

FCC Test Report

Product Name	Speech Generating Device
Model No.	TD I-110
FCC ID.	2AAOV-TDI110

Applicant	Tobii Dynavox LLC
Address	2100 Wharton Street, Suite 400, Pittsburgh PA 15203 United States

Date of Receipt	Jul. 11, 2021
Issued Date	Oct. 29, 2021
Report No.	2170396R-RFUSBT2V01
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test Report

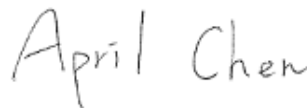
Issued Date: Oct. 29, 2021

Report No.: 2170396R-RFUSBT2V01



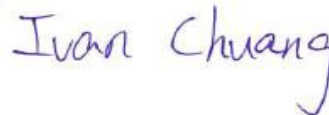
Product Name	Speech Generating Device
Applicant	Tobii Dynavox LLC
Address	2100 Wharton Street, Suite 400, Pittsburgh PA 15203 United States
Manufacturer	Onyx healthcare Inc
Model No.	TD I-110
FCC ID.	2AAOV-TDI110
EUT Rated Voltage	AC 100-240V, 50-60Hz
EUT Test Voltage	AC 120V/60Hz
Trade Name	Tobii Dynavox
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By :



(Senior Project Specialist / April Chen)

Tested By :



(Senior Engineer / Ivan Chuang)

Approved By :



(Senior Engineer / Jack Hsu)

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Appendix 1: EUT Test Photographs

Appendix 2: Product Photos-Please refer to the file: 2170396R-Product Photos

Revision History

Report No.	Version	Description	Issued Date
2170396R-RFUSBT2V01	V1.0	Initial issue of report.	Oct. 29, 2021

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Speech Generating Device
Trade Name	Tobii Dynavox
Model No.	TD I-110
FCC ID.	2AAOV-TDI110
Frequency Range	2402 – 2480MHz
Channel Number	79
Type of Modulation	FHSS: GFSK(1Mbps) / π /4DQPSK(2Mbps) / 8DPSK(3Mbps)
Antenna Type	PIFA Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
Power Adapter	MFR: Adapter Technology, M/N: ATM036T-A150 Input: AC 100-240V~50-60Hz 0.45A Output: DC 15V=2.4A 36W Cable Out: Non-shielded, 1.5m Power Cord: Non-shielded, 0.9m

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	ARISTOTLE	RFA-25-AP379-70-175 (Main)	PIFA Antenna	4.39dBi for 2.4 GHz
2	ARISTOTLE	RFA-25-AP379-70B-95 (Aux)	PIFA Antenna	3.20dBi for 2.4 GHz

Note: The antenna of EUT conforms to FCC 15.203.

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 20:	2422 MHz	Channel 40:	2442 MHz	Channel 60:	2462 MHz
Channel 01:	2403 MHz	Channel 21:	2423 MHz	Channel 41:	2443 MHz	Channel 61:	2463 MHz
Channel 02:	2404 MHz	Channel 22:	2424 MHz	Channel 42:	2444 MHz	Channel 62:	2464 MHz
Channel 03:	2405 MHz	Channel 23:	2425 MHz	Channel 43:	2445 MHz	Channel 63:	2465 MHz
Channel 04:	2406 MHz	Channel 24:	2426 MHz	Channel 44:	2446 MHz	Channel 64:	2466 MHz
Channel 05:	2407 MHz	Channel 25:	2427 MHz	Channel 45:	2447 MHz	Channel 65:	2467 MHz
Channel 06:	2408 MHz	Channel 26:	2428 MHz	Channel 46:	2448 MHz	Channel 66:	2468 MHz
Channel 07:	2409 MHz	Channel 27:	2429 MHz	Channel 47:	2449 MHz	Channel 67:	2469 MHz
Channel 08:	2410 MHz	Channel 28:	2430 MHz	Channel 48:	2450 MHz	Channel 68:	2470 MHz
Channel 09:	2411 MHz	Channel 29:	2431 MHz	Channel 49:	2451 MHz	Channel 69:	2471 MHz
Channel 10:	2412 MHz	Channel 30:	2432 MHz	Channel 50:	2452 MHz	Channel 70:	2472 MHz
Channel 11:	2413 MHz	Channel 31:	2433 MHz	Channel 51:	2453 MHz	Channel 71:	2473 MHz
Channel 12:	2414 MHz	Channel 32:	2434 MHz	Channel 52:	2454 MHz	Channel 72:	2474 MHz
Channel 13:	2415 MHz	Channel 33:	2435 MHz	Channel 53:	2455 MHz	Channel 73:	2475 MHz
Channel 14:	2416 MHz	Channel 34:	2436 MHz	Channel 54:	2456 MHz	Channel 74:	2476 MHz
Channel 15:	2417 MHz	Channel 35:	2437 MHz	Channel 55:	2457 MHz	Channel 75:	2477 MHz
Channel 16:	2418 MHz	Channel 36:	2438 MHz	Channel 56:	2458 MHz	Channel 76:	2478 MHz
Channel 17:	2419 MHz	Channel 37:	2439 MHz	Channel 57:	2459 MHz	Channel 77:	2479 MHz
Channel 18:	2420 MHz	Channel 38:	2440 MHz	Channel 58:	2460 MHz	Channel 78:	2480 MHz
Channel 19:	2421 MHz	Channel 39:	2441 MHz	Channel 59:	2461 MHz		

Note:

1. The EUT is an Speech Generating Device with built-in WLAN (802.11a/b/g/n/ac) with Bluetooth V5.0 + V2.1+EDR transceiver, this report for Bluetooth V2.1+EDR.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. The test mode is based on the Bluetooth technology, while testing 1Mbps, 2Mbps and 3Mbps, the worst case is 1Mbps and 3Mbps, and only worse case data is recorded in this report.

Test Mode	Mode 1: Transmit - 1Mbps Mode 2: Transmit - 3Mbps
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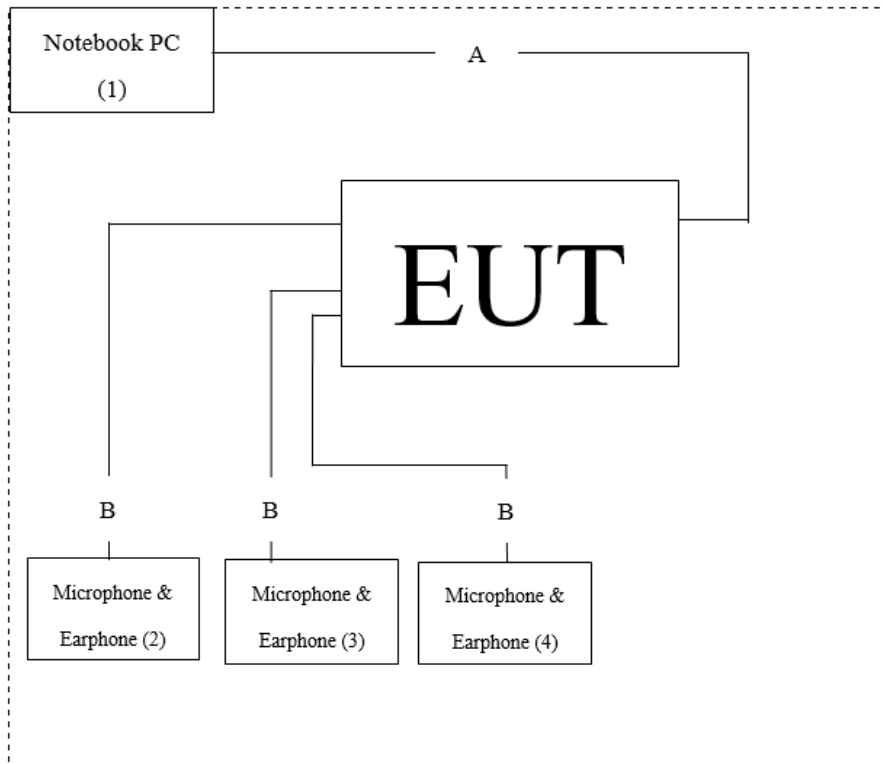
1.2. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 Notebook PC	ACER	N16Q2	N/A	N/A
2 Microphone & Earphone	Verbatim	C09024VB	N/A	N/A
3 Microphone & Earphone	Verbatim	C09024VB	N/A	N/A
4 Microphone & Earphone	Verbatim	C09024VB	N/A	N/A

Signal Cable Type	Signal cable Description
A USB Cable	Shielded, 1.8m
B Microphone & Earphone Cable	Non-shielded, 1.2m, three PCS.

1.3. Configuration of Tested System



1.4. EUT Exercise Software

1. Setup the EUT as shown in Section 1.3.
2. Execute software “QRCT Version 4.0.00185.0” on the EUT.
3. Configure the test mode, the test channel, and the data rate.
4. Press “OK” to start the continuous Transmit.
5. Verify that the EUT works properly.

1.5. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Conducted Emission	Temperature (°C)	10~40 °C	25.6°C
	Humidity (%RH)	10~90 %	56.7 %
Radiated Emission	Temperature (°C)	10~40 °C	24.6 °C
	Humidity (%RH)	10~90 %	59.5 %
Conductive	Temperature (°C)	10~40 °C	22 °C
	Humidity (%RH)	10~90 %	55 %

USA : FCC Registration Number: TW0033

Canada : IC Registration Number: 26930

Site Description : Accredited by TAF
Accredited Number: 3023

Test Laboratory : DEKRA Testing and Certification Co., Ltd
Address : No. 5-22, Ruishukeng Linkou District, New Taipei City,
24451, Taiwan

Performed Location : No. 26, Huaya 1st Rd., Guishan Dist., Taoyuan City
333411, Taiwan, R.O.C.

Phone number : +886-3-275-7255
Fax number : +866-3-327-8031
Email address : info.tw@dekra.com
Website : <http://www.dekra.com.tw>

1.6. List of Test Equipment

For Conduction measurements /SH1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	EMI Test Receiver	R&S	ESR7	101601	2021.06.19	2022.06.18
X	Two-Line V-Network	R&S	ENV216	101306	2021.04.08	2022.04.07
X	Two-Line V-Network	R&S	ENV216	101307	2021.05.04	2022.05.03
X	Coaxial Cable	DEKRA	RG400_BNC	RF001	2021.05.24	2022.05.23

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : DEKRA Testing System V2.0

For Conducted measurements /SH2

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	R&S	FSV30	103466	2020.12.28	2021.12.27
X	Peak Power Analyzer	KEYSIGHT	8900B	MY51000539	2021.06.07	2022.06.06
X	Power Sensor	KEYSIGHT	N1923A	MY59240002	2021.05.17	2022.05.16
X	Power Sensor	KEYSIGHT	N1923A	MY59240003	2021.05.17	2022.05.16

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : DEKRA Conduction Test System V9.0.5.

For Radiated measurements /966-1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	AMETEK	HLA6121	56736	2021.04.14	2022.04.13
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-678	2021.01.29	2022.01.28
X	Horn Antenna	ETS-Lindgren	3117	00203761	2020.11.23	2021.11.22
X	Horn Antenna	Com-Power	AH-840	101087	2021.06.18	2022.06.17
X	Pre-Amplifier	EMCI	EMC001330	980302	2021.07.26	2022.07.25
X	Pre-Amplifier	EMCI	EMC051835SE	980312	2021.02.24	2022.02.23
X	Pre-Amplifier	EMCI	EMC05820SE	980308	2021.09.23	2022.09.22
X	Pre-Amplifier	EMCI	EMC184045SE	980369	2021.04.27	2022.04.26
X	Filter	MICRO TRONICS	BRM50702	G251	2021.09.16	2022.09.15
	Filter	MICRO TRONICS	BRM50716	G188	2021.09.16	2022.09.15
X	EMI Test Receiver	R&S	ESR	102792	2020.12.15	2021.12.14
X	Spectrum Analyzer	R&S	FSV3044	101113	2021.02.04	2022.02.03
X	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3380/2	2021.08.30	2022.08.29
X	Coaxial Cable	SGH, EMCI, SUHNER	HA800 , SGH18, SUCOFLEX 106, EMC106	HY2108-003C	2021.03.03	2022.03.02

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : AUDIX e3 V9

1.7. Uncertainty

Uncertainties have been calculated according to the DEKRA internal document, and is described in each test chapter of this report.

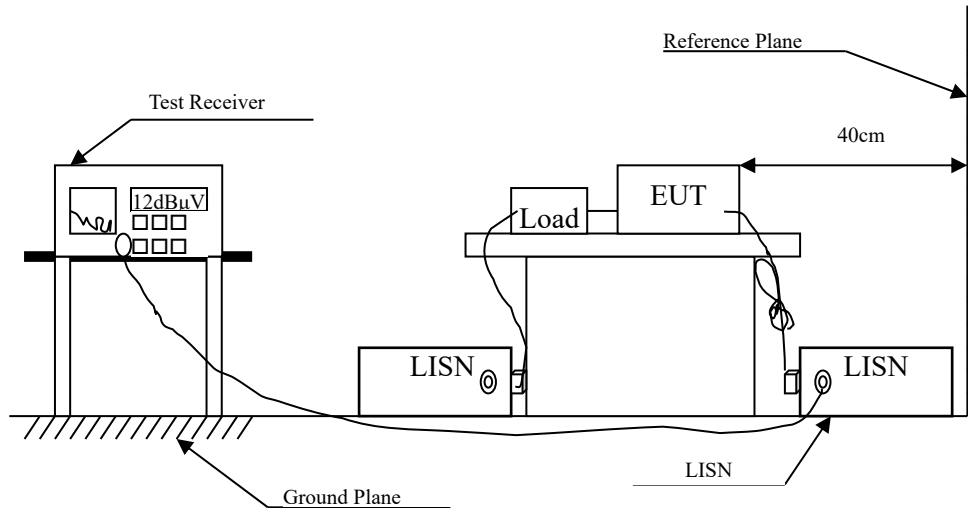
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test item	Uncertainty	
Conducted Emission	±3.42 dB	
Peak Power Output	±0.91 dB	
Radiated Emission	Under 1GHz ±4.06 dB	Above 1GHz ±3.73 dB
RF Antenna Conducted Test	±2.53 dB	
Band Edge	Under 1GHz ±4.06 dB	Above 1GHz ±3.73 dB
Channel Number	N/A	
Channel Separation	±682.83 Hz	
Dwell Time	±2.31 ms	
Occupied Bandwidth	±682.83 Hz	
Duty Cycle	±2.31 ms	

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dB μ V) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.3. Test Procedure

The EUT and Peripherals are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

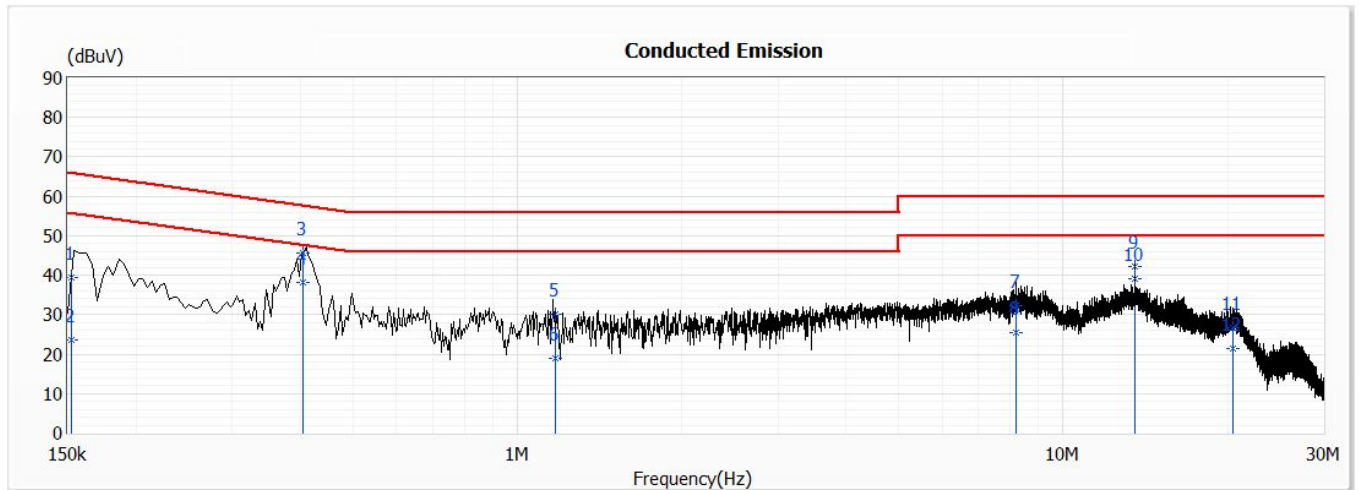
Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

The EUT setup and the test procedure are according to ANSI C63.4, 2014 to comply with the requirements of FCC 47CFR Subpart C.

2.4. Test Result of Conducted Emission

Model No	TD I-110	Site	SH1
Test Voltage	AC 120V/60Hz	Test Date	2021/9/28
Test Mode	Mode 1: Transmit	Engineer	Gerry Juang
Phase	L1	Temperature (°C)	25.6
Test Condition	--	Humidity (%RH)	56.7

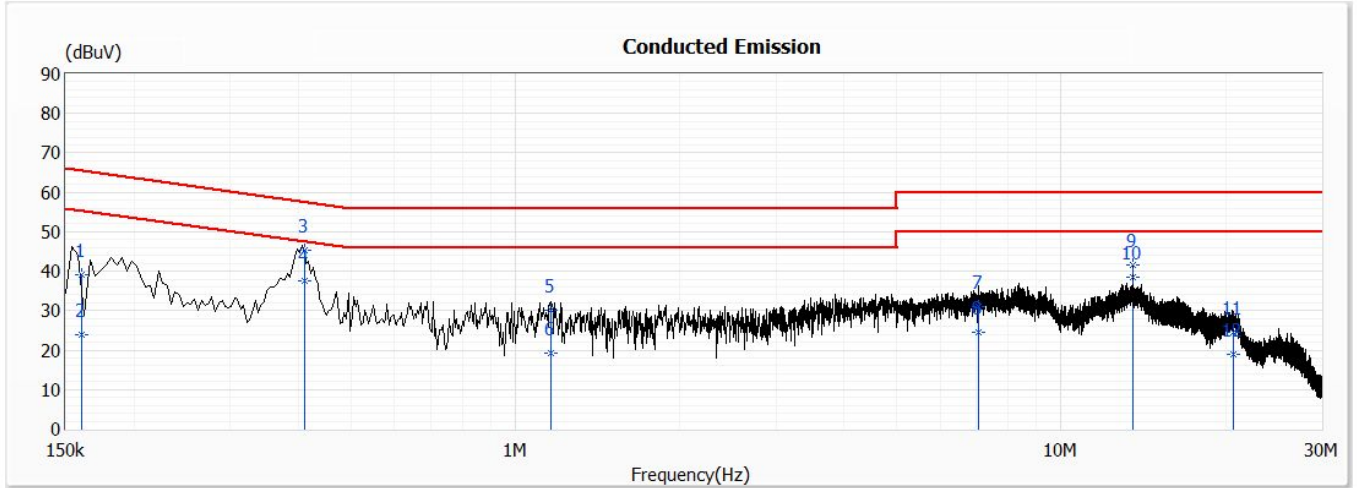


No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.152	39.32	65.88	-26.56	29.62	9.70	QP
2	0.152	23.64	55.88	-32.24	13.94	9.70	AV
3	0.406	45.64	57.74	-12.10	35.94	9.70	QP
*4	0.406	38.32	47.74	-9.42	28.62	9.70	AV
5	1.174	30.02	56.00	-25.98	20.26	9.76	QP
6	1.174	19.07	46.00	-26.93	9.31	9.76	AV
7	8.201	32.17	60.00	-27.83	21.33	10.84	QP
8	8.201	25.53	50.00	-24.47	14.69	10.84	AV
9	13.561	42.22	60.00	-17.78	31.38	10.84	QP
10	13.561	39.12	50.00	-10.88	28.28	10.84	AV
11	20.476	26.71	60.00	-33.29	15.96	10.75	QP
12	20.476	21.27	50.00	-28.73	10.52	10.75	AV

Note:

1. “ * “ means this data is the worst emission level.
2. Emission Level = Reading Level + Correct Factor.
3. Margin = Emission Level – Limit.
4. Correct Factor = LISN insertion loss + Cable loss.

