

FCC PART 15.247

TEST REPORT

For

Winner Wave Limited

Unit 1615 Peninsula Tower, 538 Castle Peak Road, Lai Chi Kok Kowloon, Hong Kong

FCC ID: 2ADFS-B10-R01-LR01

Report Type: Original Report	Product Type: EZCast Pro/QuattroPod
Report Number: RSZ201210001-00B	
Report Date: 2021-03-12	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	EZCast Pro/QuattroPod
Tested Model	R01
Multiple Model	LR01, B10
Model Differences	Refer to the DoS letter
Frequency Range	BLE: 2402-2480MHz
Maximum Conducted Output Peak Power	4.48dBm
Modulation Technique	GFSK
Antenna Specification	3.05dBi
Voltage Range	DC 5.0V from adapter
Date of Test	2020-12-29 to 2021-02-20
Sample serial number	RSZ201210001-RF-S1 (Assigned by BACL, Shenzhen)
Received date	2020-12-10
Sample/EUT Status	Good condition
Adapter information	Model: ICP12-050-2000B Input: AC 100-240V, 50/60Hz, 0.3A Output: DC 5.0V, 2.0A, 10.0W

Note: According to the test data in the part 15B report, the worst case is model R01, so model R01 was chosen for the test.

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's 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 Compliance Testing of Unlicensed Wireless Devices.

And KDB 558074 D01 15.247 Meas Guidance v05r02.

All 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%
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 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

Description of Test Configuration

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

“Bluetooth MP Tool” * exercise software was made to the EUT tested and the power level is 28*. The software and power level is provided by the applicant.

Duty cycle

Test Result: Pass. Please refer to the Report RSZ200717003-00B.

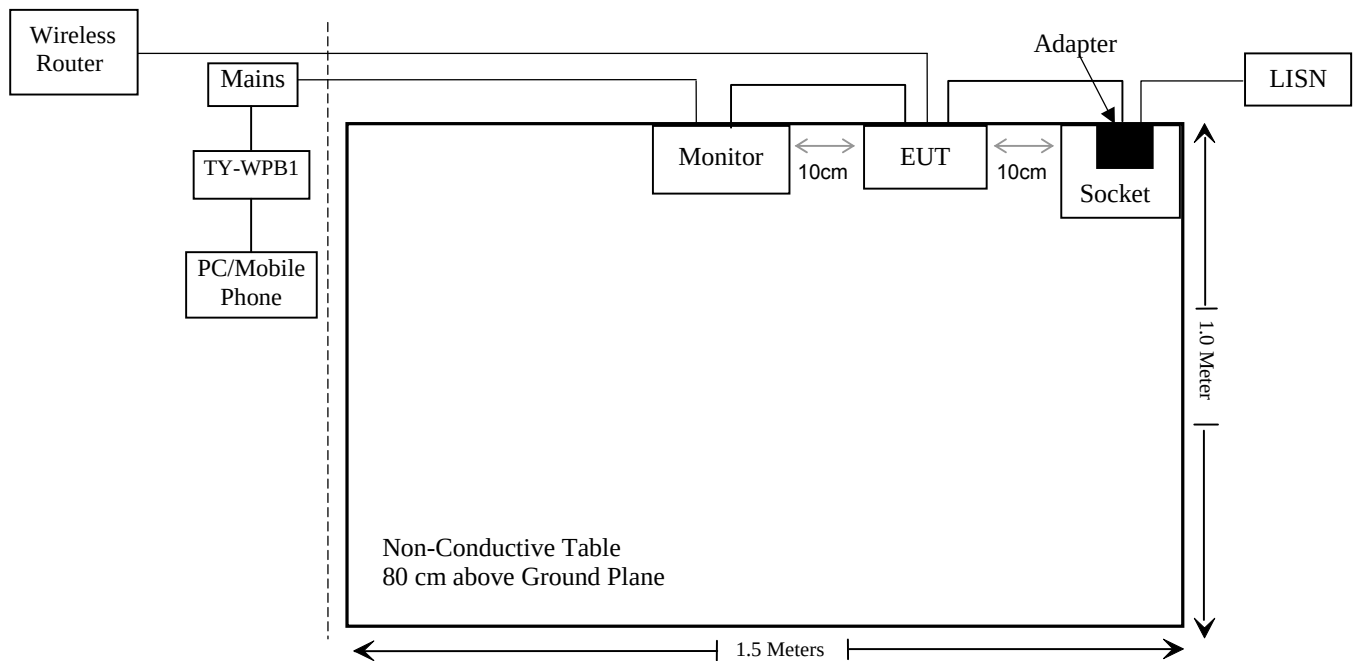
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
BULL	Socket	GN-212	A37209315081183
SAMSUNG	Monitor	S24E390HL	ZZFRH4ZMB01718J
DELL	PC	Latitude E5430	JG3NLV1
Apple	Mobile Phone	ML6N2CH/A	ML6N2CH/A
Panasonic Corporation	EZCast Pro	TY-WPB1	TY-WPB1
SAGEM	Wireless Router	SAGEM F@ST TM 2604 White	2604

