



FCC RADIO TEST REPORT

FCC ID : APYHRO00310
Equipment : Smart phone
Brand Name : SHARP
Model Name : APYHRO00310
Applicant : SHARP CORPORATION
1 Takumi-cho, Sakai-ku, Sakai City Osaka,
Japan 590-8522
Manufacturer : SHARP CORPORATION
1 Takumi-Cho, Sakai-Ku, Sakai-Shi, Osaka
590-8522, Japan
Standard : FCC Part 15 Subpart C §15.247

The product was received on Jan. 17, 2022 and testing was performed from Feb. 25, 2022 to Mar. 11, 2022. 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 variant report apply exclusively to the tested model / sample. Without written approval from 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.)



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History of this test report

Report No.	Version	Description	Issue Date
FR211502-01C	01	Initial issue of report	Mar. 18, 2022



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.247(a)(2)	6dB Bandwidth	Not Required	-
-	2.1049	99% Occupied Bandwidth	Not Required	-
3.1	15.247(b)	Power Output Measurement	Pass	-
-	15.247(e)	Power Spectral Density	Not Required	-
-	15.247(d)	Conducted Band Edges	Not Required	-
		Conducted Spurious Emission	Not Required	-
3.2	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	3.46 dB under the limit at 2389.520 MHz
-	15.207	AC Conducted Emission	Not Required	-
3.3	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Note:

1. Not required means after assessing, test items are not necessary to carry out.
2. The RF circuit, output power level and antenna performance is the same in WLAN function across all two FCC ID APYHRO00309 and APYHRO00310, since the change, only verify RF output power and radiated spurious emission test data the worst mode was reported in this report.

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: Keven Cheng

Report Producer: Ruby Zou



1 General Description

1.1 Product Feature of Equipment Under Test

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

Product Feature	
Antenna Type	WWAN <Ant. 0>: Monopole Antenna <Ant. 1>: PIFA Antenna <Ant. 2>: Monopole Antenna WLAN: Loop Antenna Bluetooth: Loop Antenna GPS / Glonass / BDS / Galileo: PIFA Antenna NFC: Loop Antenna

Antenna information		
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	-1.36

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. 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. TH05-HY, 03CH16-HY

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

FCC designation No.: TW3786

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 KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- ♦ 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 Z plane as worst plane.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		

2.2 Test Mode

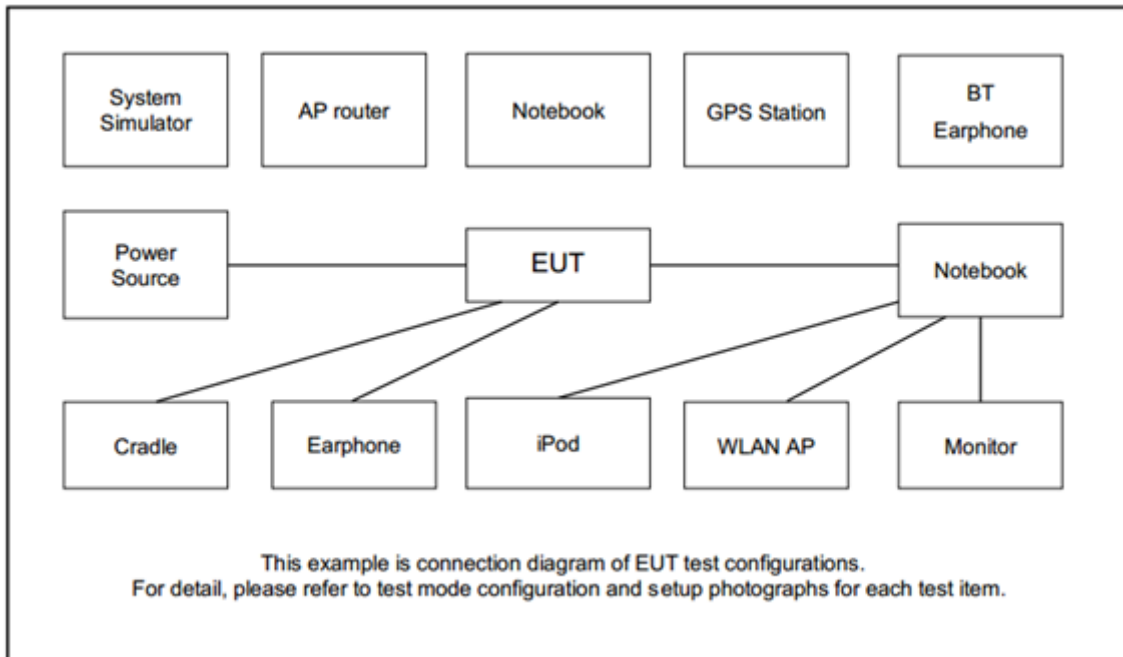
The final test modes consider the modulation and the worst data rates as shown in the table below.

