RADIO REPORT

FCC 47 CFR Part 15C
ISED Canada RSS-247

Digital transmission systems operating within the 2400.0 MHz - 2483.5 MHz band

Report Reference No	G0M-2009-9273-TFC247BL-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	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)	ENW89855A1KF
Additional Model(s)	None
Brand Name(s)	PAN3011
Hardware Version(s)	01
Software Version(s)	Stack 2.1c
FCC ID	T7V301X
IC	216Q-301X
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 °C - 30 °C
Test Lab Humidity	25 % - 55 %
Date of receipt of test item	2021-01-21
Report:	

Compiled by	Wilfried Treffke	
Tested by (+ signature) (Responsible for Test)	Wilfried Treffke	
Approved by (+ signature) (Deputy Head of Lab)	Toralf Jahn	
Date of Issue	2021-04-27	
Total number of pages	90	

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:

ADDITIONAL VARIANTS

Additional Variants (not tested and not evaluated variants)		
Not-tested Variant	**Description**	
1	Product Type Description	Bluetooth Low Energy Module
	Model name	ENW89855A2KF
	Brand name	PAN3012
	Hardware Version	01
	Software Version	01
2	Product Type Description	Bluetooth Low Energy Module
	Model name	ENW89855A3KF
	Brand name	PAN3013
	Hardware Version	01
	Software Version	01
Comment: Those named additional variants above have not been tested. Those additional variants of the series have been declared by the manufacturer. The test report explicitly states that those variants were neither tested nor assessed nor evaluated.		

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2021-04-27	Initial Release	

ABBREVIATIONS AND ACRONYMS

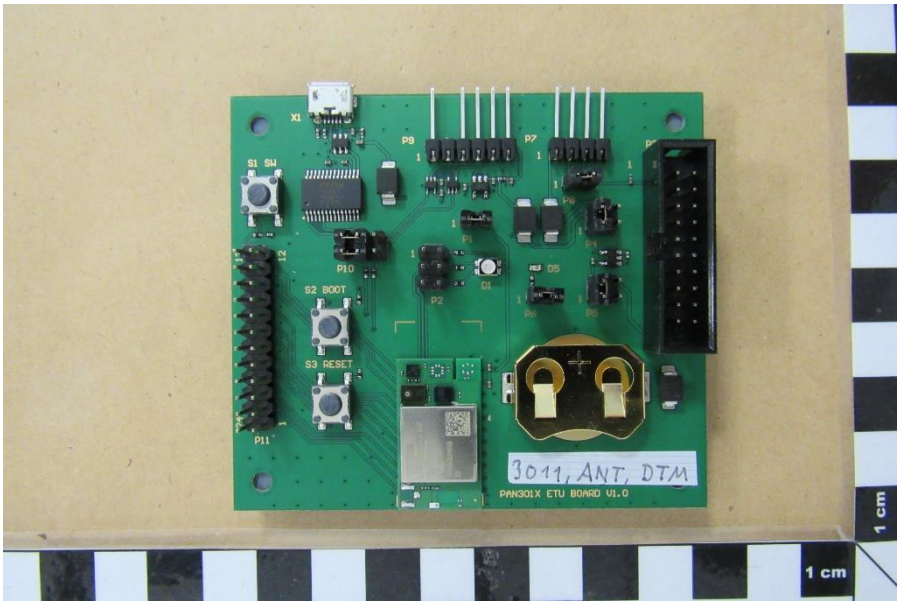
Acronyms	
Acronym	Description
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
RBW	Resolution bandwidth
RMS	Root mean square
VBW	Video bandwidth
V_{NOM}	Nominal supply voltage

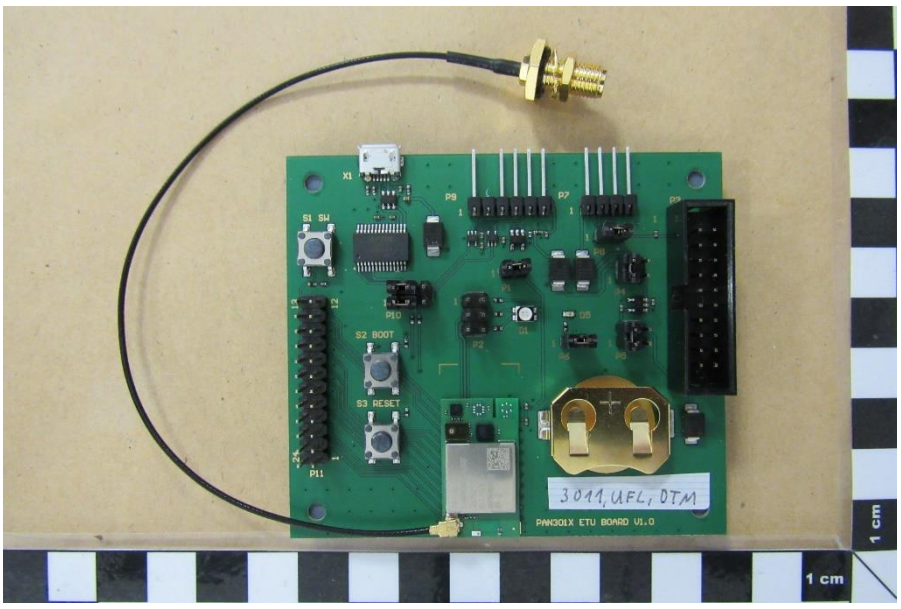
REPORT INDEX

1 Equipment (Test Item) Under Test

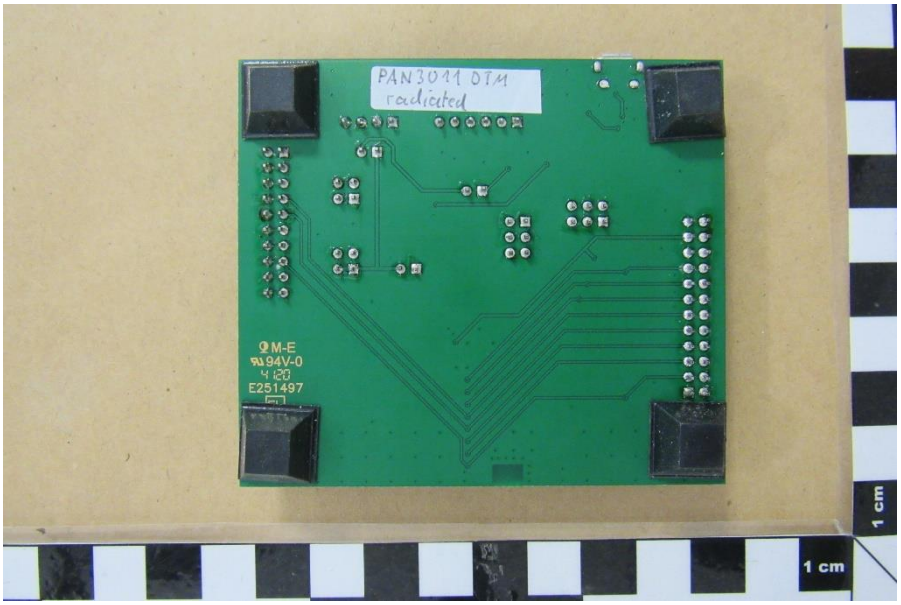
Description	Bluetooth Low Energy Module		
Model	ENW89855A1KF		
Additional Model(s)	None		
Brand Name(s)	PAN3011		
Serial Number(s)	None None	Radiated Test Sample ID 32825 Conducted Test Sample ID 32830	
Hardware Version(s)	01		
Software Version(s)	Stack 2.1c		
PMN	PAN3011, PAN3012, PAN3013		
HVIN	ENW89855A1KF, ENW89855A2KF, ENW89855A3KF		
FVIN	Stack 2.1c		
HMN	n/a		
FCC ID	T7V301X		
IC	216Q-301X		
Equipment type	Radio Module		
Radio type	Transceiver		
Assigned frequency bands	2400.0 MHz - 2483.5 MHz		
Radio technology	Bluetooth LE 4.2		
Bluetooth Specification	LE 1M PHY		Yes
	LE 2M PHY		No
	LE Coded PHY S=2 (500 kbit)		No
	LE Coded PHY S=8 (125 kbit)		No
	Stable Modulation Index - Transmitter		No
	Stable Modulation Index - Receiver		No
Modulation	GFSK		
Number of antenna ports	1		
Antenna	Type	Integrated, chip antenna	
	Model	ANT016008LCS2442MA1	
	Manufacturer	TDK	
	Gain	1.6 dBi (declared by customer)	
Supply Voltage	V_{NOM}	3.0 VDC (evaluation board powered by 5V USB)	
Operating Temperature	T_{NOM}	25 °C	
AC/DC-Adaptor	Model	None	
Manufacturer	Panasonic Industrial Devices Europe GmbH Zeppelinstr. 19 21337 Lüneburg GERMANY		

1.1 Photos – Equipment External

EUT Top View, Radiated Sample


EUT Top View, Conducted Sample


EUT Bottom View

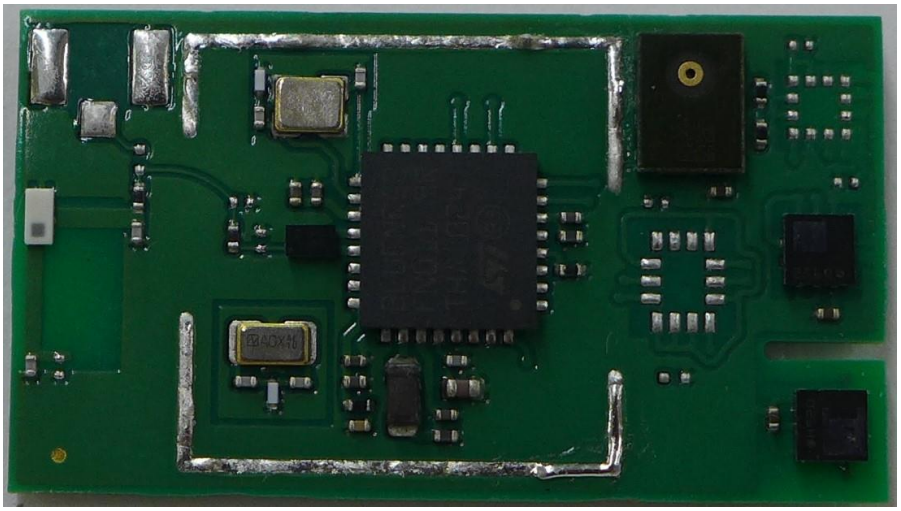


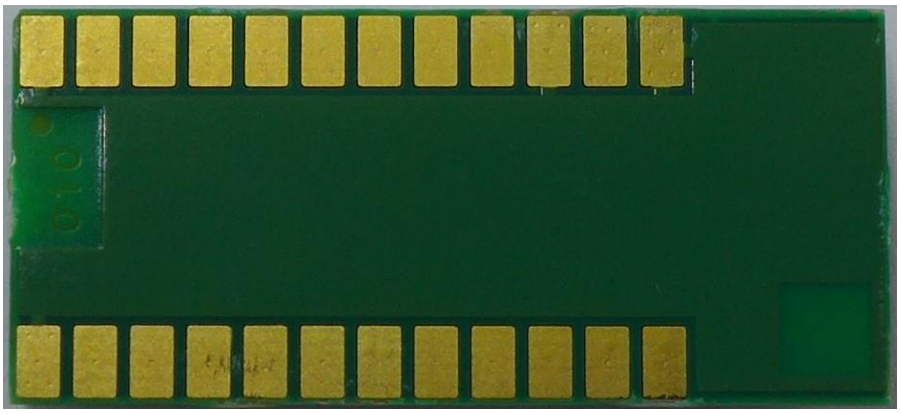
EUT BLE- Module

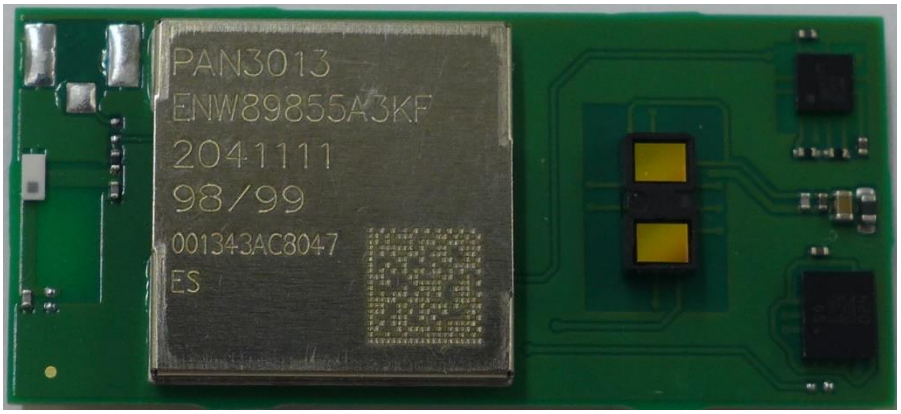
1.2 Photos – Equipment Internal

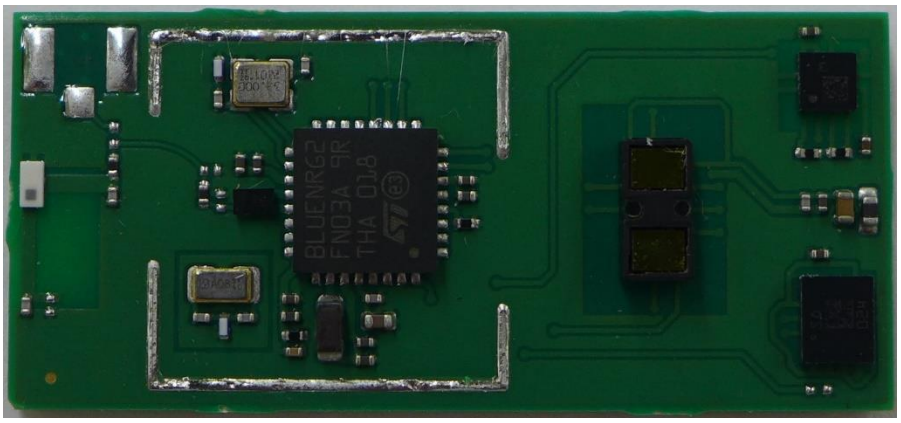
PAN3011_12_backside


PAN3011_12_external

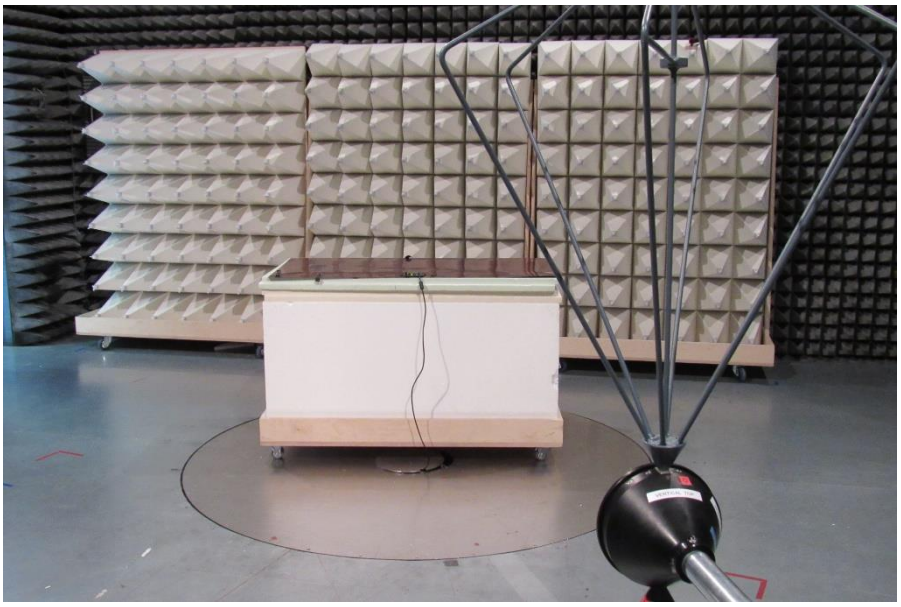

PAN3011_12_internal


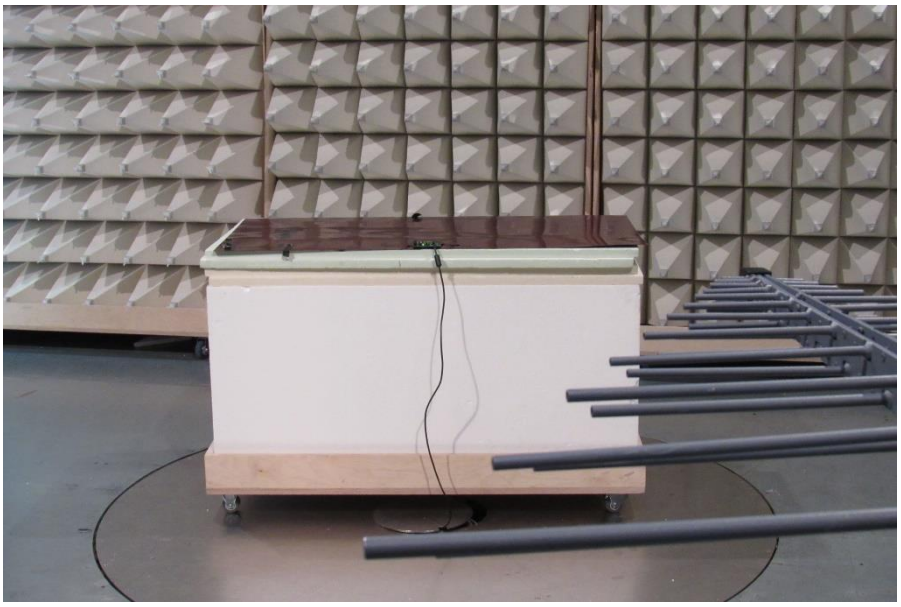
PAN3013_backside


PAN3013_external


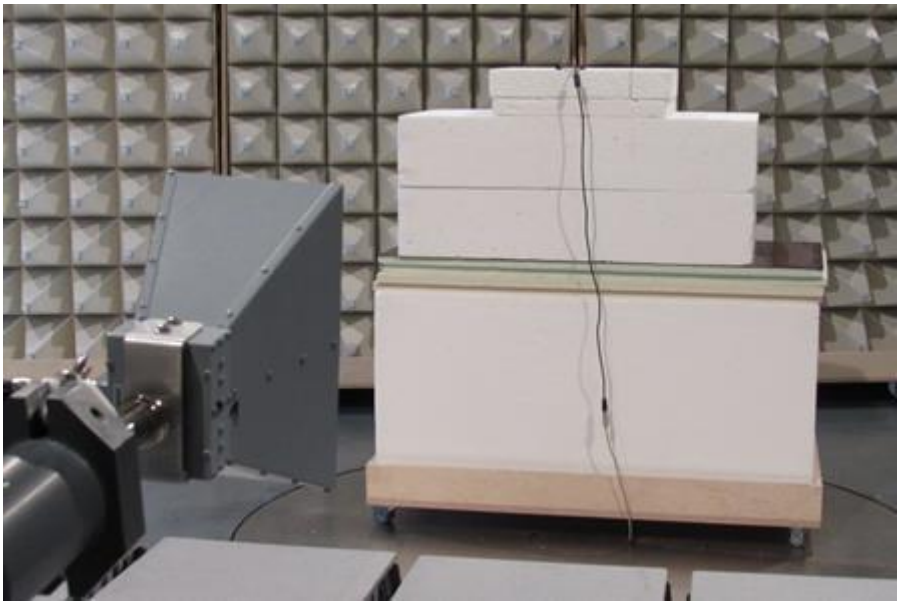
PAN3013_internal


1.3 Photos – Test Setup

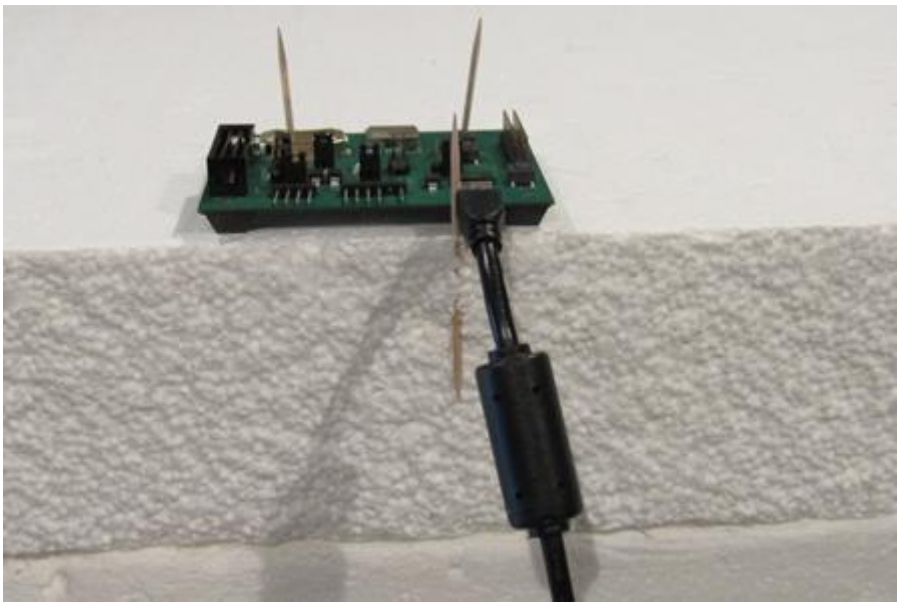
Radiated Setup A


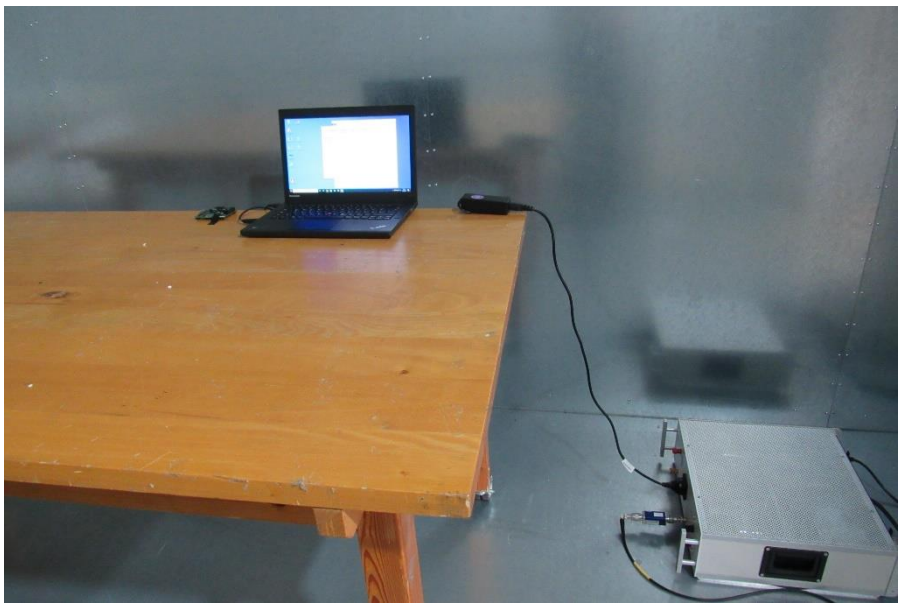
Radiated Setup B


Radiated Setup C



Radiated Setup Close Up View



Conducted Setup


1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
none				
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment:				

1.5 Test Modes

Mode	Description
GFSK	Mode = Transmit Modulation = GFSK Spreading = None Duty cycle = 64%
Receive	Mode = Receive
Comment:	

1.6 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx / Rx	0	2402
F2	Tx / Rx	19	2440
F3	Tx / Rx	39	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 6.7)	Occupied Bandwidth	ANSI C63.10-2013	N/R	Informational only
FCC § 15.247(a)(2) ISED RSS-247, Issue 2 (section 5.2)	6 dB Bandwidth	ANSI C63.10-2013	PASS	
FCC § 15.247(b) ISED RSS-247, Issue 2 (section 5.4)	Maximum peak conducted power	ANSI C63.10-2013	PASS	
FCC § 15.247(e) ISED RSS-247, Issue 2 (section 5.2)	Power spectral density	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

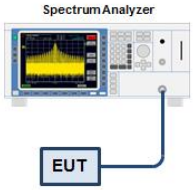
Test Information	
Reference	ISED RSS-Gen, Issue 5 (section 6.7)
Measurement Method	ANSI C63.10 6.9.3
Measurement Uncertainty	± 1.26 %
Test Sample ID	32830
Operator	Wilfried Treffke
Date	2021-03-17

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 Analyser	R&S	FSU 26	EF01709	2021-02	2022-02
Cable	Gigalane	SMS111B	EF00779	2020-12	2021-12

