RADIO REPORT

FCC 47 CFR Part 15E

Unlicensed National Information Infrastructure Devices in the 5 GHz Bands

Report Reference No	G0M-2101-9569-TFC407WF-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	DAkkS Deutsche Akkreditierungsstelle D-PL-12092-01-04 DAkkS - Registration number : D-PL-12092-01-04 FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	Panasonic Industrial Devices Europe GmbH
Address	Zeppelinstr. 19 21337 Lüneburg GERMANY
Test Specification	47 CFR Part 15E
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model(s)	ENWF9408A1EF
Additional Model(s)	None
Brand Name(s)	PAN9028
Hardware Version(s)	04
Software Version(s)	01
FCC ID	T7V9028
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 - 23 °C	
Test Lab Humidity	32 – 38 %	
Date of receipt of test item	2021-05-27	
Report:		
Compiled by	Wilfried Treffke	
Tested by (+ signature) (Responsible for Test)	Wilfried Treffke	W. Treffke
Approved by (+ signature) (Deputy Head of Lab)	Toralf Jahn	T. J
Date of Issue	2021-08-20	
Total number of pages	250	
General Remarks:		
The test results presented in this report relate only to the object tested. **The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.** This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.		
Additional Comments:		

ADDITIONAL VARIANTS

Additional Variants (not tested and not evaluated variants)		
Not-tested Variant	**Description**	
1	Product Type Description	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
	Model name	ENWF9408A2EF
	Brand name	PAN9028
	Hardware Version	04
	Software Version	01
Comment: Those named additional variants above have not been tested. Those additional variants of the series have been declared by the manufacturer. The test report explicitly states that those variants were neither tested nor assessed nor evaluated.		

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2021-08-20	Initial Release	

ABBREVIATIONS AND ACRONYMS

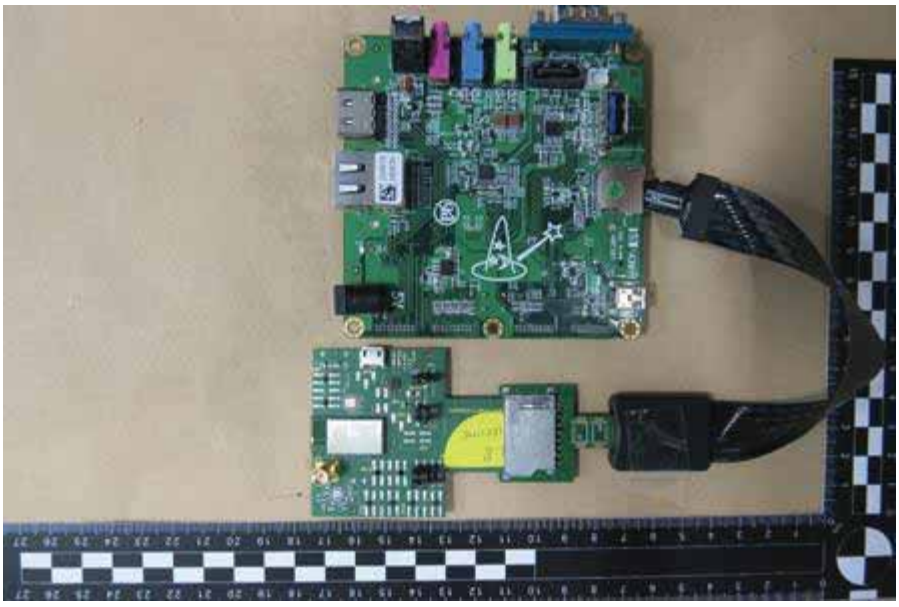
Acronyms	
Acronym	Description
BPSK	Binary Phase Shift Keying
EIRP	Equivalent Isotropic Radiated Power
EUT	Equipment Under Test
FCC	Federal Communications Commission
HT	High Throughput
IEEE 802.11	MAC and PHY Layer for WiFi
OFDM	Orthogonal Frequency Division Multiplexing
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RBW	Resolution bandwidth
RMS	Root mean square
TPC	Transmit Power Control
VBW	Video bandwidth
VHT	Very High Throughput

REPORT INDEX

1 Equipment (Test Item) Under Test

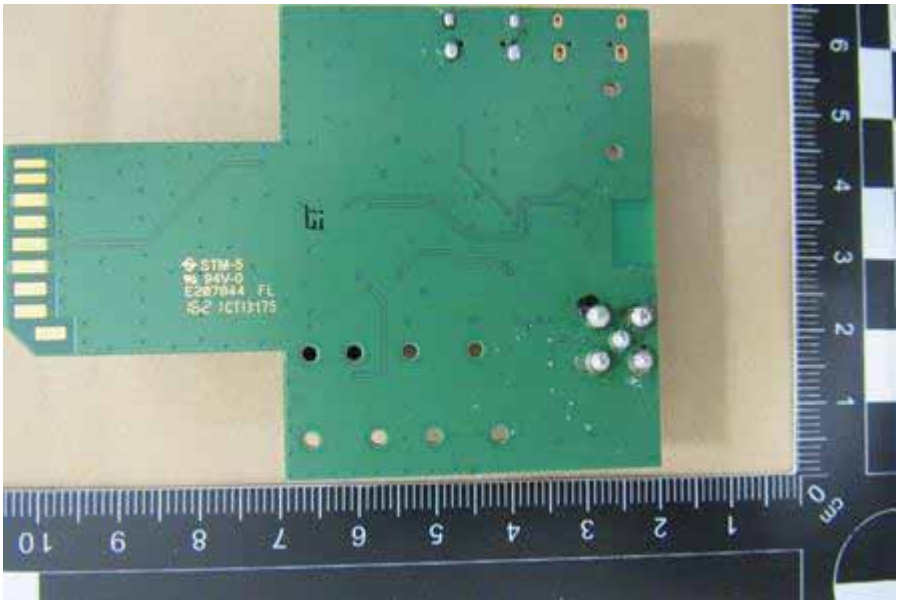
Description	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module	
Model	ENWF9408A1EF	
Additional Model(s)	None	
Brand Name(s)	PAN9028	
Serial Number(s)	A1 8 SerNr: 826 Radiated Test Sample ID 34968	
Hardware Version(s)	04	
Software Version(s)	01	
FCC-ID	T7V9028	
Equipment type	Radio Module	
Device type	Access point, Client	
Radio type	Transceiver	
Assigned frequency bands	5150 - 5250 MHz 5725 - 5850 MHz	
Radio technology	IEEE 802.11a IEEE 802.11n (HT20) IEEE 802.11n (HT40) IEEE 802.11ac (VHT20) IEEE 802.11ac (VHT40) IEEE 802.11ac (VHT80)	
Modulation	BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM	
Number of antenna ports	1	
Transmit power control	No	
Antenna	Type	Integrated antenna
	Model	ANT162442DT-2001A2
	Manufacturer	TDK
	Gain	1.5 dBi (declared by applicant)
Supply Voltage	V_{NOM}	3.3 V
	V_{MIN}	3.0 V
	V_{MAX}	3.6 V
Operating Temperature	T_{NOM}	25 °C
	T_{MIN}	-30 °C
	T_{MAX}	85 °C
Battery supply	Yes	
AC/DC-Adaptor	Model	None
Manufacturer	Panasonic Industrial Devices Europe GmbH Zeppelinstr. 19 21337 Lüneburg GERMANY	

1.1 Photos – Equipment External

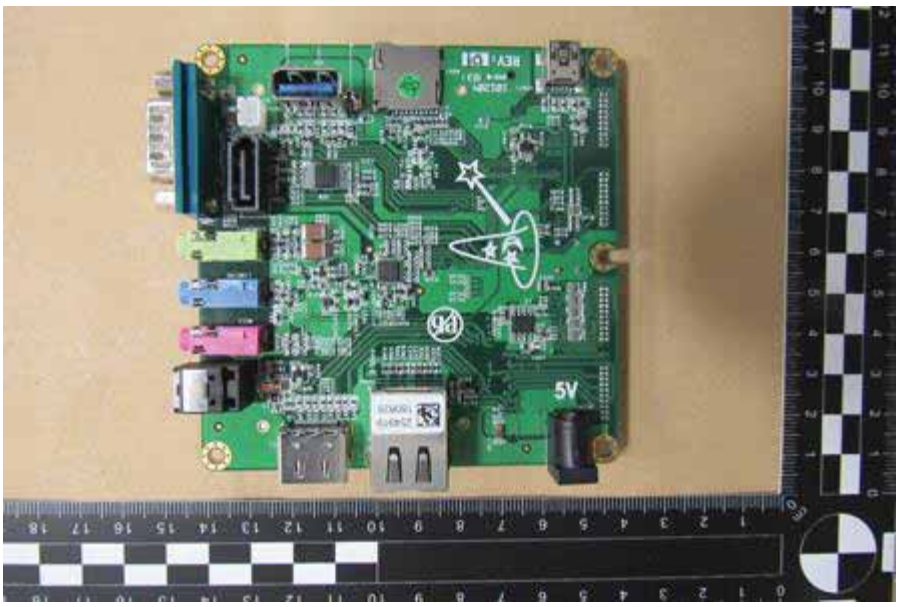
EUT Overview


IMG_3311 A1 8 SerNr: 826


EUT Bottom View

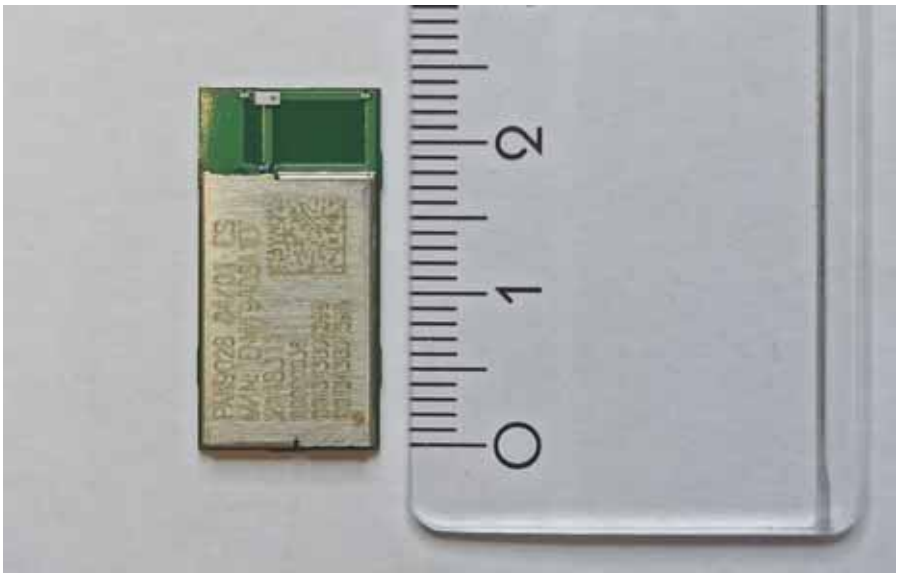


AE 1: Wandboard WBIMX6U, Top View



AE 1: Wandboard WBIMX6U, Bottom View


1.2 Photos – Equipment Internal

ENWF9408A1EF_top_case


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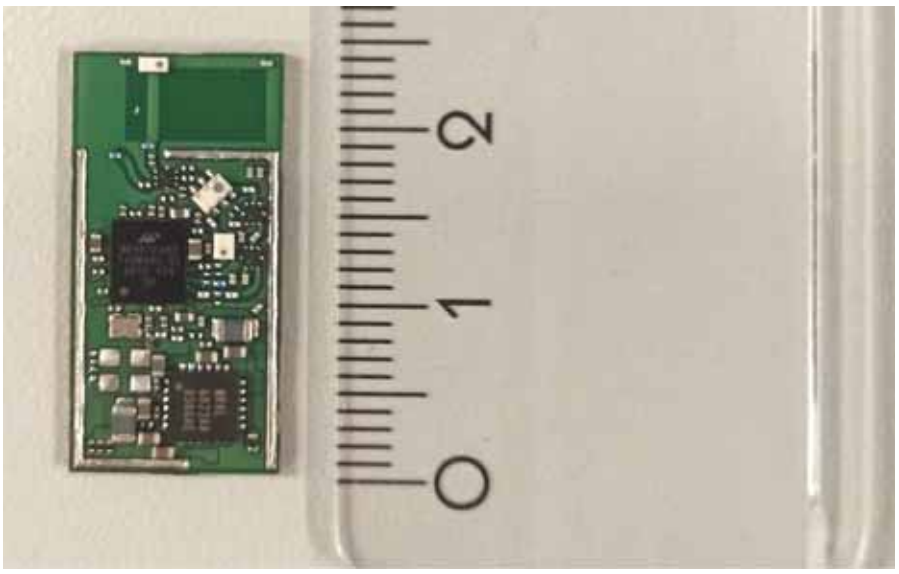

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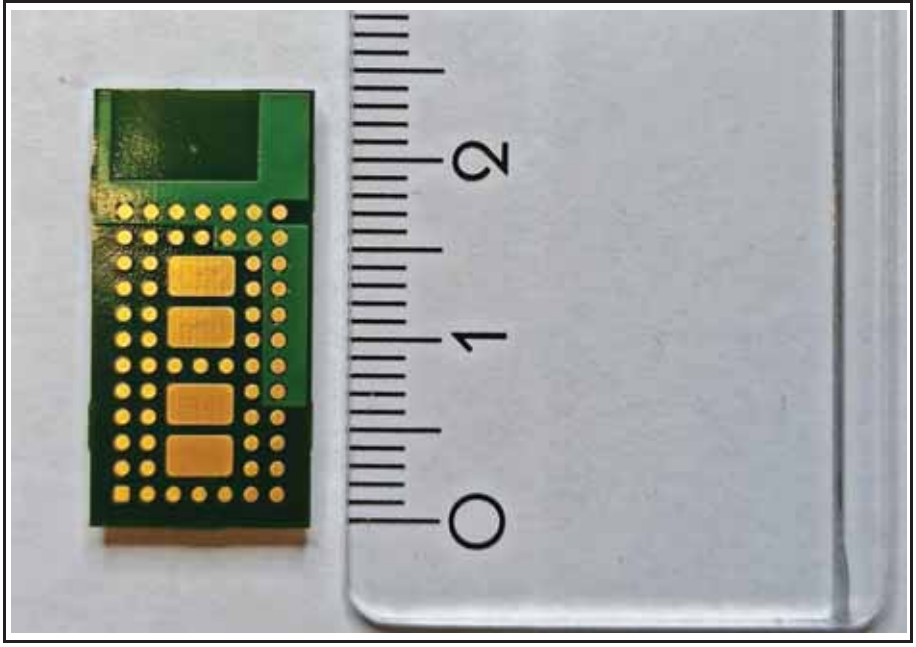

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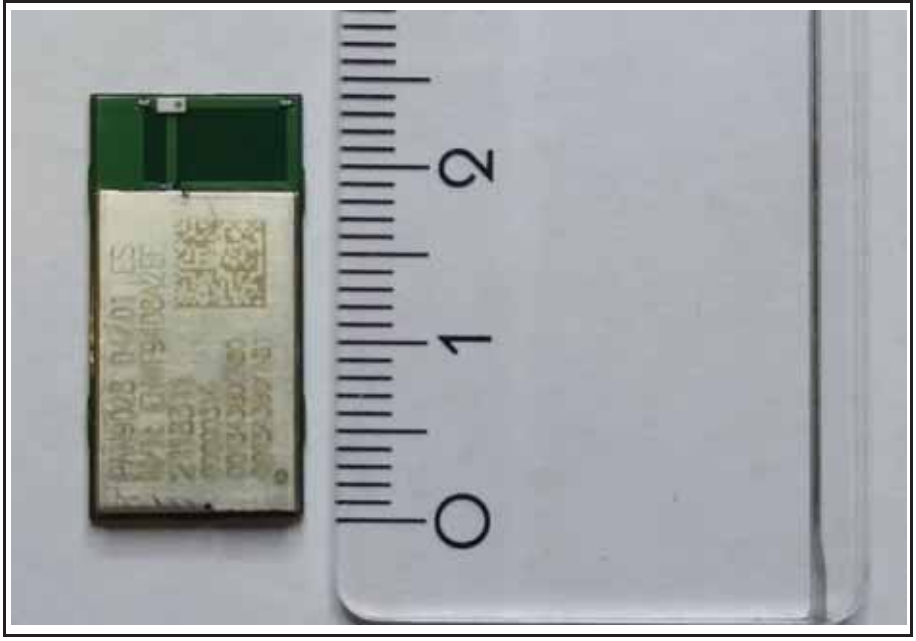

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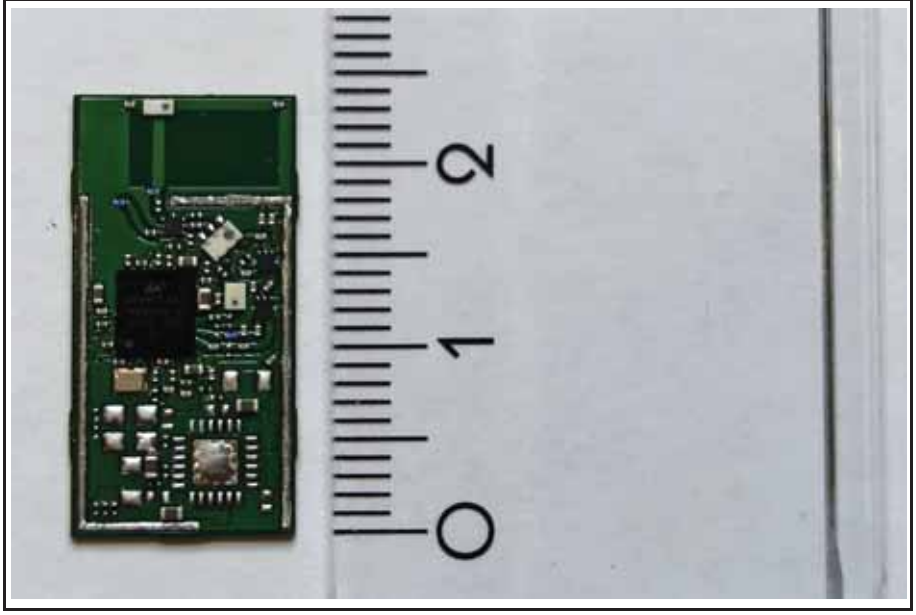
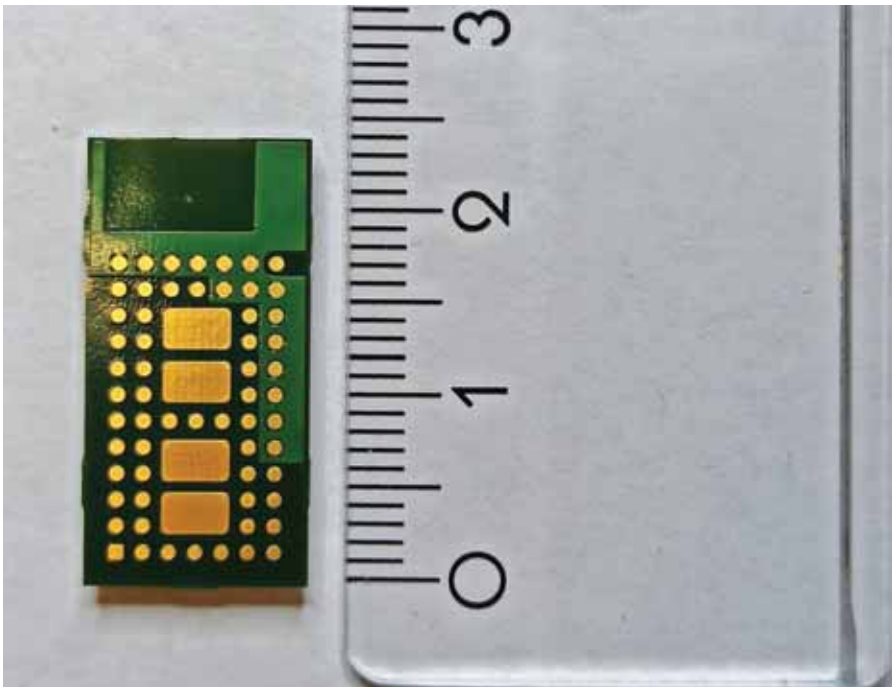
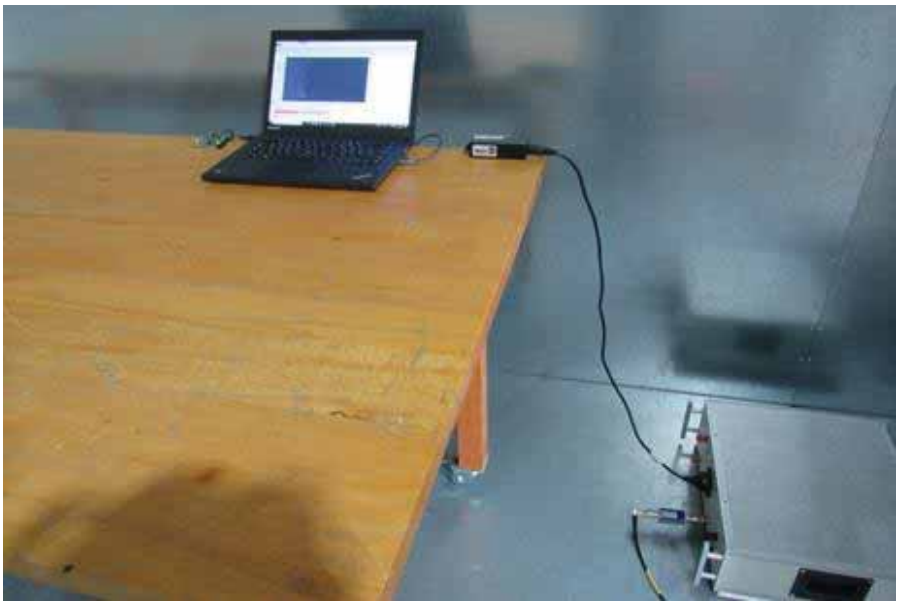


