FCC - TEST REPORT

Report Number	:	**68.950.23.1003.01**	Date of Issue:	**2024-1-17**
Model	:	**TG-S7A, TG-S7E, TG-S7H, TG-S7J, TG-S8A, TG-S8E, TG-S8H, TG-S8J, TG-S9A, TG-S9E, TG-S9H, TG-S9J**		
Product Type	:	Multi-functional AI Translation Pen		
Applicant	:	Zhongshan Tess Gift Co., Ltd.		
Address	:	#B106, 760 Creative Park, 12 Minying West Road, Shiqi District, Zhongshan, Guangdong, China		
Manufacturer	:	Zhongshan Tess Gift Co., Ltd.		
Address	:	#B106, 760 Creative Park, 12 Minying West Road, Shiqi District, Zhongshan, Guangdong, China		
Factory	:	Zhongshan Tess Gift Co., Ltd.		
Address	:	#B106, 760 Creative Park, 12 Minying West Road, Shiqi District, Zhongshan, Guangdong, China		
Test Result	:	■ **Positive** ☐ **Negative**		
Total pages including Appendices	:	**59**		

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12 & 13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District Shenzhen 518052 P.R. China
Telephone:	86 755 8828 6998
Fax:	86 755 828 5299
FCC Registration No.:	514049
FCC Designation Number:	CN5009

3 Description of the Equipment Under Test

Product:	Multi-functional AI Translation Pen
Model no.:	TG-S7A, TG-S7E, TG-S7H, TG-S7J, TG-S8A, TG-S8E, TG-S8H, TG-S8J, TG-S9A, TG-S9E, TG-S9H, TG-S9J
Hardware Version Identification No. (HVIN)	TG-S7A, TG-S7E, TG-S7H, TG-S7J, TG-S8A, TG-S8E, TG-S8H, TG-S8J, TG-S9A, TG-S9E, TG-S9H, TG-S9J
Product Marketing Name (PMN)	Multi-functional AI Translation Pen
Brand name:	TESS GIFT
FCC ID:	2BHDR-13EA2BHDR
Options and accessories:	N/A
Rating:	5VDC, 1A by external Type-C input or by 4.2VDC, 1200mAh battery
RF Transmission Frequency:	2402MHz-2480MHz
No. of Operated Channel:	79
Modulation:	GFSK, π/4-DQPSK, 8DPSK
Antenna Type:	FPC
Antenna Gain:	1.65dBi
Description of the EUT:	The EUT is a Multi-functional AI Translation Pen which supports BT, BLE and 2.4G Wi-Fi functions. All models use the same Bluetooth & Wi-Fi RF module and antenna, the difference among the models is the software version, the model: TG-S7A was chosen as the representative model to perform full tests, and the other models were deemed to fulfil relevant requirements without further testing. Only Bluetooth (BR+EDR) included in this report.

NOTE 1: The above EUT's information is declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2023 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05r02 Measurement Guidance and ANSI C63.10-2020.

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5 Summary of Test Results

Technical Requirements			
FCC Part 15 Subpart C			
Test Condition		Test Site	Test Result
§15.207	Conducted emission AC power port	Site 1	Pass
§15.247(b)(1)	Conducted peak output power	Site 1	Pass
§15.247(a)(1)	20dB bandwidth	Site 1	Pass
§15.247(a)(1	Carrier channel frequency separation	Site 1	Pass
§15.247(a)(1)(iii)	Number of hopping frequencies	Site 1	Pass
§15.247(a)(1)(iii)	Dwell Time - Average Time of Occupancy	Site 1	Pass
§15.247(d)	Spurious RF conducted emissions	Site 1	Pass
§15.247(d)	Band edge	Site 1	Pass
§15.247(d) & §15.209 &§15.205	Spurious radiated emissions for transmitter	Site 1	Pass
§15.203	Antenna requirement	See note 2	Pass

Note 1: N/A=Not Applicable.
Note 2: The EUT use a FPC antenna, which gain is 1.65dBi. In accordance to §15.203, it is considered sufficiently to comply with the provisions of this section.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2BHDR-13EA2BHDR, complies with Section 15.207, 15.209, 15.205, 15.247 of the FCC Part 15, Subpart C.

The EUT supports Bluetooth Low Energy/Bluetooth BR+EDR/Wi-Fi functions and the TX and RX range is 2402MHz-2480MHz for Bluetooth, 2412MHz – 2462MHz for 2.4GHz Wi-Fi.

Note: The report is for BR+EDR only.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

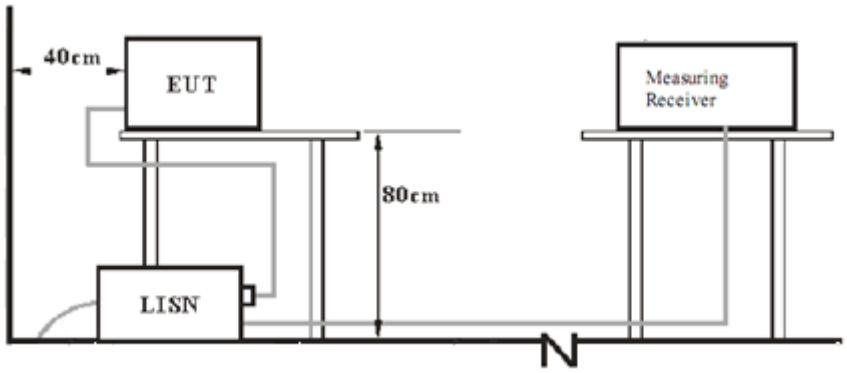
Sample Received Date:	2023-11-22
Testing Start Date:	2023-11-23
Testing End Date:	2024-1-8

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:	Prepared by:	Tested by:
John Zhi	Lynn Huang	Carry Cai
Project Manager	Project Engineer	Test Engineer

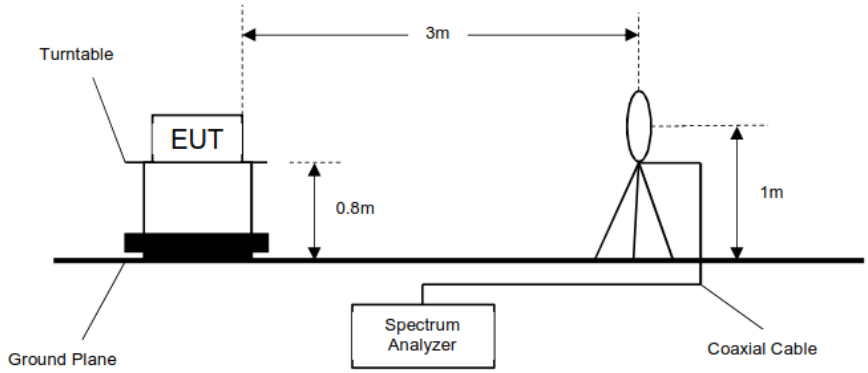
7 Test Setups

7.1 AC Power Line Conducted Emission test setups

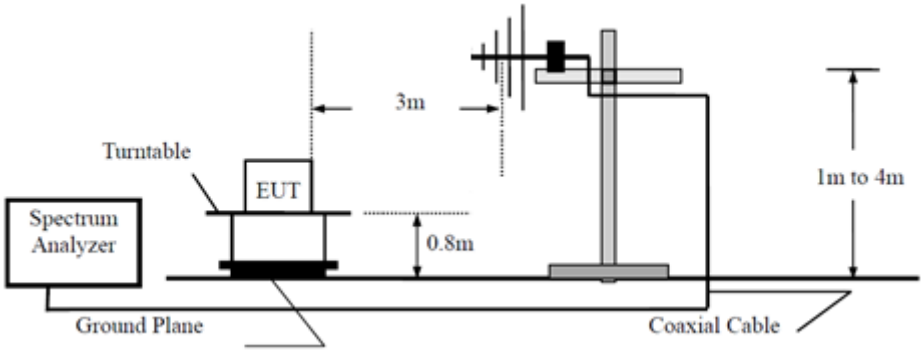


7.2 Radiated test setups

9KHz - 30MHz



30MHz - 1GHz



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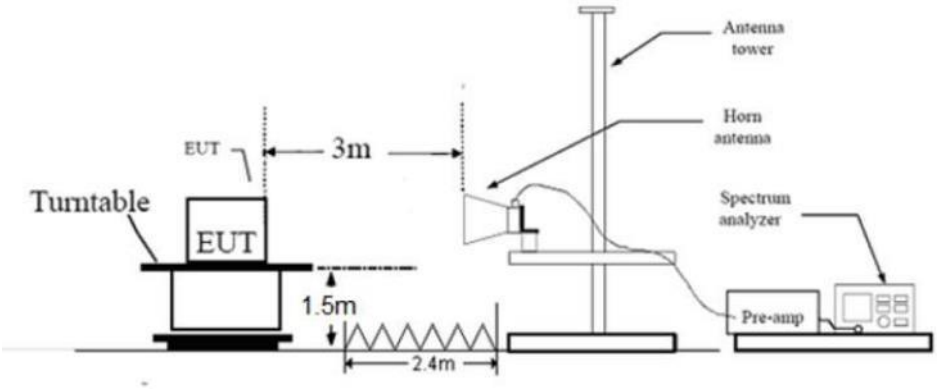
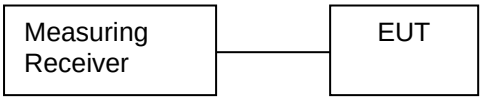
Above 1GHz



7.3 Conducted RF test setups



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8 Systems Test Configuration

Auxiliary Equipment Used during Test:

Description	Manufacturer	Model NO.	S/N
---	---	---	---

Cables Used During Test:

Cable	Length	Shielded/unshielded	With / without ferrite
---	---	---	---

Test software information:

Test Software	cmd.exe	
Modulation	Setting TX Power	Packet Type
GFSK	7(max)	PRBS9
π/4-DQPSK	7(max)	PRBS9
8DPSK	7(max)	PRBS9

The system was configured to hopping mode and non-hopping mode.

Hopping mode: typical working mode (normal hopping status)

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power.

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9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. Both sides of AC line were checked for maximum conducted interference.
6. The frequency range from 150 kHz to 30 MHz was searched.
7. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

Limit

According to §15.207, Conducted Emission limit as below:

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

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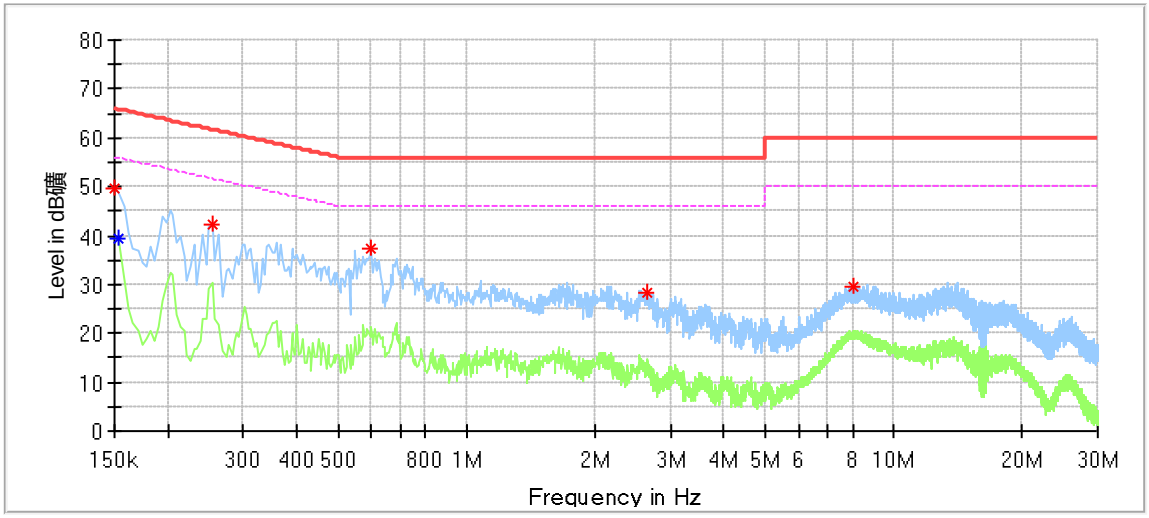
Conducted Emission

Product Type	:	Multi-functional AI Translation Pen
M/N	:	TG-S7A
Operating Condition	:	Transmit mode
Test Specification	:	Line
Comment	:	AC 120V/60Hz



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.150000	49.69	---	66.00	16.31	L1	9.52
0.154000	---	39.20	55.78	16.58	L1	9.52
0.254000	42.38	---	61.63	19.25	L1	9.56
0.598000	37.20	---	56.00	18.80	L1	9.60
2.634000	28.29	---	56.00	27.71	L1	9.64
8.018000	29.56	---	60.00	30.44	L1	9.88

Remark:
Level=Reading Level + Correction Factor
Correction Factor=Cable Loss + LISN Factor
(The Reading Level is recorded by software which is not shown in the sheet)

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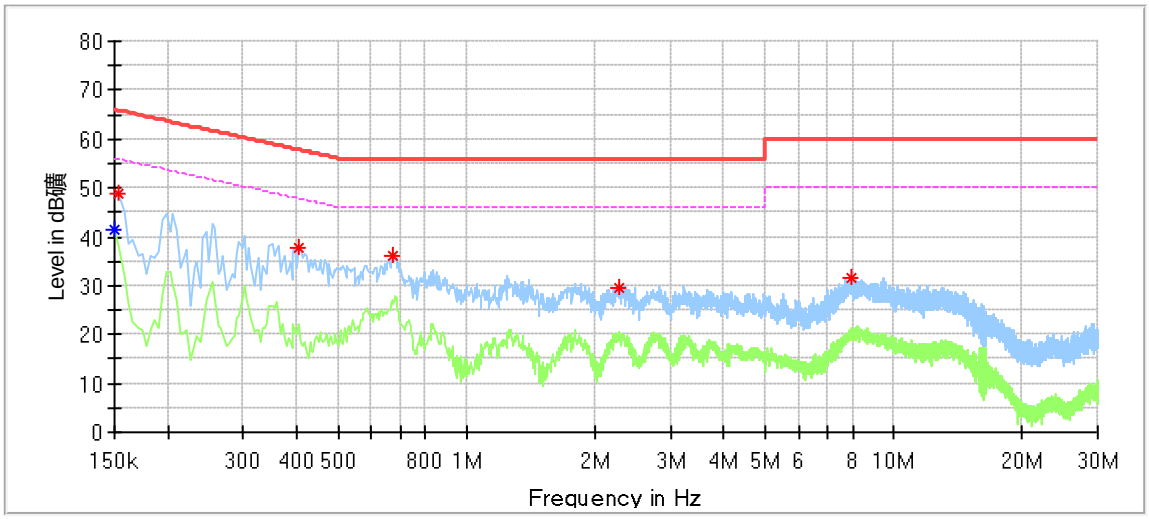
Conducted Emission

Product Type	:	Multi-functional AI Translation Pen
M/N	:	TG-S7A
Operating Condition	:	Transmit mode
Test Specification	:	Neutral
Comment	:	AC 120V/60Hz



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.150000	---	41.49	56.00	14.51	N	9.55
0.154000	48.66	---	65.78	17.13	N	9.55
0.406000	37.82	---	57.73	19.91	N	9.61
0.674000	36.13	---	56.00	19.87	N	9.63
2.266000	29.43	---	56.00	26.57	N	9.66
7.942000	31.70	---	60.00	28.30	N	9.90

Remark:
Level=Reading Level + Correction Factor
Correction Factor=Cable Loss + LISN Factor
(The Reading Level is recorded by software which is not shown in the sheet)

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9.2 Conducted Peak Output Power

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Use the following test receiver settings:
   Span = approximately 5 times the 20dB bandwidth, centered on a hopping channel
   RBW > the 20dB bandwidth of the emission being measured, VBW≥RBW,
   Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power and record the results in the test report.
5. Repeat above procedures until all frequencies measured were complete.