3.1.5 Procedure

Test Procedure

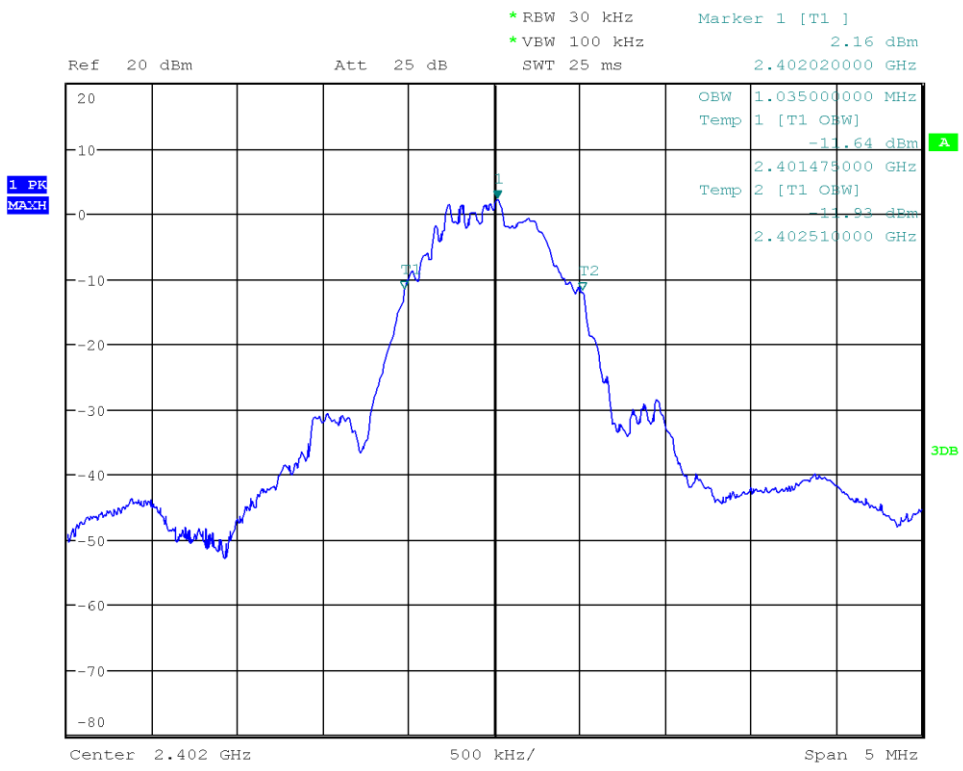
1. EUT transmitter is activated in test mode under normal conditions
2. The spectrum analyzer is set to peak detection and maximum hold with a span twice the emission spectrum
3. The resolution bandwidth is set to the range of 1 % to 5 % of the occupied bandwidth
4. The occupied bandwidth is measured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

3.1.6 Results

Test Results		
Mode	Frequency [MHz]	Bandwidth [MHz]
GFSK	2402	1.035
GFSK	2440	1.030
GFSK	2480	1.035

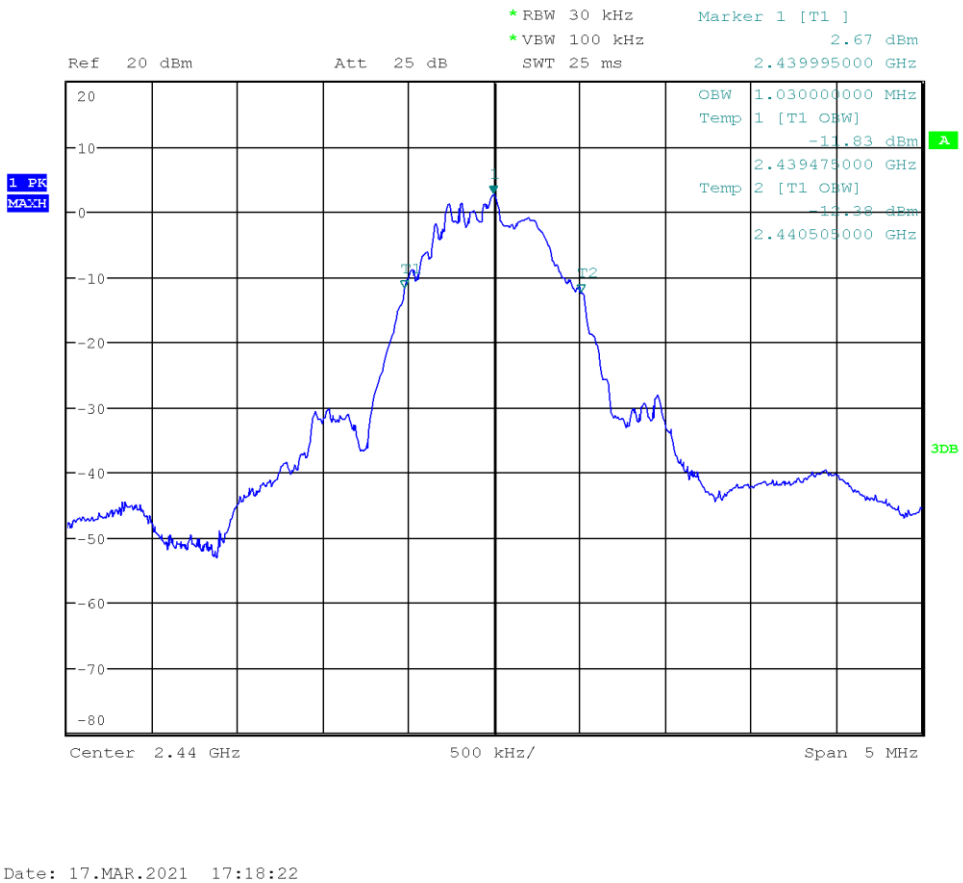
Occupied Bandwidth

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Occupied Bandwidth [MHz]:	1.035



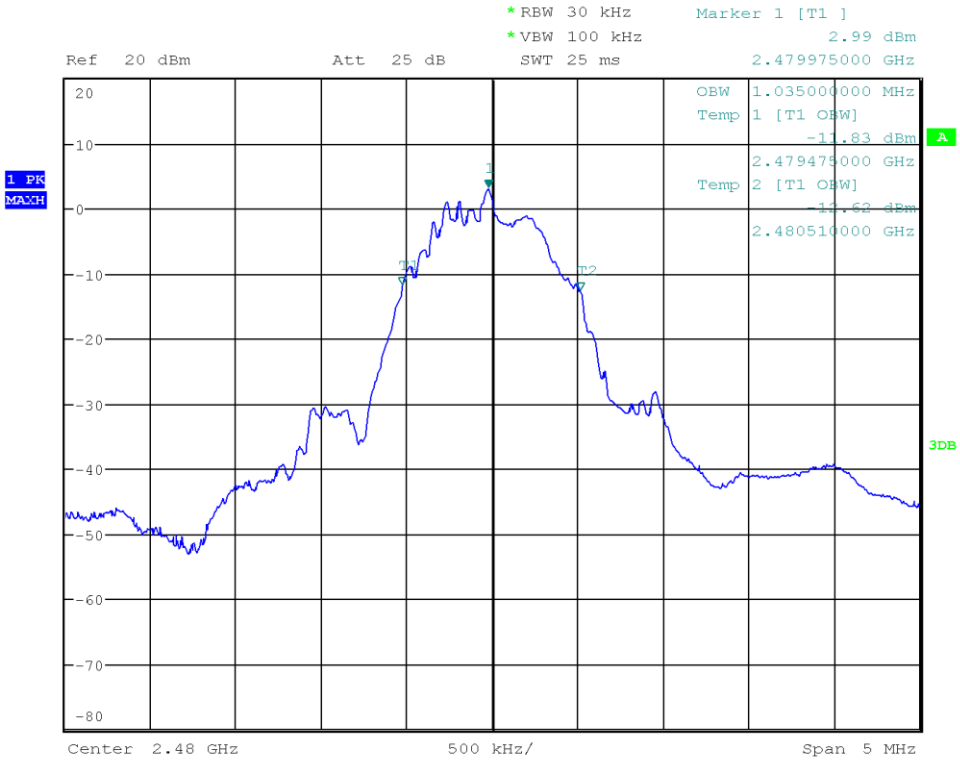
Occupied Bandwidth

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Occupied Bandwidth [MHz]:	1.030



Occupied Bandwidth

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Occupied Bandwidth [MHz]:	1.035



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3.2 Test Conditions and Results - 6 dB bandwidth

3.2.1 Information

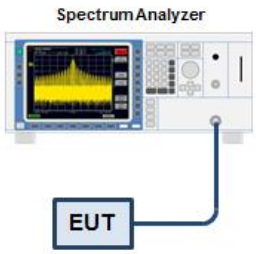
Test Information	
Reference	FCC § 15.247(a)(2); ISED RSS-247, Issue 2 (section 5.2)
Measurement Method	ANSI C63.10 11.8
Measurement Uncertainty	± 1.26 %
Operator	Wilfried Treffke
Date	2021-03-17

3.2.2 Limits

Limits
≥ 500kHz

3.2.3 Setup

Test Setup



3.2.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSU 26	EF01709	2021-02	2022-02
Cable	Gigalane	SMS111B	EF00779 CAAAZ	2020-12	2021-12

3.2.5 Procedure

Test Procedure

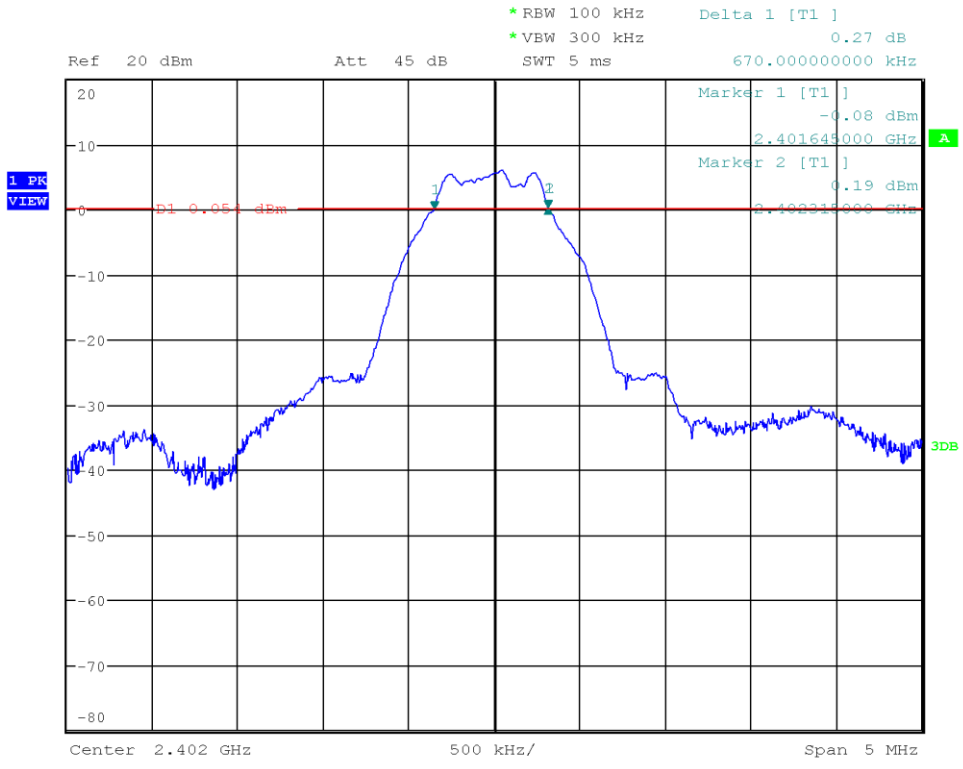
1. EUT set to test mode
2. Span set to at least twice the emission spectrum
3. Detector set to peak and max hold and RBW is set to 100 kHz
4. Envelope peak value of emission spectrum is selected
5. Marker on envelope of spectrum is set to level of -6 dB to the left of the peak
6. Marker on envelope of spectrum is set to level of -6 dB to the right of the peak
7. 6 dB Bandwidth is determined by marker frequency separation

3.2.6 Results

Test Results				
Mode	Frequency [MHz]	Bandwidth [kHz]	Limit [kHz]	Verdict
GFSK	2402	670	500	PASS
GFSK	2440	665	500	PASS
GFSK	2480	670	500	PASS

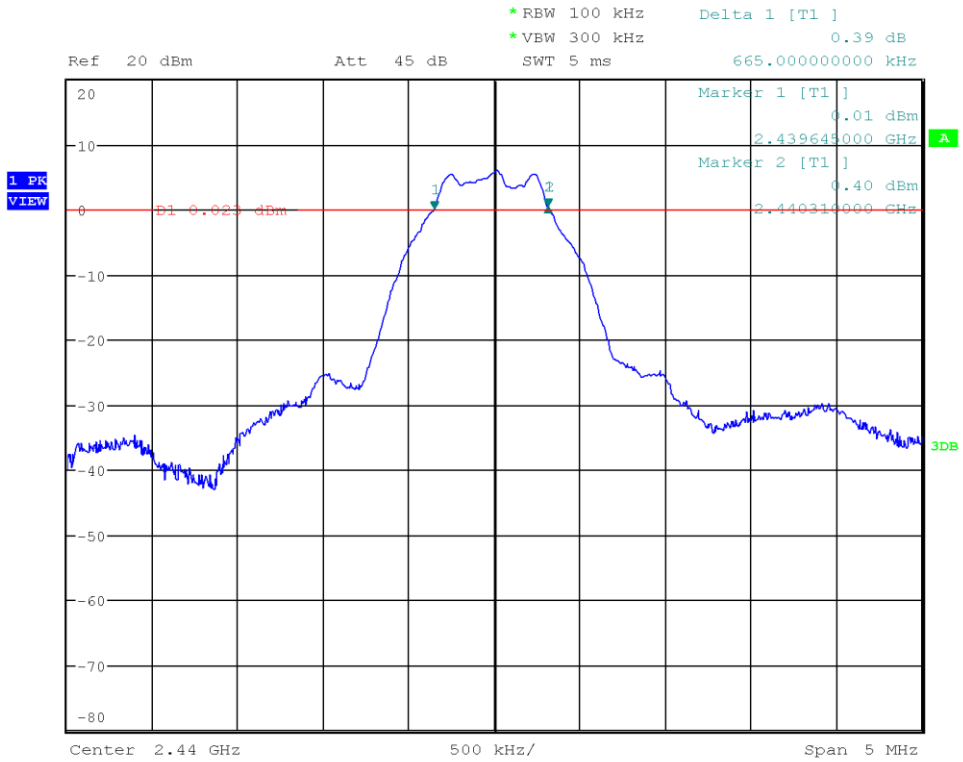
DTS (6 dB) Bandwidth

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Lower Frequency [MHz]:	2401.645
Upper Frequency [MHz]:	2402.315
6 dB Bandwidth [kHz]:	670



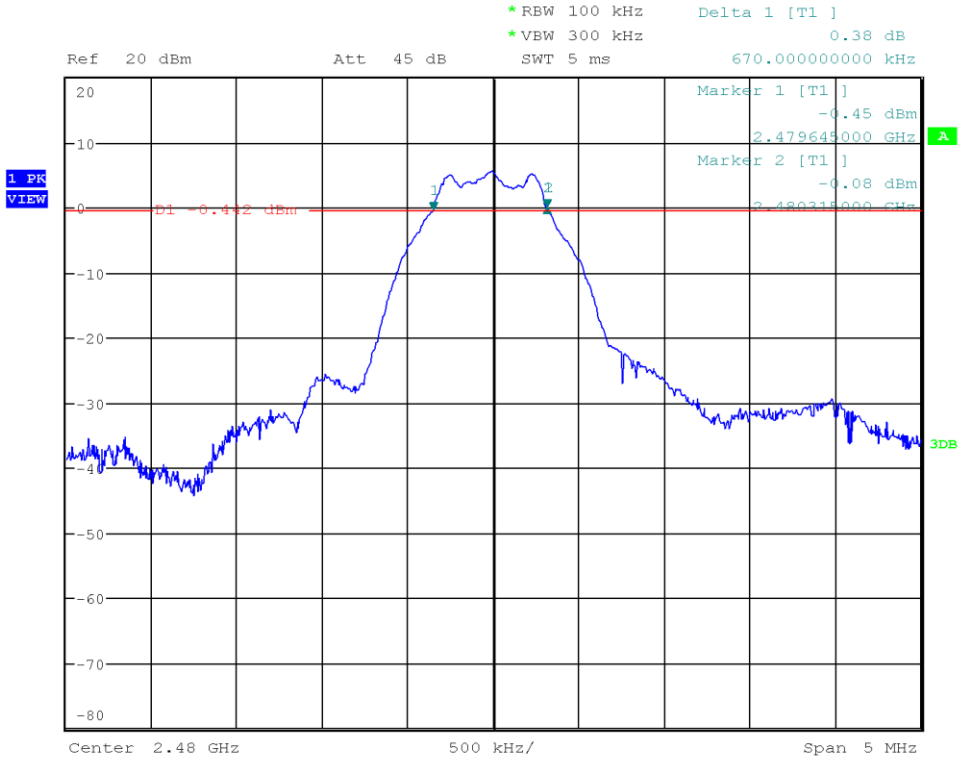
DTS (6 dB) Bandwidth

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Lower Frequency [MHz]:	2439.645
Upper Frequency [MHz]:	2440.310
6 dB Bandwidth [kHz]:	665



DTS (6 dB) Bandwidth

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Lower Frequency [MHz]:	2479.645
Upper Frequency [MHz]:	2480.315
6 dB Bandwidth [kHz]:	670



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3.3 Test Conditions and Results - Maximum peak conducted output power

3.3.1 Information

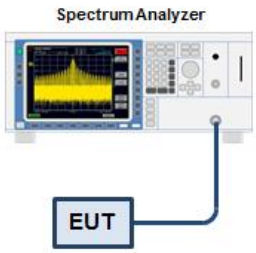
Test Information	
Reference	FCC § 15.247(b); ISED RSS-247, Issue 2 (section 5.4)
Measurement Method	ANSI C63.10 11.9.1
Measurement Uncertainty	± 2.86 dB
Operator	Wilfried Treffke
Date	2021-03-17

3.3.2 Limits

Limits
1 W (30 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.

3.3.3 Setup

Test Setup



3.3.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSU 26	EF01709	2021-02	2022-02
Cable	Gigalane	SMS111B	EF00779 CAAAZ	2020-12	2021-12

3.3.5 Procedure

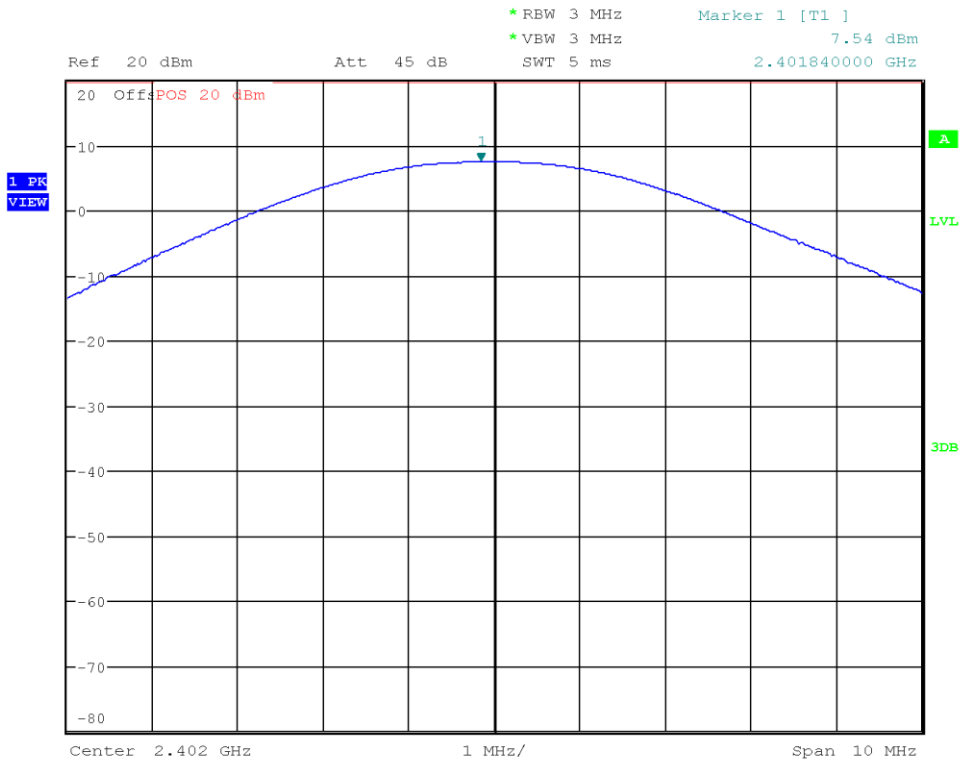
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Analyzer resolution bandwidth is set ≥ DTS bandwidth 3. Detector set to peak and max hold 4. Sweep time is set to auto 5. After the trace has stabilized a marker is set to peak of envelope

3.3.6 Results

Test Results				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2402	7.539	0.0057	1.0	PASS
2440	7.379	0.0055	1.0	PASS
2480	7.047	0.0051	1.0	PASS

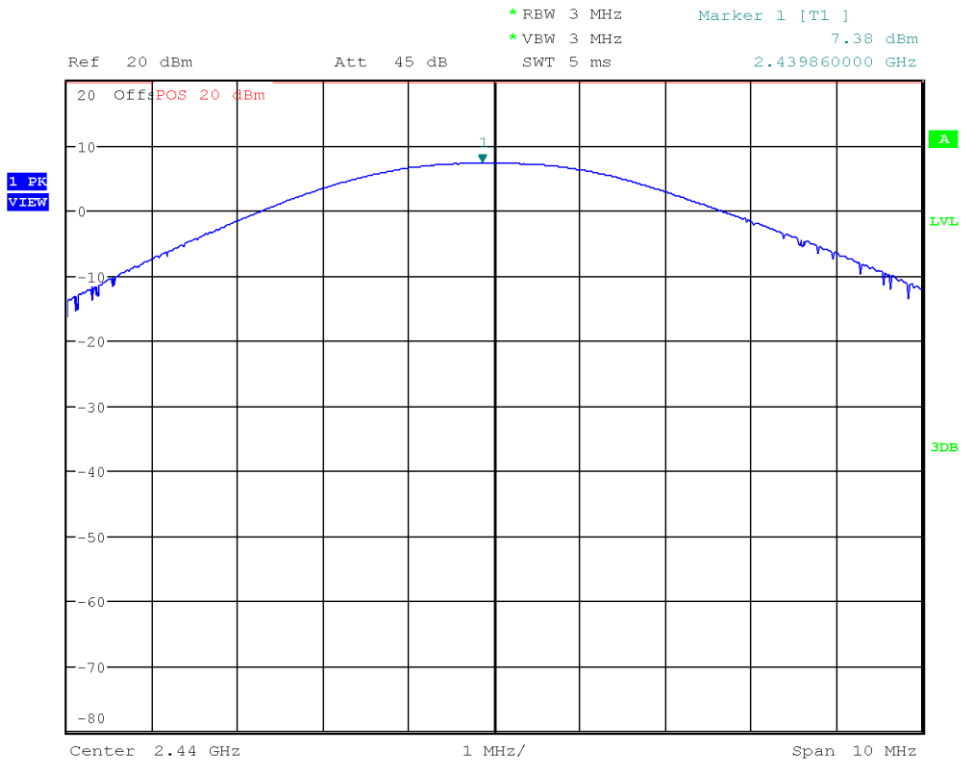
Peak Conducted Output Power

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.9.1.1
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Peak Power [dBm]:	7.539
Peak Power [W]:	0.0057



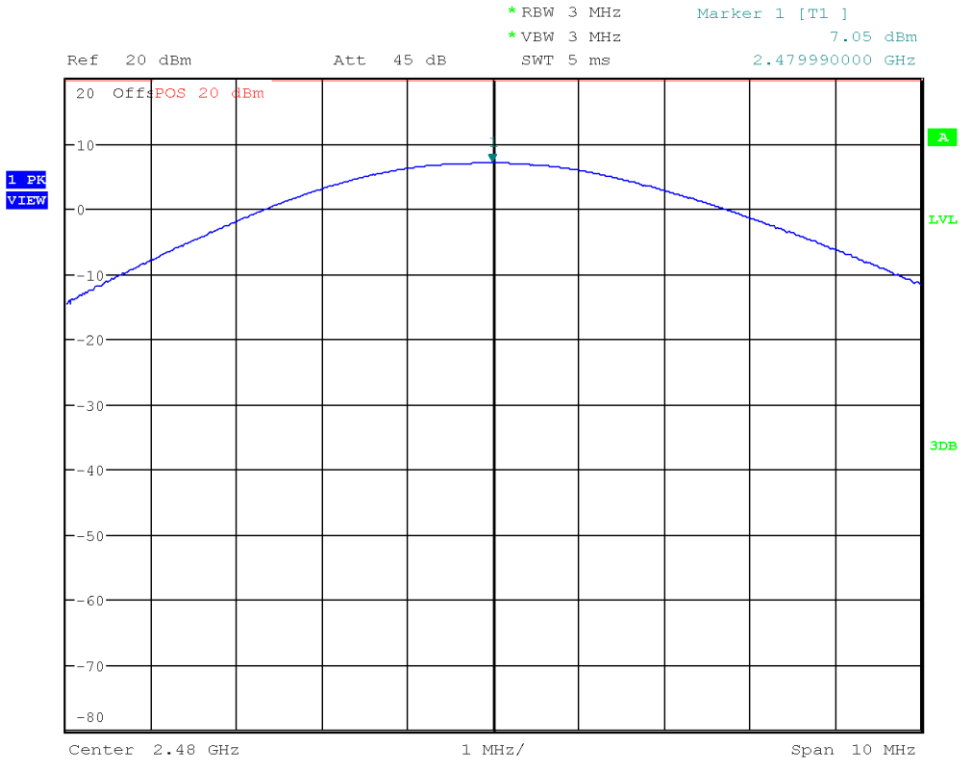
Peak Conducted Output Power

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.9.1.1
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Peak Power [dBm]:	7.379
Peak Power [W]:	0.0055



Peak Conducted Output Power

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.9.1.1
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Peak Power [dBm]:	7.047
Peak Power [W]:	0.0051



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3.4 Test Conditions and Results - Power spectral density

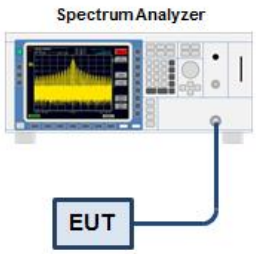
3.4.1 Information

Test Information	
Reference	FCC § 15.247(e); ISED RSS-247, Issue 2 (section 5.2)
Measurement Method	ANSI C63.10 11.10.2, 14.3.2
Measurement Uncertainty	± 2.86 dB
Operator	Wilfried Treffke
Date	2021-03-17

