ACCREDITED
TESTING LABORATORY
CERTIFICATE # 4821.01

BACL
Bay Area Compliance Labs Corp.

FCC PART 15.249

TEST REPORT

For

BYTECH NY INC.

2585 West 13 Street, Brooklyn, NY 11223

FCC ID: 2AHN6-AE

Report Type:	**Product Type:**
Original Report	Wireless Keyboard–Black Dongle

Report Number:	RSZ201116832-00
Report Date:	2020-12-03
Reviewed By:	Jacob Kong RF Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Wireless Keyboard–Black Dongle
Tested Model	BY-KB-WS-102-BK-AE
Frequency Range	2402~2480 MHz
Maximum Field Strength	92.70dBuV/m@3m
Modulation Technique	GFSK
Antenna Specification*	0 dBi (It is provided by the applicant)
Voltage Range	DC 5 V
Date of Test	2020-11-22 to 2020-12-03
Sample serial number	RSZ201116832-RF-S1(Assigned by BACL, Shenzhen)
Received date	2020-11-16
Sample/EUT Status	Good condition

Objective

This type approval report is in accordance with Part 2-Subpart J, and Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.249 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
AC Power Lines Conducted Emissions		±1.95dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		±1℃
Humidity		±6%
Supply voltages		±0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing by manufacturer.

Frequency List

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402 MHz	11	2422 MHz	21	2442 MHz	31	2462 MHz
2	2404 MHz	12	2424 MHz	22	2444 MHz	32	2464 MHz
3	2406 MHz	13	2426 MHz	23	2446 MHz	33	2466 MHz
4	2408 MHz	14	2428 MHz	24	2448 MHz	34	2468 MHz
5	2410 MHz	15	2430 MHz	25	2450 MHz	35	2470 MHz
6	2412 MHz	16	2432 MHz	26	2452 MHz	36	2472 MHz
7	2414 MHz	17	2434 MHz	27	2454 MHz	37	2474 MHz
8	2416 MHz	18	2436 MHz	28	2456 MHz	38	2476 MHz
9	2418 MHz	19	2438 MHz	29	2458 MHz	39	2478 MHz
10	2420 MHz	20	2440 MHz	30	2460 MHz	40	2480 MHz

Channel 1, Channel 20 and Channel 40 were selected for testing.

EUT Exercise Software

“SE67T_Test_v161”* software was use to the EUT tested. The software was provided by the applicant.

Equipment Modifications

No modifications were made to the unit tested.

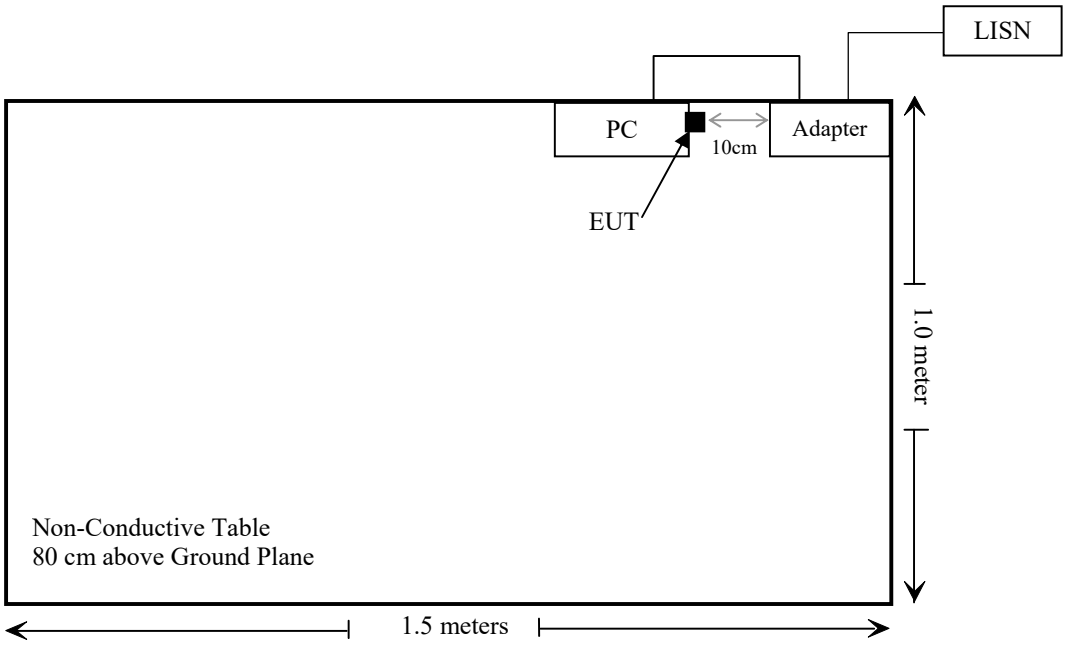
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	PC	Latitude E5430	JG3NLV1
TOSHIBA	PC	C600-C02R	PSC2NQ-00G006

Support Cable Descriptions

Cable Description	Length (m)	From/Port	To
/	/	/	/

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	Conduction Emissions	Compliance
15.205, §15.209, §15.249(a)(c)(d)	Radiated Emissions& Outside of Band Emission	Compliance
§15.215 (c)	20 dB Bandwidth	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2020/08/04	2021/08/03
Rohde & Schwarz	LISN	ENV216	101613	2020/08/04	2021/08/03
Rohde & Schwarz	Transient Limitor	ESH3Z2	DE25985	2020/11/29	2021/11/28
Unknown	CE Cable	CE Cable	UF A210B-1-0720-504504	2020/11/29	2021/11/28
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2020/08/04	2021/08/03
Sonoma instrument	Pre-amplifier	310 N	186238	2020/08/04	2021/08/03
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
Unknown	Cable 2	RF Cable 2	F-03-EM197	2019/11/29	2020/11/28
Unknown	Cable	Chamber Cable 1	F-03-EM236	2019/11/29	2020/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2020/08/04	2021/08/03
COM-POWER	Pre-amplifier	PA-122	181919	2019/11/29	2020/11/28
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2019/11/29	2020/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017/12/22	2020/12/21
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2019/11/29	2020/11/28
Unknown	RF Cable	W1101-EQ1 OUT	F-19-EM005	2019/11/29	2020/11/28
SNSD	Band Reject filter	BSF2402-2480MN-0898-001	2.4G filter	2020/04/20	2021/04/20
Ducommun Technolagies	Horn antenna	ARH-4223-02	1007726-02 1304	2017/12/06	2020/12/05

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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.

