

TEST REPORT

FCC Part 15C

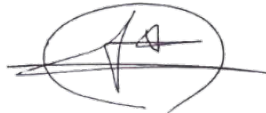

Equipment under test Wireless Power Bank
Model name GB-WL3000
FCC ID 2BA5M-GB-WL3000
Applicant HiggsKorea CO.,LTD
Manufacturer DIGIWAY ELECTRONICS CO., LTD
Date of test(s) 2023.03.22 ~ 2023.04.03
Date of issue 2023.06.26

Issued to**HiggsKorea CO.,LTD**

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Test and report completed by :	Report approval by :
	
Bong-Seok, Kim Test engineer	Young-Jun, Cho Technical manager

This test report is not related to KS Q ISO/IEC 17025 and KOLAS

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Revision history

Revision	Date of issue	Test report No.	Description
-	2023.06.26	KES-RF-23T0089	Initial

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1. General information

Applicant HiggsKorea CO.,LTD
Applicant address 14059 B-308B, 57-2, Heungan-daero 427beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, South Korea
Test site KES Co., Ltd.
Test site address ☐ 3701, 40, Simin-daero 365beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea43
☒ 473-29, Gayeo-ro, Yeoju-si, Gyeonggi-do, Korea
Test Facility FCC Accreditation Designation No.: KR0100, Registration No.: 444148
FCC rule part(s): Part 15C
FCC ID: 2BA5M-GB-WL3000
Test device serial No. ☒ Production ☐ Pre-production ☐ Engineering

1.1. EUT description

Equipment under test Wireless Power Bank
5 W : 0.127 MHz ~ 0.148 MHz
Frequency 7.5 W : 0.128 MHz
10 W : 0.121 MHz ~ 0.138 MHz
Inductive charging technique Magnetic Induction
Model: GB-WL3000
Antenna specification Internal type (Coil antenna)
Power source DC 3.7 V (Battery)
S/W Version DHW2204_WXC_V1.0
H/W version GBHW2304_3000_V2.03

1.2. Test configuration

The **HiggsKorea CO.,LTD / Wireless Power Bank / GB-WL3000 / FCC ID: 2BA5M-GB-WL3000** was tested according to the specification of EUT, the EUT must comply with following standards.

FCC Part 15C
ANSI C63.10-2013
KDB 680106 D01 V03

1.3. Test frequency

		Frequency Range
Power source	DC 3.7 V(Battery)	5 W : 0.127 MHz ~ 0.148 MHz
		7.5 W : 0.128 MHz
		10 W : 0.121 MHz ~ 0.138 MHz

1.4. Test mode

Mode	Charging current	Description
Charging mode With load	90%	Using Max load
	50%	Using Mid load
	10%	Using Min load

1.5. Information about derivative model

N/A

1.6. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
-	-	-	-	-

1.7. Measurement Uncertainty`

Test Item		Uncertainty
Uncertainty for Conduction emission test		2.22 dB (SHIELD ROOM #6)
Uncertainty for Radiation emission test (include Fundamental emission)	Below 1GHz	4.04 dB (SAC #6)
	Above 1GHz	4.42 dB (SAC #5)
Note. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.		

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2. Summary of tests

FCC Part Sections	Parameter	Test results
15.209	Radiated spurious emission	Pass
2.1049	20 dB Bandwidth	Pass
15.207	AC conducted emissions	Pass

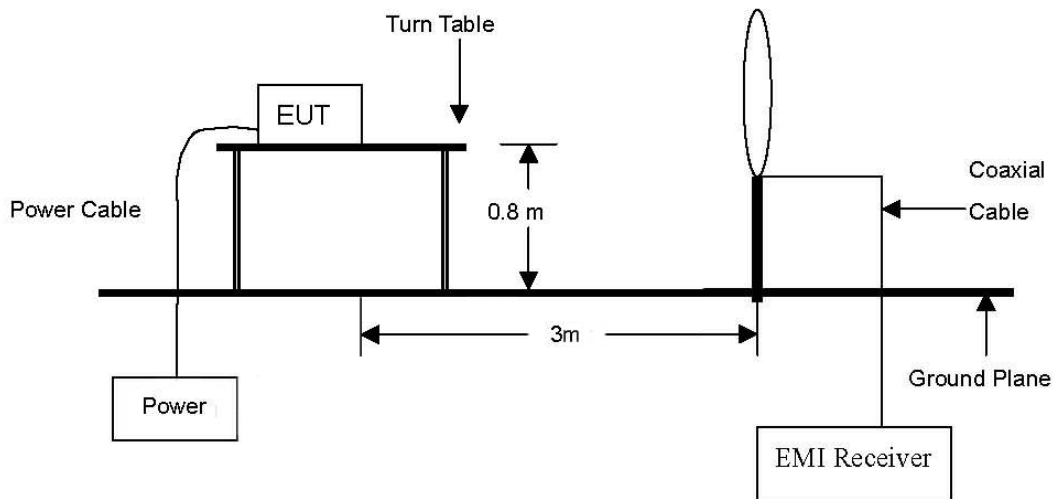
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3. Test results

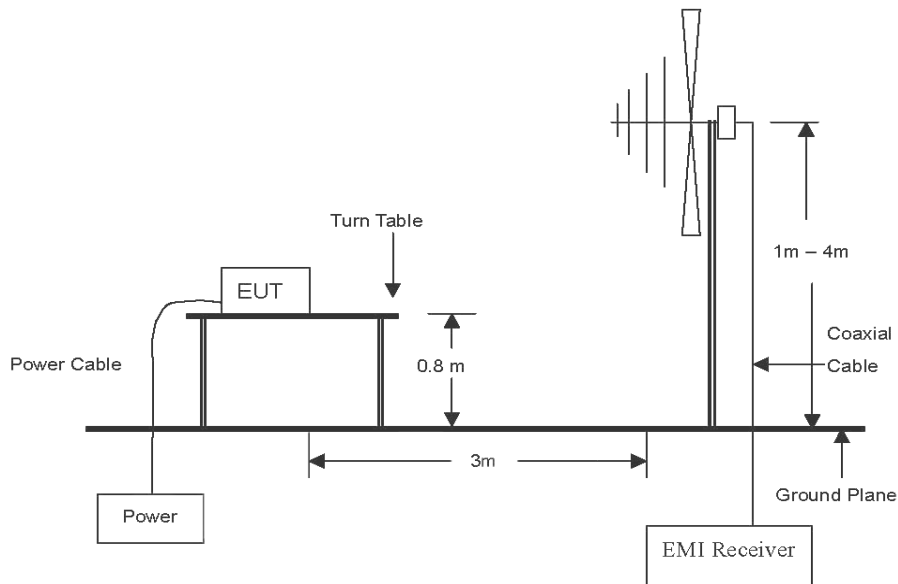
3.1. Radiated spurious emission

Test setup

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



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



Test procedure

[9 kHz to 30 MHz]

The EUT was placed on the top of a rotating table 0.8 meter 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. 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 and ground parallel of the antenna are set to make the measurement. 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. The test-receiver system was set to Quasi-peak function and specified bandwidth with maximum hold mode.

[30 MHz to 1 GHz]

The height of the measuring antenna was varied between 1 to 4 m and the table was rotated a full revolution in order to obtain maximum values of the electric field intensity.

The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

Note:

1. According to exploratory test no any obvious emission were detected from 9 kHz to 30 MHz. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
2. Measurement distance : 3 m.
3. Field strength = Level + Correction factor + F_d
4. $F_d = 40\log(D_m / D_s)$

Where:

F_d = Distance factor in dB

D_m = Measurement distance in meters

D_s = Specification distance in meters

For 300m: $40\log(300/3) = 80$ dB for frequency band 0.009 MHz to 0.490 MHz

For 30m: $40\log(30/3) = 40$ dB for frequency band 0.490 MHz to 30 MHz

5. No significant emissions were found in the 90 - 110kHz restricted band.

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Limit

According to 15.209(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values :

Frequency (MHz)	Distance (Meters)	Radiated ($\mu\text{V/m}$)
0.009 ~ 0.490	300	2400 / F(kHz)
0.490 ~ 1.705	30	24000 / F(kHz)
1.705 ~ 30.0	30	30
30 ~ 88	3	100**
88 ~ 216	3	150**
216 ~ 960	3	200**
Above 960	3	500

**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 MHz, 76 ~ 88 MHz, 174 ~ 216 MHz or 470 ~ 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.



