

FCC CO-LOCATION RADIO TEST REPORT

FCC ID : APYHRO00283
Equipment : Wireless router
Applicant : SHARP CORPORATION
1 Takumi-cho, Sakai-ku, Sakai City,
Osaka, Japan 590-8522
Manufacturer : SHARP CORPORATION
2-13-1, HACHIHONMATSU-IIDA,
HIGASHI-HIROSHIMA-SHI, HIROSHIMA
PREFECTURE 739-0192, JAPAN
Standard : 47 CFR Part 2, 22(H), 24(E), 27(L)

The product was received on Dec. 10, 2019 and testing was started from Dec. 18, 2019 and completed on Feb. 05, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this 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
FG900422-06C	01	Initial issue of report	Feb. 10, 2020



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.4	§2.1053 §22.917 (a) §24.238 (a) §27.53 (h)	Field Strength of Spurious Radiation	Pass	Under limit 16.39 dB at 3426.000 MHz

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: Dara Chiu



1 General Description

1.1 Product Feature of Equipment Under Test

WCDMA/LTE and Wi-Fi 2.4GHz 802.11b/g/n/ax

Product Specification subjective to this standard	
Antenna Type	WWAN <Ant.1>: PIFA Antenna <Ant.2>: Coupling type (LDS) Antenna WLAN <Ant.1>: Loop Antenna <Ant.2>: Loop Antenna

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, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	Sporton Site No. 03CH11-HY
Test Engineer	Cookie Ku, Fu Chen, and Troye Hsieh
Temperature	18.7~26.5°C
Relative Humidity	40.8~70%

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:

- ♦ ANSI C63.26-2015
- ♦ ANSI / TIA-603-E
- ♦ 47 CFR Part 2, 22(H), 24(E), 27(L)
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02.

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.

Radiated emissions were investigated as following frequency range:

1. 30 MHz to 18000 MHz for WCDMA Band IV.

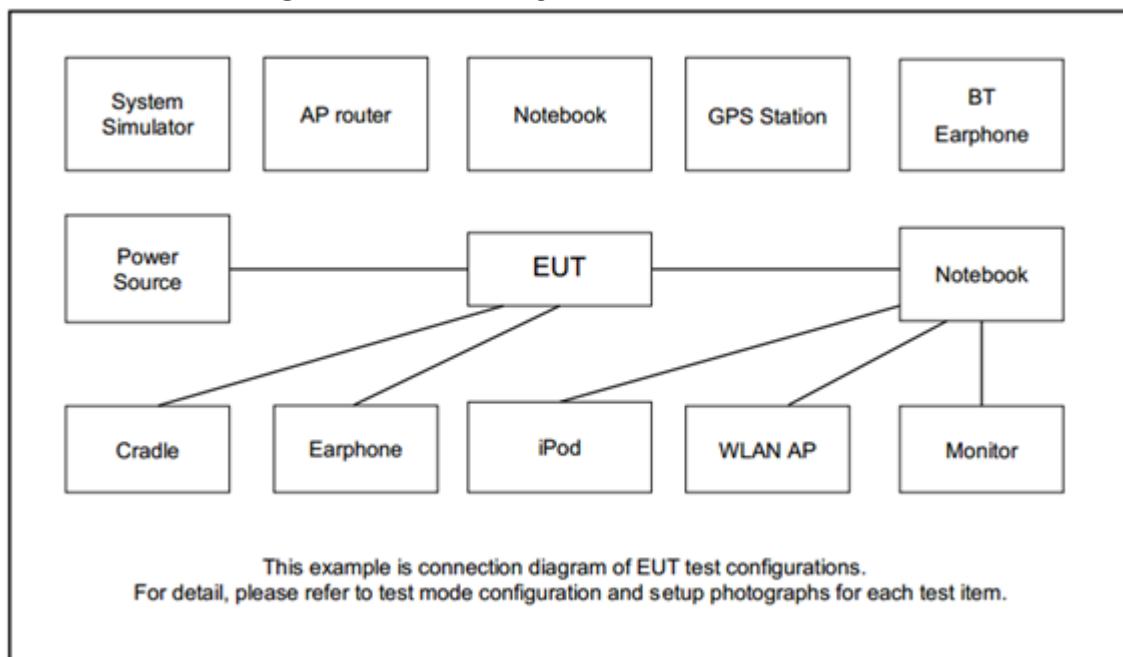
All modes and data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

Test Modes	
Band	Radiated TCs
WCDMA Band IV	■ RMC 12.2Kbps Link

Remark: During the test, the EUT turn on the WLAN function simultaneously.

