

TEST REPORT

Applicant: GT-tronics HK Limited
Address: Unit 10, 2/F., Block B, Tonic Industrial Center 19
Lam Hing Street, Kowloon Bay, Kowloon, Hong Kong
Equipment Type: GT-tronics QCC Bluetooth Module
Model Name: QC356FNB-S (refer to section 2.3)
Brand Name: GT-tronics
FCC ID: B4O-QC35XFNX
Test Standard: 47 CFR Part 15 Subpart C
(refer to section 3.1)
Sample Arrival Date: Dec. 30, 2022
Test Date: Jan. 05, 2023 - Jul. 13, 2023
Date of Issue: Aug. 22, 2023

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Julie Zhu**Checked by:** Ye Hongji**Approved by:** Liao Jianming
(Technical Director)

Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Aug. 22, 2023</u>	<u>Initial Issue</u>

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☒ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	GT-tronics HK Limited
Address	Unit 10, 2/F., Block B, Tonic Industrial Center 19 Lam Hing Street, Kowloon Bay, Kowloon, Hong Kong

2.2 Manufacturer Information

Manufacturer	GT-tronics HK Limited
Address	B210, Tonic Industrial Center, 19 Lam Hing Street, Kowloon Bay, Hong Kong

2.3 General Description for Equipment under Test (EUT)

EUT Name	GT-tronics QCC Bluetooth Module
Model Name Under Test	QC356FNB-S
Series Model Name	QC356FNA, QC356FNB, QC350FNA, QC350FNB, QCC350FNB-S, QC551FNA, QCC551FNB, QC551FNB-S, QCCx5xFNx, QCCx4xFNx, QCCx5xFPx, QCCx4xFPx, QCCx5xFCx, QCCx4xFCx, QCCx5xFEx, QCCx4xFEx
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name. (this information provided by the applicant)
Hardware Version	v1.0
Software Version	v1.0
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

Network and Wireless connectivity	Bluetooth (BR+EDR+BLE)
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The requirement for the following technical information of the EUT was tested in this report:

Modulation Technology	FHSS	
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8-DPSK	
Product Type	☒ Mobile ☐ Portable ☐ Fix Location	
Transfer Rate	DH5: 1 Mbps 2DH5: 2 Mbps 3DH5: 3 Mbps	
Frequency Range	The frequency range used is 2400 MHz to 2483.5 MHz.	
Number of Channel	79 (at intervals of 1 MHz)	
Tested Channel	0 (2402 MHz), 39 (2441 MHz), 78 (2480 MHz)	
Antenna Type/ Antenna Gain	Antenna Type	Antenna Gain
	Ceramic Chip Antenna	2.00 dBi
	Metal Antenna	2.71 dBi
	PCB Antenna	-0.30 dBi
	Dipole Antenna 1	3.00 dBi
	Dipole Antenna 2	2.00 dBi
	Dipole Antenna 3	2.00 dBi
Antenna Impedance	50 Ω	
Antenna System (MIMO Smart Antenna)	N/A	

All channel was listed on the following table:

Channel number	Freq. (MHz)	Channel number	Freq. (MHz)	Channel number	Freq. (MHz)	Channel number	Freq. (MHz)
0	2402	21	2423	42	2444	63	2465
1	2403	22	2424	43	2445	64	2466
2	2404	23	2425	44	2446	65	2467
3	2405	24	2426	45	2447	66	2468
4	2406	25	2427	46	2448	67	2469
5	2407	26	2428	47	2449	68	2470
6	2408	27	2429	48	2450	69	2471
7	2409	28	2430	49	2451	70	2472
8	2410	29	2431	50	2452	71	2473
9	2411	30	2432	51	2453	72	2474
10	2412	31	2433	52	2454	73	2475
11	2413	32	2434	53	2455	74	2476
12	2414	33	2435	54	2456	75	2477
13	2415	34	2436	55	2457	76	2478
14	2416	35	2437	56	2458	77	2479
15	2417	36	2438	57	2459	78	2480
16	2418	37	2439	58	2460	-	-
17	2419	38	2440	59	2461	-	-
18	2420	39	2441	60	2462	-	-
19	2421	40	2442	61	2463	-	-
20	2422	41	2443	62	2464	-	-

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C	Intentional radiators of radio frequency equipment
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
3	KDB 558074 D01 15.247 Meas Guidance v05r02	Guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules

3.2 Test Verdict

No.	Description	FCC Part No.	Channel	Test Result	Verdict	Remark
1	Antenna Requirement	15.203	N/A	--	Pass	Note ¹
2	Number of Hopping Frequencies	15.247(a)	Hopping Mode	ANNEX A.1	Pass	Note ²
3	Peak Output Power	15.247(b)	Low/Middle/High	ANNEX A.2	Pass	--
4	Occupied Bandwidth	15.247(a)	Low/Middle/High	ANNEX A.3	Pass	Note ²
5	Carrier Frequency Separation	15.247(a)	Hopping Mode	ANNEX A.4	Pass	Note ²
6	Time of Occupancy (Dwell time)	15.247(a)	Hopping Mode	ANNEX A.5	Pass	Note ²
7	Conducted Spurious Emission & Authorized-band band-edge	15.247(d)	Hopping Mode; Low/Middle/High	ANNEX A.6	Pass	Note ²
8	Conducted Emission	15.207	Low/Middle/High	ANNEX A.7	Pass	Note ²
9	Radiated Spurious Emission	15.209 15.247(d)	Low/Middle/High	ANNEX A.8	Pass	Note ²
10	Band Edge(Restricted-band band-edge)	15.209 15.247(d)	Low/High	ANNEX A.9	Pass	Note ²

Note ¹: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203.

Note ²: $\pi/4$ -DQPSK is the EDR 2M rate mode, 8-DPSK is the EDR 3M rate mode. The consistency of test results in $\pi/4$ -DQPSK and 8-DPSK is very high. So we chose 8-DPSK as a typical representative to appear on the report. Another we will show all the modes on the RF output power test item.

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

Relative Humidity	51% to 63%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+20.3°C to +23.4°C
Working Voltage of the EUT	NV (Normal Voltage)	5 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	KEYSIGHT	N9020A	MY46471071	2022.07.26	2023.07.25
Spectrum Analyzer	KEYSIGHT	N9020A	MY50531259	2022.09.06	2023.09.05
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	02460	2021.05.19	2024.05.08
Test Antenna-Horn	A-INFO	LB-180400KF	J211060273	2021.07.02	2024.07.01
Anechoic Chamber	RAINFORD	9m*6m*6m	140	2021.08.16	2024.08.15
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2022.09.09	2023.09.08
Test Antenna-Loop	SCHWARZBECK	FMZB 1519	1519-037	2021.04.16	2024.04.15
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60*7.35m	130	2021.08.15	2024.08.14
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2022.09.09	2023.09.08
LISN	SCHWARZBECK	NSLK 8127	8127-687	2022.06.01	2023.05.31
				2023.05.16	2024.05.15
Shielded Enclosure	YiHeng Electronic Co., Ltd	3.5m*3.1m*2.8m	112	2022.02.19	2025.02.18
EMI Receiver	Agilent	N9038A	MY55330120	2022.09.09	2023.09.08
Amplifier	COM-MV	ZT30-1000M	B2017119081	2022.09.09	2023.09.08
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	9168-00867	2022.04.12	2025.04.11
Anechoic Chamber	YiHeng	9m*6m*6m	142	2022.02.19	2024.08.18
Amplifier	COM-MV	LSCX_LNA1-12G-01	180602	2020.09.08	2023.09.07
Amplifier	COM-MV	XKu_LNA7-18G-01	180601	2020.09.08	2023.09.07
Amplifier	COM-MV	KA_LNA18-40G-01	18050001	2020.09.08	2023.09.07

4.3 Test Software List

Description	Manufacturer	Software Version	Serial No.	Applicable test Setup
BL410R	BALUN	V2.1.1.488	N/A	The section 4.5.1
BL410E	BALUN	V22.930	N/A	The section 4.5.2&4.5.3&4.5.4&4.5.5

4.4 Measurement Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Parameters	Uncertainty
Occupied Channel Bandwidth	2.8%
RF output power, conducted	1.28 dB
Power Spectral Density, conducted	1.30 dB
Unwanted Emissions, conducted	1.84 dB
All emissions, radiated	5.36 dB
Temperature	0.8 °C
Humidity	4 %

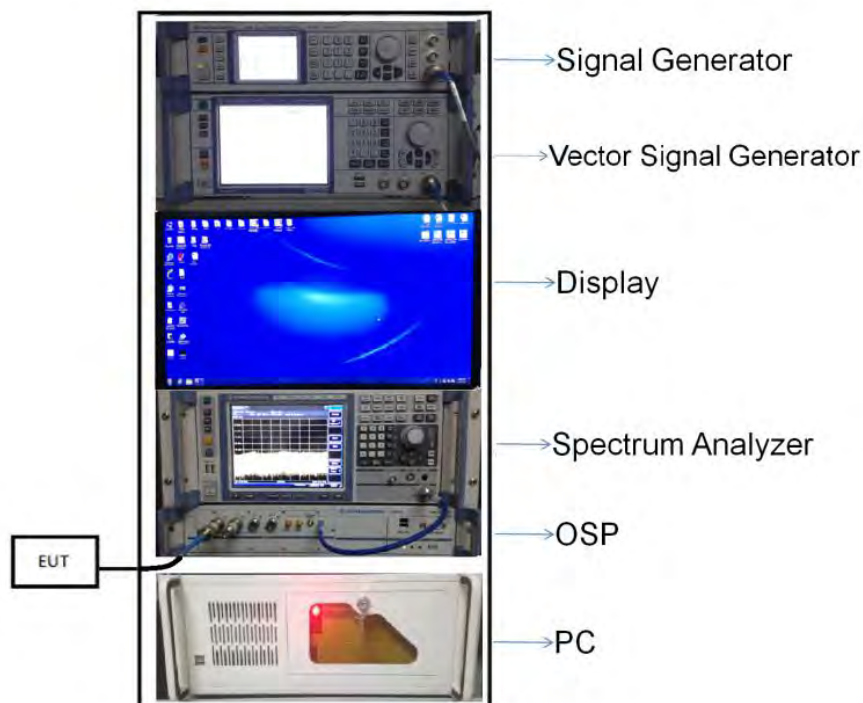
4.5 Description of Test Setup

4.5.1 For Antenna Port Test

Conducted value (dBm) = Measurement value (dBm) + cable loss (dB)

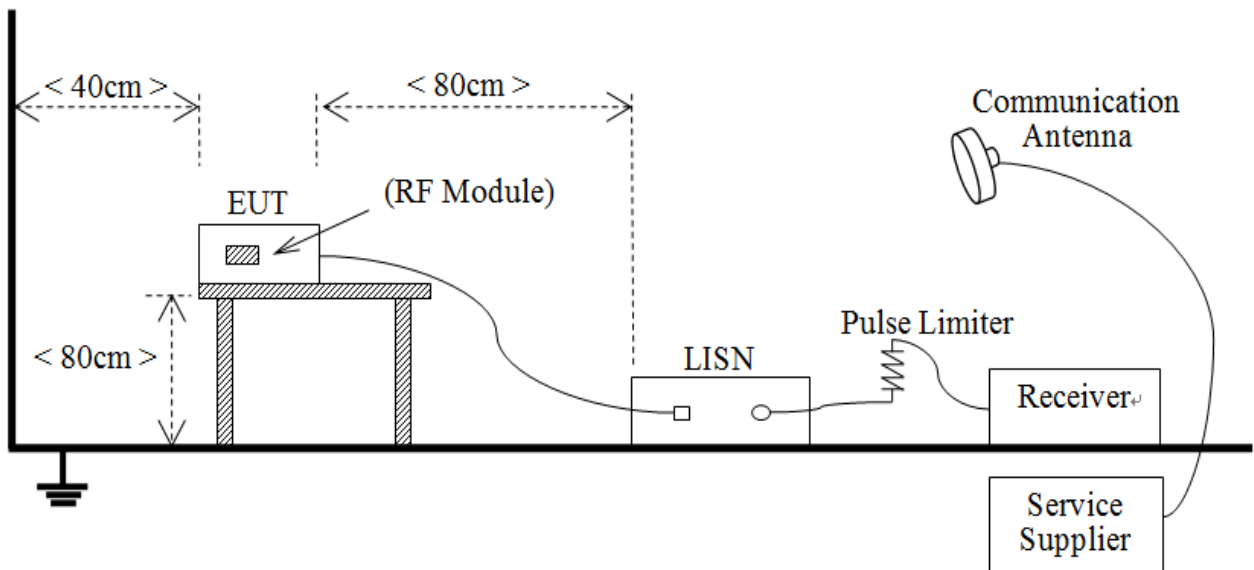
For example: the measurement value is 10 dBm and the cable 0.5dBm used, then the final result of EUT:

Conducted value (dBm) = 10 dBm + 0.5 dB = 10.5 dBm



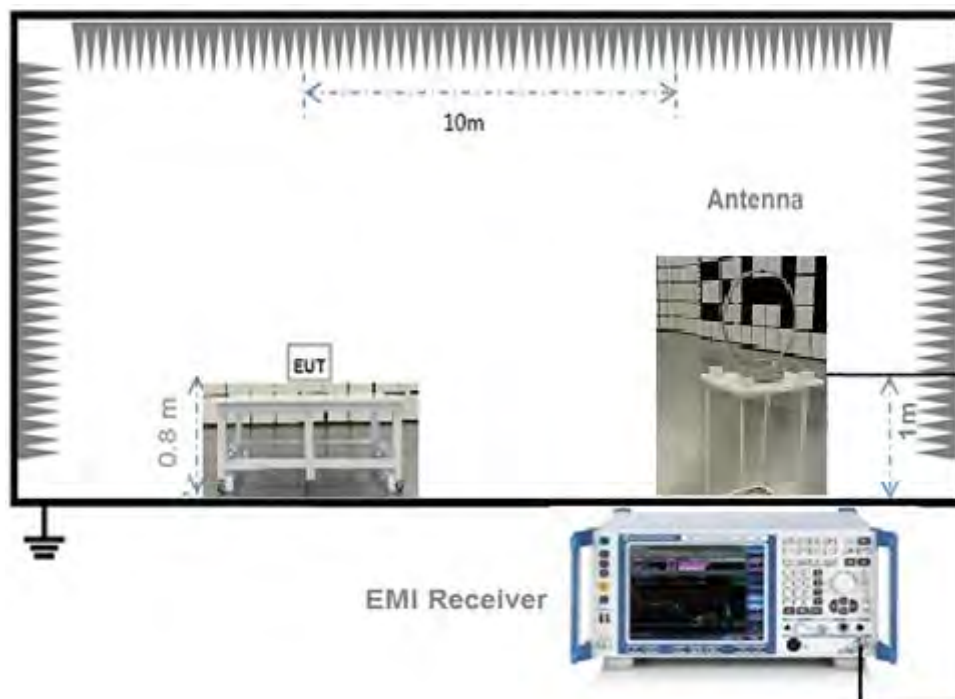
(Diagram 1)

4.5.2 For AC Power Supply Port Test



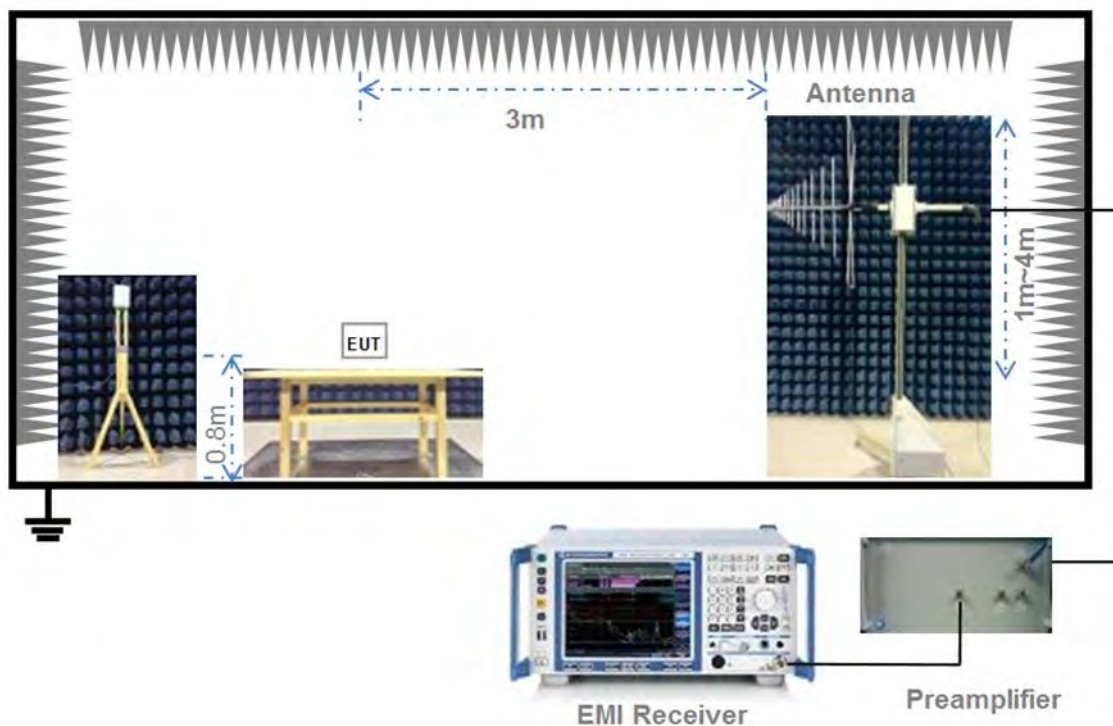
(Diagram 2)

4.5.3 For Radiated Test (Below 30 MHz)



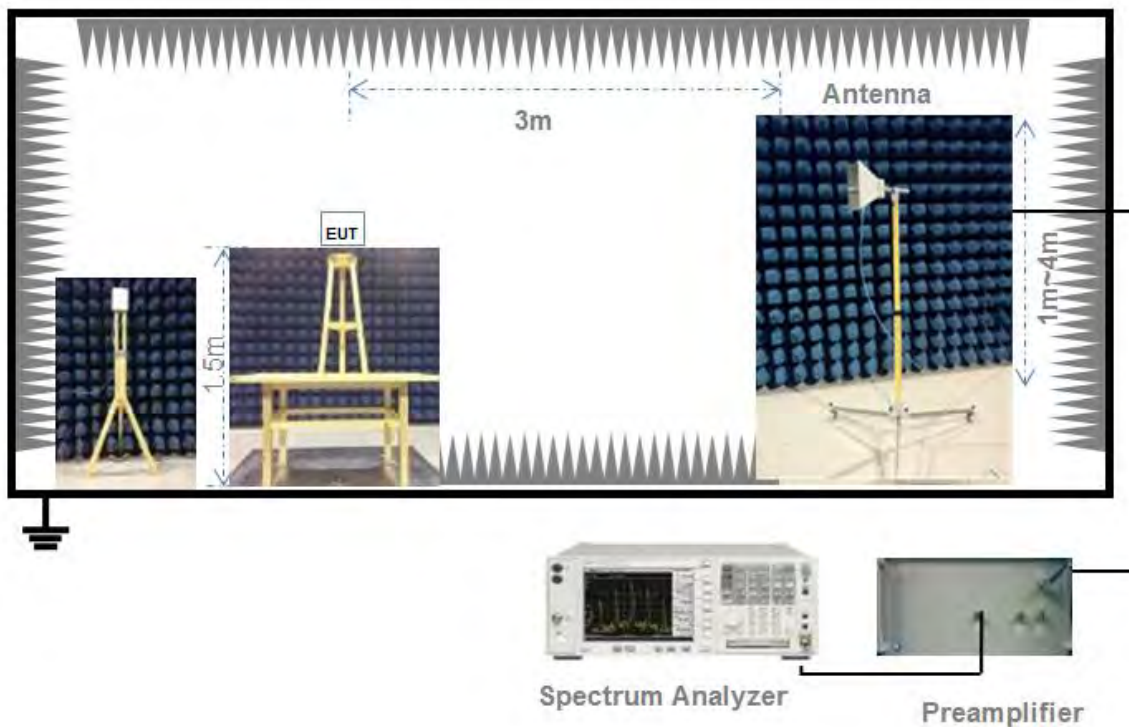
(Diagram 3)

4.5.4 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)

4.5.5 For Radiated Test (Above 1 GHz)



(Diagram 5)

4.6 Measurement Results Explanation Example

4.6.1 For conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

5 TEST ITEMS

5.1 Antenna Requirements

5.1.1 Relevant Standards

FCC §15.203 & 15.247(b)

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

5.1.2 Antenna Anti-Replacement Construction

The Antenna Anti-Replacement as following method:

Protected Method	Description
The antenna is embedded in the product.	An embedded-in antenna design is used.

Reference Documents	Item
Photo	Please refer to the EUT Photo documents.

5.1.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

5.2 Frequency Hopping Systems

5.2.1 Relevant Standards

FCC §15.247(a) (1) (i) (ii) (iii) (iv); FCC §15.247(g); FCC §15.247(h)

Describe how the hopping sequence is generated. Provide an example of the hopping sequence channels, to demonstrate that the sequence meets the requirement specified in the definition of an FHSS system. Per the definition in Section 2.1(c), the hop set shall appear as random in the near term, shall appear as evenly distributed in the long term, and sequential hops shall be randomly distributed in both direction and magnitude of change.

Describe how each individual EUT meets the requirement that each of its hopping channels is used equally on average (e.g., that each new transmission event begins on the next channel in the hopping sequence after the final channel used in the previous transmission event).

Describe how the associated receiver(s) complies with the requirement that the input bandwidth (either RF or IF) matches the bandwidth of the transmitted signal.

Describe how the associated receiver(s) has the ability to shift frequencies in synchronization with the transmitted signals.

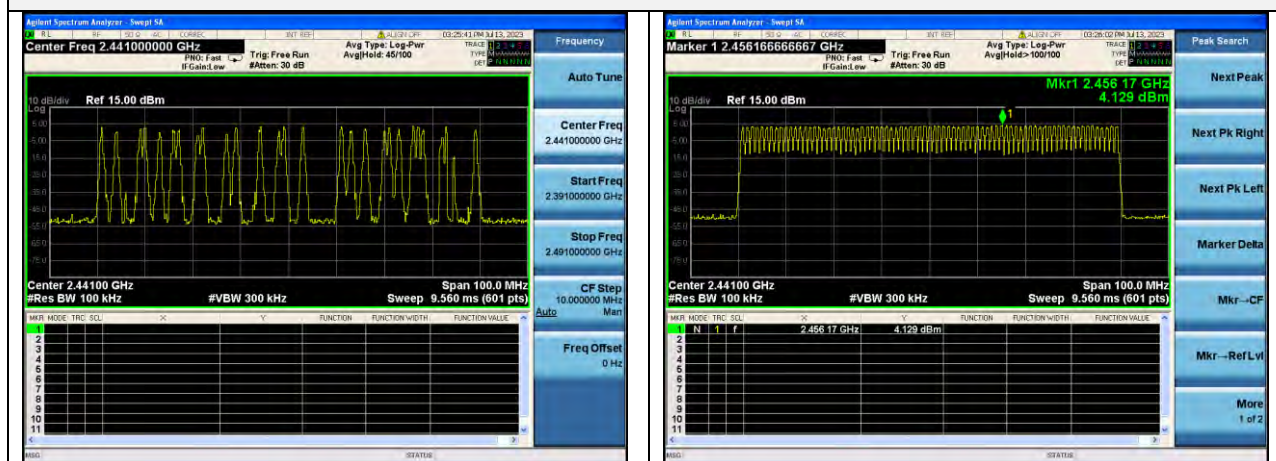
For short burst systems, describe how the EUT complies with the requirement that it be designed to be capable of operating as a true frequency hopping system. Specifically, the device shall comply with the equal frequency use and pseudorandom hopping sequence requirement when transmitting in short bursts, and shall be designed to comply when presented with continuous data (or information) stream.

Describe how the EUT complies with the requirement that it not have the ability to be coordinated with other FHSS systems in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

5.2.2 Description of the systems

1. According to the preset procedure of the whole network, all the stations in the automatic control network synchronously change the frequency multiple times within one second, and temporarily stay on each frequency hopping channel. Periodic synchronization signaling is sent from the primary station, instructing all slaves to simultaneously change the operating frequency, then the hopping sequence is generated.
2. The hop set shall appear as random in the near term, shall appear as evenly distributed in the long term, and sequential hops shall be randomly distributed in both direction and magnitude of change.

Reference Documents



3. Channels are classified into two categories, used and unused, where used channels are part of the hopping sequence and unused channels are replaced in the hopping sequence by used channels in a pseudo-random way. Make each individual EUT meets the requirement that each of its hopping channels is used equally on average.
4. The input bandwidth and transmitted bandwidth are both 1MHz, the associated receiver(s) complies with the requirement that the input bandwidth matches the bandwidth of the transmitted signal.
5. Connected devices communicate on the same physical channel by synchronizing with a common clock and hopping sequence.
6. EUT isn't short burst systems.
7. EUT can't have the ability to be coordinated with other FHSS systems in an effort.

5.3 Number of Hopping Frequencies

5.3.1 Limit

FCC §15.247(a) (1) (iii)

Frequency hopping systems operating in the 2400 MHz to 2483.5 MHz bands shall use at least 15 hopping frequencies.

5.3.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.3.3 Test Procedure

The EUT must have its hopping function enabled. 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 $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

5.3.4 Test Result

Please refer to ANNEX A.1.

5.4 Peak Output Power

5.4.1 Test Limit

FCC § 15.247(b)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

5.4.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.4.3 Test Procedure

The Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

Use the following spectrum analyzer settings:

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

RBW > the 20 dB bandwidth of the emission being measured

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

5.4.4 Test Result

Please refer to ANNEX A.2.

5.5 Occupied Bandwidth

5.5.1 Limit

FCC §15.247(a)

Measurement of the 20dB bandwidth of the modulated signal.

5.5.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel

RBW = in the range of 1% to 5% of the OBW

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate, Allow the trace to stabilize.

5.5.4 Test Result

Please refer to ANNEX A.3.

5.6 Carrier Frequency Separation

5.6.1 Limit

FCC §15.247(a)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 2/3 of the 20 dB bandwidth of the hopping channel, whichever is greater.

