

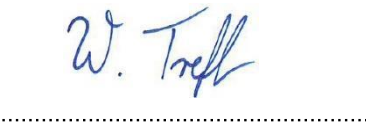


<b>RADIO REPORT</b> <b>FCC 47 CFR Part 15C</b> <b>ISED Canada RSS-247</b> <b>Frequency hopping systems operating within the 2400.0 MHz - 2483.5 MHz MHz band</b>	
<b>Report Reference No</b>	G0M-2309-2215-TFC247BT-V01
<b>Testing Laboratory</b>	Eurofins Product Service GmbH
<b>Address</b>	Storkower Str. 38c 15526 Reichenwalde Germany
<b>Accreditation</b>	 <p>                     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                 </p>
<b>Applicant</b>	Panasonic Industrial Devices Europe GmbH
<b>Address</b>	Zeppelinstr. 19 21337 Lüneburg GERMANY
<b>Test Specification</b>	47 CFR Part 15C RSS-247, Issue 3, 2023-08 RSS-Gen, Issue 5, Amendment 2, 2021-02
<b>Non-Standard Test Method</b>	None
<b>Equipment under Test (EUT):</b>	
<b>Product Description</b>	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
<b>Model(s)</b>	ENWF9511C1KF
<b>Additional Model(s)</b>	None
<b>Brand Name(s)</b>	PAN9019A
<b>Hardware Version(s)</b>	03
<b>Software Version(s)</b>	01
<b>FCC ID</b>	T7V9019
<b>IC</b>	216Q-9019
<b>Test Result</b>	<b>PASSED</b>

<b>Possible test case verdicts:</b>		
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)	
<b>Testing:</b>		
Test Lab Temperature	20 °C - 30 °C	
Test Lab Humidity	25 % - 55 %	
Date of receipt of test item	2023-12-11	
<b>Report:</b>		
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	2024-03-19	
Total number of pages	144	
<b>General Remarks:</b>		
<p><b>The test results presented in this report relate only to the object tested.</b></p> <p><b>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.</b></p> <p>This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.</p>		
<b>Additional Comments:</b>		
None		

**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	2024-03-19	Initial Release	--

## ABBREVIATIONS AND ACRONYMS

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

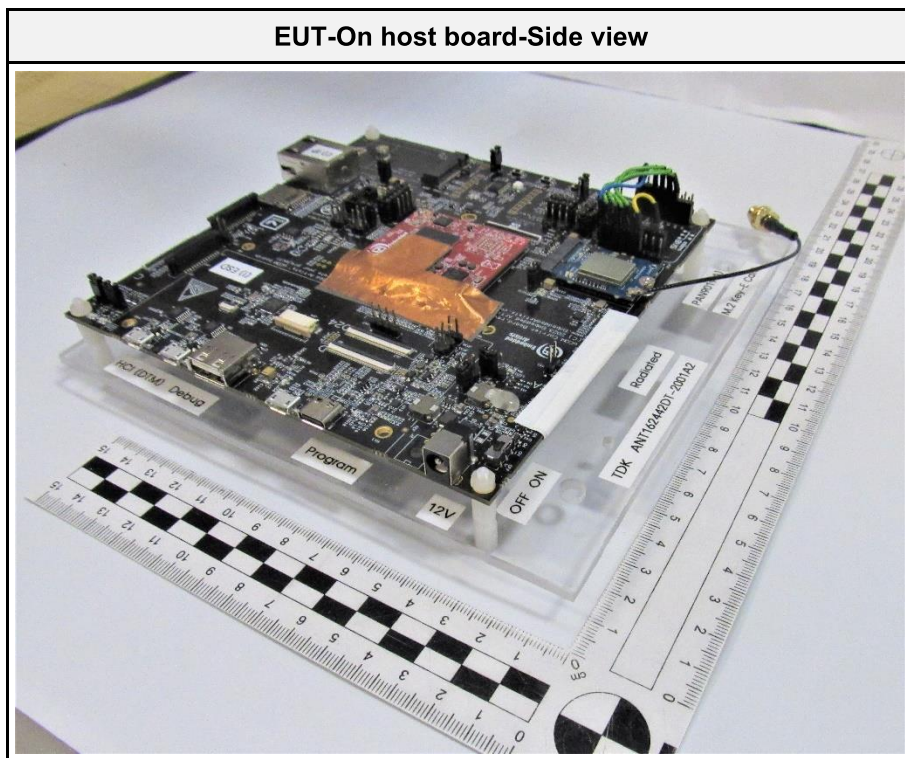
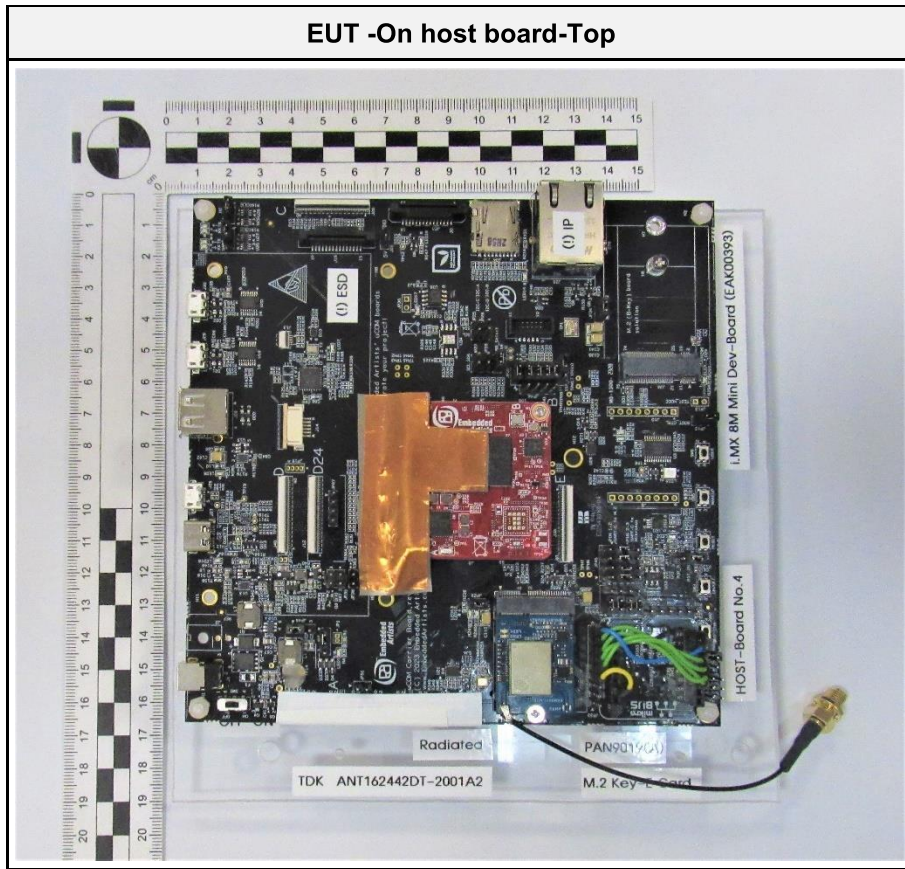
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**1 Equipment (Test Item) Under Test**

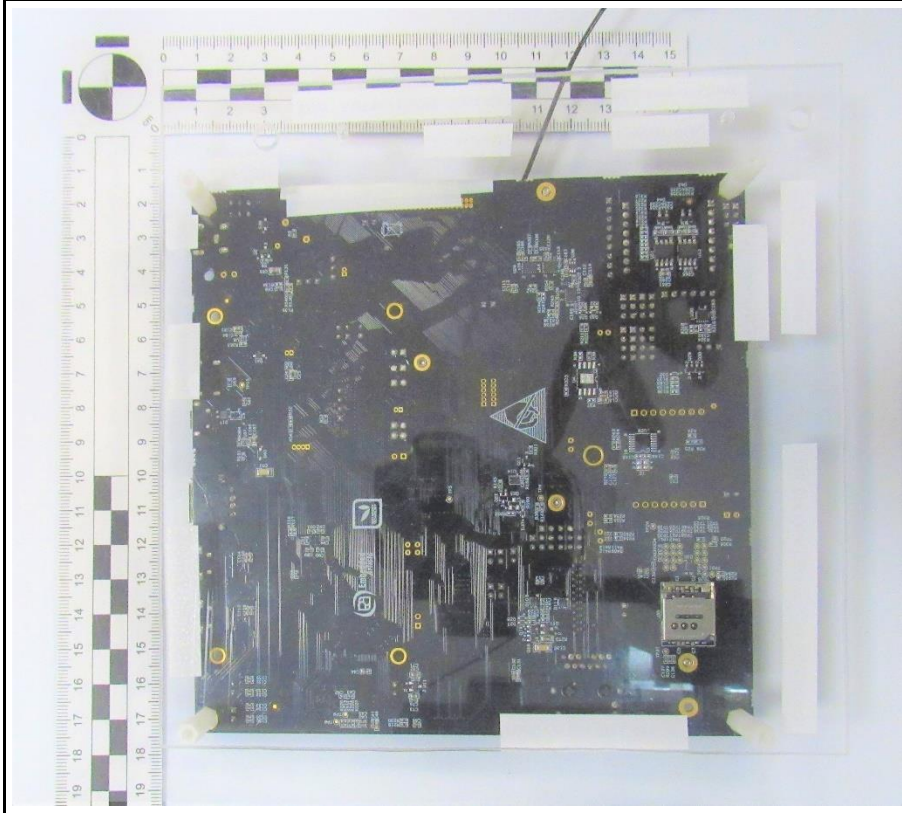
Description	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module		
Model	ENWF9511C1KF		
Additional Model(s)	None		
Brand Name(s)	PAN9019A		
Sample Identification	EUT #	Sample-ID	Serial Number
	PAN9019A with Antenna 1	46900	00000290
	PAN9019A with Antenna 2	46856	00000306
	PAN9019A with Antenna 3	46898	00000279
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	Bluetooth		
Modulation	GFSK, PI/4-DQPSK, 8-DPSK		
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 <sub>NOM</sub>	1.8/3.3 VDC	
	V <sub>MIN</sub>	1.71/3.14 VDC	
	V <sub>MAX</sub>	1.89/3.46 VDC	
Operating Temperature	T <sub>NOM</sub>	25°C	
	T <sub>MIN</sub>	-40°C	
	T <sub>MAX</sub>	85°C	
AC/DC-Adaptor	None		
Manufacturer	Panasonic Industrial Devices Europe GmbH Zeppelinstr. 19 21337 Lüneburg GERMANY		

