




# TEST REPORT

<p><b>KCTL Inc.</b>                  52-20, Sinjeong-ro 41beon-gil, Giheung-gu,                  Yongin-si, Gyeonggi-Do, Korea                  TEL: 82-31-326-6700 FAX: 82-505-299-8311  <a href="http://www.kctl.co.kr">www.kctl.co.kr</a></p>	<p>Report No.:                  KR19-YEF0031                  Page (1) of (22)</p>	
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**1. Client**

- Name : FINETEK Co.,Ltd.
- Address : 22, 4sandan 6-gil, Jiksan-eup, Seobuk-gu, Cheonan-si,  
 Chungcheongnam-do, Republic of Korea.
- Date of Receipt : 2019-05-14

**2. Use of Report** : -



**3. Name of Product and Model** : ESL(Electronic Shelf Label) / FNTAP

**4. Manufacturer and Country of Origin** : FINETEK VN / Vietnam

**5. Date of Test** : 2019-05-23 to 2019-05-28

**6. Test method used** : FCC Part 15 Subpart B, Class B

**7. Test Results** : Refer to the test result in the test report

Affirmation	Tested by 	Technical Manager 
	Name : Bongjae Shin (Signature)	Name : Jaeho Park (Signature)

2019-06-04

**KCTL Inc.**

As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.

**REPORT REVISION HISTORY**

Date	Revision	Page No
2019-06-04	Originally issued	-

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## Contents

<b>1.</b>	<b>Applicant information .....</b>	<b>4</b>
<b>2.</b>	<b>Laboratory information.....</b>	<b>5</b>
<b>3.</b>	<b>Test system configuration.....</b>	<b>7</b>
	3.1 Operation environment.....	7
	3.2 Measurement Uncertainty .....	8
	3.3 Measurement Program.....	9
<b>4.</b>	<b>Description of EUT .....</b>	<b>10</b>
	4.1 General information.....	10
	4.2 Product description.....	11
	4.3 Auxiliary equipments .....	11
	4.4 Test configuration .....	12
	4.5 Operating conditions .....	13
<b>5.</b>	<b>Summary of test results.....</b>	<b>14</b>
	5.1 Summary of EMI emission test results.....	14
<b>6.</b>	<b>Test results .....</b>	<b>15</b>
	6.1 Conducted Emissions.....	15
	6.2 Radiated Emission .....	18

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Page (4) of (22)

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## 1. Applicant information

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**Fax:** +82-41-583-1701  
**E-mail:** [sypark@ifinetek.com](mailto:sypark@ifinetek.com)  
**Contact name:** Sun Young Park

**Manufacturer:** FINETEK VN  
**Address:** Lot No A1-3, Road N2, A Area, Hoa Mac Industrial Zone, Hoa Mac Town,  
Duy Tien District, Ha Nam Province, Vietnam

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Report No.:  
KR19-YEF0031

Page (5) of (22)

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## 2. Laboratory information

