FCC RF Test Report

APPLICANT	:	**SHARP CORPORATION, IoT Communication BU**
EQUIPMENT	:	**Smart Phone**
FCC ID	:	**APYHRO00246**
STANDARD	:	**FCC Part 15 Subpart E §15.407**
CLASSIFICATION	:	**(NII) Unlicensed National Information Infrastructure**

The product was received on Aug. 23, 2016 and testing was completed on Nov. 18, 2016. 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

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.

TABLE OF CONTENTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR682304E	Rev. 01	Initial issue of report	Dec. 29, 2016

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.403(i)	6dB, 26dB and 99% Occupied Bandwidth	> 500kHz	Pass	-
3.2	15.407(a)	Maximum Conducted Output Power	≤ 30 dBm	Pass	-
3.3	15.407(a)	Power Spectral Density	≤ 30 dBm/500kHz	Pass	-
3.4	15.407(b)	Unwanted Emissions	15.407(b)(4)(i) &15.209(a)	Pass	Under limit 5.53 dB at 42.610 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 14.40 dB at 0.558 MHz
3.6	15.407(g)	Frequency Stability	Within Operation Band	Pass	-
3.7	15.407(c)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.8	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

SHARP CORPORATION, IoT Communication BU
2-13-1, Hachihonmatsu-Iida, Higashi-hiroshima-shi, Hiroshima pref. 739-0192, Japan

1.2 Manufacturer

FIH Co., LTD.
No. 4, Minsheng St., Tucheng Dist., New Taipei City 23679, Taiwan (R.O.C.)

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Smart Phone
FCC ID	APYHRO00246
EUT supports Radios application	GSM/GPRS/WCDMA/HSPA/LTE WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 Bluetooth BR/EDR/LE
HW Version	DVT
SW Version	000C_1_050
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	5745 MHz ~ 5825 MHz
Maximum Output Power	802.11a : 13.82 dBm / 0.0241 W 802.11n HT20 : 13.77 dBm / 0.0238 W 802.11n HT40 : 13.75 dBm / 0.0237 W
99% Occupied Bandwidth	802.11a : 18.73 MHz 802.11n HT20 : 19.43 MHz 802.11n HT40 : 37.06 MHz
Type of Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Antenna Type / Gain	PIFA Antenna with gain -0.17 dBi

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. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1st 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	
Test Site No.	**Sporton Site No.**	
	CO05-HY	

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

Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.	
Test Site Location	No. 101, Complex Building C, Guanlong Village, Xili Town, Nanshan District, Shenzhen, Guangdong, P.R.C. TEL: +86-755-8637-9589	
Test Site No.	**Sporton Site No.**	
	TH01-SZ	03CH03-SZ

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 E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03
- 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

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: conducted emission (150 kHz to 30 MHz) and radiated 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 (X plane) were recorded in this report.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5725-5850 MHz Band 4 (U-NII-3)	149	5745	157	5785
	151*	5755	159*	5795
	153	5765	161	5805
	155	5775	165	5825

Note: The above Frequency and Channel in "*" were 802.11n HT40.

2.2 Test Mode

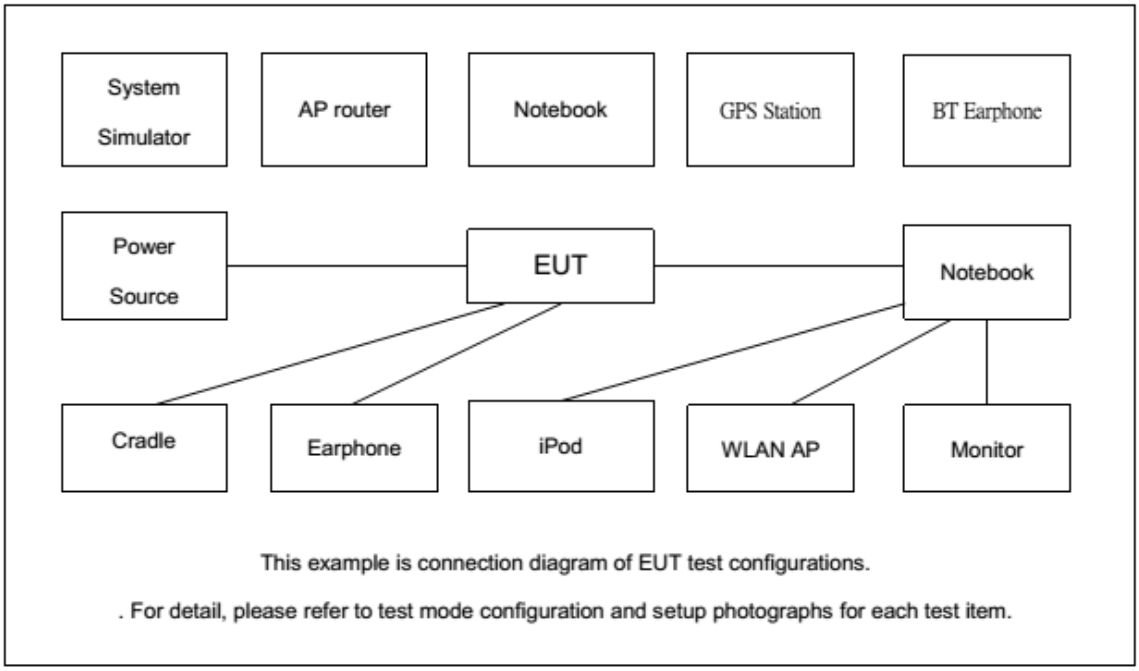
Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates as below table.

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0

AC Conducted Emission	Mode 1 : GSM1900 Idle + Bluetooth Link + WLAN (5GHz) Link + Earphone + Camera (Front) + USB Cable (Charging from Adapter)

Ch. #		Band IV：5725-5850 MHz		
		802.11a	802.11n HT20	802.11n HT40
L	Low	149	149	151
M	Middle	157	157	-
H	High	165	165	159

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.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
3.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
5.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A
6.	Adapter	SHARP	DSA-10PFL-05 FEU050200	NA	NA	NA
7.	USB Cable	SHARP	CUBB01M-FA002-DH	NA	Shielded 1.0m	NA
8.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.5 EUT Operation Test Setup

For WLAN function, programmed RF utility, “QPST” installed in the notebook make the EUT provide functions like channel selection and power level for continuous transmitting and receiving signals.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.
Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).
= 4.2 + 10 = 14.2 (dB)

3 Test Result

3.1 6dB and 26dB and 99% Occupied Bandwidth Measurement

3.1.1 Description of 6dB and 26dB and 99% Occupied Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

26dB and 99% Occupied bandwidth are reporting only.

3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

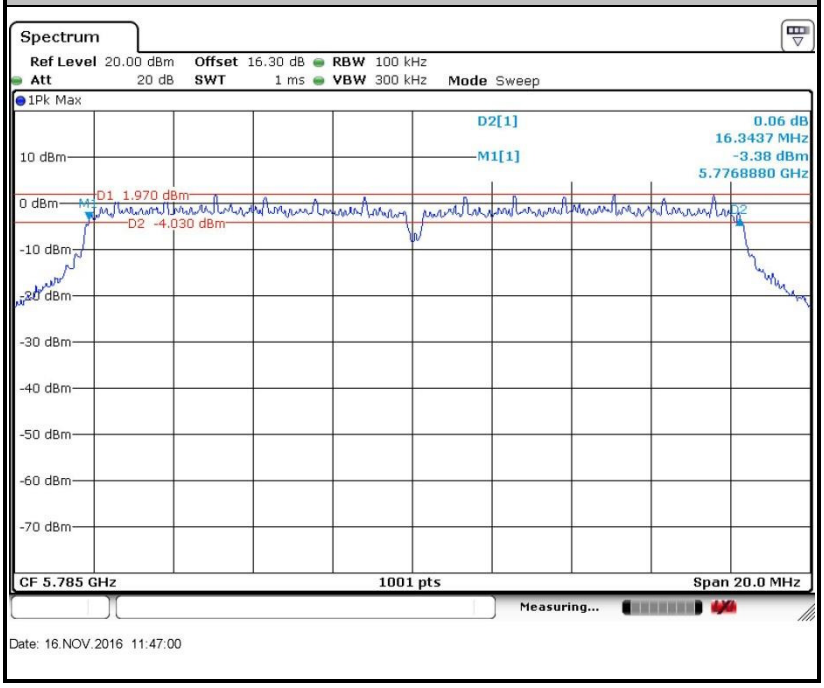
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03. Section C) Emission bandwidth for the band 5.725-5.85GHz
2. Set RBW = 100kHz.
3. Set the VBW ≥ 3 x RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 6 dB down from the peak of the emission.
7. Measure and record the results in the test report.

3.1.4 Test Setup

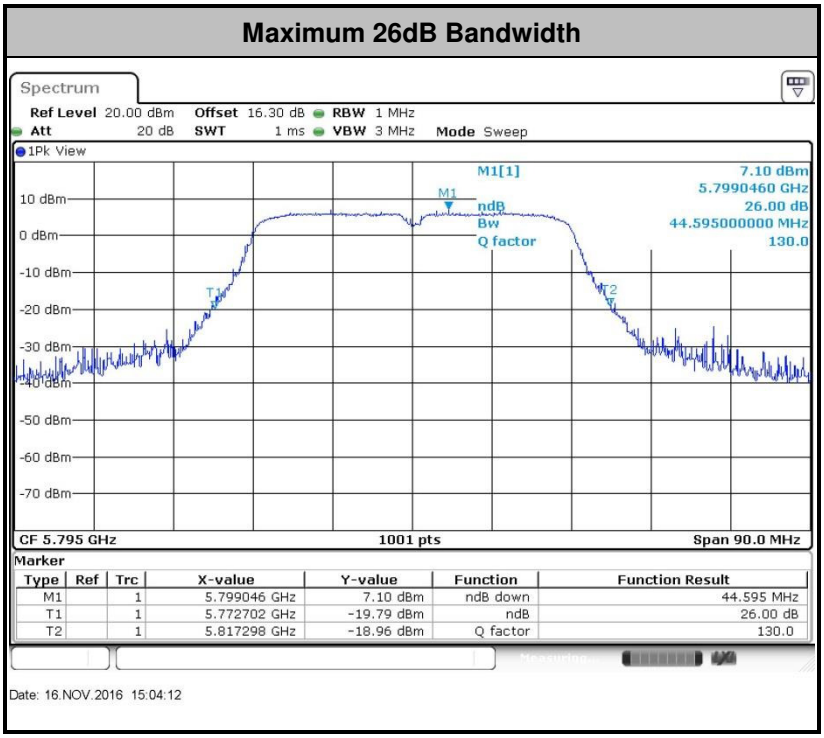
3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

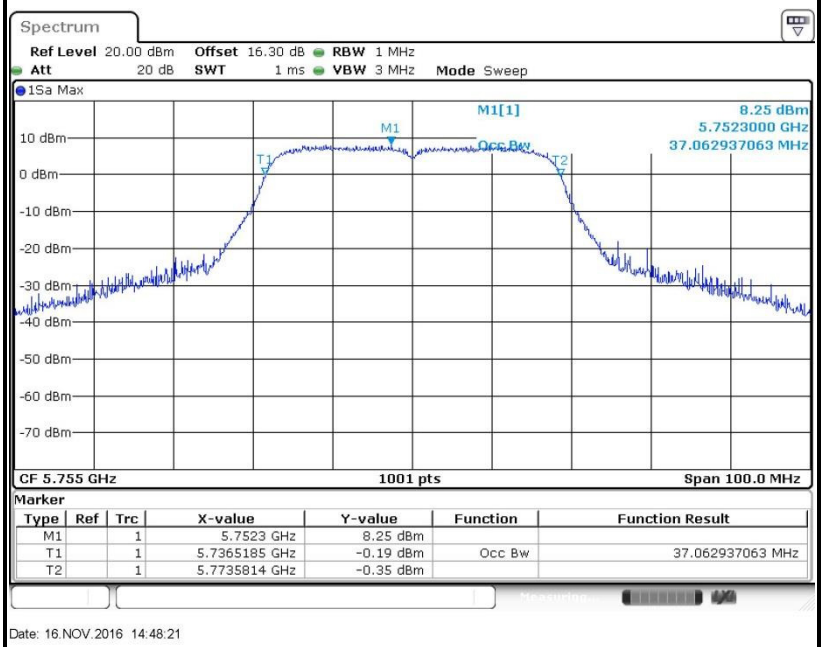
Minimum 6dB Bandwidth



Maximum 26dB Bandwidth



Maximum 99% Occupied Bandwidth



Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Maximum Conducted Output Power Measurement

3.2.1 Limit of Maximum Conducted Output Power

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.2.2 Measuring Instruments

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

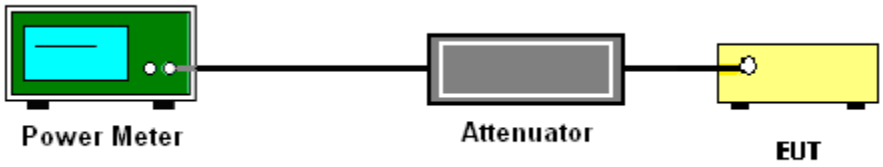
3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, 10 log(1/x), where x is the duty cycle.