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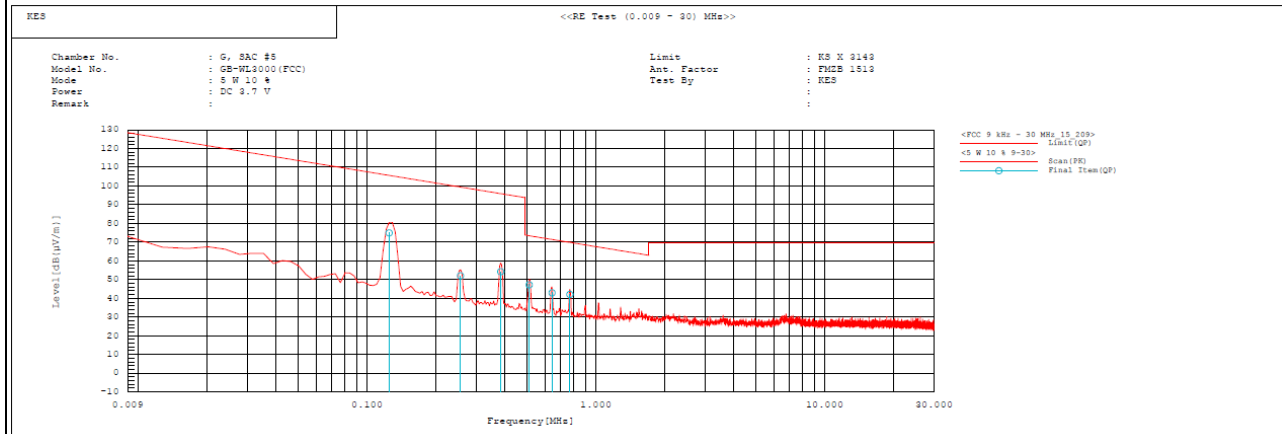
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Test results (Below 30 MHz)

Mode: 5 W // 10 % charger

Distance of measurement: 3 meter

Parallel



Final Result

No.	Frequency	Reading	c.f	Result	Limit	Margin	Angle	Remark
	[MHz]	QP [dB (μV)]	[dB (1/m)]	QP [dB (μV/m)]	QP [dB (μV/m)]	QP [dB]	[deg]	
1	0.125	55.1	19.9	75.0	105.7	30.7	353.7	
2	0.256	32.4	19.7	52.1	99.4	47.3	359.9	
3	0.384	34.4	19.9	54.3	95.9	41.6	353.7	
4	0.511	27.1	20.1	47.2	73.4	26.2	330.6	
5	0.643	22.6	20.4	43.0	71.4	28.4	330.6	
6	0.770	21.5	20.6	42.1	69.9	27.8	359.9	

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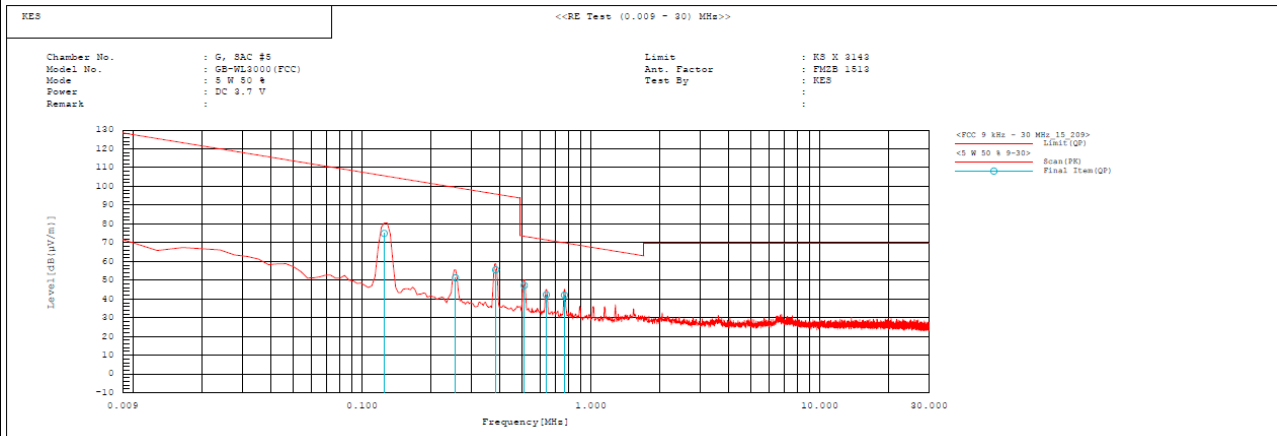
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Mode: 5 W // 50 % charger

Distance of measurement: 3 meter

Parallel



Final Result

No.	Frequency	Reading	c.f	Result	Limit	Margin	Angle	Remark
	[MHz]	QP		QP	QP	QP		
		[dB (μV)]	[dB (1/m)]	[dB (μV/m)]	[dB (μV/m)]	[dB]	[deg]	
1	0.125	55.1	19.9	75.0	105.7	30.7	7.2	
2	0.256	31.6	19.7	51.3	99.4	48.1	30.2	
3	0.384	35.6	19.9	55.5	95.9	40.4	7.2	
4	0.511	27.1	20.1	47.2	73.4	26.2	7.2	
5	0.639	21.9	20.4	42.3	71.5	29.2	0.0	
6	0.766	21.5	20.6	42.1	69.9	27.8	0.2	

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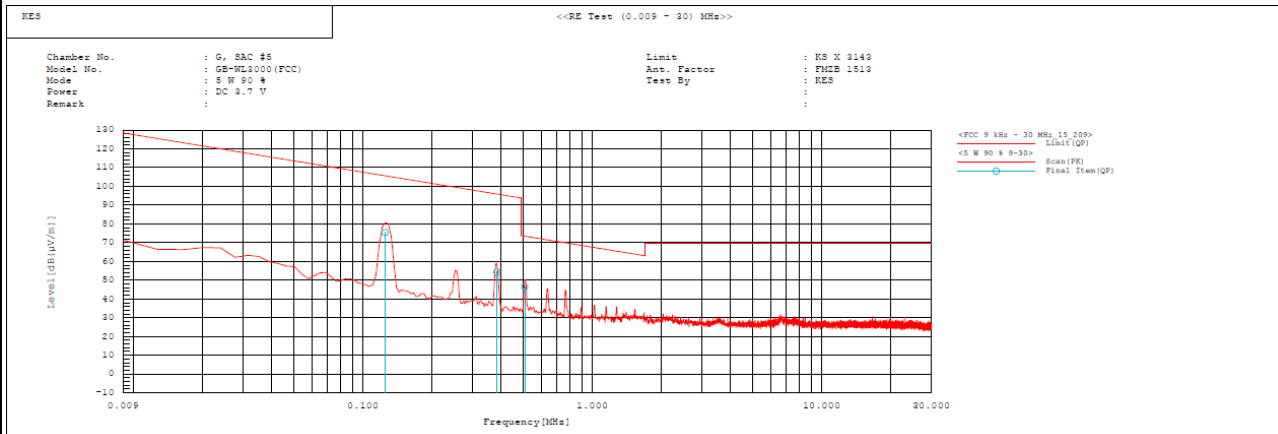
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Mode: 5 W // 90 % charge

Distance of measurement: 3 meter

Parallel



Final Result

No.	Frequency	Reading	c.f	Result	Limit	Margin	Angle	Remark
	[MHz]	QP [dB (μV)]	[dB (1/m)]	QP [dB (μV/m)]	QP [dB (μV/m)]	QP [dB]	[deg]	
1	0.125	55.6	19.9	75.5	105.7	30.2	0.0	
2	0.384	34.5	19.9	54.4	95.9	41.5	0.0	
3	0.508	26.4	20.1	46.5	73.5	27.0	0.0	

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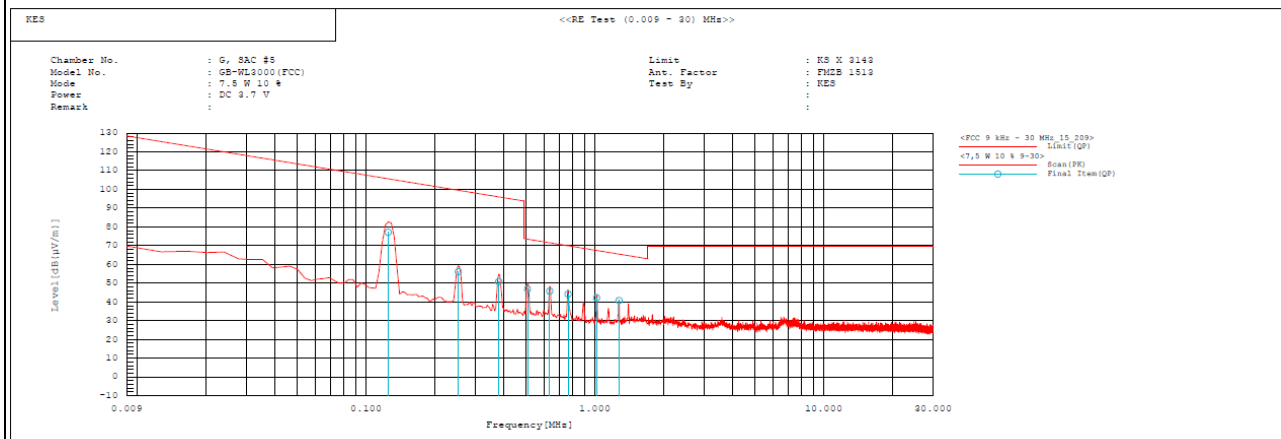
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Mode: 7.5 W // 10 % charger

Distance of measurement: 3 meter

Parallel



Final Result

No.	Frequency	Reading	c.f	Result	Limit	Margin	Angle	Remark
	[MHz]	[dB(μV)]	[dB (1/m)]	[dB (μV/m)]	[dB (μV/m)]	[dB]	[deg]	
1	0.125	57.2	19.9	77.1	105.7	28.6	0.0	
2	0.253	36.4	19.7	56.1	99.5	43.4	310.0	
3	0.380	31.0	19.9	50.9	96.0	45.1	332.5	
4	0.508	26.8	20.1	46.9	73.5	26.6	0.0	
5	0.635	25.4	20.4	45.8	71.6	25.8	0.0	
6	0.763	23.6	20.6	44.2	70.0	25.8	0.0	
7	1.017	21.4	20.9	42.3	67.5	25.2	332.5	
8	1.276	19.9	20.9	40.8	65.5	24.7	0.0	