### Address

#### **KCTL Inc. (Yongin Lab.)**

52-20, Sinjeong-ro 41beon-gil, Giheung-gu, Yongin-si, Gyonggi-Do, Korea

Telephone Number: 82 31 326 6700

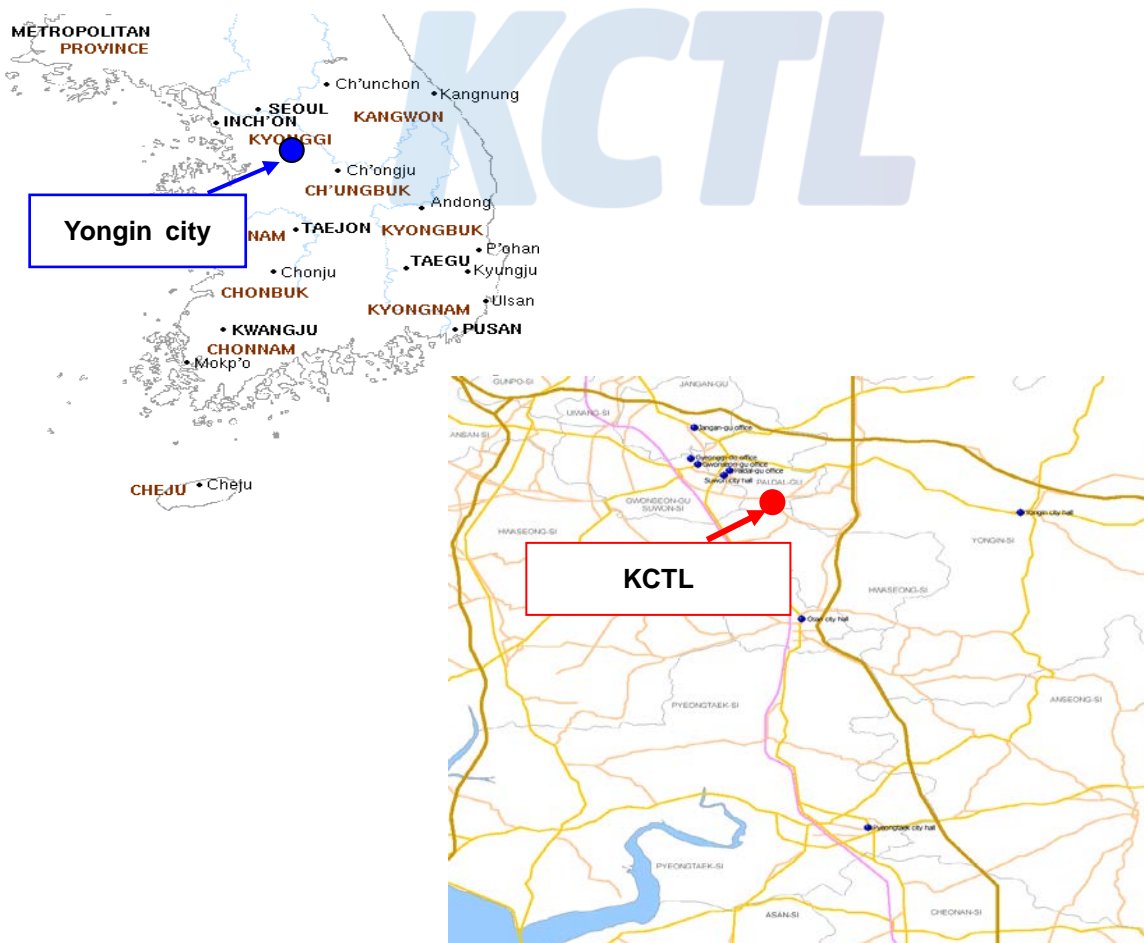
Facsimile Number: 82 505 299 8311

FCC Site Designation No: KR0040

VCCI Registration No. : C-2915, T-11320, R-14386, G-10547

KOLAS NO.: KT231

### SITE MAP



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Report No.:  
KR19-YEF0031

Page (6) of (22)

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### KCTL Inc. (Suwon Lab.)

