

TEST REPORT



CTK Co., Ltd.
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Report No.:
CTK-2020-00338
Page (1) / (30) Pages

1. Client

- Name : KAONMEDIA Co., Ltd.
- Address : KAONMEDIA Building, 884-3, Seongnam-daero, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea
- Date of Receipt : 2019-12-10



2. Manufacturer

- Name : KAONMEDIA Co., Ltd.
- Address : KAONMEDIA Building, 884-3, Seongnam-daero, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea

3. Use of Report : For FCC SDoC Report

4. Test Sample / Model: WiFi Extender / AR2040 and EVO5500EXT

5. Date of Test : 2020-01-07 to 2020-01-15

6. Test Standard(method) used : FCC Part 15 Subpart B

7. Testing Environment: refer to 11 pages to 18 pages

8. Test Results : refer to 11 pages to 18 pages

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Tested by	Approved by
	Lee Wonho: (Signature) EMC Test Engineer	Lee Eunwon: (Signature) Technical Manager

2020-01-20

Republic of KOREA **CTK Co., Ltd.**

**CTK Co., Ltd.**

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Report No.:
CTK-2020-00338
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REPORT REVISION HISTORY

Date	Revision	Page No
2020-01-20	Issued (CTK-2020-00338)	All

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1.0 General Product Description

No.	ITEM		APPLICATION	
1	Test Sample		WiFi Extender	
2	Model		AR2040	
3	Variant Model		EVO5500EXT	
4	Dimensions (W x L x H)		50 mm × 162 mm × 165 mm	
5	Mobility		☒ Table-top ☐ Floor-standing	
6	Maximum Clock Frequency		5.85 GHz	
7	Electrical Ratings	EUT	Input:	DC 12 V, 1.5 A
			Output:	-
		Switching Mode Power Adaptor	Input:	AC 100 V - AC 240 V, 50 Hz / 60 Hz, 0.6 A
			Output:	DC 12 V, 1.5 A
8	Test Voltage / Frequency		Voltage:	AC 120 V
			Frequency:	60 Hz

1.1 Model Differences

AR2040 and EVO5500EXT are no technical difference from each model only except for Model name because of marketing purposes.

1.2 Device Modifications

The following modifications were necessary for compliance:

Not applicable

1.3 EUT Configuration(s)

See Appendix A for individual test set-up configuration(s). The following peripheral devices and/or interface cables were connected during the measurement:

☒ Peripheral Devices

Device	Model No.	Serial No.	Manufacturer
Switching Mode Power Adaptor	F18L16-120150SPAU		SHENZHEN FRECOM ELECTRONICS CO.,LTD.
Notebook Computer	HSTNN-I66C-5U	5CG7234N21	HP Inc.
AC POWER ADAPTER	PPP009A	-	ACBEL POLYTECH INC.

☒ Cable Description

No.	From		To		Type of Cable		
	Device	I/O Port	Device	I/O Port	Length (m)	Shielded or Unshielded	Ferrite Core [Y/N]
1	EUT	DC In	Switching Mode Power Adaptor	DC Out	1.0	U	N
2		LAN1	Notebook Computer	LAN	0.8	U	N
3		LAN2	Cable	-	-	-	-
4	Notebook Computer	DC In	AC POWER ADAPTER	DC Out	0.8	U	Y
5	AC POWER ADAPTER	AC POWER	AC Mains	-	1.2	U	N
6	Switching Mode Power Adaptor	AC POWER	AC Mains	-	-	-	-

* Shielded or Unshielded : Unshielded=U, Shielded=S

1.4 Test Software

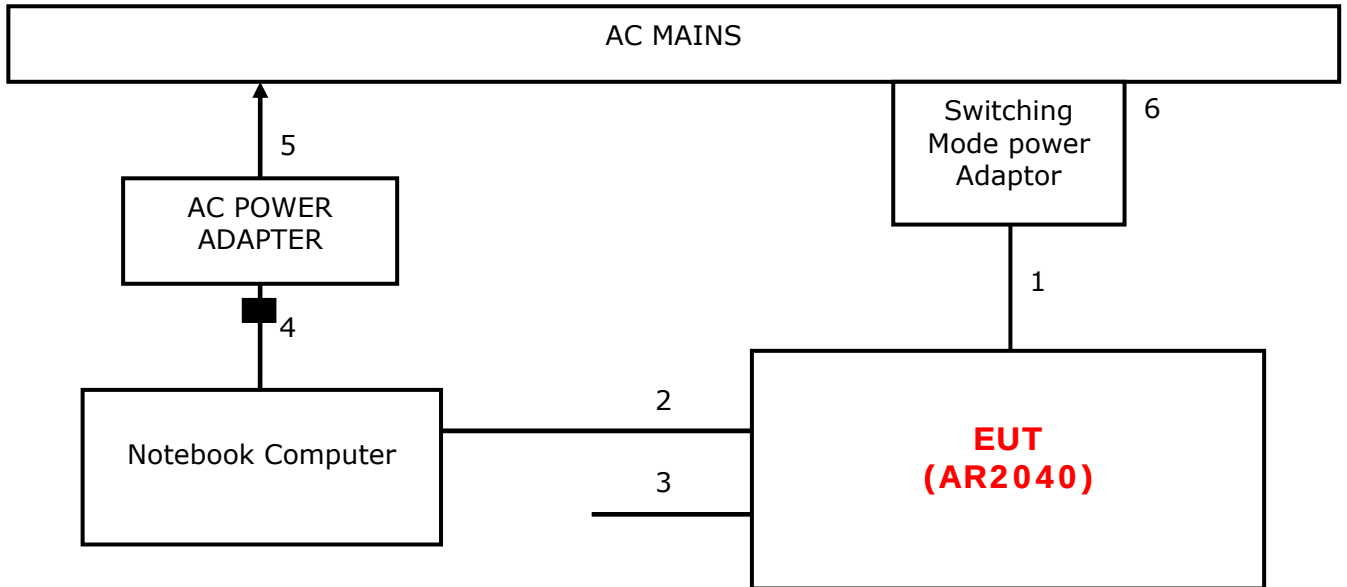
- ☐ EMC Test V 1.0
☐ Display Test Patterns – V1.5
☐ Ping.exe
☒ Not applicable