Antenna Connector Construction

The EUT has one PCB antenna which was permanently attached and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

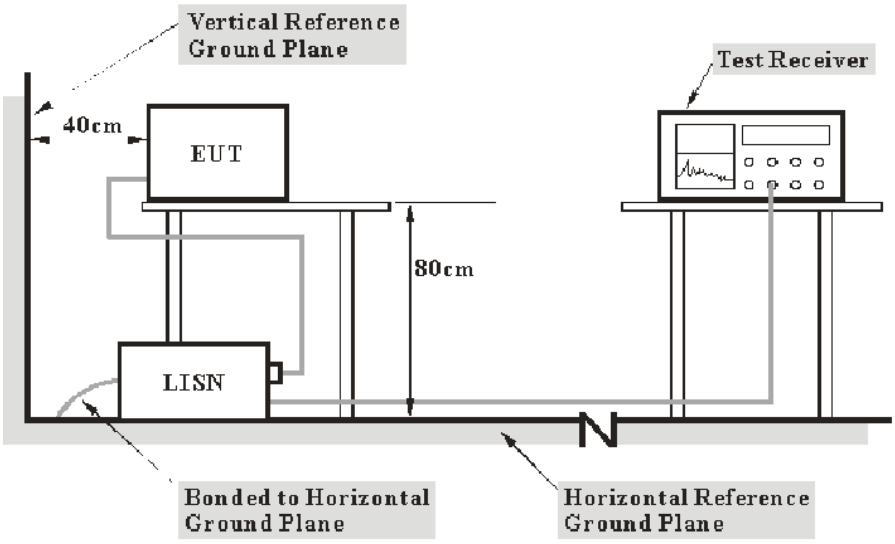
Result: Compliance.

FCC §15.207 – AC LINE CONDUCTED EMISSIONS

Applicable Standard

According to FCC §15.207

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with per ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Correction Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the EUT complied with the FCC Part 15.207,

Test Data

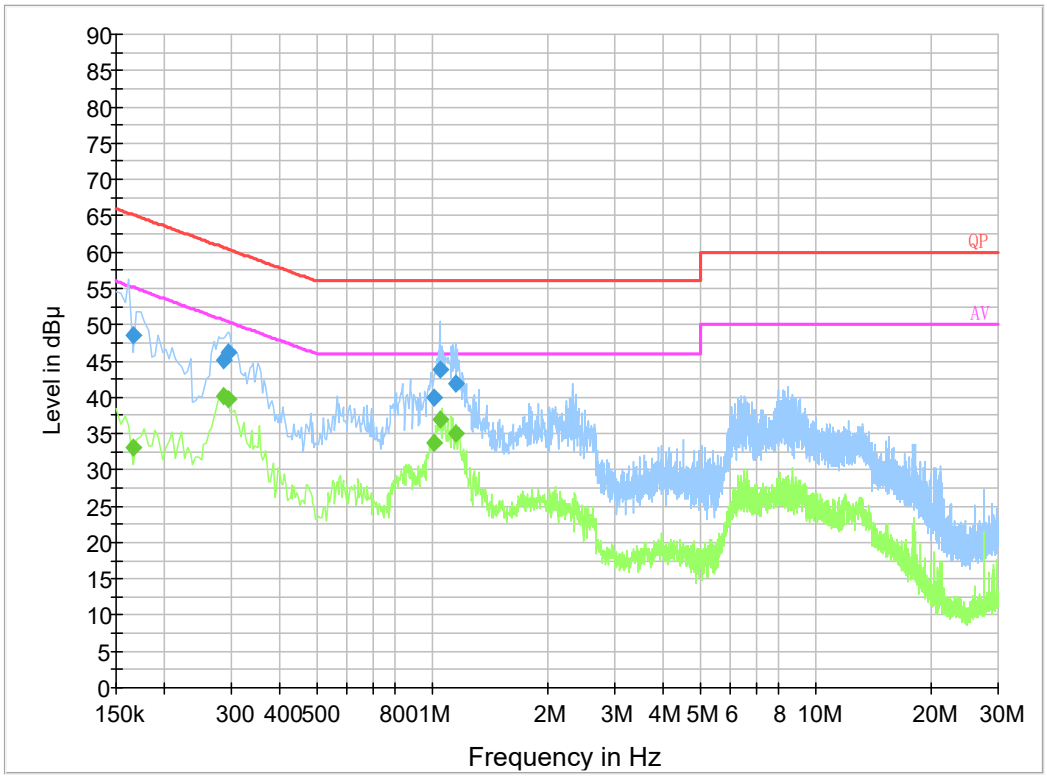
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li on 2020-12-03.