Limits

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

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Conducted Peak Output Power & EIRP

Bluetooth Mode GFSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	4.27	Pass
Middle channel 2441MHz	4.24	Pass
High channel 2480MHz	4.00	Pass

Bluetooth Mode π/4-DQPSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	4.16	Pass
Middle channel 2441MHz	4.14	Pass
High channel 2480MHz	3.88	Pass

Bluetooth Mode 8DPSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	4.27	Pass
Middle channel 2441MHz	4.25	Pass
High channel 2480MHz	4.02	Pass

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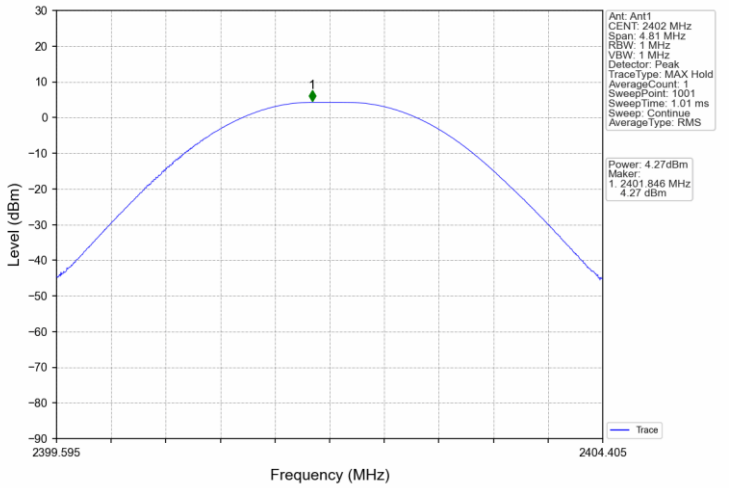
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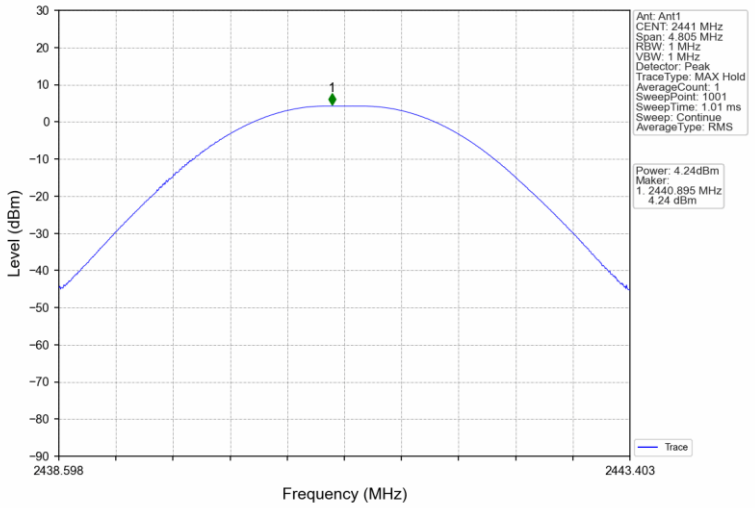
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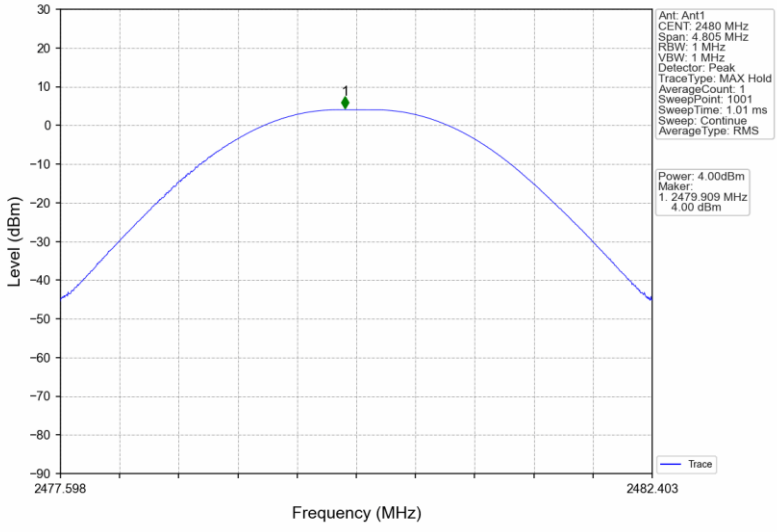

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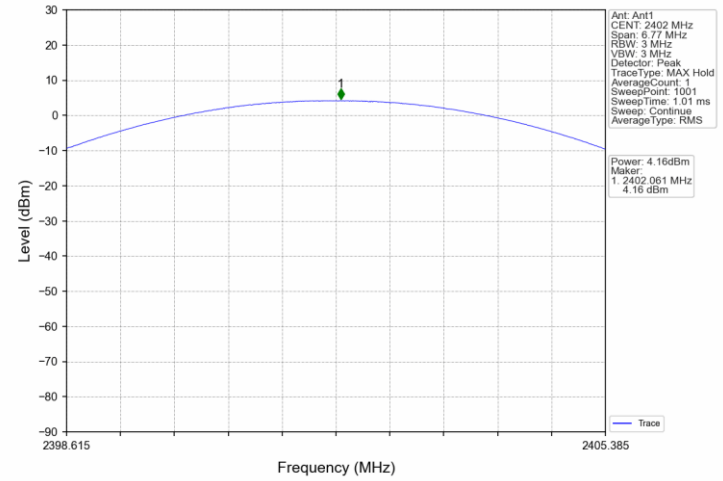
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant_B_NTNV

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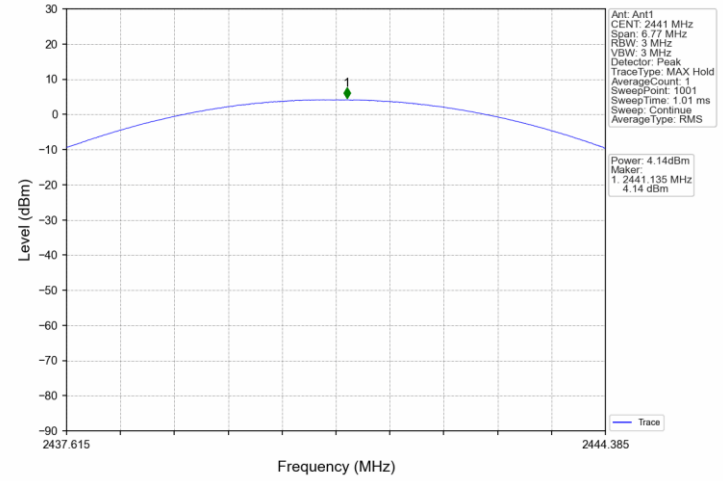
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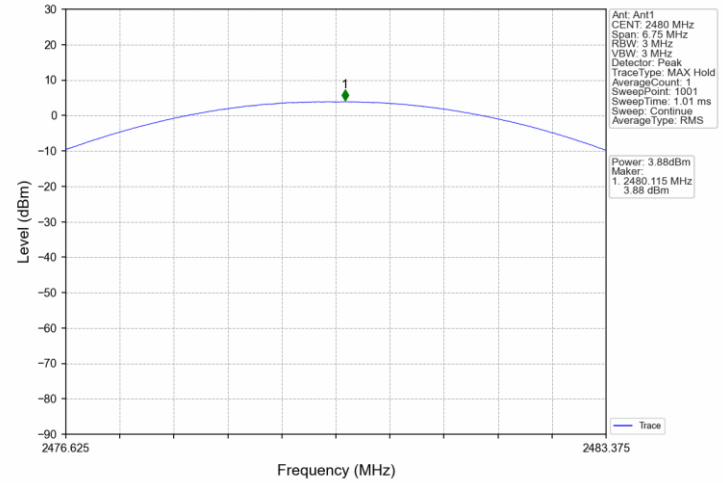

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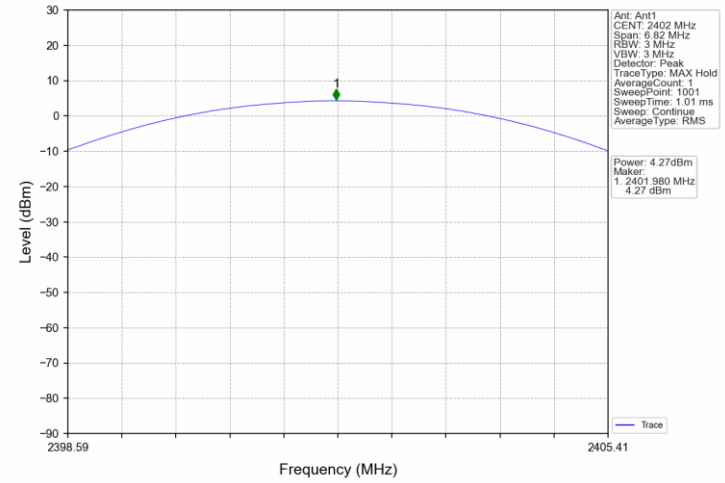
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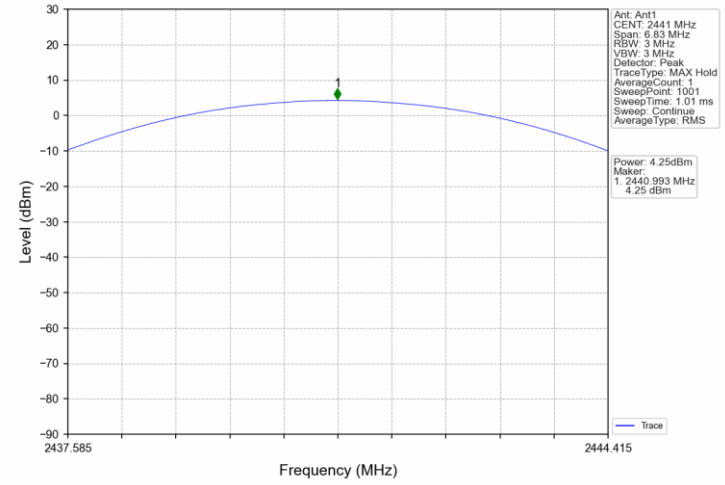
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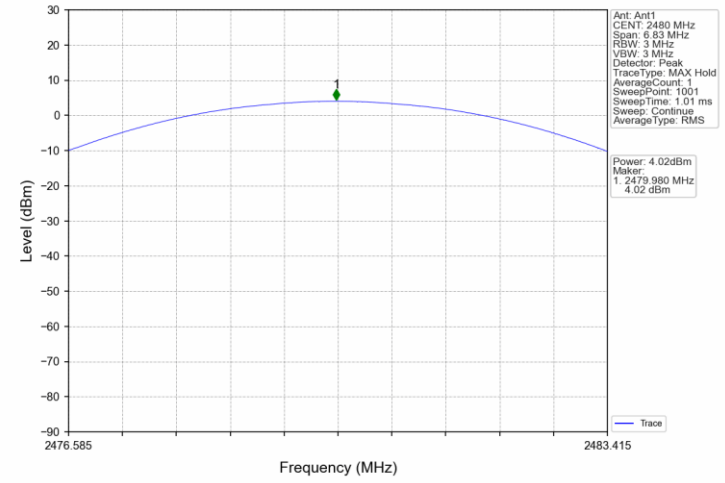

9.3 20 dB Bandwidth

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Use the following test receiver settings:
   Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
   RBW ≥ 1% to 5% of the 20 dB bandwidth/99% OBW, VBW≥3RBW,
   Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Measure the frequency difference of two frequencies that were attenuated 20 dB/99% OBW from the reference level. Record the frequency difference as the emission bandwidth. Record the results.
5. Repeat above procedures until all frequencies measured were complete.

Limit

Limit [kHz]
N/A

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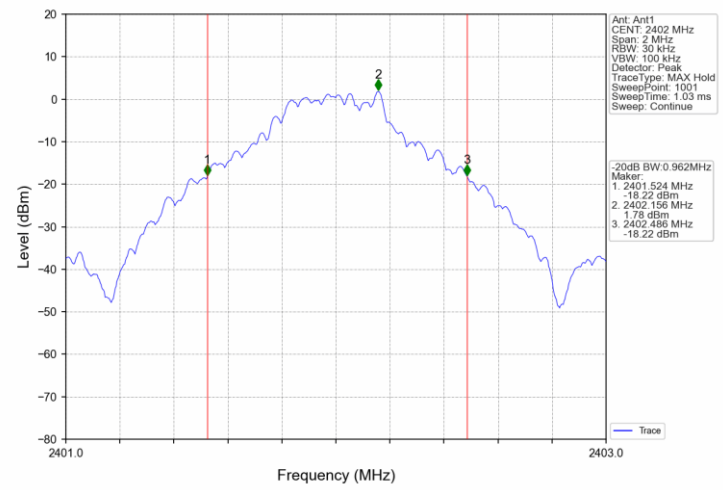
20 dB bandwidth

Test result

TestMode	Frequency MHz	20 dB Bandwidth MHz	Limit MHz	Result
GFSK	2402	0.962	--	Pass
GFSK	2441	0.961	--	Pass
GFSK	2480	0.961	--	Pass
π/4-DQPSK	2402	1.354	--	Pass
π/4-DQPSK	2441	1.354	--	Pass
π/4-DQPSK	2480	1.350	--	Pass
8DPSK	2402	1.364	--	Pass
8DPSK	2441	1.366	--	Pass
8DPSK	2480	1.366	--	Pass

20 dB Bandwidth

GFSK_DH5_LCH_2402MHz_Ant_1_NTNV



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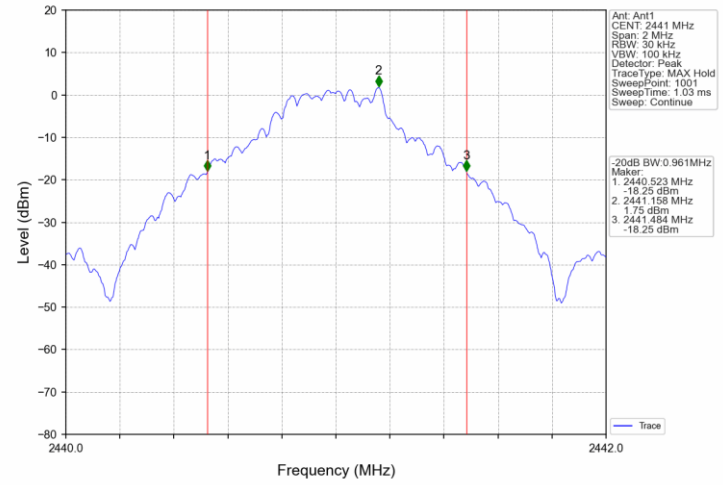

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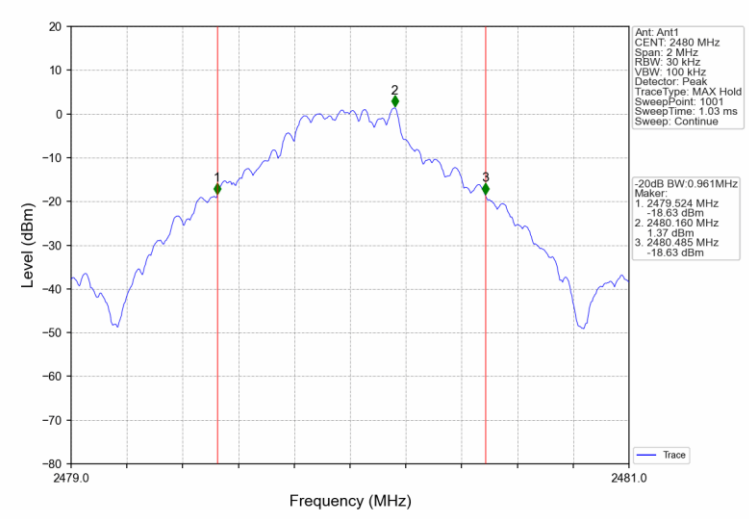

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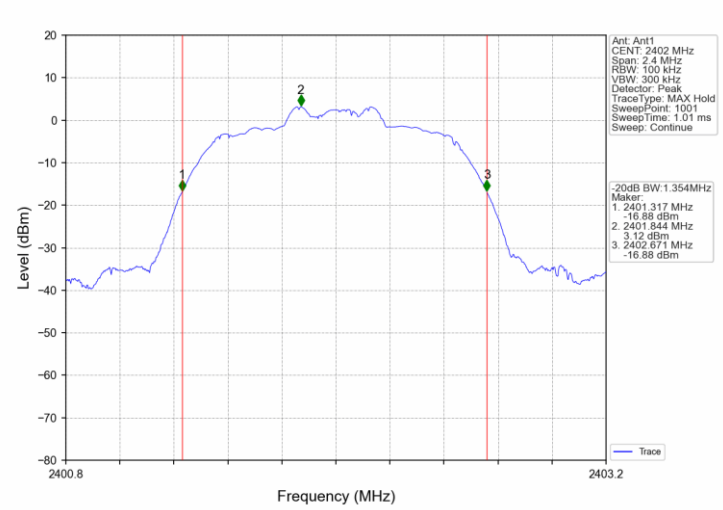
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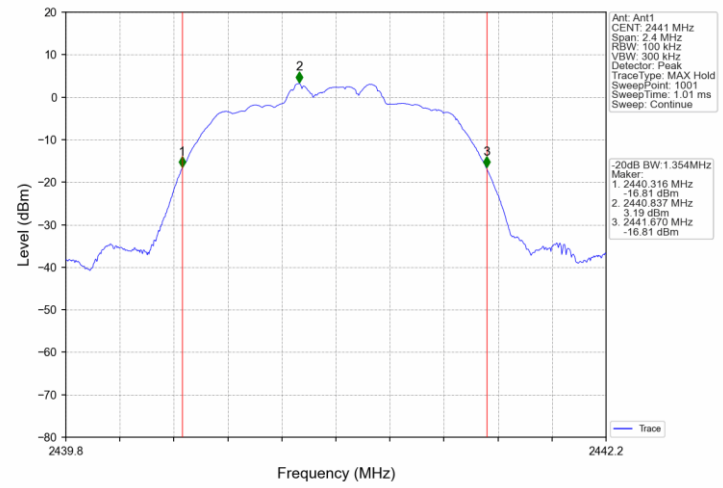
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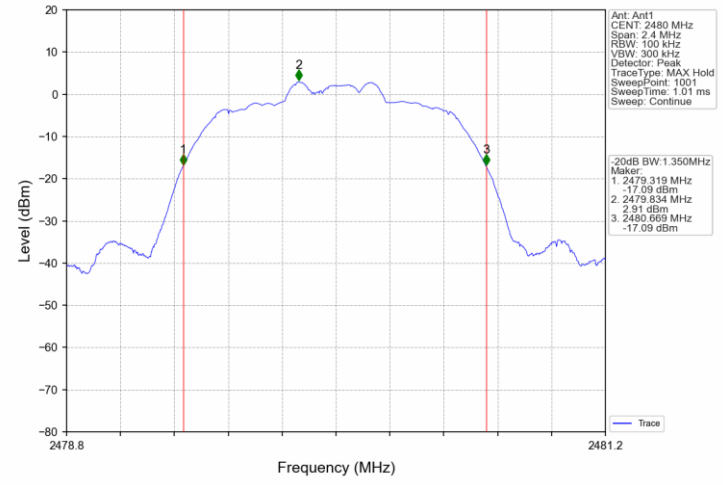