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0

Ch. #	2400-2483.5 MHz			
	802.11b	802.11g	802.11n HT20	802.11n HT40
Low	-	-	01	03
Middle	-	-	-	-
High	11	11	-	09

Remark: For radiation spurious emission, the modulation and the data rate picked for testing are determined by the Max. RF conducted 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.	Earphone	Nokia	WH-108	FCC DoC	Unshielded, 1.5m	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “QRCT v3.0.298” 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 Output Power Measurement

3.1.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5 MHz, the limit for output power is 30 dBm. If transmitting antenna with directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

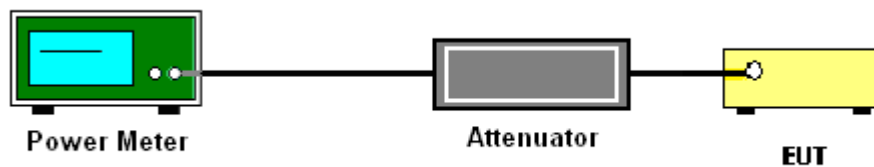
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
2. The RF output of EUT is connected to the power meter by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of Average Output Power

Please refer to Appendix A.



3.2 Radiated Band Edges and Spurious Emission Measurement

3.2.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device is measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

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

3.2.2 Measuring Instruments

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

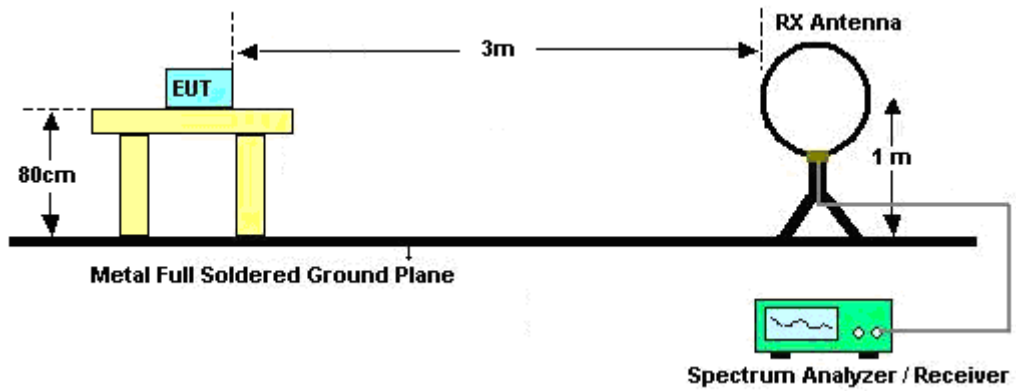


3.2.3 Test Procedures

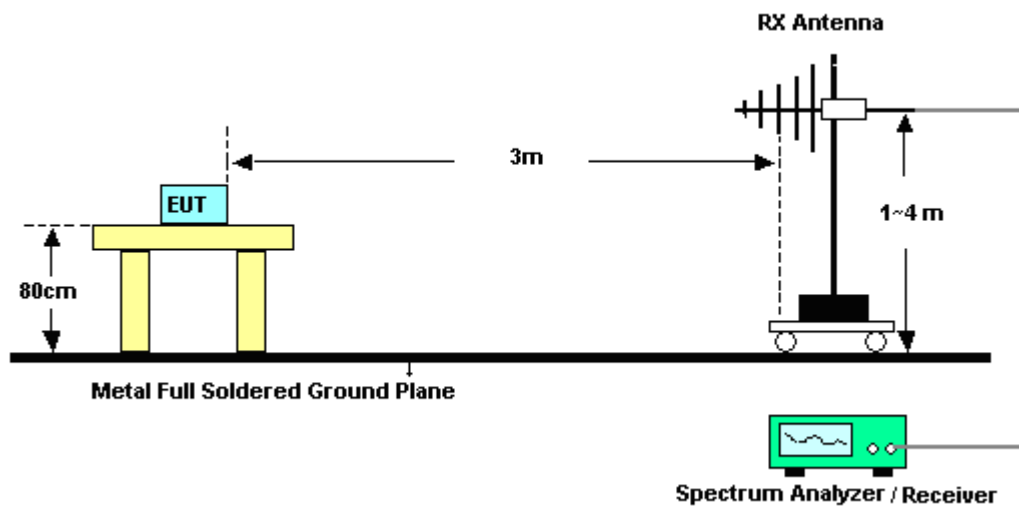
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. 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.
4. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
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 “-”.
8. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW = 100 kHz for $f < 1$ GHz; $VBW \geq RBW$; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, $VBW = 3$ MHz for $f \geq 1$ GHz for peak measurement.
For average measurement:
 - $VBW = 10$ 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.

