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RADIO REPORT FCC 47 CFR Part 15C ISED Canada RSS-247 Frequency hopping systems operating within the 2400.0 MHz - 2483.5 MHz MHz band	
Report Reference No	G0M-2108-9951-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 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 2, 2021-02
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model(s)	ENWF9408A1EF
Additional Model(s)	None
Brand Name(s)	PAN9028
Hardware Version(s)	04
Software Version(s)	01
FCC ID	T7V9028
IC	216Q-9028
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	2022-12-09	
Report:		
Compiled by	Odai Qawasmeh	
Tested by (+ signature)	Odai Qawasmeh	
Tested by (+ signature) (Responsible for Test)	Wilfried Treffke	
Approved by (+ signature) (Deputy Head of Lab)	Toralf Jahn	
Date of Issue	2022-04-27	
Total number of pages	53	
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 VARIANTS

Additional Variants (not tested and not evaluated variants)		
Not-tested Variant	**Description**	
1	Product Type Description	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
	Model name	ENWF9408A2EF
	Brand name	PAN9028
	Hardware Version	04
	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	2022-04-27	Initial Release	

ABBREVIATIONS AND ACRONYMS

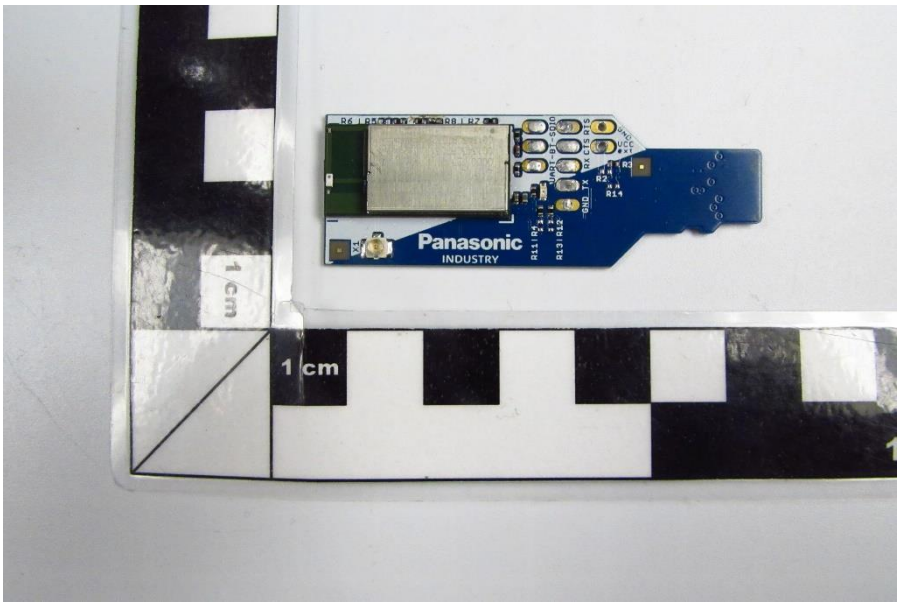
Acronyms	
Acronym	Description
BR	Basic Rate (Bluetooth)
EDR	Enhanced Data Rate (Bluetooth)
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
RBW	Resolution bandwidth
RMS	Root mean square
VBW	Video bandwidth
V_{NOM}	Nominal supply voltage

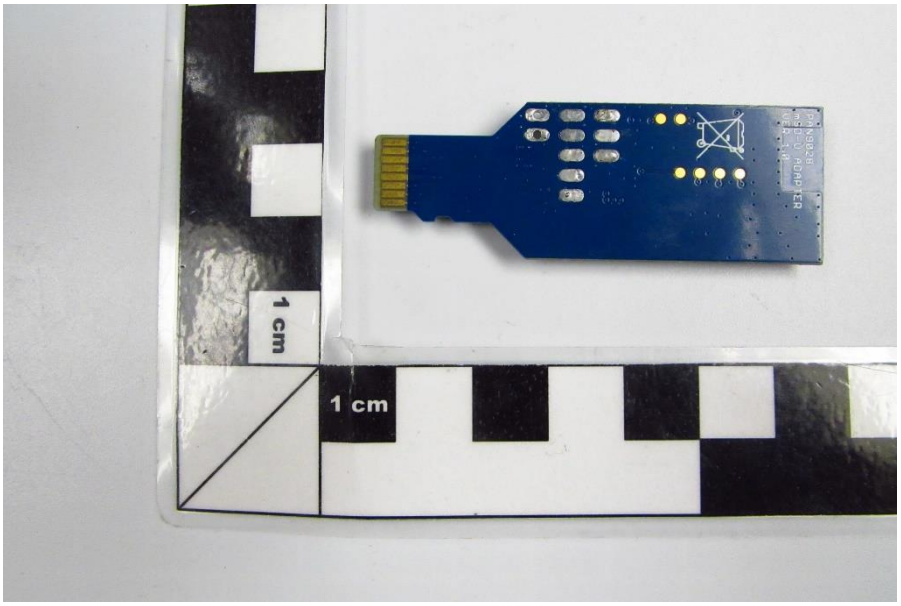
REPORT INDEX

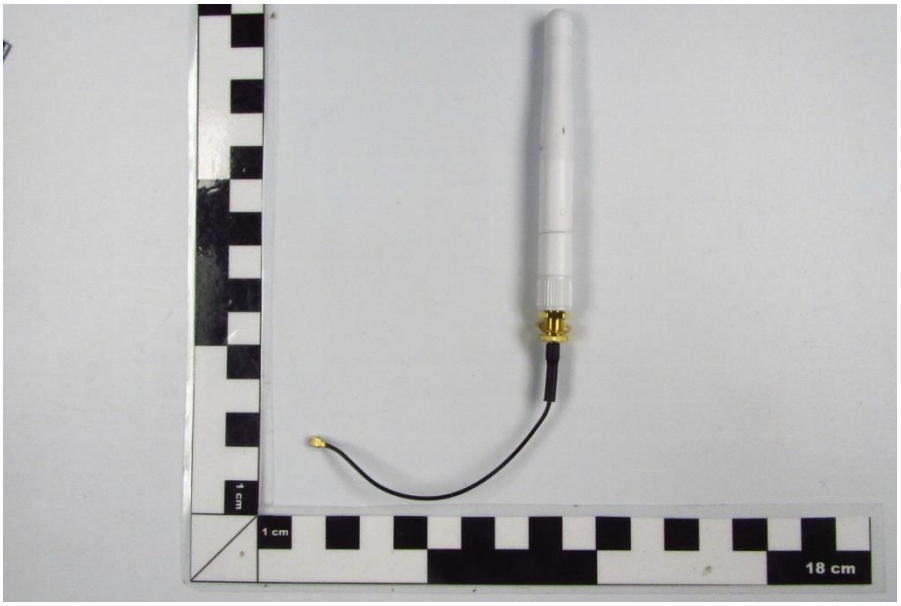
1 Equipment (Test Item) Under Test

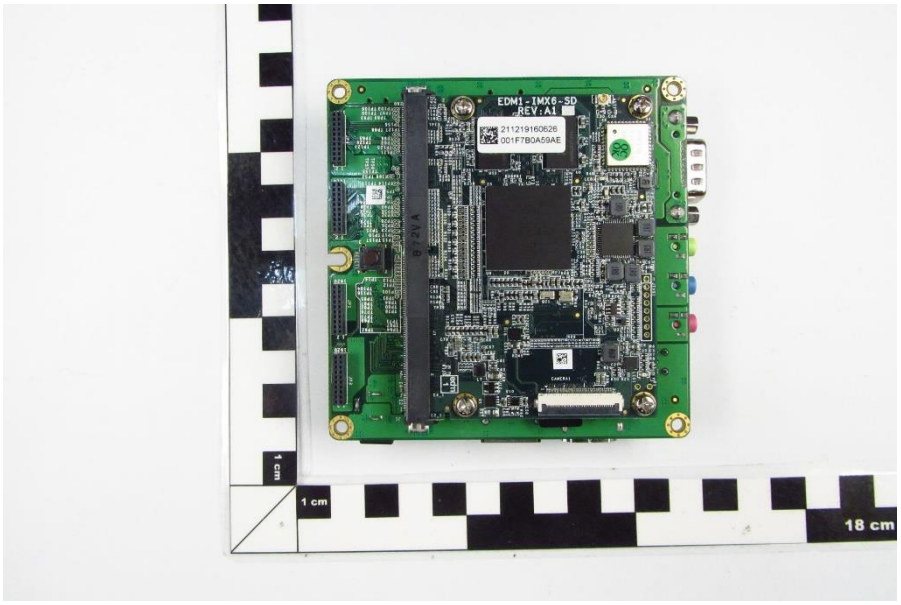
Description	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module	
Model	ENWF9408A1EF	
Additional Model(s)	None	
Brand Name(s)	PAN9028	
Serial Number(s)	Prototype	Test Sample ID 37322
Hardware Version(s)	04	
Software Version(s)	01	
PMN	1. PAN9028 2. PAN9028	
HVIN	1. ENWF9408A1EF 2. ENWF9408A2EF	
FVIN	N/A	
HMN	N/A	
FCC ID	T7V9028	
IC	216Q-9028	
Equipment type	Radio Module	
Radio type	Transceiver	
Assigned frequency bands	2400.0 MHz - 2483.5 MHz	
Radio technology	Bluetooth	
Modulation	GFSK, PI/4-DQPSK, 8-DPSK	
Number of antenna ports	1	
Antenna	Type	External
	Model	X9001091-W3DRMW
	Manufacturer	Kyocera AVX
	Gain	1.8 dBi (declared by manufacturer)
Supply Voltage	V_{NOM}	3.3 VDC
Operating Temperature	T_{NOM}	25 °C
Manufacturer	Panasonic Industrial Devices Europe GmbH Zeppelinstr. 19 21337 Lüneburg GERMANY	

