

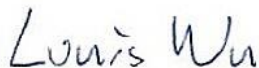


FCC CO-LOCATION RADIO TEST REPORT

FCC ID : 2AFZZ123G
Equipment : Mobile Phone
Brand Name : XIAOMI
Model Name : 2201123G
Applicant : Xiaomi Communications Co., Ltd.
#019, 9th Floor, Building 6, 33 Xi'erqi Middle
Road, Haidian District, Beijing, China, 100085
Manufacturer : Xiaomi Communications Co., Ltd.
#019, 9th Floor, Building 6, 33 Xi'erqi Middle
Road, Haidian District, Beijing, China, 100085
Standard : FCC Part 15 Subpart E §15.407

The product was received on Nov. 15, 2021 and testing was performed from Nov. 22, 2021 and completed on Dec. 08, 2021. We, Sporton International Inc. Wensan 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. Wensan Laboratory, the test report shall not be reproduced except in full.



Approved by: Louis Wu

Sporton International Inc. Wensan Laboratory

No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)



Table of Contents

History of this test report.....	3
Summary of Test Result.....	4
1 General Description	5
1.1 Product Feature of Equipment Under Test.....	5
1.2 Modification of EUT	5
1.3 Testing Location	6
1.4 Applicable Standards.....	6
2 Test Configuration of Equipment Under Test	7
2.1 Carrier Frequency and Channel	7
2.2 Test Mode.....	7
2.3 Connection Diagram of Test System.....	8
2.4 Support Unit used in test configuration and system	8
2.5 EUT Operation Test Setup	8
3 Test Result	9
3.1 Unwanted Emissions Measurement	9
3.2 Antenna Requirements.....	14
4 List of Measuring Equipment.....	15
5 Uncertainty of Evaluation	16
Appendix A. Radiated Spurious Emission	
Appendix B. Radiated Spurious Emission Plots	
Appendix C. Duty Cycle Plots	
Appendix D. Setup Photographs	



History of this test report

Report No.	Version	Description	Issued Date
FR1N0901G	01	Initial issue of report	Dec. 20, 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 3.08 dB at 2390.000 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: Lewis Ho

Report Producer: Tina Chuang

1 General Description

1.1 Product Feature of Equipment Under Test

GSM/ WCDMA/LTE/5G NR, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ax, Wi-Fi 5GHz 802.11a/n/ac/ax, Wi-Fi 6GHz 802.11ax, NFC, WPC/WPT, and GNSS.

Product Feature	
Sample 1	EMMC 8G + 256GB
Sample 2	EMMC 12G + 256GB
Sample 3	EMMC 8G + 128GB
Antenna Type	WWAN: PIFA Antenna WLAN 2.4GHz: <Ant. 16>: PIFA Antenna <Ant. 18>: PIFA Antenna WLAN 5GHz: <Ant. 17>: PIFA Antenna <Ant. 18>: PIFA Antenna WLAN 6GHz: <Ant. 17>: PIFA Antenna <Ant. 18>: PIFA Antenna Bluetooth: <Ant. 16>: PIFA Antenna <Ant. 18>: PIFA Antenna GPS/Glonass/BDS/Galileo/SBAS/QZSS : PIFA Antenna NFC: Planar Antenna WPC/WPT: Coil Antenna

Antenna information		
2400 MHz ~ 2483.5 MHz (Bluetooth)	Peak Gain (dBi)	<Ant. 16>: -2.5 <Ant. 18>: -3.0
2400 MHz ~ 2483.5 MHz (WLAN)	Peak Gain (dBi)	<Ant. 16>: -2.5 <Ant. 18>: -3.0
5250 MHz ~ 5350 MHz	Peak Gain (dBi)	<Ant. 17>: -2.5 <Ant. 18>: -5.0

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

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. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	Sporton Site No. 03CH20-HY

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

FCC designation No.: TW3786

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 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.
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ 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

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 Bluetooth		2400-2483.5 MHz 802.11ax HE40		5250~5350 MHz 802.11ax HE20	
Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
78	2480	03	2422	64	5320

2.2 Test Mode

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

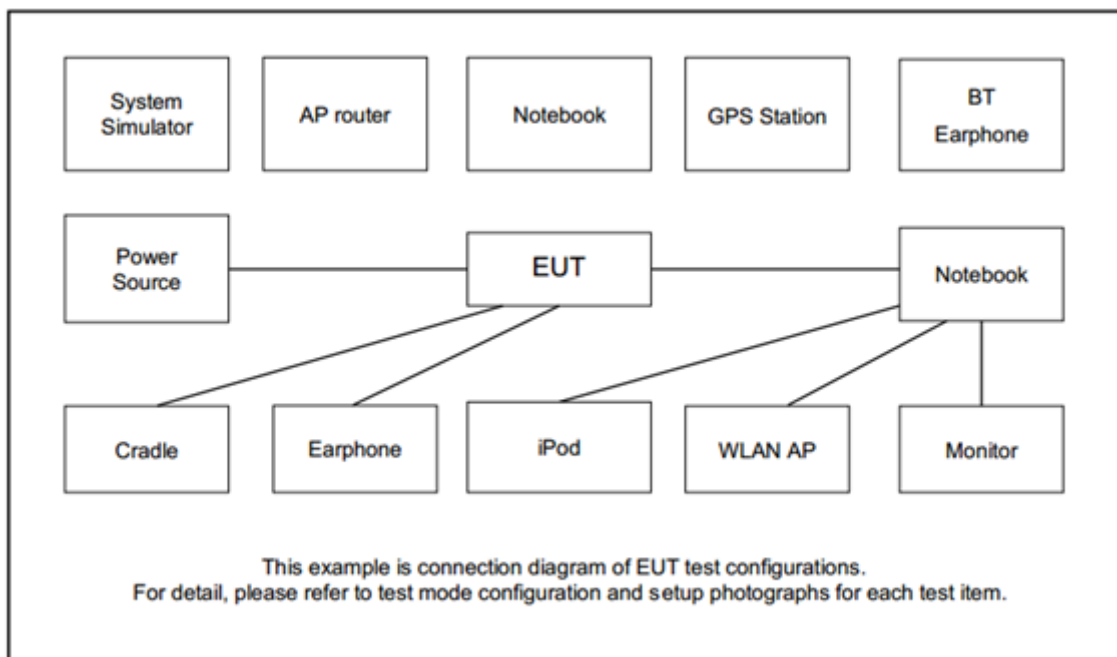
<Co-Location>

Modulation	Data Rate
2.4GHz 802.11ax HE40 for MIMO <Ant. 16 + 18> 5GHz 802.11ax HE20 for <MIMO Ant. 17+18> + LTE Band 7	MCS0 + MCS0 + QPSK
Bluetooth for Ant. 16 + 5GHz 802.11ax HE20 for <MIMO Ant. 17+18> + LTE Band 7	1Mbps + MCS0 + QPSK
Bluetooth for Ant. 18 + 5GHz 802.11ax HE20 for <MIMO Ant. 17+18> + LTE Band 7	1Mbps + MCS0 + QPSK

Remark:

1. For Radiated Test Cases, the tests were performed with USB Cable 1 and Sample 1.
2. During the Radiated Spurious Emission test, the EUT turn on the WWAN functions simultaneously, the WWAN mode selected the frequency band with the closest transmission frequency and used the WLAN worst case output power.