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-390, Korea

Telephone Number: 82 31 285 0894

Facsimile Number: 82 505 299 8311

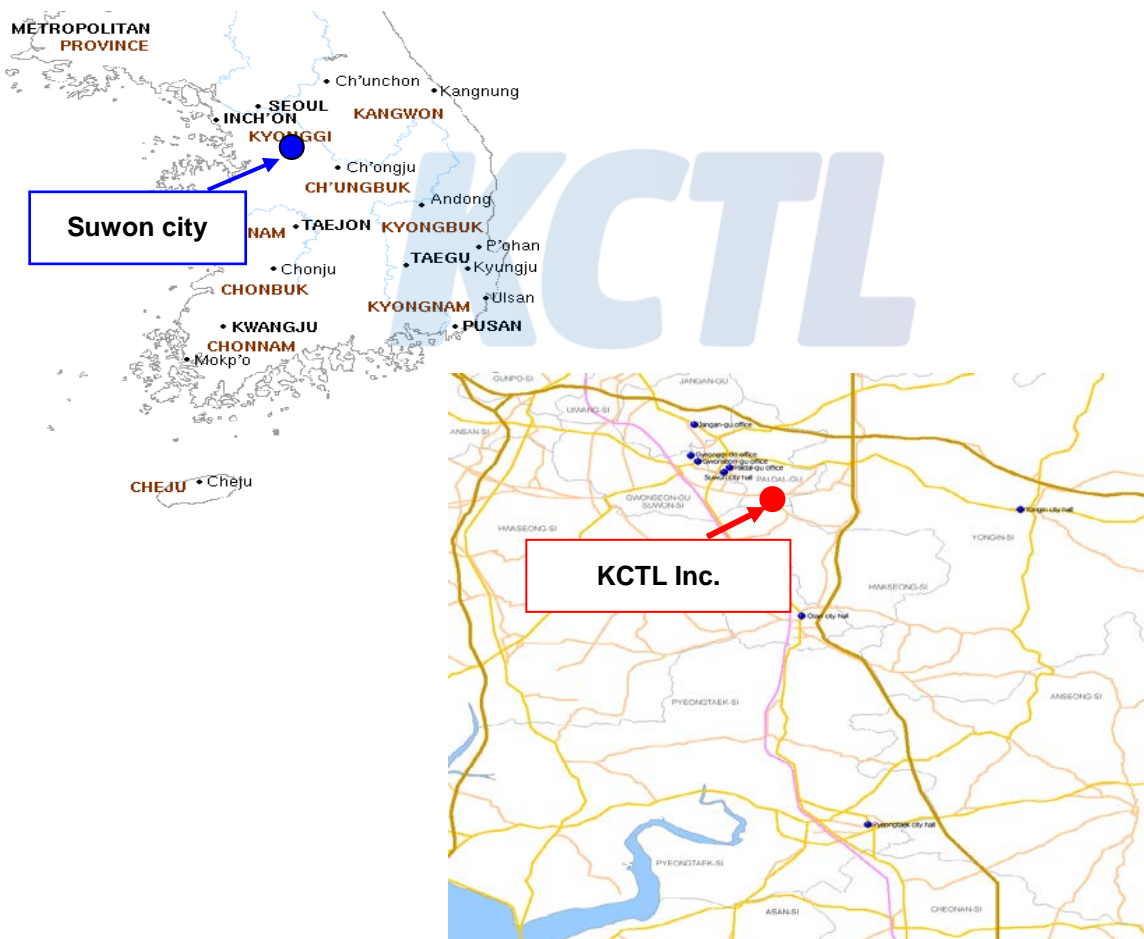
FCC Site Designation No: KR0040

VCCI Registration No. : R-3327, G-198, C-3706, T-1849

Industry Canada Registration No. : 8035A

KOLAS NO.: KT231

### SITE MAP



### 3. Test system configuration

#### 3.1 Operation environment

	Temperature	Humidity	Pressure
Chamber 10 m(RE)	22.1 °C	40.7 % R.H.	-
Chamber 10 m(RE)	22.8 °C	46.1 % R.H.	-
Shielded room(CE)	25.5 °C	33.1 % R.H.	-

#### Test site

These testing items were performed following locations;

Test item	Test site
Conducted Emission	Shielded Room (Yongin Lab.)
Radiated Emission (Below 1 GHz)	10 m Chamber (Yongin Lab.)
Radiated Emission (Above 1 GHz)	10 m Chamber (Suwon Lab. 4F)

### 3.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC.

The factors contributing to uncertainties are test receiver, cable loss, antenna factor calibration, Antenna directivity, antenna factor variation with height, antenna phase center variation, antenna frequency interpolation, measurement distance variation, site imperfection, mismatch, and system repeatability. Based on CISPR 16-4-2, the measurement uncertainty level with a 95 % confidence level was applied.

Conducted Emission measurement_AMN (Confidence level about 95 %, $k = 2$ )		
Shielded Room (CE#1)	9 kHz ~ 150 kHz	2.24 dB
	150 kHz ~ 30 MHz	2.49 dB
Shielded Room (CE#2)	9 kHz ~ 150 kHz	2.10 dB
	150 kHz ~ 30 MHz	2.41 dB
Conducted Emission measurement_AAN (Confidence level about 95 %, $k = 2$ )		
Shielded Room	150 kHz ~ 30 MHz	AAN with aLCL = 55...40 dB : 3.54 dB
		AAN with aLCL = 65...50 dB : 3.98 dB
		AAN with aLCL = 75...60 dB : 4.48 dB
Radiated Emission measurement (Confidence level about 95 %, $k = 2$ )		
10 m Chamber	30 MHz ~ 1000 MHz (Horizontal)	3 m : 4.84 dB
		10 m : 4.66 dB
	30 MHz ~ 1000 MHz (Vertical)	3 m : 4.78 dB
		10 m : 4.62 dB
	1 GHz ~ 6 GHz	3 m : 5.26 dB
Disturbance Power Electromagnetic Fields (Confidence level about 95 %, $k = 2$ )		
Shielded Room	30 MHz ~ 300 MHz	3.73 dB



### 3.3 Measurement Program

These test items were performed by software programs;

Test item	Measurement Program	Used
Conducted Emission	EP5CE_V 5.4.0(TOYO)	<input checked="" type="checkbox"/>
Radiated Emission	EP5RE_V 4.6.0(TOYO) EP5RE_V 5.11.0(TOYO)	<input checked="" type="checkbox"/>
Disturbance Power	EMC32_V 9.12(R&S)	<input type="checkbox"/>
Radiated Electromagnetic Disturbance	EMC32_V 9.2(R&S)	<input type="checkbox"/>
Discontinuous interference	AFJ Click Meter Soft CMS_V 1.0	<input type="checkbox"/>
Radiated RF Immunity	TDK Radiated Immunity Lab_V 10.99.0.2	<input type="checkbox"/>
Conducted RF Immunity	TDK Conducted Immunity Lab_V 3.33	<input type="checkbox"/>
Immunity of Broadcast Receivers	T80-K1_V 2.21(R&S)	<input type="checkbox"/>
Harmonics current emissions, Voltage fluctuations and flicker	IEC Soft_V 2.4f(N4L)	<input type="checkbox"/>

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Report No.:  
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Page (10) of (22)

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## 4. Description of EUT

### 4.1 General information

Model	AP	
INDICATOR	LED Color	Sign
	Red	Power
	Green	Ethernet link
	Amber	Ethernet Activate
	Blue/Red	Operation Active(Blue) / Error(Red)
Network	Ethernet (10/100 Base)	
Wireless Communication	IEEE 802.15.4 Based on 2.4GHz ISM Band, Data Rate: 250Kbps, Service Area: Radius Max. 30m (Line of Sight)	
Antenna	External Dipole Antenna, 3.05dBi	
Approval	FCC,KC	
ROHS	ROHS Compliance	
Power	DC	5V / 3A
	PoE	IEEE802.3af Class 1
Operating Temperature	5°C ~ 40°C / 41°F~104°F	
Operating Humidity	0%~80% / non-condensing	
Size	210mm x 210mm x 40mm(H)	
Weight	445g	