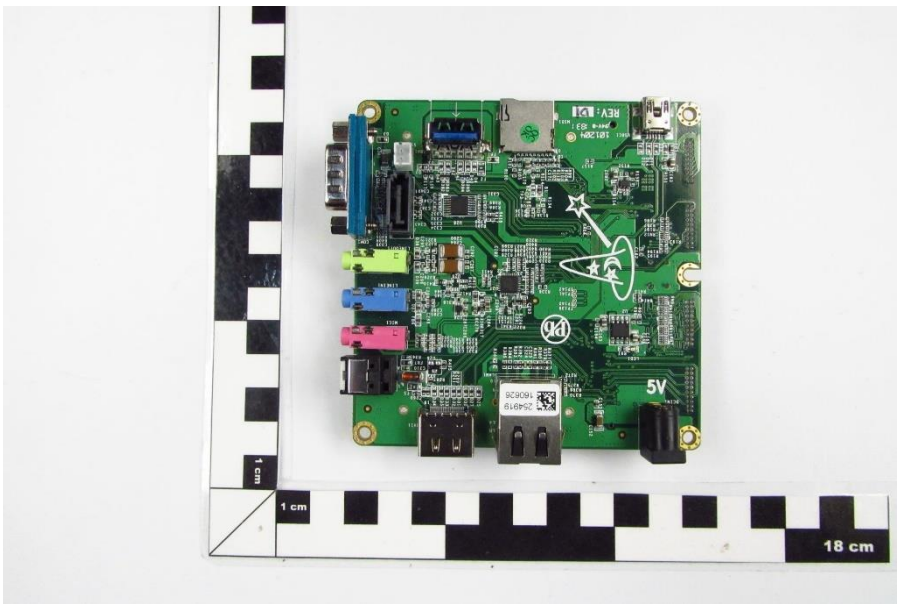
1.1 Photos – Equipment External

EUT Top View


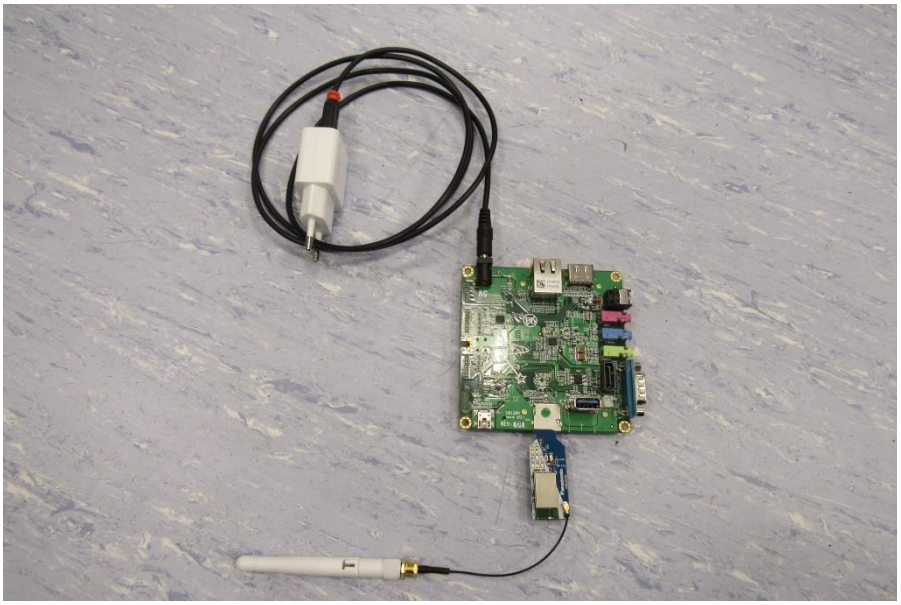
EUT Bottom View


Antenna


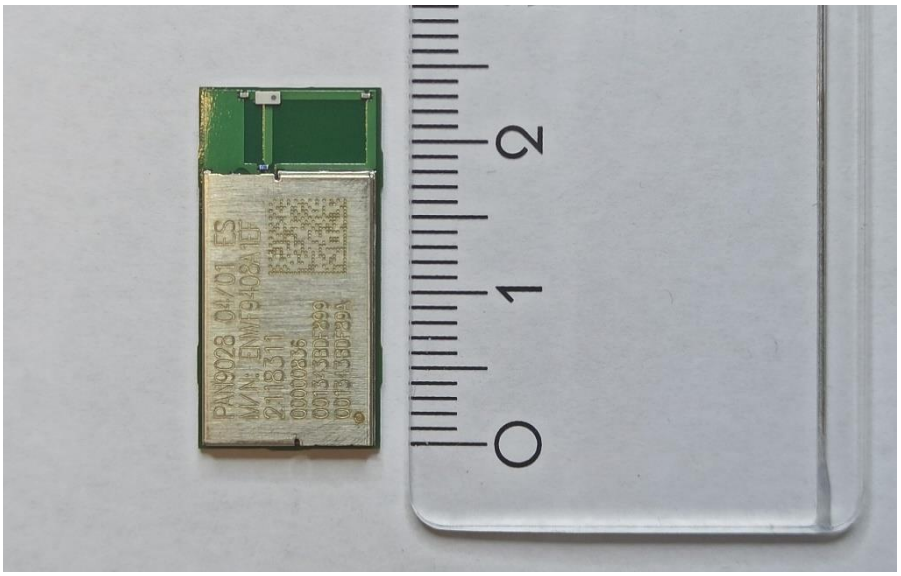
Evaluation Board Bottom View


Evaluation Board Top View


Supply cable


EUT with auxiliary equipment


1.1 Photos – Equipment Internal

ENWF9408A1EF_top_case


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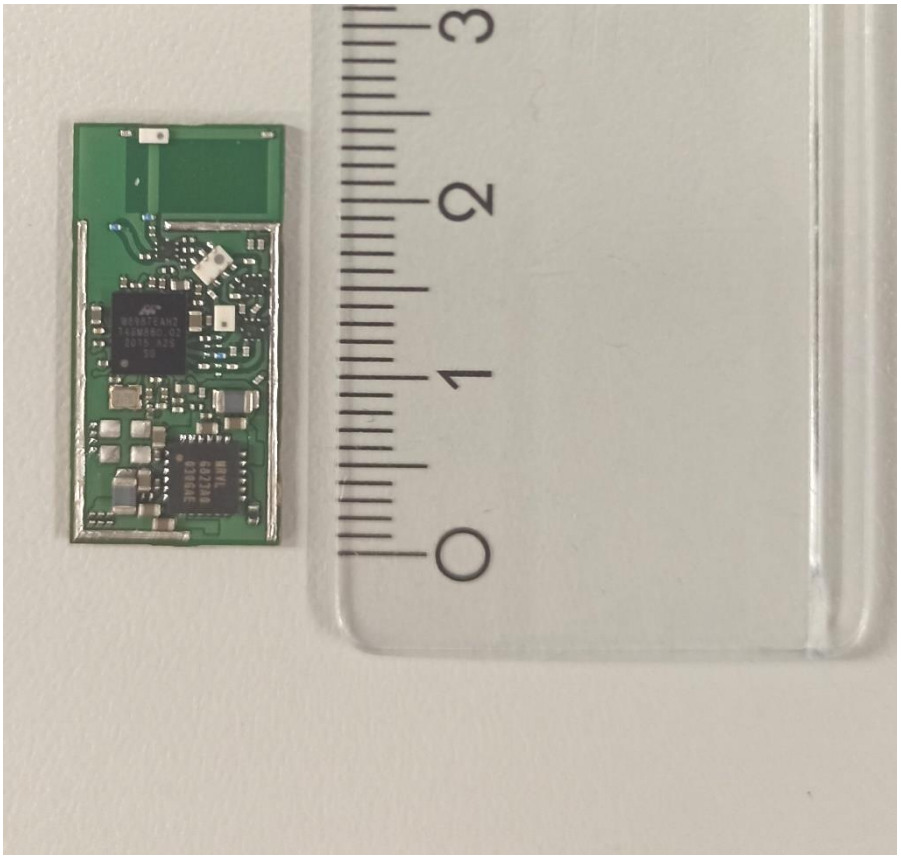
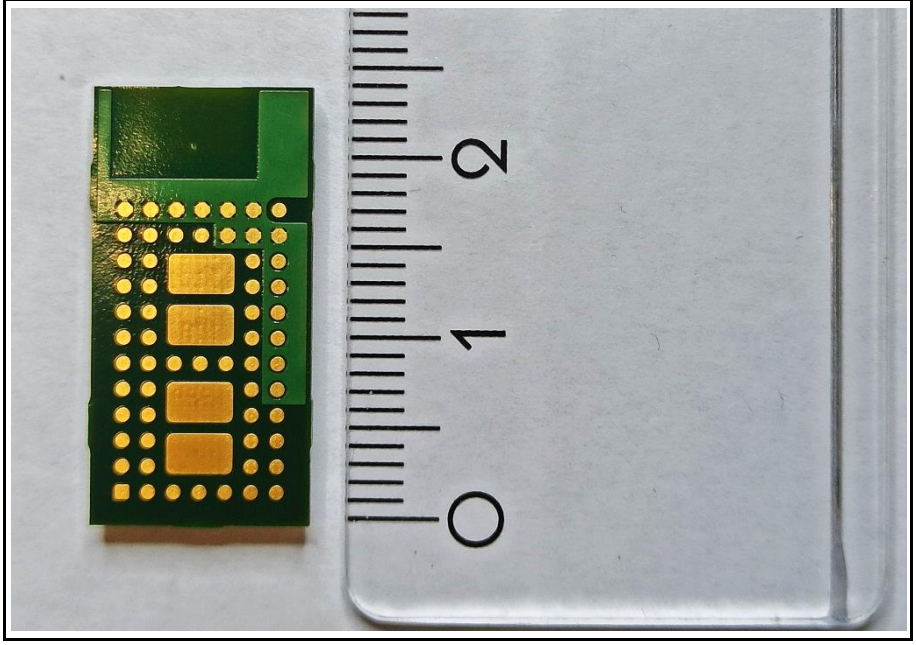


ENWF9408A1EF_back


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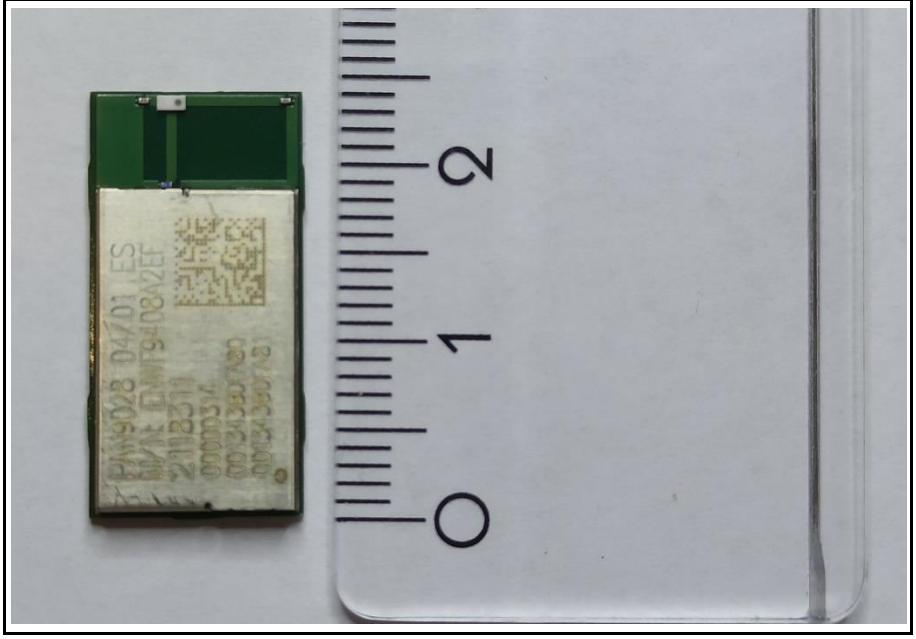

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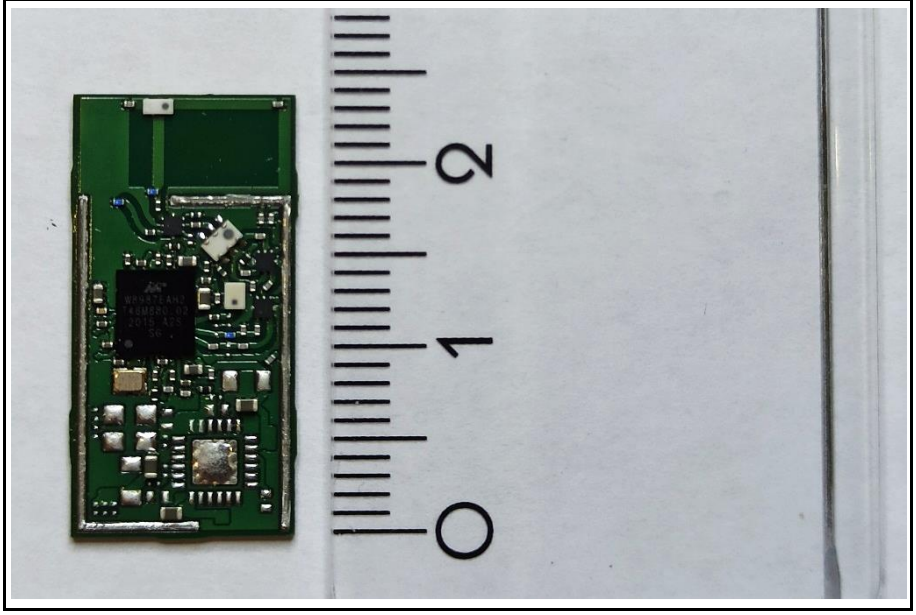
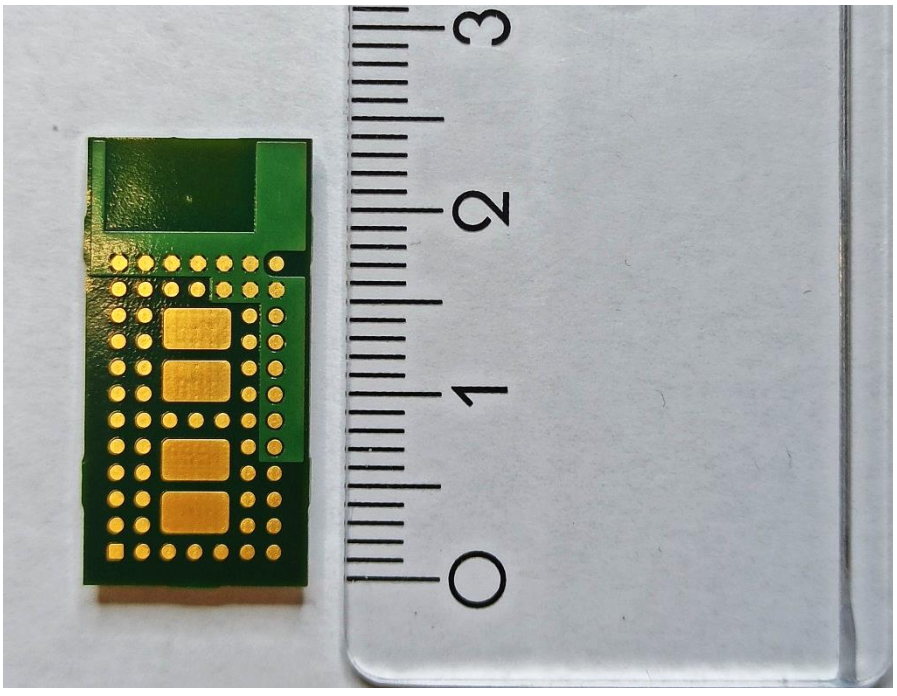


ENWF9408A2EF_back


1.2 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Controller	Wandboard	WBIMX6U	Wandboard with i.MX6 Dual Core
SFT	WLANipulator	Panasonic	-	for configuring test modes
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment:				

1.3 Test Modes

Mode	Description
DH5 Single	Mode = Transmit Modulation = GFSK Spreading = None Packet type = DH5 Duty cycle = 78%
Receive	Mode = Receive
Comment: The above settings were found as worst case during pre-tests.	

1.4 Test Frequencies

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

1.5 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 A2 (section 6.7)	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	N/T	
FCC § 15.247(a)(1)(iii) ISED RSS-247, Issue 2 (section 5.1)	Number of hopping frequencies	ANSI C63.10-2013	N/T	
FCC § 15.247(a)(1) ISED RSS-247, Issue 2 (section 5.1)	Frequency hopping channel separation	ANSI C63.10-2013	N/T	
FCC § 15.247(a)(1)(iii) ISED RSS-247, Issue 2 (section 5.1)	Time of occupancy (Dwell time)	ANSI C63.10-2013	N/T	
FCC § 15.247(b) ISED RSS-247, Issue 2 (section 5.4)	Maximum peak conducted power	ANSI C63.10-2013	N/T	
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	N/T	
FCC § 15.247(d) ISED RSS-247, Issue 2 (section 5.5)	Conducted spurious emissions	ANSI C63.10-2013	N/T	
FCC § 15.247(d) FCC § 15.209 ISED RSS-Gen, Issue 5 A2 (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 C63.4-2014	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 - AC powerline conducted emissions

3.1.1 Information

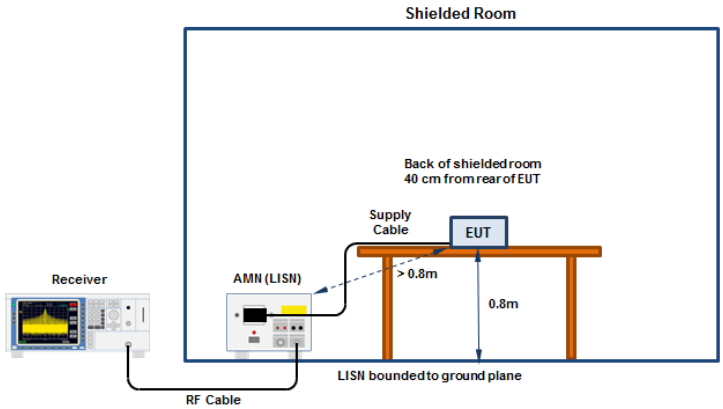
Test Information	
Reference	FCC § 15.207; ISED RSS-247, Issue 2 (section 3.1)
Measurement Method	ANSI C63.10 6.2
Measurement Uncertainty	± 3.82 dB
Operator	Odai Qawasmeh
Date	2022-03-24

3.1.2 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		

3.1.3 Setup

Test Setup



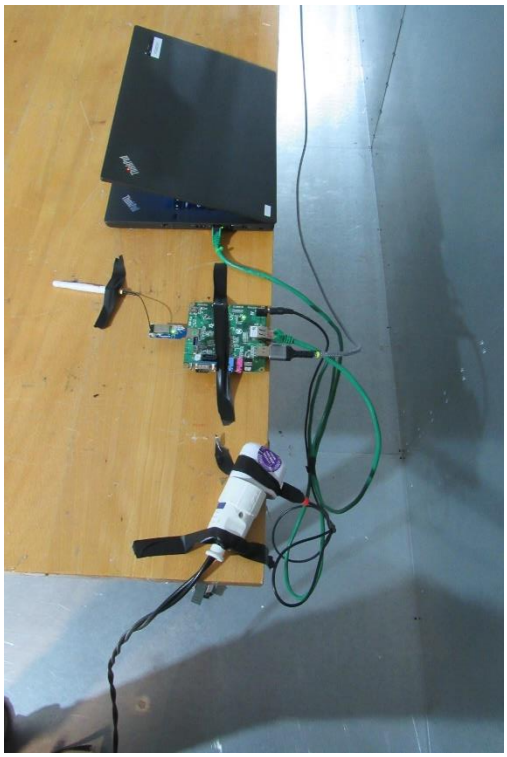
3.1.4 Equipment

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	2021-08	2022-08
Pulse Limiter	R&S	ESH3-Z2	EF01222	2021-07	2022-07
LISN	Schwarzbeck	NSLK 8127 RC	EF01592	2021-07	2022-07

3.1.5 Setup Photos

Setup for measurements 150 kHz - 30 MHz


Setup for measurements 150 kHz - 30 MHz (2)


Conducted emissions at the mains power port according to 47 CFR Part 15.247

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Test Date:	2022-03-24
Operating Conditions:	ambient temperature: 22 °Celsius power input: 3.3 VDC
LISN:	Schwarzbeck NSLK 8127 RC L
Operational Mode:	BT; DH5, ext. antenna; 2441 MHz
EUT Configuration:	
Applied to Port:	3.3 VDC via Evaluation Board (supplied with AC/DC Adapter 120 VAC / 60 Hz)

Note 1:

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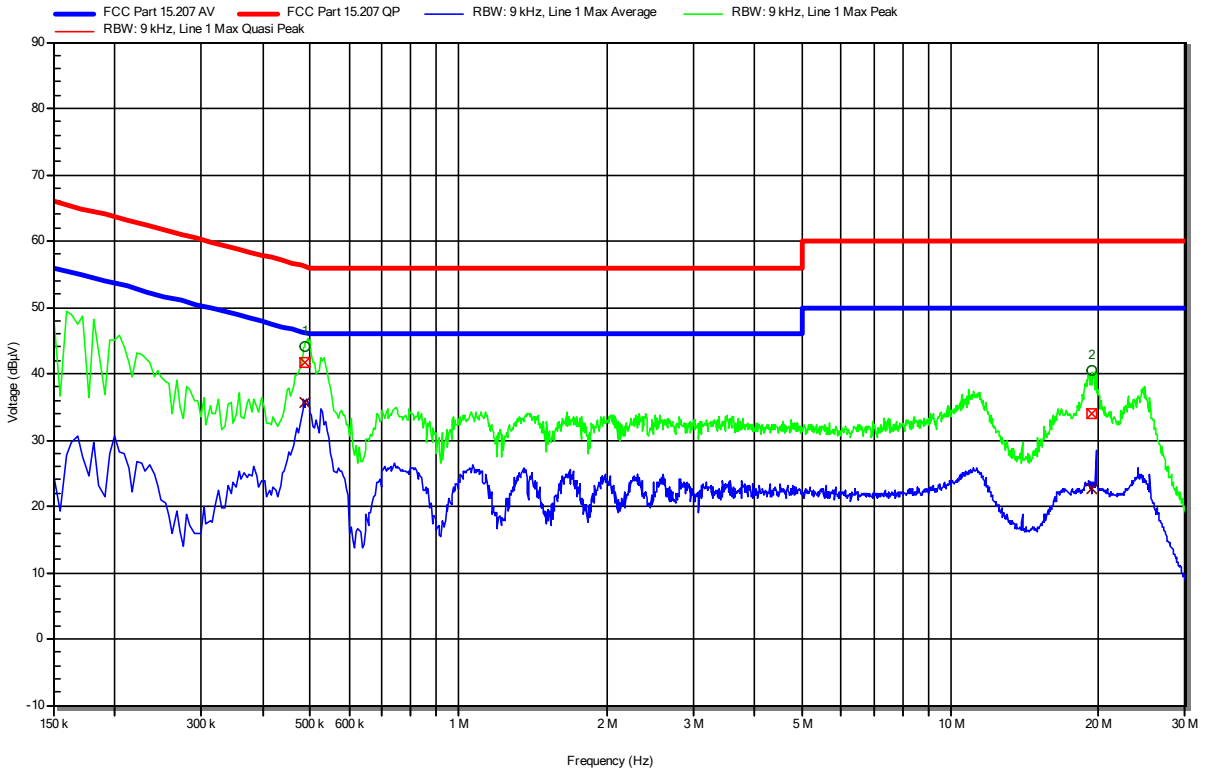
RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	487.5 kHz	41.79 dBµV	56.21 dBµV	-14.42 dB	Pass	Line 1
2	19.298 MHz	33.96 dBµV	60 dBµV	-26.04 dB	Pass	Line 1

