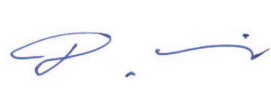



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Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order Date:</i>	2021-10-19	
Auftraggeber: <i>Client:</i>	Donut Robotics Co., Ltd. 1-17-1 Toranomon, Minato-Ku, Tokyo, 105-6415, Japan			
Prüfgegenstand: <i>Test Item:</i>	Smart Mask			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	C-FACE	Serien-Nr.: <i>Serial No.:</i>	N/A	
Auftrags-Inhalt: <i>Order Content:</i>	Radio Testing			
Prüfgrundlage: <i>Test Specification:</i>	FCC 47 CFR Part 15, Subpart C, Section 15.247 ANSI C63.10-2013			
Wareneingangsdatum: <i>Date of Receipt:</i>	2021-11-19			
Prüfmuster-Nr.: <i>Test Sample No.:</i>	A003168123			
Prüfzeitraum: <i>Testing Period:</i>	2021-11-22 - 2021-12-09			
Ort der Prüfung: <i>Place of Testing:</i>	Yokohama EMC Laboratory			
Prüflaboratorium: <i>Testing Laboratory:</i>	TÜV Rheinland Japan Ltd.			
Prüfergebnis*: <i>Test Result*:</i>	Pass			
Überprüft von: <i>Reviewed by:</i>		Genehmigt von: <i>Authorized by:</i>		
Datum: 2022-01-26 <i>Date:</i>	_____	Datum: 2022-01-26 <i>Date:</i>	_____	
Stellung / Position:	Inspector	Stellung / Position:	Reviewer	
Sonstiges / Other:				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the Test Item at Delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende: P(ass) = entspricht o.g. Prüfgrundlage(n) * Legend: 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	
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

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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 ANSI C63.10-2013		
Conducted Output Power	FCC 15.247(b)(1)	Pass
Conducted Spurious Emissions	FCC 15.247(d)	Pass
20dB Bandwidth	FCC 15.215(c), 15.247(a)(1)	Pass
99% Bandwidth	For reference	Performed
Carrier Frequency Separation	FCC §15.247(a)(1)	Pass
Number of Hopping Frequencies	FCC §15.247(a)(1)(iii)	Pass
Average Time of Occupancy	FCC §15.247(a)(1)(iii)	Pass
Radiated Spurious Emissions of Transmitter	FCC 15.247(d)	Pass
Conducted Emission on AC Power Ports	FCC 15.207 Not applicable since the EUT is not able to transmit during battery charge.	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 listed in section 1.1 for original grant application.

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 used test equipment is in accordance with CISPR 16 for measurement of radio interference.

The test facility is recognized by the Federal Communications Commission (FCC) as Accredited Testing Laboratory under designation number JP0017.

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

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	ESW 44	101751	RF-0809	1 year	2021-09-27	2022-09-27
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
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	LP1000CH 3	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
Constant Voltage Constant Frequency Stabilizers and Power Accessories							
DC Power Supply	Agilent	E3646A	MY503500 07	RF-0412	N/A	N/A	N/A
True RMS Multimeter	Fluke	87V	16110176	RF-0414	1 year	2021-06-10	2022-06-10

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
Antenna Port Conducted Emission	20Hz - 40GHz	±1.5dB
Radiated Emission	150kHz - 30MHz	±4.7dB
	30MHz - 1GHz	±3.8dB
	> 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** (Equipment Under Test) is a mask incorporating Bluetooth module for voice communication.

3.2 Ratings and System Details

Radio standard:	Bluetooth 2.1 with EDR (class 1)
Frequency range:	2402 – 2480MHz
Antenna gain:	2dBi
Antenna type:	Chip Antenna
Antenna mounting type:	Internal
Modulation type:	DH5, (FHSS): GFSK 2DH5, (OFDM): $\pi/4$ -DQPSK 3DH5: (OFDM): 8DPSK
Signal spreading:	FHSS (coupled with modulation type above)
Transmit speed:	DH5: 1 Mbps, 2DH5: 2 Mbps, 3DH5: 3 Mbps
Number of channels:	79
Channel spacing:	1MHz (2MHz for Inquiry)
Rated temperature:	+5 to 40°C
Rated voltage:	DC 3.7V
Rated input Current:	Not specified
Protection class:	III
Test voltage:	DC 3.7V

3.3 Noise Generating and Noise Suppressing Parts

The highest frequency generated or used by the EUT is 2480MHz as maximum fundamental frequency of incorporated Bluetooth module.

3.4 Submitted Documents and Information

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.

The test methods, which have been used, are based on ANSI C63.10.

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 a modulated signal at lowest channel (2402MHz)
- B. EUT transmits a modulated signal at middle channel (2441MHz)
- C. EUT transmits a modulated signal at middle channel (2480MHz)
- H. EUT transmits on pseudo-random sequence on all channels (hopping mode)
- R. EUT operates in receive mode at middle channel (2441MHz)

Configurations:

- BT1. DH5 (BDR 1 Mbps)
- BT2. 2DH5 (EDR 2 Mbps)
- BT3. 3DH5 (EDR 3 Mbps)
- BT4. DH1, DH3, DH5, 3DH1, 3DH3, 3DH5

Note: Unless otherwise specified, the measurements shall be made with the transmit speed (data rate) and packet type (DH) corresponding to the worst case output power (found by peak output power measurement.)

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

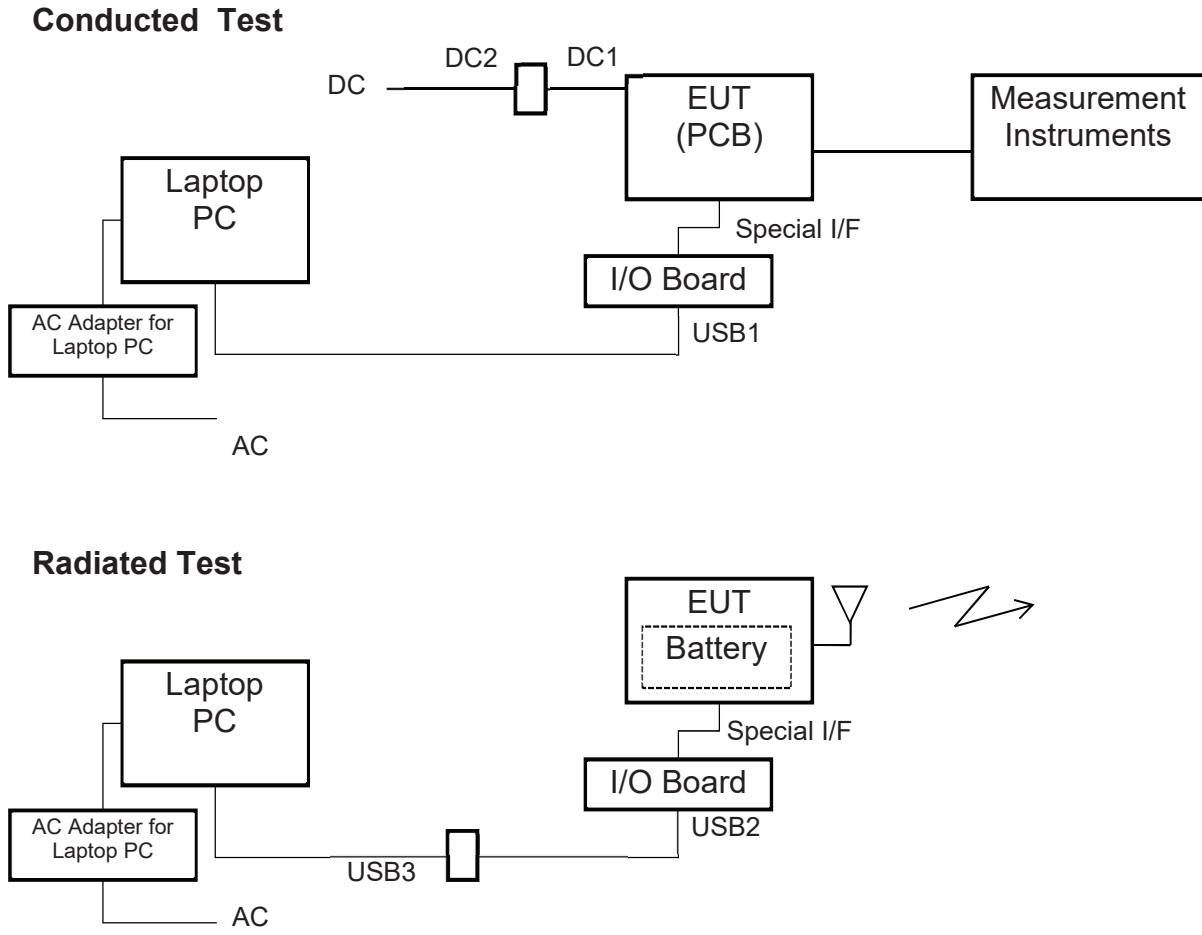


Table 4: Interfaces present on the EUT

No.	Interface(s):	Max. Cable Length, Shielding	Cable Classification
1.	USB1	0.50m, Shielded	Signal Line
2.	Special I/F	0.15m, Un-shielded	Signal Line
3.	USB, Type C	2.00m, Shielded	Signal Line
4.	DC1	0.20m, Un-shielded	DC Power Line
5.	DC2 (Test Lead)	1.10m, Un-shielded	DC Power Line
6.	USB2	1.10m, Shielded	Signal Line
7.	USB3 (Extension)	5.00m, Shielded	Signal Line

Note:

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

4.4 Test Software

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

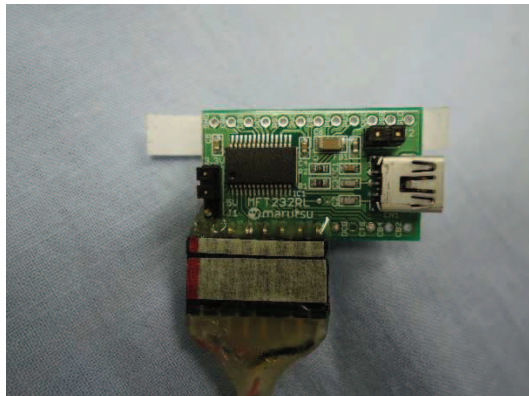
Software used for testing: RTLBTAPP version 5.2.2.52 by Realtek
RtlBluetoothMP.dll version 5.3.1.20 by Realtek

4.5 Special Accessories and Auxiliary Equipment

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

1. Product: I/O Board
Manufacturer: N/A
Model: N/A

Photograph 1: I/O Board



2. Product: Laptop PC
Manufacturer: Dell
Model: Latitude E6230
Rated Voltage: DC 19.5V
Input Current: 3.34A
Protection Class: III
Serial Number: JVN3GV1

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3. Product: AC Adapter for Laptop PC
Manufacturer: Dell
Model: LA65NS2-01
Rated Voltage: AC 100-240V
Input Current: 1.6A
Frequency: 50-60Hz
Protection Class: II
Serial Number: CN-06TM1C-72438-25A-3483-A00

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.

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5.1.3 Restricted Bands of Operation

RESULT:

PASS

Requirements:

FCC 15.205

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: 2021-11-22

Ambient temperature: 22°C

Relative humidity: 54%

Atmospheric pressure: 1008hPa

Operation Modes: A ~ C

Configurations: BT1 ~ BT3

Requirements:

FCC 15.247(b)(1)

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).

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.

Table 5: Maximum Peak Output Power, BDR (DH5)

Freq. [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
2402	2.09	21	18.91
2441	2.95	21	18.05
2480	2.34	21	18.66

Table 6: Maximum Peak Output Power, EDR (2DH5)

Freq. [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
2402	4.56	21	16.44
2441	4.97	21	16.03
2480	3.85	21	17.15

Table 7: Maximum Peak Output Power, EDR (3DH5)

Freq. [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
2402	5.07	21	15.93
2441	5.46	21	15.54
2480	4.77	21	16.23

Figure 2: Maximum Peak Output Power, DH5, Mode A (2402MHz)

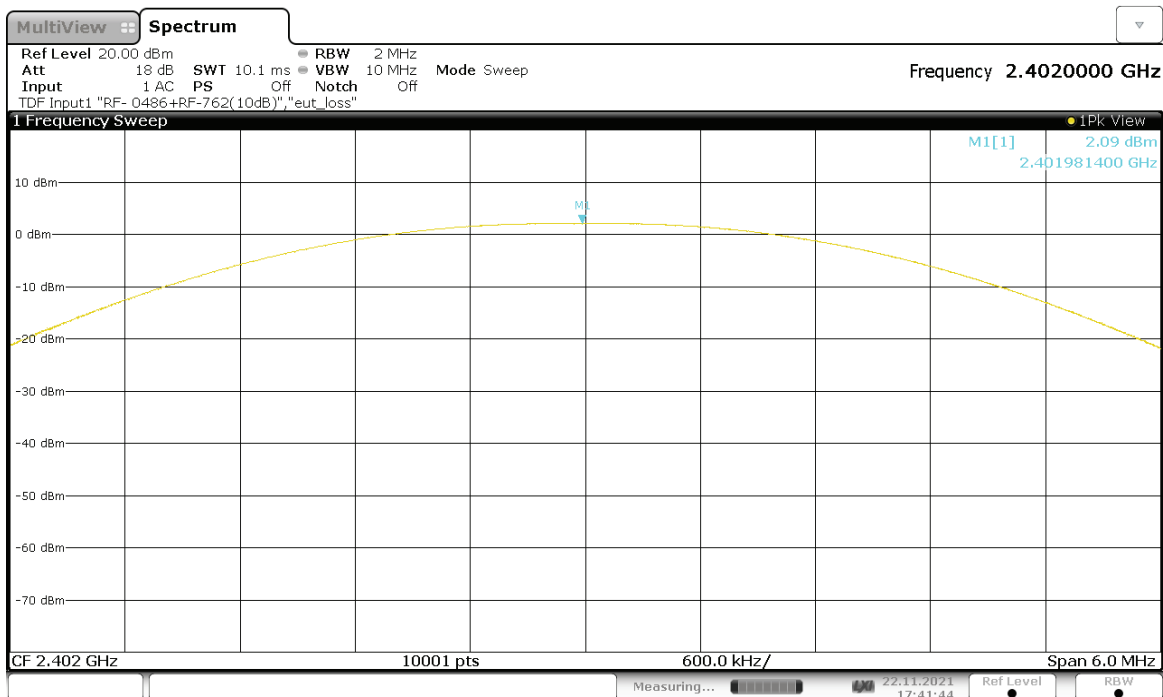
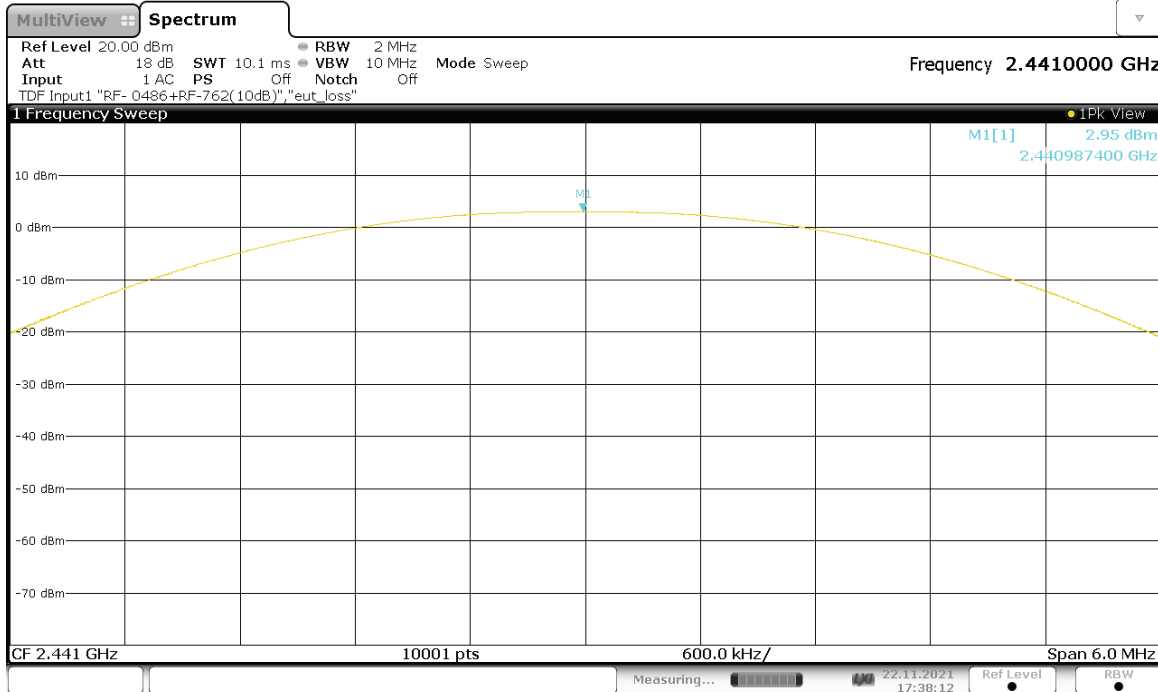
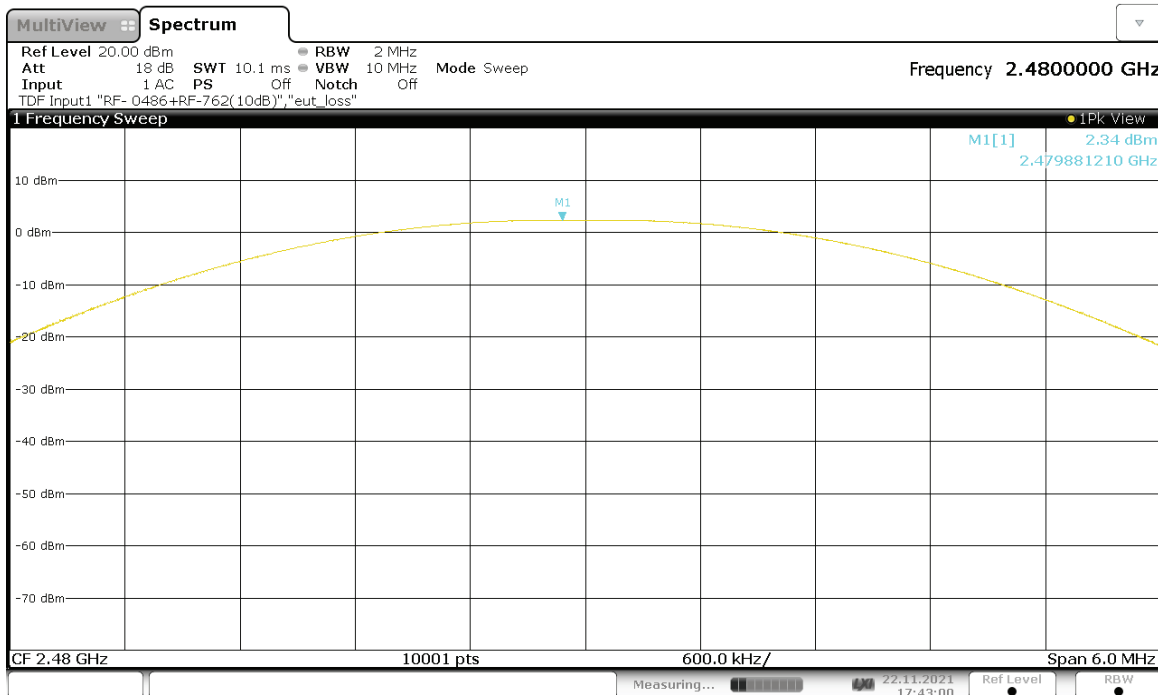


Figure 3: Maximum Peak Output Power, DH5, Mode B (2441MHz)



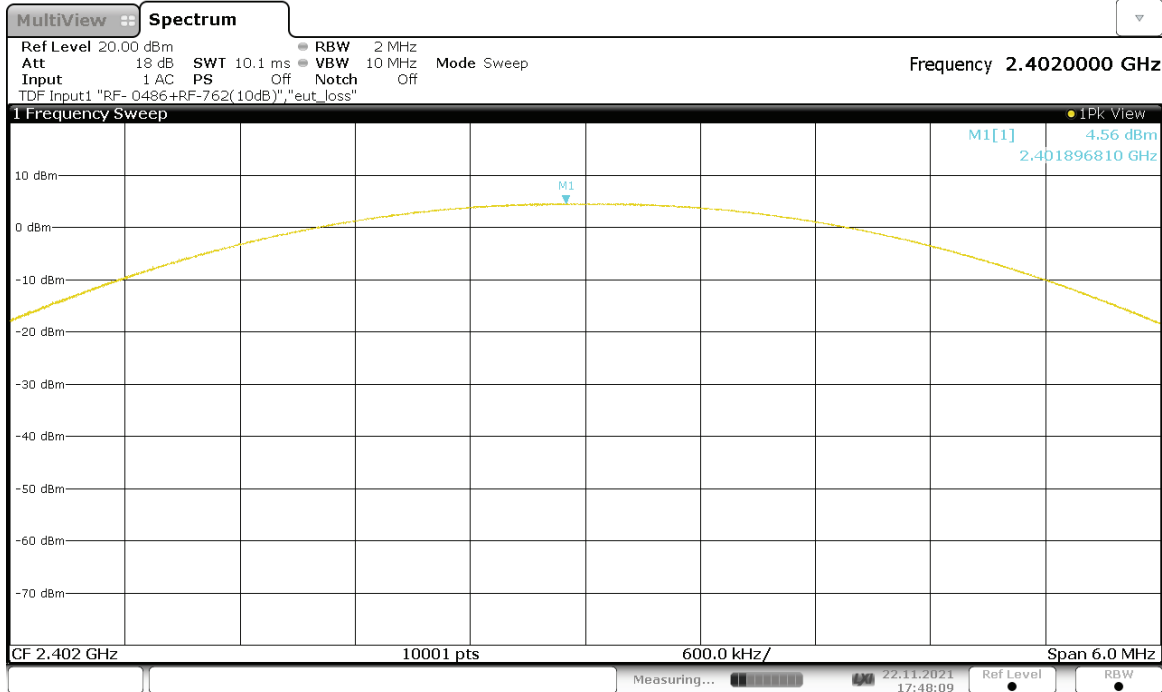
17:38:13 22.11.2021

Figure 4: Maximum Peak Output Power, DH5, Mode B (2480MHz)



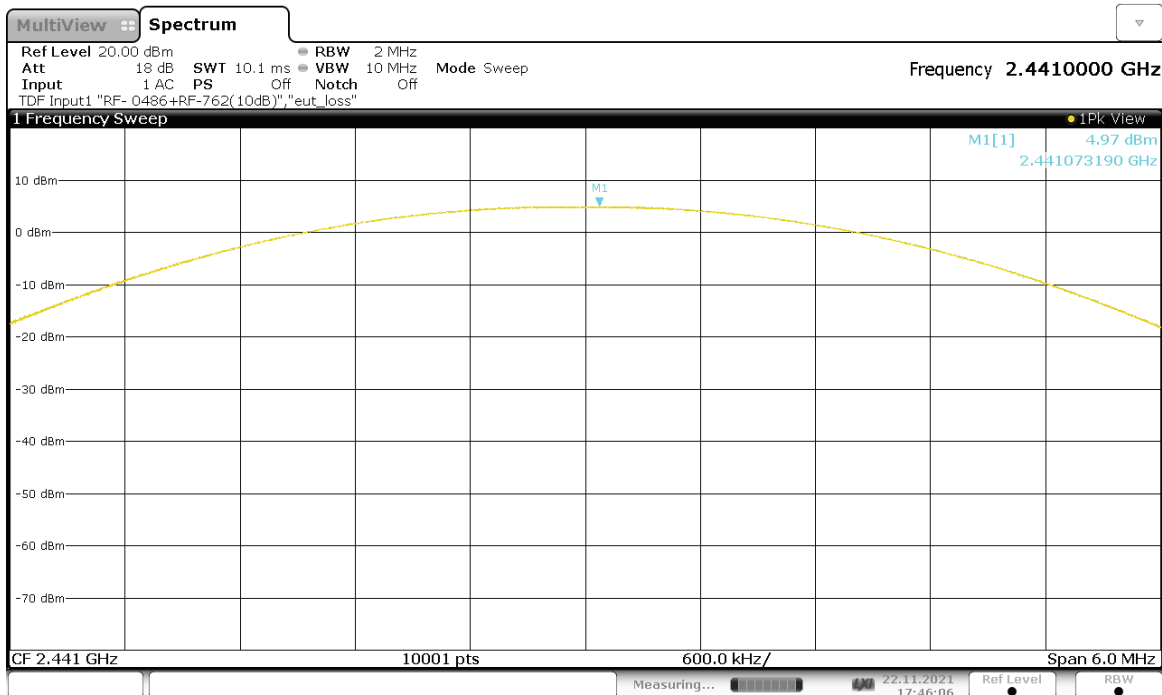
17:43:01 22.11.2021

Figure 5: Maximum Peak Output Power, 2DH5, Mode A (2402MHz)



