

FCC PART 15.249

TEST REPORT

For

Hobbico Inc

2904 Research Road, Champaign, Illinois United States

FCC ID: IYF0205

Report Type: Original Report		Product Type: Vusion 250 Race Quad RTF 25mW	
Report Number:	RDG160905009-00A		
Report Date:	2016-09-26		
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.(Dongguan). This report may contain data or test methods that are not covered by the NVLAP accreditation scope and shall be marked with an asterisk "*" and noted.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Hobbico Inc*'s product, model number: *RISE0205 (FCC ID: IYF0205)* (the "EUT") in this report was a *Vusion 250 Race Quad RTF 25mW*, which was measured approximately: 32.5 cm (L) x 28.5 cm (W) x 6.8 cm(H), rated input voltage: DC11.1V from rechargeable battery, the battery can remove from the EUT and charged by adapter.

AC Power Adapter:

INPUT : AC100-240V~50Hz/60Hz 0.8A MAX

OUTPUT : DC12.0V, 2.0A

Note: The series product, model RISE0205, RISE2017 are electrically identical, the difference between them is the model name, we selected RISE0205 for fully testing, the details were explained in the declaration letter.

** All measurement and test data in this report was gathered from production sample serial number: 160905009 (Assigned by BACL.Dongguan). The EUT was received on 2016-09-07.*

Objective

This type approval report is prepared on behalf of *Hobbico Inc* in accordance with Part 2-Subpart J, and Part 15-Subparts A, B 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.

Related Submittal(s)/Grant(s)

Submitted with the Part of a system with FCC ID: IYFJ2000.

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 emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 06, 2015.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in engineering mode with maximum output power and switched the channels by key. It has 3 channels: 5769MHz, 5806MHz and 5843MHz.

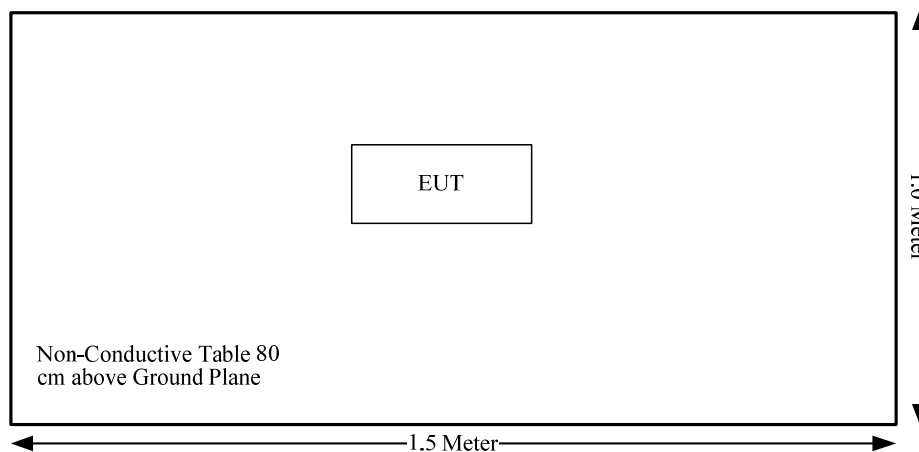
EUT Exercise Software

No software was used in test.

Equipment Modifications

No modifications were made to the EUT.

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	Radiated Emissions	Compliance
§15.215 (c)	20 dB Bandwidth	Compliance

Note: Test time: 2016-09-20 ~ 2016-09-25.

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

For intentional device, 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.

Antenna Connector Construction

The EUT has one external detachable antenna and with RP-SMA female connector, the antenna gain is 0.95dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cisp} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cisp} of Table 1, then:

