

# TEST REPORT

OF

FCC Part 15 Subpart C §15.207, §15.209

FCC ID : ZH3TBW20Q

Equipment Under Test : LS Wireless Charger  
LSWC-TBW20-Q  
Model Name : (Alt: LSWC-T, LSWC-TBB20-M, LSWC-TWW20-M,  
LSWC-TPW20-M, LSWC-TGW10-M, LSWC-TKW10-M,  
LSWC-TSW10-M)  
Serial No. : N/A  
Applicant : LS Cable & System Ltd.  
Manufacturer : LS Cable & System Ltd.  
Date of Test(s) : 2011. 06. 20 ~ 2011. 07. 11  
Date of Issue : 2011. 10. 06

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

Tested By:



Grant Lee

Date

2011. 10. 06

Approved By:



Feel Jeong

Date

2011. 10. 06

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## 1. General Information

### 1.1. Testing Laboratory

SGS Korea Co., Ltd.

- 705, Dongchun-Dong Sooji-Gu, Yongin-Shi, Kyungki-Do, South Korea.
- Wireless Div. 2FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040

[www.ee.sgs.com/korea](http://www.ee.sgs.com/korea)

Telephone : +82 +31 428 5700

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### 1.2. Details of Applicant

Applicant : LS Cable & System Ltd.

Address : 555, Hogue-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Contact Person : Danny Seo

Phone No. : +82 +31 428 4156

### 1.3. Description of EUT

<b>Kind of Product</b>	LS Wireless Charger
<b>Model Name</b>	LSWC-TBW20-Q (Alt: LSWC-T, LSWC-TBB20-M, LSWC-TWW20-M, LSWC-TPW20-M, LSWC-TGW10-M, LSWC-TKW10-M, LSWC-TSW10-M)
<b>Serial Number</b>	N/A
<b>Power Supply</b>	AC 100 V ~ 240V, 50 Hz/ 60 Hz(Used adapter: DC 19 V / 1 A)
<b>Frequency Range</b>	Tx : 111 kHz ~ 205 kHz
<b>Operating Conditions</b>	-10 °C ~ 50 °C
<b>Antenna Type</b>	Coil Antenna

### 1.4. Declarations by the manufacturer

- Operation temperature: -10 °C ~ 50 °C
- Variant models have only a different color than basic model.

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## 1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal Due.
Test Receiver	R & S	ESU26	100109	Feb. 21, 2012
Loop Antenna	R & S	HFH2-Z2	100118	Aug. 31, 2011
Antenna Master	EMCO	1050	N.C.R.	N.C.R.
Turn Table	Daeil EMC	DI-1500	N.C.R.	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N.C.R.	N.C.R.
Two-Line V-Network	R & S	ENV216	100190	Jan. 06, 2012
Test Receiver	R & S	ESHS10	863365/018	Jul. 07, 2012

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## 1.6. Summary of Test Results

The EUT has been tested according to the following specifications:

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

## 1.7 Test Report Revision

Revision	Report number	Description
0	F690501/RF-RTL004820	Initial
1	F690501/RF-RTL004820-1	Convert the 3 m result to 300 m or 30 m

