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TEST REPORT

of

FCC Part 15 Subpart C §15.209

FCC ID: 2AV76-NMOK-301W

Equipment Under Test	:	WIRELESS POWER CHARGING SYSTEM
Model Name	:	NMOK-301W
Variant Model Name(s)	:	-
Applicant	:	NIDEC MOBILITY KOREA CORPORATION
Manufacturer	:	NIDEC MOBILITY KOREA CORPORATION
Date of Receipt	:	2022.03.23
Date of Test(s)	:	2022.05.12 ~ 2022.08.26
Date of Issue	:	2022.09.02

In the configuration tested, the EUT complied with the standards specified above. This test report does not assure KOLAS accreditation.

1) The results of this test report are effective only to the items tested.
2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.
3) This test report cannot be reproduced, except in full, without prior written permission of the Company.

Tested by: Teo Kim

Technical Manager: Jinhyoung Cho

SGS Korea Co., Ltd. Gunpo Laboratory

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)
- 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

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1.2. Details of Applicant

Applicant : NIDEC MOBILITY KOREA CORPORATION
Address : 790-12, Bogaewonsam-ro, Bogae-myeon, Anseong-si, Gyeonggi-do, South Korea, 17507
Contact Person : Nam, Sang-il
Phone No. : +82 2 850 5789

1.3. Details of Manufacturer

Company : Same as applicant
Address : Same as applicant

1.4. Description of EUT

Kind of Product	WIRELESS POWER CHARGING SYSTEM
Model Name	NMOK-301W
Serial Number	001
Power Supply	DC 12 V
Operation Mode	5 W, 10 W
Frequency Range	120 ㎑
Antenna Type	Coil Antenna
Antenna Part Number	CM00000484
H/W Version	1.00
S/W Version	1.00

1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Spectrum Analyzer	R&S	FSV30	103210	Dec. 08, 2021	Annual	Dec. 08, 2022
Signal Generator	R&S	SMBV100A	255834	May 25, 2022	Annual	May 25, 2023
Amplifier	H.P.	8447F	2944A03909	Aug. 04, 2022	Annual	Aug. 04, 2023
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 23, 2021	Biennial	Aug. 23, 2023
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB9163	01126	Feb. 07, 2022	Annual	Feb. 07, 2023
Test Receiver	R&S	ESU26	100109	Jan. 18, 2022	Annual	Jan. 18, 2023
Turn Table	Innco systems GmbH	DS 1200 S	N/A	N.C.R.	N/A	N.C.R.
Controller	Innco systems GmbH	CONTROLLER CO3000-4P	CO3000/963/38 330516/L	N.C.R.	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N.C.R.	N/A	N.C.R.
Coaxial Cable	RFONE	PL360P-292M292M-1.5M-A	20200324002	Aug. 18, 2022	Semi-Annual	Feb. 18, 2023
Coaxial Cable	RFONE	MWX221-NMSNMS (4 m)	J1023142	Apr. 04, 2022	Semi-Annual	Oct. 04, 2022
Coaxial Cable	RFONE	142A SERIES 502839-8 (10 m)	90000034	Apr. 04, 2022	Semi-Annual	Oct. 04, 2022

▶ Support Equipment

Description	Manufacturer	Model	FCC ID
Portable Handset	Samsung Electronics Co., Ltd.	SM-G906S	A3LSMG906S
Portable Handset	Samsung Electronics Co., Ltd.	SM-G975U	A3LSMG975U

Note;
- For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

1.6. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15 Subpart C		
Section	**Test Item(s)**	**Result**
15.209	Radiated Emission, Spurious Emission and Field Strength of Fundamental	Complied
2.1049	20 ㏈ Bandwidth	Complied
15.207	AC Power Line Conducted Emission	N/A[1)]

Note;

1) The AC power line test was not performed because the EUT use battery power for operation and which do not operate from the AC power lines.

1.7. Test Procedure(s)

The measurement procedures described in the American National Standard of Procedure for Compliance Testing of unlicensed Wireless Devices (ANSI C63.10-2013).

