TEST REPORT

of

FCC PART 15 SUBPART E

New Application; Class I PC; Class II PC Full Modular Approval

Product :	5G +2.4G 2T/2R WLAN FMC
Brand:	Nane
Model:	Detail please refer to page 6
Model Difference:	Market Segmentation
FCC ID:	O7N-CWFB211-XXX
	it identifies a single equipment "X" is letter of the alphabet
FCC Rule Part:	§15.407
Applicant:	ChipSiP Technology CO., Ltd.
Address:	8F1, No.186, Jian 1st Rd., Zhonghe Dist., New Taipei City 235, Taiwan

Test Performed by:

International Standards Laboratory

<Lung-Tan LAB> *Site Registration No. BSMI: SL2-IN-E-0013; MRA TW1036; TAF: 0997; IC: IC4067B-3; *Address: No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd. Lung-Tan Hsiang, Tao Yuan County 325, Taiwan *Tel : 886-3-407-1718; Fax: 886-3-407-1738 Report No.: **ISL-13LR006FE** Issue Date : **2013/02/21**



Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.

This report MUST not be used to claim product endorsement by TAF, NVLAP or any agency of the Government.

This test report shall not be reproduced except in full, without the written approval of International Standards Laboratory.



VERIFICATION OF COMPLIANCE

Applicant:	ChipSiP Technology CO., Ltd.
Product Description:	5G +2.4G 2T/2R WLAN FMC
Brand Name:	Nane
Model No.:	Detail please refer to page 6
Model Difference:	Market segmentation
FCC ID:	O7N-CWFB211-XXX, it identifies a single equipment "X" is letter of the alphabet
FCC Rule Part:	§15.407
Date of test:	2013/01/07 ~ 2013/01/19
Date of EUT Received:	2013/01/07

We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Test By:	DinoChen	Date:	2013/02/21
	Dion Chang / Engineer		
Prepared By:	makas	Date:	2013/02/21
	Eva Kao / Technical Supervisor		
Approved By:	Timent In	Date:	2013/02/21
	Vincent Su / Technical Manager		



Version

Version No.	Date	Description
00	2013/02/21	Initial creation of document



Table of Contents

1.	GEN	ERAL INFORMATION	6
	1.1.	Product Description	6
	1.2.	Related Submittal(s) / Grant (s)	8
	1.3.	Test Methodology	8
	1.4.	Test Facility	8
	1.5.	Special Accessories	8
	1.6.	Equipment Modifications	8
2.	SYST	TEM TEST CONFIGURATION	9
	2.1.	EUT Configuration	9
	2.2.	EUT Exercise	9
	2.3.	Test Procedure	9
	2.4.	Configuration of Tested System	10
3.	SUM	MARY OF TEST RESULT	11
4.	DES	CRIPTION OF TEST MODES	11
5.	AC P	OWER LINE CONDUCTED EMISSION TEST	12
	5.1.	Standard Applicable	12
	5.2.	Measurement Equipment Used:	12
	5.3.	EUT Setup:	12
	5.4.	Measurement Procedure:	13
	5.5.	Measurement Result:	13
6.	PEA	K OUTPUT POWER MEASUREMENT	16
	6.1	Standard Applicable	16
	6.2	Measurement Procedure	16
	6.3	Measurement Equipment Used:	16
	6.4	Measurement Equipment Used:	16
	6.5	Measurement Result	17
7.	26dB	EMISSION BANDWIDTH MEASUREMENT	19
	7.1	Standard Applicable	19
	7.2	Measurement Procedure	19
	7.3	Measurement Equipment Used:	19
	7.4	Test Set-up:	19
	7.5	Measurement Result	20
8.	PEA	K POWER SPECTRAL DENSITY	
	8.1	Standard Applicable	
	8.2	Measurement Procedure	
	8.3	Measurement Equipment Used:	
	8.4	Test Set-up:	
	8.5	Measurement Result	27



9.	PEAI	K EXCURSION MEASUREMENT	
	9.1	Standard Applicable	
	9.2	Measurement Procedure	
	9.3	Measurement Equipment Used:	
	9.4	Test Set-up:	36
	9.5	Test Results:	
10.	UND	ESIRABLE EMISSION - CONDUCTED MEASUREMENT	43
	10.1	Standard Applicable	43
	10.2	Measurement Procedure	44
	10.3	Measurement Equipment Used:	44
11.	UND	ESIRABLE EMISSION - RADICTED MEASUREMENT	66
	11.1	Standard Applicable	66
	11.2	EUT Setup	68
	11.3	Measurement Procedure	69
	11.4	Test SET-UP (Block Diagram of Configuration)	70
	11.5	Measurement Equipment Used:	71
	11.6	Field Strength Calculation	72
	11.7	Measurement Result	72
12.	TRA	NSMISSION IN THE ABSENCE OF DATA	85
	12.1	Standard Applicable	85
	12.2	Result:	85
13.	FREG	QUENCY STABILITY	
	13.1	Standard Applicable	86
	13.2	Result:	86
14.	ANT	ENNA REQUIREMENT	
	14.1	Standard Applicable	
	14.2	Antenna Connected Construction	
15.	Maxi	mum Permissible Exposure (MPE)	
	15.1	Standard Applicable	
	15.2	Maximum Permissible Exposure (MPE) Evaluation	



1. GENERAL INFORMATION

1.1. Product Description

General:

Product Name	5G +2.4G 2T/2R WLAN FMC				
Brand Name	Nane				
	CWFB210		CWFB211-D00		
	CWFB210-T01	CWFB210-R01	CWFB211-D01	CWFB212-L01	
	CWFB210-T02	CWFB210-R02	CWFB211-D02	CWFB212-L02	
	CWFB210-T03	CWFB210-R03	CWFB211-D03	CWFB212-L03	
	CWFB210-T04	CWFB210-R04	CWFB211-D04	CWFB212-L04	
Model Name	CWFB210-T05	CWFB210-R05	CWFB211-D05	CWFB212-L05	
	CWFB210-T06	CWFB210-R06	CWFB211-D06	CWFB212-L06	
	CWFB210-T07	CWFB210-R07	CWFB211-D07	CWFB212-L07	
	CWFB210-T08	CWFB210-R08	CWFB211-D08	CWFB212-L08	
	CWFB210-T09	CWFB210-R09	CWFB211-D09	CWFB212-L09	
	CWFB210-T10	CWFB210-R10	CWFB211-D10	CWFB212-L10	
Model Difference	Market segmenta	tion			
Power Supply	3.7Vdc				



WLAN: 2X2 MIMO

Wi-Fi	Frequency Range (MHz)	Channels	Peak Rated Power	Modulation Technology
802.11b	2412 - 2462(DTS)	11	19.52dBm	DSSS
802.11g	2412 - 2462(DTS)	11	23.87dBm	DSSS, OFDM
202.11n	HT20 2412 - 2462(DTS)	11	23.77dBm	OEDM
802.1111	HT40 2422 - 2452(DTS)	7	23.71dBm	OFDM
802.110	5180 - 5240(NII)	4	9.19dBm	OEDM
802.11a	5745 - 5825(DTS)	5	23.88dBm	OFDM
	HT20 5180 – 5240(NII)	4	8.65dBm	
902.11.	HT20 5745 - 5825(DTS)	5	24.81dBm	OFDM
802.11n	HT40 5190 – 5230(NII)	2	10.93dBm	OFDM
	HT40 5755 – 5795(DTS)	2	24.60dBm	
Modulation type		CCK, DQPSK 64QAM. 16Q	, DBPSK for DSSS AM, QPSK, BPSK fo	or OFDM
Transition Rate:		Upto 300Mbp	s	

Antenna Designation:

	Manufacturer	Model No.	Connector Type	Туре	Gain (2.4GHz)	Gain (5GHz)
Ant 1	Airwave Technologies INC.	EDA-8709-25GR2-A4-RM	Revise SMA, unique	Dipole Ant	2 dBi	2 dBi
Ant 2	ARISTRTLE	RFA-25-C2S1-70-90	unique	Dipole Ant	2 dBi	2 dBi
Ant 3	Tranwo technology corp.	SD001-201003-A101	Revise SMA, unique	Dipole Ant	2dBi	2 dBi
Ant 3-1	Tranwo technology corp.	RFA-05-2-L14M3-B70-1	Revise SMA, unique	Dipole Ant	2dBi	2 dBi
Ant 3-2	Tranwo technology corp.	202-000442-00	unique	Patch Ant	0 dBi	-1 dBi
Ant 3-3	Tranwo technology corp.	202-000441-00	unique	Patch Ant	0.5 dBi	-0.5 dBi
Ant 4	UDM Group Tech- nology Co., Ltd	26-52-01800G	unique	PCB Ant (Green)	2.5 dBi	4 dBi
Ant 5	Unictron Technologies Corporation	H2P566WKBA0100	unique	PCB Ant (Blue)	2.3 dBi	4dBi

The EUT is compliance with IEEE 802.11 a/b/g/n Standard. This report applies for frequency bands 5150 MHz– 5250 MHz



1.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for <u>FCC ID: NM8DGH100</u> filing to comply with Section 15.407 of the FCC Part 15, Subpart E Rules. The composite system (digital device) is compliance with Subpart B is authorized under a DoC procedure.

1.3. Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2003). Radiated testing was performed at an antenna to EUT distance 3 meters.

KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

1.4. Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003. FCC Registration Number are: 990257 and 236194, Canada Registration Number: 4620A-4.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 &10 meters) and FCC Registration Number: 94644.

1.5. Special Accessories

Not available for this EUT intended for grant.

1.6. Equipment Modifications

Not available for this EUT intended for grant.



2. SYSTEM TEST CONFIGURATION

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

2.3. Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7 and 13 of ANSI C63.4-2003.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." Is still within the 3Db illumination BW of the measurement antenna. According to the requirements in Section 8 and 13 and Subclause 8.3.1.2 of ANSI C63.4-2003.



2.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System



Table 1-1 Equipment Used in Tested System

Itom	Fauinment	Mfr/Brand	Model/	Sorios No	Data Cabla	
Ittill	Equipment		Type No.	501105110.	Data Cable	Power Cord
1	Notebook	IBM	X40	N/A	Shield	Non-shield
2	Kit	N/A	N/A	N/A	Shield	Non-shield



3. SUMMARY OF TEST RESULT

FCC Rules	Description Of Test	Result
§15.207	AC Power Line Conducted	Compliant
	Emission	
§15.407(a)	26 dB Emission Bandwidth	Compliant
§15.407(a)	Peak Output Power Measurement	Compliant
§15.407(a)	Peak Power Spectral Density	Compliant
	Measurement	
15.407(a)(6)	Peak Excursion Measurement	Compliant
§15.407(b)	Undesirable Emission – Con-	Compliant
	ducted Measurement	
§15.407(b)	Undesirable Emission – Radiated	Compliant
	Measurement	
§15.407©	Transmission in case of Absence	Compliant
	of Information	
§15.407(g)	Frequency Stability	Compliant
§15.407(a)	Antenna Requirement	Compliant
§15.407(d)	TPC and DFS Measurement	Compliant
MPE	Maximum Permissible Exposure	Compliant

4. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting mode is programmed.

a mode: 5150MHz-5250MHz: Channel lowest (5180MHz), Mid (5220MHz) and Highest (5240MHz) with 6Mbps data rate are chosen for full testing.

n HT 20 mode: 5150MHz-5250MHz: Channel lowest (5180MHz), Mid (5220MHz) and Highest (5240MHz) with 6.5Mbps data rate are chosen for full testing

n HT 40 mode: 5150MHz-5250MHz: Channel lowest (5190MHz) and Highest (5230MHz) with 13.5Mbps data rate are chosen for full testing

The worst case 802.11 n HT40 (5GHz) with antenna 4 was reported for Radiated Emission.



5. AC POWER LINE CONDUCTED EMISSION TEST

5.1. Standard Applicable

According to \$15.207, frequency range within 150 KHz to 30 MHz shall not exceed the Limit table as below.

Frequency range	Limits dB(uV)				
MHz	Quasi-peak Average				
0.15 to 0.50	66 to 56	56 to 46			
0.50 to 5	56	46			
5 to 30	60	50			
Note					
1. The lower limit shall apply at the t	ransition frequencies				

2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
Conduction 03 -1 Cable	WOKEN	CFD 300-NL	Conduction 0-1	06/28/2012	06/28/2013			
EMI Receiver 12	ROHDE & SCHWARZ	ESCI	100804	07/13/2012	07/13/2013			
LISN 07	FCC Inc.	FCC-LISN-50-100-4 -02	07040	07/13/2012	07/13/2013			
LISN 08	FCC	FCC-LISN50-25-2-0 1	07039	07/13/2012	07/13/2013			

5.2. Measurement Equipment Used:

5.3. EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2003.

2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.

3. The LISN was connected with 120Vac/60Hz power source.



5.4. Measurement Procedure:

- 1. The EUT was placed on a table which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured were complete.

5.5. Measurement Result:

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Note: Refer to next page for measurement data and plots.



-14 of 89-

AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation Mode	Test Date:	2013/01/17
Test By:	Dino		



Site:	Conduction 04	Phase: L1	Temperature(°C):26(°C)		
Condition:	CISPR13 Class B Conduction	PR13 Class B Conduction			
		Power:	AC 120V/60Hz		

No.	Frequency)	read	ling(dBu	IV)	Factor(dB)	Measur	ement(d	BuV)	limit(d	BuV)	margi	n(dB)	Comment
	(MHz)	Peak	QP	AVG	(dB)	Peak	QP	AVG	P/Q	AVG	P/Q	AVG	
1	0.1516	56.77	53.97	39.66	9.58	66.35	63.55	49.24	65.91	55.91	-2.36	-6.67	
2	0.1980	50.23	47.29	33.14	9.59	59.82	56.88	42.73	63.69	53.69	-6.81	-10.96	
3	0.2500	45.13	41.78	29.18	9.59	54.72	51.37	38.77	61.76	51.76	-10.39	-12.99	
4	0.6300	33.00	28.97	23.35	9.60	42.60	38.57	32.95	56.00	46.00	-17.43	-13.05	
5	3.1260	25.97	21.27	15.36	9.60	35.57	30.87	24.96	56.00	46.00	-25.13	-21.04	
6	6.5500	26.69	22.23	16.64	9.63	36.32	31.86	26.27	60.00	50.00	-28.14	-23.73	





Site:	Conduction 04	Phase: N	Temperature(℃):26(℃)
Condition:	CISPR13 Class B Conduction		Humidity:54%
Compamy:	景鉅	Power:	AC 120V/60Hz

No.	Frequency)	read	ling(dBı	ıV)	Factor(dB)	Measur	ement(d	BuV)	limit(d	lBuV)	margi	n(dB)	Comment
	(MHz)	Peak	QP	AVG	(dB)	Peak	QP	AVG	P/Q	AVG	P/Q	AVG	
1	0.1500	31.43	23.72	19.59	9.59	41.02	33.31	29.18	66.00	56.00	-32.69	-26.82	
2	0.2020	49.00	46.13	30.70	9.59	58.59	55.72	40.29	63.53	53.53	-7.81	-13.24	
3	0.2460	43.95	39.26	24.10	9.59	53.54	48.85	33.69	61.89	51.89	-13.04	-18.20	
4	0.6260	31.51	27.80	22.10	9.60	41.11	37.40	31.70	56.00	46.00	-18.60	-14.30	
5	3.2100	27.08	22.14	15.91	9.60	36.68	31.74	25.51	56.00	46.00	-24.26	-20.49	
6	6.6100	28.52	22.46	16.76	9.63	38.15	32.09	26.39	60.00	50.00	-27.91	-23.61	



6. PEAK OUTPUT POWER MEASUREMENT

6.1 Standard Applicable

According to §15.407(a)

- 1. For the band 5.15-5.25 GHz, the maximum conducted power over the frequency of operation shall not exceed the lesser of 50 mW (17dBm) or 4 dBm + 10log B.
- 2. For the band 5.25-5.35 GHz and 5.47-5.725GMHz, the maximum conducted power over the frequency of operation shall not exceed the lesser of 250 mW (24dBm) or 11 dBm + 10log B.
- 3. For the band 5.725-5.825 GHz, the maximum conducted power over the frequency of operation shall not exceed the lesser of 1W (30dBm) or 17 dBm + 10log B.

6.2 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
- 3. Record the max. reading.
- 4. Repeat above procedures until all frequency measured were complete.

Refer to section C4 of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
ТҮРЕ		NUMBER	NUMBER	CAL.				
Power Meter 05	Anritsu	ML2495A	1116010	04/17/2012	04/16/2013			
Power Sensor 05	Anritsu	MA2411B	34NKF50	04/16/2012	04/15/2013			
Temperature Chamber	KSON	THS-B4H100	2287	03/03/2012	03/02/2013			
DC Power supply	ABM	51850	N/A	06/17/2012	06/16/2013			
AC Power supply	EXTECH	CFC105W	NA	12/19/2012	12/18/2013			
Splitter	MCLI	PS4-199	12465	07/18/2012	07/17/2013			
Spectrum analyzer	Agilent	N9030A	MY51360021	03/11/2012	03/10/2013			

6.3 Measurement Equipment Used:

6.4 Measurement Equipment Used:





6.5 Measurement Result

Mode	Freq(MHz)	channel	Peak power (dBm)	limit(dBm)	result
	5180	36	9.19	16.98	pass
902.11	5200	40	8.67	16.98	pass
802.11a	5220	44	8.89	16.98	pass
	5240	48	8.76	16.98	pass

2*2 MIMO

			Output Ch	ain (dBm)	Combine			
Mode	Freq(MHz)	channel	Chain A	chain B	Output Power (dBm)	Limit(dBm)	Result	
	5180	36	5.21	6.03	8.65	16.98	Pass	
N LIT20	5200	40	5.52	5.05	8.30	16.98	Pass	
N H120	5220	44	5.61	5.45	8.54	16.98	Pass	
	5240	48	5.63	4.82	8.25	16.98	Pass	

			Output Ch	ain (dBm)	Combine		
Mode	Freq(MHz)	channel	Chain A	chain B	Peak Output Power (dBm)	Limit(dBm)	Result
N UT40	5190	38	8.02	7.81	10.93	16.98	Pass
IN IT 140	5230	46	7.59	7.33	10.47	16.98	Pass



100% Duty Cycle

Agilent Spectrum Ana	alyzer - Swept SA					
Center Freq 5	5.18000000	OGHZ	Trig: Free Run	Avg Type: Log-Pwr	06:47:51 PM Mar 01, 2013 TRACE 2 2 4 5 TYPE	Frequency
10 dB/div Ref	Offset 0.8 dB 30.80 dBm	IFGain:Low	#Atten: 40 dB		Cet Later	Auto Tune
2018 Junio/Arrandy	an same and a sector	hant-promitication (1)	and approximation of has	haddennistanushanarkansti	yeyelestritationstational	Center Freq 5.180000000 GHz
10.0						Start Freq 5.18000000 GHz
-6.20						Stop Fred 5.18000000 GHz
-29.2						CF Step 8.000000 MHz <u>Auto</u> Mar
-49.2						Freq Offset 0 Hz
Center 5.1800 Res BW 8 MHz	00000 GHz	#VBW	50 MHz	Sweep	Span 0 Hz 1.000 s (1001 pts)	
MSG				STATU		



7. 26dB EMISSION BANDWIDTH MEASUREMENT

7.1 Standard Applicable

According to §15.407(a). No Limit required.