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.	Notebook	DELL	Latitude5310	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
2.	Bluetooth Base Station	R&S	CBT32	N/A	N/A	Unshielded, 1.8 m
3.	System Simulator	R&S	MT8821C	N/A	N/A	Unshielded, 1.8 m

2.5 EUT Operation Test Setup

For Bluetooth test items, utility “QRCT 4 Version 4.0.00196.0” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to contact with base station to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

For WLAN test items, EUT (SW: MIUI13) 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.

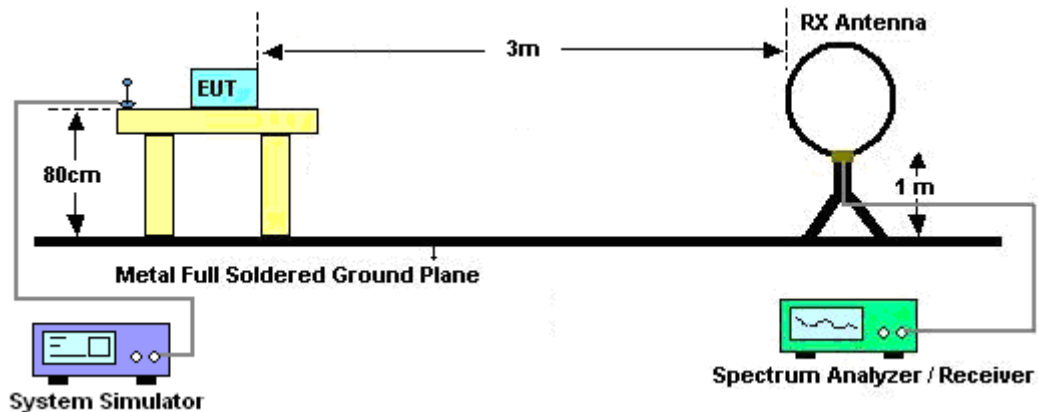
3.1.2 Test Procedures

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 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.

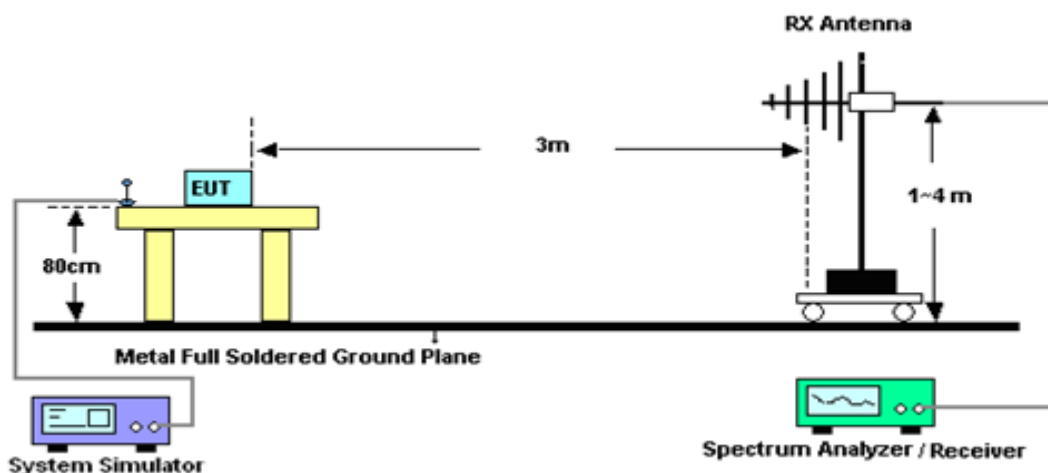
7. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as “-”.
8. 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 “-”.

3.1.3 Test Setup

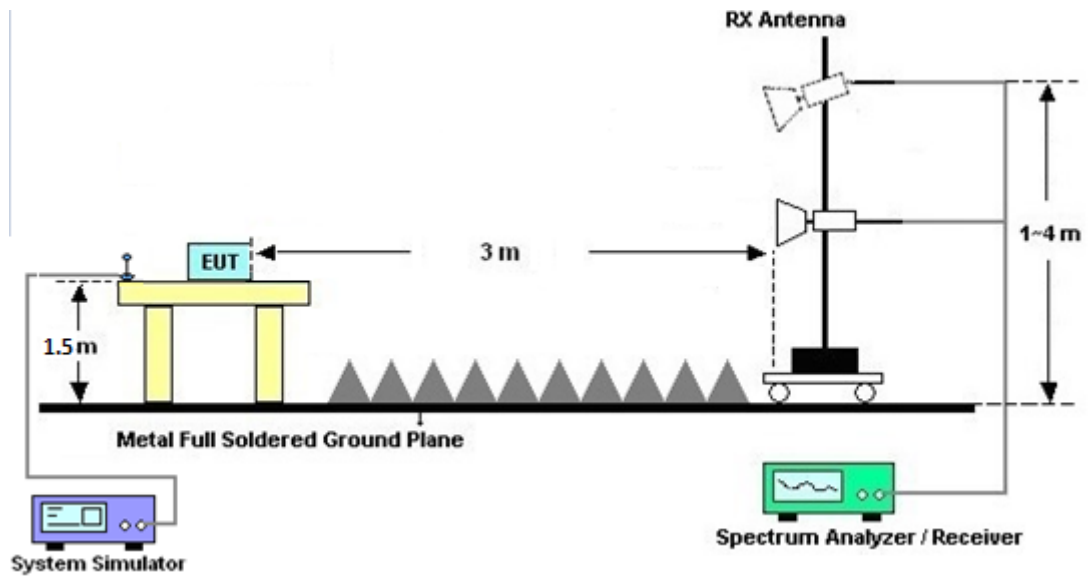
For radiated emissions below 30MHz



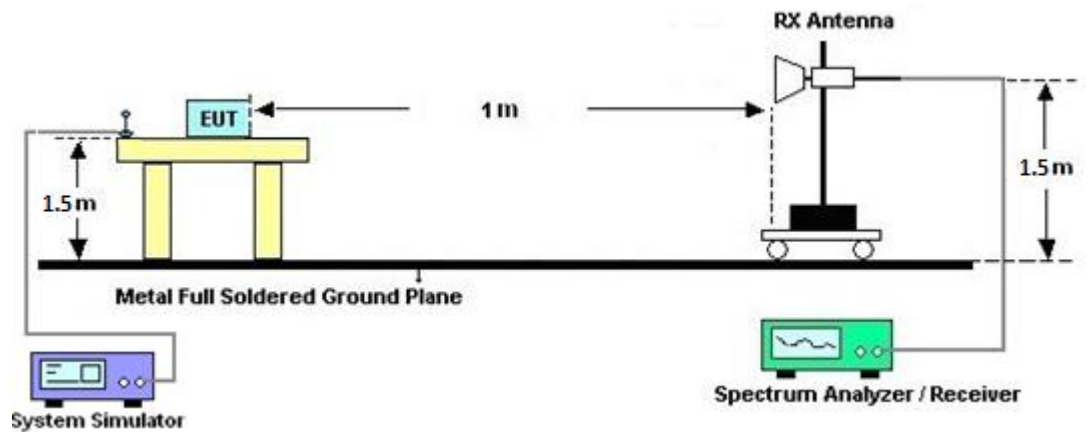
For radiated emissions from 30MHz to 1GHz



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 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.

