

FCC PART 15.249

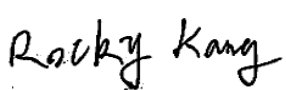
TEST REPORT

For

Zeeva International Limited

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FCC ID: 2ADM5-000929

Report Type: Original Report	Product Type: RC FLIP CAR (REMOTE)
Report Number: RSZ190410830-00	
Report Date: 2019-05-23	
Reviewed By: RF Engineer	Rocky Kang 
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The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity.

TABLE OF CONTENTS

GENERAL INFORMATION.....	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY	3
MEASUREMENT UNCERTAINTY	4
TEST FACILITY	4
SYSTEM TEST CONFIGURATION.....	5
JUSTIFICATION	5
EUT EXERCISE SOFTWARE	5
EQUIPMENT MODIFICATIONS	5
SUPPORT EQUIPMENT LIST AND DETAILS	5
SUPPORT CABLE DESCRIPTIONS.....	5
BLOCK DIAGRAM OF TEST SETUP	6
SUMMARY OF TEST RESULTS	7
TEST EQUIPMENT LIST	8
FCC§15.203 - ANTENNA REQUIREMENT.....	9
APPLICABLE STANDARD	9
ANTENNA CONNECTOR CONSTRUCTION	9
FCC§15.205, §15.209 & §15.249(D) - RADIATED EMISSIONS.....	10
APPLICABLE STANDARD	10
TEST EQUIPMENT SETUP	10
EUT SETUP	11
TEST PROCEDURE	12
CORRECTED AMPLITUDE & MARGIN CALCULATION	12
TEST RESULTS SUMMARY	12
TEST DATA	12
FCC§15.215(C) - 20DB EMISSION BANDWIDTH	19
APPLICABLE STANDARD	19
TEST PROCEDURE	19
TEST DATA	19

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	RC FLIP CAR (REMOTE)
Tested Model	ITM1901-000929
Frequency Range	2410~2473MHz
Modulation Technique	GFSK
Antenna Specification	0dBi
Voltage Range	DC 1.5V*3 AAA from battery
Date of Test	2019-04-18 ~ 2019-05-23
Sample serial number	190410830
Received date	2019-04-10
Sample/EUT Status	Good condition

Objective

This type approval report is prepared on behalf of *Zeeva International Limited* 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, 15.209 and 15.249 rules.

Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s).

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%
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 °C
Humidity		±6%
Supply voltages		±0.4%

Note: 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.

25 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2410	13	2441
1	2414	14	2442
2	2415	15	2446
3	2417	16	2450
4	2418	17	2458
5	2419	18	2462
6	2421	19	2464
7	2426	20	2465
8	2429	21	2466
9	2430	22	2469
10	2433	23	2470
11	2434	24	2473
12	2439		

Channel 0, Channel 14 and Channel 24 were selected for testing.

EUT Exercise Software

No software was used.

Equipment Modifications

No modifications were made to the unit tested.

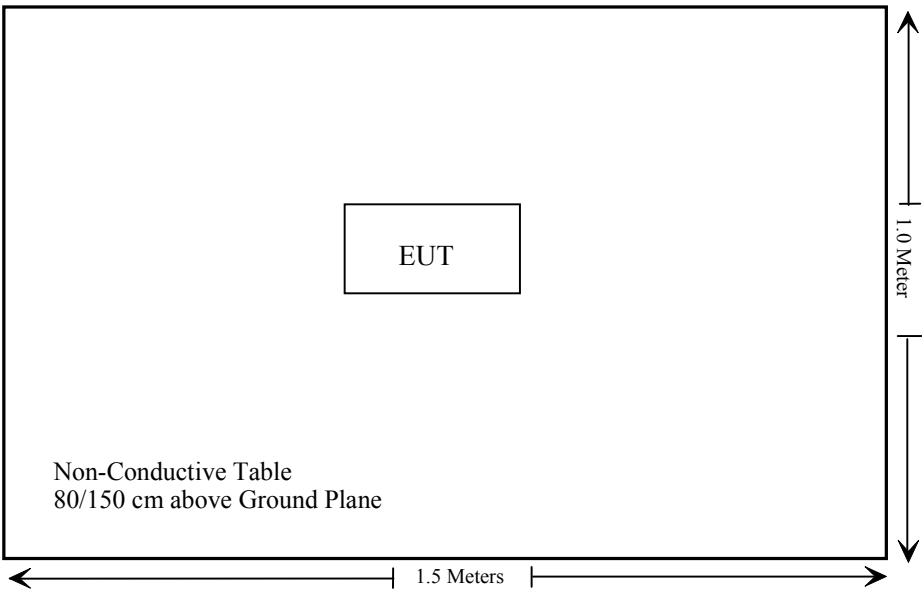
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
N/A	N/A	N/A	N/A

Support Cable Descriptions

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

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	Not Applicable
15.205, § 15.209, § 15.249(d)	Radiated Emissions& Outside of Band Emission	Compliance
§ 15.215 (c)	20 dB Bandwidth	Compliance