3.2.4 Test Setup

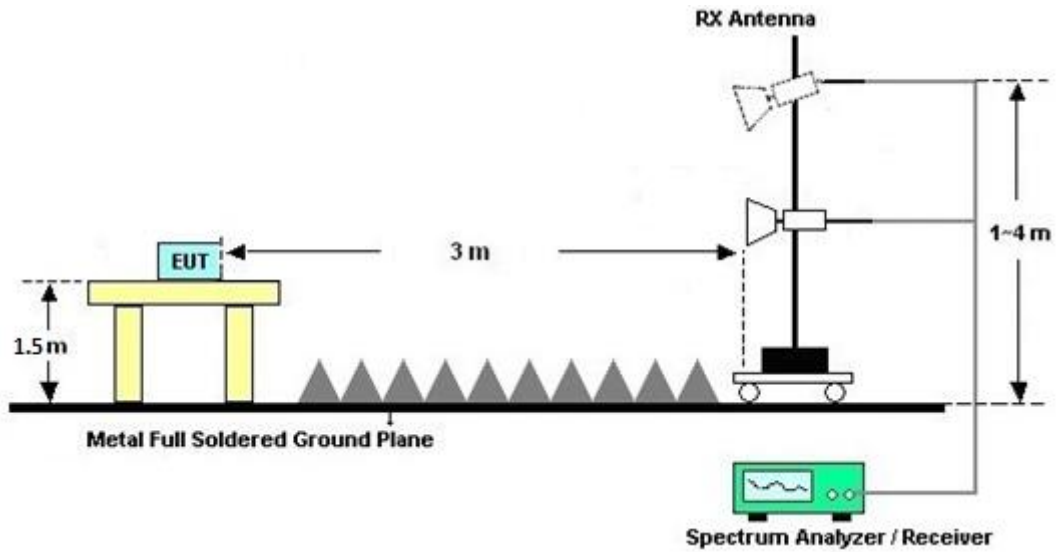
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated test above 1GHz



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

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 comes out very similar.

3.2.6 Test Results of Radiated Spurious Emissions (above 18GHz)

For frequency above 18GHz, the pre-scanned result is 20dB lower than the limit line is not reported.

3.2.7 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B and C.

3.2.8 Duty Cycle

Please refer to Appendix D.

3.2.9 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix B and C.



3.3 Antenna Requirements

3.3.1 Standard Applicable

If directional gain of transmitting Antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.3.3 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
Hygrometer	TECEPEL	DTM-303A	TP201996	N/A	Nov. 16, 2021	Feb. 25, 2022~ Mar. 11, 2022~	Nov. 15, 2022	Conducted (TH05-HY)
Power Meter	DARE	RPR3006W	16I00054SNO 12 (NO:113)	10MHz~6GHz	Dec. 16, 2021	Feb. 25, 2022~ Mar. 11, 2022~	Dec. 15, 2022	Conducted (TH05-HY)
Power Meter	Anritsu	ML2495A	932001	N/A	Sep. 30, 2021	Feb. 25, 2022~ Mar. 11, 2022~	Sep. 29, 2022	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	846202	300MHz~40GHz	Sep. 30, 2021	Feb. 25, 2022~ Mar. 11, 2022~	Sep. 29, 2022	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Aug. 30, 2021	Feb. 25, 2022~ Mar. 11, 2022~	Aug. 29, 2022	Conducted (TH05-HY)
Switch Control Manframe	E-IUSTRUMENT	ETF-1405-0	EC1900067 (BOX7)	N/A	Aug. 12, 2021	Feb. 25, 2022~ Mar. 11, 2022~	Aug. 11, 2022	Conducted (TH05-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 07, 2021	Mar. 04, 2022~ Mar. 11, 2022	Sep. 06, 2022	Radiation (03CH16-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00802N1D01N -06	47020 & 06	30MHz to 1GHz	Oct. 09, 2021	Mar. 04, 2022~ Mar. 11, 2022	Oct. 08, 2022	Radiation (03CH16-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-02114	1G~18GHz	Aug. 04, 2021	Mar. 04, 2022~ Mar. 11, 2022	Aug. 03, 2022	Radiation (03CH16-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	00993	18GHz ~40GHz	Nov. 30, 2021	Mar. 04, 2022~ Mar. 11, 2022	Nov. 29, 2022	Radiation (03CH16-HY)
Amplifier	SONOMA	310N	371607	9kHz~1G	Jul. 05, 2021	Mar. 04, 2022~ Mar. 11, 2022	Jul. 04, 2022	Radiation (03CH16-HY)
Amplifier	EMCI	EMC051845S E	980729	1-18GHz	Jul. 09, 2021	Mar. 04, 2022~ Mar. 11, 2022	Jul. 08, 2022	Radiation (03CH16-HY)
Preamplifier	EMEC	EM18G40G	060801	18GHz~40GHz	Jun. 22, 2021	Mar. 04, 2022~ Mar. 11, 2022	Jun. 21, 2022	Radiation (03CH16-HY)
Preamplifier	Keysight	83017A	MY53270264	1GHz~26.5GHz	Dec. 09, 2021	Mar. 04, 2022~ Mar. 11, 2022	Dec. 08, 2022	Radiation (03CH16-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY57290111	3Hz~26.5GHz	Dec. 15, 2021	Mar. 04, 2022~ Mar. 11, 2022	Dec. 14, 2022	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY11680/4P E	NA	Aug. 28, 2021	Mar. 04, 2022~ Mar. 11, 2022	Aug. 27, 2022	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY11688/4P E	NA	Aug. 28, 2021	Mar. 04, 2022~ Mar. 11, 2022	Aug. 27, 2022	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	EC-A5-300-5 757	NA	Aug. 28, 2021	Mar. 04, 2022~ Mar. 11, 2022	Aug. 27, 2022	Radiation (03CH16-HY)
Software	Audix	E3 6.2009-8-24	RK-001136	N/A	N/A	Mar. 04, 2022~ Mar. 11, 2022	N/A	Radiation (03CH16-HY)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	Mar. 04, 2022~ Mar. 11, 2022	N/A	Radiation (03CH16-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Mar. 04, 2022~ Mar. 11, 2022	N/A	Radiation (03CH16-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Mar. 04, 2022~ Mar. 11, 2022	N/A	Radiation (03CH16-HY)



