



TEST REPORT

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.: KR21-SEF0033-A Page (1) of (20)	
1. Client		
◦ Name : ISTCONTROL CO., LTD. ◦ Address : #1203, 12F, 37, Maebongsan-ro, Mapo-gu, Seoul, Republic of Korea ◦ Date of Receipt : 2021-01-26		
2. Use of Report : -		
3. Name of Product / Model : Smart RFID Card Reader / IRD4M		
4. Manufacturer / Country of Origin : ISTCONTROL CO., LTD. / Korea		
5. Date of Test : 2021-01-27 to 2021-01-28		
6. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing (Address: 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)		
7. Test method used : ANSI C63.4:2014, Class A		
8. FCC ID : 2AZS5IRD4M		
9. Test Results : Refer to the test result in the test report		
Affirmation	Tested by Name : Seungkyun Yoo (Signature)	Technical Manager Name : Gunsu Park (Signature)
2021-06-11		
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
2021-05-03	Originally issued	-
2021-06-11	Removed conducted emissions test, Revised note	all

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Note. The report No. KR21-SEF0033 is superseded by the report No. KR21-SEF0033-A.

General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

☒ Statement not required by the standard or client used for type testing

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1. Applicant information

Applicant: ISTCONTROL CO., LTD.
Address: #1203, 12F, 37, Maebongsan-ro, Mapo-gu, Seoul, Republic of Korea

Manufacturer: ISTCONTROL CO., LTD.
Address: #1203, 12F, 37, Maebongsan-ro, Mapo-gu, Seoul, Republic of Korea