3.4.2 Limits

Limits
8 dBm / 3 kHz

3.4.3 Setup

Test Setup


3.4.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSU 26	EF01709	2021-02	2022-02
Cable	Gigalane	SMS111B	EF00779 CAAAZ	2020-12	2021-12

3.4.5 Procedure

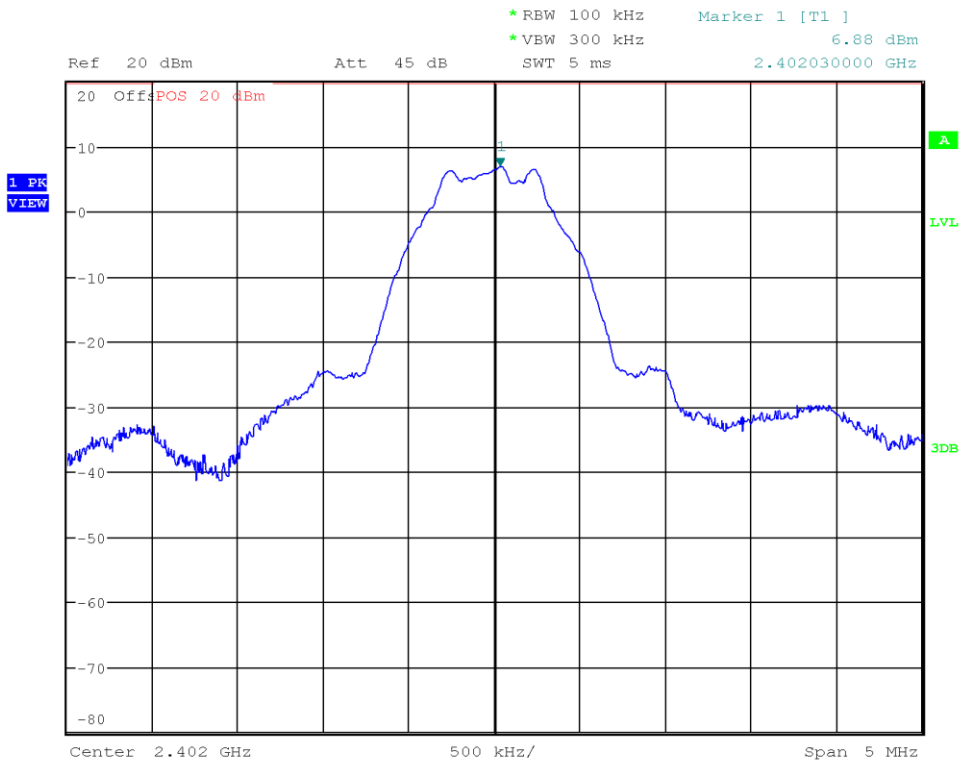
Test Procedure
1. EUT set to test mode 2. The analyzer is set to DTS channel center frequency with a span of 1.5 times the DTS bandwidth 3. The RBW is set to 100 kHz with VBW ≥ RBW and the detector is set to peak with max hold 4. After the trace has stabilized a marker is set to the envelope maximum 5. If the power spectral density is above the limit the RBW is reduced (not lower than 3 kHz) and the measurement is repeated 6. If the EUT has more than one transmit chain the procedure is repeated for each transmit chain

3.4.6 Results

Test Results			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2402	6.884	8.0	PASS
2440	6.780	8.0	PASS
2480	6.385	8.0	PASS
RBW = 100 kHz			

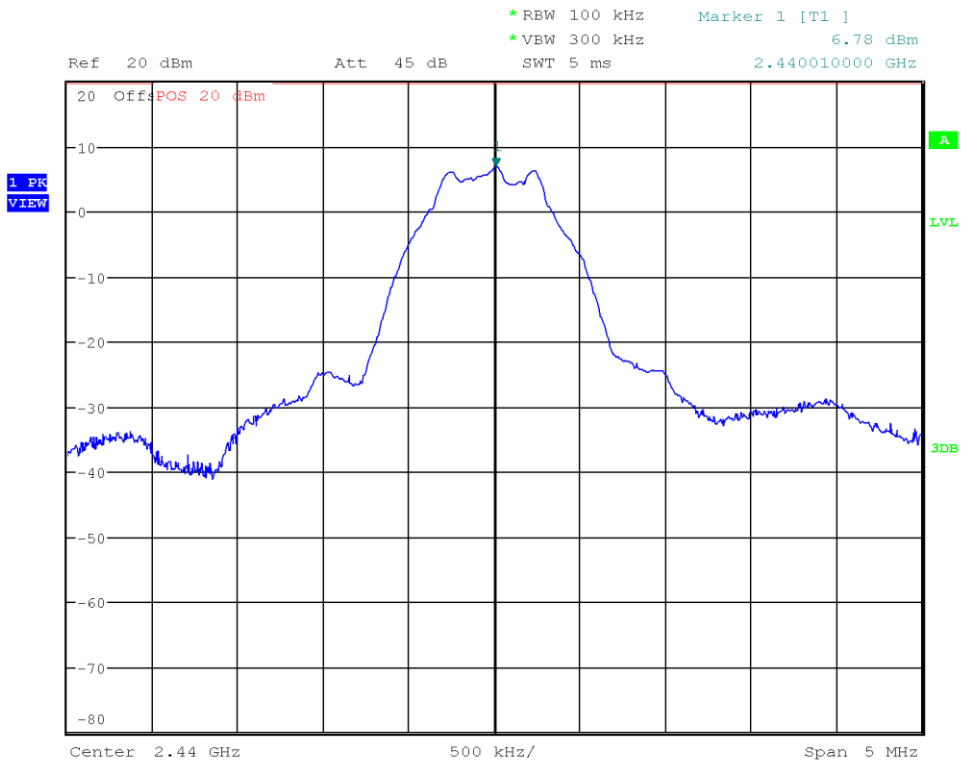
Peak Power Spectral Density

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Peak Frequency [MHz]:	2402.030
Spectral Density [dBm/RBW]:	6.884
Resolution Bandwidth [kHz]:	100 kHz



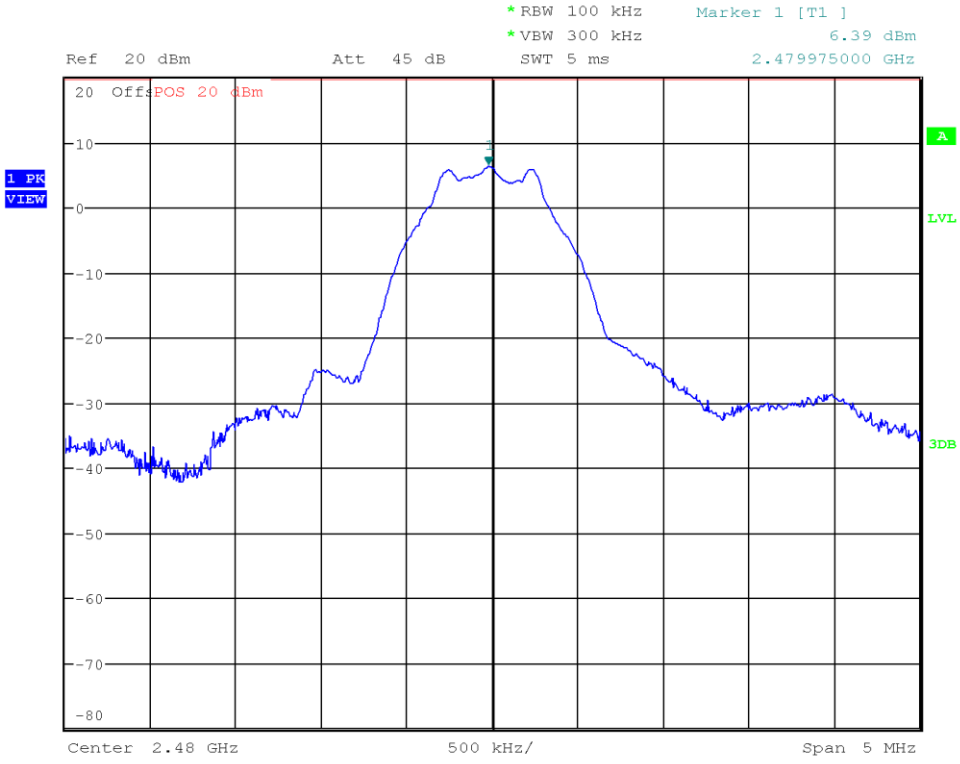
Peak Power Spectral Density

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Peak Frequency [MHz]:	2440.010
Spectral Density [dBm/RBW]:	6.780
Resolution Bandwidth [kHz]:	100 kHz



Peak Power Spectral Density

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Peak Frequency [MHz]:	2479.975
Spectral Density [dBm/RBW]:	6.385
Resolution Bandwidth [kHz]:	100 kHz



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3.5 Test Conditions and Results - AC powerline conducted emissions

3.5.1 Information

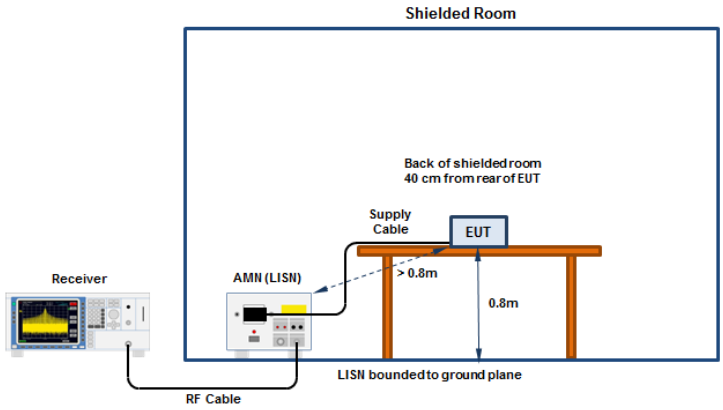
Test Information	
Reference	FCC § 15.207; ISED RSS-247, Issue 2 (section 3.1)
Measurement Method	ANSI C63.10 6.2
Measurement Uncertainty	± 3.82 dB
Operator	Wilfried Treffke
Date	2021-03-13

3.5.2 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		

3.5.3 Setup

Test Setup



3.5.4 Equipment

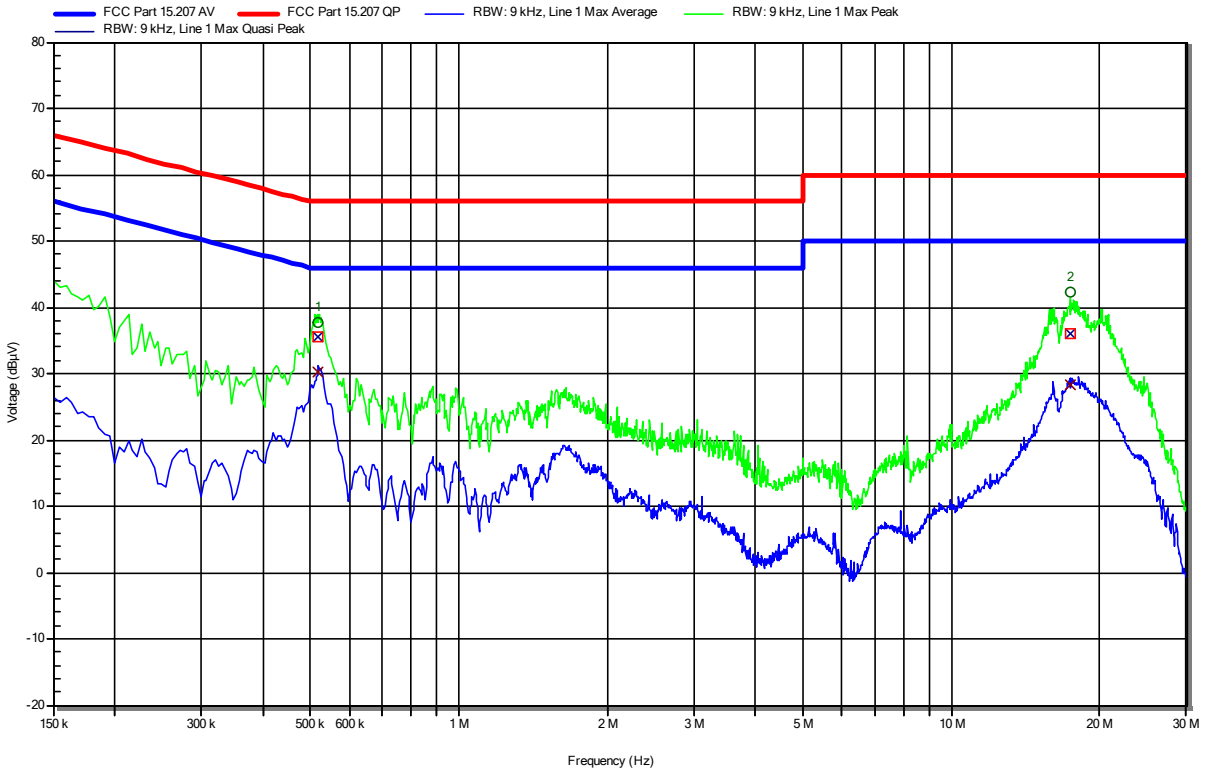
Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2020.1.8

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	R&S	ESR7	EF00943	2020-07	2021-07
Pulse Limiter	R&S	ESH3-Z2	EF01222	2020-07	2021-07
LISN	Schwarzbeck	NSLK 8127 RC	EF01592	2020-07	2021-07

Conducted emissions at the mains power port
according to FCC part 15 C

Project Number:	G0M-2009-9272
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Date:	2021-03-17
Operating Conditions:	ambient temperature: 23.4 °Celsius power input: 120 VAC
LISN:	Schwarzbeck NSLK 8127 RC L
Operational Mode & EUT Configuration:	BLE; GFSK; 2440 MHz
Applied to Port:	AC Mains

Index 74
RadiMation

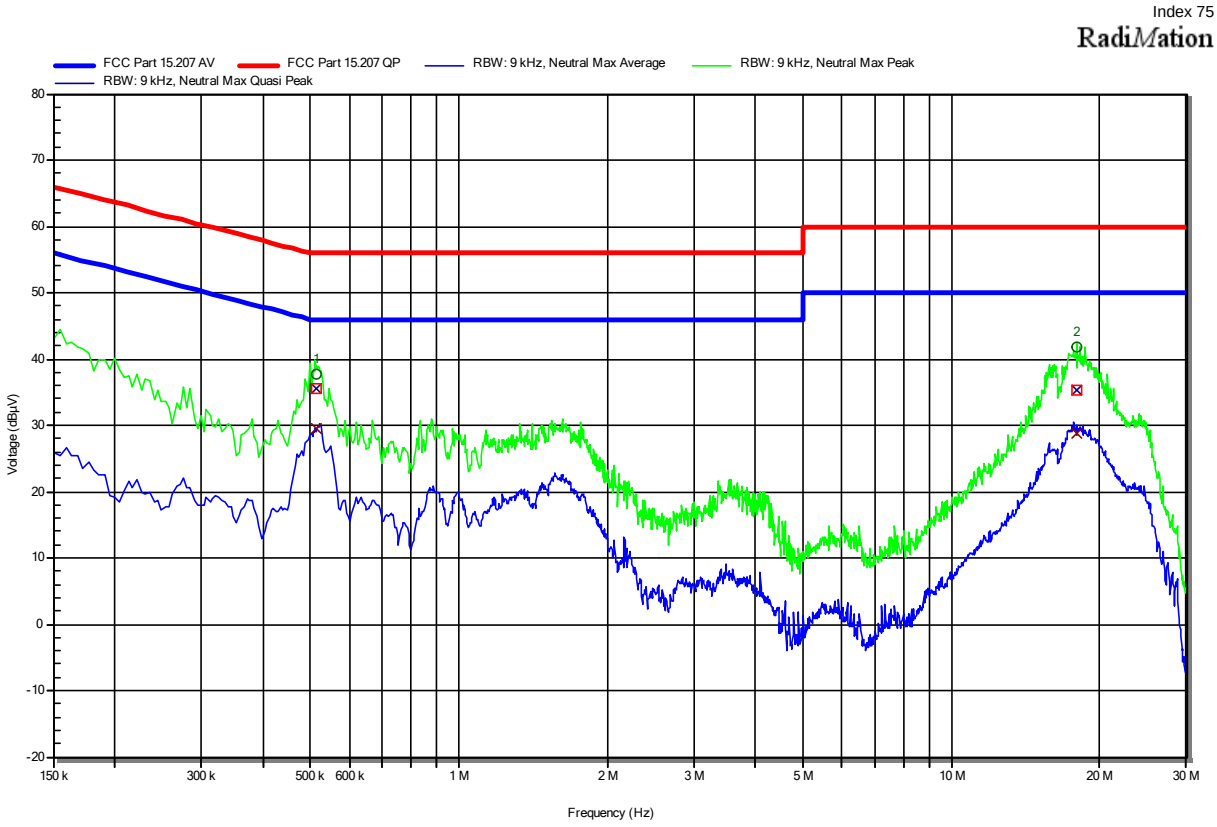


Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	519 kHz	35.62 dBµV	56 dBµV	-20.38 dB	Pass	Line 1
2	17.448 MHz	36.07 dBµV	60 dBµV	-23.93 dB	Pass	Line 1

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	519 kHz	30.16 dBµV	46 dBµV	-15.84 dB	Pass	Line 1
2	17.448 MHz	28.41 dBµV	50 dBµV	-21.59 dB	Pass	Line 1

Conducted emissions at the mains power port
according to FCC part 15 C

Project Number:	G0M-2009-9272
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Date:	2021-03-17
Operating Conditions:	ambient temperature: 23.4 °Celsius power input: 120 VAC
LISN:	Schwarzbeck NSLK 8127 RC N
Operational Mode & EUT Configuration:	BLE; GFSK; 2440 MHz
Applied to Port:	AC Mains



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	514.5 kHz	35.53 dBµV	56 dBµV	-20.47 dB	Pass	Neutral
2	17.957 MHz	35.23 dBµV	60 dBµV	-24.77 dB	Pass	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	514.5 kHz	29.42 dBµV	46 dBµV	-16.58 dB	Pass	Neutral
2	17.957 MHz	28.7 dBµV	50 dBµV	-21.3 dB	Pass	Neutral

3.6 Test Conditions and Results - Band-edge compliance

3.6.1 Information

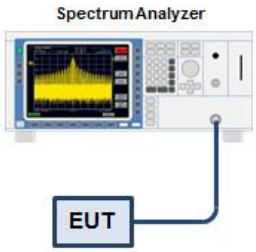
Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSU 26	EF01709	2021-02	2022-02

3.6.2 Limits

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

3.6.3 Setup

Test Setup



3.6.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSU 26	EF01709	2021-02	2022-02
Cable	Gigalane	SMS111B	EF00779 CAAAZ	2020-12	2021-12

3.6.5 Procedure

Test Procedure

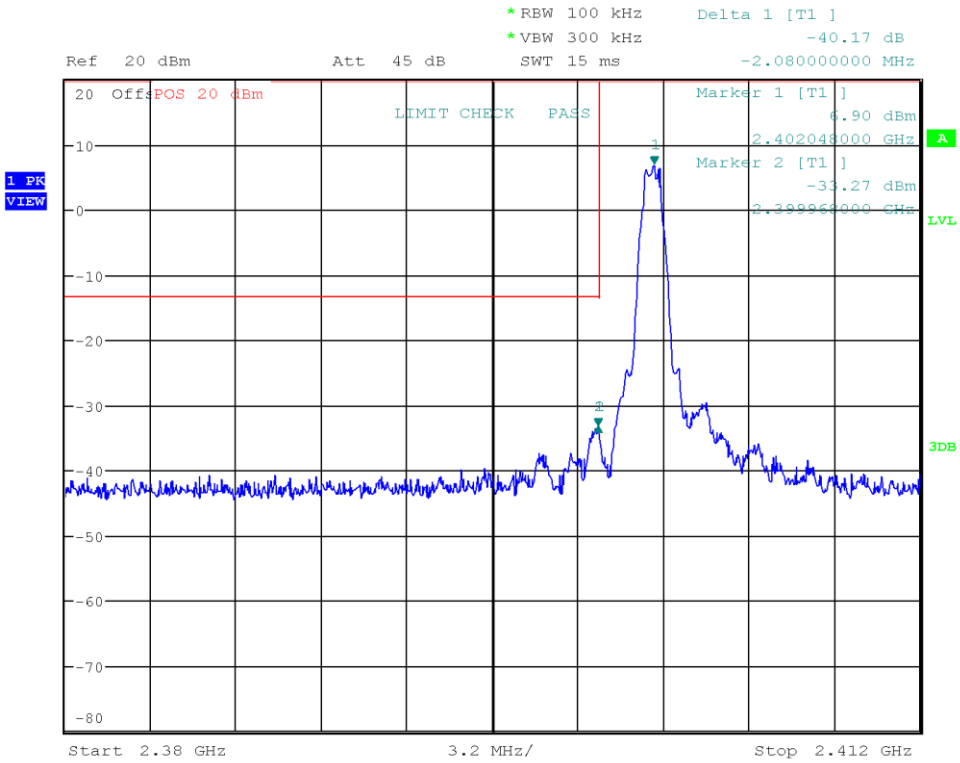
1. EUT set to test mode (Communication tester is used if needed)
2. Span set around lower band edge and detector is set to peak and max hold
3. Resolution bandwidth is set to 100 kHz
4. Markers are set to peak emission levels within frequency band and outside frequency band
5. Band edge attenuation is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

3.6.6 Results

Test Results				
Mode	Channel [MHz]	Out-of-band Attenuation [dB]	Limit [dB]	Verdict
GFSK	2402	-40.17	-20	PASS
GFSK	2480	-41.34	-20	PASS

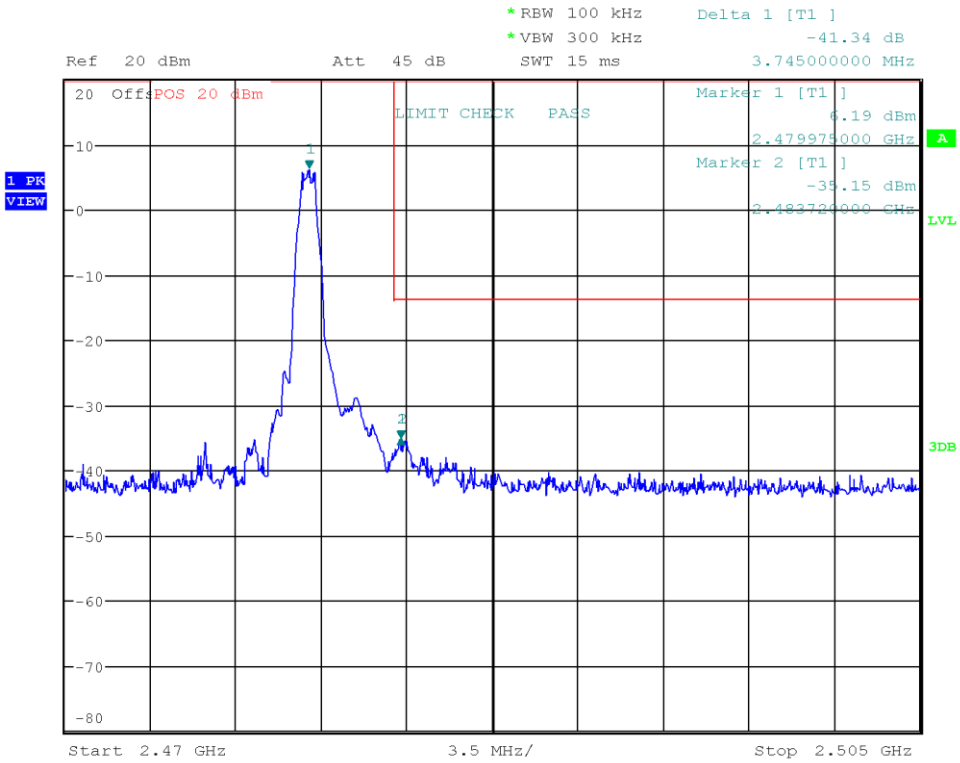
Emissions in nonrestricted frequency bands at the Band-edge

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Band-edge	Lower
In-band Frequency [MHz]:	2402.048
Max. in-band Level [dBm/100 kHz]:	6.899
Out-of-band Frequency [MHz]:	2399.968
Max. out-of-band Level [dBm/100 kHz]:	-33.271
Attenuation [dB]:	-40.17



Emissions in nonrestricted frequency bands at the Band-edge

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Band-edge	Upper
In-band Frequency [MHz]:	2479.975
Max. in-band Level [dBm/100 kHz]:	6.19
Out-of-band Frequency [MHz]:	2483.72
Max. out-of-band Level [dBm/100 kHz]:	-35.152
Attenuation [dB]:	-41.34



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3.7 Test Conditions and Results - Conducted spurious emissions

3.7.1 Information

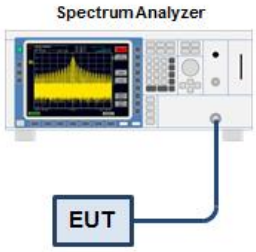
Test Information	
Reference	FCC § 15.247(d); ISED RSS-247, Issue 2 (section 5.5)
Measurement Uncertainty	± 4.25 dB
Measurement Method	ANSI C63.10 11.11
Operator	Wilfried Treffke
Date	2021-03-13

3.7.2 Limits

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

3.7.3 Setup

Test Setup



3.7.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSU 26	EF01709	2021-02	2022-02
Cable	Gigalane	SMS111B	EF00779 CAAAZ	2020-12	2021-12

