



FCC CO-LOCATION RADIO TEST REPORT

FCC ID : P4Q-N672B
Equipment : LTE Module
Brand Name : MiTAC, Mio, NAVMAN, MAGELLAN
Model Name : SC600T-NA
Applicant : MiTAC Digital Technology Corporation
4F., NO. 1, R&D ROAD 2, HSINCHU SCIENCE
PARK, HSINCHU 30076, TAIWAN, R.O.C.
Manufacturer : MITAC Computer (Kunshan) Co., Ltd.
No. 269, 2nd Avenue, District A, Comprehensive
Free Trade Zone, 300 Kunshan, China
Standard : FCC Part 15 Subpart E §15.407

The product was received on Dec. 09, 2020 and testing was started from Jan. 14, 2021 and completed on Feb. 11, 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 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
FR0D1806F	01	Initial issue of report	Feb. 28, 2021

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.407(b)	Unwanted Emissions	Pass	Under limit 1.45 dB at 5350.320 MHz
3.2	15.203 15.407(a)	Antenna Requirement	Pass	-

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: Vivian Hsu



1 General Description

1.1 Product Feature of Equipment Under Test

WCDMA/LTE, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n, Wi-Fi 5GHz 802.11a/n/ac, and GNSS.

Product Specification subjective to this standard		
Sample 1	EUT with Host 1	
Sample 2	EUT with Host 2	
Antenna Type	WWAN: PIFA Antenna WLAN: PIFA Antenna Bluetooth: PIFA Antenna GPS / Glonass : Patch Antenna	
Antenna information		
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	0.90
5250 MHz ~ 5350 MHz	Peak Gain (dBi)	-0.20

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



The product was installed into Tablet (Brand Name: MiTAC, Mio, NAVMAN, MAGELLAN, Model Name: N672B) during test, and the host information was recorded in the following table.

Host Information	
Host 1	Host with SKU A
Host 2	Host with SKU B

Sample Information		
Functions	SKU A	SKU B
Screen	5" 720x1280 (HD), IPS, 350nits (w/ touch)	5" 720x1280 (HD), IPS, 350nits (w/ touch)
CPU	SD625 octa core 2.0GHz	SD625 octa core 2.0GHz
Battery	4110mAh (hard pack)	4110mAh (hard pack)
RAM	3GB	3GB
Storage	32GB	32GB
External storage	Support	Support
WWAN + WLAN Module	Support (SC600T-NA)	Support (SC600T-NA)
NFC/RFID(HF)	Support	Support
GPS	Support	Support
Barcode	Support(N6603)	Support(N3601)

Functions	SKU C	SKU D
Screen	5" 720x1280 (HD), IPS, 350nits (w/ touch)	5" 720x1280 (HD), IPS, 350nits (w/ touch)
CPU	SD625 octa core 2.0GHz	SD625 octa core 2.0GHz
Battery	4110mAh (hard pack)	4110mAh (hard pack)
RAM	2GB	2GB
Storage	16GB	16GB
External storage	Support	Support
WWAN + WLAN Module	Support (SC600T-NA)	Support (SC600T-NA)
NFC/RFID(HF)	Support	Support
GPS	Support	Support
Barcode	Support(N6603)	Support(N3601)

1.2 Modification of EUT

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

1.3 Testing Location

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. 03CH15-HY

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

FCC designation No.: TW0007

1.4 Applicable Standards

According to the specifications of 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 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01.
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- ♦ 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. The TAF code is not including all the FCC KDB listed without accreditation.

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, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z Plane for Sample 1; Y Plane for Sample 2) were recorded in this report.

2.1 Carrier Frequency and Channel

2400-2483.5 MHz Bluetooth EDR		2400-2483.5 MHz 802.11n HT40		5250-5350 MHz 802.11ac VHT80	
Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
78	2480	09	2452	58	5290

Remark: During the Radiated Spurious Emission test, the EUT turn on the WWAN functions simultaneously.

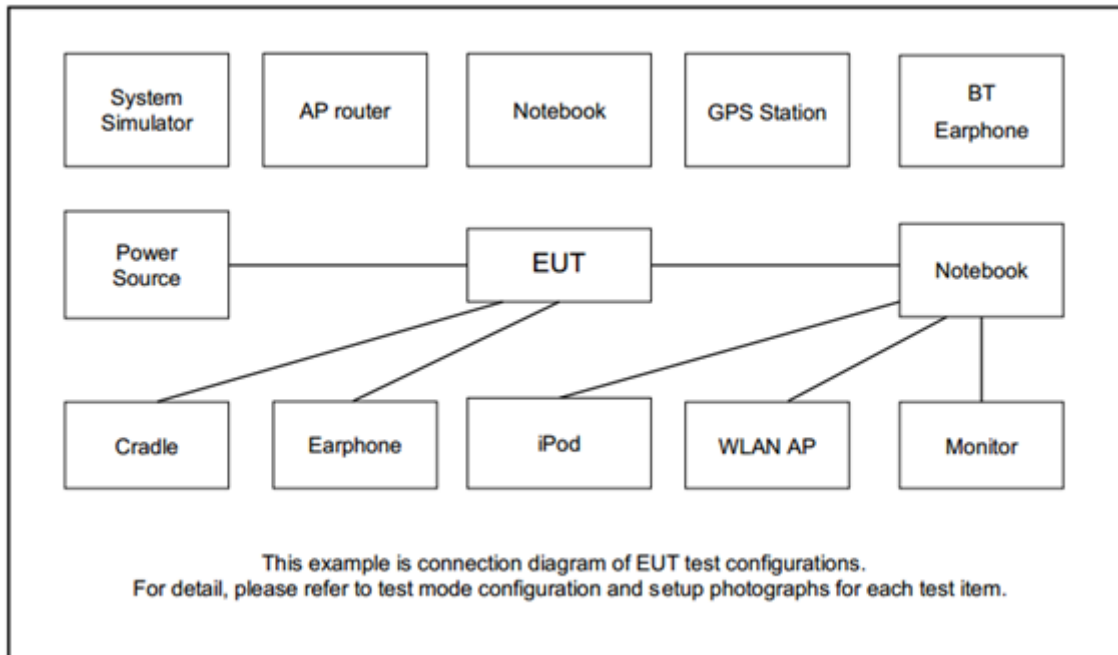
2.2 Test Mode

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

<Co-Location>

Modulation	Data Rate
WLAN 5GHz 802.11ac VHT80 + LTE Band 41	MCS0 + QPSK
Bluetooth EDR + WLAN 2.4GHz 802.11n HT40 + LTE Band 41	6 Mbps + MCS0 + QPSK