3.2.4 Test Setup



3.2.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

For the band 5.725–5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03. Section F) Maximum power spectral density.

 # Method SA-2 #

(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

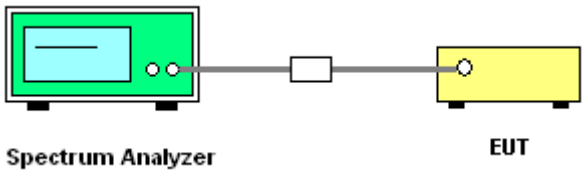
- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 300 kHz.
- Set VBW ≥ 1 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- Add 10 log(500kHz/RBW) to the test result.
- Add 10 log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add 10 log(1/0.25) = 6 dB if the duty cycle is 25 percent.

1. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
2. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.
3. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

   Method (c): Measure and add 10 log(N_{ANT}) dB.

   With this technique, spectrum measurements are performed at each output of the device, but rather than summing the spectra or the spectral peaks across the outputs, the quantity 10 log(N_{ANT}) dB is added to each spectrum value before comparing to the emission limit. The addition of 10 log(N_{ANT}) dB serves to apportion the emission limit among the N_{ANT} outputs so that each output is permitted to contribute no more than $1/N_{ANT}$ th of the PSD limit.

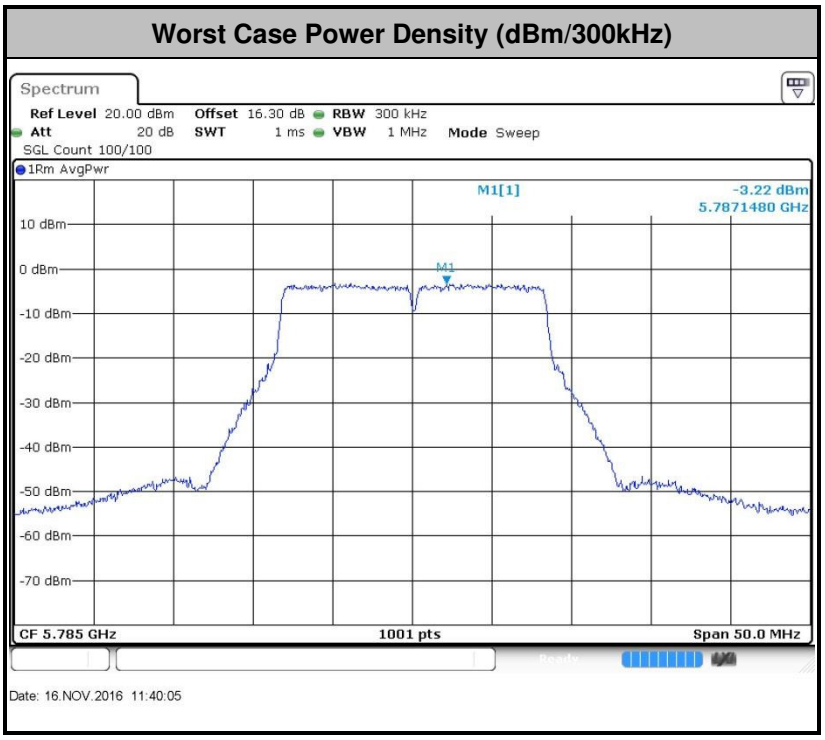
3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

Worst Case Power Density (dBm/300kHz)



3.4 Unwanted Emissions Measurement

This section as specified in FCC Part 15.407(b) is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement. The unwanted emissions shall comply with 15.407(b)(1) to (6), and restricted bands per FCC Part15.205.

3.4.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 5.725-5.85 GHz band:

15.407(b)(4)(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(2) Unwanted spurious emissions fallen in restricted bands per FCC Part15.205 shall comply with the general field strength limits set forth in § 15.209 as below table,

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

Note: The following formula is used to convert the EIRP to field strength.

$$E=\frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts)

EIRP (dBm)	Field Strength at 3m (dBμV/m)
-17	78.3
- 27	68.3

(3) KDB 789033 D02 General UNII Test Procedures New Rules v01r03 G)2)c) As specified in 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in 15.407(b)(4)). However, an out-of-band emission that complies with both the average and peak limits of 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz peak emission limit.

3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03. Section G) Unwanted emissions measurement.

   (1) Procedure for Unwanted Emissions Measurements Below 1000MHz

   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

   (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz

   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

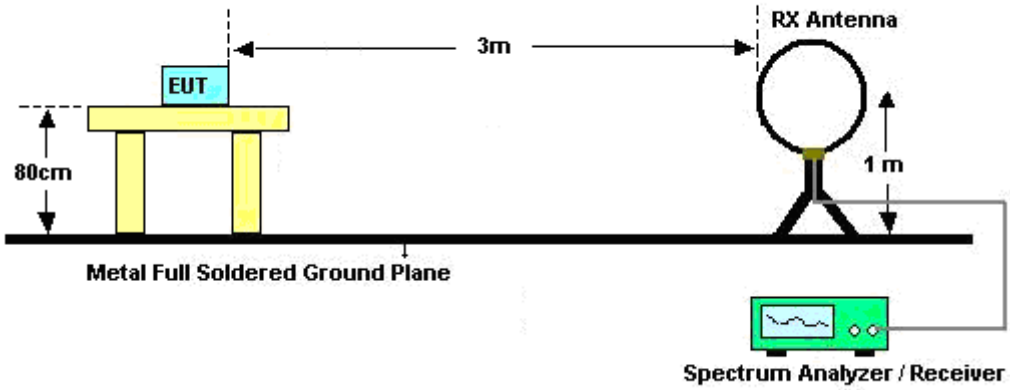
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 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.

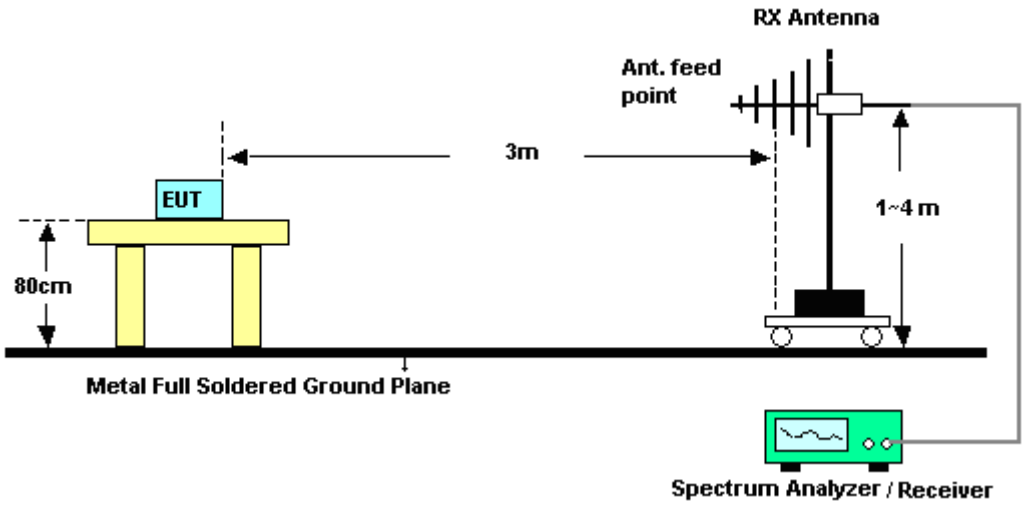
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
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.

3.4.4 Test Setup

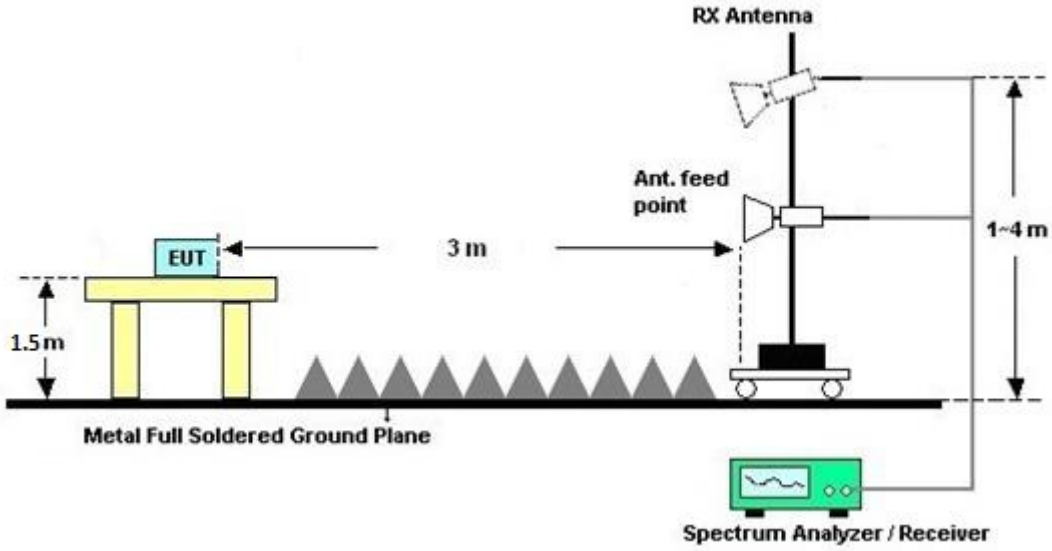
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

3.4.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B and C.

3.4.7 Duty Cycle

Please refer to Appendix D.

3.4.8 Test Result of Radiated Spurious Emissions (30MHz ~ 10th Harmonic)

Please refer to Appendix B and C.

3.5 AC Conducted Emission Measurement

3.5.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

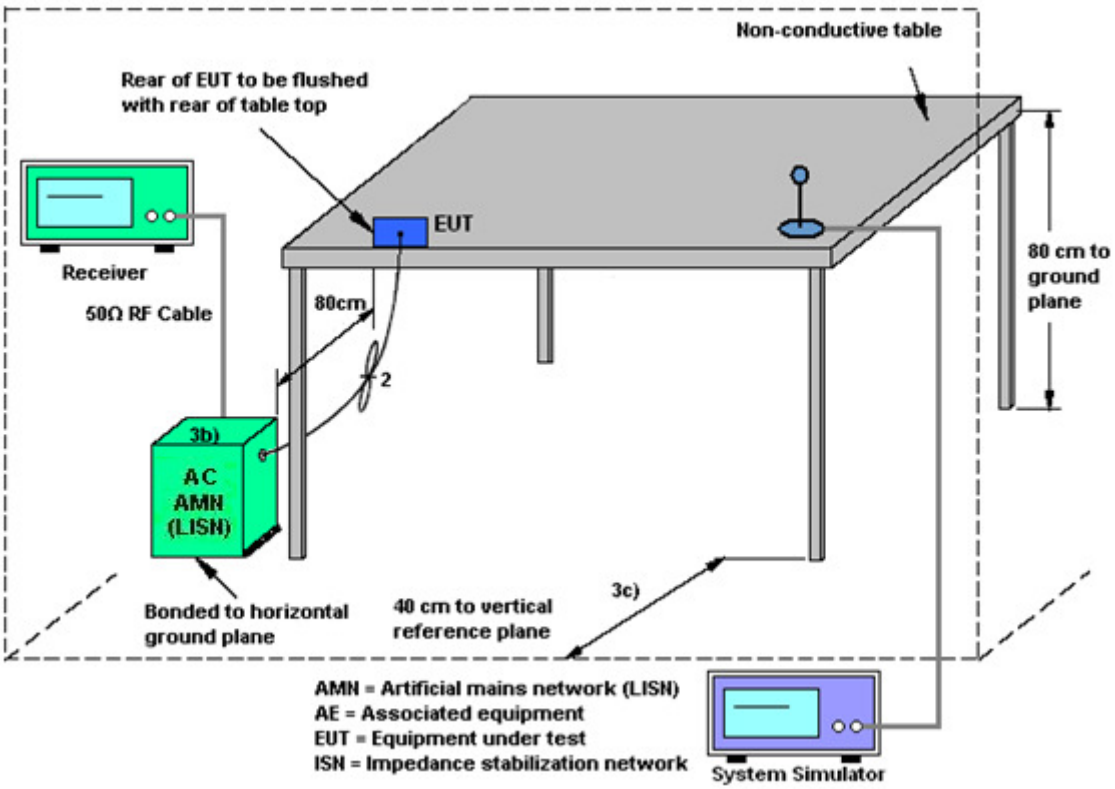
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