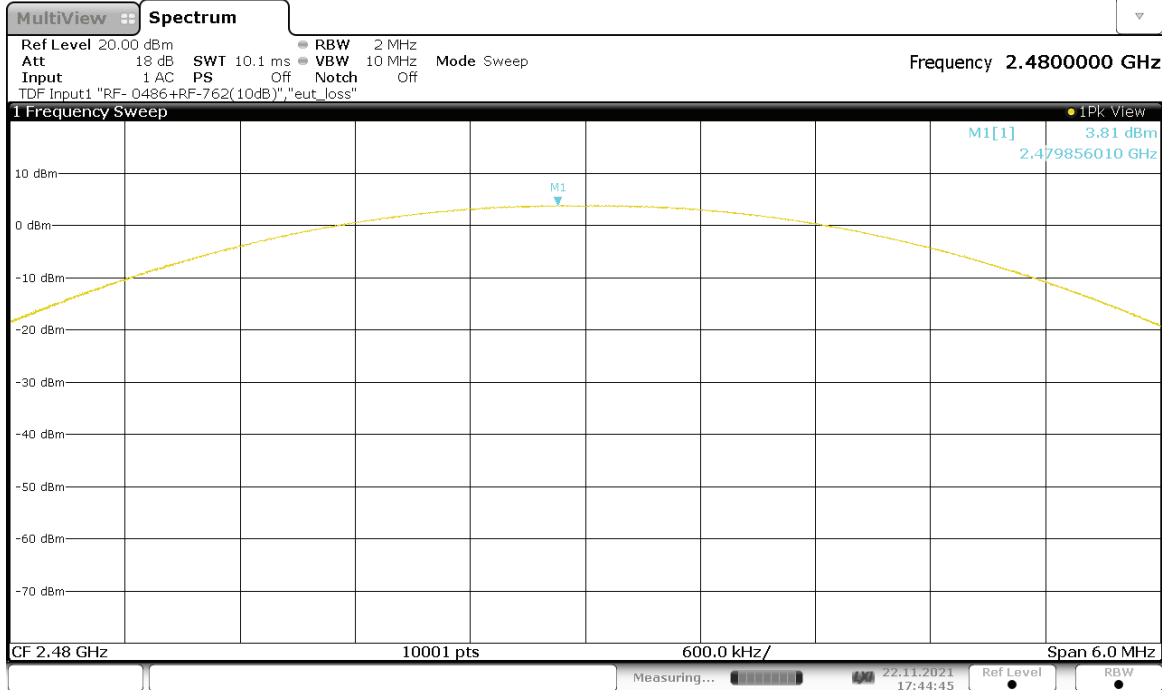
17:48:09 22.11.2021

Figure 6: Maximum Peak Output Power, 2DH5, Mode B (2441MHz)



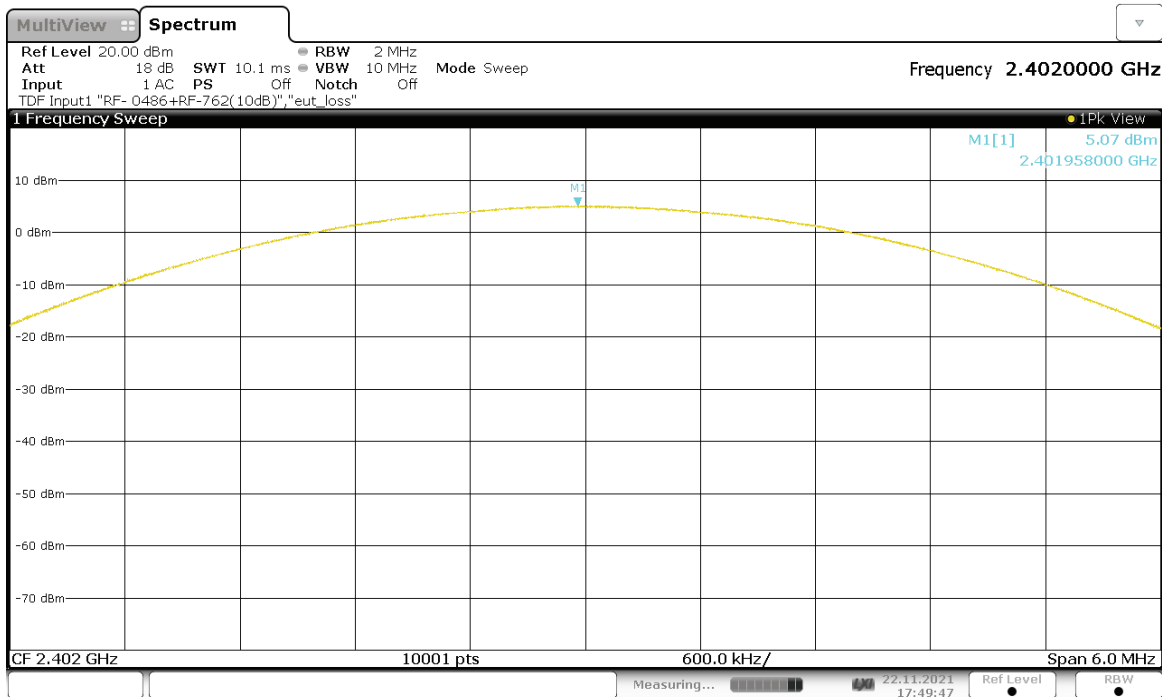
17:46:07 22.11.2021

Figure 7: Maximum Peak Output Power, 2DH5, Mode C (2480MHz)



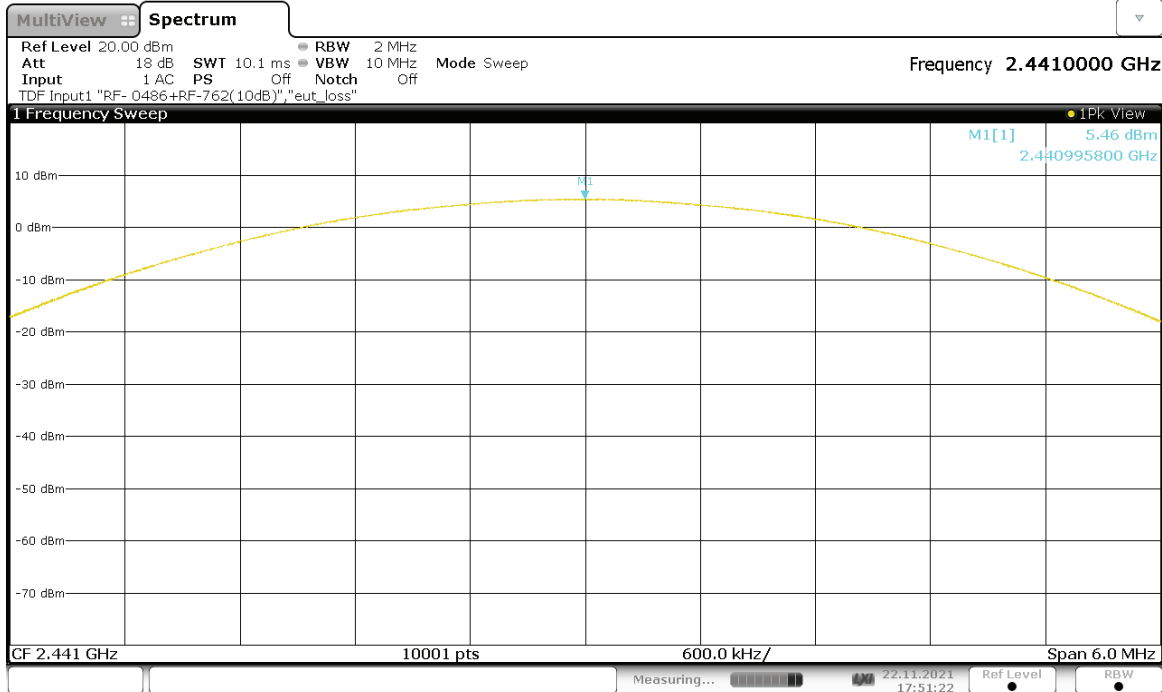
17:44:46 22.11.2021

Figure 8: Maximum Peak Output Power, 3DH5, Mode A (2402MHz)



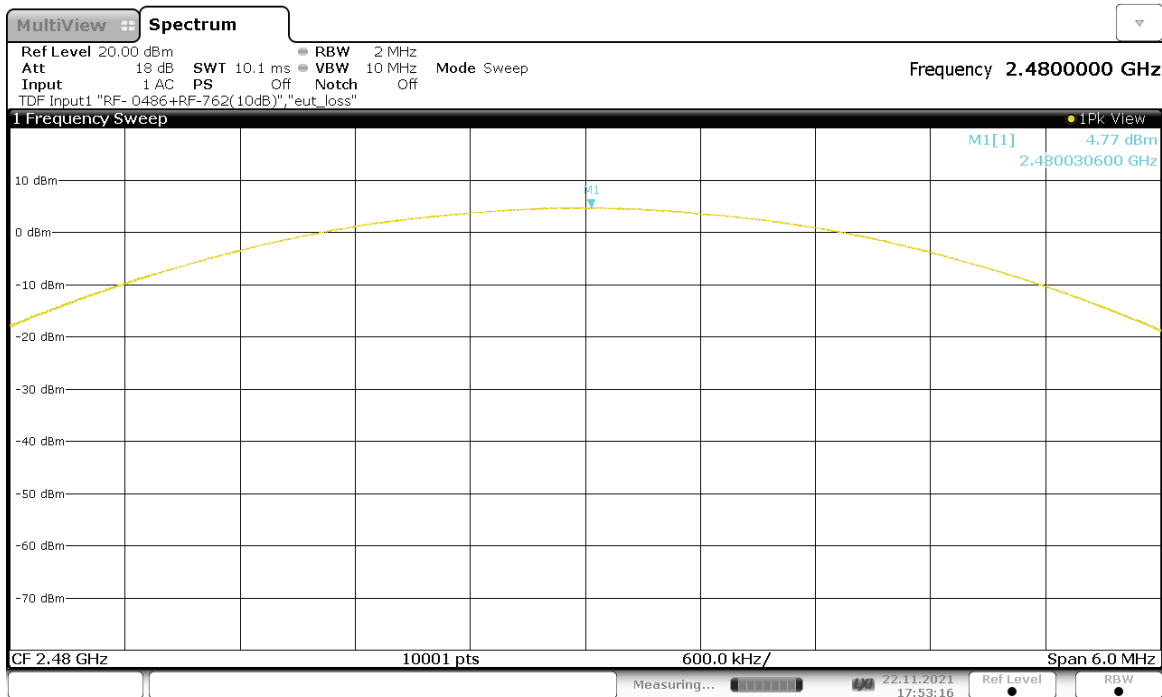
17:49:48 22.11.2021

Figure 9: Maximum Peak Output Power, 3DH5, Mode B(2441MHz)



17:51:22 22.11.2021

Figure 10: Maximum Peak Output Power, 3DH5, Mode C (2480MHz)



17:53:17 22.11.2021

5.2.2 20dB Bandwidth

RESULT:

PASS

Date of testing: 2021-11-22

Ambient temperature: 22°C
Relative humidity: 54%
Atmospheric pressure: 1008hPa
Operation Modes: A ~ C
Configurations: BT1, BT3

Requirements:

FCC 15.215(c) and 15.247(a)(1)

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

The 20dB bandwidth shall be contained within the frequency band designated in the rule section under which the equipment is operated.

Test procedure:

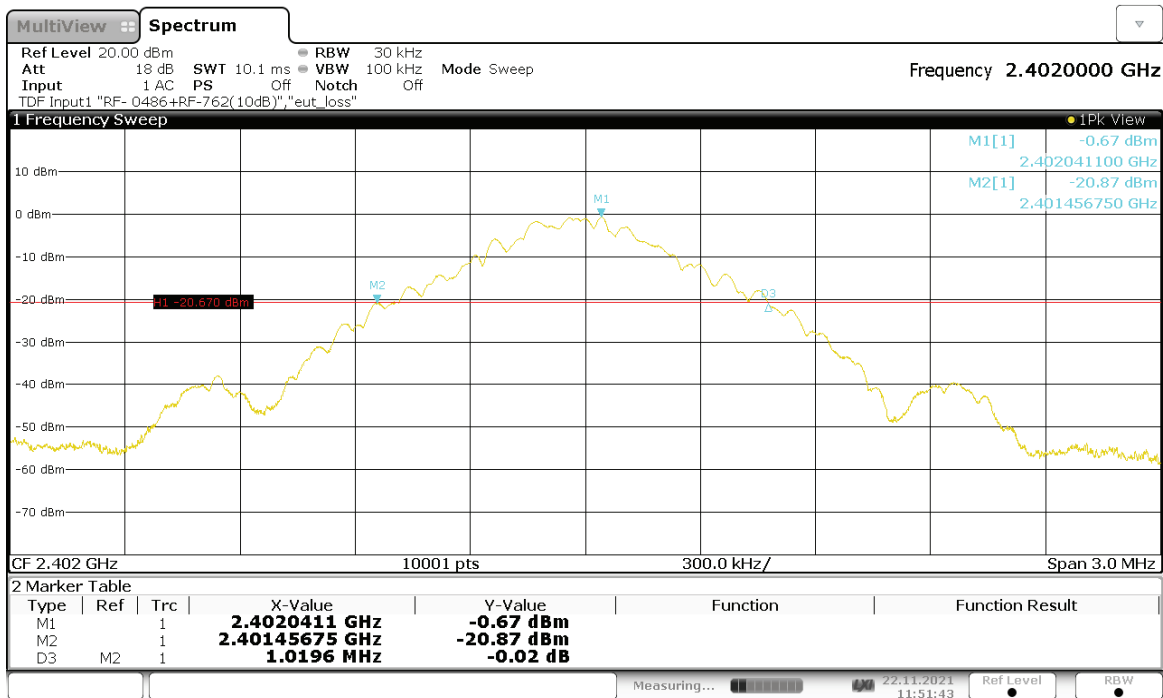
ANSI C63.10 §7.8.7.

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 8: 20dB Bandwidth, DH5

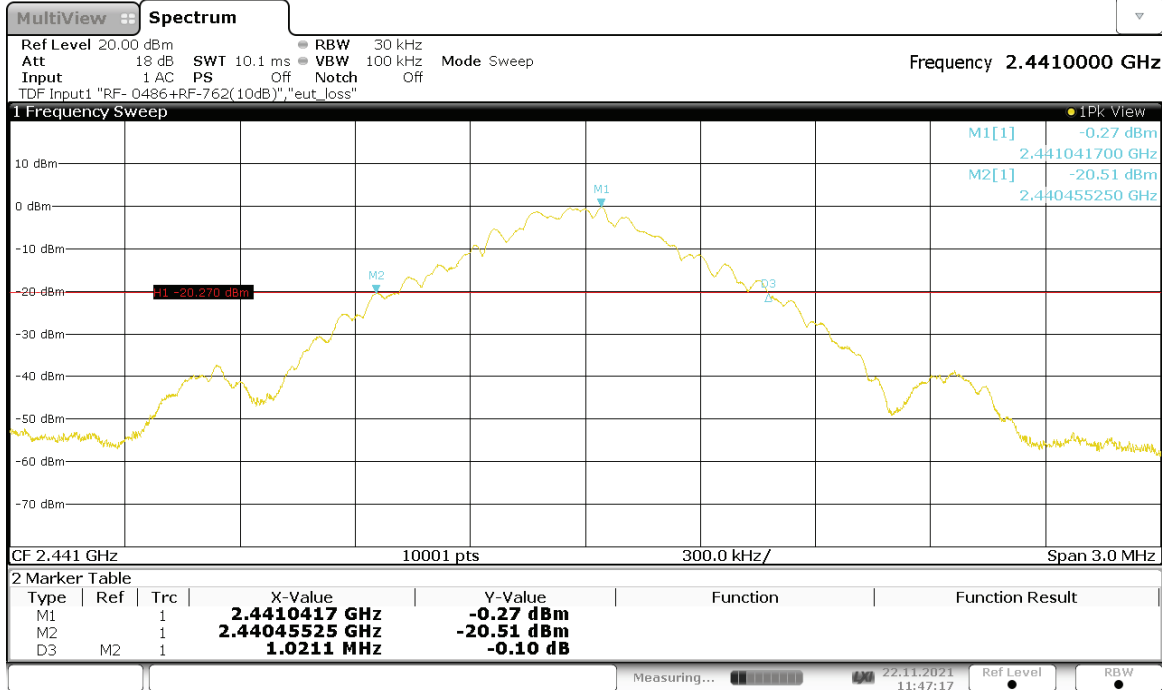
Operating Frequency [MHz]	20dB Bandwidth [MHz]
2402	1.020
2441	1.021
2480	1.023

Figure 11: 20dB Bandwidth, DH5, Mode A (2402MHz)



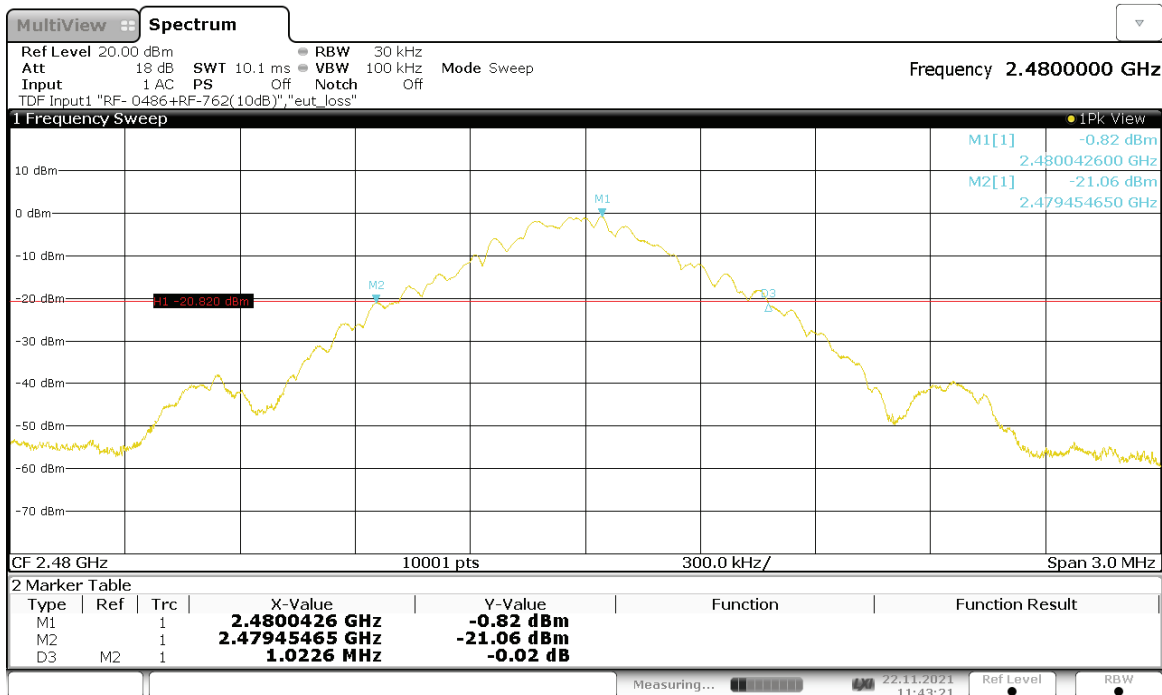
11:51:44 22.11.2021

Figure 12: 20dB Bandwidth, DH5, Mode B (2441MHz)



11:47:17 22.11.2021

Figure 13: 20dB Bandwidth, DH5, Mode C (2480MHz)

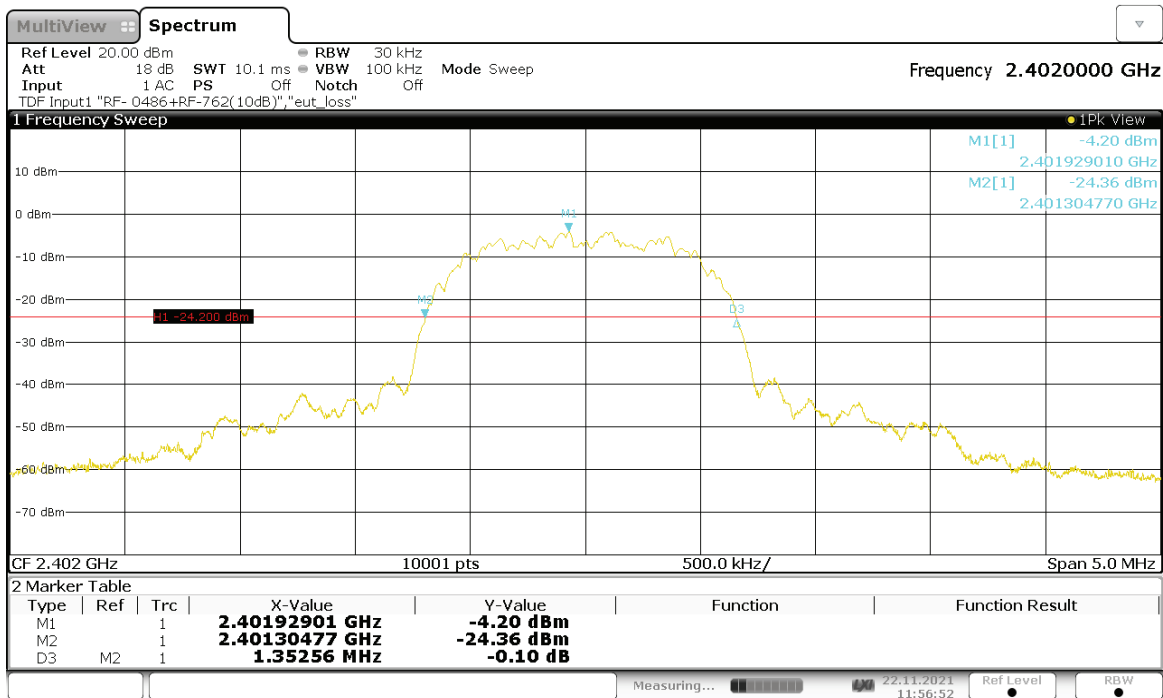


11:43:22 22.11.2021

Table 9: 20dB Bandwidth, 3DH5

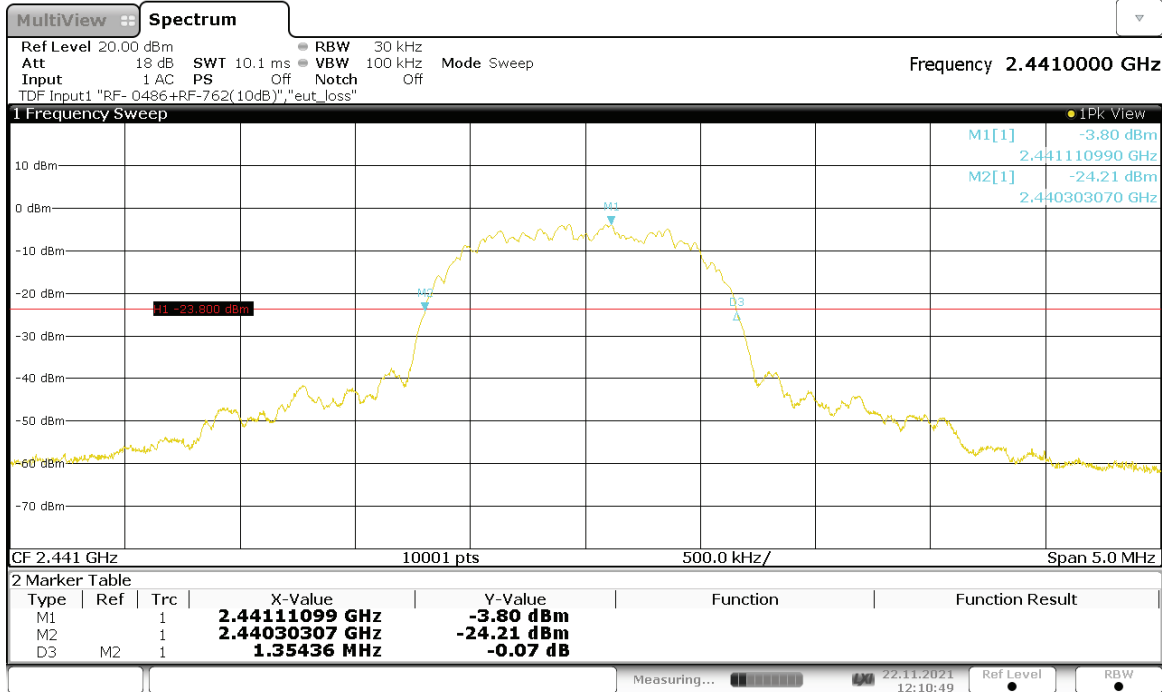
Operating Frequency [MHz]	20dB Bandwidth [MHz]
2402	1.353
2441	1.354
2480	1.351

Figure 14: 20dB Bandwidth, 3DH5, Mode A (2402MHz)



