



FCC CO-LOCATION RADIO TEST REPORT

FCC ID : PY321100529
Equipment : Netgear 5G MHS Travel Router
Brand Name : Netgear
Model Name : MR6500
Applicant : Netgear Inc
350 E. Plumeria Drive, San Jose, CA 95134, United States
Manufacturer : Netgear Inc
350 E. Plumeria Drive, San Jose, CA 95134, United States
Standard : FCC Part 15 Subpart E §15.407

The product was received on Nov. 04, 2021 and testing was performed from Dec. 17, 2021 to Dec. 20, 2021. 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 test results in this report apply exclusively to the tested model / sample. Without written approval from 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 333, Taiwan (R.O.C.)



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History of this test report

Report No.	Version	Description	Issue Date
FR190614E	01	Initial issue of report	Jan. 28, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.407(b)	Unwanted Emissions	Pass	6.01 dB under the limit at 85.890 MHz
3.2	15.203 15.407(a)	Antenna Requirement	Pass	-

Declaration of Conformity:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
2. The measurement uncertainty please refer to this report "Uncertainty of Evaluation".

Comments and Explanations:

The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Avis Chuang

Report Producer: Vivian Hsu

1 General Description

1.1 Product Feature of Equipment Under Test

LTE/5G NR, Wi-Fi 2.4GHz 802.11b/g/n/ac/ax, Wi-Fi 5GHz 802.11a/n/ac/ax, Wi-Fi 6GHz 802.11a/n/ac/ax, and GPS

Product Feature		
Antenna Type	WWAN: <Ant. 1>: Monopole Antenna <Ant. 2>: Monopole Antenna WLAN: <Ant. 3>: Monopole Antenna <Ant. 4>: Monopole Antenna GPS: PIFA Antenna	
Antenna information		
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	Ant. 3: 2.63 Ant. 4: 2.15
5150 MHz ~ 5250 MHz	Peak Gain (dBi)	Ant. 3: 3.29 Ant. 4: 2.59

Remark: The EUT's information above is declared by manufacturer. Please refer to Comments and Explanations in report summary.

1.2 Modification of EUT

No modifications made to the EUT during the testing.

1.3 Testing Location

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	Sporton Site No. 03CH07-HY

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

FCC designation No.: TW1190

1.4 Applicable Standards

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC Part 15 Subpart E
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01.
- ♦ ANSI C63.10-2013

Remark:

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

2 Test Configuration of Equipment Under Test

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and find X plane as worst plane.

2.1 Carrier Frequency and Channel

2400-2483.5 MHz 802.11b		5150-5250 MHz 802.11a	
Channel	Freq. (MHz)	Channel	Freq. (MHz)
11	2462	36	5180

2.2 Test Mode

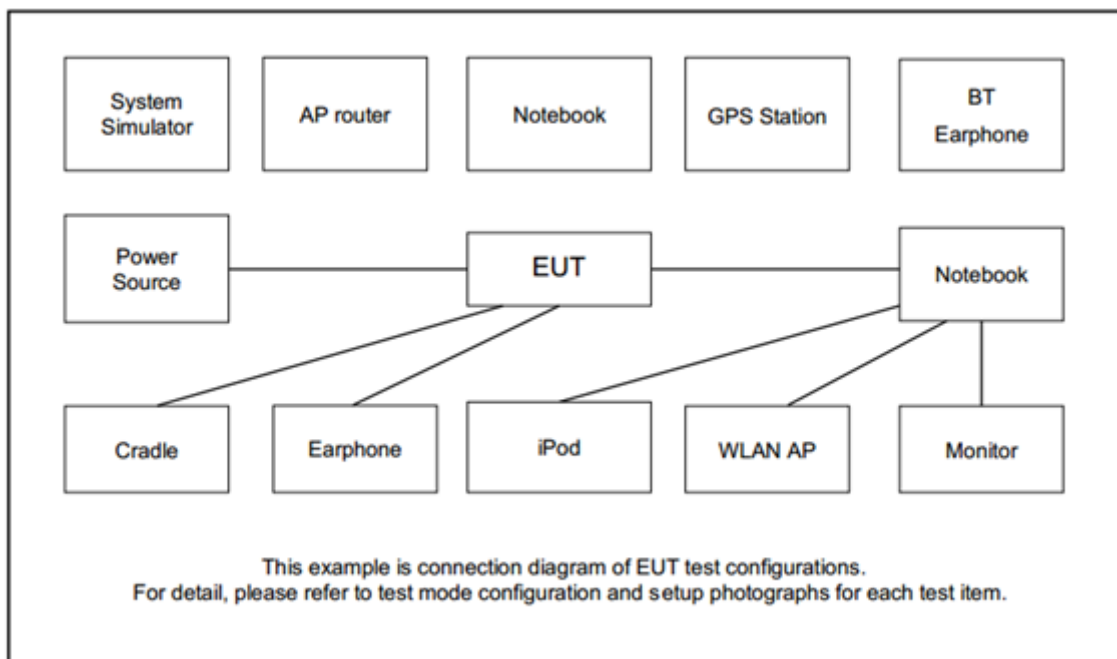
The final test modes consider the modulation and the worst data rates as shown in the table below.

<Co-Location>

Modulation	Data Rate
2.4GHz 802.11b for Ant. 3 + 5GHz 802.11a for Ant. 4 + LTE Band 48 for Ant. 1	1 Mbps + 6 Mbps + QPSK
2.4GHz 802.11b for Ant. 4 + 5GHz 802.11a for Ant. 3 + LTE Band 30 for Ant. 2	1 Mbps + 6 Mbps + QPSK

Remark: For Radiated Test Cases, the tests were performed with Adapter 1.

