

# FCC Co-Location Test Report

**FCC ID** : I88WRE6505V2  
**Equipment** : Wireless AC750 Range Extender  
**Model No.** : WRE6505 v2  
**Brand Name** : **ZYXEL**  
**Applicant** : Zyxel Communications Corporation  
**Address** : No.2 Industry East RD. IX, Hsinchu Science  
Park, Hsinchu 30075, Taiwan, R.O.C  
**Standard** : 47 CFR FCC Part 15.247  
47 CFR FCC Part 15.407  
**Received Date** : May 04, 2016  
**Tested Date** : Aug. 02 ~ Aug. 12, 2016

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:

  
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Along Chen / Assistant Manager

Approved by:

  
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Gary Chang / Manager



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## Release Record

Report No.	Version	Description	Issued Date
FR650401CO	Rev. 01	Initial issue	Oct. 21, 2016

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## Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.247(d) 15.407(b) 15.209	Radiated Emissions	[dBuV/m at 3m]: 63.95MHz 33.11 (Margin -6.89dB) – PK	Pass

# 1 General Description

## 1.1 Information

The following versions are provided to this EUT.

sample version	Internal DDR Size	Working voltage of DDR
VE3	32M	DDR1 voltage: 2.5V
VE4	64M	DDR2 voltage: 1.8V

### 1.1.1 Specification of the Equipment under Test (EUT)

<b>Operating Frequency</b>	802.11b/g/n: 2412 MHz ~ 2462 MHz 802.11a/n/ac: 5180 MHz ~ 5240 MHz; 5745 ~ 5825 MHz
<b>Modulation Type</b>	802.11b: DSSS (DBPSK / DQPSK / CCK) 802.11a/g/n/ac: OFDM (BPSK / QPSK / 16QAM / 64QAM/256QAM)

### 1.1.2 Antenna Details

Model	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)		
			2400~2483.5	5150~5250	5725~5850
ALA110-052026	PIFA	N/A	4.70836	--	--
ALA160-222034	PIFA	N/A	2.82	3.43	3.43

### 1.1.3 Power Supply Type of Equipment under Test (EUT)

<b>Power Supply Type</b>	100-240V, 0.15A, 50/60Hz
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### 1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	RJ45 cable	0.94m non-shielded w/o core

## 1.2 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber 3 / (03CH03-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	Agilent	N9010A	MY53400091	Sep. 14, 2015	Sep. 13, 2016
Receiver	Agilent	N9038A	MY53290044	Oct. 14, 2015	Oct. 13, 2016
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-563	Dec. 29, 2015	Dec. 28, 2016
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Feb. 24, 2016	Feb. 23, 2017
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2015	Nov. 03, 2016
Preamplifier	EMC	EMC02325	980187	Sep. 21, 2015	Sep. 20, 2016
Preamplifier	Agilent	83017A	MY53270014	Sep. 07, 2015	Sep. 06, 2016
Preamplifier	EMC	EMC184045B	980192	Sep. 01, 2015	Aug. 31, 2016
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Feb. 05, 2016	Feb. 04, 2017
RF cable-8M	HUBER+SUHNER	SUCOFLEX104	MY22600/4	Feb. 05, 2016	Feb. 04, 2017
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Feb. 05, 2016	Feb. 04, 2017
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Feb. 05, 2016	Feb. 04, 2017
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Feb. 05, 2016	Feb. 04, 2017
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Feb. 05, 2016	Feb. 04, 2017
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 16, 2015	Nov. 15, 2016
Measurement Software	AUDIX	e3	6.120210g	NA	NA

Note: Calibration Interval of instruments listed above is one year.

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Feb. 17, 2016	Feb. 16, 2017
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Nov. 27, 2015	Nov. 26, 2016
Power Meter	Anritsu	ML2495A	1241002	Sep. 21, 2015	Sep. 20, 2016
Power Sensor	Anritsu	MA2411B	1207366	Sep. 21, 2015	Sep. 20, 2016
Signal Generator	R&S	SMB100A	175727	Oct. 05, 2015	Oct. 04, 2016
AC POWER SOURCE	APC	AFC-500W	F312060012	Oct. 26, 2015	Oct. 25, 2016
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA

Note: Calibration Interval of instruments listed above is one year.

