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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

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1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
- Date of Receipt : 2022-04-06

2. Use of Report : -

3. Name of Product / Model : Smart Wearable / SM-R905U

4. Manufacturer / Country of Origin : Samsung Electronics Co., Ltd. / Vietnam

5. Date of Test : 2022-05-27

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 B

8. FCC ID : A3LSMR905

9. Test Results : Refer to the test result in the test report

Affirmation	Tested by Name : Junggil Ryu (Signature)	Technical Manager Name : Gunsu Park (Signature)

2022-06-15

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
2022-05-30	Originally issued	-
2022-06-15	Added the variant model	10 Page

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Note. The report No. KR22-SEF0091 is superseded by the report No. KR22-SEF0091-A.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**

Contents

1. Applicant information 4

2. Laboratory information 5

3. Test system configuration 6

3.1 Operation environment 6

3.2 Measurement Uncertainty 7

4. Description of EUT 9

4.1 General information 9

4.2 Product description 10

4.3 Auxiliary equipments 10

4.4 Test configuration 11

4.5 Operating conditions 13

5. Summary of test results 14

5.1 Summary of EMI emission test results 14

6. Test results 15

6.1 Conducted Emissions 15

6.2 Radiated Emission 18

1. Applicant information

Applicant: Samsung Electronics Co., Ltd.
Address: 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Manufacturer: Samsung Electronics Co., Ltd.
Address: 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Factory: AG TECH CO.,LTD
Address: Lot G3, Que Vo Industrial Park(Expanded Area), Nam son Ward, Bac Ninh Province, Vietnam