1.8. Sample Calculation

Where relevant, the following sample calculation is provided:
Field strength level (㏈㎶/m) = Measured level (㏈㎶) + Antenna factor (㏈) + Cable loss (㏈) + (AMP (㏈))

1.9. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL003402	2022.09.02	Initial

1.10. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty	
20 dB Bandwidth	3.90 ㎑	
Radiated Emission, 9 ㎑ to 30 ㎒	H	3.30 dB
	V	3.30 dB
Radiated Emission, below 1 ㎓	H	4.80 dB
	V	5.20 dB

All measurement uncertainty values are shown with a coverage factor of *k*=2 to indicate a 95 % level of confidence.

1.11. Worst Case of Test Configurations

Charging mode with client device	Mode		Description
Model: SM-G906S FCC ID: A3LSMG906S Model: SM-G975U FCC ID: A3LSMG975U	5 W	10 W	1 % of battery 50 % of battery 99 % of battery
	Ant. 1: 120 ㎑	Ant. 1: 120 ㎑	
	SM-G906S	SM-G975U	

Mode	Battery	Frequency (㎑)	Detect Mode	Reading (dBμV)
5 W	1 %	120	Average	**66.80**
	50 %			65.90
	99 %			65.90
10 W	1 %	120	Average	**68.50**
	50 %			67.90
	99 %			67.55

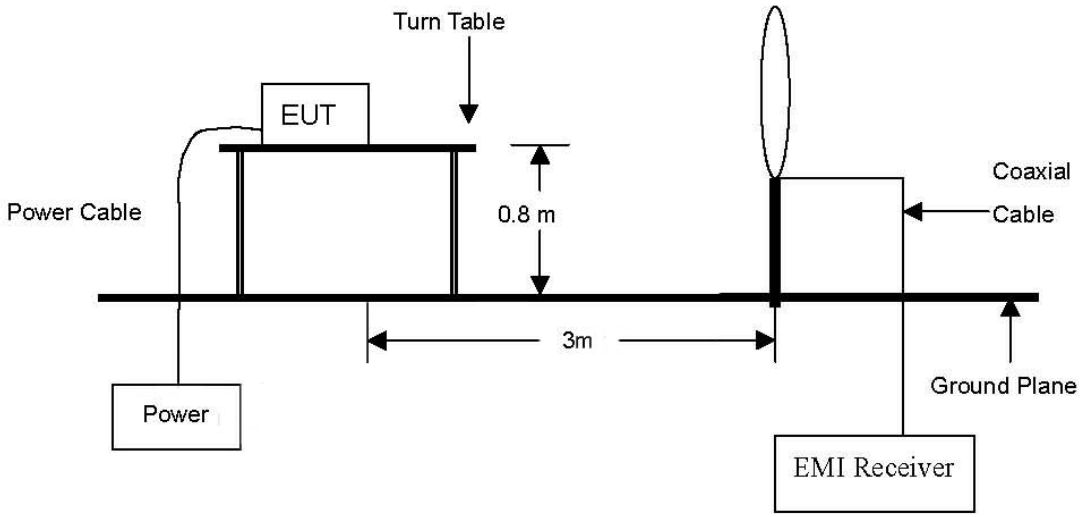
Note;

- EUT was investigated with client device under normal charging condition as above then worst value was only reported.