7.2 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set the spectrum analyzer as RBW=300KHz, VBW =1MHz, Span= 50MHz, Sweep=auto
- 4. Mark the peak frequency and –26dB (upper and lower) frequency.
- 5. Repeat above procedures until all frequency measured were complete.

Refer to section D of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

7.3 Measurement Equipment Used:

Refer to section 6.3 for details.

7.4 Test Set-up:

Refer to section 6.4 for details.



7.5 Measurement Result

802.11a Mode

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	21.220	13.27
5220	21.820	13.39
5240	21.280	13.28

802.11n HT20 Mode

Frequency	26dB Bandwidth	10 Log (B)		
(MHz)	(MHz)	(dB)		
5180	21.520	13.33		
5220	21.520	13.33		
5240	21.640	13.35		

802.11n HT40 Mode

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)		
5190	39.370	15.95		
5270	39.480	15.96		



802.11a

26dB Band Width Test Data CH-Low



26dB Band Width Test Data CH-Mid





26dB Band Width Test Data CH-High





802.11n HT20 26dB Band Width Test Data CH-Low



26dB Band Width Test Data CH-Mid





26dB Band Width Test Data CH-High





802.11n HT40 26dB Band Width Test Data CH-Low



26dB Band Width Test Data CH-High

Agilent Spectrum	Analyzer - O	locupled BW									
Center Freq 5.230000000 GHz		Senter Freq: 5.230000000 GHz Trig: Free Run Avg Held>10/10 #Atten: 30 dB			Radio Device: BTS		M Jan 10, 2013 None ce: BTS	Frequency			
10 dB/div	Ref Offse Ref 11.	et 9 dB 00 dBm									
1.00 9.00 	pre	an a	and and a state of the		for the second s	kan setter	-manuala	m			Center Freq 5.230000000 GHz
290 390 490	**								<u>م</u> ر	, and have	
-59.0 											
Center 5.23 #Res BW 30	GHz 00 kHz			#VE	SW 1 MH	z		S	spar Swe	n 50 MHz ep 1 ms	CF Step 5.000000 MHz Auto Man
Occupie	d Ban	dwidth 36.	016 MI	Hz	Total P	ower	16.9) dBn	n		Freq Offset 0 Hz
Transmit Freq Error 124.12 x dB Bandwidth 39.48 M		kHz AHz	Hz OBW Power Hz x dB		99 -26.	99.00 % -26.00 dB					
MSQ							STATUS				



8. PEAK POWER SPECTRAL DENSITY

8.1 Standard Applicable

According to §15.407(a)

- 1. For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band.
- 2. For the band 5.25-5.35 GHz and 5.47-5.725GMHz, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band.
- 3. For the band 5.725-5.825 GHz, the peak power spectral density shall not exceed 17 dBm in any 1-MHz band.

8.2 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
- 3. Set RBW=1MHz,VBW=3MHz, Span=50MHz (Base Mode), Sweep time = Auto, traces 100 sweeps of video averaging.
- 4. Record the max. reading.
- 5. Repeat above procedures until all frequency measured were complete.

Refer to section E of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

8.3 Measurement Equipment Used:

Refer to section 6.3 for details.

8.4 Test Set-up:

Refer to section 6.4 for details.



8.5 Measurement Result

802.11a Mode

Frequency	RF Power Density Reading	Cable loss	Maximum Limit		
MHZ	(dBm)	(dB)	(dBm)		
5180	3.717	0.00	4		
5220	3.781	0.00	4		
5240	3.679	0.00	4		
802. 11n HT20					
Frequency MHz	Chain A RF Power Density Reading	Chain A RF Power Density Reading	Cable loss	RF Power Density Level	Maximum Limit
	(dBm)	(dBm)	(dB)	(dBm)	(dBm)
5180	0.652	0.721	0.00	3.697	4
5220	0.434	0.931	0.00	3.700	4
5240	0.638	0.980	0.00	3 823	4

802.11n HT40 Mode

Frequency MHz	Chain A RF Power Density Reading Reading (dBm)	Chain B RF PowerCable lossingDensity Reading(dB)		RF Power Density Level Level (dBm)	Maximum Limit (dBm)
5190	0.480	0.997	0.00	3.756	4
5270	0.694	0.899	0.00	3.808	4





802.11a



Peak Power Spectral Density Data Plot (CH Low)

Peak Power Spectral Density Data Plot (CH Mid)







Peak Power Spectral Density Data Plot (CH High)



802.11n HT20 (Antenna A Port) Power Spectral Density Test Plot (CH-Low)











802.11n HT20 for 5GHz (Antenna B Port) Power Spectral Density Test Plot (CH-Low)











802.11n HT40 (Antenna A Port) Power Spectral Density Test Plot (CH-Low)







802.11n HT40 for 5GHz (Antenna B Port) Power Spectral Density Test Plot (CH-Low)







9. PEAK EXCURSION MEASUREMENT

9.1 Standard Applicable

15.407(a)(6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

9.2 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to spectrum.
- 3. Trace A, Set RBW=1MHz, VBW = 3MHz, Span = 26dBc, Max. hold.
- 4. Trace B, Set RBW=1MHz, VBW = 30KHz, Span = 26dBc, Max. hold..
- 5. Delta Mark trace A center frequency and trace B center frequency.
- 6. Repeat above procedures until all frequency measured were complete.

Refer to section F of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

9.3 Measurement Equipment Used:

Refer to section 6.3 for details.

9.4 Test Set-up:

Refer to section 6.4 for details.


9.5 Test Results:

802.11a Mode

Frequency	peak excursion	Limit	Margin
(MHz)	(dB)	(dB)	(dB)
5180	6.683	13.00	-6.32
5220	6.809	13.00	-6.19
5240	6.860	13.00	-6.14

802.11n HT20 Mode

Frequency	peak excursion	Limit	Margin
(MHz)	(dB)	(dB)	(dB)
5180	6.181	13.00	-6.82
5220	6.606	13.00	-6.39
5240	6.899	13.00	-6.10

802.11n HT40 Mode

Frequency	peak excursion	Limit	Margin
(MHz)	(dB)	(dB)	(dB)
5190	6.240	13.00	-6.76
5230	6.299	13.00	-6.70



802.11a mode

Peak Excursion Data Plot (CH Low)



Peak Excursion Data Plot (CH Mid)





Peak Excursion Data Plot (CH High)





802.11n HT20 Mode Peak Excursion Data Plot (CH Low)



Peak Excursion Data Plot (CH Mid)





Peak Excursion Data Plot (CH High)





802.11n HT40 Mode Peak Excursion Data Plot (CH Low)



Peak Excursion Data Plot (CH High)





10. UNDESIRABLE EMISSION - CONDUCTED MEASUREMENT

10.1 Standard Applicable

According to §15.407(b),

(b) Undesirable Emission Limits: Except as shown in Paragraph (b)(6) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.
- (3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.
- (5) The above emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in Section 15.207.
- (7) The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.
- (8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.



10.2 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to spectrum.
- 3. Set Spectrum RBW=1MHz, VBW = 1MHz for peak measurement and 10Hz for average measurement.
- 4. Set Spectrum at lower/upper band edge and the restricted band adjacent to the lower/upper edge of the authorized band, with the transmitter set to the lowest/highest channel.
- 5. Set Spectrum over the 30MHz to 40GHz range with the transmitter set to the lowest, middle, and highest channels.

Refer to section E of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

Conducted RF measurements of the transmitter output were made at the band edges and the adjacent restricted bands.

Also, conducted RF measurements of the transmitter output over the 30 MHz to 40 GHz band were made in order to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

10.3 Measurement Equipment Used:

Refer to section 6.3 for details.