ENWF9408A2EF_back



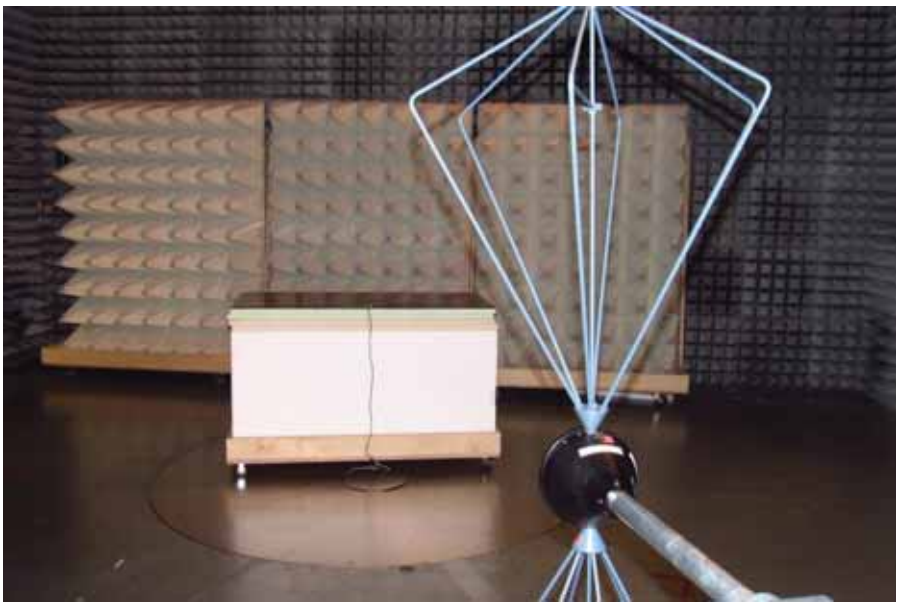
1.1 Photos – Test Setup

Test setup A - conducted measurement


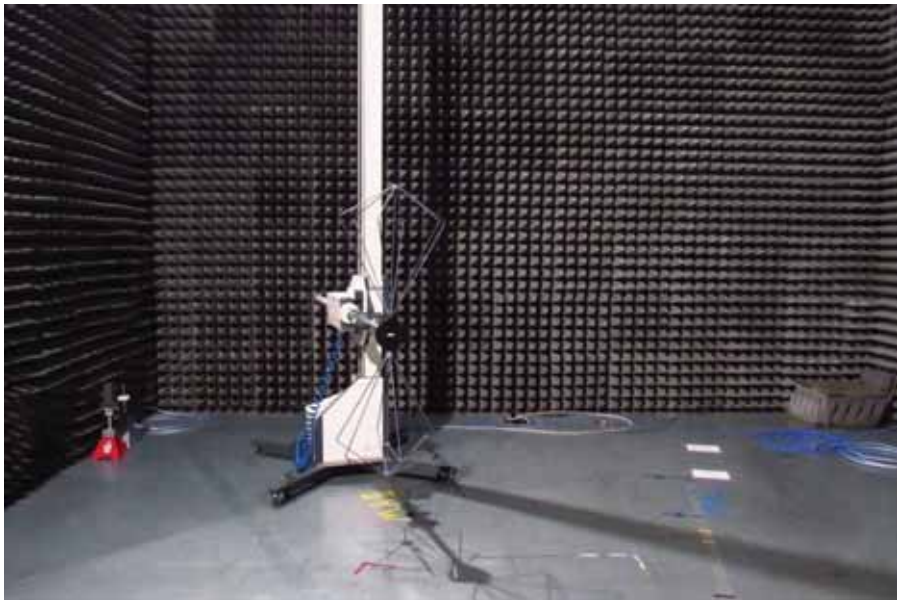
Test setup B - conducted measurement


Radiated Setup - View A

Radiated Setup - View B

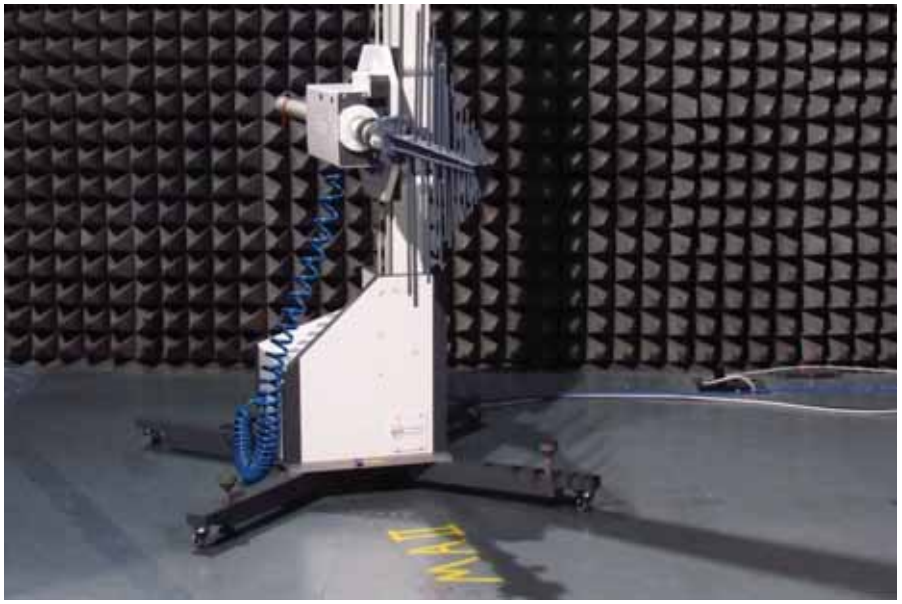


Radiated Setup - View C

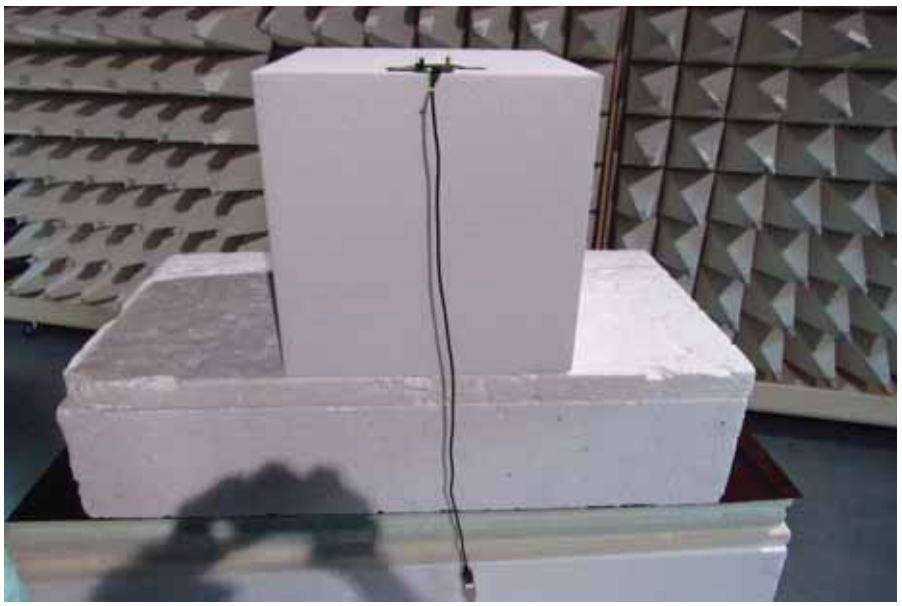


Radiated Setup - View D

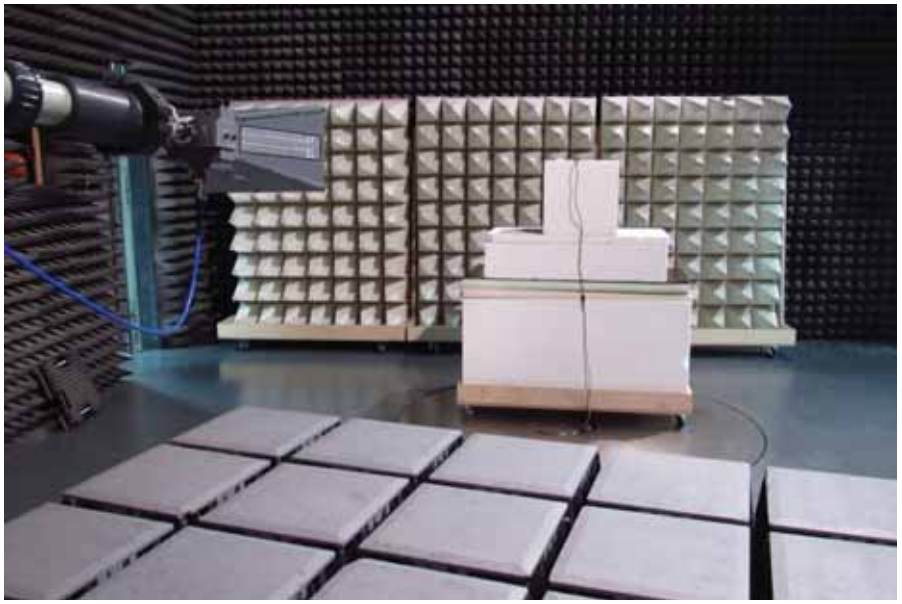
Radiated Setup - View E



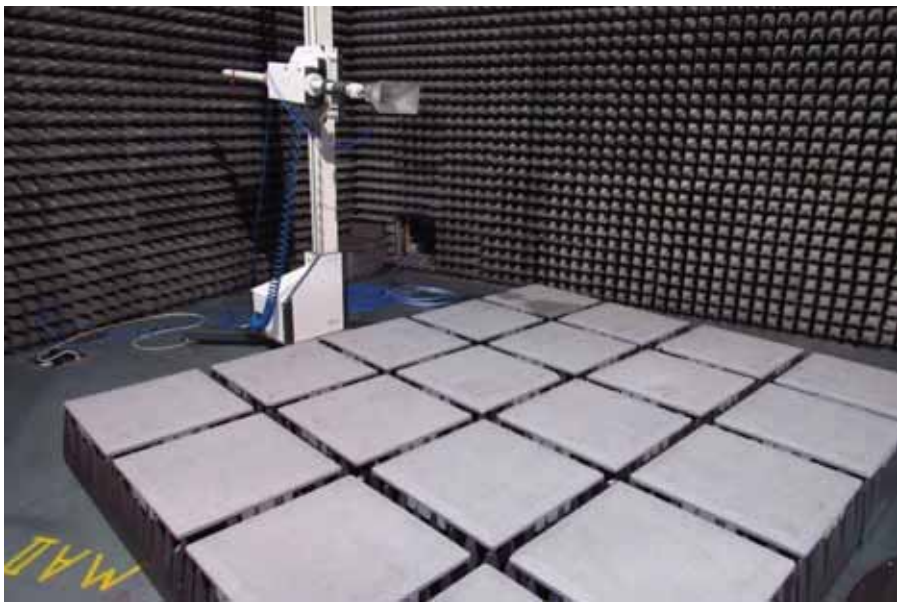
Radiated Setup - View F



Radiated Setup - View G



Radiated Setup - View H



1.2 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Controller	Wandboard	WBIMX6U	Wandboard with i.MX6 Dual Core
AE	PAN9028 EngBrd_V30	Panasonic Industrial Devices Europe	PAN9028 EngBrd_V30	SDIO Stick
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
SFT Note: 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:				

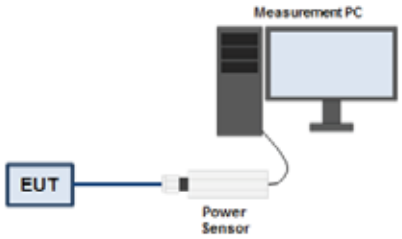
1.3 Test mode data rate evaluation

1.3.1 Information

Test Information	
Measurement Method	KDB 789033 E

1.3.2 Setup

Test Setup



1.3.3 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Power Sensor	R & S	NRP-Z81	EF01732	2021-04	2022-04

1.3.4 Procedure

Test Procedure

1. EUT set to test mode on the first supported channel for each modulation and data rate
2. The conducted power is measured with a wide band power sensor
3. The power is measured for all data rates/modulations supported by the EUT
4. The data rate with the highest output power for each technology is selected for test mode

1.3.5 Results

OFDM - 5180 MHz							
Output power [dBm]							
6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
17.3	17.3	17.3	17.2	17.2	17.1	17.2	17.2

HT20 - 5180 MHz							
Output power [dBm]							
MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7
17.3	17.3	17.3	17.3	17.3	16.3	16.3	16.3

HT40 - 5190 MHz							
Output power [dBm]							
MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7
17.1	17.1	17.1	17.1	17.1	16.1	16.1	16.1

VHT20 - 5180 MHz									
Output power [dBm]									
MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
17.3	17.3	17.3	17.3	17.3	17.3	16.3	16.3	13.2	N/A

VHT40 - 5190 MHz									
Output power [dBm]									
MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
17.1	17.1	17.1	17.1	17.1	16.1	16.1	16.1	12.0	12.0

VHT80 - 5210 MHz									
Output power [dBm]									
MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
15.4	15.4	15.4	15.4	15.4	13.5	13.5	13.6	11.5	11.5

OFDM - 5745 MHz							
Output power [dBm]							
6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5

HT20 - 5745 MHz							
Output power [dBm]							
MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7
12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7

HT40 - 5755 MHz							
Output power [dBm]							
MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7
12.7	12.7	12.7	12.7	12.7	12.7	12.6	12.7

VHT20 - 5745 MHz									
Output power [dBm]									
MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
12.7	12.7	12.7	12.7	12.7	12.7	12.6	12.7	12.7	N/A

VHT40 - 5755 MHz									
Output power [dBm]									
MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5

VHT80 - 5775 MHz									
Output power [dBm]									
MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9
12.9	12.9	12.9	12.9	12.9	12.9	12.9	13.0	13.0	13.0

1.4 Test mode duty cycle evaluation

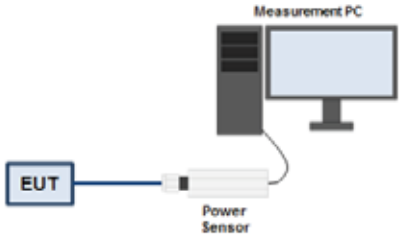
1.4.1 Information

Test Information	
Measurement Method	ANSI C63.10 12.2

1.4.2 Requirements

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

1.4.3 Setup

Test Setup


1.4.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Power Sensor	ETS-Lindgren	7002-006	EF00934	2020-07	2021-07

1.4.5 Procedure

Test Procedure
1. EUT set to test mode
2. Sweep time is set long enough to capture at least 5 bursts
3. The maximum burst duration TON is measured
4. The minimum idle duration TOFF is measured
5. The duty cycle is calculated by DC = T_{ON} / (T_{ON} + T_{OFF})
6. The duty cycle correction is calculated by DC = 10 x Log_{10}(T_{ON} / (T_{ON} + T_{OFF}))

1.4.6 Results

Duty Cycle Results				
Mode	Channel [MHz]	Data rate [Mbps]	Duty Cycle [%]	Correction Factor [dB]
OFDM	5180	6	98.9	0
HT20	5180	6.5	98.7	0
HT40	5180	13	98.6	0
VHT20	5180	8.6	98.7	0
VHT40	5180	17.2	98.7	0
VHT80	5180	36	98.4	0

1.5 Test Modes

Mode	Description
OFDM (IEEE 802.11a)	Mode = Transmit Modulation = OFDM/BPSK Bandwidth = 20 MHz Duty cycle = 98.9% Power setting = max Data rate = 6 Mbps
HT20 (IEEE 802.11n)	Mode = Transmit Modulation = OFDM/BPSK Bandwidth = 20 MHz Duty cycle = 98.7% Power setting (1 Simultaneous Tx) = max Data rate (1 Simultaneous Tx) = 6.5 Mbps MCS (1 Simultaneous Tx) = 0
HT40 (IEEE 802.11n)	Mode = Transmit Modulation = OFDM/BPSK Bandwidth = 40 MHz Duty cycle = 98.6% Power setting (1 Simultaneous Tx) = max Data rate (1 Simultaneous Tx) = 13 Mbps MCS (1 Simultaneous Tx) = 0
VHT20 (IEEE 802.11ac)	Mode = Transmit Modulation = OFDM/BPSK Bandwidth = 20 MHz Duty cycle = 98.7% Power setting (1 Simultaneous Tx) = max Data rate (1 Simultaneous Tx) = 30 Mbps
VHT40 (IEEE 802.11ac)	Mode = Transmit Modulation = OFDM/BPSK Bandwidth = 40 MHz Duty cycle = 98.7% Power setting (1 Simultaneous Tx) = max Data rate (1 Simultaneous Tx) = 13 Mbps MCS (1 Simultaneous Tx) = 0
VHT80 (IEEE 802.11ac)	Mode = Transmit Modulation = OFDM/BPSK Bandwidth = 80 MHz Duty cycle = 98.4% Power setting (1 Simultaneous Tx) = max Data rate (1 Simultaneous Tx) = 13 Mbps MCS (1 Simultaneous Tx) = 0
Comment: The above settings were found as worst case during pre-tests. The values for the maximum output power are stored in the test software and are unchangeable.	

1.6 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx / Rx	36	5180
F2	Tx / Rx	40	5200
F3	Tx / Rx	48	5240
F4	Tx / Rx	36+40	5190
F5	Tx / Rx	44+48	5230
F6	Tx / Rx	36+40+44+48	5210
F7	Tx / Rx	149	5745
F8	Tx / Rx	157	5785
F9	Tx / Rx	165	5825
F10	Tx / Rx	149+153	5755
F11	Tx / Rx	157+161	5795
F12	Tx / Rx	149+153+157+161	5775

1.7 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dBµV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

Reading on Analyzer (dBµV) + A.F. (dB/m) = Net field strength (dBµV/m)

Net:

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

Limit:

This is the FCC Class B radiated emission limit (in units of dBµV/m). The FCC limits are given in units of µV/m. The following formula is used to convert the units of µV/m to dBµV/m:

Limit (dBµV/m) = 20*log (µV/m)

Margin:

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

Example only:

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

1.8 Normative References

References	
Designator	Reference
KDB 789033	KDB 789033 D02 v02r01
ANSI C63.10	ANSI C63.10:2013

2 Result Summary

FCC 47 CFR Part 15E				
Product Standard Reference	**Requirement**	**Reference Method**	**Result**	**Remarks**
FCC 15.407(e)	6 dB bandwidth	KDB 789033 C.2	PASS	Only required in 5725-5850 MHz band.
FCC 15.407(a)(2),(a)(5),(h)(2)	26 dB bandwidth	KDB 789033 C.1	PASS	No limit. Basis for other measurements.
FCC 15.407(a)	Maximum output power	KDB 789033 E	PASS	
FCC 15.407(a)	Transmit power control	KDB 789033 E	N/R	Required in 5250-5350 and 5470-5725 MHz bands. Not required for EIRP < 500 mW.
FCC 15.407(a)	Power spectral density	KDB 789033 F	PASS	
FCC 15.407(g)	Frequency stability	ANSI C63.10 6.8	PASS	
FCC 15.207	AC power line conducted emissions	ANSI C63.10 6.2	PASS	
FCC 15.407(b)	Transmitter radiated emissions	KDB 789033 G	PASS	
FCC 15.407(a)	Radiation pattern	KDB 789033 H	N/T	5150-5250 MHz band only with EIRP > 21 dBm
Comment:				

Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

3 Test Conditions and Results

3.1 Test Conditions and Results - 6 dB bandwidth

3.1.1 Information

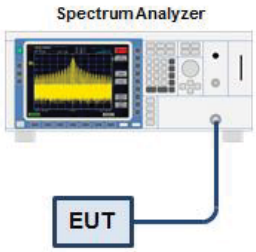
Test Information	
Reference	FCC 15.407(e)
Measurement Method	KDB 789033 C.2
Operator	Wilfried Treffke
Date	2021-07-06
Measurement uncertainty	±1.26 %

3.1.2 Limits

Limits
≥ 500 kHz

3.1.3 Setup

Test Setup



3.1.4 Equipment

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

3.1.5 Procedure

Test Procedure

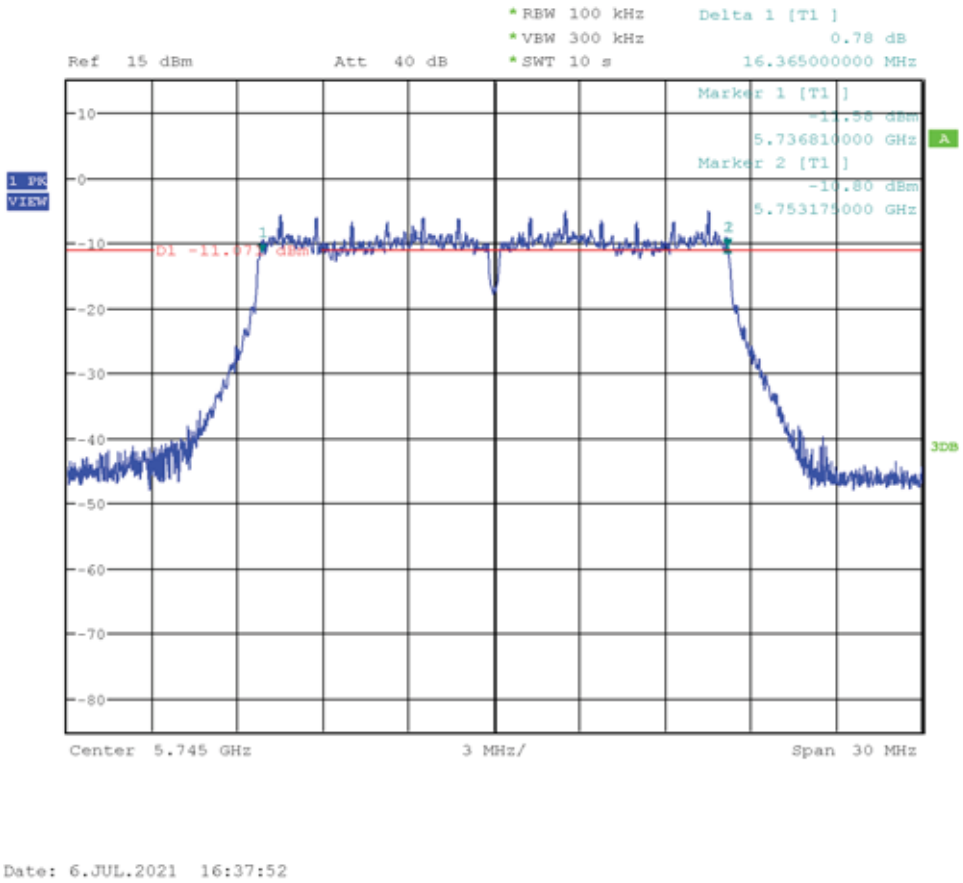
1. EUT transmitter is activated in test mode under normal conditions
2. The spectrum analyzer is set to peak detection and maximum hold with a span twice the nominal channel bandwidth
3. The resolution bandwidth is set to 100 kHz and video bandwidth ≥ 3 x RBW
4. The peak of the emission spectrum is determined
5. The left most frequency that corresponds to an emission level 6 dB below the maximum is determined
6. The right most frequency that corresponds to an emission level 6 dB below the maximum is determined
7. The 6 dB bandwidth is calculated from the two edge frequencies

