



FCC RF Test Report

APPLICANT : Tabletop Media, LLC d/b/a Ziosk
EQUIPMENT : Ziosk Aurizon
BRAND NAME : Ziosk
MODEL NAME : Z500
FCC ID : XOX-Z500
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Jan. 10, 2020 and testing was completed on Mar. 14, 2020. We, Sporton International (ShenZhen) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (ShenZhen) Inc., the test report shall not be reproduced except in full.

Reviewed by: Derreck Chen / Supervisor

Approved by: Eric Shih / Manager



Sporton International (ShenZhen) Inc.

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People's Republic of China



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR011014C	Rev. 01	Initial issue of report	Mar. 25, 2020

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(b)	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.2	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.31 dB at 2483.520 MHz
3.3	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.



1 General Description

1.1 Applicant

Tabletop Media, LLC d/b/a Ziosk
12404 Park Central Dr, Suite 350, Dallas, TX 75251

1.2 Manufacturer

SMTC de Chihuahua SA. DE C.V.
Washington 3701 building 20. Parque Industrial Las Americas, Chihuahua, Chih. 31200

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Ziosk Aurizon
Brand Name	Ziosk
Model Name	Z500
FCC ID	XOX-Z500
EUT supports Radios application	NFC WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
HW Version	5.1.R
SW Version	Android 5.1.1
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. This is a variant report for Z500. The change note could be referred to the product equality declaration which is exhibit separately. Based on the similarity between current and previous project, only the related test cases from original test report (Sporton Report Number FR820812C) were verified for the differences.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification			
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz		
Maximum (Peak) Output Power to antenna	802.11b : 22.30 dBm (0.1698 W) 802.11g : 22.00 dBm (0.1585 W) MIMO <Ant. 1 + 2> 802.11n HT20 : 25.19 dBm (0.3304 W) 802.11n HT40 : 23.20 dBm (0.2089 W)		
Antenna Type / Gain	Ant. 1: PIFA Antenna with gain 2.21 dBi Ant. 2: PIFA Antenna with gain 1.51 dBi		
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)		
Antenna Function		Ant. 1	Ant. 2
	802.11b/g/n SISO	V	V
	802.11n MIMO	V	

1.5 Modification of EUT

No modifications are made to the EUT during all test items.



1.6 Testing Location

Sporton International (Shenzhen) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International (Shenzhen) Inc.		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	TH01-SZ	CN1256	421272

Test Firm	Sporton International (Shenzhen) Inc.		
Test Site Location	No. 3 Bldg the third floor of south, Shahe River west, Fengzeyuan Warehouse, Nanshan Shenzhen, 518055 People's Republic of China TEL: +86-755-33202398		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	03CH02-SZ	CN1256	421272

1.7 Test Software

Item	Site	Manufacture	Name	Version
1.	03CH02-SZ	AUDIX	E3	6.2009-8-24a



1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 15 Subpart C §15.247
- ♦ FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		



2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

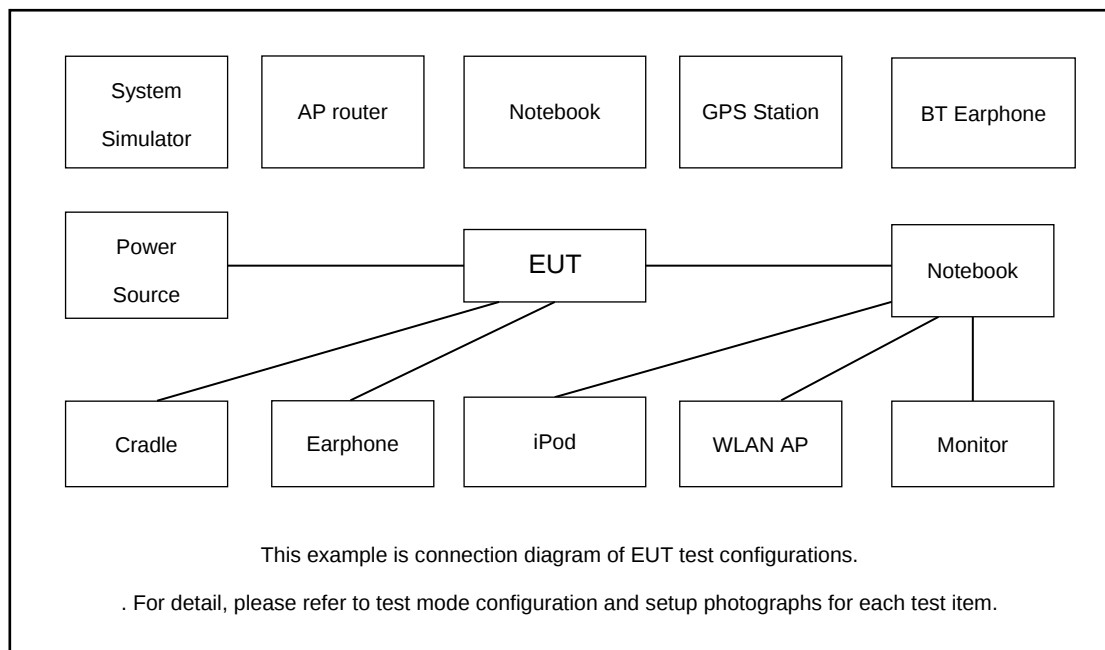
Single Antenna

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps

MIMO Antenna

Modulation	Data Rate
802.11n HT20	MCS0
802.11n HT40	MCS0

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	BT Base Station	Anritus	8852B	N/A	N/A	Unshielded,1.8m

2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuous transmit/receive.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

3 Test Result

3.1 Output Power Measurement

3.1.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna with directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

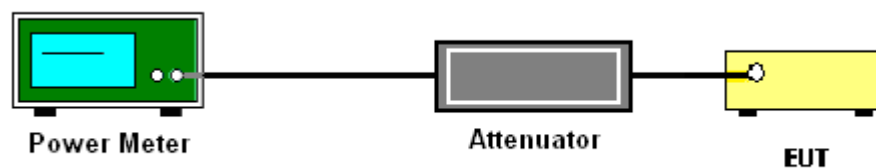
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1 Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.2 Method AVGPM-G method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.
5. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

3.1.4 Test Setup



3.1.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.1.6 Test Result of Average output Power (Reporting Only)

Please refer to Appendix A.

