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-2309-2215-TFC247WF-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 3, 2023-08 RSS-Gen, Issue 5, Amendment 2, 2021-02
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model(s)	ENWF9511C1KF
Additional Model(s)	None
Brand Name(s)	PAN9019A
Hardware Version(s)	03
Software Version(s)	01
FCC ID	T7V9019
IC	216Q-9019
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	2023-12-11	
Report:		
Compiled by	Md Abu Bakar Siddique	
Tested by (+ signature) (Responsible for Test)	Md Abu Bakar Siddique	
Approved by (+ signature) (Test Lab Engineer)	Wilfried Treffke	
Date of Issue	2024-03-25	
Total number of pages	163	
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:		
This test report only includes measurement results of IEEE 802.11ax HE-TB with partial RU and HE20-SU ER modes. For measurement results of the other modes, refer to the test report 3938RER001, published by Eurofins Electric & Electronics Finland Oy on 08-Mar-24		

ADDITIONAL VARIANTS

Additional Variants (not tested and not evaluated variants)		
Not-tested Variant	**Description**	
1	Product Type Description	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz and Bluetooth® Module
	Model name	ENWF9501C1KF
	Brand name	PAN9019
	PMN	PAN9019
	HVIN	ENWF9501C1KF
	FVIN	--
	HMN	--
	Hardware Version	03
	Software Version	01
2	Product Type Description	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module, M.2 card
	Model name	ENWF9511CMKF
	Brand name	PAN9019A-M2E-EVD
	PMN	PAN9019A-M2E-EVD
	HVIN	ENWF9511CMKF
	FVIN	--
	HMN	--
	Hardware Version	01
	Software Version	01
3	Product Type Description	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz and Bluetooth® Module, M.2 card
	Model name	ENWF9501CMKF
	Brand name	PAN9019-M2E-EVD
	PMN	PAN9019-M2E-EVD
	HVIN	ENWF9501CMKF
	FVIN	--
	HMN	--
	Hardware Version	01
	Software Version	01
4	Product Type Description	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module, M.2 card with chip antenna
	Model name	ENWF9511AMKF
	Brand name	PAN9019A-M2E-C-EVD
	PMN	PAN9019A-M2E-C-EVD
	HVIN	ENWF9511AMKF
	FVIN	--
	HMN	--
	Hardware Version	01
	Software Version	01
5	Product Type Description	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz and Bluetooth®, M.2 card with chip antenna
	Model name	ENWF9501AMKF
	Brand name	PAN9019-M2E-C-EVD
	PMN	PAN9019-M2E-C-EVD
	HVIN	ENWF9501AMKF
	FVIN	--
	HMN	--
	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	2024-03-25	Initial Release	--

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
BPSK	Binary Phase Shift Keying
DSSS	Direct Sequence Spread Spectrum
ER	Extended range
EUT	Equipment Under Test
FCC	Federal Communications Commission
HT	High Throughput
HE	High Efficiency
IEEE 802.11	MAC and PHY Layer for WiFi
ISED	Innovation, Science and Economic Development Canada
MCS	Modulation Coding Scheme
MU	Multi user
OFDM	Orthogonal Frequency Division Multiplexing
OFDMA	Orthogonal frequency-division multiple access
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RBW	Resolution bandwidth
RMS	Root mean square
SU	Single user
TB	Trigger based
VBW	Video bandwidth
V_{NOM}	Nominal supply voltage

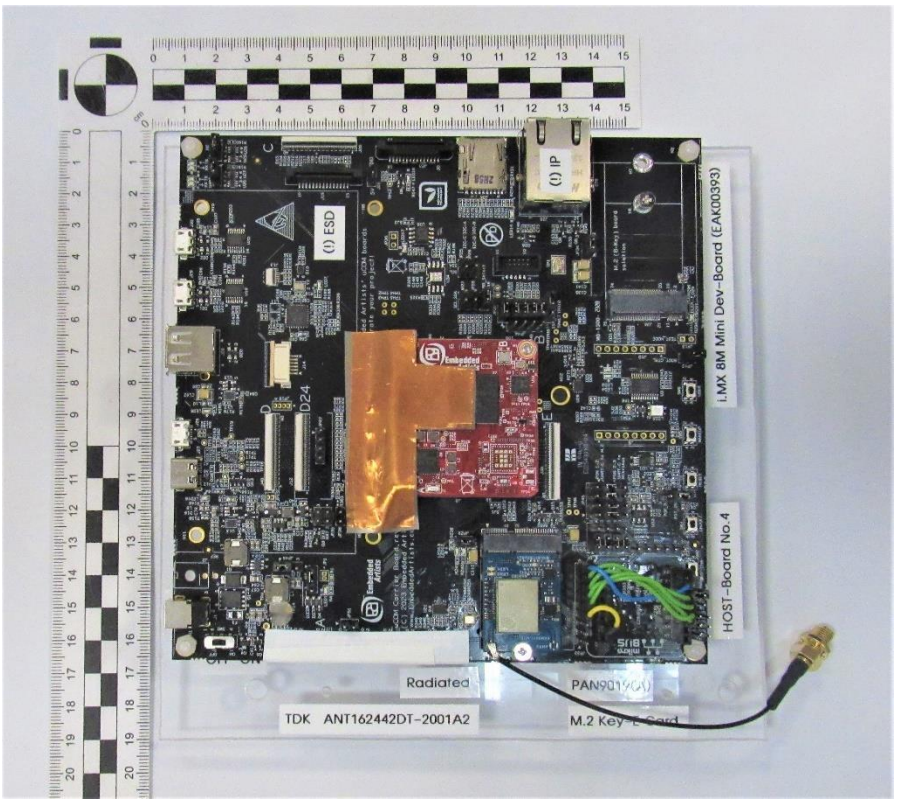
REPORT INDEX

1 Equipment (Test Item) Under Test

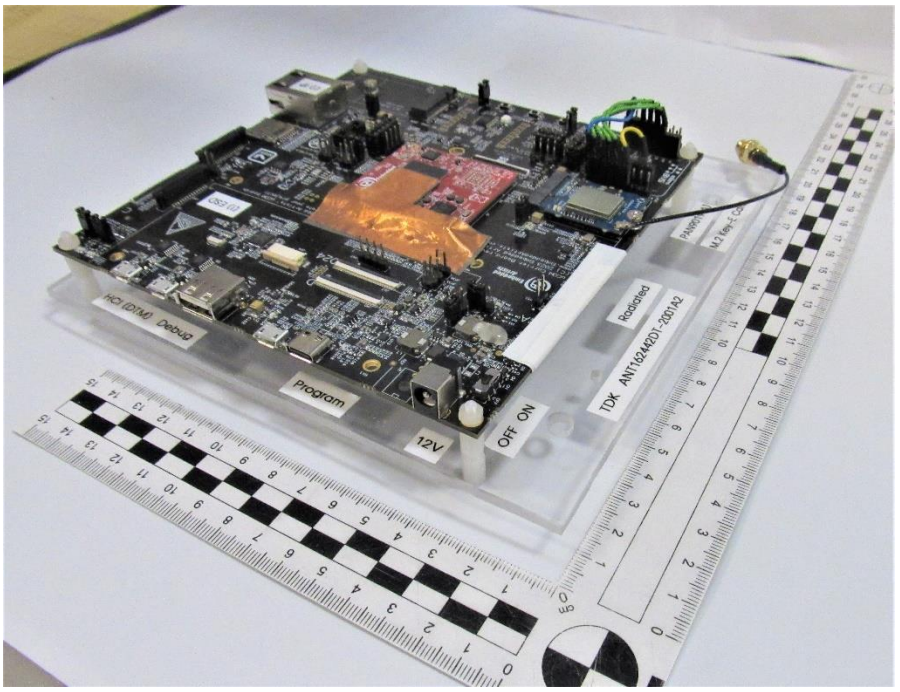
Description	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module		
Model	ENWF9511C1KF		
Additional Model(s)	None		
Brand Name(s)	PAN9019A		
Sample Identification	EUT #	Sample-ID	Serial Number
	PAN9019A with Antenna 1	46850	00000330
	PAN9019A with Antenna 2	46856	00000298
	PAN9019A with Antenna 3	46897	00000277
Hardware Version(s)	03		
Software Version(s)	01		
PMN	PAN9019A		
HVIN	ENWF9511C1KF		
FVIN	--		
HMN	--		
FCC ID	T7V9019		
IC	216Q-9019		
Equipment type	Radio Module		
Radio type	Transceiver		
Assigned frequency bands	2400.0 MHz - 2483.5 MHz		
Radio technology	IEEE 802.11 b/g/n/ax		
Modulation	BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM		
Number of antenna ports	1		
Antenna 1	Type	External antenna	
	Model	GW.51.5153	
	Manufacturer	Taoglas	
	Gain	5.2 dBi	
Antenna 2	Type	External antenna	
	Model	2JF1002P	
	Manufacturer	2J Antennas	
	Gain	4.2 dBi	
Antenna 3	Type	External antenna	
	Model	ANT162442DT-2001A2	
	Manufacturer	TDK	
	Gain	2.1 dBi	
Supply Voltage	V_{NOM}	1.8/3.3 VDC	
	V_{MIN}	1.71/3.14 VDC	
	V_{MAX}	1.89/3.46 VDC	
Operating Temperature	T_{NOM}	25 °C	
	T_{MIN}	-40 °C	
	T_{MAX}	85 °C	
AC/DC-Adaptor	None		
Manufacturer	Panasonic Industrial Devices Europe GmbH Zeppelinstr. 19 21337 Lüneburg GERMANY		

