

TEST REPORT

OF

FCC Part 15 Subpart C §15.209

FCC ID: A3LEPPA510

Equipment Under Test : WIRELESS CHARGER
Model Name : EP-PA510
Applicant : Samsung Electronics Co., Ltd.
Manufacturer : Samsung Electronics Co., Ltd.
Date of Test(s) : 2015.08.28 ~ 2015.09.10
Date of Issue : 2015.09.14

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Jaeha Chung

Date:

2015.09.14

Approved By:



Hyunchoe You

Date:

2015.09.14

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1. General Information

1.1. Testing laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 435-837

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

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1.2. Details of applicant

Applicant : Samsung Electronics Co., Ltd.

Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677 Republic of Korea

Contact Person : Kim, Kyung-Won

Phone No. : +82 31 301 0274

1.3. Description of EUT

Kind of Product	WIRELESS CHARGER
Model Name	EP-PA510
Power Supply	DC 5.0 V
Frequency Range	120 kHz ~ 190 kHz
Operating Conditions	-20 °C ~ 60 °C
Antenna Type	Inductive loop coil antenna
H/W Version	REV0.1
S/W Version	0913

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1.4. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal Date	Cal Interval	Cal Due.
Spectrum Analyzer	R&S	FSV30	100768	Mar. 24, 2015	Annual	Mar. 24, 2016
Signal Generator	Agilent	8648D	3847M00534	Mar. 23, 2015	Annual	Mar. 23, 2016
DC Power Supply	Agilent	U8002A	MY48490027	Dec. 22, 2014	Annual	Dec. 22, 2015
Test Receiver	R&S	ESU26	100109	Mar. 03, 2015	Annual	Mar. 03, 2016
Test Receiver	R&S	ESCI 7	100911	Dec. 24, 2014	Annual	Dec. 24, 2015
Loop Antenna	R&S	FMZB 1519	1519-039	Aug. 19, 2015	Biennial	Aug. 19, 2017
Two-Line V-Network	R&S	ENV216	100190	Dec. 25, 2014	Annual	Dec. 25, 2015
Antenna Master	INN-CO	MM4000	N/A	N.C.R.	N/A	N.C.R.
Turn Table	INN-CO	DS 1200 S	N/A	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.
Shield Room	SY Corporation	L × W × H (6.5 m × 3.5 m × 3.5 m)	N/A	N.C.R.	N/A	N.C.R.

1.5. Sample calculation

Where relevant, the following sample calculation is provided:

Field strength level (dB μ V/m) = Measured level (dB μ V) + Antenna factor (dB) + Cable loss (dB) – amplifier gain (dB)

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1.6. Worst case of test configurations

In order to check all kinds of possible configurations, EUT was evaluated with appropriate client and under each charging condition as below table.

EUT configuration	Description
Charging Mode with client device (Galaxy S 6 : SM-G920A FCC ID : A3LSMG920A)	Less than 1 % of battery
	Less than 50 % of battery
	100 % full charging of battery

1.7. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15 Subpart C §15.209		
Section in FCC Part 15 Subpart C	Test Item	Result
15.209 15.209(a)	Radiated emission, Spurious Emission and Field Strength of Fundamental	Complied
2.1049	20 dB Bandwidth	Complied
15.207	Transmitter AC Power Line Conducted Emission	Complied