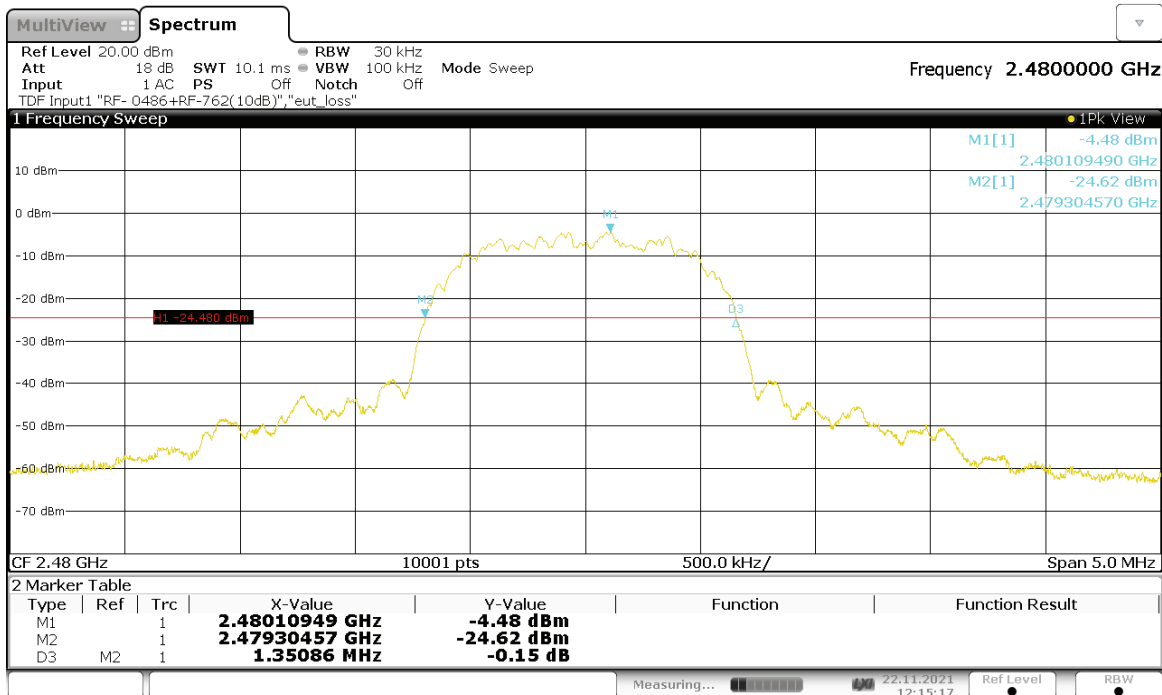
11:56:54 22.11.2021

Figure 15: 20dB Bandwidth, 3DH5, Mode B (2441MHz)



12:10:50 22.11.2021

Figure 16: 20dB Bandwidth, 3DH5, Mode C (2480MHz)



12:15:18 22.11.2021

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5.2.3 99% Bandwidth

RESULT:

PERFORMED

Date of testing: 2021-11-22

Ambient temperature: 22°C

Relative humidity: 54%

Atmospheric pressure: 1008hPa

Operation Modes: A ~ C, H

Configurations: BT1, BT3

Test procedure:

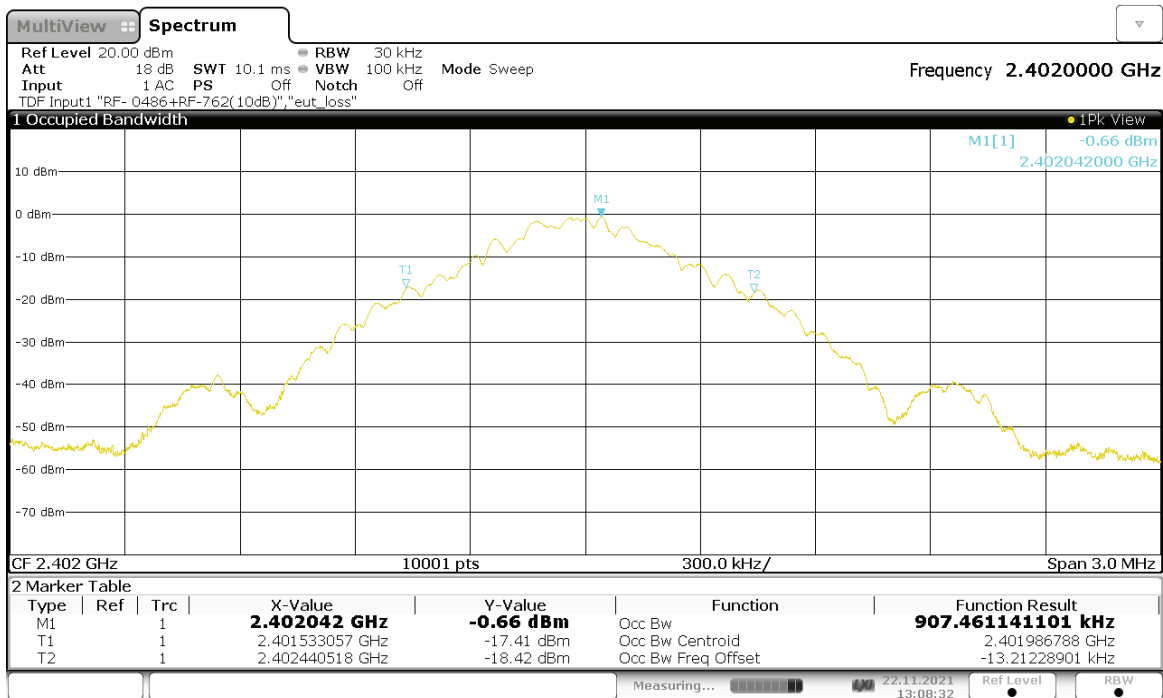
ANSI C63.10 §6.9.3

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 10: 99% Bandwidth, DH5

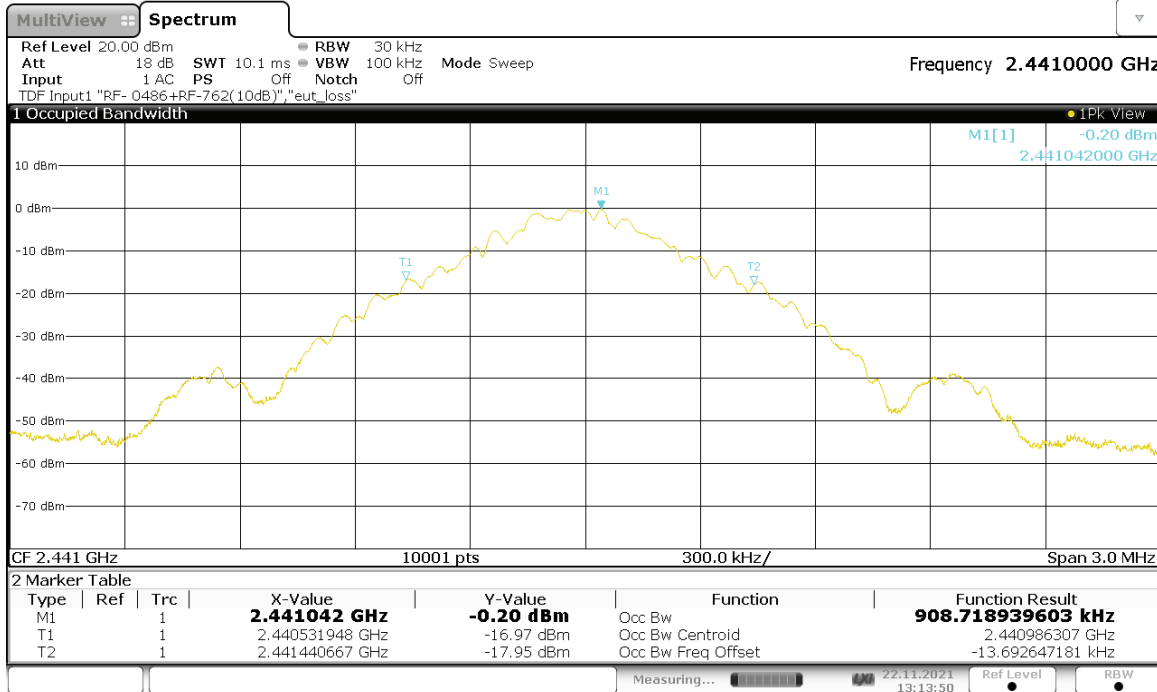
Operating Frequency [MHz]	99% Bandwidth [MHz]
2402	0.907
2441	0.909
2480	0.907

Figure 17: 99% Bandwidth, DH5, Mode A (2402MHz)



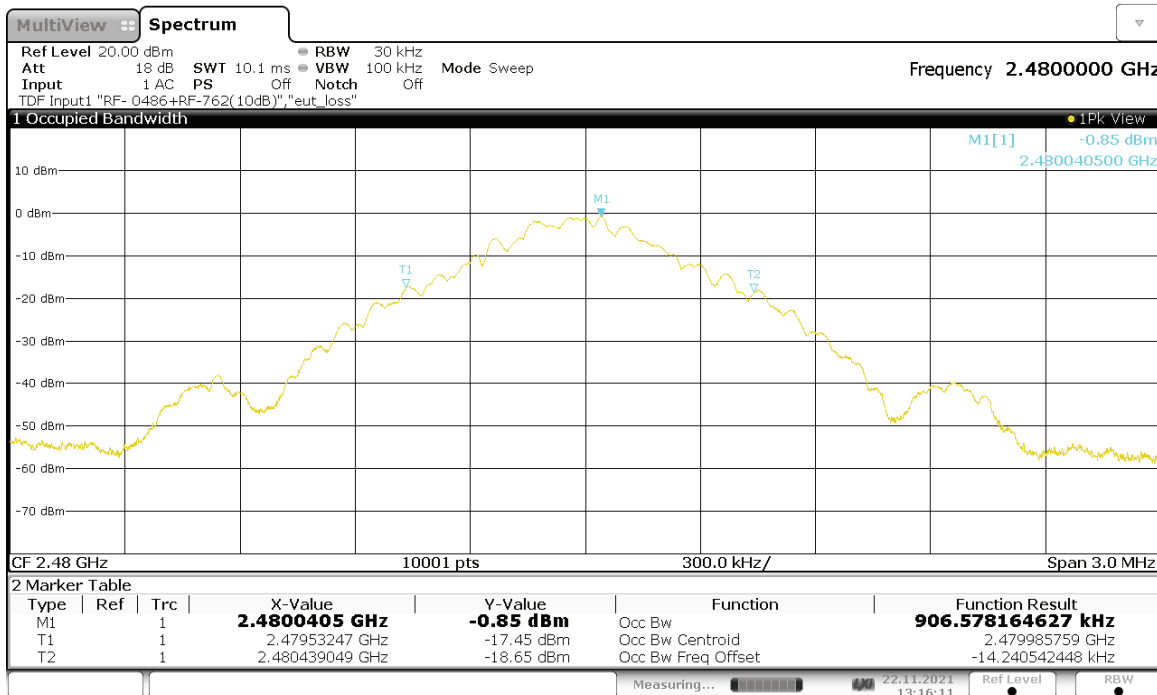
13:08:32 22.11.2021

Figure 18: 99% Bandwidth, DH5, Mode B (2441MHz)



13:13:51 22.11.2021

Figure 19: 99% Bandwidth, DH5, Mode C (2480MHz)

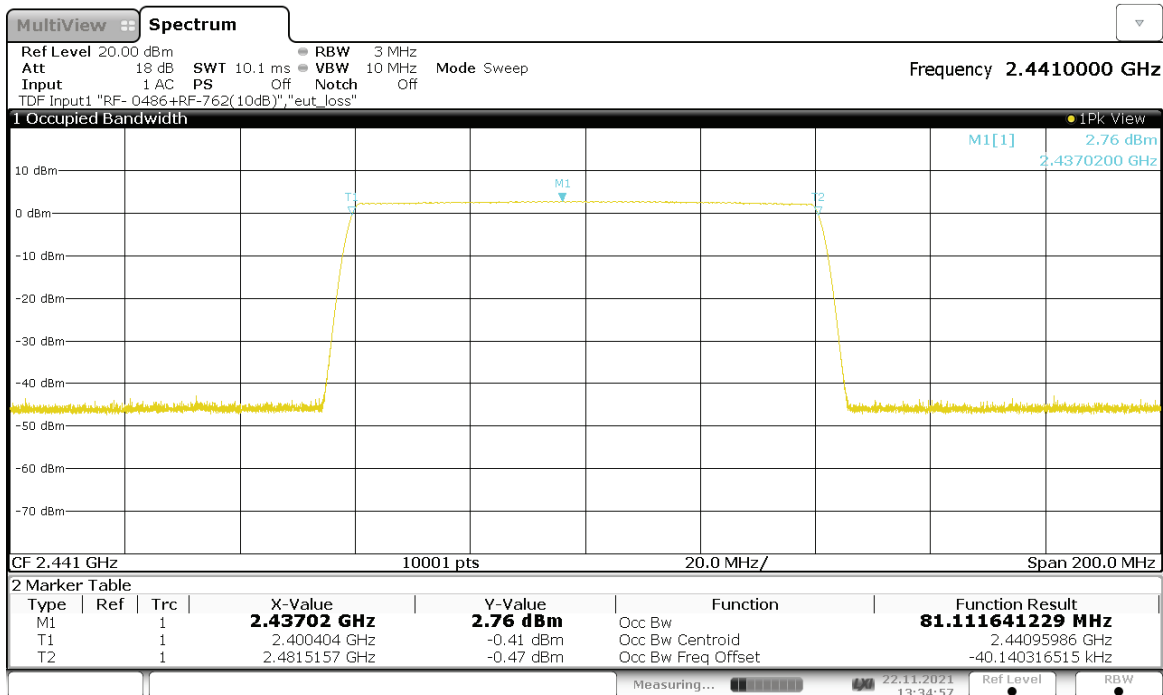


13:16:12 22.11.2021

Table 11: 99% Bandwidth, DH5, Mode H

Operating Frequency [MHz]	99% Bandwidth [MHz]
Hopping	81.112

Figure 20: 99% Bandwidth, DH5, Mode H

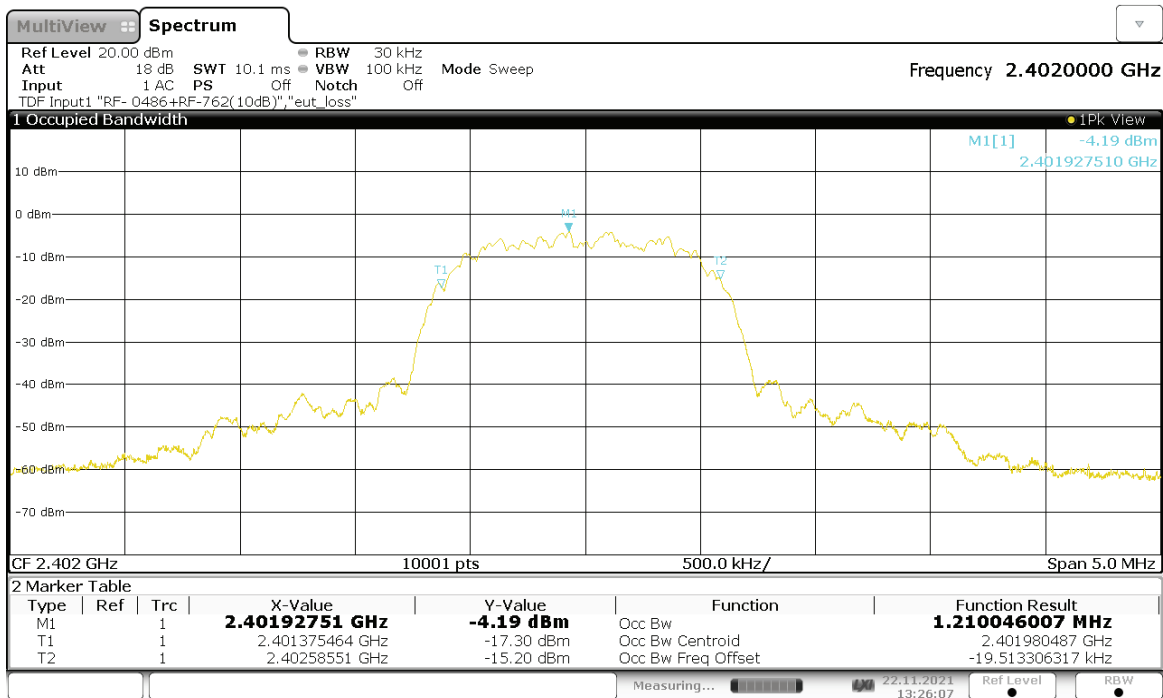


13:34:58 22.11.2021

Table 12: 99% Bandwidth, 3DH5

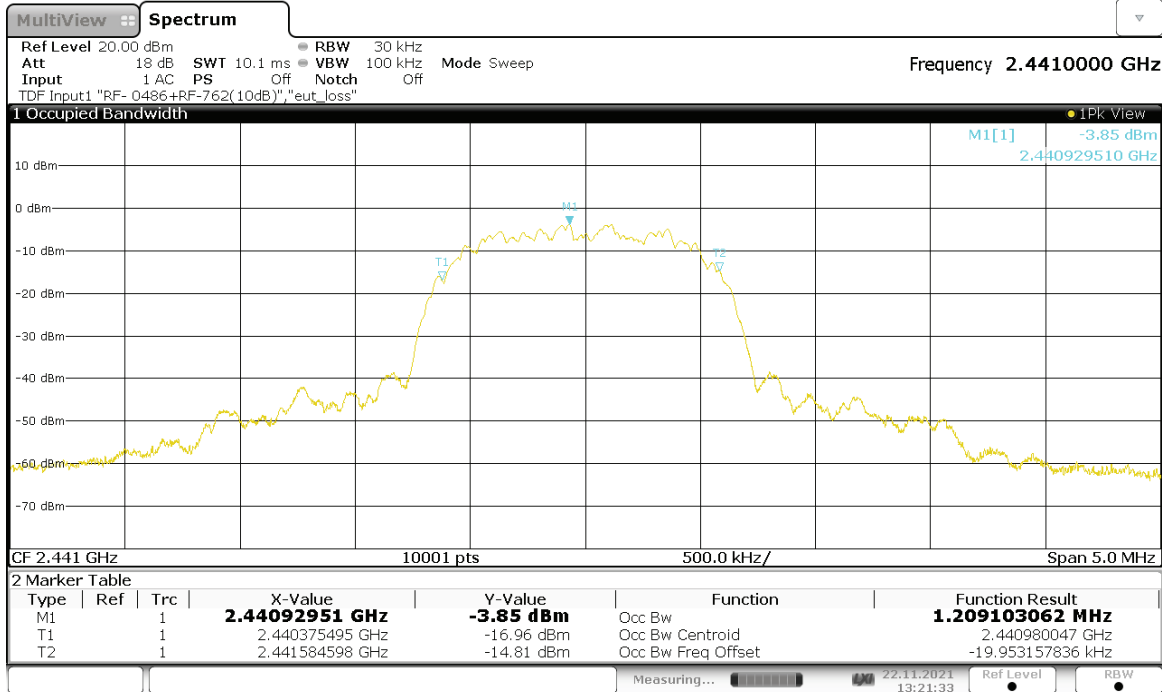
Operating Frequency [MHz]	99% Bandwidth [MHz]
2402	1.210
2441	1.209
2480	1.208

Figure 21: 99% Bandwidth, 3DH5, Mode A (2402MHz)



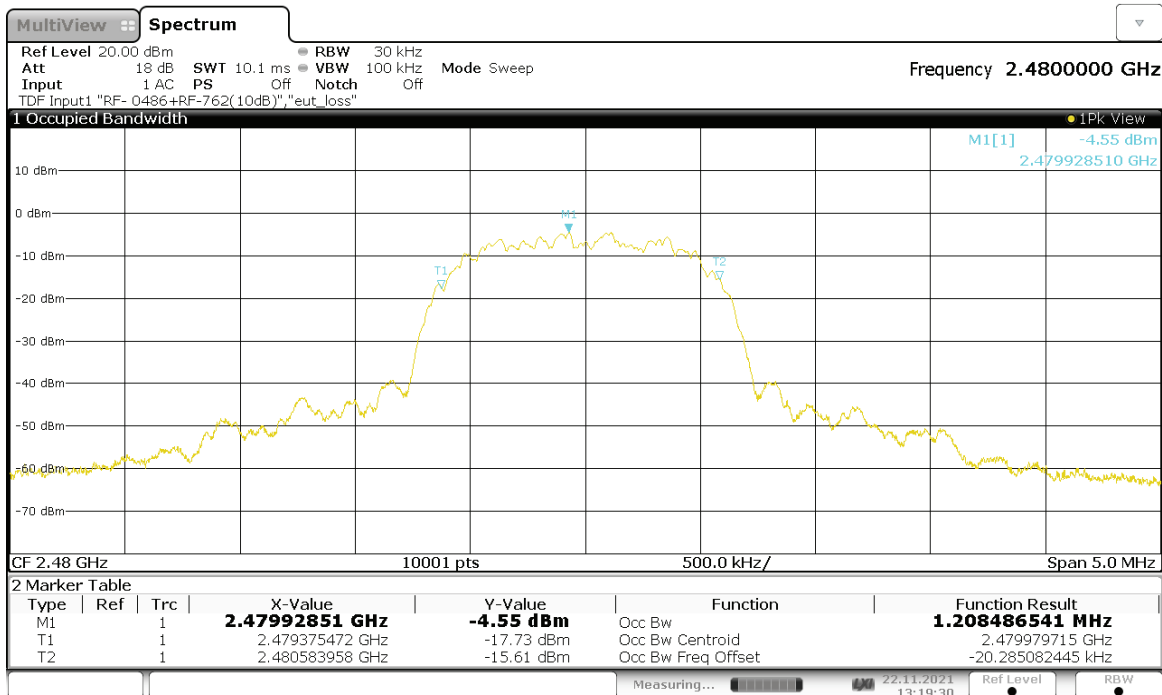
13:26:08 22.11.2021

Figure 22: 99% Bandwidth, 3DH5, Mode B (2441MHz)



13:21:33 22.11.2021

Figure 23: 99% Bandwidth, 3DH5, Mode C (2480MHz)

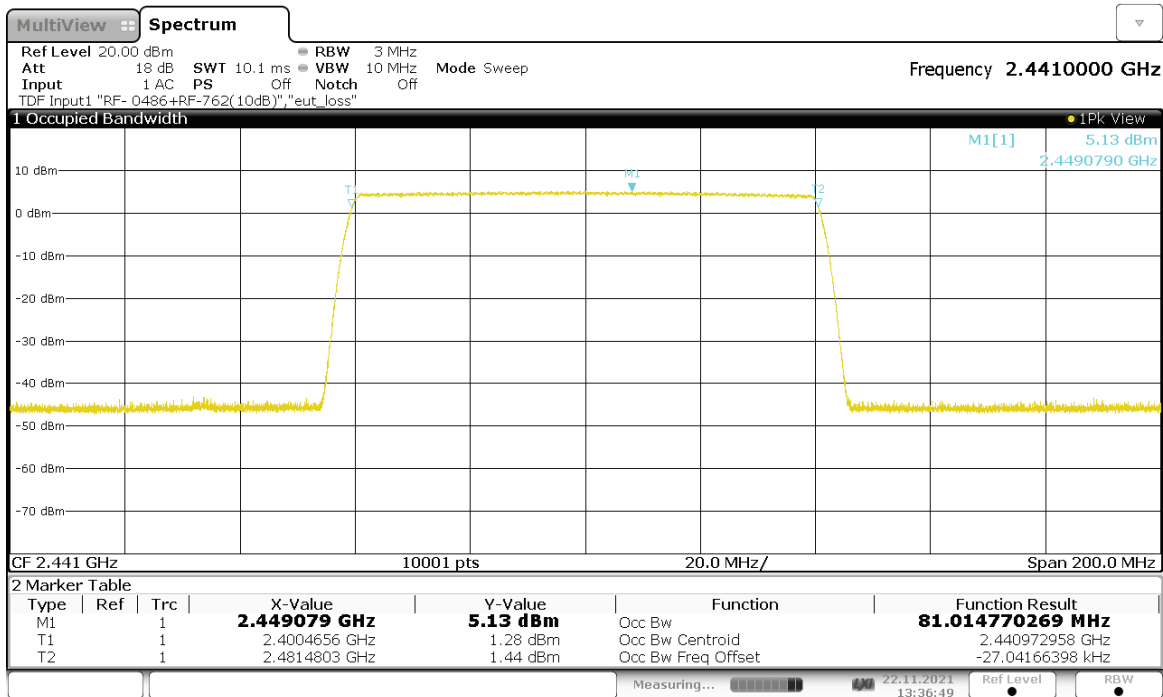


13:19:30 22.11.2021

Table 13: 99% Bandwidth, 3DH5, Mode H

Operating Frequency [MHz]	99% Bandwidth [MHz]
Hopping	81.015

Figure 24: 99% Bandwidth, 3DH5, Mode H



13:36:50 22.11.2021

5.2.4 Carrier Frequency Separation

RESULT:

PASS

Date of testing: 2021-11-22

Ambient temperature: 22°C
Relative humidity: 54%
Atmospheric pressure: 1008hPa
Operation Modes: H
Configurations: BT1, BT3

Requirements:

FCC 15.247(a)(1)

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.