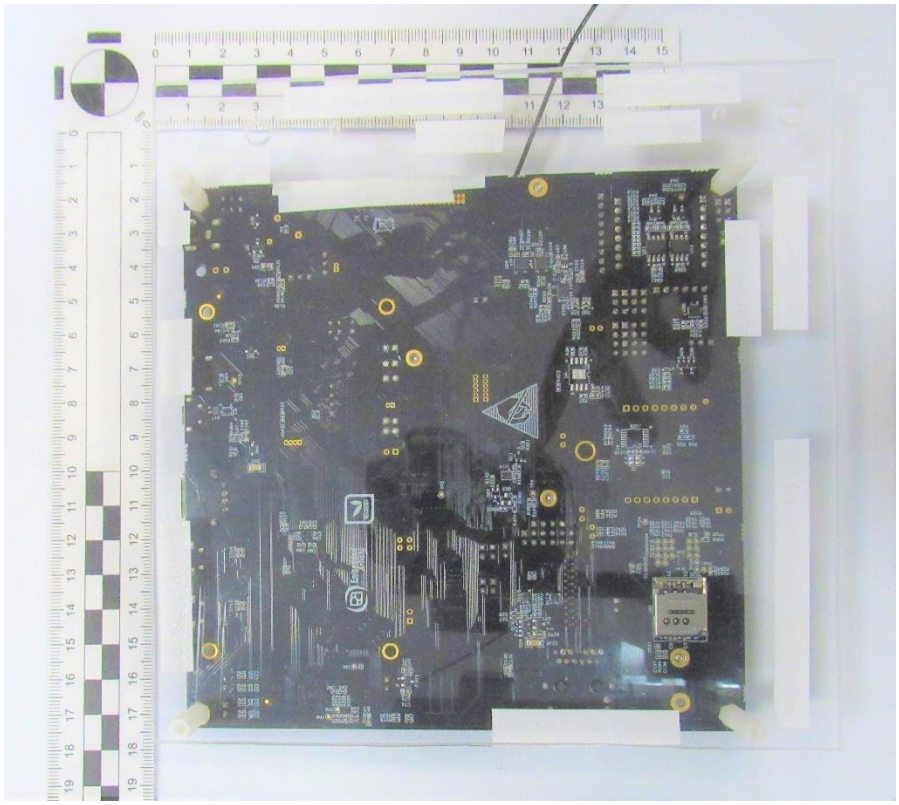
1.1 Photos – Equipment External

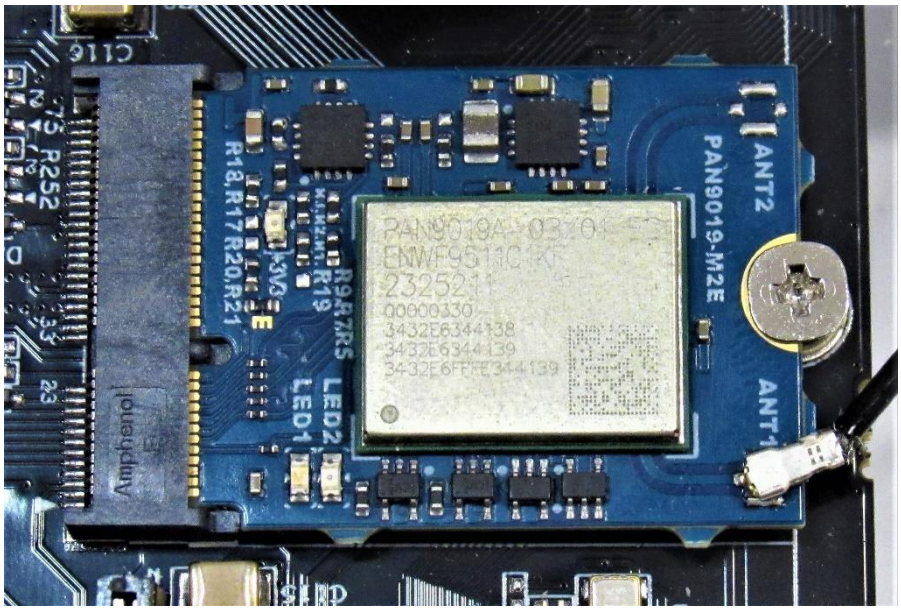
EUT -On host board-Top



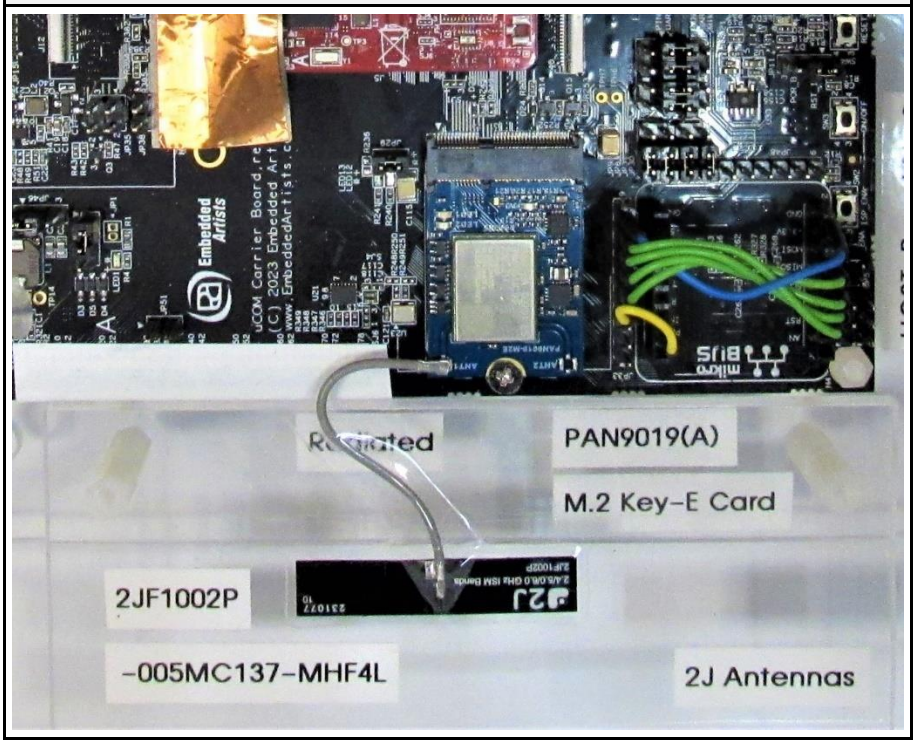
EUT-On host board-Side view



EUT-On host board-Bottom


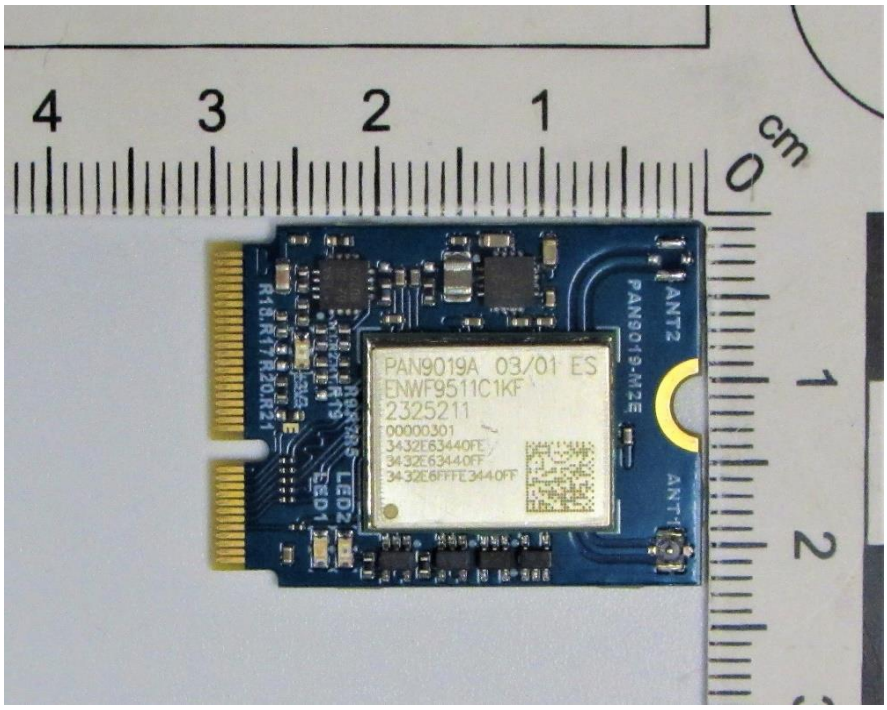
EUT-Radio Module


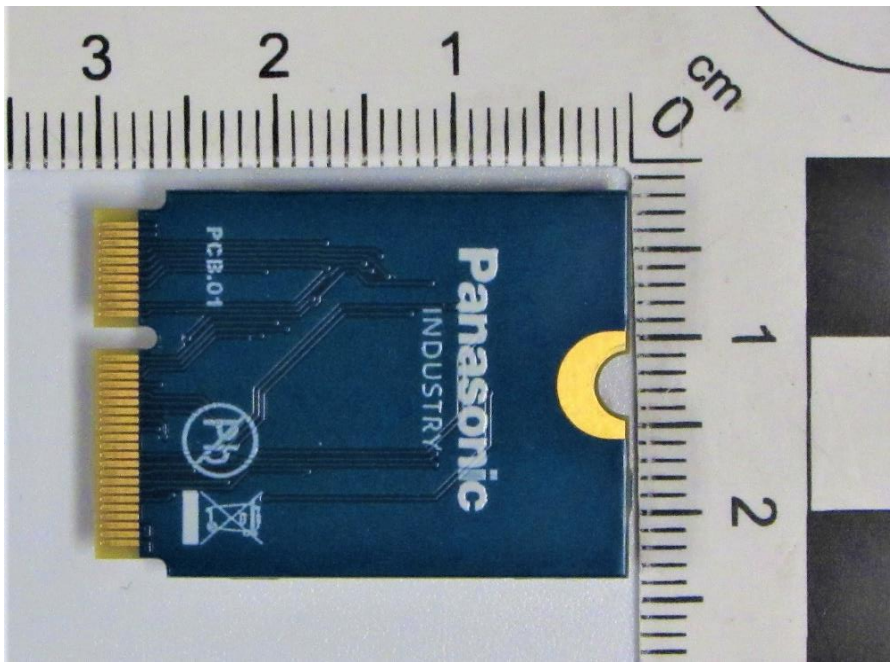
EUT -On host board-With Antenna 1

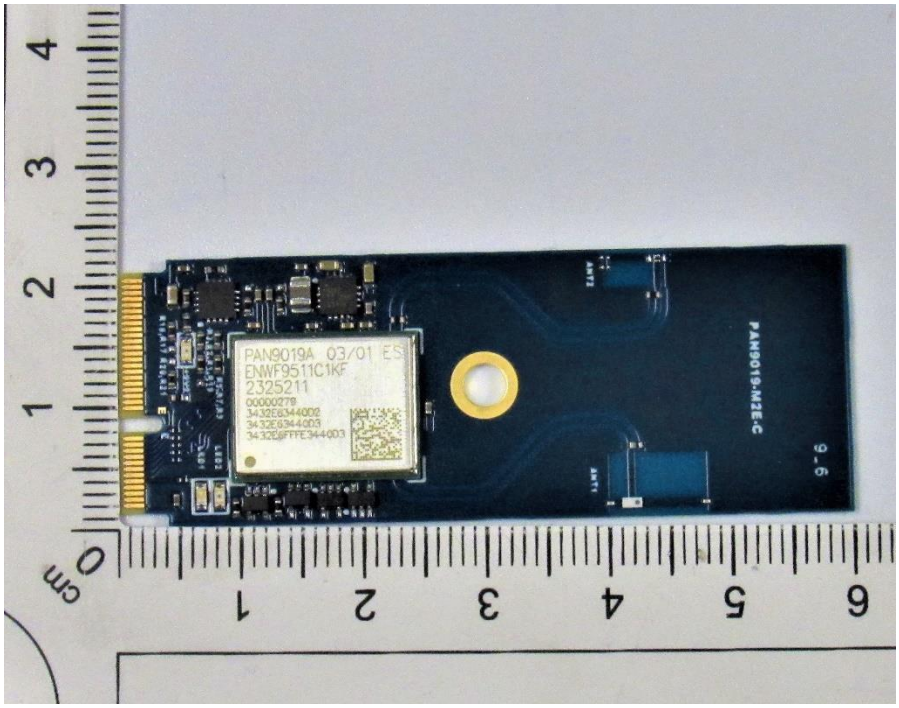

EUT -On host board-With Antenna 2


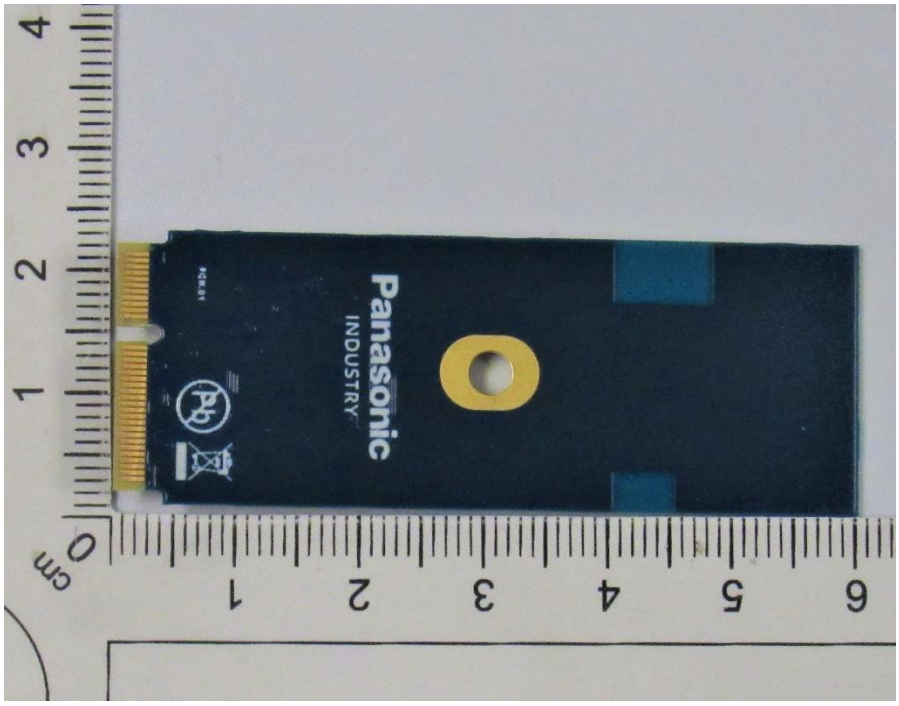
EUT -On host board-With Antenna 3

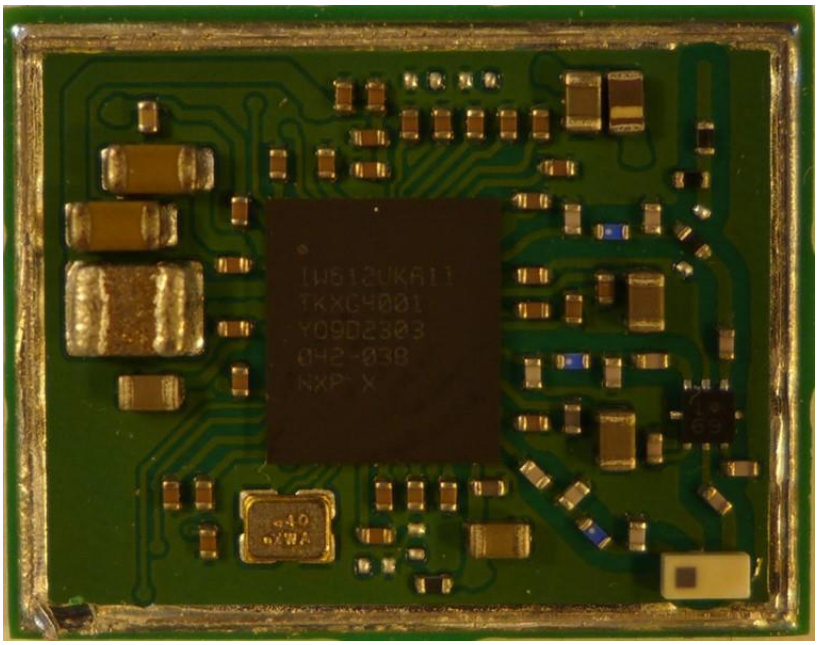

1.2 Photos – Equipment Internal

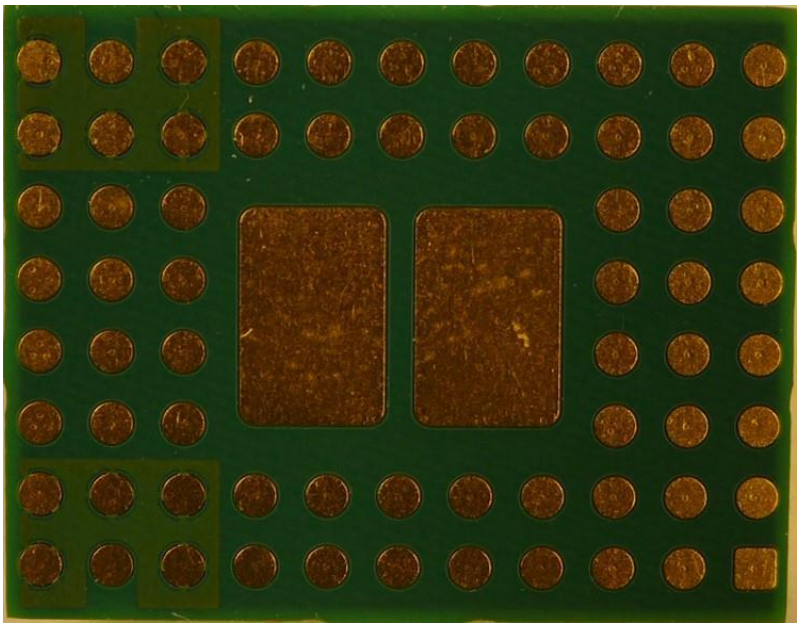
RF Module-PAN9019(A)-top


RF Module-PAN9019(A)-bottom


RF Module-PAN9019(A)-With antenna 3-top


RF Module-PAN9019(A)-With antenna 3-bottom


RF Module-PAN9019(A)-top without shielding


RF Module-PAN9019(A)-bottom top without shielding


1.3 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Host-Board-iMX8M Mini Developer´s Kit V3	Embedded Artists	EAK00393	For configuring test modes
AE	Notebook	Lenovo	Thinkpad	
AE	AC/DC Adapter	Phihong Technology Co. Ltd.	PSAA30R-120	To power the evaluation board
CBL	Ethernet	---	---	Connection between evaluation board and notebook
SFT	Web GUI	Panasonic	---	For test mode activation
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
SFT : The Equipment Under Test used an operating system with a test firmware. The driver for the tested technology was running in a manufacturer mode.				
Comment:				

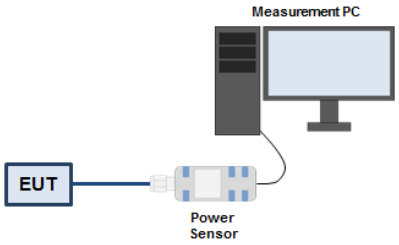
1.4 Test mode output power

1.4.1 Information

Test Information	
Measurement Method	ANSI C63.10 11.9, 14.3

1.4.2 Setup

Test Setup



1.4.3 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Power sensor	R&S	NRP-Z81	EF01732	2023-08	2024-08
Cable(CAABC)	Gigalane	GIGALANE 1730	EF00779	2023-03	2024-03

1.4.4 Procedure

Test Procedure

1. EUT set to test mode
2. The peak power is measured with the wideband power sensor
3. The power is measured for the lowest data rate on all three channels
4. For the channel with the highest power the power is also measured for all data rates
5. The data rate with the highest output power is selected for test mode

1.4.5 Results

Results - HE20-TB(RU-242)			
MCS	Power [dBm] Channel 2412 [MHz]	Power [dBm] Channel 2437 [MHz]	Power [dBm] Channel 2462 [MHz]
0	**20.68**	**20.65**	**20.66**
1	20.50	20.60	20.61
2	20.30	20.60	20.40
3	20.66	20.55	20.50
4	20.49	20.49	20.60
5	20.45	20.50	20.40
6	20.40	20.55	20.60
7	20.50	20.49	20.35
8	20.55	20.30	20.50
9	20.60	20.48	20.45
10	20.47	20.50	20.40
11	20.60	20.62	20.43
Note: Conducted measurement without antenna gain			

Results – HE40-TB (RU-484)			
MCS	Power [dBm] Channel 2422 [MHz]	Power [dBm] Channel 2437 [MHz]	Power [dBm] Channel 2452 [MHz]
0	**20.61**	**20.53**	**20.72**
1	20.55	20.50	20.70
2	20.50	20.50	20.68
3	20.60	20.47	20.50
4	20.49	20.50	20.49
5	20.52	20.30	20.53
6	20.50	20.46	20.57
7	20.60	20.50	20.60
8	20.53	20.48	20.67
9	20.60	20.50	20.70
10	20.56	20.50	20.60
11	20.45	20.51	20.55
Note: Conducted measurement without antenna gain			

Results – HE20-SU-ER(RU-242)			
MCS	Power [dBm] Channel 2422 [MHz]	Power [dBm] Channel 2437 [MHz]	Power [dBm] Channel 2462 [MHz]
0	**23.56**	**23.51**	**23.63**
1	23.55	23.49	23.62
2	23.52	23.49	23.63
Note: Conducted measurement without antenna gain			

1.5 Test mode duty cycle

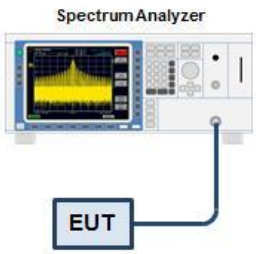
1.5.1 Information

Test Information	
Measurement Method	ANSI C63.10 11.6

1.5.2 Requirements

Requirements	
Duty cycle	Duty cycle correction
≥ 98 %	No correction required
< 98 %	Correction required (10 x Log_{10}(1/DC)

1.5.3 Setup

Test Setup


1.5.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSU 43	EF01631	2023-08	2024-08
Cable(CAABC)	Gigalane	GIGALANE 1730	EF00779	2023-03	2024-03

1.5.5 Procedure

Test Procedure
1. EUT set to test mode 2. Span is set to zero span 3. Detector set to peak 4. Sweep time is set long enough to capture at least 5 bursts 5. Envelope peak value of emission spectrum is selected 6. The maximum burst duration T_{ON} is measured using two markers set to the start and the end of the longest burst 7. The minimum idle duration T_{OFF} is measured using two markers set to the start and the end of the shortest idle period 8. The duty cycle is calculated by DC = T_{ON} / (T_{ON} + T_{OFF}) 9. The duty cycle correction is calculated by DC = 10 x Log_{10}(T_{ON} / (T_{ON} + T_{OFF}))

1.5.6 Results

Duty Cycle Results		
Mode	Duty Cycle	Correction Factor [dB]
HE20	96.7	-0.1
HE40	96.7	-0.1

1.6 Test Modes

Mode	Description
HE-TB (IEEE 802.11ax)	Mode = Transmit Bandwidth = 20 MHz Duty cycle = 96.7% Power setting = 3 (2412 MHz, 2437 MHz, 2462 MHz) Data rate (1 Simultaneous Tx) = 8.6 Mbps(MCS 0) Resource Unit = 242 (index 61),484 (index 65)
HE20 - SU-ER Extended range mode (IEEE 802.11ax)	Mode = Transmit Bandwidth = 20 MHz Duty cycle = 96.7% Power setting = 13 (2412 MHz, 2462 MHz), 14 (2437 MHz) Data rate (1 Simultaneous Tx) = 8.6 Mbps(MCS 0) Resource Unit = 106(index 54),242(index 61)
Comment: The above settings were found as worst case during pre-tests. Conducted peak output power was evaluated to determine the worst-case settings.	

1.7 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx / Rx	1	2412
F2	Tx / Rx	3	2422
F3	Tx / Rx	6	2437
F4	Tx / Rx	9	2452
F5	Tx / Rx	11	2462

1.8 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).

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.

Field strength 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:

Field strength limit (dBµV/m) = 20 · log (µV/m)

Example only for radiated field strength:

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

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 3 (section 5.2)	6 dB Bandwidth	ANSI C63.10-2013	PASS	--
FCC § 15.247(b) ISED RSS-247, Issue 3 (section 5.4)	Maximum peak conducted power	ANSI C63.10-2013	PASS	--
FCC § 15.247(e) ISED RSS-247, Issue 3 (section 5.2)	Power spectral density	ANSI C63.10-2013	PASS	--
FCC § 15.207 ISED RSS-247, Issue 3 (section 3.1)	AC power line conducted emissions	ANSI C63.10-2013	N/R	Results are available in full test report. (3938RER001)
FCC § 15.247(d) ISED RSS-247, Issue 3 (section 5.5)	Band edge compliance	ANSI C63.10-2013	PASS	--
FCC § 15.247(d) ISED RSS-247, Issue 3 (section 5.5)	Conducted spurious emissions	ANSI C63.10-2013	PASS	--
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 3 (section 3.1)	Receiver radiated spurious emissions	ANSI C63.4-2014	PASS	--
Comment: The Decision Rule is applied on the basis of ETSI TR 102 273 and ETSI TR 100 028. These standards provide guidance on how to calculate and apply measurement uncertainty whilst providing maximum uncertainties allowance. In all cases due consideration will be given to ILAC-G8:09/2019. Where a result is considered conditional in respect of its proximity to the limit line, the customer would be made aware of situation so that they can make an informed decision on how to proceed.				

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

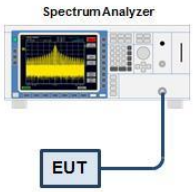
3.1.1 Information

Test Information	
Reference	ISED RSS-Gen, Issue 5 A2 (section 6.7)
Measurement Method	ANSI C63.10 6.9.3
Measurement Uncertainty	± 1.26 %
Test Sample ID	46856
Operator	Md Abu Bakar Siddique
Date	2024-03-04

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 43	EF01631	2023-08	2024-08
Cable(CAABC)	Gigalane	GIGALANE 1730	EF00779	2023-03	2024-03

3.1.5 Procedure

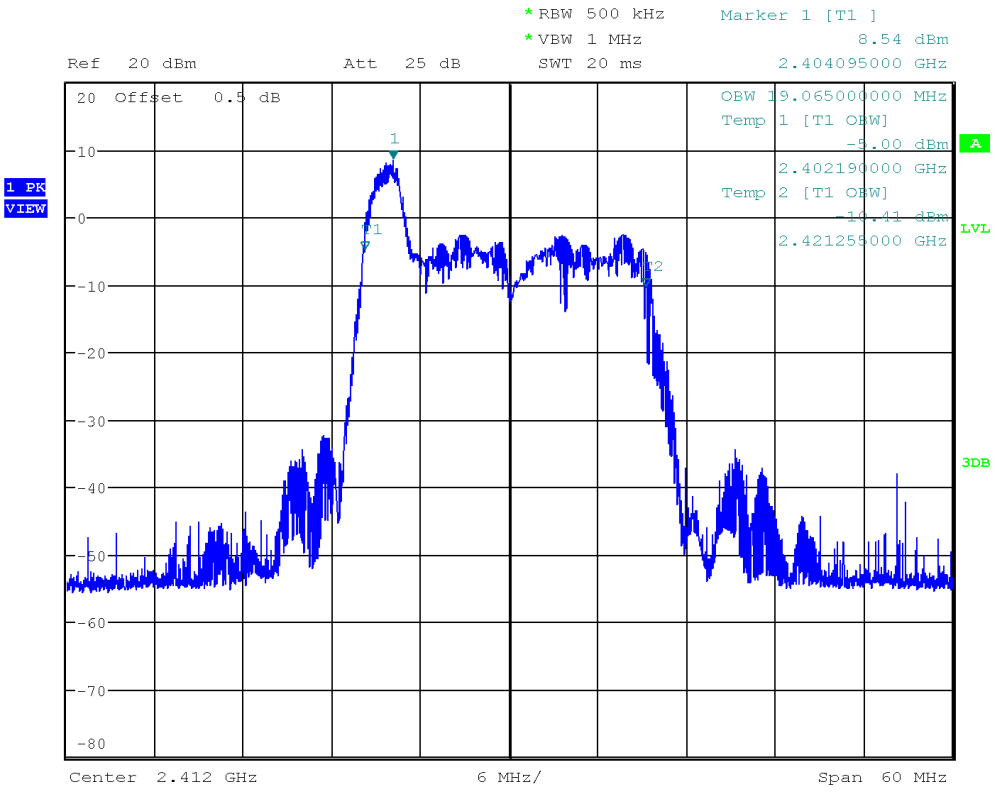
Test Procedure
1. EUT transmitter is activated in test mode under normal conditions 2. The spectrum analyzer is set to peak detection and maximum hold with a span twice the emission spectrum 3. The resolution bandwidth is set to the range of 1 % to 5 % of the occupied bandwidth 4. The occupied bandwidth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

3.1.6 Results

Test Results		
Mode	Frequency [MHz]	Bandwidth [MHz]
HE20-TB(RU-26)	2412	19.065
HE20-TB(RU-52)	2437	18.240
HE20-TB(RU-106)	2462	18.135
HE40-TB(RU-242)	2422	19.680
HE40-TB(RU-484)	2452	37.530
HE20-SU-ER(RU-242)	2412	18.885
HE20-SU-ER(RU-242)	2442	18.870
HE20-SU-ER(RU-242)	2462	18.885

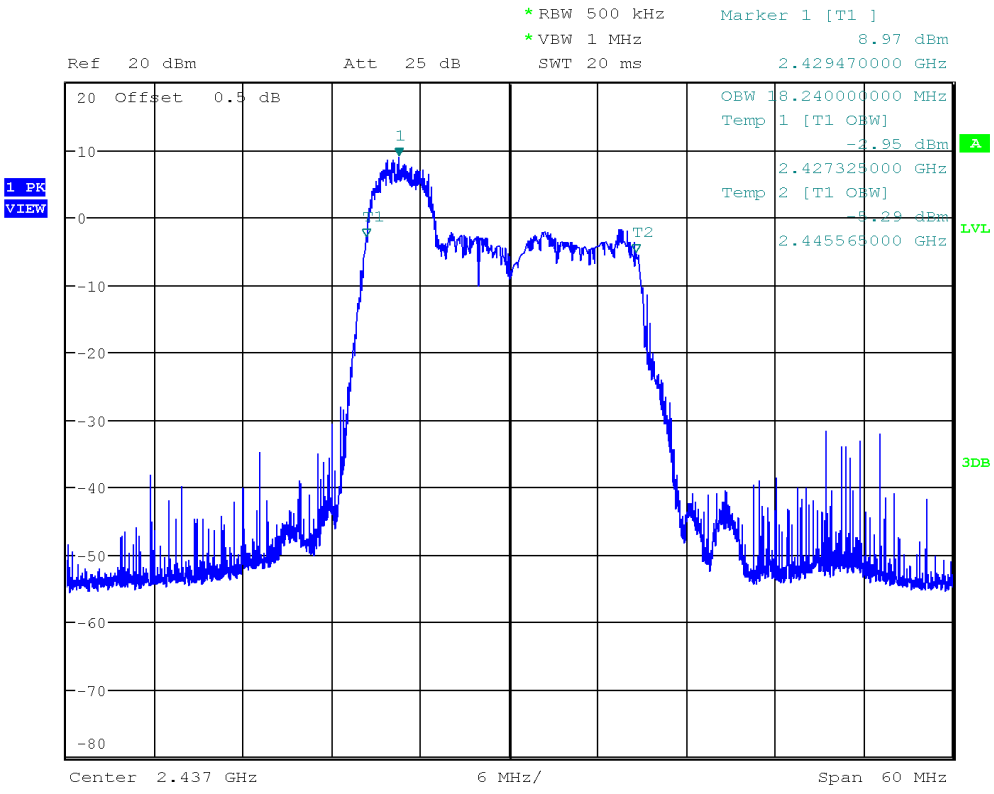
Occupied Bandwidth

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	IEEE 802.11 ax HE20-TB(RU-26), Channel: 1, 2412 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Occupied Bandwidth [MHz]:	19.065