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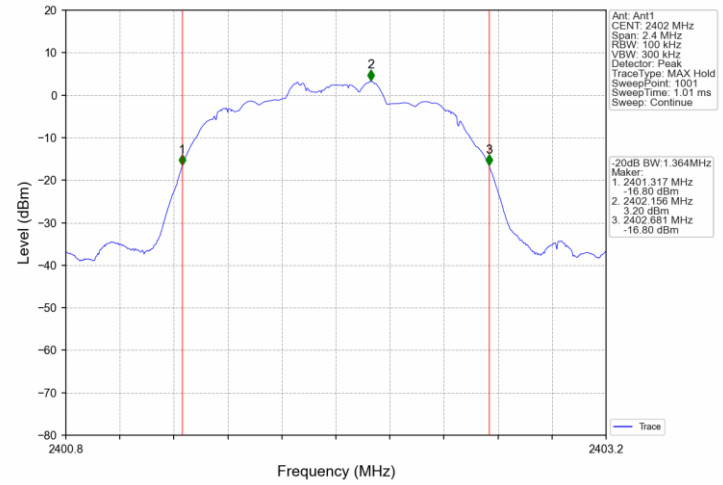
8DPSK_3DH5_LCH_2402MHz_Ant_B_NTNV

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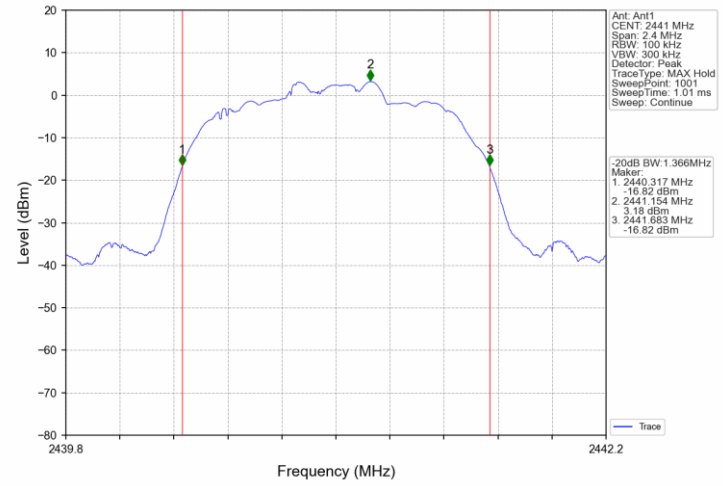
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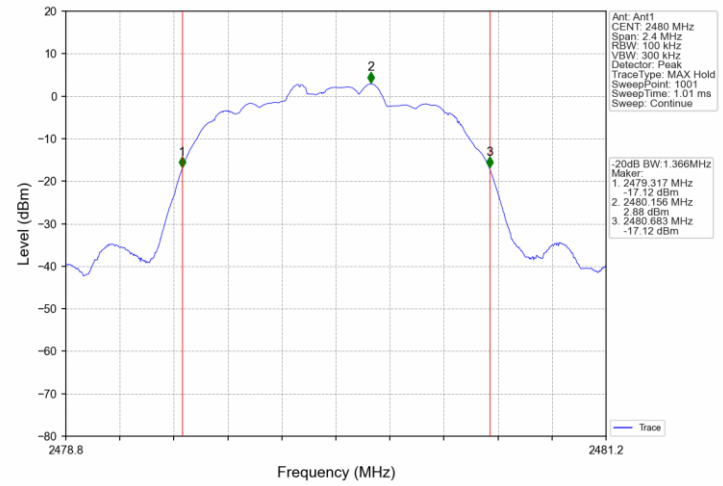

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9.4 Carrier Frequency Separation

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit to hopping mode.
3. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels, RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel. VBW ≥RBW, Sweep = auto, Detector function = peak.
4. By using the Max-Hold function record the separation of two adjacent channels.
5. Measure the frequency difference of these two adjacent channels by spectrum analyzer marker function. Record the results.
6. Repeat above procedures until all frequencies measured were complete.

Limit

Limit kHz
≥25KHz or 2/3 of the 20 dB bandwidth which is greater

Limit

Modulation	Frequency MHz	2/3 of 20 dB Bandwidth kHz
GFSK	2441	641
π/4-DQPSK	2441	903
8DPSK	2441	911

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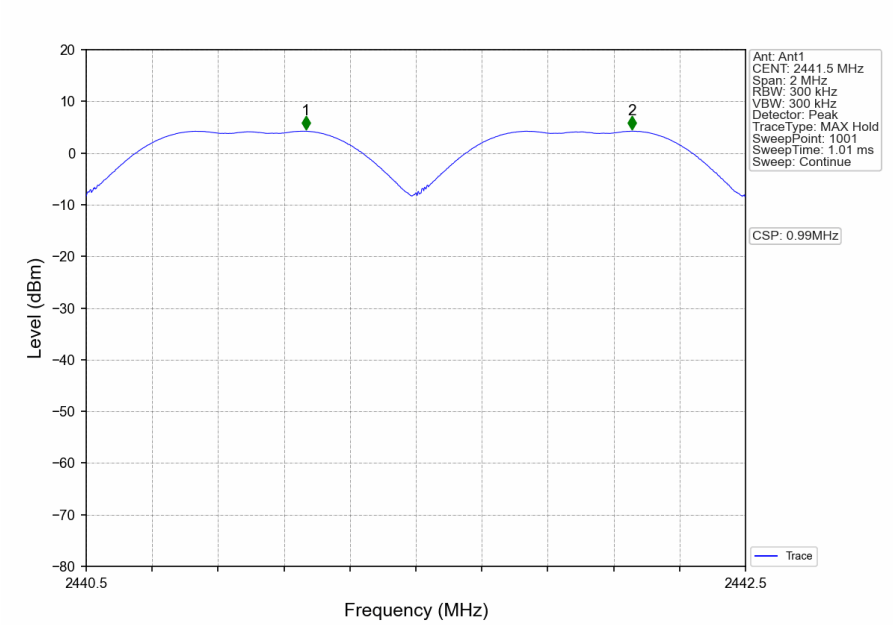
Carrier Frequency Separation

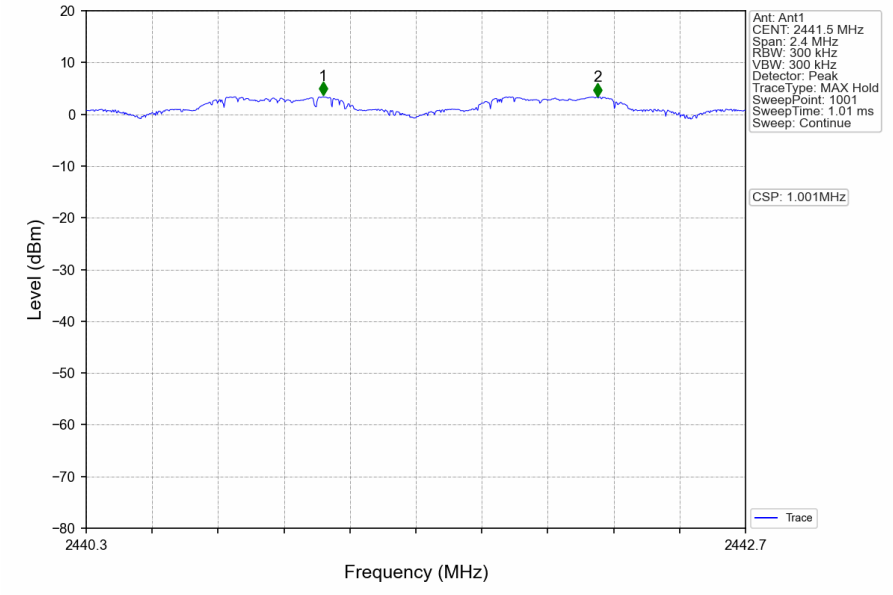
Test result: The measurement was performed with the typical configuration (normal hopping status).

Modulation	Frequency MHz	Carrier Frequency Separation MHz	Result
GFSK	2441	0.990	Pass
π/4-DQPSK	2441	1.001	Pass
8DPSK	2441	0.994	Pass

DH5_Ant1_Hop



2DH5_Ant1_Hop



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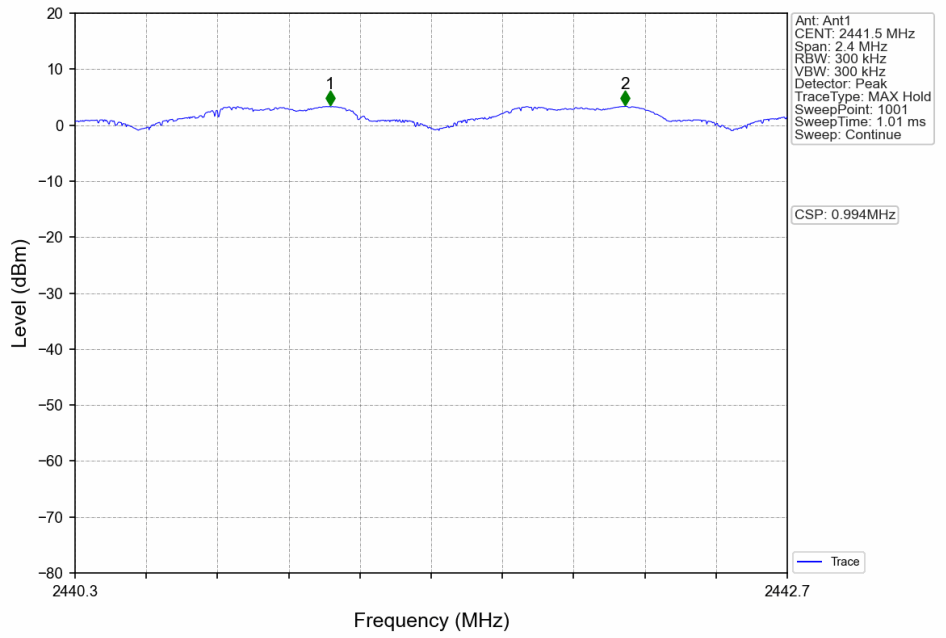
3DH5_Ant1_Hop



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9.5 Number of Hopping Frequencies

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit to hopping mode.
3. Use the following spectrum analyzer settings:
   Span = the frequency band of operation, RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller, VBW ≥RBW, Sweep = auto, Detector function = peak, Trace=Max hold.
4. Allow the trace to stabilize. It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

Limit

Limit number
≥ 15

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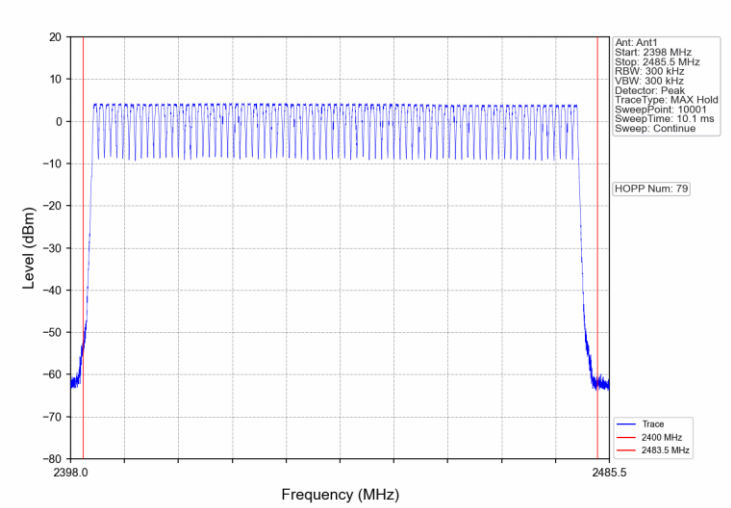
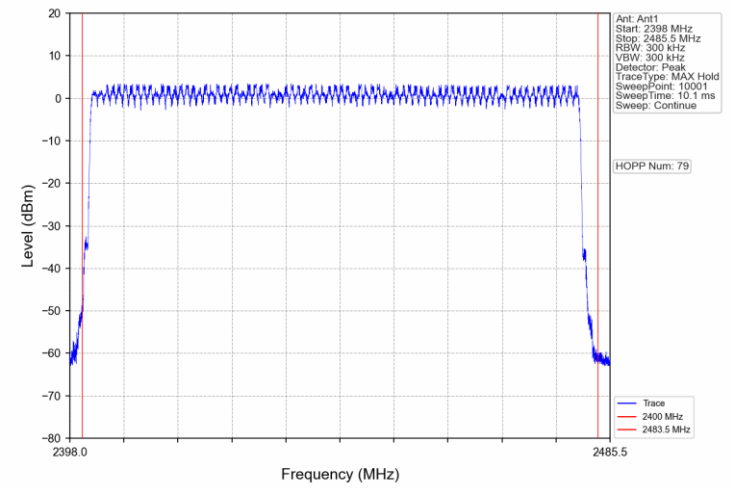
Number of Hopping Frequencies

Number of hopping frequencies	Result
79	Pass

GFSK_DH5_HOPP_Ant_1_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant_1_NTNV



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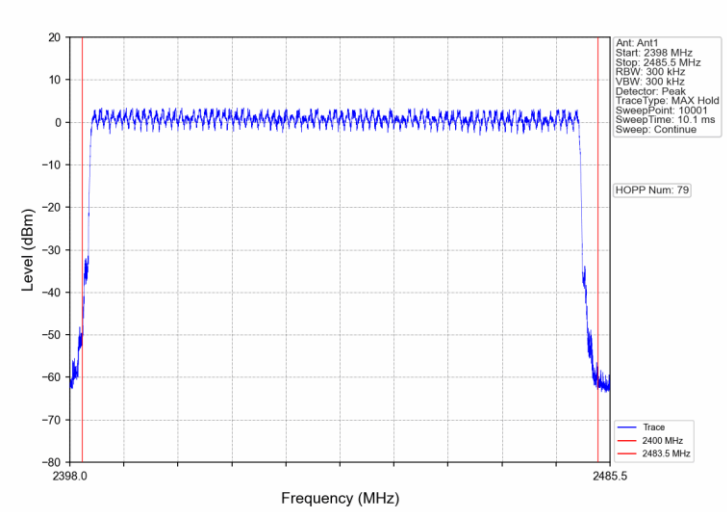
8DPSK_3DH5_HOPP_Ant_1_NTNV


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9.6 Dwell Time

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit to hopping mode.
3. Span: Zero span, centered on a hopping channel.
4. RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
5. Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
6. Detector function: Peak.
7. Trace: Max hold. Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

Limit

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

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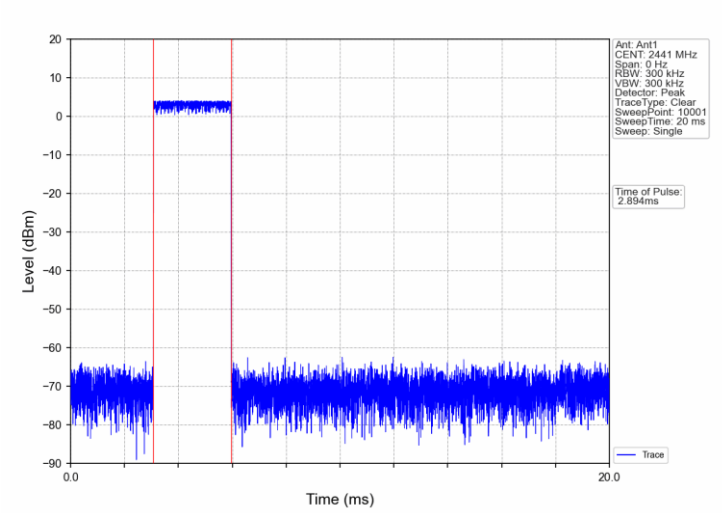
Dwell Time

Dwell time

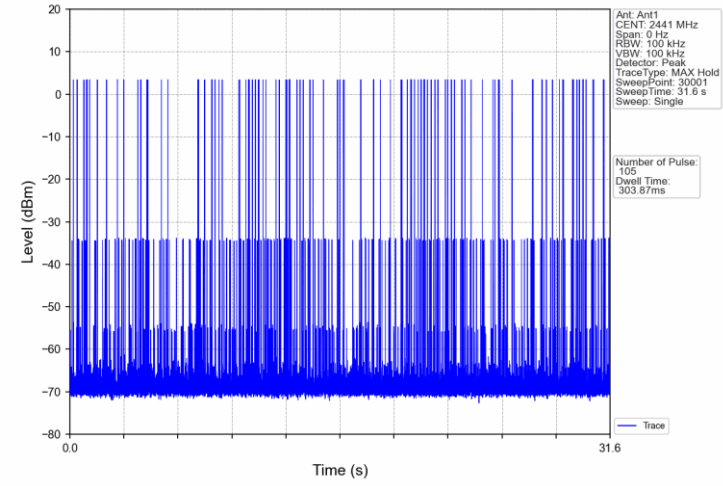
The maximum dwell time shall be 0.4 s.
According to the Bluetooth Core Specification,
The duration for dwell time calculation: 0.4 [s] * hopping number = 0.4 [s] * 79 [ch] = 31.6 [s]
The Dwell Time = Burst Width * Total Hops.

