

# TEST REPORT

of

## FCC Part 15 Subpart C §15.249

### FCC ID : WEK-SKD-01

Equipment Under Test : Screen Keeper Wireless USB dongle  
Model Name : SKD-01  
Serial No. : N/A  
Applicant : Semilink Inc.  
Manufacturer : Semilink Inc.  
Date of Test(s) : 2010.06.10 ~ 2010.06.24  
Date of Issue : 2010.06.29

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

Tested By:



Date

2010.06.29

Duke Ko

Approved By:



Date

2010.06.29

Charles Kim

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## 1. General information

### 1.1 Testing laboratory

SGS Testing Korea Co., Ltd.

Wireless Div. 2FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040

[www.electrolab.kr.sgs.com](http://www.electrolab.kr.sgs.com)

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### 1.2 Details of applicant

Applicant : Semilink Inc.

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Gyeonggi-do, Korea 431-070

Contact Person : Caley Kim

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### 1.3. Description of EUT

Kind of Product	Screen Keeper Wireless USB dongle
Model Name	SKD-01
Serial Number	N/A
Power Supply	AC 100 ~ 240 V (Use PC USB port DC 5 V)
Frequency Range	2 402 ~ 2 480 MHz
Modulation Technique	GFSK
Number of Channels	79
Operating Conditions	-10℃ ~ 50℃
Antenna Type	Fixed Type
Antenna Gain	3.88 dBi
H/W Version	USB-DONGLE-A VER4.2
S/W Version	USB_OTP_100617

### 1.4 Details of modification

-N/A

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### 1.5. Test equipment list

Equipment	Manufacturer	Model	Cal Due.
Signal Generator	Agilent	E4438C	Mar 31, 2011
Spectrum Analyzer	R & S	FSV30	May 12, 2011
Attenuator	Agilent	8495B	Apr. 02, 2011
High Pass Filter	Wainwright	WHK3.0/18G-10SS	Sep. 29, 2010
DC power Supply	Agilent	U8002A	Jan. 06, 2011
Preamplifier	H.P.	8447F	Jul. 02, 2010
Preamplifier	Agilent	8449B	Mar. 31, 2011
Test Receiver	R & S	ESU26	Apr. 08, 2011
Bilog Antenna	SCHWARZBECK MESSELEKTRONIK	VULB9163	Jul. 22, 2010
Horn Antenna	Rohde & Schwarz	HF 906	Oct. 08, 2011
Antenna Master	EMCO	1050	N.C.R
Turn Table	Daeil EMC	DI-1500	N.C.R
Anechoic Chamber	SY Corporation	L x W x H (9.6 m x 6.4 m x 6.6 m)	Jan. 27, 2011
Two-Line V-Network	R & S	ENV216	Jan. 06, 2011
Test Receiver	R & S	ESHS10	Jul. 13, 2010
Anechoic Chamber	SY Corporation	L x W x H (6.5 m x 3.5 m x 3.5 m)	N.C.R

### 1.6. Support equipment

Equipment	Manufacturer	Type	S/N
Notebook PC	LG IBM	2366	99-LZLR2

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## 1.7. Summary of test results

The EUT has been tested according to the following specifications:

Applied Standard : FCC Part15, Subpart C		
Standard Section	Test Item	Result
15.209(a) 15.249(a) 15.249(d) 15.205	Fundamental, Spurious emission and edge band radiated emission	Complied
15.207(a)	Conducted power line test	Complied