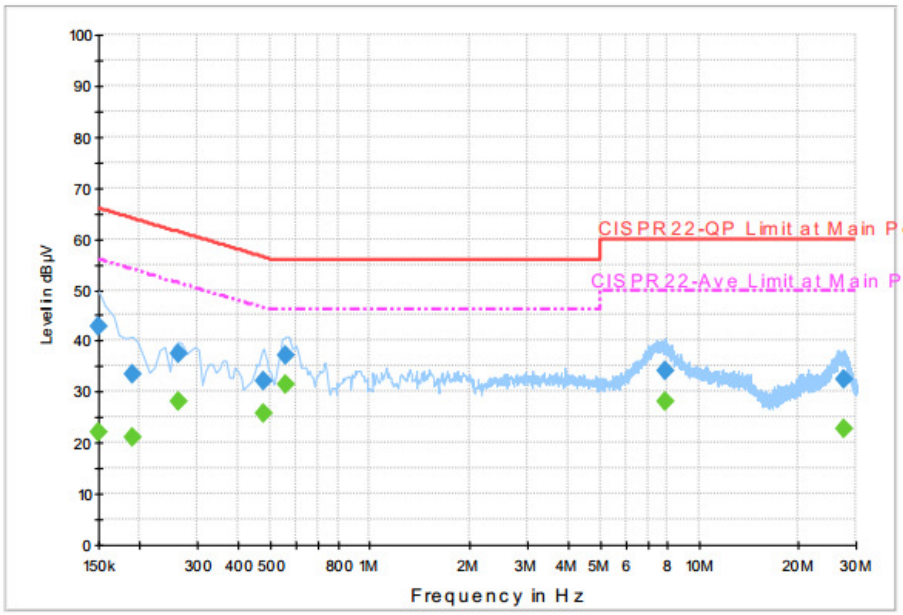
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.5.4 Test Setup



3.5.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	21~23℃
Test Engineer :	Arthur Hsieh	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM1900 Idle + Bluetooth Link + WLAN (5GHz) Link + Earphone + Camera (Front) + USB Cable (Charging from Adapter)		



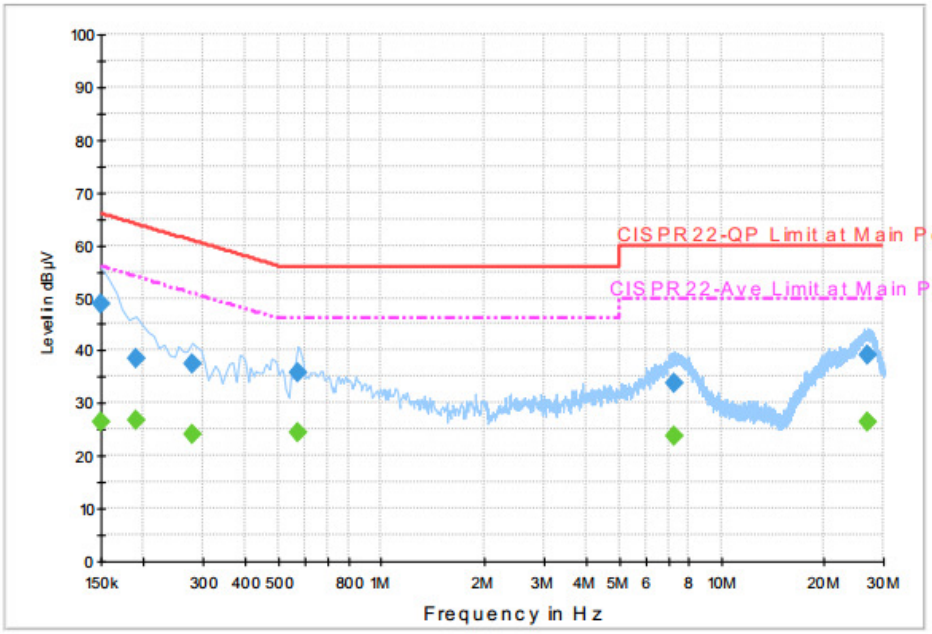
Final Result : QuasiPeak

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	42.7	Off	L1	19.6	23.3	66.0
0.190000	33.5	Off	L1	19.6	30.5	64.0
0.262000	37.5	Off	L1	19.6	23.9	61.4
0.478000	32.2	Off	L1	19.6	24.2	56.4
0.558000	37.1	Off	L1	19.6	18.9	56.0
7.862000	34.3	Off	L1	20.0	25.7	60.0
27.550000	32.4	Off	L1	21.0	27.6	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	22.1	Off	L1	19.6	33.9	56.0
0.190000	21.2	Off	L1	19.6	32.8	54.0
0.262000	28.0	Off	L1	19.6	23.4	51.4
0.478000	25.6	Off	L1	19.6	20.8	46.4
0.558000	31.6	Off	L1	19.6	14.4	46.0
7.862000	27.9	Off	L1	20.0	22.1	50.0
27.550000	22.7	Off	L1	21.0	27.3	50.0

Test Mode :	Mode 1	Temperature :	21~23℃
Test Engineer :	Arthur Hsieh	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM1900 Idle + Bluetooth Link + WLAN (5GHz) Link + Earphone + Camera (Front) + USB Cable (Charging from Adapter)		



Final Result : QuasiPeak

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	48.8	Off	N	19.6	17.2	66.0
0.190000	38.6	Off	N	19.6	25.4	64.0
0.278000	37.5	Off	N	19.6	23.4	60.9
0.566000	35.8	Off	N	19.6	20.2	56.0
7.246000	33.9	Off	N	20.0	26.1	60.0
26.998000	39.3	Off	N	21.2	20.7	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	26.3	Off	N	19.6	29.7	56.0
0.190000	26.6	Off	N	19.6	27.4	54.0
0.278000	23.9	Off	N	19.6	27.0	50.9
0.566000	24.4	Off	N	19.6	21.6	46.0
7.246000	23.7	Off	N	20.0	26.3	50.0
26.998000	26.3	Off	N	21.2	23.7	50.0

3.6 Frequency Stability Measurement

3.6.1 Limit of Frequency Stability

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.

3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

1. To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.
2. The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10dB lower than the measured peak value.
3. The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

3.6.4 Test Setup

3.6.5 Test Result of Frequency Stability

Please refer to Appendix A.

3.7 Automatically Discontinue Transmission

3.7.1 Limit of Automatically Discontinue Transmission

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 signaling 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 to describe how this requirement is met.

3.7.2 Measuring Instruments

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

3.7.3 Test Result of Automatically Discontinue Transmission

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

3.8 Antenna Requirements

3.8.1 Standard Applicable

According to FCC 47 CFR Section 15.407(a)(1)(2) ,if transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.8.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.8.3 Antenna Gain

The antenna gain 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
Spectrum Analyzer	R&S	FSV40	101078	9kHz~40GHz	May 07, 2016	Nov. 07, 2016 ~ Nov. 18, 2016	May 06, 2017	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1207253	30MHz~40GHz	Jan. 12, 2016	Nov. 07, 2016 ~ Nov. 18, 2016	Jan. 11, 2017	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Jan. 12, 2016	Nov. 07, 2016 ~ Nov. 18, 2016	Jan. 11, 2017	Conducted (TH01-SZ)
DC Power Supply	GWINSTEK	AnritsuGPS-3030D	EM882636	Max 30V	May 07, 2016	Nov. 07, 2016 ~ Nov. 18, 2016	May 06, 2017	Conducted (TH01-SZ)
Thermal Chamber	Ten Billion Hongzhangroup	LP-150U	H2014081803	-40~+150°C	Jul. 16, 2016	Nov. 07, 2016 ~ Nov. 18, 2016	Jul. 15, 2017	Conducted (TH01-SZ)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Nov. 03, 2016	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 30, 2016	Nov. 03, 2016	Aug. 29, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 02, 2015	Nov. 03, 2016	Dec. 01, 2016	Conduction (CO05-HY)
EMI Test Receiver&SA	KEYSIGHT	N9038A	MY54450083	20Hz~8.4GHz	May 07, 2016	Nov. 11, 2016 ~ Nov. 14, 2016	May 06, 2017	Radiation (03CH03-SZ)
EXA Spectrum Anaiyzer	KEYSIGHT	N9010A	MY55150246	10Hz~44GHz;	May 07, 2016	Nov. 11, 2016 ~ Nov. 14, 2016	May 06, 2017	Radiation (03CH03-SZ
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 07, 2016	Nov. 11, 2016 ~ Nov. 14, 2016	May 06, 2017	Radiation (03CH03-SZ)
Bilog Antenna	TeseQ	CBL6112D	35408	30MHz-2GHz	May 21, 2016	Nov. 11, 2016 ~ Nov. 14, 2016	May 20, 2017	Radiation (03CH03-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1355	1GHz~18GHz	May 07, 2016	Nov. 11, 2016 ~ Nov. 14, 2016	May 06, 2017	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 16, 2016	Nov. 11, 2016 ~ Nov. 14, 2016	Jul. 15, 2017	Radiation (03CH03-SZ
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Aug. 10, 2016	Nov. 11, 2016 ~ Nov. 14, 2016	Aug. 09, 2017	Radiation (03CH03-SZ)
Amplifier	Burgeon	BPA-530	102210	0.01Hz ~3000MHz	Oct. 11, 2016	Nov. 11, 2016 ~ Nov. 14, 2016	Oct. 10, 2017	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 11, 2016	Nov. 11, 2016 ~ Nov. 14, 2016	Oct. 10, 2017	Radiation (03CH03-SZ
Amplifier	Agilent Technologies	83017A	MY39501302	500MHz~26.5GHz	Jan. 12, 2016	Nov. 11, 2016 ~ Nov. 14, 2016	Jan. 11, 2017	Radiation (03CH03-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	Nov. 11, 2016 ~ Nov. 14, 2016	NCR	Radiation (03CH03-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Nov. 11, 2016 ~ Nov. 14, 2016	NCR	Radiation (03CH03-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Nov. 11, 2016 ~ Nov. 14, 2016	NCR	Radiation (03CH03-SZ)

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.7**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.1**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0**

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0**

Appendix A. Conducted Test Results

Report Number : FR682304E

Test Engineer:	Bruce Huang	Temperature:	21~25	°C
Test Date:	2016/11/07~2016/11/18	Relative Humidity:	51~54	%

TEST RESULTS DATA
6dB and 26dB EBW and 99% OBW

Band IV									
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Bandwidth (MHz)	26 dB Bandwidth (MHz)	6 dB Bandwidth (MHz)	6dB Bandwidth min. Limit (MHz)	Pass/Fail
11a	6M bps	1	149	5745	18.48	23.526	16.3836	0.5	Pass
11a	6Mbps	1	157	5785	18.73	23.327	16.3437	0.5	Pass
11a	6Mbps	1	165	5825	18.73	23.177	16.3836	0.5	Pass
HT20	MCS 0	1	149	5745	19.23	23.726	17.5824	0.5	Pass
HT20	MCS 0	1	157	5785	19.43	23.726	17.5824	0.5	Pass
HT20	MCS 0	1	165	5825	19.33	23.427	17.5824	0.5	Pass
HT40	MCS 0	1	151	5755	37.06	44.326	35.4446	0.5	Pass
HT40	MCS 0	1	159	5795	36.76	44.595	35.1249	0.5	Pass

TEST RESULTS DATA
Average Power Table

Band IV										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)		Pass/Fail
11a	6M bps	1	149	5745	0.31	13.60	30.00	-0.17		Pass
11a	6Mbps	1	157	5785	0.31	13.82	30.00	-0.17		Pass
11a	6Mbps	1	165	5825	0.31	13.44	30.00	-0.17		Pass
HT20	MCS 0	1	149	5745	0.33	13.71	30.00	-0.17		Pass
HT20	MCS 0	1	157	5785	0.33	13.77	30.00	-0.17		Pass
HT20	MCS 0	1	165	5825	0.33	13.59	30.00	-0.17		Pass
HT40	MCS 0	1	151	5755	0.63	13.73	30.00	-0.17		Pass
HT40	MCS 0	1	159	5795	0.63	13.75	30.00	-0.17		Pass

