



# FCC RF Test Report

**APPLICANT** : Motorola Mobility LLC  
**EQUIPMENT** : Mobile Cellular Phone  
**BRAND NAME** : Motorola  
**MODEL NAME** : XT1929-6  
**FCC ID** : IHDT56XE4  
**STANDARD** : FCC Part 15 Subpart C §15.247  
**CLASSIFICATION** : (DTS) Digital Transmission System

This is a variant report. The product was received on Jan. 18, 2018 and testing was completed on Mar. 12, 2018. We, SPORTON INTERNATIONAL 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 INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager



## **SPORTON INTERNATIONAL INC.**

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FCC ID: IHDT56XE4

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### SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
-	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Not Required	-
-	-	99% Bandwidth	-	Not Required	-
3.1	15.247(b)	Power Output Measurement	≤ 30dBm	Pass	-
-	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Not Required	-
-	15.247(d)	Conducted Band Edges	≤ 20dBc	Not Required	-
		Conducted Spurious Emission		Not Required	-
3.2	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.96 dB at 2390.000 MHz
-	15.207	AC Conducted Emission	15.207(a)	Not Required	-
3.3	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

**Remark:** Not required means after assessing, test items are not necessary to carry out.



# 1 General Description

## 1.1 Applicant

Motorola Mobility LLC  
222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

## 1.2 Manufacturer

Motorola Mobility LLC  
222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

## 1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT1929-6
FCC ID	IHDT56XE4
Sample 1	EUT with Dual SIM
Sample 2	EUT with Single SIM
IMEI Code	<b>Conducted</b> IMEI 1: 354102090009834 IMEI 2: 354102090009842
	<b>Radiation:</b> IMEI 1: 354102090018132 IMEI 2: 354102090018140
EUT supports Radios application	GSM/EGPRS/WCDMA/HSPA/LTE/GNSS/NFC WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
HW Version	DVT2
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. All the test cases were performed on original report which can be referred to Sporton Report Number FR811821-02C.



<b>Accessory List</b>	
<b>AC Adapter 1</b>	Brand Name : Motorola
	Model Name : SC-22 SPN5970A
	Manufacturer : Salom
<b>AC Adapter 2</b>	Brand Name : Motorola
	Model Name : SC-22 SPN5993A
	Manufacturer : Chenyang
<b>AC Adapter 3</b>	Brand Name : Motorola
	Model Name : SC-23 SPN5971A
	Manufacturer : Salom
<b>AC Adapter 4</b>	Brand Name : Motorola
	Model Name : SC-23 SPN5989A
	Manufacturer : Chenyang
<b>AC Adapter 5</b>	Brand Name : Motorola
	Model Name : SC-27 SPN5975A
	Manufacturer : Salom
<b>AC Adapter 6</b>	Brand Name : Motorola
	Model Name : SC-27 SPN5992A
	Manufacturer : Chenyang
<b>Battery</b>	Brand Name : Motorola
	Model Name : JS40
	Manufacturer : SUNWODA
<b>C2Audio Cable 1</b>	Brand Name : Motorola
	Model Name : SC18C27844
	Manufacturer : Luxshare
<b>C2Audio Cable 2</b>	Brand Name : Motorola
	Model Name : SC18C27845
	Manufacturer : Cabletech
<b>USB Cable 1</b>	Brand Name : Cabletech
	Model Name : SKN6473A
<b>USB Cable 2</b>	Brand Name : FOXLINK
	Model Name : SKN6473A 17195-C 0403532
<b>USB Cable 3</b>	Brand Name : SAIBAO
	Model Name : SKN6473A 17214-C 1127044
<b>USB Cable 4</b>	Brand Name : Luxshare
	Model Name : SKN6473A 17227-C 1126538



### 1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
<b>Tx/Rx Channel Frequency Range</b>	2412 MHz ~ 2462 MHz
<b>Maximum (Peak) Output Power to antenna</b>	802.11b : 21.82 dBm (0.1521 W) 802.11g : 21.73 dBm (0.1498 W) 802.11n HT20 : 21.72 dBm (0.1486 W)
<b>Antenna Type / Gain</b>	Loop Antenna with gain -5.0 dBi
<b>Type of Modulation</b>	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

### 1.5 Modification of EUT

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

### 1.6 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1190 and TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

<b>Test Site</b>	SPORTON INTERNATIONAL INC.
<b>Test Site Location</b>	No. 52, Hwa Ya 1 <sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978
<b>Test Site No.</b>	<b>Sporton Site No.</b> TH05-HY