Test Mode	Channel	Burst Width (ms)	Total Hops	Result (ms)	Limit (ms)	Verdict
DH5	Hop	2.894	105	303.870	<=400	PASS
2DH5	Hop	2.894	101	292.294	<=400	PASS
3DH5	Hop	2.890	94	271.660	<=400	PASS

GFSK_DH5_HOPP_Ant1_NTNV



GFSK_DH5_HOPP_Ant1_NTNV



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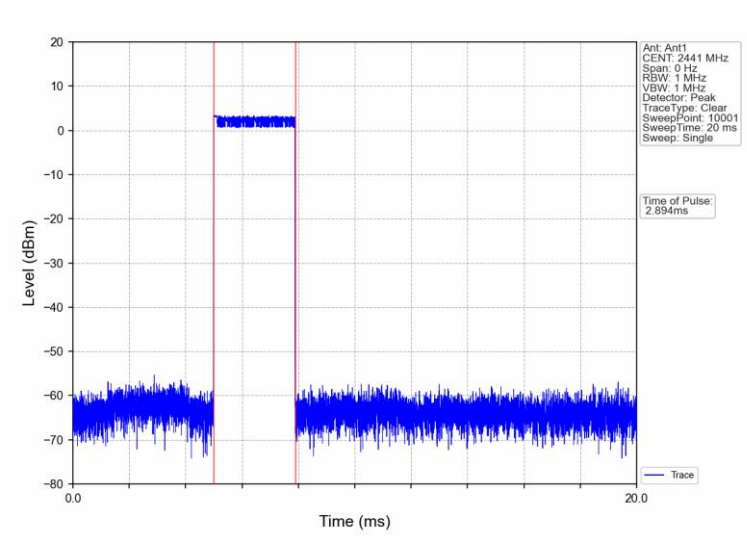
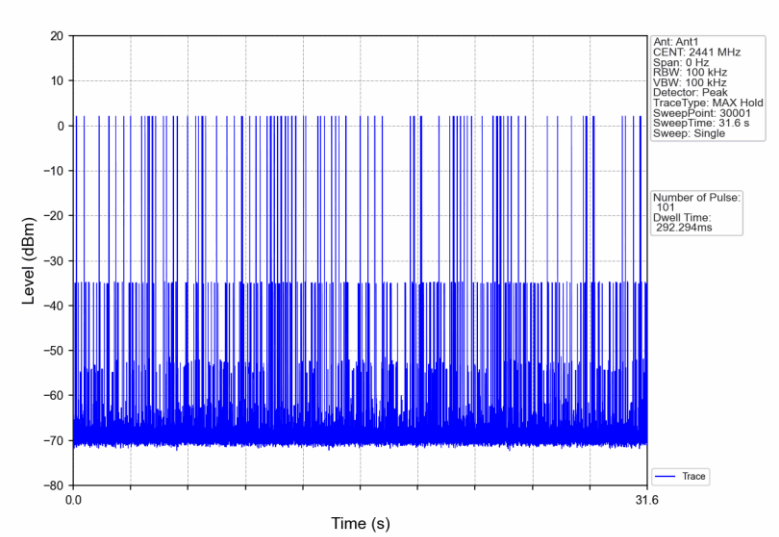
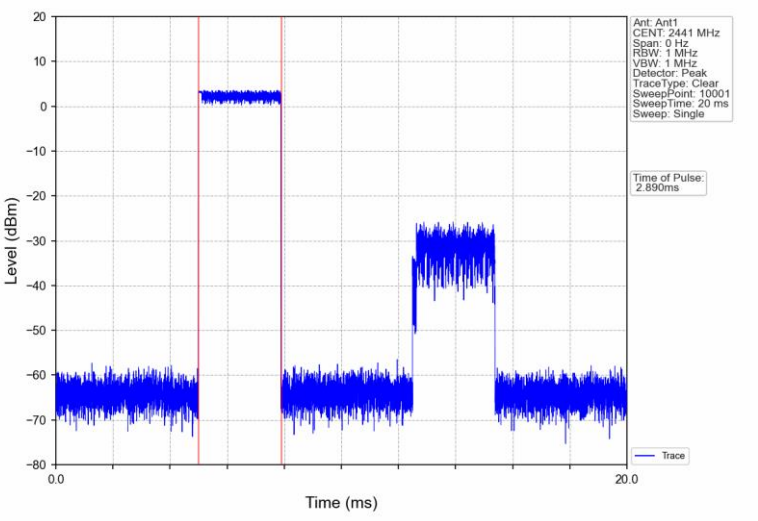
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV


Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV


8DPSK_3DH5_HOPP_Ant1_NTNV


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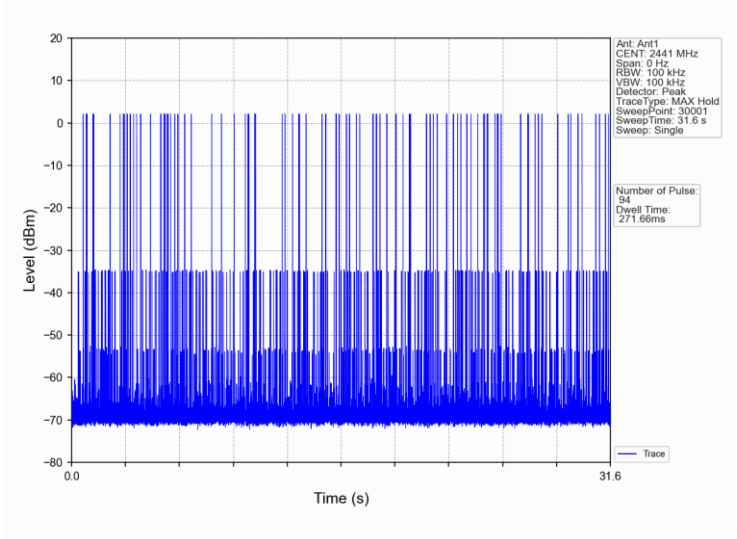
8DPSK_3DH5_HOPP_Ant1_NTNV


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9.7 Spurious RF Conducted Emissions

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector, Sweep = auto, Span = wide enough to capture the peak level of the in-band emission and all spurious emissions, Trace = max hold. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. The level displayed must comply with the limit specified in this Section.
4. Measure and record the results in the test report.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

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Spurious RF Conducted Emissions

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
GFSK	SISO	2402	DH5	1	**4.12**
		2441	DH5	1	4.08
		2480	DH5	1	3.84
Pi/4DQPSK	SISO	2402	2DH5	1	3.18
		2441	2DH5	1	**3.20**
		2480	2DH5	1	2.87
8DPSK	SISO	2402	3DH5	1	**3.23**
		2441	3DH5	1	3.17
		2480	3DH5	1	2.89
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.					

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	SISO	2402	DH5	1	4.12	-15.88	Pass
		2441	DH5	1	4.12	-15.88	Pass
		2480	DH5	1	4.12	-15.88	Pass
		HOPP	DH5	1	4.12	-15.88	Pass
					4.12	-15.88	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	3.20	-16.80	Pass
		2441	2DH5	1	3.20	-16.80	Pass
		2480	2DH5	1	3.20	-16.80	Pass
		HOPP	2DH5	1	3.20	-16.80	Pass
					3.20	-16.80	Pass
8DPSK	SISO	2402	3DH5	1	3.23	-16.77	Pass
		2441	3DH5	1	3.23	-16.77	Pass
		2480	3DH5	1	3.23	-16.77	Pass
		HOPP	3DH5	1	3.23	-16.77	Pass
					3.23	-16.77	Pass
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.							

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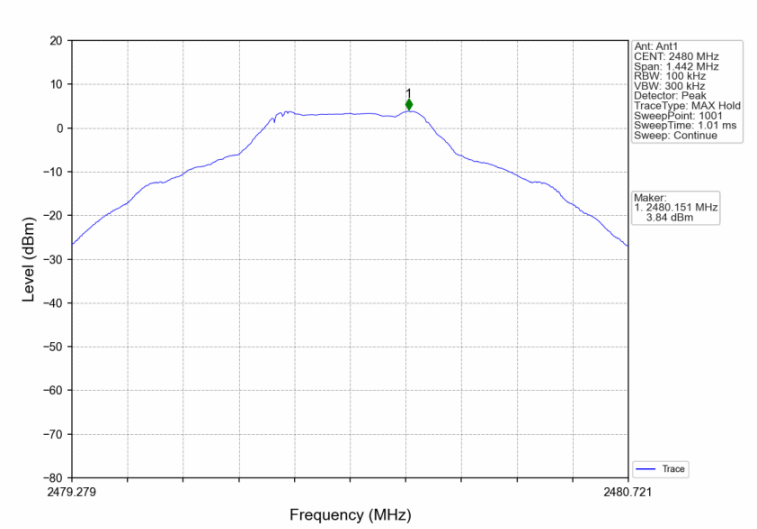
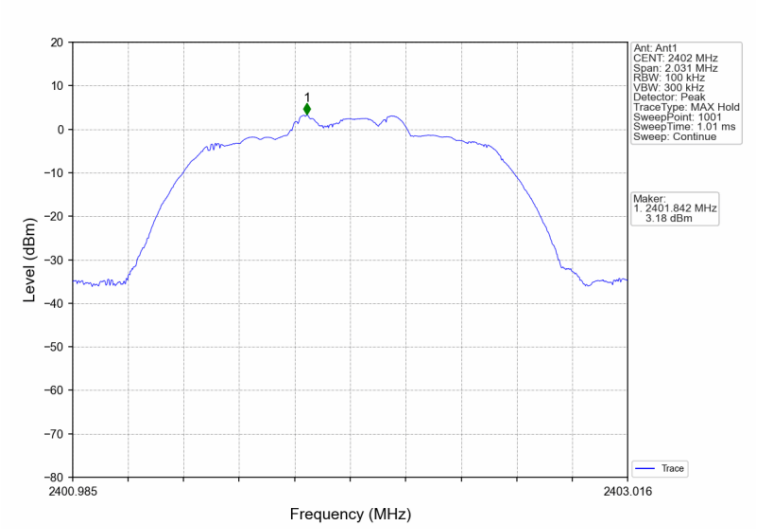
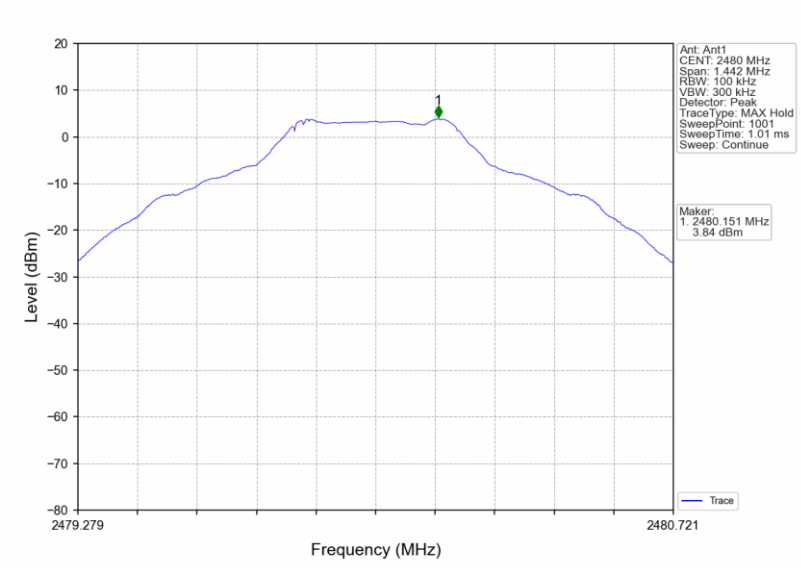
GFSK_DH5_LCH_2402MHz_Ant_1_NTNV



GFSK_DH5_MCH_2441MHz_Ant_1_NTNV



GFSK_DH5_HCH_2480MHz_Ant_1_NTNV



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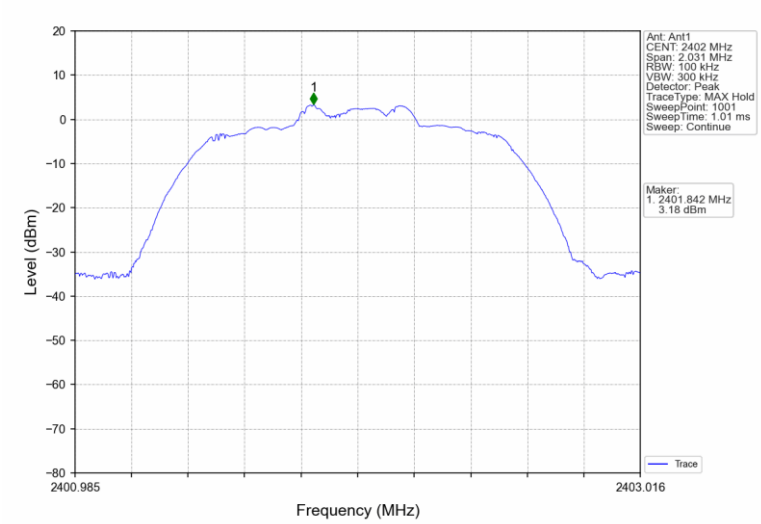
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant_1_NTNV

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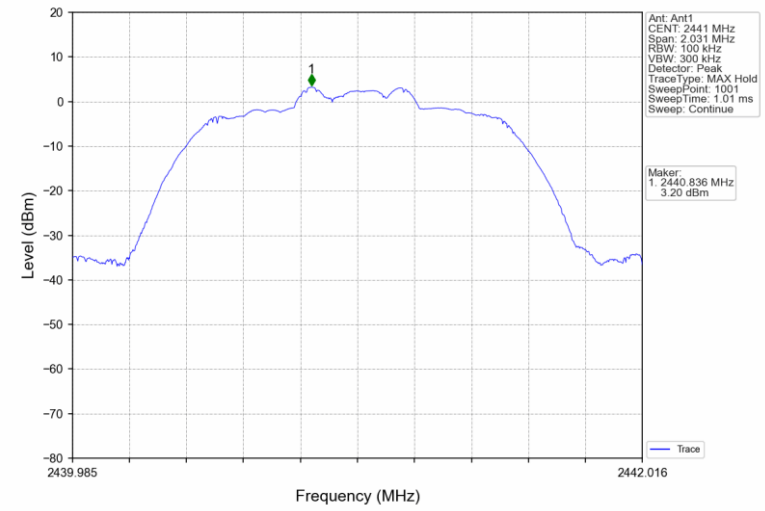
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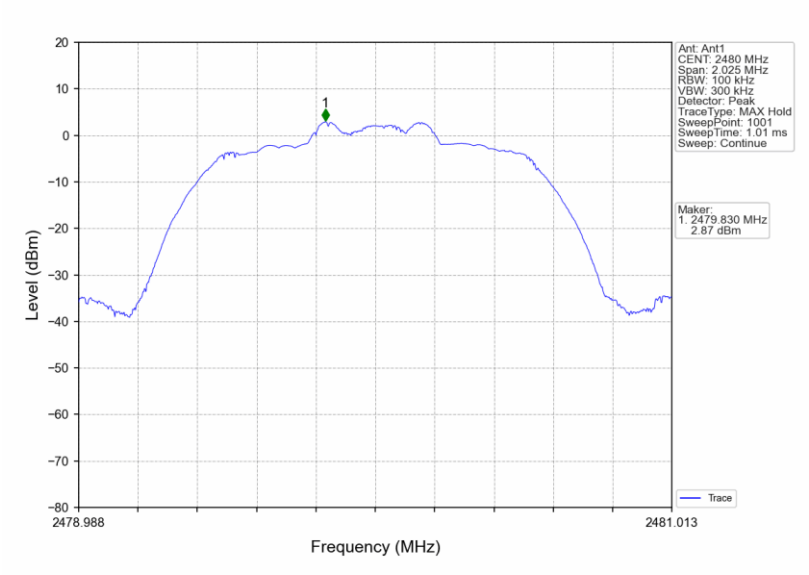

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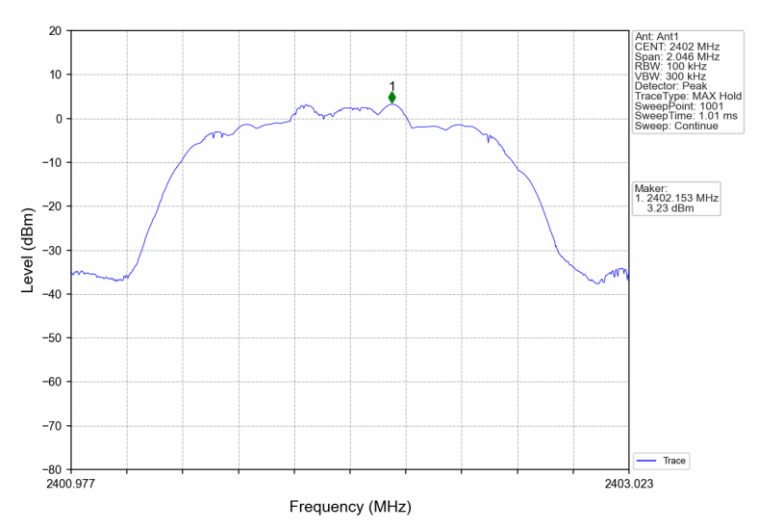
8DPSK_3DH5_LCH_2402MHz_Ant_1_NTNV