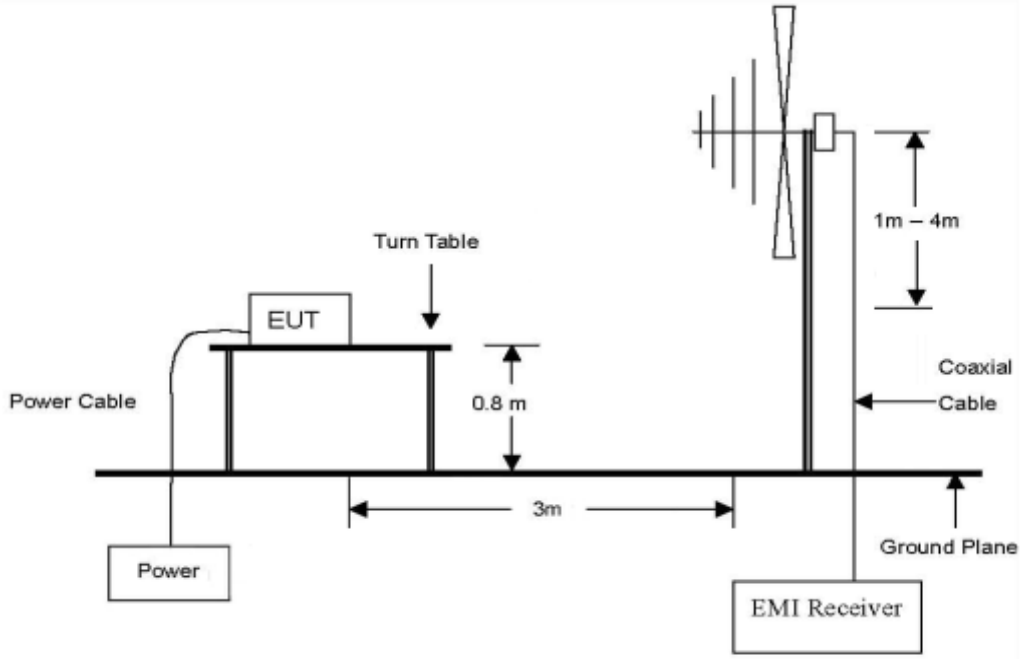
2. Field Strength of Fundamental and Spurious Emission

2.1. Test Setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓.



2.2. Limit

2.2.1. Radiated emission limits, general requirements

According to §15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (㎒)	Field Strength (microvolts/meter)	Measurement Distance (meter)
0.009-0.490	2 400/F(㎑)	300
0.490-1.705	24 000/F(㎑)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 ㎒, 76-88 ㎒, 174-216 ㎒ or 470-806 ㎒. however, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241

2.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.10:2013.

2.3.1. Test Procedures for emission from 9 ㎑ to 30 ㎒

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
b. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
c. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
d. The test-receiver system was set to Quasi Peak and Average Detect Function and Specified Bandwidth with Maximum Hold Mode.

2.3.2. Test Procedures for emission from 30 ㎒ to 1 000 ㎒

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
b. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3 meter away from the interference-receiving antenna.
c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. For measurements below 1 ㎓ resolution bandwidth is set to 100 ㎑ for peak detection measurements or 120 ㎑ for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

2.4. Field Strength of Fundamental Test Result

Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on between polarizations of horizontal and vertical.

Test Condition: 5 W Operating mode with client device (1 % battery status of client device)

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB㎶/m) at 3 m	Actual (dB㎶/m) at 300 m	Limit (dB㎶/m) at 300 m	Margin (dB)
Ant. 1 (120 ㎑)									
0.120	66.80	Average	H	17.90	0.02	84.72	4.72	26.02	21.30

Test Condition: 10 W Operating mode with client device (1 % battery status of client device)

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB㎶/m) at 3 m	Actual (dB㎶/m) at 300 m	Limit (dB㎶/m) at 300 m	Margin (dB)
Ant. 1 (120 ㎑)									
0.120	68.50	Average	H	17.90	0.02	86.42	6.42	26.02	19.60

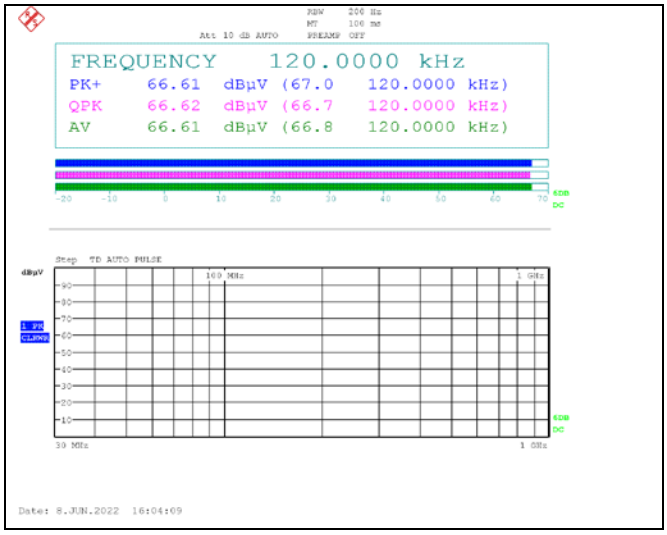
Remark;