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	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A

2.5 EUT Operation Test Setup

The RF test items, utility "QRCT Version 3.0.303.0" 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.

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.

<Limit of Unwanted Emissions>

- (1) 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

- (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.

3.1.1 Measuring Instruments

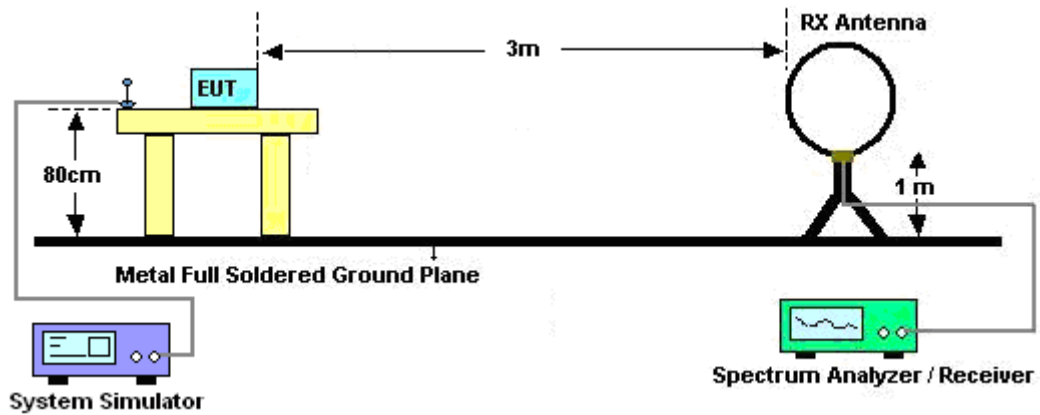
See list of measuring equipment of this test report.

3.1.2 Test Procedures

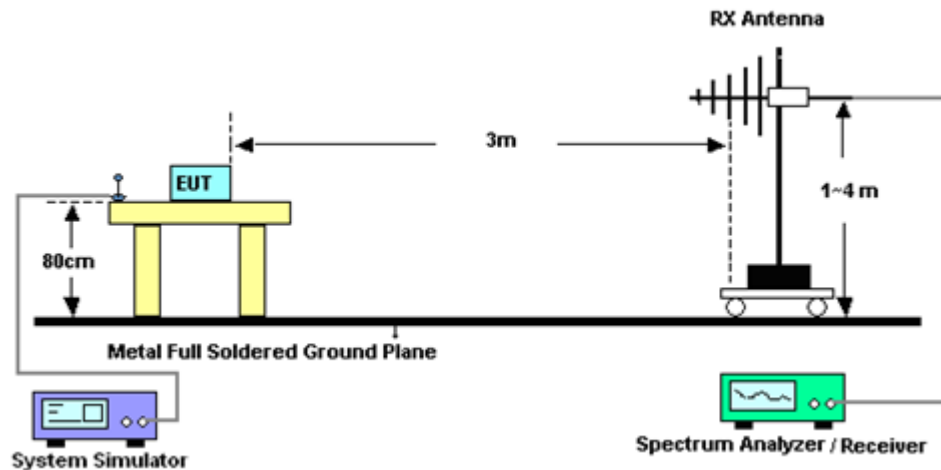
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
Section G) Unwanted emissions measurement.
(1) Procedure for Unwanted Emissions Measurements Below 1000MHz
 - RBW = 120 kHz
 - VBW = 300 kHz
 - Detector = Peak
 - Trace mode = max hold
(2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
 - RBW = 1 MHz
 - VBW $\geq$ 3 MHz
 - Detector = Peak
 - Sweep time = auto
 - Trace mode = max hold
(3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz
 - RBW = 1 MHz
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq$ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.1.3 Test Setup