Model	AP
Maximum Transmit Power	2.4GHz - 802.15.4 (Zigbee)
	3.5 dBm (RF1), 2.5 dBm (RF2)
Available Transmit Power Setting	2.4GHz
	20.0 dBm (100mW)
	18.2 dBm (66mW)
	16.4 dBm (44mW)
	14.2 dBm (27mW)
	11.7 dBm (15mW)
	09.2 dBm (9mW)

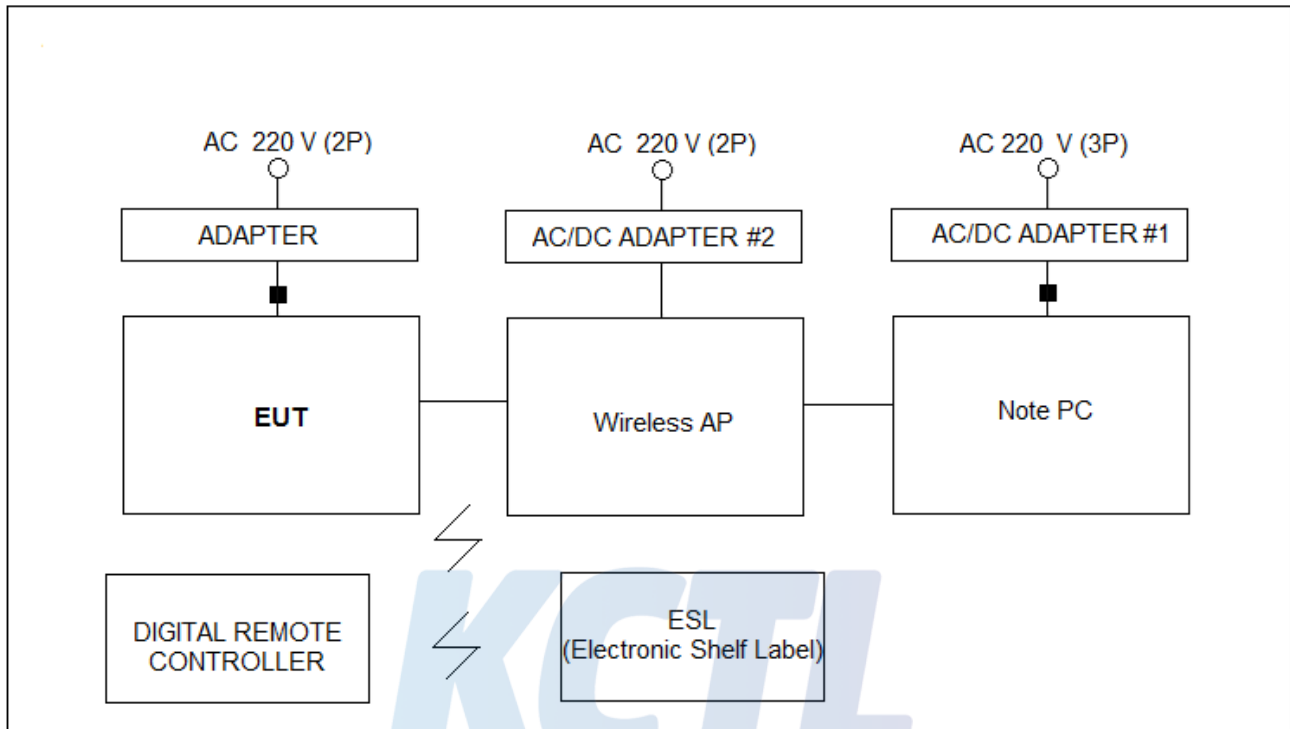
## 4.2 Product description

Type of product	ESL(Electronic Shelf Label)
Model name (Basic)	FNTAP
Model name (Variant)	-
Difference	-
Serial no	-
Testing voltage	220 V, 60 Hz
Input rating	-Adapter Input: AC (100-240) V, (50/60) Hz, 1.5 A Output:DC 5 V, 3000 mA
Frequency range	2.405 MHz ~ 2 480 MHz(Zigbee)
Note	-

## 4.3 Auxiliary equipments

Type	Model / Part #	S/N	Manufacturer
ADAPTER	SW20-05003000-KC	-	ShenZhen Top-Asia Electronics Co., Limited.
ESL (Electronic Shelf Label)	FNT22R	-	FINETEK VN
DIGITAL REMOTE CONTROLLER	-	-	-
Note PC	MS-16J-1	-	MSI
AC/DC ADAPTER #1	ADP-120MH D	-	DELTA ELECTRONICS (JIANGSU) LTD.
Wireless AP	ipTIME A1004NS		EMF networks&multimedia
AC/DC ADAPTER #2	HB30-120200SPA		SHEN ZHEN CITY HONG BEN ELECTRONIC CO.,LTD.

