

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-2108-9951-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 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	2021-12-09	
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
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

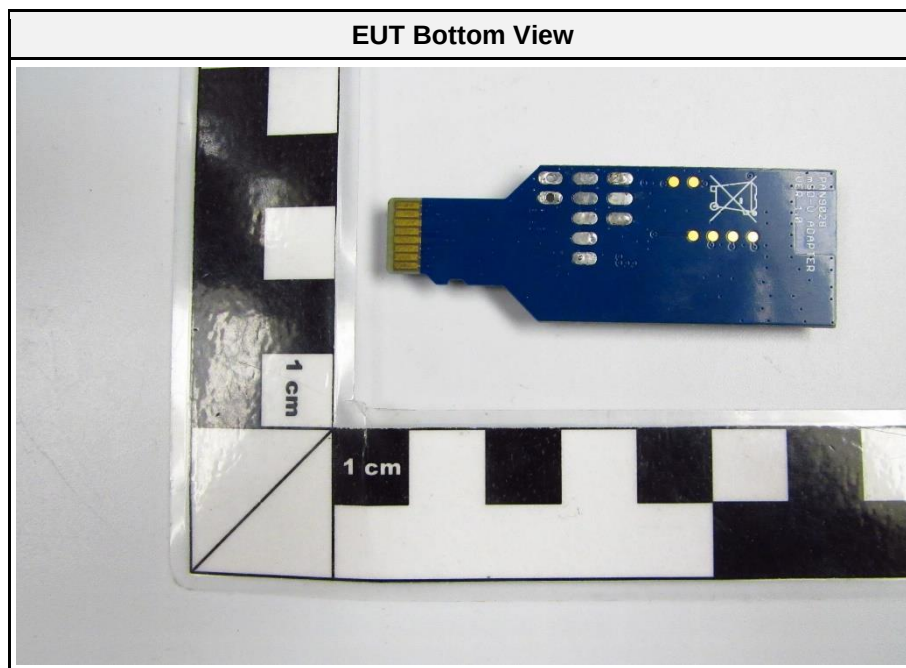
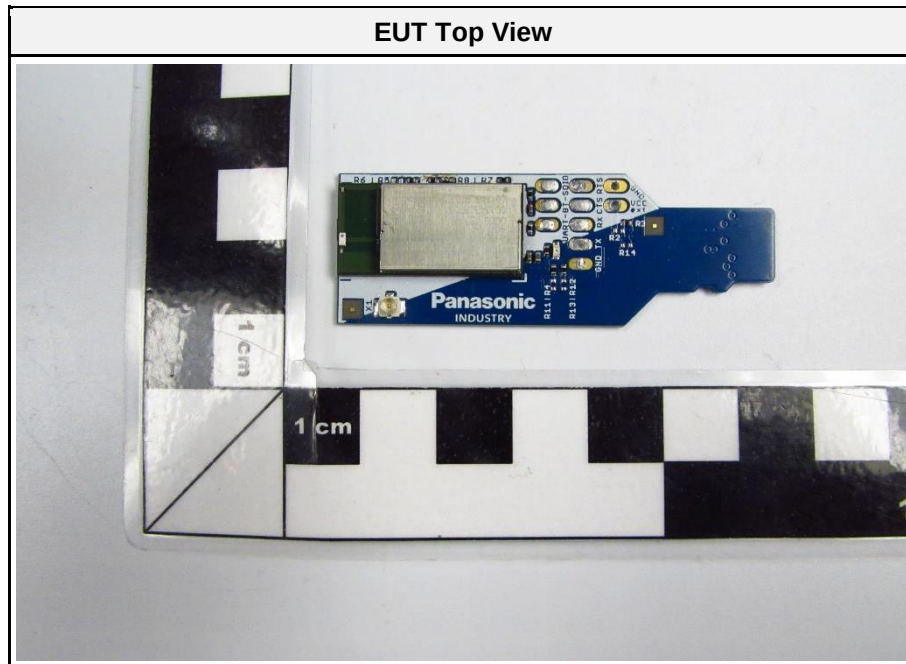
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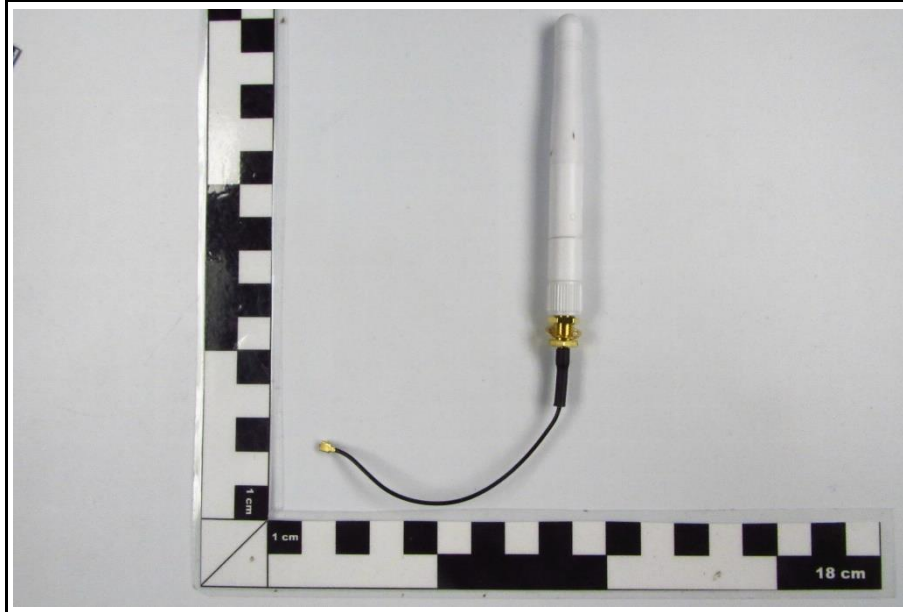
1 Equipment (Test Item) Under Test

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 LE 5.2	
Bluetooth Specification	LE 1M PHY	Yes
	LE 2M PHY	Yes
	LE Coded PHY S=8 (125 kbit)	No
	LE Coded PHY S=2 (500 kbit)	No
	Stable Modulation Index - Transmitter	No
	Stable Modulation Index - Receiver	No
Modulation	GFSK	
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	

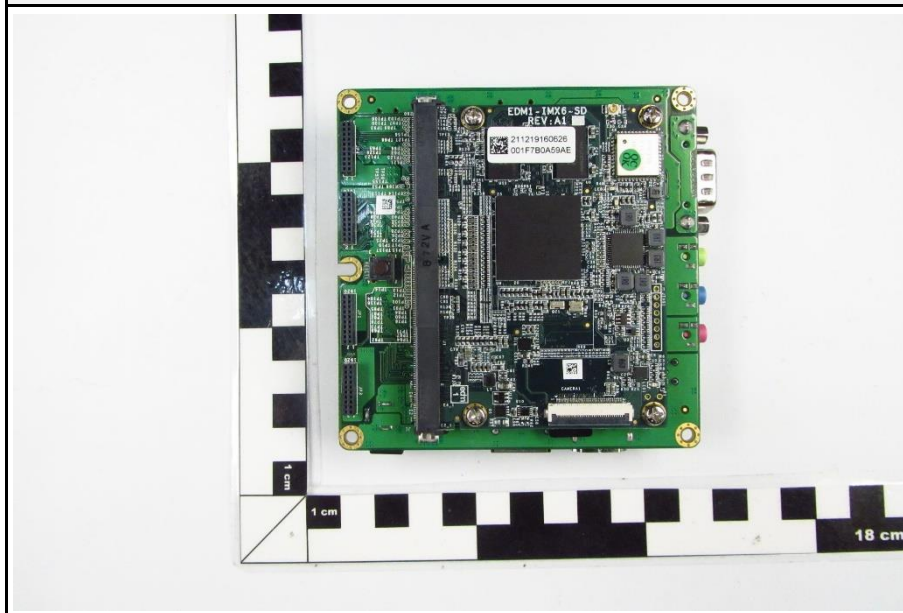
1.1 Photos – Equipment External



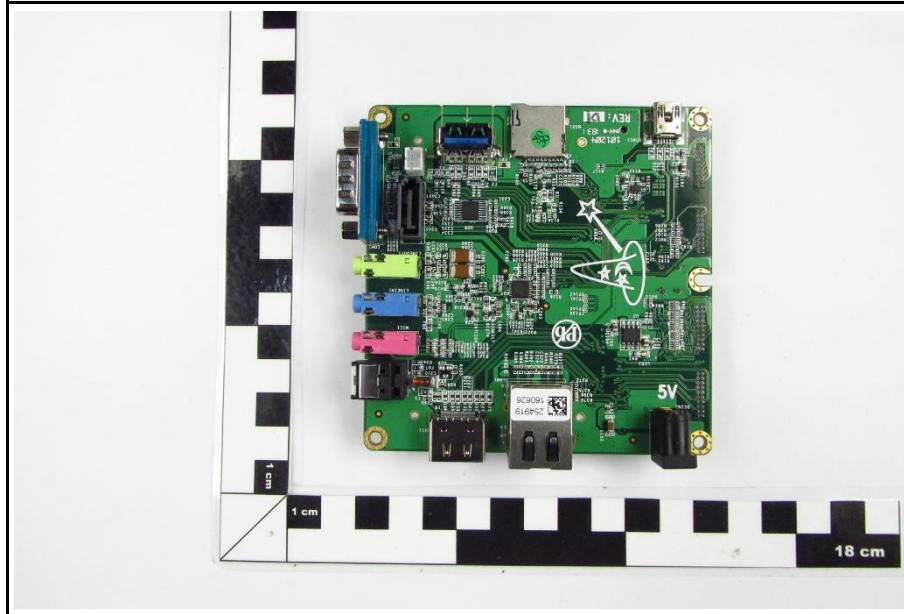
Antenna



Evaluation Board Bottom View



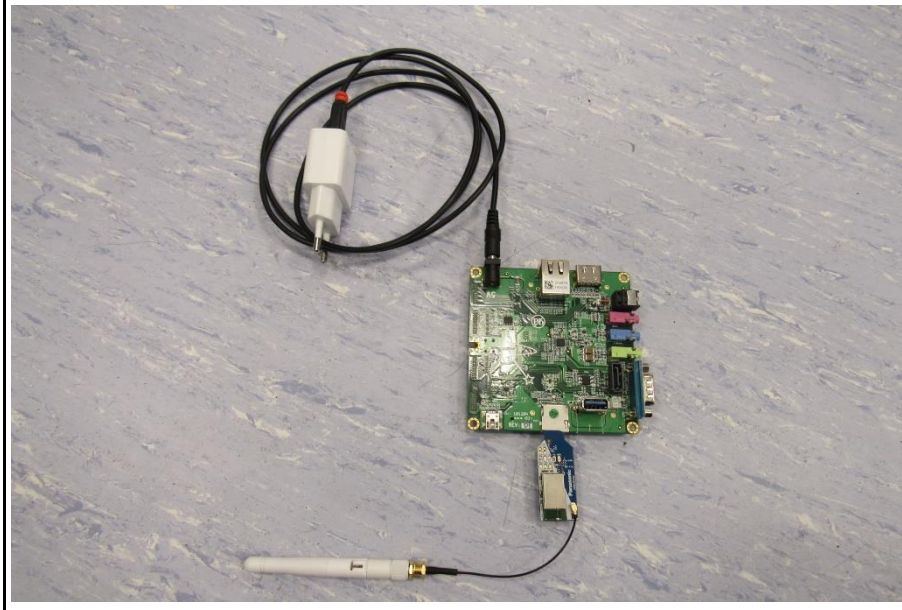
Evaluation Board Top View



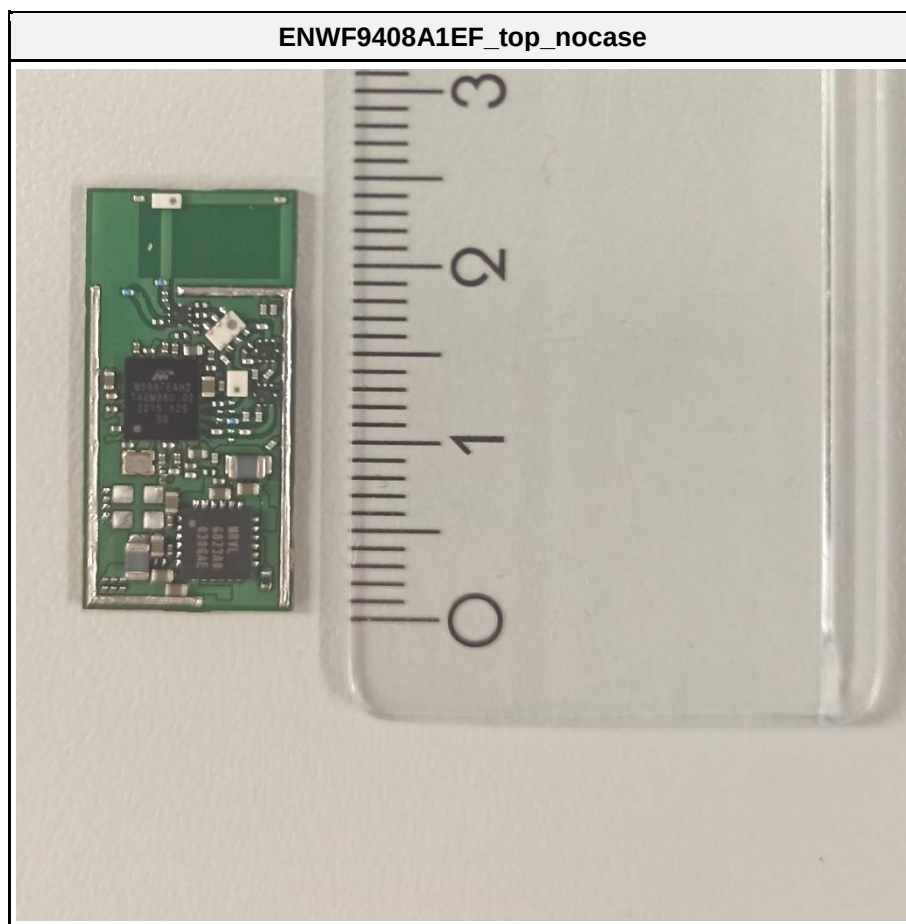
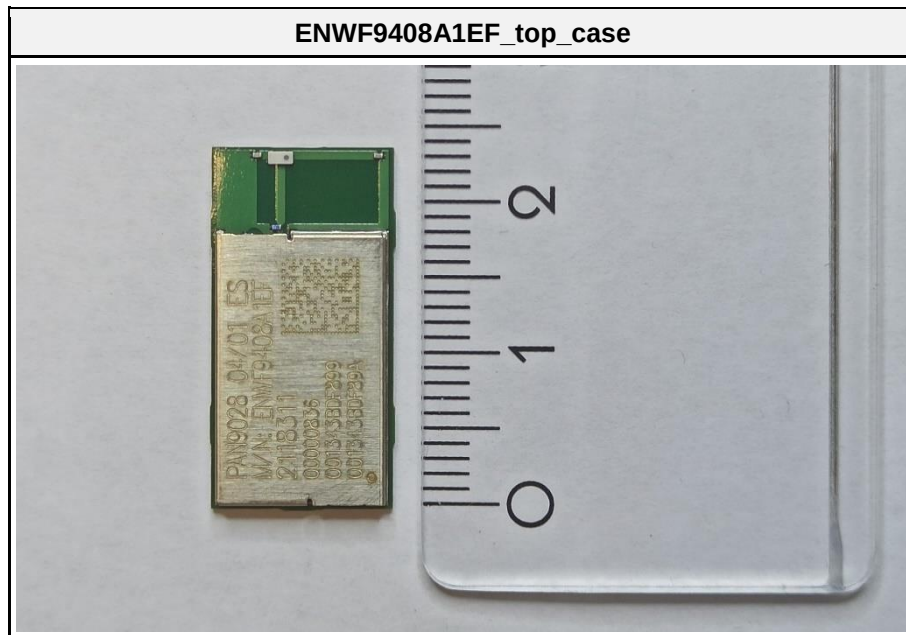
Supply cable