1.5 EUT Operating Mode(s)

Equipment under test was operated during the measurement under the following conditions:

- ☒ Networking function : Network data rate and cable type: UTP 1 Gbps

1.6 Configuration



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1.7 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

1.8 Test Facility

The measurement facility is located at
(Ho-dong) 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea.
(Unhak-dong) 142, Dongbu-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea.

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.9 Measurement Procedure

Preliminary AC power line conducted emissions tests were performed shielded room. To find worst mode, several typical mode and typical cable position were tested. Final AC power line conducted emissions test was performed shielded room. (location is same as Preliminary test)
Based on the preliminary tests of the EUT, final test was proceeded worst case test mode and cable configuration.

Preliminary radiated emissions test were performed Semi-Anechoic Chamber or anechoic chamber (Distance of antenna and EUT was 3 m). To find worst mode, several typical mode and typical cable position were tested and peak level and frequency were recorded.

Final radiated emissions test was performed Semi-Anechoic Chamber.
Based on the preliminary tests of the EUT, final test was proceeded worst case test mode and cable configuration.

* Measurement procedures was In accordance with ANSI C63.4-2014 7.3.3, 7.3.4, 8.3.1.1, 8.3.1.2, 8.3.2.1, 8.3.2.2

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1.10 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Registration Number	Logo
USA	FCC	FCC Part 15 & 18 EMI (Electromagnetic Interference / Emission)	805871	
JAPAN	VCCI	VCCI V-3 EMI (Electromagnetic Interference / Emission)	C-10986 T-11843 R-3627 G-10387	
KOREA	MSIP	EMI (Electromagnetic Interference / Emission) EMS (Electromagnetic Susceptibility / Immunity)	KR0025	
International	KOLAS	EMI (Electromagnetic Interference / Emission) EMS (Electromagnetic Susceptibility / Immunity)	TESTING NO.KT119	
CANADA	ISED	ICES-003, Issue 6 EMI (Electromagnetic Interference / Emission)	8737A-2	

1.11 Measurement Uncertainty

Compliance of the product is based on the measured value.

However, the measurement uncertainty is included for information purposes.

The measurement uncertainties given below are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

[Ho-dong Lab]

Measurement Type	Frequency Range	Expanded Uncertainty
Conducted Emission of Mains Ports	150 kHz to 30 MHz	2.26 dB (C.L.: Approx. 95 %, $k=2$)
Radiated Emission	30 MHz to 1 000 MHz	4.38 dB (C.L.: Approx. 95 %, $k=2$)
Radiated Emission	1 GHz Above	5.12 dB (C.L.: Approx. 95 %, $k=2$)

[Unhak-dong Lab]

Measurement Type	Frequency Range	Expanded Uncertainty
Conducted Emission of Mains Ports	150 kHz to 30 MHz	2.26 dB (C.L.: Approx. 95 %, $k=2$)
Radiated Emission	30 MHz to 1 000 MHz	4.14 dB (C.L.: Approx. 95 %, $k=2$)
Radiated Emission	1 GHz to 40 GHz	4.72 dB (C.L.: Approx. 95 %, $k=2$)

2.0 EMC Test Regulations / Standards

The tests were performed according to following regulations:

Applied standard	Title	Applied	Test Result
FCC Part 15 Subpart B ☐ Class A ☒ Class B	Conducted Voltage Emissions	☒	☒ MET ☐ NOT MET
	Radiated Electric Field Emissions	☒	☒ MET ☐ NOT MET

3.0 Results of Individual Test

3.1 Conducted Voltage Emissions of Mains ports

Test Date

2020-01-07

Test Location

Ho-dong Lab Shielded Room

Test Equipment

Name of Equipment	Model No.	Manufacturer	Serial No.	Due Date	Applied
EMI Test Receiver	ESCI3	Rohde & Schwarz	100032	2020-01-29	☒
LISN	ENV216	Rohde & Schwarz	101235	2020-01-29	☒
LISN	ENV216	Rohde & Schwarz	101236	2020-10-22	☒