EUT Operation Mode: Transmitting

AC 120V/60 Hz, Line



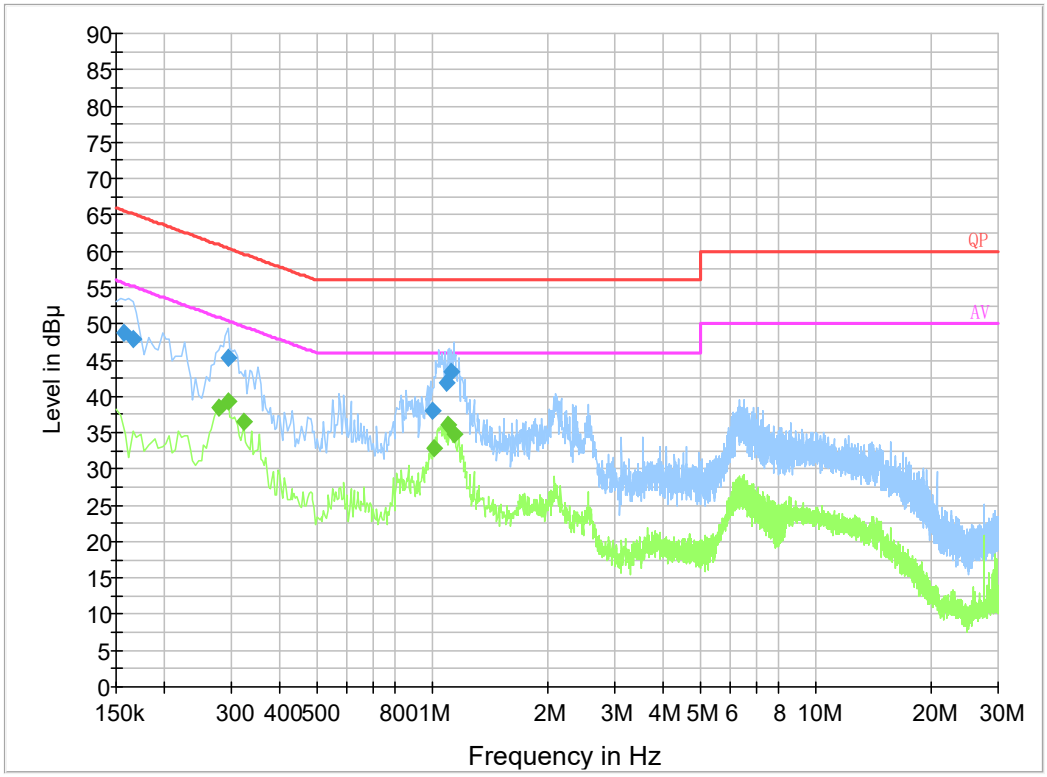
Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.165500	48.5	9.000	L1	19.9	16.7	65.2
0.285500	45.2	9.000	L1	19.7	15.5	60.7
0.293500	46.2	9.000	L1	19.7	14.2	60.4
1.011030	40.0	9.000	L1	19.9	16.0	56.0
1.050250	43.9	9.000	L1	19.9	12.1	56.0
1.152750	41.8	9.000	L1	19.8	14.2	56.0

Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.165500	33.0	9.000	L1	19.9	22.2	55.2
0.285500	40.1	9.000	L1	19.7	10.6	50.7
0.293500	39.8	9.000	L1	19.7	10.6	50.4
1.011030	33.8	9.000	L1	19.9	12.2	46.0
1.050250	36.9	9.000	L1	19.9	9.1	46.0
1.152750	35.0	9.000	L1	19.8	11.0	46.0

AC 120V/60 Hz, Neutral



Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.157500	48.7	9.000	N	19.8	16.9	65.6
0.165500	47.8	9.000	N	19.8	17.4	65.2
0.293500	45.3	9.000	N	19.7	15.1	60.4
0.999150	37.9	9.000	N	19.8	18.1	56.0
1.093350	41.8	9.000	N	19.8	14.2	56.0
1.124870	43.3	9.000	N	19.8	12.7	56.0

Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.278000	38.5	9.000	N	19.7	12.4	50.9
0.294000	39.2	9.000	N	19.7	11.2	50.4
0.322000	36.5	9.000	N	19.8	13.2	49.7
1.010000	33.0	9.000	N	19.8	13.0	46.0
1.098000	36.1	9.000	N	19.8	9.9	46.0
1.142000	34.9	9.000	N	19.8	11.1	46.0

Note:
1) Correction Factor =LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
The corrected factor has been input into the transducer of the test software.
2) Corrected Amplitude = Reading + Correction Factor
3) Margin = Limit – Corrected Amplitude

FCC§15.205, §15.209 & §15.249(a)(c)(d) - RADIATED EMISSIONS

Applicable Standard

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

As per FCC§15.249 (d), Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

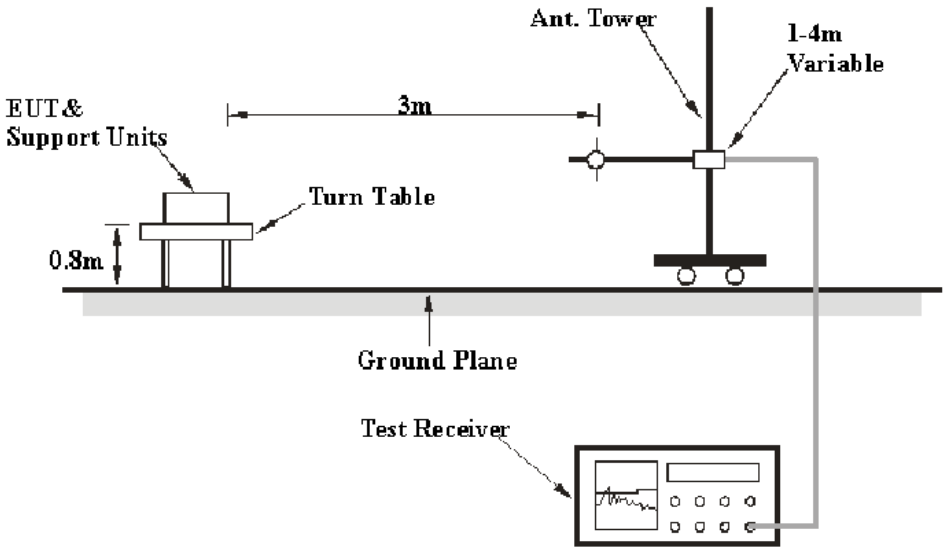
Test Equipment Setup

The system was investigated from 30 MHz to 25 GHz.