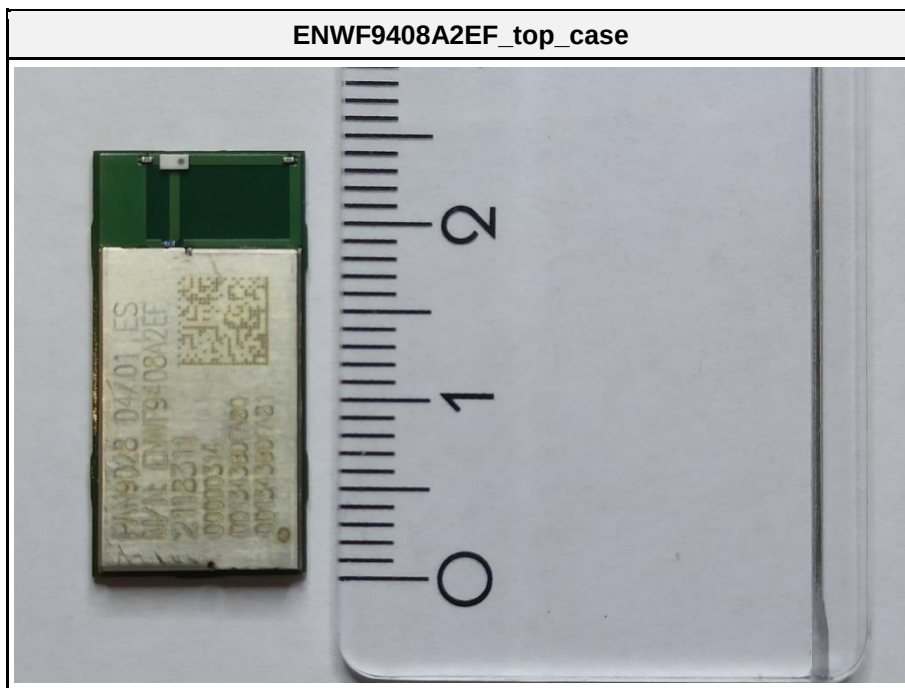
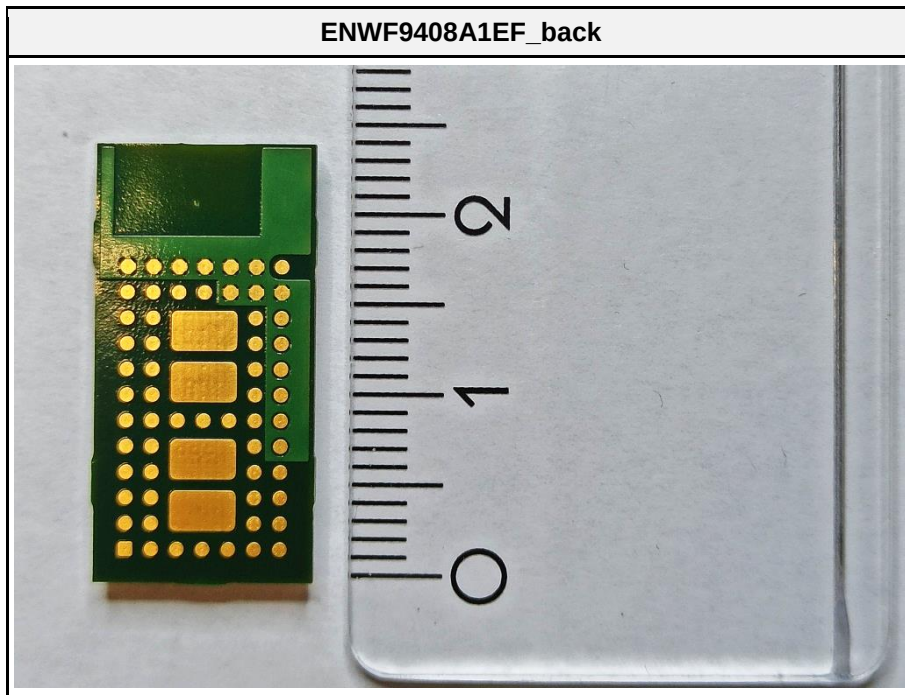


EUT with auxiliary equipment

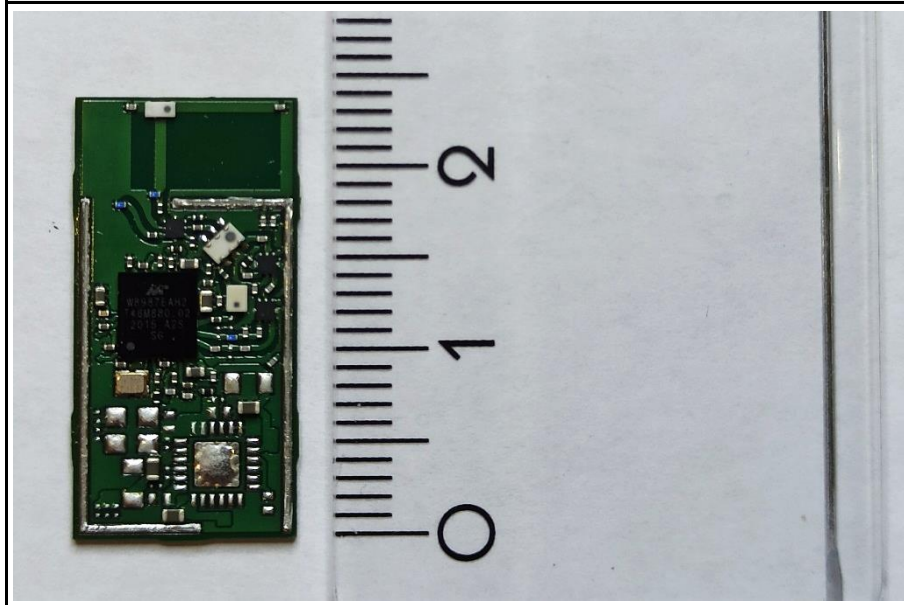


1.1 Photos – Equipment Internal

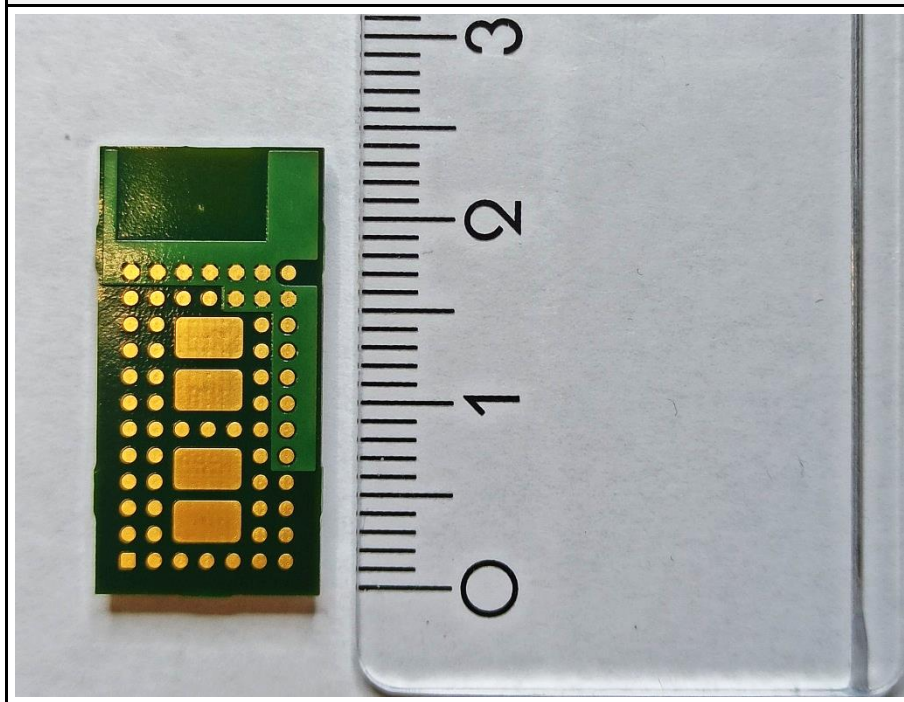




ENWF9408A2EF_top_nocase



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
GFSK	Mode = Transmit Modulation = GFSK Spreading = None Packet Type = PRBS9 Packet Length = 37 Bytes Data Rate = 1 Mbps Duty cycle = 64%
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	19	2440
F3	Tx	39	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:

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

Net:

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

Limit:

This is the FCC Class B radiated emission limit (in units of 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:

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

Margin:

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

Example only:

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)(2) ISED RSS-247, Issue 2 (section 5.2)	6 dB Bandwidth	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 § 15.247(e) ISED RSS-247, Issue 2 (section 5.2)	Power spectral density	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

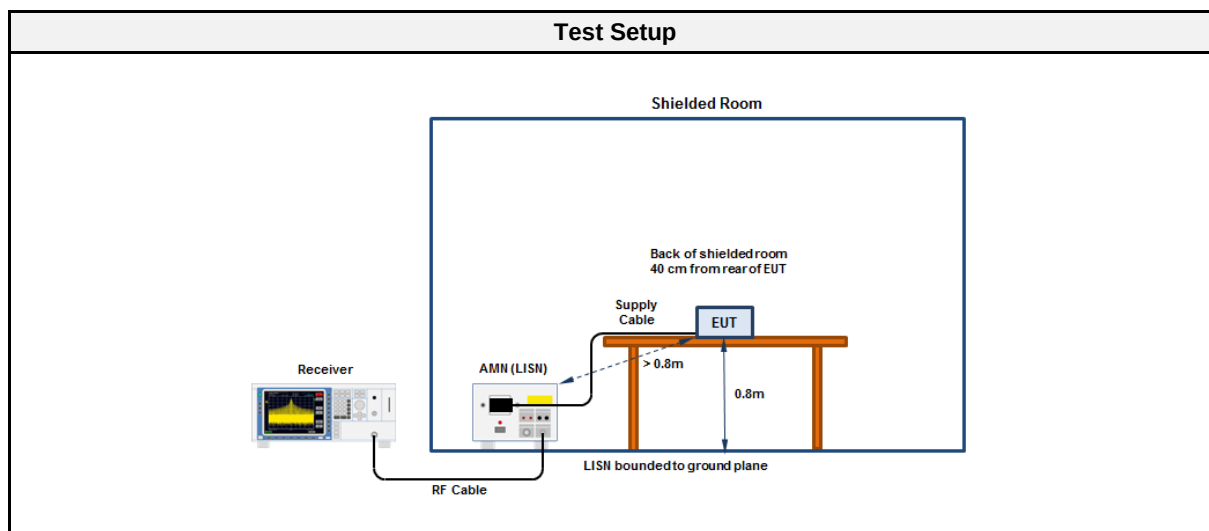
Test Information	
Reference	FCC § 15.207; ISED RSS-247, Issue 2 (section 3.1)
Measurement Method	ANSI C63.10 6.2
Measurement Uncertainty	± 3.82 dB
Operator	Odai Qawasmeh
Date	2022-03-24

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



3.1.4 Equipment

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

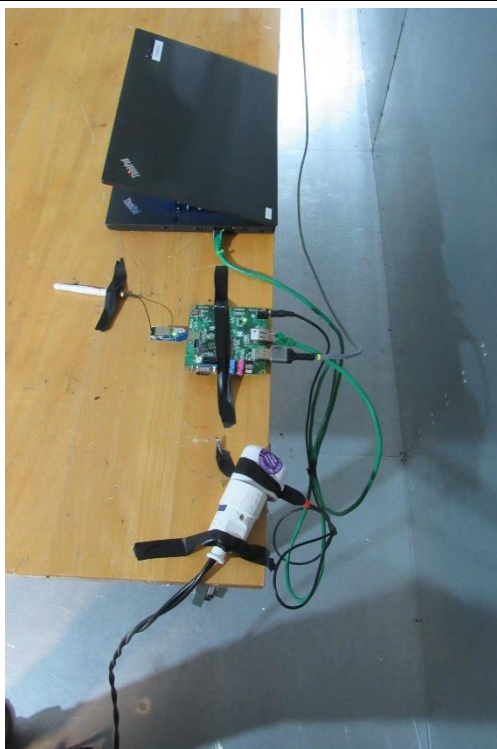
Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	R&S	ESR7	EF00943	2021-08	2022-08
Pulse Limiter	R&S	ESH3-Z2	EF01222	2021-07	2022-07
LISN	Schwarzbeck	NSLK 8127 RC	EF01592	2021-07	2022-07

3.1.5 Setup Photos

Setup for measurements 150 kHz - 30 MHz



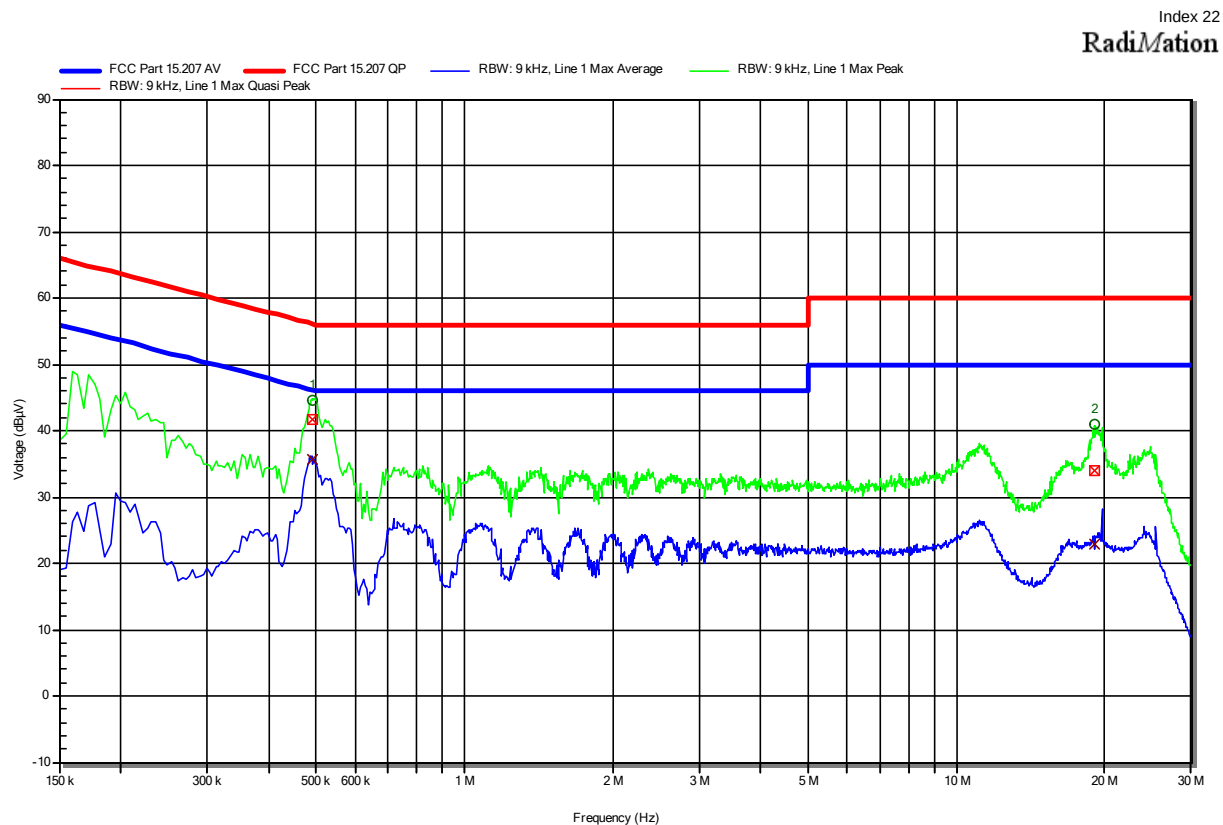
Setup for measurements 150 kHz - 30 MHz (2)



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: 20 °Celsius
 power input: 3.3 VDC
 LISN: Schwarzbeck NSLK 8127 RC L
 Operational Mode: BLE; 1 Mbps, ext. antenna; 2440 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	492 kHz	41.75 dBμV	56.13 dBμV	-14.38 dB	Pass	Line 1
2	19.077 MHz	34.09 dBμV	60 dBμV	-25.91 dB	Pass	Line 1

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	492 kHz	35.58 dBμV	46.13 dBμV	-10.56 dB	Pass	Line 1
2	19.077 MHz	22.81 dBμV	50 dBμV	-27.19 dB	Pass	Line 1