Test Software

ESCI7, ESCI3 : EMC32 Ver. 8.50.0

ESR7 : EMC32 Ver. 8.53.0

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Setting

IF Band Width: 9 kHz

Climate Condition

Temperature: (21 ± 1) °C

Relative Humidity: (54 ± 1) %

Atmospheric Pressure: 99 kPa

Test Result

The requirements are: ☒ MET ☐ NOT MET

Frequency (MHz)	Measured Data (dBμV)	Margin (dB)	Remark
0.505 500	37.5	8.5	CAverage

The Result is calculated by using the following formula;

* Result = Limit – Margin (Result included the correction factor)

* Correction factor = Cable Loss + Insertion loss of LISN

Test Data

[Line: L1]

EMI Auto Test(5)

1 / 2

Test Report

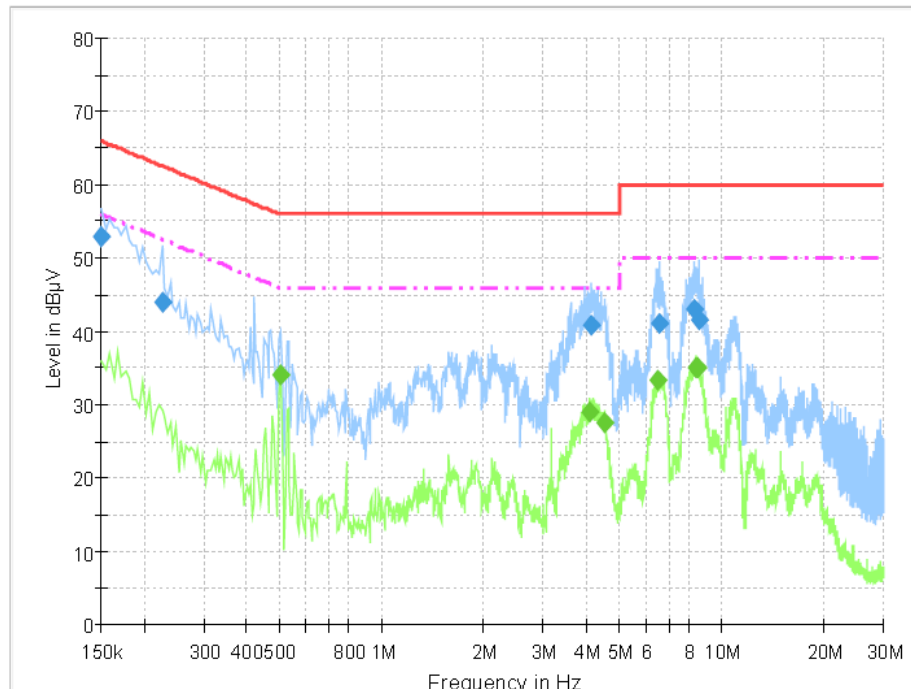
Common Information

Test Model Name: AR2040
Test Mode: Operating
Tester: Lee Wonho

Hardware Setup: EMI conducted Voltage with ENV216_FO(with EC)(101236) - [EMI conducted]

Subrange 1
Frequency Range: 150 kHz - 30 MHz
Receiver: ESCI 3 [ESCI 3]
@ GPIB0 (ADR 21), SN 100032/003, FW 4.42
Signal Path: ESCI 3-ENV216 FO(with EC)(101236)
Correction Table: 3CE Cable Loss
LISN: ENV216 FO(with EC)(101236)
Correction Table (Line 0): ENV216_FO_N(with EC)(101236)
Correction Table (Line 1): ENV216_FO_L1(with EC)(101236)

(with EC)3CE_Class B_L1



EMI Auto Test(5)

2 / 2

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	52.9	1000.0	9.000	On	L1	10.0	13.1	66.0
0.226500	44.0	1000.0	9.000	On	L1	9.9	18.6	62.6
4.159500	40.9	1000.0	9.000	On	L1	10.0	15.1	56.0
6.567000	41.0	1000.0	9.000	On	L1	10.0	19.0	60.0
8.326500	43.0	1000.0	9.000	On	L1	10.1	17.0	60.0
8.565000	41.6	1000.0	9.000	On	L1	10.1	18.4	60.0

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.505500	34.1	1000.0	9.000	On	L1	10.0	11.9	46.0
4.101000	29.0	1000.0	9.000	On	L1	10.0	17.0	46.0
4.515000	27.4	1000.0	9.000	On	L1	10.0	18.6	46.0
6.513000	33.3	1000.0	9.000	On	L1	10.0	16.7	50.0
8.376000	35.1	1000.0	9.000	On	L1	10.1	14.9	50.0
8.466000	35.1	1000.0	9.000	On	L1	10.1	14.9	50.0

1/7/2020

7:36:26

[Line : Neutral]

EMI Auto Test(5)

