# FCC Test Report

## Report No.: AGC07235170401FE04

FCC ID	:	XUJV1MDIAGUNIV
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	LAUNCH V1M
BRAND NAME	:	LAUNCH
MODEL NAME	:	V1M DiagunIV
CLIENT	:	Launch Tech Co., Ltd.
DATE OF ISSUE	:	Apr. 19, 2017
STANDARD(S) TEST PROCEDURE(S)	:	FCC Part 15.247 KDB 558074 D01 DTS Meas Guidance v04
<b>REPORT VERSION</b>	:	V1.0



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# **Report Revise Record**

<b>Report Version</b>	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Apr. 19, 2017	Valid	Original Report

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Applicant	Launch Tech Co., Ltd.		
Address	Launch Industrial Park, North of Wuhe Rd. Banxuegang, Longgang, Shenzhen, China		
Manufacturer	Shenzhen OVVI Technology Co, Ltd.		
Address	Room 201, Block D, Number 16 LangShan Road, North of Science Technology Park		
Product Designation	LAUNCH V1M		
Brand Name	LAUNCH		
Test Model	V1M DiagunIV		
Date of test	Apr. 17, 2017 to Apr. 19, 2017		
Deviation	None		
Condition of Test Sample	Normal		
Test Result	Pass		
Report Template	AGCRT-US-BGN/RF		

## **1. VERIFICATION OF CONFORMITY**

We hereby certify that:

The above equipment was tested by Dongguan Precise Testing Service Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.247.

Nox 2han Tested by Apr. 19, 2017 Max Zhang(Zhang Yi) BONPL xie Reviewed by Bart Xie(Xie Xiaobin)) Apr. 19, 2017 Approved by Solger Zhang(Zhang Hongyi) Apr. 19, 2017 Authorized Officer

## 2. GENERAL INFORMATION

## 2.1. PRODUCT DESCRIPTION

The EUT is designed as "LAUNCH V1M". It is designed by way of utilizing the DSSS and OFDM technology to achieve the system operation.

Amajor teorinioar accomption	a major technical description of 201 is described as following			
<b>Operation Frequency</b>	2.412 GHz~2.462GHz			
Output Power	IEEE 802.11b:9.74dBm; IEEE 802.11g:7.96dBm;			
Output Power	IEEE 802.11n(20):7.25dBm; IEEE 802.11n(40):4.33dBm			
Modulation	DSSS(DBPSK/DQPSK/CCK);OFDM(BPSK/QPSK/16-QAM/64-QAM)			
Number of channels	11			
Hardware Version	V1M_MAINBOARD_P1			
Software Version	V7.0.004.P0.170331.V1M_C-v			
Antenna Designation	Integrated Antenna (Met 15.203 Antenna requirement)			
Antenna Gain	-3dBi			
Power Supply	DC 5V by adapter or DC 3.7V by battery			

A major technical description of EUT is described as following

#### 2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency	
	1	2412 MHZ	
	2	2417 MHZ	
	3	2422 MHZ	
	4	2427 MHZ	
	5	2432 MHZ 2437 MHZ	
2400~2483.5MHZ	6		
	7	2442 MHZ	
	8	2447 MHZ	
	9	2452 MHZ	
	10	2457 MHZ	
	11	2462 MHZ	

Note: For 20MHZ bandwidth system use Channel 1 to Channel 11 For 40MHZ bandwidth system use Channel 3 to Channel 9

MCS Index	Nss	Modulation	R	NBPSC	NCBPS		NDBPS		Data rate(Mbps) 800nsGI	
					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0
6	1	64-QAM	3/4	6	312	648	234	489	58.5	121.5
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0

#### 2.3. IEEE 802.11N MODULATION SCHEME

Symbol	Explanation	
NSS	Number of spatial streams	
R Code rate		
NBPSC	Number of coded bits per single carrier	
NCBPS	Number of coded bits per symbol	
NDBPS	Number of data bits per symbol	
GI	Guard interval	

## 2.4. RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: XUJV1MDIAGUNIV** filing to comply with the FCC Part 15 requirements.

#### 2.5. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters.

Others testing (listed at item 5.3) was performed according to the procedures in FCC Part 15.247 rules KDB 558074 D01 DTS Meas Guidance v04.

#### 2.6. SPECIAL ACCESSORIES

Refer to section 5.2.

## 2.7. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

## **3. MEASUREMENT UNCERTAINTY**

Conducted measurement: +/- 3.18dB Radiated measurement: +/- 3.91dB

## 4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION				
1	Low channel TX				
2	Middle channel TX				
3	High channel TX				
4	Normal operating				
Note: Transmit by 802.11b with Date rate (1/2/5.5/11) Transmit by 802.11g with Date rate (6/9/12/18/24/36/48/54) Transmit by 802.11g (20MHz) with Date rate (6.5/13/19.5/26/39/52/58.5/65)					

Transmit by 802.11n (20MHz) with Date rate (6.5/13/19.5/26/39/52/58.5/65)

Transmit by 802.11n (40MHz) with Date rate

(13.5/27/40.5/54/81/108/121.5/135)

#### Note:

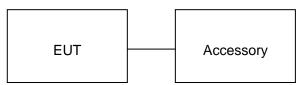
1. The EUT has been set to operate continuously on the lowest, middle and highest operation frequency Individually, and the eut is operating at its maximum duty cycle>or equal 98%

- 2. All modes under which configure applicable have been tested and the worst mode test data recording in the test report, if no other mode data.
- 3. For Radiated Emission, 3axis were chosen for testing for each applicable mode.

## **5. SYSTEM TEST CONFIGURATION**

#### **5.1. CONFIGURATION OF EUT SYSTEM**

## Configure:



#### **5.2. EQUIPMENT USED IN EUT SYSTEM**

Item	Equipment	ent Model No. ID or Specification		Remark
1	LAUNCH V1M	V1M DiagunIV	XUJV1MDIAGUNIV	EUT
2	Adapter	XCMS03-0510	DC5V/1A	Marketed

#### 5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.247	Output Power	Compliant
§15.247	6 dB Bandwidth	Compliant
§15.247	Conducted Spurious Emission	Compliant
§15.247	Maximum Conducted Output Power SPECTRAL Density	Compliant
§15.209	Radiated Emission	Compliant
§15.247	Band Edges	Compliant
§15.207	Line Conduction Emission	Compliant

## 6. TEST FACILITY

Site	Dongguan Precise Testing Service Co., Ltd.
Location	Building D, Baoding Technology Park, Guangming Road2, Dongcheng District, Dongguan, Guangdong, China.
FCC Registration No.	371540
Description	The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2014.