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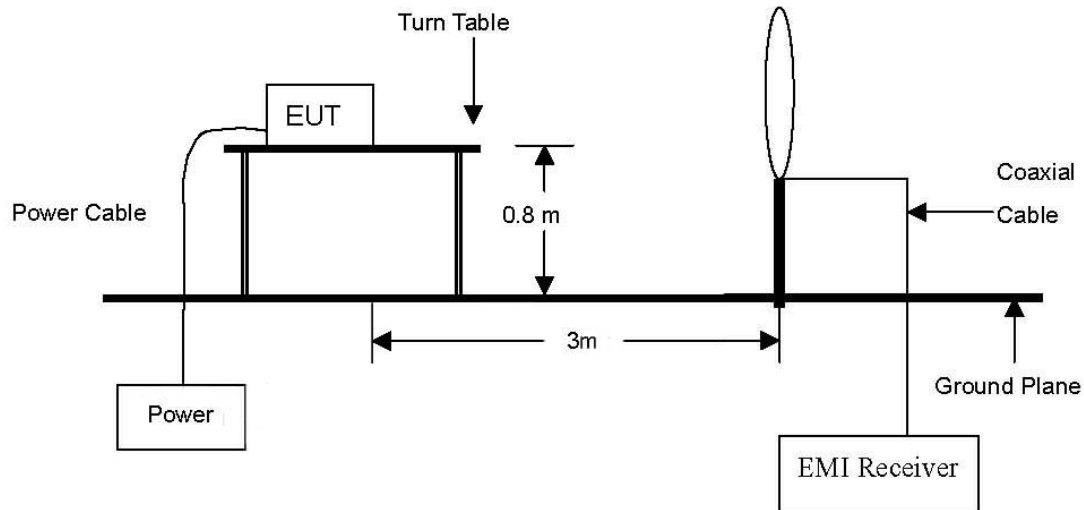
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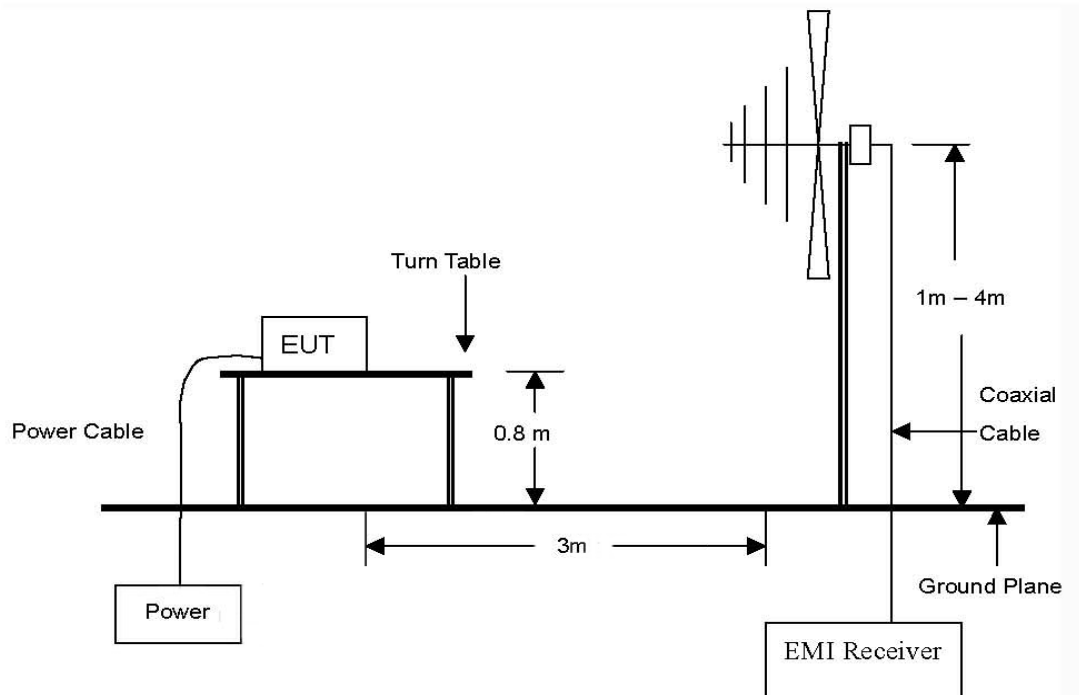
## 2. Field Strength of Fundamental

### 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.



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



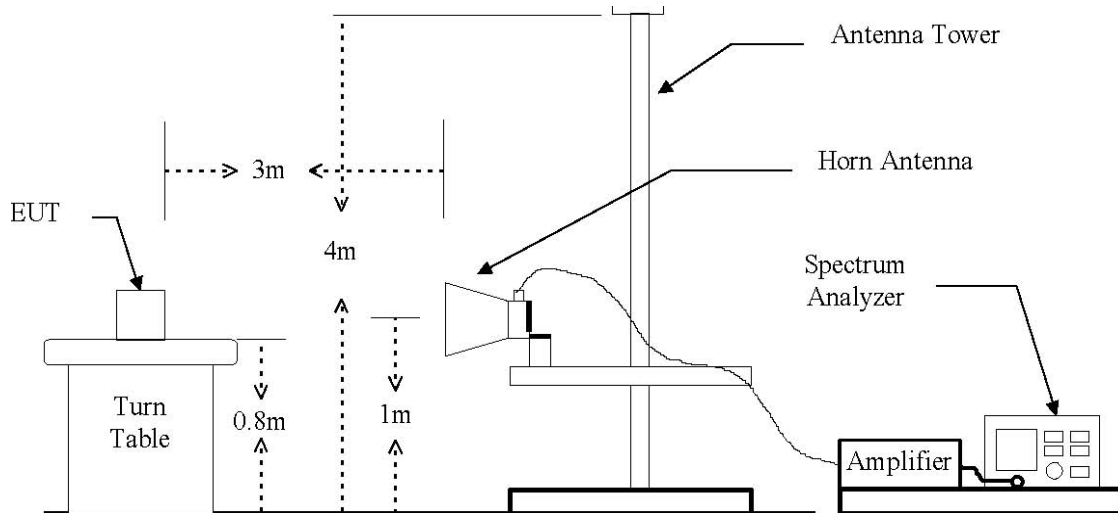
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The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 18 GHz Emissions.