1.1 Photos – Equipment External

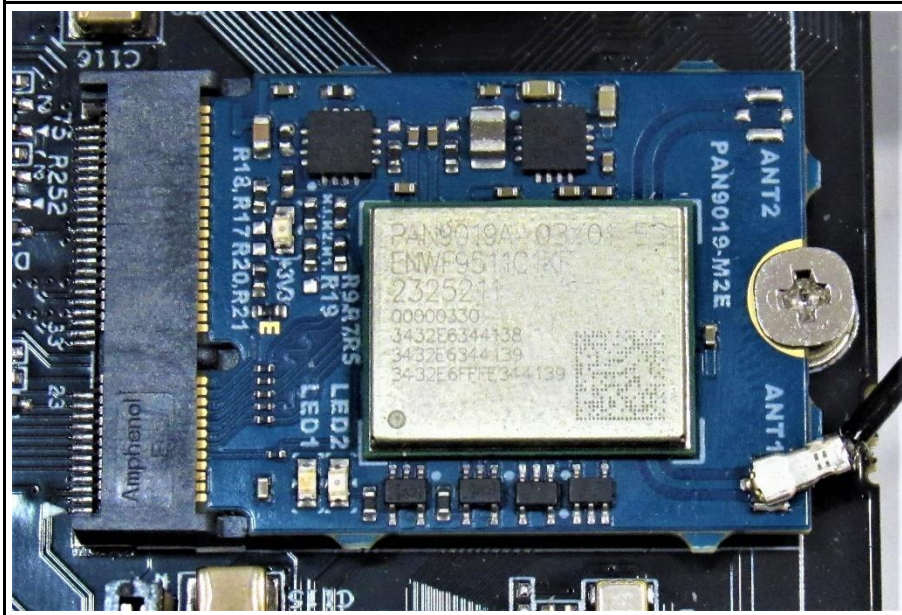




EUT-On host board-Bottom



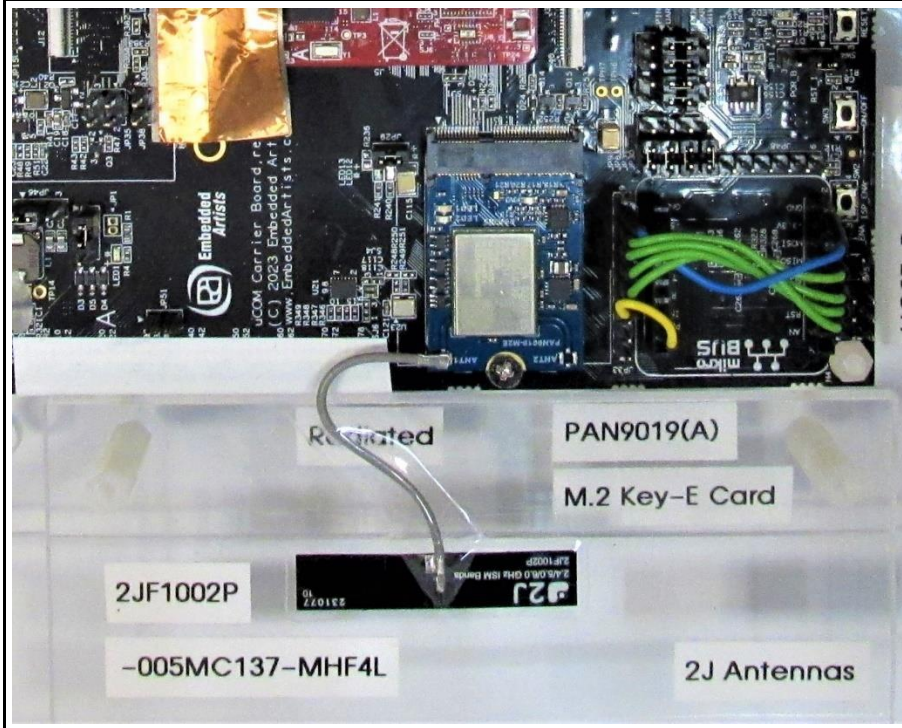
EUT-Radio Module



EUT -On host board-With Antenna 1

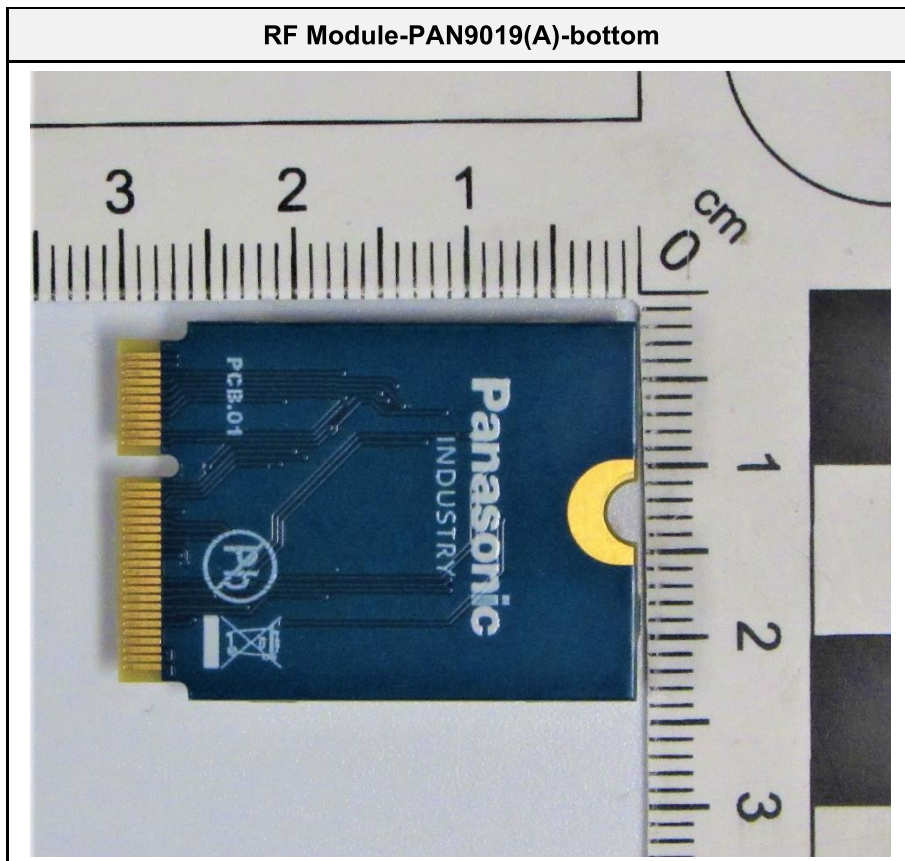
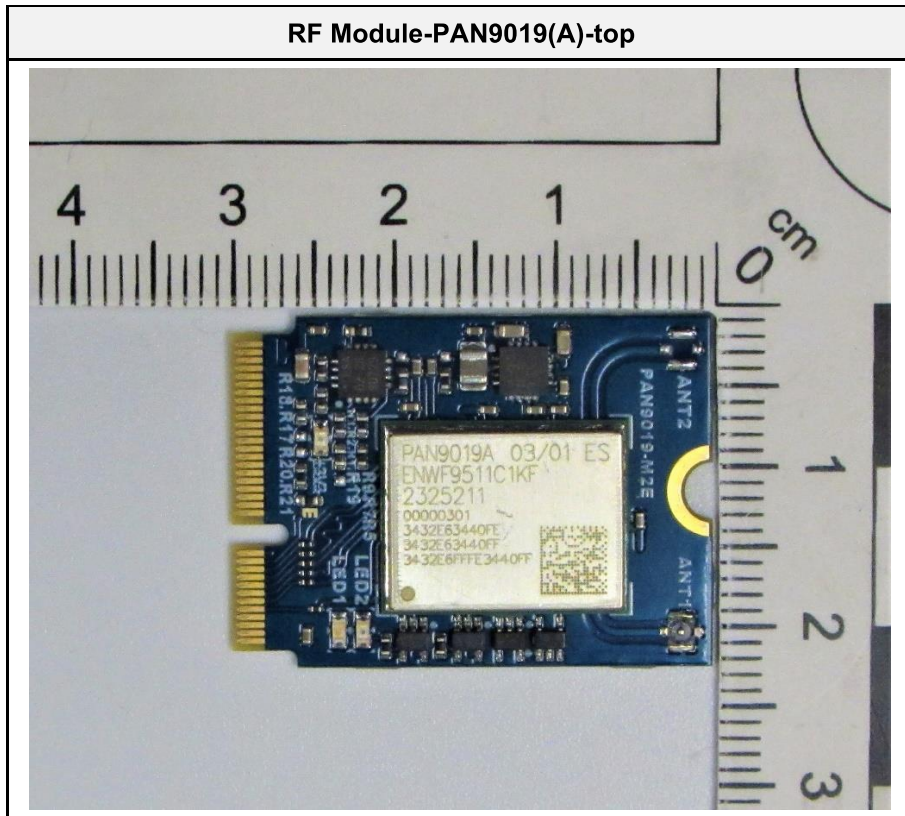


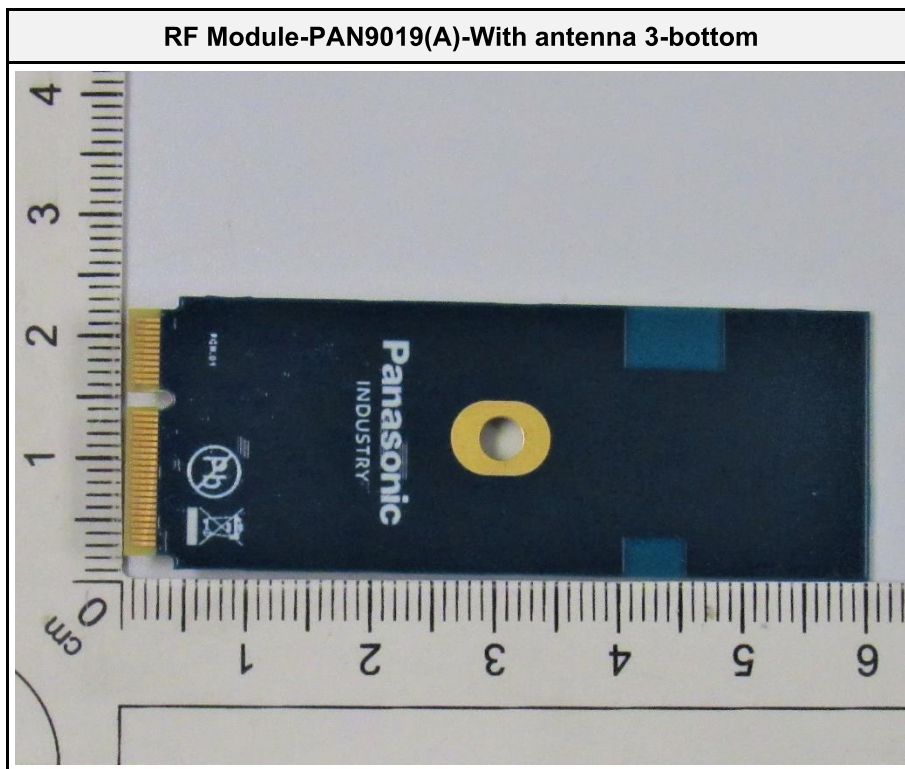
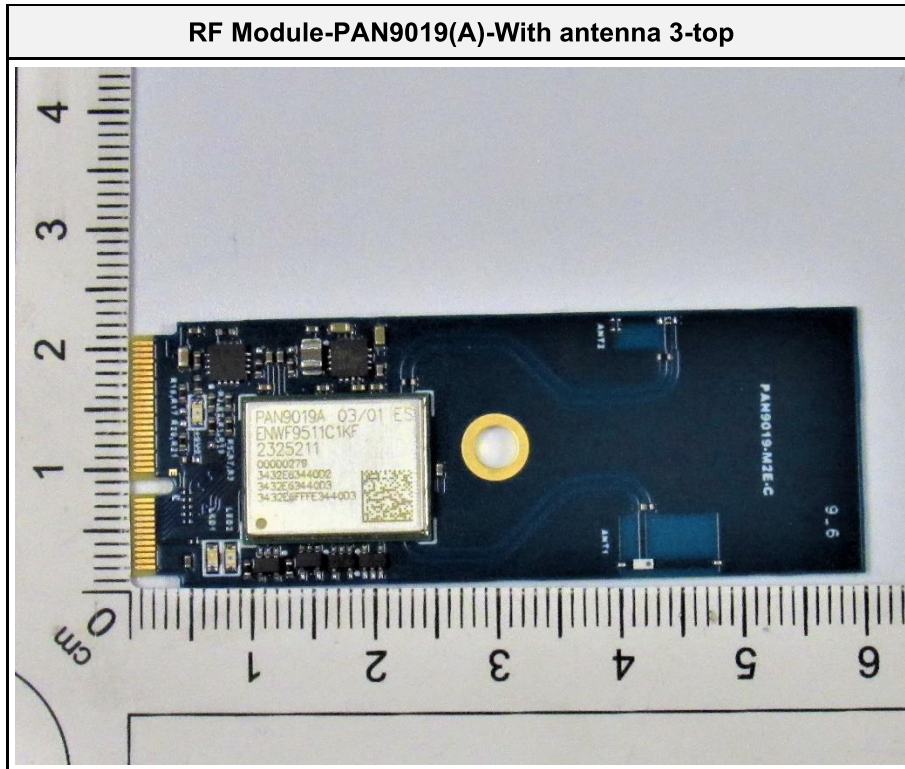
EUT -On host board-With Antenna 2



