

KCTL

REPORT REVISION HISTORY

Date	Revision	Page No
2020-10-15	Originally issued	-
2020-10-19	Updated	15

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Note. The report No. KR20-SEF0155 is superseded by the report No. KR20-SEF0155-A.

General remarks for test reports

Nothing significant to report.

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KCTL Inc. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea Tel: 82-31-285-0894 Fax: 82-505-299-8311 www.kctl.co.kr	Report No.: KR20-SEF0155-A Page (4) of (40)	
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1. Applicant information

Applicant: Samsung Electronics Co., Ltd.
Address: 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do,
 16677, Rep. of Korea
E-mail: kevin1.lee@samsung.com
Contact name: Byungjae Lee

Manufacturer: Samsung Electronics Co., Ltd.
Address: 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do,
 16677, Rep. of Korea
E-mail: kevin1.lee@samsung.com
Contact name: Byungjae Lee

Factory #1: Samsung Electronics Vietnam Co. Ltd.
Address #1: KCN Yen Binh I, Pho Yen, Thai Nguyen, VIETNAM

Factory #2: Samsung India Electronics PVT. Ltd
Address #2: B-1, Sector-8 NOIDA Uttar Pradesh, India 201-305

Factory #3: Samsung Electronics Vietnam Thai Nguyen Co., Ltd
Address #3: 506-723 16000 Yen Phong 1 Industrial Zone, Yen Trung Commu,
 Yen Phong District, Bac Ninh Province, Vietnam

KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
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2. Laboratory information

Address

KCTL Inc. (Suwon Lab.)

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea

Telephone Number: 82 31 285 0894

Facsimile Number: 82 505 299 8311

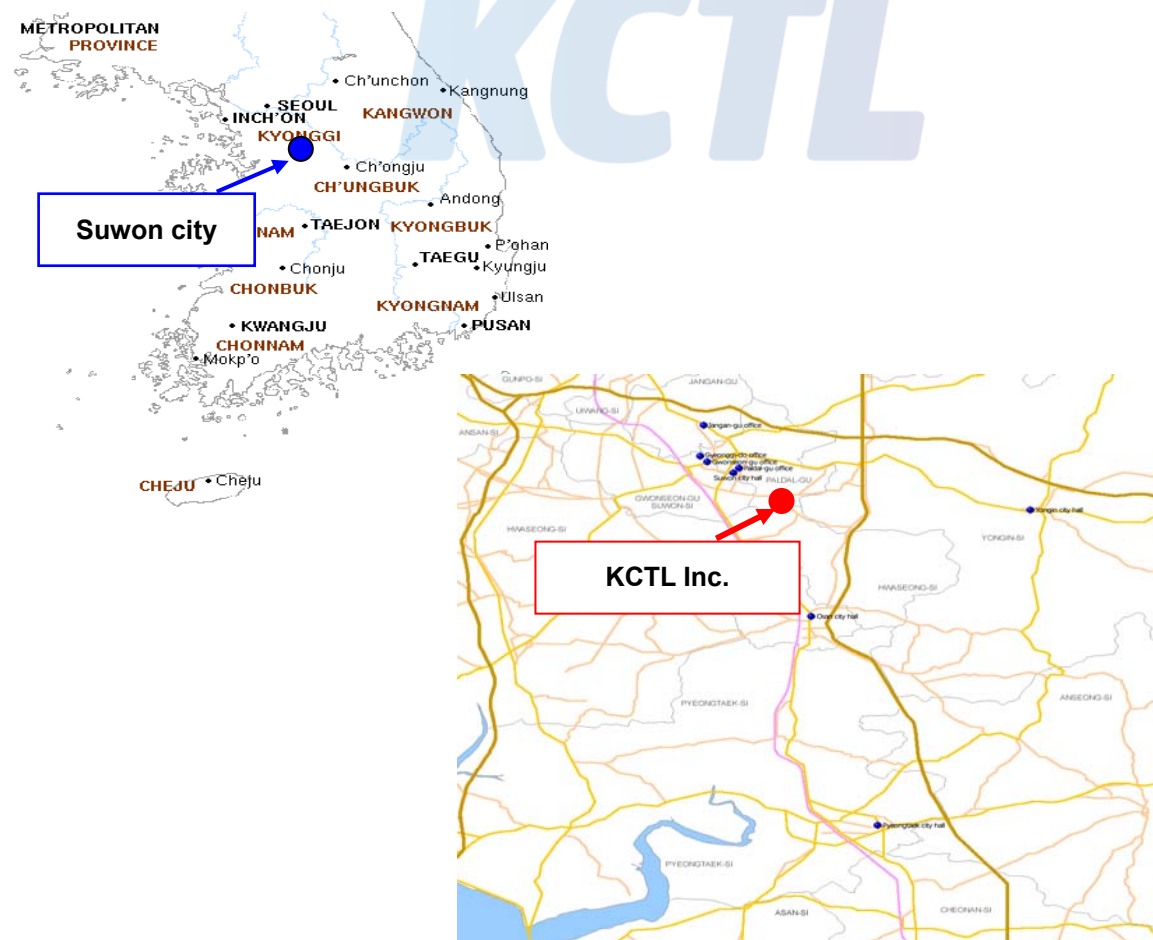
FCC Site Designation No: KR0040

VCCI Registration No.: R-20080, G-20078, C-20059, T-20056

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)	21.4 °C / 21.7 °C	40.3 % R.H. / 40.5 % R.H.	-
Shielded room(CE)	22.8 °C	41.4 % R.H.	-

Test site

These testing items were performed following locations;

Test item	Test site
Conducted Emission	Shielded Room
Radiated Emission	10 m Chamber

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 (Confidence level about 95 %, $k = 2$)		
Shielded Room (CE#1)	9 kHz ~ 150 kHz: 3.7 dB	
	150 kHz ~ 30 MHz: 3.3 dB	
Shielded Room (CE#2)	9 kHz ~ 150 kHz: 3.5 dB	
	150 kHz ~ 30 MHz: 3.1 dB	
Radiated Emission measurement (Confidence level about 95 %, $k = 2$)		
10 m Chamber (4F)	30 MHz ~ 300 MHz	3 m: 5.4 dB
		10 m: 5.3 dB
	300 MHz ~ 1 000 MHz	3 m: 5.5 dB
		10 m: 5.4 dB
	1 GHz ~ 6 GHz	3 m: 6.4 dB
	6 GHz ~ 18 GHz	3 m: 6.6 dB
	18 GHz ~ 30 GHz	3 m: 6.7 dB
	30 GHz ~ 40 GHz	3 m: 6.2 dB
10 m Chamber (2F)	30 MHz ~ 300 MHz	3 m: 5.0 dB
		10 m: 5.0 dB
	300 MHz ~ 1 000 MHz	3 m: 5.2 dB
		10 m: 5.0 dB
	1 GHz ~ 6 GHz	3 m: 6.4 dB
	6 GHz ~ 18 GHz	3 m: 6.6 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)		☒
Radiated Emission	2F	EP5RE_V 4.6.0(TOYO)	☒
	4F	EP5RE_V 5.11.10(TOYO)	

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4. Description of EUT

4.1 General information

Declared Hardware Version	REV1.0
Declared Software Version	M315F.001
IMEI No	350265510204626/01
Operating Band(s)	GSM 850/900/1800/1900 WCDMA FDD 1/2/4/5/8 LTE FDD 1/2/3/4/5/7/8/12/13/17/20/26/28/66 LTE TDD 38/40/41

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4.2 Product description

Type of product	Mobile phone
Model name (Basic)	SM-F415F/DS
Model name (Variant)	-
Difference	-
Serial no	-
Testing voltage	120 V, 60 Hz / DC 3.85 V
Input/Output rating	Adapter (EP-TA200) Input: AC 100 V - 240 V, 50-60 Hz, 0.5 A Output: DC 9.0 V, 1.67 A or DC 5.0 V, 2.0 A Serial no: R37M37G2BC1DK3 Battery: DC 3.85 V
Internal clock frequency	Above 108 MHz
RF Frequency	Bluetooth(BDR/EDR/BLE) 2 402 MHz ~ 2 480 MHz 2 412 MHz ~ 2 462 MHz (802.11b/g/n_HT20) UNII-1: 5 180 MHz ~ 5 240 MHz (802.11a/n_HT20/ac_VHT20) UNII-1: 5 190 MHz ~ 5 230 MHz (802.11n_HT40/ac_VHT40) UNII-1: 5 210 MHz (802.11ac_VHT80) UNII-2A: 5 260 MHz ~ 5 320 MHz (802.11a/n_HT20/ac_VHT20) UNII-2A: 5 270 MHz ~ 5 310 MHz (802.11n_HT40/ac_VHT40) UNII-2A: 5 290 MHz (802.11ac_VHT80) UNII-2C: 5 500 MHz ~ 5 720 MHz (802.11a/n_HT20/ac_VHT20) UNII-2C: 5 510 MHz ~ 5 710 MHz (802.11n_HT40/ac_VHT40) UNII-2C: 5 530 MHz ~ 5 690 MHz (802.11ac_VHT80) UNII-3: 5 745 MHz ~ 5 825 MHz (802.11a/n_HT20/ac_VHT20) UNII-3: 5 755 MHz ~ 5 795 MHz (802.11n_HT40/ac_VHT40) UNII-3: 5 775 MHz (802.11ac_VHT80) LTE Band 2_1 850.7 MHz ~ 1 909.3 MHz LTE Band 4_1 710.7 MHz ~ 1 754.3 MHz LTE Band 5_824.7 MHz ~ 848.3 MHz LTE Band 12_699.7 MHz ~ 715.3 MHz LTE Band 13_779.5 MHz ~ 784.5 MHz LTE Band 17_706.5 MHz ~ 713.5 MHz LTE Band 26_824.7 MHz ~ 848.3 MHz, 814.7 MHz ~ 823.3 MHz LTE Band 41_2 498.5 MHz ~ 2 687.5 MHz LTE Band 66_1 710.7 MHz ~ 1 779.3 MHz GSM 850_824.2 MHz ~ 848.8 MHz GSM 1900_1 850.2 MHz ~ 1 909.8 MHz WCDMA 850_826.4 MHz ~ 846.6 MHz WCDMA 1700_1 712.4 MHz ~ 1 752.6 MHz WCDMA 1910_1 852.4 MHz ~ 1 907.6 MHz
Note	-

