



FCC RADIO TEST REPORT

FCC ID : UZ7TC520K
Equipment : Touch Computer
Brand Name : Zebra
Model Name : TC520K
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 Apr. 24, 2020 and testing was started from Apr. 30, 2020 and completed on May 25, 2020. We, SPORTON INTERNATIONAL INC., EMC & Wireless Communications Laboratory, 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 variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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History of this test report

Report No.	Version	Description	Issued Date
FR040704E	01	Initial issue of report	Jun. 03, 2020



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.403(i)	26dB Bandwidth	Not Required	-
-	2.1049	99% Occupied Bandwidth	Not Required	-
3.1	15.407(a)	Maximum Conducted Output Power	Pass	-
3.2	15.407(a)	Power Spectral Density	Pass	-
3.3	15.407(b)	Unwanted Emissions	Pass	Under limit 4.26 dB at 5453.680 MHz
-	15.207	AC Conducted Emission	Not Required	-
-	15.407(c)	Automatically Discontinue Transmission	Not Required	-
3.4	15.203 15.407(a)	Antenna Requirement	Pass	-

Note:

1. Not required means after assessing, test items are not necessary to carry out.
2. This is a variant report by Change List. All the test cases were performed on original report which can be referred to Sporton Report Number FR853105E. Based on the original report, the test cases were verified.

Declaration of Conformity:

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

Comments and Explanations:

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

Reviewed by: Wii Chang

Report Producer: Cindy Liu



1 General Description

1.1 Product Feature of Equipment Under Test

Product Specification subjective to this standard	
Equipment	Touch computer
Brand Name	Zebra
Model Name	TC520K
FCC ID	UZ7TC520K
EUT supports Radios application	NFC WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
HW Version	DV1
SW Version	10-10-19.00-QG-U04-PRD-HEL-04
FW Version	FUSION_QA_2_1.0.0.013_Q
MFD	26MAR20
EUT Stage	Engineering Sample

Remark: The above EUT's information was declared by manufacturer.

Specification of Accessories				
Adapter	Brand Name	Zebra	Model Name	SAWA-65-20005A
Battery 1	Brand Name	Zebra	Part Number	BT-000314-50
Battery 2	Brand Name	Zebra	Part Number	BT-000314-01
USB cable	Brand Name	Zebra	Part Number	CBL-TC51-USB1-01
Headset Jumper 1	Brand Name	Zebra	Part Number	CBL-TC51-HDST25-01
Headset Jumper 2	Brand Name	Zebra	Part Number	CBL-TC51-HDST35-01
2.5mm Earphone	Brand Name	Zebra	Part Number	HDST-25MM-PTVP-01
3.5mm Earphone	Brand Name	Zebra	Part Number	HDST-35MM-PTVP-01
Exoskeleton	Brand Name	Zebra	Part Number	SG-TC51-EX01-01
Trigger Handle	Brand Name	Zebra	Part Number	TRG-TC51-SNP1-01
Soft Holster	Brand Name	Zebra	Part Number	SG-TC51-HLSTR1-01
Hand strap	Brand Name	Zebra	Part Number	SG-TC51-BHDSTP1-03
USB-C Adaptor	Brand Name	Zebra	Part Number	ADPTR-TC56-USBC-01
USB Type C cable	Brand Name	Zebra	Part Number	N/A

1.2 Product Specification of Equipment Under Test

Standards-related Product Specification							
Tx/Rx Frequency Range	5180 MHz ~ 5240 MHz 5260 MHz ~ 5320 MHz 5500 MHz ~ 5720 MHz						
Maximum Output Power to Antenna	<p><5180 MHz ~ 5240 MHz> MIMO <Ant. 1 + 2> 802.11a : 20.96 dBm / 0.1247 W 802.11n HT20 : 20.56 dBm / 0.1138 W 802.11n HT40 : 19.46 dBm / 0.0883 W 802.11ac VHT20: 20.31 dBm / 0.1074 W 802.11ac VHT40: 19.16 dBm / 0.0824 W 802.11ac VHT80: 14.81 dBm / 0.0303 W</p> <p><5260 MHz ~ 5320 MHz> MIMO <Ant. 1 + 2> 802.11a : 20.41 dBm / 0.1099 W 802.11n HT20 : 20.16 dBm / 0.1038 W 802.11n HT40 : 19.56 dBm / 0.0904 W 802.11ac VHT20: 19.81 dBm / 0.0957 W 802.11ac VHT40: 19.36 dBm / 0.0863 W 802.11ac VHT80: 12.06 dBm / 0.0161 W</p> <p><5500 MHz ~ 5720 MHz> MIMO <Ant. 1 + 2> 802.11a : 19.07 dBm / 0.0807 W 802.11n HT20 : 19.36 dBm / 0.0863 W 802.11n HT40 : 19.11 dBm / 0.0815 W 802.11ac VHT20: 19.31 dBm / 0.0853 W 802.11ac VHT40: 19.01 dBm / 0.0796 W 802.11ac VHT80: 19.12 dBm / 0.0817 W</p>						
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)						
Antenna Type / Gain	<p><5180 MHz ~ 5240 MHz> Ant. 1 : PIFA Antenna with gain 3.70 dBi Ant. 2 : PIFA Antenna with gain -0.10 dBi</p> <p><5260 MHz ~ 5320 MHz> Ant. 1 : PIFA Antenna with gain 3.60 dBi Ant. 2 : PIFA Antenna with gain -0.10 dBi</p> <p><5500 MHz ~ 5700 MHz > Ant. 1 : PIFA Antenna with gain 3.00 dBi Ant. 2 : PIFA Antenna with gain 2.10 dBi</p>						
Antenna Function Description	<table border="1"> <thead> <tr> <th></th> <th>Ant. 1</th> <th>Ant. 2</th> </tr> </thead> <tbody> <tr> <td>802.11 a/n/ac MIMO</td> <td>V</td> <td>V</td> </tr> </tbody> </table>		Ant. 1	Ant. 2	802.11 a/n/ac MIMO	V	V
	Ant. 1	Ant. 2					
802.11 a/n/ac MIMO	V	V					

Note: MIMO Ant. 1+2 is a calculated result from sum of the power MIMO Ant. 1 and MIMO Ant. 2.

1.3 Modification of EUT

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



1.4 Testing Location

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	Sporton Site No.
	TH05-HY

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

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
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.

FCC designation No.: TW1190 and TW0007

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.
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.
3. The TAF code is not including all the FCC KDB listed without accreditation.

2 Test Configuration of Equipment Under Test

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: 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 (X plane) were recorded in this report.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5150-5250 MHz Band 1 (U-NII-1)	36	5180	44	5220
	38*	5190	46*	5230
	40	5200	48	5240
	42 [#]	5210		
Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5250-5350 MHz Band 2 (U-NII-2A)	52	5260	60	5300
	54*	5270	62*	5310
	56	5280	64	5320
	58 [#]	5290		
Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5470-5725 MHz Band 3 (U-NII-2C)	100	5500	112	5560
	102*	5510	116	5580
	104	5520	132	5660
	106 [#]	5530	134*	5670
	108	5540	136	5680
	110*	5550	140	5700



Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
TDWR Channel	118*	5590	124	5620
	120	5600	126*	5630
	122 [#]	5610	128	5640

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
Straddle Channel	138 [#]	5690	144	5720
	142*	5710		

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

MIMO Mode

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT20 (Covered by HT20)	MCS0
802.11ac VHT40 (Covered by HT40)	MCS0
802.11ac VHT80	MCS0

Remark: For Radiated Test Cases, the tests were performed with Battery 1, Headset Jumper 1 and 2.5mm Earphone.



Ch. #		Band III : 5470-5725MHz	
		802.11a	
L	Low	-	
M	Middle	-	
H	High	140	

Ch. #		Band II : 5250-5350 MHz	
		802.11n HT20	
L	Low	-	
M	Middle	-	
H	High	64	

Ch. #		Band I : 5150-5250 MHz	Band II : 5250-5350 MHz	Band III : 5470-5725MHz
		802.11n HT40	802.11n HT40	802.11n HT40
L	Low	38	-	102
M	Middle	-	-	-
H	High	-	62	-

Ch. #		Band I : 5150-5250 MHz	Band II : 5250-5350 MHz	Band III : 5470-5725MHz
		802.11ac VHT80	802.11ac VHT80	802.11ac VHT80
L	Low	-	-	106
M	Middle	42	58	-
H	High	-	-	-

Remark: For radiation spurious emission, the final modulation and the worst data rate was reference the max RF conducted power.



802.11a RF Output Power (dBm)		
Power vs. Channel		
Channel	Frequency (MHz)	Data Rate (bps)
		6M
CH 036	5180	20.86
CH 044	5220	20.96
CH 048	5240	20.66
CH 052	5260	20.26
CH 060	5300	20.41
CH 064	5320	18.76
CH 100	5500	18.91
CH 116	5580	19.07
CH 140	5700	17.96
CH 144*	5720	19.01

Note: The above Frequency and Channel in "*" were straddle Channel.

802.11n HT20 RF Output Power (dBm)		
Power vs. Channel		
Channel	Frequency (MHz)	MCS Index
		MCS0
CH 036	5180	20.56
CH 044	5220	20.16
CH 048	5240	20.36
CH 052	5260	20.11
CH 060	5300	20.16
CH 064	5320	19.06
CH 100	5500	19.31
CH 116	5580	18.87
CH 140	5700	17.81
CH 144*	5720	19.36

Note: The above Frequency and Channel in "*" were straddle Channel.



802.11n HT40 RF Output Power (dBm)		
Power vs. Channel		
Channel	Frequency (MHz)	MCS Index
		MCS0
CH 038	5190	16.91
CH 046	5230	19.46
CH 054	5270	19.56
CH 062	5310	14.66
CH 102	5510	16.97
CH 110	5550	18.77
CH 134	5670	19.11
CH 142*	5710	19.06

Note: The above Frequency and Channel in "*" were straddle Channel.

802.11ac VHT20 RF Output Power (dBm)		
Power vs. Channel		
Channel	Frequency (MHz)	MCS Index
		MCS0
CH 036	5180	20.16
CH 044	5220	20.16
CH 048	5240	20.31
CH 052	5260	19.66
CH 060	5300	19.81
CH 064	5320	19.06
CH 100	5500	19.31
CH 116	5580	18.92
CH 140	5700	17.81
CH 144*	5720	19.36

Note: The above Frequency and Channel in "*" were straddle Channel.



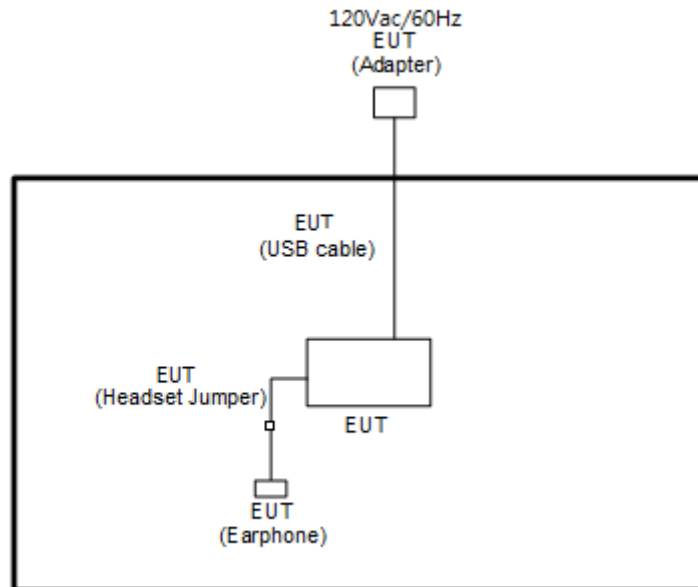
802.11ac VHT40 RF Output Power (dBm)		
Power vs. Channel		
Channel	Frequency (MHz)	MCS Index
		MCS0
CH 038	5190	16.86
CH 046	5230	19.16
CH 054	5270	19.36
CH 062	5310	14.51
CH 102	5510	16.97
CH 110	5550	18.71
CH 134	5670	19.01
CH 142*	5710	19.06

Note: The above Frequency and Channel in "*" were straddle Channel.

