FCC RF Test Report

APPLICANT	:	**Essential Products Inc.**
EQUIPMENT	:	**Smartphone**
BRAND NAME	:	**Essential Products**
MODEL NAME	:	**A11**
FCC ID	:	**2ALBB-A11**
STANDARD	:	**FCC Part 15 Subpart E §15.407**
CLASSIFICATION	:	**(NII) Unlicensed National Information Infrastructure**

The product was received on Apr. 08, 2017 and testing was completed on Jun. 13, 2017. 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.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR740822F	Rev. 01	Initial issue of report	Jun. 16, 2017
FR740822F	Rev. 02	Add the test results description of radiated spurious emission below 30MHz in section 3.4.5.	Jun. 20, 2017

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 3.77 dB at 33.780 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 14.50 dB at 0.518 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

Essential Products Inc.
380 Portage Ave., Palo Alto, CA 94306

1.2 Manufacturer

FIH Mobile Limited
No.4, Mingsheng St.,Tu-Cheng Dist., New Taipei City 23679, Taiwan

1.3 Feature of Equipment Under Test

GSM/WCDMA/CDMA2000/LTE, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n, Wi-Fi 5GHz 802.11a/n/ac, NFC, and GPS.

Product Specification subjective to this standard	
Antenna Type	WWAN: PIFA Antenna WLAN: Monopole Antenna Bluetooth: Monopole Antenna GPS/Glonass/Galileo/Beidou : Monopole Antenna NFC: Loop Antenna

1.4 Modification of EUT

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

1.5 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW0007 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.**	
	TH05-HY	CO05-HY

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

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH12-HY

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

1.6 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.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- FCC KDB 644545 D03 Guidance for IEEE 802 11ac New Rules v01
- 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: conduction emission (150 kHz to 30 MHz), 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.

b. AC power line Conducted Emission was tested under maximum output power.

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:

1. The above Frequency and Channel in "*" were 802.11n HT40 and 802.11ac VHT40.
2. The above Frequency and Channel in "#" were 802.11ac VHT80.

2.2 Test Mode

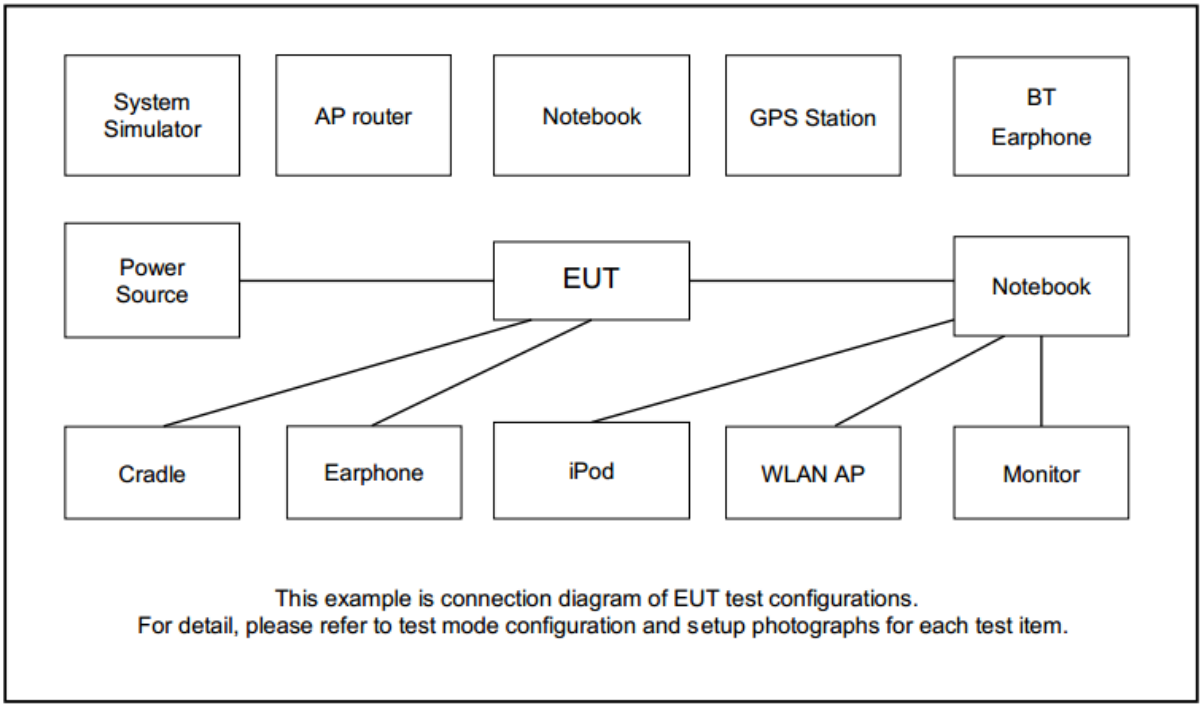
Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates as below table.

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT20	MCS0
802.11ac VHT40	MCS0
802.11ac VHT80	MCS0

Test Cases	
AC Conducted Emission	Mode 1 : GSM850 Idle + Bluetooth Link + WLAN (5GHz) Link + NFC On + USB Cable (Charging from Adapter)

Ch. #		Band IV：5725-5850 MHz		
		802.11n HT20	802.11n HT40	802.11ac VHT80
L	Low	149	151	-
M	Middle	157	-	155
H	High	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.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
3.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
4.	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

2.5 EUT Operation Test Setup

The RF test items, programmed RF utility, “QRCT” 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

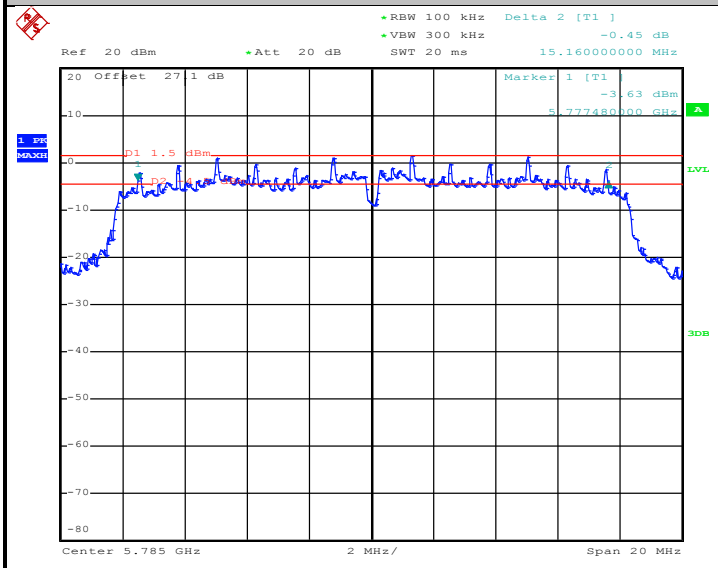
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03. Section C) Emission bandwidth for the band 5.725-5.85GHz
2. Set RBW = 100kHz.
3. Set the VBW ≥ 3 x RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 6 dB down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

3.1.4 Test Setup

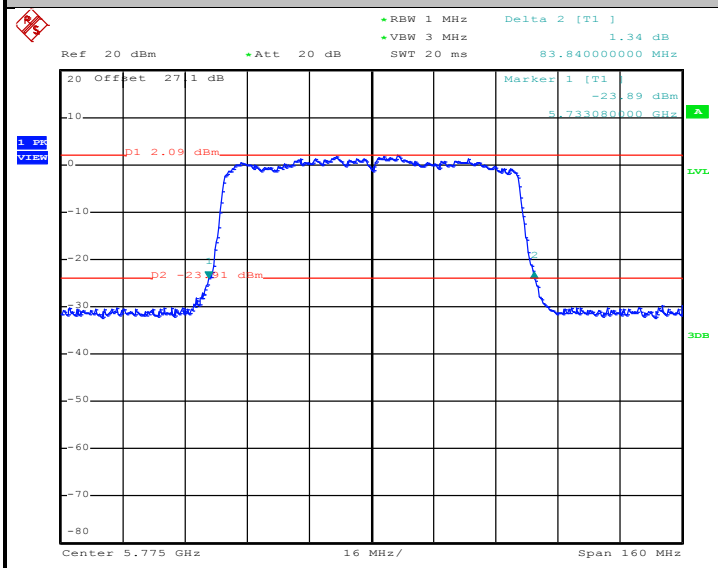
3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

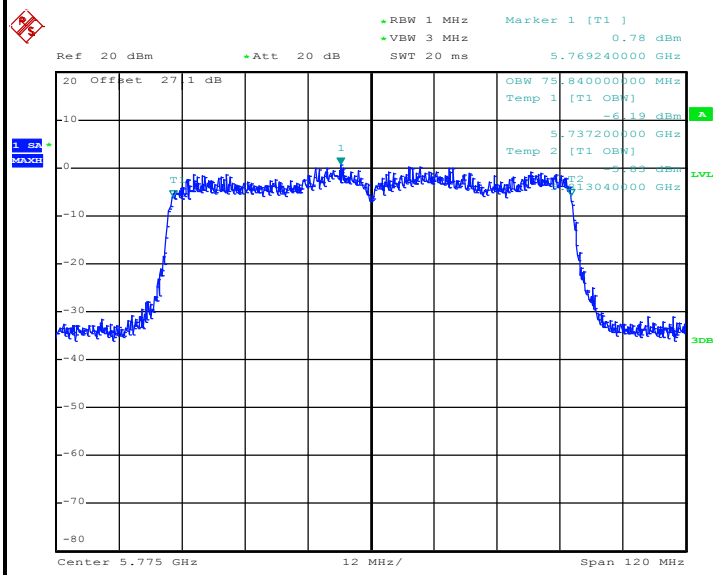
Minimum 6dB Bandwidth



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.

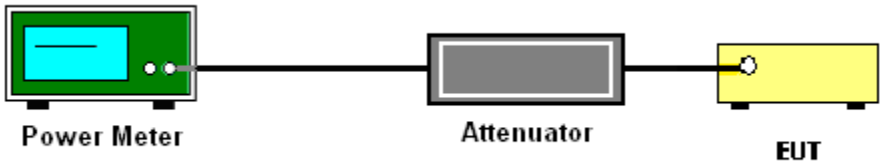
3.2.3 Test Procedures

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).

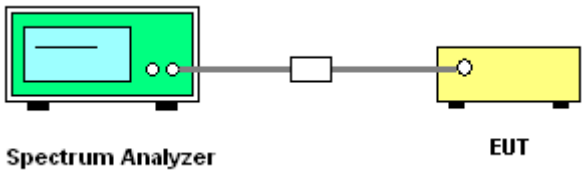
- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 300 kHz.
- Set VBW ≥ 1 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- Add 10 log(500kHz/RBW) 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.

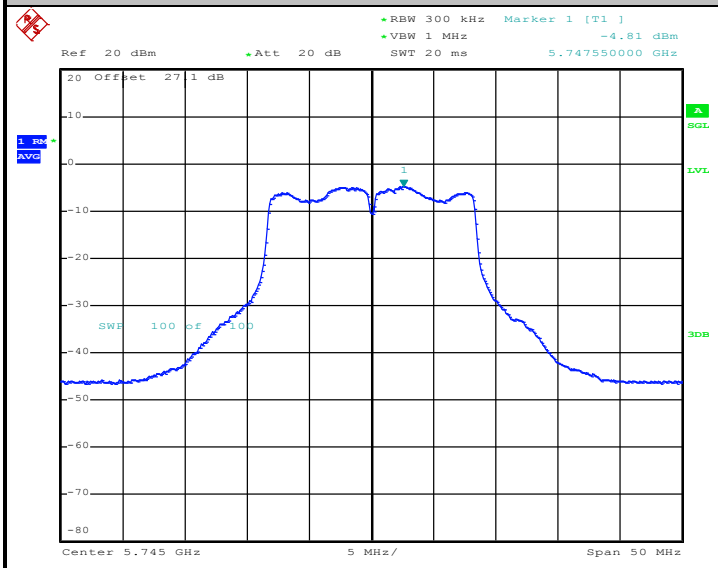
3.3.4 Test Setup



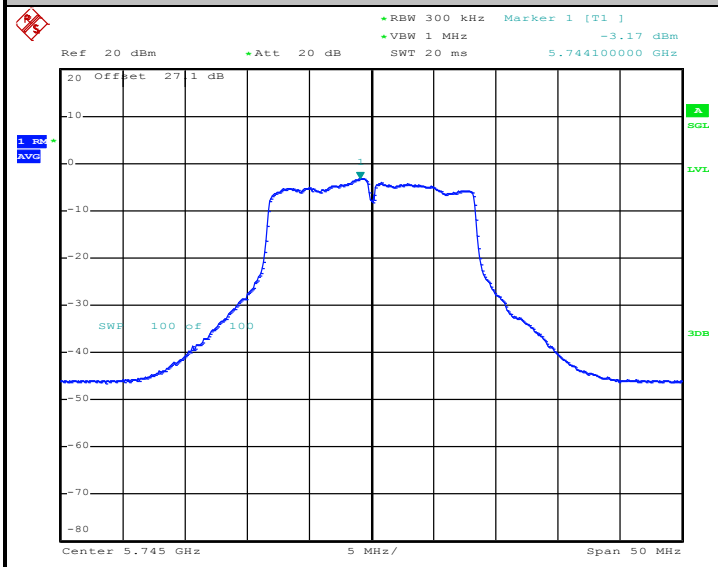
3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

Worst Case Power Density (dBm/300kHz) for MMIO Ant. 1



Worst Case Power Density (dBm/300kHz) for MMIO Ant. 2



3.4 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

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) KDB789033 D02 v01r03 G)2)c)

(i) Section 15.407(b)(1-3) specifies the unwanted emissions limit for the U-NII-1 and 2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz. However, an out-of-band emission that complies with both the average and peak limits of Section 15.209 is not required to satisfy the -27 dBm/MHz dBm/MHz peak emission limit.