3.1.6 Results

Test Results - 5725 - 5850 MHz					
Mode	Channel	Frequency [MHz]	Nominal BW [MHz]	BW [MHz]	Verdict
OFDM	149	5745	20	16.365	PASS
OFDM	157	5785	20	16.350	PASS
OFDM	165	5825	20	16.365	PASS
HT20	149	5745	20	17.565	PASS
HT20	157	5785	20	17.580	PASS
HT20	165	5825	20	17595	PASS
HT40	149+153	5755	40	35.820	PASS
HT40	157+161	5795	40	35.670	PASS
VHT20	149	5745	20	17.580	PASS
VHT20	157	5785	20	17.565	PASS
VHT20	165	5825	20	17.565	PASS
VHT40	149+153	5755	40	35.520	PASS
VHT40	157+161	5795	40	35.550	PASS
VHT80	149+153+157+161	5775	80	75.840	PASS

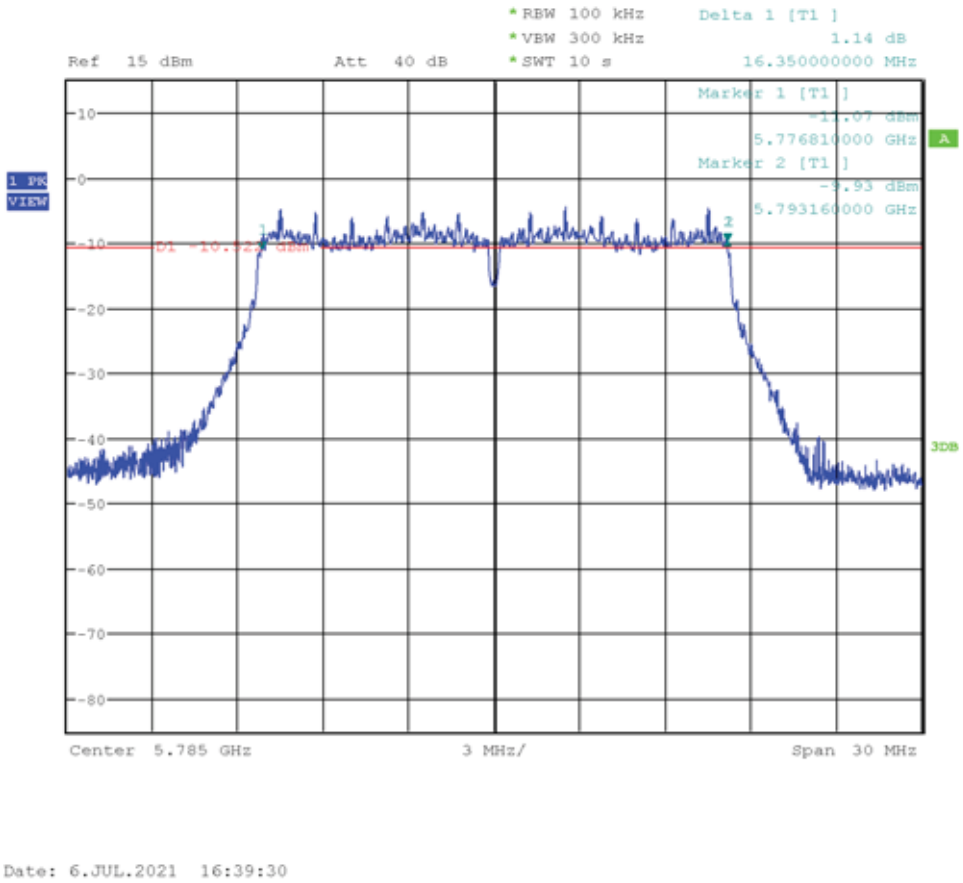
DTS (6 dB) Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972 (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11a, Channel: 149, 5745 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5736.810
Upper Frequency [MHz]:	5753.175
6 dB Bandwidth [kHz]:	16365.0



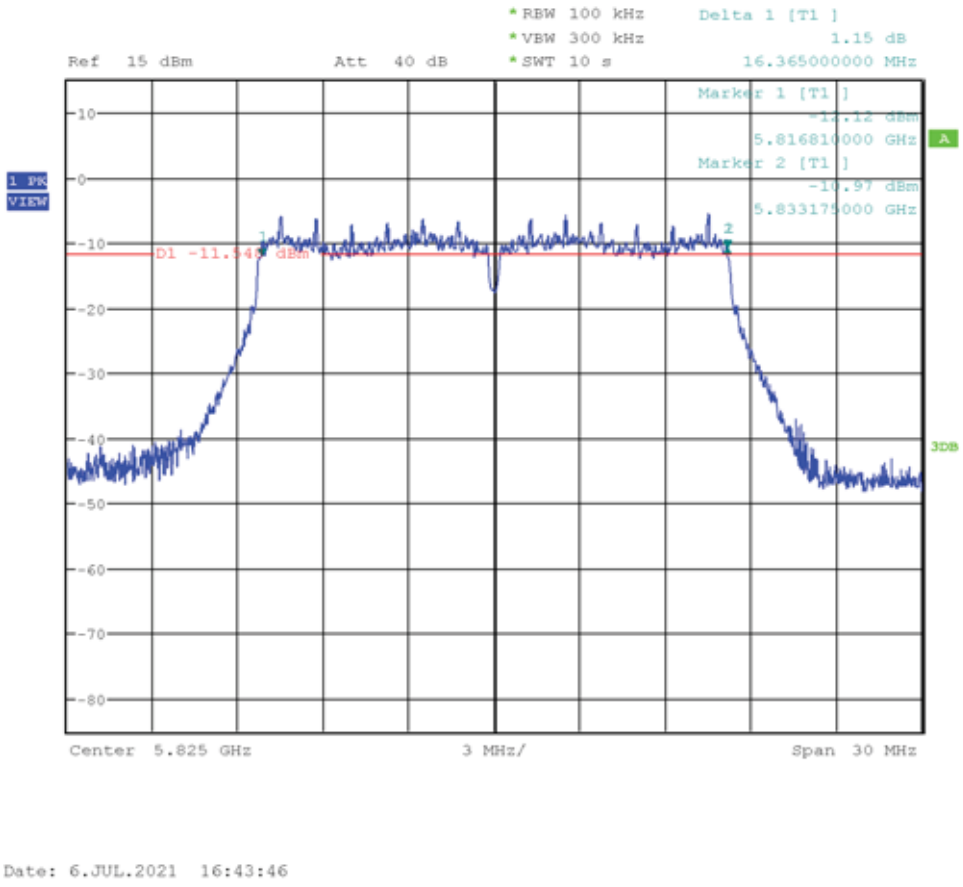
DTS (6 dB) Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972 (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11a, Channel: 157, 5785 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5776.810
Upper Frequency [MHz]:	5793.160
6 dB Bandwidth [kHz]:	16350.0



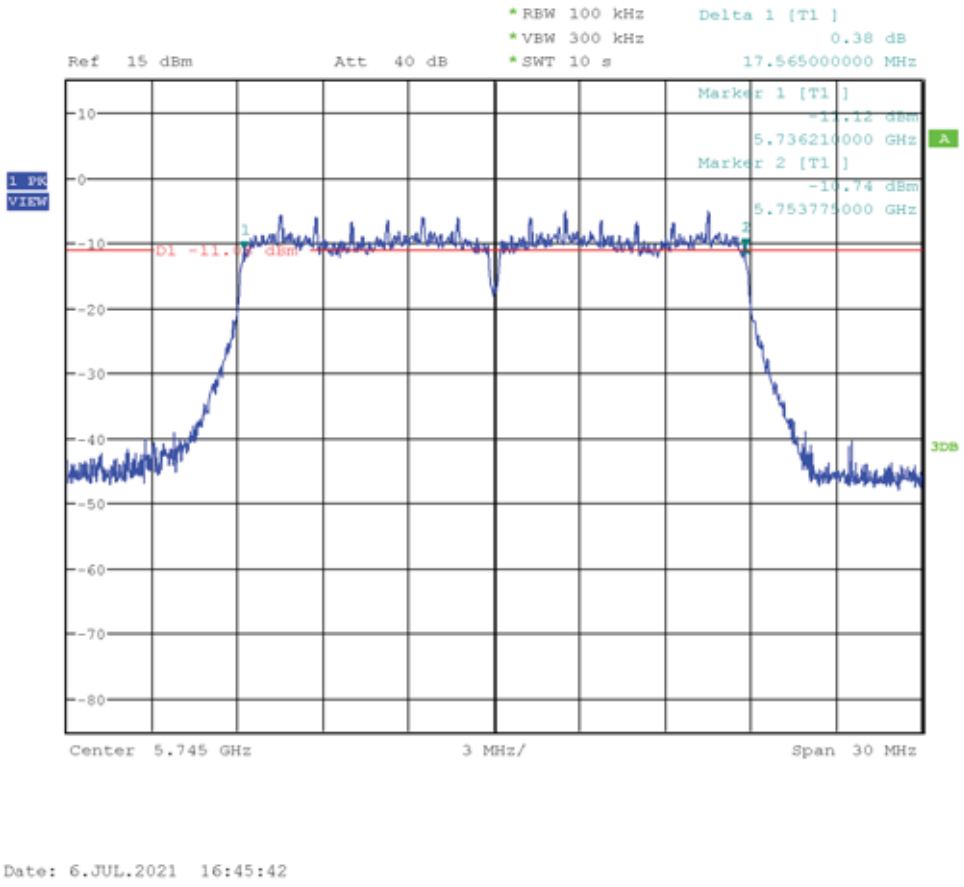
DTS (6 dB) Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972 (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11a, Channel: 165, 5825 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5816.810
Upper Frequency [MHz]:	5833.175
6 dB Bandwidth [kHz]:	16365.0



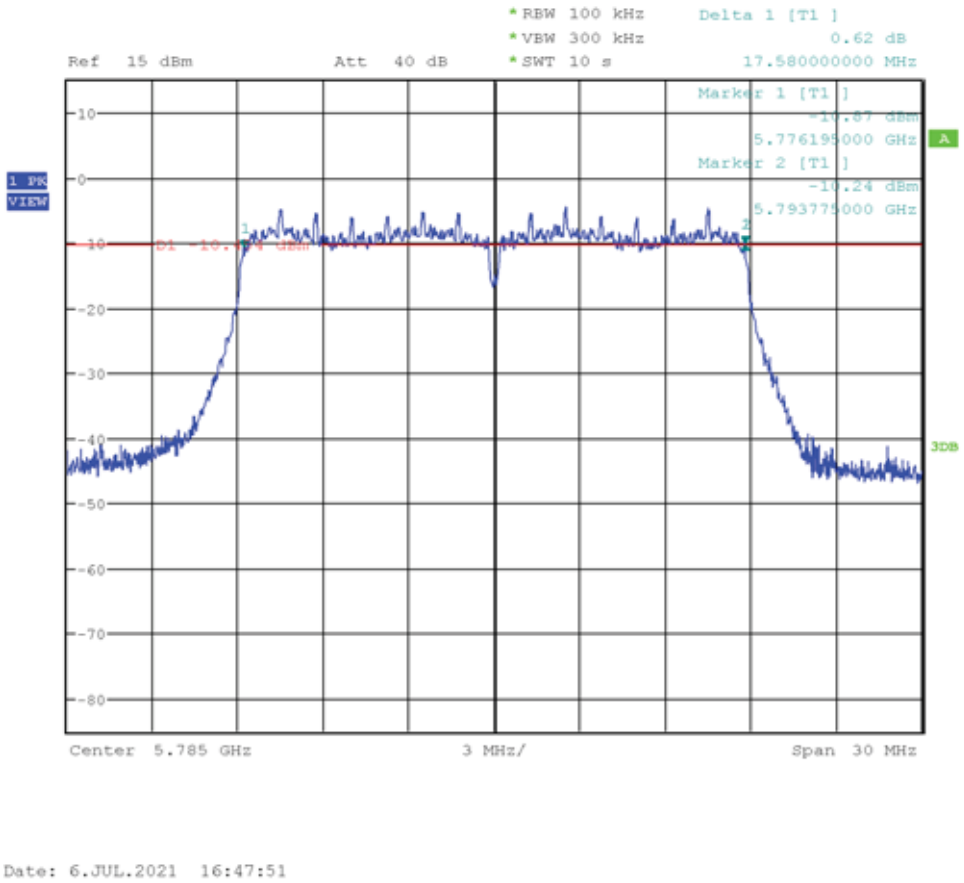
DTS (6 dB) Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972 (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11n (HT20), Channel: 149, 5745 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5736.210
Upper Frequency [MHz]:	5753.775
6 dB Bandwidth [kHz]:	17565.0



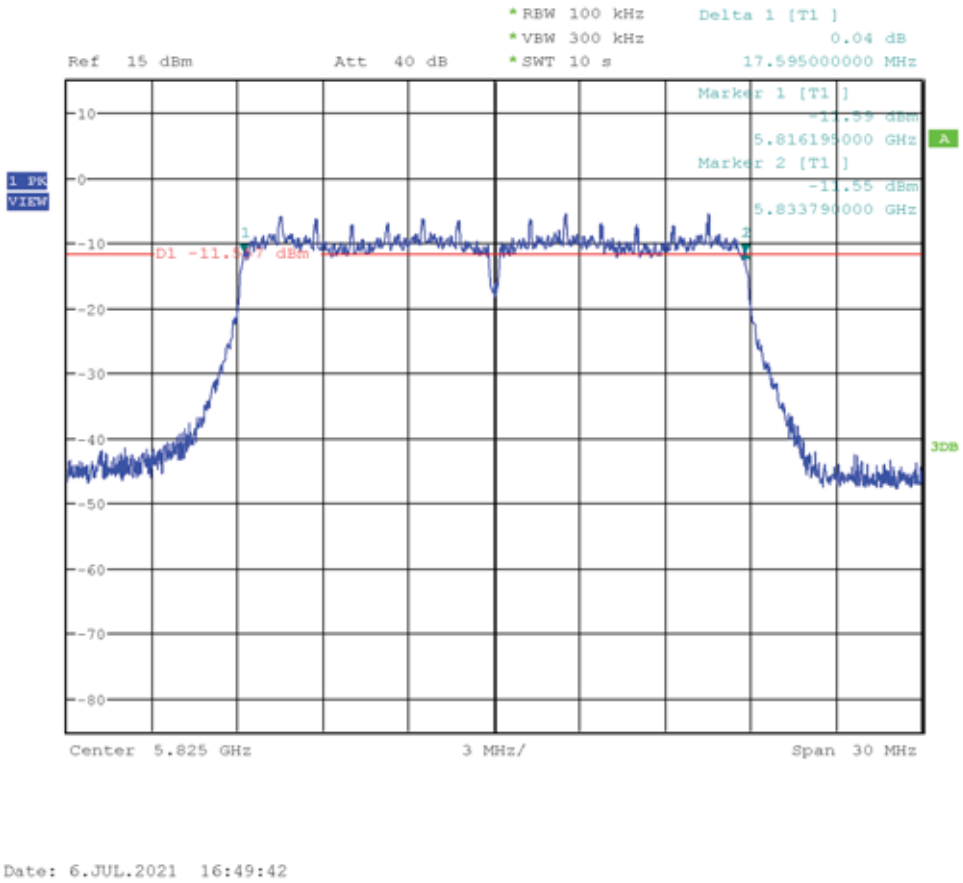
DTS (6 dB) Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972 (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11n (HT20), Channel: 157, 5785 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5776.195
Upper Frequency [MHz]:	5793.775
6 dB Bandwidth [kHz]:	17580.0



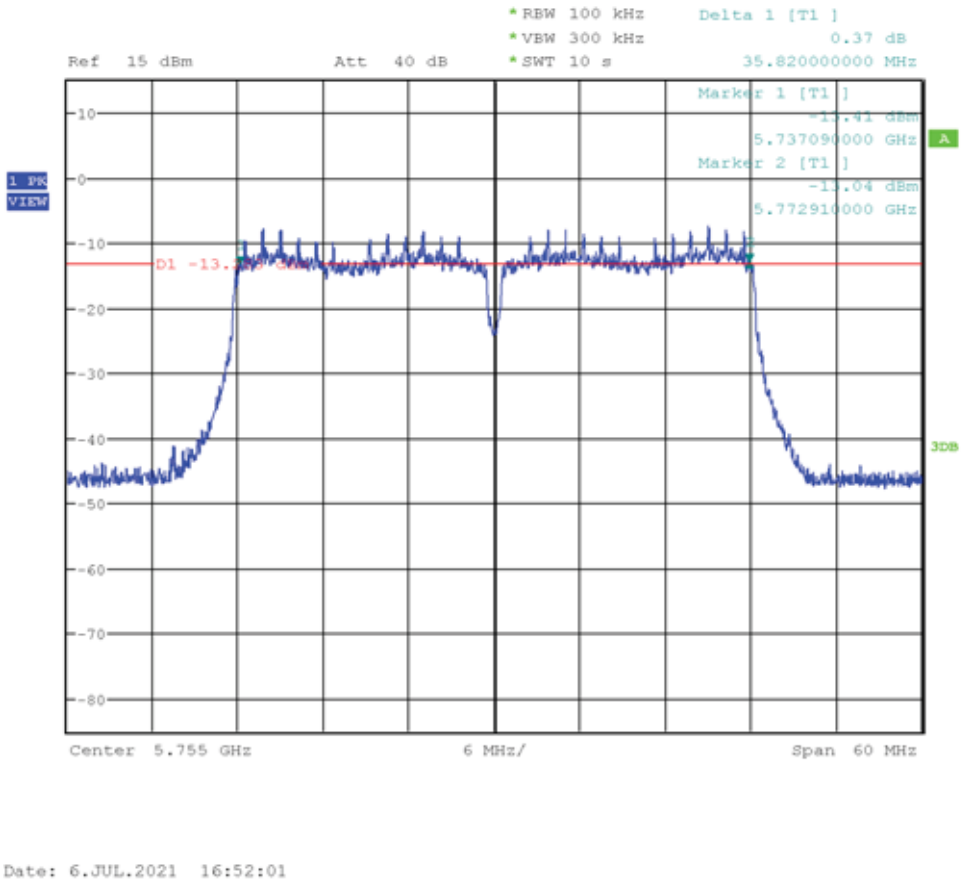
DTS (6 dB) Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972 (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11n (HT20), Channel: 165, 5825 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5816.195
Upper Frequency [MHz]:	5833.790
6 dB Bandwidth [kHz]:	17595.0



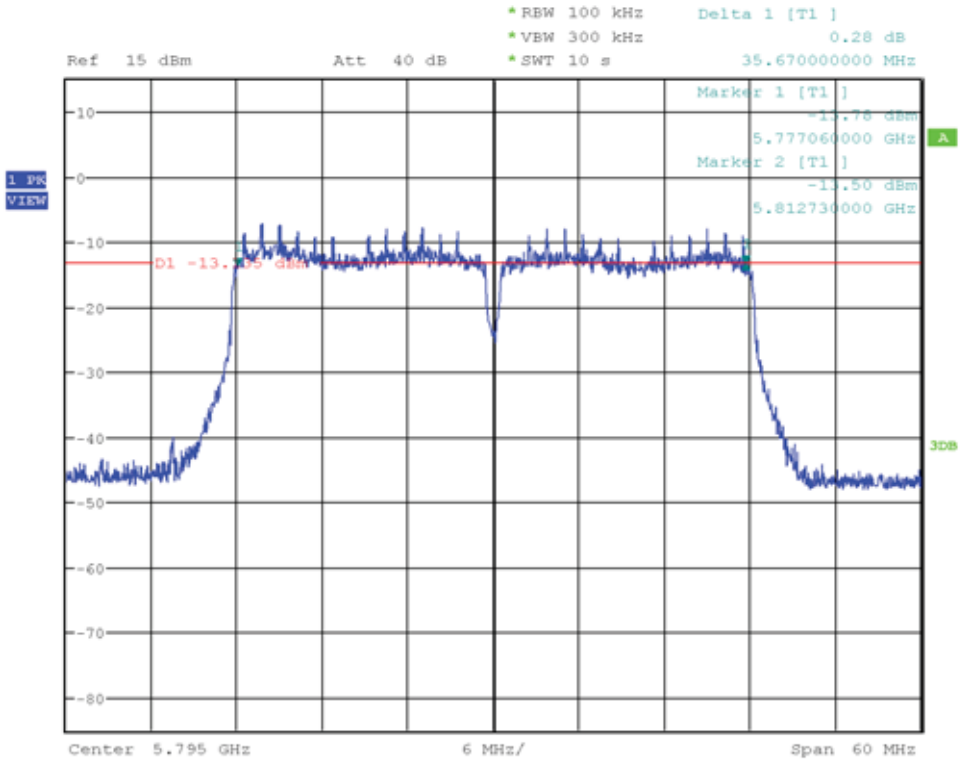
DTS (6 dB) Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972 (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11n (HT40), Channel: 151, 5755 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5737.090
Upper Frequency [MHz]:	5772.910
6 dB Bandwidth [kHz]:	35820.0



DTS (6 dB) Bandwidth

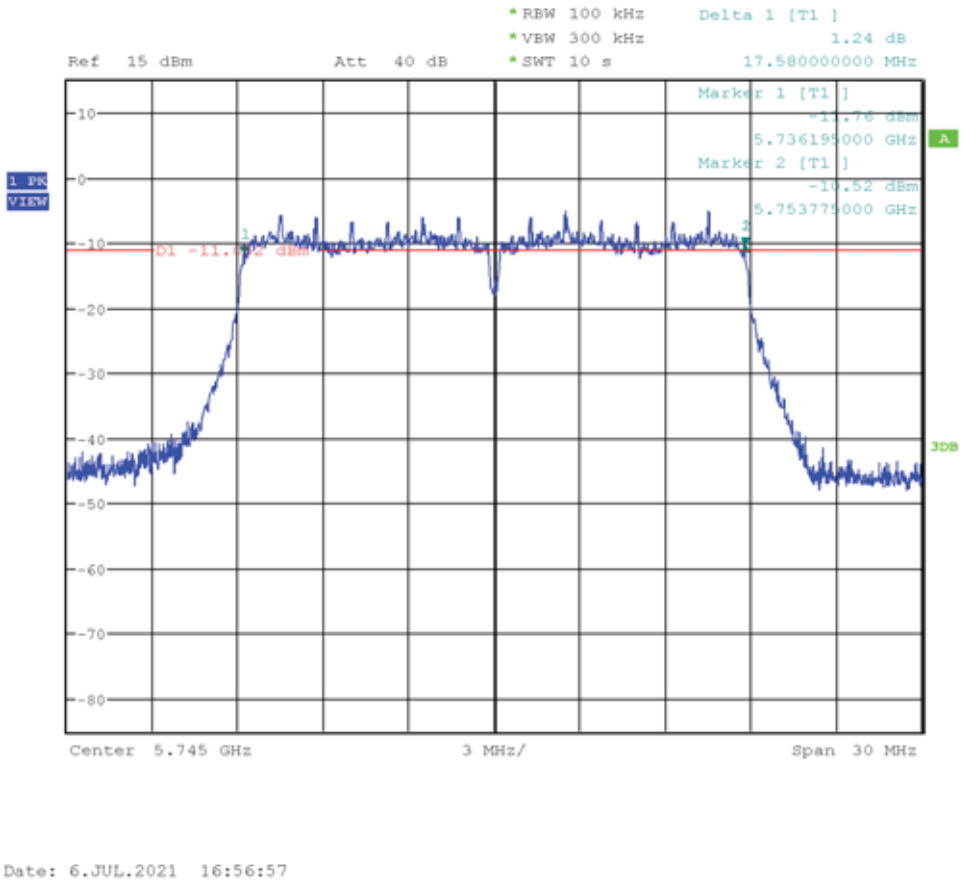
Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972 (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11n (HT40), Channel: 159, 5795 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5777.060
Upper Frequency [MHz]:	5812.730
6 dB Bandwidth [kHz]:	35670.0