802.11ac VHT80 RF Output Power (dBm)		
Power vs. Channel		
Channel	Frequency (MHz)	MCS Index
		MCS0
CH 042	5210	14.81
CH 058	5290	12.06
CH 106	5530	16.56
CH 122	5610	19.11
CH 138*	5690	18.96

Note: The above Frequency and Channel in "*" were straddle Channel.

2.3 Connection Diagram of Test System



2.4 EUT Operation Test Setup

The RF test items, utility “QRCT V3.0.303.0” 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.

2.5 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 Maximum Conducted Output Power Measurement

3.1.1 Limit of Maximum Conducted Output Power

<FCC 14-30 CFR 15.407>

For the 5.15–5.25 GHz bands:

- For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW. For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

For the 5.25–5.725 GHz bands:

- The maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz.

For Straddle Channel, according to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, if the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

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.

Note that U-NII-2 band, devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

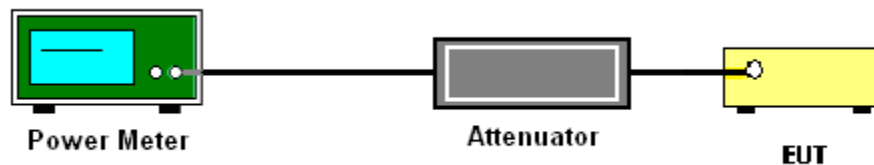
The testing follows Method PM-G of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

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

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit at its maximum power control level.
3. Measure the average power of the transmitter
4. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.
5. 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.

For Straddle Channel, according to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, if the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

3.1.4 Test Setup





3.1.5 Test Result of Maximum Conducted Output Power

Test Engineer :	Sylvia Li	Temperature :	21~25°C
		Relative Humidity :	51~54%

Band I												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	2	36	5180	17.70	18.00	20.86	24.00	3.70		Pass	
11a	6Mbps	2	44	5220	17.80	18.10	20.96	24.00	3.70		Pass	
11a	6Mbps	2	48	5240	17.60	17.70	20.66	24.00	3.70		Pass	
HT20	MCS0	2	36	5180	17.40	17.70	20.56	24.00	3.70		Pass	
HT20	MCS0	2	44	5220	17.00	17.30	20.16	24.00	3.70		Pass	
HT20	MCS0	2	48	5240	17.20	17.50	20.36	24.00	3.70		Pass	
HT40	MCS0	2	38	5190	13.80	14.00	16.91	24.00	3.70		Pass	
HT40	MCS0	2	46	5230	16.30	16.60	19.46	24.00	3.70		Pass	
VHT20	MCS0	2	36	5180	17.00	17.30	20.16	24.00	3.70		Pass	
VHT20	MCS0	2	44	5220	17.00	17.30	20.16	24.00	3.70		Pass	
VHT20	MCS0	2	48	5240	17.20	17.40	20.31	24.00	3.70		Pass	
VHT40	MCS0	2	38	5190	13.70	14.00	16.86	24.00	3.70		Pass	
VHT40	MCS0	2	46	5230	16.10	16.20	19.16	24.00	3.70		Pass	
VHT80	MCS0	2	42	5210	11.70	11.90	14.81	24.00	3.70		Pass	



Band II													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
11a	6Mbps	2	52	5260	17.20	17.30	20.26	23.98	3.60	30	Pass		
11a	6Mbps	2	60	5300	17.30	17.50	20.41	23.98	3.60	30	Pass		
11a	6Mbps	2	64	5320	15.80	15.70	18.76	23.98	3.60	30	Pass		
HT20	MCS0	2	52	5260	17.00	17.20	20.11	23.98	3.60	30	Pass		
HT20	MCS0	2	60	5300	17.10	17.20	20.16	23.98	3.60	30	Pass		
HT20	MCS0	2	64	5320	16.10	16.00	19.06	23.98	3.60	30	Pass		
HT40	MCS0	2	54	5270	16.50	16.60	19.56	23.98	3.60	30	Pass		
HT40	MCS0	2	62	5310	11.60	11.70	14.66	23.98	3.60	30	Pass		
VHT20	MCS0	2	52	5260	16.60	16.70	19.66	23.98	3.60	30	Pass		
VHT20	MCS0	2	60	5300	16.80	16.80	19.81	23.98	3.60	30	Pass		
VHT20	MCS0	2	64	5320	16.10	16.00	19.06	23.98	3.60	30	Pass		
VHT40	MCS0	2	54	5270	16.30	16.40	19.36	23.98	3.60	30	Pass		
VHT40	MCS0	2	62	5310	11.50	11.50	14.51	23.98	3.60	30	Pass		
VHT80	MCS0	2	58	5290	9.00	9.10	12.06	23.98	3.60	30	Pass		



Band III													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
11a	6Mbps	2	100	5500	16.10	15.70	18.91	23.98	3.00	30	Pass		
11a	6Mbps	2	116	5580	16.30	15.80	19.07	23.98	3.00	30	Pass		
11a	6Mbps	2	140	5700	15.10	14.80	17.96	23.98	3.00	30	Pass		
11a	6Mbps	2	144	5720	16.10	15.90	19.01	23.98	3.00	30	Pass		
HT20	MCS0	2	100	5500	16.50	16.10	19.31	23.98	3.00	30	Pass		
HT20	MCS0	2	116	5580	16.10	15.60	18.87	23.98	3.00	30	Pass		
HT20	MCS0	2	140	5700	14.90	14.70	17.81	23.98	3.00	30	Pass		
HT20	MCS0	2	144	5720	16.40	16.30	19.36	23.98	3.00	30	Pass		
HT40	MCS0	2	102	5510	14.30	13.60	16.97	23.98	3.00	30	Pass		
HT40	MCS0	2	110	5550	16.00	15.50	18.77	23.98	3.00	30	Pass		
HT40	MCS0	2	134	5670	16.30	15.90	19.11	23.98	3.00	30	Pass		
HT40	MCS0	2	142	5710	16.10	16.00	19.06	23.98	3.00	30	Pass		
VHT20	MCS0	2	100	5500	16.50	16.10	19.31	23.98	3.00	30	Pass		
VHT20	MCS0	2	116	5580	16.20	15.60	18.92	23.98	3.00	30	Pass		
VHT20	MCS0	2	140	5700	14.90	14.70	17.81	23.98	3.00	30	Pass		
VHT20	MCS0	2	144	5720	16.40	16.30	19.36	23.98	3.00	30	Pass		
VHT40	MCS0	2	102	5510	14.20	13.70	16.97	23.98	3.00	30	Pass		
VHT40	MCS0	2	110	5550	15.90	15.50	18.71	23.98	3.00	30	Pass		
VHT40	MCS0	2	134	5670	16.20	15.80	19.01	23.98	3.00	30	Pass		
VHT40	MCS0	2	142	5710	16.10	16.00	19.06	23.98	3.00	30	Pass		
VHT80	MCS0	2	106	5530	13.60	13.50	16.56	23.98	3.00	30	Pass		
VHT80	MCS0	2	122	5610	16.30	15.90	19.115	23.98	3.00	30	Pass		
VHT80	MCS0	2	138	5690	16.00	15.90	18.96	23.98	3.00	30	Pass		



3.2 Power Spectral Density Measurement

3.2.1 Limit of Power Spectral Density

<FCC 14-30 CFR 15.407>

For the 5.15–5.25 GHz bands:

For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1.0 MHz band. For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1.0 MHz band.

For the 5.25–5.725 GHz bands:

The maximum power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

For Straddle Channel, according to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, if the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

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

Method SA-3

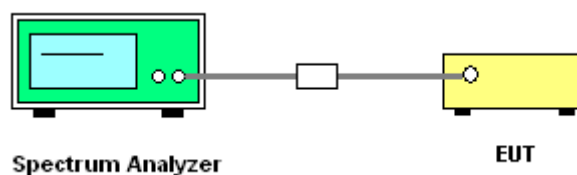
(power averaging (rms) detection with max hold):

- Set span to encompass the entire emission bandwidth (EBW) of the signal.
 - Set RBW = 1 MHz.
 - Set VBW \geq 3 MHz
 - Number of points in sweep \geq 2 Span / RBW.
 - Sweep time \leq (number of points in sweep) \times 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.
 - Detector = power averaging (rms).
 - Trace mode = max hold.
 - Allow max hold to run for at least 60 seconds, or longer as needed to allow the trace to stabilize.
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 (a): Measure and sum the spectra across the outputs.

The total final Power Spectral Density is from a device with 2 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points; the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 to obtain the value for the first frequency bin of the summed spectrum.

3.2.4 Test Setup





3.2.5 Test Result of Power Spectral Density

Test Engineer :	Sylvia Li	Temperature :	21~25°C
		Relative Humidity :	51~54%

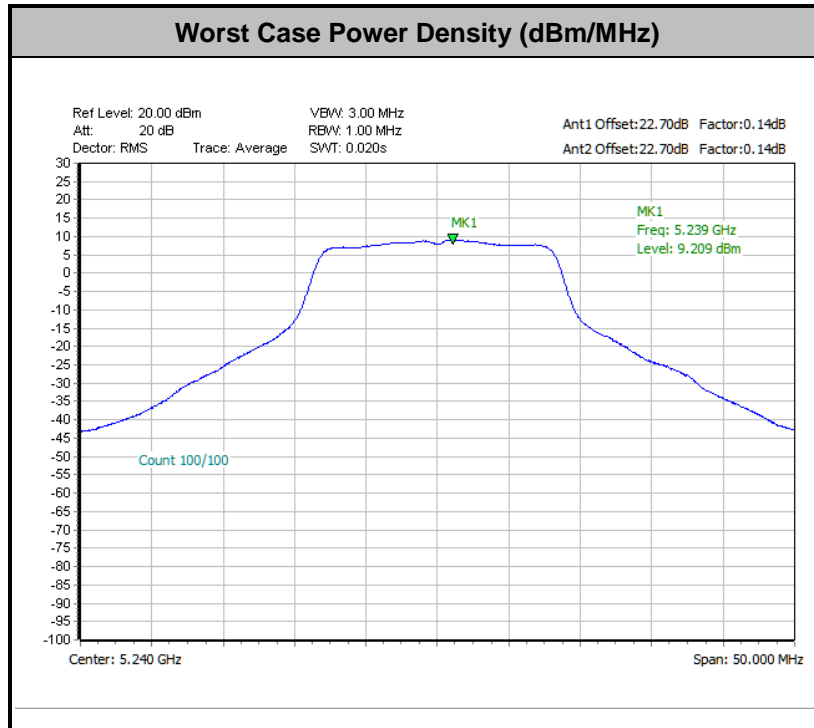
Band I														
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Duty Factor (dB)		Average Power Density (dBm/MHz)			Average PSD Limit (dBm/MHz)		DG (dBi)		Pass /Fail
					Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	2	36	5180	0.09	0.11			8.88		11.00		5.02	Pass
11a	6Mbps	2	44	5220	0.09	0.11			9.15		11.00		5.02	Pass
11a	6Mbps	2	48	5240	0.09	0.11			9.21		11.00		5.02	Pass
HT20	MCS0	2	36	5180	0.13	0.16			8.39		11.00		5.02	Pass
HT20	MCS0	2	44	5220	0.13	0.16			8.07		11.00		5.02	Pass
HT20	MCS0	2	48	5240	0.13	0.16			8.52		11.00		5.02	Pass
HT40	MCS0	2	38	5190	0.26	0.26			0.96		11.00		5.02	Pass
HT40	MCS0	2	46	5230	0.26	0.26			4.36		11.00		5.02	Pass
VHT80	MCS0	2	42	5210	0.51	0.57			-3.22		11.00		5.02	Pass



