



# FCC RADIO TEST REPORT

**FCC ID** : UZ7TM2000  
**Equipment** : Trailer Monitoring Unit  
**Brand Name** : ZEBRA  
**Model name** : TM2000  
**Applicant** : Zebra Technologies Corporation  
1 Zebra Plaza Holtsville, NY 11742  
**Manufacturer** : Zebra Technologies Corporation  
1 Zebra Plaza Holtsville, NY 11742  
**Standard** : FCC Part 15 Subpart E §15.407

The product was received on May 08, 2018 and testing was started from May 08, 2018 and completed on Jun, 03, 2018. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERTIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Jones Tsai

**SPORTON INTERTIONAL INC. EMC & Wireless Communications Laboratory**

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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## Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.403 (i)	6dB & 26dB Bandwidth	Pass	-
3.1	2.1049	99% Occupied Bandwidth	Reporting only	-
3.2	15.407 (a)	Maximum Conducted Output Power	Pass	-
3.3	15.407 (a)	Power Spectral Density	Pass	-
3.4	15.407(b)	Unwanted Emissions	Pass	Under limit 9.62 dB at 431.600 MHz
3.5	15.207	AC Conducted Emission	Pass	Under limit 9.66 dB at 0.611 MHz
3.6	15.407 (c)	Automatically Discontinue Transmission	Pass	-
3.7	15.203 & 15.407 (a)	Antenna Requirement	Pass	-

Reviewed by: Joseph Lin

Report Producer: Natasha Hsieh



# 1 General Description

## 1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Trailer Monitoring Unit
Brand Name	ZEBRA
Model Name	TM2000
FCC ID	UZ7TM2000
EUT supports Radios application	WLAN 11a/b/g/n HT20
HW Version	EV 3.0
SW Version	2.0.14
FW Version	2.0.14
MFD	15APR2018
EUT Stage	Engineering Sample

## 1.2 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	5745 MHz ~ 5825 MHz
Maximum Output Power to Antenna	802.11a : 13.16 dBm / 0.0207 W 802.11n HT20 : 13.02 dBm / 0.0200 W
99% Occupied Bandwidth	802.11a : 17.85 MHz 802.11n HT20 : 19.55 MHz
Antenna Gain / Gain	Omni-directional Antenna with gain -0.64 dBi
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

**Note:** WLAN operation in 5600 MHz ~ 5650 MHz is notched.

## 1.3 Modification of EUT

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



### 1.4 Testing Location

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

<b>Test Site</b>	SPORTON INTERNATIONAL INC.		
<b>Test Site Location</b>	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978		
<b>Test Site No.</b>	<b>Sporton Site No.</b>		
	TH05-HY	CO05-HY	03CH07-HY

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

### 1.5 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 v02r01.
- ♦ ANSI C63.10-2013

**Remark:**

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



## 2 Test Configuration of Equipment Under Test

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: 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).
- 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
	-	-	-	-
	153	5765	161	5805
	-	-	165	5825

### 2.2 Test Mode

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

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0

Test Cases	
AC Conducted Emission	Mode 1 : WLAN Link (5GHz) + 3D Camera + RGB Camera + Adapter + RJ45 Link with Notebook + TEC cooling



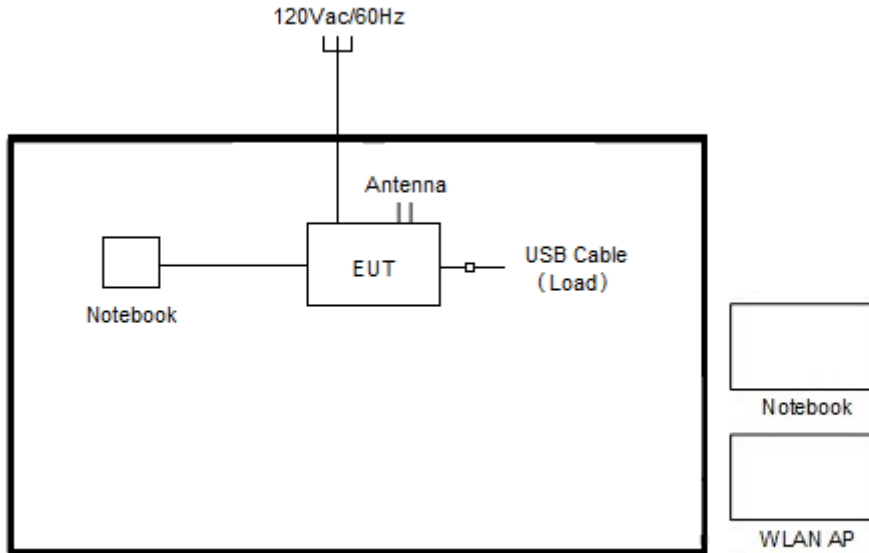
802.11a RF Output Power (dBm)										
Power vs. Channel			Power vs Data Rate							
Channel	Frequency (MHz)	Data Rate (bps)	channel	Data Rate (bps)						
		6M		9M	12M	18M	24M	36M	48M	54M
Duty Cycle (%)		66.67		57.50	50.49	41.04	34.19	26.62	20.77	19.69
CH 149	5745	13.16	CH 149							
CH 157	5785	12.59		12.90	12.97	13.10	12.99	13.05	13.01	12.72
CH 165	5825	12.85								

802.11n HT20 RF Output Power (dBm)										
Power vs. Channel			Power vs Data Rate							
Channel	Frequency (MHz)	MCS Index)	channel	MCS Index						
		MCS0		MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Duty Cycle (%)		65.31		49.00	39.29	32.89	25.55	20.16	19.69	18.40
CH 149	13.02	13.02	CH 149							
CH 157	12.87	12.87		13.00	12.68	13.01	12.43	12.80	12.51	12.39
CH 165	12.79	12.79								

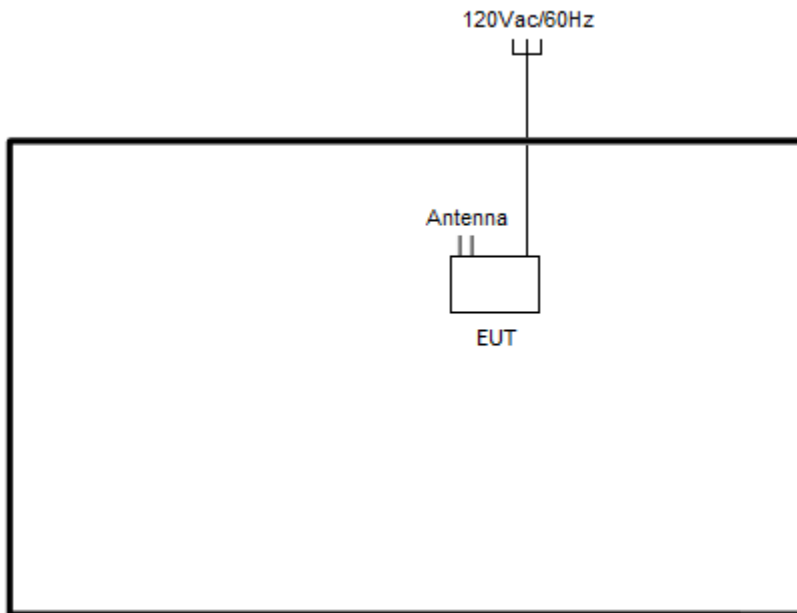


## 2.3 Connection Diagram of Test System

<AC Conducted Emission Mode>



<Radiation Emission Mode>





## 2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded,1.8m
2.	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, utility “Putty” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

## 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).*

$$= 4.2 + 10 = 14.2 \text{ (dB)}$$

### 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.

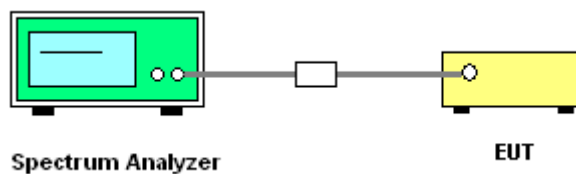
##### 3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

##### 3.1.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section C) Emission bandwidth for the band 5.725-5.85GHz
2. Set RBW = 100kHz.
3. Set the VBW  $\geq 3 \times$  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