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	487.5 kHz	35.68 dBµV	46.21 dBµV	-10.53 dB	Pass	Line 1
2	19.298 MHz	22.7 dBµV	50 dBµV	-27.3 dB	Pass	Line 1

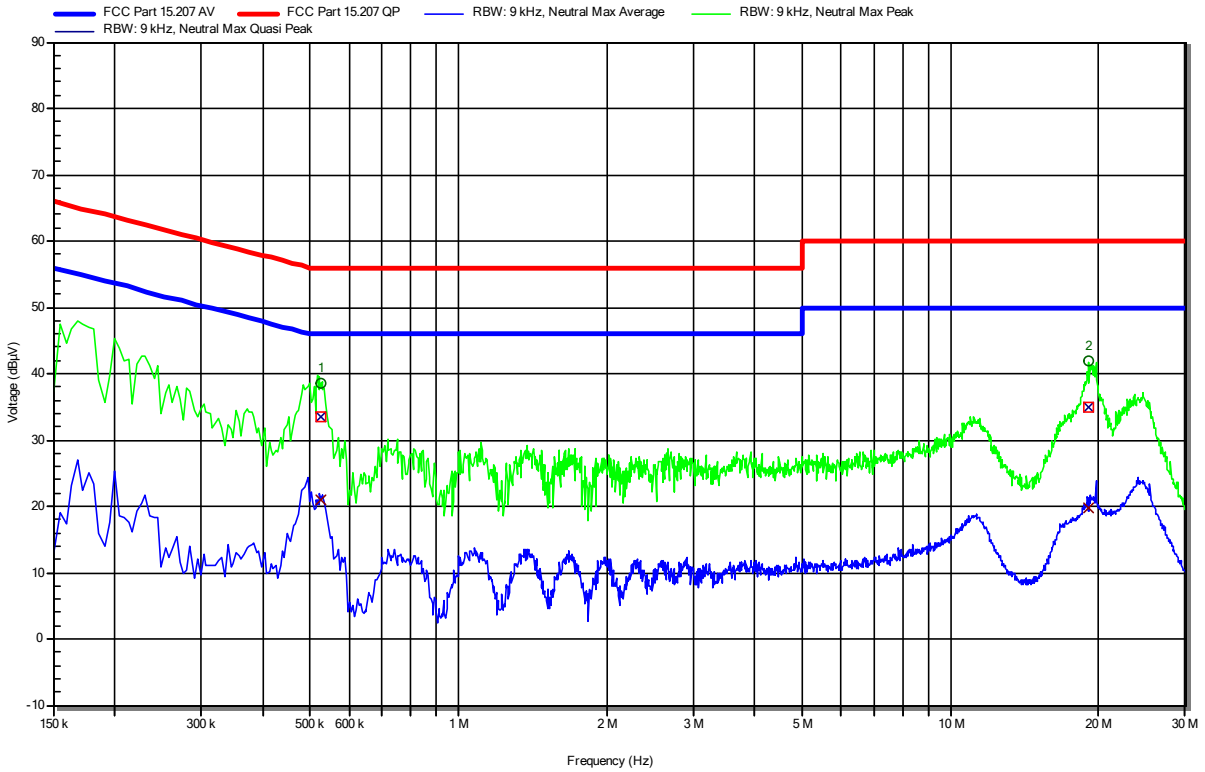
Conducted emissions at the mains power port according to 47 CFR Part 15.247

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Test Date:	2022-03-24
Operating Conditions:	ambient temperature: 22 °Celsius power input: 3.3 VDC
LISN:	Schwarzbeck NSLK 8127 RC N
Operational Mode:	BT; DH5, ext. antenna; 2441 MHz
EUT Configuration:	
Applied to Port:	3.3 VDC via Evaluation Board (supplied with AC/DC Adapter 120 VAC / 60 Hz)

Note 1:

Index 37

RadiMation



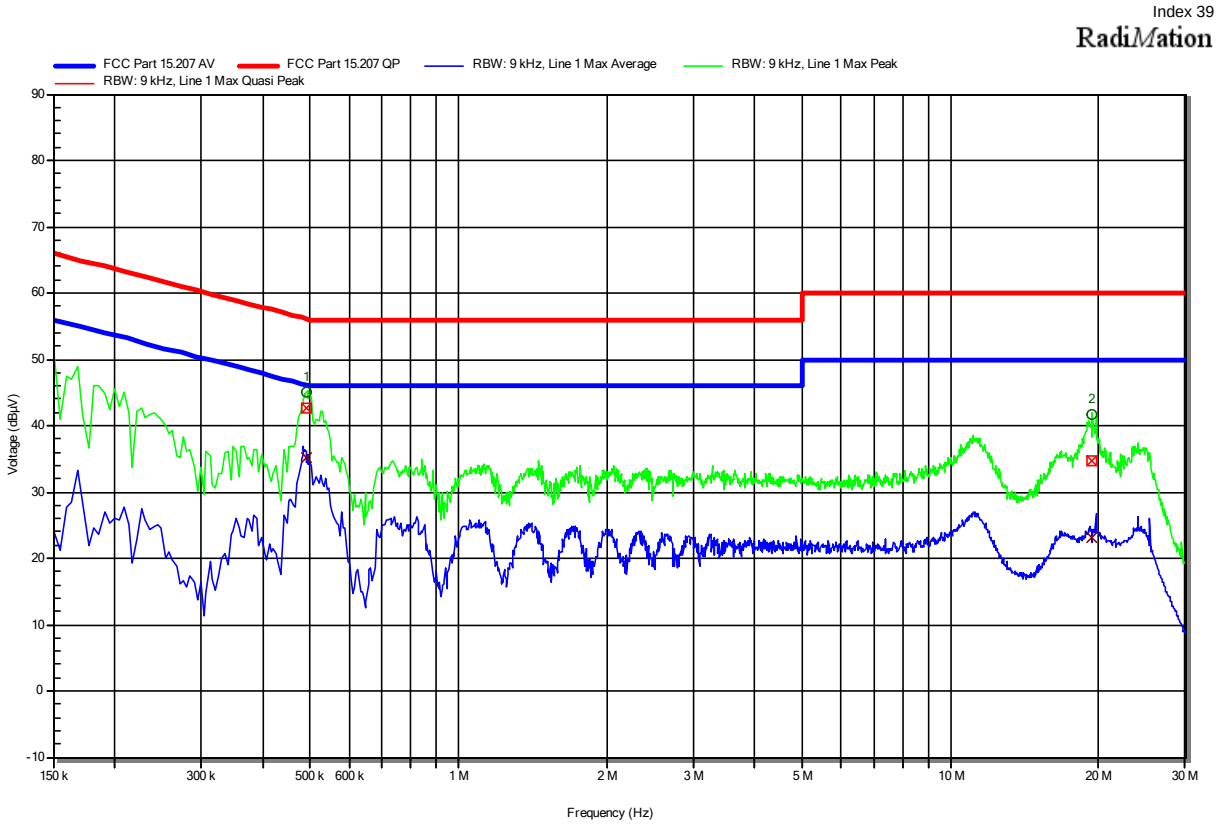
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	523.5 kHz	33.48 dBµV	56 dBµV	-22.52 dB	Pass	Neutral
2	19.109 MHz	34.82 dBµV	60 dBµV	-25.18 dB	Pass	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	523.5 kHz	20.92 dBµV	46 dBµV	-25.08 dB	Pass	Neutral
2	19.109 MHz	19.7 dBµV	50 dBµV	-30.3 dB	Pass	Neutral

Conducted emissions at the mains power port according to RSS-247, RSS-Gen

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Test Date:	2022-03-24
Operating Conditions:	ambient temperature: 20 °Celsius power input: 3.3 VDC
LISN:	Schwarzbeck NSLK 8127 RC L
Operational Mode:	BT; ext. antenna; 2441 MHz
EUT Configuration:	
Applied to Port:	3.3 VDC via Evaluation Board (supplied with AC/DC Adapter 120 VAC / 60 Hz)

Note 1:



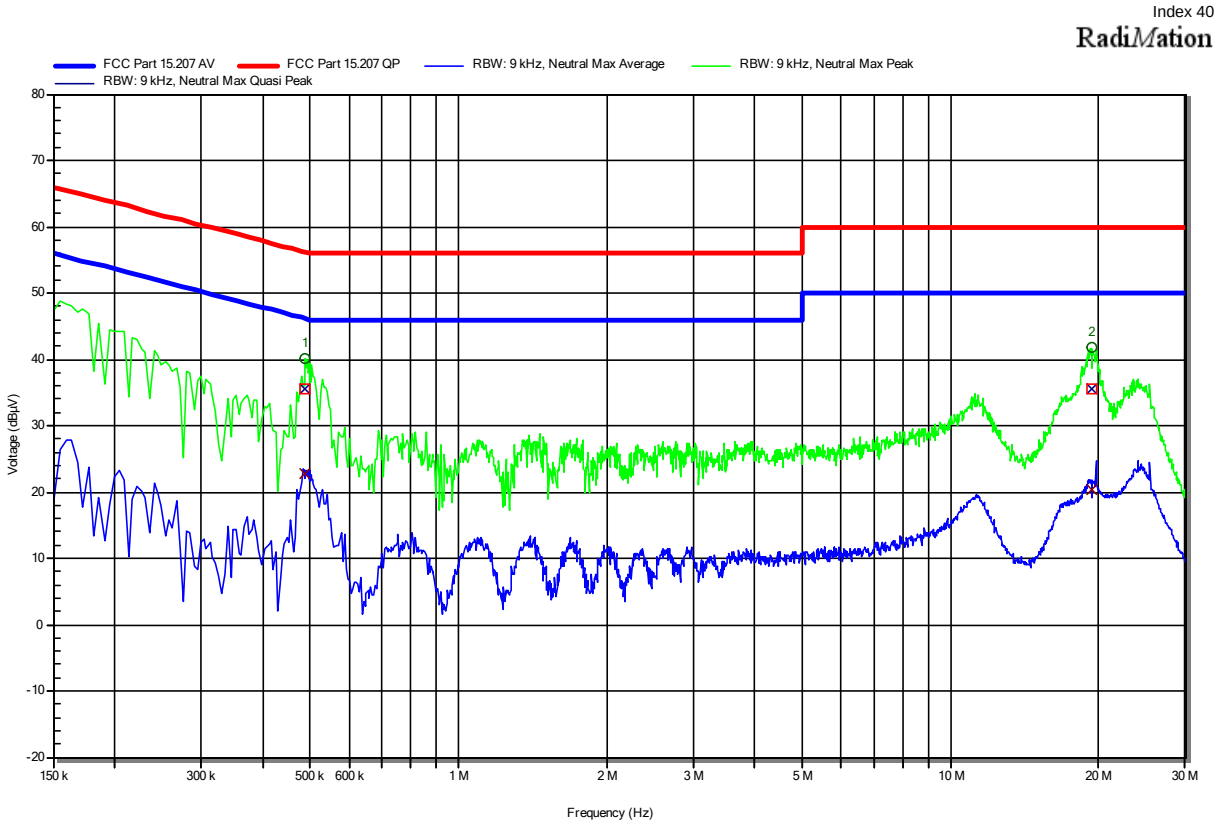
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	490.65 kHz	42.56 dBµV	56.16 dBµV	-13.6 dB	Pass	Line 1
2	19.32 MHz	34.66 dBµV	60 dBµV	-25.34 dB	Pass	Line 1

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	490.65 kHz	35.27 dBµV	46.16 dBµV	-10.89 dB	Pass	Line 1
2	19.32 MHz	23.24 dBµV	50 dBµV	-26.76 dB	Pass	Line 1

Conducted emissions at the mains power port according to RSS-247, RSS-Gen

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Test Date:	2022-03-24
Operating Conditions:	ambient temperature: 20 °Celsius power input: 3.3 VDC
LISN:	Schwarzbeck NSLK 8127 RC N
Operational Mode:	BT; ext. antenna; 2441 MHz
EUT Configuration:	
Applied to Port:	3.3 VDC via Evaluation Board (supplied with AC/DC Adapter 120 VAC / 60 Hz)

Note 1:



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	488.85 kHz	35.5 dBµV	56.19 dBµV	-20.68 dB	Pass	Neutral
2	19.32 MHz	35.57 dBµV	60 dBµV	-24.43 dB	Pass	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	488.85 kHz	22.85 dBµV	46.19 dBµV	-23.34 dB	Pass	Neutral
2	19.32 MHz	20.28 dBµV	50 dBµV	-29.72 dB	Pass	Neutral

3.2 Test Conditions and Results - Transmitter radiated emissions

3.2.1 Information

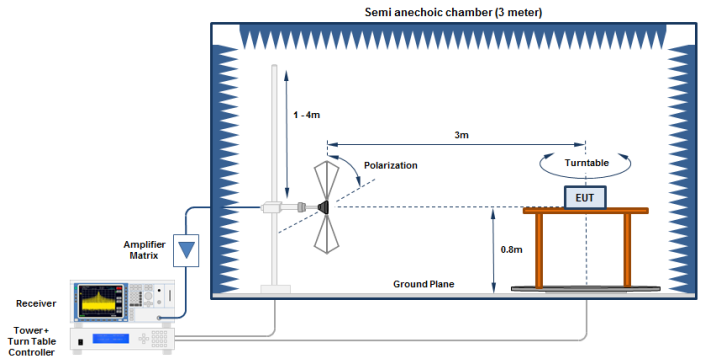
Test Information	
Reference	FCC § 15.247(d); FCC § 15.209; ISED RSS-Gen, Issue 5 A2 (section 6.13)
Measurement Uncertainty	± 5.95 dB
Measurement Method	ANSI C63.10 6.4, 6.5, 6.6
Operator	Wilfried Treffke
Date	2021-12-14

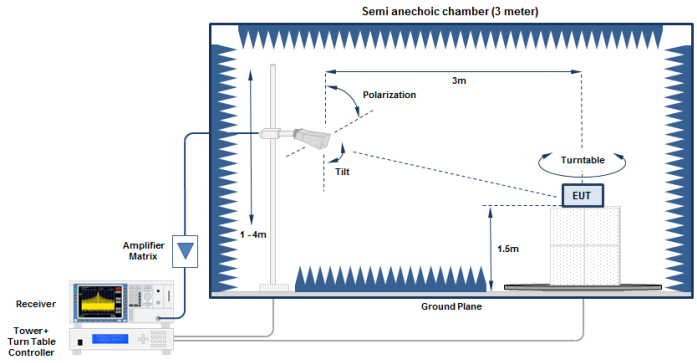
3.2.2 Limits

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

3.2.3 Setup

Test Setup 30 MHz - 1000 MHz



Test Setup > 1 GHz


3.2.4 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	AC6	EF00062	2021-07	2024-07
EMI Test Receiver	R&S	ESU26	EF00887	2021-07	2022-07
Trilog Broadband Antenna	Schwarzbeck	VULB 9162	EF00978	2019-10	2022-10

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber	Frankonia	AC 2	EF01616	2021-09	2022-09
Spectrum analyzer	R&S	FSU43	EF01631	2021-07	2022-07
Antenna	Schwarzbeck	BBHA 9120B	EF01678	2021-03	2022-03
Antenna	Schwarzbeck	HWRD 650	EF01679	2021-03	2022-03
Antenna	Amplifier Research	AT4560	EF00302	2021-06	2023-06