3.2 Radiated Band Edges and Spurious Emission Measurement

3.2.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/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

3.2.2 Measuring Instruments

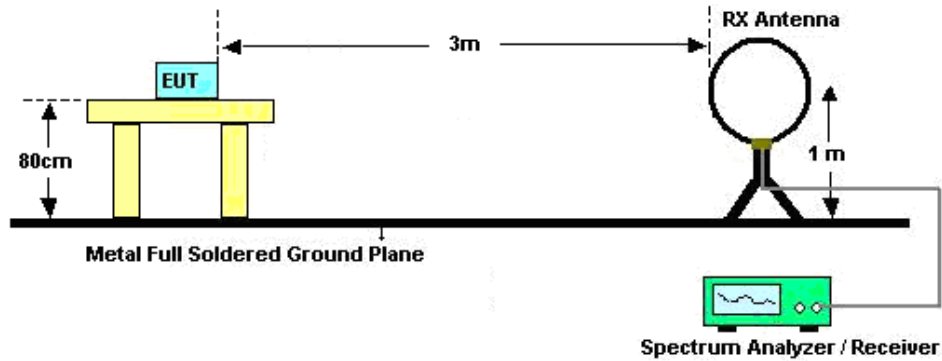
The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

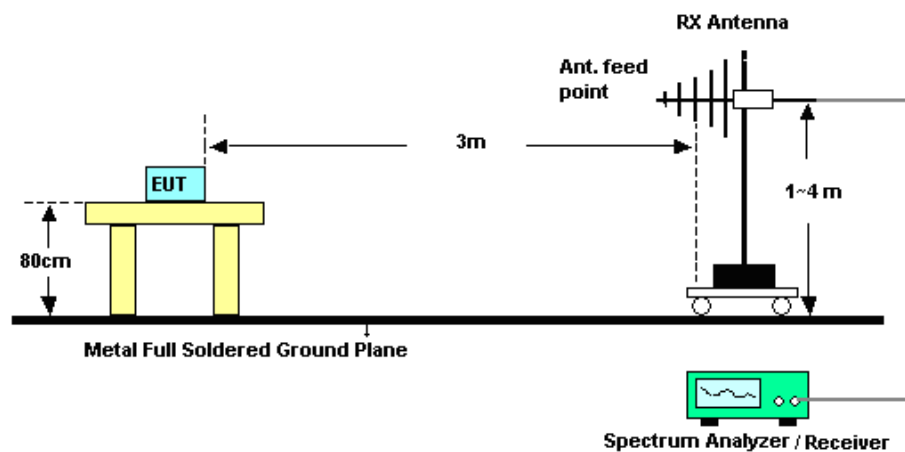
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.
For average measurement:
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.2.4 Test Setup

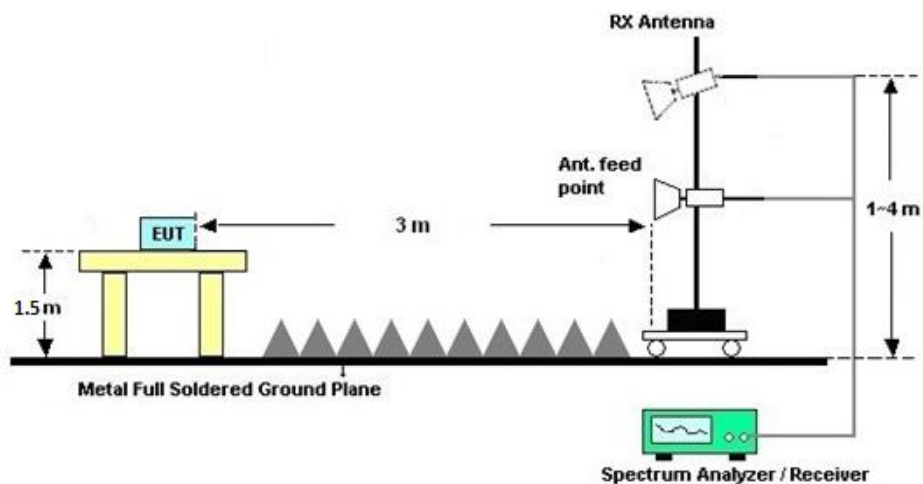
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





3.2.5 Test Results of Radiated Spurious Emissions (9kHz ~ 30MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B.

3.2.7 Duty Cycle

Please refer to Appendix C.

3.2.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix B.

3.3 Antenna Requirements

3.3.1 Standard Applicable

If directional gain of transmitting Antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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 rule.

3.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.3.3 Antenna Gain

<CDD Modes >

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

For power spectral density (PSD) measurements on all devices,

Array Gain = $10 \log(N_{ANT}/N_{SS}=1)$ dB.

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$.

Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain;

The EUT supports CDD mode.

For power, the directional gain G_{ANT} is set equal to the antenna having the highest gain, i.e., F)2)f)i).

For PSD, the directional gain calculation is following F)2)f)ii) of KDB 662911 D01 v02r01.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain "DG" is calculated as following table.

