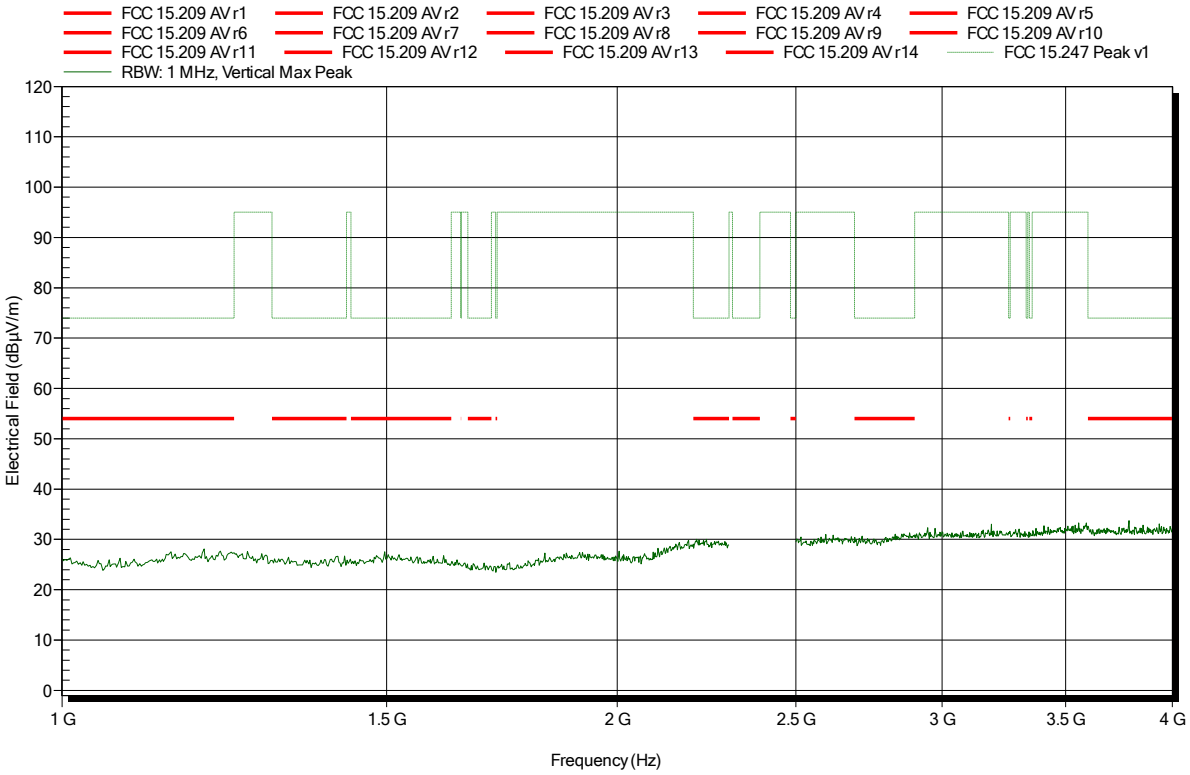

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2480 MHz
Test Date:	2019-04-26
Note:	upper bandedge

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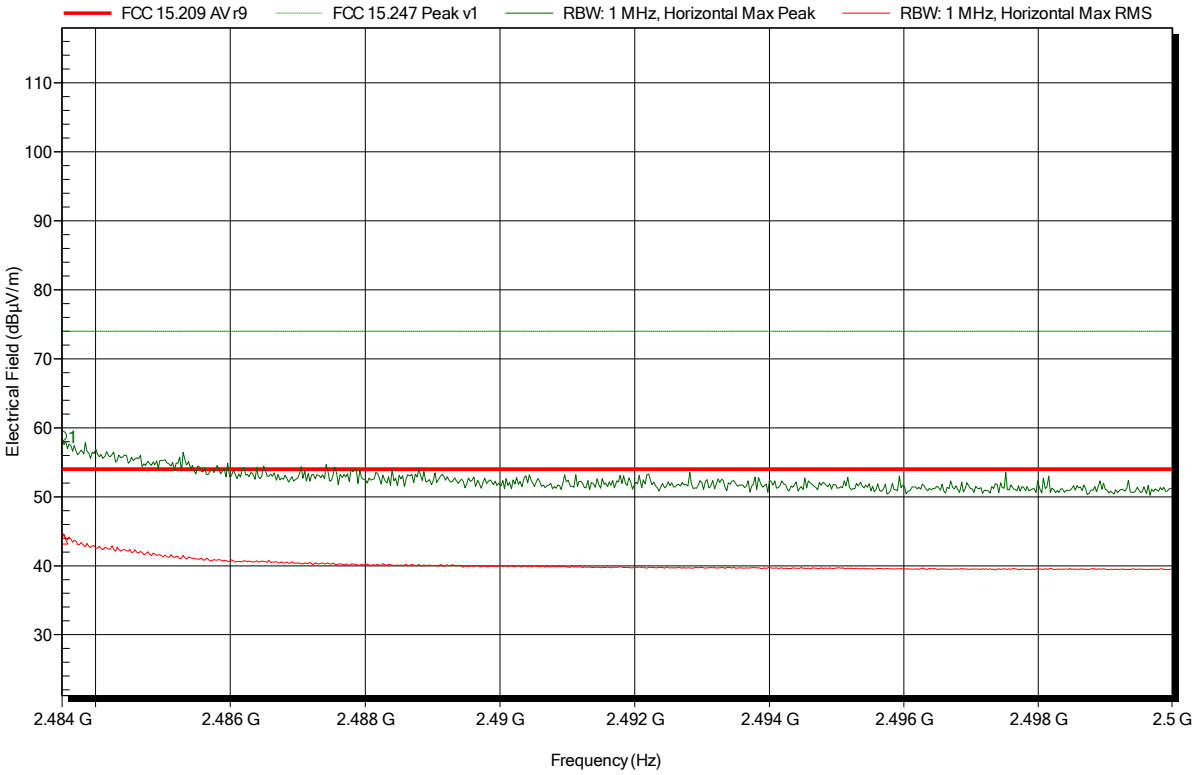