1 / 2

Test Report

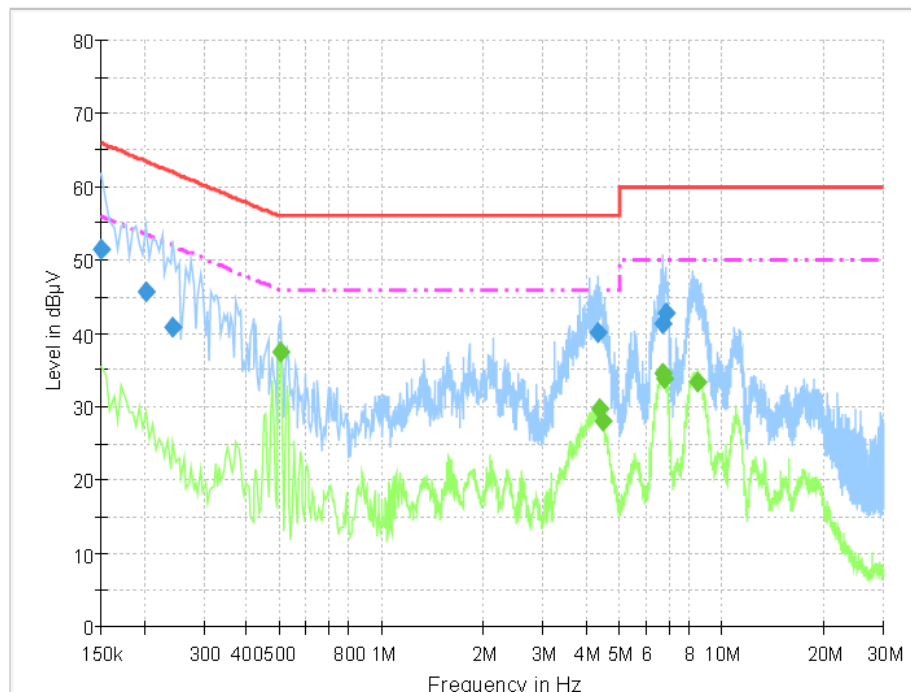
Common Information

Test Model Name: AR2040
Test Mode: Operating
Tester: Lee Wonho

Hardware Setup: EMI conducted Voltage with ENV216_FO(with EC)(101236) - [EMI conducted]

Subrange 1
Frequency Range: 150 kHz - 30 MHz
Receiver: ESCI 3 [ESCI 3]
@ GPIB0 (ADR 21), SN 100032/003, FW 4.42
Signal Path: ESCI 3-ENV216 FO(with EC)(101236)
Correction Table: 3CE Cable Loss
LISN: ENV216 FO(with EC)(101236)
Correction Table (Line 0): ENV216_FO_N(with EC)(101236)
Correction Table (Line 1): ENV216_FO_L1(with EC)(101236)

(with EC)3CE_Class B_N



1/7/2020

7:43:50

EMI Auto Test(5)

2 / 2

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	51.4	1000.0	9.000	On	N	9.9	14.6	66.0
0.204000	45.7	1000.0	9.000	On	N	10.0	17.8	63.4
0.244500	40.8	1000.0	9.000	On	N	9.8	21.1	61.9
4.353000	40.2	1000.0	9.000	On	N	10.0	15.8	56.0
6.706500	41.3	1000.0	9.000	On	N	10.1	18.7	60.0
6.846000	42.7	1000.0	9.000	On	N	10.1	17.3	60.0

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.505500	37.5	1000.0	9.000	On	N	10.0	8.5	46.0
4.375500	29.6	1000.0	9.000	On	N	10.0	16.4	46.0
4.474500	28.0	1000.0	9.000	On	N	10.0	18.0	46.0
6.724500	34.6	1000.0	9.000	On	N	10.1	15.4	50.0
6.832500	33.9	1000.0	9.000	On	N	10.1	16.1	50.0
8.511000	33.4	1000.0	9.000	On	N	10.1	16.6	50.0

1/7/2020

7:43:50

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3.2 Radiated Electric Field Emissions (Below 1 GHz)

Test Date

2020-01-10

Test Location

Ho-dong Lab 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)

Test Equipment

Name of Equipment	Model No.	Manufacturer	Serial No.	Due Date	Applied
EMI Test Receiver	ESCI7	Rohde & Schwarz	100814	2020-10-22	☒
Bilog Antenna	CBL6111C	Schaffner	2551	2020-05-10	☒
6dB Attenuator	DNF	Rohde & Schwarz	272.4110.50-2	2020-10-25	☒
Amplifier	310	SONOMA	291721	2020-01-28	☒

