TEST REPORT

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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KCTL

1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
- Date of Receipt : 2020-04-03

2. Use of Report : -

3. Name of Product / Model : Smart Wearable / SM-R855U

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

5. Date of Test : 2020-05-22

6. Location of Test : ■ Permanent Testing Lab □ On Site Testing (Address: -)

7. Test method used : ANSI C63.4:2014Class B

8. FCC ID A3LSMR855

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

Affirmation	Tested by Name : Jinwon Kim (Signature)	Technical Manager Name : Moonsup Cho (Signature)

2020-05-27

KCTL Inc.

REPORT REVISION HISTORY

Date	Revision	Page No
2020-05-25	Originally issued	-
2020-05-27	Updated	10, 11

Note. The report No. KR20-SEF0085 is superseded by the report No. KR20-SEF0085-A.

General remarks for test reports

Nothing significant to report.

Contents

1. Applicant information

Applicant:	Samsung Electronics Co., Ltd.
Address:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
E-mail:	taekun08.kim@samsung.com
Contact name:	Taekun Kim

Manufacturer:	Samsung Electronics Co., Ltd.
Address:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
E-mail:	taekun08.kim@samsung.com
Contact name:	Taekun Kim

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)	26.8 °C / 27.1 °C	39.8 % R.H. / 40.1 % R.H.	-
Shielded room(CE)	24.5 °C	38.5 % 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: 3.7 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)	

4. Description of EUT

4.1 General information

Declared Hardware Version	REV1.0
Declared Software Version	R855U.001
Operating Band(s)	WCDMA FDD 2/4/5 LTE FDD 2/4/5/12/13/25/26/66/71
Testing Band(s)	LTE FDD 13