Date: 6.JUL.2021 16:53:53

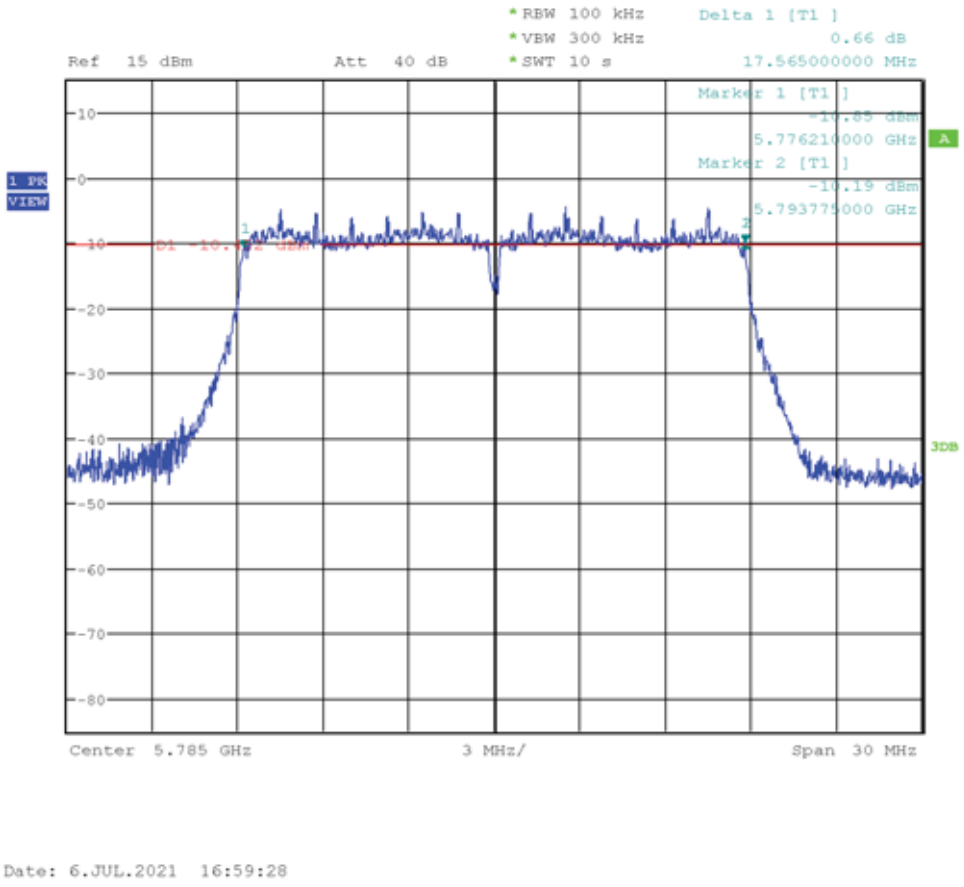
DTS (6 dB) Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972 (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT20), Channel: 149, 5745 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5736.195
Upper Frequency [MHz]:	5753.775
6 dB Bandwidth [kHz]:	17580.0



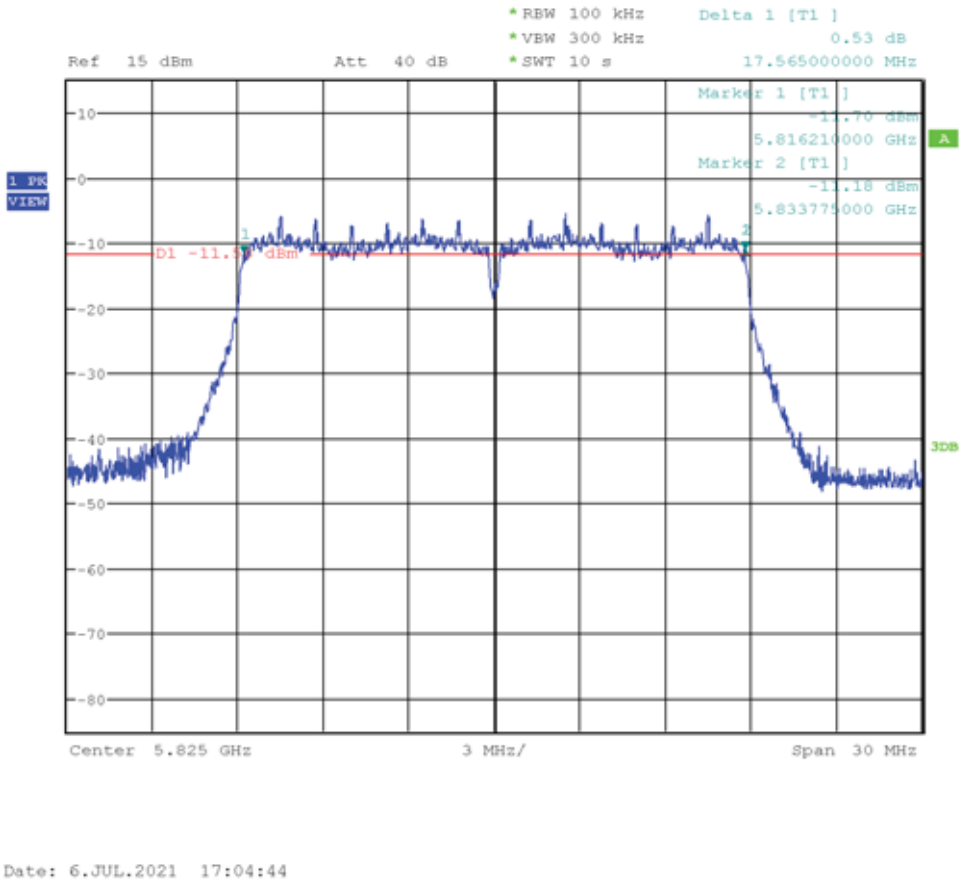
DTS (6 dB) Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972 (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT20), Channel: 157, 5785 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5776.210
Upper Frequency [MHz]:	5793.775
6 dB Bandwidth [kHz]:	17565.0



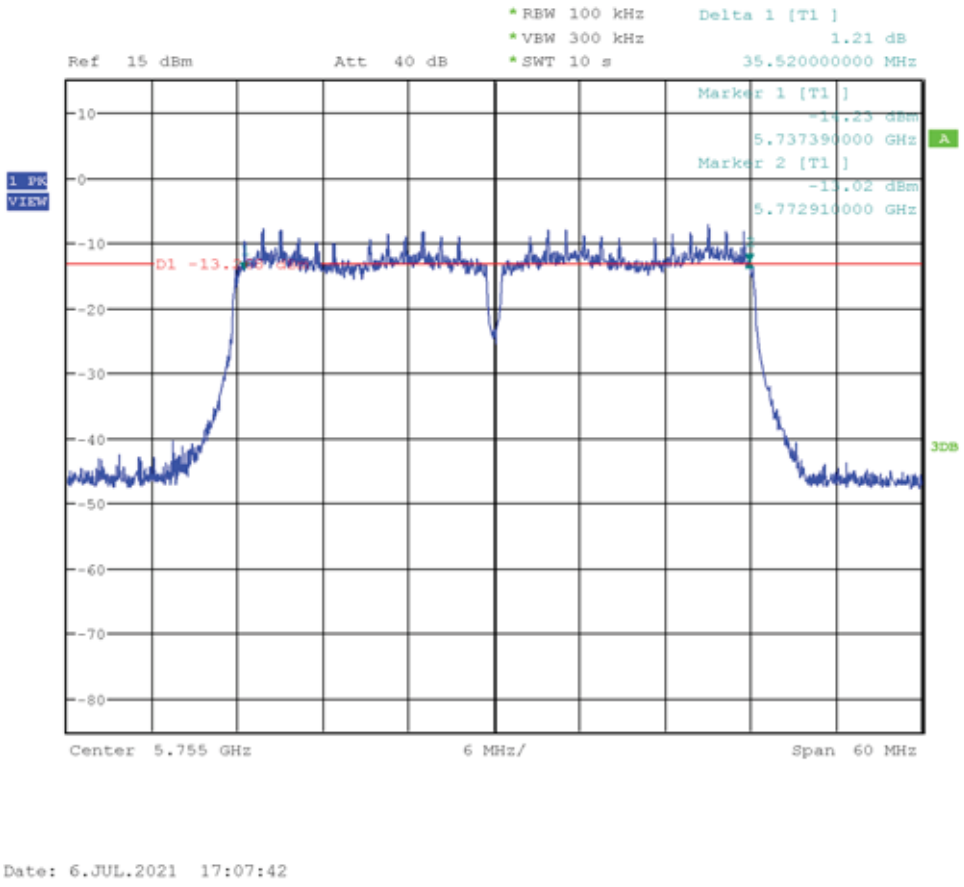
DTS (6 dB) Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972 (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT20), Channel: 165, 5825 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5816.210
Upper Frequency [MHz]:	5833.775
6 dB Bandwidth [kHz]:	17565.0



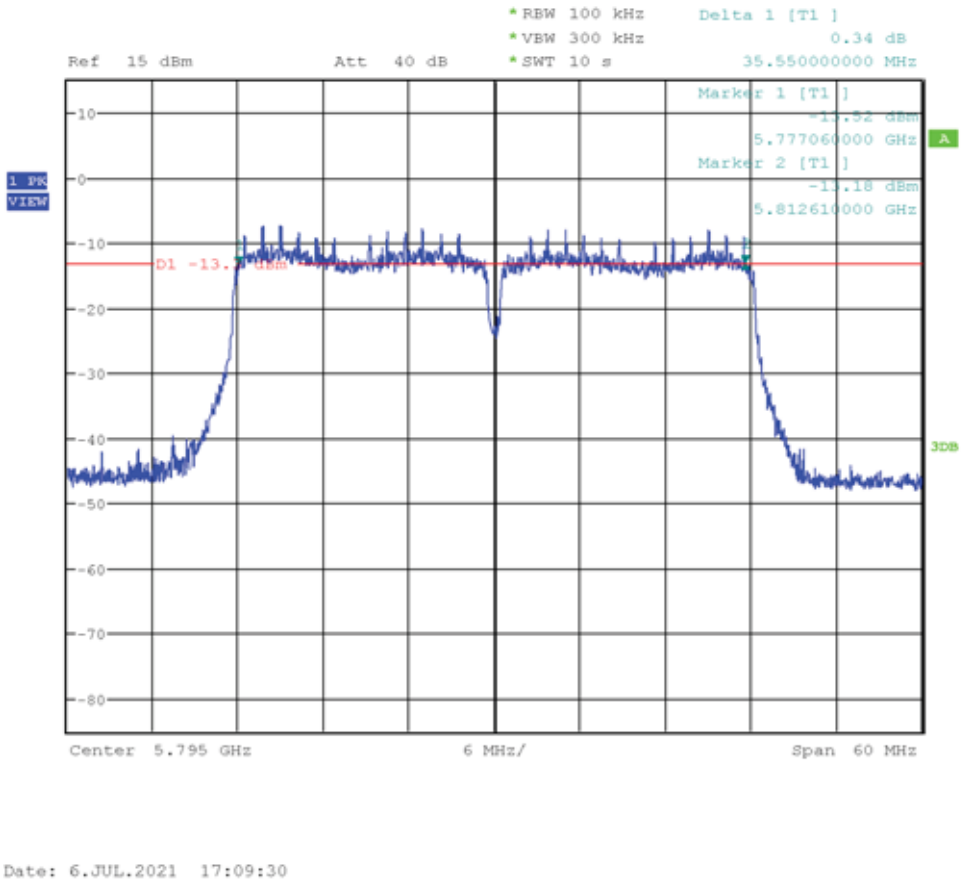
DTS (6 dB) Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972 (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT40), Channel: 151, 5755 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5737.390
Upper Frequency [MHz]:	5772.910
6 dB Bandwidth [kHz]:	35520.0



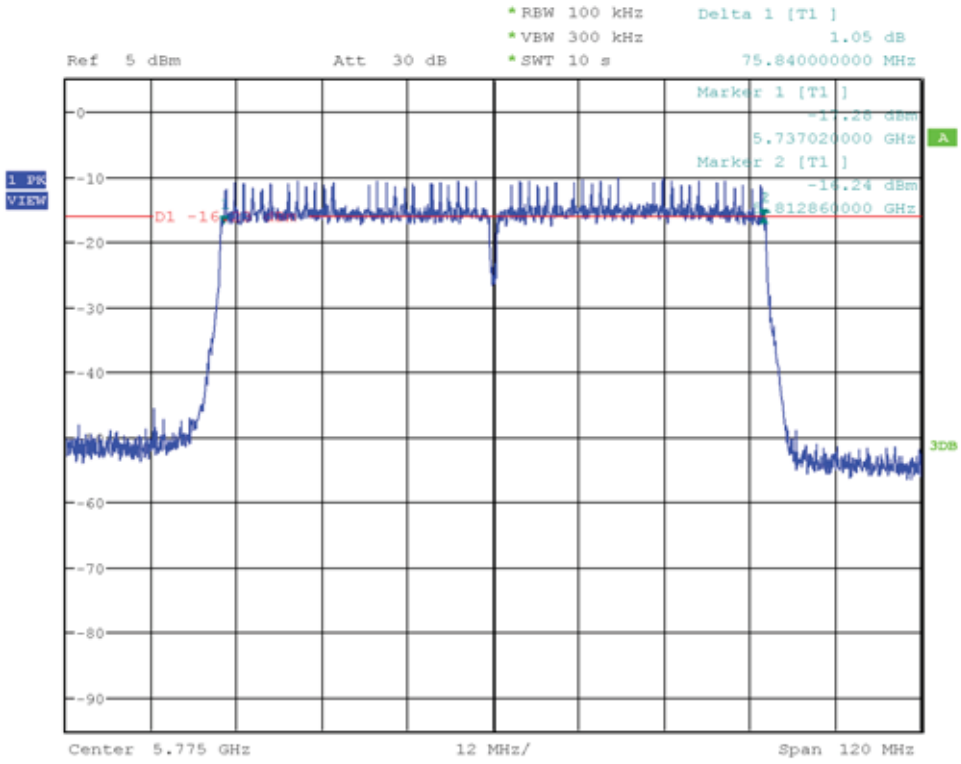
DTS (6 dB) Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972 (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT40), Channel: 159, 5795 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5777.060
Upper Frequency [MHz]:	5812.610
6 dB Bandwidth [kHz]:	35550.0



DTS (6 dB) Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972 (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT80), Channel: 155, 5775 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5737.020
Upper Frequency [MHz]:	5812.860
6 dB Bandwidth [kHz]:	75840.0



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3.2 Test Conditions and Results - 26 dB emission bandwidth

3.2.1 Information

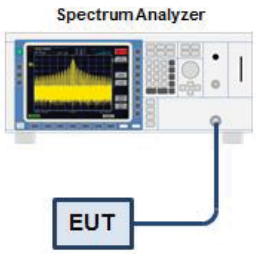
Test Information	
Reference	FCC 15.407(a)(2),(a)(5),(h)(2)
Measurement Method	KDB 789033 C.1
Operator	Wilfried Treffke
Date	2021-07-06
Measurement uncertainty	±1.26 %

3.2.2 Limits

Limits
None, used to determine power limit and necessary DFS functionality

3.2.3 Setup

Test Setup



3.2.4 Equipment

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

3.2.5 Procedure

Test Procedure

1. EUT 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 nominal channel bandwidth
3. The resolution bandwidth is set to approximately 1% of the emission bandwidth and video bandwidth ≥ RBW
4. The peak of the emission spectrum is determined
5. The left most frequency that corresponds to an emission level 26 dB below the maximum is determined
6. The right most frequency that corresponds to an emission level 26 dB below the maximum is determined
7. The 26 dB bandwidth is calculated from the two edge frequencies
8. The RBW is corrected and the measurement is repeated if needed

3.2.6 Results

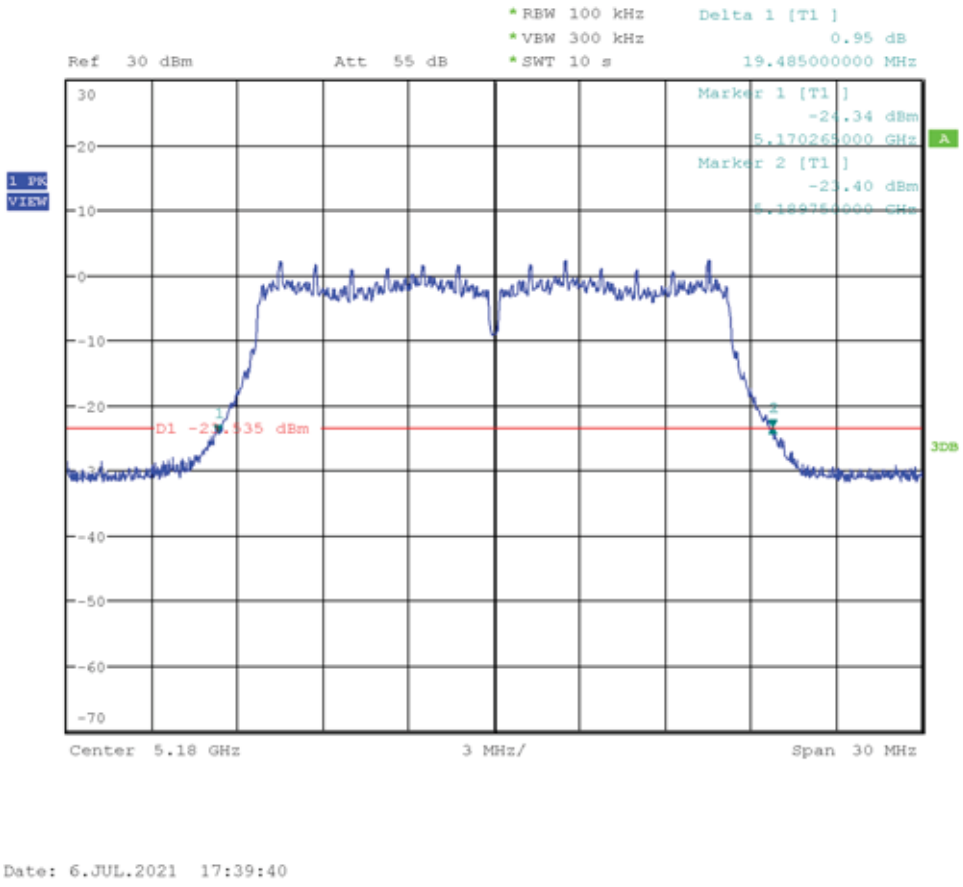
Test Results - 5150 - 5250 MHz					
Mode	Channel	Frequency [MHz]	Nominal BW [MHz]	BW Upper Edge [MHz]	BW [MHz]
OFDM	36	5180	20	N/A	19.485
OFDM	40	5200	20	N/A	19.125
OFDM	48	5240	20	5249.495	19.020
HT20	36	5180	20	N/A	19.650
HT20	40	5200	20	N/A	19.665
HT20	48	5240	20	5249.765	19.695
HT40	36+40	5190	40	N/A	40.740
HT40	44+48	5230	40	**5250.730**	40.950
VHT20	36	5180	20	N/A	19.650
VHT20	40	5200	20	N/A	19.665
VHT20	48	5240	20	5249.855	19.740
VHT40	36+40	5190	40	N/A	40.710
VHT40	44+48	5230	40	**5250.550**	40.830
VHT80	36+40+44+48	5210	80	**5250.560**	81.780

Test Results - 5150 - 5250 MHz - 99% BW					
Mode	Channel	Frequency [MHz]	Nominal BW [MHz]	BW Upper Edge [MHz]	BW [MHz]
OFDM	48	5240	20	N/R	N/R
HT20	48	5240	20	N/R	N/R
HT40	44+48	5230	40	5248.240	36.440
VHT20	48	5240	20	N/R	N/R
VHT40	44+48	5230	40	5248.240	36.480
VHT80	36+40+44+48	5210	80	5248.160	76.240
If the Emission Bandwidth (26 dB) does not fall entirely in the band, Occupied Bandwidth (99%) can be used instead to determine whether DFS testing is required for this band					

Test Results - 5725 - 5850 MHz					
Mode	Channel	Frequency [MHz]	Nominal BW [MHz]	BW Lower Edge [MHz]	BW [MHz]
OFDM	149	5745	20	5735.415	19.140
OFDM	157	5785	20	N/A	19.170
OFDM	165	5825	20	N/A	19.065
HT20	149	5745	20	5735.190	19.695
HT20	157	5785	20	N/A	19.515
HT20	165	5825	20	N/A	19.740
HT40	149+153	5755	40	5734.840	40.350
HT40	157+161	5795	40	N/A	40.710
VHT20	149	5745	20	5735.145	19.635
VHT20	157	5785	20	N/A	19.710
VHT20	165	5825	20	N/A	19.650
VHT40	149+153	5755	40	5734.690	40.650
VHT40	157+161	5795	40	N/A	40.560
VHT80	149+153+157+161	5775	80	5734.080	81.720