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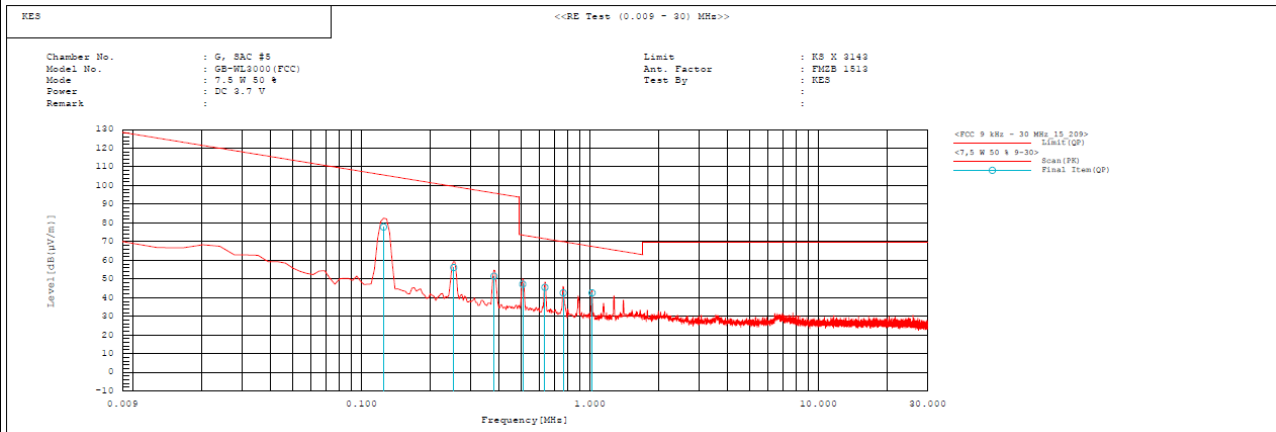
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Mode: 7.5 W // 50 % charger

Distance of measurement: 3 meter

Parallel



Final Result

No.	Frequency [MHz]	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Angle [deg]	Remark
1	0.125	57.9	19.9	77.8	105.7	27.9	0.1	
2	0.253	36.4	19.7	56.1	99.5	43.4	0.1	
3	0.380	31.6	19.9	51.5	96.0	44.5	0.1	
4	0.508	27.1	20.1	47.2	73.5	26.3	26.3	
5	0.635	25.1	20.4	45.5	71.6	26.1	201.7	
6	0.763	22.0	20.6	42.6	70.0	27.4	4.6	
7	1.021	21.7	20.9	42.6	67.4	24.8	0.1	

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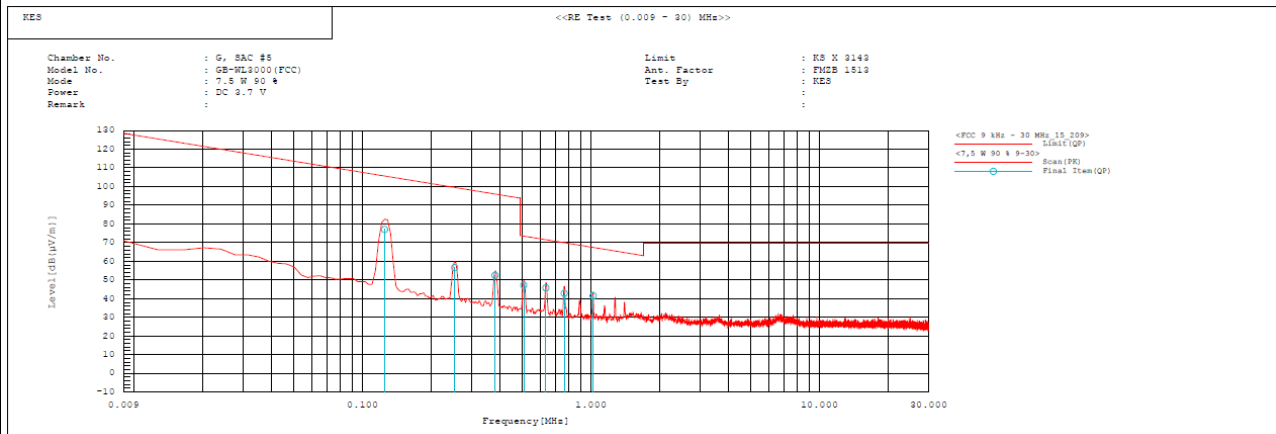
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Mode: 7.5 W // 90 % charge

Distance of measurement: 3 meter

Parallel



Final Result

No.	Frequency	Reading	c.f	Result	Limit	Margin	Angle	Remark
	[MHz]	QP [dB(μV)]	[dB(1/m)]	QP [dB(μV/m)]	QP [dB(μV/m)]	QP [dB]	[deg]	
1	0.125	57.1	19.9	77.0	105.7	28.7	333.1	
2	0.253	36.9	19.7	56.6	99.5	42.9	312.7	
3	0.380	32.6	19.9	52.5	96.0	43.5	359.9	
4	0.508	27.1	20.1	47.2	73.5	26.3	359.9	
5	0.635	25.4	20.4	45.8	71.6	25.8	359.9	
6	0.763	22.3	20.6	42.9	70.0	27.1	353.9	
7	1.021	20.7	20.9	41.6	67.4	25.8	359.9	

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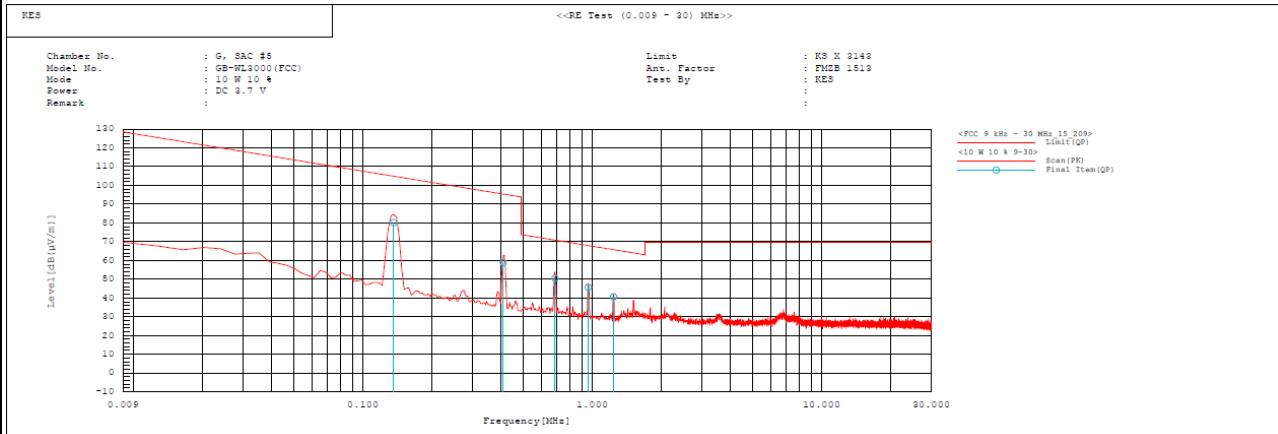
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Mode: 10 W // 10 % charger

Distance of measurement: 3 meter

Parallel



Final Result

No.	Frequency	Reading	c.f	Result	Limit	Margin	Angle	Remark
	[MHz]	[dB(μV)]	[dB (1/m)]	[dB (μV/m)]	[dB (μV/m)]	[dB]	[deg]	
1	0.136	60.3	19.9	80.2	104.9	24.7	0.1	
2	0.410	38.9	20.0	58.9	95.3	36.4	0.1	
3	0.688	30.1	20.5	50.6	70.9	20.3	5.4	
4	0.961	24.8	20.9	45.7	68.0	22.3	0.1	
5	1.239	19.8	20.9	40.7	65.8	25.1	25.5	

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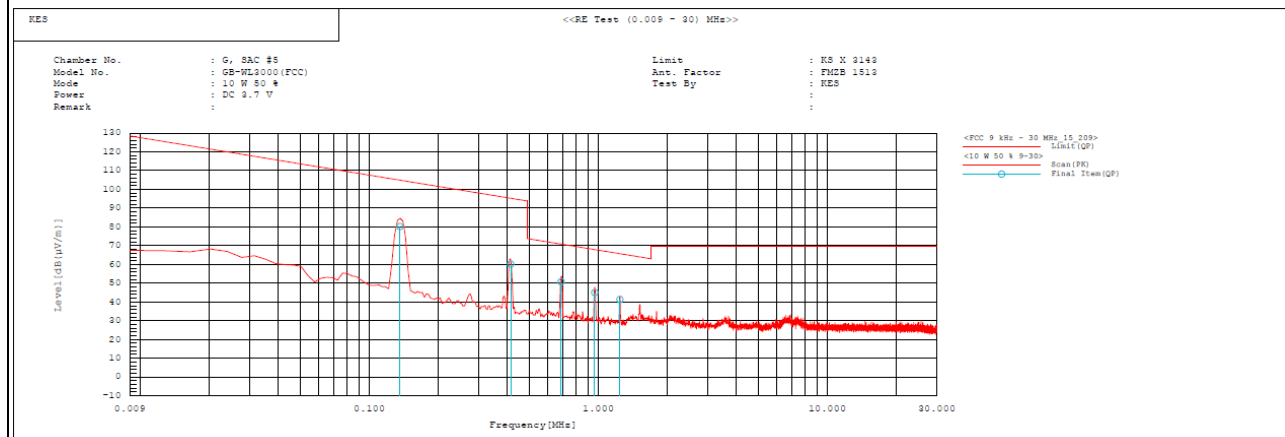
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Mode: 10 W // 50 % charger