#### 4.4 Test configuration



	Start		End		Cable	
	Name	I/O port	Name	I/O port	Length (m)	Spec.
1	<b>EUT</b>	DC In	ADAPTER	-	1.6	Unshield (Core 1EA)
2		LAN (RJ-45)	Wireless AP	LAN (RJ-45)	3.0	Unshield
3	ADAPTER	Power	AC Main	-	1.0	Unshield
4	DIGITAL REMOTE CONTROLLER	-	-	-	-	-
5	ESL(Electronic Shelf Label)	-	-	-	-	-
6	Wireless AP	DC In	AC/DC ADAPTER #2	-	1.6	Unshield
7		LAN (RJ-45)	Note PC	LAN (RJ-45)	3.0	Unshield
8	Note PC	DC In	AC/DC ADAPTER #1	-	1.6	Unshield (Core 1EA)
9	AC/DC ADAPTER #1	Power	AC Main	-	1.4	Unshield
10	AC/DC ADAPTER #2	Power	AC Main	-	1.0	Unshield

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Report No.:  
KR19-YEF0031

Page (13) of (22)

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## 4.5 Operating conditions

The EUT was configured as normal intended use.

Test mode	Description
#1	Wireless Mode

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## 5. Summary of test results

In the above configuration tested, The EUT complied with the requirement of the specification

### 5.1 Summary of EMI emission test results

FCC Part 15 Subpart B (Class B)

ANSI C63.4 – 2014

Applied	Test items	Test method	Result
<input checked="" type="checkbox"/>	Conducted Emission	15.107 Conducted limits	Pass
<input checked="" type="checkbox"/>	Radiated Emission	15.109 Radiated emission limits	Pass



## 6. Test results

### 6.1 Conducted Emissions

Test specification	FCC Part 15, Section 15.107(e), Class B		
Testing voltage	220 V, 60 Hz		
Test facility	Shielded room (CE#1) (Yongin Lab.)		
Date	2019. 05. 23		
Temperature (°C)	25.5 °C	Humidity (% R.H.)	33.1 % R.H.
Remarks	Pass		

#### 6.1.1 Limits of conducted emissions measurement

AC main

Frequency [MHz]	Class A (dB( $\mu$ V))		Class B (dB( $\mu$ V))	
	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.5	79	66	66 ~ 56 *	56 ~ 46*
0.5 ~ 5	73	60	56	46
5 ~ 30	73	60	60	50

\*The limit decreases linearly with the logarithm of frequency

### 6.1.2 Measurement procedure

The measurements were performed in a shielded room. EUT was setup as shown in photograph and placed on a non-metallic table height of 0.8 m above the reference ground plane. The rear of table was located 0.4 m to the vertical conducted plane. EUT was power through the LISN, which was bonded to the ground plane. The LISN power was filtered. Each EUT power lead, except ground (safety) lead was individually connected through a LISN to input power source. EUT signal cables that hung closer than 0.4 m to the Horizontal metal ground 0.3 m ~ 0.4 m long. The power cord was bundles in the center. All peripheral equipment was powered from a sub LISN. The LISN and ISN were positioned 0.8 m from the EUT. Peak and Average detection were used in preliminary testing and Quasi-peak and Average detections were used at final measurement. Both lines of power cord, hot and neutral, were measured.

$$\text{Result QP/CAV}[\text{dB}(\mu\text{V})] = \text{Reading QP/CAV}[\text{dB}(\mu\text{V})] + \text{c.f}(\text{Insertion Loss} [\text{dB}] + \text{Cable Loss} [\text{dB}])$$

Result QP/CAV : Result, Reading QP/CAV : Meter Reading, c.f : Correction Factor

Margin (QP/CAV) = Limit (QP/CAV) – Results (QP/CAV)

Note1) QP : Abbreviation of Quasi-Peak

Note2) CAV : Abbreviation of CISPR Average

### 6.1.3 Used equipments

Equipment	Model	Serial No.	Makers	Next Cal. Date	Used
EMI Test Receiver	ESCI	100373	R&S	2020.01.21	<input checked="" type="checkbox"/>
Two Line V-Network	ENV216	101718	R&S	2019.09.18	<input checked="" type="checkbox"/>
Two Line V-Network	ESH2-Z5	842966/014	R&S	2019.09.18	<input checked="" type="checkbox"/>
EMI Test Receiver	ESCI	100374	R&S	2020.04.26	<input type="checkbox"/>
Two Line V-Network	ENV216	101719	R&S	2020.07.12	<input type="checkbox"/>
Two Line V-Network	ESH3-Z5	862770/025	R&S	2020.04.26	<input type="checkbox"/>
V-Network	ESH3-Z6	100431	R&S	2020.04.26	<input type="checkbox"/>
V-Network	ESH3-Z6	100432	R&S	2020.04.26	<input type="checkbox"/>