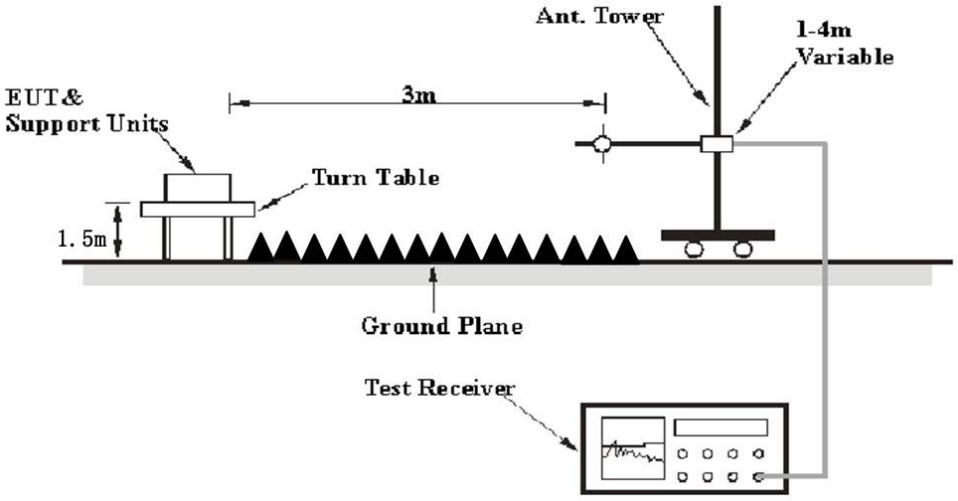
Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Average

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission and out of band emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209/15.205 and FCC 15.249 limits.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane for below 1GHz or 1.5 meter for above 1GHz, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Data

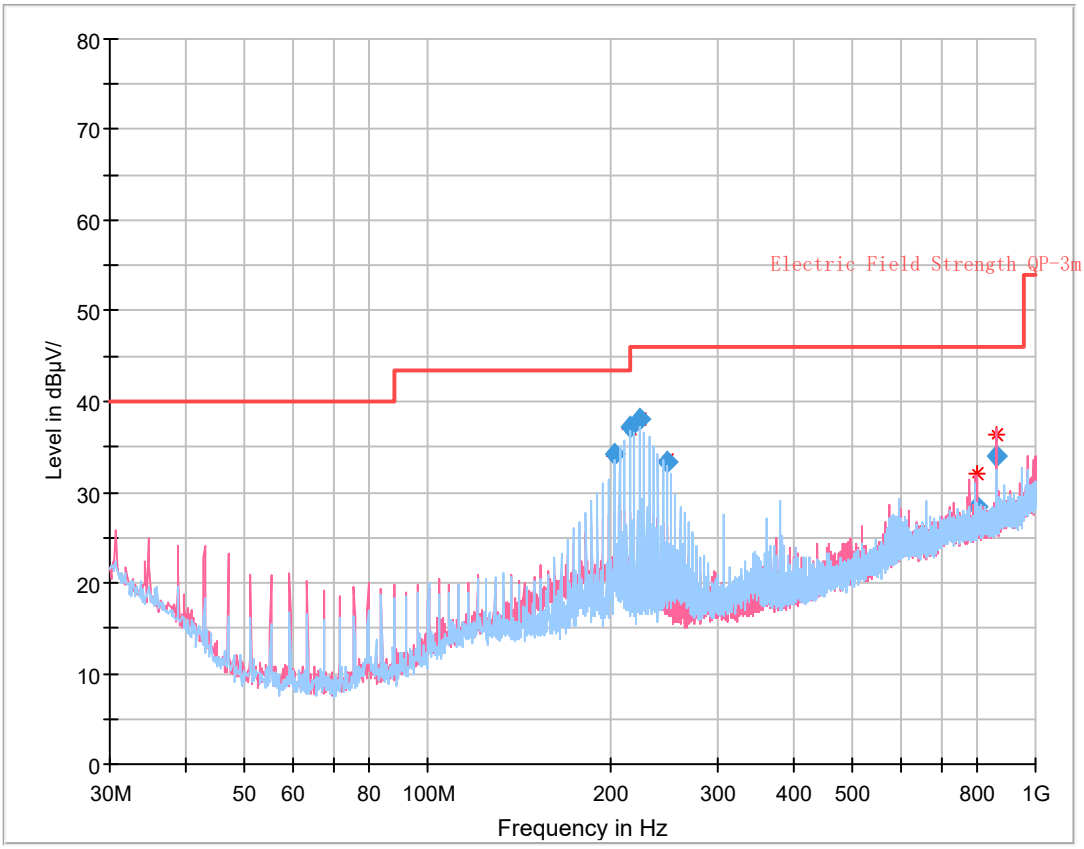
Environmental Conditions

Temperature:	27.8~28 ℃
Relative Humidity:	49~51 %
ATM Pressure:	101.0~101.1 kPa

The testing was performed by Holland Yang on 2020-11-22 for below 1GHz and Alan He on 2020-11-25 for above 1GHz.

Test Mode: Transmitting

30MHz – 1 GHz (worst case is Low channel):



Final_Result

Frequency (MHz)	QuasiPeak (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
202.752875	34.30	43.50	9.20	169.0	H	194.0	-10.6
215.036375	37.29	43.50	6.21	146.0	H	200.0	-10.7
223.227375	38.00	46.00	8.00	119.0	H	201.0	-10.7
247.805375	33.41	46.00	12.59	102.0	H	217.0	-10.8
799.773250	28.34	46.00	17.66	178.0	V	318.0	-0.2
862.507750	34.03	46.00	11.97	103.0	V	75.0	0.8