## 1.8. Test report revision

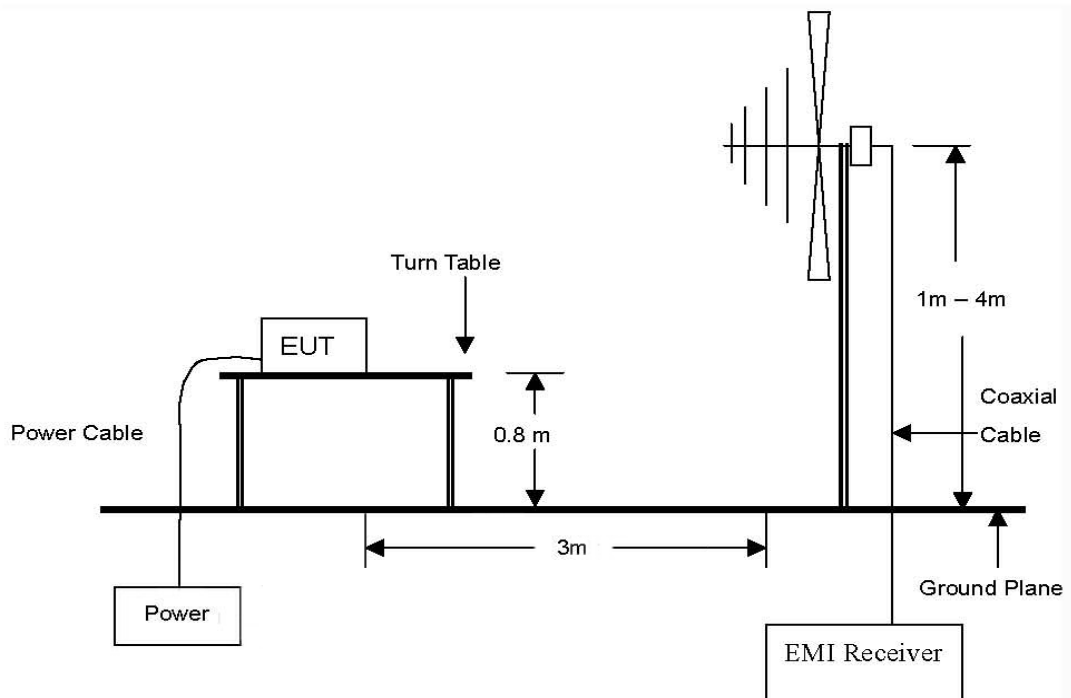
Revision	Report number	Description
0	F690501/RF-RTL003942	Initial

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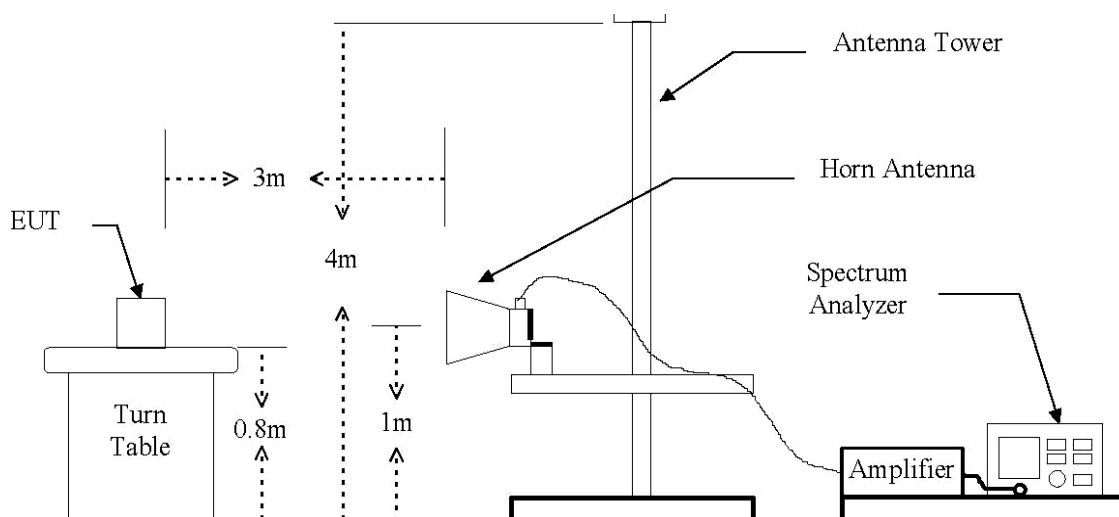
## 2. Fundamental, Spurious emission and edge band radiated emission

### 2.1. Test setup

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



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 24 GHz Emissions.