5.6.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.6.3 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) $\geq 1\%$ of the span

Video (or Average) Bandwidth (VBW) $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

5.6.4 Test Result

Please refer to ANNEX A.4.

5.7 Time of Occupancy (Dwell time)

5.7.1 Limit

FCC §15.247(a)

Frequency hopping systems in the 2400 MHz - 2483.5 MHz band shall use at least 15 non-overlapping channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.7.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.7.3 Test Procedure

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

Span: Zero span, centered on a hopping channel

RBW shall be $\leq$ channel spacing and where possible RBW should be set $\gg 1/T$, where T is the expected dwell time per channel

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

Detector function: Peak

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.

The average time of occupancy on any channel within the Period can be calculated with formulas:

For GFSK and 8-DPSK:

For DH1 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (1600 / 2) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$

$$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$$

For DH3 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (1600 / 4) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$

$$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$$

For DH5 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (1600 / 6) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$

$$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$$

For AFH Mode:

For DH1 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (800 / 2) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$

$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$

For DH3 package type

$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (800 / 4) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$

$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$

For DH5 package type

$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (800 / 6) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$

$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$

The lowest, middle and highest channels are selected to perform testing to record the dwell time of each occupation measured in this channel, which is called Pulse Time here.

5.7.4 Test Result

Please refer to ANNEX A.5.

5.8 Conducted Spurious Emission & Authorized-band band-edge

5.8.1 Limit

FCC §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 a radiated measurement.

5.8.2 Test Setup

See section 4.5.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.8.3 Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW = 300 kHz

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

5.8.4 Test Result

Please refer to ANNEX A.6.

5.9 Conducted Emission

5.9.1 Limit

FCC §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

5.9.2 Test Setup

See section 4.5.2 for test setup description for the AC power supply port. The photo of test setup please refer to ANNEX B.

5.9.3 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

5.9.4 Test Result

Please refer to ANNEX A.7.

5.10 Radiated Spurious Emission

5.10.1 Limit

FCC §15.209&15.247(d)

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

1. Field Strength (dBμV/m) = 20*log[Field Strength (μV/m)].
2. In the emission tables above, the tighter limit applies at the band edges.
3. For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
4. For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).

5.10.2 Test Setup

See section 4.5.3 to 4.5.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.10.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported, Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

5.10.4 Test Result

Please refer to ANNEX A.8.

5.11 Band Edge (Restricted-band band-edge)

5.11.1 Limit

FCC §15.209&15.247(d)

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

5.11.2 Test Setup

See section 4.5.3 to 4.5.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.11.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported, Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

5.11.4 Test Result

Please refer to ANNEX A.9.

ANNEX A TEST RESULT

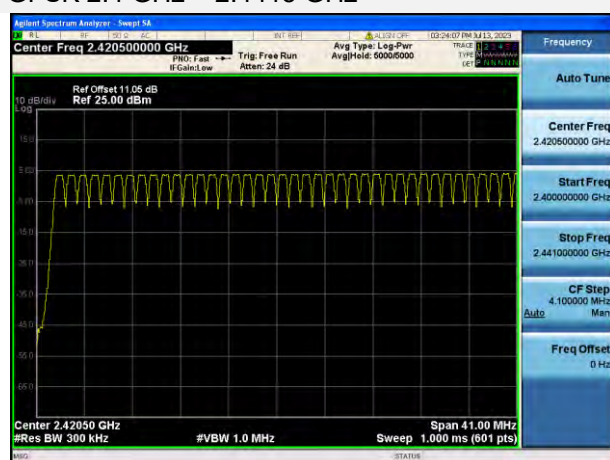
A.1 Number of Hopping Frequency

Test Data

Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Verdict
GFSK	2400 - 2483.5	79	15	Pass
8-DPSK	2400 - 2483.5	79	15	Pass

Test Plots

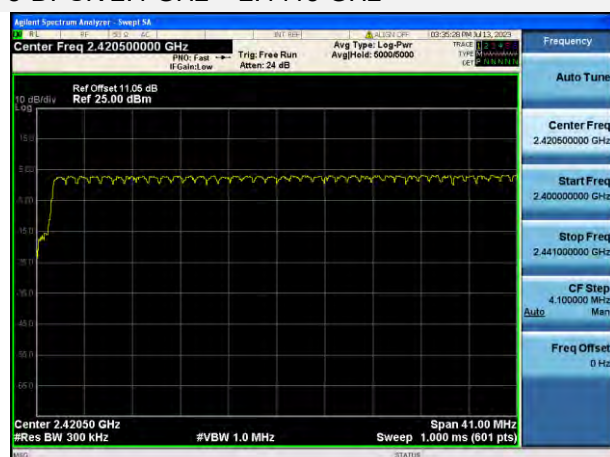
GFSK 2.4 GHz ~ 2.4415 GHz



GFSK 2.4415 GHz ~ 2.4835 GHz



8-DPSK 2.4 GHz ~ 2.4415 GHz



8-DPSK 2.4415 GHz ~ 2.4835 GHz



A.2 Peak Output Power

Peak Power Test Data

Channel	Measured Output Peak Power						Limit		Verdict
	GFSK		π/4-DQPSK		8-DPSK		dBm	mW	
	dBm	mW	dBm	mW	dBm	mW			
Low	3.67	2.33	4.94	3.12	5.30	3.39	21	125	Pass
Middle	4.04	2.54	5.63	3.66	6.14	4.11			Pass
High	4.39	2.75	6.12	4.09	6.80	4.79			Pass

Test Plots

GFSK LOW CHANNEL



GFSK MIDDLE CHANNEL



GFSK HIGH CHANNEL



$\pi/4$ -DQPSK LOW CHANNEL



$\pi/4$ -DQPSK MIDDLE CHANNEL



$\pi/4$ -DQPSK HIGH CHANNEL



8-DPSK LOW CHANNEL



8-DPSK MIDDLE CHANNEL



8-DPSK HIGH CHANNEL



A.3 20 dB and 99% bandwidth

Test Data

GFSK		
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	0.960000	0.879100
Middle	0.900000	0.881260
High	0.960000	0.877010
$\pi/4$ -DQPSK		
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	1.370000	1.271000
Middle	1.365000	1.264600
High	1.360000	1.256700
8-DPSK		
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	1.320000	1.340200
Middle	1.320000	1.331100
High	1.315000	1.310200

Test Plots

20 dB Bandwidth

GFSK LOW CHANNEL



GFSK MIDDLE CHANNEL



GFSK HIGH CHANNEL



$\pi/4$ -DQPSK LOW CHANNEL



$\pi/4$ -DQPSK MIDDLE CHANNEL



$\pi/4$ -DQPSK HIGH CHANNEL



8-DPSK LOW CHANNEL



8-DPSK MIDDLE CHANNEL



8-DPSK HIGH CHANNEL



99% Bandwidth

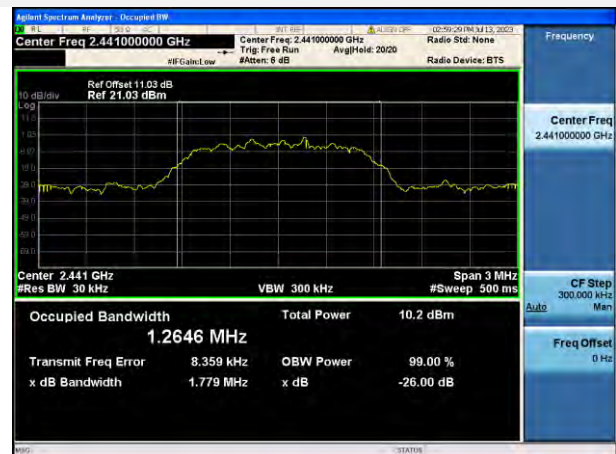
GFSK LOW CHANNEL



GFSK MIDDLE CHANNEL



GFSK HIGH CHANNEL

 $\pi/4$ -DQPSK LOW CHANNEL $\pi/4$ -DQPSK MIDDLE CHANNEL

$\pi/4$ -DQPSK HIGH CHANNEL



8-DPSK LOW CHANNEL



8-DPSK MIDDLE CHANNEL



8-DPSK HIGH CHANNEL



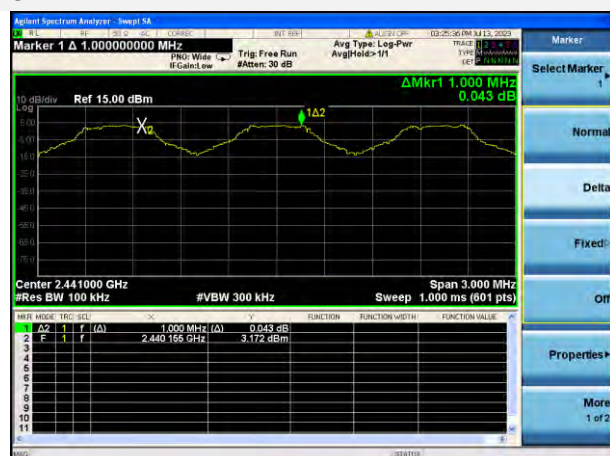
A.4 Hopping Frequency Separation

Test Data

Mode	Frequency separation (MHz)	2/3 of the 20 dB Bandwidth (MHz)	Verdict
GFSK	1.000	0.640	Pass
8-DPSK	1.015	0.880	Pass

Test Plots

GFSK



8-DPSK



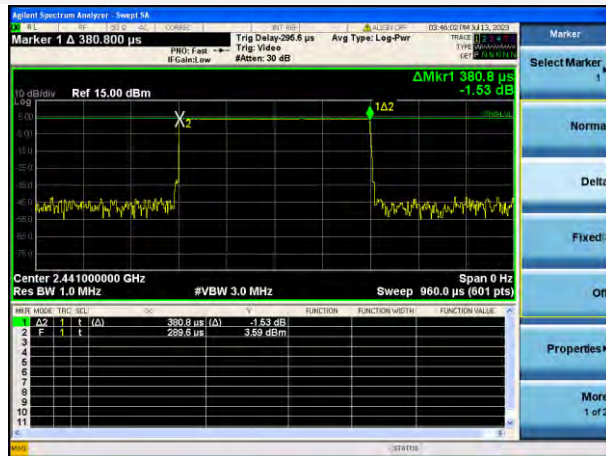
A.5 Average Time of Occupancy

Test Data

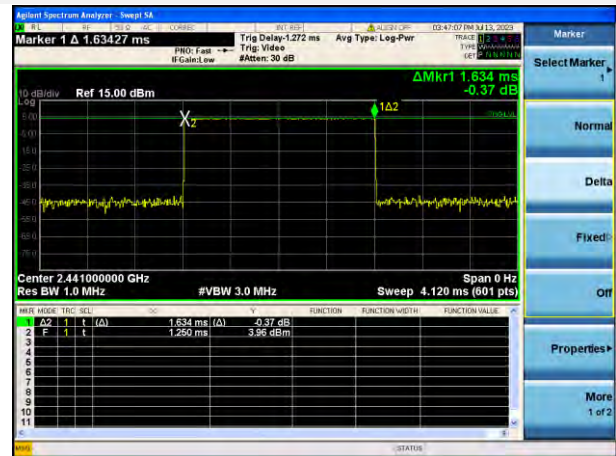
GFSK				
DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
DH 1	0.38080	121.856	0.4	Pass
DH 3	1.63400	261.440	0.4	Pass
DH 5	2.87600	306.773	0.4	Pass
8-DPSK				
DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
DH 1	0.38400	122.880	0.4	Pass
DH 3	1.63400	261.440	0.4	Pass
DH 5	2.88800	308.053	0.4	Pass
AFH Mode				
DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
DH 1	0.37920	60.672	0.4	Pass
DH 3	1.63400	130.720	0.4	Pass
DH 5	2.88800	154.027	0.4	Pass

Test Plots

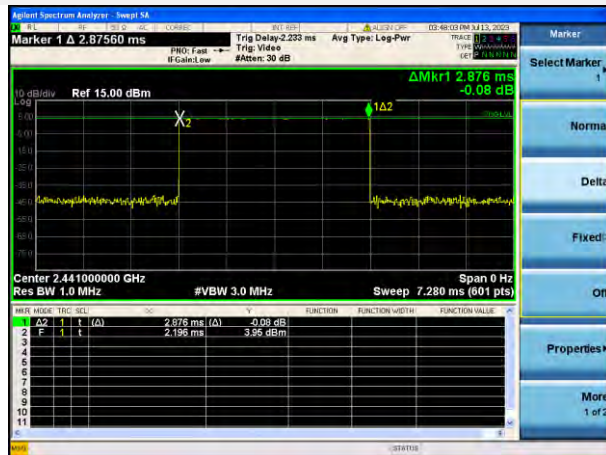
GFSK DH1



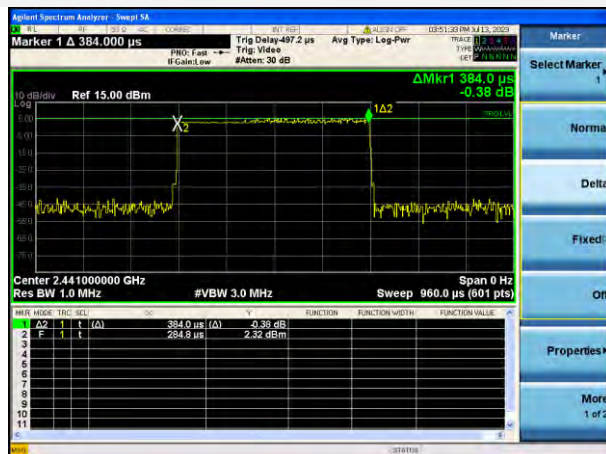
GFSK DH3



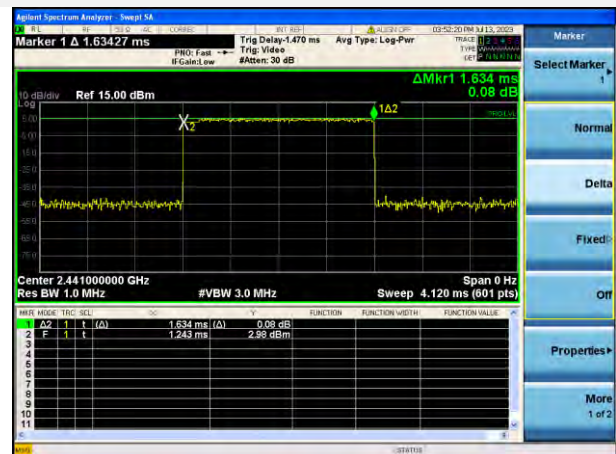
GFSK DH5



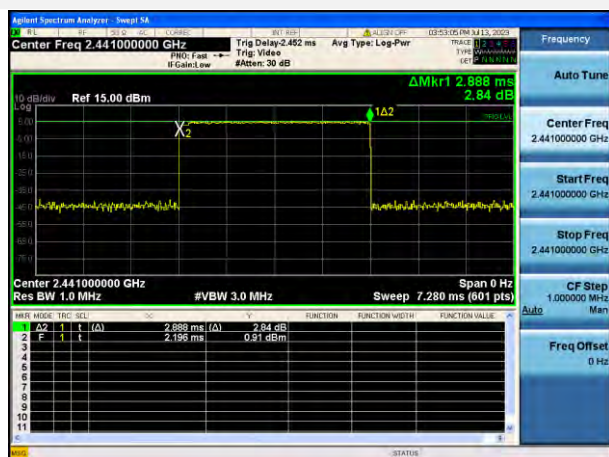
8-DPSK DH1



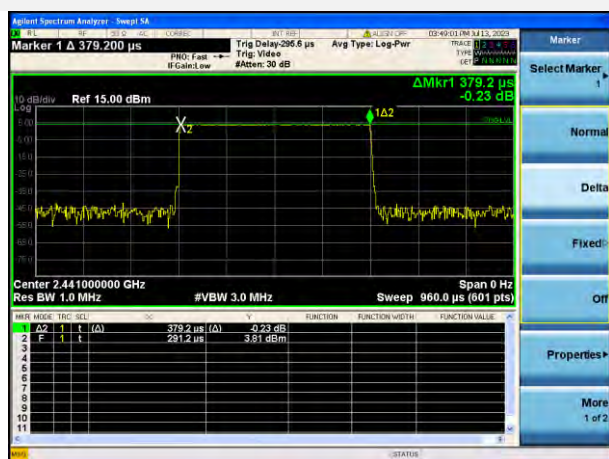
8-DPSK DH3



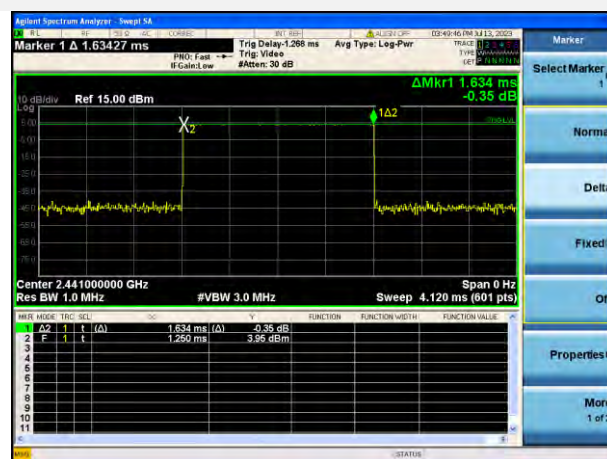
8-DPSK DH5



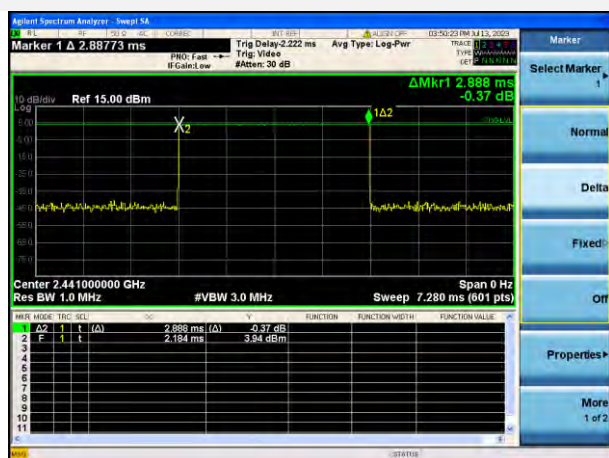
AFH Mode DH1



AFH Mode DH3



AFH Mode DH5



A.6 Conducted Spurious Emissions & Authorized-band band-edge

Test Data

GFSK				
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-35.00	3.57	-16.43	Pass
Middle	-35.29	3.94	-16.06	Pass
High	-34.21	4.30	-15.70	Pass
8-DPSK				
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-34.70	2.70	-17.30	Pass
Middle	-34.46	2.93	-17.07	Pass
High	-35.31	3.30	-16.70	Pass
Hopping Mode				
Mode	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
GFSK	-34.40	4.13	-15.87	Pass
8-DPSK	-35.14	3.09	-16.91	Pass

Test Plots

GFSK LOW CHANNEL, CARRIER LEVEL

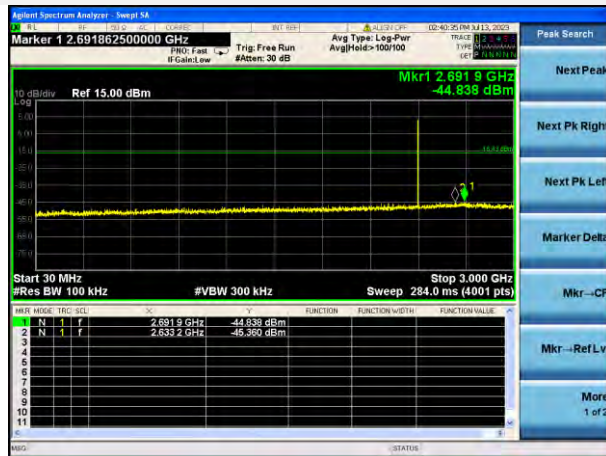


GFSK LOW CHANNEL, BAND EDGE



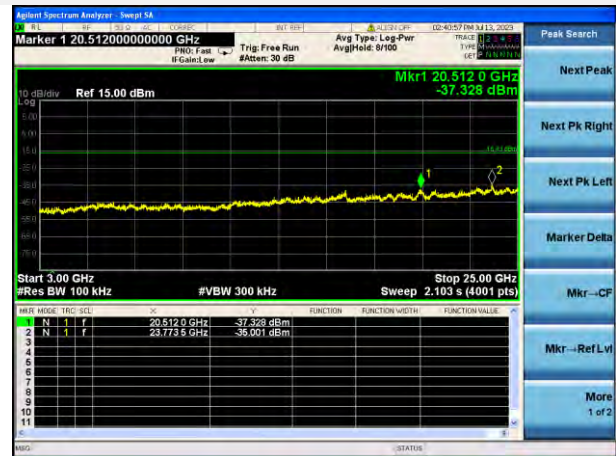
GFSK LOW CHANNEL, SPURIOUS

30 MHz ~ 3 GHz



GFSK LOW CHANNEL, SPURIOUS

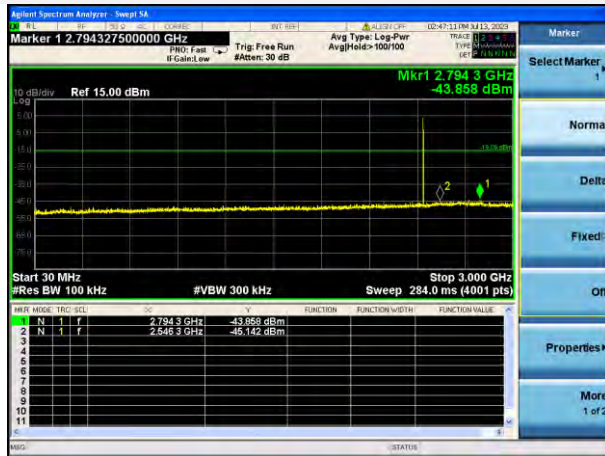
3 GHz ~ 25 GHz



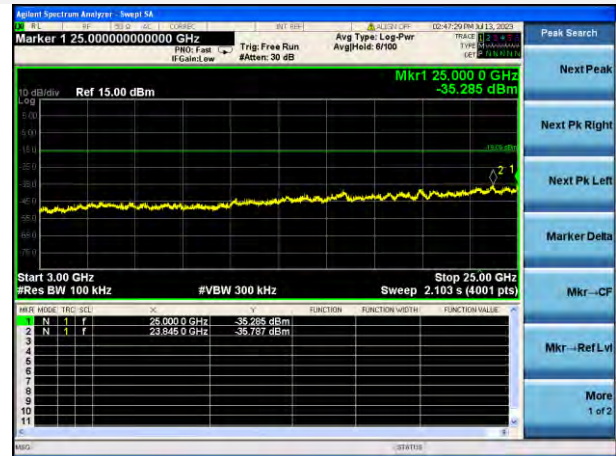
GFSK MIDDLE CHANNEL, CARRIER LEVEL



GFSK MIDDLE CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



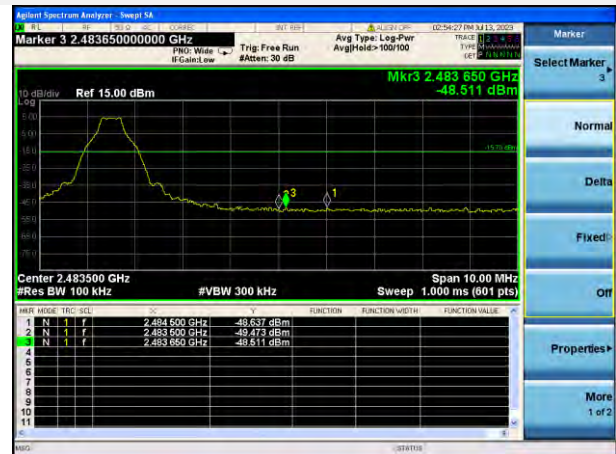
GFSK MIDDLE CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



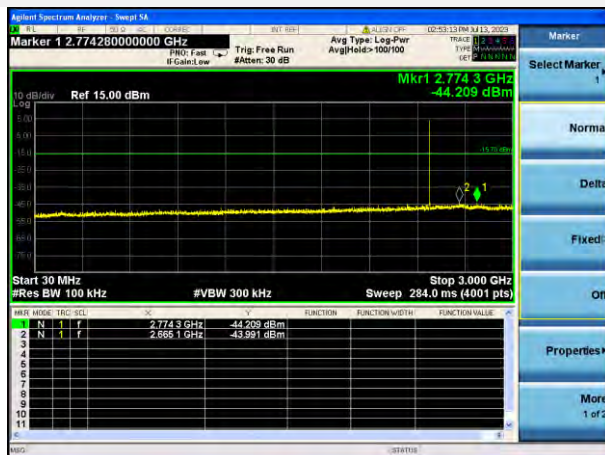
GFSK HIGH CHANNEL, CARRIER LEVEL



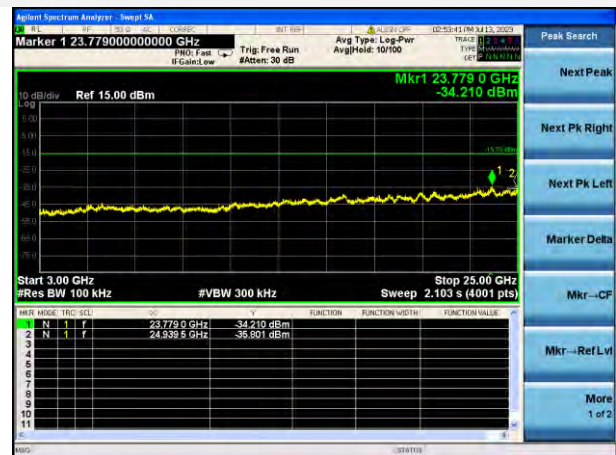
GFSK HIGH CHANNEL, BAND EDGE



GFSK HIGH CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



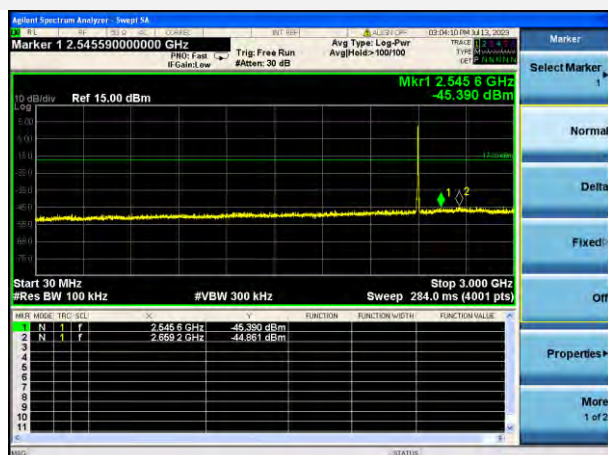
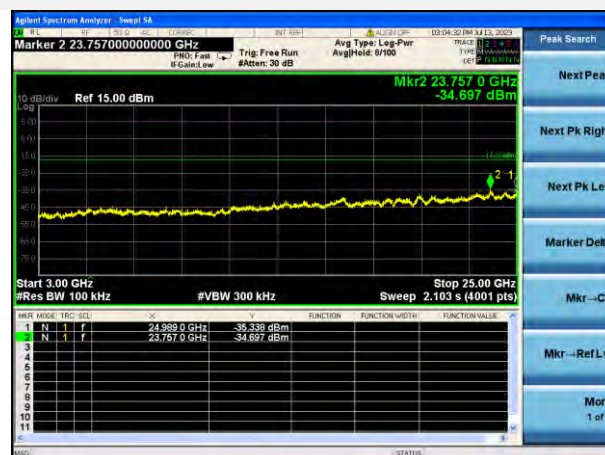
GFSK HIGH CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