Model No	TD I-110	Site	SH1
Test Voltage	AC 120V/60Hz	Test Date	2021/9/28
Test Mode	Mode 1: Transmit	Engineer	Gerry Juang
Phase	N	Temperature (°C)	25.6
Test Condition	--	Humidity (%RH)	56.7



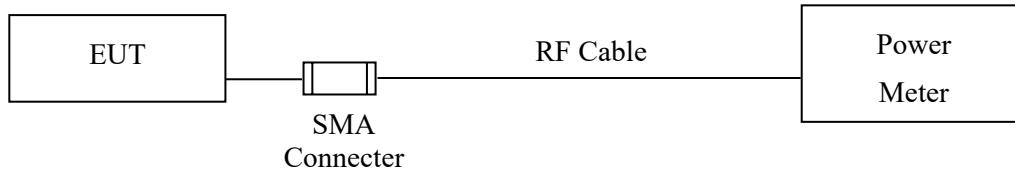
No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.161	39.02	65.42	-26.40	29.31	9.71	QP
2	0.161	23.95	55.42	-31.47	14.24	9.71	AV
3	0.410	45.37	57.64	-12.27	35.66	9.71	QP
*4	0.410	37.61	47.64	-10.03	27.90	9.71	AV
5	1.160	30.11	56.00	-25.89	20.36	9.75	QP
6	1.160	19.18	46.00	-26.82	9.43	9.75	AV
7	7.053	31.06	60.00	-28.94	20.21	10.85	QP
8	7.053	24.50	50.00	-25.50	13.65	10.85	AV
9	13.561	41.45	60.00	-18.55	30.57	10.88	QP
10	13.561	38.48	50.00	-11.52	27.60	10.88	AV
11	20.689	24.66	60.00	-35.34	13.83	10.83	QP
12	20.689	18.93	50.00	-31.07	8.10	10.83	AV

Note:

1. “ * “ means this data is the worst emission level.
2. Emission Level = Reading Level + Correct Factor.
3. Margin = Emission Level – Limit.
4. Correct Factor = LISN insertion loss + Cable loss.

3. Peak Power Output

3.1. Test Setup



3.2. Limit

The maximum peak power shall be less 1Watt.

3.3. Test Procedure

Tested according to FHSS test procedure of KDB 558074 section 9 (b for compliance to FCC 47CFR 15.247 requirements.

3.4. Test Result of Peak Power Output

Product : Speech Generating Device
Test Item : Peak Power Output
Test Mode : Mode 1: Transmit - 1Mbps
Test Date : 2021/08/19

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	1.91	1 Watt= 30 dBm	Pass
Channel 39	2441.00	1.29	1 Watt= 30 dBm	Pass
Channel 78	2480.00	1.97	1 Watt= 30 dBm	Pass

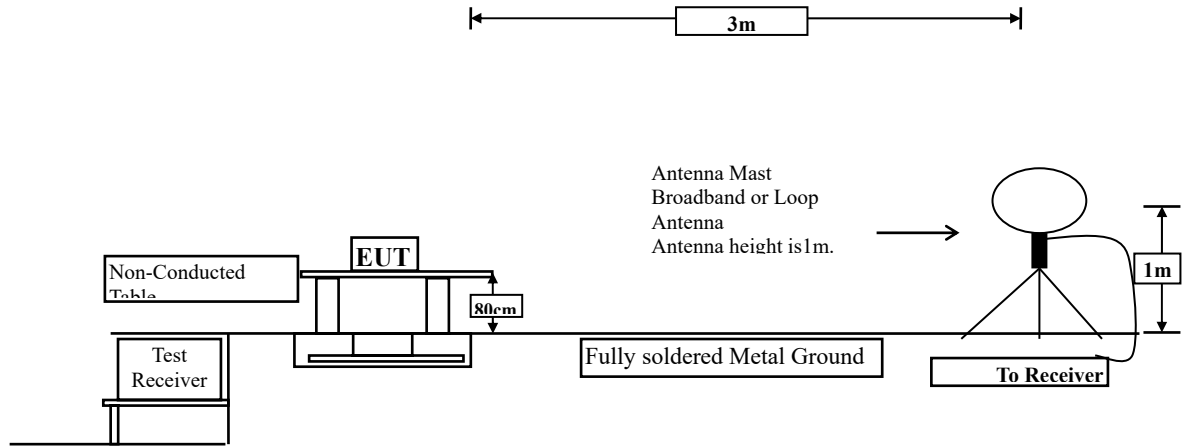
Product : Speech Generating Device
Test Item : Peak Power Output
Test Mode : Mode 2: Transmit - 3Mbps
Test Date : 2021/08/19

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	5.44	1 Watt= 30 dBm	Pass
Channel 39	2441.00	4.92	1 Watt= 30 dBm	Pass
Channel 78	2480.00	6.75	1 Watt= 30 dBm	Pass

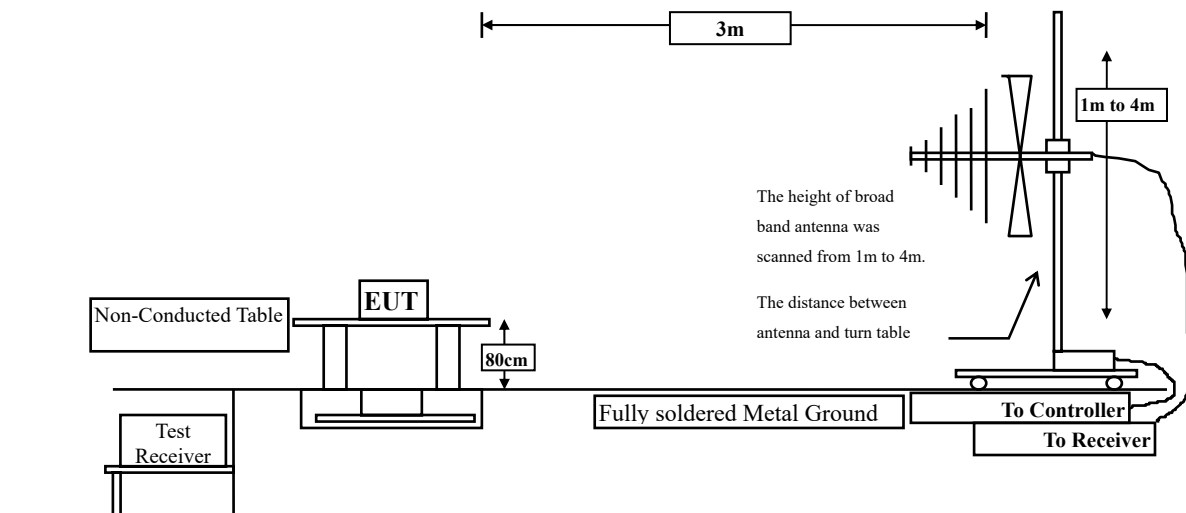
4. Radiated Emission

4.1. Test Setup

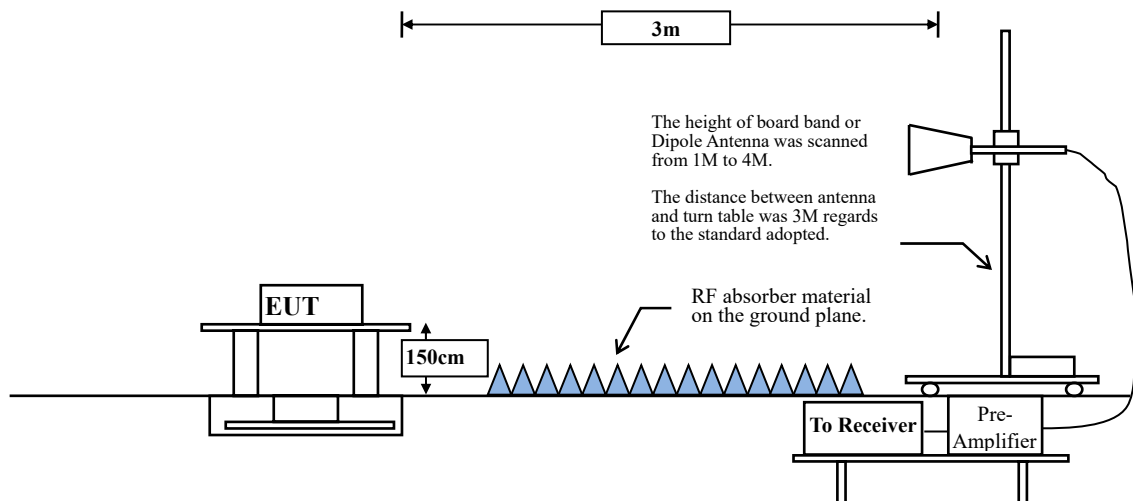
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



4.2. Limits

➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

- Remarks:
1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

4.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.247 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

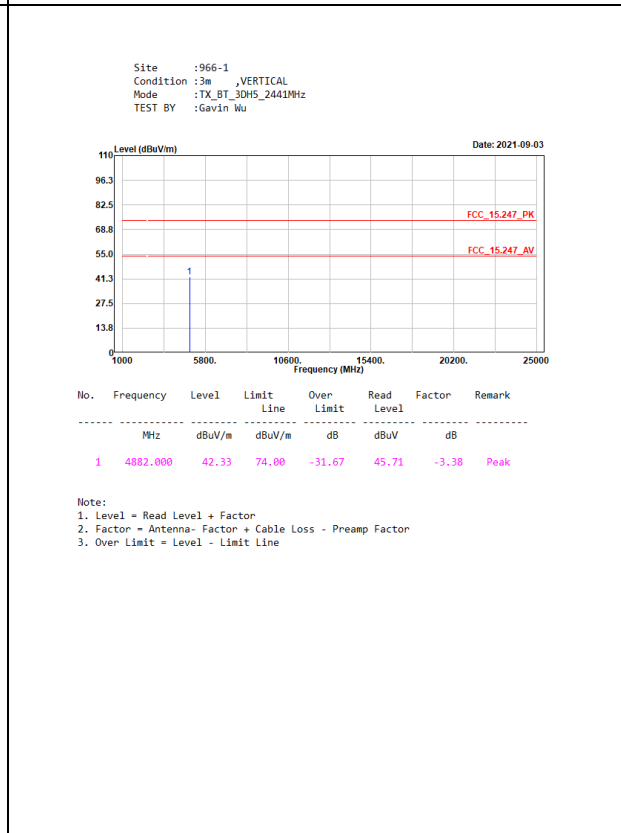
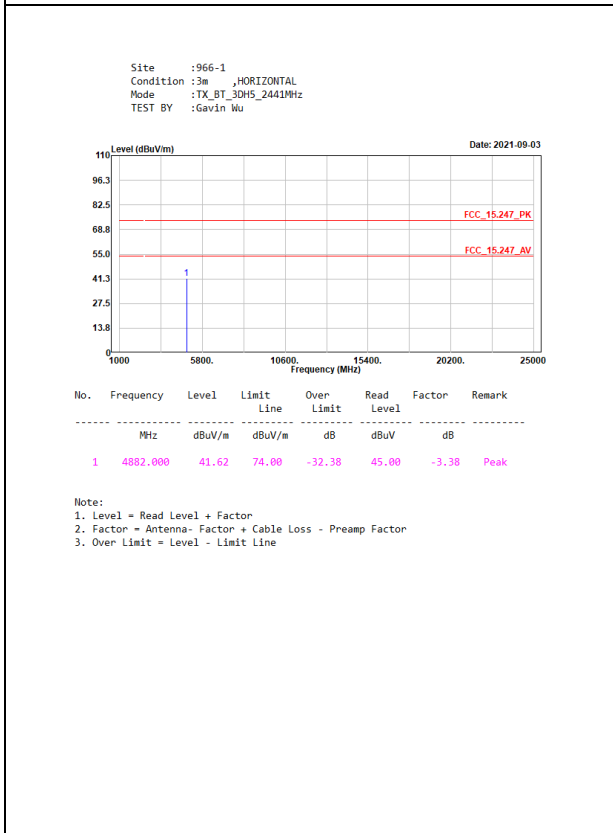
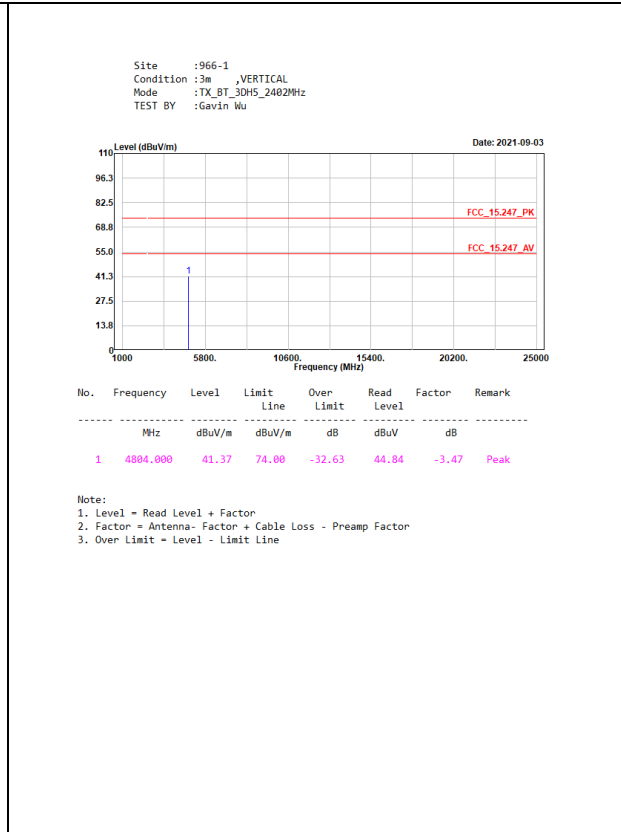
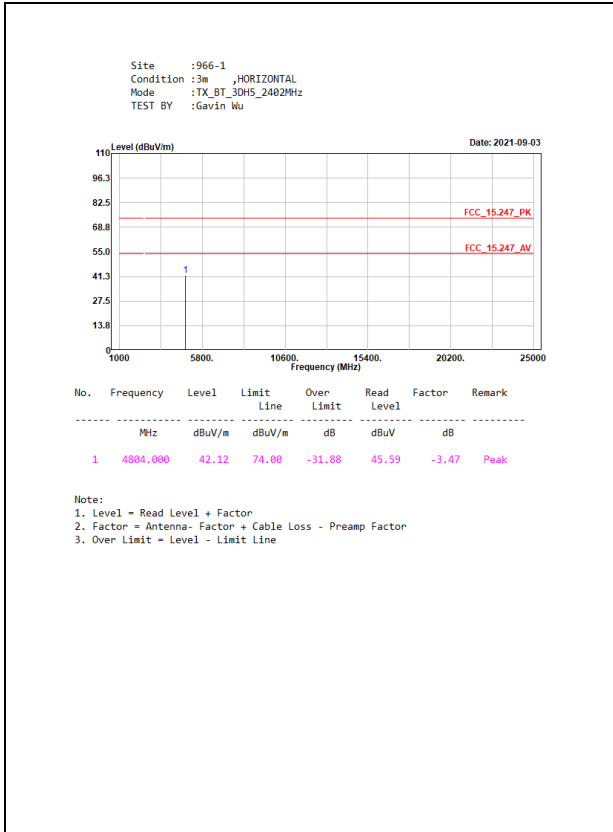
Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

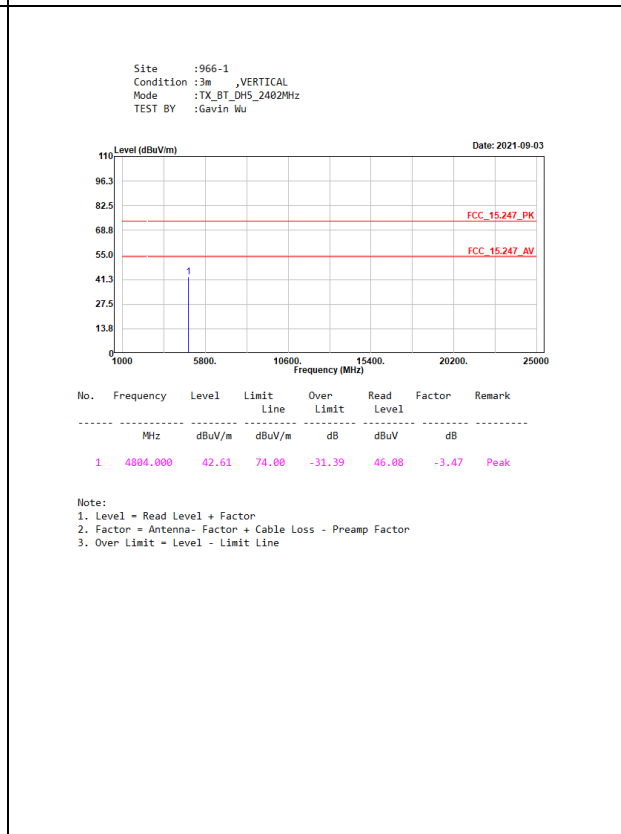
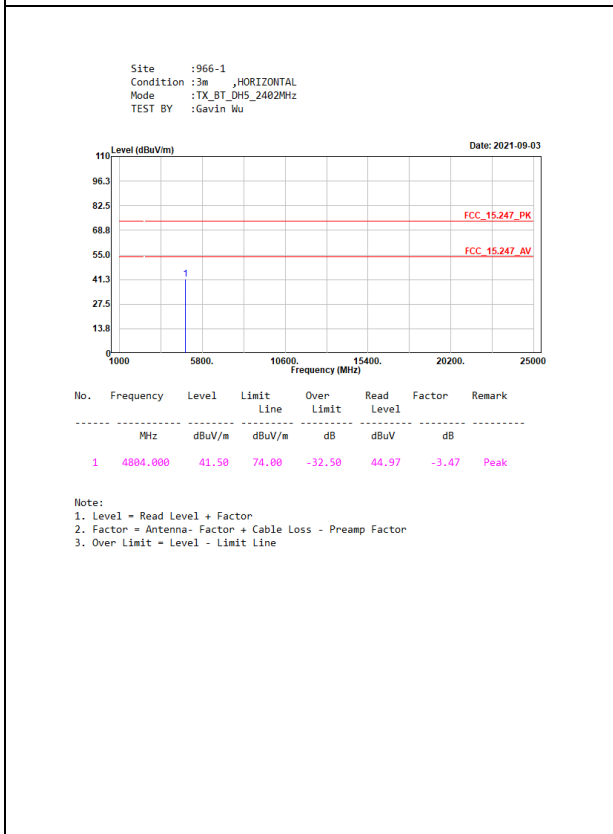
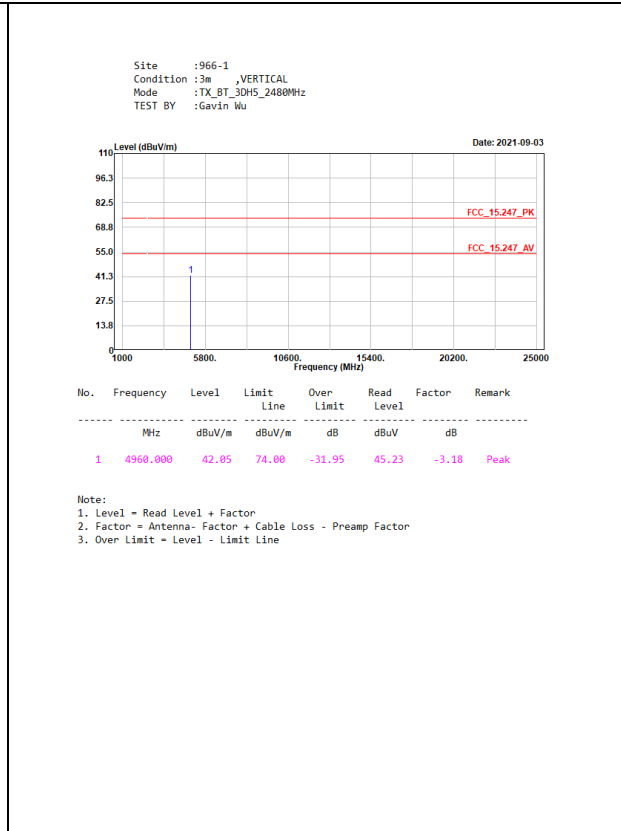
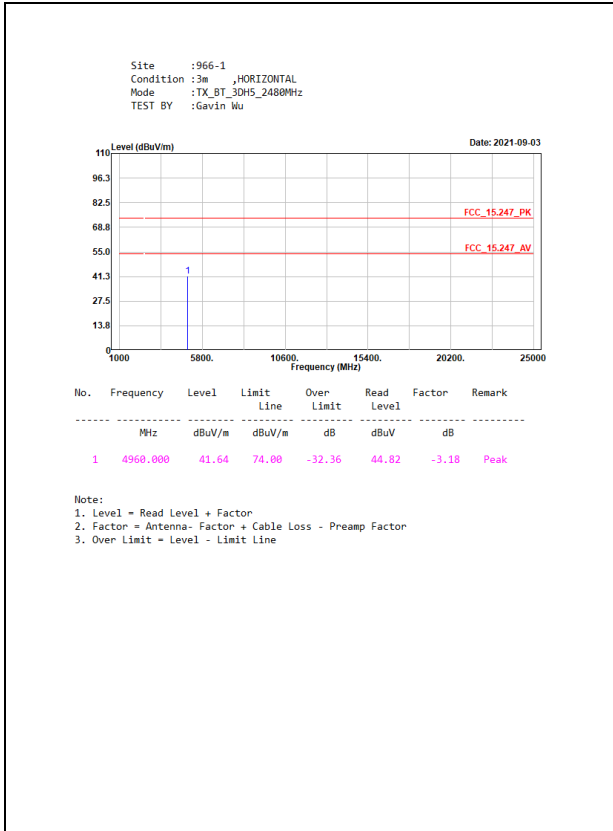
The measurement is divided into the Preliminary Measurement and the Final Measurement.