3.2.5 Procedure

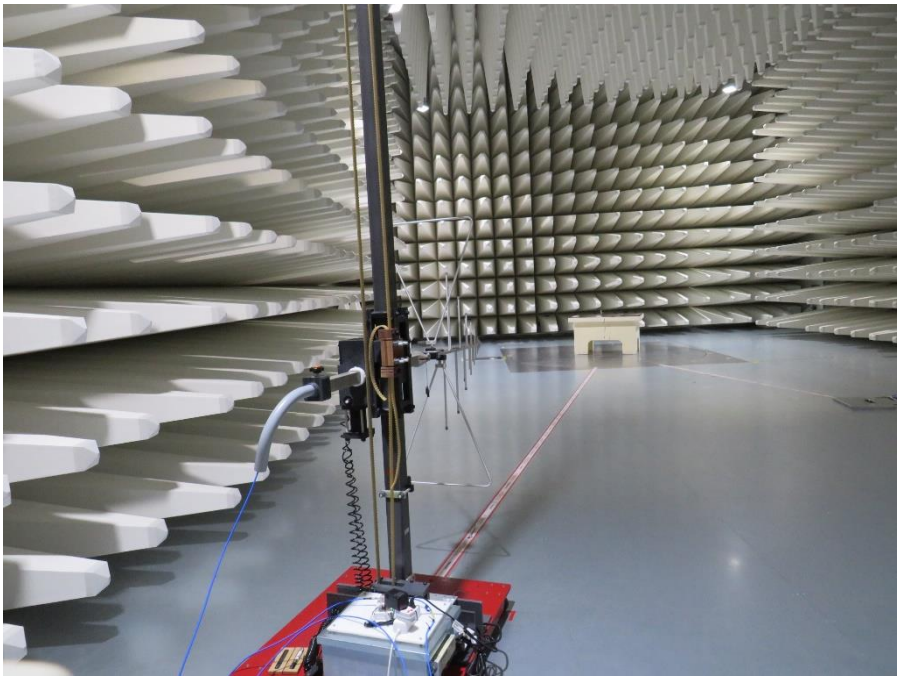
Test Procedure 30 MHz - 1000 MHz
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground 2. EUT set to test mode 3. The receiver is set to peak detection with max hold 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m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

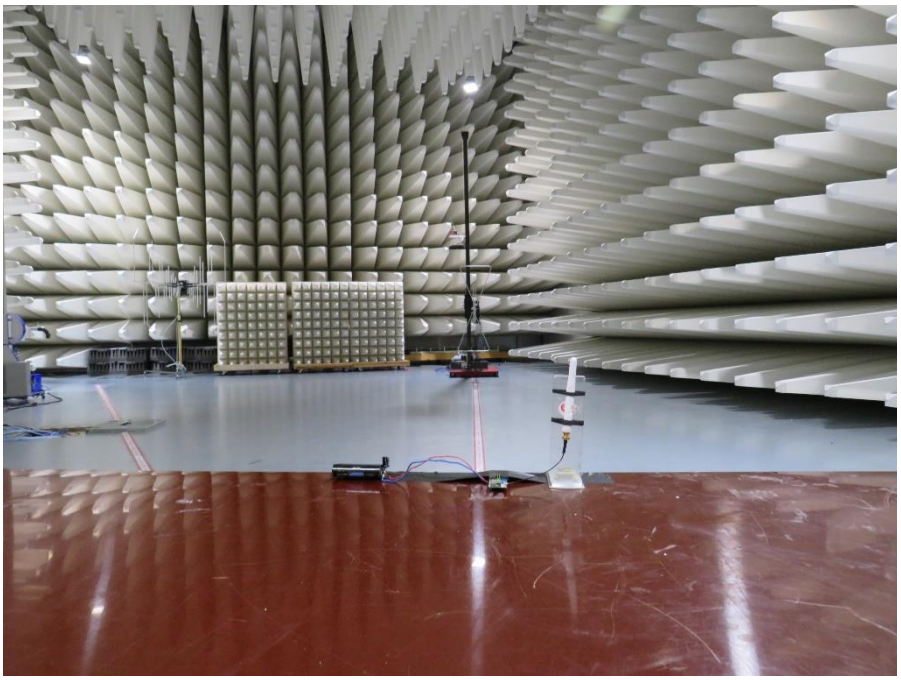
Test Procedure > 1 GHz
1. EUT is placed on a non conducting support at the center of a turn table 1.5 m above the ground 2. EUT set to test mode 3. The receiver is set to peak detection with max hold 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m 5. All significant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

3.2.6 Results

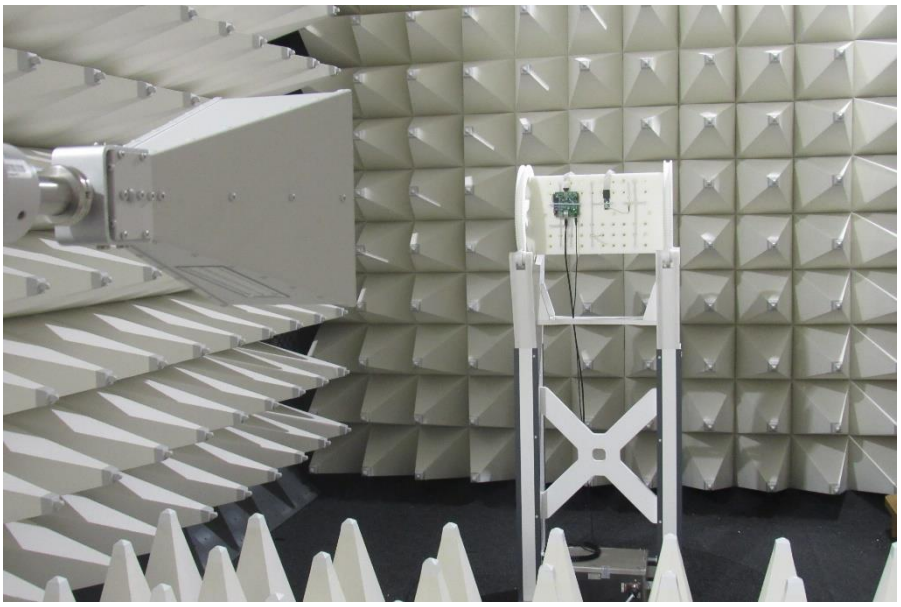
Test Results - DH5						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
2402	613.067	32.50	pk	ver	46.00	-13.50
2402	2389	57.47	pk	ver	74.00	-16.53
2402	2389	45.00	avg	ver	54.00	-09.00
2402	2498.2	46.22	pk	ver	74.00	-27.78
2402	2498.2	33.70	avg	ver	54.00	-20.30
2402	4804	44.96	pk	ver	74.00	-29.04
2402	4804	40.48	avg	ver	54.00	-13.52
2441	611.224	31.00	pk	ver	46.00	-15.00
2441	2338.6	45.37	pk	ver	74.00	-28.63
2441	2338.6	34.02	avg	ver	54.00	-19.98
2441	2341.9	45.83	pk	ver	74.00	-28.17
2441	2341.9	34.52	avg	ver	54.00	-19.48
2480	611.256	31.90	pk	ver	46.00	-14.10
2480	2375	45.29	pk	ver	74.00	-28.71
2480	2375	36.91	avg	ver	54.00	-17.09
2480	2378.4	45.02	pk	ver	74.00	-28.98
2480	2378.4	36.38	avg	ver	54.00	-17.62
2480	2483.5	46.57	pk	ver	74.00	-27.43
2480	2483.5	37.53	avg	ver	54.00	-16.47
2480	2483.7	58.08	pk	ver	74.00	-15.92
2480	2483.7	45.38	avg	ver	54.00	-08.62

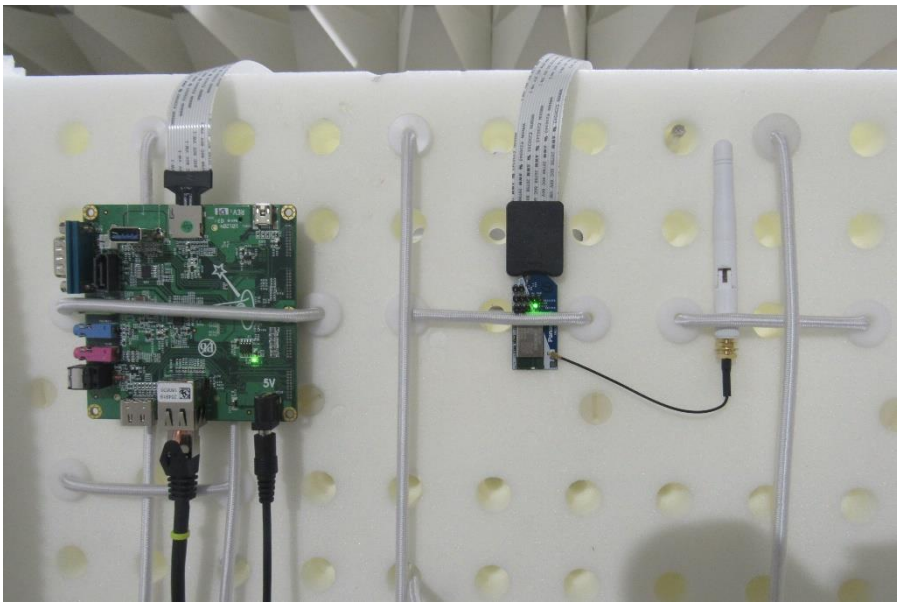
3.2.7 Setup Photos

Setup for measurements below 1 GHz


Setup for measurements below 1 GHz


Test Setup


Setup for measurement above 1 GHz


Test Setup


3.3 Test Conditions and Results - Receiver radiated emissions

3.3.1 Information

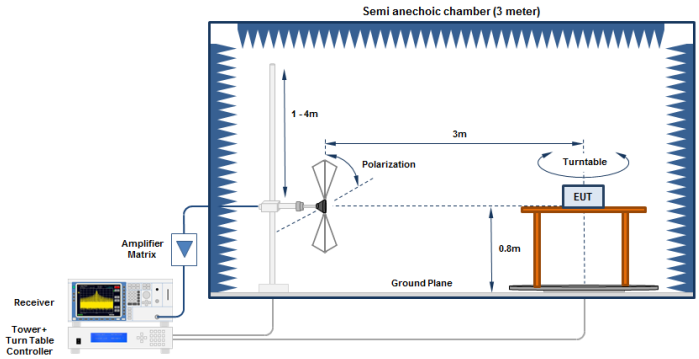
Test Information	
Reference	ISED RSS-247, Issue 2 (section 3.1)
Measurement Uncertainty	± 5.95 dB
Measurement Method	ANSI C63.4-2014 8.1-8.3
Operator	Odai Qawasmeh
Date	2022-03-17

3.3.2 Limits

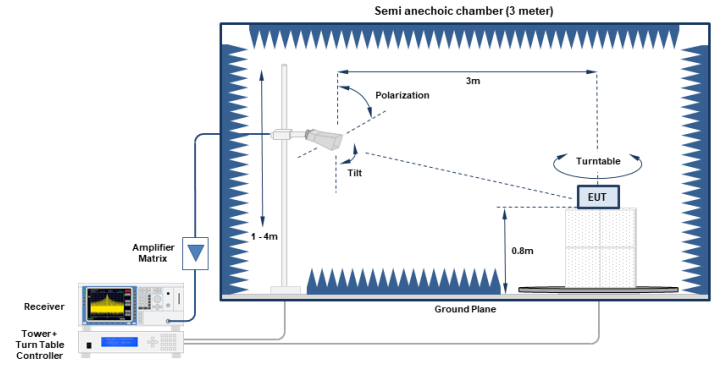
Limits			
Frequency range [MHz]	Detector	Field strength [µV/m]	Measurement distance [m]
30 - 88	Quasi-Peak	100	3
88 - 216	Quasi-Peak	150	3
216 - 960	Quasi-Peak	200	3
960 - 1000	Quasi-Peak	500	3
>1000	Average	500	3

3.3.3 Setup

Test Setup 30 MHz - 1000 MHz



Test Setup > 1 GHz



3.3.4 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	AC6	EF00062	2021-02	2024-02
EMI Test Receiver	R&S	ESU26	EF00887	2021-07	2022-07
Trilog Broadband Antenna	Schwarzbeck	VULB 9162	EF00978	2019-10	2022-10

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2021-02	2024-02
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2021-07	2022-07
Horn antenna	Schwarzbeck	BBHA 9120B	EF01678	2021-03	2022-03
Horn Antenna	Schwarzbeck	HWRD 650	EF01679	2021-03	2022-03

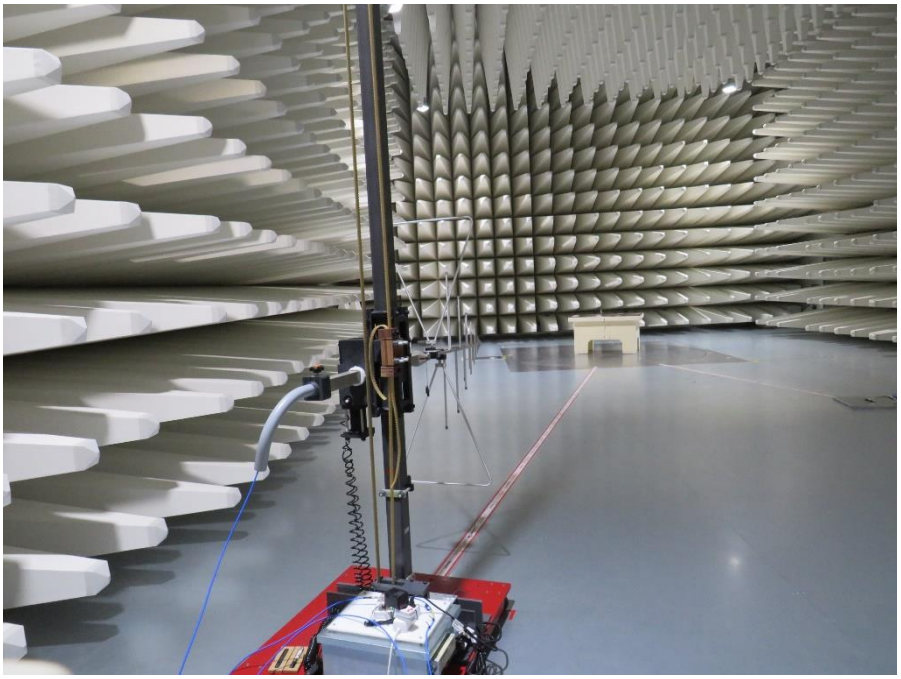
3.3.5 Procedure

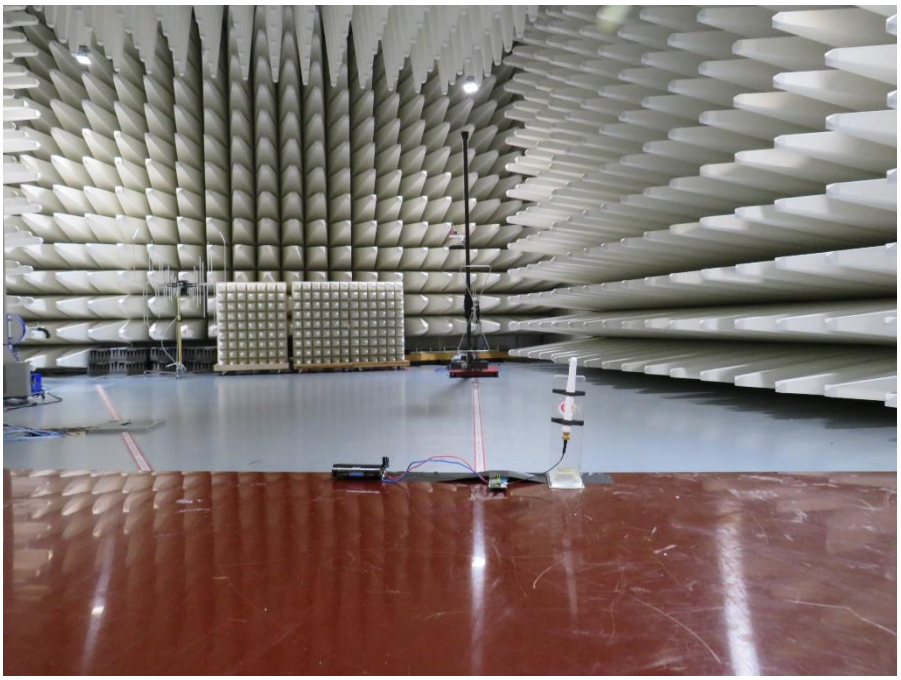
Test Procedure
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground
2. EUT is set to test mode
3. The receiver is set to peak detection with max hold
4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m
5. All significant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

