Prüfbericht - Produkte
Test Report - Products

VLAC-017 Certificate #5056.02

Prüfbericht-Nr.: *Test Report No.:*	**JP229S3F 002**	**Auftrags-Nr.:** *Order No.:*	**150246456**	**Seite 1 von 106** *Page 1 of 106*
Kunden-Referenz-Nr.: *Client Reference No.:*	N/A	**Auftragsdatum:** *Order Date:*	2021-08-31	
Auftraggeber: *Client:*	Panasonic Corporation 4261 Ikonobe-cho, Tsuzuki-ku, Yokohama-shi, Kanagawa-ken 224-8520, Japan			
Prüfgegenstand: *Test Item:*	Car Navigation			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	AT2201	**Serien-Nr.:** *Serial No.:*	No. 002	
Auftrags-Inhalt: *Order Content:*	Radio Testing			
Prüfgrundlage: *Test Specification:*	**FCC 47 CFR Part 15, Subpart C, Section 15.247** **RSS-Gen (Issue 5): 2018+A1:2019** **RSS-247 (Issue 2): 2017** ANSI C63.10-2013 KDB Publication No. 558074 D01 (v05r02): Guidance for Compliance Measurement on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operation under Section 15.247 of the FCC Rules			
Wareneingangsdatum: *Date of Receipt:*	2021-09-06			
Prüfmuster-Nr.: *Test Sample No.:*	A003125761, A003125757			
Prüfzeitraum: *Testing Period:*	2021-09-07 - 2021-10-28			
Ort der Prüfung: *Place of Testing:*	Yokohama EMC Laboratory			
Prüflaboratorium: *Testing Laboratory:*	TÜV Rheinland Japan Ltd.			
Prüfergebnis*: *Test Result*:*	Pass			

Überprüft von: *Reviewed by:*		**Genehmigt von:** *Authorized by:*	
Datum: 2022-03-15 *Date:*	Daisuke Watanuki	**Datum:** 2022-03-15 *Date:*	Pin Zhang
***Stellung** / Position:*	Inspector	***Stellung** / Position:*	Reviewer

Sonstiges / *Other:*

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the Test Item at Delivery:*	Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

* Legende: ** Legend:*	P(ass) = entspricht o.g. Prüfgrundlage(n) *P(ass) = passed a.m. test specification(s)*	F(ail) = entspricht nicht o.g. Prüfgrundlage(n) *F(ail) = failed a.m. test specification(s)*	N/A = nicht anwendbar *N/A = not applicable*	N/T = nicht getestet *N/T = not tested*

REVISIONS

Report No.	Issue date	Changes / Remarks
JP229S3F 001	2022-02-18	Original document for Bluetooth Classic
JP229S3F 002	2022-03-15	Corrections in the section 5.2.7.

Contents

1. General Remarks

1.1 Test Specifications

Table 1: Test Summary

Test	Specifications	Result
Radio: FCC 47 CFR Part 15, Subpart C, Section 15.247 RSS-Gen (Issue 5): 2018+A1:2019 RSS-247 (Issue 2): 2017 ANSI C63.10-2013 KDB Publication No. 558074 D01 (v05r02): Guidance for Compliance Measurement on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operation under Section 15.247 of the FCC Rules		
Conducted Output Power	FCC 15.247(b)(1) RSS-247 Section 5.4	Pass
20dB Bandwidth	FCC 15.215(c), 15.247(a)(1) RSS-247 Section 5.1	Pass
99% Bandwidth	For reference	Performed
Carrier Frequency Separation	FCC §15.247(a)(1) RSS-247 Section 5.1	Pass
Number of Hopping Frequencies	FCC §15.247(a)(1)(iii) RSS-247 Section 5.1	Pass
Average Time of Occupancy	FCC §15.247(a)(1)(iii) RSS-247 Section 5.1	Pass
Conducted Spurious Emissions	FCC 15.247(d) RSS-247 Section 5.5	Pass
Duty Cycle	For reference	Performed
Radiated Spurious Emissions of Transmitter	FCC 15.205, FCC 15.209, FCC 15.247(d) RSS-Gen Section 8.10, 8.9, RSS-247 Section 5.5	Pass
Conducted Emission on AC Power Ports	FCC 15.207 RSS-Gen Section 8.8 Not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.	N/A

1.2 Test Report Purpose

The purpose of this test report is to show compliance of the EUT (Equipment Under Test) with the requirements of the FCC rules and ISED standards listed in section 1.1.

This test report covers Bluetooth Classic part of the product, who has multiple wireless connectivity: Bluetooth (Classic and Low Energy), WLAN (2.4GHz and 5GHz).

This test report JP229S3F 002 replaces the original one JP229S3F 001 due to corrections.

1.3 Complementary Materials

There is no attachment to this test report.

2. Test Sites

2.1 Test Facilities

TÜV Rheinland Japan Ltd. – Global Technology Assessment Center
4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan

The test facility is accredited by VLAC (member of ILAC) under number VLAC-017-1 according to ISO/IEC 17025:2017.

The test facility is recognized by the Federal Communications Commission (FCC) as a Conformity Assessment Body under designation number JP0017 and test firm registration number 386498.

The test site is registered by Innovation, Science and Economic Development Canada (ISED) under OATS filing number 3466B-1.

2.2 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Model Name	Serial Number	Equip. ID	Cal. Interval	Cal. Date	Next Cal.
For Antenna Port Conducted Emission							
EMI Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	1 year	2021-08-25	2022-08-25
EMI Receiver	Rohde & Schwarz	ESW 26	101316	RF-0812	1 year	2021-05-21	2022-05-21
EMI Receiver	Rohde & Schwarz	ESW 44	101751	RF-0809	1 year	2021-09-27	2022-09-27
10dB Attenuator	Huber + Suhner	6610_SMA -50- 1/199_NE	-	RF-0762	1 year	2021-03-17	2022-03-17
For Radiated Emission (RE)							
Radiated Emission Measurement Soft-ware (above 30MHz)	Toyo Corporation	EP7/RE	VER. 8.0.90	RF-0026	1 year	2021-02-16	2022-02-16
EMI Receiver	Rohde & Schwarz	ESU 8	100025	RF-0020	1 year	2021-03-12	2022-03-12
EMI Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	1 year	2021-08-25	2022-08-25
RF Selector (10m Chamber)	Toyo Corporation	NS4900	0703-182	RF-0029	1 year	2021-02-16	2022-02-16
Loop Antenna with Amplifier, 9kHz-30MHz	Rohde & Schwarz	HFH2-Z2	100139	RF-0048	1 year	2021-04-27	2022-04-27

Kind of Equipment	Manufacturer	Model Name	Serial Number	Equip. ID	Cal. Interval	Cal. Date	Next Cal.
Trilog Antenna No. 2, 30-1000MHz	Schwarzbeck	VULB 9168	9168-475	RF-0462	1 year	2021-05-18	2022-05-18
5dB Attenuator	Pasternack	PE7047-5	-	RF-0731	1 year	2021-05-18	2022-05-18
Low Noise Preamplifier, 9kHz-1GHz	TSJ	MLA-10K01-B01-35	1370750	RF-0253	1 year	2021-01-06	2022-01-06
Low Pass Filter, DC-1GHz	R&K	LP1000CH3	12104001	RF-0515	1 year	2021-01-06	2022-01-06
Horn Antenna, 1-8GHz	Schwarzbeck	BBHA 9120 D	1059	RF-0553	1 year	2021-04-03	2022-04-03
Microwave Preamplifier, 1-8GHz	Toyo Corporation	TPA0108-40	0634	RF-0052	1 year	2021-01-06	2022-01-06
Band Reject Filter, 1-8GHz	Nitsuki	NF-49BT	027	RF-0131	1 year	2021-01-06	2022-01-06
Horn Antenna with Preamplifier, 8-18GHz (RX)	Toyo Corporation	HAP06-18W	00000025	RF-0065	1 year	2021-04-03	2022-04-03
High Pass Filter, 8-18GHz	Micro-Tronics	HPM50107	006	RF-0334	1 year	2021-04-03	2022-04-03
Horn Antenna with Preamplifier, 18-26.5GHz (RX)	Toyo Corporation	HAP18-26N	00000010	RF-0070	1 year	2021-04-03	2022-04-03
Horn Antenna with Preamplifier, 26.5 -40GHz (RX)	Toyo Corporation	HAP26-40N	00000007	RF-0069	1 year	2021-04-03	2022-04-03
20dB Attenuator	Weinschel Associates	WA54-20-12	-	RF-0560	1 year	2021-07-15	2022-07-15
Band Reject filter	MICRO-TRONICS	BRM50702	G488	RF-0933	1 year	2021-09-14	2022-09-14
Band Reject filter	MICRO-TRONICS	BRC50703	027	RF-0408	1 year	2021-07-16	2022-07-16
Constant Voltage Constant Frequency Stabilizers and Power Accessories							
CVCF (10m Chamber)	NF Corporation	ES2000U	9067307	RF-0212	1 year	2021-03-12	2022-03-12
CVCF Booster (10m Chamber)	NF Corporation	ES2000B	9074408	RF-0213	1 year	2021-03-12	2022-03-12
DC Power Supply	Kikusui	PWR800L	NA003235	PV-0039	N/A	N/A	N/A
True RMS Multimeter	Fluke	87V	97680445	RF-0281	1 year	2020-12-15	2021-12-15
True RMS Multimeter	Fluke	87V	97680450	RF-0282	1 year	2021-03-23	2022-03-23
True RMS Multimeter	Fluke	87V	16110176	RF-0414	1 year	2021-06-10	2022-06-10
AC,DC Power Source	NF Corporation	EC1000SA	9364678	RF-0940	1 year	2021-09-21	2022-09-21

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025 has been confirmed before testing.

2.3 Measurement Uncertainty

Table 3: Emission Measurement Uncertainty

Measurement Type	Frequency	Uncertainty
AC Power Line Conducted Emission	150kHz - 30MHz	±2.0dB
Antenna Port Conducted Emission	20Hz - 40GHz	±1.5dB
Radiated Emission	150kHz - 30MHz	±4.7dB
	30MHz - 1GHz	±3.8dB at 3m ±5.0dB at 10m
	> 1GHz	±4.5dB

Note:

The measurement instrumentation uncertainty (MIU) was determined according to CISPR 16-4-2 and ETSI TR 100-028. All MIU values mentioned in the above table are smaller than the uncertainty budgets specified by CISPR 16-4-2 and ETSI TR 100-028, therefore compliance for all emission measurements is deemed to occur if no measured disturbance level exceeds the disturbance limit.

3. General Product Information

3.1 Product Function and Intended Use

The **EUT** (**E**quipment **U**nder **T**est) is a car navigation to be installed in vehicles with wireless connectivity of Bluetooth, WLAN (2.4GHz and 5GHz) and GNSS.

3.2 Ratings and System Details

Radio standard:	Bluetooth Ver.3.0 DH5, 2DH5, 3DH5
Frequency range:	2402 - 2480MHz
Antenna gain:	+1.01dBi (RF1)
Antenna type:	Inverted F Type Antenna
Antenna mounting type:	Internal
Modulation type:	FHSS coupled with GFSK (1Mbps), π/4-DQPSK (2Mbps) and 8DPSK (3Mbps)
Signal spreading:	FHSS (coupled with modulation type above)
Transmit speed:	DH5: 1Mbps, 2DH5: 2Mbps, 3DH5: 3Mbps
Number of channels:	79
Channel spacing:	1MHz
FCC classification:	DSS (Spread Spectrum Transmitter)
ISED classification:	Bluetooth Device, Vehicle Device, RSS-247 Non-DFS
Emission designator:	F1D (GFSK) and G1D (π/4-DQPSK & 8DPSK)
Simultaneous transmission:	CDD, MIMO for WLAN 5GHz WLAN 5GHz, WLAN 2.4GHz and Bluetooth can simultaneously transmit.
Rated temperature:	-30 to +65°C
Rated voltage:	DC 12V
Rated input Current:	13.11A (Max.)
Protection class:	III
Test voltage:	DC 13.2V for radio testing

3.3 Noise Generating and Noise Suppressing Parts

The highest frequency generated or used by the EUT is 5825MHz as intentional radiator portion.

3.4 Submitted Documents and Information

Following documents have been submitted by the client:

Block Diagram, BOM, Label and location.

Following information provided in this test report has been submitted by the client:

- client name and address;
- EUT identification, ratings, system details, and description of product function and intended use;
- information related to noise generating and noise suppressing parts (if any).

4. Test Setup and Operation Modes

4.1 Test Methodology

The test methodology used is based on the requirements of 47 CFR Part 15, Sections 15.31, 15.33, 15.35, 15.205, 15.207, 15.209, 15.247, RSS-247 and RSS-Gen.

The test methods, which have been used, are based on ANSI C63.10 and KDB 558074 D01.

For details, see under each test item.

4.2 Operation Modes

Testing was performed at the lowest operating frequency (2402MHz), at the operating frequency in the middle of the specified frequency band (2441MHz) and at the highest operating frequency (2480MHz).

The basic operation modes used for testing are:

A. EUT transmits (TX mode), with full power, at lowest channel (2402MHz), with the highest duty cycle available, modulated signal streaming.

B. EUT transmits (TX mode), with full power, at middle channel (2441MHz), with the highest duty cycle available, modulated signal streaming.

C. EUT transmits (TX mode), with full power, at highest channel (2480MHz), with the highest duty cycle available, modulated signal streaming.

H. EUT transmits (TX mode), with full power, a continuous modulated signal streaming while hopping on all channels.

Configurations:

BDR 1 Mbps (DH1, DH3, DH5)
EDR 2 Mbps (2DH1, 2DH3, 2DH5)
EDR 3 Mbps (3DH1, 3DH3, 3DH5)

Note: DH5, 2DH5 and 3DH5 are tested as representative configurations. 2DH mode are excluded for test items other than Maximum Peak Output Power by using 3DH as representative.

4.3 Physical Configuration for Testing

The test system was configured in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.10.

Figure 1: Block Diagram

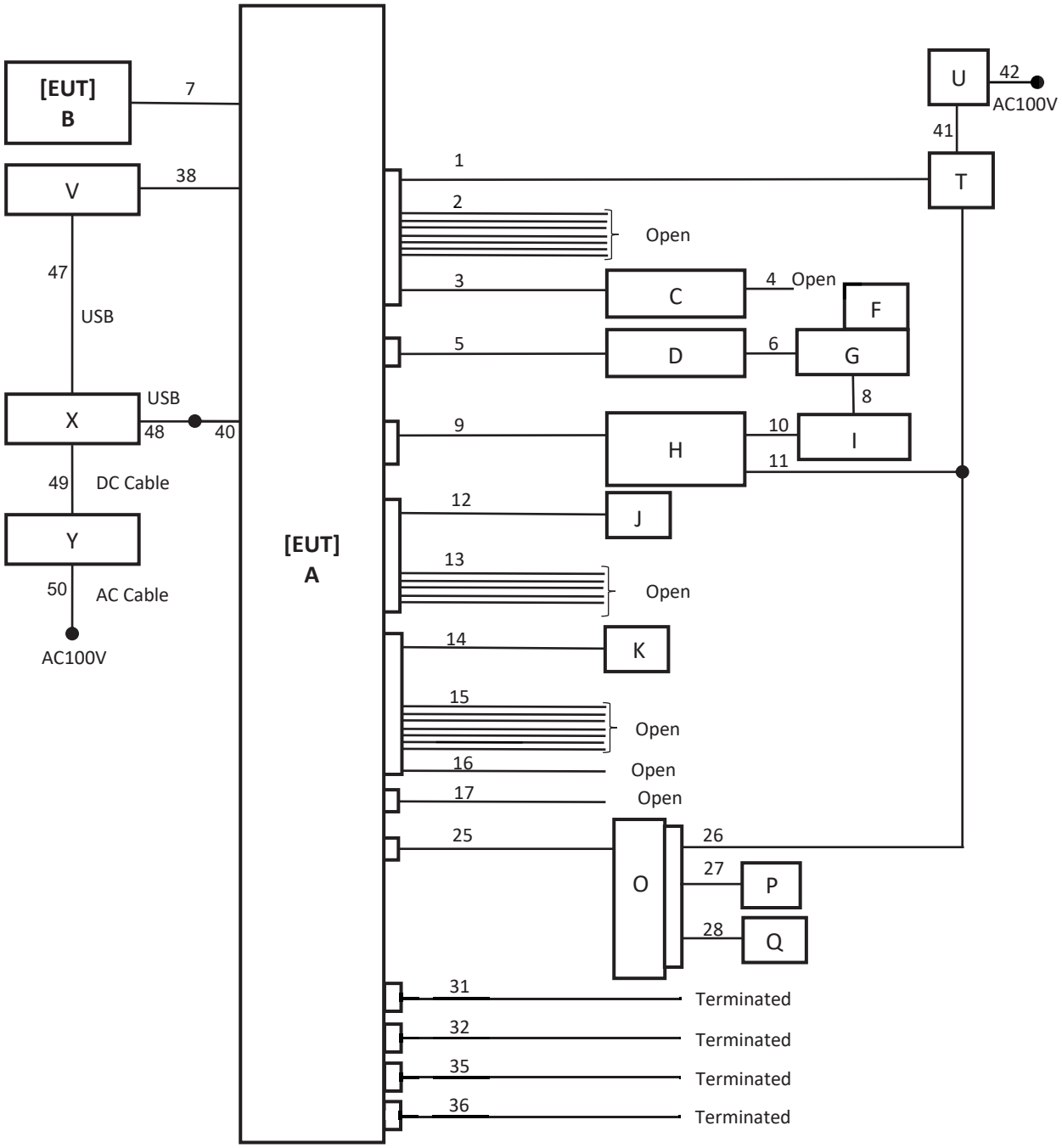

Table 4: The System consists of the Following Units

No.	Item	Model No.	Serial Number	Manufacturer	Remark
A	Car Navigation	AT2201	No. 002	Panasonic Corporation	EUT
B	GNSS Antenna	3498778-10	06D30023	Panasonic Corporation	EUT
C	Steering Switch	-/-	1143	Panasonic Corporation	-/-
D	IF Box	DEP32-10078	035	Panasonic Corporation	-/-
F	USB memory	RUF3-KS	-/-	Buffalo Inc.	-/-
G	USB Hub	U3H-A422BX	0600235	ELECOM	-/-
H	JIG Board	GVIF2HDJIG	15	Panasonic Corporation	-/-
I	Separate Display	ON-LAP 11021	-/-	TEKWIND	-/-
J	Mic	GP-SDA3510A	0DC062856	Panasonic Corporation	-/-
K	Mic	GP-SDA3510A	0DC062519	Panasonic Corporation	-/-
O	MOST AMP	CL-DL47X2AJ Rev.A	513263	Panasonic Corporation	-/-
P	Speaker	TS-X180	-/-	Pioneer	-/-
Q	Dummy load	-/-	Unspecified	Panasonic Corporation	-/-
T	Terminal Block	-/-	-/-	-/-	-/-
U *1)	Power Supply (DC) CVCF+Booster	ES2000U, ES2000B	9067307, 9074408	NF Corporation, NF Corporation	-/-
U *2)	Power Supply (DC)	PWR800L	NA003235	Kikusui	-/-
V	Jig board	WR12-3224	-/-	WESTEK	-/-

X	Laptop PC	20U2S5M60Q	PF2YP1PV	Lenovo	-/-
Y	AC adapter for Laptop PC	ADLX65YDC2 D	8SSA10R16918D1S G 16B0 1H7	Lenovo	-/-

*1) Used for Radiated Emission test
*2) Used for Conducted test

Note: For more details, refer to section: Photographs of the Test Set-Up.

Table 5: Interfaces present on the EUT

No.	Name	Length(m)	Shield		Remarks
			Cable	Connector	
1	DC cable	2.0m	Unshielded	Unshielded	-
2	Signal cable	2.0m	Unshielded	Unshielded	-
3	Signal cable	2.0+0.1m	Unshielded	Unshielded	-
4	IF Box Power	0.3m	Unshielded	Unshielded	-
5	Signal cable	1.0m	Shielded	Shielded	-
6	USB cable	0.07m	Shielded	Shielded	-
7	GPS cable	3.7m	Shielded	Shielded	-
8	USB cable	1.2m	Shielded	Shielded	-
9	GBIF (Separate Display)	1.9m	Shielded	Shielded	-
10	HDMI cable	1.2m	Shielded	Shielded	-
11	DC cable	2.0+0.5m	Unshielded	Unshielded	-
12	Mic	2.0m	Unshielded	Unshielded	-
13	Signal cable	2.0m	Unshielded	Unshielded	-
14	Mic	2.0m	Unshielded	Unshielded	-
15	Signal cable	2.0m	Unshielded	Unshielded	-
16	Signal cable	2.0m	Unshielded	Unshielded	-
17	RSE	2.0m	Shielded	Shielded	-
25	MOST AMP	2.5m	Unshielded	Unshielded	-
26	DC cable	1.0m	Unshielded	Unshielded	-
27	Speaker cable	1.0+4.8m	Unshielded	Unshielded	-
28	Speaker cable	1.0m	Unshielded	Unshielded	-
31	A2B	3.0m	Unshielded	Unshielded	-
32	DCM	3.0m	Unshielded	Unshielded	-
35	FM	2.0m	Shielded	Shielded	-
36	FM	2.0m	Shielded	Shielded	-
38	Signal cable	0.1m	Unshielded	Unshielded	*3)
40	UART	0.3m	Unshielded	Unshielded	*3)
47	USB	1.1m	Shielded	Shielded	*3)
48	UART-USB	1.8m	Shielded	Shielded	*3)
49	DC cable of AC adapter	1.8m	Shielded	Shielded	*3)
50	AC cable of AC adapter	1.0m	Unshielded	Unshielded	*3)

*3) This cable is for testing and is not included with products.

For more details, refer to section: Photographs of the Test Setup.

4.4 Test Software

The EUT was provided by the manufacturer with suitable software to allow operation in all the required modes.

Software used for testing:

Tera term version 4.106 (SVN# 9298) by TeraTerm Project
CCD_WiFi_TxPower_3dB_UP_Procedure manual_00.xlsx by Panasonic
BT_BLE_Procedure manual version.xls by Panasonic

These software were running on external PC. It was used to enable the operation modes listed in section 4.2 as appropriate.

4.5 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

1. Product: Laptop PC
   Manufacturer: Lenovo
   Model: 20U2S5M60Q
   Rated Voltage: DC 20V
   Input Current: 2.25A
   Protection Class: III
   Serial Number: PF2YP1PV

2. Product: AC adapter for Laptop PC
   Manufacturer: Lenovo
   Model: ADLX65YDC2D
   Rated Voltage: AC 100-240V
   Input Current: 1.8A
   Frequency: 50-60Hz
   Protection Class: II
   Serial Number: 8SSA10R16918D1SG 16B0 1H7

3. Product: Steering Switch
   Manufacturer: Panasonic Corporation
   Protection Class: III
   Serial Number: 1143

Note: See section 6 for more details of this Steering Switch as test jig.