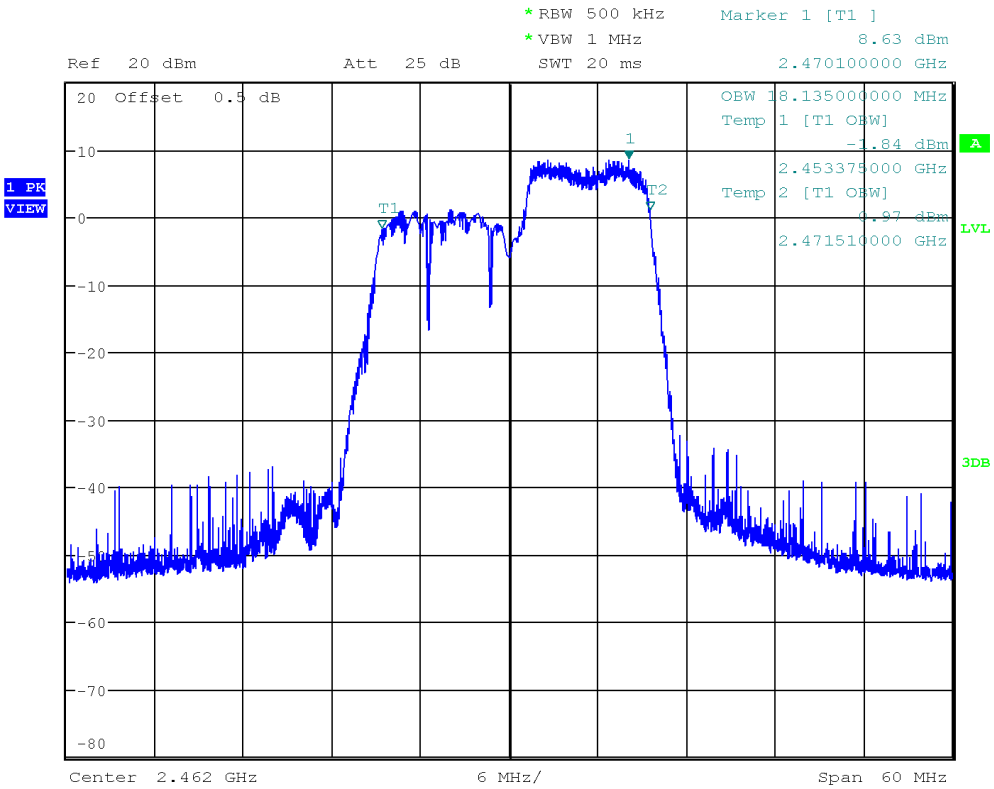
Occupied Bandwidth

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	IEEE 802.11 ax HE20-TB(RU-52), Channel: 6, 2437 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Occupied Bandwidth [MHz]:	18.240



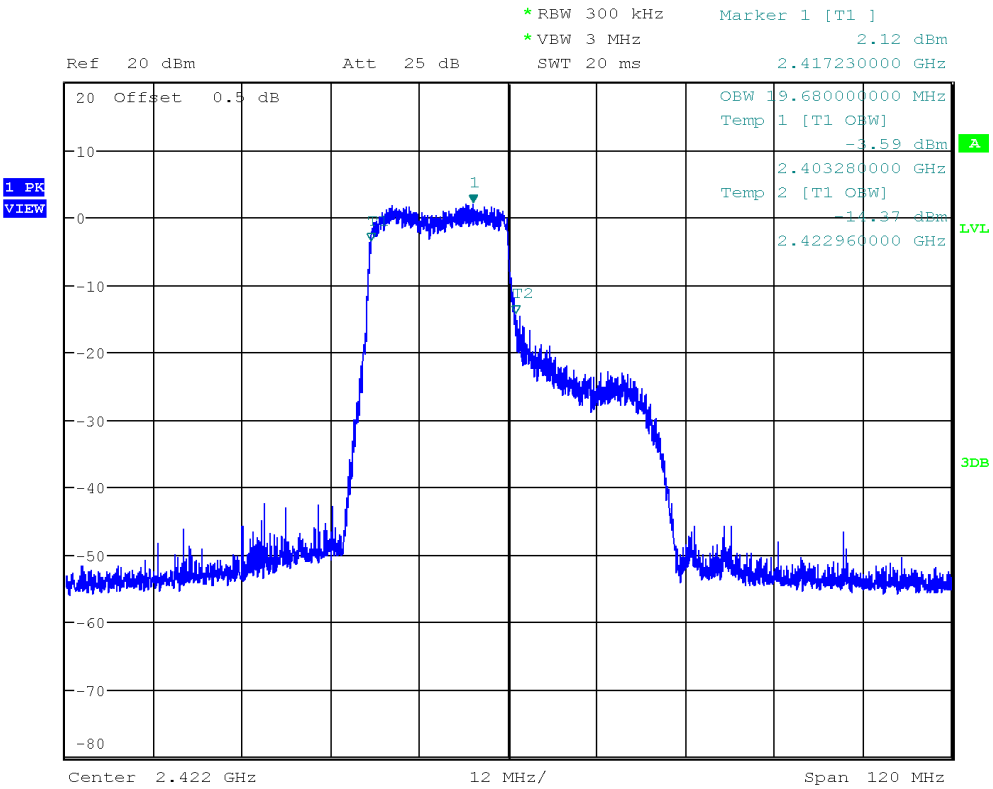
Occupied Bandwidth

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	IEEE 802.11 ax HE20-TB(RU-26), Channel: 11, 2462 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Occupied Bandwidth [MHz]:	18.135



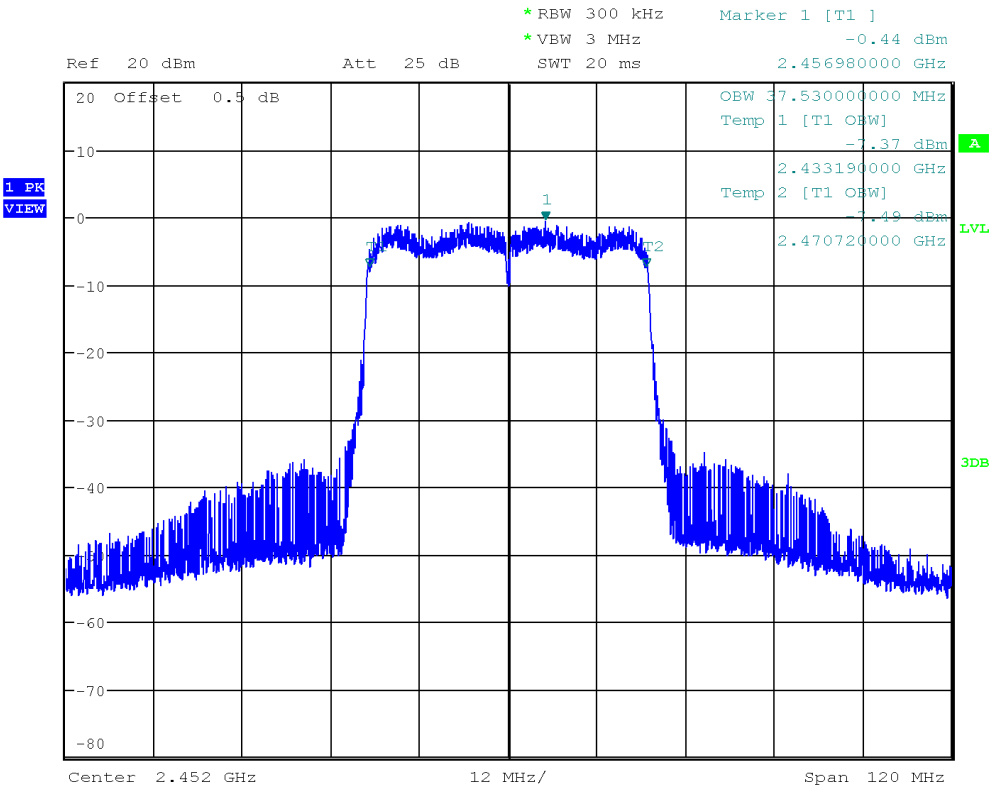
Occupied Bandwidth

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	IEEE 802.11 ax HE40-TB(RU-242), Channel: 3, 2422
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Occupied Bandwidth [MHz]:	19.680



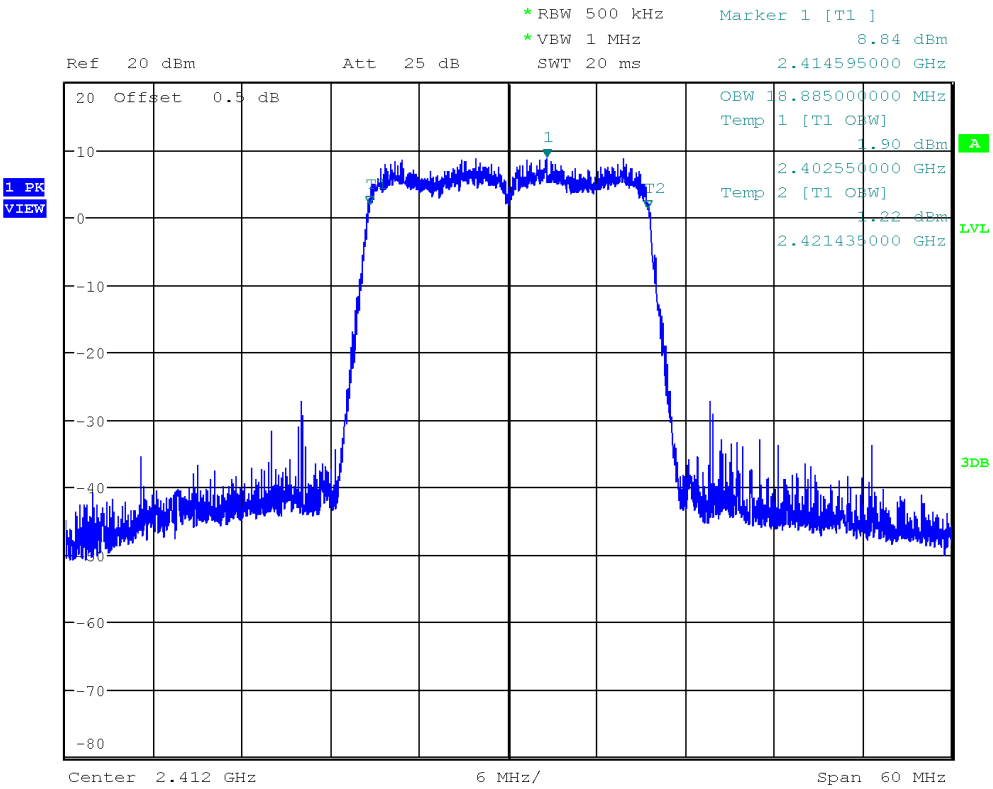
Occupied Bandwidth

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	IEEE 802.11 ax HE40-TB(RU-484), Channel: 9, 2452
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Occupied Bandwidth [MHz]:	37.530



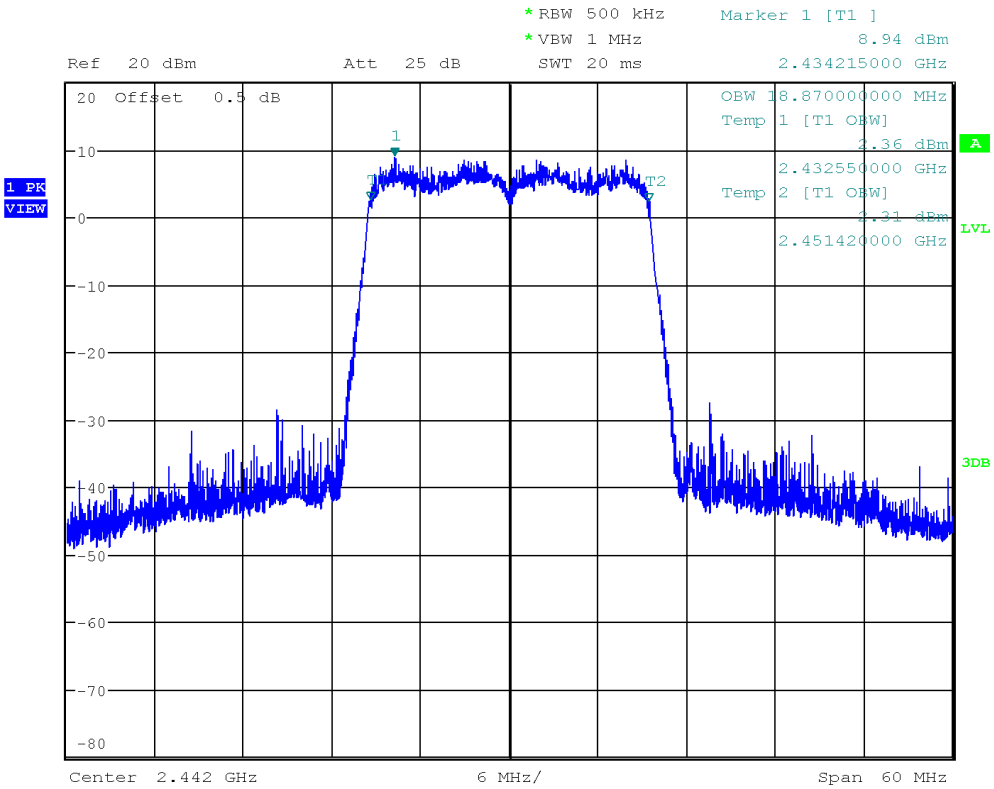
Occupied Bandwidth

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	IEEE 802.11 ax HE20-SU-ER(RU-242), Channel: 1, 2412
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Occupied Bandwidth [MHz]:	18.885



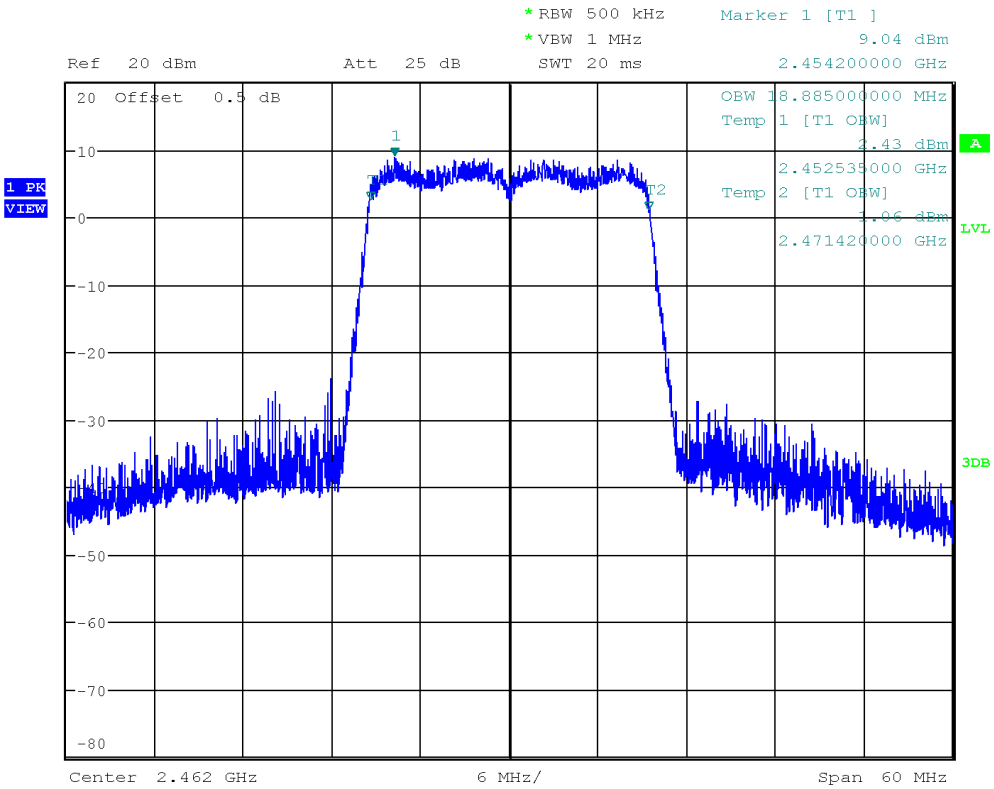
Occupied Bandwidth

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	IEEE 802.11 ax HE20-SU-ER(RU-242), Channel: 7, 2442
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Occupied Bandwidth [MHz]:	18.870



Occupied Bandwidth

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	IEEE 802.11 ax HE20-SU-ER(RU-242), Channel: 11, 2462
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Occupied Bandwidth [MHz]:	18.885



3.2 Test Conditions and Results - 6 dB bandwidth

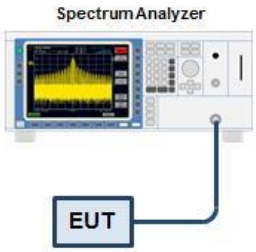
3.2.1 Information

Test Information	
Reference	FCC § 15.247(a)(2); ISED RSS-247, Issue 3 (section 5.2)
Measurement Method	ANSI C63.10 11.8
Measurement Uncertainty	± 1.26 %
Operator	Md Abu Bakar Siddique
Date	2024-03-04

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 43	EF01631	2023-08	2024-08
Cable(CAABC)	Gigalane	GIGALANE 1730	EF00779	2023-03	2024-03

3.2.5 Procedure

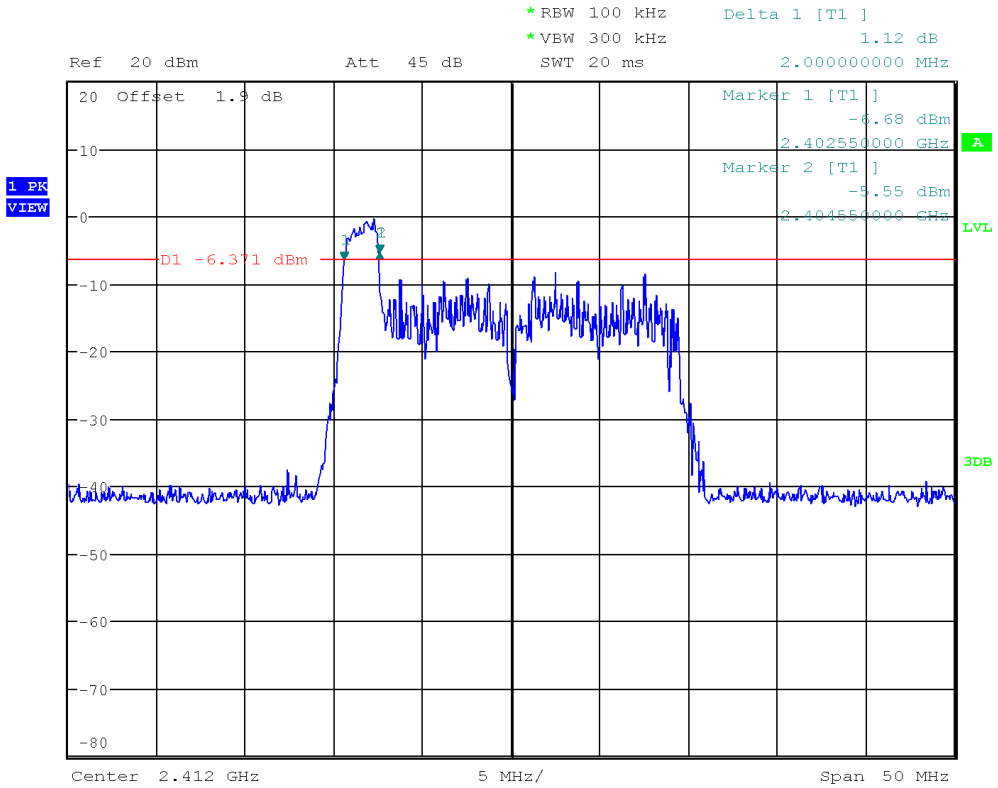
Test Procedure
1. EUT set to test mode 2. Span set to at least twice the emission spectrum 3. Detector set to peak and max hold and RBW is set to 100 kHz 4. Envelope peak value of emission spectrum is selected 5. Marker on envelope of spectrum is set to level of -6 dB to the left of the peak 6. Marker 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 Port 1 [kHz]	Limit [kHz]	Verdict
HE20-TB(RU-26)	2412	2000	500	PASS
HE20-TB(RU-52)	2437	16950	500	PASS
HE20-TB(RU-106)	2462	17050	500	PASS
HE40-TB(RU-242)	2422	18600	500	PASS
HE40-TB(RU-484)	2452	36700	500	PASS
HE20-SU-ER(RU-242)	2412	17500	500	PASS
HE20-SU-ER(RU-242)	2437	17600	500	PASS
HE20-SU-ER(RU-242)	2462	17650	500	PASS

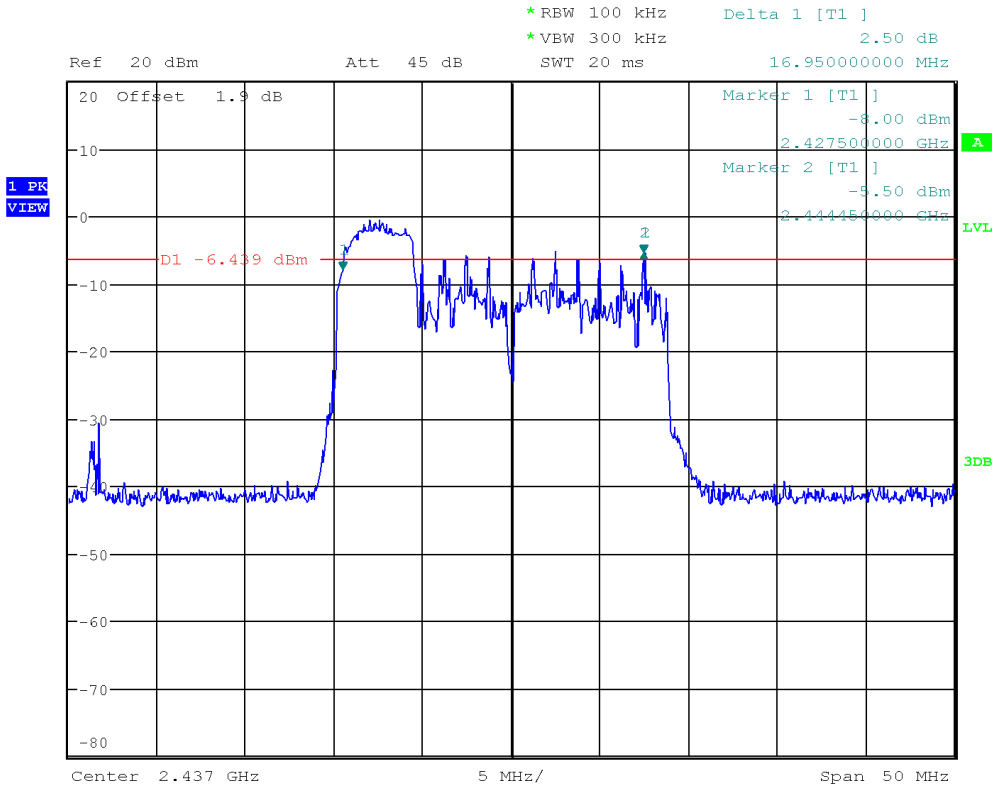
DTS (6 dB) Bandwidth

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11 HE20-TB(RU-26), Channel: 1, 2412 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Lower Frequency [MHz]:	2402.550
Upper Frequency [MHz]:	2404.550
6 dB Bandwidth [kHz]:	2000