Report Number : FR682304E

TEST RESULTS DATA
Power Spectral Density

Band IV										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	10log (500kHz /RBW) Factor (dB)	Average Power Density (dBm/500kHz)	Average PSD Limit (dBm/500kHz)	DG (dBi)	Pass/Fail
11a	6M bps	1	149	5745	0.31	2.22	-0.74	30.00	-0.17	Pass
11a	6Mbps	1	157	5785	0.31	2.22	-0.69	30.00	-0.17	Pass
11a	6Mbps	1	165	5825	0.31	2.22	-0.93	30.00	-0.17	Pass
HT20	MCS 0	1	149	5745	0.33	2.22	-1.79	30.00	-0.17	Pass
HT20	MCS 0	1	157	5785	0.33	2.22	-1.79	30.00	-0.17	Pass
HT20	MCS 0	1	165	5825	0.33	2.22	-1.69	30.00	-0.17	Pass
HT40	MCS 0	1	151	5755	0.63	2.22	-4.40	30.00	-0.17	Pass
HT40	MCS 0	1	159	5795	0.63	2.22	-5.09	30.00	-0.17	Pass

Report Number : FR682304E

TEST RESULTS DATA
Frequency Stability

Band IV										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Center Frequency (MHz)	Frequency Deviation (MHz)	Frequency Stablility (ppm)	Temperature (°C)	Voltage (V)	Note
11a	6M bps	1	149	5745	5745.050	0.050	8.70	20	3.5	
11a	6M bps	1	149	5745	5745.050	0.050	8.70	20	4.1	
11a	6M bps	1	149	5745	5745.050	0.050	8.70	20	3.8	
11a	6M bps	1	149	5745	5745.100	0.100	17.41	-30	3.8	
11a	6M bps	1	149	5745	5745.050	0.050	8.70	50	3.8	

Appendix B. Radiated Spurious Emission

Test Engineer :	LiangLiang Lu	Temperature :	22~25°C
		Relative Humidity :	48~52%

Band 4 - 5725~5850MHz

WIFI 802.11a (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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 149 5745MHz		5646	47.63	-20.67	68.3	40.28	33.17	7.67	33.49	152	111	P	H
		5692.8	49.87	-50.12	99.99	42.47	33.23	7.68	33.51	152	111	P	H
		5705.6	47.8	-59.07	106.87	40.39	33.25	7.68	33.52	152	111	P	H
		5723.8	56.91	-62.65	119.56	49.48	33.27	7.68	33.52	152	111	P	H
		5745	103.45	-	-	95.95	33.29	7.74	33.53	152	111	P	H
		5745	95.39	-	-	87.89	33.29	7.74	33.53	152	111	A	H
													H
													H
		5643.6	48.47	-19.83	68.3	41.14	33.17	7.65	33.49	151	43	P	V
		5691.4	49.17	-49.79	98.96	41.77	33.23	7.68	33.51	151	43	P	V
		5720	47.69	-63.21	110.9	40.26	33.27	7.68	33.52	151	43	P	V
		5724.2	54.45	-66.03	120.48	47.02	33.27	7.68	33.52	151	43	P	V
		5745	100.6	-	-	93.1	33.29	7.74	33.53	151	43	P	V
		5745	92.96	-	-	85.46	33.29	7.74	33.53	151	43	A	V
													V
													V

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)
		5607.6	48.01	-20.29	68.3	40.73	33.12	7.65	33.49	151	40	P	H
		5682.2	46.96	-45.21	92.17	39.59	33.21	7.67	33.51	151	40	P	H
		5717.6	47.59	-62.64	110.23	40.16	33.27	7.68	33.52	151	40	P	H
		5720	46.89	-64.01	110.9	39.46	33.27	7.68	33.52	151	40	P	H
		5785	102.17	-	-	94.58	33.33	7.8	33.54	151	40	P	H
		5785	93.55	-	-	85.96	33.33	7.8	33.54	150	40	A	H
		5852.6	49.05	-67.32	116.37	41.33	33.41	7.87	33.56	151	40	P	H
		5855.8	47.35	-63.33	110.68	39.61	33.43	7.87	33.56	151	40	P	H
		5876.6	48.23	-55.88	104.11	40.46	33.46	7.87	33.56	151	40	P	H
		5928.8	47.42	-20.88	68.3	39.53	33.52	7.95	33.58	151	40	P	H
													H
802.11a CH 157 5785MHz													H
		5617.2	47.24	-21.06	68.3	39.94	33.14	7.65	33.49	153	100	P	V
		5696.6	46.66	-56.13	102.79	39.26	33.23	7.68	33.51	153	100	P	V
		5704.8	47.41	-59.24	106.65	40	33.25	7.68	33.52	153	100	P	V
		5721	47.41	-65.77	113.18	39.98	33.27	7.68	33.52	153	100	P	V
		5785	101.13	-	-	93.54	33.33	7.8	33.54	153	100	P	V
		5785	91.85	-	-	84.26	33.33	7.8	33.54	153	100	A	V
		5850.4	46.31	-75.08	121.39	38.59	33.41	7.87	33.56	153	100	P	V
		5862.8	47.92	-60.79	108.71	40.18	33.43	7.87	33.56	153	100	P	V
		5916.6	48.07	-26.42	74.49	40.24	33.5	7.91	33.58	153	100	P	V
		5942.6	47.4	-20.9	68.3	39.49	33.54	7.95	33.58	153	100	P	V
													V
													V

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)
		5825	101.25	-	-	93.57	33.39	7.84	33.55	153	110	P	H
		5825	93.15	-	-	85.47	33.39	7.84	33.55	153	110	A	H
		5850.2	48.71	-73.13	121.84	40.99	33.41	7.87	33.56	153	110	P	H
		5865.4	47.58	-60.41	107.99	39.84	33.43	7.87	33.56	153	110	P	H
		5877	49.28	-54.53	103.81	41.51	33.46	7.87	33.56	153	110	P	H
		5943	47.66	-20.64	68.3	39.75	33.54	7.95	33.58	153	110	P	H
													H
802.11a													H
CH 165		5825	100.11	-	-	92.43	33.39	7.84	33.55	202	38	P	V
5825MHz		5825	92.58	-	-	84.9	33.39	7.84	33.55	202	38	A	V
		5850.2	46.88	-74.96	121.84	39.16	33.41	7.87	33.56	202	38	P	V
		5873	47.17	-58.69	105.86	39.4	33.46	7.87	33.56	202	38	P	V
		5920.2	49.86	-21.98	71.84	42.03	33.5	7.91	33.58	202	38	P	V
		5926.6	46.95	-21.35	68.3	39.06	33.52	7.95	33.58	202	38	P	V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11a (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)
802.11a CH 149 5745MHz		11490	49.16	-24.84	74	58.11	39.7	11.1	59.75	145	265	P	H
		17235	51.87	-16.43	68.3	55.17	40.06	14.89	58.25	174	321	P	H
													H
													H
		11490	49.9	-24.1	74	58.85	39.7	11.1	59.75	145	265	P	V
		17235	51.92	-16.38	68.3	55.22	40.06	14.89	58.25	174	321	P	V
													V
													V
802.11a CH 157 5785MHz		11570	48.13	-25.87	74	57.13	39.66	11.17	59.83	105	198	P	H
		17355	53.09	-15.21	68.3	55.77	40.34	14.78	57.8	189	185	P	H
													H
													H
		11570	48.26	-25.74	74	57.26	39.66	11.17	59.83	105	198	P	V
		17355	53.04	-15.26	68.3	55.72	40.34	14.78	57.8	189	185	P	V
													V
													V
802.11a CH 165 5825MHz		11650	47.6	-26.4	74	56.65	39.62	11.23	59.9	250	0	P	H
		17475	52.74	-15.56	68.3	54.8	40.62	14.67	57.35	150	0	P	H
													H
													H
		11650	47.28	-26.72	74	56.33	39.62	11.23	59.9	250	0	P	V
		17475	52.7	-15.6	68.3	54.76	40.62	14.67	57.35	150	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		5613	49.02	-19.28	68.3	41.74	33.12	7.65	33.49	151	111	P	H
		5693	51.52	-48.62	100.14	44.12	33.23	7.68	33.51	151	111	P	H
		5720	51.58	-59.32	110.9	44.15	33.27	7.68	33.52	151	111	P	H
		5724.2	56.52	-63.96	120.48	49.09	33.27	7.68	33.52	151	111	P	H
		5745	103.1	-	-	95.6	33.29	7.74	33.53	151	111	P	H
		5745	95.35	-	-	87.85	33.29	7.74	33.53	151	111	A	H
802.11n													H
HT20													H
CH 149		5605.8	47.63	-20.67	68.3	40.36	33.12	7.64	33.49	223	42	P	V
5745MHz		5693.6	50.19	-50.39	100.58	42.79	33.23	7.68	33.51	223	42	P	V
		5719.4	48.48	-62.25	110.73	41.05	33.27	7.68	33.52	223	42	P	V
		5723.4	57.25	-61.4	118.65	49.82	33.27	7.68	33.52	223	42	P	V
		5745	101.2	-	-	93.7	33.29	7.74	33.53	223	42	P	V
		5745	94.09	-	-	86.59	33.29	7.74	33.53	223	42	A	V
													V
													V

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)
		5602.8	47.08	-21.22	68.3	39.81	33.12	7.64	33.49	152	111	P	H
		5667.8	47.14	-34.37	81.51	39.76	33.21	7.67	33.5	152	111	P	H
		5719	47.98	-62.64	110.62	40.55	33.27	7.68	33.52	152	111	P	H
		5720	47.67	-63.23	110.9	40.24	33.27	7.68	33.52	152	111	P	H
		5785	102.7	-	-	95.11	33.33	7.8	33.54	152	111	P	H
		5785	95.44	-	-	87.85	33.33	7.8	33.54	152	111	A	H
		5851.8	46.56	-71.64	118.2	38.84	33.41	7.87	33.56	152	111	P	H
		5868	47.69	-59.57	107.26	39.95	33.43	7.87	33.56	152	111	P	H
		5923.6	47.69	-21.64	69.33	39.84	33.52	7.91	33.58	152	111	P	H
		5932	47.34	-20.96	68.3	39.45	33.52	7.95	33.58	152	111	P	H
802.11n													H
HT20													H
CH 157		5642	46.71	-21.59	68.3	39.38	33.17	7.65	33.49	236	39	P	V
5785MHz		5654.2	47.47	-23.95	71.42	40.11	33.19	7.67	33.5	236	39	P	V
		5711	47.16	-61.22	108.38	39.75	33.25	7.68	33.52	236	39	P	V
		5724.8	46.96	-74.88	121.84	39.53	33.27	7.68	33.52	236	39	P	V
		5785	100.55	-	-	92.96	33.33	7.8	33.54	236	39	P	V
		5785	95.18	-	-	87.59	33.33	7.8	33.54	236	39	A	V
		5854.4	46.4	-65.87	112.27	38.66	33.43	7.87	33.56	236	39	P	V
		5859.6	46.69	-62.92	109.61	38.95	33.43	7.87	33.56	236	39	P	V
		5895.6	47.93	-42.09	90.02	40.11	33.48	7.91	33.57	236	39	P	V
		5940.4	47.23	-21.07	68.3	39.32	33.54	7.95	33.58	236	39	P	V
													V
													V

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)
		5825	101.85	-	-	94.17	33.39	7.84	33.55	154	114	P	H
		5825	95.2	-	-	87.52	33.39	7.84	33.55	154	114	A	H
		5850.6	48.44	-72.49	120.93	40.72	33.41	7.87	33.56	154	114	P	H
		5855.2	47.32	-63.52	110.84	39.58	33.43	7.87	33.56	154	114	P	H
		5877	48.54	-55.27	103.81	40.77	33.46	7.87	33.56	154	114	P	H
		5947	47.8	-20.5	68.3	39.89	33.54	7.95	33.58	154	114	P	H
802.11n													H
HT20													H
CH 165		5825	99.81	-	-	92.13	33.39	7.84	33.55	152	42	P	V
5825MHz		5825	93.14	-	-	85.46	33.39	7.84	33.55	152	42	A	V
		5854.2	48	-64.72	112.72	40.26	33.43	7.87	33.56	152	42	P	V
		5871.8	46.83	-59.36	106.19	39.06	33.46	7.87	33.56	152	42	P	V
		5923	47.87	-21.9	69.77	40.02	33.52	7.91	33.58	152	42	P	V
		5933.8	47.62	-20.68	68.3	39.73	33.52	7.95	33.58	152	42	P	V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.