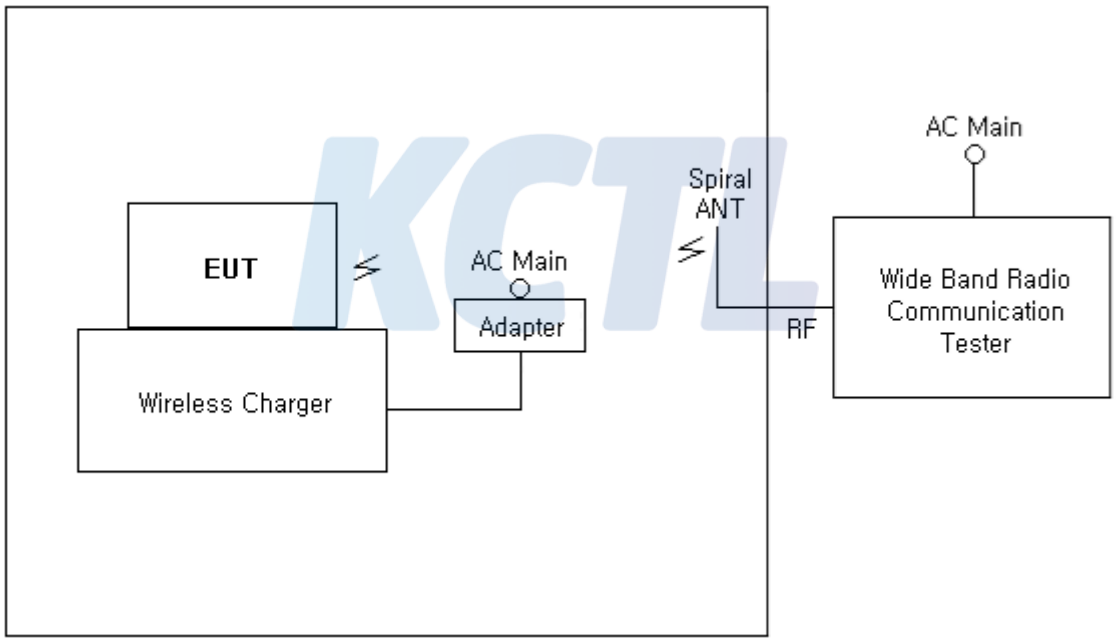
4.2 Product description

Type of product	Smart Wearable
Model name (Basic)	SM-R855U
Model name (Variant)	SM-R855F
Difference	The difference between basic model (SM-R855U) and derivative model (SM-R855F) is: a. RF Supported Band is Different. (R855U: 3G (B2, B4, B5), 4G (B2, B4, B5, B12, B13, B25, B26, B66, B71)) (R855F: 3G (B1, B2, B4, B5, B8), 4G (B1, B2, B3, B4, B5, B7, B8, B12, B13, B20, B25, B28, B66)) - In EUR R855F : 3G (B1, B5, B8), 4G (B1, B3, B5, B7, B8, B20, B28) b. All other protocol part is same. c. All other features of Volte, SUPL is same. d. In USA & Canada, 4G (B7) disabled by MCC code. Because device doesn't support B7 roaming in USA & Canada.
Serial no	-
Testing voltage	120 V, 60 Hz
Input rating	DC 5 V
Internal clock frequency	Above 108 MHz
RF Frequency	Bluetooth(BDR/EDR/BLE)_2 402 MHz ~ 2 480 MHz WIFI(802.11b/g/n20)_2 412 MHz ~ 2 472 MHz 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 25_1 850.7 MHz ~ 1 914.3 MHz LTE Band 26_824.7 MHz ~ 848.3 MHz, 814.7 MHz ~ 823.3 MHz LTE Band 66_1 710.7 MHz ~ 1 779.3 MHz LTE Band 71_665.5 MHz ~ 688.0 MHz WCDMA 850_826.4 MHz ~ 846.6 MHz WCDMA 1700_1 712.4 MHz ~ 1 752.6 MHz WCDMA 1900_1 852.4 MHz ~ 1 907.6 MHz
Note	-The following accessory was provided by the manufacturer. 1) Wireless Charger (EP-OR825) - FCC ID & IC: A3LEPOR825 / 649E-EPOR825

4.3 Auxiliary equipments

Type	Model / Part #	S/N	Manufacturer
Wireless Charger	EP-OR825	-	SAMSUNG
Adapter	EP-TA200	R37M2VSB1L1HH3	SAMSUNG
Wide Band Radio Communication Tester	CMW500	141780	R&S
Spiral ANT	PSA-75301R/170	406827-0001	COBHAM

4.4 Test configuration



	Start		End		Cable	
	Name	I/O port	Name	I/O port	Length (m)	Spec.
1	**EUT**	-	Wireless Charger	-	Direct	-
2	Wireless Charger	USB	Adapter	-	0.8	Shield
3	Wide Band Radio Communication Tester	RF	Spiral ANT	-	3.0	Shield

4.5 Operating conditions

The EUT was configured as normal intended use.

Test mode	Normal operating
Test #1	Charging (w/TA) + Cellular receiver (LTE FDD 13_Center frequency)

Note 1. All cellular RX bands operating below 1 GHz, including WCDMA and LTE have been investigated with low/mid/high channels and test results are not significantly different.

Note 2. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z.
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

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#1)		
Date	2020-05-22		
Temperature (°C)	24.5 °C	Humidity (% R.H.)	38.5 % 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

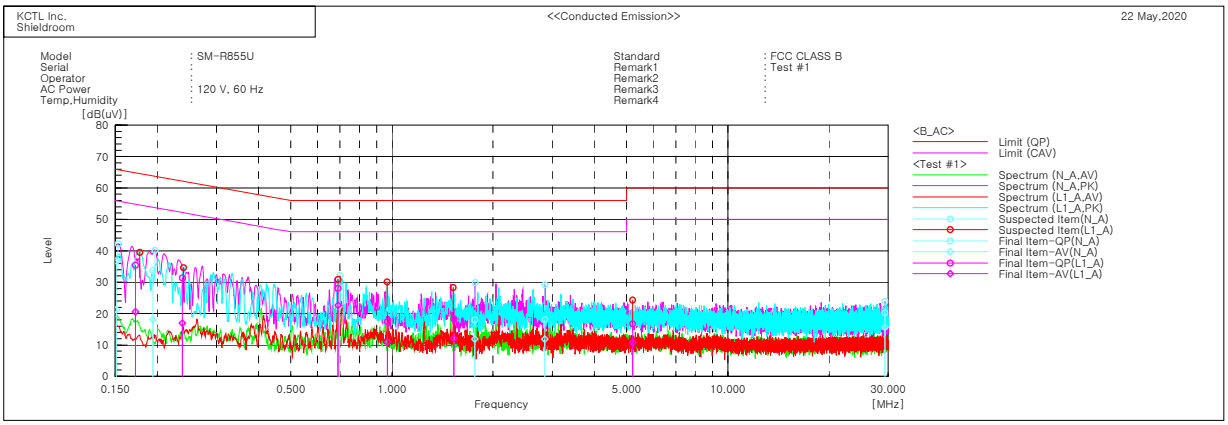
The measurements were performed in a shielded room. EUT was setup as shown in photograph and placed on a non-metallic table height of 0.8 m above the reference ground plane. The rear of table was located 0.4 m to the vertical conducted plane. EUT was power through the LISN, which was bonded to the ground 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	2020.08.22	☒
TWO-LINE V-NETWORK	ENV216	101358	R&S	2020.10.02	☒
TWO-LINE V-NETWORK	ENV216	101352	R&S	2021.04.06	☐