<CDD Modes>						
			DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
	Ant. 1 (dBi)	Ant. 2 (dBi)				
2.4 GHz	2.21	1.51	2.21	4.88	0.00	0.00

$Power\ Limit\ Reduction = DG(Power) - 6dBi, (min = 0)$

$PSD\ Limit\ Reduction = DG(PSD) - 6dBi, (min = 0)$



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Nov. 02, 2019	Feb. 28, 2020	Nov. 01, 2020	Conducted (TH01-KS)
Pulse Power Sensor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 13, 2020	Feb. 28, 2020	Jan. 12, 2021	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 13, 2020	Feb. 28, 2020	Jan. 12, 2021	Conducted (TH01-KS)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Apr. 19, 2019	Mar. 07, 2020~Mar. 14, 2020	Apr. 18, 2020	Radiation (03CH02-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 29, 2018	Mar. 07, 2020~Mar. 14, 2020	May 28, 2020	Radiation (03CH02-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz~2GHz	Jul. 19, 2019	Mar. 07, 2020~Mar. 14, 2020	Jul. 18, 2020	Radiation (03CH02-SZ)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00119436	1GHz~18GHz	Aug. 27, 2019	Mar. 07, 2020~Mar. 14, 2020	Aug. 26, 2020	Radiation (03CH02-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 22, 2019	Mar. 07, 2020~Mar. 14, 2020	Jul. 21, 2020	Radiation (03CH02-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18GHz~40GHz	Apr. 18, 2019	Mar. 07, 2020~Mar. 14, 2020	Apr. 17, 2020	Radiation (03CH02-SZ)
LF Amplifier	Burgeon	BPA-530	102211	0.01~3000Mhz	Oct. 18, 2019	Mar. 07, 2020~Mar. 14, 2020	Oct. 17, 2020	Radiation (03CH02-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 18, 2019	Mar. 07, 2020~Mar. 14, 2020	Oct. 17, 2020	Radiation (03CH02-SZ)
HF Amplifier	KEYSIGHT	83017A	MY53270105	0.5GHz~26.5GHz	Oct. 18, 2019	Mar. 07, 2020~Mar. 14, 2020	Oct. 17, 2020	Radiation (03CH02-SZ)
AC Power Source	Chroma	61601	616010002470	N/A	NCR	Mar. 07, 2020~Mar. 14, 2020	NCR	Radiation (03CH02-SZ)
Turn Table	Chaintek	T-200	N/A	0~360 degree	NCR	Mar. 07, 2020~Mar. 14, 2020	NCR	Radiation (03CH02-SZ)
Antenna Mast	Chaintek	MBS-400	N/A	1 m~4 m	NCR	Mar. 07, 2020~Mar. 14, 2020	NCR	Radiation (03CH02-SZ)

NCR: No Calibration Required

5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage $K=2$ to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.0 dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.0 dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.4 dB
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Appendix A. Conducted Test Results

Test Engineer:	Sam zhang	Temperature:	21~25	°C
Test Date:	2020/2/28	Relative Humidity:	51~54	%

TEST RESULTS DATA
Peak Output Power

2.4GHz Band																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	
11b	1Mbps	1	1	2412	21.11	20.95		30.00	30.00	2.21	1.51	23.32	22.46	36.00	36.00	Pass
11b	1Mbps	1	6	2437	22.13	22.30		30.00	30.00	2.21	1.51	24.34	23.81	36.00	36.00	Pass
11b	1Mbps	1	11	2462	20.96	20.81		30.00	30.00	2.21	1.51	23.17	22.32	36.00	36.00	Pass
11g	6Mbps	1	1	2412	21.87	21.75		30.00	30.00	2.21	1.51	24.08	23.26	36.00	36.00	Pass
11g	6Mbps	1	6	2437	21.90	22.00		30.00	30.00	2.21	1.51	24.11	23.51	36.00	36.00	Pass
11g	6Mbps	1	11	2462	21.61	21.87		30.00	30.00	2.21	1.51	23.82	23.38	36.00	36.00	Pass
HT20	MCS0	2	1	2412	18.83	19.10	21.98	30.00		2.21		24.19		36.00		Pass
HT20	MCS0	2	6	2437	22.15	22.21	25.19	30.00		2.21		27.40		36.00		Pass
HT20	MCS0	2	11	2462	19.44	19.82	22.64	30.00		2.21		24.85		36.00		Pass
HT40	MCS0	2	3	2422	17.56	17.95	20.77	30.00		2.21		22.98		36.00		Pass
HT40	MCS0	2	6	2437	20.13	20.24	23.20	30.00		2.21		25.41		36.00		Pass
HT40	MCS0	2	9	2452	15.50	15.62	18.57	30.00		2.21		20.78		36.00		Pass

Note: Measured power (dBm) has offset with cable loss.

TEST RESULTS DATA
Average Output Power

2.4GHz Band									
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)		
					Ant 1	Ant 2	Ant 1	Ant 2	SUM
11b	1Mbps	1	1	2412	0.08	0.08	18.38	18.37	
11b	1Mbps	1	6	2437	0.08	0.08	19.81	19.77	
11b	1Mbps	1	11	2462	0.08	0.08	18.26	18.21	
11g	6Mbps	1	1	2412	0.10	0.08	16.75	16.87	
11g	6Mbps	1	6	2437	0.10	0.08	16.92	17.11	
11g	6Mbps	1	11	2462	0.10	0.08	16.66	16.83	
HT20	MCS0	2	1	2412	0.12	0.12	13.77	13.98	16.88
HT20	MCS0	2	6	2437	0.12	0.12	17.25	17.39	20.33
HT20	MCS0	2	11	2462	0.12	0.12	14.46	14.75	17.61
HT40	MCS0	2	3	2422	0.10	0.10	13.57	13.77	16.68
HT40	MCS0	2	6	2437	0.10	0.10	16.31	16.42	19.38
HT40	MCS0	2	9	2452	0.10	0.10	11.50	11.65	14.59

Note: Measured power (dBm) has offset with cable loss.