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## 2.2. Limit

### 2.2.1. Radiated emission limits, general requirements

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	2400/F(kHz)	300
0.490 – 1.705	24000/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 C63.4:2003

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

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

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

- 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.
- During performing radiated emission below 1 GHz, 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 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
- 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.
- 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.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

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## 2.4. Test Result

Ambient temperature : (24 ± 2) °C  
Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical. The field strength of spurious emission was measured in three orthogonal EUT position (x-axis, y-axis and z-axis). Worst case is z-axis.

### A. Low Channel (115 kHz)

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB $\mu$ V/m) at 3 m	Actual (dB $\mu$ V/m) at 300 m	Limit (dB $\mu$ V/m)	Margin (dB)
0.115 02	81.40	Average	H	18.94	0.01	100.35	20.35	26.39	6.04

### B. Middle Channel (159 kHz)

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB $\mu$ V/m) at 3 m	Actual (dB $\mu$ V/m) at 300 m	Limit (dB $\mu$ V/m)	Margin (dB)
0.159 30	70.30	Average	H	18.93	0.01	89.24	9.24	23.56	14.32

### C. High Channel (205 kHz)

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB $\mu$ V/m) at 3 m	Actual (dB $\mu$ V/m) at 300 m	Limit (dB $\mu$ V/m)	Margin (dB)
0.205 73	65.80	Average	H	18.91	0.01	84.72	4.72	21.34	16.62

#### Note:

1. 300 m Result(dB $\mu$ V/m) = 3 m Result(dB $\mu$ V/m) – 40log(300/3) (dB $\mu$ V/m)

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### 3. Spurious Emission

#### 3.1. Test Setup

Same as section 2.1 of this report

#### 3.2. Limit

Same as section 2.2 of this report

#### 3.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

##### 3.3.1. 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 quasi-peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

##### 3.3.2. Test Procedures for emission from 30 MHz to 1 000 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. During performing radiated emission below 1 GHz, 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 GHz, 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. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

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### 3.4. Test Result

Ambient temperature : (24 ± 2) °C  
Relative humidity : 47 % R.H.

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

#### A. Low Channel (115 kHz)

Radiated Emissions			Ant	Correction Factors	Total		FCC Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF/CL (dB/m)/(dB)	Actual (dB $\mu$ V/m) at 3 m	Actual (dB $\mu$ V/m) at 300 m or 30 m	Limit (dB $\mu$ V/m)	Margin (dB)
0.229 92	57.57	Average	H	18.87/0.01	76.45	-3.55	20.37	23.92
0.345 00	41.50	Average	H	18.80/0.01	60.31	-19.69	16.85	36.54
0.460 40	38.60	Average	H	18.79/0.01	57.40	-22.60	14.34	36.94
0.574 76	40.40	Q.P.	H	18.79/0.01	59.20	19.20	32.41	13.21
0.690 64	33.90	Q.P.	H	18.79/0.01	52.70	12.70	30.82	18.12
0.805 96	21.50	Q.P.	H	18.79/0.01	40.30	0.30	29.48	29.18
0.920 40	31.80	Q.P.	H	18.79/0.01	50.60	10.60	28.32	17.72
1.035 96	29.20	Q.P.	H	18.79/0.01	48.00	8.00	27.30	19.30
1.151 20	11.80	Q.P.	H	18.79/0.01	30.60	-9.40	26.38	35.78
1.264 60	24.80	Q.P.	H	18.78/0.01	43.59	3.59	25.57	21.98
1.379 52	25.20	Q.P.	H	18.78/0.01	43.99	3.99	24.81	20.82
1.495 80	24.20	Q.P.	H	18.78/0.01	42.99	2.99	24.11	21.12
1.612 08	19.10	Q.P.	H	18.78/0.01	37.89	-2.11	23.46	25.57
1.723 72	9.60	Q.P.	H	18.78/0.01	28.39	-11.61	29.54	41.15
1.841 60	15.90	Q.P.	H	18.77/0.01	34.68	-5.32	29.54	34.86
1.956 12	19.30	Q.P.	H	18.77/0.01	38.08	-1.92	29.54	31.46
2.071 44	18.60	Q.P.	H	18.77/0.01	37.38	-2.62	29.54	32.16