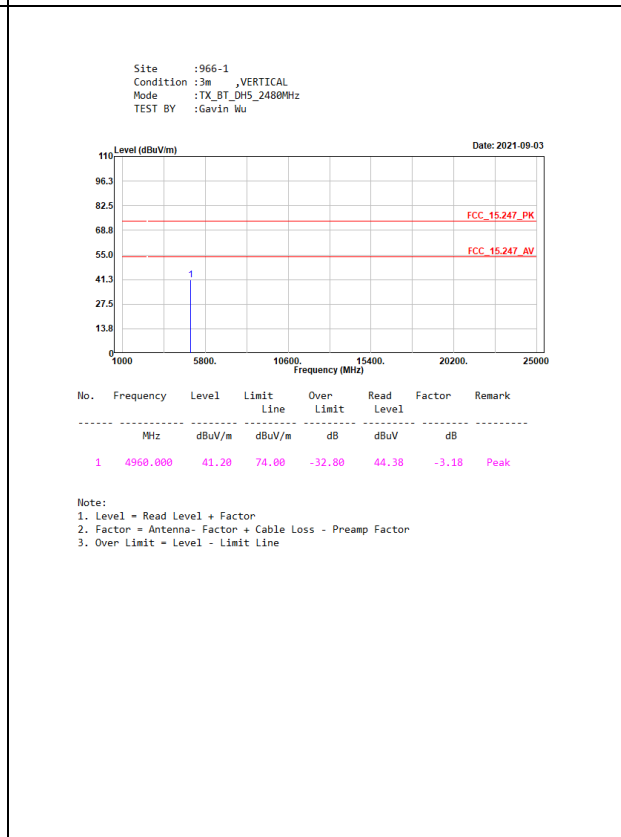
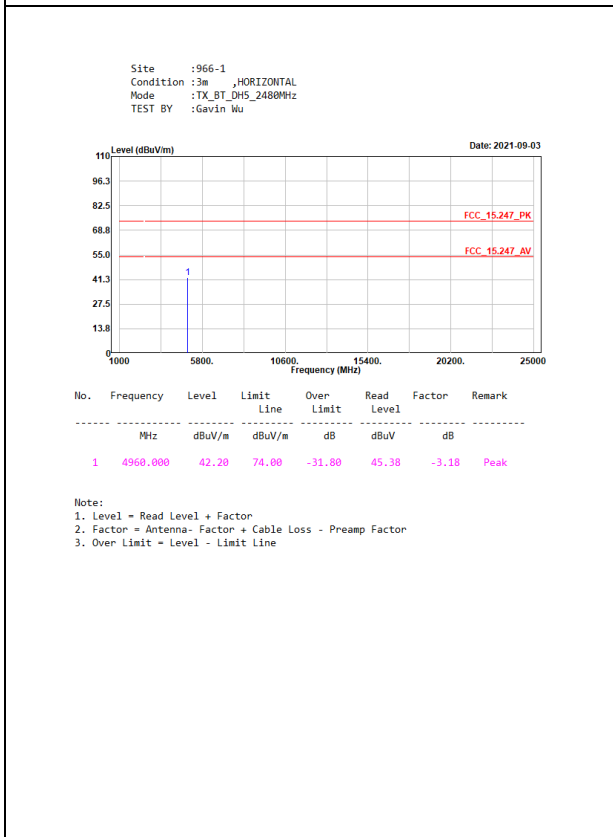
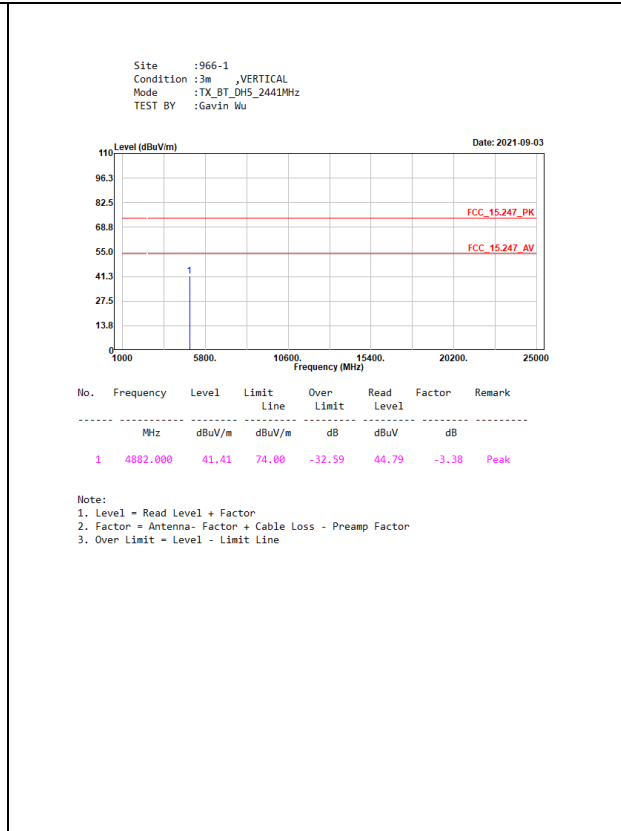
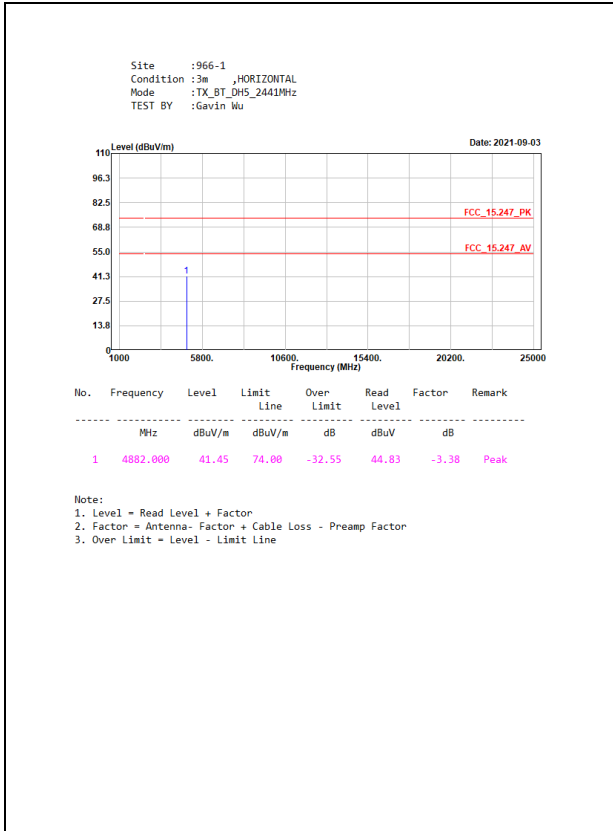
The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

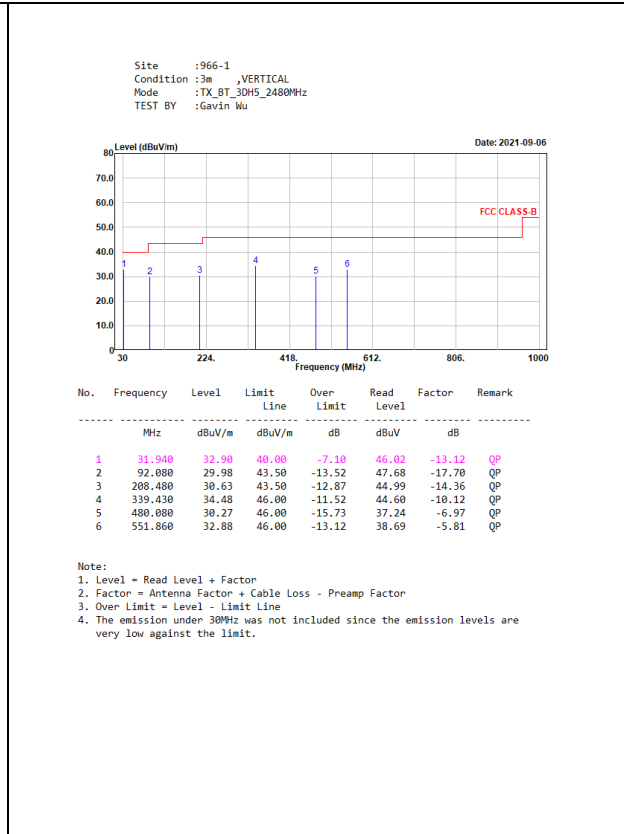
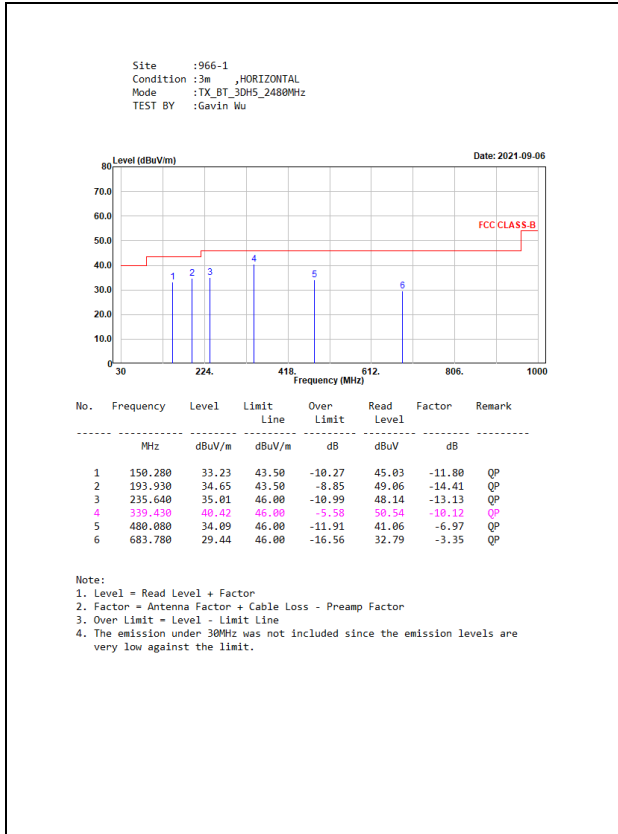
The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

4.4. Test Result of Radiated Emission



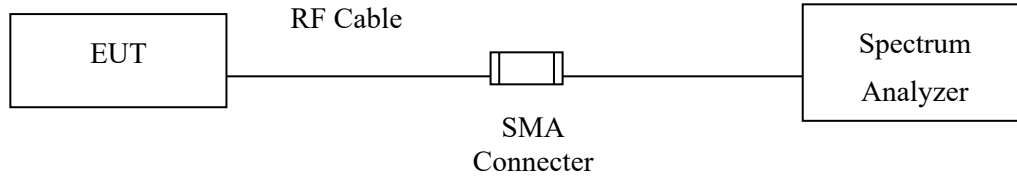






5. RF Antenna Conducted Test

5.1. Test Setup



5.2. Limits

According to FCC Section 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.3. Test Procedure

Tested according to FHSS test procedure of KDB558074 section 9 b) for compliance to FCC 47CFR 15.247 requirements.

5.4. Test Result of RF Antenna Conducted Test

Product : Speech Generating Device
 Test Item : RF Antenna Conducted Test
 Test Mode : Mode 1: Transmit - 1Mbps
 Test Date : 2021/08/18

Figure Channel 00:

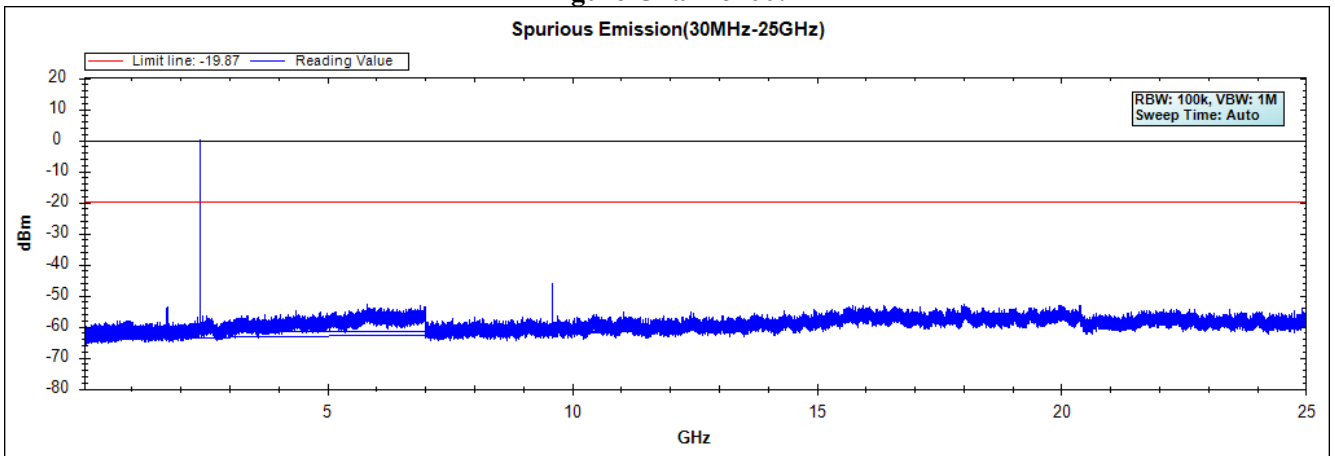


Figure Channel 39:

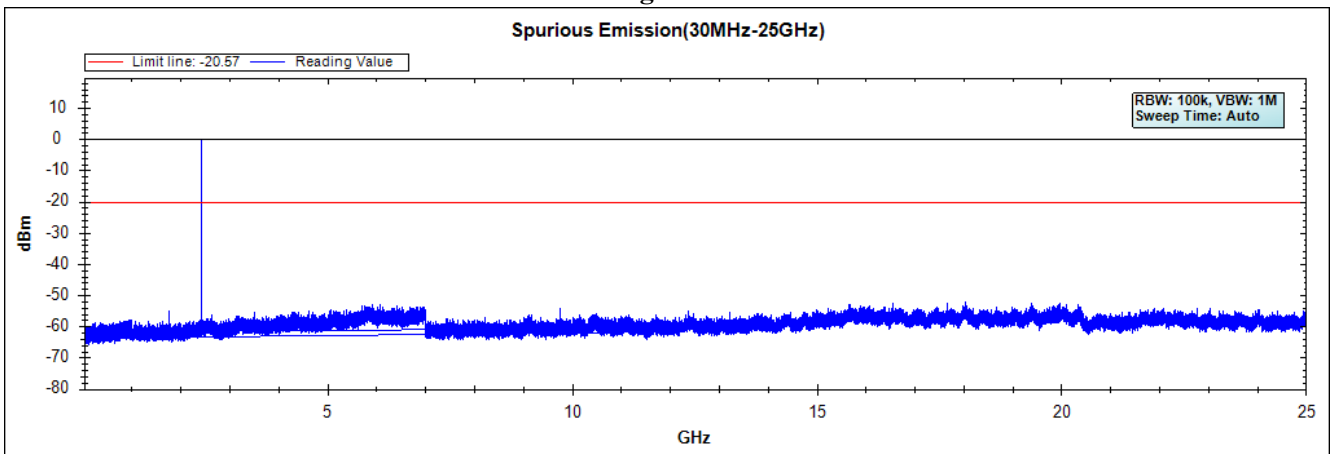
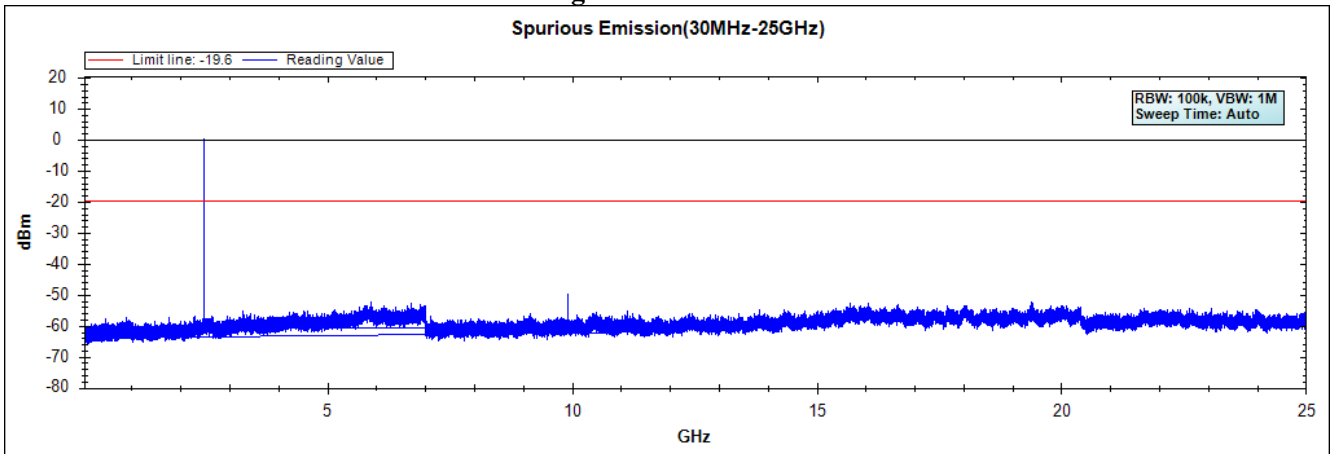


Figure Channel 78:



Note: The above test pattern is synthesized by multiple of the frequency range.