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.4835 GHz	58.72 dBµV/m	74 dBµV/m	-15.28 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
2.4835 GHz	43.96 dBµV/m	54 dBµV/m	-10.04 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2480 MHz
Test Date:	2019-04-26
Note:	upper bandedge

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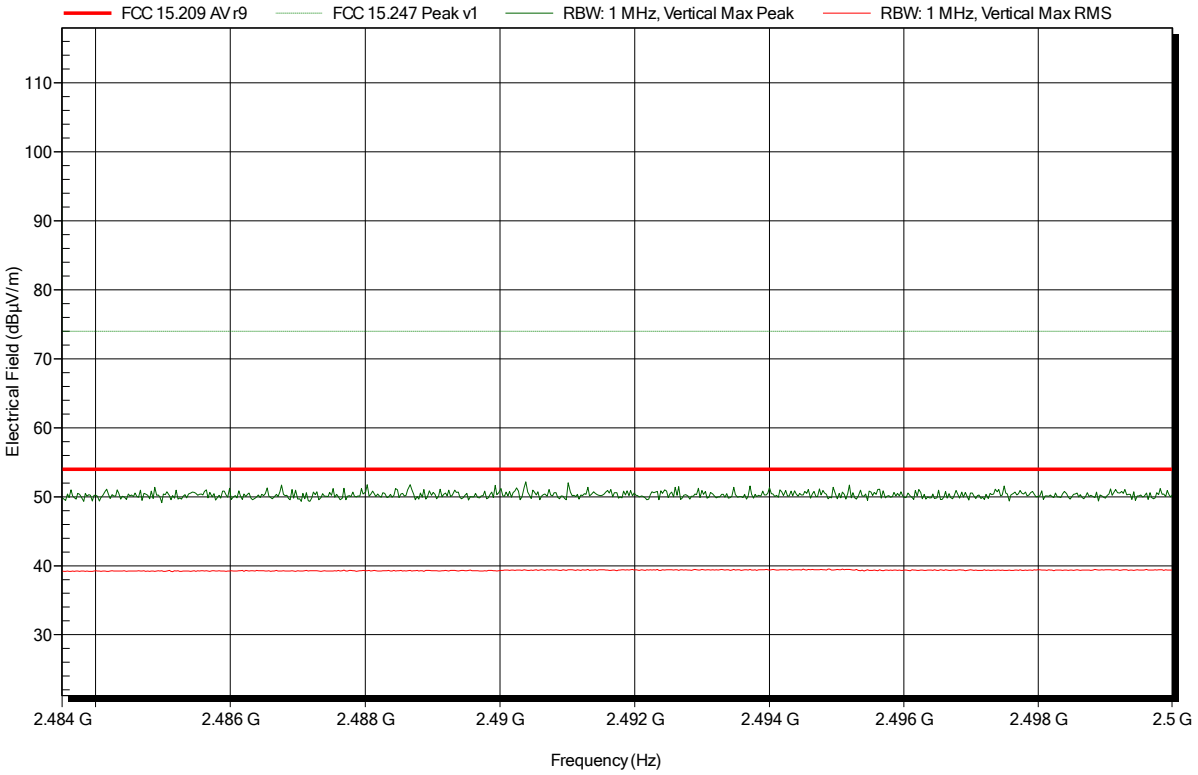

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2480 MHz
Test Date:	2019-04-26
Note:	

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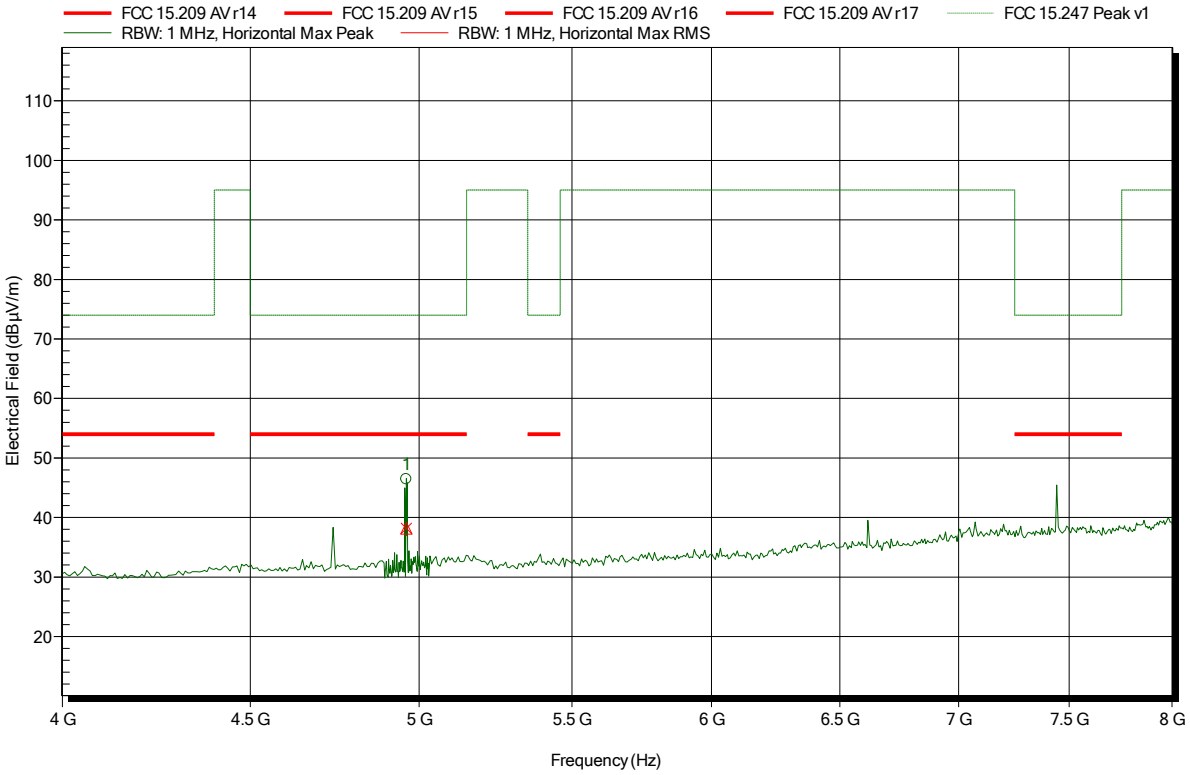