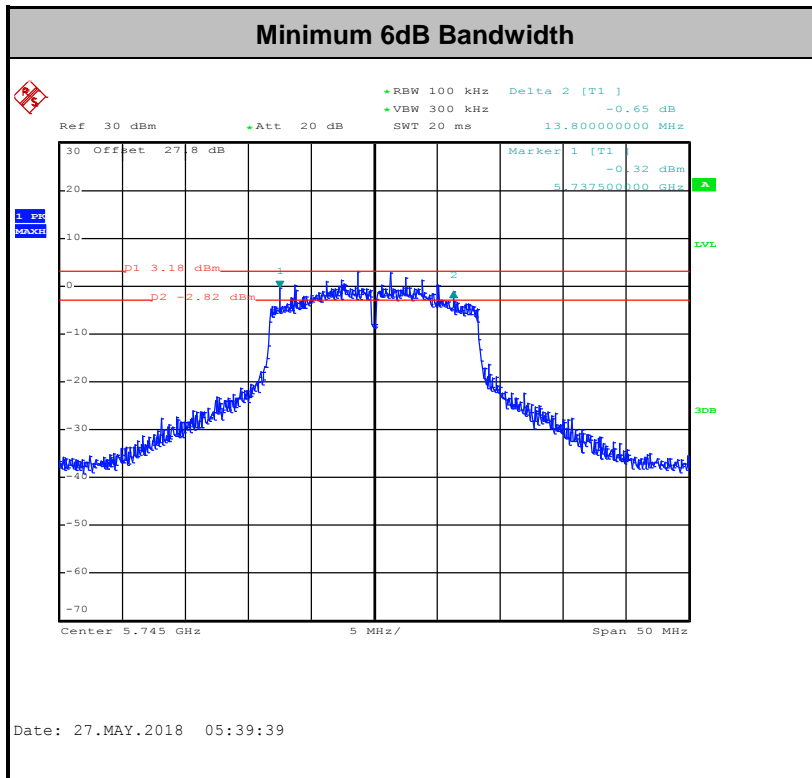


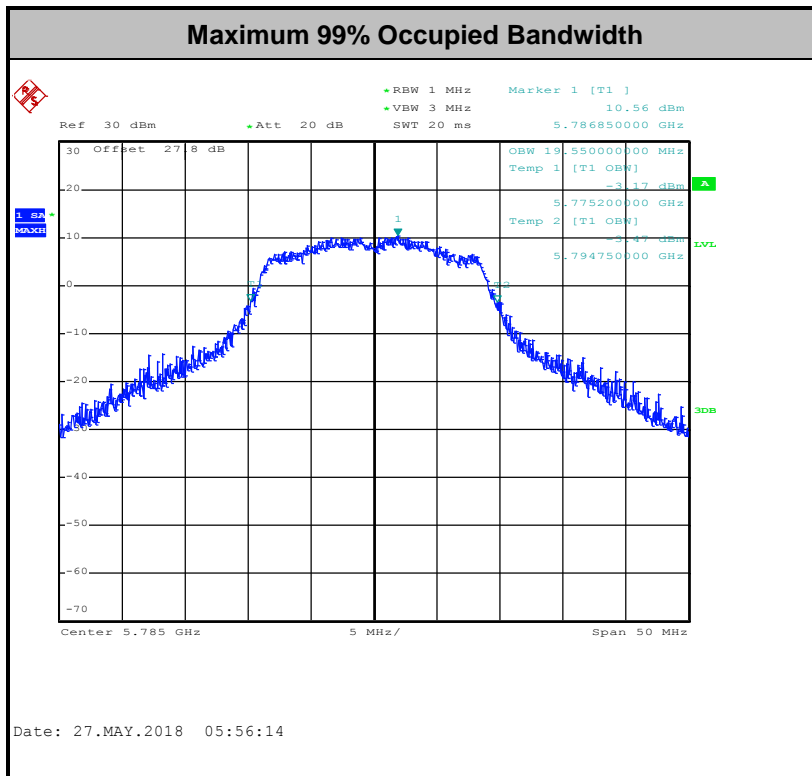
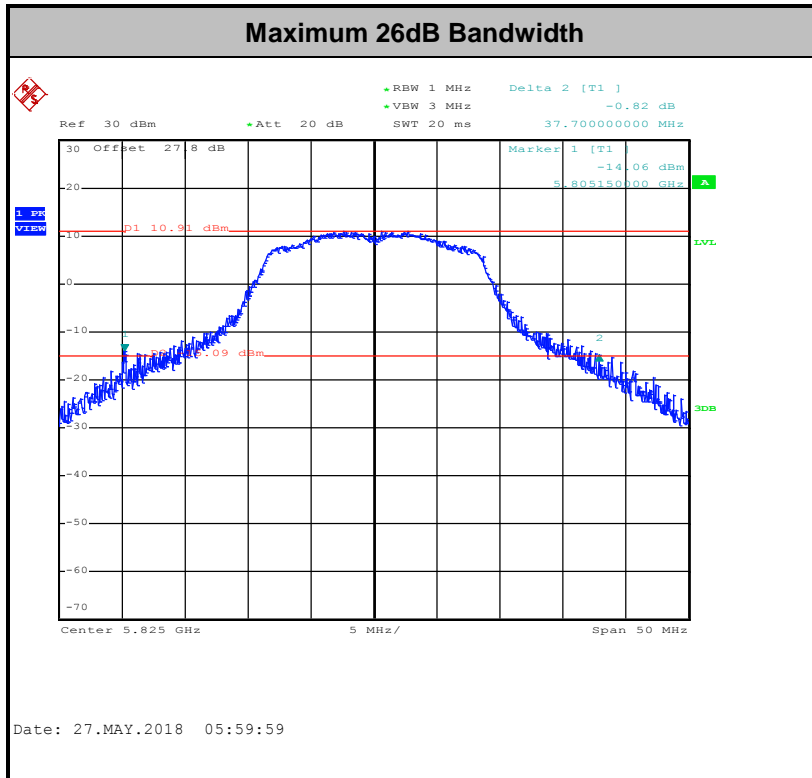


3.1.5 Test Result of 6dB Bandwidth

Test Engineer :	Kai Liao and Lena Lo	Temperature :	21~25°C
		Relative Humidity :	51~54%

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	1	149	5745	17.75	-	34.85	-	13.80	-	0.5	-	Pass
11a	6Mbps	1	157	5785	17.85	-	33.90	-	15.00	-	0.5	-	Pass
11a	6Mbps	1	165	5825	17.75	-	36.55	-	15.00	-	0.5	-	Pass
HT20	MCS0	1	149	5745	19.50	-	36.85	-	15.00	-	0.5	-	Pass
HT20	MCS0	1	157	5785	19.55	-	35.65	-	15.10	-	0.5	-	Pass
HT20	MCS0	1	165	5825	19.35	-	37.70	-	15.05	-	0.5	-	Pass





**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

See list of measuring equipment of this test report.

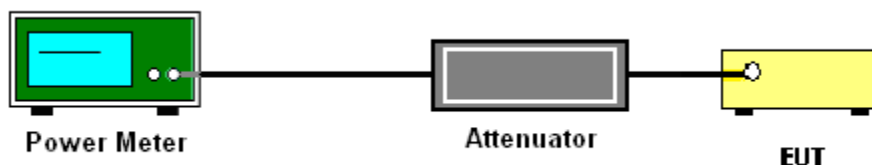
### 3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

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

Test Engineer :	Kai Liao and Lena Lo	Temperature :	21~25°C
		Relative Humidity :	51~54%

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	1.76	-	13.16	-	-	30.00	-	-0.64	-	Pass
11a	6Mbps	1	157	5785	1.76	-	12.59	-	-	30.00	-	-0.64	-	Pass
11a	6Mbps	1	165	5825	1.76	-	12.85	-	-	30.00	-	-0.64	-	Pass
HT20	MCS0	1	149	5745	1.85	-	13.02	-	-	30.00	-	-0.64	-	Pass
HT20	MCS0	1	157	5785	1.85	-	12.87	-	-	30.00	-	-0.64	-	Pass
HT20	MCS0	1	165	5825	1.85	-	12.79	-	-	30.00	-	-0.64	-	Pass



### 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

See list of measuring equipment of this test report.

#### 3.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section F) Maximum power spectral density.

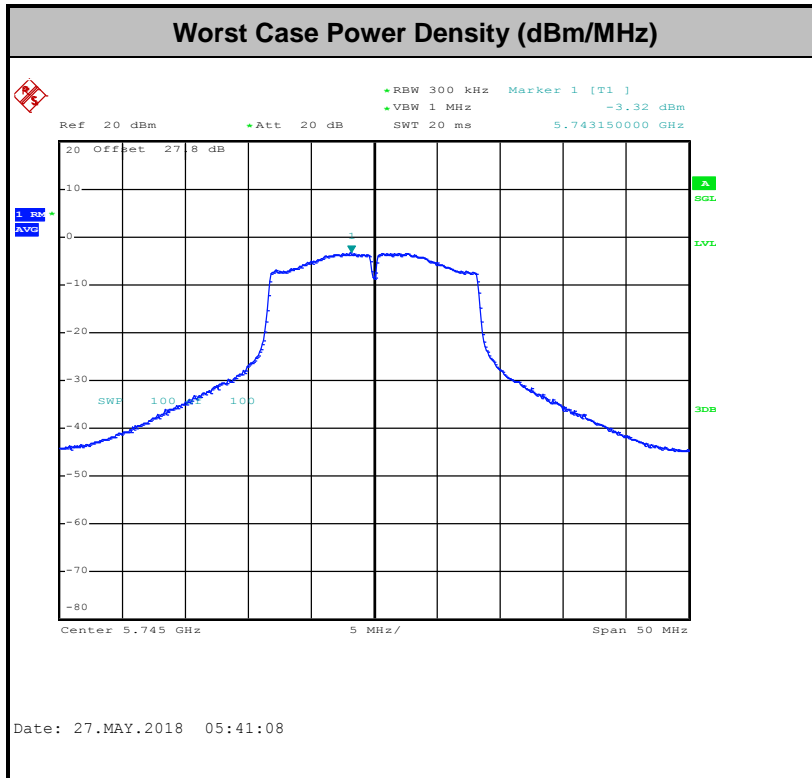
##### # Method SA-2 #

(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  $\geq$  1 MHz.
  - Number of points in sweep  $\geq$  2 Span / RBW.
  - Sweep time = auto.
  - Detector = RMS
  - Trace average at least 100 traces in power averaging mode.
  - Add  $10 \log(500\text{kHz}/\text{RBW})$  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.









