FCC PART 15.247
RSS-GEN ISSUE 5, FEBRUARY 2021 AMENDMENT 2
RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

For

Hatch Baby, Inc.

3525 Alameda De Las Pulgas, Suite D, Menlo Park, California, United States 94025

FCC ID: 2AFYZ-HBRESTPLUS2
IC: 23920-HBRESTPLUS2

Report Type:	**Product Type:**
Original Report	Hatch Rest Plus – Sound Machine and Night Light

Report Number:	SZ4210713-28792E-RF
Report Date:	2021-08-04
Reviewed By:	Jacob Kong RF Engineer
Prepared By:	Bay Area Compliant Laboratories Corp. (Shenzhen) 5F(B-West) ,6F,7F,the 3rd Phase of Wan Li Industrial Building D,Shihua Rd, FuTian Free Trade Zone, Shenzhen, 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	Hatch Rest Plus – Sound Machine and Night Light
Tested Model	HBRESTPLUS2
HVIN	HBRESTPLUS2
Frequency Range	Bluetooth LE: 2402~2480MHz Wi-Fi: 2412-2472MHz
Maximum Conducted Peak Output Power	Bluetooth LE: 10.41dBm Wi-Fi: 18.75dBm(802.11b), 15.89dBm(802.11g), 13.83dBm(802.11n-HT20), 13.97dBm(802.11n-HT40)
Modulation Technique	BLE: GFSK Wi-Fi: DSSS, OFDM
Antenna Specification*	2.0dBi (It is provided by the applicant)
Voltage Range	DC 5V from adapter
Date of Test	2021-07-21 to 2021-07-30
Sample number	SZ4210713-28792E-RF-S1 (Assigned by BACL, Shenzhen)
Received date	2021-07-13
Sample/EUT Status	Good condition
Adapter 1 information	Model: CYSE12-050200U Input: 100-240V, 50/60Hz, 0.35A Max Output: 5V, 2.0A
Adapter 2 information	Model: SA130-050200U Input: 100-240V, 50/60Hz, 0.4A Max Output: 5V, 2A

Objective

This report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules and RSS-GEN Issue 5, February 2021 Amendment 2 and RSS-247, Issue 2, February 2017 of the Innovation, Science and Economic Development Canada 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 15.247 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliant Testing of Unlicensed Wireless Devices and RSS-GEN Issue 5, February 2021 Amendment 2 and RSS-247, Issue 2, February 2017.

And KDB 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed at Bay Area Compliant Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.
Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF Output Power with Power meter		±0.73dB
RF conducted test with spectrum		±1.6dB
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 Compliant Laboratories Corp. (Shenzhen) to collect test data is located on the 5F(B-West) ,6F,7F,the 3rd Phase of Wan Li Industrial Building D,Shihua Rd, FuTian Free Trade Zone, Shenzhen, 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 lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0023.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

For 802.11b, 802.11g, 802.11n-HT20, 13 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13	2472
7	2442	/	/

For 802.11b, 802.11g, 802.11n-HT20, EUT was tested with Channel 1, 7 and 13.

For 802.11n-HT40 mode, 9 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2422	6	2447
2	2427	7	2452
3	2432	8	2457
4	2437	9	2462
5	2442	/	/

EUT was tested with Channel 1, 5 and 9.

For BLE mode, 40 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

EUT was tested with Channel 0, 19 and 39.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

"ESP_RF_test_tool_v2.5"* software was use to the EUT tested. The software and power level was provided by the applicant.

The device was tested with the worst case was performed as below:

Mode	Data rate	Power level*		
		Low channel	Middle channel	High channel
802.11b	1 Mbps	0	0	0
802.11g	6 Mbps	12	15	16
802.11n-HT20	MCS0	22	24	26
802.11n-HT40	MCS0	20	20	22
BLE	1 Mbps	Default	Default	Default

Pre-scan with all the data rates, the above data rate is the worst case for Wi-Fi test.

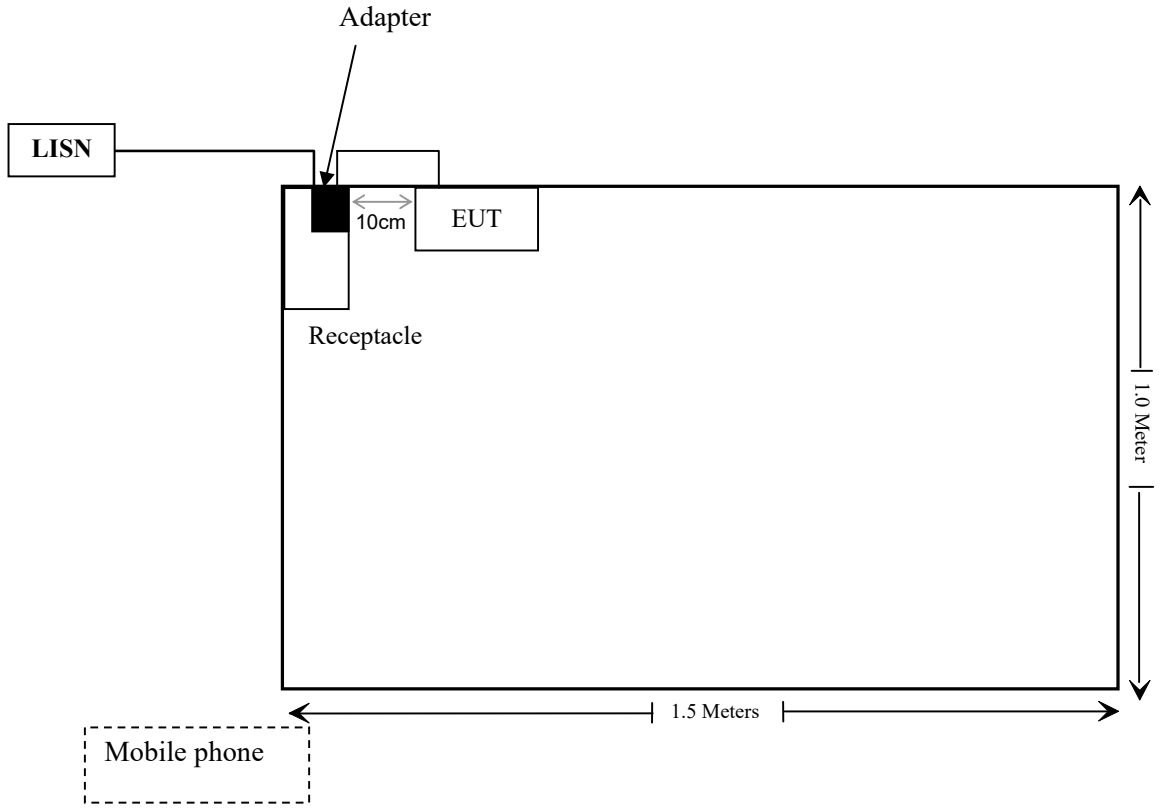
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
BULL	Socket	GN-212	A37209315081183
HONOUR	Mobile phone	V10	BKL-AL20

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielding Un-Detachable AC Cable	1.2	LISN	Receptacle
Un-shielding Un-Detachable DC Cable	1.5	EUT	Adapter