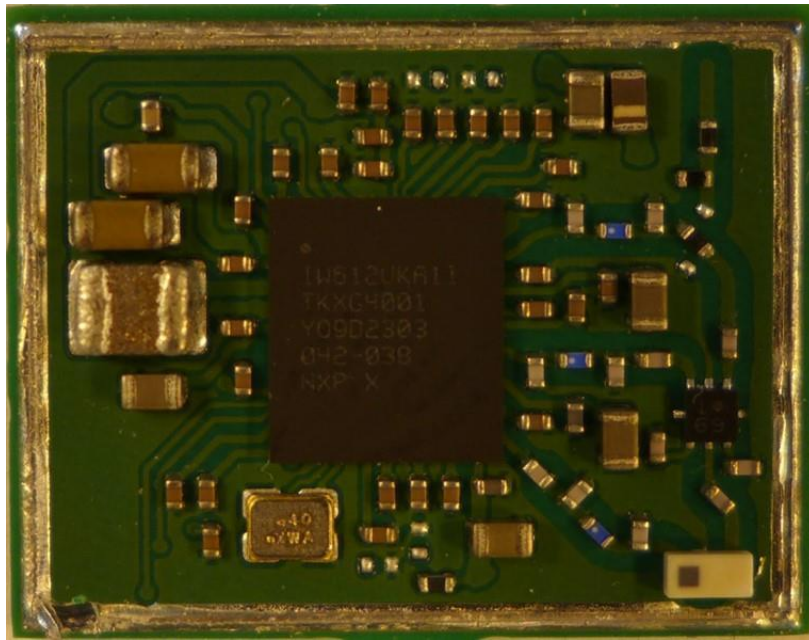


1.2 Photos – Equipment Internal

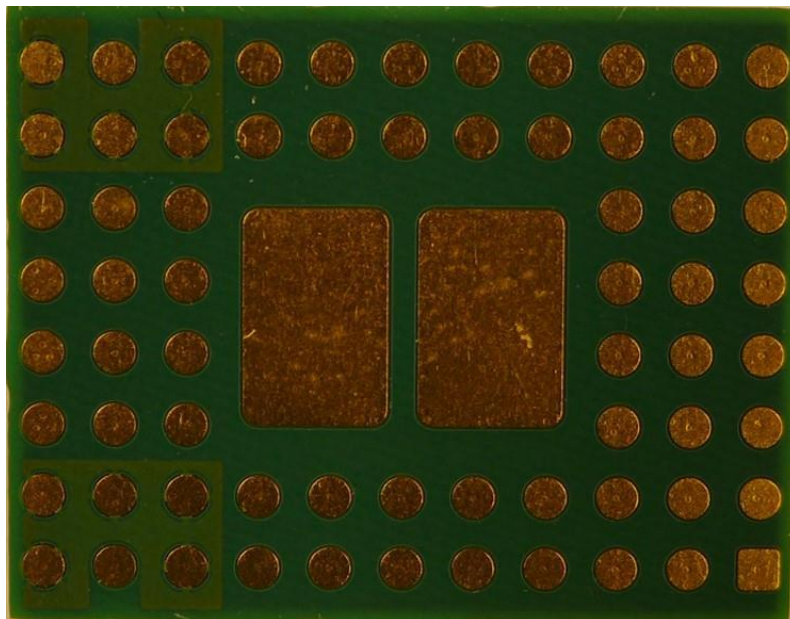




RF Module-PAN9019(A)-top without shielding



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 Modes**

Mode	Description
DH5 Single	Mode = Transmit Modulation = GFSK Spreading = None Packet type = DH5 Duty cycle = 43.3%
2-DH5 Single	Mode = Transmit Modulation = PI/4-DQPSK Spreading = None Packet type = 2-DH5 Duty cycle = 43.3%
3-DH5 Single	Mode = Transmit Modulation = 8-DPSK Spreading = None Packet type = 3-DH5 Duty cycle = 43.3%
DH5 Hopping	Mode = Transmit Modulation = GFSK Spreading = FHSS Packet type = DH5 Duty cycle = 43.3%
2-DH5 Hopping	Mode = Transmit Modulation = PI/4-DQPSK Spreading = FHSS Packet type = 2-DH5 Duty cycle = 43.3%
3-DH5 Hopping	Mode = Transmit Modulation = 8-DPSK Spreading = FHSS Packet type = 3-DH5 Duty cycle = 43.3%
Receive	Mode = Receive
Comment:	



### 1.5 Test Frequencies

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

### 1.6 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).

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:

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

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)(1) ISED RSS-247 § 5.1 Issue 2	20 dB Bandwidth	ANSI C63.10-2013	PASS	--
FCC § 15.247(a)(1)(iii) ISED RSS-247, Issue 2 (section 5.1)	Number of hopping frequencies	ANSI C63.10-2013	PASS	--
FCC § 15.247(a)(1) ISED RSS-247, Issue 2 (section 5.1)	Frequency hopping channel separation	ANSI C63.10-2013	PASS	--
FCC § 15.247(a)(1)(iii) ISED RSS-247, Issue 2 (section 5.1)	Time of occupancy (Dwell time)	ANSI C63.10-2013	PASS	--
FCC § 15.247(b) ISED RSS-247, Issue 2 (section 5.4)	Maximum peak conducted power	ANSI C63.10-2013	PASS	--
FCC § 15.207 ISED RSS-247, Issue 2 (section 3.1)	AC power line conducted emissions	ANSI C63.10-2013	PASS	--
FCC § 15.247(d) ISED RSS-247, Issue 2 (section 5.5)	Band edge compliance	ANSI C63.10-2013	PASS	--
FCC § 15.247(d) ISED RSS-247, Issue 2 (section 5.5)	Conducted spurious emissions	ANSI C63.10-2013	PASS	--
FCC § 15.247(d) FCC § 15.209 ISED RSS-Gen, Issue 5 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: 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

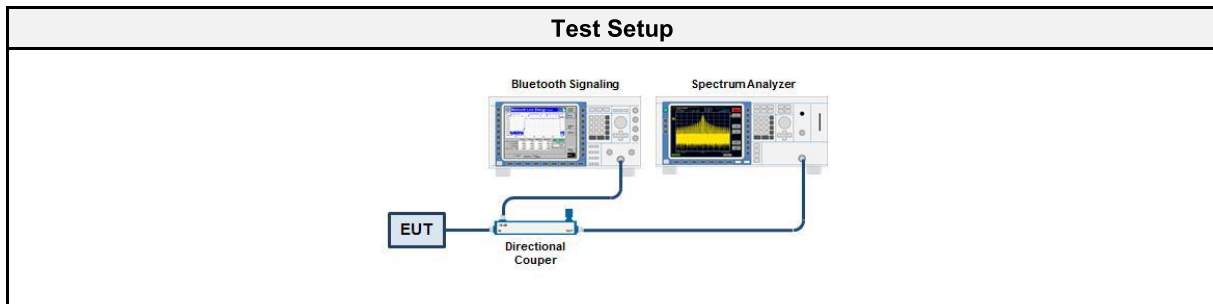
##### 3.1.1 Information

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	46900
Operator	Md Abu Bakar Siddique
Date	2024-01-26

##### 3.1.2 Limits

Limits
None (Informational only)

##### 3.1.3 Setup



##### 3.1.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSP 30	EF00312	2023-08	2024-08
Cable(CAABC)	Gigalane	GIGALANE 1730	EF00779	2023-03	2024-03

##### 3.1.5 Procedure

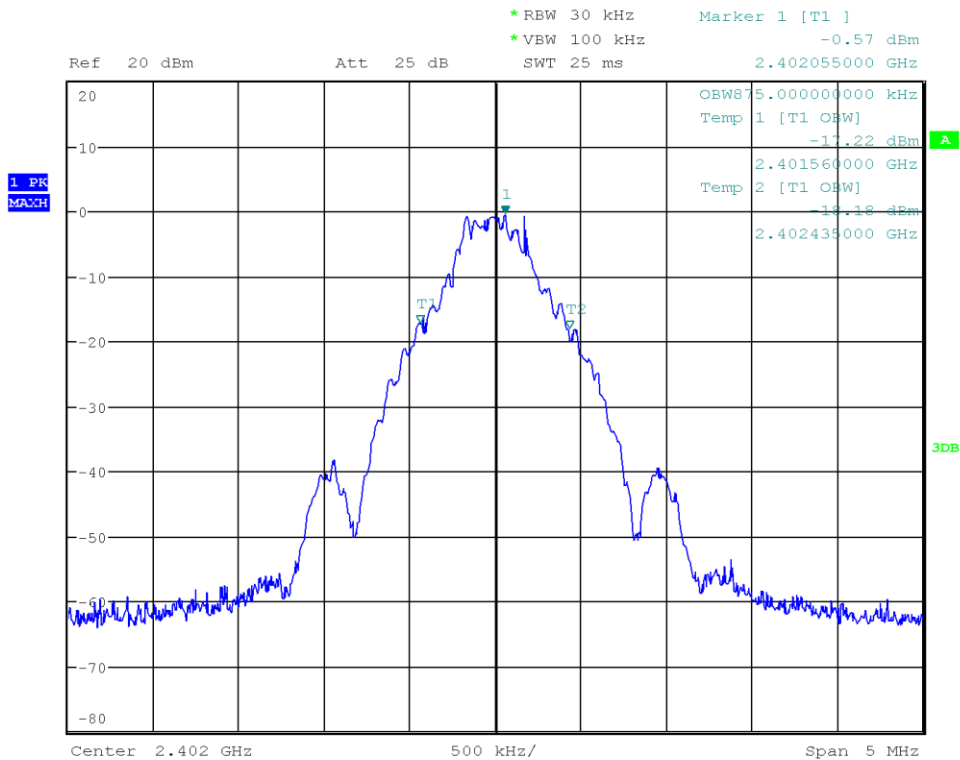
Test Procedure
<ol style="list-style-type: none"> <li>EUT transmitter is activated in test mode under normal conditions</li> <li>The spectrum analyzer is set to peak detection and maximum hold with a span twice the emission spectrum</li> <li>The resolution bandwidth is set to the range of 1 % to 5 % of the occupied bandwidth</li> <li>The occupied bandwidth is measured with the build-in analyzer function</li> </ol>

## 3.1.6 Results

Test Results		
Mode	Frequency [MHz]	Bandwidth [MHz]
DH5	2402	0.880
DH5	2441	0.885
DH5	2480	0.880
2-DH5	2402	1.180
2-DH5	2441	1.180
2-DH5	2480	1.170
3-DH5	2402	1.175
3-DH5	2441	1.180
3-DH5	2480	1.185

### Occupied Bandwidth

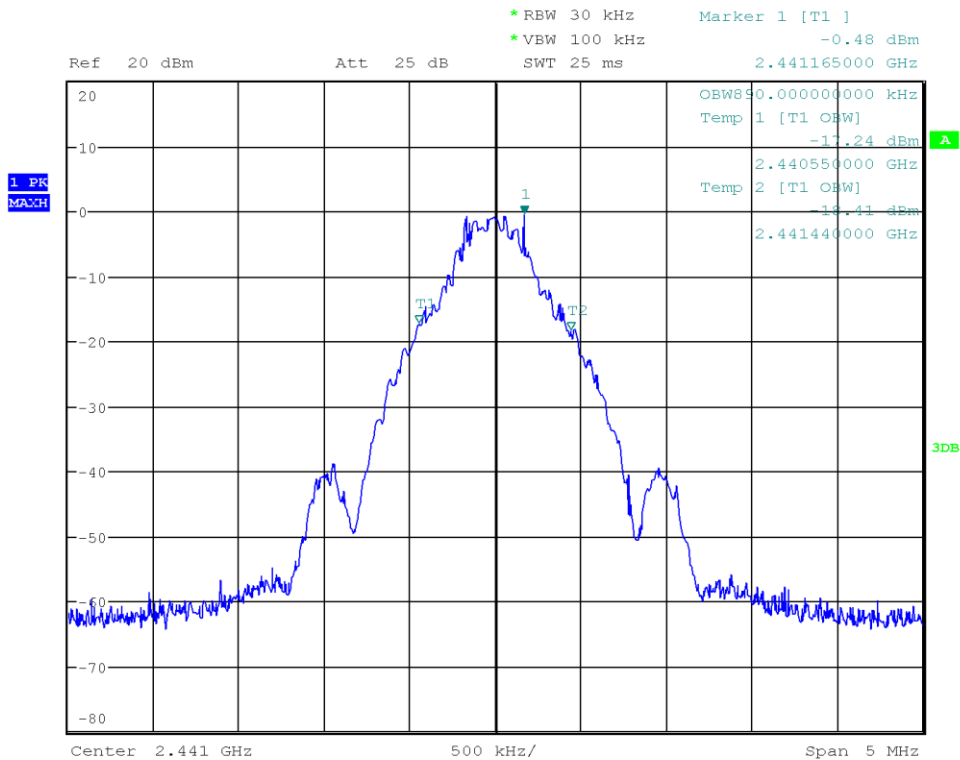
Project Number: G0M-2309-2215  
 Applicant: Panasonic Industrial Devices Europe GmbH  
 Model Description: Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module  
 Model: ENWF9511C1KF  
 Test Sample ID: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.3  
 Operational Mode: DH5, Channel: 0, 2402 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-26  
 Occupied Bandwidth [MHz]: 0.880