**Note:** The test site complies with ANSI C63.4 2014 requirement.

<b>Test Site</b>	SPORTON INTERNATIONAL INC.
<b>Test Site Location</b>	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
<b>Test Site No.</b>	<b>Sporton Site No.</b> 03CH12-HY

**Note:** The test site complies with ANSI C63.4 2014 requirement.



## **1.7 Applicable Standards**

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04
- ♦ 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 (Z 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

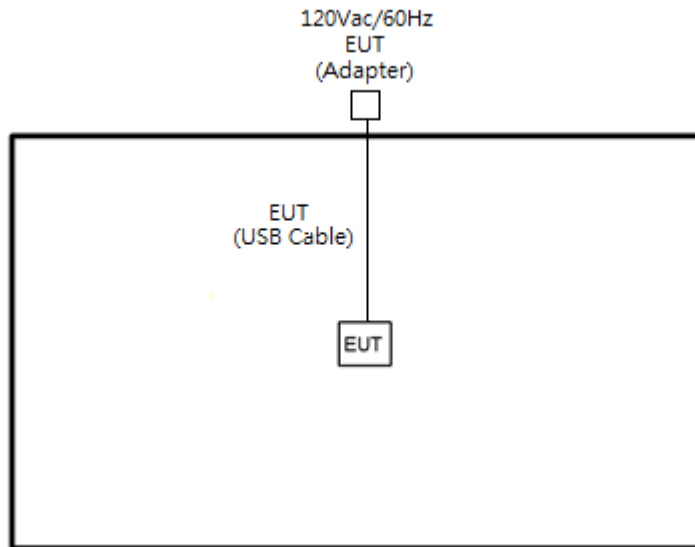
Final test modes are considering the modulation and worse data rates as below table.

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0

**Remark:** For Radiated Test Cases, The tests were performance with Adapter 1, USB Cable 1 Type C, and Sample 1.

## 2.3 Connection Diagram of Test System

<WLAN Tx Mode>



## 2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	Lenovo	E335	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

## 2.5 EUT Operation Test Setup

The RF test items, utility "QRCT" was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

### 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.

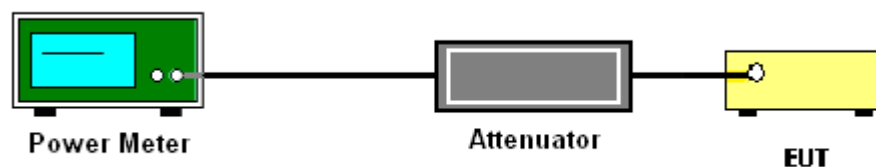
##### 3.1.2 Measuring Instruments

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 FCC KDB No. 558074 DTS D01 Meas. Guidance v04 section 9.1.3 PKPM1 Peak power meter 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.