1. According to §15.31(f)(2),
   - 300 m Result (dB㎶/m) = 3 m Result (dB㎶/m) - 40log (300/3) (dB㎶/m).
2. According to field strength table of general requirement in §15.209(a), field strength limits below 1.705 ㎒ were calculated as below.
   - 9 ㎑ to 490 ㎑: 20log (2 400 / F (㎑)) at 300 m (dB㎶/m)
   - 490 ㎑ to 1.705 ㎒: 20log (24 000/F (㎑)) at 30 m (dB㎶/m)
3. According to §15.209(d), the measurements were tested by using Quasi peak detector except for the frequency bands 9-90 ㎑, 110-490 ㎑ and above 1 ㎓ in these three bands on measurements employing an average detector.
4. The limit above was calculated based on table of §15.209(a).

- Test plots

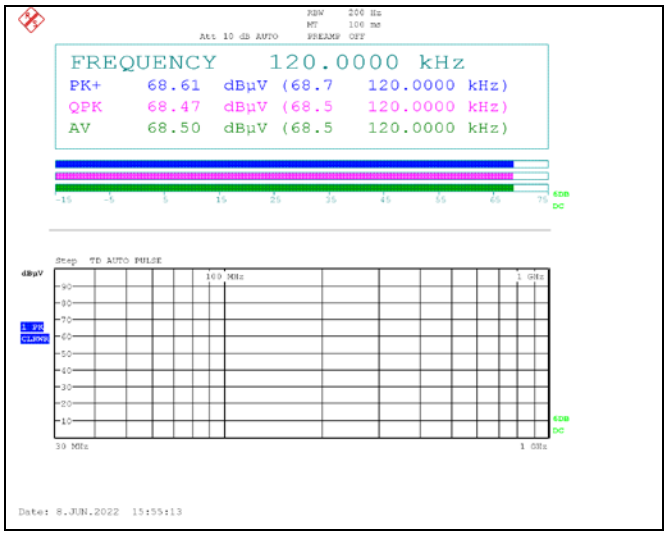
Test Condition: 5 W Operating mode with client device (1 % battery status of client device)

Ant. 1 (120 ㎑)



Test Condition: 10 W Operating mode with client device (1 % battery status of client device)

Ant. 1 (120 ㎑)



2.5. Spurious Emission Test Result

Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on between polarizations of horizontal and vertical.

Test Condition: 5 W Operating mode with client device (1 % battery status of client device)

Ant. 1 (120 ㎑)

Below 30 ㎒

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB㎶/m) at 3 m	Actual (dB㎶/m) at 300 m or 30 m	Limit (dB㎶/m) at 300 m or 30 m	Margin (dB)
0.035	30.70	Average	H	18.09	0.01	48.80	-31.20	36.72	67.92
0.067	20.80	Average	H	17.99	0.02	38.81	-41.19	31.08	72.27
0.086	13.20	Average	H	17.94	0.02	31.16	-48.84	28.91	77.75
0.090	15.40	Average	H	17.93	0.02	33.35	-46.65	28.52	75.17
0.357	27.30	Average	H	17.93	0.04	45.27	-34.73	16.55	51.28
0.596	21.30	Quasi Peak	H	18.04	0.07	39.41	-0.59	32.10	32.69
0.838	20.51	Quasi Peak	H	18.14	0.12	38.77	-1.23	29.14	30.37
Above 1.000	Not detected	-	-	-	-	-	-	-	-