### 1.3 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.247

47 CFR FCC Part 15.407

ANSI C63.10-2013

FCC KDB 558074 D01 DTS Meas Guidance v03r05

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03

FCC KDB 644545 D03 Guidance for IEEE 802 11ac New Rules v01

FCC KDB 412172 D01 Determining ERP and EIRP v01r01

### 1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Measurement Uncertainty	
Parameters	Uncertainty
Radiated emission $\leq$ 1GHz	$\pm 3.66$ dB
Radiated emission $>$ 1GHz	$\pm 5.37$ dB

## 2 Test Configuration

### 2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
Radiated Emissions	03CH03-WS	23-25°C / 60-64%	Warren Lee Brad Wu
Conducted Emissions	TH01-WS	22°C / 65%	Brad Wu

➤ FCC site registration No.: 207696

➤ IC site registration No.: 10807C-1

### 2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Channel	Data Rate	Test Configuration
Radiated Emissions	2.4G 11b + 5G 11a	CH6 + CH40	1Mbps + 6Mbps	1, 2
Conducted Emissions				1

**NOTE:**

- 1) The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **X-plane** results were found as the worst case and were shown in this report.
- 2) The EUT has two versions for different Internal DDR Size and Working voltage of DDR (Sample 1: VE3; Sample 2: VE4).
- 3) The test configurations are listed as follows:  
Configuration 1 : Sample 1: VE3  
Configuration 2 : Sample 2: VE4
- 4) The selected channel is the maximum power channel of Wi-Fi mode



### 3 Transmitter Test Results

#### 3.1 Unwanted Emissions into Restricted Frequency Bands

##### 3.1.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

**Note 1:**  
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

**Note 2:**  
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

##### 3.1.2 Test Procedures

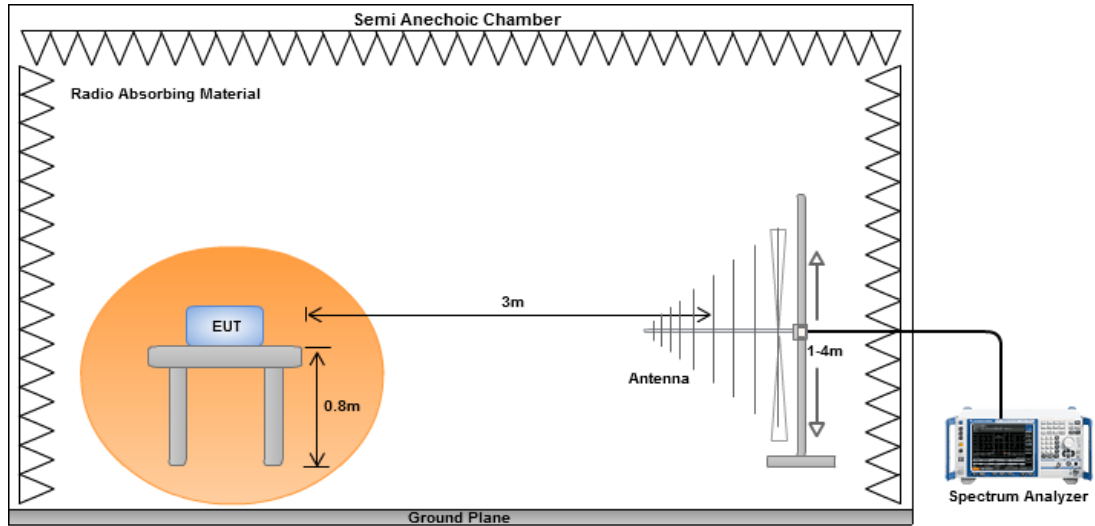
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m.
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