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8821C	N/A	N/A	Unshielded, 1.8 m

2.5 EUT Operation Test Setup

The RF test items, utility "QSPR v5.0.00188" was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

3 Test Result

3.1 Unwanted Emissions Measurement

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

3.1.1 Limit of Unwanted Emissions

(1) Unwanted spurious emissions falls 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.

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

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

(2) 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.



3.1.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.1.3 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 1000 MHz

- 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

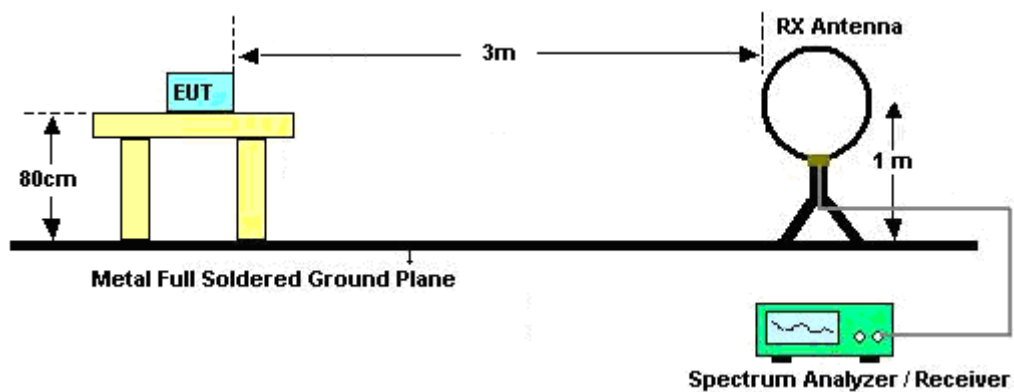
(3) Procedures for Average Unwanted Emissions Measurements Above 1000 MHz

- 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.

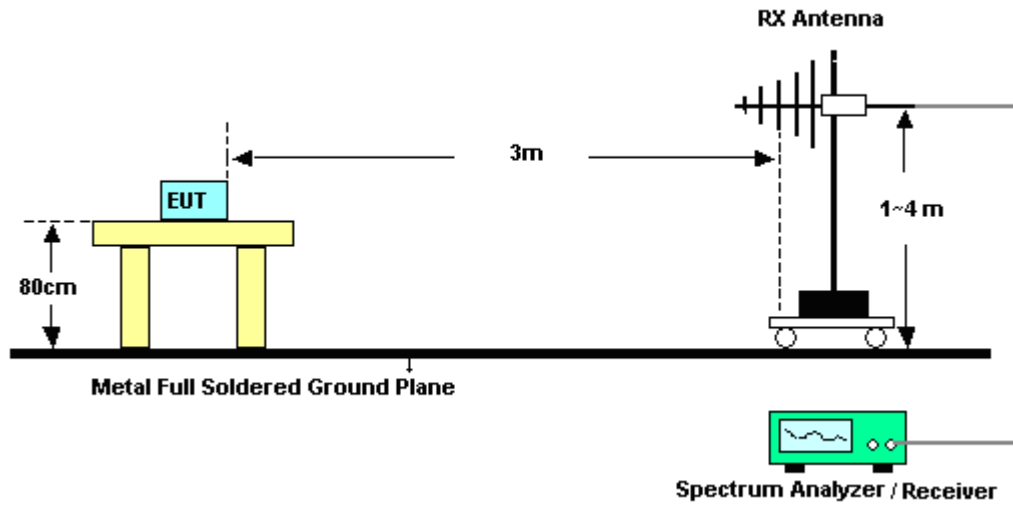
2. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
3. The EUT is set 3 meters away from the receiving antenna which is mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna 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 is 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. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as “-”.
7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as “-”.