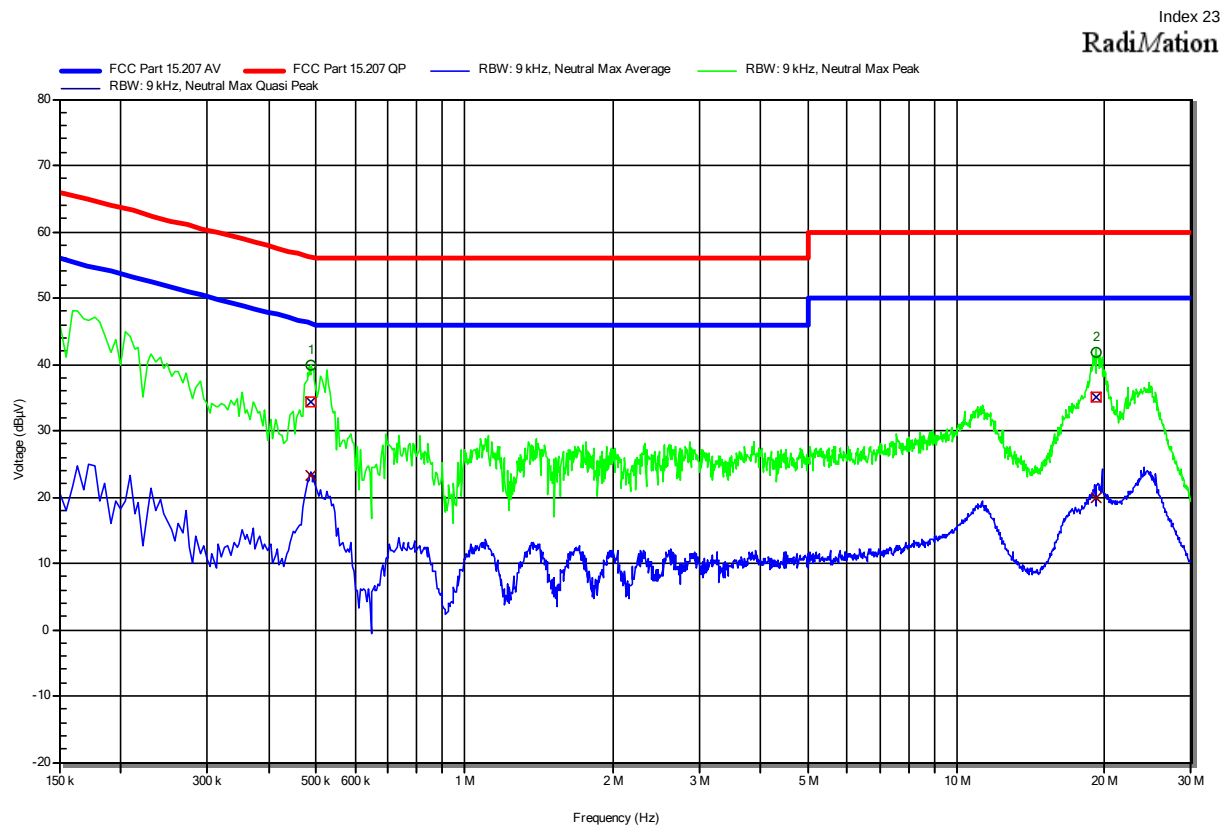
Test Report No.: G0M-2108-9951-TFC247BL-V01

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

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: 20 °Celsius
 power input: 3.3 VDC
 LISN: Schwarzbeck NSLK 8127 RC N
 Operational Mode: BLE; 1 Mbps, ext. antenna; 2440 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	487.5 kHz	34.32 dBµV	56.21 dBµV	-21.89 dB	Pass	Neutral
2	19.158 MHz	35.13 dBµV	60 dBµV	-24.87 dB	Pass	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	487.5 kHz	23.17 dBµV	46.21 dBµV	-23.04 dB	Pass	Neutral
2	19.158 MHz	19.98 dBµV	50 dBµV	-30.02 dB	Pass	Neutral

Test Report No.: G0M-2108-9951-TFC247BL-V01

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

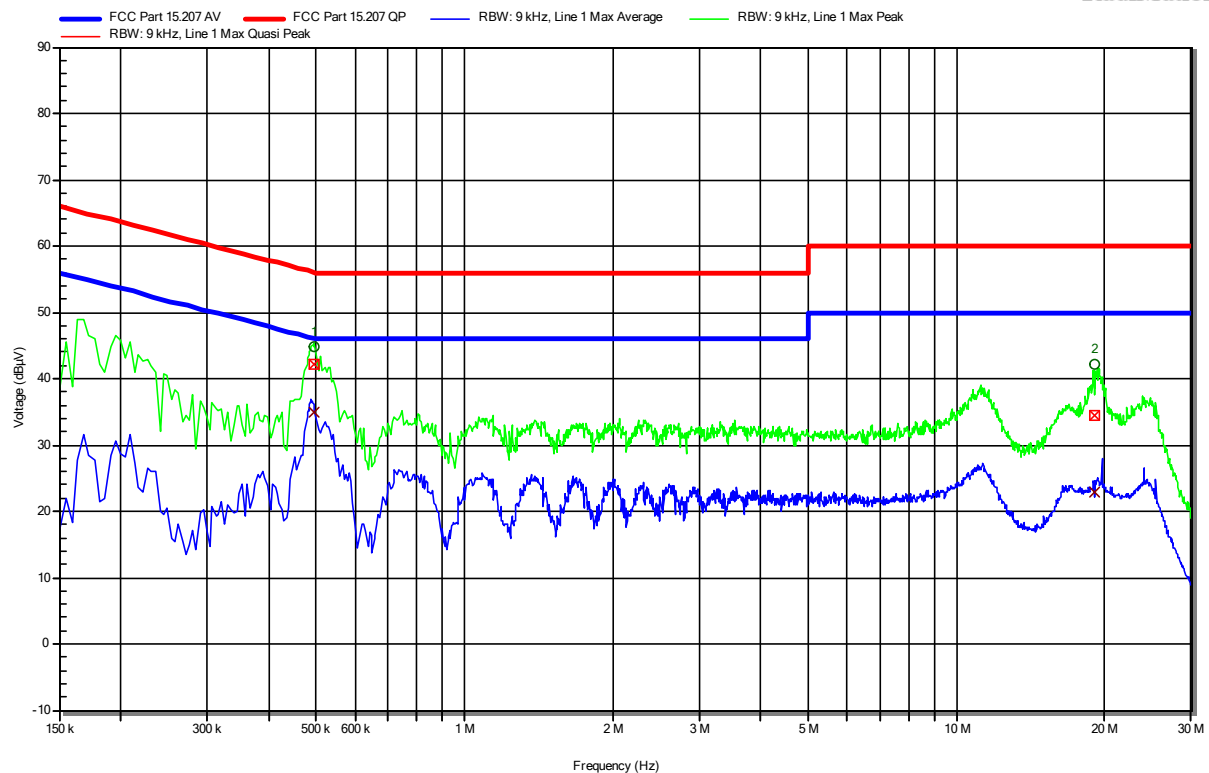
Conducted emissions at the mains power port according to RSS-247

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: 20 °Celsius
 power input: 3.3 VDC
 LISN: Schwarzbeck NSLK 8127 RC L
 Operational Mode: BLE; ext. antenna; 2440 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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Radiation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	496.5 kHz	42.16 dBμV	56.06 dBμV	-13.9 dB	Pass	Line 1
2	19.082 MHz	34.43 dBμV	60 dBμV	-25.57 dB	Pass	Line 1
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	496.5 kHz	34.86 dBμV	46.06 dBμV	-11.19 dB	Pass	Line 1
2	19.082 MHz	22.92 dBμV	50 dBμV	-27.08 dB	Pass	Line 1

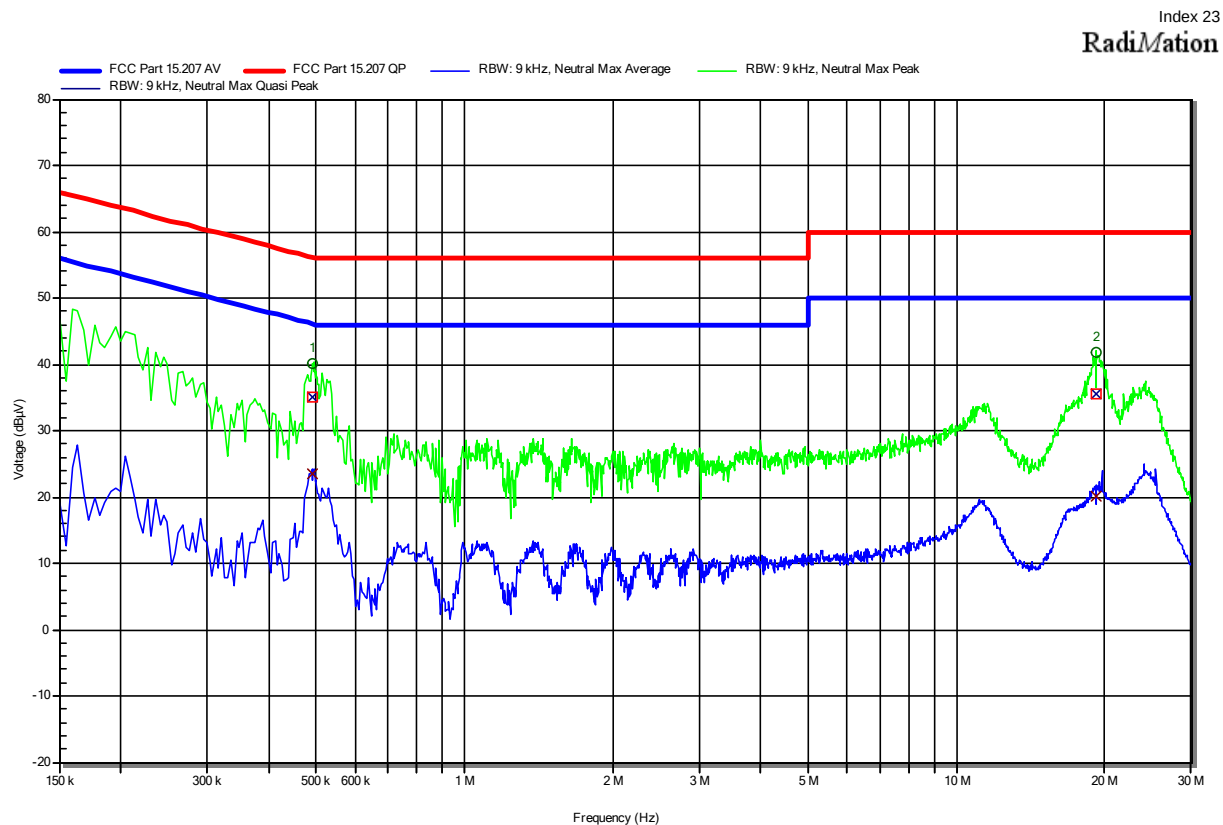
Test Report No.: G0M-2108-9951-TFC247BL-V01

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

Conducted emissions at the mains power port according to RSS-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: 20 °Celsius
 power input: 3.3 VDC
 LISN: Schwarzbeck NSLK 8127 RC N
 Operational Mode: BLE; ext. antenna; 2440 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	491.1 kHz	35.16 dBμV	56.15 dBμV	-20.99 dB	Pass	Neutral
2	19.163 MHz	35.43 dBμV	60 dBμV	-24.57 dB	Pass	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	491.1 kHz	23.39 dBμV	46.15 dBμV	-22.76 dB	Pass	Neutral
2	19.163 MHz	20.14 dBμV	50 dBμV	-29.86 dB	Pass	Neutral

Test Report No.: G0M-2108-9951-TFC247BL-V01

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

3.2 Test Conditions and Results - Transmitter radiated emissions

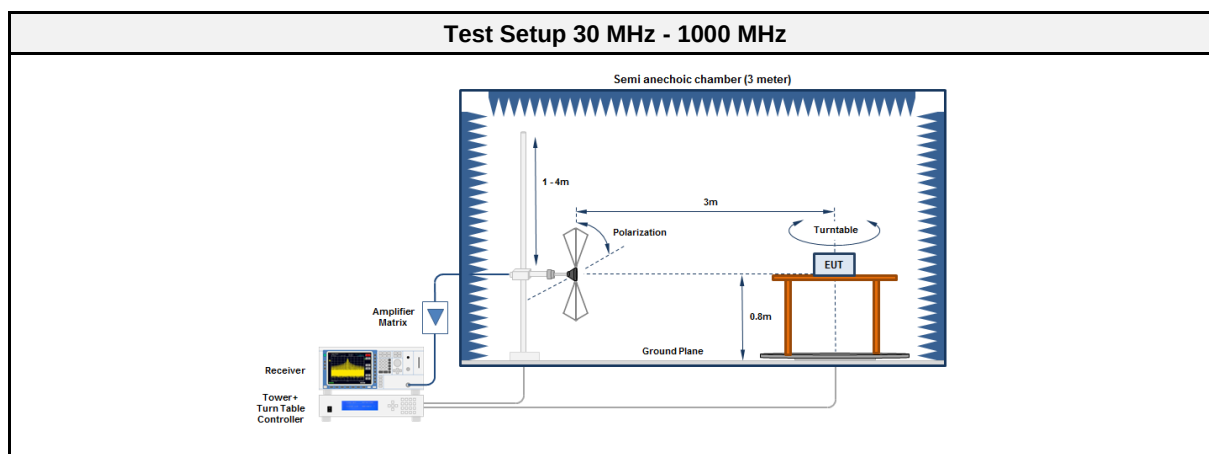
3.2.1 Information

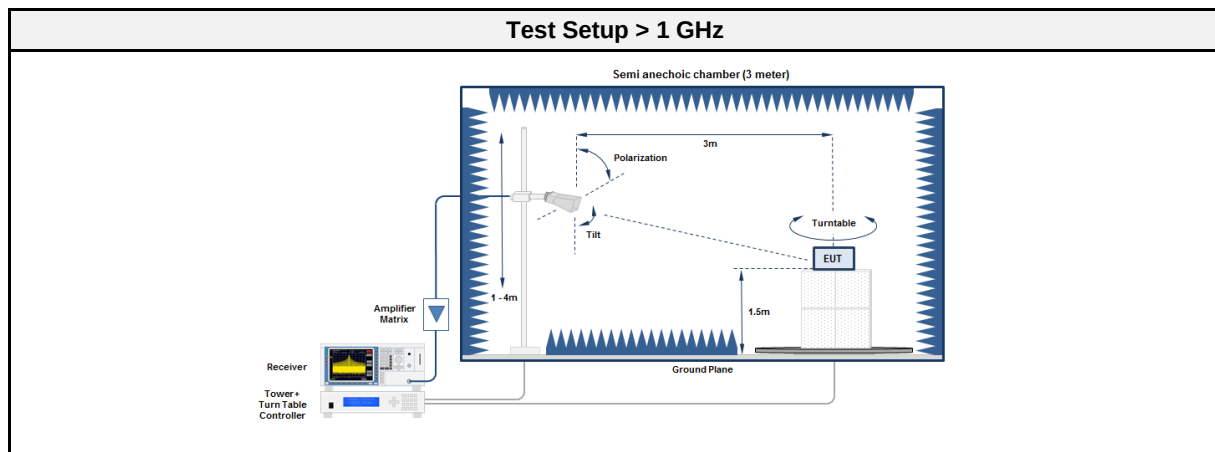
Test Information	
Reference	FCC § 15.247(d); FCC § 15.209; ISSED RSS-Gen, Issue 5 A2 (section 6.13)
Measurement Uncertainty	± 5.95 dB
Measurement Method	ANSI C63.10 6.4, 6.5, 6.6, 11.12
Operator	Wilfried Treffke
Date	2021-12-11

3.2.2 Limits

Limits			
Frequency range [MHz]	Detector	Field strength [$\mu\text{V/m}$]	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