Above 30 ㎒

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
33.38	47.10	Peak	V	16.48	-26.70	**36.88**	40.00	3.12
79.21	39.70	Peak	V	12.92	-26.15	26.47	40.00	13.53
109.96	36.40	Peak	H	17.40	-25.84	27.96	43.50	15.54
150.99	44.10	Peak	V	13.90	-25.44	32.56	43.50	10.94
199.35	43.20	Peak	V	17.17	-24.86	35.51	43.50	7.99
278.10	43.40	Peak	H	18.62	-24.28	37.74	46.00	8.26
Above 300.00	Not detected	-	-	-	-	-	-	-

Test Condition: 10 W Operating mode with client device (1 % battery status of client device)

Ant. 1 (120 ㎑)

Below 30 ㎒

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB㎶/m) at 3 m	Actual (dB㎶/m) at 300 m or 30 m	Limit (dB㎶/m) at 300 m or 30 m	Margin (dB)
0.035	31.10	Average	H	18.09	0.01	49.20	-30.80	36.72	67.52
0.070	9.20	Average	H	17.99	0.02	27.21	-52.79	30.70	83.49
0.078	8.70	Average	H	17.96	0.02	26.68	-53.32	29.76	83.08
0.094	13.40	Quasi Peak	H	17.92	0.02	31.34	-48.66	28.14	76.80
0.359	32.40	Average	H	17.93	0.04	50.37	-29.63	16.50	46.13
0.599	27.60	Quasi Peak	H	18.04	0.07	45.71	5.71	32.06	26.35
0.837	18.14	Quasi Peak	H	18.13	0.12	36.39	-3.61	29.15	32.76
Above 1.000	Not detected	-	-	-	-	-	-	-	-

Above 30 ㎒

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
32.87	46.00	Quasi Peak	V	16.40	-26.70	35.70	40.00	4.30
79.19	40.70	Peak	V	12.92	-26.15	27.47	40.00	12.53
108.72	38.50	Peak	H	17.53	-25.86	30.17	43.50	13.33
151.08	44.50	Peak	V	13.90	-25.44	32.96	43.50	10.54
199.02	44.10	Peak	V	17.20	-24.86	36.44	43.50	7.06
279.99	46.20	Peak	H	18.70	-24.26	40.64	46.00	5.36
Above 300.00	Not detected	-	-	-	-	-	-	-

Remark;

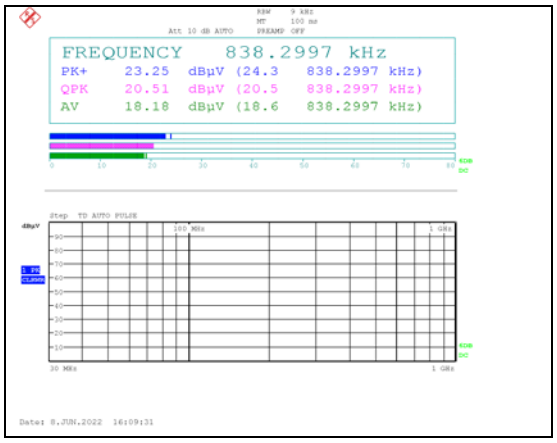
1. According to §15.31 (f)(2),
   - 300 m Result (dBμV/m) = 3 m Result (dBμV/m) - 40log (300/3) (dBμV/m)
   - 30 m Result (dBμV/m) = 3 m Result (dBμV/m) - 40log (30/3) (dBμV/m)
2. According to field strength table of general requirement in §15.209 (a), field strength limits below 1.705 ㎒ were calculated as below.
   - 9 ㎑ to 490 ㎑: 20log (2 400 / F (㎑)) at 300 m (dBμV/m)
   - 490 ㎑ to 1.705 ㎒: 20log (24 000 / F (㎑)) at 30 m (dBμV/m)
3. According to §15.209 (d), the measurements were tested by using Quasi peak detector except for the frequency bands 9-90 ㎑, 110-490 ㎑ and above 1 ㎓ in these three bands on measurements employing an average detector.
4. The limit above was calculated based on table of §15.209 (a).
5. Radiated spurious emission measurement as below 30 ㎒.
   (Actual (dBμA/m) at 3m = Reading (dBμV) + AF (dB/m) + CL (dB))
6. Radiated spurious emission measurement as above 30 ㎒.
   (Actual (dBμA/m) = Reading (dBμV) + AF (dB/m) + CL (dB) + AMP (dB))
7. According to §15.31(o), emission levels are not report much lower than the limits by over 20 dB.