Band II														
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Power Density (dBm/MHz)			Average PSD Limit (dBm/MHz)		DG (dBi)		Pass /Fail
					Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	2	52	5260	0.09	0.11			8.80	11.00	4.96		Pass	
11a	6Mbps	2	60	5300	0.09	0.11			8.87	11.00	4.96		Pass	
11a	6Mbps	2	64	5320	0.09	0.11			7.18	11.00	4.96		Pass	
HT20	MCS0	2	52	5260	0.13	0.16			8.15	11.00	4.96		Pass	
HT20	MCS0	2	60	5300	0.13	0.16			8.27	11.00	4.96		Pass	
HT20	MCS0	2	64	5320	0.13	0.16			7.71	11.00	4.96		Pass	
HT40	MCS0	2	54	5270	0.26	0.26			4.56	11.00	4.96		Pass	
HT40	MCS0	2	62	5310	0.26	0.26			-0.34	11.00	4.96		Pass	
VHT80	MCS0	2	58	5290	0.51	0.57			-5.87	11.00	4.96		Pass	



Band III														
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Power Density (dBm/MHz)			Average PSD Limit (dBm/MHz)		DG (dBi)		Pass /Fail
					Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	2	100	5500	0.09	0.11			7.35		11.00		5.57	Pass
11a	6Mbps	2	116	5580	0.09	0.11			7.36		11.00		5.57	Pass
11a	6Mbps	2	140	5700	0.09	0.11			5.82		11.00		5.57	Pass
11a	6Mbps	2	144	5720	0.09	0.11			6.97		11.00		5.57	Pass
HT20	MCS0	2	100	5500	0.13	0.16			7.33		11.00		5.57	Pass
HT20	MCS0	2	116	5580	0.13	0.16			6.59		11.00		5.57	Pass
HT20	MCS0	2	140	5700	0.13	0.16			4.93		11.00		5.57	Pass
HT20	MCS0	2	144	5720	0.13	0.16			6.82		11.00		5.57	Pass
HT40	MCS0	2	102	5510	0.26	0.26			1.84		11.00		5.57	Pass
HT40	MCS0	2	110	5550	0.26	0.26			3.66		11.00		5.57	Pass
HT40	MCS0	2	134	5670	0.26	0.26			3.87		11.00		5.57	Pass
HT40	MCS0	2	142	5710	0.26	0.26			3.53		11.00		5.57	Pass
VHT80	MCS0	2	106	5530	0.51	0.57			-1.87		11.00		5.57	Pass
VHT80	MCS0	2	122	5610	0.51	0.57			0.90		11.00		5.57	Pass
VHT80	MCS0	2	138	5690	0.51	0.57			0.78		11.00		5.57	Pass



Note: Average Power Density (dB) = Measured value+ Duty Factor



3.3 Unwanted Emissions Measurement

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

3.3.1 Limit of Unwanted Emissions

- (1) For transmitters operating in the 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of -27dBm/MHz.

For transmitters operating in the 5250-5350 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band must meet all applicable technical requirements for operation in the 5150-5250 MHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5150-5250 MHz band.

For transmitters operating in the 5470-5600 MHz and 5650-5725MHz band: all emissions outside of the 5470-5600 MHz and 5650-5725MHz band shall not exceed an EIRP of -27 dBm/MHz.

- (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) Sections 15.407(b)(1-3) specifies the unwanted emissions limit 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.
- (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). The emission limits are based on the use of a peak detector.

3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

3.3.3 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 Peak Unwanted Emissions Measurements Above 1000 MHz

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

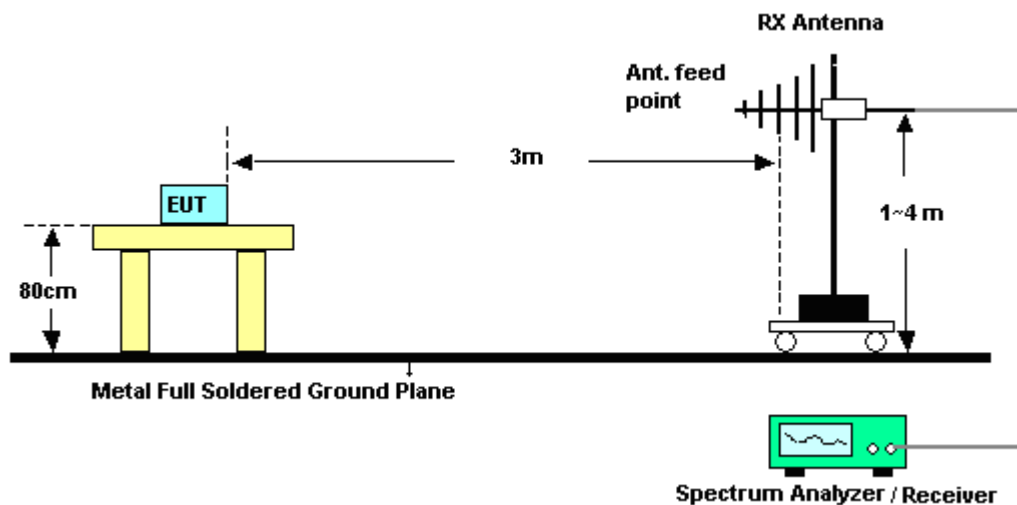
(2) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

- 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.

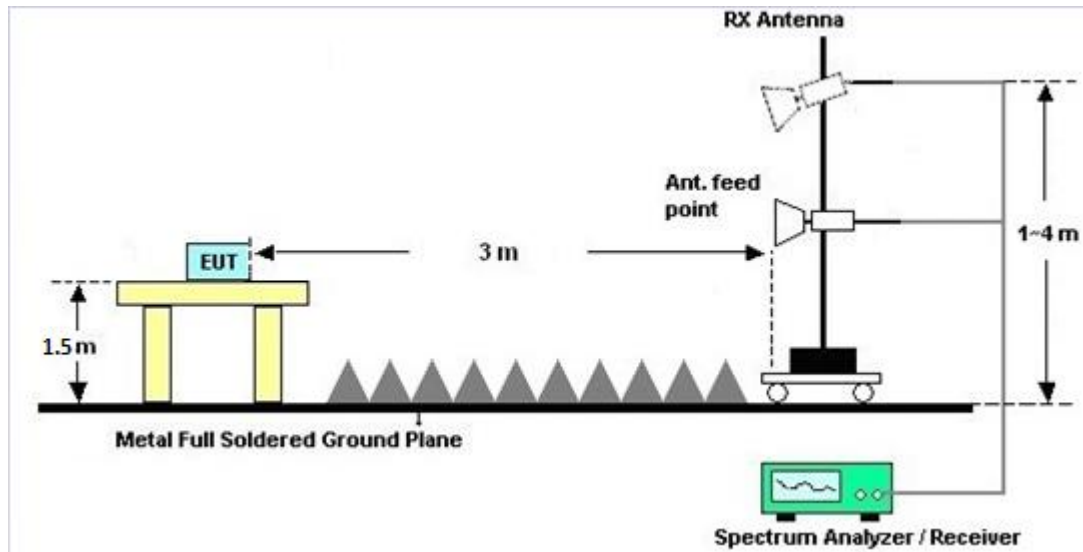
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband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

3.3.4 Test Setup

For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.3.5 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A and B.

3.3.6 Duty Cycle

Please refer to Appendix C.

3.3.7 Test Result of Radiated Spurious Emissions

Please refer to Appendix A and B.



3.4 Antenna Requirements

3.4.1 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.

3.4.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.4.3 Antenna Gain

<CDD Modes >

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain = GANT + Array Gain, where Array Gain is as follows.

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

Array Gain = 10 log(NANT/NSS=1) dB.

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4.

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

The EUT supports CDD mode.

For power, the directional gain GANT 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	Ant. 2	DG for Power	DG for PSD	Power Limit Reduction	PSD Limit Reduction
	(dBi)	(dBi)	(dBi)	(dBi)	(dB)	(dB)
Band I	3.70	-0.10	3.70	5.02	0.00	0.00
Band II	3.60	-0.10	3.60	4.96	0.00	0.00
Band III	3.00	2.10	3.00	5.76	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
Hygrometer	Testo	608-H2	41410069	N/A	Jun. 17, 2019	Apr. 30, 2020 ~ May 25, 2020	Jun. 16, 2020	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	16I00054SN O10	10MHz~6GHz	Dec. 23, 2019	Apr. 30, 2020 ~ May 25, 2020	Dec. 22, 2020	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz-40GHz	Aug. 14, 2019	Apr. 30, 2020 ~ May 25, 2020	Aug. 13, 2020	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF-058	EC1300484	N/A	Aug. 22, 2019	Apr. 30, 2020 ~ May 25, 2020	Aug. 21, 2020	Conducted (TH05-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Dec. 26, 2019	May 06, 2020 ~ May 18, 2020	Dec. 25, 2020	Radiation (03CH12-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D0 1N-06	37059 & 01	30MHz~1GHz	Oct. 12, 2019	May 06, 2020 ~ May 18, 2020	Oct. 11, 2020	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1328	1GHz~18GHz	Nov. 14, 2019	May 06, 2020 ~ May 18, 2020	Nov. 13, 2020	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA91705 84	18GHz~40GHz	Dec. 10, 2019	May 06, 2020 ~ May 18, 2020	Dec. 09, 2020	Radiation (03CH12-HY)
Preamplifier	COM-POWER	PA-103	161075	10MHz~1GHz	Mar. 25, 2020	May 06, 2020 ~ May 18, 2020	Mar. 24, 2021	Radiation (03CH12-HY)
Preamplifier	Keysight	83017A	MY5327014 8	1GHz~26.5GHz	Dec. 20, 2019	May 06, 2020 ~ May 18, 2020	Dec. 19, 2020	Radiation (03CH12-HY)
Preamplifier	Jet-Power	JPA0118-55-303K	1710001800 054002	1GHz~18GHz	Aug. 06, 2019	May 06, 2020 ~ May 18, 2020	Aug. 05, 2020	Radiation (03CH12-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 13, 2019	May 06, 2020 ~ May 18, 2020	Dec. 12, 2020	Radiation (03CH12-HY)
Spectrum Analyzer	Agilent	N9010A	MY5347011 8	10Hz~44GHz	Mar. 12, 2020	May 06, 2020 ~ May 18, 2020	Mar. 11, 2021	Radiation (03CH12-HY)
Filter	Wainwright	WLKS1200-12SS	SN2	1.2GHz Low Pass Filter	Mar. 21, 2020	May 06, 2020 ~ May 18, 2020	Mar. 20, 2021	Radiation (03CH12-HY)
Filter	Wainwright	WHKX8-587 2.5-6750-18 000-40ST	SN2	6.75GHz High Pass Filter	Mar. 18, 2020	May 06, 2020 ~ May 18, 2020	Mar. 17, 2021	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY15539/4	30MHz~18GHz	Feb. 25, 2020	May 06, 2020 ~ May 18, 2020	Feb. 24, 2021	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30MHz~40GHz	Feb. 25, 2020	May 06, 2020 ~ May 18, 2020	Feb. 24, 2021	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30MHz~40GHz	Feb. 25, 2020	May 06, 2020 ~ May 18, 2020	Feb. 24, 2021	Radiation (03CH12-HY)
Hygrometer	TECPEL	DTM-303B	TP140349	N/A	Oct. 25, 2019	May 06, 2020 ~ May 18, 2020	Oct. 24, 2020	Radiation (03CH12-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	May 06, 2020 ~ May 18, 2020	N/A	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500 -B	N/A	1m~4m	N/A	May 06, 2020 ~ May 18, 2020	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	May 06, 2020 ~ May 18, 2020	N/A	Radiation (03CH12-HY)
Software	Audix	E3 6.2009-8-24	RK-000989	N/A	N/A	May 06, 2020 ~ May 18, 2020	N/A	Radiation (03CH12-HY)