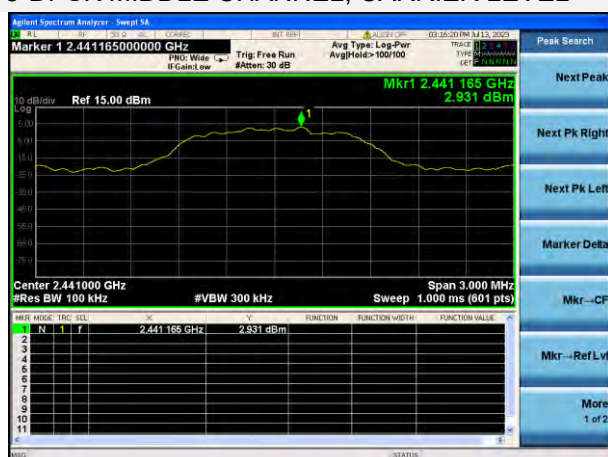
8-DPSK LOW CHANNEL, CARRIER LEVEL



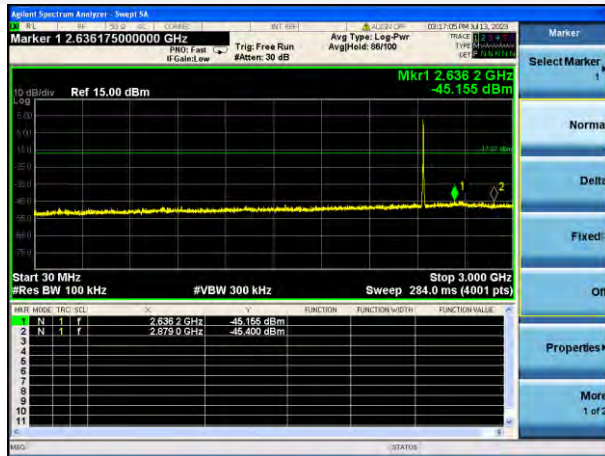
8-DPSK LOW CHANNEL, BAND EDGE

8-DPSK LOW CHANNEL, SPURIOUS
30 MHz ~ 3 GHz8-DPSK LOW CHANNEL, SPURIOUS
3 GHz ~ 25 GHz

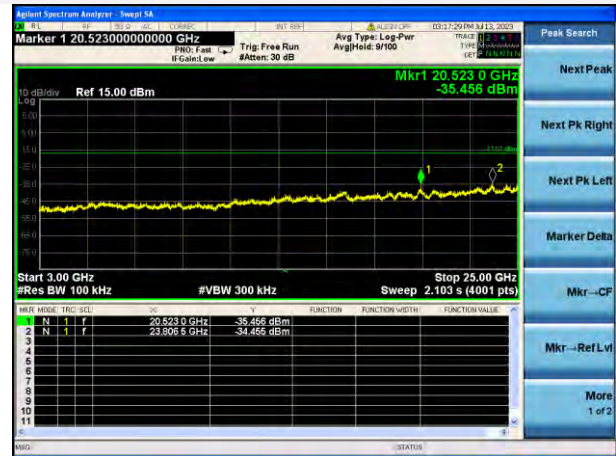
8-DPSK MIDDLE CHANNEL, CARRIER LEVEL



8-DPSK MIDDLE CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



8-DPSK MIDDLE CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



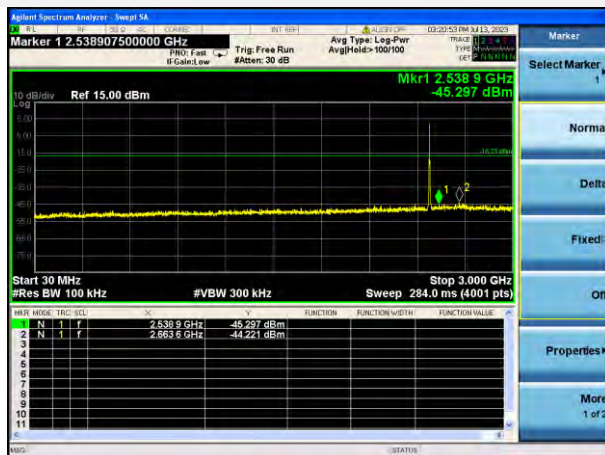
8-DPSK HIGH CHANNEL, CARRIER LEVEL



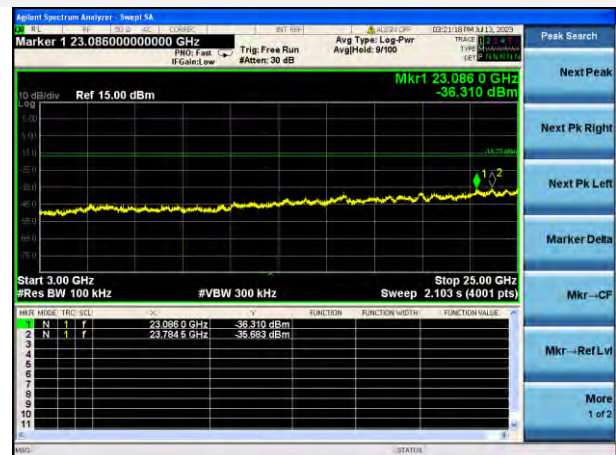
8-DPSK HIGH CHANNEL, BAND EDGE



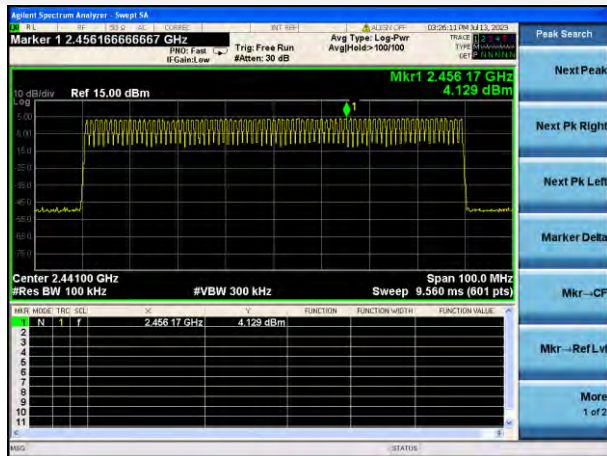
8-DPSK HIGH CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



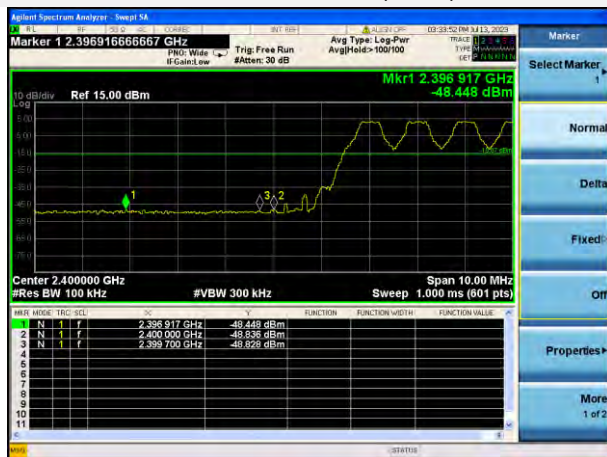
8-DPSK HIGH CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



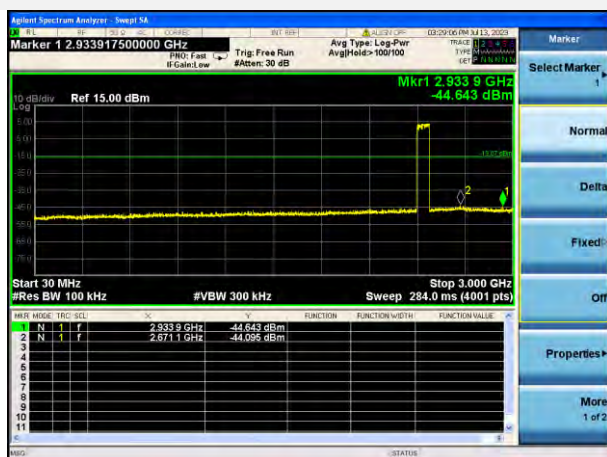
GFSK HOPPING, CARRIER LEVEL



GFSK HOPPING BAND EDGE (LOW)



GFSK HOPPING BAND EDGE (HIGH)

GFSK Hopping Mode, SPURIOUS
30 MHz ~ 3 GHzGFSK Hopping Mode, SPURIOUS
3GHz ~ 25 GHz

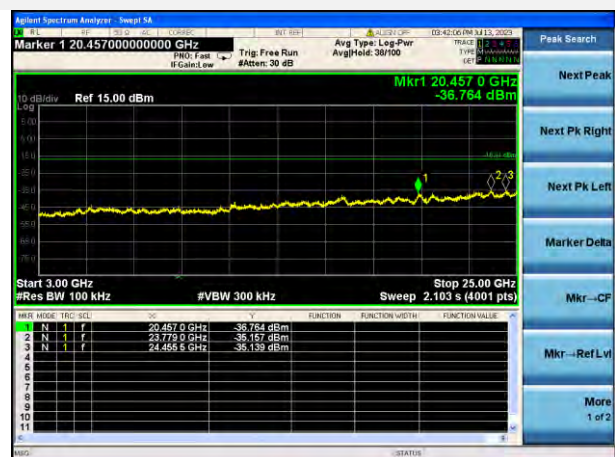
8-DPSK HOPPING, CARRIER LEVEL



8-DPSK Hopping BAND EDGE (LOW)



8-DPSK Hopping BAND EDGE (HIGH)

8-DPSK Hopping Mode, SPURIOUS
30 MHz ~ 3 GHz8-DPSK Hopping Mode, SPURIOUS
3GHz ~ 25 GHz

A.7 Conducted Emissions

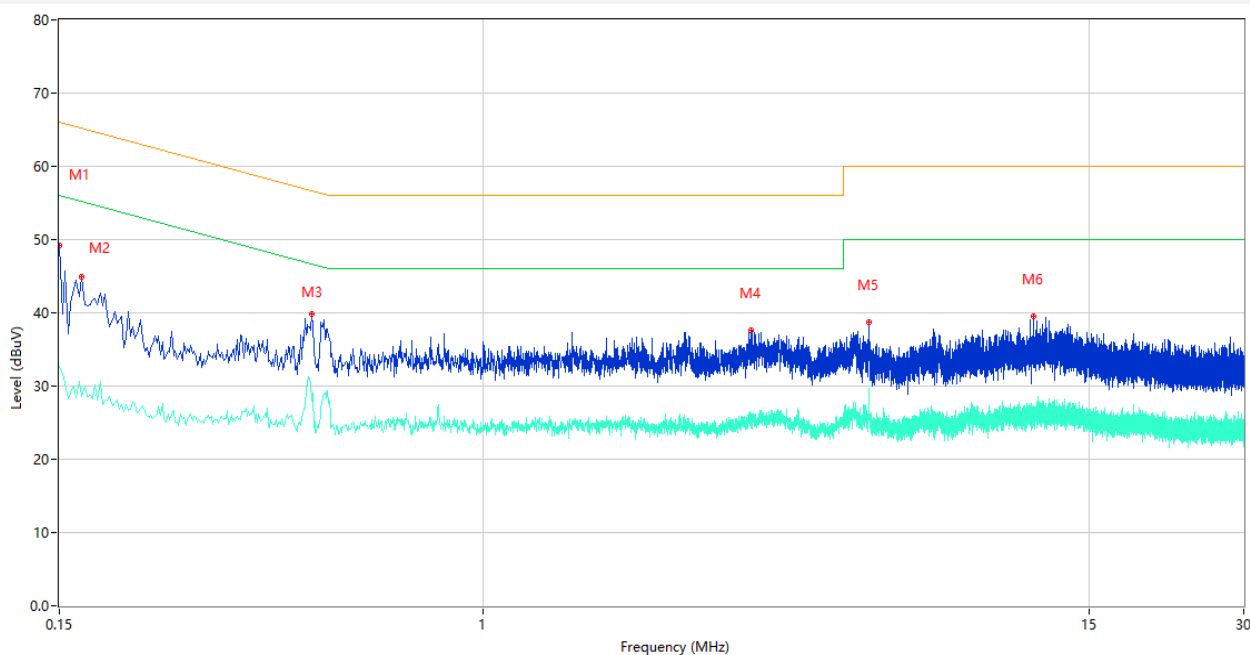
Note ¹: The EUT is working in the Normal link mode. All modes have been tested and normal link mode is worst.

Note ²: Results (dBuV) = Original reading level of Spectrum Analyzer (dBuV) + Factor (dB)

Test Data and Plots

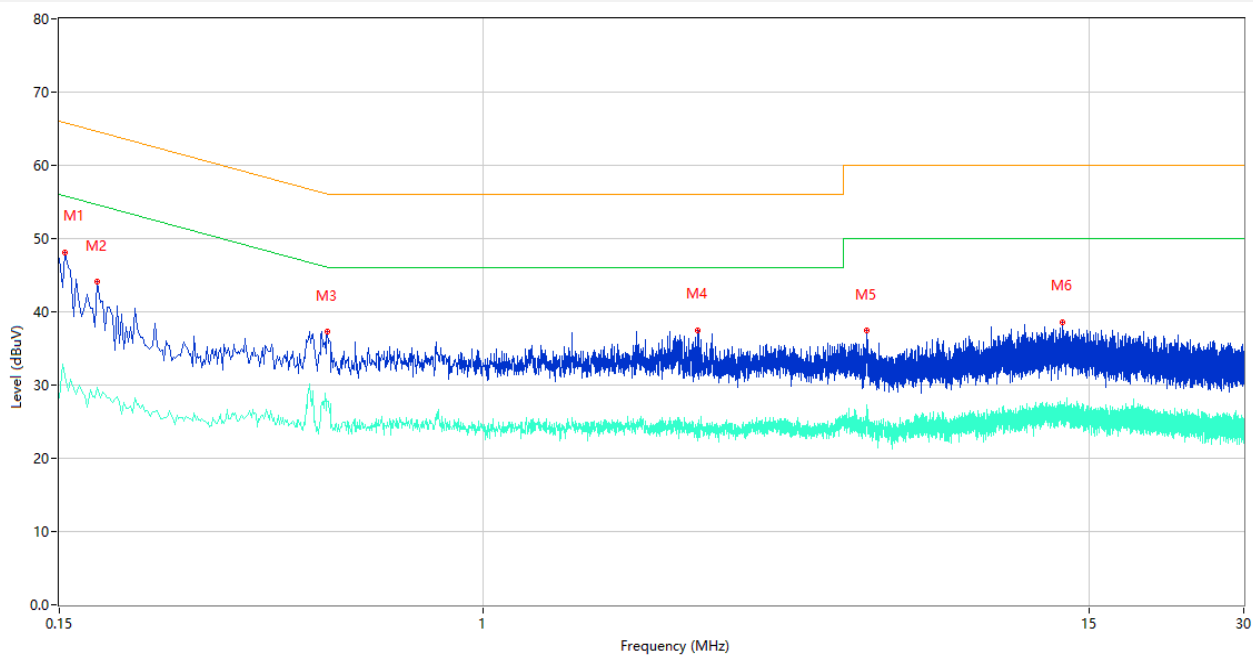
Ceramic Chip Antenna

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.150	49.18	10.09	66.00	16.82	Peak	L	Pass
1**	0.150	32.75	10.09	56.00	23.25	AV	L	Pass
2	0.166	44.87	10.08	65.16	20.29	Peak	L	Pass
2**	0.166	28.56	10.08	55.16	26.60	AV	L	Pass
3	0.464	39.80	10.21	56.62	16.82	Peak	L	Pass
3**	0.464	27.92	10.21	46.62	18.70	AV	L	Pass
4	3.308	37.67	10.43	56.00	18.33	Peak	L	Pass
4**	3.308	26.12	10.43	46.00	19.88	AV	L	Pass
5	5.610	38.81	10.43	60.00	21.19	Peak	L	Pass
5**	5.610	29.76	10.43	50.00	20.24	AV	L	Pass
6	11.720	39.58	10.08	60.00	20.42	Peak	L	Pass
6**	11.720	26.81	10.08	50.00	23.19	AV	L	Pass

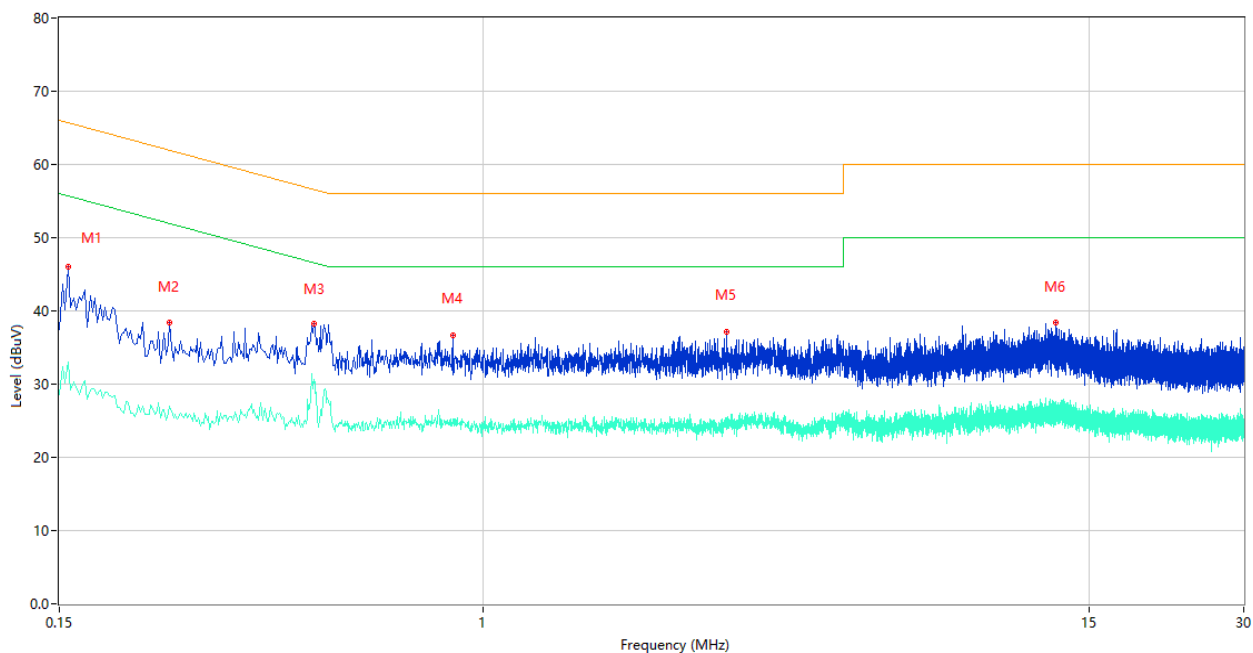
PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.154	48.13	10.09	65.78	17.65	Peak	N	Pass
1**	0.154	31.27	10.09	55.78	24.51	AV	N	Pass
2	0.178	44.05	10.07	64.58	20.53	Peak	N	Pass
2**	0.178	29.63	10.07	54.58	24.95	AV	N	Pass
3	0.498	37.27	10.17	56.03	18.76	Peak	N	Pass
3**	0.498	27.77	10.17	46.03	18.26	AV	N	Pass
4	2.614	37.53	9.94	56.00	18.47	Peak	N	Pass
4**	2.614	23.89	9.94	46.00	22.11	AV	N	Pass
5	5.546	37.42	10.53	60.00	22.58	Peak	N	Pass
5**	5.546	27.26	10.53	50.00	22.74	AV	N	Pass
6	13.356	38.58	10.43	60.00	21.42	Peak	N	Pass
6**	13.356	27.06	10.43	50.00	22.94	AV	N	Pass

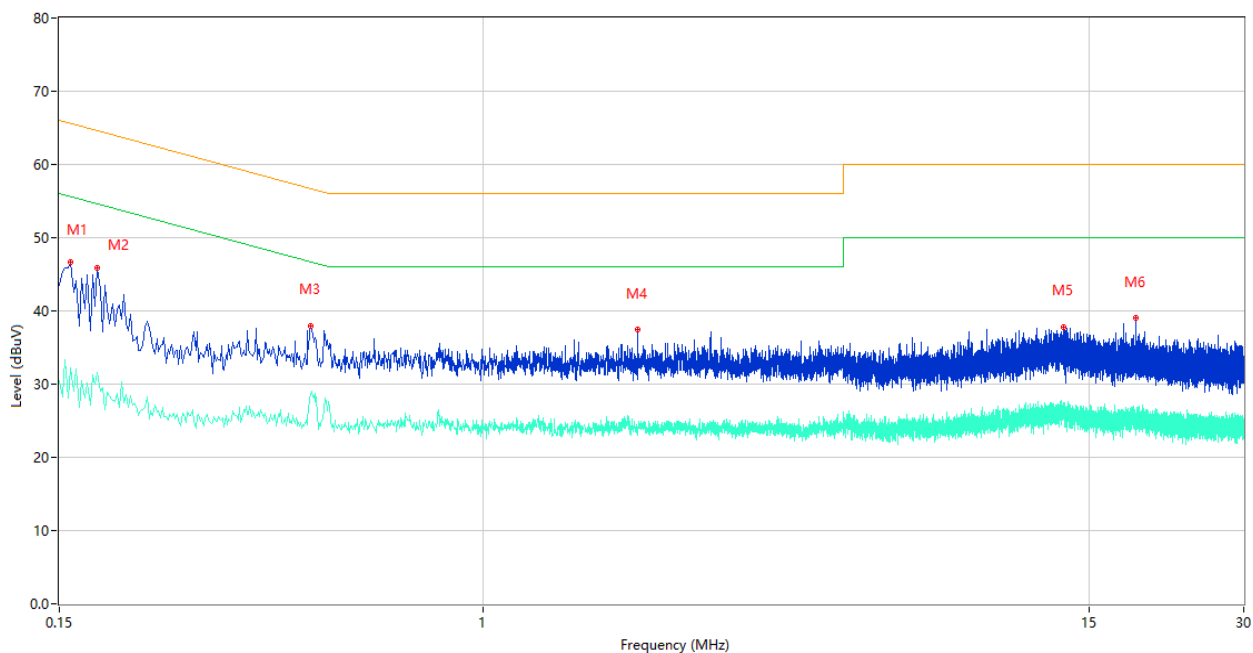
Metal Antenna

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.156	46.04	10.09	65.67	19.63	Peak	L	Pass
1**	0.156	33.06	10.09	55.67	22.61	AV	L	Pass
2	0.246	38.39	10.02	61.89	23.50	Peak	L	Pass
2**	0.246	27.06	10.02	51.89	24.83	AV	L	Pass
3	0.468	38.25	10.21	56.55	18.30	Peak	L	Pass
3**	0.468	30.68	10.21	46.55	15.87	AV	L	Pass
4	0.872	36.69	10.55	56.00	19.31	Peak	L	Pass
4**	0.872	25.31	10.55	46.00	20.69	AV	L	Pass
5	2.968	37.21	10.30	56.00	18.79	Peak	L	Pass
5**	2.968	24.94	10.30	46.00	21.06	AV	L	Pass
6	12.938	38.37	10.42	60.00	21.63	Peak	L	Pass
6**	12.938	26.15	10.42	50.00	23.85	AV	L	Pass