Not Applicable: The EUT was powered by battery only.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
A.H. System	Horn Antenna	SAS-200/571	135	2018-09-01	2021-08-31
Rohde & Schwarz	Signal Analyzer	FSEM	845987/005	2018-06-23	2019-06-23
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
COM-POWER	Pre-amplifier	PA-122	181919	2018-11-12	2019-11-12
Sonoma Instrument	Amplifier	310N	186238	2018-11-12	2019-11-12
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2018-07-11	2019-07-11
Ducommun technologies	RF Cable	UFA147A-2362-100100	MFR64639 231029-003	2018-11-12	2019-11-12
Ducommun technologies	RF Cable	104PEA	218124002	2018-11-12	2019-11-12
Ducommun technologies	RF Cable	RG-214	1	2018-11-19	2019-05-21
Ducommun technologies	RF Cable	RG-214	1	2019-05-21	2019-11-19
Ducommun technologies	RF Cable	RG-214	2	2018-11-12	2019-11-12
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2017-12-29	2020-12-28
Heatsink Required	Amplifier	QLW-18405536-J0	15964001002	2018-11-12	2019-11-12
Sinoscite	Notch Filter	BSF2402-2480MN-0898-001	99632	2018-11-12	2019-11-12
RF Conducted Test					
WEINSCHL	3dB Attenuator	6231	666	Each Time	
Rohde & Schwarz	Spectrum Analyzer	FSU26	200120	2019-03-02	2020-03-01
Ducommun Technologies	RF Cable	RG-214	3	Each Time	

* **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 an internal antenna arrangement, 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§15.205, §15.209 & §15.249(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 spectrum analyzer or receiver is set as:

Below 1000MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

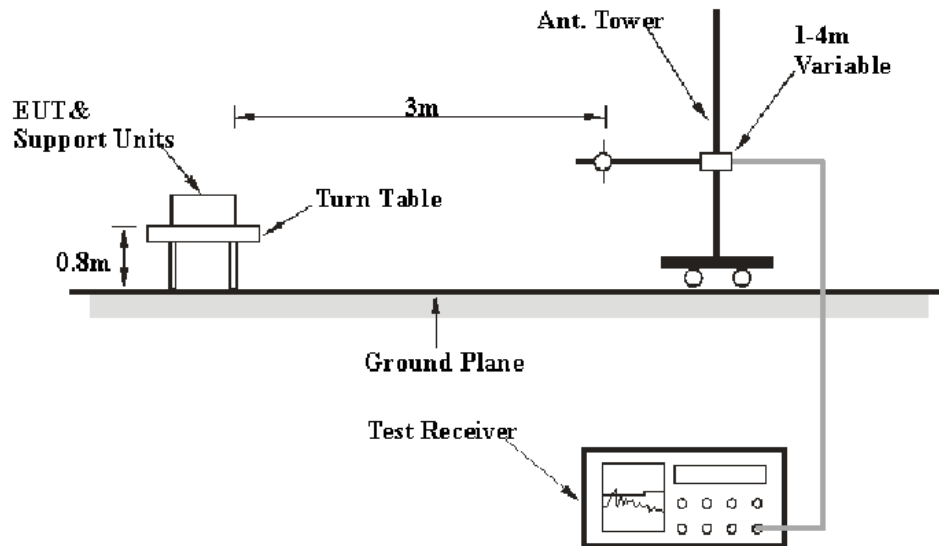
Above 1000MHz:

Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto

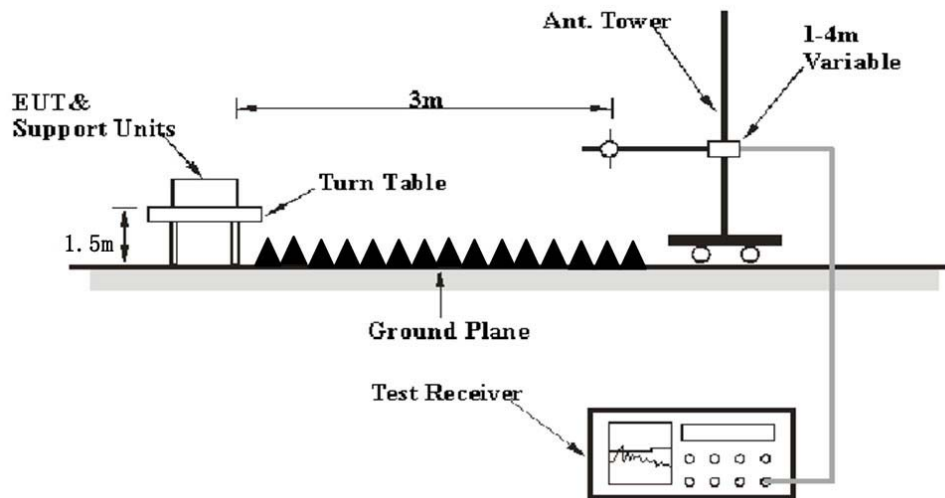
Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