### 3.4 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 shall comply with the general field strength limits 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.

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



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

(3) KDB789033 D02 v02r01 G)2)c)

- (i) Section 15.407(b)(1) to (b)(3) specify the unwanted emission limits for the U-NII-1 and U-NII-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.<sup>3</sup>
- (ii) Section 15.407(b)(4) specifies the unwanted emission limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are in terms of a Peak detector. 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 devices using the alternative limit.<sup>4</sup>

**Note 3:** 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 peak emission limit.

**Note 4:** Only devices with antenna gains of 10 dBi or less may be approved using the emission limits specified in Section 15.247(d) till March 2, 2018; all other devices operating in this band must use the mask specified in Section 15.407(b)(4)(i).

### 3.4.2 Measuring Instruments

See list of measuring equipment of this test report.



### **3.4.3 Test Procedures**

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. 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  $\geq$  3 MHz
- Detector = Peak
- Sweep time = auto
- Trace mode = max hold

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

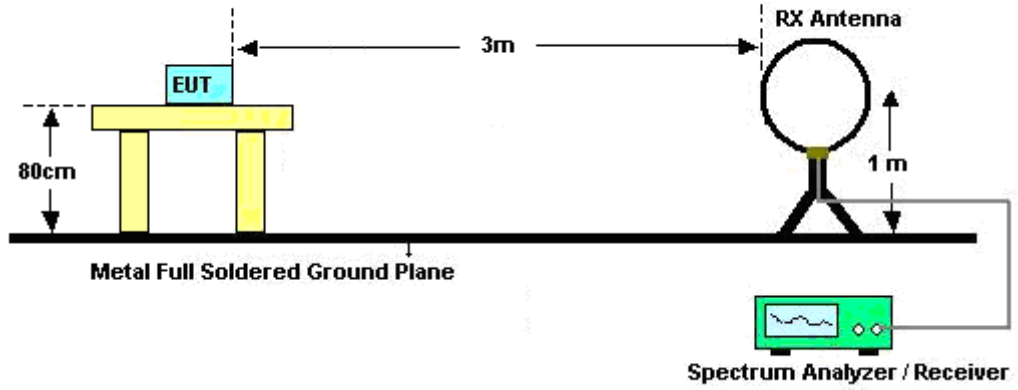
- RBW = 1 MHz
- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW  $\geq$  1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.



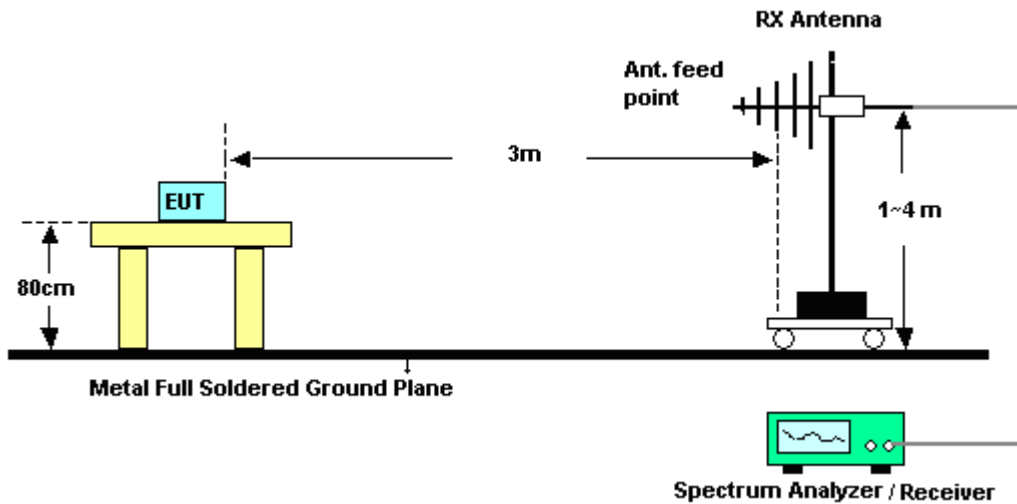
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband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

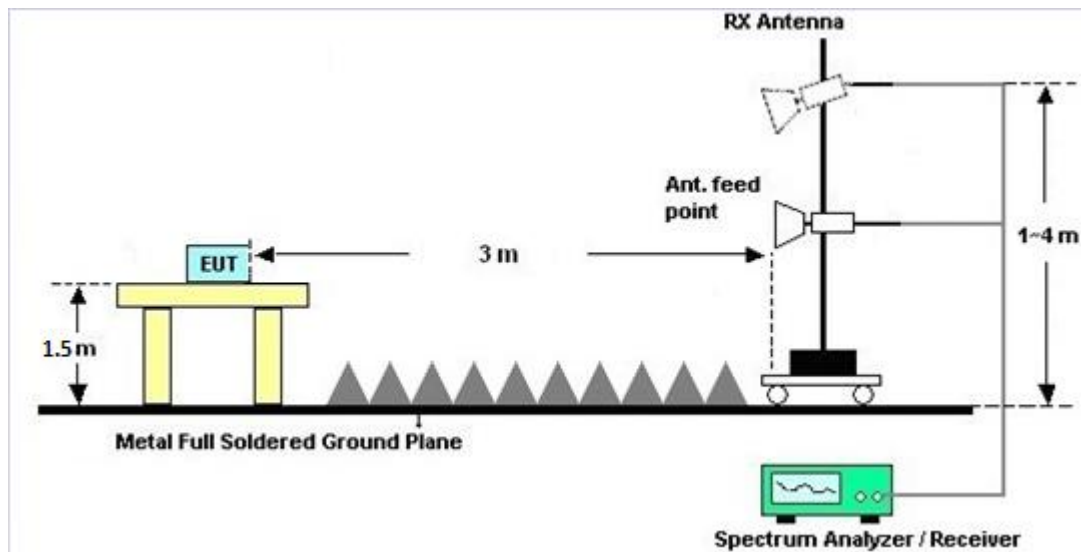
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



### 3.4.5 Test Results of Radiated 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 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 Unwanted Radiated Emission (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 (dB $\mu$ V)	
	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.

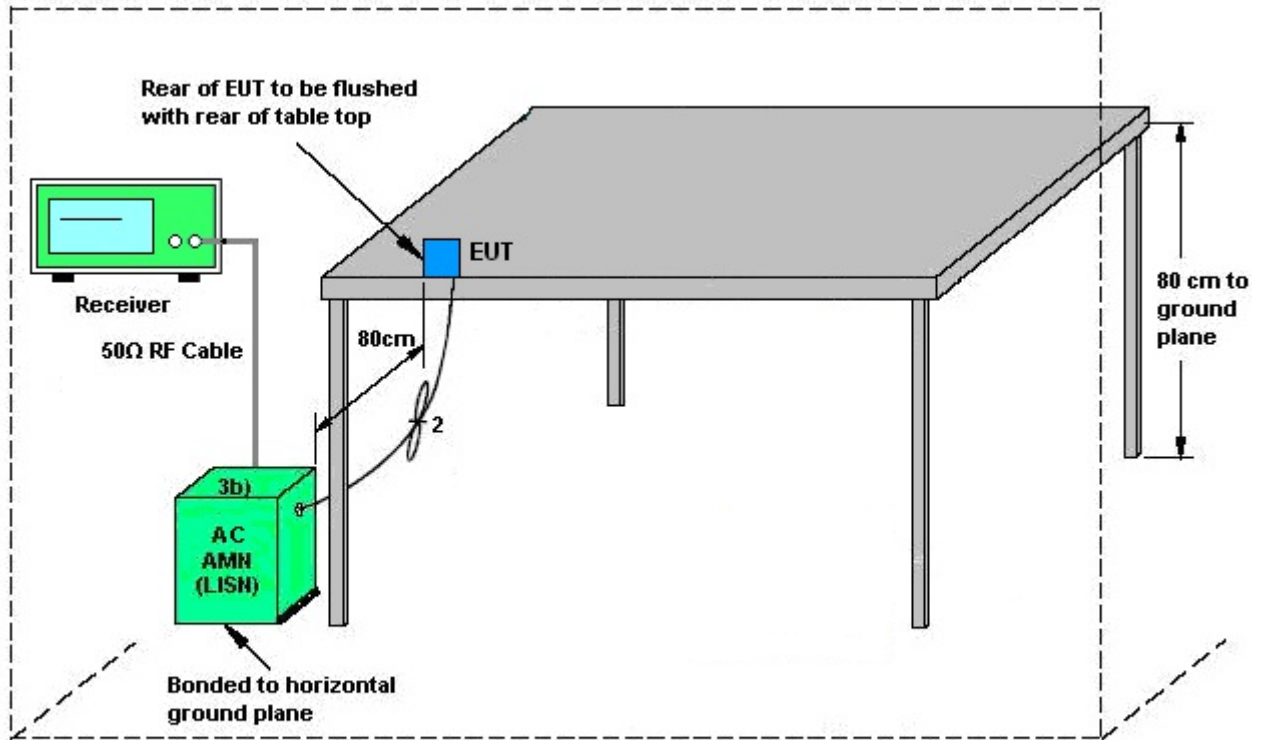
#### 3.5.2 Measuring Instruments

See list of measuring equipment 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



AMN = Artificial mains network (LISH)  
 AE = Associated equipment  
 EUT = Equipment under test  
 ISN = Impedance stabilization network

### 3.5.5 Test Result of AC Conducted Emission

Please refer to Appendix A.