Distance of measurement: 3 meter

Parallel



Final Result

No.	Frequency	Reading	c.f	Result	Limit	Margin	Angle	Remark
	[MHz]	[dB (μV)]	[dB (1/m)]	[dB (μV/m)]	[dB (μV/m)]	[dB]	[deg]	
1	0.136	60.3	19.9	80.2	104.9	24.7	0.0	
2	0.414	40.2	20.0	60.2	95.3	35.1	0.0	
3	0.688	30.3	20.5	50.8	70.9	20.1	0.0	
4	0.965	24.1	20.9	45.0	67.9	22.9	0.0	
5	1.242	20.5	20.9	41.4	65.7	24.3	0.0	

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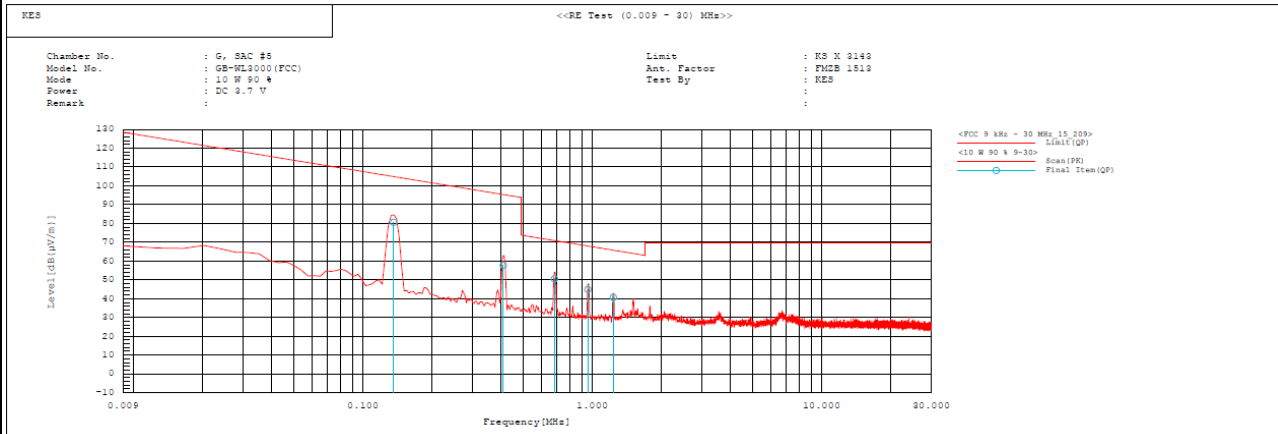
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Mode: 10 W // 90 % charge

Distance of measurement: 3 meter

Parallel



Final Result

No.	Frequency	Reading	c.f	Result	Limit	Margin	Angle	Remark
	[MHz]	[dB (μV)]	[dB (1/m)]	QP	QP	QP	[deg]	
1	0.136	60.7	19.9	80.6	104.9	24.3	0.0	
2	0.410	37.8	20.0	57.8	95.3	37.5	8.0	
3	0.684	30.1	20.5	50.6	70.9	20.3	28.3	
4	0.957	24.0	20.9	44.9	68.0	23.1	336.6	
5	1.235	19.9	20.9	40.8	65.8	25.0	8.0	

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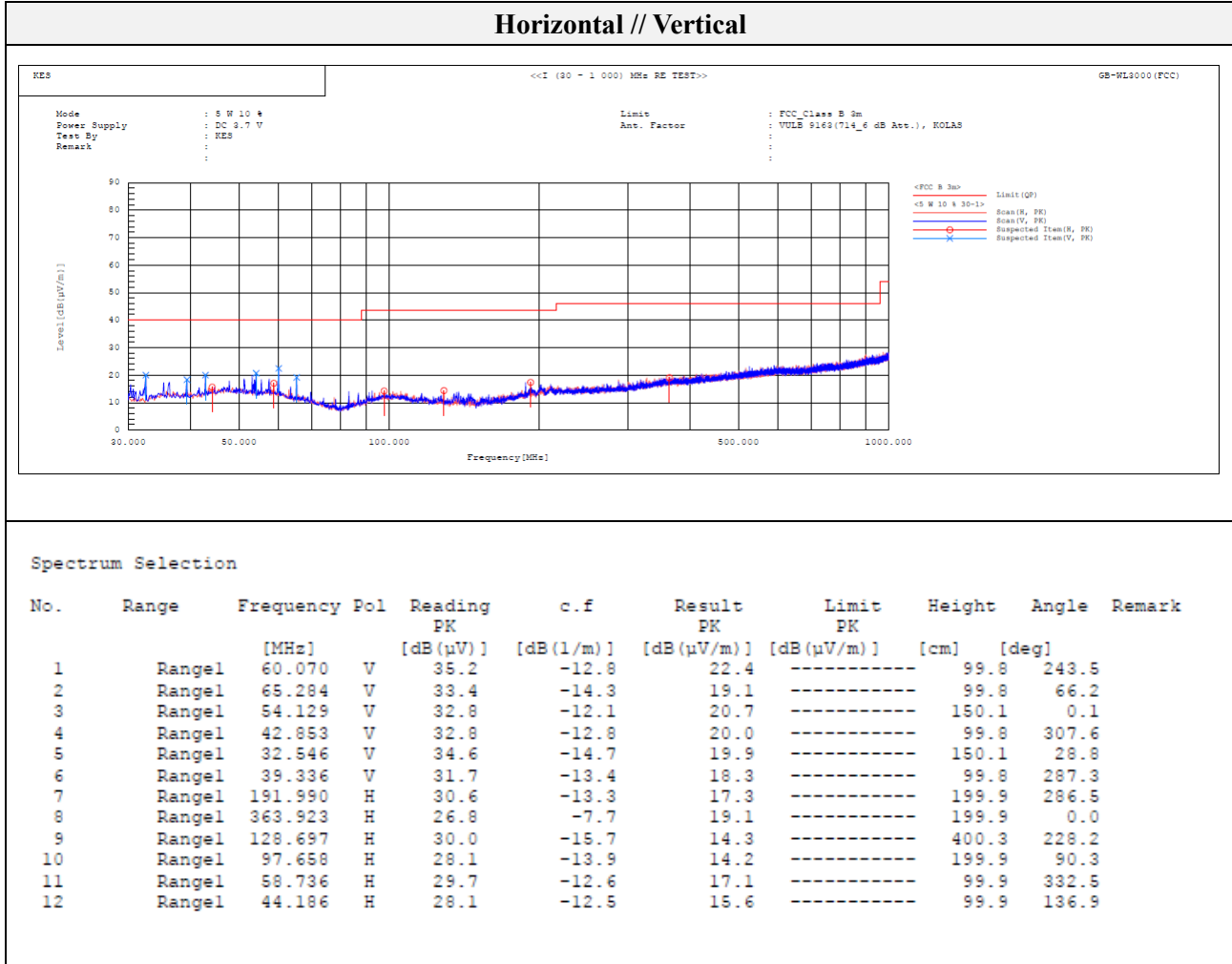
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Test results (Below 1 000 MHz)