3.1.4 Test Setup

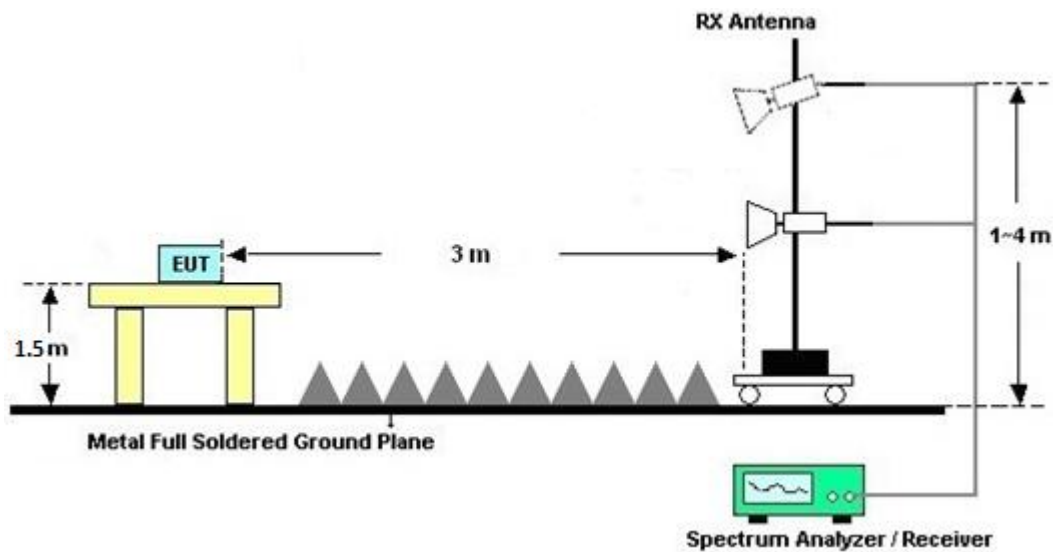
For radiated emissions below 30MHz



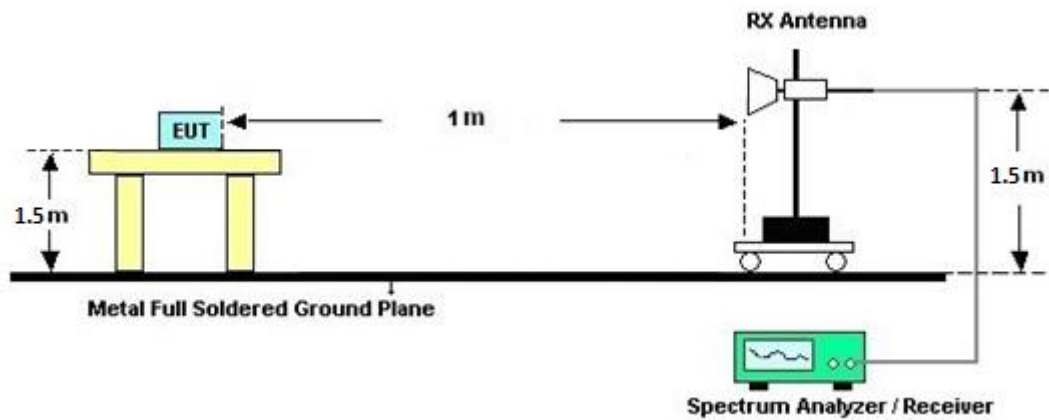
For radiated emissions from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



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

The low frequency, which starts from 9 kHz to 30 MHz, is pre-scanned and the result which is 20 dB lower than the limit line is not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.1.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A and B.

3.1.7 Duty Cycle

Please refer to Appendix C.

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

Please refer to Appendix A and B.



3.2 Antenna Requirements

3.2.1 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.

3.2.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.2.3 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	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	35419 & 03	30MHz~1GHz	Apr. 28, 2021	Dec. 17, 2021~ Dec. 20, 2021	Apr. 27, 2022	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Dec. 03, 2021	Dec. 17, 2021~ Dec. 20, 2021	Dec. 02, 2022	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Jan. 04, 2021	Dec. 17, 2021~ Dec. 20, 2021	Jan. 03, 2022	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-00101 800-30-10P	1590075	1GHz~18GHz	Apr. 22, 2021	Dec. 17, 2021~ Dec. 20, 2021	Apr. 21, 2022	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz~1GHz	Oct. 04, 2021	Dec. 17, 2021~ Dec. 20, 2021	Oct. 03, 2022	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~26.5GHz	Oct. 04, 2021	Dec. 17, 2021~ Dec. 20, 2021	Oct. 03, 2022	Radiation (03CH07-HY)
Preamplifier	EMEC	EM18G40G	0600789	18-40GHz	Jul. 23, 2021	Dec. 17, 2021~ Dec. 20, 2021	Jul. 22, 2022	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9030A	MY52350276	3Hz~44GHz	Jul. 22, 2021	Dec. 17, 2021~ Dec. 20, 2021	Jul. 21, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY15682-4	30MHz to 18GHz	Feb. 24, 2021	Dec. 17, 2021~ Dec. 20, 2021	Feb. 23, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24971-4	9kHz to 18GHz	Feb. 24, 2021	Dec. 17, 2021~ Dec. 20, 2021	Feb. 23, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655-4	9kHz to 18GHz	Feb. 24, 2021	Dec. 17, 2021~ Dec. 20, 2021	Feb. 23, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2858/2,801 606/2	18GHz~40GHz	Feb. 24, 2021	Dec. 17, 2021~ Dec. 20, 2021	Feb. 23, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126	532078/126E	30MHz~18GHz	Sep. 17, 2021	Dec. 17, 2021~ Dec. 20, 2021	Sep. 16, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	801606/2	9KHz ~ 40GHz	Apr. 03, 2021	Dec. 17, 2021~ Dec. 20, 2021	Apr. 02, 2022	Radiation (03CH07-HY)
Controller	EMEC	EM1000	N/A	Control Ant Mast	N/A	Dec. 17, 2021~ Dec. 20, 2021	N/A	Radiation (03CH07-HY)
Controller	MF	MF-7802	N/A	Control Turn table	N/A	Dec. 17, 2021~ Dec. 20, 2021	N/A	Radiation (03CH07-HY)
Antenna Mast	EMEC	AM-BS-4500E	N/A	Boresight mast 1M~4M	N/A	Dec. 17, 2021~ Dec. 20, 2021	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Dec. 17, 2021~ Dec. 20, 2021	N/A	Radiation (03CH07-HY)
Software	Audix	E3	N/A	N/A	N/A	Dec. 17, 2021~ Dec. 20, 2021	N/A	Radiation (03CH07-HY)
USB Data Logger	TECPEL	TR-32	HE17XB2495	N/A	Mar. 09, 2021	Dec. 17, 2021~ Dec. 20, 2021	Mar. 08, 2022	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz~40GHz	Nov. 30, 2021	Dec. 17, 2021~ Dec. 20, 2021	Nov. 29, 2022	Radiation (03CH07-HY)