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## 2.2. Test procedures

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

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic Chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
3. 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 polarization of the antenna are set to make the measurement.
4. 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.
5. 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.

Note :

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1 GHz.

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## 2.3. Limit

In the section 15.249(a) :

Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (mV/m)	Field strength of harmonics ( $\mu$ V/m)
902 ~ 928 MHz	50	500
2 400 ~ 2 483.5 MHz	50	500
5 725 ~ 5 875 MHz	50	500
24.0 ~ 24.25 GHz	250	2 500

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:

Fundamental frequency (MHz)	Field strength ( $\mu$ V/m)	Measurement distance (m)
30 ~ 88	100*	3
88 ~ 216	150*	3
216 ~960	200*	3
Above 960	500	3

Remark:

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.

In the above emission table, the tighter limit applies at the band edges.

Fundamental frequency (MHz)	Field strength ( $\mu$ V/m at 3 meter)	Field strength (dB $\mu$ V/m at 3 meter)
30 ~ 88	100	40
88 ~ 216	150	43.5
216 ~960	200	46
Above 960	500	54

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## 2.4. Test result

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

### 2.4.1. Below 1 GHz

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
Below 1 000.000	Not detected	-	-	-	-	-	-	-

#### Remark

1. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes. Worst case is XZ -plane..
2. All spurious emission at channels are almost the same below 1 GHz, so that the channel was chosen at representative in final test.

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## 2.4.2. Above 1 GHz

### A. Low Channel (2 402 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
2 402.000	62.27	Peak	V	28.07	4.87	95.21	114.00	18.79
2 402.000	57.99	Average	V	28.07	4.87	90.93	94.00	3.07
*2 390.000	33.17	Peak	V	28.09	4.84	66.10	74.00	7.90
*2 390.000	17.92	Average	V	28.09	4.84	50.85	54.00	3.15

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4 804.000	49.12	Peak	V	32.59	-27.78	53.93	74.00	20.07
Above 4 900.000	Not detected	-	-	-	-	-	-	-

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## B. Middle Channel (2 439 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
2 439.000	60.21	Peak	V	28.00	4.82	93.03	114.00	20.97

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4 878.000	49.42	Peak	V	32.88	-27.59	54.71	74.00	19.29
4 878.000	36.82	Average	V	32.88	-27.59	42.11	54.00	11.89
Above 4 900.000	Not detected	-	-	-	-	-	-	-

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## C. High Channel (2 480 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
2 480.000	59.44	Peak	V	28.08	4.78	92.30	114.00	21.70
*2 483.500	37.07	Peak	V	28.09	4.78	69.94	74.00	4.06
*2 483.500	17.53	Average	V	28.09	4.78	50.40	54.00	3.60

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4 960.000	48.90	Peak	V	33.22	-27.41	54.71	74.00	19.29
4 960.000	37.02	Average	V	33.22	-27.41	42.83	54.00	11.17
Above 5 000.000	Not detected	-	-	-	-	-	-	-