3.1.5 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
EMI Test Receiver	Keysight	N9010B	MY60241055	10Hz~44GHz	Jul. 12, 2021	Nov. 22, 2021~Dec. 08, 2021	Jul. 11, 2022	Radiation (03CH20-HY)
Preamplifier	COM-POWER	PAM-103	18020201	1MHz-1000MHz	Jan. 04, 2021	Nov. 22, 2021~Dec. 08, 2021	Jan. 03, 2022	Radiation (03CH20-HY)
Amplifier	EMCI	EMC118A45SE	980792	N/A	Nov. 15, 2021	Nov. 22, 2021~Dec. 08, 2021	Nov. 14, 2022	Radiation (03CH20-HY)
Preamplifier	EMEC	EM18G40G	060801	18GHz~40GHz	Jun. 22, 2021	Nov. 22, 2021~Dec. 08, 2021	Jun. 21, 2022	Radiation (03CH20-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Jan. 04, 2021	Nov. 22, 2021~Dec. 08, 2021	Jan. 03, 2022	Radiation (03CH20-HY)
Bilog Antenna	TESEQ	CBL 6111D&00802 N1D01N-06	55606 & 08	30MHz~1GHz	Oct. 17, 2021	Nov. 22, 2021~Dec. 08, 2021	Oct. 16, 2022	Radiation (03CH20-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-02294	1GHz~18GHz	Jun. 23, 2021	Nov. 22, 2021~Dec. 08, 2021	Jun. 22, 2022	Radiation (03CH20-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA9170	00991	18GHz-40GHz	May 12, 2021	Nov. 22, 2021~Dec. 08, 2021	May 11, 2022	Radiation (03CH20-HY)
Hygrometer	TECPEL	DTM-303B	TP200728	N/A	Mar. 09, 2021	Nov. 22, 2021~Dec. 08, 2021	Mar. 08, 2022	Radiation (03CH20-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	519229/2,804015/2,804027/2	N/A	Jan. 20, 2021	Nov. 22, 2021~Dec. 08, 2021	Jan. 19, 2022	Radiation (03CH20-HY)
1.53GHz Low Pass Filter	Wainwright	WLK4-1000-1530-8000-40SS	SN27	N/A	May 25, 2021	Nov. 22, 2021~Dec. 08, 2021	May 24, 2022	Radiation (03CH20-HY)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN8	N/A	Mar. 26, 2021	Nov. 22, 2021~Dec. 08, 2021	Mar. 25, 2022	Radiation (03CH20-HY)
Filter	Wainwright	WHKX8-6090-7000-18000-40SS	SN99	N/A	Nov. 04, 2021	Nov. 22, 2021~Dec. 08, 2021	Nov. 03, 2022	Radiation (03CH20-HY)
Filter	Wainwright	WRCQV14-5425-5825-6525-6925-60SS	SN2	N/A	Jan. 08, 2021	Nov. 22, 2021~Dec. 08, 2021	Jan. 07, 2022	Radiation (03CH20-HY)
Filter	Wainwright	WRCQV14-6025-6425-7125-7525-60SS	SN1	N/A	Jan. 08, 2021	Nov. 22, 2021~Dec. 08, 2021	Jan. 07, 2022	Radiation (03CH20-HY)
Filter	Wainwright	WHW2-7100-10000-18000-40CC	SN3	N/A	May 25, 2021	Nov. 22, 2021~Dec. 08, 2021	May 24, 2022	Radiation (03CH20-HY)
Software	Audix	E3 6.2009-8-24	RK-002156	N/A	N/A	Nov. 22, 2021~Dec. 08, 2021	N/A	Radiation (03CH20-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Nov. 22, 2021~Dec. 08, 2021	N/A	Radiation (03CH20-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Nov. 22, 2021~Dec. 08, 2021	N/A	Radiation (03CH20-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Nov. 22, 2021~Dec. 08, 2021	N/A	Radiation (03CH20-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.9 dB
---	--------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.2 dB
---	--------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.7 dB
---	--------



Appendix A. Radiated Spurious Emission

Test Engineer :	Bill Chang, JC Liang and Nick Yu	Temperature :	18~20°C
		Relative Humidity :	65~68%

MIMO <Ant. 16+18> 802.11ax HE40 CH03 + MIMO <Ant. 17+18> 802.11ax HE20 CH64 + LTE Band 7
2.4GHz 2400~2483.5MHz

MIMO <Ant. 16+18> WIFI 802.11ax HE40 (Band Edge @ 3m)

WIFI Ant. 16+18	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)	Chain Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802. 11ax HE40 CH03 2422MHz		2389.84	61.1	-12.9	74	51.69	27.26	18.42	36.27	112	284	P	H
		2390	50.92	-3.08	54	41.51	27.26	18.42	36.27	112	284	A	H
	*	2422	106.83	-	-	97.25	27.39	18.48	36.29	112	284	P	H
	*	2422	97.69	-	-	88.11	27.39	18.48	36.29	112	284	A	H
		2499.12	58.82	-15.18	74	48.83	27.7	18.61	36.32	112	284	P	H
		2500	45.94	-8.06	54	35.94	27.7	18.62	36.32	112	284	A	H
		2389.52	59.46	-14.54	74	50.05	27.26	18.42	36.27	365	46	P	V
		2390	48.86	-5.14	54	39.45	27.26	18.42	36.27	365	46	A	V
	*	2422	106.62	-	-	97.04	27.39	18.48	36.29	365	46	P	V
	*	2422	97.14	-	-	87.56	27.39	18.48	36.29	365	46	A	V
		2499.52	52.29	-21.71	74	42.3	27.7	18.61	36.32	365	46	P	V
		2500	40.66	-13.34	54	30.66	27.7	18.62	36.32	365	46	A	V



Band 2 - 5250~5350MHz

MIMO <Ant. 17+18> WIFI 802. 11ax HE20 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Chain	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
17+18		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802. 11ax HE20 CH64 5320MHz	*	5320	113.09	-	-	105.28	32.88	12.74	37.81	100	118	P	H
	*	5320	103.63	-	-	95.82	32.88	12.74	37.81	100	118	A	H
		5355.68	59.61	-14.39	74	51.93	32.72	12.78	37.82	100	118	P	H
		5437.28	47.65	-6.35	54	39.74	32.9	12.86	37.85	100	118	A	H
													H
													H
	*	5320	108.16	-	-	100.35	32.88	12.74	37.81	384	59	P	V
	*	5320	98.63	-	-	90.82	32.88	12.74	37.81	384	59	A	V
		5350.4	57.03	-16.97	74	49.38	32.7	12.77	37.82	384	59	P	V
		5350.08	46.94	-7.06	54	39.29	32.7	12.77	37.82	384	59	A	V
													V
													V



MIMO <Ant. 16+18> 802.11ax HE40 CH03 + MIMO <Ant. 17+18> 802.11ax HE20 CH64 + LTE Band 7

(Harmonic @ 3m)

WIFI	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)	Chain Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE40 CH03 2422MHz +		4844	47.27	-26.73	74	40.2	32.38	12.26	37.57	-	-	P	H
		7266	47.88	-26.12	74	33.48	36.94	15.95	38.49	-	-	P	H
		10640	49.17	-24.83	74	33.38	38.84	18.67	41.72	100	258	P	H
		10640	40.35	-13.65	54	24.56	38.84	18.67	41.72	100	258	A	H
		15960	50.38	-23.62	74	33.78	37.52	23.46	44.38	100	147	P	H
		15960	40.84	-13.16	54	24.24	37.52	23.46	44.38	100	147	A	H
													H
													H
		4844	44.86	-29.14	74	37.79	32.38	12.26	37.57	-	-	P	V
		7266	47.93	-26.07	74	33.53	36.94	15.95	38.49	-	-	P	V
5320MHz +		10640	49.78	-24.22	74	33.99	38.84	18.67	41.72	255	21	P	V
		10640	39.92	-14.08	54	24.13	38.84	18.67	41.72	255	21	A	V
		15960	49.84	-24.16	74	33.24	37.52	23.46	44.38	284	33	P	V
		15960	40.69	-13.31	54	24.09	37.52	23.46	44.38	284	33	A	V
													V
LTE Band 7 CH21100 2535MHz													V
													V