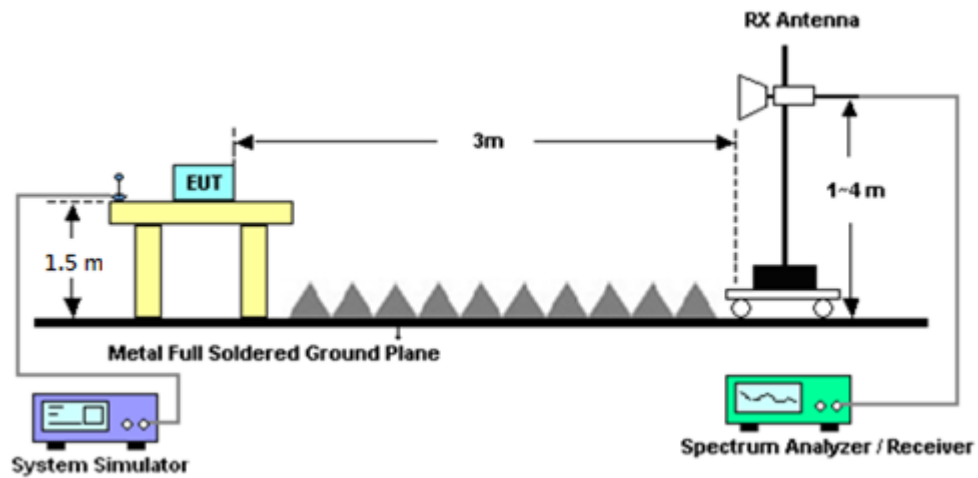
For radiated emissions below 30MHz



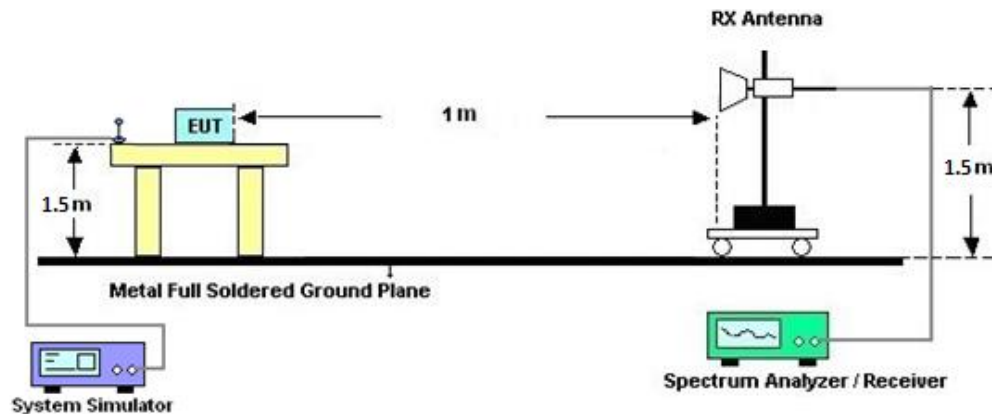
For radiated emissions from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



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

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

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

3.1.5 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A and B.

3.1.6 Duty Cycle

Please refer to Appendix C.

3.1.7 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
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Jul. 14, 2020	Jan. 14, 2021~ Feb. 11, 2021	Jul. 13, 2021	Radiation (03CH15-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N -06	41912 & 05	30MHz~1GHz	Feb. 09, 2020	Jan. 14, 2021~ Feb. 07, 2021	Feb. 08, 2021	Radiation (03CH15-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N -06	41912 & 05	30MHz~1GHz	Feb. 08, 2021	Feb. 08, 2021~ Feb. 11, 2021	Feb. 07, 2022	Radiation (03CH15-HY)
Amplifier	SONOMA	310N	363440	9kHz~1GHz	Dec. 28, 2020	Jan. 14, 2021~ Feb. 11, 2021	Dec. 27, 2021	Radiation (03CH15-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120 D	9120D-01620	1GHz~18GHz	Nov. 03, 2020	Jan. 14, 2021~ Feb. 11, 2021	Nov. 02, 2021	Radiation (03CH15-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA917025 1	18GHz~40GHz	Dec. 02, 2020	Jan. 14, 2021~ Feb. 11, 2021	Dec. 01, 2021	Radiation (03CH15-HY)
Preamplifier	Jet-Power	JPA0118-55-3 03	1710001800 055006	1GHz~18GHz	May 07, 2020	Jan. 14, 2021~ Feb. 11, 2021	May 06, 2021	Radiation (03CH15-HY)
Preamplifier	Keysight	83017A	MY53270195	1GHz~26.5GHz	Aug. 21, 2020	Jan. 14, 2021~ Feb. 11, 2021	Aug. 20, 2021	Radiation (03CH15-HY)
Preamplifier	EMEC	EM18G40G	0600789	18-40GHz	Oct. 27, 2020	Jan. 14, 2021~ Feb. 11, 2021	Oct. 26, 2021	Radiation (03CH15-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY54130085	20MHz~8.4GHz	Nov. 02, 2020	Jan. 14, 2021~ Feb. 11, 2021	Nov. 01, 2021	Radiation (03CH15-HY)
Spectrum Analyzer	Agilent	E4446A	MY50180136	3Hz~44GHz	May 04, 2020	Jan. 14, 2021~ Feb. 11, 2021	May 03, 2021	Radiation (03CH15-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Jan. 14, 2021~ Feb. 11, 2021	N/A	Radiation (03CH15-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Jan. 14, 2021~ Feb. 11, 2021	N/A	Radiation (03CH15-HY)
Software	Audix	E3 6.2009-8-24 (k5)	RK-000451	N/A	N/A	Jan. 14, 2021~ Feb. 11, 2021	N/A	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104, 102E	MY36980/4, MY9838/4PE ,508405/2E	30MHz~18G	Nov. 16, 2020	Jan. 14, 2021~ Feb. 11, 2021	Nov. 15, 2021	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30MHz-40GHz	Feb. 25, 2020	Jan. 14, 2021~ Feb. 11, 2021	Feb. 24, 2021	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30MHz-40GHz	Feb. 25, 2020	Jan. 14, 2021~ Feb. 11, 2021	Feb. 24, 2021	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz~30MHz	Mar. 12, 2020	Jan. 14, 2021~ Feb. 11, 2021	Mar. 11, 2021	Radiation (03CH15-HY)
Filter	Wainwright	WLJ4-1000-15 30-6000-40ST	SN4	1.53GHz Low Pass Filter	Jul. 03, 2020	Jan. 14, 2021~ Feb. 11, 2021	Jul. 02, 2021	Radiation (03CH15-HY)
Filter	Wainwright	WHKX12-2700 -3000-18000-6 0ST	SN4	3GHz High Pass Filter	Sep. 16, 2020	Jan.14, 2021~ Feb.11, 2021	Sep. 15, 2021	Radiation (03CH15-HY)
Filter	Wainwright	WHKX8-5872. 5-6750-18000- 40ST	SN6	6.75GHz High Pass Filter	Jul. 01, 2020	Jan. 16, 2021~ Feb. 11, 2021	Jun. 30, 2021	Radiation (03CH15-HY)