Product : Speech Generating Device
Test Item : RF Antenna Conducted Test
Test Mode : Mode 2: Transmit - 3Mbps
Test Date : 2021/08/18

Figure Channel 00:

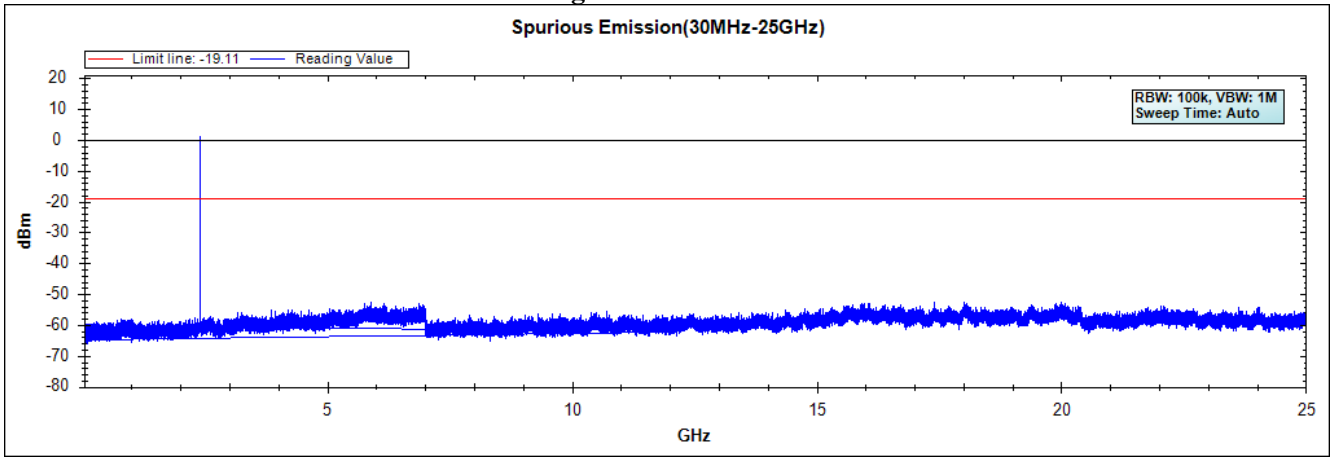


Figure Channel 39:

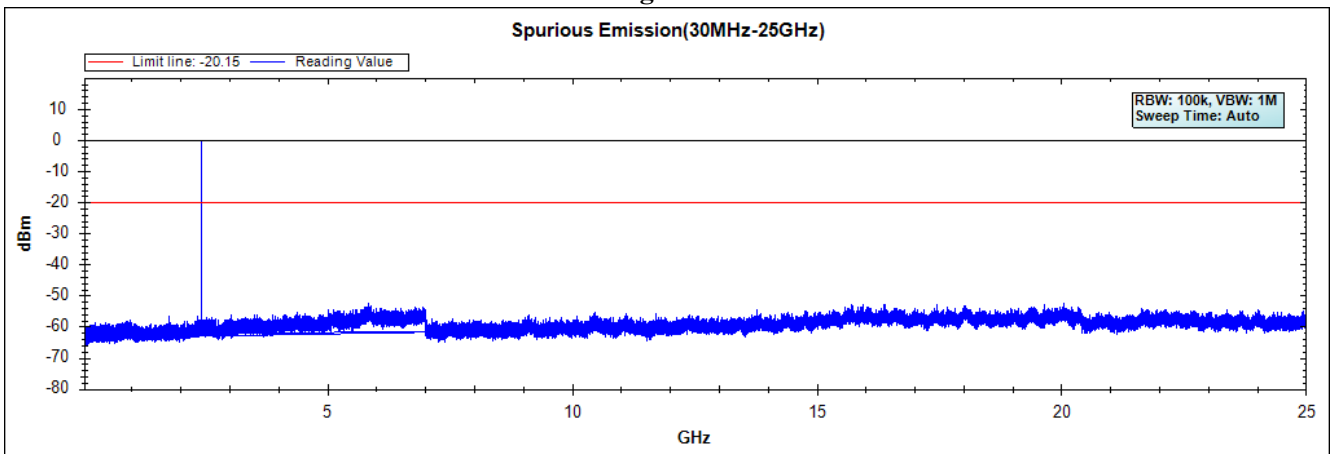
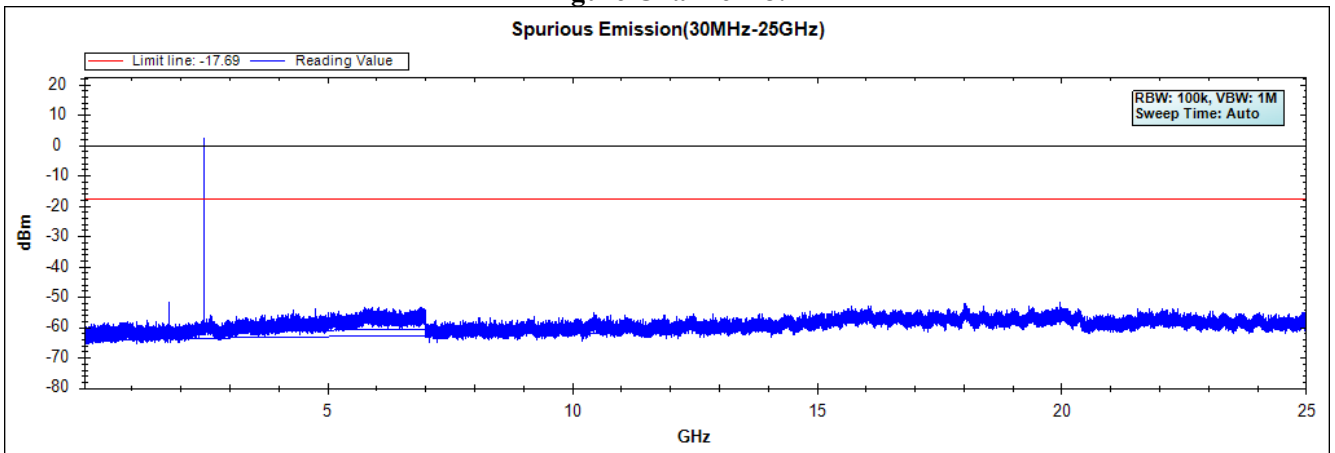


Figure Channel 78:

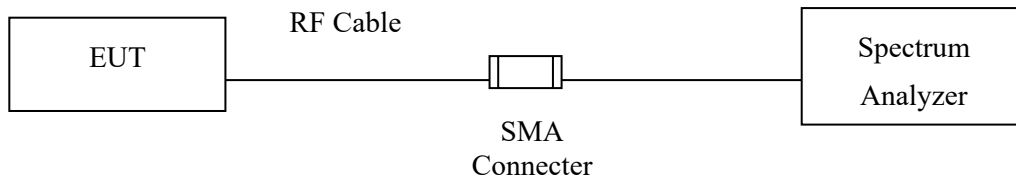


Note: The above test pattern is synthesized by multiple of the frequency range.

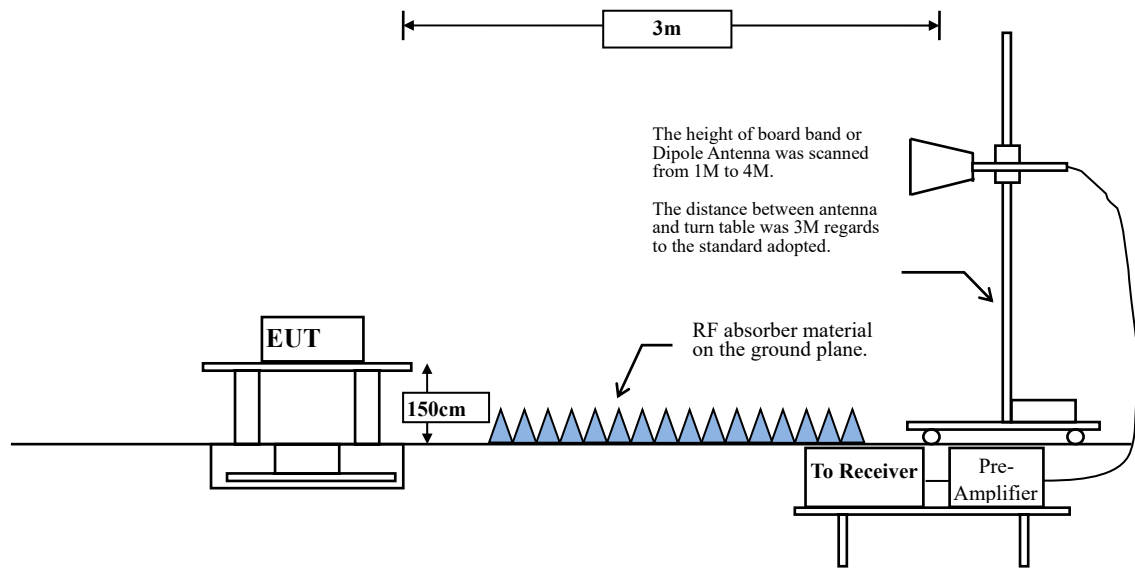
6. Band Edge

6.1. Test Setup

RF Conducted Measurement



RF Radiated Measurement:



6.2. Limit

According to FCC Section 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.3. Test Procedure

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

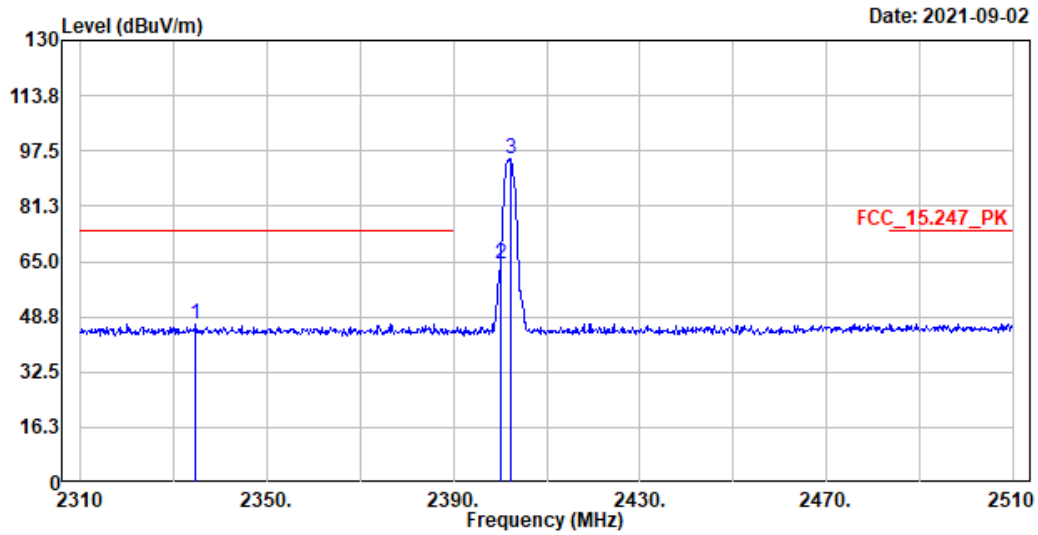
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The bandwidth setting below 1GHz and above 1GHz on the field strength meter is 120 kHz and 1MHz, respectively.

6.4. Test Result of Band Edge

Site :966-1
 Condition :3m ,Horizontal
 Mode :TX_BT_DH5_2402MHz
 TEST BY :Carlos Chen



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2334.800	46.70	74.00	-27.30	36.35	10.35	Peak
2	2400.000	64.36	-----	-----	54.02	10.34	Peak
3	2402.200	94.94	-----	-----	84.59	10.35	Peak

Note:

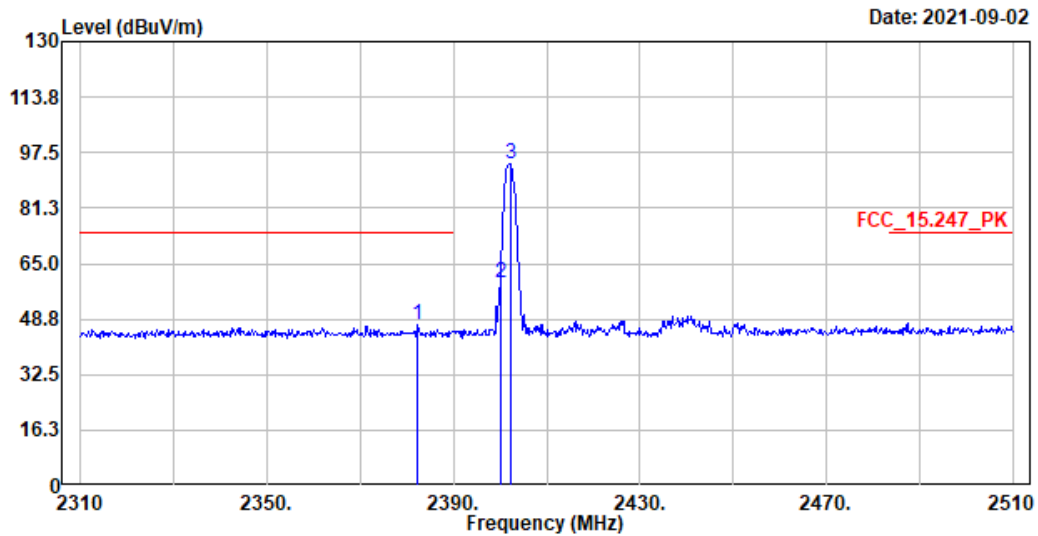
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
00 (Average)	2334.8	46.7	-21.240	25.460	-28.540	54.000	Pass
00 (Average)	2400	64.36	-21.240	43.120	--	--	Pass
00 (Average)	2402.2	94.94	-21.240	73.700	--	--	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Site :966-1
 Condition :3m ,Vertical
 Mode :TX_BT_DH5_2402MHz
 TEST BY :Carlos Chen



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2382.400	46.93	74.00	-27.07	36.56	10.37	Peak
2	2400.000	59.35	-----	-----	49.01	10.34	Peak
3	2402.200	93.99	-----	-----	83.64	10.35	Peak

Note:

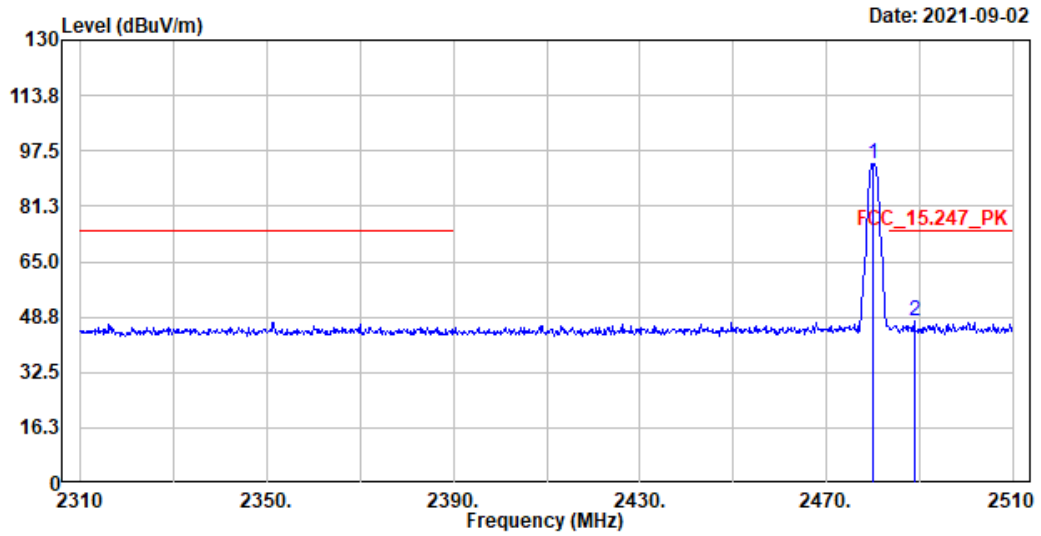
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
00 (Average)	2382.4	46.93	-21.240	25.690	-28.310	54.000	Pass
00 (Average)	2400	59.35	-21.240	38.110	--	--	Pass
00 (Average)	2402.2	93.99	-21.240	72.750	--	--	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Site :966-1
 Condition :3m ,Horizontal
 Mode :TX_BT_DH5_2480MHz
 TEST BY :Carlos Chen



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2480.000	93.54	-----	-----	82.73	10.81	Peak
2	2488.800	47.40	74.00	-26.60	36.51	10.89	Peak

Note:

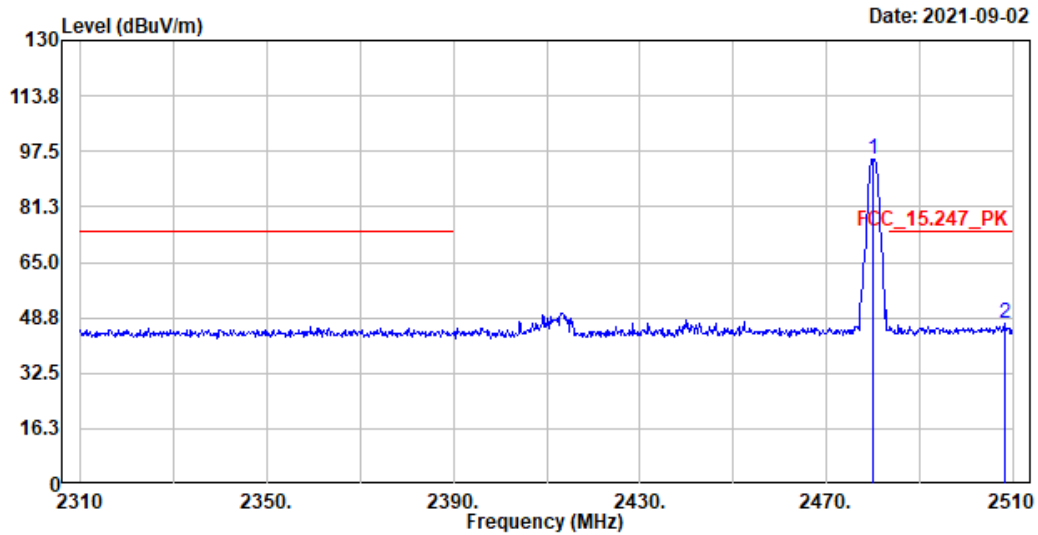
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
78 (Average)	2480	93.54	-21.240	72.300	--	--	Pass
78 (Average)	2488.8	47.4	-21.240	26.160	-27.840	54.000	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Site :966-1
 Condition :3m ,Vertical
 Mode :TX_BT_DH5_2480MHz
 TEST BY :Carlos Chen



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2480.000	94.99	-----	-----	84.18	10.81	Peak
2	2508.200	46.86	74.00	-27.14	35.88	10.98	Peak

Note:

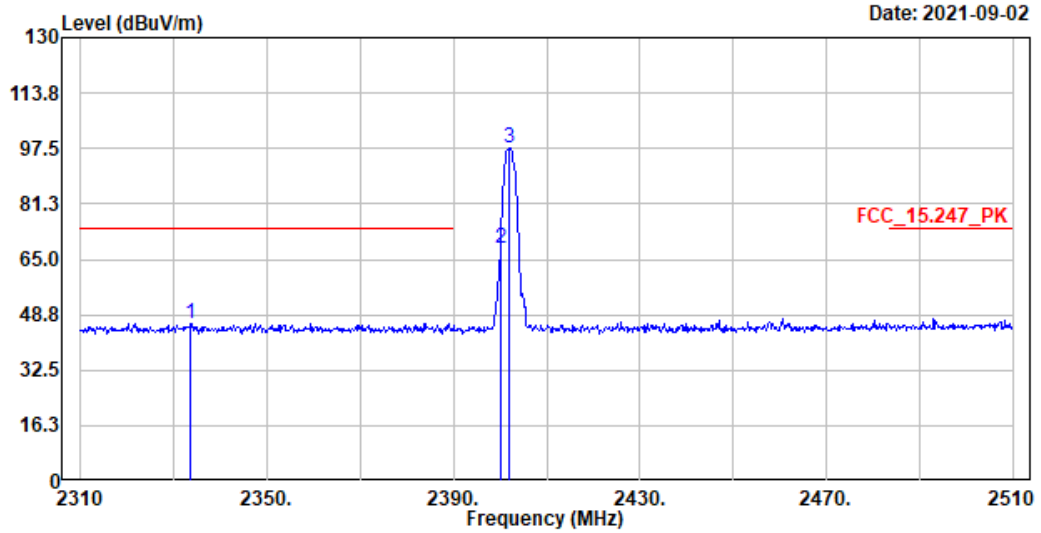
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
78 (Average)	2480	94.99	-21.240	73.750	--	--	Pass
78 (Average)	2508.2	46.86	-21.240	25.620	-28.380	54.000	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Site :966-1
 Condition :3m ,Horizontal
 Mode :TX_BT_3DH5_2402MHz
 TEST BY :Carlos Chen