## **3.6 Automatically Discontinue Transmission**

### **3.6.1 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.

### **3.6.2 Measuring Instruments**

See list of measuring equipment of this test report.

### **3.6.3 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.



## **3.7 Antenna Requirements**

### **3.7.1 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.

### **3.7.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

### **3.7.3 Antenna Gain**

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



## 4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Meter	Anritsu	ML2495A	1132003	N/A	Aug. 09, 2017	May 08, 2018~ May 27, 2018	Aug. 08, 2018	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	1126017	300MHz~40GHz z	Aug. 09, 2017	May 08, 2018~ May 27, 2018	Aug. 08, 2018	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100057	9kHz-40GHz	Nov. 21, 2017	May 08, 2018~ May 27, 2018	Nov. 20, 2018	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000 W	N/A	N/A	N/A	May 12, 2018	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	3.6GHz	Dec. 08, 2017	May 12, 2018	Dec. 07, 2018	Conduction (CO05-HY)
ISN	TESEQ	ISN T8-Cat6	38909	N/A	Jan. 29, 2018	May 12, 2018	Jan. 28, 2019	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 30, 2017	May 12, 2018	Nov. 29, 2018	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	May 12, 2018	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 03, 2018	May 12, 2018	Jan. 02, 2019	Conduction (CO05-HY)
ISN Cable	Woken	RG-400	N/A	N/A	Jan. 05, 2018	May 12, 2018	Jan. 04, 2019	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 03, 2018	May 12, 2018	Jan. 02, 2019	Conduction (CO05-HY)



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Bilog Antenna	TESEQ	CBL 6111D&008 00N1D01N- 06	35419&03	30MHz to 1GHz	Dec. 18, 2017	May 31, 2018~ Jun. 03, 2018	Dec. 17, 2018	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 23, 2017	May 31, 2018~ Jun. 03, 2018	Aug. 22, 2018	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Nov. 10, 2017	May 31, 2018~ Jun. 03, 2018	Nov. 09, 2018	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-00 101800-30- 10P	1590075	1GHz ~ 18GHz	Apr. 25, 2018	May 31, 2018~ Jun. 03, 2018	Apr. 24, 2019	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz-1GHz	May 21, 2018	May 31, 2018~ Jun. 03, 2018	May 20, 2019	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~ 26.5GHz	Oct. 30, 2017	May 31, 2018~ Jun. 03, 2018	Oct. 29, 2018	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9010A	MY53470118	10Hz~44GHz	Apr. 17, 2018	May 31, 2018~ Jun. 03, 2018	Apr. 16, 2019	Radiation (03CH07-HY)
Antenna Mast	Max-Full	MFA520BS	N/A	1m~4m	N/A	May 31, 2018~ Jun. 03, 2018	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	May 31, 2018~ Jun. 03, 2018	N/A	Radiation (03CH07-HY)
Amplifier	MITEQ	TTA1840-3 5-HG	1871923	18GHz~40GHz, VSWR : 2.5:1 max	Jul. 18, 2017	May 31, 2018~ Jun. 03, 2018	Jul. 17, 2018	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA917025 1	18GHz- 40GHz	Nov. 10, 2017	May 31, 2018~ Jun. 03, 2018	Nov. 09, 2018	Radiation (03CH07-HY)
EMI Test Receiver	Agilent	N9038A (MXE)	MY53290053	20Hz to 26.5GHz	Jan. 16, 2018	May 31, 2018~ Jun. 03, 2018	Jan. 15, 2019	Radiation (03CH07-HY)
Software	Audix	E3 6.2009- 8-24	8050400465 6H	N/A	N/A	May 31, 2018~ Jun. 03, 2018	N/A	Radiation (03CH07-HY)
Filter	Microwave	H1G013G1	SN477215	1.0G High Pass	Dec. 07, 2017	May 31, 2018~ Jun. 03, 2018	Dec. 06, 2018	Radiation (03CH07-HY)
Filter	Wainwright	WLKS1200 -8SS	SN3	1.2G Low Pass	Nov. 21, 2017	May 31, 2018~ Jun. 03, 2018	Nov. 20, 2018	Radiation (03CH07-HY)
Filter	Microwave	H3G018G1	SN477220	3.0G High Pass	Nov. 21, 2017	May 31, 2018~ Jun. 03, 2018	Nov. 20, 2018	Radiation (03CH07-HY)
Filter	Microwave	WHKX7.0/2 6.5G-6SS	SN4	7G High Pass	Nov. 21, 2017	May 31, 2018~ Jun. 03, 2018	Nov. 20, 2018	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLE X 104	MY24971/4, MY28655/4	9KHz~30MHz	Jan. 02, 2018	May 31, 2018~ Jun. 03, 2018	Jan. 01, 2019	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLE X 104	MY28655/4, MY24971/4, MY15682/4	30MHz~1GHz	Feb. 27, 2018	May 31, 2018~ Jun. 03, 2018	Feb. 26, 2019	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLE X 104	MY28655/4, MY24971/4, MY15682/4	1GHz~18GHz	Feb. 27, 2018	May 31, 2018~ Jun. 03, 2018	Feb. 26, 2019	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLE X 102	MY2858/2	18GHz~40GHz	Feb. 27, 2018	May 31, 2018~ Jun. 03, 2018	Feb. 26, 2019	Radiation (03CH07-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
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.70
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.50
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### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.20
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## Appendix A. AC Conducted Emission Test Results

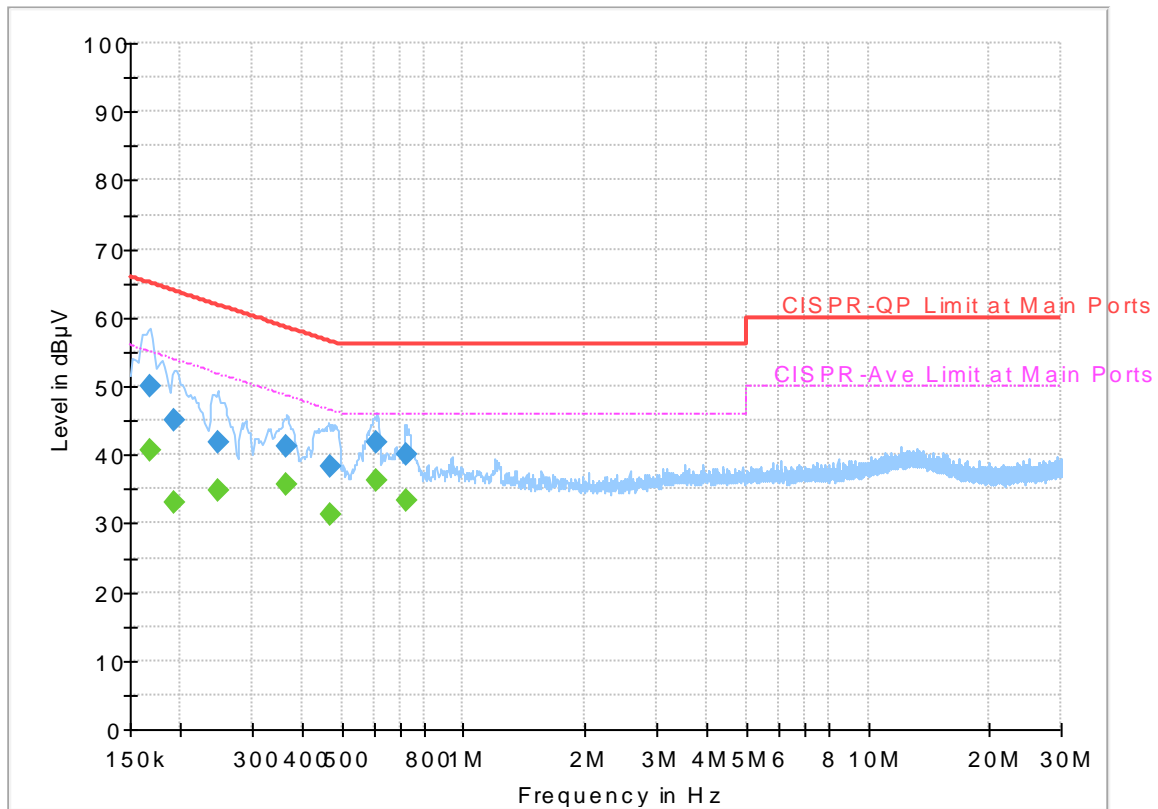
Test Engineer :	Kai Chun Chu	Temperature :	25~27°C
		Relative Humidity :	50~52%



# EUT Information

Report NO : 850206  
 Test Mode : Mode 1  
 Test Voltage : 120Vac/60Hz  
 Phase : Line