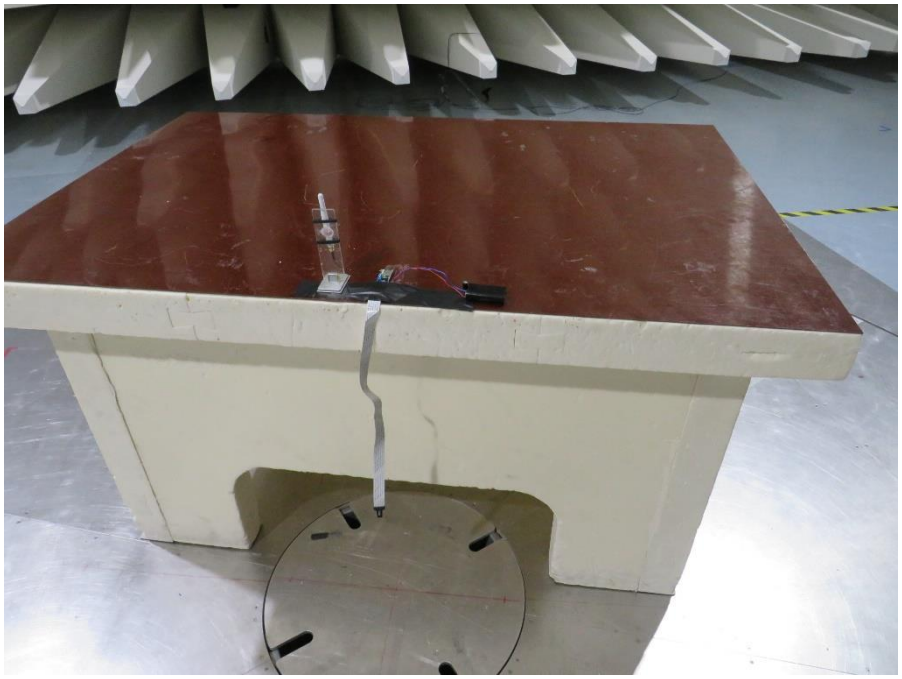
3.3.6 Results

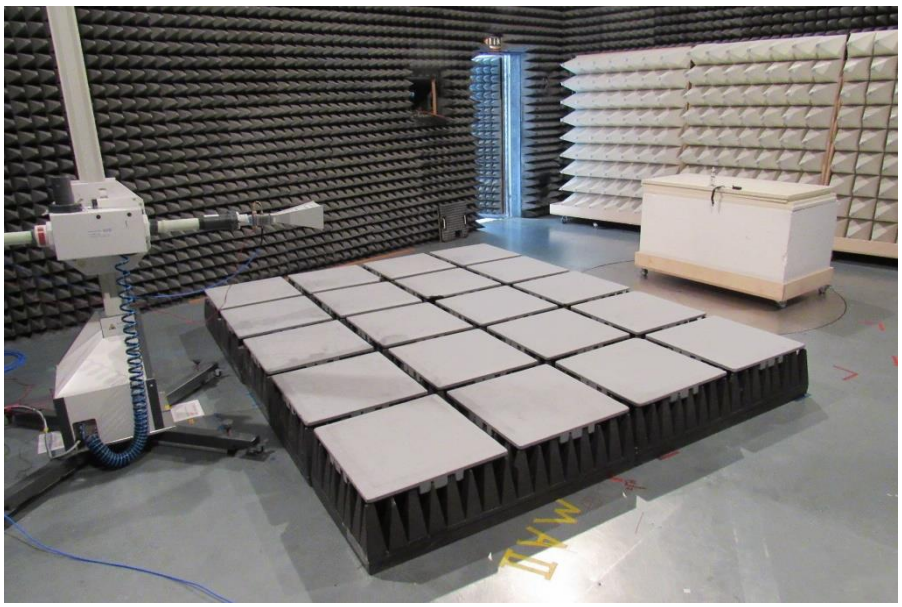
Test Results						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
2441	853.983	38.00	ver	ver	46.00	-08.00
2441	6261	48.41	ver	ver	74.00	-25.59
2441	6261	39.66	ver	ver	53.98	-14.32
2441	16394	47.41	ver	ver	74.00	-26.59
2441	16394	38.33	ver	ver	53.98	-15.65

3.3.7 Setup Photos

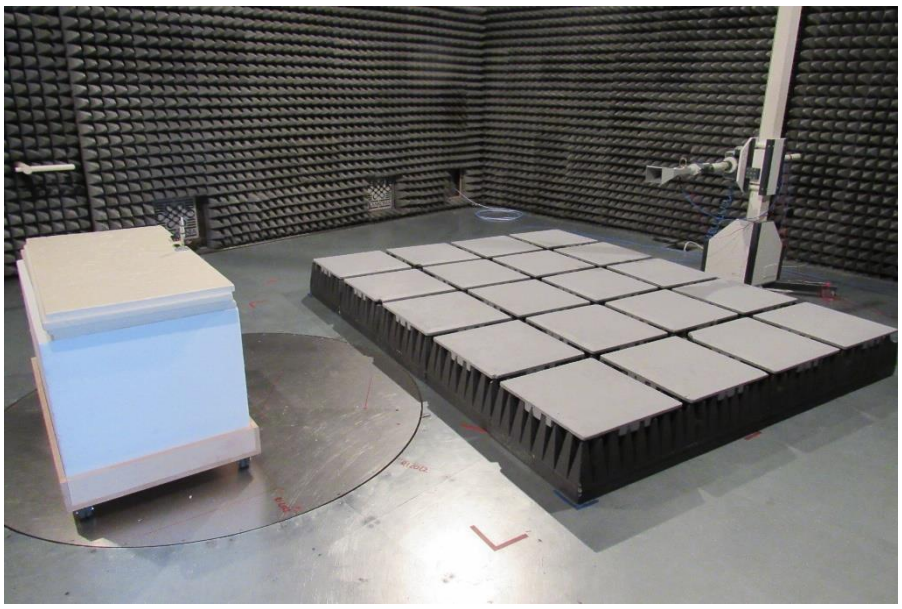
Setup for measurements below 1 GHz


Setup for measurements below 1 GHz


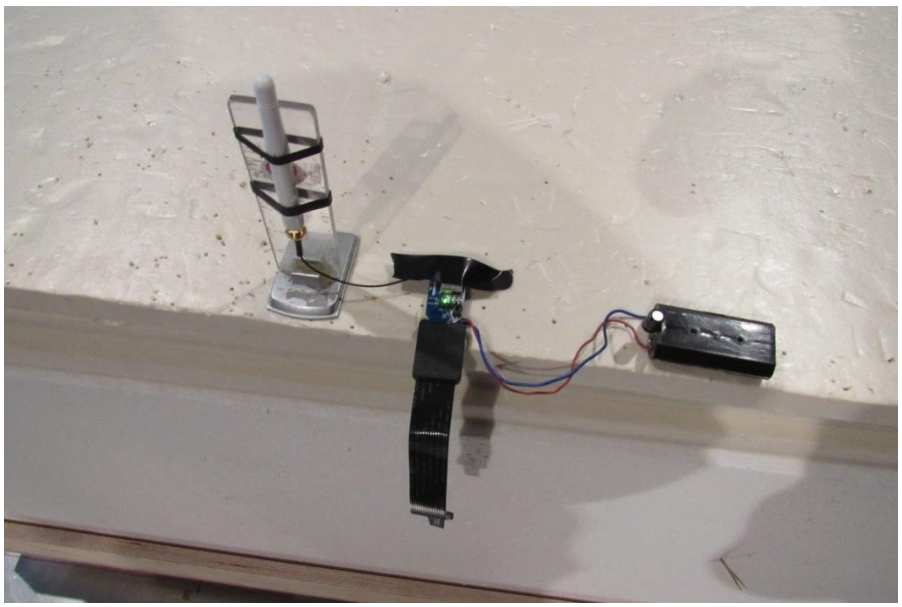
Test Setup


Setup for measurements above 1 GHz


Setup for measurements above 1 GHz



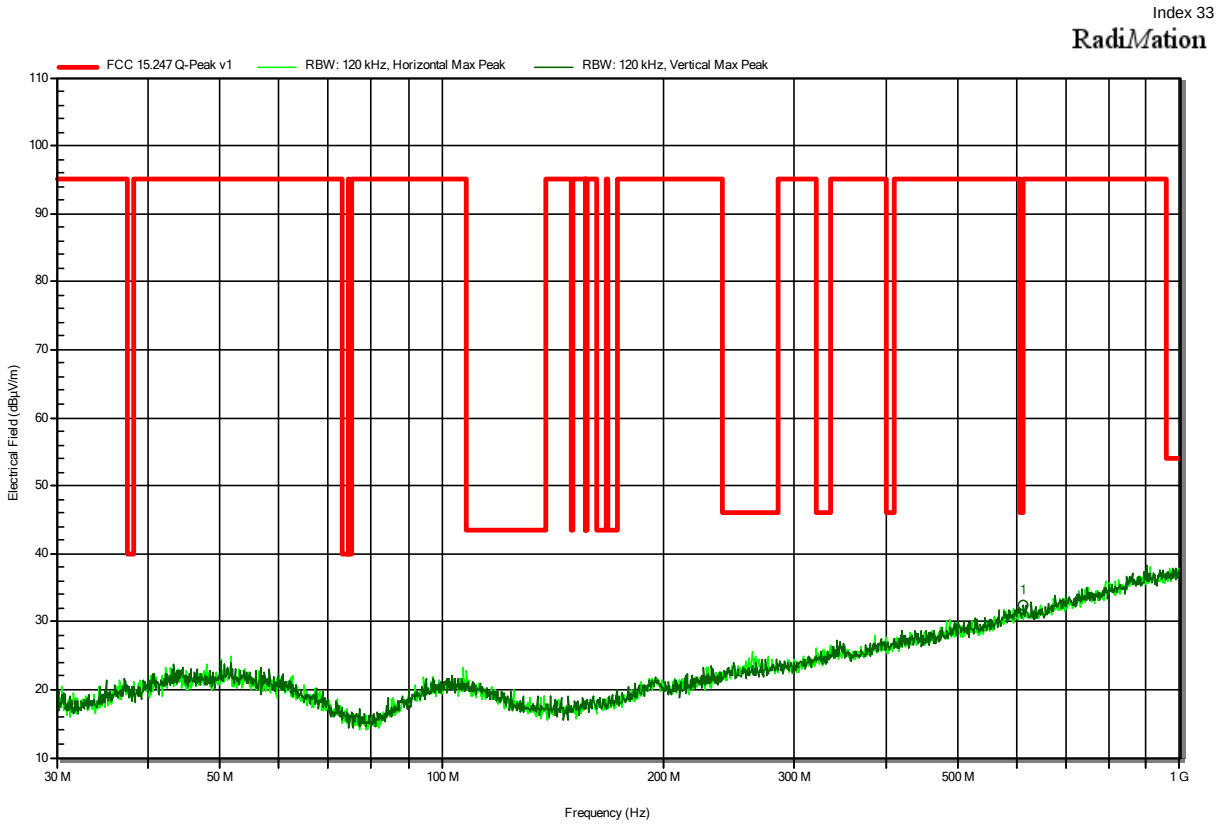
Test Setup



ANNEX A Transmitter spurious emissions

Radiated Spurious Emissions according to 47 CFR Part 15.247

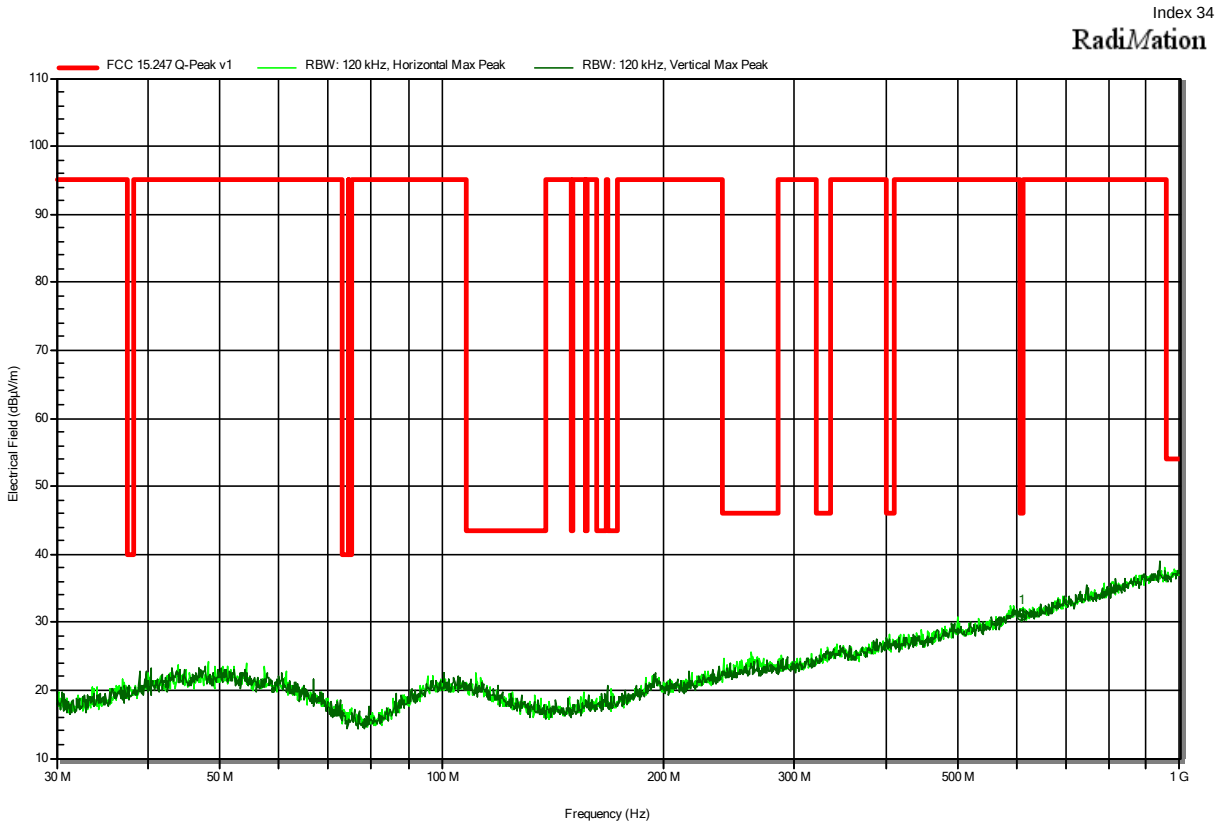
Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.3 VDC
Antenna:	Schwarzbeck VULB 9162
Measurement distance:	3 m
Mode:	Tx; BT; DH5, ext. antenna; 2402 MHz
Test Date:	2022-03-17
Note:	



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
613.067 MHz	32.5 dBµV/m	46 dBµV/m	-13.5 dB	Pass	Vertical

Radiated Spurious Emissions according to 47 CFR Part 15.247

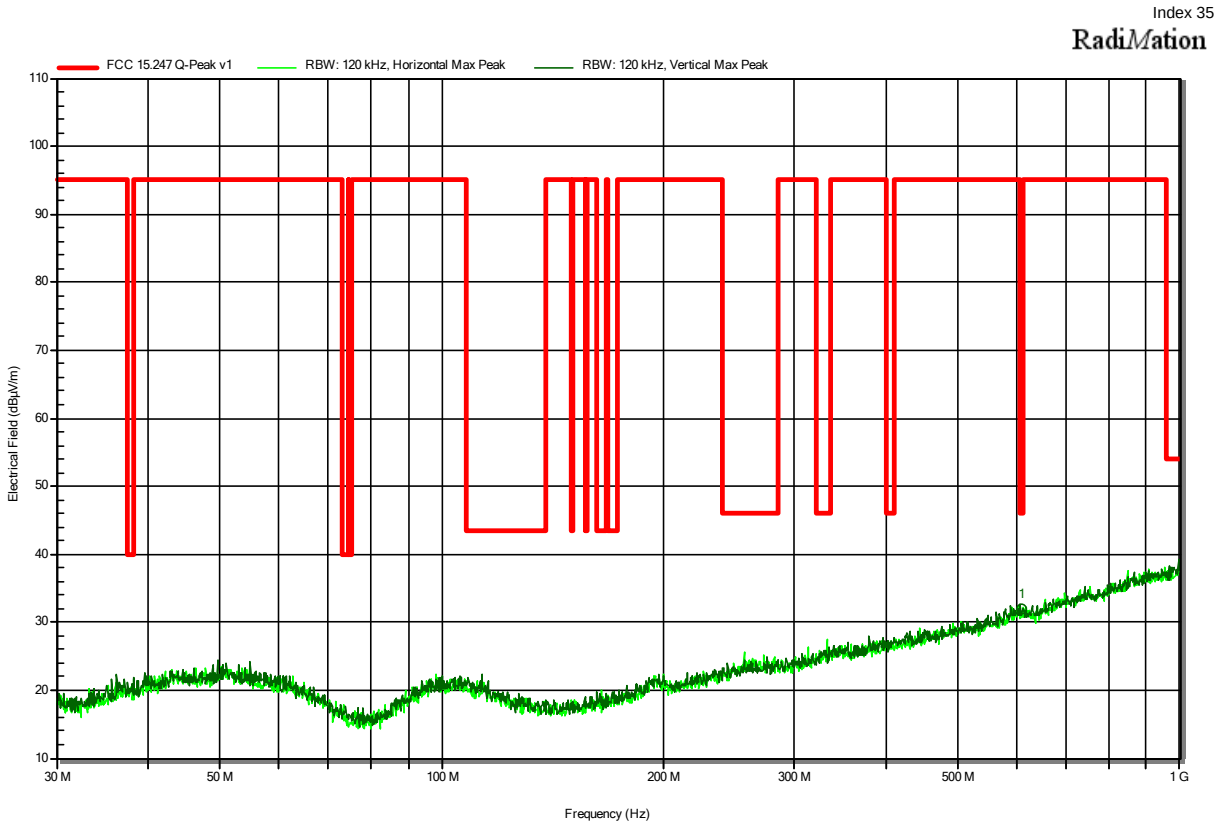
Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.3 VDC
Antenna:	Schwarzbeck VULB 9162
Measurement distance:	3 m
Mode:	Tx; BT; DH5, ext. antenna; 2441 MHz
Test Date:	2022-03-17
Note:	