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 meter, 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:

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

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 Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.205, 15.209 & §15.249

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

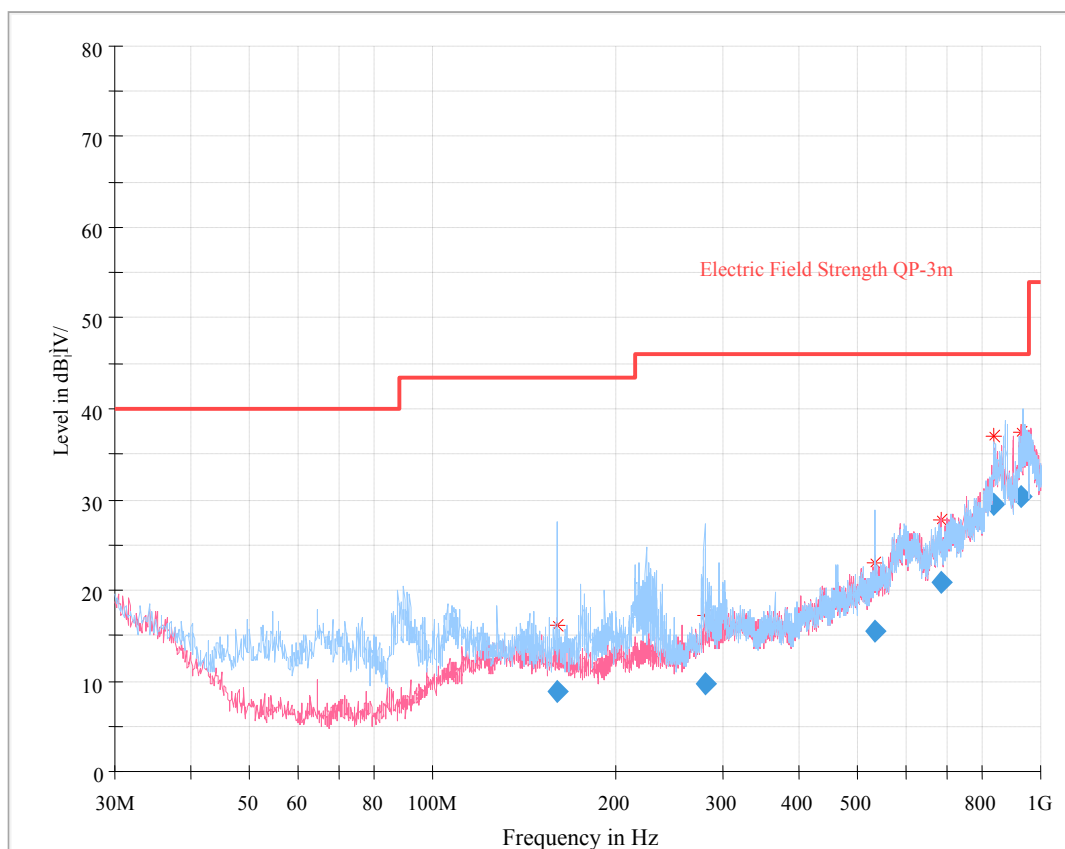
Test Data

Environmental Conditions

Temperature:	23~25 °C
Relative Humidity:	50~52 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by Carry Xiang from 2019-04-18 to 2019-05-23.

Test Mode: Transmitting

Low Channel (Worst Mode):**30 MHz~1 GHz:**

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
159.988875	8.76	122.0	H	183.0	-14.5	43.50	34.74
279.968250	9.62	375.0	H	104.0	-12.0	46.00	36.38
535.369375	15.51	190.0	H	71.0	-6.0	46.00	30.49
684.656375	20.93	371.0	V	116.0	-1.9	46.00	25.07
837.833625	29.41	139.0	V	203.0	5.7	46.00	16.59
927.747500	30.25	172.0	V	289.0	7.4	46.00	15.75