5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.1 dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.8 dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.0 dB
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Appendix A. Radiated Spurious Emission

Test Engineer :	Jesse Wang, Stan Hsieh and Ken Wu	Temperature :	23.1~25.3°C
		Relative Humidity :	53.6~59.1%

2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz

802.11b_Tx_CH11_ANT 3 + 802.11a_Tx_CH36_ANT 4 + LTE Band 48_ANT 1

(Band Edge @ 3m)

WIFI Ant. Simultaneously	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 11 2462MHz	*	2462	104.88	-	-	89.84	32.25	18.23	35.44	170	20	P	H
	*	2462	101.7	-	-	86.66	32.25	18.23	35.44	170	20	A	H
		2494.76	55.14	-18.86	74	39.97	32.38	18.25	35.46	170	20	P	H
		2494.92	44.21	-9.79	54	29.04	32.38	18.25	35.46	170	20	A	H
													H
													H
	*	2462	98.43	-	-	83.39	32.25	18.23	35.44	177	360	P	V
	*	2462	95.17	-	-	80.13	32.25	18.23	35.44	177	360	A	V
		2488.68	54.3	-19.7	74	39.16	32.35	18.24	35.45	177	360	P	V
		2494.04	44.21	-9.79	54	29.04	32.38	18.25	35.46	177	360	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz

802.11b_Tx_CH11_ANT 3 + 802.11a_Tx_CH36_ANT 4 + LTE Band 48_ANT 1

(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.
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 36 5180MHz		5104.26	49.87	-24.13	74	39.03	34.4	11.74	35.3	103	121	P	H
		5132.86	39.95	-14.05	54	29.07	34.4	11.77	35.29	103	121	A	H
	*	5180	100.36	-	-	89.28	34.52	11.83	35.27	103	121	P	H
	*	5180	92.68	-	-	81.6	34.52	11.83	35.27	103	121	A	H
													H
													H
		5050.7	49.49	-24.51	74	38.94	34.2	11.68	35.33	100	302	P	V
		5150	40.19	-13.81	54	29.28	34.4	11.79	35.28	100	302	A	V
	*	5180	102.41	-	-	91.33	34.52	11.83	35.27	100	302	P	V
	*	5180	94.98	-	-	83.9	34.52	11.83	35.27	100	302	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz

802.11b_Tx_CH11_ANT 3 + 802.11a_Tx_CH36_ANT 4 + LTE Band 48_ANT 1

(Harmonic @ 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.
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 11 2462MHz + 802.11a CH 36 5180MHz		4924	50.52	-23.48	74	39.96	34.25	11.64	35.33	-	-	P	H
		7386	43.94	-30.06	74	50.38	36.24	15.3	57.98	-	-	P	H
		10360	49.73	-18.47	68.2	52.81	37.66	18.57	59.31	-	-	P	H
		15540	48.1	-25.9	74	40.9	41.1	23.33	57.23	-	-	P	H
		4924	50.17	-23.83	74	39.61	34.25	11.64	35.33	-	-	P	V
		7386	42.46	-31.54	74	48.9	36.24	15.3	57.98	-	-	P	V
		10360	50.3	-17.9	68.2	53.38	37.66	18.57	59.31	-	-	P	V
		15540	47.64	-26.36	74	40.44	41.1	23.33	57.23	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												



2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz

802.11b_Tx_CH11_ANT 4 + 802.11a_Tx_CH36_ANT 3 + LTE Band 30_ANT 2

(Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preampl Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 11 2462MHz	*	2462	103.11	-	-	88.07	32.25	18.23	35.44	282	162	P	H
	*	2462	100.01	-	-	84.97	32.25	18.23	35.44	282	162	A	H
		2499.2	54.9	-19.1	74	39.7	32.4	18.26	35.46	282	162	P	H
		2493.12	44.11	-9.89	54	28.95	32.37	18.25	35.46	282	162	A	H
													H
													H
	*	2462	98.04	-	-	83	32.25	18.23	35.44	369	51	P	V
	*	2462	95.08	-	-	80.04	32.25	18.23	35.44	369	51	A	V
		2492.2	54.85	-19.15	74	39.69	32.37	18.25	35.46	369	51	P	V
		2492.96	44.19	-9.81	54	29.03	32.37	18.25	35.46	369	51	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz

802.11b_Tx_CH11_ANT 4 + 802.11a_Tx_CH36_ANT 3 + LTE Band 30_ANT 2

(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.
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 36 5180MHz		5109.46	49.3	-24.7	74	38.45	34.4	11.75	35.3	100	117	P	H
		5131.3	39.98	-14.02	54	29.1	34.4	11.77	35.29	100	117	A	H
	*	5180	99.13	-	-	88.05	34.52	11.83	35.27	100	117	P	H
	*	5180	91.52	-	-	80.44	34.52	11.83	35.27	100	117	A	H
													H
													H
		5037.44	48.85	-25.15	74	38.3	34.23	11.66	35.34	100	296	P	V
		5130.26	39.95	-14.05	54	29.07	34.4	11.77	35.29	100	296	A	V
	*	5180	102.21	-	-	91.13	34.52	11.83	35.27	100	296	P	V
	*	5180	94.87	-	-	83.79	34.52	11.83	35.27	100	296	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz

802.11b_Tx_CH11_ANT 4 + 802.11a_Tx_CH36_ANT 3 + LTE Band 30_ANT 2

(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.
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 11 2462MHz + 802.11a CH 36 5180MHz		4924	49.98	-24.02	74	39.42	34.25	11.64	35.33	-	-	P	H
		7386	41.81	-32.19	74	48.25	36.24	15.3	57.98	-	-	P	H
		10360	50.7	-17.5	68.2	53.78	37.66	18.57	59.31	-	-	P	H
		15540	47.43	-26.57	74	40.23	41.1	23.33	57.23	-	-	P	H
		4924	49.68	-24.32	74	39.12	34.25	11.64	35.33	-	-	P	V
		7386	41.48	-32.52	74	47.92	36.24	15.3	57.98	-	-	P	V
		10360	48.6	-19.6	68.2	51.68	37.66	18.57	59.31	-	-	P	V
		15540	47.31	-26.69	74	40.11	41.1	23.33	57.23	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												



Emission below 1GHz

2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz

802.11b Tx_CH11_ANT 3 + 802.11a Tx_CH36_ANT 4 + LTE Band 48_ANT 1

(LF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 11 2462MHz + 802.11a CH 36 5180MHz		57	27.92	-12.08	40	44.41	12.17	1.35	30.01	-	-	P	H
		89.94	35.29	-8.21	43.5	49.03	14.66	1.59	29.99	-	-	P	H
		162.03	30.01	-13.49	43.5	41.46	16.41	2.12	29.98	-	-	P	H
		772.5	30.2	-15.8	46	27.75	27.77	4.32	29.64	-	-	P	H
		878.9	31.48	-14.52	46	27.16	28.73	4.64	29.05	-	-	P	H
		951.7	32.87	-13.13	46	26.3	30.39	4.88	28.7	-	-	P	H
		30	32.78	-7.22	40	37.34	24.57	0.9	30.03	-	-	P	V
		57.54	32.38	-7.62	40	49.02	12.01	1.36	30.01	-	-	P	V
		85.89	33.99	-6.01	40	48.3	14.1	1.59	30	-	-	P	V
		771.1	30.2	-15.8	46	27.77	27.76	4.31	29.64	-	-	P	V
		874	31.69	-14.31	46	27.35	28.8	4.63	29.09	-	-	P	V
		957.3	33.82	-12.18	46	26.93	30.67	4.9	28.68	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												



Emission below 1GHz

2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz

802.11b_Tx_CH11_ANT 4 + 802.11a_Tx_CH36_ANT 3 + LTE Band 30_ANT 2

(LF)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 11 2462MHz + 802.11a CH 36 5180MHz		52.14	27.36	-12.64	40	42.75	13.31	1.31	30.01	-	-	P	H
		91.29	34.23	-9.27	43.5	47.82	14.79	1.61	29.99	-	-	P	H
		161.76	30.86	-12.64	43.5	42.3	16.42	2.12	29.98	-	-	P	H
		806.8	29.76	-16.24	46	27.22	27.65	4.43	29.54	-	-	P	H
		870.5	31.77	-14.23	46	27.49	28.76	4.63	29.11	-	-	P	H
		953.1	33.24	-12.76	46	26.6	30.46	4.88	28.7	-	-	P	H
		30	31.8	-8.2	40	36.36	24.57	0.9	30.03	-	-	P	V
		52.41	31.77	-8.23	40	47.27	13.2	1.31	30.01	-	-	P	V
		86.7	33.39	-6.61	40	47.57	14.23	1.59	30	-	-	P	V
		773.2	29.61	-16.39	46	27.15	27.78	4.32	29.64	-	-	P	V
		841.8	30.65	-15.35	46	26.9	28.48	4.58	29.31	-	-	P	V
		953.8	33.26	-12.74	46	26.58	30.49	4.89	28.7	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												



Note symbol

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is over limit line.
P/A	P eak or A verage
H/V	H orizontal or V ertical

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

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	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)

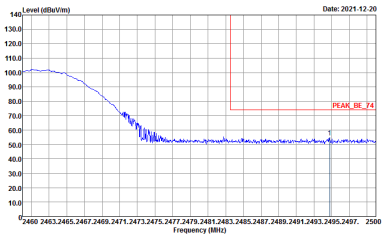
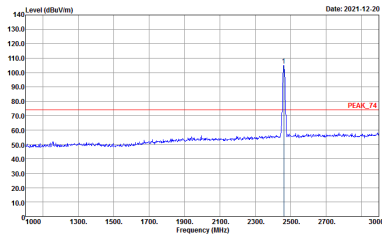
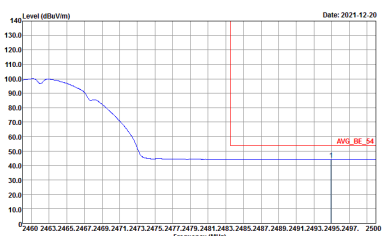
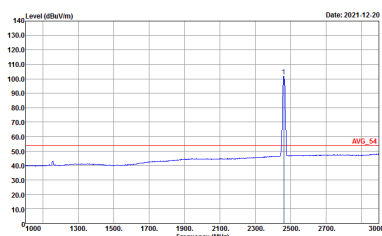
Both peak and average measured complies with the limit line, so test result is “PASS”.