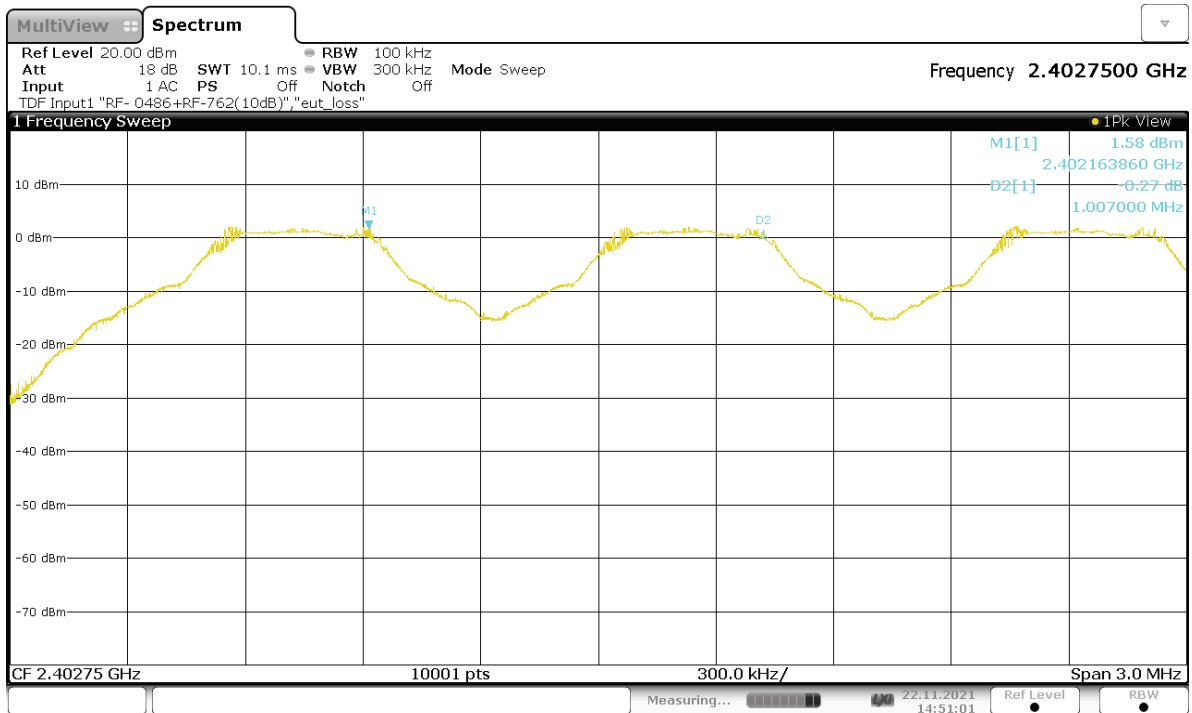
A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 300kHz and the video bandwidth to 1MHz. The Delta Marker function was used to determine the separation between the peaks of two adjacent channels.

Table 14: Carrier Frequency Separation, DH5

Freq. [MHz]	Channel Separation [MHz]	20dB Bandwidth [MHz]	Limit [MHz]
2402	1.007	1.020	0.680
2441	1.003	1.021	0.681
2480	1.011	1.023	0.682

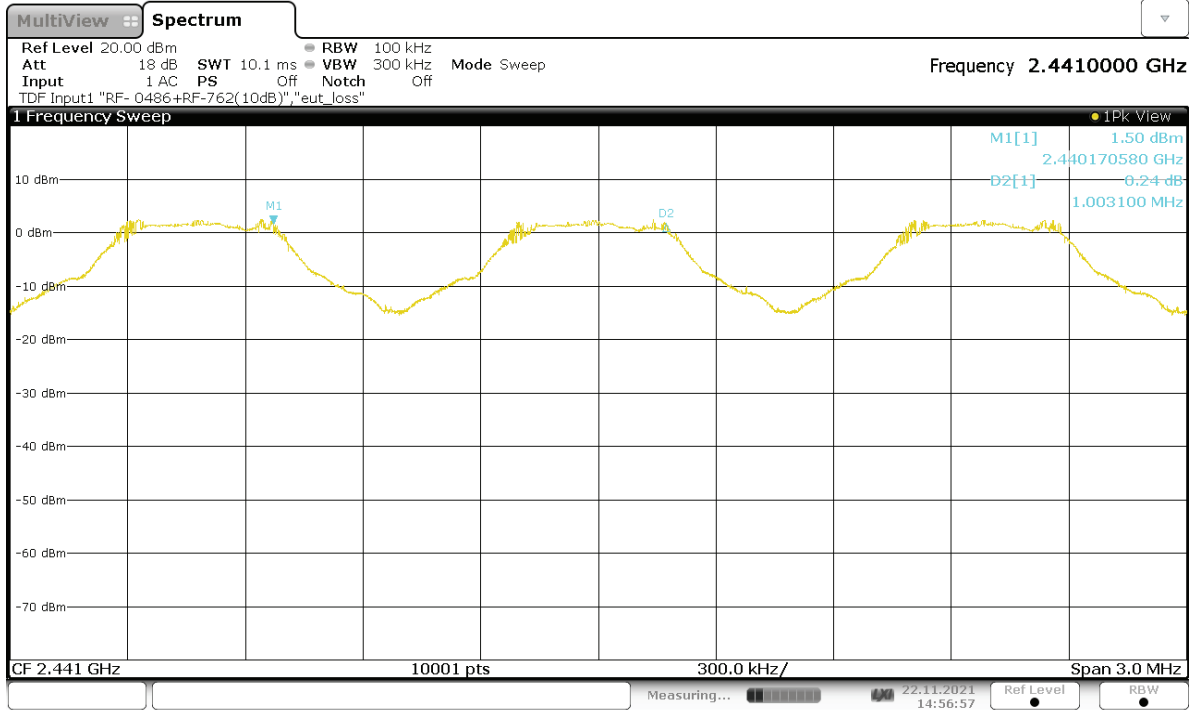
Notes: Limit = 20dB bandwidth * 2/3 since it is greater than 125kHz and the output power is less than 125mW.

Figure 25: Carrier Frequency Separation, DH5, Mode A (2402MHz)



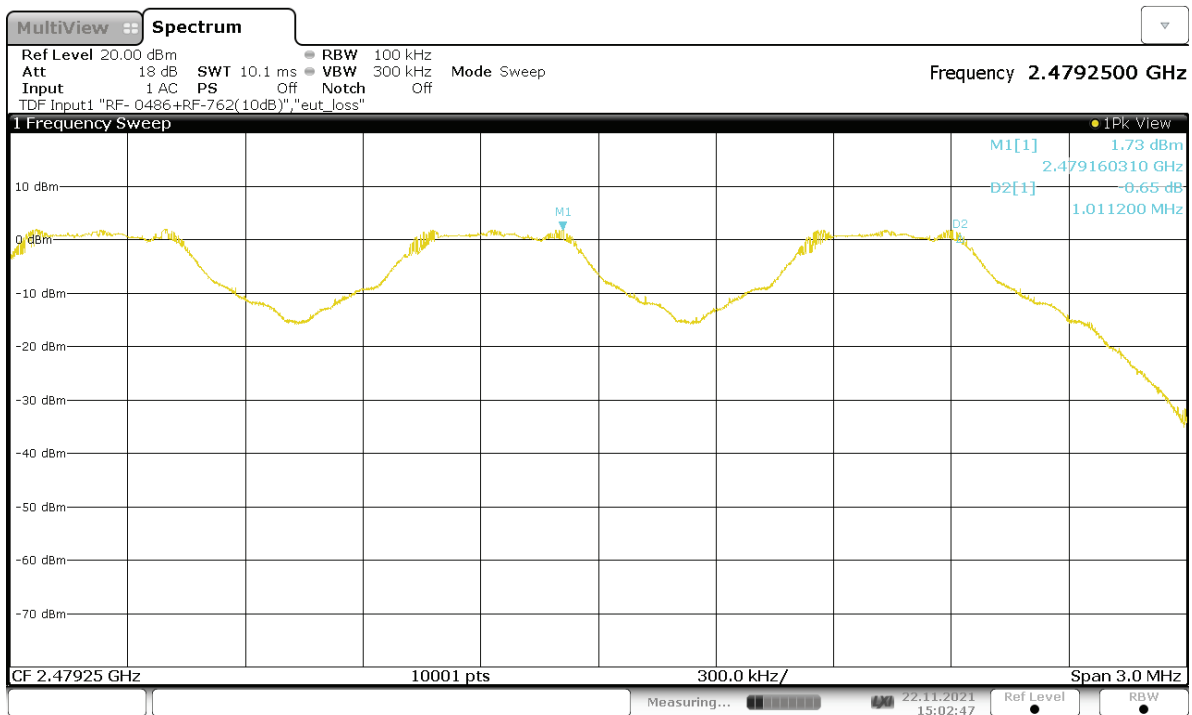
14:51:01 22.11.2021

Figure 26: Carrier Frequency Separation, DH5, Mode B (2441MHz)



14:56:57 22.11.2021

Figure 27: Carrier Frequency Separation, DH5, Mode C (2480MHz)



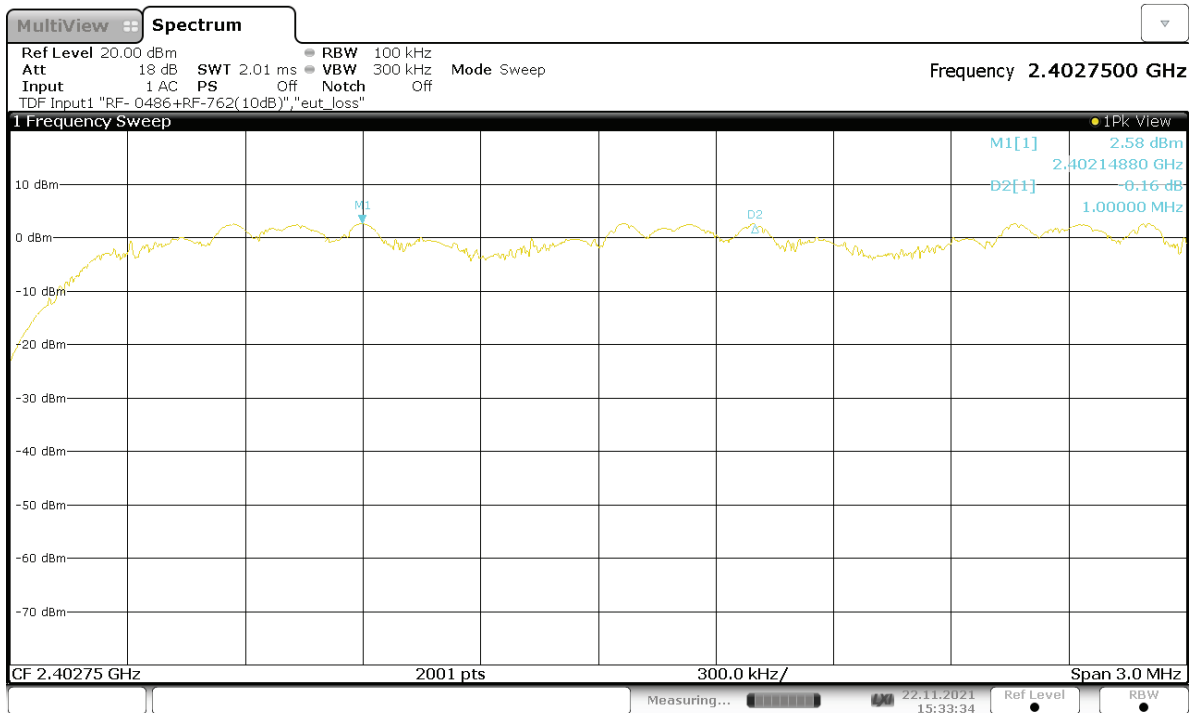
15:02:47 22.11.2021

Table 15: Carrier Frequency Separation, 3DH5

Freq. [MHz]	Channel Separation [MHz]	20dB Bandwidth [MHz]	Limit [MHz]
2402	1.000	1.353	0.902
2441	1.002	1.354	0.903
2480	1.001	1.351	0.901

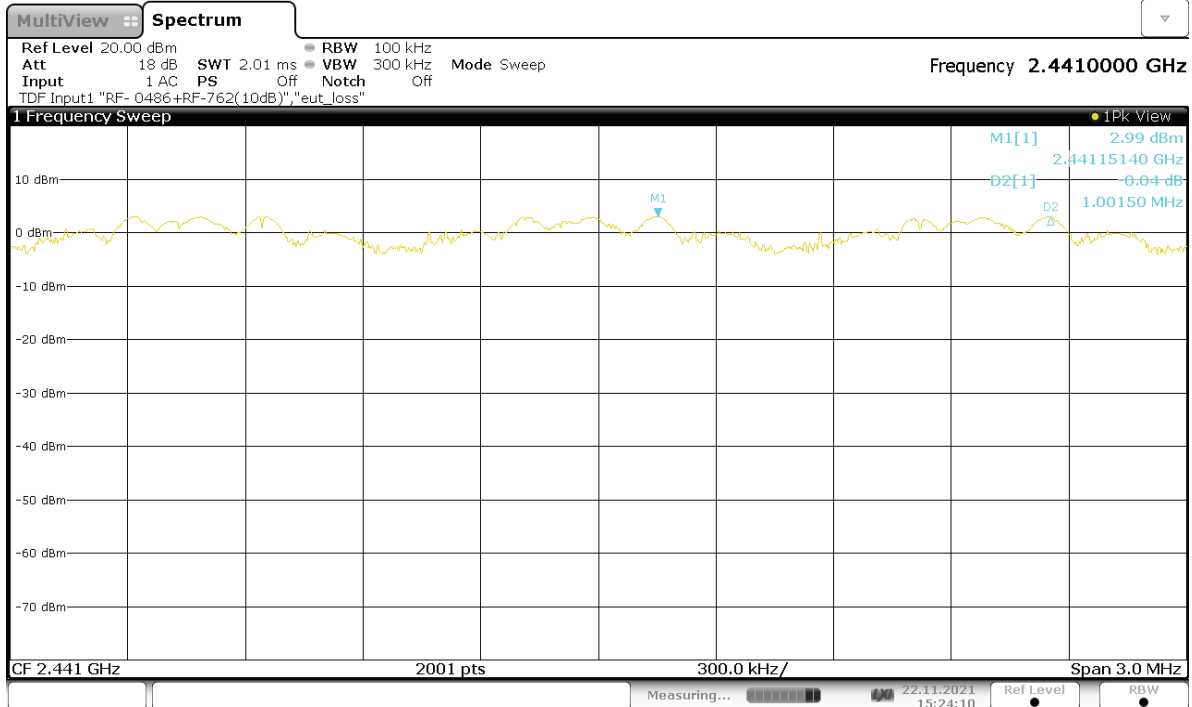
Notes: Limit = 20dB bandwidth * 2/3 since it is greater than 125kHz and the output power is less than 125mW.

Figure 28: Carrier Frequency Separation, 3DH5, Mode A (2402MHz)



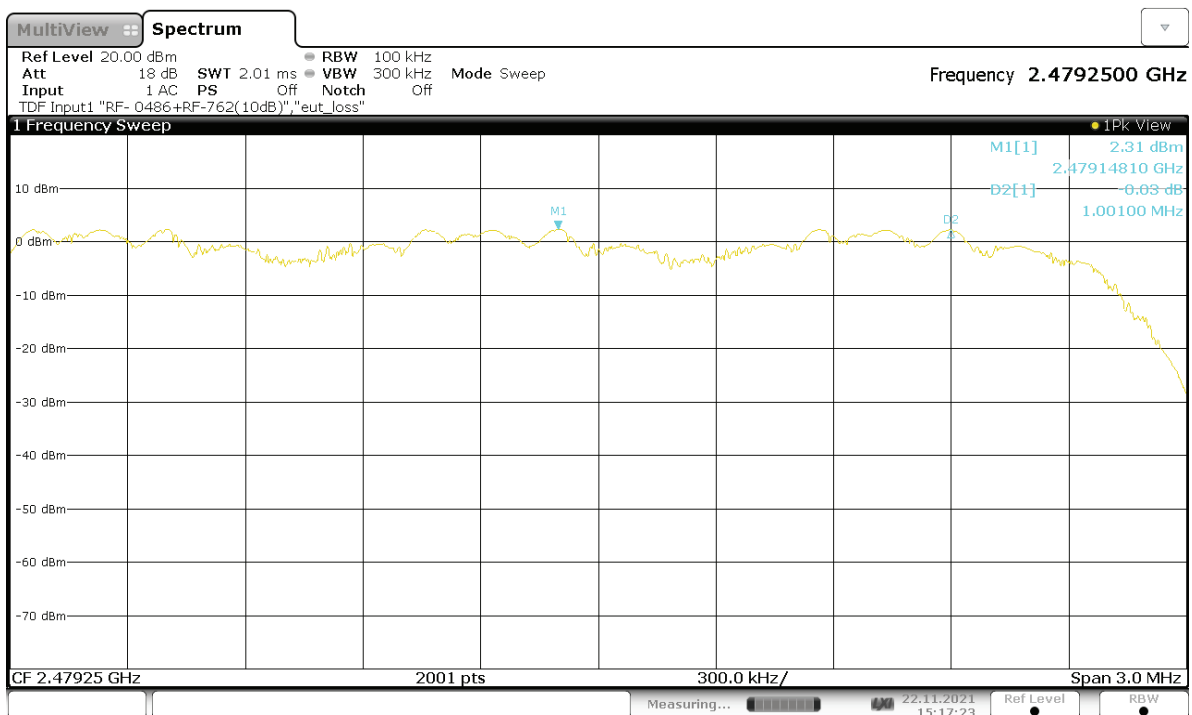
15:33:35 22.11.2021

Figure 29: Carrier Frequency Separation, 3DH5, Mode B (2441MHz)



15:24:11 22.11.2021

Figure 30: Carrier Frequency Separation, 3DH5, Mode C (2480MHz)



15:17:23 22.11.2021

5.2.5 Number of Hopping Frequencies

RESULT:

PASS

Date of testing: 2021-11-22

Ambient temperature: 22°C
Relative humidity: 54%
Atmospheric pressure: 1008hPa
Operation Modes: H
Configurations: BT1, BT3

Requirements:

FCC 15.247(a)(1)(iii)

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

Test procedure:

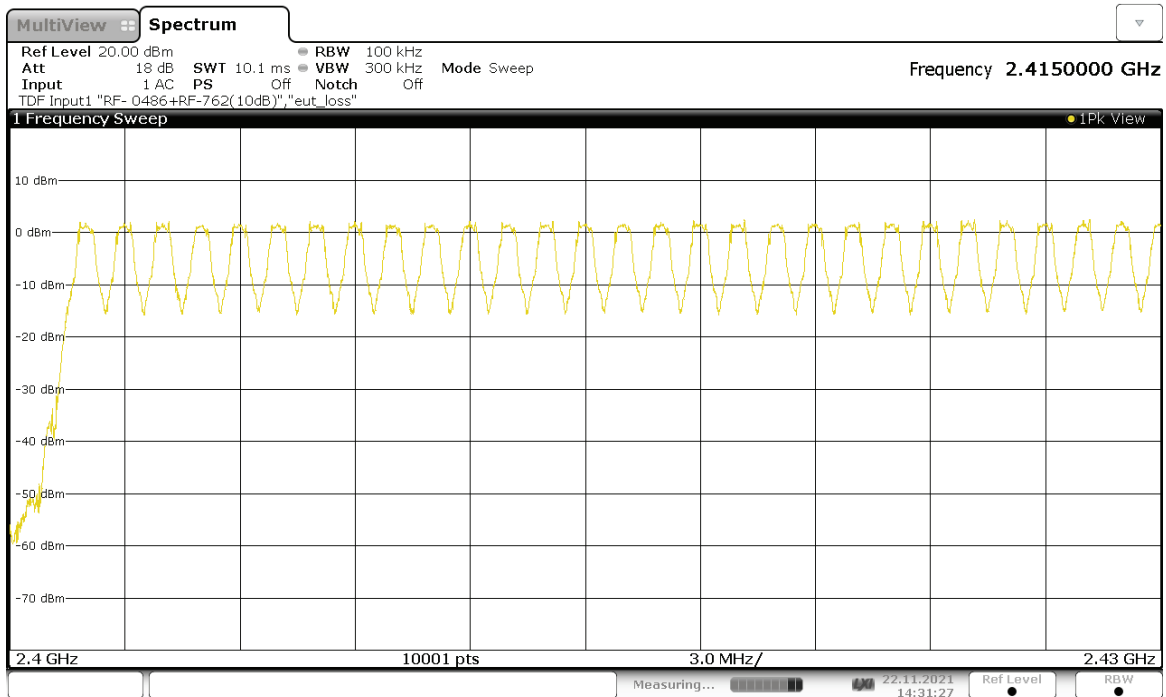
ANSI C63.10 §7.8.3.

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 in two plots having each a 50MHz span to show all the hopping frequencies.

Table 16: Number of Hopping Frequencies, DH5

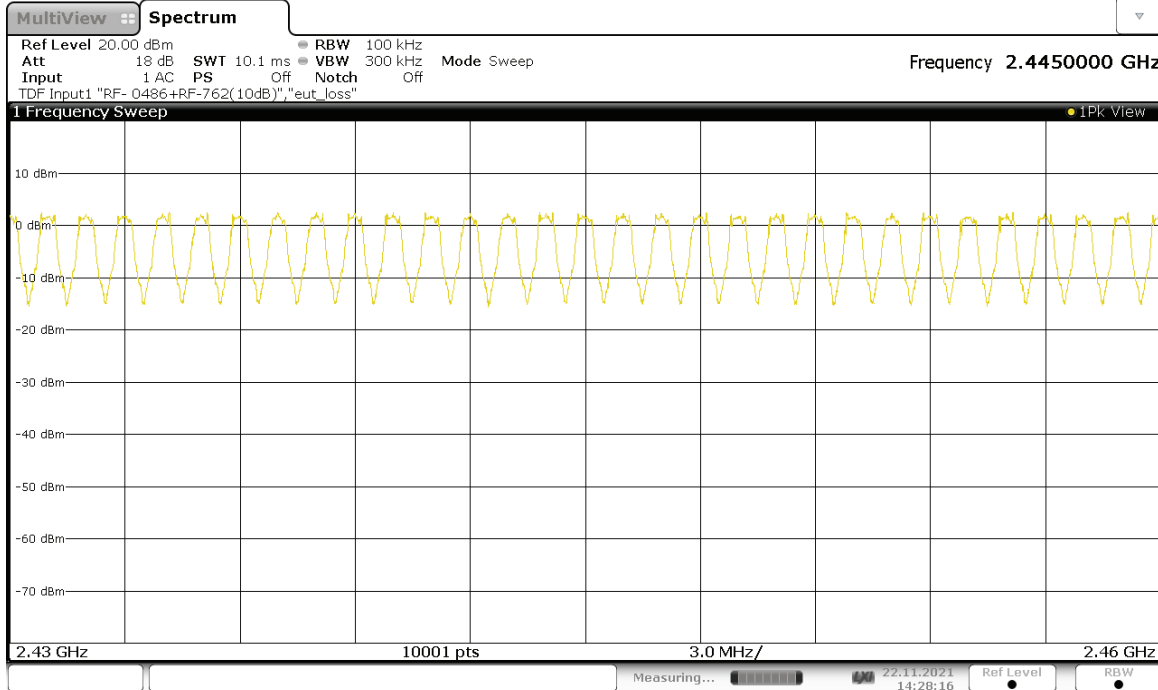
Number of Hopping Frequencies	Limit
79	15

Figure 31: Hopping Frequencies, DH5, Mode H (Low Range)



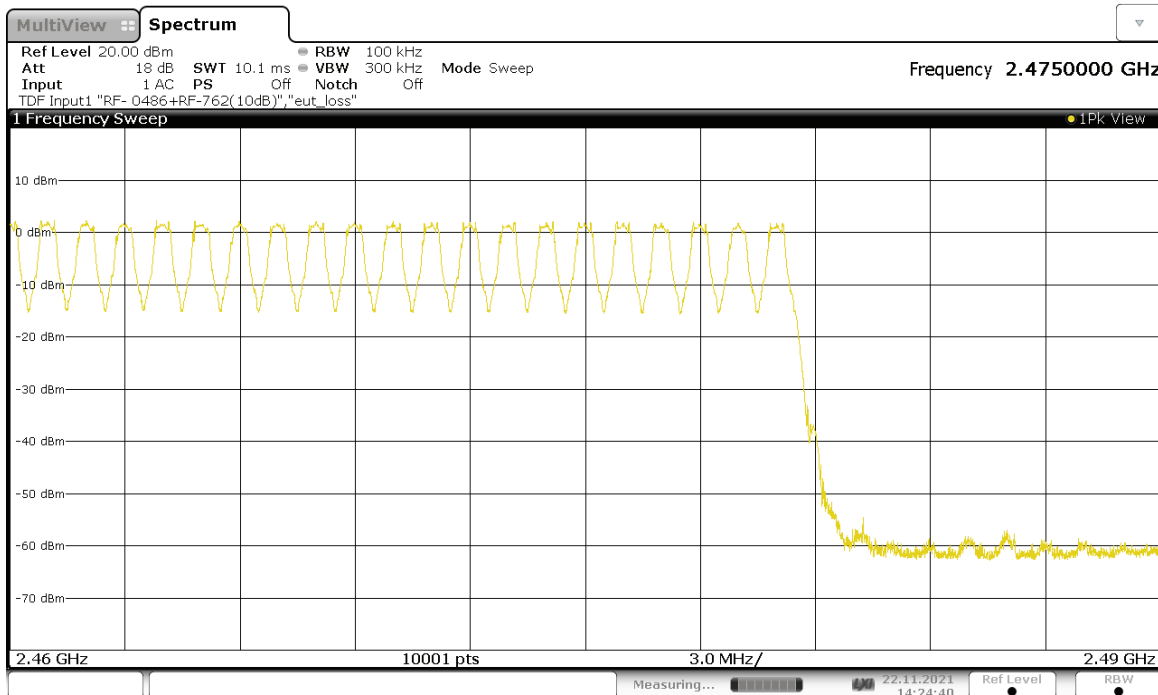
14:31:27 22.11.2021

Figure 32: Hopping Frequencies, DH5, Mode H (Middle Range)