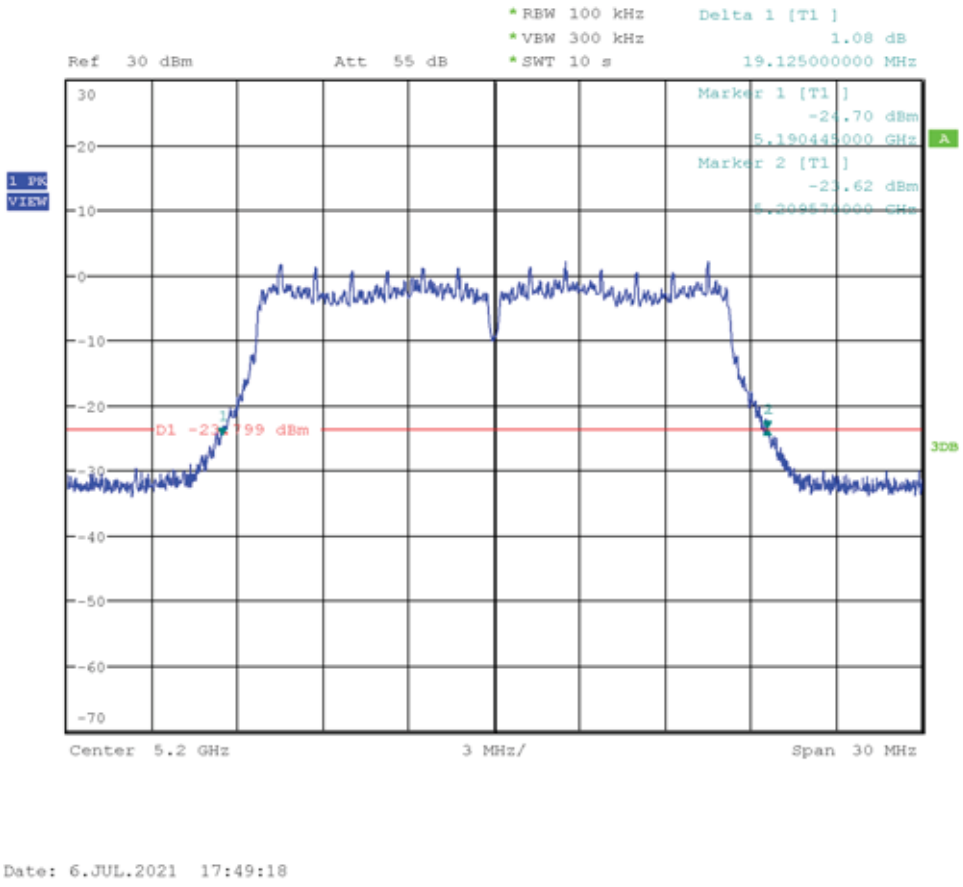
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11a, Channel: 36, 5180 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5170.265
Upper Frequency [MHz]:	5189.750
26 dB Bandwidth [MHz]:	19.485



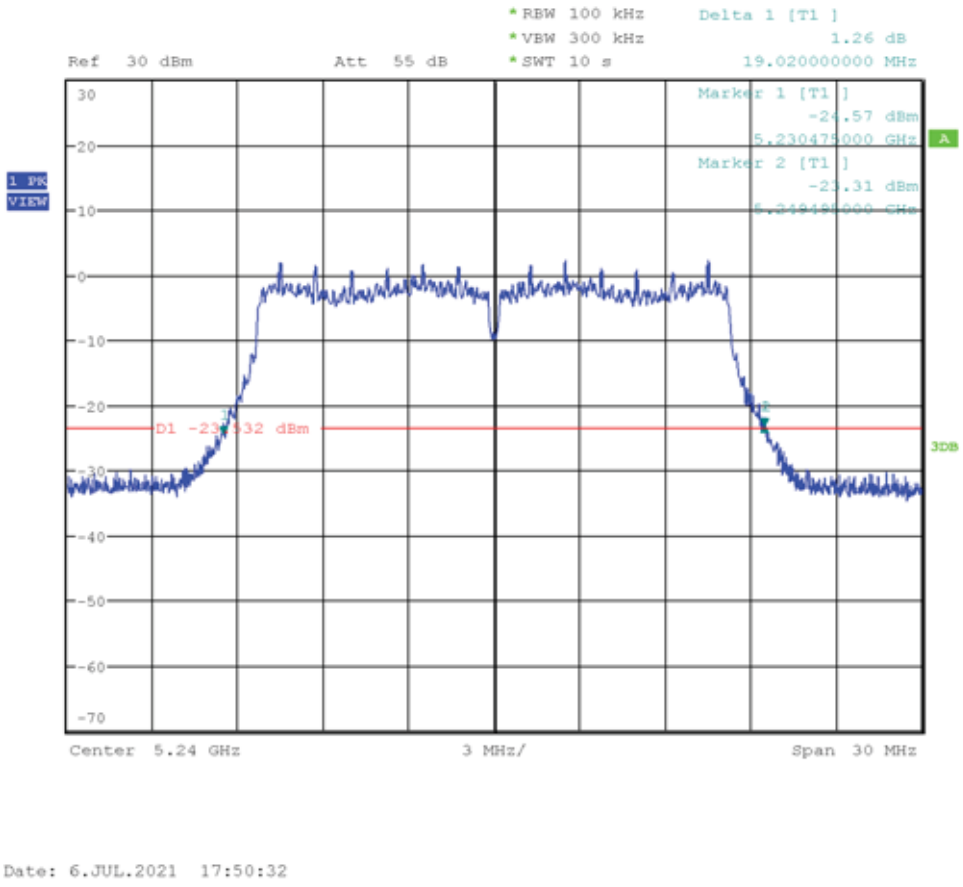
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11a, Channel: 40, 5200 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5190.445
Upper Frequency [MHz]:	5209.570
26 dB Bandwidth [MHz]:	19.125



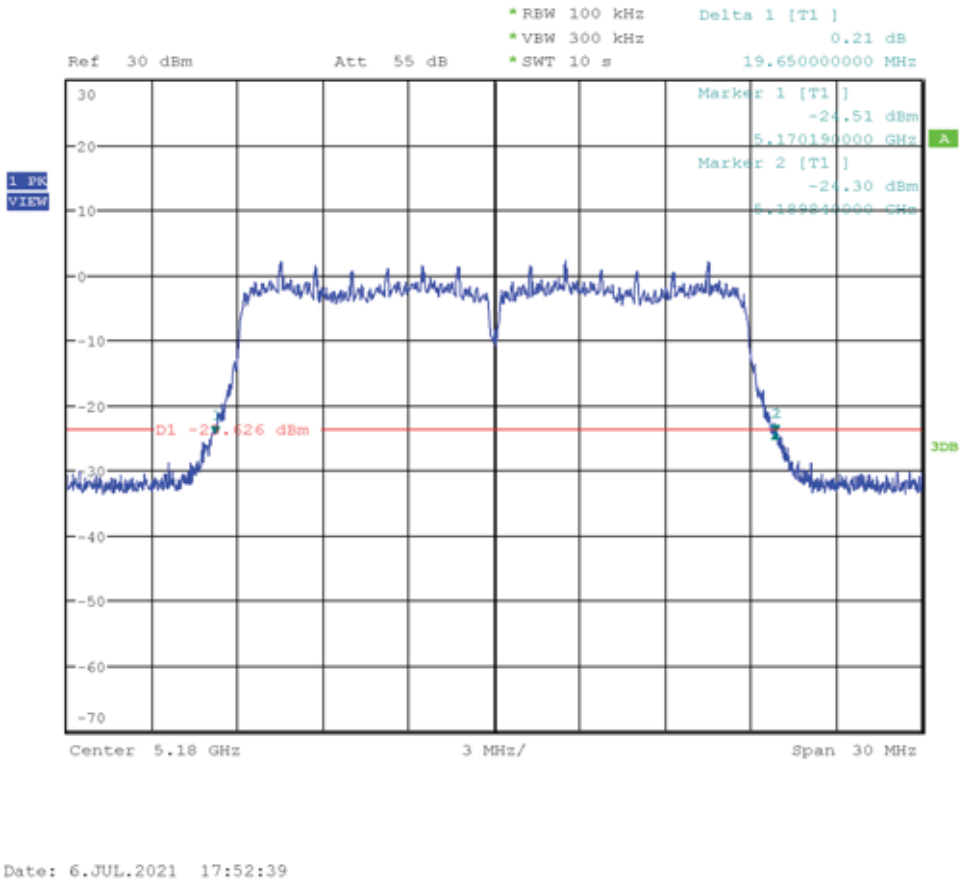
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11a, Channel: 48, 5240 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5230.475
Upper Frequency [MHz]:	5249.495
26 dB Bandwidth [MHz]:	19.020



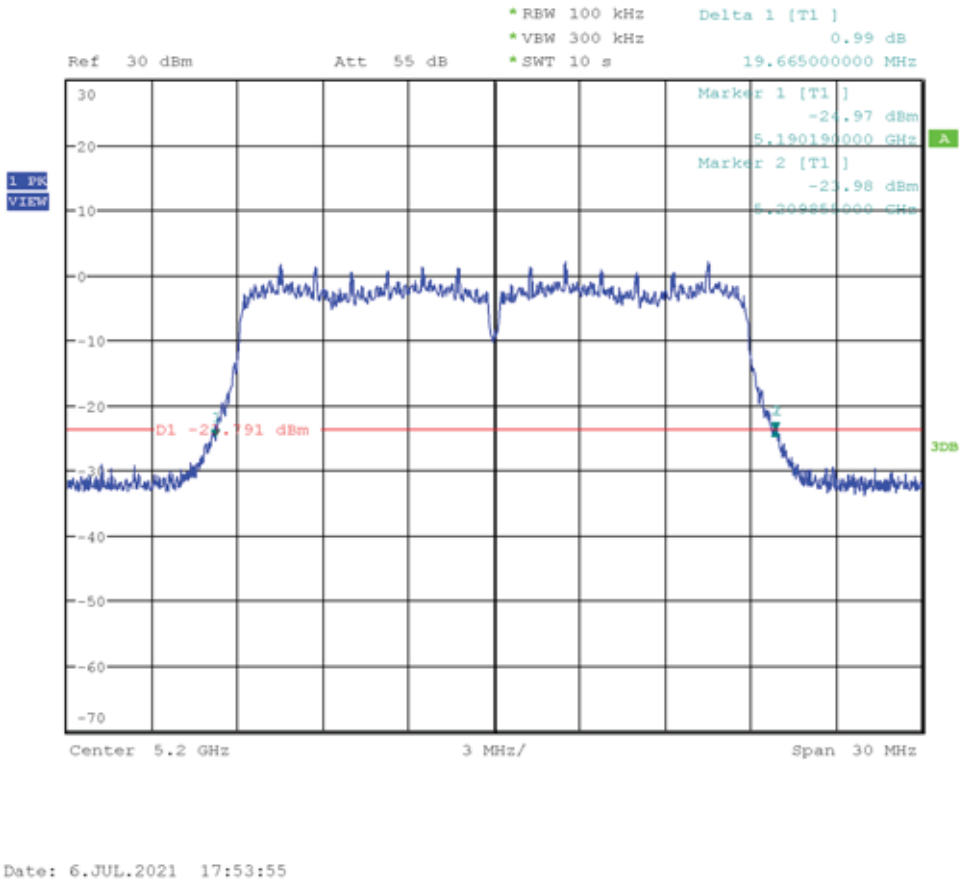
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11n (HT20), Channel: 36, 5180 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5170.190
Upper Frequency [MHz]:	5189.840
26 dB Bandwidth [MHz]:	19.650



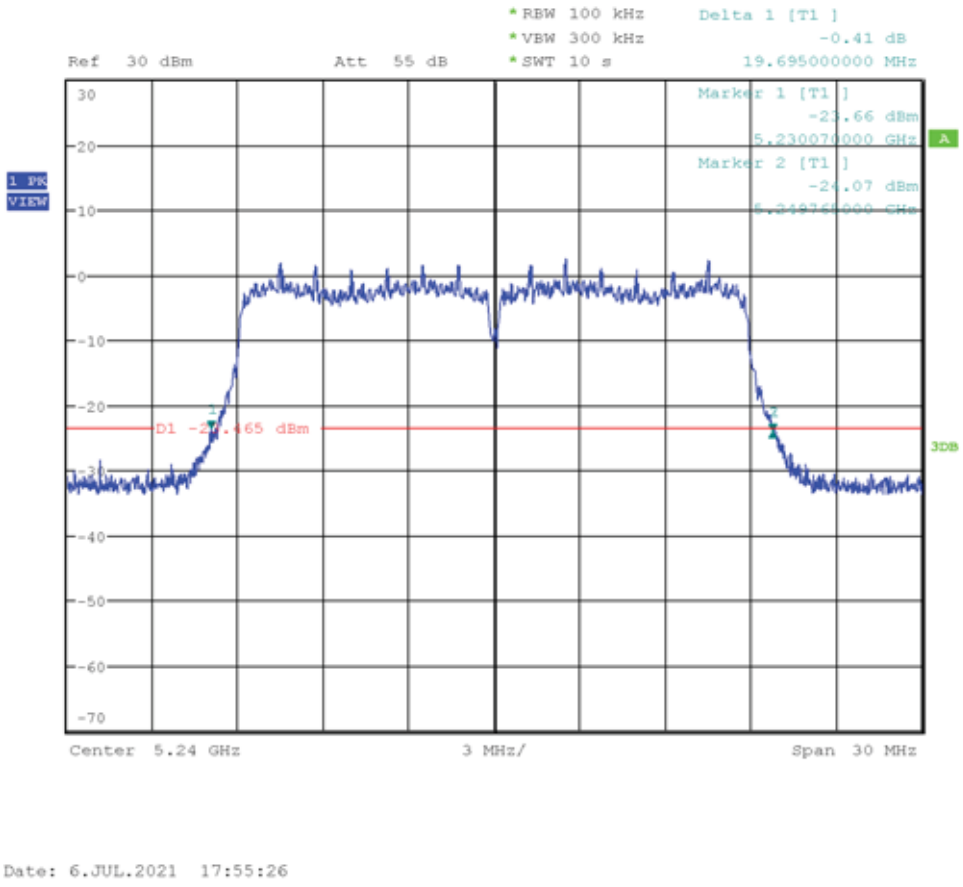
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11n (HT20), Channel: 40, 5200 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5190.190
Upper Frequency [MHz]:	5209.855
26 dB Bandwidth [MHz]:	19.665



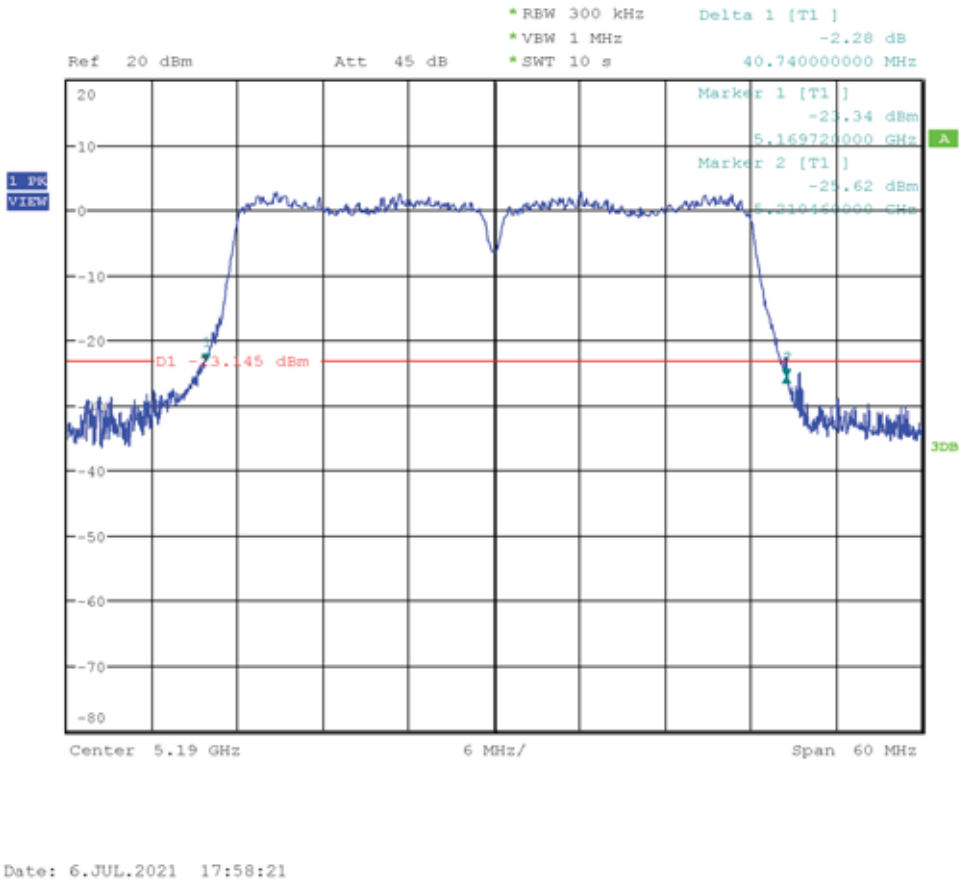
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11n (HT20), Channel: 48, 5240 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5230.070
Upper Frequency [MHz]:	5249.765
26 dB Bandwidth [MHz]:	19.695



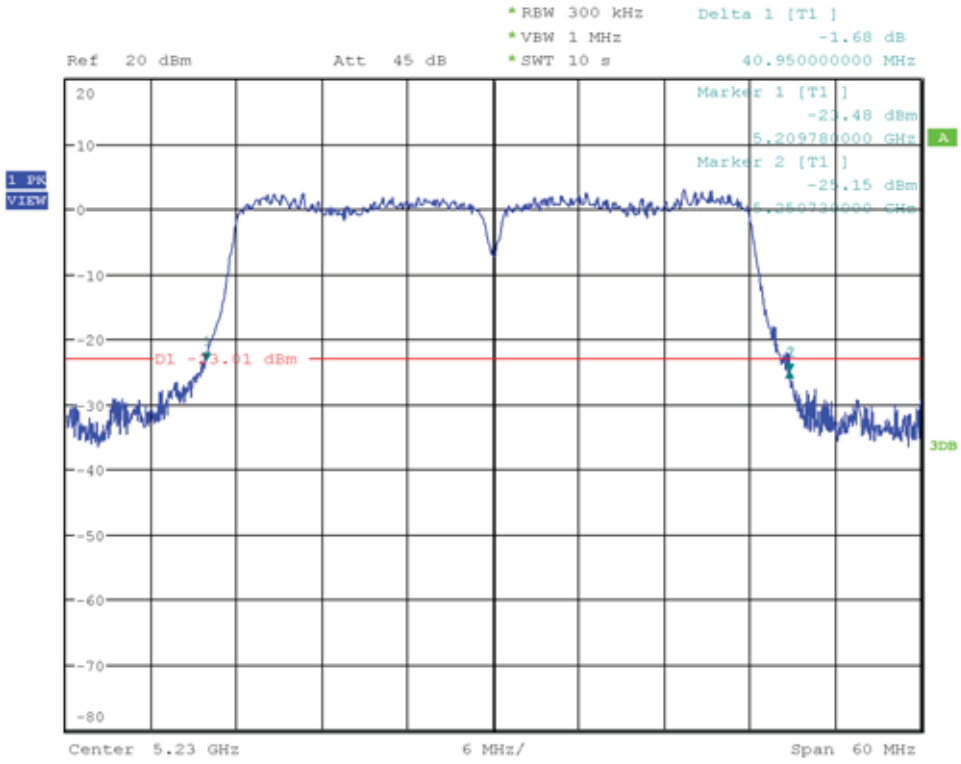
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11n (HT40), Channel: 38, 5190 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5169.720
Upper Frequency [MHz]:	5210.460
26 dB Bandwidth [MHz]:	40.740



26 dB Bandwidth

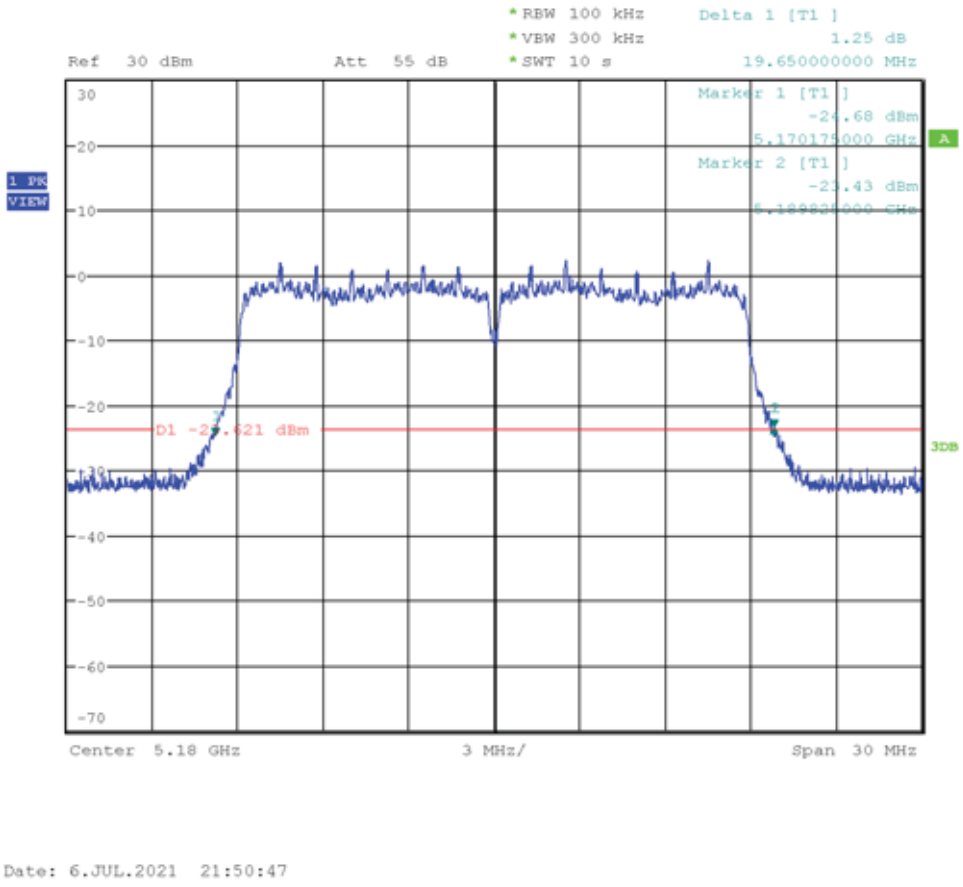
Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11n (HT40), Channel: 46, 5230 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5209.780
Upper Frequency [MHz]:	5250.730
26 dB Bandwidth [MHz]:	40.950