Mode: 5 W // 10 % charge

Distance of measurement: 3 meter

Horizontal // Vertical



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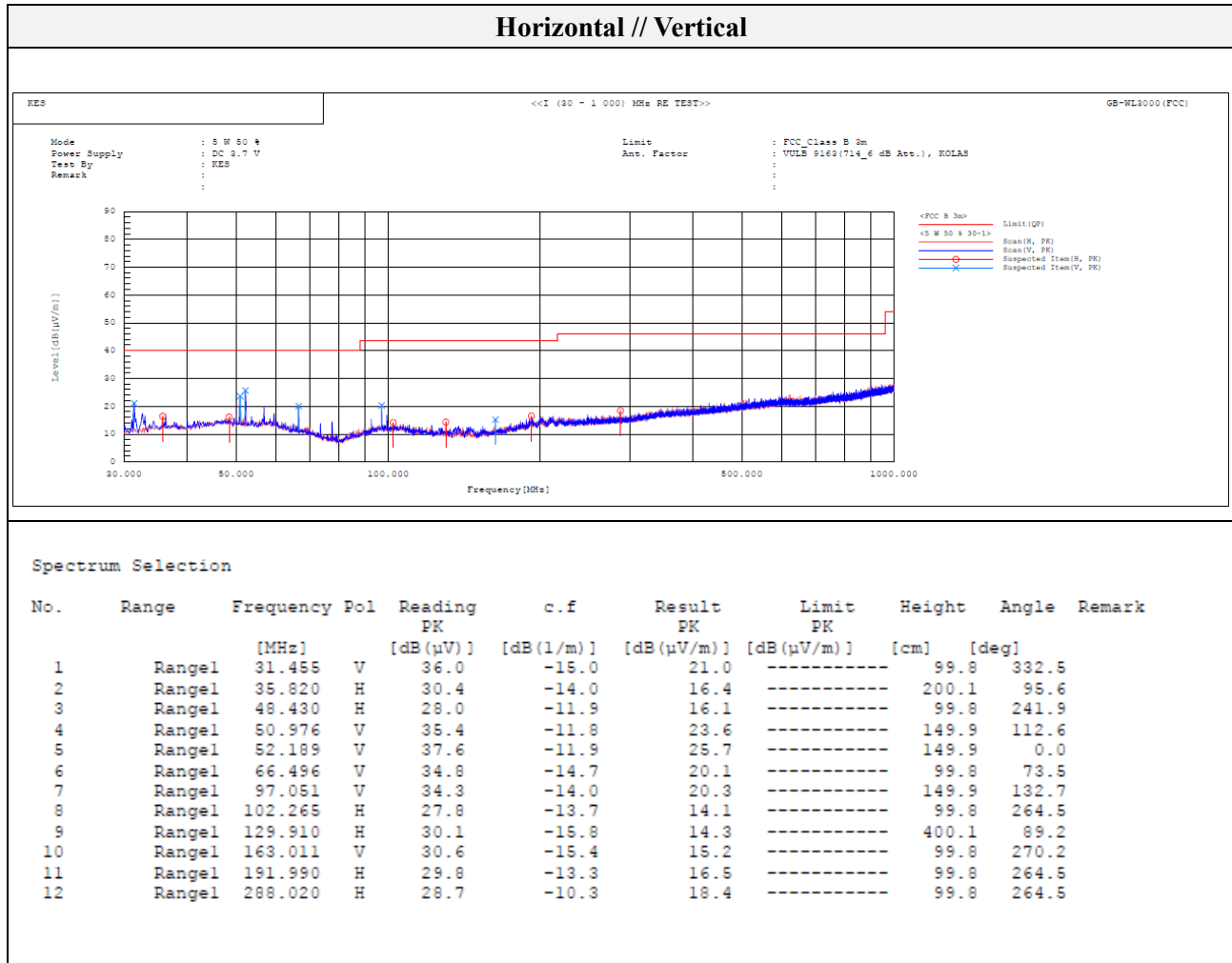
3701, 40, Simin-daero 365beon-gil,
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Report No.:
KES-RF-23T0089
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Mode: 5 W // 50 % charge

Distance of measurement: 3 meter

Horizontal // Vertical



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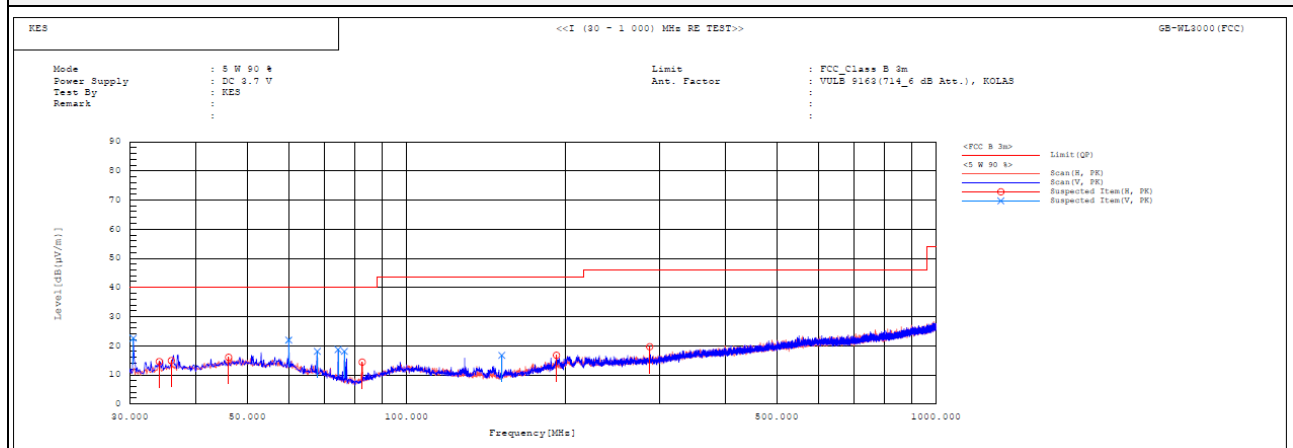
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Mode: 5 W // 90 % charge

Distance of measurement: 3 meter

Horizontal // Vertical



Spectrum Selection

No.	Range	Frequency	Pol	Reading	c.f	Result	Limit	Height	Angle	Remark
		[MHz]		[dB (μV)]	[dB (l/m)]	[dB (μV/m)]	[dB (μV/m)]	[cm]	[deg]	
1	Range1	30.485	V	37.8	-15.2	22.6	-----	99.8	246.2	
2	Range1	34.123	H	28.9	-14.4	14.5	-----	400.2	270.2	
3	Range1	35.941	H	28.8	-14.0	14.8	-----	99.8	206.0	
4	Range1	46.126	H	28.2	-12.2	16.0	-----	99.8	160.9	
5	Range1	59.949	V	34.8	-12.8	22.0	-----	150.1	226.9	
6	Range1	67.830	V	33.2	-15.1	18.1	-----	150.1	0.0	
7	Range1	74.256	V	35.5	-16.9	18.6	-----	150.1	11.5	
8	Range1	76.318	V	35.6	-17.5	18.1	-----	99.8	67.6	
9	Range1	82.501	H	32.1	-17.7	14.4	-----	199.8	349.5	
10	Range1	151.371	V	33.0	-16.4	16.6	-----	99.8	200.2	
11	Range1	191.990	H	30.0	-13.3	16.7	-----	99.8	160.9	
12	Range1	288.020	H	29.9	-10.3	19.6	-----	99.8	119.0	

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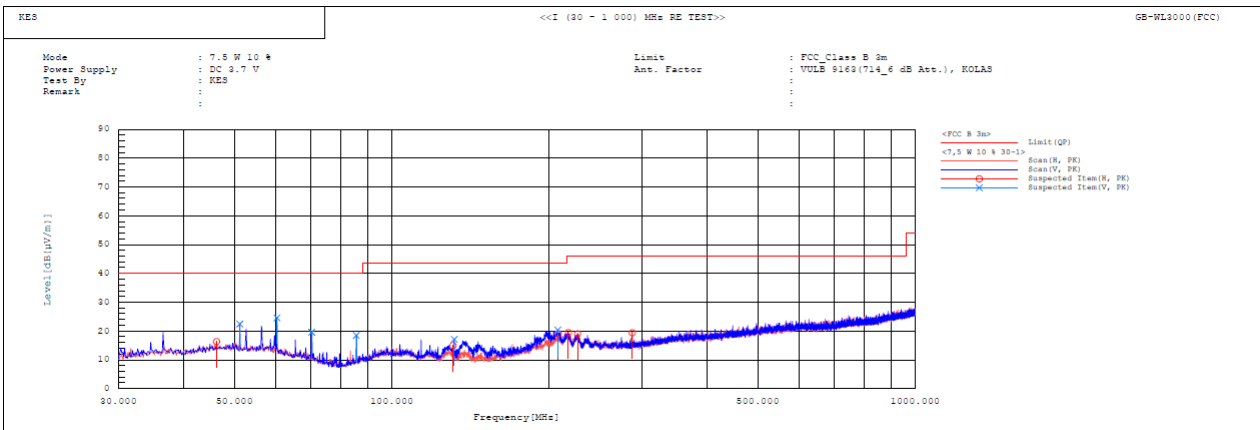
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Mode: 7.5 W // 10 % charge

Distance of measurement: 3 meter

Horizontal // Vertical



Spectrum Selection

No.	Range	Frequency [MHz]	Pol	Reading PK [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Limit PK [dB(μV/m)]	Height [cm]	Angle [deg]	Remark
1	Range1	46.248	H	28.5	-12.2	16.3	-----	99.9	133.7	
2	Range1	51.219	V	34.2	-11.8	22.4	-----	99.8	337.2	
3	Range1	60.313	V	37.5	-12.9	24.6	-----	99.8	181.1	
4	Range1	70.255	V	35.3	-15.7	19.6	-----	149.8	222.7	
5	Range1	85.833	V	35.1	-16.7	18.4	-----	99.8	271.3	
6	Range1	130.880	H	30.7	-15.8	14.9	-----	200.2	139.9	
7	Range1	131.608	V	33.0	-15.9	17.1	-----	149.8	109.2	
8	Range1	207.510	V	32.9	-12.5	20.4	-----	99.8	271.3	
9	Range1	208.116	H	31.6	-12.5	19.1	-----	400.3	177.7	
10	Range1	217.574	H	31.6	-12.1	19.5	-----	400.3	154.6	
11	Range1	226.425	H	30.8	-11.8	19.0	-----	400.3	359.9	
12	Range1	288.020	H	29.7	-10.3	19.4	-----	99.9	245.3	