14:28:17 22.11.2021

Figure 33: Hopping Frequencies, DH5, Mode H (High Range)

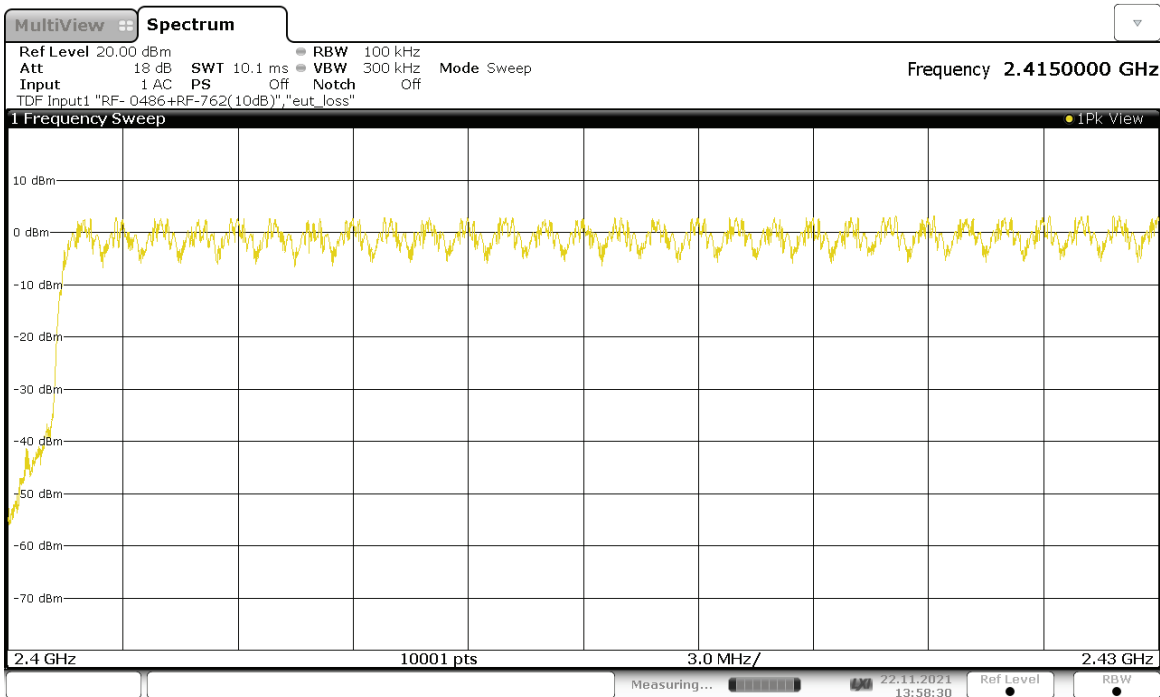


14:24:41 22.11.2021

Table 17: Number of Hopping Frequencies, 3DH5

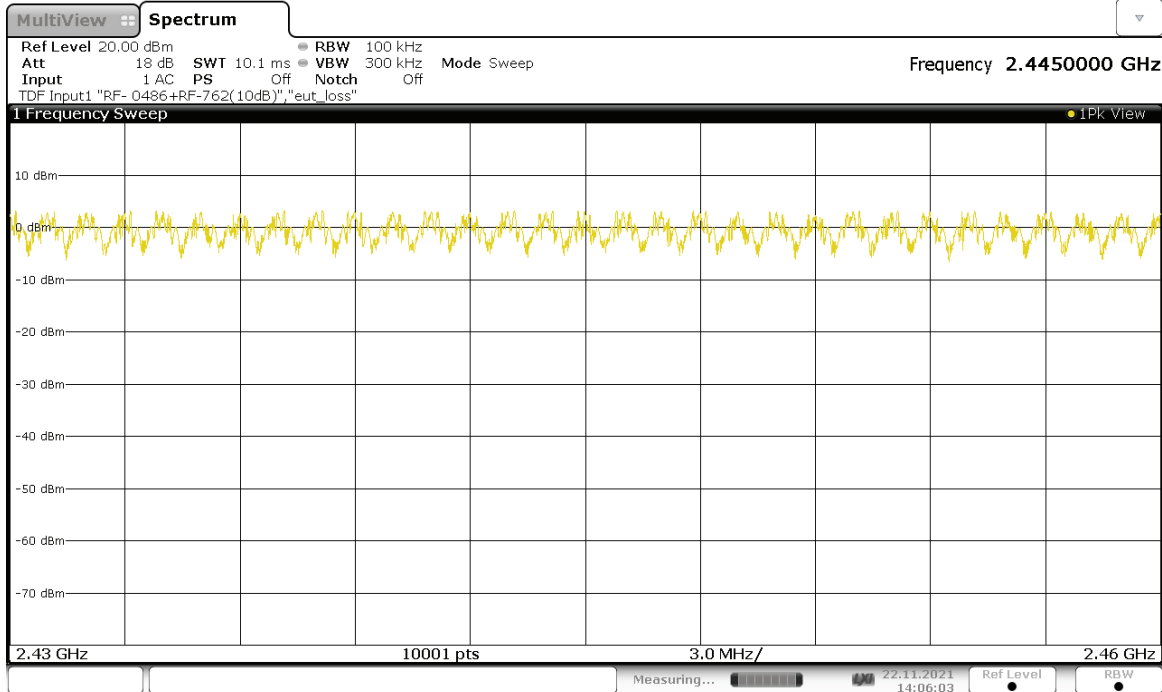
Number of Hopping Frequencies	Limit
79	15

Figure 34: Hopping Frequencies, 3DH5, Mode H (Low Range)



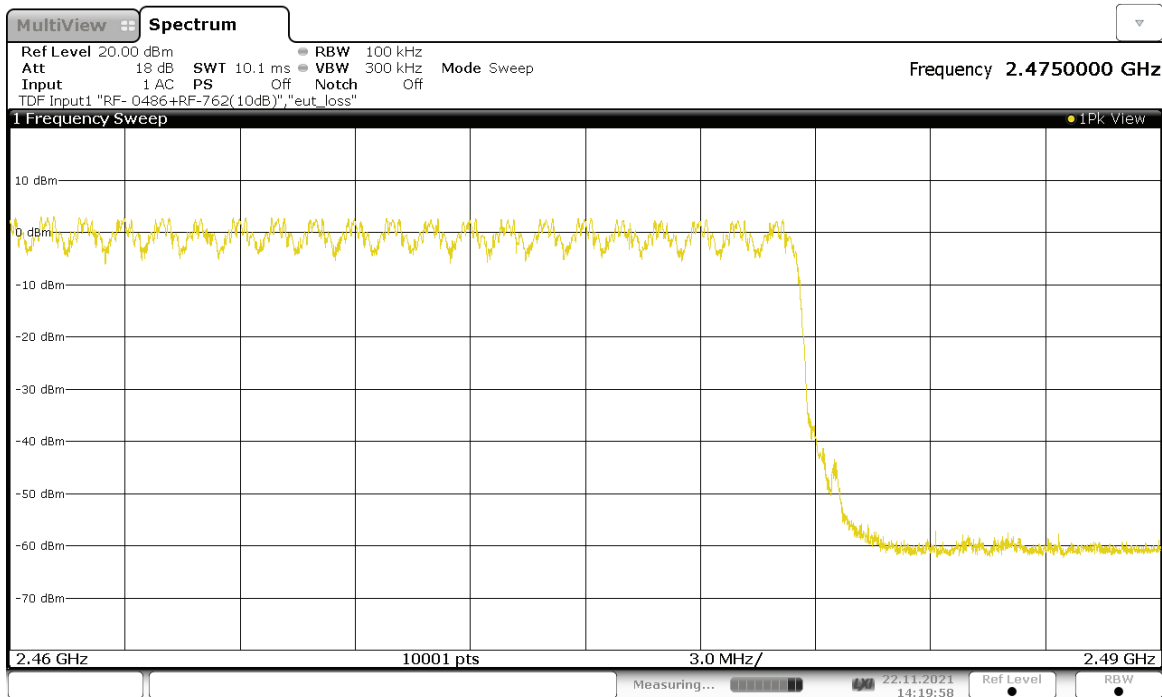
13:58:30 22.11.2021

Figure 35: Hopping Frequencies, 3DH5, Mode H (Middle Range)



14:06:03 22.11.2021

Figure 36: Hopping Frequencies, 3DH5, Mode H (High Range)



14:19:59 22.11.2021

5.2.6 Average Time of Occupancy

RESULT:

PASS

Date of testing: 2021-11-22

Ambient temperature: 22°C
Relative humidity: 54%
Atmospheric pressure: 1008hPa
Operation Modes: H
Configurations: BT4

Requirements:

FCC 15.247(a)(1)(iii)

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.

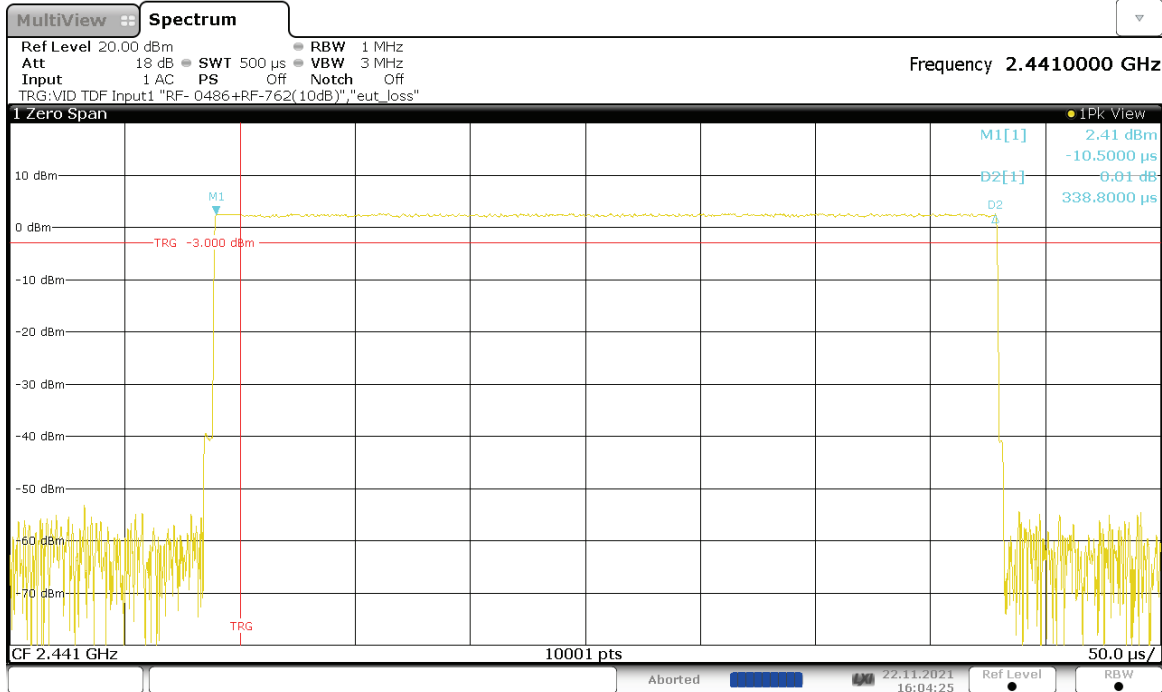
A spectrum analyzer was connected to the antenna port of the EUT. The analyzer was set in zero span mode centered on a hopping channel. The dwell time of a single packet was measured first with the Delta Marker function.

Table 18: Average Time of Occupancy, DH

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	0.339	52	328.64	111.409	400
DH3	1.637	29	183.28	300.029	400
DH5	2.885	18	113.76	328.198	400

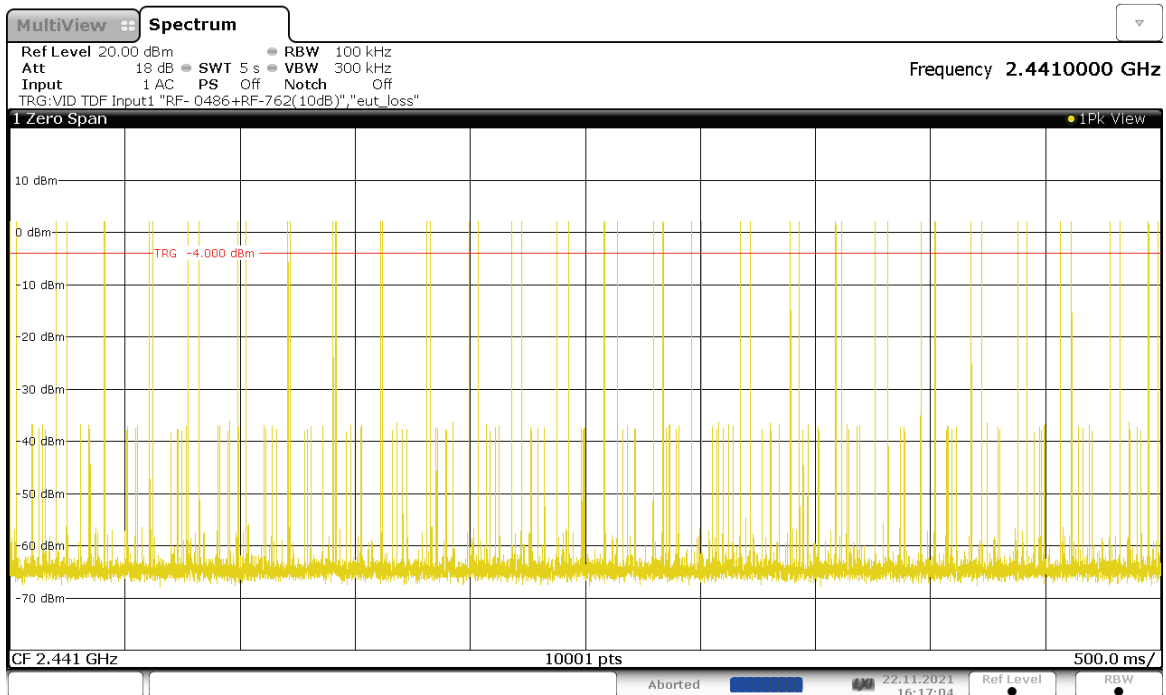
Note: Calculated number of hops per channel in 31.6s period = Measured number of hops per channel in 5s period × (31.6s / 5s)
Average time of occupancy in 31.6s period = Packet duration × Calculated number of hops per channel in 31.6s period

Figure 37: Package Duration, Mode H, DH1



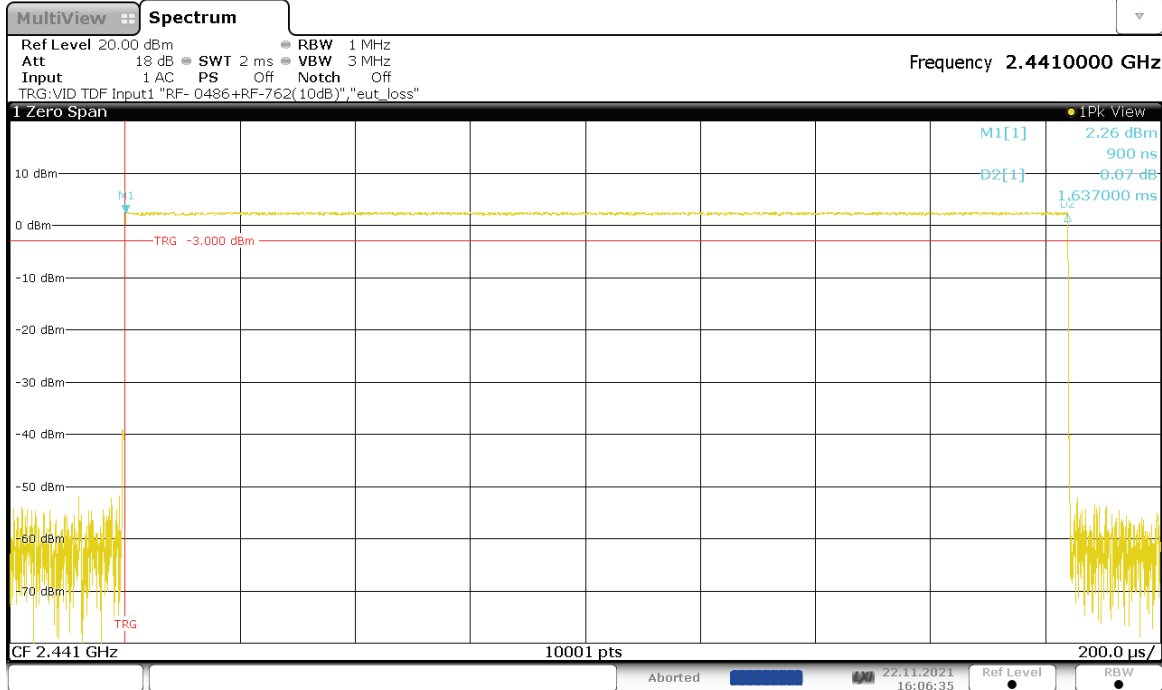
16:04:25 22.11.2021

Figure 38: Number of Hops, Mode H, DH1



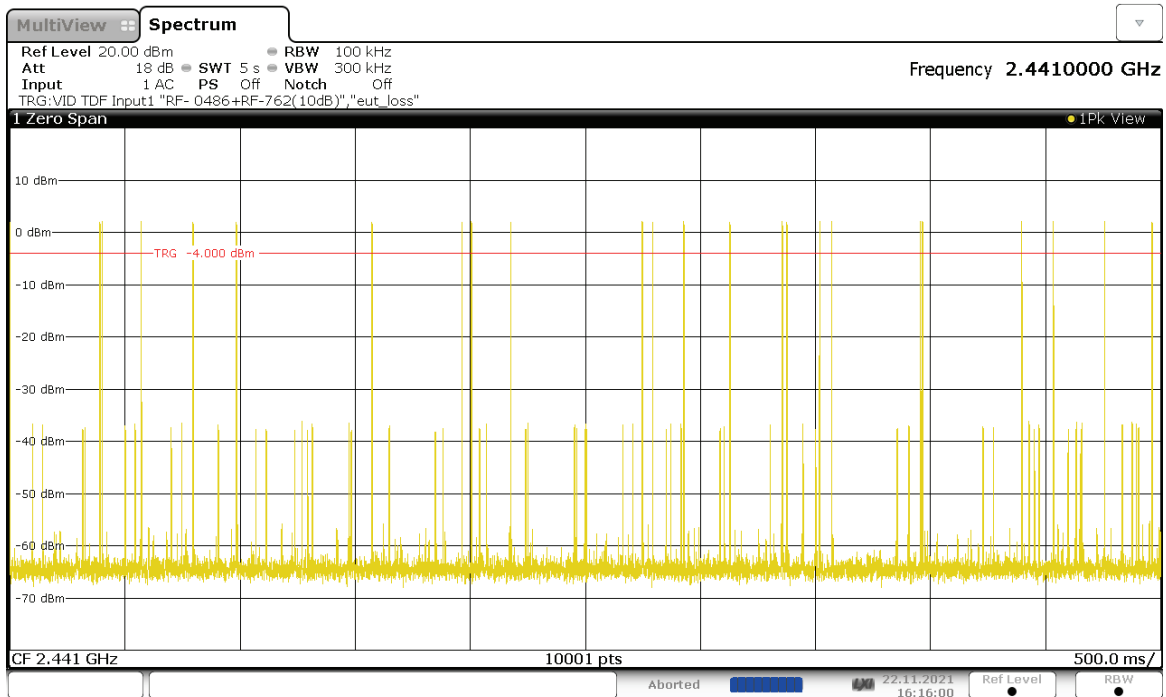
16:17:05 22.11.2021

Figure 39: Package Duration, Mode H, DH3



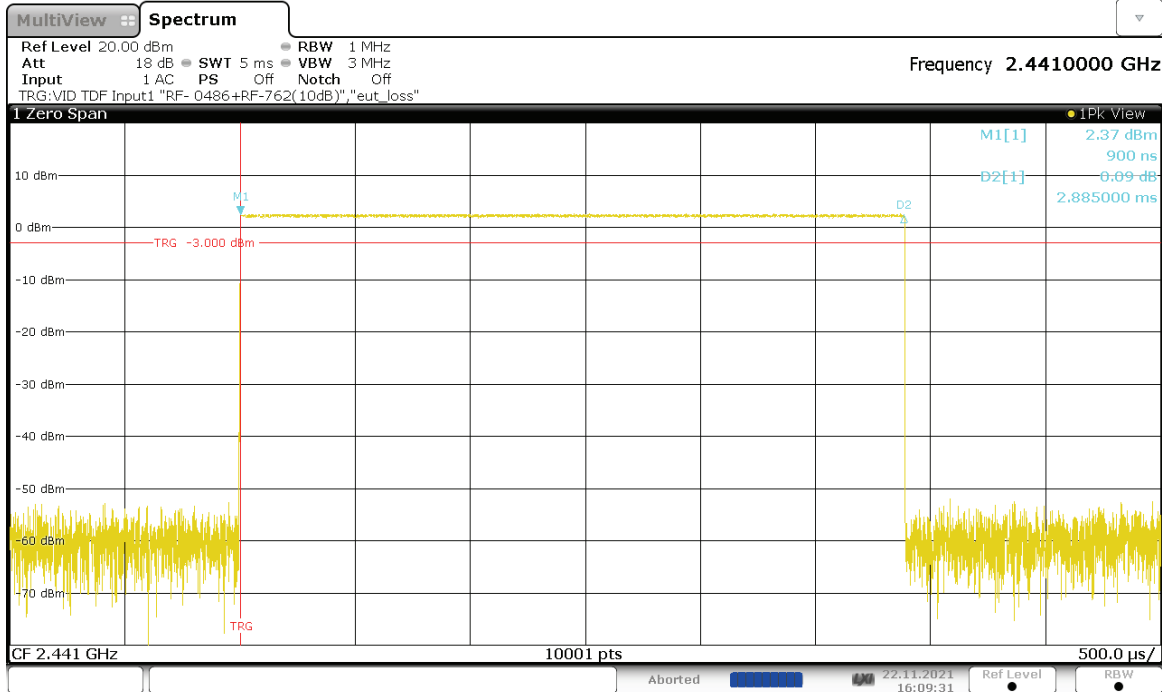
16:06:35 22.11.2021

Figure 40: Number of Hops, Mode H, DH3



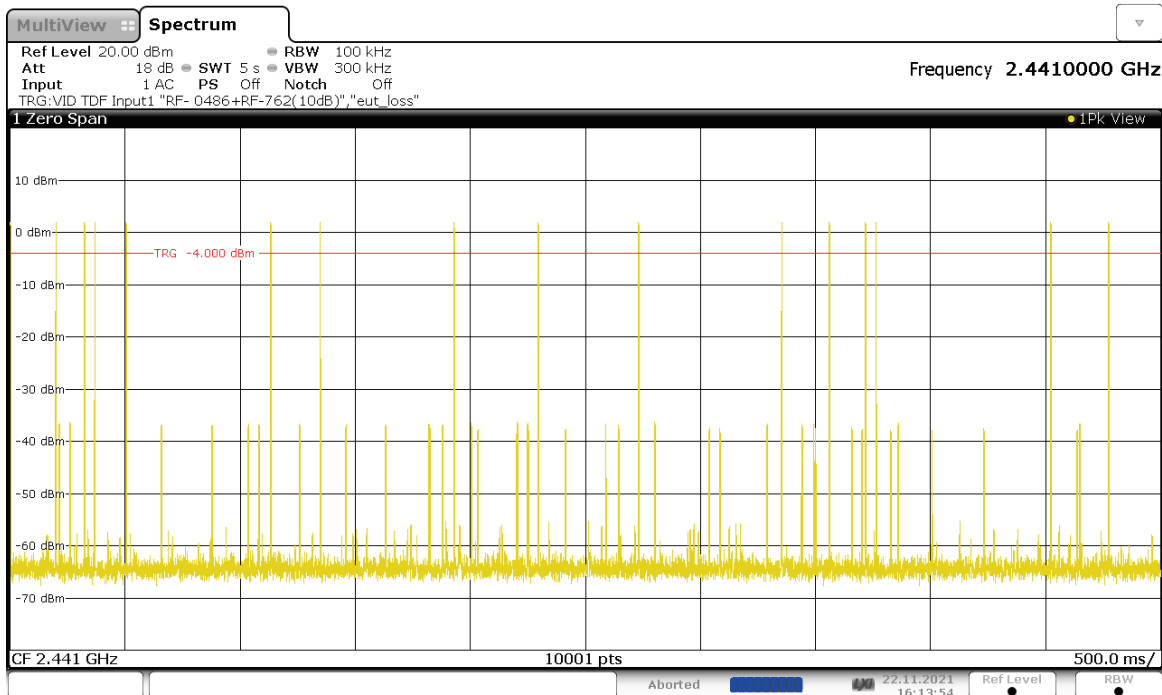
16:16:01 22.11.2021

Figure 41: Package Duration, Mode H, DH5



16:09:31 22.11.2021

Figure 42: Number of Hops, Mode H, DH5



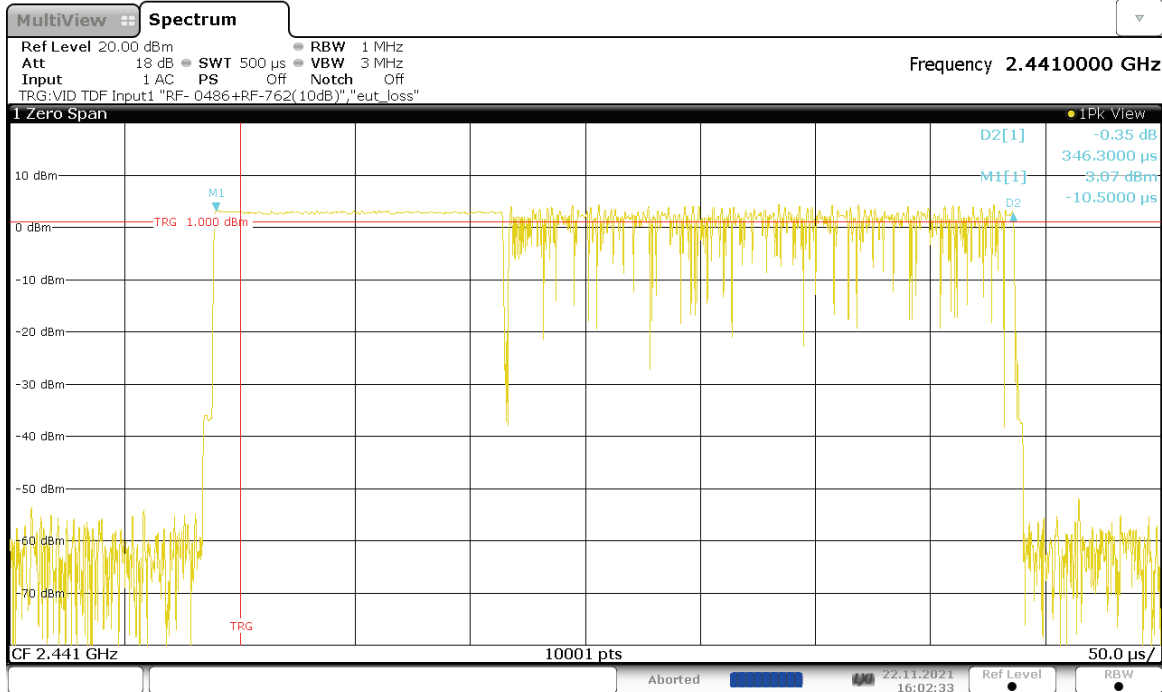
16:13:54 22.11.2021

Table 19: Average Time of Occupancy, 3DH

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	0.346	52	328.64	113.709	400
3DH3	1.641	26	164.32	269.649	400
3DH5	2.892	19	120.08	347.271	400