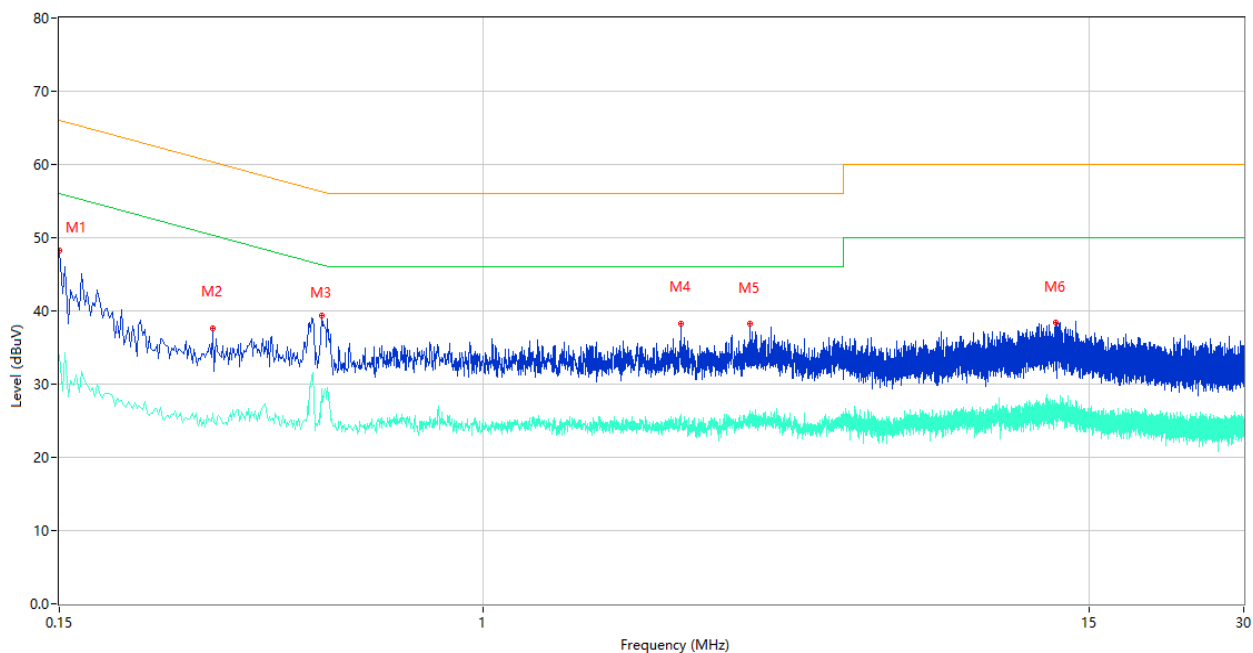
PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.158	46.64	10.08	65.57	18.93	Peak	N	Pass
1**	0.158	32.23	10.08	55.57	23.34	AV	N	Pass
2	0.178	45.82	10.07	64.58	18.76	Peak	N	Pass
2**	0.178	31.53	10.07	54.58	23.05	AV	N	Pass
3	0.462	37.96	10.21	56.66	18.70	Peak	N	Pass
3**	0.462	28.37	10.21	46.66	18.29	AV	N	Pass
4	1.994	37.46	10.30	56.00	18.54	Peak	N	Pass
4**	1.994	23.40	10.30	46.00	22.60	AV	N	Pass
5	13.400	37.85	10.26	60.00	22.15	Peak	N	Pass
5**	13.400	26.70	10.26	50.00	23.30	AV	N	Pass
6	18.496	39.01	10.25	60.00	20.99	Peak	N	Pass
6**	18.496	24.81	10.25	50.00	25.19	AV	N	Pass

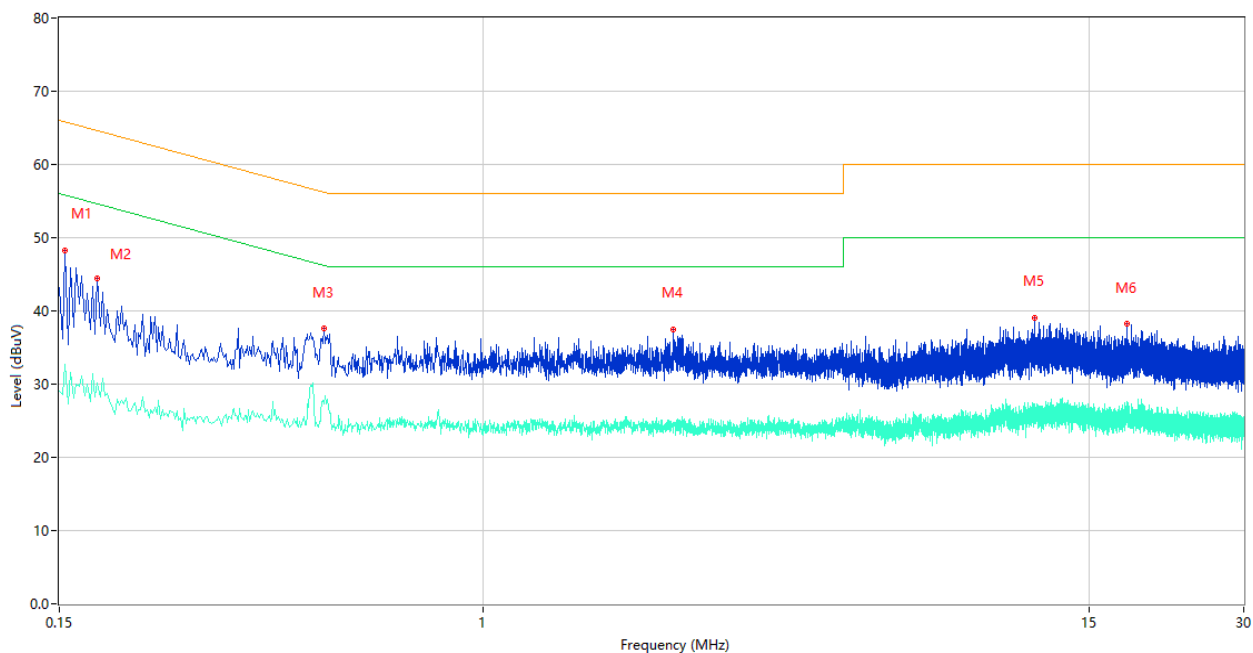
PCB Antenna

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.150	48.29	10.09	66.00	17.71	Peak	L	Pass
1**	0.150	34.05	10.09	56.00	21.95	AV	L	Pass
2	0.298	37.69	9.98	60.30	22.61	Peak	L	Pass
2**	0.298	25.98	9.98	50.30	24.32	AV	L	Pass
3	0.486	39.34	10.19	56.24	16.90	Peak	L	Pass
3**	0.486	29.35	10.19	46.24	16.89	AV	L	Pass
4	2.416	38.22	10.34	56.00	17.78	Peak	L	Pass
4**	2.416	25.95	10.34	46.00	20.05	AV	L	Pass
5	3.290	38.20	10.37	56.00	17.80	Peak	L	Pass
5**	3.290	25.51	10.37	46.00	20.49	AV	L	Pass
6	12.918	38.33	10.33	60.00	21.67	Peak	L	Pass
6**	12.918	26.39	10.33	50.00	23.61	AV	L	Pass

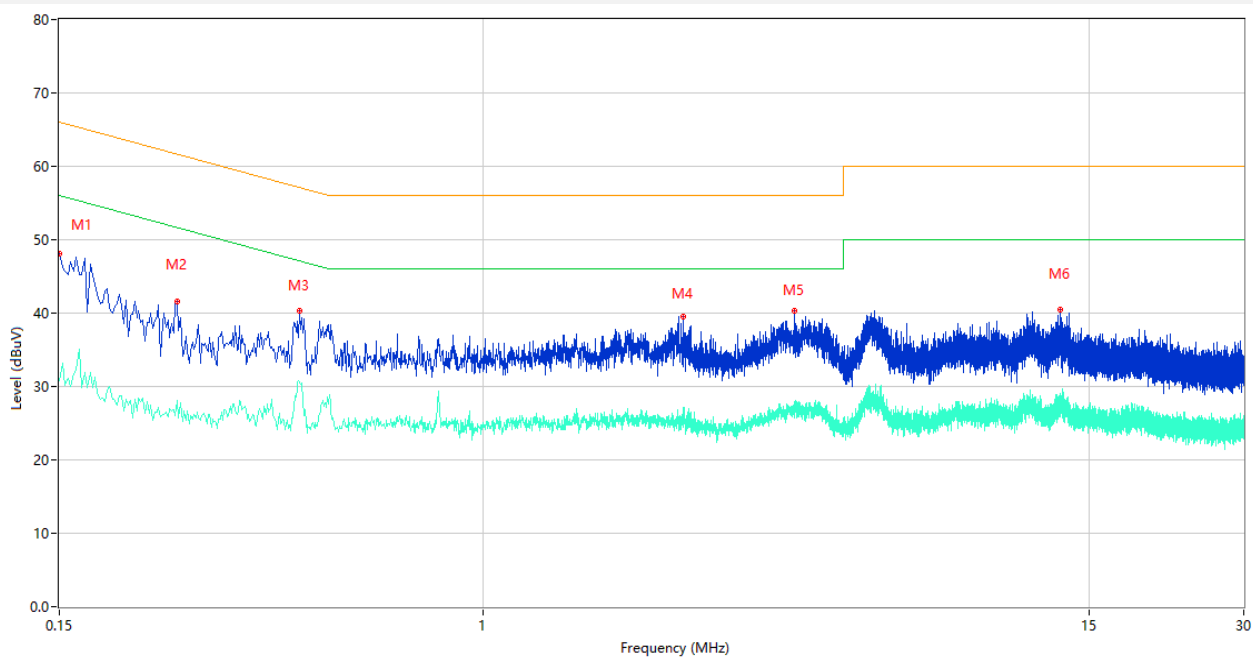
PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.154	48.31	10.09	65.78	17.47	Peak	N	Pass
1**	0.154	32.72	10.09	55.78	23.06	AV	N	Pass
2	0.178	44.51	10.07	64.58	20.07	Peak	N	Pass
2**	0.178	30.09	10.07	54.58	24.49	AV	N	Pass
3	0.490	37.55	10.18	56.17	18.62	Peak	N	Pass
3**	0.490	27.29	10.18	46.17	18.88	AV	N	Pass
4	2.334	37.49	10.16	56.00	18.51	Peak	N	Pass
4**	2.334	24.48	10.16	46.00	21.52	AV	N	Pass
5	11.786	39.08	10.22	60.00	20.92	Peak	N	Pass
5**	11.786	27.34	10.22	50.00	22.66	AV	N	Pass
6	17.768	38.19	10.18	60.00	21.81	Peak	N	Pass
6**	17.768	26.76	10.18	50.00	23.24	AV	N	Pass

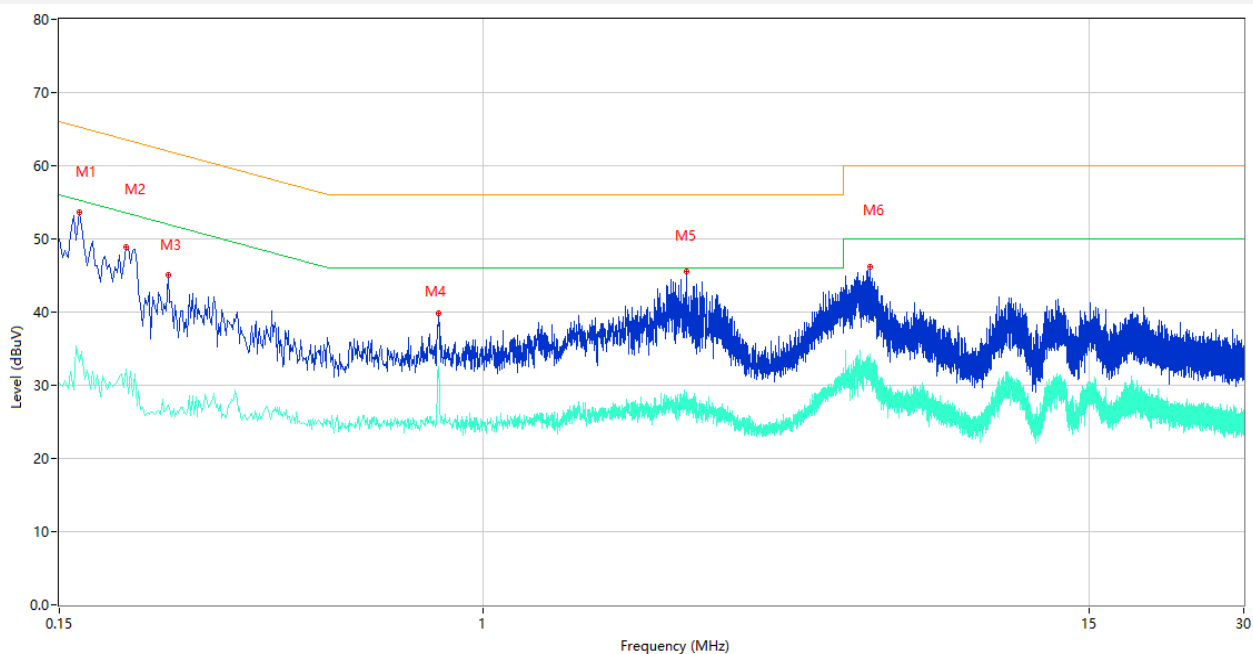
Dipole Antenna 1

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.150	48.04	10.09	66.00	17.96	Peak	L	Pass
1**	0.150	30.77	10.09	56.00	25.23	AV	L	Pass
2	0.254	41.64	10.01	61.63	19.99	Peak	L	Pass
2**	0.254	28.14	10.01	51.63	23.49	AV	L	Pass
3	0.440	40.29	10.33	57.06	16.77	Peak	L	Pass
3**	0.440	30.66	10.33	47.06	16.40	AV	L	Pass
4	2.442	39.50	10.28	56.00	16.50	Peak	L	Pass
4**	2.442	26.11	10.28	46.00	19.89	AV	L	Pass
5	4.030	40.24	10.27	56.00	15.76	Peak	L	Pass
5**	4.030	28.00	10.27	46.00	18.00	AV	L	Pass
6	13.196	40.47	10.52	60.00	19.53	Peak	L	Pass
6**	13.196	28.50	10.52	50.00	21.50	AV	L	Pass

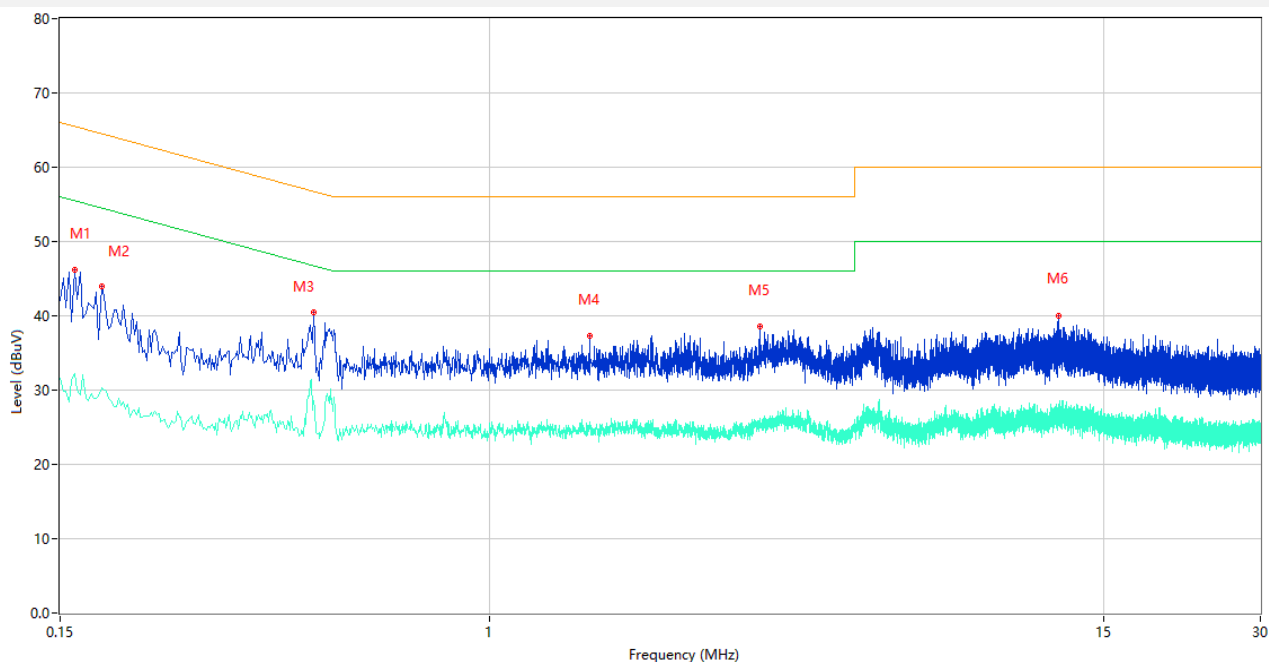
PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.164	53.63	10.08	65.26	11.63	Peak	N	Pass
1**	0.164	33.19	10.08	55.26	22.07	AV	N	Pass
2	0.202	48.91	10.05	63.53	14.62	Peak	N	Pass
2**	0.202	32.17	10.05	53.53	21.36	AV	N	Pass
3	0.244	45.08	10.02	61.96	16.88	Peak	N	Pass
3**	0.244	27.37	10.02	51.96	24.59	AV	N	Pass
4	0.820	39.81	10.70	56.00	16.19	Peak	N	Pass
4**	0.820	32.08	10.70	46.00	13.92	AV	N	Pass
5	2.476	45.54	10.26	56.00	10.46	Peak	N	Pass
5**	2.476	28.35	10.26	46.00	17.65	AV	N	Pass
6	5.640	46.21	10.45	60.00	13.79	Peak	N	Pass
6**	5.640	30.92	10.45	50.00	19.08	AV	N	Pass

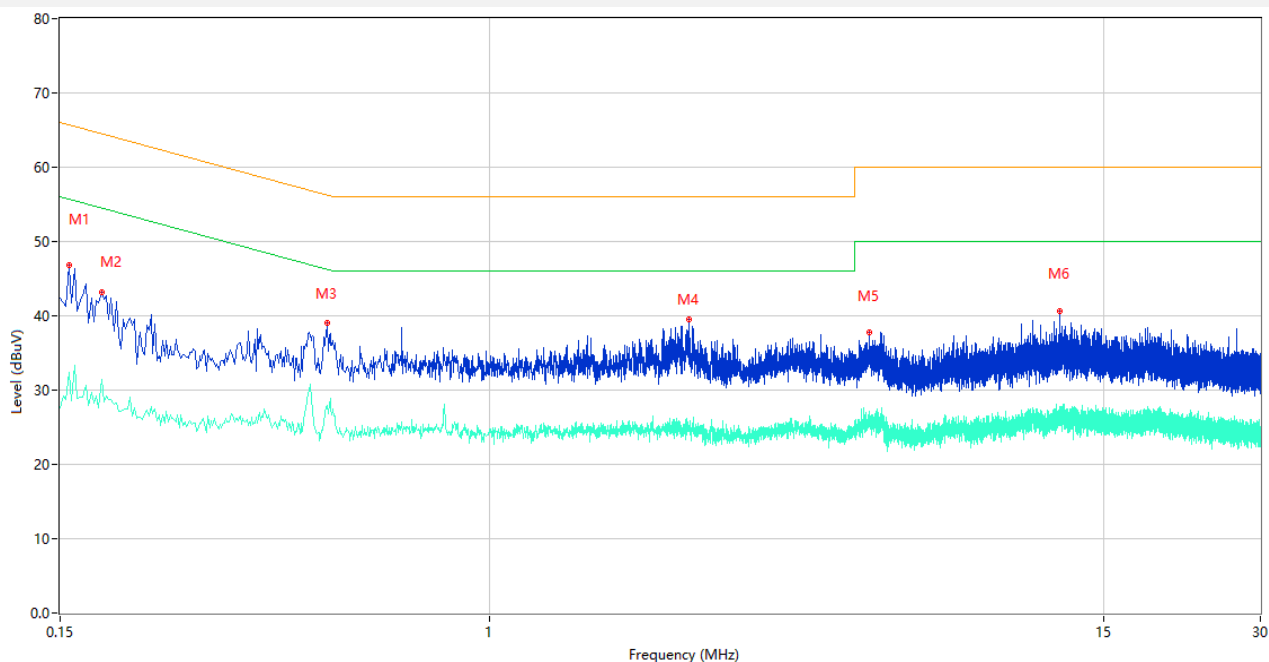
Dipole Antenna 2

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.160	46.17	10.08	65.46	19.29	Peak	L	Pass
1**	0.160	32.28	10.08	55.46	23.18	AV	L	Pass
2	0.180	43.96	10.07	64.49	20.53	Peak	L	Pass
2**	0.180	30.35	10.07	54.49	24.14	AV	L	Pass
3	0.460	40.46	10.22	56.69	16.23	Peak	L	Pass
3**	0.460	28.55	10.22	46.69	18.14	AV	L	Pass
4	1.554	37.27	10.22	56.00	18.73	Peak	L	Pass
4**	1.554	25.51	10.22	46.00	20.49	AV	L	Pass
5	3.296	38.54	10.40	56.00	17.46	Peak	L	Pass
5**	3.296	25.91	10.40	46.00	20.09	AV	L	Pass
6	12.308	40.01	10.31	60.00	19.99	Peak	L	Pass
6**	12.308	27.51	10.31	50.00	22.49	AV	L	Pass

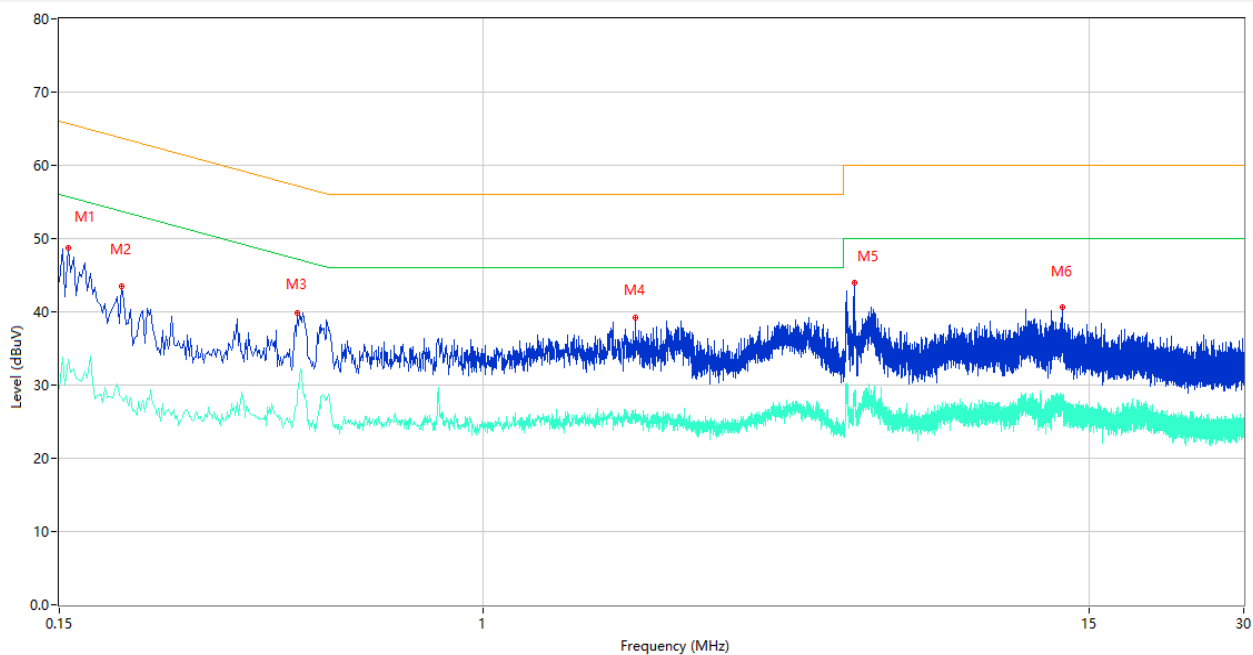
PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.156	46.79	10.09	65.67	18.88	Peak	N	Pass
1**	0.156	32.33	10.09	55.67	23.34	AV	N	Pass
2	0.180	43.25	10.07	64.49	21.24	Peak	N	Pass
2**	0.180	31.38	10.07	54.49	23.11	AV	N	Pass
3	0.488	39.11	10.18	56.20	17.09	Peak	N	Pass
3**	0.488	27.87	10.18	46.20	18.33	AV	N	Pass
4	2.406	39.47	10.36	56.00	16.53	Peak	N	Pass
4**	2.406	24.79	10.36	46.00	21.21	AV	N	Pass
5	5.334	37.75	10.28	60.00	22.25	Peak	N	Pass
5**	5.334	27.20	10.28	50.00	22.80	AV	N	Pass
6	12.358	40.69	10.48	60.00	19.31	Peak	N	Pass
6**	12.358	27.66	10.48	50.00	22.34	AV	N	Pass

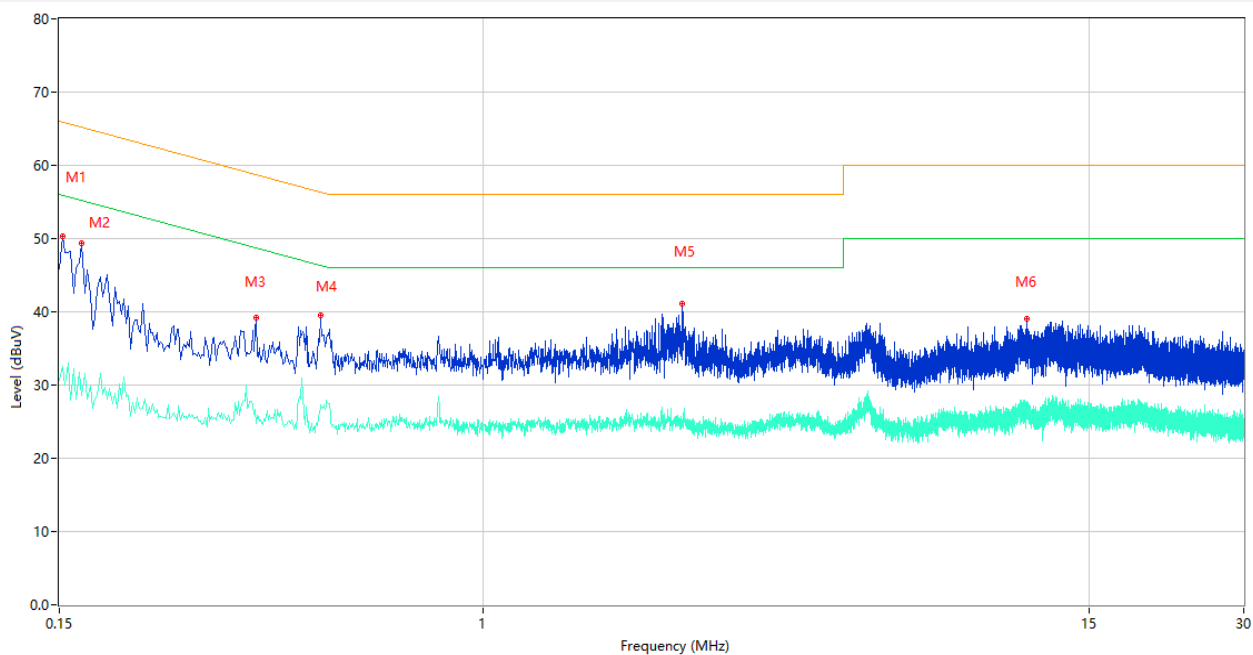
Dipole Antenna 3

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.156	48.68	10.09	65.67	16.99	Peak	L	Pass
1**	0.156	33.51	10.09	55.67	22.16	AV	L	Pass
2	0.198	43.51	10.06	63.69	20.18	Peak	L	Pass
2**	0.198	28.23	10.06	53.69	25.46	AV	L	Pass
3	0.434	39.90	10.39	57.18	17.28	Peak	L	Pass
3**	0.434	27.52	10.39	47.18	19.66	AV	L	Pass
4	1.976	39.19	10.29	56.00	16.81	Peak	L	Pass
4**	1.976	26.67	10.29	46.00	19.33	AV	L	Pass
5	5.268	43.92	10.45	60.00	16.08	Peak	L	Pass
5**	5.268	27.23	10.45	50.00	22.77	AV	L	Pass
6	13.302	40.65	10.42	60.00	19.35	Peak	L	Pass
6**	13.302	27.73	10.42	50.00	22.27	AV	L	Pass

PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.152	50.29	10.09	65.89	15.60	Peak	N	Pass
1**	0.152	32.53	10.09	55.89	23.36	AV	N	Pass
2	0.166	49.35	10.08	65.16	15.81	Peak	N	Pass
2**	0.166	28.59	10.08	55.16	26.57	AV	N	Pass
3	0.362	39.16	10.92	58.68	19.52	Peak	N	Pass
3**	0.362	24.78	10.92	48.68	23.90	AV	N	Pass
4	0.482	39.49	10.19	56.30	16.81	Peak	N	Pass
4**	0.482	27.05	10.19	46.30	19.25	AV	N	Pass
5	2.438	41.11	10.29	56.00	14.89	Peak	N	Pass
5**	2.438	25.00	10.29	46.00	21.00	AV	N	Pass
6	11.370	39.08	10.33	60.00	20.92	Peak	N	Pass
6**	11.370	26.51	10.33	50.00	23.49	AV	N	Pass

A.8 Radiated Spurious Emission

Note ¹: The symbol of “--” in the table which means not application.