3.7.5 Procedure

Test Procedure

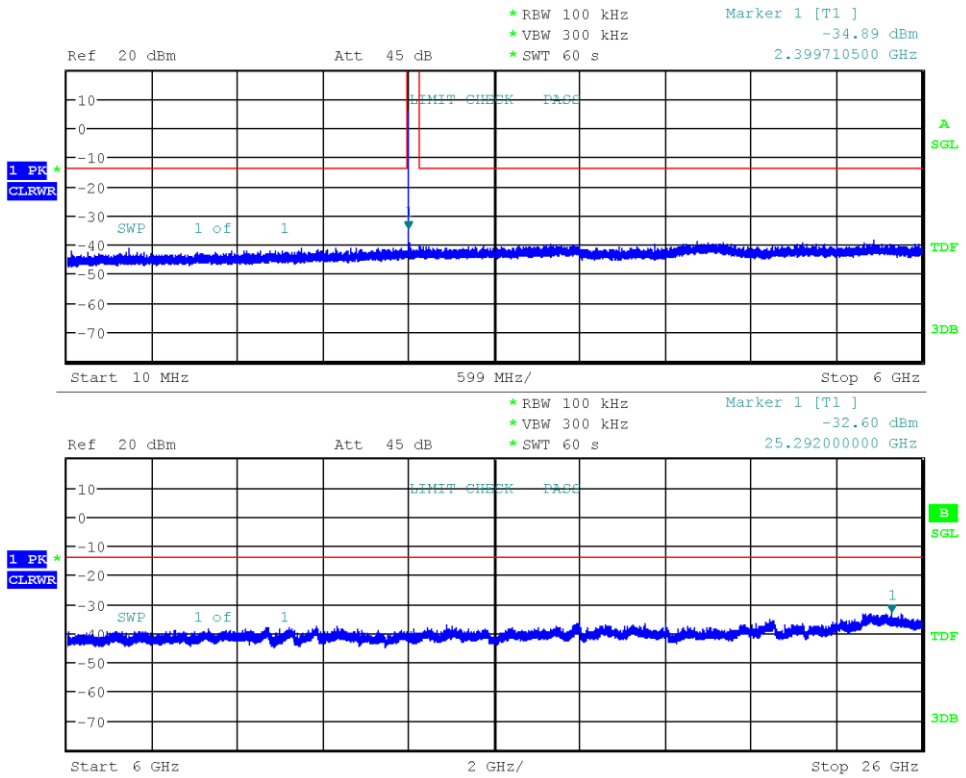
1. EUT set to test mode (Communication tester is used if needed)
2. Span set around lower band edge and detector is set to peak and max hold
3. Resolution bandwidth is set to 100 kHz
4. Markers are set to peak emission levels outside frequency band

3.7.6 Results

Test Results		
Mode	Channel [MHz]	Verdict
GFSK	2402	PASS
GFSK	2440	PASS
GFSK	2480	PASS

Conducted Spurious Emissions

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Max. in-band Frequency [MHz]:	2402.0
Max. in-band Level [dBm/100 kHz]:	6.4
Out-of-band Limit [dBm/100 kHz]:	-13.6



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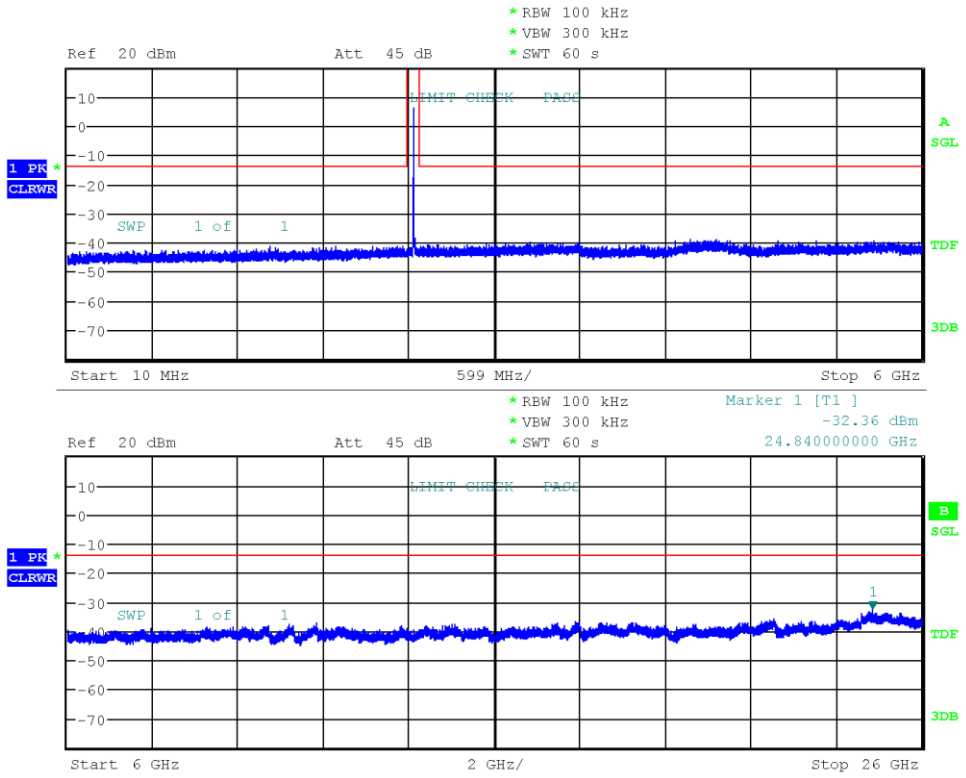
Conducted Spurious Emissions

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Max. in-band Frequency [MHz]:	2440.0
Max. in-band Level [dBm/100 kHz]:	6.4
Out-of-band Limit [dBm/100 kHz]:	-13.6



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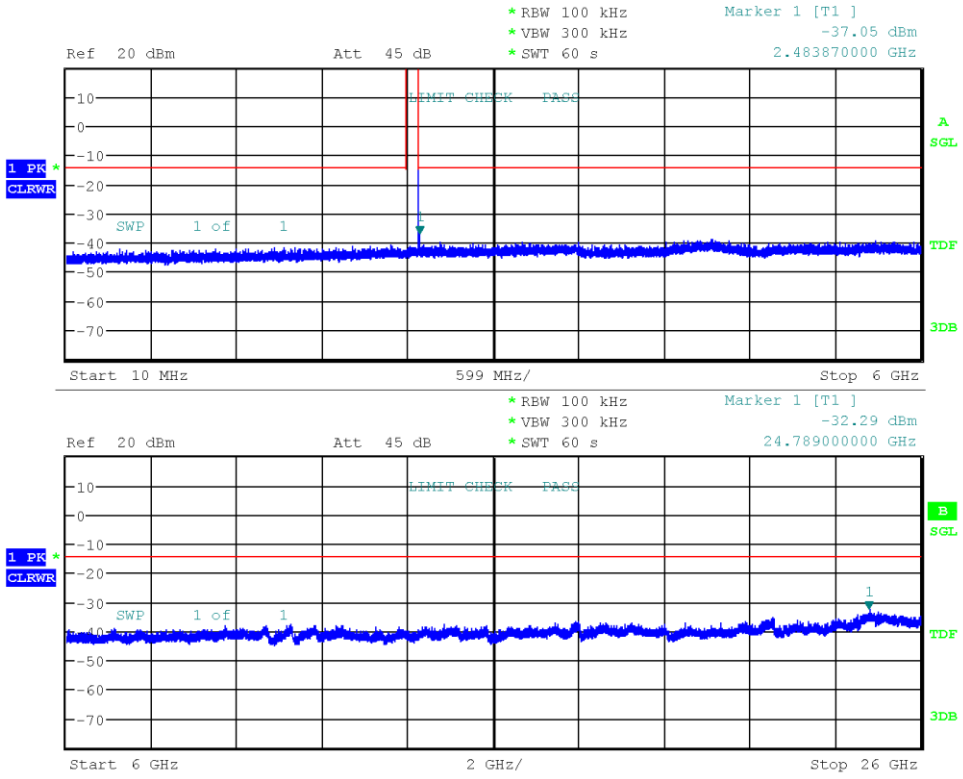
Conducted Spurious Emissions

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32830
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-03-17
Max. in-band Frequency [MHz]:	2480.0
Max. in-band Level [dBm/100 kHz]:	5.9
Out-of-band Limit [dBm/100 kHz]:	-14.1



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3.8 Test Conditions and Results - Transmitter radiated emissions

3.8.1 Information

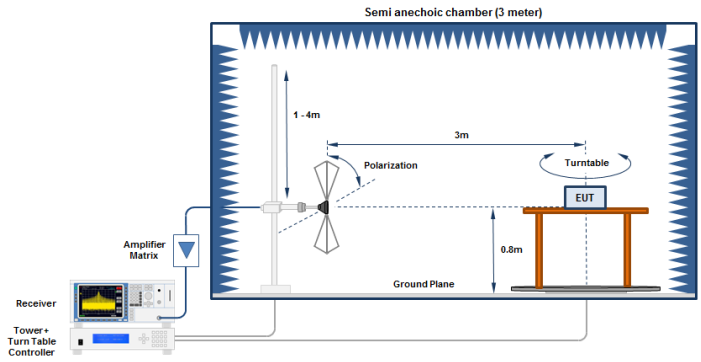
Test Information	
Reference	FCC § 15.247(d); FCC § 15.209; ISED RSS-Gen, Issue 5 (section 6.13)
Measurement Uncertainty	± 5.95 dB
Measurement Method	ANSI C63.10 6.4, 6.5, 6.6, 11.12
Operator	Wilfried Treffke
Date	2021-03-16

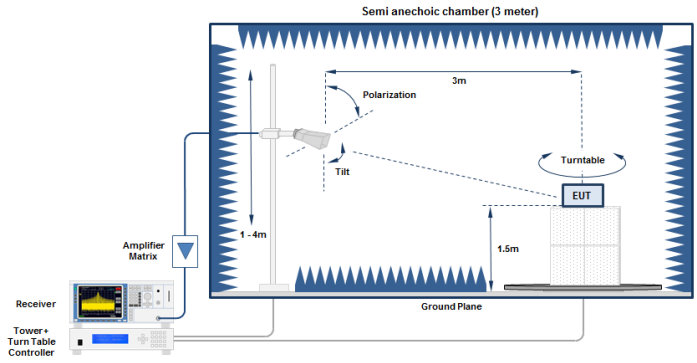
3.8.2 Limits

Limits			
Frequency range [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

3.8.3 Setup

Test Setup 30 MHz - 1000 MHz



Test Setup > 1 GHz


3.8.4 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2020.1.8

Test Equipment 30 MHz - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2021-02	2024-02
Measurement Receiver	R&S	ESU 26	EF00887	2020-07	2021-07
Antenna	R&S	HK 116	EF00030	2019-04	2022-04
Antenna	R&S	HL 223	EF00187	2019-05	2022-05

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2021-02	2024-02
Measurement Receiver	R&S	ESU 26	EF00887	2020-07	2021-07
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2019-10	2022-10
Antenna	Amplifier Research	AT4560	EF00302	2019-05	2021-05

3.8.5 Procedure

Test Procedure 30 MHz - 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

3.8.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
2402	2385.9	56.77	pk	hor	74.00	-17.23
2402	2389.4	44.24	pk	ver	74.00	-29.76
2402	2389.4	22.94	avg	ver	54.00	-31.06
2440	12199	53.55	pk	ver	74.00	-20.45
2440	12199	43.02	avg	ver	54.00	-10.98
2480	2483.8	73.41	pk	hor	74.00	-00.59
2480	2483.8	44.29	avg	hor	54.00	-09.71

3.9 Test Conditions and Results - Receiver radiated emissions

3.9.1 Information

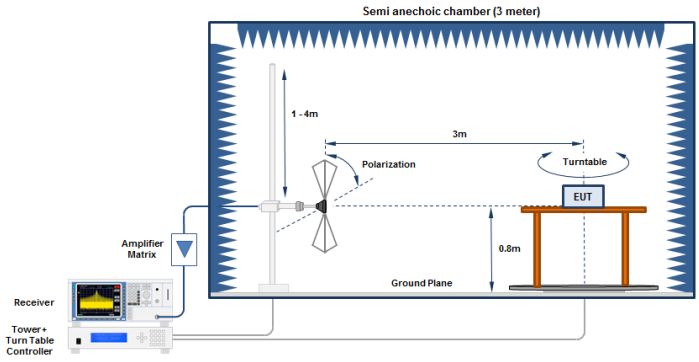
Test Information	
Reference	ISED RSS-247, Issue 2 (section 3.1)
Measurement Uncertainty	± 5.95 dB
Measurement Method	ANSI C63.10 6.5, 6.6, 11.12
Operator	Wilfried Treffke
Date	2021-03-17

3.9.2 Limits

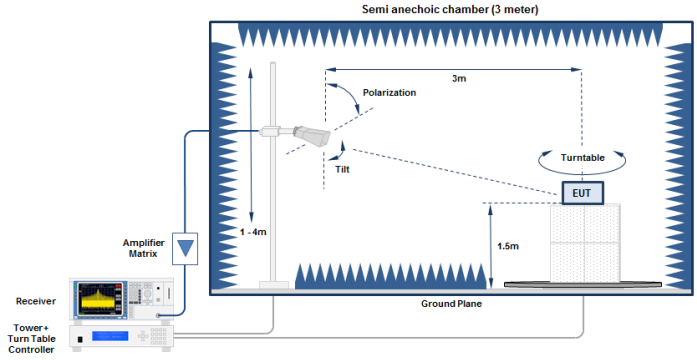
Limits			
Frequency range [MHz]	Detector	Field strength [µV/m]	Measurement distance [m]
30 - 88	Quasi-Peak	100	3
88 - 216	Quasi-Peak	150	3
216 - 960	Quasi-Peak	200	3
960 - 1000	Quasi-Peak	500	3
>1000	Average	500	3

3.9.3 Setup

Test Setup 30 MHz - 1000 MHz



Test Setup > 1 GHz



3.9.4 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2020.1.8

Test Equipment 30 MHz - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2021-02	2024-02
Measurement Receiver	R&S	ESU 26	EF00887	2020-07	2021-07
Antenna	R&S	HK 116	EF00030	2019-04	2022-04
Antenna	R&S	HL 223	EF00187	2019-05	2022-05

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2021-02	2024-02
Measurement Receiver	R&S	ESU 26	EF00887	2020-07	2021-07
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2019-10	2022-10
Antenna	Amplifier Research	AT4560	EF00302	2019-05	2021-05

3.9.5 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

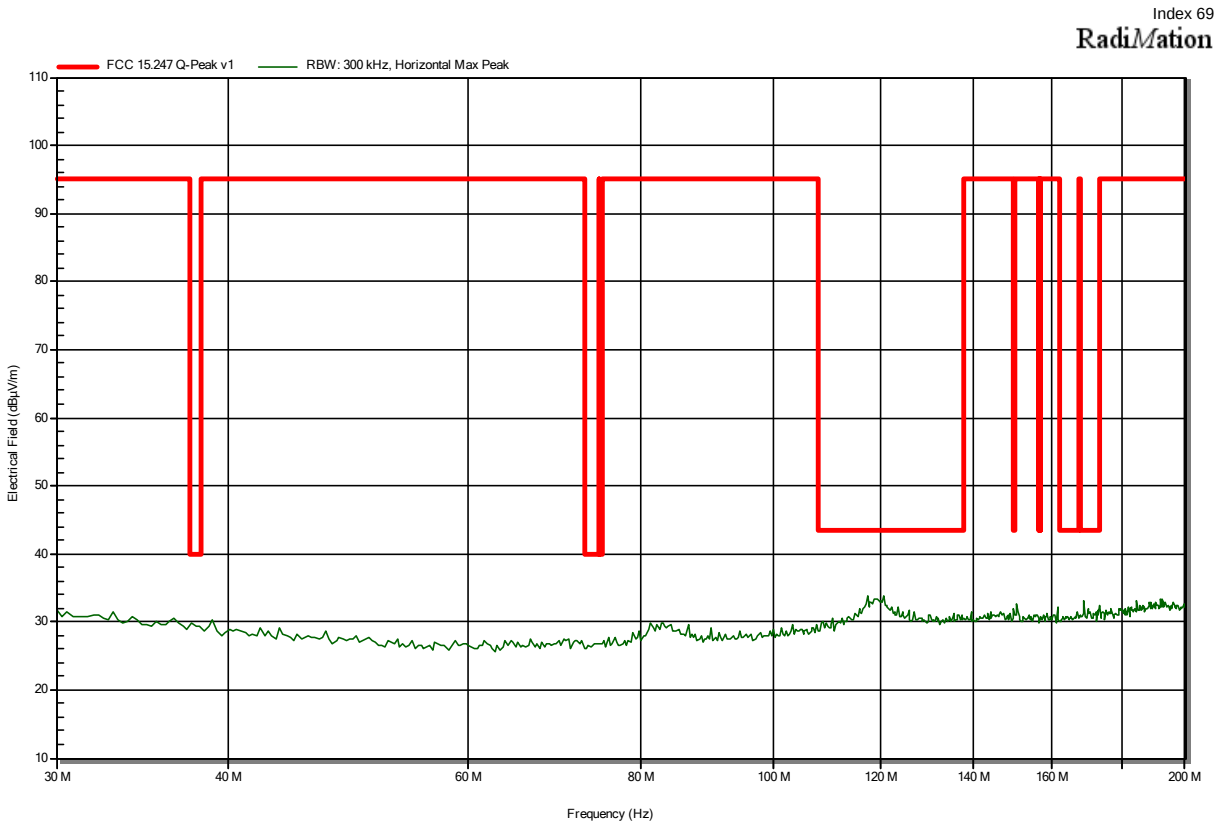
3.9.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
2440	912.821	34.67	pk	hor	46.00	-11.33
2440	912.821	33.86	pk	ver	46.00	-12.14

ANNEX A Transmitter spurious emissions

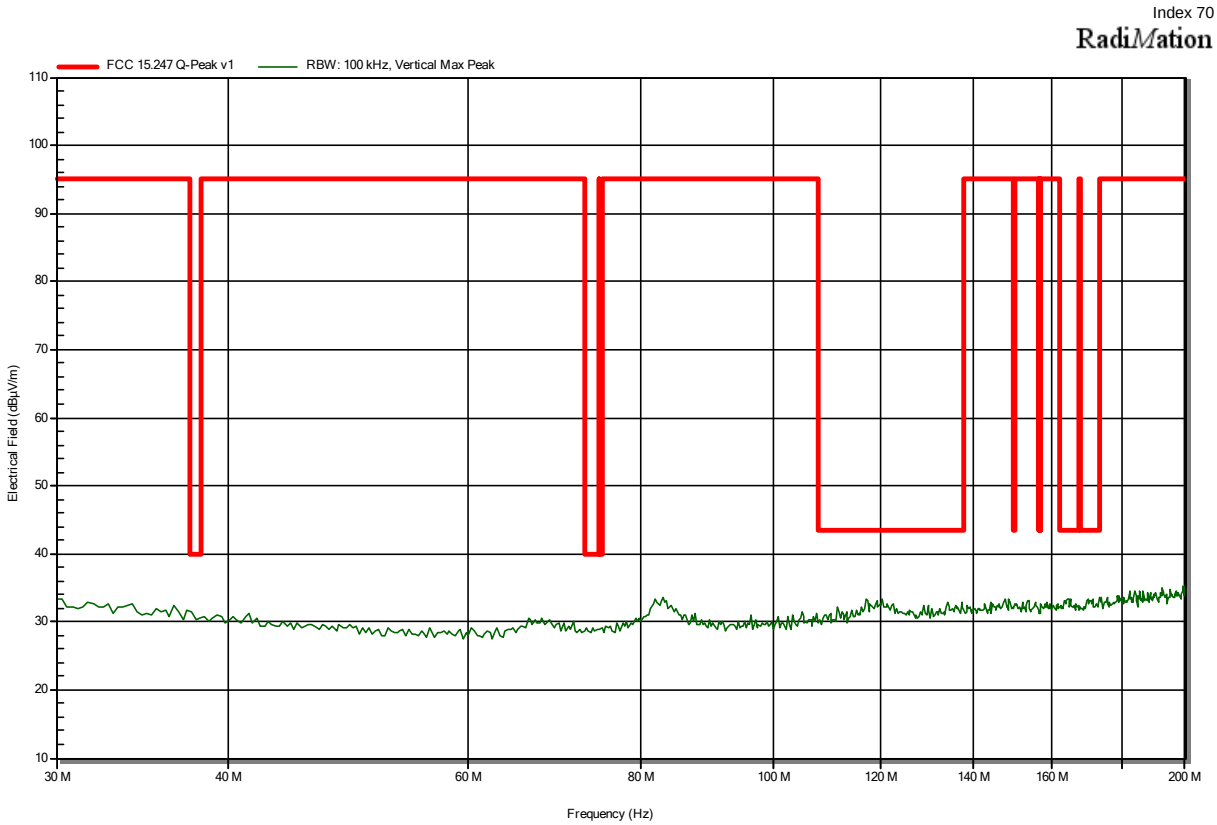
Radiated Spurious Emissions according to FCC CFR Part 15.247

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2402 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



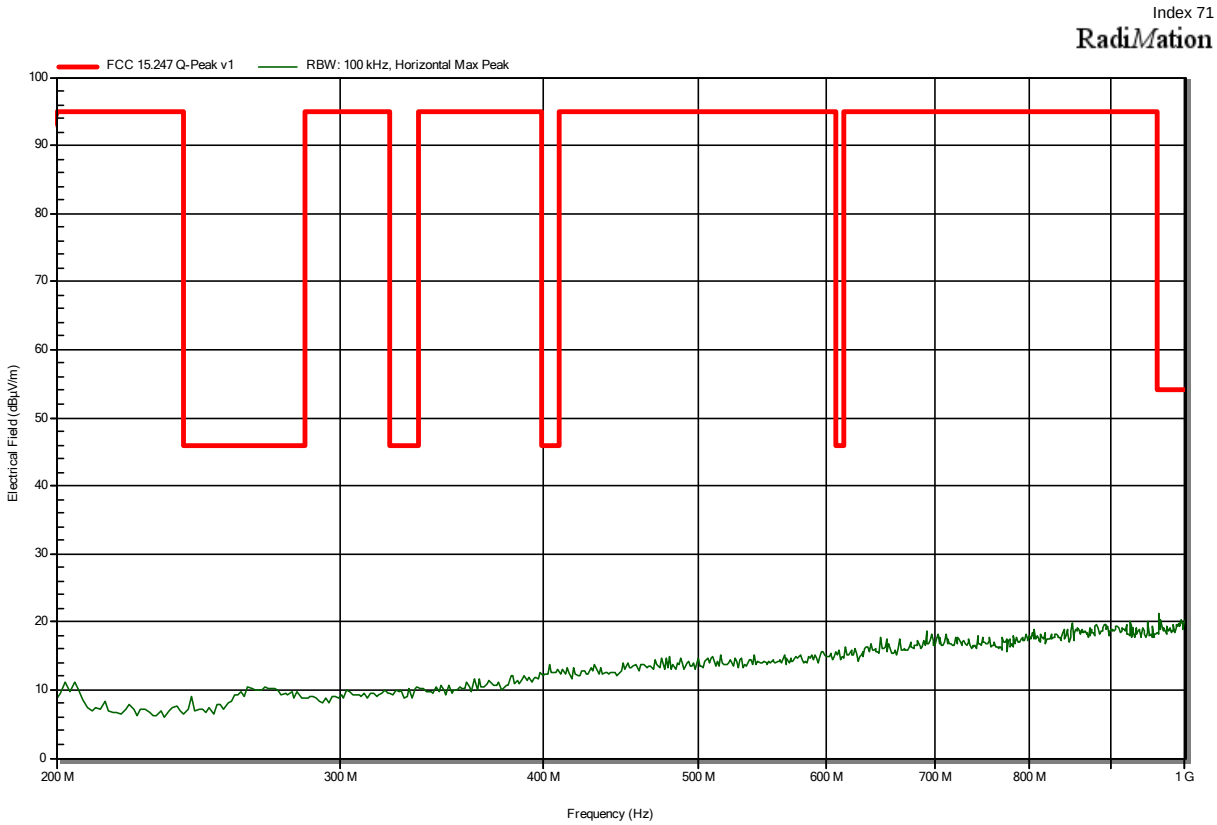
Radiated Spurious Emissions according to FCC CFR Part 15.247

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2402 MHz
Test Date:	2021-03-16
Note:	3.3 V Battery, EUT horizontal