5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.6
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.0
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Appendix A. Radiated Spurious Emission

Test Engineer :	Jack Cheng , Lance Chiang and Chuan Chu	Temperature :	22.2~24.7°C
		Relative Humidity :	54.7~61.2%

Band 1 - 5150~5250MHz

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)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 38 5190MHz		5035.62	52.9	-21.1	74	41.12	31.61	8.89	28.72	100	90	P	H
		5148.72	46.13	-7.87	54	34.09	31.8	8.97	28.73	100	90	A	H
	*	5190	107.5	-	-	95.51	31.72	9	28.73	100	90	P	H
	*	5190	99.69	-	-	87.7	31.72	9	28.73	100	90	A	H
		5422.76	52.46	-21.54	74	40.42	31.49	9.3	28.75	100	90	P	H
		5454.4	44.73	-9.27	54	32.52	31.62	9.34	28.75	100	90	A	H
		5074.1	54.39	-19.61	74	42.39	31.8	8.92	28.72	100	114	P	V
		5148.72	45.87	-8.13	54	33.83	31.8	8.97	28.73	100	114	A	V
	*	5190	106.08	-	-	94.09	31.72	9	28.73	100	114	P	V
	*	5190	99.01	-	-	87.02	31.72	9	28.73	100	114	A	V
		5402.88	51.89	-22.11	74	39.95	31.41	9.27	28.74	100	114	P	V
	5446.84	44.62	-9.38	54	32.45	31.59	9.33	28.75	100	114	A	V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**Band 1 5150~5250MHz
WIFI 802.11n HT40 (Harmonic @ 3m)**

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 38		10380	49.74	-18.46	68.2	55.43	39.9	16.59	62.18	100	0	P	H
		15570	48.94	-25.06	74	51.77	37.96	19.8	60.59	100	0	P	H
													H
													H
5190MHz		10380	50.43	-17.77	68.2	56.12	39.9	16.59	62.18	100	0	P	V
		15570	49.67	-24.33	74	52.5	37.96	19.8	60.59	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**Band 1 5150~5250MHz
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)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT80 CH 42 5210MHz		5125.06	52.67	-21.33	74	40.6	31.85	8.95	28.73	103	95	P	H
		5140.4	47.65	-6.35	54	35.59	31.82	8.97	28.73	103	95	A	H
	*	5210	102.64	-	-	90.71	31.64	9.02	28.73	103	95	P	H
	*	5210	95.61	-	-	83.68	31.64	9.02	28.73	103	95	A	H
		5449.64	52.44	-21.56	74	40.25	31.6	9.34	28.75	103	95	P	H
		5448.8	45.99	-8.01	54	33.8	31.6	9.34	28.75	103	95	A	H
		5004.16	54.38	-19.62	74	42.82	31.42	8.86	28.72	100	117	P	V
		5135.46	46.29	-7.71	54	34.23	31.83	8.96	28.73	100	117	A	V
	*	5210	101.77	-	-	89.84	31.64	9.02	28.73	100	117	P	V
	*	5210	94.89	-	-	82.96	31.64	9.02	28.73	100	117	A	V
		5459.72	52.63	-21.37	74	40.39	31.64	9.35	28.75	100	117	P	V
	5450.2	46.19	-7.81	54	34	31.6	9.34	28.75	100	117	A	V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**Band 1 5150~5250MHz
WIFI 802.11ac VHT80 (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)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)	
802.11ac VHT80 CH 42 5210MHz		10420	49.92	-18.28	68.2	55.57	39.98	16.63	62.26	100	0	P	H	
		15630	48.1	-25.9	74	50.95	37.84	19.8	60.49	100	0	P	H	
													H	
													H	
			10420	50.07	-18.13	68.2	55.72	39.98	16.63	62.26	100	0	P	V
			15630	48.03	-25.97	74	50.88	37.84	19.8	60.49	100	0	P	V
														V
														V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



Band 2 - 5250~5350MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

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+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT20 CH 64 5320MHz	*	5320	111.19	-	-	99.44	31.32	9.17	28.74	109	100	P	H
	*	5320	103.75	-	-	92	31.32	9.17	28.74	109	100	A	H
		5392.48	53.04	-20.96	74	41.15	31.37	9.26	28.74	109	100	P	H
		5357.12	45.18	-8.82	54	33.48	31.23	9.21	28.74	109	100	A	H
													H
													H
	*	5320	110.99	-	-	99.24	31.32	9.17	28.74	100	120	P	V
	*	5320	103.39	-	-	91.64	31.32	9.17	28.74	100	120	A	V
		5352.32	54.77	-19.23	74	43.09	31.21	9.21	28.74	100	120	P	V
		5357.12	45.7	-8.3	54	34	31.23	9.21	28.74	100	120	A	V
												V	
												V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 2 5250~5350MHz
WIFI 802.11n HT20 (Harmonic @ 3m)

Table with 14 columns: WIFI Ant. 1+2, Note, Frequency (MHz), Level (dBµV/m), Over Limit (dB), Limit Line (dBµV/m), Read Level (dBµV), Antenna Factor (dB/m), Path Loss (dB), Preamp Factor (dB), Ant Pos (cm), Table Pos (deg), Peak Avg. (P/A), Pol. (H/V). Rows include data for 802.11n HT20 CH 64 at 5320MHz and a Remark section.



Band 2 5250~5350MHz
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)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 62 5310MHz		5116.62	53.82	-20.18	74	41.73	31.87	8.95	28.73	108	88	P	H
		5078.2	44.48	-9.52	54	32.47	31.81	8.92	28.72	108	88	A	H
	*	5310	105.53	-	-	93.76	31.36	9.15	28.74	108	88	P	H
	*	5310	98	-	-	86.23	31.36	9.15	28.74	108	88	A	H
		5350.08	55.03	-18.97	74	43.36	31.2	9.21	28.74	108	88	P	H
		5350.08	49.31	-4.69	54	37.64	31.2	9.21	28.74	108	88	A	H
		5117.98	52.96	-21.04	74	40.88	31.86	8.95	28.73	100	116	P	V
		5096.9	44.76	-9.24	54	32.67	31.89	8.93	28.73	100	116	A	V
	*	5310	105.14	-	-	93.37	31.36	9.15	28.74	100	116	P	V
	*	5310	97.41	-	-	85.64	31.36	9.15	28.74	100	116	A	V
		5352	53.99	-20.01	74	42.31	31.21	9.21	28.74	100	116	P	V
		5350.32	48.4	-5.6	54	36.73	31.2	9.21	28.74	100	116	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**Band 2 5250~5350MHz
WIFI 802.11n HT40 (Harmonic @ 3m)**

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)	
802.11n HT40 CH 62 5310MHz		10620	50.59	-23.41	74	56.16	40.04	16.84	62.45	100	38	P	H	
		10620	42.23	-11.77	54	47.8	40.04	16.84	62.45	100	38	A	H	
		15930	47.11	-26.89	74	49.75	37.54	19.83	60.01	100	0	P	H	
													H	
			10620	51.75	-22.25	74	57.32	40.04	16.84	62.45	120	100	P	V
			10620	42.22	-11.78	54	47.79	40.04	16.84	62.45	120	100	A	V
			15930	47.37	-26.63	74	50.01	37.54	19.83	60.01	100	0	P	V
													V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



Band 2 5250~5350MHz
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)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT80 CH 58 5290MHz		5040.46	53.39	-20.61	74	41.58	31.64	8.89	28.72	120	94	P	H
		5076.5	46.19	-7.81	54	34.18	31.81	8.92	28.72	120	94	A	H
	*	5290	99.03	-	-	87.24	31.4	9.13	28.74	120	94	P	H
	*	5290	92.68	-	-	80.89	31.4	9.13	28.74	120	94	A	H
		5355.12	52.86	-21.14	74	41.17	31.22	9.21	28.74	120	94	P	H
		5350.08	48.14	-5.86	54	36.47	31.2	9.21	28.74	120	94	A	H
		5123.08	51.82	-22.18	74	39.75	31.85	8.95	28.73	100	117	P	V
		5126.48	46	-8	54	33.93	31.85	8.95	28.73	100	117	A	V
	*	5290	98.42	-	-	86.63	31.4	9.13	28.74	100	117	P	V
	*	5290	91.73	-	-	79.94	31.4	9.13	28.74	100	117	A	V
		5350.08	54.07	-19.93	74	42.4	31.2	9.21	28.74	100	117	P	V
	5351.04	47.78	-6.22	54	36.11	31.2	9.21	28.74	100	117	A	V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**Band 2 5250~5350MHz
WIFI 802.11ac VHT80 (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)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)	
802.11ac VHT80 CH 58 5290MHz		10580	49.52	-18.68	68.2	55.09	40.06	16.8	62.43	100	0	P	H	
		15870	47.56	-26.44	74	50.34	37.51	19.82	60.11	100	0	P	H	
													H	
													H	
			10580	50.44	-17.76	68.2	56.01	40.06	16.8	62.43	100	0	P	V
			15870	47.35	-26.65	74	50.13	37.51	19.82	60.11	100	0	P	V
														V
													V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



Band 3 - 5470~5725MHz
WiFi 802.11a (Band Edge @ 3m)