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.96 GHz	46.43 dBµV/m	74 dBµV/m	-27.57 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
4.96 GHz	38.18 dBµV/m	54 dBµV/m	-15.82 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; BT; 3DH5; 2480 MHz
Test Date:	2019-04-26
Note:	

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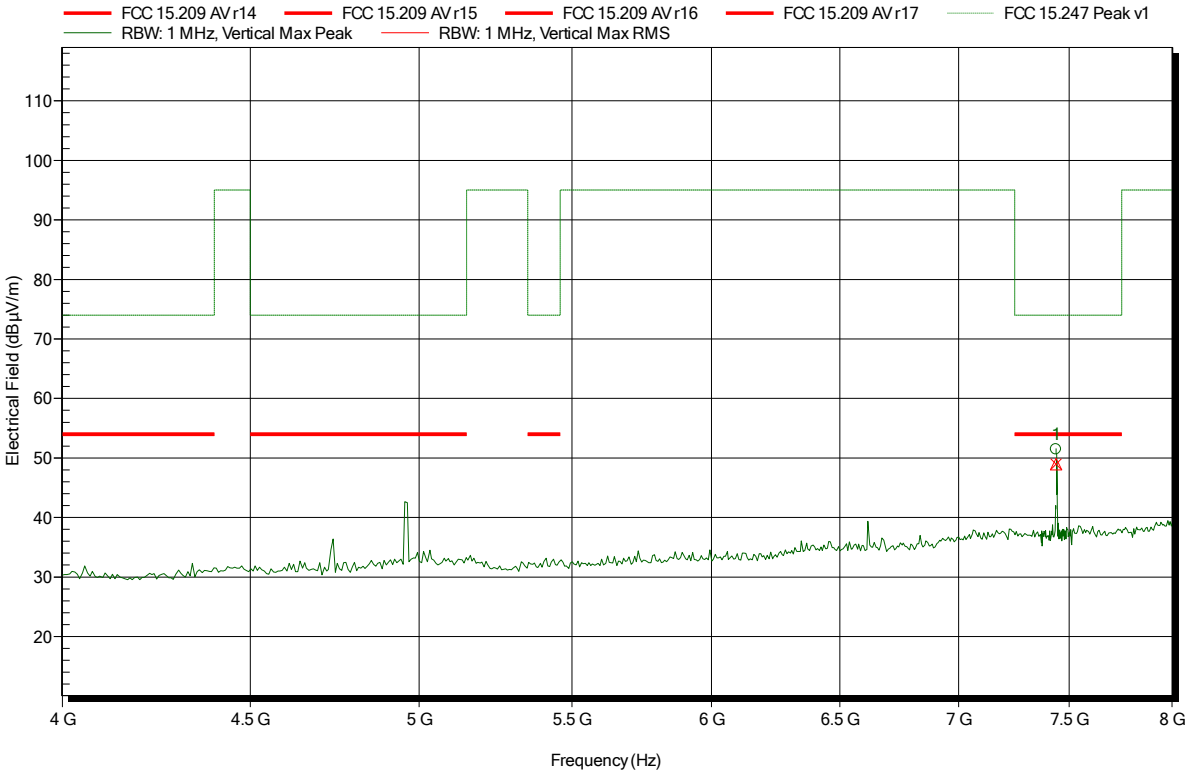

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
7.439 GHz	51.43 dBµV/m	74 dBµV/m	-22.57 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
7.439 GHz	48.95 dBµV/m	54 dBµV/m	-5.05 dB	Pass

ANNEX B Receiver spurious emissions

Spurious emissions according to RSS-247 Issue 2

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	RX; BT; scan mode
Test Date:	2019-04-26
Note:	