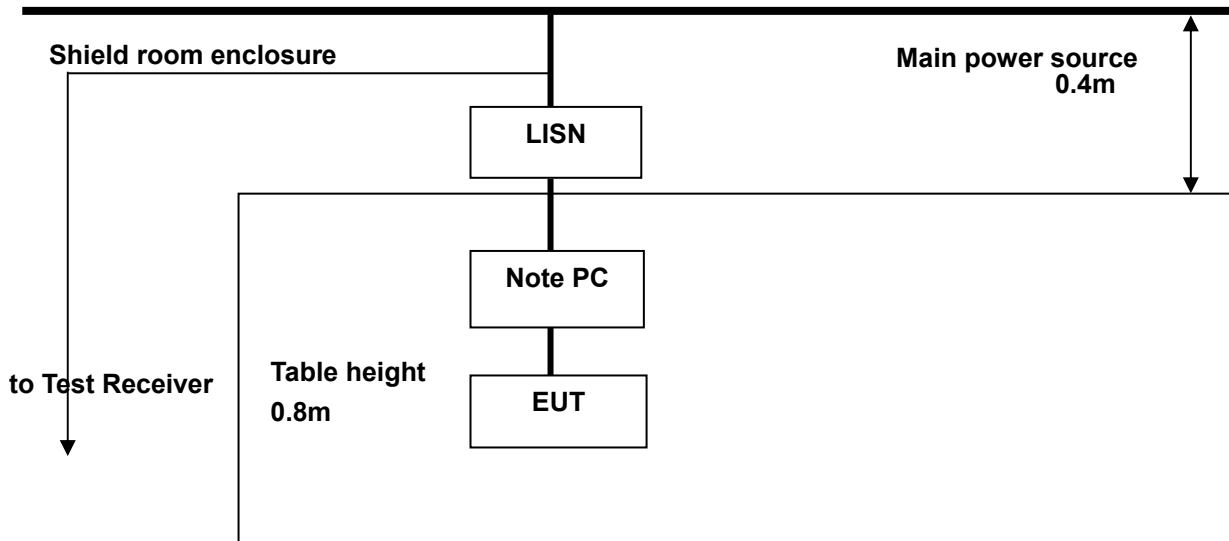
## Remarks ;

1. “\*” means the restricted band.
2. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes. Worst case is zx-plane..
3. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental Frequency.
4. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using peak/average detector mode.
5. Average test would be performed if the peak result were greater than the average limit.
6. Actual = Reading + AF - Amp Gain + CL

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### 3. Conducted power line test

#### 3.1. Test setup



#### 3.2. Limit

According to §15.107(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 µV)	
	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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### 3.3. Test procedure

The test procedure is performed in a 6.5m × 3.6m × 3.6m (L×W×H) shielded room. The EUT along with its peripherals were placed on a 1.0m(W)× 1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.

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. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room. 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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### 3.4. Test result

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

Ambient temperature : (24 ± 2) °C  
Relative humidity : 47 % R.H.  
Frequency range : 0.15 MHz – 30 MHz  
Measured Bandwidth 9 kHz

Freq. (MHz)	Level(dB uV)		Line	Limit(dB uV)		Margin(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.15	54.4	38.3	H	66.00	56.00	11.6	17.7
0.21	44.0	33.3	H	63.41	53.41	19.4	20.1
0.52	39.8	29.7	H	56.00	46.00	16.2	16.3
1.44	31.0	30.7	H	56.00	46.00	25.0	15.3
7.67	32.9	30.4	H	60.00	50.00	27.1	19.6
13.56	31.6	27.1	H	60.00	50.00	28.4	22.9
0.19	51.5	38.7	N	64.04	54.04	12.5	15.3
0.25	45.4	26.2	N	61.92	51.92	16.5	25.7
0.60	37.2	22.6	N	56.00	46.00	18.8	23.4
1.52	37.8	26.4	N	56.00	46.00	18.2	19.6
2.56	31.9	24.9	N	56.00	46.00	24.1	21.1
7.06	28.7	26.1	N	60.00	50.00	31.3	23.9