2.2 Connection Diagram of Test System





2.3 Support Unit used in test configuration

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	8821C	N/A	N/A	Unshielded, 1.8 m

2.4 Frequency List of Low/Middle/High Channels

Frequency List				
Band	Channel/Frequency(MHz)	Lowest	Middle	Highest
WCDMA Band IV	Channel	1312	1413	1513
	Frequency	1712.4	1732.6	1752.6

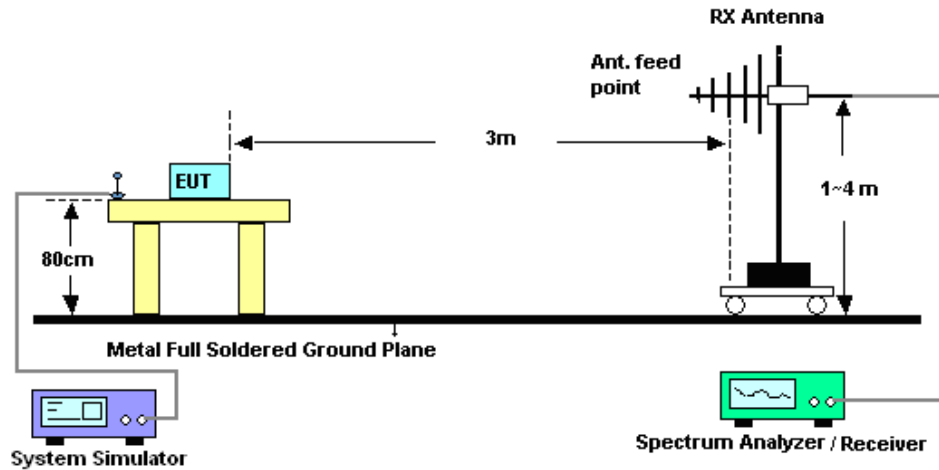
3 Radiated Test Items

3.1 Measuring Instruments

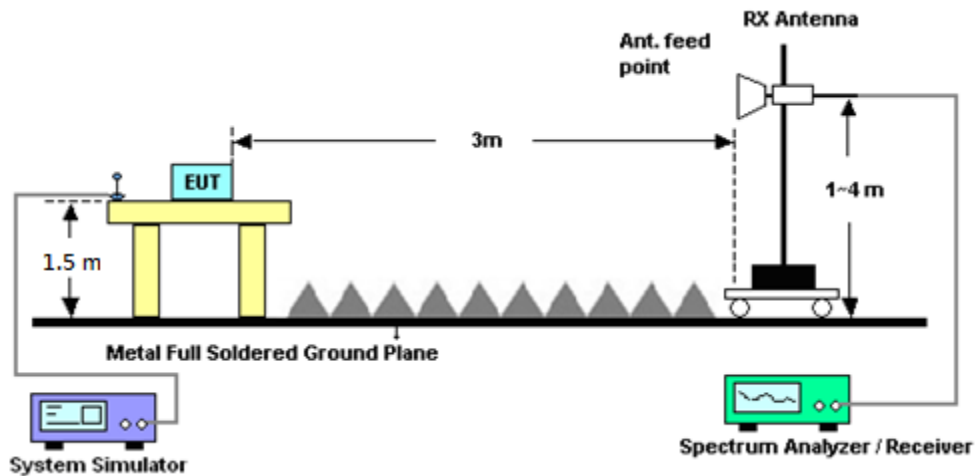
See list of measuring instruments of this test report.

3.2 Test Setup

For radiated test from 30MHz to 1GHz



For radiated test above 1GHz



3.3 Test Result of Radiated Test

Please refer to Appendix A.



3.4 Field Strength of Spurious Radiation Measurement

3.4.1 Description of Field Strength of Spurious Radiated Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

3.4.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 7 and ANSI / TIA-603-E Section 2.2.12.