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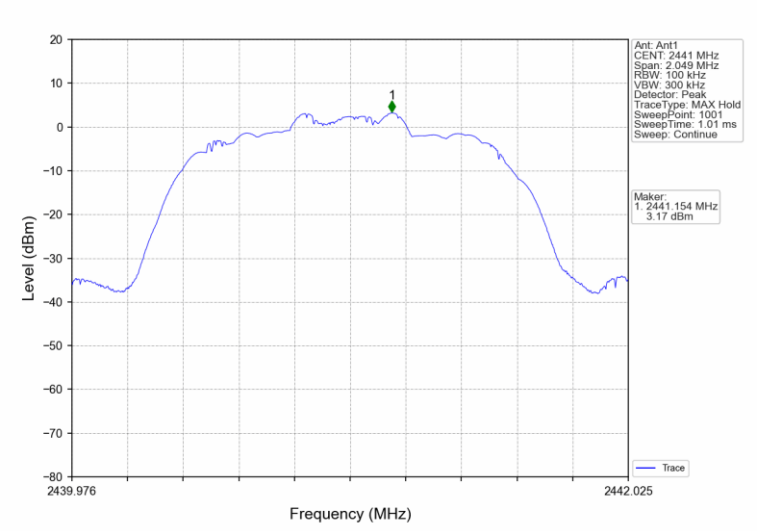
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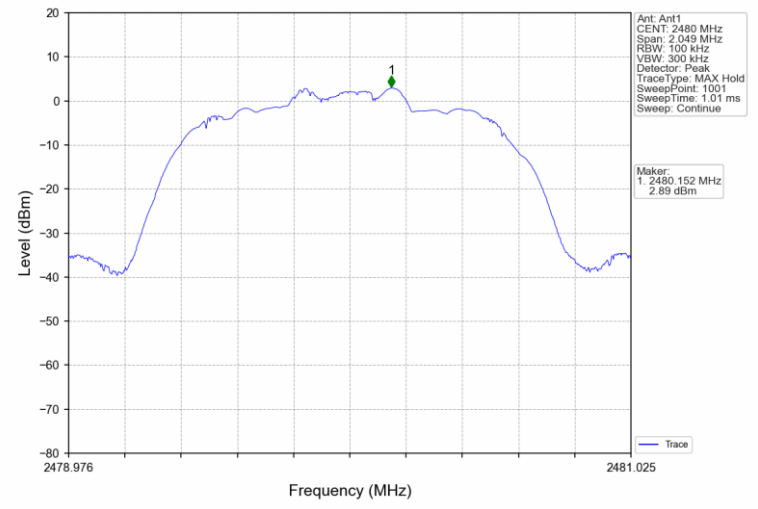

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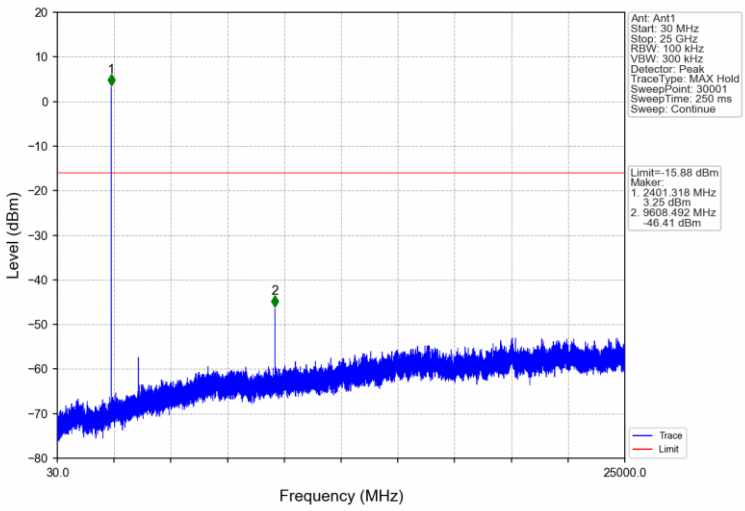
GFSK_DH5_LCH_2402MHz_Ant_1_NTNV

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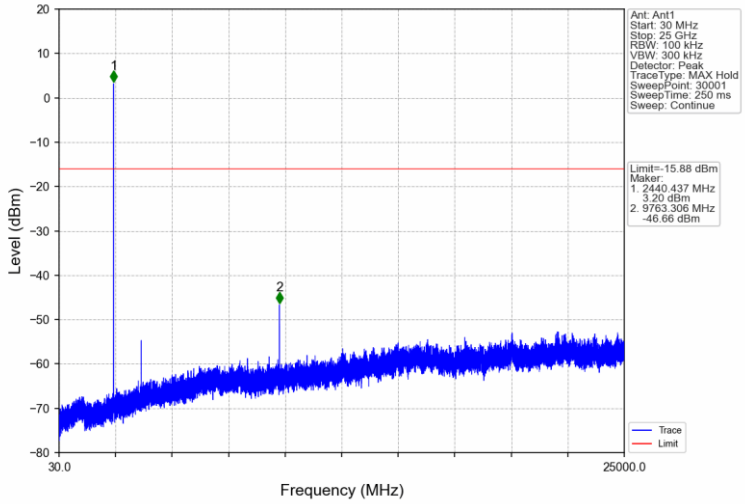
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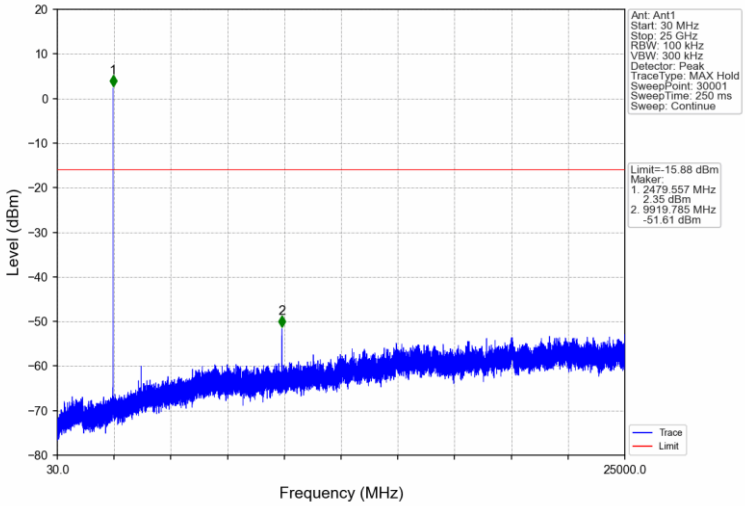

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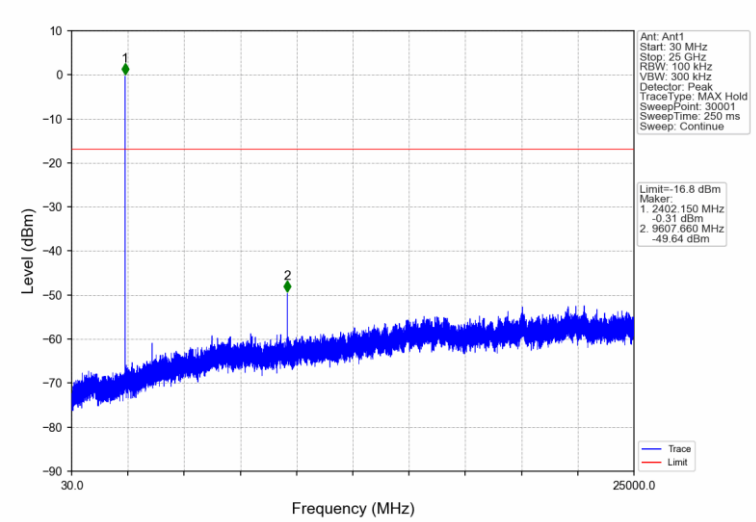
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant_1_NTNV

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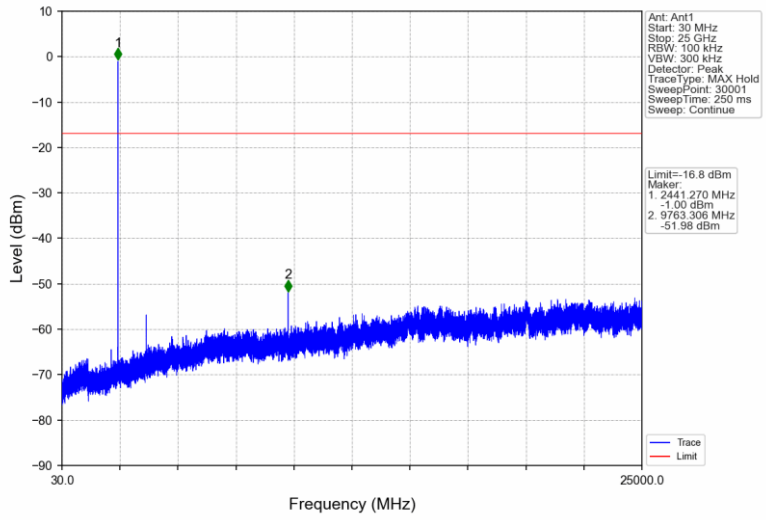
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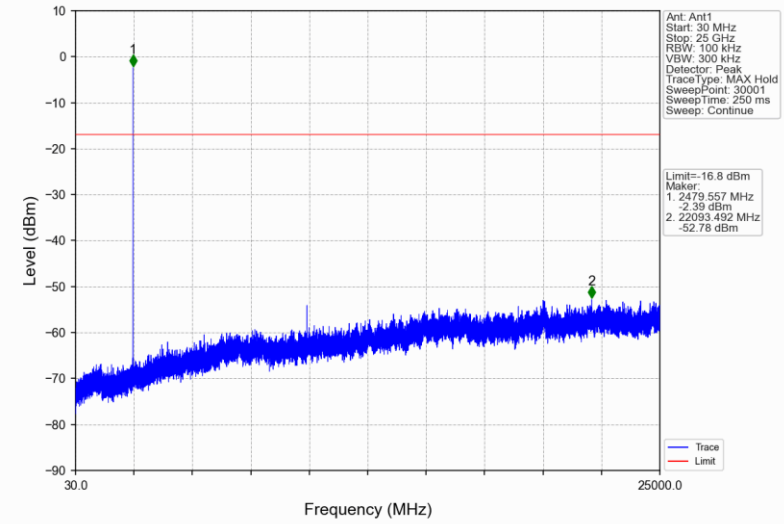

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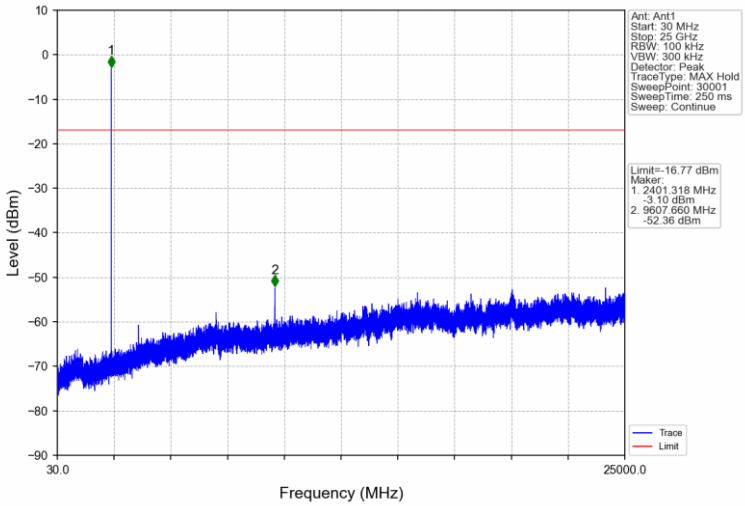
8DPSK_3DH5_LCH_2402MHz_Ant_1_NTNV

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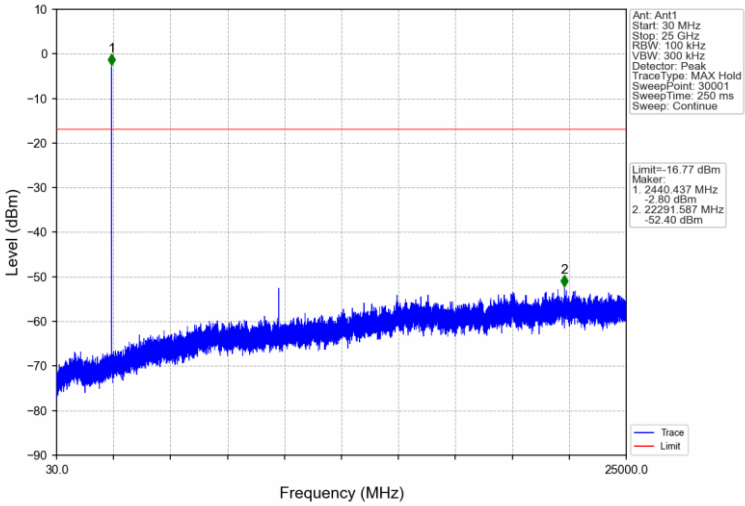
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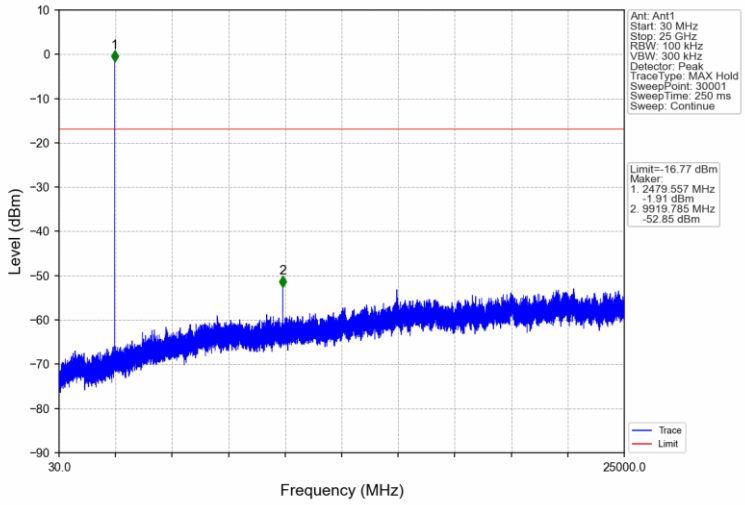

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9.8 Band Edge

Test Method

1. The RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously. Set the EUT to the lowest frequency channel.
3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector, Trace: Max hold, Sweep time: Coupled, Span: Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products that fall outside of the authorized band of operation. Allow the trace to stabilize.
4. Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge. Enable the marker-delta function, and then use the marker-to-peak function to move the marker to the peak of the in-band emission.
5. Set the EUT to the highest frequency channel and repeat step 2) to 4)
6. Enable the EUT hopping mode, repeat the test.

Limit:

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits.