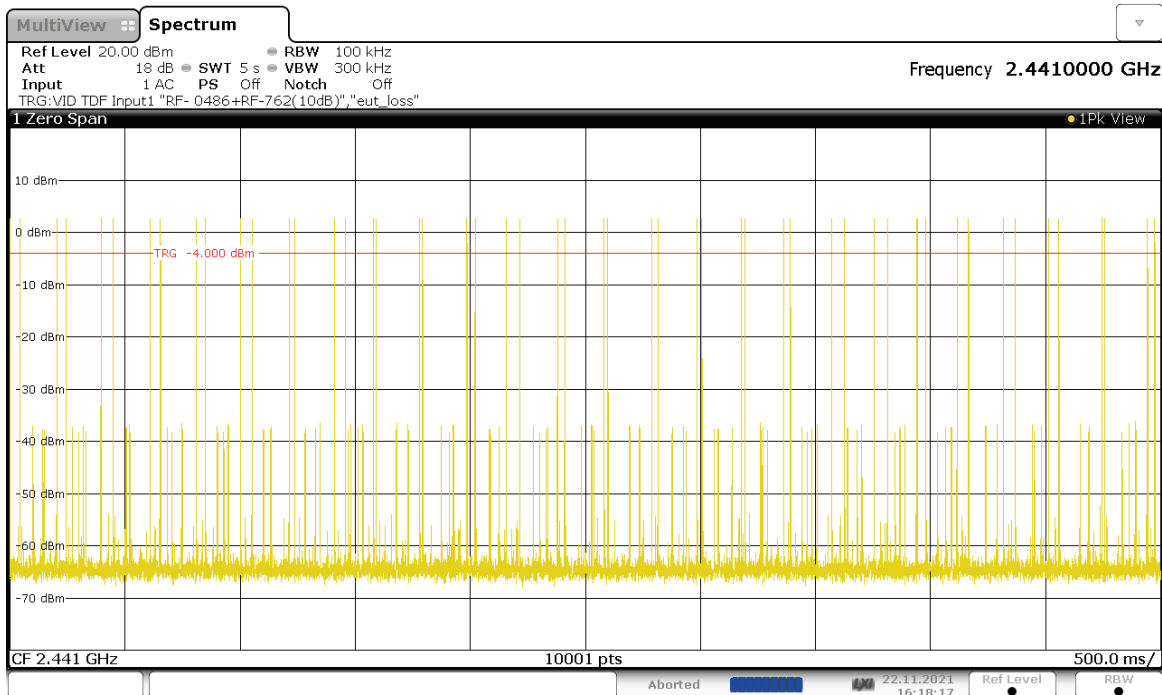
Note: Calculated number of hops per channel in 31.6s period = Measured number of hops per channel in 5s period × (31.6s / 5s)
Average time of occupancy in 31.6s period = Packet duration × Calculated number of hops per channel in 31.6s period

Figure 43: Package Duration, Mode H, 3DH1



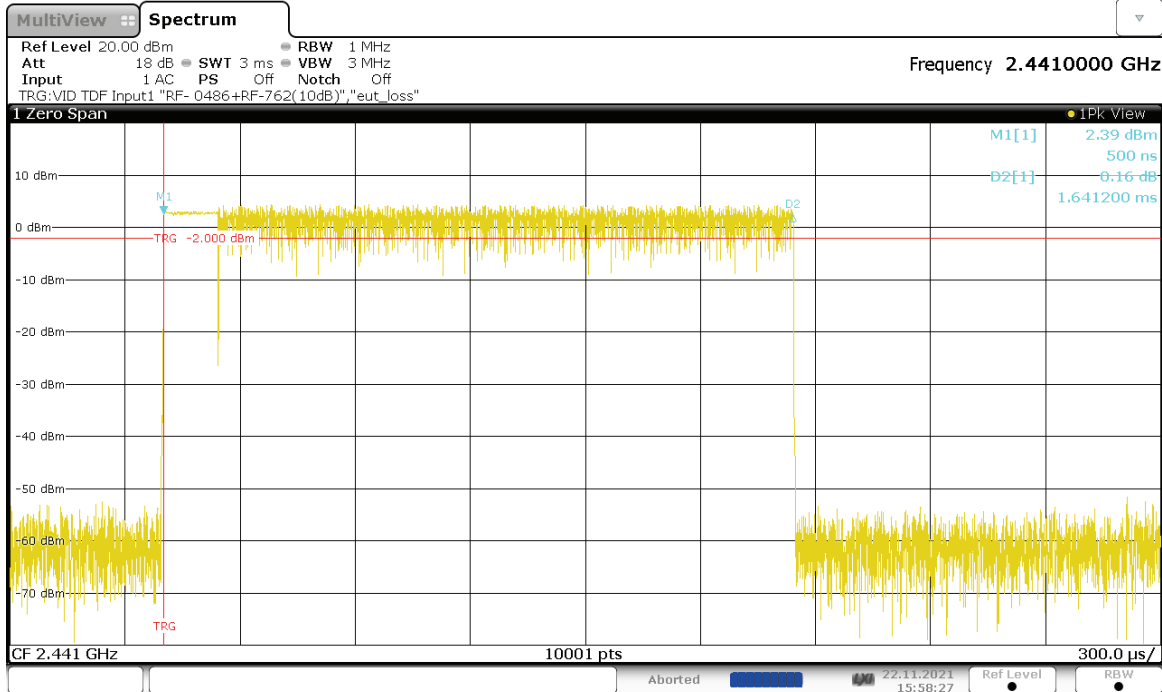
16:02:33 22.11.2021

Figure 44: Number of Hops, Mode H, 3DH1



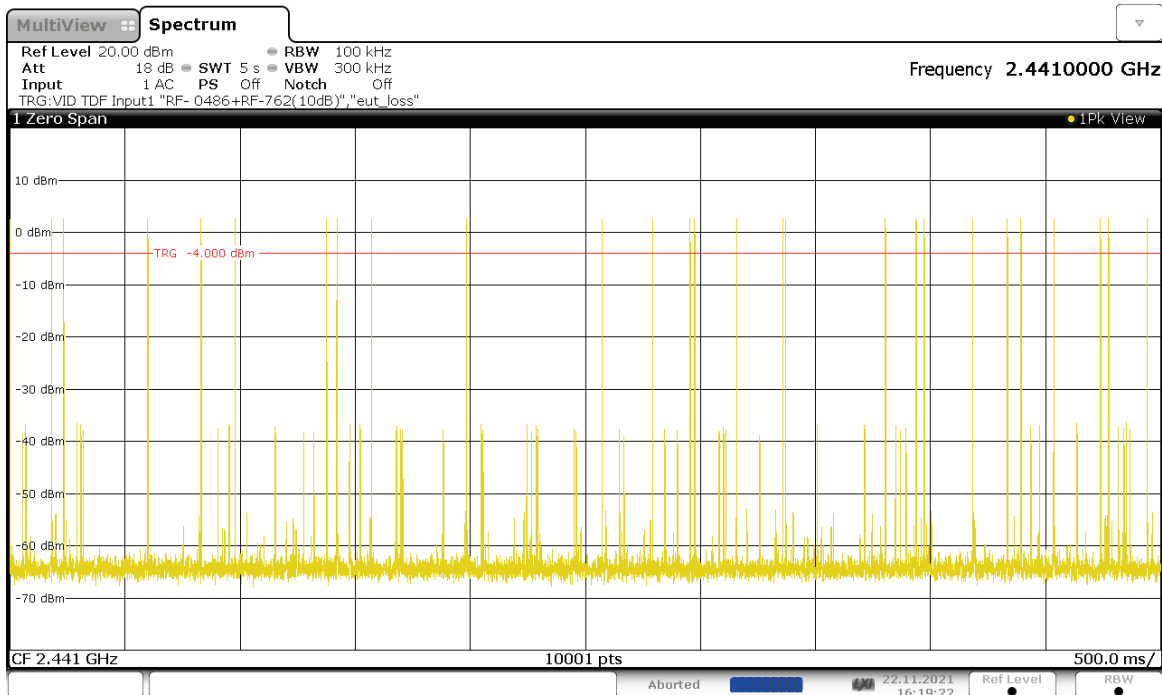
16:18:18 22.11.2021

Figure 45: Package Duration, Mode H, 3DH3



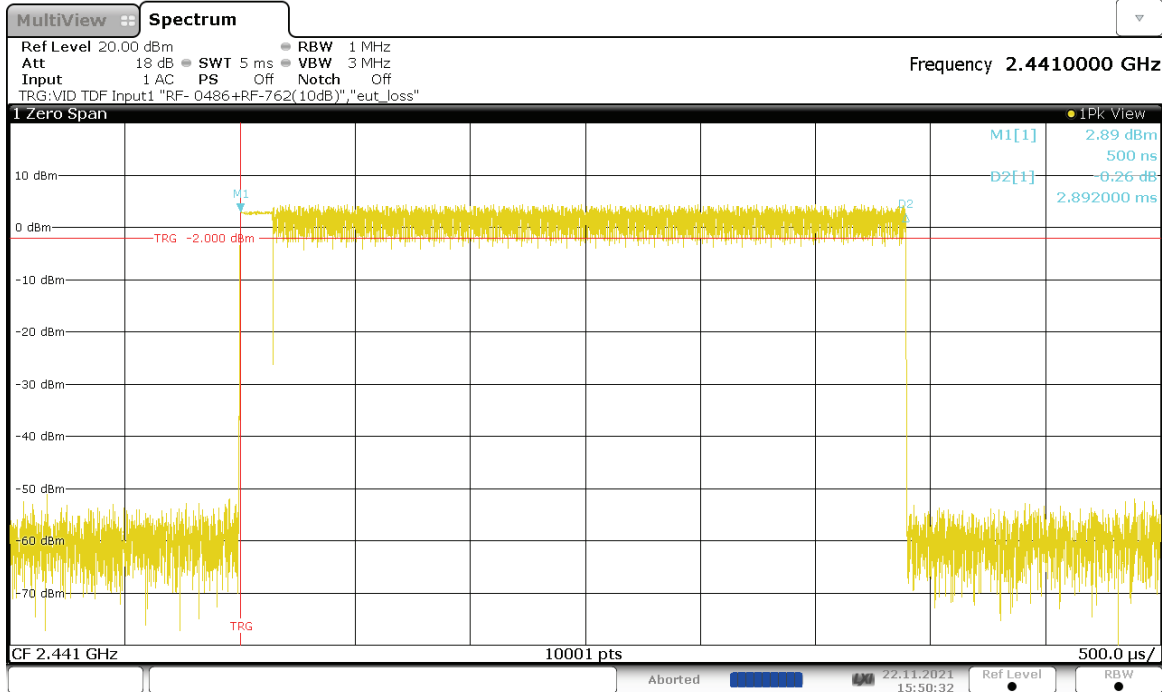
15:58:27 22.11.2021

Figure 46: Number of Hops, Mode H, 3DH3



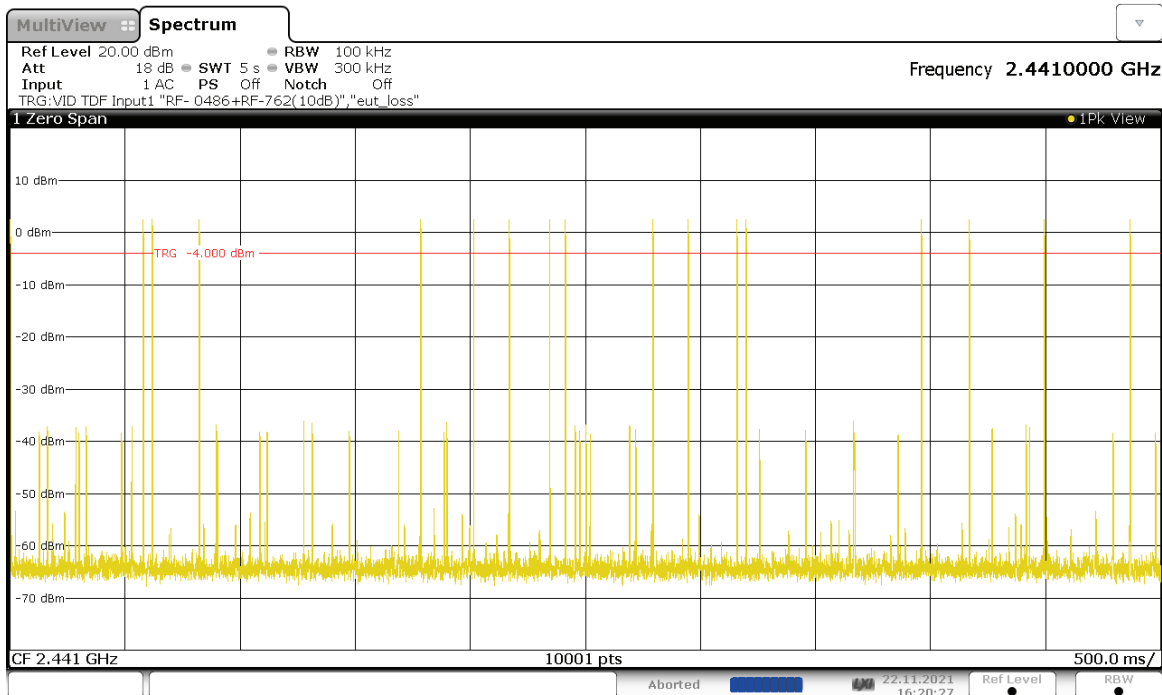
16:19:22 22.11.2021

Figure 47: Package Duration, Mode H, 3DH5



15:50:33 22.11.2021

Figure 48: Number of Hops, Mode H, 3DH5



16:20:28 22.11.2021

5.2.7 Conducted Spurious Emissions

RESULT:

PASS

Date of testing: 2021-11-24

Ambient temperature: 20°C
Relative humidity: 41%
Atmospheric pressure: 1004hPa
Operation Modes: A ~ C
Configurations: BT1, BT3

Requirements:

FCC 15.247(d)

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.

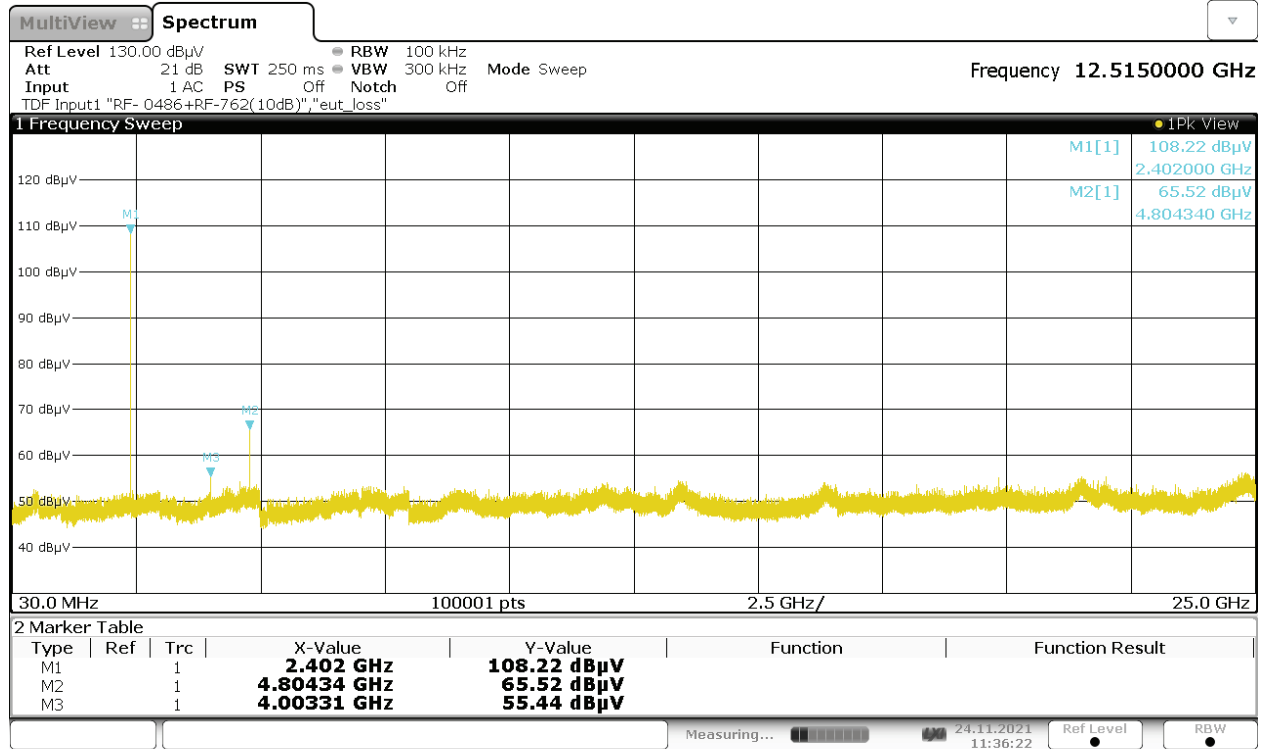
Test procedure:

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 (10th harmonics).

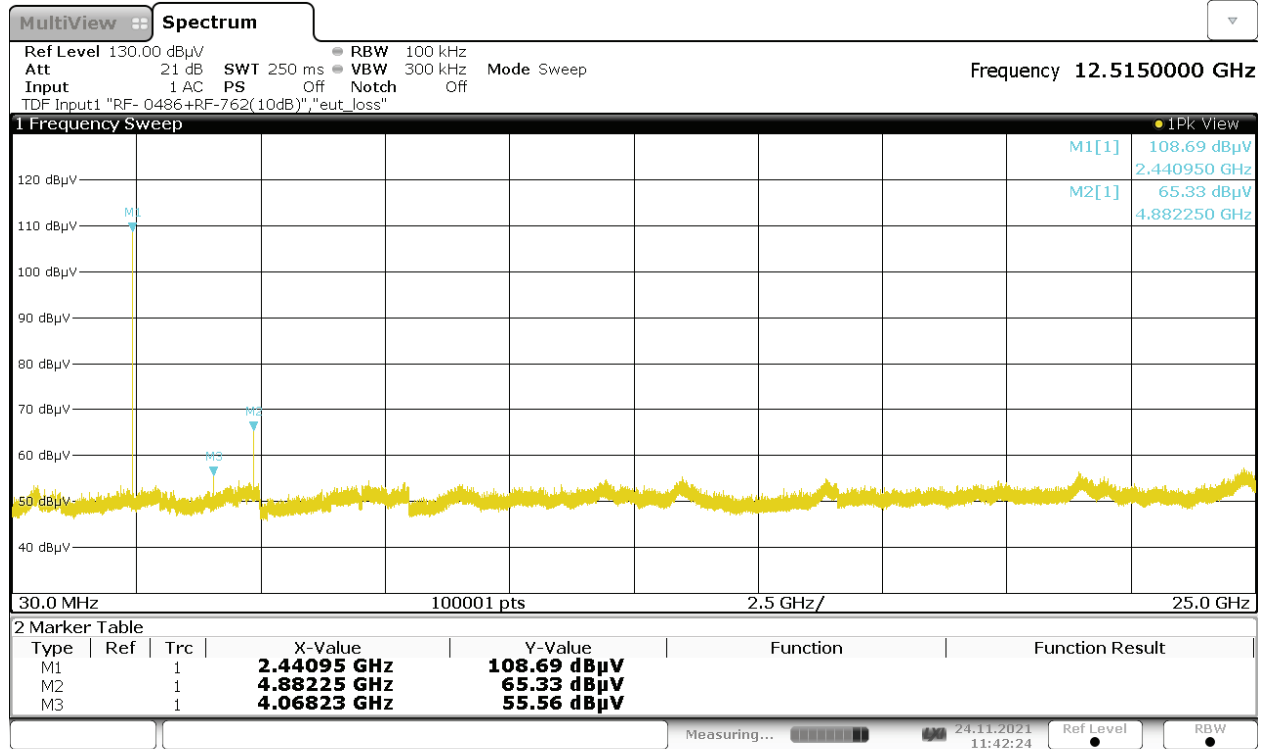
The readings of the measurements take into account the loss generated by all the involved cables.