- Test plots

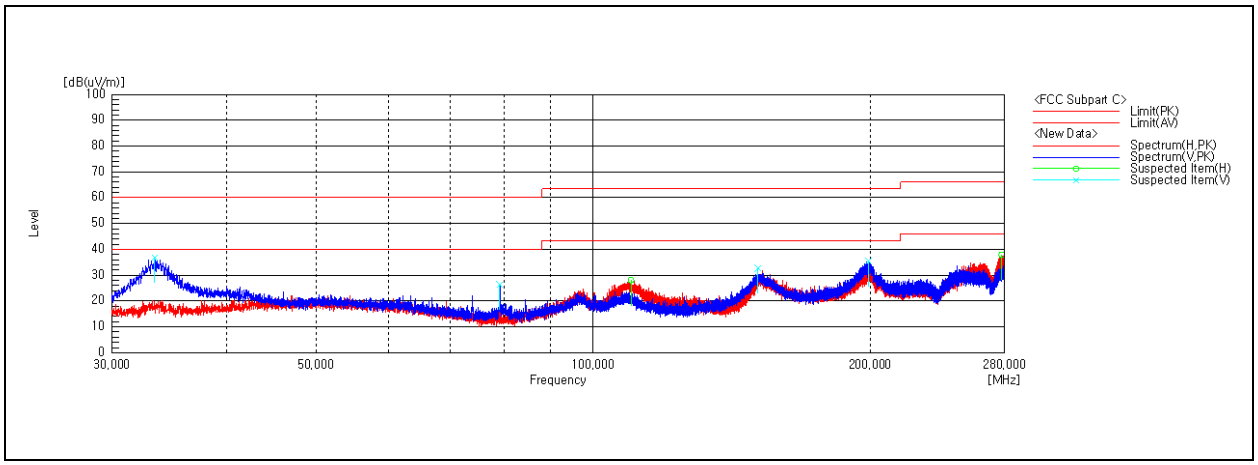
Test Condition: 5 W Operating mode with client device (1 % battery status of client device)

Ant. 1 (120 ㎑)

Below 30 ㎒



Above 30 ㎒



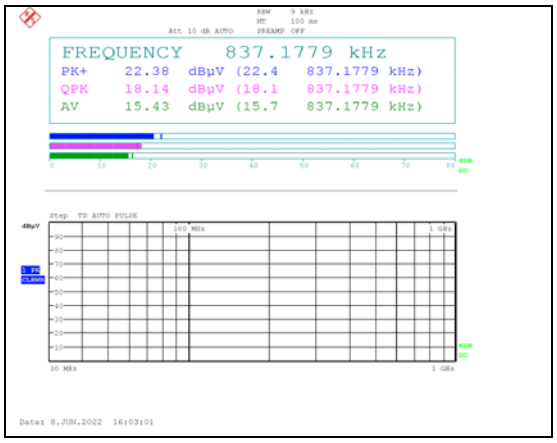
Remark;

- Traces shown in the plot were made by using a peak detector.