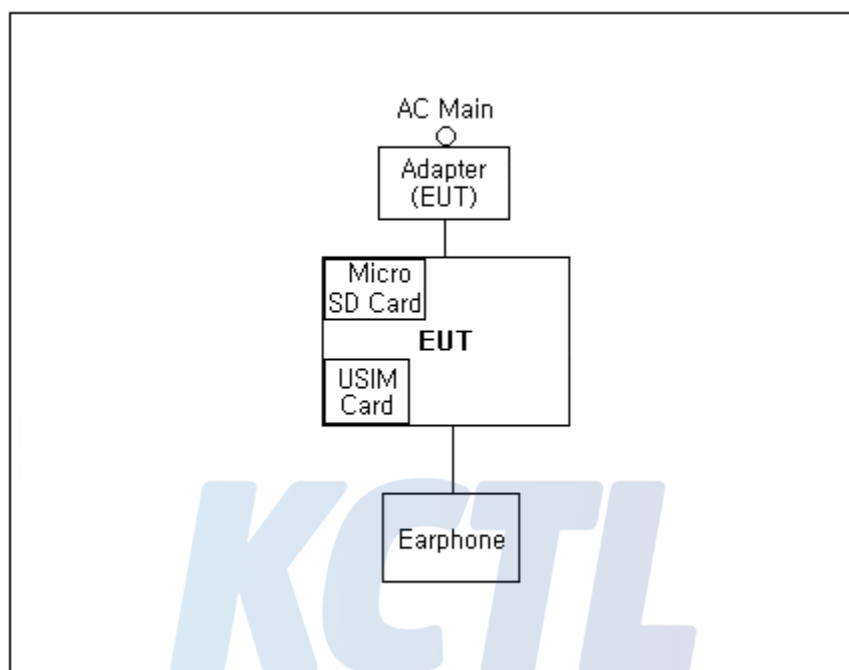
4.3 Auxiliary equipments

Type	Model / Part #	S/N	Manufacturer
Adapter (EUT)	EP-TA200	R37M37G2BC1DK3	SAMSUNG
Battery (EUT)	EB-BM207ABY	-	SAMSUNG
USB Cable (EUT)	EP-DR140AWE	-	SAMSUNG
Earphone	EHS64AVFWE	-	SAMSUNG
USIM Card	4G CSIM	000964	SEIPER
Micro SD Card (64 GB)	Samsung Pro Plus MB-MD64G	-	SAMSUNG
Note PC #1	HP ProBook 470 G2	CND5074WT	HP
Adapter #1	PPP009C	F220881440034736	HP

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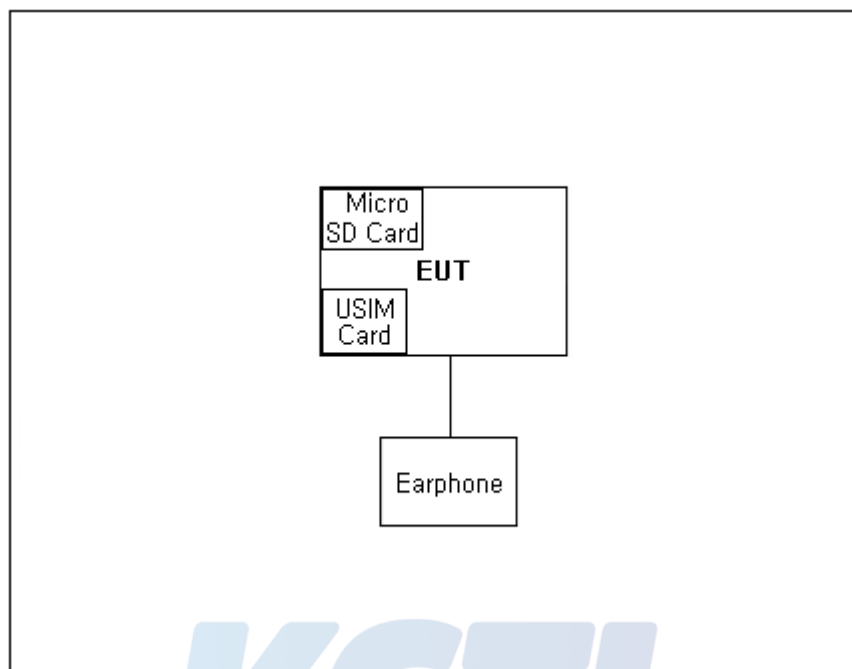
4.4 Test configuration

[Test #1 ~ Test #4_CE / Test #1_RE]



	Start		End		Cable	
	Name	I/O port	Name	I/O port	Length (m)	Spec.
1	EUT	Power	Adapter(EUT)	USB	1.0	Shield
2		USIM	USIM Card	-	Direct	-
3		Micro SD	Micro SD Card	-	Direct	-
4		Earphone	Earphone	-	1.6	Unshield
5	Adapter (EUT)	Power	AC Main	-	Direct	-

[Test #2 ~ Test #4_RE]



	Start		End		Cable	
	Name	I/O port	Name	I/O port	Length (m)	Spec.
1	EUT	USIM	USIM Card	-	Direct	-
2		Micro SD	Micro SD Card	-	Direct	-
3		Earphone	Earphone	-	1.6	Unshield

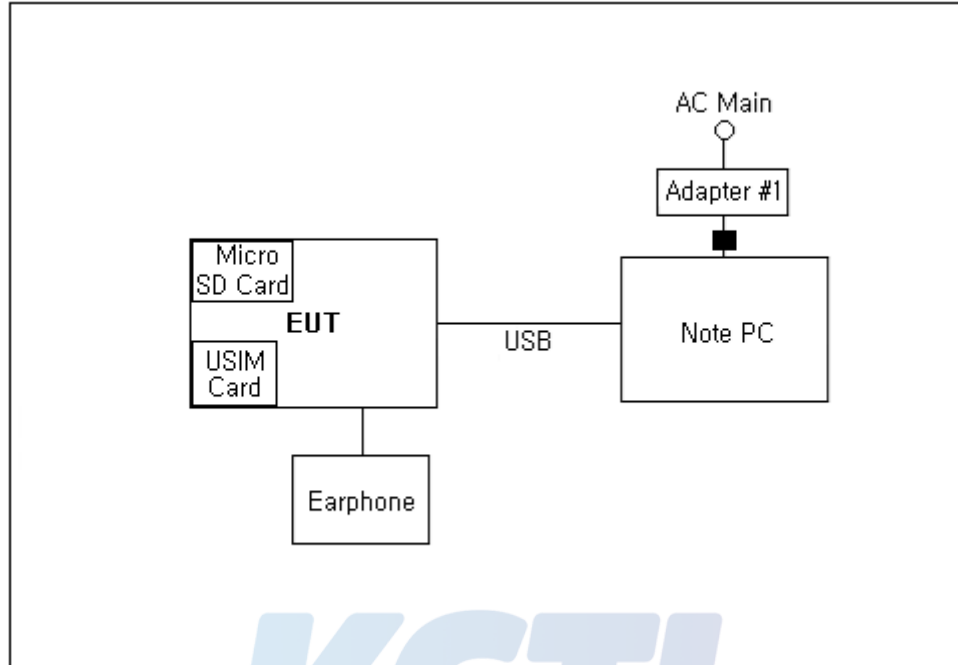
KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
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[Test #5_CE, RE]



	Start		End		Cable	
	Name	I/O port	Name	I/O port	Length (m)	Spec.
1	EUT	USB	Note PC	USB	1.0	Shield
2		USIM	USIM Card	-	Direct	-
3		Micro SD	Micro SD Card	-	Direct	-
4		Earphone	Earphone	-	1.6	Unshield
5	Note PC	Power	Adapter #1	-	1.5	Unshield (Core)

4.5 Operating conditions

The EUT was configured as normal intended use.

Test mode		Normal operating
Test #1	CE Test	Camera(Rear) + Charging(w/TA) + FM(Low Ch.) Test the operation status of the Rear Camera, Charging and FM radio low ch.
Test #2		Camera(Front) + Charging(w/TA) + FM(Mid Ch.) Test the operation status of the Front Camera, Charging and FM radio Mid ch.
Test #3		Charging(w/TA) + FM(High Ch.) Test the operation status of the Charging and FM radio High Ch.
Test #4		Charging(w/TA) + Test by playing Video & Audio playback from internal memory data.
Test #5		Connect Note PC and EUT USB Cable and test it by communicating data through Micro SD Card.
Test #1	RE Test	Camera(Rear) + Charging(w/TA) + FM(Low Ch.) Test the operation status of the Rear Camera, Charging and FM radio low ch.
Test #2		Camera(Front) + FM(Mid Ch.) Test the operation status of the Front Camera, FM radio low ch.
Test #3		FM(High Ch.) Test the operation status of FM radio High ch.
Test #4		Charging(w/TA) + Test by playing Video & Audio playback from internal memory data.
Test #5		Connect Note PC and EUT USB Cable and test it by communicating data through Micro SD Card.