#### ALL TEST EQUIPMENT LIST

Radiated Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI Test Receiver	Rohde & Schwarz	ESCI	101417	July 3, 2016	July 2, 2017
Trilog Broadband Antenna (25M-1GHz)	SCHWARZBECK	VULB9160	9160-3355	July 3, 2016	July 2, 2017
Signal Amplifier	SCHWARZBECK	BBV 9475	9745-0013	July 3, 2016	July 2, 2017
RF Cable	SCHWARZBECK	AK9515E	96221	July 3, 2016	July 2, 2017
3m Anechoic Chamber	CHENGYU	966	PTS-001	June 3, 2016	June 2, 2017
MULTI-DEVICE Positioning Controller	Max-Full	MF-7802	MF780208339	N/A	N/A
Active loop antenna (9K-30MHz)	Schwarzbeck	FMZB1519	1519-038	June 3, 2016	June 2, 2017
Spectrum analyzer	Agilent	E4407B	MY46185649	June 3, 2016	June 2, 2017
Power Sensor	Agilent	U2021XA	MY55050474	June 3, 2016	June 2, 2017
Horn Antenna (1G-18GHz)	SCHWARZBECK	BBHA9120D	9120D-1246	June 3, 2016	June 2, 2017
Horn Ant (18G-40GHz)	Schwarzbeck	BBHA 9170	9170-181	June 3, 2016	June 2, 2017

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI Test Receiver	Rohde & Schwarz	ESCI	101417	July 3, 2016	July 2, 2017
Artificial Mains Network	Narda	L2-16B	000WX31025	July 3, 2016	July 2, 2017
Artificial Mains Network (AUX)	Narda	L2-16B	000WX31026	July 3, 2016	July 2, 2017
RF Cable	SCHWARZBECK	AK9515E	96222	July 3, 2016	July 2, 2017
Shielded Room	CHENGYU	843	PTS-002	June 3, 2016	June 2, 2017

## 7. OUTPUT POWER

## 7.1. MEASUREMENT PROCEDURE

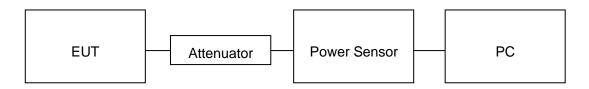
For average power test:

- 1. Connect EUT RF output port to power sensor through an RF attenuator.
- 2. Connect the power sensor to the PC.
- 3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 4. Record the maximum power from the software.

Note : The EUT was tested according to KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

## 7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

## AVERAGE POWER SETUP



## 7.3. LIMITS AND MEASUREMENT RESULT

TEST ITEM	OUTPUT POWER
TEST MODE	802.11b with data rate 1

Frequency (GHz)	Average Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.412	9.74	30	Pass
2.437	9.25	30	Pass
2.462	9.11	30	Pass

TEST ITEM	OUTPUT POWER
TEST MODE	802.11g with data rate 6

Frequency (GHz)	Average Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.412	7.54	30	Pass
2.437	7.61	30	Pass
2.462	7.96	30	Pass

TEST ITEM	OUTPUT POWER
TEST MODE	802.11n 20 with data rate 6.5

Frequency (GHz)	Average Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.412	6.85	30	Pass
2.437	7.11	30	Pass
2.462	7.25	30	Pass

TEST ITEM	OUTPUT POWER
TEST MODE	802.11n 40 with data rate 6.5

Frequency (GHz)	Average Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.422	4.33	30	Pass
2.437	4.27	30	Pass
2.452	4.16	30	Pass

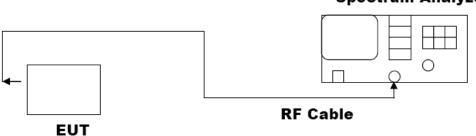
## 8.6 DB BANDWIDTH

#### 8.1. MEASUREMENT PROCEDURE

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 KHz, VBW $\ge$ 3×RBW.
- 4. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

#### 8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



#### **Spectrum Analyzer**

## 8.3. LIMITS AND MEASUREMENT RESULTS

TEST ITEM	6DB BANDWIDTH
TEST MODE	802.11b with data rate 11

LIMITS AND MEASUREMENT RESULT							
Applicable Limite		Applicable Limits					
Applicable Limits	Test Da	ita (MHz)	Criteria				
	Low Channel	9.105	PASS				
>500KHZ	Middle Channel	8.060	PASS				
	High Channel	8.073	PASS				

TEST ITEM	6DB BANDWIDTH
TEST MODE	802.11g with data rate 54

LIMITS AND MEASUREMENT RESULT							
Annlinghla Limita		Applicable Limits					
Applicable Limits	Test Da	ta (MHz)	Criteria				
	Low Channel	12.93	PASS				
>500KHZ	Middle Channel	11.32	PASS				
	High Channel	8.889	PASS				

TEST ITEM	6DB BANDWIDTH
TEST MODE	802.11n 20 with data rate 65

LIMITS AND MEASUREMENT RESULT							
Applicable Limite		Applicable Limits					
Applicable Limits	Test Da	ata (MHz)	Criteria				
	Low Channel	15.40	PASS				
>500KHZ	Middle Channel	10.10	PASS				
	High Channel	8.891	PASS				

TEST ITEM	6DB BANDWIDTH
TEST MODE	802.11n 40 with data rate 65

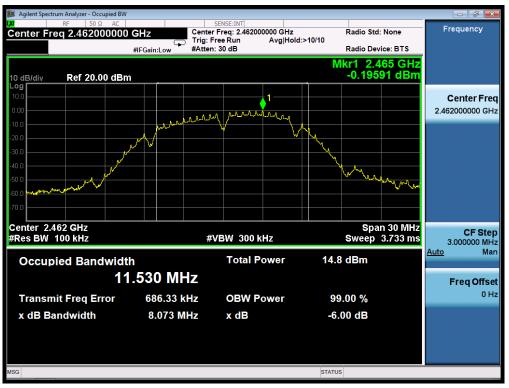
LIMITS AND MEASUREMENT RESULT							
Applicable Limite	Applicable Limits						
Applicable Limits	Test Da	ta (MHz)	Criteria				
	Low Channel	32.59	PASS				
>500KHZ	Middle Channel	12.53	PASS				
	High Channel	35.72	PASS				



#### 802.11b TEST RESULT TEST PLOT OF BANDWIDTH FOR LOW CHANNEL

#### TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

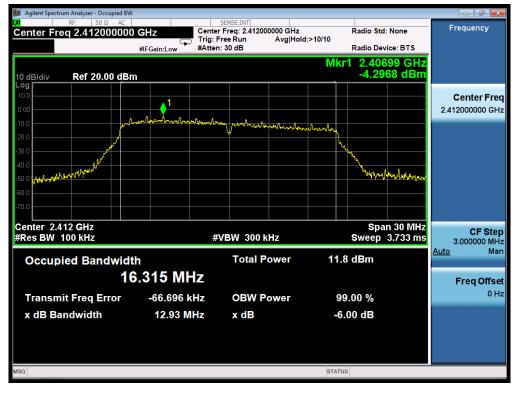




#### TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

## 802.11g TEST RESULT

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL





#### TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL





## 802.11n (20) TEST RESULT TEST PLOT OF BANDWIDTH FOR LOW CHANNEL

#### TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL





#### TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

#### 802.11n (40) TEST RESULT

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL





#### TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



## 9. CONDUCTED SPURIOUS EMISSION

## 9.1. MEASUREMENT PROCEDURE

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set SPA Trace 1 Max hold, then View.
- Note: The EUT was tested according to KDB 558074 for compliance to FCC 47CFR 15.247 requirements. Owing to satisfy the requirements of the number of measurement points, we set the RBW=1MHz, VBW > RBW, scan up through 10th harmonic, and consider the tested results as the worst case, if the tested results conform to the requirement, we can deem that the real tested results(set the RBW=100KHz, VBW > RBW) are conform to the requirement.

#### 9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

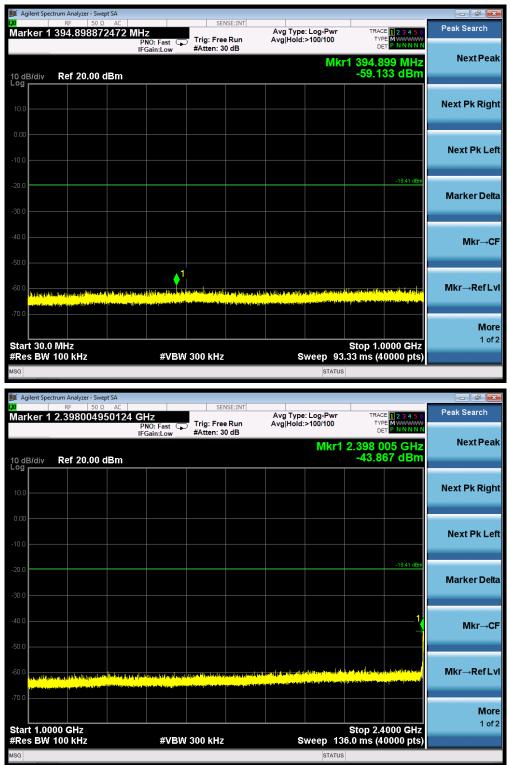
The same as described in section 8.2.