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
611.224 MHz	31 dBµV/m	46 dBµV/m	-15.0 dB	Pass	Vertical

Radiated Spurious Emissions according to 47 CFR Part 15.247

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.3 VDC
Antenna:	Schwarzbeck VULB 9162
Measurement distance:	3 m
Mode:	Tx; BT; DH5, ext. antenna; 2480 MHz
Test Date:	2022-03-17
Note:	



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
611.256 MHz	31.9 dBµV/m	46 dBµV/m	-14.1 dB	Pass	Horizontal

Radiated Spurious Emissions according to 47 CFR Part 15.247

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120B
Measurement distance:	3 m
Mode:	Tx; BT; DH5, ext. antenna; 2402 MHz
Test Date:	2021-12-14
Note:	

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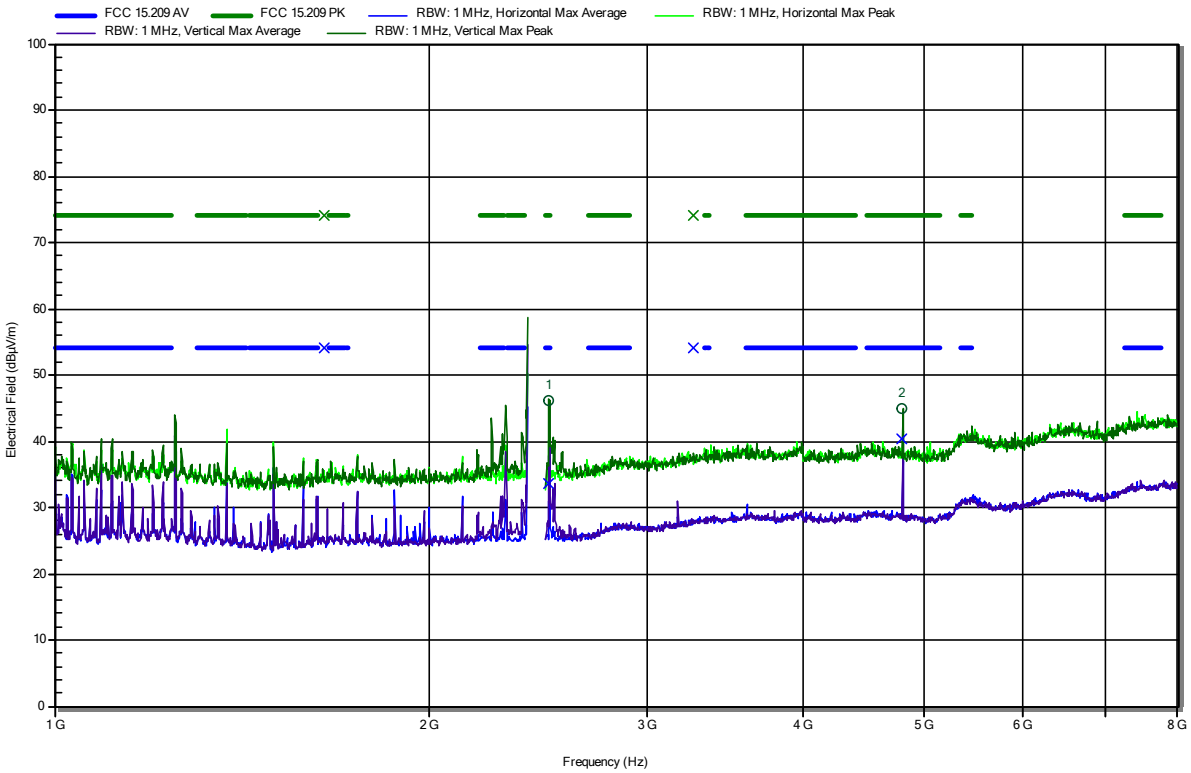
RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
2.4982 GHz	46.22 dBµV/m	74 dBµV/m	-27.78 dB	Pass	Vertical
4.804 GHz	44.96 dBµV/m	74 dBµV/m	-29.04 dB	Pass	Vertical

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
2.4982 GHz	33.7 dBµV/m	54 dBµV/m	-20.3 dB	Pass	Vertical
4.804 GHz	40.48 dBµV/m	54 dBµV/m	-13.52 dB	Pass	Vertical

Radiated Spurious Emissions according to 47 CFR Part 15.247

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120B
Measurement distance:	3 m
Mode:	Tx; BT; DH5, ext. antenna; 2441 MHz
Test Date:	2021-12-14
Note:	

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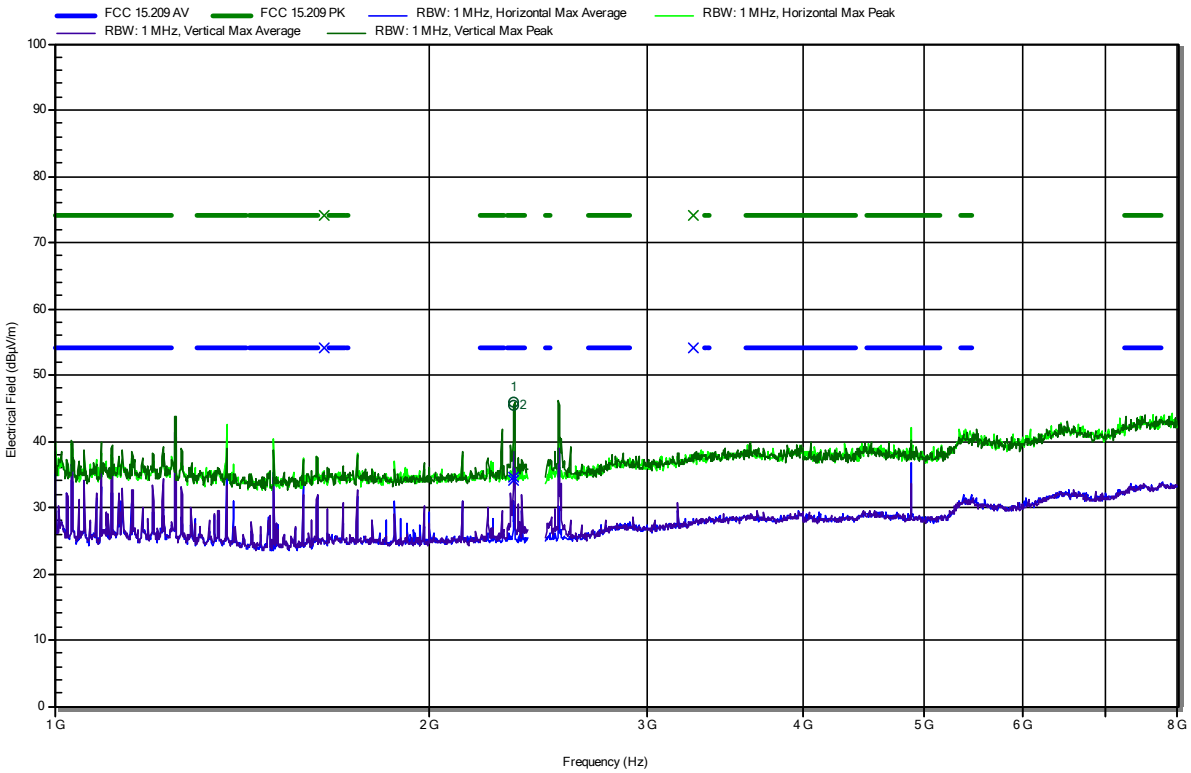
RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
2.3386 GHz	45.37 dBµV/m	74 dBµV/m	-28.63 dB	Pass	Vertical
2.3419 GHz	45.83 dBµV/m	74 dBµV/m	-28.17 dB	Pass	Vertical

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
2.3386 GHz	34.02 dBµV/m	54 dBµV/m	-19.98 dB	Pass	Vertical
2.3419 GHz	34.52 dBµV/m	54 dBµV/m	-19.48 dB	Pass	Vertical

Radiated Spurious Emissions according to 47 CFR Part 15.247

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120B
Measurement distance:	3 m
Mode:	Tx; BT; DH5, ext. antenna; 2480 MHz
Test Date:	2021-12-14
Note:	

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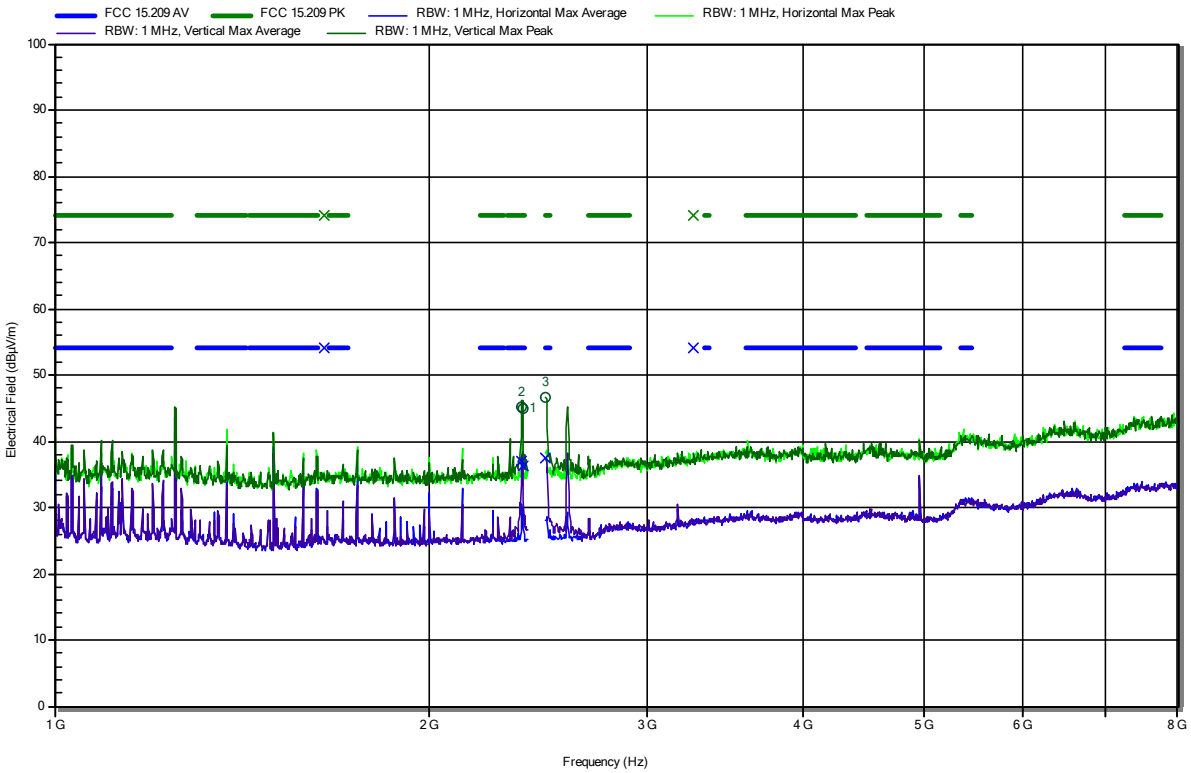
RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
2.375 GHz	45.29 dBµV/m	74 dBµV/m	-28.71 dB	Pass	Vertical
2.3784 GHz	45.02 dBµV/m	74 dBµV/m	-28.98 dB	Pass	Vertical
2.4835 GHz	46.57 dBµV/m	74 dBµV/m	-27.43 dB	Pass	Vertical

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
2.375 GHz	36.91 dBµV/m	54 dBµV/m	-17.09 dB	Pass	Vertical
2.3784 GHz	36.38 dBµV/m	54 dBµV/m	-17.62 dB	Pass	Vertical
2.4835 GHz	37.53 dBµV/m	54 dBµV/m	-16.47 dB	Pass	Vertical

Radiated Spurious Emissions according to 47 CFR Part 15.247

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120B
Measurement distance:	3 m
Mode:	Tx; BT; DH5, ext. antenna; 2402 MHz
Test Date:	2021-12-14
Note:	lower bandedge

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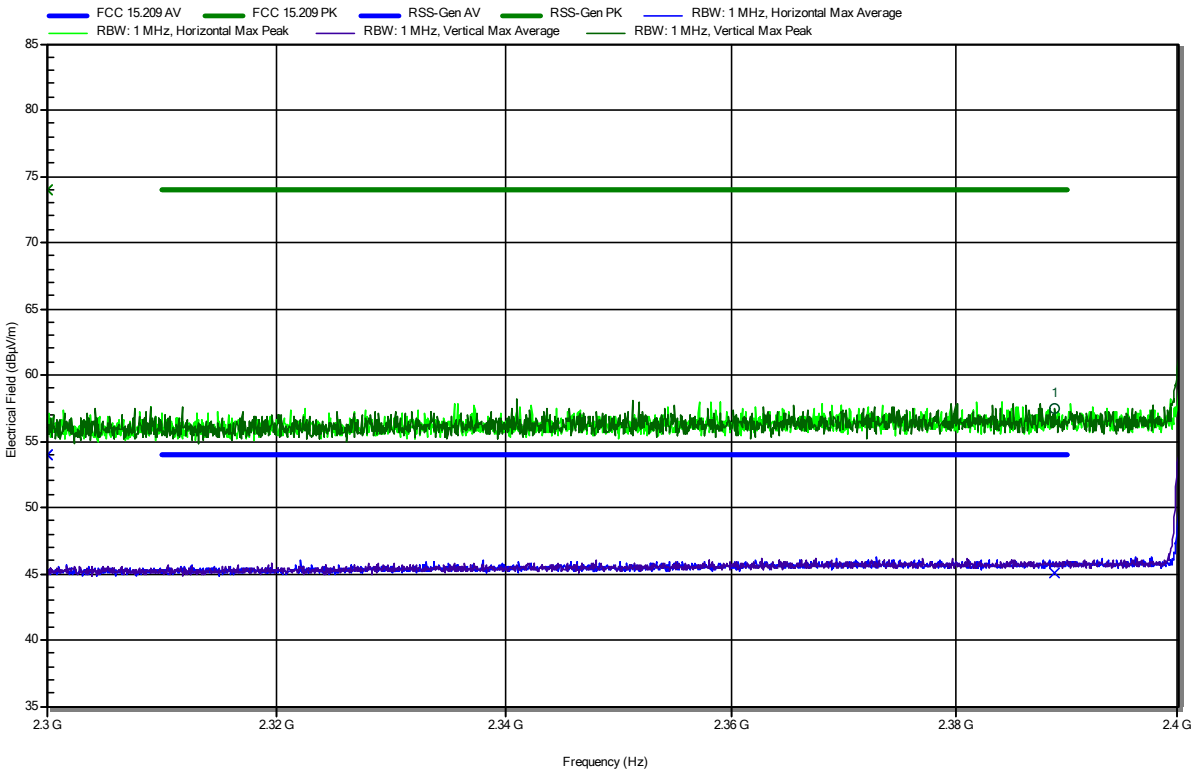
RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
2.389 GHz	57.47 dBµV/m	74 dBµV/m	-16.53 dB	Pass	Vertical

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
2.389 GHz	45 dBµV/m	54 dBµV/m	-9 dB	Pass	Vertical

Radiated Spurious Emissions according to 47 CFR Part 15.247

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120B
Measurement distance:	3 m
Mode:	Tx; BT; DH5, ext. antenna; 2480 MHz
Test Date:	2021-12-14
Note:	upper bandedge