Test Software

TOYO EMI software Ver. 6.0.1.0

Frequency Range of Measurement

30 MHz to 1 GHz

Instrument Setting

IF Band Width: 120 kHz

Climate Condition

Temperature: (22 ± 1) °C

Relative Humidity: (45 ± 1) %

Atmospheric Pressure: 99 kPa

Test Result

The requirements are: ☒ MET ☐ NOT MET

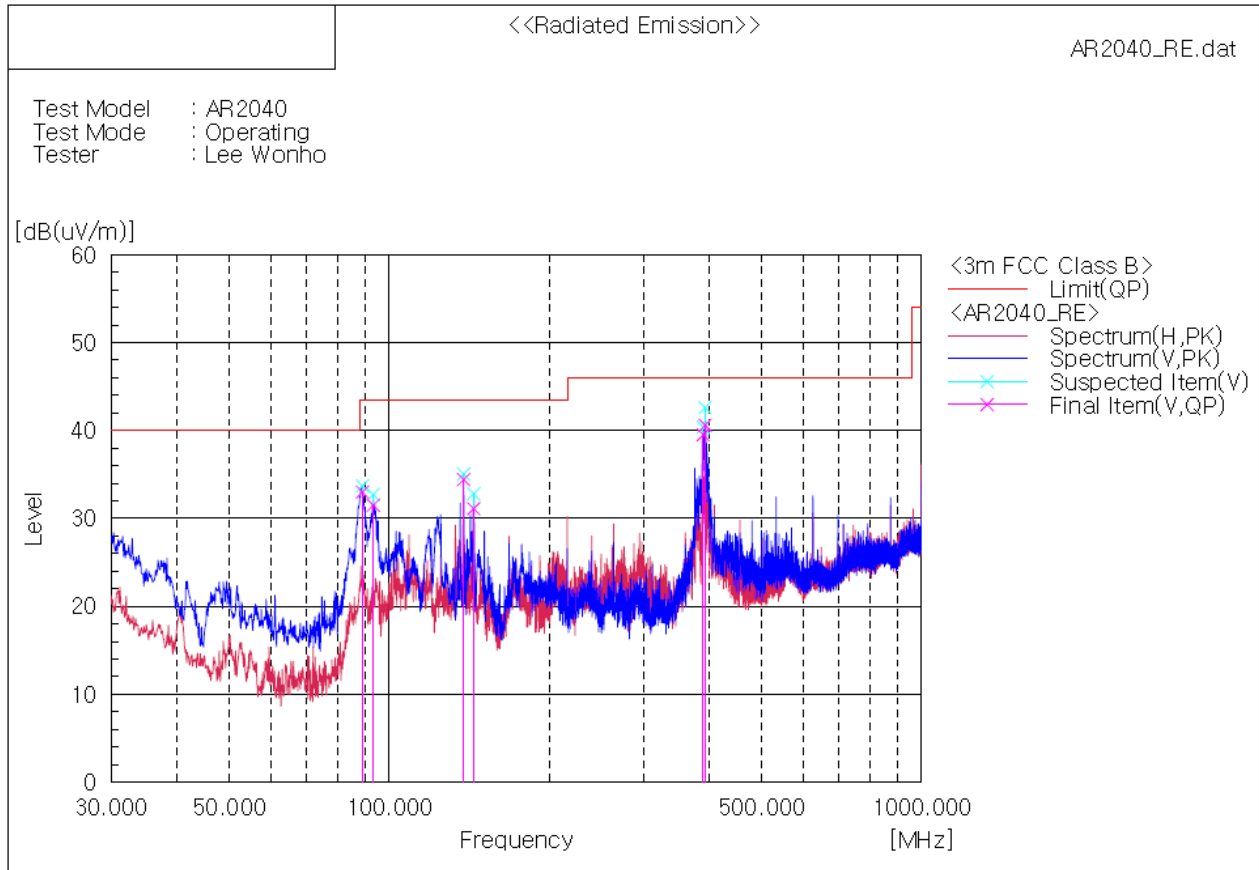
Frequency (MHz)	Measured Data (dBμV/m)	Margin (dB)	Remark
392.053	40.6	5.4	Quasi-peak

The Result is calculated by using the following formula;

* Result = Reading + Correction factor

* Correction factor = Antenna Factor + Cable Loss + 6 dB attenuator – Amp Gain

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	89.049	V	47.8	-14.8	33.0	43.5	10.5	100.0	354.0
2	93.293	V	45.9	-14.4	31.5	43.5	12.0	100.0	293.0
3	137.913	V	45.9	-11.5	34.4	43.5	9.1	100.0	81.0
4	144.096	V	42.8	-11.7	31.1	43.5	12.4	100.0	130.0
5	388.658	V	45.1	-5.6	39.5	46.0	6.5	100.0	306.0
6	392.053	V	46.0	-5.4	40.6	46.0	5.4	100.0	296.0

3.3 Radiated Electric Field Emissions (Above 1 GHz)

Test Date

2020-01-15

Test Location

Ho-dong Lab 3 m SAC

Test Equipment

Name of Equipment	Model No.	Manufacturer	Serial No.	Due Date	Applied
EMI Test Receiver	ESU40	Rohde & Schwarz	100336	2020-01-29	☒
Double Ridged Guide Antenna	3117	ETS-Lindgren	00154525	2021-09-25	☒
Preamplifier	8449B	Agilent	3008A02011	2020-11-25	☒

Test Software

TOYO EMI software Ver. 6.0.1.0

Frequency Range of Measurement

1 GHz to 30 GHz

Instrument Setting

IF Band Width: 1 MHz

Climate Condition

Temperature: (24 ± 1) °C

Relative Humidity: (41 ± 1) %

Atmospheric Pressure: 100 kPa

Test Result

The requirements are: ☒ MET ☐ NOT MET

Frequency (MHz)	Measured Data (dBμV/m)	Margin (dB)	Remark
28 330.150	48.5	5.5	CAverage