(ii) Section 15.407(b)(4) specifies the unwanted emissions limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). An alternative to the band emissions mask is specified in Section 15.407(b)(4)(ii). The alternative limits are based on the highest antenna gain specified in the filing. There are also marketing and importation restrictions for the alternative 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

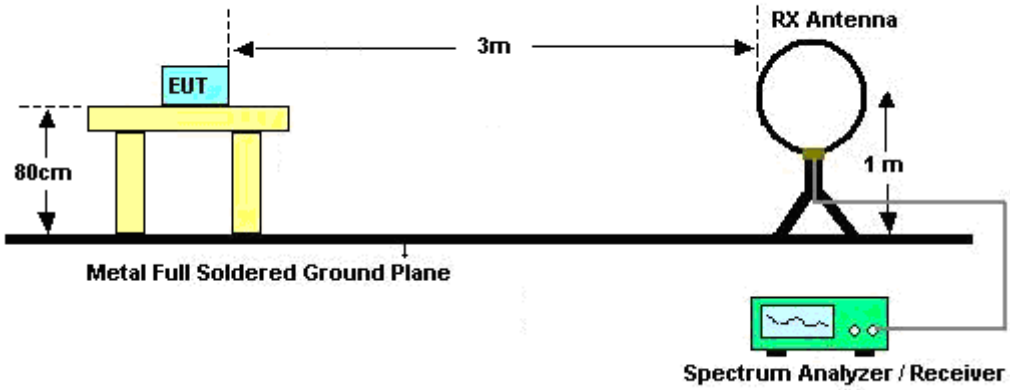
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

   - 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.

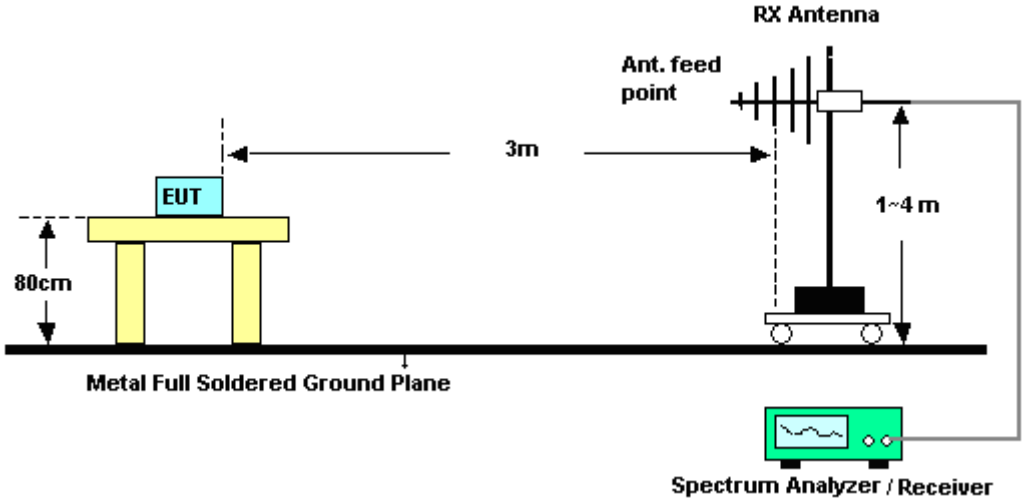
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband 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

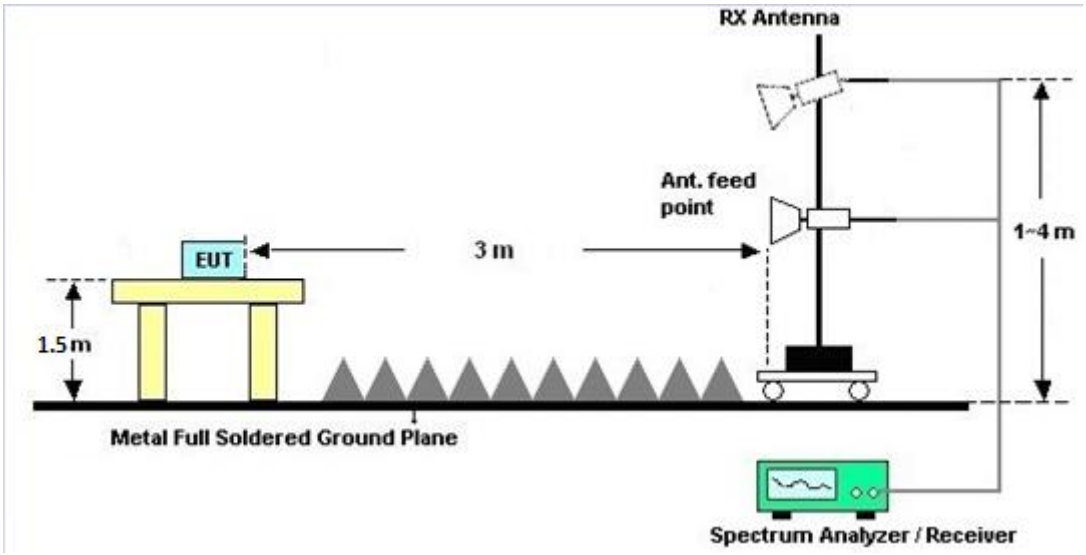
For radiated emissions below 30MHz



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 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.

3.4.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.4.7 Duty Cycle

Please refer to Appendix E.

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

Please refer to Appendix C and D.

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.

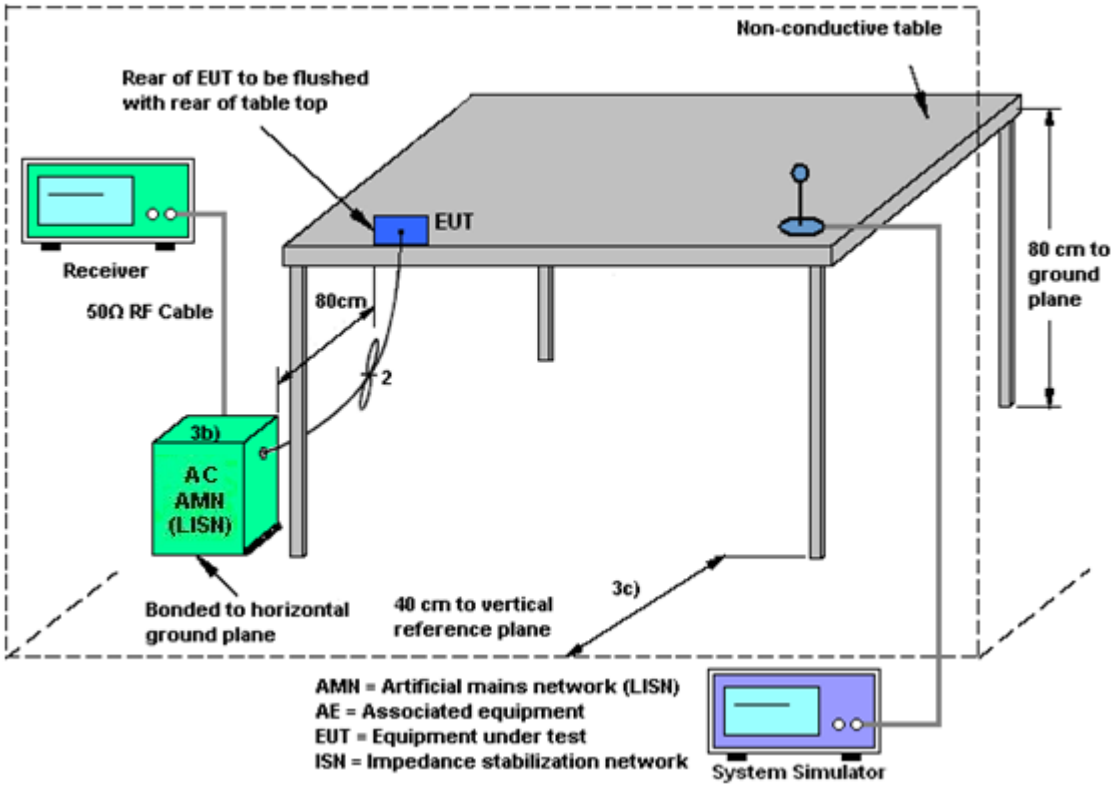
3.5.2 Measuring Instruments

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

Please refer to Appendix B.

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

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

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

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

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

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

For power measurements on IEEE 802.11 devices,

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

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

The EUT supports CDD mode.

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

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

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

The directional gain “DG” is calculated as following table.

	Ant 1 (dBi)	Ant 2 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
Band IV	1.30	-7.20	1.30	1.06	0.00	0.00

Power limit reduction = Composite gain – 6dBi, (min = 0)

PSD limit reduction = Composite gain + PSD Array gain – 6dBi, (min = 0)

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Meter	Anritsu	ML2495A	0932001	300MHz~40GHz	Sep. 29, 2016	Jun. 08, 2017 ~ Jun. 11, 2017	Sep. 28, 2017	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	0846202	300MHz~40GHz	Sep. 29, 2016	Jun. 08, 2017 ~ Jun. 11, 2017	Sep. 28, 2017	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz-40GHz	Jul. 17, 2016	Jun. 08, 2017 ~ Jun. 11, 2017	Jul. 16, 2017	Conducted (TH05-HY)
Temperature Chamber	ESPEC	SH-641	92013720	-40℃ ~90℃	Sep. 01, 2016	Jun. 08, 2017 ~ Jun. 11, 2017	Aug. 31, 2017	Conducted (TH05-HY)
Programmable Power Supply	GW Instek	PSS-2005	EL890094	1V~20V 0.5A~5A	Oct. 11, 2016	Jun. 08, 2017 ~ Jun. 11, 2017	Oct. 10, 2017	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jun. 06, 2017	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 30, 2016	Jun. 06, 2017	Aug. 29, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 29, 2016	Jun. 06, 2017	Nov. 28, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Dec. 06, 2016	Jun. 06, 2017	Dec. 05, 2017	Conduction (CO05-HY)
Preamplifier	COM-POWER	PA-103	161075	10MHz~1GHz	Mar. 23, 2017	Jun. 09, 2017 ~ Jun. 13, 2017	Mar. 22, 2018	Radiation (03CH12-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Oct. 20, 2016	Jun. 09, 2017 ~ Jun. 13, 2017	Oct. 19, 2018	Radiation (03CH12-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	37059&01	30MHz~1GHz	Oct. 15, 2016	Jun. 09, 2017 ~ Jun. 13, 2017	Oct. 14, 2017	Radiation (03CH12-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100390	20Hz~26.5GHz	Dec. 23, 2016	Jun. 09, 2017 ~ Jun. 13, 2017	Dec. 22, 2017	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1328	1GHz ~ 18GHz	Oct. 25, 2016	Jun. 09, 2017 ~ Jun. 13, 2017	Oct. 24, 2017	Radiation (03CH12-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1815698	1GHz~18GHz	Dec. 01, 2016	Jun. 09, 2017 ~ Jun. 13, 2017	Nov. 30, 2017	Radiation (03CH12-HY)
Preamplifier	Keysight	83017A	MY53270148	1GHz~26.5GHz	Jan. 12, 2017	Jun. 09, 2017 ~ Jun. 13, 2017	Jan. 11, 2018	Radiation (03CH12-HY)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Filter	Wainwright	WLJ4-1000-1530-6000-40ST	SN3	1.53 GHz Lowpass	Jul. 07, 2016	Jun. 09, 2017 ~ Jun. 13, 2017	Jul. 06, 2017	Radiation (03CH12-HY)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN2	3 GHz Highpass	Jul. 07, 2016	Jun. 09, 2017 ~ Jun. 13, 2017	Jul. 06, 2017	Radiation (03CH12-HY)
Filter	Woken	WHKX8-5272.5-6750-18000-40ST	SN2	6.75G Highpass	Dec. 08, 2016	Jun. 09, 2017 ~ Jun. 13, 2017	Dec. 07, 2017	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Jun. 09, 2017 ~ Jun. 13, 2017	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Jun. 09, 2017 ~ Jun. 13, 2017	N/A	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170576	18GHz ~ 40GHz	Apr. 27, 2017	Jun. 09, 2017 ~ Jun. 13, 2017	Apr. 26, 2018	Radiation (03CH12-HY)
Preamplifier	MITEQ	TTA 1840-35-HG	1887435	18GHz ~ 40GHz	Oct. 13, 2016	Jun. 09, 2017 ~ Jun. 13, 2017	Oct. 12, 2017	Radiation (03CH12-HY)
Spectrum Analyzer	Agilent	N9030A	MY52350276	3Hz~44GHz	Mar. 23, 2017	Jun. 09, 2017 ~ Jun. 13, 2017	Mar. 22, 2018	Radiation (03CH12-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.70**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.10**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.20**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.70**