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+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 140 5700MHz	*	5700	110.71	-	-	98.11	31.8	9.66	28.86	100	91	P	H
	*	5700	102.91	-	-	90.31	31.8	9.66	28.86	100	91	A	H
		5726.36	54.39	-13.81	68.2	41.66	31.91	9.7	28.88	100	91	P	H
													H
													H
													H
	*	5700	110.7	-	-	98.1	31.8	9.66	28.86	100	111	P	V
	*	5700	103.36	-	-	90.76	31.8	9.66	28.86	100	111	A	V
		5735	55.27	-12.93	68.2	42.5	31.94	9.71	28.88	100	111	P	V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**Band 3 - 5470~5725MHz
WIFI 802.11a (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)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)	
802.11a CH 140 5700MHz		11400	49.86	-24.14	74	54.71	39.9	17.61	62.36	100	0	P	H	
		17100	50.71	-17.49	68.2	48.33	40.1	21	58.72	100	0	P	H	
													H	
													H	
			11400	49.86	-24.14	74	54.71	39.9	17.61	62.36	100	0	P	V
			17100	49.85	-18.35	68.2	47.47	40.1	21	58.72	100	0	P	V
														V
														V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



**Band 3 - 5470~5725MHz
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)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 102 5510MHz		5456.56	52.49	-21.51	74	40.26	31.63	9.35	28.75	105	80	P	H
		5468.08	56.23	-11.97	68.2	43.95	31.67	9.36	28.75	105	80	P	H
		5458.96	46.31	-7.69	54	34.07	31.64	9.35	28.75	105	80	A	H
	*	5510	107.17	-	-	94.73	31.78	9.42	28.76	105	80	P	H
	*	5510	99.55	-	-	87.11	31.78	9.42	28.76	105	80	A	H
		5745.785	53.43	-14.77	68.2	40.62	31.98	9.72	28.89	105	80	P	H
		5431.6	51.78	-22.22	74	39.69	31.53	9.31	28.75	100	93	P	V
		5470	57.35	-10.85	68.2	45.06	31.68	9.36	28.75	100	93	P	V
		5459.2	45.9	-8.1	54	33.66	31.64	9.35	28.75	100	93	A	V
	*	5510	106.63	-	-	94.19	31.78	9.42	28.76	100	93	P	V
	*	5510	99.47	-	-	87.03	31.78	9.42	28.76	100	93	A	V
		5751.14	53.29	-14.91	68.2	40.45	32	9.73	28.89	100	93	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**Band 3 - 5470~5725MHz
WIFI 802.11n HT40 (Harmonic @ 3m)**

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)	
802.11n HT40 CH 102 5510MHz		11020	50.75	-23.25	74	55.94	40.16	17.24	62.59	101	42	P	H	
		11020	41.52	-12.48	54	46.71	40.16	17.24	62.59	101	42	A	H	
		16530	49.79	-18.41	68.2	49.4	39.18	20.39	59.18	100	0	P	H	
													H	
			11020	50.24	-23.76	74	55.43	40.16	17.24	62.59	124	95	P	V
			11020	41.55	-12.45	54	46.74	40.16	17.24	62.59	124	95	A	V
			16530	50.38	-17.82	68.2	49.99	39.18	20.39	59.18	100	0	P	V
														V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



Band 3 - 5470~5725MHz
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)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT80 CH 106 5530MHz		5444.56	53.53	-20.47	74	41.37	31.58	9.33	28.75	124	79	P	H
		5466.16	56.94	-11.26	68.2	44.67	31.66	9.36	28.75	124	79	P	H
		5453.68	49.74	-4.26	54	37.54	31.61	9.34	28.75	124	79	A	H
	*	5530	102.75	-	-	90.33	31.74	9.45	28.77	124	79	P	H
	*	5530	96.39	-	-	83.97	31.74	9.45	28.77	124	79	A	H
		5748.62	53.32	-14.88	68.2	40.49	31.99	9.73	28.89	124	79	P	H
		5457.76	52.81	-21.19	74	40.58	31.63	9.35	28.75	126	81	P	V
		5466.64	52.57	-15.63	68.2	40.29	31.67	9.36	28.75	126	81	P	V
		5459.92	47.9	-6.1	54	35.66	31.64	9.35	28.75	126	81	A	V
	*	5530	98.59	-	-	86.17	31.74	9.45	28.77	126	81	P	V
	*	5530	91.47	-	-	79.05	31.74	9.45	28.77	126	81	A	V
		5746.415	52.87	-15.33	68.2	40.05	31.99	9.72	28.89	126	81	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**Band 3 5470~5725MHz
WIFI 802.11ac VHT80 (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)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)	
802.11ac VHT80 CH 106 5530MHz		11060	52.43	-21.57	74	57.63	40.08	17.28	62.56	105	37	P	H	
		11060	42.94	-11.06	54	48.14	40.08	17.28	62.56	105	37	A	H	
		16740	50.67	-17.53	68.2	48.94	40.18	20.61	59.06	100	0	P	H	
													H	
			11060	53.34	-20.66	74	58.54	40.08	17.28	62.56	132	103	P	V
			11060	43.04	-10.96	54	48.24	40.08	17.28	62.56	132	103	A	V
			16740	51.28	-16.92	68.2	49.55	40.18	20.61	59.06	100	0	P	V
													V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average 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	Peak or Average
H/V	Horizontal or Vertical



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+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. 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 B. Radiated Spurious Emission

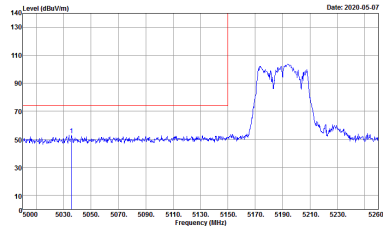
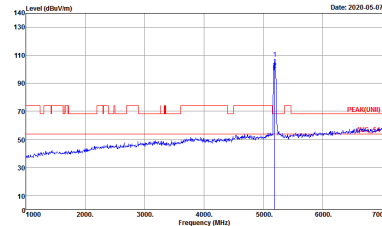
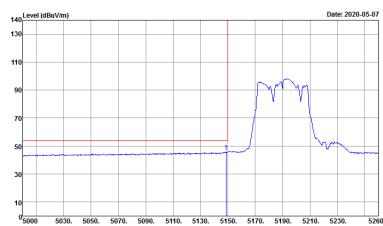
Test Engineer :	Jack Cheng , Lance Chiang and Chuan Chu	Temperature :	22.2~24.7°C
		Relative Humidity :	54.7~61.2%

Note symbol

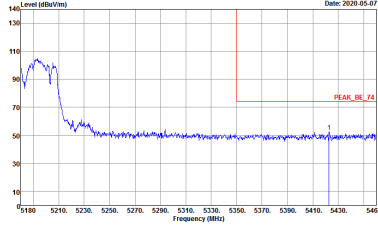
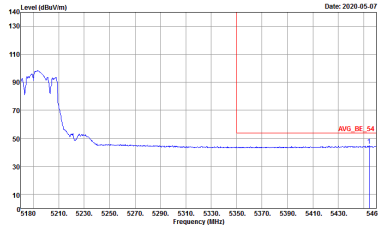
-L	Low channel location
-R	High channel location



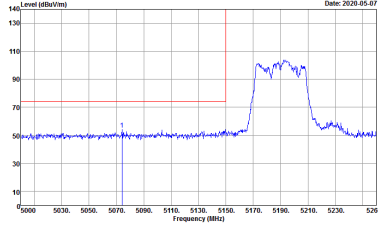
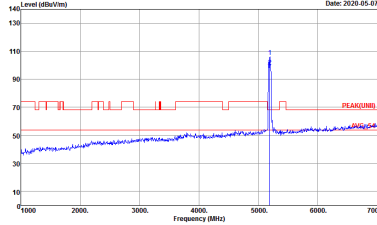
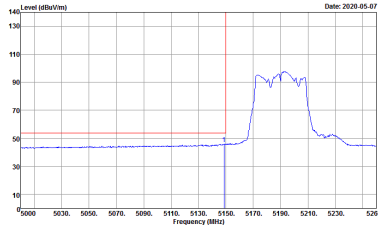
Band 1 - 5150~5250MHz
WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - L	
1+2	Horizontal	Fundamental
<p>Peak</p>	 <p>Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 12.5</p>	 <p>Site : 03CH12-HY Condition : PEAK(LINE) 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 12.5</p>
<p>Avg.</p>	 <p>Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 12.5</p>	<p>Left blank</p>

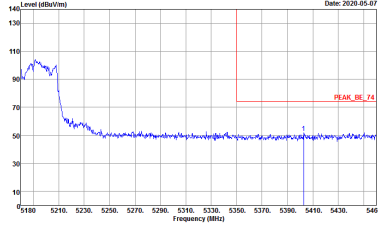
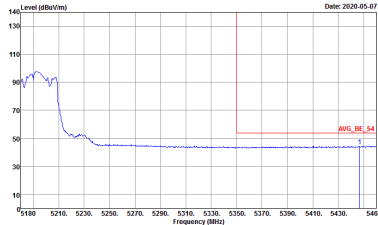


WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - R	
1+2	Horizontal	Fundamental
<p>Peak</p>	 <p>Site : 03CH2-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 12.5</p>	<p>Left blank</p>
<p>Avg.</p>	 <p>Site : 03CH2-HY Condition : AVG_BE_54 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 12.5</p>	<p>Left blank</p>



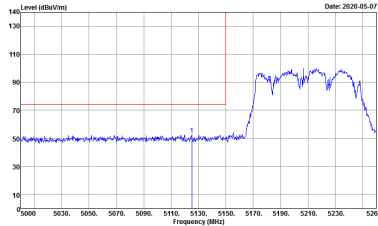
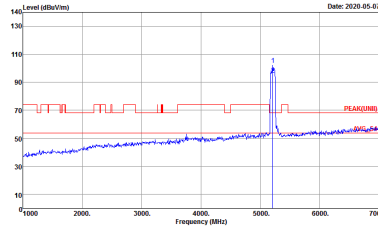
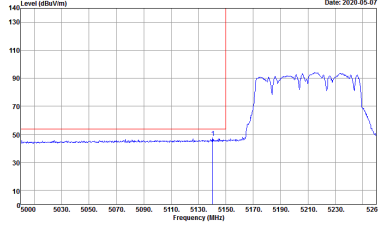
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - L	
1+2	Vertical	Fundamental
Peak	 <p>Site : 03CH12-11Y Condition : PEAK_8E_74 3m HORN_9120D_1328 VERTICAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 12.5</p>	 <p>Site : 03CH12-11Y Condition : PEAK(UNL) 3m HORN_9120D_1328 VERTICAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 12.5</p>
Avg.	 <p>Site : 03CH12-11Y Condition : AVG_BE_14 3m HORN_9120D_1328 VERTICAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 12.5</p>	Left blank



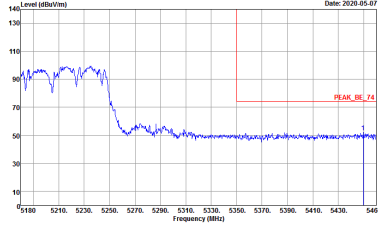
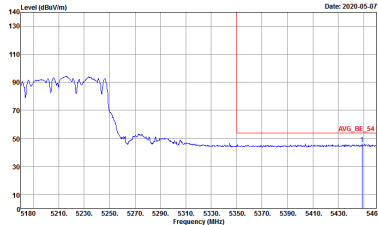
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - R	
1+2	Vertical	Fundamental
<p>Peak</p>	 <p>Site : 03CH2-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 VERTICAL RBW:10000000Hz VBW:3000.0000Hz SWT:Auto Detector : Peak Project : 040704 Setting : 12.5</p>	<p>Left blank</p>
<p>Avg.</p>	 <p>Site : 03CH2-HY Condition : AVG_BE_54 3m HORN_9120D_1328 VERTICAL RBW:10000000Hz VBW:3.0000Hz SWT:Auto Detector : Peak Project : 040704 Setting : 12.5</p>	<p>Left blank</p>