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	0.15101	26.8	11.3	10.0	36.8	21.3	65.9	55.9	29.1	34.6
2	0.19428	23.5	7.9	10.2	33.7	18.1	63.9	53.9	30.2	35.8
3	0.69538	17.9	12.1	10.2	28.1	22.3	56.0	46.0	27.9	23.7
4	1.76533	7.7	1.6	10.3	18.0	11.9	56.0	46.0	38.0	34.1
5	2.84889	7.8	1.5	10.3	18.1	11.8	56.0	46.0	37.9	34.2
6	29.33536	8.8	4.1	11.5	20.3	15.6	60.0	50.0	39.7	34.4

--- 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	0.17248	25.1	10.3	10.3	35.4	20.6	64.8	54.8	29.4	34.2
2	0.23788	21.4	7.1	9.9	31.3	17.0	62.2	52.2	30.9	35.2
3	0.69161	17.9	12.5	10.2	28.1	22.7	56.0	46.0	27.9	23.3
4	0.96981	7.2	0.8	10.2	17.4	11.0	56.0	46.0	38.6	35.0
5	1.52752	8.0	1.8	10.3	18.3	12.1	56.0	46.0	37.7	33.9
6	5.20148	6.3	0.4	10.4	16.7	10.8	60.0	50.0	43.3	39.2

6.2 Radiated Emission

Test specification		ANSI C63.4:2014, Class B FCC Part 15 Subpart B		
Testing voltage		120 V, 60 Hz		
Test facility		10 m Chamber (4F)		
Test distance		3 m		
Date		2020-05-22		
30 MHz ~ 1 000 MHz	Temperature (°C)	26.8 °C	Humidity (% R.H.)	39.8 % R.H.
1 GHz ~ 30 GHz		27.1 °C		40.1 % R.H.
Remarks		Pass		

6.2.1 Limits of radiated emission measurement

Frequency [MHz]	Class A (dB(μV/m)) @ 10 m	Class B (dB(μV/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	2020.08.22	☒
Bilog Antenna	CBL 6112D	55545	TESEQ	2022.04.24	☒
AMPLIFIER	310N	293004	SONOMA	2020.08.22	☒
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	2020.09.18	☒
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:

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

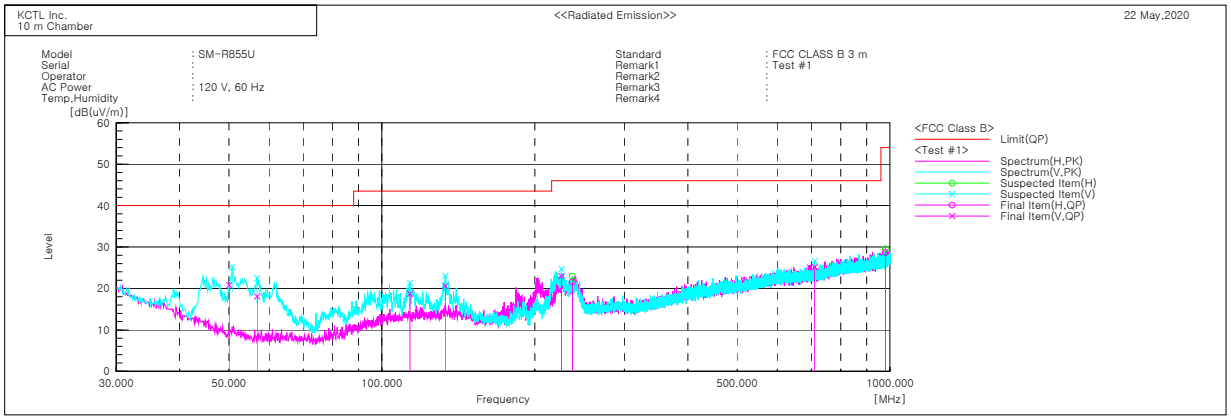
The result is 30 + 12 + 5 + 6 – 35 = 18 dB (μN/m)