Figure 49: Conducted Spurious Emissions, 30MHz - 25GHz, DH5, Mode A (2402MHz)



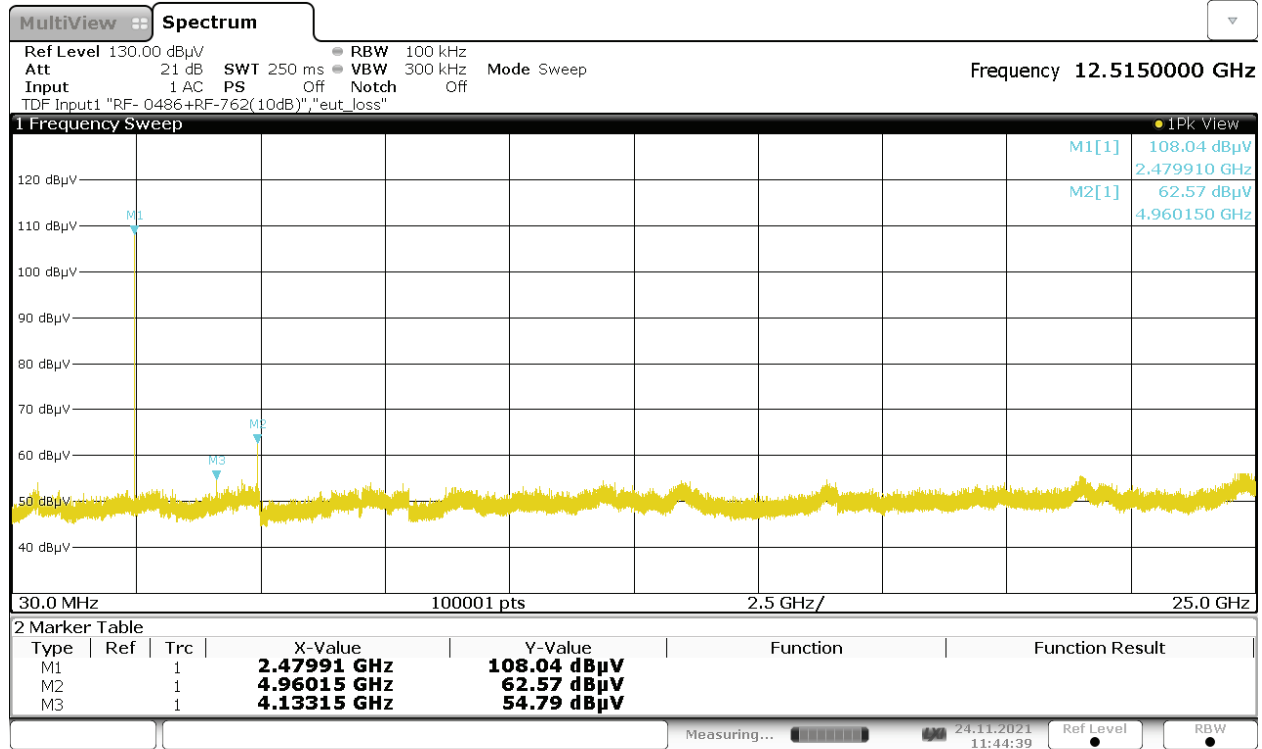
11:36:23 24.11.2021

Figure 50: Conducted Spurious Emissions, 30MHz - 25GHz, DH5, Mode B (2441MHz)



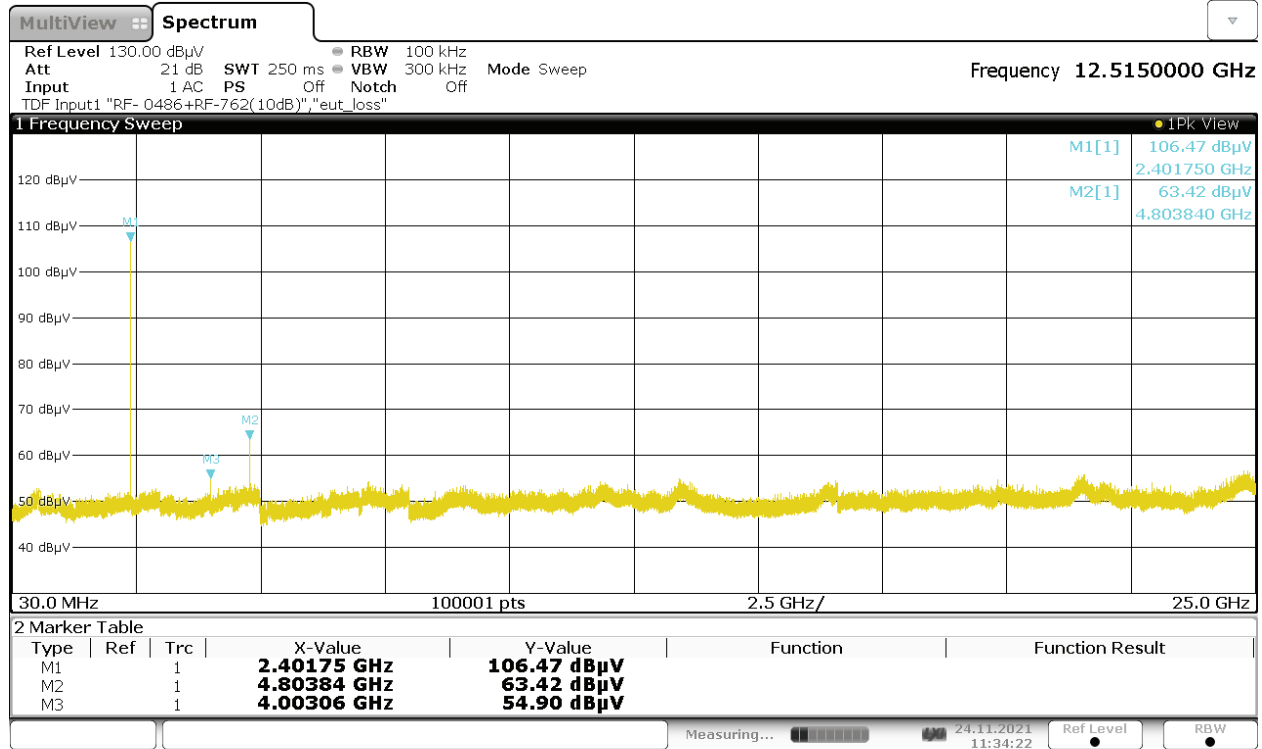
11:42:25 24.11.2021

Figure 51: Conducted Spurious Emissions, 30MHz - 25GHz, DH5, Mode C (2480MHz)



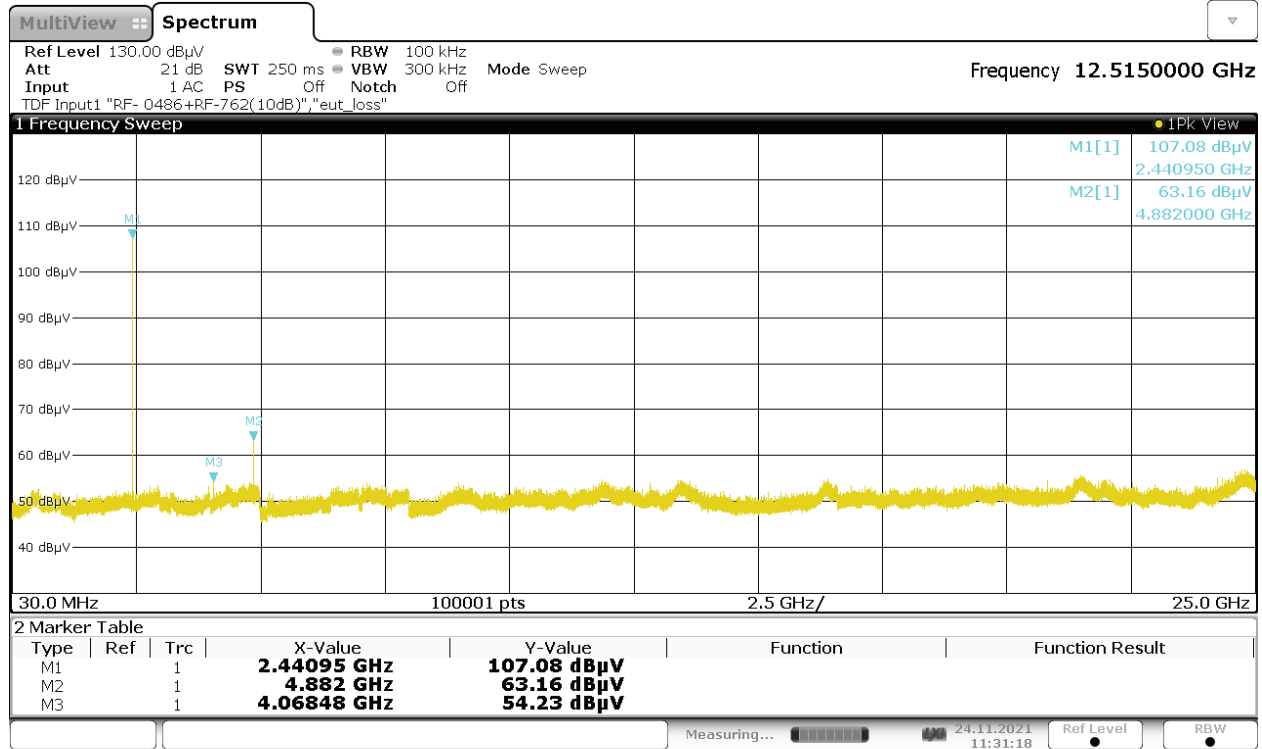
11:44:40 24.11.2021

Figure 52: Conducted Spurious Emissions, 30MHz - 25GHz, 3DH5, Mode A (2402MHz)



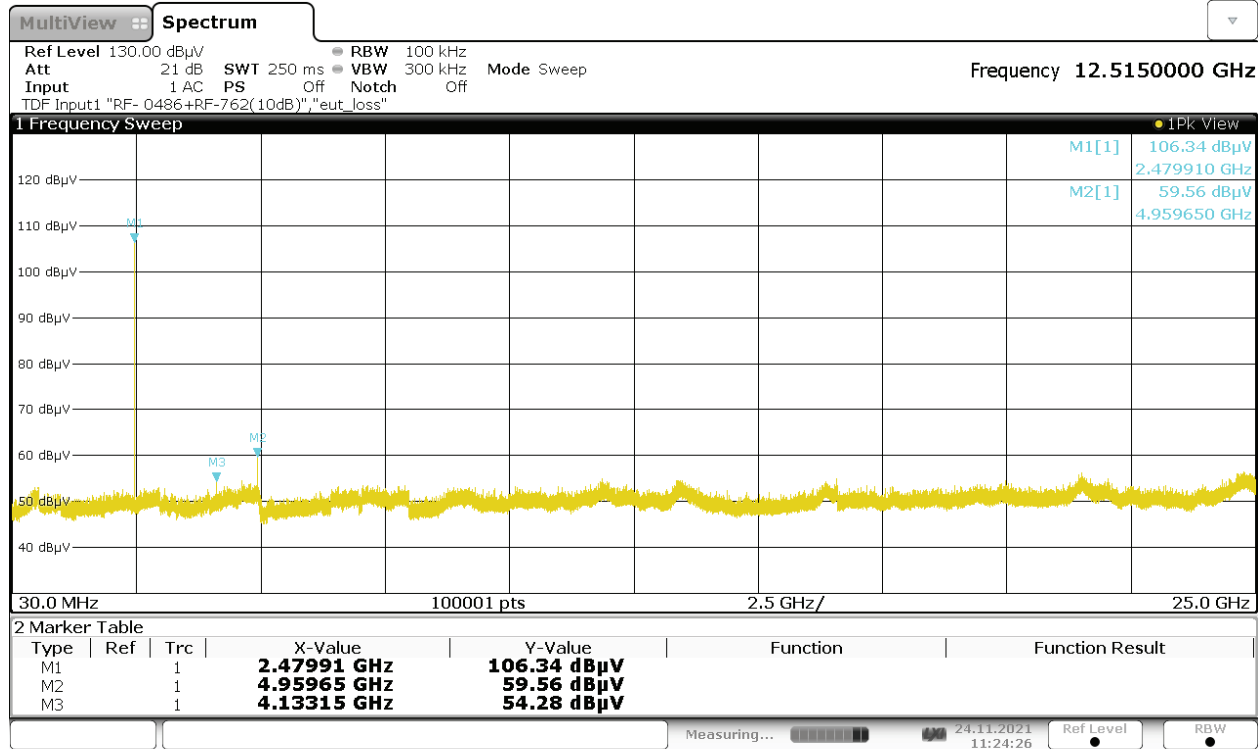
11:34:23 24.11.2021

Figure 53: Conducted Spurious Emissions, 30MHz - 25GHz, 3DH5, Mode B (2441MHz)



11:31:18 24.11.2021

Figure 54: Conducted Spurious Emissions, 30MHz - 25GHz, 3DH5, Mode C (2480MHz)



11:24:26 24.11.2021

Table 20: Conducted Spurious Emissions, 30MHz - 25GHz, DH5, -20dB Limit to Peak Power

Operating Frequency [MHz]	Fundamental Level [dBm]	Spurious Limit [dBm]	Measured Frequency [MHz]	Band Edge Level [dBm]	Margin [dB]
2402	1.22	-18.8	4804.34	-41.5	22.7
2440	1.69	-18.3	4882.25	-41.7	23.4
2480	1.04	-19.0	4960.15	-44.4	25.5

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

Table 21: Conducted Spurious Emissions, 30MHz - 25GHz, 3DH5, Mode B, -20dB Limit to Peak Power

Operating Frequency [MHz]	Fundamental Level [dBm]	Band Edge Limit [dBm]	Measured Frequency [MHz]	Band Edge Level [dBm]	Margin [dB]
2402	-0.53	-20.5	4803.84	-43.6	23.1
2440	0.08	-19.9	4882.00	-43.8	23.9
2480	-0.66	-20.7	4959.65	-47.4	26.8

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

Figure 55: Conducted Emissions at Band Edge, Spectral Diagram, DH5, Modes A (2402MHz) and C (2480MHz)

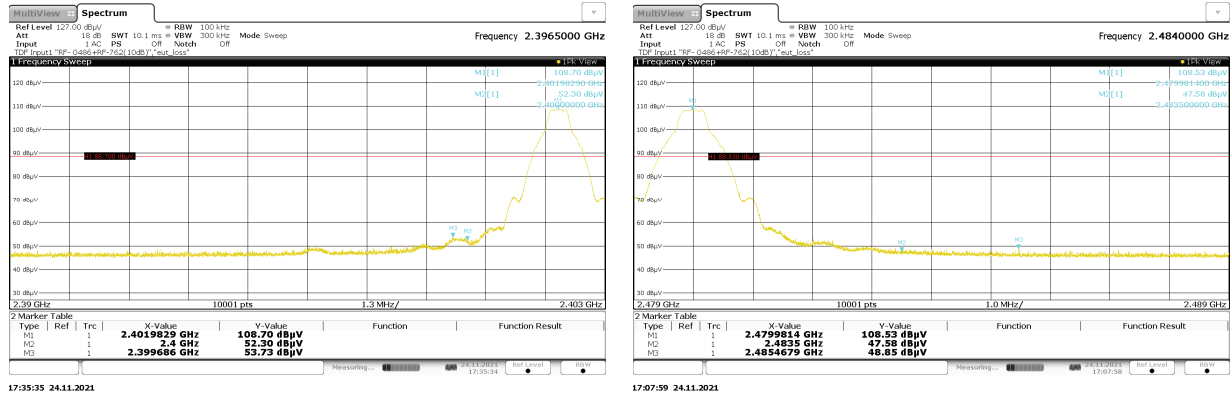


Figure 56: Conducted Emissions at Band Edge, Spectral Diagram, DH5, Mode H

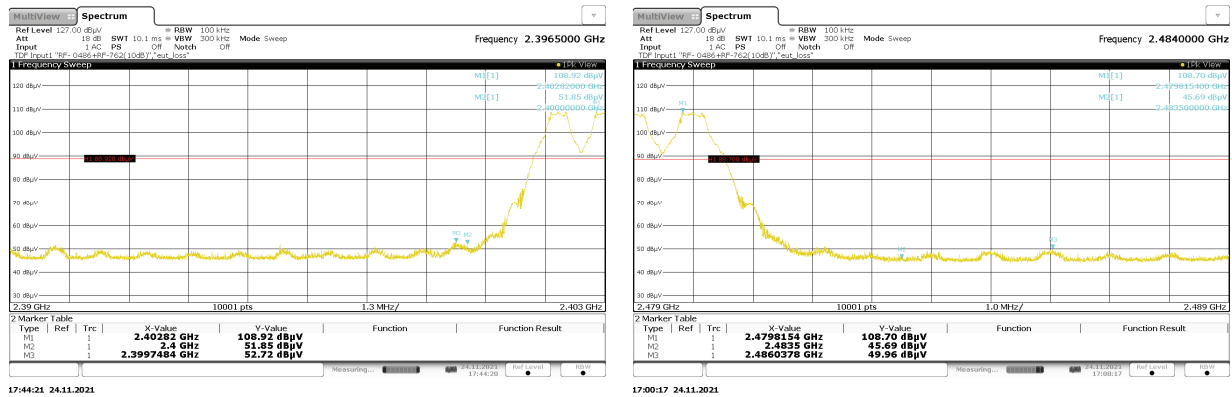


Figure 57: Conducted Emissions at Band Edge, Spectral Diagram, 3DH5, Modes A (2402MHz) and C (2480MHz)

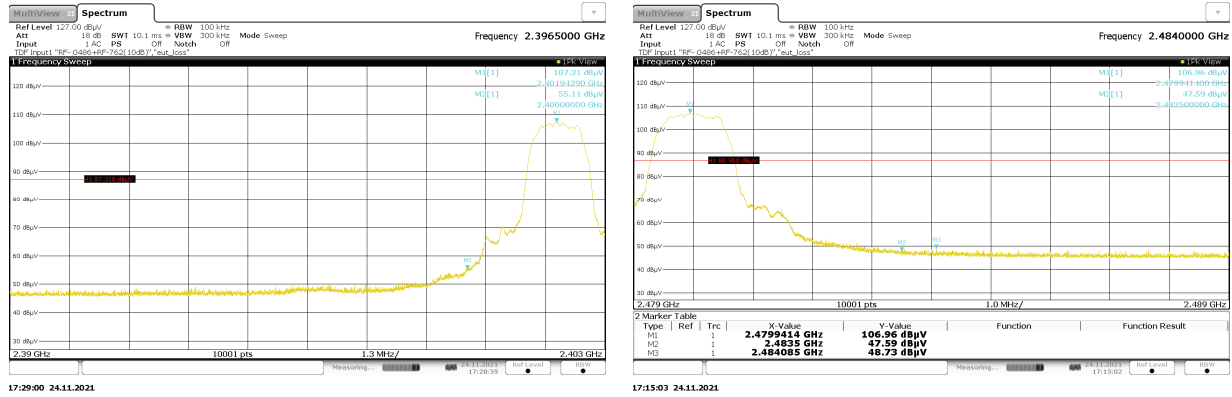
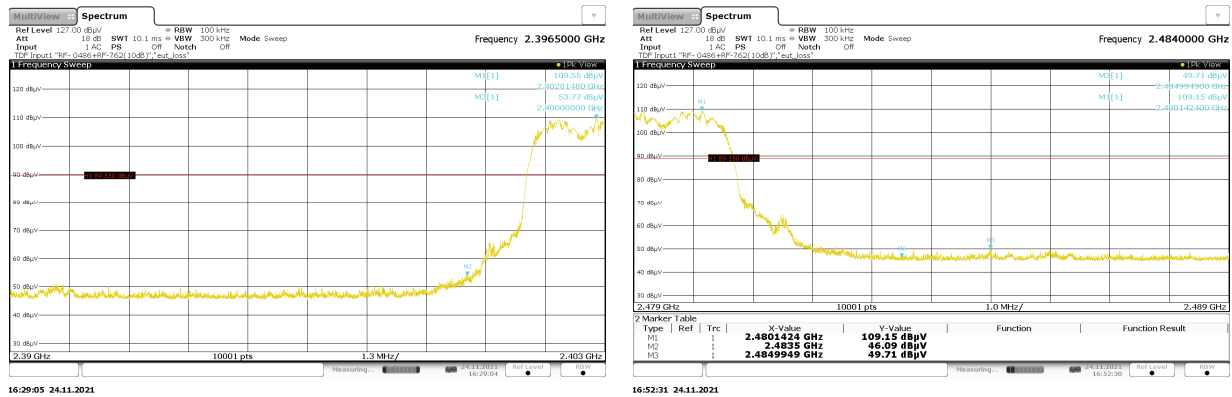


Figure 58: Conducted Emissions at Band Edge, Spectral Diagram, 3DH5, Mode H



5.2.8 Duty Cycle

RESULT:

PERFORMED

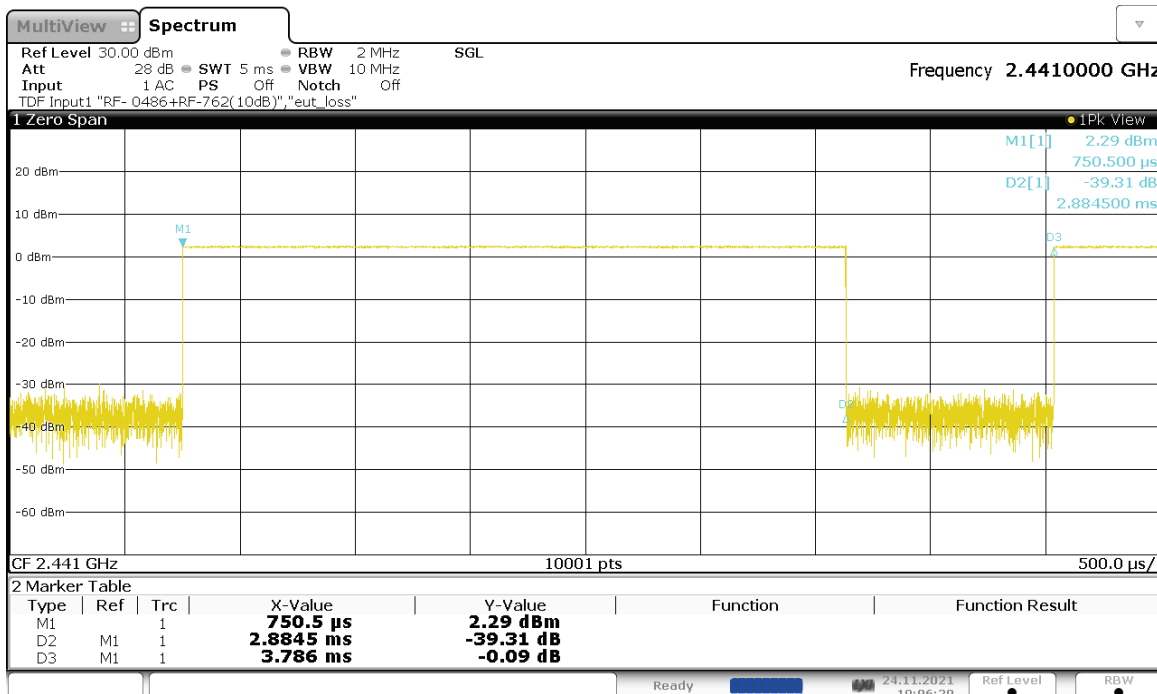
Date of testing: 2021-11-24

Ambient temperature: 20°C
Relative humidity: 41%
Atmospheric pressure: 1004hPa
Operation Modes: B
Configurations: BT1, BT3

Table 22: 20dB Bandwidth, DH5, 3DH5

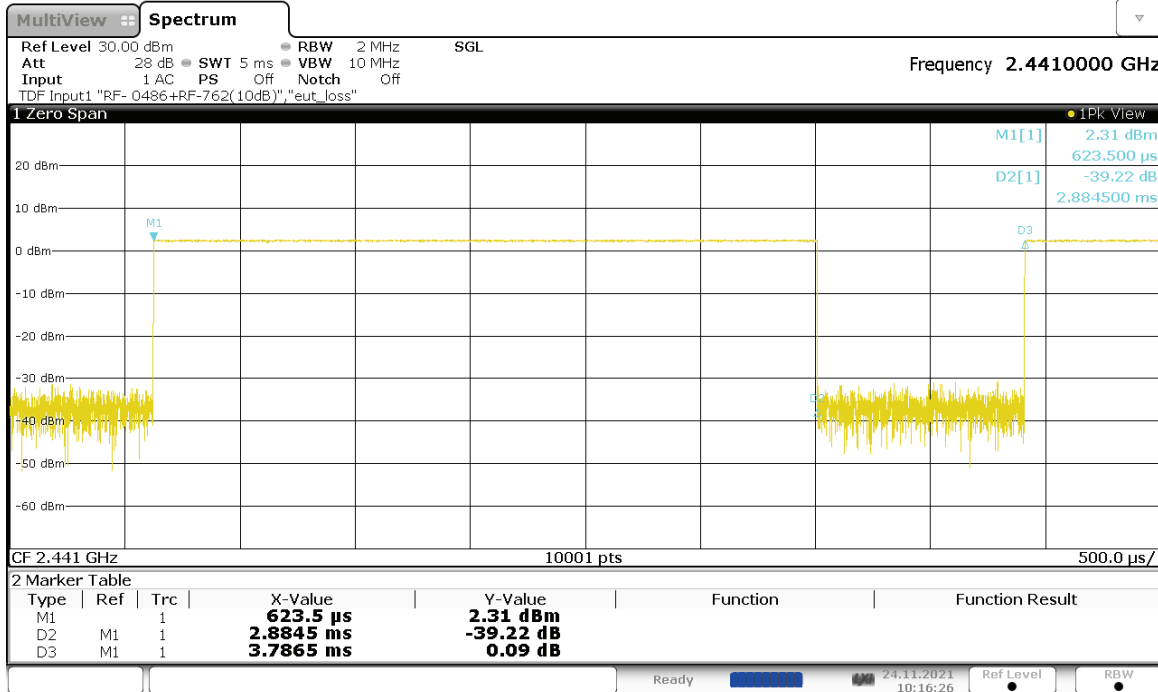
Radio	On-Time [ms]	Period [ms]	Duty Cycle
DH5	2.885	3.786	76.20%
3DH5	2.885	3.787	76.18%

Figure 59: Duty Cycle, DH5, Mode B (2441MHz)



10:06:29 24.11.2021

Figure 60: Duty Cycle, 3DH5, Mode B (2441MHz)



10:16:27 24.11.2021

5.3 Radiated Measurements

5.3.1 Radiated Spurious Emissions of Transmitter

RESULT:

PASS

Date of testing: 2021-12-06, 2021-12-07, 2021-12-08,
2021-12-09

Ambient temperature: 23, 24, 23, 23°C
Relative humidity: 56, 55, 50, 48%
Atmospheric pressure: 1023, 1017, 1013, 1023hPa

Frequency range: 9kHz - 25GHz
Measurement distance: 3m
Kind of test site: Semi Anechoic Chamber
Operation Modes: A ~ C, H
Configurations: BT1, BT3

Requirements:

FCC 15.205, FCC 15.209, FCC 15.247(d).