Band 4 5725~5850MHz

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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		11490	47.93	-26.07	74	56.88	39.7	11.1	59.75	250	0	P	H
		17235	51.13	-17.17	68.3	54.43	40.06	14.89	58.25	150	0	P	H
802.11n													H
HT20													H
CH 149		11490	48.01	-25.99	74	56.96	39.7	11.1	59.75	250	0	P	V
5745MHz		17235	52.64	-15.66	68.3	55.94	40.06	14.89	58.25	150	0	P	V
													V
													V
		11570	48.44	-25.56	74	57.44	39.66	11.17	59.83	105	198	P	H
		17355	52.64	-15.66	68.3	55.32	40.34	14.78	57.8	189	185	P	H
802.11n													H
HT20													H
CH 157		11570	48.71	-25.29	74	57.71	39.66	11.17	59.83	105	198	P	V
5785MHz		17355	53.62	-14.68	68.3	56.3	40.34	14.78	57.8	189	185	P	V
													V
													V
		11650	49.05	-24.95	74	58.1	39.62	11.23	59.9	146	347	P	H
		17475	54.94	-13.36	68.3	57	40.62	14.67	57.35	100	360	P	H
802.11n													H
HT20													H
CH 165		11650	48.44	-25.56	74	57.49	39.62	11.23	59.9	146	347	P	V
5825MHz		17475	54.63	-13.67	68.3	56.69	40.62	14.67	57.35	100	360	P	V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.

Band 4 5725~5850MHz

WIFI 802.11n HT40 (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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		5626	48.31	-19.99	68.3	41.01	33.14	7.65	33.49	166	118	P	H
		5652.8	49.24	-21.14	70.38	41.87	33.19	7.67	33.49	166	118	P	H
		5717.2	53.49	-56.63	110.12	46.08	33.25	7.68	33.52	166	118	P	H
		5721.6	56.68	-57.87	114.55	49.25	33.27	7.68	33.52	166	118	P	H
		5755	98.33	-	-	90.81	33.31	7.74	33.53	166	118	P	H
		5755	90.12	-	-	82.6	33.31	7.74	33.53	166	118	A	H
		5851	46.3	-73.72	120.02	38.58	33.41	7.87	33.56	166	118	P	H
		5857.4	47.46	-62.77	110.23	39.72	33.43	7.87	33.56	166	118	P	H
		5903.4	48.06	-36.19	84.25	40.24	33.48	7.91	33.57	166	118	P	H
		5929.6	47.75	-20.55	68.3	39.86	33.52	7.95	33.58	166	118	P	H
802.11n													H
HT40													H
CH 151		5633.8	48.18	-20.12	68.3	40.85	33.17	7.65	33.49	239	42	P	V
5755MHz		5657.4	48.2	-25.6	73.8	40.84	33.19	7.67	33.5	239	42	P	V
		5718	53.32	-57.02	110.34	45.89	33.27	7.68	33.52	239	42	P	V
		5724.6	59.03	-62.36	121.39	51.6	33.27	7.68	33.52	239	42	P	V
		5755	97.26	-	-	89.74	33.31	7.74	33.53	239	42	P	V
		5755	89.63	-	-	82.11	33.31	7.74	33.53	239	42	A	V
		5851.4	46.56	-72.55	119.11	38.84	33.41	7.87	33.56	239	42	P	V
		5862.6	48.12	-60.65	108.77	40.38	33.43	7.87	33.56	239	42	P	V
		5922	49.5	-21.01	70.51	41.65	33.52	7.91	33.58	239	42	P	V
		5937.2	47.83	-20.47	68.3	39.94	33.52	7.95	33.58	239	42	P	V
													V
													V

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)
		5606.6	47.6	-20.7	68.3	40.32	33.12	7.65	33.49	150	115	P	H
		5689.8	48.46	-49.32	97.78	41.06	33.23	7.68	33.51	150	115	P	H
		5711.8	46.89	-61.72	108.61	39.48	33.25	7.68	33.52	150	115	P	H
		5723.4	46.88	-71.77	118.65	39.45	33.27	7.68	33.52	150	115	P	H
		5795	99.16	-	-	91.55	33.35	7.8	33.54	150	115	P	H
		5795	90.11	-	-	82.5	33.35	7.8	33.54	150	115	A	H
		5852.8	46.36	-69.56	115.92	38.64	33.41	7.87	33.56	150	115	P	H
		5863	47.25	-61.41	108.66	39.51	33.43	7.87	33.56	150	115	P	H
		5881.6	48.06	-52.34	100.4	40.29	33.46	7.87	33.56	150	115	P	H
		5928.6	50.08	-18.22	68.3	42.19	33.52	7.95	33.58	150	115	P	H
802.11n													H
HT40													H
CH 159		5607	47.77	-20.53	68.3	40.49	33.12	7.65	33.49	168	40	P	V
5795MHz		5664	48.15	-30.54	78.69	40.79	33.19	7.67	33.5	168	40	P	V
		5702.2	46.88	-59.04	105.92	39.46	33.25	7.68	33.51	168	40	P	V
		5723.2	48.82	-69.38	118.2	41.39	33.27	7.68	33.52	168	40	P	V
		5795	96.69	-	-	89.08	33.35	7.8	33.54	168	40	P	V
		5795	89.11	-	-	81.5	33.35	7.8	33.54	168	40	A	V
		5854.2	47.46	-65.26	112.72	39.72	33.43	7.87	33.56	168	40	P	V
		5869.2	46.58	-60.34	106.92	38.84	33.43	7.87	33.56	168	40	P	V
		5919.8	47.51	-24.62	72.13	39.68	33.5	7.91	33.58	168	40	P	V
		5944	48.03	-20.27	68.3	40.12	33.54	7.95	33.58	168	40	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11n HT40 (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)
		11510	48.72	-25.28	74	57.68	39.7	11.1	59.76	100	360	P	H
		17265	52.79	-15.51	68.3	55.93	40.14	14.85	58.13	100	360	P	H
802.11n													H
HT40													H
CH 151		11510	48.92	-25.08	74	57.88	39.7	11.1	59.76	100	360	P	V
5755MHz		17265	52.74	-15.56	68.3	55.88	40.14	14.85	58.13	100	360	P	V
													V
													V
		11590	48.55	-25.45	74	57.58	39.65	11.17	59.85	100	300	P	H
		17385	54.74	-13.56	68.3	57.25	40.42	14.74	57.67	100	200	P	H
802.11n													H
HT40													H
CH 159		11590	48.26	-25.74	74	57.29	39.65	11.17	59.85	100	300	P	V
5795MHz		17385	54.06	-14.24	68.3	56.57	40.42	14.74	57.67	100	200	P	V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.

Emission below 1GHz

5GHz WIFI 802.11n HT20 (LF @ 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)
		30.97	27.22	-12.78	40	32.1	26.28	0.62	31.78	-	-	P	H
		98.87	36.15	-7.35	43.5	48.04	18.7	0.99	31.58	100	0	P	H
		205.57	33.03	-10.47	43.5	47.12	15.88	1.28	31.25	-	-	P	H
		335.55	30.2	-15.8	46	39.77	20.02	1.71	31.3	-	-	P	H
		425.76	30.85	-15.15	46	34.75	25.43	1.89	31.22	-	-	P	H
		974.78	33.74	-20.26	54	31.92	29.9	3.19	31.27	-	-	P	H
													H
													H
													H
													H
5GHz													H
802.11n													H
HT20		42.61	34.47	-5.53	40	44.78	20.82	0.62	31.75	100	0	P	V
LF		91.11	37.67	-5.83	43.5	50.4	17.9	0.99	31.62	-	-	P	V
		168.71	31.95	-11.55	43.5	45.17	16.98	1.15	31.35	-	-	P	V
		201.69	35.1	-8.4	43.5	49.38	15.69	1.28	31.25	-	-	P	V
		893.3	32.37	-13.63	46	32.43	28.45	2.77	31.28	-	-	P	V
		985.45	34.11	-19.89	54	32.07	30.11	3.19	31.26	-	-	P	V
													V
													V
													V
													V
													V
													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		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		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. Radiated Spurious Emission Plots

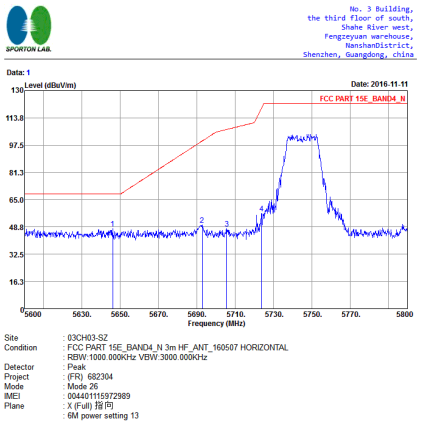
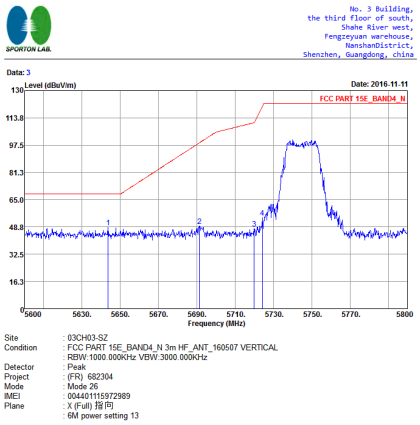
Test Engineer :	LiangLiang Lu	Temperature :	22~25°C
		Relative Humidity :	48~52%

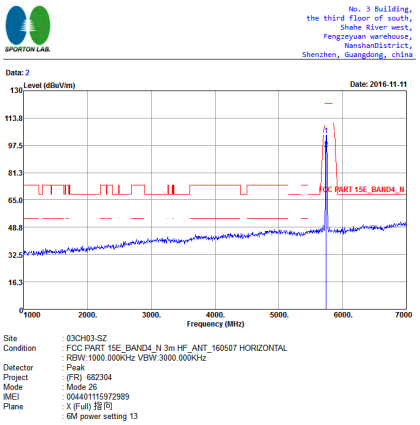
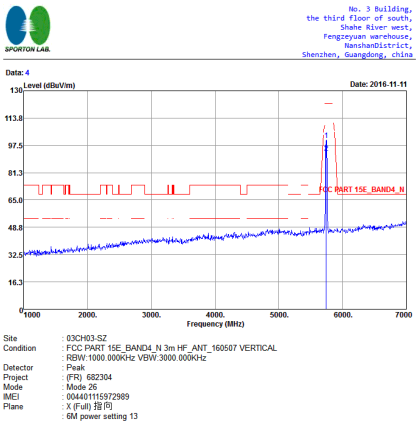
Note symbol

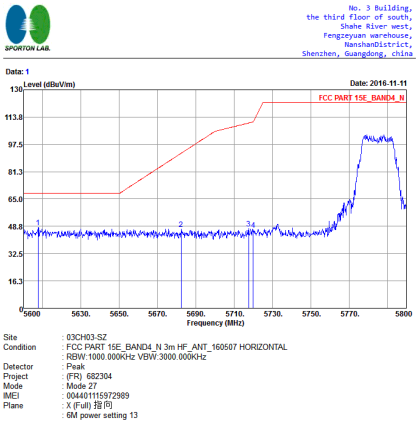
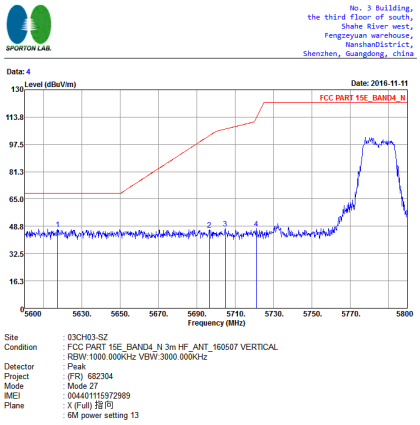
-L	**Low channel location**
-R	**High channel location**