802.11a mode Ch Low 30MHz – 6GHz

Agilent Spectr	um Analyzer - Swept S							
Marker 1	3.7657300000	00 GHz	SENSEINT	Avg Type	Log-Pwr	10:00:02 TRA	PM Jan 00, 2013	Marker
		PNO: Fast 🖵	Trig: Free Run Atten: 30 dB	Avg Hold	>100/100	n t	PE PANNNA	Select Marker
10 dB/div	Ref 20.00 dBn	1			Mkr	45.1	73 GHz 10 dBm	1
10.0								Normal
0,00								Delta
-10.0								_
-20.0							-37 (Ó (Ch	Fixed
-40.0			and an and the second	1 malmalman	والجيوات فيرافقهم	when h	جمدو ^{مر} وم (10 اللي	no
-000	المتيافق فيتجر عامليستان في ورجاحتم	entelantilleran aller and						Properties
Start 10 N	лнz					Stop (5.000 GHz	More 1 of 2
#Res BW	1.0 MHz	#VBW	3.0 MHZ		Sweep	10.0 ms	(1001 pts)	

Ch Low 6GHz – 18GHz

rker 1 25.90000000000	O GHz PNO: Fast	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold>100/100	TRACE 12145 TYPE Monomore DET ENINEMENT	Peak Search
Bidly Ref 20.00 dBm	I GUILLUN			Mkr1 25.90 GHz -40.825 dBm	NextPeak
					Next Pk Right
·					Next Pk Lef
				-27.00 alfre	Marker Delta
matronanium	nin planner from	والمريد ومرور المراري	and all himsen and and and and and and and and and an	Normal Street of the second street when	Mkr→CF
					Mkr→RefLv
rt 6.00 GHz				Stop 26.00 GHz	More 1 of 2



Ch Low 18GHz – 40GHz

Agilent Spectrum Analyzer - Swep	1 5A				
Marker 1 38.8240000	00000 GHz PNO: Fast	Trig: Free Run	Avg Type: Log-Pwr Avg Hold>100/100	10:02:53 PM Jan 00, 2013 TRACE 12:04 5 TYPE 2000	Peak Search
10 dB/div Ref 20.00 dB	IF Gain:Low	Atten: JU GD	M	kr1 38.824 GHz -35.370 dBm	Next Peak
10.0					Next Pk Right
-10.0					Next Pk Left
-20.0				-27 tib ages	Marker Delta
-43.0 399,94,94,94,94,94,94,94,94 ,94,94	and all the second s	Antologin and a static factor	and an and a start way to be a start of the	and and a second s	Mkr→CF
-ED 0					Mkr→RefLvi
Start 26.000 GHz #Res BW 1.0 MHz	#VBW 3	.0 MHz	Sweep	Stop 40.000 GHz 23.3 ms (1001 pts)	More 1 of 2
MSG			STATU	\$][?]	

Ch Mid 30MHz – 6GHz





Ch Mid 6GHz – 18GHz

Agitent Spectrum Analyzer - Swept	58				
Marker 1 25.64000000	0000 GHz PNO: Fast	Trig: Free Run	Avg Type: Log-Pwr Avg Hold>100/100	10:04:37 PM Jan 00, 2013 TRACE	Peak Search
10 dB/div Ref 20.00 dB	IF Gain:Low	Atten: 30 dB	N	Akr1 25.64 GHz -40.183 dBm	Next Peak
10.0					Next Pk Right
-10.0					Next Pk Left
-20.0				-27.00 dites	Marker Delta
-0.0	and an	المسيعة الإزام وعادهما العاري	والمسبو يسرو والمتلايلة ومتجه موام وعدمه	and a second	Mkr→CF
-000					Mkr→RefLvi
Start 6.00 GHz #Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep	Stop 26.00 GHz 33.3 ms (1001 pts)	More 1 of 2
MSG			STATU	9 <u>1</u>	

Ch Mid 18GHz – 40GHz





Ch High 30MHz – 6GHz



Ch High 6GHz – 18GHz

Marker 1 25.9200000000	00 GHz PNO: Fast	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold>100/100	10:06:43 PM Je100, 2013 TRACE 2 2 4 8 TYPE 24101741	Peak Search
10 dB/div Ref 20.00 dBm	I UIII.LUW		N	1kr1 25.92 GHz -40.268 dBm	Next Peak
10.0					Next Pk Right
10.0					Next Pk Lef
20.0				-27 00 apri	Marker Delta
43.0 50.0 percent of the property and the percent	na the spin was to all with	والمراجع والمراجع والمراجع والمراجع	Hardput And Antonia Angel	net the second second second	Mkr→Cf
a.o					Mkr→RefLv
Start 6.00 GHz #Res BW 1.0 MHz	#VBW :	3.0 MHz	Sweep	Stop 26.00 GHz 33.3 ms (1001 pts)	More 1 of 2



Ch High 18GHz – 40GHz

Agilent Spectrum Analyzer - Swept	54				
Marker 1 38.88000000	0000 GHz PN0: Fast 😱	Trig: Free Run	Avg Type: Log-Pwr Avg Hold>100/100	10:07:38 PM Jan 00, 2013 TRACE 2014 5 TYPE MUNICIPAL	Peak Search
10 dB/div Ref 20.00 dB	Il-Gain:Low	Atten: JU db	IV	lkr1 38.880 GHz -35.289 dBm	Next Peak
10.0					Next Pk Right
-10.0					Next Pk Left
-20.0				27 00 aths	Marker Delta
-43.0 <mark>104,893,81,000,000,000,000,000,000,000,000,000,</mark>	علاو الالالية العراق المستعمل المستعمل	undhagtendreikkerstaa	pen-pallpro-lefton/how/h head	alenter and the start of the start of the	Mkr→CF
-m0					Mkr→RefLv
Start 26.000 GHz #Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep	Stop 40.000 GHz 23.3 ms (1001 pts)	More 1 of 2
MSG			STATE	15	





802.11n HT20 Mode (Antenna A Port) Ch Low 30MHz – 6GHz

Agilent Spect	rum Analyzer - Swept SA	{						
Marker 1	3.77172000000	00 GHz	Trig: Free Run	Avg Type: AvgHold>	Log-Pwr 100/100	09:54:35 TRJ	PM 3e100, 2013	Peak Search
10 dB/div	Ref 20.00 dBm	IFGain:Low	Atten: 30 dB		Mkr	1 3.771	72 GHz 29 dBm	Next Peak
10.0								Next Pk Right
-10.0								Next Pk Left
-20.0							-27 tib atm	Marker Delta
-40.0		م. مىلى تەرىلى تەرىلى تەرىلى تەرىلى	and a state of the	awane	the section		man	Mkr⊸CF
-80.0	have a second source of the second							Mkr→RefLvi
Start 10 M #Res BW	инz 1.0 MHz	#VBW	3.0 MHz		Sweep	Stop 10.0 ms	6.000 GHz (1001 pts)	More 1 of 2
MSG					STATU	\$]:	48	

Ch Low 6GHz – 18GHz

arker 1 25.92000000000	PNO: Fast	rig: Free Run Atten: 30 dB	Avg Type: Log-Pv Avg[Hold:> 100/100	VF TRACE 12:45	Peak Search
dB/div Ref 20.00 dBm				Mkr1 25.92 GHz -39.779 dBm	Next Peak
					Next Pk Right
					Next Pk Lef
3.0 				-07 00 altre	Marker Delta
2.0 2.0 Martythorphistorythological	and a single for the state of t	enersala escanaçãos	KALA MARINE TO THE STATE OF THE STATE	aquerelisti ogen ansidered aver	Mkr⊸CF
					Mkr→RefLv
art 6.00 GHz		0.044-	Suine	Stop 26.00 GHz	More 1 of 2



Ch Low 18GHz – 40GHz

Agilent Spectrum Analyzer - Swept SA	V						
Marker 1 38.054000000	000 GHz PNO: Fast CTrig: Fre	e Run	Avg Type: Avg Hold>	Log-Pwr 100/100	09:53:21 F TRAC TVT D	M Jah00, 2013 E 12 7 4 8 E MWWWWWW	Peak Search
10 dB/div Ref 20.00 dBm	IP GAIN. LOW			M	(r1 38.0 -34.6	54 GHz 36 dBm	Next Peak
10.0							Next Pk Right
-10.0							Next Pk Left
-20.0					•1-	-27.05 atom	Marker Delta
-43.0 allanarally Alan some and participation	بسعوده ساليهم والمراجع المدور المراجع والمراجع وال	ton znakano	http://www.ething	and and the	name have	enner	Mkr→CF
-ED 0							Mkr→RefLvi
Start 26.000 GHz #Res BW 1.0 MHz	#VBW 3.0 MH;			Sweep 2	Stop 40 23.3 ms (.000 GHz 1001 pts)	More 1 of 2
MSG				STATUS	it.	1.	