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## B. Middle Channel (159 kHz)

Radiated Emissions			Ant	Correction Factors	Total		FCC Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF/CL (dB/m)/(dB)	Actual (dB $\mu$ V/m) at 3 m	Actual (dB $\mu$ V/m) at 300 m or 30 m	Limit (dB $\mu$ V/m)	Margin (dB)
0.318 40	26.30	Average	H	18.80/0.01	45.11	-34.89	17.54	52.43
0.477 88	46.20	Average	H	18.79/0.01	65.00	-15.00	14.02	29.02
0.638 24	21.70	Q.P.	H	18.79/0.01	40.50	0.50	31.50	31.00
0.796 52	37.30	Q.P.	H	18.79/0.01	56.10	16.10	29.58	13.48
0.955 92	19.10	Q.P.	H	18.79/0.01	37.90	-2.10	28.00	30.10
1.115 24	31.50	Q.P.	H	18.79/0.01	50.30	10.30	26.66	16.36
1.273 36	16.90	Q.P.	H	18.78/0.01	35.69	-4.31	25.51	29.82
1.431 40	25.80	Q.P.	H	18.78/0.01	44.59	4.59	24.49	19.90
1.591 76	15.60	Q.P.	H	18.78/0.01	34.39	-5.61	23.57	29.18
1.752 17	24.20	Q.P.	H	18.77/0.01	42.98	2.98	29.54	26.56
1.910 72	15.10	Q.P.	H	18.77/0.01	33.88	-6.12	29.54	35.66
2.072 13	20.70	Q.P.	H	18.77/0.01	39.48	-0.52	29.54	30.06

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### C. High Channel (205 kHz)

Radiated Emissions			Ant	Correction Factors	Total		FCC Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF/CL (dB/m)/(dB)	Actual (dB $\mu$ V/m) at 3 m	Actual (dB $\mu$ V/m) at 300 m or 30 m	Limit (dB $\mu$ V/m)	Margin (dB)
0.411 43	28.30	Average	H	18.79/0.01	47.10	-32.90	15.32	48.22
0.617 15	43.80	Q.P.	H	18.79/0.01	62.60	22.60	31.80	9.20
0.822 85	23.00	Q.P.	H	18.79/0.01	41.80	1.80	29.30	27.50
1.028 57	35.00	Q.P.	H	18.79/0.01	53.80	13.80	27.36	13.56
1.234 30	19.90	Q.P.	H	18.79/0.01	38.70	-1.30	25.78	27.08
1.440 00	29.10	Q.P.	H	18.78/0.01	47.89	7.89	24.44	16.55
1.645 69	18.00	Q.P.	H	18.78/0.01	36.79	-3.21	23.28	26.49
1.851 43	24.70	Q.P.	H	18.77/0.01	43.48	3.48	29.54	26.06
2.057 15	16.50	Q.P.	H	18.77/0.01	35.28	-4.72	29.54	34.26

#### Remark:

To get a maximum emission level from the EUT, the EUT was moved throughout the x-axis, y-axis and z-axis.