Ant. 16_BT_CH78 + MIMO <Ant. 17+18> 802.11ax HE20 CH64 + LTE Band 7

2.4GHz 2400~2483.5MHz

Ant. 16_BT_CH78 (Band Edge @ 3m)

BT Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Chain Pos	Table Pos	Peak Avg.	Pol.
16		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH78 2480MHz	*	2480	105.66	-	-	105.8	27.62	8.55	36.31	100	288	P	H
	*	2480	80.88	-	-	-	-	-	-	-	-	A	H
		2499.44	62.23	-11.77	74	62.27	27.7	8.58	36.32	100	288	P	H
		2499.44	37.45	-16.55	54	-	-	-	-	-	-	A	H
													H
													H
	*	2480	100.19	-	-	100.33	27.62	8.55	36.31	385	117	P	V
	*	2480	75.41	-	-	-	-	-	-	-	-	A	V
		2496.4	51.25	-22.75	74	51.3	27.69	8.58	36.32	385	117	P	V
		2496.4	26.47	-27.53	54	-	-	-	-	-	-	A	V
													V
													V



Band 2 - 5250~5350MHz

MIMO <Ant. 17+18> WIFI 802. 11ax HE20 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Chain	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
17+18		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802. 11ax HE20 CH64 5320MHz	*	5320	108.49	-	-	100.68	32.88	12.74	37.81	100	114	P	H
	*	5320	98.92	-	-	91.11	32.88	12.74	37.81	100	114	A	H
		5350.4	55.51	-18.49	74	47.86	32.7	12.77	37.82	100	114	P	H
		5350.08	45.03	-8.97	54	37.38	32.7	12.77	37.82	100	114	A	H
												P	H
												A	H
	*	5320	108.09	-	-	100.28	32.88	12.74	37.81	391	96	P	V
	*	5320	98.19	-	-	90.38	32.88	12.74	37.81	391	96	A	V
		5350.56	54.47	-19.53	74	46.82	32.7	12.77	37.82	391	96	P	V
		5350.08	44.23	-9.77	54	36.58	32.7	12.77	37.82	391	96	A	V
												P	V
												A	V



Ant. 16_BT_CH78 + MIMO <Ant. 17+18> 802.11ax HE20 CH64 + LTE Band 7

(Harmonic @ 3m)

BT+WIFI	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)	Chain Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BT_Tx CH78 2480MHz + 802.11ax HE20 CH64 5320MHz + LTE Band 7 CH21100 2535MHz		4960	47.21	-26.79	74	39.5	33.02	12.35	37.66	-	-	P	H
		4960	22.43	-31.57	54	-	-	-	-	-	-	A	H
		7440	47.06	-26.94	74	33.52	36.22	15.95	38.63			P	H
		7440	22.28	-31.72	54	-	-	-	-	-	-	A	H
		10640	49.54	-24.46	74	33.75	38.84	18.67	41.72	125	145	P	H
		10640	40.13	-13.87	54	24.34	38.84	18.67	41.72	125	145	A	H
		15960	48.72	-25.28	74	32.12	37.52	23.46	44.38	100	148	P	H
		15960	40.88	-13.12	54	24.28	37.52	23.46	44.38	100	148	A	H
		4960	47.01	-26.99	74	39.3	33.02	12.35	37.66			P	V
		4960	22.23	-31.77	54	-	-	-	-	-	-	A	V
		7440	46.76	-27.24	74	33.22	36.22	15.95	38.63			P	V
		7440	21.98	-32.02	54	-	-	-	-	-	-	A	V
		10640	48.73	-25.27	74	32.94	38.84	18.67	41.72	355	148	P	V
		10640	39.92	-14.08	54	24.13	38.84	18.67	41.72	355	148	A	V
		15960	49.3	-24.7	74	32.7	37.52	23.46	44.38	322	258	P	V
		15960	40.96	-13.04	54	24.36	37.52	23.46	44.38	322	258	A	V

**Ant. 18_BT_CH78 + MIMO <Ant. 17+18> 802.11ax HE20 CH64 + LTE Band 7****2.4GHz 2400~2483.5MHz****Ant. 18_BT_CH78 (Band Edge @ 3m)**

BT Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Chain Pos	Table Pos	Peak Avg.	Pol.
18		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH78 2480MHz	*	2480	105.87	-	-	106.01	27.62	8.55	36.31	265	288	P	H
	*	2480	81.08	-	-	-	-	-	-	-	-	A	H
		2499.52	56.25	-17.75	74	56.29	27.7	8.58	36.32	265	288	P	H
		2499.52	31.46	-22.54	54	-	-	-	-	-	-	A	H
													H
													H
	*	2480	102.49	-	-	102.63	27.62	8.55	36.31	381	11	P	V
	*	2480	77.7	-	-	-	-	-	-	-	-	A	V
		2499.56	58.9	-15.1	74	58.94	27.7	8.58	36.32	381	11	P	V
		2499.56	34.11	-19.89	54	-	-	-	-	-	-	A	V
													V
													V



Band 2 - 5250~5350MHz

MIMO <Ant. 17+18> WIFI 802. 11ax HE20 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Chain	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
17+18		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802. 11ax HE20 CH64 5320MHz	*	5320	109.47	-	-	101.66	32.88	12.74	37.81	100	115	P	H
	*	5320	99.24	-	-	91.43	32.88	12.74	37.81	100	115	A	H
		5352.32	56.06	-17.94	74	48.4	32.71	12.77	37.82	100	115	P	H
		5350.08	45.65	-8.35	54	38	32.7	12.77	37.82	100	115	A	H
													H
													H
	*	5320	109.58	-	-	101.77	32.88	12.74	37.81	391	86	P	V
	*	5320	98.65	-	-	90.84	32.88	12.74	37.81	391	86	A	V
		5350.24	55.33	-18.67	74	47.68	32.7	12.77	37.82	391	86	P	V
		5350.08	45.07	-8.93	54	37.42	32.7	12.77	37.82	391	86	A	V
													V
													V



Ant. 18_BT_CH78 + MIMO <Ant. 17+18> 802.11ax HE20 CH64 + LTE Band 7

(Harmonic @ 3m)

BT+WIFI	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)	Chain Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BT_Tx CH78 2480MHz + 802.11ax HE20 CH64 5320MHz + LTE Band 7 CH21100 2535MHz		4960	48.92	-25.08	74	41.21	33.02	12.35	37.66	100	123	P	H
		4960	24.13	-29.87	54	-	-	-	-	-	-	A	H
		7440	47.25	-26.75	74	33.71	36.22	15.95	38.63			P	H
		7440	22.46	-31.54	54	-	-	-	-	-	-	A	H
		10640	49.46	-24.54	74	33.67	38.84	18.67	41.72	100	128	P	H
		10640	40.12	-13.88	54	24.33	38.84	18.67	41.72	100	128	A	H
		15960	49.52	-24.48	74	32.92	37.52	23.46	44.38	100	217	P	H
		15960	41.16	-12.84	54	24.56	37.52	23.46	44.38	100	217	A	H
		4960	50.02	-23.98	74	42.31	33.02	12.35	37.66	352	127	P	V
		4960	25.23	-28.77	54	-	-	-	-	-	-	A	V
		7440	47.16	-26.84	74	33.62	36.22	15.95	38.63			P	V
		7440	22.37	-31.63	54	-	-	-	-	-	-	A	V
		10640	49.09	-24.91	74	33.3	38.84	18.67	41.72	255	327	P	V
		10640	40.12	-13.88	54	24.33	38.84	18.67	41.72	255	327	A	V
		15960	49.63	-24.37	74	33.03	37.52	23.46	44.38	322	258	P	V
		15960	41.23	-12.77	54	24.63	37.52	23.46	44.38	322	258	A	V