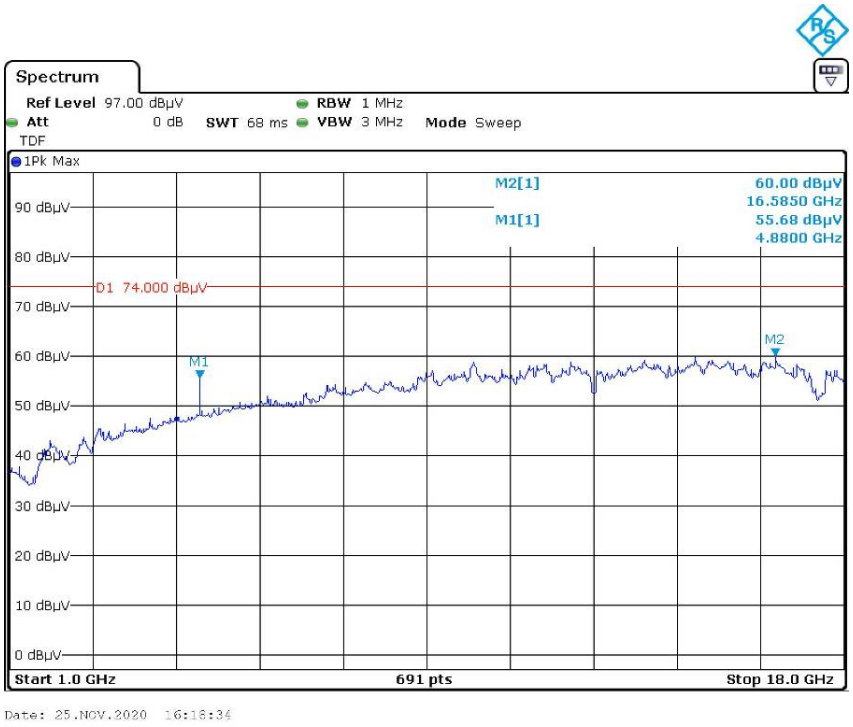
1 GHz - 25 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.249&15.209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2402 MHz)									
2402.00	57.44	PK	109	1.0	H	31.87	89.31	114	24.7
2402.00	56.59	AV	109	1.0	H	31.87	88.46	94	5.5
2402.00	57.12	PK	44	1.1	V	31.87	88.99	114	25.0
2402.00	55.99	AV	44	1.1	V	31.87	87.86	94	6.1
2348.61	29.05	PK	89	1.1	H	31.64	60.69	74	13.31
2348.61	15.12	AV	89	1.1	H	31.64	46.76	54	7.24
2396.36	29.13	PK	282	1.4	H	31.87	61.00	74	13.00
2396.36	14.73	AV	282	1.4	H	31.87	46.60	54	7.40
2485.05	29.66	PK	126	2.0	H	32.13	61.79	74	12.21
2485.05	14.55	AV	126	2.0	H	32.13	46.68	54	7.32
4804.00	52.26	PK	110	1.5	H	5.40	57.66	74	16.34
4804.00	44.51	AV	110	1.5	H	5.40	49.91	54	4.09
Middle Channel (2440 MHz)									
2440.00	59.36	PK	278	2.3	H	31.97	91.33	114	22.7
2440.00	58.44	AV	278	2.3	H	31.97	90.41	94	3.6
2440.00	56.28	PK	125	1.7	V	31.97	88.25	114	25.8
2440.00	55.17	AV	125	1.7	V	31.97	87.14	94	6.9
4880.00	52.75	PK	327	1.7	H	6.43	59.18	74	14.82
4880.00	44.91	AV	327	1.7	H	6.43	51.34	54	2.66
High Channel (2480 MHz)									
2480.00	60.57	PK	101	1.3	H	32.13	92.70	114	21.3
2480.00	59.66	AV	101	1.3	H	32.13	91.79	94	2.2
2480.00	55.41	PK	184	1.6	V	32.13	87.54	114	26.5
2480.00	54.32	AV	184	1.6	V	32.13	86.45	94	7.6
2347.92	29.70	PK	180	1.0	H	31.64	61.34	74	12.66
2347.92	14.49	AV	180	1.0	H	31.64	46.13	54	7.87
2484.13	29.91	PK	211	1.8	H	32.13	62.04	74	11.96
2484.13	17.03	AV	211	1.8	H	32.13	49.16	54	4.84
4960.00	50.46	PK	75	1.0	H	6.95	57.41	74	16.59
4960.00	43.59	AV	75	1.0	H	6.95	50.54	54	3.46

Note:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor=Antenna factor (RX) +cable loss – amplifier factor
Margin = Limit- Corr. Amplitude
The emission more than20dB below the limit was not required to be recorded.

Pre-scan with middle channel Peak

Horizontal



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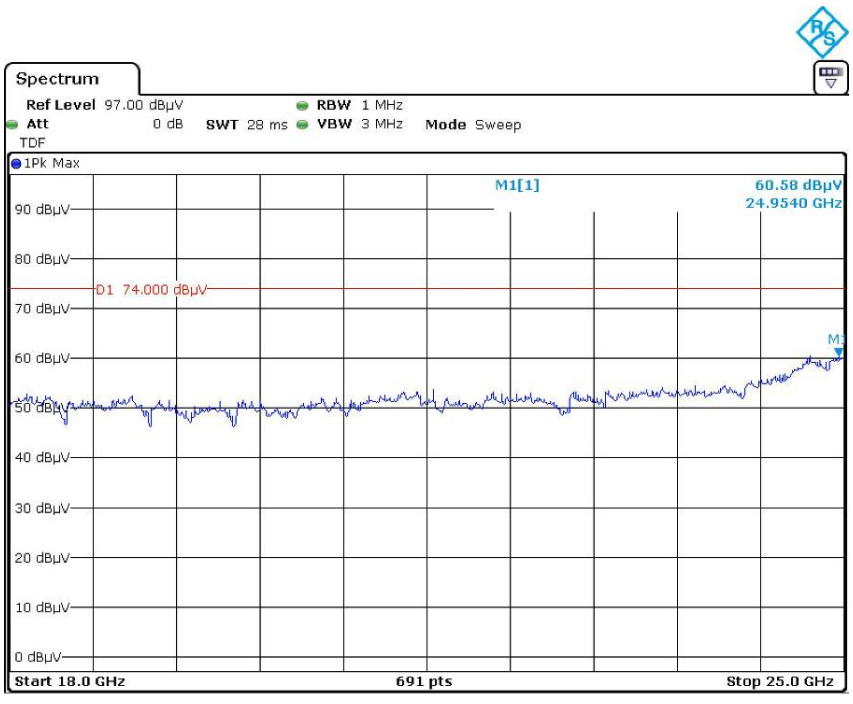