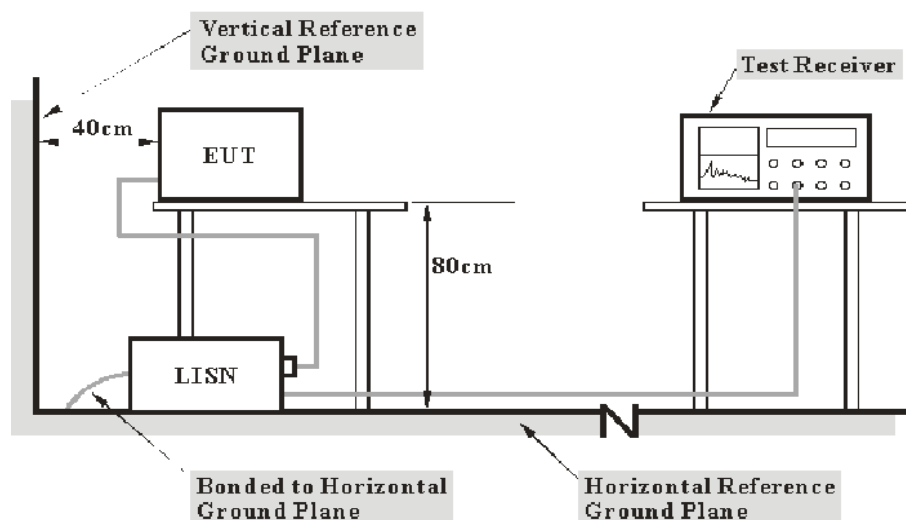
- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit.

Based on CISPR 16-4-2-2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Dongguan) is 3.12 dB (150 kHz to 30 MHz).

Table 1 – Values of U_{cisp}

Measurement	U_{cisp}
Conducted disturbance at mains port using AMN (150 kHz to 30 MHz)	3.4 dB

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.

The adapter was connected to a 120 V/60 Hz AC power source.

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 of laptop was connected to the first LISN.

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

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

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

$$C_f = A_C + VDF$$

Herein,

V_C (cord. Reading): corrected voltage amplitude

V_R : reading voltage amplitude

A_C : attenuation caused by cable loss

VDF: voltage division factor of AMN

C_f : Correction Factor

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

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2015-12-10	2016-12-09
R&S	L.I.S.N	ESH3-Z5	892107/021	2016-07-16	2017-07-15
R&S	Two-line V-network	ENV 216	3560.6550.12	2015-11-26	2016-11-25
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

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

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

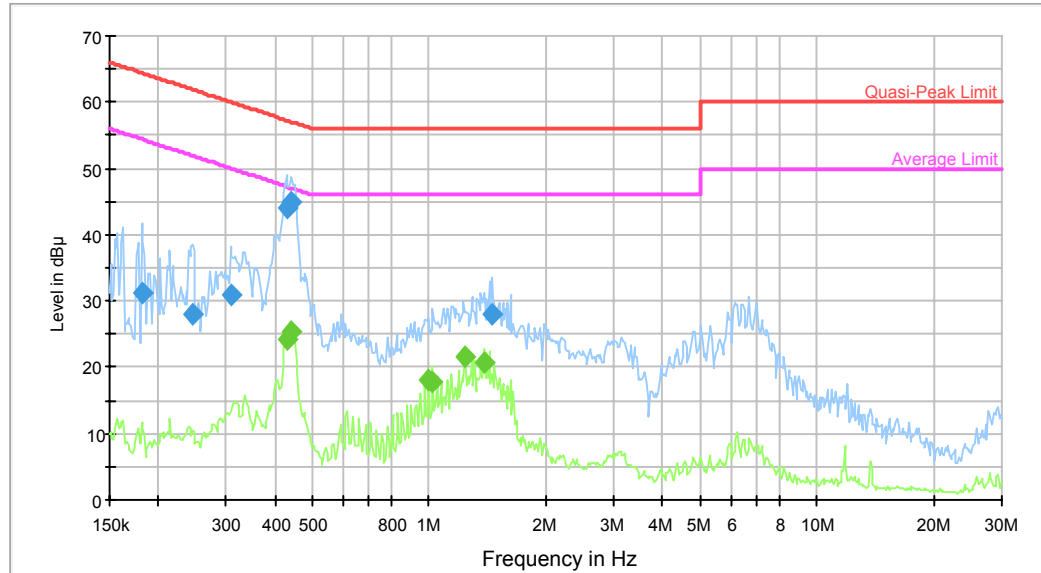
Test Data**Environmental Conditions**

Temperature:	27.8 °C
Relative Humidity:	51 %
ATM Pressure:	100.7 kPa

The testing was performed by Costa Dong on 2016-09-20.