5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.7
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.3
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.9
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Appendix A. Radiated Spurious Emission

Test Engineer :	Leo Lee, Mancy Chou and Bigshow Wang	Temperature :	22.1~23.1℃
		Relative Humidity :	55~60%

<Sample 1>

WLAN5G 802.11ac VHT80 + LTE Band 41 (Band Edge @ 3m)

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)
11ac VHT80 Ch58 5290MHz + LTE Band 41		5059.16	50.86	-23.14	74	39.26	31.72	9.9	30.02	399	292	P	H
		5124.1	44.01	-9.99	54	32.25	31.8	9.97	30.01	399	292	A	H
	*	5290	96.87	-	-	85.55	31.2	10.12	30	399	292	P	H
	*	5290	88.63	-	-	77.31	31.2	10.12	30	399	292	A	H
		5361.36	60.76	-13.24	74	49.41	31.17	10.18	30	399	292	P	H
		5350.32	52.55	-1.45	54	41.28	31.1	10.17	30	399	292	A	H
		5015.64	51.54	-22.46	74	40.27	31.43	9.86	30.02	299	4	P	V
		5050.66	43.81	-10.19	54	32.24	31.7	9.89	30.02	299	4	A	V
	*	5290	95.02	-	-	83.7	31.2	10.12	30	299	4	P	V
	*	5290	87.92	-	-	76.6	31.2	10.12	30	299	4	A	V
		5361.12	60.04	-13.96	74	48.69	31.17	10.18	30	299	4	P	V
		5350.32	52.08	-1.92	54	40.81	31.1	10.17	30	299	4	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



WLAN5G 802.11ac VHT80 + LTE Band 41 (Harmonic @ 3m)

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)
11ac VHT80 Ch58 5290MHz + LTE Band 41		10580	46.59	-21.61	68.2	53.42	39.7	14.57	61.1	100	0	P	H
		15870	46.71	-27.29	74	53.17	37.17	17.49	61.12	100	0	P	H
		18000	59.48	-14.52	74	49.34	49	19.04	57.9	100	55	P	H
		18000	50.06	-3.94	54	39.92	49	19.04	57.9	100	55	A	H
													H
													H
													H
													H
		10580	46.56	-21.64	68.2	53.39	39.7	14.57	61.1	100	0	P	V
		15870	46.84	-27.16	74	53.3	37.17	17.49	61.12	100	0	P	V
		18000	60.23	-13.77	74	50.09	49	19.04	57.9	100	17	P	V
		18000	50.16	-3.84	54	40.02	49	19.04	57.9	100	17	A	V
													V
													V
													V
													V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												



Emission above 18GHz

WLAN5G 802.11ac VHT80 + LTE Band 41 (SHF)

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)
11ac VHT80 Ch58 5290MHz + LTE Band 41		22818	40.29	-33.71	74	43.36	38.78	12.4	54.25	150	0	P	H
		34016	43.7	-24.5	68.2	41.91	41.78	17.93	57.92	150	0	P	H
													H
													H
													H
													H
		20640	38.07	-35.93	74	42.99	38.7	11.22	54.84	150	0	P	V
		34060	43.58	-24.62	68.2	41.84	41.74	17.96	57.96	150	0	P	V
													V
													V
													V
													V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

WLAN5G 802.11ac VHT80 + LTE Band 41 (LF)

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)
11ac VHT80 Ch58 5290MHz + LTE Band 41		67.83	32.16	-7.84	40	51.03	12.54	1.13	32.54	250	189	Q	H
		189.08	36.9	-6.6	43.5	52.37	14.99	2	32.46	-	-	P	H
		298.69	37.7	-8.3	46	48.72	19.08	2.39	32.49	-	-	Q	H
		447.1	36.43	-9.57	46	43.16	22.84	2.84	32.41	-	-	Q	H
		734.22	37.79	-8.21	46	39.02	27.54	3.68	32.45	-	-	P	H
		896.21	37.99	-8.01	46	36.91	28.58	4.15	31.65	-	-	P	H
													H
		40.67	34.34	-5.66	40	46.97	19.11	0.82	32.56	121	250	Q	V
		185.2	34.83	-8.67	43.5	50.26	15.06	1.98	32.47	-	-	Q	V
		298.69	34.04	-11.96	46	45.06	19.08	2.39	32.49	-	-	Q	V
		535.37	31.47	-14.53	46	37.07	23.84	3.18	32.62	-	-	P	V
		734.22	34.61	-11.39	46	35.84	27.54	3.68	32.45	-	-	P	V
		895.24	39.02	-6.98	46	37.94	28.58	4.15	31.65	-	-	P	V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



<Sample 2>

2.4GHz 2400~2483.5MHz

BT + 802.11n HT40 + LTE Band 41

BT (Band Edge @ 3m)

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)
BT CH 78 2480MHz + 802.11n HT40 CH 09 2452MHz + LTE Band 41	*	2480	103.44	-	-	90.18	27.44	16.7	30.88	171	57	P	H
	*	2480	78.68	-	-	-	-	-	-	-	-	A	H
		2484.68	66.43	-7.57	74	53.17	27.43	16.71	30.88	171	57	P	H
		2484.68	41.67	-12.33	54	-	-	-	-	-	-	A	H
													H
													H
	*	2480	102.51	-	-	89.25	27.44	16.7	30.88	300	351	P	V
	*	2480	77.75	-	-	-	-	-	-	-	-	A	V
		2484	68.11	-5.89	74	54.85	27.43	16.71	30.88	300	351	P	V
		2484	43.35	-10.65	54	-	-	-	-	-	-	A	V
													V
													V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												



WLAN (Band Edge @ 3m)