Note ²: For the test data above 1 GHz, according the ANSI C63.10-2013, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note ³: The EUT is working in the Normal link mode below 1 GHz. All modes have been tested and DH5-Hopping mode is the worst.

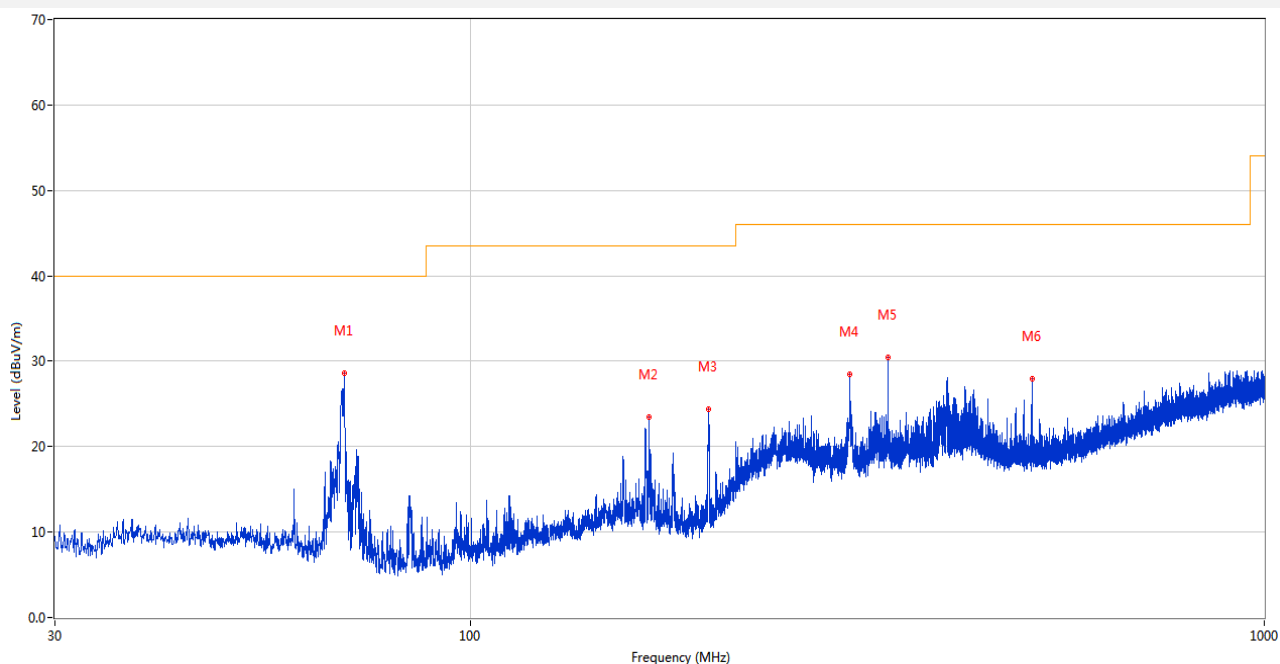
Note ⁴: Results (dBuV/m) = Original reading level of Spectrum Analyzer (dBuV/m) + Factor (dB)

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

Test Data and Plots

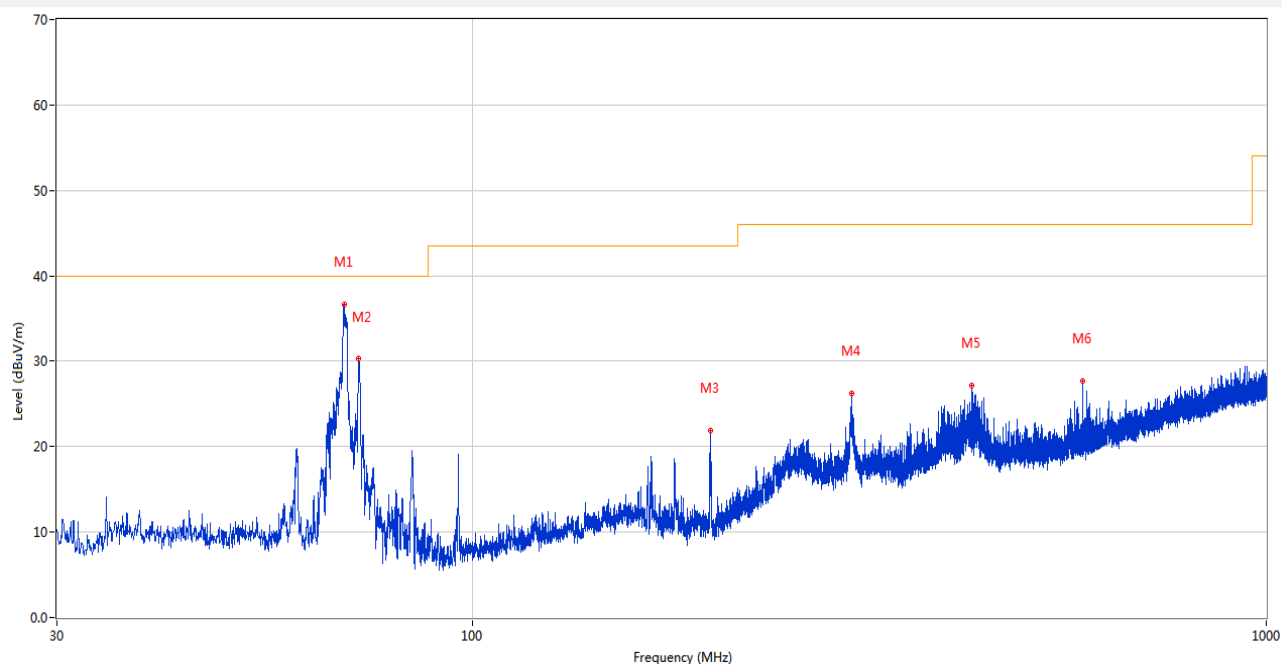
Ceramic Chip Antenna

30 MHz to 1 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	69.430	28.65	-28.95	40.0	11.35	Peak	108.00	200	Horizontal	Pass
2	168.031	23.45	-25.39	43.5	20.05	Peak	334.00	200	Horizontal	Pass
3	199.508	24.41	-28.64	43.5	19.09	Peak	360.00	200	Horizontal	Pass
4	300.921	28.43	-24.01	46.0	17.57	Peak	226.00	100	Horizontal	Pass
5	335.986	30.50	-22.76	46.0	15.50	Peak	119.00	100	Horizontal	Pass
6	509.714	27.93	-18.52	46.0	18.07	Peak	168.00	200	Horizontal	Pass

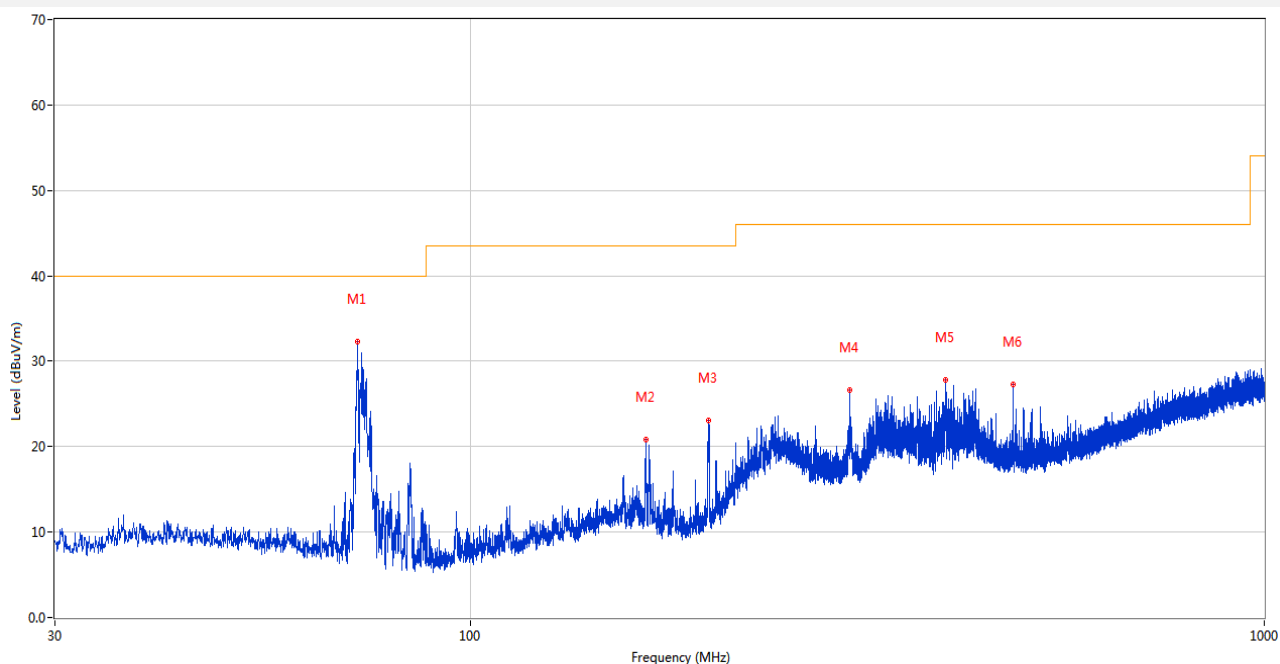
30 MHz to 1 GHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	69.091	36.67	-28.91	40.0	3.33	Peak	61.00	100	Vertical	Pass
2	72.001	30.27	-29.45	40.0	9.73	Peak	92.00	100	Vertical	Pass
3	199.362	21.86	-28.65	43.5	21.64	Peak	279.00	100	Vertical	Pass
4	300.970	26.20	-24.01	46.0	19.80	Peak	238.00	200	Vertical	Pass
5	425.566	27.12	-20.55	46.0	18.88	Peak	122.00	100	Vertical	Pass
6	587.508	27.69	-16.86	46.0	18.31	Peak	142.00	200	Vertical	Pass

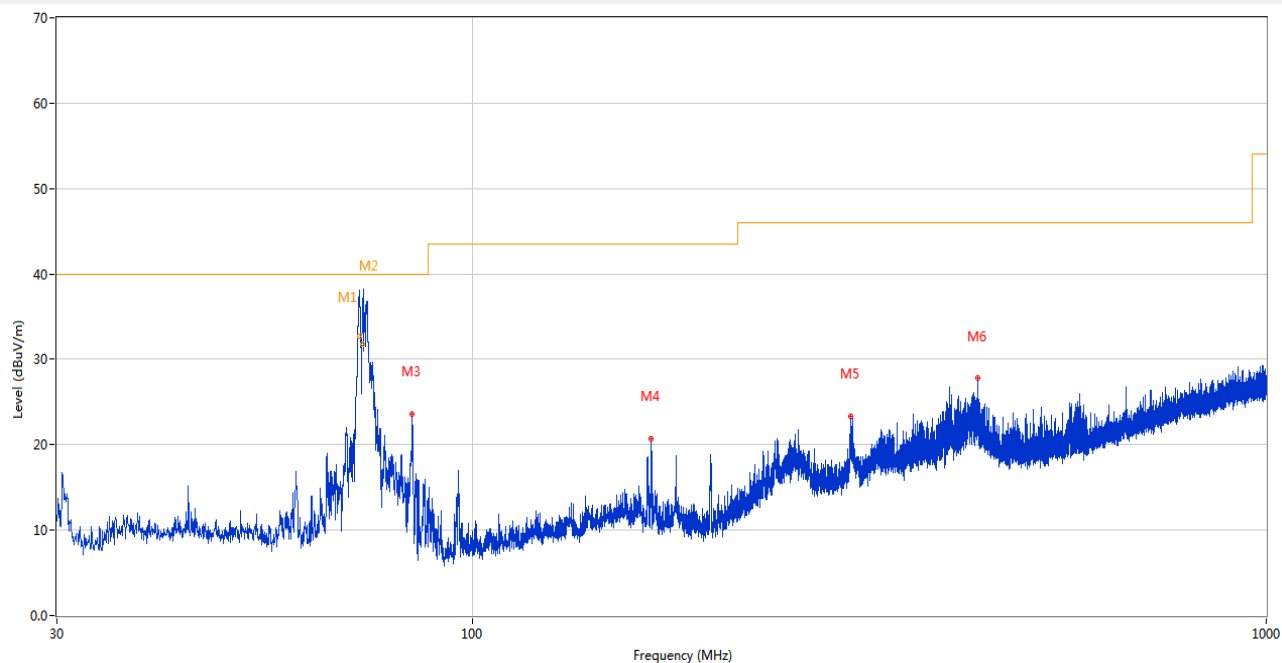
Metal Antenna

30 MHz to 1 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	72.098	32.26	-29.47	40.0	7.74	Peak	54.00	100	Horizontal	Pass
2	166.430	20.80	-25.37	43.5	22.70	Peak	1.00	200	Horizontal	Pass
3	199.847	23.05	-28.62	43.5	20.45	Peak	333.00	200	Horizontal	Pass
4	300.824	26.61	-24.01	46.0	19.39	Peak	108.00	100	Horizontal	Pass
5	396.563	27.82	-21.28	46.0	18.18	Peak	88.00	100	Horizontal	Pass
6	482.359	27.31	-19.13	46.0	18.69	Peak	123.00	100	Horizontal	Pass

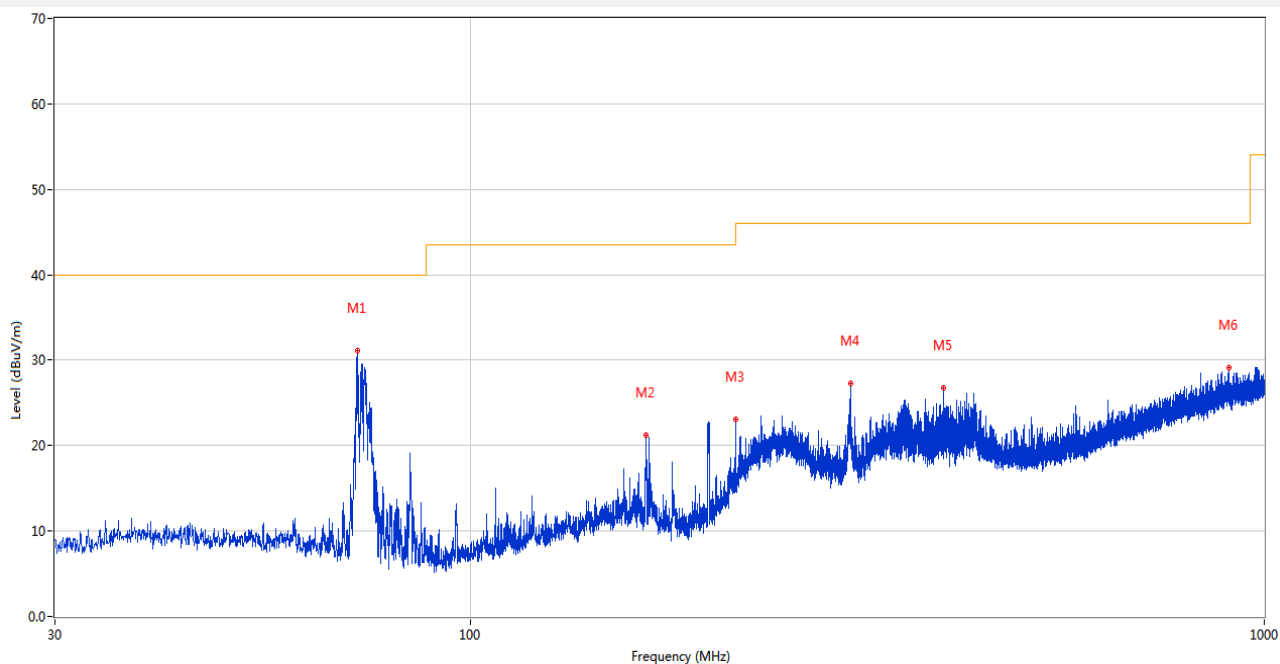
30 MHz to 1 GHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	72.078	41.30	-29.49	40.0	-1.30	Peak	270.00	151	Vertical	N/A
1*	72.078	32.70	-29.49	40.0	7.30	QP	270.00	151	Vertical	Pass
2	72.829	40.56	-29.56	40.0	-0.56	Peak	138.00	100	Vertical	N/A
2*	72.829	31.79	-29.56	40.0	8.21	QP	138.00	100	Vertical	Pass
3	84.029	23.66	-30.41	40.0	16.34	Peak	138.00	100	Vertical	Pass
4	168.031	20.74	-25.39	43.5	22.76	Peak	237.00	100	Vertical	Pass
5	299.563	23.32	-24.07	46.0	22.68	Peak	13.00	200	Vertical	Pass
6	433.520	27.75	-20.19	46.0	18.25	Peak	0.00	100	Vertical	Pass

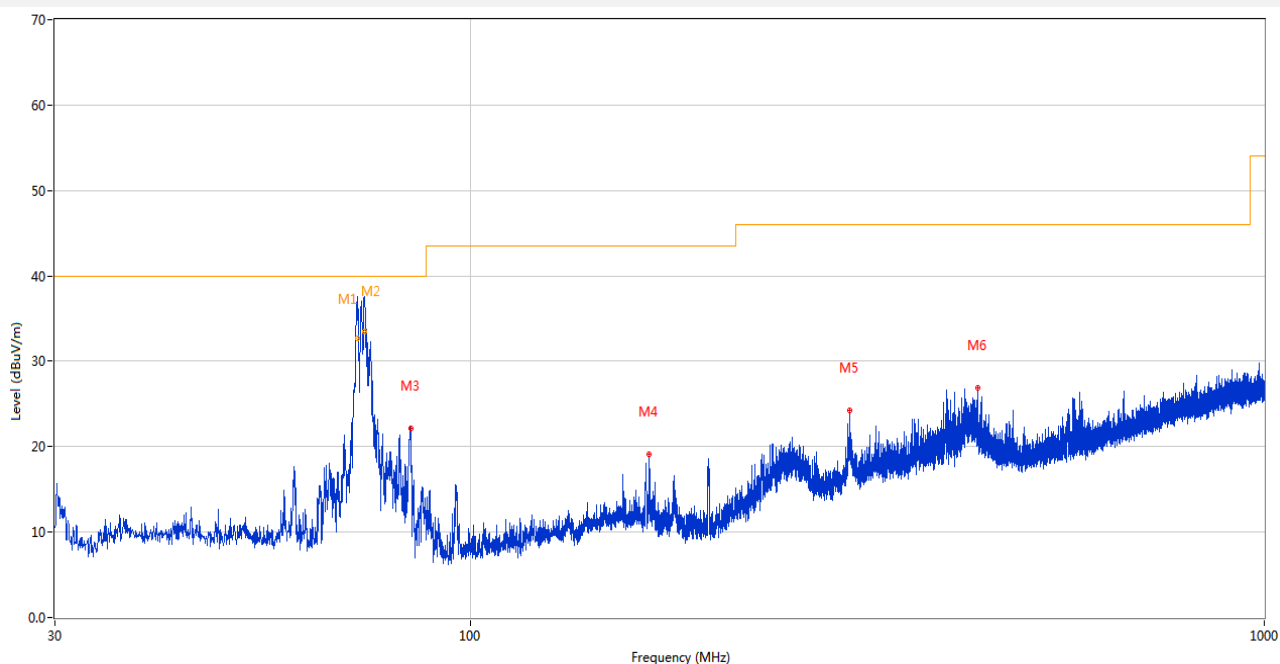
PCB Antenna

30 MHz to 1 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	72.049	31.14	-29.46	40.0	8.86	Peak	63.00	100	Horizontal	Pass
2	166.479	21.23	-25.37	43.5	22.27	Peak	0.00	200	Horizontal	Pass
3	216.094	23.08	-27.85	46.0	22.92	Peak	149.00	100	Horizontal	Pass
4	301.115	27.25	-24.00	46.0	18.75	Peak	83.00	100	Horizontal	Pass
5	394.768	26.77	-21.61	46.0	19.23	Peak	108.00	100	Horizontal	Pass
6	903.776	29.09	-11.30	46.0	16.91	Peak	106.00	100	Horizontal	Pass

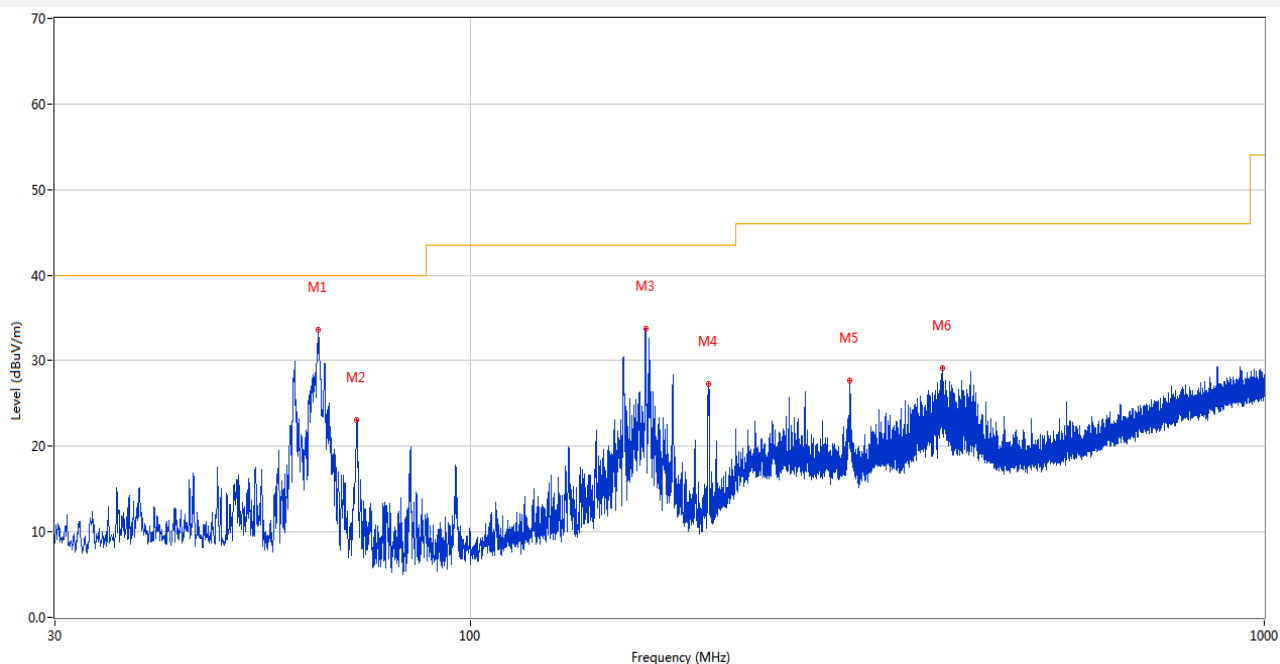
30 MHz to 1 GHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	72.082	41.75	-29.49	40.0	-1.75	Peak	87.00	108	Vertical	N/A
1*	72.082	32.66	-29.49	40.0	7.34	QP	87.00	108	Vertical	Pass
2	73.611	40.66	-29.60	40.0	-0.66	Peak	104.00	100	Vertical	N/A
2*	73.611	33.50	-29.60	40.0	6.50	QP	104.00	100	Vertical	Pass
3	84.126	22.16	-30.40	40.0	17.84	Peak	117.00	100	Vertical	Pass
4	168.080	19.06	-25.38	43.5	24.44	Peak	87.00	200	Vertical	Pass
5	300.776	24.24	-24.02	46.0	21.76	Peak	143.00	200	Vertical	Pass
6	436.187	26.85	-20.32	46.0	19.15	Peak	26.00	100	Vertical	Pass