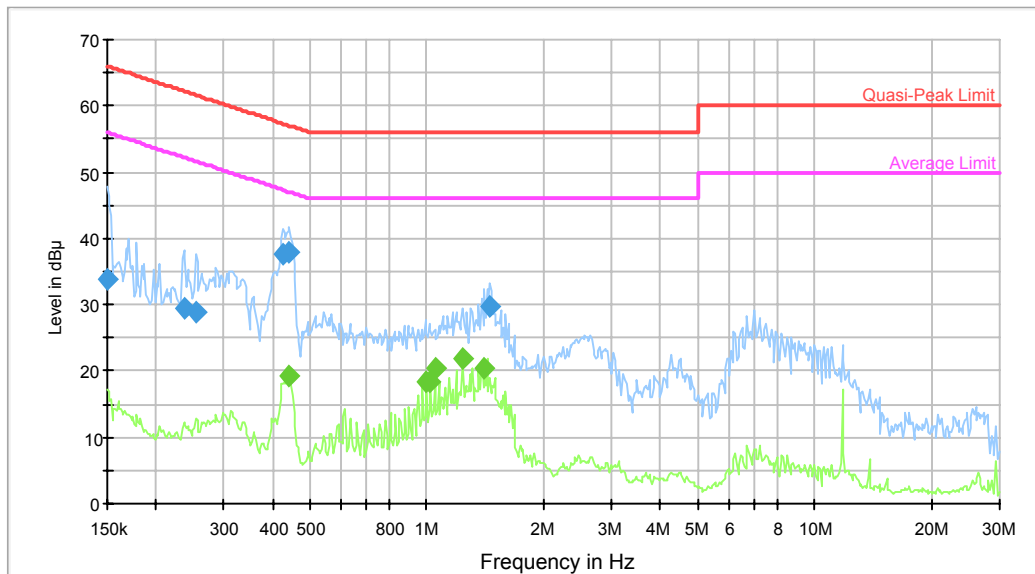
Test Mode: Charging

AC120 V, 60 Hz, Line:



Frequency (MHz)	Quasi Peak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.181612	31.2	9.000	L1	9.7	33.2	64.4	Compliance
0.245835	28.1	9.000	L1	9.6	33.8	61.9	Compliance
0.307284	30.9	9.000	L1	9.6	29.1	60.0	Compliance
0.429420	43.9	9.000	L1	9.7	13.4	57.3	Compliance
0.443327	44.9	9.000	L1	9.7	12.1	57.0	Compliance
1.453260	28.1	9.000	L1	9.7	27.9	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.429420	24.2	9.000	L1	9.7	23.1	47.3	Compliance
0.443327	25.3	9.000	L1	9.7	21.7	47.0	Compliance
0.999305	18.2	9.000	L1	9.7	27.8	46.0	Compliance
1.023481	17.8	9.000	L1	9.7	28.2	46.0	Compliance
1.239175	21.6	9.000	L1	9.7	24.4	46.0	Compliance
1.385415	20.7	9.000	L1	9.7	25.3	46.0	Compliance

AC120 V, 60 Hz, Neutral:

Frequency (MHz)	Quasi Peak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.150000	33.7	9.000	N	9.6	32.3	66.0	Compliance
0.236234	29.4	9.000	N	9.6	32.8	62.2	Compliance
0.253797	28.7	9.000	N	9.6	32.9	61.6	Compliance
0.426011	37.7	9.000	N	9.6	19.6	57.3	Compliance
0.443327	38.0	9.000	N	9.6	19.0	57.0	Compliance
1.453260	29.7	9.000	N	9.7	26.3	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.443327	19.3	9.000	N	9.6	27.7	47.0	Compliance
0.999305	18.3	9.000	N	9.7	27.7	46.0	Compliance
1.023481	18.3	9.000	N	9.7	27.7	46.0	Compliance
1.048242	20.5	9.000	N	9.7	25.5	46.0	Compliance
1.239175	21.8	9.000	N	9.7	24.2	46.0	Compliance
1.407671	20.4	9.000	N	9.7	25.6	46.0	Compliance

FCC§15.205, §15.209&§15.249- 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.