Date: 26.JAN.2024 16:36:38

### Occupied Bandwidth

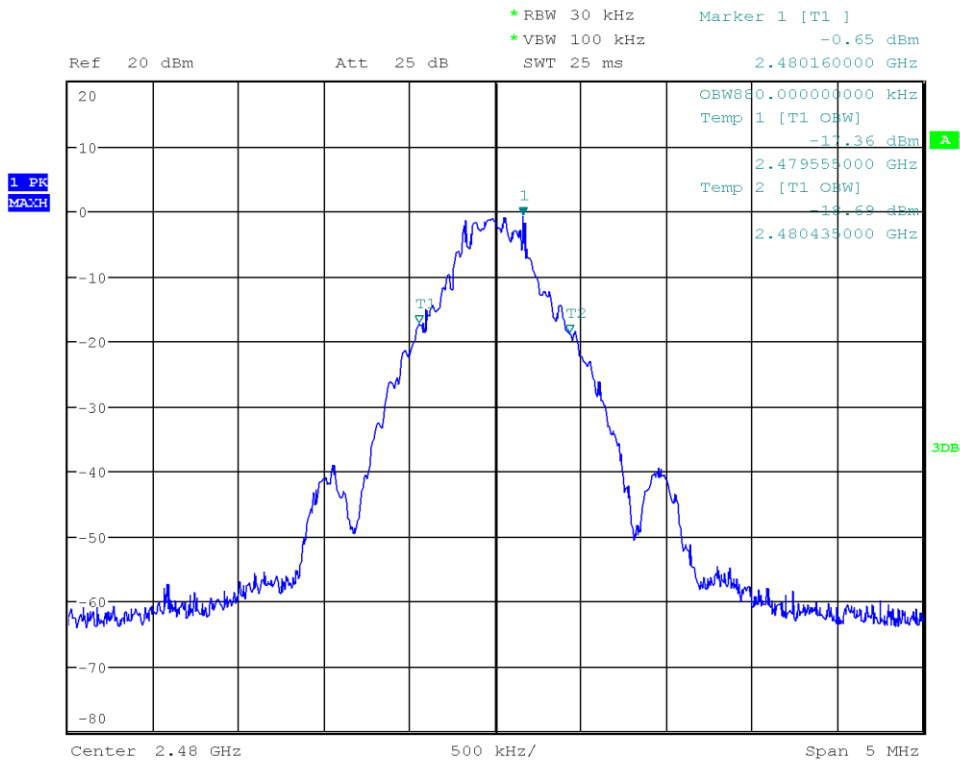
Project Number: G0M-2309-2215  
 Applicant: Panasonic Industrial Devices Europe GmbH  
 Model Description: Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module  
 Model: ENWF9511C1KF  
 Test Sample ID: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.3  
 Operational Mode: DH5, Channel: 39, 2441 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-26  
 Occupied Bandwidth [MHz]: 0.885



Date: 26.JAN.2024 16:11:43

### 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: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.3  
 Operational Mode: DH5, Channel: 78, 2480 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-26  
 Occupied Bandwidth [MHz]: 0.880

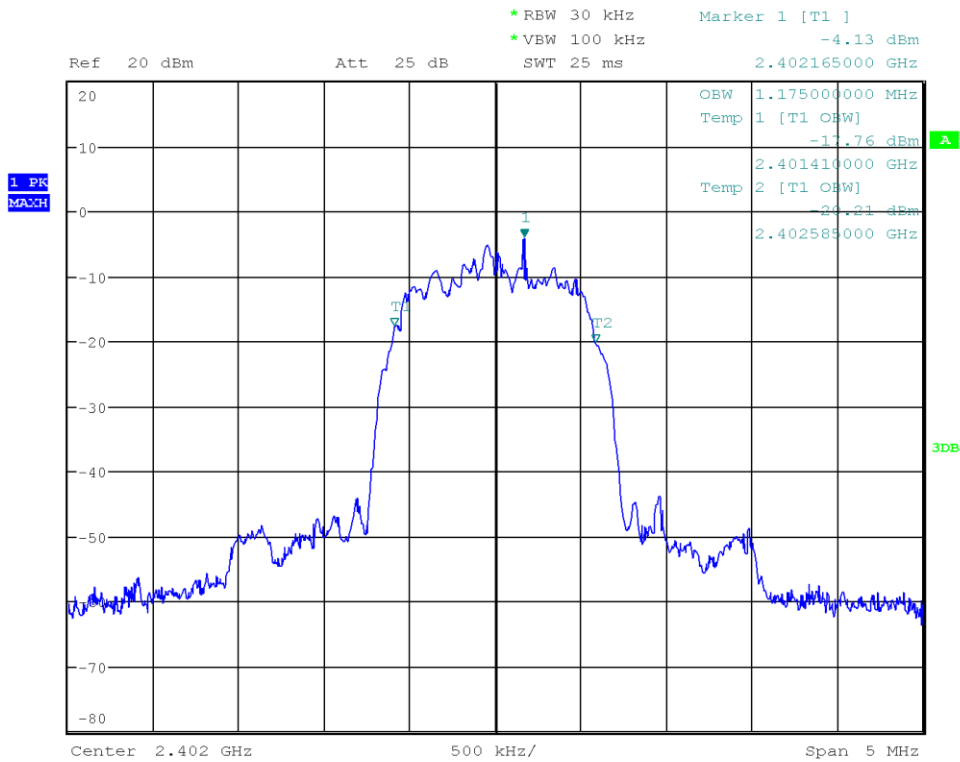


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### Occupied Bandwidth

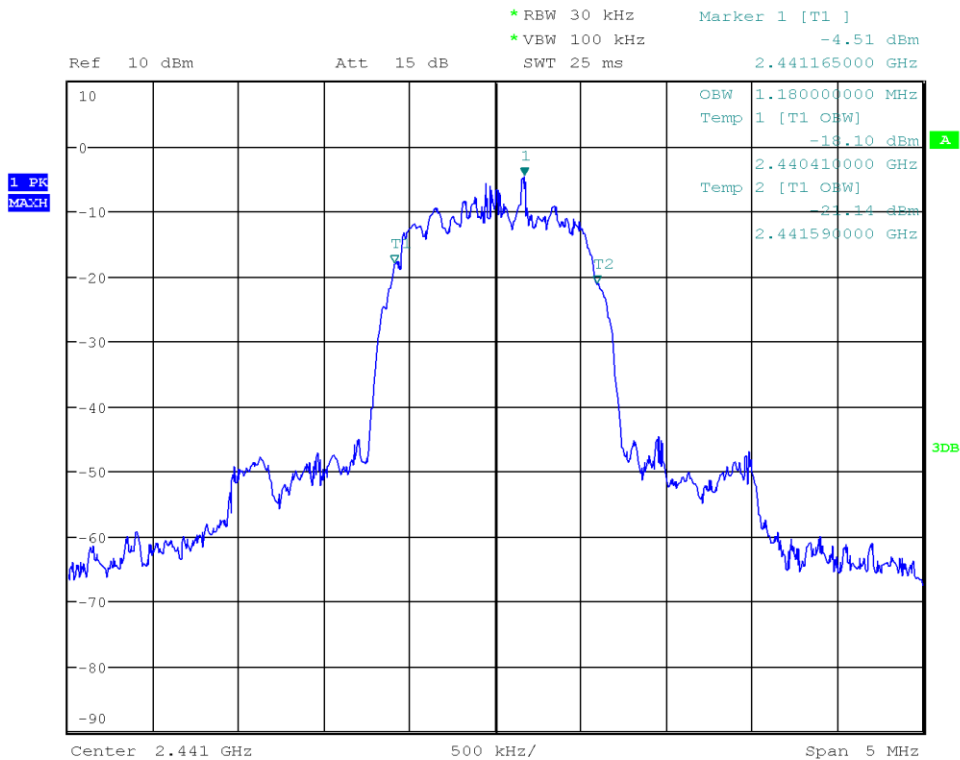
Project Number: G0M-2309-2215  
 Applicant: Panasonic Industrial Devices Europe GmbH  
 Model Description: Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module  
 Model: ENWF9511C1KF  
 Test Sample ID: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.3  
 Operational Mode: 2-DH5, Channel: 0, 2402 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-26  
 Occupied Bandwidth [MHz]: 1.180



Date: 26.JAN.2024 16:15:31

### Occupied Bandwidth

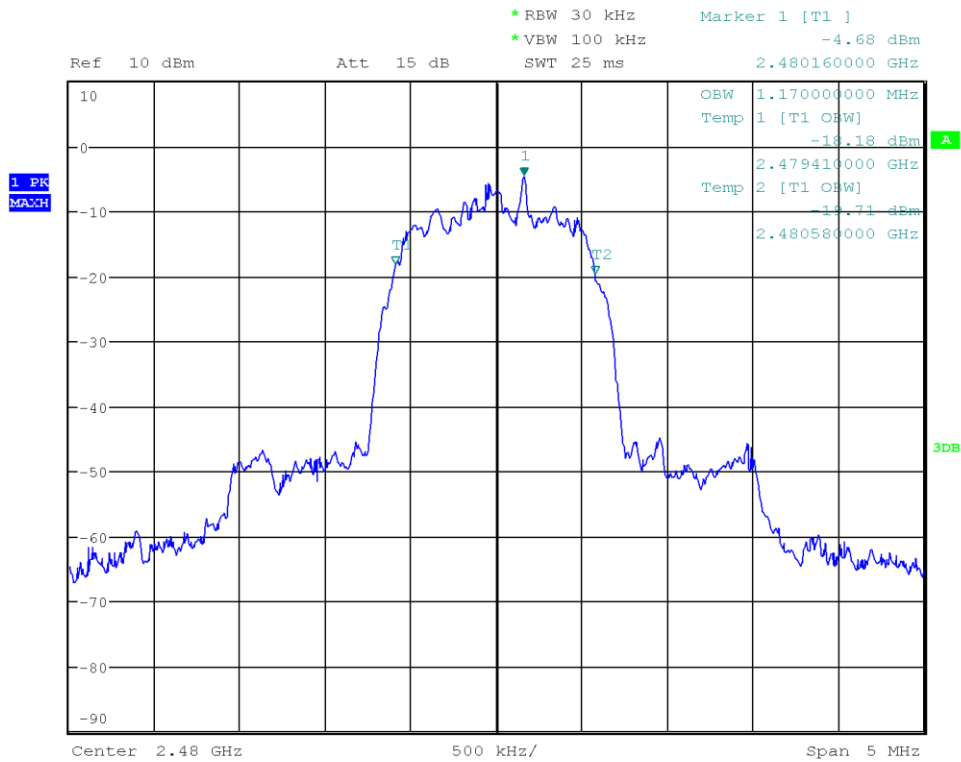
Project Number: G0M-2309-2215  
 Applicant: Panasonic Industrial Devices Europe GmbH  
 Model Description: Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module  
 Model: ENWF9511C1KF  
 Test Sample ID: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.3  
 Operational Mode: 2-DH5, Channel: 39, 2441 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-26  
 Occupied Bandwidth [MHz]: 1.180



Date: 26.JAN.2024 16:17:10

### Occupied Bandwidth

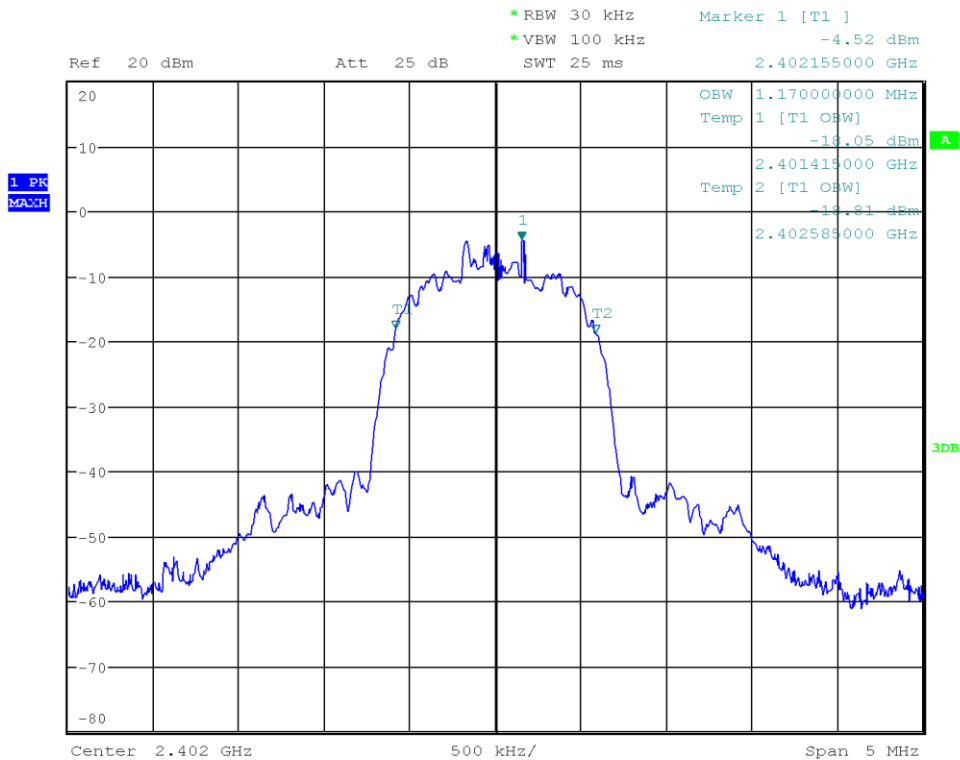
Project Number: G0M-2309-2215  
 Applicant: Panasonic Industrial Devices Europe GmbH  
 Model Description: Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module  
 Model: ENWF9511C1KF  
 Test Sample ID: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.3  
 Operational Mode: 2-DH5, Channel: 78, 2480 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-26  
 Occupied Bandwidth [MHz]: 1.170