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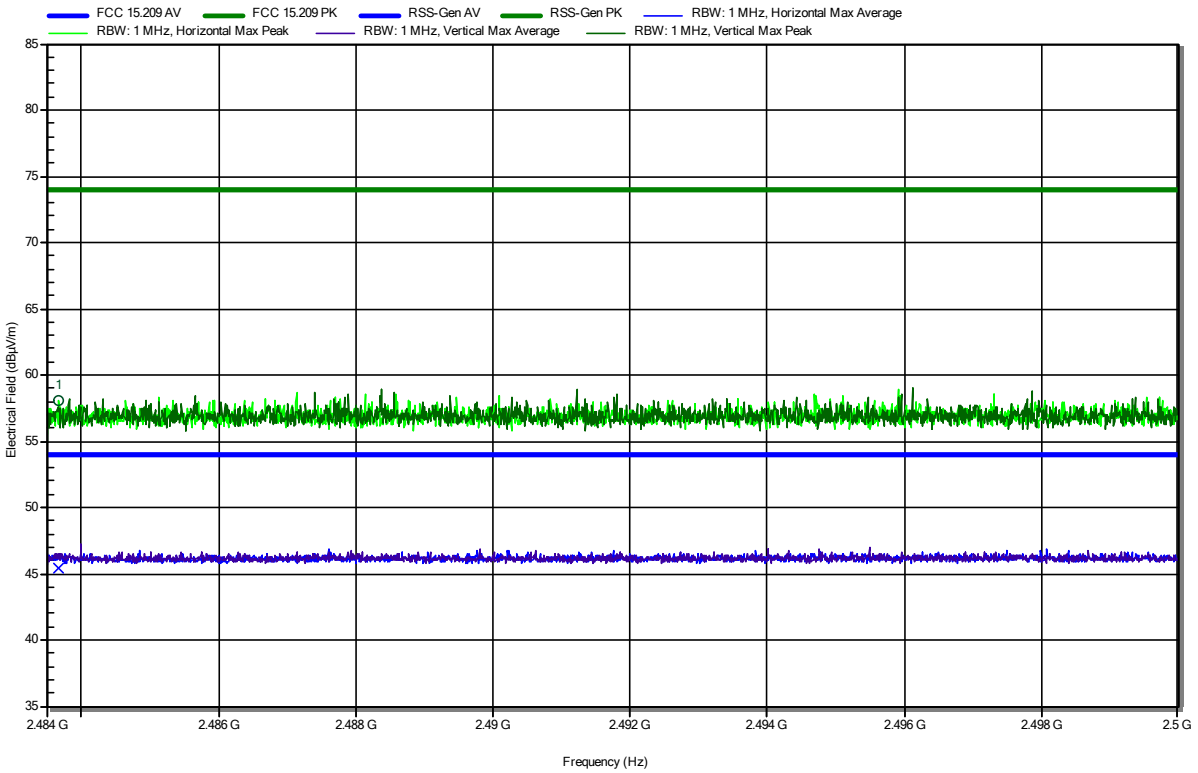
RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
2.4837 GHz	58.08 dBµV/m	74 dBµV/m	-15.92 dB	Pass	Horizontal

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
2.4837 GHz	45.38 dBµV/m	54 dBµV/m	-8.62 dB	Pass	Horizontal

Radiated Spurious Emissions according to 47 CFR Part 15.247

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.3 VDC
Antenna:	Schwarzbeck HWRD 650
Measurement distance:	3 m
Mode:	Tx; BT; DH5, ext. antenna; 2402 MHz
Test Date:	2021-12-14
Note:	

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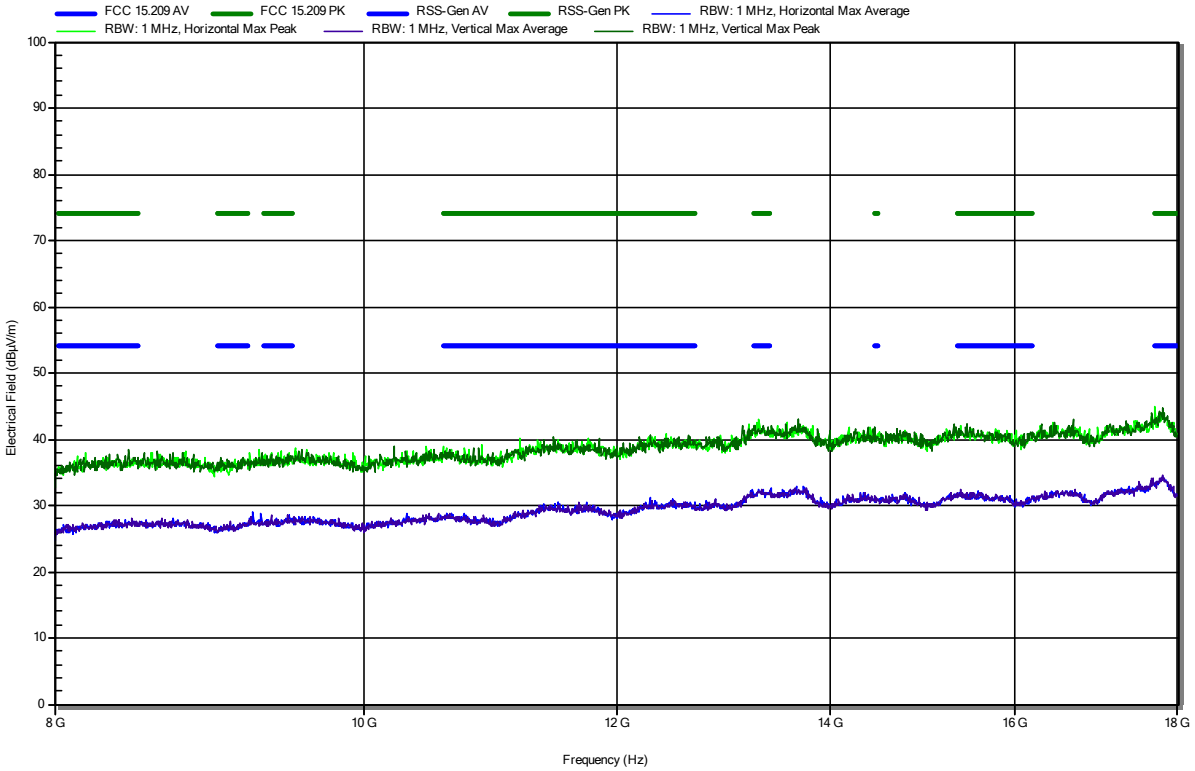
RadiMation



Radiated Spurious Emissions according to 47 CFR Part 15.247

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.3 VDC
Antenna:	Schwarzbeck HWRD 650
Measurement distance:	3 m
Mode:	Tx; BT; DH5, ext. antenna; 2441 MHz
Test Date:	2021-12-14
Note:	

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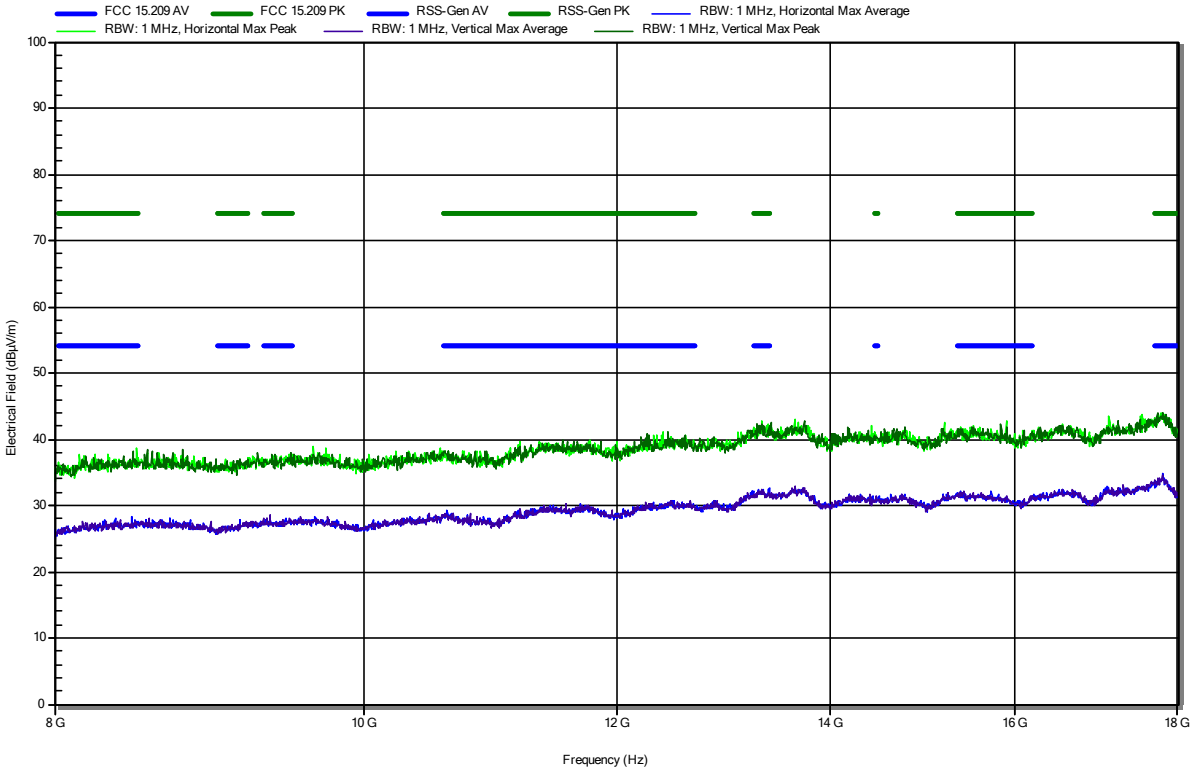
RadiMation



Radiated Spurious Emissions according to 47 CFR Part 15.247

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.3 VDC
Antenna:	Schwarzbeck HWRD 650
Measurement distance:	3 m
Mode:	Tx; BT; DH5, ext. antenna; 2480 MHz
Test Date:	2021-12-14
Note:	

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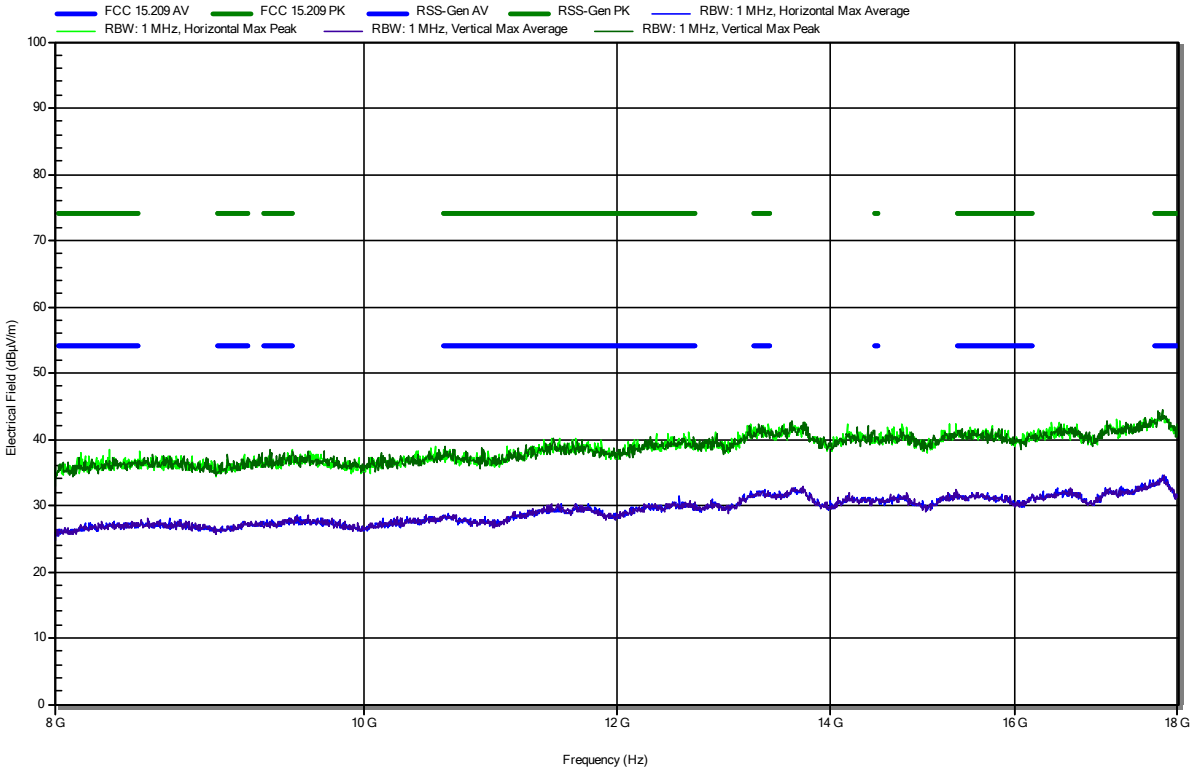
RadiMation



Radiated Spurious Emissions according to 47 CFR Part 15.247

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.3 VDC
Antenna:	Amplifier Research AT4560
Measurement distance:	3 m
Mode:	Tx; BT; DH5, ext. antenna; 2402 MHz
Test Date:	2021-12-14
Note:	

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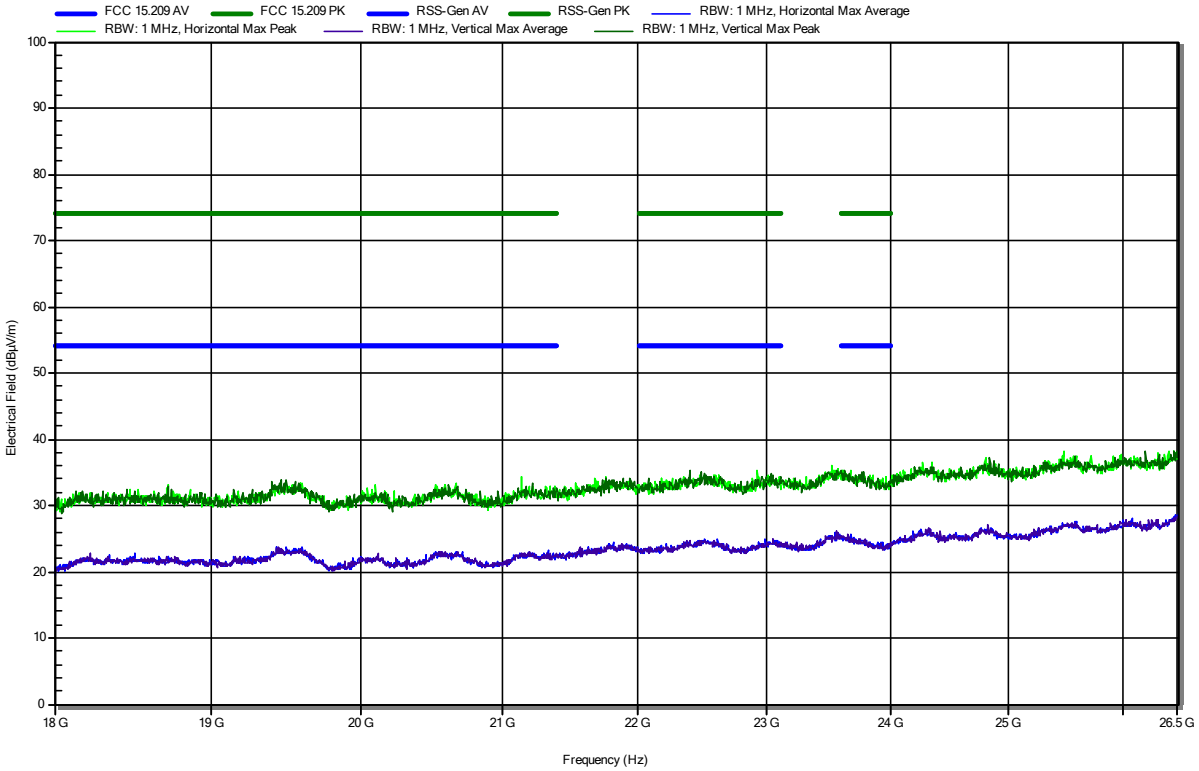
RadiMation



Radiated Spurious Emissions according to 47 CFR Part 15.247

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.3 VDC
Antenna:	Amplifier Research AT4560
Measurement distance:	3 m
Mode:	Tx; BT; DH5, ext. antenna; 2441 MHz
Test Date:	2021-12-14
Note:	