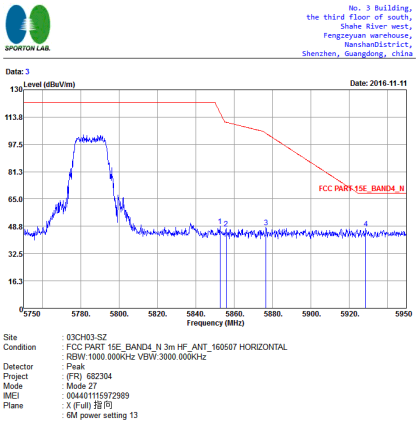
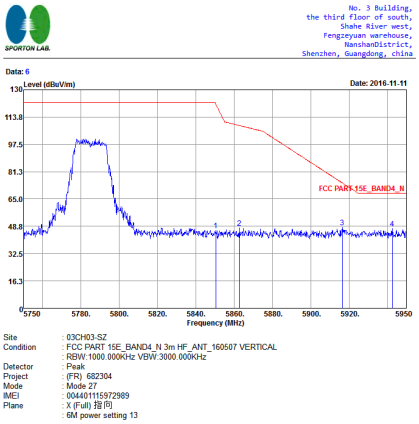
Band 4 - 5725~5850MHz

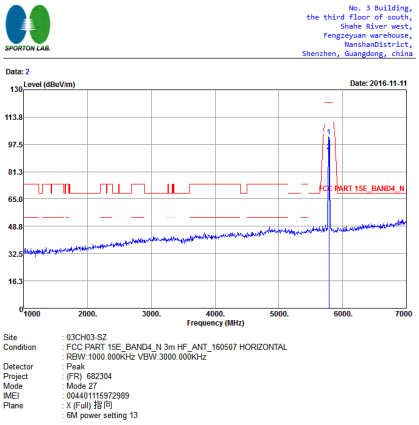
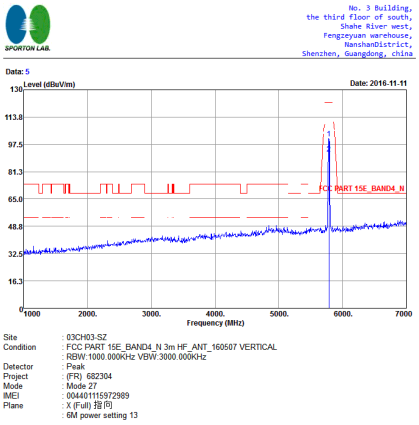
WIFI 802.11a (Band Edge @ 3m)

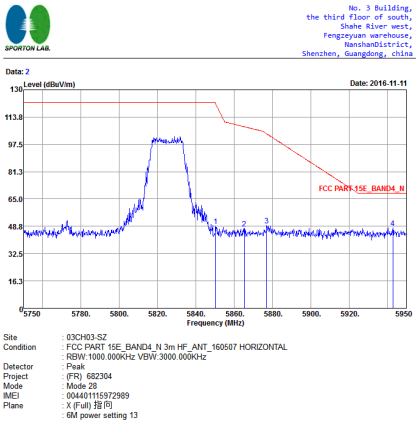
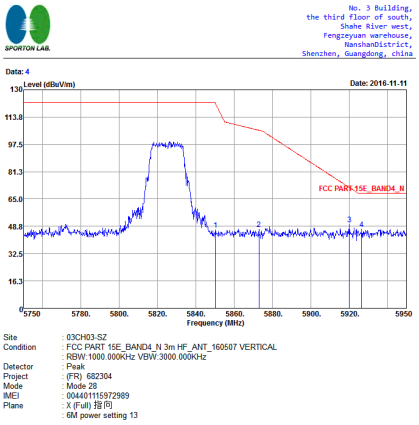
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH149 5745MHz	
1	Horizontal	Vertical
Peak		

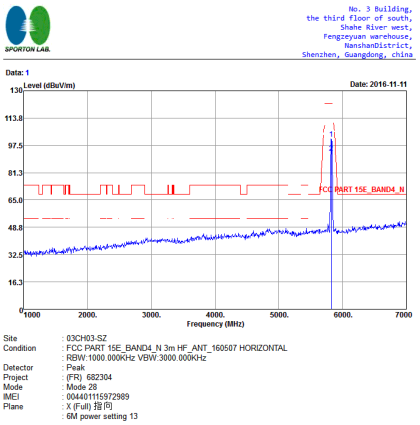
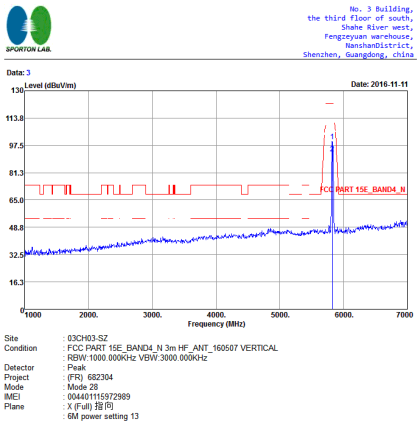
WIFI	Band 4 5725~5850MHz Fundamental @ 3m	
ANT	802.11a CH149 5745MHz	
1	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz – L	
1	Horizontal	Vertical
Peak		

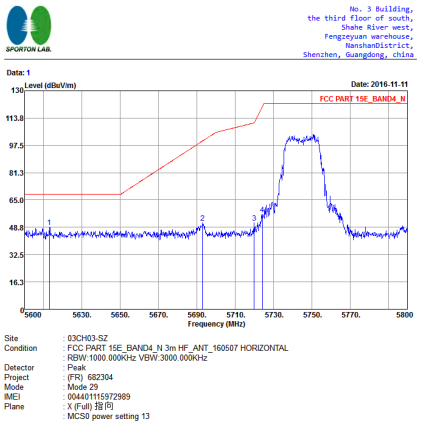
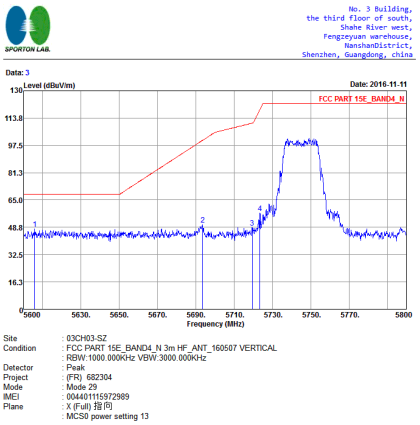
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz – R	
1	Horizontal	Vertical
Peak		

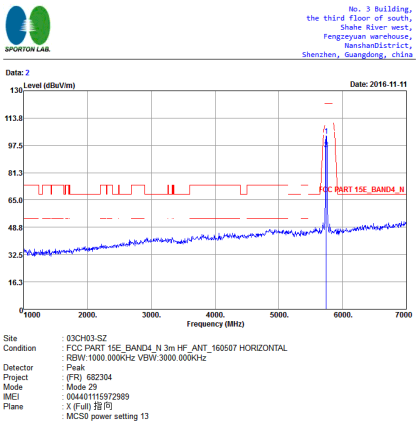
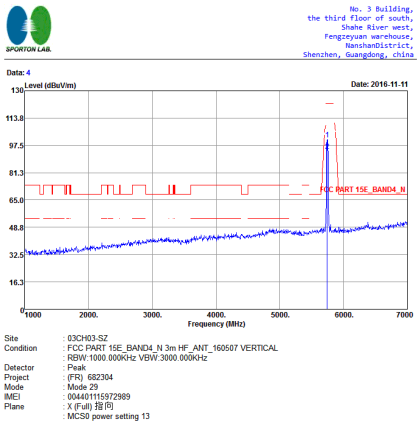
WIFI	Band 4 5725~5850MHz Fundamental @ 3m	
ANT	802.11a CH157 5785MHz	
1	Horizontal	Vertical
Peak Avg.		

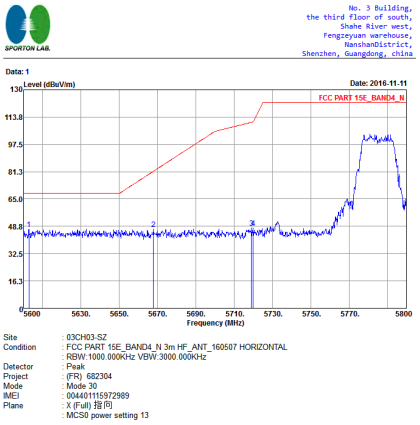
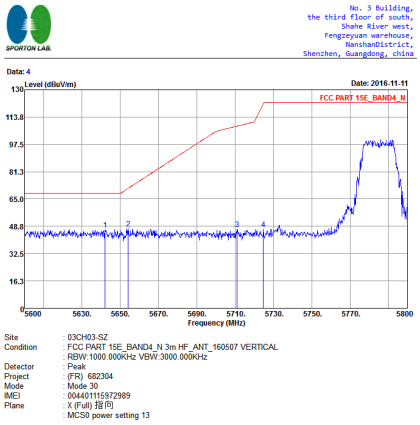
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Vertical
Peak		

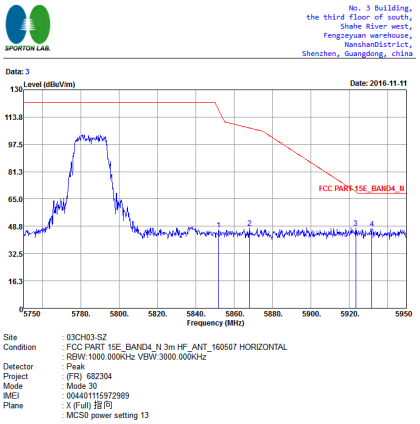
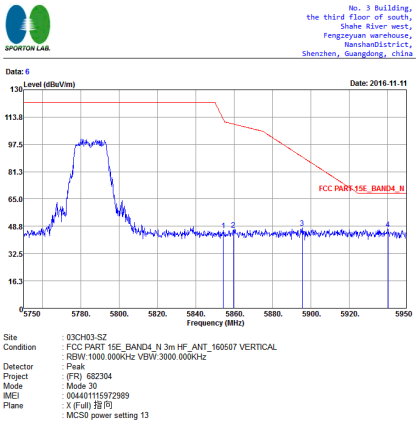
WIFI	Band 4 5725~5850MHz Fundamental @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Vertical
Peak Avg.		

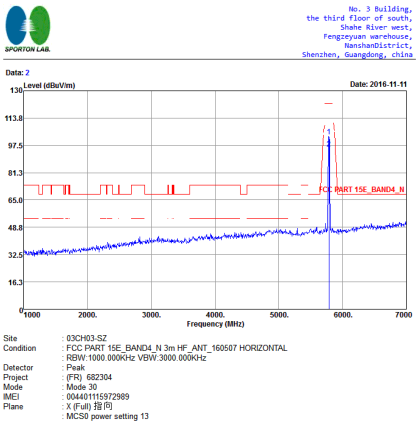
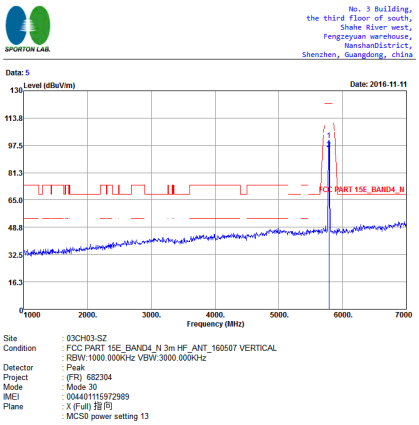
Band 4 5725~5850MHz
WIFI 802.11n HT20 (Band Edge @ 3m)

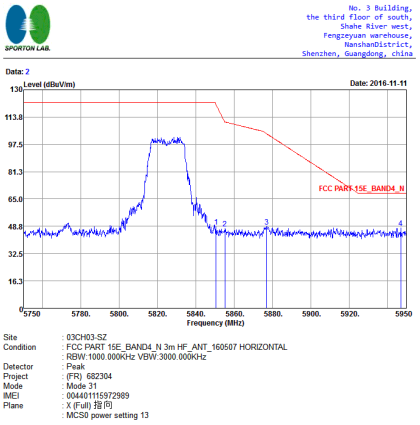
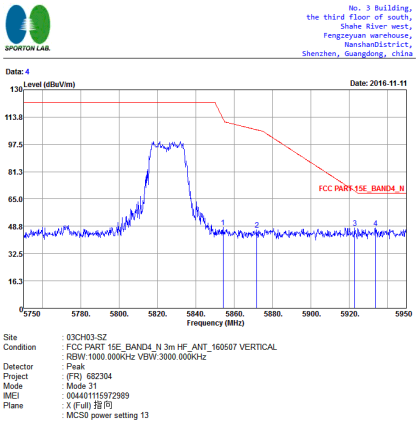
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Horizontal	Vertical
Peak		