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)
BT CH 78 2480MHz + 802.11n HT40 CH 09 2452MHz + LTE Band 41		2357.32	55.81	-18.19	74	42.56	27.67	16.51	30.93	246	51	P	H
		2345.56	47.26	-6.74	54	33.99	27.71	16.49	30.93	246	51	A	H
	*	2452	93.29	-	-	80.02	27.5	16.66	30.89	246	51	P	H
	*	2452	86.88	-	-	73.61	27.5	16.66	30.89	246	51	A	H
		2483.83	58.76	-15.24	74	45.5	27.43	16.71	30.88	246	51	P	H
		2484.46	51.55	-2.45	54	38.29	27.43	16.71	30.88	246	51	A	H
		2336.88	55.1	-18.9	74	41.83	27.73	16.48	30.94	244	6	P	V
		2335.2	47.44	-6.56	54	34.18	27.73	16.47	30.94	244	6	A	V
	*	2452	94.69	-	-	81.42	27.5	16.66	30.89	244	6	P	V
	*	2452	86.34	-	-	73.07	27.5	16.66	30.89	244	6	A	V
		2485.65	58.24	-15.76	74	44.98	27.43	16.71	30.88	244	6	P	V
		2484.53	50.79	-3.21	54	37.53	27.43	16.71	30.88	244	6	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



BT + 802.11n HT40 + LTE Band 41 (Harmonic @ 3m)

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)
BT CH 78 2480MHz + 802.11n HT40 CH 09 2452MHz + LTE Band 41		4904	40.92	-33.08	74	58.92	31.02	10.12	59.14	100	0	P	H
		4960	40.57	-33.43	74	58.36	31.22	10.17	59.18	100	0	P	H
		7356	46.22	-27.78	74	56.08	36.3	12.34	58.5	100	0	P	H
		7440	47.01	-26.99	74	56.7	36.3	12.39	58.38	100	0	P	H
		18000	60.81	-13.19	74	50.82	49	18.89	57.9	100	254	P	H
		18000	50.01	-3.99	54	40.02	49	18.89	57.9	100	254	A	H
		4904	39.76	-34.24	74	57.76	31.02	10.12	59.14	100	0	P	V
		4960	40.13	-33.87	74	57.92	31.22	10.17	59.18	100	0	P	V
		7356	46.27	-27.73	74	56.13	36.3	12.34	58.5	100	0	P	V
		7440	47.29	-26.71	74	56.98	36.3	12.39	58.38	100	0	P	V
		17985	59.72	-14.28	74	50.03	48.73	18.88	57.92	100	32	P	V
		17985	49.59	-4.41	54	39.9	48.73	18.88	57.92	100	32	A	V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												

**Emission above 18GHz****BT + 802.11n HT40 + LTE Band 41 (SHF)**

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)
BT CH 78 2480MHz + 802.11n HT40 CH 09 2452MHz + LTE Band 41		22352	40.21	-33.79	74	43.62	38.89	12.26	54.56	150	0	P	H
													H
													H
													H
													H
													H
		23032	40.37	-33.63	74	43.39	38.61	12.46	54.09	150	0	P	V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

BT + 802.11n HT40 + LTE Band 41 (LF)

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)
BT CH 78 2480MHz + 802.11n HT40 CH 09 2452MHz + LTE Band 41		67.83	33.91	-6.09	40	52.78	12.54	1.13	32.54	300	31	Q	H
		122.15	32.38	-11.12	43.5	45.67	17.68	1.57	32.54	-	-	P	H
		176.47	37.68	-5.82	43.5	52.85	15.39	1.92	32.48	122	198	Q	H
		285.11	40.49	-5.51	46	51.88	18.71	2.36	32.46	112	139	Q	H
		714.82	38	-8	46	40.2	26.62	3.63	32.45	-	-	P	H
		892.33	37.88	-8.12	46	36.88	28.53	4.14	31.67	-	-	P	H
													H
		40.67	34.07	-5.93	40	46.7	19.11	0.82	32.56	100	322	Q	V
		94.99	35.8	-7.7	43.5	51.38	15.52	1.38	32.48	100	200	Q	V
		176.47	35.7	-7.8	43.5	50.87	15.39	1.92	32.48	100	15	Q	V
		298.69	32.9	-13.1	46	43.92	19.08	2.39	32.49	-	-	P	V
		714.82	37.71	-8.29	46	39.91	26.62	3.63	32.45	-	-	P	V
		897.18	37.57	-8.43	46	36.49	28.57	4.15	31.64	-	-	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:

	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		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”.



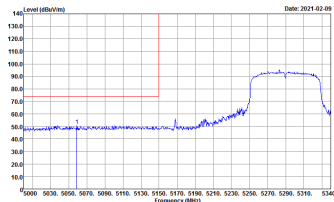
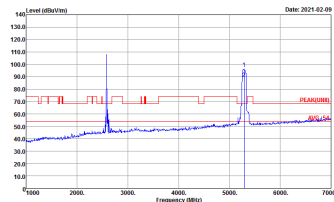
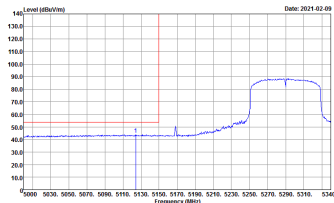
Appendix B. Radiated Spurious Emission Plots

Test Engineer :	Leo Lee, Mancy Chou and Bigshow Wang	Temperature :	22.1~23.1℃
		Relative Humidity :	55~60%

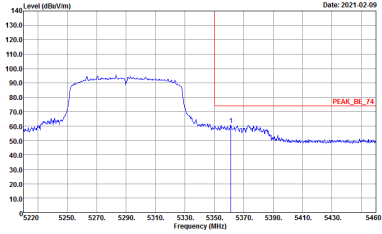
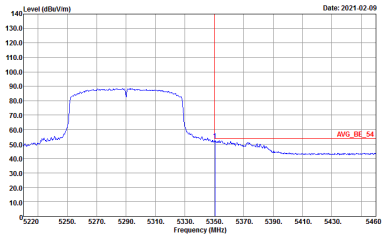
Note symbol