Appendix B. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2388.33	49.8	-24.2	74	47.36	27.7	7.54	32.8	112	1	P	H
		2390	42.79	-11.21	54	40.33	27.7	7.54	32.78	112	1	A	H
	*	2412	105.03	-	-	102.6	27.67	7.54	32.78	112	1	P	H
	*	2412	101.62	-	-	99.19	27.67	7.54	32.78	112	1	A	H
		2332.05	47.59	-26.41	74	45.02	27.93	7.48	32.84	275	50	P	V
		2387.49	37.6	-16.4	54	35.16	27.7	7.54	32.8	275	50	A	V
	*	2412	98.24	-	-	95.81	27.67	7.54	32.78	275	50	P	V
	*	2412	95.97	-	-	93.54	27.67	7.54	32.78	275	50	A	V
802.11b CH 06 2437MHz		2324.56	47.84	-26.16	74	45.27	27.93	7.48	32.84	136	3	P	H
		2389.94	37.7	-16.3	54	35.24	27.7	7.54	32.78	136	3	A	H
	*	2437	106.74	-	-	104.36	27.6	7.54	32.76	136	3	P	H
	*	2437	103.11	-	-	100.73	27.6	7.54	32.76	136	3	A	H
		2483.55	50.06	-23.94	74	47.78	27.47	7.53	32.72	136	3	P	H
		2483.5	41.61	-12.39	54	39.33	27.47	7.53	32.72	136	3	A	H
		2352.28	47.66	-26.34	74	45.14	27.83	7.51	32.82	277	51	P	V
		2389.94	36.89	-17.11	54	34.43	27.7	7.54	32.78	277	51	A	V
	*	2437	100.61	-	-	98.23	27.6	7.54	32.76	277	51	P	V
	*	2437	97.94	-	-	95.56	27.6	7.54	32.76	277	51	A	V
		2486.84	48.6	-25.4	74	46.32	27.47	7.53	32.72	277	51	P	V
		2485.02	38.41	-15.59	54	36.13	27.47	7.53	32.72	277	51	A	V



802.11b CH 11 2462MHz	*	2462	105.42	-	-	103.09	27.53	7.54	32.74	128	2	P	H
	*	2462	102.17	-	-	99.84	27.53	7.54	32.74	128	2	A	H
		2483.52	55.46	-18.54	74	53.18	27.47	7.53	32.72	128	2	P	H
		2483.52	50.69	-3.31	54	48.41	27.47	7.53	32.72	128	2	A	H
	*	2462	100.38	-	-	98.05	27.53	7.54	32.74	255	53	P	V
	*	2462	98.14	-	-	95.81	27.53	7.54	32.74	255	53	A	V
		2483.84	52.3	-21.7	74	50.02	27.47	7.53	32.72	255	53	P	V
		2483.52	45.62	-8.38	54	43.34	27.47	7.53	32.72	255	53	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		4824	40.1	-33.9	74	53.46	31.15	9.86	54.37	189	153	P	H
		4824	39.62	-34.38	74	52.98	31.15	9.86	54.37	185	255	P	V
802.11b CH 06 2437MHz		4874	38.68	-35.32	74	52.02	31.13	9.88	54.35	189	156	P	H
		7311	43.78	-30.22	74	50.01	36.4	11.88	54.51	145	198	P	H
		4874	39.06	-34.94	74	52.4	31.13	9.88	54.35	165	106	P	V
		7311	43.21	-30.79	74	49.44	36.4	11.88	54.51	174	100	P	V
802.11b CH 11 2462MHz		4924	38.02	-35.98	74	51.21	31.23	9.91	54.33	150	285	P	H
		7386	43.62	-30.38	74	49.91	36.3	12.01	54.6	155	274	P	H
		4924	37.57	-36.43	74	50.76	31.23	9.91	54.33	142	85	P	V
		7386	43.94	-30.06	74	50.23	36.3	12.01	54.6	178	145	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz
WIFI 802.11g (Band Edge @ 3m)

WIFI Ant. 2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		2390	60.26	-13.74	74	57.8	27.7	7.54	32.78	120	355	P	H
		2390	46.01	-7.99	54	43.55	27.7	7.54	32.78	120	355	A	H
	*	2412	107.08	-	-	104.65	27.67	7.54	32.78	120	355	P	H
	*	2412	99.78	-	-	97.35	27.67	7.54	32.78	120	355	A	H
		2389.905	49.98	-24.02	74	47.52	27.7	7.54	32.78	290	48	P	V
		2390	38.87	-15.13	54	36.41	27.7	7.54	32.78	290	48	A	V
	*	2412	99.04	-	-	96.61	27.67	7.54	32.78	290	48	P	V
	*	2412	92.29	-	-	89.86	27.67	7.54	32.78	290	48	A	V
802.11g CH 06 2437MHz		2389.38	49.38	-24.62	74	46.94	27.7	7.54	32.8	107	356	P	H
		2389.94	37.7	-16.3	54	35.24	27.7	7.54	32.78	107	356	A	H
	*	2437	107.94	-	-	105.56	27.6	7.54	32.76	107	356	P	H
	*	2437	100.2	-	-	97.82	27.6	7.54	32.76	107	356	A	H
		2484.95	54.43	-19.57	74	52.15	27.47	7.53	32.72	107	356	P	H
		2485.51	39.86	-14.14	54	37.58	27.47	7.53	32.72	107	356	A	H
		2354.8	47.23	-26.77	74	44.71	27.83	7.51	32.82	316	66	P	V
		2340.66	36.63	-17.37	54	34.07	27.9	7.48	32.82	316	66	A	V
	*	2437	100.66	-	-	98.28	27.6	7.54	32.76	316	66	P	V
	*	2437	93.88	-	-	91.5	27.6	7.54	32.76	316	66	A	V
		2485.72	49.15	-24.85	74	46.87	27.47	7.53	32.72	316	66	P	V
		2484.32	37.52	-16.48	54	35.24	27.47	7.53	32.72	316	66	A	V



802.11g CH 11 2462MHz	*	2462	107.39	-	-	105.06	27.53	7.54	32.74	104	355	P	H
	*	2462	100.36	-	-	98.03	27.53	7.54	32.74	104	355	A	H
		2484.12	61	-13	74	58.72	27.47	7.53	32.72	104	355	P	H
		2483.52	48.19	-5.81	54	45.91	27.47	7.53	32.72	104	355	A	H
	*	2462	100.07	-	-	97.74	27.53	7.54	32.74	328	274	P	V
	*	2462	93.39	-	-	91.06	27.53	7.54	32.74	328	274	A	V
		2484.68	53.06	-20.94	74	50.78	27.47	7.53	32.72	328	274	P	V
		2483.52	41.64	-12.36	54	39.36	27.47	7.53	32.72	328	274	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