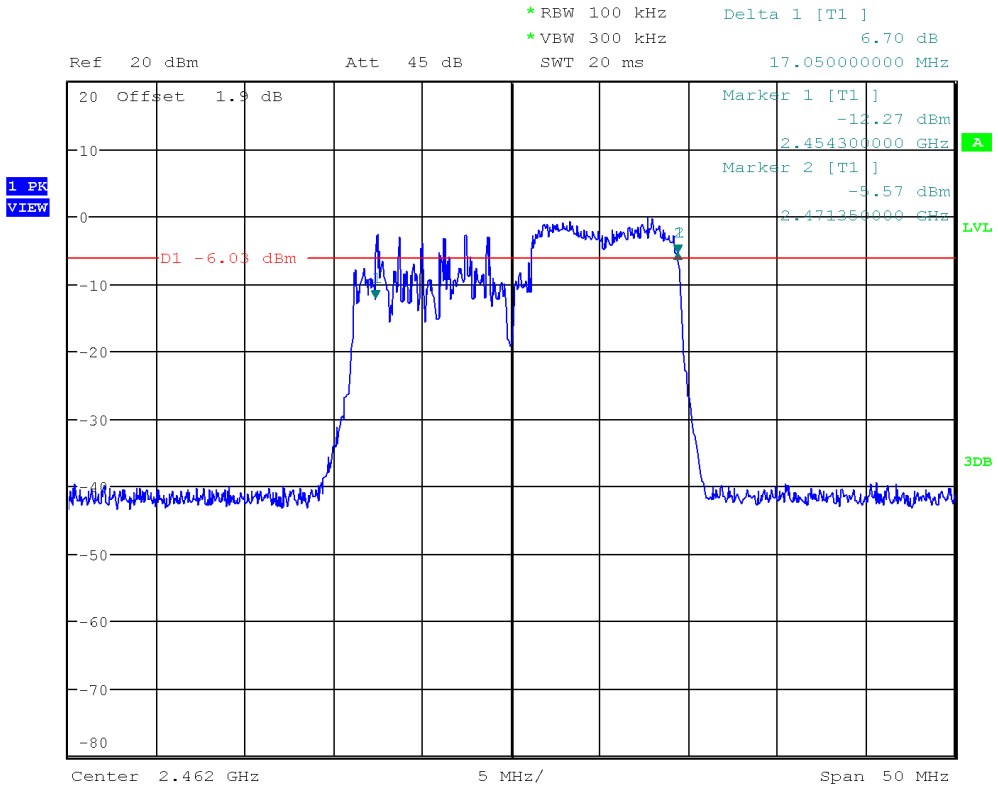
DTS (6 dB) Bandwidth

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11 HE20-TB(RU-52), Channel: 6, 2437 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Lower Frequency [MHz]:	2427.500
Upper Frequency [MHz]:	2444.450
6 dB Bandwidth [kHz]:	16950



DTS (6 dB) Bandwidth

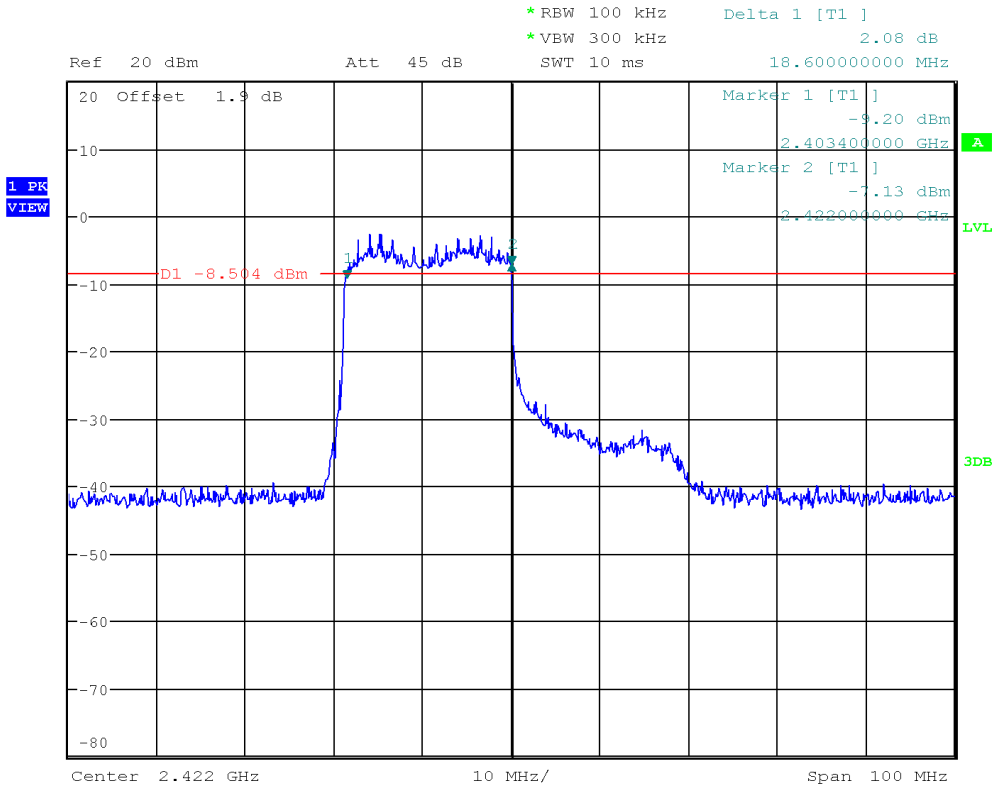
Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11 HE20-TB(RU-106), Channel: 11, 2462 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Lower Frequency [MHz]:	2454.300
Upper Frequency [MHz]:	2471.350
6 dB Bandwidth [kHz]:	17050



Date: 4.MAR.2024 12:12:18

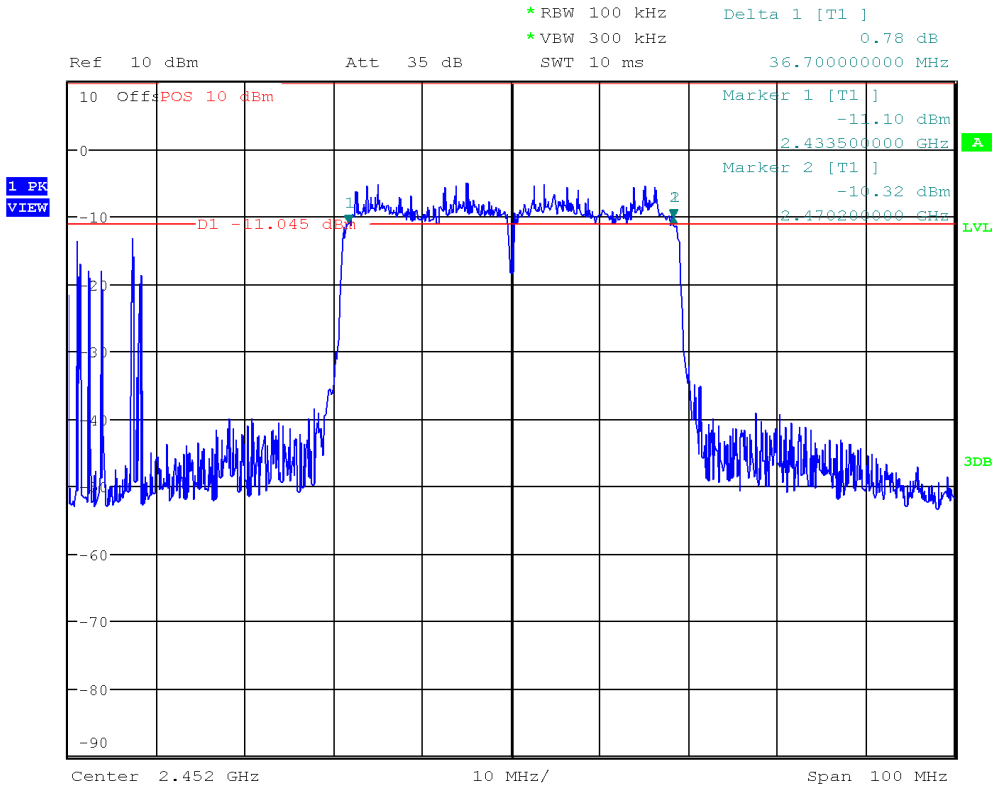
DTS (6 dB) Bandwidth

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11 HE40-TB(RU-242), Channel: 3, 2422 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Lower Frequency [MHz]:	2403.400
Upper Frequency [MHz]:	2422.000
6 dB Bandwidth [kHz]:	18600



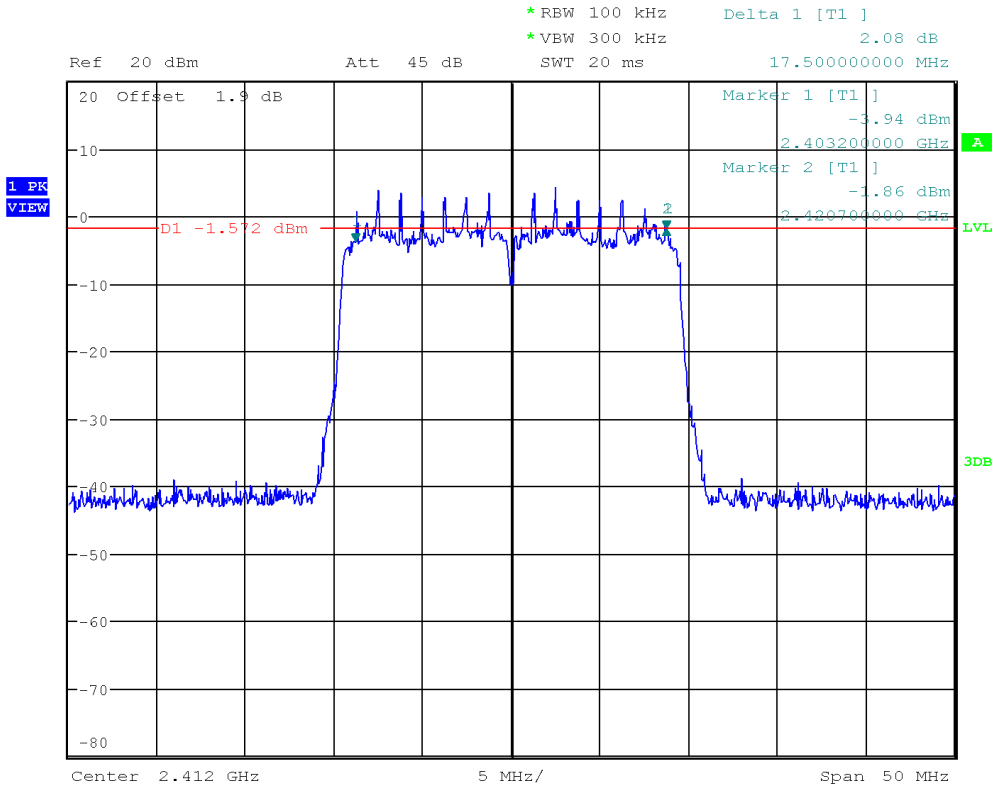
DTS (6 dB) Bandwidth

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11 HE40-TB(RU-484), Channel: 9, 2452 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Lower Frequency [MHz]:	2433.500
Upper Frequency [MHz]:	2470.200
6 dB Bandwidth [kHz]:	36700



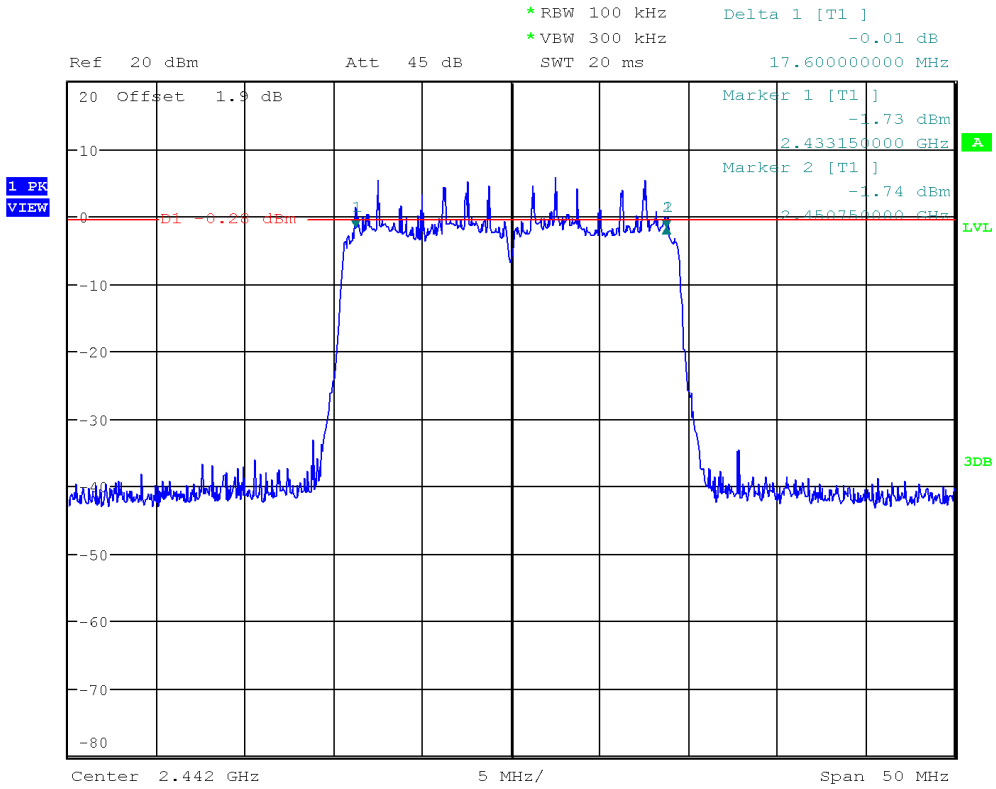
DTS (6 dB) Bandwidth

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11 HE20-SU-ER(RU-242), Channel: 1, 2412 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Lower Frequency [MHz]:	2403.200
Upper Frequency [MHz]:	2420.700
6 dB Bandwidth [kHz]:	17500



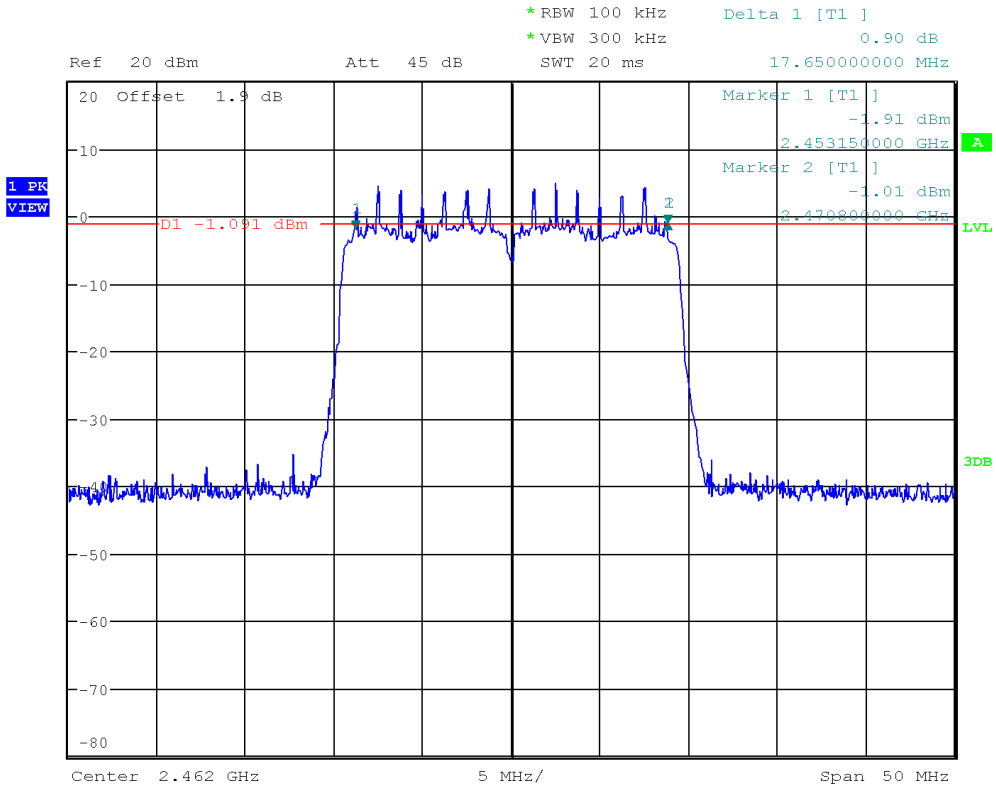
DTS (6 dB) Bandwidth

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11 HE20-SU-ER(RU-242), Channel: 7, 2442 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Lower Frequency [MHz]:	2433.150
Upper Frequency [MHz]:	2450.750
6 dB Bandwidth [kHz]:	17600



DTS (6 dB) Bandwidth

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11 HE20-SU-ER(RU-242), Channel: 11, 2462 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Lower Frequency [MHz]:	2453.150
Upper Frequency [MHz]:	2470.800
6 dB Bandwidth [kHz]:	17650



3.3 Test Conditions and Results - Maximum peak conducted output power

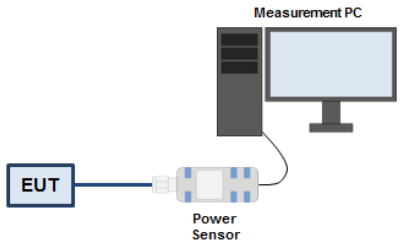
3.3.1 Information

Test Information	
Reference	FCC § 15.247(b); ISED RSS-247, Issue 3 (section 5.4)
Measurement Method	ANSI C63.10 11.9.1
Measurement Uncertainty	± 2.86 dB
Operator	Md Abu Bakar Siddique
Date	2024-03-04

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 43	EF01631	2023-08	2024-08
Cable(CAABC)	Gigalane	GIGALANE 1730	EF00779	2023-03	2024-03

3.3.5 Procedure

Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. The EUT antenna port is connected to a wideband power sensor 3. The peak power is measured with the power sensor 4. If the EUT has more than one transmit chain the procedure is repeated for each transmit chain and the power is summed up

3.3.6 Results

Test Results – HE20-TB(RU-242)				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2412	20.50	0.1122	1.0	PASS
2437	21.30	0.1349	1.0	PASS
2462	20.80	0.1202	1.0	PASS

Test Results – HE40-TB(RU-484)				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2422	20.90	0.1230	1.0	PASS
2437	21.10	0.1288	1.0	PASS
2452	20.90	0.1230	1.0	PASS

Test Results – HE20-SU-ER(RU-242)				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2412	23.54	0.2259	1.0	PASS
2442	23.45	0.2213	1.0	PASS
2462	23.66	0.2323	1.0	PASS

Test Results – HE20-TB(RU-242) - ISED							
Channel [MHz]	Conducted Power [dBm]	Conducted Power [W]	Conducted Limit [W]	EIRP Power [dBm]	EIRP Power [W]	EIRP Limit [W]	Verdict
2412	20.50	0.1122	1.0	25.7	0.3715	4.0	PASS
2437	21.30	0.1349	1.0	26.5	0.4467	4.0	PASS
2462	20.80	0.1202	1.0	26	0.3981	4.0	PASS

Test Results – HE40-TB(RU-484) - ISED							
Channel [MHz]	Conducted Power [dBm]	Conducted Power [W]	Conducted Limit [W]	EIRP Power [dBm]	EIRP Power [W]	EIRP Limit [W]	Verdict
2412	20.90	0.1230	1.0	26.1	0.4074	4.0	PASS
2437	21.10	0.1288	1.0	26.3	0.4266	4.0	PASS
2462	20.90	0.1230	1.0	26.1	0.4074	4.0	PASS

Test Results – HE20-SU-ER(RU-242) - ISED							
Channel [MHz]	Conducted Power [dBm]	Conducted Power [W]	Conducted Limit [W]	EIRP Power [dBm]	EIRP Power [W]	EIRP Limit [W]	Verdict
2412	23.54	0.2259	1.0	28.74	0.7482	4.0	PASS
2437	23.45	0.2213	1.0	28.65	0.7328	4.0	PASS
2462	23.66	0.2323	1.0	28.86	0.7691	4.0	PASS

3.4 Test Conditions and Results - Power spectral density

3.4.1 Information

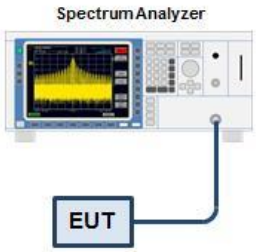
Test Information	
Reference	FCC § 15.247(e); ISED RSS-247, Issue 3 (section 5.2)
Measurement Method	ANSI C63.10 11.10.2, 14.3.2
Measurement Uncertainty	± 2.86 dB
Operator	Md Abu Bakar Siddique
Date	2024-03-04