4. Product: IF Box
   Manufacturer: Panasonic Corporation
   Model: DEP32-10078
   Protection Class: III
   Serial Number: 035

5. Product: USB Memory
   Manufacturer: Buffalo Inc.
   Model: RUF3-KS
   Protection Class: III

6. Product: USB Hub
   Manufacturer: ELECOM
   Model: U3H-A422BX
   Protection Class: III
   Serial Number: 0600235

7. Product: JIG Board
   Manufacturer: Panasonic Corporation
   Model: GVIF2HDJIG
   Protection Class: III
   Serial Number: 15

8. Product: Separate Display
   Manufacturer: TEKWIND
   Model: ON-LAP 11021
   Rated Voltage: DC 5V
   Input Current: 1.7A
   Protection Class: III

9. Product: Mic
   Manufacturer: Panasonic Corporation
   Model: GP-SDA3510A
   Protection Class: III
   Serial Number: 0DC062856

10. Product: Mic
    Manufacturer: Panasonic Corporation
    Model: GP-SDA3510A
    Protection Class: III
    Serial Number: 0DC062519

11. Product: MOST AMP
    Manufacturer: Panasonic Corporation
    Model: CL-DL47X2AJ Rev.A
    Protection Class: III
    Serial Number: 513263

12. Product: Speaker
    Manufacturer: Pioneer
    Model: TS-X180
    Protection Class: III

4.6 Countermeasures to achieve Compliance

No additional measures were employed to achieve compliance.

5. Test Results RADIO

5.1 Technical Requirements

5.1.1 Supply Voltage Requirements

RESULT: **PASS**

Requirements:

FCC 15.31(e)

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

Verdict:

The EUT has an internal voltage regulator to supply the RF circuit. Hence it complies with the supply voltage requirements.

5.1.2 Antenna Requirements

RESULT: **PASS**

Requirements:

FCC 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Verdict:

The EUT has an internal antenna which is not user accessible. Hence it complies with the antenna requirements.

5.1.3 Restricted Bands of Operation

RESULT: **PASS**

Requirements:

FCC 15.205 and RSS-Gen 8.10

Only spurious emissions are permitted in any of the restricted frequency bands, unless otherwise specified.

Verdict:

The EUT operation frequency range is 2400-2483.5MHz. Therefore only spurious emissions may be found in the restricted bands of operation and the EUT complies with the restricted frequency band requirement.

5.2 Conducted Measurements at Antenna Port

5.2.1 Maximum Peak Output Power

RESULT: **PASS**

Date of testing: 2021-09-27, 2021-09-28

Ambient temperature: 22, 24°C
Relative humidity: 58, 51%
Atmospheric pressure: 1016, 1015hPa

Requirements:

FCC 15.247(b)(1) and RSS-247 5.4

For frequency hopping systems operating in the 2400-2483.5MHz band employing at least 75 non-overlapping hopping channels, the maximum peak conducted output power shall be 1W (30dBm). For other hopping systems operating in the 2400-2483.5MHz band, the maximum peak conducted output power shall be 0.125W (21dBm). The e.i.r.p. shall not exceed 4 W.

Test procedure:

ANSI C63.10 §7.8.5.

The maximum peak output power (conducted) was measured at the antenna connector with a power meter. The final result takes into account the loss generated by all the involved cables.

The measurement was performed at all the available modulations (data rates) in order to identify the one producing the highest output power for each of radios. The results given here below show that the worst case output power is found at the data rate of DH5 for the radio DH and of 2DH5 for the radio 2DH and of 3DH5 for the radio 3DH. Therefore, all the other measurements for the evaluation of the radio properties of the EUT have been performed using this data rates.

Maximum Average Output Power was not performed since the Maximum Peak Output Power is lower than the SAR Test Exclusion Threshold at 5mm distance according to KDB 447498 D01 and RSS-102.

Table 6: Maximum Peak Output Power, DH5

Freq. [MHz]	Peak Power [dBm]	Peak Power Limit [dBm]	Peak Power Margin [dB]	Antenna Gain [dBi]	e.i.r.p. [dBm]	e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
2402	2.90	21	18.10	1.01	3.91	36	32.09
2441	4.27	21	16.73	1.01	5.28	36	30.72
2480	3.39	21	17.61	1.01	4.40	36	31.60

Note:
Cable (including temporary RF cable) and attenuator loss has been compensated for Peak Power
e.i.r.p. [dBm] = Peak Power [dBm] + Antenna Gain [dBi]

Table 7: Maximum Peak Output Power, 2DH5

Freq. [MHz]	Peak Power [dBm]	Peak Power Limit [dBm]	Peak Power Margin [dB]	Antenna Gain [dBi]	e.i.r.p. [dBm]	e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
2402	1.87	21	19.13	1.01	2.88	36	33.12
2441	2.30	21	18.70	1.01	3.31	36	32.69
2480	2.32	21	18.68	1.01	3.33	36	32.67

Note:
Cable (including temporary RF cable) and attenuator loss has been compensated for Peak Power
e.i.r.p. [dBm] = Peak Power [dBm] + Antenna Gain [dBi]

Table 8: Maximum Peak Output Power, 3DH5

Freq. [MHz]	Peak Power [dBm]	Peak Power Limit [dBm]	Peak Power Margin [dB]	Antenna Gain [dBi]	e.i.r.p. [dBm]	e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
2402	2.18	21	18.82	1.01	3.19	36	32.81
2441	2.60	21	18.40	1.01	3.61	36	32.39
2480	2.61	21	18.39	1.01	3.62	36	32.38

Note:
Cable (including temporary RF cable) and attenuator loss has been compensated for Peak Power
e.i.r.p. [dBm] = Peak Power [dBm] + Antenna Gain [dBi]

5.2.2 20dB Bandwidth

RESULT: **PASS**

Date of testing: 2021-10-24

Ambient temperature: 22°C
Relative humidity: 48%
Atmospheric pressure: 1024hPa

Requirements:

FCC 15.215(c),15.247(a)(1) and RSS-247 5.1

For frequency hopping systems operating in the 2400-2483.5MHz band, no bandwidth limit is specified, but data shall be taken for reference.

Test procedure:

ANSI C63.10 §7.8.7.

The 20dB bandwidth was measured at the antenna port with a spectrum analyzer using a peak detector with the following settings: RBW = 30kHz, VBW = 100kHz. Markers were placed at the lowest and highest intersections of the trace with a 20dBc line to obtain the value of the emission bandwidth.

Table 9: 20dB Bandwidth, DH5

Operating Frequency [MHz]	20dB Bandwidth [MHz]
2402	1.027
2441	1.017
2480	1.024

Figure 2: 20dB Bandwidth, DH5, Mode A (2402MHz)

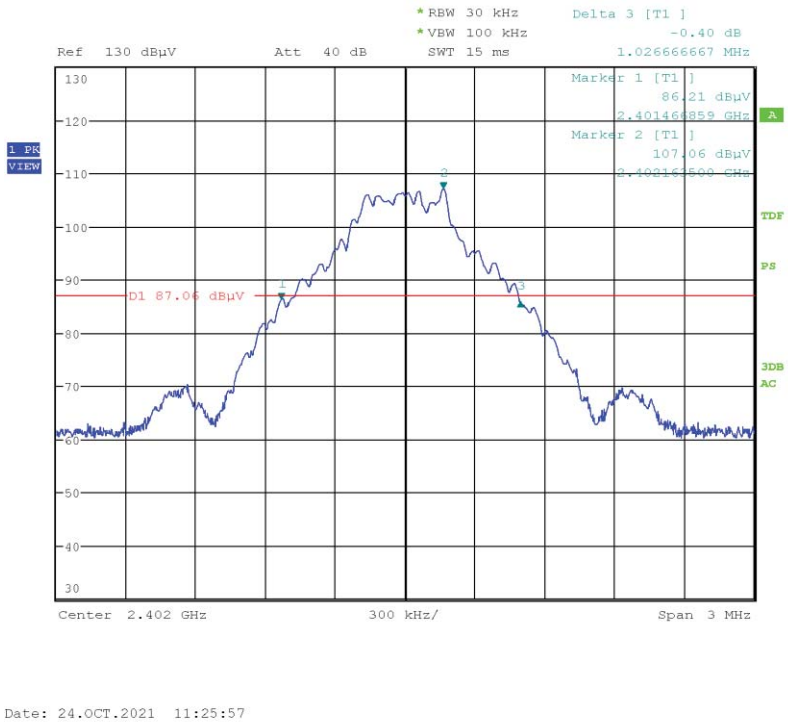

Figure 3: 20dB Bandwidth, DH5, Mode B (2441MHz)

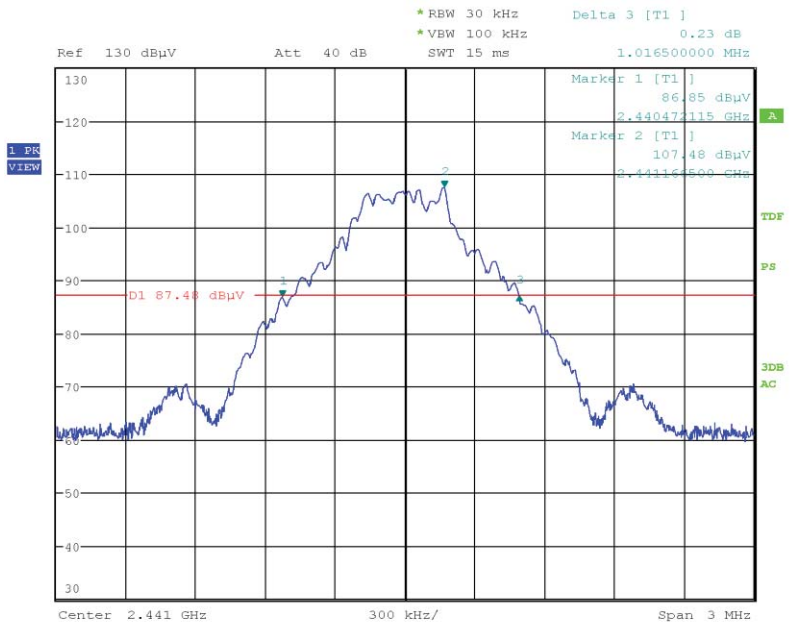

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Figure 4: 20dB Bandwidth, DH5, Mode C (2480MHz)

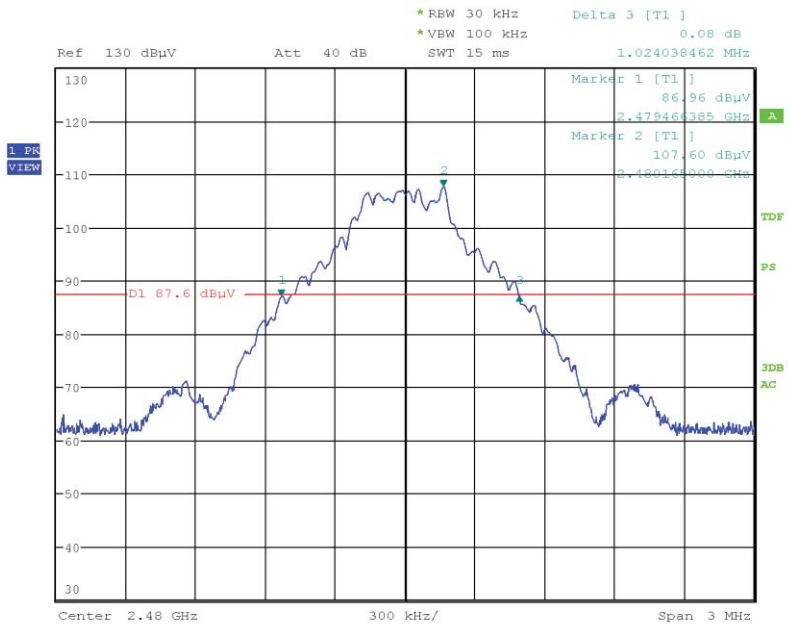

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Table 10: 20dB Bandwidth, 3DH5

Operating Frequency [MHz]	20dB Bandwidth [MHz]
2402	1.303
2441	1.308
2480	1.304

Figure 5: 20dB Bandwidth, 3DH5, Mode A (2402MHz)

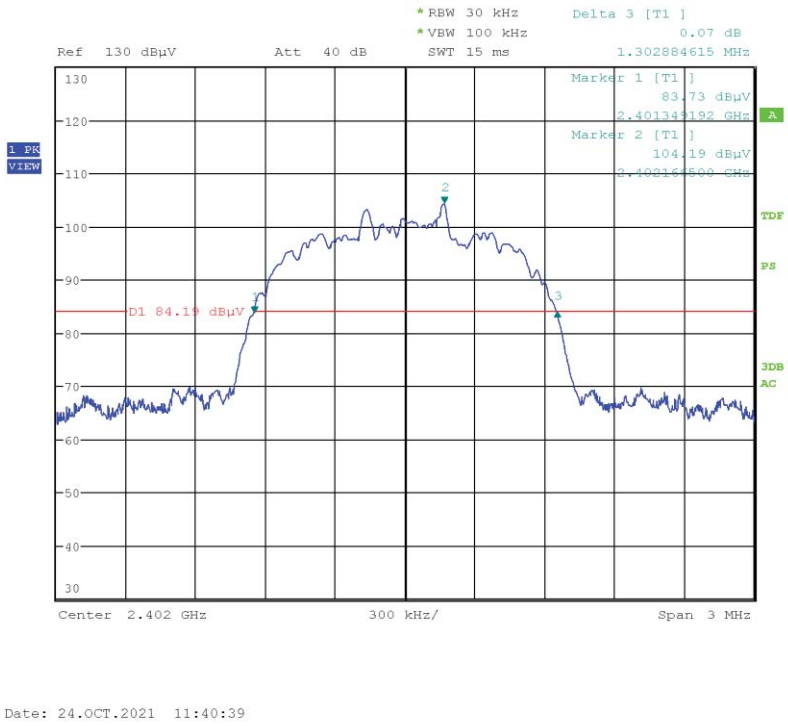

Figure 6: 20dB Bandwidth, 3DH5, Mode B (2441MHz)

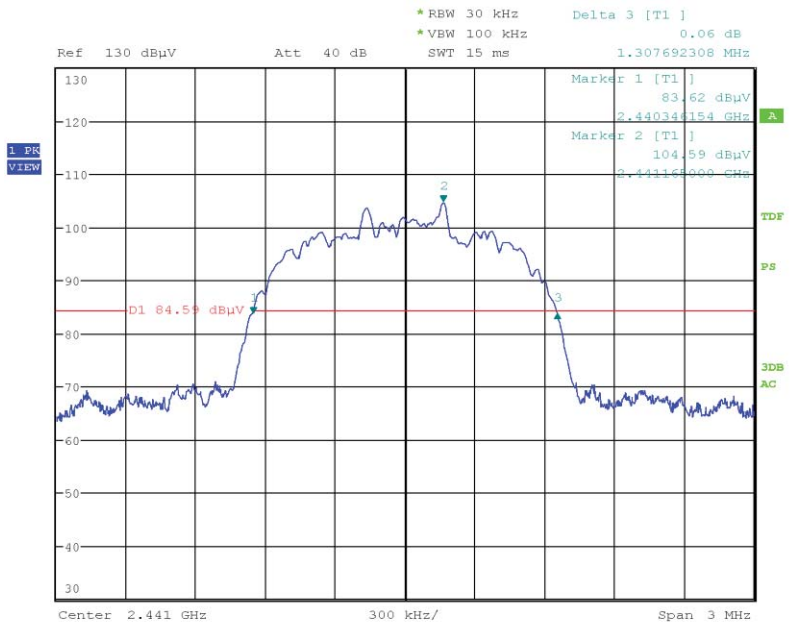

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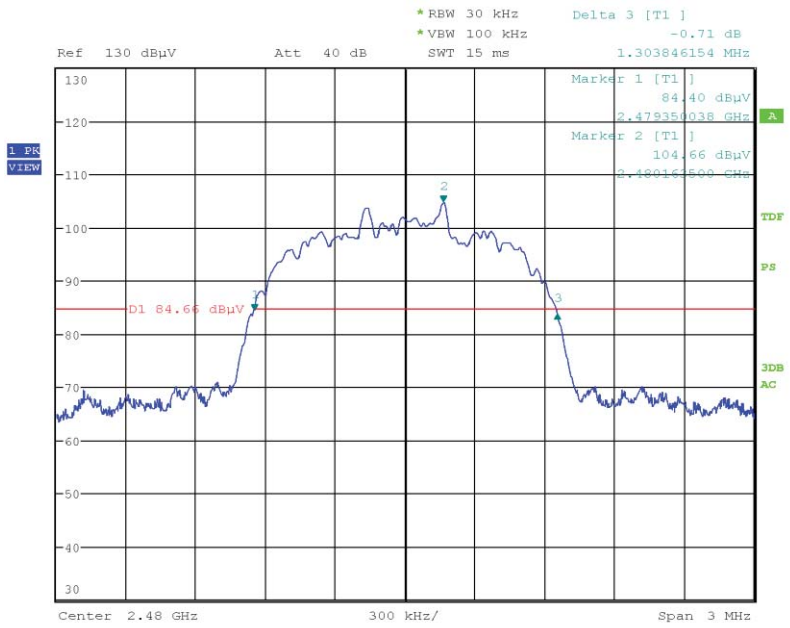
Figure 7: 20dB Bandwidth, 3DH5, Mode C (2480MHz)



Date: 24.OCT.2021 11:57:51

5.2.3 99% Bandwidth

RESULT: **PERFORMED**

Date of testing:	2021-10-24, 2021-10-28
Ambient temperature:	22, 22°C
Relative humidity:	48,58%
Atmospheric pressure:	1024, 1018hPa

Test procedure:

ANSI C63.10 §6.9.3

The 99% bandwidth was measured at the antenna port with a spectrum analyzer using a peak detector. The value of the emission bandwidth was obtained by using the OBW function of the analyzer with a 99% coverage setting.

Table 11: 99% Bandwidth, DH5

Operating Frequency [MHz]	99% Bandwidth [MHz]	Remarks
2402	0.8700	
2441	0.8715	
2480	0.8745	Widest OBW,875KF1D

Figure 8: 99% Bandwidth, DH5, Mode A (2402MHz)

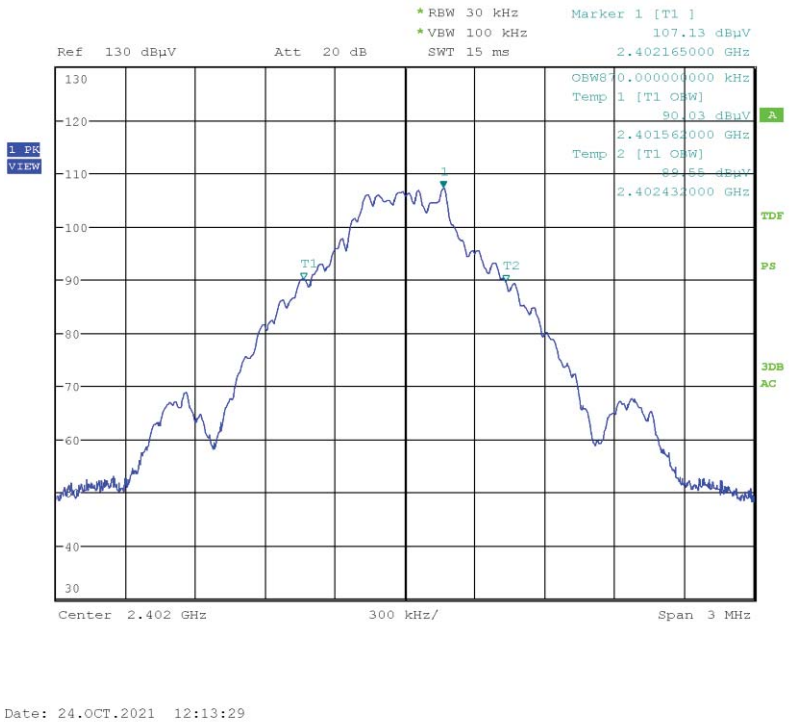


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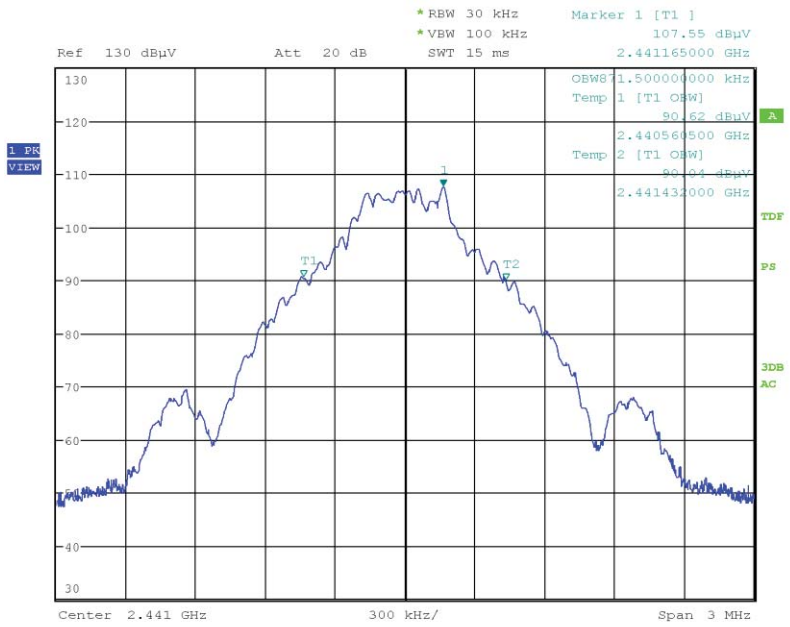
Figure 9: 99% Bandwidth, DH5, Mode B (2441MHz)



Date: 24.OCT.2021 12:15:30

Figure 10: 99% Bandwidth, DH5, Mode C (2480MHz)

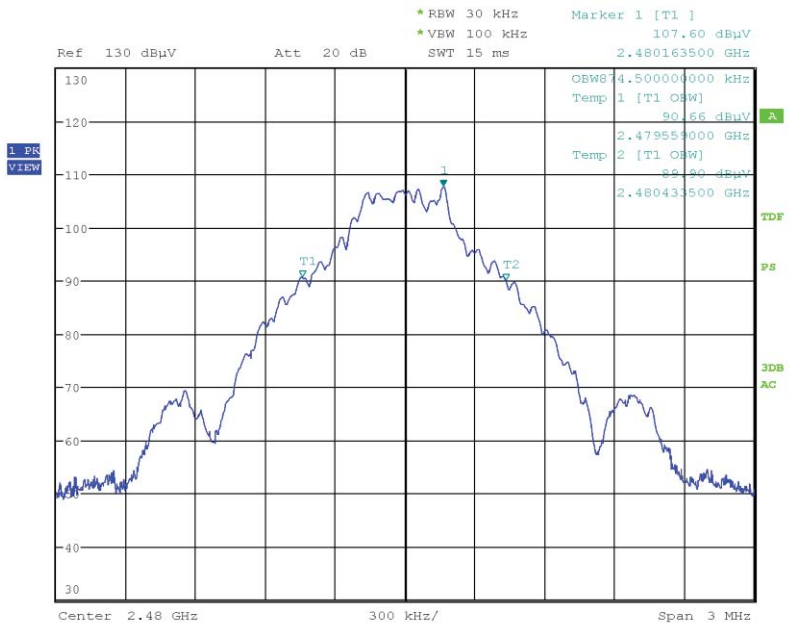


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Table 12: 99% Bandwidth, DH5, Mode H