Date: 6.JUL.2021 18:00:34

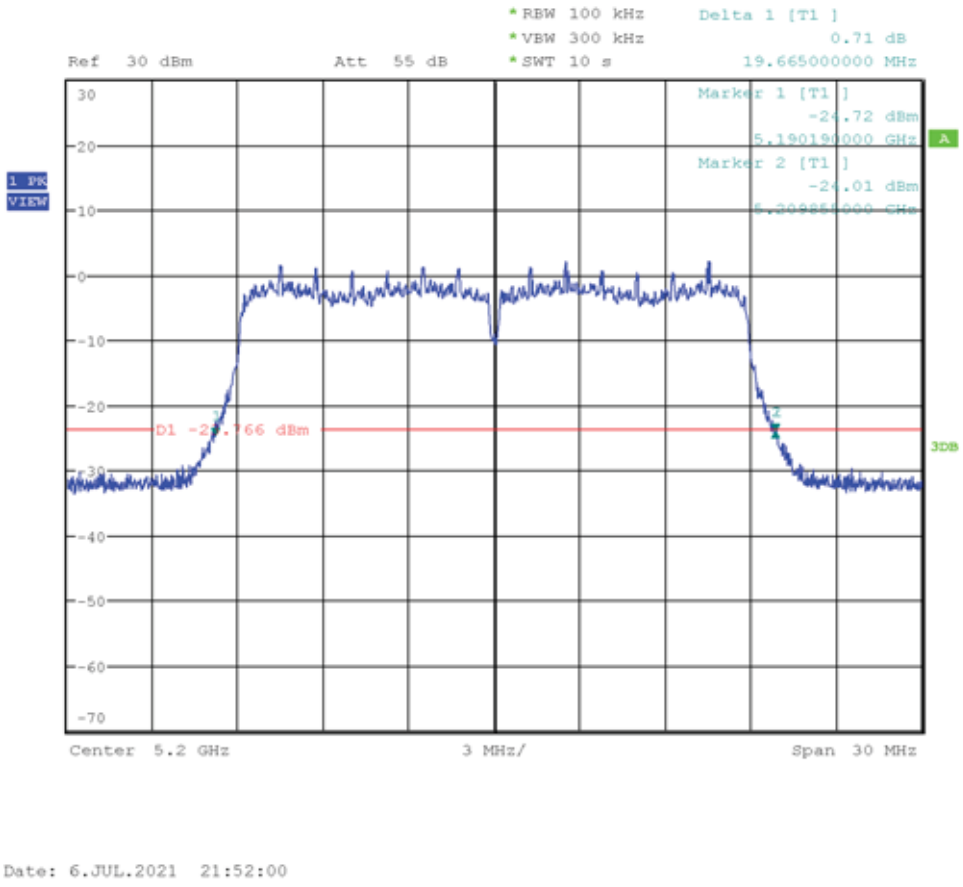
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT20), Channel: 36, 5180 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5170.175
Upper Frequency [MHz]:	5189.825
26 dB Bandwidth [MHz]:	19.650



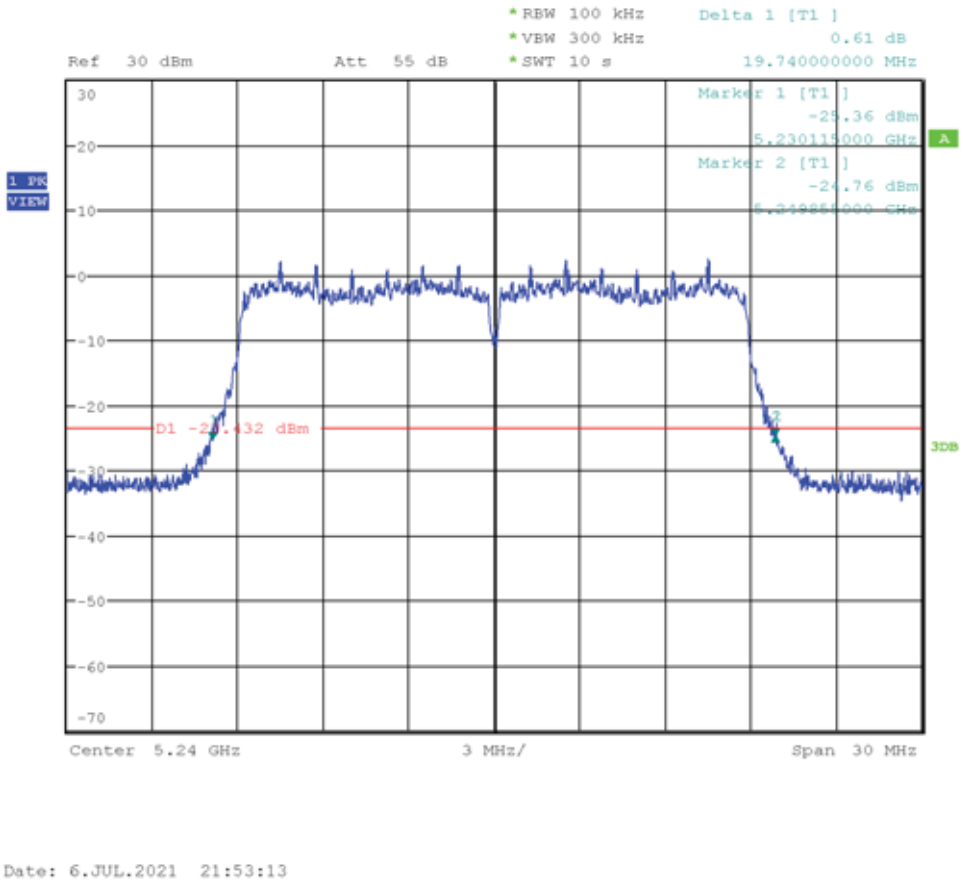
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT20), Channel: 40, 5200 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5190.190
Upper Frequency [MHz]:	5209.855
26 dB Bandwidth [MHz]:	19.665



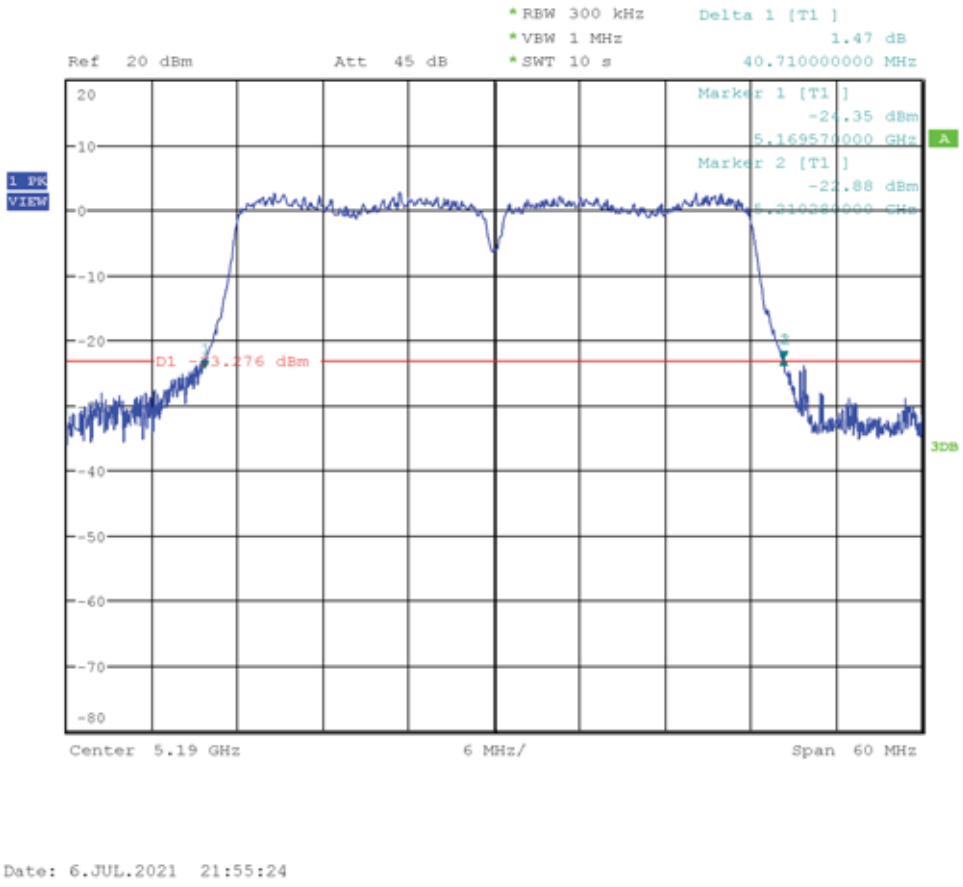
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT20), Channel: 48, 5240 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5230.115
Upper Frequency [MHz]:	5249.855
26 dB Bandwidth [MHz]:	19.740



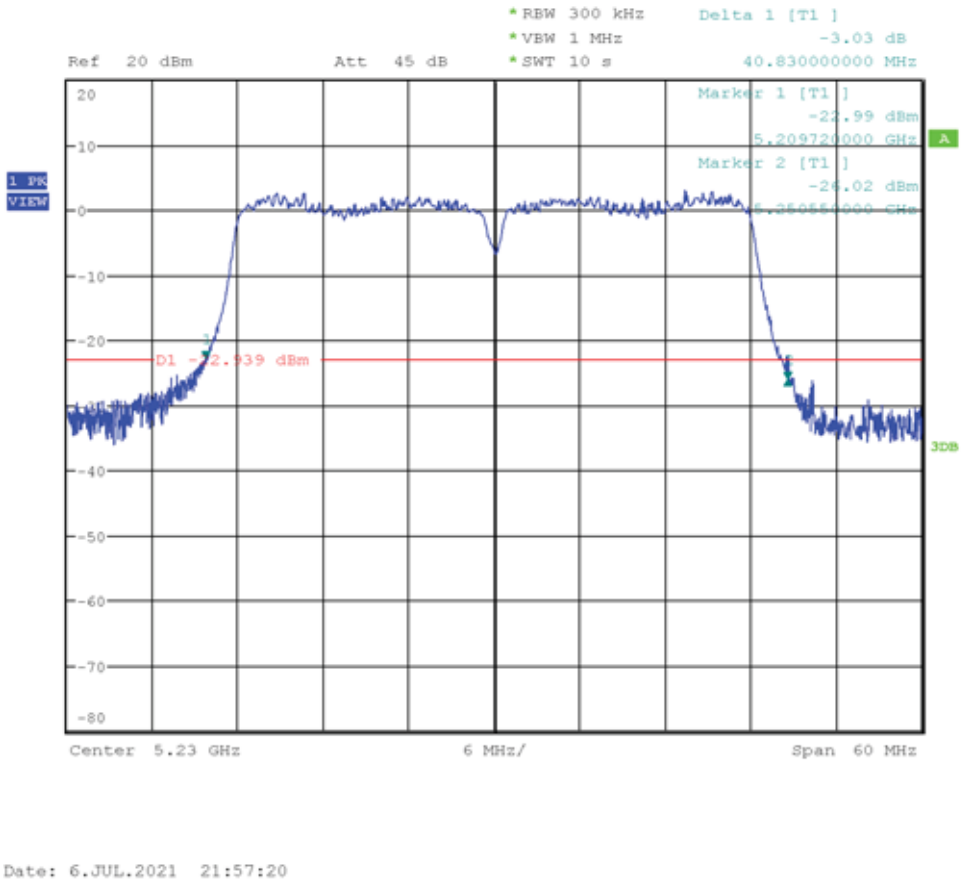
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT40), Channel: 38, 5190 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5169.570
Upper Frequency [MHz]:	5210.280
26 dB Bandwidth [MHz]:	40.710



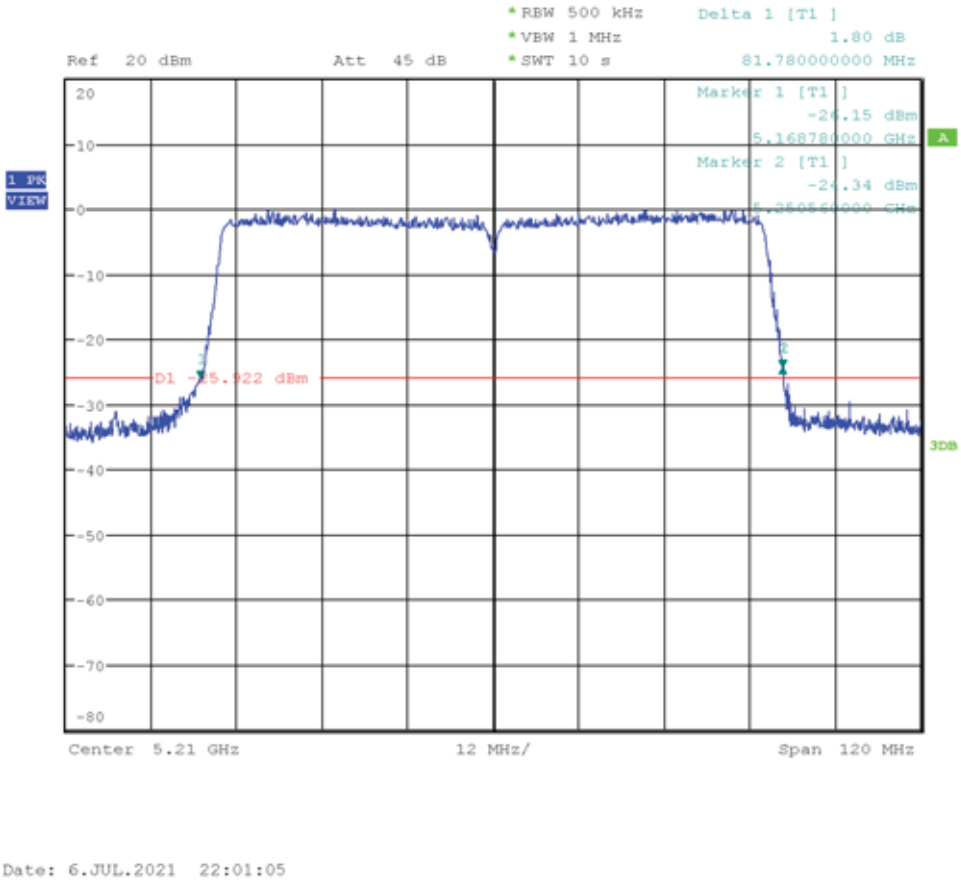
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT40), Channel: 46, 5230 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5209.720
Upper Frequency [MHz]:	5250.550
26 dB Bandwidth [MHz]:	40.830



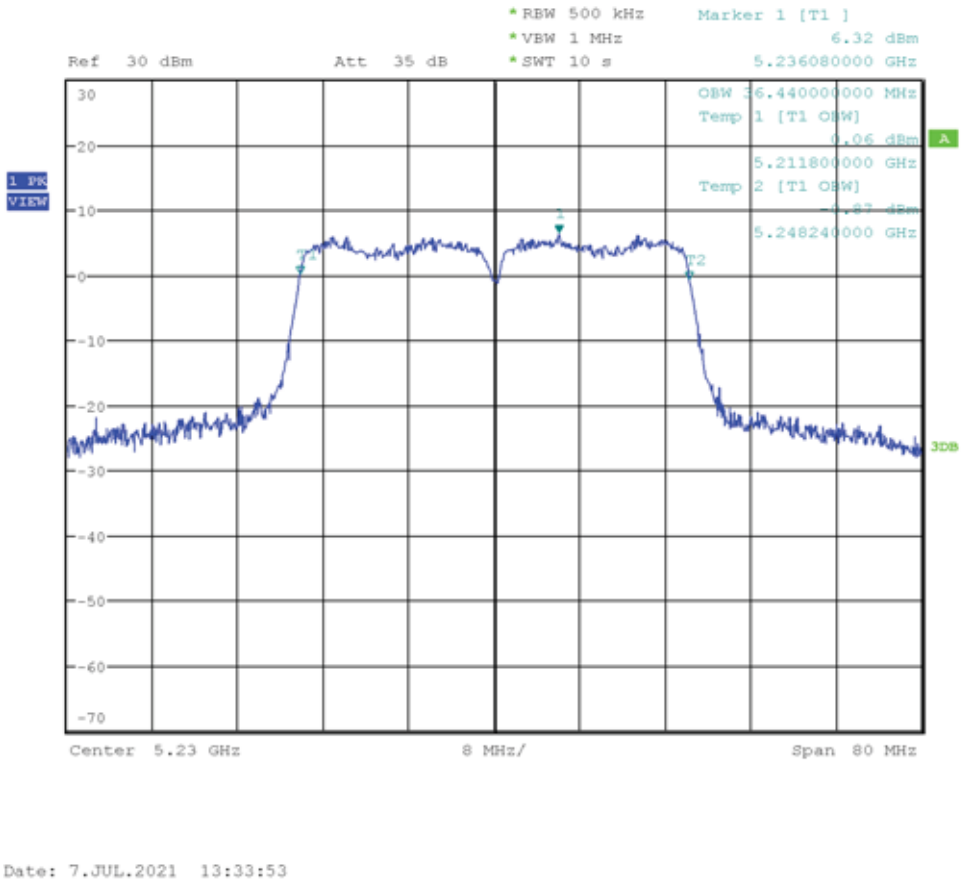
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT80), Channel: 42, 5210 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5168.780
Upper Frequency [MHz]:	5250.560
26 dB Bandwidth [MHz]:	81.780



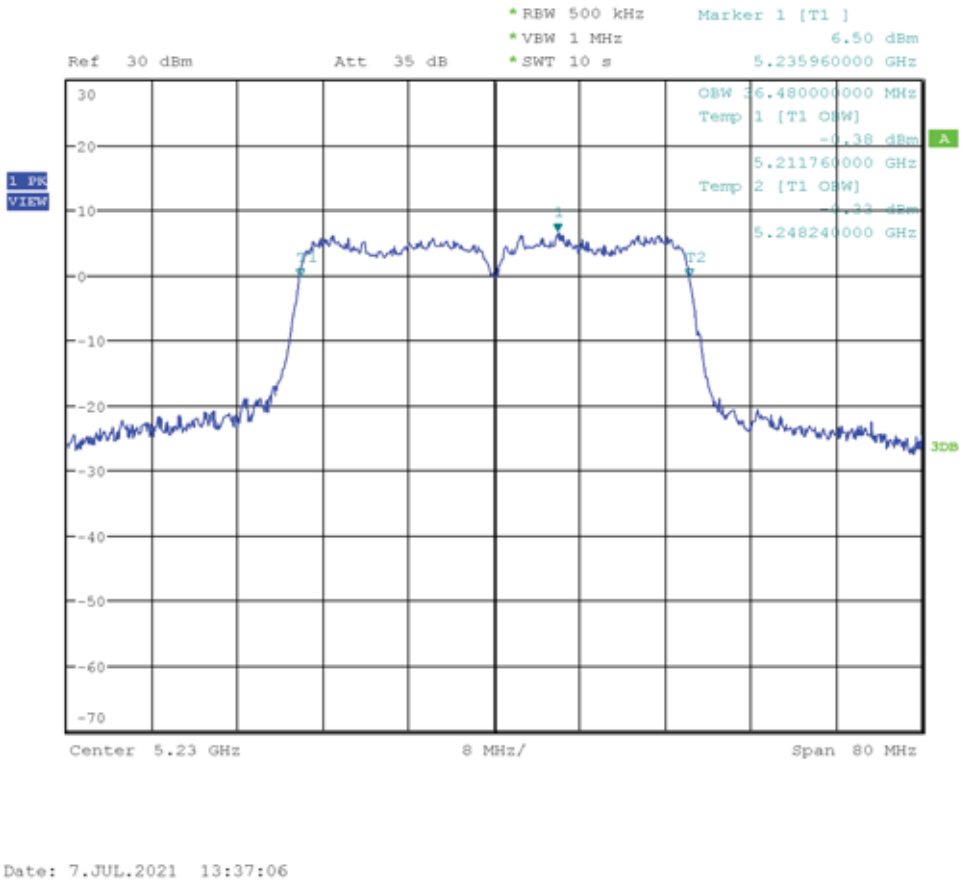
Occupied Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	IEEE 802.11n (HT40), Channel: 46, 5230 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-07
Antenna Port:	A
Occ. Bandwidth Lower Edge [MHz]:	5211.800
Occ. Bandwidth Upper Edge [MHz]:	5248.240
Occupied Bandwidth [MHz]:	36.440



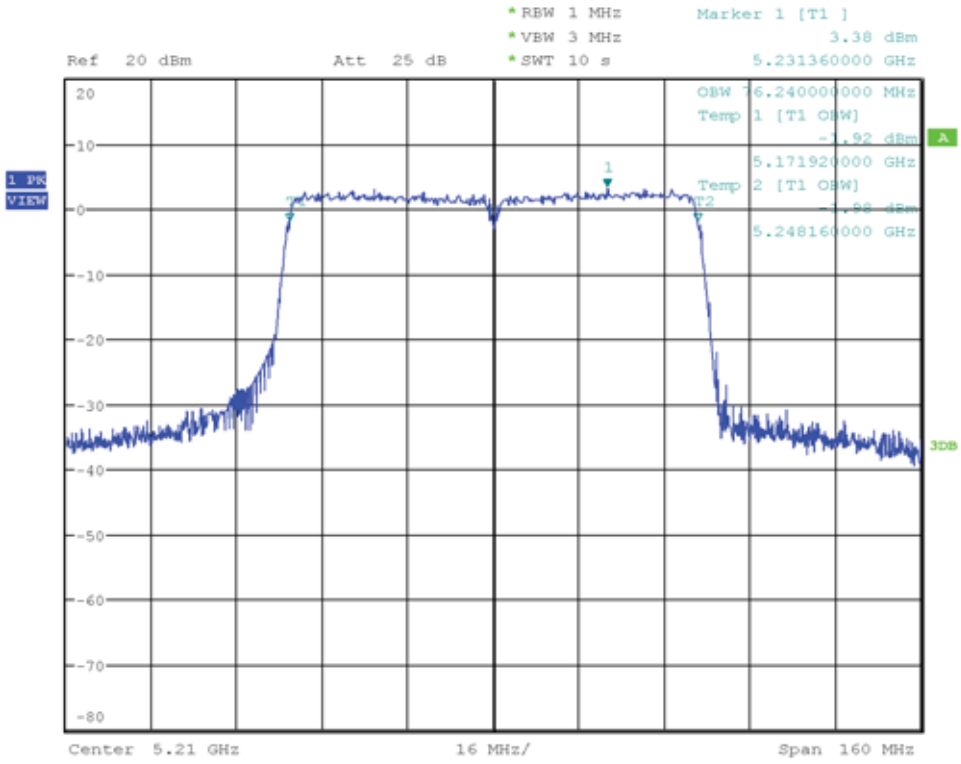
Occupied Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	IEEE 802.11ac (VHT40), Channel: 46, 5230 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-07
Antenna Port:	A
Occ. Bandwidth Lower Edge [MHz]:	5211.760
Occ. Bandwidth Upper Edge [MHz]:	5248.240
Occupied Bandwidth [MHz]:	36.480