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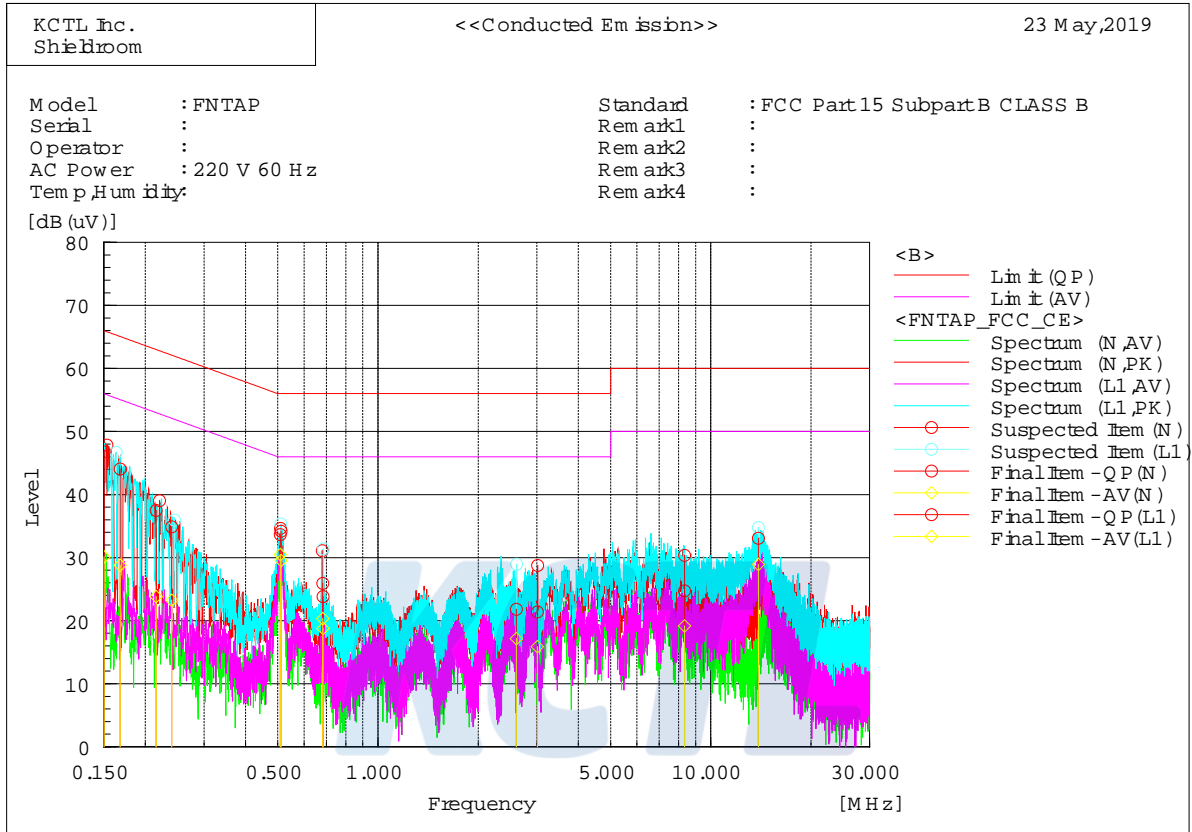
Report No.:  
KR19-YEF0031

Page (17) of (22)



## 6.1.4 Conducted emissions measurement result

\* AC Main



### Final Result

--- N Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]	Remark
1	0.15014	36.8	20.1	10.0	46.8	30.1	66.0	56.0	19.2	25.9	
2	0.21558	27.5	13.8	10.0	37.5	23.8	63.0	53.0	25.5	29.2	
3	0.51176	24.0	19.3	10.2	34.2	29.5	56.0	46.0	21.8	16.5	
4	0.68373	13.7	8.7	10.1	23.8	18.8	56.0	46.0	32.2	27.2	
5	3.01413	11.4	5.9	10.0	21.4	15.9	56.0	46.0	34.6	30.1	
6	8.34142	14.4	8.9	10.3	24.7	19.2	60.0	50.0	35.3	30.8	

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]	Remark
1	0.16792	33.8	18.5	10.3	44.1	28.8	65.1	55.1	21.0	26.3	
2	0.23983	25.0	13.4	9.9	34.9	23.3	62.1	52.1	27.2	28.8	
3	0.50895	23.4	20.3	10.2	33.6	30.5	56.0	46.0	22.4	15.5	
4	0.68237	15.8	10.2	10.1	25.9	20.3	56.0	46.0	30.1	25.7	
5	2.60517	11.8	7.2	10.0	21.8	17.2	56.0	46.0	34.2	28.8	
6	13.90407	22.4	18.2	10.7	33.1	28.9	60.0	50.0	26.9	21.1	

## 6.2 Radiated Emission

Test specification	FCC Part 15, Section 15.109(g), Class B		
Testing voltage	220 V, 60 Hz		
Test facility	10 m Chamber (Yongin Lab.)		
Test distance	3 m		
Date	2019. 05. 23		
Temperature (°C)	22.1 °C	Humidity (% R.H.)	40.7 % R.H.
Remarks	Pass		

Test specification	FCC Part 15, Section 15.109(g), Class B		
Testing voltage	220 V, 60 Hz		
Test facility	10 m Chamber (Suwon Lab. 4F)		
Test distance	3 m		
Date	2019. 05. 28		
Temperature (°C)	22.8 °C	Humidity (% R.H.)	46.1 % R.H.
Remarks	Pass		