**Note:**

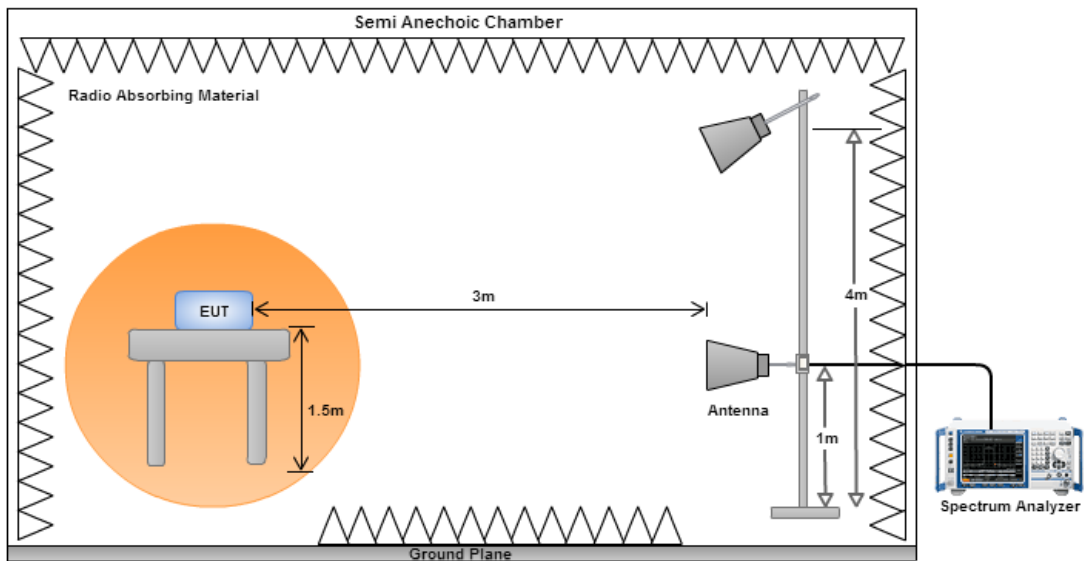
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

### 3.1.3 Test Setup

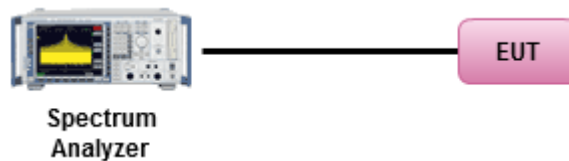
#### Radiated Emissions below 1 GHz



#### Radiated Emissions above 1 GHz



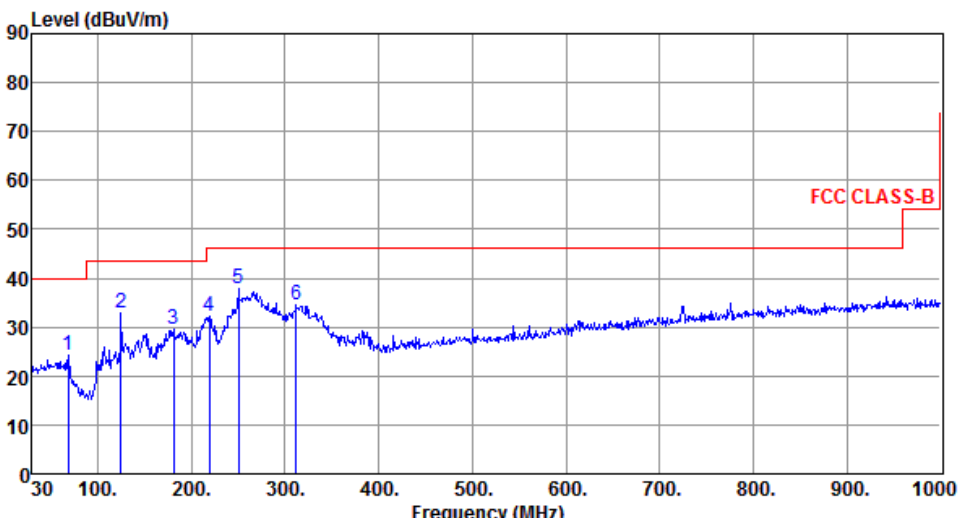
#### Transmitter Conducted Unwanted Emissions (30MHz~40GHz)



### Configuration 1 : Sample 1: VE3

#### 3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

<b>Modulation</b>	2.4G 11b + 5G 11a	<b>Test Channel</b>	CH6 + CH40
<b>Polarization</b>	Horizontal		