WIFI Ant. 2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		4824	39.5	-34.5	74	52.86	31.15	9.86	54.37	185	255	P	H
		4824	39.37	-34.63	74	52.73	31.15	9.86	54.37	189	153	P	V
802.11g CH 06 2437MHz		4874	39.6	-34.4	74	52.94	31.13	9.88	54.35	196	163	P	H
		7311	43.12	-30.88	74	49.35	36.4	11.88	54.51	193	191	P	H
		4874	39.12	-34.88	74	52.46	31.13	9.88	54.35	165	106	P	V
		7311	44.03	-29.97	74	50.26	36.4	11.88	54.51	174	100	P	V
802.11g CH 11 2462MHz		4924	37.23	-36.77	74	50.42	31.23	9.91	54.33	142	85	P	H
		7386	43.61	-30.39	74	49.9	36.3	12.01	54.6	178	145	P	H
		4924	37.17	-36.83	74	50.36	31.23	9.91	54.33	150	285	P	V
		7386	42.67	-31.33	74	48.96	36.3	12.01	54.6	155	274	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 01 2412MHz		2389.905	55.7	-18.3	74	53.24	27.7	7.54	32.78	106	36	P	H
		2389.905	45.77	-8.23	54	43.31	27.7	7.54	32.78	106	36	A	H
	*	2412	107.11	-	-	104.68	27.67	7.54	32.78	106	36	P	H
	*	2412	100.06	-	-	97.63	27.67	7.54	32.78	106	36	A	H
		2388.96	53.66	-20.34	74	51.22	27.7	7.54	32.8	269	48	P	V
		2389.905	41.86	-12.14	54	39.4	27.7	7.54	32.78	269	48	A	V
	*	2412	101.14	-	-	98.71	27.67	7.54	32.78	269	48	P	V
	*	2412	94.31	-	-	91.88	27.67	7.54	32.78	269	48	A	V
802.11n HT20 CH 06 2437MHz		2389.52	53.44	-20.56	74	51	27.7	7.54	32.8	105	2	P	H
		2389.66	40.5	-13.5	54	38.06	27.7	7.54	32.8	105	2	A	H
	*	2437	111.42	-	-	109.04	27.6	7.54	32.76	105	2	P	H
	*	2437	104.27	-	-	101.89	27.6	7.54	32.76	105	2	A	H
		2483.69	60.12	-13.88	74	57.84	27.47	7.53	32.72	105	2	P	H
		2484.81	43.85	-10.15	54	41.57	27.47	7.53	32.72	105	2	A	H
		2388.54	47.66	-26.34	74	45.22	27.7	7.54	32.8	328	272	P	V
		2389.66	37.7	-16.3	54	35.26	27.7	7.54	32.8	328	272	A	V
	*	2437	103.59	-	-	101.21	27.6	7.54	32.76	328	272	P	V
	*	2437	96.9	-	-	94.52	27.6	7.54	32.76	328	272	A	V
		2483.69	48.96	-25.04	74	46.68	27.47	7.53	32.72	328	272	P	V
		2484.39	39.17	-14.83	54	36.89	27.47	7.53	32.72	328	272	A	V



802.11n HT20 CH 11 2462MHz	*	2462	107.78	-	-	105.45	27.53	7.54	32.74	112	37	P	H
	*	2462	100.96	-	-	98.63	27.53	7.54	32.74	112	37	A	H
		2483.64	58.5	-15.5	74	56.22	27.47	7.53	32.72	112	37	P	H
		2483.52	46.96	-7.04	54	44.68	27.47	7.53	32.72	112	37	A	H
	*	2462	102.56	-	-	100.23	27.53	7.54	32.74	320	64	P	V
	*	2462	95.6	-	-	93.27	27.53	7.54	32.74	320	64	A	V
		2483.88	56.98	-17.02	74	54.7	27.47	7.53	32.72	320	64	P	V
		2483.8	44.29	-9.71	54	42.01	27.47	7.53	32.72	320	64	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz
WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 01 2412MHz		4824	40.85	-33.15	74	54.21	31.15	9.86	54.37	136	299	P	H
		4824	41.01	-32.99	74	54.37	31.15	9.86	54.37	189	153	P	V
802.11n HT20 CH 06 2437MHz		4874	39.4	-34.6	74	52.74	31.13	9.88	54.35	165	106	P	H
		7311	44.14	-29.86	74	50.37	36.4	11.88	54.51	174	100	P	H
		4874	37.94	-36.06	74	51.28	31.13	9.88	54.35	196	163	P	V
		7311	43.29	-30.71	74	49.52	36.4	11.88	54.51	193	191	P	V
802.11n HT20 CH 11 2462MHz		4924	37.8	-36.2	74	50.99	31.23	9.91	54.33	150	285	P	H
		7386	42.73	-31.27	74	49.02	36.3	12.01	54.6	155	274	P	H
		4924	37.31	-36.69	74	50.5	31.23	9.91	54.33	142	85	P	V
		7386	42.91	-31.09	74	49.2	36.3	12.01	54.6	178	145	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 03 2422MHz		2389.94	51.57	-22.43	74	49.11	27.7	7.54	32.78	115	38	P	H
		2389.8	42.7	-11.3	54	40.24	27.7	7.54	32.78	115	38	A	H
	*	2422	104.31	-	-	101.9	27.63	7.54	32.76	115	38	P	H
	*	2422	95.7	-	-	93.29	27.63	7.54	32.76	115	38	A	H
		2484.18	48.46	-25.54	74	46.18	27.47	7.53	32.72	115	38	P	H
		2484.46	39.33	-14.67	54	37.05	27.47	7.53	32.72	115	38	A	H
		2389.94	50.23	-23.77	74	47.77	27.7	7.54	32.78	270	52	P	V
		2389.94	41.92	-12.08	54	39.46	27.7	7.54	32.78	270	52	A	V
	*	2422	100.62	-	-	98.21	27.63	7.54	32.76	270	52	P	V
	*	2422	92.79	-	-	90.38	27.63	7.54	32.76	270	52	A	V
		2486.07	49.81	-24.19	74	47.53	27.47	7.53	32.72	270	52	P	V
		2485.09	40.08	-13.92	54	37.8	27.47	7.53	32.72	270	52	A	V
802.11n HT40 CH 06 2437MHz		2389.52	55.75	-18.25	74	53.31	27.7	7.54	32.8	107	0	P	H
		2389.94	46.03	-7.97	54	43.57	27.7	7.54	32.78	107	0	A	H
	*	2437	108.18	-	-	105.8	27.6	7.54	32.76	107	0	P	H
	*	2437	100.65	-	-	98.27	27.6	7.54	32.76	107	0	A	H
		2485.02	60.02	-13.98	74	57.74	27.47	7.53	32.72	107	0	P	H
		2483.9	49.21	-4.79	54	46.93	27.47	7.53	32.72	107	0	A	H
		2389.8	48	-26	74	45.54	27.7	7.54	32.78	286	270	P	V
		2389.94	38.58	-15.42	54	36.12	27.7	7.54	32.78	286	270	A	V
	*	2437	100.01	-	-	97.63	27.6	7.54	32.76	286	270	P	V
	*	2437	92.53	-	-	90.15	27.6	7.54	32.76	286	270	A	V
		2484.6	54.32	-19.68	74	52.04	27.47	7.53	32.72	286	270	P	V
		2483.5	44.06	-9.94	54	41.78	27.47	7.53	32.72	286	270	A	V