#### Note:

- 300 m Result(dB $\mu$ V/m) = 3 m Result(dB $\mu$ V/m) – 40log(300/3) (dB $\mu$ V/m)
- 30 m Result(dB $\mu$ V/m) = 3 m Result(dB $\mu$ V/m) – 40log(30/3) (dB $\mu$ V/m)

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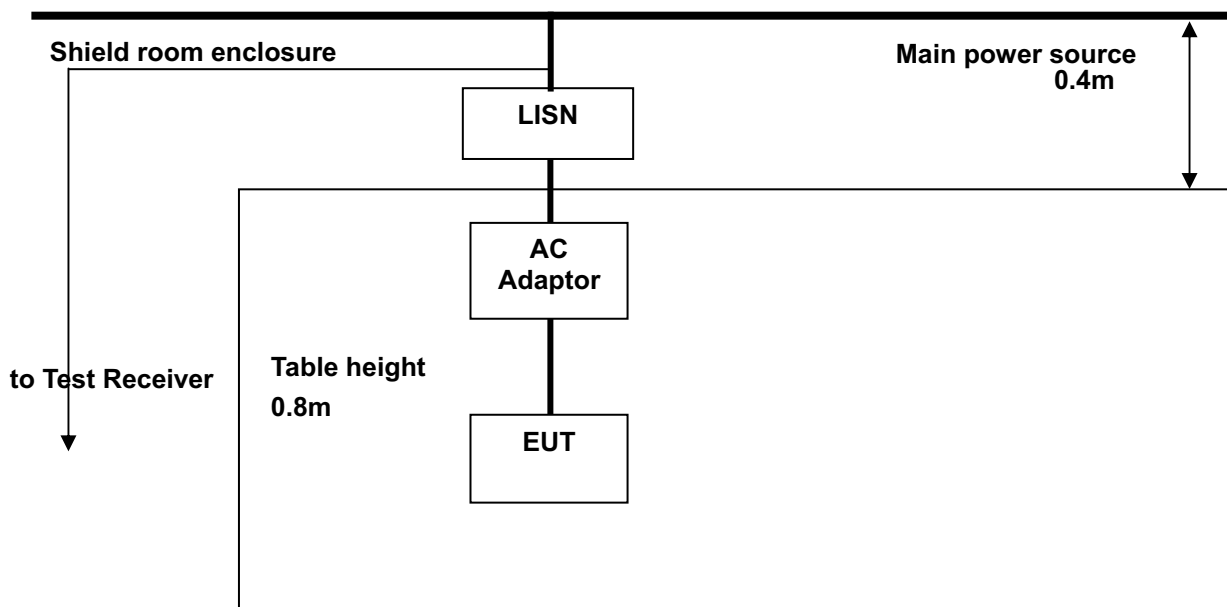
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## 4. Transmitter AC Power Line Conducted Emission

### 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 uH/50 ohm line impedance stabilization network(LISN).

Compliance with the provision of this paragraph shall 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 $\mu$ 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

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

1. The test procedure is performed in a 6.5 m × 3.6 m × 3.6 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. The conducted emission was measured in three channels of EUT. Worst case is high channel.

Ambient temperature : (23 ± 2) °C  
Relative humidity : 47 % R.H.  
  
Frequency range : 0.15 MHz – 30 MHz  
Measured Bandwidth : 9 kHz

##### A. High Channel (205 kHz)

FREQ. (MHz)	LEVEL(dB $\mu$ V)		LINE	LIMIT(dB $\mu$ V)		MARGIN(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.62	44.60	41.70	H	56.00	46.00	11.40	4.30
1.03	44.00	40.80	H	56.00	46.00	12.00	5.20
1.44	44.10	40.90	H	56.00	46.00	11.90	5.10
1.85	43.90	40.30	H	56.00	46.00	12.10	5.70
3.09	43.90	40.60	H	56.00	46.00	12.10	5.40
0.62	44.30	41.50	N	56.00	46.00	11.70	4.50
1.03	43.90	40.90	N	56.00	46.00	12.10	5.10
1.44	44.00	40.90	N	56.00	46.00	12.00	5.10
1.85	43.80	40.70	N	56.00	46.00	12.20	5.30
3.09	43.10	40.00	N	56.00	46.00	12.90	6.00