Note 1. It means this device needs to be tested with 3 orientations (x,y and z) and at least the worst case orientation shall be set for final test.

It was determined that Z orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in Z orientation.

5. Summary of test results

5.1 Summary of EMI emission test results

Applied	Test items	Test method	Result
☒	Conducted Emission	FCC Part 15 Subpart B (Class B) ANSI C63.4:2014	Pass
☒	Radiated Emission	FCC Part 15 Subpart B (Class B) ANSI C63.4:2014	Pass

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6. Test results

6.1 Conducted Emissions

Test specification	ANSI C63.4:2014, Class B FCC Part 15 Subpart B		
Testing voltage	120 V, 60 Hz		
Test facility	Shielded room (CE#2)		
Date	2020-10-05		
Temperature (°C)	22.8 °C	Humidity (% R.H.)	41.4 % R.H.
Remarks	Pass		

6.1.1 Limits of conducted emissions measurement

Frequency [MHz]	Class A (dB(μ V))		Class B (dB(μ V))	
	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.5	79	66	66 ~ 56 ¹⁾	56 ~ 46 ¹⁾
0.5 ~ 5	73	60	56	46
5 ~ 30	73	60	60	50

¹⁾ 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.

6.1.3 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. Date	Used
EMI TEST RECEIVER	ESCI	100710	R&S	2021.08.20	☒
TWO-LINE V-NETWORK	ENV216	101584	R&S	2021.04.06	☒
TWO-LINE V-NETWORK	NNLK8121	8121-472	SCHWARZBECK	2021.08.20	☐

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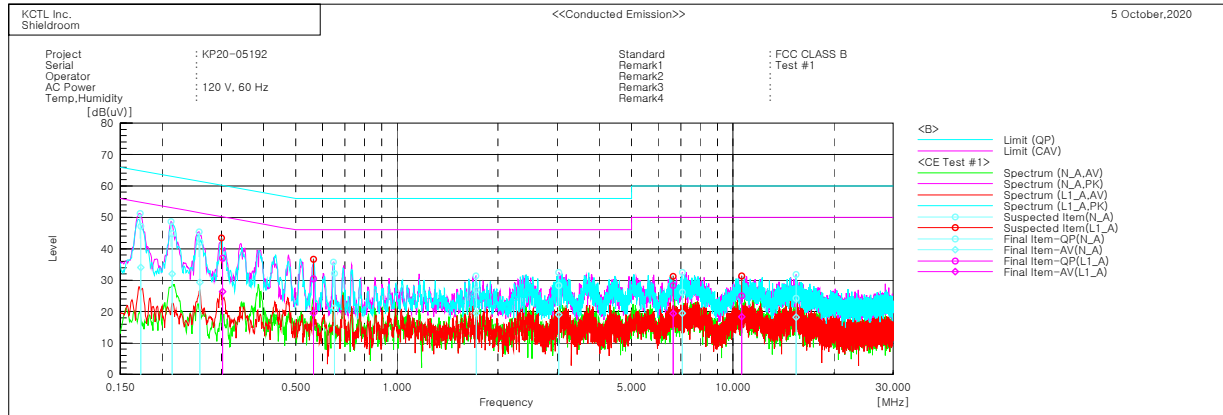
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6.1.4 Conducted emissions measurement result

AC Main



Final Result

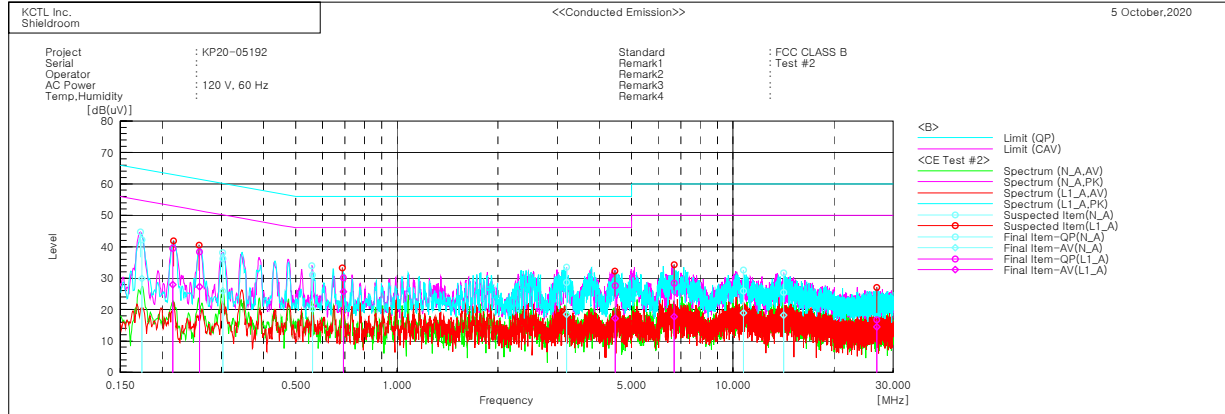
--- N_A Phase ---									
No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]
1	0.17284	36.9	23.8	10.3	47.2	34.1	64.8	54.8	17.6
2	0.21427	34.8	22.0	10.0	44.8	32.0	63.0	53.0	18.2
3	0.2588	32.2	19.4	9.9	42.1	29.3	61.5	51.5	19.4
4	0.65111	22.1	11.1	10.1	32.2	21.2	56.0	46.0	23.8
5	1.72105	16.9	9.4	10.1	27.0	19.5	56.0	46.0	29.0
6	3.02782	18.2	8.9	10.1	28.3	19.0	56.0	46.0	27.7
7	7.07829	16.0	9.2	10.2	26.2	19.4	60.0	50.0	33.8
8	15.423	13.7	7.6	10.6	24.3	18.2	60.0	50.0	35.7

--- L1_A 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]
1	0.30234	27.2	16.5	9.8	37.0	26.3	60.2	50.2	23.2
2	0.5649	20.4	9.4	10.0	30.4	19.4	56.0	46.0	25.6
3	6.64669	18.3	9.3	10.0	28.3	19.3	60.0	50.0	31.7
4	10.63414	14.9	8.1	10.2	25.1	18.3	60.0	50.0	34.9

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Final Result

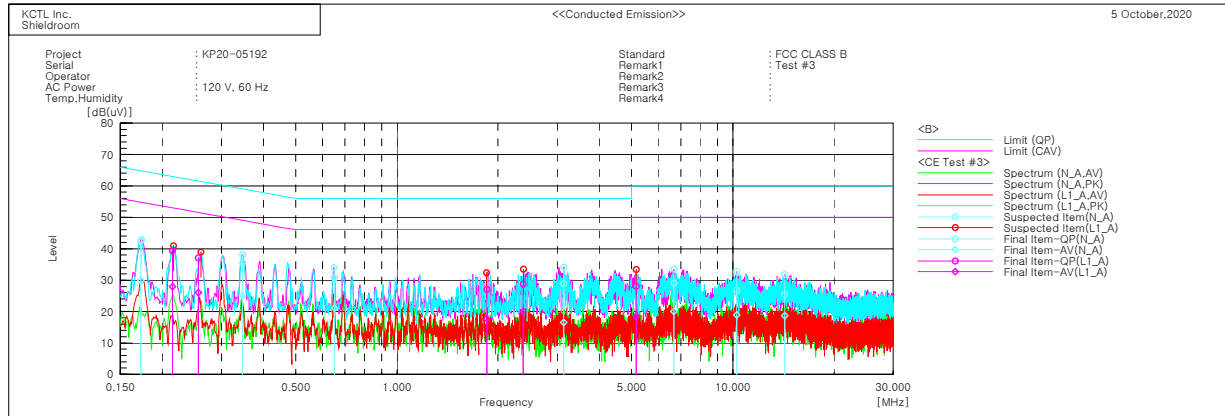
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No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]
1	0.17388	31.9	19.5	10.3	42.2	29.8	64.8	54.8	22.6
2	0.30294	26.2	15.9	10.0	36.2	25.9	60.2	50.2	24.0
3	0.55966	20.7	10.1	10.2	30.9	20.3	56.0	46.0	25.1
4	3.19851	18.5	8.4	10.1	28.6	18.5	56.0	46.0	27.4
5	10.75174	15.6	8.5	10.4	26.0	18.9	60.0	50.0	34.0
6	14.1734	15.0	7.7	10.5	25.5	18.2	60.0	50.0	34.5

--- L1_A 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]
1	0.21497	29.7	18.1	9.8	39.5	27.9	63.0	53.0	23.5
2	0.25816	28.7	17.6	9.7	38.4	27.3	61.5	51.5	23.1
3	0.69245	20.2	15.8	9.9	30.1	25.7	56.0	46.0	25.9
4	4.46245	17.7	7.3	9.9	27.6	17.2	56.0	46.0	28.4
5	6.69141	18.4	7.7	10.0	28.4	17.7	60.0	50.0	31.6
6	26.84534	5.8	3.6	10.9	16.7	14.5	60.0	50.0	43.3