Full Spectrum



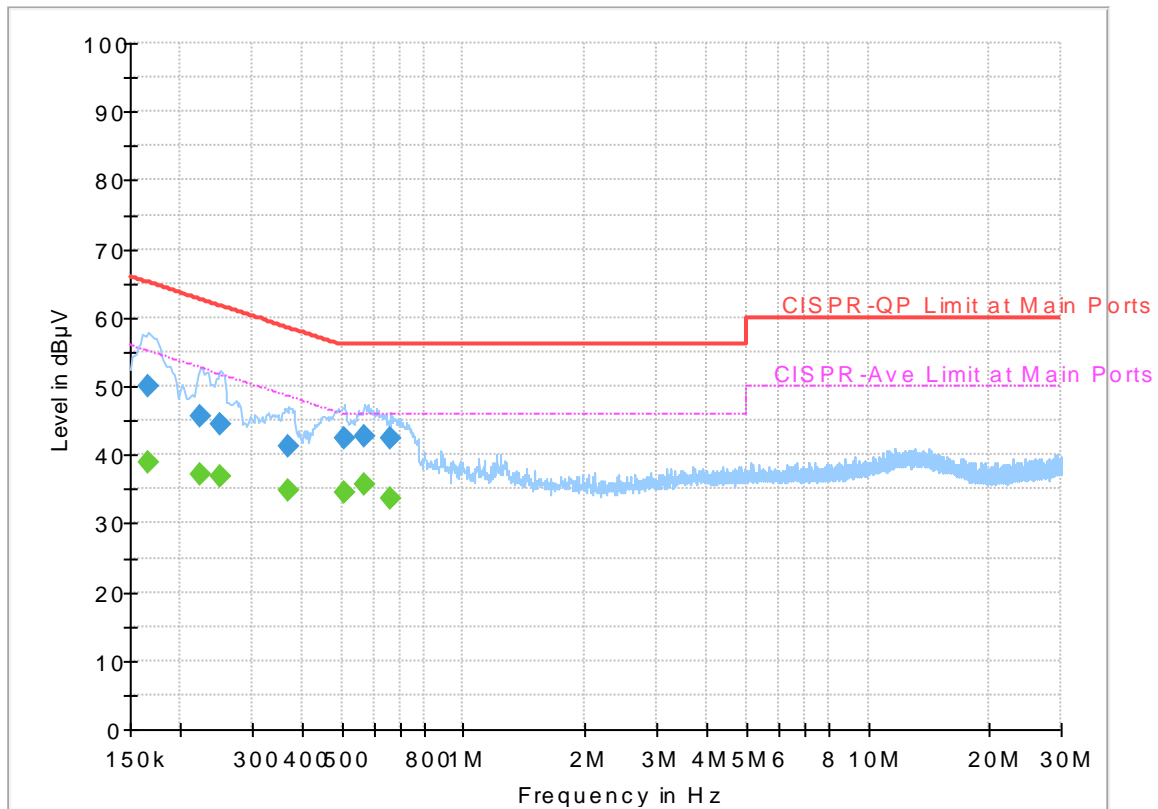
## Final\_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.168000	---	40.64	55.06	14.42	L1	OFF	19.5
0.168000	50.07	---	65.06	14.99	L1	OFF	19.5
0.192750	---	32.95	53.92	20.97	L1	OFF	19.5
0.192750	45.08	---	63.92	18.84	L1	OFF	19.5
0.246750	---	34.72	51.87	17.15	L1	OFF	19.5
0.246750	41.72	---	61.87	20.15	L1	OFF	19.5
0.366000	---	35.62	48.59	12.97	L1	OFF	19.5
0.366000	41.09	---	58.59	17.50	L1	OFF	19.5
0.469500	---	31.35	46.52	15.17	L1	OFF	19.5
0.469500	38.31	---	56.52	18.21	L1	OFF	19.5
0.611250	---	36.34	46.00	9.66	L1	OFF	19.5
0.611250	41.83	---	56.00	14.17	L1	OFF	19.5
0.719250	---	33.37	46.00	12.63	L1	OFF	19.5
0.719250	40.10	---	56.00	15.90	L1	OFF	19.5

## EUT Information

Report NO : 850206  
 Test Mode : Mode 1  
 Test Voltage : 120Vac/60Hz  
 Phase : Neutral

Full Spectrum



## Final\_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.165750	---	38.96	55.17	16.21	N	OFF	19.5
0.165750	50.01	---	65.17	15.16	N	OFF	19.5
0.224250	---	37.25	52.66	15.41	N	OFF	19.5
0.224250	45.72	---	62.66	16.94	N	OFF	19.5
0.251250	---	36.74	51.72	14.98	N	OFF	19.5
0.251250	44.33	---	61.72	17.39	N	OFF	19.5
0.370500	---	34.79	48.49	13.70	N	OFF	19.5
0.370500	41.31	---	58.49	17.18	N	OFF	19.5
0.507750	---	34.50	46.00	11.50	N	OFF	19.5
0.507750	42.39	---	56.00	13.61	N	OFF	19.5
0.568500	---	35.64	46.00	10.36	N	OFF	19.5
0.568500	42.62	---	56.00	13.38	N	OFF	19.5
0.663000	---	33.64	46.00	12.36	N	OFF	19.5
0.663000	42.47	---	56.00	13.53	N	OFF	19.5



## Appendix B. Radiated Spurious Emission

Test Engineer :	Jesse Wang and Stan Hsieh	Temperature :	21~23°C
		Relative Humidity :	51~54%