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KCTL

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

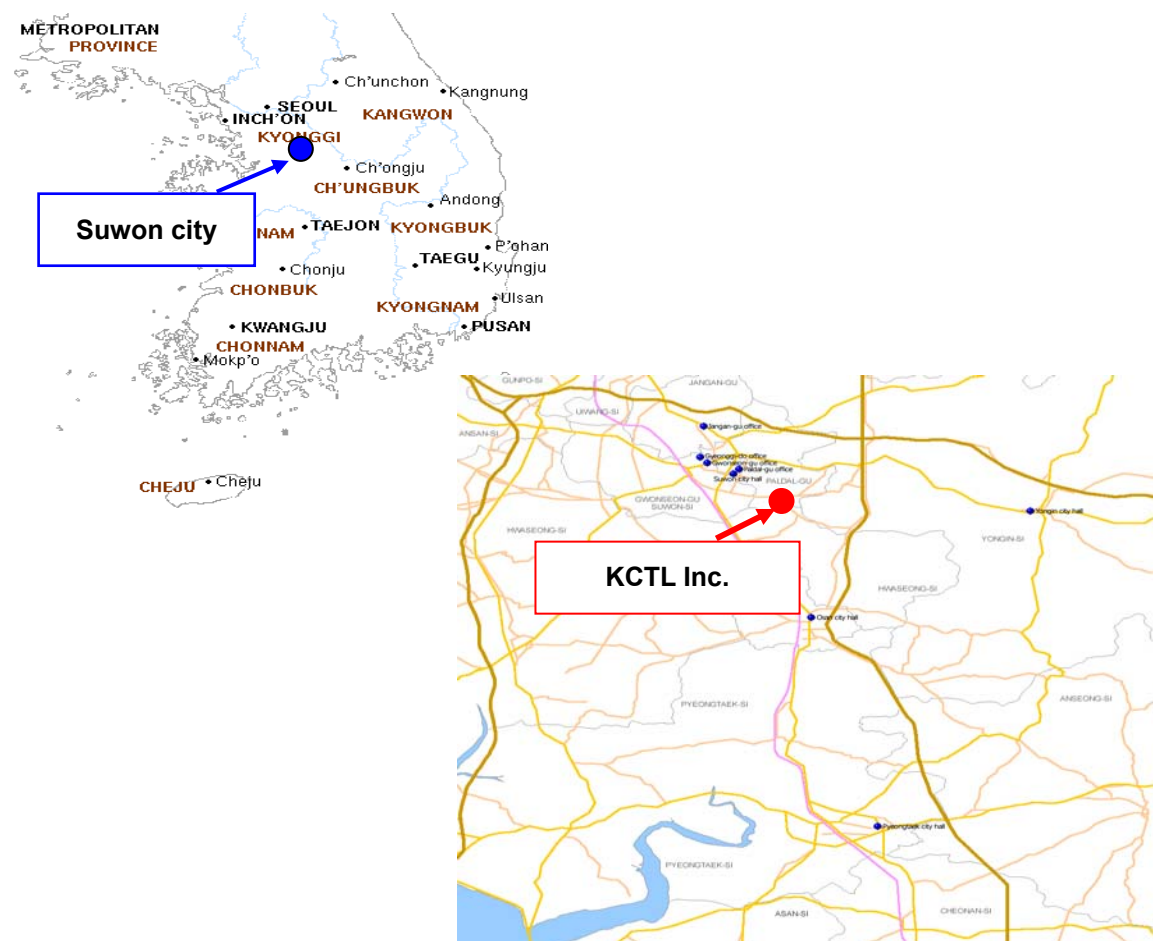
FCC Site Designation No: KR0040

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)	23.3 °C /	10.6 % R.H. /	-
	23.2 °C	9.4 % 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:	3.50 dB
	150 kHz ~ 30 MHz:	3.06 dB
Shielded Room (CE#2)	9 kHz ~ 150 kHz:	3.05 dB
	150 kHz ~ 30 MHz:	3.06 dB
Radiated Emission measurement (Confidence level about 95 %, $k = 2$)		
10 m Chamber (4F)	30 MHz ~ 300 MHz	3 m: 5.36 dB
		10 m: 5.34 dB
	300 MHz ~ 1 000 MHz	3 m: 5.46 dB
		10 m: 5.44 dB
	1 GHz ~ 6 GHz	3 m: 6.24 dB
	6 GHz ~ 18 GHz	3 m: 6.60 dB
	18 GHz ~ 30 GHz	3 m: 6.72 dB
	30 GHz ~ 40 GHz	3 m: 6.14 dB
10 m Chamber (2F)	30 MHz ~ 300 MHz	3 m: 4.88 dB
		10 m: 4.86 dB
	300 MHz ~ 1 000 MHz	3 m: 4.94 dB
		10 m: 4.94 dB
	1 GHz ~ 6 GHz	3 m: 6.28 dB

3.3 Measurement Program

These test items were performed by software programs;

Test item	Measurement Program		Used
Conducted Emission	EP5/CE_Ver 5.4.0(TOYO)		☐
Radiated Emission	2F	EP5/RE_Ver 4.6.0(TOYO)	☒
	4F	EP5/RE_Ver 5.11.10(TOYO)	

4. Description of EUT

4.1 General information

Transmit Frequency	13.56Mhz
Protocol	ISO/IEC 14443 A/B, 15693 Standards I-CODE, Tag-It, Felica, Jewel Protocols, ISO/IEC 18092
Mounting	Wall Switch Size
Dimensions	87*130*22 (mm)
Operating Voltage Range	12 VDC Linear Supply recommended
Operating Temperature	0-75
Panel Connection	Pigtail