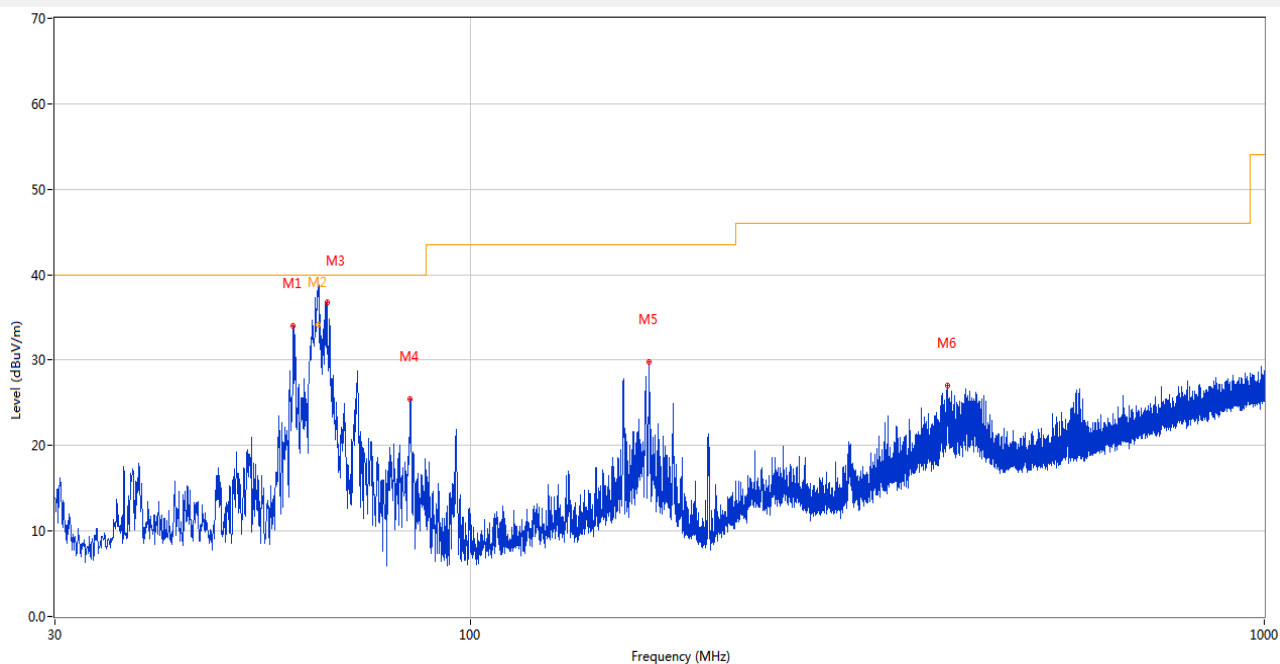
Dipole Antenna 1

30 MHz to 1 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	64.435	33.65	-27.97	40.0	6.35	Peak	39.00	200	Horizontal	Pass
2	72.001	23.10	-29.45	40.0	16.90	Peak	54.00	100	Horizontal	Pass
3	166.624	33.79	-25.38	43.5	9.71	Peak	154.00	200	Horizontal	Pass
4	199.653	27.29	-28.63	43.5	16.21	Peak	144.00	100	Horizontal	Pass
5	301.018	27.64	-24.01	46.0	18.36	Peak	103.00	100	Horizontal	Pass
6	392.926	29.11	-21.92	46.0	16.89	Peak	290.00	100	Horizontal	Pass

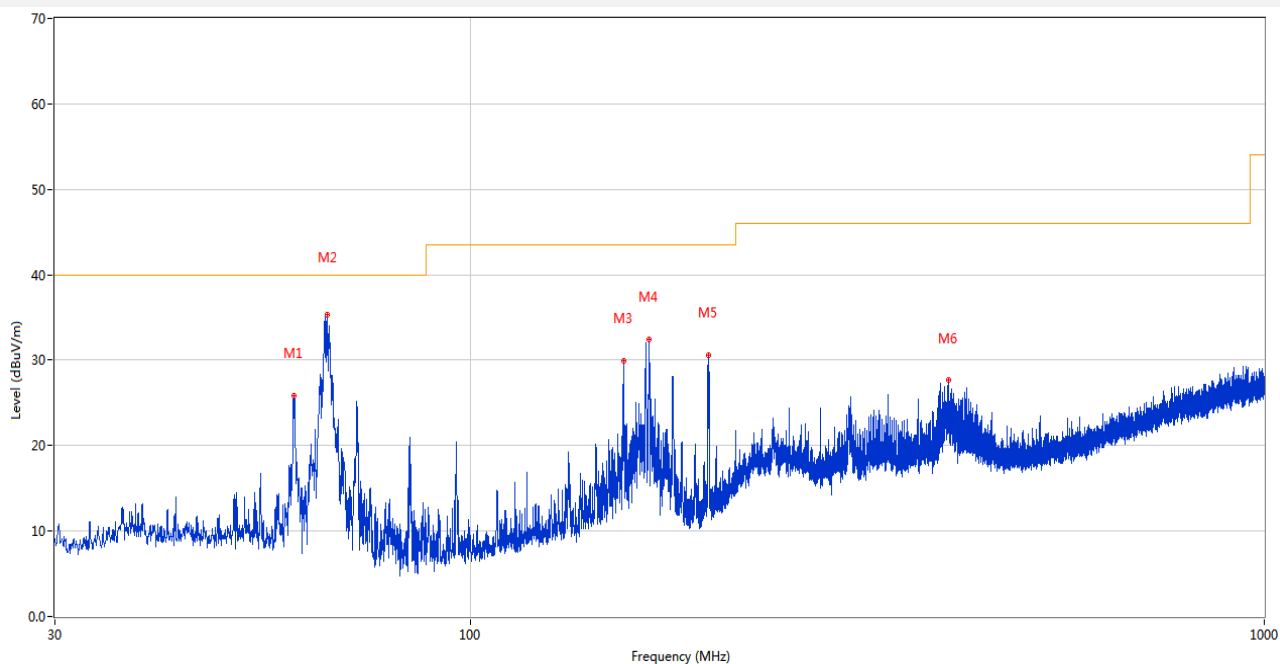
30 MHz to 1 GHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	59.876	33.98	-27.58	40.0	6.02	Peak	107.00	100	Vertical	Pass
2	64.338	39.71	-27.94	40.0	0.29	Peak	92.00	100	Vertical	N/A
2*	64.338	34.20	-27.94	40.0	5.80	QP	92.00	100	Vertical	Pass
3	65.987	36.75	-28.42	40.0	3.25	Peak	75.00	100	Vertical	Pass
4	84.077	25.44	-30.41	40.0	14.56	Peak	197.00	100	Vertical	Pass
5	168.031	29.78	-25.39	43.5	13.72	Peak	207.00	100	Vertical	Pass
6	398.842	27.05	-21.44	46.0	18.95	Peak	161.00	100	Vertical	Pass

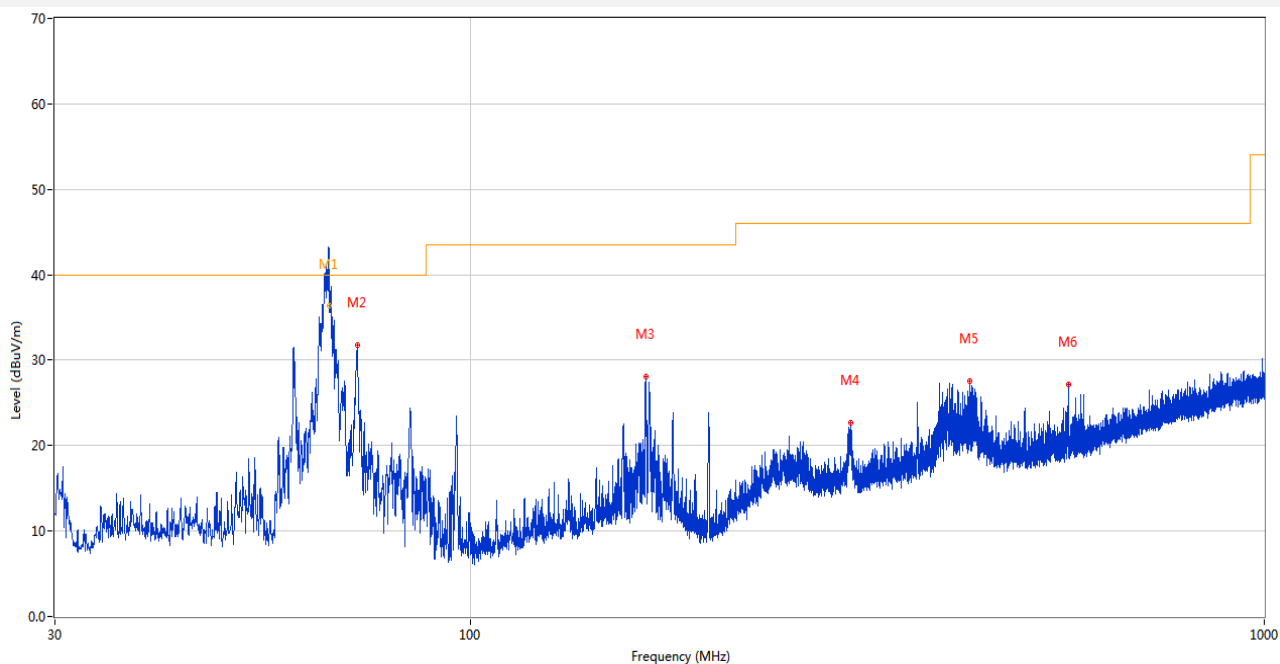
Dipole Antenna 2

30 MHz to 1 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	60.070	25.87	-27.57	40.0	14.13	Peak	29.00	200	Horizontal	Pass
2	65.987	35.31	-28.42	40.0	4.69	Peak	9.00	100	Horizontal	Pass
3	156.052	29.90	-24.85	43.5	13.60	Peak	1.00	200	Horizontal	Pass
4	167.982	32.48	-25.40	43.5	11.02	Peak	326.00	200	Horizontal	Pass
5	199.314	30.60	-28.65	43.5	12.90	Peak	159.00	200	Horizontal	Pass
6	400.443	27.62	-21.56	46.0	18.38	Peak	306.00	100	Horizontal	Pass

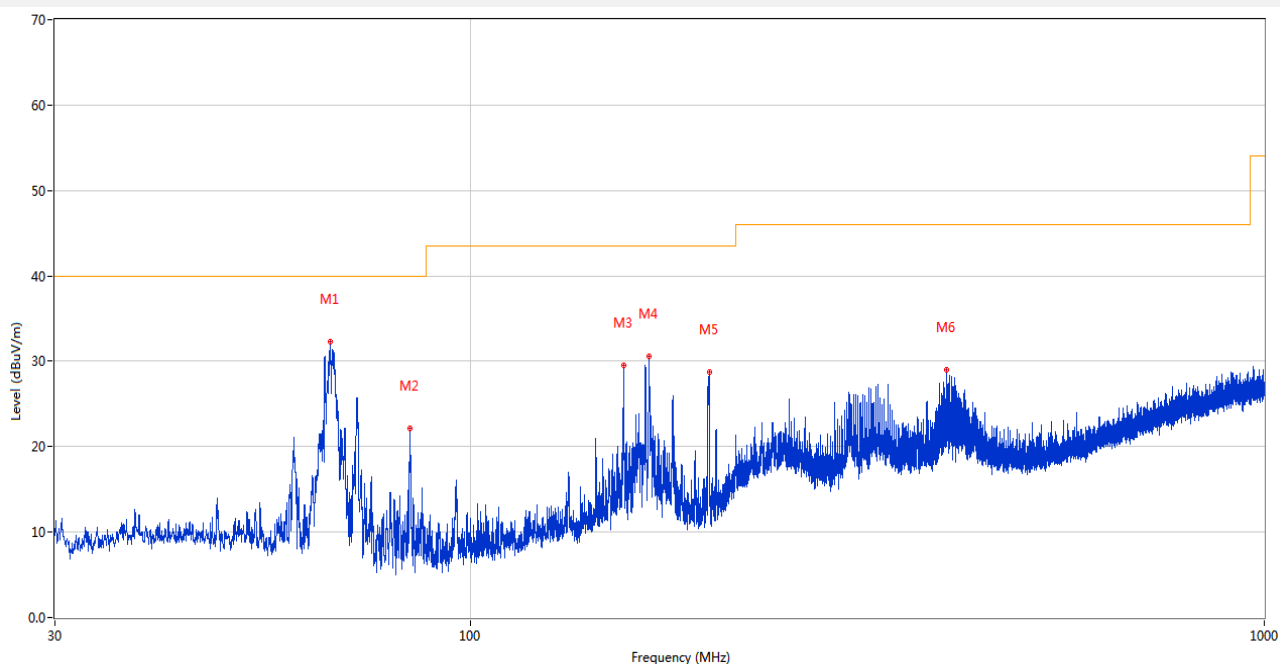
30 MHz to 1 GHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	66.379	47.21	-28.48	40.0	-7.21	Peak	102.00	100	Vertical	N/A
1*	66.379	36.34	-28.48	40.0	3.66	QP	102.00	100	Vertical	Pass
2	72.098	31.76	-29.47	40.0	8.24	Peak	60.00	100	Vertical	Pass
3	166.624	28.08	-25.38	43.5	15.42	Peak	68.00	200	Vertical	Pass
4	301.164	22.73	-24.00	46.0	23.27	Peak	111.00	200	Vertical	Pass
5	425.469	27.52	-20.57	46.0	18.48	Peak	138.00	100	Vertical	Pass
6	566.458	27.14	-17.24	46.0	18.86	Peak	120.00	100	Vertical	Pass

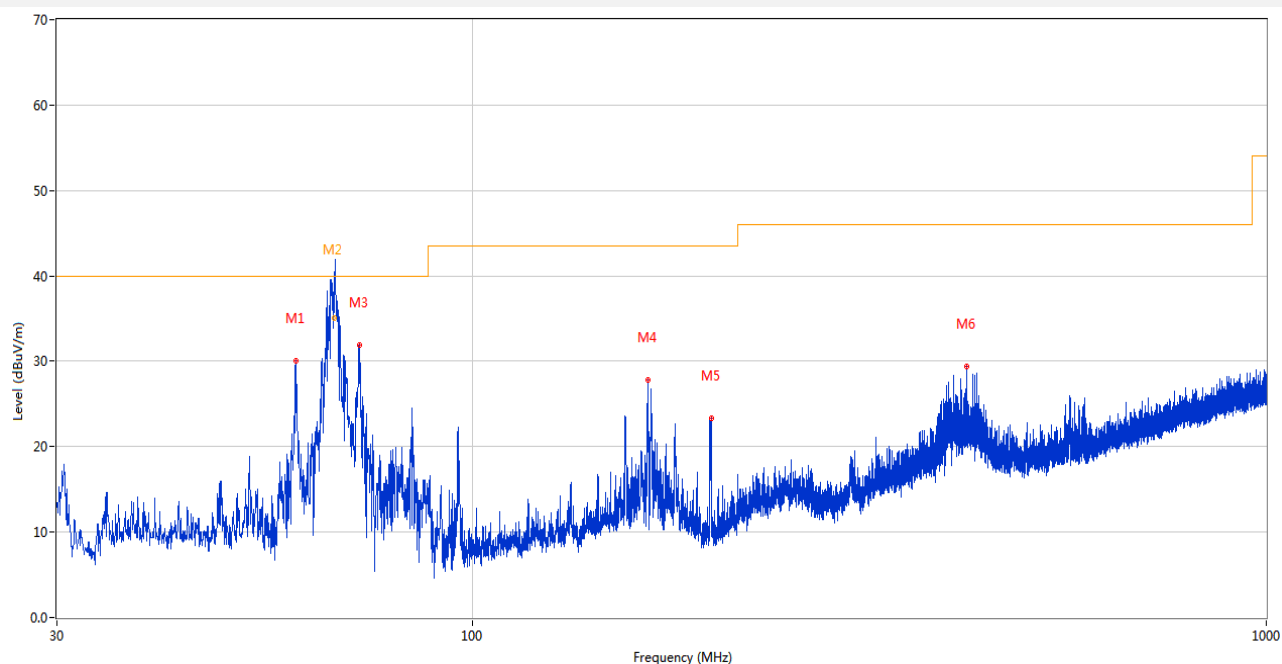
Dipole Antenna 3

30 MHz to 1 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	66.618	32.29	-28.53	40.0	7.71	Peak	44.00	200	Horizontal	Pass
2	83.932	22.18	-30.42	40.0	17.82	Peak	138.00	200	Horizontal	Pass
3	155.954	29.53	-24.86	43.5	13.97	Peak	171.00	200	Horizontal	Pass
4	168.080	30.63	-25.38	43.5	12.87	Peak	3.00	200	Horizontal	Pass
5	199.992	28.74	-28.62	43.5	14.76	Peak	6.00	200	Horizontal	Pass
6	398.018	29.03	-21.24	46.0	16.97	Peak	105.00	100	Horizontal	Pass

30 MHz to 1 GHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	59.925	30.09	-27.58	40.0	9.91	Peak	84.00	100	Vertical	Pass
2	67.041	43.90	-28.65	40.0	-3.90	Peak	105.00	117	Vertical	N/A
2*	67.041	35.08	-28.65	40.0	4.92	QP	105.00	117	Vertical	Pass
3	72.049	31.97	-29.46	40.0	8.03	Peak	235.00	100	Vertical	Pass
4	166.334	27.85	-25.37	43.5	15.65	Peak	250.00	100	Vertical	Pass
5	199.944	23.33	-28.62	43.5	20.17	Peak	1.00	100	Vertical	Pass
6	419.067	29.41	-20.57	46.0	16.59	Peak	18.00	100	Vertical	Pass

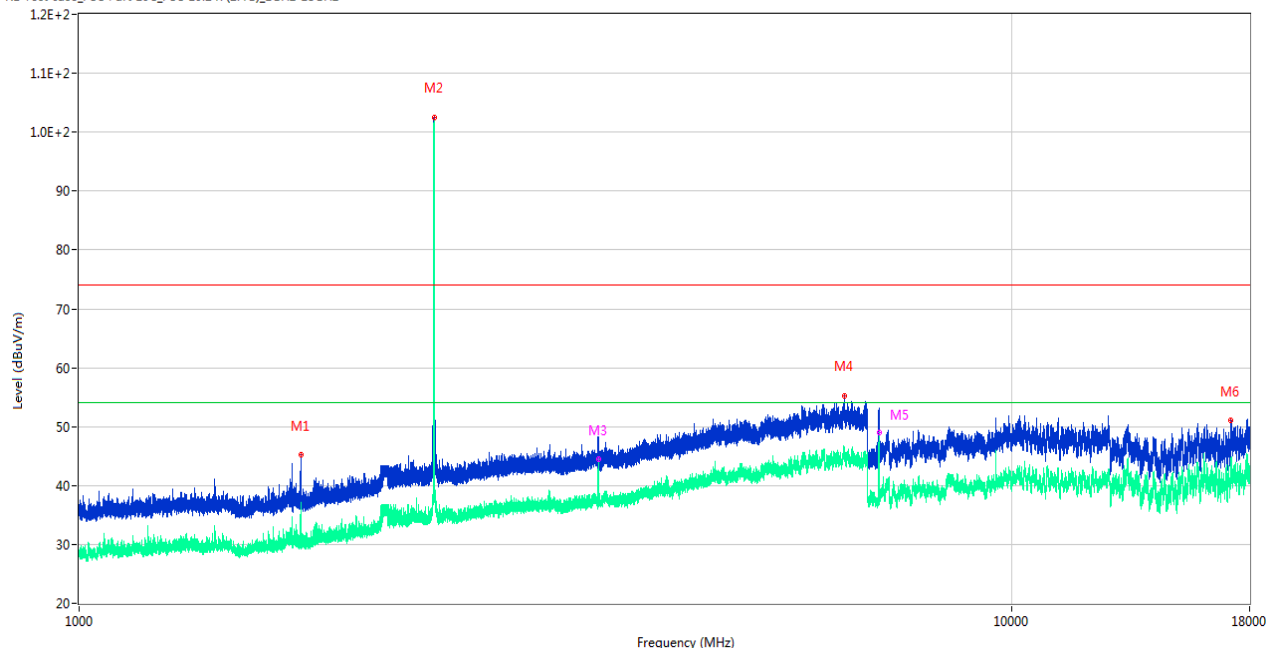
Note 1: The marked spikes near 2400 MHz with circle should be ignored because they are Fundamental signal.

Note 2: The spurious from 18GHz-25GHz is noise only, do not show on the report.

Ceramic Chip Antenna

GFSK LOW CHANNEL 1 GHz to 18 GHz, ANT H

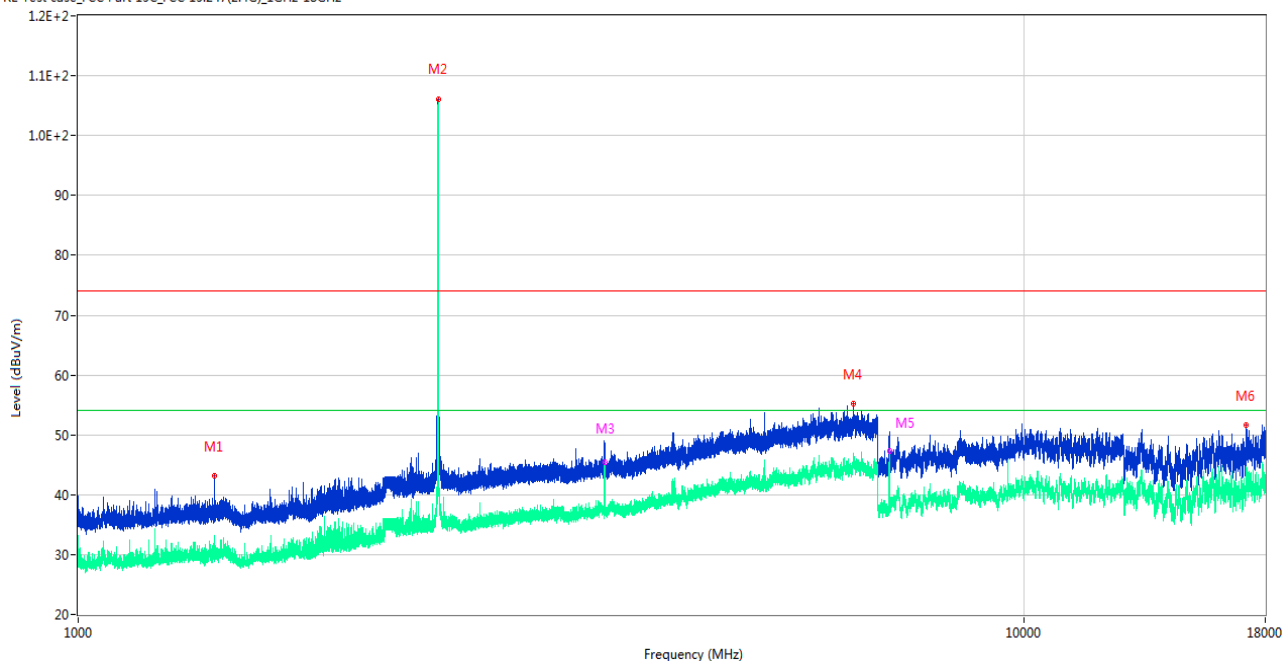
RE Test case_FCC Part 15C_FCC 15.247(2.4G)_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1727.900	45.22	-16.99	74.0	28.78	Peak	285.00	200	Horizontal	Pass
1**	1727.900	30.24	-16.99	54.0	23.76	AV	285.00	200	Horizontal	Pass
2	2402.100	102.52	-11.74	74.0	-28.52	Peak	291.00	100	Horizontal	N/A
2**	2402.100	102.32	-11.74	54.0	-48.32	AV	291.00	100	Horizontal	N/A
3	3603.200	48.28	-6.75	74.0	25.72	Peak	234.00	200	Horizontal	Pass
3**	3603.200	44.45	-6.75	54.0	9.55	AV	234.00	200	Horizontal	Pass
4	6613.800	55.24	2.10	74.0	18.76	Peak	171.00	100	Horizontal	Pass
4**	6613.800	45.85	2.10	54.0	8.15	AV	171.00	100	Horizontal	Pass
5	7206.712	51.16	-4.31	74.0	22.84	Peak	93.00	200	Horizontal	Pass
5**	7206.712	48.91	-4.31	54.0	5.09	AV	93.00	200	Horizontal	Pass
6	17198.588	51.05	1.98	74.0	22.95	Peak	156.00	400	Horizontal	Pass
6**	17198.588	42.94	1.98	54.0	11.06	AV	156.00	400	Horizontal	Pass

GFSK LOW CHANNEL 1 GHz to 18 GHz, ANT V

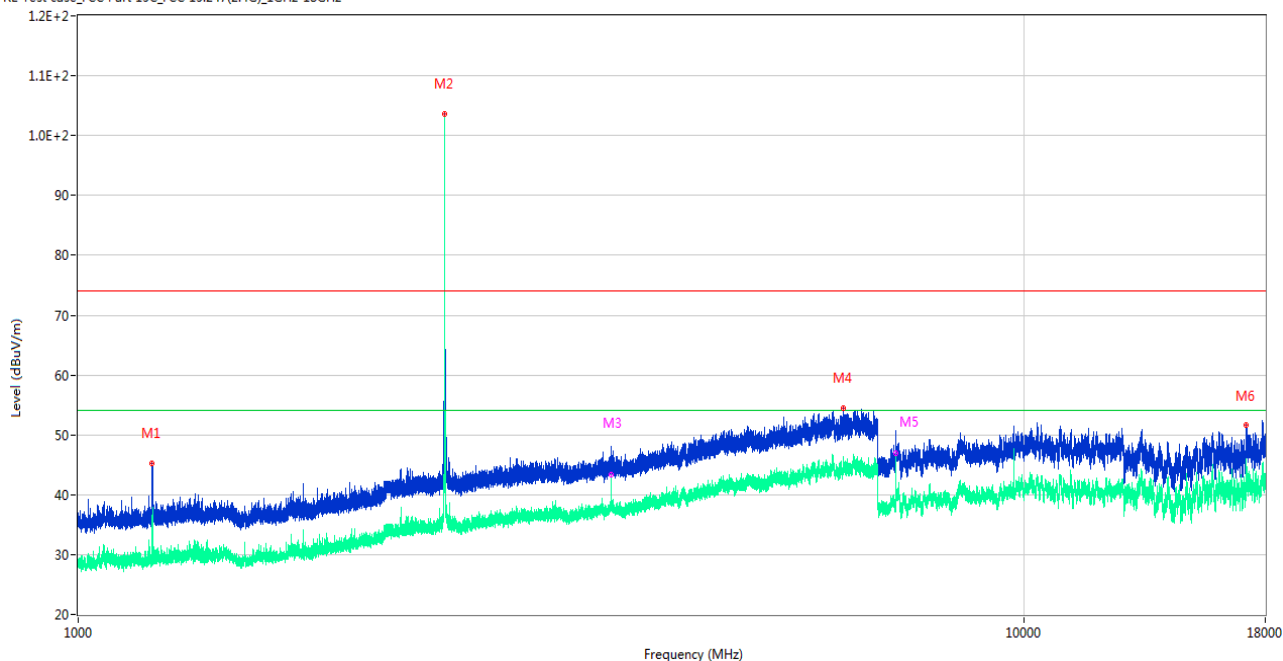
RE Test case_FCC Part 15C_FCC 15.247(2.4G)_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1394.200	43.13	-17.65	74.0	30.87	Peak	79.00	200	Vertical	Pass
1**	1394.200	29.97	-17.65	54.0	24.03	AV	79.00	200	Vertical	Pass
2	2402.100	106.15	-11.74	74.0	-32.15	Peak	235.00	100	Vertical	N/A
2**	2402.100	105.85	-11.74	54.0	-51.85	AV	235.00	100	Vertical	N/A
3	3603.000	48.22	-6.78	74.0	25.78	Peak	146.00	100	Vertical	Pass
3**	3603.000	45.39	-6.78	54.0	8.61	AV	146.00	100	Vertical	Pass
4	6604.400	55.17	1.85	74.0	18.83	Peak	360.00	100	Vertical	Pass
4**	6604.400	46.21	1.85	54.0	7.79	AV	360.00	100	Vertical	Pass
5	7205.562	49.64	-4.29	74.0	24.36	Peak	98.00	100	Vertical	Pass
5**	7205.562	47.23	-4.29	54.0	6.77	AV	98.00	100	Vertical	Pass
6	17186.251	51.60	2.48	74.0	22.40	Peak	220.00	400	Vertical	Pass
6**	17186.251	43.15	2.48	54.0	10.85	AV	220.00	400	Vertical	Pass