Ch Mid 30MHz – 6GHz





Ch Mid 6GHz – 18GHz

Agilent Spectrum Analyzer	- Swept SA				
Marker 1 25.9400	000000000 GHz PN0: Fast C	Trig: Free Run	Avg Type: Log-Pwr Avg Hold>100/100	109:55:54 PM Jari00, 2013 TRACE 22:04 B TYPE Moderation	Peak Search
10 dB/div Ref 20.0	IFGain:Low	Atten: 30 dB	N	lkr1 25.94 GHz -39.604 dBm	Next Peak
10.0					Next Pk Right
-10.0					Next Pk Left
-20.0				-27 (b) atre	Marker Delta
-0.0 -0.0 medandundu	and the and the second and the second se	التحريد حورور محادث		an and the state of the state o	Mkr→CF
-ED0					Mkr→RefLvi
Start 6.00 GHz #Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep :	Stop 26.00 GHz 33.3 ms (1001 pts)	More 1 of 2
MSG			STATUS		

Ch Mid 18GHz – 40GHz





Ch High 30MHz – 6GHz



Ch High 6GHz – 18GHz

Agitent Spectrum Analyzer - Swept SA		SINSEINT	ALIONAUT	0 09:58:34 PM Jan 08, 2013	
Marker 1 25.7000000000	PNO: Fast	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pw Avg Hold>100/100	TYPE	Peak Search
10 dB/dlv Ref 20.00 dBm	a connert			Mkr1 25.70 GHz -40.132 dBm	Next Peak
10.0					Next Pk Right
-10.0					Next Pk Left
-20.0				-27.00 x8%	Marker Delta
-43.0 -50.0 Minderford and a martin	riveryanya	Adinghangkaipteender	Nameshara Maraka Mar	anismustran plan anitan particular	Mkr→CF
-m0 					Mkr→RefLvl
Start 6.00 GHz #Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep	Stop 26.00 GHz 33.3 ms (1001 pts)	More 1 of 2
MSG			STA	tus	



Ch High 18GHz – 40GHz

Agilent Spectrum Analyzer -	Swept SA								
Marker 1 38.58600	0000000	PNO: Fast	Trig: Free	Run	Avg Typ Avg Hold	e: Log-Pwr > 100/100	09:57:531 TRA TY	PM 3e100, 2013	Peak Search
10 dB/dlv Ref 20.0	0 dBm	IFGain:Low	Atten: 30	dD		M	kr1 38.5 -35.9	586 GHz 79 dBm	NextPeak
10.0									Next Pk Right
-10.0									Next Pk Left
-20.0								-37 (b ates	Marker Delta
-43.0 JUNING. BARANSA	angerige die Antolika a	the the falses	مساليها الملي	han Malana	n man address	second the second s	alangter Sould	maning	Mkr→CF
-83.0									Mkr→RefLv
Start 26.000 GHz #Res BW 1.0 MHz		#VBW	3.0 MHz			Sweep	Stop 40 23.3 ms	.000 GHz (1001 pts)	More 1 of 2
MSG						STATU	5		



802.11n HT20 Mode (Antenna B Port) Ch Low 30MHz – 6GHz

							zer - Swept SA	Spectrum Analyz	Agiltent :
Marker	M Jan 10, 2013	03:54:40 F	Type: Log-Pwr	Avg	SEMIE:IN	GHz	720000000	er 2 3.7717	Mark
Select Marker	T HANNANN M	D	1010:> 100/100	Avgi	Atten: 30 dB	PNO: Fast G			
2	72 GHz 61 dBm	3.771	Mkr2				20.00 dBm	div Ref 2	10 dB/
Normal		\$ 1							- 0.01 - 0.01
Delta	-277.000 (1897)			¢ ²					20.0
FixedP	~~~	anna (L) hay	~~~~		An and a star of a loss	teres i dire anno inte	مەيرىيە يەروپىيە يەروپىيە مەيرىيە يەروپىيە		-50.0 -60.0 -70.0
Off	.000 GHz 1001 pts)	Stop 6 0.0 ms (Sweep 1		3.0 MHz	#VBW	Hz	10 MHz BW 1.0 MH	Start #Res
	IN VALUE	FUNCTI	FUNCTION WIDTH	FUNCTION	γ 0,288 dBm	79 37 GHz	× 5.17	DDE TRC SCL	MKR MO
Properties►					-45.361 dBm	71 72 GHz	3.7	N 1 7	34567
More 1 of 2									8 9 10 11
			STATUS						150

Ch Low 6GHz – 18GHz

Marker		Territe	e: Log-Pwr d: 96/100	Avg 1 Avg H	Run	Trig: Free	GHz	0000000	25.92000	rker 1
Select Marker	DETEMNING	_	199311175	100000	dB	Atten: 30	FGain:Low			
1	.733 dBm	1kr1 -4	N					dBm	Ref 20.00	B/div
10000										
Norma										
Delt	- 27.00 iOm									
		Section 199		i la cinta						
			Star al relation of					and the second	introduction	white
Fixed										
									-	
	s (1001 pts)	33.3 n	Sweep 3			3.0 MHz	#VBV		1.0 MHz	es BW
	ICTION VALUE	R	UNCTION WIDTH	NCTION		Y		×	RC SCL	MODE TR
-					Bm	-41.733 dt	92 GHZ	25		N 1
Properties										
Mor										=:
1 of										



Ch Low 18GHz – 40GHz

Marker 1 38.054000000	00 GHz	SENSE 3NT	Avg Type: Log-Pwr AvgIHeld: 41(100	03:55:43 PM Jin 10, 2013 TRACE	Marker
	IFGain:Low	Atten: 30 dB	Mk	r1 38.054 GHz	Select Marker
10 dB/div Ref 20.00 dBm				-38.532 dBm	Norma
-10.0 -20.0 -30.0 -40.0		contest and the state	a policitation and a policitation of the second states and the sec	-27.00 (Em	Delta
-50.0 -60.0 -70.0					Fixed
Start 26.000 GHz #Res BW 1.0 MHz MKR MODE TRC SCL ×	#VBW 38.054 GHz	3.0 MHz Y Fu 38.532 dBm	Sweep 2	Stop 40.000 GHz 3.3 ms (1001 pts) FUNCTION VALUE	Of
2 3 4 5 6 7					Properties
8 9 10 11					More 1 of 2

Ch Mid 30MHz – 6GHz





Ch Mid 6GHz – 18GHz

arker 1 25.940000000	PNO: Fast C Trig: Fr IFGain:Low Atten:	e Run Avg Type e Run Avg Hold	e: Log-Pwr : 81/100		Peak Search
dB/div Ref 20.00 dBm			Mkr1 -4	25.94 GHz 1.336 dBm	NextPeak
00					Next Pk Right
00 00 00				-27 00 100	Next Pk Left
0.0 0.0 0.0					Marker Delta
tart 6.00 GHz Res BW 1.0 MHz	#VBW 3.0 MH		Sweep 33.3	op 26.00 GHz ms (1001 pts)	Mkr→CF
OR MODE TRC SCL X	25.94 GHz -41.336	FUNCTION FU	INCTION WIDTH	UNCTION VALUE	_
2 3 4 5 6					Mkr→RefLv
7 8 9 9					More 1 of 2

Ch Mid 18GHz – 40GHz

Marker	03:57:19 PM Jan 10, 2013 TRACE	Type: Log-Pwr	eti	Trig: Free Rus	0 GHz	89400000000	Marker 1 3
Select Marker	DET P 24 M M M N	1010.000		Atten: 30 dB	IFGain:Low		
	r1 38.894 GHz -37.796 dBm	Mk				f 20.00 dBm	10 dB/div
Normal							10.0
Delta	1 mar and a start and a start and a start a sta		cromat	ور المراجع الم			30.0 30.0 40.0
FixedD							-50.0 -60.0 -70.0
no	Stop 40.000 GHz 3.3 ms (1001 pts)	Sweep 2		3.0 MHz	#VBW	GHZ MHZ	Start 26.00 #Res BW 1
	FUNCTION VALUE	FUNCTION WIDTH	FUNCT	γ -37.796 dBm	.894 GHz	L X 38	MKR MODE TRC
Properties►							2 3 4 5 6 7
More 1 of 2							8 9 10 11
		STATUS			A	117	150



Ch High 30MHz – 6GHz



Ch High 6GHz – 18GHz

Marker 1 25.7000000	0000 GHz PN0: Fast C	Trig: Free Run	Avg Type: Log-Pwr Avg Hold: 80/100	03:58:31 PM Jan 10, 2013 TRACE 2 2 4 5 TYPE Museum	Peak Search				
Mkr1 25.70 GHz -41.055 dBm									
00 100					Next Pk Righ				
20.0 30.0 40.0				-27.00 item	Next Pk Lef				
50 0 60 0 70.0					Marker Delta				
Start 6.00 GHz #Res BW 1.0 MHz #KR MODE TRC SCL	#VB	W 3.0 MHz -41.055 dBm	SWEED	Stop 25.00 GHz 33.3 ms (1001 pts) FUNCTION VALUE	Mkr→CF				
2 3 4 4 4 5 5 6 5 6 5 6 5 6 5 6 5 6 5 6 5 6					Mkr→RefLv				
8 9 10 11					More 1 of 2				
50			STATU	5					



Ch High 18GHz – 40GHz

						alyzer - Swept SA	eetrum 4	ient Spe
Marker	03:50:56 PM Jan 10, 2013 TRACE	Type: Log-Pwr told: 46/100	Avg	Trig: Free Run	DO GHZ	860000000	1 38	RL Irker
Select Marker	1 38.586 GHz -37.387 dBm	Mk		Atten: 30 dB	IFGain:Low	20.00 dBm	v R	dB/di
Norma								
Delti	1 -27.00 mm	and the second of the second		والمرجع	مندور مرجم		1.1. ¹ .1	0 0
Fixed								0 0
o	Stop 40.000 GHz 3.3 ms (1001 pts)	Sweep 2	PUNCTION	3.0 MHz	#VBI	Hz MHz ×	5.000 W 1.0	es B
Properties				-37.387 dBm	8.586 GHz	25	1	N
Mon 1 of 2								
		STATUS						



802.11n HT40 Mode (Antenna A Port) Ch Low 30MHz – 6GHz

Agilent Spectrum Analyz	zer - Swept SA							
Marker 1 4.047	260000000	GHz	Trig: Free Run	Avg Type Avg Hold	2: Log-Pwr > 100/100	09:49:32 TRA TO	PM 3a100, 2013	Peak Search
10 dB/div Ref 2	0.00 dBm	IFGain:Low	Atten: 30 dB	K-Southa	Mkr	1 4.047 -44.8	26 GHz 19 dBm	Next Peak
10.0								Next Pk Right
0,03 -10.0						1		Next Pk Left
-20.0							-27 05 42%	Marker Delta
-40.0		- يەر ئىرىدىلىرىدى ئارىدى	malalization	aprox 2	in the state of a	mont	ennis	Mkr⊸CF
								Mkr→RefLvi
Start 10 MHz #Res BW 1.0 MH	Iz	#vbw	3.0 MHz		Sweep	Stop (10.0 ms	5.000 GHz (1001 pts)	More 1 of 2
MSG					STATUS	91.		