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

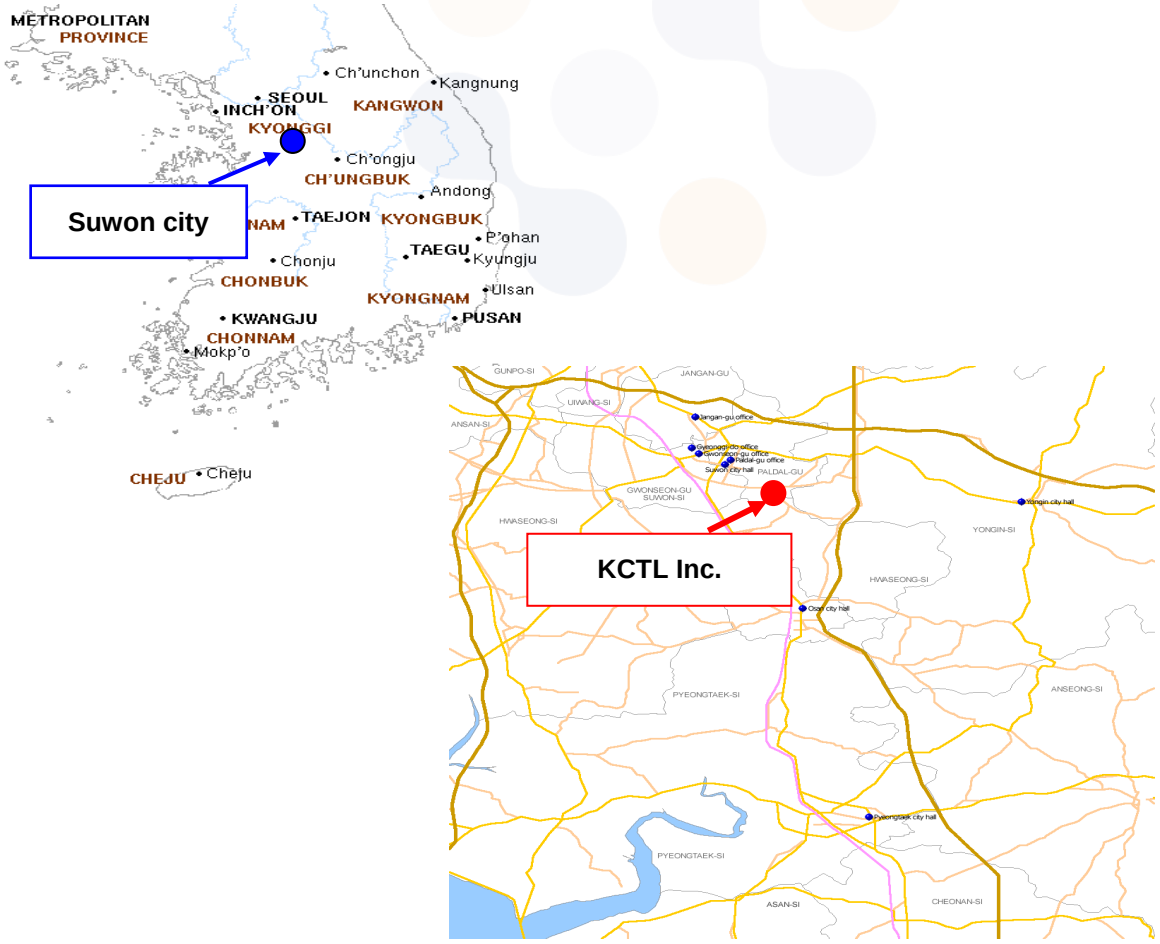
FCC Site Designation No: KR0040

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)	21.6 °C	29.9 % R.H.	-
Shielded room(CE)	20.8 °C	27.5 % 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 ~ 200 MHz	3 m: 4.98 dB
		10 m: 4.96 dB
	200 MHz ~ 1 000 MHz	3 m: 4.28 dB
		10 m: 4.28 dB
	1 GHz ~ 6 GHz	3 m: 5.08 dB
	6 GHz ~ 18 GHz	3 m: 5.38 dB
	18 GHz ~ 30 GHz	3 m: 5.22 dB
	30 GHz ~ 40 GHz	3 m: 4.44 dB
10 m Chamber (2F)	30 MHz ~ 200 MHz	3 m: 4.50 dB
		10 m: 4.48 dB
	200 MHz ~ 1 000 MHz	3 m: 3.72 dB
		10 m: 3.70 dB
	1 GHz ~ 6 GHz	3 m: 5.08 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	EP10/RE_Ver 2021.01.000 (TOYO)	☒
	4F	EP5/RE_Ver 5.11.10(TOYO)	

4. Description of EUT

4.1 General information

Declared Hardware Version	REV1.0
Declared Software Version	SM-R905U
Operating Band(s)	WCDMA 2/4/5 LTE 2/4/5/12/13/25/26/66/71

4.2 Product description

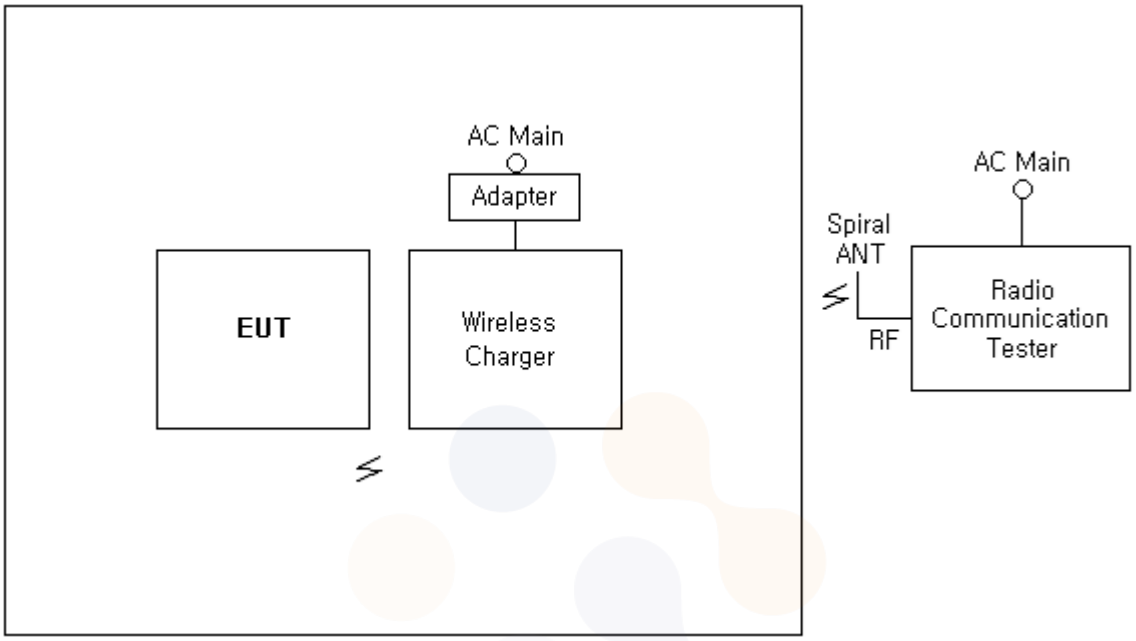
Type of product	Smart Wearable
Model name (Basic)	SM-R905U
Model name (Variant)	SM-R905F
Difference	Software difference
Serial no	-
Testing voltage	120 V, 60 Hz / DC 3.88 V
Input rating	120 V, 60 Hz (Power supplied from Wireless Charger Adapter) DC 3.88 V (Built in Battery)
Internal clock frequency	Above 108 MHz
RF Frequency	LTE Band 5_869 MHz ~ 894 MHz LTE Band 12_729 MHz ~ 746 MHz LTE Band 13_746 MHz ~ 756 MHz LTE Band 26_859 MHz ~ 894 MHz LTE Band 71_617 MHz ~ 652 MHz WCDMA 5: 869 MHz ~ 894 MHz
Note	-The following accessory was provided by the manufacturer. 1) Wireless Charger (EP-OR900) - FCC ID & IC: A3LEPOR900 / 649E-EPOR900