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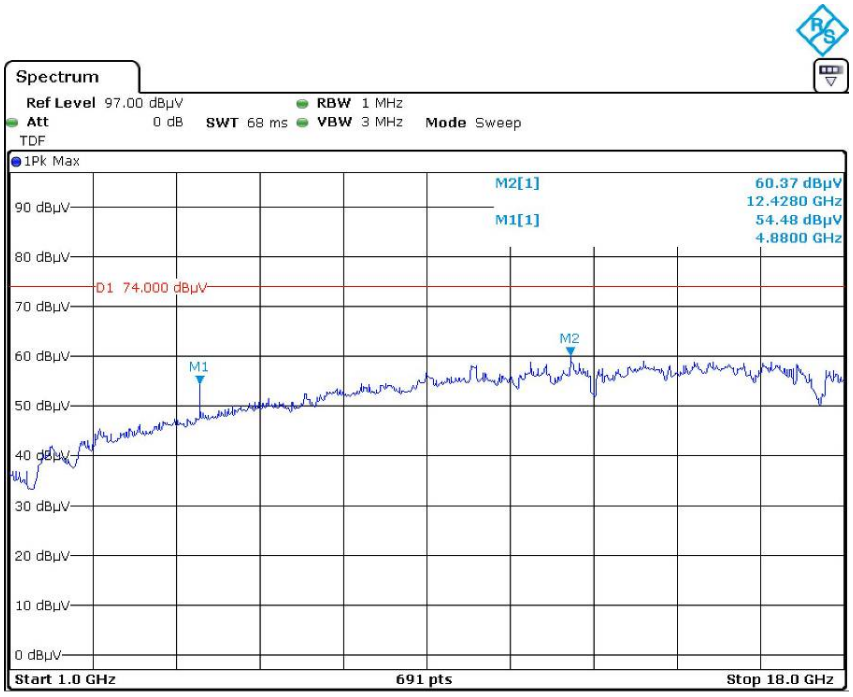
Vertical



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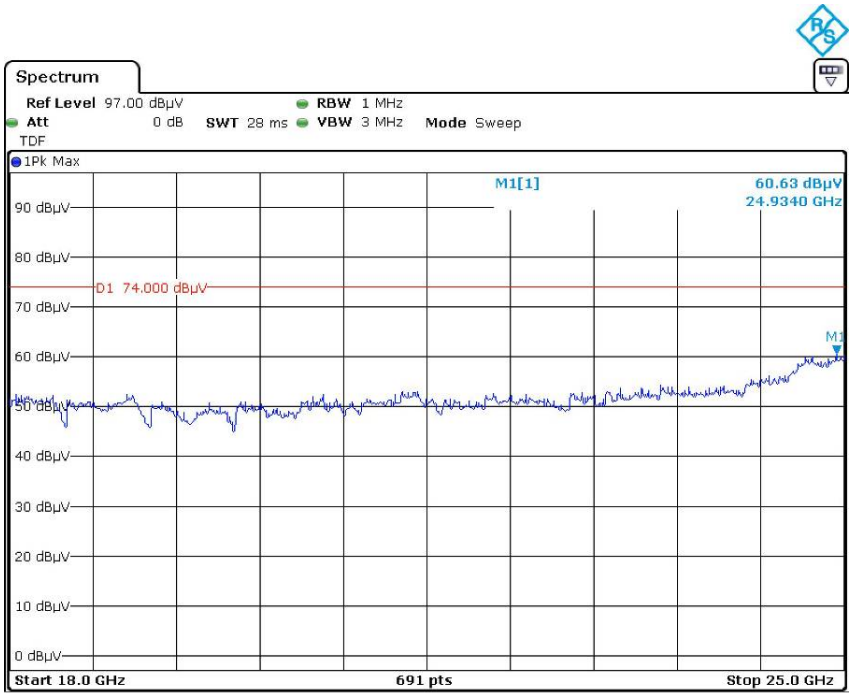