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Allen Lin/Bill Kuo	Temperature:	21~25	°C
Test Date:	2017/6/8~6/11	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)		26dB Bandwidth (MHz)		6 dB Bandwidth (MHz)		6 dB Bandwidth Min. Limit (MHz)		Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	2	149	5745	17.70	17.55	24.70	25.20	16.04	15.48	0.5		Pass
11a	6Mbps	2	157	5785	17.30	17.45	24.00	24.30	15.16	15.72	0.5		Pass
11a	6Mbps	2	165	5825	17.65	17.50	24.70	24.80	15.96	15.16	0.5		Pass
HT20	MCS0	2	149	5745	19.00	18.60	26.80	25.10	16.80	15.48	0.5		Pass
HT20	MCS0	2	157	5785	18.35	18.65	25.10	25.30	15.16	15.72	0.5		Pass
HT20	MCS0	2	165	5825	18.85	18.70	26.40	25.50	16.80	16.00	0.5		Pass
HT40	MCS0	2	151	5755	36.40	36.60	41.94	42.30	35.44	35.20	0.5		Pass
HT40	MCS0	2	159	5795	36.70	36.60	41.76	41.94	35.20	35.36	0.5		Pass
VHT80	MCS0	2	155	5775	75.84	75.84	83.52	83.84	75.52	75.36	0.5		Pass

Report Number : FR740822F

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
					Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
11a	6Mbps	1	149	5745	0.24	0.24	11.12	9.41		30.00	30.00	1.30	-7.20		Pass
11a	6Mbps	1	157	5785	0.24	0.24	11.08	9.30		30.00	30.00	1.30	-7.20		Pass
11a	6Mbps	1	165	5825	0.24	0.24	11.07	9.29		30.00	30.00	1.30	-7.20		Pass
HT20	MCS0	1	149	5745	0.26	0.26	11.19	9.49		30.00	30.00	1.30	-7.20		Pass
HT20	MCS0	1	157	5785	0.26	0.26	11.18	9.37		30.00	30.00	1.30	-7.20		Pass
HT20	MCS0	1	165	5825	0.26	0.26	11.01	9.47		30.00	30.00	1.30	-7.20		Pass
HT40	MCS0	1	151	5755	0.47	0.44	11.28	9.46		30.00	30.00	1.30	-7.20		Pass
HT40	MCS0	1	159	5795	0.47	0.44	11.16	9.43		30.00	30.00	1.30	-7.20		Pass
VHT20	MCS0	1	149	5745	0.26	0.26	9.17	7.49		30.00	30.00	1.30	-7.20		Pass
VHT20	MCS0	1	157	5785	0.26	0.26	9.16	7.42		30.00	30.00	1.30	-7.20		Pass
VHT20	MCS0	1	165	5825	0.26	0.26	9.02	7.16		30.00	30.00	1.30	-7.20		Pass
VHT40	MCS0	1	151	5755	0.47	0.49	9.29	7.49		30.00	30.00	1.30	-7.20		Pass
VHT40	MCS0	1	159	5795	0.47	0.49	9.27	7.42		30.00	30.00	1.30	-7.20		Pass
VHT80	MCS0	1	155	5775	0.59	0.63	9.23	7.20		30.00	30.00	1.30	-7.20		Pass
11a	6Mbps	2	149	5745	0.24	0.24	11.23	11.68	14.48	30.00		1.30			Pass
11a	6Mbps	2	157	5785	0.24	0.24	11.22	11.47	14.36	30.00		1.30			Pass
11a	6Mbps	2	165	5825	0.24	0.24	11.10	11.29	14.21	30.00		1.30			Pass
HT20	MCS0	2	149	5745	0.26	0.26	11.23	11.74	14.50	30.00		1.30			Pass
HT20	MCS0	2	157	5785	0.26	0.26	11.21	11.56	14.40	30.00		1.30			Pass
HT20	MCS0	2	165	5825	0.26	0.26	11.07	11.49	14.30	30.00		1.30			Pass
HT40	MCS0	2	151	5755	0.47	0.52	11.33	11.65	14.50	30.00		1.30			Pass
HT40	MCS0	2	159	5795	0.47	0.52	11.15	11.54	14.36	30.00		1.30			Pass
VHT20	MCS0	2	149	5745	0.26	0.26	9.25	9.70	12.49	30.00		1.30			Pass
VHT20	MCS0	2	157	5785	0.26	0.26	9.19	9.52	12.37	30.00		1.30			Pass
VHT20	MCS0	2	165	5825	0.26	0.26	9.31	9.51	12.42	30.00		1.30			Pass
VHT40	MCS0	2	151	5755	0.49	0.49	9.43	9.70	12.58	30.00		1.30			Pass
VHT40	MCS0	2	159	5795	0.49	0.49	9.35	9.65	12.52	30.00		1.30			Pass
VHT80	MCS0	2	155	5775	0.59	0.59	9.24	9.64	12.46	30.00		1.30			Pass

Report Number : FR740822F

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
					Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	2	149	5745	0.24	0.24	2.22				2.30	30.00		1.06		Pass
11a	6Mbps	2	157	5785	0.24	0.24	2.22				2.06	30.00		1.06		Pass
11a	6Mbps	2	165	5825	0.24	0.24	2.22				1.27	30.00		1.06		Pass
HT20	MCS0	2	149	5745	0.26	0.26	2.22				1.64	30.00		1.06		Pass
HT20	MCS0	2	157	5785	0.26	0.26	2.22				1.34	30.00		1.06		Pass
HT20	MCS0	2	165	5825	0.26	0.26	2.22				0.88	30.00		1.06		Pass
HT40	MCS0	2	151	5755	0.47	0.52	2.22				-1.46	30.00		1.06		Pass
HT40	MCS0	2	159	5795	0.47	0.52	2.22				-1.65	30.00		1.06		Pass
VHT80	MCS0	2	155	5775	0.59	0.59	2.22				-6.44	30.00		1.06		Pass

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	6Mbps	1	149	5745	5745.050	0.050	8.70	50	3.85	
11a	6Mbps	1	149	5745	5745.050	0.050	8.70	-30	3.85	
11a	6Mbps	1	149	5745	5745.050	0.050	8.70	20	4.2	
11a	6Mbps	1	149	5745	5745.050	0.050	8.70	20	3.5	
11a	6Mbps	1	149	5745	5745.050	0.050	8.70	20	3.85	

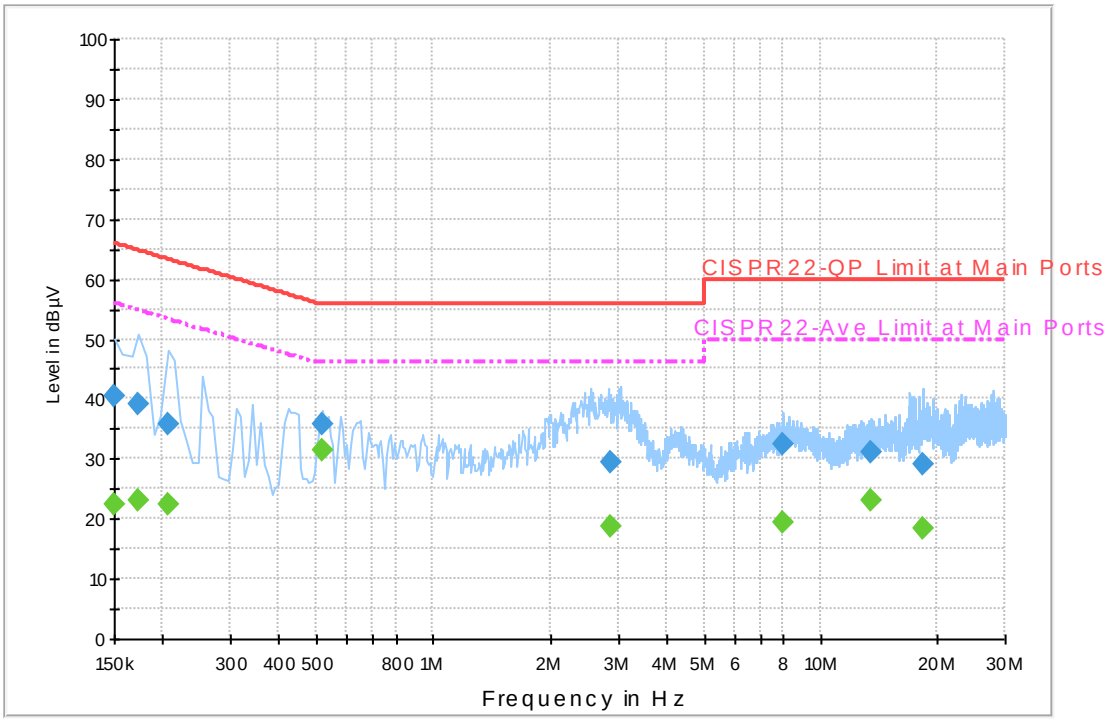
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Marolwe Ho	**Temperature :**	24~26℃
		Relative Humidity :	50~52%

EUT Information

Report NO :	740822
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

ENV216 Auto Test FCC Power Bar - L



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	40.5	Off	L1	19.6	25.5	66.0
0.174000	39.2	Off	L1	19.6	25.6	64.8
0.206000	35.8	Off	L1	19.6	27.6	63.4
0.518000	35.9	Off	L1	19.6	20.1	56.0
2.862000	29.5	Off	L1	19.5	26.5	56.0
8.030000	32.4	Off	L1	19.9	27.6	60.0
13.558000	31.1	Off	L1	20.2	28.9	60.0
18.510000	29.1	Off	L1	20.5	30.9	60.0

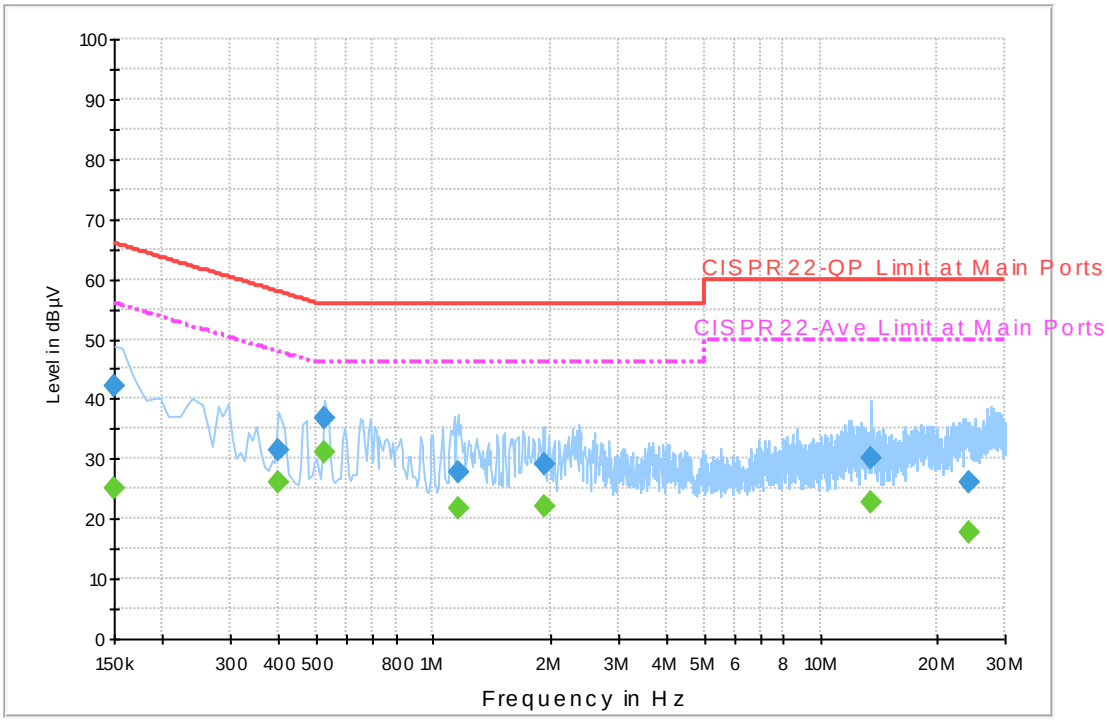
Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	22.6	Off	L1	19.6	33.4	56.0
0.174000	22.9	Off	L1	19.6	31.9	54.8
0.206000	22.5	Off	L1	19.6	30.9	53.4
0.518000	31.5	Off	L1	19.6	14.5	46.0
2.862000	18.7	Off	L1	19.5	27.3	46.0
8.030000	19.3	Off	L1	19.9	30.7	50.0
13.558000	23.0	Off	L1	20.2	27.0	50.0
18.510000	18.4	Off	L1	20.5	31.6	50.0

EUT Information

Report NO :	740822
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral

ENV216 Auto Test FCC Power Bar - N



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	42.1	Off	N	19.5	23.9	66.0
0.398000	31.3	Off	N	19.5	26.6	57.9
0.526000	36.6	Off	N	19.5	19.4	56.0
1.158000	27.6	Off	N	19.6	28.4	56.0
1.934000	29.1	Off	N	19.6	26.9	56.0
13.558000	30.1	Off	N	20.3	29.9	60.0
24.278000	26.2	Off	N	20.9	33.8	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	25.2	Off	N	19.5	30.8	56.0
0.398000	26.0	Off	N	19.5	21.9	47.9
0.526000	31.2	Off	N	19.5	14.8	46.0
1.158000	21.6	Off	N	19.6	24.4	46.0
1.934000	22.1	Off	N	19.6	23.9	46.0
13.558000	22.9	Off	N	20.3	27.1	50.0
24.278000	17.8	Off	N	20.9	32.2	50.0