Ch Low 6GHz – 18GHz

Aarker 1 25.88000000	0000 GHz PN0: Fast C	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold>100/100	09:40:56 PM Jan 00, 2013 TRACE 2 7 4 5 TYPE MUNICIPAL OF THE DET F ANNIN 12	Peak Search
0 dB/div Ref 20.00 dB	m		D	Akr1 25.88 GHz -40.224 dBm	NextPeak
10.0					Next Pk Righ
0.00 10.0					Next Pk Lef
0.0				-27 (k) dys	Marker Delt
an welder have been	Mannashungka	Martin Propagation States	nagasti financerativite, et.m.petinei	Landon Landon Richter Berger	Mkr⊸Cl
D O					Mkr→RefLv
tart 6.00 GHz Res BW 1.0 MHz	#VBW 1	3.0 MHz	Sweep	Stop 26.00 GHz	More 1 of 2
Res BW 1.0 MHz	#VBW :	S.O IMHZ	Sweep	33.3 ms (1001 pts)	



Ch Low 18GHz – 40GHz

Agilent Spectrum Analyzer - Swept :	54				
Marker 1 38.44600000	COOO GHz PNO: Fast	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Held>100/100	09:40:13 PM Jan00, 2013 TRACE 27:4 B TYPE DET BALINISTAN	Peak Search
10 dB/div Ref 20.00 dB	m		MI	kr1 38.446 GHz -35.566 dBm	Next Peak
10.0					Next Pk Right
-10.0					Next Pk Left
-20.0				-27 00 des	Marker Delta
-43.0 - 49.0 - 49.0 - 49.0 - 49.0 - 49.0 - 49.0 - 49.0 - 49.0 - 49.0 - 49.0 - 49.0 - 49.0 - 49.0 - 49.0 - 49.0	مديمانور اوارامي ويعتبرا والمراجد	an a	and and the second s	and the second	Mkr→CF
en 0					Mkr→RefLvi
Start 26.000 GHz #Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep	Stop 40.000 GHz 23.3 ms (1001 pts)	More 1 of 2
MSG			STATUS	11	

Ch High 30MHz – 6GHz





Ch High 6GHz – 18GHz

Agilent Spectrum Analyzer - Swept SA					
Marker 1 25.9600000000	00 GHz PNO: Fast 🖵	Trig: Free Run	Avg Type: Log-Pwr Avg Hold>100/100	TRACE	Peak Search
10 dB/dly Ref 20.00 dBm	IF Gain.Low	Autor. of da	N	1kr1 25.96 GHz -39.957 dBm	Next Peak
10.0					Next Pk Right
-10.0					Next Pk Left
-20.0				-27 (i) atm	Marker Delta
-13.0 -50.0 hour from man alfred and a	andreamin	مىرىيەرايىچەلەردىسلىرىم	galiferniw Wardson pravies	1 	Mkr→CF
an 0					Mkr→RefLvl
Start 6.00 GHz #Res BW 1.0 MHz	#VBW :	3.0 MHz	Sweep	Stop 26.00 GHz 33.3 ms (1001 pts)	More 1 of 2
MBG			STATUS	1	

Ch High 18GHz – 40GHz





802.11n HT40 Mode (Antenna B Port) Ch Low 30MHz – 6GHz

Agilent Spectr	um Analyzer - Swept SA							
Marker 1	4.04726000000	O GHz PNO: Fast 🖵	Trig: Free Run	Avg Typ Avg Hold	e: Log-Pwr i> 100/100	09:49:32 TR/ T	PM 3(4)00, 2013	Peak Search
10 dB/div	Ref 20.00 dBm	IF Gain:Low	Atten: 30 dB		Mkr	1 4.047	26 GHz 319 dBm	Next Peak
10.0								Next Pk Right
0,00 -10.0						1		Next Pk Left
-20.0 -30.0							-27.0b.dtm	Marker Delta
-43.0		الاليد الإرواري والماري	malification	aprox.	1 4. It Revelopment	mul	mmin	Mkr⊸CF
-000	redit Bartward, and areas							Mkr→RefLvl
Start 10 M #Res BW	лнz 1.0 MHz	#VBW	3.0 MHz		Sweep	Stop 10.0 ms	6.000 GHz (1001 pts)	More 1 of 2
MSG					STATUS	9E	18	

Ch Low 6GHz – 18GHz

Aarker 1 25.88000000	0000 GHz PN0: Fast C	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold>100/100	09:40:56 PM Jan 00, 2013 TRACE 2 2 3 4 5 TYPE DET 2 ANN M 1	Peak Search
0 dB/dlv Ref 20.00 dB	m		D	Akr1 25.88 GHz -40.224 dBm	Next Peak
10.0					Next Pk Righ
0.00 10.0					Next Pk Lef
0.0				-27 (i) dys	Marker Delt
an welder have been	Mannashungka	Martin Propagation States	mayorthe storage was	مى بەلىرى بەلەر يەنىيە بەلىرى بەل مەلىرى بەلەر بەل	Mkr⊸Cl
D O					Mkr→RefLv
tart 6.00 GHz Res BW 1.0 MHz	#VBW 1	3.0 MHz	Sweep	Stop 26.00 GHz	More 1 of 2
Res BW 1.0 MHz	#VBW 3	S.O IMHZ	Sweep	33.3 ms (1001 pts)	



Ch Low 18GHz – 40GHz

Agilent Spectrum Analyzer - Swept 5	54				
Marker 1 38.44600000	0000 GHz	Trig: Free Run	Avg Type: Log-Pwr Avg[Hold>100/100	109:40:13 PM Jan00, 2013 TRACE 12:04.0 Type	Peak Search
10 dB/div Ref 20.00 dBr	IFGain:Low	Atten: 30 dB	M	kr1 38.446 GHz -35.566 dBm	Next Peak
10.0					Next Pk Right
-10.0					Next Pk Left
-20.0				-27 (i) dive	Marker Delta
-43.0 48.47 - 48.47 - 44.49 - 44.49 - 44.49 - 44.49 - 44.49 - 44.49 - 44.49 - 44.49 - 44.49 - 44.49 - 44.49 - 44.49	مديماني المراجع المريمية المريمية المستقدمة المستقدمة المستقدمة المستقدمة المستقدمة المستقد المستقد المستقد ال	ger an Egymenter an an Erren State Stat	the physical production of the section	and the second second second	Mkr⊸CF
-80.0					Mkr→RefLv
Start 26.000 GHz #Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep	Stop 40.000 GHz 23.3 ms (1001 pts)	More 1 of 2
MSG			STATUS	11	

Ch High 30MHz – 6GHz





Ch High 6GHz – 18GHz

Agilent Spectrum Analyzer - Swept SA					
Marker 1 25.9600000000	O GHz PNO: Fast 😱	Trig: Free Run	Avg Type: Log-Pwr Avg Hold>100/100	09:51:07 PM Jan00, 2013 TRACE 12:14 5 TYPE North Control 10:00	Peak Search
10 dB/dly Ref 20.00 dBm	IFGain:Low	Atten: 30 dB	N	Akr1 25.96 GHz -39.957 dBm	Next Peak
10.0					Next Pk Right
-10.0					Next Pk Left
-20.0 -20.0				-27.00 dim	Marker Delta
-43.0 -50.0 multerenereneretereneret	marray	مرسوايغوايمهم	addatation of the second s	1 دياسمي الاست المانية عارية حاملا الاست	Mkr⊸CF
#D 0					Mkr→RefLvl
Start 6.00 GHz #Res BW 1.0 MHz	#VBW 3	3.0 MHz	Sweep	Stop 26.00 GHz 33.3 ms (1001 pts)	More 1 of 2
MSG			STATU	si: A	

Ch High 18GHz – 40GHz





11. UNDESIRABLE EMISSION - RADICTED MEASUREMENT

11.1 Standard Applicable According to §15.407(b),

(b) Undesirable Emission Limits: Except as shown in Paragraph (b)(6) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.
- (3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.
- (5) The above emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in Section 15.207.
- (7) The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.
- (8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.



§15.205- RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	(²)
13.36 - 13.41	322 - 335.4		

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.