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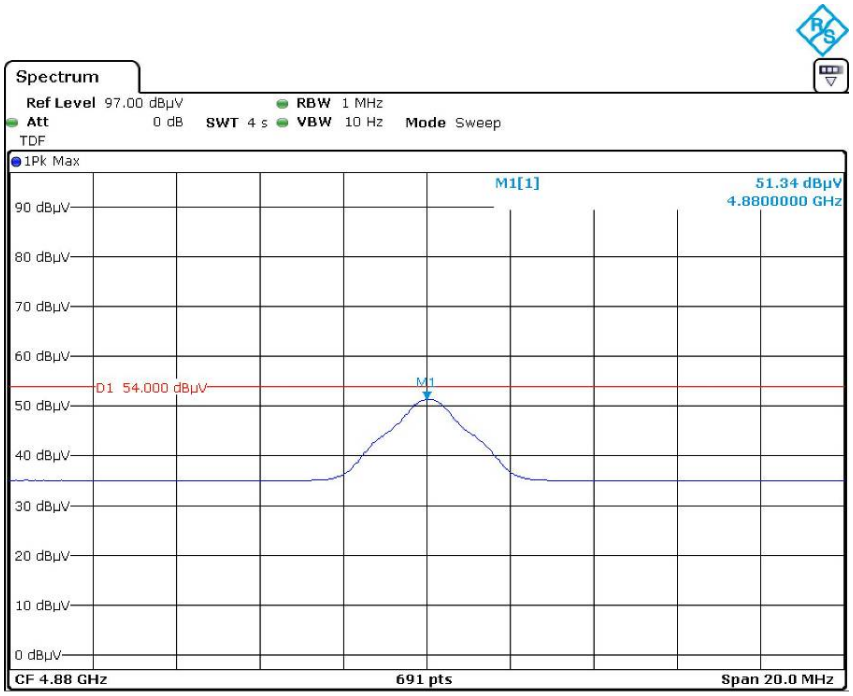
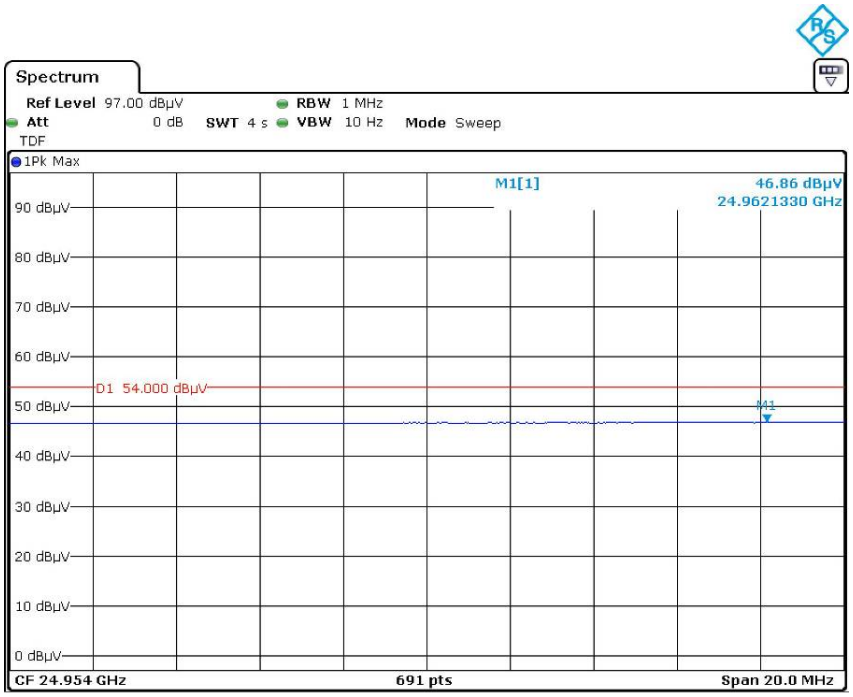
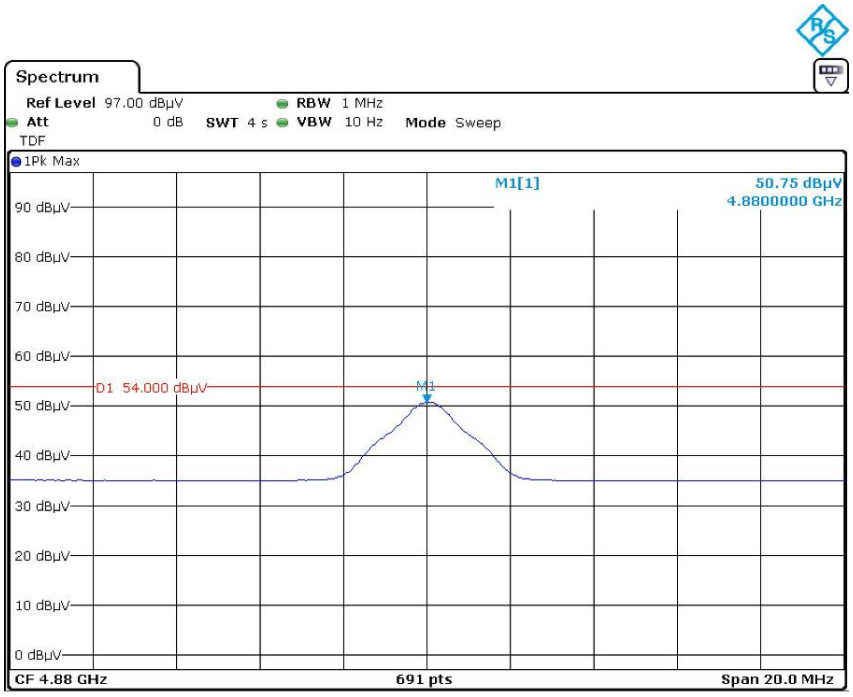
Average value for the peak point at pre-scan

Horizontal





Vertical



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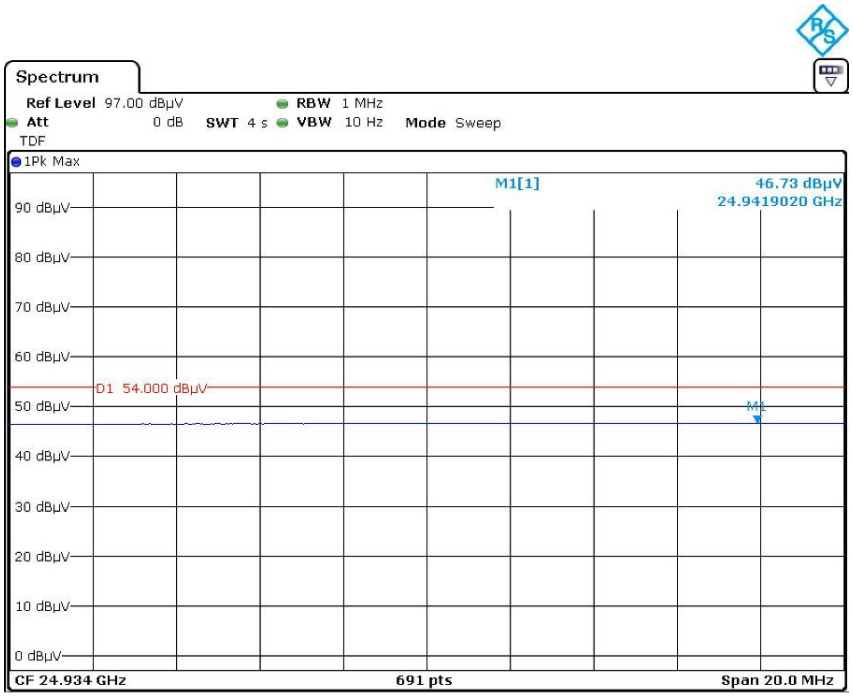

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FCC§15.215(c) - 20dB EMISSION BANDWIDTH

Applicable Standard

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

3. Measure the frequency difference of two frequencies that indicated 20dB bandwidth.

4. Repeat above procedures until all frequencies measured were complete.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