##### 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.

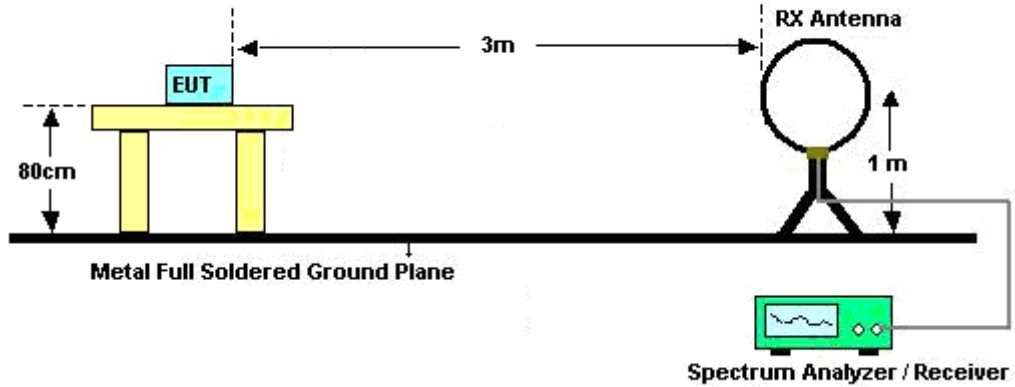


### 3.2.3 Test Procedures

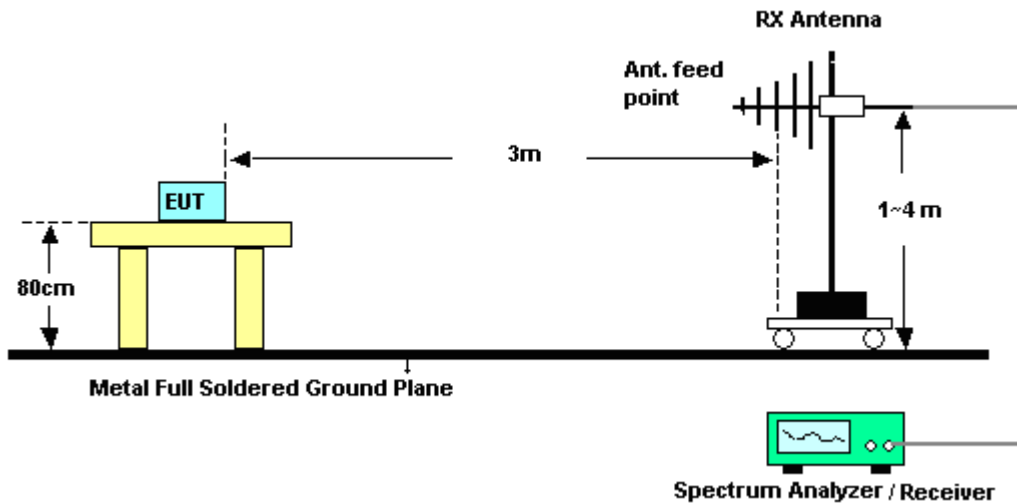
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test 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

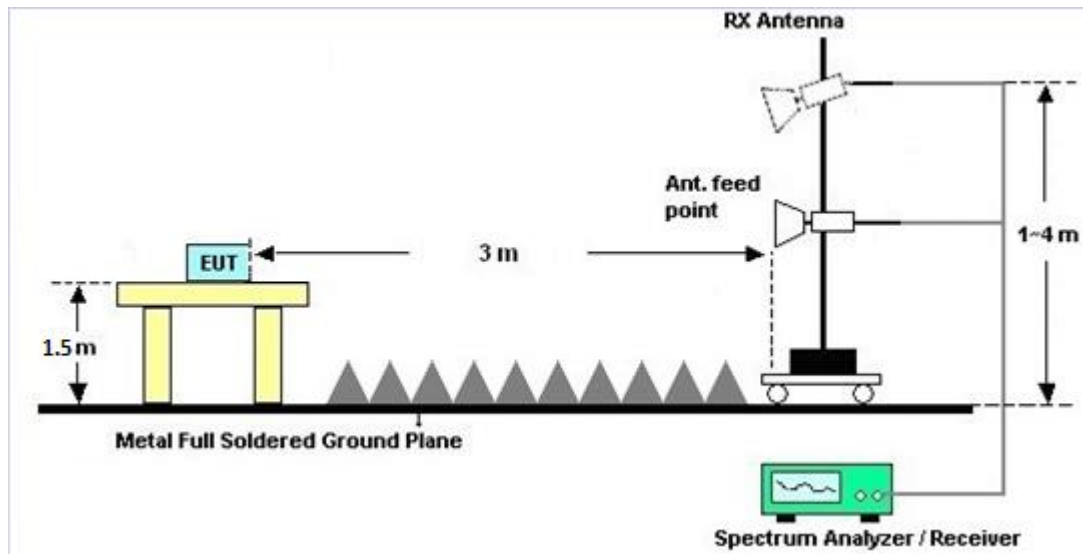
For radiated emissions below 30MHz



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 and C.

### 3.2.7 Duty Cycle

Please refer to Appendix D.

### 3.2.8 Test Result of Radiated Spurious Emission (30MHz ~ 10<sup>th</sup> Harmonic)

Please refer to Appendix B and C.



### **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**

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.