1.8. Test Report Revision

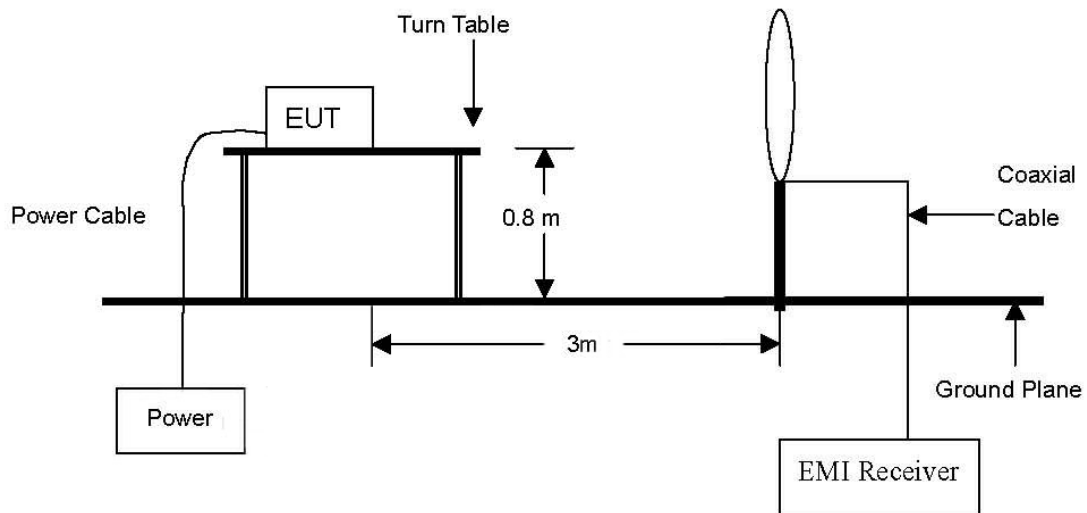
Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL009129	2015.09.14	Initial

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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 kHz to 30 MHz Emissions.



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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 (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meter)
0.009 - 0.490	2 400/F(kHz)	300
0.490 - 1.705	24 000/F(kHz)	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 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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2.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2009

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

- 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

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2.4. Field Strength of Fundamental Test Result

Ambient temperature : $(24 \pm 1) ^\circ\text{C}$
Relative humidity : 47 % R.H.

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

Radiated Emissions			Ant.	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m) at 300 m	Margin (dB)
Charging mode with client (less than 1 % battery status)									
0.171	55.55	Average	H	19.32	0.11	74.98	-5.02	22.94	27.96
Charging mode with client (less than 50 % battery status)									
0.139	63.60	Average	H	19.40	0.10	83.10	3.10	24.74	21.64
Charging mode with client (100 % battery status)									
0.127	68.30	Average	H	19.43	0.10	87.83	7.83	25.53	17.70

Note;

- According to §15.31 (f)(2) 300 m Result(dB μ V/m) = 3 m Result(dB μ V/m) – 40log(300/3) (dB μ V/m).
- According to §15.209 (d), the measurements were tested by using Quasi peak detector except for the frequency bands 9 – 90 kHz, 110 – 490 kHz and above 1 GHz in these three bands on measurements employing an average detector.
- The limit above was calculated based on table of §15.209 (a).

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2.5. Spurious Emission Test Result

Ambient temperature : (24 ± 1) °C
Relative humidity : 47 % R.H.

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

Charging mode with client device (less than 1 % battery status)

Radiated Emissions			Ant.	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 300 m	Limit (dBμV/m) at 300 m	Margin (dB)
0.013	27.80	Average	H	19.64	0.14	47.58	-32.42	45.33	77.75
0.026	34.70	Average	H	19.38	0.13	54.21	-25.79	39.30	65.09
0.035	41.40	Average	H	19.30	0.13	60.83	-19.17	36.72	55.89
0.094	37.01	Quasi Peak	H	19.48	0.09	56.58	-23.42	28.14	51.56

Radiated Emissions			Ant.	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 30 m	Limit (dBμV/m) at 30 m	Margin (dB)
0.540	32.60	Quasi Peak	H	19.12	0.20	51.92	11.92	32.96	21.04
0.855	31.10	Quasi Peak	H	19.31	0.27	50.68	10.68	28.96	18.28
0.927	26.70	Quasi Peak	H	19.36	0.29	46.35	6.35	28.26	21.91
2.431	24.10	Quasi Peak	H	19.33	0.37	43.80	3.80	29.54	25.74
Above 2.500	Not Detected	-	-	-	-	-	-	-	-

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Charging mode with client device (less than 50 % battery status)

Radiated Emissions			Ant.	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m) at 300 m	Margin (dB)
0.026	34.50	Average	H	19.38	0.13	54.01	-25.99	39.30	65.29
0.035	42.20	Average	H	19.30	0.13	61.63	-18.37	36.72	55.09
0.064	24.30	Average	H	19.36	0.11	43.77	-36.23	31.48	67.71
0.094	36.60	Quasi Peak	H	19.48	0.09	56.17	-23.83	28.14	51.97
0.414	39.20	Average	H	19.06	0.17	58.43	-21.57	15.26	36.83