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--- N_A Phase ---

No.	Frequency	Reading QP	Reading CAV	c.f	Result QP	Result CAV	Limit QP	Limit AV	Margin QP	Margin CAV
	[MHz]	[dB(uV)]	[dB(uV)]	[dB]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB]	[dB]
1	0.17294	32.1	19.7	10.3	42.4	30.0	64.8	54.8	22.4	24.8
2	0.34638	25.5	14.9	10.1	35.6	25.0	59.0	49.0	23.4	24.0
3	0.65158	20.6	11.0	10.1	30.7	21.1	56.0	46.0	25.3	24.9
4	3.13952	18.8	6.5	10.1	28.9	16.6	56.0	46.0	27.1	29.4
5	6.67148	18.9	9.8	10.2	29.1	20.0	60.0	50.0	30.9	30.0
6	10.26817	16.4	8.5	10.4	26.8	18.9	60.0	50.0	33.2	31.1
7	14.27441	14.9	8.2	10.5	25.4	18.7	60.0	50.0	34.6	31.3

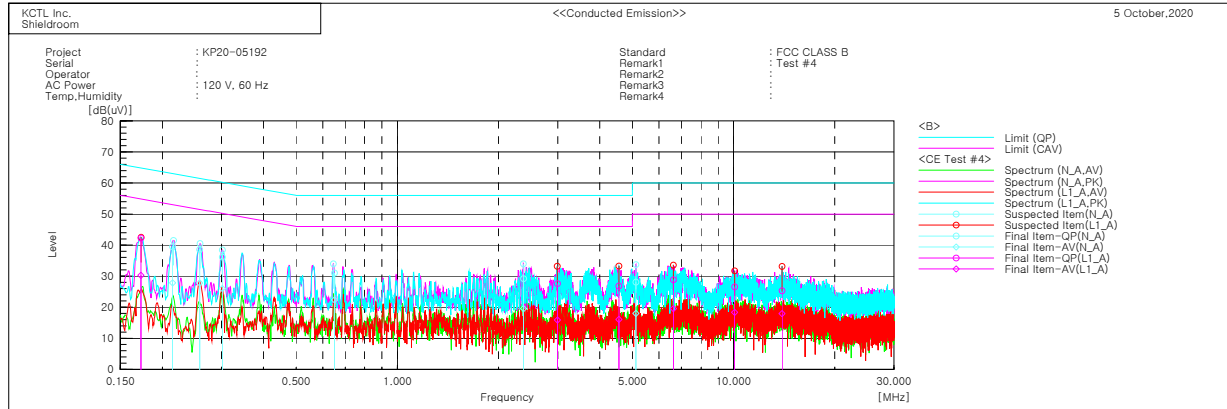
--- L1_A Phase ---

No.	Frequency	Reading QP	Reading CAV	c.f	Result QP	Result CAV	Limit QP	Limit AV	Margin QP	Margin CAV
	[MHz]	[dB(uV)]	[dB(uV)]	[dB]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB]	[dB]
1	0.21475	29.6	18.1	9.8	39.4	27.9	63.0	53.0	23.6	25.1
2	0.25659	27.5	16.3	9.7	37.2	26.0	61.5	51.5	24.3	25.5
3	1.85155	17.1	7.9	9.9	27.0	17.8	56.0	46.0	29.0	28.2
4	2.37803	18.9	10.1	9.9	28.8	20.0	56.0	46.0	27.2	26.0
5	5.15655	18.2	8.7	9.9	28.1	18.6	60.0	50.0	31.9	31.4

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Final Result

--- N_A 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]
1	0.25822	28.7	17.9	9.9	38.6	27.8	61.5	51.5	22.9	23.7
2	0.21467	29.5	17.8	10.0	39.5	27.8	63.0	53.0	23.5	25.2
3	0.30164	26.2	16.0	10.0	36.2	26.0	60.2	50.2	24.0	24.2
4	0.65007	20.9	12.3	10.1	31.0	22.4	56.0	46.0	25.0	23.6
5	2.37445	19.1	9.5	10.1	29.2	19.6	56.0	46.0	26.8	26.4
6	5.12038	18.0	7.9	10.1	28.1	18.0	60.0	50.0	31.9	32.0

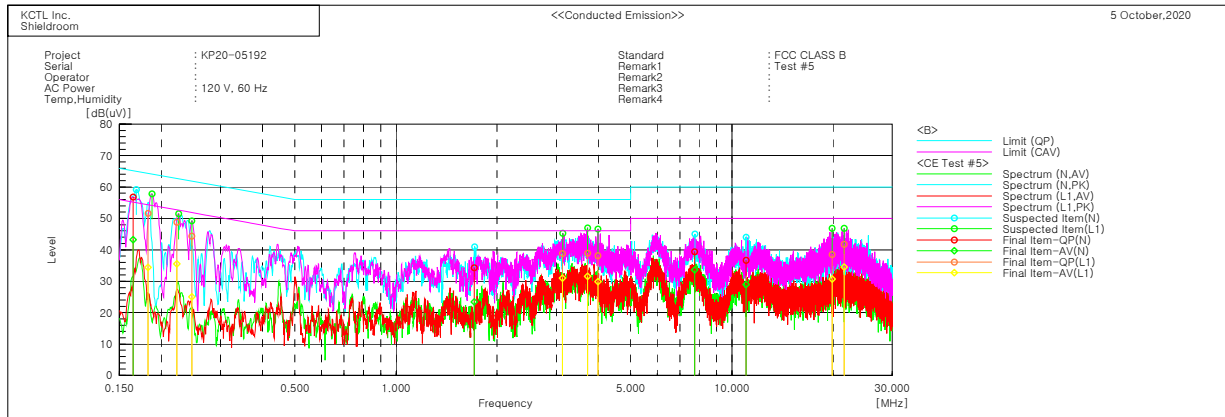
--- L1_A Phase ---

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]
1	0.17291	32.1	20.2	10.1	42.2	30.3	64.8	54.8	22.6	24.5
2	2.99224	17.7	6.0	9.9	27.6	15.9	56.0	46.0	28.4	30.1
3	4.56059	17.0	6.2	9.9	26.9	16.1	56.0	46.0	29.1	29.9
4	6.62028	18.8	9.5	10.0	28.8	19.5	60.0	50.0	31.2	30.5
5	13.94218	14.9	7.5	10.4	25.3	17.9	60.0	50.0	34.7	32.1
6	10.07969	16.4	8.1	10.2	26.6	18.3	60.0	50.0	33.4	31.7

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Final Result

--- N Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.16511	46.8	33.2	10.0	56.8	43.2	65.2	55.2	8.4	12.0
2	1.71168	24.6	13.7	9.7	34.3	23.4	56.0	46.0	21.7	22.6
3	7.75131	29.7	24.0	9.7	39.4	33.7	60.0	50.0	20.6	16.3
4	11.01032	26.8	19.1	9.9	36.7	29.0	60.0	50.0	23.3	21.0

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.18293	41.6	24.4	10.0	51.6	34.4	64.4	54.4	12.8	20.0
2	0.22267	39.0	25.7	9.8	48.8	35.5	62.7	52.7	13.9	17.2
3	0.24636	34.7	15.3	9.7	44.4	25.0	61.9	51.9	17.5	26.9
4	3.13135	29.0	21.2	9.8	38.8	31.0	56.0	46.0	17.2	15.0
5	3.71633	29.1	21.8	9.8	38.9	31.6	56.0	46.0	17.1	14.4
6	3.99151	28.3	20.1	9.8	38.1	29.9	56.0	46.0	17.9	16.1
7	19.86564	28.4	20.6	10.1	38.5	30.7	60.0	50.0	21.5	19.3
8	21.60339	31.6	24.4	10.1	41.7	34.5	60.0	50.0	18.3	15.5

6.2 Radiated Emission

Test specification	ANSI C63.4:2014, Class B FCC Part 15 Subpart B		
Testing voltage	120 V, 60 Hz / DC 3.85 V		
Test facility	10 m Chamber (4F)		
Test distance	3 m		
Date	2020-10-06		
Temperature (°C)	21.4 °C / 21.7 °C	Humidity (% R.H.)	40.3 % R.H. / 40.5 % R.H.
Remarks	Pass		

6.2.1 Limits of radiated emission measurement

Frequency [MHz]	Class A (dB(μ V/m)) @ 10 m	Class B (dB(μ V/m)) @ 3 m
30-88	39	40
88-216	43.5	43.5
216-960	46.4	46
Above 960	49.5	54

Note- Alternative standard: CISPR, Pub. 22

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	ESR7	101078	R&S	2021.08.20	☒
Bilog Antenna	CBL 6112D	55545	TESEQ	2022.04.24	☒
AMPLIFIER	310N	293004	SONOMA	2021.08.20	☒
ATTENUATOR	8491B-6dB	MY39271060	KEYSIGHT	-	☒
Antenna Mast	MA4640-XP-ET	-	Innco Systems	-	☒
Turn Table	TT 3.0-3t	-	MATURO	-	☒
DOUBLE RIDGED HORN ANTENNA	3117-PA	00161083	ETS-LINDGREN	2021.09.18	☒
Horn antenna	3116	00086635	ETS-LINDGREN	2021.05.12	☒
AMPLIFIER	JS44-18004000-33-8P	2000996	L-3Narda-MITEQ	2021.01.22	☒
Spectrum Analyzer	FSV40	100988	R&S	2021.01.03	☒

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:

$$\text{Result} = \text{M.R} + \text{C.F}(\text{A.F} + \text{C.L} + 6 \text{ dB Att} - \text{A.G})$$

M.R = Meter Reading

C.F = Correction Factor

A.F = Antenna Factor

C.L = Cable Loss

A.G = Amplifier Gain

6 dB Att = 6 dB Attenuator

If M.R is 30 dB, A.F 12 dB, C.L 5 dB, 6 dB, A.G 35 dB

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

Bilog Antenna and ATTENUATOR (6 dB) were calibrated together.