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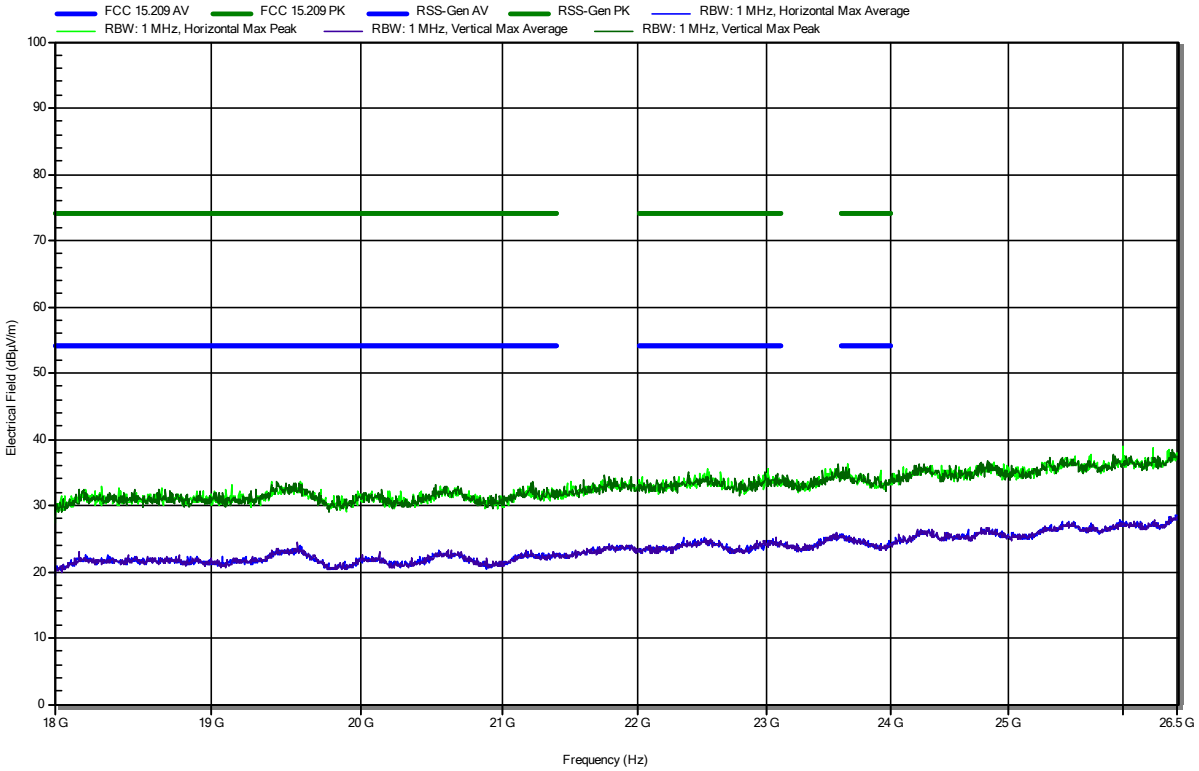
RadiMation



Radiated Spurious Emissions according to 47 CFR Part 15.247

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.3 VDC
Antenna:	Amplifier Research AT4560
Measurement distance:	3 m
Mode:	Tx; BT; DH5, ext. antenna; 2480 MHz
Test Date:	2021-12-14
Note:	

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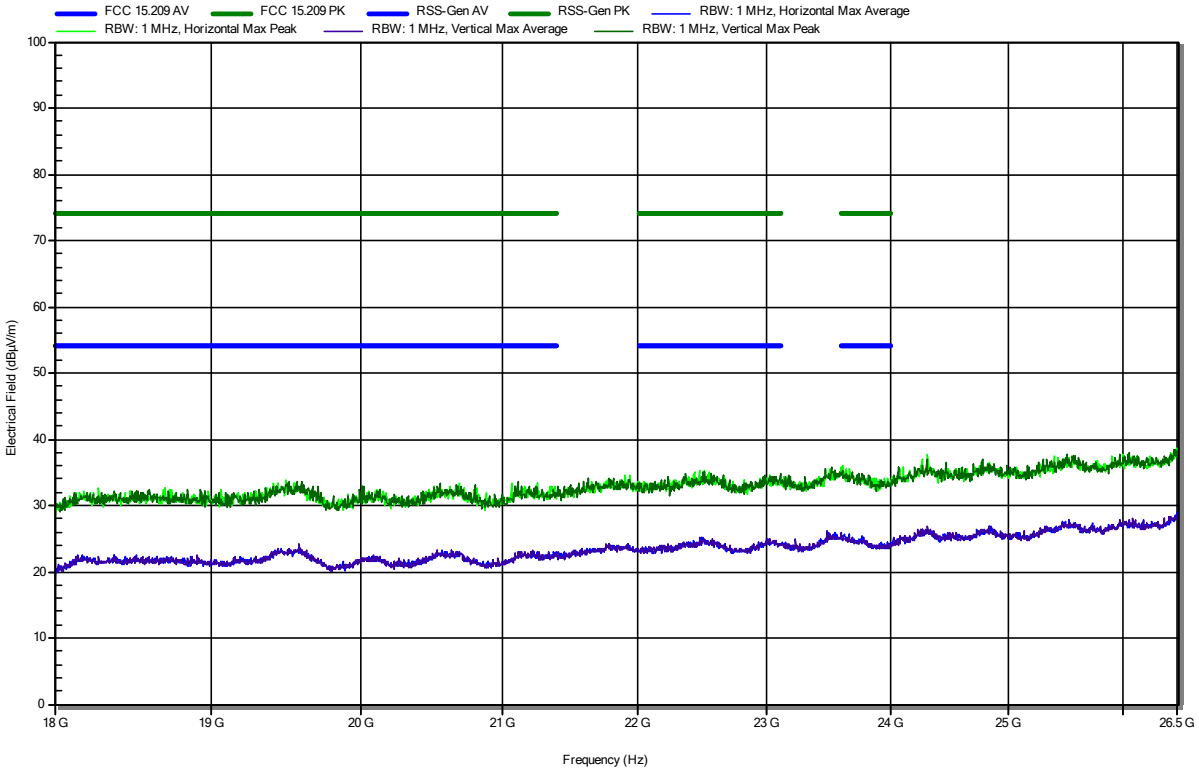
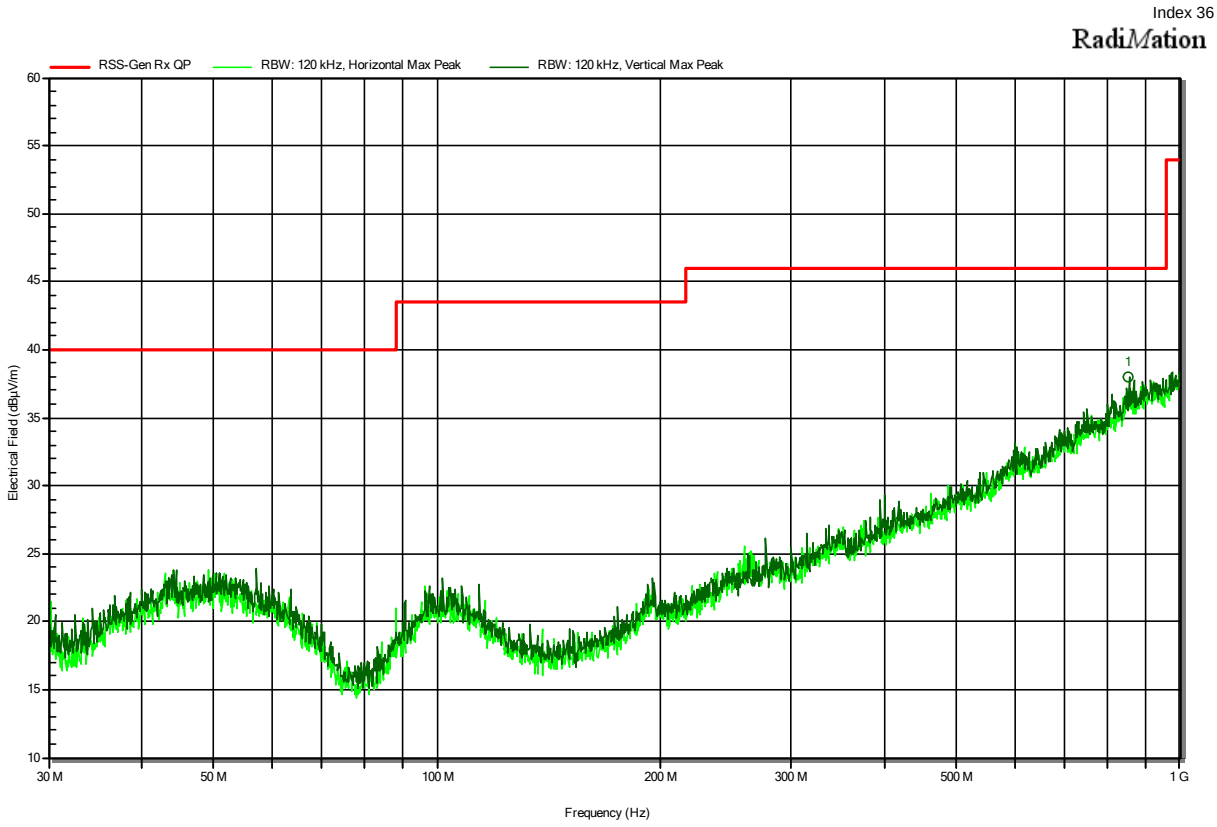
RadiMation



ANNEX B Receiver spurious emissions

Radiated Spurious Emissions according to RSS-247, RSS-Gen

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.3 VDC
Antenna:	Schwarzbeck VULB 9162
Measurement distance:	10 m
Mode:	Rx; BT; ext. antenna; 2441 MHz
Test Date:	2022-03-17
Note:	



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
853.983 MHz	38 dBµV/m	46 dBµV/m	-8.0 dB	Pass	Vertical

Radiated Spurious Emissions according to RSS-247, RSS-Gen

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 20 °Celsius, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D
Measurement distance:	3 m
Mode:	Rx; BT; ext. antenna; 2441 MHz
Test Date:	2022-03-18
Note:	

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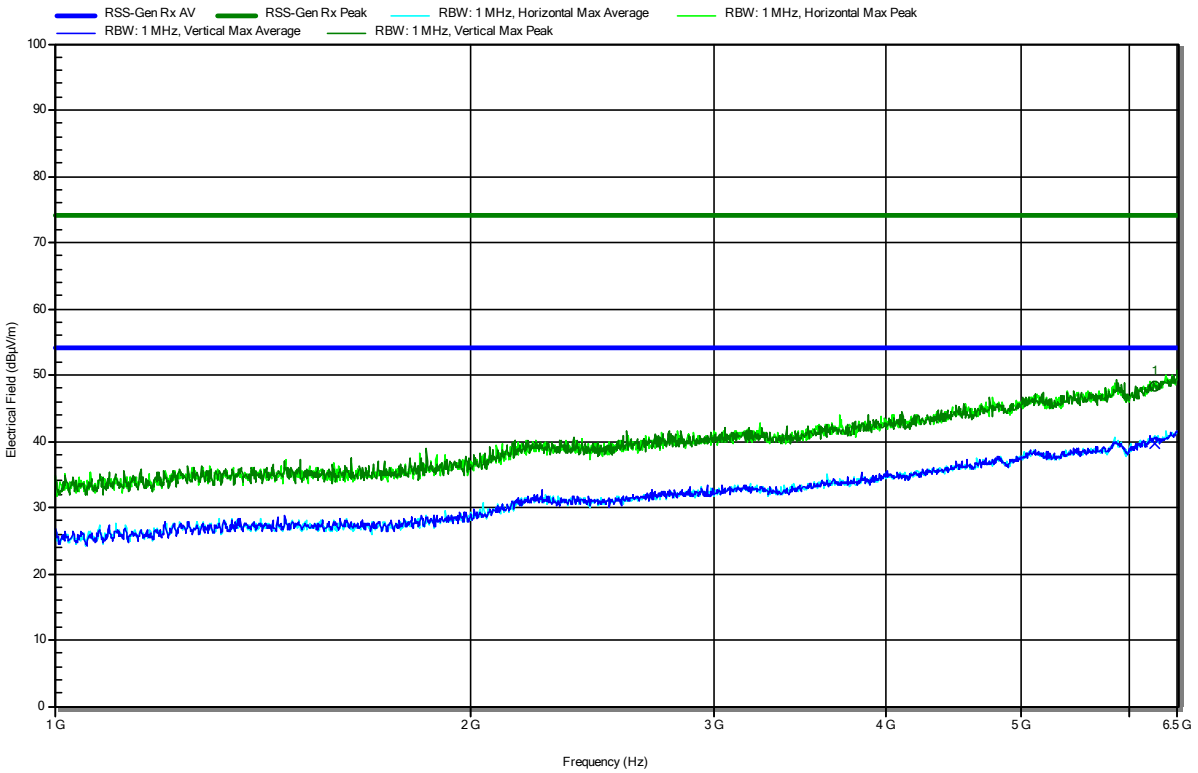
RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
6.261 GHz	48.41 dBµV/m	74 dBµV/m	-25.59 dB	Pass	Vertical

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
6.261 GHz	39.66 dBµV/m	53.98 dBµV/m	-14.32 dB	Pass	Vertical

Radiated Spurious Emissions according to RSS-247, RSS-Gen

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	37322
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 20 °Celsius, Vnom: 3.3 VDC
Antenna:	Schwarzbeck HWRD 650
Measurement distance:	3 m
Mode:	Rx; BT; ext. antenna; 2441 MHz
Test Date:	2022-03-18
Note:	

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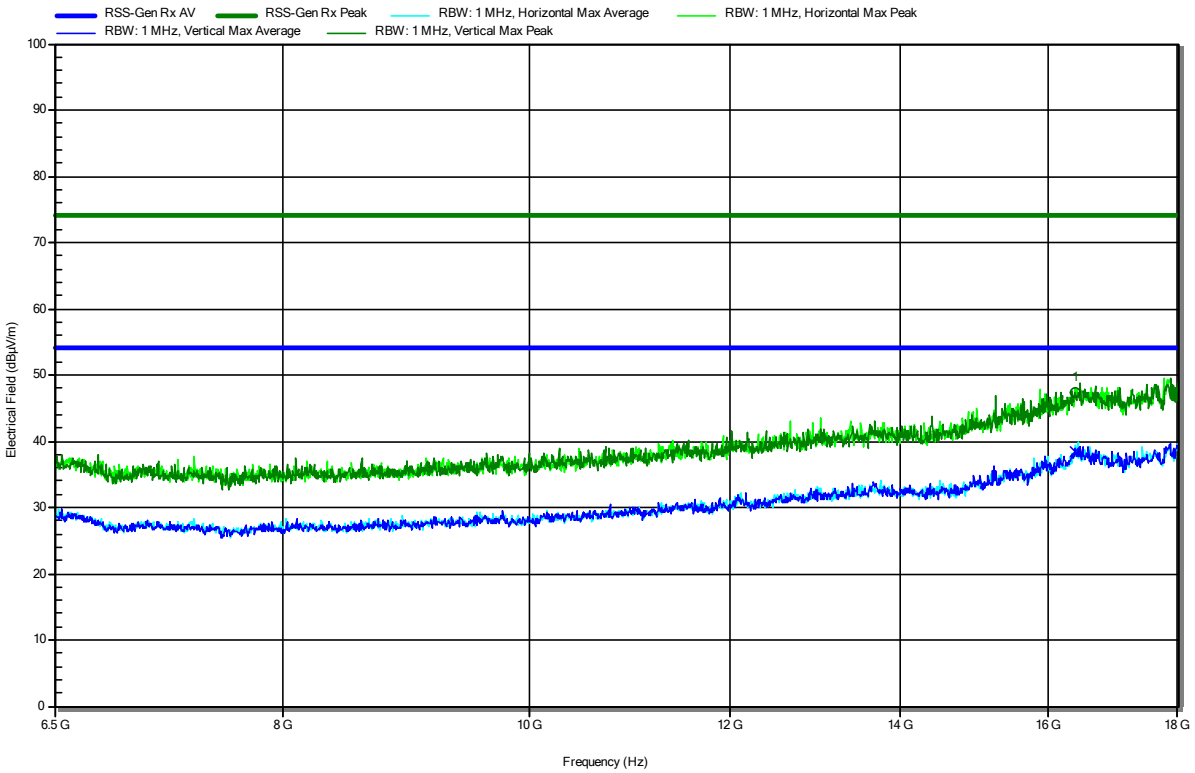
RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
16.394 GHz	47.41 dBµV/m	74 dBµV/m	-26.59 dB	Pass	Vertical

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
16.394 GHz	38.33 dBµV/m	53.98 dBµV/m	-15.65 dB	Pass	Vertical

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