Date: 26.JAN.2024 16:19:44

### Occupied Bandwidth

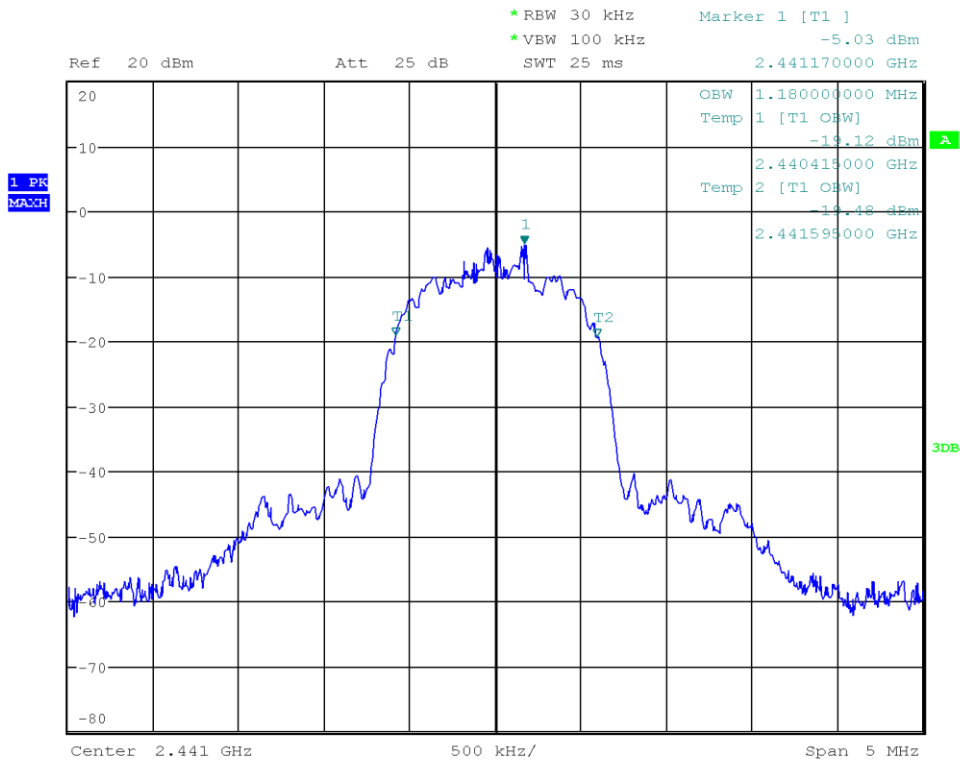
Project Number: G0M-2309-2215  
 Applicant: Panasonic Industrial Devices Europe GmbH  
 Model Description: Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module  
 Model: ENWF9511C1KF  
 Test Sample ID: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.3  
 Operational Mode: 3-DH5, Channel: 0, 2402 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-26  
 Occupied Bandwidth [MHz]: 1.175



Date: 26.JAN.2024 16:21:55

### Occupied Bandwidth

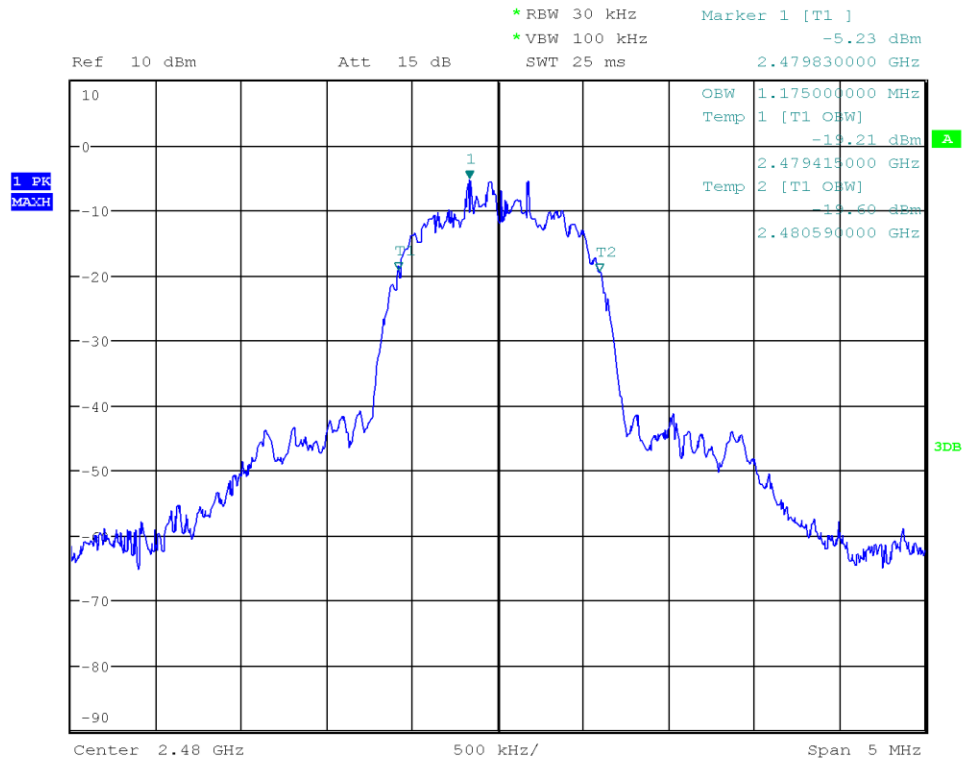
Project Number: G0M-2309-2215  
 Applicant: Panasonic Industrial Devices Europe GmbH  
 Model Description: Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module  
 Model: ENWF9511C1KF  
 Test Sample ID: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.3  
 Operational Mode: 3-DH5, Channel: 39, 2441 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-26  
 Occupied Bandwidth [MHz]: 1.180



Date: 26.JAN.2024 16:34:46

### 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: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.3  
 Operational Mode: 3-DH5, Channel: 78, 2480 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-26  
 Occupied Bandwidth [MHz]: 1.185



Date: 26.JAN.2024 16:35:33

### 3.2 Test Conditions and Results - 20 dB bandwidth

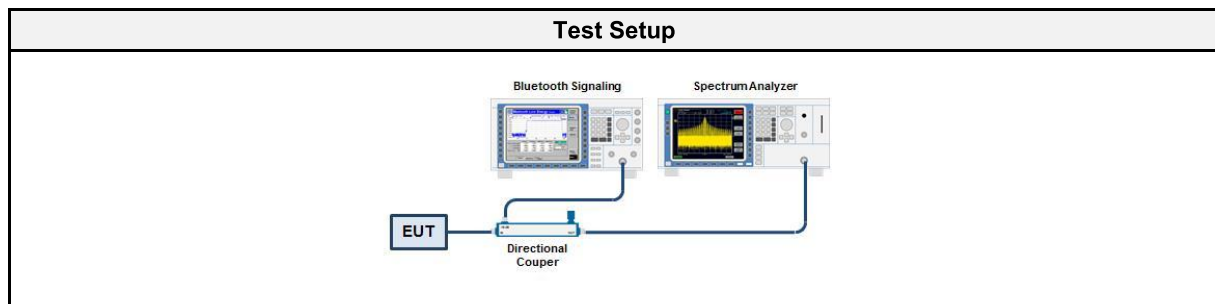
#### 3.2.1 Information

Test Information	
Reference	FCC 15.247(a)(1) / ISED RSS-247 5.1
Measurement Method	ANSI C63.10 6.9.2
Measurement Uncertainty	± 1.26 %
Test Sample ID	46900
Operator	Md Abu Bakar Siddique
Date	2024-01-26

#### 3.2.2 Limits

Limits
None (Informational only)

#### 3.2.3 Setup



#### 3.2.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSP 30	EF00312	2023-08	2024-08
Cable(CAABC)	Gigalane	GIGALANE 1730	EF00779	2023-03	2024-03

#### 3.2.5 Procedure

Test Procedure
<ol style="list-style-type: none"> <li>1. EUT set to test mode (Communication tester is used if needed)</li> <li>2. Span set to at least twice the emission spectrum</li> <li>3. Detector set to peak and max hold</li> <li>4. Envelope peak value of emission spectrum is selected</li> <li>5. Marker on envelope of spectrum is set to level of -20 dB to the left of the peak</li> <li>6. Marker on envelope of spectrum is set to level of -20 dB to the right of the peak</li> <li>7. 20dB Bandwidth is determined by marker frequency separation</li> </ol>

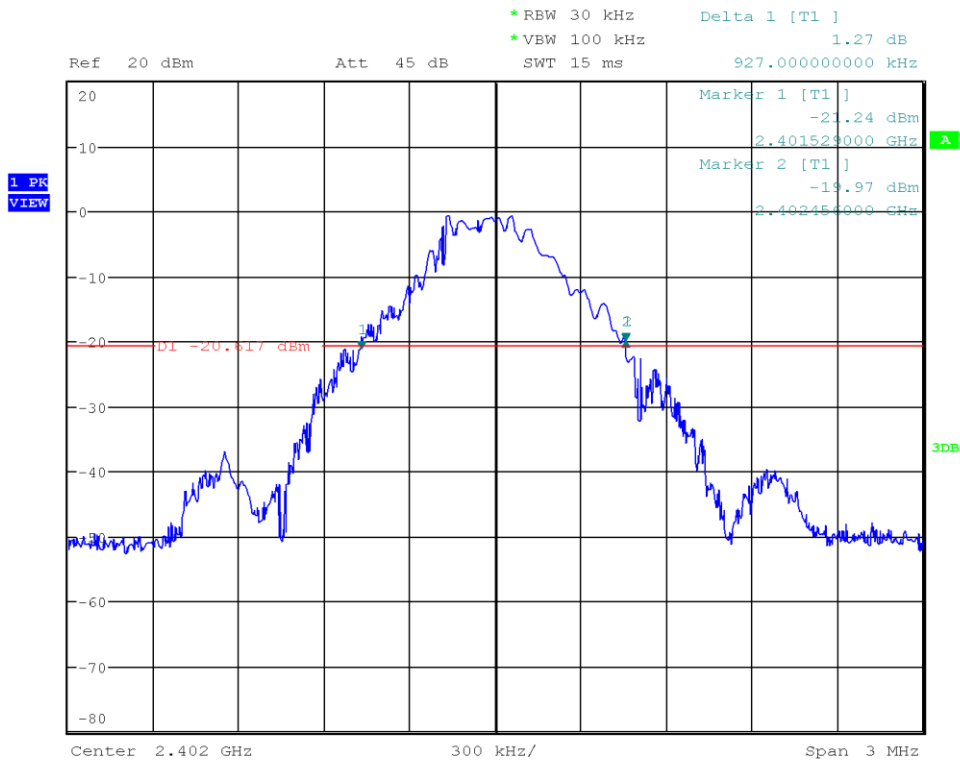
## 3.2.6 Results

Test Results		
Mode	Frequency [MHz]	Bandwidth [MHz]
DH5	2402	0.927
DH5	2441	0.957
DH5	2480	0.966
2-DH5	2402	1.293
2-DH5	2441	1.353
2-DH5	2480	1.326
3-DH5	2402	1.299
3-DH5	2441	1.299
3-DH5	2480	1.305



### 20 dB Bandwidth

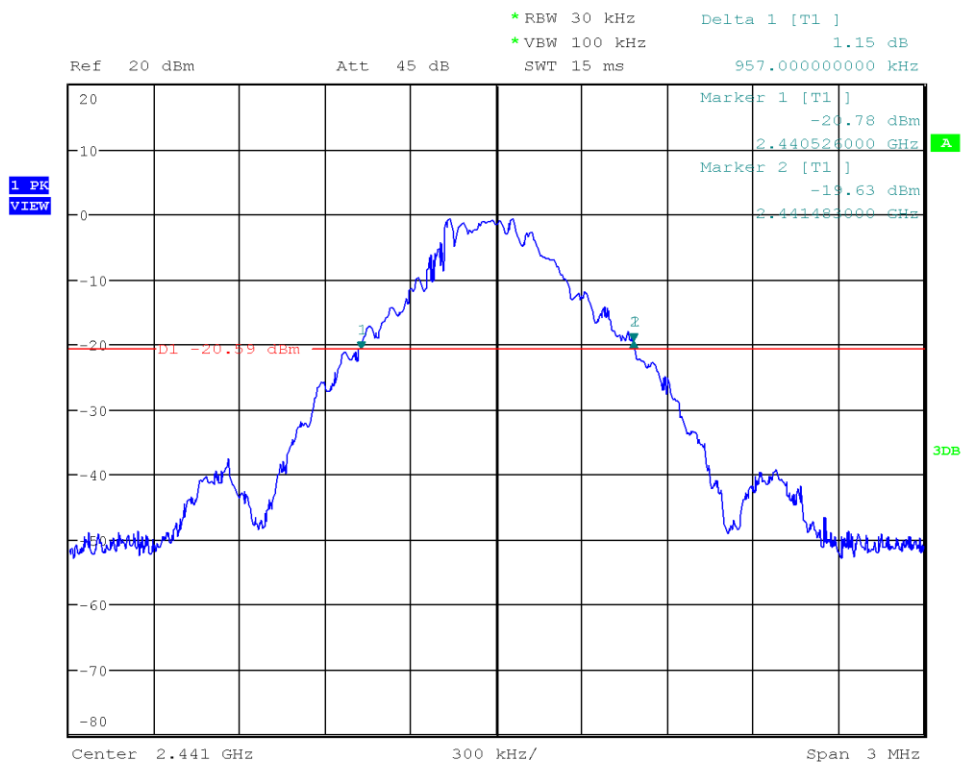
Project Number: G0M-2309-2215  
 Applicant: Panasonic Industrial Devices Europe GmbH  
 Model Description: Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module  
 Model: ENWF9511C1KF  
 Test Sample ID: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.2  
 Operational Mode: DH5, Channel: 0, 2402 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-26  
 Lower Frequency [MHz]: 2401.529  
 Upper Frequency [MHz]: 2402.456  
 20 dB Bandwidth [MHz]: 0.927