802.11n HT40 CH 09 2452MHz		2365.3	47.48	-26.52	74	44.94	27.83	7.51	32.8	114	39	P	H
		2389.38	38.12	-15.88	54	35.68	27.7	7.54	32.8	114	39	A	H
	*	2452	99.83	-	-	97.43	27.6	7.54	32.74	114	39	P	H
	*	2452	92.77	-	-	90.37	27.6	7.54	32.74	114	39	A	H
		2483.62	53.62	-20.38	74	51.34	27.47	7.53	32.72	114	39	P	H
		2485.09	43.1	-10.9	54	40.82	27.47	7.53	32.72	114	39	A	H
		2355.08	47.57	-26.43	74	45.05	27.83	7.51	32.82	286	62	P	V
		2340.38	37.55	-16.45	54	34.99	27.9	7.48	32.82	286	62	A	V
	*	2452	96.38	-	-	93.98	27.6	7.54	32.74	286	62	P	V
	*	2452	89.06	-	-	86.66	27.6	7.54	32.74	286	62	A	V
		2485.16	51.46	-22.54	74	49.18	27.47	7.53	32.72	286	62	P	V
		2485.16	42.4	-11.6	54	40.12	27.47	7.53	32.72	286	62	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz
WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 03 2422MHz		4844	40.06	-33.94	74	53.34	31.2	9.88	54.36	196	332	P	H
		7266	43.37	-30.63	74	49.64	36.4	11.81	54.48	266	302	P	H
		4844	39.77	-34.23	74	53.05	31.2	9.88	54.36	150	350	P	V
		7266	44.04	-29.96	74	50.31	36.4	11.81	54.48	200	360	P	V
802.11n HT40 CH 06 2437MHz		4874	38.56	-35.44	74	51.9	31.13	9.88	54.35	163	209	P	H
		7311	43.55	-30.45	74	49.78	36.4	11.88	54.51	136	196	P	H
		4874	38.01	-35.99	74	51.35	31.13	9.88	54.35	165	230	P	V
		7311	43.76	-30.24	74	49.99	36.4	11.88	54.51	186	323	P	V
802.11n HT40 CH 09 2452MHz		4904	37.58	-36.42	74	50.84	31.17	9.9	54.33	185	99	P	H
		7356	43.5	-30.5	74	49.72	36.4	11.94	54.56	136	306	P	H
		4904	37.61	-36.39	74	50.87	31.17	9.9	54.33	150	360	P	V
		7356	43.75	-30.25	74	49.97	36.4	11.94	54.56	165	335	P	V
Remark		1. No other spurious found. 2. All results are PASS against Peak and Average limit line.											



2.4GHz 2400~2483.5MHz

Emission below 1GHz

2.4GHz WIFI 802.11b (LF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11b LF		33.88	24.32	-15.68	40	33.45	22.08	0.77	31.98	-	-	P	H
		199.75	22.7	-20.8	43.5	36.57	15.6	1.86	31.33	-	-	P	H
		341.37	37.59	-8.41	46	46.16	20.2	2.44	31.21	100	83	P	H
		450.98	36.28	-9.72	46	42.24	22.52	2.81	31.29	-	-	P	H
		535.37	30.82	-15.18	46	35.21	23.78	3.07	31.24	-	-	P	H
		836.07	32.21	-13.79	46	33.19	26.31	3.89	31.18	-	-	P	H
		33.88	25.19	-14.81	40	34.32	22.08	0.77	31.98	-	-	P	V
		360.77	33.83	-12.17	46	41.86	20.67	2.51	31.21	-	-	P	V
		580.96	32.28	-13.72	46	36.04	24.29	3.21	31.26	-	-	P	V
		693.48	31.39	-14.61	46	34.28	24.87	3.5	31.26	-	-	P	V
		741.98	30.27	-15.73	46	32.41	25.44	3.64	31.22	-	-	P	V
		896.21	34.22	-11.78	46	34.85	26.49	4.04	31.16	100	26	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



Note symbol

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is over limit line.
P/A	P eak or A verage
H/V	H orizontal or V ertical