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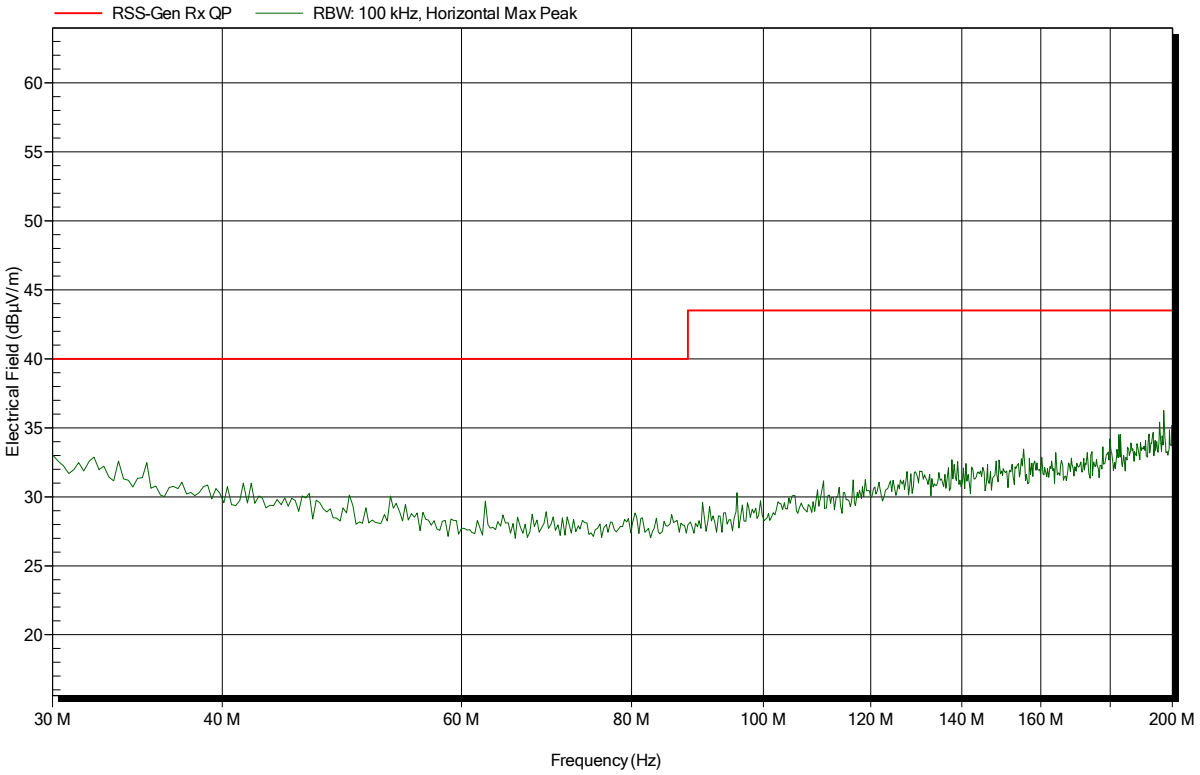

Spurious emissions according to RSS-247 Issue 2

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	RX; BT; scan mode
Test Date:	2019-04-26
Note:	

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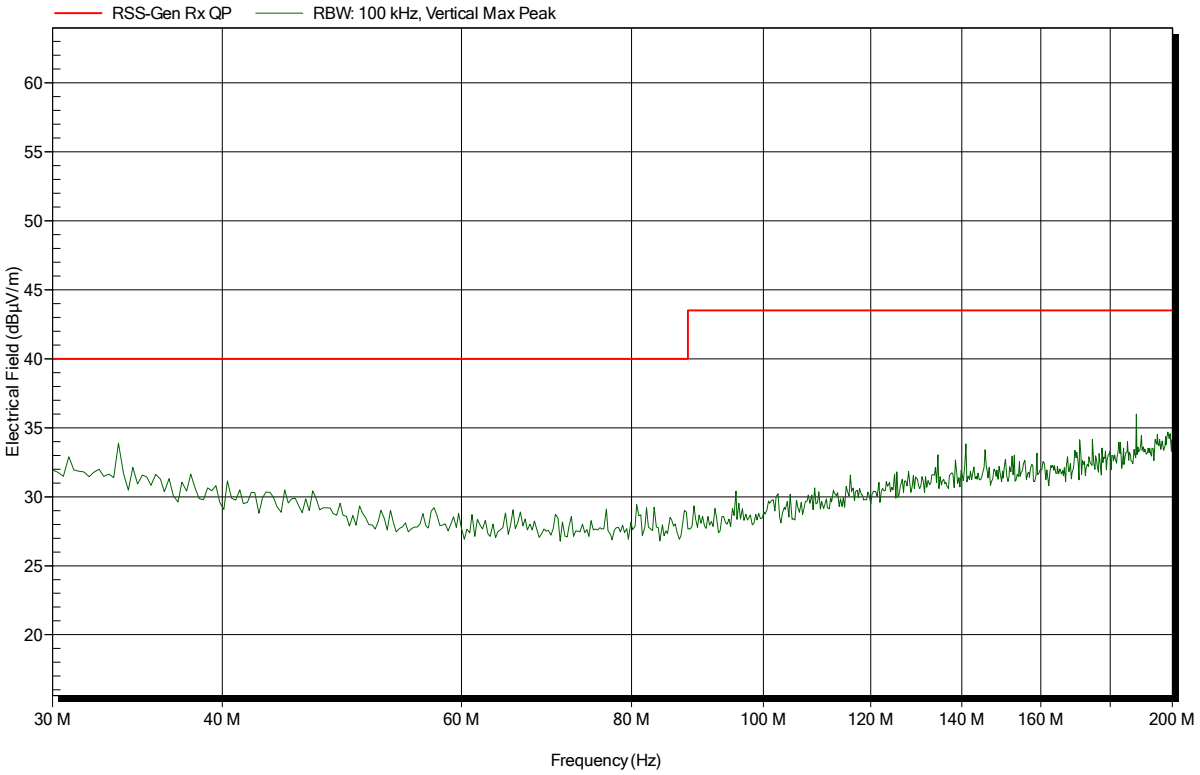

Spurious emissions according to RSS-247 Issue 2

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	RX; BT; scan mode
Test Date:	2019-04-26
Note:	