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	RSS-247 & RSS-Gen Rules	Description of Test	Result
§15.247 (i), §2.1091	RSS-102 § 2.5.2	Maximum Permissible Exposure (MPE)& Exemption Limits for Routine Evaluation – RF Exposure Evaluation	Compliant
§15.203	RSS-Gen §6.8	Antenna Requirement	Compliant
§15.207 (a)	RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	RSS-GEN § 8.10 & RSS-247 § 5.5	Spurious Emissions	Compliant
§15.247 (a)(2)	RSS- Gen§6.7 RSS-247 § 5.2 (a)	99% Occupied Bandwidth & 6 dB Emission Bandwidth	Compliant*
§15.247(b)(3)	RSS-247 § 5.4(d)	Maximum Conducted Output Power	Compliant*
§15.247(d)	RSS-247 § 5.5	100 kHz Bandwidth of Frequency Band Edge	Compliant*
§15.247(e)	RSS-247 § 5.2 (b)	Power Spectral Density	Compliant*

Compliant*: As this product is an upgrade version which has just added wireless charging function base on the report SZ4210608-22190E-00 and SZ4210608-22190E-08, so test data were referred to the report SZ4210608-22190E-00(FCC ID: 2AFYZ-HBREST2) and SZ4210608-22190E-08 (IC: 23920-HBREST2) issued on 2021-07-08.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2021/07/07	2022/07/06
Rohde & Schwarz	LISN	ENV216	101613	2021/07/07	2022/07/06
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	2021/07/06	2022/07/05
Sonoma instrument	Pre-amplifier	310 N	186238	2020/08/04	2021/08/03
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2020/12/22	2023/12/21
Unknown	Cable 2	RF Cable 2	F-03-EM197	2020/11/29	2021/11/28
Unknown	Cable	Chamber Cable 4	EC-007	2020/11/29	2021/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10.00	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2021/07/06	2022/07/05
COM-POWER	Pre-amplifier	PA-122	181919	2020/11/29	2021/11/28
CHIGO	Temperature & Humidity Meter	HTC-1S	T-03-EM451	2021/04/07	2022/04/06
Sunol Sciences	Horn Antenna	3115	9107-3694	2021/01/15	2024/01/14
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2020/11/29	2021/11/28
Unknown	RF Cable	W1101-EQ1 OUT	F-19-EM005	2020/11/29	2021/11/28
MICRO-TRONICS	Passband filter	HPM50111	2.8G filter	2021/04/20	2022/04/20
Ducommun Technolagies	Horn antenna	ARH-4223-02	1007726-02 1304	2020/12/06	2023/12/05
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2020/11/28	2021/11/27

*** Statement of Traceability:** Bay Area Compliant 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 §15.247 (i) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)& RSS-102 § 2.5.2 –EXEMPTION LIMITS FOR ROUTINE EVALUATION-RF EXPOSURE EVALUATION

Applicable Standard

For FCC

According to subpart 15.247 (i) and subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (Minutes)**
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

For ISEDC

According to RSS-102 § (2.5.2):

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:
• below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
• at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
• at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
• at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
• at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance). In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

Result

For FCC

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Mode	Frequency (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
BLE	2402-2480	2.0	1.58	11.0	12.59	20	0.004	1
2.4G Wi-Fi	2412-2472	2.0	1.58	19.0	79.43	20	0.025	1

Note: 1. the tune up conducted power was declared by the applicant
2. The Bluetooth can't transmit at the same time with Wi-Fi.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliant

For ISEDC

Calculated Data:

For Wi-Fi:
The max tune-up conducted output power is 19.0 dBm, antenna gain is 2.0dBi.
So the maximum e.i.r.p. of the device is 19.0dBm + 2.0dBi = 21dBm =0.126 W<2.68 W

The worst case is f = 2412 MHz:
The limit is 1.31 x 10^{-2} $f^{0.6834}$ W=2.68W

For BLE:
The max tune-up conducted output power is 11.0 dBm, antenna gain is 2.0dBi.
So the maximum e.i.r.p. of the device is 11.0dBm +2.0dBi = 13.0dBm =0.02 W<2.68 W

The worst case is f = 2402 MHz:
The limit is 1.31 x 10^{-2} $f^{0.6834}$ W=2.68W

So the RF Exposure evaluation can be exempted.

§15.203 & RSS-Gen §6.8 ANTENNA REQUIREMENT

Applicable Standard

For FCC:
According to § 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 user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For ISEDC

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.
Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

Antenna Connector Construction

The EUT has an integral antenna arrangement which was permanently attached and the antenna gain is 2.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Type	Antenna Gain	Impedance
PCB	2.0dBi	50 Ω

Result: Compliant

§ 15.207 (a) & RSS-GEN §8.8 AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC § 15.207 (a) & RSS-GEN §8.8

Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50 µH / 50 Ω line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table 4 shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the boundary between the frequency ranges. The device used to power the EUT shall be representative of typical applications.

Table 4 - AC Power Lines Conducted Emission Limits		
Frequency range (MHz)	Conducted limit (dBµV)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56[1]	56 to 46[1]
0.5 – 5	56	46
5 – 30	60	50

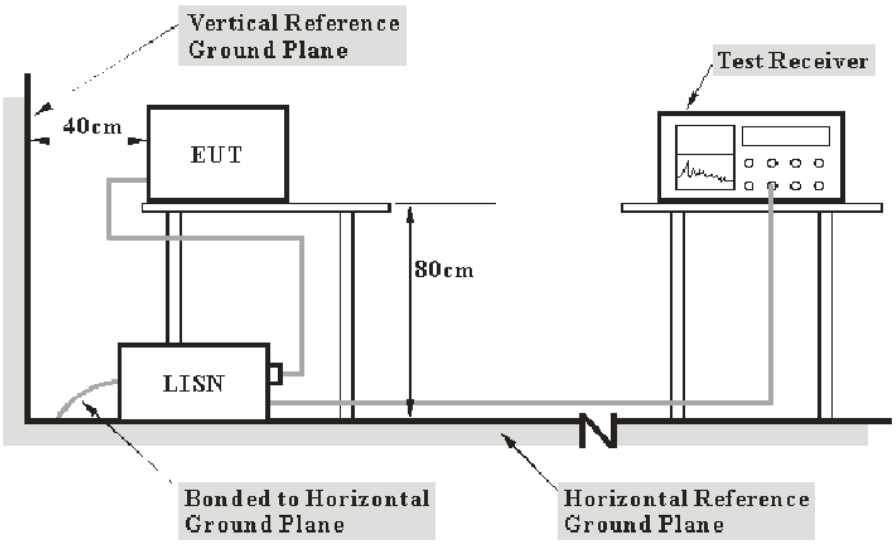
Note 1: The level decreases linearly with the logarithm of the frequency.

For an EUT with a permanent or detachable antenna operating between 150 kHz and 30 MHz, the AC power-line conducted emissions must be measured using the following configurations:

(a) Perform the AC power-line conducted emissions test with the antenna connected to determine compliance with the limits of table 4 outside the transmitter's fundamental emission band.

(b) Retest with a dummy load instead of the antenna to determine compliance with the limits of table 4 within the transmitter's fundamental emission band. For a detachable antenna, remove the antenna and connect a suitable dummy load to the antenna connector. For a permanent antenna, remove the antenna and terminate the RF output with a dummy load or network that simulates the antenna in the fundamental frequency band.

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 setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 & RSS-247/RSS-Gen limits.