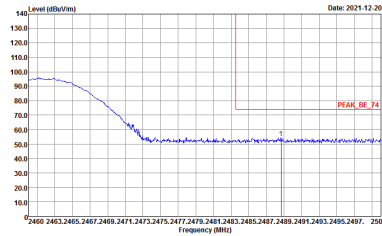
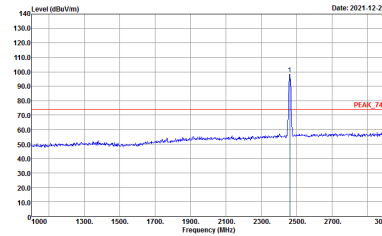
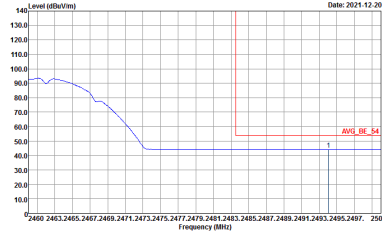
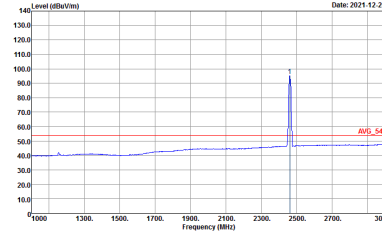
Appendix B. Radiated Spurious Emission Plots

Test Engineer :	Jesse Wang, Stan Hsieh and Ken Wu	Temperature :	23.1~25.3°C
		Relative Humidity :	53.6~59.1%

2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz
802.11b_Tx_CH11_ANT 3 + 802.11a_Tx_CH36_ANT 4 + LTE Band 48_ANT 1
(Band Edge @ 3m)

ANT	802.11b CH11 2462MHz	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00060584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00060584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto
Avg.	 Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00060584 HORIZONTAL : RBW:1000.000kHz VBW:0.030kHz SWT:Auto	 Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00060584 HORIZONTAL : RBW:1000.000kHz VBW:0.030kHz SWT:Auto



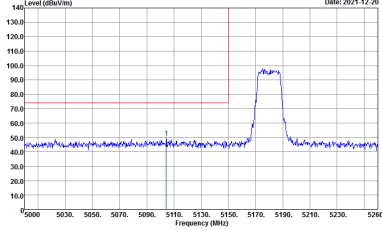
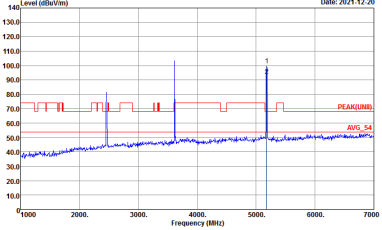
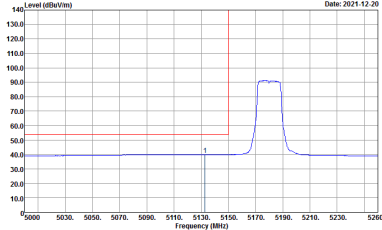
ANT	802.11b CH11 2462MHz	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto
Avg.	 Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:0.010kHz SWT:Auto	 Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:0.010kHz SWT:Auto



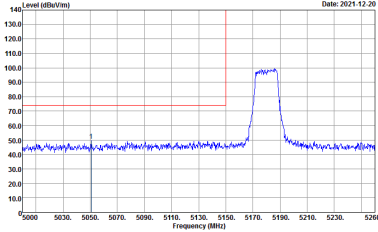
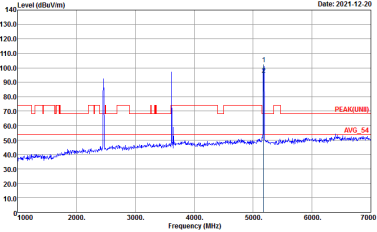
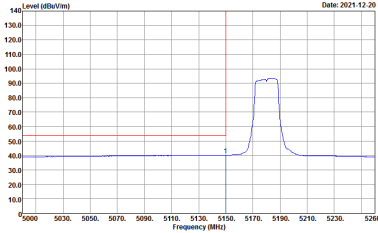
2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz

802.11b_Tx_CH11_ANT 3 + 802.11a_Tx_CH36_ANT 4 + LTE Band 48_ANT 1

(Band Edge @ 3m)

ANT	802.11a CH36 5180MHz	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00066584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH07-HY Condition : PEAK(UNI) 3m HF_ANT_00066584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto
Avg.	 Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00066584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	Left blank



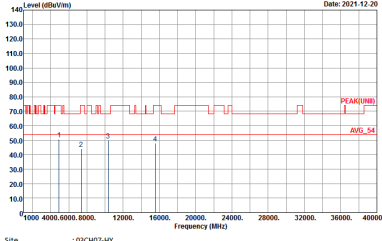
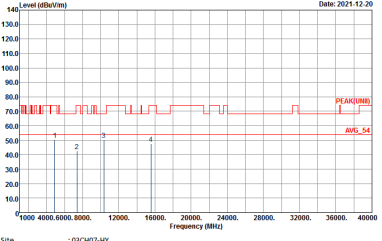
ANT	802.11a CH36 5180MHz	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_96_74 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH07-HY Condition : PEAK[UN] 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto
Avg.	 Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:3.000kHz SWT:Auto	Left blank



2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz

802.11b_Tx_CH11_ANT 3 + 802.11a_Tx_CH36_ANT 4 + LTE Band 48_ANT 1

(Band Edge @ 3m)