4.2 Product description

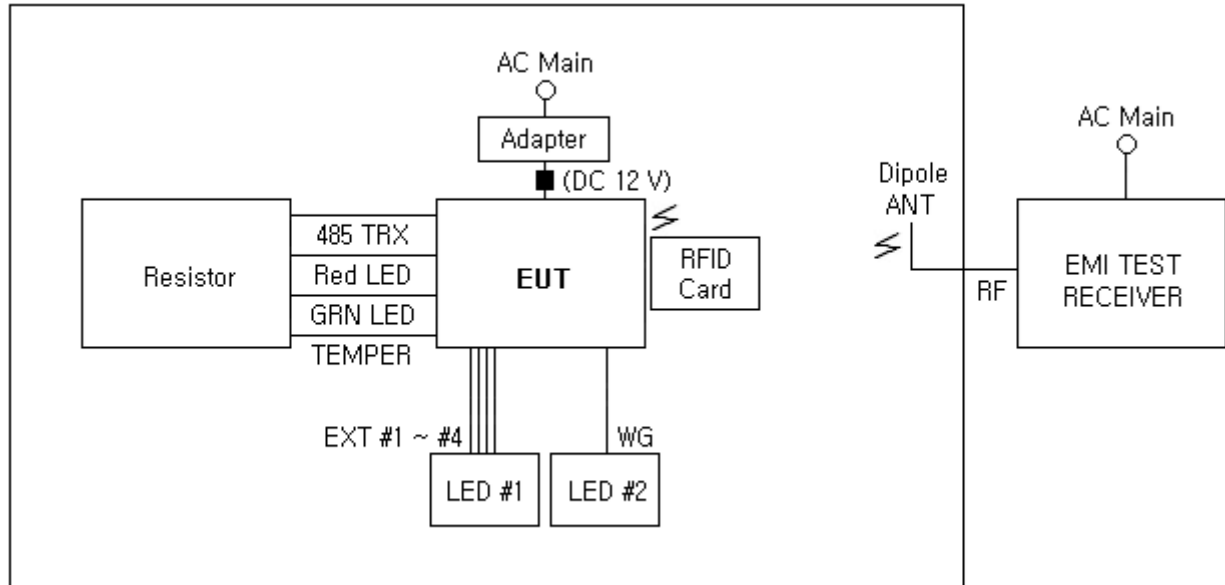
Type of product	Smart RFID Card Reader
Model name (Basic)	IRD4M
Model name (Variant)	-
Difference	-
Serial no	-
Testing voltage	DC 12 V (Power supplied from Adapter)
Input rating	DC 12 V
Internal clock frequency	13.56 MHz, 2 402 MHz ~ 2 480 MHz
FCC ID	2AZS5IRD4M
Note	-The continuous operation status of EUT cannot be checked when RF function is turned off, so the test was conducted by turning on RF function. -The following accessory was not provided by the manufacturer. 1) Adapter

4.3 Auxiliary equipments

Type	Model / Part #	S/N	Manufacturer
Adapter	DSA-60PFB-12 1 120500	-	Dee Van Electronics CO.,Ltd.
LED #1, #2	-	-	-
Resistor	-	-	-
RFID Card	-	-	-
Mobile Phone	SM-N935S	-	SAMSUNG
EMI TEST RECEIVER	ESCI 3	101408	R&S
Dipole ANT	-	-	-