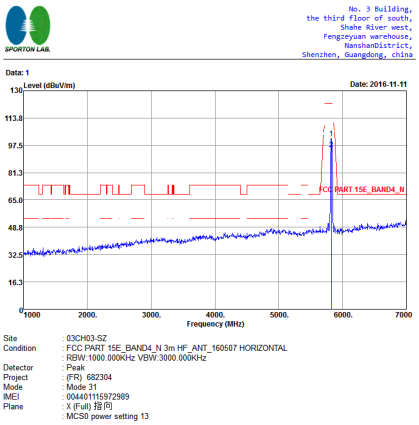
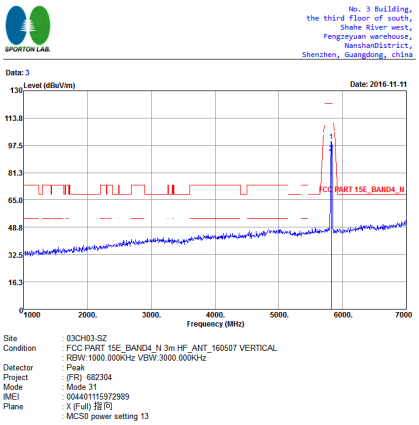
WIFI	Band 4 5725~5850MHz Fundamental @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz - L	
1	Horizontal	Vertical
Peak		

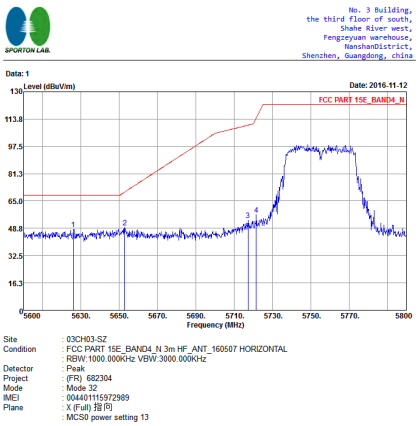
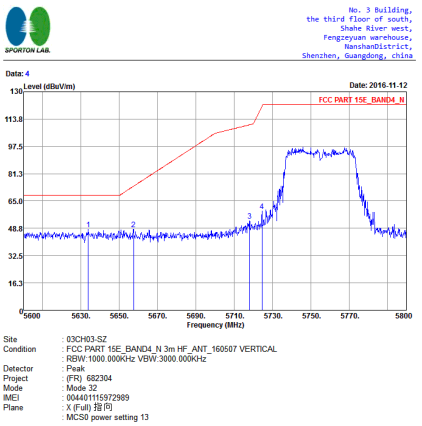
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz - R	
1	Horizontal	Vertical
Peak		

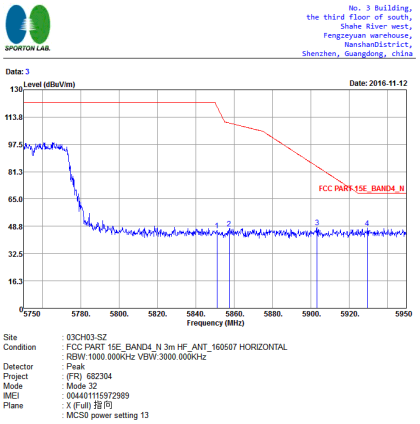
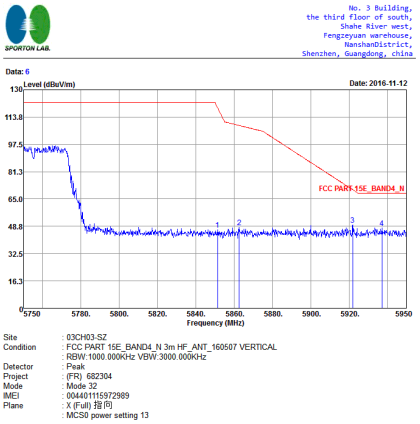
WIFI	Band 4 5725~5850MHz Fundamental @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Horizontal	Vertical
Peak Avg.		

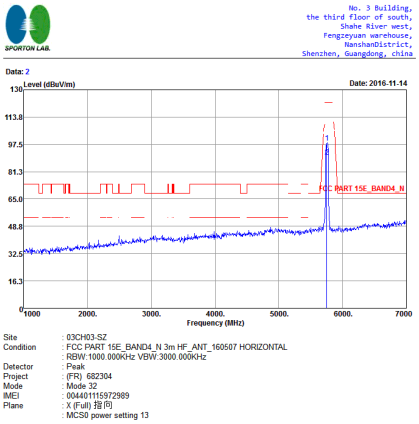
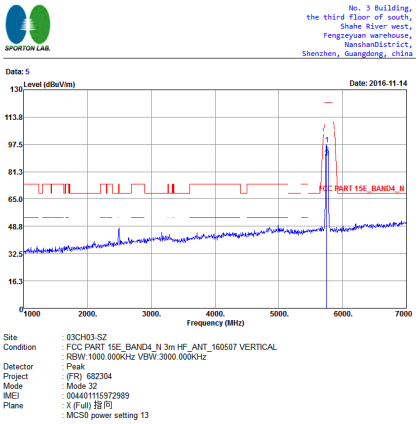
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1	Horizontal	Vertical
Peak		

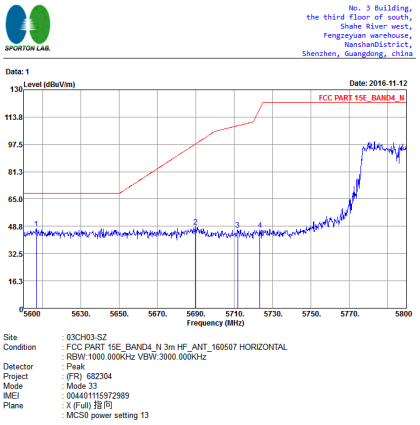
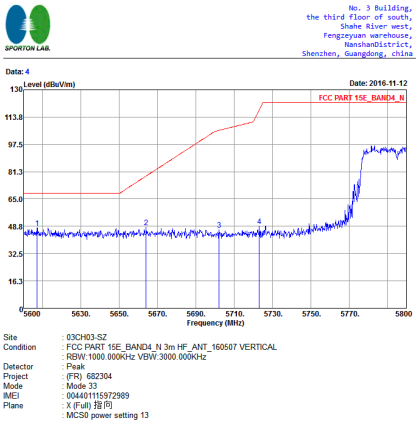
WIFI	Band 4 5725~5850MHz Fundamental @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1	Horizontal	Vertical
Peak Avg.		

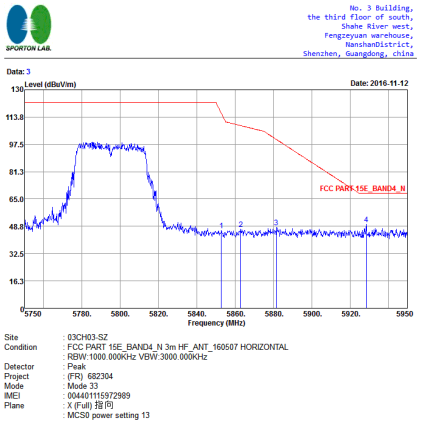
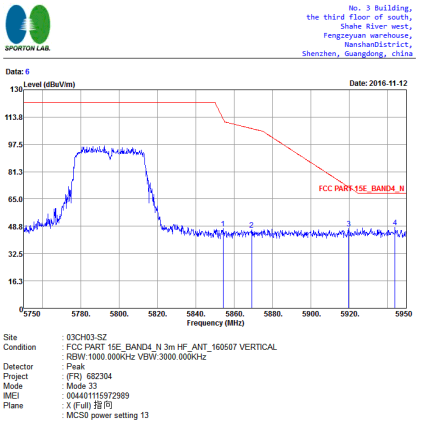
Band 4 5725~5850MHz
WIFI 802.11n HT40 (Band Edge @ 3m)

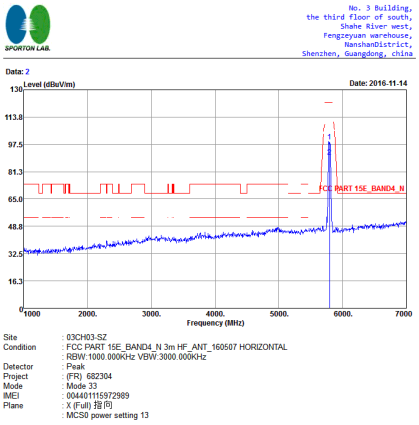
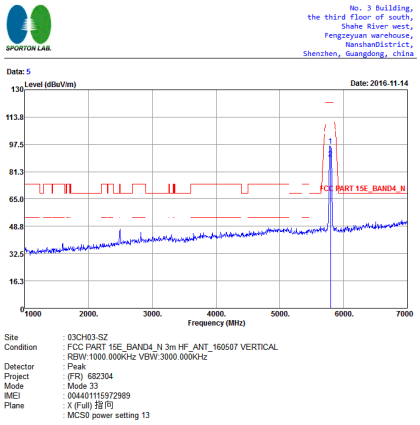
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH151 5755MHz - L	
1	Horizontal	Vertical
Peak		

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH151 5755MHz - R	
1	Horizontal	Vertical
Peak		

WIFI	Band 4 5725~5850MHz Fundamental @ 3m	
ANT	802.11n HT40 CH151 5755MHz	
1	Horizontal	Vertical
Peak Avg.		

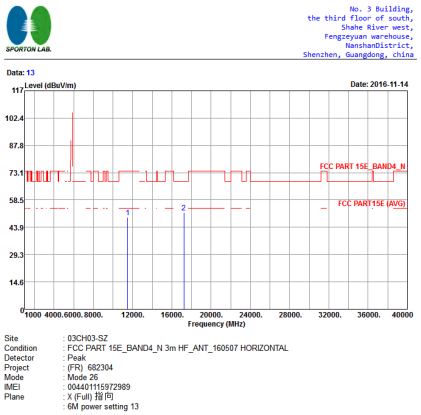
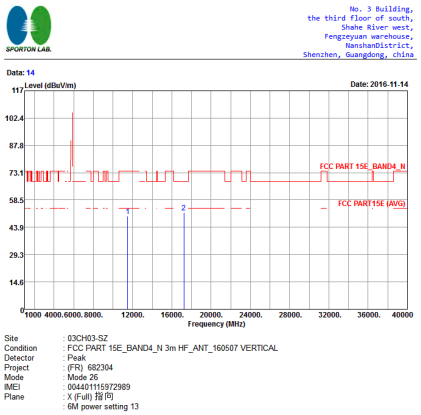
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH159 5795MHz - L	
1	Horizontal	Vertical
Peak		

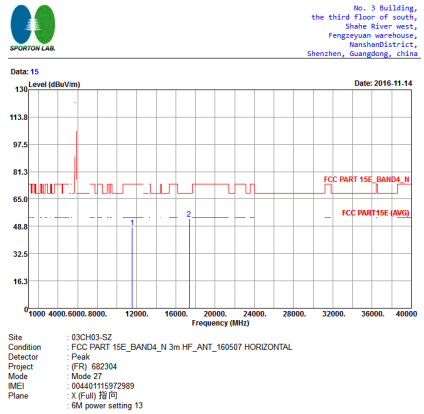
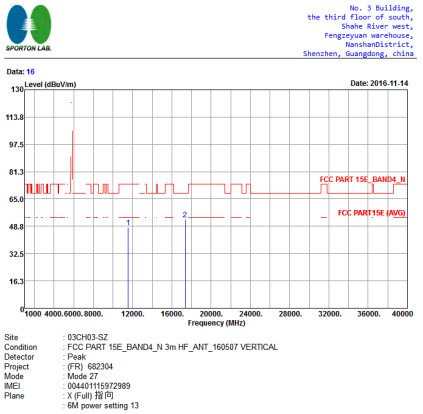
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH159 5795MHz - R	
1	Horizontal	Vertical
Peak		

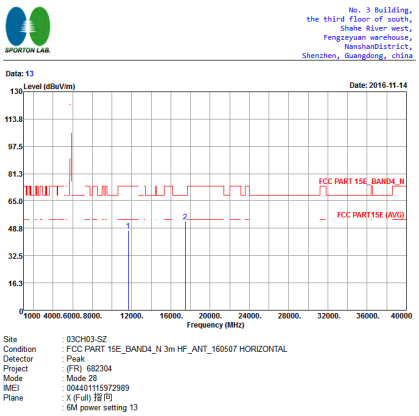
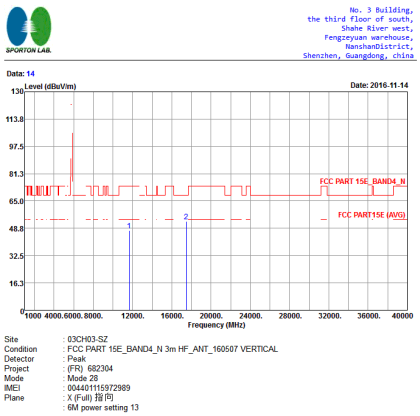
WIFI	Band 4 5725~5850MHz Fundamental @ 3m	
ANT	802.11n HT40 CH159 5795MHz	
1	Horizontal	Vertical
Peak Avg.		