External I/O Cable

Cable Description	Length (m)	From Port	To
Unshielded Un-detachable AC Cable	1.0	Socket	LISN
Unshielded Detachable DC Cable	1.0	Adapter	EUT
Unshielded Detachable AC Cable	1.0	Monitor	Mains
Unshielded Detachable HDMI Cable	1.0	Monitor	EUT
Unshielded Detachable RJ45 Cable	10.0	EUT	Router

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §2.1091	Maximum Permissible Exposure(MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance*
§15.247(b)(3)	Maximum Conducted Output Power	Compliance*
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance*
§15.247(e)	Power Spectral Density	Compliance*

Compliance*: The EUT has the same Bluetooth and Wi-Fi modular with the device (FCC ID: 2ADFSTYWPR1). Please refer to the declaration letter for the details. So the conducted test was refer to the report RSZ200717003-00B which was tested by Bay Area Compliance Laboratories Corp. (Shenzhen) on 2020-09-11.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2020/7/9	2021/7/8
Rohde & Schwarz	LISN	ENV216	101613	2020/1/22	2021/1/21
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	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 1	F-03-EM236	2020/11/29	2021/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2020/7/22	2021/7/21
COM-POWER	Pre-amplifier	PA-122	181919	2020/11/29	2021/11/28
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2020/11/29	2021/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2020/12/22	2023/12/21
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
SNSD	Band Reject filter	BSF2402-2480MN-0898-001	2.4G filter	2020/04/20	2021/04/20
Ducommun Technologies	Horn antenna	ARH-4223-02	1007726-02 1304	2020/12/06	2023/12/05

* **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 §15.247 (i) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

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

Result

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/cm²)

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)

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Frequency (MHz)	Antenna Gain		Maximum Tune Up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
2402-2480	3.05	2.02	4.5	2.82	20	0.001	1
5150-5250	4.42	2.77	12.0	15.85	20	0.009	1
5725-5850	4.42	2.77	12.5	17.78	20	0.010	1

Note:

- 1) To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.
- 2) Bluetooth and 5GHz Wi-Fi can transmit simultaneously for this device.
- 3) Simultaneous transmitting consideration:

The ratio= $MPE_{DTS}/limit + MPE_{NII}/limit = 0.001 + 0.010 = 0.011 < 1.0$, so simultaneous exposure is not required.

Result: Pass

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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.

Antenna Connector Construction

The EUT has an internal PCB antenna arrangement for BLE which was permanently attached and the antenna gain is 3.05dBi, fulfill the requirement of this section. Please refer to the EUT photos.

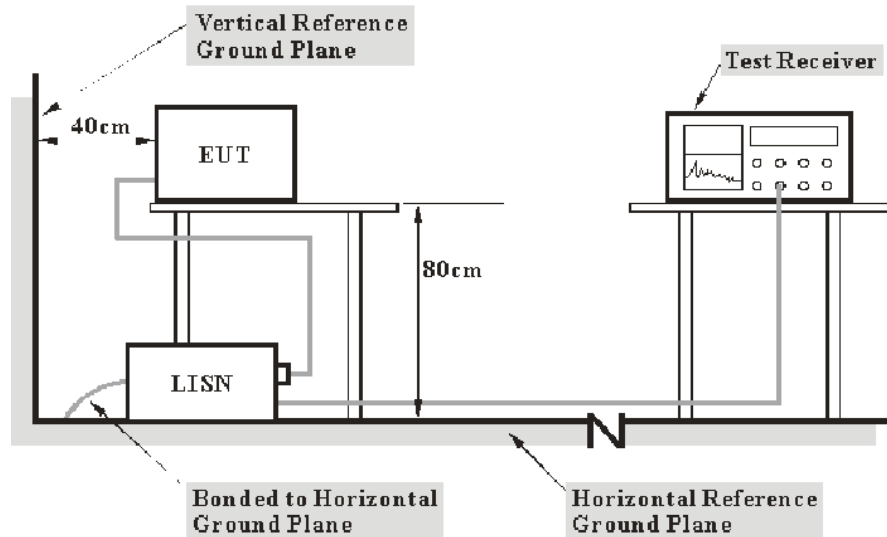
Result: Pass

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

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

The spacing between the peripherals was 10 cm.

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

During the conducted emission test, the adapter was connected to the outlet of the LISN.

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:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