Operating Frequency [MHz]	99% Bandwidth [MHz]
Hopping	78.900

Figure 11: 99% Bandwidth, DH5, Mode H

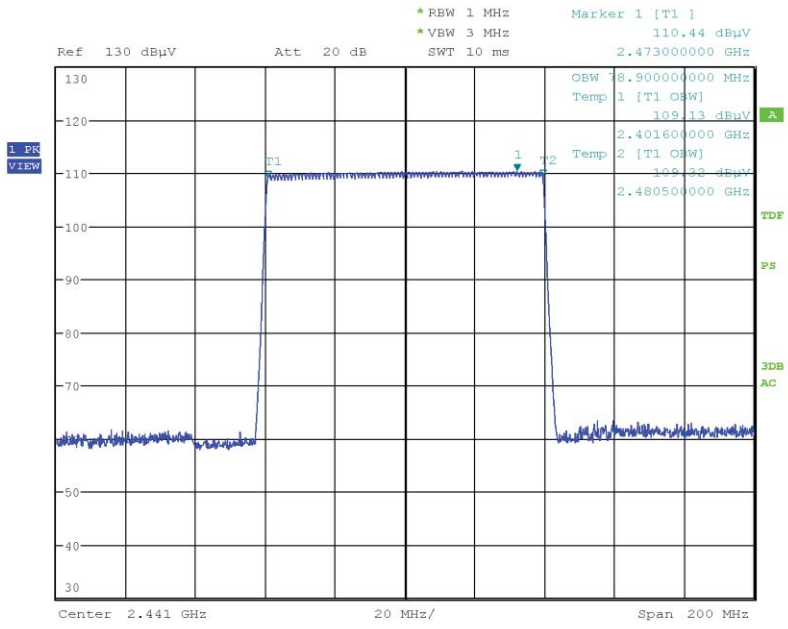

Table 13: 99% Bandwidth, 3DH5

Operating Frequency [MHz]	99% Bandwidth [MHz]	Remarks
2402	1.1760	Widest OBW,1M18G1D
2441	1.1760	
2480	1.1745	

Figure 12: 99% Bandwidth, 3DH5, Mode A (2402MHz)

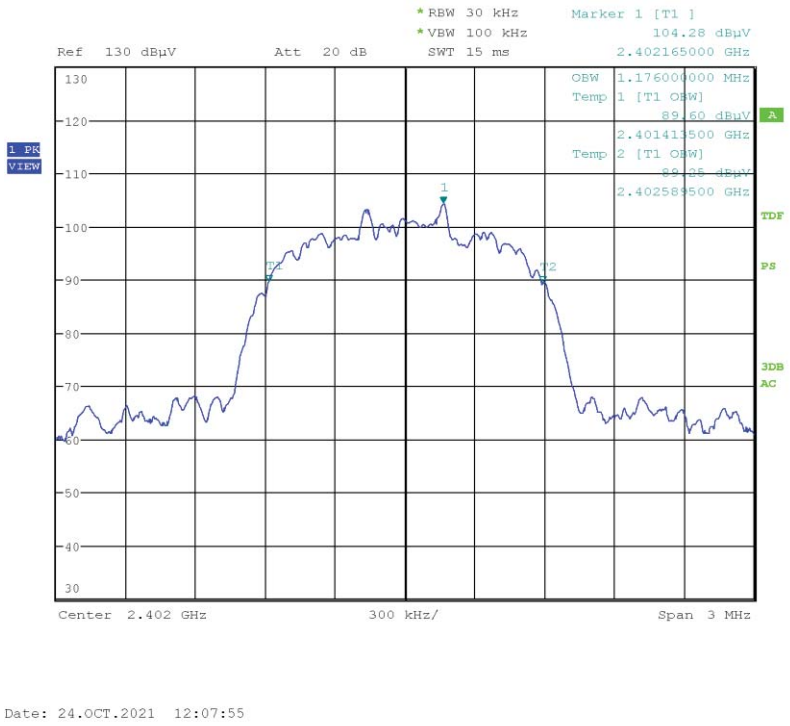

Figure 13: 99% Bandwidth, 3DH5, Mode B (2441MHz)

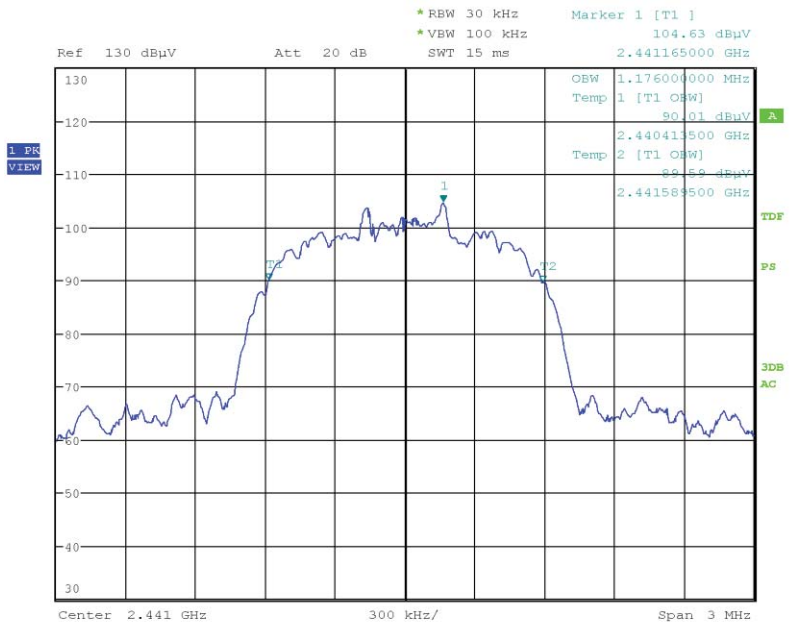

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Figure 14: 99% Bandwidth, 3DH5, Mode C (2480MHz)

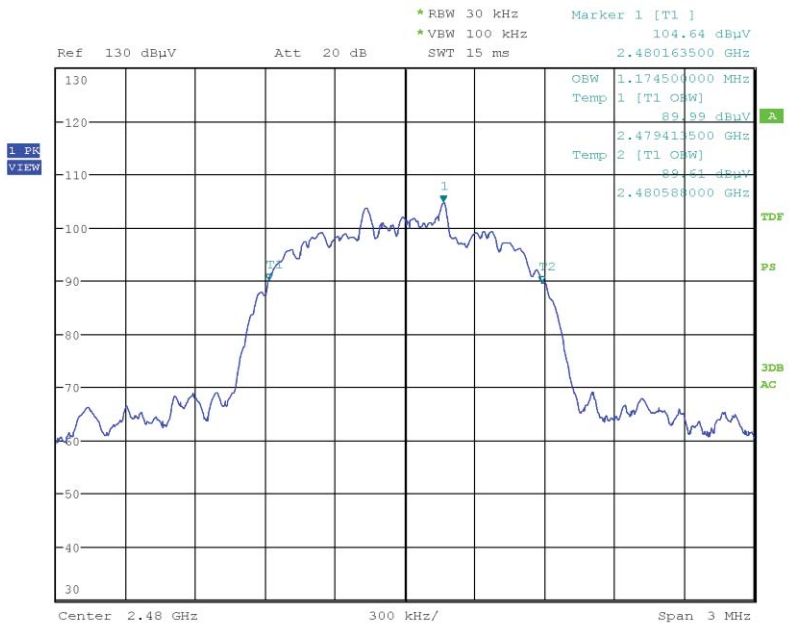

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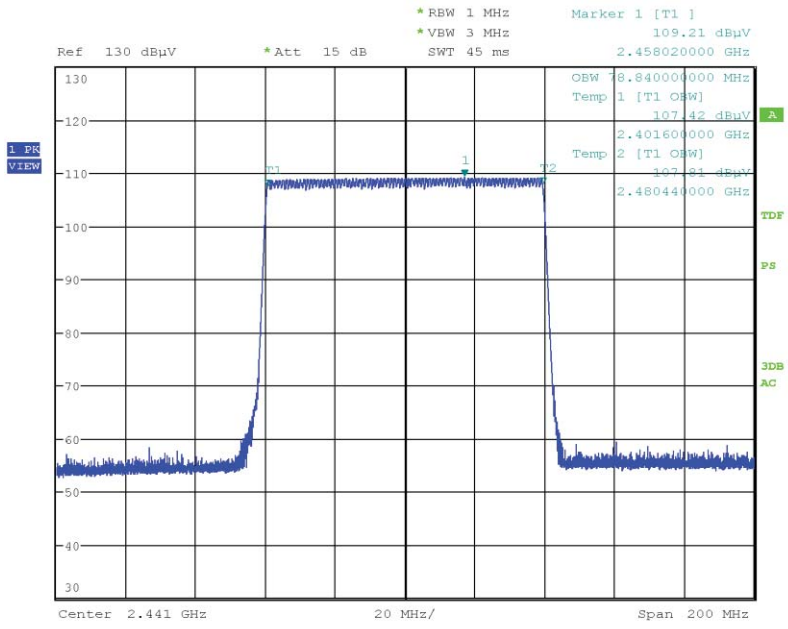
Table 14: 99% Bandwidth, 3DH5, Mode H

Operating Frequency [MHz]	99% Bandwidth [MHz]
Hopping	78.840

Figure 15: 99% Bandwidth, 3DH5, Mode H



5.2.4 Carrier Frequency Separation

RESULT: **PASS**

Date of testing: 2021-10-24, 2021-10-27, 2021-10-28

Ambient temperature: 22, 22, 22°C
Relative humidity: 48, 53, 58%
Atmospheric pressure: 1024, 1015, 1018hPa

Requirements:

FCC 15.247(a)(1) and RSS-247 5.1 (b)

Frequency hopping systems operating in the 2400-2483.5MHz band shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater. In case of an output power less than 125mW, the frequency hopping system may have channels separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

Test procedure:

ANSI C63.10 §7.8.2.

A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 100kHz and the video bandwidth to 1MHz. The Delta Marker function was used to determine the separation between the peaks of two adjacent channels.

Table 15: Carrier Frequency Separation, DH5

Freq. [MHz]	Channel Separation [MHz]	20dB Bandwidth [MHz]	Limit [MHz]
2402	1.003	1.027	0.685
2441	1.001	1.017	0.678
2480	1.004	1.024	0.683

Note: Limit = 20dB bandwidth x 2/3 since it is greater than 25kHz and the output power is less than 125mW.

Figure 16: Carrier Frequency Separation, DH5, Mode A (2402MHz)

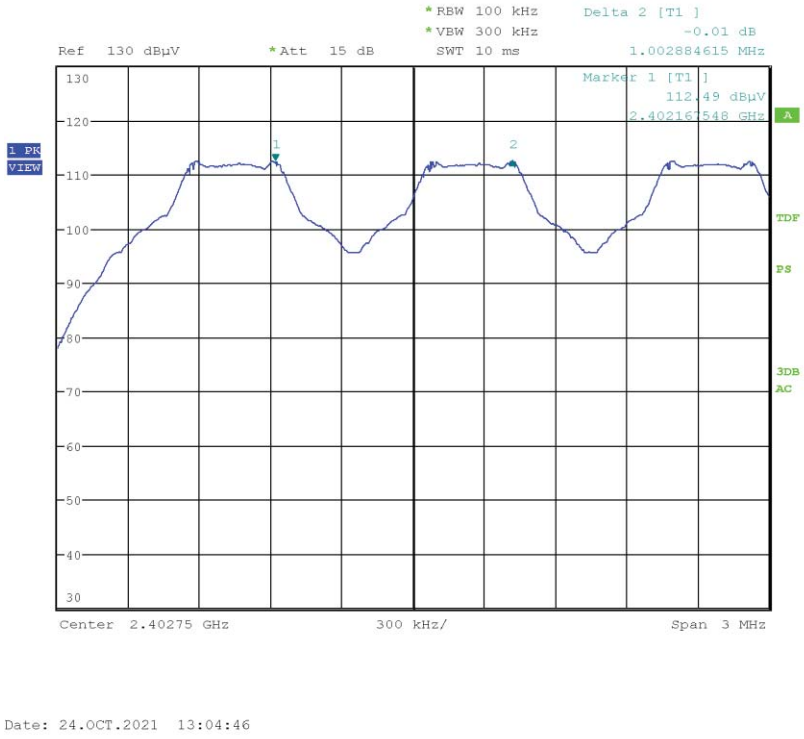


Figure 17: Carrier Frequency Separation, DH5, Mode B (2441MHz)

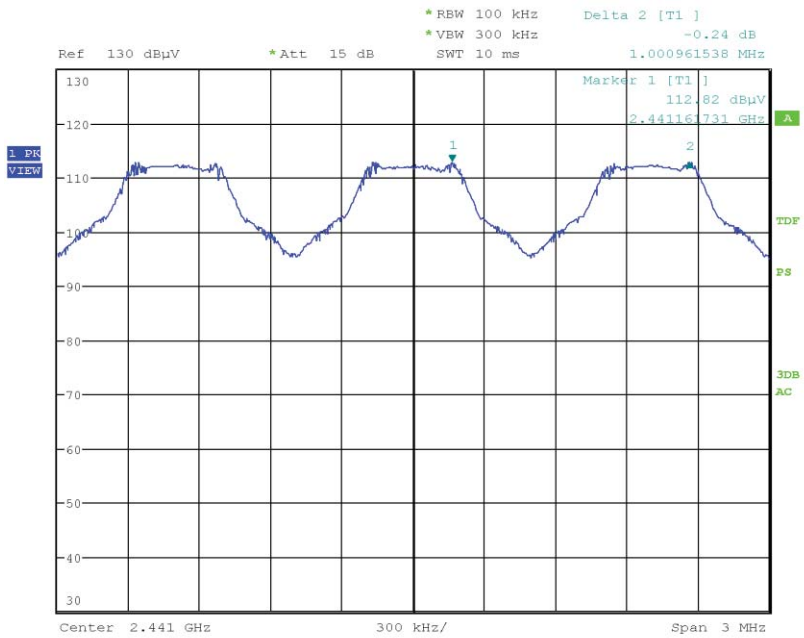


Figure 18: Carrier Frequency Separation, DH5, Mode C (2480MHz)

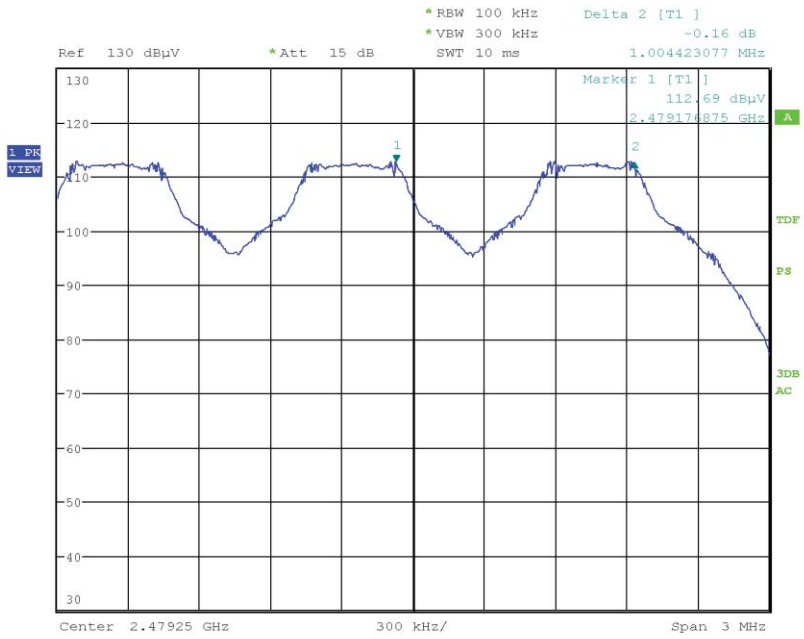


Table 16: Carrier Frequency Separation, 3DH5

Freq. [MHz]	Channel Separation [MHz]	20dB Bandwidth [MHz]	Limit [MHz]
2402	1.007	1.303	0.869
2441	1.005	1.308	0.872
2480	1.007	1.304	0.869

Note: Limit = 20dB bandwidth × 2/3 since it is greater than 25kHz and the output power is less than 125mW.

Figure 19: Carrier Frequency Separation, 3DH5, Mode A (2402MHz)

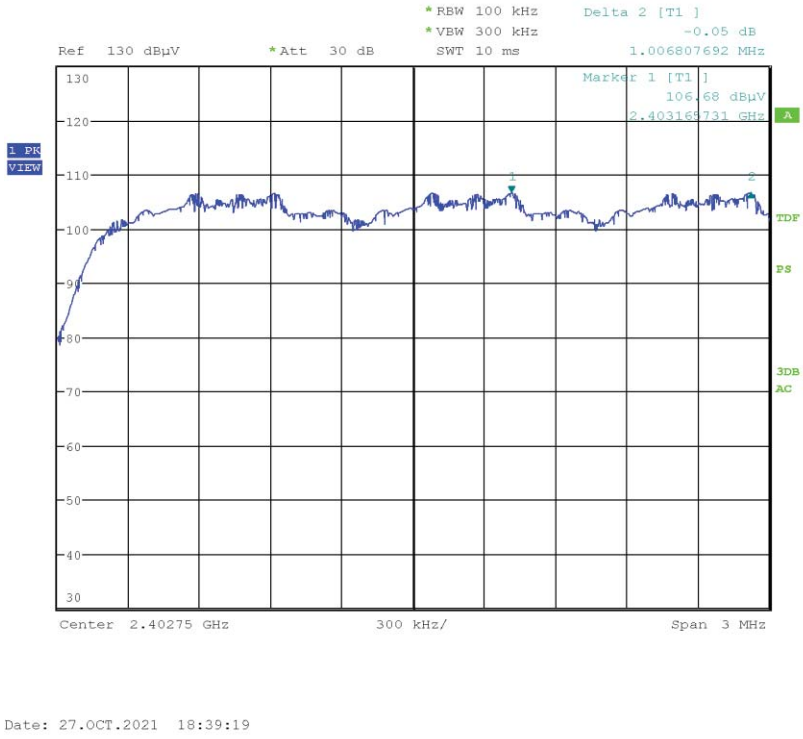


Figure 20: Carrier Frequency Separation, 3DH5, Mode B (2441MHz)

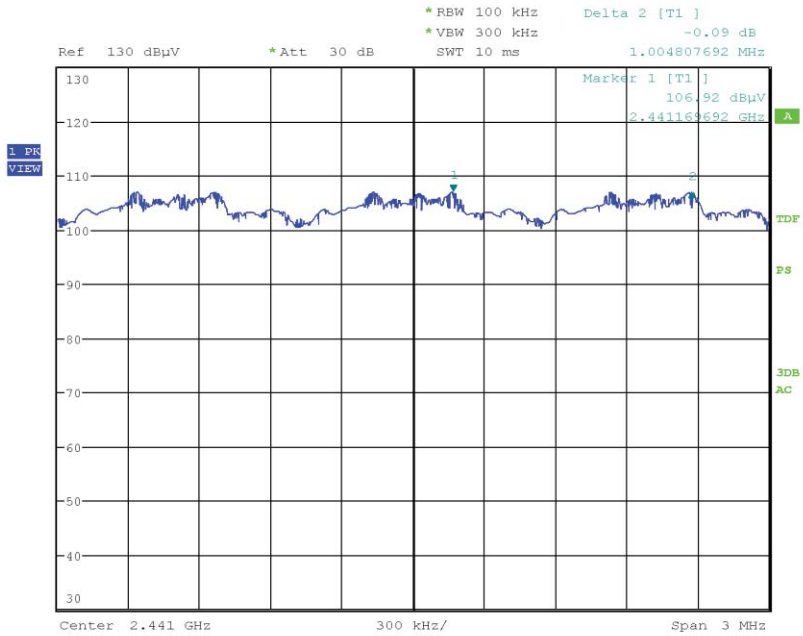


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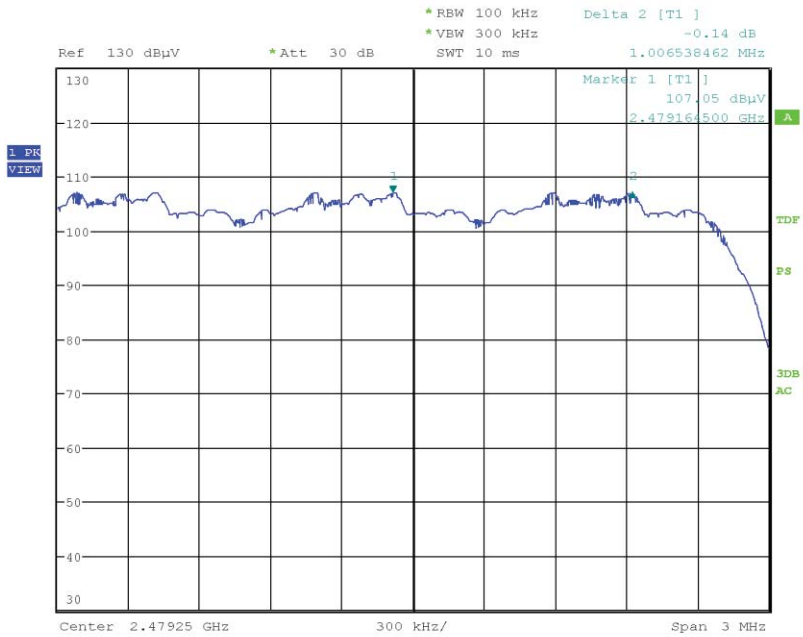
Figure 21: Carrier Frequency Separation, 3DH5, Mode C (2480MHz)



Date: 28.OCT.2021 10:32:35

5.2.5 Number of Hopping Frequencies

RESULT: **PASS**

Date of testing:	2021-10-28
Ambient temperature:	22°C
Relative humidity:	58%
Atmospheric pressure:	1018hPa

Requirements:

FCC 15.247(a)(1)(iii) and RSS-247 5.1 (d)

Frequency hopping systems operating in the 2400-2483.5MHz band shall use at least 15 channels.

Test procedure:

ANSI C63.10 §7.8.3.

A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth and video bandwidth were set to 100kHz. The spectrum was broken into 3 subranges having each a 30MHz span to show all the hopping frequencies.