#### 9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.

#### 9.4. LIMITS AND MEASUREMENT RESULT

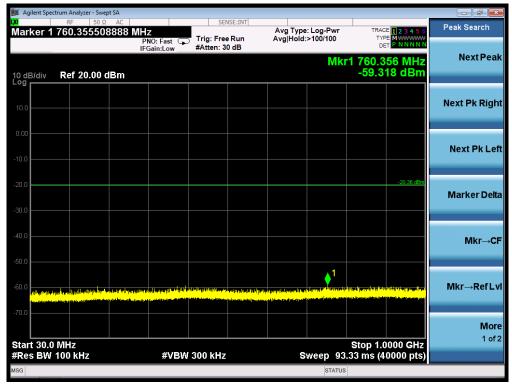
LIMITS AND MEASUREMENT RESULT								
Appliachta Limita	Measurement Result							
Applicable Limits	Test Data	Criteria						
In any 100 KHz Bandwidth Outside the	At least -20dBc than the limit							
frequency band in which the spread spectrum	Specified on the BOTTOM	PASS						
intentional radiator is operating, the radio frequency	Channel							
power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a))	At least -20dBc than the limit Specified on the TOP Channel	PASS						



#### TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF 802.11b FOR MODULATION IN LOW CHANNEL

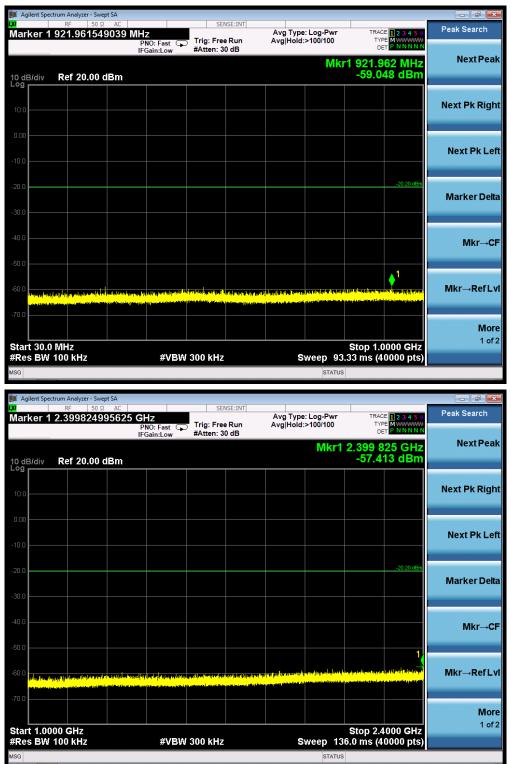


#### TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE OF 802.11b FOR MODULATION IN MIDDLE CHANNEL



- F									m Analyzer - Sv	ilent Spect	📕 Ag
Peak Search	TRACE 1 2 3 4 5 6 TYPE MWWWW DET P NNNN		be: Log-Pw d:>100/100		IO: Fast ( ) Trig: Free Run			269032	RF 50 .050761	ker 1	lar
NextPeal	50 761 GHz 58.672 dBm	kr1 2.0	Mkr		30 dB	#Atten: 3	IFGain:Low				
	08.072 aBm							dBm	Ref 20.00	3/div	) dE >g
Next Pk Rig											
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	ns (40000 pts)	136.0 n	Sweep '		z	300 kHz	#VBW		00 kHz		
		TATUS	STAT								G
					NSE:INT	1 50			m Analyzer - Sv RF 50	ilent Specti	Ag
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		00	d:>100/100	Avg H		Trig: Fre #Atten: \$	PNO: Fast G				
NextPe	l.961 2 GHz 38.628 dBm	/kr1 24 -3	M				Gumeen		Ref 20.00	3/div	2.46
								ubm	L 20.00	5/017	og

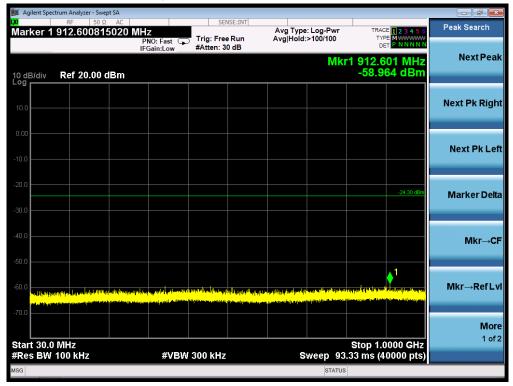
	PNO: Fas IFGain:Lo		Avg Hold:>100/100							
10 dB/div Ref 20.0	0 dBm		Mkr	1 24.961 2 GHz -38.628 dBm	Next Peak					
10.0					Next Pk Righ					
-10.0					Next Pk Lei					
-20.0				-20.36 dBm	Marker Delta					
-40.0	alla distante di stato	ter sta			Mkr→Cl					
-50.0 <b>1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.</b>					Mkr→RefLv					
-70.0 Start 2.48 GHz				Stop 25.00 GHz	<b>Mor</b> 1 of 2					
#Res BW 1.0 MHz	Res BW 1.0 MHz #VBW 3.0 MHz Sweep 58.67 ms (40000 pts)									



## TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE OF 802.11b FOR MODULATION IN HIGH CHANNEL

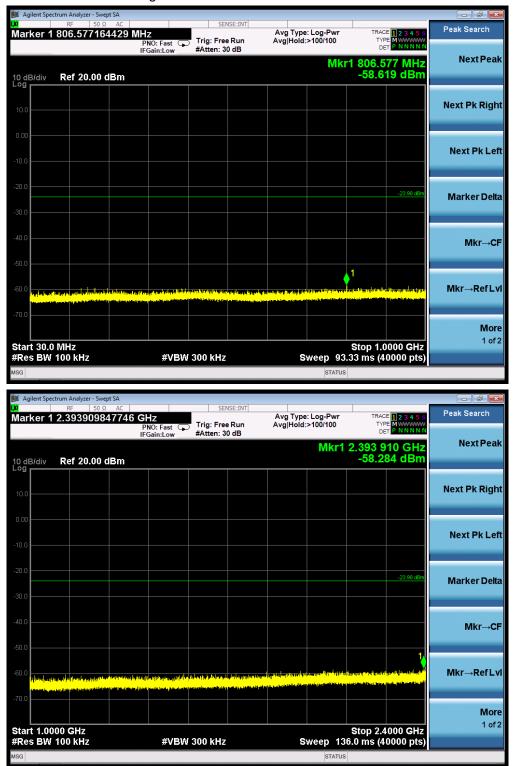


#### TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF 802.11g FOR MODULATION IN LOW CHANNEL



c đ					ENSE:INT	55		ept SA	um Analyzer - Sv RF 50	ilent Spect	( Agil
Peak Search	E 1 2 3 4 5 6 E M T P NNNNN	TRAI TY D	: Log-Pwr >100/100	Avg Typ Avg Hold	e Run		HZ PNO: Fast G FGain:Low	94750 (	2.399789	ker 1	lark
Next Pea	'90 GHz 40 dBm	2.399 -46.6	Mkr1						Ref 20.00	3/div	0 dE
Next Pk Rig											°g 
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Peak Search	DE <mark>1 2 3 4 5</mark> 6	TRAC	: Log-Pwr	Avg Typ	ENSE:INT			50 Ω AC 34984624		arke <u>r</u> 1
Next P	1 8 GHz 17 dBm	□ 1 24.80	:>100/100 Mkr	Avg Hold		Trig: Fre #Atten: 3	PNO: Fast IFGain:Low		Ref 20.0	dB/div
Next Pk R										
Next Pk										.0
Marker [	-24.30 dBm									
Mkr-			Appelarth		e linnelite		an <mark>A. H. d</mark> ata	dense, bleg beingetig	La un al anti-	0
Mkr→Re										0 <b></b>
<b>N</b> 1	5.00 GHz									art 2.4
	0000 pts)		weep 58	8		V 3.0 MHz	#VBV		1.0 MHz	es BW