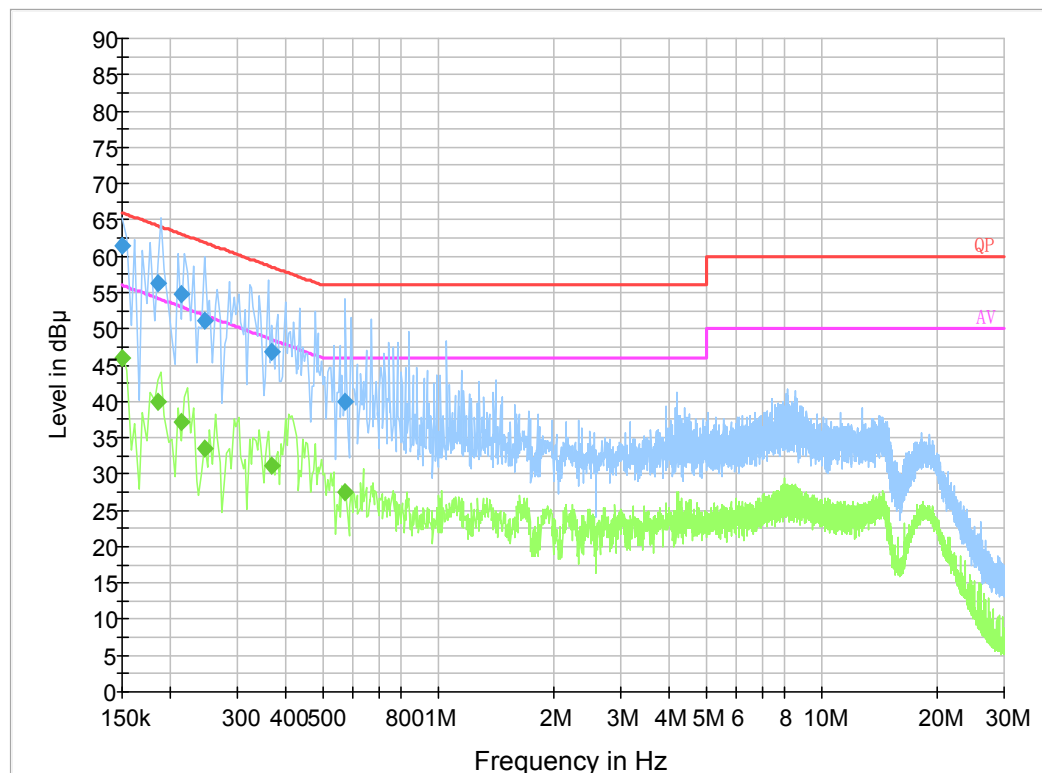
Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li on 2020-12-30

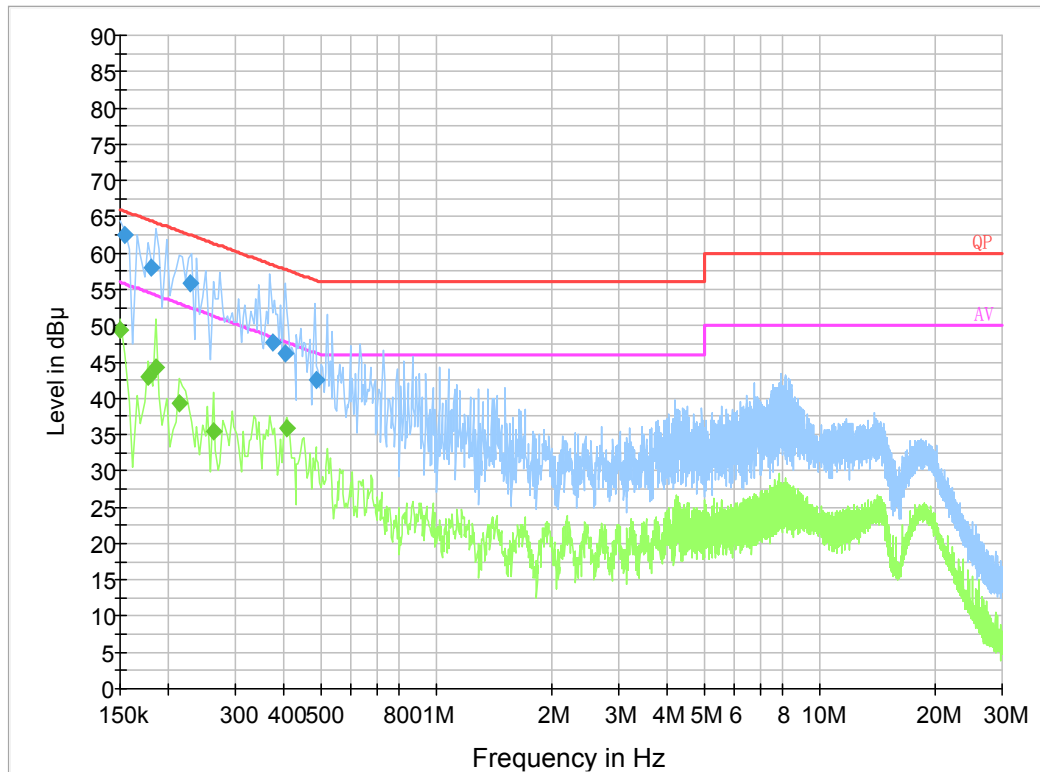
EUT operation mode: Transmitting

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)
0.150000	61.4	0.200	L1	19.8	4.6	66.0
0.185500	56.2	9.000	L1	19.8	8.0	64.2
0.213500	54.8	9.000	L1	19.8	8.3	63.1
0.245500	51.1	9.000	L1	19.8	10.8	61.9
0.367430	46.9	9.000	L1	19.9	11.7	58.6
0.573390	39.9	9.000	L1	19.8	16.1	56.0