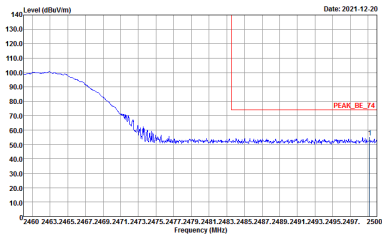
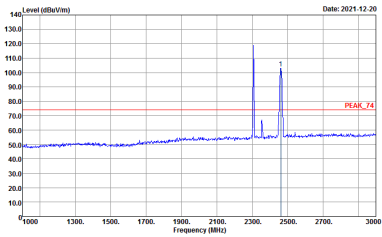
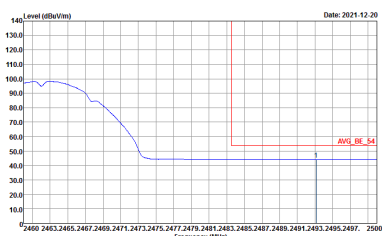
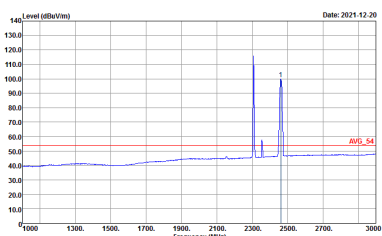
ANT	11b_Tx_Ch11_ANT3 + 11a_Tx_Ch36_ANT4 + LTE B48_ANT1	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH07-4Y Condition : PEAK[UNITS] 3m HF_ANT_00060504 HORIZONTAL	 Site : 03CH07-4Y Condition : PEAK[UNITS] 3m HF_ANT_00060504 VERTICAL



2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz

802.11b_Tx_CH11_ANT 4 + 802.11a_Tx_CH36_ANT 3 + LTE Band 30_ANT 2

(Band Edge @ 3m)

ANT	802.11b CH11 2462MHz	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH67-HY Condition : PEAK_BE_74 3m HF_ANT_00060584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH67-HY Condition : PEAK_74 3m HF_ANT_00060584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto
Avg.	 Site : 03CH67-HY Condition : AVG_BE_54 3m HF_ANT_00060584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH67-HY Condition : AVG_54 3m HF_ANT_00060584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto



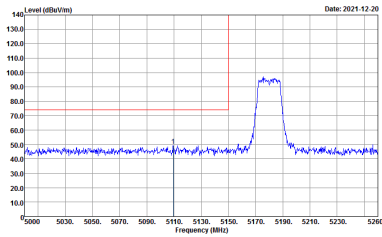
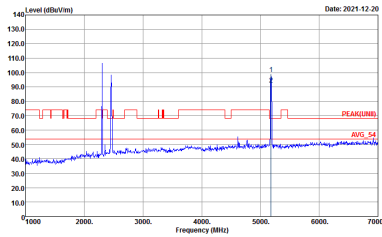
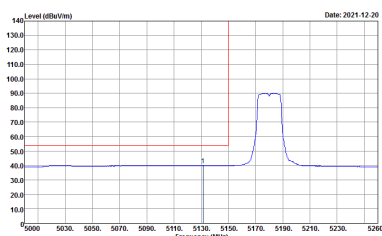
ANT	802.11b CH11 2462MHz	
Simultaneously	Vertical	Fundamental
Peak	Site : 03CH07-4Y Condition : PEAK_9E_74 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	Site : 03CH07-4Y Condition : PEAK_7A 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto
Avg.	Site : 03CH07-4Y Condition : AVG_BE_54 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:0.010kHz SWT:Auto	Site : 03CH07-4Y Condition : AVG_54 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:0.010kHz SWT:Auto



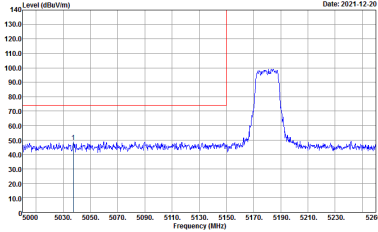
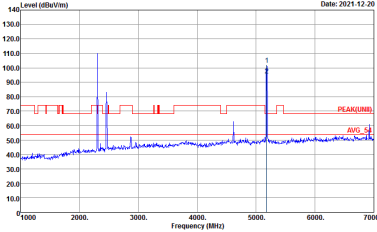
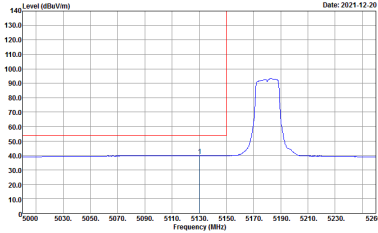
2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz

802.11b_Tx_CH11_ANT 4 + 802.11a_Tx_CH36_ANT 3 + LTE Band 30_ANT 2

(Band Edge @ 3m)

ANT	802.11a CH36 5180MHz	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00065584 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH07-HY Condition : PEAK(UNII) 3m HF_ANT_00065584 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00065584 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank



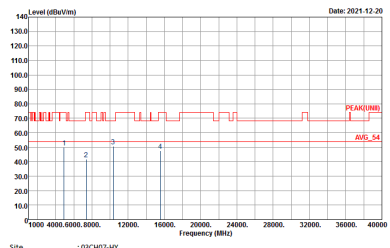
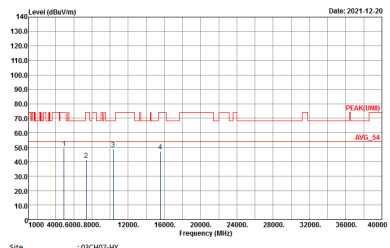
ANT	802.11a CH36 5180MHz	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_9E_74.3m HF_ANT_00066584 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH07-HY Condition : PEAK(UMI) 3m HF_ANT_00066584 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00066584 VERTICAL : RBW:1000.000KHz VBW:3.0310KHz SWT:Auto	Left blank