4.3 Auxiliary equipments

Type	Model / Part #	S/N	Manufacturer
Wireless Charger	EP-OR900	-	SAMSUNG
Adapter	EP-TA800	-	SAMSUNG
Radio Communication Tester	CMU200	-	R&S
Spiral ANT	-	-	-

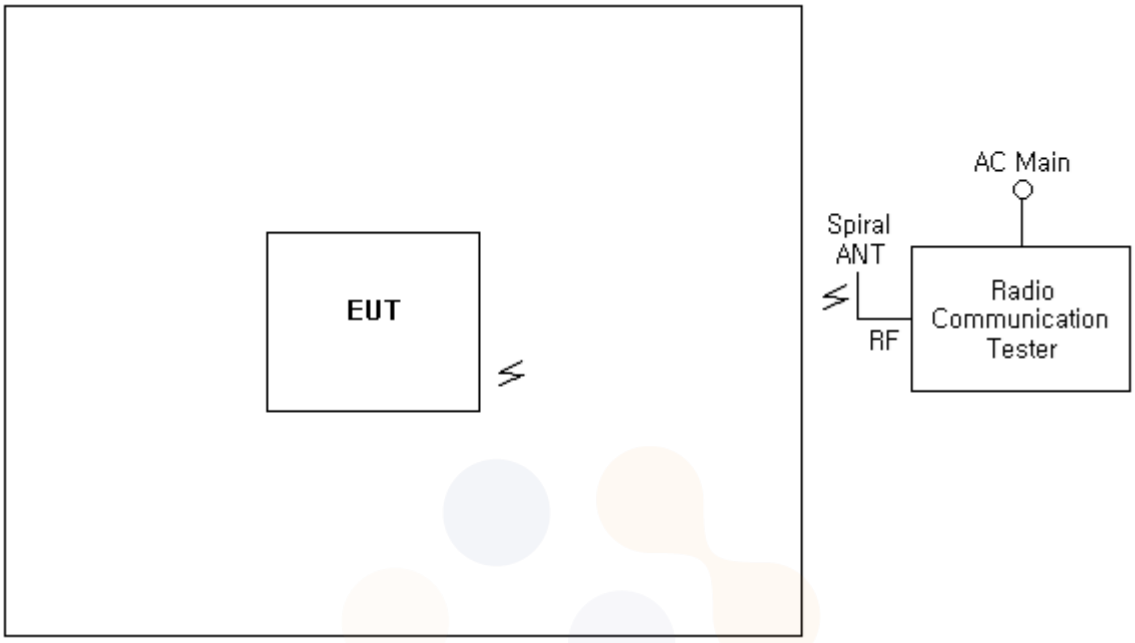
4.4 Test configuration

[Test #1]



	Start		End		Cable	
	Name	I/O port	Name	I/O port	Length (m)	Spec.
1	**EUT**	-	-	-	-	-
2	Wireless Charger	Power	Adapter	-	1.0	Shield
3	Radio Communication Tester	RF	Spiral ANT	-	2.0	Shield

[Test #2]



	Start		End		Cable	
	Name	I/O port	Name	I/O port	Length (m)	Spec.
1	**EUT**	-	-	-	-	-
2	Radio Communication Tester	RF	Spiral ANT	-	2.0	Shield

4.5 Operating conditions

The EUT was configured as normal intended use.