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 (2410 MHz)									
2410.00	78.62	PK	38	1.4	H	-0.36	78.26	114	35.74
2410.00	76.08	Ave.	38	1.4	H	-0.36	75.72	94	18.28
2410.00	75.13	PK	147	1.2	V	-0.36	74.77	114	39.23
2410.00	73.17	Ave.	147	1.2	V	-0.36	72.81	94	21.19
2334.46	27.99	PK	233	1.1	H	31.64	59.63	74	14.37
2334.46	14.25	Ave.	233	1.1	H	31.64	45.89	54	8.11
2490.93	26.71	PK	311	1.9	H	32.13	58.84	74	15.16
2490.93	13.96	Ave.	311	1.9	H	32.13	46.09	54	7.91
4820.00	46.35	PK	132	1.9	H	6.28	52.63	74	21.37
4820.00	42.41	Ave.	34	1.2	H	6.28	48.69	54	5.31
Middle Channel (2442 MHz)									
2442.00	77.57	PK	180	2.0	H	-0.26	77.31	114	36.69
2442.00	74.68	Ave.	180	2.0	H	-0.26	74.42	94	19.58
2442.00	75.63	PK	154	1.6	V	-0.26	75.37	114	38.63
2442.00	73.24	Ave.	154	1.6	V	-0.26	72.98	94	21.02
4884.00	44.11	PK	97	1.1	H	5.46	49.57	74	24.43
4884.00	33.81	Ave.	97	1.1	H	5.46	39.27	54	14.73
High Channel (2473 MHz)									
2473.00	77.83	PK	282	1.3	H	-0.15	77.68	114	36.32
2473.00	75.27	Ave.	282	1.3	H	-0.15	75.12	94	18.88
2473.00	75.36	PK	311	1.0	V	-0.15	75.21	114	38.79
2473.00	73.19	Ave.	311	1.0	V	-0.15	73.04	94	20.96
2339.49	27.92	PK	301	1.1	H	31.64	59.56	74	14.44
2339.49	14.56	Ave.	301	1.1	H	31.64	46.20	54	7.80
2487.00	27.42	PK	216	1.6	H	32.13	59.55	74	14.45
2487.00	13.93	Ave.	216	1.6	H	32.13	46.06	54	7.94
4946.00	45.41	PK	211	1.5	H	6.76	52.17	74	21.83
4946.00	38.35	Ave.	211	1.5	H	6.76	45.11	54	8.89

Note:

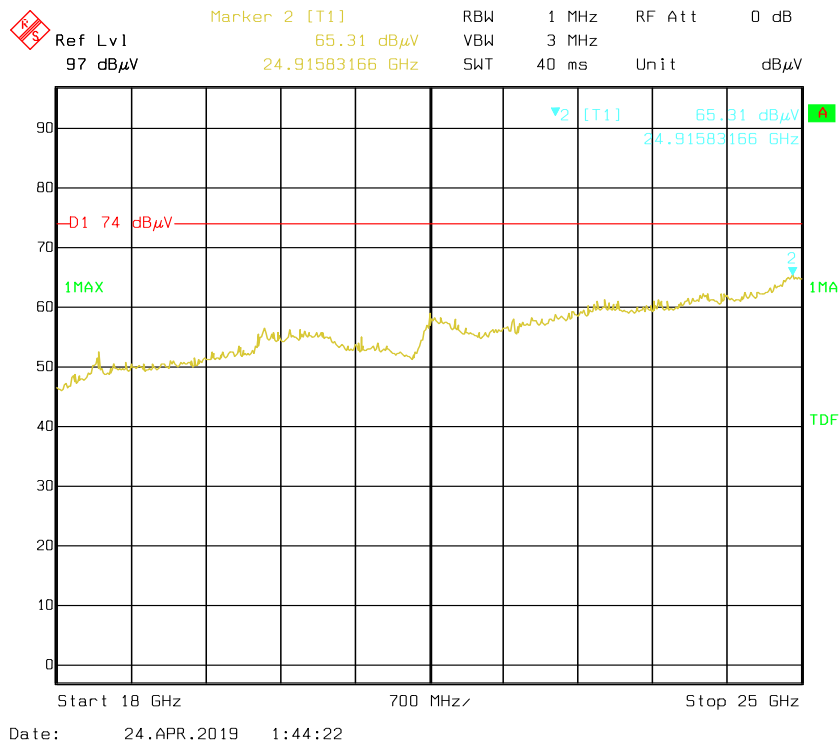
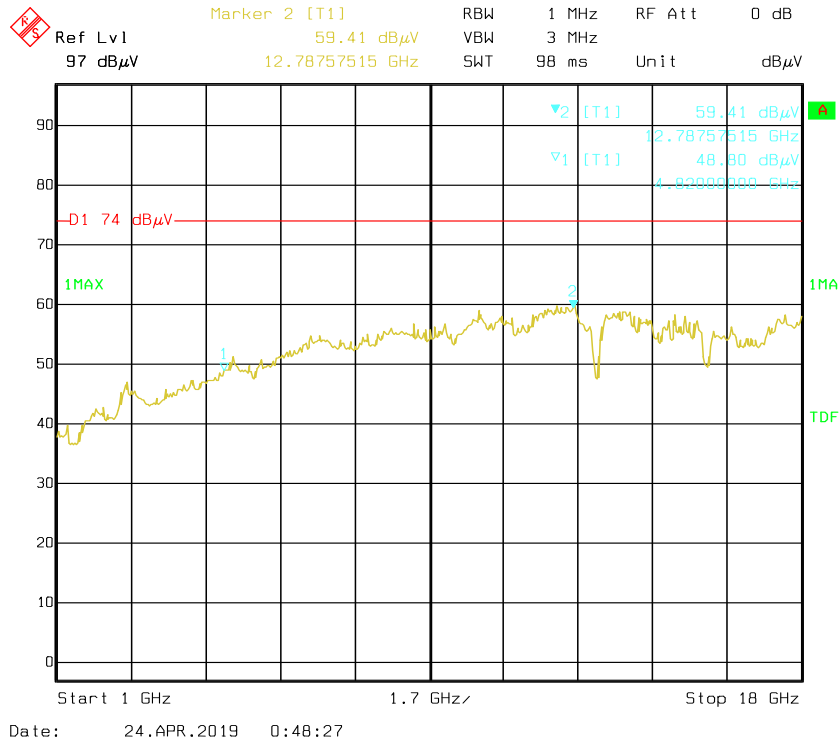
Corrected Amplitude = Corrected Factor + Reading