-L	Low channel location
-R	High channel location

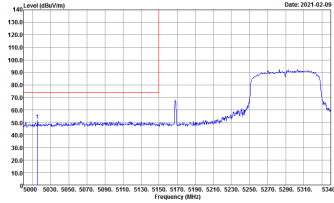
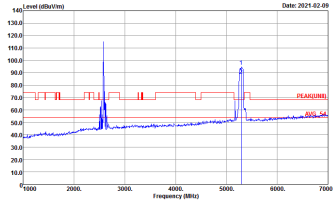
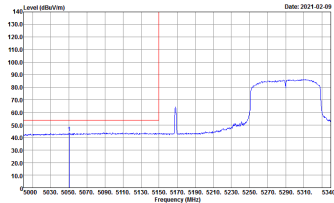
<Sample 1>
WLAN5G 802.11ac VHT80 + LTE Band 41 (Band edge @ 3m)

ANT	11ac VHT80 Ch58 + LTE Band 41 - L	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH5-HY Condition : PEAK_BE_74 3m 91200_15_1620 HORIZONTAL : RBW:3000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH5-HY Condition : PEAK(FUND) 3m 91200_15_1620 HORIZONTAL : RBW:3000.000kHz VBW:3000.000kHz SWT:Auto
Avg.	 Site : 03CH5-HY Condition : AVG_BE_54 3m 91200_15_1620 HORIZONTAL : RBW:3000.000kHz VBW:10.000kHz SWT:Auto	

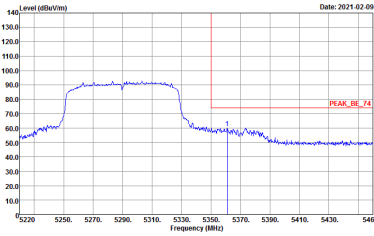
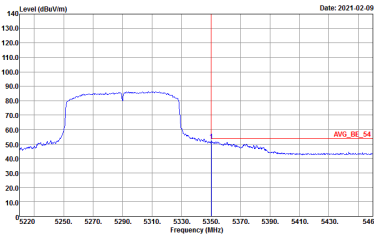


ANT	11ac VHT80 Ch58 + LTE Band 41 - R	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left Blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 HORIZONTAL : RBW:1000.000KHz VBW:10.000KHz SWT:Auto	Left Blank



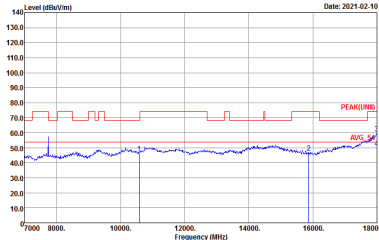
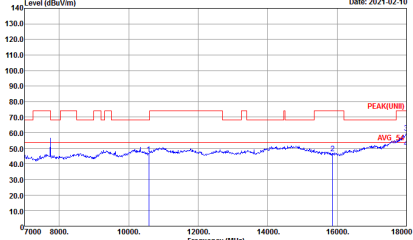
ANT	11ac VHT80 Ch58 + LTE Band 41 - L	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH15-HY Condition : PEAK(LINE1) 3m 91200_15_1620 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 VERTICAL : RBW:1000.000KHz VBW:10.000KHz SWT:Auto	Left blank



ANT	11ac VHT80 Ch58 + LTE Band 41- R	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	Left Blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 VERTICAL : RBW:1000.000kHz VBW:10.000kHz SWT:Auto	Left Blank



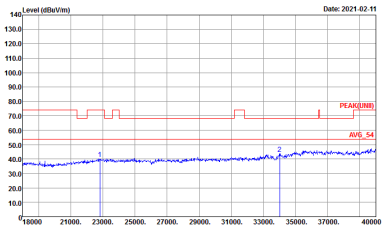
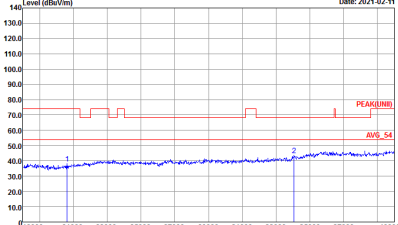
WLAN5G 802.11ac VHT80 + LTE Band 41 (Harmonic @ 3m)

ANT	11ac VHT80 Ch58 + LTE Band 41	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m 91200_15_1620 HORIZONTAL	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m 91200_15_1620 VERTICAL



Emission above 18GHz

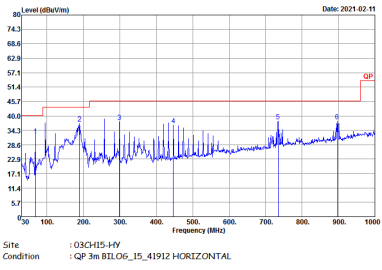
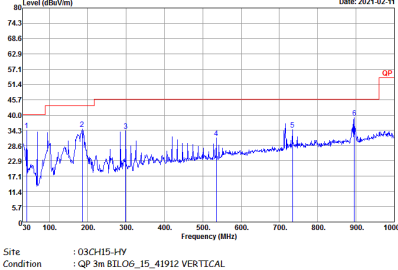
WLAN5G 802.11ac VHT80 + LTE Band 41 (SHF)

ANT	11ac VHT80 Ch58 + LTE Band 41	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH16-HY Condition : PEAK(UNIT) 1m SHF HORN BBHA9170576 HORIZONTAL	 Site : 03CH16-HY Condition : PEAK(UNIT) 1m SHF HORN BBHA9170576 VERTICAL



Emission below 1GHz

WLAN5G 802.11ac VHT80 + LTE Band 41 (LF)