-68 of 89-

§15.209- RADIATED EMISSION LIMITS: GENERAL REQUIREMENTS

MEASURING DISTANCE OF 3 METER					
FREQUENCY RANGE FIELD STRENGTH FIELD STRENGTH					
(MHz)	(Microvolts/m)	(dBuV/m)			
30-88	100	40			
88-216	150	43.5			
216-960	200	46			
Above 960	500	54			

FCC PART 15.209

11.2 EUT Setup

- 1. The radiated emission tests were performed in the 3 meter open-test site, using the setup in accordance with the ANSI C63.4-1992.
- The EUT was put in the front of the test table. The host PC system was placed on the center of the back edge on the test table. The peripherals like modem, monitor printer, K/B, and mouse were placed on the side of the host PC system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
- 3. The keyboard was placed directly in the front of the monitor, flushed with the front tabletop. The mouse was placed next to the Keyboard, flushed with the back of keyboard.
- 4. The spacing between the peripherals was 10 centimeters.
- 5. External I/O cables were draped along the edge of the test table and bundle when necessary.
- 6. The host PC system was connected with 120Vac/60Hz power source.



11.3 Measurement Procedure

- 1. The EUT was placed on a turn table which is 0.8m above ground plane.
- 2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 6. Repeat above procedures until all frequency measured were complete.

Refer to section E of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02





11.4 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz





11.5 Measurement Equipment Used:

Chamber 14(966)						
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.	
ТҮРЕ		NUMBER	NUMBER	CAL.		
Spectrum Analyzer	Agilent	N9010A	MY49060537	07/17/2012	07/16/2013	
21(26.5GHz)						
Spectrum Analyzer	Agilent	E4443A	MY48250315	05/24/2012	05/23/2013	
20(6.5GHz)						
Spectrum Analyzer	R&S	FSU43	100143	04/25/2012	04/24/2013	
22(43GHz)						
Dipole antenna	SCHWARZBECK	VHAP,30-300	919	11/16/2011	11/15/2013	
Dipole antenna	SCHWARZBECK	UHAP,300-100 0	1195	10/25/2011	10/24/2013	
Loop Antenna9K-30M	A.H.SYSTEM	SAS-564	294	02/28/2011	02/27/2013	
Bilog Antenna30-1G	Schaffner	CBL 6111B	2756	01/13/2013	01/12/2014	
Horn antenna1-18G	COM-POWER	AH118	2011071401	03/01/2012	02/29/2013	
Horn antenna1-18G(06)	EMCO	3117	0006665	10/15/2012	10/14/2013	
Horn antenna26-40G(05)	Com-power	AH-640	100A	01/09/2013	01/08/2015	
Horn antenna18-26G(04)	Com-power	AH-826	081001	05/04/2011	05/03/2013	
Preamplifier9-1000M	HP	8447D	NA	02/10/2012	02/09/2013	
Preamplifier1-18G	MITEQ	AFS44-001018 00-25-10P-44	1329256	07/23/2012	07/22/2013	
Preamplifier1-26G	EM	EM01M26G	NA	02/21/2012	02/202013	
Preamplifier26-40G	MITEQ	JS-26004000-2 7-5A	818471	05/21/2011	05/20/2013	
Cable1-18G	HUBER SUHNER	Sucoflex 106	NA	02/10/2012	02/09/2013	
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	10/08/2012	10/07/2013	
SUCOFLEX 1GHz~40GHz cable	HUBER SUHNER	Sucoflex 102	27963/2&3742 1/2	09/21/2011	09/20/2013	
Signal Generator	R&S	SMU200A	102330	02/07/2012	02/06/2013	
Signal Generator	Anritsu	MG3692A	20311	09/18/2012	09/17/2013	
2.4G Filter	Micro-Tronics	Brm50702	76	12/27/2012	12/26/2013	
5G Filter	Micro-Tronics	Brm50716	005	12/27/2012	12/26/2013	



11.6 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$\mathbf{FS} = \mathbf{RA} + \mathbf{AF} + \mathbf{CL} - \mathbf{AG}$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

11.7 Measurement Result

Refer to attach tabular data sheets.

NOTE:

The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 100kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.


Radiated Spurious Emission Measurement Result (below 1GHz) (worst case)

Operation Mode	802.11n HT40 TX CH Low	Test Date	2013/01/16
Fundamental Frequency	5190MHz	Test By	Dino
Temperature	25	Pol	Ver./Hor
Humidity	65 %		

No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	120.21	51.60	-15.34	36.26	43.50	-7.24	Peak	VERTICAL
2	250.19	51.52	-14.13	37.39	46.00	-8.61	Peak	VERTICAL
3	312.27	54.52	-12.17	42.35	46.00	-3.65	Peak	VERTICAL
4	399.57	50.46	-10.62	39.84	46.00	-6.16	Peak	VERTICAL
5	468.44	49.18	-9.32	39.86	46.00	-6.14	Peak	VERTICAL
6	759.44	40.64	-3.77	36.87	46.00	-9.13	Peak	VERTICAL
1	120.21	55.36	-15.34	40.02	43.50	-3.48	Peak	HORIZONTAL
2	199.75	53.89	-16.48	37.41	43.50	-6.09	Peak	HORIZONTAL
3	312.27	52.33	-12.17	40.16	46.00	-5.84	Peak	HORIZONTAL
4	350.10	52.57	-11.54	41.03	46.00	-4.97	Peak	HORIZONTAL
5	468.44	50.16	-9.32	40.84	46.00	-5.16	Peak	HORIZONTAL
6	749.74	36.18	-3.86	32.32	46.00	-13.68	Peak	HORIZONTAL

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP
- 4 Measurement result within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.



Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	802.11n HT40 TX CH High	Test Date	2013/01/16
Fundamental Frequency	5230MHz	Test By	Dino
Temperature	25	Pol	Ver./Hor
Humidity	65 %		

No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	120.21	54.33	-15.34	38.99	43.50	-4.51	Peak	VERTICAL
2	250.19	50.57	-14.13	36.44	46.00	-9.56	Peak	VERTICAL
3	312.27	54.56	-12.17	42.39	46.00	-3.61	Peak	VERTICAL
4	375.32	52.30	-10.88	41.42	46.00	-4.58	Peak	VERTICAL
5	500.45	49.79	-9.04	40.75	46.00	-5.25	Peak	VERTICAL
6	755.56	41.69	-3.81	37.88	46.00	-8.12	Peak	VERTICAL
1	120.21	54.19	-15.34	38.85	43.50	-4.65	Peak	HORIZONTAL
2	312.27	51.39	-12.17	39.22	46.00	-6.78	Peak	HORIZONTAL
3	399.57	51.72	-10.62	41.10	46.00	-4.90	Peak	HORIZONTAL
4	500.45	49.01	-9.04	39.97	46.00	-6.03	Peak	HORIZONTAL
5	600.36	39.25	-6.74	32.51	46.00	-13.49	Peak	HORIZONTAL
6	749.74	34.97	-3.86	31.11	46.00	-14.89	Peak	HORIZONTAL

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP
- 4 Measurement result within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.



Radiated Spurious Emission Measurement Result (above 1GHz) (worst case)

Operation Mode	802.11n HT40 TX CH Low	Test Date	2013/01/16
Fundamental Frequency	5190MHz	Test By	Dino
Temperature	25	Humidity	60 %

No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	6537.00	35.13	3.02	38.15	74.00	-35.85	Peak	VERTICAL
2	10380.00	27.72	7.01	34.73	74.00	-39.27	Peak	VERTICAL
1	6922.00	37.07	3.93	41.00	74.00	-33.00	Peak	HORIZONTAL
2	10380.00	28.67	7.01	35.68	74.00	-38.32	Peak	HORIZONTAL

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



Radiated Spurious Emission Measurement Result (above 1GHz) (worst case)

Operation Mode	802.11n HT40 TX CH High	Test Date	2013/01/16
Fundamental Frequency	5230MHz	Test By	Dino
Temperature	25	Humidity	60 %

No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	7370.00	33.63	4.55	38.18	74.00	-35.82	Peak	VERTICAL
2	10460.00	26.34	7.13	33.47	74.00	-40.53	Peak	VERTICAL
1	6971.00	36.00	4.04	40.04	74.00	-33.96	Peak	HORIZONTAL
2	10460.00	27.79	7.13	34.92	74.00	-39.08	Peak	HORIZONTAL

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- ² Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



Band Edges test 802.11a mode CH-Low







٦

Radiated Emission: 802.11a mode

Operation Mode Fundamental Frequency Temperature	TX CH Low 5180 MHz 25	J		Test Date Test By Humidity	2013/01/16 Dino 65 %
			0		

No	Freq	Reading	Factor	Level	Limit	Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	5150.00	48.13	-1.27	46.86	74.00	-27.14	Peak	VERTICAL
1	5150.00	47.94	-1.27	46.67	74.00	-27.33	Peak	HORIZONTAL

Operation Mode	TX CH High
Fundamental Frequency	5240MHz
Temperature	25

Test Date2013/01/16Test ByDinoHumidity65 %

No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	5350.00	47.60	-0.75	46.85	74.00	-27.15	Peak	VERTICAL
1	5350.00	46.18	-0.75	45.43	74.00	-28.57	Peak	HORIZONTAL

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- ² Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