Test mode	Normal operating
Test #1	Wireless Charging(w/TA) + Cellular receiver (LTE 13_Middle)
Test #2	Battery + Cellular receiver (LTE 13_Middle)

Note 1. All cellular RX bands operating below 1 GHz, including WCDMA and LTE have been investigated with low/middle/high channels. Among the bands, LTE 13_Middle is the worst mode.

Note 2. 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 B FCC Part 15 Subpart B	Pass
☒	Radiated Emission	ANSI C63.4:2014, Class B FCC Part 15 Subpart B	Pass

6. Test results

6.1 Conducted Emissions

Testing voltage	120 V, 60 Hz		
Test facility	Shielded room (CE#1)		
Date	2022-05-27		
Temperature (°C)	20.8 °C	Humidity (% R.H.)	27.5 % R.H.
Remarks	Pass		

6.1.1 Limits of conducted emissions measurement

Frequency [MHz]	Class A (dB(μV))		Class B (dB(μV))	
	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

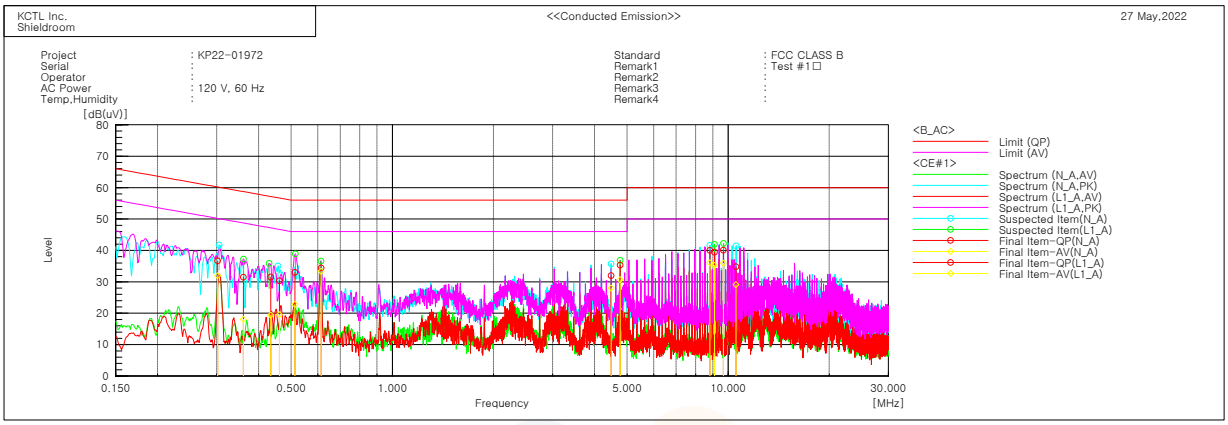
The measurements were performed in a shielded room. EUT was setup as shown in photograph and placed on a non-metallic table height of 0.8 m above the reference ground plane. The rear of table was located 0.4 m to the vertical conducted plane. EUT was power through the LISN, which was bonded to the ground 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	100001	R&S	2022.08.19	☒
TWO-LINE V-NETWORK	ENV216	101358	R&S	2022.09.30	☒
TWO-LINE V-NETWORK	ENV216	101352	R&S	2023.03.29	☐

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]	Margin CAV [dB]
1	0.30198	27.0	22.2	9.7	36.7	31.9	60.2	50.2	23.5	18.3
2	0.46108	20.4	9.6	9.9	30.3	19.5	56.7	46.7	26.4	27.2
3	4.48174	22.2	18.2	9.8	32.0	28.0	56.0	46.0	24.0	18.0
4	8.81562	30.0	26.0	10.0	40.0	36.0	60.0	50.0	20.0	14.0
5	10.5553	24.6	18.9	10.2	34.8	29.1	60.0	50.0	25.2	20.9