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 43	EF01631	2023-08	2024-08
Cable(CAABC)	Gigalane	GIGALANE 1730	EF00779	2023-03	2024-03

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 – HE20-TB(RU-26)			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2412	-0.340	8.0	PASS
2437	-0.164	8.0	PASS
2462	-0.766	8.0	PASS
RBW = 100 kHz			

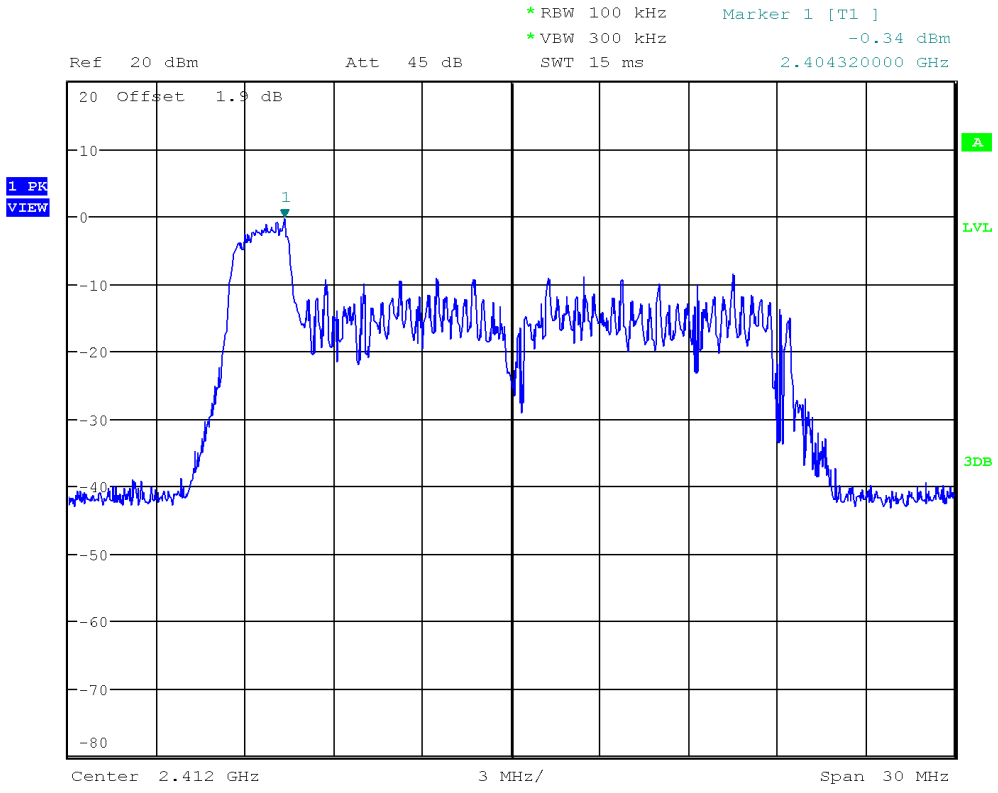
Test Results – HE20-TB(RU-242)			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2412	-2.216	8.0	PASS
2437	-1.957	8.0	PASS
2462	-2.169	8.0	PASS
RBW = 100 kHz			

Test Results – HE40-TB(RU-484)			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2422	-5.242	8.0	PASS
2437	-5.012	8.0	PASS
2452	-5.014	8.0	PASS
RBW = 100 kHz			

Test Results – HE20-SU-ER(RU-242)			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2412	4.707	8.0	PASS
2437	4.821	8.0	PASS
2462	5.110	8.0	PASS
RBW = 100 kHz			

Peak Power Spectral Density

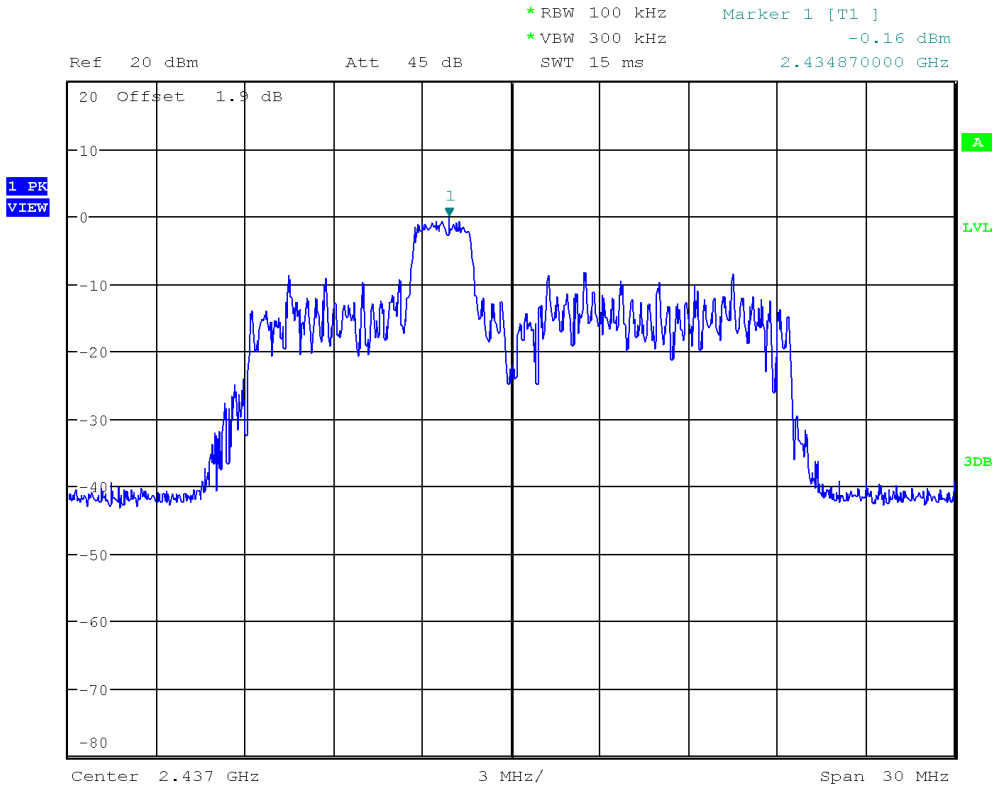
Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	IEEE 802.11 HE20-TB(RU-26), Channel: 1, 2412 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Peak Frequency [MHz]:	2404.320
Spectral Density [dBm/RBW]:	-0.340
Resolution Bandwidth [kHz]:	100 kHz



Date: 4.MAR.2024 13:36:57

Peak Power Spectral Density

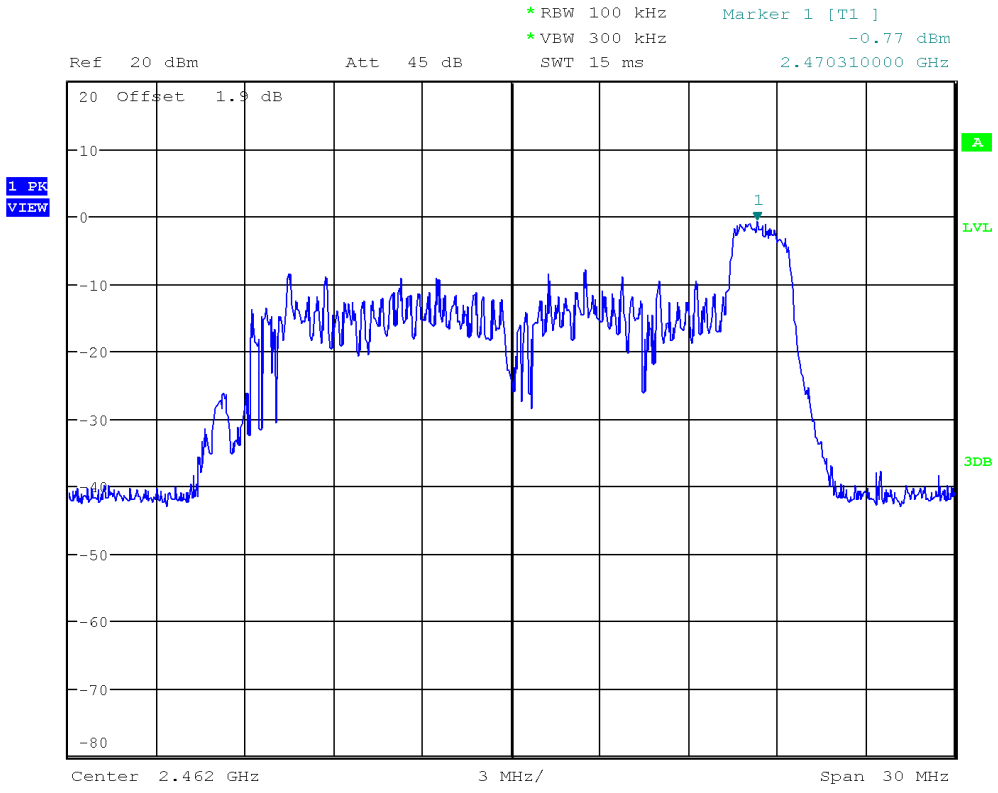
Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	IEEE 802.11 HE20-TB(RU-26), Channel: 6, 2437 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Peak Frequency [MHz]:	2434.870
Spectral Density [dBm/RBW]:	-0.164
Resolution Bandwidth [kHz]:	100 kHz



Date: 4.MAR.2024 13:37:58

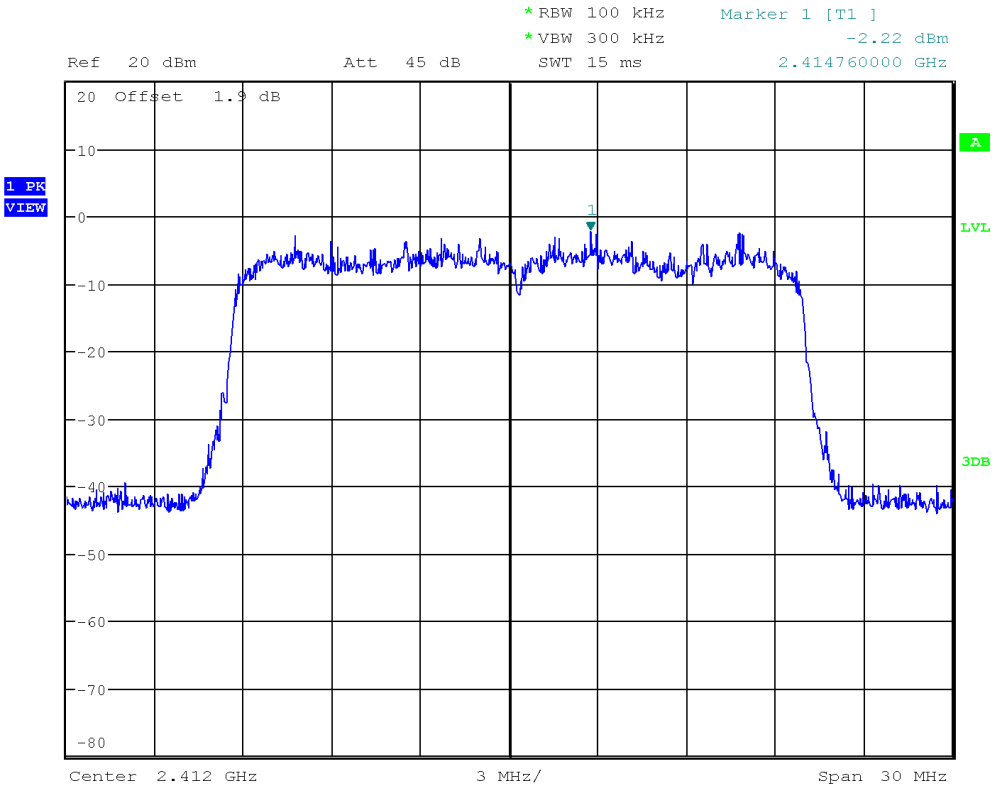
Peak Power Spectral Density

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	IEEE 802.11 HE20-TB(RU-26), Channel: 11, 2462 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Peak Frequency [MHz]:	2470.310
Spectral Density [dBm/RBW]:	-0.766
Resolution Bandwidth [kHz]:	100 kHz



Peak Power Spectral Density

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	IEEE 802.11 HE20-TB(RU-242), Channel: 1, 2412 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Peak Frequency [MHz]:	2414.760
Spectral Density [dBm/RBW]:	-2.216
Resolution Bandwidth [kHz]:	100 kHz



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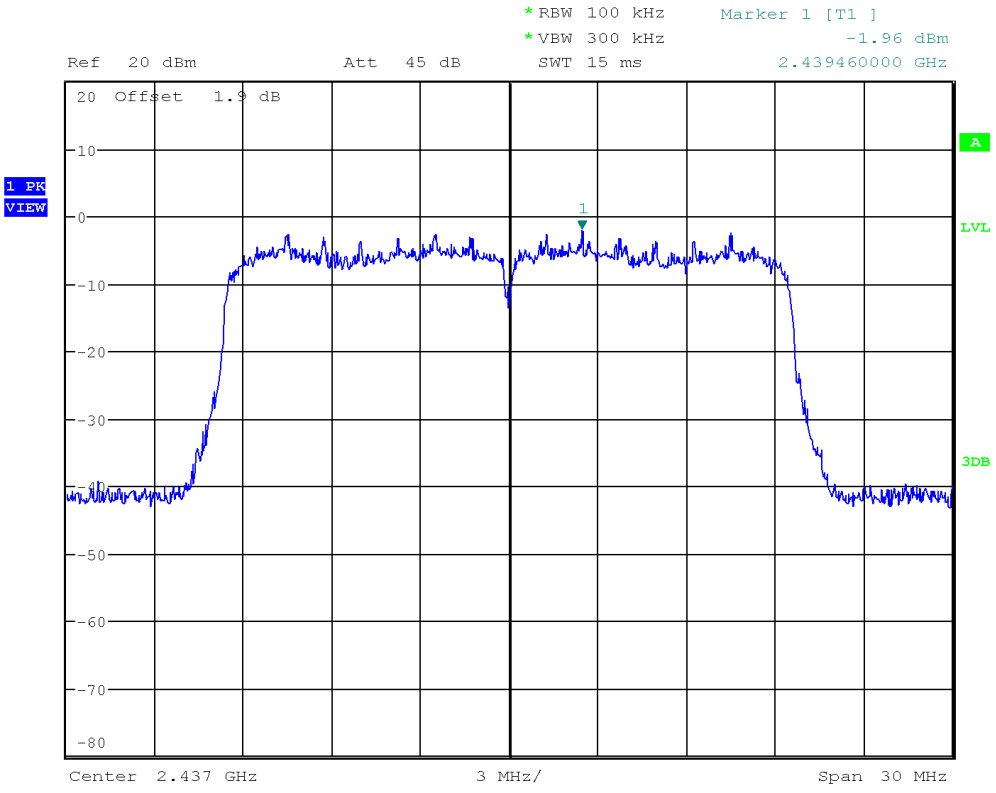
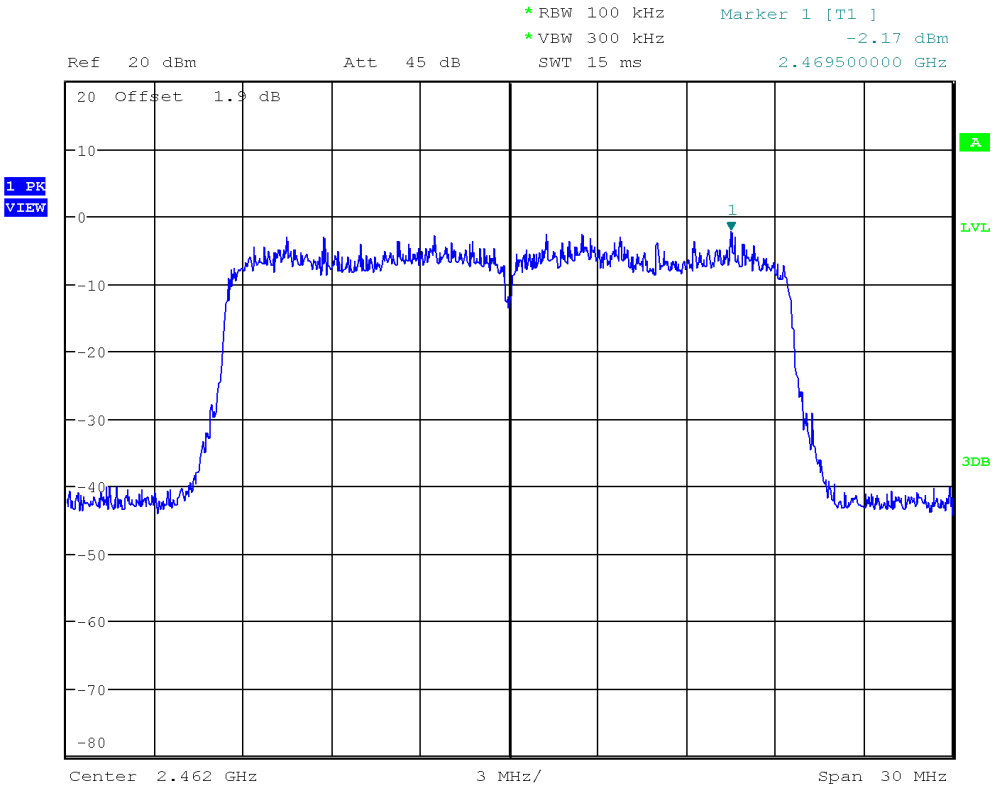
Peak Power Spectral Density

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	IEEE 802.11 HE20-TB(RU-242), Channel: 6, 2437 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Peak Frequency [MHz]:	2439.460
Spectral Density [dBm/RBW]:	-1.957
Resolution Bandwidth [kHz]:	100 kHz



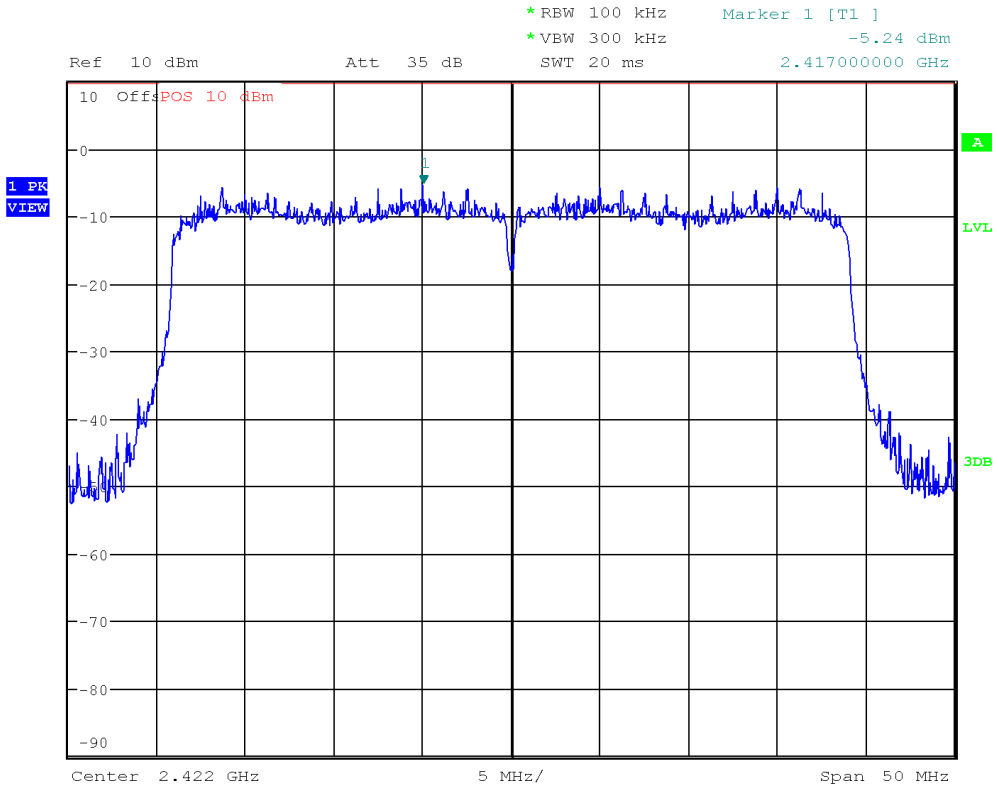
Peak Power Spectral Density

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	IEEE 802.11, HE20-TB(RU-242), Channel: 11, 2462 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Peak Frequency [MHz]:	2469.500
Spectral Density [dBm/RBW]:	-2.169
Resolution Bandwidth [kHz]:	100 kHz



Peak Power Spectral Density

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	IEEE 802.11, HE40-TB(RU-484), Channel: 3, 2422 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Peak Frequency [MHz]:	2417.000
Spectral Density [dBm/RBW]:	-5.242
Resolution Bandwidth [kHz]:	100 kHz