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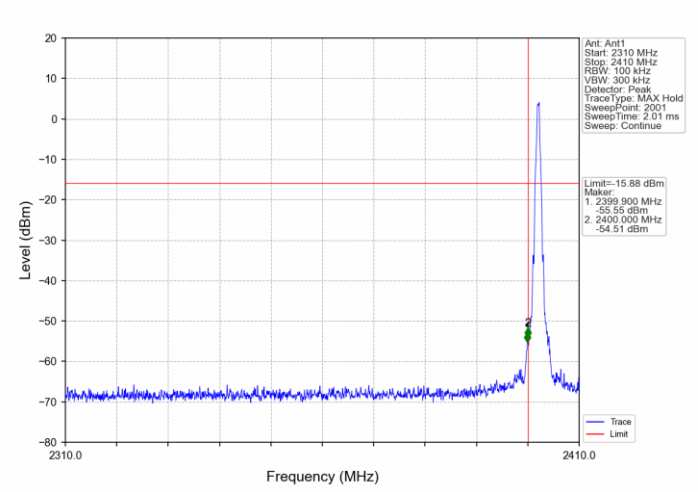
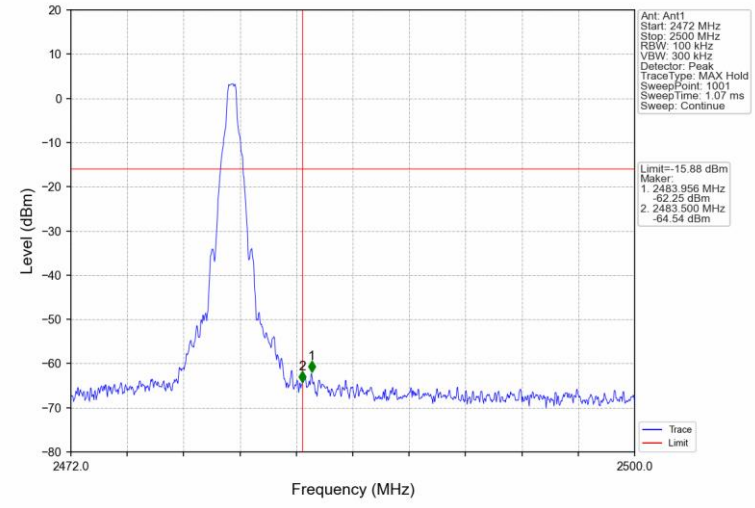
Band Edge

Mode	Frequency (MHz)	Packet Type	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	2402	DH5	4.12	<=-15.88	Pass
	2480	DH5	4.12	<=-15.88	Pass
	HOPP	DH5	4.12	<=-15.88	Pass
			4.12	<=-15.88	Pass
Pi/4DQPSK	2402	2DH5	3.20	<=-16.80	Pass
	2480	2DH5	3.20	<=-16.80	Pass
	HOPP	2DH5	3.20	<=-16.80	Pass
			3.20	<=-16.80	Pass
8DPSK	2402	3DH5	3.23	<=-16.77	Pass
	2480	3DH5	3.23	<=-16.77	Pass
	HOPP	3DH5	3.23	<=-16.77	Pass
			3.23	<=-16.77	Pass

GFSK_DH5_LCH_2402MHz_Ant_1_NTNV



GFSK_DH5_HCH_2480MHz_Ant_1_NTNV



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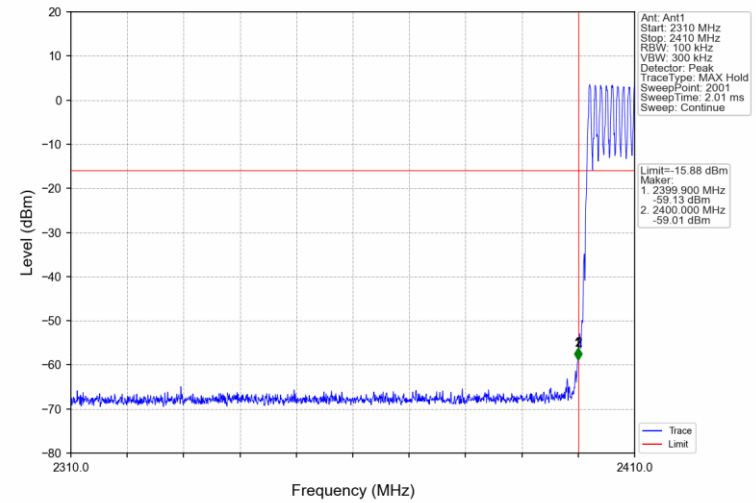
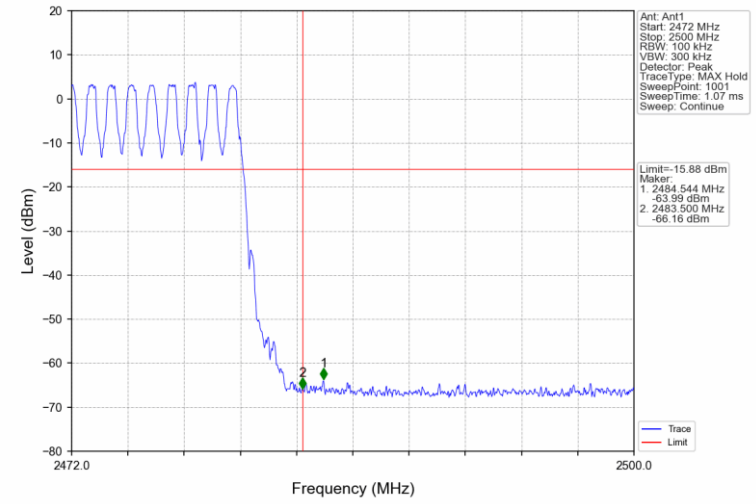
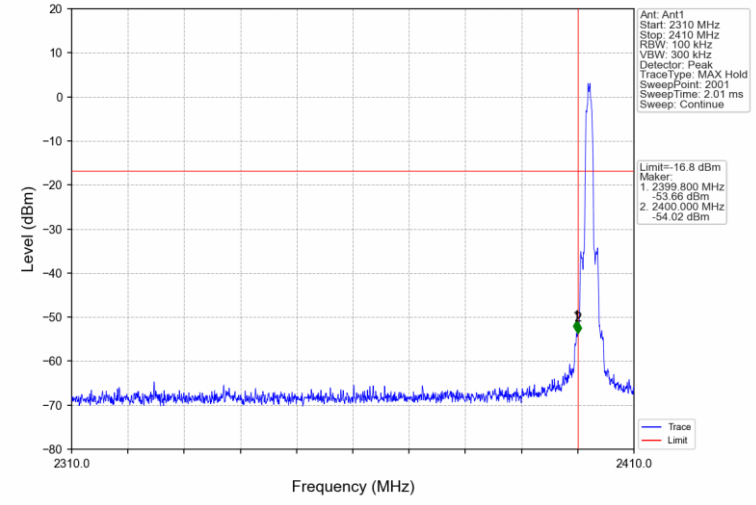
GFSK_DH5_HOPP_Ant_1_NTNV


GFSK_DH5_HOPP_Ant_1_NTNV


Pi/4DQPSK_2DH5_LCH_2402MHz_Ant_1_NTNV


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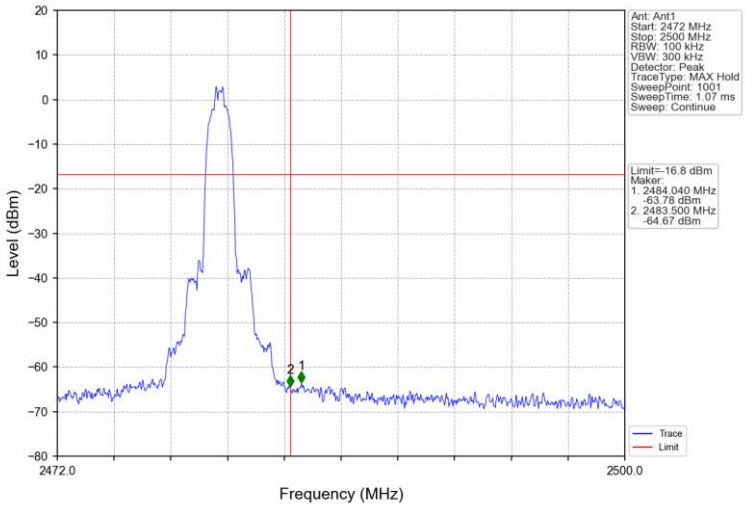
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant_1_NTNV

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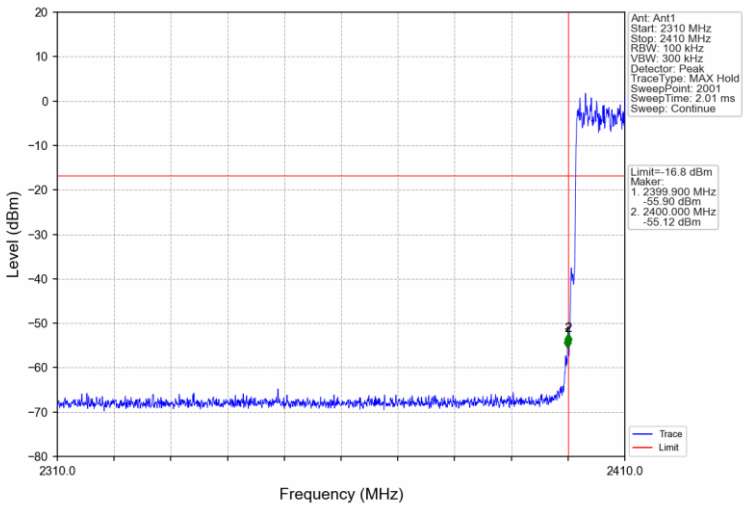
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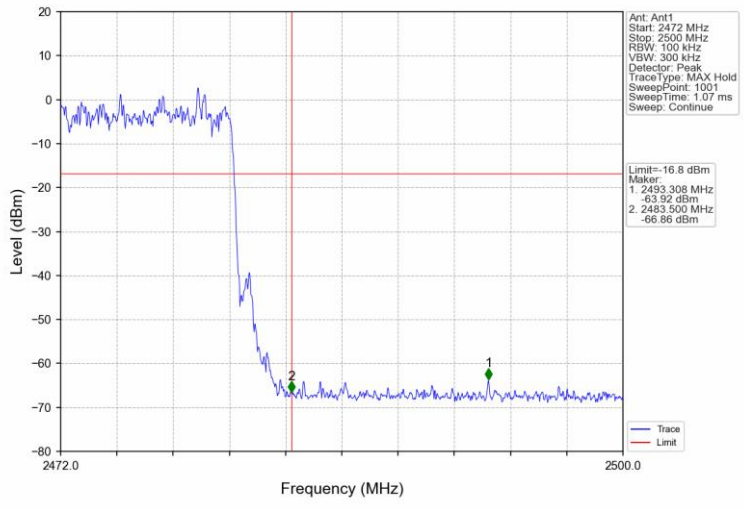

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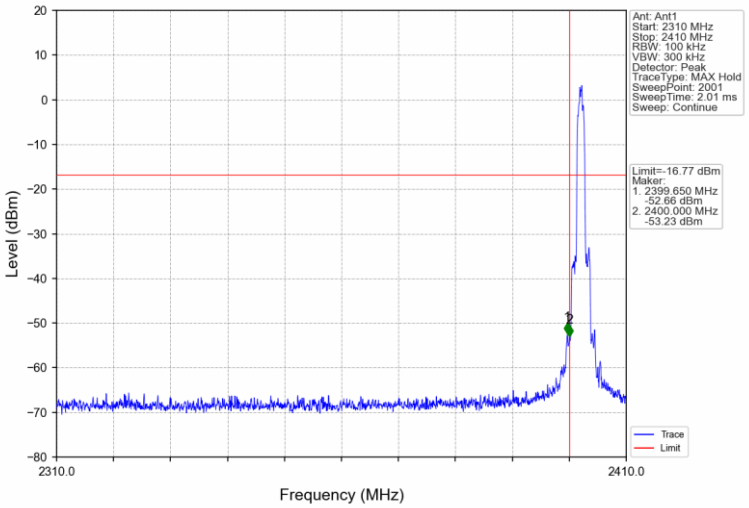
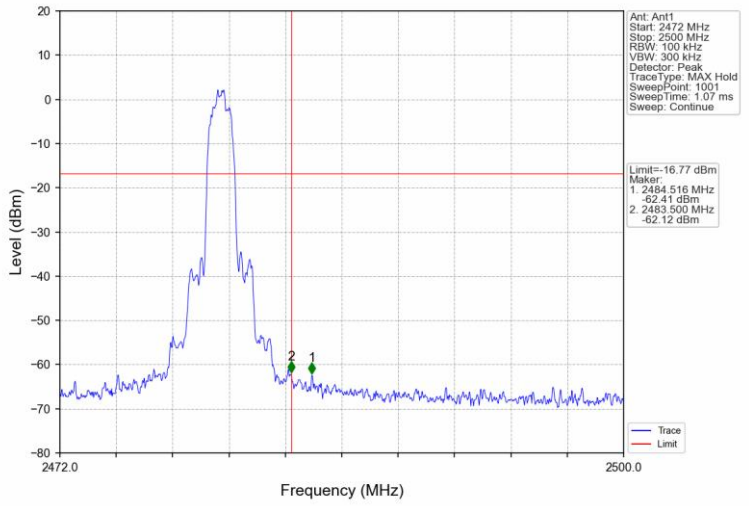
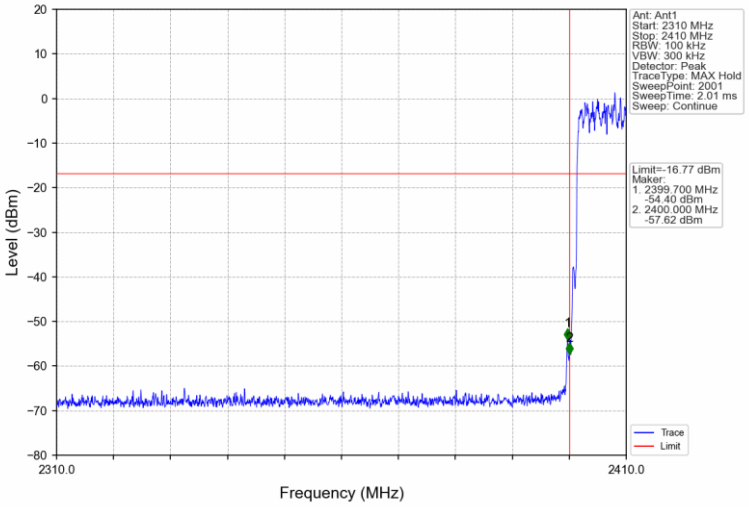
8DPSK_3DH5_LCH_2402MHz_Ant_1_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant_1_NTNV



8DPSK_3DH5_HOPP_Ant_1_NTNV



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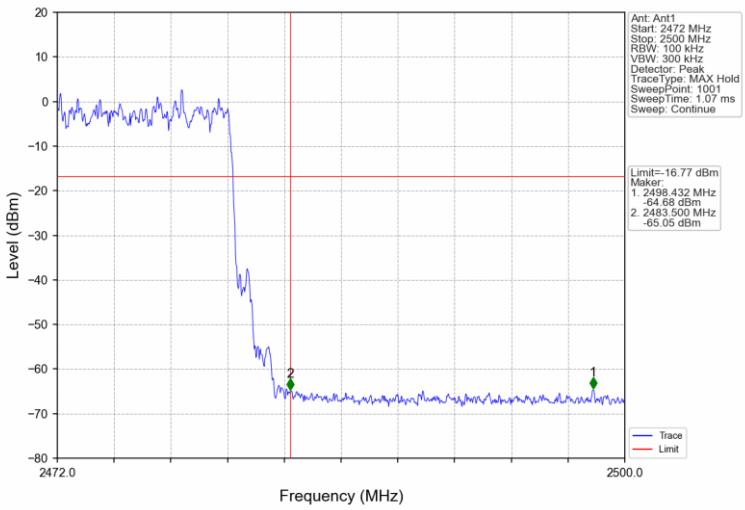
8DPSK_3DH5_HOPP_Ant_1_NTNV


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9.9 Spurious Radiated Emissions for Transmitter

Test Method

1. The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meters chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
4. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
5. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
6. Use the following test receiver settings According to C63.10:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz to 120KHz for f < 1 GHz; VBW≥ RBW; Sweep = auto; Detector function = QP; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥1 GHz for peak measurement.
   For average measurement:
   The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (20log(1/duty cycle)).
   The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
7. Repeat above procedures until all frequencies measured were complete.

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Spurious Radiated Emissions for Transmitter

Limit

The radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength μV/m	Field Strength dBμV/m	Detector	Measurement distance meters
0.009-0.490	2400/F(kHz)	48.5-13.8	AV	300
0.490-1.705	24000/F(kHz)	33.8-23.0	QP	30
1.705-30	30	29.5	QP	30
30-88	100	40	QP	3
88-216	150	43.5	QP	3
216-960	200	46	QP	3
960-1000	500	54	QP	3
Above 1000	500	54	AV	3
Above 1000	5000	74	PK	3

Note 1: Limit 3m(dBμV/m)=Limit 300m(dBμV/m)+40Log(300m/3m) (Below 30MHz)
Note 2: Limit 3m(dBμV/m)=Limit 30m(dBμV/m)+40Log(30m/3m) (Below 30MHz)

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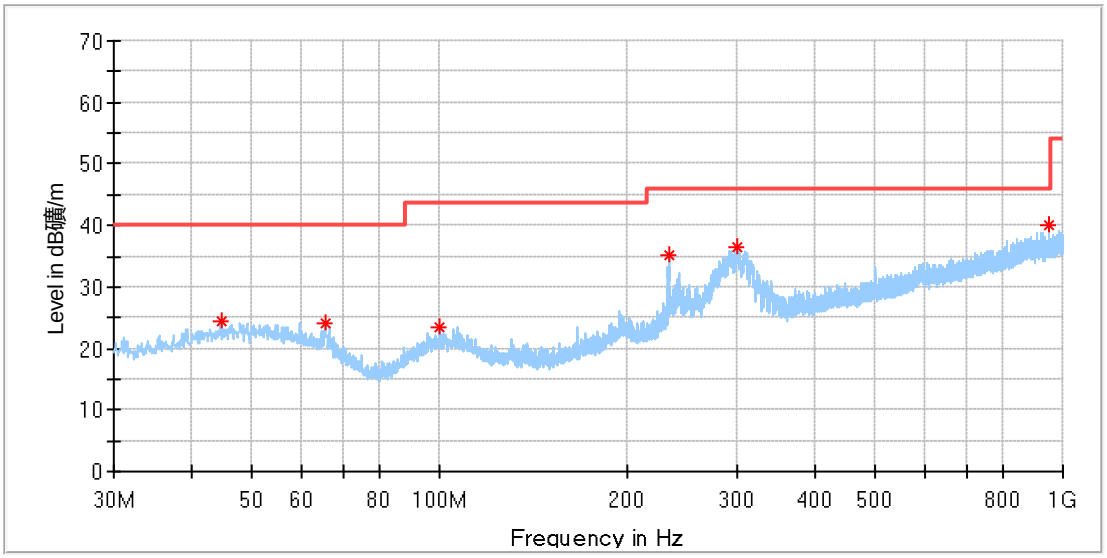
Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

The only worse case (which is subject to the maximum EIRP, 8DPSK mode) test result is listed in the report.