Corrected Factor=Antenna factor (RX) +cable loss – amplifier factor

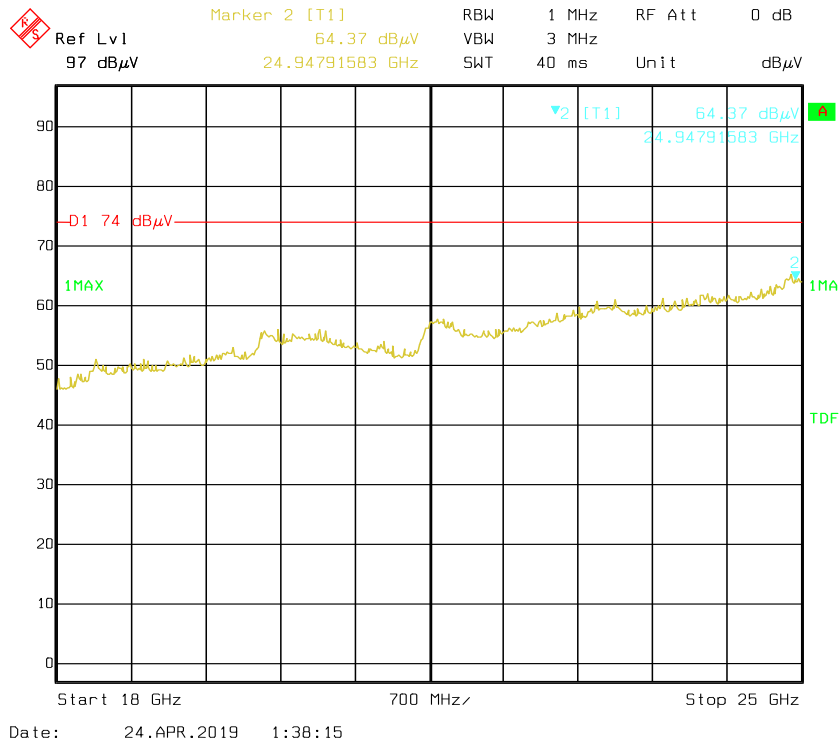
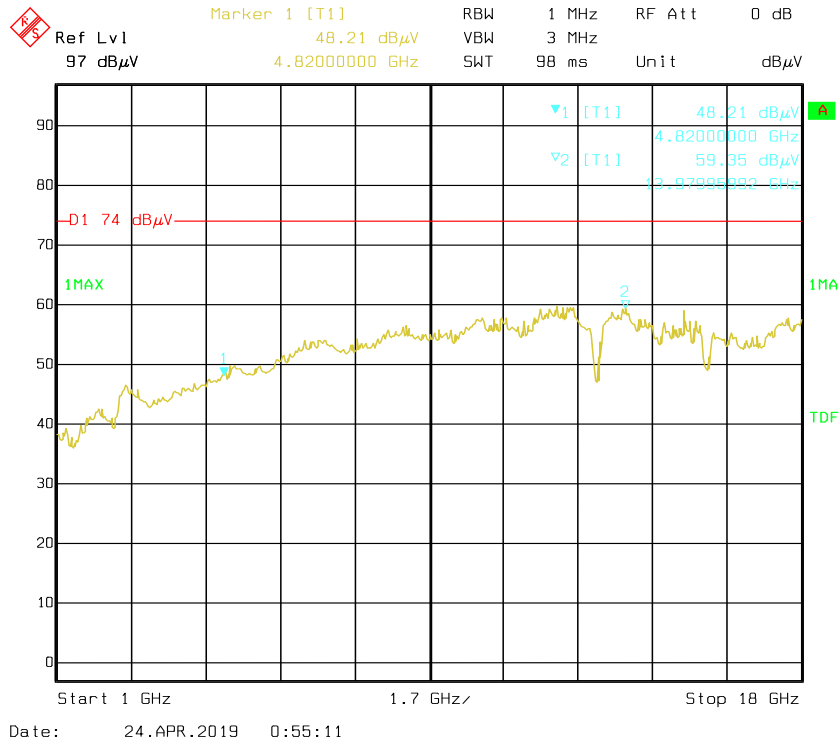
Margin = Limit- Corr. Amplitude

The emission more than 20dB below the limit was not required to be recorded.