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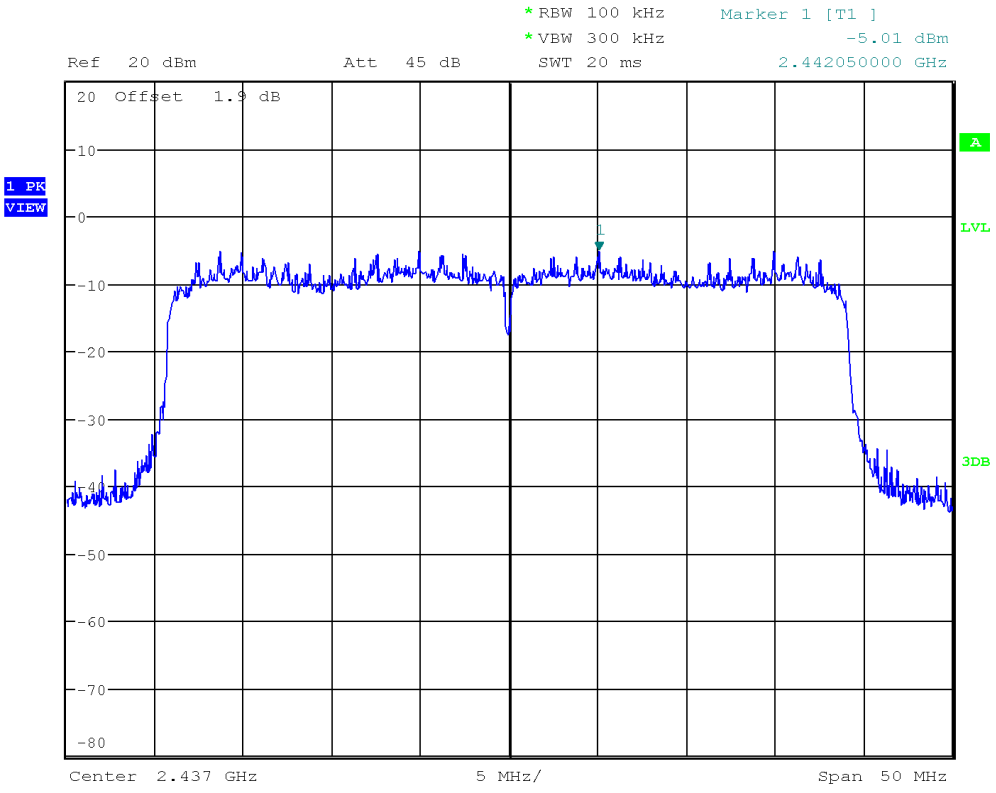
Peak Power Spectral Density

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	IEEE 802.11, HE40-TB(RU-484), Channel: 6, 2437 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Peak Frequency [MHz]:	2442.050
Spectral Density [dBm/RBW]:	-5.012
Resolution Bandwidth [kHz]:	100 kHz



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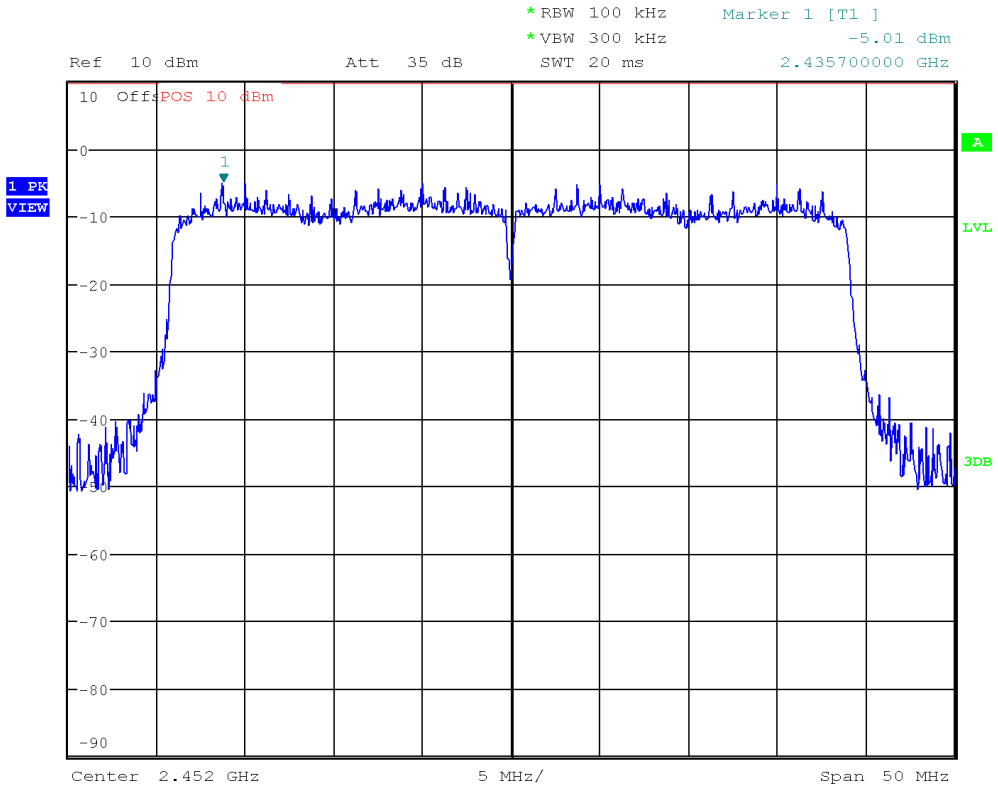
Peak Power Spectral Density

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	IEEE 802.11, HE40-TB(RU-484), Channel: 9, 2452 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Peak Frequency [MHz]:	2435.700
Spectral Density [dBm/RBW]:	-5.014
Resolution Bandwidth [kHz]:	100 kHz



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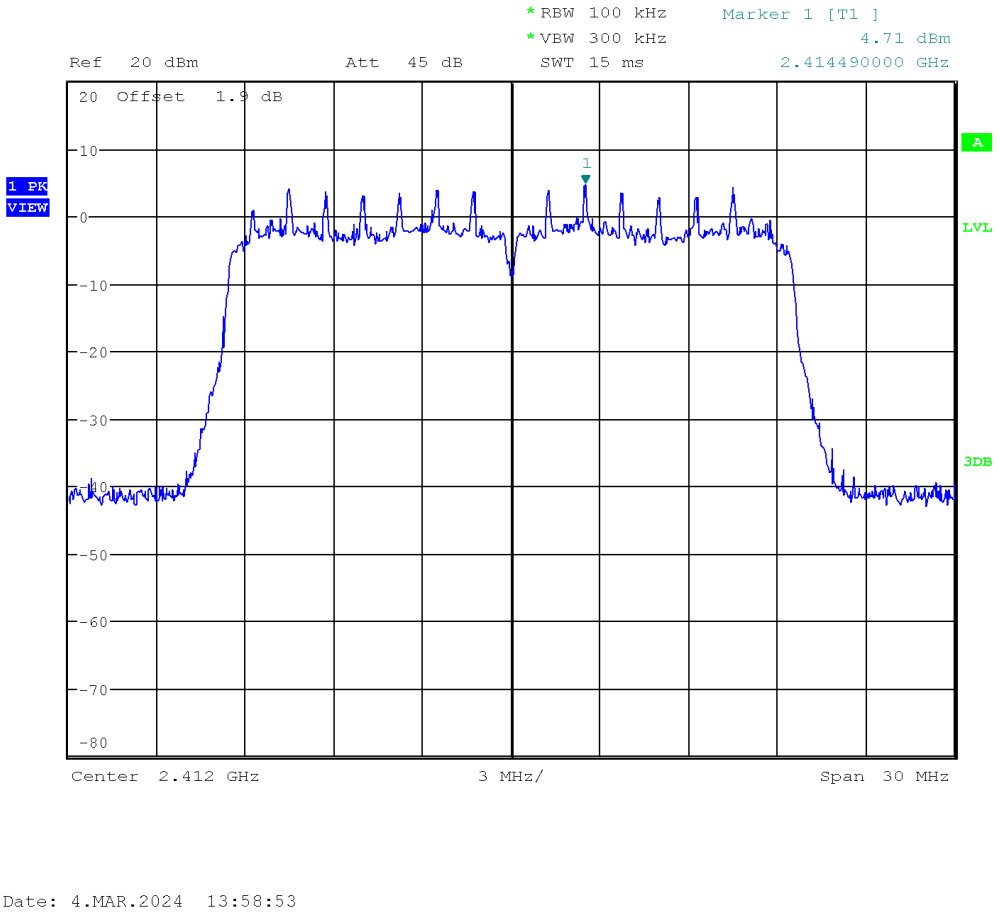
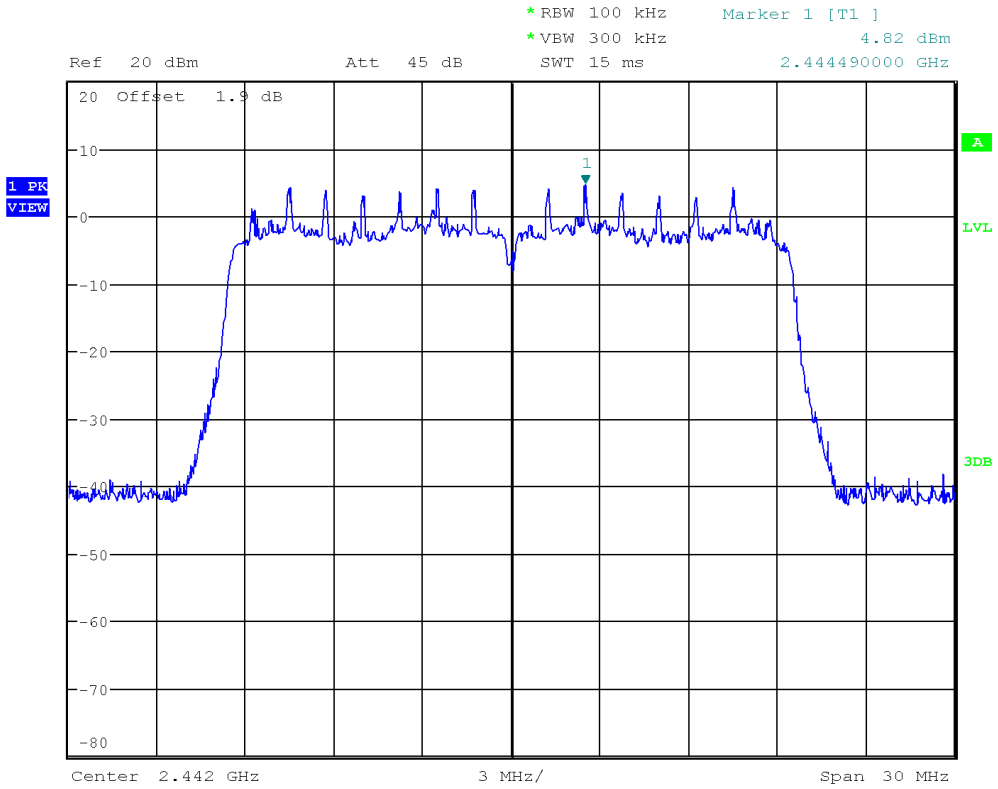
Peak Power Spectral Density

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	IEEE 802.11, HE20-SU-ER(RU-242), Channel: 1, 2412 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Peak Frequency [MHz]:	2414.490
Spectral Density [dBm/RBW]:	4.707
Resolution Bandwidth [kHz]:	100 kHz



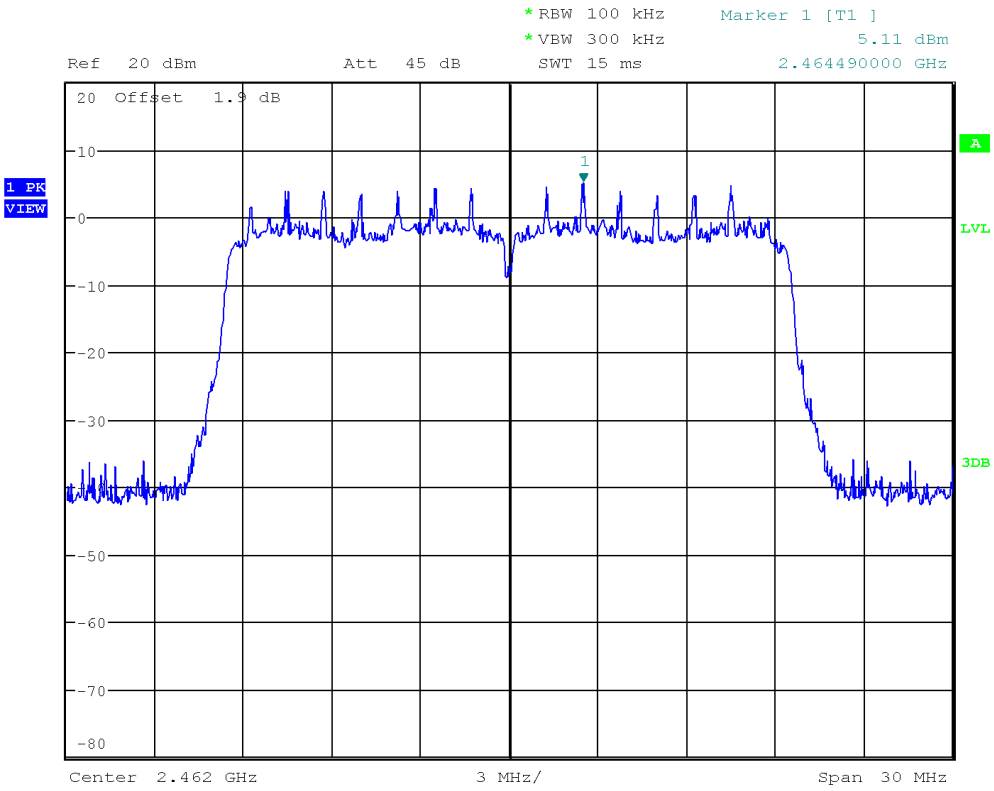
Peak Power Spectral Density

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	IEEE 802.11, HE20-SU-ER(RU-242), Channel: 7, 2442 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Peak Frequency [MHz]:	2444.490
Spectral Density [dBm/RBW]:	4.821
Resolution Bandwidth [kHz]:	100 kHz



Peak Power Spectral Density

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	IEEE 802.11, HE20-SU-ER(RU-242), Channel: 11, 2462 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Peak Frequency [MHz]:	2464.490
Spectral Density [dBm/RBW]:	5.110
Resolution Bandwidth [kHz]:	100 kHz



Date: 4.MAR.2024 14:00:02

3.5 Test Conditions and Results - Band-edge compliance

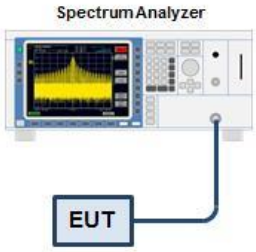
3.5.1 Information

Test Information	
Reference	FCC § 15.247(d); ISED RSS-247, Issue 3 (section 5.5)
Measurement Uncertainty	± 3.64 dB
Measurement Method	ANSI C63.10 11.13
Operator	Md Abu Bakar Siddique
Date	2024-03-04

3.5.2 Limits

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

3.5.3 Setup

Test Setup


3.5.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSU 43	EF01631	2023-08	2024-08
Cable(CAABC)	Gigalane	GIGALANE 1730	EF00779	2023-03	2024-03

3.5.5 Procedure

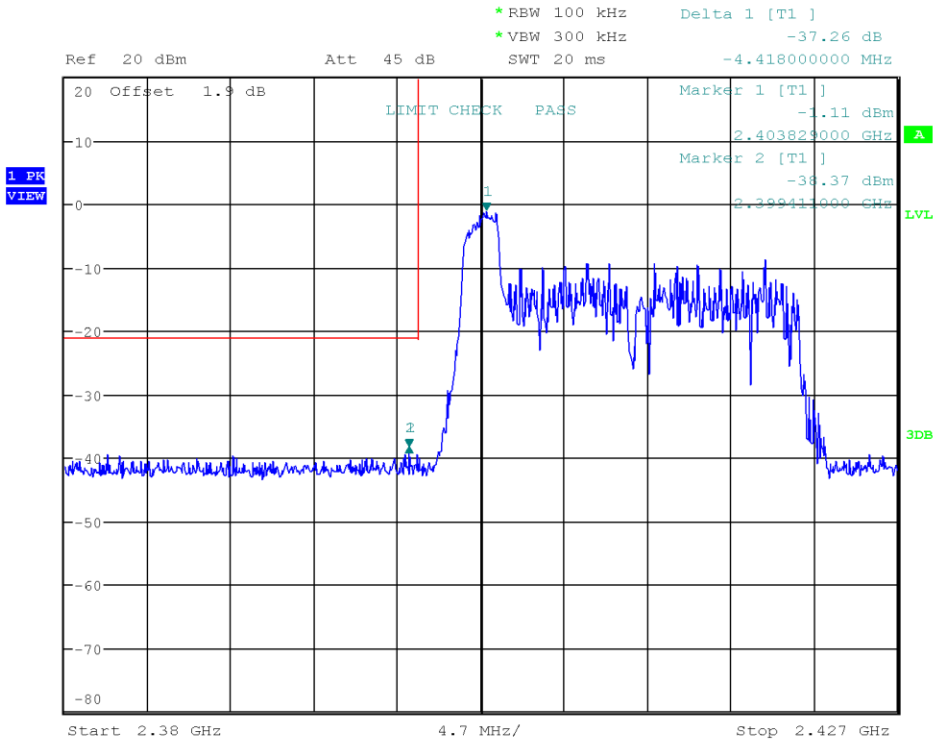
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set around lower band edge and detector is set to peak and max hold 3. Resolution bandwidth is set to 100 kHz 4. Markers are set to peak emission levels within frequency band and outside frequency band 5. Band edge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

3.5.6 Results

Test Results				
Mode	Channel [MHz]	Out-of-band Attenuation [dB]	Limit [dB]	Verdict
HE20-TB(RU-26)	2412	-37.26	-20	PASS
HE20-TB(RU-26)	2462	-38.73	-20	PASS
HE20-TB(RU-242)	2412	-37.38	-20	PASS
HE20-TB(RU-242)	2462	-36.26	-20	PASS
HE40-TB(RU-484)	2422	-34.51	-20	PASS
HE40-TB(RU-484)	2452	-37.20	-20	PASS
HE20-SU-ER(RU-242)	2412	-42.38	-20	PASS
HE20-SU-ER(RU-242)	2462	-43.25	-20	PASS

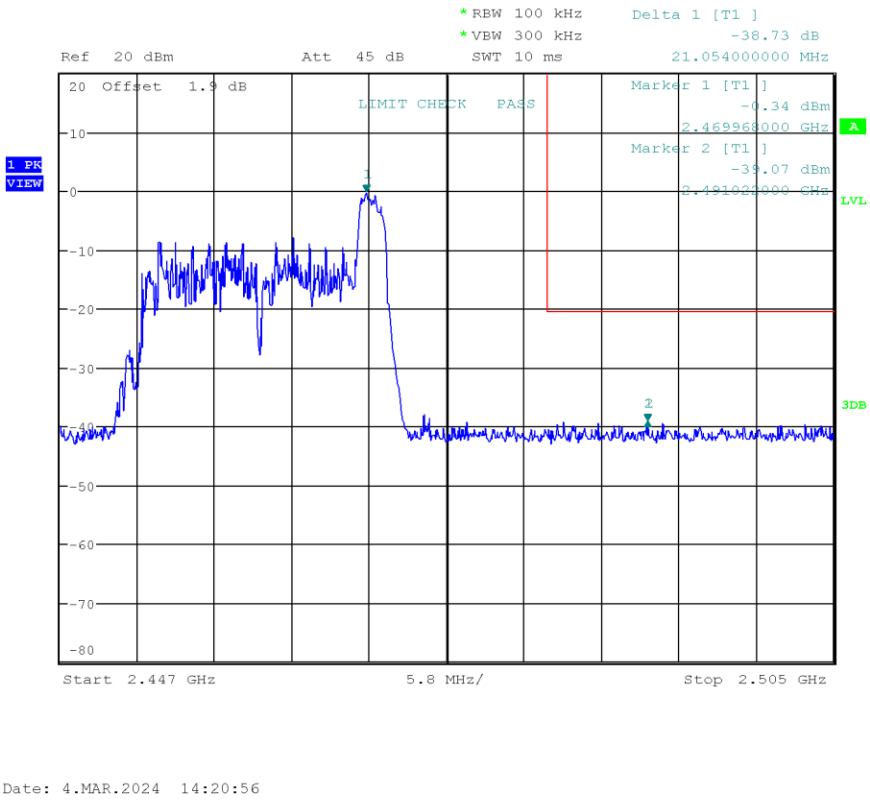
Emissions in nonrestricted frequency bands at the Band-edge

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11, HE20-TB(RU-26), Channel: 1,2412 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Band-edge	Lower
In-band Frequency [MHz]:	2403.829
Max. in-band Level [dBm/100 kHz]:	-1.108
Out-of-band Frequency [MHz]:	2399.411
Max. out-of-band Level [dBm/100 kHz]:	-38.37
Attenuation [dB]:	-37.26