## 4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Meter	Anritsu	ML2495A	1218006	N/A	Oct. 06, 2017	Feb. 12, 2018~ Feb. 19, 2018	Oct. 05, 2018	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	1207363	300MHz~40GHz z	Oct. 06, 2017	Feb. 12, 2018~ Feb. 19, 2018	Oct. 05, 2018	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100057	9kHz-40GHz	Nov. 21, 2017	Feb. 12, 2018~ Feb. 19, 2018	Nov. 20, 2018	Conducted (TH05-HY)
Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz, VSWR : 2.5:1 max	Jul. 18, 2017	Mar. 07, 2018~ Mar. 12, 2018	Jul. 17, 2018	Radiation (03CH12-HY)
Bilog Antenna	TESEQ	CBL 6111D&N-6-0 6	35414&AT- N0602	30MHz~1GHz	Oct. 14, 2017	Mar. 07, 2018~ Mar. 12, 2018	Oct. 13, 2018	Radiation (03CH12-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Nov. 23, 2017	Mar. 07, 2018~ Mar. 12, 2018	Nov. 22, 2019	Radiation (03CH12-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100390	20Hz~26.5GHz	Dec. 25, 2017	Mar. 07, 2018~ Mar. 12, 2018	Dec. 24, 2018	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120D	9120D-132 8	1GHz ~ 18GHz	Oct. 20, 2017	Mar. 07, 2018~ Mar. 12, 2018	Oct. 19, 2018	Radiation (03CH12-HY)
Preamplifier	COM-POWER	PA-103	161075	10MHz~1GHz	Mar. 23, 2017	Mar. 07, 2018~ Mar. 12, 2018	Mar. 22, 2018	Radiation (03CH12-HY)
Preamplifier	Keysight	83017A	MY532701 48	1GHz~26.5GHz	Jan. 15, 2018	Mar. 07, 2018~ Mar. 12, 2018	Jan. 14, 2019	Radiation (03CH12-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800	2025787	1GHZ~18GHZ	Feb. 13, 2017	Mar. 07, 2018~ Mar. 12, 2018	Feb. 12, 2019	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500- B	N/A	1m~4m	N/A	Mar. 07, 2018~ Mar. 12, 2018	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Mar. 07, 2018~ Mar. 12, 2018	N/A	Radiation (03CH12-HY)
Attenuator	Fairview Microwave	SA18S5W-10	n/a	10db	Mar. 24, 2017	Mar. 07, 2018~ Mar. 12, 2018	Mar. 23, 2018	Radiation (03CH12-HY)
Spectrum Analyzer	Keysight	N9010A	MY553705 26	10Hz~44GHz	Mar. 15, 2017	Mar. 07, 2018~ Mar. 12, 2018	Mar. 14, 2018	Radiation (03CH12-HY)



## 5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.10
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.20
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### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.70
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## Appendix A. Test Result of Conducted Test Items

Test Engineer:	Lena Lo / Tommy Lee	Temperature:	21~25	°C
Test Date:	2018/2/12~2018/2/19	Relative Humidity:	51~54	%

**TEST RESULTS DATA**  
**Peak Power Table**

2.4GHz Band										
Mod.	Data Rate	N <sub>TX</sub>	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
11b	1Mbps	1	1	2412	21.39	30.00	-5.00	16.39	36.00	Pass
11b	1Mbps	1	6	2437	21.78	30.00	-5.00	16.78	36.00	Pass
11b	1Mbps	1	11	2462	21.82	30.00	-5.00	16.82	36.00	Pass
11g	6Mbps	1	1	2412	21.42	30.00	-5.00	16.42	36.00	Pass
11g	6Mbps	1	6	2437	21.31	30.00	-5.00	16.31	36.00	Pass
11g	6Mbps	1	11	2462	21.73	30.00	-5.00	16.73	36.00	Pass
HT20	MCS0	1	1	2412	21.50	30.00	-5.00	16.50	36.00	Pass
HT20	MCS0	1	6	2437	21.72	30.00	-5.00	16.72	36.00	Pass
HT20	MCS0	1	11	2462	21.62	30.00	-5.00	16.62	36.00	Pass

**TEST RESULTS DATA**  
**Average Power Table**  
***(Reporting Only)***

2.4GHz Band						
Mod.	Data Rate	N <sub>TX</sub>	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.06	18.64
11b	1Mbps	1	6	2437	0.06	18.98
11b	1Mbps	1	11	2462	0.06	18.99
11g	6Mbps	1	1	2412	0.25	16.81
11g	6Mbps	1	6	2437	0.25	16.71
11g	6Mbps	1	11	2462	0.25	16.94
HT20	MCS0	1	1	2412	0.27	16.68
HT20	MCS0	1	6	2437	0.27	16.95
HT20	MCS0	1	11	2462	0.27	16.81



### Appendix B. Radiated Spurious Emission

Test Engineer :	Watt Tseng, Karl Hou, Nick Yu	Temperature :	21~24°C
		Relative Humidity :	54~60%

#### 2.4GHz 2400~2483.5MHz

#### WIFI 802.11b (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)	
802.11b CH 11 2462MHz	*	2462	106.16	-	-	96.29	27.32	14.11	31.56	342	143	P	H	
	*	2462	102.07	-	-	92.2	27.32	14.11	31.56	342	143	A	H	
		2488.28	53.96	-20.04	74	43.98	27.4	14.14	31.56	342	143	P	H	
		2488.6	41.61	-12.39	54	31.63	27.4	14.14	31.56	342	143	A	H	
													H	
														H
	*	2462	109.39	-	-	99.52	27.32	14.11	31.56	159	86	P	V	
	*	2462	104.85	-	-	94.98	27.32	14.11	31.56	159	86	A	V	
		2484.08	55.54	-18.46	74	45.6	27.36	14.14	31.56	159	86	P	V	
		2488.48	41.95	-12.05	54	31.97	27.4	14.14	31.56	159	86	A	V	
													V	
													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)

Table with 14 columns: WIFI Ant. 1, Note, Frequency (MHz), Level (dBµV/m), Over Limit (dB), Limit Line (dBµV/m), Read Level (dBµV), Antenna Factor (dB/m), Path Loss (dB), Preamp Factor (dB), Ant Pos (cm), Table Pos (deg), Peak Avg. (P/A), Pol. (H/V). Rows include data for 802.11b CH 11 2462MHz and a Remark section.