Appendix C. Radiated Spurious Emission

Test Engineer :	Peter Liao and Nick Yu	Temperature :	22~23°C
		Relative Humidity :	54~56%

Band 4 - 5725~5850MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		5625.8	49.91	-18.29	68.2	41.81	32.75	6.34	30.99	104	325	P	H
		5672.4	49.85	-34.97	84.82	41.63	32.88	6.35	31.01	104	325	P	H
		5704.6	51.38	-55.11	106.49	43.06	32.97	6.36	31.01	104	325	P	H
		5724.2	54.68	-65.7	120.38	46.3	33.03	6.37	31.02	104	325	P	H
	*	5745	101.68	-	-	93.25	33.09	6.37	31.03	104	325	P	H
	*	5745	91.04	-	-	82.61	33.09	6.37	31.03	104	325	A	H
802.11n													H
HT20													H
CH 149		5629.2	49.92	-18.28	68.2	41.81	32.76	6.35	31	163	326	P	V
5745MHz		5687.8	50.59	-45.61	96.2	42.31	32.93	6.36	31.01	163	326	P	V
		5707.6	51.06	-56.27	107.33	42.74	32.98	6.36	31.02	163	326	P	V
		5720.8	50.07	-62.55	112.62	41.7	33.02	6.37	31.02	163	326	P	V
	*	5745	100.14	-	-	91.71	33.09	6.37	31.03	163	326	P	V
	*	5745	89.61	-	-	81.18	33.09	6.37	31.03	163	326	A	V
													V
													V

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		5635.6	49.49	-18.71	68.2	41.36	32.78	6.35	31	101	332	P	H
		5653	50.06	-20.37	70.43	41.88	32.83	6.35	31	101	332	P	H
		5714.4	49.64	-59.59	109.23	41.3	33	6.36	31.02	101	332	P	H
		5724.4	49.58	-71.25	120.83	41.2	33.03	6.37	31.02	101	332	P	H
	*	5785	102.06	-	-	93.53	33.2	6.38	31.05	101	332	P	H
	*	5785	91.63	-	-	83.1	33.2	6.38	31.05	101	332	A	H
		5854.8	51.11	-60.15	111.26	42.36	33.39	6.42	31.06	101	332	P	H
		5870	50.43	-56.17	106.6	41.63	33.44	6.43	31.07	101	332	P	H
		5909.4	50.92	-28.79	79.71	42	33.55	6.46	31.09	101	332	P	H
		5936	51.08	-17.12	68.2	42.07	33.62	6.48	31.09	101	332	P	H
802.11n													H
HT20													H
CH 157		5602.2	50.34	-17.86	68.2	42.29	32.69	6.34	30.98	172	336	P	V
5785MHz		5675.4	49.9	-37.14	87.04	41.67	32.89	6.35	31.01	172	336	P	V
		5701	49.57	-55.91	105.48	41.26	32.96	6.36	31.01	172	336	P	V
		5721.8	49.4	-65.5	114.9	41.03	33.02	6.37	31.02	172	336	P	V
	*	5785	99.05	-	-	90.52	33.2	6.38	31.05	172	336	P	V
	*	5785	88.47	-	-	79.94	33.2	6.38	31.05	172	336	A	V
		5854.2	50.24	-62.38	112.62	41.49	33.39	6.42	31.06	172	336	P	V
		5860.2	50.34	-59	109.34	41.58	33.41	6.42	31.07	172	336	P	V
		5921.8	50.27	-20.29	70.56	41.31	33.58	6.47	31.09	172	336	P	V
		5935.4	50.96	-17.24	68.2	41.95	33.62	6.48	31.09	172	336	P	V
													V
													V

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
	*	5825	103.6	-	-	94.95	33.31	6.39	31.05	100	332	P	H
	*	5825	92.98	-	-	84.33	33.31	6.39	31.05	100	332	A	H
		5850	55.86	-66.34	122.2	47.12	33.38	6.42	31.06	100	332	P	H
		5856.4	51.2	-59.21	110.41	42.44	33.4	6.42	31.06	100	332	P	H
		5923.4	51.34	-18.04	69.38	42.37	33.59	6.47	31.09	100	332	P	H
		5940.2	51.61	-16.59	68.2	42.59	33.63	6.48	31.09	100	332	P	H
802.11n													H
HT20													H
CH 165	*	5825	100.23	-	-	91.58	33.31	6.39	31.05	182	333	P	V
5825MHz	*	5825	89.66	-	-	81.01	33.31	6.39	31.05	182	333	A	V
		5851	50.74	-69.18	119.92	42	33.38	6.42	31.06	182	333	P	V
		5873	51	-54.76	105.76	42.2	33.44	6.43	31.07	182	333	P	V
		5895.2	50.8	-39.41	90.21	41.93	33.51	6.44	31.08	182	333	P	V
		5949.6	50.95	-17.25	68.2	41.9	33.66	6.48	31.09	182	333	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+2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		11490	48.39	-25.61	74	55.43	40.2	9.82	57.57	100	0	P	H
		17235	49.82	-18.38	68.2	52	41.92	12.09	56.83	100	0	P	H
802.11n													H
HT20													H
CH 149		11490	48.53	-25.47	74	55.57	40.2	9.82	57.57	100	0	P	V
5745MHz		17235	49.27	-18.93	68.2	51.45	41.92	12.09	56.83	100	0	P	V
													V
													V
		11570	48.84	-25.16	74	56.01	40.06	9.86	57.6	100	0	P	H
		17355	48.64	-19.56	68.2	50.94	42.18	12.19	57.3	100	0	P	H
802.11n													H
HT20													H
CH 157		11570	48.69	-25.31	74	55.86	40.06	9.86	57.6	100	0	P	V
5785MHz		17355	48.84	-19.36	68.2	51.14	42.18	12.19	57.3	100	0	P	V
													V
													V
		11650	47.8	-26.2	74	55.09	39.9	9.9	57.6	100	0	P	H
		17475	50.3	-17.9	68.2	52.72	42.44	12.29	57.77	100	0	P	H
802.11n													H
HT20													H
CH 165		11650	47.74	-26.26	74	55.03	39.9	9.9	57.6	100	0	P	V
5825MHz		17475	48.65	-19.55	68.2	51.07	42.44	12.29	57.77	100	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 HT40 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		5607.6	50.41	-17.79	68.2	42.36	32.7	6.34	30.99	100	330	P	H
		5673.8	50.61	-35.24	85.85	42.38	32.89	6.35	31.01	100	330	P	H
		5717.6	54.13	-56	110.13	45.77	33.01	6.37	31.02	100	330	P	H
		5721.6	55.72	-58.73	114.45	47.35	33.02	6.37	31.02	100	330	P	H
	*	5755	98.47	-	-	90.02	33.11	6.37	31.03	100	330	P	H
	*	5755	87.5	-	-	79.05	33.11	6.37	31.03	100	330	A	H
		5852.6	51.07	-65.2	116.27	42.32	33.39	6.42	31.06	100	330	P	H
		5872.8	50.34	-55.48	105.82	41.54	33.44	6.43	31.07	100	330	P	H
		5876	50.67	-53.79	104.46	41.86	33.45	6.43	31.07	100	330	P	H
		5937.2	50.16	-18.04	68.2	41.15	33.62	6.48	31.09	100	330	P	H
802.11n													H
HT40													H
CH 151		5647	49.34	-18.86	68.2	41.18	32.81	6.35	31	164	333	P	V
5755MHz		5692	50.21	-49.09	99.3	41.92	32.94	6.36	31.01	164	333	P	V
		5718.6	51.32	-59.09	110.41	42.96	33.01	6.37	31.02	164	333	P	V
		5722	53.12	-62.24	115.36	44.75	33.02	6.37	31.02	164	333	P	V
	*	5755	96.45	-	-	88	33.11	6.37	31.03	164	333	P	V
	*	5755	85.99	-	-	77.54	33.11	6.37	31.03	164	333	A	V
		5851.8	50.84	-67.26	118.1	42.09	33.39	6.42	31.06	164	333	P	V
		5859.6	49.88	-59.63	109.51	41.12	33.41	6.42	31.07	164	333	P	V
		5915.8	50.43	-24.55	74.98	41.49	33.56	6.47	31.09	164	333	P	V
		5926.4	50.19	-18.01	68.2	41.22	33.59	6.47	31.09	164	333	P	V
													V
													V

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		5637.8	49.72	-18.48	68.2	41.58	32.79	6.35	31	100	331	P	H
		5696.6	49.36	-53.33	102.69	41.06	32.95	6.36	31.01	100	331	P	H
		5711	49.54	-58.74	108.28	41.21	32.99	6.36	31.02	100	331	P	H
		5720.2	49.27	-61.99	111.26	40.9	33.02	6.37	31.02	100	331	P	H
	*	5795	98.14	-	-	89.58	33.23	6.38	31.05	100	331	P	H
	*	5795	88.03	-	-	79.47	33.23	6.38	31.05	100	331	A	H
		5852.4	50.83	-65.9	116.73	42.08	33.39	6.42	31.06	100	331	P	H
		5866.4	51.33	-56.28	107.61	42.54	33.43	6.43	31.07	100	331	P	H
		5896.8	50.63	-38.4	89.03	41.76	33.51	6.44	31.08	100	331	P	H
		5943.2	50.61	-17.59	68.2	41.58	33.64	6.48	31.09	100	331	P	H
802.11n													H
HT40													H
CH 159		5645	49.36	-18.84	68.2	41.2	32.81	6.35	31	152	328	P	V
5795MHz		5692.2	49.81	-49.64	99.45	41.52	32.94	6.36	31.01	152	328	P	V
		5714.2	50.07	-59.11	109.18	41.73	33	6.36	31.02	152	328	P	V
		5723.4	49.71	-68.84	118.55	41.33	33.03	6.37	31.02	152	328	P	V
	*	5795	96.38	-	-	87.82	33.23	6.38	31.05	152	328	P	V
	*	5795	86.33	-	-	77.77	33.23	6.38	31.05	152	328	A	V
		5853	50.17	-65.19	115.36	41.42	33.39	6.42	31.06	152	328	P	V
		5871	50.55	-55.77	106.32	41.75	33.44	6.43	31.07	152	328	P	V
		5877.2	50.25	-53.32	103.57	41.43	33.46	6.43	31.07	152	328	P	V
		5932.6	50.46	-17.74	68.2	41.47	33.61	6.47	31.09	152	328	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 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		5632.6	49.94	-18.26	68.2	41.82	32.77	6.35	31	100	328	P	H
		5693.6	51.05	-49.43	100.48	42.76	32.94	6.36	31.01	100	328	P	H
		5716.4	54.29	-55.5	109.79	45.94	33.01	6.36	31.02	100	328	P	H
		5720.8	51.79	-60.83	112.62	43.42	33.02	6.37	31.02	100	328	P	H
	*	5775	94.41	-	-	85.9	33.17	6.38	31.04	100	328	P	H
	*	5775	83.98	-	-	75.47	33.17	6.38	31.04	100	328	A	H
		5852.4	52.18	-64.55	116.73	43.43	33.39	6.42	31.06	100	328	P	H
		5865	55.98	-52.02	108	47.2	33.42	6.43	31.07	100	328	P	H
		5882.4	51.56	-48.14	99.7	42.72	33.47	6.44	31.07	100	328	P	H
		5948.8	50.64	-17.56	68.2	41.59	33.66	6.48	31.09	100	328	P	H
802.11ac													H
VHT80													H
CH 155		5621.4	49.79	-18.41	68.2	41.7	32.74	6.34	30.99	236	326	P	V
5775MHz		5693.4	50.59	-49.74	100.33	42.3	32.94	6.36	31.01	236	326	P	V
		5712.6	53.1	-55.63	108.73	44.76	33	6.36	31.02	236	326	P	V
		5721.8	50.62	-64.28	114.9	42.25	33.02	6.37	31.02	236	326	P	V
	*	5775	91.69	-	-	83.18	33.17	6.38	31.04	236	326	P	V
	*	5775	81.38	-	-	72.87	33.17	6.38	31.04	236	326	A	V
		5855	50.78	-60.02	110.8	42.03	33.39	6.42	31.06	236	326	P	V
		5859	52.85	-56.83	109.68	44.09	33.41	6.42	31.07	236	326	P	V
		5900.6	50.21	-36.01	86.22	41.31	33.52	6.46	31.08	236	326	P	V
		5939.6	50.54	-17.66	68.2	41.52	33.63	6.48	31.09	236	326	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+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		95.07	28.45	-15.05	43.5	42.57	15.42	0.8	30.4	-	-	P	H
		180.93	29.09	-14.41	43.5	43	15.12	1.09	30.29	-	-	P	H
		211.44	28.03	-15.47	43.5	41.73	15.23	1.19	30.26	-	-	P	H
		617.1	27.86	-18.14	46	29.18	26.23	2	29.64	-	-	P	H
		754.3	31.24	-14.76	46	30.14	28.22	2.21	29.43	100	0	P	H
		995.1	34.48	-19.52	54	29.95	30.73	2.55	28.97	-	-	P	H
													H
													H
													H
													H
5GHz													H
802.11n													H
HT20		33.78	36.23	-3.77	40	43.52	22.49	0.48	30.23	100	0	P	V
LF		62.94	33.23	-6.77	40	51.06	11.89	0.68	30.44	-	-	P	V
		89.94	30.26	-13.24	43.5	45.01	14.84	0.76	30.41	-	-	P	V
		729.8	32.42	-13.58	46	31.96	27.65	2.18	29.47	-	-	P	V
		885.9	34.45	-11.55	46	31.84	29.21	2.42	29.18	-	-	P	V
		948.9	34.3	-11.7	46	29.84	30.79	2.49	29.06	-	-	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+2		(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 D. Radiated Spurious Emission Plots