5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.8 dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.2 dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.8 dB
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Appendix A. Test Result of Conducted Test Items

Test Engineer:	Hank Hsu	Temperature:	21~25	°C
Test Date:	2022/2/25~2022/3/11	Relative Humidity:	51~54	%

TEST RESULTS DATA
Average Output Power

2.4GHz Band Single Antenna																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					Ant4	Ant5	SUM	Ant4	Ant5	Ant4	Ant5	Ant4	Ant5	Ant4	Ant5	
11b	1Mbps	1	1	2412	17.30	-		30.00	-	-1.36	-	15.94	-	36.00	-	Pass
11b	1Mbps	1	6	2437	18.10	-		30.00	-	-1.36	-	16.74	-	36.00	-	Pass
11b	1Mbps	1	11	2462	18.40	-		30.00	-	-1.36	-	17.04	-	36.00	-	Pass
11g	6Mbps	1	1	2412	18.60	-		30.00	-	-1.36	-	17.24	-	36.00	-	Pass
11g	6Mbps	1	6	2437	18.60	-		30.00	-	-1.36	-	17.24	-	36.00	-	Pass
11g	6Mbps	1	11	2462	18.30	-		30.00	-	-1.36	-	16.94	-	36.00	-	Pass
HT20	MCS0	1	1	2412	18.50	-		30.00	-	-1.36	-	17.14	-	36.00	-	Pass
HT20	MCS0	1	6	2437	18.10	-		30.00	-	-1.36	-	16.74	-	36.00	-	Pass
HT20	MCS0	1	11	2462	17.60	-		30.00	-	-1.36	-	16.24	-	36.00	-	Pass
HT40	MCS0	1	3	2422	15.80	-		30.00	-	-1.36	-	14.44	-	36.00	-	Pass
HT40	MCS0	1	6	2437	16.30	-		30.00	-	-1.36	-	14.94	-	36.00	-	Pass
HT40	MCS0	1	9	2452	14.80	-		30.00	-	-1.36	-	13.44	-	36.00	-	Pass
VHT20	MCS0	1	1	2412	18.40	-		30.00	-	-1.36	-	17.04	-	36.00	-	Pass
VHT20	MCS0	1	6	2437	18.00	-		30.00	-	-1.36	-	16.64	-	36.00	-	Pass
VHT20	MCS0	1	11	2462	17.50	-		30.00	-	-1.36	-	16.14	-	36.00	-	Pass
VHT40	MCS0	1	3	2422	15.70	-		30.00	-	-1.36	-	14.34	-	36.00	-	Pass
VHT40	MCS0	1	6	2437	16.20	-		30.00	-	-1.36	-	14.84	-	36.00	-	Pass
VHT40	MCS0	1	9	2452	14.70	-		30.00	-	-1.36	-	13.34	-	36.00	-	Pass

Note: Measured power (dBm) has offset with cable loss.



Appendix B. Radiated Spurious Emission

Test Engineer :	Andy Yang, Karl Hou and Wilson Wu	Temperature :	20~25°C
		Relative Humidity :	50~60%

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI Ant.	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	105.05	-	-	89.08	27.67	18.35	30.05	285	73	P	H
	*	2462	101.75	-	-	85.78	27.67	18.35	30.05	285	73	A	H
		2495.64	57.54	-16.46	74	41.3	27.87	18.41	30.04	285	73	P	H
		2487.28	45.14	-8.86	54	28.96	27.82	18.4	30.04	285	73	A	H
													H
													H
	*	2462	104.1	-	-	88.13	27.67	18.35	30.05	183	289	P	V
	*	2462	100.88	-	-	84.91	27.67	18.35	30.05	183	289	A	V
		2493.04	57.26	-16.74	74	41.03	27.86	18.41	30.04	183	289	P	V
		2487.52	44.95	-9.05	54	28.76	27.83	18.4	30.04	183	289	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
WIFI 802.11b (Harmonic @ 3m)**