**Band 4 - 5725~5850MHz**  
**WIFI 802.11a (Band Edge @ 3m)**

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.	
1		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )	
802.11a CH 149 5745MHz		5605.4	51.15	-17.05	68.2	39.89	35.04	11.4	35.18	272	306	P	H	
		5654	51.67	-19.5	71.17	40.31	35.12	11.43	35.19	272	306	P	H	
		5719.2	57.43	-53.15	110.58	45.92	35.21	11.5	35.2	272	306	P	H	
		5723	63.25	-54.39	117.64	51.74	35.21	11.5	35.2	272	306	P	H	
	*	5745	100.64	-	-	89.08	35.24	11.53	35.21	272	306	P	H	
	*	5745	93.36	-	-	81.8	35.24	11.53	35.21	272	306	A	H	
														H
														H
			5608.4	51.87	-16.33	68.2	40.61	35.04	11.4	35.18	137	330	P	V
			5699.8	54.19	-50.86	105.05	42.76	35.17	11.46	35.2	137	330	P	V
			5720	61.54	-49.26	110.8	50.03	35.21	11.5	35.2	137	330	P	V
			5723.8	66.93	-52.53	119.46	55.42	35.21	11.5	35.2	137	330	P	V
	*		5745	107.3	-	-	95.74	35.24	11.53	35.21	137	330	P	V
	*		5745	99.82	-	-	88.26	35.24	11.53	35.21	137	330	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 )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)
		5630.6	51.68	-16.52	68.2	40.37	35.07	11.43	35.19	260	309	P	H
		5664.4	51.39	-27.5	78.89	40	35.12	11.46	35.19	260	309	P	H
		5702	51.01	-54.75	105.76	39.52	35.19	11.5	35.2	260	309	P	H
		5721.8	48.8	-66.1	114.9	37.29	35.21	11.5	35.2	260	309	P	H
	*	5785	101.49	-	-	89.86	35.29	11.56	35.22	260	309	P	H
	*	5785	94.29	-	-	82.66	35.29	11.56	35.22	260	309	A	H
		5854	50.24	-62.84	113.08	38.46	35.41	11.6	35.23	260	309	P	H
		5870	48.74	-57.86	106.6	36.92	35.41	11.65	35.24	260	309	P	H
		5902.2	50.08	-34.95	85.03	38.17	35.46	11.69	35.24	260	309	P	H
		5928.4	49.57	-18.63	68.2	37.62	35.5	11.69	35.24	260	309	P	H
													H
													H
<b>802.11a</b>													
<b>CH 157</b>													
<b>5785MHz</b>		5635	52.78	-15.42	68.2	41.45	35.09	11.43	35.19	201	329	P	V
		5677.4	52.42	-36.1	88.52	41.01	35.14	11.46	35.19	201	329	P	V
		5715.4	52.33	-57.18	109.51	40.84	35.19	11.5	35.2	201	329	P	V
		5724	51.83	-68.09	119.92	40.32	35.21	11.5	35.2	201	329	P	V
	*	5785	107.72	-	-	96.09	35.29	11.56	35.22	201	329	P	V
	*	5785	100.16	-	-	88.53	35.29	11.56	35.22	201	329	A	V
		5850.6	50.05	-70.78	120.83	38.3	35.38	11.6	35.23	201	329	P	V
		5867	51.28	-56.16	107.44	39.46	35.41	11.65	35.24	201	329	P	V
		5876.6	49.77	-54.24	104.01	37.93	35.43	11.65	35.24	201	329	P	V
		5939.4	49.7	-18.5	68.2	37.73	35.53	11.69	35.25	201	329	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 )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
802.11a CH 165 5825MHz	*	5825	101.38	-	-	89.64	35.36	11.6	35.22	248	309	P	H	
	*	5825	94.29	-	-	82.55	35.36	11.6	35.22	248	309	A	H	
		5850.01	52.78	-69.4	122.18	41.03	35.38	11.6	35.23	248	309	P	H	
		5861.6	50.65	-58.3	108.95	38.83	35.41	11.65	35.24	248	309	P	H	
		5885.4	50.34	-47.14	97.48	38.5	35.43	11.65	35.24	248	309	P	H	
		5938.8	49.42	-18.78	68.2	37.45	35.53	11.69	35.25	248	309	P	H	
														H
														H
	*	5825	108.21	-	-	96.47	35.36	11.6	35.22	231	326	P	V	
	*	5825	100.88	-	-	89.14	35.36	11.6	35.22	231	326	A	V	
		5852	61.54	-56.1	117.64	49.79	35.38	11.6	35.23	231	326	P	V	
		5857.6	57.3	-52.77	110.07	45.52	35.41	11.6	35.23	231	326	P	V	
		5892	50.86	-41.72	92.58	38.99	35.46	11.65	35.24	231	326	P	V	
		5942.4	50.62	-17.58	68.2	38.6	35.53	11.74	35.25	231	326	P	V	
														V
														V
													V	
<b>Remark</b>	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 )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
802.11a CH 149 5745MHz		11490	46.37	-27.63	74	47.23	38.38	18.1	57.34	100	0	P	H	
		17235	51.2	-17	68.2	43.92	41.77	21.26	55.75	100	0	P	H	
													H	
													H	
			11490	46.09	-27.91	74	46.95	38.38	18.1	57.34	100	0	P	V
			17235	50.95	-17.25	68.2	43.67	41.77	21.26	55.75	100	0	P	V
														V
802.11a CH 157 5785MHz		11570	45.57	-28.43	74	46.15	38.46	18.16	57.2	100	0	P	H	
		17355	50.29	-17.91	68.2	43.06	41.61	21.35	55.73	100	0	P	H	
													H	
													H	
			11570	45.52	-28.48	74	46.1	38.46	18.16	57.2	100	0	P	V
			17355	51.54	-16.66	68.2	44.31	41.61	21.35	55.73	100	0	P	V
														V
802.11a CH 165 5825MHz		11650	46.39	-27.61	74	46.72	38.51	18.27	57.11	100	0	P	H	
		17475	50.19	-18.01	68.2	43.02	41.45	21.43	55.71	100	0	P	H	
													H	
													H	
			11650	46.14	-27.86	74	46.47	38.51	18.27	57.11	100	0	P	V
			17475	50.54	-17.66	68.2	43.37	41.45	21.43	55.71	100	0	P	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 )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
802.11n HT20 CH 149 5745MHz		5645.6	51.75	-16.45	68.2	40.42	35.09	11.43	35.19	284	309	P	H	
		5682.6	50.84	-41.52	92.36	39.44	35.14	11.46	35.2	284	309	P	H	
		5719.6	58.26	-52.43	110.69	46.75	35.21	11.5	35.2	284	309	P	H	
		5723.6	64.98	-54.03	119.01	53.47	35.21	11.5	35.2	284	309	P	H	
	*	5745	100.35	-	-	88.79	35.24	11.53	35.21	284	309	P	H	
	*	5745	93.1	-	-	81.54	35.24	11.53	35.21	284	309	A	H	
														H
														H
			5605	52.81	-15.39	68.2	41.55	35.04	11.4	35.18	138	330	P	V
			5698	51.96	-51.77	103.73	40.53	35.17	11.46	35.2	138	330	P	V
			5720	63.56	-47.24	110.8	52.05	35.21	11.5	35.2	138	330	P	V
			5724.8	69.69	-52.05	121.74	58.18	35.21	11.5	35.2	138	330	P	V
	*		5745	107.35	-	-	95.79	35.24	11.53	35.21	138	330	P	V
	*		5745	99.62	-	-	88.06	35.24	11.53	35.21	138	330	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 )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)
		5633.8	52.01	-16.19	68.2	40.68	35.09	11.43	35.19	258	308	P	H
		5661.4	50.61	-26.05	76.66	39.22	35.12	11.46	35.19	258	308	P	H
		5700	51.62	-53.58	105.2	40.19	35.17	11.46	35.2	258	308	P	H
		5720.2	50	-61.26	111.26	38.49	35.21	11.5	35.2	258	308	P	H
	*	5785	101.19	-	-	89.56	35.29	11.56	35.22	258	308	P	H
	*	5785	93.85	-	-	82.22	35.29	11.56	35.22	258	308	A	H
		5854.6	50.33	-61.38	111.71	38.55	35.41	11.6	35.23	258	308	P	H
		5866	50.66	-57.06	107.72	38.84	35.41	11.65	35.24	258	308	P	H
		5884.8	50.1	-47.82	97.92	38.26	35.43	11.65	35.24	258	308	P	H
		5941.8	50.03	-18.17	68.2	38.01	35.53	11.74	35.25	258	308	P	H
<b>802.11n</b>													H
<b>HT20</b>													H
<b>CH 157</b>		5609.8	50.99	-17.21	68.2	39.73	35.04	11.4	35.18	202	329	P	V
<b>5785MHz</b>		5686.2	51.88	-43.14	95.02	40.45	35.17	11.46	35.2	202	329	P	V
		5708.4	50.94	-56.61	107.55	39.45	35.19	11.5	35.2	202	329	P	V
		5720.4	50.57	-61.14	111.71	39.06	35.21	11.5	35.2	202	329	P	V
	*	5785	107.49	-	-	95.86	35.29	11.56	35.22	202	329	P	V
	*	5785	100.13	-	-	88.5	35.29	11.56	35.22	202	329	A	V
		5850.8	51.44	-68.94	120.38	39.69	35.38	11.6	35.23	202	329	P	V
		5855.6	50.74	-59.89	110.63	38.96	35.41	11.6	35.23	202	329	P	V
		5879.8	50.8	-50.83	101.63	38.96	35.43	11.65	35.24	202	329	P	V
		5942.6	49.59	-18.61	68.2	37.57	35.53	11.74	35.25	202	329	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 )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
802.11n HT20 CH 165 5825MHz	*	5825	101.24	-	-	89.5	35.36	11.6	35.22	245	309	P	H	
	*	5825	93.82	-	-	82.08	35.36	11.6	35.22	245	309	A	H	
		5850.01	57.53	-64.65	122.18	45.78	35.38	11.6	35.23	245	309	P	H	
		5855.4	52.32	-58.37	110.69	40.54	35.41	11.6	35.23	245	309	P	H	
		5913.2	49.61	-27.29	76.9	37.68	35.48	11.69	35.24	245	309	P	H	
		5935.2	49.65	-18.55	68.2	37.71	35.5	11.69	35.25	245	309	P	H	
														H
														H
	*	5825	108.31	-	-	96.57	35.36	11.6	35.22	230	326	P	V	
	*	5825	100.63	-	-	88.89	35.36	11.6	35.22	230	326	A	V	
		5850.6	64.03	-56.8	120.83	52.28	35.38	11.6	35.23	230	326	P	V	
		5857	56.53	-53.71	110.24	44.75	35.41	11.6	35.23	230	326	P	V	
		5904.2	50.67	-32.88	83.55	38.76	35.46	11.69	35.24	230	326	P	V	
		5949.2	49.92	-18.28	68.2	37.9	35.53	11.74	35.25	230	326	P	V	
														V
														V
<b>Remark</b>	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 )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n HT20 CH 149 5745MHz		11490	47.76	-26.24	74	48.62	38.38	18.1	57.34	100	0	P	H
		17235	52.44	-15.76	68.2	45.16	41.77	21.26	55.75	100	0	P	H
													H
													H
		11490	46.67	-27.33	74	47.53	38.38	18.1	57.34	100	0	P	V
		17235	50.45	-17.75	68.2	43.17	41.77	21.26	55.75	100	0	P	V
													V
802.11n HT20 CH 157 5785MHz		11570	46.65	-27.35	74	47.23	38.46	18.16	57.2	100	0	P	H
		17355	50.89	-17.31	68.2	43.66	41.61	21.35	55.73	100	0	P	H
													H
													H
		11570	46.16	-27.84	74	46.74	38.46	18.16	57.2	100	0	P	V
		17355	51.17	-17.03	68.2	43.94	41.61	21.35	55.73	100	0	P	V
													V
802.11n HT20 CH 165 5825MHz		11650	46.38	-27.62	74	46.71	38.51	18.27	57.11	100	0	P	H
		17475	51.67	-16.53	68.2	44.5	41.45	21.43	55.71	100	0	P	H
													H
													H
		11650	46.69	-27.31	74	47.02	38.51	18.27	57.11	100	0	P	V
		17475	52.26	-15.94	68.2	45.09	41.45	21.43	55.71	100	0	P	V
													V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												





**Note symbol**

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



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

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

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

**For Peak Limit @ 2390MHz:**

1. Level(dBμV/m)  
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)  
= 55.45 (dBμV/m)
2. Over Limit(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 55.45(dBμV/m) – 74(dBμV/m)  
= -18.55(dB)

**For Average Limit @ 2390MHz:**

1. Level(dBμV/m)  
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)  
= 43.54 (dBμV/m)
2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)  
= 43.54(dBμV/m) – 54(dBμV/m)  
= -10.46(dB)

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



## Appendix C. Radiated Spurious Emission Plots

Test Engineer :	Jesse Wang and Stan Hsieh	Temperature :	21~23°C
		Relative Humidity :	51~54%