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:

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.

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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 and Average detector.

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.

For emissions below 1GHz, final measurements were performed with the worst case which was determined by pre-check.

Table 23: Radiated Emissions, Quasi Peak Data, 9kHz - 30MHz, 3DH5, Mode C (2480MHz)

Freq. [MHz]	Antenna Orientation	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Margin QP [dB]	Height [cm]	Angle [°]
1.432	6.8	1.1	19.8	26.6	20.9	64.5	65	38

Note: Level QP = Reading QP + Factor

Table 24: Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, 3DH5, Mode C (2480MHz)

Freq. [MHz]	Antenna Orientation	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Margin QP [dB]	Height [cm]	Angle [°]
48.021	V	52.1	-21.2	30.9	40.0	9.1	105	327
56.976	V	53.3	-21.1	32.2	40.0	7.8	100	164
143.769	V	55.3	-21.3	34.0	43.5	9.5	111	149
144.303	H	63.9	-22.3	41.6	43.5	1.9 (*)	232	235
167.995	H	56.5	-21.1	35.4	43.5	8.1	240	244
395.584	H	46.6	-16.7	29.9	46.0	16.1	100	116

Note: Level QP = Reading QP + Factor

(*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

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 [°]
2016.811	V	59.2	-15.4	43.8	74	30.2	102	176
4803.962	H	57.8	-7.5	50.3	74	23.7	176	238
4803.971	V	55.6	-7.5	48.1	74	25.9	116	242
7206.195	H	53.1	-0.3	52.8	74	21.2	193	34
7247.582	V	53.4	-0.1	53.3	74	20.7	170	26
12013.01	H	51.8	-5.2	46.6	74	27.4	180	185
21615.85	V	52.8	-10.6	42.2	74	31.8	203	149

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 [°]
2016.811	V	40.0	-15.4	24.6	54	29.4	102	176
4803.962	H	51.8	-7.5	44.3	54	9.7	176	238
4803.971	V	44.7	-7.5	37.2	54	16.8	116	242
7206.195	H	39.1	-0.3	38.8	54	15.2	193	34
7247.582	V	39.5	-0.1	39.4	54	14.6	170	26
12013.01	H	37.5	-5.2	32.3	54	21.7	180	185
21615.85	V	38.3	-10.6	27.7	54	26.3	203	149

Note: Level AV = Reading AV + Factor

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Table 27: 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 [°]
2088.803	V	58.8	-14.8	44.0	74	30.0	100	7
4881.970	V	55.3	-7.8	47.5	74	26.5	114	219
4881.971	H	58.9	-7.8	51.1	74	22.9	192	222
7323.234	H	53.2	0.0	53.2	74	20.8	103	50
7353.087	V	53.1	-0.1	53.0	74	21.0	198	167
12191.34	H	51.2	-5.2	45.9	74	28.1	171	226
21897.48	H	52.6	-10.6	42.0	74	32.0	100	303

Note: Level PK = Reading PK + Factor

Table 28: 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 [°]
2088.803	V	40.3	-14.8	25.5	54	28.5	100	7
4881.970	V	47.3	-7.8	39.5	54	14.5	114	219
4881.971	H	54.4	-7.8	46.6	54	7.4	192	222
7323.234	H	39.2	0.0	39.2	54	14.8	103	50
7353.087	V	39.3	-0.1	39.2	54	14.8	198	167
12191.34	H	37.1	-5.2	31.9	54	22.1	171	226
21897.48	H	38.3	-10.6	27.7	54	26.3	100	303

Note: Level AV = Reading AV + Factor

Table 29: 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 [°]
1897.425	V	61.9	-15.8	46.1	74	27.9	181	87
4959.956	H	59.1	-7.5	51.6	74	22.4	200	231
4960.017	V	54.9	-7.5	47.4	74	26.6	103	238
7456.589	V	53.5	-0.3	53.2	74	20.8	103	112
7467.652	H	53.8	-0.3	53.5	74	20.5	173	62
12402.67	V	51.7	-6.8	44.9	74	29.1	158	308
22346.50	V	54.0	-10.9	43.1	74	30.9	100	222

Note: Level PK = Reading PK + Factor

Table 30: 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 [°]
1897.425	V	39.8	-15.8	24.0	54	30.0	181	87
4959.956	H	54.5	-7.5	47.0	54	7.0	200	231
4960.017	V	45.3	-7.5	37.8	54	16.2	103	238
7456.589	V	39.3	-0.3	39.0	54	15.0	103	112
7467.652	H	39.2	-0.3	38.9	54	15.1	173	62
12402.67	V	37.8	-6.8	31.0	54	23.0	158	308
22346.50	V	38.2	-10.9	27.3	54	26.7	100	222

Note: Level AV = Reading AV + Factor

Table 31: 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 [°]
2013.136	V	54.7	-15.4	39.3	74	34.7	122	232
4803.967	H	59.3	-7.5	51.8	74	22.2	180	241
4803.978	V	56.0	-7.5	48.5	74	25.5	184	244
7164.215	H	53.6	-0.7	52.8	74	21.2	143	300
7166.607	H	53.5	-0.7	52.9	74	21.1	114	259
12013.01	H	51.7	-5.2	46.5	74	27.5	140	124
21642.44	V	52.4	-10.7	41.8	74	32.2	203	93

Note: Level PK = Reading PK + Factor

Table 32: 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 [°]
2013.136	V	39.8	-15.4	24.4	54	29.6	122	232
4803.967	H	51.2	-7.5	43.7	54	10.3	180	241
4803.978	V	43.7	-7.5	36.2	54	17.8	184	244
7164.215	H	39.6	-0.7	38.9	54	15.1	143	300
7166.607	H	39.6	-0.7	38.9	54	15.1	114	259
12013.01	H	37.9	-5.2	32.7	54	21.3	140	124
21642.44	V	38.2	-10.7	27.5	54	26.5	203	93

Note: Level AV = Reading AV + Factor

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Table 33: 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 [°]
2233.471	H	53.9	-13.4	40.5	74	33.5	198	198
4881.916	V	55.7	-7.8	47.9	74	26.1	170	235
4881.955	H	60.7	-7.8	52.9	74	21.1	151	239
7338.001	H	52.8	0.0	52.8	74	21.2	143	131
7347.701	V	53.5	-0.1	53.4	74	20.6	138	114
12202.43	H	51.0	-5.3	45.6	74	28.4	181	174
21893.78	V	52.9	-10.6	42.3	74	31.7	203	148

Note: Level PK = Reading PK + Factor

Table 34: 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 [°]
2233.471	H	40.0	-13.4	26.6	54	27.4	198	198
4881.916	V	45.8	-7.8	38.0	54	16.0	170	235
4881.955	H	52.9	-7.8	45.1	54	8.9	151	239
7338.001	H	39.4	0.0	39.4	54	14.6	143	131
7347.701	V	39.4	-0.1	39.3	54	14.7	138	114
12202.43	H	36.9	-5.3	31.6	54	22.4	181	174
21893.78	V	38.3	-10.6	27.7	54	26.3	203	148

Note: Level AV = Reading AV + Factor

Table 35: 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 [°]
1896.656	V	59.9	-15.8	44.1	74	29.9	114	258
4959.943	H	59.6	-7.5	52.1	74	21.9	202	240
4960.008	V	53.9	-7.5	46.4	74	27.6	110	251
7430.652	H	53.0	-0.3	52.8	74	21.2	151	323
7467.746	H	52.8	-0.3	52.5	74	21.5	179	245
12401.97	V	52.2	-6.8	45.4	74	28.6	185	340
22287.78	H	52.3	-10.8	41.5	74	32.5	131	354

Note: Level PK = Reading PK + Factor

Table 36: 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 [°]
1896.656	V	39.9	-15.8	24.1	54	29.9	114	258
4959.943	H	50.5	-7.5	43.0	54	11.0	202	240
4960.008	V	41.4	-7.5	33.9	54	20.1	110	251
7430.652	H	39.2	-0.3	38.9	54	15.1	151	323
7467.746	H	39.2	-0.3	38.9	54	15.1	179	245
12401.97	V	37.7	-6.8	30.9	54	23.1	185	340
22287.78	H	38.3	-10.8	27.5	54	26.5	131	354

Note: Level AV = Reading AV + Factor

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Table 37: Band Edge, DH5, Modes A (2402MHz) and C (2480MHz), -20dB Limit to Peak Power

Operating Frequency [MHz]	Fundamental Level [dBm]	Band Edge Limit [dBm]	Band Edge Frequency [MHz]	Band Edge Level [dBm]	Margin [dB]
2402	-15.4	-35.4	2400.0	-60.8	25.3
2480	-16.2	-36.2	2483.5	-51.0	14.8

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

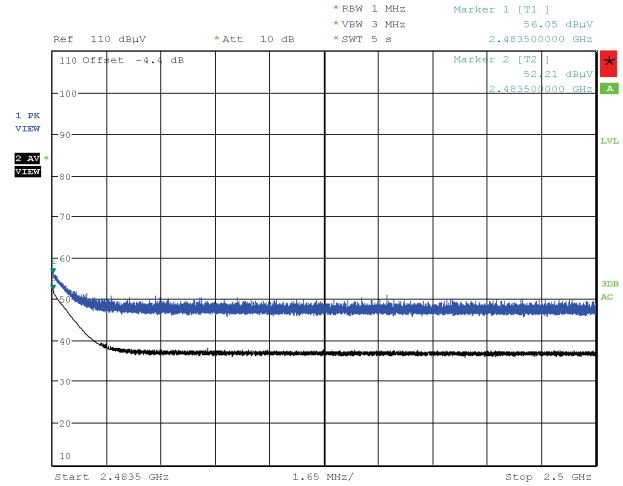
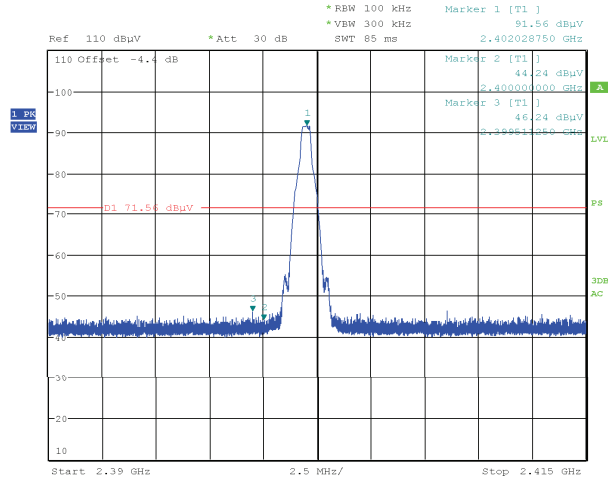
Table 38: Band Edge, DH5, Modes A (2402MHz) and C (2480MHz), Restricted Band

Operating Frequency [MHz]	Band Edge Frequency [MHz]	Average Limit [dBuV/m]	Peak Limit [dBuV/m]	Average Level [dBuV/m]	Peak Level [dBuV/m]	Average Margin [dB]	Peak Margin [dB]
2402	2390.0	54	74	41.59	51.78	12.41	22.22
2480	2483.5	54	74	52.21	56.05	(*) 1.79	17.95

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

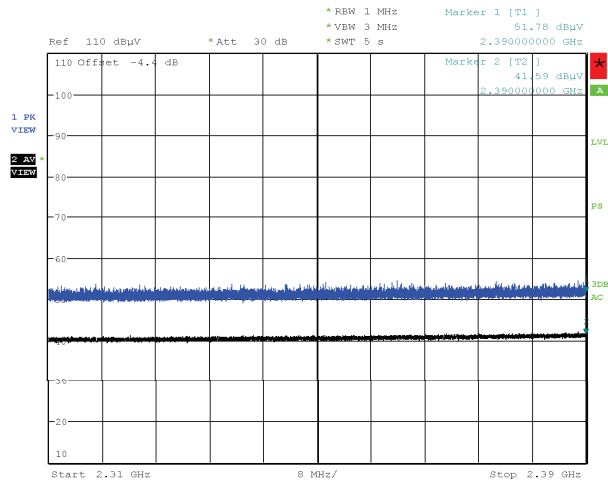
(*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

Figure 61: Radiated Emissions at Band Edge, Spectral Diagram, DH5, Modes A (2402MHz) and C (2480MHz)



Date: 7.DEC.2021 14:15:08

Date: 7.DEC.2021 13:24:44



Date: 7.DEC.2021 14:19:10

Table 39: Band Edge, DH5, Mode H (Hopping), -20dB Limit to Peak Power

Operating Frequency [MHz]	Fundamental Level [dBm]	Band Edge Limit [dBm]	Band Edge Frequency [MHz]	Band Edge Level [dBm]	Margin [dB]
N/A	-15.6	-35.6	2400.0	-70.6	35.0
N/A	-16.3	-36.3	2483.5	-55.5	19.2

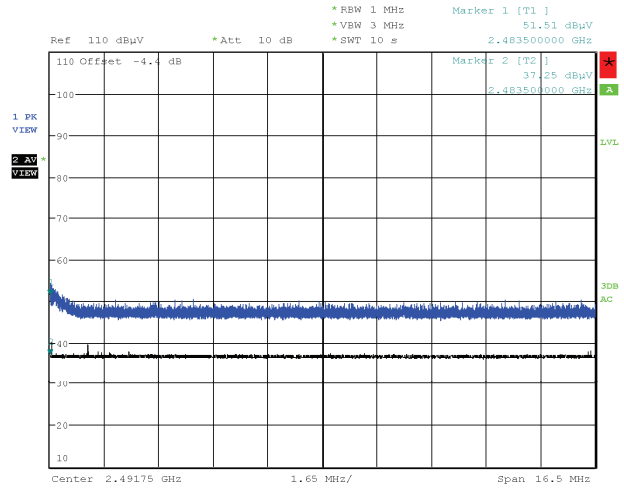
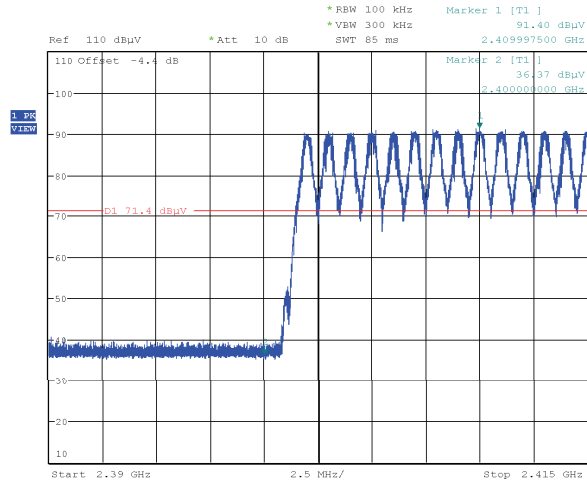
Notes: All correction factors are included in the measurement values.

Table 40: Band Edge, DH5, Modes H (Hopping), Restricted Band

Operating Frequency [MHz]	Band Edge Frequency [MHz]	Average Limit [dBuV/m]	Peak Limit [dBuV/m]	Average Level [dBuV/m]	Peak Level [dBuV/m]	Average Margin [dB]	Peak Margin [dB]
N/A	2390.0	54	74	36.53	47.07	17.47	26.93
N/A	2483.5	54	74	37.25	51.51	16.75	22.49

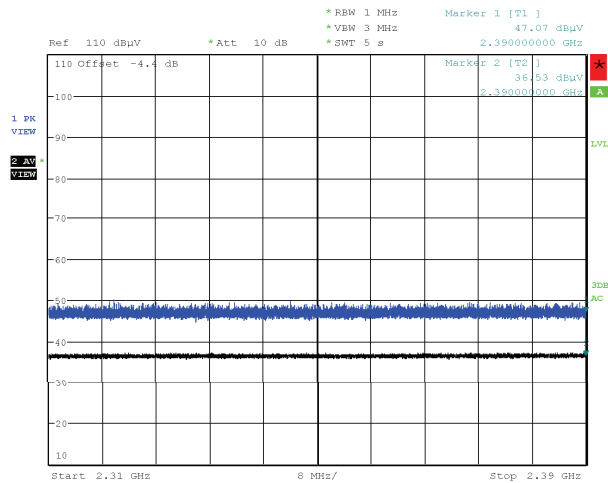
Notes: All correction factors are included in the measurement values.

Figure 62: Radiated Emissions at Band Edge, Spectral Diagram, DH5, Mode H



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Date: 9.DEC.2021 20:57:38



Date: 9.DEC.2021 21:00:04

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Table 41: Band Edge, 3DH5, Modes A (2402MHz) and C (2480MHz), -20dB Limit to Peak Power

Operating Frequency [MHz]	Fundamental Level [dBm]	Band Edge Limit [dBm]	Band Edge Frequency [MHz]	Band Edge Level [dBm]	Margin [dB]
2402	-16.6	-36.6	2400.0	-61.0	24.4
2480	-16.9	-36.9	2483.5	-50.7	13.8

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

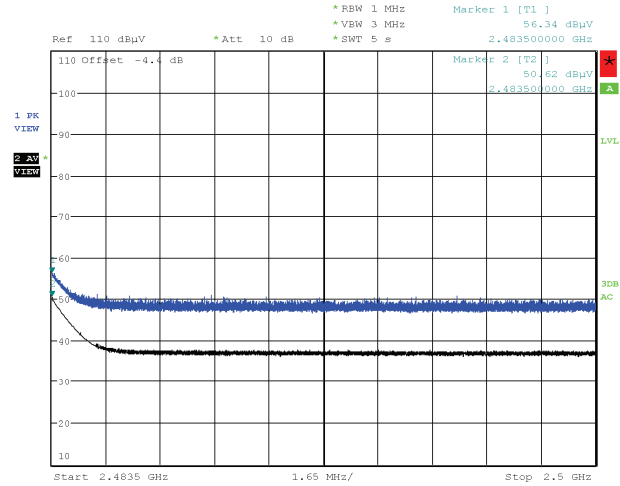
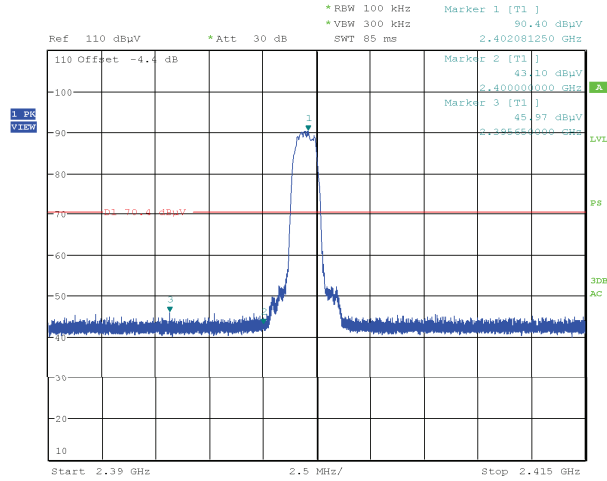
Table 42: Band Edge, 3DH5, Modes A (2402MHz) and C (2480MHz), Restricted Band

Operating Frequency [MHz]	Band Edge Frequency [MHz]	Average Limit [dBuV/m]	Peak Limit [dBuV/m]	Average Level [dBuV/m]	Peak Level [dBuV/m]	Average Margin [dB]	Peak Margin [dB]
2402	2390.0	54	74	41.32	51.16	12.68	22.84
2480	2483.5	54	74	50.62	56.34	(*) 3.38	17.66

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

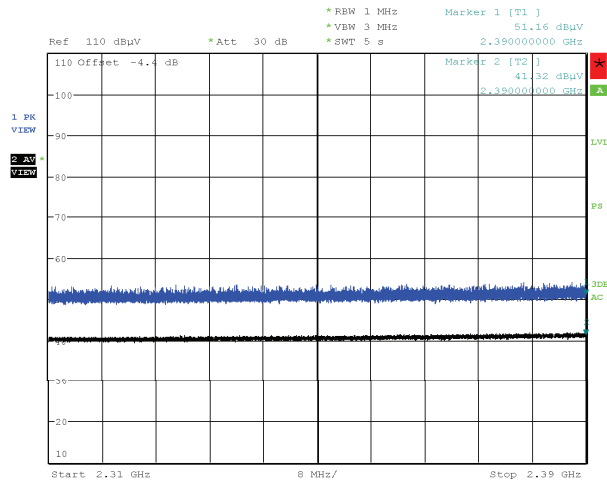
(*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

Figure 63: Radiated Emissions at Band Edge, Spectral Diagram, 3DH5, Modes A (2402MHz) and C (2480MHz)



Date: 7.DEC.2021 14:29:36

Date: 7.DEC.2021 12:04:48



Date: 7.DEC.2021 14:33:05

Table 43: Band Edge, 3DH5, Mode H, -20dB Limit to Peak Power

Operating Frequency [MHz]	Fundamental Level [dBm]	Band Edge Limit [dBm]	Band Edge Frequency [MHz]	Band Edge Level [dBm]	Margin [dB]
N/A	-14.0	-34.0	2400.0	-69.2	35.2
N/A	-14.3	-34.3	2483.5	-51.7	17.3

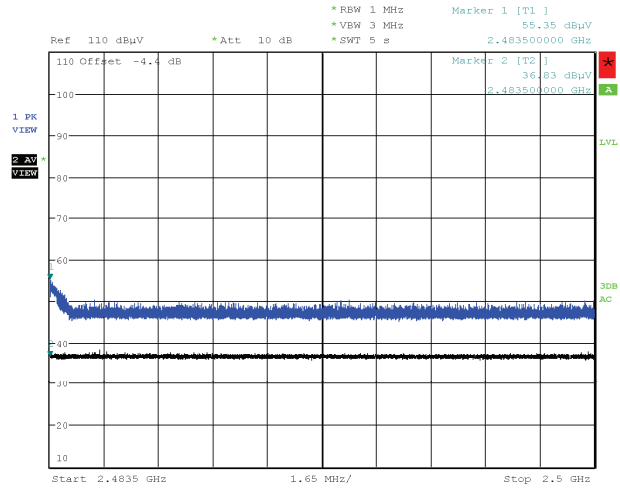
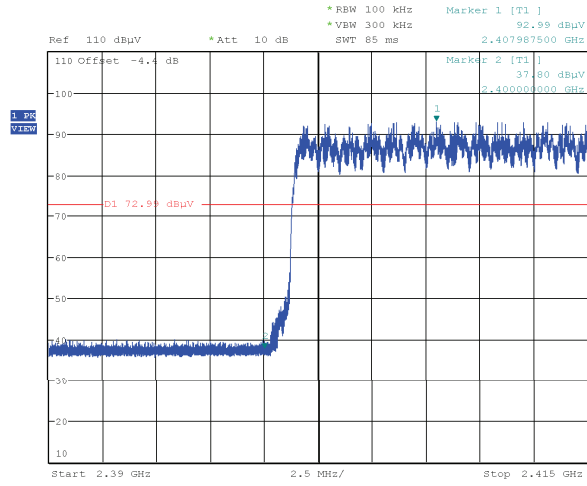
Notes: All correction factors are included in the measurement values.

Table 44: Band Edge, 3DH5, Modes H (Hopping), Restricted Band

Operating Frequency [MHz]	Band Edge Frequency [MHz]	Average Limit [dBuV/m]	Peak Limit [dBuV/m]	Average Level [dBuV/m]	Peak Level [dBuV/m]	Average Margin [dB]	Peak Margin [dB]
N/A	2390.0	54	74	36.88	47.19	17.12	26.81
N/A	2483.5	54	74	36.83	55.35	17.17	18.65

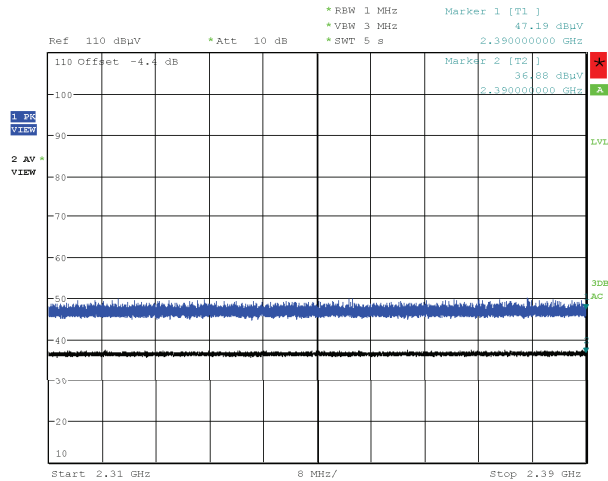
Notes: All correction factors are included in the measurement values.

Figure 64: Radiated Emissions at Band Edge, Spectral Diagram, 3DH5, Mode H



Date: 9.DEC.2021 21:37:45

Date: 9.DEC.2021 21:07:59



Date: 9.DEC.2021 21:04:14

5.4 AC Power Line Conducted Measurements

5.4.1 AC Power Line Conducted Emission of Transmitter

RESULT:

N/A

Requirements:

FCC 15.207

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.

Test procedure:

ANSI C63.10 §6.2

Note:

Not applicable since the EUT is not the device that is designed not to transmit during battery charge via. AC/DC charger.

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