WIFI Ant. 4	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)
		4924	51.78	-22.22	74	62.03	32.84	12.3	55.39	100	278	P	H
		4924	50.3	-3.7	54	60.55	32.84	12.3	55.39	100	278	A	H
		7386	55.03	-18.97	74	58.03	36.41	16.25	55.66	100	172	P	H
		7386	45.72	-8.28	54	48.72	36.41	16.25	55.66	100	172	A	H
		10965	49.65	-24.35	74	46.65	38.87	19.51	55.38	-	-	P	H
		10965	38.46	-15.54	54	35.46	38.87	19.51	55.38	-	-	A	H
		14475	48.65	-25.35	74	40.57	40.4	22	54.32	-	-	P	H
		14475	42.84	-11.16	54	34.76	40.4	22	54.32	-	-	A	H
		17985	53.1	-20.9	74	41.77	42.88	25.04	56.59	-	-	P	H
		17985	42.71	-11.29	54	31.38	42.88	25.04	56.59	-	-	A	H
													H
													H
802.11b													
CH 11													
2462MHz		4924	45.85	-28.15	74	56.1	32.84	12.3	55.39	-	-	P	V
		7380	53.06	-20.94	74	56.05	36.46	16.21	55.66	100	50	P	V
		7386	43.12	-10.88	54	46.12	36.41	16.25	55.66	100	50	A	V
		11685	49.46	-24.54	74	45.48	38.63	20.29	54.94	-	-	P	V
		11685	39.47	-14.53	54	35.49	38.63	20.29	54.94	-	-	A	V
		14475	49.4	-24.6	74	41.32	40.4	22	54.32	-	-	P	V
		14475	42.93	-11.07	54	34.85	40.4	22	54.32	-	-	A	V
		17985	52.95	-21.05	74	41.62	42.88	25.04	56.59	-	-	P	V
		17985	42.99	-11.01	54	31.66	42.88	25.04	56.59	-	-	A	V
													V
													V
													V

Remark

- No other spurious found.
- All results are PASS against Peak and Average limit line.
- The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.
- The emission level close to 18GHz is checked that the average emission level is noise floor only.



2.4GHz 2400~2483.5MHz
WIFI 802.11g (Harmonic @ 3m)

WIFI Ant. 4	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)
		4924	42.01	-31.99	74	52.26	32.84	12.3	55.39	-	-	P	H
		7386	53.42	-20.58	74	56.42	36.41	16.25	55.66	378	0	P	H
		7386	41.56	-12.44	54	44.56	36.41	16.25	55.66	378	0	A	H
		10860	49.2	-24.8	74	46.21	38.96	19.43	55.4	-	-	P	H
		10860	39.15	-14.85	54	36.16	38.96	19.43	55.4	-	-	A	H
		14490	49.02	-24.98	74	40.94	40.4	22.01	54.33	-	-	P	H
		14490	38.96	-15.04	54	30.88	40.4	22.01	54.33	-	-	A	H
		17895	53.86	-20.14	74	43.22	42.14	25.03	56.53	-	-	P	H
		17895	43.8	-10.2	54	33.16	42.14	25.03	56.53	-	-	A	H
													H
													H
													H
802.11g													
CH 11													
2462MHz		4924	47.69	-26.31	74	57.94	32.84	12.3	55.39	-	-	P	V
		7386	53.17	-20.83	74	56.17	36.41	16.25	55.66	100	27	P	V
		7386	41.42	-12.58	54	44.42	36.41	16.25	55.66	100	27	A	V
		10635	49.33	-24.67	74	46.55	39	19.24	55.46	-	-	P	V
		10635	39.28	-14.72	54	36.5	39	19.24	55.46	-	-	A	V
		14490	49.19	-24.81	74	41.11	40.4	22.01	54.33	-	-	P	V
		14490	39.11	-14.89	54	31.03	40.4	22.01	54.33	-	-	A	V
		17985	53.91	-20.09	74	42.58	42.88	25.04	56.59	-	-	P	V
		17985	43.84	-10.16	54	32.51	42.88	25.04	56.59	-	-	A	V
													V
													V
													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.
	4. The emission level close to 18GHz is checked that the average emission level is noise floor only.



**2.4GHz 2400~2483.5MHz
WIFI 802.11n HT20 (Band Edge @ 3m)**

WIFI Ant. 4	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)	
802.11n HT20 CH 01 2412MHz		2389.8	59.84	-14.16	74	44.33	27.36	18.22	30.07	302	64	P	H	
		2390	50.36	-3.64	54	34.85	27.36	18.22	30.07	302	64	A	H	
	*	2412	107.17	-	-	91.53	27.45	18.26	30.07	302	64	P	H	
	*	2412	99.41	-	-	83.77	27.45	18.26	30.07	302	64	A	H	
													H	
													H	
			2390	59.77	-14.23	74	44.26	27.36	18.22	30.07	100	120	P	V
			2390	49.9	-4.1	54	34.39	27.36	18.22	30.07	100	120	A	V
		*	2412	106.12	-	-	90.48	27.45	18.26	30.07	100	120	P	V
		*	2412	98.28	-	-	82.64	27.45	18.26	30.07	100	120	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
WIFI 802.11n HT40 (Band Edge @ 3m)

Table with 14 columns: WIFI Ant. 4, Note, Frequency (MHz), Level (dBµV/m), Over Limit (dB), Limit Line (dBµV/m), Read Level (dBµV), Antenna Factor (dB/m), Path Loss (dB), Preamp Factor (dB), Ant Pos (cm), Table Pos (deg), Peak Avg. (P/A), Pol. (H/V). Rows include test data for 802.11n HT40 CH 03 2422MHz and a Remark section.