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2333.600	46.15	74.00	-27.85	35.80	10.35	Peak
2	2400.000	68.27	-----	-----	57.93	10.34	Peak
3	2402.000	97.84	-----	-----	87.49	10.35	Peak

Note:

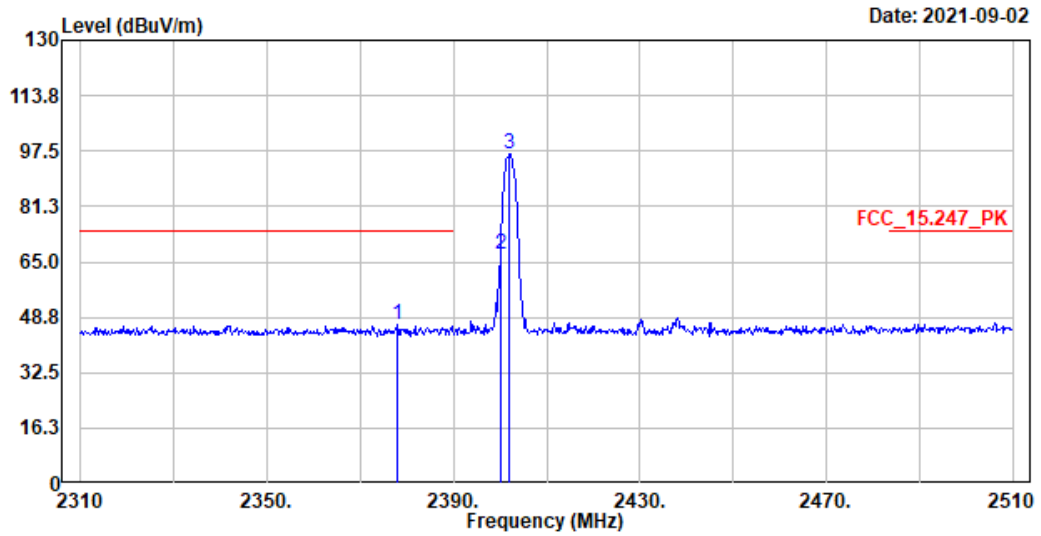
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
00 (Average)	2333.6	46.15	-24.761	21.389	-32.611	54.000	Pass
00 (Average)	2400	68.27	-24.761	43.509	--	--	Pass
00 (Average)	2402	97.84	-24.761	73.079	--	--	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Site :966-1
 Condition :3m ,Vertical
 Mode :TX_BT_3DH5_2402MHz
 TEST BY :Carlos Chen



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2378.000	46.47	74.00	-27.53	36.11	10.36	Peak
2	2400.000	67.24	-----	-----	56.90	10.34	Peak
3	2402.000	96.63	-----	-----	86.28	10.35	Peak

Note:

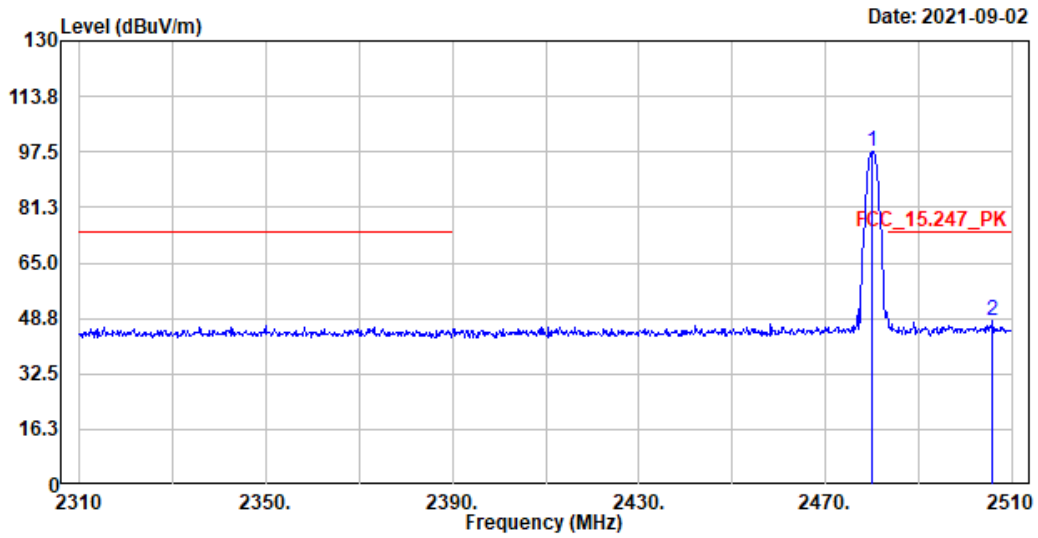
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
00 (Average)	2378	46.47	-24.761	21.709	-32.291	54.000	Pass
00 (Average)	2400	67.24	-24.761	42.479	--	--	Pass
00 (Average)	2402	96.63	-24.761	71.869	--	--	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Site :966-1
 Condition :3m ,Horizontal
 Mode :TX_BT_3DH5_2480MHz
 TEST BY :Carlos Chen



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2480.000	97.60	-----	-----	86.79	10.81	Peak
2	2505.800	48.06	74.00	-25.94	37.08	10.98	Peak

Note:

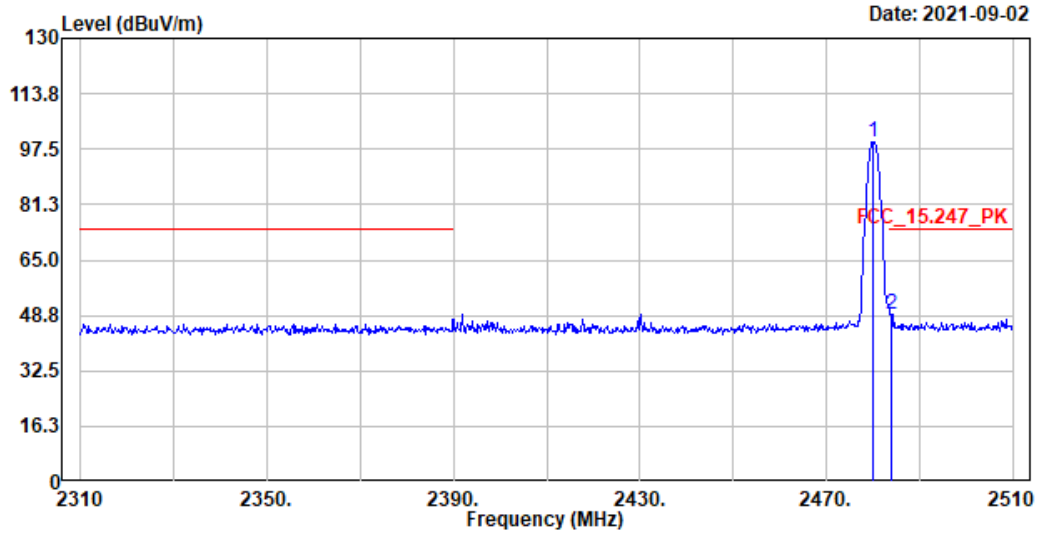
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
78 (Average)	2480	97.6	-24.761	72.839	--	--	Pass
78 (Average)	2505.8	48.06	-24.761	23.299	-30.701	54.000	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Site :966-1
 Condition :3m ,Vertical
 Mode :TX_BT_3DH5_2480MHz
 TEST BY :Carlos Chen



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2480.000	99.77	-----	-----	88.96	10.81	Peak
2	2484.000	49.07	74.00	-24.93	38.23	10.84	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
78 (Average)	2480	99.77	-24.761	75.009	--	--	Pass
78 (Average)	2484	49.07	-24.761	24.309	-29.691	54.000	Pass

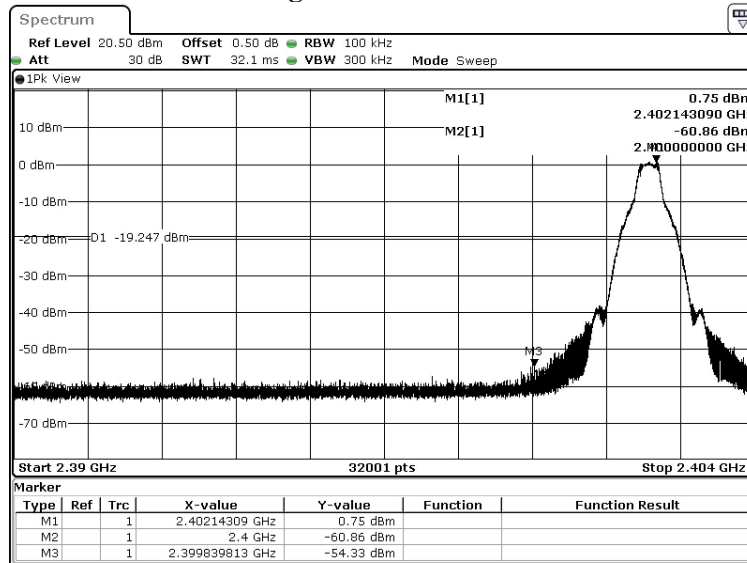
Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product : Speech Generating Device
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit - 1Mbps(Hopping off)
 Test Date : 2021/08/17

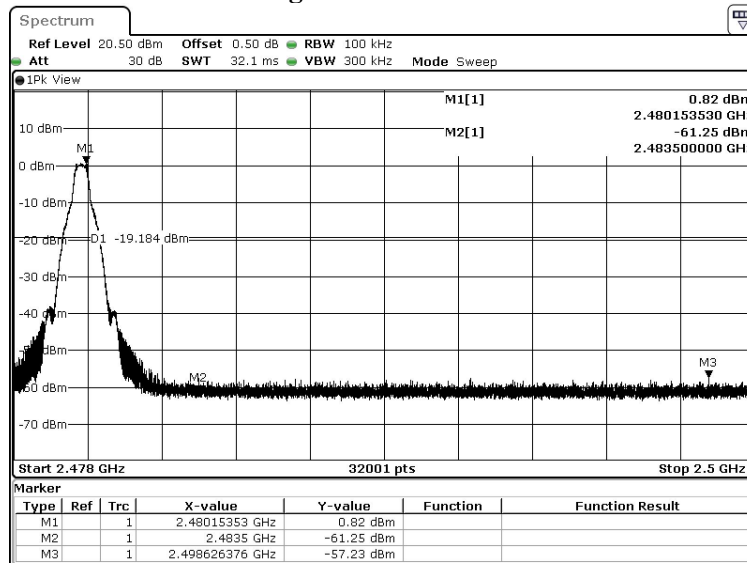
Measurement Level	Result
Δ (dB)	
> 20	PASS

Figure Channel 00:



Date: 17.AUG.2021 23:28:59

Figure Channel 78:

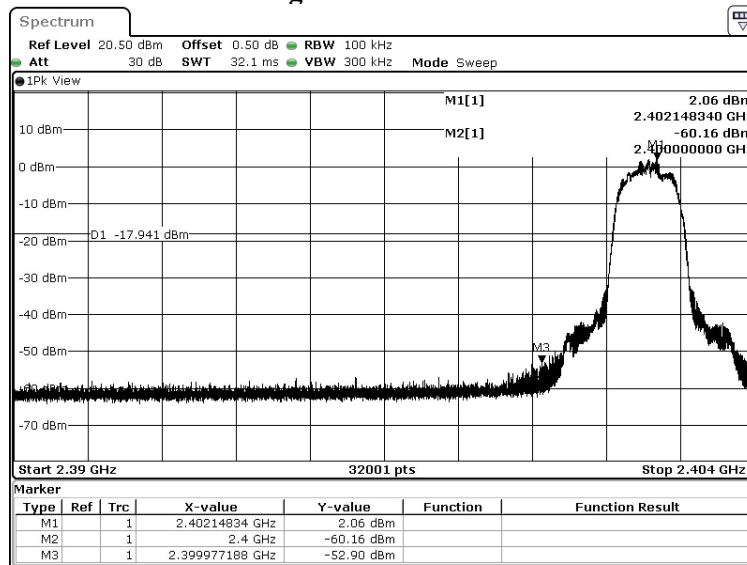


Date: 17.AUG.2021 23:52:45

Product : Speech Generating Device
 Test Item : Band Edge
 Test Mode : Mode 2: Transmit - 3Mbps (Hopping off)
 Test Date : 2021/08/18

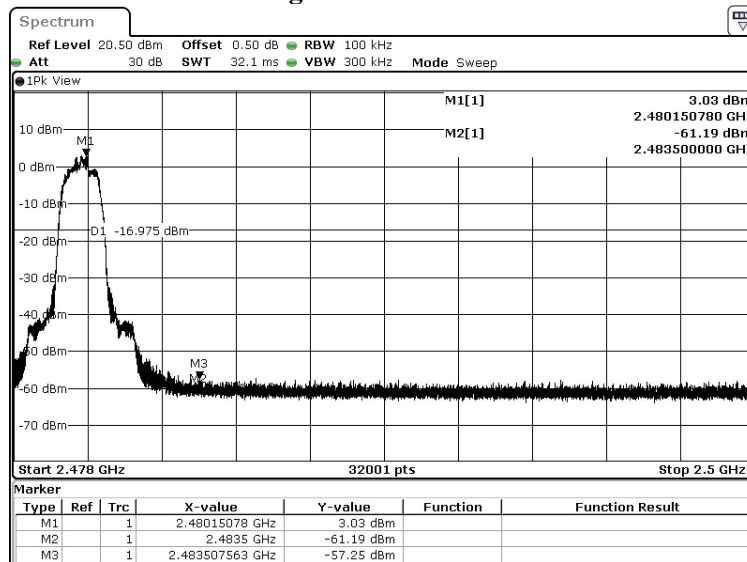
Measurement Level	Result
Δ (dB)	
> 20	PASS

Figure Channel 00:



Date: 18.AUG.2021 02:07:09

Figure Channel 78:

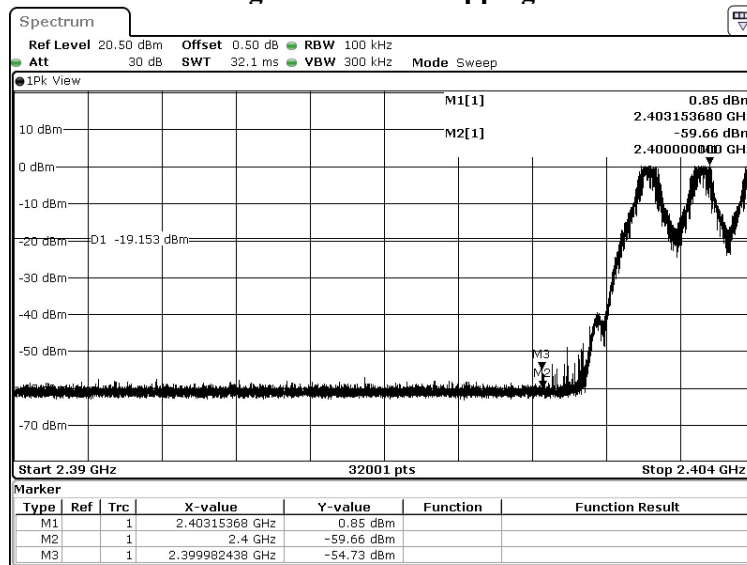


Date: 18.AUG.2021 02:57:57

Product : Speech Generating Device
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit - 1Mbps(Hopping on)
 Test Date : 2021/08/17

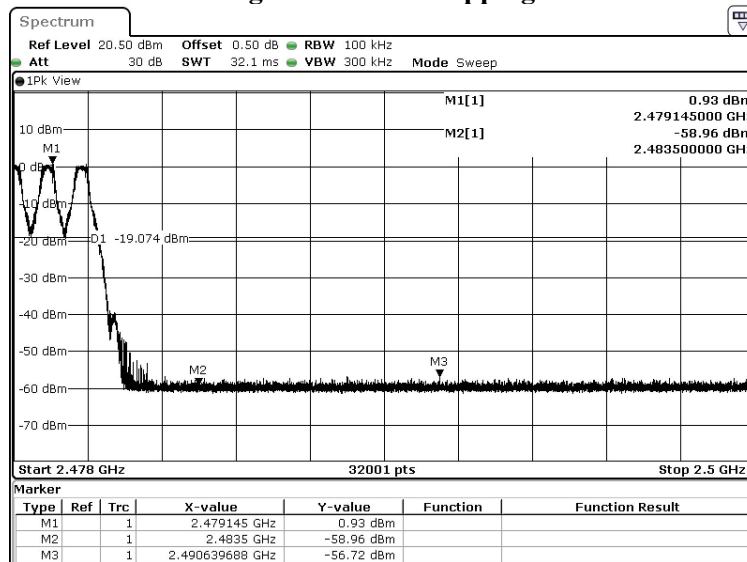
Measurement Level	Result
Δ (dB)	
> 20	PASS

Figure Channel Hopping:



Date: 17.AUG.2021 23:32:31

Figure Channel Hopping:

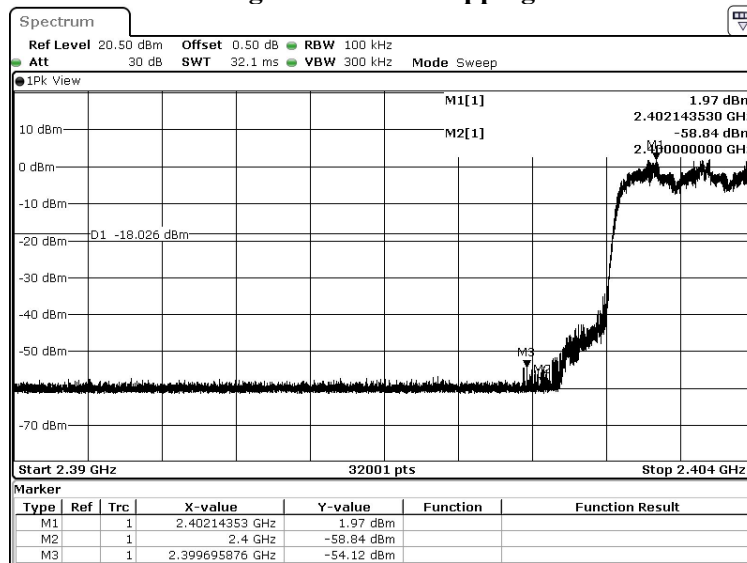


Date: 17.AUG.2021 23:57:15

Product : Speech Generating Device
 Test Item : Band Edge
 Test Mode : Mode 2: Transmit - 3Mbps (Hopping on)
 Test Date : 2021/08/18

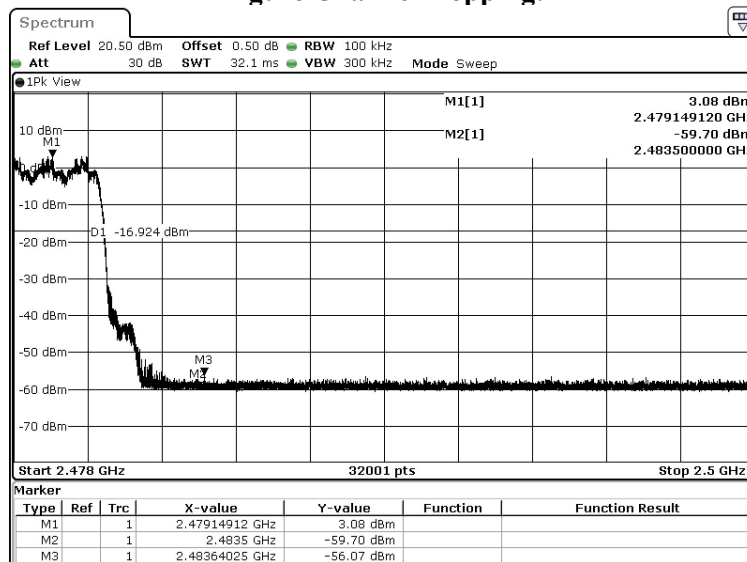
Measurement Level	Result
Δ (dB)	
> 20	PASS

Figure Channel Hopping:



Date: 18.AUG.2021 02:29:49

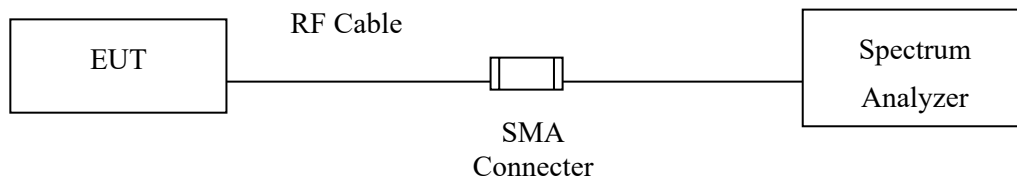
Figure Channel Hopping:



Date: 18.AUG.2021 03:07:54

7. Channel Number

7.1. Test Setup



7.2. Limit

Frequency hopping systems operating in the 2400-2483.5 MHz bands shall use at least 75 hopping frequencies.