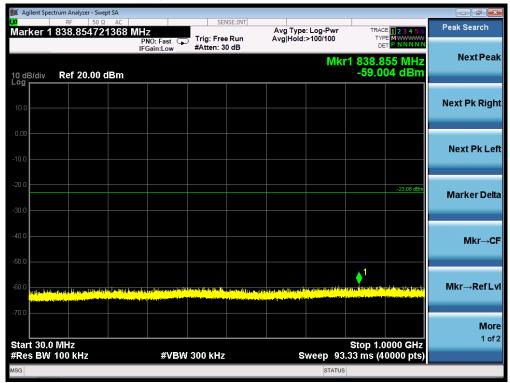


#### TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE OF 802.11g FOR MODULATION IN MIDDLE CHANNEL



TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE

OF 802.11g FOR MODULATION IN HIGH CHANNEL



Mkr→RefLvl

Stop 25.00 GHz Sweep 58.67 ms (40000 pts)

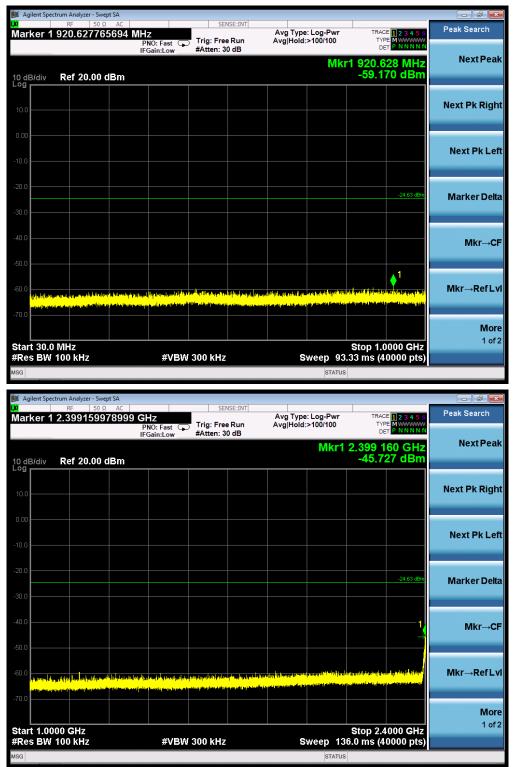
TATUS

More 1 of 2

Peak Search								n Analyzer - Sv	gnene opee
		e: Log-Pwr :>100/100		SENSE:INT	Trig	PNO: Fast 🔾		RF 50 393139	ker 1
NextPe	393 140 GHz	Mkr1		n: 30 dB	#Atte	FGain:Low			
	58.070 dBm						dBm	Ref 20.00	B/div
Next Pk Rig									<b> </b>
Next Pk L									
NEXTERE									<u> </u>
Marker De	-23.08 dBm								
Mkr→									
Mire Defi									
Mkr→Ref		n an an tha an	al para di mangan penganakan di sebutah di sebutah sebutah sebutah sebutah sebutah sebutah sebutah sebutah seb	TENITY INTO A			noodekel ave	de la stration	la Ensiell
Mo									
1 c	op 2.4000 GHz				V 300 I	<i>4</i> 0 (B)			rt 1.00
	man (40000 mén)			ΠZ		# V D V			
	ms (40000 pts)				- 500			0 kHz	S DVV
	ms (40000 pts)	status			¥ 300 I			0 kHz	S DW
	ms (40000 pts)							n Analyzer - Sv	_
رت الله المعالم المعالم Peak Search	TRACE 1 2 3 4 5 6	STATUS	Avg Typ	SENSE:INT		GHz	Ω AC		gilent Spec
Peak Search	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNN	STATUS e: Log-Pwr :>100/100	Avg Typ	SENSE:INT Free Run n: 30 dB	Trig:		Ω AC	n Analyzer - Sv RF 50	gilent Spec
Peak Search	TRACE 1 2 3 4 5 6 TYPE M WWWWW	STATUS e: Log-Pwr :>100/100	Avg Typ	Free Run	Trig:	GHz PNO: Fast	Ω AC 178355	n Analyzer - Sv RF 50	gilent Spec
Peak Search Next Pe		STATUS e: Log-Pwr :>100/100	Avg Typ	Free Run	Trig:	GHz PNO: Fast	Ω AC 178355	n Analyzer - Sv RF 50 <b>1.92963</b>	gilent Spec
Peak Search Next Pe		STATUS e: Log-Pwr :>100/100	Avg Typ	Free Run	Trig:	GHz PNO: Fast	Ω AC 178355	n Analyzer - Sv RF 50 <b>1.92963</b>	gilent Spec
Peak Search Next Pe		STATUS e: Log-Pwr :>100/100	Avg Typ	Free Run	Trig:	GHz PNO: Fast	Ω AC 178355	n Analyzer - Sv RF 50 <b>1.92963</b>	gilent Spec
Peak Search Next Pe Next Pk Rig		STATUS e: Log-Pwr :>100/100	Avg Typ	Free Run	Trig:	GHz PNO: Fast	Ω AC 178355	n Analyzer - Sv RF 50 <b>1.92963</b>	gilent Spece ker 1
Peak Search Next Pe Next Pk Rig		STATUS e: Log-Pwr :>100/100	Avg Typ	Free Run	Trig:	GHz PNO: Fast	Ω AC 178355	n Analyzer - Sv RF 50 <b>1.92963</b>	gilent Spec
Peak Search Next Pe Next Pk Rig	TRACE 1 2 3 4 5 6 TYPE M WWWWWWW DET P NNNNN 4.929 6 GHz 38.518 dBm	STATUS e: Log-Pwr :>100/100	Avg Typ	Free Run	Trig:	GHz PNO: Fast	Ω AC 178355	n Analyzer - Sv RF 50 <b>1.92963</b>	gilent Spece
Peak Search Next Pe Next Pk Rig Next Pk L		STATUS e: Log-Pwr :>100/100	Avg Typ	Free Run	Trig:	GHz PNO: Fast	Ω AC 178355	n Analyzer - Sv RF 50 <b>1.92963</b>	gilent Spece
Peak Search Next Pe Next Pk Rig Next Pk L	TRACE 1 2 3 4 5 6 TYPE M WWWWWWW DET P NNNNN 4.929 6 GHz 38.518 dBm	STATUS e: Log-Pwr :>100/100	Avg Typ	Free Run	Trig:	GHz PNO: Fast	Ω AC 178355	n Analyzer - Sv RF 50 <b>1.92963</b>	gilent Spece
Peak Search Next Pe Next Pk Rig Next Pk L Marker De	TRACE 1 2 3 4 5 6 TYPE M WWWWWWW DET P NNNNN 4.929 6 GHz 38.518 dBm	E: Log-Pwr :>100/100 Mkr1	Avg Typ	Free Run	Trig:	GHz PNO: Fast	Ω AC 178355	n Analyzer - Sv RF 50 <b>1.92963</b>	gilent Spece