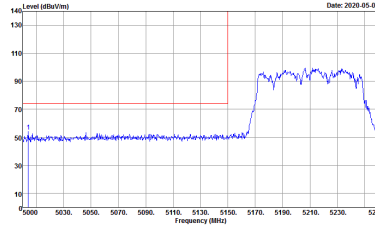
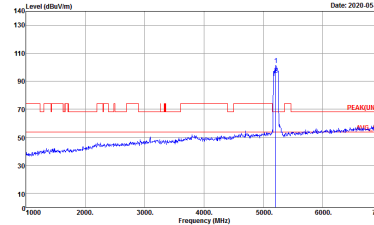
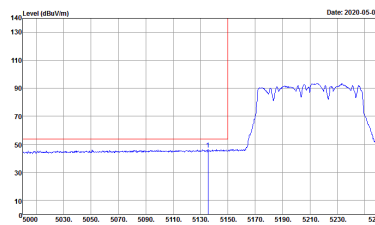
Band 1 5150~5250MHz
WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - L	
1+2	Horizontal	Fundamental
<p align="center">Peak</p>	 <p>Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_91200_1328 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 11</p>	 <p>Site : 03CH12-HY Condition : PEAK(UNIT1) 3m HORN_91200_1328 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 11</p>
<p align="center">Avg.</p>	 <p>Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_91200_1328 HORIZONTAL RBW:1000.000KHz VBW:10000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 11</p>	<p align="center">Left blank</p>

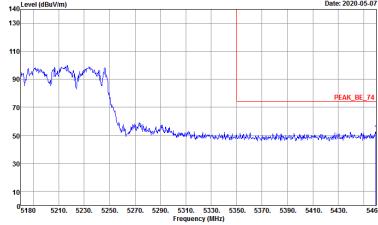
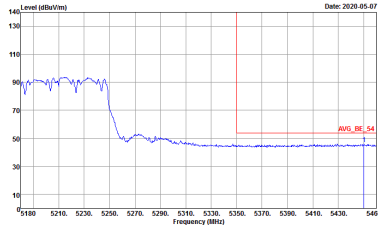


WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - R	
1+2	Horizontal	Fundamental
<p>Peak</p>	 <p>Site : 03CH2-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 11</p>	<p>Left blank</p>
<p>Avg.</p>	 <p>Site : 03CH2-HY Condition : AVG_BE_54 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 11</p>	<p>Left blank</p>



WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - L	
1+2	Vertical	Fundamental
<p>Peak</p>	 <p>Site : 03CH12-11Y Condition : PEAK_8C_74 3m HORN_9120D_1328 VERTICAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 11</p>	 <p>Site : 03CH12-11Y Condition : PEAK(UN11) 3m HORN_9120D_1328 VERTICAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 11</p>
<p>Avg.</p>	 <p>Site : 03CH12-11Y Condition : AVG_BE_14 3m HORN_9120D_1328 VERTICAL RBW:3000.000KHz VBW:10.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 11</p>	<p>Left blank</p>



WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - R	
1+2	Vertical	Fundamental
<p>Peak</p>	 <p>Site : 03CH2-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 040704 Setting : 11</p>	<p>Left blank</p>
<p>Avg.</p>	 <p>Site : 03CH2-HY Condition : AVG_BE_54 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 040704 Setting : 11</p>	<p>Left blank</p>



Band 1 - 5150~5250MHz
WIFI 802.11n HT40 (Harmonic @ 3m)

Table with 2 columns: Horizontal and Vertical. Each column contains a spectral plot showing Level (dBm/100) vs Frequency (MHz) with a peak at 5190MHz. Includes metadata like Site, Condition, Detector, Project, and Setting.



**Band 1 5150~5250MHz
WIFI 802.11ac VHT80 (Harmonic @ 3m)**

WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz	
1+2	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH12-HY Condition : PEAK(UNII) 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 11</p>	<p>Site : 03CH12-HY Condition : PEAK(UNII) 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 040704 Setting : 11</p>



Band 2 - 5250~5350MHz
WIFI 802.11n HT20 (Band Edge @ 3m)

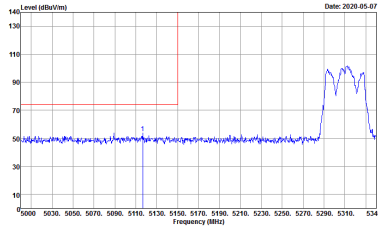
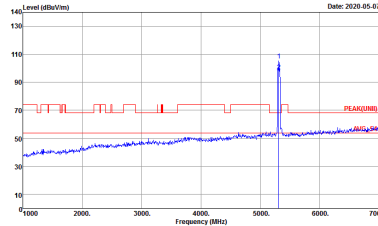
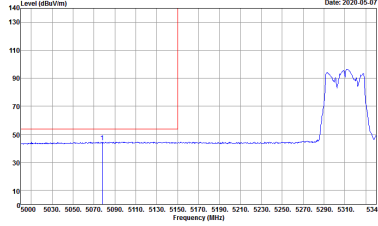
WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11n HT20 CH64 5320MHz	
1+2	Horizontal	Fundamental
<p align="center">Peak</p>	<p>Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 16</p>	<p>Site : 03CH12-HY Condition : PEAK(FUN) 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 16</p>
<p align="center">Avg.</p>	<p>Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 16</p>	<p align="center">Left blank</p>



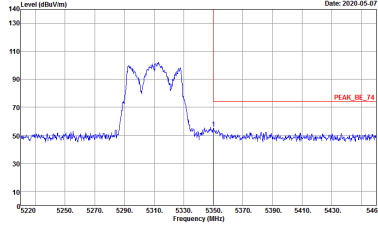
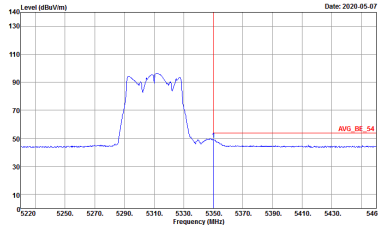
WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11n HT20 CH64 5320MHz	
1+2	Vertical	Fundamental
Peak	<p>Site : 03CH12-11Y Condition : PEAK_BE_74 3m HORN_9120D_1328 VERTICAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 10</p>	<p>Site : 03CH12-11Y Condition : PEAK(UNL) 3m HORN_9120D_1328 VERTICAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 10</p>
Avg.	<p>Site : 03CH12-11Y Condition : AVG_BE_54 3m HORN_9120D_1328 VERTICAL RBW:3000.000KHz VBW:1.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 10</p>	Left blank



Band 2 5250~5350MHz
WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11n HT40 CH62 5310MHz - L	
1+2	Horizontal	Fundamental
<p>Peak</p>	 <p>Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_91200_1328 HORIZONTAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 10.5</p>	 <p>Site : 03CH12-HY Condition : PEAK(UNIT) 3m HORN_91200_1328 HORIZONTAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 10.5</p>
<p>Avg.</p>	 <p>Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_91200_1328 HORIZONTAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 10.5</p>	<p>Left blank</p>

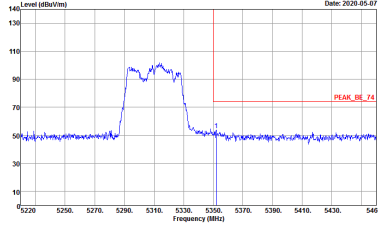
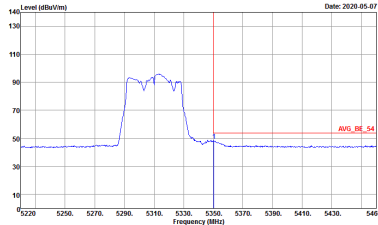


WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11n HT40 CH62 5310MHz - R	
1+2	Horizontal	Fundamental
<p>Peak</p>	 <p>Site : 03CH2-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 10.5</p>	<p>Left blank</p>
<p>Avg.</p>	 <p>Site : 03CH2-HY Condition : AVG_BE_54 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 10.5</p>	<p>Left blank</p>



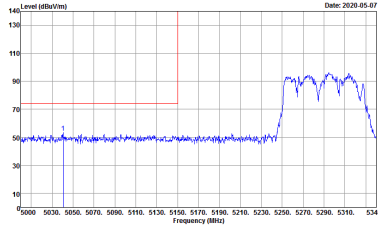
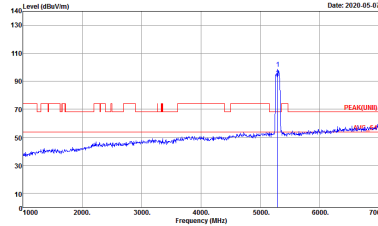
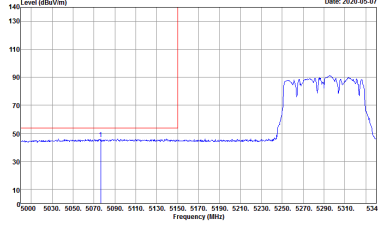
WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11n HT40 CH62 5310MHz - L	
1+2	Vertical	Fundamental
Peak	<p>Site : 03CH2-11Y Condition : PEAK_8C_74 3m HORN_9120D_1328 VERTICAL RBW:3000.000kHz VBW:3000.000kHz SWT:Auto Detector : Peak Project : 040704 Setting : 10.5</p>	<p>Site : 03CH2-11Y Condition : PEAK(UNL) 3m HORN_9120D_1328 VERTICAL RBW:3000.000kHz VBW:3000.000kHz SWT:Auto Detector : Peak Project : 040704 Setting : 10.5</p>
Avg.	<p>Site : 03CH2-11Y Condition : AVG_BE_1A 3m HORN_9120D_1328 VERTICAL RBW:3000.000kHz VBW:3000.000kHz SWT:Auto Detector : Peak Project : 040704 Setting : 10.5</p>	Left blank



WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11n HT40 CH62 5310MHz - R	
1+2	Vertical	Fundamental
<p>Peak</p>	 <p>Site : 03CH2-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 040704 Setting : 10.5</p>	<p>Left blank</p>
<p>Avg.</p>	 <p>Site : 03CH2-HY Condition : AVG_BE_54 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 040704 Setting : 10.5</p>	<p>Left blank</p>



Band 2 5250~5350MHz
WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH58 5290MHz - L	
1+2	Horizontal	Fundamental
<p>Peak</p>	 <p>Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_91200_1328 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 8.5</p>	 <p>Site : 03CH12-HY Condition : PEAK(UNIT) 3m HORN_91200_1328 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 8.5</p>
<p>Avg.</p>	 <p>Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_91200_1328 HORIZONTAL RBW:1000.000KHz VBW:10000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 8.5</p>	<p>Left blank</p>

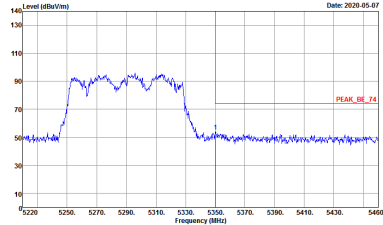
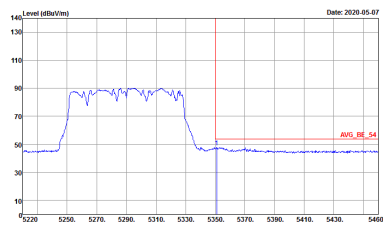


WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH58 5290MHz - R	
1+2	Horizontal	Fundamental
Peak	<p>Site : 03CH2-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 8.5</p>	Left blank
Avg.	<p>Site : 03CH2-HY Condition : AVG_BE_54 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 8.5</p>	Left blank



WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH58 5290MHz - L	
1+2	Vertical	Fundamental
Peak	<p>Site : 03CH2-11Y Condition : PEAK_8C_74 3m HORN_9120D_1328 VERTICAL RBW:3000.000kHz VBW:3000.000kHz SWT:Auto Detector : Peak Project : 040704 Setting : 8.5</p>	<p>Site : 03CH2-11Y Condition : PEAK(UNIT) 3m HORN_9120D_1328 VERTICAL RBW:3000.000kHz VBW:3000.000kHz SWT:Auto Detector : Peak Project : 040704 Setting : 8.5</p>
Avg.	<p>Site : 03CH2-11Y Condition : AVG_BE_1A 3m HORN_9120D_1328 VERTICAL RBW:3000.000kHz VBW:10.000kHz SWT:Auto Detector : Peak Project : 040704 Setting : 8.5</p>	Left blank



WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH58 5290MHz - R	
1+2	Vertical	Fundamental
<p>Peak</p>	 <p>Site : 03CH2-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 040704 Setting : 8.5</p>	<p>Left blank</p>
<p>Avg.</p>	 <p>Site : 03CH2-HY Condition : AVG_BE_54 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 040704 Setting : 8.5</p>	<p>Left blank</p>



Band 2 - 5250~5350MHz
WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI	Band 2 5250~5350MHz Harmonic @ 3m	
ANT	802.11n HT20 CH64 5320MHz	
1+2	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH12-HY Condition : PEAK(LINE1) 3m HORN_91200_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 16</p>	<p>Site : 03CH12-HY Condition : PEAK(LINE1) 3m HORN_91200_1328 VERTICAL Detector : Peak Project : 040704 Setting : 16</p>



**Band 2 5250~5350MHz
WIFI 802.11n HT40 (Harmonic @ 3m)**

WIFI	Band 2 5250~5350MHz Harmonic @ 3m	
ANT	802.11n HT40 CH62 5310MHz	
1+2	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH12-HY Condition : PEAK(UNII) 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 10.5</p>	<p>Site : 03CH12-HY Condition : PEAK(UNII) 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 040704 Setting : 10.5</p>



**Band 2 5250~5350MHz
WIFI 802.11ac VHT80 (Harmonic @ 3m)**

WIFI	Band 2 5250~5350MHz Harmonic @ 3m	
ANT	802.11ac VHT80 CH58 5290MHz	
1+2	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH12-HY Condition : PEAK(UNII) 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 8.5</p>	<p>Site : 03CH12-HY Condition : PEAK(UNII) 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 040704 Setting : 8.5</p>



Band 3 - 5470~5725MHz
WIFI 802.11a (Band Edge @ 3m)

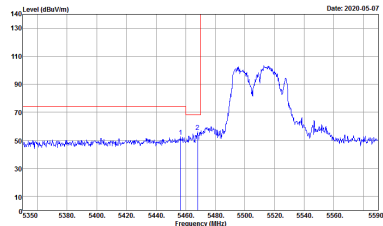
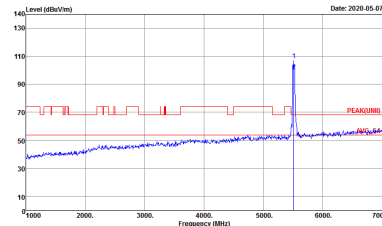
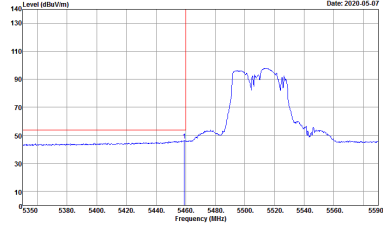
Table with 2 columns: Horizontal and Fundamental. It contains two spectral plots showing Level (dBm/100) vs Frequency (MHz) with associated test parameters like Site, Condition, Detector, Project, and Setting.



WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11a CH140 5700MHz	
1+2	Vertical	Fundamental
Peak	<p>Site : 03CHZ-14V Condition : PEAK_BE(UNII)_B3 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 040704 Setting : 14.5</p>	<p>Site : 03CHZ-14V Condition : PEAK(FUN) 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 040704 Setting : 14.5</p>



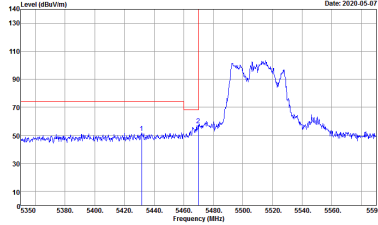
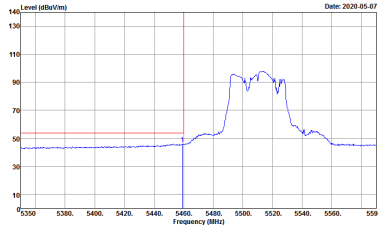
Band 3 5470~5725MHz
WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11n HT40 CH102 5510MHz - L	
1+2	Horizontal	Fundamental
<p>Peak</p>	 <p>Site : 03CH12-HY Condition : PEAK_BE(UNIT1)_B3 3m HORN_9120D_1328 HORIZONTAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 13.5</p>	 <p>Site : 03CH12-HY Condition : PEAK(UNIT1) 3m HORN_9120D_1328 HORIZONTAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 13.5</p>
<p>Avg.</p>	 <p>Site : 03CH12-HY Condition : AVG_BE(UNIT1)_B3 3m HORN_9120D_1328 HORIZONTAL RBW:3000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 13.5</p>	<p>Left blank</p>



WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11n HT40 CH102 5510MHz - R	
1+2	Horizontal	Fundamental
Peak	<p>Site : 03CHZ-11Y Condition : PEAK_BEUNIII_B3 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 13.5</p>	Left blank



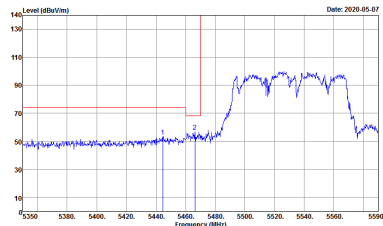
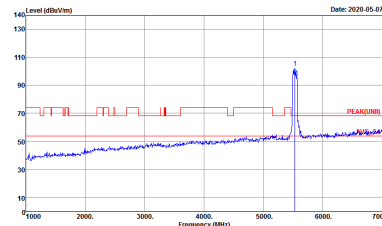
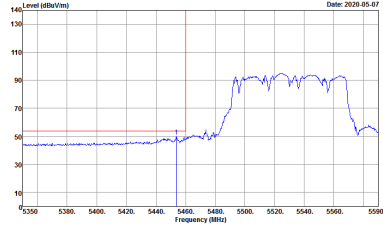
WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11n HT40 CH102 5510MHz - L	
1+2	Vertical	Fundamental
Peak	 <p>Site : 03CH12-HY Condition : PEAK_BE(UNIT1)_B3 3m HORN_9120D_1328 VERTICAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 13.5</p>	 <p>Site : 03CH12-HY Condition : PEAK(UNIT1) 3m HORN_9120D_1328 VERTICAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 13.5</p>
Avg.	 <p>Site : 03CH12-HY Condition : AVG_BE(UNIT1)_B3 3m HORN_9120D_1328 VERTICAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 13.5</p>	Left blank



WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11n HT40 CH102 5510MHz - R	
1+2	Vertical	Fundamental
Peak	<p>Site : 03CHZ-11Y Condition : PEAK_BE(UNIT)_B3 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 040704 Setting : 13.5</p>	Left blank



**Band 3 5470~5725MHz
WIFI 802.11ac VHT80 (Band Edge @ 3m)**

WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - L	
1+2	Horizontal	Fundamental
<p>Peak</p>	 <p>Site : 03CH12-HY Condition : PEAK_BE(UNIT1)_B3 3m HORN_9120D_1328 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 13</p>	 <p>Site : 03CH12-HY Condition : PEAK(UNIT1) 3m HORN_9120D_1328 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 13</p>
<p>Avg.</p>	 <p>Site : 03CH12-HY Condition : AVG_BE(UNIT1)_B3 3m HORN_9120D_1328 HORIZONTAL RBW:1000.000KHz VBW:10000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 13</p>	<p align="center">Left blank</p>



WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - R	
1+2	Horizontal	Fundamental
Peak	<p>Site : 03CHZ-11Y Condition : PEAK_BEUNIII_B3 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 13</p>	Left blank



WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - L	
1+2	Vertical	Fundamental
Peak	<p>Site : 03CH12-11Y Condition : PEAK_BE(UNIT1)_B3 3m HORN_91200_1328 VERTICAL Detector : Peak Project : 040704 Setting : 13</p>	<p>Site : 03CH12-11Y Condition : PEAK(UNIT1) 3m HORN_91200_1328 VERTICAL Detector : Peak Project : 040704 Setting : 13</p>
Avg.	<p>Site : 03CH12-11Y Condition : AVG_BE(UNIT1)_B3 3m HORN_91200_1328 VERTICAL Detector : Peak Project : 040704 Setting : 13</p>	Left blank



WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - R	
1+2	Vertical	Fundamental
Peak	<p>Site : 03CHZ-11Y Condition : PEAK_BE(UNIT)_B3 3m HORN_9120D_1328 VERTICAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 040704 Setting : 13</p>	Left blank



Band 3 - 5470~5725MHz
WIFI 802.11a (Harmonic @ 3m)

WIFI	Band 3 5470~5725MHz Harmonic @ 3m	
ANT	802.11a CH140 5700MHz	
1+2	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH12-HY Condition : PEAK(UM) 3m HORN_91200_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 14.5</p>	<p>Site : 03CH12-HY Condition : PEAK(UM) 3m HORN_91200_1328 VERTICAL Detector : Peak Project : 040704 Setting : 14.5</p>



**Band 3 5470~5725MHz
WIFI 802.11n HT40 (Harmonic @ 3m)**

WIFI	Band 3 5470~5725MHz Harmonic @ 3m	
ANT	802.11n HT40 CH102 5510MHz	
1+2	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH12-HY Condition : PEAK(UNII) 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 13.5</p>	<p>Site : 03CH12-HY Condition : PEAK(UNII) 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 040704 Setting : 13.5</p>



**Band 3 5470~5725MHz
WIFI 802.11ac VHT80 (Harmonic @ 3m)**

WIFI	Band 3 5470~5725MHz Harmonic @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz	
1+2	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH12-HY Condition : PEAK(UNII) 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 040704 Setting : 13</p>	<p>Site : 03CH12-HY Condition : PEAK(UNII) 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 040704 Setting : 13</p>