Date: 26.JAN.2024 16:42:24

### 20 dB Bandwidth

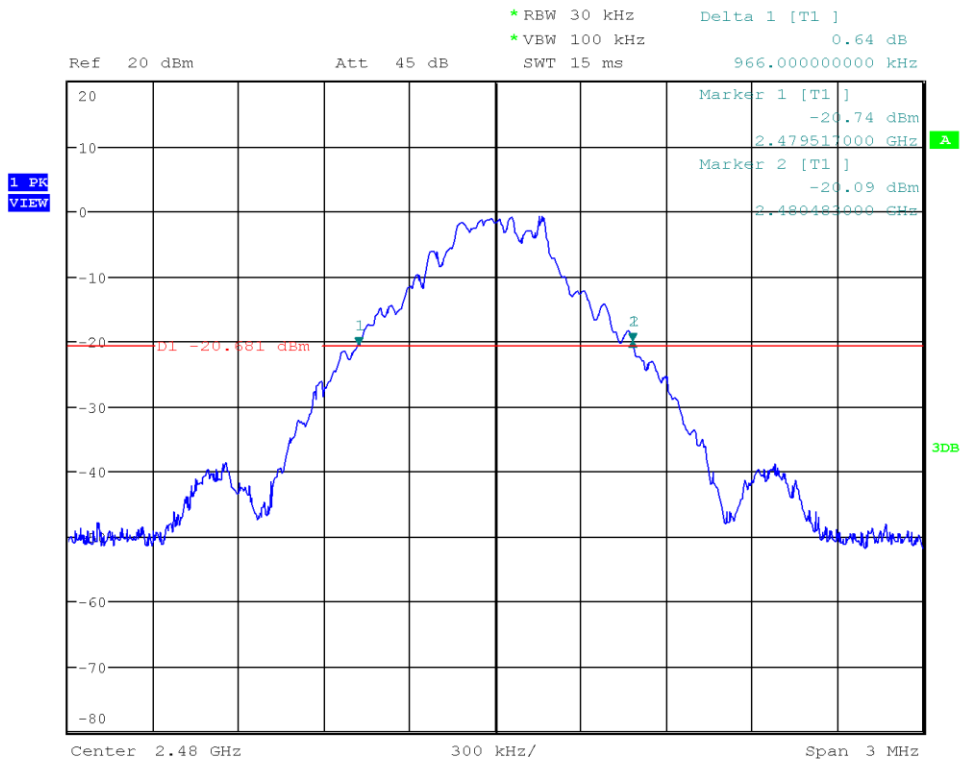
Project Number: G0M-2309-2215  
 Applicant: Panasonic Industrial Devices Europe GmbH  
 Model Description: Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module  
 Model: ENWF9511C1KF  
 Test Sample ID: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.2  
 Operational Mode: DH5, Channel: 39, 2441 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-26  
 Lower Frequency [MHz]: 2440.526  
 Upper Frequency [MHz]: 2441.483  
 20 dB Bandwidth [MHz]: 0.957



Date: 26.JAN.2024 16:43:35

### 20 dB Bandwidth

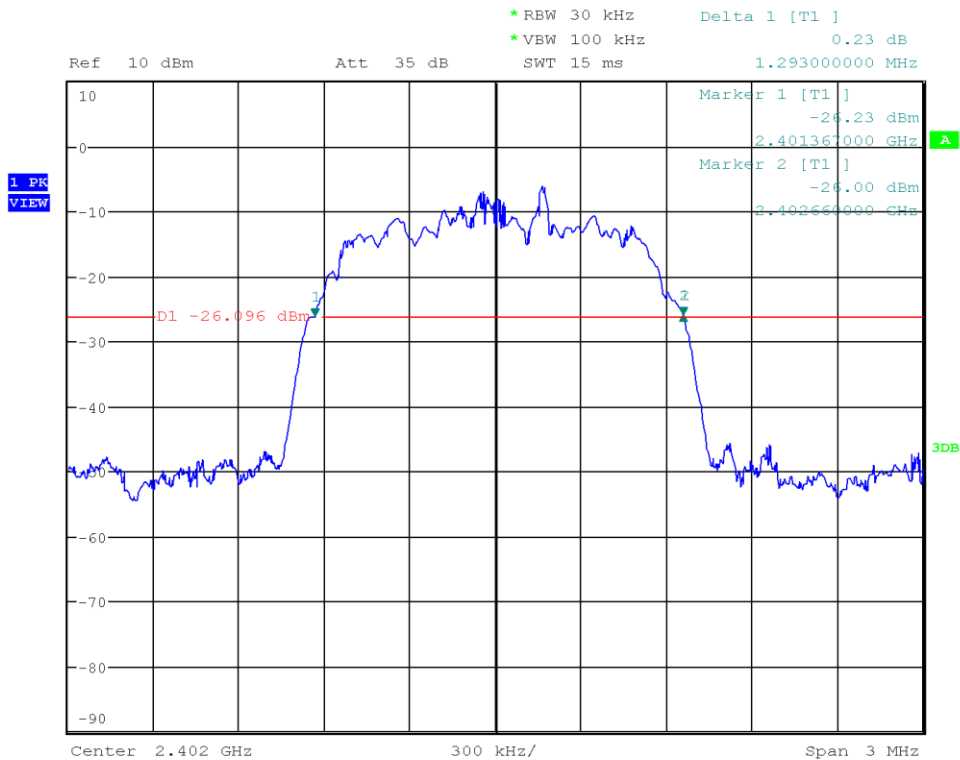
Project Number: G0M-2309-2215  
 Applicant: Panasonic Industrial Devices Europe GmbH  
 Model Description: Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module  
 Model: ENWF9511C1KF  
 Test Sample ID: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.2  
 Operational Mode: DH5, Channel: 78, 2480 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-26  
 Lower Frequency [MHz]: 2479.517  
 Upper Frequency [MHz]: 2480.483  
 20 dB Bandwidth [MHz]: 0.966



Date: 26.JAN.2024 16:44:20

### 20 dB Bandwidth

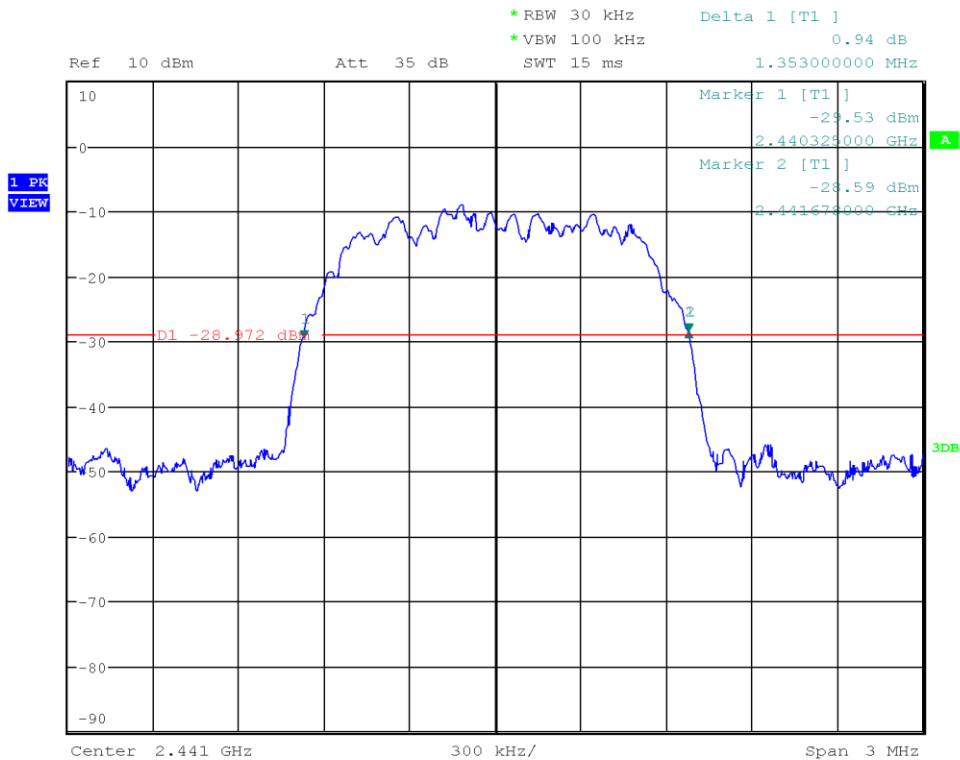
Project Number: G0M-2309-2215  
 Applicant: Panasonic Industrial Devices Europe GmbH  
 Model Description: Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module  
 Model: ENWF9511C1KF  
 Test Sample ID: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.2  
 Operational Mode: 2-DH5, Channel: 0, 2402 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-29  
 Lower Frequency [MHz]: 2401.367  
 Upper Frequency [MHz]: 2402.660  
 20 dB Bandwidth [MHz]: 1.293



Date: 29.JAN.2024 11:56:11

### 20 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: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.2  
 Operational Mode: 2-DH5, Channel: 39, 2441 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-29  
 Lower Frequency [MHz]: 2440.325  
 Upper Frequency [MHz]: 2441.678  
 20 dB Bandwidth [MHz]: 1.353



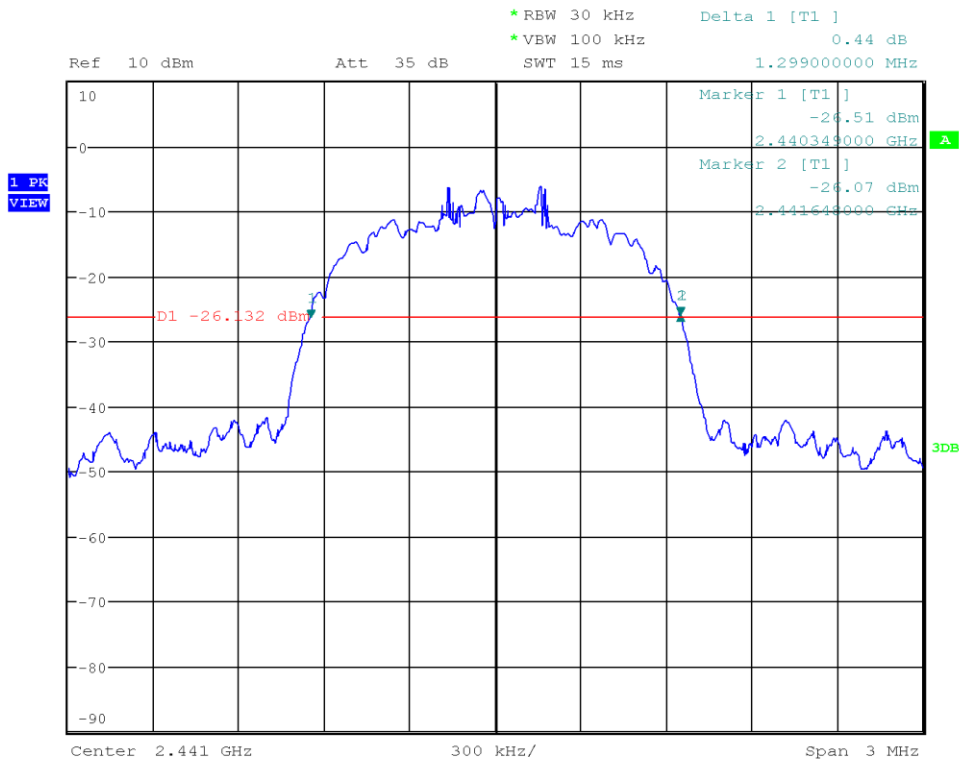
Date: 29.JAN.2024 11:57:04





### 20 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: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.2  
 Operational Mode: 3-DH5, Channel: 39, 2441 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-29  
 Lower Frequency [MHz]: 2440.349  
 Upper Frequency [MHz]: 2441.648  
 20 dB Bandwidth [MHz]: 1.299