Emission below 1GHz

MIMO <Ant. 16+18> 802.11ax HE40 CH03 + MIMO <Ant. 17+18> 802.11ax HE20 CH64 + LTE Band 7

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
LF		30.97	22.87	-17.13	40	33.72	23.9	0.97	35.72	-	-	P	H
		150.28	17.86	-25.64	43.5	34.04	17.25	2.13	35.56	-	-	P	H
		265.71	20.58	-25.42	46	33.02	20.05	2.84	35.33	-	-	P	H
		431.58	29.94	-16.06	46	38.34	22.85	3.64	34.89	-	-	P	H
		744.89	31.11	-14.89	46	32.53	27.67	4.82	33.91	-	-	P	H
		942.77	34.44	-11.56	46	31.95	30.08	5.59	33.18	-	-	P	H
													H
													H
													H
													H
													H
													H
		30	24.84	-15.16	40	35.24	24.37	0.95	35.72	-	-	P	V
		55.22	26.36	-13.64	40	48.17	12.65	1.25	35.71	-	-	P	V
		158.04	26.13	-17.37	43.5	42.98	16.51	2.19	35.55	-	-	P	V
		431.58	28.09	-17.91	46	36.49	22.85	3.64	34.89	-	-	P	V
		729.37	34.55	-11.45	46	36.49	27.26	4.76	33.96	-	-	P	V
		885.54	37.8	-8.2	46	37.07	28.7	5.43	33.4	-	-	P	V
													V
													V
													V
													V
													V
													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	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	Chain	Table	Peak	Pol.
Chain.				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 :	Bill Chang, JC Liang and Nick Yu	Temperature :	18~20°C
		Relative Humidity :	65~68%

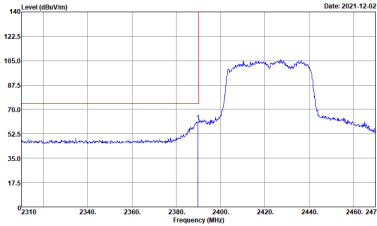
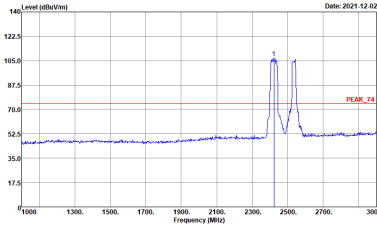
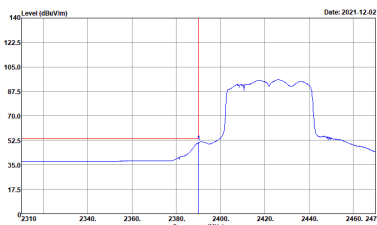
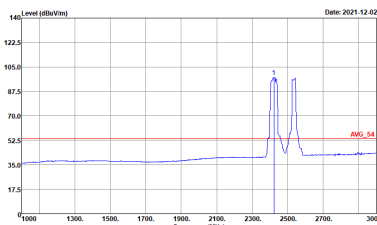
Note symbol

-L	Low channel location
-R	High channel location

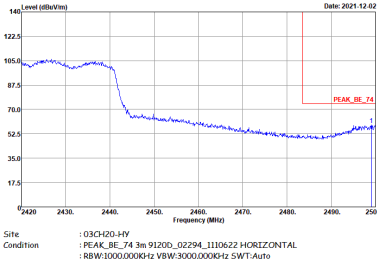
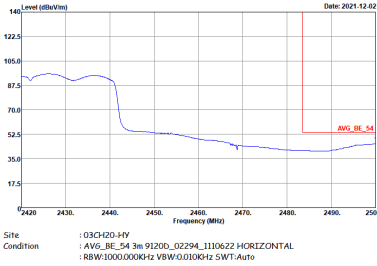


MIMO <Ant. 16+18> 802.11ax HE40 CH03 + MIMO <Ant. 17+18> 802.11ax HE20 CH64 + LTE Band 7
2.4GHz 2400~2483.5MHz

MIMO <Ant. 16+18> WIFI 802.11ax HE40 (Band Edge @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422 - L	
16+18	Horizontal	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 91200_02294_1110622 HORIZONTAL : RBW:1000.000kHz VSW:3000.000kHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK_74 3m 91200_02294_1110622 HORIZONTAL : RBW:1000.000kHz VSW:3000.000kHz SWT:Auto
Avg.	 Site : 03CH20-HY Condition : AVG_BE_54 3m 91200_02294_1110622 HORIZONTAL : RBW:1000.000kHz VSW:1.000kHz SWT:Auto	 Site : 03CH20-HY Condition : AVG_54 3m 91200_02294_1110622 HORIZONTAL : RBW:1000.000kHz VSW:1.000kHz SWT:Auto

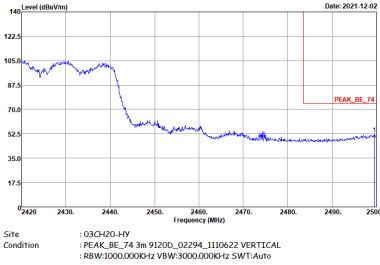
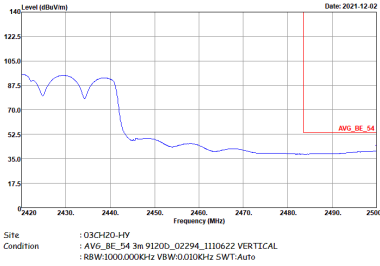


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422 - R	
16+18	Horizontal	Fundamental
Peak	 Site : 03CH20-HV Condition : PEAK_BE_74 3m 91200_02294_1110622 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH20-HV Condition : AVG_BE_54 3m 91200_02294_1110622 HORIZONTAL RBW:1000.000KHz VBW:0.010KHz SWT:Auto	Left blank

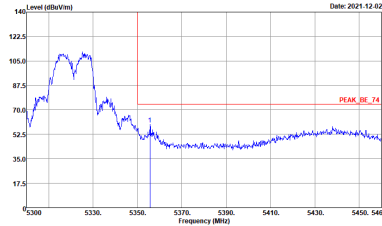
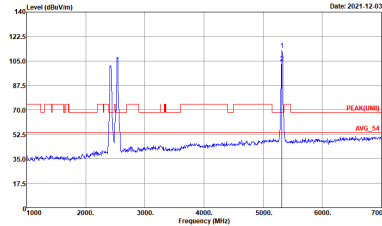
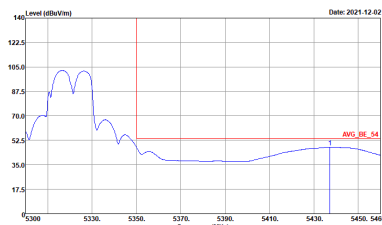