Transmitting spurious emission test result as below:

Test data_30MHz to 1000MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
44.731875	24.43	40.00	15.57	200.0	H	0.0	20.41
65.708125	24.20	40.00	15.80	100.0	H	359.0	18.03
99.961250	23.46	43.50	20.04	200.0	H	0.0	18.94
233.154375	35.16	46.00	10.84	100.0	H	264.0	19.78
300.569375	36.42	46.00	9.58	100.0	H	356.0	21.33
948.286875	40.06	46.00	5.94	100.0	H	78.0	32.20

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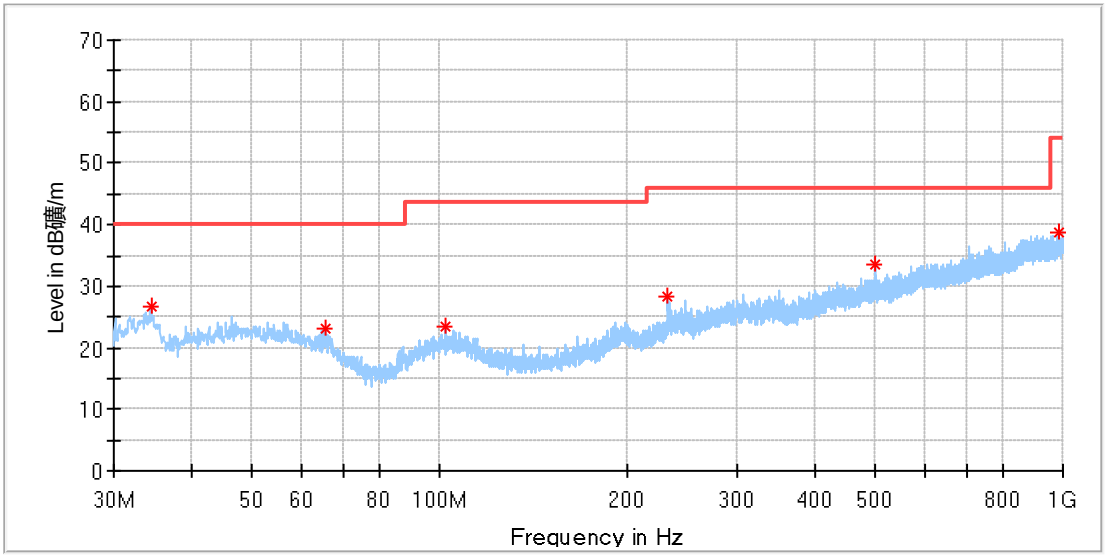

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
34.425625	26.76	40.00	13.24	100.0	V	151.0	17.21
65.465625	23.02	40.00	16.98	100.0	V	0.0	18.12
102.265000	23.41	43.50	20.09	100.0	V	73.0	19.14
232.548125	28.42	46.00	17.58	100.0	V	210.0	19.76
499.783125	33.63	46.00	12.37	100.0	V	7.0	25.92
987.814375	38.59	54.00	15.41	100.0	V	243.0	32.60

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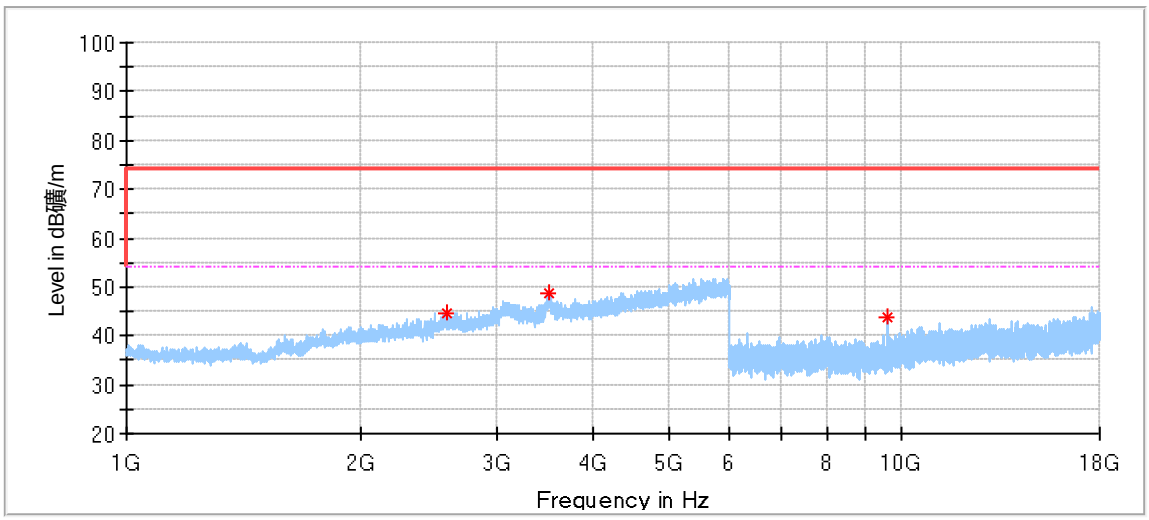
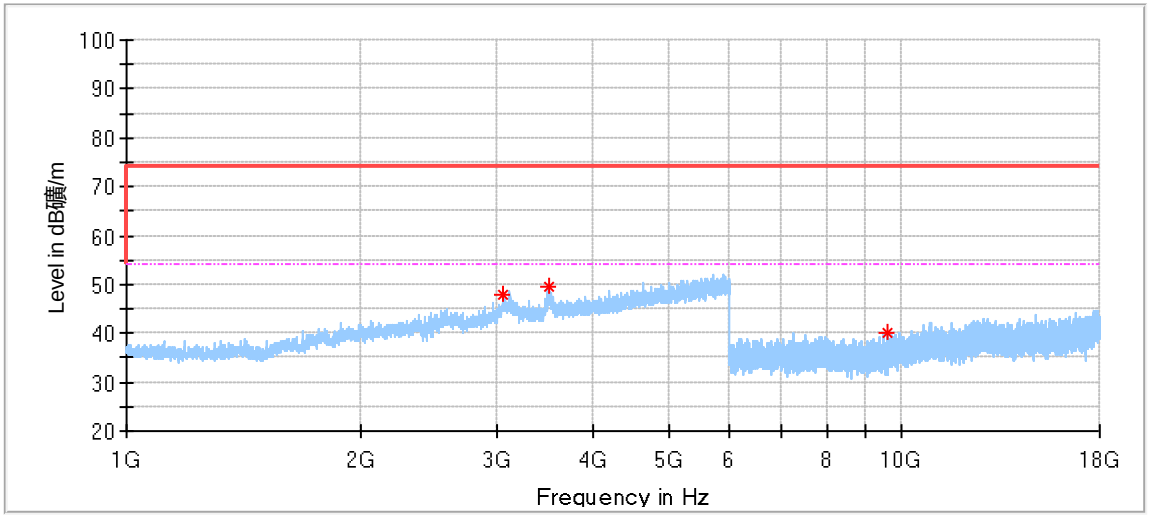
Test data 1GHz to 18GHz:
3DH5_Low Channel:



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2593.000000	44.64	74.00	29.36	150.0	H	0.0	-1.08
3498.000000	48.82	74.00	25.18	150.0	H	13.0	4.33
9608.000000	43.69	74.00	30.32	150.0	H	1.0	8.87



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3054.500000	48.09	74.00	25.91	150.0	V	267.0	1.63
3497.000000	49.35	74.00	24.65	150.0	V	123.0	4.25
9607.500000	40.13	74.00	33.87	150.0	V	43.0	8.87

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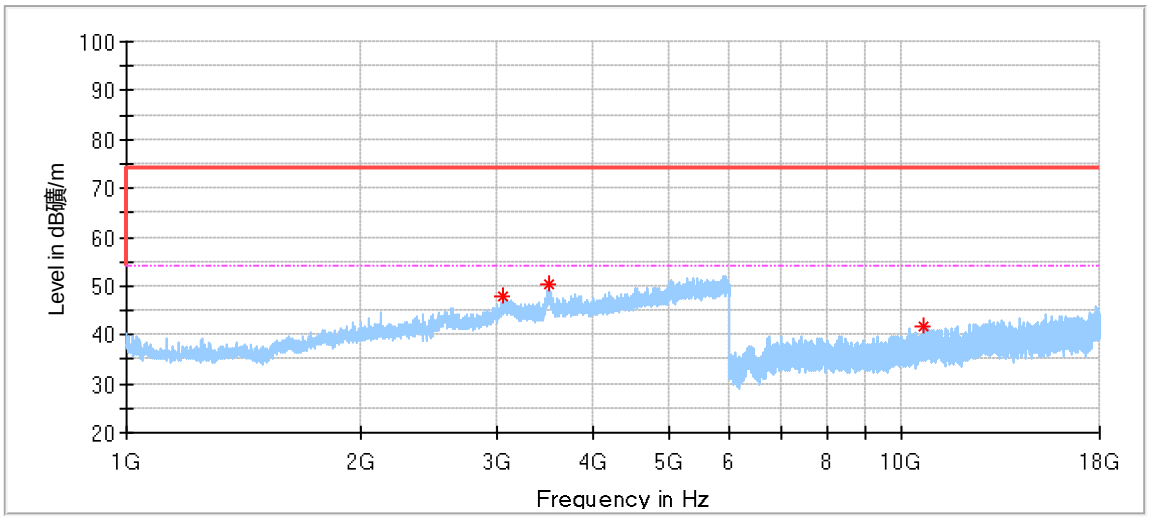
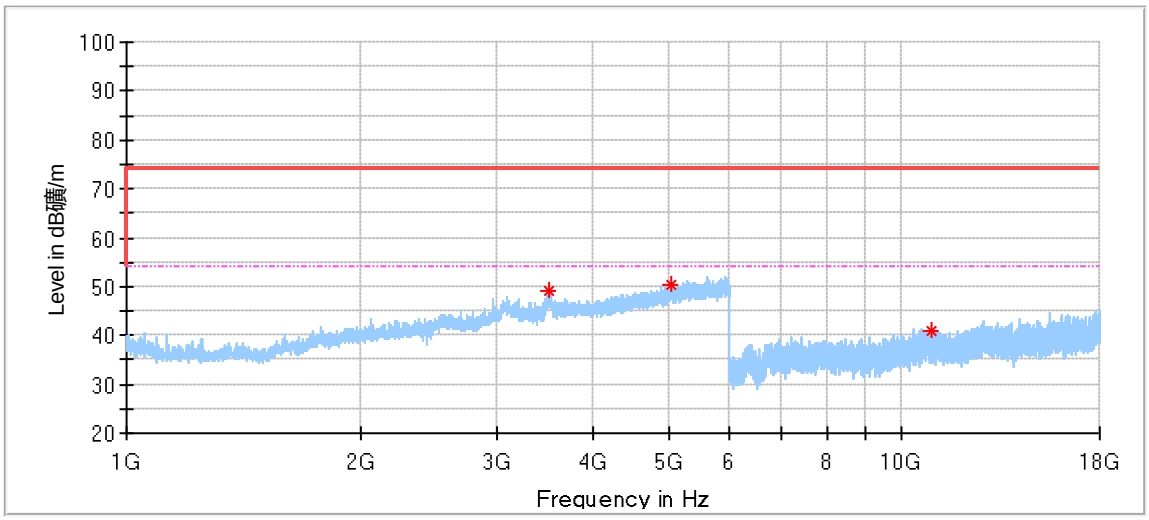
3DH5_Middle Channel:



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3067.000000	47.96	74.00	26.04	150.0	H	105.0	1.57
3509.500000	50.40	74.00	23.60	150.0	H	7.0	4.01
10639.000000	41.69	74.00	32.31	150.0	H	220.0	10.27



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3511.000000	48.94	74.00	25.06	150.0	V	130.0	3.93
5055.000000	50.43	74.00	23.57	150.0	V	332.0	5.83
10913.000000	40.51	74.00	33.49	150.0	V	218.0	10.85

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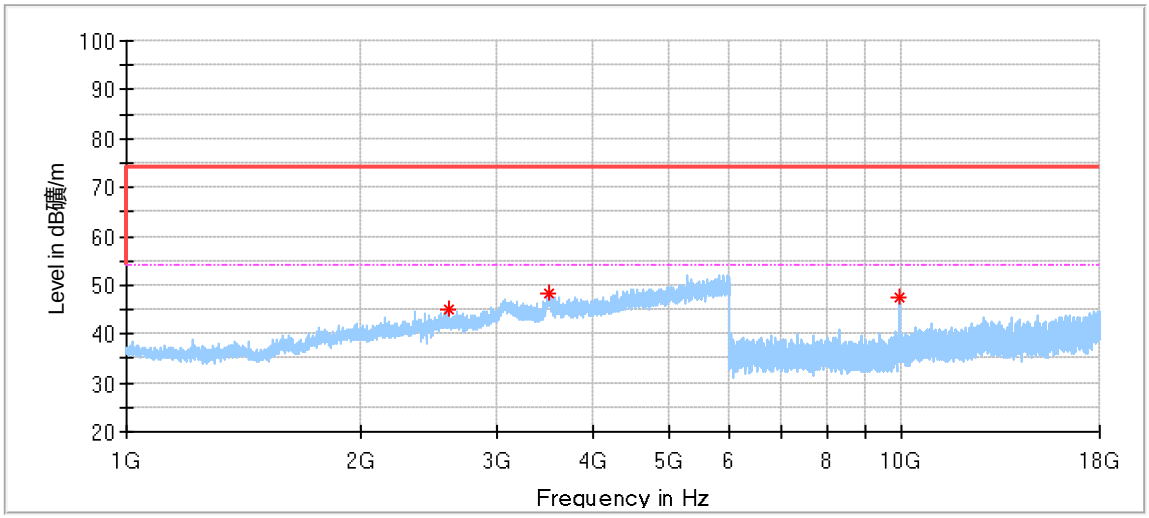
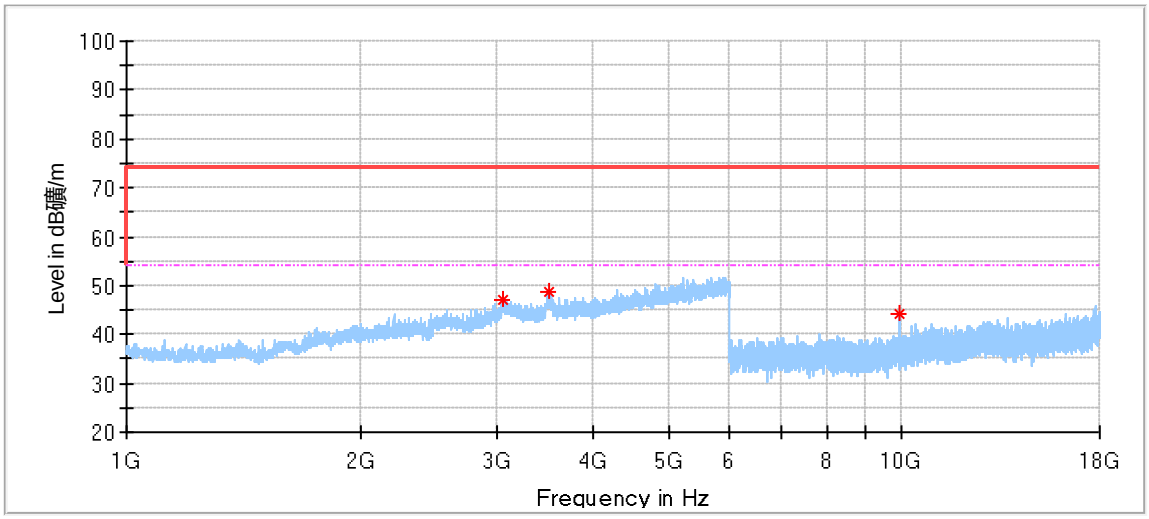
3DH5_Hight Channel:



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2601.000000	45.17	74.00	28.83	150.0	H	95.0	-1.05
3501.500000	48.26	74.00	25.74	150.0	H	75.0	4.41
9920.000000	47.48	74.00	26.52	150.0	H	57.0	9.39



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3051.500000	47.01	74.00	26.99	150.0	V	4.0	1.65
3503.000000	48.78	74.00	25.22	150.0	V	96.0	4.34
9920.000000	44.20	74.00	29.80	150.0	V	58.0	9.39