(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.

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cisprr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cisprr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cisprr})$, exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cisprr})$, exceeds the disturbance limit.

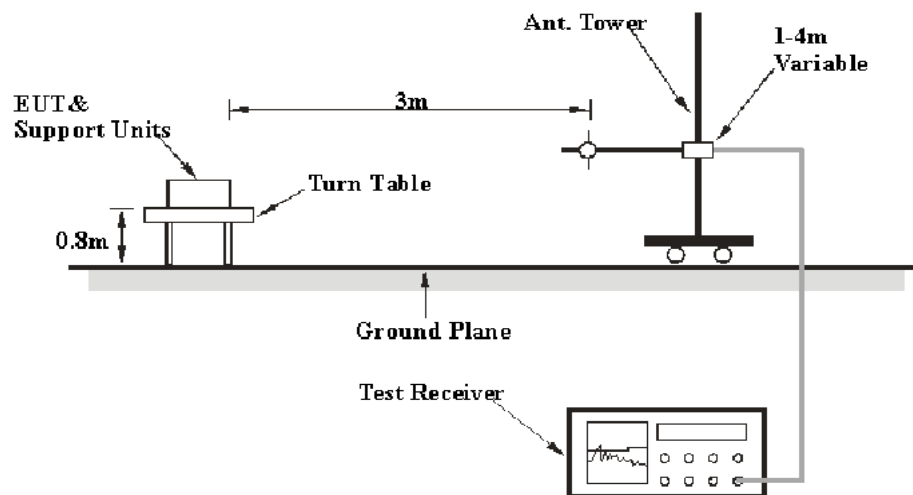
Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is: 30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical; 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical; 1G~6GHz: 4.45 dB, 6G~18GHz: 5.23 dB.

Table 1 – Values of U_{cispr}

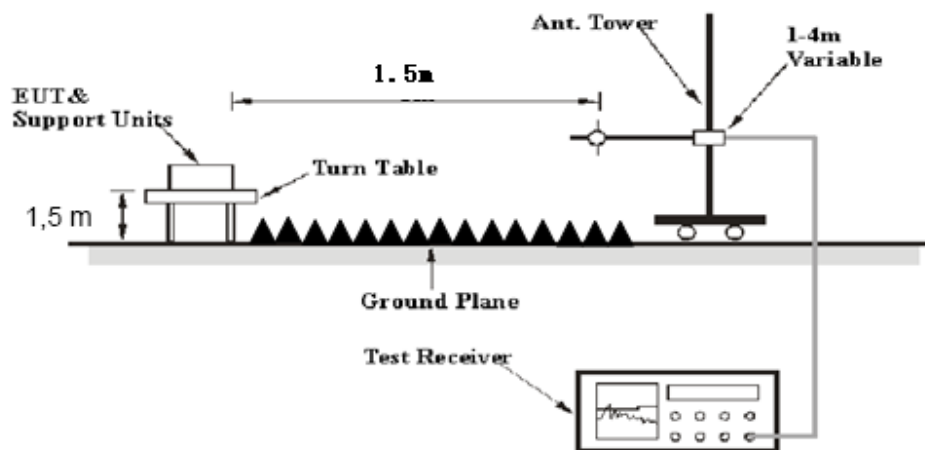
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission below 1GHz tests were in the 3 meters chamber test site and out of band emission tests were performed in the 1.5 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 Equipment Setup

The system was investigated from 30 MHz to 40 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	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave

Test Procedure

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

All data was recorded in the Quasi-peak detection mode from 30 MHz to 1GHz, peak and average detection mode above 1 GHz.