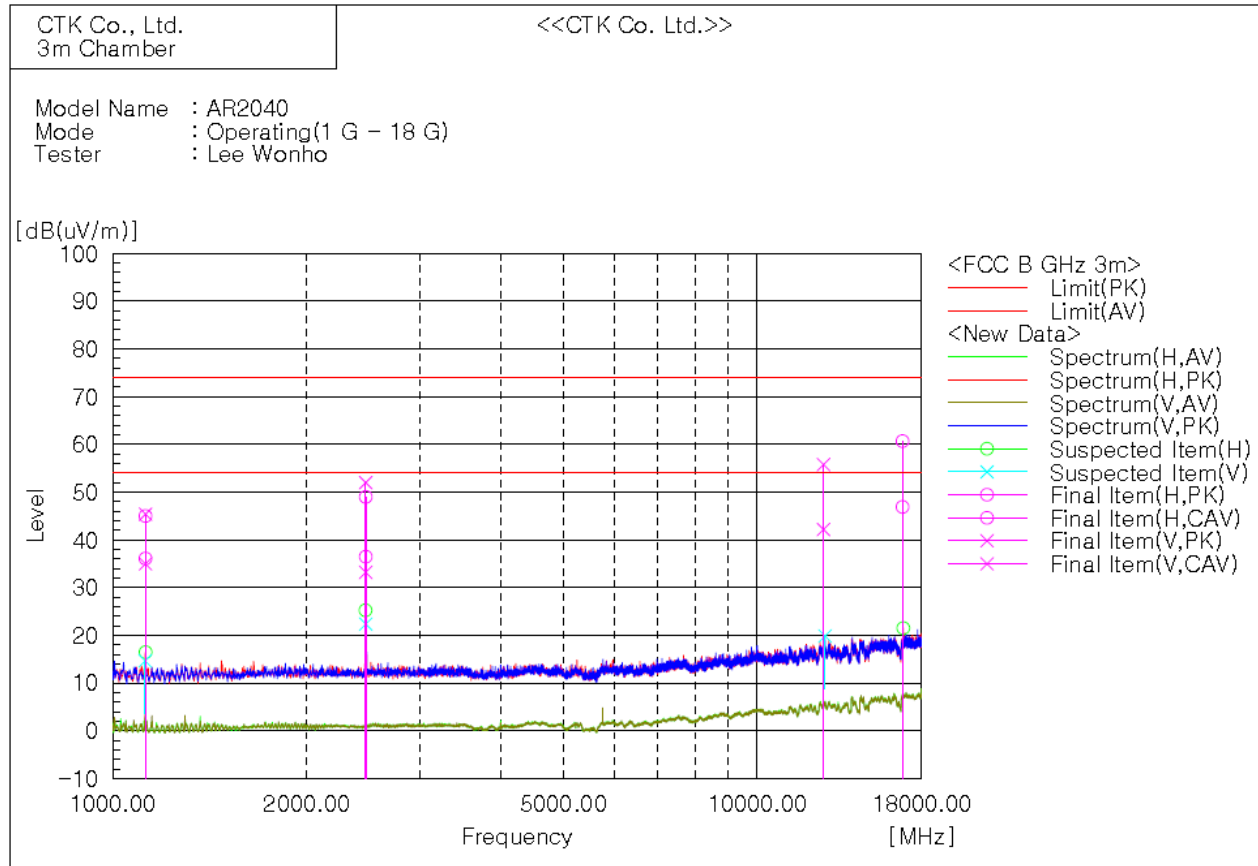
The Result is calculated by using the following formula;