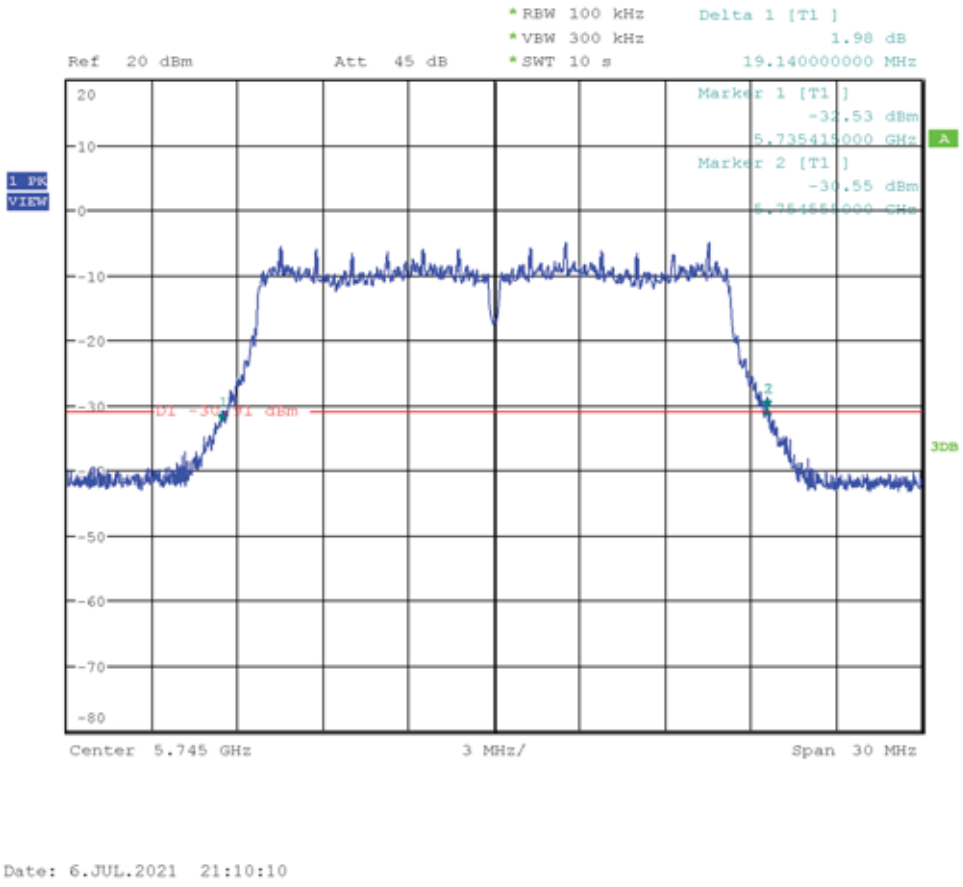
Occupied Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	IEEE 802.11ac (VHT80), Channel: 42, 5210 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-07
Antenna Port:	A
Occ. Bandwidth Lower Edge [MHz]:	5171.920
Occ. Bandwidth Upper Edge [MHz]:	5248.160
Occupied Bandwidth [MHz]:	76.240



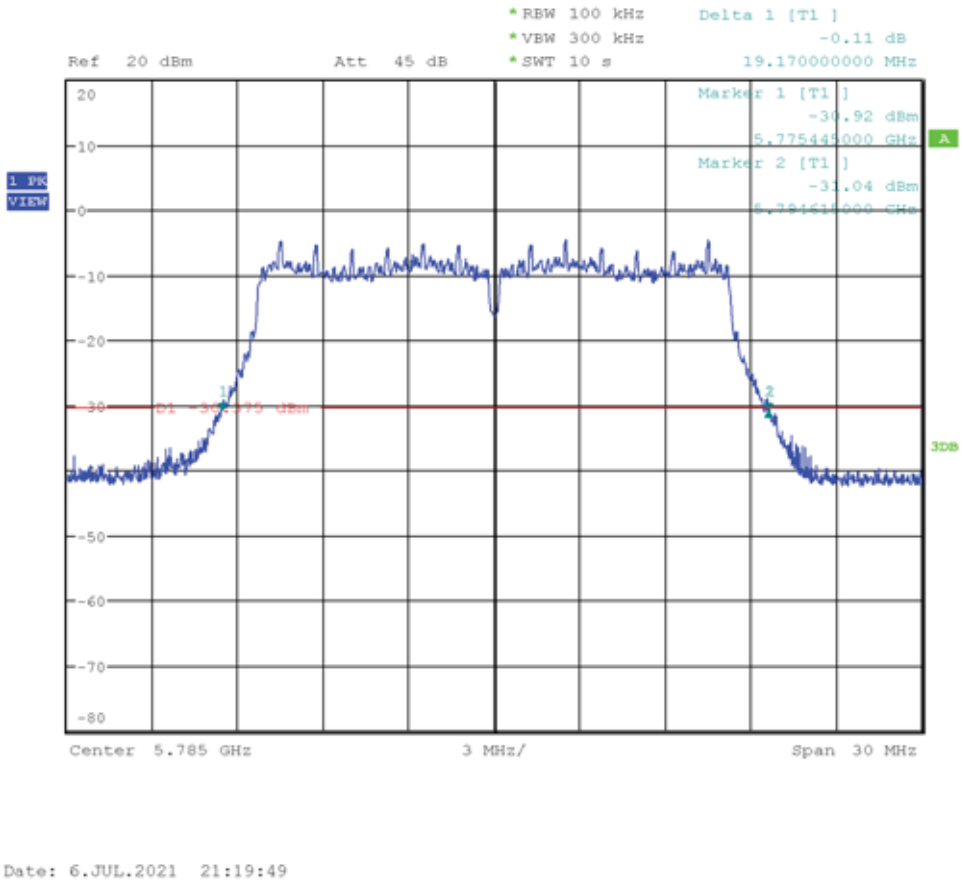
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11a, Channel: 149, 5745 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5735.415
Upper Frequency [MHz]:	5754.555
26 dB Bandwidth [MHz]:	19.140



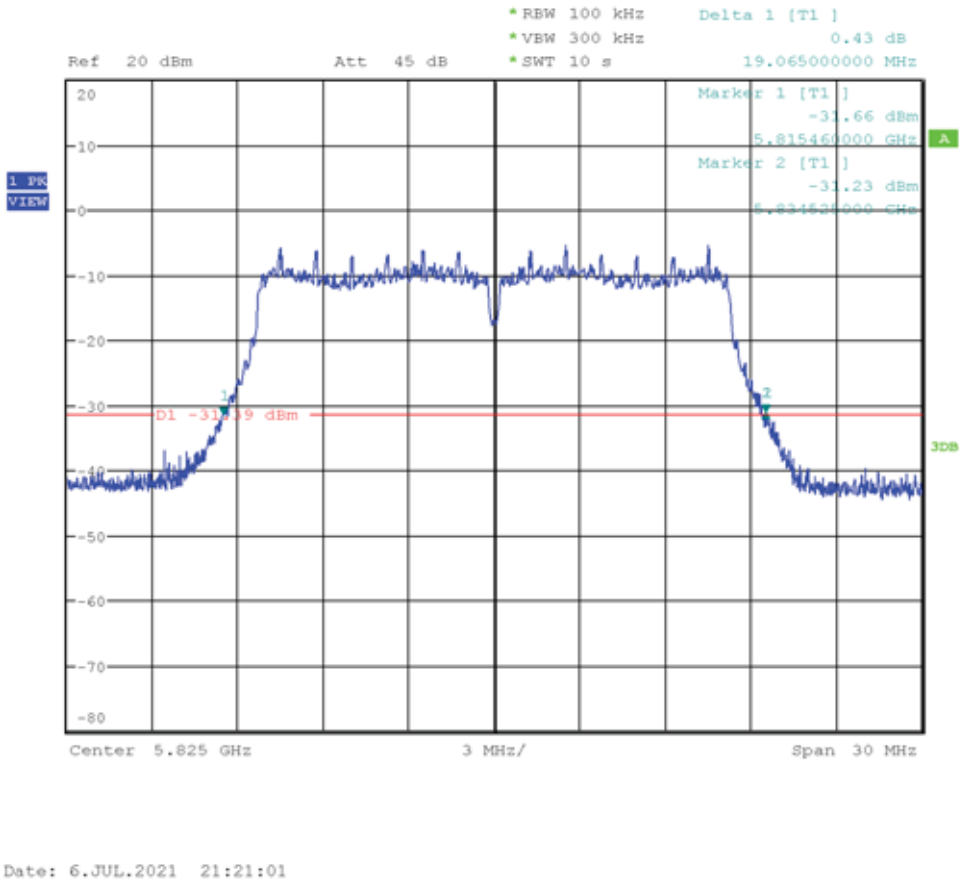
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11a, Channel: 157, 5785 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5775.445
Upper Frequency [MHz]:	5794.615
26 dB Bandwidth [MHz]:	19.170



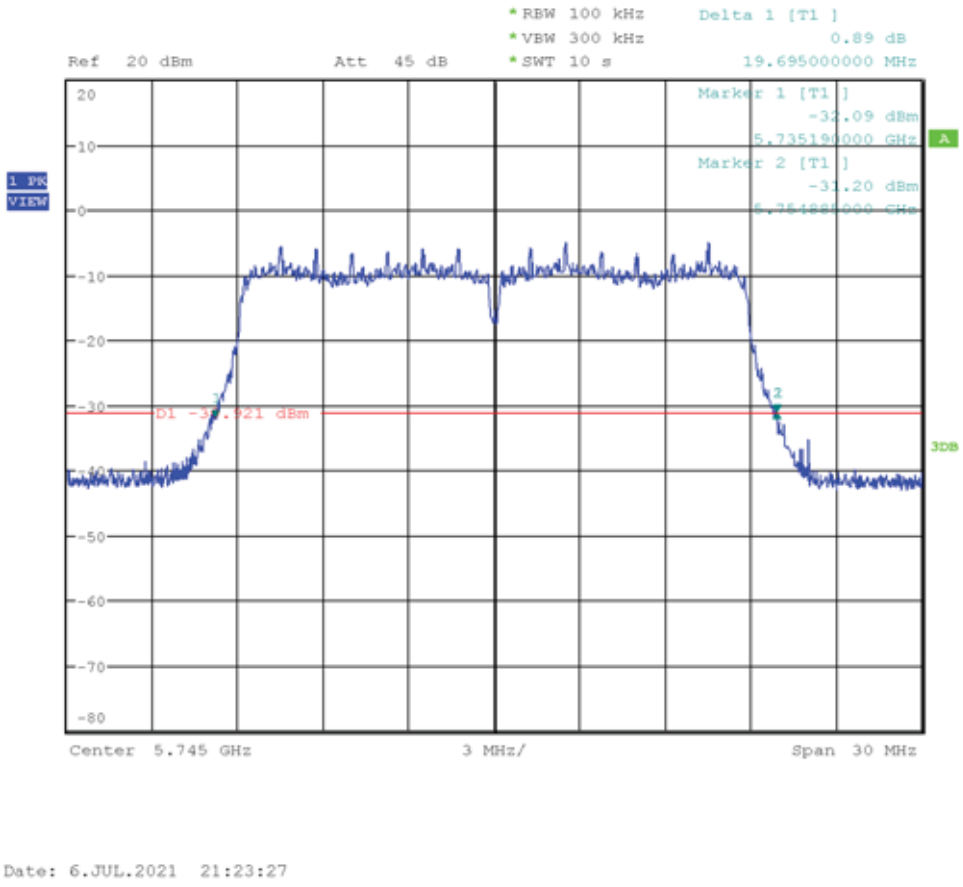
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11a, Channel: 165, 5825 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5815.460
Upper Frequency [MHz]:	5834.525
26 dB Bandwidth [MHz]:	19.065



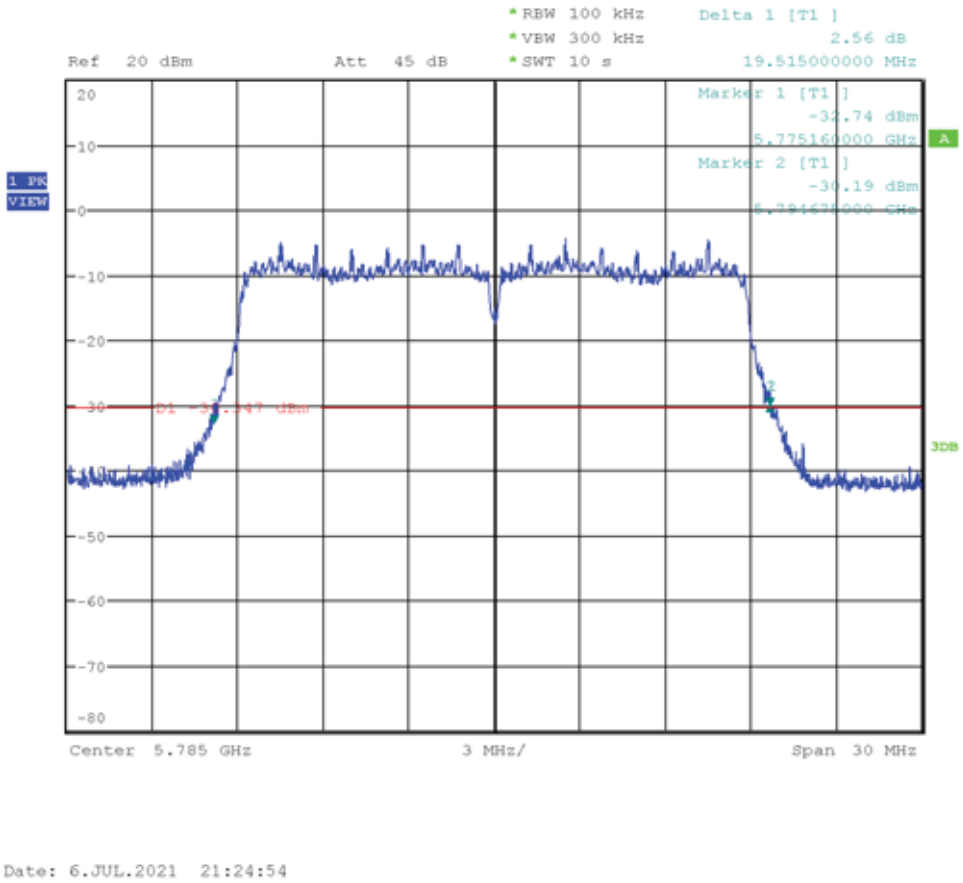
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11n (HT20), Channel: 149, 5745 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5735.190
Upper Frequency [MHz]:	5754.885
26 dB Bandwidth [MHz]:	19.695



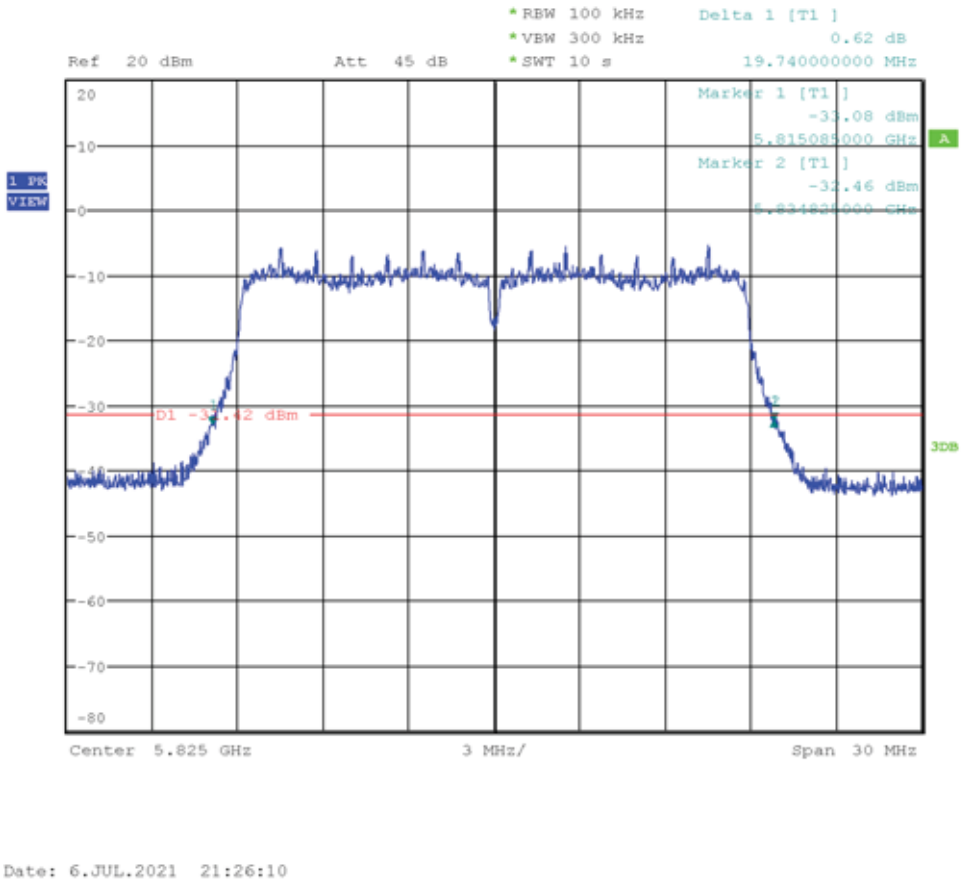
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11n (HT20), Channel: 157, 5785 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5775.160
Upper Frequency [MHz]:	5794.675
26 dB Bandwidth [MHz]:	19.515



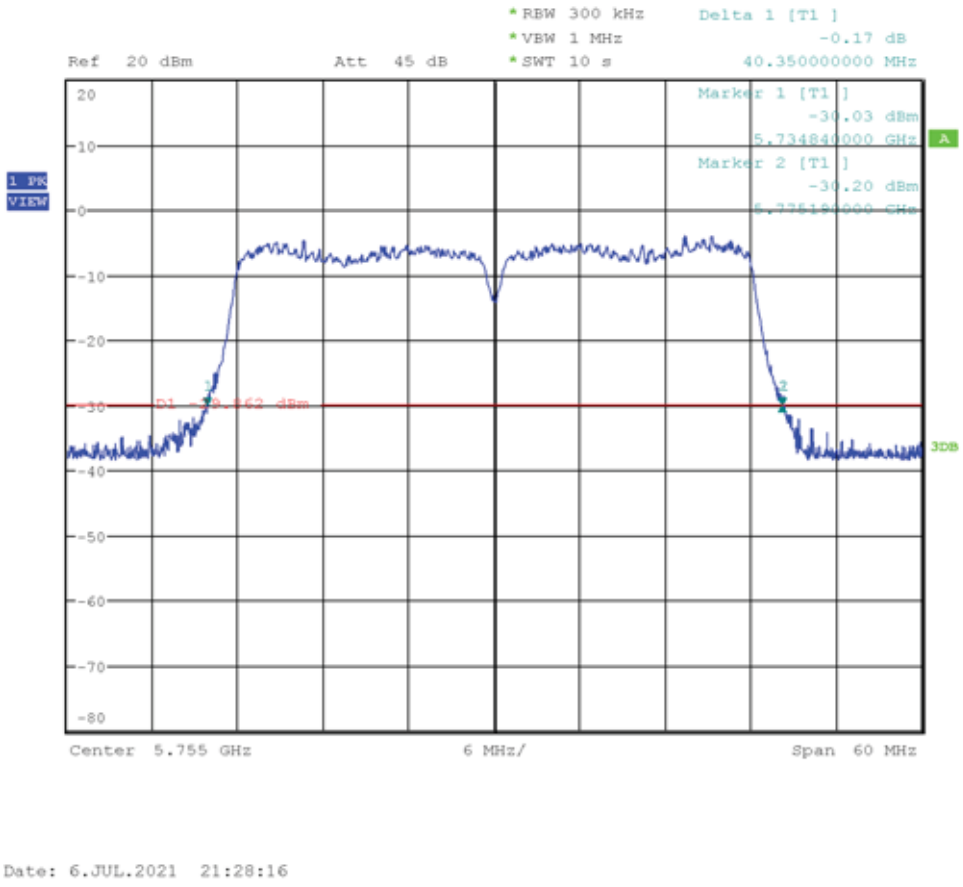
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11n (HT20), Channel: 165, 5825 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5815.085
Upper Frequency [MHz]:	5834.825
26 dB Bandwidth [MHz]:	19.740



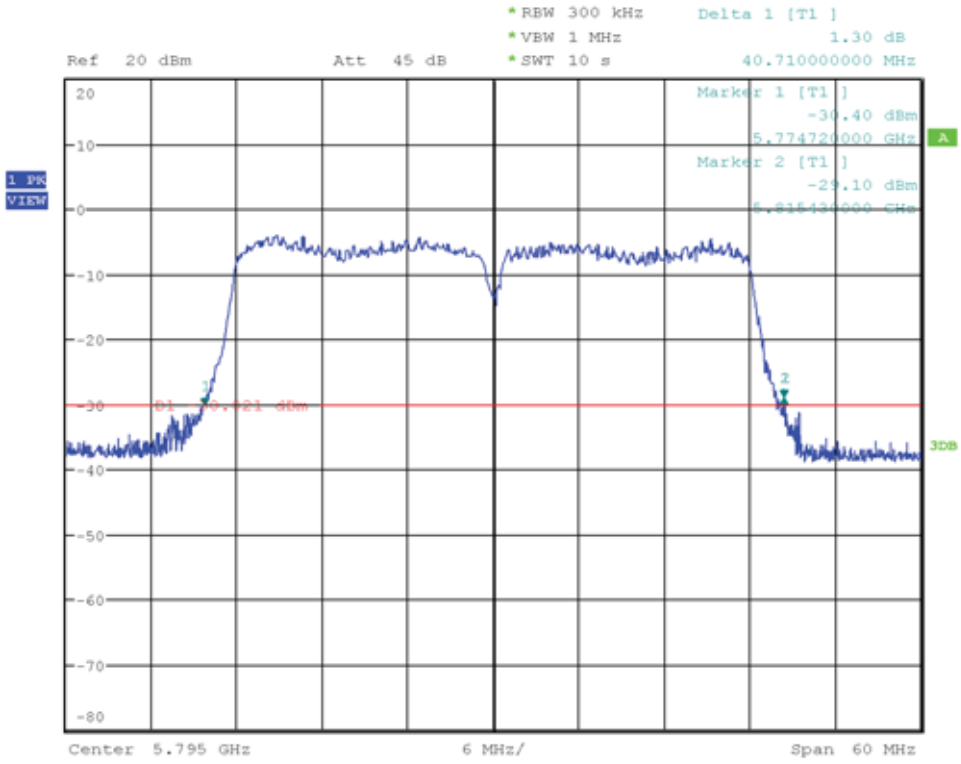
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11n (HT40), Channel: 151, 5755 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5734.840
Upper Frequency [MHz]:	5775.190
26 dB Bandwidth [MHz]:	40.350