Table 17: Number of Hopping Frequencies, DH5

Number of Hopping Frequencies	Limit
79	15

Figure 22: Hopping Frequencies, DH5, Mode H, 1/3

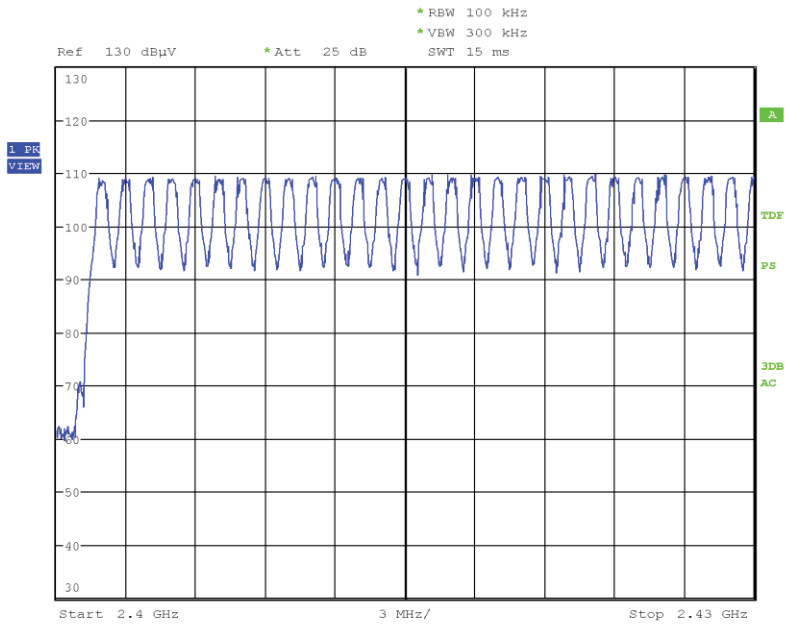


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Figure 23: Hopping Frequencies, DH5, Mode H, 2/3

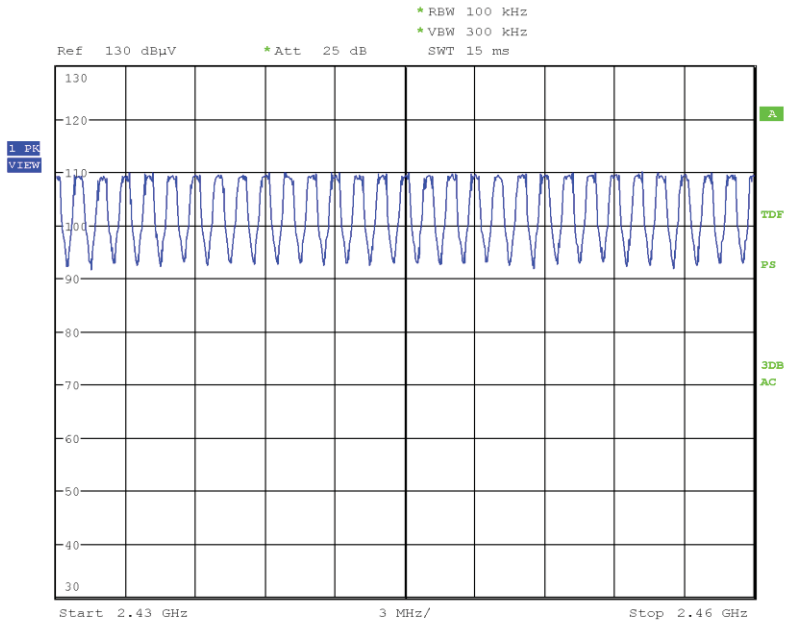


Figure 24: Hopping Frequencies, DH5, Mode H, 3/3

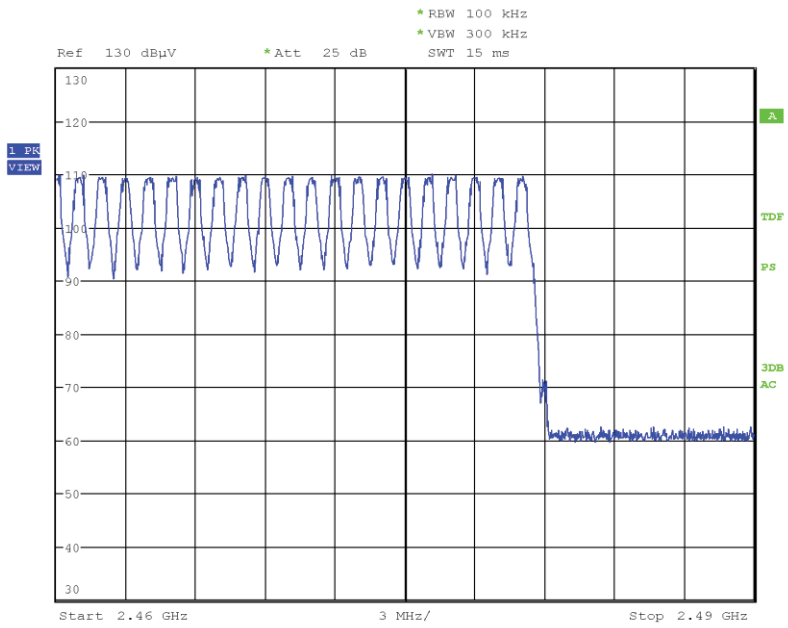


Table 18: Number of Hopping Frequencies, 3DH5

Number of Hopping Frequencies	Limit
79	15

Figure 25: Hopping Frequencies, 3DH5, Mode H, 1/3

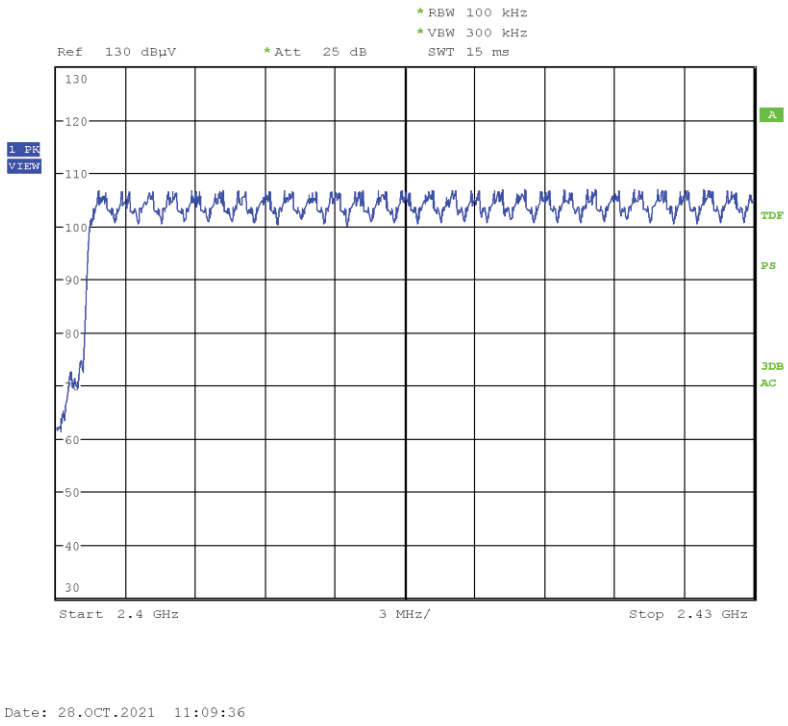


Figure 26: Hopping Frequencies, 3DH5, Mode H, 2/3

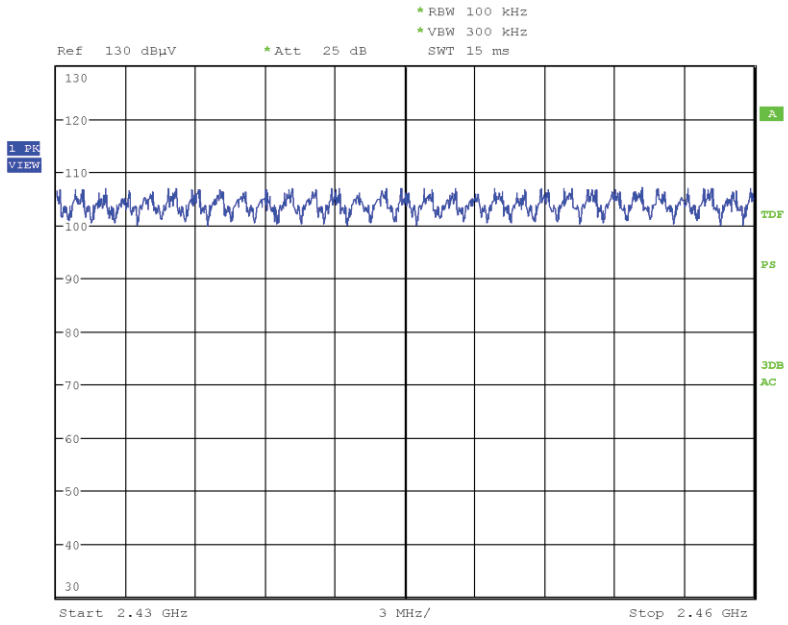
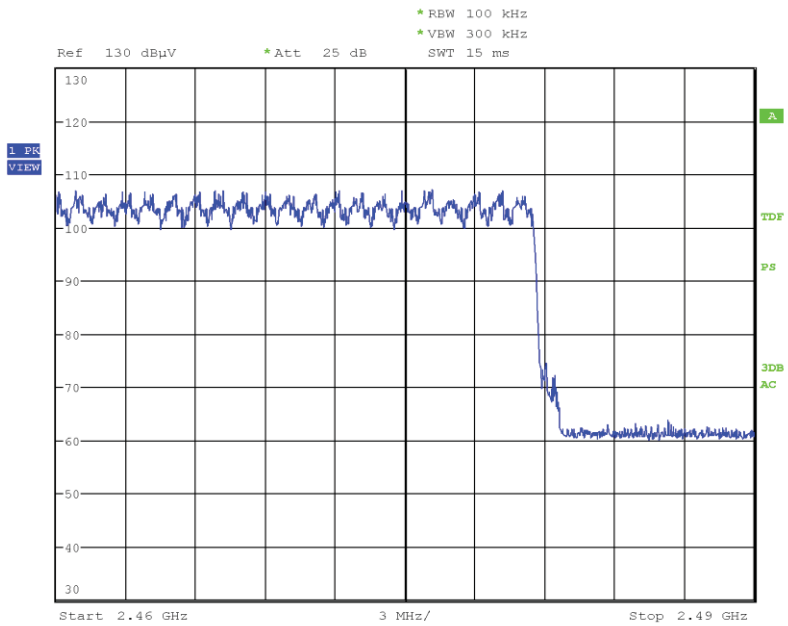


Figure 27: Hopping Frequencies, 3DH5, Mode H, 3/3



5.2.6 Average Time of Occupancy

RESULT: **PASS**

Date of testing: 2021-10-28

Ambient temperature: 22°C
Relative humidity: 58%
Atmospheric pressure: 1018hPa

Requirements:

FCC 15.247(a)(1)(iii) and RSS-247 5.1 (d)

For frequency hopping systems operating in the 2400-2483.5MHz band, the average time of occupancy on any channel shall not be greater than 0.4s within a period of 0.4s multiplied by the number of hopping channels employed.

Test procedure:

ANSI C63.10 §7.8.4.

A spectrum analyzer was connected to the antenna port of the EUT. The analyzer was set in zero span mode centered on a hopping channel. The dwell time of a single packet was measured first with the Delta Marker function.

Table 19: Average Time of Occupancy, DH1 to 5

Packet Type	Packet Duration [ms]	Measured Number of Hops per Channel in 5s Period	Calculated Number of Hops per Channel in 31.6s Period	Average Time of Occupancy in 31.6s Period [ms]	Limit [ms]
DH1	0.378	50	316.00	119.448	400
DH3	1.633	27	170.64	278.655	400
DH5	2.882	19	120.08	346.071	400

Note: Calculated number of hops per channel in 31.6s period = Measured number of hops per channel in 5s period × (31.6s / 5s)
Average time of occupancy in 31.6s period = Packet duration × Calculated number of hops per channel in 31.6s period

Figure 28: Package Duration, Mode H, DH1

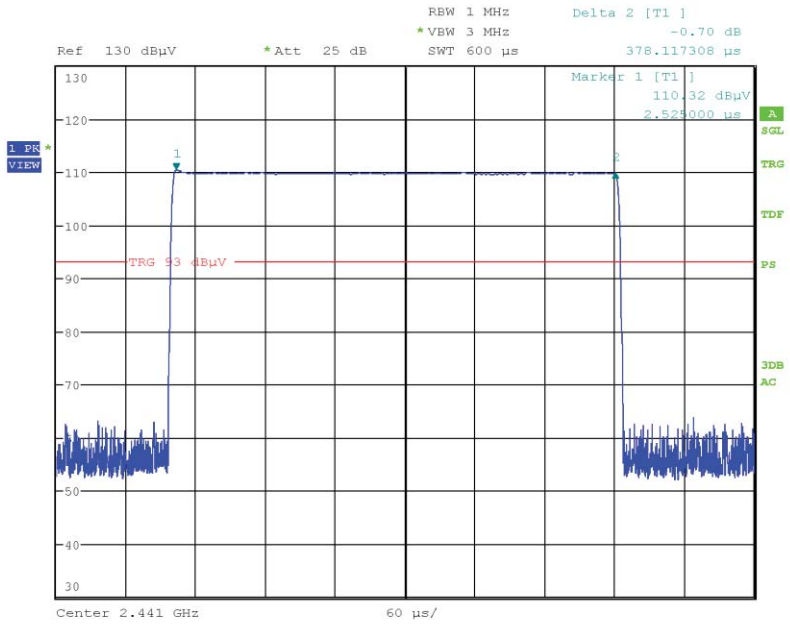


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Figure 29: Number of Hops, Mode H, DH1

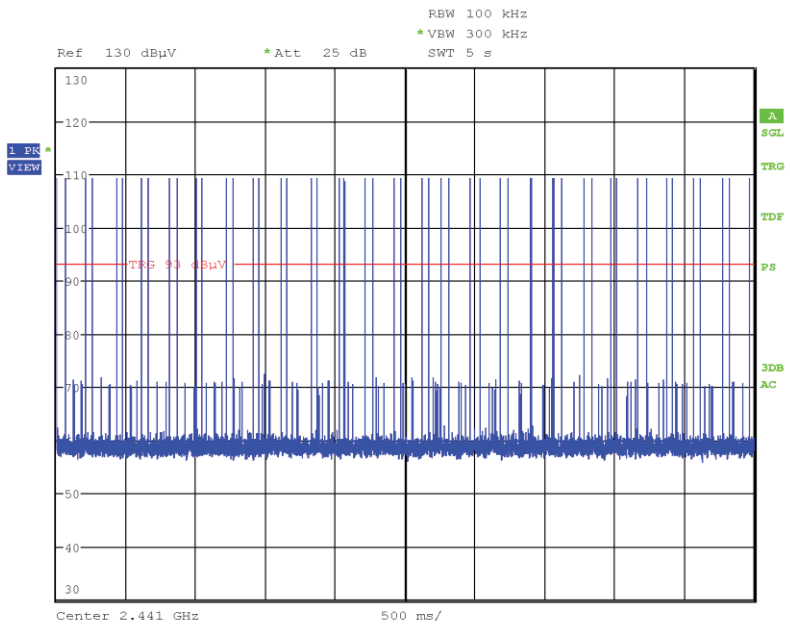

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Figure 30: Package Duration, Mode H, DH3

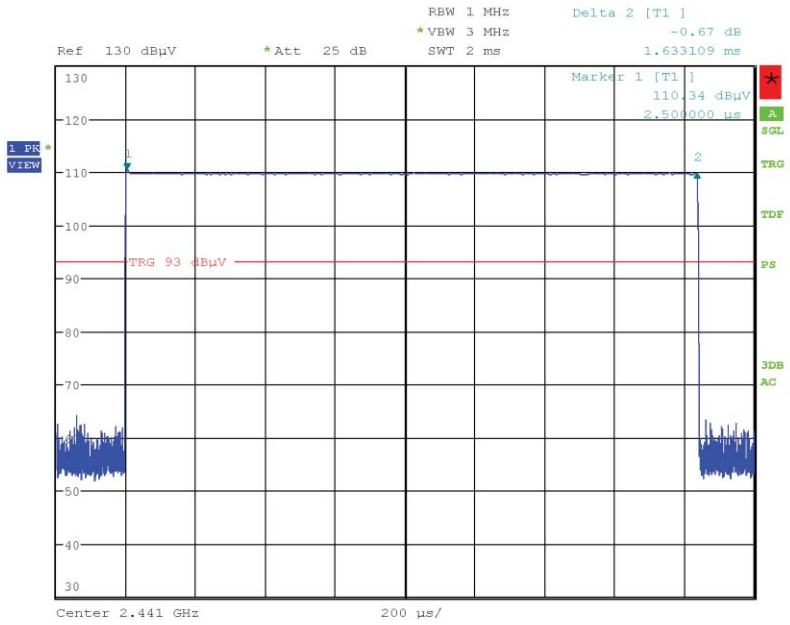


Figure 31: Number of Hops, Mode H, DH3

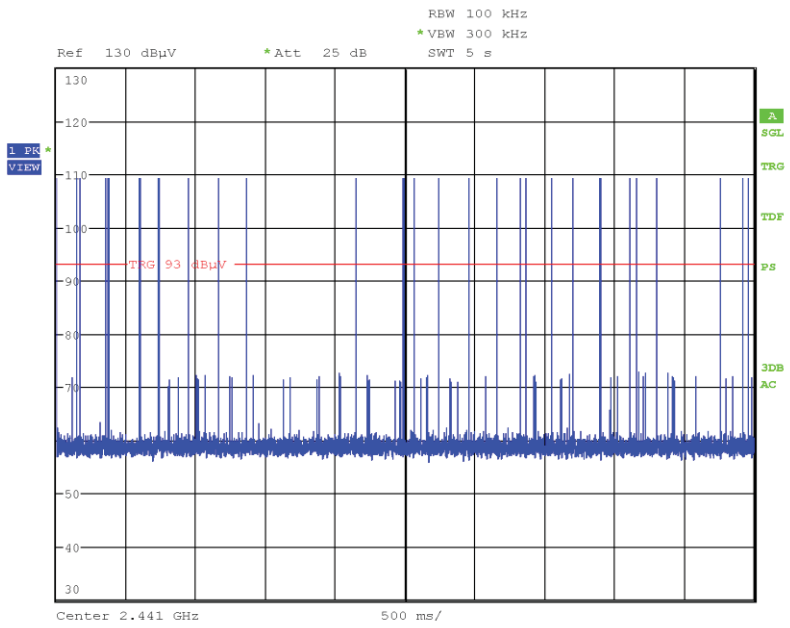


Figure 32: Package Duration, Mode H, DH5

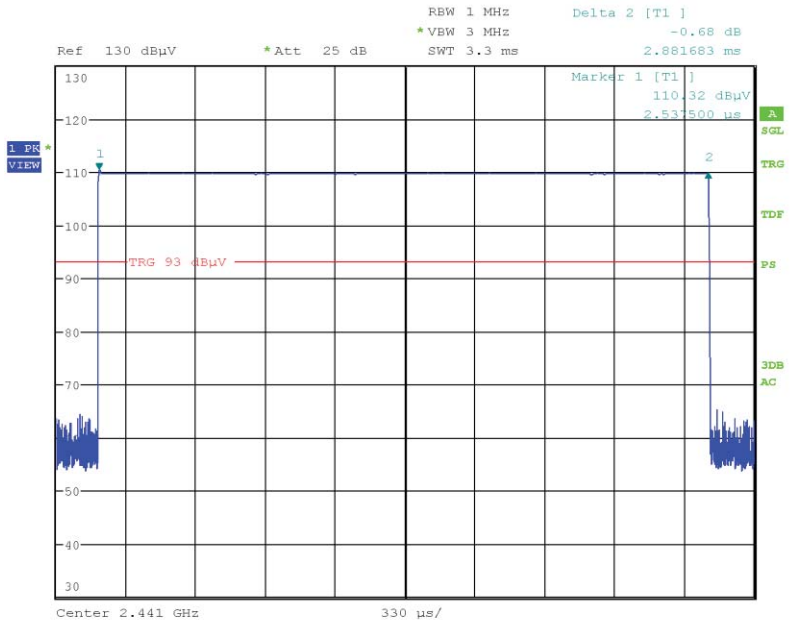


Figure 33: Number of Hops, Mode H, DH5

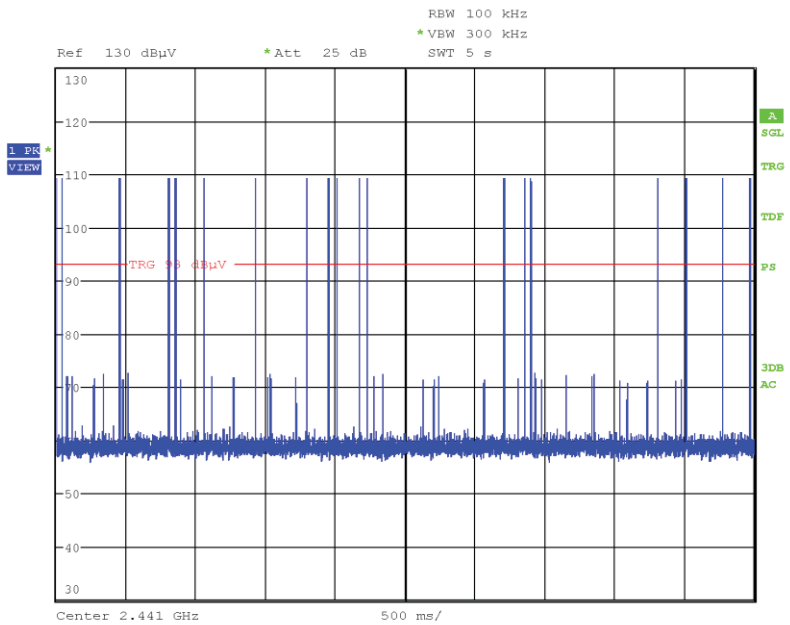
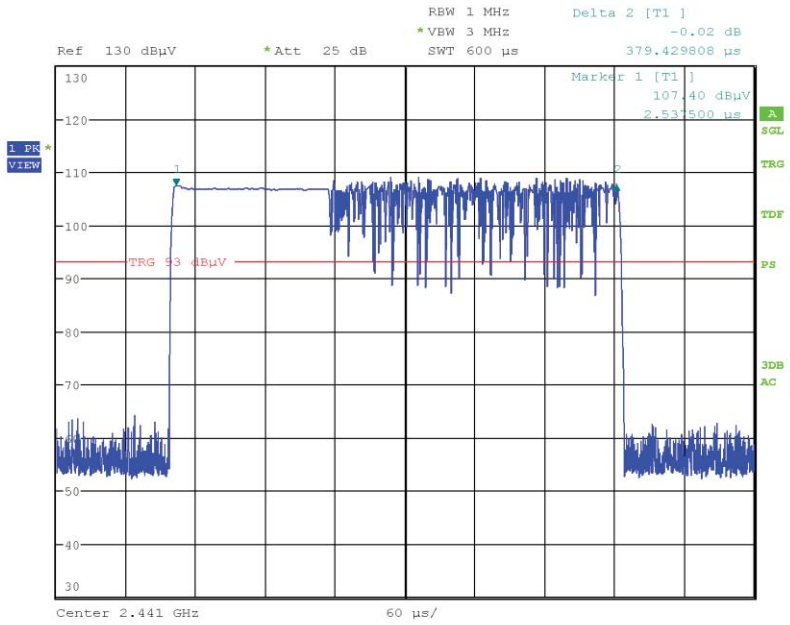


Table 20: Average Time of Occupancy, 3DH1 to 5

Packet Type	Packet Duration [ms]	Measured Number of Hops per Channel in 5s Period	Calculated Number of Hops per Channel in 31.6s Period	Average Time of Occupancy in 31.6s Period [ms]	Limit [ms]
3DH1	0.379	51	322.32	122.159	400
3DH3	1.629	26	164.32	267.677	400
3DH5	2.879	21	132.72	382.101	400

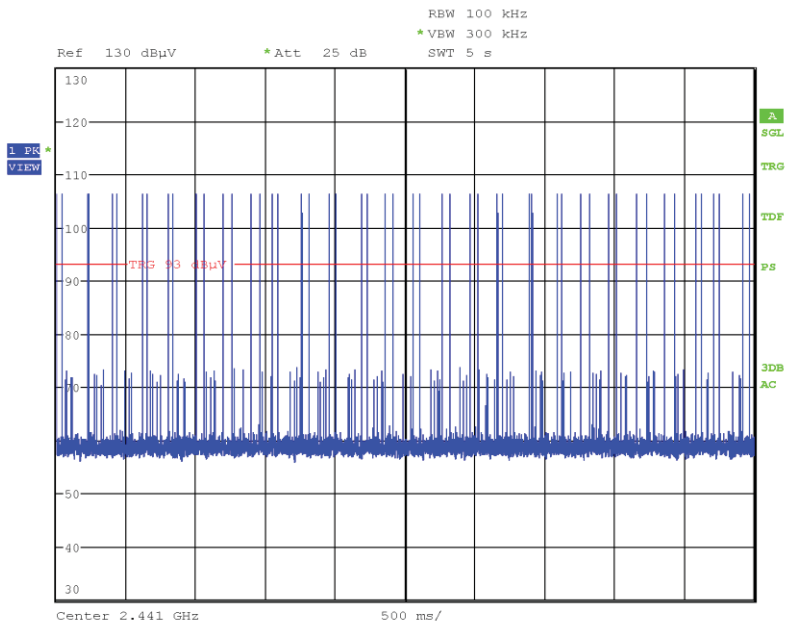
Note: Calculated number of hops per channel in 31.6s period = Measured number of hops per channel in 5s period × (31.6s / 5s)
Average time of occupancy in 31.6s period = Packet duration × Calculated number of hops per channel in 31.6s period