**2.4GHz 2400~2483.5MHz  
WIFI 802.11n HT20 (Band Edge @ 3m)**

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Path 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	59.15	-14.85	74	49.51	27.15	14.06	31.57	315	137	P	H	
		2390	46.39	-7.61	54	36.75	27.15	14.06	31.57	315	137	A	H	
	*	2412	105.07	-	-	95.37	27.19	14.08	31.57	315	137	P	H	
	*	2412	95.29	-	-	85.59	27.19	14.08	31.57	315	137	A	H	
													H	
														H
			2390	61.6	-12.4	74	51.96	27.15	14.06	31.57	190	86	P	V
			2390	50.04	-3.96	54	40.4	27.15	14.06	31.57	190	86	A	V
		*	2412	108.16	-	-	98.46	27.19	14.08	31.57	190	86	P	V
		*	2412	98.02	-	-	88.32	27.19	14.08	31.57	190	86	A	V
													V	
													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	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n HT20 CH 01		4824	40.09	-33.91	74	66.77	31.36	6.7	64.74	100	0	P	H
													H
													H
													H
2412MHz		4824	40.35	-33.65	74	67.03	31.36	6.7	64.74	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**Emission below 1GHz**  
**2.4GHz WIFI 802.11n HT20 (LF)**

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	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 )	
2.4GHz 802.11n HT20 LF		96.96	20.23	-23.27	43.5	34.36	15.41	0.86	30.4			P	H	
		170.4	24.73	-18.77	43.5	38.48	15.3	1.26	30.31			P	H	
		290.01	23.6	-22.4	46	33.43	18.86	1.46	30.15			P	H	
		563.9	27.45	-18.55	46	29.18	25.95	2.03	29.71			P	H	
		846	33.02	-12.98	46	31.14	28.68	2.46	29.26	100	0	P	H	
		972.7	34.15	-19.85	54	29.32	31.11	2.74	29.02			P	H	
													H	
													H	
													H	
													H	
													H	
													H	
			30.81	34.5	-5.5	40	40.55	23.7	0.44	30.19	100	0	P	V
			46.2	32.77	-7.23	40	46.85	15.72	0.61	30.41			P	V
			143.4	22.46	-21.04	43.5	34.76	17	1.04	30.34			P	V
			555.5	26.94	-19.06	46	28.98	25.66	2.02	29.72			P	V
			785.1	31.33	-14.67	46	30.29	28.03	2.38	29.37			P	V
			977.6	34.39	-19.61	54	29.54	31.1	2.76	29.01			P	V
												V		
												V		
												V		
												V		
												V		
												V		
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against limit line.													



**Note symbol**

*	<b>Fundamental Frequency</b> which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is <b>over limit</b> line.
P/A	<b>Peak</b> or <b>Average</b>
H/V	<b>Horizontal</b> or <b>Vertical</b>



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

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	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		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. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =  
Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

1. Level(dBμV/m)  
= Antenna Factor(dB/m) + Path 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) + Path 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. Radiated Spurious Emission Plots

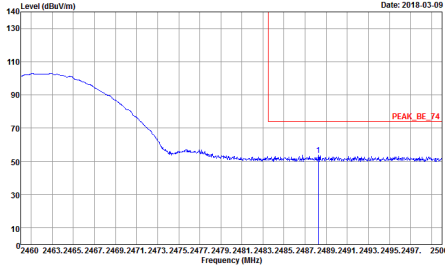
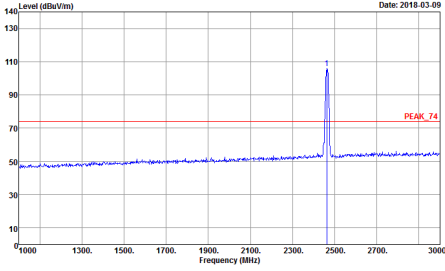
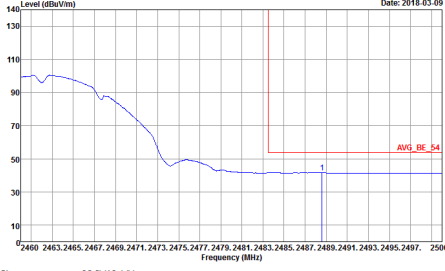
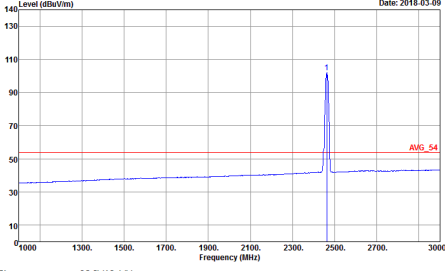
Test Engineer :	Watt Tseng, Karl Hou, Nick Yu	Temperature :	21~24°C
		Relative Humidity :	54~60%