* Result = Reading + Correction factor

* Correction factor = Antenna Factor + Cable Loss- Amp Gain

Test Data

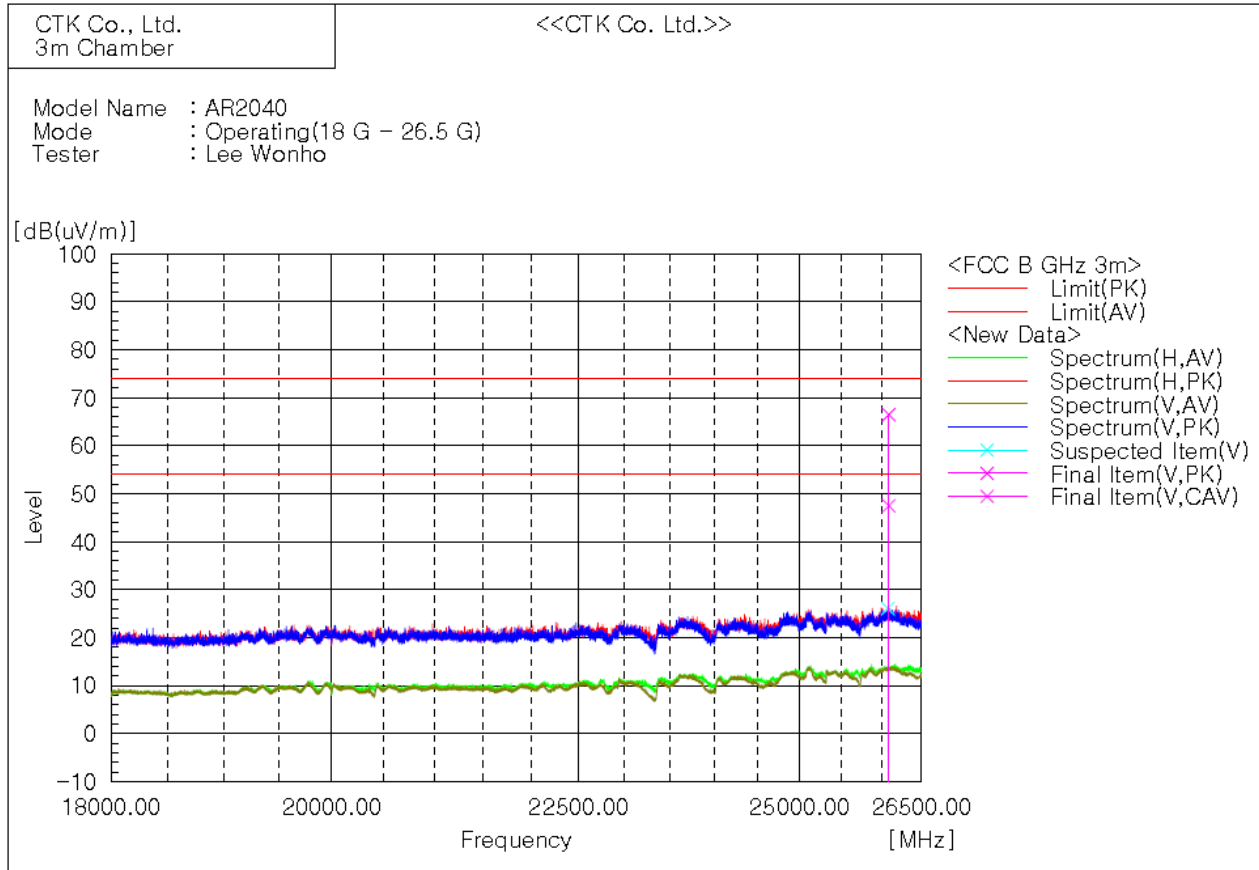
[1 GHz - 18 GHz]



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]
1	1124.971	V	54.5	44.1	-9.1	45.4	35.0	74.0	54.0	28.6	19.0	300.0	15.0
2	1124.971	H	54.1	45.2	-9.1	45.0	36.1	74.0	54.0	29.0	17.9	200.0	215.0
3	2470.011	V	53.6	34.8	-1.6	52.0	33.2	74.0	54.0	22.0	20.8	300.0	312.0
4	2470.415	H	50.6	33.1	-1.6	49.0	36.5	74.0	54.0	25.0	17.5	200.0	337.0
5	12669.460	V	46.3	32.7	9.5	55.8	42.2	74.0	54.0	18.2	11.8	200.0	197.0
6	16805.660	H	47.2	33.4	13.5	60.7	46.9	74.0	54.0	13.3	7.1	100.0	17.0

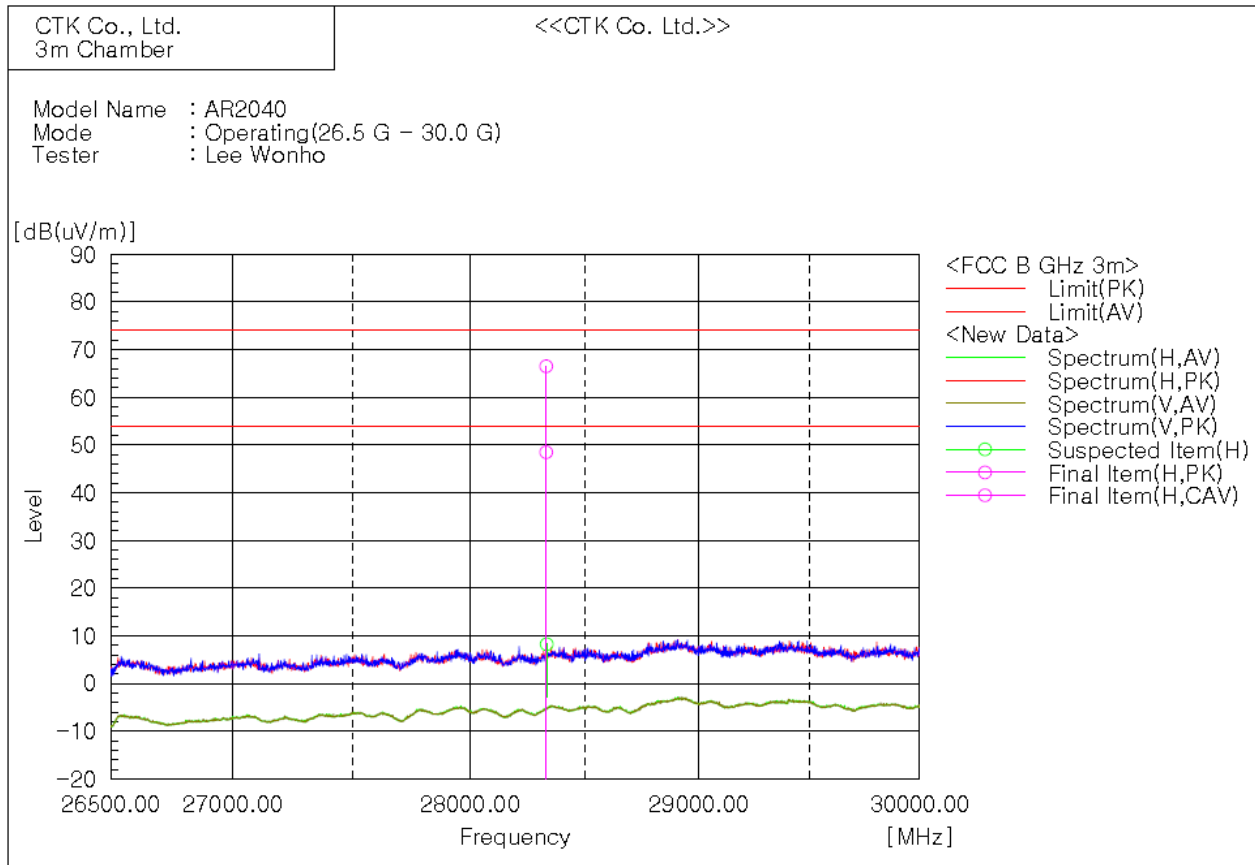
[18 GHz – 26.5 GHz]