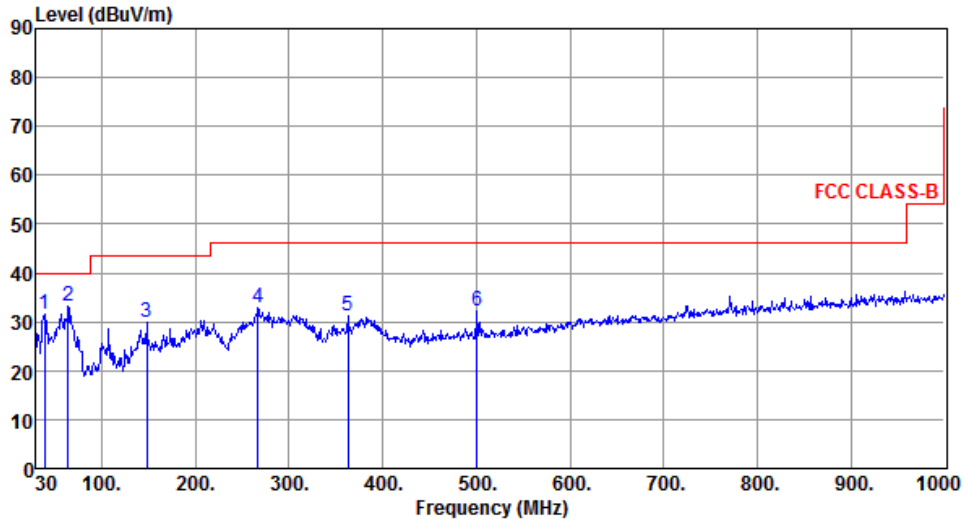
  


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	68.80	24.24	40.00	-15.76	34.53	-10.29	Peak	---	---
2	125.06	32.87	43.50	-10.63	43.08	-10.21	Peak	---	---
3	181.32	29.67	43.50	-13.83	39.41	-9.74	Peak	---	---
4	219.15	32.38	46.00	-13.62	43.16	-10.78	Peak	---	---
5	250.19	37.74	46.00	-8.26	47.06	-9.32	Peak	---	---
6	312.27	34.47	46.00	-11.53	41.87	-7.40	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)  
 \*Factor includes antenna factor , cable loss and amplifier gain  
 Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).  
 Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

<b>Modulation</b>	2.4G 11b + 5G 11a	<b>Test Channel</b>	CH6 + CH40
<b>Polarization</b>	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	38.73	31.62	40.00	-8.38	40.08	-8.46	Peak	---	---
2	63.95	33.11	40.00	-6.89	42.44	-9.33	Peak	---	---
3	148.34	29.75	43.50	-13.75	37.93	-8.18	Peak	---	---
4	266.68	32.89	46.00	-13.11	41.65	-8.76	Peak	---	---
5	362.71	31.13	46.00	-14.87	37.13	-6.00	Peak	---	---
6	500.45	32.29	46.00	-13.71	35.18	-2.89	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

\*Factor includes antenna factor , cable loss and amplifier gain

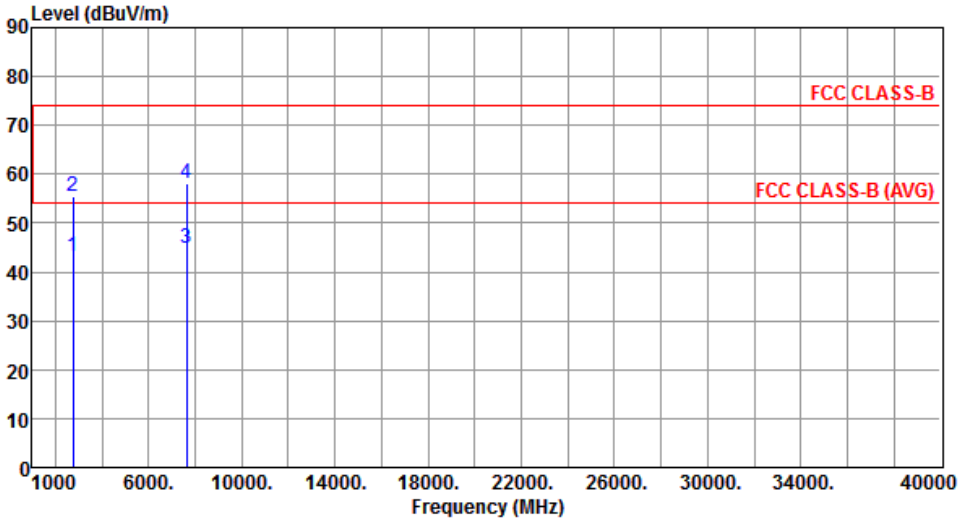
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