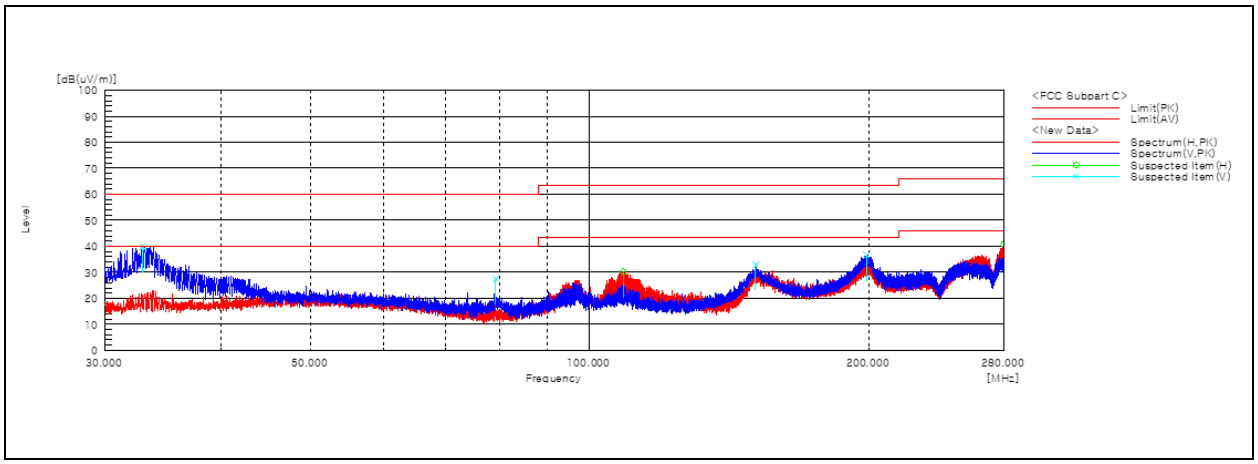
Test Condition: 10 W Operating mode with client device (1 % battery status of client device)

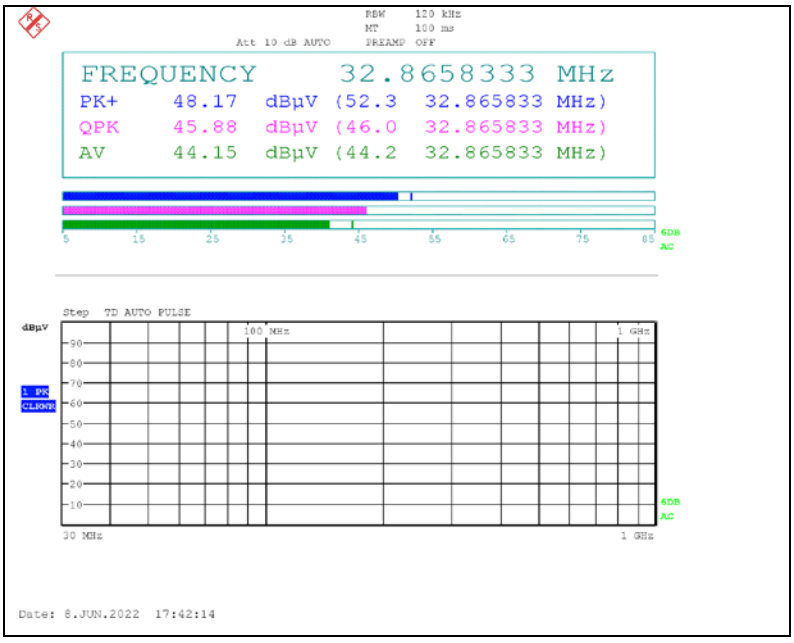
Ant. 1 (120 ㎑)

Below 30 ㎒



Above 30 ㎒



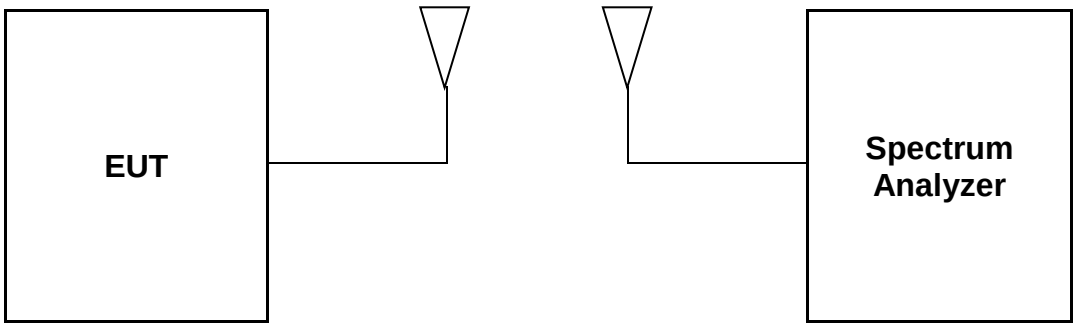


Remark;

- Traces shown in the plot were made by using a peak detector.