Final Result 2

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150000	46.0	9.000	L1	19.8	10.0	56.0
0.185500	40.0	9.000	L1	19.8	14.2	54.2
0.213500	37.2	9.000	L1	19.8	15.9	53.1
0.245500	33.6	9.000	L1	19.8	18.3	51.9
0.367430	31.2	9.000	L1	19.9	17.4	48.6
0.573390	27.5	9.000	L1	19.8	18.5	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)
0.154500	62.6	9.000	N	19.8	3.2	65.8
0.181500	58.0	9.000	N	19.8	6.4	64.4
0.229500	55.9	9.000	N	19.8	6.6	62.5
0.375550	47.6	9.000	N	19.8	10.8	58.4
0.403910	46.1	9.000	N	19.8	11.7	57.8
0.489230	42.6	9.000	N	19.8	13.6	56.2

Final Result 2

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150000	49.3	9.000	N	19.8	6.7	56.0
0.178000	43.0	9.000	N	19.8	11.6	54.6
0.186000	44.1	9.000	N	19.8	10.1	54.2
0.214000	39.3	9.000	N	19.8	13.7	53.0
0.262000	35.4	9.000	N	19.8	16.0	51.4
0.410000	35.8	9.000	N	19.8	11.8	47.6

Note:

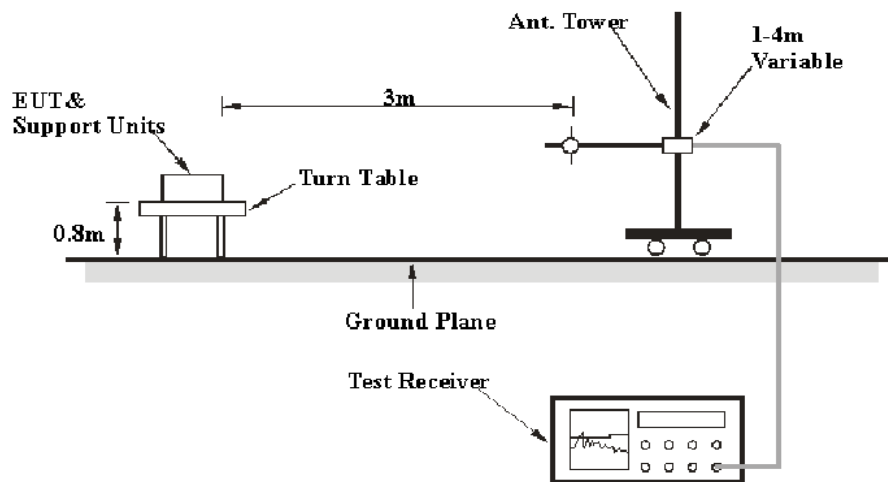
- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS**Applicable Standard**

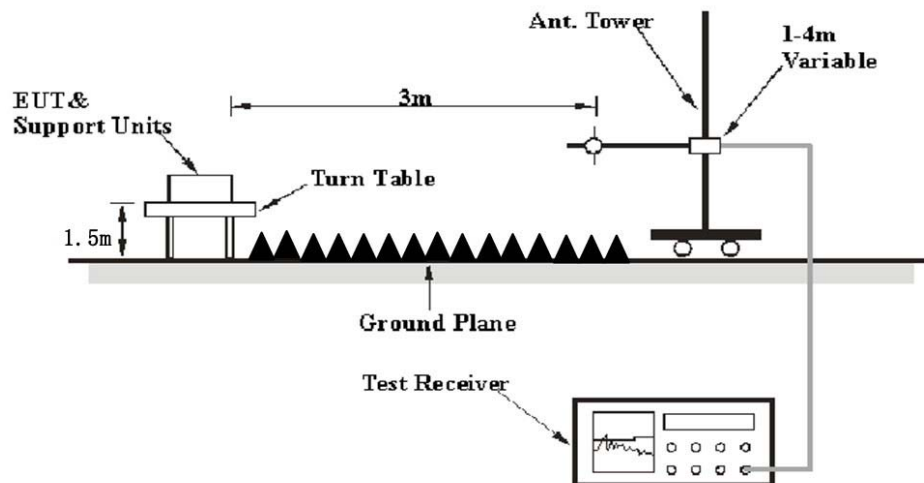
FCC §15.247 (d); §15.209; §15.205;

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. The specification used was the FCC 15.209, and FCC 15.247 limits.

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.

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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Data