802.11n HT20 mode (Antenna A Port) Band Edges Test Data CH-Low

						Smoot SA	Analyzer - S	pectrum	lent S
Peak Search	07:04:56 PM Jan00, 2013	Type: Log-Pwr Held>100/100	A	Trig: Free Run	GHz PNO: Fast	000000	176900	er 1 5	arke
Next Peak	1 5.176 9 GHz 1.035 dBm	Mkr		Atten: 20 dB	IFGain:Low) dBm	Ref 10.00	div	dB/d
Next Pk Righ	Â								9 00 10
Next Pk Lef	Je starter								
Marker Delt		algender-mit W.R		and any poly and an all from a	nantrian tan tan tan	n markenjera	anal-stano	ور م ^{یر} رول م	
Mkr→Cl	Stop 5.2000 GHz 40 ms (1001 pts)	Sweep 7.		1.0 MHz	#VBW) GHz 00 kHz	4.500 BW 3	art 4 tes l
	FUNCTION VALUE	FUNCTION WIDTH	FUNCTION	1.035 dBm	76 9 GHz	×	SEL.	DE TRC	R MOI
Mkr→RefLv				52.191 dbm	100 0 GHZ				
More 1 of 3									
		STATUS							





802.11n HT20 mode (Antenna B Port) Band Edges Test Data CH-Low

ilent Spectrum Analyzer - Swept SA						
arker 2 5.150000000000	GHz	Trig: Free Run	Avg	Type: Log-Pwr Held:>100/100	07:00:20 PM Jan 00, 2013 TRACE 12:24 S TYPE 24	Marker
	IFGain:Low	Atten: 20 dB	10000	WARE STOLEN. ()	DET CANNING	Select Marker
dB/div Ref 10.00 dBm				Mkr	2 5.150 0 GHz -48.410 dBm	2
99 00 0.0					ń	Norma
10 58 59					-77 fo ally	Delta
10 Julionen andre service and a service of the serv	ang ang dina sa	والعود والمعروبين	metal-according	anna daharikan karanta	-Inononan bet	Fixed
art 4.5000 GHz tes BW 300 kHz	#VBW	1.0 MHz		Sweep 7	Stop 5.2000 GHz .40 ms (1001 pts)	or
R MODE TRC SCL X	183 9 GHz	γ 2.003 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	
N 1 r 5.	150 0 GHZ	-48.410 dBm				Properties
						More 1 of 2
	10			STATUS		





Radiated Emission: 802.11n HT20 mode, Antenna A+B

Operation Mode	TX CH Low	Test Date	2013/01/16
Fundamental Frequency	5180 MHz	Test By	Dino
Temperature	25	Humidity	65 %

No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	5150.00	48.21	-1.27	46.94	74.00	-27.06	Peak	VERTICAL
1	5150.00	48.22	-1.27	46.95	74.00	-27.05	Peak	HORIZONTAL

Operation Mode	TX CH High
Fundamental Frequency	5240MHz
Temperature	25

Test Date2013/01/16Test ByDinoHumidity65 %

No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	5350.00	46.99	-0.75	46.24	74.00	-27.76	Peak	VERTICAL
1	5350.00	46.49	-0.75	45.74	74.00	-28.26	Peak	HORIZONTAL

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- ² Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



802.11n HT40 mode (Antenna A Port) Band Edges Test Data CH-Low

ient Spectrum Analyzer - Swept SA	2					
arker 2 5.1500000000	00 GHz	Trig: Free Run	Avg	Type: Log-Pwr Hold>100/100	107:06:07 PM Je100, 2013	Marker
	IFGain:Low	Atten: 20 dB			DET E MAINING	Select Marker
dB/div. Ref 10.00 dBm	i.			Mkr	2 5.150 0 GHz -49.716 dBm	2
					4	Norm
φ φ					-77 do atleve	Delt
0 0 0		and an	مىملولى <u>مەرىسە</u>	al an	and the second sec	Fixed
art 4.5000 GHz es BW 300 kHz	#VBI	N 1.0 MHz		Sweep 7	Stop 5.2000 GHz .40 ms (1001 pts)	0
R MODE TRC SCL X	5 196 0 GHz	γ 3 799 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	
Ñ I F	5.150 0 GHz	49.716 dBm				Properties
						Mor 1 of
				STATUS		





802.11n HT40 mode (Antenna B Port) Band Edges Test Data CH-Low

ilent Spectrum Analyzer - Swept SA				
arker 2 5.15000000000	GHz	Avg Type: Log-Pwr AvgHold>100/100	107:07:35 PM Jan00, 2013	Marker
	IFGain:Low Atten: 20 dB	and the second s	DET E ANNINN	Select Marker
dB/div Ref 10.00 dBm		Mkr	2 5.150 0 GHz -38.714 dBm	2
0.0			μ.	Norma
0.0			20 mm	Delta
10 10 10 10 10	nyy gina dibung talah panga bahan satalah panghan dibung	وموجعهم ويسرقهم والمحموط ومكسا والم	Careford Marine	Fixed
art 4.5000 GHz tes BW 300 kHz	#VBW 1.0 MHz	Sweep 7	Stop 5.2000 GHz .40 ms (1001 pts)	no
R MODE TRC SCL X	7 1951 GHz -0.549 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	
N 1 f 5.	150 0 GHz -38.714 dBm			Properties
				More 1 of 2
2	le de la companya de	STATUS		





Radiated Emission: 802.11n HT40 mode, Antenna A+B

Operation Mode	TX CH Low	Test Date	2013/01/16
Fundamental Frequency	5190 MHz	Test By	Dino
Temperature	25	Humidity	65 %

No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	5150.00	47.58	-1.27	46.31	74.00	-27.69	Peak	VERTICAL
1	5150.00	51.75	-1.27	50.48	74.00	-23.52	Peak	HORIZONTAL

Operation Mode	TX CH High
Fundamental Frequency	5230MHz
Temperature	25

Test Date2013/01/16Test ByDinoHumidity65 %

No	Freq	Reading	Factor	Level	Limit	Over Limit	Remark	Pol
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
1	5350.00	46.84	-0.75	46.09	74.00	-27.91	Peak	VERTICAL
1	5350.00	47.90	-0.75	47.15	74.00	-26.85	Peak	HORIZONTAL

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- ² Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



12. TRANSMISSION IN THE ABSENCE OF DATA

12.1 Standard Applicable

According to §15.407(c)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signalling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

12.2 Result:

No non-compliance noted: Refer to the theory of operation.



13. FREQUENCY STABILITY

13.1 Standard Applicable

According to §15.407 (g) Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

13.2 Result:

No non-compliance noted: ±20ppm ppm was defined in product specification.



14. ANTENNA REQUIREMENT

14.1 Standard Applicable

According to §15.203, Antenna requirement.

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. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

14.2 Antenna Connected Construction

The directional gins of antenna used for transmitting please refer to below table, and the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

	0					
	Manufacturer	Model No.	Connector Type	Туре	Gain (2.4GHz)	Gain (5GHz)
Ant 1	Airwave Technolo- gies INC.	EDA-8709-25GR2-A4-RM	Revise SMA, unique	Dipole Ant	2 dBi	2 dBi
Ant 2	ARISTRTLE	RFA-25-C2S1-70-90	unique	Dipole Ant	2 dBi	2 dBi
Ant 3	Tranwo technology corp.	SD001-201003-A101	Revise SMA, unique	Dipole Ant	2dBi	2 dBi
Ant 3-1	Tranwo technology corp.	RFA-05-2-L14M3-B70-1	Revise SMA, unique	Dipole Ant	2dBi	2 dBi
Ant 3-2	Tranwo technology corp.	202-000442-00	unique	Patch Ant	0 dBi	-1 dBi
Ant 3-3	Tranwo technology corp.	202-000441-00	unique	Patch Ant	0.5 dBi	-0.5 dBi
Ant 4	UDM Group Tech- nology Co., Ltd	26-52-01800G	unique	PCB Ant (Green)	2.5 dBi	4 dBi
Ant 5	Unictron Technolo- gies Corporation	H2P566WKBA0100	unique	PCB Ant (Blue)	2.3 dBi	4dBi

Antenna Designation:



15. Maximum Permissible Exposure (MPE)

15.1 Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range	Electric Field	Magnetic Field	Power Density	Averaging Time	
(MHz)	Strength (V/m)	Strength (A/m)	(mW/cm^2)	(minute)	
Limits for General Population/Uncontrolled Exposure					
0.3-1.34	614	1.63	*(100)	30	
1.34-30	824/f	2.19/f	*(180/f ²)	30	
30-300	27.5	0.073	0.2	30	
300-1500	/	/	F/1500	30	
1500-15000	/	/	1.0	30	

F =frequency in MHz

* = Plane-wave equipment power density



15.2 Maximum Permissible Exposure (MPE) Evaluation

MPE Prediction (802.11n HT40) (worst case)

Power measurement:

			Output Chain (dBm)		Combine		
Mode	Freq(MHz)	channel	Chain A	chain B	Peak Output Power (dBm)	Limit(dBm)	Result
N UT40	5190	38	8.02	7.81	10.93	16.98	Pass
IN H140	5230	46	7.59	7.33	10.47	16.98	Pass

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

S=PG/4 R^2

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	10.93	(dBm)
Maximum peak output power at antenna input terminal:	12.38796587	(mW)
Duty cycle:	100	(%)
Maximum Pav :	12.38796587	(mW)
Antenna gain (typical):	4	(dBi)
Maximum antenna gain:	2.511886432	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5190	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.0061937	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.00619 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 5190MHz.