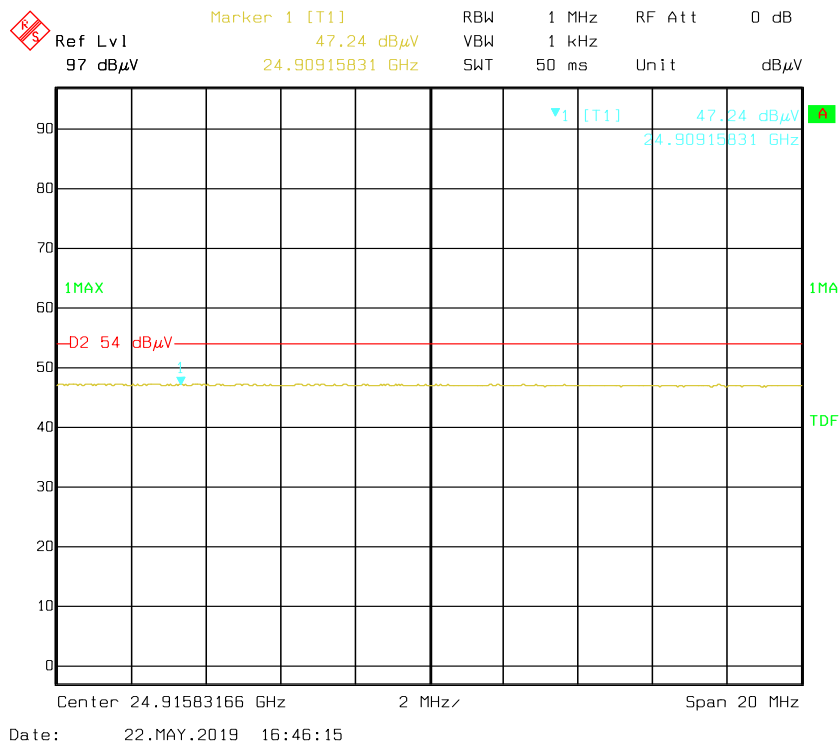
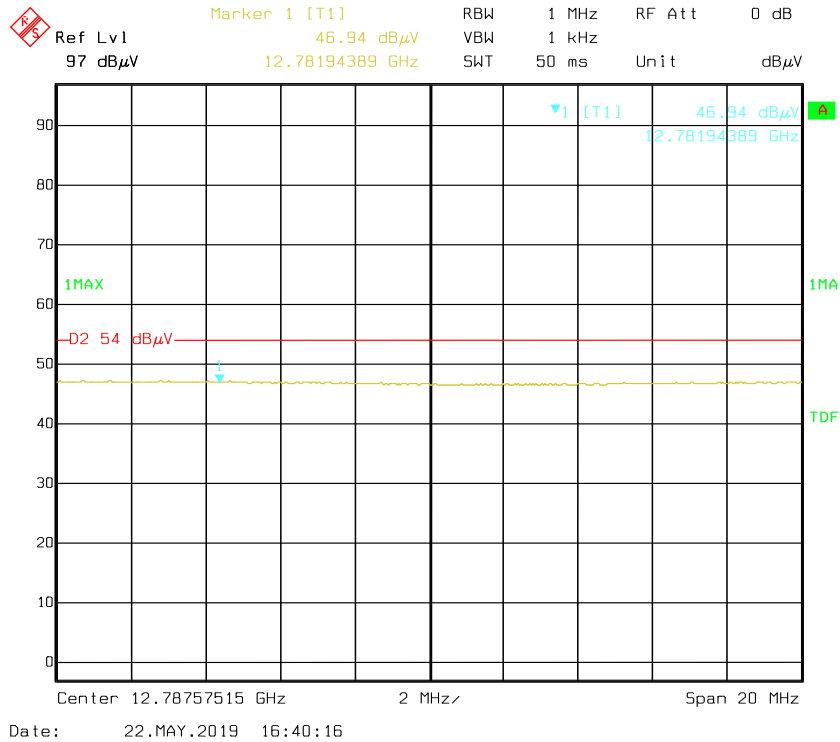
Pre-scan with Low Channel Horizontal