3. 20 dB Bandwidth

3.1. Test Setup



3.2. Limit

None; for reporting purposed only

3.3. Test Procedure

a. Span = set to capture all products of the modulation process, including the emission skirts. RBW = 200 Hz, VBW = 200 Hz, Sweep = auto, Detector = peak, Trace = max hold.
b. The marker-to-peak function to set the mark to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is 20 dB bandwidth of the emission.

3.4. Test Result

Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

Test Condition: 5 W Operating mode with client device (1 % battery status of client device)

Antenna	Frequency (㎑)	EUT Status	20 ㏈ Bandwidth (㎑)	Limit
1	120	With client device (1 % battery status of client device)	0.521	Reporting proposed only

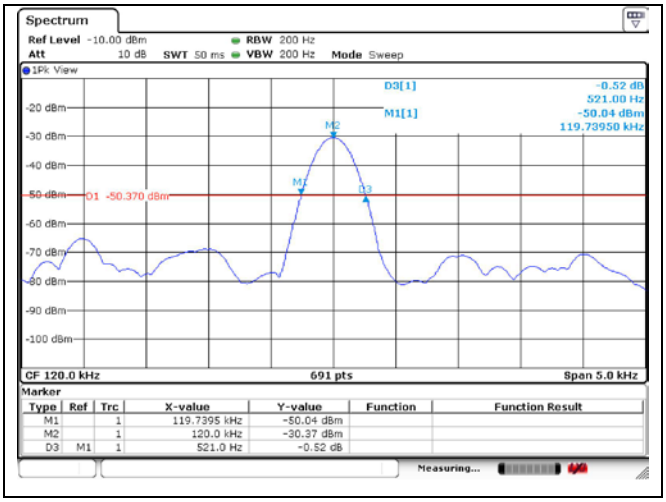
Test Condition: 10 W Operating mode with client device (1 % battery status of client device)

Antenna	Frequency (㎑)	EUT Status	20 ㏈ Bandwidth (㎑)	Limit
1	120	With client device (1 % battery status of client device)	0.514	Reporting proposed only

- Test plots

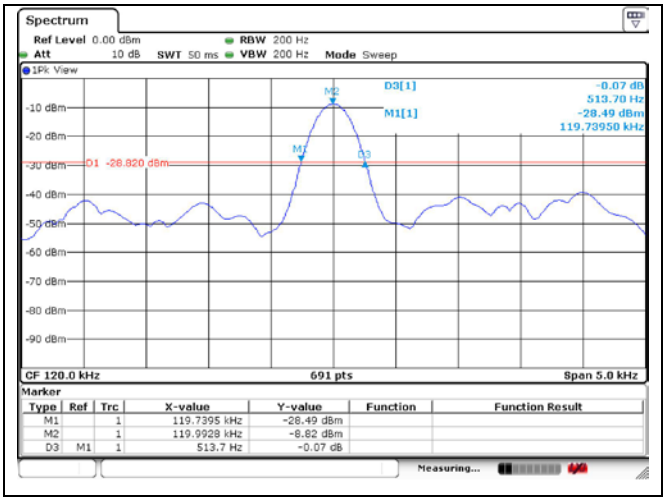
Test Condition: 5 W Operating mode with client device (1 % battery status of client device)

Ant. 1 (120 ㎑)



Test Condition: 10 W Operating mode with client device (1 % battery status of client device)

Ant. 1 (120 ㎑)



- End of the Test Report -