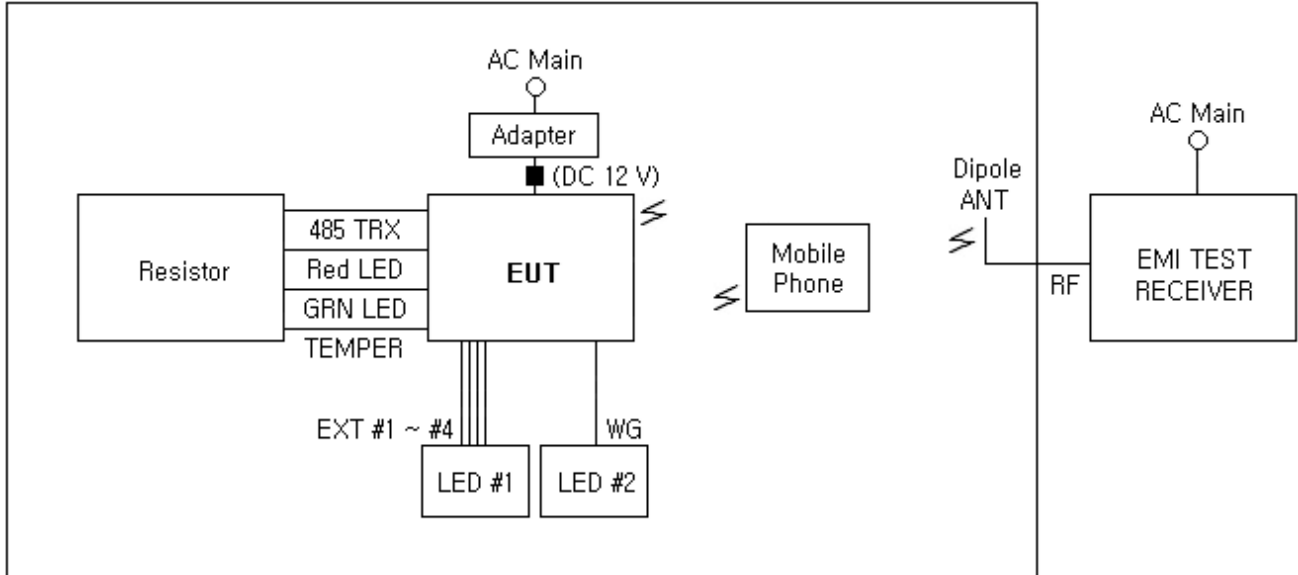
4.4 Test configuration

[Test #1]



	Start		End		Cable	
	Name	I/O port	Name	I/O port	Length (m)	Spec.
1	EUT	Power	Adapter	-	3.0	Unshield (Core)
2		EXT #1 ~ #4	LED #1	-	3.0	Unshield
3		WG	LED #2	-	3.0	Unshield
4		485 TRX	Resistor	-	3.0	Unshield
5		Red LED	Resistor	-	3.0	Unshield
6		GRN LED	Resistor	-	3.0	Unshield
7		TEMPER	Resistor	-	3.0	Unshield
8	EMI TEST RECEIVER	RF	Dipole ANT	-	3.0	Shield

[Test #2]



	Start		End		Cable	
	Name	I/O port	Name	I/O port	Length (m)	Spec.
1	EUT	Power	Adapter	-	3.0	Unshield (Core)
2		EXT #1 ~ #4	LED #1	-	3.0	Unshield
3		WG	LED #2	-	3.0	Unshield
4		485 TRX	Resistor	-	3.0	Unshield
5		Red LED	Resistor	-	3.0	Unshield
6		GRN LED	Resistor	-	3.0	Unshield
7		TEMPER	Resistor	-	3.0	Unshield
8	EMI TEST RECEIVER	RF	Dipole ANT	-	3.0	Shield

4.5 Operating conditions

The EUT was configured as normal intended use.

Test mode	Normal operating
Test #1	Using RFID Card, the RFID operation status of the EUT is checked with LED and tested.
	Check the 485 TRX, Red LED, GRN LED, TAMPER by using the Resistor, and test by checking the EXT #1 ~ #4 and WG using LED #1 and #2.
Test #2	Using the Mobile Phone's "Mobile ID" application, test frequency using EUT's BLE Test and EMI TEST RECEIVER.
	Check the 485 TRX, Red LED, GRN LED, TAMPER by using the Resistor, and test by checking the EXT #1 ~ #4 and WG using LED #1 and #2.

Note. 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	ANSI C63.4:2014, Class A FCC Part 15 Subpart B	NA ¹⁾
☒	Radiated Emission	ANSI C63.4:2014, Class A FCC Part 15 Subpart B	Pass

These results are deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations.

Note:

1) This test is not applicable because the EUT only connects DC power line.