Radiated Emissions			Ant.	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 30 m	Limit (dB μ V/m) at 30 m	Margin (dB)
0.699	30.30	Quasi Peak	H	19.22	0.24	49.76	9.76	30.71	20.95
1.240	24.50	Quasi Peak	H	19.39	0.32	44.21	4.21	25.74	21.53
2.264	17.20	Quasi Peak	H	19.34	0.36	36.90	-3.10	29.54	32.64
Above 2.300	Not Detected	-	-	-	-	-	-	-	-

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Charging mode with client device (100 % battery status)

Radiated Emissions			Ant.	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m) at 300 m	Margin (dB)
0.026	34.70	Average	H	19.38	0.13	54.21	-25.79	39.30	65.09
0.035	41.80	Average	H	19.30	0.13	61.23	-18.77	36.72	55.49
0.064	23.50	Average	H	19.36	0.11	42.97	-37.03	31.48	68.51
0.094	36.60	Quasi Peak	H	19.48	0.09	56.17	-23.83	28.14	51.97
0.375	41.50	Average	H	19.04	0.16	60.70	-19.30	16.12	35.42

Radiated Emissions			Ant.	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 30 m	Limit (dB μ V/m) at 30 m	Margin (dB)
0.624	33.70	Quasi Peak	H	19.17	0.22	53.09	13.09	31.70	18.61
0.874	32.50	Quasi Peak	H	19.32	0.28	52.10	12.10	28.77	16.67
1.212	25.60	Quasi Peak	H	19.39	0.32	45.31	5.31	25.93	20.62
Above 1.300	Not Detected	-	-	-	-	-	-	-	-

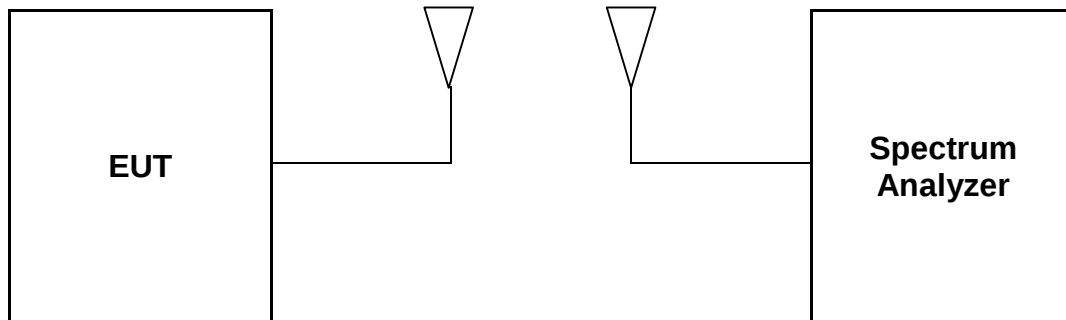
Note;

- According to §15.31 (f)(2),
 - 300 m Result(dB μ V/m) = 3 m Result(dB μ V/m) – 40log(300/3) (dB μ V/m)
 - 30 m Result(dB μ V/m) = 3 m Result(dB μ V/m) – 40log(30/3) (dB μ V/m)
- According to field strength table of general requirement in §15.209 (a), field strength limits below 1.705 MHz were calculated as below.
 - 9 kHz to 490 kHz : 20log(2 400 / F (kHz)) at 300 m (dB μ V/m)
 - 490 kHz to 1 705 kHz : 20log(24 000 / F (kHz)) at 30 m (dB μ V/m)
- According to §15.209 (d), the measurements were tested by using Quasi peak detector except for the frequency bands 9 – 90 kHz, 110 – 490 kHz and above 1 GHz in these three bands on measurements employing an average detector.

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3. 20 dB Bandwidth

3.1. Test Setup



3.2. Limit

None; for reporting purposed only

3.3. Test Procedure

20 dB Bandwidth

- Span = approximately 2 to 3 times the 20 dB bandwidth, RBW = greater than 1 % of the 20 dB bandwidth, VBW = RBW, Sweep = auto, Detector = peak, Trace = max hold.
- 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.