### Note symbol

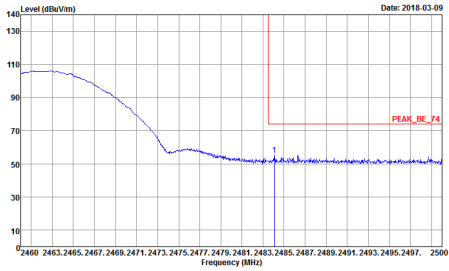
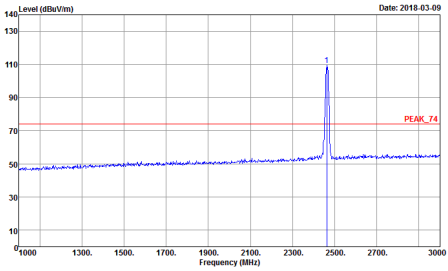
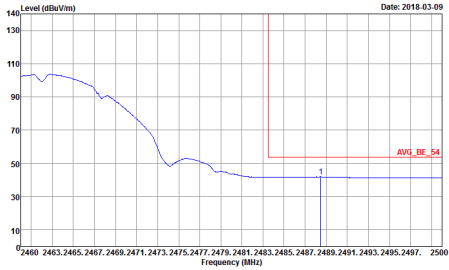
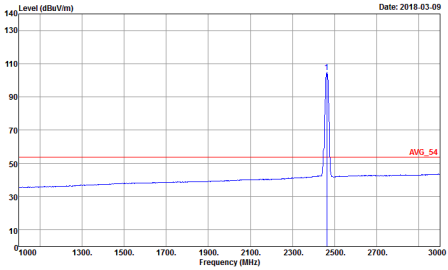
-L	Low channel location
-R	High channel location



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

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH11 2462MHz	
1	Horizontal	Fundamental
Peak	 <p>Date: 2018-03-09</p> <p>Level (dBuV/m) vs Frequency (MHz)</p> <p>PEAK_BE_74</p> <p>Site : 03CH12-HY            Condition : PEAK_BE_74 3m HORN_9120D_1328 HORIZONTAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Date: 2018-03-09</p> <p>Level (dBuV/m) vs Frequency (MHz)</p> <p>PEAK_74</p> <p>Site : 03CH12-HY            Condition : PEAK_74 3m HORN_9120D_1328 HORIZONTAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Date: 2018-03-09</p> <p>Level (dBuV/m) vs Frequency (MHz)</p> <p>AVG_BE_54</p> <p>Site : 03CH12-HY            Condition : AVG_BE_54 3m HORN_9120D_1328 HORIZONTAL            : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	 <p>Date: 2018-03-09</p> <p>Level (dBuV/m) vs Frequency (MHz)</p> <p>AVG_54</p> <p>Site : 03CH12-HY            Condition : AVG_54 3m HORN_9120D_1328 HORIZONTAL            : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>



WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH11 2462MHz	
1	Vertical	Fundamental
Peak	 <p>Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Site : 03CH12-HY Condition : PEAK_74 3m HORN_9120D_1328 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_9120D_1328 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	 <p>Site : 03CH12-HY Condition : AVG_54 3m HORN_9120D_1328 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>