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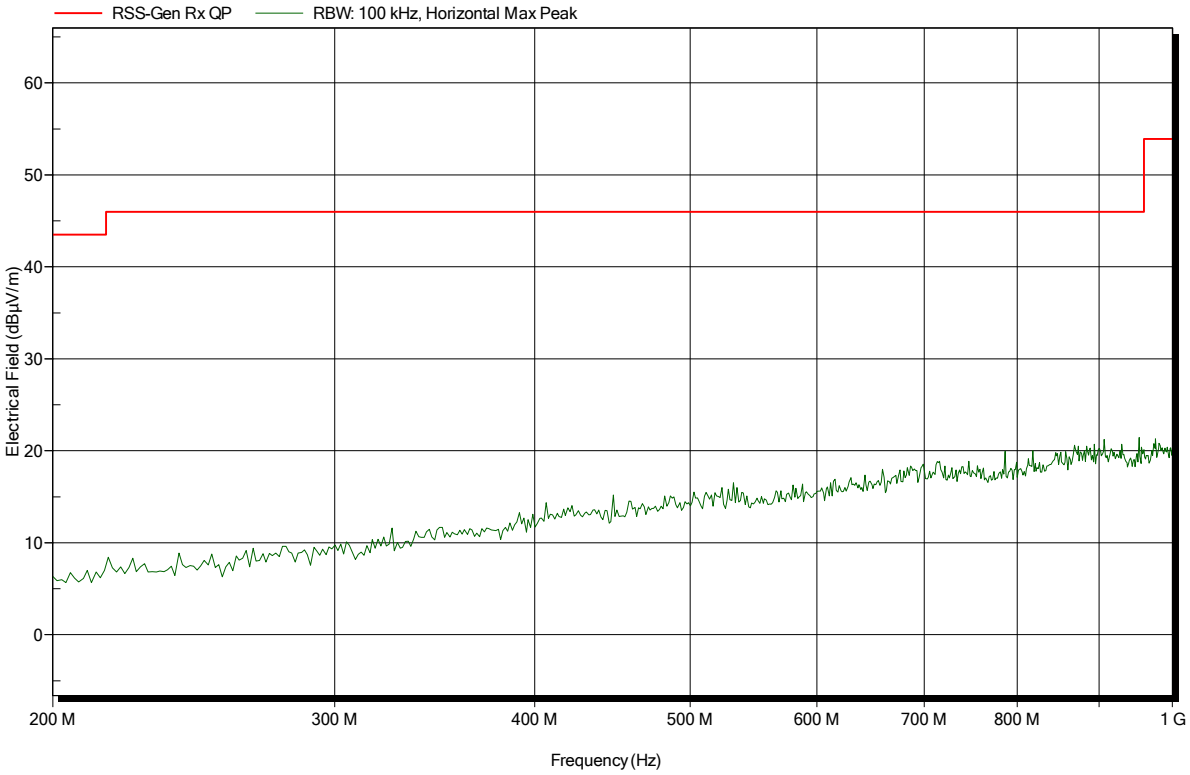

Spurious emissions according to RSS-247 Issue 2

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	RX; BT; scan mode
Test Date:	2019-04-26
Note:	

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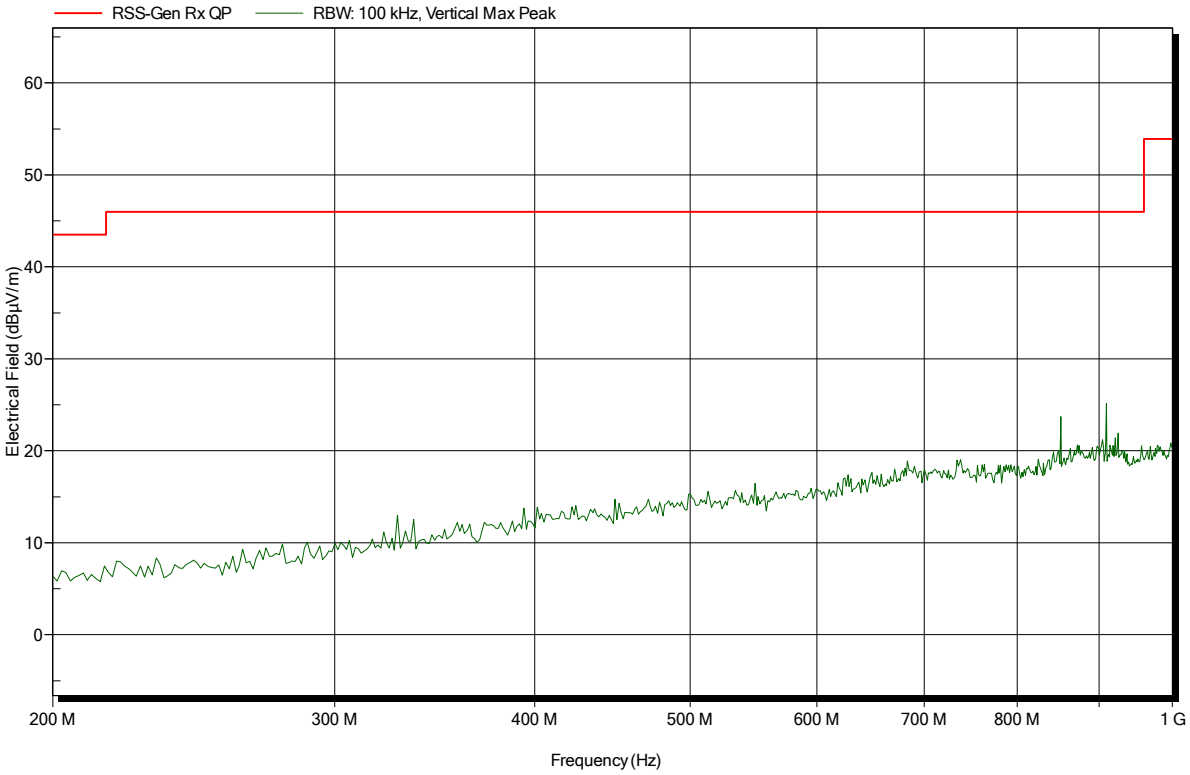