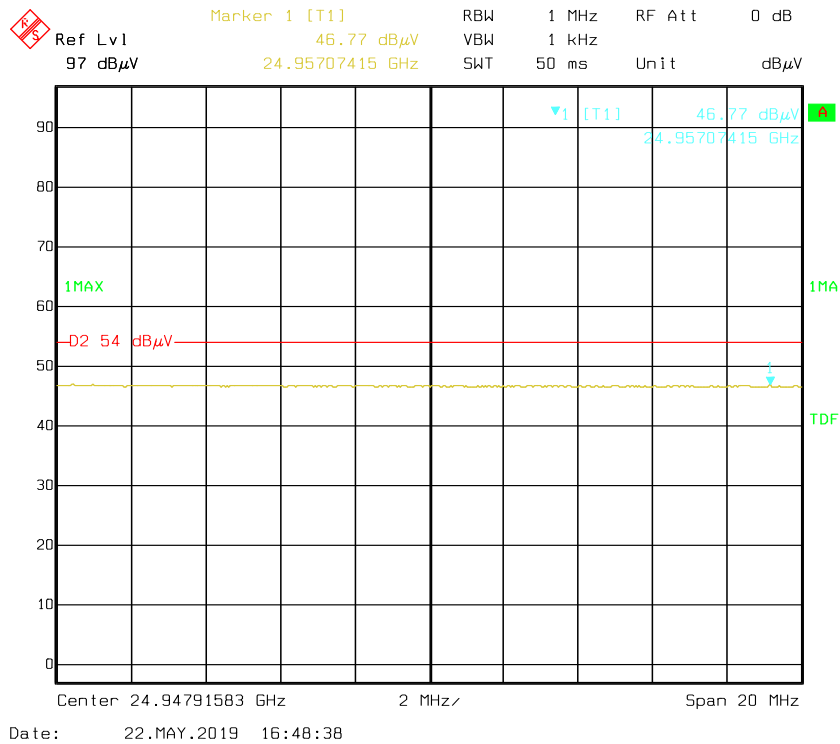
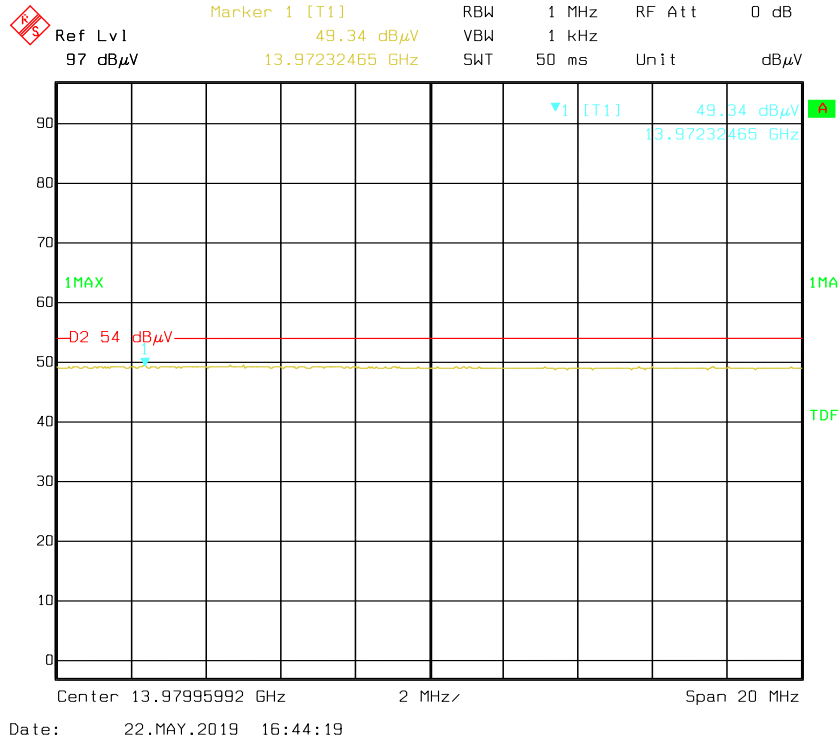
Vertical



Pre-scan for Average Horizontal



Vertical



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 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

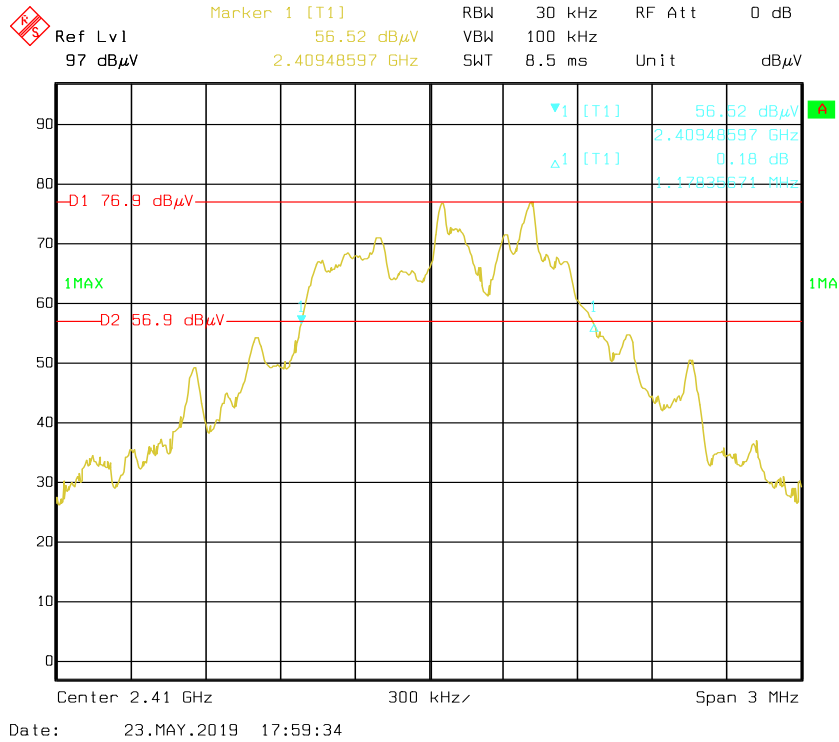
The testing was performed by Leo Huang on 2019-05-23.