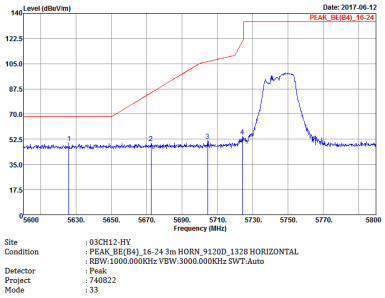
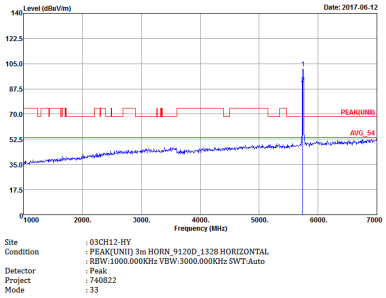
Test Engineer :	Peter Liao and Nick Yu	**Temperature :**	22~23°C
		Relative Humidity :	54~56%

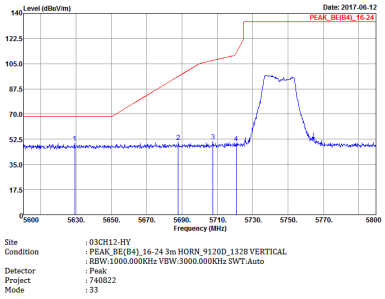
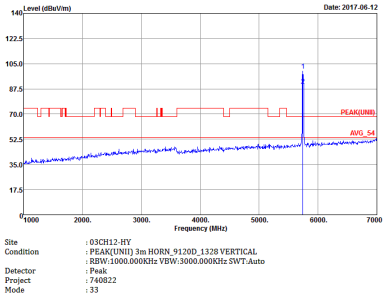
Note symbol

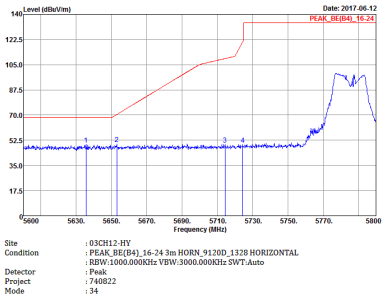
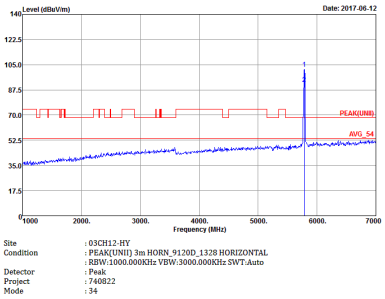
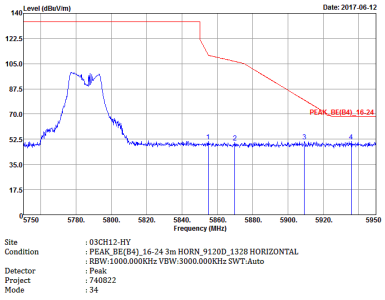
-L	**Low channel location**
-R	**High channel location**

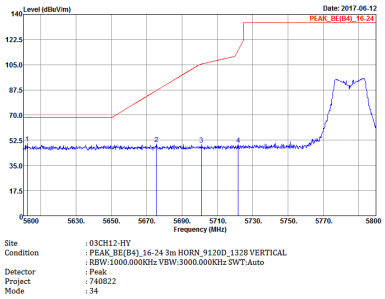
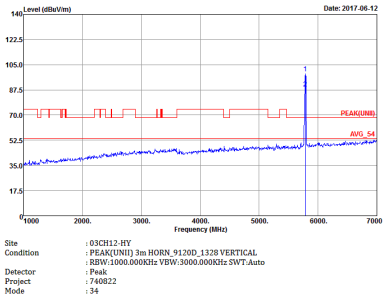
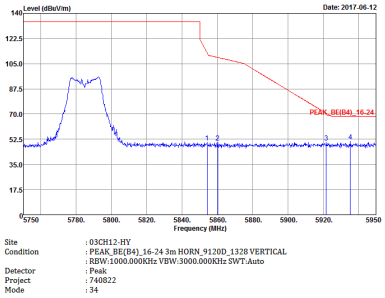
Band 4 - 5725~5850MHz

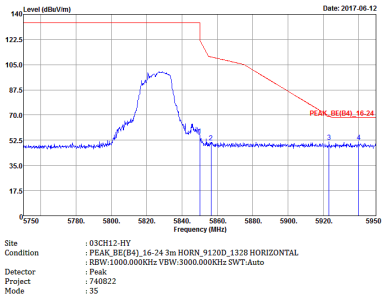
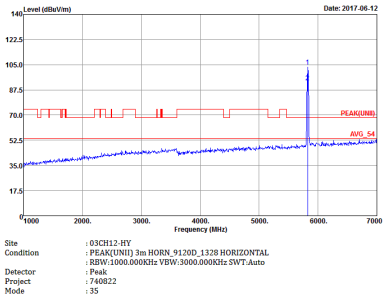
WIFI 802.11n HT20 (Band Edge @ 3m)

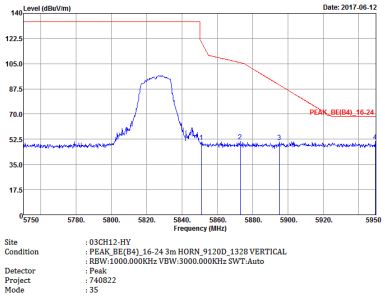
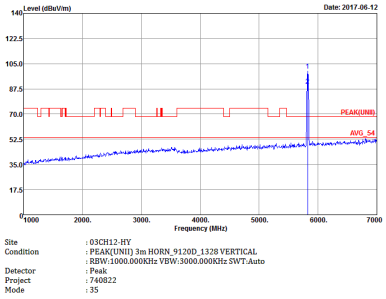
WIFI	**Band 4 5725~5850MHz Band Edge @ 3m**	
ANT	**802.11n HT20 CH149 5745MHz**	
1+2	**Horizontal**	**Fundamental**
Peak		

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1+2	Vertical	Fundamental
Peak		

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1+2	Horizontal	Fundamental
Peak		
Peak		Left blank

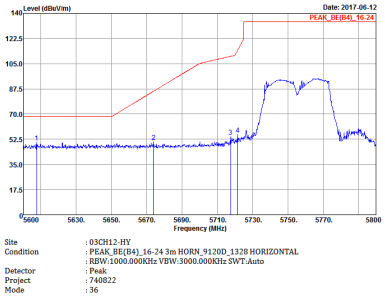
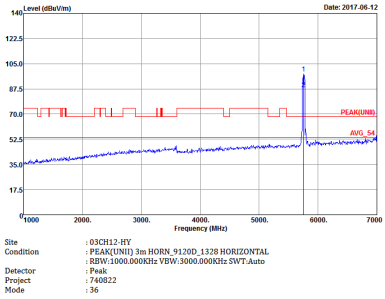
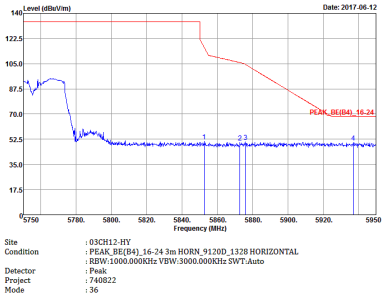
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1+2	Vertical	Fundamental
Peak		
Peak		Left blank

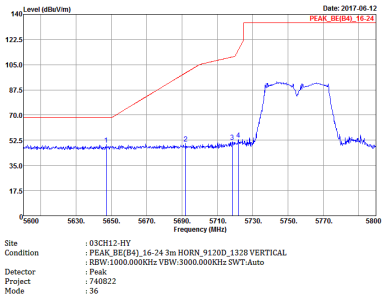
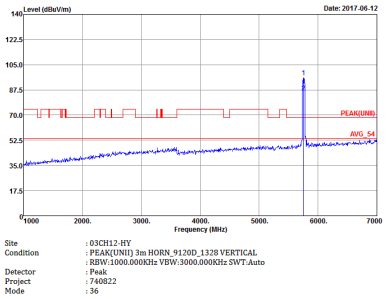
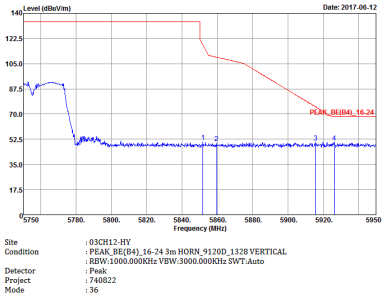
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1+2	Horizontal	Fundamental
Peak		

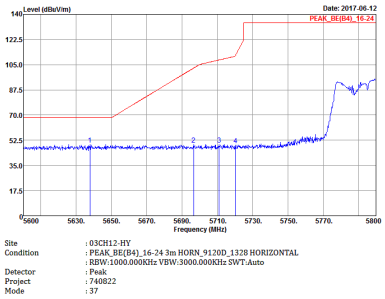
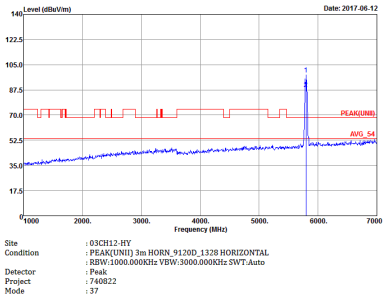
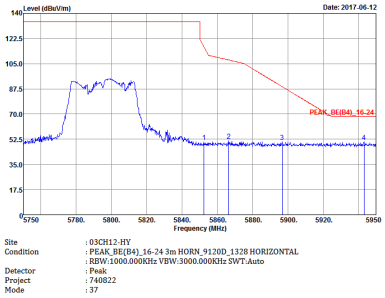
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1+2	Vertical	Fundamental
Peak		

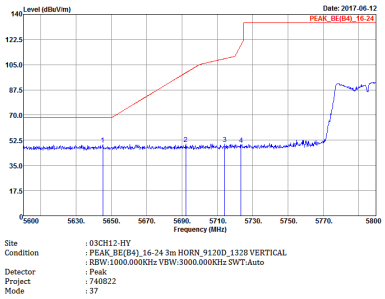
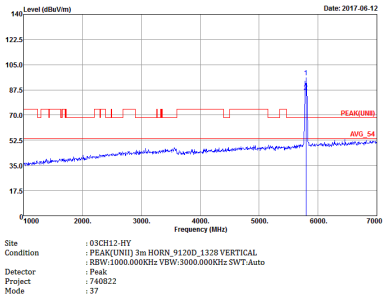
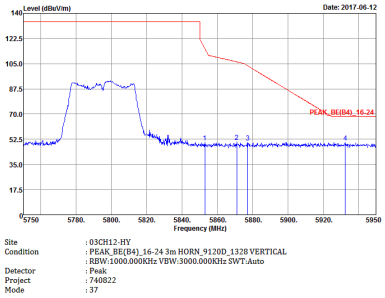
Band 4 5725~5850MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH151 5755MHz	
1+2	Horizontal	Fundamental
Peak		
Peak		Left blank

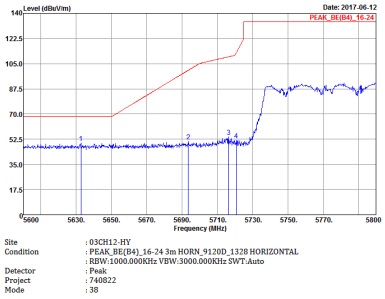
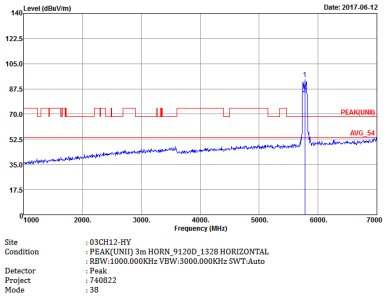
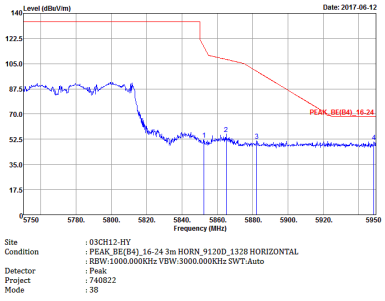
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH151 5755MHz	
1+2	Vertical	Fundamental
Peak		
Peak		Left blank