2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz

802.11b_Tx_CH11_ANT 4 + 802.11a_Tx_CH36_ANT 3 + LTE Band 30_ANT 2

(Band Edge @ 3m)

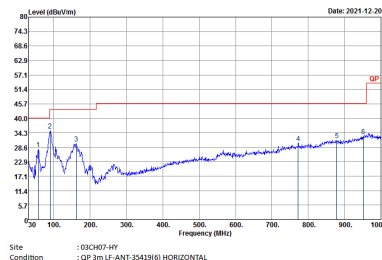
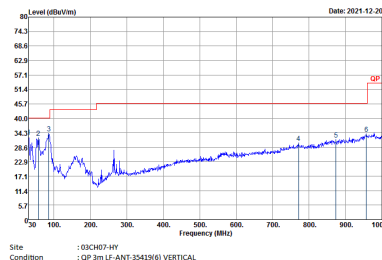
ANT	11b_Tx_Ch11_ANT4 + 11a_Tx_Ch36_ANT3 + LTE B30_ANT2	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH07-HY Condition : PEAK(UWB) 3m HF_ANT_00060504 HORIZONTAL	 Site : 03CH07-HY Condition : PEAK(UWB) 3m HF_ANT_00060504 VERTICAL



2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz

802.11b_Tx_CH11_ANT 3 + 802.11a_Tx_CH36_ANT 4 + LTE Band 48_ANT 1

(LF @ 3m)

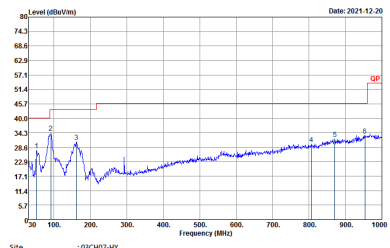
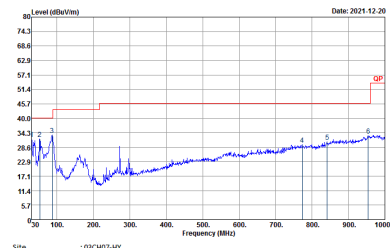
ANT	11b_Tx_Ch11_ANT3 + 11a_Tx_Ch36_ANT4 + LTE B48_ANT1	
Simultaneously	Horizontal	Vertical
QP / Peak		



2.4GHz 2400~2483.5MHz + 5GHz Band 1 5150~5250MHz

802.11b_Tx_CH11_ANT 4 + 802.11a_Tx_CH36_ANT 3 + LTE Band 30_ANT 2

(LF @ 3m)

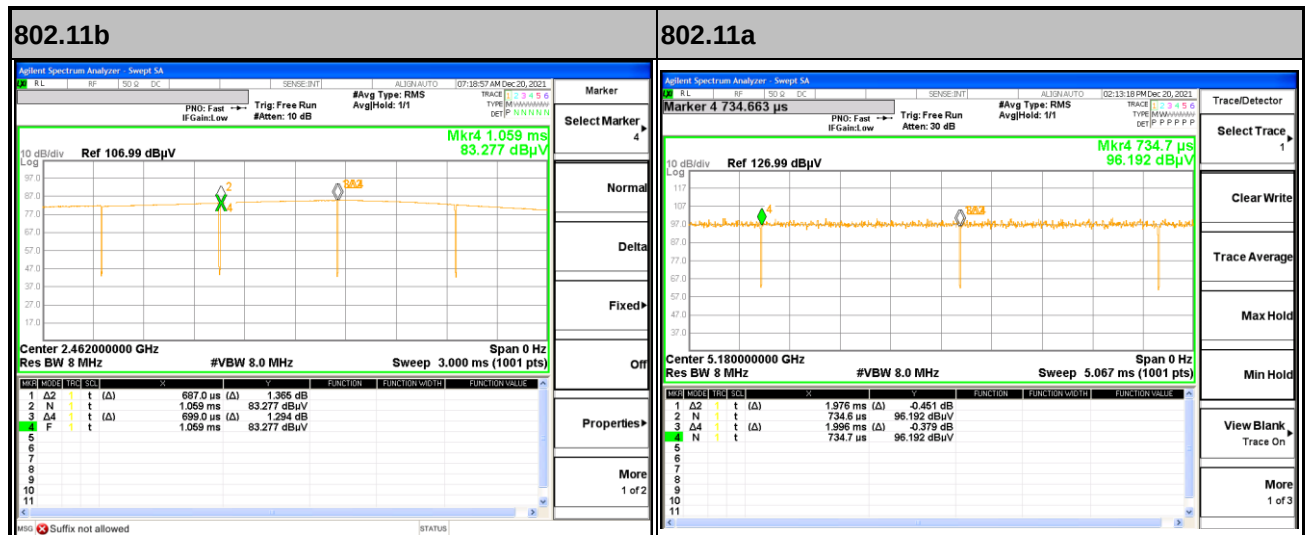
ANT	11b_Tx_Ch11_ANT4 + 11a_Tx_Ch36_ANT3 + LTE B30_ANT2	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35413(s) HORIZONTAL	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35413(s) VERTICAL



Appendix C. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
3	802.11b	98.28	-	-	10Hz
4	802.11b	97.72	686	1.46	10Hz
3	802.11a	99.00	-	-	10Hz
4	802.11a	99.25	-	-	10Hz

<Ant. 3>



<Ant. 4>