**2.4GHz 2400~2483.5MHz
WIFI 802.11n HT40 (Harmonic @ 3m)**

WIFI Ant. 4	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)
		4904	41.57	-32.43	74	51.92	32.72	12.3	55.37	-	-	P	H
		7356	47.82	-26.18	74	50.75	36.65	16.08	55.66	-	-	P	H
		10875	48.24	-25.76	74	45.3	38.9	19.44	55.4	-	-	P	H
		10875	38.75	-15.25	54	35.81	38.9	19.44	55.4	-	-	A	H
		14491	49.12	-24.88	74	41.04	40.4	22.01	54.33	-	-	P	H
		14491	40.19	-13.81	54	32.11	40.4	22.01	54.33	-	-	A	H
		18000	53.88	-20.12	74	42.44	43	25.04	56.6	-	-	P	H
		18000	43.5	-10.5	54	32.06	43	25.04	56.6	-	-	A	H
													H
													H
													H
													H
802.11n HT40 CH 09 2452MHz		4904	40.31	-33.69	74	50.66	32.72	12.3	55.37	-	-	P	V
		7356	46.56	-27.44	74	49.49	36.65	16.08	55.66	-	-	P	V
		10880	48.84	-25.16	74	45.92	38.88	19.44	55.4	-	-	P	V
		10880	38.82	-15.18	54	35.9	38.88	19.44	55.4	-	-	A	V
		14491	49.2	-24.8	74	41.12	40.4	22.01	54.33	-	-	P	V
		14491	39.97	-14.03	54	31.89	40.4	22.01	54.33	-	-	A	V
		17880	53.76	-20.24	74	43.3	41.96	25.02	56.52	-	-	P	V
		17880	43.04	-10.96	54	32.58	41.96	25.02	56.52	-	-	A	V
													V
													V
													V
													V

Remark

- No other spurious found.
- All results are PASS against Peak and Average limit line.
- The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.
- The emission level close to 18GHz is checked that the average emission level is noise floor only.



Emission below 1GHz
2.4GHz WIFI 802.11n HT40 (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.		
4		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)	
2.4GHz 802.11n HT40 LF		155.13	21.12	-22.38	43.5	34.07	16.95	2.35	32.25	-	-	P	H	
		251.16	21.47	-24.53	46	32.09	18.73	2.89	32.24	-	-	P	H	
		313.24	23.42	-22.58	46	33.08	19.47	3.14	32.27	-	-	P	H	
		555.74	27.15	-18.85	46	29.58	25.86	4.13	32.42	-	-	P	H	
		584.84	29.22	-16.78	46	31.87	25.63	4.25	32.53	-	-	P	H	
		796.3	33.15	-12.85	46	32.55	27.97	4.89	32.26	-	-	P	H	
														H
														H
														H
														H
														H
			65.89	25.84	-14.16	40	44.64	12.04	1.44	32.28	-	-	P	V
			86.26	24.25	-15.75	40	40.85	14.06	1.65	32.31	-	-	P	V
			187.14	22.57	-20.93	43.5	37.54	14.83	2.43	32.23	-	-	P	V
			501.42	25.85	-20.15	46	30.25	24.04	3.91	32.35	-	-	P	V
			739.07	31.27	-14.73	46	30.94	27.99	4.69	32.35	-	-	P	V
			796.3	33.55	-12.45	46	32.95	27.97	4.89	32.26	-	-	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 and emission level has at least 6dB margin against limit or emission is 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	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

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

For Peak Limit @ 2390MHz:

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

For Average Limit @ 2390MHz:

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

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



Appendix C. Radiated Spurious Emission Plots

Test Engineer :	Andy Yang, Karl Hou and Wilson Wu	Temperature :	20~25°C
		Relative Humidity :	50~60%

Note symbol

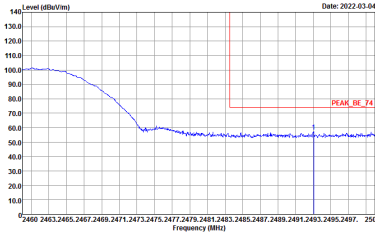
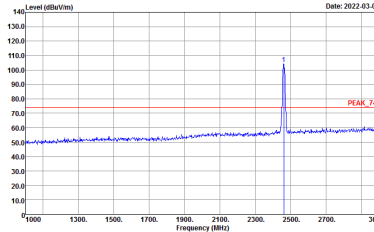
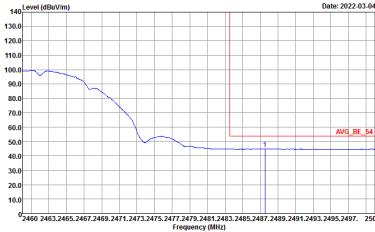
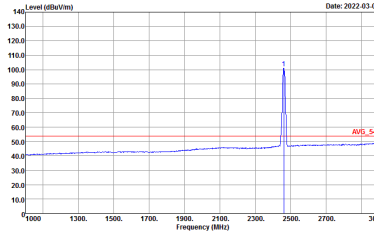
-L	Low channel location
-R	High channel location