### Note symbol

-L	Low channel location
-R	High channel location

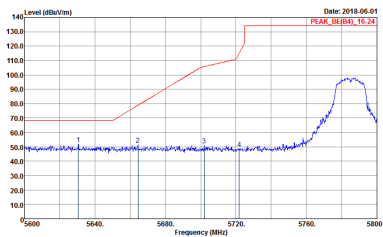
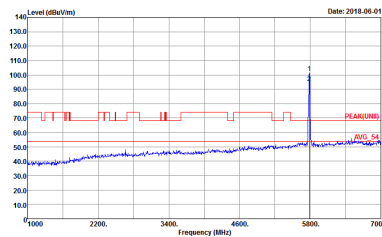
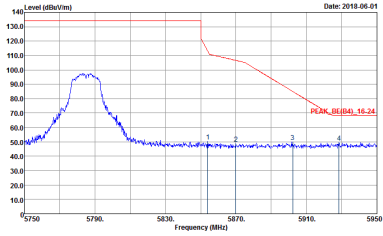
**Band 4 - 5725~5850MHz**  
**WIFI 802.11a (Band Edge @ 3m)**

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH149 5745MHz	
1	Horizontal	Fundamental
<b>Peak</b>	<p>Site : 03CH07-HY Condition : PEAK_BE(84)_16-24 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 850206 Mode : 10</p>	<p>Site : 03CH07-HY Condition : PEAK(UNII) 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 850206 Mode : 10</p>



WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH149 5745MHz	
1	Vertical	Fundamental
Peak	<p>Site : 03CH07-1M Condition : PEAK_BE(B4)_16-24 3m HF_ANT_0007596z VERTICAL Detector : Peak Project : 850206 Mode : 10</p>	<p>Site : 03CH07-1M Condition : PEAK(LINII) 3m HF_ANT_0007596z VERTICAL Detector : Peak Project : 850206 Mode : 10</p>



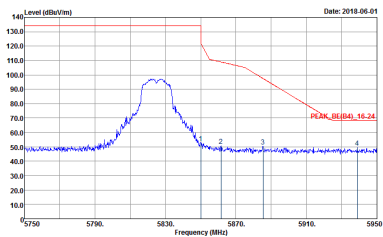
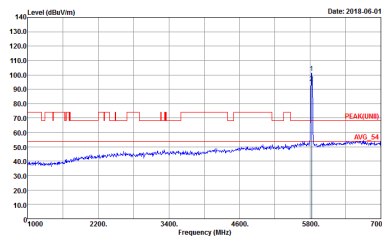
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz	
1	Horizontal	Fundamental
<p><b>Peak</b></p>	 <p>Site : 03CH07-HY            Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL            Detector : Peak            Project : 850206            Mode : 11</p>	 <p>Site : 03CH07-HY            Condition : PEAK(LINII) 3m HF_ANT_00075962 HORIZONTAL            Detector : Peak            Project : 850206            Mode : 11</p>
<p><b>Peak</b></p>	 <p>Site : 03CH07-HY            Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL            Detector : Peak            Project : 850206            Mode : 11</p>	<p><b>Left blank</b></p>



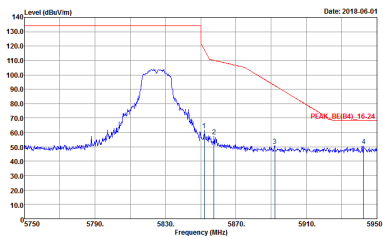
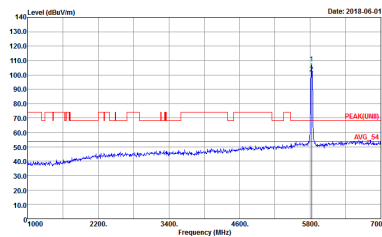


WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz	
1	Vertical	Fundamental
<p><b>Peak</b></p>	<p>Date: 2018.06.01 PEAK_BE(B4)_16-24</p> <p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_0007596z VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 850206 Mode : II</p>	<p>Date: 2018.06.01 PEAK(LINII)</p> <p>Site : 03CH07-HY Condition : PEAK(LINII) 3m HF_ANT_0007596z VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 850206 Mode : II</p>
<p><b>Peak</b></p>	<p>Date: 2018.06.01 PEAK_BE(B4)_16-24</p> <p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_0007596z VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 850206 Mode : II</p>	<p><b>Left blank</b></p>



WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Fundamental
Peak	 <p>Site : 03CH07-3M          Condition : PEAK_BE(B4)_16-24 3m HF_ANT_0007596z HORIZONTAL          Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto          Project : 850206          Mode : 12</p>	 <p>Site : 03CH07-3M          Condition : PEAK(LINII) 3m HF_ANT_0007596z HORIZONTAL          Detector : Peak          Project : 850206          Mode : 12</p>



WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
1	Vertical	Fundamental
Peak	 <p>Site : 03CH07-111          Condition : PEAK_BE(B4)_16-24 3m HF_ANT_0007596z VERTICAL          Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto          Project : 850206          Mode : 12</p>	 <p>Site : 03CH07-111          Condition : PEAK(LINII) 3m HF_ANT_0007596z VERTICAL          Detector : Peak          Project : 850206          Mode : 12</p>



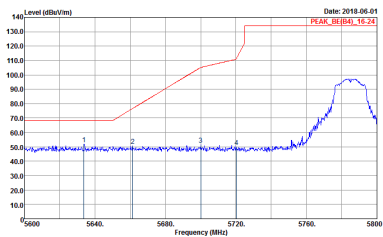
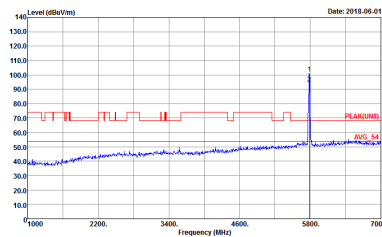
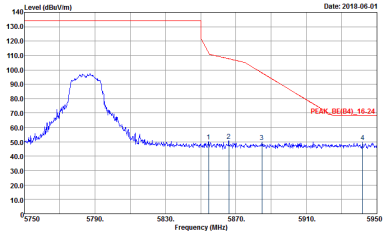
**Band 4 5725~5850MHz  
WIFI 802.11n HT20 (Band Edge @ 3m)**

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Horizontal	Fundamental
<b>Peak</b>	<p>Date: 2018-06-01 PEAK_BE(B4)_16-24</p> <p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 850206 Mode : ZZ</p>	<p>Date: 2018-06-01 PEAK(UBB) AVG_54</p> <p>Site : 03CH07-HY Condition : PEAK(UNIT) 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 850206 Mode : ZZ</p>

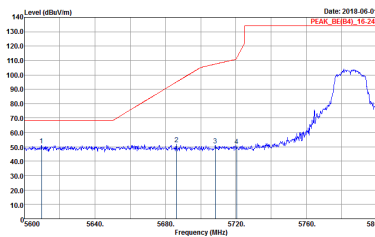
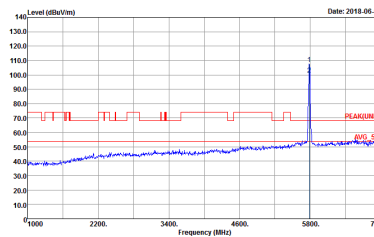
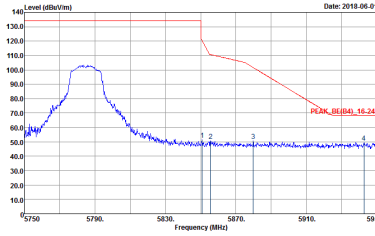


WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Vertical	Fundamental
<b>Peak</b>	<p>Site : 03CH07-3M Condition : PEAK_BE(B4)_16-24 3m HF_ANT_0007596z VERTICAL Detector : Peak Project : 850206 Mode : Z2</p>	<p>Site : 03CH07-3M Condition : PEAK(LINII) 3m HF_ANT_0007596z VERTICAL Detector : Peak Project : 850206 Mode : Z2</p>

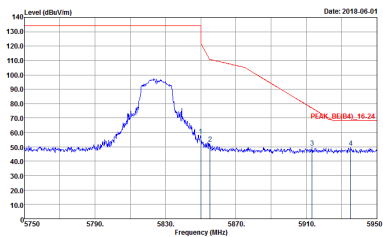
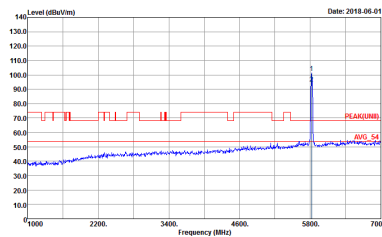


WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Horizontal	Fundamental
<p><b>Peak</b></p>	 <p>Site : 03CH07-HY            Condition : PEAK_BE(B4)_16-24 3m HF_ANT_0007596z HORIZONTAL            Detector : Peak            Project : 850206            Mode : Z3</p>	 <p>Site : 03CH07-HY            Condition : PEAK(LINII) 3m HF_ANT_0007596z HORIZONTAL            Detector : Peak            Project : 850206            Mode : Z3</p>
<p><b>Peak</b></p>	 <p>Site : 03CH07-HY            Condition : PEAK_BE(B4)_16-24 3m HF_ANT_0007596z HORIZONTAL            Detector : Peak            Project : 850206            Mode : Z3</p>	<p><b>Left blank</b></p>