ANT	11ac VHT80 Ch58 + LTE Band 41	
Simultaneously	Horizontal	Vertical
QP / Peak		



<Sample 2>

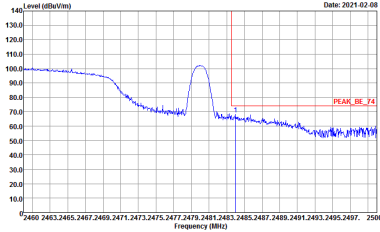
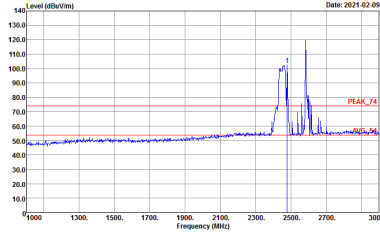
2.4GHz 2400~2483.5MHz

BT + 802.11n HT40 + LTE Band 41

BT (Band Edge @ 3m)

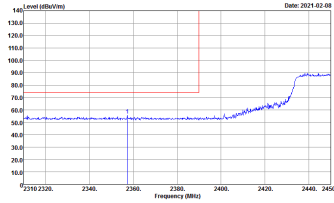
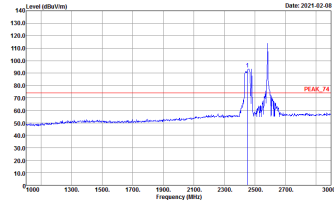
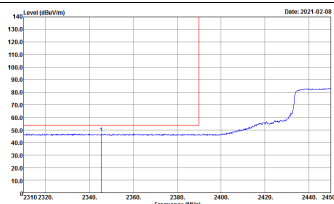
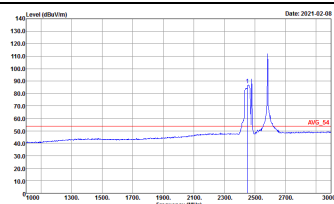
ANT	BT Ch78 + 11n 40 Ch09 + LTE Band 41 - L	
Simultaneously	Horizontal	Fundamental
Peak	Site : 03CH15-HV Condition : PEAK_BE_74 3m 91200_15_1620 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Site : 03CH15-HV Condition : PEAK_74 3m 91200_15_1620 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto



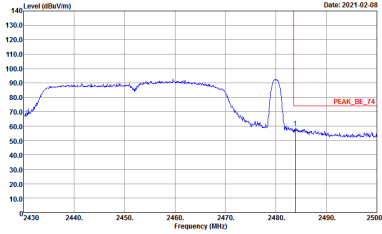
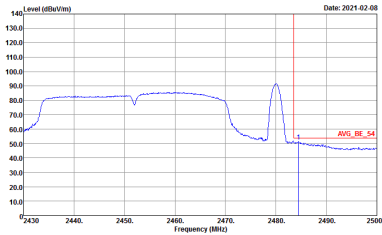
ANT	BT Ch78 + 11n 40 Ch09 + LTE Band 41 - L	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_RE_74 3m 91200_15_1620 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH15-HY Condition : PEAK_74 3m 91200_15_1620 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto



WLAN (Band Edge @ 3m)

ANT	BT Ch78 + 11n 40 Ch09 + LTE Band 41 - L	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH15-HY Condition : PEAK_74 3m 91200_15_1620 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH15-HY Condition : AVG_54 3m 91200_15_1620 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto

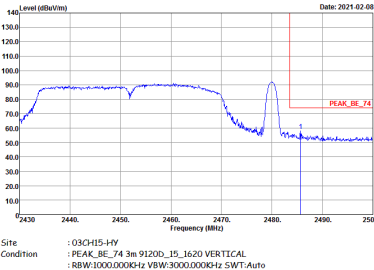
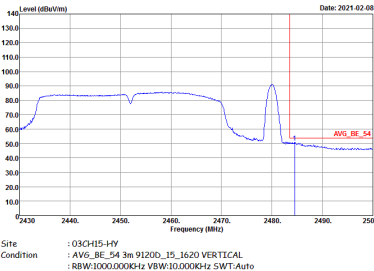


ANT	BT Ch78 + 11n 40 Ch09 + LTE Band 41 - R	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left Blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:10.000KHz SWT:Auto	Left Blank



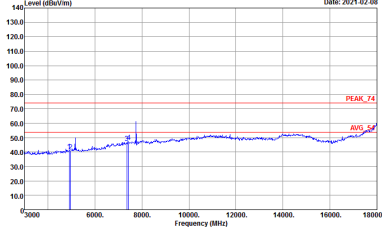
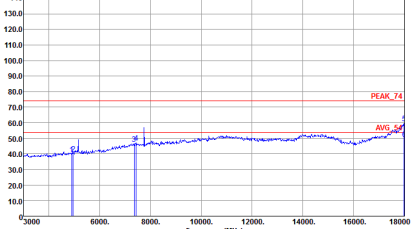
ANT	BT Ch78 + 11n 40 Ch09 + LTE Band 41 - L	
Simultaneously	Vertical	Fundamental
Peak	Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 VERTICAL : RBW:1000.0000Hz VBW:3000.0000Hz SWT:Auto	Site : 03CH15-HY Condition : PEAK_F4 3m 91200_15_1620 VERTICAL : RBW:1000.0000Hz VBW:3000.0000Hz SWT:Auto
Avg.	Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 VERTICAL : RBW:1000.0000Hz VBW:3000.0000Hz SWT:Auto	Site : 03CH15-HY Condition : AVG_F4 3m 91200_15_1620 VERTICAL : RBW:1000.0000Hz VBW:3000.0000Hz SWT:Auto



ANT	BT Ch78 + 11n 40 Ch09 + LTE Band 41 - R	
Simultaneously	Vertical	Fundamental
Peak		Left Blank
Avg.		Left Blank