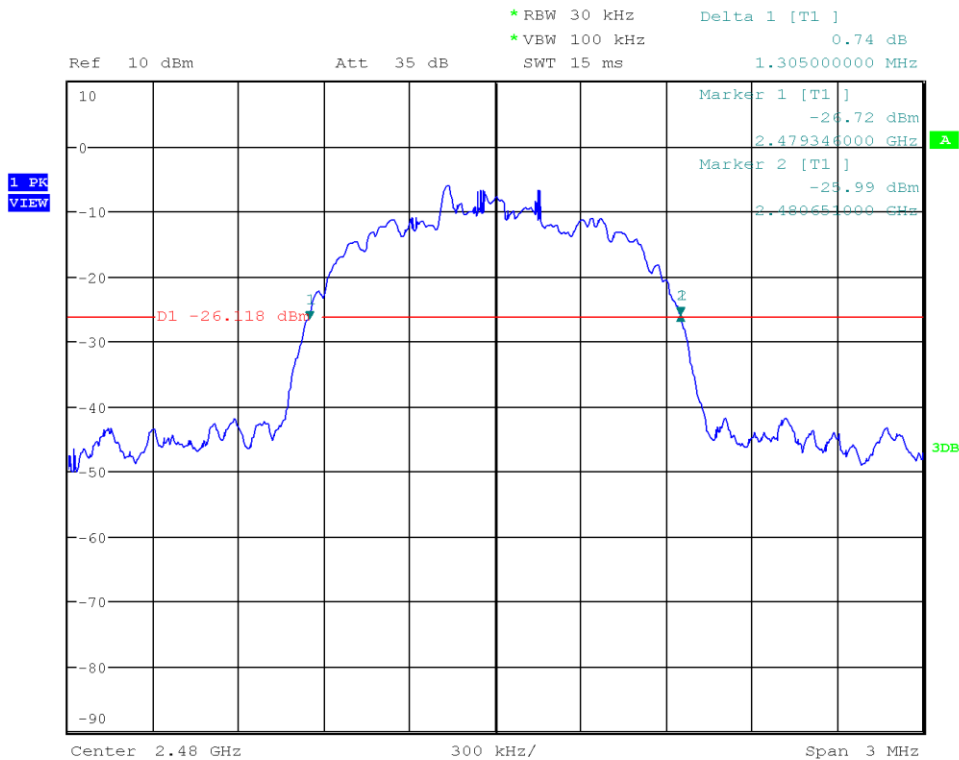


Date: 29.JAN.2024 11:59:59



## 20 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: 46900  
 Reference Standards: FCC 15.247, RSS-247  
 Reference Method: ANSI C63.10:2013, Section 6.9.2  
 Operational Mode: 3-DH5, Channel: 78, 2480 MHz  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-29  
 Lower Frequency [MHz]: 2479.346  
 Upper Frequency [MHz]: 2480.651  
 20 dB Bandwidth [MHz]: 1.305



Date: 29.JAN.2024 12:01:19

### 3.3 Test Conditions and Results - Number of hopping frequencies

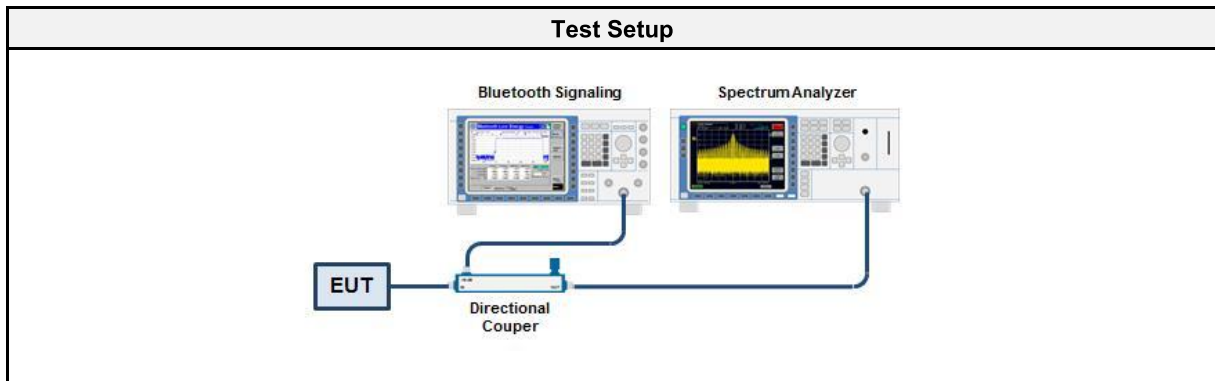
#### 3.3.1 Information

Test Information	
Reference	FCC § 15.247(a)(1)(iii); ISED RSS-247, Issue 3 (section 5.1)
Measurement Method	ANSI C63.10 7.8.3
Operator	Md Abu Bakar Siddique
Date	2024-01-29

#### 3.3.2 Limits

Limits
≥ 15

#### 3.3.3 Setup



#### 3.3.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSP 30	EF00312	2023-08	2024-08
Cable(CAABC)	Gigalane	GIGALANE 1730	EF00779	2023-03	2024-03

#### 3.3.5 Procedure

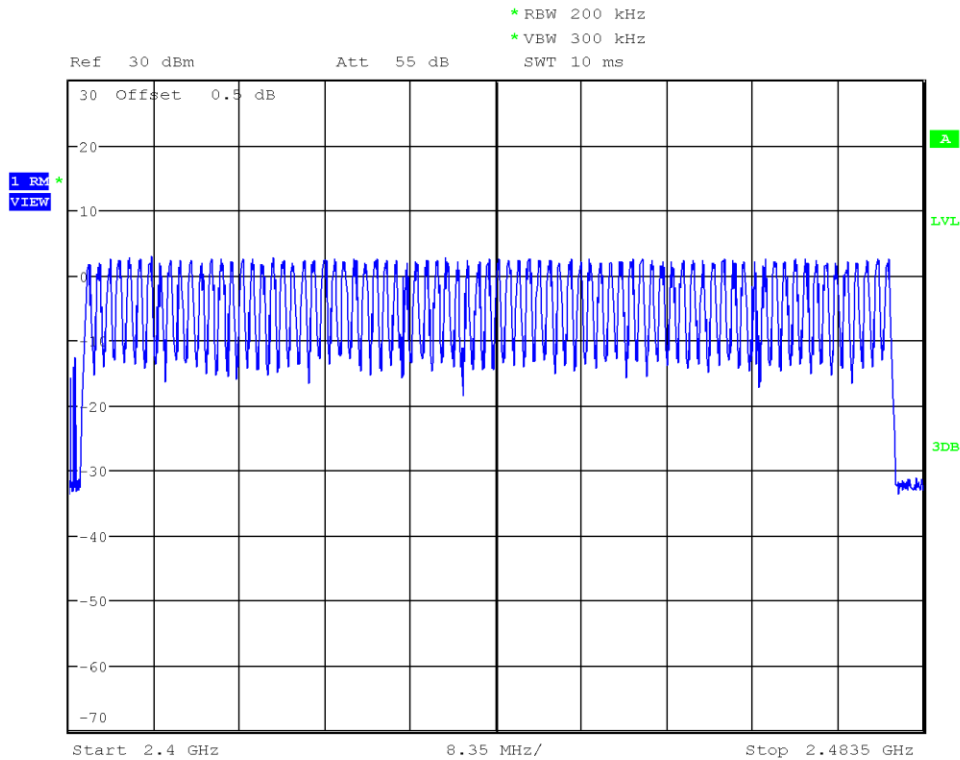
Test Procedure
<ol style="list-style-type: none"> <li>1. EUT set to test mode (Communication tester is used if needed)</li> <li>2. Span set to measurement frequency range</li> <li>3. Detector set to peak and max hold</li> <li>4. Resolution bandwidth is set small enough to resolve hopping channel emission spectra</li> <li>5. The number of peaks is counted to determine number of hopping frequencies</li> </ol>

#### 3.3.6 Results

Test Results		
Number of hopping frequencies	Limit	Verdict
79	≥ 15	PASS

### Number of hopping frequencies

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: 46900  
 Reference Standards: FCC 15.27 (a)(1)(iii)  
 Reference Method: ANSI C63.10:2013 7.8.3  
 Operational Mode: Bluetooth, DH5, Hopping Mode  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-29  
 Number of Hopping Channels: 79



Date: 29.JAN.2024 12:37:34

### 3.4 Test Conditions and Results - Frequency hopping channel separation

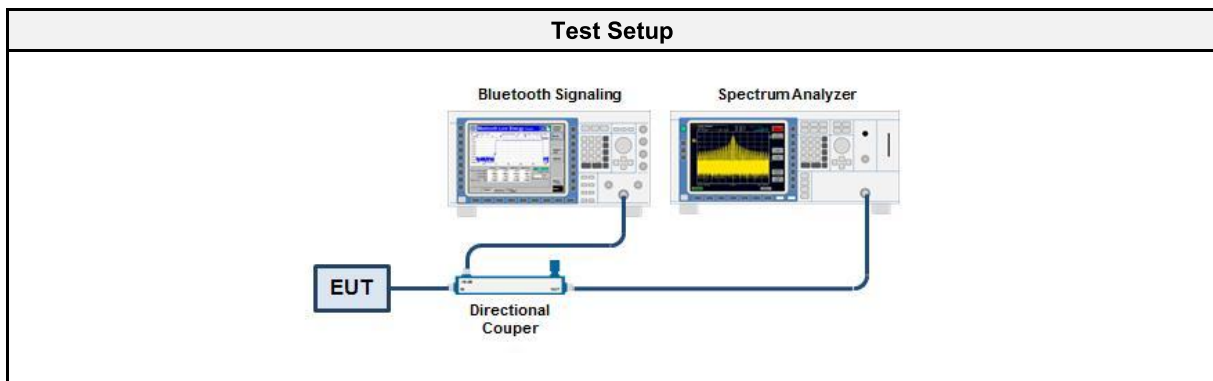
#### 3.4.1 Information

Test Information	
Reference	FCC § 15.247(a)(1); ISED RSS-247, Issue 3 (section 5.1)
Measurement Method	ANSI C63.10 7.8.4
Measurement Uncertainty	± 3.14 %
Operator	Md Abu Bakar Siddique
Date	2024-02-02

#### 3.4.2 Limits

Limit
≥ 25 kHz or $\frac{2}{3}$ of 20 dB bandwidth

#### 3.4.3 Setup



#### 3.4.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSP 30	EF00312	2023-08	2024-08
Cable(CAABC)	Gigalane	GIGALANE 1730	EF00779	2023-03	2024-03

#### 3.4.5 Procedure

Test Procedure
<ol style="list-style-type: none"> <li>EUT set to test mode (Communication tester is used if needed)</li> <li>Span set to measurement frequency range</li> <li>Detector set to peak and max hold</li> <li>Resolution bandwidth is set small enough to resolve hopping channel emission spectra</li> <li>The two adjacent channel peaks are marked</li> <li>Channel separation is determined from frequency separation of markers</li> </ol>

#### 3.4.6 Results

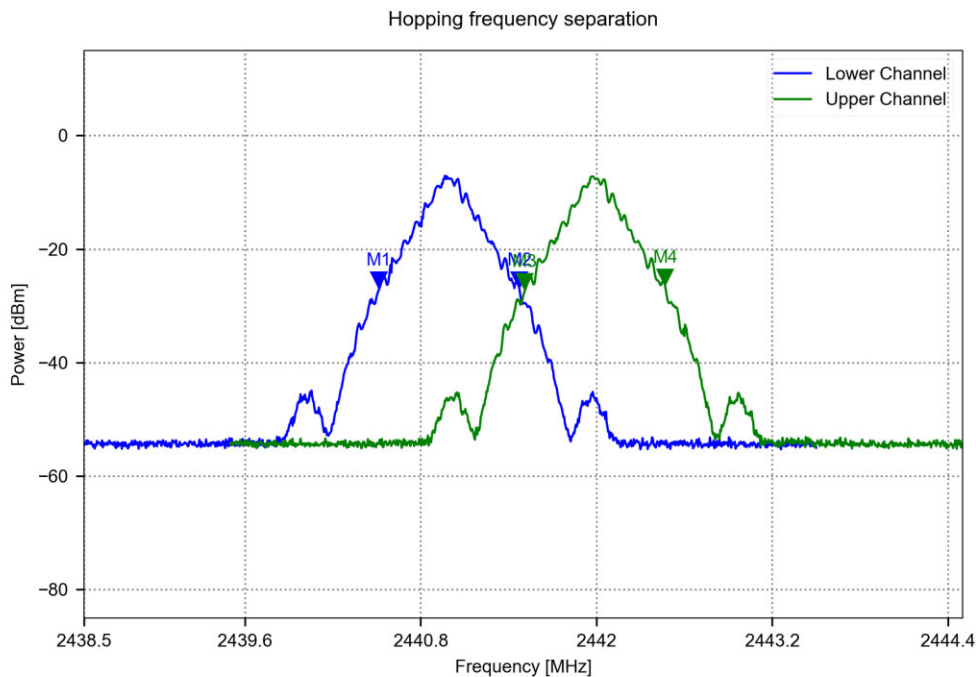
Test Results			
Mode	Channel separation [kHz]	Limit [kHz]	Verdict
DH5 Hopping	995	$\geq \frac{2}{3} \cdot 927 = 618$	PASS
2-DH5 Hopping	1000	$\geq \frac{2}{3} \cdot 1293 = 862$	PASS
3-DH5 Hopping	1003	$\geq \frac{2}{3} \cdot 1299 = 866$	PASS