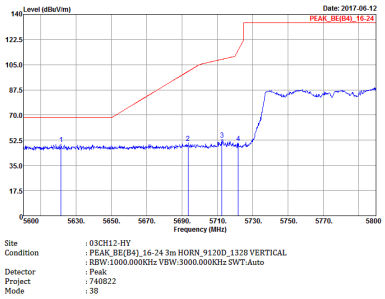
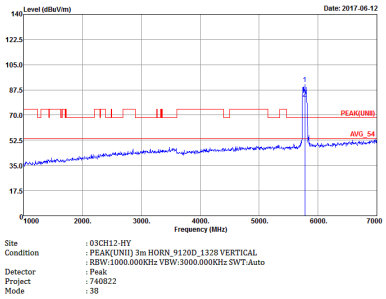
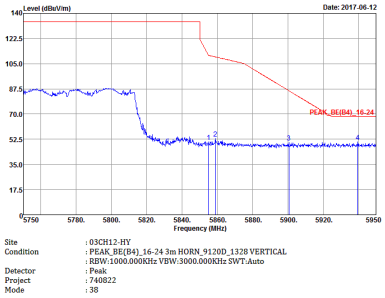
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH159 5795MHz	
1+2	Horizontal	Fundamental
Peak		
Peak		Left blank

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH159 5795MHz	
1+2	Vertical	Fundamental
Peak		
Peak		Left blank

Band 4 5725~5850MHz

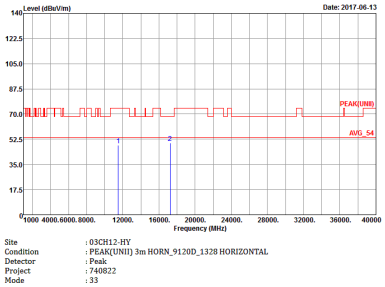
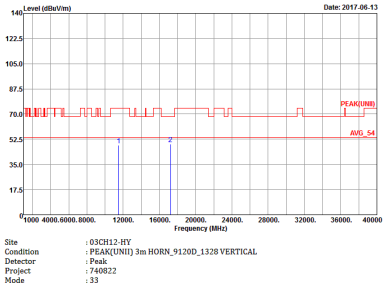
WIFI 802.11ac VHT80 (Band Edge @ 3m)

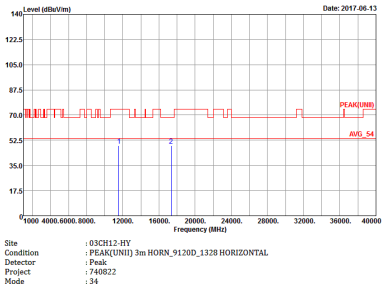
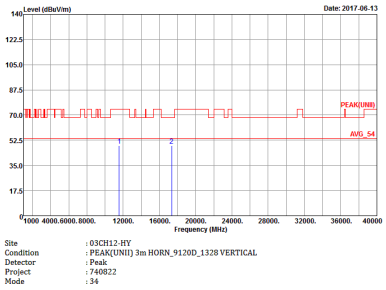
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH155 5775MHz	
1+2	Horizontal	Fundamental
Peak		
Peak		Left blank

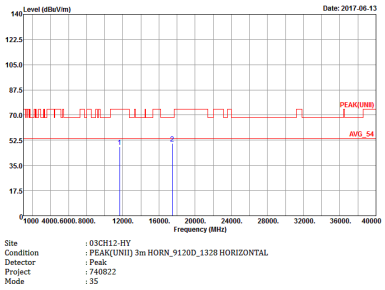
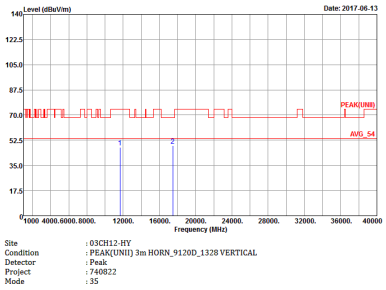
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH155 5775MHz	
1+2	Vertical	Fundamental
Peak		
Peak		Left blank

Band 4 - 5725~5850MHz

WIFI 802.11n HT20 (Harmonic @ 3m)

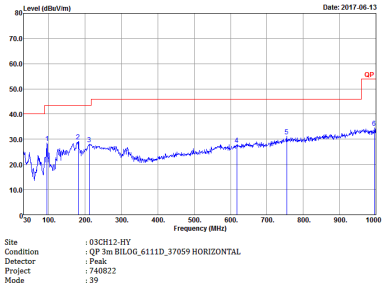
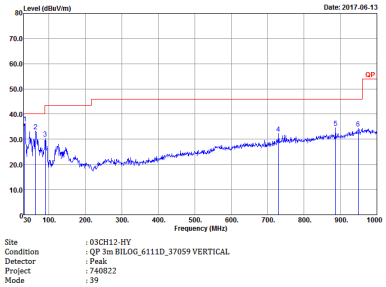
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1+2	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1+2	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1+2	Horizontal	Vertical
Peak Avg.		

Emission below 1GHz

5GHz WIFI 802.11n HT20 (LF)

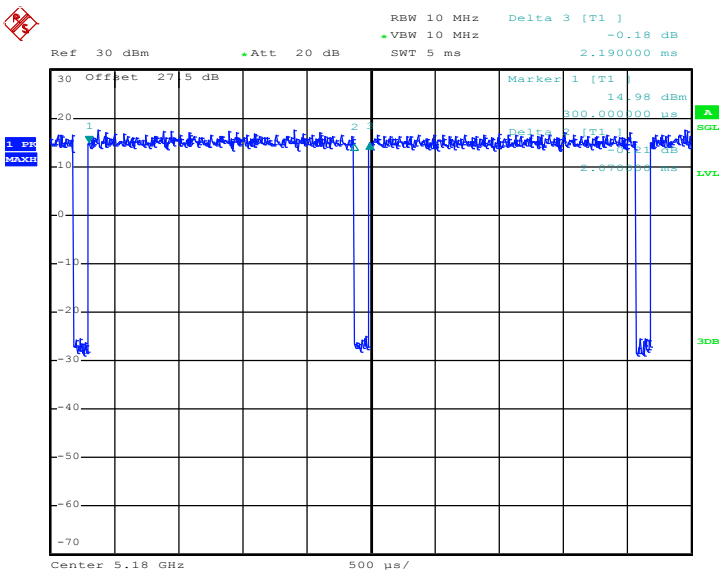
WIFI	5GHz 5725~5850MHz	
ANT	802.11n HT20 LF	
1+2	Horizontal	Vertical
QP / Peak		

Appendix E. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
1	802.11a	94.52	2070	0.48	1kHz
1	5GHz 802.11n HT20	94.15	1930	0.52	1kHz
1	5GHz 802.11n HT40	89.77	948	1.05	3kHz
1	5GHz 802.11n ac20	94.18	1940	0.52	1kHz
1	5GHz 802.11n ac40	89.77	948	1.05	3kHz
1	5GHz 802.11n ac80	87.2	736	1.36	3kHz
2	802.11a	94.52	2070	0.48	1kHz
2	5GHz 802.11n HT20	94.15	1930	0.52	1kHz
2	5GHz 802.11n HT40	90.29	948	1.05	3kHz
2	5GHz 802.11n ac20	94.18	1940	0.52	1kHz
2	5GHz 802.11n ac40	89.27	948	1.05	3kHz
2	5GHz 802.11n ac80	86.59	736	1.36	3kHz
1+2	5GHz 802.11a for Ant. 1	94.52	2070	0.48	1kHz
1+2	5GHz 802.11n HT20 for Ant. 1	94.18	1940	0.52	1kHz
1+2	5GHz 802.11n HT40 for Ant. 1	89.77	948	1.05	3kHz
1+2	5GHz 802.11n ac20 for Ant. 1	94.18	1940	0.52	1kHz
1+2	5GHz 802.11n ac40 for Ant. 1	89.27	948	1.05	3kHz
1+2	5GHz 802.11n ac80 for Ant. 1	87.2	736	1.36	3kHz
1+2	5GHz 802.11a for Ant. 2	94.52	2070	0.48	1kHz
1+2	5GHz 802.11n HT20 for Ant. 2	94.15	1930	0.52	1kHz
1+2	5GHz 802.11n HT40 for Ant. 2	88.76	948	1.05	3kHz
1+2	5GHz 802.11n ac20 for Ant. 2	94.18	1940	0.52	1kHz
1+2	5GHz 802.11n ac40 for Ant. 2	89.27	948	1.05	3kHz
1+2	5GHz 802.11n ac80 for Ant. 2	87.2	736	1.36	3kHz