Figure 34: Package Duration, Mode H, 3DH1



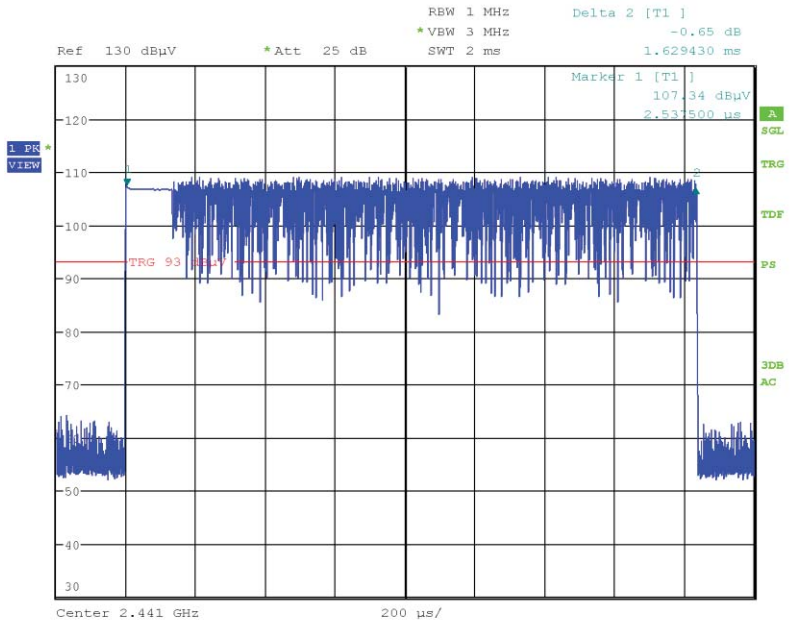
Date: 28.OCT.2021 12:32:47

Figure 35: Number of Hops, Mode H, 3DH1



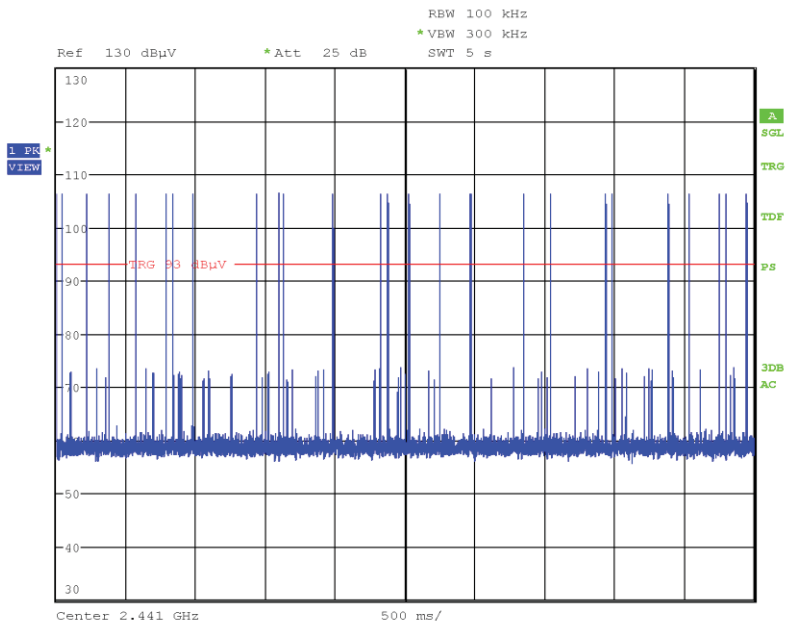
Date: 28.OCT.2021 12:18:01

Figure 36: Package Duration, Mode H, 3DH3



Date: 28.OCT.2021 12:35:23

Figure 37: Number of Hops, Mode H, 3DH3



Date: 28.OCT.2021 12:16:52

Figure 38: Package Duration, Mode H, 3DH5

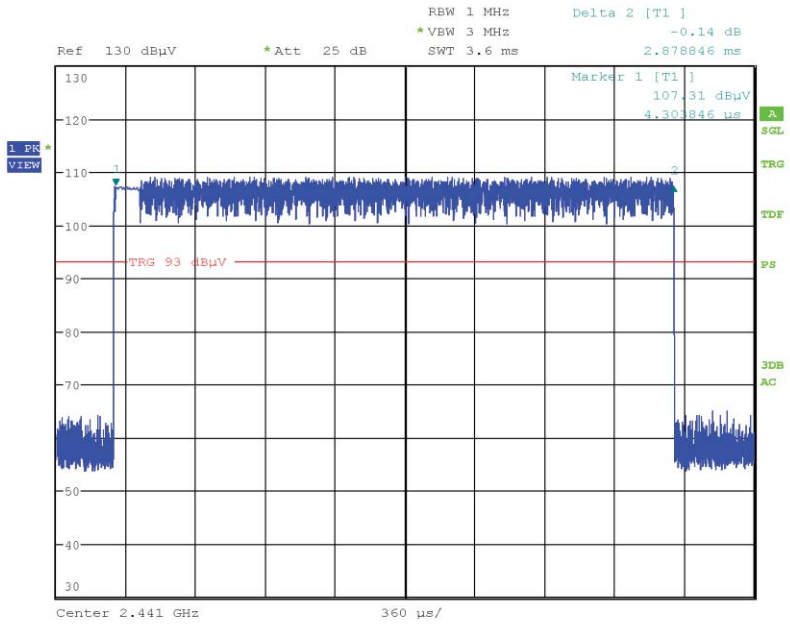
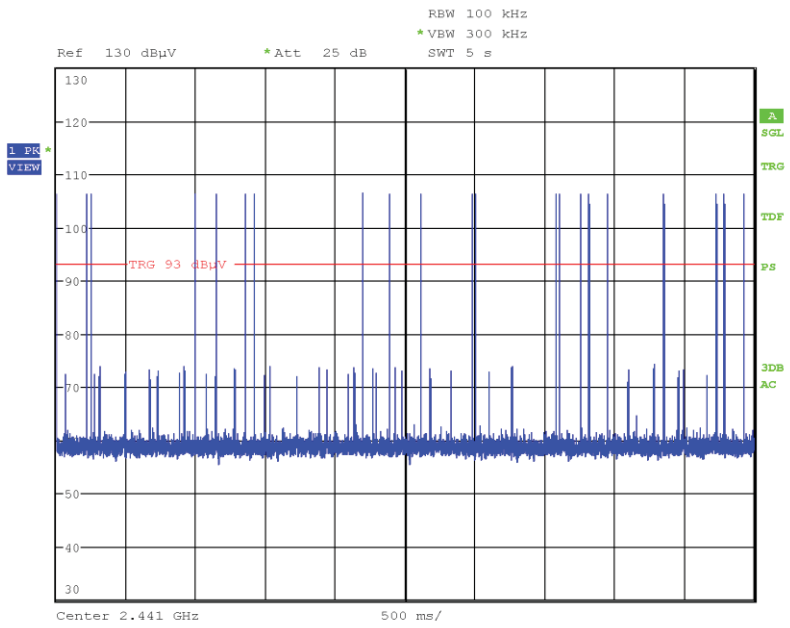


Figure 39: Number of Hops, Mode H, 3DH5



5.2.7 Conducted Spurious Emissions

RESULT: **PASS**

Date of testing: 2021-10-22, 2021-10-24

Ambient temperature: 23, 22°C
Relative humidity: 47, 48%
Atmospheric pressure: 1012, 1024hPa

Requirements:

FCC 15.247(d) and RSS-247 5.5

In any 100kHz bandwidth outside the frequency band in which the intentional radiator is operating, the RF power shall be at least 20dB below that of the maximum in-band 100kHz emission.

Test procedure:

ANSI C63.10 §7.8.8.

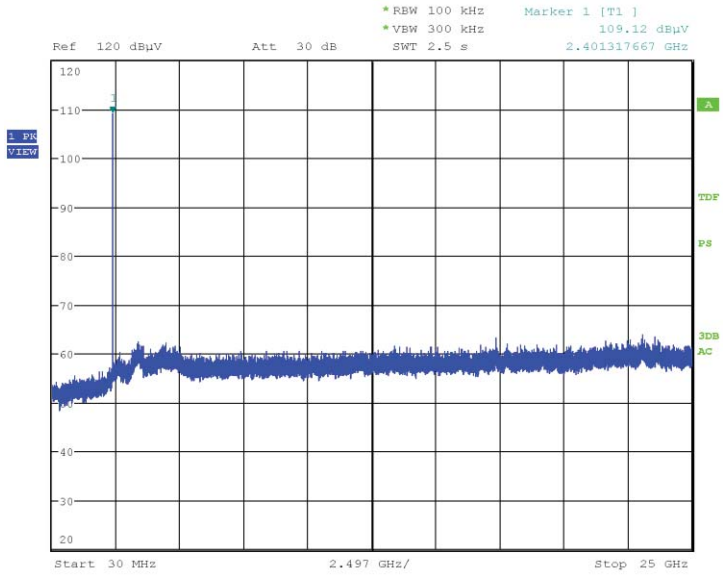
The conducted spurious emissions were measured at the antenna port with a spectrum analyzer using a peak detector. The resolution bandwidth was set to 100kHz and the video bandwidth to 300kHz. Measurements were performed from 30MHz to 25GHz (10^{th} harmonics).

The readings of the measurements take into account the loss generated by all the involved cables.

No significant sprious emission was obserbed in each spectra.

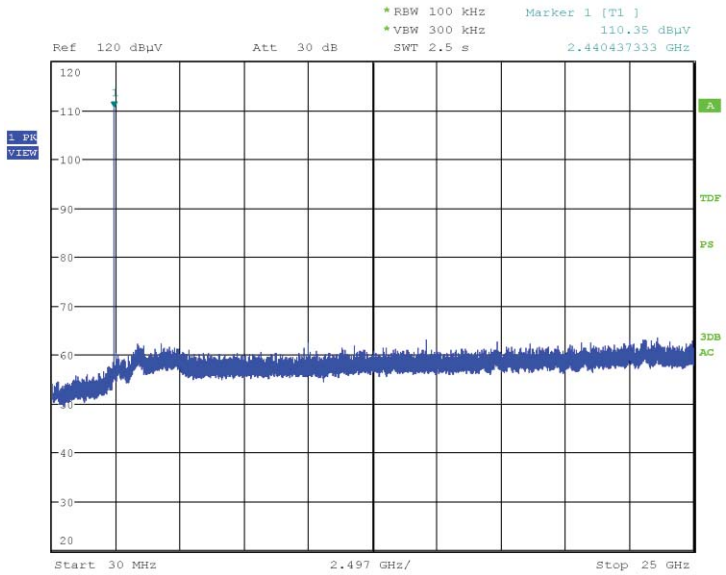
For Band Edge Compliance, both Hopping Off (Mode A or C) and On (Mode H) states were measured at the both Lower side and Higher side in the Frequency band.

Figure 40: Conducted Spurious Emissions, 30MHz - 25GHz, DH5, Mode A (2402MHz)



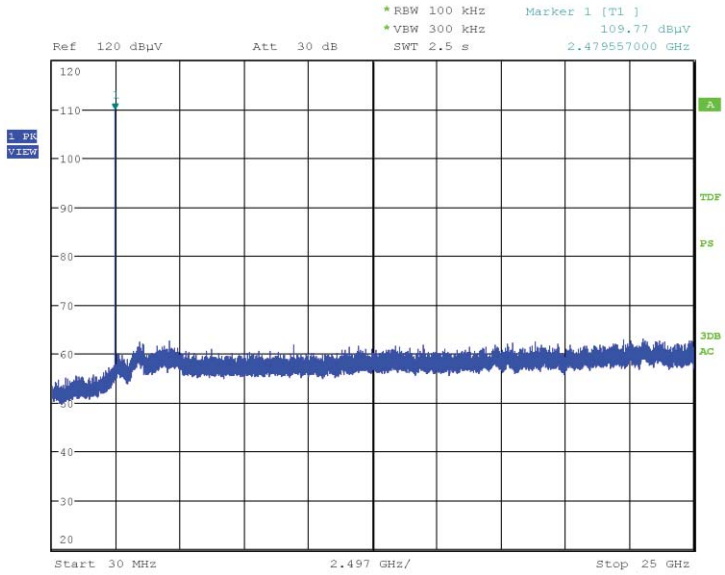
Date: 22.OCT.2021 13:08:18

Figure 41: Conducted Spurious Emissions, 30MHz - 25GHz, DH5, Mode B (2441MHz)



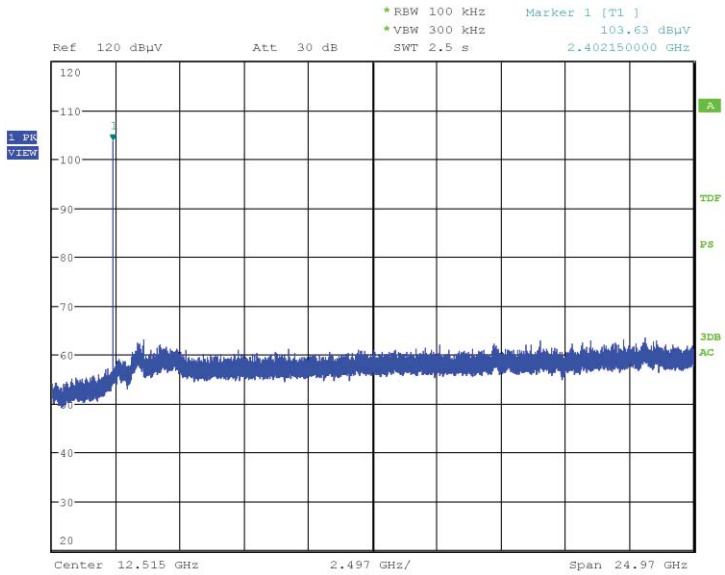
Date: 22.OCT.2021 13:11:12

Figure 42: Conducted Spurious Emissions, 30MHz - 25GHz, DH5, Mode C (2480MHz)



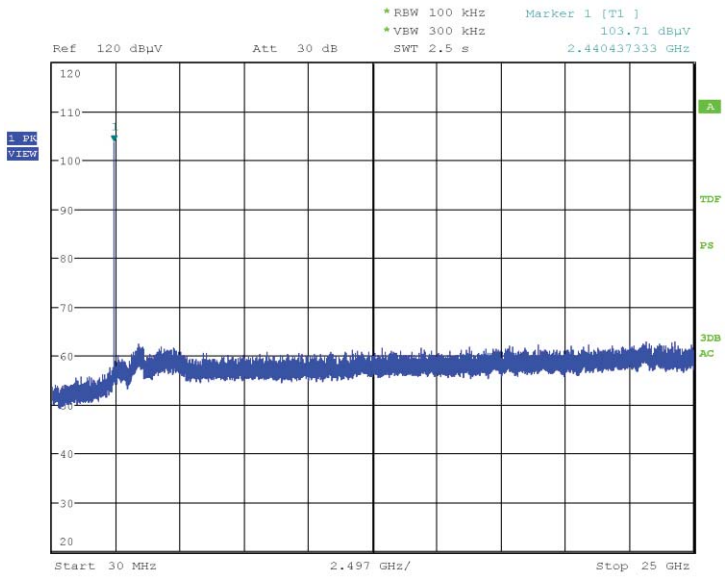
Date: 22.OCT.2021 13:33:59

Figure 43: Conducted Spurious Emissions, 30MHz - 25GHz, 3DH5, Mode A (2402MHz)



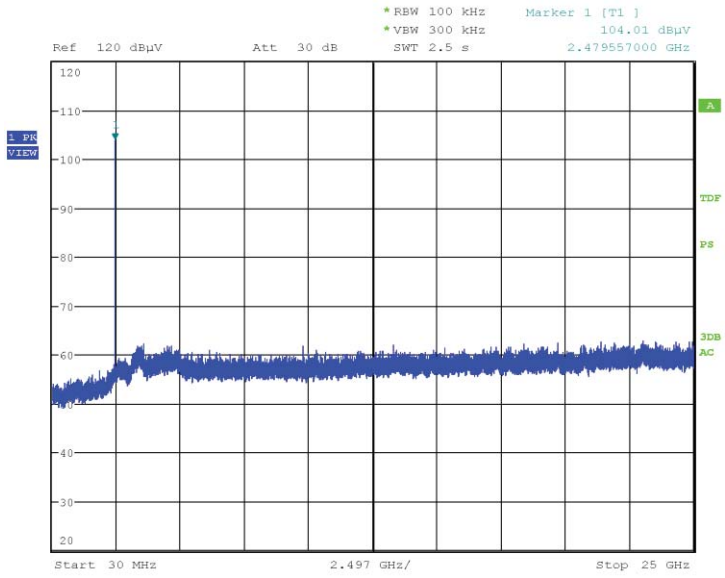
Date: 22.OCT.2021 13:35:55

Figure 44: Conducted Spurious Emissions, 30MHz - 25GHz, 3DH5, Mode B (2441MHz)



Date: 22.OCT.2021 13:55:01

Figure 45: Conducted Spurious Emissions, 30MHz - 25GHz, 3DH5, Mode C (2480MHz)

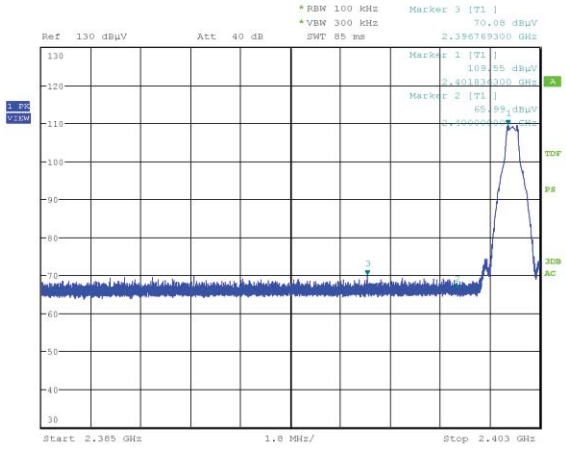


Date: 22.OCT.2021 13:56:51

Figure 46: Conducted Spurious Emissions, Band Edge Compliance, DH5, Low side

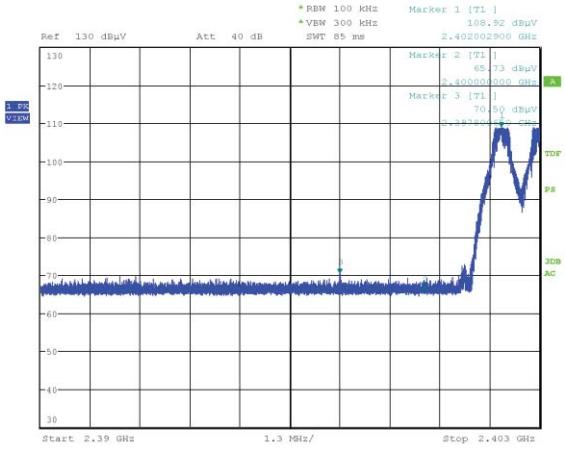
Lower side

Hopping Off



Date: 24.OCT.2021 16:02:26

Hopping On

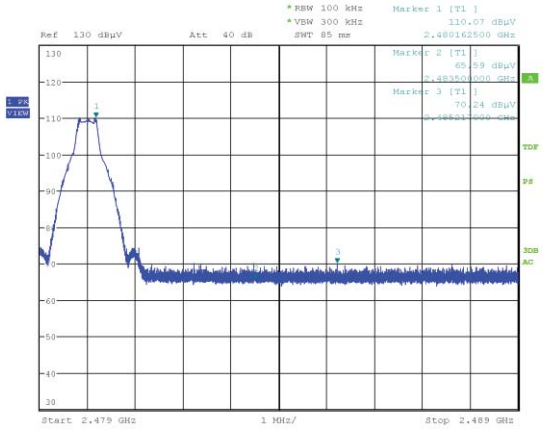


Date: 24.OCT.2021 16:34:07

Figure 47: Conducted Spurious Emissions, Band Edge Compliance, DH5, High side

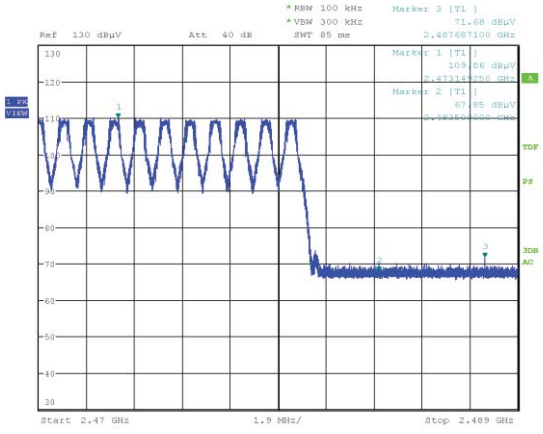
Higher side

Hopping Off



Date: 24.OCT.2021 16:38:22

Hopping On

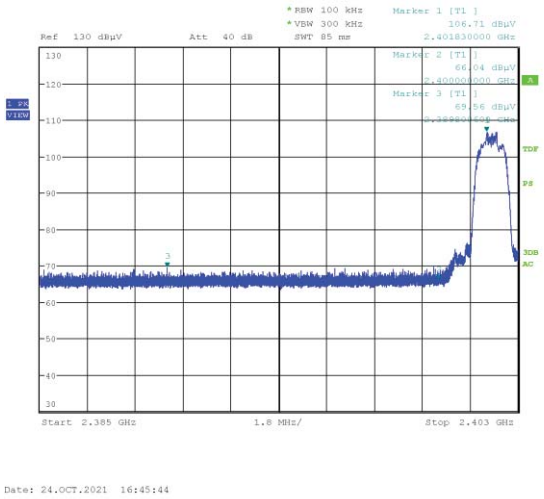


Date: 24.OCT.2021 16:26:52

Figure 48: Conducted Spurious Emissions, Band Edge Compliance, 3DH5, Low side

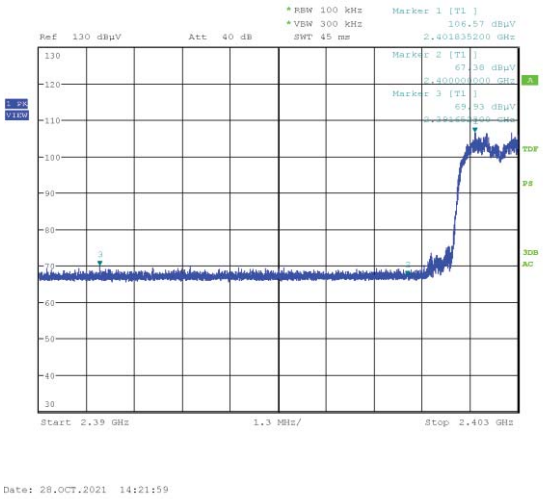
Lower side

Hopping Off



Date: 24.OCT.2021 16:45:44

Hopping On

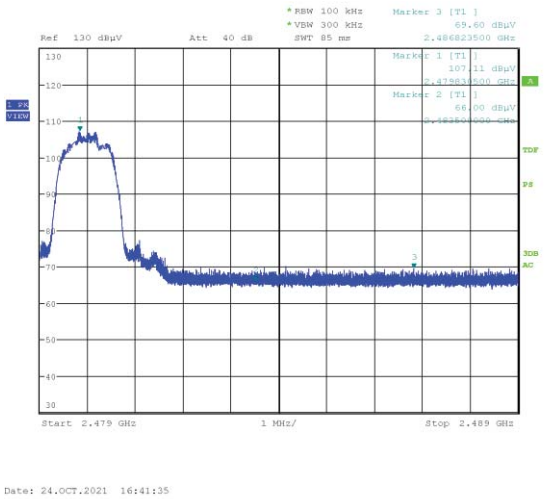


Date: 28.OCT.2021 14:21:59

Figure 49: Conducted Spurious Emissions, Band Edge Compliance, 3DH5, High side

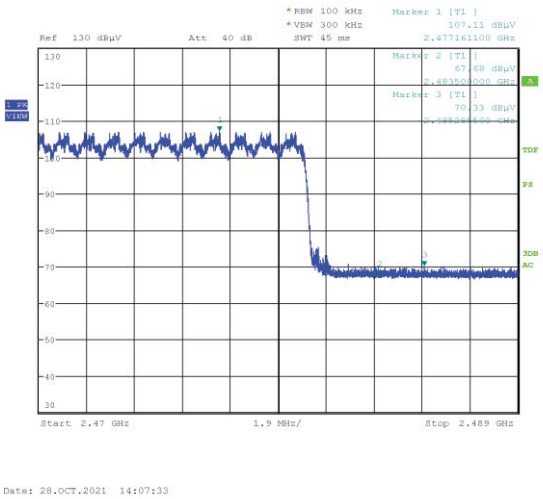
Higher side

Hopping Off



Date: 24.OCT.2021 16:41:35

Hopping On



Date: 28.OCT.2021 14:07:33

5.2.8 Duty Cycle

RESULT: **PERFORMED**

Date of testing:	2021-10-28
Ambient temperature:	22°C
Relative humidity:	58%
Atmospheric pressure:	1018hPa

Requirements:

N/A, this test item was performed as reference.