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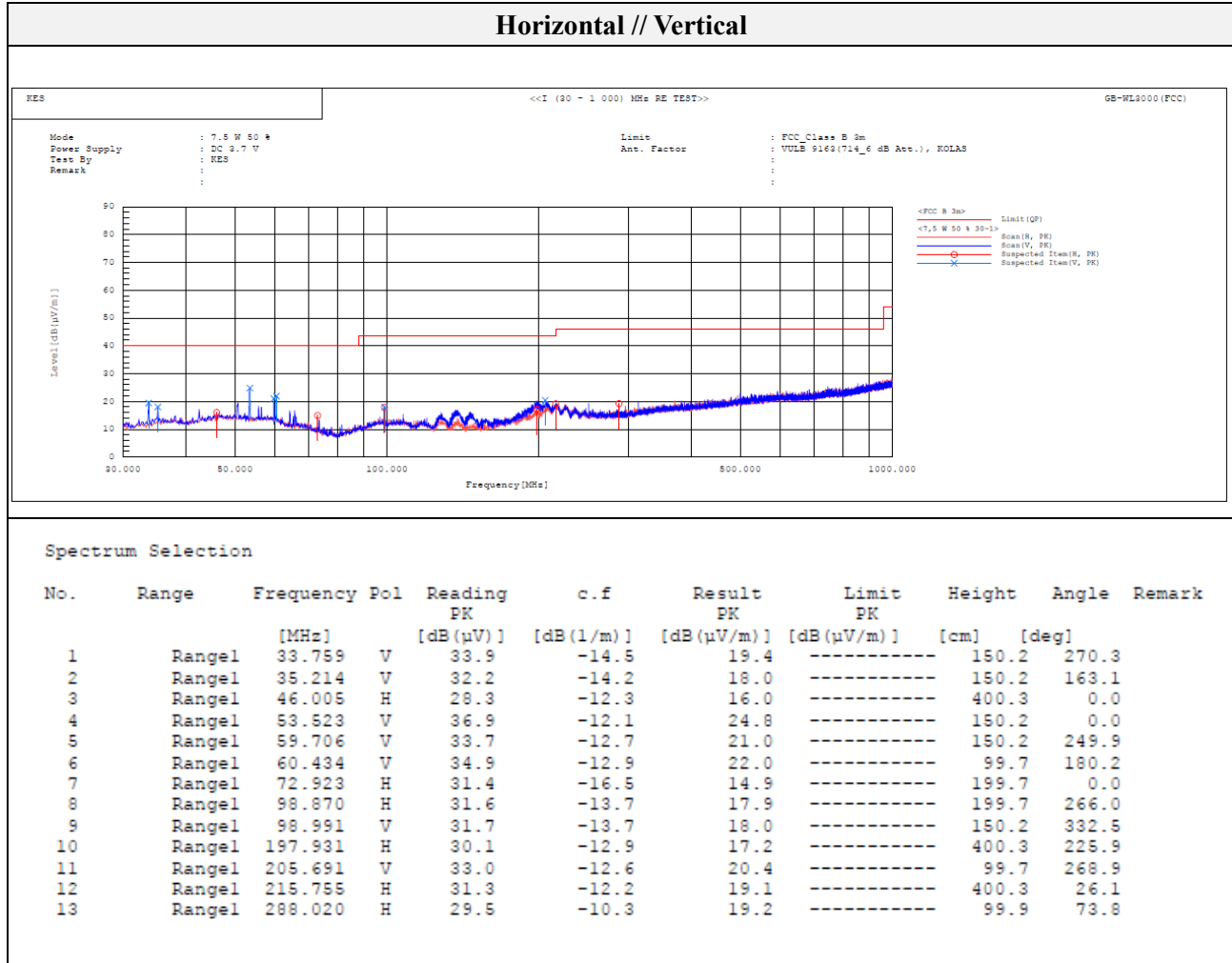
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Mode: 7.5 W // 50 % charge

Distance of measurement: 3 meter

Horizontal // Vertical



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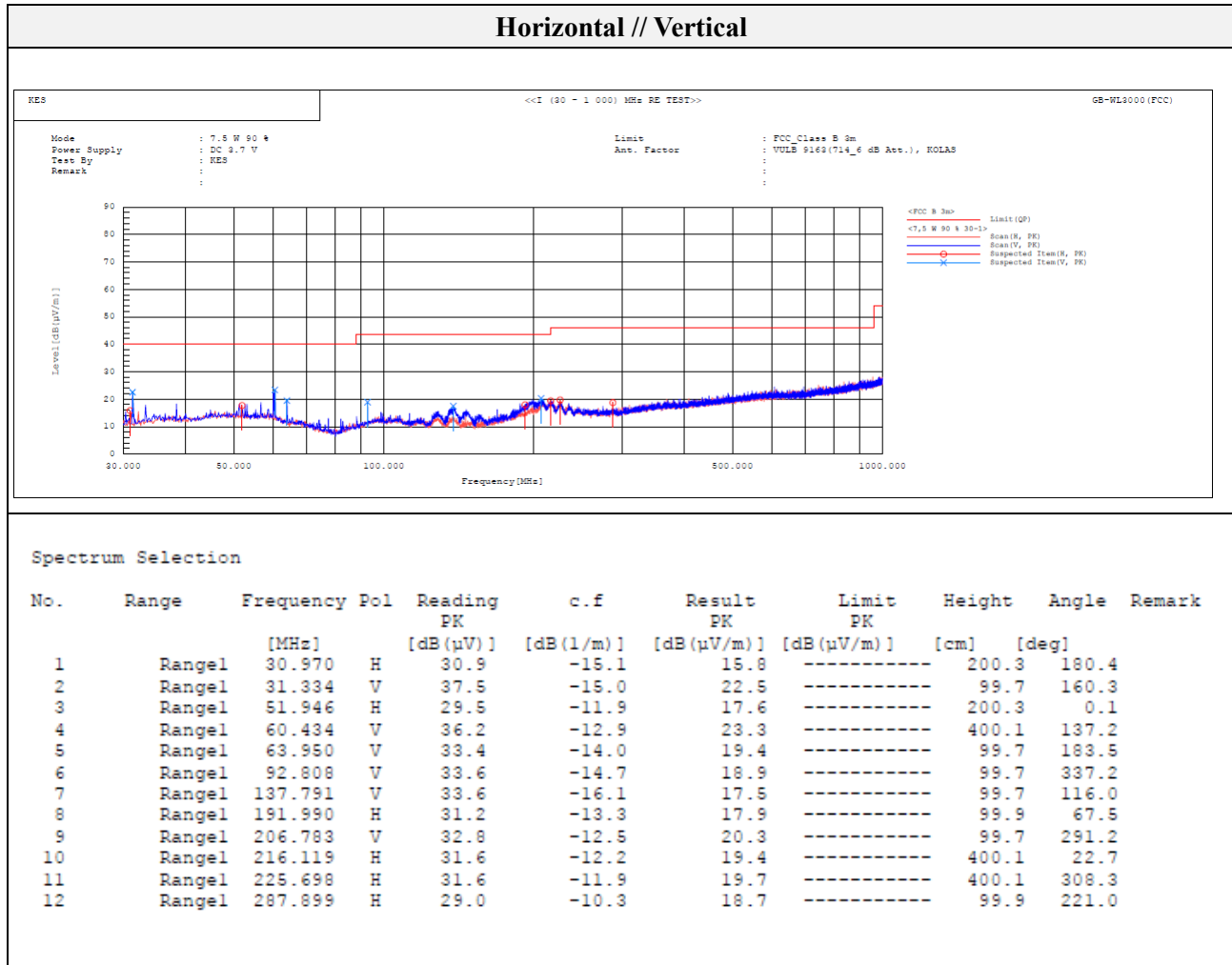
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Mode: 7.5 W // 90 % charge

Distance of measurement: 3 meter

Horizontal // Vertical



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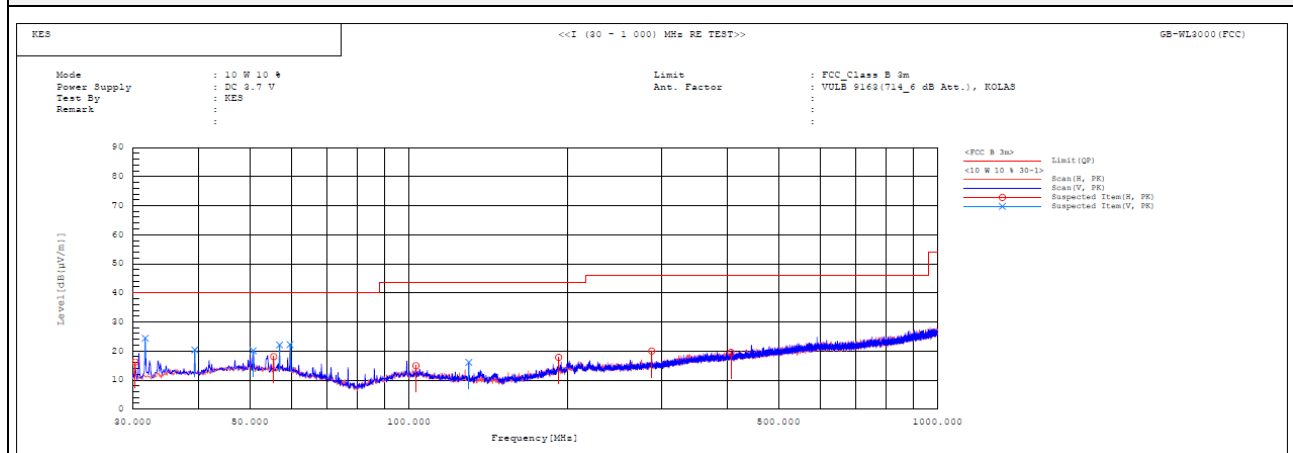
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Mode: 10 W // 10 % charge