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

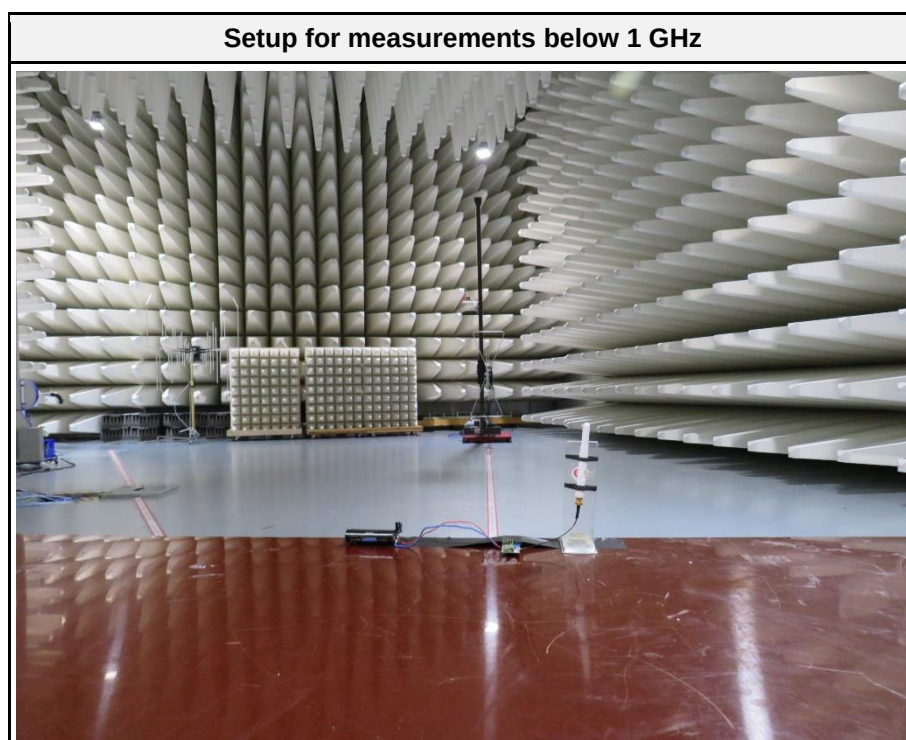
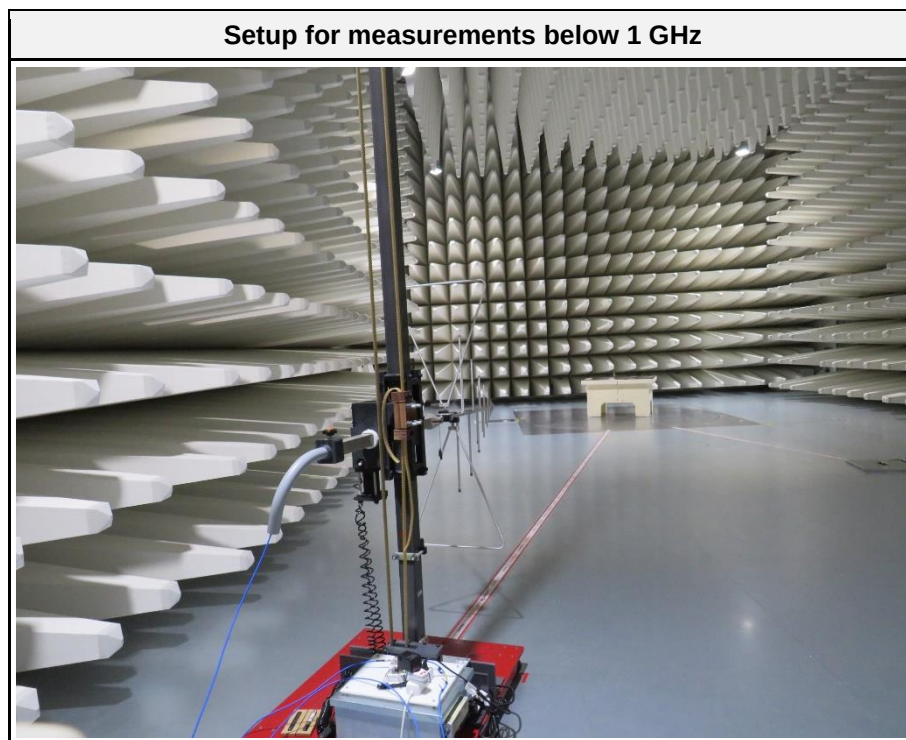
Test Procedure 30 MHz - 1000 MHz	
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground 2. EUT set to test mode 3. The receiver is set to peak detection with max hold 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m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

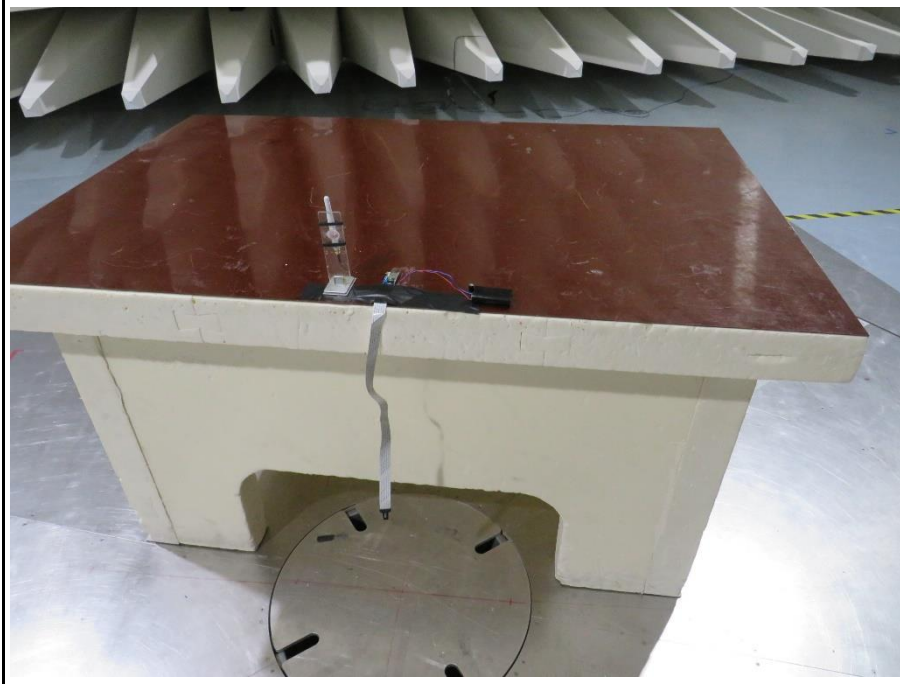
3.2.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2402	2247.4	44.22	pk	ver	74.00	-29.78
2402	2247.4	32.54	avg	ver	54.00	-21.46
2402	2387.6	58.58	pk	ver	74.00	-15.42
2402	2387.6	45.05	avg	ver	54.00	-08.95
2402	4803.7	45.00	pk	ver	74.00	-29.00
2402	4803.7	38.20	avg	ver	54.00	-15.80
2440	2364.8	49.47	pk	ver	74.00	-24.53
2440	2364.8	40.87	avg	ver	54.00	-13.13
2440	2368.6	47.31	pk	ver	74.00	-26.69
2440	2368.6	41.32	avg	ver	54.00	-12.68
2480	2485.7	63.64	pk	ver	74.00	-10.36
2480	2485.7	45.66	avg	ver	54.00	-08.34
2480	7463	44.29	pk	ver	74.00	-29.71
2480	7463	31.18	avg	ver	54.00	-22.82

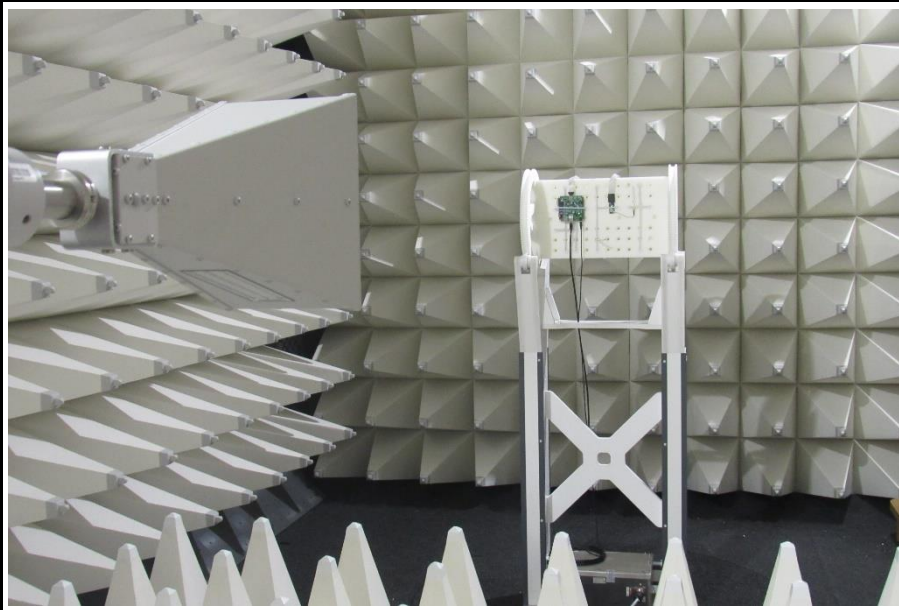
3.2.7 Setup Photos



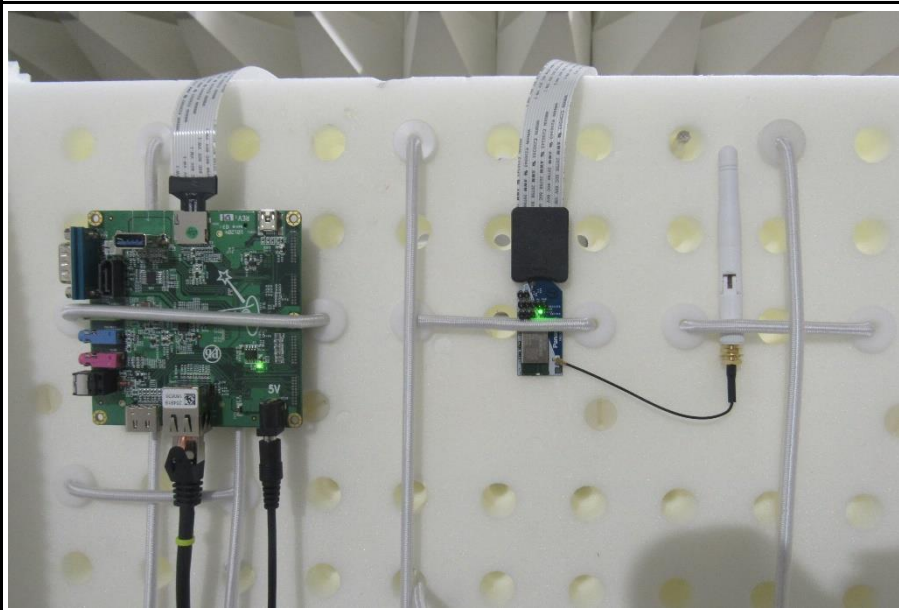
Test Setup



Setup for measurement above 1 GHz



Test Setup



3.3 Test Conditions and Results - Receiver radiated emissions

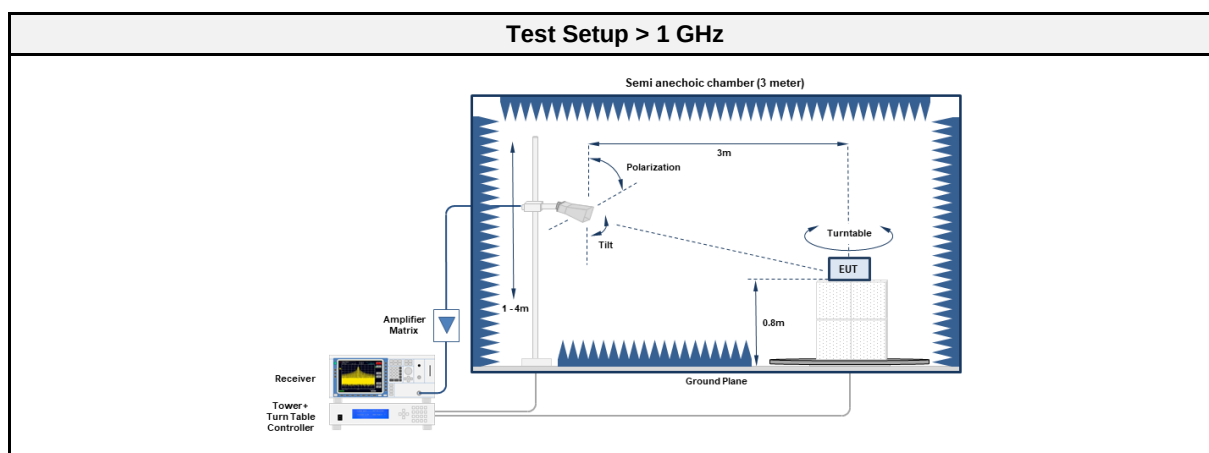
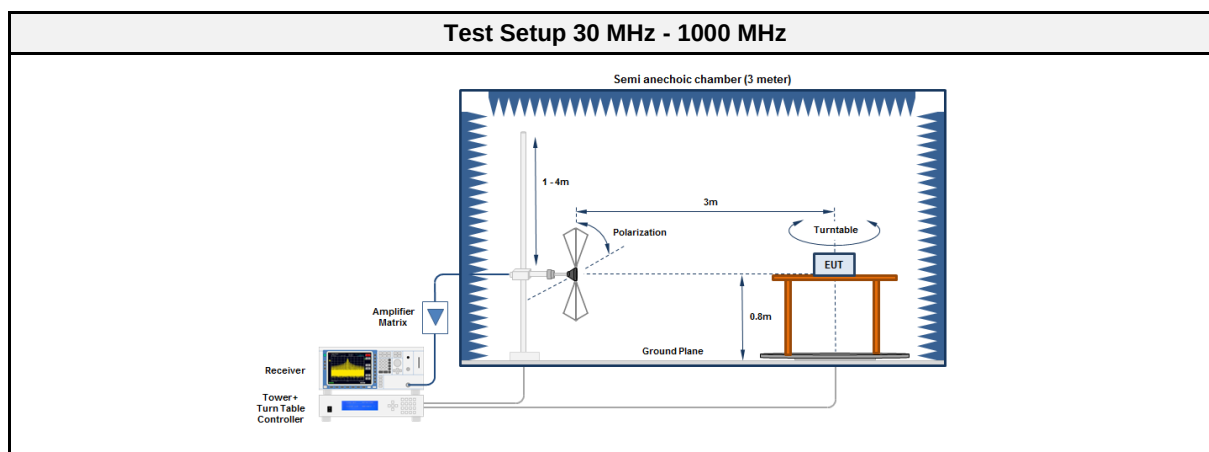
3.3.1 Information

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 [$\mu\text{V/m}$]	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



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
Antenna	Schwarzbeck	BBHA 9120B	EF01678	2021-03	2022-03
Antenna	Schwarzbeck	HWRD 650	EF01679	2021-03	2022-03

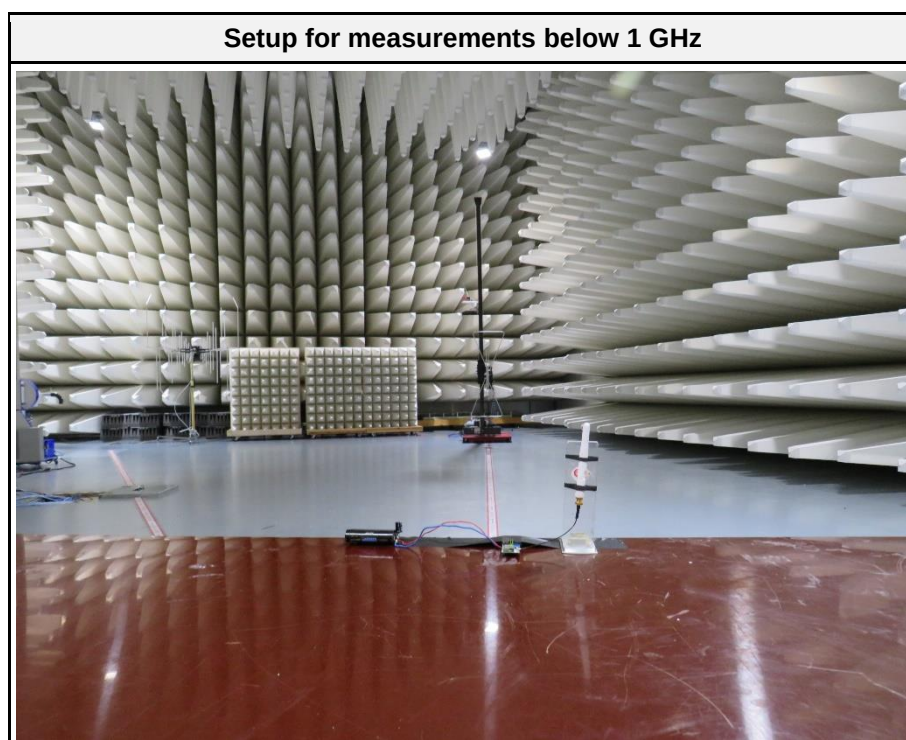
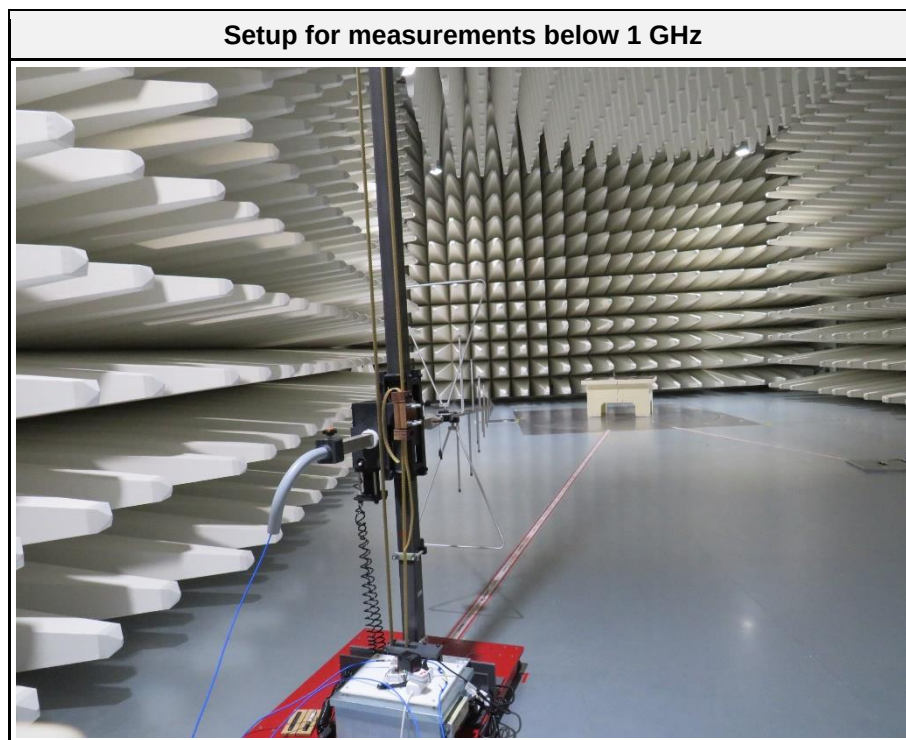
3.3.5 Procedure