2.4GHz 2400~2483.5MHz
WIFI 802.11b (Band Edge @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH11 2462MHz	
4	Horizontal	Fundamental
Peak	<p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_02114_210804 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	<p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_02114_210804 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	<p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_02114_210804 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	<p>Site : 03CH16-HY Condition : AVG_54 3m 91200_02114_210804 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>



WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH11 2462MHz	
4	Vertical	Fundamental
Peak	 <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_02114_210804 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_02114_210804 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_02114_210804 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	 <p>Site : 03CH16-HY Condition : AVG_54 3m 91200_02114_210804 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>

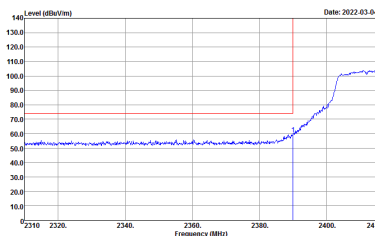
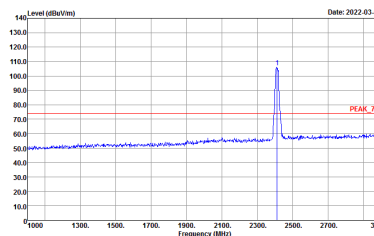
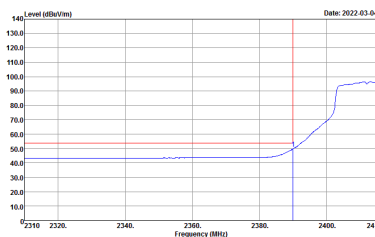
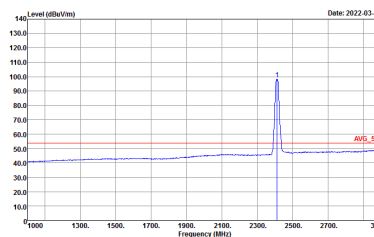


2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH01 2412MHz	
4	Horizontal	Fundamental
Peak	<p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_02114_210804 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	<p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_02114_210804 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	<p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_02114_210804 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	<p>Site : 03CH16-HY Condition : AVG_54 3m 91200_02114_210804 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>



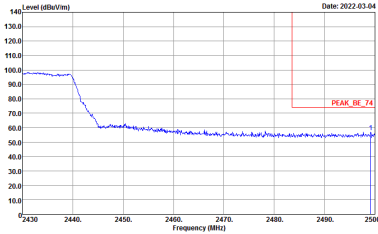
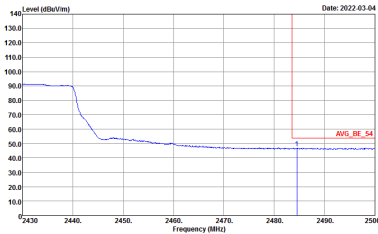
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH01 2412MHz	
4	Vertical	Fundamental
Peak	 <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_02114_210804 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_02114_210804 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_02114_210804 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>	 <p>Site : 03CH16-HY Condition : AVG_54 3m 91200_02114_210804 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto</p>



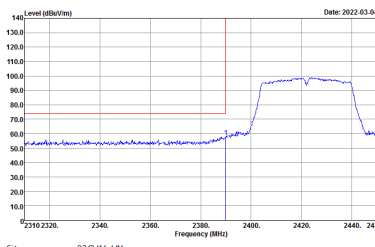
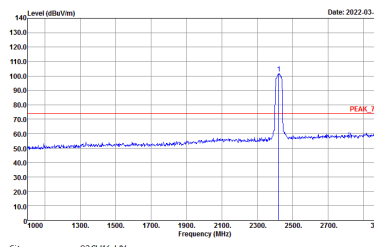
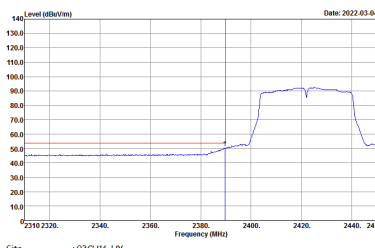
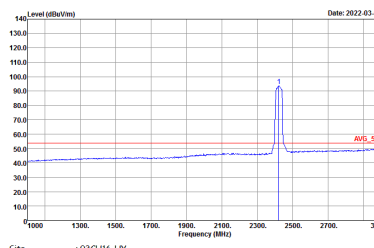
2.4GHz 2400~2483.5MHz
 WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH03 2422MHz - L	
4	Horizontal	Fundamental
Peak	<p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_02114_210804 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	<p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_02114_210804 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	<p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_02114_210804 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto</p>	<p>Site : 03CH16-HY Condition : AVG_54 3m 91200_02114_210804 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto</p>