GFSK MIDDLE CHANNEL 1 GHz to 18 GHz, ANT H

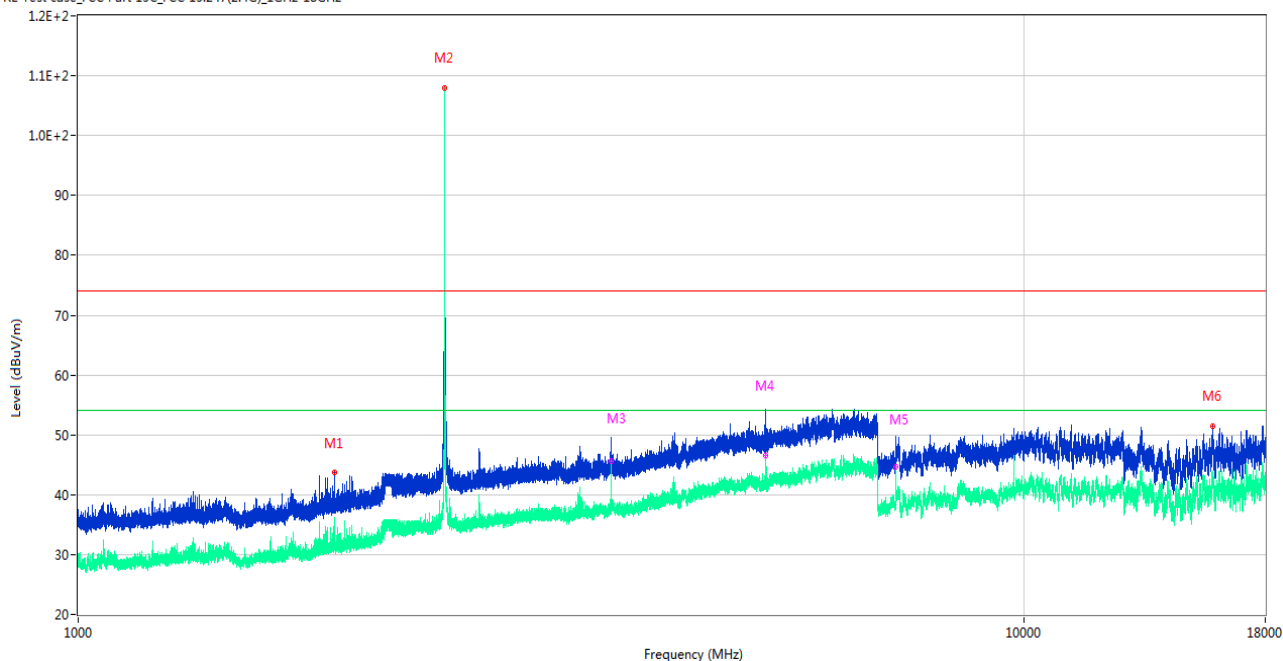
RE Test case_FCC Part 15C_FCC 15.247(2.4G)_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1195.700	45.23	-17.80	74.0	28.77	Peak	0.00	100	Horizontal	Pass
1**	1195.700	28.39	-17.80	54.0	25.61	AV	0.00	100	Horizontal	Pass
2	2441.100	103.69	-12.19	74.0	-29.69	Peak	5.00	200	Horizontal	N/A
2**	2441.100	103.36	-12.19	54.0	-49.36	AV	5.00	200	Horizontal	N/A
3	3661.400	48.07	-6.39	74.0	25.93	Peak	257.00	400	Horizontal	Pass
3**	3661.400	43.28	-6.39	54.0	10.72	AV	257.00	400	Horizontal	Pass
4	6449.800	54.48	1.93	74.0	19.52	Peak	247.00	100	Horizontal	Pass
4**	6449.800	44.61	1.93	54.0	9.39	AV	247.00	100	Horizontal	Pass
5	7323.725	49.41	-3.59	74.0	24.59	Peak	88.00	200	Horizontal	Pass
5**	7323.725	47.00	-3.59	54.0	7.00	AV	88.00	200	Horizontal	Pass
6	17198.850	51.64	1.96	74.0	22.36	Peak	201.00	200	Horizontal	Pass
6**	17198.850	43.12	1.96	54.0	10.88	AV	201.00	200	Horizontal	Pass

GFSK MIDDLE CHANNEL 1 GHz to 18 GHz, ANT V

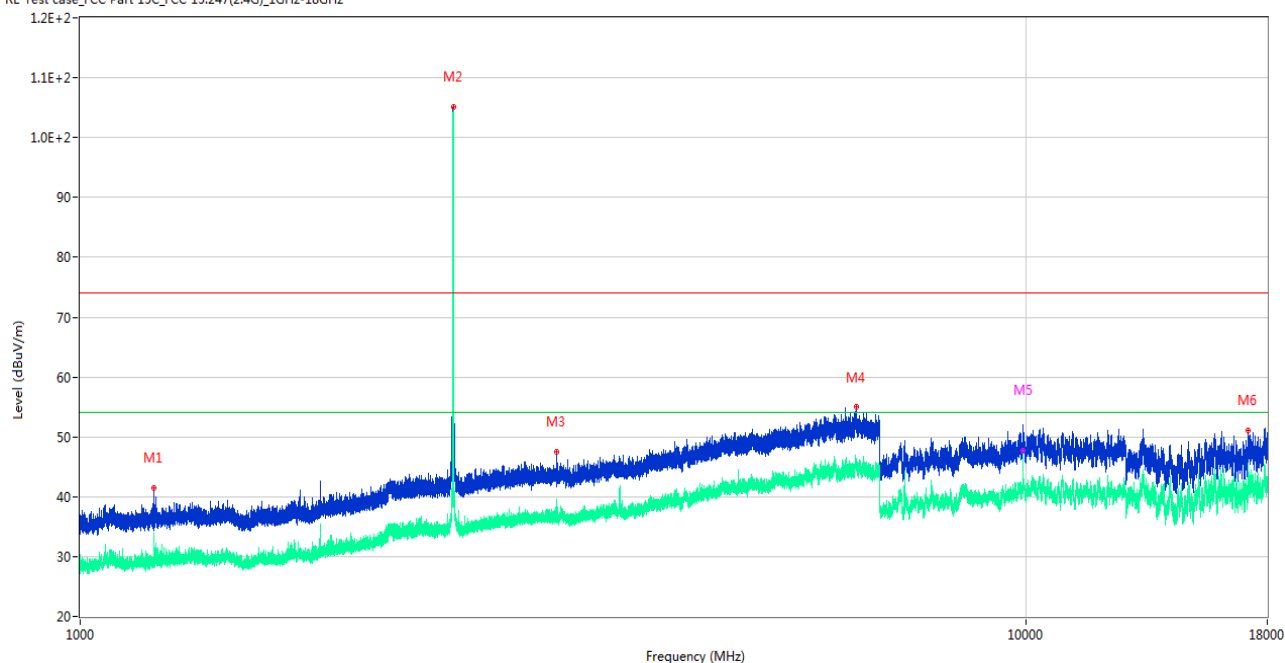
RE Test case_FCC Part 15C_FCC 15.247(2.4G)_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1865.600	43.67	-15.96	74.0	30.33	Peak	97.00	300	Vertical	Pass
1**	1865.600	30.65	-15.96	54.0	23.35	AV	97.00	300	Vertical	Pass
2	2441.100	108.04	-12.19	74.0	-34.04	Peak	45.00	100	Vertical	N/A
2**	2441.100	107.91	-12.19	54.0	-53.91	AV	45.00	100	Vertical	N/A
3	3661.800	48.98	-6.40	74.0	25.02	Peak	123.00	300	Vertical	Pass
3**	3661.800	45.67	-6.40	54.0	8.33	AV	123.00	300	Vertical	Pass
4	5328.200	50.90	-2.47	74.0	23.10	Peak	81.00	200	Vertical	Pass
4**	5328.200	46.55	-2.47	54.0	7.45	AV	81.00	200	Vertical	Pass
5	7322.862	49.47	-3.61	74.0	24.53	Peak	73.00	200	Vertical	Pass
5**	7322.862	44.62	-3.61	54.0	9.38	AV	73.00	200	Vertical	Pass
6	15833.850	51.45	1.46	74.0	22.55	Peak	106.00	300	Vertical	Pass
6**	15833.850	43.06	1.46	54.0	10.94	AV	106.00	300	Vertical	Pass

GFSK HIGH CHANNEL 1 GHz to 18 GHz, ANT H

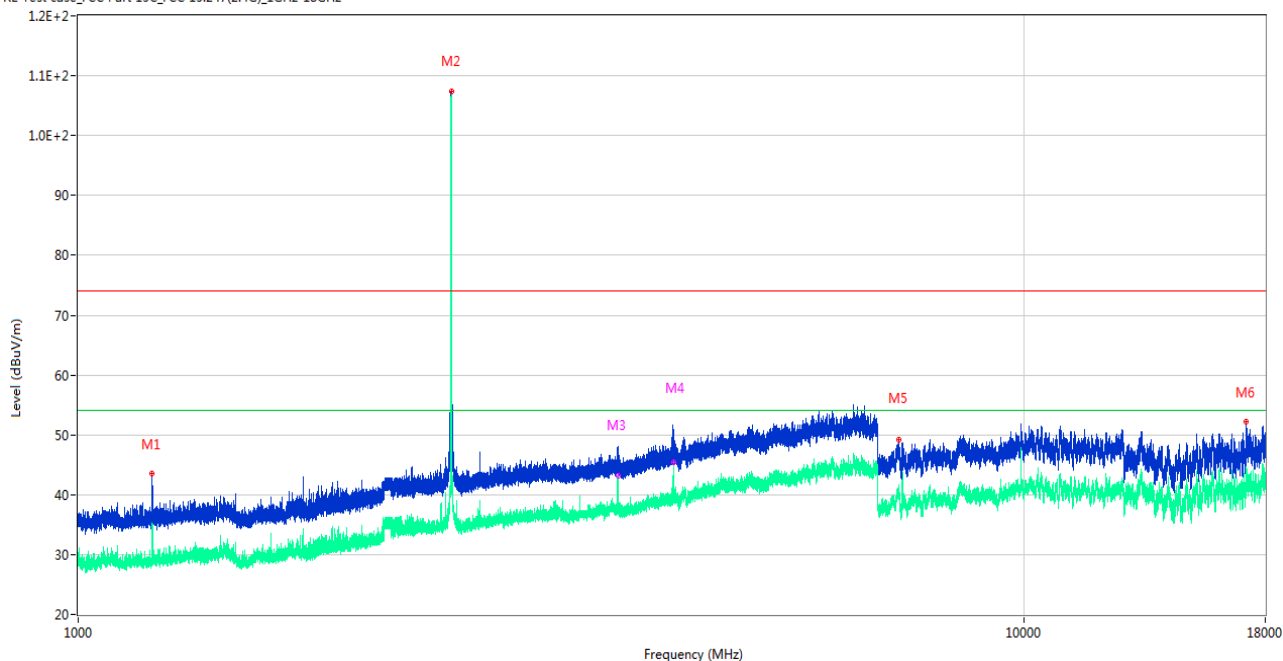
RE Test case_FCC Part 15C_FCC 15.247(2.4G)_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1195.100	41.52	-17.79	74.0	32.48	Peak	0.00	100	Horizontal	Pass
1**	1195.100	28.89	-17.79	54.0	25.11	AV	0.00	100	Horizontal	Pass
2	2479.800	105.18	-12.20	74.0	-31.18	Peak	294.00	200	Horizontal	N/A
2**	2479.800	104.22	-12.20	54.0	-50.22	AV	294.00	200	Horizontal	N/A
3	3190.000	47.56	-7.83	74.0	26.44	Peak	60.00	300	Horizontal	Pass
3**	3190.000	39.40	-7.83	54.0	14.60	AV	60.00	300	Horizontal	Pass
4	6618.600	54.97	1.83	74.0	19.03	Peak	155.00	300	Horizontal	Pass
4**	6618.600	45.42	1.83	54.0	8.58	AV	155.00	300	Horizontal	Pass
5	9919.563	51.47	-1.07	74.0	22.53	Peak	291.00	100	Horizontal	Pass
5**	9919.563	47.71	-1.07	54.0	6.29	AV	291.00	100	Horizontal	Pass
6	17197.011	51.08	2.07	74.0	22.92	Peak	315.00	100	Horizontal	Pass
6**	17197.011	43.74	2.07	54.0	10.26	AV	315.00	100	Horizontal	Pass

GFSK HIGH CHANNEL 1 GHz to 18 GHz, ANT V

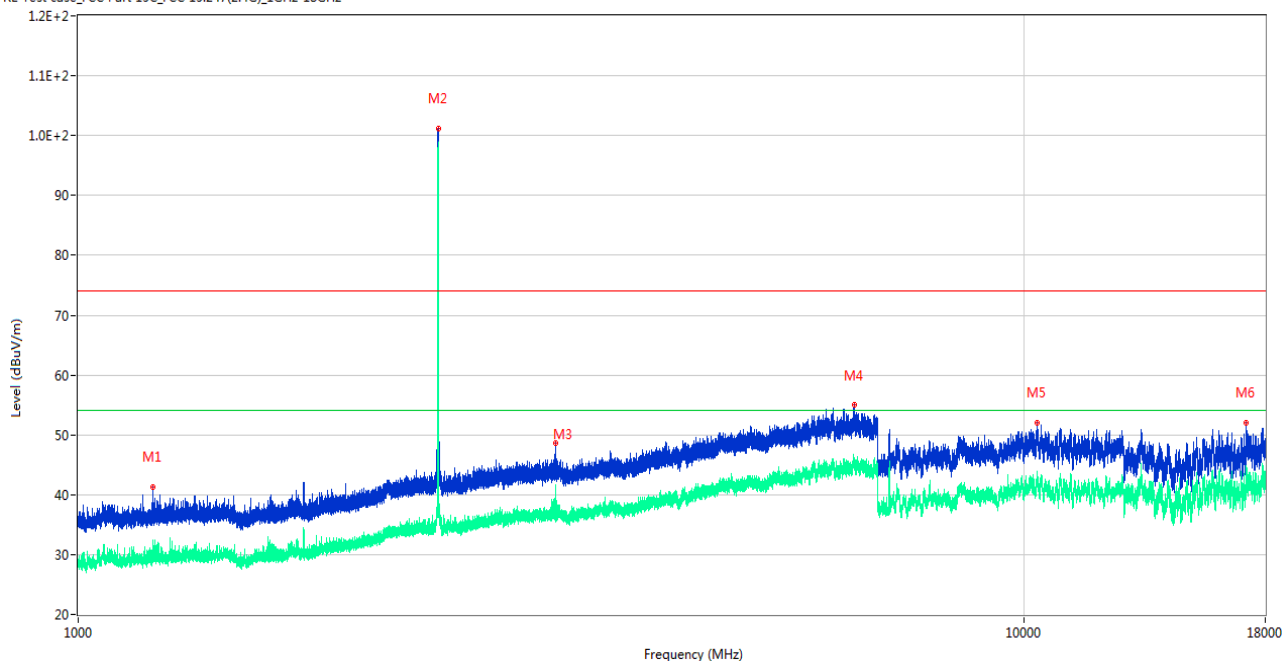
RE Test case_FCC Part 15C_FCC 15.247(2.4G)_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1195.500	43.45	-17.80	74.0	30.55	Peak	159.00	100	Vertical	Pass
1**	1195.500	35.28	-17.80	54.0	18.72	AV	159.00	100	Vertical	Pass
2	2479.800	107.45	-12.20	74.0	-33.45	Peak	242.00	100	Vertical	N/A
2**	2479.800	106.91	-12.20	54.0	-52.91	AV	242.00	100	Vertical	N/A
3	3720.200	48.03	-5.88	74.0	25.97	Peak	188.00	100	Vertical	Pass
3**	3720.200	43.20	-5.88	54.0	10.80	AV	188.00	100	Vertical	Pass
4	4267.000	46.68	-3.85	74.0	27.32	Peak	62.00	300	Vertical	Pass
4**	4267.000	45.38	-3.85	54.0	8.62	AV	62.00	300	Vertical	Pass
5	7371.450	49.13	-3.89	74.0	24.87	Peak	203.00	400	Vertical	Pass
5**	7371.450	40.38	-3.89	54.0	13.62	AV	203.00	400	Vertical	Pass
6	17186.775	52.19	2.46	74.0	21.81	Peak	0.00	100	Vertical	Pass
6**	17186.775	43.17	2.46	54.0	10.83	AV	0.00	100	Vertical	Pass

8-DPSK LOW CHANNEL 1 GHz to 18 GHz, ANT H

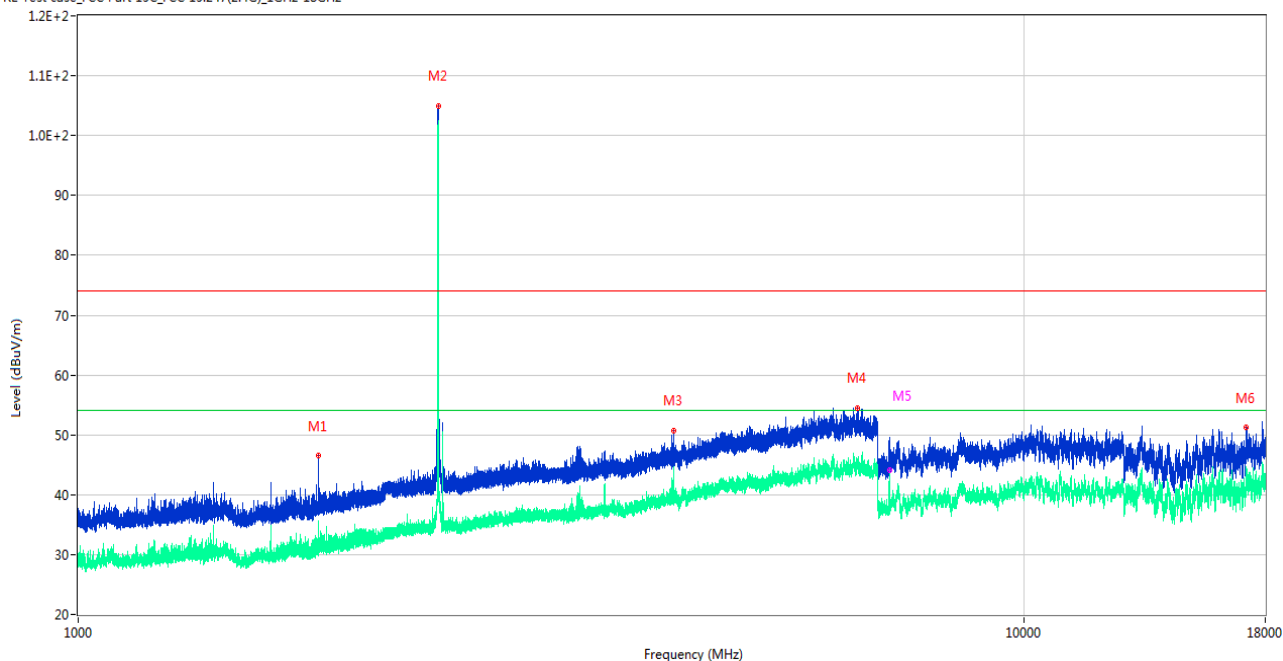
RE Test case_FCC Part 15C_FCC 15.247(2.4G)_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1198.000	41.35	-17.87	74.0	32.65	Peak	18.00	400	Horizontal	Pass
1**	1198.000	32.43	-17.87	54.0	21.57	AV	18.00	400	Horizontal	Pass
2	2402.300	101.21	-11.74	74.0	-27.21	Peak	283.00	100	Horizontal	N/A
2**	2402.300	98.42	-11.74	54.0	-44.42	AV	283.00	100	Horizontal	N/A
3	3197.200	48.67	-7.65	74.0	25.33	Peak	145.00	100	Horizontal	Pass
3**	3197.200	38.82	-7.65	54.0	15.18	AV	145.00	100	Horizontal	Pass
4	6617.400	55.02	1.63	74.0	18.98	Peak	29.00	400	Horizontal	Pass
4**	6617.400	44.45	1.63	54.0	9.55	AV	29.00	400	Horizontal	Pass
5	10324.938	52.09	-0.07	74.0	21.91	Peak	234.00	400	Horizontal	Pass
5**	10324.938	42.61	-0.07	54.0	11.39	AV	234.00	400	Horizontal	Pass
6	17195.176	52.06	2.18	74.0	21.94	Peak	183.00	400	Horizontal	Pass
6**	17195.176	43.51	2.18	54.0	10.49	AV	183.00	400	Horizontal	Pass

8-DPSK LOW CHANNEL 1 GHz to 18 GHz, ANT V

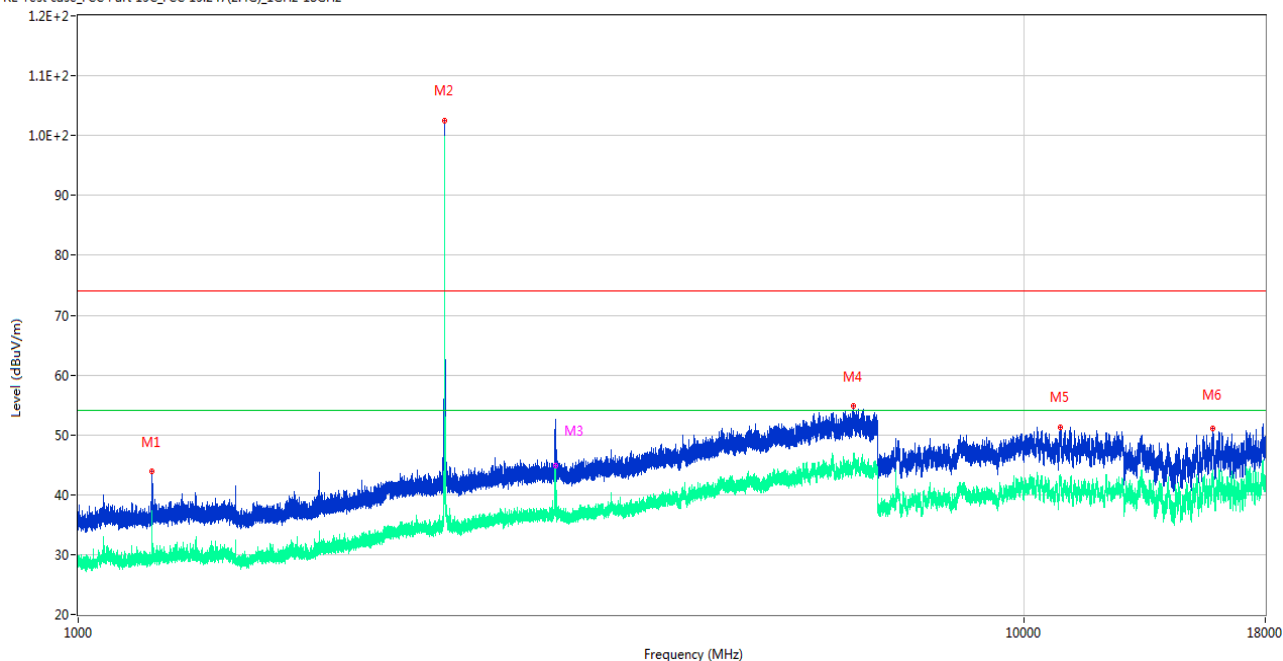
RE Test case_FCC Part 15C_FCC 15.247(2.4G)_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1795.900	46.48	-16.64	74.0	27.52	Peak	83.00	100	Vertical	Pass
1**	1795.900	29.88	-16.64	54.0	24.12	AV	83.00	100	Vertical	Pass
2	2402.100	104.98	-11.74	74.0	-30.98	Peak	296.00	100	Vertical	N/A
2**	2402.100	102.43	-11.74	54.0	-48.43	AV	296.00	100	Vertical	N/A
3	4267.000	50.76	-3.85	74.0	23.24	Peak	92.00	100	Vertical	Pass
3**	4267.000	40.29	-3.85	54.0	13.71	AV	92.00	100	Vertical	Pass
4	6676.200	54.55	0.13	74.0	19.45	Peak	61.00	300	Vertical	Pass
4**	6676.200	45.36	0.13	54.0	8.64	AV	61.00	300	Vertical	Pass
5	7205.850	47.49	-4.33	74.0	26.51	Peak	74.00	400	Vertical	Pass
5**	7205.850	44.02	-4.33	54.0	9.98	AV	74.00	400	Vertical	Pass
6	17187.037	51.24	2.45	74.0	22.76	Peak	90.00	100	Vertical	Pass
6**	17187.037	43.15	2.45	54.0	10.85	AV	90.00	100	Vertical	Pass