According to C63.10, the above 1G test result shall be extrapolated to the specified distance using an extrapolation factor of 20dB/decade from 3m to 1.5m

Distance extrapolation factor = $20 \log (\text{specific distance [3m]}/\text{test distance [1.5m]})$ dB

Extrapolation result = Corrected Amplitude (dB μ V/m) - distance extrapolation factor (6dB)

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2016-09-01	2017-09-01
Sunol Sciences	Antenna	JB3	A060611-1	2014-11-06	2017-11-05
HP	Amplifier	8447E	2434A02181	2016-09-01	2017-09-01
Agilent	Spectrum Analyzer	E4440A	SG43360054	2015-11-23	2016-11-22
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2016-02-19	2017-02-19
N/A	Coaxial Cable	14m	N/A	2016-05-06	2017-05-06
N/A	Coaxial Cable	8m	N/A	2016-05-06	2017-05-06
Agilent	Spectrum Analyzer	8564E	3943A01781	2016-05-08	2017-05-08
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2014-06-16	2017-06-15
Ducommun Technologies	Horn Antenna	ARH-2823-02	1007726-01 1302	2014-06-16	2017-06-15
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2016-09-06	2017-09-06
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A

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

Test Results Summary

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

Test Data**Environmental Conditions**

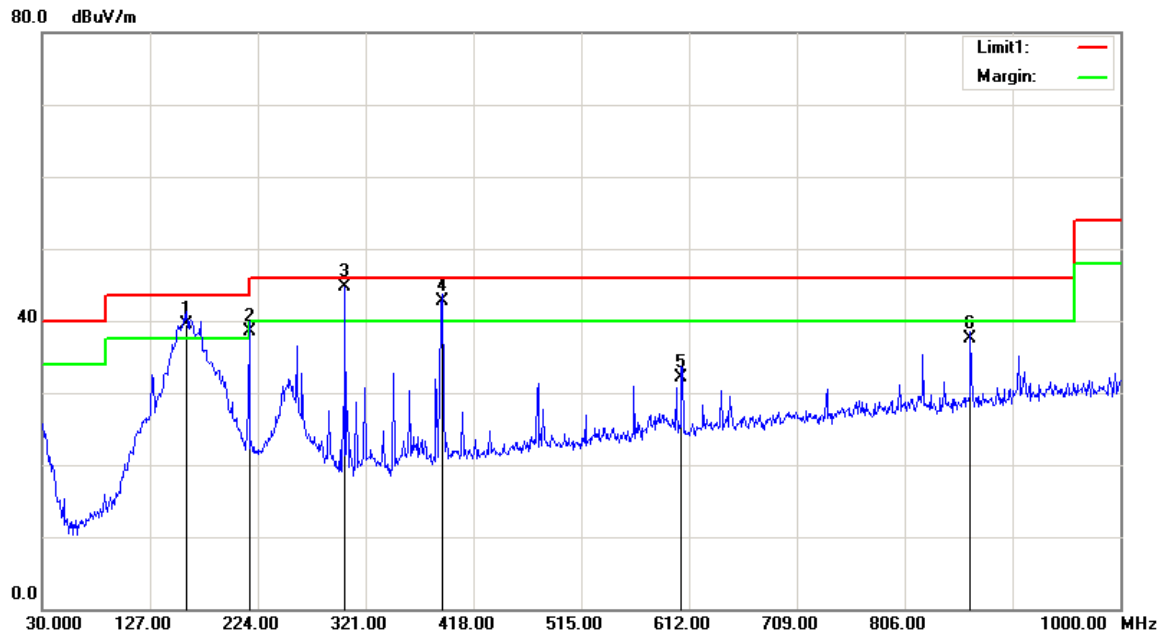
Temperature:	27.6 °C
Relative Humidity:	36 %
ATM Pressure:	100.1 kPa

The testing was performed by Costa Dong on 2016-09-25.