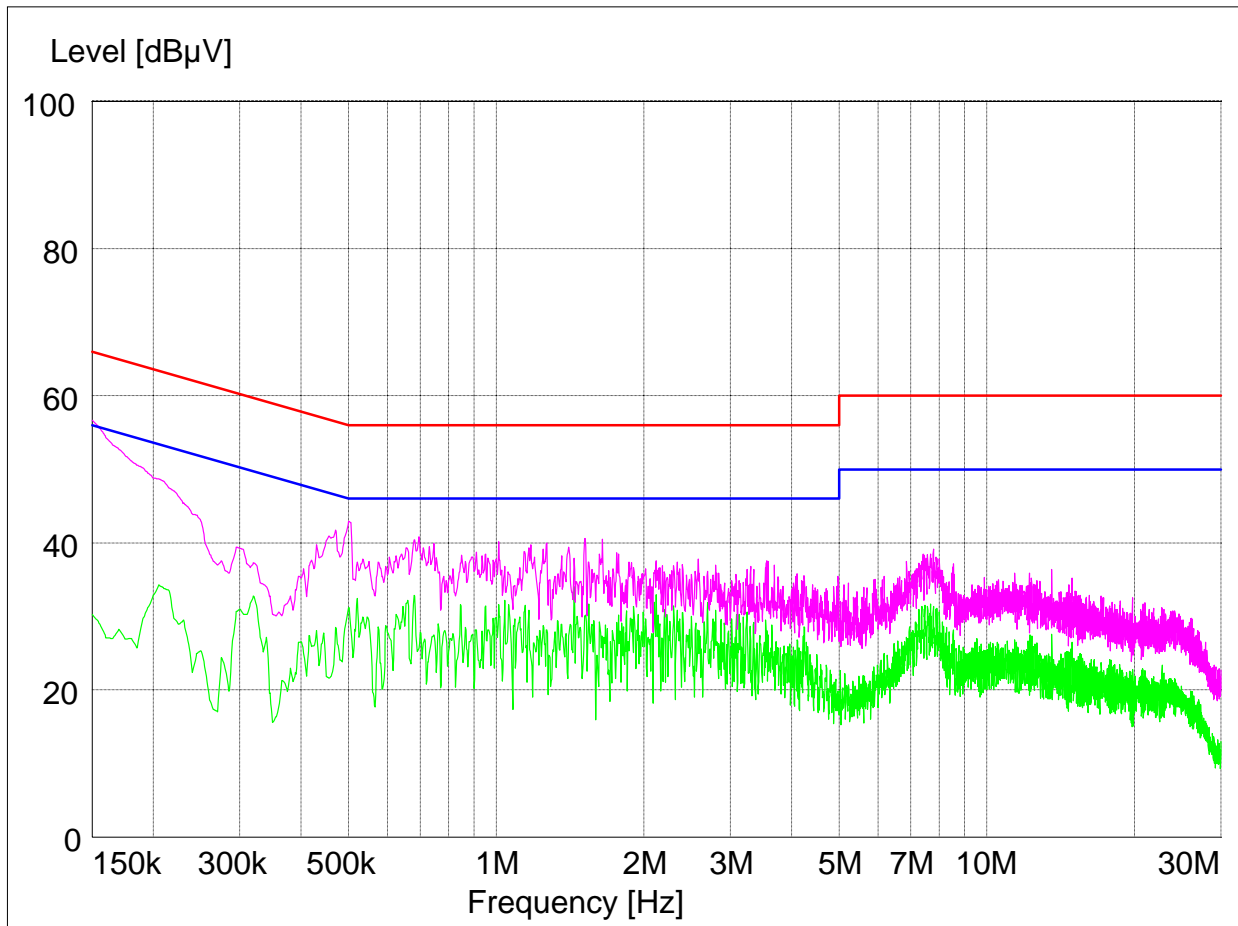
Note ;

Line ( H ) : Hot  
Line ( N ) : Neutral

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## Plot of conducted power line