Spurious emissions according to RSS-247 Issue 2

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m
Mode:	RX; BT; scan mode
Test Date:	2019-04-26
Note:	

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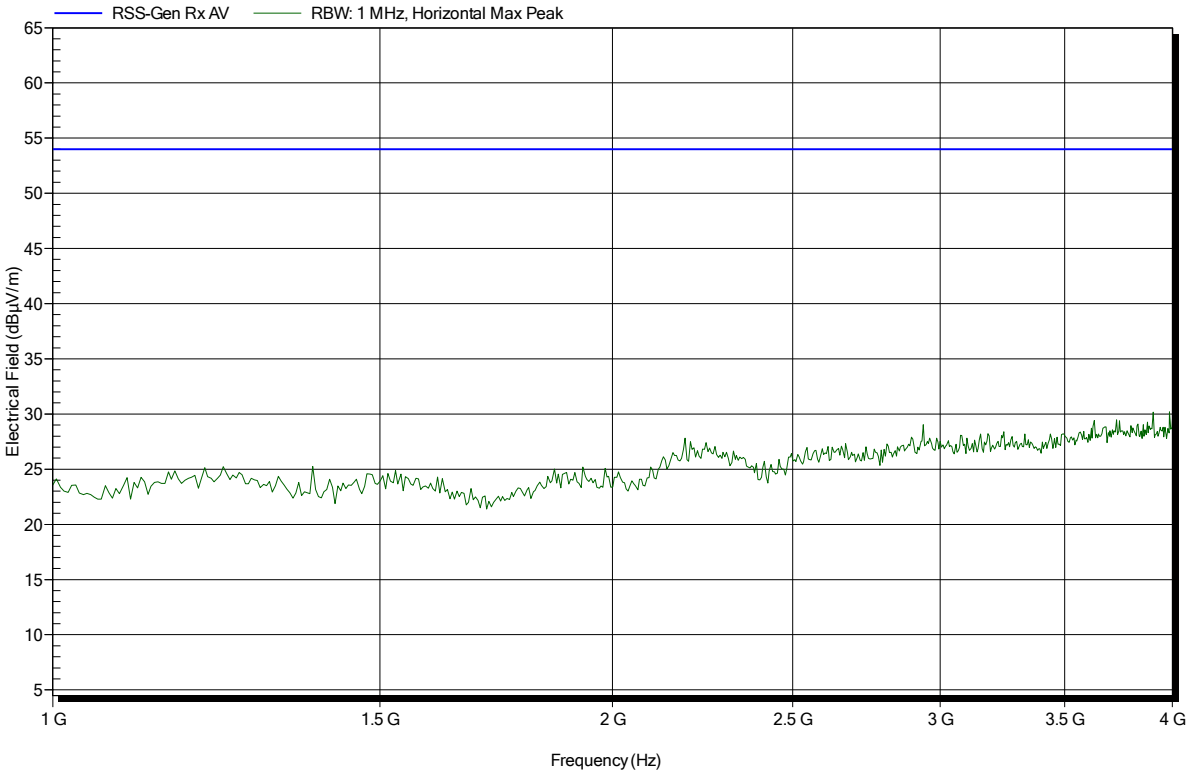

Spurious emissions according to RSS-247 Issue 2

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m
Mode:	RX; BT; scan mode
Test Date:	2019-04-26
Note:	

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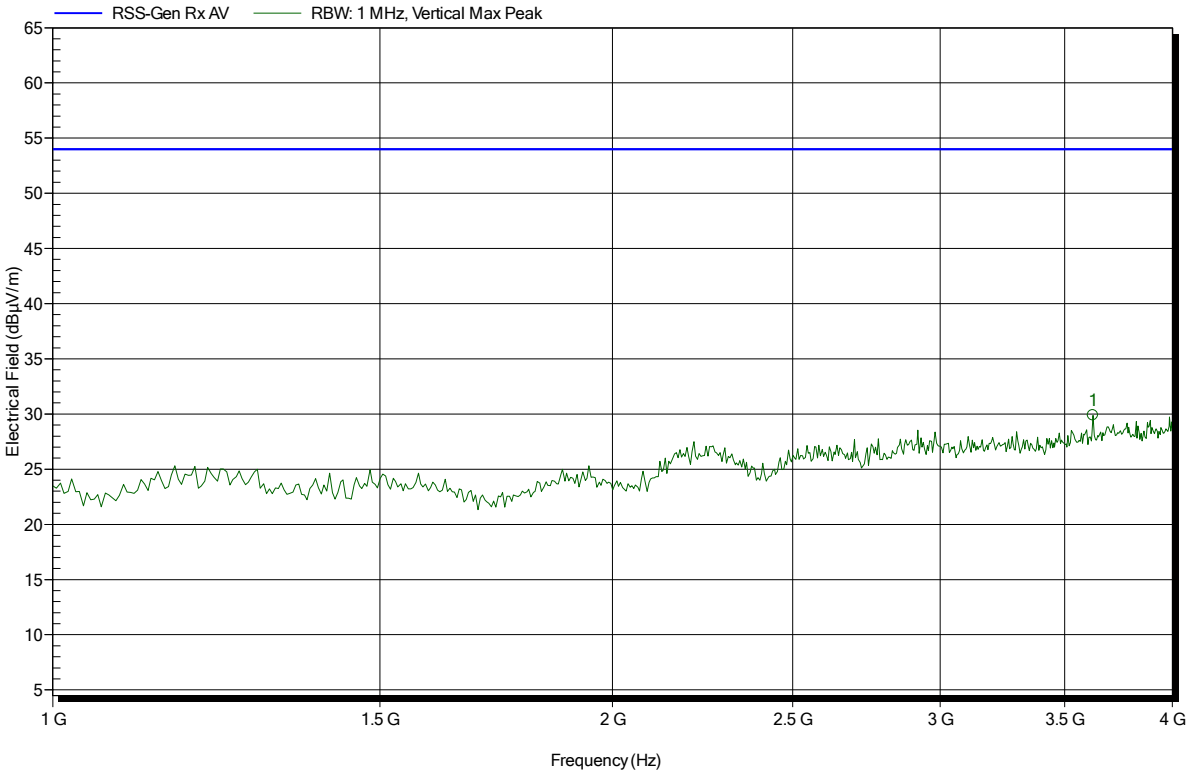