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	

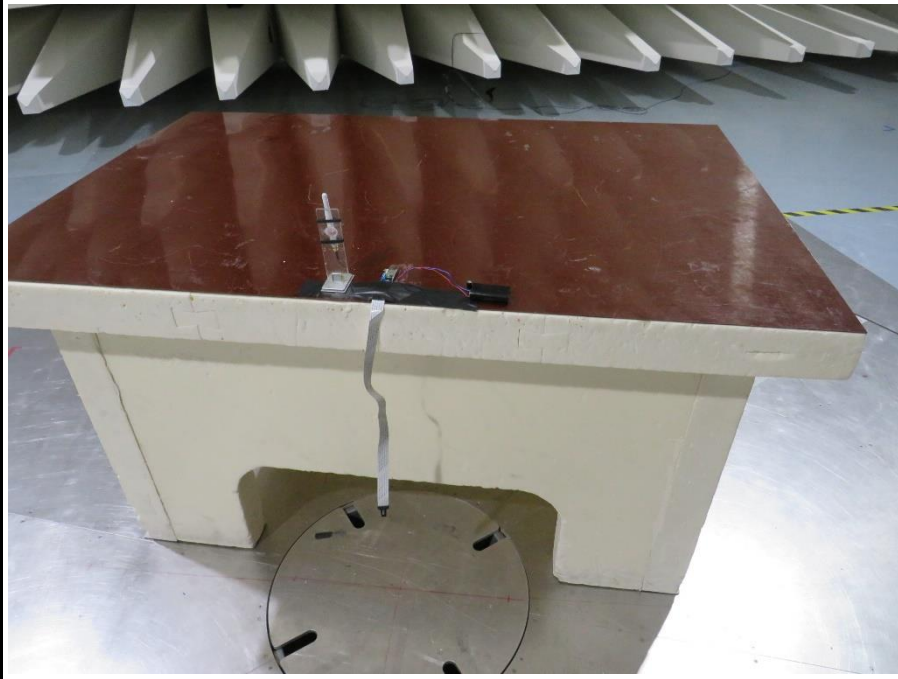
3.3.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2440	6479	48.36	pk	ver	74.00	-25.64
2440	6479	39.86	avg	ver	53.98	-14.12
2440	16456	47.08	pk	ver	74.00	-26.92
2440	16456	36.99	avg	ver	53.98	-16.99

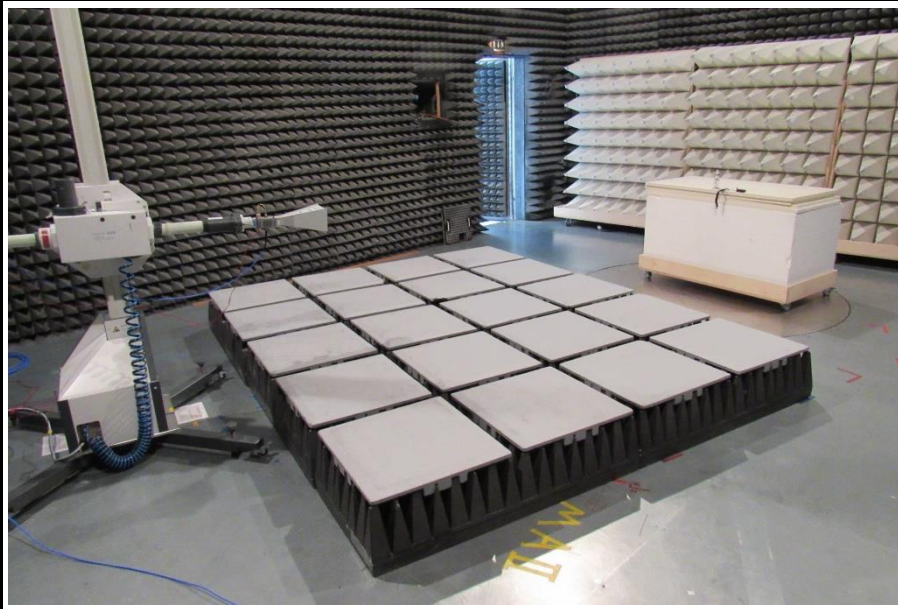
3.3.7 Setup Photos



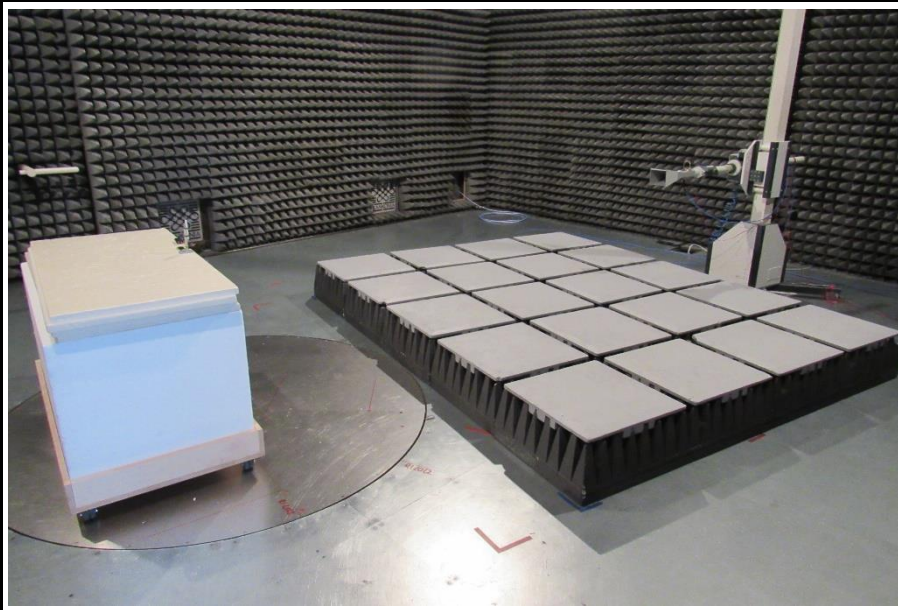
Test Setup



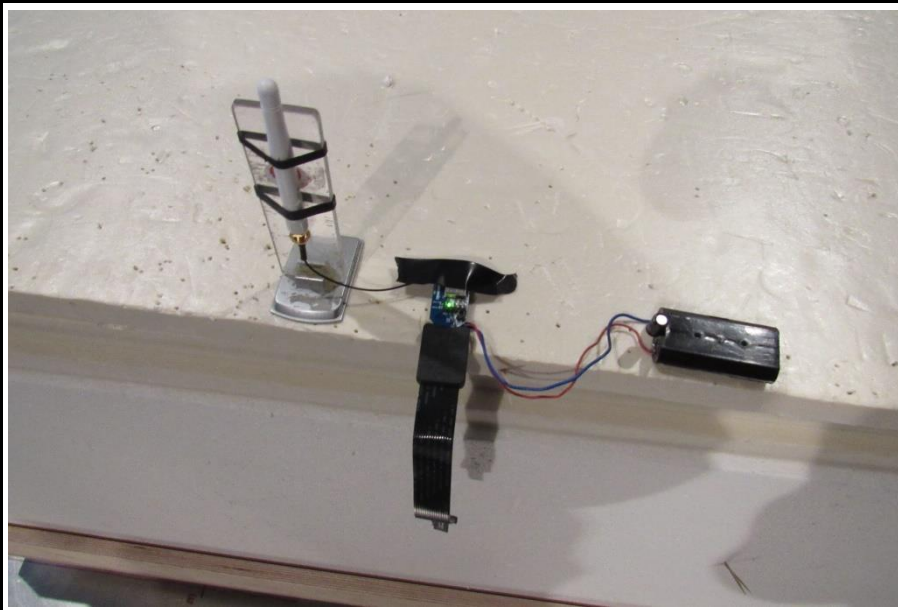
Setup for measurements above 1 GHz



Setup for measurements above 1 GHz



Test Setup



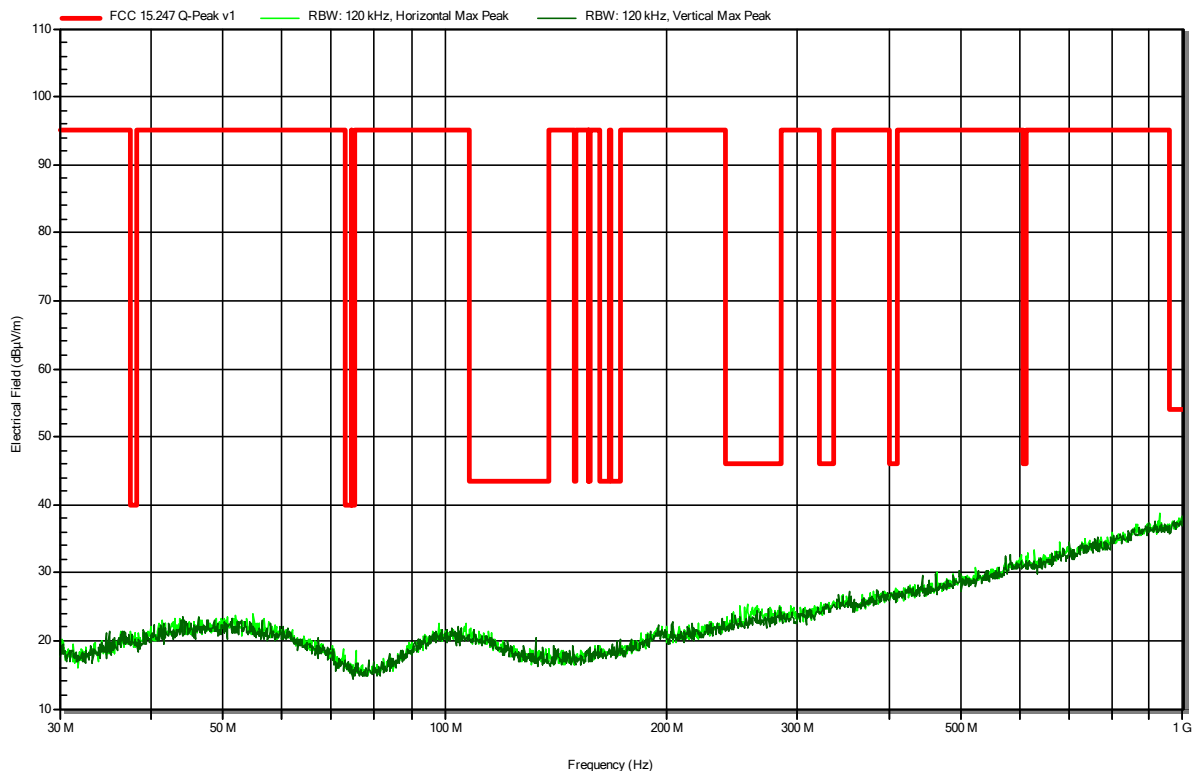
ANNEX A Transmitter spurious emissions

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: 23 °Celsius, Vnom: 3.3 VDC
 Antenna: Schwarzbeck VULB 9162
 Measurement distance: 3 m
 Mode: Tx; BLE; 1 Mbps, ext. antenna; 2402 MHz
 Test Date: 2022-03-17
 Note:

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RadiMation

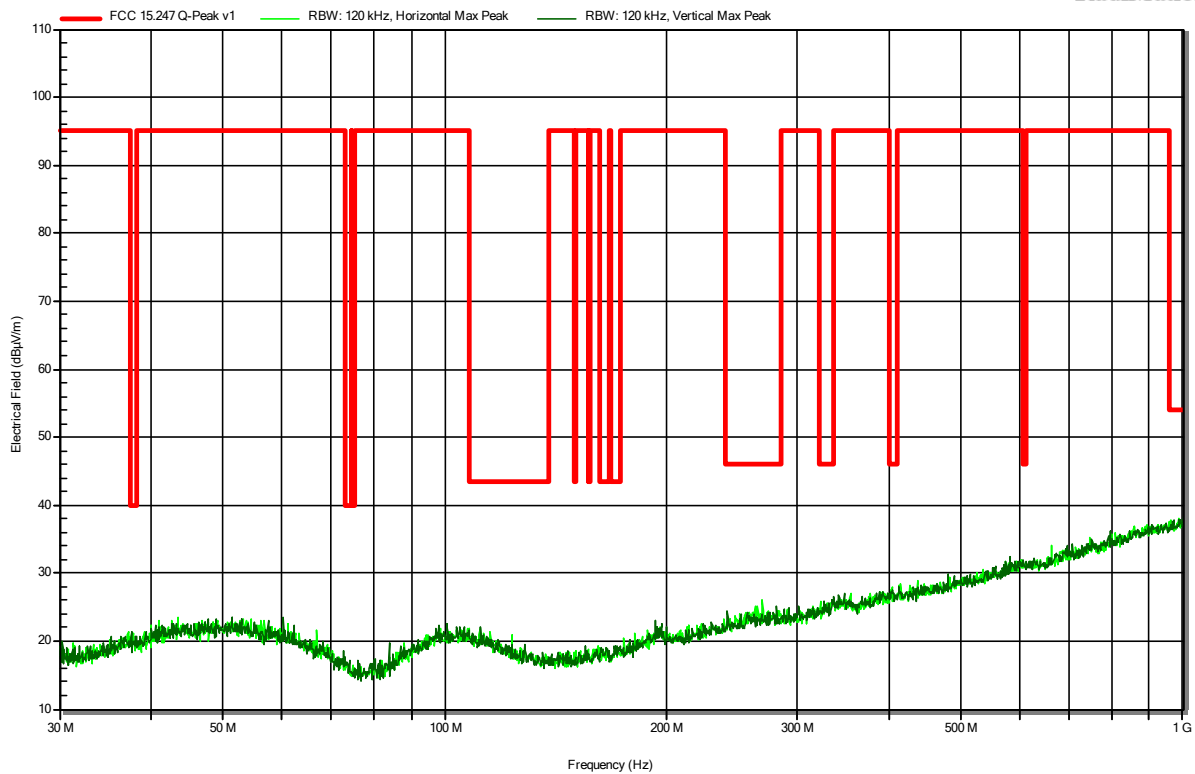


Radiated Spurious Emissions according to 47 CFR Part 15.247

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. Voigt
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 3.3 VDC
 Antenna: Schwarzbeck VULB 9162
 Measurement distance: 3 m
 Mode: Tx; BLE; 1 Mbps, ext. antenna; 2440 MHz
 Test Date: 2022-03-17
 Note:

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RadiMation

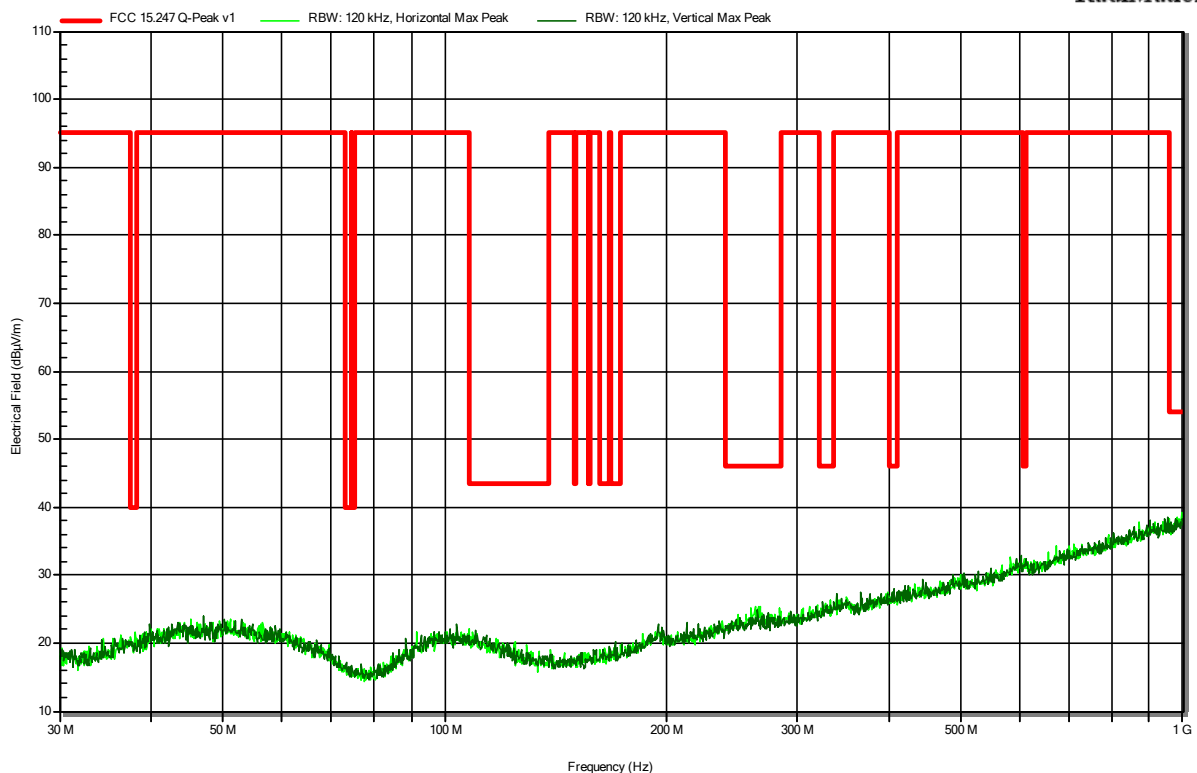


Radiated Spurious Emissions according to 47 CFR Part 15.247

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. Voigt
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 3.3 VDC
 Antenna: Schwarzbeck VULB 9162
 Measurement distance: 3 m
 Mode: Tx; BLE; 1 Mbps, ext. antenna; 2480 MHz
 Test Date: 2022-03-17
 Note:

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RadiMation

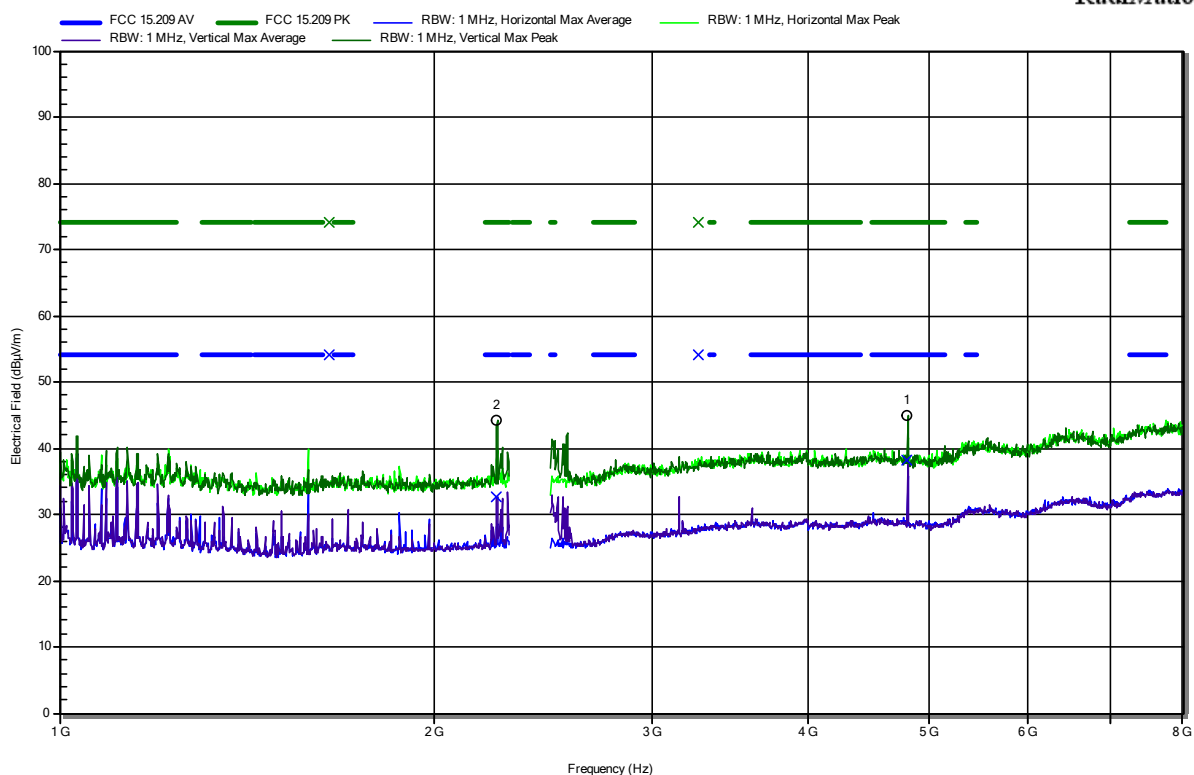


Radiated Spurious Emissions according to 47 CFR Part 15.247

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: 24 °Celsius, Vnom: 3.3 VDC
 Antenna: Schwarzbeck BBHA 9120B
 Measurement distance: 3 m
 Mode: Tx; BLE; 1 Mbps, ext. antenna; 2402 MHz
 Test Date: 2021-12-11
 Note:

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RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
2.2474 GHz	44.22 dBμV/m	74 dBμV/m	-29.78 dB	Pass	Vertical
4.8037 GHz	45 dBμV/m	74 dBμV/m	-29 dB	Pass	Vertical

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
2.2474 GHz	32.54 dBμV/m	54 dBμV/m	-21.46 dB	Pass	Vertical
4.8037 GHz	38.2 dBμV/m	54 dBμV/m	-15.8 dB	Pass	Vertical

Test Report No.: G0M-2108-9951-TFC247BL-V01

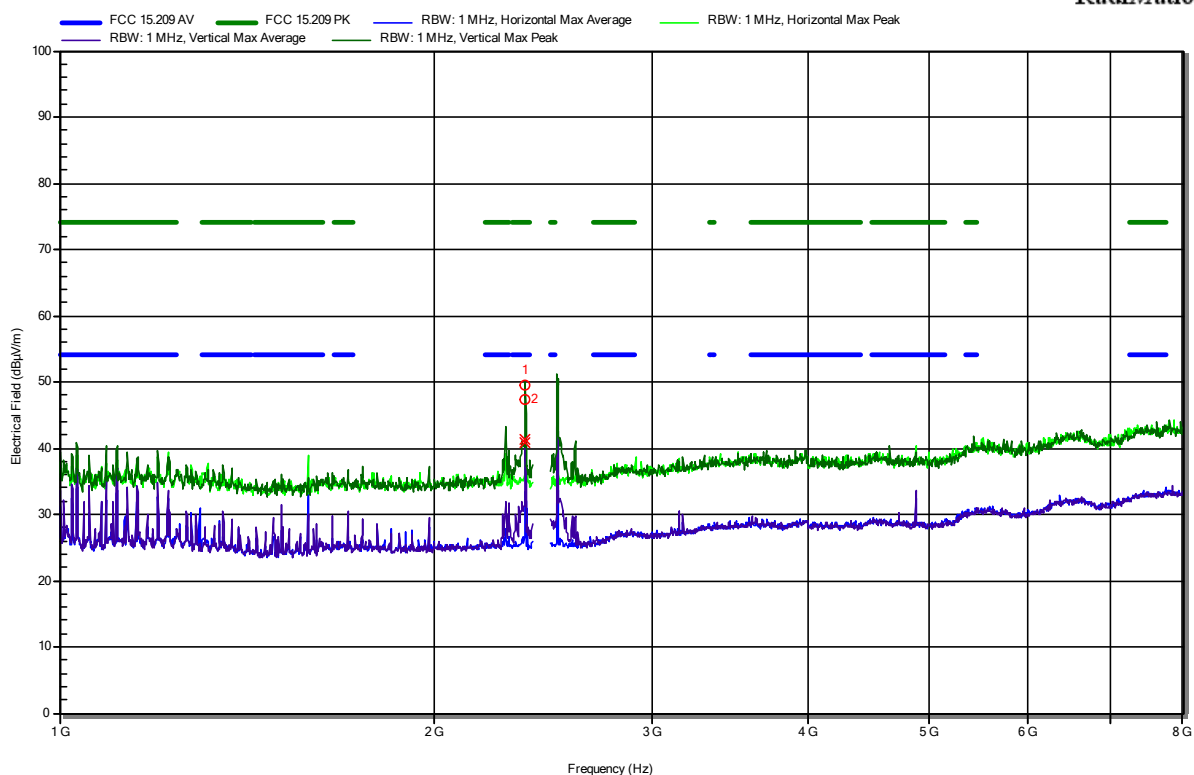
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

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: 24 °Celsius, Vnom: 3.3 VDC
 Antenna: Schwarzbeck BBHA 9120B
 Measurement distance: 3 m
 Mode: Tx; BLE; 1 Mbps, ext. antenna; 2440 MHz
 Test Date: 2021-12-11
 Note:

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RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
2.3648 GHz	49.47 dBμV/m	74 dBμV/m	-24.53 dB	Pass	Vertical
2.3686 GHz	47.31 dBμV/m	74 dBμV/m	-26.69 dB	Pass	Vertical

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
2.3648 GHz	40.87 dBμV/m	54 dBμV/m	-13.13 dB	Pass	Vertical
2.3686 GHz	41.32 dBμV/m	54 dBμV/m	-12.68 dB	Pass	Vertical

Test Report No.: G0M-2108-9951-TFC247BL-V01

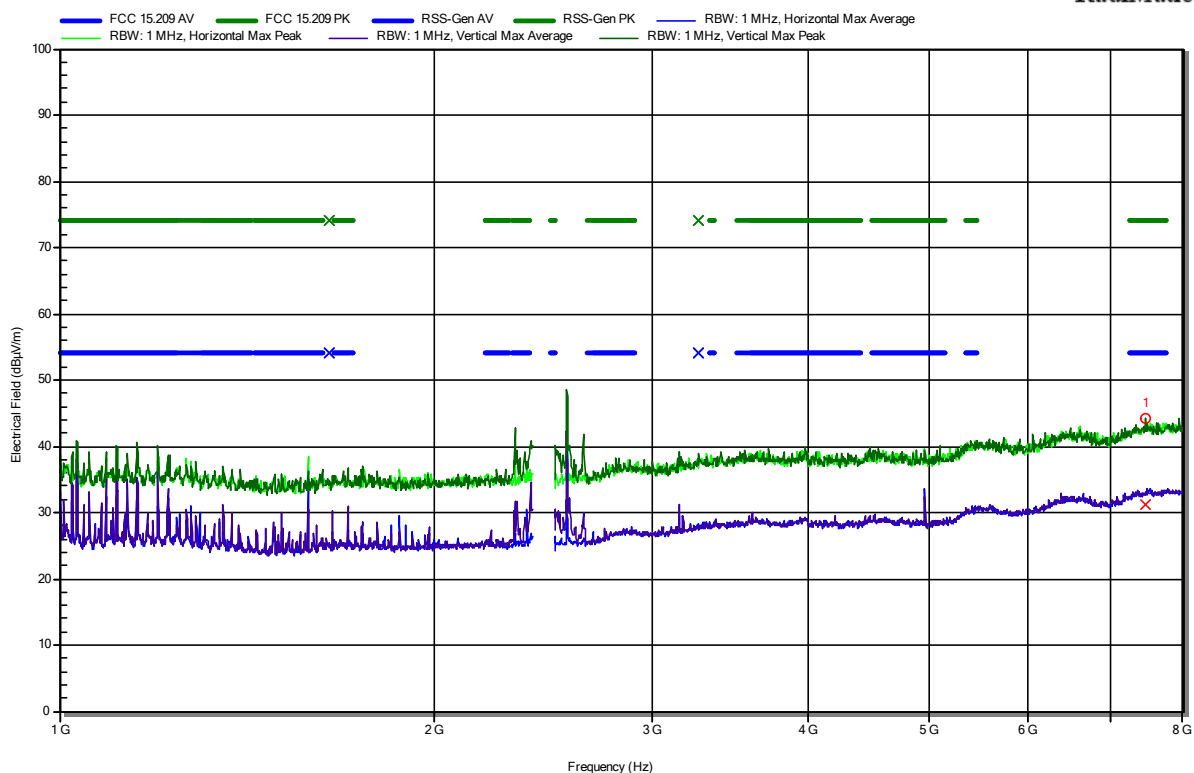
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

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: 24 °Celsius, Vnom: 3.3 VDC
 Antenna: Schwarzbeck BBHA 9120B
 Measurement distance: 3 m
 Mode: Tx; BLE; 1 Mbps, ext. antenna; 2480 MHz
 Test Date: 2021-12-11
 Note:

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RadiMation



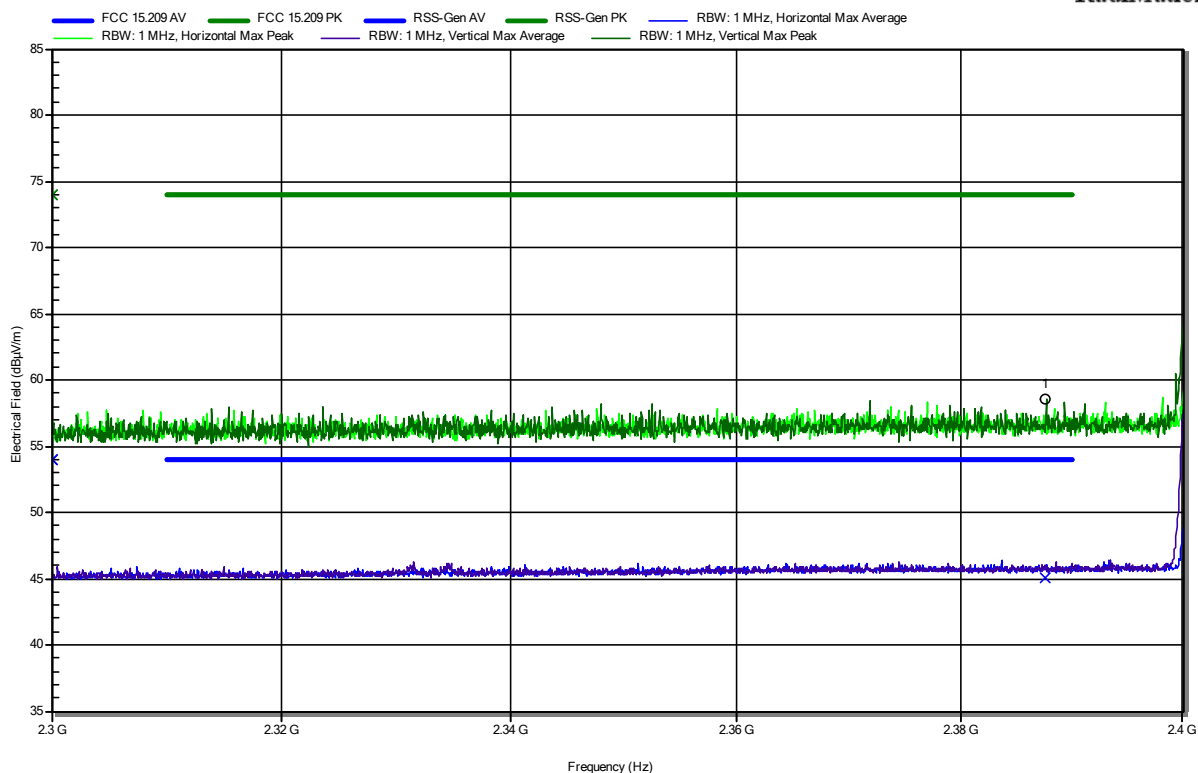
Frequency 7.463 GHz	Peak 44.29 dBµV/m	Peak Limit 74 dBµV/m	Peak Difference -29.71 dB	Peak Status Pass	Polarization Vertical
Frequency 7.463 GHz	Average 31.18 dBµV/m	Average Limit 54 dBµV/m	Average Difference -22.82 dB	Average Status Pass	Polarization Vertical

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: 24 °Celsius, Vnom: 3.3 VDC
 Antenna: Schwarzbeck BBHA 9120B
 Measurement distance: 3 m
 Mode: Tx; BLE; 1 Mbps, ext. antenna; 2402 MHz
 Test Date: 2021-12-11
 Note: lower bandedge

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RadiMation



Frequency 2.3876 GHz	Peak 58.58 dBμV/m	Peak Limit 74 dBμV/m	Peak Difference -15.42 dB	Peak Status Pass	Polarization Vertical
Frequency 2.3876 GHz	Average 45.05 dBμV/m	Average Limit 54 dBμV/m	Average Difference -8.95 dB	Average Status Pass	Polarization Vertical