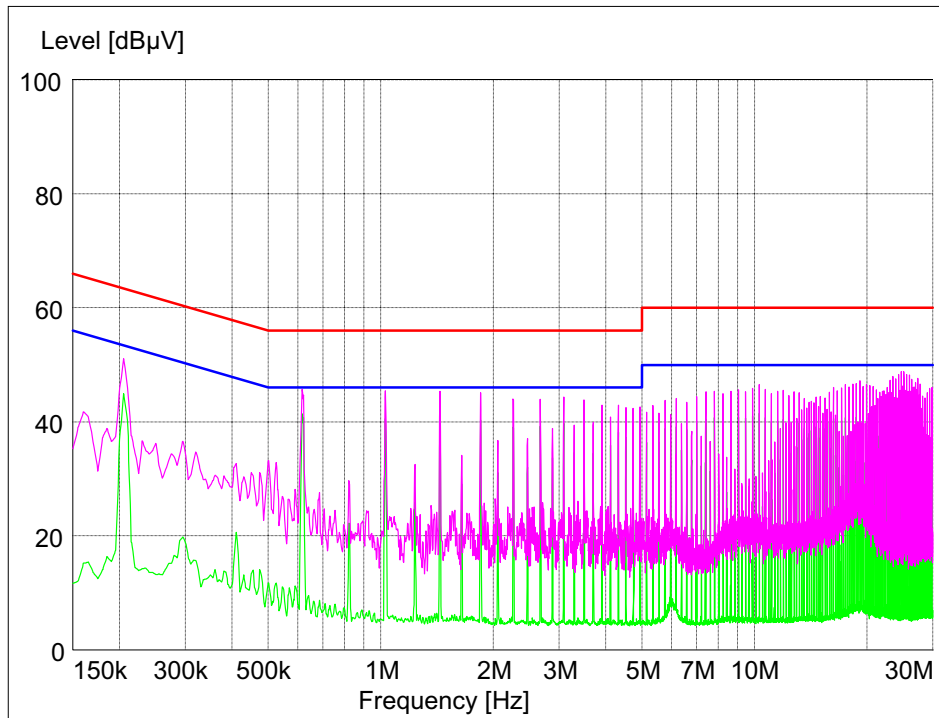
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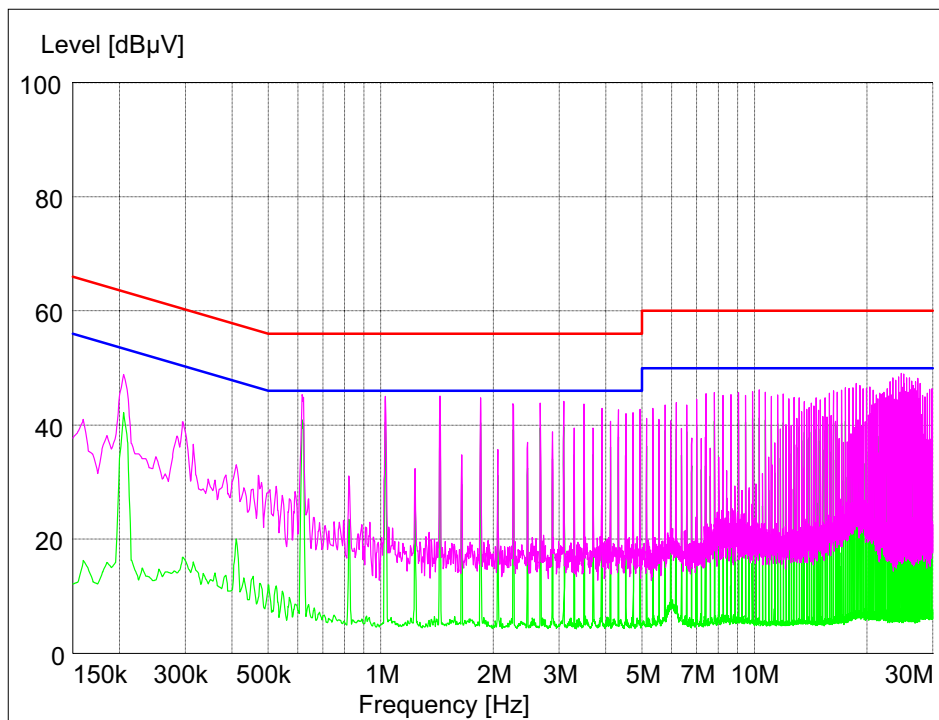
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Test mode : (Hot)



Test mode : (Neutral)



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