The spacing between the peripherals was 10 cm.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

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 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 Data

Environmental Conditions

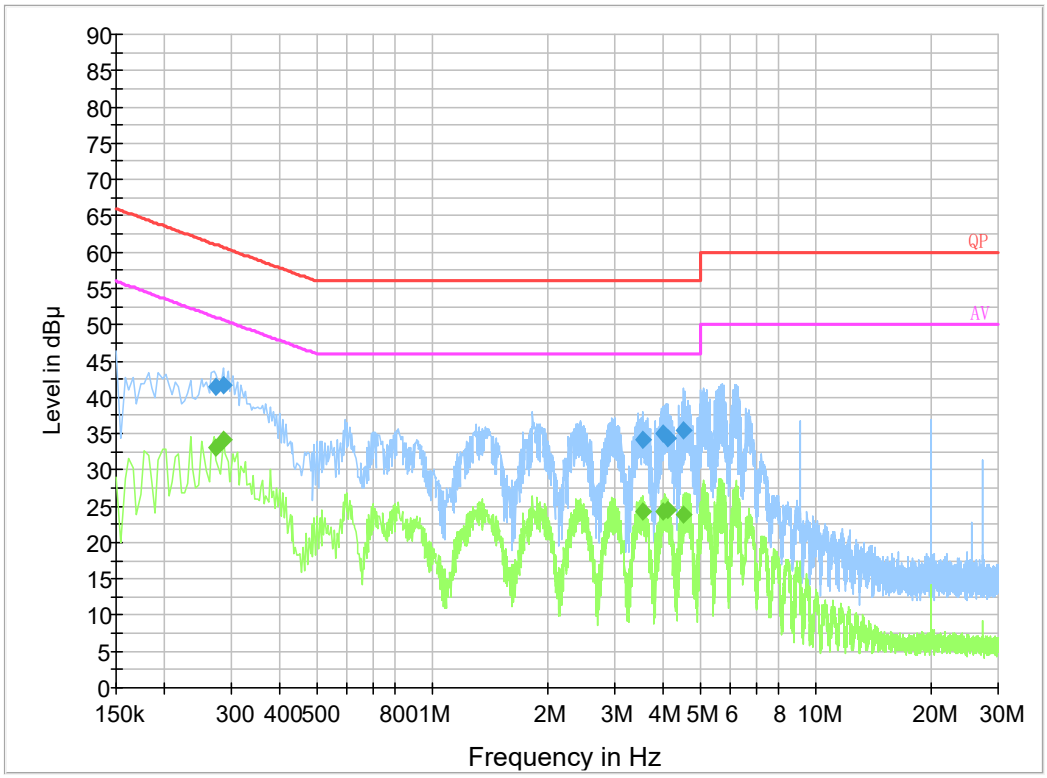
Temperature:	26 ℃
Relative Humidity:	70 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li on 2021-07-22.

EUT operation mode: Transmitting

For adapter 1 (Model: CYSE12-050200U)

AC 120V/60 Hz, Line



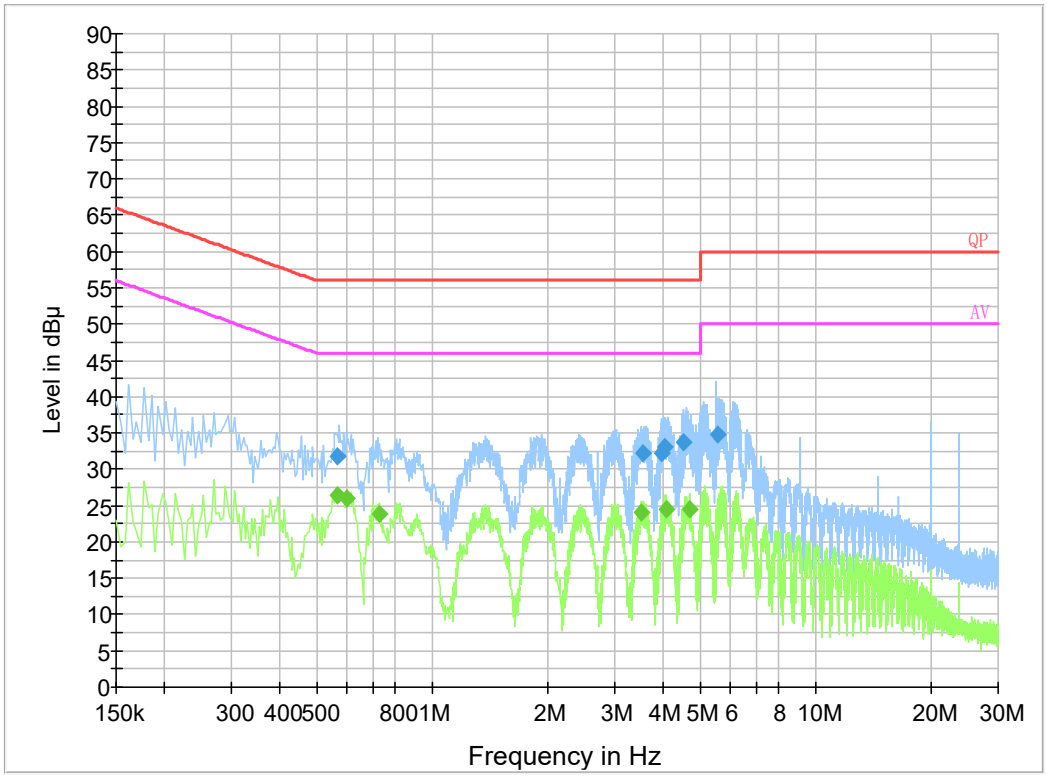
Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.273500	41.4	9.000	L1	19.8	19.6	61.0
0.285500	41.7	9.000	L1	19.7	19.0	60.7
3.536990	34.2	9.000	L1	19.9	21.8	56.0
3.997970	35.0	9.000	L1	19.9	21.0	56.0
4.116410	34.4	9.000	L1	19.9	21.6	56.0
4.530290	35.4	9.000	L1	19.9	20.6	56.0

Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.273500	33.0	9.000	L1	19.8	18.0	51.0
0.285500	34.1	9.000	L1	19.7	16.6	50.7
3.536990	24.4	9.000	L1	19.9	21.6	46.0
3.997970	24.3	9.000	L1	19.9	21.7	46.0
4.116410	24.5	9.000	L1	19.9	21.5	46.0
4.530290	23.9	9.000	L1	19.9	22.1	46.0

AC 120V/60 Hz, Neutral



Final Result 1

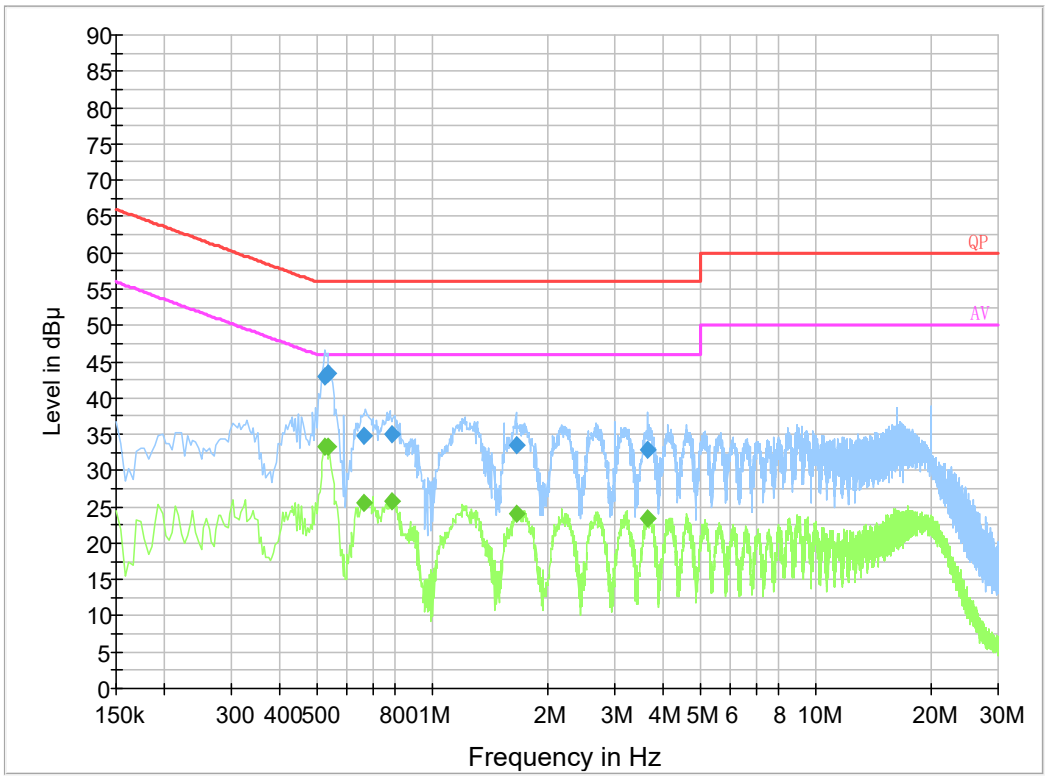
Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.565390	31.7	9.000	N	19.8	24.3	56.0
3.540450	32.3	9.000	N	19.9	23.7	56.0
3.974570	32.3	9.000	N	19.9	23.7	56.0
4.029070	33.2	9.000	N	19.9	22.8	56.0
4.540850	33.7	9.000	N	19.9	22.3	56.0
5.563650	34.8	9.000	N	19.9	25.2	60.0

Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.566000	26.4	9.000	N	19.8	19.6	46.0
0.598000	25.9	9.000	N	19.8	20.1	46.0
0.730000	23.9	9.000	N	19.8	22.1	46.0
3.526000	24.0	9.000	N	19.9	22.0	46.0
4.090000	24.5	9.000	N	19.9	21.5	46.0
4.686000	24.6	9.000	N	19.9	21.4	46.0

For adapter 2 (Model: SA130-050200U)

AC 120V/60 Hz, Line



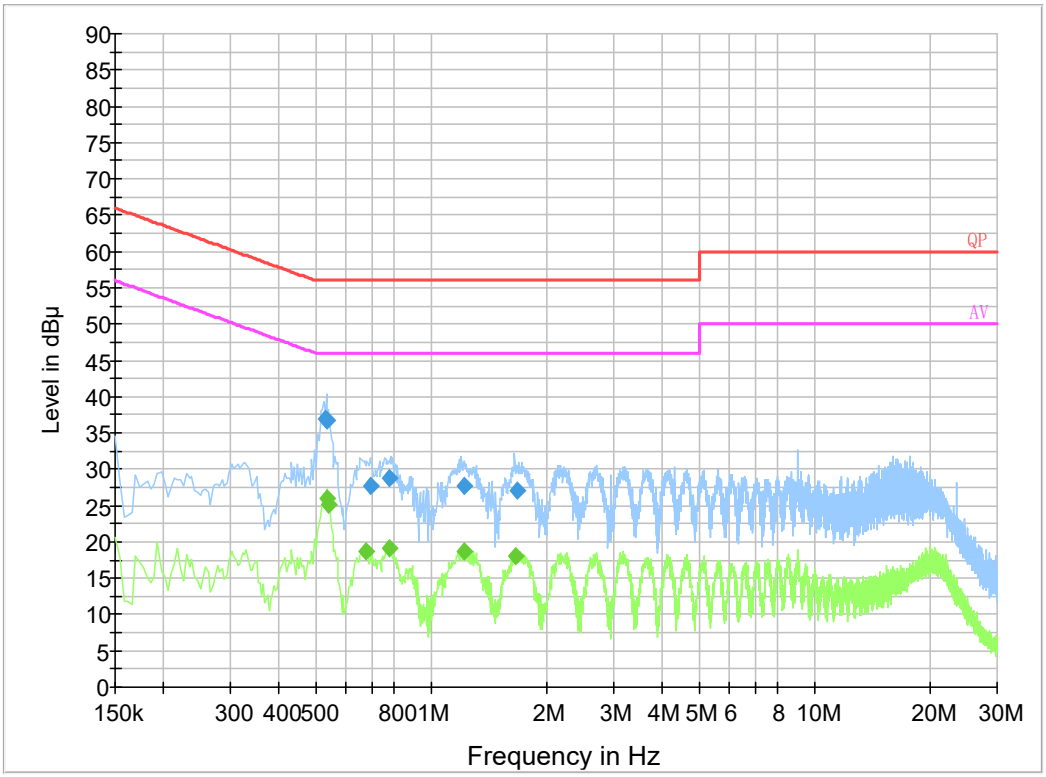
Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.526110	43.0	9.000	L1	19.8	13.0	56.0
0.533870	43.4	9.000	L1	19.8	12.6	56.0
0.663950	34.9	9.000	L1	19.8	21.1	56.0
0.789670	35.0	9.000	L1	19.8	21.0	56.0
1.657130	33.5	9.000	L1	19.9	22.5	56.0
3.651430	32.8	9.000	L1	19.9	23.2	56.0

Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.526110	33.2	9.000	L1	19.8	12.8	46.0
0.533870	33.3	9.000	L1	19.8	12.7	46.0
0.663950	25.7	9.000	L1	19.8	20.3	46.0
0.789670	25.7	9.000	L1	19.8	20.3	46.0
1.657130	24.0	9.000	L1	19.9	22.0	46.0
3.651430	23.3	9.000	L1	19.9	22.7	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)
0.529990	36.9	9.000	N	19.8	19.1	56.0
0.533870	36.7	9.000	N	19.8	19.3	56.0
0.695590	27.7	9.000	N	19.8	28.3	56.0
0.782210	28.7	9.000	N	19.8	27.3	56.0
1.219970	27.6	9.000	N	19.8	28.4	56.0
1.677190	27.0	9.000	N	19.8	29.0	56.0

Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.534000	26.1	9.000	N	19.8	19.9	46.0
0.542000	25.2	9.000	N	19.8	20.8	46.0
0.678000	18.8	9.000	N	19.8	27.2	46.0
0.778000	19.1	9.000	N	19.8	26.9	46.0
1.218000	18.6	9.000	N	19.8	27.4	46.0
1.658000	18.0	9.000	N	19.8	28.0	46.0

§15.205, §15.209, §15.247(d) & RSS-GEN § 8.10 & RSS-247 § 5.5 SPURIOUS EMISSIONS

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

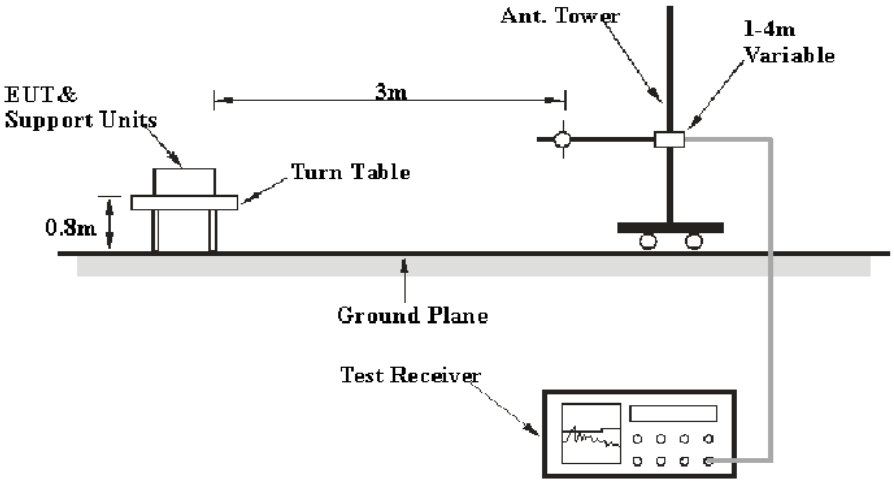
According to RSS-GEN § 8.10 & RSS-247 § 5.5

Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:(a) The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287, Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD).(b) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.(c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

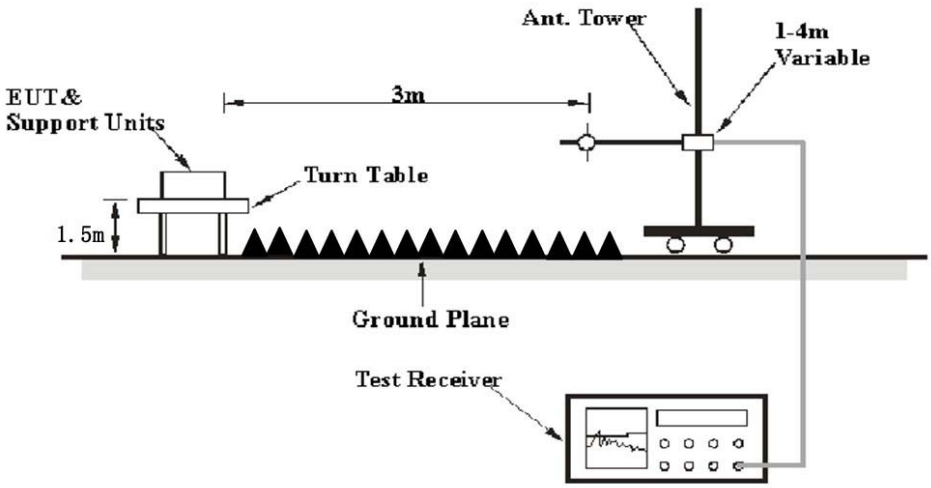
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013 & RSS-Gen. The specification used was the FCC 15.209, and FCC 15.247 & RSS-Gen limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz Note 1	/	Average
	1MHz	＞1/T Note 2	/	Average

Note 1: when duty cycle is no less than 98%
Note 2: when duty cycle is less than 98%

Test Procedure

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

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

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

Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.

Repeat above procedures until all measured frequencies were complete.

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

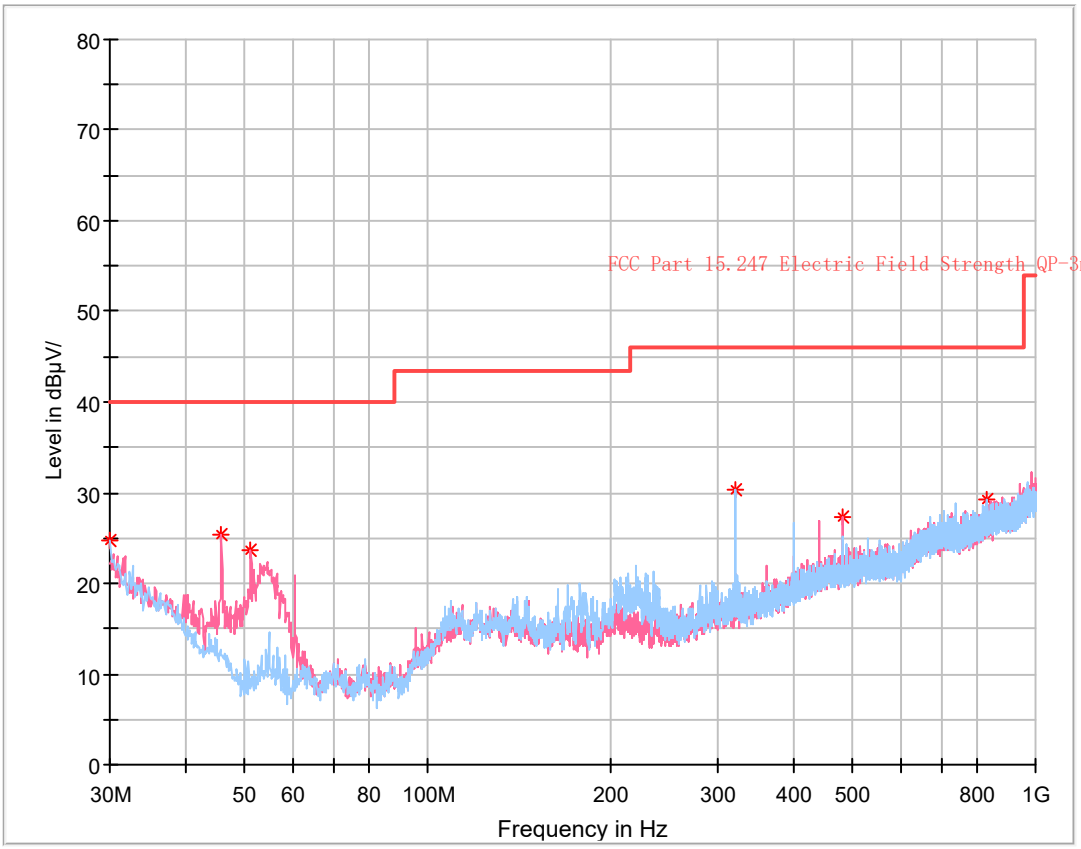
Temperature:	26.1~29℃
Relative Humidity:	44~55 %
ATM Pressure:	101~101.1kPa

The testing was performed by Williarm Wang on 2021-07-21 for below 1GHz and by Bruce Lin on 2021-07-30 for above 1GHz