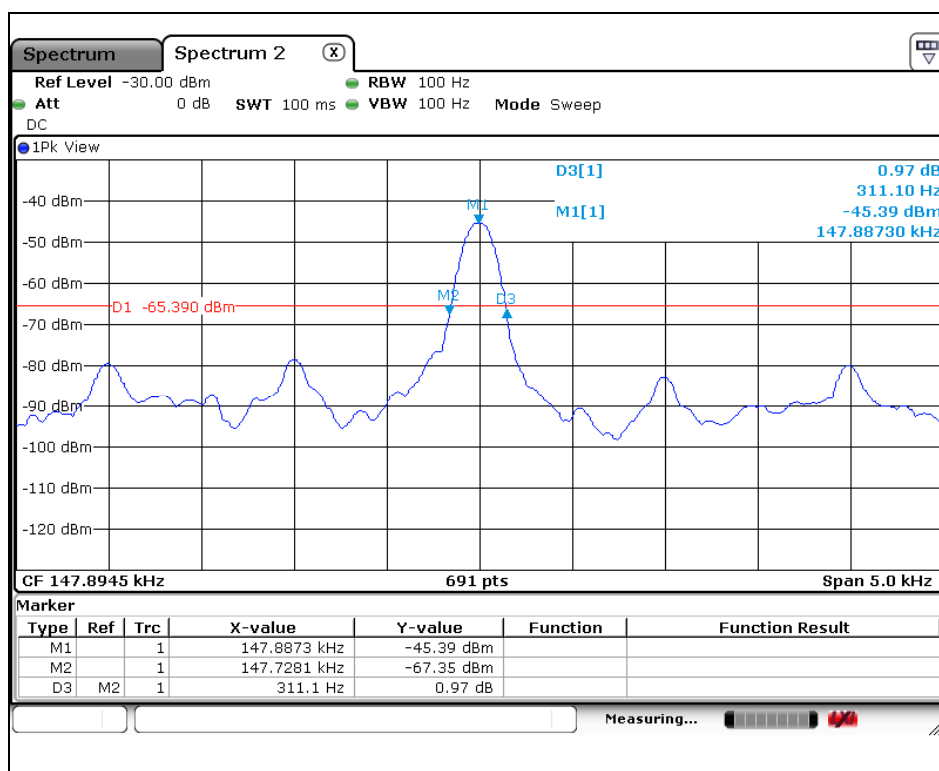
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3.4. Test Result

Ambient temperature : (24 ± 1) °C
Relative humidity : 47 % R.H.

EUT status	20 dB Bandwidth (kHz)	Limit
With client device (100 % of battery)	0.311	Reporting proposed only