Test Mode: Transmitting

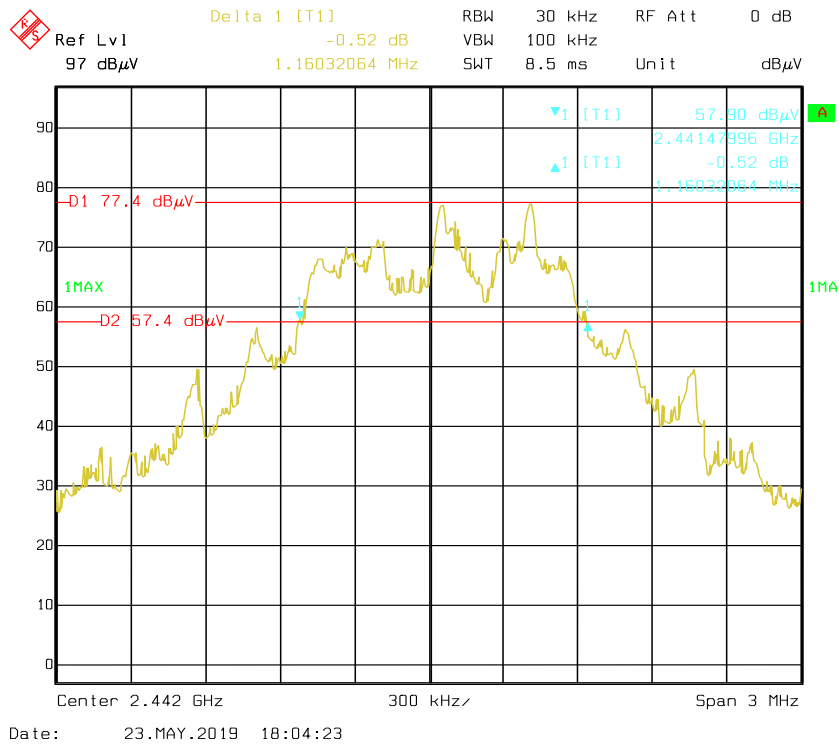
Please refer to the following table and plots.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
Low	2410	1.178
Middle	2442	1.160
High	2473	1.353

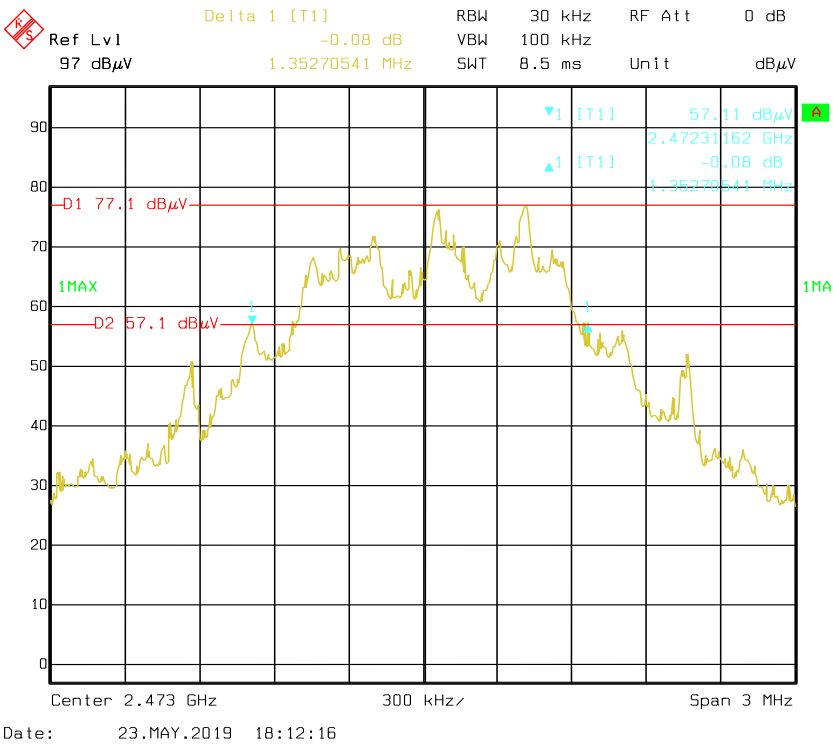
Low Channel



Middle Channel



High Channel



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