6. Test results

6.1 Radiated Emission

Testing voltage		DC 12 V		
Test facility		10 m Chamber (4F)		
Test distance		10 m, 3 m		
Date		2021-01-27		
10 m	Temperature (°C)	23.3 °C	Humidity (% R.H.)	10.6 % R.H.
3 m		23.2 °C		9.4 % R.H.
Remarks		Pass		

6.1.1 Limits of radiated emission measurement

	Class A at 10 m QP(dB(μV/m))		Class B at 3 m QP(dB(μV/m))	
Frequency [MHz]	FCC ¹⁾	ISED (ICES Issue 7)	FCC ¹⁾	ISED (ICES Issue 7)
30-88	39.1	40.0	40.0	40.0
88-216	43.5	43.5	43.5	43.5
216-230	46.4	46.4	46.0	46.0
230-960	46.4	47.0	46.0	47.0
Above 960	49.5	49.5	54.0	54.0

- ¹⁾: Alternative standard: CISPR, Pub. 22

- Test data in this section has been taken against the FCC 15.109(a) or (B) Limit as it is the most stringent limit.

By complying with more restrictive FCC 15.109 Limit compliance with the ICES-003 Issue 7 limit also demonstrated.

6.1.2 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.

6.1.3 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	37876	TESEQ	2022.12.08	☑
AMPLIFIER	310N	293004	SONOMA	2021.08.20	☑
ATTENUATOR	8491B	MY39270292	AGILENT	-	☑
Antenna Mast	MA4640-XP-ET	-	Innco Systems	-	☑
Turn Table	TT 3.0-3t	-	MATURO	-	☑
DOUBLE RIDGED HORN ANTENNA	3117	00161083	ETS-LINDGREN	2021.09.23	☑
Broadband Preamplifier	BBV9718	9718-233	SCHWARZBECK	2021.08.20	☑
Spectrum Analyzer	N9040B	MY57010132	AGILENT	2021.07.29	☑

6.1.4 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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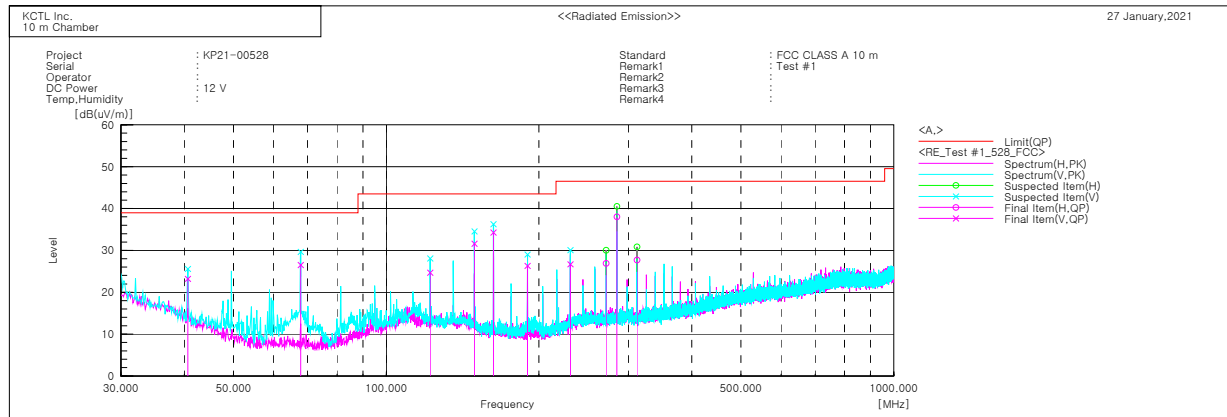
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6.1.5 Radiated emission measurement result

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	40.670	V	33.7	-10.5	23.2	39.0	15.8	164.0	278.0
2	67.830	V	42.8	-16.3	26.5	39.0	12.5	181.0	238.0
3	122.029	V	34.4	-9.7	24.7	43.5	18.8	134.0	123.0
4	149.189	V	42.1	-10.5	31.6	43.5	11.9	109.0	56.0
5	162.648	V	45.7	-11.4	34.3	43.5	9.2	101.0	87.0
6	189.808	V	37.9	-11.6	26.3	43.5	17.2	194.0	38.0
7	230.548	V	35.7	-9.0	26.7	46.5	19.8	166.0	74.0
8	271.166	H	34.4	-7.5	26.9	46.5	19.6	375.0	336.0
9	284.746	H	45.2	-7.2	38.0	46.5	8.5	381.0	337.0
10	311.906	H	34.1	-6.4	27.7	46.5	18.8	394.0	145.0