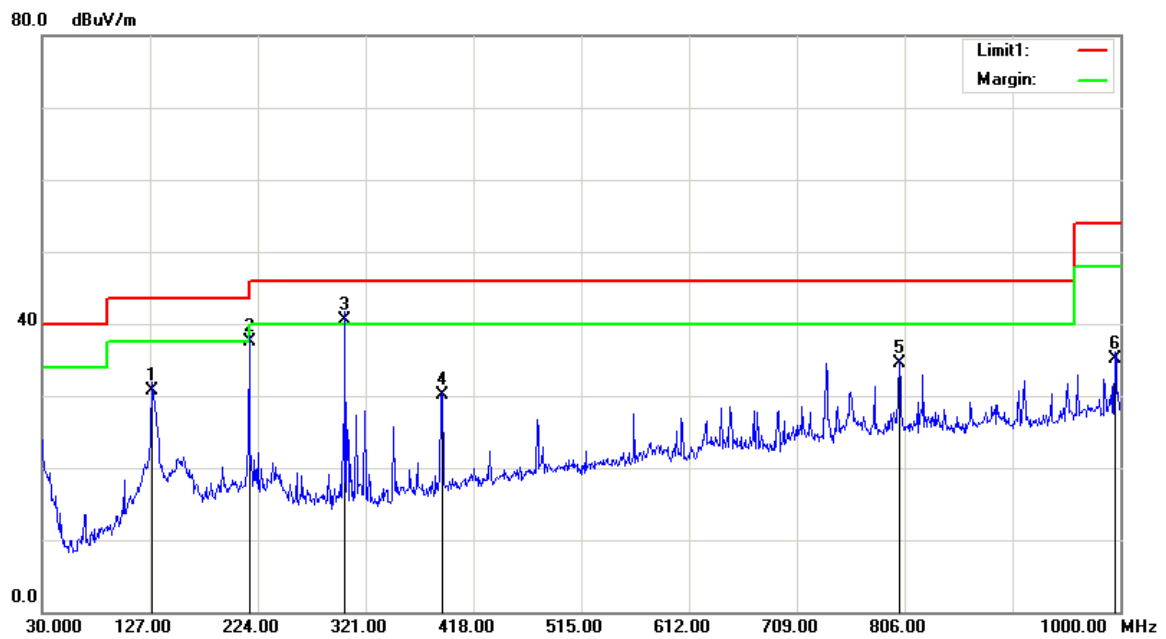
Test Mode: Transmitting

30MHz-1GHz:

Horizontal



Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
159.9800	46.92	QP	-7.32	39.60	43.50	3.90
216.2400	47.71	QP	-9.11	38.60	46.00	7.40
302.5700	50.50	QP	-5.80	44.70	46.00	1.30
389.8700	46.96	QP	-4.16	42.80	46.00	3.20
605.2100	32.44	QP	-0.34	32.10	46.00	13.90
865.1700	34.15	QP	3.45	37.60	46.00	8.40

Vertical

Frequency (MHz)	Receiver Reading (dBμV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
128.9400	36.65	QP	-5.85	30.80	43.50	12.70
216.2400	46.71	QP	-9.11	37.60	46.00	8.40
302.5700	46.30	QP	-5.80	40.50	46.00	5.50
389.8700	34.26	QP	-4.16	30.10	46.00	15.90
801.1500	31.84	QP	2.76	34.60	46.00	11.40
995.1500	30.00	QP	5.20	35.20	54.00	18.80

1G-40GHz:

Frequency	Receiver		Rx Antenna		Cable Loss	Amplifier Gain	Corrected Amplitude	Extrapolation Result	Limit	Margin
	Reading	Detector	Polar	Factor						
MHz	dBμV	PK/QP/AV	H/V	dB(1/m)	dB	dB	dBμV/m	dBμV/m	dBμV/m	dB
frequency: 5769MHz										
5769	67.36	PK	H	32.15	5.49	0.00	105.00	99.00	114.00	15.00
5769	51.28	AV	H	32.15	5.49	0.00	88.92	82.92	94.00	11.08
5769	66.65	PK	V	32.15	5.49	0.00	104.29	98.29	114.00	15.71
5769	50.26	AV	V	32.15	5.49	0.00	87.90	81.90	94.00	12.10
5725	26.70	PK	H	32.15	5.60	0.00	64.45	58.45	74.00	15.55
5725	13.59	AV	H	32.15	5.60	0.00	51.34	45.34	54.00	8.66
11538	26.44	PK	H	37.90	8.94	26.10	47.18	41.18	74.00	32.82
11538	13.75	AV	H	37.90	8.94	26.10	34.49	28.49	54.00	25.51
17307	29.72	PK	H	41.34	13.27	25.63	58.70	52.70	74.00	21.30
17307	14.58	AV	H	41.34	13.27	25.63	43.56	37.56	54.00	16.44
3092	32.68	PK	H	27.49	6.81	27.46	39.52	33.52	74.00	40.48
3092	16.33	AV	H	27.49	6.81	27.46	23.17	17.17	54.00	36.83
3240	29.22	PK	H	27.97	6.26	27.34	36.11	30.11	74.00	43.89
3240	14.67	AV	H	27.97	6.26	27.34	21.56	15.56	54.00	38.44
frequency: 5806MHz										
5806	67.85	PK	H	32.16	5.52	0.00	105.53	99.53	114.00	14.47
5806	51.28	AV	H	32.16	5.52	0.00	88.96	82.96	94.00	11.04
5806	67.14	PK	V	32.16	5.52	0.00	104.82	98.82	114.00	15.18
5806	51.48	AV	V	32.16	5.52	0.00	89.16	83.16	94.00	10.84
11612	26.59	PK	H	37.90	8.91	1.00	72.40	66.40	95.00	28.60
11612	13.74	AV	H	37.90	8.91	2.00	58.55	52.55	96.00	43.45
17418	26.37	PK	H	42.01	12.63	3.00	78.01	72.01	97.00	24.99
17418	13.22	AV	H	42.01	12.63	4.00	63.86	57.86	98.00	40.14
3092.00	33.54	PK	H	27.49	6.81	5.00	62.84	56.84	99.00	42.16
3092.00	17.38	AV	H	27.49	6.81	6.00	45.68	39.68	100.00	60.32
3240.00	28.35	PK	H	27.97	6.26	5.00	57.58	51.58	99.00	47.42
3240.00	14.22	AV	H	27.97	6.26	6.00	42.45	36.45	100.00	63.55
frequency: 5843MHz										
5843	67.36	PK	H	32.17	5.97	0.00	105.50	99.50	114.00	14.50
5843	51.28	AV	H	32.17	5.97	0.00	89.42	83.42	94.00	10.58
5843	66.65	PK	V	32.17	5.97	0.00	104.79	98.79	114.00	15.21
5843	50.26	AV	V	32.17	5.97	0.00	88.40	82.40	94.00	11.60
5875	26.70	PK	H	32.18	5.97	0.00	64.85	58.85	74.00	15.15
5875	13.59	AV	H	32.18	5.97	0.00	51.74	45.74	54.00	8.26
11686	26.44	PK	H	37.90	8.88	25.53	47.69	41.69	74.00	32.31
11686	13.64	AV	H	37.90	8.88	25.53	34.89	28.89	54.00	25.11
17529	29.72	PK	H	42.67	12.19	25.22	59.36	53.36	74.00	20.64
17529	14.23	AV	H	42.67	12.19	25.22	43.87	37.87	54.00	10.13
3425	28.33	PK	H	28.56	5.06	27.21	34.74	28.74	74.00	45.26
3425	13.74	AV	H	28.56	5.06	27.21	20.15	14.15	54.00	33.85
3092	33.86	PK	H	27.49	6.81	27.46	40.70	34.70	74.00	39.30
3092	17.32	AV	H	27.49	6.81	27.46	24.16	18.16	54.00	29.84

Note: For above 1GHz, the test distance is 1.5m.

FCC §15.215(c) – 20 dB BANDWIDTH TESTING

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 on the test table without connection to measurement instrument. Turn on the EUT. 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 were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSEM	831259/019	2016-07-11	2017-07-11
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06

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

Test Data

Environmental Conditions

Temperature:	27.4 °C
Relative Humidity:	33 %
ATM Pressure:	100.2 kPa

* The testing was performed by Costa Dong on 2016-09-22.