### 3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

<b>Modulation</b>	2.4G 11b + 5G 11a	<b>Test Channel</b>	CH6 + CH40	
<b>Polarization</b>	Horizontal			

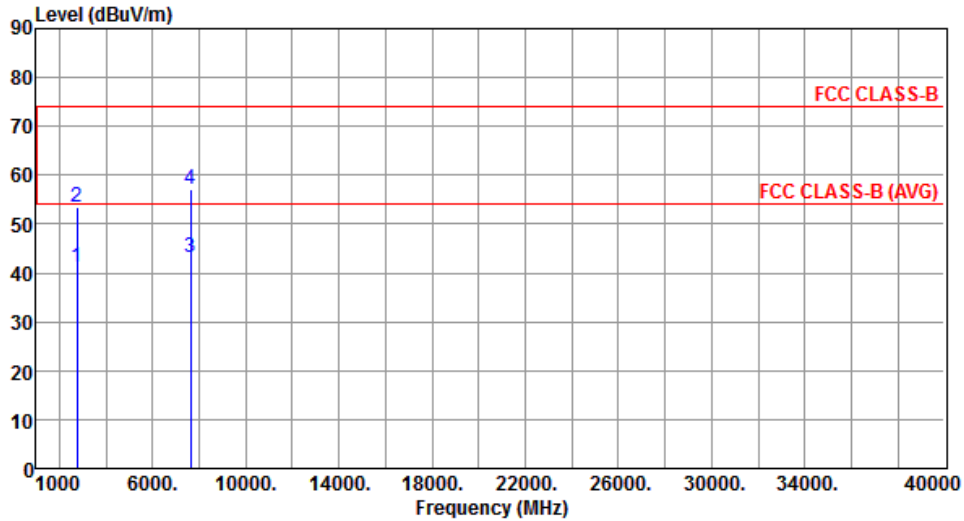


The graph plots Level (dBuV/m) on the y-axis (0 to 90) against Frequency (MHz) on the x-axis (1000 to 40000). Two horizontal red lines represent FCC CLASS-B (at ~75 dBuV/m) and FCC CLASS-B (AVG) (at ~55 dBuV/m). Two vertical blue lines indicate peaks at 2763.00 MHz (labeled '2') and 7636.00 MHz (labeled '4').

	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2763.00	43.11	54.00	-10.89	42.97	0.14	Average	186	33
2	2763.00	55.59	74.00	-18.41	55.45	0.14	Peak	186	33
3	7636.00	44.90	54.00	-9.10	33.88	11.02	Average	190	153
4	7636.00	58.13	74.00	-15.87	47.11	11.02	Peak	190	153

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)  
\*Factor includes antenna factor , cable loss and amplifier gain  
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

<b>Modulation</b>	2.4G 11b + 5G 11a	<b>Test Channel</b>	CH6 + CH40
<b>Polarization</b>	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2763.00	41.33	54.00	-12.67	41.19	0.14	Average	211	120
2	2763.00	53.59	74.00	-20.41	53.45	0.14	Peak	211	120
3	7636.00	43.10	54.00	-10.90	32.08	11.02	Average	174	240
4	7636.00	57.18	74.00	-16.82	46.16	11.02	Peak	174	240