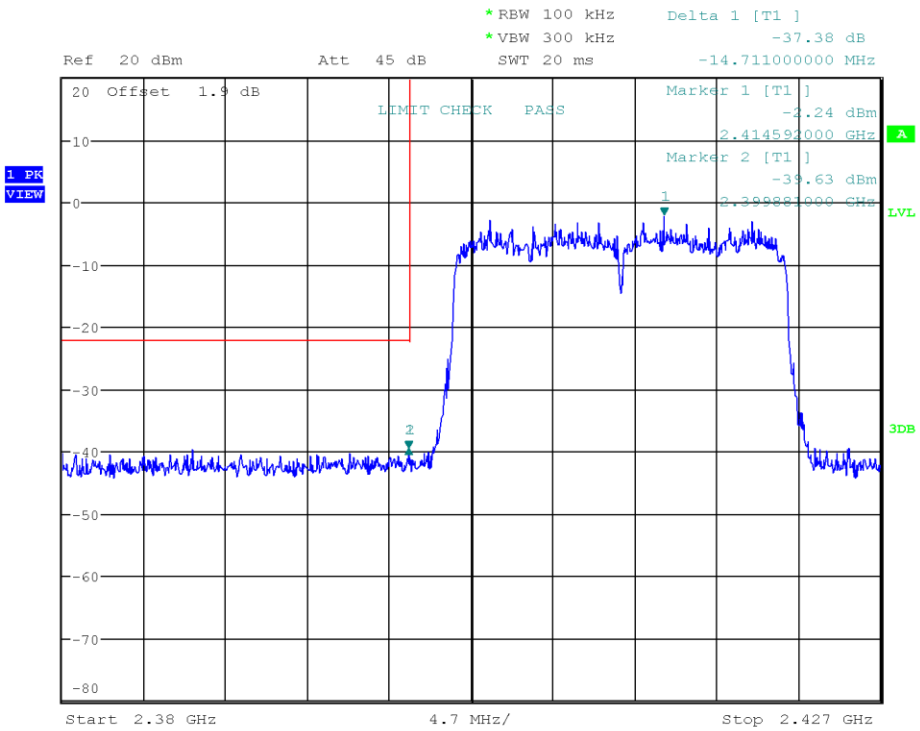
Emissions in nonrestricted frequency bands at the Band-edge

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11,HE20-TB(RU-26),Channel:11, 2462 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Band-edge	Upper
In-band Frequency [MHz]:	2469.968
Max. in-band Level [dBm/100 kHz]:	-0.343
Out-of-band Frequency [MHz]:	2491.022
Max. out-of-band Level [dBm/100 kHz]:	-39.074
Attenuation [dB]:	-38.73



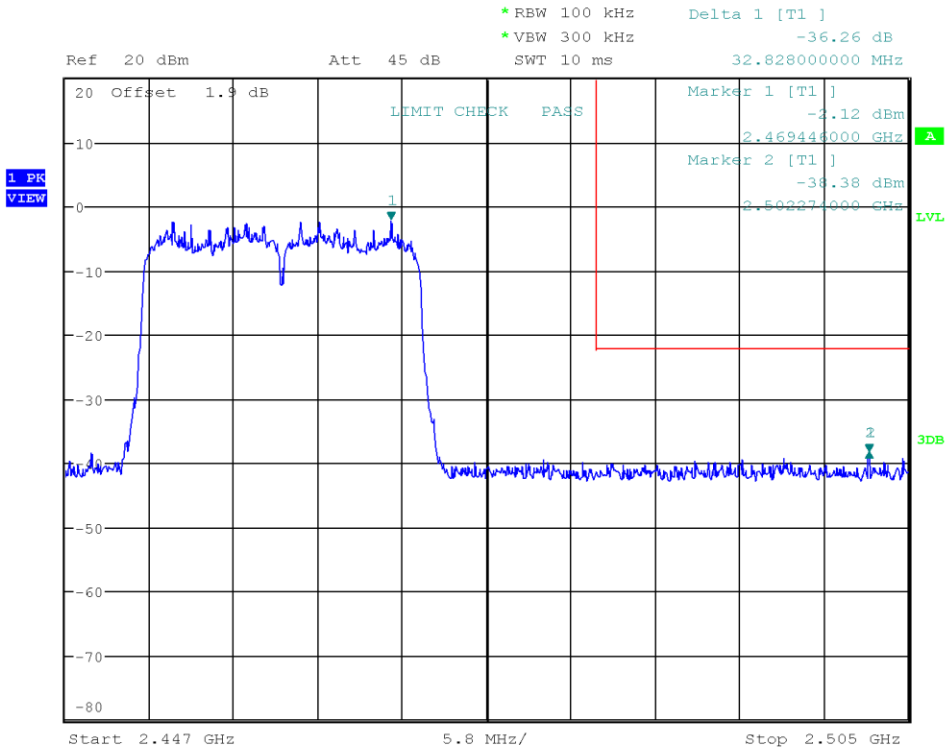
Emissions in nonrestricted frequency bands at the Band-edge

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11 HE20-TB(RU-242),Channel: 1, 2412 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Band-edge	Lower
In-band Frequency [MHz]:	2414.592
Max. in-band Level [dBm/100 kHz]:	-2.244
Out-of-band Frequency [MHz]:	2399.881
Max. out-of-band Level [dBm/100 kHz]:	-39.626
Attenuation [dB]:	-37.38



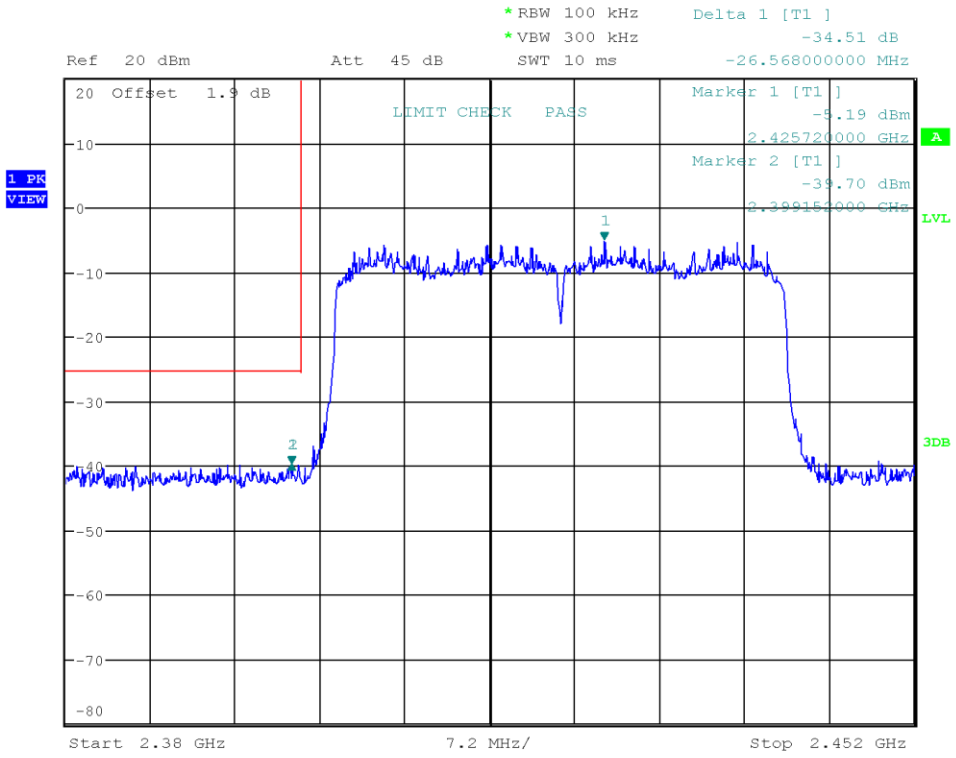
Emissions in nonrestricted frequency bands at the Band-edge

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11, HE20-TB(RU-242), Channel: 11, 2462 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Band-edge	Upper
In-band Frequency [MHz]:	2469.446
Max. in-band Level [dBm/100 kHz]:	-2.123
Out-of-band Frequency [MHz]:	2502.274
Max. out-of-band Level [dBm/100 kHz]:	-38.379
Attenuation [dB]:	-36.26



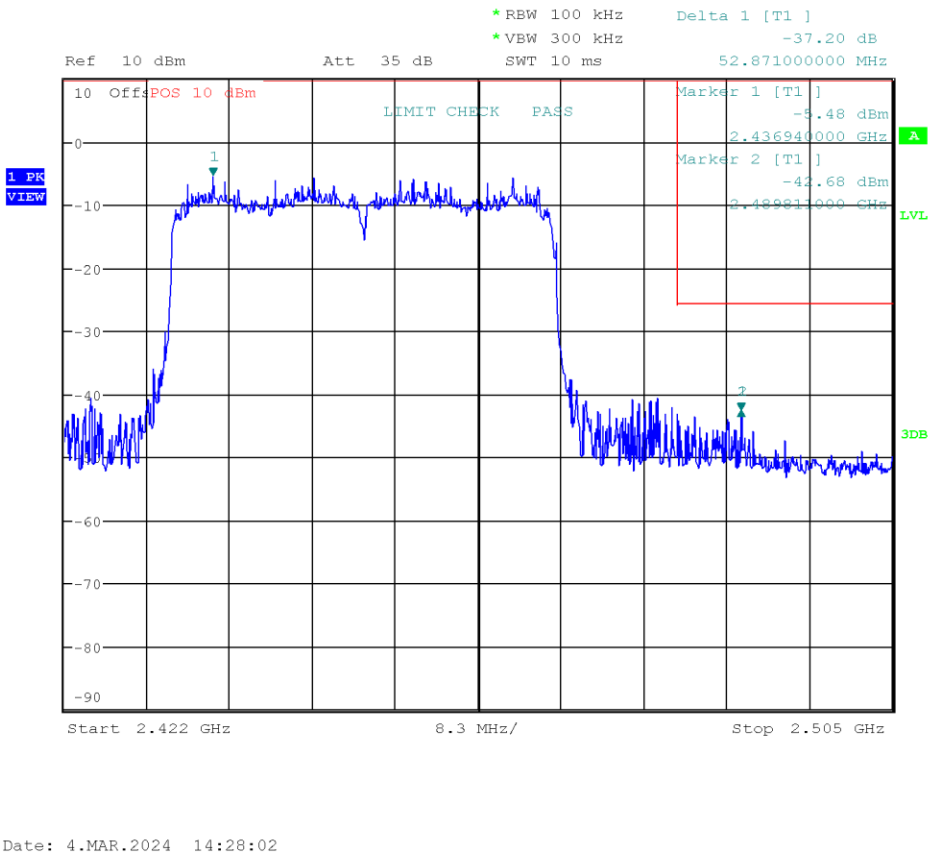
Emissions in nonrestricted frequency bands at the Band-edge

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11, HE40-TB(RU-484), Channel: 3, 2422 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Band-edge	Lower
In-band Frequency [MHz]:	2425.72
Max. in-band Level [dBm/100 kHz]:	-5.191
Out-of-band Frequency [MHz]:	2399.152
Max. out-of-band Level [dBm/100 kHz]:	-39.697
Attenuation [dB]:	-34.51



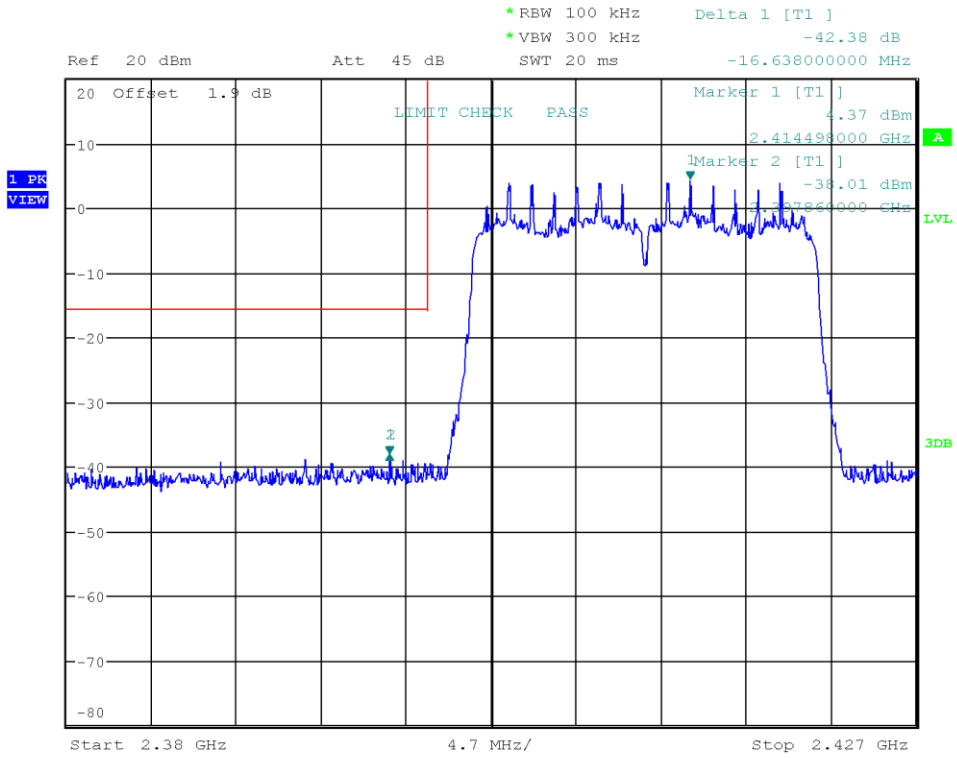
Emissions in nonrestricted frequency bands at the Band-edge

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11, HE40-TB(RU-484), Channel: 9, 2452 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Band-edge	Upper
In-band Frequency [MHz]:	2436.94
Max. in-band Level [dBm/100 kHz]:	-5.478
Out-of-band Frequency [MHz]:	2489.811
Max. out-of-band Level [dBm/100 kHz]:	-42.681
Attenuation [dB]:	-37.2



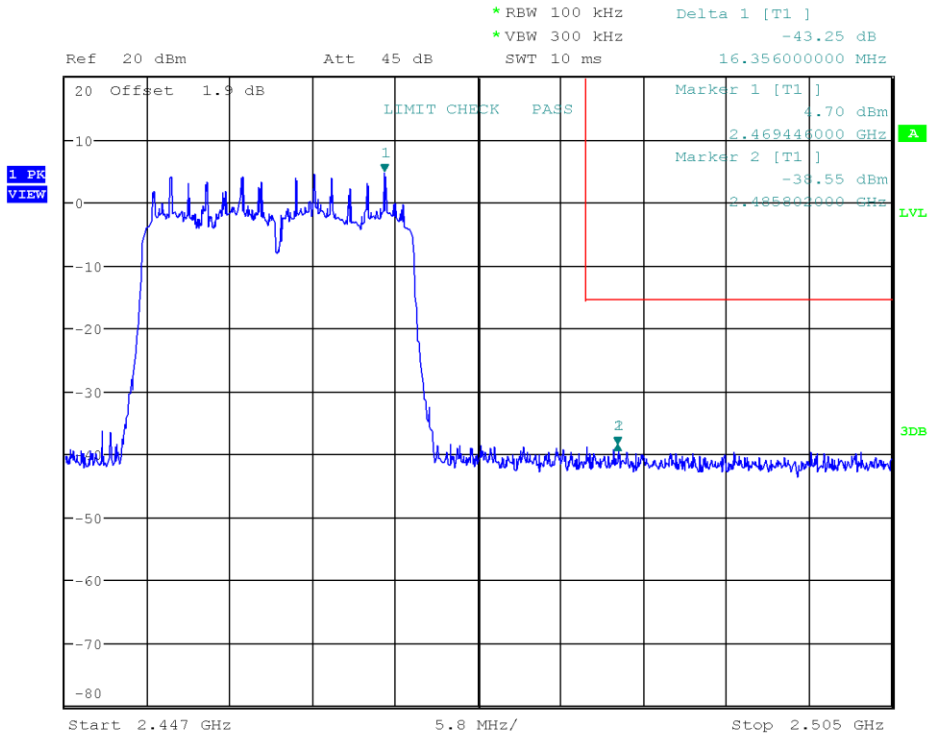
Emissions in nonrestricted frequency bands at the Band-edge

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11, HE20-SU-ER(RU-242), Channel: 1, 2412 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Band-edge	Lower
In-band Frequency [MHz]:	2414.498
Max. in-band Level [dBm/100 kHz]:	4.373
Out-of-band Frequency [MHz]:	2397.86
Max. out-of-band Level [dBm/100 kHz]:	-38.011
Attenuation [dB]:	-42.38



Emissions in nonrestricted frequency bands at the Band-edge

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11,HE20-SU-ER(RU-242), Channel: 11, 2462 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Band-edge	Upper
In-band Frequency [MHz]:	2469.446
Max. in-band Level [dBm/100 kHz]:	4.698
Out-of-band Frequency [MHz]:	2485.802
Max. out-of-band Level [dBm/100 kHz]:	-38.552
Attenuation [dB]:	-43.25



3.6 Test Conditions and Results - Conducted spurious emissions

3.6.1 Information

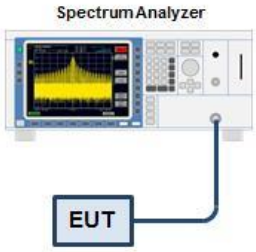
Test Information	
Reference	FCC § 15.247(d); ISED RSS-247, Issue 3 (section 5.5)
Measurement Uncertainty	± 4.25 dB
Measurement Method	ANSI C63.10 11.11
Operator	Md Abu Bakar Siddique
Date	2024-03-04

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 43	EF01631	2023-08	2024-08
Cable(CAABC)	Gigalane	GIGALANE 1730	EF00779	2023-03	2024-03

3.6.5 Procedure

Test Procedure

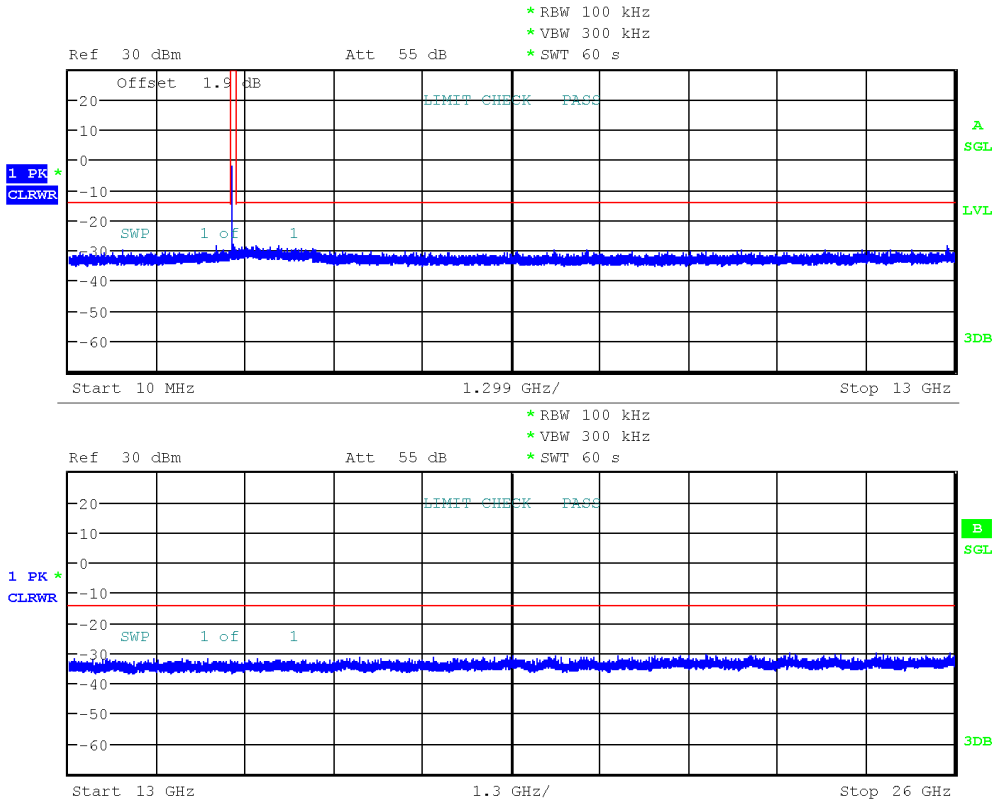
1. EUT set to test mode (Communication tester is used if needed)
2. Span set around lower band edge and detector is set to peak and max hold
3. Resolution bandwidth is set to 100 kHz
4. Markers are set to peak emission levels outside frequency band

3.6.6 Results

Test Results		
Mode	Channel [MHz]	Verdict
HE20-TB(RU-26)	2412	PASS
HE20-TB(RU-26)	2437	PASS
HE20-TB(RU-26)	2462	PASS
HE20-TB(RU-242)	2412	PASS
HE20-TB(RU-242)	2437	PASS
HE20-TB(RU-242)	2462	PASS
HE40-TB(RU-484)	2422	PASS
HE40-TB(RU-484)	2437	PASS
HE40-TB(RU-484)	2452	PASS
HE20-SU-ER(RU-242)	2412	PASS
HE20-SU-ER(RU-242)	2442	PASS
HE20-SU-ER(RU-242)	2462	PASS

Conducted Spurious Emissions

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11 n HT20, Channel: 1, 2412 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Max. in-band Frequency [MHz]:	2402.2
Max. in-band Level [dBm/100 kHz]:	5.7
Out-of-band Limit [dBm/100 kHz]:	-14.3