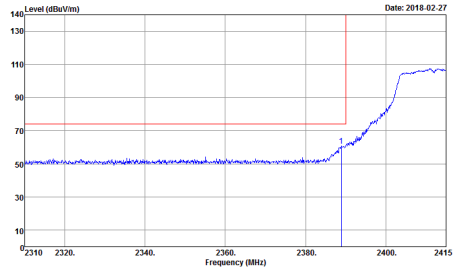
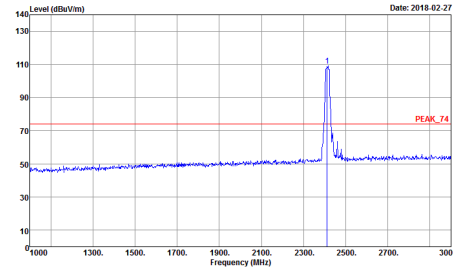
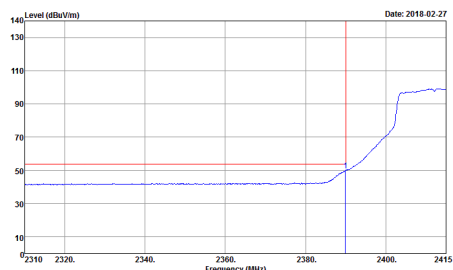
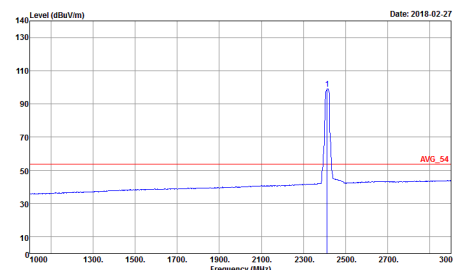


**2.4GHz 2400~2483.5MHz**  
**WIFI 802.11n HT20 (Band Edge @ 3m)**

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH01 2412MHz	
1	Horizontal	Fundamental
<b>Peak</b>	<p>Site : 03CH12-HY            Condition : PEAK_BE_74 3m HORN_9120D_1328 HORIZONTAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	<p>Site : 03CH12-HY            Condition : PEAK_74 3m HORN_9120D_1328 HORIZONTAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
<b>Avg.</b>	<p>Site : 03CH12-HY            Condition : AVG_BE_54 3m HORN_9120D_1328 HORIZONTAL            : RBW:1000.000KHz VBW:1.000KHz SWT:Auto</p>	<p>Site : 03CH12-HY            Condition : AVG_54 3m HORN_9120D_1328 HORIZONTAL            : RBW:1000.000KHz VBW:1.000KHz SWT:Auto</p>





WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH01 2412MHz	
1	Vertical	Fundamental
Peak	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Vertical. The x-axis ranges from 2310 to 2415 MHz, and the y-axis ranges from 0 to 140 dBuV/m. A red horizontal line is at approximately 75 dBuV/m. A blue curve shows the signal level, which rises sharply after 2380 MHz. A vertical red line is at 2412 MHz.</p> <p>Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Fundamental. The x-axis ranges from 1000 to 3000 MHz, and the y-axis ranges from 0 to 140 dBuV/m. A red horizontal line is at approximately 75 dBuV/m. A blue curve shows a sharp peak at 2412 MHz. A vertical red line is at 2412 MHz, and a red label 'PEAK_74' is next to the peak.</p> <p>Site : 03CH12-HY Condition : PEAK_74 3m HORN_9120D_1328 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Vertical. The x-axis ranges from 2310 to 2415 MHz, and the y-axis ranges from 0 to 140 dBuV/m. A red horizontal line is at approximately 55 dBuV/m. A blue curve shows the average signal level, which rises after 2380 MHz. A vertical red line is at 2412 MHz.</p> <p>Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_9120D_1328 VERTICAL : RBW:1000.000KHz VBW:1000KHz SWT:Auto</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Fundamental. The x-axis ranges from 1000 to 3000 MHz, and the y-axis ranges from 0 to 140 dBuV/m. A red horizontal line is at approximately 55 dBuV/m. A blue curve shows a sharp peak at 2412 MHz. A vertical red line is at 2412 MHz, and a red label 'AVG_54' is next to the peak.</p> <p>Site : 03CH12-HY Condition : AVG_54 3m HORN_9120D_1328 VERTICAL : RBW:1000.000KHz VBW:1000KHz SWT:Auto</p>



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

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11b CH11 2462MHz	
1	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH12-HY Condition : PEAK_74 3m HORN_9120D_1328 HORIZONTAL Detector : Peak</p>	<p>Site : 03CH12-HY Condition : PEAK_74 3m HORN_9120D_1328 VERTICAL Detector : Peak</p>



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

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11n HT20 CH01 2412MHz	
1	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH12-HY            Condition : PEAK_74 3m HORN_9120D_1328 HORIZONTAL            Detector : Peak</p>	<p>Site : 03CH12-HY            Condition : PEAK_74 3m HORN_9120D_1328 VERTICAL            Detector : Peak</p>



Emission below 1GHz  
2.4GHz WIFI 802.11n HT20 (LF)