Test procedure:

ANSI C63.10-2013 §7.5 and KDB 558074 D01, especially. Section 9 b) **(*)**

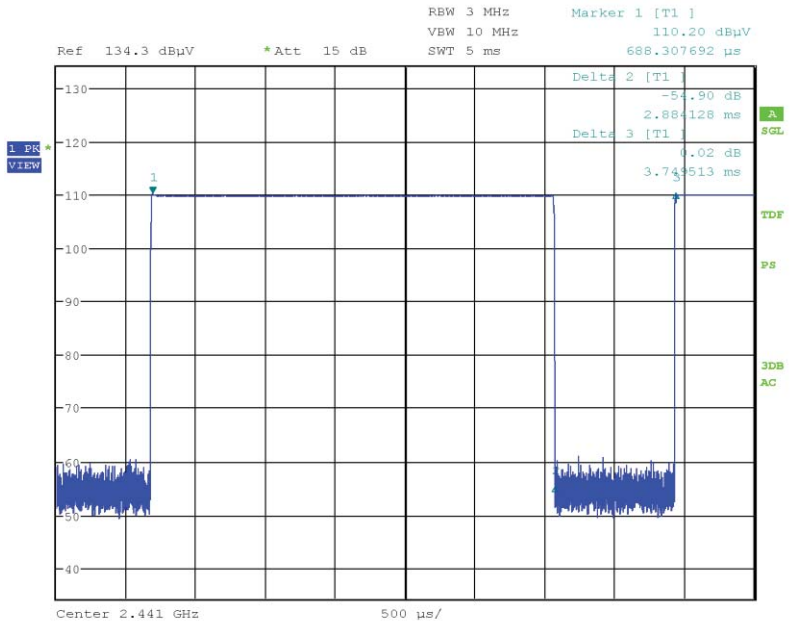
Note:

(*) The use of a Duty Cycle Correction Factor (DCCF) is permitted for calculating average radiated field strength emission levels for an FHSS device within a Government Restricted band. The average radiated field strength is calculated by subtracting the DCCF from the maximum radiated field strength level as determined through measurement.

Table 21: Duty Cycle, DH5

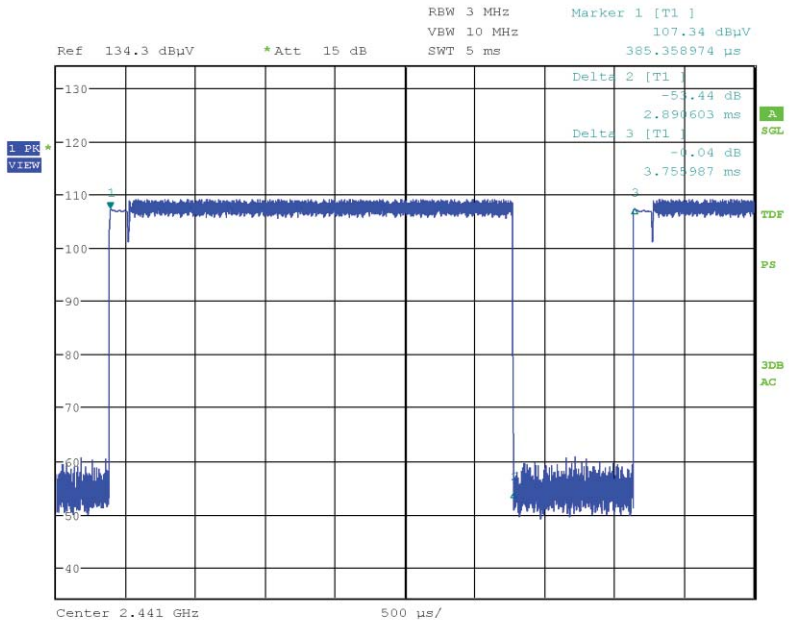
Radio	On-Time [ms]	Period [ms]	Duty Cycle [%]
DH5	2.884	3.750	76.91
2DH5	2.891	3.756	76.97
3DH5	2.901	3.750	77.36

Figure 50: Duty Cycle, DH5, Mode B (2441MHz)



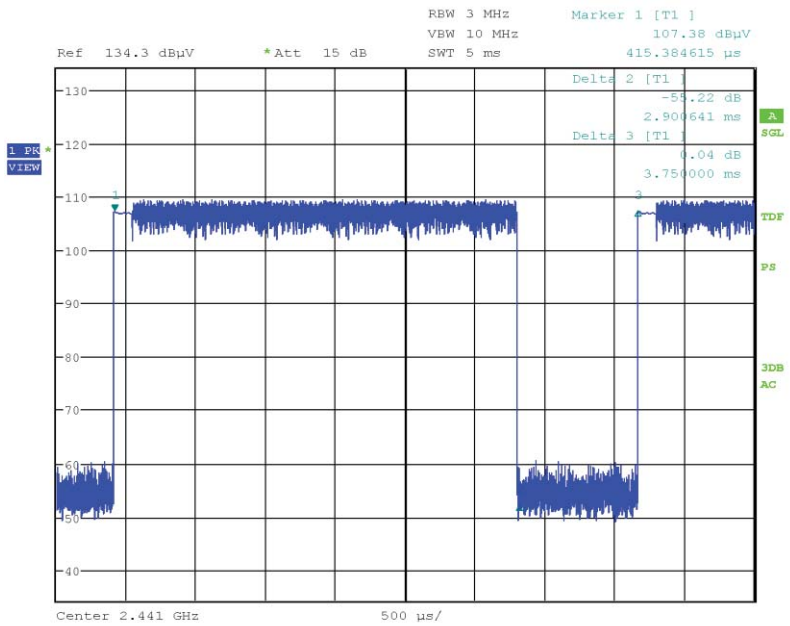
Date: 28.OCT.2021 13:17:35

Figure 51: Duty Cycle, 2DH5, Mode B (2441MHz)



Date: 28.OCT.2021 13:19:48

Figure 52: Duty Cycle, 3DH5, Mode B (2441MHz)

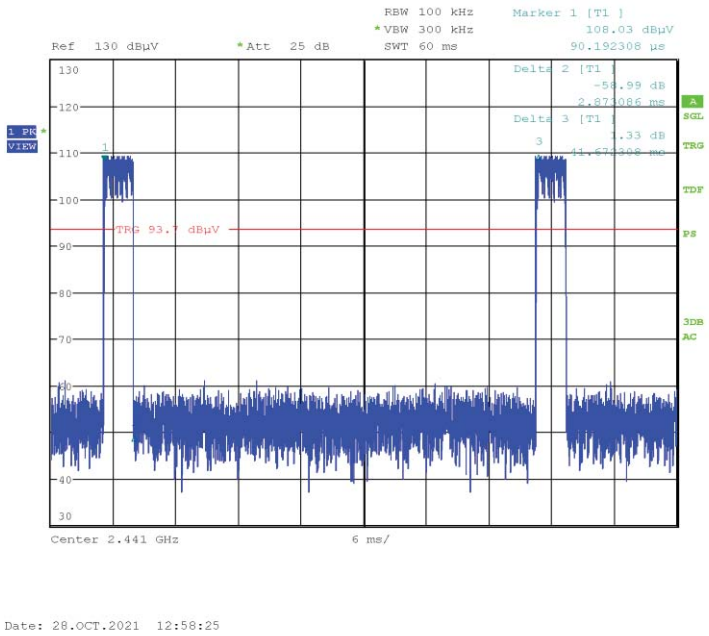


Date: 28.OCT.2021 13:15:06

Table 22: Duty Cycle for DCCF, Mode H

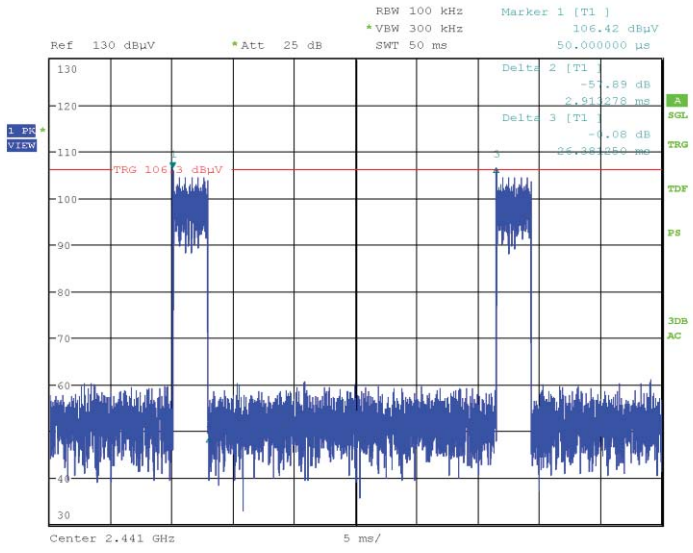
Radio	On-Time [ms]	Period [ms]	DCCF
DH5	2.873	41.672	23.23
3DH5	2.913	26.381	19.14

Figure 53: Duty Cycle, DH5, Mode H



Date: 28.OCT.2021 12:58:25

Figure 54: Duty Cycle, 3DH5, Mode H



Date: 28.OCT.2021 12:45:15

5.3 Radiated Measurements

5.3.1 Radiated Spurious Emissions of Transmitter

RESULT: **PASS**

Date of testing:	2021-09-07, 2021-09-08, 2021-09-15, 2021-09-16, 2021-09-21, 2021-10-03, 2021-10-04
Ambient temperature:	22, 23, 20, 23, 21, 23, 22°C
Relative humidity:	50, 52, 59, 62, 58, 59, 52%
Atmospheric pressure:	1013, 1011, 1009, 1013, 1013, 1018, 1022hPa
Frequency range:	9kHz - 25GHz
Measurement distance:	3m
Kind of test site:	Semi Anechoic Chamber

Requirements:

FCC 15.205, FCC 15.209, FCC 15.247(d) and RSS-247 5.5, RSS-Gen 8.9, 8.10.

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the radiated emission limits specified in FCC 15.209(a).

Radiated emissions which fall outside the operation frequency band and outside restricted bands shall either meet the limit specified in FCC 15.209(a) or be attenuated at least 20dB below the power level in the 100kHz bandwidth within the band that contains the highest level of the desired power (the less severe limit applies).

Test procedure:

ANSI C63.10 §6.3, 6.4, 6.5, 6.6, 6.10

The EUT was placed on a nonconductive turntable. The table height was 0.8m for measurements below 1GHz and 1.5m for measurements above 1GHz. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 9kHz to the 10th harmonic of the highest fundamental transmitter frequency (25GHz). Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° in order to determine the emission’s maximum level. For frequencies above 30MHz, the antenna was raised and lowered from 1 to 4m and measurements were taken using both horizontal and vertical antenna polarizations.

For emissions between 30MHz and 1GHz, measurements were performed with a test receiver operating in the CISPR quasi-peak detection mode with a 20dB Bandwidth set to 120kHz.

For emissions above 1GHz, measurements were performed with a spectrum analyzer using Peak detector. Average results were calculated with peak results and were compensated by subtracting the DCCF as per the section 9 b) of the KDB 558074 D01. For frequencies not related to the fundamental or its harmonics, average results were measured with RBW = 1MHz & VBW = 10Hz.

Absorbers have been placed on the floor between the EUT and the measuring antenna for testing above 1GHz.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Emissions other than those mentioned are small or not detectable.

Table 23: Radiated Emissions, Quasi Peak Data, 9kHz - 30MHz, Bluetooth Hopping on DH5 with 802.11ac-80, CDD, 5210MHz and 802.11n-20 on 2437MH

Freq. [MHz]	Antenna Orientation	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Margin QP [dB]	Height [cm]	Angle [°]
0.01371	H	29.6	19.8	49.4	125.0	75.6	100.0	186
0.38338	H	26.7	19.6	46.3	96.0	49.7	100.0	252
1.51601	H	17.2	19.8	37.0	64.0	27.0	100.0	4
1.93180	H	15.6	19.8	35.4	69.5	34.1	100.0	30
2.57502	H	16.0	19.8	35.8	69.5	33.7	100.0	7
28.17876	H	16.2	21.0	37.2	69.5	32.3	100.0	29
0.01069	V	27.5	20.0	47.5	127.1	79.6	100.0	192
0.01365	V	34.0	19.8	53.8	125.0	71.2	100.0	190
0.38501	V	26.4	19.6	46.0	95.9	49.9	100.0	196
0.66808	V	7.3	19.7	27.0	71.1	44.1	100.0	225
2.57573	V	12.2	19.8	32.0	69.5	37.5	100.0	270
27.79529	V	16.4	20.9	37.3	69.5	32.2	100.0	52

Note: Level QP = Reading QP + Factor

Table 24: Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode B (2441MHz)

Freq. [MHz]	Antenna Orientation	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Margin QP [dB]	Height [cm]	Angle [°]
148.346	H	57.6	-21.0	36.6	43.5	6.9	205	146
445.037	V	51.4	-15.2	36.2	46.0	9.8	138	104
445.039	H	53.3	-15.2	38.1	46.0	7.9	255	78

Note: Level QP = Reading QP + Factor

Table 25: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode A (2402MHz)

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
1038.378	V	67.2	-18.7	48.5	74.0	25.5	146	200
3708.471	V	57.2	-10.8	46.5	74.0	27.5	133	302
4814.621	V	52.7	-7.6	45.2	74.0	28.8	167	286
7206.010	V	62.3	-0.3	62.0	74.0	12.0	105	44
9608.106	H	52.8	-8.0	44.7	74.0	29.3	186	328
12006.087	V	51.5	-5.2	46.3	74.0	27.7	176	103
21618.000	V	52.0	-10.6	41.4	74.0	32.6	164	174

Note: Level PK = Reading PK + Factor

Table 26: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode A (2402MHz)

Freq. [MHz]	Antenna Orientation	Reading AV [dBµV]	Factor [dB(1/m)]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
1038.378	V	60.0	-18.7	41.3	54.0	12.7	146	200
3708.471	V	41.7	-10.8	30.9	54.0	23.1	133	302

Note: Level AV = Reading AV + Factor

Average results are measured with 10Hz of VBW.

Table 27: Radiated Emissions, Average Data Compensated with DCCF, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode A (2402MHz)

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	DCCF [dB]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
4814.621	V	52.7	-7.6	23.2	21.9	54.0	32.1	167	286
7206.010	V	62.3	-0.3	23.2	38.8	54.0	15.2	105	44
9608.106	H	52.8	-8.0	23.2	21.6	54.0	32.4	186	328
12006.087	V	51.5	-5.2	23.2	23.1	54.0	30.9	176	103
21618.000	V	52.0	-10.6	23.2	18.2	54.0	35.8	164	174

Note: Level AV = Reading PK + Factor - DCCF

Table 28: Band Edge, DH5, Modes A (2402MHz)

Operating Frequency [MHz]	Antenna Orientation	Fundamental Level [dBµV]	Band Edge Limit [dBµV]	Band Edge Frequency [MHz]	Band Edge Level [dBµV]	Margin [dB]
2402	H	84.51	64.51	2400	27.41	37.10
2402	V	87.50	67.50	2400	29.05	38.45

Notes: All correction factors are included in the measurement values.

Figure 55: Radiated Emissions at Band Edge (Authorized Band), Spectral Diagram, DH5, Mode A (2402MHz), Horizontal Antenna Orientation

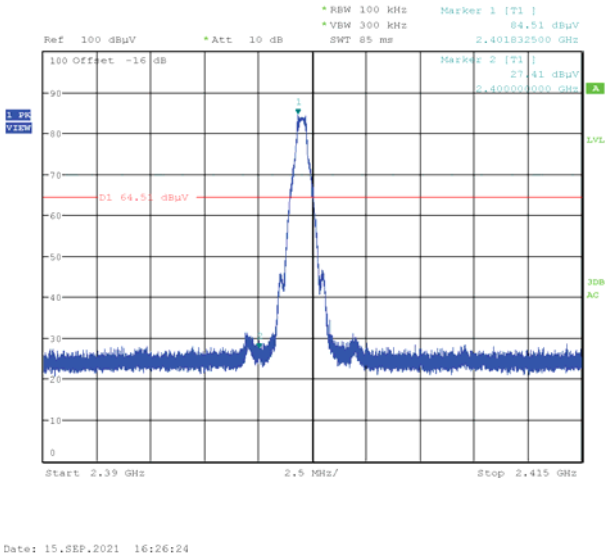
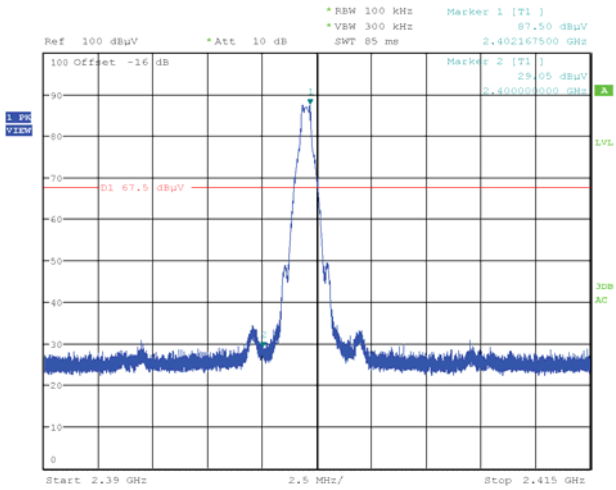
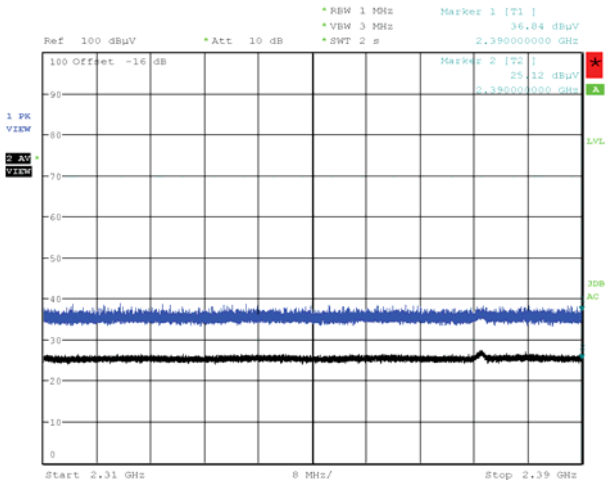


Figure 56: Radiated Emissions at Band Edge (Authorized Band), Spectral Diagram, DH5, Mode A (2402MHz), Vertical Antenna Orientation



Date: 15.SEP.2021 16:56:59

Figure 57: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, DH5, Mode A (2402MHz), Horizontal Antenna Orientation



Date: 15.SEP.2021 16:30:16

Figure 58: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, DH5, Mode A (2402MHz), Vertical Antenna Orientation

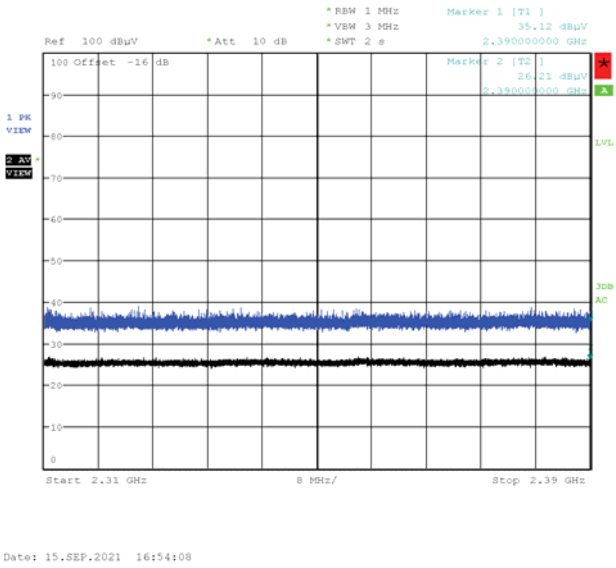


Table 29: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode B (2441MHz)

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
1038.367	V	63.8	-18.7	45.1	74.0	28.9	174	56
3708.845	H	57.7	-10.8	46.9	74.0	27.1	171	92
4881.962	V	54.7	-7.8	46.9	74.0	27.1	111	22
7323.039	V	59.2	0.0	59.2	74.0	14.8	106	37
9764.055	V	54.4	-7.0	47.4	74.0	26.6	189	349
12205.412	H	52.0	-5.4	46.6	74.0	27.4	192	313
21969.000	H	52.4	-10.6	41.8	74.0	32.2	190	308

Note: Level PK = Reading PK + Factor

Table 30: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode B (2441MHz)

Freq. [MHz]	Antenna Orientation	Reading AV [dBµV]	Factor [dB(1/m)]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
1038.367	V	51.8	-18.7	33.1	54.0	20.9	174	56
3708.845	H	41.3	-10.8	30.5	54.0	23.5	171	92

Note: Level AV = Reading AV + Factor

Average results are measured with 10Hz of VBW.