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

AV = CAV : Abbreviation of CISPR Average

6.2.5 Radiated emission measurement result

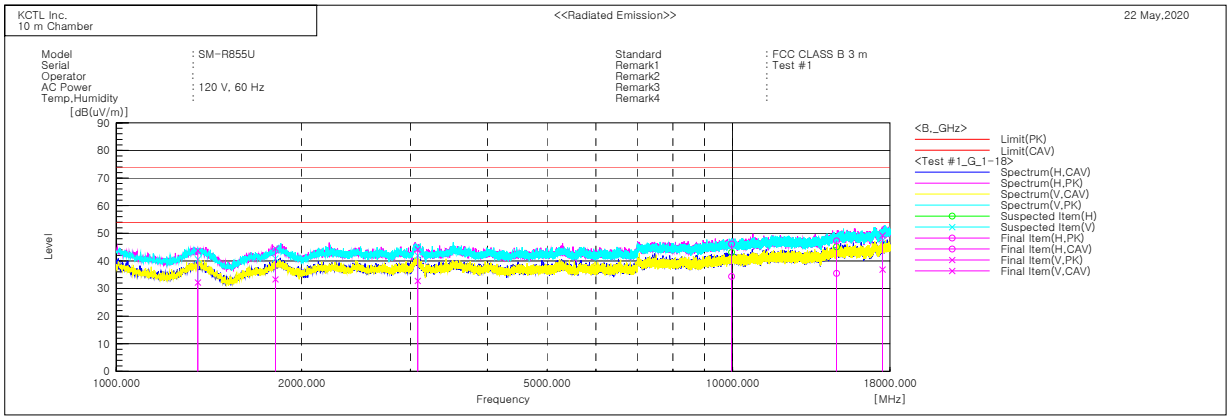
30 MHz ~ 1 GHz



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	50.021	V	36.4	-15.6	20.8	40.0	19.2	108.0	4.0
2	56.796	V	34.9	-16.8	18.1	40.0	21.9	120.0	55.0
3	113.541	V	28.7	-10.0	18.7	43.5	24.8	302.0	100.0
4	133.305	V	30.5	-9.9	20.6	43.5	22.9	379.0	334.0
5	225.576	V	32.0	-9.0	23.0	46.0	23.0	116.0	36.0
6	237.095	H	29.7	-8.1	21.6	46.0	24.4	197.0	149.0
7	711.425	V	20.5	4.7	25.2	46.0	20.8	300.0	73.0
8	979.630	H	18.5	10.2	28.7	54.0	25.3	311.0	9.0

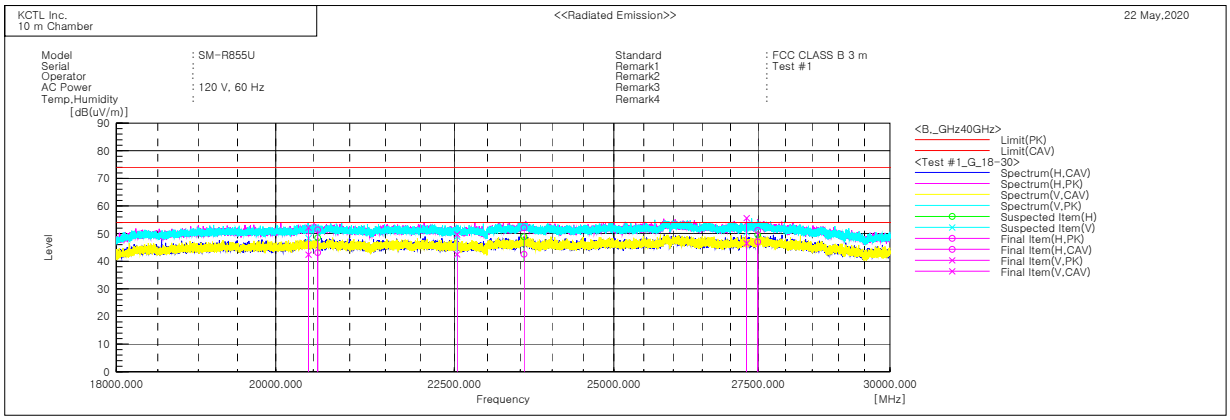
1 GHz ~ 18 GHz



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	1356.168	V	59.6	48.1	-15.9	43.7	32.2	74.0	54.0	30.3	21.8	141.0	162.0
2	1812.641	V	57.8	46.6	-13.3	44.5	33.3	74.0	54.0	29.5	20.7	296.0	105.0
3	3083.454	V	52.9	41.5	-8.7	44.2	32.8	74.0	54.0	29.8	21.2	182.0	291.0
4	9961.147	H	45.0	33.3	1.1	46.1	34.4	74.0	54.0	27.9	19.6	111.0	94.0
5	14743.490	H	45.2	33.4	2.1	47.3	35.5	74.0	54.0	26.7	18.5	289.0	16.0
6	17498.470	V	41.6	29.3	7.6	49.2	36.9	74.0	54.0	24.8	17.1	104.0	1.0

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	20436.120	V	49.3	39.5	2.9	52.2	42.4	74.0	54.0	21.8	11.6	118.0	81.0
2	20559.730	H	48.5	40.2	2.9	51.4	43.1	74.0	54.0	22.6	10.9	109.0	2.0
3	22542.230	V	46.7	39.5	3.0	49.7	42.5	74.0	54.0	24.3	11.5	280.0	231.0
4	23561.080	H	48.2	38.6	3.9	52.1	42.5	74.0	54.0	21.9	11.5	300.0	270.0
5	27291.470	V	47.3	38.2	8.3	55.6	46.5	74.0	54.0	18.4	7.5	118.0	223.0
6	27491.280	H	42.3	38.2	8.8	51.1	47.0	74.0	54.0	22.9	7.0	160.0	294.0