--- 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	0.36015	21.7	8.2	9.8	31.5	18.0	58.7	48.7	27.2	30.7
2	0.43445	21.6	9.5	9.9	31.5	19.4	57.2	47.2	25.7	27.8
3	0.51296	23.1	12.9	9.9	33.0	22.8	56.0	46.0	23.0	23.2
4	0.61366	24.5	23.4	9.9	34.4	33.3	56.0	46.0	21.6	12.7
5	4.76854	25.5	20.8	9.8	35.3	30.6	56.0	46.0	20.7	15.4
6	9.10406	29.4	25.2	10.1	39.5	35.3	60.0	50.0	20.5	14.7
7	9.68152	30.0	25.8	10.1	40.1	35.9	60.0	50.0	19.9	14.1

6.2 Radiated Emission

Testing voltage	120 V, 60 Hz / DC 3.88 V		
Test facility	10 m Chamber (4F)		
Test distance	3 m		
Date	2022-05-27		
Temperature (°C)	21.6 °C	Humidity (% R.H.)	29.9 % R.H.
Remarks	Pass		

6.2.1 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.

6.2.2 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	2022.08.19	☒
Bilog Antenna	CBL 6112D	37876	TESEQ	2022.12.08	☒
AMPLIFIER	310N	293004	SONOMA	2022.08.19	☒
ATTENUATOR	8491B	MY39270292	AGILENT	-	☒
Antenna Mast	MA4640-XP-ET	-	Innco Systems	-	☒
Turn Table	DT3000-2t	-	Innco Systems	-	☒
Horn antenna	3116	00086635	ETS-LINDGREN	2023.05.04	☒
DOUBLE RIDGED HORN ANTENNA	3117	00161083	ETS-LINDGREN	2023.01.21	☒
AMPLIFIER	JS44-18004000-33-8P	2000996	L-3Narda-MITEQ	2023.01.21	☒
BROADBAND PREAMPLIFIER	BBV 9718C	00138	SCHWARZBECK	2023.10.19	☒
Spectrum Analyzer	N9040B	MY57010132	AGILENT	2022.12.31	☒

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:

Result = M.R + C.F(A.F + C.L + 6 dB Att – 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

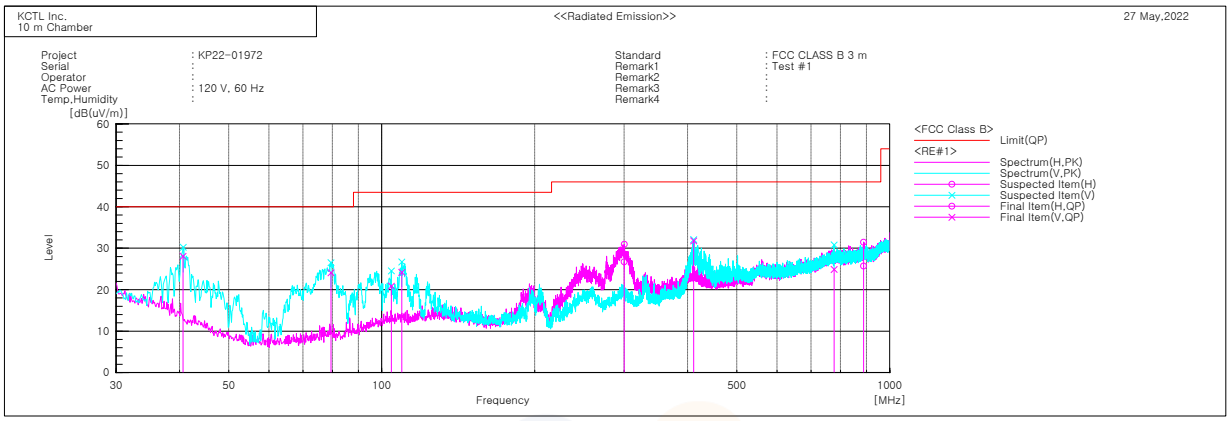
The result is 30 + 12 + 5 + 6 – 35 = 18 dB (μN/m)