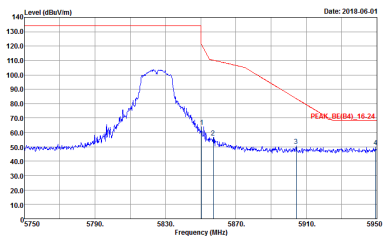
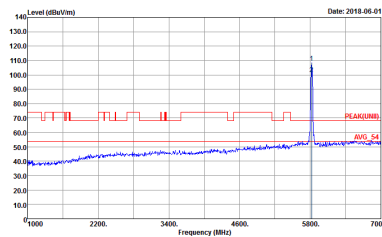
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Vertical	Fundamental
<p><b>Peak</b></p>	 <p>Site : 03CH07-HY            Condition : PEAK_BE(B4)_16-24 3m HF_ANT_0007596z VERTICAL            Detector : Peak            Project : 850206            Mode : Z3</p>	 <p>Site : 03CH07-HY            Condition : PEAK(LINII) 3m HF_ANT_0007596z VERTICAL            Detector : Peak            Project : 850206            Mode : Z3</p>
<p><b>Peak</b></p>	 <p>Site : 03CH07-HY            Condition : PEAK_BE(B4)_16-24 3m HF_ANT_0007596z VERTICAL            Detector : Peak            Project : 850206            Mode : Z3</p>	<p><b>Left blank</b></p>



WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1	Horizontal	Fundamental
Peak	 <p>Site : 03CH07-111          Condition : PEAK_BE(B4)_16-24 3m HF_ANT_0007596z HORIZONTAL          Detector : Peak          Project : 850206          Mode : Z4</p>	 <p>Site : 03CH07-111          Condition : PEAK(LINII) 3m HF_ANT_0007596z HORIZONTAL          Detector : Peak          Project : 850206          Mode : Z4</p>





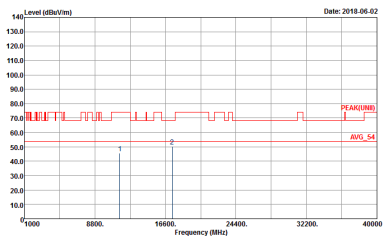
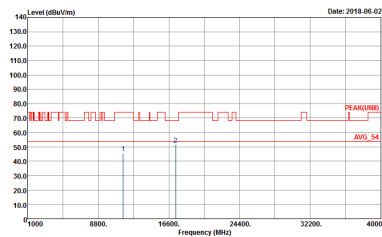
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1	Vertical	Fundamental
<p><b>Peak</b></p>	 <p>Site : 03CH07-111            Condition : PEAK_BE(B4)_16-24 3m HF_ANT_0007596z VERTICAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 850206            Mode : Z4</p>	 <p>Site : 03CH07-111            Condition : PEAK(LINII) 3m HF_ANT_0007596z VERTICAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 850206            Mode : Z4</p>



**Band 4 - 5725~5850MHz**  
**WIFI 802.11a (Harmonic @ 3m)**

<b>WIFI</b>	<b>Band 4 5725~5850MHz Harmonic @ 3m</b>	
<b>ANT</b>	<b>802.11a CH149 5745MHz</b>	
<b>1</b>	<b>Horizontal</b>	<b>Vertical</b>
<b>Peak</b> <b>Avg.</b>	<p>Site : 03CH07-HY          Condition : PEAK(UNIT) 3m SHF-EHF_131029 HORIZONTAL          Detector : Peak          Project : 850206          Mode : 10</p>	<p>Site : 03CH07-HY          Condition : PEAK(UNIT) 3m SHF-EHF_131029 VERTICAL          Detector : Peak          Project : 850206          Mode : 10</p>



WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH157 5785MHz	
1	Horizontal	Vertical
<p>Peak</p> <p>Avg.</p>	 <p>Site : 03CH07-3M          Condition : PEAK(LINE) 3m SHF-EHF_131029 HORIZONTAL          Detector : Peak          Project : 850206          Mode : 11</p>	 <p>Site : 03CH07-3M          Condition : PEAK(LINE) 3m SHF-EHF_131029 VERTICAL          Detector : Peak          Project : 850206          Mode : 11</p>



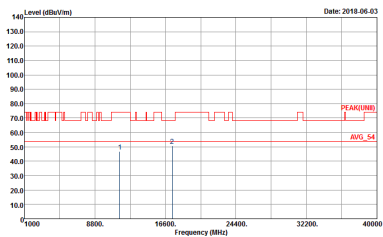
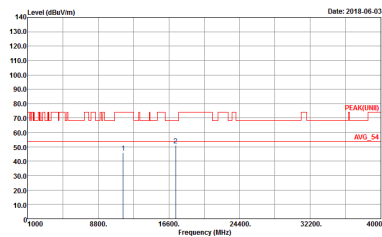
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH07-4M Condition : PEAK(LINE) 3m SHF-EHF_131029 HORIZONTAL Detector : Peak Project : 850206 Mode : 12</p>	<p>Site : 03CH07-4M Condition : PEAK(LINE) 3m SHF-EHF_131029 VERTICAL Detector : Peak Project : 850206 Mode : 12</p>



**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.	<p>Site : 03CH07-HY            Condition : PEAK(UNIT) 3m SHF-EHF_131029 HORIZONTAL            Detector : Peak            Project : 850206            Mode : Z2</p>	<p>Site : 03CH07-HY            Condition : PEAK(UNIT) 3m SHF-EHF_131029 VERTICAL            Detector : Peak            Project : 850206            Mode : Z2</p>



WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Horizontal	Vertical
<p>Peak</p> <p>Avg.</p>	 <p>Site : 03CH07-1M          Condition : PEAK(LINE) 3m SHF-EHF_131029 HORIZONTAL          Detector : Peak          Project : 850206          Mode : 23</p>	 <p>Site : 03CH07-1M          Condition : PEAK(LINE) 3m SHF-EHF_131029 VERTICAL          Detector : Peak          Project : 850206          Mode : 23</p>



WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH07-111 Condition : PEAK(LINE) 3m SHF-EHF_131029 HORIZONTAL Detector : Peak Project : 850206 Mode : 24</p>	<p>Site : 03CH07-111 Condition : PEAK(LINE) 3m SHF-EHF_131029 VERTICAL Detector : Peak Project : 850206 Mode : 24</p>



Emission below 1GHz  
5GHz WIFI 802.11n HT20 (LF)

WIFI	5GHz 5725-5850MHz	
ANT	802.11n HT20 LF	
1	Horizontal	Vertical
QP / Peak	<p>Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(6) HORIZONTAL Detector : Peak Project : 850206 Mode : 26</p>	<p>Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(6) VERTICAL Detector : Peak Project : 850206 Mode : 26</p>



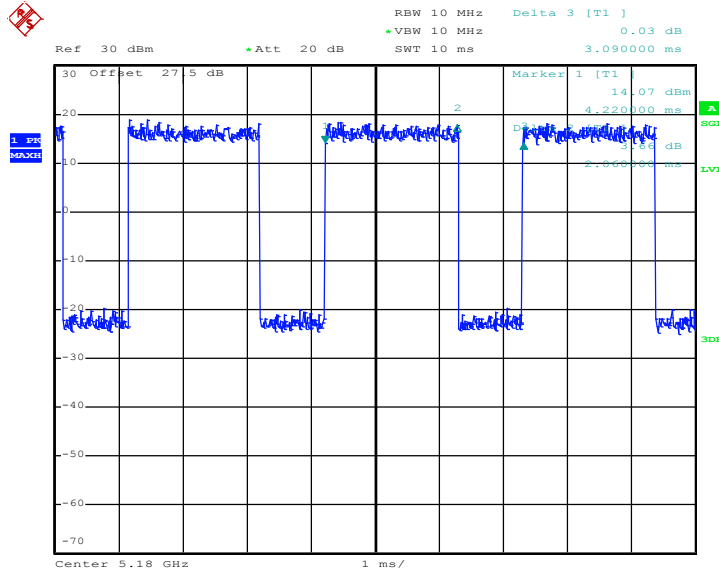


## Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
802.11a	66.67	2060	0.49	1kHz	1.76
5GHz 802.11n HT20	65.31	1920	0.52	1kHz	1.85

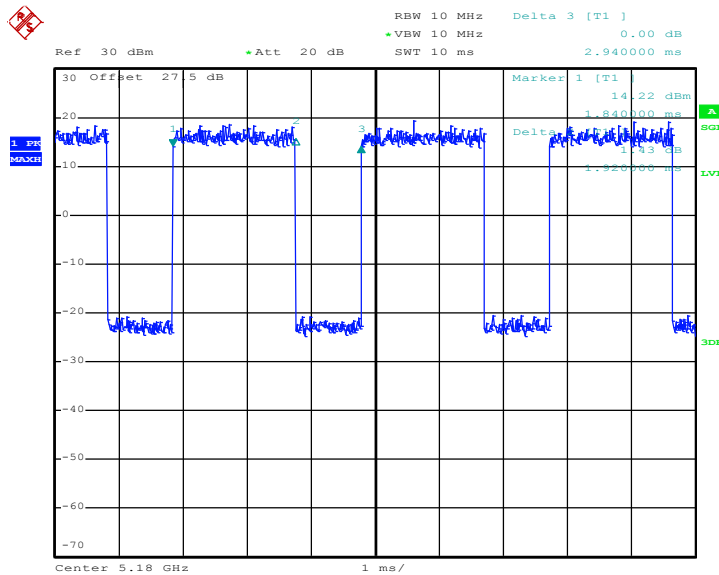


802.11a



Date: 8.MAY.2018 07:57:44

802.11n HT20



Date: 8.MAY.2018 09:14:53