26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11n (HT40), Channel: 159, 5795 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5774.720
Upper Frequency [MHz]:	5815.430
26 dB Bandwidth [MHz]:	40.710



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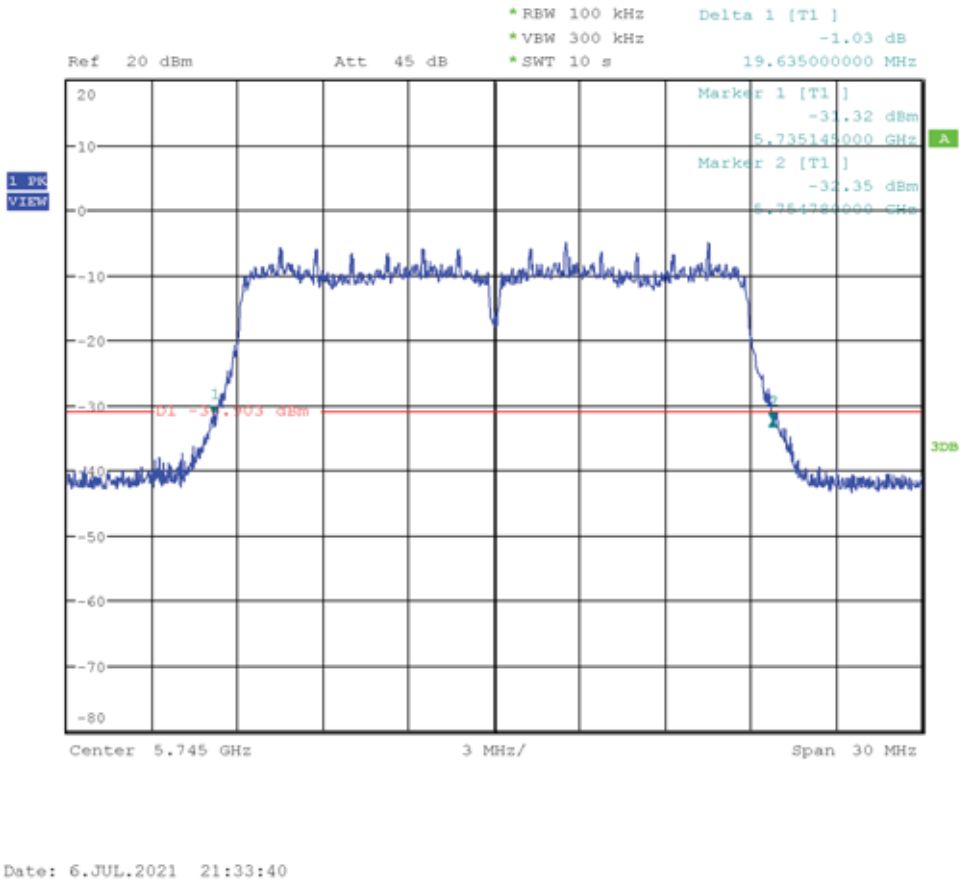
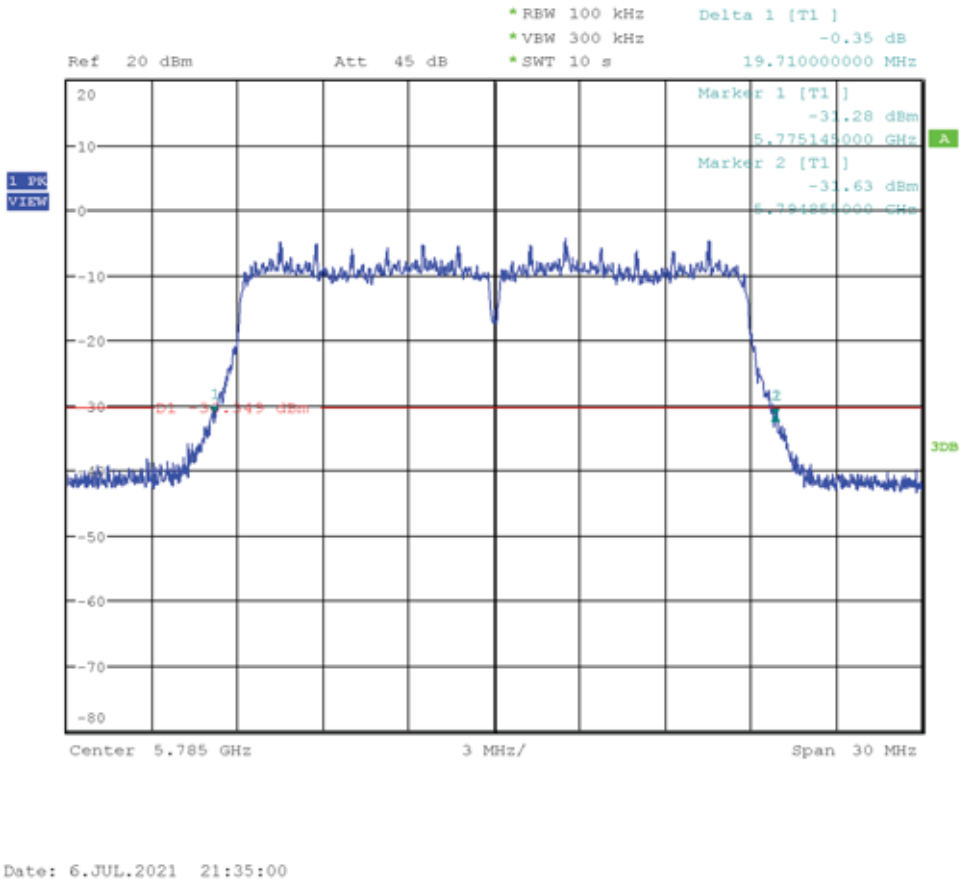
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT20), Channel: 149, 5745 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5735.145
Upper Frequency [MHz]:	5754.780
26 dB Bandwidth [MHz]:	19.635



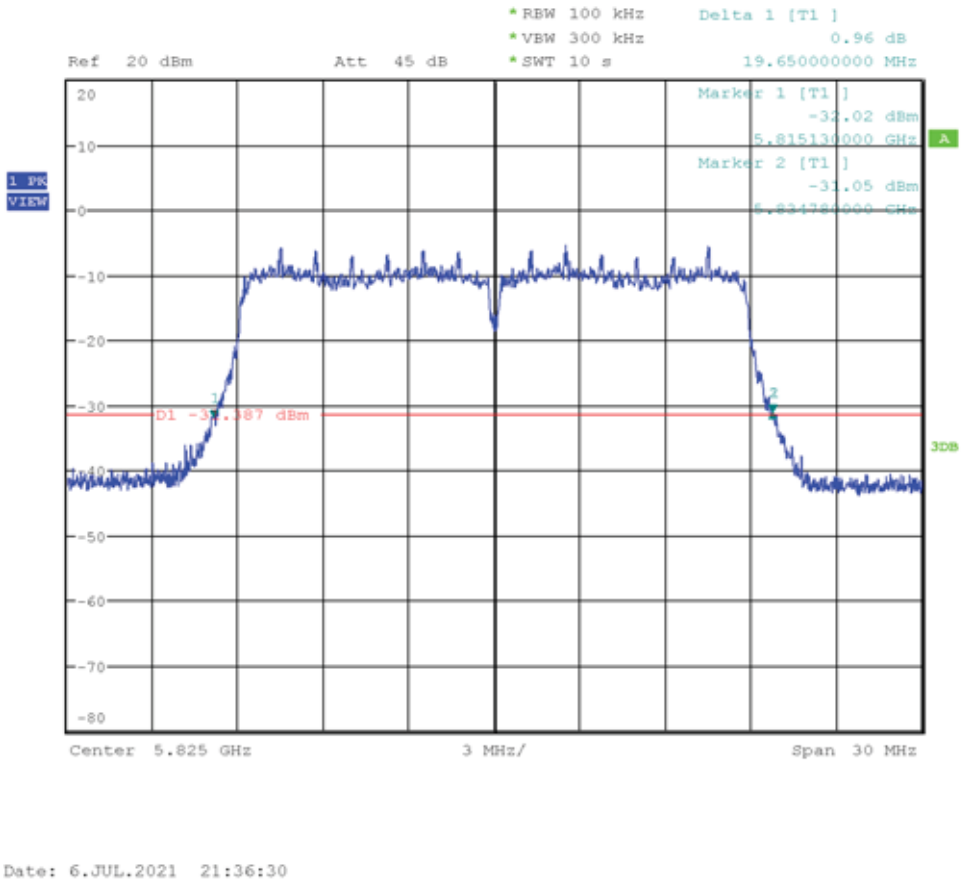
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT20), Channel: 157, 5785 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5775.145
Upper Frequency [MHz]:	5794.855
26 dB Bandwidth [MHz]:	19.710



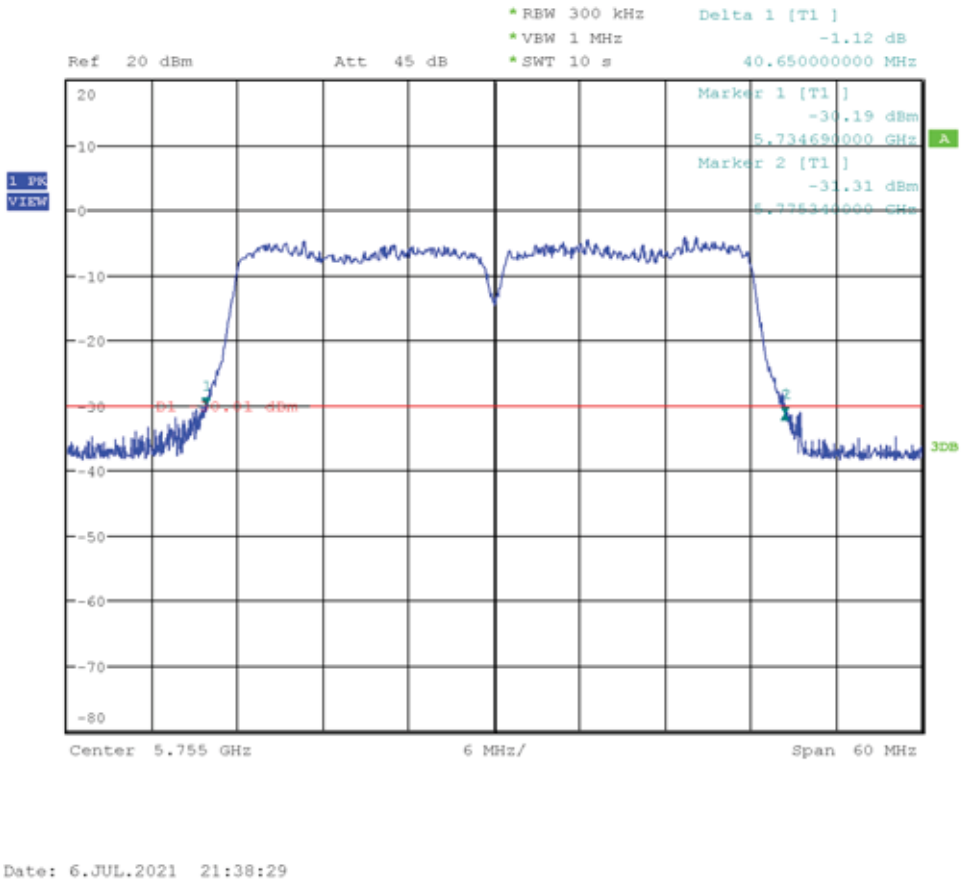
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT20), Channel: 165, 5825 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5815.130
Upper Frequency [MHz]:	5834.780
26 dB Bandwidth [MHz]:	19.650



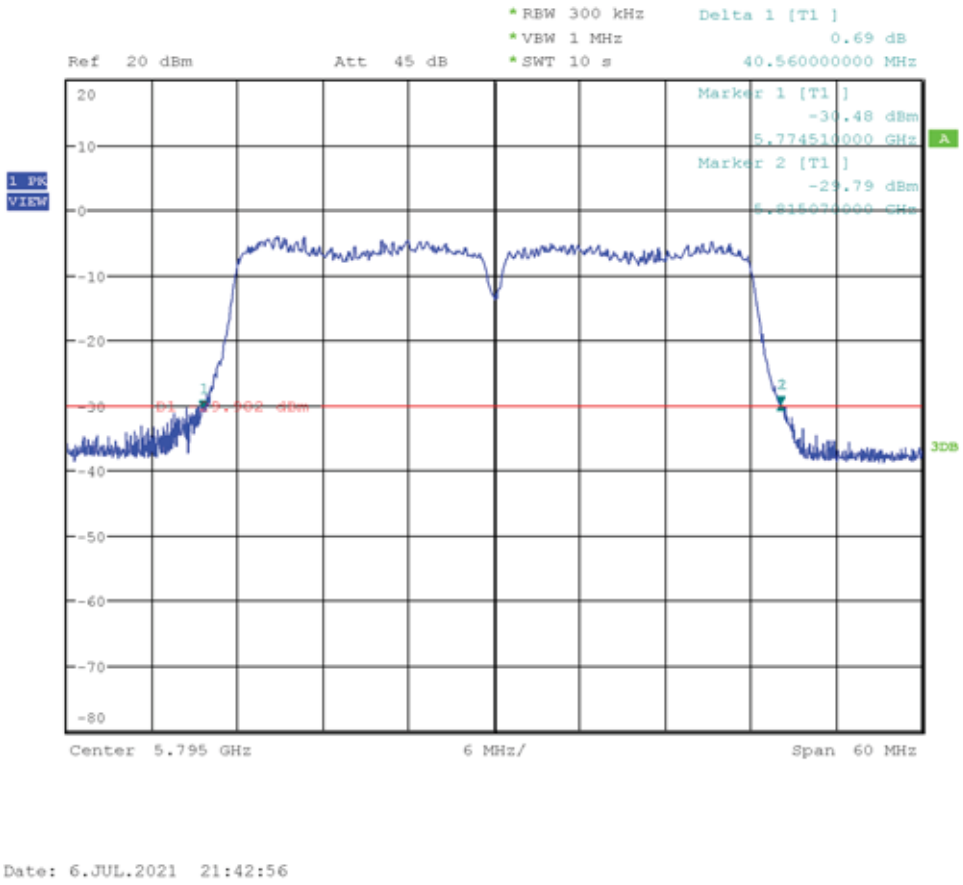
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT40), Channel: 151, 5755 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5734.690
Upper Frequency [MHz]:	5775.340
26 dB Bandwidth [MHz]:	40.650



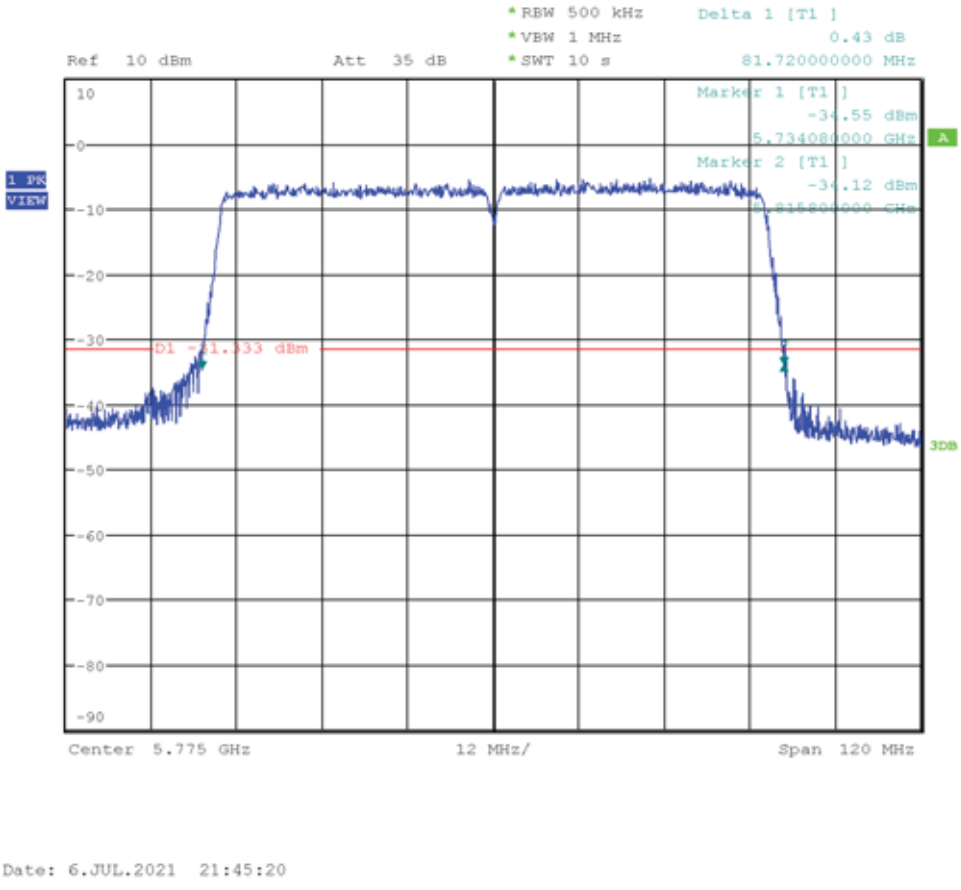
26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT40), Channel: 159, 5795 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5774.510
Upper Frequency [MHz]:	5815.070
26 dB Bandwidth [MHz]:	40.560



26 dB Bandwidth

Project Number:	G0M-2101-9569
Applicant:	Panasonic Industrial Devices Europe GmbH
Model Description:	Wi-Fi Dual Band 2.4/5 GHz and Bluetooth Module
Model:	ENWF9408A1EF
Test Sample ID:	34972, (A1 15 SMA)
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	IEEE 802.11ac (VHT80), Channel: 155, 5775 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2021-07-06
Antenna Port:	A
Lower Frequency [MHz]:	5734.080
Upper Frequency [MHz]:	5815.800
26 dB Bandwidth [MHz]:	81.720



3.3 Test Conditions and Results - Maximum output power

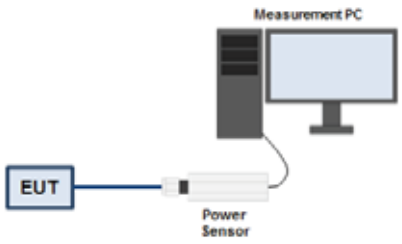
3.3.1 Information

Test Information	
Reference	FCC 15.407(a)
Measurement Method	KDB 789033 E
Operator	Wilfried Treffke
Date	2021-07-07
Measurement uncertainty	±1.59 %

3.3.2 Limits

Limits			
Frequency band	Condition	Power limit	Maximum antenna gain[1]
5150 - 5250 MHz	Access point, indoor	1 W/30 dBm	6 dBi
5150 - 5250 MHz	Access point, outdoor	1 W/30 dBm	6 dBi
5150 - 5250 MHz	Access point, fixed point to point	1 W/30 dBm	23 dBi
5150 - 5250 MHz	Client	250 mW/24 dBm	6 dBi
5250 - 5350 MHz	-	Minimum of 250 mW/24 dBm or 11 dBm + 10*Log_{10}(BW[3])	6 dBi
5470 - 5725 MHz	-	Minimum of 250 mW/24 dBm or 11 dBm + 10*Log_{10}(BW[3])	6 dBi
5725 - 5850 MHz	-	1 W/30 dBm[2]	6 dBi
Note 1: The maximum output power must be reduced by the amount in dB that the gain exceeds the maximum allowed gain Note 2: Fixed point to point applications are excluded from power reduction according to Note 1 Note 3: BW is the 26 dB bandwidth in MHz			

3.3.3 Setup

Test Setup


3.3.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Power sensor	ETS-Lindgren USA	7002-006	EF00934	2020-07	2021-07

3.3.5 Procedure

Test Procedure
1. One wide band power sensor is connected to each antenna port of the EUT
1. EUT transmitter is activated in test mode under normal conditions
2. The output power is measured simultaneously at all antenna ports
3. The maximum power level is determined

3.3.6 Results

Test Results - 5150 - 5250 MHz						
Mode	Channel	Frequency [MHz]	Nominal BW [MHz]	Power [dBm]	Limit [dBm]	Verdict
OFDM	36	5180	20	16.6	24	PASS
OFDM	40	5200	20	16.0	24	PASS
OFDM	48	5240	20	18.2	24	PASS
HT20	36	5180	20	16.8	24	PASS
HT20	40	5200	20	16.2	24	PASS
HT20	48	5240	20	18.3	24	PASS
HT40	36+40	5190	40	16.5	24	PASS
HT40	44+48	5230	40	18.2	24	PASS
VHT20	36	5180	20	16.8	24	PASS
VHT20	40	5200	20	16.2	24	PASS
VHT20	48	5240	20	18.3	24	PASS
VHT40	36+40	5190	40	16.5	24	PASS
VHT40	44+48	5230	40	18.2	24	PASS
VHT80	36+40+44+48	5210	80	14.8	24	PASS
Comment	Includes 2.0 dB PCB loss					

Test Results - 5725 - 5850 MHz						
Mode	Channel	Frequency [MHz]	Nominal BW [MHz]	Power [dBm]	Limit [dBm]	Verdict
OFDM	149	5745	20	9.8	30	PASS
OFDM	157	5785	20	9.6	30	PASS
OFDM	165	5825	20	9.4	30	PASS
HT20	149	5745	20	10.0	30	PASS
HT20	157	5785	20	9.8	30	PASS
HT20	165	5825	20	9.6	30	PASS
HT40	149+153	5755	40	9.8	30	PASS
HT40	157+161	5795	40	9.6	30	PASS
VHT20	149	5745	20	10.0	30	PASS
VHT20	157	5785	20	9.8	30	PASS
VHT20	165	5825	20	9.6	30	PASS
VHT40	149+153	5755	40	9.8	30	PASS
VHT40	157+161	5795	40	9.6	30	PASS
VHT80	149+153+157+161	5775	80	10.2	30	PASS
Comment	Includes 5.0 dB PCB loss					