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

AV = CAV : Abbreviation of CISPR Average

6.2.5 Radiated emission measurement result

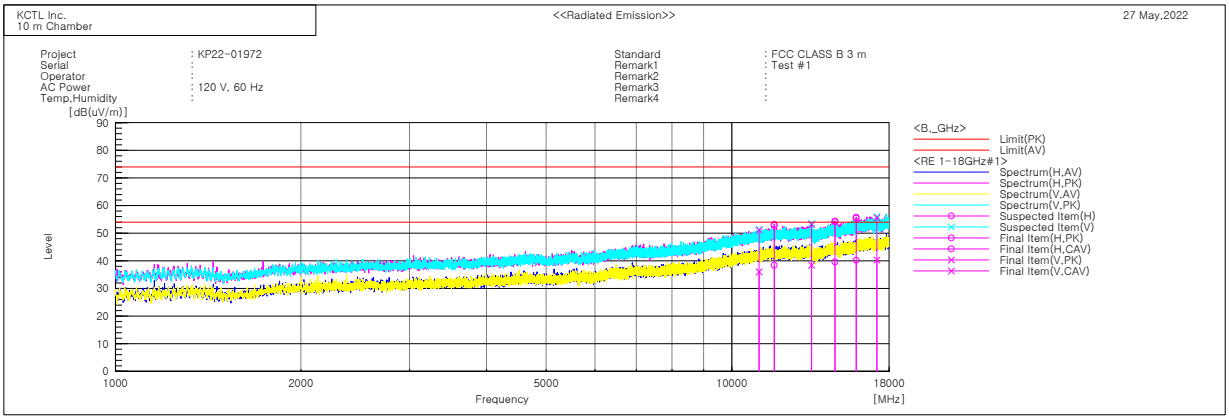
30 MHz ~ 1 GHz



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	40.645	V	38.5	-10.4	28.1	40.0	11.9	106.0	74.0
2	79.445	V	39.5	-15.4	24.1	40.0	15.9	114.0	316.0
3	104.442	V	31.2	-10.3	20.9	43.5	22.6	220.0	34.0
4	109.489	V	34.2	-10.0	24.2	43.5	19.3	166.0	146.0
5	300.215	H	31.4	-4.7	26.7	46.0	19.3	116.0	349.0
6	411.241	V	32.3	-0.5	31.8	46.0	14.2	163.0	354.0
7	777.021	V	16.2	8.7	24.9	46.0	21.1	344.0	118.0
8	888.450	H	15.5	10.2	25.7	46.0	20.3	278.0	273.0

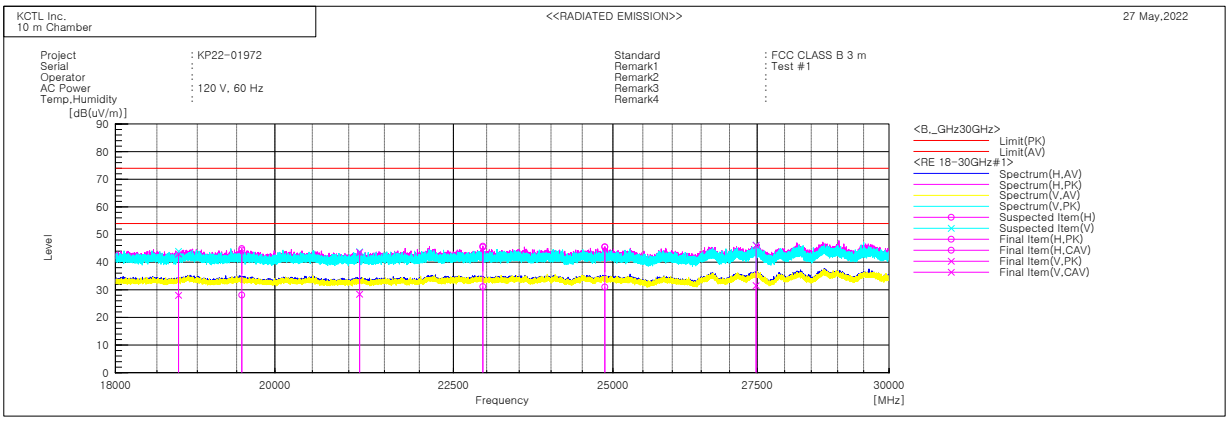
1 GHz ~ 18 GHz



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	11072.140	V	36.6	21.5	14.5	51.1	36.0	74.0	54.0	22.9	18.0	299.0	316.0
2	11720.410	H	37.2	22.8	15.6	52.8	38.4	74.0	54.0	21.2	15.6	150.0	196.0
3	13472.490	V	35.9	21.2	17.2	53.1	38.4	74.0	54.0	20.9	15.6	134.0	291.0
4	14700.730	H	36.9	22.4	17.2	54.1	39.6	74.0	54.0	19.9	14.4	110.0	264.0
5	15917.430	H	37.6	22.4	17.8	55.4	40.2	74.0	54.0	18.6	13.8	168.0	241.0
6	17194.160	V	35.6	20.3	20.0	55.6	40.3	74.0	54.0	18.4	13.7	108.0	23.0