Distance of measurement: 3 meter

Horizontal // Vertical



Spectrum Selection

No.	Range	Frequency	Pol	Reading	c.f	Result	Limit	Height	Angle	Remark
		[MHz]		[dB(μV)]	[dB(1/m)]	[dB(μV/m)]	[dB(μV/m)]	[cm]	[deg]	
1	Range1	30.364	H	31.4	-15.2	16.2	-----	400.2	73.8	
2	Range1	31.698	V	39.3	-14.9	24.4	-----	99.8	244.8	
3	Range1	39.336	V	33.7	-13.4	20.3	-----	99.8	22.9	
4	Range1	50.734	V	31.9	-11.8	20.1	-----	150.3	0.0	
5	Range1	55.463	H	30.4	-12.3	18.1	-----	400.2	314.6	
6	Range1	56.918	V	34.5	-12.4	22.1	-----	99.8	222.5	
7	Range1	59.585	V	34.9	-12.7	22.2	-----	150.3	332.3	
8	Range1	103.114	H	28.7	-13.8	14.9	-----	199.9	359.9	
9	Range1	129.789	V	31.9	-15.8	16.1	-----	99.8	333.9	
10	Range1	191.990	H	31.1	-13.3	17.8	-----	199.9	69.1	
11	Range1	288.020	H	30.3	-10.3	20.0	-----	99.8	137.0	
12	Range1	406.481	H	26.6	-7.1	19.5	-----	400.2	229.1	

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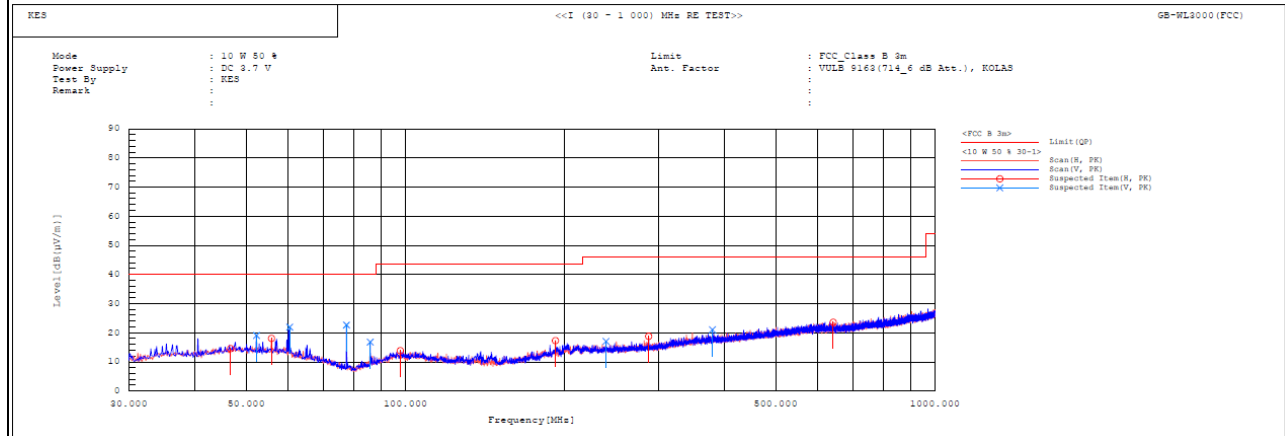
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Mode: 10 W // 50 % charge

Distance of measurement: 3 meter

Horizontal // Vertical



Spectrum Selection

No.	Range	Frequency [MHz]	Pol	Reading PK [dB(μV)]	c.f [dB(l/m)]	Result PK [dB(μV/m)]	Limit PK [dB(μV/m)]	Height [cm]	Angle [deg]	Remark
1	Range1	46.733	H	26.7	-12.1	14.6	-----	99.7	221.3	
2	Range1	52.310	V	31.0	-11.9	19.1	-----	99.8	225.2	
3	Range1	55.826	H	30.4	-12.3	18.1	-----	400.3	114.6	
4	Range1	60.434	V	34.8	-12.9	21.9	-----	99.8	225.2	
5	Range1	77.409	V	40.5	-17.8	22.7	-----	99.8	292.3	
6	Range1	85.775	V	33.4	-16.6	16.8	-----	99.8	182.7	
7	Range1	97.779	H	27.8	-13.9	13.9	-----	400.3	70.1	
8	Range1	191.990	H	30.6	-13.3	17.3	-----	99.7	89.1	
9	Range1	239.278	V	28.5	-11.4	17.1	-----	400.3	48.9	
10	Range1	288.020	H	29.1	-10.3	18.8	-----	99.7	67.4	
11	Range1	379.806	V	28.5	-7.5	21.0	-----	99.8	332.4	
12	Range1	642.555	H	27.3	-3.7	23.6	-----	400.3	355.2	

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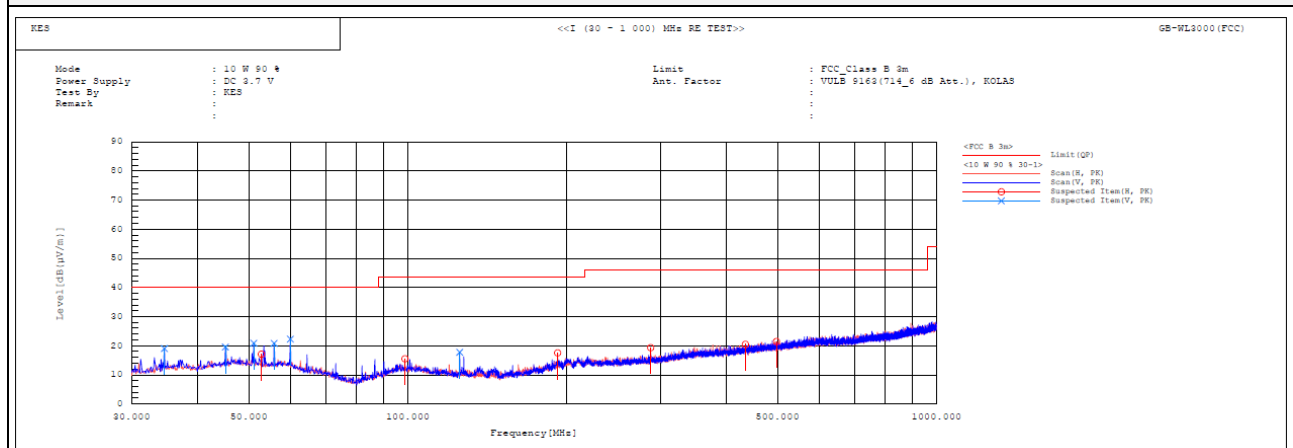
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Mode: 10 W // 90 % charge

Distance of measurement: 3 meter

Horizontal // Vertical



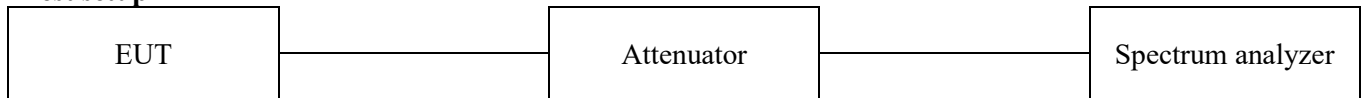
Spectrum Selection

No.	Range	Frequency [MHz]	Pol	Reading PK [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Limit PK [dB(μV/m)]	Height [cm]	Angle [deg]	Remark
1	Range1	34.608	V	33.3	-14.3	19.0	-----	150.3	269.9	
2	Range1	45.156	V	31.9	-12.4	19.5	-----	99.8	156.8	
3	Range1	51.098	V	32.7	-11.8	20.9	-----	150.3	74.4	
4	Range1	52.795	H	29.1	-12.0	17.1	-----	99.7	313.7	
5	Range1	55.826	V	33.1	-12.3	20.8	-----	400.1	201.2	
6	Range1	59.949	V	35.0	-12.8	22.2	-----	99.8	0.0	
7	Range1	98.749	H	29.2	-13.7	15.5	-----	199.9	223.4	
8	Range1	125.303	V	33.3	-15.6	17.7	-----	99.8	288.1	
9	Range1	191.990	H	30.9	-13.3	17.6	-----	99.7	49.5	
10	Range1	288.020	H	29.6	-10.3	19.3	-----	99.7	269.4	
11	Range1	435.218	H	27.0	-6.5	20.5	-----	99.7	139.1	
12	Range1	498.025	H	26.8	-5.4	21.4	-----	400.1	27.5	

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3.2. 20 dB Bandwidth

Test setup



Test procedures

The transmitter output is connected to a spectrum analyzer. The RBW is set to $\geq 1\%$ of the emission bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