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
3.625 GHz	29.89 dBµV/m	53.98 dBµV/m	-24.09 dB	Pass

Spurious emissions according to RSS-247 Issue 2

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m
Mode:	RX; BT; scan mode
Test Date:	2019-04-26
Note:	

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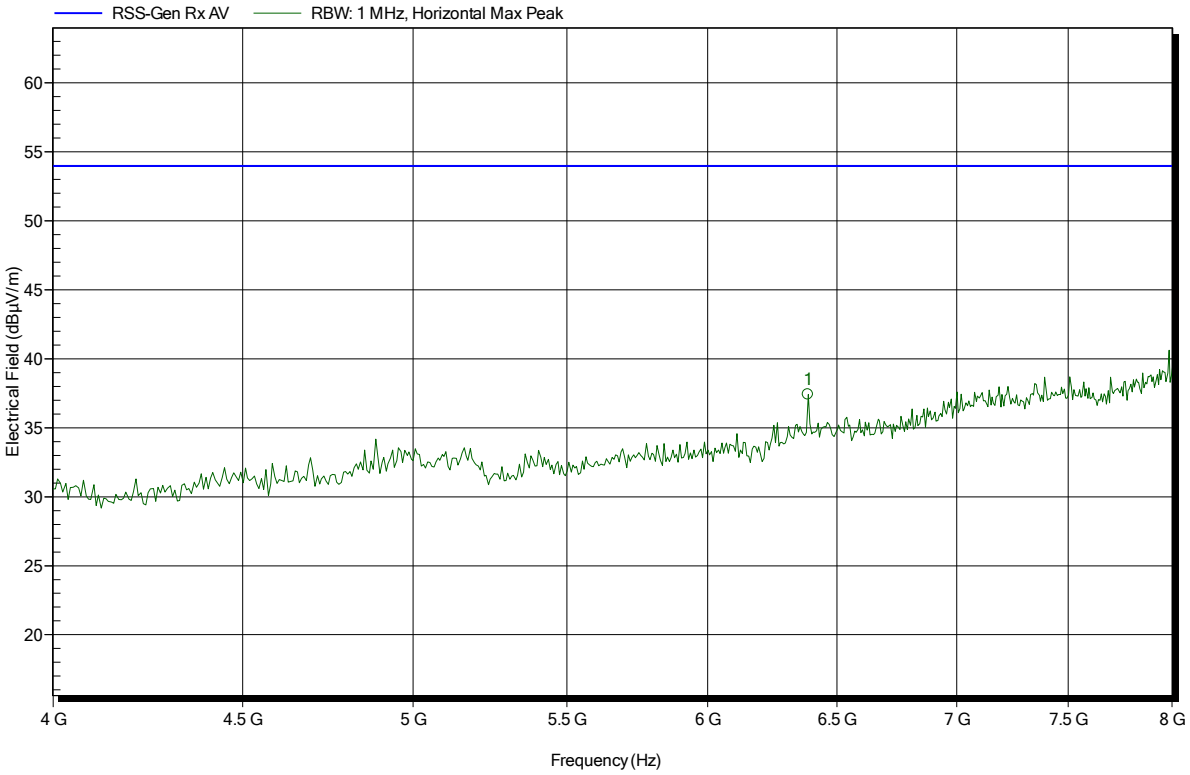

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
6.385 GHz	37.41 dBµV/m	53.98 dBµV/m	-16.57 dB	Pass

Spurious emissions according to RSS-247 Issue 2

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m
Mode:	RX; BT; scan mode
Test Date:	2019-04-26
Note:	