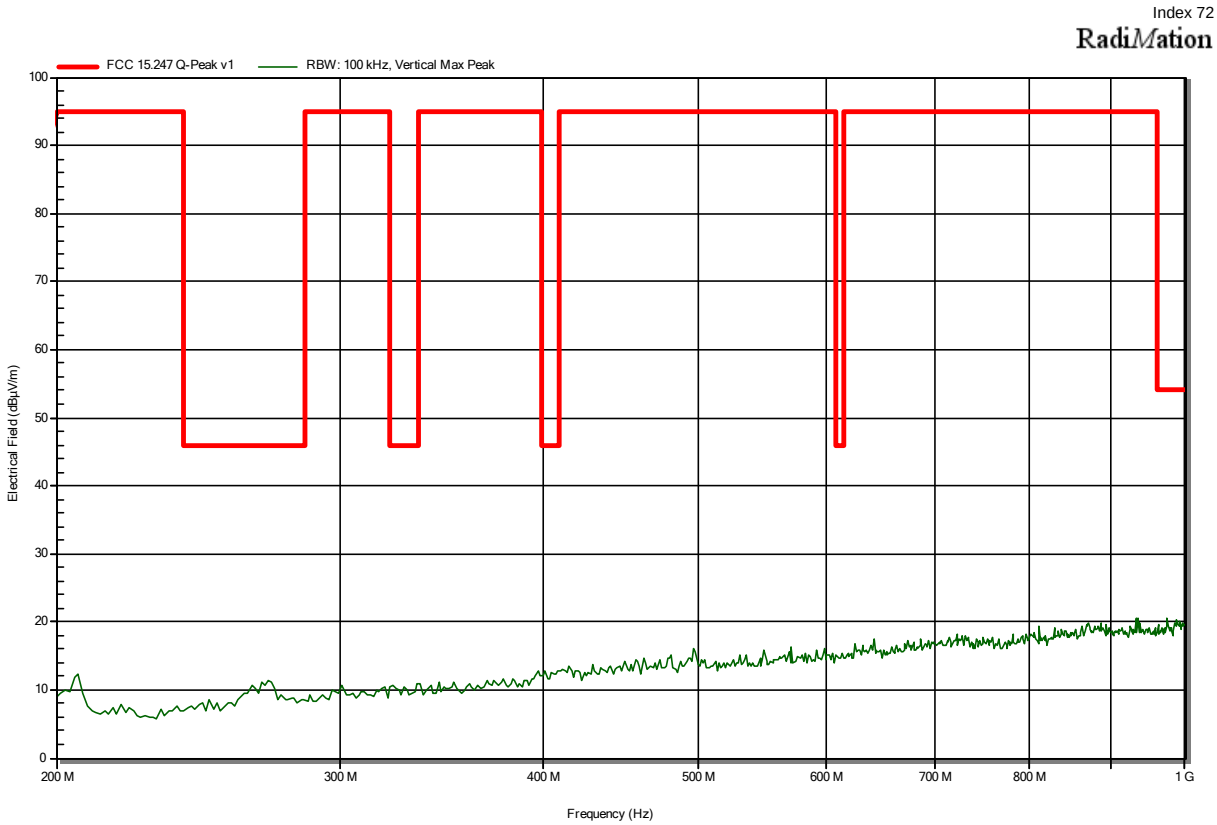
Radiated Spurious Emissions according to FCC CFR Part 15.247

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2402 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



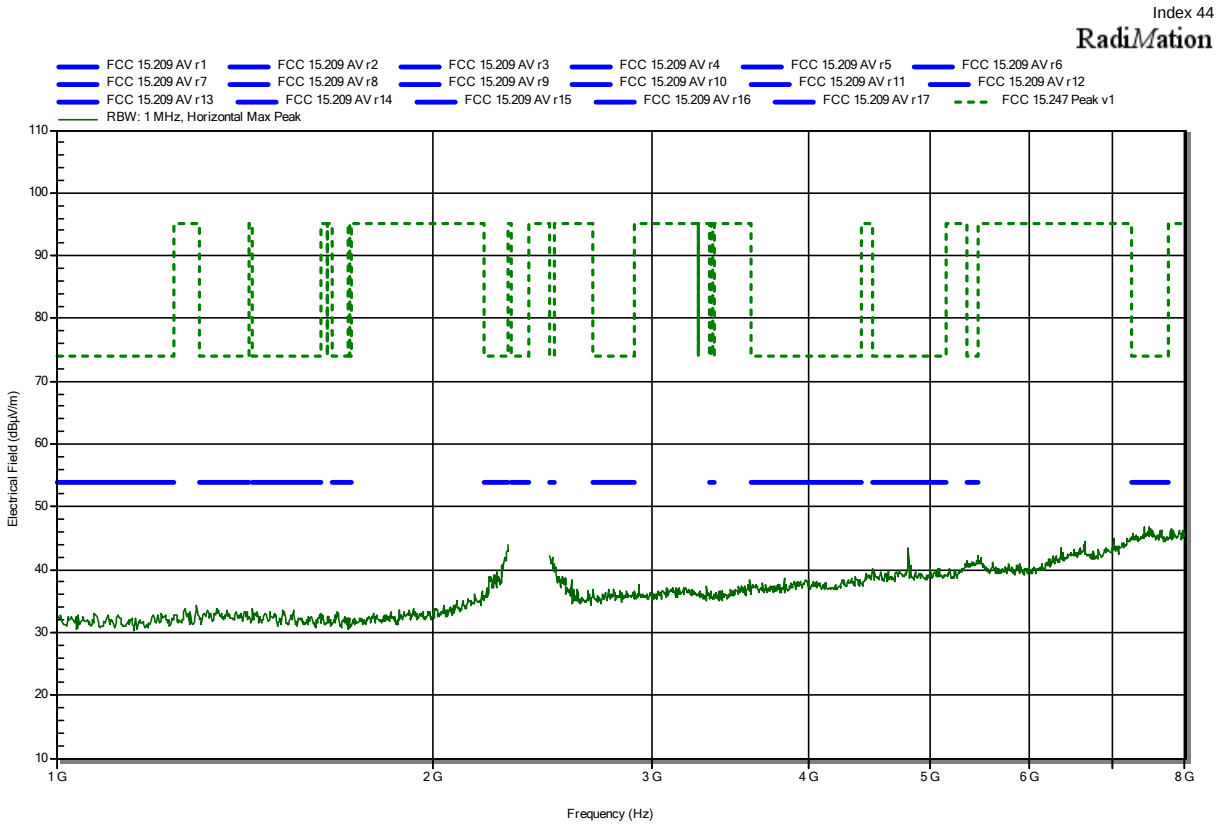
Radiated Spurious Emissions according to FCC CFR Part 15.247

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2402 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



Radiated Spurious Emissions according to FCC CFR Part 15.247

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2402 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



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Model:	ENW89855A1KF
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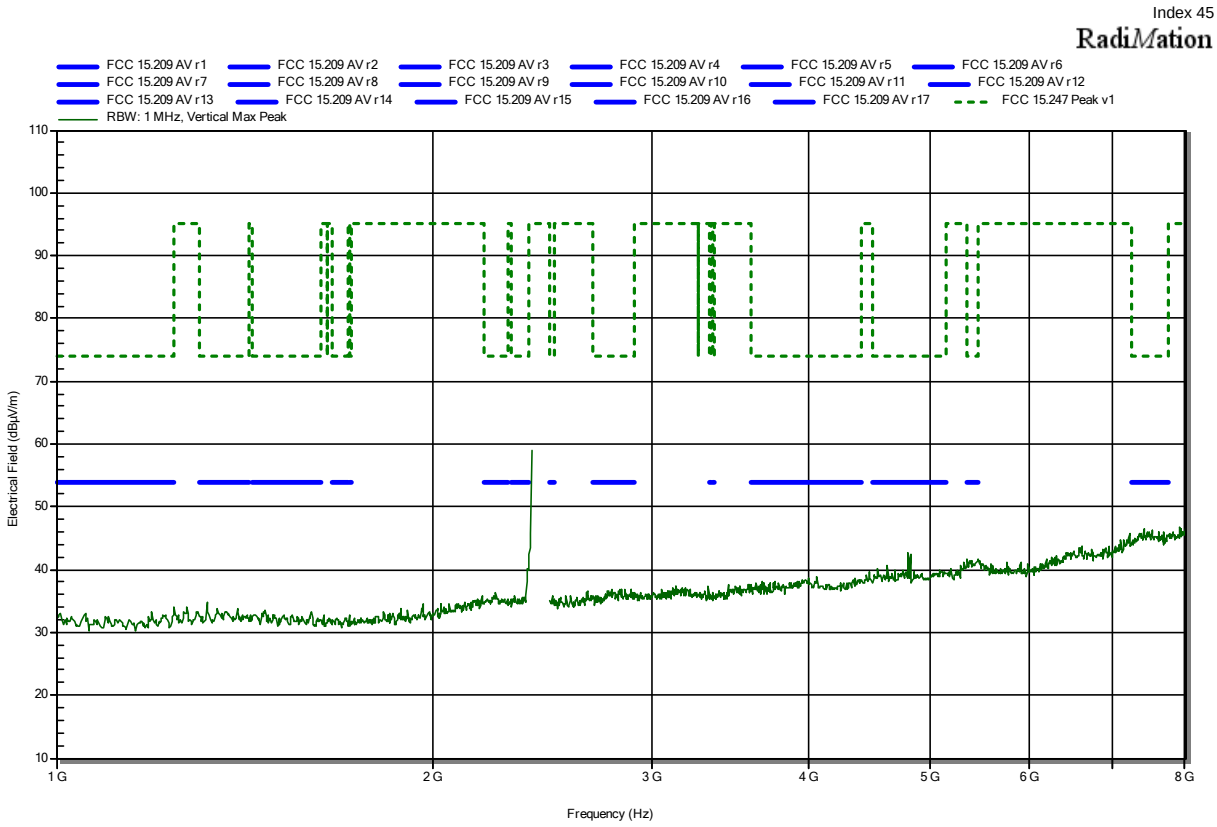
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2402 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



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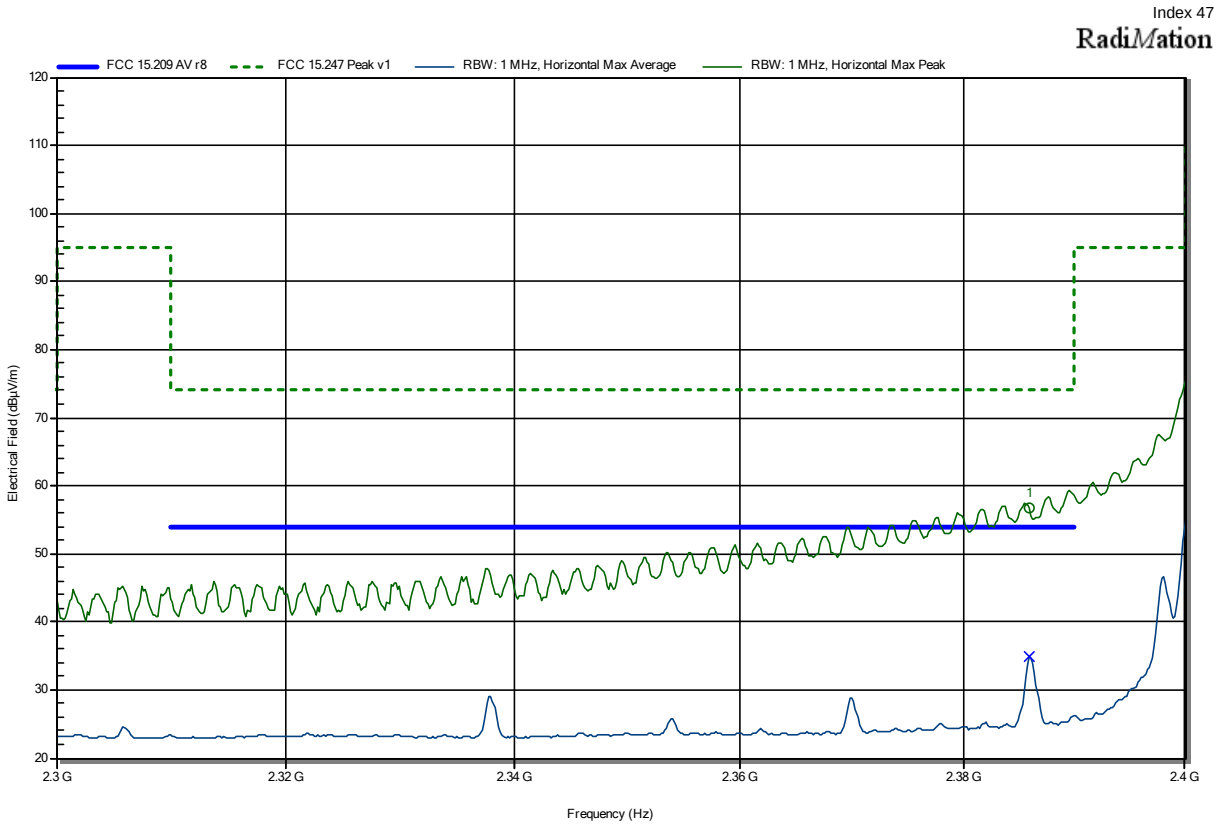
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2402 MHz
Test Date:	2021-03-16
Note:	lower bandedge



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.3859 GHz	56.77 dBµV/m	74 dBµV/m	-17.23 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
2.3859 GHz	34.86 dBµV/m	54 dBµV/m	-19.14 dB	Pass

Radiated Spurious Emissions according to FCC CFR Part 15.247

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Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2402 MHz
Test Date:	2021-03-16
Note:	lower bandedge

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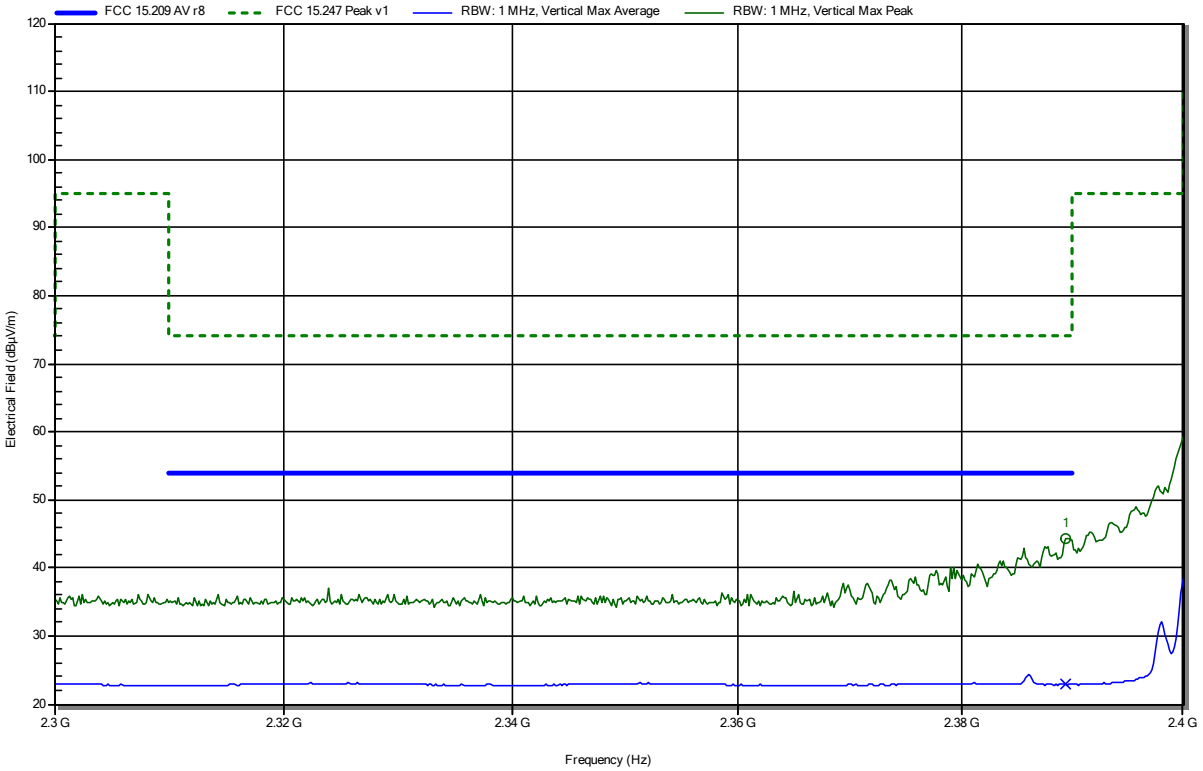

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.3894 GHz	44.24 dBµV/m	74 dBµV/m	-29.76 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
2.3894 GHz	22.94 dBµV/m	54 dBµV/m	-31.06 dB	Pass

Radiated Spurious Emissions according to FCC CFR Part 15.247

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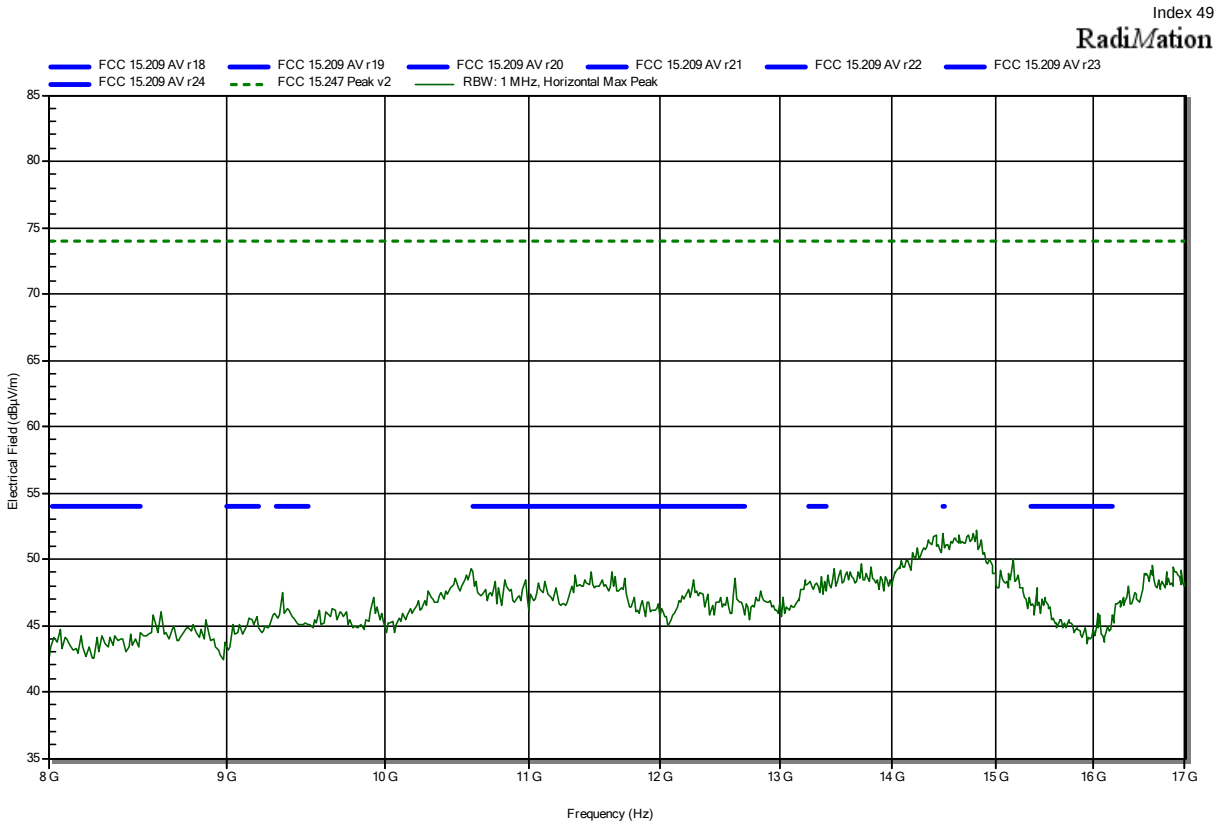
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2402 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



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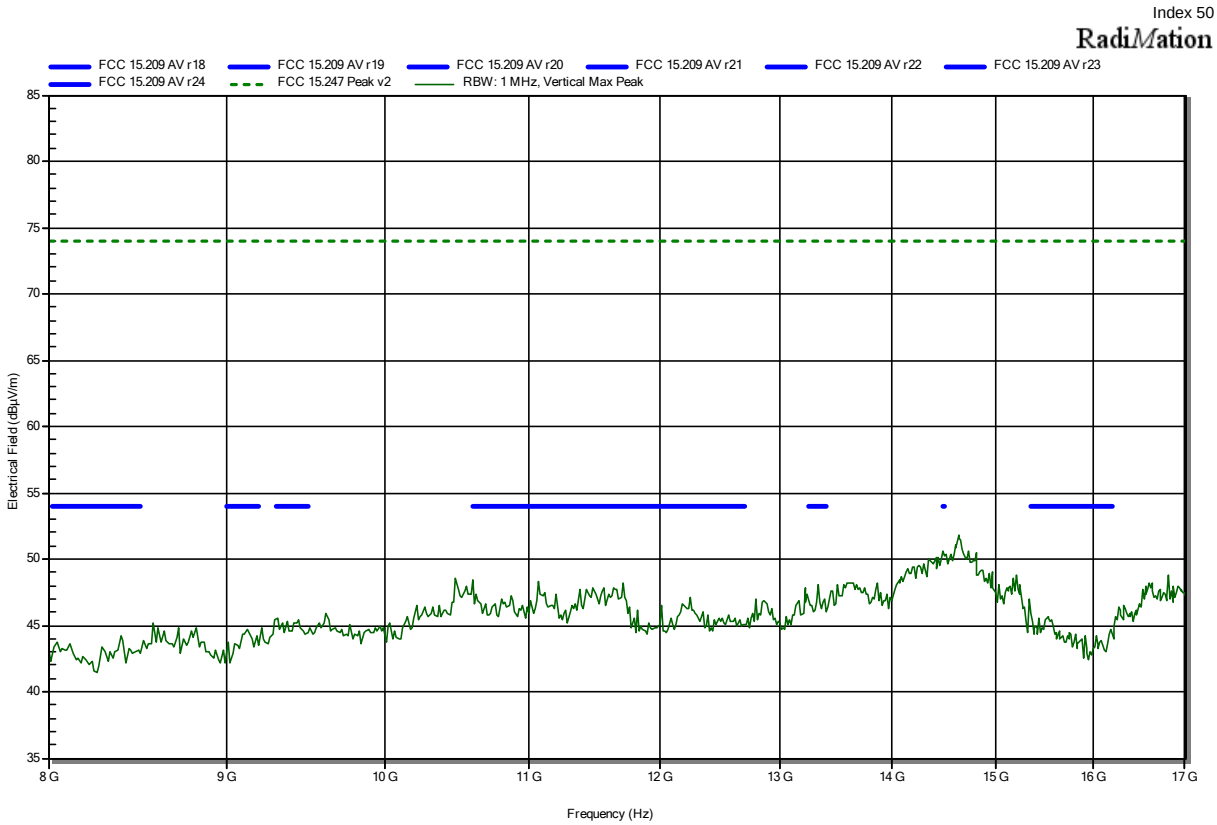
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2402 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



Radiated Spurious Emissions according to FCC CFR Part 15.247

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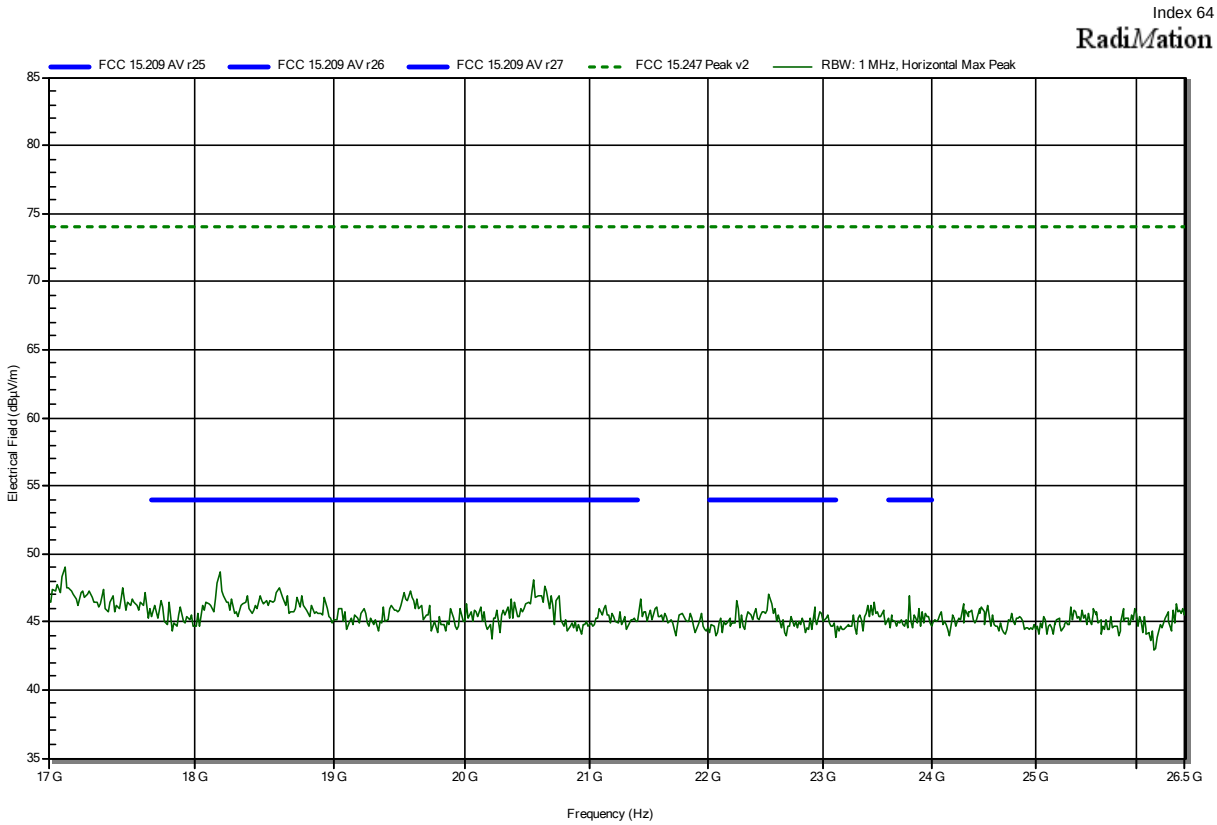
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Amplifier Research AT4560, Horizontal
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2402 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