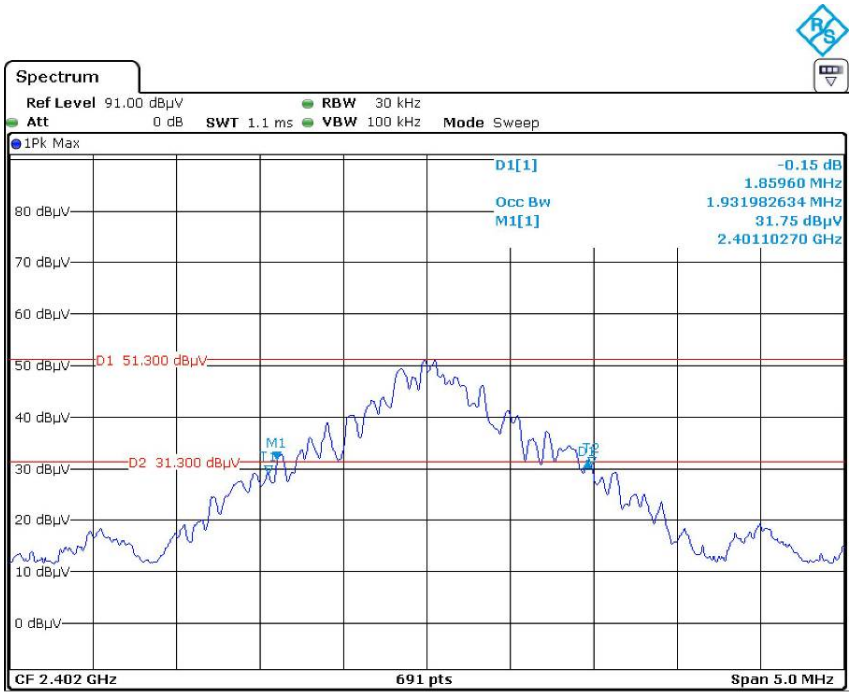
The testing was performed by Thea Xiao on 2020-11-26.

Test Mode: Transmitting

Please refer to the following table and plots.

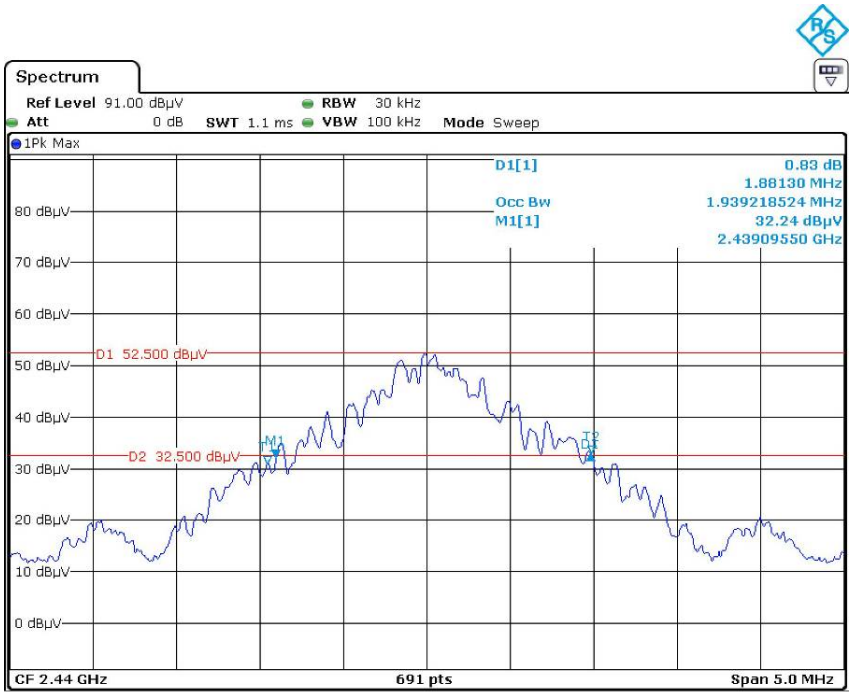
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
Low	2402	1.860
Middle	2440	1.881
High	2480	1.954

Low Channel



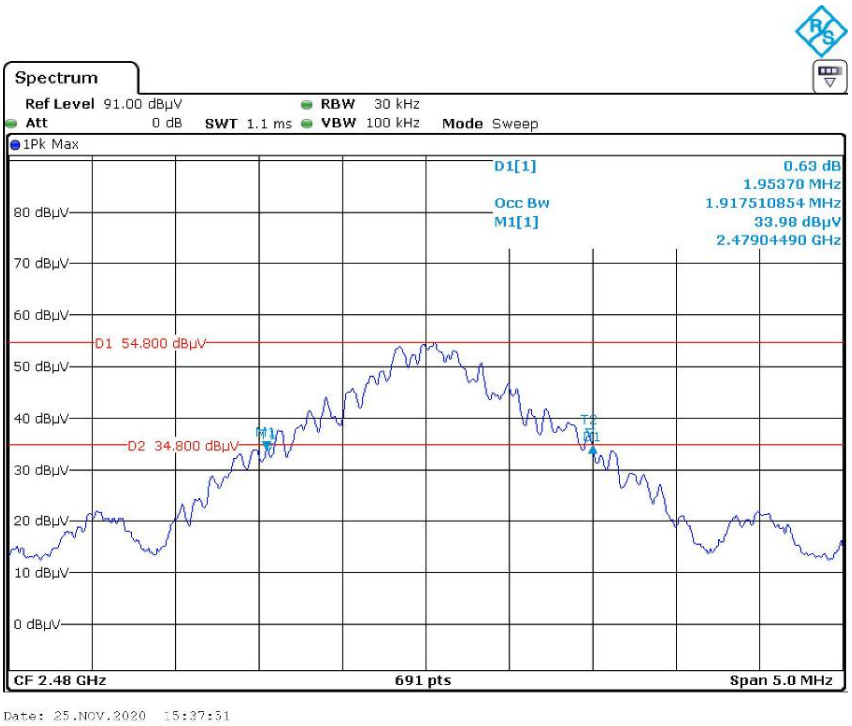
Date: 25.NOV.2020 16:05:48

Middle Channel



Date: 25.NOV.2020 15:55:07

High Channel



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