Test Report No.: G0M-2309-2215-TFC247BT-V01

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

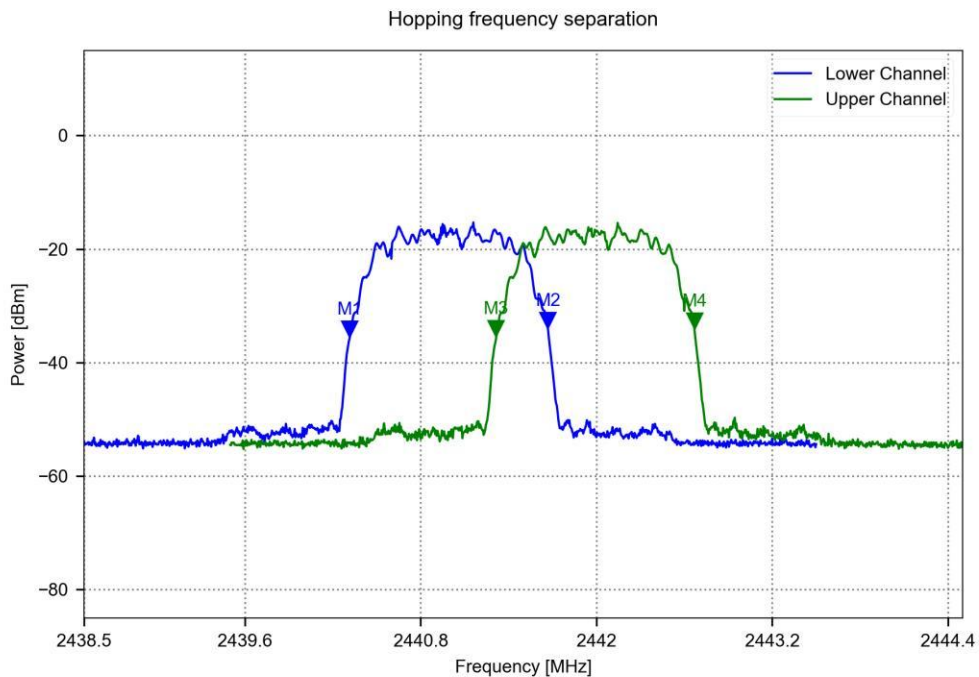
### Hopping frequency separation

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:	46900
Reference Standards:	FCC 15.247(a)(1)
Reference Method:	ANSI C63.10:2013 7.8.2
Operational Mode:	Bluetooth, DH5, Channels: 2441 + 2442 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-02-02
Lower Frequency (M1) [MHz]:	2440.515
Upper Frequency (M2) [MHz]:	2441.475
Lower Frequency (M3) [MHz]:	2441.510
Upper Frequency (M4) [MHz]:	2442.470
Lower center Frequency [MHz]:	2440.995
Upper center Frequency [MHz]:	2441.990
Hopping Frequency Separation [MHz]:	0.995



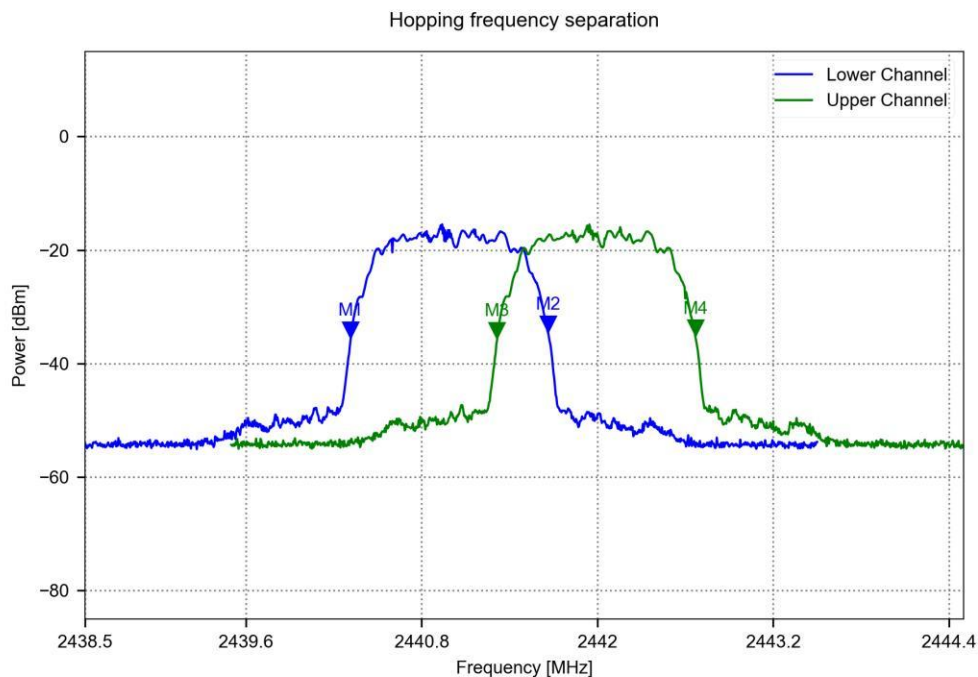
### Hopping frequency separation

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:	46900
Reference Standards:	FCC 15.247(a)(1)
Reference Method:	ANSI C63.10:2013 7.8.2
Operational Mode:	Bluetooth, 2-DH5, Channels: 2441 + 2442 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-02-02
Lower Frequency (M1) [MHz]:	2440.315
Upper Frequency (M2) [MHz]:	2441.670
Lower Frequency (M3) [MHz]:	2441.315
Upper Frequency (M4) [MHz]:	2442.670
Lower center Frequency [MHz]:	2440.993
Upper center Frequency [MHz]:	2441.993
Hopping Frequency Separation [MHz]:	1.000



### Hopping frequency separation

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:	46900
Reference Standards:	FCC 15.247(a)(1)
Reference Method:	ANSI C63.10:2013 7.8.2
Operational Mode:	Bluetooth, 3-DH5, Channels: 2441 + 2442 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Md Abu Bakar Siddique
Test Site:	Eurofins Product Service GmbH
Test Date:	2024-02-02
Lower Frequency (M1) [MHz]:	2440.315
Upper Frequency (M2) [MHz]:	2441.665
Lower Frequency (M3) [MHz]:	2441.315
Upper Frequency (M4) [MHz]:	2442.670
Lower center Frequency [MHz]:	2440.990
Upper center Frequency [MHz]:	2441.993
Hopping Frequency Separation [MHz]:	1.003



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

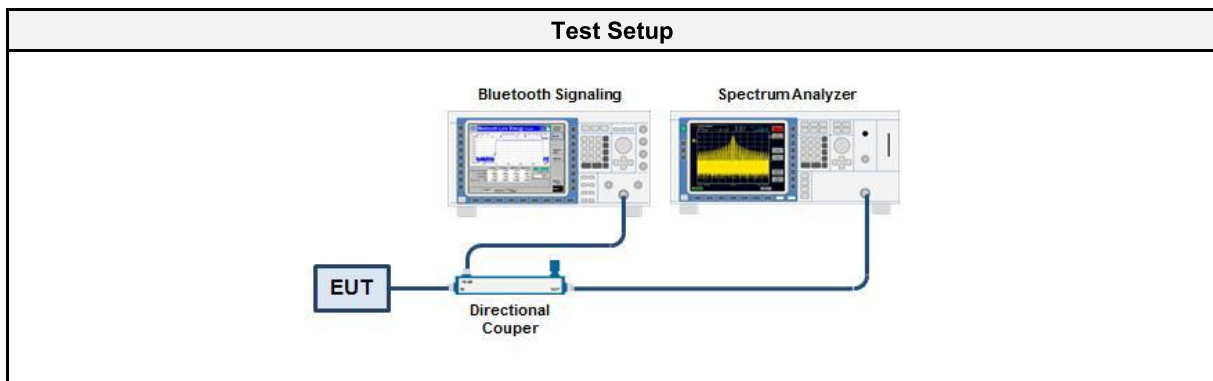
#### 3.5.1 Information

Test Information	
Reference	FCC § 15.247(a)(1)(iii); ISED RSS-247, Issue 3 (section 5.1)
Measurement Method	ANSI C63.10 7.8.2
Measurement Uncertainty	± 78.53 %
Operator	Md Abu Bakar Siddique
Date	2024-01-29

#### 3.5.2 Limits

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

#### 3.5.3 Setup



#### 3.5.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSP 30	EF00312	2023-08	2024-08
Cable(CAABC)	Gigalane	GIGALANE 1730	EF00779	2023-03	2024-03

#### 3.5.5 Procedure

Test Procedure
<ol style="list-style-type: none"> <li>EUT set to test hopping mode (Communication tester is used if needed)</li> <li>Analyzer span is set to zero span</li> <li>Detector set to peak and max hold</li> <li>RBW is set to 100 kHz and VBW to 300 kHz</li> <li>The sweep time is set to capture one single dwell time</li> <li>Trigger is set to video trigger</li> <li>A marker is set to the start and end positions of the burst</li> <li>The dwell time is determined from the marker difference</li> <li>Another sweep is initiated without trigger and sweep time set to the observation time</li> <li>The number of hops is counted</li> <li>The total time of occupancy is calculated from the dwell time per hop multiplied by the number of hops</li> </ol>

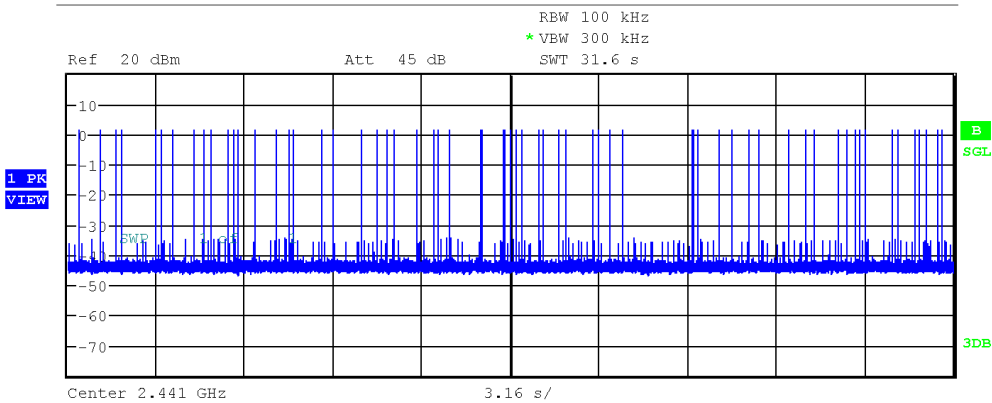
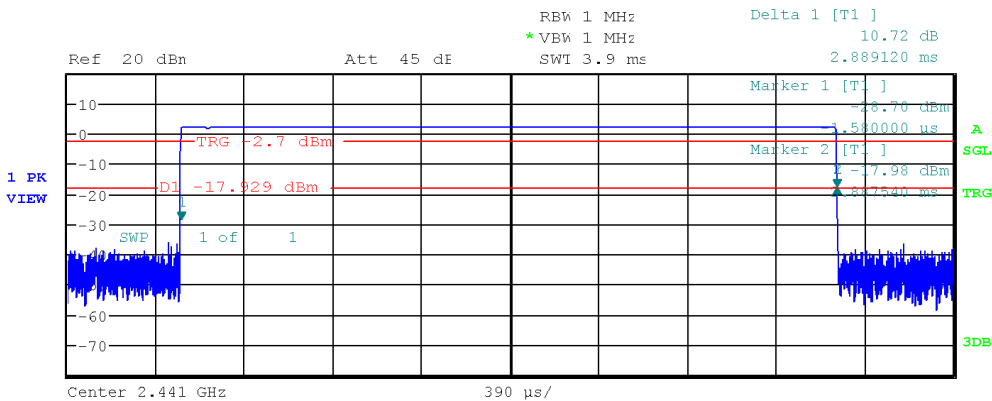


## 3.5.6 Results

Test Results					
Observation Period [s]	Number of Hops	Dwell time per Hop [s]	Time of occupancy [s]	Limit [s]	Margin [s]
31.6	63	0.002889	0.182	0.4	-0.218

### Time of occupancy

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: 46900  
 Reference Method: ANSI C63.10:2013 7.8.4  
 Operational Mode: DH5, Hopping mode  
 Operating Conditions: Tnom/Vnom  
 Operator: Md Abu Bakar Siddique  
 Test Site: Eurofins Product Service GmbH  
 Test Date: 2024-01-29  
 Dwell Time per Hop [ms]: 2.889  
 Number of Hops: 63  
 Time of occupancy [s]: 0.182



Date: 29.JAN.2024 14:06:52