Start 2.48 GHz #Res BW 1.0 MHz

#VBW 3.0 MHz

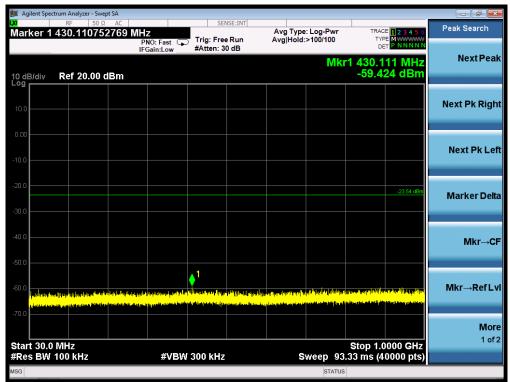


#### TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF 802.11n20 FOR MODULATION IN LOW CHANNEL



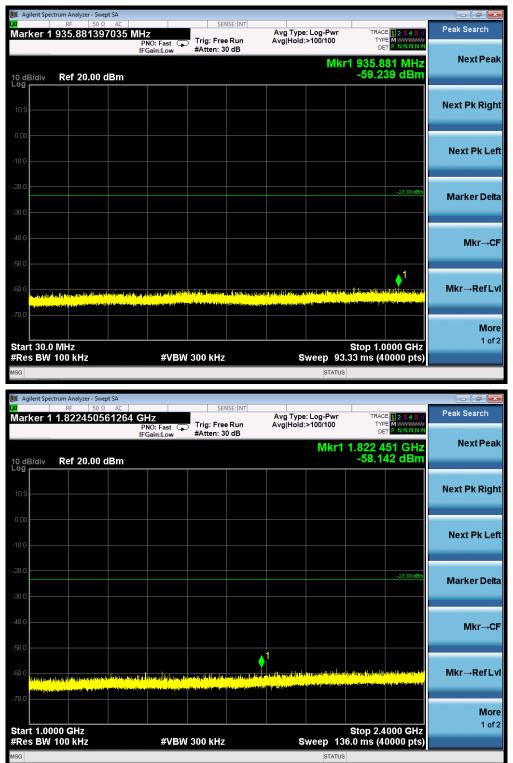
TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE

OF 802.11n20 FOR MODULATION IN MIDDLE CHANNEL



- F							-		n Analyzer - Sw	lent Spectr	📕 Agi
Peak Search	E 1 2 3 4 5 6 E MWWWW P NNNNN	TRAC TYP DE	: Log-Pwr >100/100	Avg Type Avg Hold			GHz PNO: Fast ⊂ IFGain:Low	Ω AC 031201	RF 50 3212480	ker 1 2	<b>v</b> Mari
NextPea	48 GHz 28 dBm	2.321 2 -58.2	Mkr1					dBm	tef 20.00	3/div	10 dE - <sup>og</sup> r
Next Pk Rigl											10.0
Next Pk Le											D.00 10.0
Marker Del	-23.54 dBm										20.0 30.0
Mkr→C											40.0
Mkr→RefL	1 Asalikalaraalari Asaliyaani		anaki dabin dan bar Japan dabi	Til Timor and the Differ		(nělastě symposisterné) rekt v dělastě symposisterné (rekt	ya Malanding ya shifta ka sh	a (la dece da de la companya La companya da de la		(Math Parala	50.0 ; 50.0 ;
<b>Мо</b> 1 о	000 GHz	Stop 2.4							GHz	1.000	70.0 Star
	0000 pts)	6.0 ms (4	weep 130 status	S	2	V 300 kHz	#VBV		0 kHz	5 BW 1	Res
- đ								vept SA	n Analyzer - Sw	lent Spectr	🔰 Agi
Peak Search	E 1 2 3 4 5 6 E MWWWW T P N N N N N	TYP	: Log-Pwr >100/100	Avg Type Avg Hold			GHz PNO: Fast G	Ω AC 3982600	RF 50 1.823803	ker 1 2	/ /larl
Next Pe	8 8 GHz 03 dBm		Mkr			#Attell.	IF GAIN:LOW	dBm	tef 20.00	3/div	I0 dE
Next Pk Rig											10.0

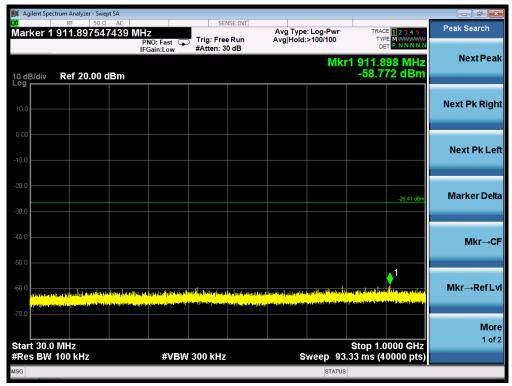
ໝ RF 50 Ω Marker 1 24.82380398	82600 GHz	SENSE:INT Avg Typ	De: Log-Pwr TRACE	123456 Peak Search
10 dB/div Ref 20.00 dB	IFGain:Low #Att	∷ Free Run Avg Holo en: 30 dB	DET Mkr1 24.823	8 GHz NextPeak 3 dBm
10.0				Next Pk Righ
-10.0				Next Pk Lef
-20.0				-23.54 dem Marker Delta
-40.0				1) Mkr→C
-60.0				Mkr→RefLv
-70.0 Start 2.48 GHz #Res BW 1.0 MHz	#VBW 3.0 F	MHz	Stop 25 Sweep 58.67 ms (40	.00 GHz
MSG	# <b>*************</b>		STATUS	



# TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE OF 802.11n20 FOR MODULATION IN HIGH CHANNEL

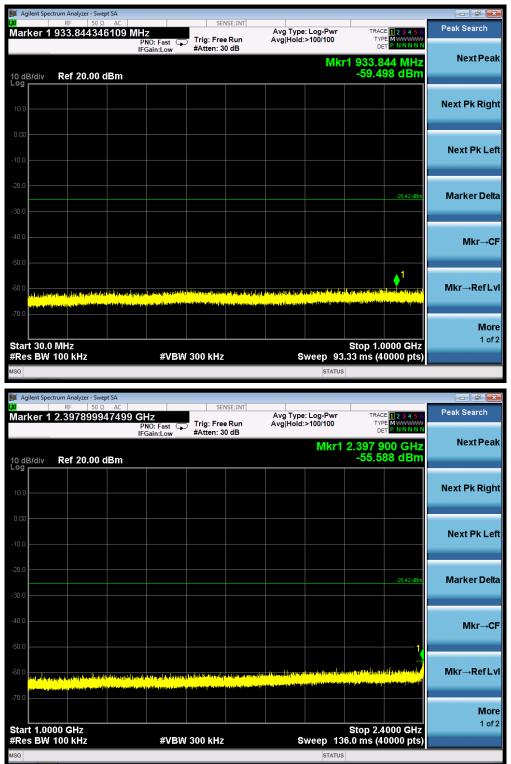


### TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF 802.11n40 FOR MODULATION IN LOW CHANNEL



				SENSE:IN		ept SA 2 AC	RF 50	
Peak Search	TRACE 1 2 3 4 5 6 TYPE MWWWW DET P NNNN	pe: Log-Pwr ld:>100/100	Avg Avg I	rig: Free Run Atten: 30 dB	<b>- Z</b> NO: Fast ⊊ Gain:Low	95625 G		arker 1
NextPe	.399 825 GHz -44.123 dBm	Mkr1 2			Sameon		Ref 20.00	dB/div
Next Pk Rig								
HEAT I KING								0.0
Next Dk I								
Next Pk L								).0
								0.0
Marker De	-26.41 dBm							0.0
	1.							
Mkr→	Š							).0
								).0
Mkr→Refl	the second the formal of the second			anna saila ni priss	litelas de de contra de contra de	n har blever a star	und Handland and Baller	).0 <mark>Uniterbare</mark>
					, ili mani sui dini di d	الترويلي بالمردخان الماطرين	lande Kalander immerställt.	
<b>M</b> o 1 o	Stop 2.4000 GHz							art 1.00
	0 ms (40000 pts)			0 kHz	#VBW			Res BW
		STATUS						3
				SENSE:IN			ım Analyzer - Sw RF 50	Agilent Spec
Peak Search	TRACE 1 2 3 4 5 6 TYPE MWWWW DET P NNNNN	pe: Log-Pwr ld:>100/100	Avg Avg	SENSE:IN	NO: Fast 😱	2 AC 947574 ( P	RF 50	
	24.954 4 GHz	ld:>100/100	Avg Avg I			2 AC 947574 ( P	RF 50	
Peak Search		ld:>100/100	Avg Avg	rig: Free Run	NO: Fast 😱	2 AC 2947574 ( P IF	RF 50	
Peak Search	24.954 4 GHz	ld:>100/100	Avg Avg t	rig: Free Run	NO: Fast 😱	2 AC 2947574 ( P IF	RF 50 4.954402	arker 1
Peak Search Next Pe	24.954 4 GHz	ld:>100/100	Avg Avg	rig: Free Run	NO: Fast 😱	2 AC 2947574 ( P IF	RF 50 4.954402	dB/div
Peak Search Next Pe Next Pk Rig	24.954 4 GHz	ld:>100/100	Avg Avg	rig: Free Run	NO: Fast 😱	2 AC 2947574 ( P IF	RF 50 4.954402	dB/div
Peak Search Next Pe	24.954 4 GHz	ld:>100/100	Avg Avgi	rig: Free Run	NO: Fast 😱	2 AC 2947574 ( P IF	RF 50 4.954402	dB/div

Agilent Spectrum Analyzer - Swept SA   RF 50 Ω AC   Marker 1 24.954402947574	4 GHz	Avg Type: Log-Pwr TRACE 12 Avg Hold:>100/100 TYPE MW	Peak Search
10 dB/div Ref 20.00 dBm	PNO: Fast Trig: Free Run IFGain:Low #Atten: 30 dB	Mkr1 24.954 4 0 -38.569 d	GHz NextPeak
10.0			Next Pk Righ
-10.0			Next Pk Lef
-20.0		-28	41 dBm Marker Delta
-40.0		and the second	Mkr→Ci
-60.0			Mkr→RefLv
Start 2.48 GHz #Res BW 1.0 MHz	#VBW 3.0 MHz	Stop 25.00 Sweep 58.67 ms (40000	GHz 1 of 2 pts)
MSG		STATUS	

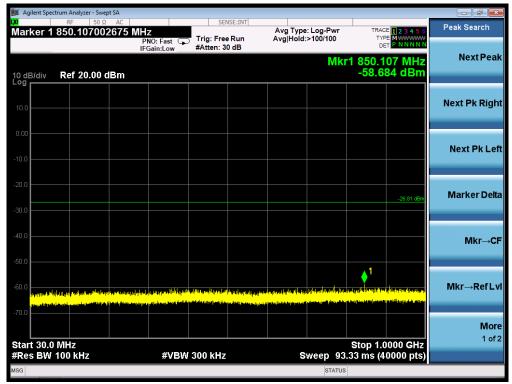


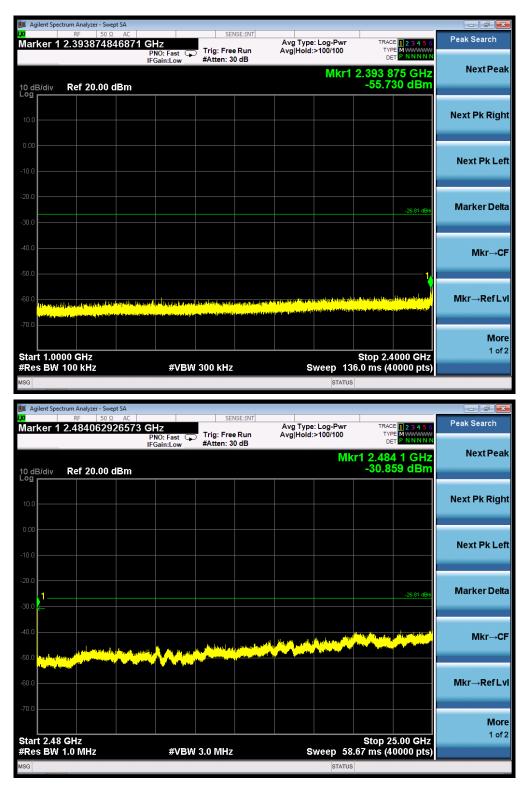
# TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE OF 802.11n40 FOR MODULATION IN MIDDLE CHANNEL



## TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE

OF 802.11n40 FOR MODULATION IN HIGH CHANNEL





Note: The 100kHz RBW used in the conducted spurious test from 2.4835GHz to 25GHz may result in long measuring times, To avoid such long measuring times, the 1MHz RBW can be used for pre-test. If the emission level exceeded the limit at one or more frequencies, the 100kHz RBW would be used for final test at the special frequency.

## **10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY**

## **10.1 MEASUREMENT PROCEDURE**

- (1). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- (2). Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- (3). Set SPA Trace 1 Max hold, then View.

Note: The method of AVPSD in the KDB 558074 item 10.3 was used in this testing.

## **10.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)**

Refer To Section 8.2.

### **10.3 MEASUREMENT EQUIPMENT USED**

Refer To Section 6.

#### **10.4 LIMITS AND MEASUREMENT RESULT**

TEST ITEM	POWER PECTRAL DENSITY
TEST MODE	802.11b with data rate 1

Channel No.	PSD (dBm/20kHz)	Limit (dBm/3kHz)	Result
Low Channel	-5.639	8	Pass
Middle Channel	-6.271	8	Pass
High Channel	-6.408	8	Pass

TEST ITEM	POWER PECTRAL DENSITY
TEST MODE	802.11g with data rate 6

Channel No.	PSD (dBm/20kHz)	Limit (dBm/3kHz)	Result
Low Channel	-10.556	8	Pass
Middle Channel	-8.764	8	Pass
High Channel	-9.389	8	Pass

TEST ITEM	POWER PECTRAL DENSITY
TEST MODE	802.11n 20 with data rate 6.5

Channel No.	PSD (dBm/20kHz)	Limit (dBm/3kHz)	Result
Low Channel	-11.208	8	Pass
Middle Channel	-8.756	8	Pass
High Channel	-9.182	8	Pass

TEST ITEM	POWER PECTRAL DENSITY
TEST MODE	802.11n 40 with data rate 6.5

Channel No.	PSD (dBm/20kHz)	Limit (dBm/3kHz)	Result
Low Channel	-11.829	8	Pass
Middle Channel	-12.857	8	Pass
High Channel	-13.802	8	Pass