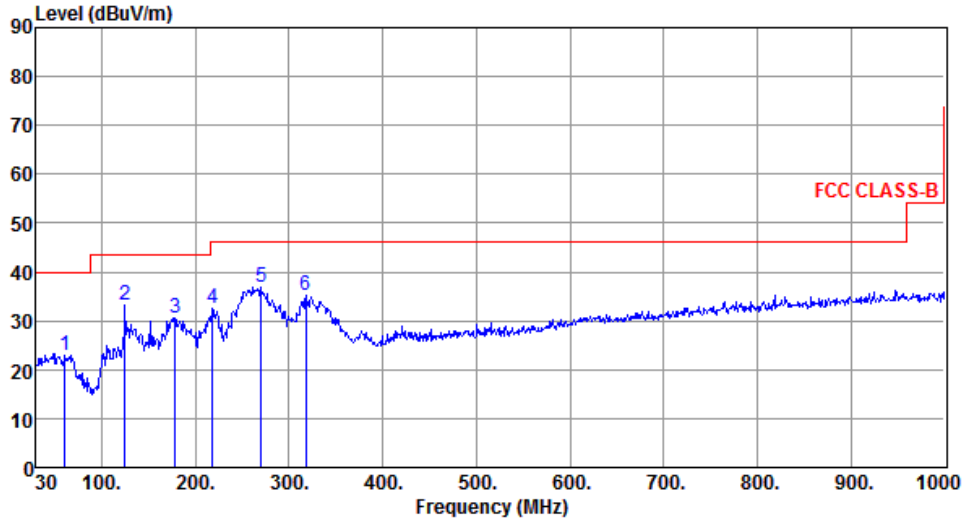
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

\*Factor includes antenna factor , cable loss and amplifier gain

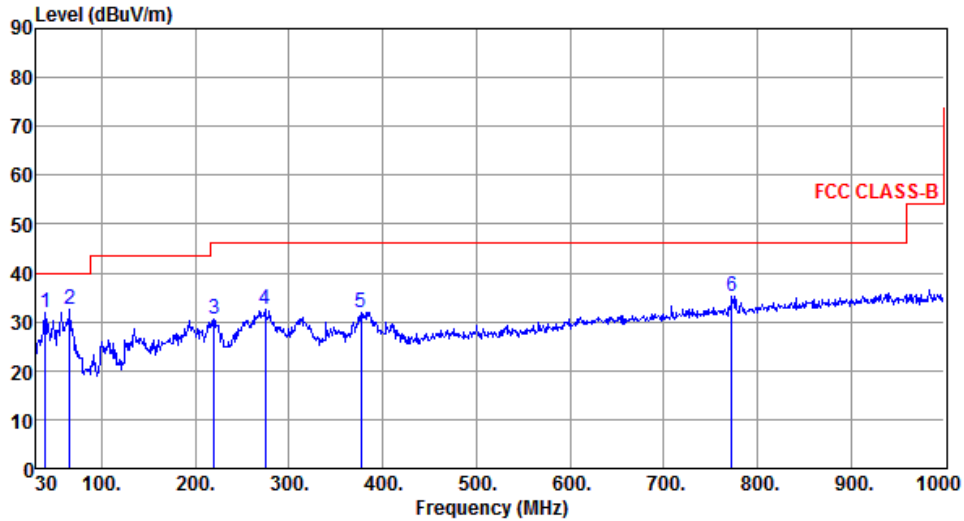
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

## Configuration 2 : Sample 2: VE4

### 3.1.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

<b>Modulation</b>	2.4G 11b + 5G 11a	<b>Test Channel</b>	CH6 + CH40						
<b>Polarization</b>	Horizontal								
 <p>The graph displays the radiated unwanted emissions for a transmitter. The y-axis represents the level in dBuV/m, ranging from 0 to 90. The x-axis represents the frequency in MHz, ranging from 30 to 1000. A red line indicates the FCC CLASS-B limit, which is 40 dBuV/m from 30 MHz to 100 MHz, 45 dBuV/m from 100 MHz to 300 MHz, and 55 dBuV/m from 300 MHz to 1000 MHz. A blue line shows the measured emission level, with six peaks labeled 1 through 6. The emission level is generally below the limit, with a margin of at least 7.24 dB at the highest peak.</p>									
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	61.04	22.87	40.00	-17.13	31.59	-8.72	Peak	---	---
2	125.06	33.08	43.50	-10.42	43.29	-10.21	Peak	---	---
3	178.41	30.52	43.50	-12.98	39.93	-9.41	Peak	---	---
4	218.18	32.40	46.00	-13.60	43.19	-10.79	Peak	---	---
5	270.56	36.74	46.00	-9.26	45.30	-8.56	Peak	---	---
6	318.09	35.20	46.00	-10.80	42.44	-7.24	Peak	---	---
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)  *Factor includes antenna factor , cable loss and amplifier gain  Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).  Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.</p>									