Table 31: Radiated Emissions, Average Data Compensated with DCCF, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode B (2441MHz)

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	DCCF [dB]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
4881.962	V	54.7	-7.8	23.2	23.7	54.0	30.3	111	22
7323.039	V	59.2	0.0	23.2	36.0	54.0	18.0	106	37
9764.055	V	54.4	-7.0	23.2	24.2	54.0	29.8	189	349
12205.412	H	52.0	-5.4	23.2	23.4	54.0	30.6	192	313
21969.000	H	52.4	-10.6	23.2	18.6	54.0	35.4	190	308

Note: Level AV = Reading PK + Factor - DCCF

Table 32: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode C (2480MHz)

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
1038.401	V	65.0	-18.7	46.3	74.0	27.7	176	191
3708.505	V	57.8	-10.8	47.0	74.0	27.0	200	308
4924.574	V	53.3	-7.8	45.6	74.0	28.4	100	188
7439.990	H	58.4	-0.3	58.1	74.0	15.9	172	4
7440.001	V	59.3	-0.3	59.0	74.0	15.0	105	30
12400.178	V	55.0	-6.8	48.2	74.0	25.8	155	356
22320.000	V	53.1	-10.9	42.2	74.0	31.8	191	7

Note: Level PK = Reading PK + Factor

Table 33: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode C (2480MHz)

Freq. [MHz]	Antenna Orientation	Reading AV [dBµV]	Factor [dB(1/m)]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
1038.401	V	56.0	-18.7	37.3	54.0	16.7	176	191
3708.505	V	41.3	-10.8	30.5	54.0	23.5	200	308

Note: Level AV = Reading AV + Factor

Average results are measured with 10Hz of VBW.

Table 34: Radiated Emissions, Average Data Compensated with DCCF, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode C (2480MHz)

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	DCCF [dB]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
4924.574	V	53.3	-7.8	23.2	22.3	54.0	31.7	100	188
7439.990	H	58.4	-0.3	23.2	34.9	54.0	19.1	172	4
7440.001	V	59.3	-0.3	23.2	35.8	54.0	18.2	105	30
12400.178	V	55.0	-6.8	23.2	25.0	54.0	29.0	155	356
22320.000	V	53.1	-10.9	23.2	19.0	54.0	35.0	191	7

Note: Level AV = Reading PK + Factor - DCCF

Figure 59: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, DH5, Mode C (2480MHz), Horizontal Antenna Orientation

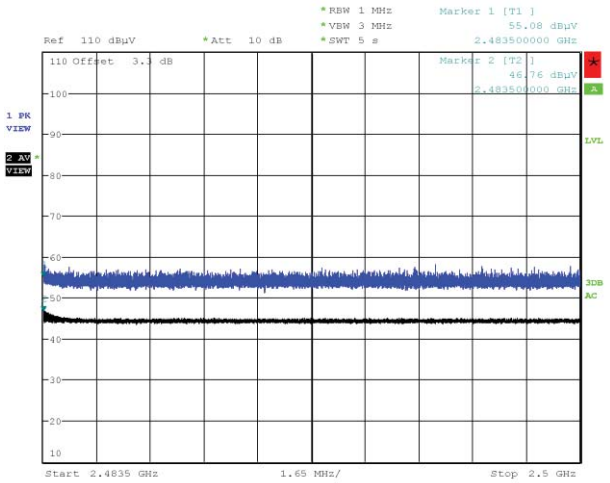


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Figure 60: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, DH5, Mode C (2480MHz), Vertical Antenna Orientation

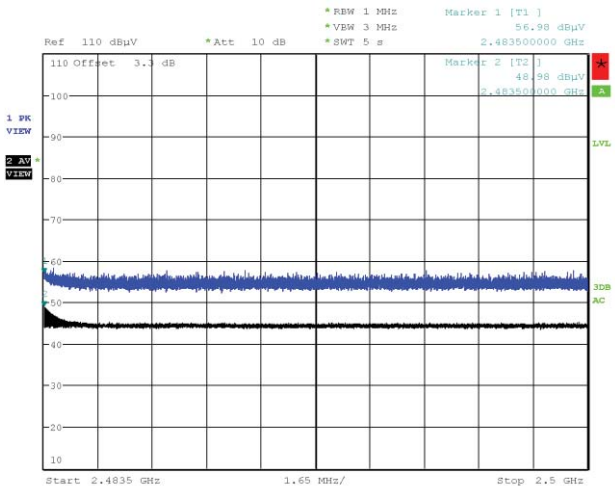

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Table 35: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode A (2402MHz)

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
1038.366	V	65.2	-18.7	46.5	74.0	27.5	168	39
2118.857	H	55.9	-14.4	41.5	74.0	32.5	100	200
3708.663	V	59.4	-10.8	48.7	74.0	25.3	109	255
4814.734	H	53.0	-7.6	45.5	74.0	28.5	121	63
7206.041	V	59.2	-0.3	58.9	74.0	15.1	191	55
9608.169	H	52.2	-8.0	44.2	74.0	29.8	164	324
12010.130	V	52.2	-5.2	47.0	74.0	27.0	186	346
21618.000	H	52.3	-10.6	41.7	74.0	32.3	188	45

Note: Level PK = Reading PK + Factor

Table 36: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode A (2402MHz)

Freq. [MHz]	Antenna Orientation	Reading AV [dBµV]	Factor [dB(1/m)]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
1038.366	V	55.7	-18.7	37.0	54.0	17.0	168	39
2118.857	H	49.3	-14.4	34.9	54.0	19.1	100	200
3708.663	V	41.8	-10.8	31.0	54.0	23.0	109	255

Note: Level AV = Reading AV + Factor

Average results are measured with 10Hz of VBW.

Table 37: Radiated Emissions, Average Data Compensated with DCCF, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode A (2402MHz)

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	DCCF [dB]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
4814.734	H	53.0	-7.6	19.1	26.3	54.0	27.7	121	63
7206.041	V	59.2	-0.3	19.1	39.8	54.0	14.2	191	55
9608.169	H	52.2	-8.0	19.1	25.1	54.0	28.9	164	324
12010.130	V	52.2	-5.2	19.1	27.9	54.0	26.1	186	346
21618.000	H	52.3	-10.6	19.1	22.6	54.0	31.4	188	45

Note: Level AV = Reading PK + Factor - DCCF

Table 38: Band Edge, 3DH5, Modes A (2402MHz)

Operating Frequency [MHz]	Antenna Orientation	Fundamental Level [dBµV]	Band Edge Limit [dBµV]	Band Edge Frequency [MHz]	Band Edge Level [dBµV]	Margin [dB]
2402	H	81.43	61.43	2400	31.10	30.33
2402	V	84.95	64.95	2400	33.48	31.47

Notes: All correction factors are included in the measurement values.

Figure 61: Radiated Emissions at Band Edge (Authorized Band), Spectral Diagram, 3DH5, Mode A (2402MHz), Horizontal Antenna Orientation

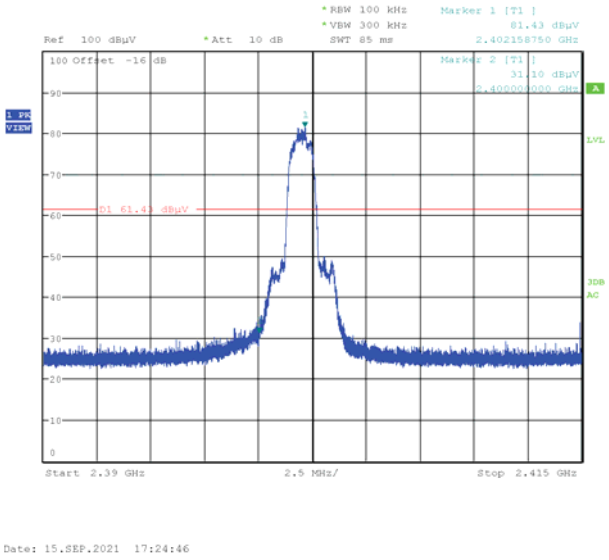

Figure 62: Radiated Emissions at Band Edge (Authorized Band), Spectral Diagram, 3DH5, Mode A (2402MHz), Vertical Antenna Orientation

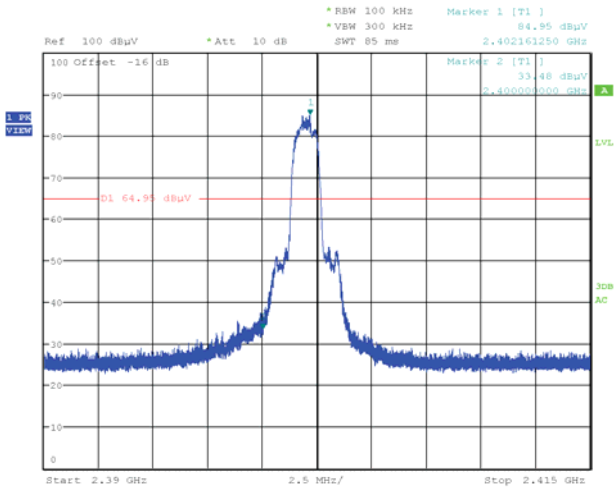

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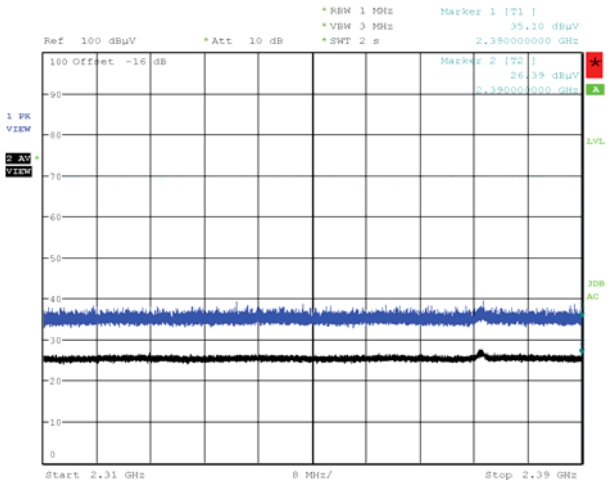
Figure 63: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, 3DH5, Mode A (2402MHz), Horizontal Antenna Orientation



Date: 15.SEP.2021 17:29:21

Figure 64: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, 3DH5, Mode A (2402MHz), Vertical Antenna Orientation

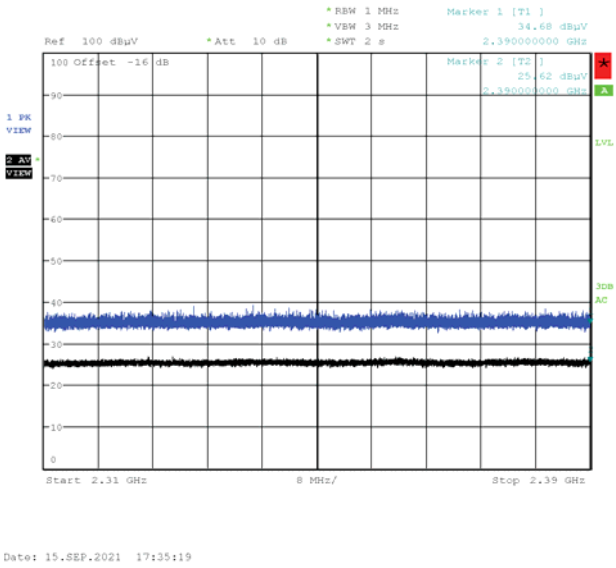


Table 39: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode B (2441MHz)

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
3709.215	V	58.6	-10.7	47.8	74.0	26.2	198	312
4882.016	V	53.7	-7.8	45.9	74.0	28.1	165	30
7323.000	V	55.9	0.0	55.9	74.0	18.1	160	330
9764.018	V	54.2	-7.0	47.2	74.0	26.8	173	351
12205.318	H	51.6	-5.4	46.2	74.0	27.8	131	67
21969.000	H	52.7	-10.6	42.1	74.0	31.9	161	304

Note: Level PK = Reading PK + Factor

Table 40: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode B (2441MHz)

Freq. [MHz]	Antenna Orientation	Reading AV [dBµV]	Factor [dB(1/m)]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
3709.215	V	41.4	-10.7	30.7	54.0	23.3	198	312

Note: Level AV = Reading AV + Factor

Average results are measured with 10Hz of VBW.

Table 41: Radiated Emissions, Average Data Compensated with DCCF, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode B (2441MHz)

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	DCCF [dB]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
4882.016	V	53.7	-7.8	19.1	26.8	54.0	27.2	165	30
7323.000	V	55.9	0.0	19.1	36.8	54.0	17.2	160	330
9764.018	V	54.2	-7.0	19.1	28.1	54.0	25.9	173	351
12205.318	H	51.6	-5.4	19.1	27.1	54.0	26.9	131	67
21969.000	H	52.7	-10.6	19.1	23.0	54.0	31.0	161	304

Note: Level AV = Reading PK + Factor - DCCF

Table 42: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode C (2480MHz)

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
3708.638	V	60.7	-10.8	50.0	74.0	24.0	109	310
4981.467	V	53.1	-7.3	45.8	74.0	28.2	114	82
7440.058	V	56.3	-0.3	56.0	74.0	18.0	129	303
9917.086	H	50.9	-7.1	43.8	74.0	30.2	107	147
12400.030	V	55.1	-6.8	48.3	74.0	25.7	148	355
22320.000	H	52.6	-10.9	41.7	74.0	32.3	170	265

Note: Level PK = Reading PK + Factor

Table 43: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode C (2480MHz)

Freq. [MHz]	Antenna Orientation	Reading AV [dBµV]	Factor [dB(1/m)]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
3708.638	V	43.3	-10.8	32.5	54.0	21.5	109	310

Note: Level AV = Reading AV + Factor

Average results are measured with 10Hz of VBW.

Table 44: Radiated Emissions, Average Data Compensated with DCCF, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode C (2480MHz)

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	DCCF [dB]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
4981.467	V	53.1	-7.3	19.1	26.7	54.0	27.3	114	82
7440.058	V	56.3	-0.3	19.1	36.9	54.0	17.1	129	303
9917.086	H	50.9	-7.1	19.1	24.7	54.0	29.3	107	147
12400.030	V	55.1	-6.8	19.1	29.2	54.0	24.8	148	355
22320.000	H	52.6	-10.9	19.1	22.6	54.0	31.4	170	265

Note: Level AV = Reading PK + Factor - DCCF

Figure 65: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, 3DH5, Mode C (2480MHz), Horizontal Antenna Orientation

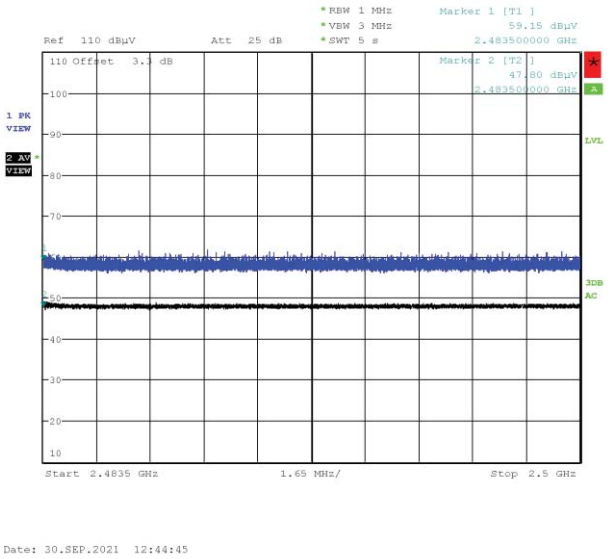


Figure 66: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, 3DH5, Mode C (2480MHz), Vertical Antenna Orientation

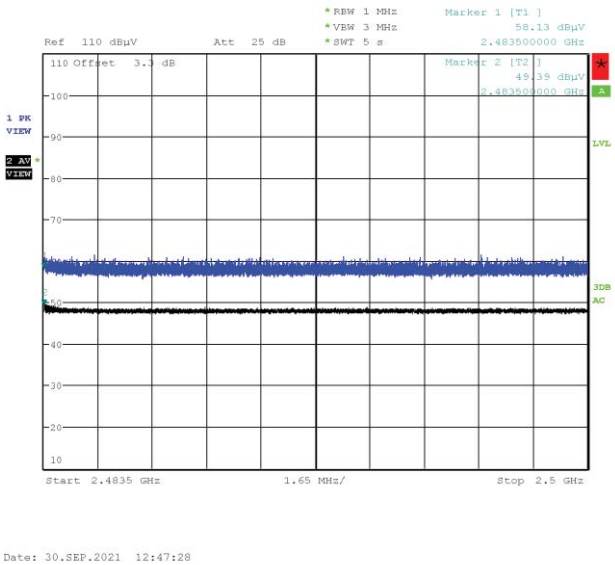


Table 45: Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode B (2441MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Margin QP [dB]	Height [cm]	Angle [°]
148.347	H	57.7	-21.0	36.7	43.5	6.8	222	341
343.654	H	57.8	-18.1	39.7	46.0	6.3	100	359
353.202	H	56.4	-17.8	38.6	46.0	7.4	100	8

Note: Level QP = Reading QP + Factor

Table 46: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode A (2402MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
2390.000	H	54.2	-13.4	40.8	74.0	33.2	183	97
2390.000	V	56.8	-13.4	43.4	74.0	30.6	199	109
4780.581	V	53.6	-6.6	47.0	74.0	27.0	130	158
4812.946	H	52.9	-6.6	46.3	74.0	27.7	118	271
7205.958	H	58.0	0.6	58.6	74.0	15.4	184	353
7205.992	V	60.7	0.6	61.3	74.0	12.7	196	45
9608.000	H	52.1	-8.0	44.1	74.0	29.9	149	325
9608.000	V	54.2	-8.0	46.2	74.0	27.8	148	1
10480.000	H	50.5	-6.9	43.6	74.0	30.4	156	303
10480.000	V	50.2	-6.9	43.3	74.0	30.7	200	19
12010.000	H	51.2	-5.2	46.0	74.0	28.0	100	65
12010.000	V	51.6	-5.2	46.4	74.0	27.6	200	359
15720.000	H	51.0	-4.9	46.1	74.0	27.9	197	349
15720.000	V	51.0	-4.9	46.1	74.0	27.9	128	352
21618.000	H	52.3	-10.6	41.7	74.0	32.3	164	7

Note: Level PK = Reading PK + Factor

Table 47: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode A (2402MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading AV [dBµV]	Factor [dB(1/m)]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
2390.000	H	41.4	-13.4	28.0	54.0	26.0	183	97
2390.000	V	43.0	-13.4	29.6	54.0	24.4	199	109
10480.000	H	37.0	-6.9	30.1	54.0	23.9	156	303
10480.000	V	36.9	-6.9	30.0	54.0	24.0	200	19
15720.000	H	37.7	-4.9	32.8	54.0	21.2	197	349
15720.000	V	37.8	-4.9	32.9	54.0	21.1	128	352

Note: Level AV = Reading AV + Factor

Average results are measured with 10Hz of VBW.

Table 48: Radiated Emissions, Average Data Compensated with DCCF, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode A (2402MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	DCCF [dB]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
4780.581	V	53.6	-6.6	23.2	23.8	54.0	30.2	130	158
4812.946	H	52.9	-6.6	23.2	23.1	54.0	30.9	118	271
7205.958	H	58.0	0.6	23.2	35.4	54.0	18.6	184	353
7205.992	V	60.7	0.6	23.2	38.1	54.0	15.9	196	45
9608.000	H	52.1	-8.0	23.2	20.9	54.0	33.1	149	325
9608.000	V	54.2	-8.0	23.2	23.0	54.0	31.0	148	1
12010.000	H	51.2	-5.2	23.2	22.8	54.0	31.2	100	65
12010.000	V	51.6	-5.2	23.2	23.2	54.0	30.8	200	359
21618.000	H	52.3	-10.6	23.2	18.5	54.0	35.5	164	7

Note: Level AV = Reading PK + Factor - DCCF

Table 49: Band Edge, DH5, Modes A (2402MHz), with 802.11ac-20, CDD, 5240MHz

Operating Frequency [MHz]	Antenna Orientation	Fundamental Level [dBµV]	Band Edge Limit [dBµV]	Band Edge Frequency [MHz]	Band Edge Level [dBµV]	Margin [dB]
2402	H	87.37	67.37	2400	48.38	18.99
2402	V	84.98	64.98	2400	47.94	17.04

Notes: All correction factors are included in the measurement values.

Figure 67: Radiated Emissions at Band Edge (Authorized Band), Spectral Diagram, DH5, Mode A (2402MHz), Horizontal Antenna Orientation, with 802.11ac-20, CDD, 5240MHz

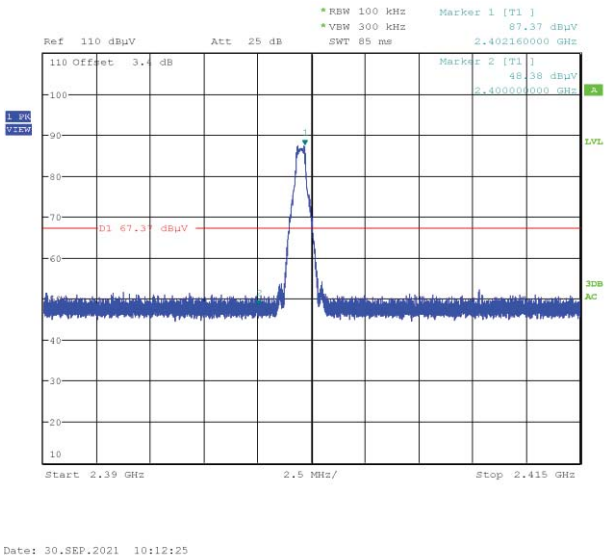


Figure 68: Radiated Emissions at Band Edge (Authorized Band), Spectral Diagram, DH5, Mode A (2402MHz), Vertical Antenna Orientation, with 802.11ac-20, CDD, 5240MHz

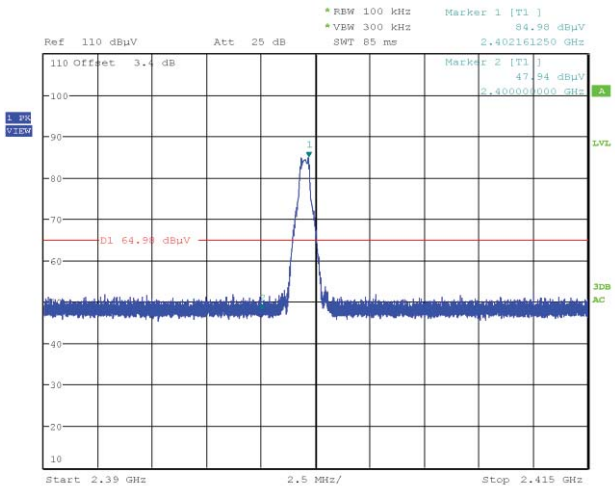


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Figure 69: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, DH5, Mode A (2402MHz), Horizontal Antenna Orientation, with 802.11ac-20, CDD, 5240MHz

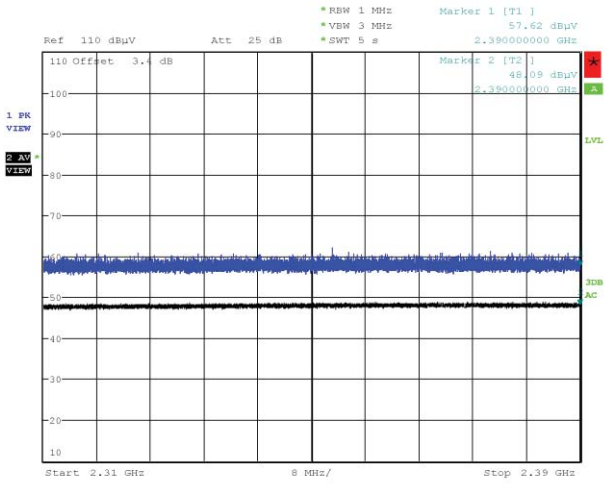

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Figure 70: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, DH5, Mode A (2402MHz), Vertical Antenna Orientation, with 802.11ac-20, CDD, 5240MHz

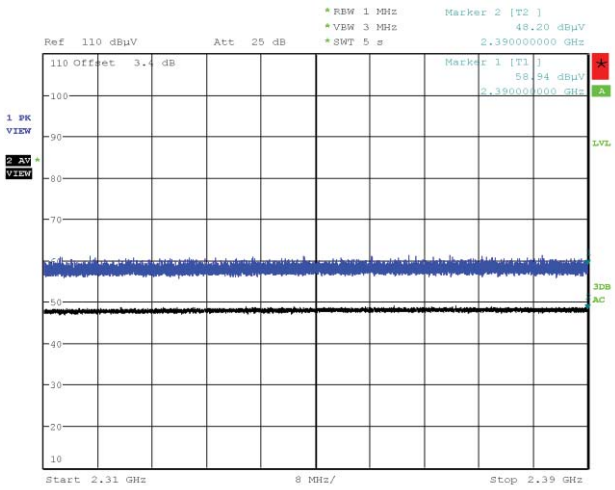

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Table 50: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode B (2441MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
4882.000	V	54.7	-6.8	47.9	74.0	26.1	184	42
4882.000	H	54.5	-6.8	47.7	74.0	26.3	196	50
7322.974	V	57.9	0.9	58.8	74.0	15.2	100	22
7323.002	H	57.1	0.9	58.0	74.0	16.0	160	359
9764.000	H	53.2	-7.0	46.2	74.0	27.8	184	34
9764.000	V	55.4	-7.0	48.4	74.0	25.6	177	354
10480.000	H	50.3	-6.9	43.4	74.0	30.6	157	302
10480.000	V	50.6	-6.9	43.7	74.0	30.3	200	8
12205.000	H	51.5	-5.4	46.1	74.0	27.9	123	65
12205.000	V	51.4	-5.4	46.0	74.0	28.0	199	353
15720.000	H	51.4	-4.9	46.5	74.0	27.5	199	74
15720.000	V	51.4	-4.9	46.5	74.0	27.5	117	347
21969.000	V	52.2	-10.6	41.6	74.0	32.4	120	0

Note: Level PK = Reading PK + Factor

Table 51: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode B (2441MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading AV [dBµV]	Factor [dB(1/m)]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
10480.000	H	37.1	-6.9	30.2	54.0	23.8	157	302
10480.000	V	37.1	-6.9	30.2	54.0	23.8	200	8
15720.000	H	37.7	-4.9	32.8	54.0	21.2	199	74
15720.000	V	37.8	-4.9	32.9	54.0	21.1	117	347

Note: Level AV = Reading AV + Factor

Average results are measured with 10Hz of VBW.