EUT operation mode: Transmitting

30 MHz~1 GHz (Wi-Fi 802.11b mode, low channel worst case):

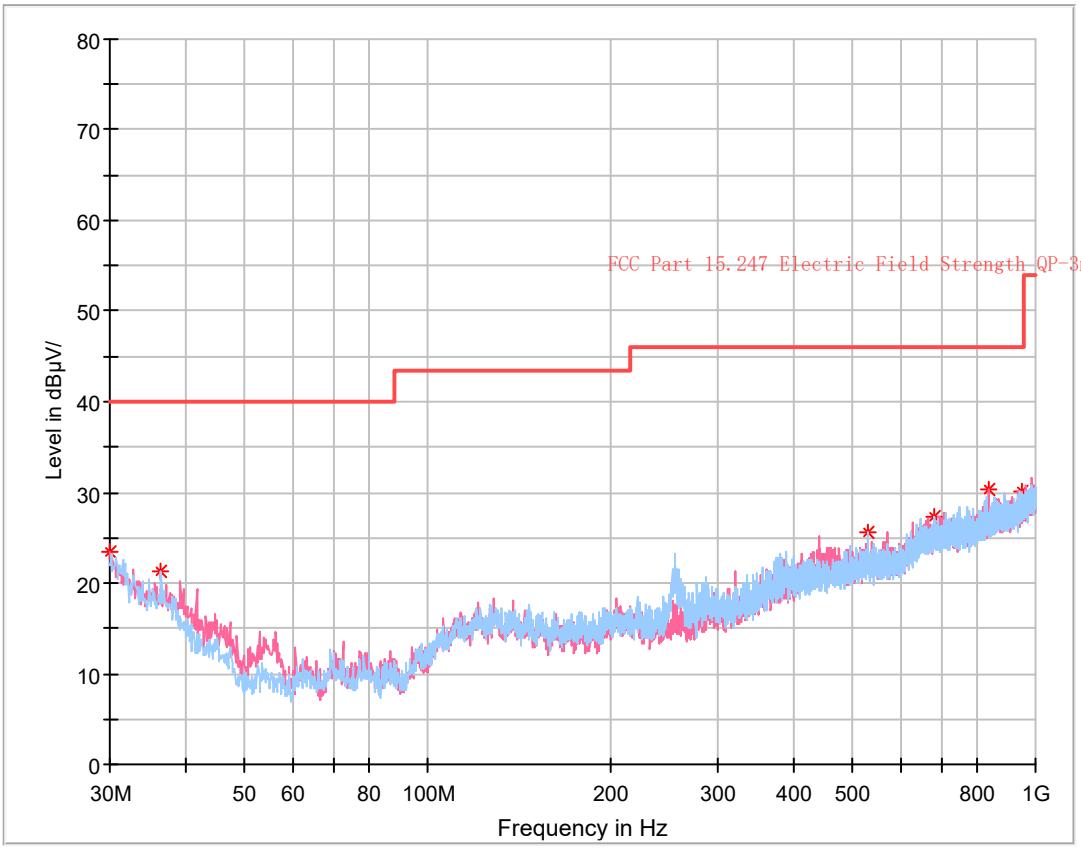
For adapter 1 (Model: CYSE12-050200U)-



Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.000000	24.71	40.00	15.29	200.0	H	277.0	-3.5
45.762500	25.31	40.00	14.69	100.0	V	204.0	-14.2
51.218750	23.58	40.00	16.42	100.0	V	62.0	-16.6
320.030000	30.22	46.00	15.78	100.0	H	279.0	-9.5
479.958750	27.21	46.00	18.79	100.0	V	51.0	-5.3
834.493750	29.30	46.00	16.70	200.0	H	192.0	0.0

For adapter 2 (Model: SA130-050200U)



Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.000000	23.45	40.00	16.55	200.0	V	132.0	-3.5
36.426250	21.19	40.00	18.81	300.0	H	103.0	-8.2
530.035000	25.63	46.00	20.37	300.0	H	328.0	-4.8
680.991250	27.41	46.00	18.59	100.0	H	303.0	-1.9
838.616250	30.38	46.00	15.62	200.0	V	330.0	0.0
951.500000	30.14	46.00	15.86	100.0	V	6.0	1.7

1 GHz-25 GHz:

For Wi-Fi

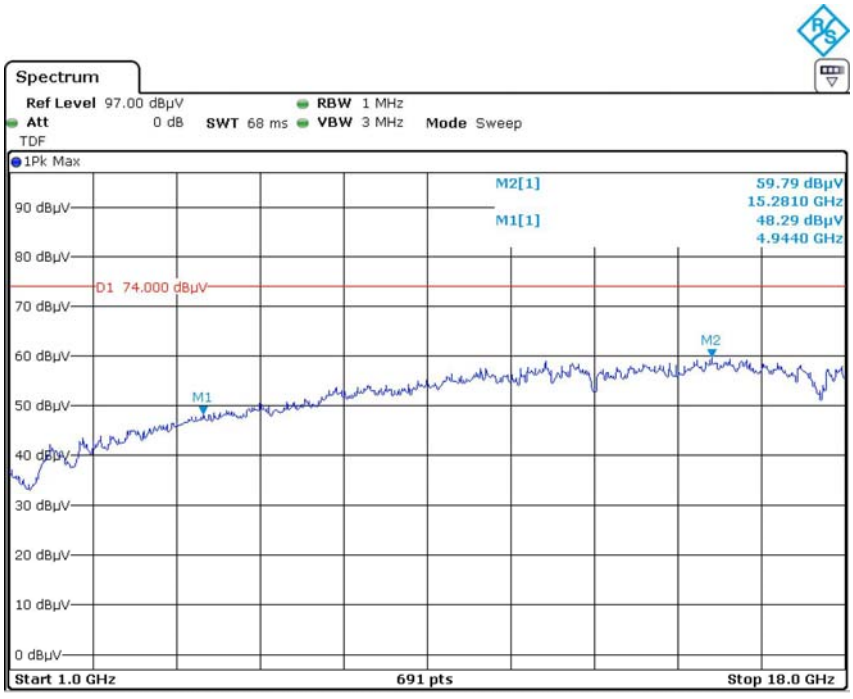
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
802.11b Mode:									
Low Channel (2412 MHz)									
2315.96	28.44	PK	226	1.7	H	31.64	60.08	74	13.92
2315.96	15.39	Ave.	226	1.7	H	31.64	47.03	54	6.97
2484.18	29.82	PK	37	1.8	H	32.13	61.95	74	12.05
2484.18	15.51	Ave.	37	1.8	H	32.13	47.64	54	6.36
4824.00	51.35	PK	111	1.8	H	6.28	57.63	74	16.37
4824.00	40.24	Ave.	111	1.8	H	6.28	46.52	54	7.48
Middle Channel (2442MHz)									
4884.00	49.60	PK	339	1.5	H	6.76	56.36	74	17.64
4884.00	38.47	Ave.	339	1.5	H	6.76	45.23	54	8.77
High Channel (2472 MHz)									
2325.34	29.43	PK	221	2.2	H	31.64	61.07	74	12.93
2325.34	15.34	Ave.	221	2.2	H	31.64	46.98	54	7.02
2484.43	31.14	PK	82	2.0	H	32.13	63.27	74	10.73
2484.43	19.62	Ave.	82	2.0	H	32.13	51.75	54	2.25
4944.00	50.82	PK	19	1.3	H	6.76	57.58	74	16.42
4944.00	40.65	Ave.	104	2.0	H	6.76	47.41	54	6.59
802.11g Mode									
Low Channel (2412 MHz)									
2379.41	28.54	PK	309	2.4	H	31.87	60.41	74	13.59
2379.41	15.32	Ave.	309	2.4	H	31.87	47.19	54	6.81
2487.54	28.47	PK	317	1.7	H	32.13	60.60	74	13.40
2487.54	15.43	Ave.	317	1.7	H	32.13	47.56	54	6.44
4824.00	48.56	PK	3	1.1	H	6.28	54.84	74	19.16
4824.00	34.05	Ave.	3	1.1	H	6.28	40.33	54	13.67
Middle Channel (2442 MHz)									
4884.00	48.77	PK	69	2.1	H	6.76	55.53	74	18.47
4884.00	34.54	Ave.	69	2.1	H	6.76	40.30	54	13.70
High Channel (2472 MHz)									
2310.98	28.66	PK	268	1.2	H	31.64	60.30	74	13.70
2310.98	15.40	Ave.	268	1.2	H	31.64	47.04	54	6.96
2483.63	29.58	PK	133	1.1	H	32.13	61.71	74	12.29
2483.63	15.42	Ave.	133	1.1	H	32.13	47.55	54	6.45
4944.00	46.06	PK	210	2.3	H	6.76	52.82	74	21.18
4944.00	30.84	Ave.	210	2.3	H	6.76	37.60	54	16.40