<b>Modulation</b>	2.4G 11b + 5G 11a	<b>Test Channel</b>	CH6 + CH40
<b>Polarization</b>	Vertical		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	39.70	31.83	40.00	-8.17	40.18	-8.35	Peak	---	---
2	65.89	32.40	40.00	-7.60	42.13	-9.73	Peak	---	---
3	220.12	30.44	46.00	-15.56	41.20	-10.76	Peak	---	---
4	274.44	32.39	46.00	-13.61	40.78	-8.39	Peak	---	---
5	377.26	32.04	46.00	-13.96	37.65	-5.61	Peak	---	---
6	773.02	35.32	46.00	-10.68	33.12	2.20	Peak	---	---

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor\* (dB)

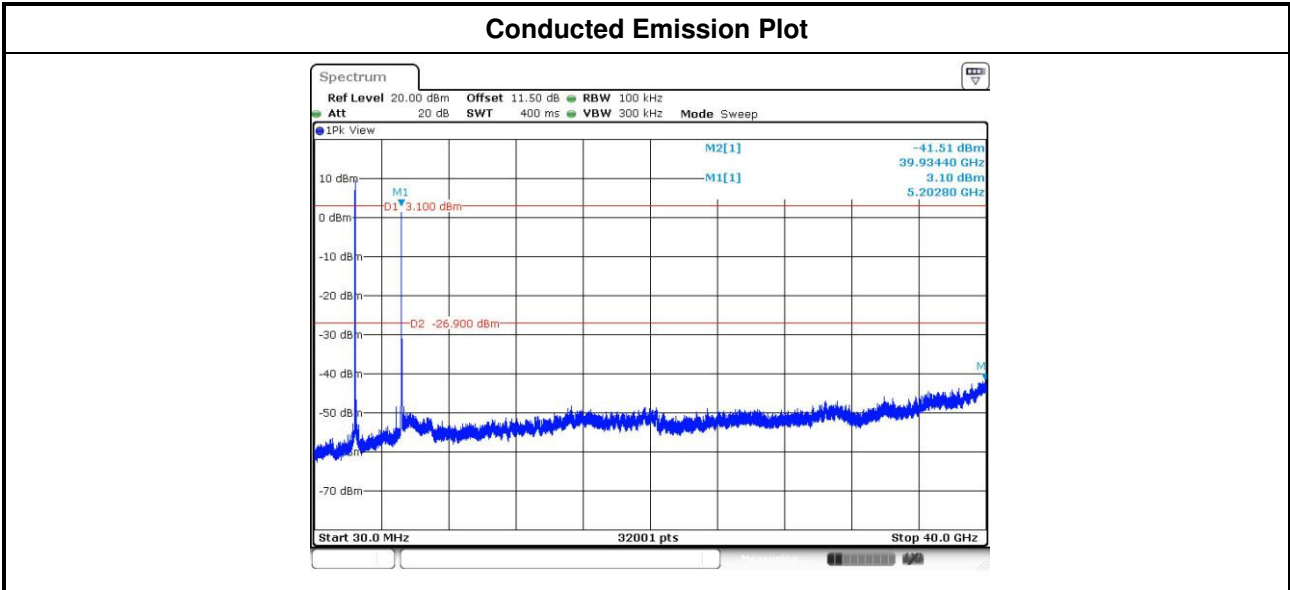
\*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.



### 3.1.7 Conducted Emissions (30MHz~40GHz)



## 4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

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333, Taiwan, R.O.C.

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St., Kwei Shan District, Tao Yuan  
City 333, Taiwan, R.O.C..

If you have any suggestion, please feel free to contact us as below information

Tel: 886-3-271-8666

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Email: ICC\_Service@icertifi.com.tw

==END==