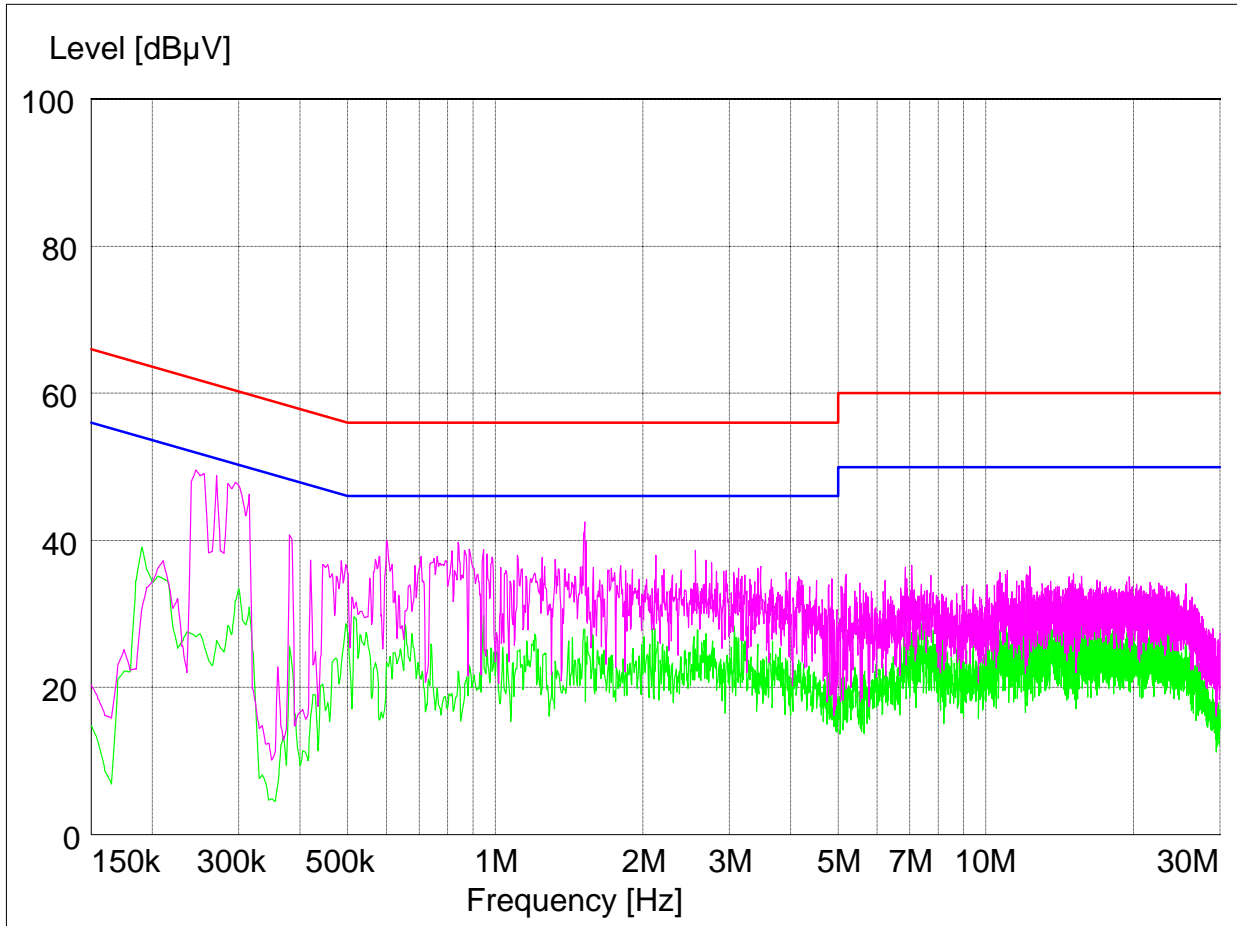
Test mode : (Hot)



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Test mode : (Neutral)



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## 4. RF Exposure Evaluation

### 4.1. Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

According to FCC 1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in §1.1307(b)

#### LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Average Time
(A) Limits for Occupational /Control Exposures				
300 – 1 500	--	--	F/300	6
1 500 – 100 000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300 – 1 500	--	--	F/1500	6
<b><u>1 500 – 100 000</u></b>	--	--	<b><u>1</u></b>	<b><u>30</u></b>

#### 4.1.1. Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

Where  $P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

$G$  = gain of antenna in linear scale

$\pi$  = 3.1416

$R$  = distance between observation point and center of the radiator in cm

$P_d$  the limit of MPE, 1 mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

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#### 4.1.2. Test Result of RF Exposure Evaluation

Test Item : RF Exposure Evaluation Data  
Test Mode : Normal Operation

#### 4.1.3. Output Power into Antenna & RF Exposure Evaluation Distance

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
Low	2 402	-1.57	3.88	0.000 34	1
Middle	2 439	-1.04	3.88	0.000 38	1
High	2 480	-0.76	3.88	0.000 41	1

Note :

1. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit of 1 mW/cm<sup>2</sup> .

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