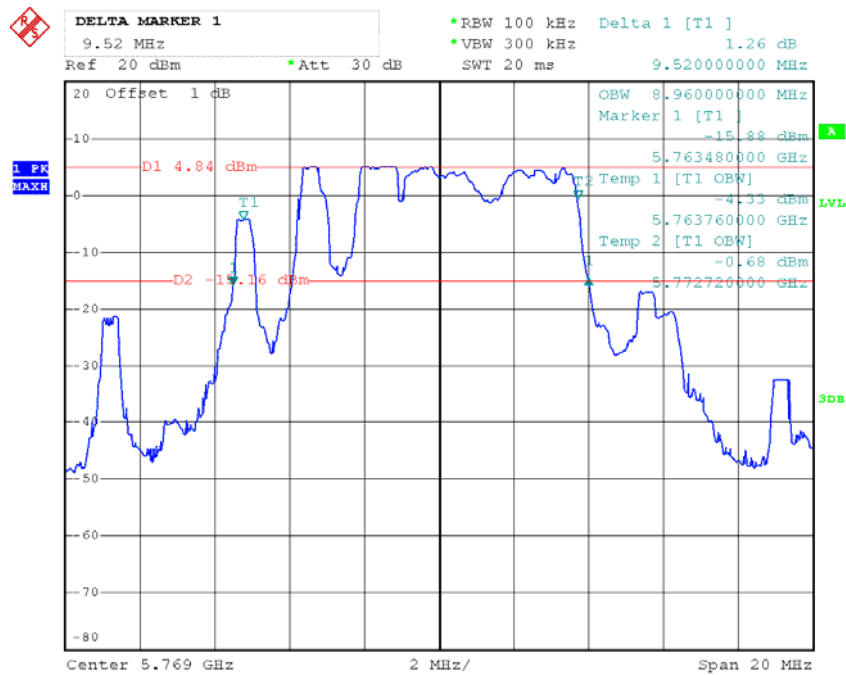
Test Result: Compliant.

Please refer to following tables and plots

Test Mode: Transmitting

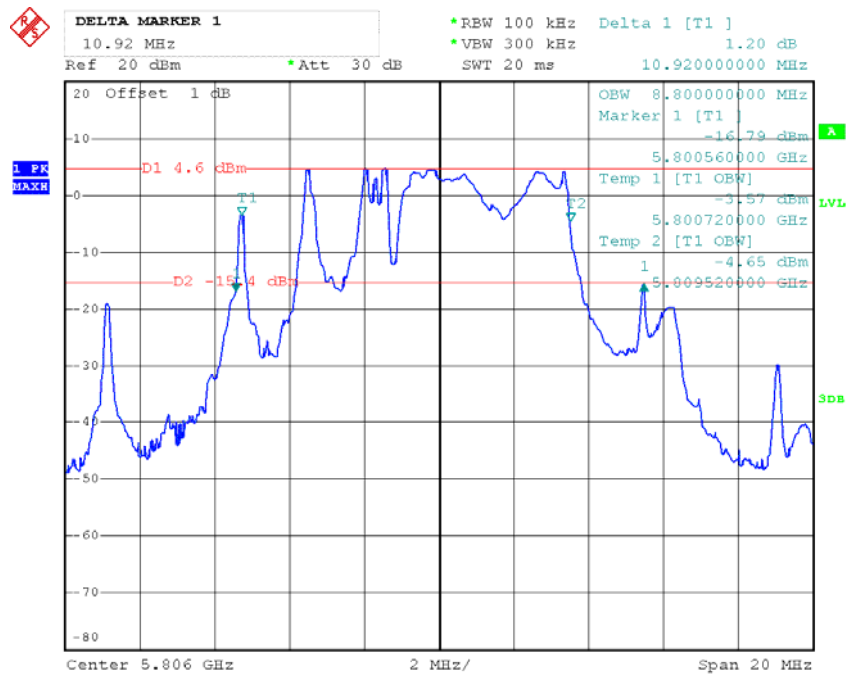
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	5769	9.52
Middle	5806	10.92
High	5843	11.04

Low Channel



Date: 22.SEP.2016 21:25:29

Middle Channel



Date: 22.SEP.2016 21:28:02

High Channel



Date: 22.SEP.2016 21:12:45

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