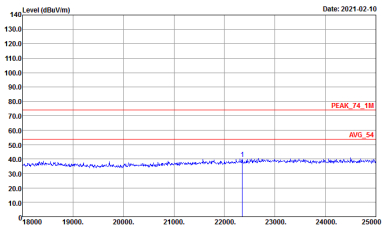
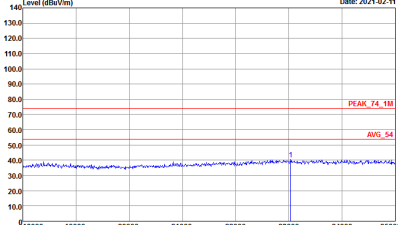
BT + 802.11n HT40 + LTE Band 41 (Harmonic @ 3m)

ANT	BT Ch78 + 11n 40 Ch09 + LTE Band 41	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH15-HY Condition : PEAK_74 3m 91200_15_1620 HORIZONTAL	 Site : 03CH15-HY Condition : PEAK_74 3m 91200_15_1620 VERTICAL



Emission above 18GHz

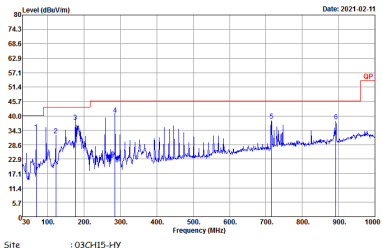
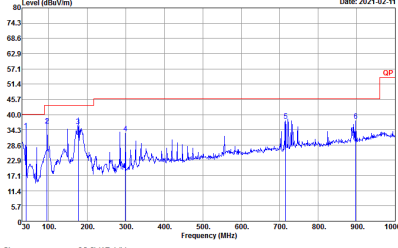
BT + 802.11n HT40 + LTE Band 41 (SHF)

ANT	BT Ch78 + 11n 40 Ch09 + LTE Band 41	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH16-HY Condition : PEAK_74_1M 1m SHF HORN BBH49170576 HORIZONTAL	 Site : 03CH16-HY Condition : PEAK_74_1M 1m SHF HORN BBH49170576 VERTICAL

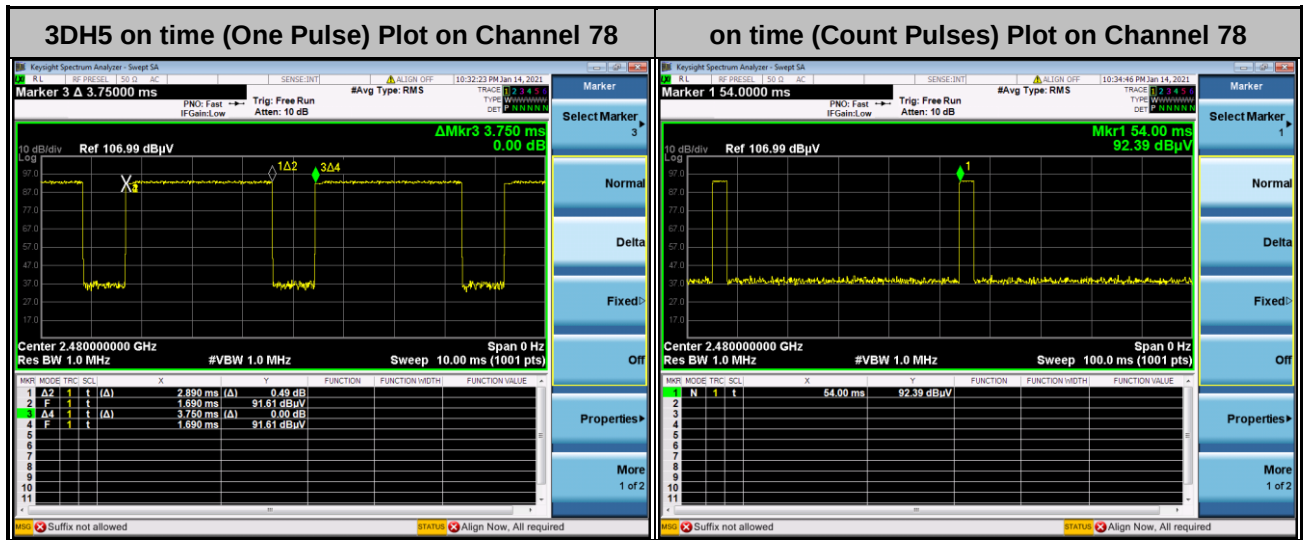


Emission below 1GHz

BT + 802.11n HT40 + LTE Band 41 (LF)

ANT	BT Ch78 + 11n 40 Ch09 + LTE Band 41	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH15-HY Condition : QP 3m B1LO6_15_41912 HORIZONTAL	 Site : 03CH15-HY Condition : QP 3m B1LO6_15_41912 VERTICAL

Appendix C. Duty Cycle Plots



Note:

1. Worst case Duty cycle = on time/100 milliseconds = $2 \times 2.89 / 100 = 5.78 \%$
2. Worst case Duty cycle correction factor = $20 \times \log(\text{Duty cycle}) = -24.76 \text{ dB}$
3. **3DH5** has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the period to have DH5 packet completing one hopping sequence is

$$2.89 \text{ ms} \times 20 \text{ channels} = 57.8 \text{ ms}$$

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. $[100 \text{ ms} / 57.8 \text{ ms}] = 2 \text{ hops}$

Thus, the maximum possible ON time:

$$2.89 \text{ ms} \times 2 = 5.78 \text{ ms}$$

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

$$20 \times \log(5.78 \text{ ms}/100 \text{ ms}) = -24.76 \text{ dB}$$



Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
2.4GHz 802.11n HT40	90.53	938	1.07	3kHz	0.43
5GHz 802.11ac VHT80	90.22	247	4.05	10kHz	0.45