7.3. Test Procedure

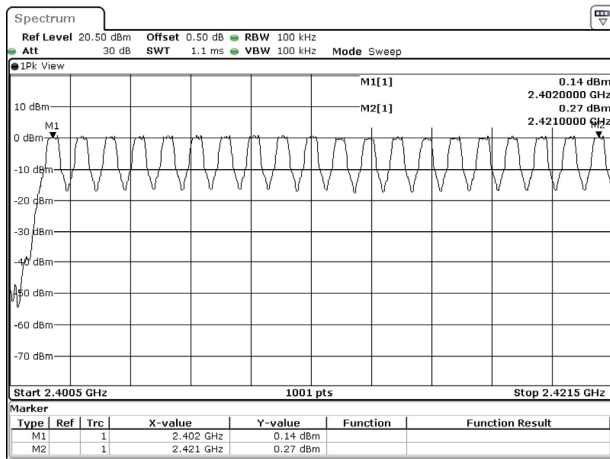
Tested according to FHSS test procedure of KDB558074 section 9 (b for compliance to FCC 47CFR 15.247 requirements.

7.4. Test Result of Channel Number

Product : Speech Generating Device
 Test Item : Channel Number
 Test Mode : Mode 1: Transmit - 1Mbps
 Test Date : 2021/08/18

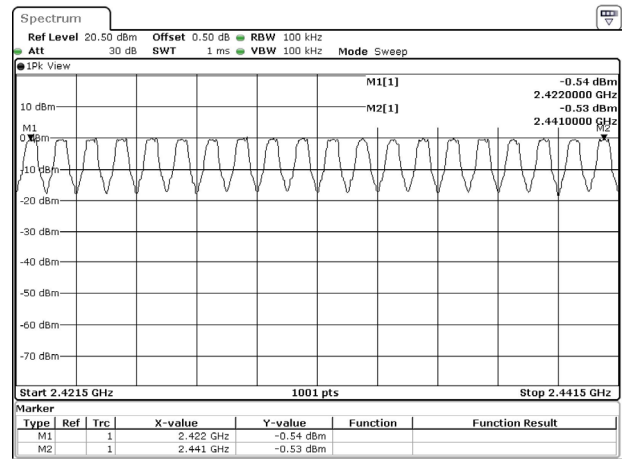
Frequency Range (MHz)	Measurement (Hopping Channel)	Required Limit (Hopping Channel)	Result
2402 ~ 2480	79	>75	Pass

2402-2421MHz



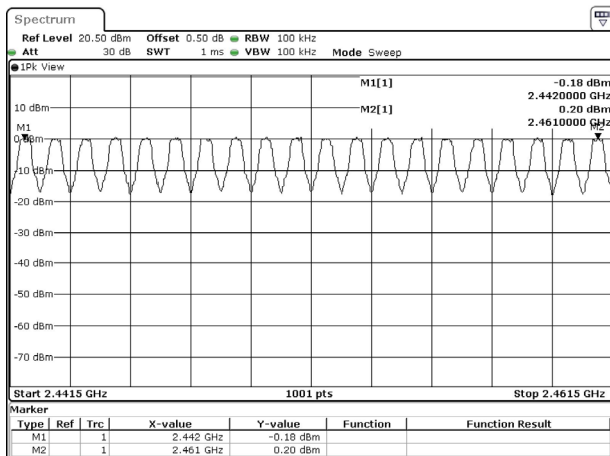
Date: 18.AUG.2021 00:00:56

2422-2441MHz



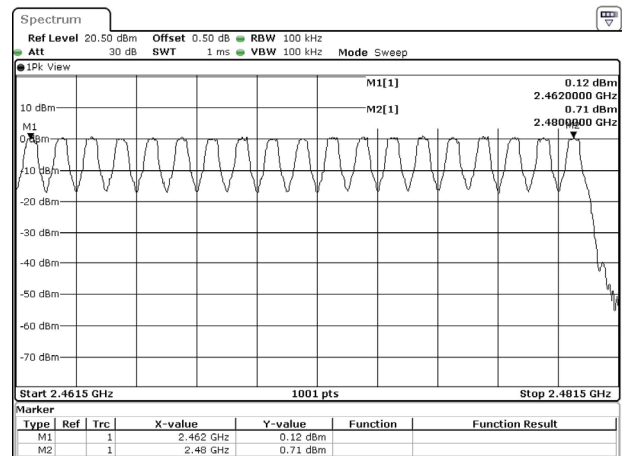
Date: 18.AUG.2021 00:03:53

2442-2461MHz



Date: 18.AUG.2021 00:05:45

2462-2480MHz

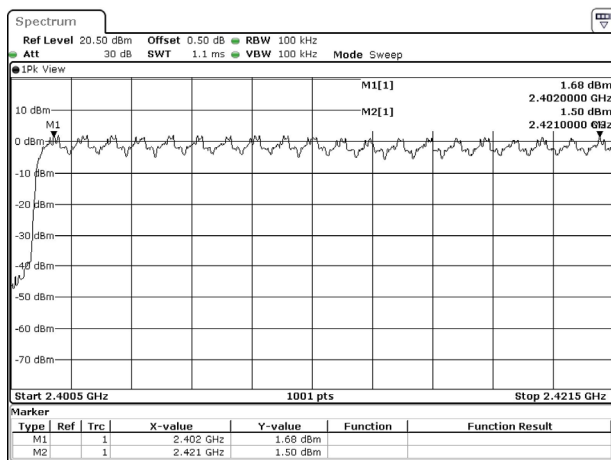


Date: 18.AUG.2021 00:08:03

Product : Speech Generating Device
 Test Item : Channel Number
 Test Mode : Mode 2: Transmit - 3Mbps
 Test Date : 2021/08/18

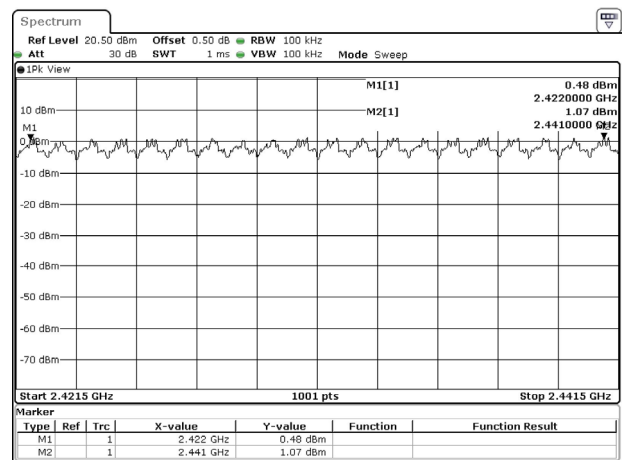
Frequency Range (MHz)	Measurement (Hopping Channel)	Required Limit (Hopping Channel)	Result
2402 ~ 2480	79	>75	Pass

2402-2421MHz



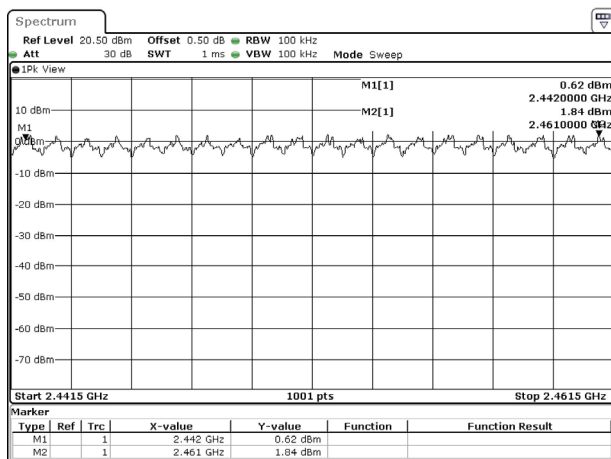
Date: 18.AUG.2021 03:13:20

2422-2441MHz



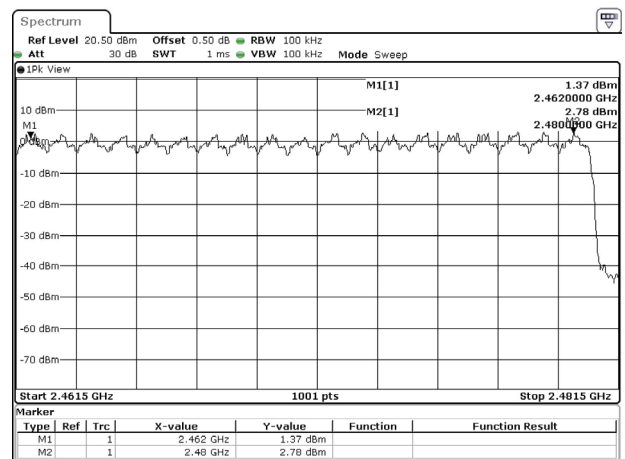
Date: 18.AUG.2021 03:18:32

2442-2461MHz



Date: 18.AUG.2021 03:21:59

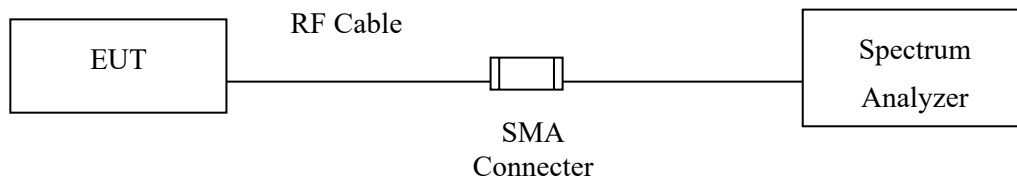
2462-2480MHz



Date: 18.AUG.2021 03:26:41

8. Channel Separation

8.1. Test Setup



8.2. Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

8.3. Test Procedure

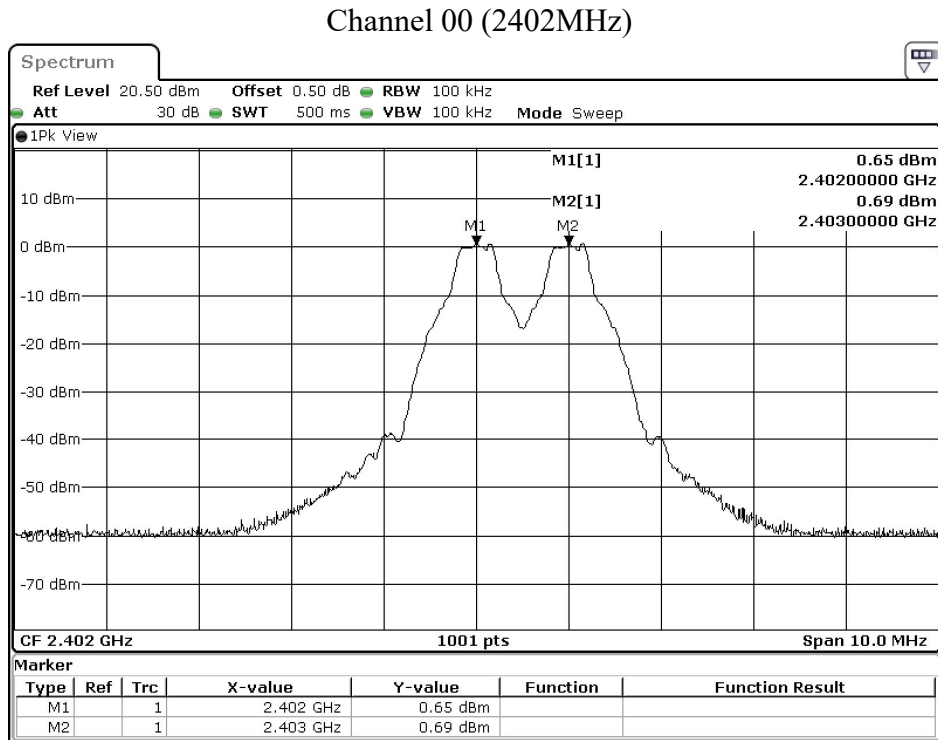
Tested according to FHSS test procedure of KDB558074 section 9 (b for compliance to FCC 47CFR 15.247 requirements).

8.4. Test Result of Channel Separation

Product : Speech Generating Device
 Test Item : Channel Separation
 Test Mode : Mode 1: Transmit - 1Mbps
 Test Date : 2021/08/19

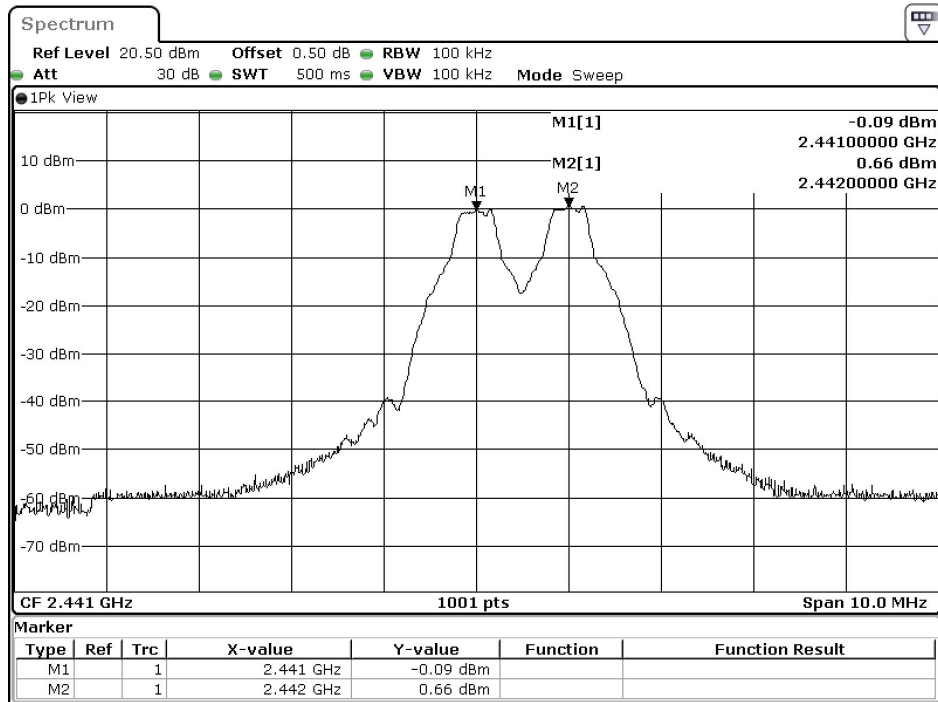
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
00	2402	1000	>25 kHz	630.0	Pass
39	2441	1000	>25 kHz	630.0	Pass
78	2480	1000	>25 kHz	628.0	Pass

NOTE: The 20dB Bandwidth is refer to section 10.



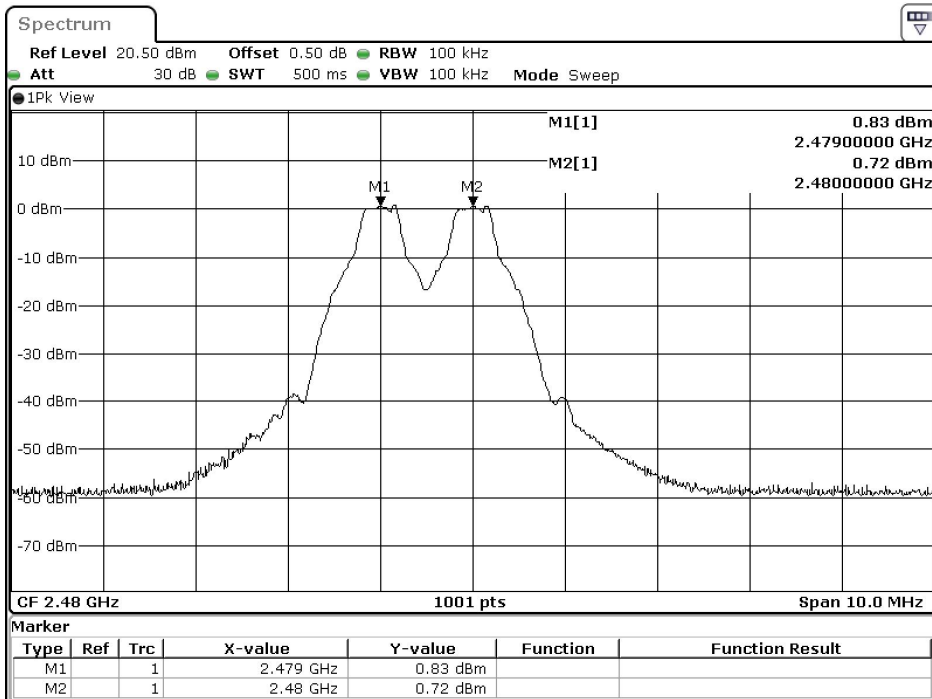
Date: 17.AUG.2021 23:28:03

Channel 39 (2441MHz)



Date: 17.AUG.2021 23:41:14

Channel 78 (2480MHz)



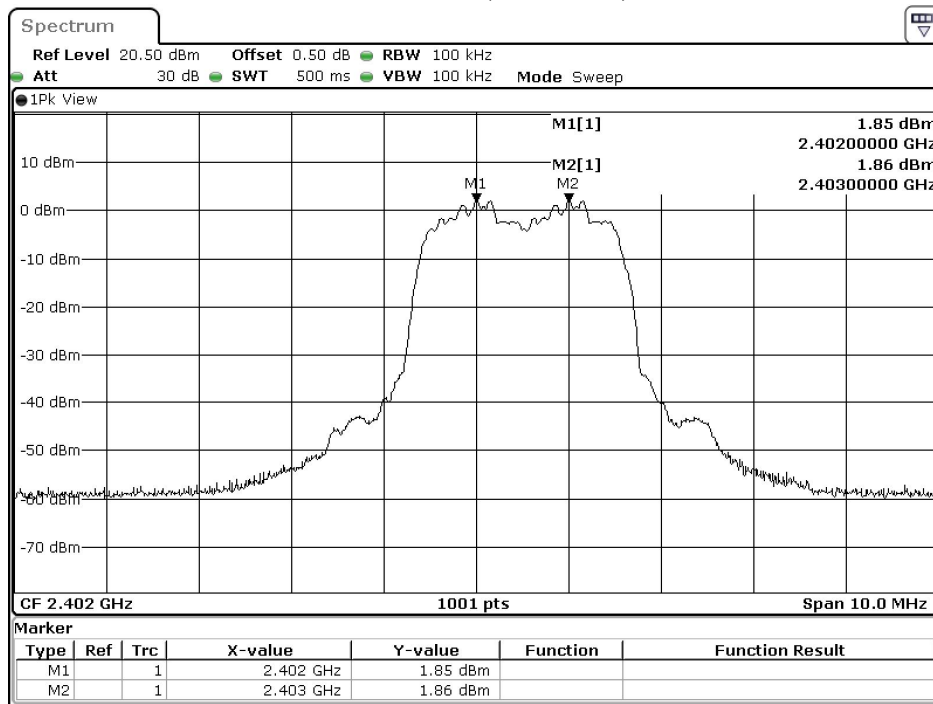
Date: 17.AUG.2021 23:51:55

Product : Speech Generating Device
 Test Item : Channel Separation
 Test Mode : Mode 2: Transmit - 3Mbps
 Test Date : 2021/08/19

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
00	2402	1000	>25 kHz	860.0	Pass
39	2441	1000	>25 kHz	858.0	Pass
78	2480	1000	>25 kHz	860.0	Pass

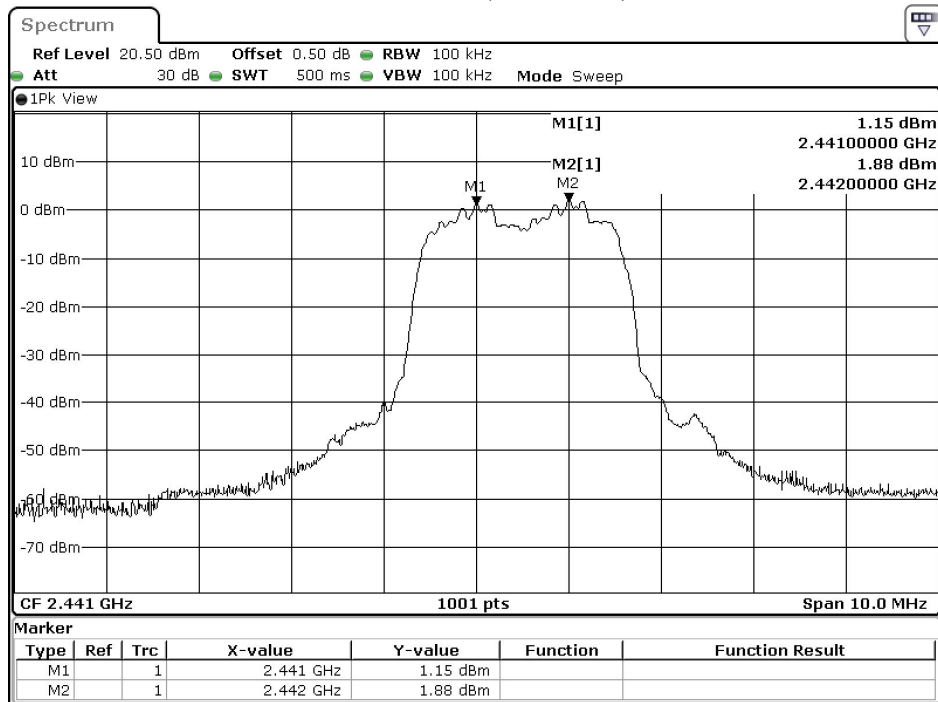
NOTE: The 20dB Bandwidth is refer to section 10.