8-DPSK MIDDLE CHANNEL 1 GHz to 18 GHz, ANT H

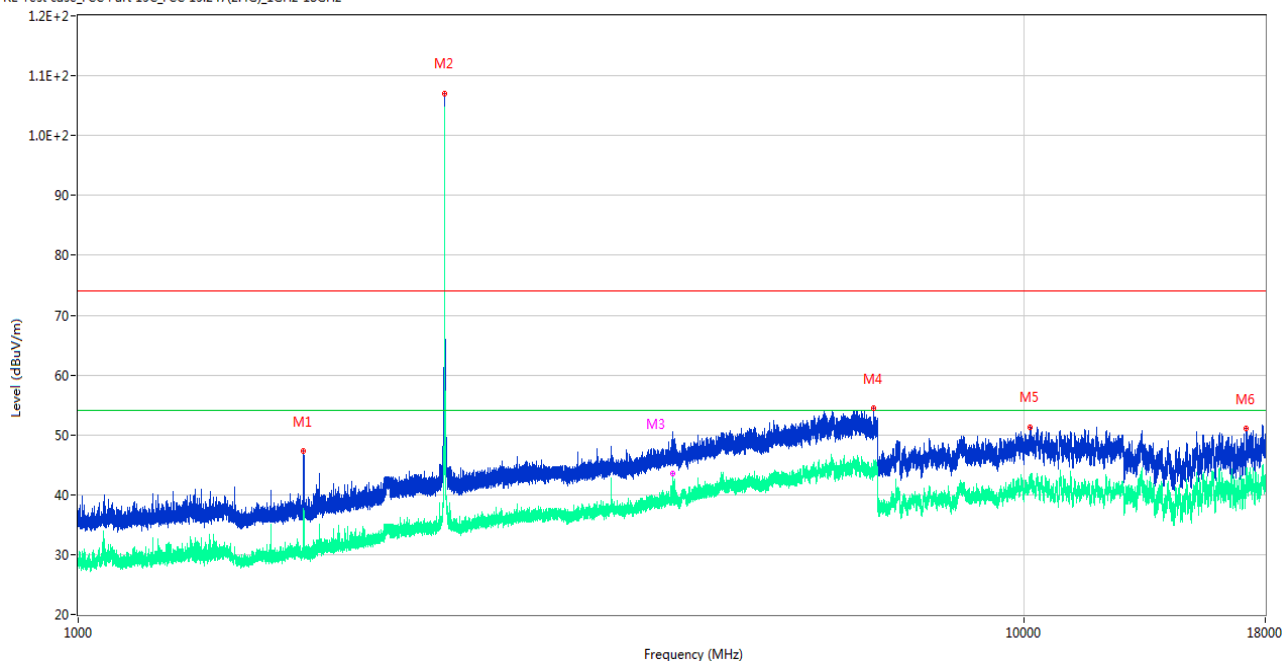
RE Test case_FCC Part 15C_FCC 15.247(2.4G)_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1196.700	43.84	-17.84	74.0	30.16	Peak	0.00	300	Horizontal	Pass
1**	1196.700	29.16	-17.84	54.0	24.84	AV	0.00	300	Horizontal	Pass
2	2441.200	102.53	-12.18	74.0	-28.53	Peak	6.00	100	Horizontal	N/A
2**	2441.200	99.85	-12.18	54.0	-45.85	AV	6.00	100	Horizontal	N/A
3	3194.600	51.58	-7.98	74.0	22.42	Peak	167.00	300	Horizontal	Pass
3**	3194.600	44.79	-7.98	54.0	9.21	AV	167.00	300	Horizontal	Pass
4	6604.800	54.78	1.88	74.0	19.22	Peak	274.00	400	Horizontal	Pass
4**	6604.800	44.97	1.88	54.0	9.03	AV	274.00	400	Horizontal	Pass
5	10935.300	51.26	-0.02	74.0	22.74	Peak	183.00	200	Horizontal	Pass
5**	10935.300	42.66	-0.02	54.0	11.34	AV	183.00	200	Horizontal	Pass
6	15854.850	50.98	1.20	74.0	23.02	Peak	309.00	400	Horizontal	Pass
6**	15854.850	42.98	1.20	54.0	11.02	AV	309.00	400	Horizontal	Pass

8-DPSK MIDDLE CHANNEL 1 GHz to 18 GHz, ANT V

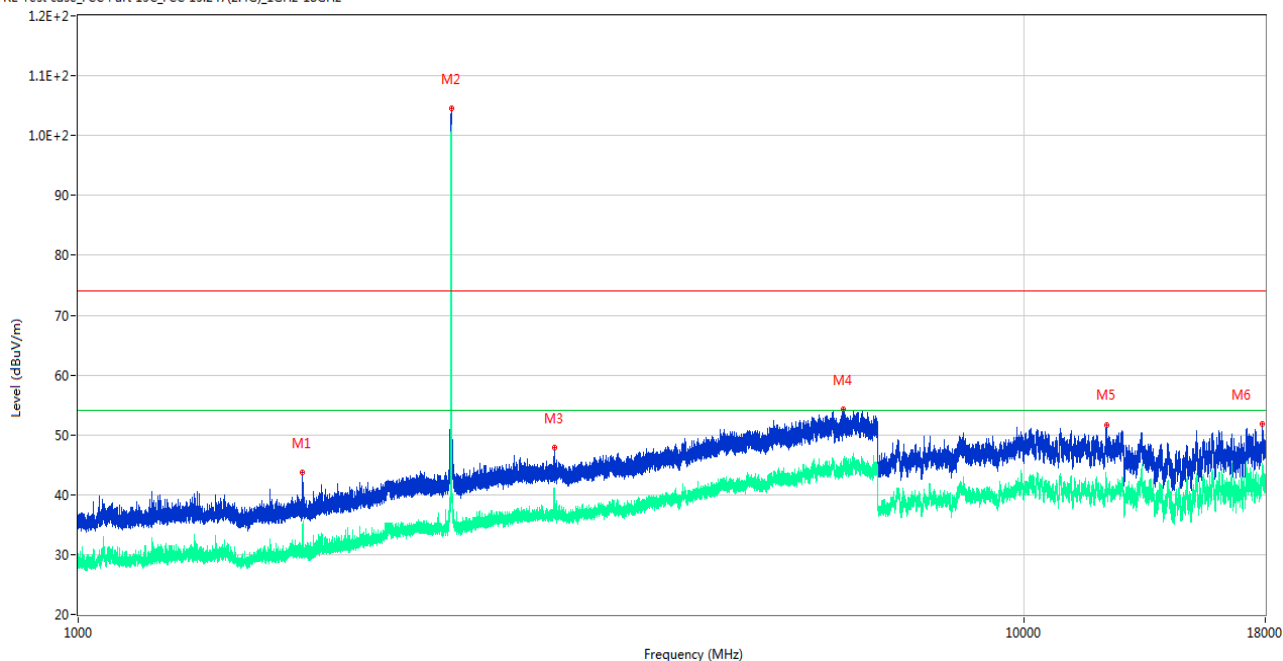
RE Test case_FCC Part 15C_FCC 15.247(2.4G)_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1728.500	47.22	-16.95	74.0	26.78	Peak	91.00	300	Vertical	Pass
1**	1728.500	29.65	-16.95	54.0	24.35	AV	91.00	300	Vertical	Pass
2	2441.100	107.06	-12.19	74.0	-33.06	Peak	6.00	100	Vertical	N/A
2**	2441.100	104.66	-12.19	54.0	-50.66	AV	6.00	100	Vertical	N/A
3	4253.800	46.09	-4.70	74.0	27.91	Peak	94.00	300	Vertical	Pass
3**	4253.800	43.48	-4.70	54.0	10.52	AV	94.00	300	Vertical	Pass
4	6942.400	54.43	2.62	74.0	19.57	Peak	184.00	400	Vertical	Pass
4**	6942.400	44.62	2.62	54.0	9.38	AV	184.00	400	Vertical	Pass
5	10153.300	51.34	-0.10	74.0	22.66	Peak	229.00	200	Vertical	Pass
5**	10153.300	42.78	-0.10	54.0	11.22	AV	229.00	200	Vertical	Pass
6	17190.187	50.99	2.33	74.0	23.01	Peak	273.00	400	Vertical	Pass
6**	17190.187	43.82	2.33	54.0	10.18	AV	273.00	400	Vertical	Pass

8-DPSK HIGH CHANNEL 1 GHz to 18 GHz, ANT H

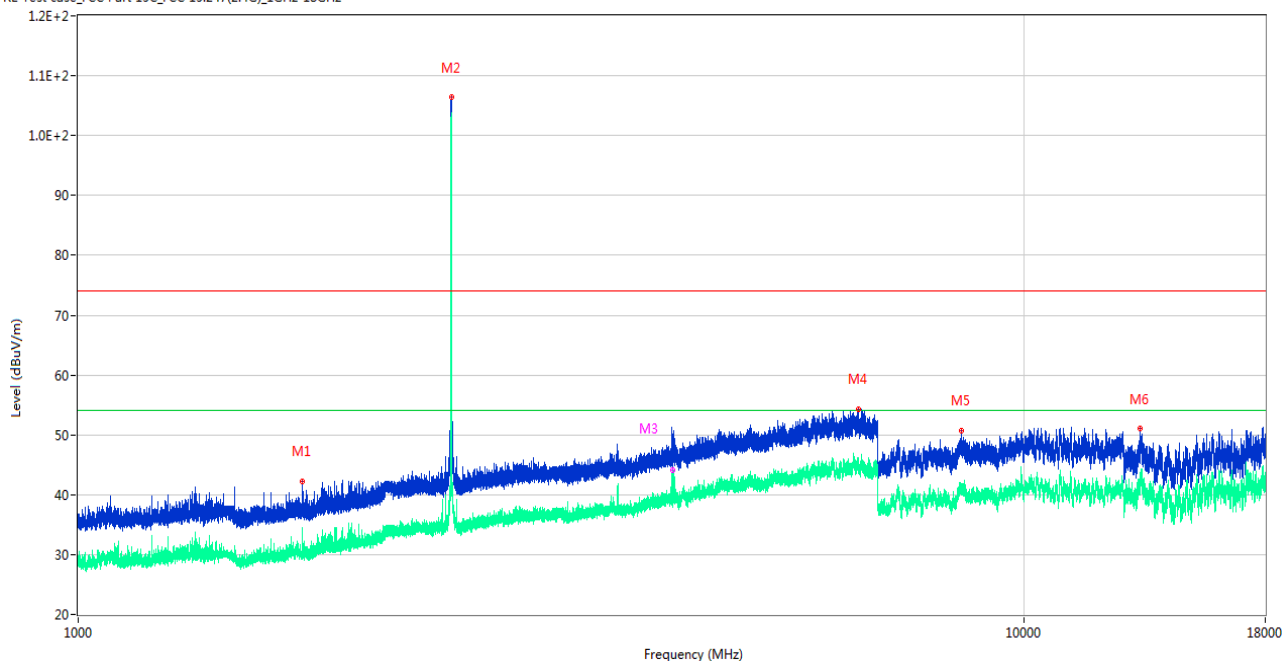
RE Test case_FCC Part 15C_FCC 15.247(2.4G)_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1726.700	43.64	-17.04	74.0	30.36	Peak	347.00	400	Horizontal	Pass
1**	1726.700	30.09	-17.04	54.0	23.91	AV	347.00	400	Horizontal	Pass
2	2480.000	104.50	-12.20	74.0	-30.50	Peak	298.00	150	Horizontal	N/A
2**	2480.000	101.04	-12.20	54.0	-47.04	AV	298.00	150	Horizontal	N/A
3	3192.800	47.80	-7.83	74.0	26.20	Peak	163.00	300	Horizontal	Pass
3**	3192.800	36.80	-7.83	54.0	17.20	AV	163.00	300	Horizontal	Pass
4	6446.800	54.20	2.00	74.0	19.80	Peak	143.00	100	Horizontal	Pass
4**	6446.800	45.91	2.00	54.0	8.09	AV	143.00	100	Horizontal	Pass
5	12225.313	51.72	1.31	74.0	22.28	Peak	330.00	300	Horizontal	Pass
5**	12225.313	42.39	1.31	54.0	11.61	AV	330.00	300	Horizontal	Pass
6	17881.874	51.83	3.59	74.0	22.17	Peak	165.00	300	Horizontal	Pass
6**	17881.874	44.49	3.59	54.0	9.51	AV	165.00	300	Horizontal	Pass

8-DPSK HIGH CHANNEL 1 GHz to 18 GHz, ANT V

RE Test case_FCC Part 15C_FCC 15.247(2.4G)_1GHz-18GHz

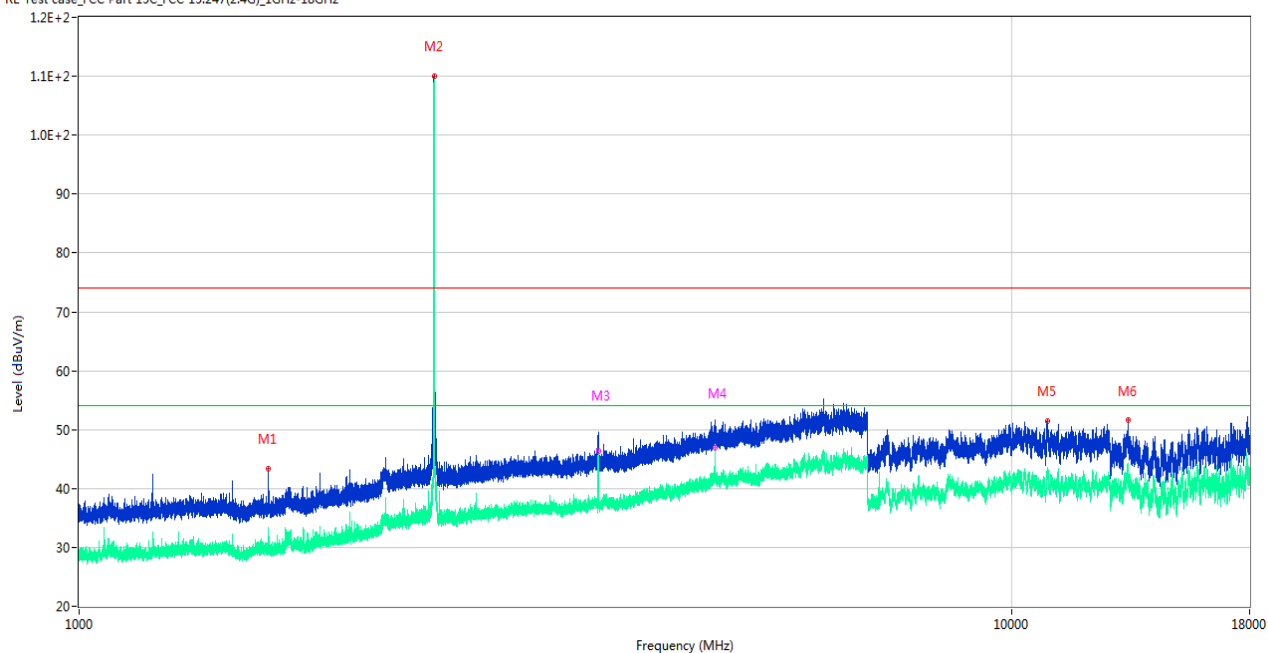


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1726.700	42.29	-17.04	74.0	31.71	Peak	16.00	100	Vertical	Pass
1**	1726.700	30.66	-17.04	54.0	23.34	AV	16.00	100	Vertical	Pass
2	2479.900	106.42	-12.20	74.0	-32.42	Peak	267.00	100	Vertical	N/A
2**	2479.900	103.26	-12.20	54.0	-49.26	AV	267.00	100	Vertical	N/A
3	4248.800	49.03	-4.92	74.0	24.97	Peak	91.00	300	Vertical	Pass
3**	4248.800	44.06	-4.92	54.0	9.94	AV	91.00	300	Vertical	Pass
4	6680.400	54.32	-0.13	74.0	19.68	Peak	49.00	100	Vertical	Pass
4**	6680.400	44.82	-0.13	54.0	9.18	AV	49.00	100	Vertical	Pass
5	8582.974	50.70	-2.09	74.0	23.30	Peak	60.00	400	Vertical	Pass
5**	8582.974	40.40	-2.09	54.0	13.60	AV	60.00	400	Vertical	Pass
6	13285.500	51.04	0.76	74.0	22.96	Peak	54.00	100	Vertical	Pass
6**	13285.500	41.27	0.76	54.0	12.73	AV	54.00	100	Vertical	Pass

Metal Antenna

GFSK LOW CHANNEL 1 GHz to 18 GHz, ANT H

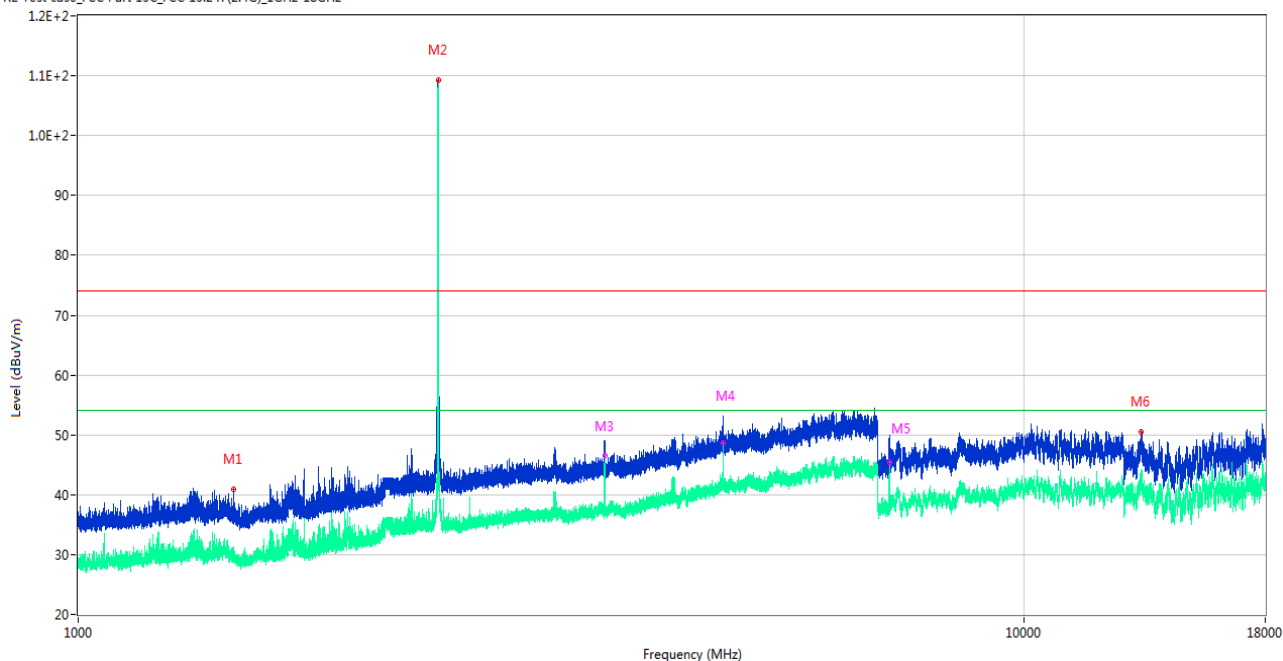
RE Test case_FCC Part 15C_FCC 15.247(2.4G)_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1594.200	43.43	-17.08	74.0	30.57	Peak	109.00	100	Horizontal	Pass
1**	1594.200	29.13	-17.08	54.0	24.87	AV	109.00	100	Horizontal	Pass
2	2402.100	110.07	-11.74	74.0	-36.07	Peak	168.00	100	Horizontal	N/A
2**	2402.100	109.83	-11.74	54.0	-55.83	AV	168.00	100	Horizontal	N/A
3	3603.200	49.56	-6.75	74.0	24.44	Peak	290.00	100	Horizontal	Pass
3**	3603.200	46.35	-6.75	54.0	7.65	AV	290.00	100	Horizontal	Pass
4	4804.200	51.31	-2.06	74.0	22.69	Peak	154.00	100	Horizontal	Pass
4**	4804.200	46.99	-2.06	54.0	7.01	AV	154.00	100	Horizontal	Pass
5	10929.838	51.43	0.09	74.0	22.57	Peak	220.00	100	Horizontal	Pass
5**	10929.838	42.16	0.09	54.0	11.84	AV	220.00	100	Horizontal	Pass
6	13335.638	51.56	1.01	74.0	22.44	Peak	344.00	100	Horizontal	Pass
6**	13335.638	42.06	1.01	54.0	11.94	AV	344.00	100	Horizontal	Pass

GFSK LOW CHANNEL 1 GHz to 18 GHz, ANT V

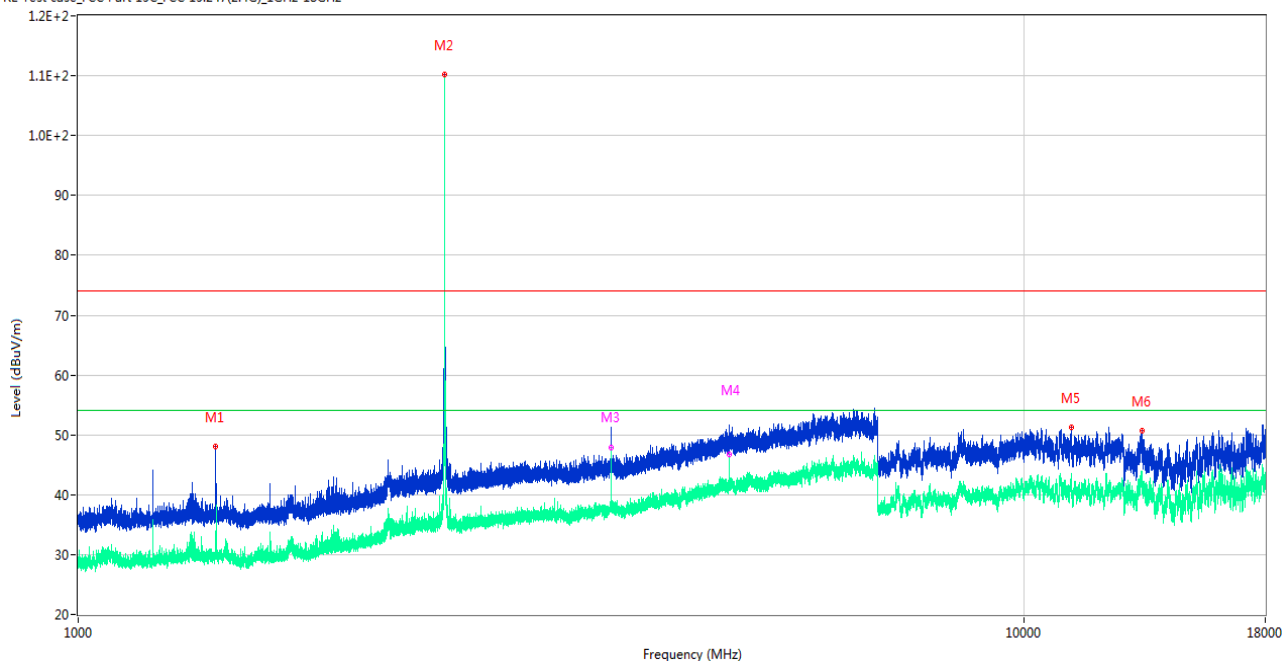
RE Test case_FCC Part 15C_FCC 15.247(2.4G)_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1461.000	40.88	-17.27	74.0	33.12	Peak	103.00	100	Vertical	Pass
1**	1461.000	29.39	-17.27	54.0	24.61	AV	103.00	100	Vertical	Pass
2	2402.200	109.32	-11.74	74.0	-35.32	Peak	126.00	200	Vertical	N/A
2**	2402.200	108.74	-11.74	54.0	-54.74	AV	126.00	200	Vertical	N/A
3	3603.200	48.43	-6.75	74.0	25.57	Peak	165.00	100	Vertical	Pass
3**	3603.200	46.51	-6.75	54.0	7.49	AV	165.00	100	Vertical	Pass
4	4804.400	53.16	-2.08	74.0	20.84	Peak	124.00	100	Vertical	Pass
4**	4804.400	48.65	-2.08	54.0	5.35	AV	124.00	100	Vertical	Pass
5	7206.138	49.63	-4.33	74.0	24.37	Peak	316.00	200	Vertical	Pass
5**	7206.138	45.36	-4.33	54.0	8.64	AV	316.00	200	Vertical	Pass
6	13305.450	50.56	0.87	74.0	23.44	Peak	158.00	100	Vertical	Pass
6**	13305.450	42.64	0.87	54.0	11.36	AV	158.00	100	Vertical	Pass

GFSK MIDDLE CHANNEL 1 GHz to 18 GHz, ANT H

RE Test case_FCC Part 15C_FCC 15.247(2.4G)_1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1398.600	48.03	-17.32	74.0	25.97	Peak	93.00	100	Horizontal	Pass
1**	1398.600	29.70	-17.32	54.0	24.30	AV	93.00	100	Horizontal	Pass
2	2441.200	110.16	-12.18	74.0	-36.16	Peak	174.00	150	Horizontal	N/A
2**	2441.200	109.70	-12.18	54.0	-55.70	AV	174.00	150	Horizontal	N/A
3	3662.000	50.78	-6.42	74.0	23.22	Peak	280.00	100	Horizontal	Pass
3**	3662.000	47.89	-6.42	54.0	6.11	AV	280.00	100	Horizontal	Pass
4	4882.200	51.12	-2.59	74.0	22.88	Peak	153.00	200	Horizontal	Pass
4**	4882.200	46.73	-2.59	54.0	7.27	AV	153.00	200	Horizontal	Pass
5	11224.526	51.20	-0.22	74.0	22.80	Peak	303.00	400	Horizontal	Pass
5**	11224.526	41.97	-0.22	54.0	12.03	AV	303.00	400	Horizontal	Pass
6	13321.201	50.61	0.91	74.0	23.39	Peak	214.00	400	Horizontal	Pass
6**	13321.201	42.45	0.91	54.0	11.55	AV	214.00	400	Horizontal	Pass