### 6.2.1 Limits of radiated emission measurement

Limits below 1 GHz

Frequency [MHz]	Class A (dB(μV/m)) @ 10 m	Class B (dB(μV/m)) @ 3 m
30-88	39.08	40.00
88-216	43.52	43.52
216-960	43.44	46.02
Above 960	49.54	53.98

\* Note- Alternative standard: CISPR, Pub. 22 \*

Limits above 1 GHz

Frequency [GHz]	Class A @ 3 m		Class B @ 3 m	
	Peak limit (dB(μV/m))	Average limit (dB(μV/m))	Peak limit (dB(μV/m))	Average limit (dB(μV/m))
Above 1 GHz	79.5	59.5	74	54

Note - The lower limit applies at the transition frequency.

### 6.2.2 Measurement procedure

The test was done at a 10 m Chamber with a quasi-peak detector.

EUT was placed on a non-metallic table height of 0.8 m above the reference ground plane.

Cables were folded back and forth forming a bundle 0.3 m to 0.4 m long and were hanged at a 0.4 m height to the ground plane. Cables connected to EUT were fixed to cause maximum emission.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

### 6.2.3 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. Date	Used
EMI Test Receiver	ESCI7	100872	R&S	2020.07.12	<input checked="" type="checkbox"/>
Amplifier	310N	353132	SONOMA	2019.09.18	<input checked="" type="checkbox"/>
Attenuator	8491B 6dB	MY39270721	KEYSIGHT	2019.09.18	<input checked="" type="checkbox"/>
Bi-Log Antenna	CBL 6112D	40522	TESEQ	2020.03.06	<input checked="" type="checkbox"/>
Spectrum Analyzer	FSV40	100988	R&S	2020.01.04	<input checked="" type="checkbox"/>
Antenna Mast	MA4640-XP-ET	-	Innco Systems	-	<input checked="" type="checkbox"/>
Turn Table	TT3.0-3t	-	MATVRO	-	<input checked="" type="checkbox"/>
DOUBLE RIDGED HORN ANTENNA	3117-PA	00161083	ETS-LINDGREN	2019.09.14	<input checked="" type="checkbox"/>

#### 6.2.4 Sample calculation

The field strength is calculated adding the antenna Factor, cable loss and, Antenna pad adding, subtracting the amplifier gain from the measured reading.

The sample calculation is as follow:

-Below 1 GHz

$$\text{Result QP}[\text{dB}(\mu\text{V}/\text{m})] = \text{Reading QP}[\text{dB}(\mu\text{V})] + \text{c.f}(\text{Antenna Factor} [\text{dB}/\text{m}] + \text{Cable Loss} [\text{dB}] + 6 \text{ dB Att} [\text{dB}] - \text{Amp Gain} [\text{dB}])$$

Result QP : Result, Reading QP : Meter Reading, c.f : Correction Factor

$$\text{Margin (QP)} = \text{Limit (QP)} - \text{Results (QP)}$$

Note1) QP : Abbreviation of Quasi-Peak

-Above 1 GHz

$$\text{Result PK/CAV} [\text{dB}(\mu\text{V}/\text{m})] = \text{Reading PK/CAV} [\text{dB}(\mu\text{V})] + \text{c.f}(\text{Antenna Factor} [\text{dB}/\text{m}] + \text{Cable Loss} [\text{dB}] - \text{Amp Gain} [\text{dB}])$$

Result PK/CAV : Result, Reading PK/CAV : Meter Reading, c.f : Correction Factor

$$\text{Margin (PK/CAV)} = \text{Limit (QP/CAV)} - \text{Results (QP/CAV)}$$

Note1) PK : Abbreviation of Peak

Note2) CAV : Abbreviation of CISPR Average

If Reading is 30 dB $\mu\text{V}$ , Antenna Factor 12 dB/m, Cable Loss 5 dB, Attenuator 6 dB, Amp Gain 35 dB