Channel 00 (2402MHz)



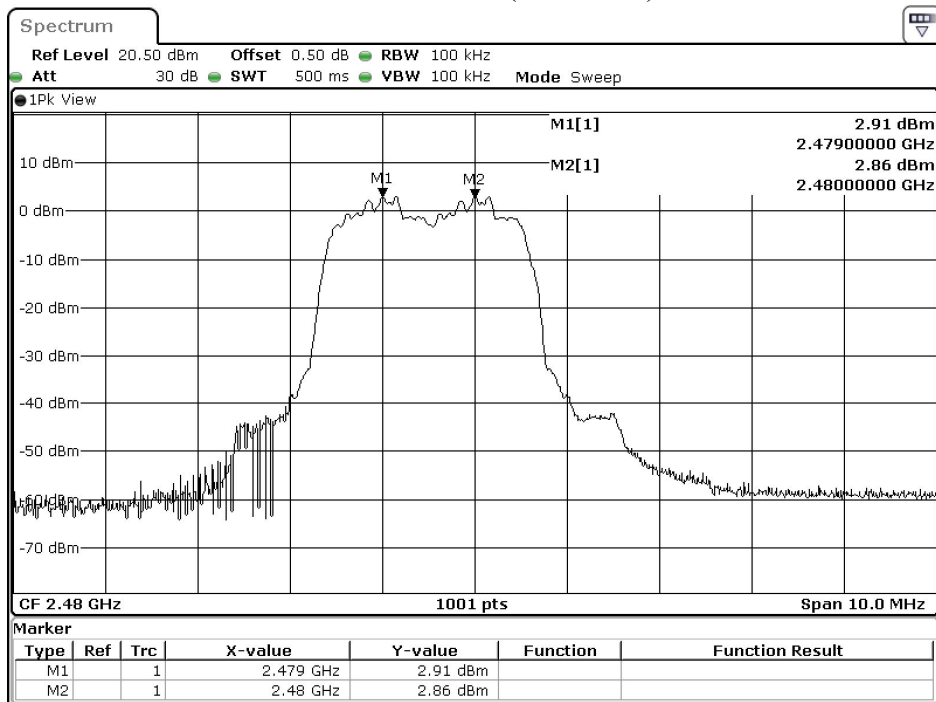
Date: 18.AUG.2021 02:06:18

Channel 39 (2441MHz)



Date: 18.AUG.2021 02:39:35

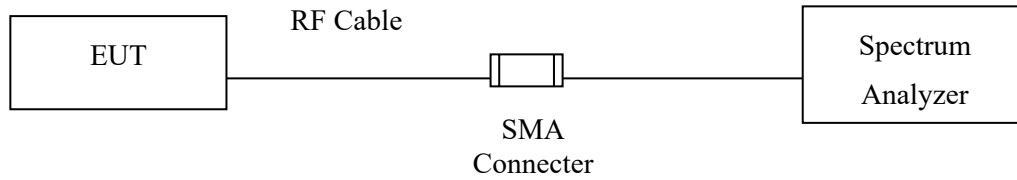
Channel 78 (2480MHz)



Date: 18.AUG.2021 02:56:07

9. Dwell Time

9.1. Test Setup



9.2. Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

9.3. Test Procedure

Tested according to FHSS test procedure of KDB558074 section 9 (b for compliance to FCC 47CFR 15.247 requirements.

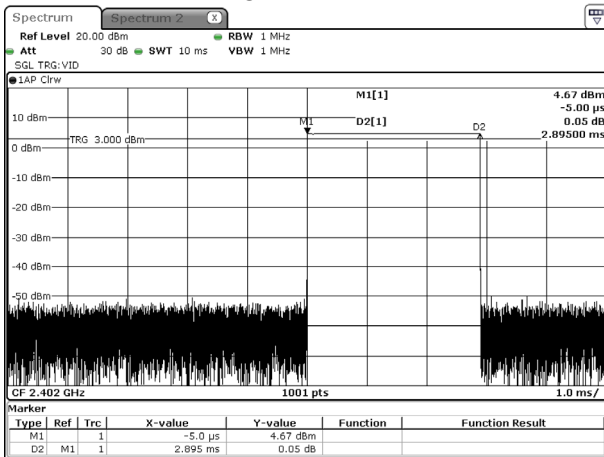
9.4. Test Result of Dwell Time

Product : Speech Generating Device
 Test Item : Dwell Time
 Test Mode : Mode 1: Transmit - 1Mbps (Channel 00,39,78)
 Test Date : 2021/08/19

Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Dwell Time (ms)	Limit (ms)	Result
2402	2.895	108	31600	312.660	400	Pass
2441	2.895	105	31600	303.975	400	Pass
2480	2.895	103	31600	298.185	400	Pass

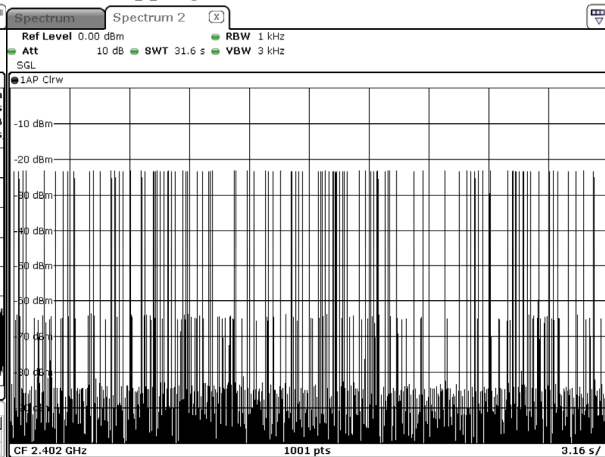
Dwell time = Time slot length(ms)*Hopping of Number

CH 00 Time slot length



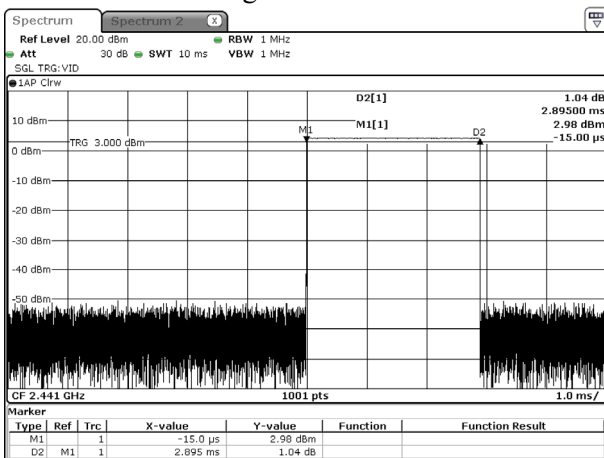
Date: 18.AUG.2021 08:27:10

CH 00 Hopping of Number



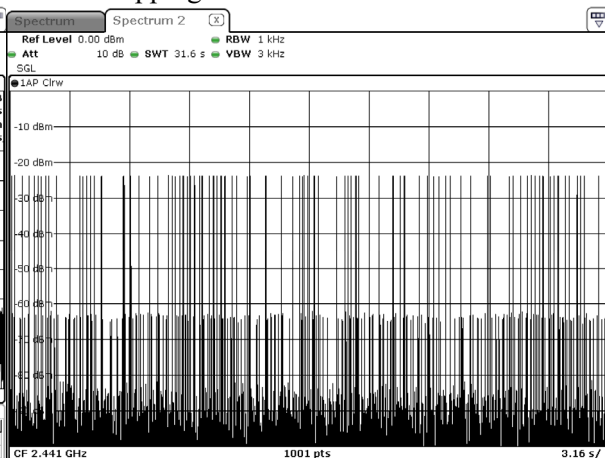
Date: 18.AUG.2021 08:29:07

CH 39 Time slot length



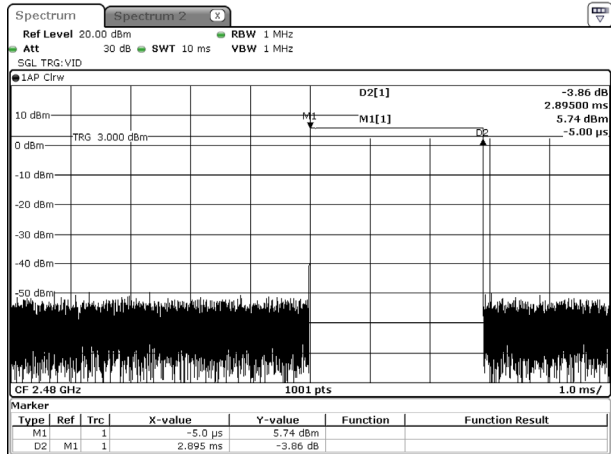
Date: 18.AUG.2021 08:29:47

CH 39 Hopping of Number



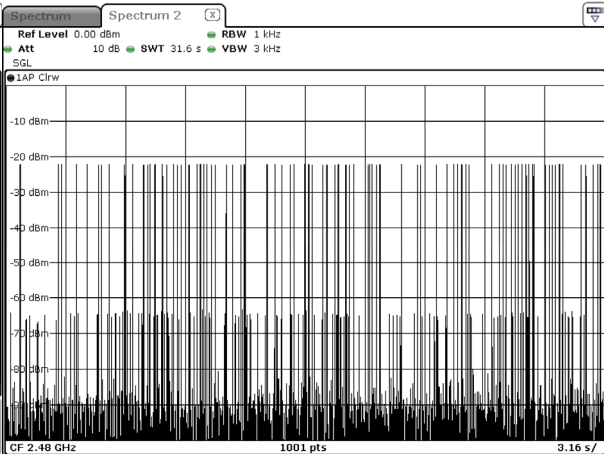
Date: 18.AUG.2021 08:32:00

CH 78 Time slot length



Date: 18.AUG.2021 08:32:49

CH 78 Hopping of Number



Date: 18.AUG.2021 08:34:33

Note:

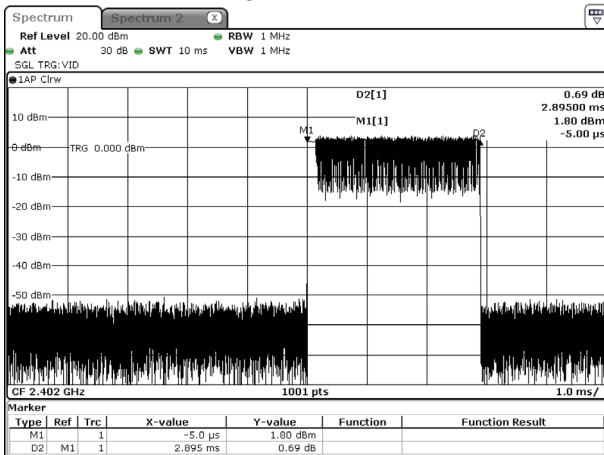
The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.

Product : Speech Generating Device
 Test Item : Dwell Time
 Test Mode : Mode 2: Transmit - 3Mbps (Channel 00,39,78)
 Test Date : 2021/08/19

Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Dwell Time (ms)	Limit (ms)	Result
2402	2.895	107	31600	309.765	400	Pass
2441	2.895	102	31600	295.290	400	Pass
2480	2.895	101	31600	292.395	400	Pass

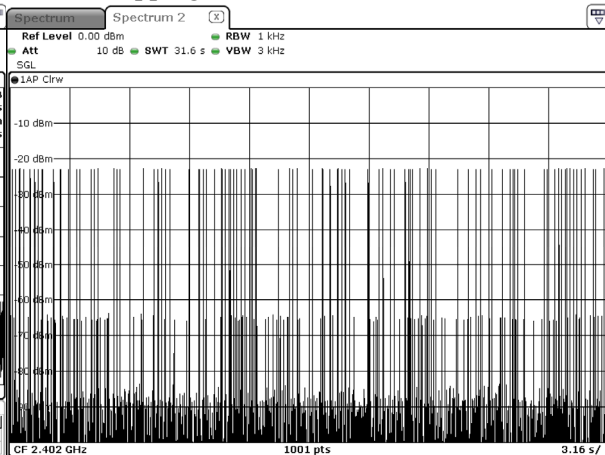
Dwell time = Time slot length(ms)*Hopping of Number

CH 00 Time slot length



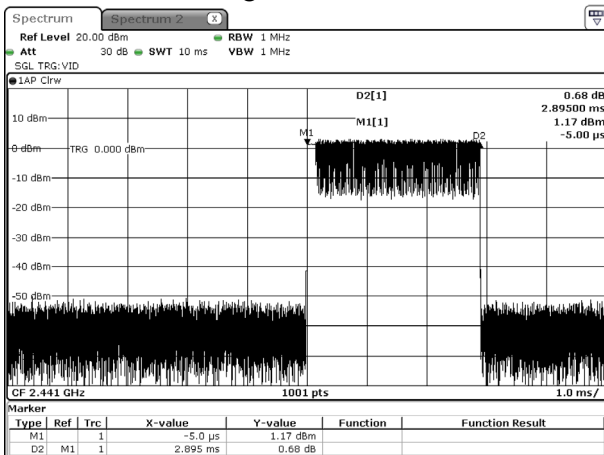
Date: 18.AUG.2021 08:39:04

CH 00 Hopping of Number



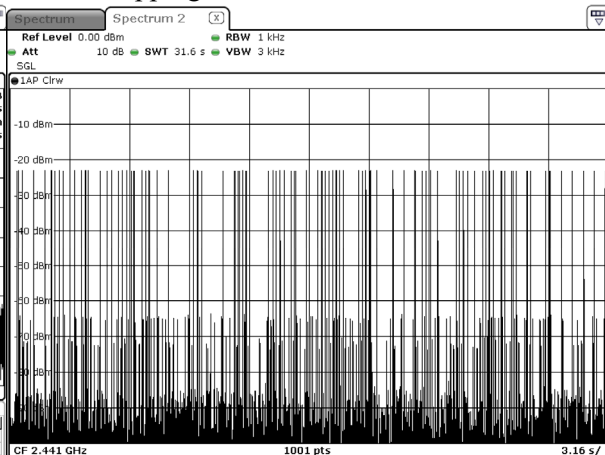
Date: 18.AUG.2021 08:40:10

CH 39 Time slot length



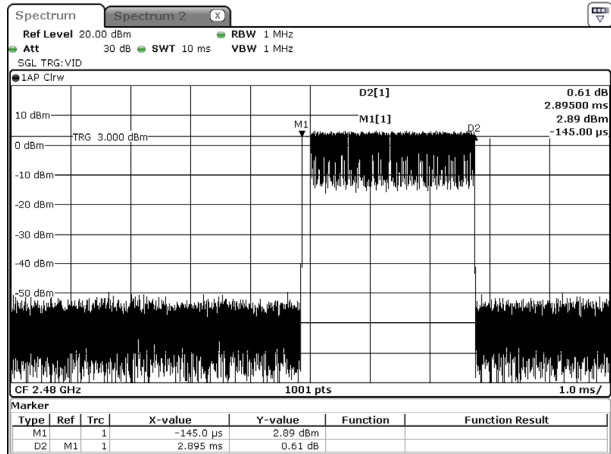
Date: 18.AUG.2021 08:37:43

CH 39 Hopping of Number



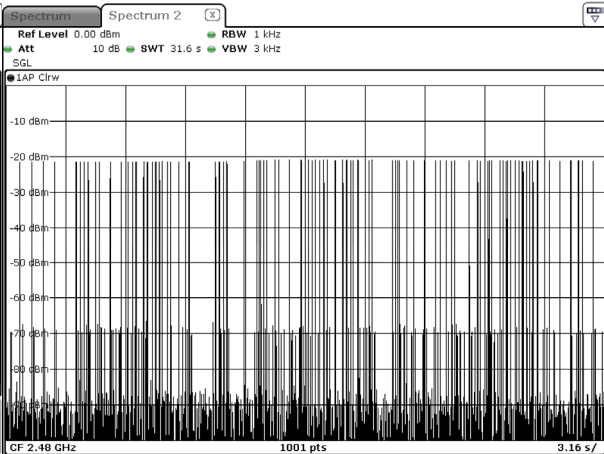
Date: 18.AUG.2021 08:38:30

CH 78 Time slot length



Date: 18.AUG.2021 08:35:42

CH 78 Hopping of Number



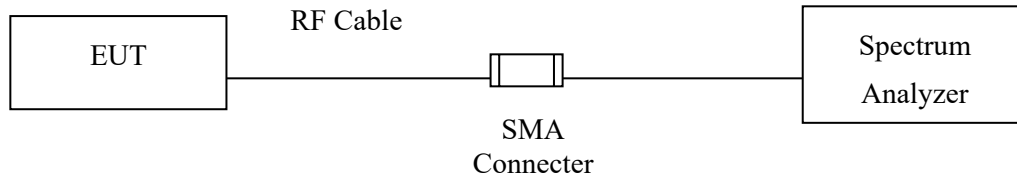
Date: 18.AUG.2021 08:36:35

Note:

The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.