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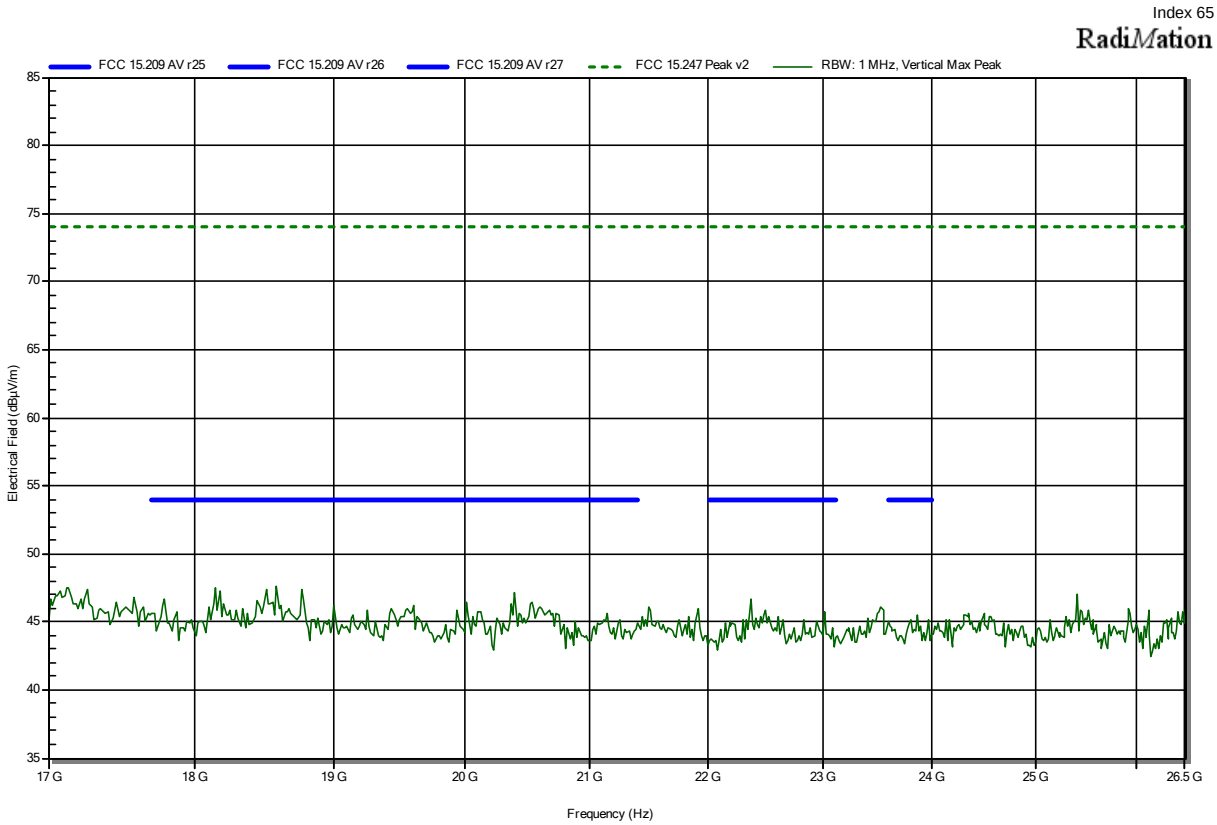
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Amplifier Research AT4560, Vertical
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2402 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



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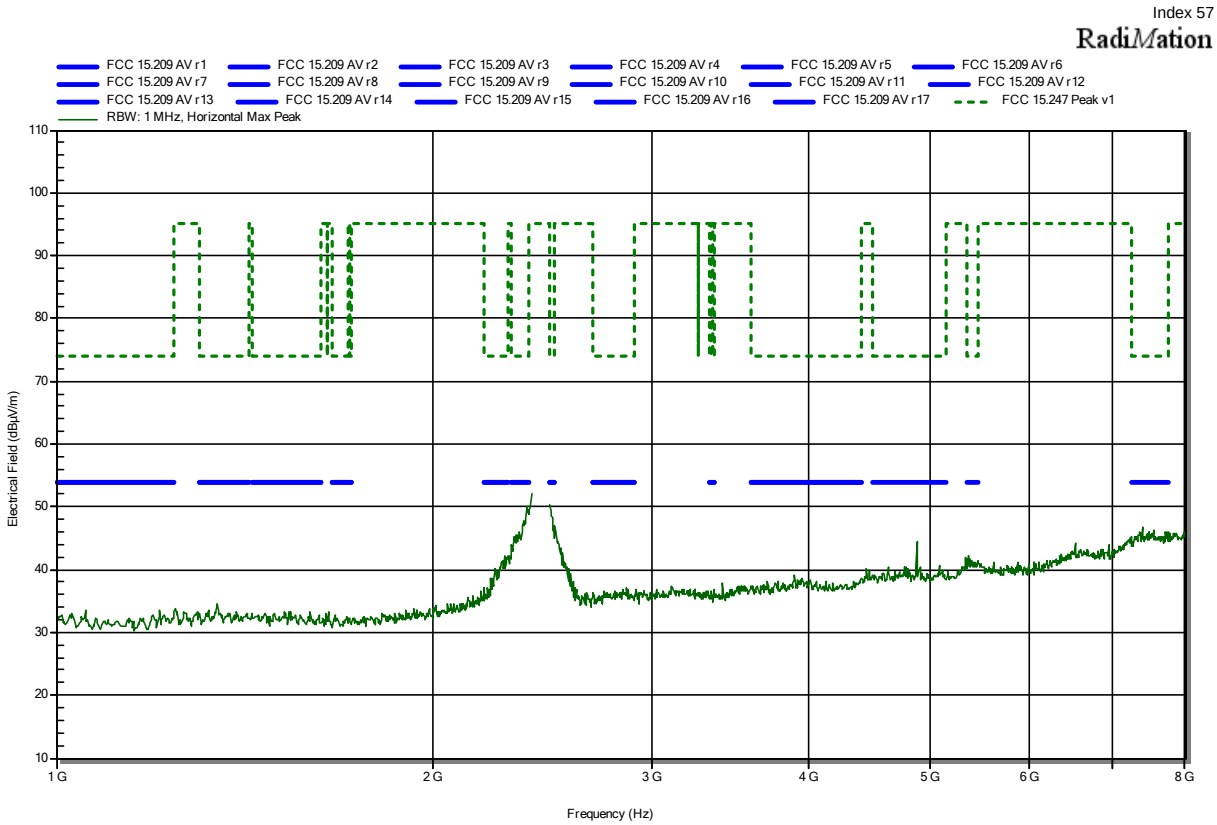
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2440 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



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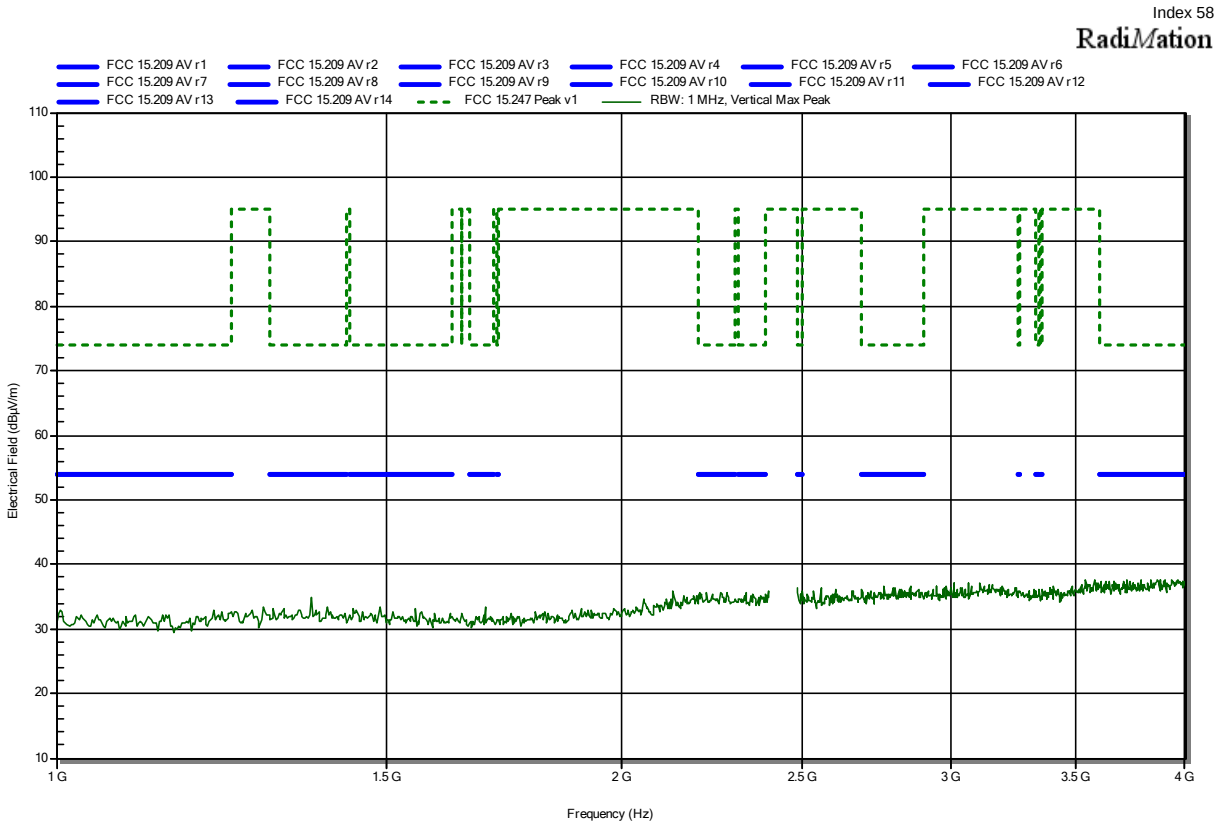
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2440 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



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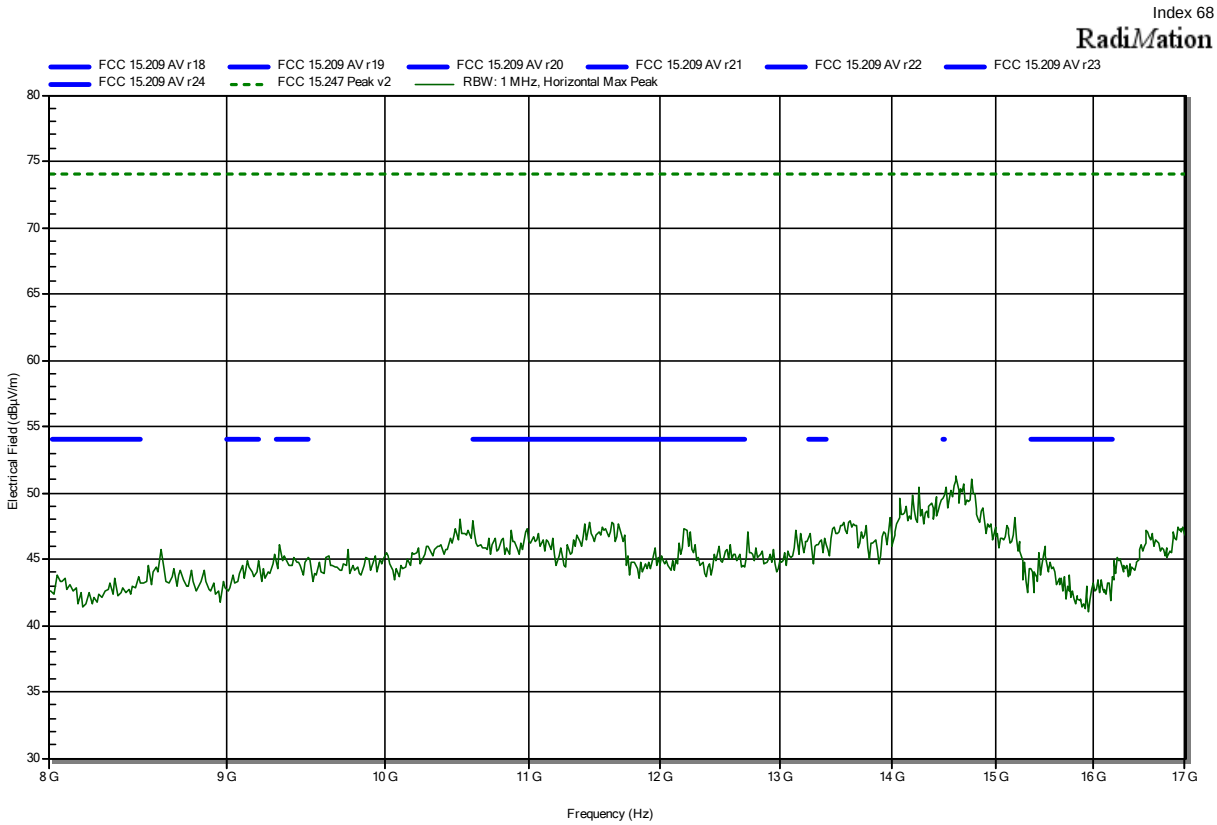
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2440 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



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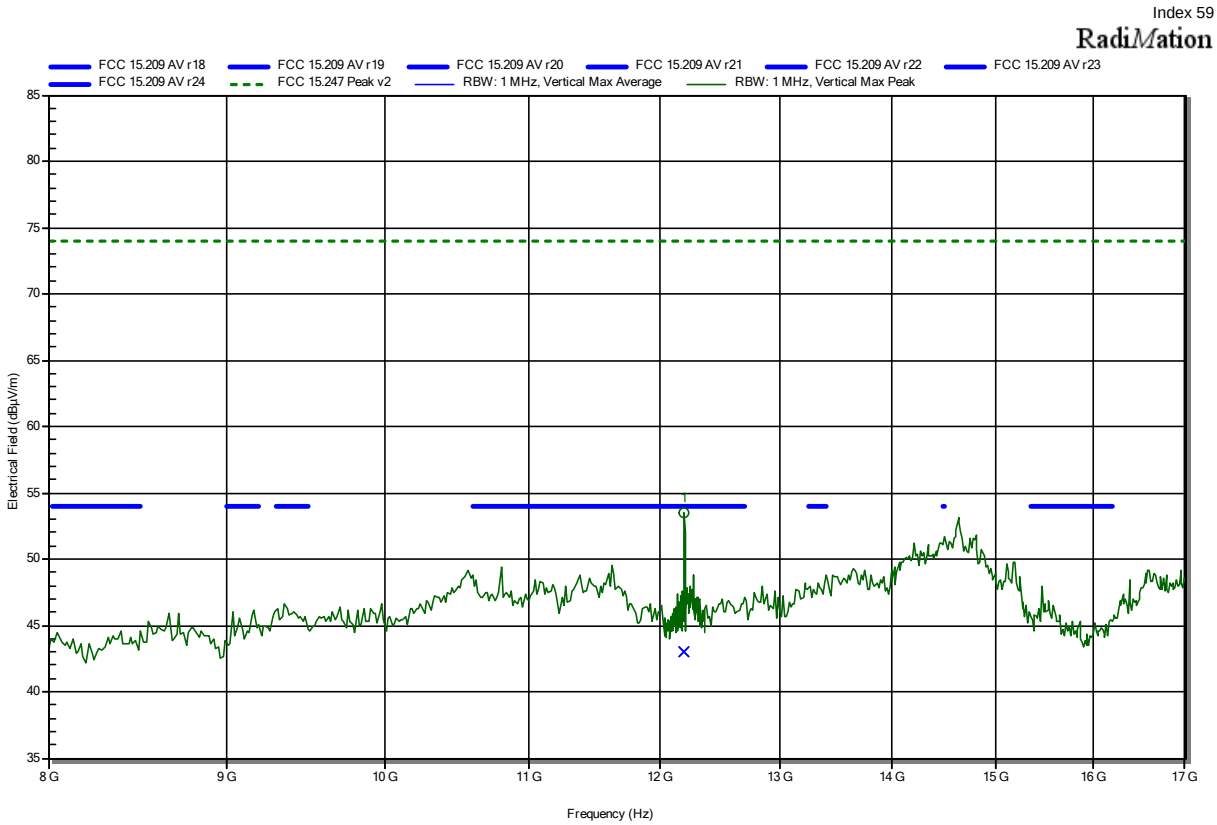
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2440 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
12.199 GHz	53.55 dBµV/m	74 dBµV/m	-20.45 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
12.199 GHz	43.02 dBµV/m	54 dBµV/m	-10.98 dB	Pass

Radiated Spurious Emissions according to FCC CFR Part 15.247

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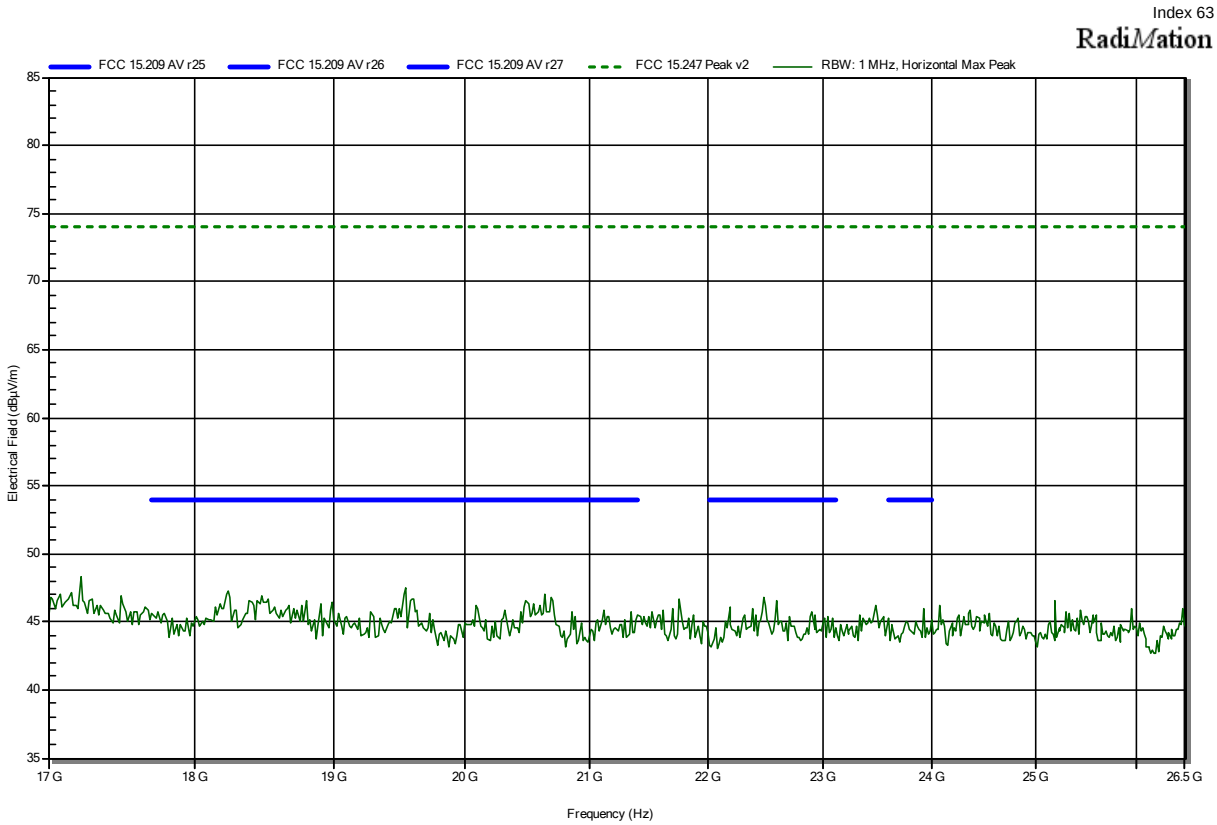
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Amplifier Research AT4560, Horizontal
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2440 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



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Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Amplifier Research AT4560, Vertical
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2440 MHz
Test Date:	2021-03-16
Note:	EUT horizontal

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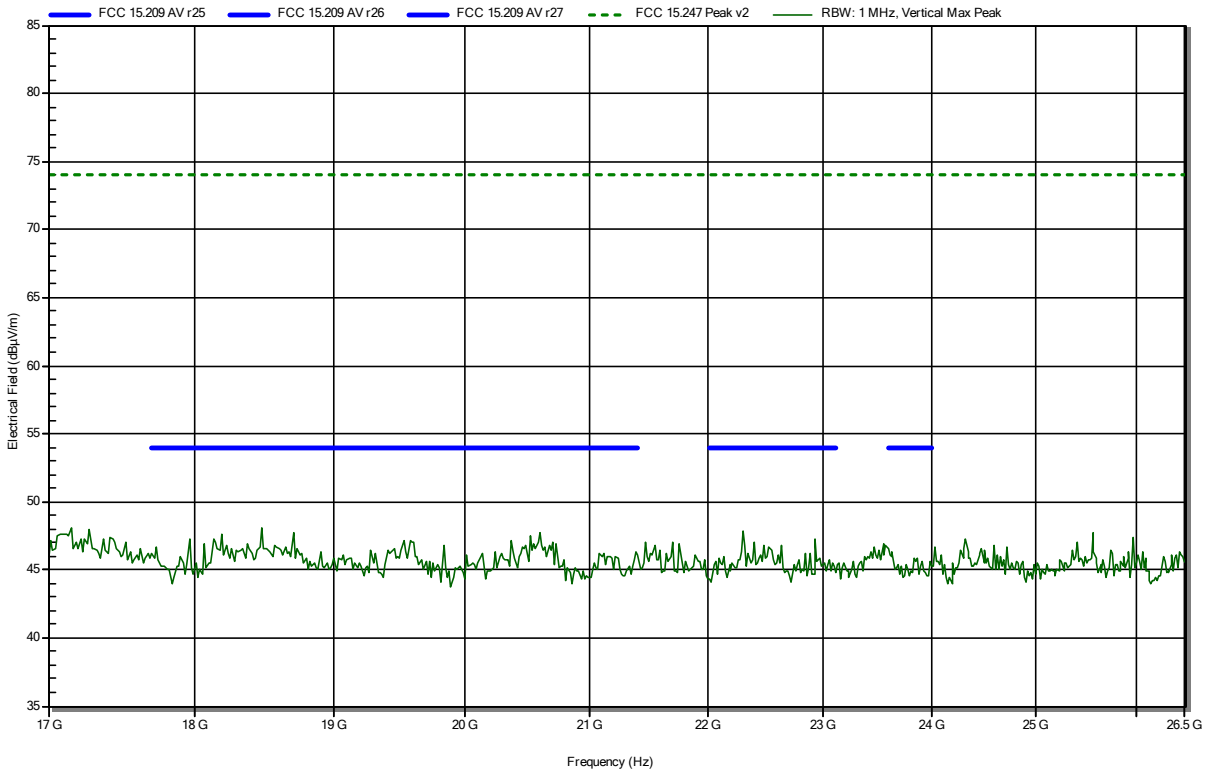
RadiMation



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Model:	ENW89855A1KF
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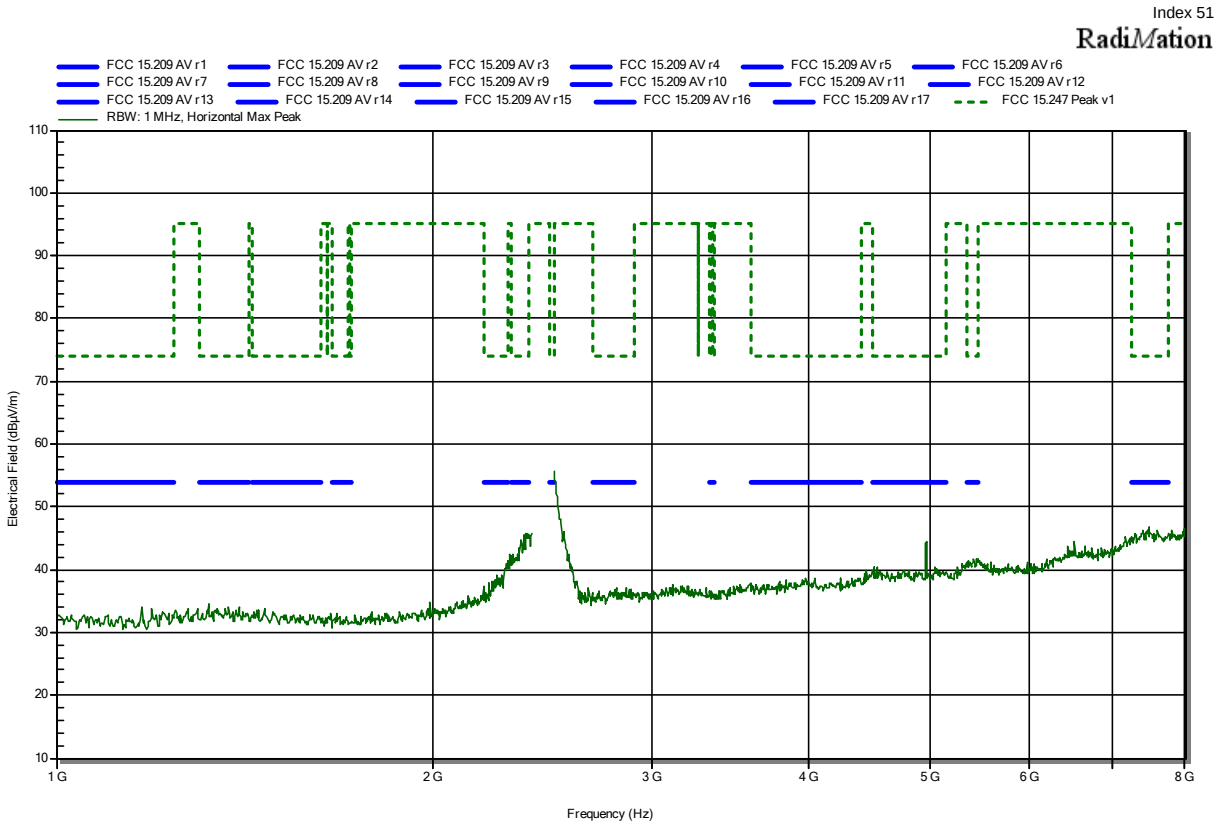
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2480 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