The result is

$$30 + 12 + 5 + 6 - 35 = 18 \text{ dB}(\mu\text{V}/\text{m})$$

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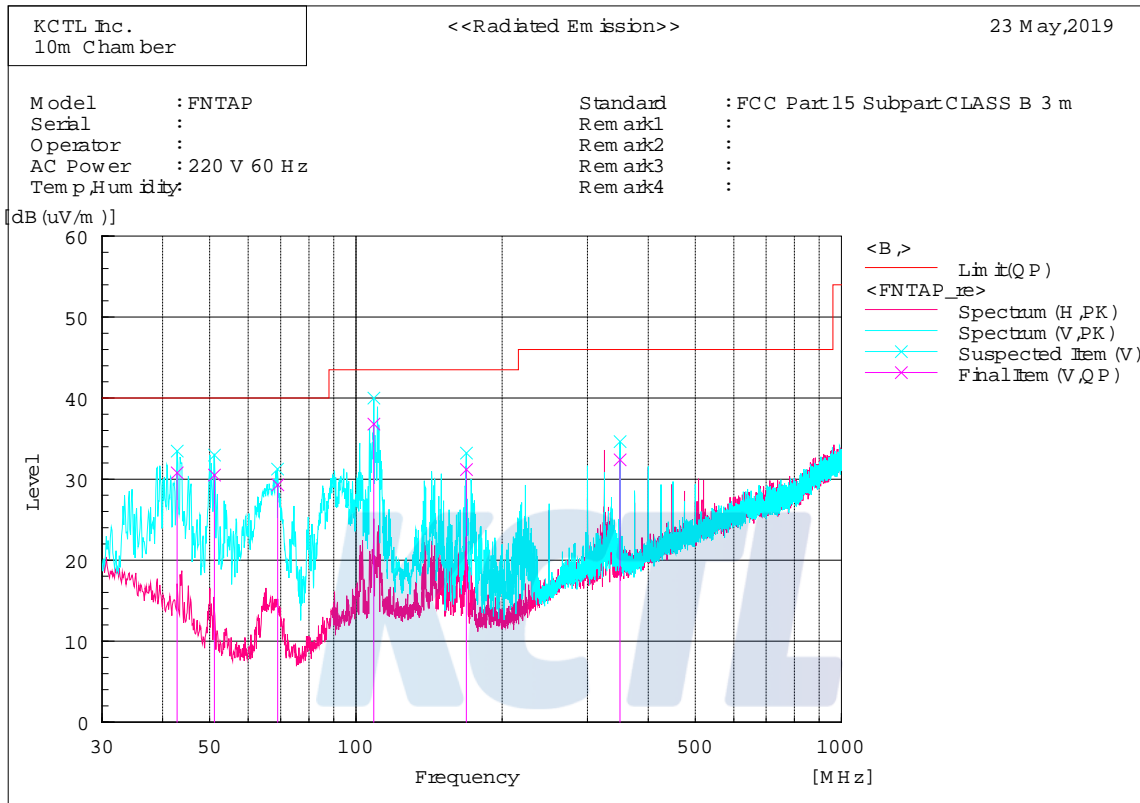
Page (21) of (22)



## 6.2.5 Radiated emission measurement result

### \* Graph and Data

\* 30 MHz ~ 1 GHz



#### 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 [dB]	Height [cm]	Angle [deg]	Remark
1	42.850	V	44.8	-14.0	30.8	40.0	9.2	200.0	310.0	
2	51.124	V	48.3	-17.8	30.5	40.0	9.5	110.0	352.0	
3	68.980	V	48.7	-19.4	29.3	40.0	10.7	300.0	210.0	
4	108.813	V	50.3	-13.5	36.8	43.5	6.7	100.0	141.0	
5	168.855	V	45.1	-13.9	31.2	43.5	12.3	100.0	195.0	
6	349.988	V	39.5	-7.1	32.4	46.0	13.6	200.0	210.0	

# KCTL Inc.

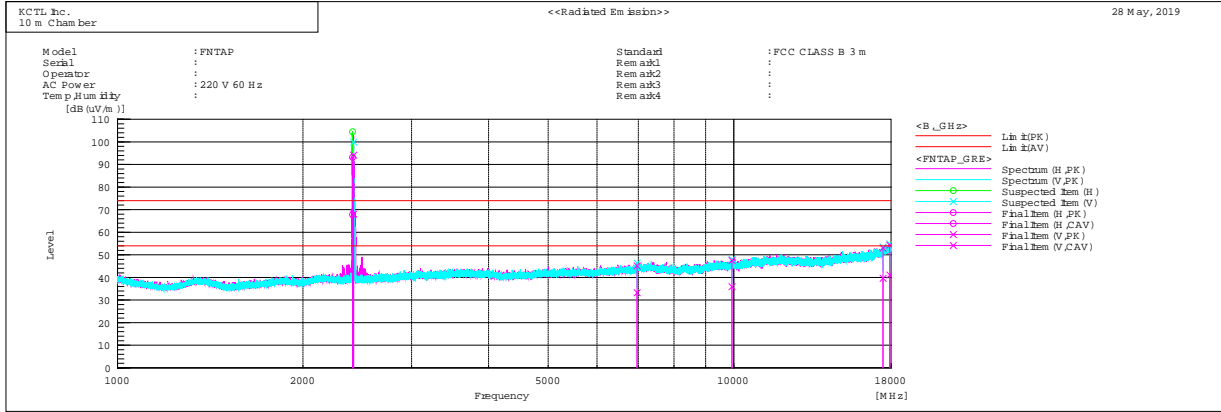
52-20, Sinjeong-ro 41beon-gil, Giheung-gu,  
Yongin-si, Gyeonggi-Do, Korea  
TEL: 82-31-326-6700 FAX: 82-505-299-8311  
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Report No.:  
KR19-YEF0031

Page (22) of (22)



\* 1 GHz ~ 18 GHz



- Excluded Band: (2 280 ~ 2 520) MHz
- Fundamental Frequency: 2 405.420 MHz(Hor.), 2 415.471 MHz(Ver.)