A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

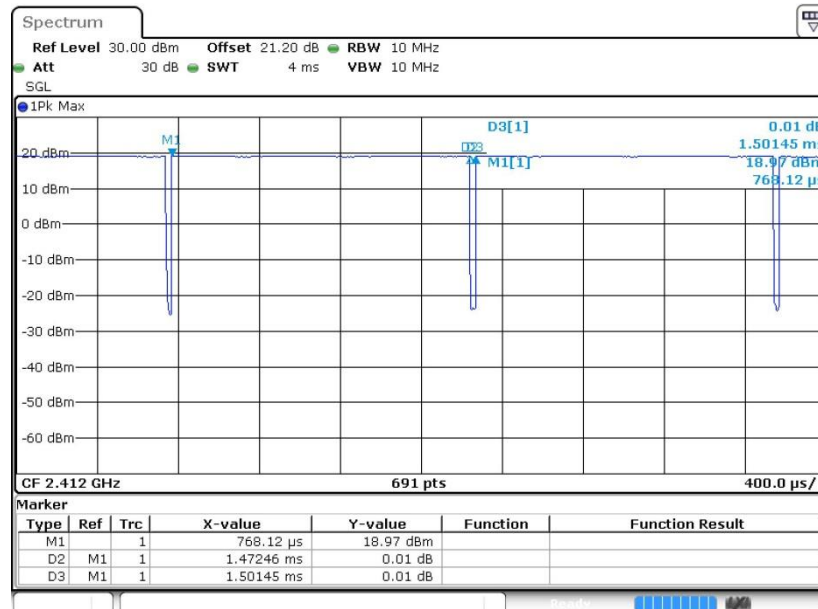
Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix C. Duty Cycle Plots

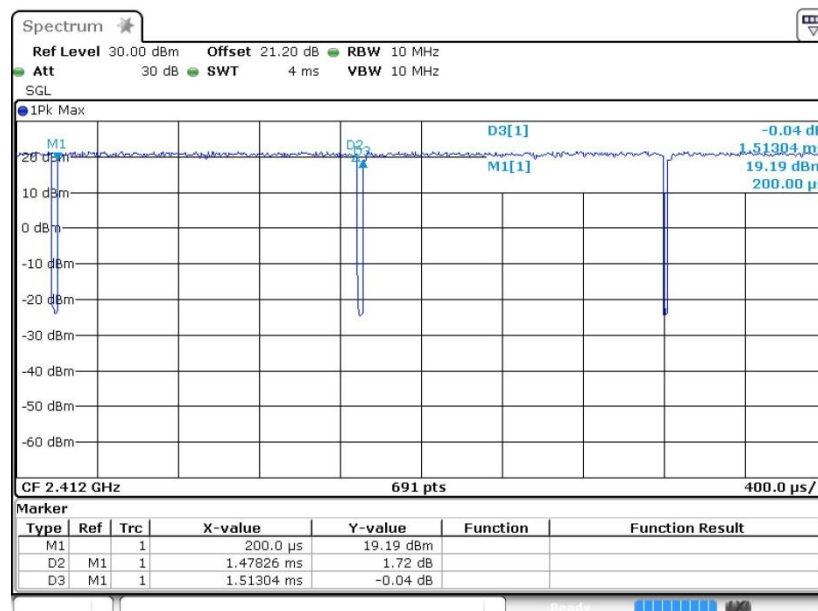
Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1	802.11b	98.07	-	-	10Hz
1	802.11g	97.70	1.478	0.676	10Hz
2	802.11b	98.08	-	-	10Hz
2	802.11g	98.08	-	-	10Hz
(1+2)1	802.11n HT20	97.34	1.484	0.674	1KHz
(1+2)1	802.11n HT40	97.71	1.487	0.673	1KHz
(1+2)2	802.11n HT20	97.35	1.490	0.671	1KHz
(1+2)2	802.11n HT40	97.71	1.487	0.673	1KHz

Ant1:

802.11b

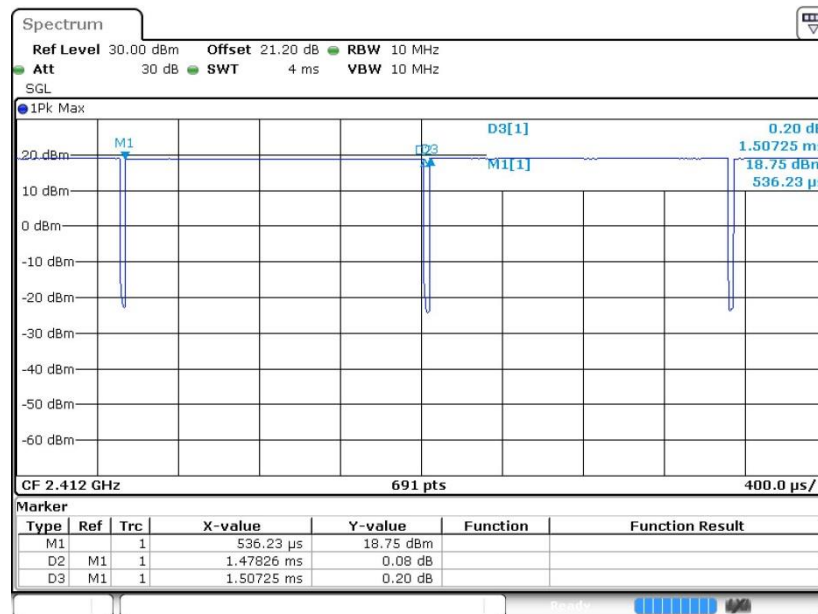


802.11g

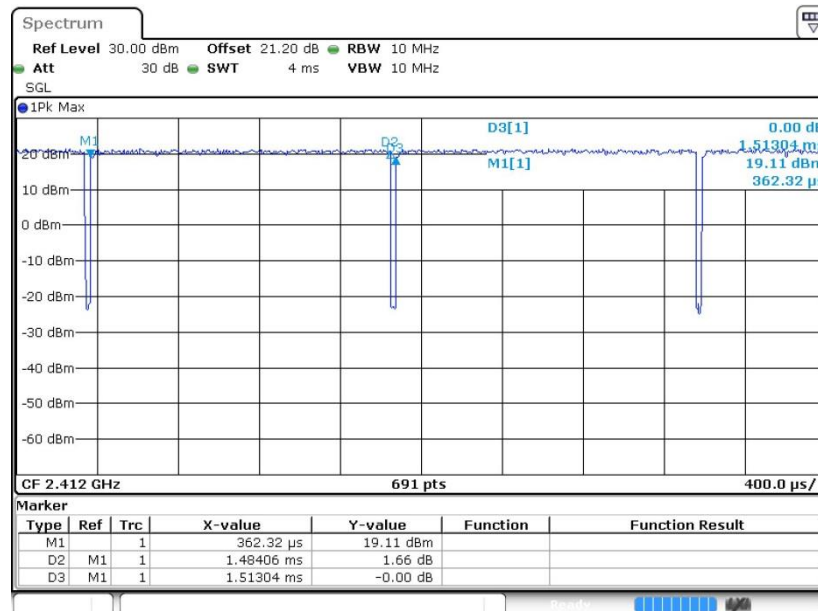


Ant2:

802.11b

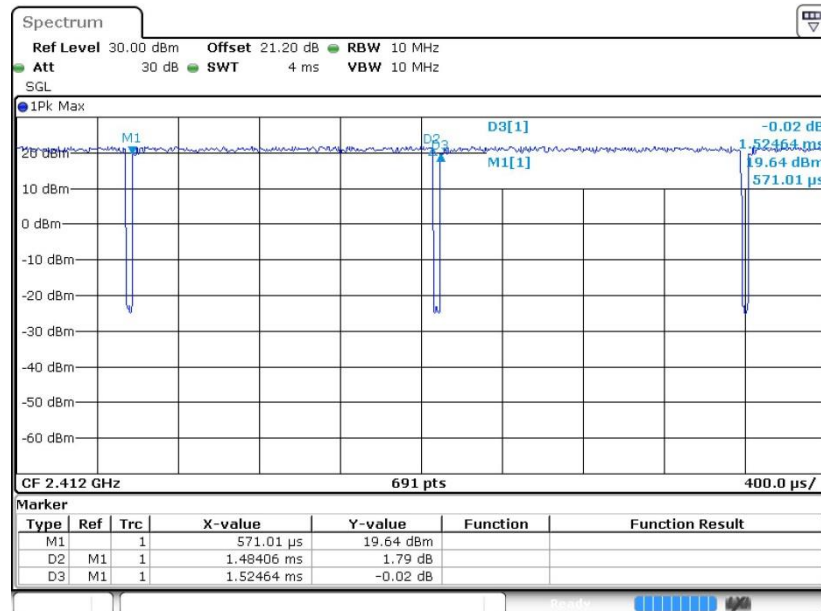


802.11g

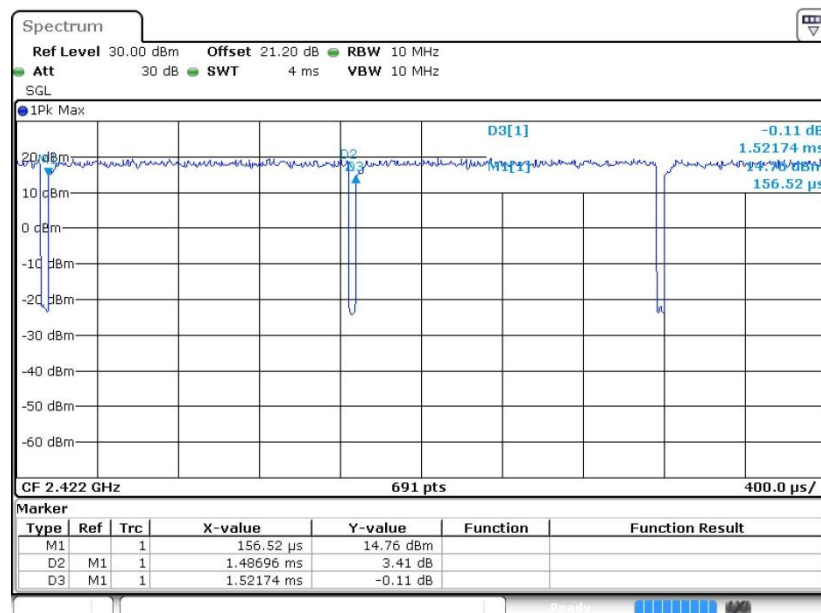


MIMO Ant1:

802.11n HT20

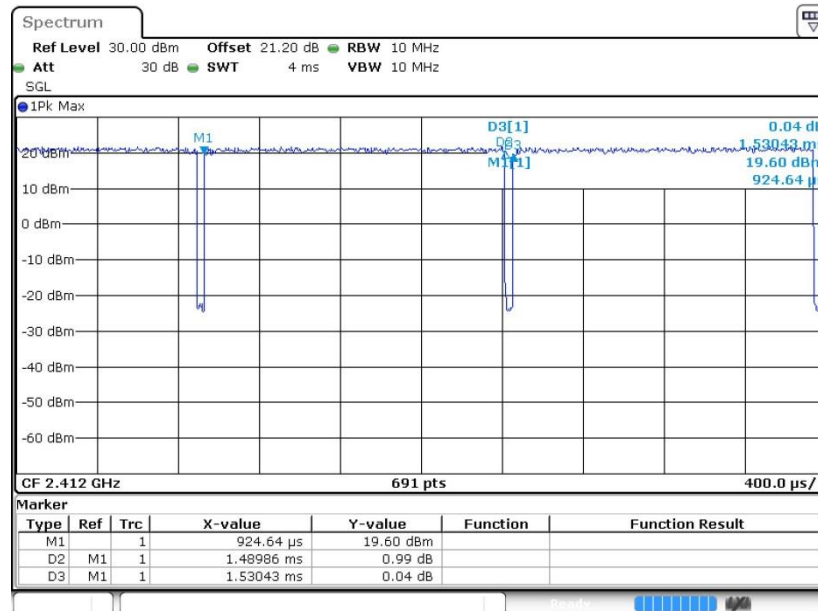


802.11n HT40



MIMO Ant2:

802.11n HT20



802.11n HT40