Band 4 - 5725~5850MHz

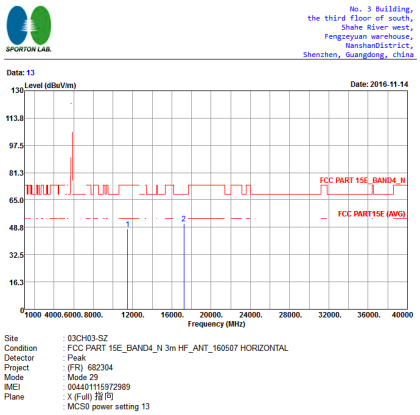
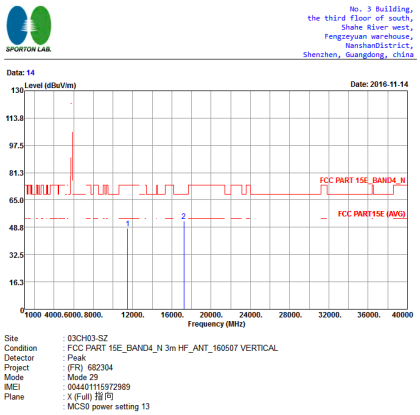
WIFI 802.11a (Harmonic @ 3m)

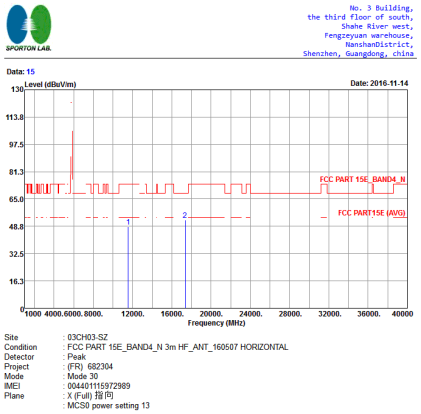
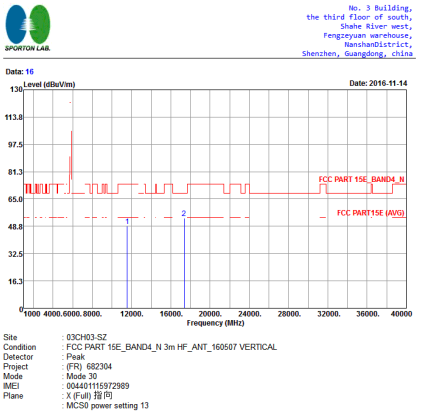
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH149 5745MHz	
1	Horizontal	Vertical
Peak Avg.		

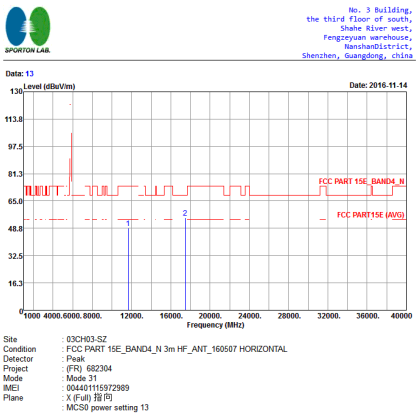
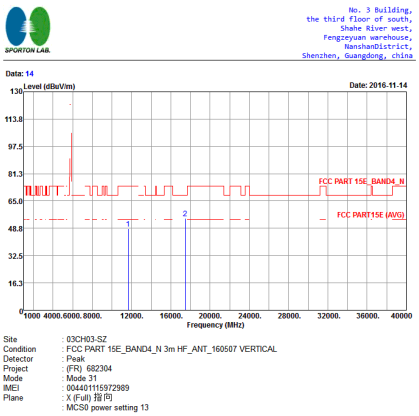
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH157 5785MHz	
1	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Vertical
Peak Avg.		

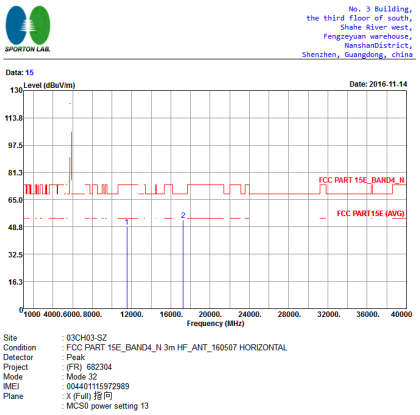
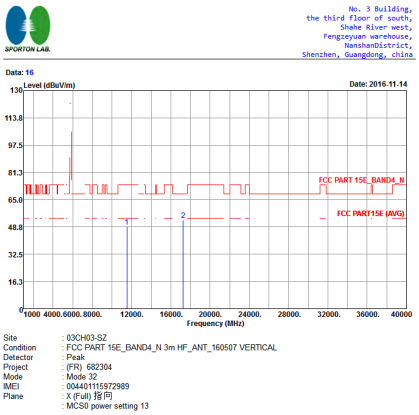
Band 4 5725~5850MHz
WIFI 802.11n HT20 (Harmonic @ 3m)

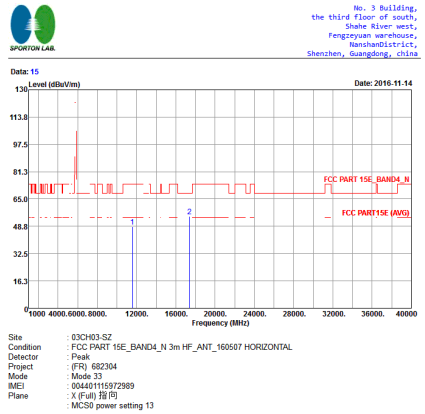
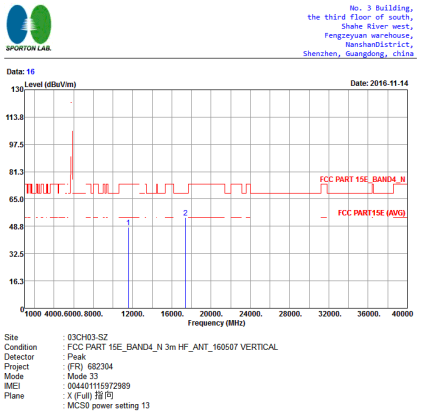
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1	Horizontal	Vertical
Peak Avg.		

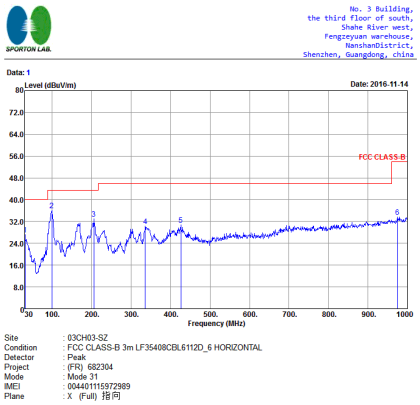
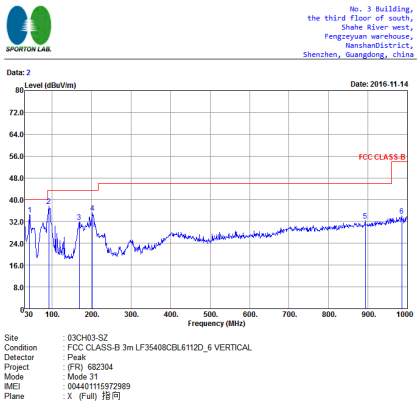
Band 4 5725~5850MHz
WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT40 CH151 5755MHz	
1	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT40 CH159 5795MHz	
1	Horizontal	Vertical
Peak Avg.		

Emission below 1GHz

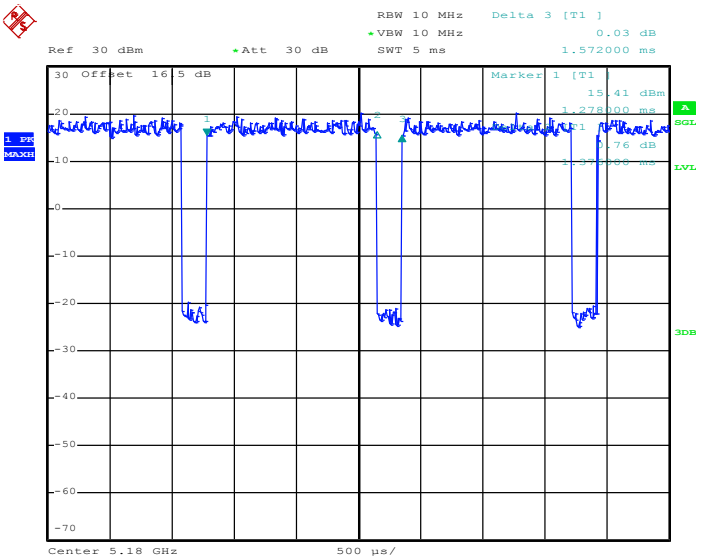
5GHz WIFI 802.11n HT20 (LF)

WIFI	5GHz 5725~5850MHz	
ANT	802.11n HT20 LF	
1	Horizontal	Vertical
QP / Peak		

Appendix D. Duty Cycle Plots

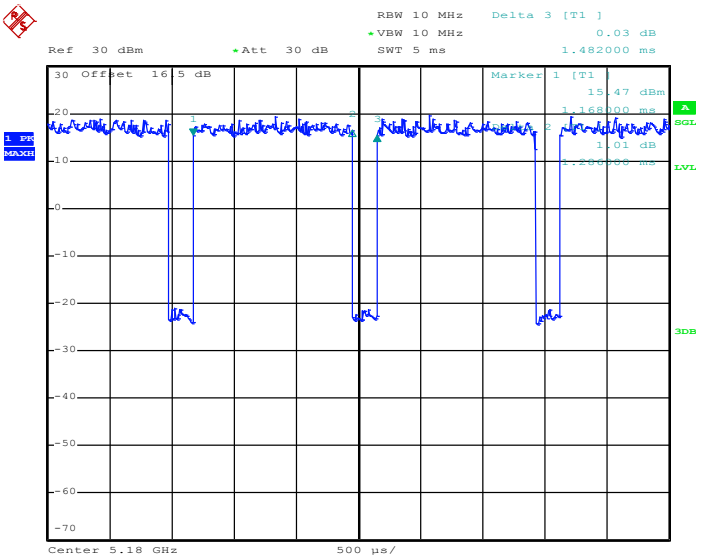
Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11a	87.53	1.38	0.73	1KHz
5GHz 802.11n HT20	86.77	1.29	0.78	1KHz
5GHz 802.11n HT40	75.83	0.64	1.56	3KHz

802.11a



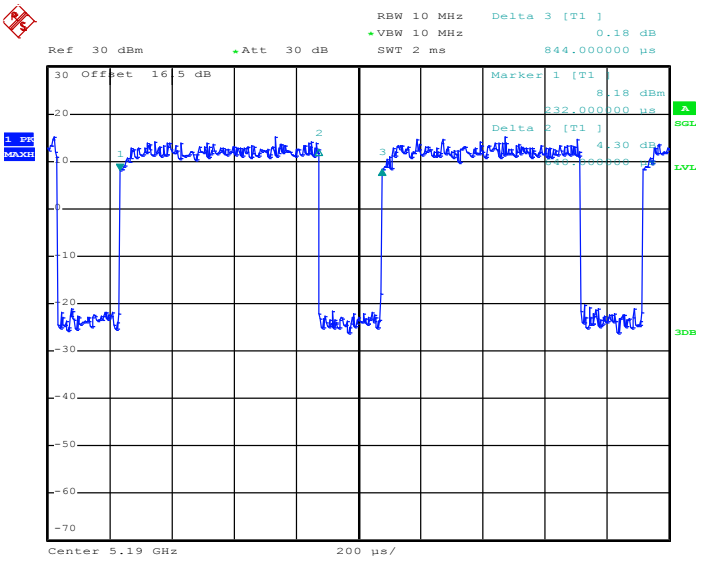
Date: 7.NOV.2016 15:28:33

802.11n HT20



Date: 7.NOV.2016 15:38:19

802.11n HT40



Date: 7.NOV.2016 15:43:18