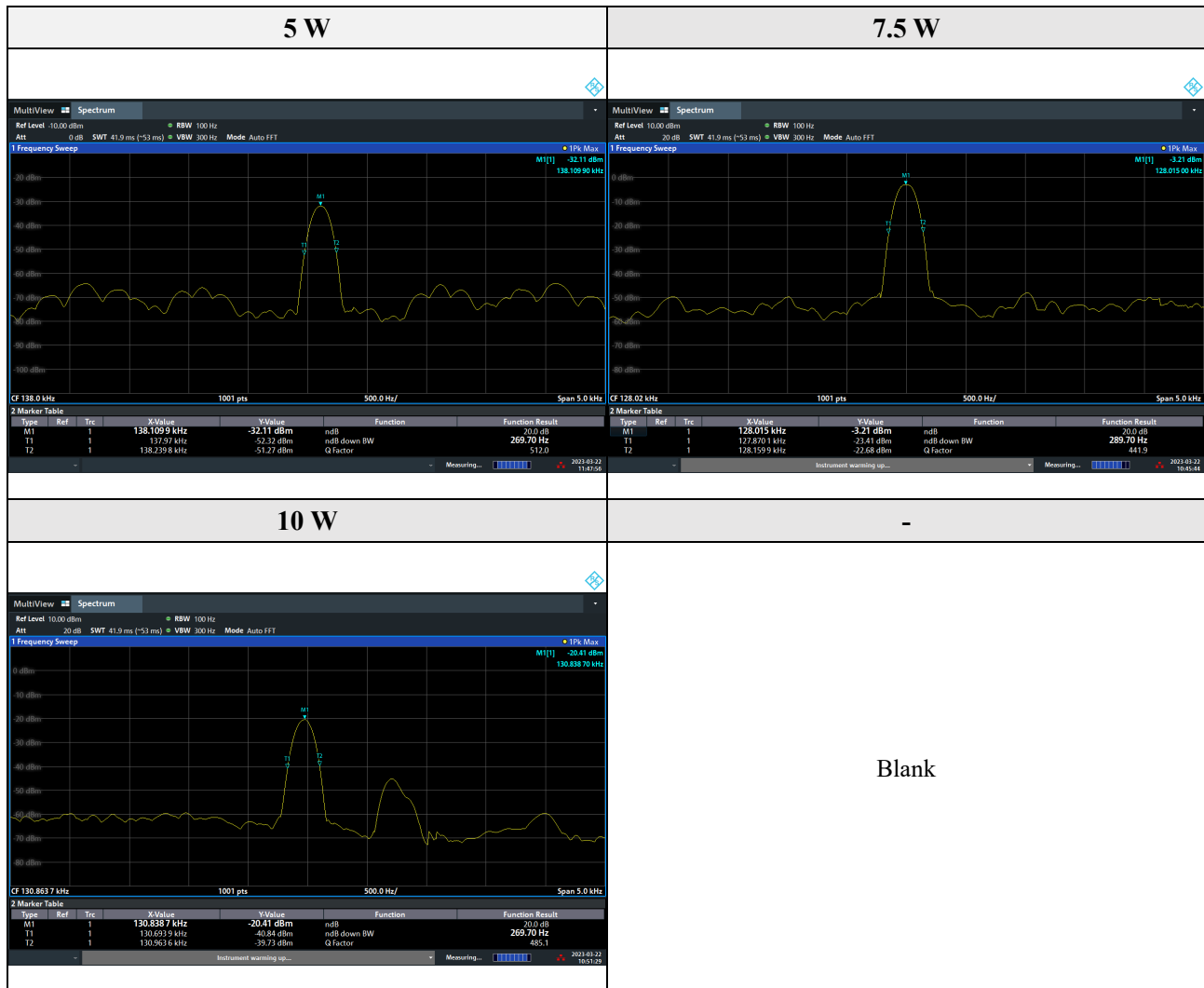
Limit

None; for reporting purposes only.



Test results

Test Mode	Frequency(MHz)	Measured bandwidth(kHz)
5 W	0.138	0.270
7.5 W	0.128	0.290
10 W	0.131	0.270



Note.

Because the measured signal is CW/CW-like, adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.

3.3. AC conducted emissions

Limit

According to 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall be on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50



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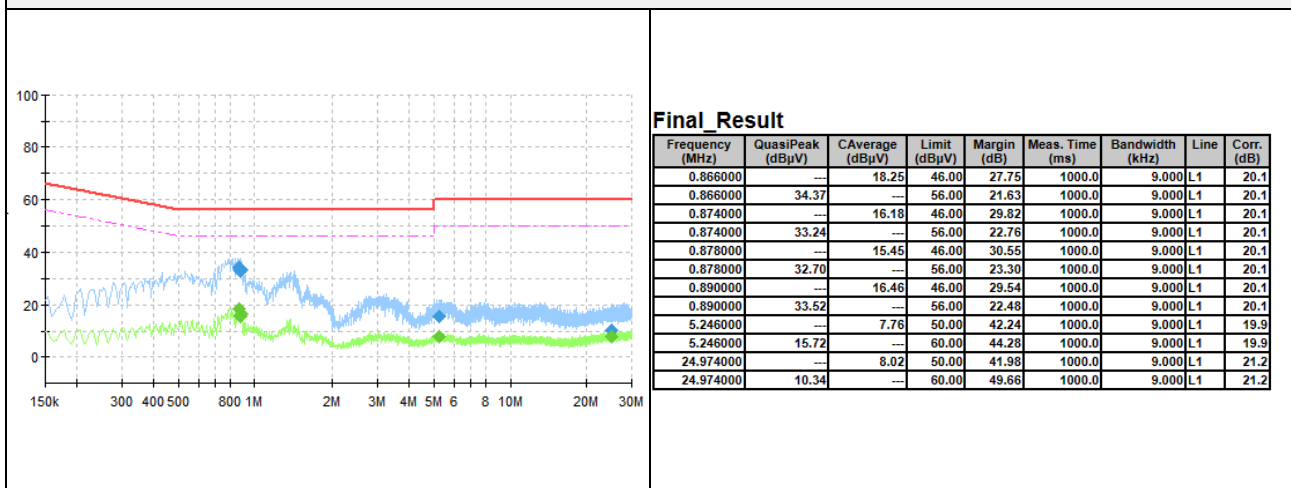
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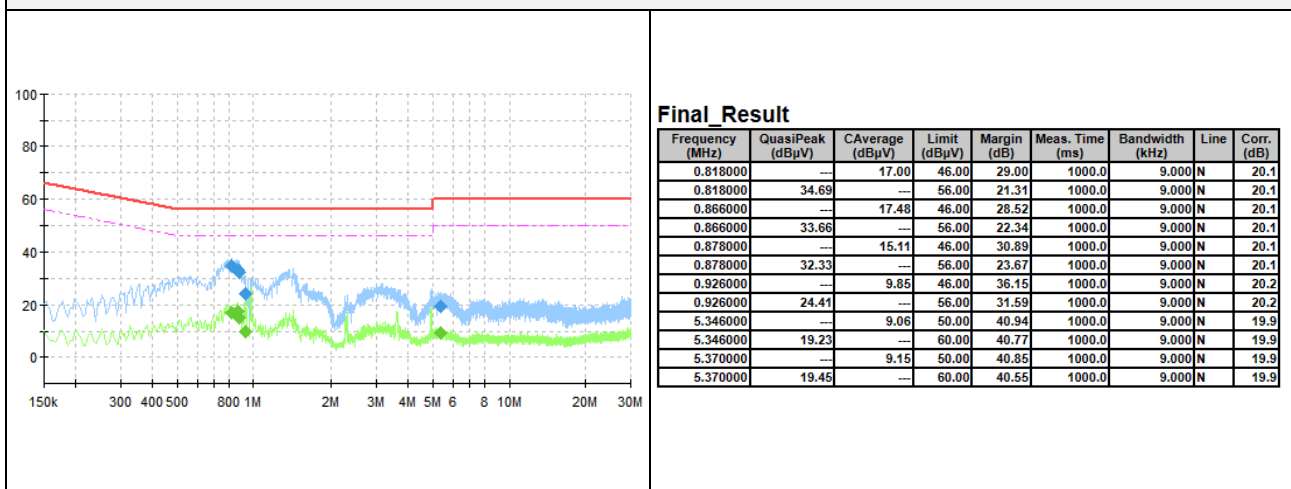
Test results

Mode: 10 W // 90 % charge
(Worst Case)

Hot Line



Neutral Line



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Appendix A. Measurement equipment

Equipment	Manufacturer	Model	Serial No.	Calibration interval	Calibration due.
Spectrum Analyzer	R&S	FSV3044	101272	1 year	2024.03.16
SIGNAL GENERATOR	KEYSIGHT	N5182B	MY59100115	1 year	2023.04.27 2024.04.19
Loop Antenna	Schwarzbeck	FMZB1513	225	2 years	2025.01.16
TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	714	2 years	2024.04.19
Attenuator	HUBER+SUHNER	6806.17.A	-	1 year	2024.03.21
Amplifier	SONOMA INSTRUMENT	310N	186549	1 year	2024.03.21
EMI Test Receiver	R&S	ESU26	100517	1 year	2023.08.01
AC POWER SOURCE/ ANALYZER	HP	6813A	3729A00754	1 year	2024.01.12
LISN	ENV216	R & S	101787	1 year	2023.11.10
EMI TEST RECEIVER	ESR3	R & S	101783	1 year	2023.11.11
PULSE LIMITER	ESH3-Z2	R & S	101915	1 year	2023.11.10

Peripheral device

Device	Manufacturer	Model No.	S/N	Note
Test Jig	-	-	-	-

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