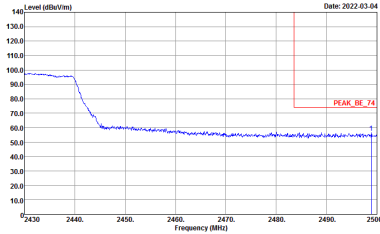
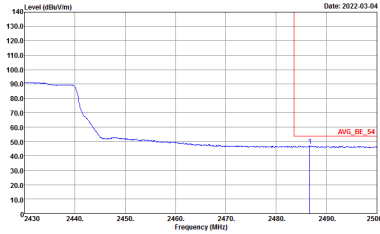


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH03 2422MHz - R	
4	Horizontal	Fundamental
<p>Peak</p>	 <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_02114_210804 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWF:Auto</p>	<p>Left Blank</p>
<p>Avg.</p>	 <p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_02114_210804 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWF:Auto</p>	<p>Left Blank</p>



WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH03 2422MHz - L	
4	Vertical	Fundamental
Peak	 <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_02114_210804 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	 <p>Site : 03CH16-HY Condition : PEAK_74 3m 91200_02114_210804 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>
Avg.	 <p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_02114_210804 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto</p>	 <p>Site : 03CH16-HY Condition : AVG_54 3m 91200_02114_210804 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto</p>



WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH03 2422MHz - R	
4	Vertical	Fundamental
<p>Peak</p>	 <p>Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_02114_210804 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWF:Auto</p>	<p>Left blank</p>
<p>Avg.</p>	 <p>Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_02114_210804 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWF:Auto</p>	<p>Left blank</p>

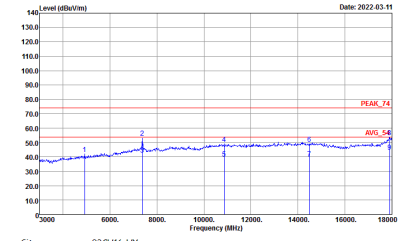
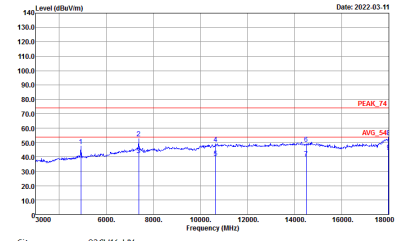


2.4GHz 2400~2483.5MHz
 WIFI 802.11b (Harmonic @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11b CH11 2462MHz	
4	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH16-HY Condition : PEAK_74 3m 9120D_02114_210804 HORIZONTAL Detector : Peak</p>	<p>Site : 03CH16-HY Condition : PEAK_74 3m 9120D_02114_210804 VERTICAL Detector : Peak</p>



2.4GHz 2400~2483.5MHz
 WIFI 802.11g (Harmonic @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11g CH11 2462MHz	
4	Horizontal	Vertical
<p>Peak Avg.</p>	 <p>Site : 03CH16-HY Condition : PEAK_74 3m 9120D_02114_210804 HORIZONTAL Detector : Peak</p>	 <p>Site : 03CH16-HY Condition : PEAK_74 3m 9120D_02114_210804 VERTICAL Detector : Peak</p>

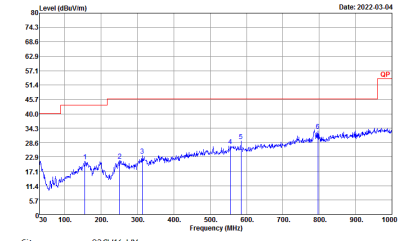
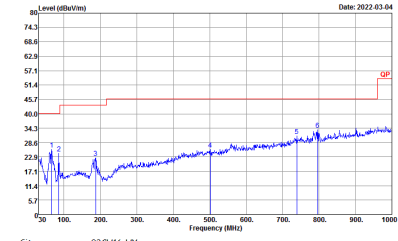


2.4GHz 2400~2483.5MHz
WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11n HT40 CH09 2452MHz	
4	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH16-HY Condition : PEAK_74 3m 9120D_02114_210804 HORIZONTAL Detector : Peak</p>	<p>Site : 03CH16-HY Condition : PEAK_74 3m 9120D_02114_210804 VERTICAL Detector : Peak</p>



Emission below 1GHz
2.4GHz WIFI 802.11n HT40 (LF)

WIFI	2.4GHz 2400~2483.5MHz	
ANT	802.11n HT40 LF	
4	Horizontal	Vertical
QP / Peak	 <p>Site : 03CH16-HY Condition : QP 3m BIL06_47020_211009 HORIZONTAL Detector : Peak</p>	 <p>Site : 03CH16-HY Condition : QP 3m BIL06_47020_211009 VERTICAL Detector : Peak</p>



Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
802.11b	100.00	-	-	10Hz
802.11g	98.33	-	-	10Hz
2.4GHz 802.11n HT20	98.21	-	-	10Hz
2.4GHz 802.11n HT40	94.59	945	1.06	3kHz