Environmental Conditions

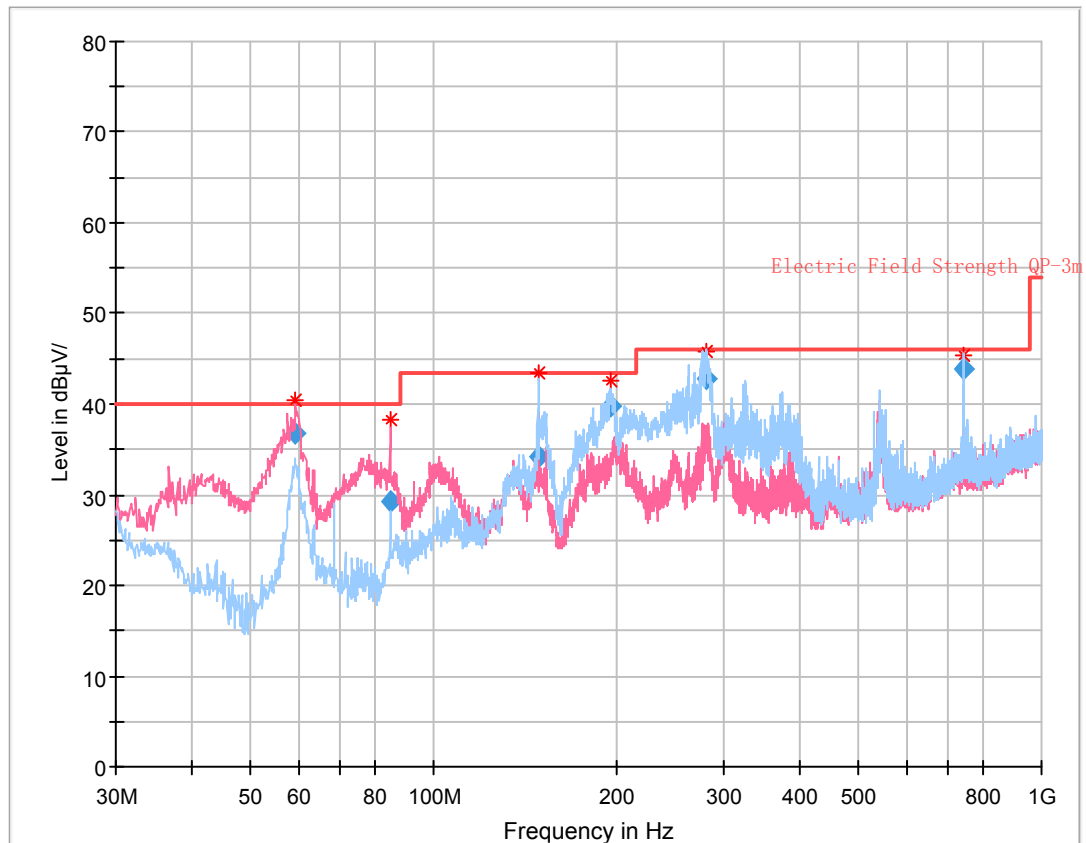
Temperature:	21~26.4°C
Relative Humidity:	45~52 %
ATM Pressure:	101.0~101.1 kPa

The testing was performed by Harris He on 2021-02-20 for below 1GHz and by Leven Gan on 2020-12-29 for above 1GHz.

EUT operation mode: Transmitting

30 MHz~1 GHz:

(The worst case is 5.2G Wi-Fi 802.11n-HT20 Mode, Middle Channel + Bluetooth 8DPSK, high channel)



Final Result

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
59.362500	36.88	40.00	3.12	117.0	V	307.0	-10.5
84.845750	29.34	40.00	10.66	106.0	V	0.0	-10.6
148.505750	34.28	43.50	9.22	222.0	H	334.0	-5.3
195.372000	39.75	43.50	3.75	198.0	H	255.0	-5.6
280.747875	42.89	46.00	3.11	126.0	H	0.0	-4.6
742.479625	43.78	46.00	2.22	113.0	H	61.0	5.3

1 GHz-25 GHz:

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)				
Low Channel (2402 MHz)									
2388.40	29.37	PK	64	1.3	H	31.87	61.24	74	12.76
2388.40	15.22	Ave.	64	1.3	H	31.87	47.09	54	6.91
2485.69	28.67	PK	39	2.0	H	32.13	60.80	74	13.20
2485.69	15.21	Ave.	39	2.0	H	32.13	47.34	54	6.66
4804.00	45.32	PK	321	2.2	H	6.28	51.60	74	22.40
4804.00	33.75	Ave.	321	2.2	H	6.28	40.03	54	13.97
Middle Channel (2440 MHz)									
4880.00	44.75	PK	278	1.2	H	6.76	51.51	74	22.49
4880.00	32.42	Ave.	278	1.2	H	6.76	39.18	54	14.82
High Channel (2480 MHz)									
2389.43	28.78	PK	144	2.1	H	31.87	60.65	74	13.35
2389.43	15.12	Ave.	144	2.1	H	31.87	46.99	54	7.01
2484.52	28.83	PK	325	1.4	H	32.13	60.96	74	13.04
2484.52	15.26	Ave.	325	1.4	H	32.13	47.39	54	6.61
4960.00	44.29	PK	95	2.0	H	6.80	51.09	74	22.91
4960.00	31.95	Ave.	95	2.0	H	6.80	38.75	54	15.25

Note:

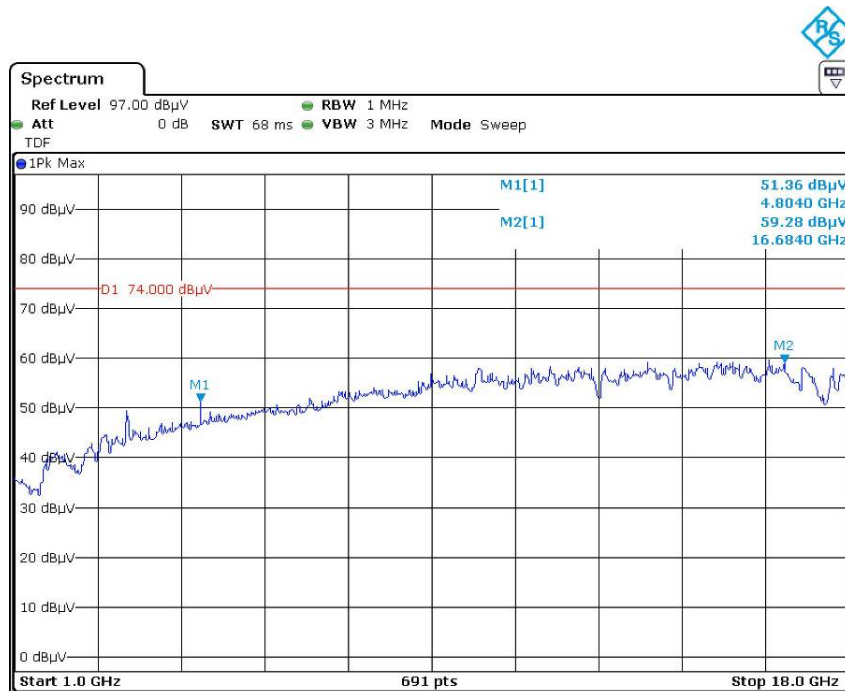
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

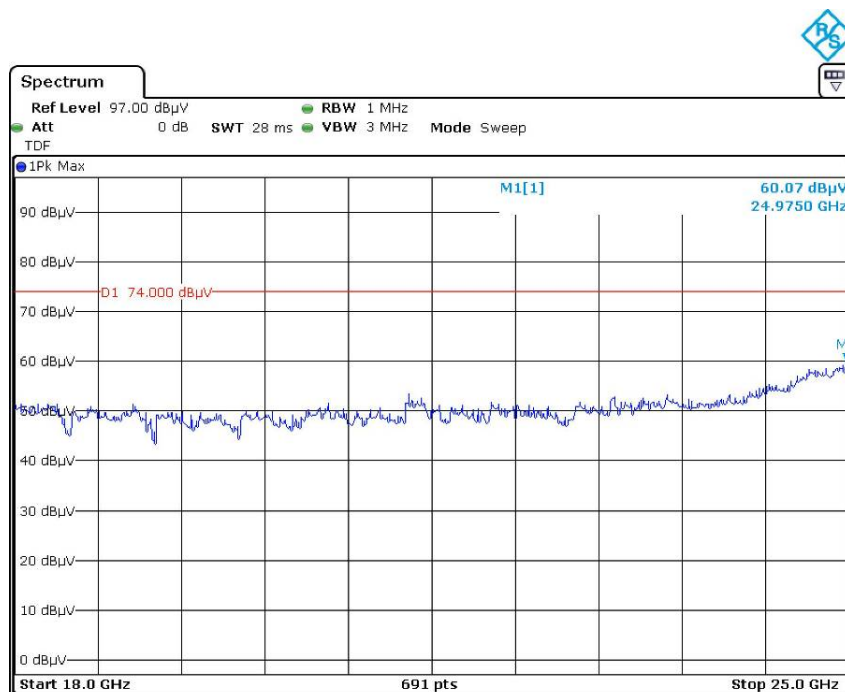
Margin = Limit - Corrected. Amplitude

The other spurious emission which is 20dB to the limit was not recorded.