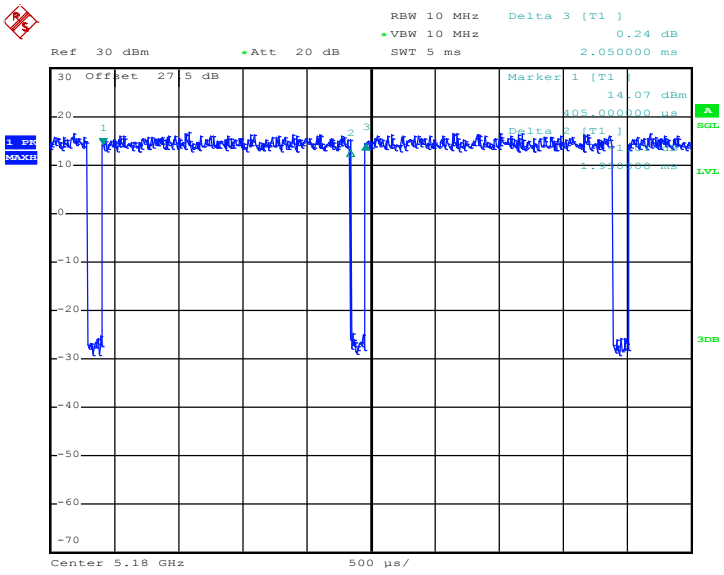
SISO <Ant. 1>

802.11a



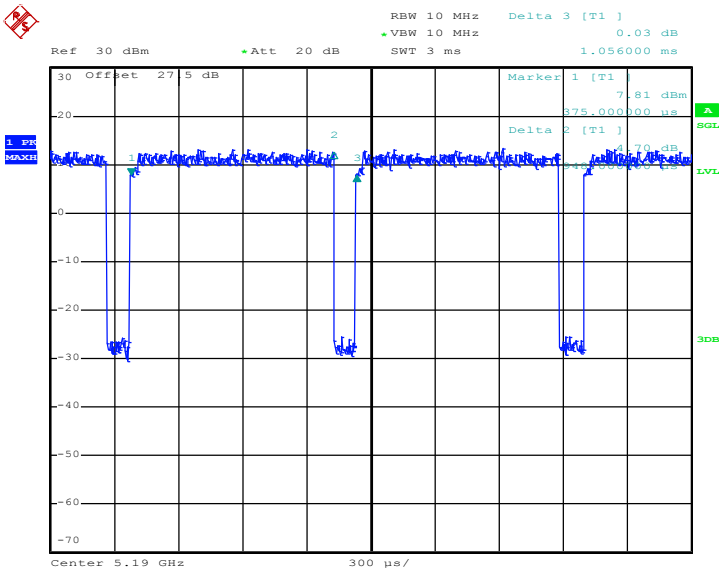
Date: 8.JUN.2017 18:54:03

802.11n HT20



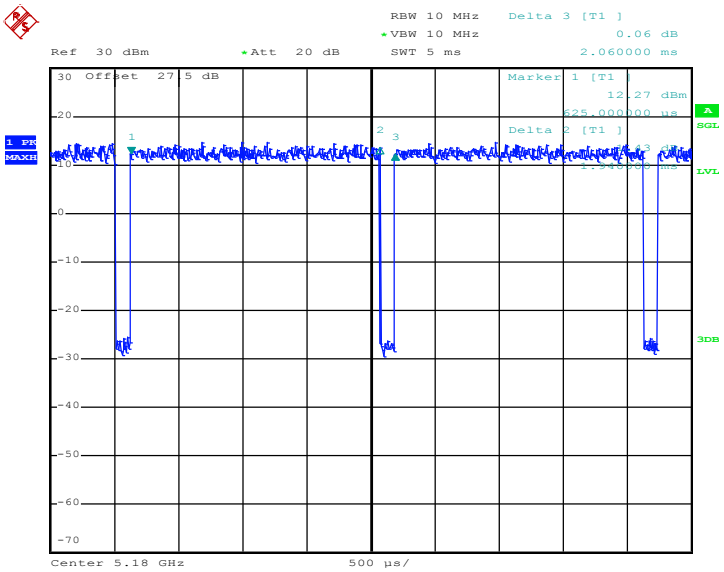
Date: 8.JUN.2017 19:07:13

802.11n HT40



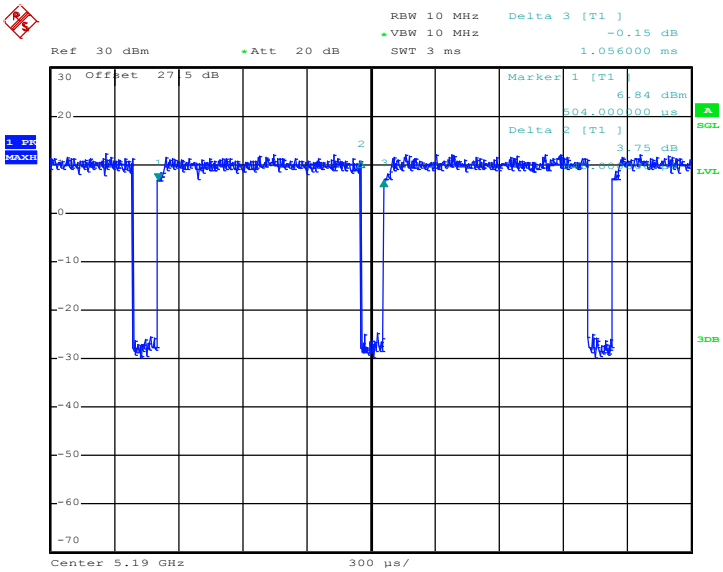
Date: 8.JUN.2017 19:17:46

802.11ac VHT20



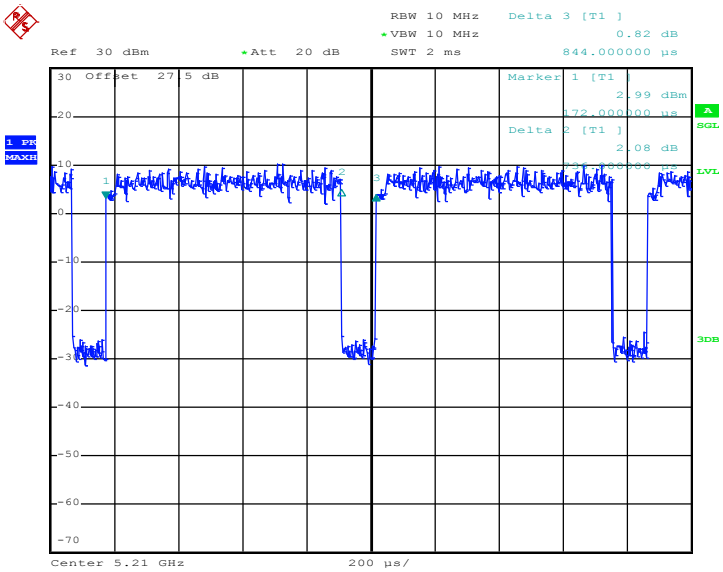
Date: 8.JUN.2017 19:21:06

802.11ac VHT40



Date: 8.JUN.2017 19:24:31

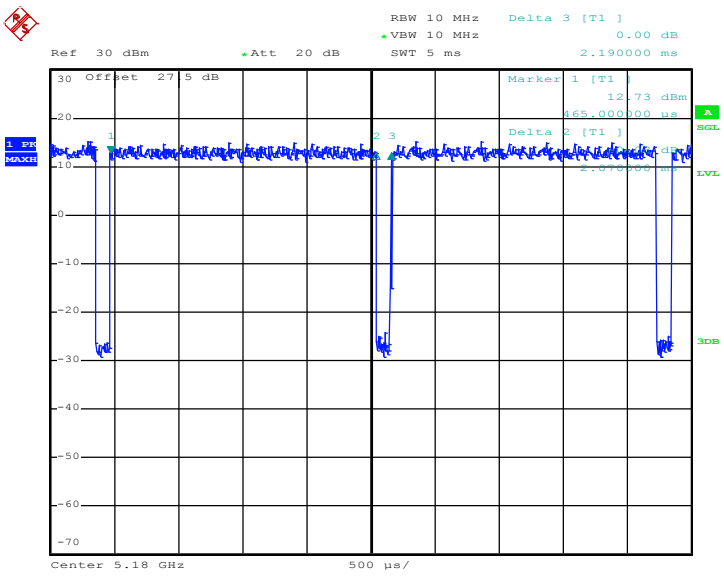
802.11ac VHT80



Date: 8.JUN.2017 19:30:29

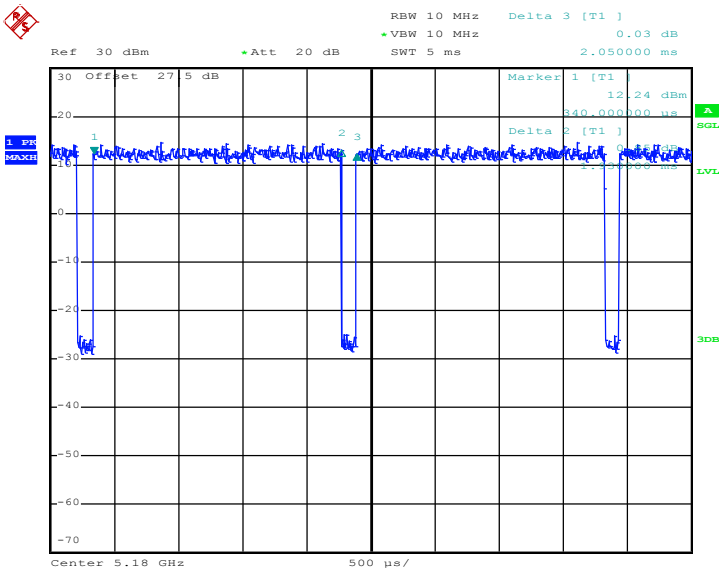
SISO <Ant. 2>

802.11a



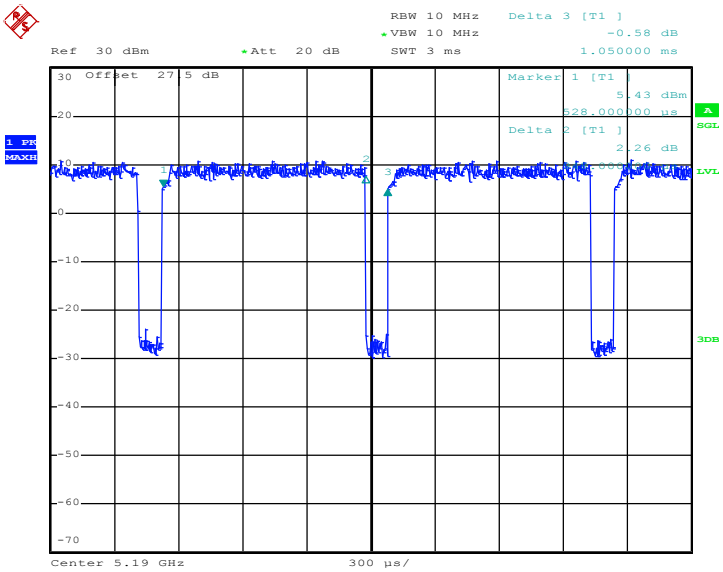
Date: 8.JUN.2017 18:55:28

802.11n HT20



Date: 8.JUN.2017 19:08:50

802.11n HT40



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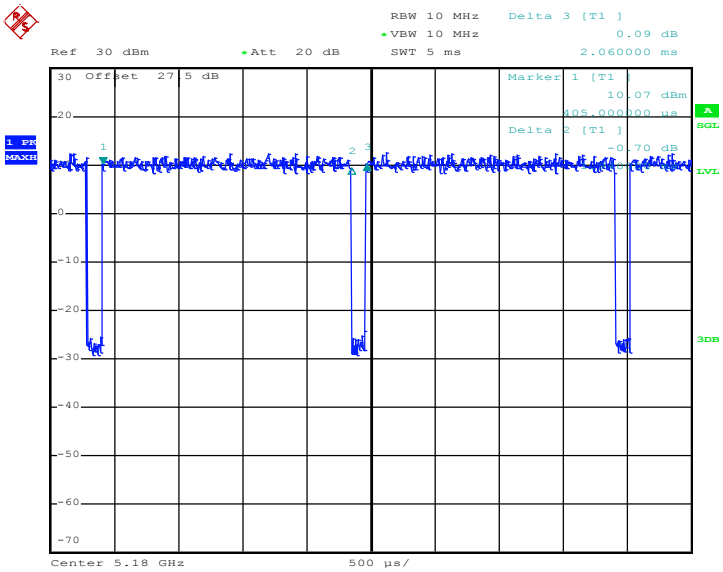

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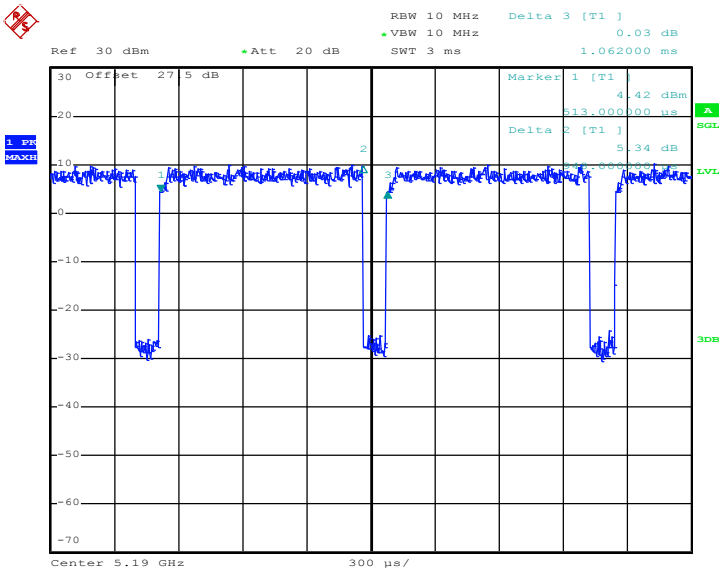

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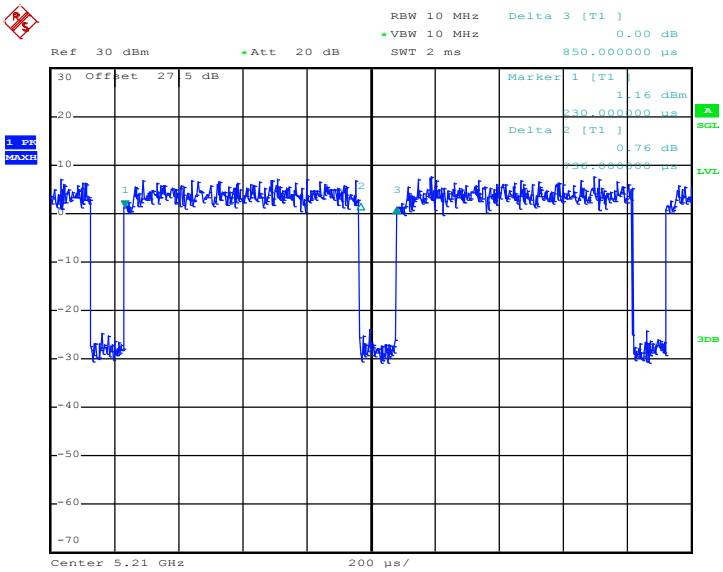
802.11ac VHT80



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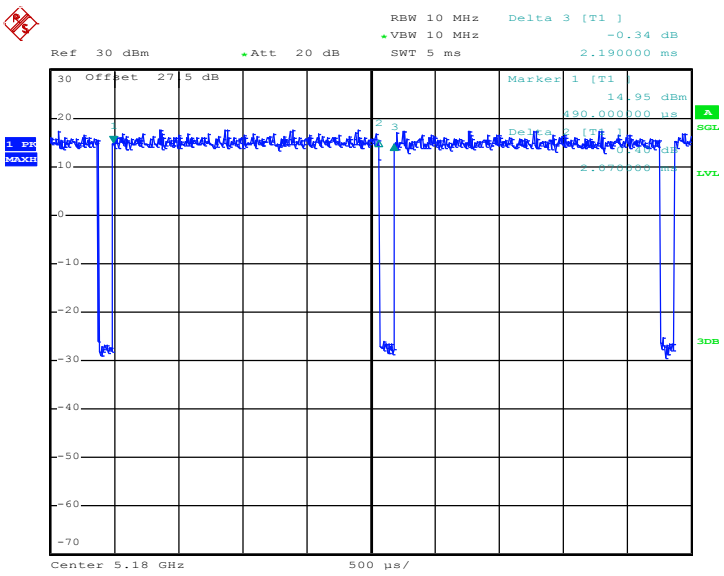
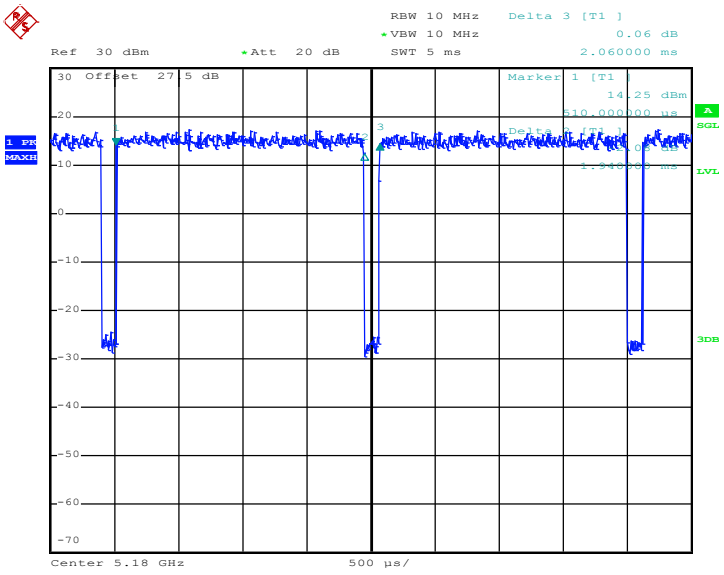
MIMO <Ant. 1>