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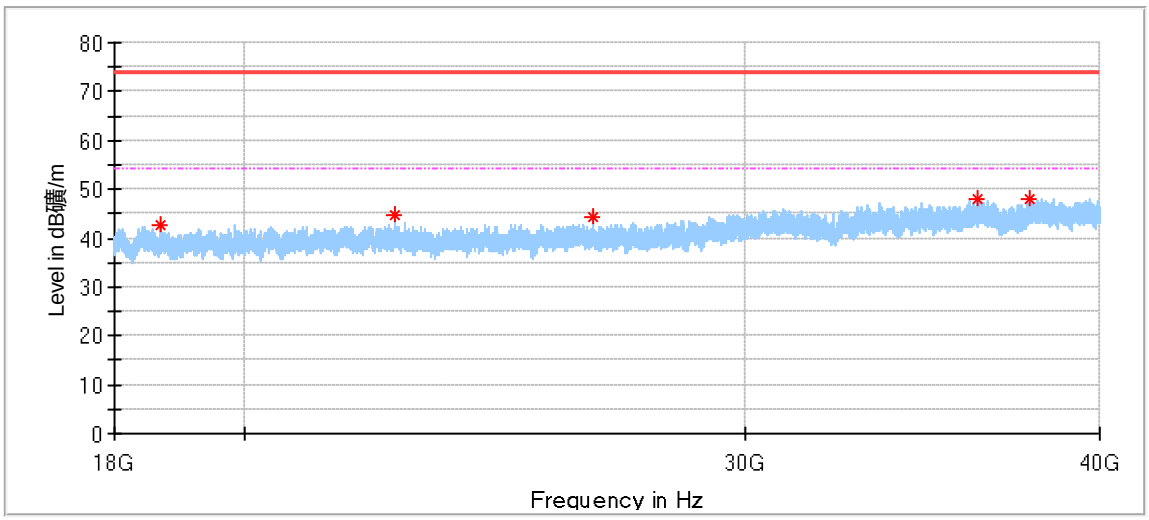
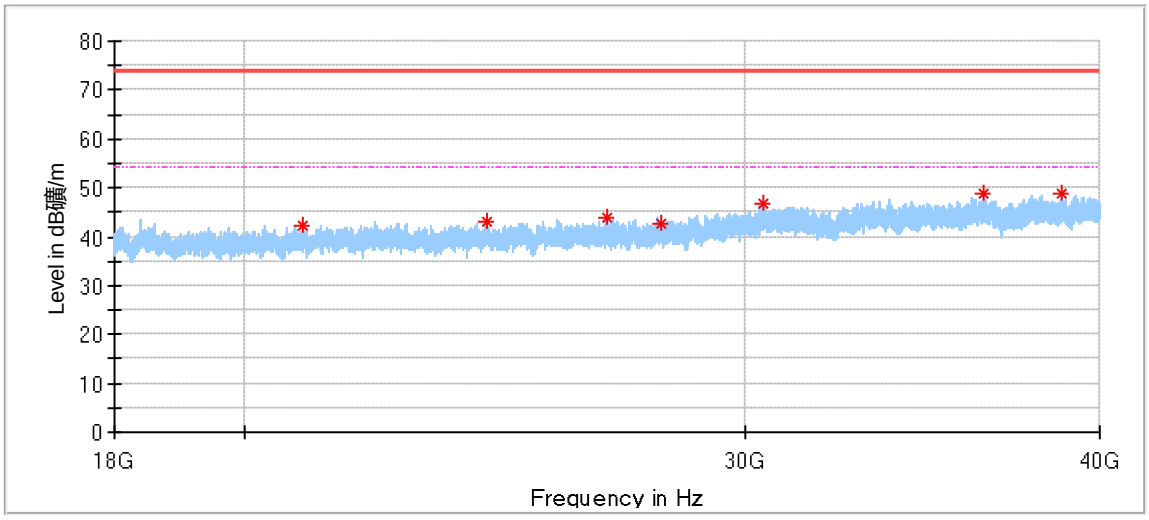
Test data 18GHz to 40GHz:
3DH5_Low Channel:



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18690.937500	42.62	74.00	31.38	150.0	H	84.0	-1.86
22579.437500	44.84	74.00	29.16	150.0	H	1.0	0.95
26536.000000	44.23	74.00	29.77	150.0	H	330.0	2.06
36223.562500	48.05	74.00	25.95	150.0	H	330.0	6.02
37821.312500	48.07	74.00	25.93	150.0	H	0.0	6.62



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
20981.000000	42.15	74.00	31.85	150.0	V	0.0	0.19
24337.375000	43.03	74.00	30.97	150.0	V	153.0	1.15
26819.937500	44.04	74.00	29.96	150.0	V	4.0	2.27
28054.687500	42.51	74.00	31.49	150.0	V	260.0	1.89
30434.812500	46.60	74.00	27.40	150.0	V	60.0	3.08
36422.937500	48.92	74.00	25.08	150.0	V	180.0	6.21
38787.250000	48.62	74.00	25.38	150.0	V	45.0	7.09

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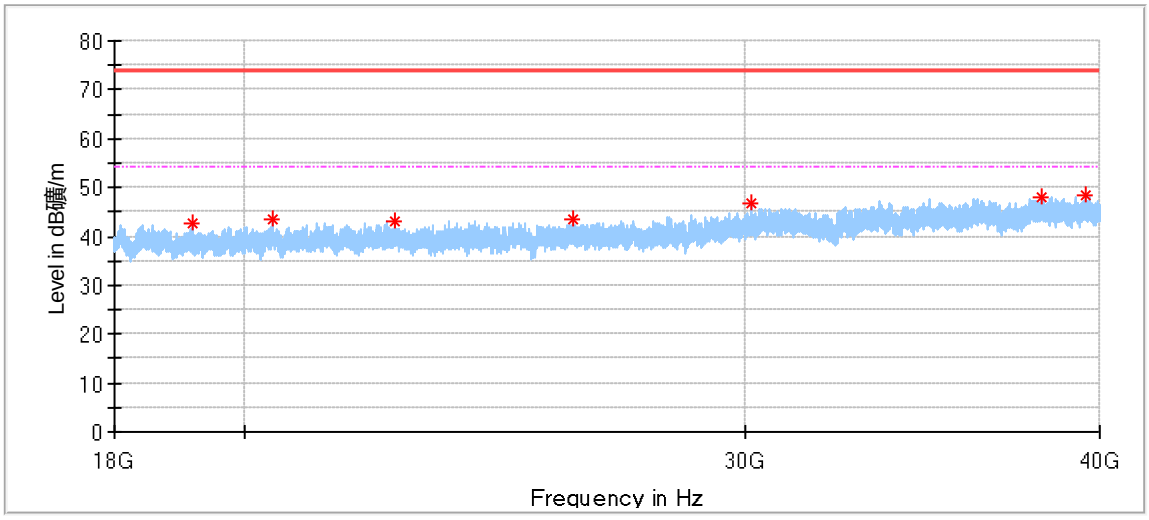
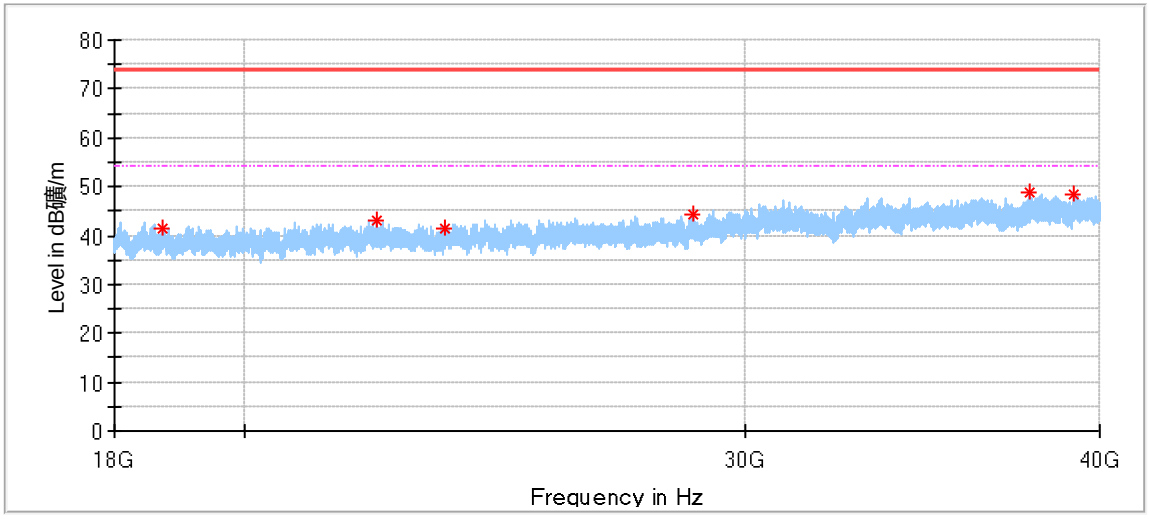
3DH5_Middle Channel:



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19162.562500	42.57	74.00	31.43	150.0	H	127.0	-1.83
20462.625000	43.42	74.00	30.58	150.0	H	0.0	-0.56
22607.625000	43.18	74.00	30.82	150.0	H	0.0	0.92
26097.375000	43.36	74.00	30.64	150.0	H	345.0	2.00
30138.500000	46.58	74.00	27.42	150.0	H	356.0	2.77
38141.687500	48.20	74.00	25.80	150.0	H	0.0	7.07
39564.812500	48.55	74.00	25.45	150.0	H	127.0	8.92



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18726.687500	41.29	74.00	32.71	150.0	V	113.0	-1.91
22263.187500	43.08	74.00	30.92	150.0	V	316.0	0.90
23544.687500	41.45	74.00	32.55	150.0	V	60.0	0.73
28755.250000	44.33	74.00	29.67	150.0	V	153.0	2.45
37795.875000	48.93	74.00	25.07	150.0	V	45.0	6.56
39175.687500	48.46	74.00	25.54	150.0	V	289.0	7.66

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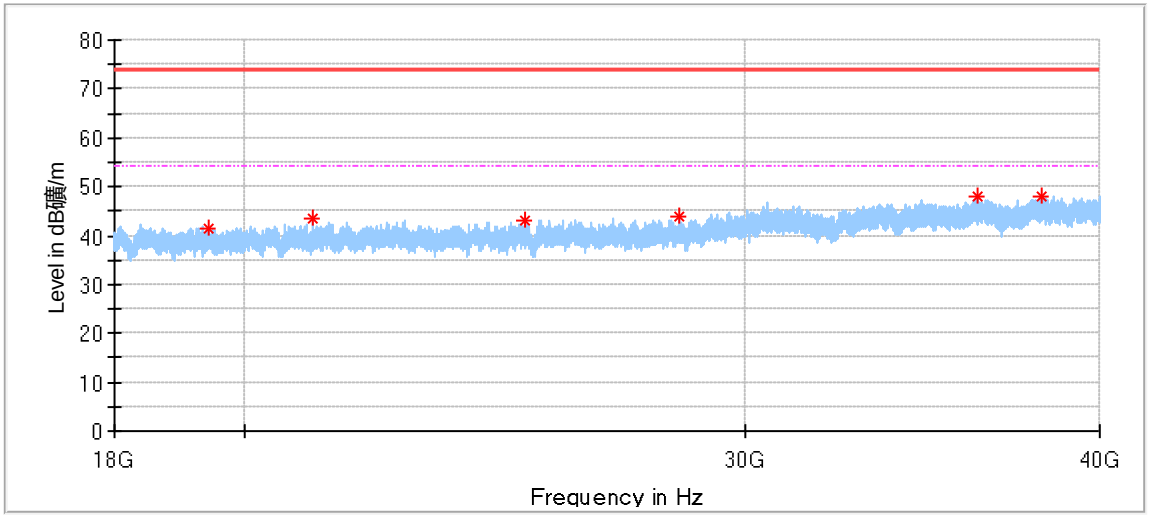
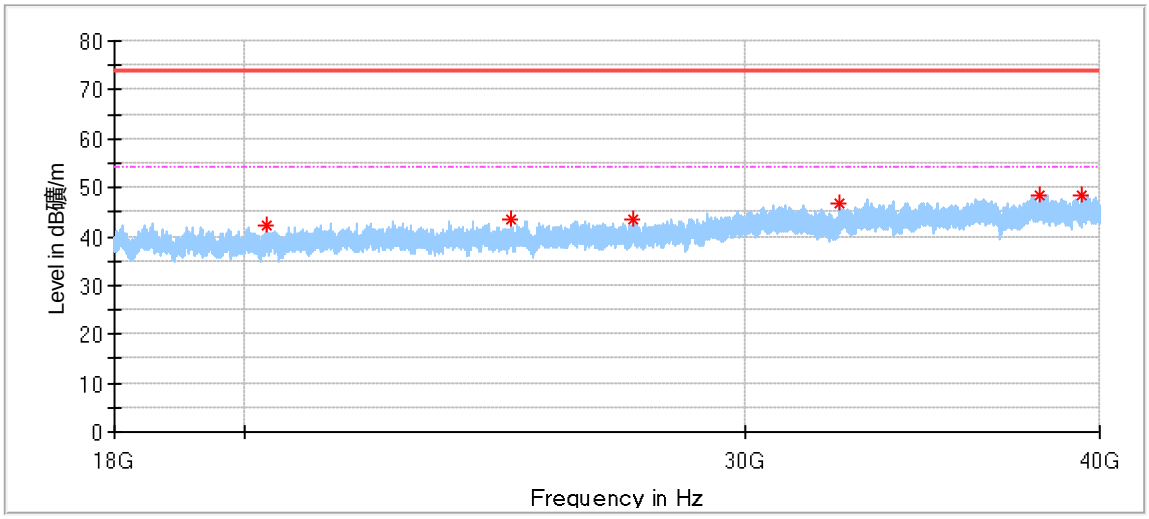
3DH5_Hight Channel:



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19423.812500	41.25	74.00	32.75	150.0	H	0.0	-1.55
21126.750000	43.38	74.00	30.62	150.0	H	0.0	0.32
25087.437500	43.01	74.00	30.99	150.0	H	0.0	1.75
28443.812500	43.92	74.00	30.08	150.0	H	330.0	2.12
36205.687500	48.06	74.00	25.94	150.0	H	0.0	6.01
38151.312500	48.03	74.00	25.97	150.0	H	204.0	7.07



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
20371.187500	42.15	74.00	31.85	150.0	V	0.0	-0.72
24813.812500	43.45	74.00	30.56	150.0	V	90.0	1.39
27396.062500	43.56	74.00	30.44	150.0	V	130.0	2.24
32407.250000	46.88	74.00	27.12	150.0	V	251.0	3.36
38098.375000	48.30	74.00	25.70	150.0	V	359.0	7.06
39430.062500	48.54	74.00	25.46	150.0	V	130.0	8.50

Remark:

(1) Data of measurement within frequency range 9kHz-30MHz are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so test data does not present in this report.

(2) Corrected Amplitude = Read level + Corrector factor
Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss

10 Test Equipment List

List of Test Instruments

Conducted Emission 2# Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	68-4-74-19-002	102590	1	2024-5-19
LISN	Rohde & Schwarz	ENV216	68-4-87-19-001	102472	1	2024-5-20
Attenuator	Shanghai Huaxiang	TS2-26-3	68-4-81-16-003	080928189	1	2024-5-19
Test software	Rohde & Schwarz	EMC32	68-4-90-19-005-A01	Version10.35.02	N/A	N/A
Shielding Room	TDK	CSR #2	68-4-90-19-005	----	3	2025-10-15

Radiated Emission 1# Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 7	68-4-74-19-001	102176	1	2024-5-20
Loop Antenna	Rohde & Schwarz	HFH2-Z2	68-4-80-14-006	100398	1	2024-8-7
3m Semi-anechoic chamber	TDK	SAC-3 #1	68-4-90-14-001	----	3	2024-5-28
Test software	Rohde & Schwarz	EMC32	68-4-90-14-001-A10	Version10.35.02	N/A	N/A

Radiated Emission 2# Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	68-4-74-14-002	101269	1	2024-5-20
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9162	68-4-80-19-003	284	1	2024-3-5
Wave Guide Antenna	ETS	3117	68-4-80-19-001	00218954	1	2024-4-26
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-001	100745	1	2024-5-19
Sideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	68-4-80-14-008	12827	1	2024-7-11
Pre-amplifier	Rohde & Schwarz	SCU 40A	68-4-29-14-002	100432	1	2024-8-1
Attenuator	Mini-circuits	UNAT-6+	68-4-81-21-002	15542	1	2024-5-19
3m Semi-anechoic chamber	TDK	SAC-3 #2	68-4-90-19-006	----	2	2024-5-28
Test software	Rohde & Schwarz	EMC32	68-4-90-19-006-A01	Version10.35.02	N/A	N/A

RF Conducted Test

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Cal interval (year)	Cal. due date
Signal Analyzer	Rohde & Schwarz	FSV40	68-4-74-14-004	101030	1	2024-5-19
Test software	TST PASS	System for BT/WIFI	68-4-93-23-001-A03	Version 2.0	N/A	N/A
Shielding Room	TDK	TS8997	68-4-90-19-003	----	3	2025-10-15

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Conducted Emission in new shielding room (68-4-90-19-005) 150kHz-30MHz (for test using AMN ENV216)	3.15dB
Uncertainty for Radiated Emission in 3m chamber (68-4-90-14-001) 9kHz-30MHz	4.70dB
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 30MHz-1000MHz	Horizontal: 4.63dB; Vertical: 4.78dB;
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 1000MHz-18000MHz	Horizontal: 5.38dB; Vertical: 5.38dB;
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 18GHz-40GHz	Horizontal: 5.29dB; Vertical: 5.29dB;
Uncertainty for Conducted RF test with TS 8997	RF Power Conducted: 1.31dB Frequency test involved: 0.6×10^{-8} or 1%

Measurement Uncertainty Decision Rule:
Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2023, clause 4.3.3 and 4.3.4.

THE END

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