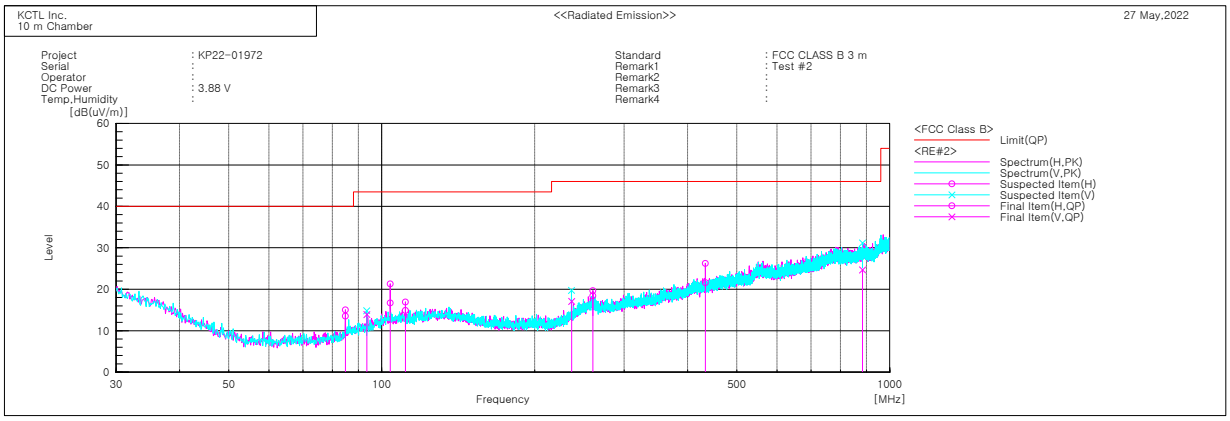
18 GHz ~ 30 GHz



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	18766.820	V	41.6	26.6	1.4	43.0	28.0	74.0	54.0	31.0	26.0	288.0	71.0
2	19565.440	H	42.9	26.6	1.5	44.4	28.1	74.0	54.0	29.6	25.9	300.0	160.0
3	21148.490	V	41.0	25.8	2.6	43.6	28.4	74.0	54.0	30.4	25.6	110.0	243.0
4	22942.440	H	42.1	27.8	3.3	45.4	31.1	74.0	54.0	28.6	22.9	300.0	77.0
5	24866.740	H	41.3	26.8	4.2	45.5	31.0	74.0	54.0	28.5	23.0	117.0	53.0
6	27478.080	V	41.2	26.6	4.9	46.1	31.5	74.0	54.0	27.9	22.5	198.0	322.0