AV = CAV : Abbreviation of CISPR Average

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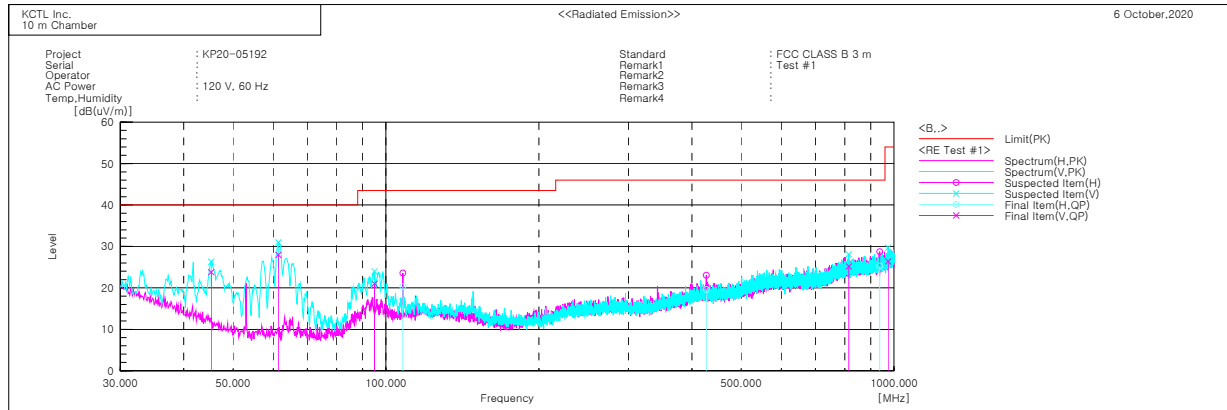
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6.2.5 Radiated emission measurement result

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 QP [dB]	Height [cm]	Angle [deg]
1	45.278	V	37.3	-13.5	23.8	40.0	16.2	112.0	295.0
2	61.410	V	44.7	-16.7	28.0	40.0	12.0	102.0	14.0
3	94.990	V	33.5	-12.5	21.0	43.5	22.5	306.0	34.0
4	107.961	H	30.8	-10.5	20.3	43.5	23.2	377.0	321.0
5	427.099	H	22.6	-3.0	19.6	46.0	26.4	351.0	284.0
6	814.731	V	21.2	4.0	25.2	46.0	20.8	166.0	262.0
7	937.678	H	20.0	5.3	25.3	46.0	20.7	375.0	344.0
8	973.684	V	20.3	6.1	26.4	54.0	27.6	173.0	35.0

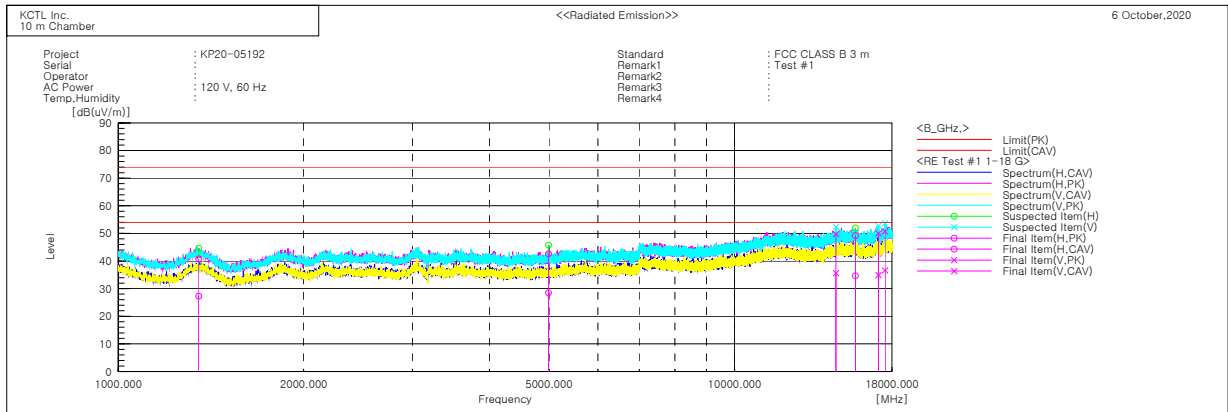
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1 GHz ~ 18 GHz



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	1351.048	H	56.1	42.6	-15.3	40.8	27.3	74.0	54.0	33.2	26.7	105.0	338.0
2	4989.249	H	48.2	34.1	-5.6	42.6	28.5	74.0	54.0	31.4	25.5	394.0	11.0
3	14605.790	V	47.4	33.2	2.4	49.8	35.6	74.0	54.0	24.2	18.4	210.0	21.0
4	15696.370	H	45.9	31.4	3.3	49.2	34.7	74.0	54.0	24.8	19.3	377.0	344.0
5	17114.250	V	42.7	27.6	7.3	50.0	34.9	74.0	54.0	24.0	19.1	163.0	267.0
6	17541.810	V	42.6	28.5	8.1	50.7	36.6	74.0	54.0	23.3	17.4	112.0	34.0



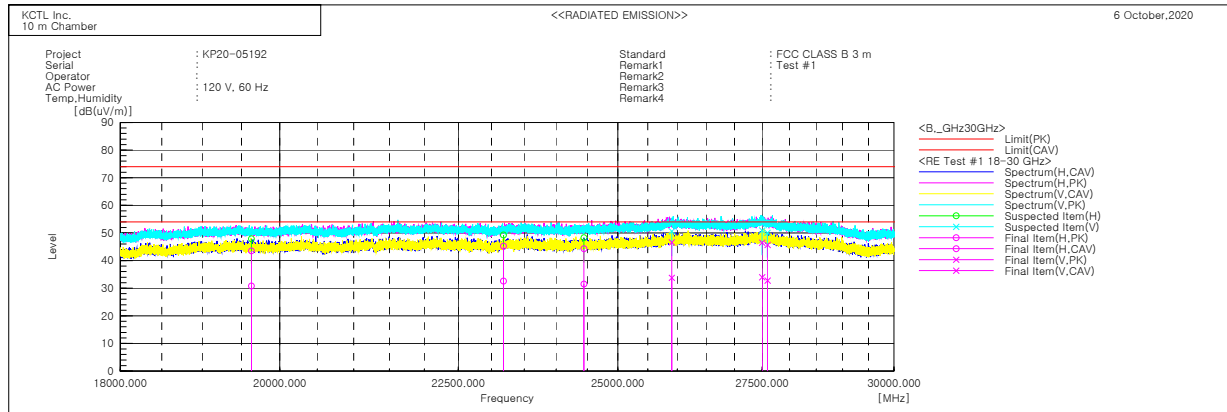
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18 GHz ~ 30 GHz



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	19628.470	H	41.9	29.2	1.6	43.5	30.8	74.0	54.0	30.5	23.2	102.0	24.0
2	23192.160	H	41.9	29.3	3.3	45.2	32.6	74.0	54.0	28.8	21.4	396.0	304.0
3	24445.520	H	40.1	27.3	4.2	44.3	31.5	74.0	54.0	29.7	22.5	370.0	248.0
4	25906.600	V	38.8	26.0	7.8	46.6	33.8	74.0	54.0	27.4	20.2	110.0	247.0
5	27498.990	V	37.7	25.2	8.8	46.5	34.0	74.0	54.0	27.5	20.0	240.0	218.0
6	27597.350	V	36.9	24.0	8.8	45.7	32.8	74.0	54.0	28.3	21.2	163.0	188.0

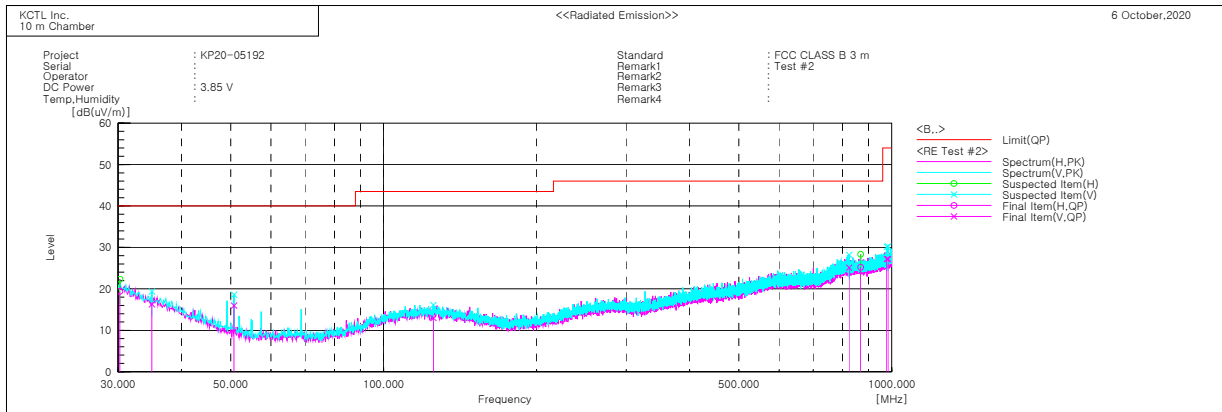
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30 MHz ~ 1 GHz