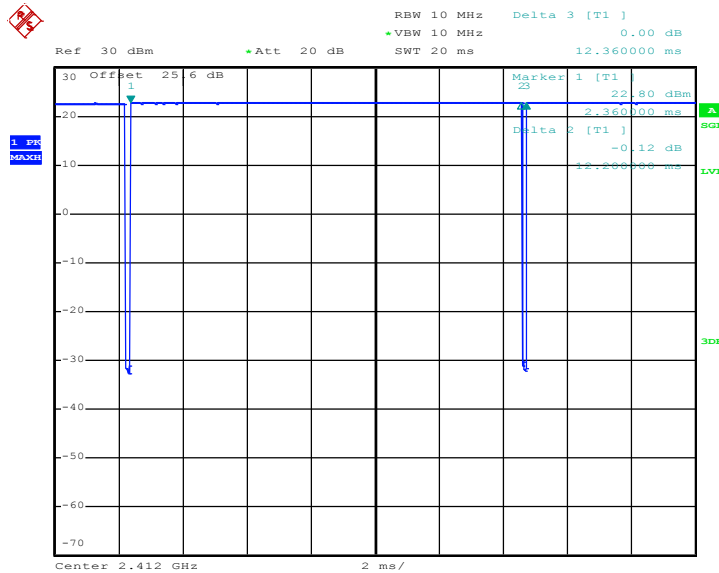
WIFI	2.4GHz 2400~2483.5MHz	
ANT	802.11n HT20 LF	
1	Horizontal	Vertical
QP / Peak	<p>Site : 03CH12-HY Condition : QP 3m BILO6_6111D_35414 HORIZONTAL Detector : Peak</p>	<p>Site : 03CH12-HY Condition : QP 3m BILO6_6111D_35414 VERTICAL Detector : Peak</p>



## Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
802.11b	98.71	-	-	10Hz	0.06
802.11g	94.39	2020	0.50	1kHz	0.25
2.4GHz 802.11n HT20	94.06	1900	0.53	1kHz	0.27

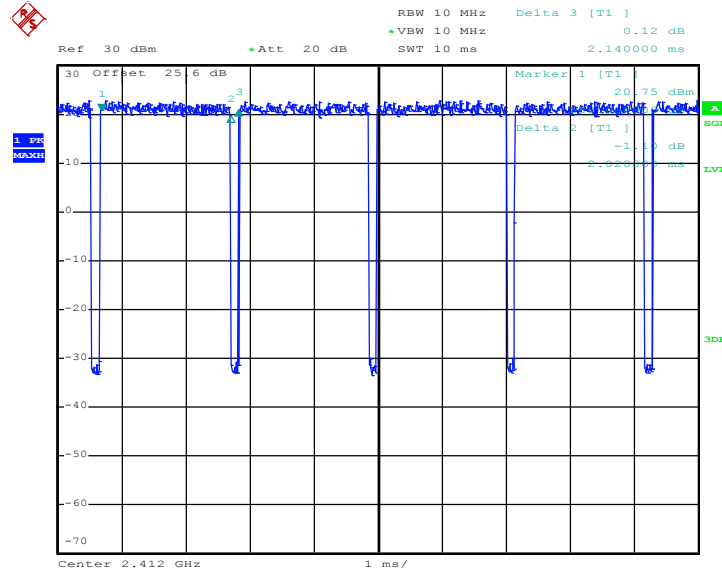
### 802.11b



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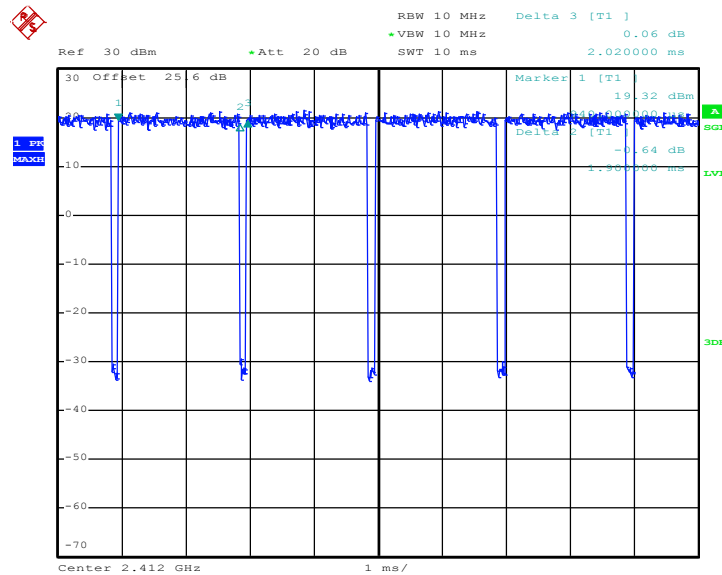


802.11g



Date: 12.FEB.2018 14:19:14

802.11n HT20



Date: 12.FEB.2018 14:24:12