802.11a



Date: 8.JUN.2017 18:59:45

802.11n HT20



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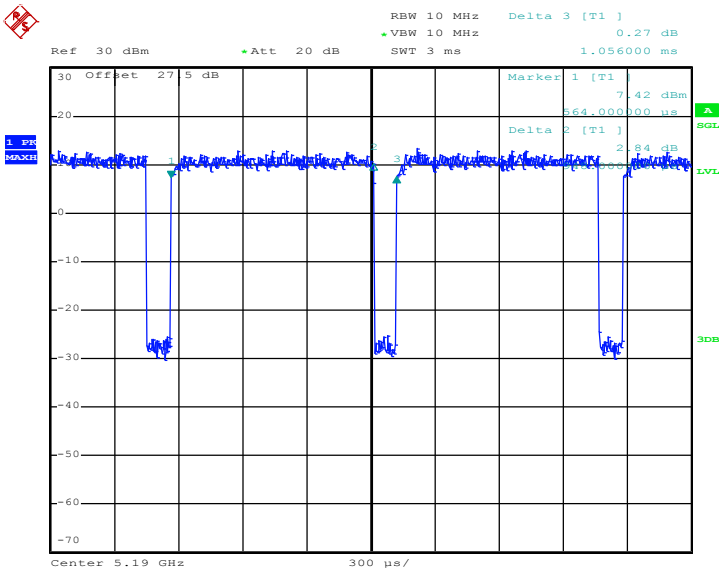
802.11n HT40



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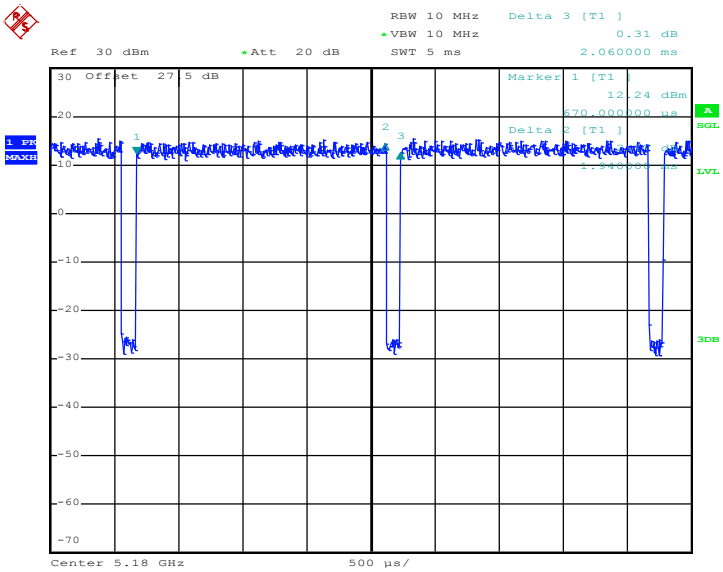
802.11ac VHT20



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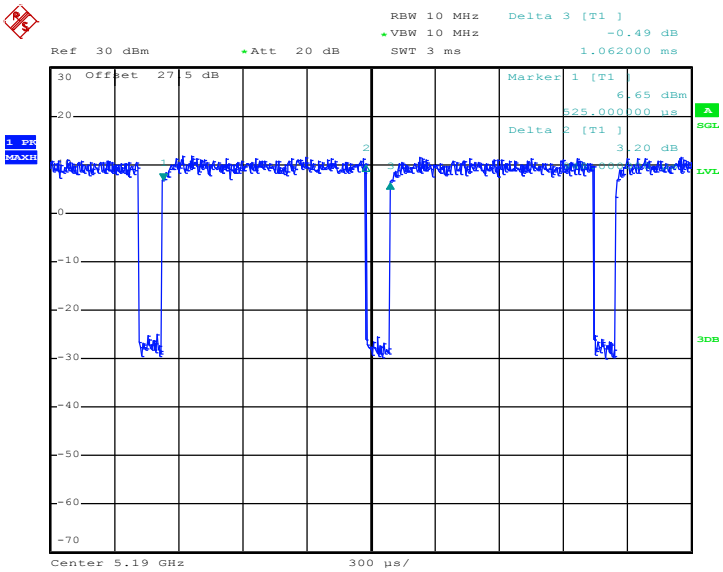

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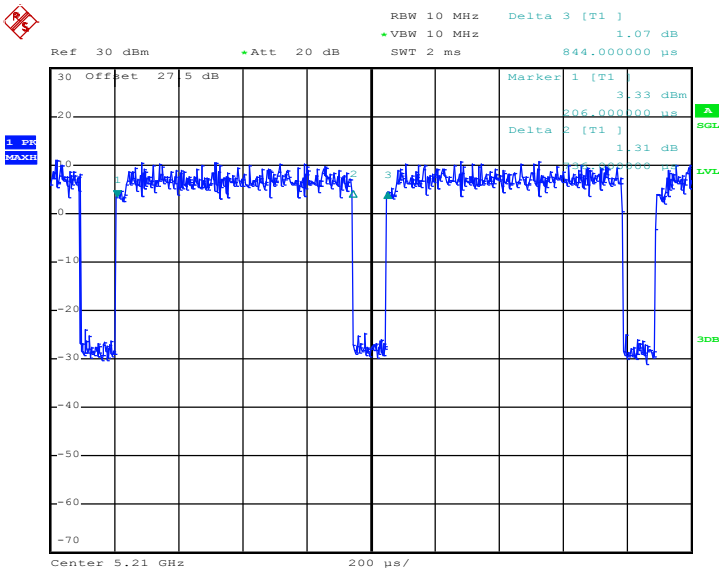
802.11ac VHT80



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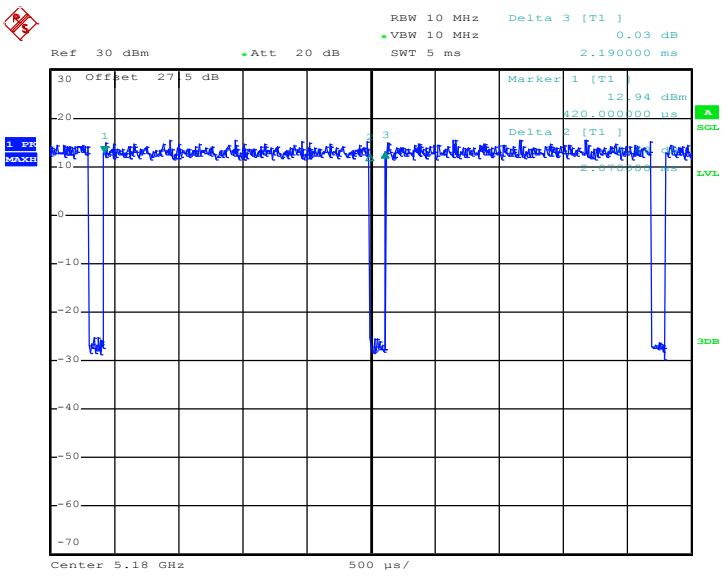
MIMO <Ant. 2>

802.11a



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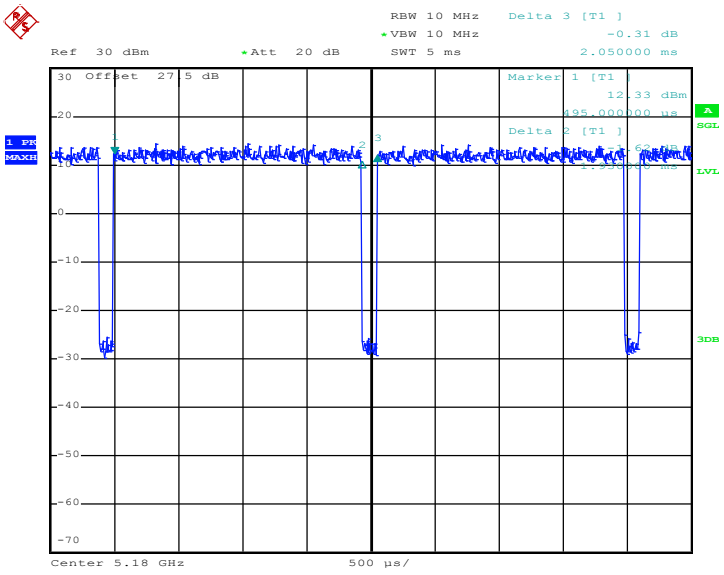

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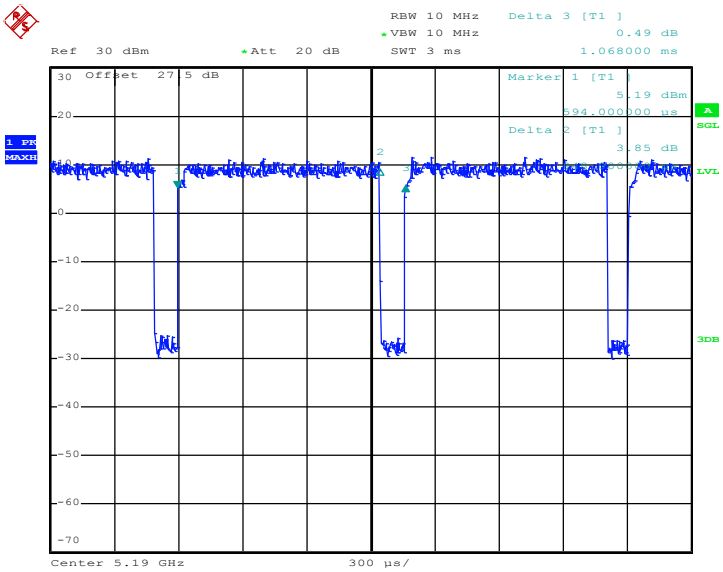
802.11n HT40



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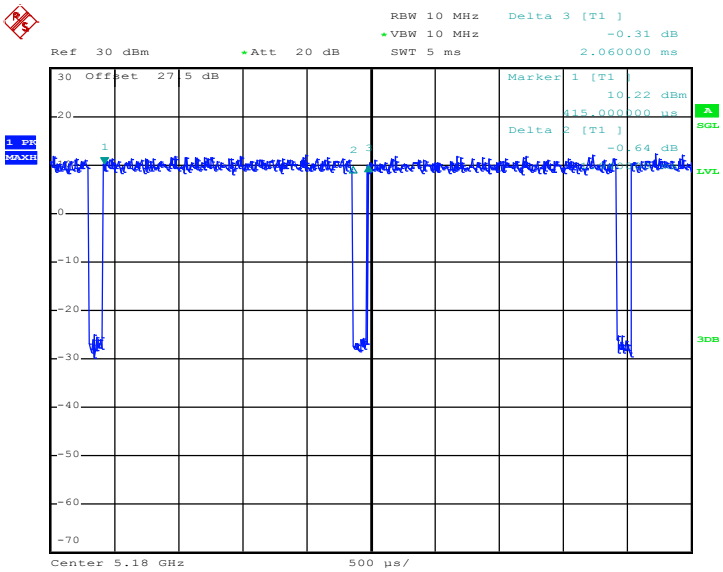
802.11ac VHT20



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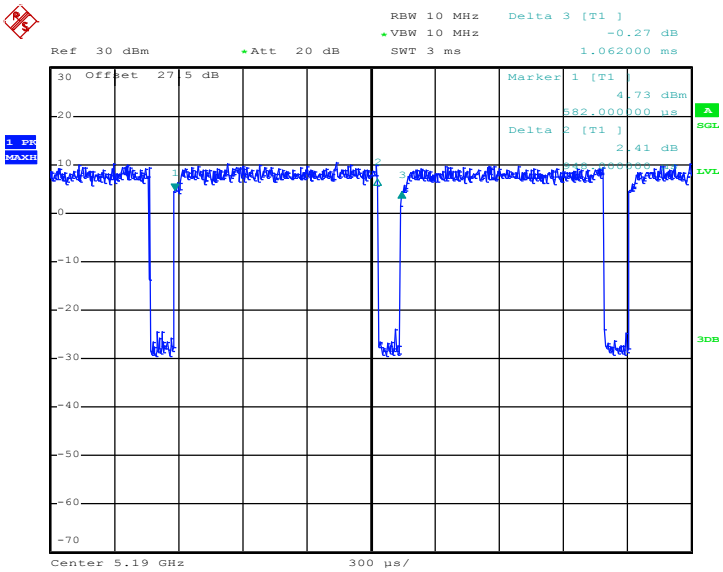
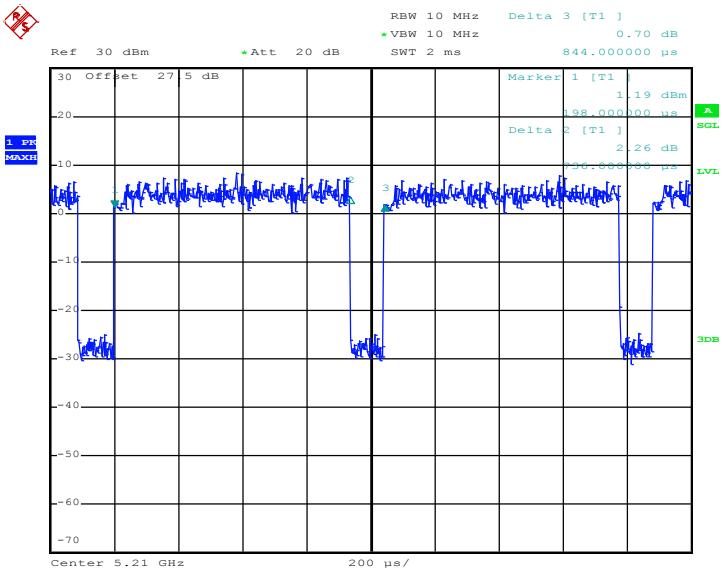


Date: 8.JUN.2017 19:28:02

802.11ac VHT80



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