Pre-scan with Low channel Horizontal

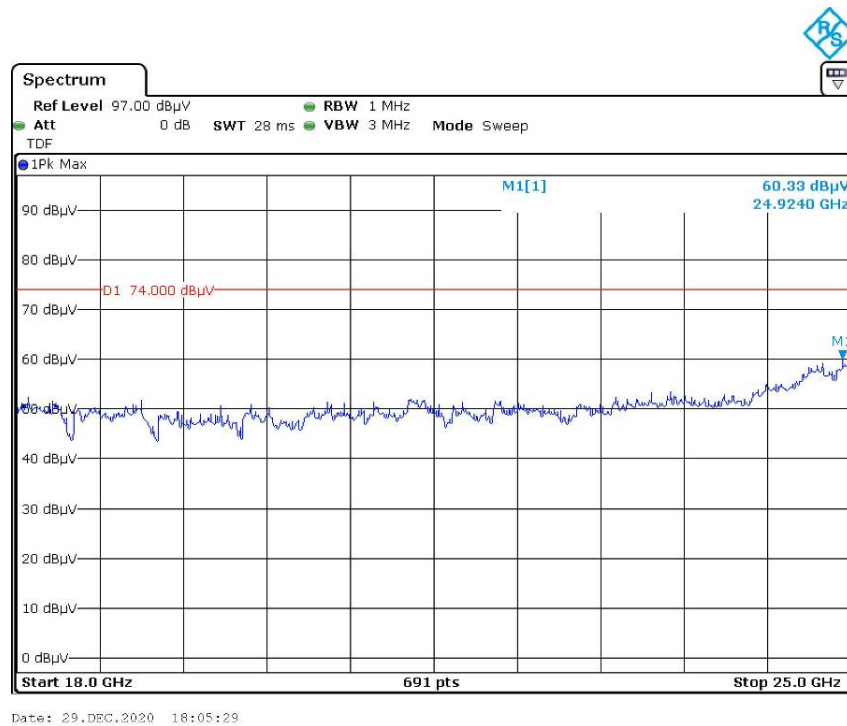
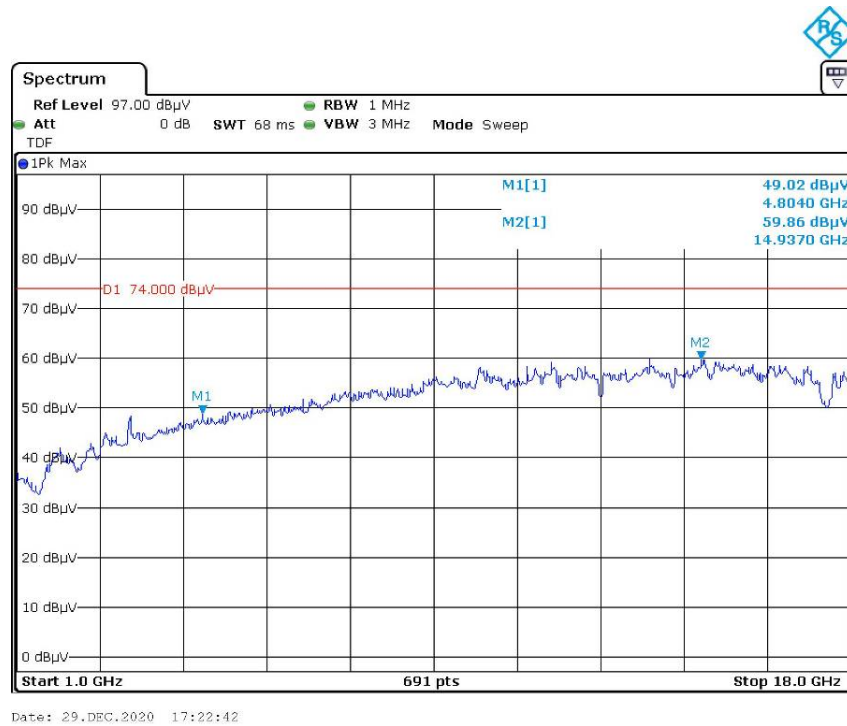