Final Result

No.	Frequency	(P)	Reading	Reading	c.f	Result	Result	Limit	Limit	Margin	Margin	Height	Angle
	[MHz]		PK	CAV		PK	CAV	PK	AV	PK	CAV	[cm]	[deg]
			[dB(uV)]	[dB(uV)]	[dB(1/m)]	[dB(uV/m)]	[dB(uV/m)]	[dB(uV/m)]	[dB(uV/m)]	[dB]	[dB]		
1	26088.150	V	44.7	25.7	21.8	66.5	47.5	74.0	54.0	7.5	6.5	400.0	255.0

[26.5 GHz - 30 GHz]



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]
1	28330.150	H	57.0	39.0	9.5	66.5	48.5	74.0	54.0	7.5	5.5	200.0	275.0

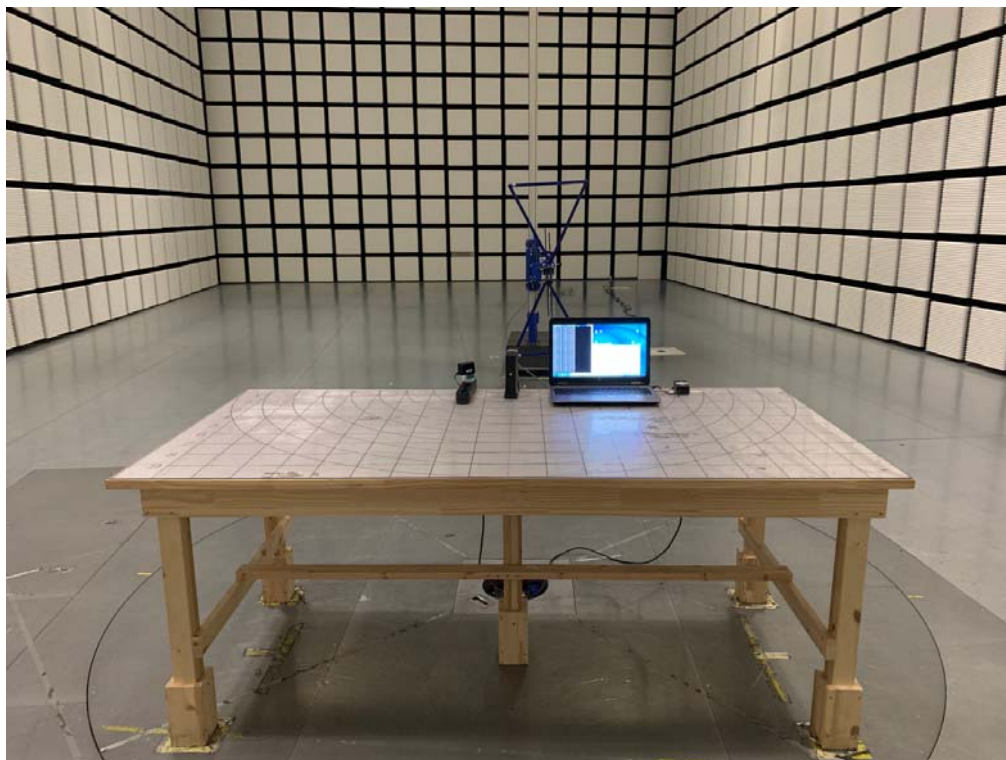
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APPENDIX A - Test Setup Photos and Configuration

Conducted Voltage Emissions of Mains Ports



Radiated Electric Field Emissions (Below 1 GHz)



Radiated Electric Field Emissions (Above 1 GHz)



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APPENDIX B – EUT Photographs

EUT External Photographs







AC/DC Adapter