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
802.11n-HT20 Mode									
Low Channel (2412 MHz)									
2321.37	29.42	PK	112	2.4	H	31.64	61.06	74	12.94
2321.37	15.36	Ave.	112	2.4	H	31.64	47.00	54	7.00
2493.13	29.13	PK	107	2.2	H	32.13	61.26	74	12.74
2493.13	15.61	Ave.	107	2.2	H	32.13	47.74	54	6.26
4824.00	48.41	PK	220	1.2	H	6.28	54.69	74	19.31
4824.00	33.31	Ave.	220	1.2	H	6.28	39.59	54	14.41
Middle Channel (2442MHz)									
4884.00	47.44	PK	134	1.2	H	6.76	54.20	74	19.80
4884.00	32.75	Ave.	134	1.2	H	6.76	39.51	54	14.49
High Channel (2472 MHz)									
2329.39	28.54	PK	52	1.5	H	31.64	60.18	74	13.82
2329.39	15.31	Ave.	52	1.5	H	31.64	46.95	54	7.05
2483.93	30.02	PK	56	2.0	H	32.13	62.15	74	11.85
2483.93	15.58	Ave.	56	2.0	H	32.13	47.71	54	6.29
4944.00	49.62	PK	258	2.0	H	6.76	56.38	74	17.62
4944.00	34.66	Ave.	258	2.0	H	6.76	41.42	54	12.58
802.11n-HT40 Mode									
Low Channel (2422 MHz)									
2358.57	29.02	PK	137	1.8	H	31.77	60.79	74	13.21
2358.57	15.4	Ave.	137	1.8	H	31.77	47.17	54	6.83
2491.41	29.19	PK	332	1.7	H	32.13	61.32	74	12.68
2491.41	15.43	Ave.	332	1.7	H	32.13	47.56	54	6.44
4844.00	44.69	PK	317	2.0	H	6.28	50.97	74	23.03
4844.00	30.66	Ave.	317	2.0	H	6.28	36.94	54	17.06
Middle Channel (2442 MHz)									
4884.00	45.32	PK	288	1.5	H	6.76	52.08	74	21.92
4884.00	30.14	Ave.	288	1.5	H	6.76	36.90	54	17.10
High Channel (2462 MHz)									
2311.79	29.42	PK	168	1.9	H	31.64	61.06	74	12.94
2311.79	15.38	Ave.	168	1.9	H	31.64	47.02	54	6.98
2483.63	29.68	PK	309	1.7	H	32.13	61.81	74	12.19
2483.63	15.84	Ave.	309	1.7	H	32.13	47.97	54	6.03
4924.00	44.69	PK	85	1.0	H	6.76	51.45	74	22.55
4924.00	31.01	Ave.	85	1.0	H	6.76	37.77	54	16.23

Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude
The other spurious emission which is 20dB to the limit was not recorded.

Peak Pre-scan with High channel in 802.11n-HT20 Mode

Horizontal



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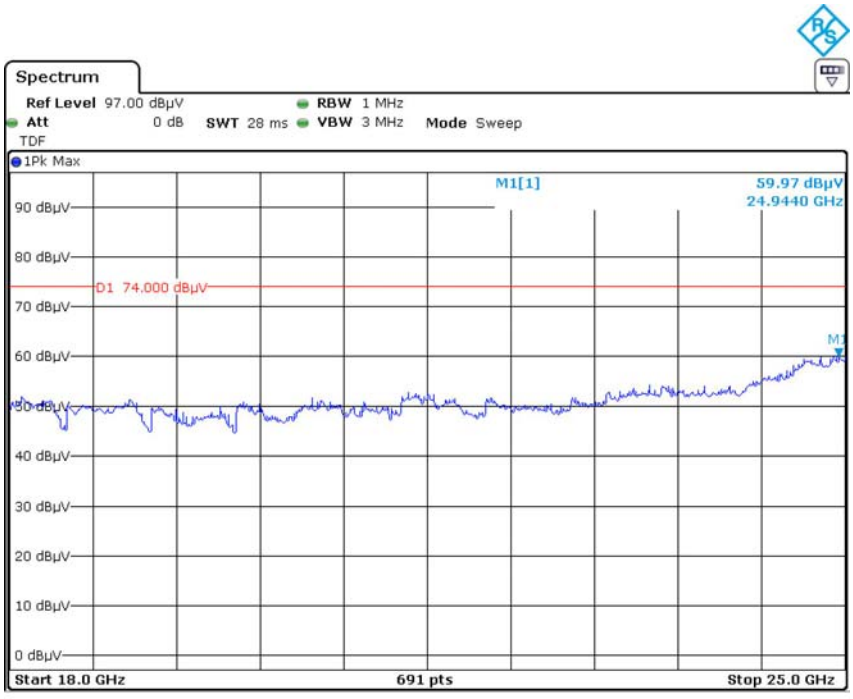

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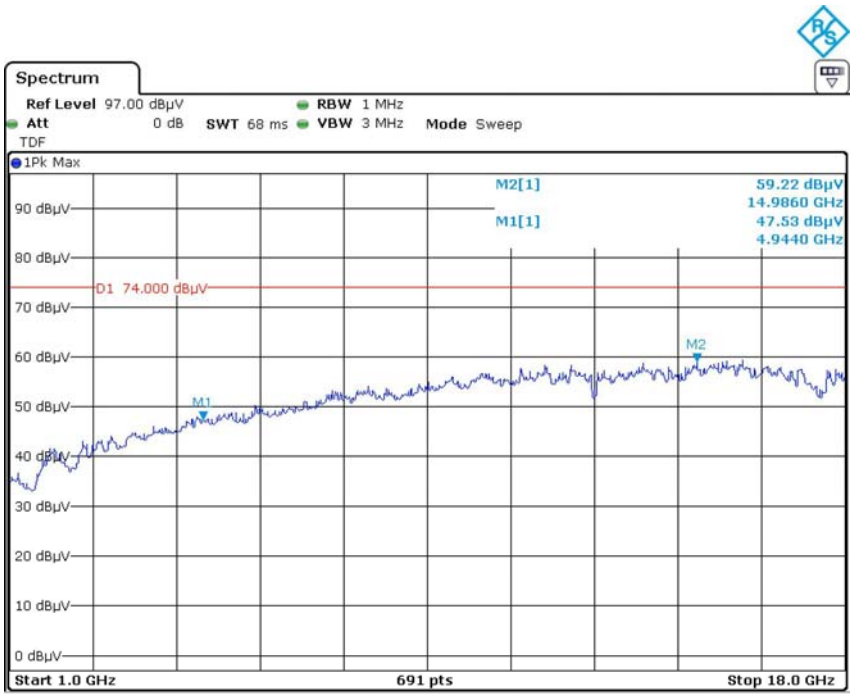
Vertical



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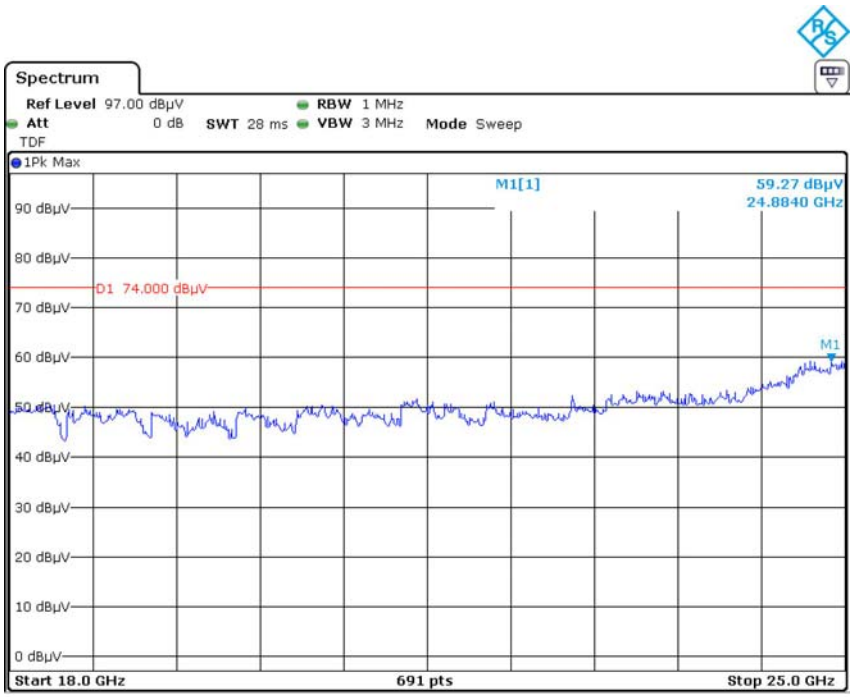