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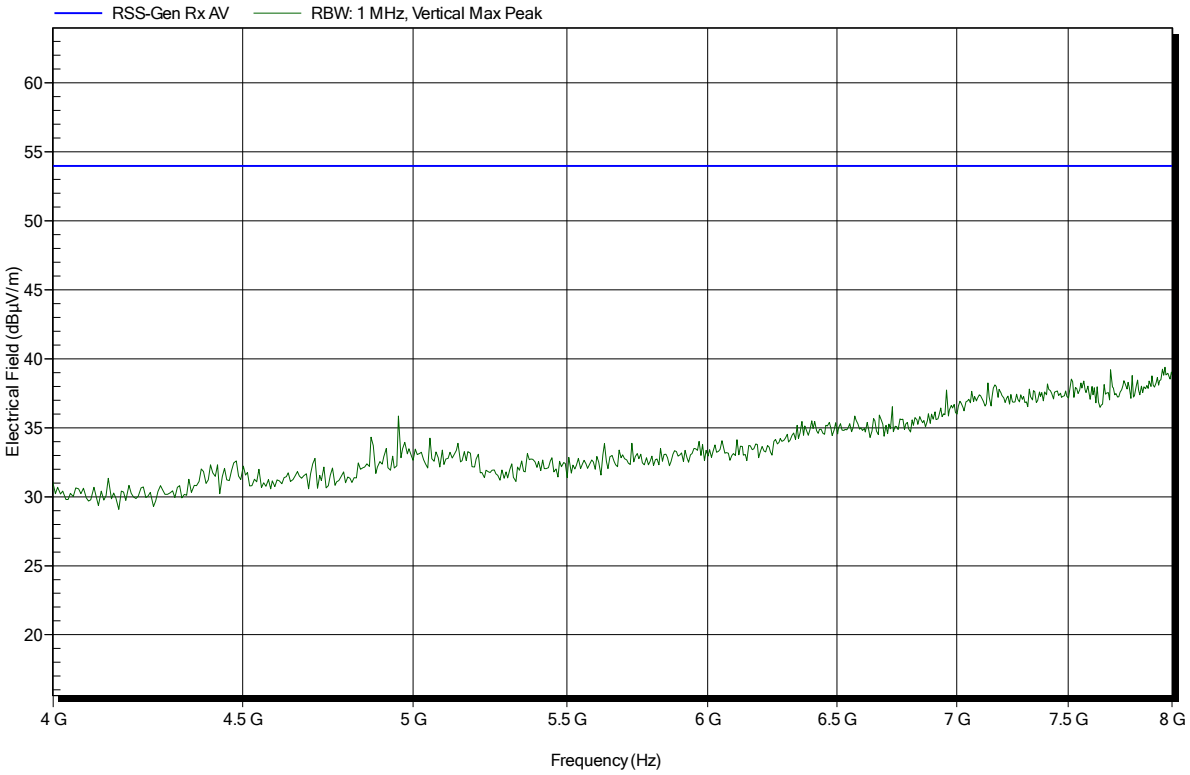

Spurious emissions according to RSS-247 Issue 2

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	RX; BT; scan mode
Test Date:	2019-04-26
Note:	

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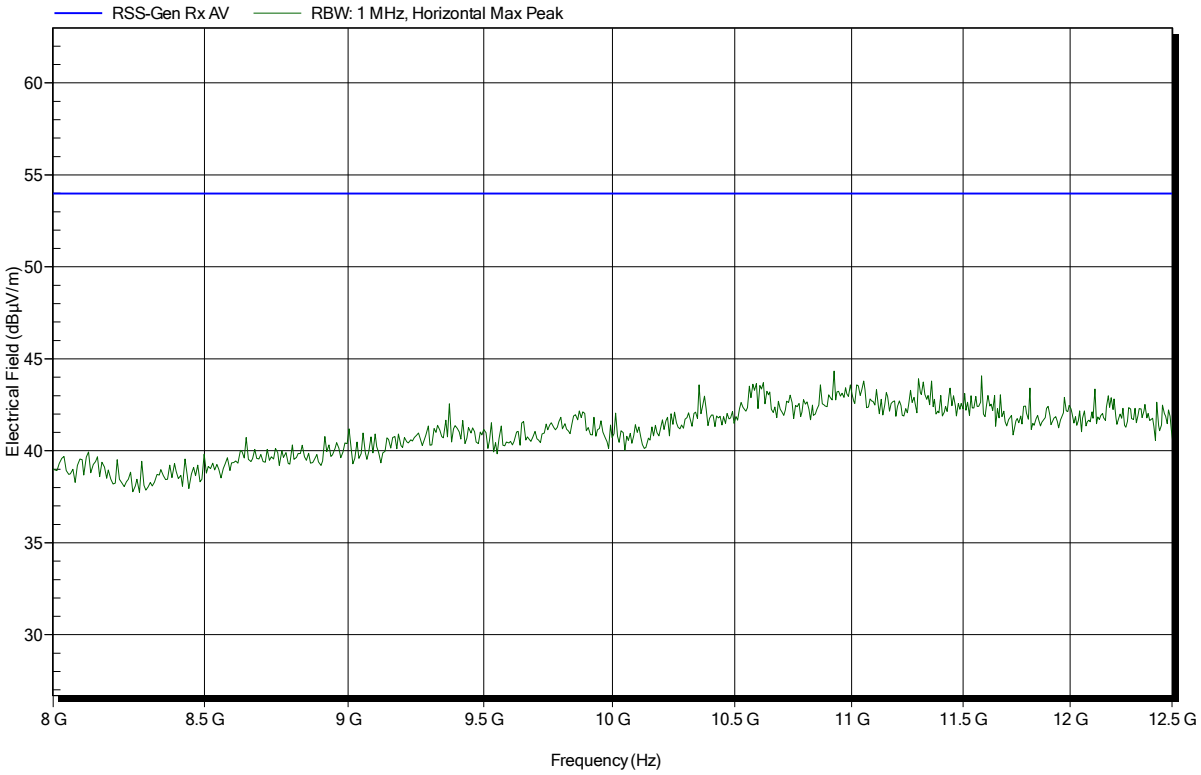

Spurious emissions according to RSS-247 Issue 2

Project number:	G0M-1902-8046
Applicant:	Panasonic Industrial Devices Europe GmbH
EUT Name:	Bluetooth Low Energy Module
Model:	ENW89823A5KF
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Test Conditions:	Tnom: 23°C, Vnom: 5.0 VDC (USB powered)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	RX; BT; scan mode
Test Date:	2019-04-26
Note:	

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