Date: 29.DEC.2020 17:12:11

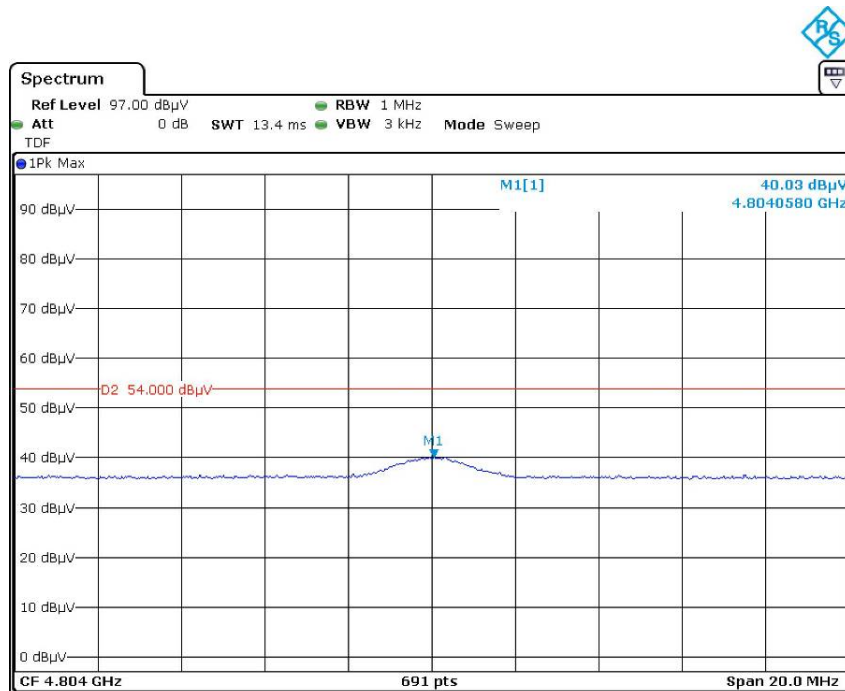


Date: 29.DEC.2020 17:57:16

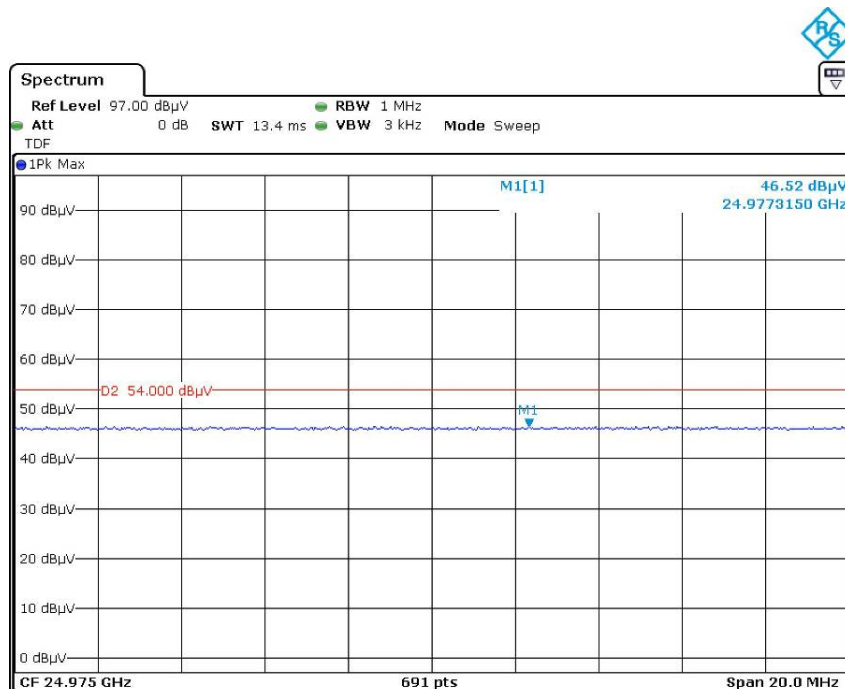
Vertical



Average Horizontal

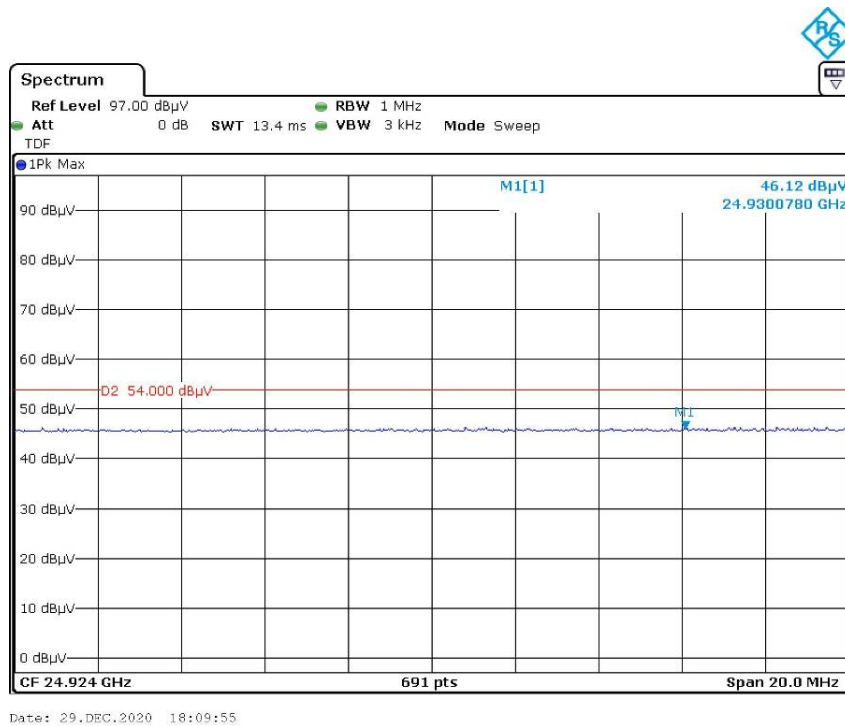
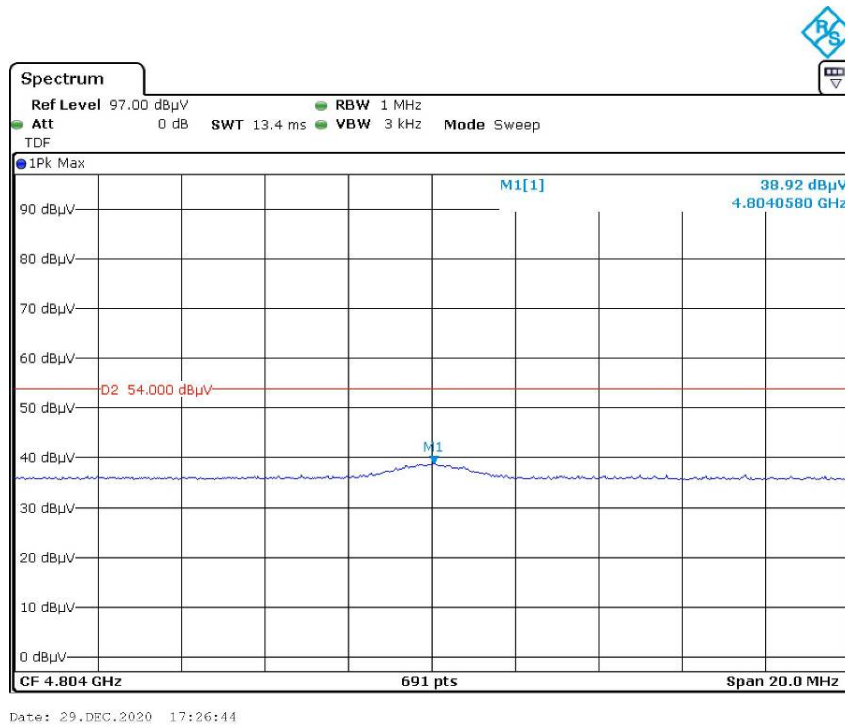


Date: 29.DEC.2020 17:18:25



Date: 29.DEC.2020 18:02:03

Vertical



***** END OF REPORT *****