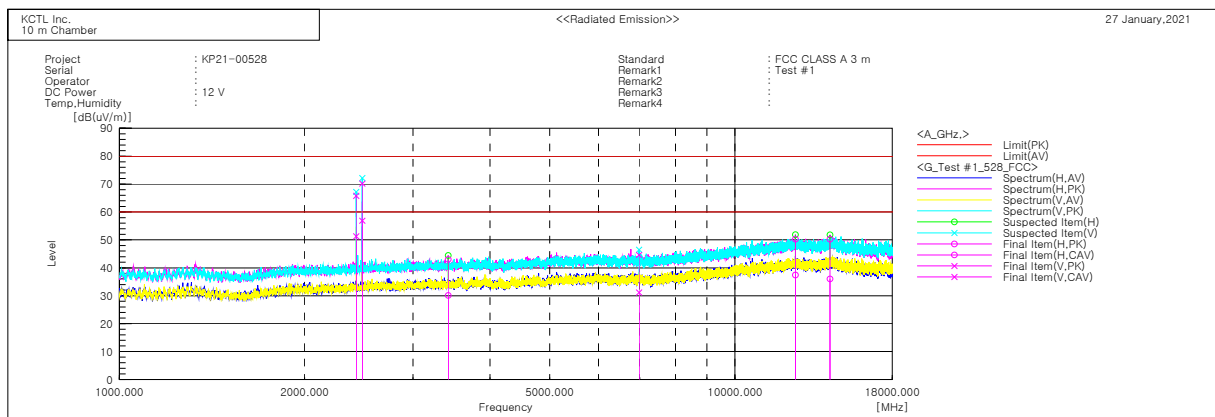
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1 GHz ~ 18 GHz



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	2425.246	V	65.6	51.1	0.2	65.8	51.3	80.0	60.0	14.2	8.7	110.0	354.0
2	2480.027	V	70.2	56.9	0.0	70.2	56.9	80.0	60.0	9.8	3.1	164.0	11.0
3	3420.745	H	42.8	29.9	0.2	43.0	30.1	80.0	60.0	37.0	29.9	384.0	108.0
4	6982.443	V	37.8	24.4	6.8	44.6	31.2	80.0	60.0	35.4	28.8	132.0	343.0
5	12527.580	H	37.8	24.9	12.5	50.3	37.4	80.0	60.0	29.7	22.6	390.0	247.0
6	14265.460	H	37.1	22.8	13.2	50.3	36.0	80.0	60.0	29.7	24.0	379.0	335.0

No. 1, 2 is the fundamental frequency. (2 425.246 MHz, 2 480.027 MHz_BLE)

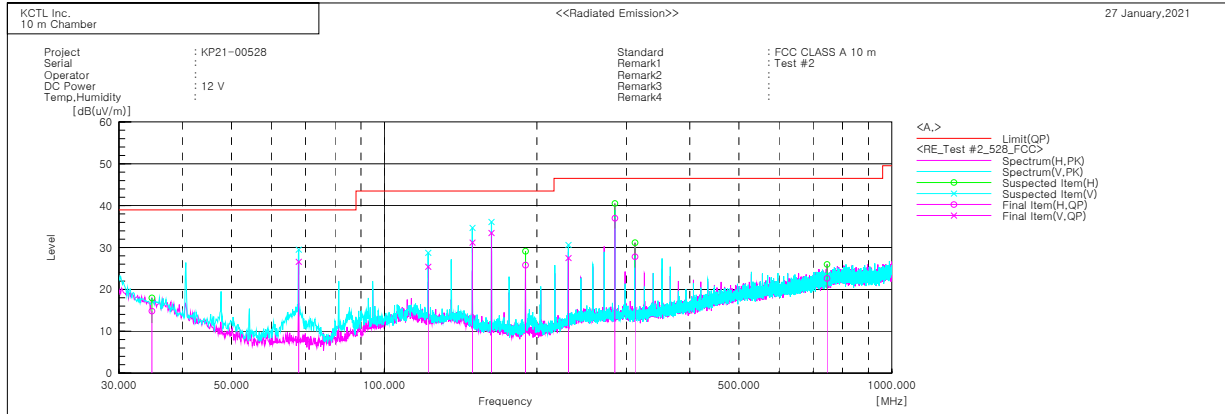
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30 MHz ~ 1 GHz