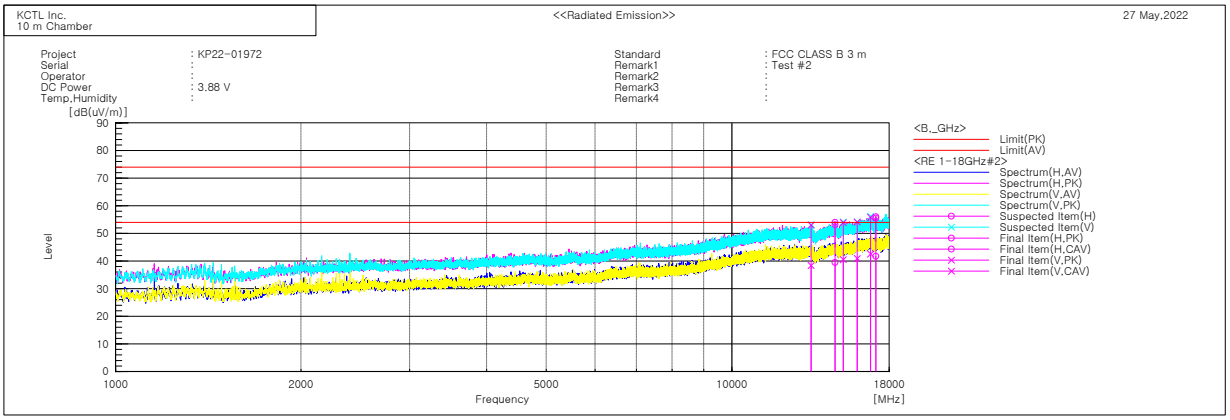
30 MHz ~ 1 GHz



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	84.841	H	27.7	-14.2	13.5	40.0	26.5	371.0	352.0
2	93.441	V	26.5	-12.6	13.9	43.5	29.6	130.0	34.0
3	103.942	H	27.0	-10.3	16.7	43.5	26.8	120.0	66.0
4	111.389	H	25.0	-10.1	14.9	43.5	28.6	383.0	325.0
5	236.458	V	25.4	-8.3	17.1	46.0	28.9	168.0	36.0
6	260.389	H	23.6	-5.2	18.4	46.0	27.6	286.0	352.0
7	433.589	H	21.4	0.2	21.6	46.0	24.4	233.0	355.0
8	883.844	V	14.7	10.0	24.7	46.0	21.3	399.0	166.0

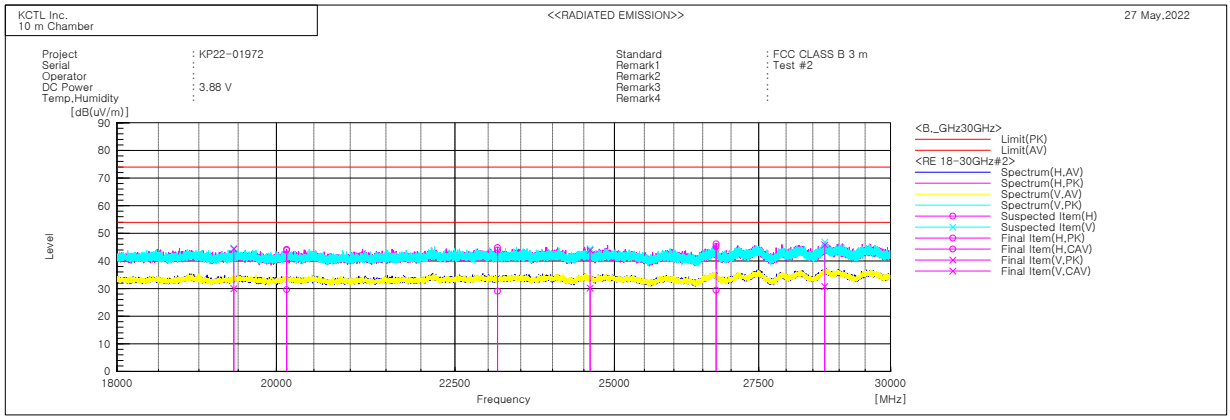
1 GHz ~ 18 GHz



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	13442.920	V	35.8	21.2	17.2	53.0	38.4	74.0	54.0	21.0	15.6	166.0	271.0
2	14706.140	H	35.9	22.3	17.2	53.1	39.5	74.0	54.0	20.9	14.5	201.0	106.0
3	15163.420	V	37.0	23.6	16.9	53.9	40.5	74.0	54.0	20.1	13.5	377.0	271.0
4	15967.550	V	36.0	22.8	18.1	54.1	40.9	74.0	54.0	19.9	13.1	137.0	241.0
5	16793.790	V	36.0	22.8	19.8	55.8	42.6	74.0	54.0	18.2	11.4	266.0	101.0
6	17119.350	H	35.6	21.8	19.9	55.5	41.7	74.0	54.0	18.5	12.3	120.0	116.0

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	19443.110	V	43.0	28.6	1.4	44.4	30.0	74.0	54.0	29.6	24.0	120.0	66.0
2	20133.750	H	42.1	27.8	1.8	43.9	29.6	74.0	54.0	30.1	24.4	133.0	182.0
3	23142.240	H	40.6	25.8	3.3	43.9	29.1	74.0	54.0	30.1	24.9	290.0	153.0
4	24601.490	V	40.5	26.8	3.4	43.9	30.2	74.0	54.0	30.1	23.8	110.0	29.0
5	26735.430	H	40.2	24.4	5.0	45.2	29.4	74.0	54.0	28.8	24.6	193.0	344.0
6	28722.280	V	41.0	26.0	4.8	45.8	30.8	74.0	54.0	28.2	23.2	168.0	119.0