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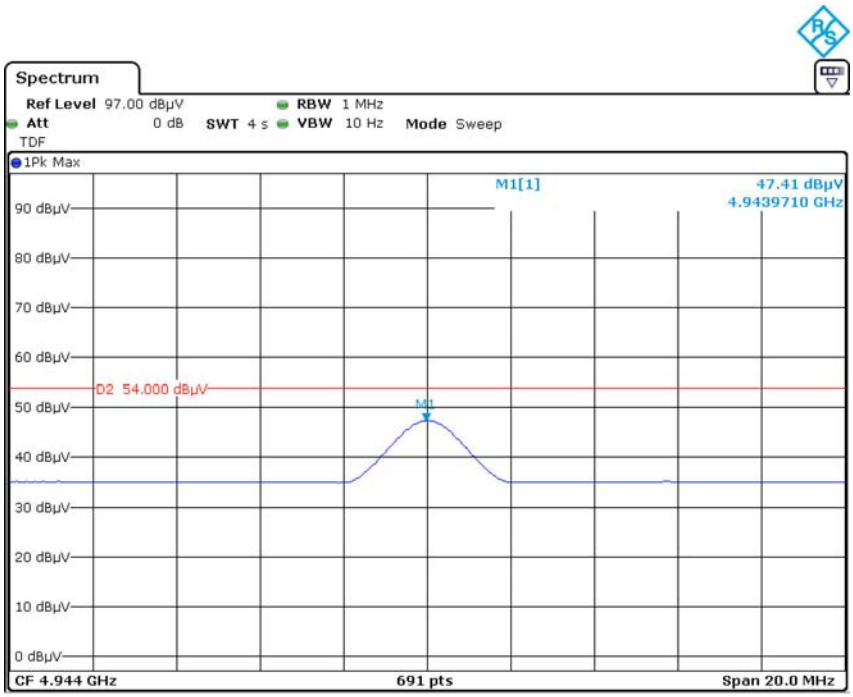
Average
Horizontal



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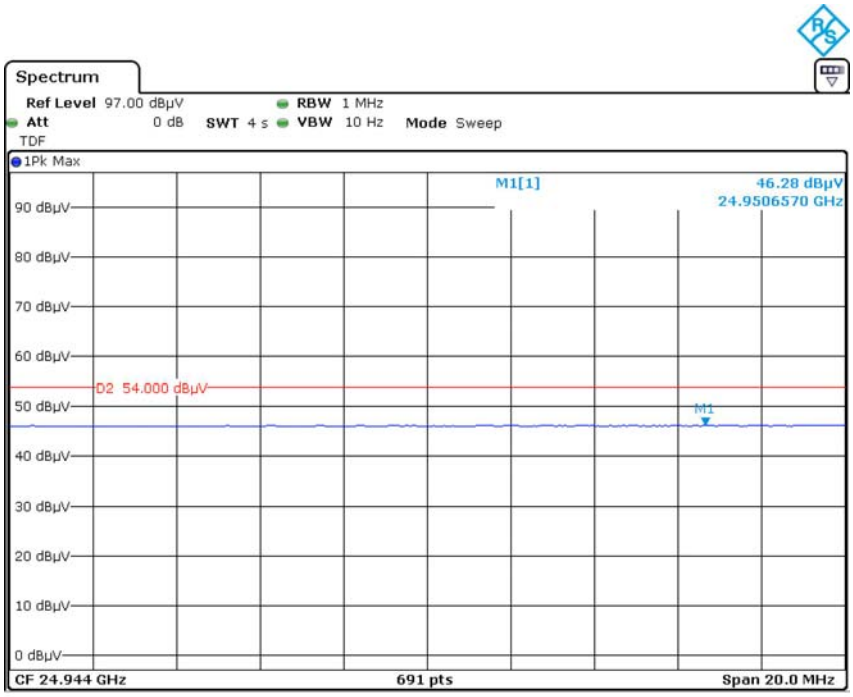

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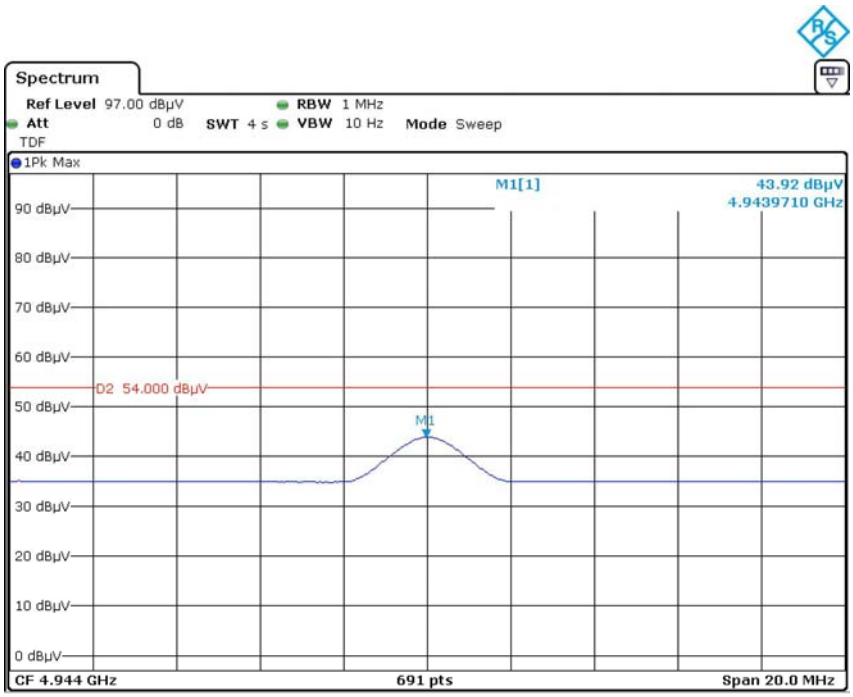

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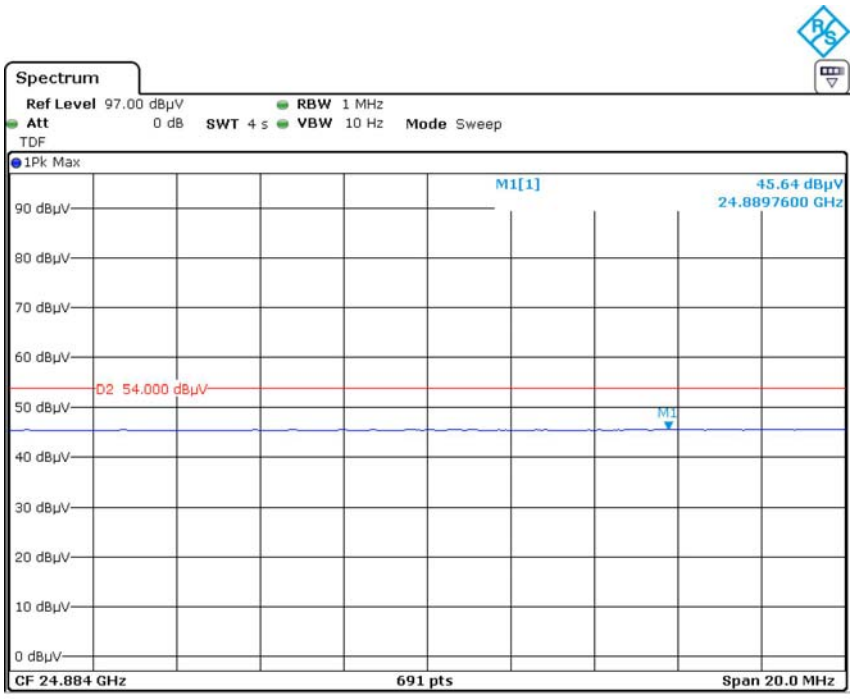

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