Test Report No.: G0M-2108-9951-TFC247BL-V01

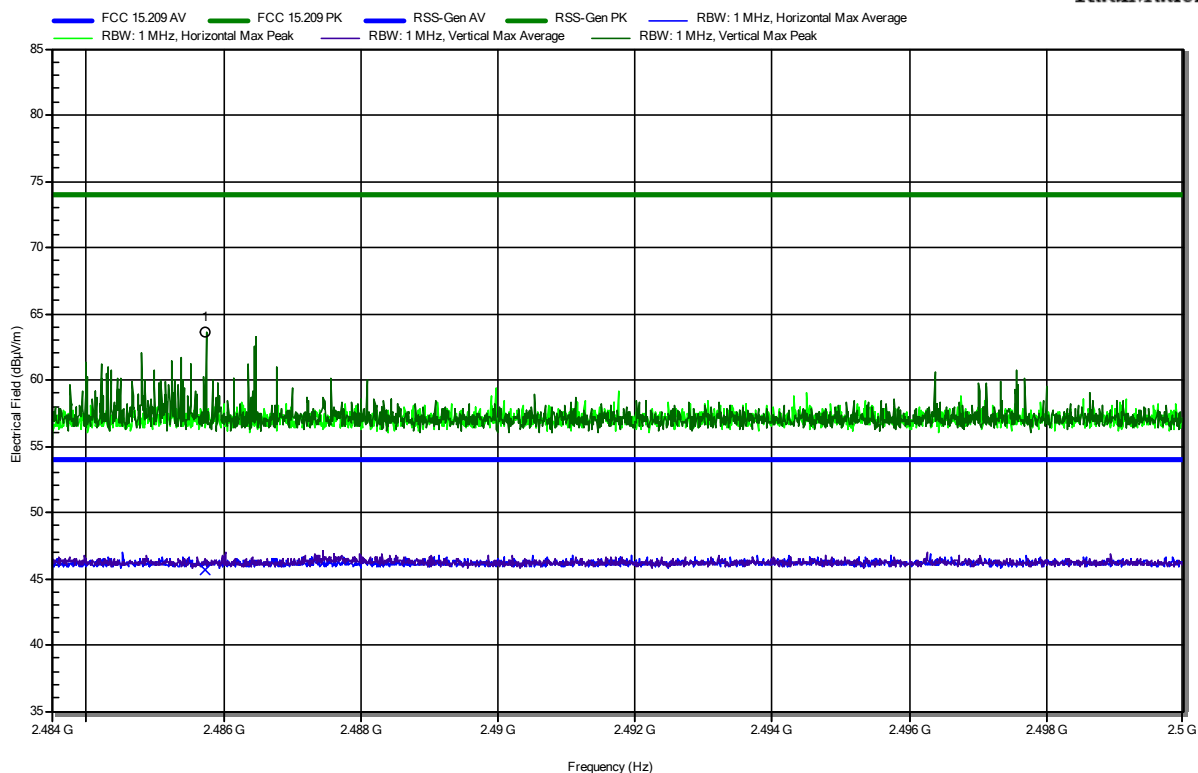
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

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: 24 °Celsius, Vnom: 3.3 VDC
 Antenna: Schwarzbeck BBHA 9120B
 Measurement distance: 3 m
 Mode: Tx; BLE; 1 Mbps, ext. antenna; 2480 MHz
 Test Date: 2021-12-11
 Note: upper bandedge

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RadiMation



Frequency 2.4857 GHz	Peak 63.64 dBµV/m	Peak Limit 74 dBµV/m	Peak Difference -10.36 dB	Peak Status Pass	Polarization Vertical
Frequency 2.4857 GHz	Average 45.66 dBµV/m	Average Limit 54 dBµV/m	Average Difference -8.34 dB	Average Status Pass	Polarization Vertical

Test Report No.: G0M-2108-9951-TFC247BL-V01

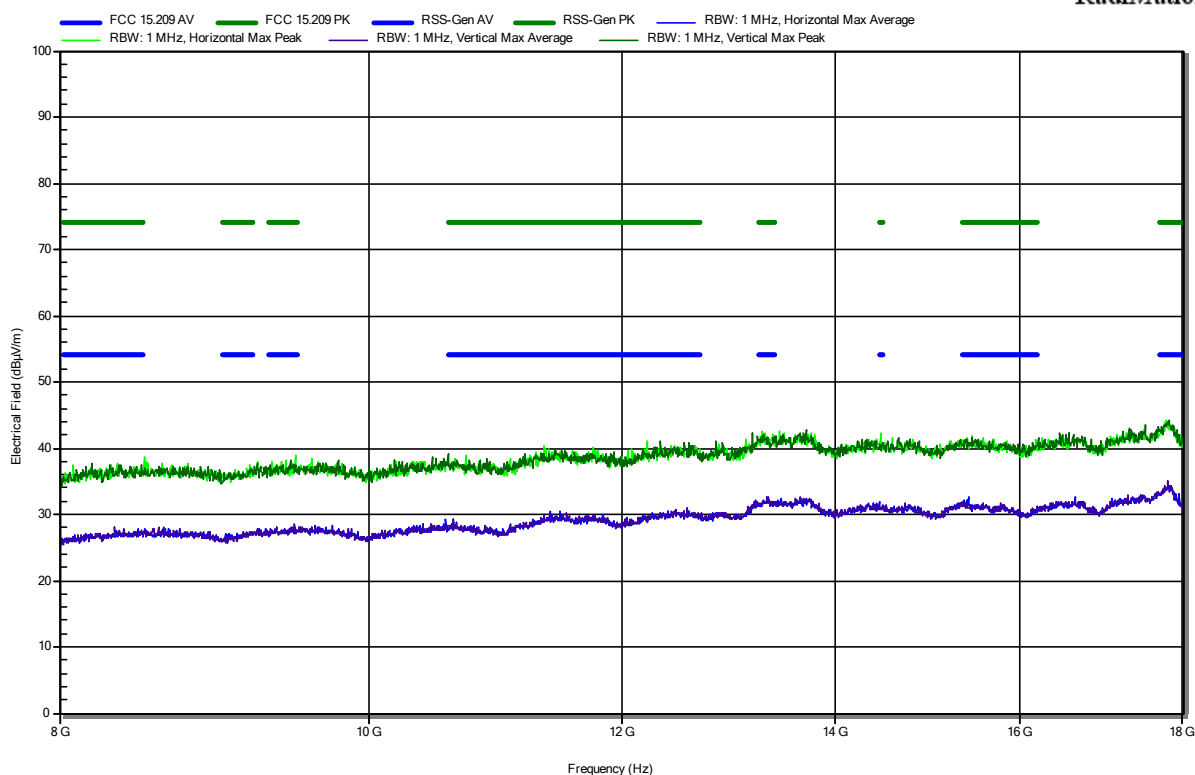
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

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: 24 °Celsius, Vnom: 3.3 VDC
 Antenna: Schwarzbeck HWRD 650
 Measurement distance: 3 m
 Mode: Tx; BLE; 1 Mbps, ext. antenna; 2402 MHz
 Test Date: 2021-12-11
 Note:

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RadiMation

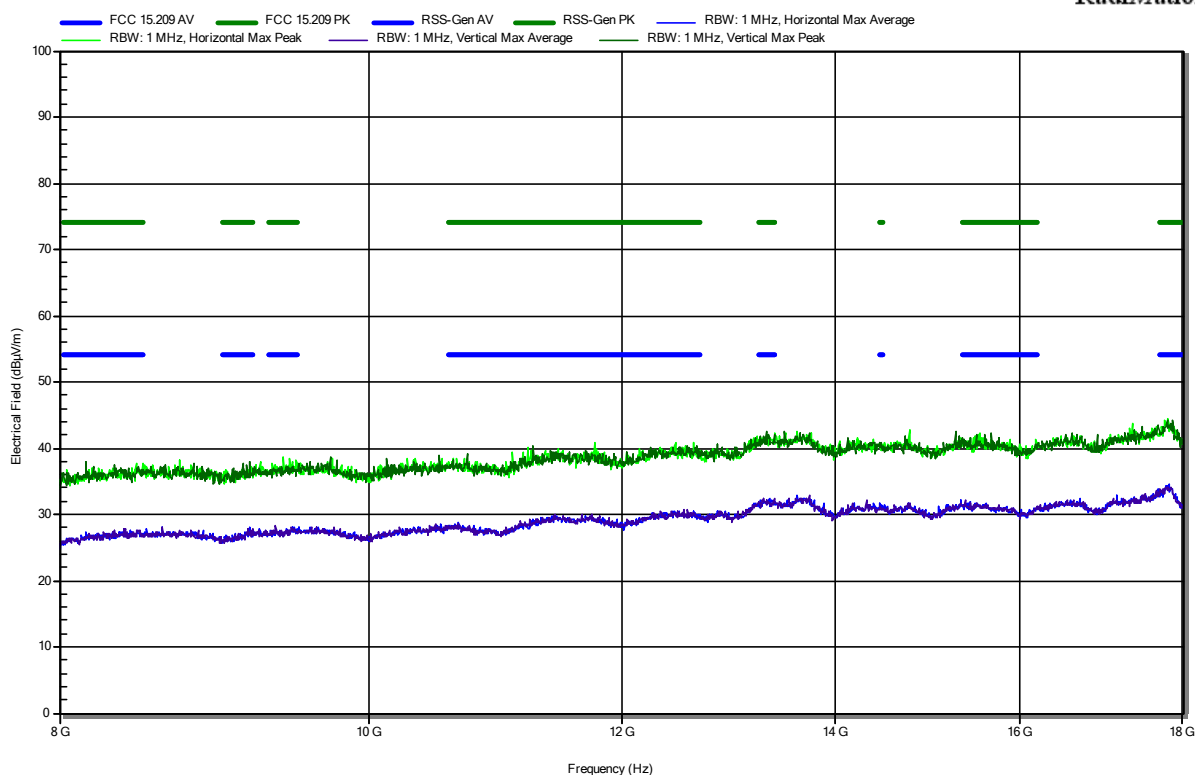


Radiated Spurious Emissions according to 47 CFR Part 15.247

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: 24 °Celsius, Vnom: 3.3 VDC
 Antenna: Schwarzbeck HWRD 650
 Measurement distance: 3 m
 Mode: Tx; BLE; 1 Mbps, ext. antenna; 2440 MHz
 Test Date: 2021-12-11
 Note:

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RadiMation

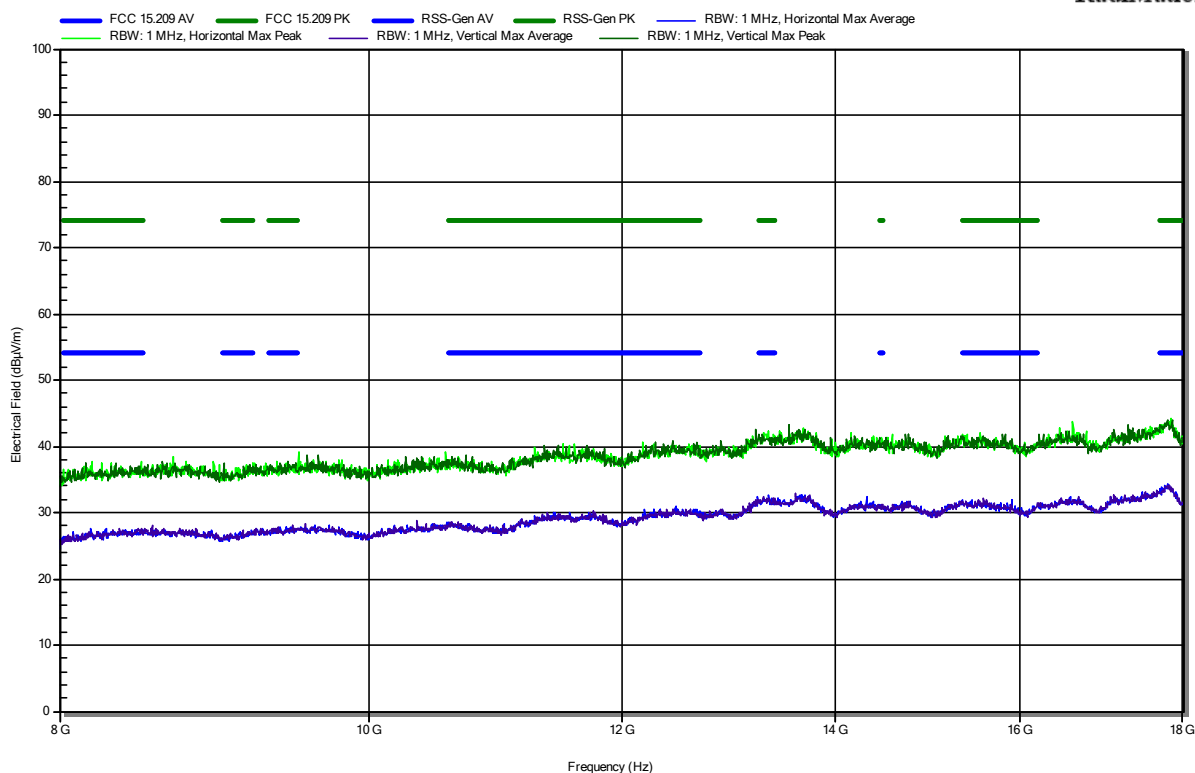


Radiated Spurious Emissions according to 47 CFR Part 15.247

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: 24 °Celsius, Vnom: 3.3 VDC
 Antenna: Schwarzbeck HWRD 650
 Measurement distance: 3 m
 Mode: Tx; BLE; 1 Mbps, ext. antenna; 2480 MHz
 Test Date: 2021-12-11
 Note:

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RadiMation

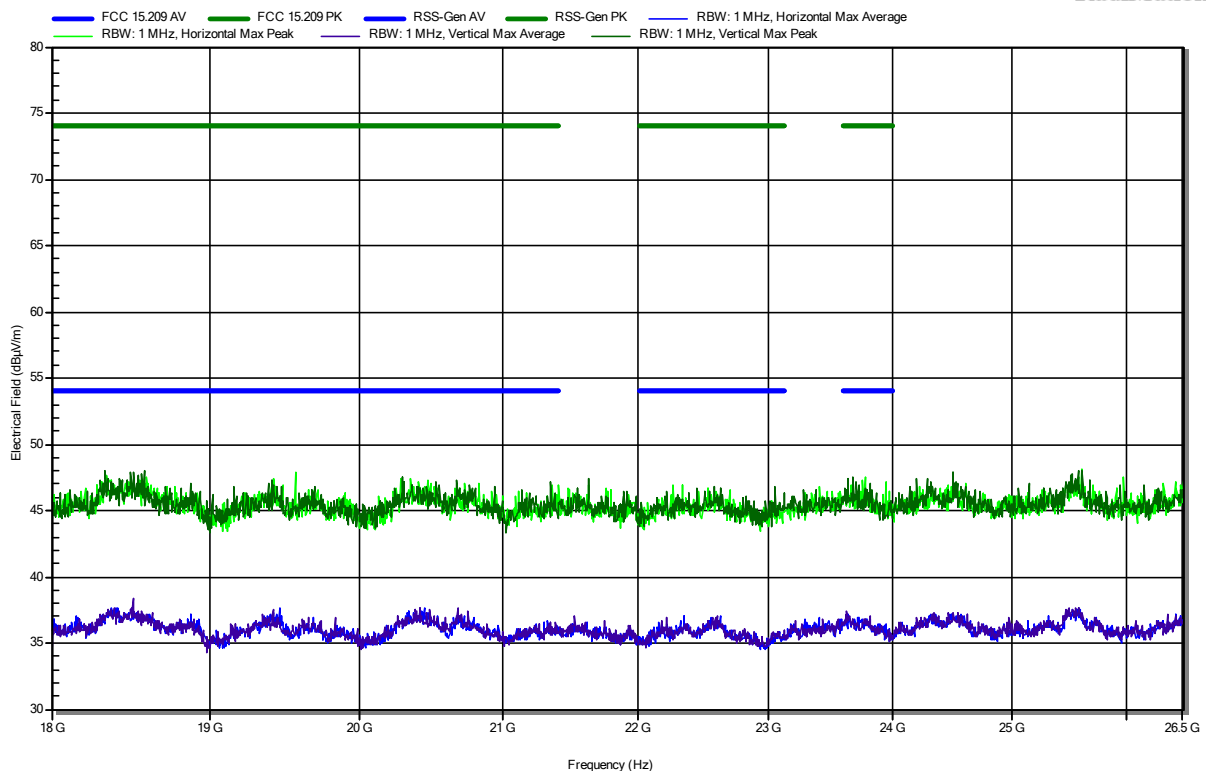


Radiated Spurious Emissions according to 47 CFR Part 15.247

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: 24 °Celsius, Vnom: 3.3 VDC
 Antenna: Amplifier Research AT4560
 Measurement distance: 3 m
 Mode: Tx; BLE; 1 Mbps, ext. antenna; 2402 MHz
 Test Date: 2021-12-11
 Note:

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RadiMation

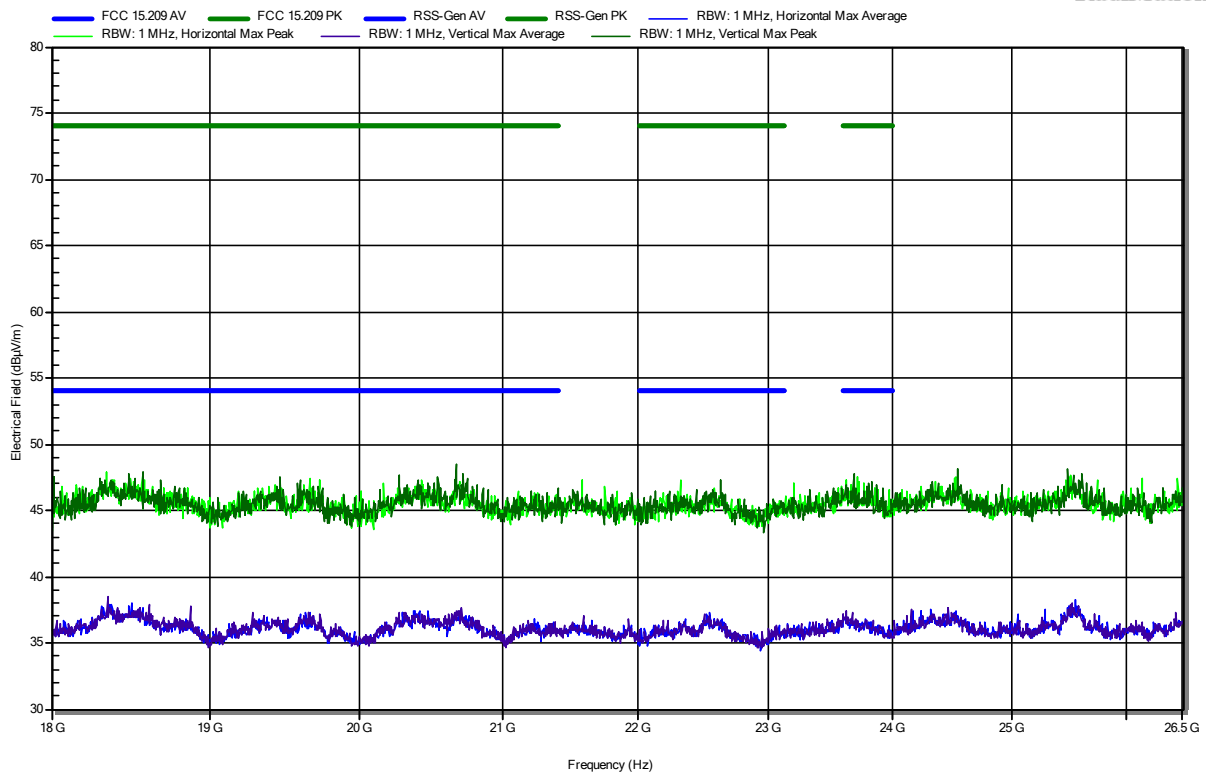


Radiated Spurious Emissions according to 47 CFR Part 15.247

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: 24 °Celsius, Vnom: 3.3 VDC
 Antenna: Amplifier Research AT4560
 Measurement distance: 3 m
 Mode: Tx; BLE; 1 Mbps, ext. antenna; 2440 MHz
 Test Date: 2021-12-11
 Note:

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RadiMation

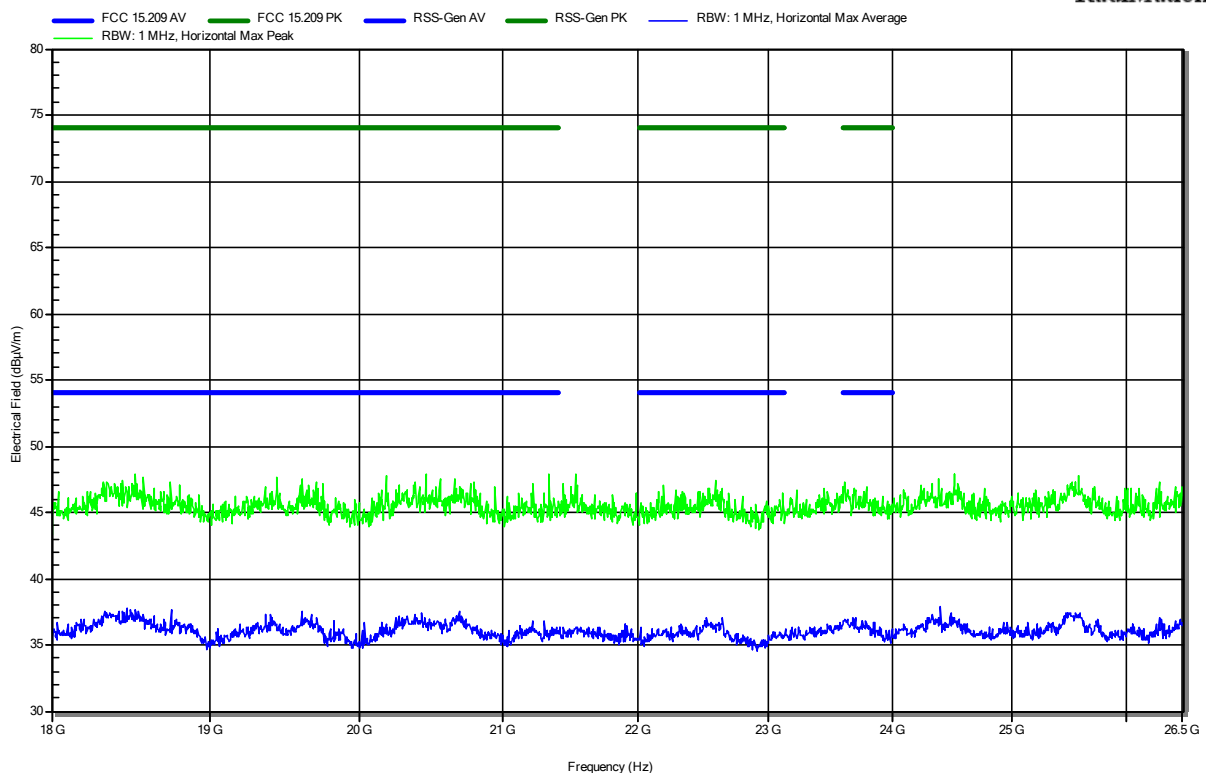


Radiated Spurious Emissions according to 47 CFR Part 15.247

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: 24 °Celsius, Vnom: 3.3 VDC
 Antenna: Amplifier Research AT4560
 Measurement distance: 3 m
 Mode: Tx; BLE; 1 Mbps, ext. antenna; 2480 MHz
 Test Date: 2021-12-11
 Note:

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RadiMation



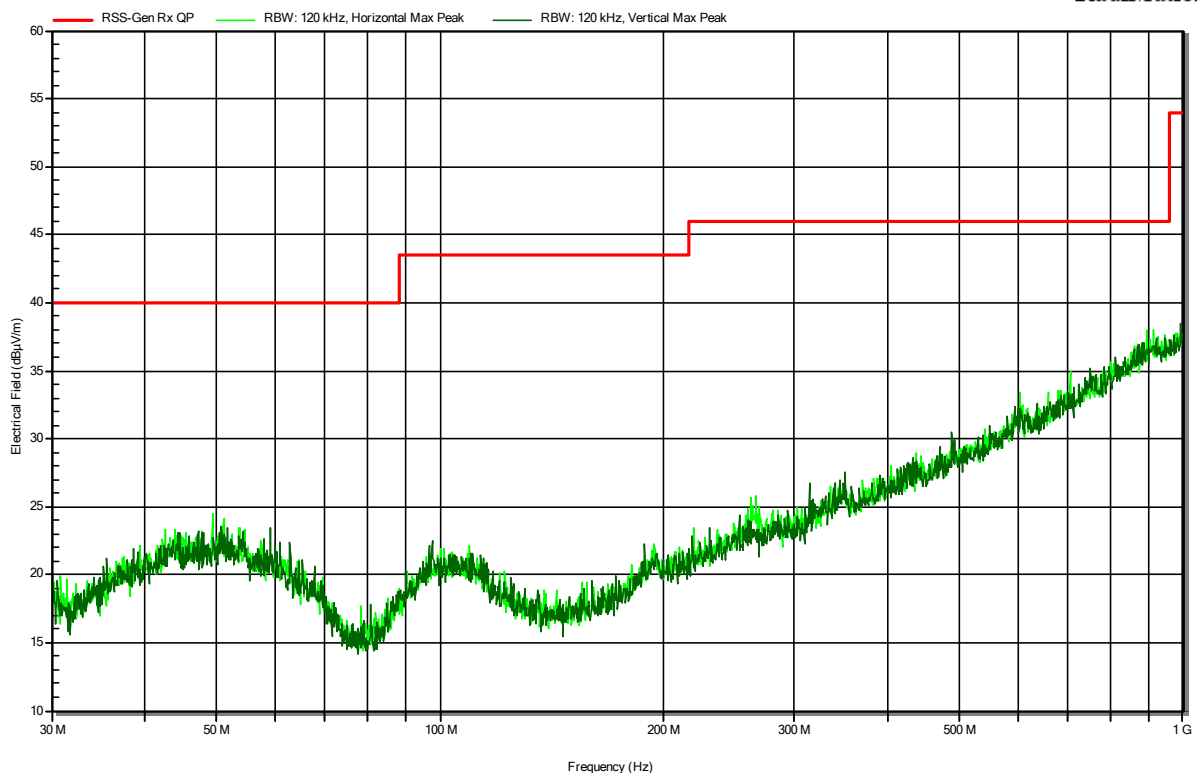
ANNEX B Receiver spurious emissions

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: 24 °Celsius, Vnom: 3.3 VDC
 Antenna: Schwarzbeck VULB 9162
 Measurement distance: 10 m
 Mode: Rx; BLE; ext. antenna; 2440 MHz
 Test Date: 2022-03-17
 Note:

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RadiMation

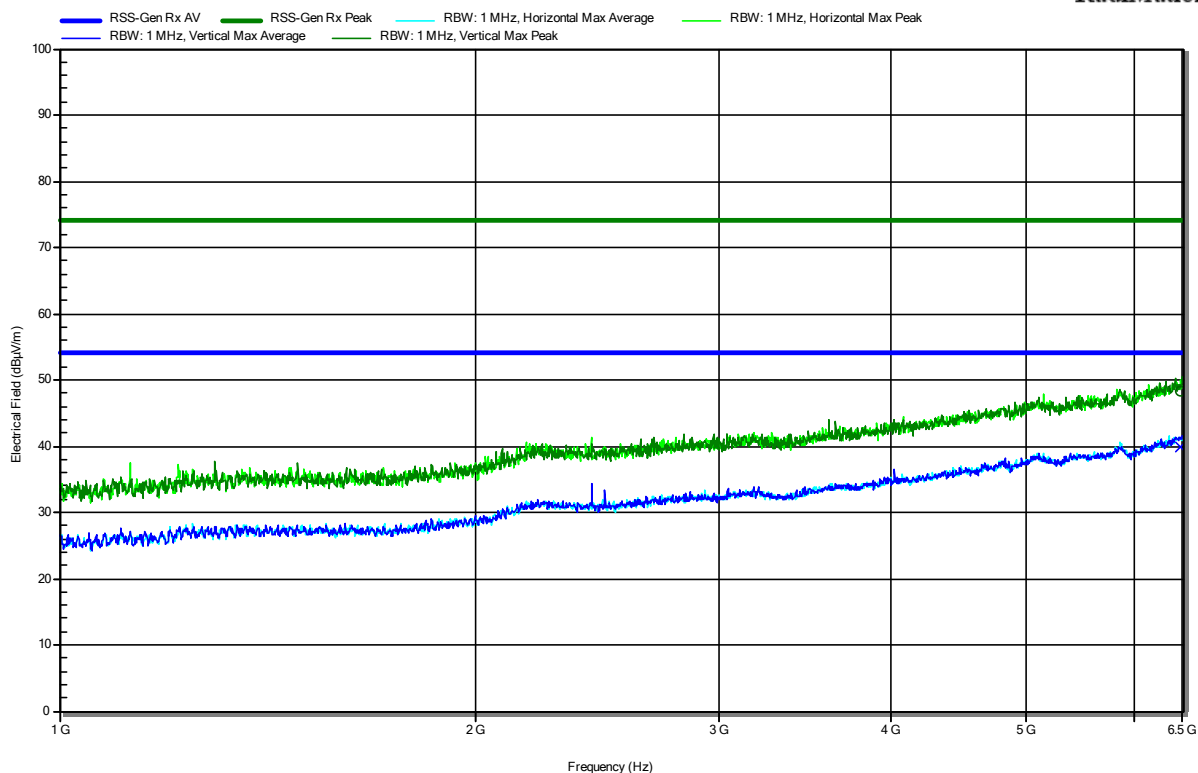


Radiated Spurious Emissions according to RSS-247, RSS-Gen

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; BLE; ext. antenna; 2440 MHz
 Test Date: 2022-03-18
 Note:

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RadiMation



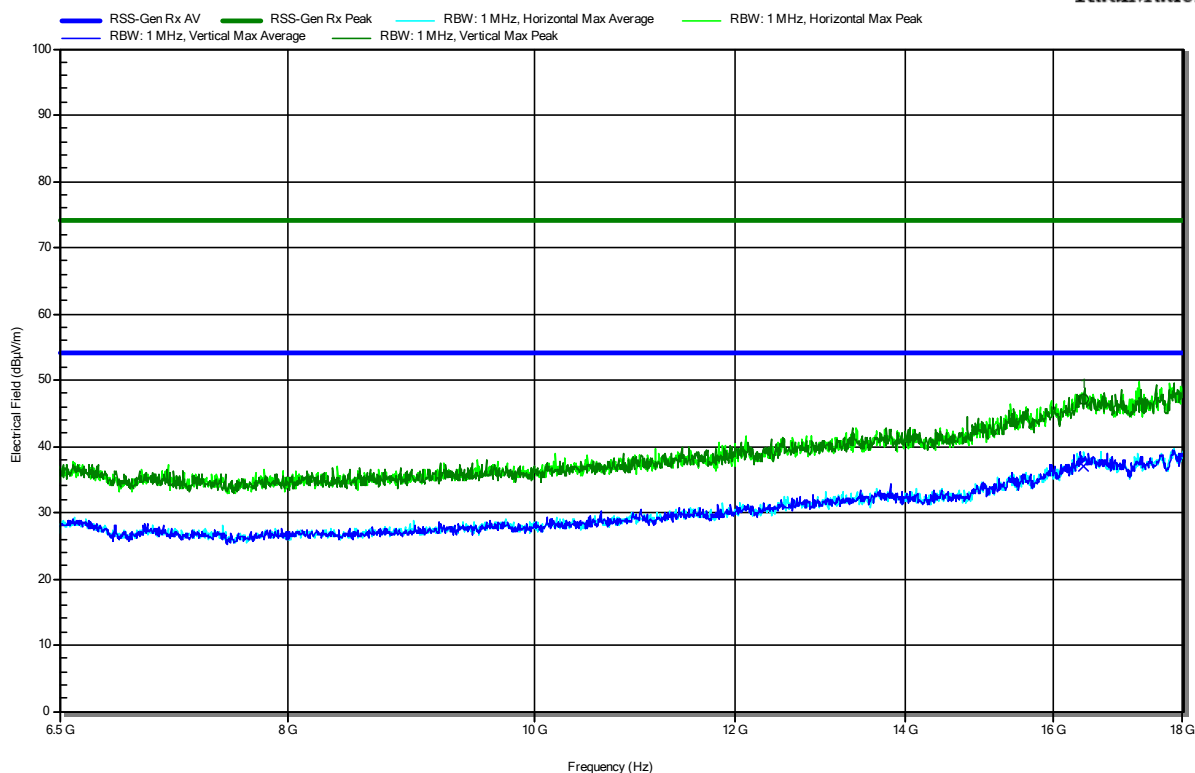
Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
6.479 GHz	48.36 dBµV/m	74 dBµV/m	-25.64 dB	Pass	Horizontal
Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
6.479 GHz	39.86 dBµV/m	53.98 dBµV/m	-14.12 dB	Pass	Horizontal

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; BLE; ext. antenna; 2440 MHz
 Test Date: 2022-03-18
 Note:

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RadiMation



Frequency 16.456 GHz	Peak 47.08 dBμV/m	Peak Limit 74 dBμV/m	Peak Difference -26.92 dB	Peak Status Pass	Polarization Horizontal
Frequency 16.456 GHz	Average 36.99 dBμV/m	Average Limit 53.98 dBμV/m	Average Difference -16.99 dB	Average Status Pass	Polarization Horizontal

== END OF TEST REPORT ==

Test Report No.: G0M-2108-9951-TFC247BL-V01

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