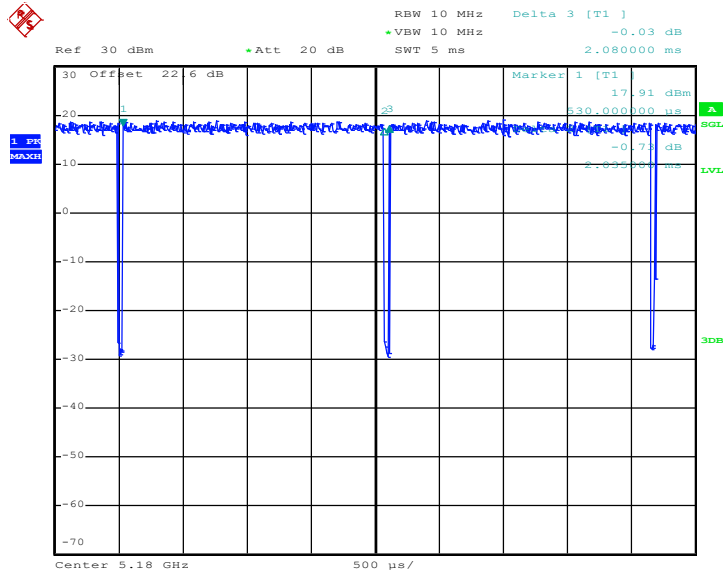
Appendix C. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
1+2	802.11a for Ant. 1	97.84	2035	0.49	1kHz	0.09
1+2	802.11a for Ant. 2	97.60	2035	0.49	1kHz	0.11
1+2	5GHz 802.11n HT20 for Ant. 1	97.05	1315	0.76	1kHz	0.13
1+2	5GHz 802.11n HT20 for Ant. 2	96.31	1305	0.77	1kHz	0.16
1+2	5GHz 802.11n HT40 for Ant. 1	94.17	646	1.55	3kHz	0.26
1+2	5GHz 802.11n HT40 for Ant. 2	94.15	644	1.55	3kHz	0.26
1+2	5GHz 802.11ac VHT80 for Ant. 1	89.01	324	3.09	10kHz	0.51
1+2	5GHz 802.11ac VHT80 for Ant. 2	87.78	316	3.16	10kHz	0.57



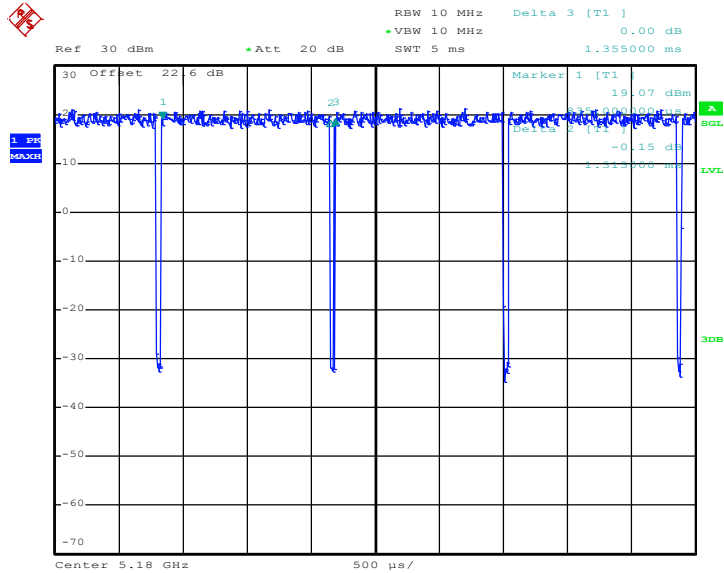
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802.11a



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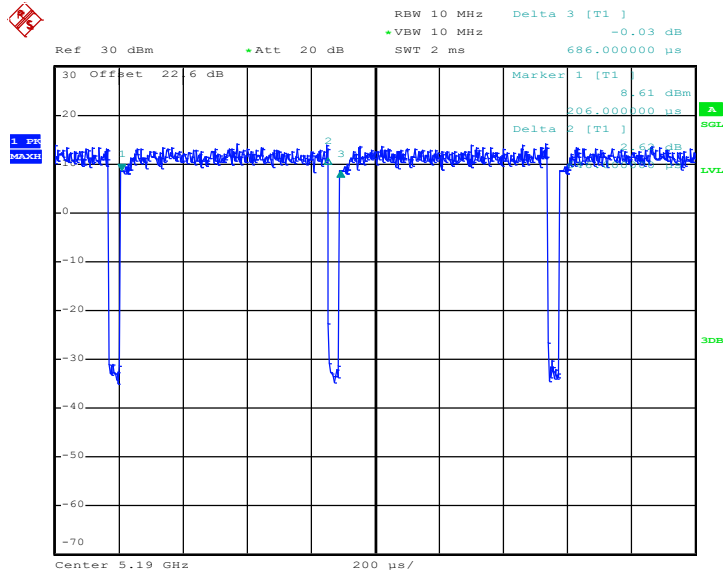
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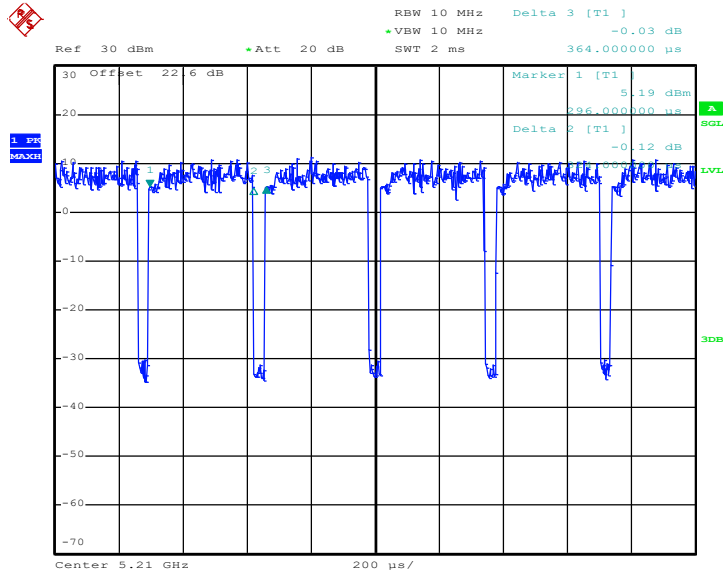


802.11n HT40



Date: 30.APR.2020 14:00:53

802.11ac VHT80

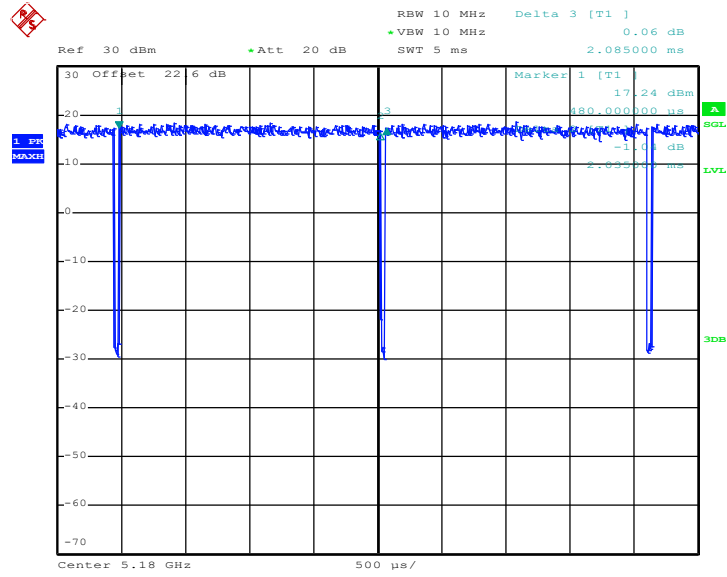


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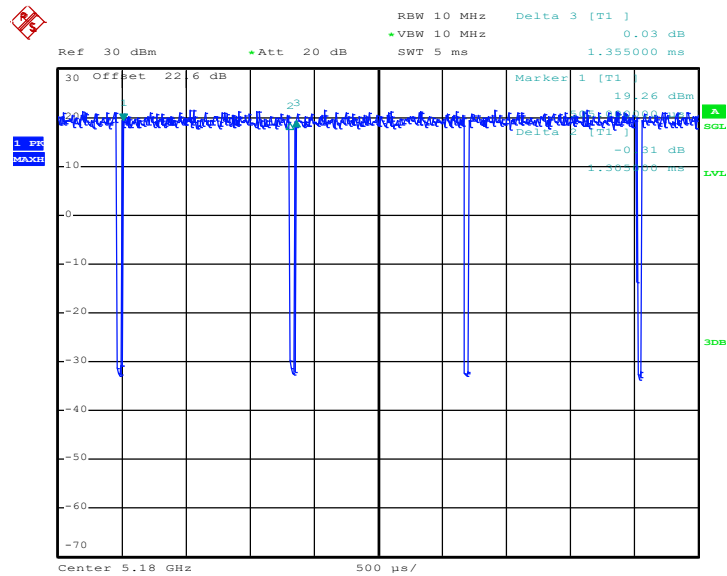
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802.11a



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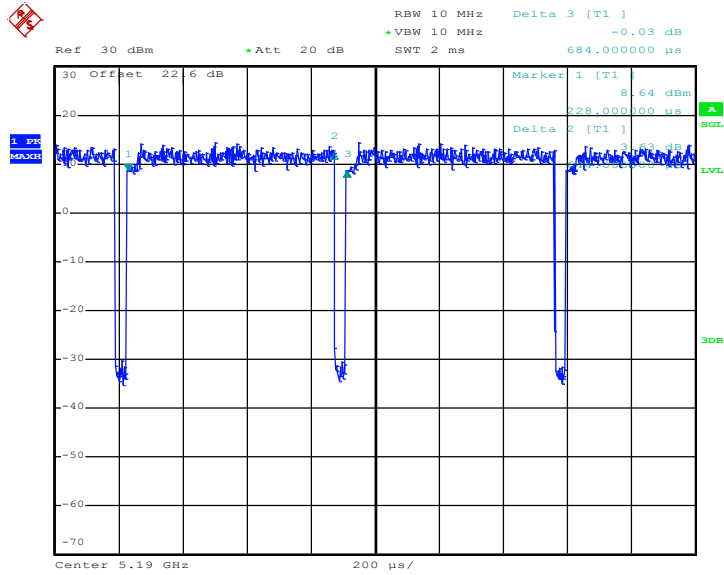
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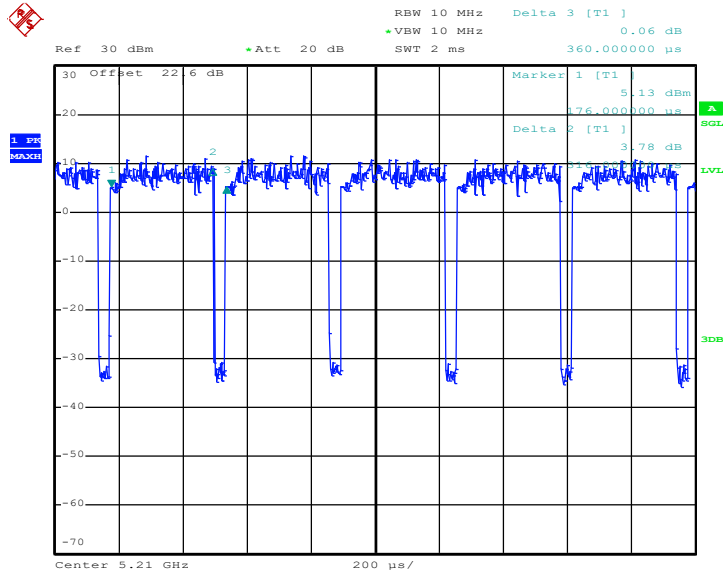


802.11n HT40



Date: 30.APR.2020 14:02:48

802.11ac VHT80



Date: 30.APR.2020 15:33:37