10. Occupied Bandwidth

10.1. Test Setup



10.2. Limits

N/A

10.3. Test Procedure

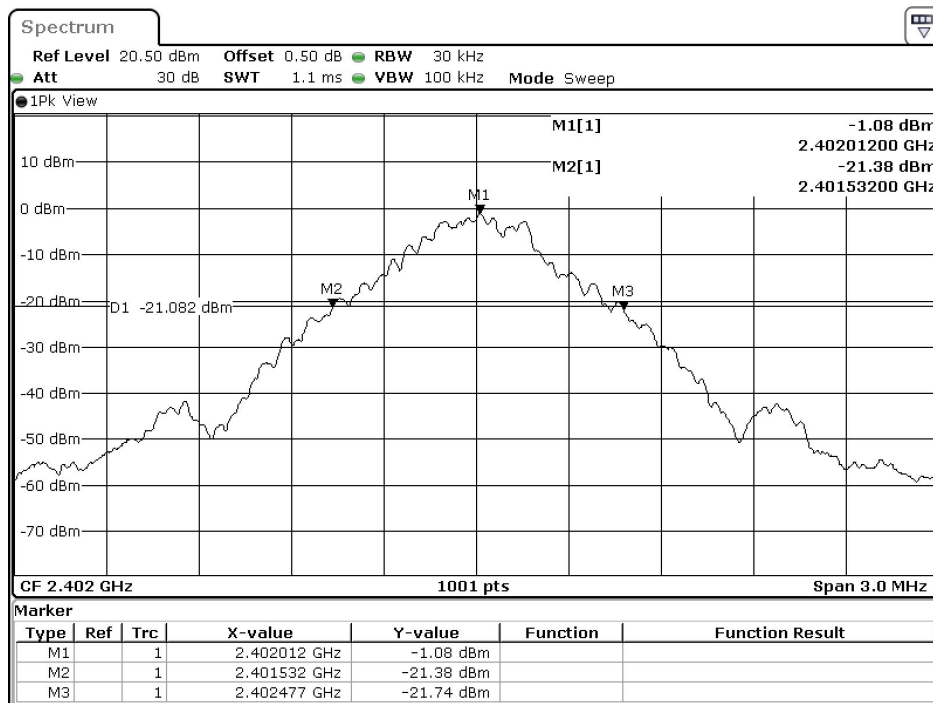
Tested according to FHSS test procedure of KDB558074 section 9 (b for compliance to FCC 47CFR 15.247 requirements.

10.4. Test Result of Occupied Bandwidth

Product : Speech Generating Device
 Test Item : Occupied Bandwidth Data
 Test Mode : Mode 1: Transmit - 1Mbps
 Test Date : 2021/08/19

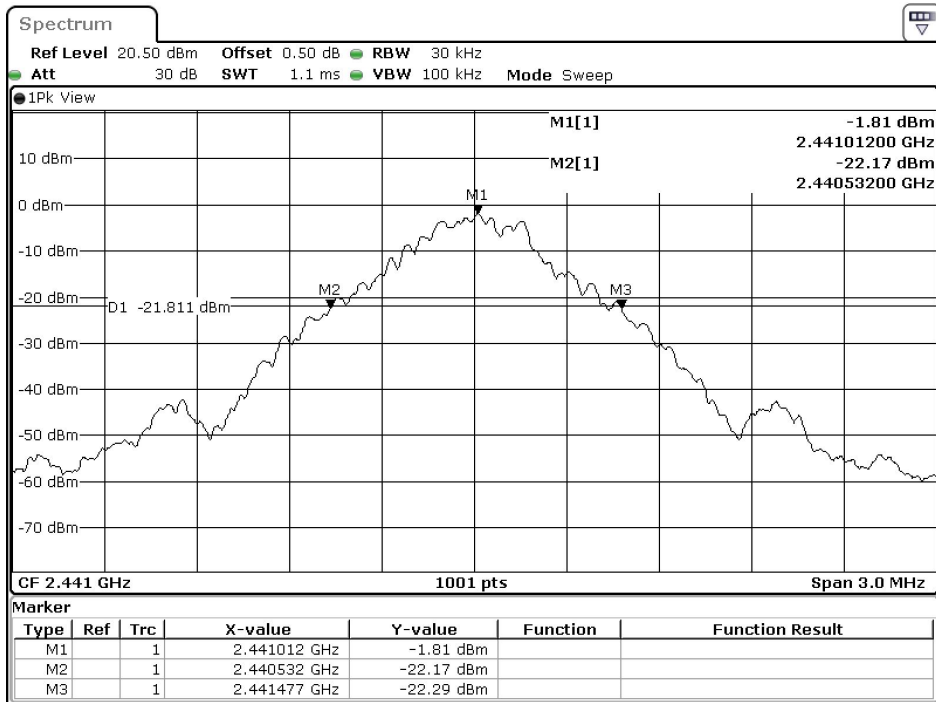
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	945	--	NA
39	2441	945	--	NA
78	2480	942	--	NA

Figure Channel 00:



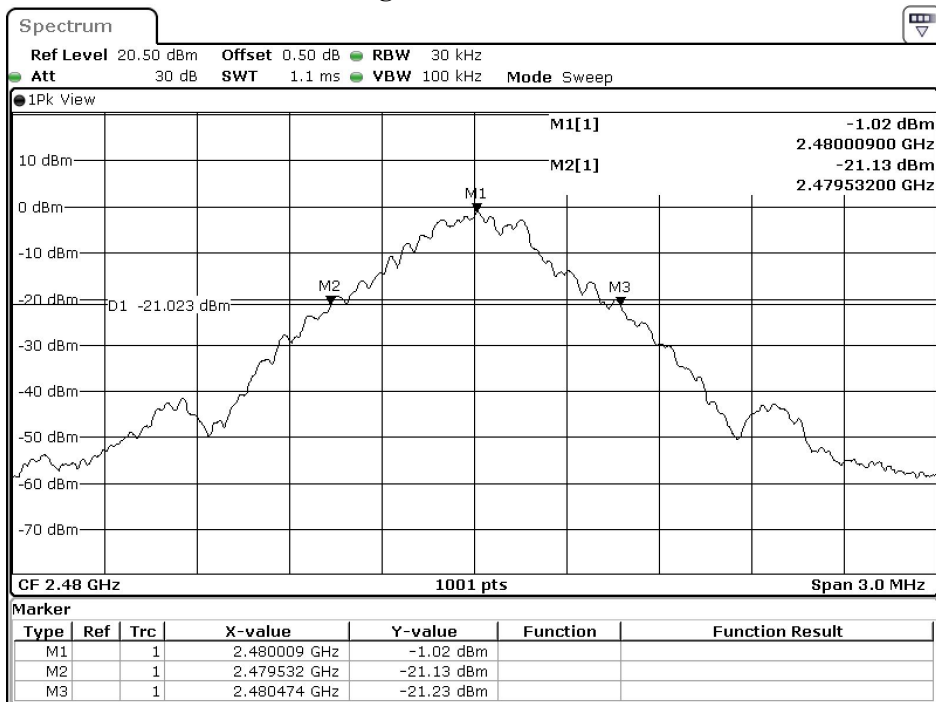
Date: 17.AUG.2021 23:34:20

Figure Channel 39:



Date: 17.AUG.2021 23:43:47

Figure Channel 78:

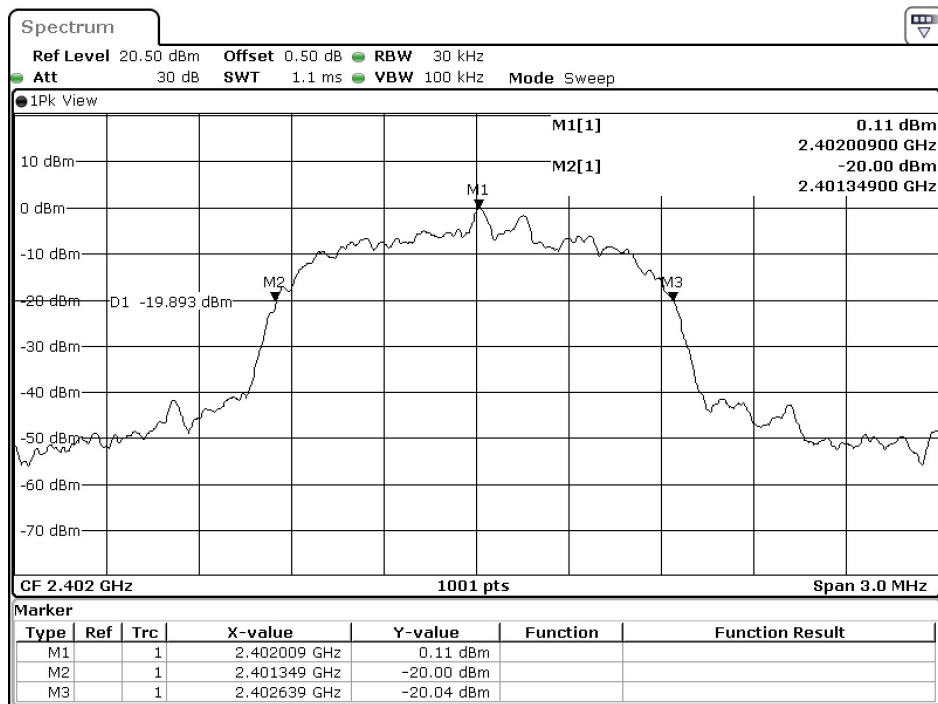


Date: 18.AUG.2021 00:12:18

Product : Speech Generating Device
 Test Item : Occupied Bandwidth Data
 Test Mode : Mode 2: Transmit - 3Mbps (2402MHz)
 Test Date : 2021/08/18

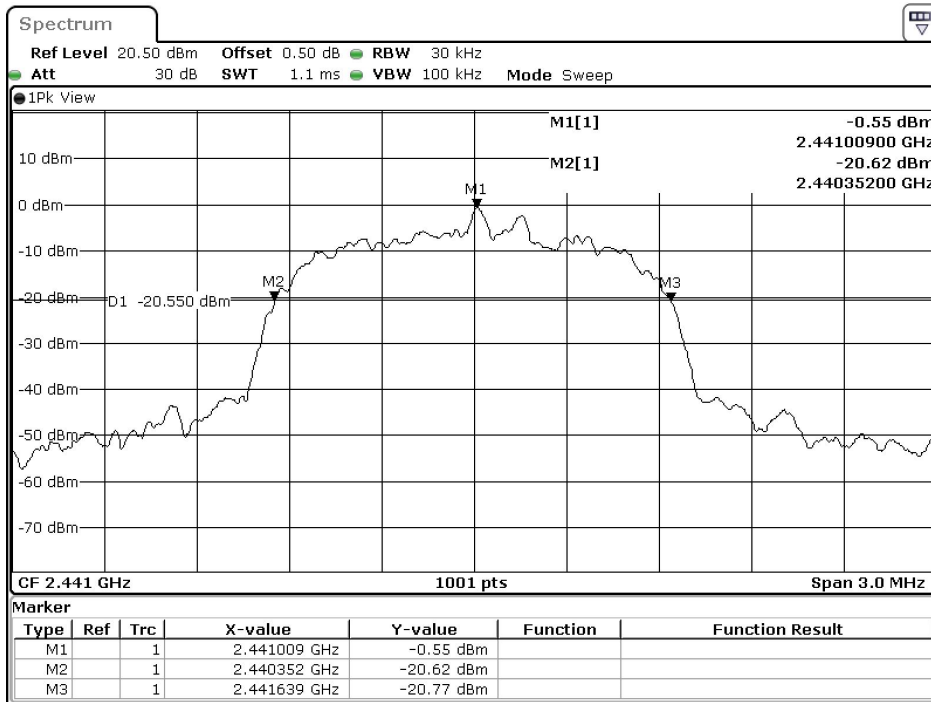
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1290	--	NA
39	2441	1287	--	NA
78	2480	1290	--	NA

Figure Channel 00:



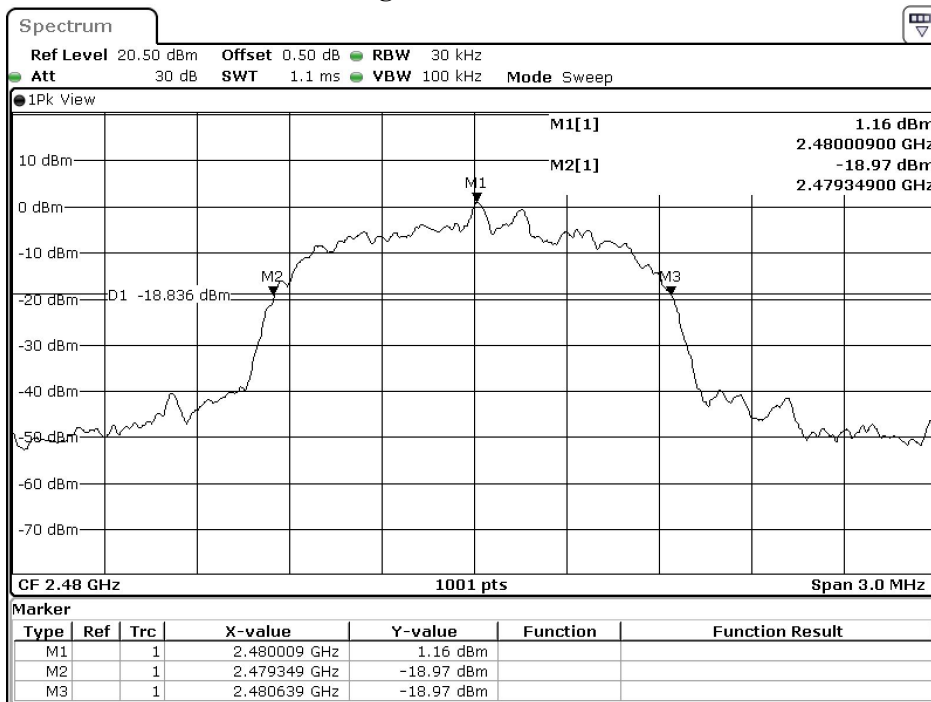
Date: 18.AUG.2021 02:34:58

Figure Channel 39:



Date: 18.AUG.2021 02:43:38

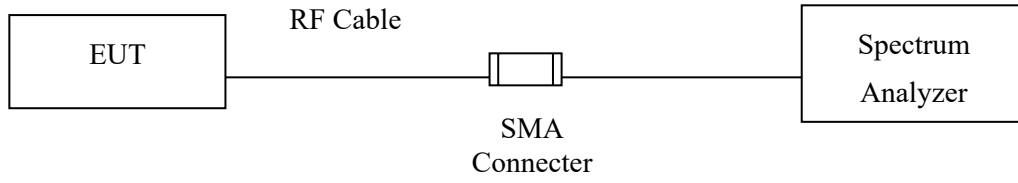
Figure Channel 78:



Date: 18.AUG.2021 03:30:20

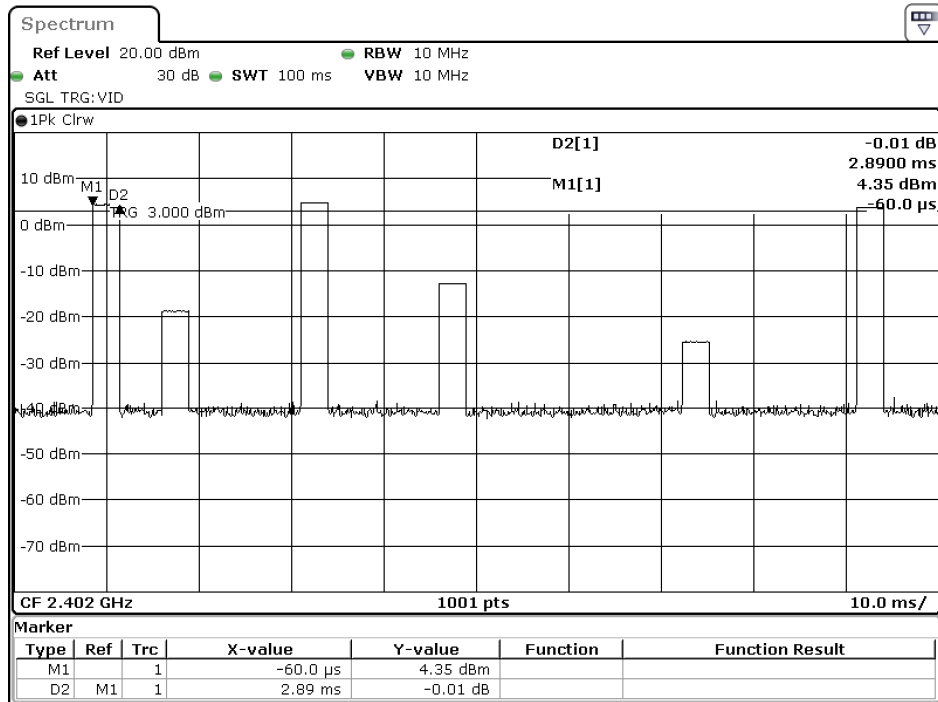
11. Duty Cycle

11.1. Test Setup



11.2. Test Result of Duty Cycle

Product : Speech Generating Device
 Test Item : Duty Cycle Data
 Test Mode : Mode 1: Transmit - 1Mbps



Date: 18.AUG.2021 06:20:51

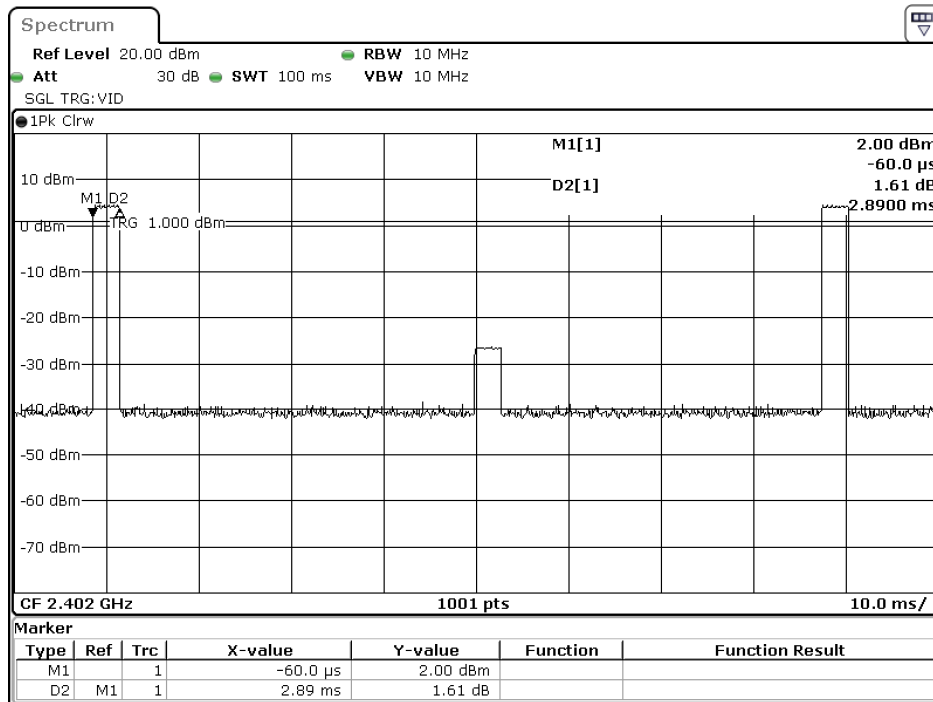
Time on of 100ms= 8.67ms

Duty Cycle=8.67ms / 100ms= 0.0867

Duty Cycle correction factor= 20 LOG 0.0867= -21.240 dB

Duty Cycle correction factor	21.240	dB
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Product : Speech Generating Device
 Test Item : Duty Cycle Data
 Test Mode : Mode 2: Transmit - 3Mbps



Date: 18.AUG.2021 06:16:57

Time on of 100ms=5.78ms

Duty Cycle= $5.78\text{ms} / 100\text{ms} = 0.0578$

Duty Cycle correction factor= $20 \text{ LOG } 0.0578 = -24.761 \text{ dB}$

Duty Cycle correction factor	21.240	dB
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12. EMI Reduction Method During Compliance Testing

No modification was made during testing.