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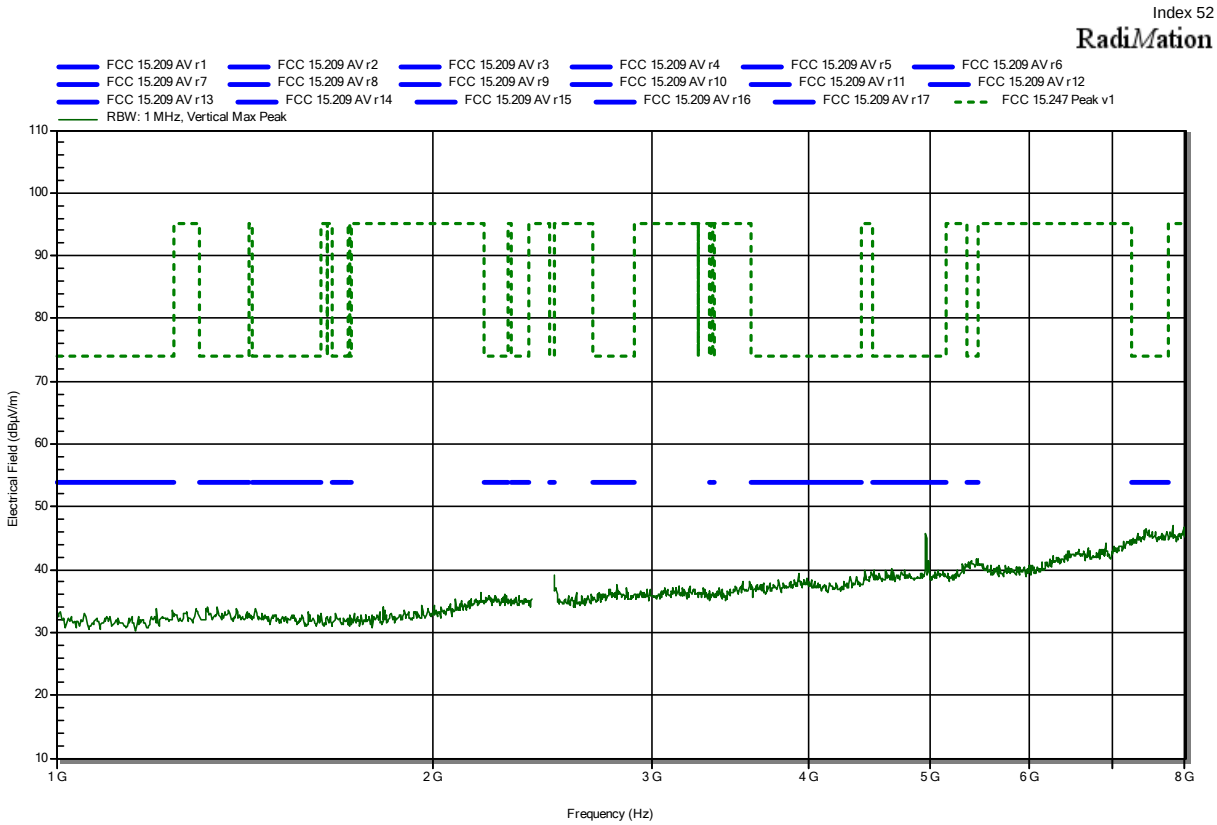
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2480 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



Radiated Spurious Emissions according to FCC CFR Part 15.247

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2480 MHz
Test Date:	2021-03-16
Note:	upper bandedge

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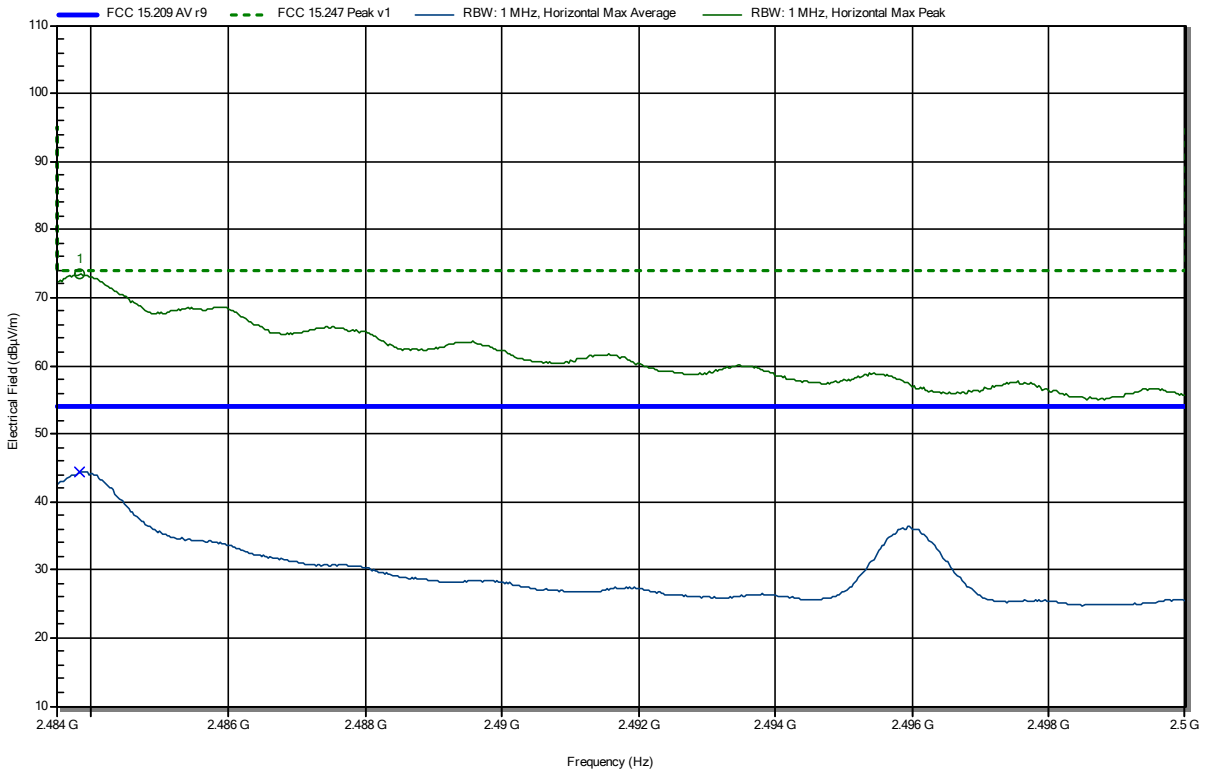
RadiMation

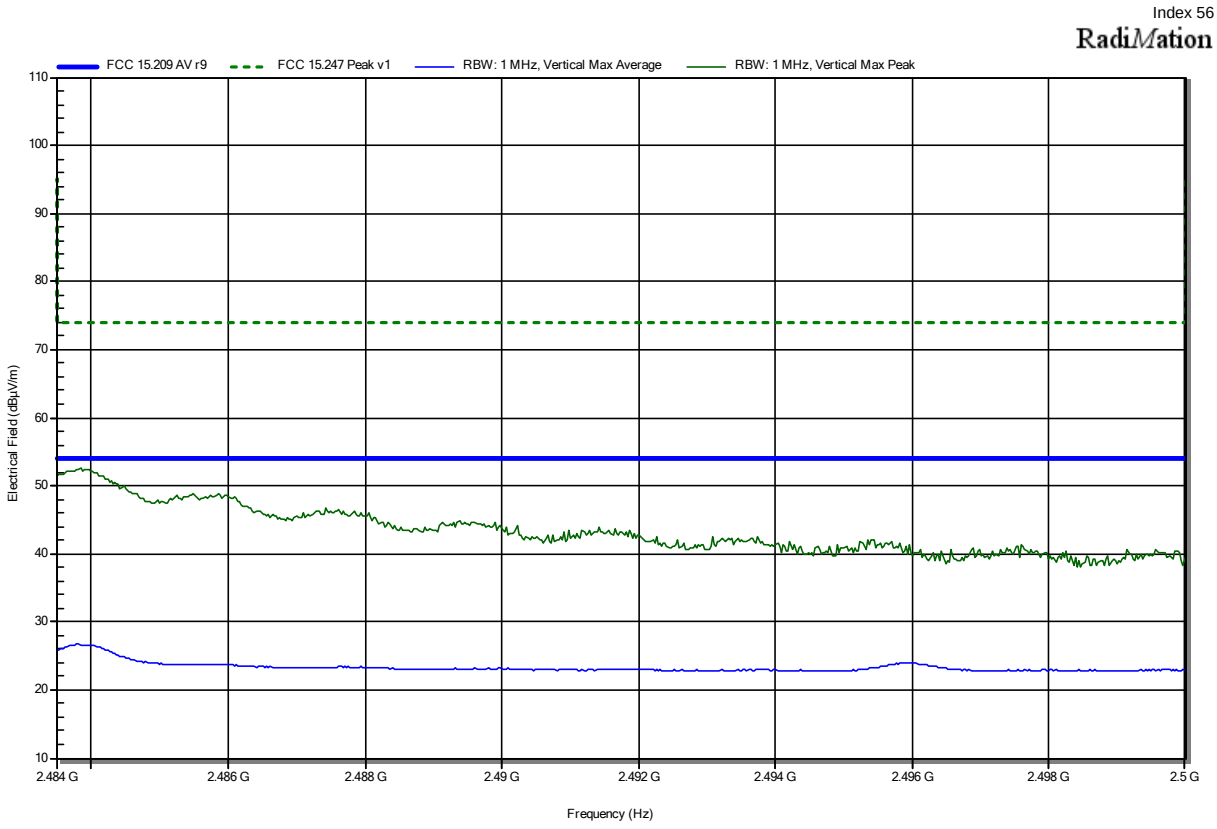


Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.4838 GHz	73.41 dBµV/m	74 dBµV/m	-0.59 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
2.4838 GHz	44.29 dBµV/m	54 dBµV/m	-9.71 dB	Pass

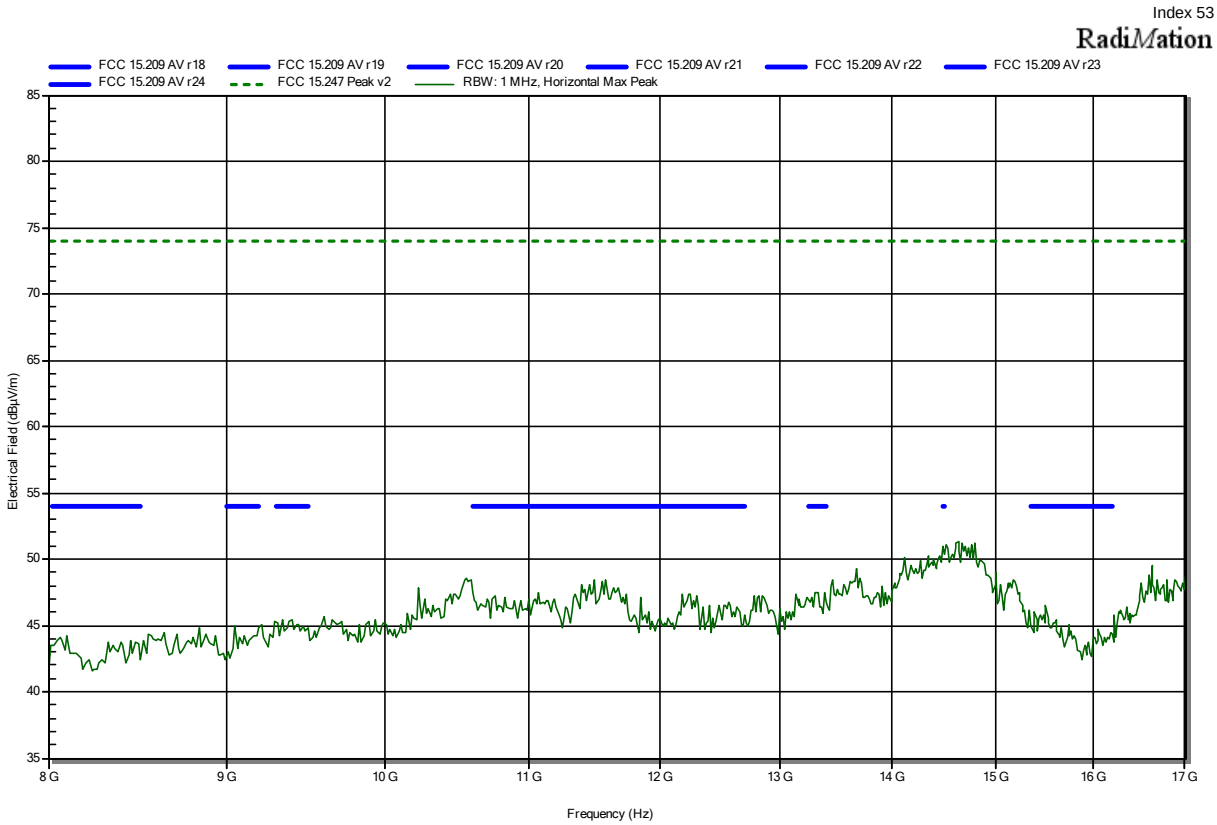
Radiated Spurious Emissions according to FCC CFR Part 15.247

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2480 MHz
Test Date:	2021-03-16
Note:	upper bandedge



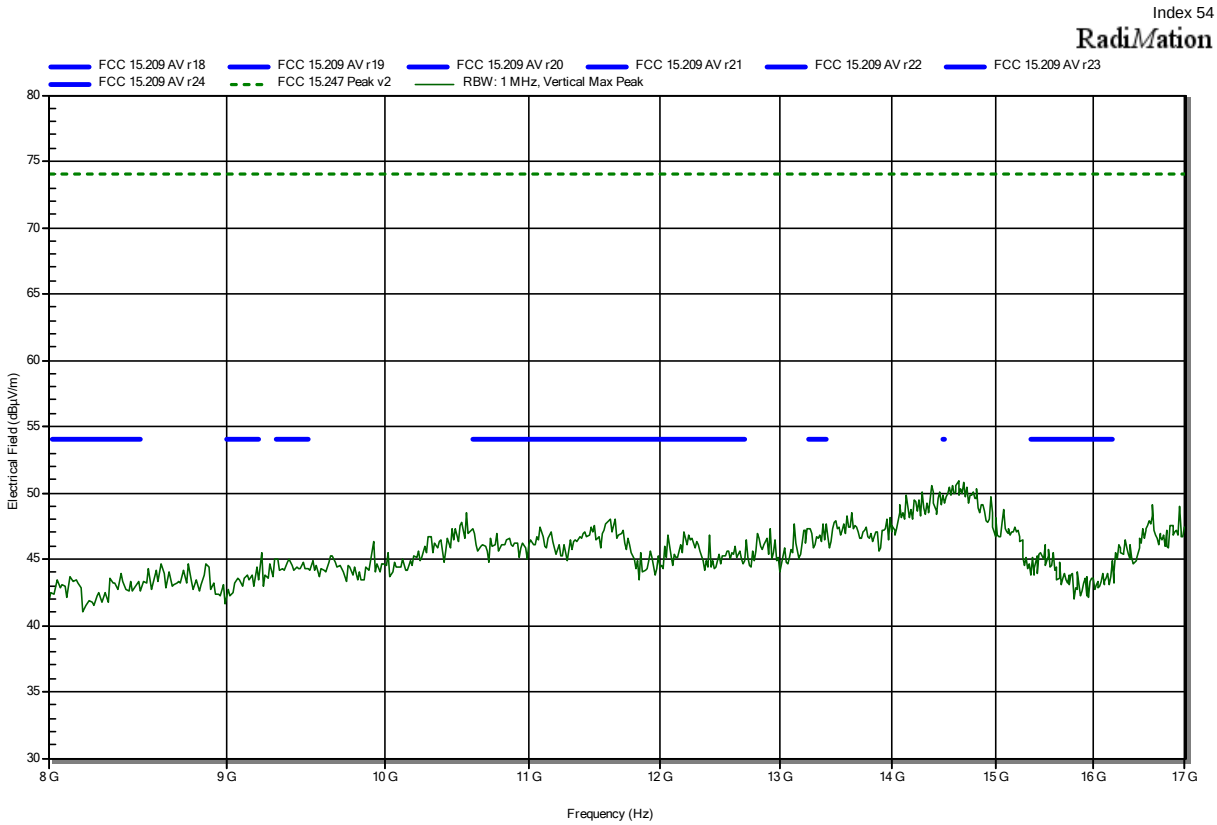
Radiated Spurious Emissions according to FCC CFR Part 15.247

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2480 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



Radiated Spurious Emissions according to FCC CFR Part 15.247

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2480 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



Radiated Spurious Emissions according to FCC CFR Part 15.247

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Amplifier Research AT4560, Horizontal
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2480 MHz
Test Date:	2021-03-16
Note:	EUT horizontal

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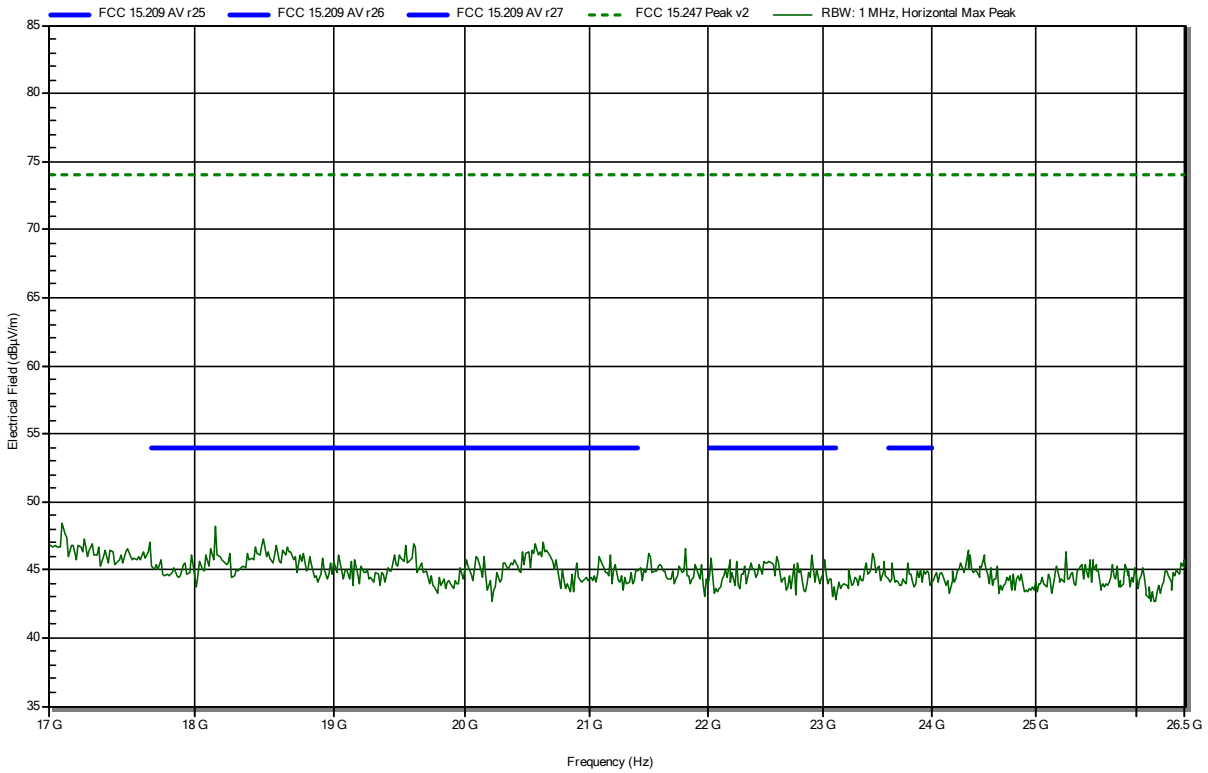
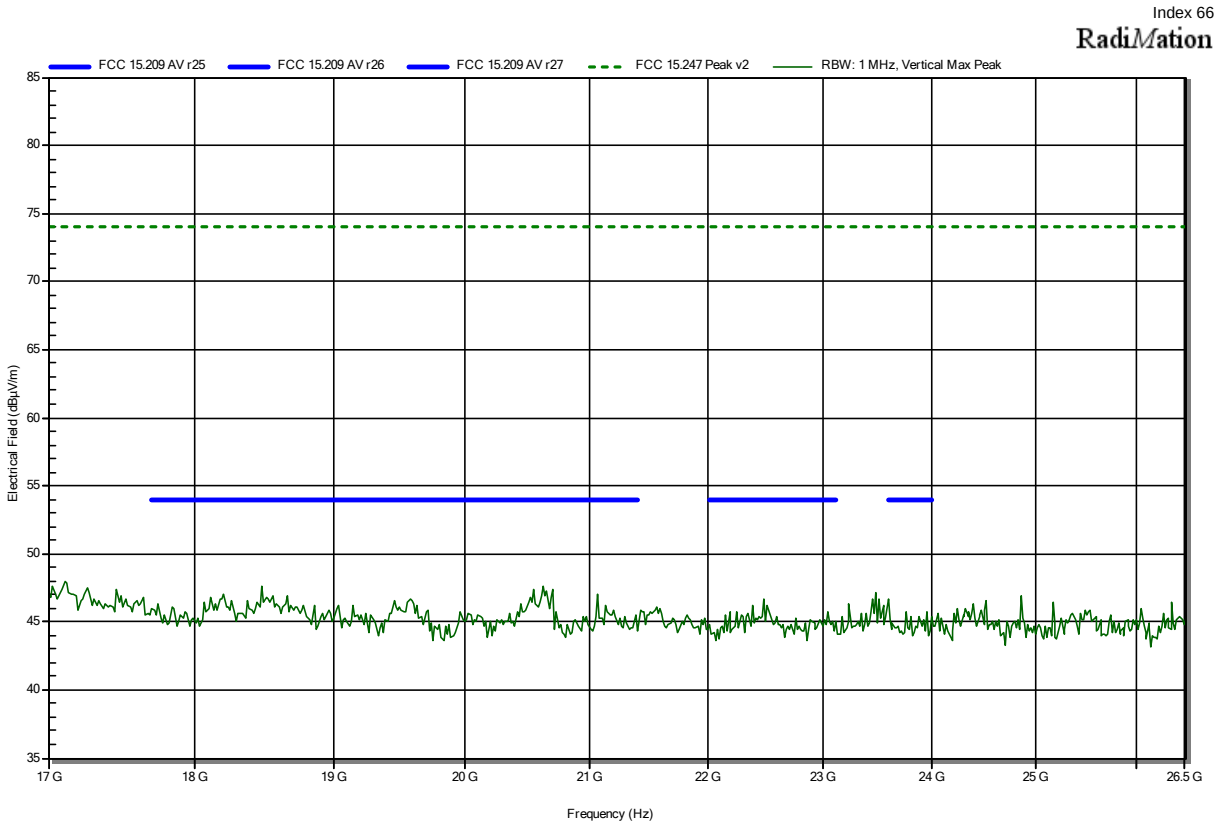
RadiMation



Radiated Spurious Emissions according to FCC CFR Part 15.247

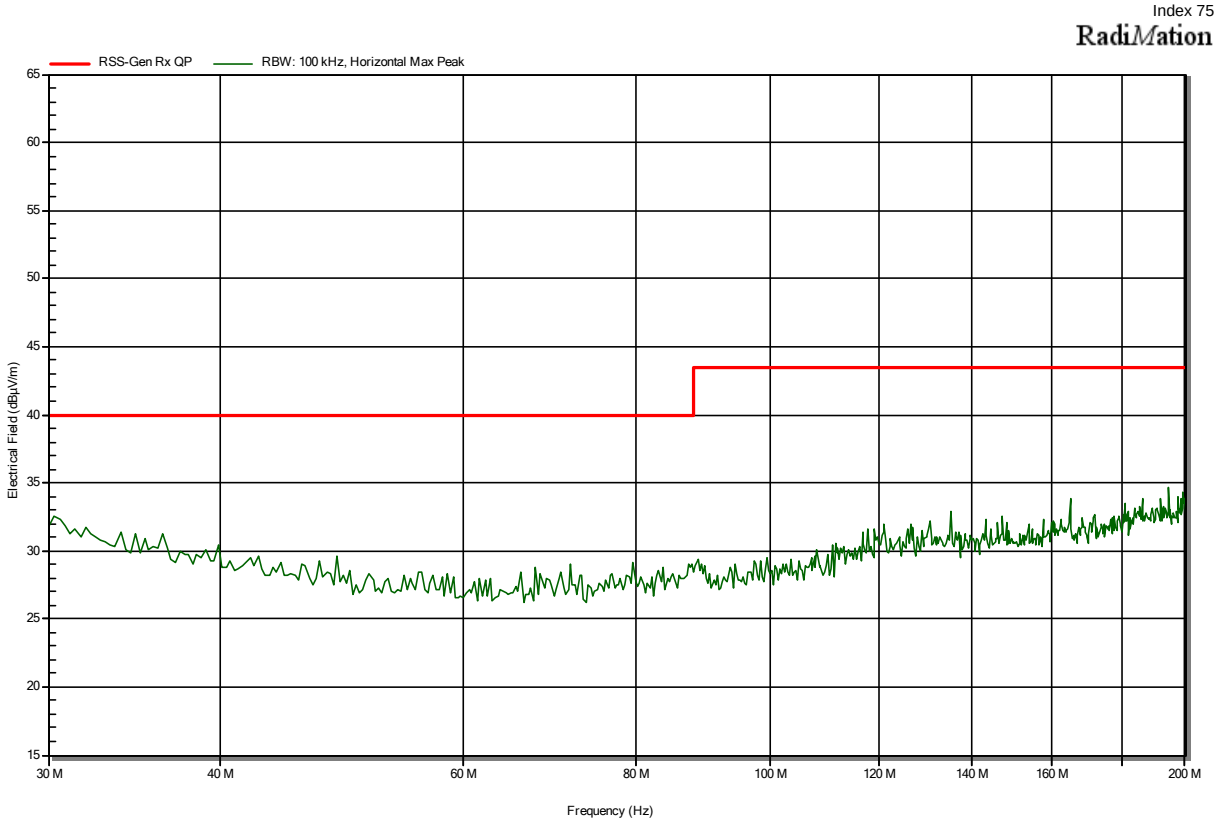
Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23.4 °Celsius, Vnom: 3.0 VDC
Antenna:	Amplifier Research AT4560, Vertical
Measurement distance:	3 m
Mode:	Tx; BLE; GFSK; 2480 MHz
Test Date:	2021-03-16
Note:	EUT horizontal