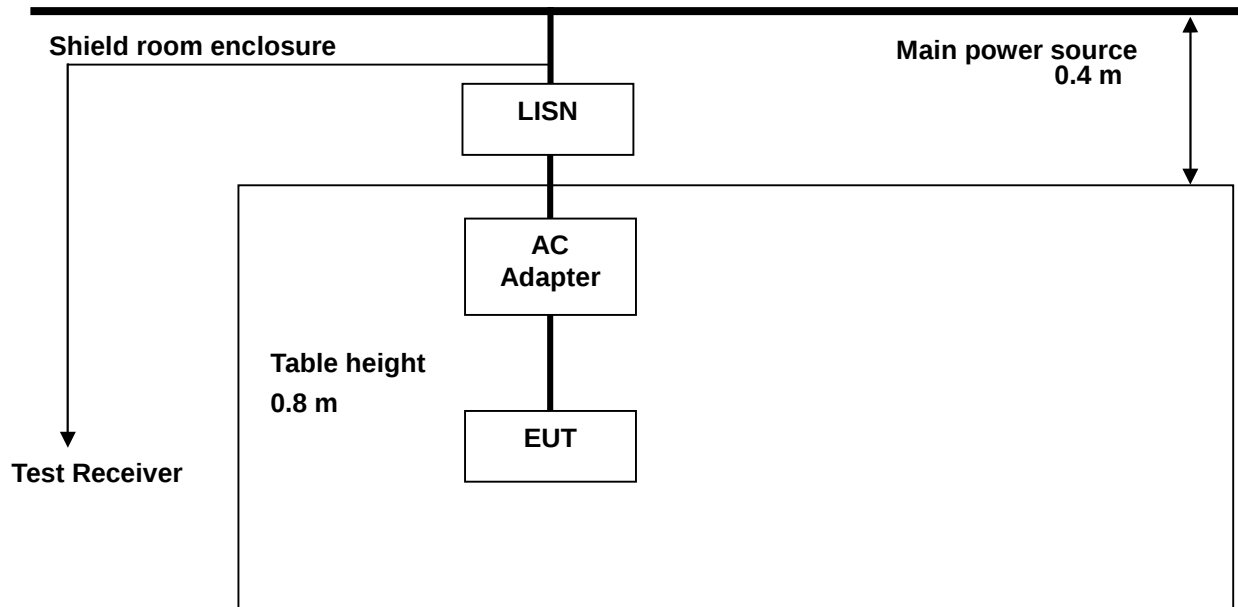
20 dB Bandwidth



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4. Transmitter AC Power Line Conducted Emission

4.1. Test Setup



4.2. 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 50 μ H / 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 frequency ranges.

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

* Decreases with the logarithm of the frequency.

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4.3. Test Procedures

AC conducted emissions from the EUT were measured according to the dictates of ANSI C63.4:2009

1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

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4.4. Test Results

The following table shows the highest levels of conducted emissions on both phase of Hot and Neutral line.

Ambient temperature : (24 ± 1) °C
Relative humidity : 47 % R.H.

Frequency range : 0.15 MHz – 30 MHz
Measured Bandwidth : 9 kHz

Charging mode with Client device (1 % status)

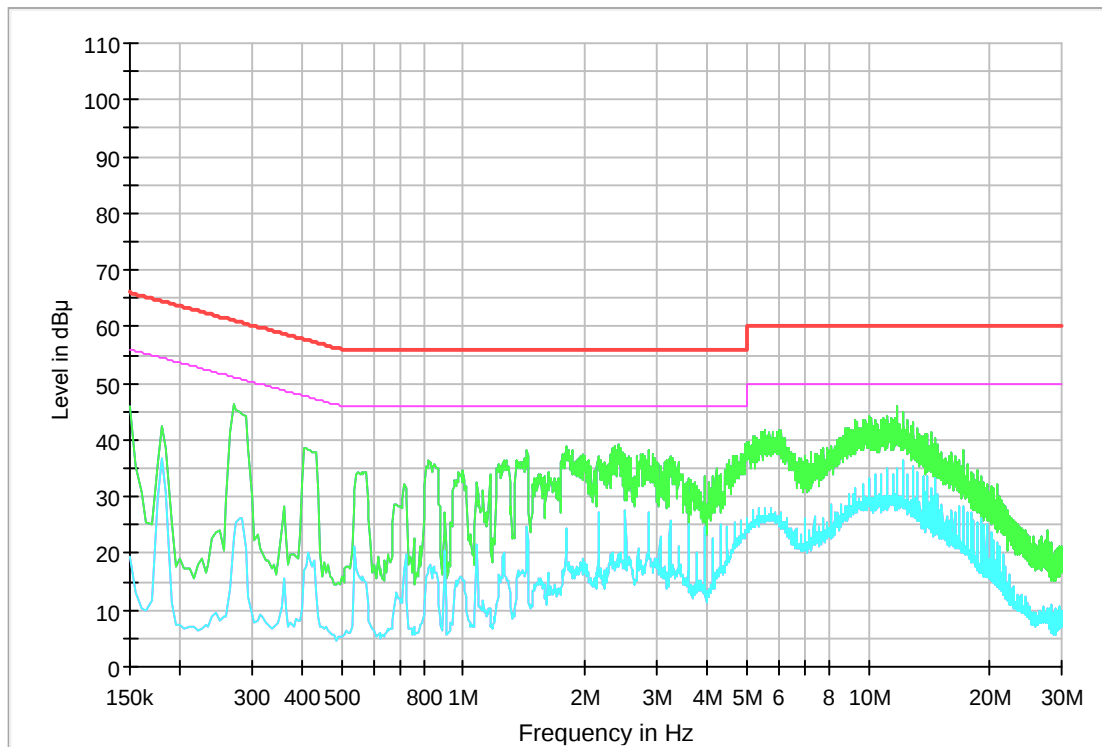
FREQ. (MHz)	LEVEL(dB μ V)		LINE	LIMIT(dB μ V)		MARGIN(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.18	41.02	37.26	N	64.49	54.49	23.47	17.23
0.29	41.62	24.83	N	60.52	50.52	18.90	25.69
2.52	27.08	22.96	N	56.00	46.00	28.92	23.04
3.64	26.92	17.05	N	56.00	46.00	29.08	28.95
11.11	39.63	35.12	N	60.00	50.00	20.37	14.88
12.18	39.47	34.39	N	60.00	50.00	20.53	15.61
0.27	43.91	25.36	H	61.12	51.12	17.21	25.76
0.41	43.61	23.47	H	57.65	47.65	14.04	24.18
0.54	30.14	20.52	H	56.00	46.00	25.86	25.48
2.53	30.91	24.68	H	56.00	46.00	25.09	21.32
6.05	30.74	24.48	H	60.00	50.00	29.26	25.52
11.54	35.05	29.29	H	60.00	50.00	24.95	20.71