## 802.11b TEST RESULT TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL

TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL

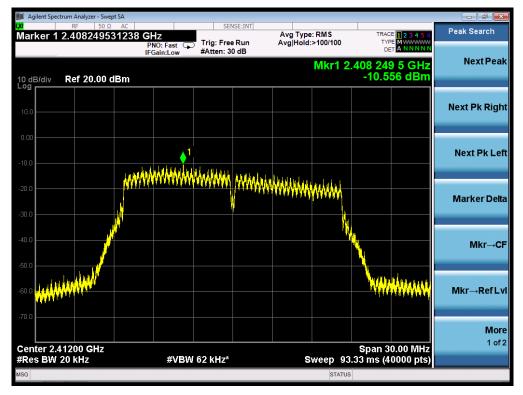


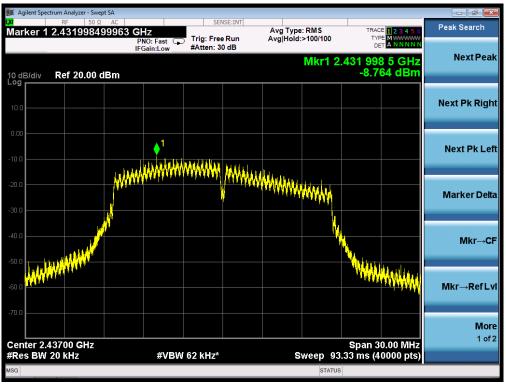


## TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL

802.11g TEST RESULT

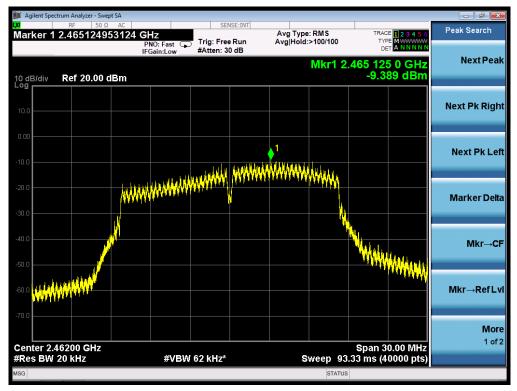
TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL

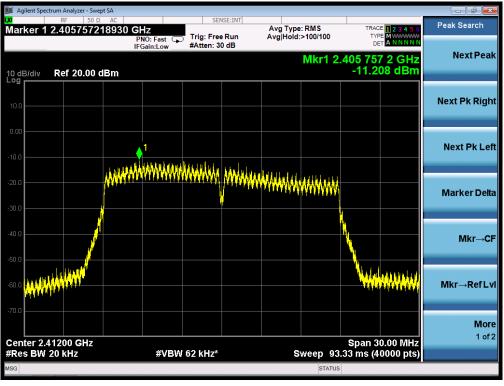




## TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL

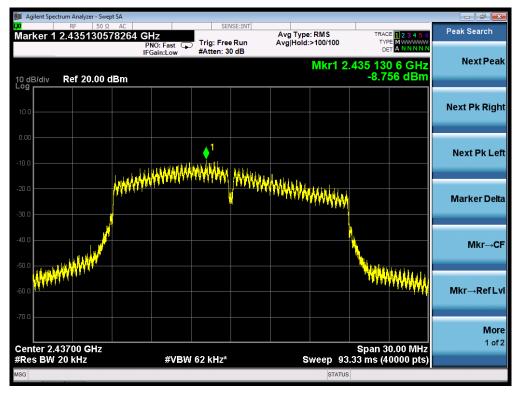
TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL

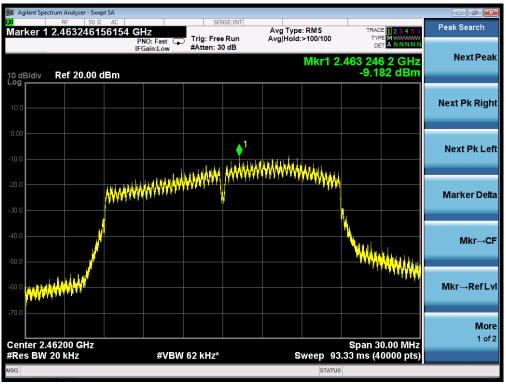




## 802.11n 20 TEST RESULT TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL

TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL

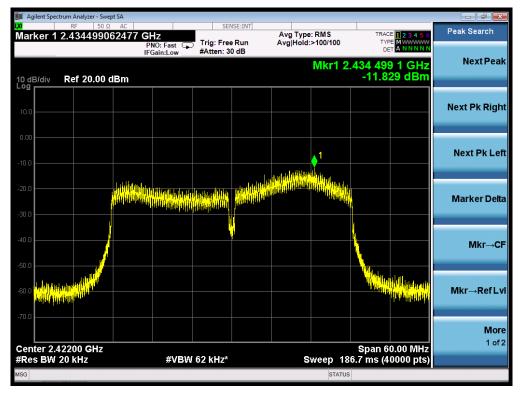


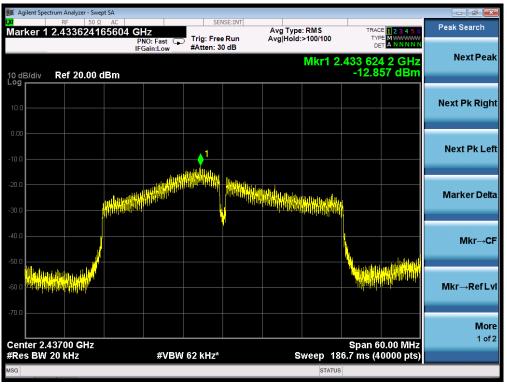


## TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL

802.11n 40 TEST RESULT

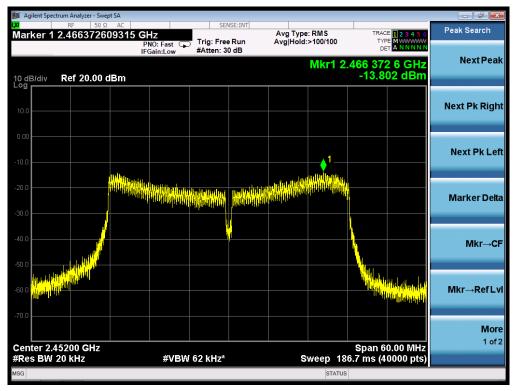
TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL





## TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL

#### TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL



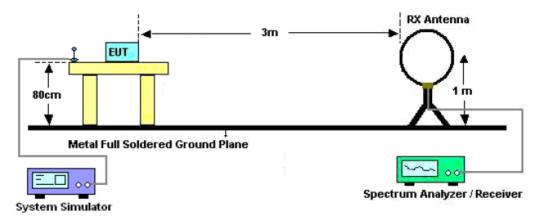
# 11. RADIATED EMISSION

### **11.1. MEASUREMENT PROCEDURE**

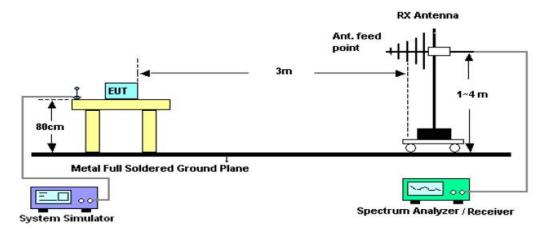
- 1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
- 2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- 3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
- 4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
- 5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
- 6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- 7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
- 8.If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
- 9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- 10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High Low scan is not required in this case.

#### 11.2. TEST SETUP

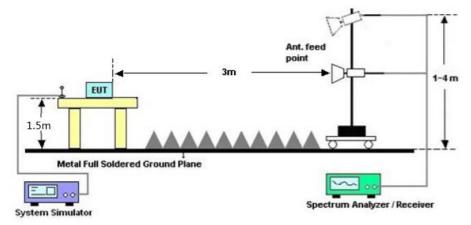
Radiated Emission Test-Setup Frequency Below 30MHz



#### RADIATED EMISSION TEST SETUP 30MHz-1000MHz



## RADIATED EMISSION TEST SETUP ABOVE 1000MHz



## **11.3. LIMITS AND MEASUREMENT RESULT**

15.209(a) Limit in the below table has to be followed

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Note: All modes were tested For restricted band radiated emission,

the test records reported below are the worst result compared to other modes.