Table 52: Radiated Emissions, Average Data Compensated with DCCF, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode B (2441MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	DCCF [dB]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
4882.000	V	54.7	-6.8	23.2	24.7	54.0	29.3	184	42
4882.000	H	54.5	-6.8	23.2	24.5	54.0	29.5	196	50
7322.974	V	57.9	0.9	23.2	35.6	54.0	18.4	100	22
7323.002	H	57.1	0.9	23.2	34.8	54.0	19.2	160	359
9764.000	H	53.2	-7.0	23.2	23.0	54.0	31.0	184	34
9764.000	V	55.4	-7.0	23.2	25.2	54.0	28.8	177	354
12205.000	H	51.5	-5.4	23.2	22.9	54.0	31.1	123	65
12205.000	V	51.4	-5.4	23.2	22.8	54.0	31.2	199	353
21969.000	V	52.2	-10.6	23.2	18.4	54.0	35.6	120	0

Note: Level AV = Reading PK + Factor - DCCF

Table 53: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode C (2480MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
4960.000	H	53.9	-6.3	47.6	74.0	26.4	105	14
4960.000	V	54.7	-6.3	48.4	74.0	25.6	191	12
7439.972	V	57.6	0.8	58.4	74.0	15.6	197	46
7440.006	H	56.3	0.8	57.1	74.0	16.9	172	355
9920.000	H	52.0	-7.1	44.9	74.0	29.1	140	30
9920.000	V	53.6	-7.1	46.5	74.0	27.5	200	354
10480.000	H	50.4	-6.9	43.5	74.0	30.5	153	301
10480.000	V	50.8	-6.9	43.9	74.0	30.1	181	9
12400.000	H	53.0	-6.8	46.2	74.0	27.8	119	53
12400.000	V	54.0	-6.8	47.2	74.0	26.8	184	286
15720.000	H	51.3	-4.9	46.4	74.0	27.6	164	277
15720.000	V	51.7	-4.9	46.8	74.0	27.2	104	216
22320.000	V	53.1	-10.9	42.2	74.0	31.8	191	7

Note: Level PK = Reading PK + Factor

Table 54: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode C (2480MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading AV [dBµV]	Factor [dB(1/m)]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
10480.000	V	37.1	-6.9	30.2	54.0	23.8	181	9
15720.000	H	37.6	-4.9	32.7	54.0	21.3	164	277

Note: Level AV = Reading AV + Factor

Average results are measured with 10Hz of VBW.

Table 55: Radiated Emissions, Average Data Compensated with DCCF, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, DH5, Mode C (2480MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	DCCF [dB]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
4960.000	H	53.9	-6.3	23.2	24.4	54.0	29.6	105	14
4960.000	V	54.7	-6.3	23.2	25.2	54.0	28.8	191	12
7439.972	V	57.6	0.8	23.2	35.2	54.0	18.8	197	46
7440.006	H	56.3	0.8	23.2	33.9	54.0	20.1	172	355
9920.000	H	52.0	-7.1	23.2	21.7	54.0	32.3	140	30
9920.000	V	53.6	-7.1	23.2	23.3	54.0	30.7	200	354
12400.000	H	53.0	-6.8	23.2	23.0	54.0	31.0	119	53
12400.000	V	54.0	-6.8	23.2	24.0	54.0	30.0	184	286
22320.000	V	53.1	-10.9	23.2	19.0	54.0	35.0	191	7

Note: Level AV = Reading PK + Factor - DCCF

Figure 71: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, DH5, Mode C (2480MHz), Horizontal Antenna Orientation, with 802.11ac-20, CDD, 5240MHz

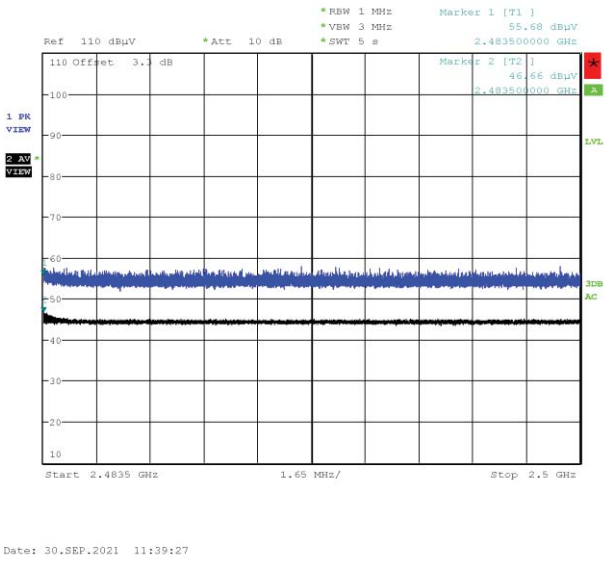

Figure 72: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, DH5, Mode C (2480MHz), Vertical Antenna Orientation, with 802.11ac-20, CDD, 5240MHz

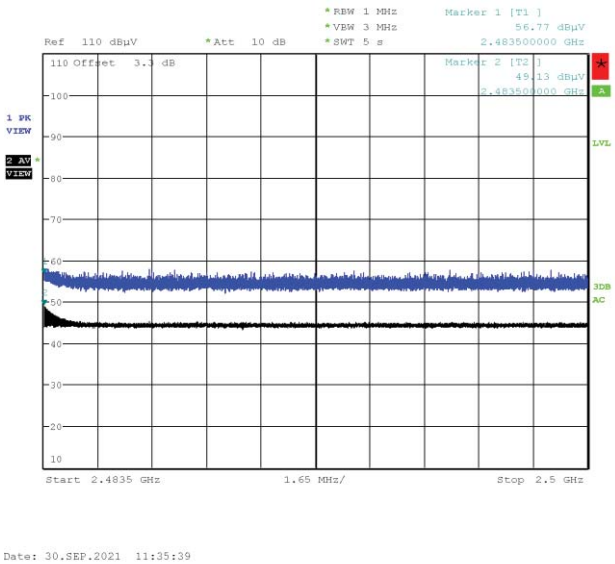

Table 56: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode A (2402MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
4823.774	H	53.2	-6.7	46.5	74.0	27.5	184	228
4831.274	V	53.6	-6.7	46.9	74.0	27.1	173	18
7206.025	H	55.8	0.6	56.4	74.0	17.6	178	333
7206.059	V	58.5	0.6	59.1	74.0	14.9	138	46
9608.000	H	51.7	-8.0	43.7	74.0	30.3	198	324
9608.000	V	53.6	-8.0	45.6	74.0	28.4	145	1
10480.000	H	50.8	-6.9	43.9	74.0	30.1	156	300
10480.000	V	50.7	-6.9	43.8	74.0	30.2	200	10
12010.000	H	50.9	-5.2	45.7	74.0	28.3	100	66
12010.000	V	51.8	-5.2	46.6	74.0	27.4	200	355
15720.000	H	50.9	-4.9	46.0	74.0	28.0	200	41
15720.000	V	50.7	-4.9	45.8	74.0	28.2	118	349

Note: Level PK = Reading PK + Factor

Table 57: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode A (2402MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading AV [dBµV]	Factor [dB(1/m)]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
4831.274	V	40.3	-6.7	33.6	54.0	20.4	173	18
10480.000	V	37.0	-6.9	30.1	54.0	23.9	200	10
15720.000	H	37.6	-4.9	32.7	54.0	21.3	200	41

Note: Level AV = Reading AV + Factor

Average results are measured with 10Hz of VBW.

Table 58: Radiated Emissions, Average Data Compensated with DCCF, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode A (2402MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	DCCF [dB]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
7206.025	H	55.8	0.6	19.1	37.3	54.0	16.7	178	333
7206.059	V	58.5	0.6	19.1	40.0	54.0	14.0	138	46
9608.000	H	51.7	-8.0	19.1	24.6	54.0	29.4	198	324
9608.000	V	53.6	-8.0	19.1	26.5	54.0	27.5	145	1
12010.000	H	50.9	-5.2	19.1	26.6	54.0	27.4	100	66
12010.000	V	51.8	-5.2	19.1	27.5	54.0	26.5	200	355

Note: Level AV = Reading PK + Factor - DCCF

Table 59: Band Edge, 3DH5, Modes A (2402MHz), with 802.11ac-20, CDD, 5240MHz

Operating Frequency [MHz]	Antenna Orientation	Fundamental Level [dBµV]	Band Edge Limit [dBµV]	Band Edge Frequency [MHz]	Band Edge Level [dBµV]	Margin [dB]
2402	H	81.84	61.84	2400	47.05	14.79
2402	V	85.85	65.85	2400	45.95	19.90

Notes: All correction factors are included in the measurement values.

Figure 73: Radiated Emissions at Band Edge (Authorized Band), Spectral Diagram, 3DH5, Mode A (2402MHz), Horizontal Antenna Orientation, with 802.11ac-20, CDD, 5240MHz

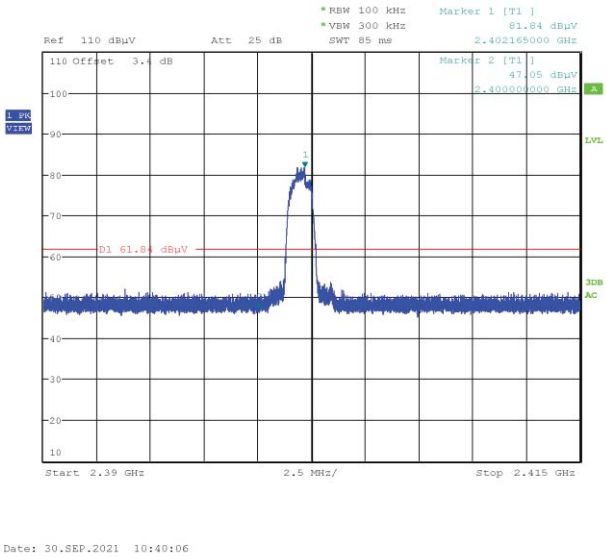

Figure 74: Radiated Emissions at Band Edge (Authorized Band), Spectral Diagram, 3DH5, Mode A (2402MHz), Vertical Antenna Orientation, with 802.11ac-20, CDD, 5240MHz

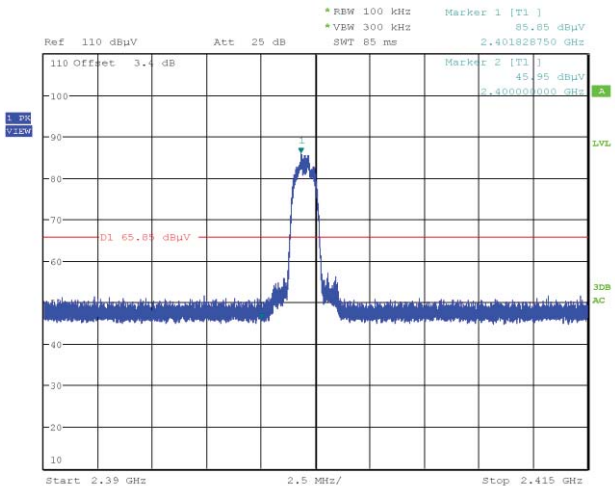

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Figure 75: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, 3DH5, Mode A (2402MHz), Horizontal Antenna Orientation, with 802.11ac-20, CDD, 5240MHz

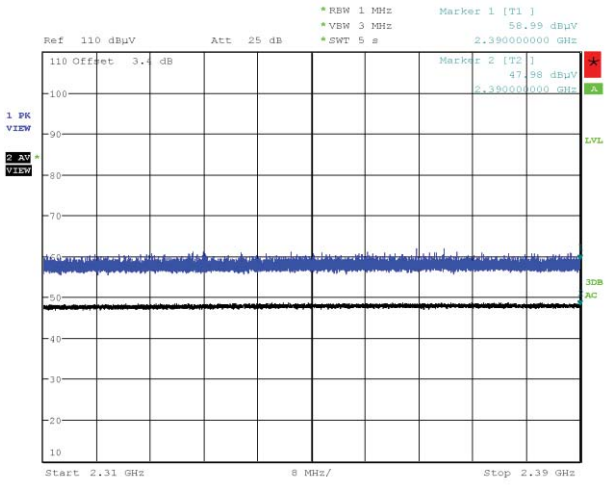

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Figure 76: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, 3DH5, Mode A (2402MHz), Vertical Antenna Orientation, with 802.11ac-20, CDD, 5240MHz

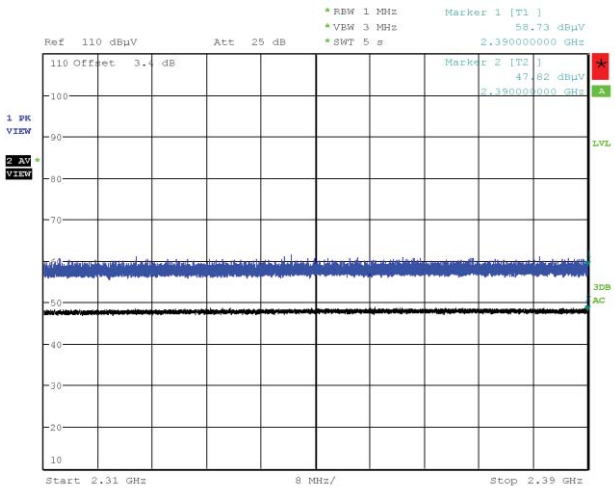

Table 60: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode B (2441MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
4882.000	H	53.7	-6.8	46.9	74.0	27.1	166	40
4882.000	V	53.1	-6.8	46.3	74.0	27.7	178	335
7323.002	V	56.9	0.9	57.8	74.0	16.2	138	45
7323.031	H	57.2	0.9	58.1	74.0	15.9	184	356
9764.000	H	52.4	-7.0	45.4	74.0	28.6	173	13
9764.000	V	54.4	-7.0	47.4	74.0	26.6	187	355
10480.000	H	51.3	-6.9	44.4	74.0	29.6	137	301
10480.000	V	50.7	-6.9	43.8	74.0	30.2	194	21
12205.000	H	51.2	-5.4	45.8	74.0	28.2	114	64
12205.000	V	52.1	-5.4	46.7	74.0	27.3	197	354
15720.000	H	51.2	-4.9	46.3	74.0	27.7	161	350
15720.000	V	51.9	-4.9	47.0	74.0	27.0	115	12

Note: Level PK = Reading PK + Factor

Table 61: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode B (2441MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading AV [dBµV]	Factor [dB(1/m)]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
10480.000	H	37.0	-6.9	30.1	54.0	23.9	137	301
15720.000	H	37.7	-4.9	32.8	54.0	21.2	161	350

Note: Level AV = Reading AV + Factor

Average results are measured with 10Hz of VBW.

Table 62: Radiated Emissions, Average Data Compensated with DCCF, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode B (2441MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	DCCF [dB]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
4882.000	H	53.7	-6.8	19.1	27.8	54.0	26.2	166	40
4882.000	V	53.1	-6.8	19.1	27.2	54.0	26.8	178	335
7323.002	V	56.9	0.9	19.1	38.7	54.0	15.3	138	45
7323.031	H	57.2	0.9	19.1	39.0	54.0	15.0	184	356
9764.000	H	52.4	-7.0	19.1	26.3	54.0	27.7	173	13
9764.000	V	54.4	-7.0	19.1	28.3	54.0	25.7	187	355
12205.000	H	51.2	-5.4	19.1	26.7	54.0	27.3	114	64
12205.000	V	52.1	-5.4	19.1	27.6	54.0	26.4	197	354

Note: Level AV = Reading PK + Factor - DCCF

Table 63: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode C (2480MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
4960.000	H	53.6	-6.3	47.3	74.0	26.7	196	179
4960.000	V	53.3	-6.3	47.0	74.0	27.0	153	15
7439.927	V	54.5	0.8	55.3	74.0	18.7	138	332
7440.050	H	54.5	0.8	55.3	74.0	18.7	113	338
9920.000	H	51.3	-7.1	44.2	74.0	29.8	200	15
9920.000	V	53.3	-7.1	46.2	74.0	27.8	200	354
10480.000	H	50.4	-6.9	43.5	74.0	30.5	141	301
10480.000	V	50.4	-6.9	43.5	74.0	30.5	198	23
12400.000	H	52.8	-6.8	46.0	74.0	28.0	123	54
12400.000	V	53.9	-6.8	47.1	74.0	26.9	200	353
15720.000	H	51.4	-4.9	46.5	74.0	27.5	163	17
15720.000	V	51.1	-4.9	46.2	74.0	27.8	200	21

Note: Level PK = Reading PK + Factor

Table 64: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode C (2480MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading AV [dBµV]	Factor [dB(1/m)]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
10480.000	V	36.9	-6.9	30.0	54.0	24.0	198	23
15720.000	H	37.7	-4.9	32.8	54.0	21.2	163	17

Note: Level AV = Reading AV + Factor

Average results are measured with 10Hz of VBW.

Table 65: Radiated Emissions, Average Data Compensated with DCCF, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode C (2480MHz), with 802.11ac-20, CDD, 5240MHz

Freq. [MHz]	Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	DCCF [dB]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
4960.000	H	53.6	-6.3	19.1	28.2	54.0	25.8	196	179
4960.000	V	53.3	-6.3	19.1	27.9	54.0	26.1	153	15
7439.927	V	54.5	0.8	19.1	36.2	54.0	17.8	138	332
7440.050	H	54.5	0.8	19.1	36.2	54.0	17.8	113	338
9920.000	H	51.3	-7.1	19.1	25.1	54.0	28.9	200	15
9920.000	V	53.3	-7.1	19.1	27.1	54.0	26.9	200	354
12400.000	H	52.8	-6.8	19.1	26.9	54.0	27.1	123	54
12400.000	V	53.9	-6.8	19.1	28.0	54.0	26.0	200	353

Note: Level AV = Reading PK + Factor - DCCF

Figure 77: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, 3DH5, Mode C (2480MHz), Horizontal Antenna Orientation, with 802.11ac-20, CDD, 5240MHz

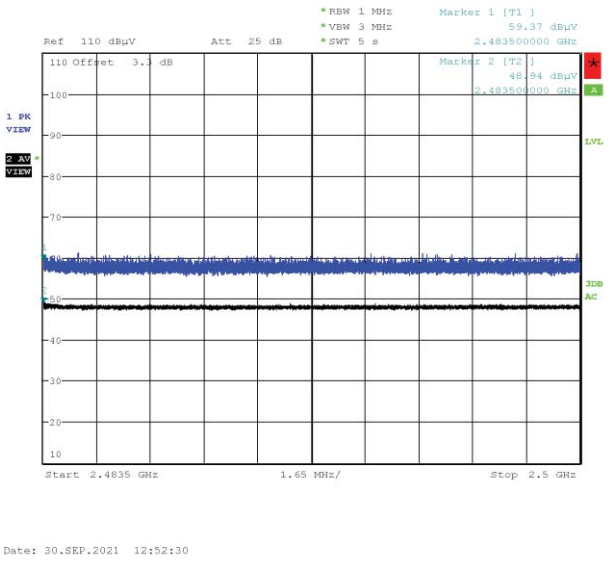

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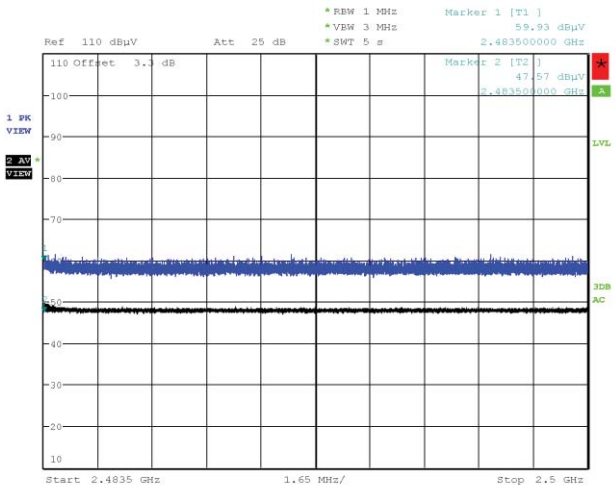
Figure 78: Radiated Emissions at Band Edge (Restricted Band), Spectral Diagram, 3DH5, Mode C (2480MHz), Vertical Antenna Orientation, with 802.11ac-20, CDD, 5240MHz



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5.4 AC Power Line Conducted Measurements

5.4.1 AC Power Line Conducted Emission of Transmitter

RESULT: **N/A**

Requirements:

FCC 15.207 and RSS-Gen 8.8.

The AC power line conducted emission on any frequency within the band 150kHz to 30MHz shall not exceed the limits specified in FCC 15.207 and RSS-Gen 8.8.

Test procedure:

ANSI C63.10 §6.2

Note:

Not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

7. List of Tables

8. List of Figures

9. List of Photographs

– End of test report –