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 QP [dB]	Height [cm]	Angle [deg]
1	30.243	H	24.5	-5.1	19.4	40.0	20.6	395.0	76.0
2	34.977	V	24.4	-8.1	16.3	40.0	23.7	384.0	230.0
3	50.734	V	31.7	-15.7	16.0	40.0	24.0	205.0	32.0
4	125.303	V	22.7	-9.7	13.0	43.5	30.5	169.0	104.0
5	824.551	V	21.0	4.1	25.1	46.0	20.9	311.0	345.0
6	868.320	H	20.7	4.5	25.2	46.0	20.8	374.0	76.0
7	977.933	V	21.0	6.2	27.2	54.0	26.8	100.0	158.0
8	983.753	V	20.9	6.3	27.2	54.0	26.8	396.0	346.0

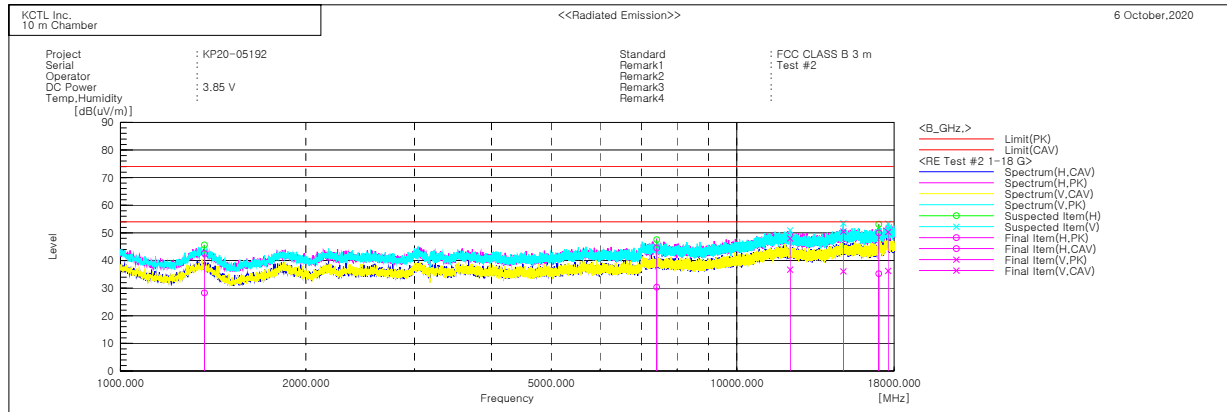
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1 GHz ~ 18 GHz



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	1368.042	H	58.1	43.8	-15.5	42.6	28.3	74.0	54.0	31.4	25.7	331.0	124.0
2	7412.712	H	48.7	34.5	-4.2	44.5	30.3	74.0	54.0	29.5	23.7	382.0	11.0
3	12201.030	V	46.2	34.9	1.8	48.0	36.7	74.0	54.0	26.0	17.3	112.0	58.0
4	14887.980	V	48.2	33.8	2.3	50.5	36.1	74.0	54.0	23.5	17.9	120.0	165.0
5	16993.550	H	42.8	28.0	7.2	50.0	35.2	74.0	54.0	24.0	18.8	296.0	111.0
6	17603.030	V	42.0	27.9	8.3	50.3	36.2	74.0	54.0	23.7	17.8	106.0	80.0

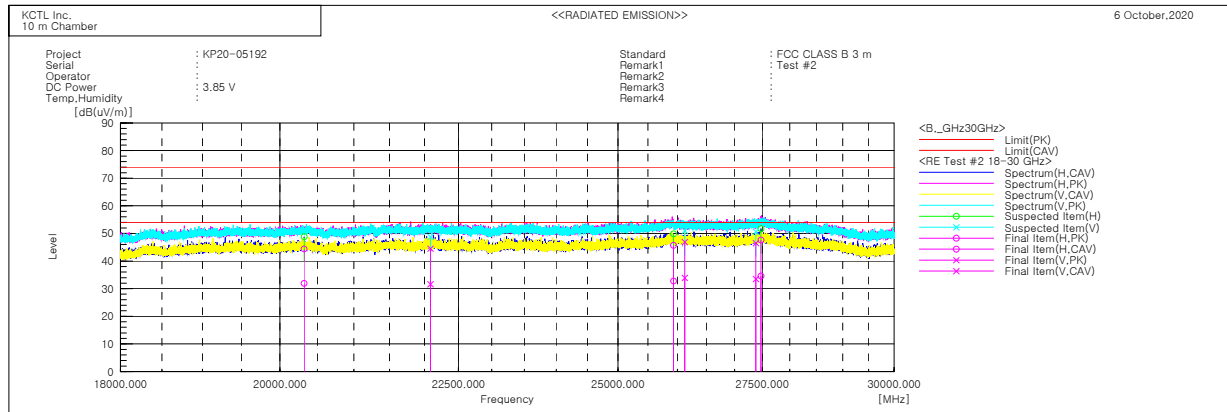
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18 GHz ~ 30 GHz



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	20320.110	H	41.6	29.3	2.6	44.4	31.9	74.0	54.0	29.6	22.1	388.0	235.0
2	22087.480	V	41.5	28.6	3.0	44.5	31.6	74.0	54.0	29.5	22.4	102.0	344.0
3	25933.200	H	37.9	25.0	7.8	45.7	32.8	74.0	54.0	28.3	21.2	331.0	348.0
4	26125.660	V	39.0	26.0	7.9	46.9	33.9	74.0	54.0	27.1	20.1	204.0	283.0
5	27383.870	V	37.9	24.9	8.6	46.5	33.5	74.0	54.0	27.5	20.5	241.0	193.0
6	27475.990	H	38.8	25.8	8.8	47.6	34.6	74.0	54.0	26.4	19.4	396.0	3.0

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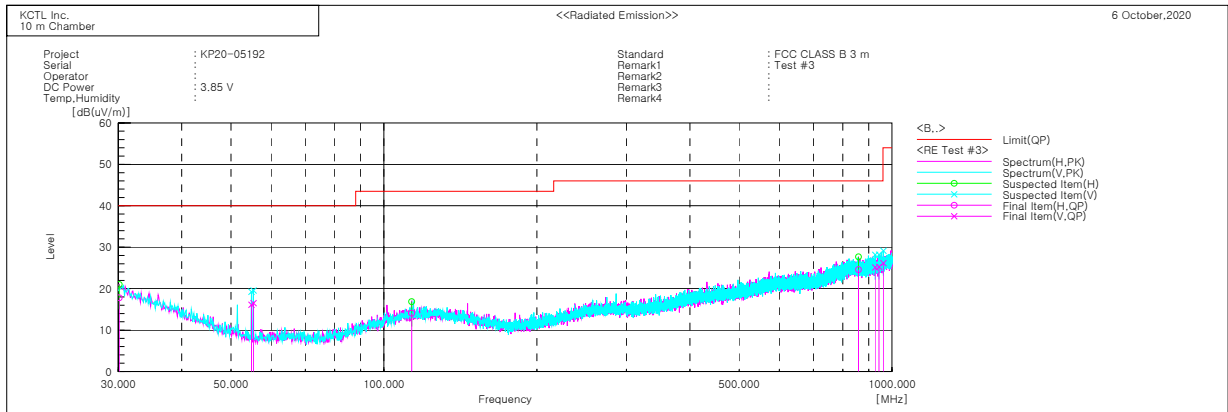
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30 MHz ~ 1 GHz



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 QP [dB]	Height [cm]	Angle [deg]
1	30.127	H	22.9	-5.1	17.8	40.0	22.2	374.0	87.0
2	54.856	V	32.6	-16.5	16.1	40.0	23.9	103.0	136.0
3	55.341	V	33.1	-16.6	16.5	40.0	23.5	344.0	133.0
4	113.422	H	24.1	-10.0	14.1	43.5	29.4	395.0	214.0
5	858.986	H	20.2	4.4	24.6	46.0	21.4	296.0	34.0
6	926.765	V	19.9	5.2	25.1	46.0	20.9	101.0	311.0
7	942.896	V	19.9	5.4	25.3	46.0	20.7	211.0	67.0
8	961.921	V	20.4	5.8	26.2	54.0	27.8	135.0	109.0

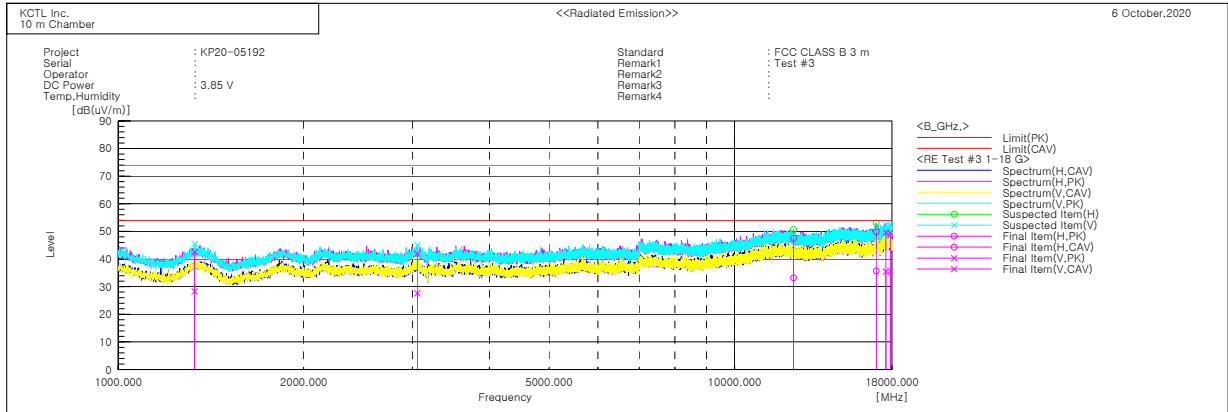
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1 GHz ~ 18 GHz