## 11.4. TEST RESULT

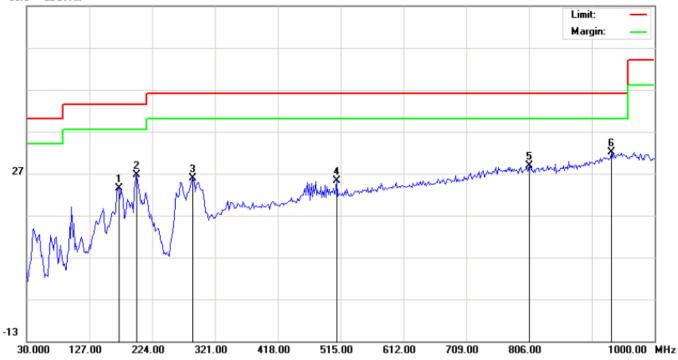
### **RADIATED EMISSION BELOW 30MHZ**

No emission found between lowest internal used/generated frequencies to 30MHz.

### **RADIATED EMISSION BELOW 1GHZ**

EUT	LAUNCH V1M	Model Name	V1M DiagunIV
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2412MHZ	Antenna	Horizontal

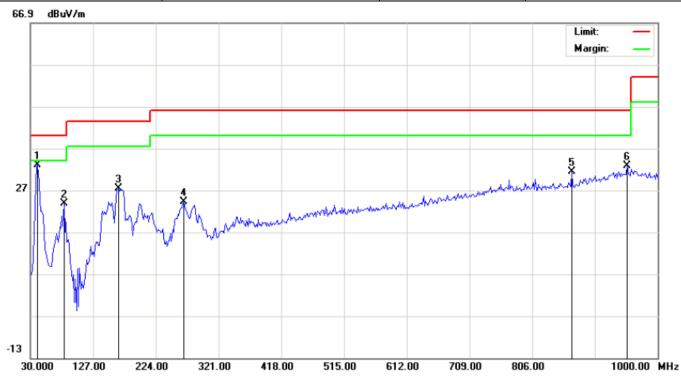
66.9 dBuV/m



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		172.2667	12.66	10.78	23.44	43.50	-20.06	peak			
2		199.7500	14.52	11.99	26.51	43.50	-16.99	peak			
3		287.0500	12.60	13.21	25.81	46.00	-20.19	peak			
4		508.5333	3.92	21.36	25.28	46.00	-20.72	peak			
5		806.0000	1.56	27.32	28.88	46.00	-17.12	peak			
6	*	933.7167	2.53	29.55	32.08	46.00	-13.92	peak			

#### **RESULT: PASS**

EUT	LAUNCH V1M	Model Name	V1M DiagunIV
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2412MHZ	Antenna	Vertical



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height		Comment
	-	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	41.3167	24.20	8.81	33.01	40.00	-6.99	peak			
2		81.7333	21.32	2.42	23.74	40.00	-16.26	peak			
3		165.8000	12.51	14.96	27.47	43.50	-16.03	peak			
4		267.6500	9.70	14.43	24.13	46.00	-21.87	peak			
5		867.4333	3.69	27.76	31.45	46.00	-14.55	peak			
6		953.1167	2.77	29.97	32.74	46.00	-13.26	peak			

## **RESULT: PASS**

Note:

1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. The "Factor" value can be calculated automatically by software of measurement system.

3. All test modes had been pre-tested. The 802.11b at low channel is the worst case and recorded in the report.

## **RADIATED EMISSION ABOVE 1GHZ**

EUT	LAUNCH V1M	Model Name	V1M DiagunIV
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2412MHZ	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4824.099	46.52	3.72	50.24	74	-23.76	peak
4824.116	41.33	3.72	45.05	54	-8.95	AVG
7236.079	40.53	8.15	48.68	74	-25.32	peak
7236.059	35.16	8.15	43.31	54	-10.69	AVG
Remark:						
Factor = Ante	enna Factor + Ca	able Loss – F	Pre-amplifier.			

EUT	LAUNCH V1M	Model Name	V1M DiagunIV
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2412MHZ	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4824.031	45.78	3.72	49.5	74	-24.5	peak
4824.083	40.69	3.72	44.41	54	-9.59	AVG
7236.070	39.54	8.15	47.69	74	-26.31	peak
7236.103	34.61	8.15	42.76	54	-11.24	AVG
Remark:						
actor = Ante	enna Factor + Ca	able Loss – F	Pre-amplifier.			

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EUT	LAUNCH V1M	Model Name	V1M DiagunIV
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2437MHZ	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4874.058	45.36	3.75	49.11	74	-24.89	peak
4874.112	40.24	3.75	43.99	54	-10.01	AVG
7311.034	40.04	8.16	48.2	74	-25.8	peak
7311.112	34.85	8.16	43.01	54	-10.99	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	LAUNCH V1M	Model Name	V1M DiagunIV
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2437MHZ	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type
4874.038	44.52	3.75	48.27	74	-25.73	peak
4874.050	39.41	3.75	43.16	54	-10.84	AVG
7311.118	39.87	8.16	48.03	74	-25.97	peak
7311.079	35.12	8.16	43.28	54	-10.72	AVG
Remark:						
actor = Ante	enna Factor + Ca	able Loss – I	Pre-amplifier.			

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EUT	LAUNCH V1M	Model Name	V1M DiagunIV
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	802.11b with date rate 1 2462MHZ	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	
4924.050	45.02	3.81	48.83	74	-25.17	peak
4924.047	40.13	3.81	43.94	54	-10.06	AVG
7386.113	39.87	8.19	48.06	74	-25.94	peak
7386.083	34.85	8.19	43.04	54	-10.96	AVG
Remark:						
Factor = Ante	enna Factor + Ca	able Loss – F	Pre-amplifier.			

EUT	LAUNCH V1M	Model Name	V1M DiagunIV	
Temperature	25°C	Relative Humidity	55.4%	
Pressure	960hPa	Test Voltage	Normal Voltage	
Test Mode	802.11b with date rate 1 2462MHZ	Antenna	Vertical	

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	
4924.111	44.85	3.81	48.66	74	-25.34	peak
4924.080	39.96	3.81	43.77	54	-10.23	AVG
7386.074	39.67	8.19	47.86	74	-26.14	peak
7386.051	34.71	8.19	42.9	54	-11.1	AVG
Remark:			•		•	•
Factor = Ante	enna Factor + Ca	able Loss – F	re-amplifier.			

## **RESULT: PASS**

Note:

Other emissions from 1G to 25 GHz are considered as ambient noise. No recording in the test report. Factor = Antenna Factor + Cable loss - Amplifier gain, Over=Measure-Limit.

The "Factor" value can be calculated automatically by software of measurement system.

All test modes had been pre-tested. The 802.11b mode is the worst case and recorded in the report.

# **12. BAND EDGE EMISSION**

### **12.1. MEASUREMENT PROCEDURE**

Radiated restricted band edge measurements

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting

#### 12.2. TEST SET-UP

same as 11.2

Note:

1. Factor=Antenna Factor + Cable loss - Amplifier gain. Field Strength=Factor + Reading level

2. The factor had been edited in the "Input Correction" of the Spectrum Analyzer. So the Amplitude of test plots is equal to Reading level plus the Factor in dB. Use the A dB( $\mu$ V) to represent the Amplitude. Use the F dB( $\mu$ V/m) to represent the Field Strength. So A=F.