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422 - L	
16+18	Vertical	Fundamental
Peak	Site : 03CH20-HY Condition : PEAK_BE_74 3m 91200_02294_1110622 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Site : 03CH20-HY Condition : PEAK_74 3m 91200_02294_1110622 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	Site : 03CH20-HY Condition : AVG_BE_54 3m 91200_02294_1110622 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	Site : 03CH20-HY Condition : AVG_54 3m 91200_02294_1110622 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

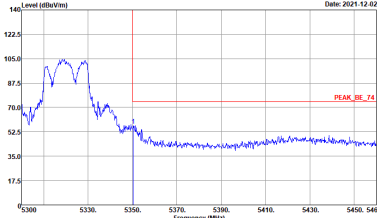
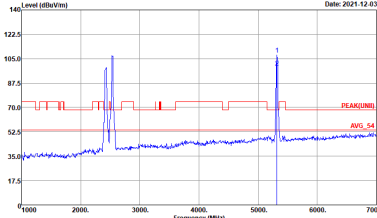
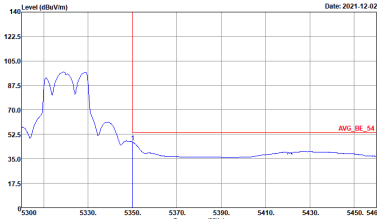


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422 - R	
16+18	Vertical	Fundamental
Peak	 Site : 03CH20-FV Condition : PEAK_BE_74 3m 91200_02294_1110622 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	Left blank
Avg.	 Site : 03CH20-FV Condition : AVG_BE_54 3m 91200_02294_1110622 VERTICAL : RBW:1000.000kHz VBW:0.010kHz SWT:Auto	Left blank

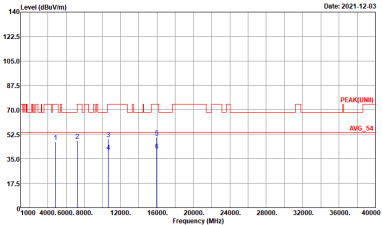
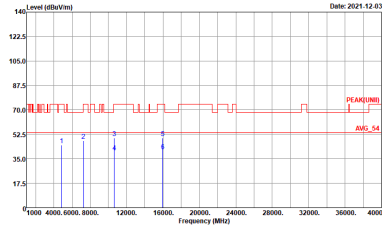
Band 2 - 5250~5350MHz
MIMO <Ant. 17+18> WIFI 802.11ax HE20 Full (Band Edge @ 3m)

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH64 5320	
17+18	Horizontal	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 91200_02294_1110622 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK(LINE) 3m 91200_02294_1110622 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH20-HY Condition : AVG_BE_54 3m 91200_02294_1110622 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	Left blank

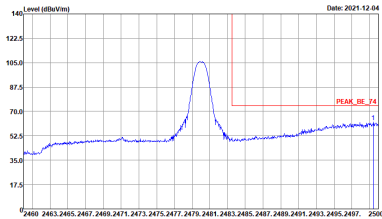
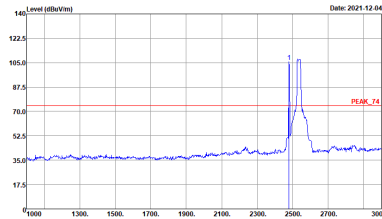


WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH64 5320	
17+18	Vertical	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 91200_02294_1110622 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK(UNIT) 3m 91200_02294_1110622 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto
Avg.	 Site : 03CH20-HY Condition : AVG_BE_54 3m 91200_02294_1110622 VERTICAL : RBW:1000.000kHz VBW:0.010kHz SWT:Auto	Left blank

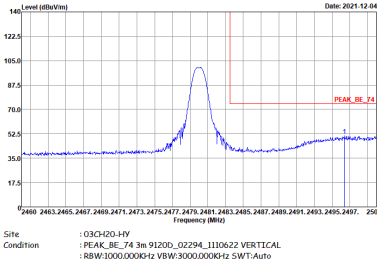
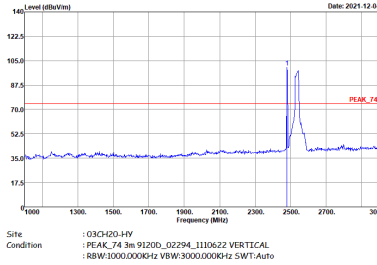
**MIMO <Ant. 16+18> 802.11ax HE40 CH03 + MIMO <Ant. 17+18> 802.11ax HE20 CH64 + LTE Band 7
(Harmonic @ 3m)**

ANT	WIFI 802.11ax HE40_Tx_CH03 + WIFI 802.11ax HE20_Tx_CH64 + LTE Band 7	
16+18 / 17+18	Horizontal	Vertical
Peak Avg.	 Site : 03CH20-HY Condition : PEAK(UNIT) 3m 91200_02294_1110622 HORIZONTAL Detector : Peak	 Site : 03CH20-HY Condition : PEAK(UNIT) 3m 91200_02294_1110622 VERTICAL Detector : Peak

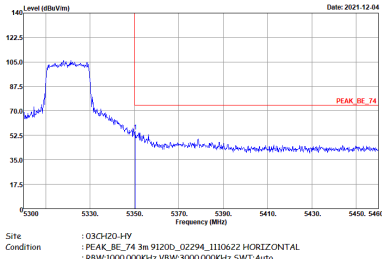
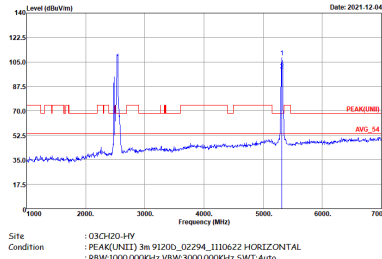
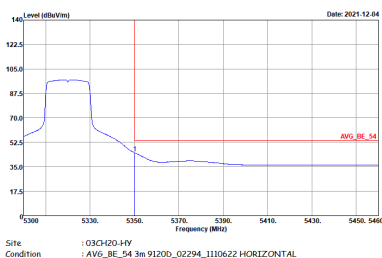
Ant. 16_BT_CH78 + MIMO <Ant. 17+18> 802.11ax HE20 CH64 + LTE Band 7
Ant. 16_BT_CH78 (Band Edge @ 3m)

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
16	Horizontal	Fundamental
Peak	 Site : 03CH20-HV Condition : PEAK_BE_74 3m 91200_02294_1110622 HORIZONTAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH20-HV Condition : PEAK_74 3m 91200_02294_1110622 HORIZONTAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto

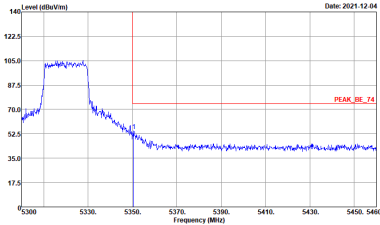
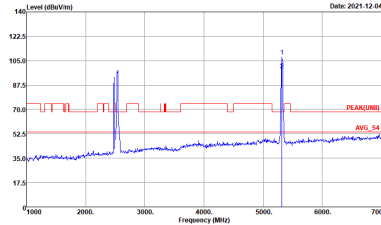
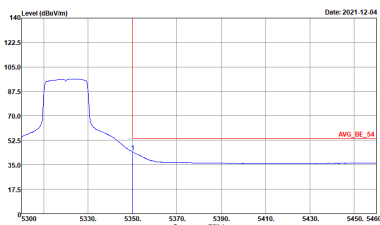


BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
16	Vertical	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 91200_02294_1110622 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK_F4 3m 91200_02294_1110622 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto

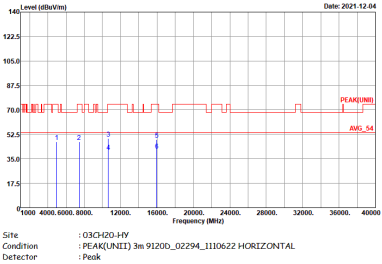
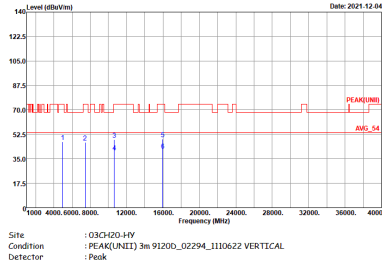
Band 2 - 5250~5350MHz
MIMO <Ant. 17+18> WIFI 802.11ax HE20 Full (Band Edge @ 3m)

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH64 5320	
17+18	Horizontal	Fundamental
Peak		
Avg.		Left blank

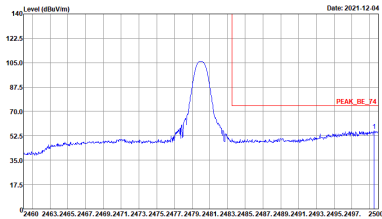
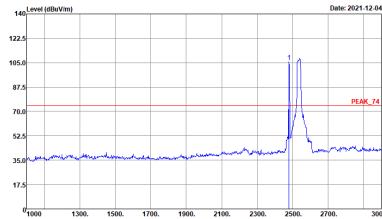


WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH64 5320	
17+18	Vertical	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 91200_02294_1110622 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK(UNIT) 3m 91200_02294_1110622 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto
Avg.	 Site : 03CH20-HY Condition : AVG_BE_54 3m 91200_02294_1110622 VERTICAL : RBW:1000.000kHz VBW:0.010kHz SWT:Auto	Left blank

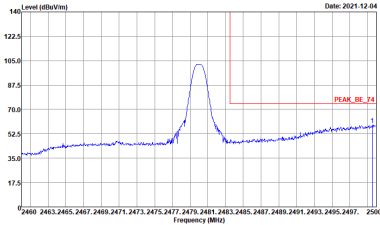
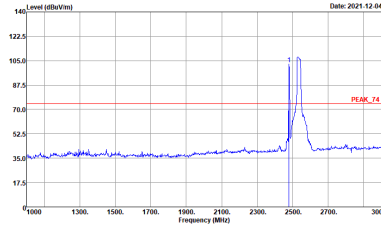
**Ant. 16_BT_CH78 + MIMO <Ant. 17+18> 802.11ax HE20 CH64 + LTE Band 7
(Harmonic @ 3m)**

ANT	BT_Tx_CH78 + WIFI 802.11ax HE20_Tx_CH64 + LTE Band 7	
16 / 17+18	Horizontal	Vertical
Peak Avg.	 Site : 03CH20-HY Condition : PEAK(UNIT) 3m 91200_02294_1110622 HORIZONTAL Detector : Peak	 Site : 03CH20-HY Condition : PEAK(UNIT) 3m 91200_02294_1110622 VERTICAL Detector : Peak

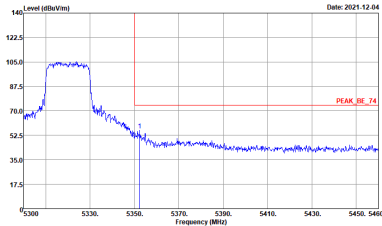
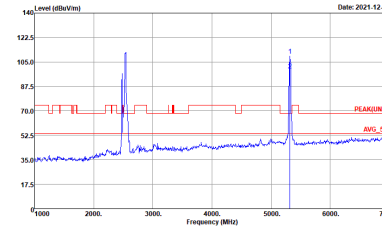
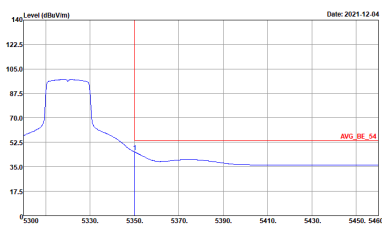
Ant. 18_BT_CH78 + MIMO <Ant. 17+18> 802.11ax HE20 CH64 + LTE Band 7
Ant. 18_BT_CH78 (Band Edge @ 3m)

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
18	Horizontal	Fundamental
Peak	 Site : 03CH20-HV Condition : PEAK_BE_74 3m 91200_02294_1110622 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH20-HV Condition : PEAK_74 3m 91200_02294_1110622 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto

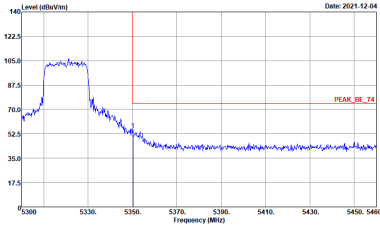
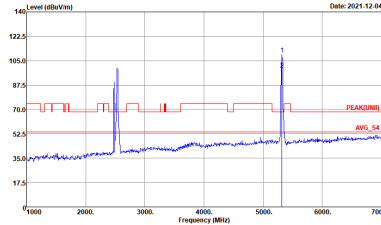
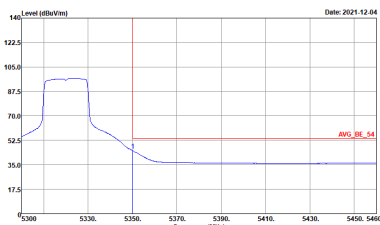


BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
18	Vertical	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 91200_02294_1110622 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK_74 3m 91200_02294_1110622 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto

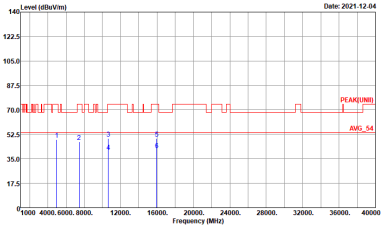
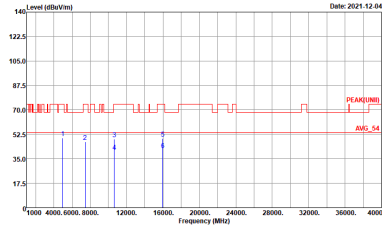
Band 2 - 5250~5350MHz
MIMO <Ant. 17+18> WIFI 802.11ax HE20 Full (Band Edge @ 3m)

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH64 5320	
17+18	Horizontal	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 91200_02294_1110622 HORIZONTAL : RBW:3000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK(LIN1) 3m 91200_02294_1110622 HORIZONTAL : RBW:3000.000kHz VBW:3000.000kHz SWT:Auto
Avg.	 Site : 03CH20-HY Condition : AVG_BE_54 3m 91200_02294_1110622 HORIZONTAL : RBW:3000.000kHz VBW:3000.000kHz SWT:Auto	Left blank

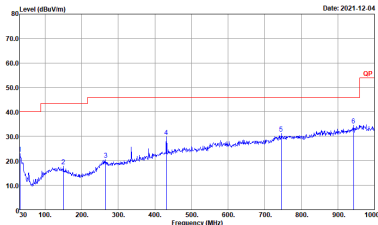
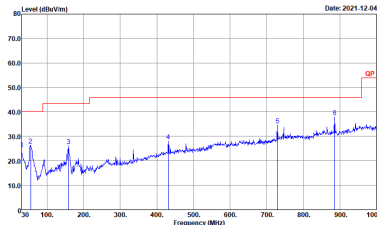


WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ax HE20 Full CH64 5320	
17+18	Vertical	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 91200_02294_1110622 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK(UNIT) 3m 91200_02294_1110622 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto
Avg.	 Site : 03CH20-HY Condition : AVG_BE_54 3m 91200_02294_1110622 VERTICAL : RBW:1000.000kHz VBW:0.010kHz SWT:Auto	Left blank

**Ant. 18_BT_CH78 + MIMO <Ant. 17+18> 802.11ax HE20 CH64 + LTE Band 7
(Harmonic @ 3m)**

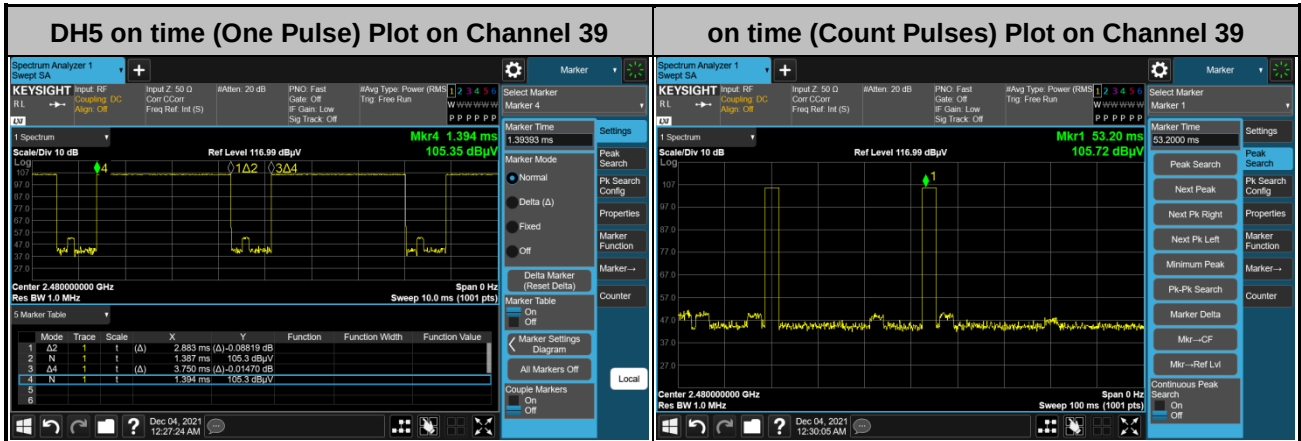
ANT	BT_Tx_CH78 + WIFI 802.11ax HE20_Tx_CH64 + LTE Band 7	
18 / 17+18	Horizontal	Vertical
Peak Avg.	 Site : 03CH20-HY Condition : PEAK(UNII) 3m 91200_02294_1110622 HORIZONTAL Detector : Peak	 Site : 03CH20-HY Condition : PEAK(UNII) 3m 91200_02294_1110622 VERTICAL Detector : Peak

Emission below 1GHz
MIMO <Ant. 16+18> 802.11ax HE40 CH03 + MIMO <Ant. 17+18> 802.11ax HE20 CH64 + LTE Band 7

ANT	WIFI 802.11ax HE40_Tx_CH03 + WIFI 802.11ax HE20_Tx_CH64 + LTE Band 7	
16+18 / 17+18	Horizontal	Vertical
QP / Peak	 Site : 03CH20-HY Condition : QP 3m LF_55606408_1101017 HORIZONTAL Detector : Peak	 Site : 03CH20-HY Condition : QP 3m LF_55606408_1101017 VERTICAL Detector : Peak

Appendix C. Duty Cycle Plots

<Ant. 16>



Note:

1. Worst case Duty cycle = on time/100 milliseconds = $2 \times 2.883 / 100 = 5.767 \%$
2. Worst case Duty cycle correction factor = $20 \times \log(\text{Duty cycle}) = -24.78 \text{ dB}$
3. **DH5** 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 on time period to have DH5 packet completing one hopping sequence is

$$2.883 \text{ ms} \times 20 \text{ channels} = 57.7 \text{ ms}$$

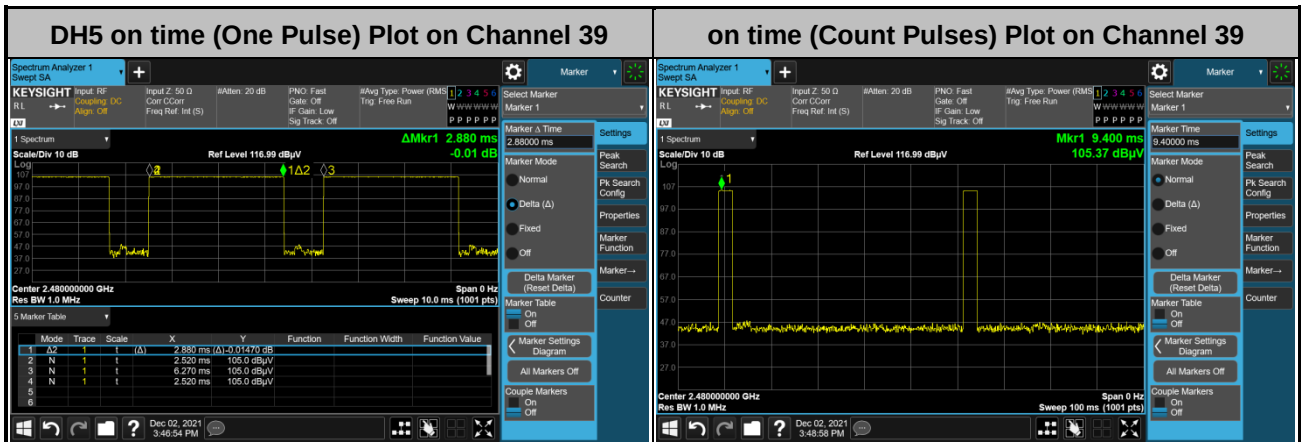
There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. $[100 \text{ ms} / 57.7 \text{ ms}] = 2 \text{ hops}$

Thus, the maximum possible ON time:

$$2.883 \text{ ms} \times 2 = 5.77 \text{ ms}$$

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

$$20 \times \log(5.77 \text{ ms}/100 \text{ ms}) = -24.78 \text{ dB}$$

<Ant. 18>

Note:

1. Worst case Duty cycle = on time/100 milliseconds = $2 \times 2.88 / 100 = 5.76 \%$
2. Worst case Duty cycle correction factor = $20 \times \log(\text{Duty cycle}) = -24.79 \text{ dB}$
3. **DH5** 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 on time period to have DH5 packet completing one hopping sequence is

$$2.88 \text{ ms} \times 20 \text{ channels} = 57.6 \text{ ms}$$

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. $[100 \text{ ms} / 57.6 \text{ ms}] = 2 \text{ hops}$

Thus, the maximum possible ON time:

$$2.88 \text{ ms} \times 2 = 5.76 \text{ ms}$$

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

$$20 \times \log(5.76 \text{ ms}/100 \text{ ms}) = -24.79 \text{ dB}$$



Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
16+18	2.4GHz 802.11ax HE40 Full RU	99.73	-	-	10Hz
17+18	5GHz 802.11ax HE20 Full RU	99.52	-	-	10Hz

MIMO <Ant. 16+18>**MIMO <Ant. 17+18>**