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	1329.818	V	57.7	43.4	-15.1	42.6	28.3	74.0	54.0	31.4	25.7	112.0	311.0
2	3057.112	V	50.4	36.1	-8.5	41.9	27.6	74.0	54.0	32.1	26.4	310.0	3.0
3	12466.210	H	45.8	31.5	1.7	47.5	33.2	74.0	54.0	26.5	20.8	388.0	354.0
4	16970.600	H	42.8	28.6	7.1	49.9	35.7	74.0	54.0	24.1	18.3	296.0	104.0
5	17592.840	V	41.3	27.1	8.3	49.6	35.4	74.0	54.0	24.4	18.6	111.0	166.0
6	17891.190	V	40.5	26.6	9.0	49.5	35.6	74.0	54.0	24.5	18.4	103.0	24.0



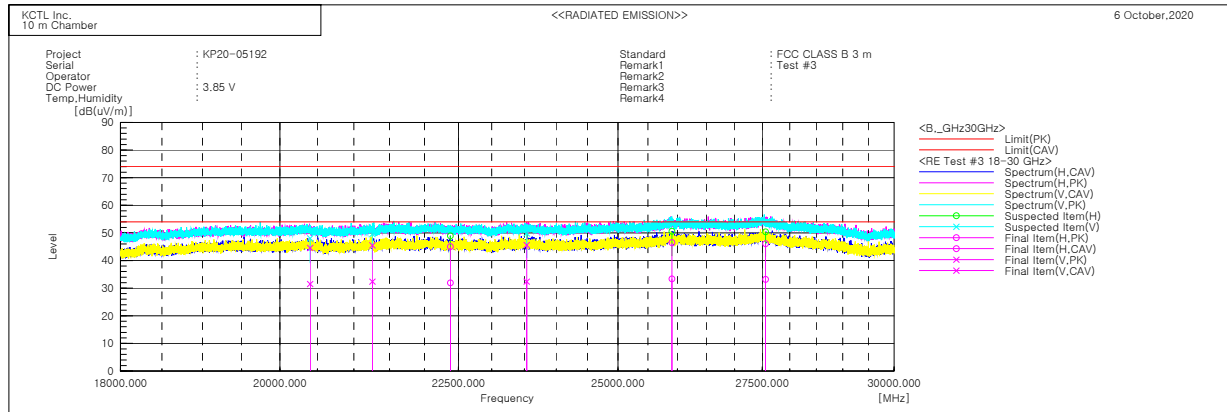
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18 GHz ~ 30 GHz



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	20400.270	V	41.8	28.7	2.8	44.6	31.5	74.0	54.0	29.4	22.5	137.0	124.0
2	21256.910	V	43.0	29.9	2.5	45.5	32.4	74.0	54.0	28.5	21.6	201.0	87.0
3	22381.990	H	42.0	28.9	3.0	45.0	31.9	74.0	54.0	29.0	22.1	322.0	323.0
4	23538.120	V	41.7	28.5	3.9	45.6	32.4	74.0	54.0	28.4	21.6	142.0	17.0
5	25906.000	H	38.7	25.6	7.8	46.5	33.4	74.0	54.0	27.5	20.6	370.0	266.0
6	27559.030	H	37.3	24.4	8.8	46.1	33.2	74.0	54.0	27.9	20.8	339.0	74.0

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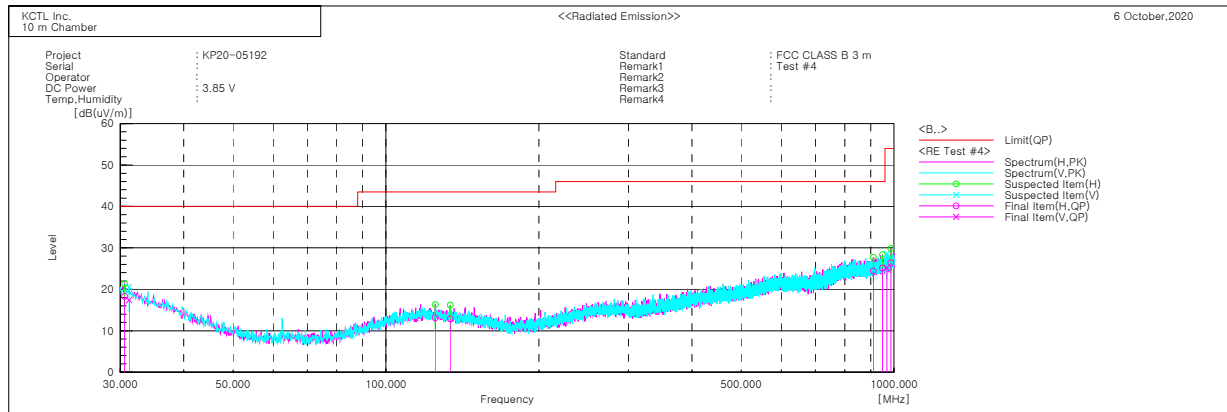
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30 MHz ~ 1 GHz



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 QP [dB]	Height [cm]	Angle [deg]
1	30.612	H	23.7	-5.4	18.3	40.0	21.7	341.0	7.0
2	31.213	V	23.2	-5.8	17.4	40.0	22.6	130.0	6.0
3	125.060	H	22.8	-9.7	13.1	43.5	30.4	312.0	162.0
4	133.794	H	22.9	-10.0	12.9	43.5	30.6	296.0	306.0
5	910.760	H	19.5	4.9	24.4	46.0	21.6	395.0	216.0
6	949.313	H	19.5	5.6	25.1	46.0	20.9	103.0	219.0
7	968.475	V	19.2	6.0	25.2	54.0	28.8	113.0	69.0
8	985.935	H	20.0	6.4	26.4	54.0	27.6	390.0	325.0

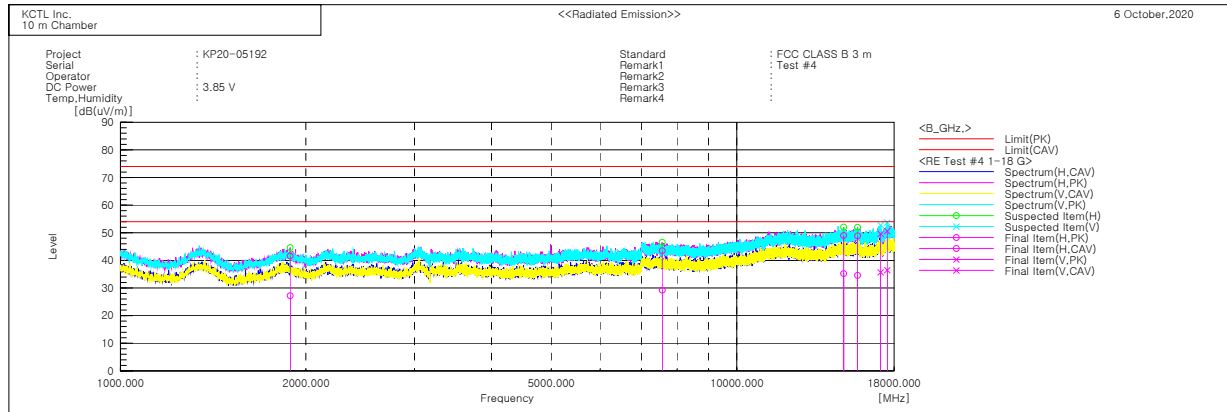
KCTL Inc.

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Suwon-si, Gyeonggi-do, 16677, Korea
Tel: 82-31-285-0894 Fax: 82-505-299-8311
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1 GHz ~ 18 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	1885.721	H	54.9	40.5	-13.3	41.6	27.2	74.0	54.0	32.4	26.8	271.0	344.0
2	7567.419	H	47.8	33.5	-4.3	43.5	29.2	74.0	54.0	30.5	24.8	355.0	351.0
3	14910.940	H	46.7	32.9	2.3	49.0	35.2	74.0	54.0	25.0	18.8	362.0	70.0
4	15696.380	H	45.6	31.3	3.3	48.9	34.6	74.0	54.0	25.1	19.4	390.0	340.0
5	17113.340	V	42.3	28.4	7.3	49.6	35.7	74.0	54.0	24.4	18.3	119.0	264.0
6	17542.000	V	42.5	28.4	8.1	50.6	36.5	74.0	54.0	23.4	17.5	203.0	34.0