ANNEX B Receiver spurious emissions

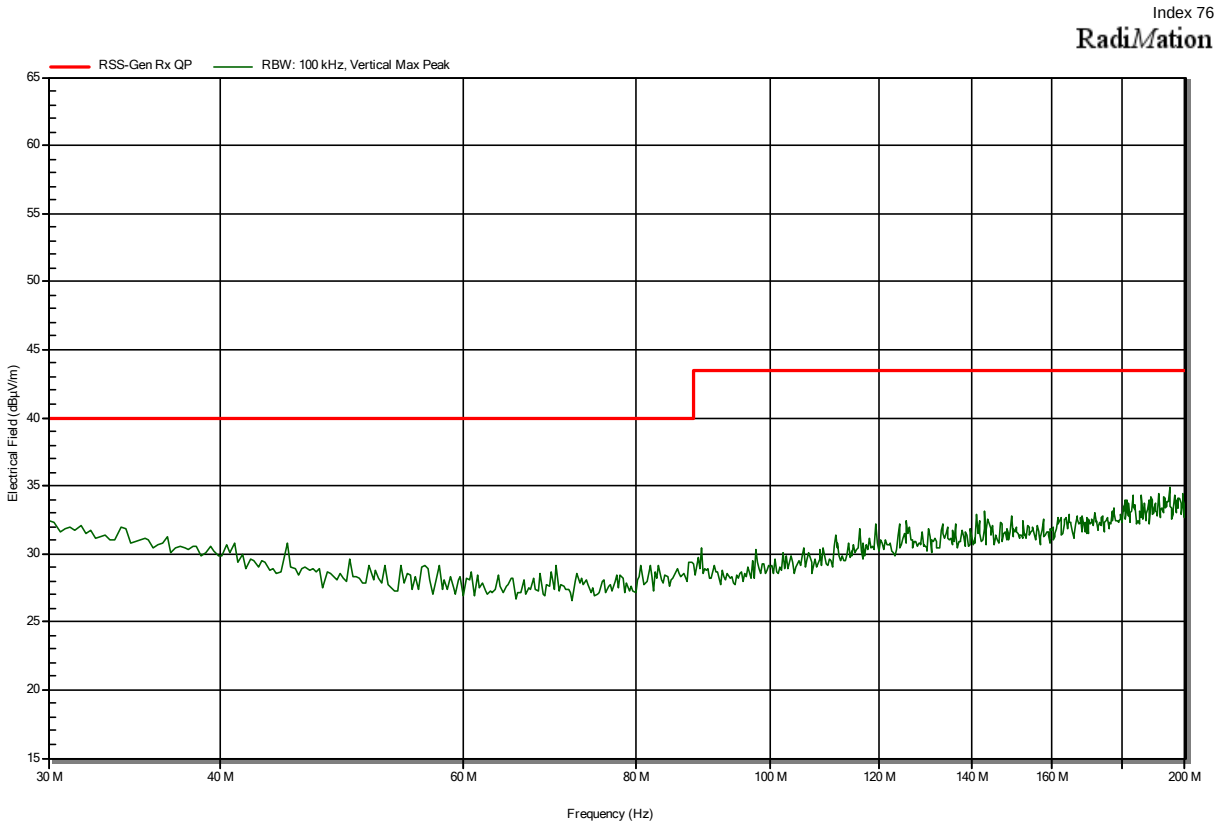
Radiated Spurious Emissions according to RSS-247

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22.5 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	Rx; BLE; GFSK; 2440 MHz
Test Date:	2021-03-17
Note:	EUT horizontal



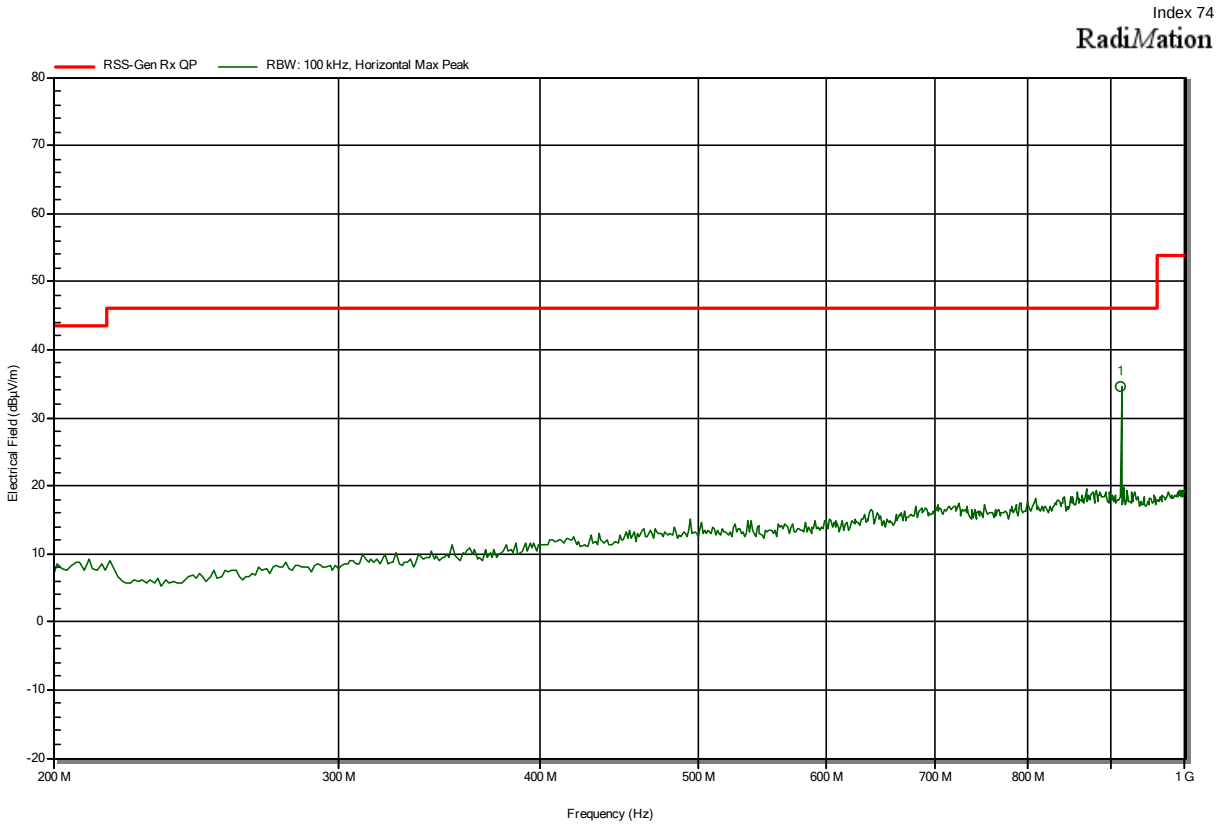
Radiated Spurious Emissions according to RSS-247

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22.5 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	Rx; BLE; GFSK; 2440 MHz
Test Date:	2021-03-17
Note:	EUT horizontal



Radiated Spurious Emissions according to RSS-247

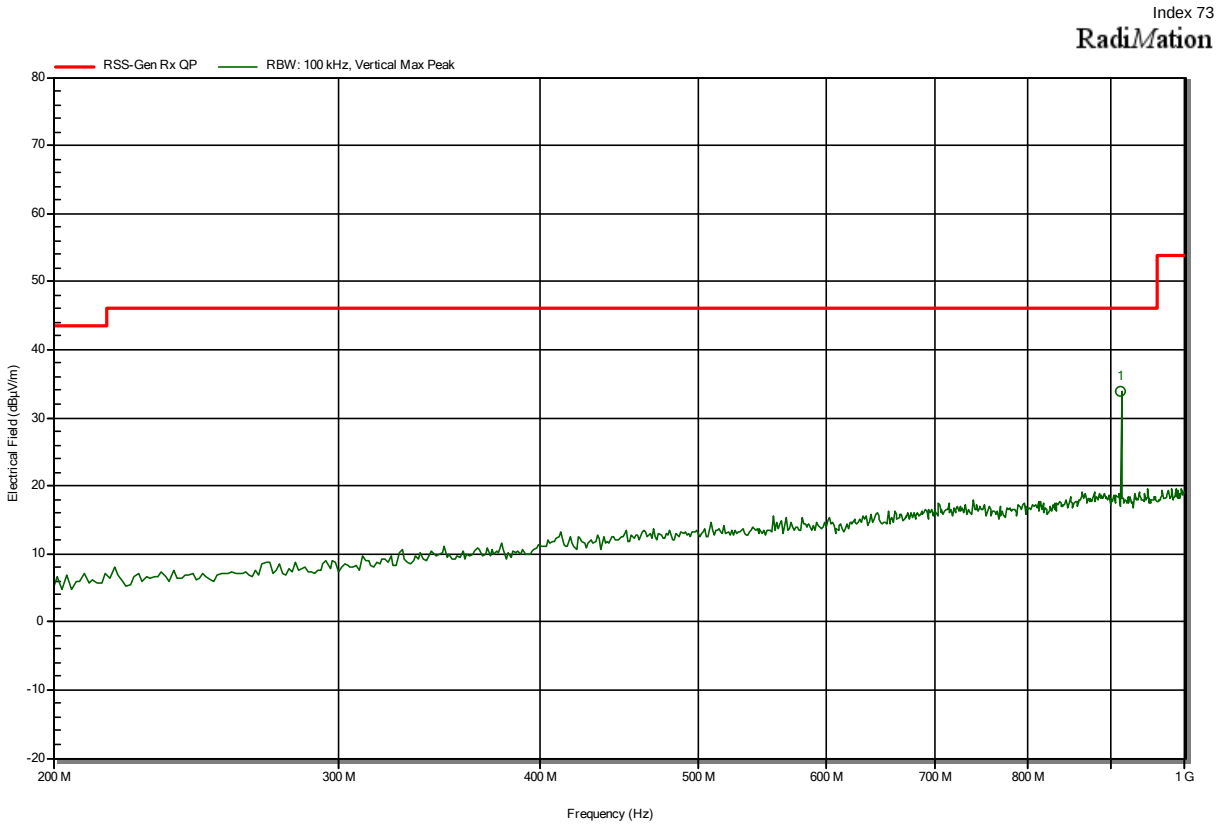
Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22.5 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	Rx; BLE; GFSK; 2440 MHz
Test Date:	2021-03-17
Note:	EUT horizontal



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
912.821 MHz	34.67 dBµV/m	46 dBµV/m	-11.33 dB	Pass

Radiated Spurious Emissions according to RSS-247

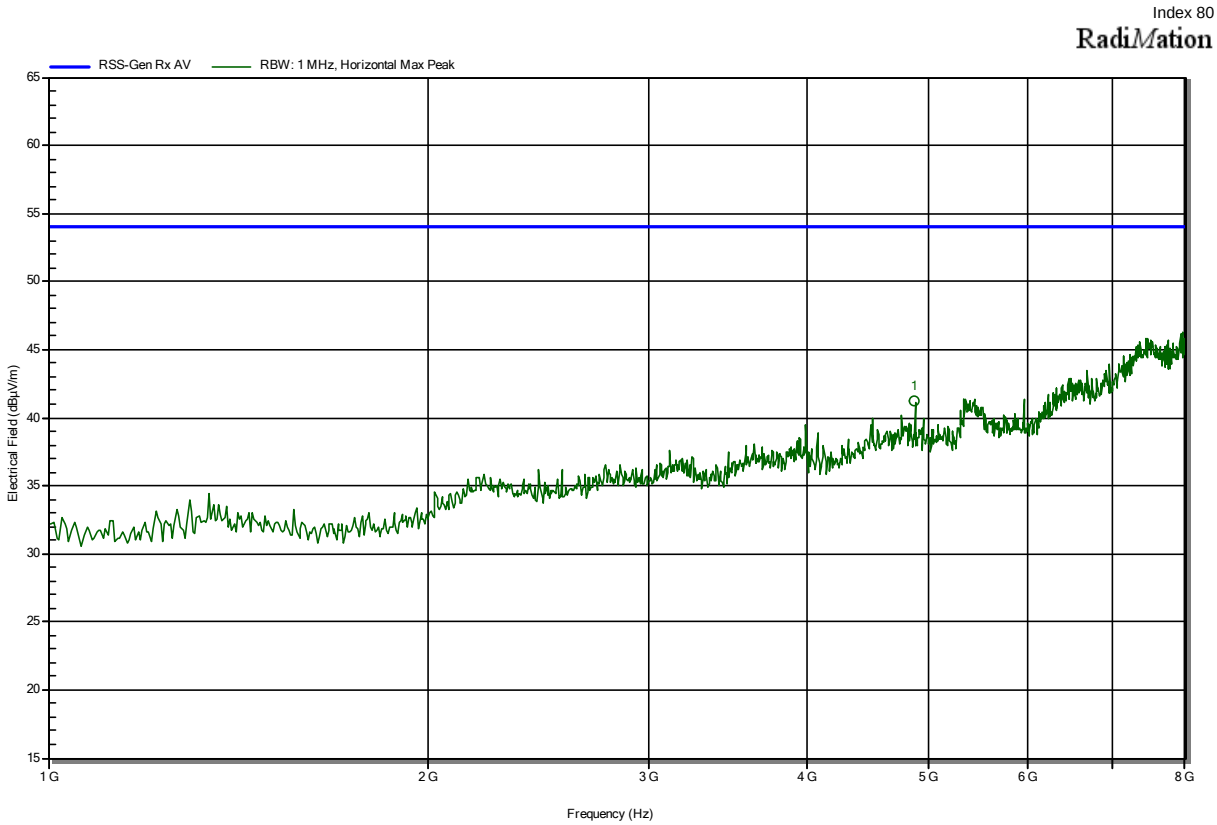
Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22.5 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	Rx; BLE; GFSK; 2440 MHz
Test Date:	2021-03-17
Note:	EUT horizontal



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
912.821 MHz	33.86 dBµV/m	46 dBµV/m	-12.14 dB	Pass

Radiated Spurious Emissions according to RSS-247

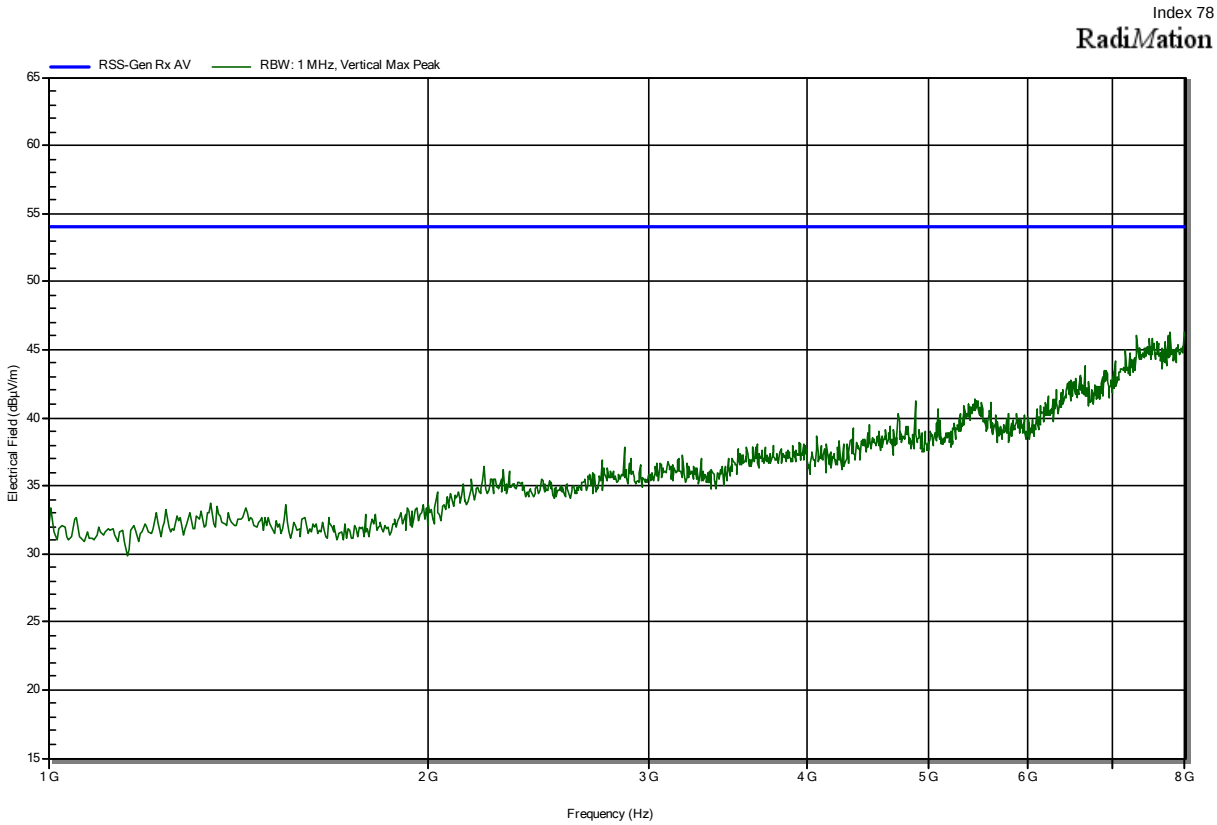
Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22.5 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Rx; BLE; GFSK; 2440 MHz
Test Date:	2021-03-17
Note:	EUT horizontal



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.878 GHz	41.18 dBµV/m	53.98 dBµV/m	-12.8 dB	Pass

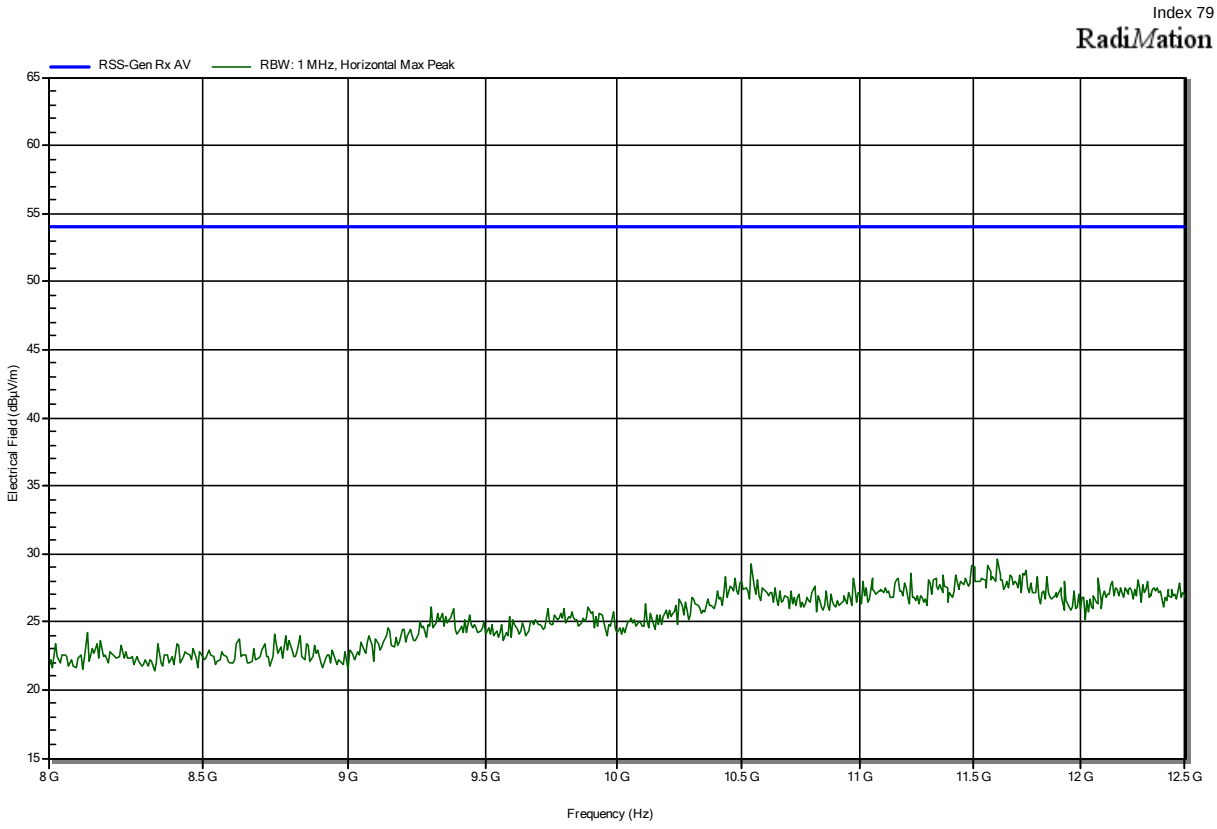
Radiated Spurious Emissions according to RSS-247

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22.5 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Rx; BLE; GFSK; 2440 MHz
Test Date:	2021-03-17
Note:	EUT horizontal



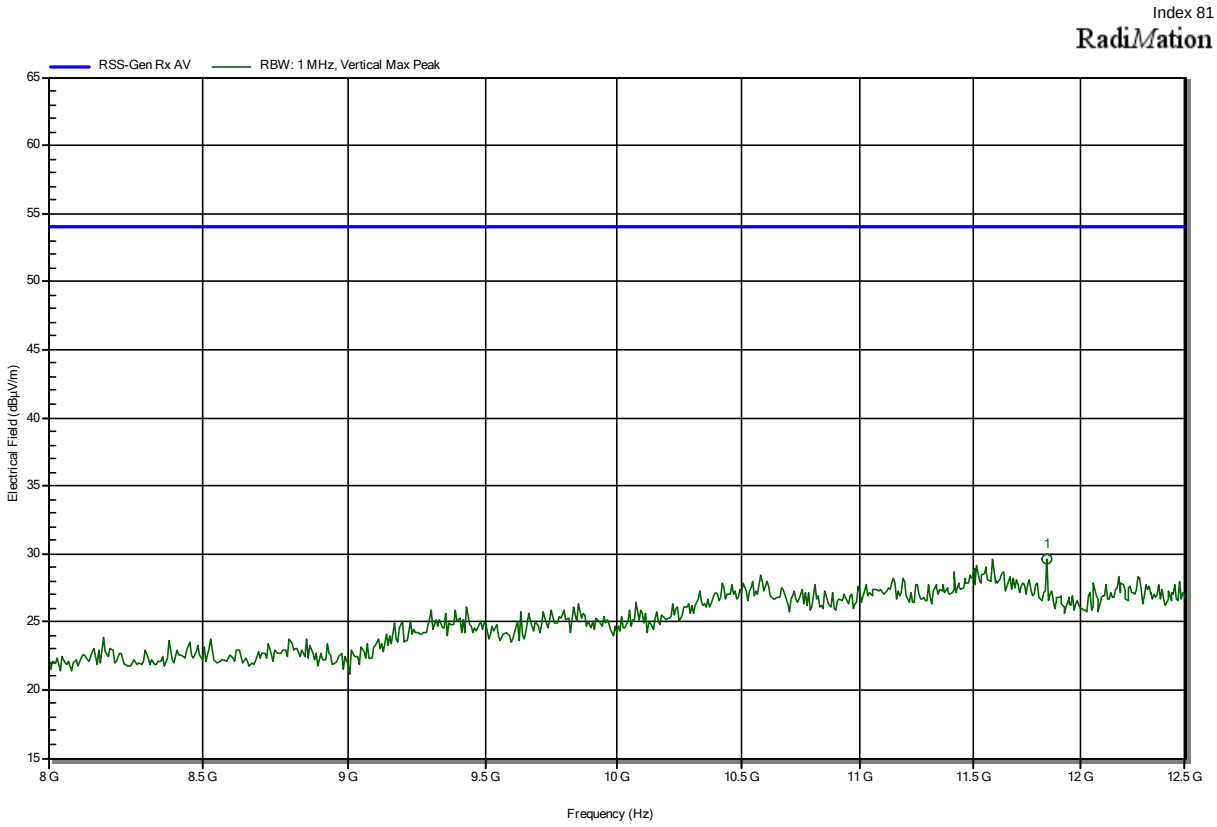
Radiated Spurious Emissions according to RSS-247

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22.5 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	Rx; BLE; GFSK; 2440 MHz
Test Date:	2021-03-17
Note:	EUT horizontal



Radiated Spurious Emissions according to RSS-247

Project Number:	G0M-2009-9273
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Bluetooth Low Energy Module
Model:	ENW89855A1KF
Test Sample ID:	32825
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22.5 °Celsius, Vnom: 3.0 VDC
Antenna:	Rohde & Schwarz BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	Rx; BLE; GFSK; 2440 MHz
Test Date:	2021-03-17
Note:	



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
11.837 GHz	29.64 dBµV/m	53.98 dBµV/m	-24.34 dB	Pass

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