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	34.850	H	22.1	-7.3	14.8	39.0	24.2	394.0	304.0
2	67.830	V	42.9	-16.3	26.6	39.0	12.4	138.0	260.0
3	122.029	V	35.1	-9.7	25.4	43.5	18.1	157.0	88.0
4	149.189	V	41.7	-10.5	31.2	43.5	12.3	109.0	70.0
5	162.648	V	44.9	-11.4	33.5	43.5	10.0	101.0	88.0
6	189.808	H	37.4	-11.6	25.8	43.5	17.7	342.0	166.0
7	230.548	V	36.5	-9.0	27.5	46.5	19.0	176.0	74.0
8	284.746	H	44.2	-7.2	37.0	46.5	9.5	351.0	324.0
9	311.906	H	34.2	-6.4	27.8	46.5	18.7	370.0	154.0
10	745.860	H	18.4	4.2	22.6	46.5	23.9	376.0	346.0

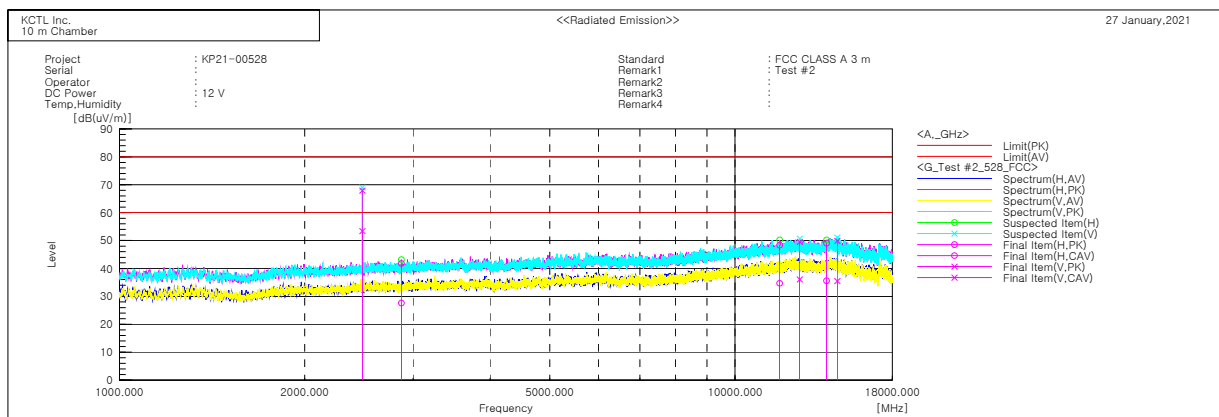
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1 GHz ~ 18 GHz



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	2480.027	V	67.9	53.4	0.0	67.9	53.4	80.0	60.0	12.1	6.6	135.0	105.0
2	2871.048	H	42.8	28.6	-1.0	41.8	27.6	80.0	60.0	38.2	32.4	348.0	354.0
3	11814.490	H	36.4	22.7	12.0	48.4	34.7	80.0	60.0	31.6	25.3	395.0	9.0
4	12729.710	V	36.8	23.4	12.7	49.5	36.1	80.0	60.0	30.5	23.9	119.0	56.0
5	14072.780	H	35.9	22.4	13.2	49.1	35.6	80.0	60.0	30.9	24.4	379.0	14.0
6	14645.150	V	37.6	23.2	12.3	49.9	35.5	80.0	60.0	30.1	24.5	125.0	11.0

No. 1 is the fundamental frequency. (2 480.027 MHz_BLE)