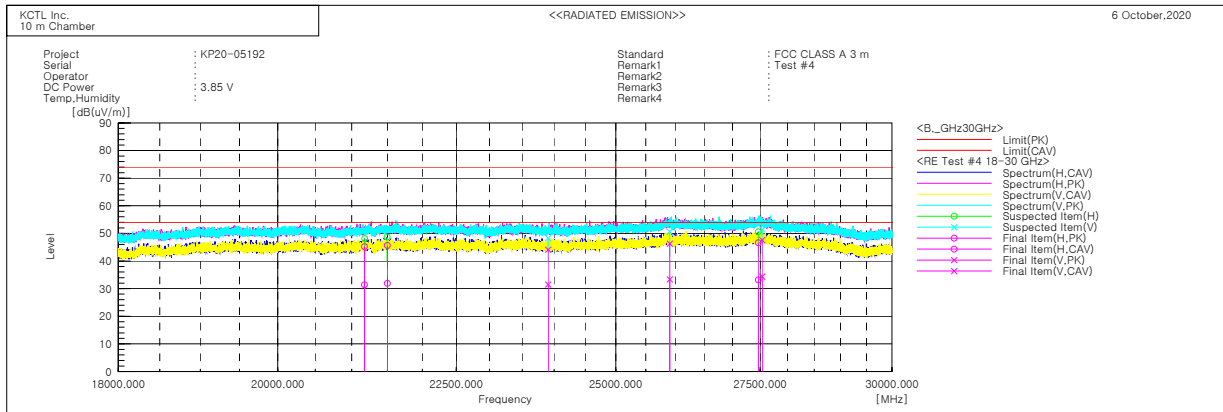
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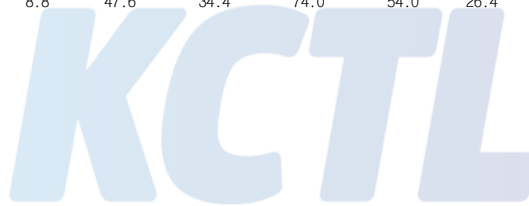


18 GHz ~ 30 GHz



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	21177.890	H	42.8	29.0	2.4	45.2	31.4	74.0	54.0	28.8	22.6	396.0	55.0
2	21498.290	H	42.9	29.2	2.7	45.6	31.9	74.0	54.0	28.4	22.1	331.0	183.0
3	23908.110	V	40.3	27.7	3.8	44.1	31.5	74.0	54.0	29.9	22.5	177.0	121.0
4	25906.340	V	38.5	25.6	7.8	46.3	33.4	74.0	54.0	27.7	20.6	252.0	243.0
5	27465.930	H	37.9	24.5	8.7	46.6	33.2	74.0	54.0	27.4	20.8	340.0	22.0
6	27533.990	V	38.8	25.6	8.8	47.6	34.4	74.0	54.0	26.4	19.6	106.0	68.0



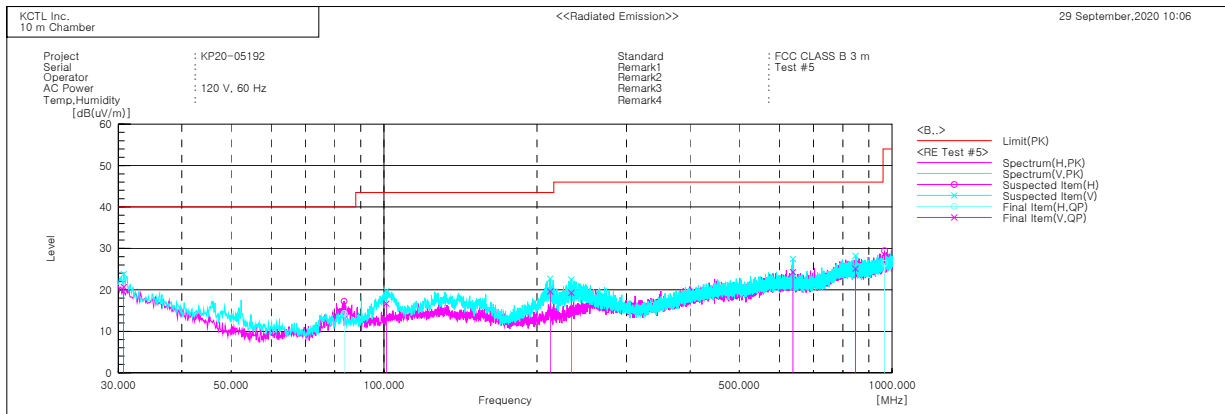
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Suwon-si, Gyeonggi-do, 16677, Korea
Tel: 82-31-285-0894 Fax: 82-505-299-8311
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30 MHz ~ 1 GHz



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	30.728	V	26.2	-5.5	20.7	40.0	19.3	132.0	113.0
2	83.474	H	29.1	-14.8	14.3	40.0	25.7	396.0	126.0
3	101.053	V	28.1	-11.4	16.7	43.5	26.8	131.0	120.0
4	212.360	V	30.1	-10.5	19.6	43.5	23.9	209.0	280.0
5	233.579	V	28.2	-8.9	19.3	46.0	26.7	344.0	36.0
6	637.948	V	23.6	0.7	24.3	46.0	21.7	137.0	5.0
7	847.229	V	20.8	4.3	25.1	46.0	20.9	193.0	6.0
8	966.412	H	20.5	5.9	26.4	54.0	27.6	390.0	19.0

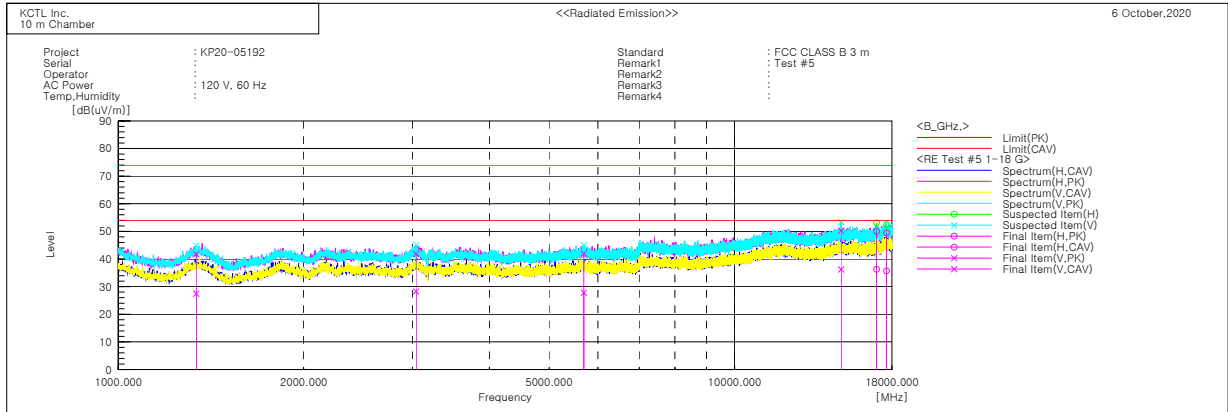
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Suwon-si, Gyeonggi-do, 16677, Korea
Tel: 82-31-285-0894 Fax: 82-505-299-8311
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1 GHz ~ 18 GHz



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	1338.314	V	57.0	42.7	-15.2	41.8	27.5	74.0	54.0	32.2	26.5	134.0	264.0
2	3040.943	V	50.3	36.8	-8.5	41.8	28.3	74.0	54.0	32.2	25.7	251.0	157.0
3	5692.225	V	46.5	32.3	-4.5	42.0	27.8	74.0	54.0	32.0	26.2	104.0	88.0
4	14889.830	V	48.0	33.9	2.3	50.3	36.2	74.0	54.0	23.7	17.8	162.0	164.0
5	16997.480	H	42.8	29.1	7.2	50.0	36.3	74.0	54.0	24.0	17.7	388.0	110.0
6	17631.400	H	41.1	27.3	8.4	49.5	35.7	74.0	54.0	24.5	18.3	379.0	138.0

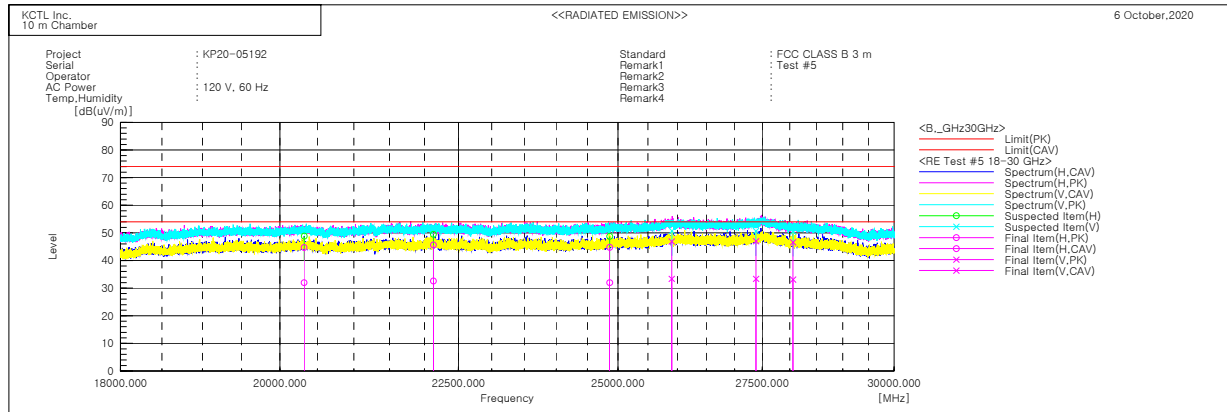
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18 GHz ~ 30 GHz



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	20320.430	H	42.1	29.4	2.6	44.7	32.0	74.0	54.0	29.3	22.0	100.1	392.0
2	22130.220	H	42.6	29.6	3.0	45.6	32.6	74.0	54.0	28.4	21.4	310.0	221.0
3	24865.060	H	39.6	26.8	5.2	44.8	32.0	74.0	54.0	29.2	22.0	241.0	310.0
4	25903.780	V	39.1	25.6	7.8	46.9	33.4	74.0	54.0	27.1	20.6	108.0	342.0
5	27384.660	V	38.4	24.8	8.6	47.0	33.4	74.0	54.0	27.0	20.6	268.0	184.0
6	28063.400	V	39.2	25.7	7.4	46.6	33.1	74.0	54.0	27.4	20.9	193.0	163.0