Note ;

- Line (H): Hot, Line (N): Neutral
- Charging mode with client device (1 %, 50 %, and 100 % of battery) was tested.
As worst condition, Charging mode with client device (1 %) is reported.
- The limit for Class B device(s) from 150 kHz to 30 MHz are specified in Section of the Title 47 CFR.
- Traces shown in plot were made by using a peak detector and average detector.
- Deviations to the Specifications: None.

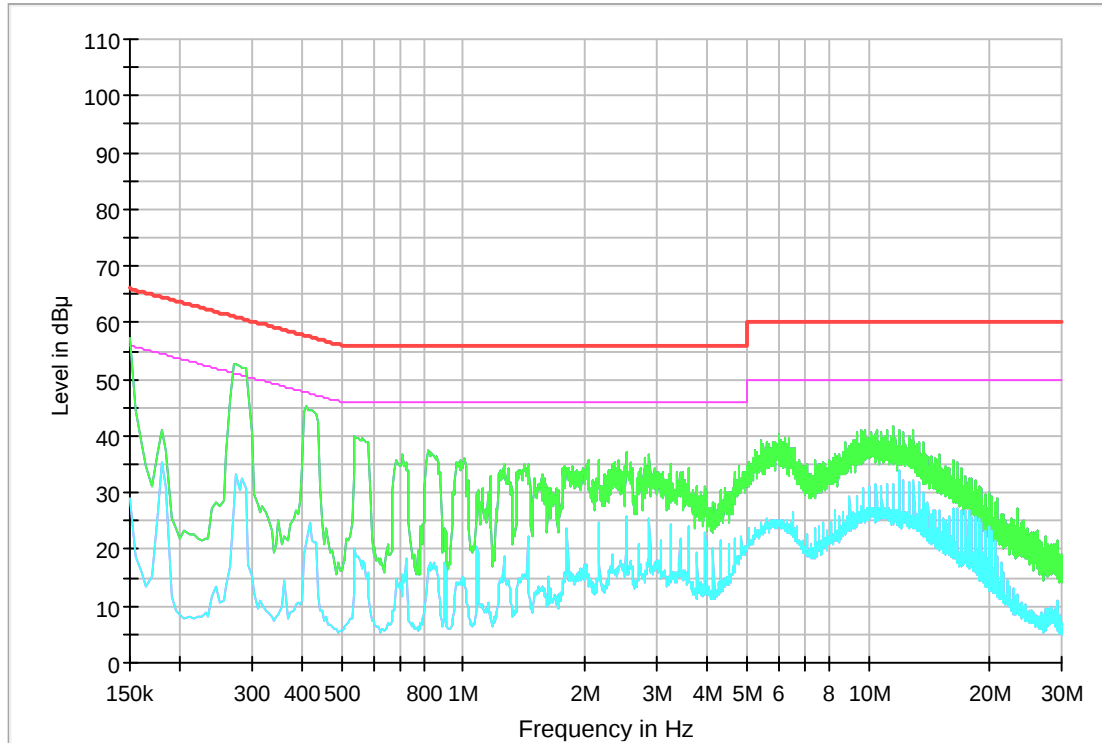
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Test mode: (Neutral)



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Test mode: (Hot)



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