1. The EUT was placed on a rotatable wooden table 0.8 meters for frequency below 1GHz and 1.5 meter for frequency above 1GHz above the ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. $EIRP \text{ (dBm)} = S.G. \text{ Power} - Tx \text{ Cable Loss} + Tx \text{ Antenna Gain}$
11. $ERP \text{ (dBm)} = EIRP - 2.15$
12. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
13. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Preamplifier	EMEC	EM18G40G	060715	18GHz ~ 40GHz	Dec. 13, 2019	Dec. 18, 2019~ Feb. 05, 2020	Dec. 12, 2020	Radiation (03CH11-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Dec. 03, 2019	Dec. 18, 2019~ Feb. 05, 2020	Dec. 02, 2020	Radiation (03CH11-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Dec. 10, 2019	Dec. 18, 2019~ Feb. 05, 2020	Dec. 09, 2020	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D & N-6-06	35414 & AT-N0602	30MHz~1GHz	Oct. 12, 2019	Dec. 18, 2019~ Feb. 05, 2020	Oct. 11, 2020	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1326	1GHz ~ 18GHz	Nov. 04, 2019	Dec. 18, 2019~ Feb. 05, 2020	Nov. 03, 2020	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY53270080	1GHz~26.5GHz	Nov. 13, 2019	Dec. 18, 2019~ Feb. 05, 2020	Nov. 12, 2020	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz~44GHz	Oct. 28, 2019	Dec. 18, 2019~ Feb. 05, 2020	Oct. 27, 2020	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-1080-1200-15000-60SS	SN2	1.2GHz High Pass Filter	Sep. 15, 2019	Dec. 18, 2019~ Feb. 05, 2020	Sep. 14, 2020	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-2700-3000-18000-60SS	SN3	3GHz High Pass Filter	Sep. 15, 2019	Dec. 18, 2019~ Feb. 05, 2020	Sep. 14, 2020	Radiation (03CH11-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	Dec. 18, 2019~ Feb. 05, 2020	N/A	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Dec. 18, 2019~ Feb. 05, 2020	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Dec. 18, 2019~ Feb. 05, 2020	N/A	Radiation (03CH11-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY55420170	20MHz~8.4GHz	Mar. 08, 2019	Dec. 18, 2019~ Feb. 05, 2020	Mar. 07, 2020	Radiation (03CH11-HY)
Software	Audix	E3 6.2009-8-24	RK-001053	N/A	N/A	Dec. 18, 2019~ Feb. 05, 2020	N/A	Radiation (03CH11-HY)
Hygrometer	TECPEL	DTN-303B	TP140325	N/A	Nov. 07, 2019	Dec. 18, 2019~ Feb. 05, 2020	Nov. 06, 2020	Radiation (03CH11-HY)
Hygrometer	TECPEL	DTN-303B	TP161237	N/A	Oct. 25, 2019	Dec. 18, 2019~ Feb. 05, 2020	Oct. 24, 2020	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz-30MHz	Mar. 13, 2019	Dec. 18, 2019~ Feb. 05, 2020	Mar. 12, 2020	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz-40GHz	Mar. 13, 2019	Dec. 18, 2019~ Feb. 05, 2020	Mar. 12, 2020	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	30M-18G	Mar. 13, 2019	Dec. 18, 2019~ Feb. 05, 2020	Mar. 12, 2020	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY4274/2	30MHz-40GHz	Mar. 13, 2019	Dec. 18, 2019~ Feb. 05, 2020	Mar. 12, 2020	Radiation (03CH11-HY)
Signal Generator	Rohde & Schwarz	SMF100A	101107	100kHz~40GHz	Aug. 27, 2019	Dec. 18, 2019~ Feb. 05, 2020	Aug. 26, 2020	Radiation (03CH11-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.09
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.44
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Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.95
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Appendix A. Test Results of Radiated Test

WCDMA 1700

WCDMA 1700 + 802.11g(n20)_Ch01									
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Lowest	3114	-44.16	-13	-31.16	-61.83	-54.86	0.74	11.44	H
	3426	-29.39	-13	-16.39	-46.99	-40.99	0.77	12.38	H
	4122	-46.31	-13	-33.31	-64.6	-57.8	0.86	12.35	H
	4824	-47.71	-13	-34.71	-69.42	-59.83	0.08	12.20	H
	5142	-50.17	-13	-37.17	-71.16	-61.68	0.97	12.48	H
	6850	-53.70	-13	-40.70	-77.71	-64.5	0.83	11.63	H
									H
	3114	-51.16	-13	-38.16	-68.97	-61.86	0.74	11.44	V
	3426	-33.78	-13	-20.78	-51.19	-45.38	0.77	12.38	V
	4122	-47.44	-13	-34.44	-66.91	-58.93	0.86	12.35	V
	4824	-52.73	-13	-39.73	-74.51	-64.85	0.08	12.20	V
	5142	-51.44	-13	-38.44	-72.6	-62.95	0.97	12.48	V
	6850	-53.11	-13	-40.11	-77.57	-63.91	0.83	11.63	V
									V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.