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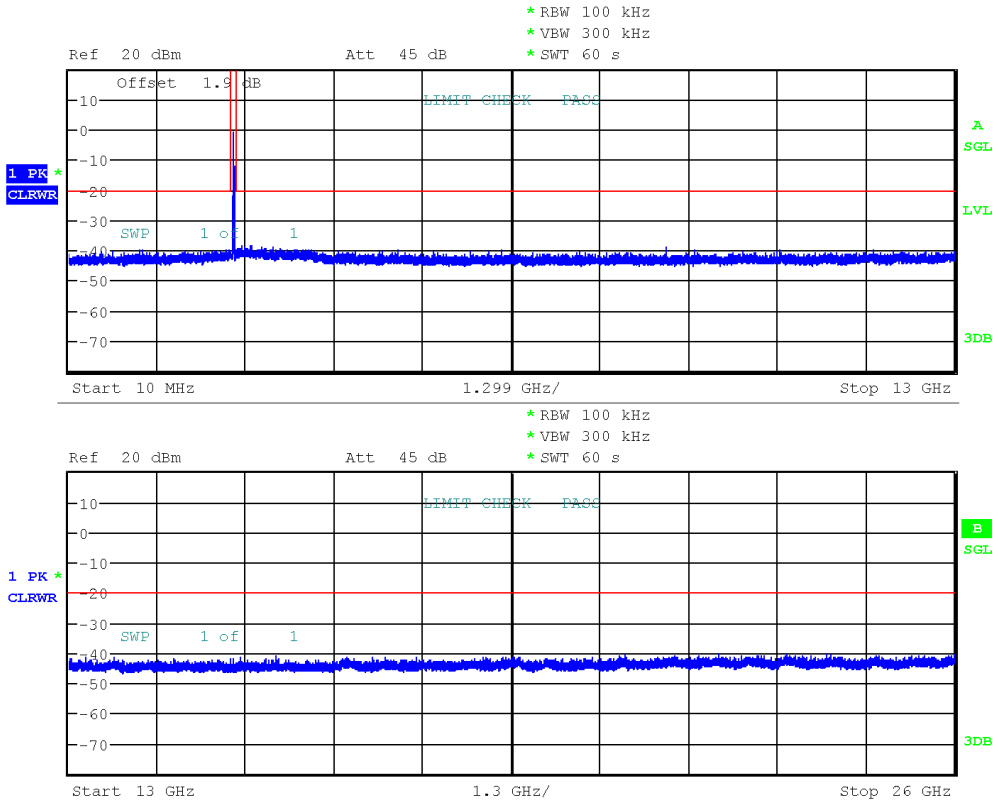
Conducted Spurious Emissions

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11 n HT20, Channel: 6, 2437 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Max. in-band Frequency [MHz]:	2434.3
Max. in-band Level [dBm/100 kHz]:	-0.3
Out-of-band Limit [dBm/100 kHz]:	-20.3



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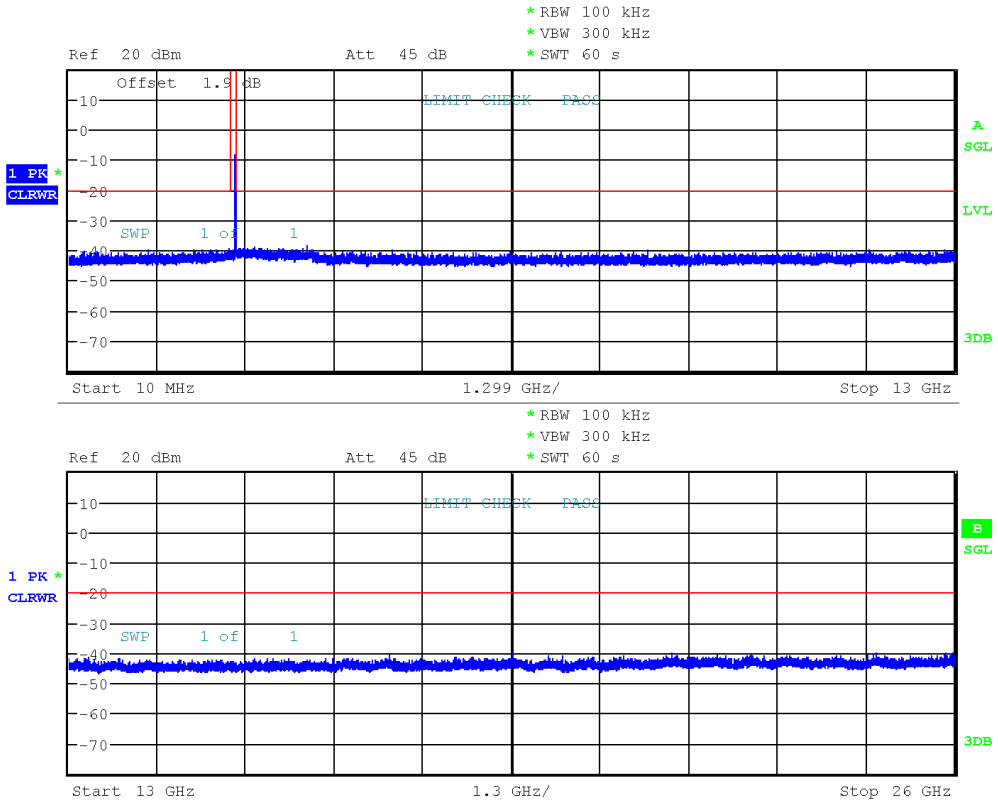
Conducted Spurious Emissions

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11 n HT20, Channel: 11, 2462 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Max. in-band Frequency [MHz]:	2469.9
Max. in-band Level [dBm/100 kHz]:	0.0
Out-of-band Limit [dBm/100 kHz]:	-20.0



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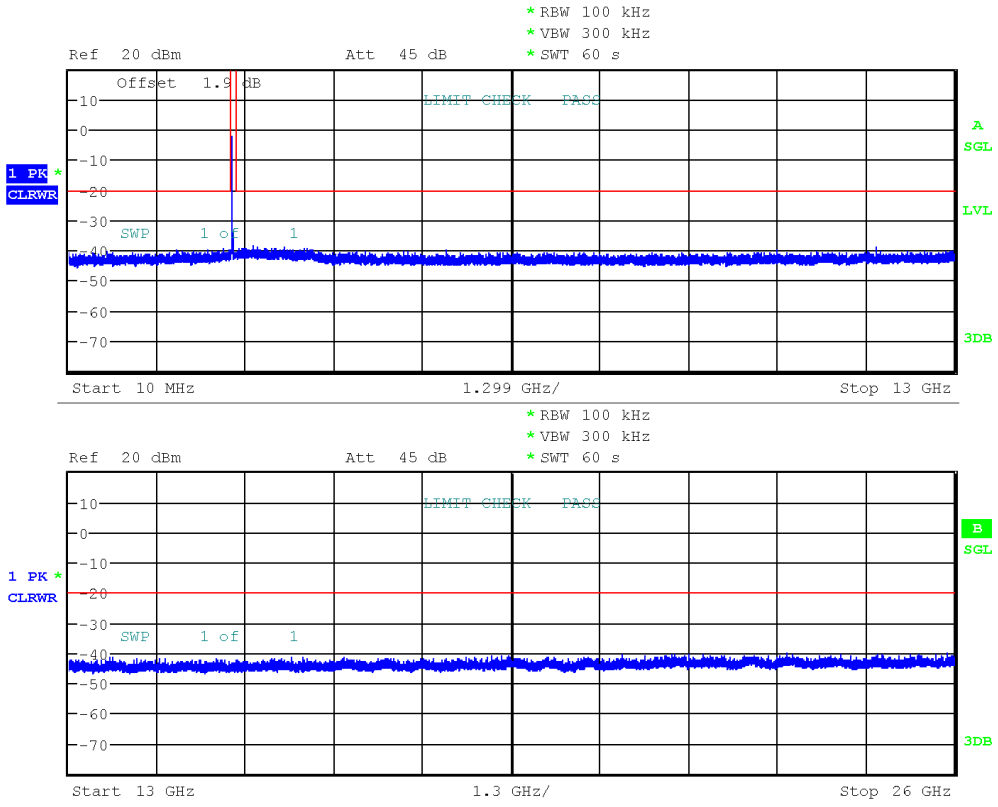
Conducted Spurious Emissions

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11 n HT20, Channel: 1, 2412 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Max. in-band Frequency [MHz]:	2404.1
Max. in-band Level [dBm/100 kHz]:	-0.0
Out-of-band Limit [dBm/100 kHz]:	-20.0



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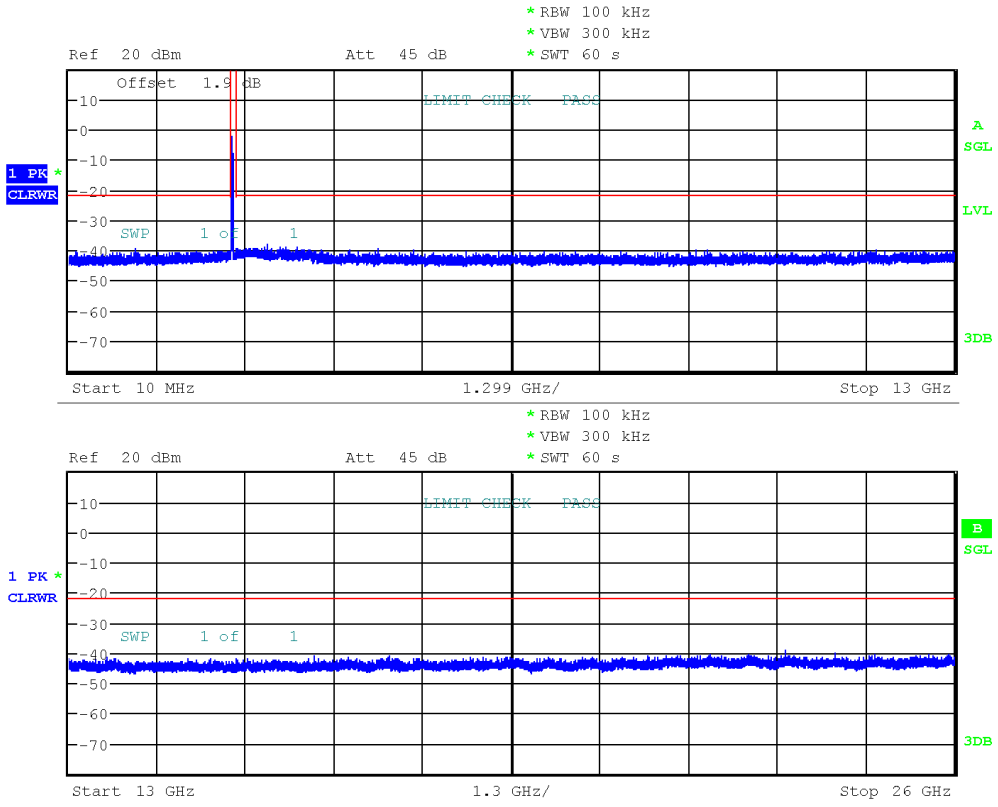
Conducted Spurious Emissions

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11 n HT20, Channel: 1, 2412 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Max. in-band Frequency [MHz]:	2414.7
Max. in-band Level [dBm/100 kHz]:	-1.9
Out-of-band Limit [dBm/100 kHz]:	-21.9



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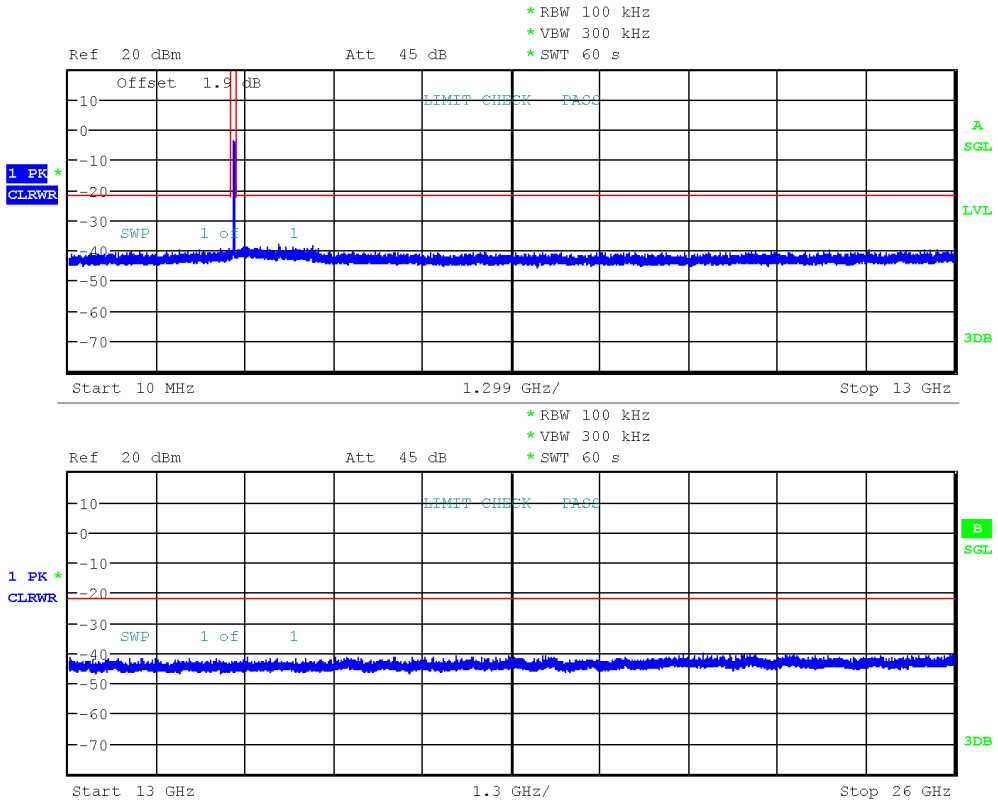
Conducted Spurious Emissions

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11 n HT20, Channel: 6, 2437 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Max. in-band Frequency [MHz]:	2439.5
Max. in-band Level [dBm/100 kHz]:	-1.8
Out-of-band Limit [dBm/100 kHz]:	-21.8



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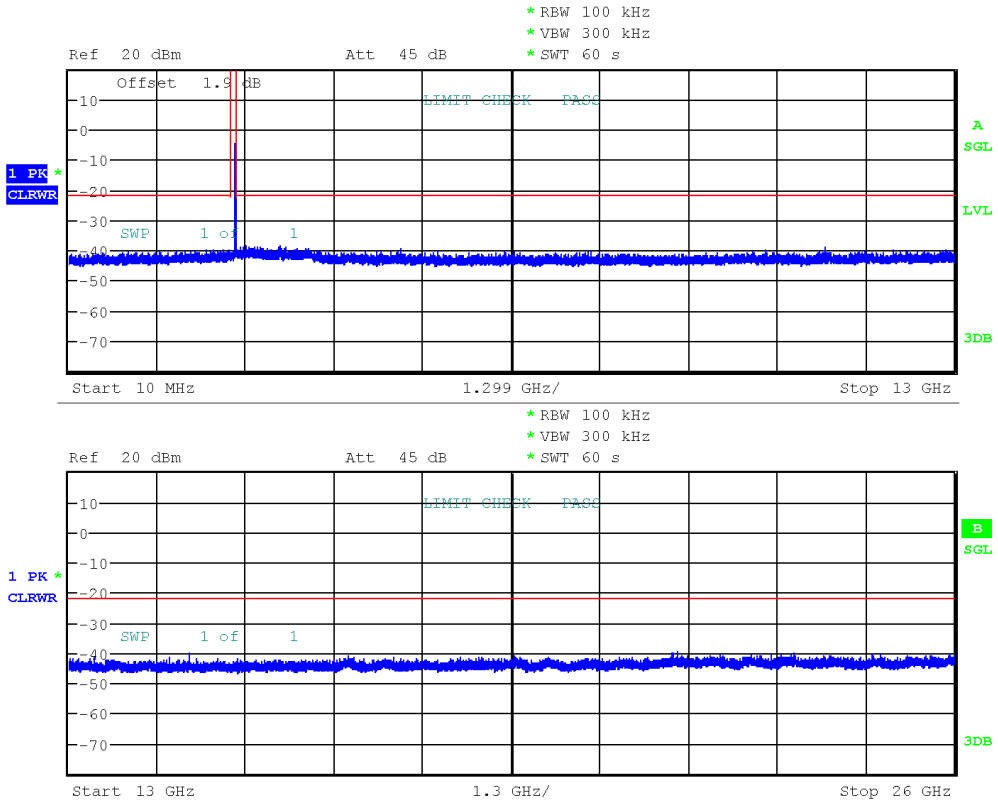
Conducted Spurious Emissions

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11 n HT20, Channel: 11, 2462 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Max. in-band Frequency [MHz]:	2464.5
Max. in-band Level [dBm/100 kHz]:	-1.7
Out-of-band Limit [dBm/100 kHz]:	-21.7



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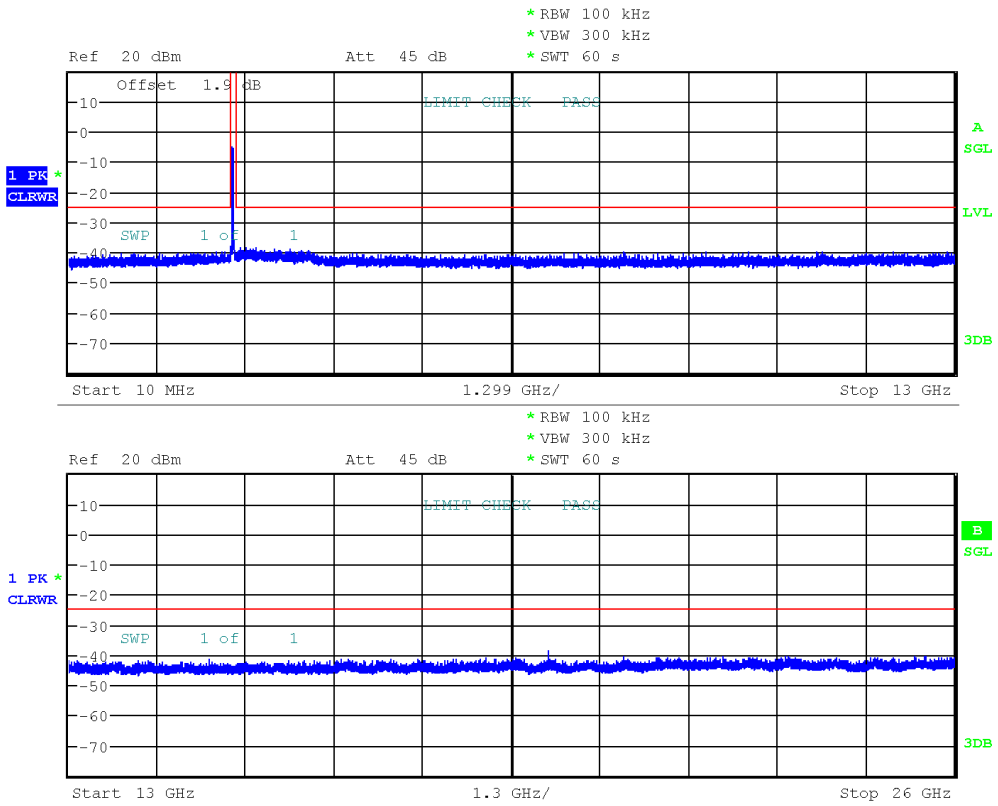
Conducted Spurious Emissions

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11 n HT40, Channel: 3, 2422 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Max. in-band Frequency [MHz]:	2437.2
Max. in-band Level [dBm/100 kHz]:	-5.0
Out-of-band Limit [dBm/100 kHz]:	-25.0



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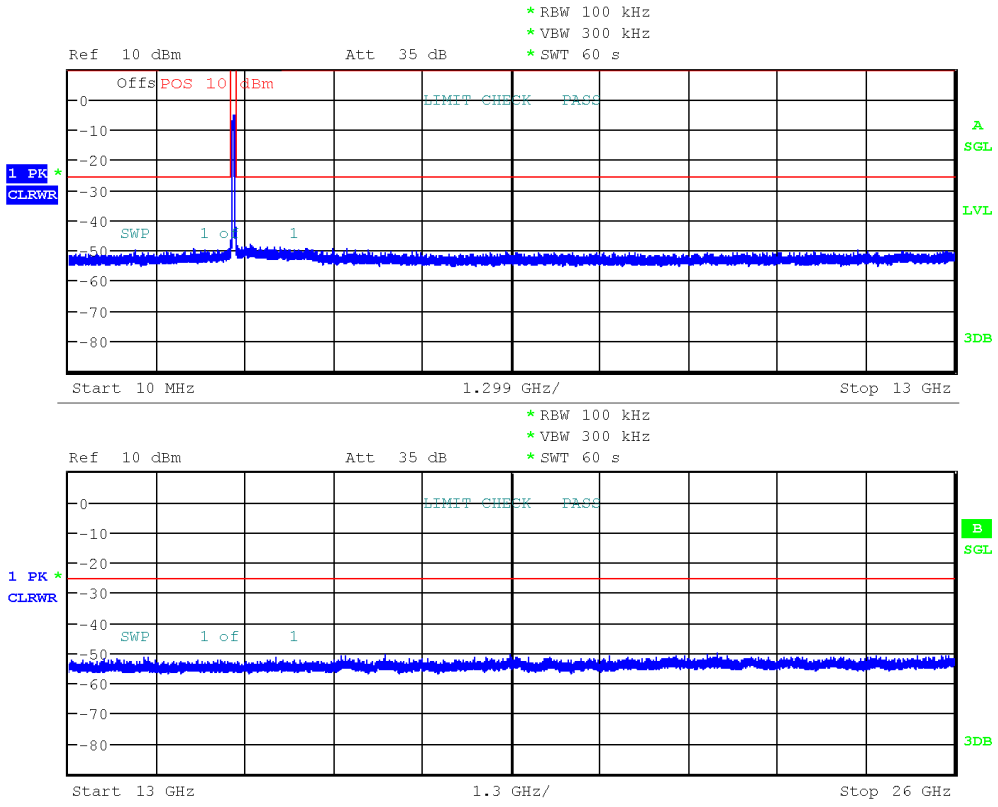
Conducted Spurious Emissions

Project Number:	G0M-2309-2215
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
Test Sample ID:	46902
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11 n HT40, Channel: 6, 2437 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-03-04
Max. in-band Frequency [MHz]:	2421.9
Max. in-band Level [dBm/100 kHz]:	-5.1
Out-of-band Limit [dBm/100 kHz]:	-25.1



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