

TEST REPORT

of

FCC Part 15 Subpart C §15.247

FCC ID : A3LWRP100

Equipment Under Test : SAMSUNG Wi-Fi Repeater
Model Name : WRP100
Serial No. : N/A
Applicant : SAMSUNG ELECTRONICS CO., LTD.
Manufacturer : SAMSUNG ELECTRONICS CO., LTD.
Date of Test(s) : 2012.01.02 ~ 2012.01.04
Date of Issue : 2012.01.05

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

Tested By:



Date

2012.01.05

Duke Ko

Approved By:



Date

2012.01.05

Charles Kim

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1. General information

1.1. Testing laboratory

SGS Korea Co., Ltd.(Gunpo Laboratory)

- 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

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1.2 Details of applicant

Applicant : SAMSUNG ELECTRONICS CO., LTD.
Address : 416, Maetan3-dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea
Contact Person : Jung, Doh Sung
Phone No. : +82 +10 6618 0370

1.3 Description of EUT

Kind of Product	SAMSUNG WiFi Repeater
Model Name	WRP100
Serial Number	N/A
Power Supply	AC 120 V
Frequency Range	5 755 MHz ~ 5 795 MHz (11n_ HT40) 5 190 MHz ~ 5 230 MHz (11n_ HT40)
Modulation Technique	OFDM
Number of Channels	5 755 MHz ~ 5 795 MHz : 2 Channels 5 190 MHz ~ 5 230 MHz : 2 Channels
Antenna Type	Fixed type (2 Tx / 4 Rx)
Antenna Gain	ANT B 5 755 MHz : 3.03 dB i 5 795 MHz : 2.57 dB i 5 190 MHz : 2.53 dB i 5 230 MHz : 3.06 dB i ANT C 5 755 MHz : 3.05 dB i 5 795 MHz : 3.22 dB i 5 190 MHz : 2.54 dB i 5 230 MHz : 2.45 dB i

1.4. Declaration by the manufacturer

- The nominal channel bandwidth: 40 MHz
- There are 4 antennas, A, B, C & D, but **Ant A** and **Ant D** are Rx only.
- EUT uses Cyclic Delay Diversity (CDD) modes and the signals are correlated.

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1.5. Test equipment list

Equipment	Manufacturer	Model	S/N	Cal Due.
Signal Generator	R & S	SMR40	100272	Jul. 15, 2012
PXA Spectrum Analyzer	Agilent	N9030A	US51350132	Oct. 28, 2012
Spectrum Analyzer	R & S	FSV30	101004	Jul. 06, 2012
Attenuator	AEROFLEX	26A-10dB	2	Apr. 06, 2012
High Pass Filter	Wainwright	WHK6.0/18G-10SS	11	Jul. 07, 2012
AC Power Supply	KIKUSUI	PCR 500M	QC002962	Mar. 16, 2012
Preamplifier	H.P.	8447F	2944A03909	Jul. 04, 2012
Preamplifier	R & S	SCU 18	10117	Mar. 23, 2012
Test Receiver	R & S	ESU26	100109	Feb. 21, 2012
Bilog Antenna	SCHWARZBECK MESSELEKTRONIK	VULB9163	396	Apr. 27, 2013
Horn Antenna	R & S	HF 906	100229	May. 04. 2012
Horn Antenna	SCHWARZBECK MESSELEKTRONIK	BBHA9170	BBHA9170223	Jun. 30, 2012
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	Apr. 27, 2012
Anechoic Chamber	SY Corporation	L × W × H (6.5 m×3.5 m×3.5 m)	N.C.R.	N.C.R.

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1.6. Summary of test result

The EUT has been tested according to the following specifications:

APPLIED STANDARD:FCC Part15 subpart C		
Standard section	Test Item	Result
15.205(a) 15.209 15.247(d)	Transmitter Radiated Spurious Emissions Conducted Spurious Emission	Complied
15.109(a)	Receiver Radiated Spurious Emission	Complied
15.247(a)(2)	6 dB Bandwidth	Complied
15.247(b)(3)	Maximum Peak Output Power	Complied
15.247(e)	Power Spectral Density	Complied
15.207	Transmitter AC Power Line Conducted Emission	Complied
1.1307(b)(1)	Maximum Permissible Exposure (Exposure of Humans to RF Fields)	Complied

1.7. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL005234	Initial

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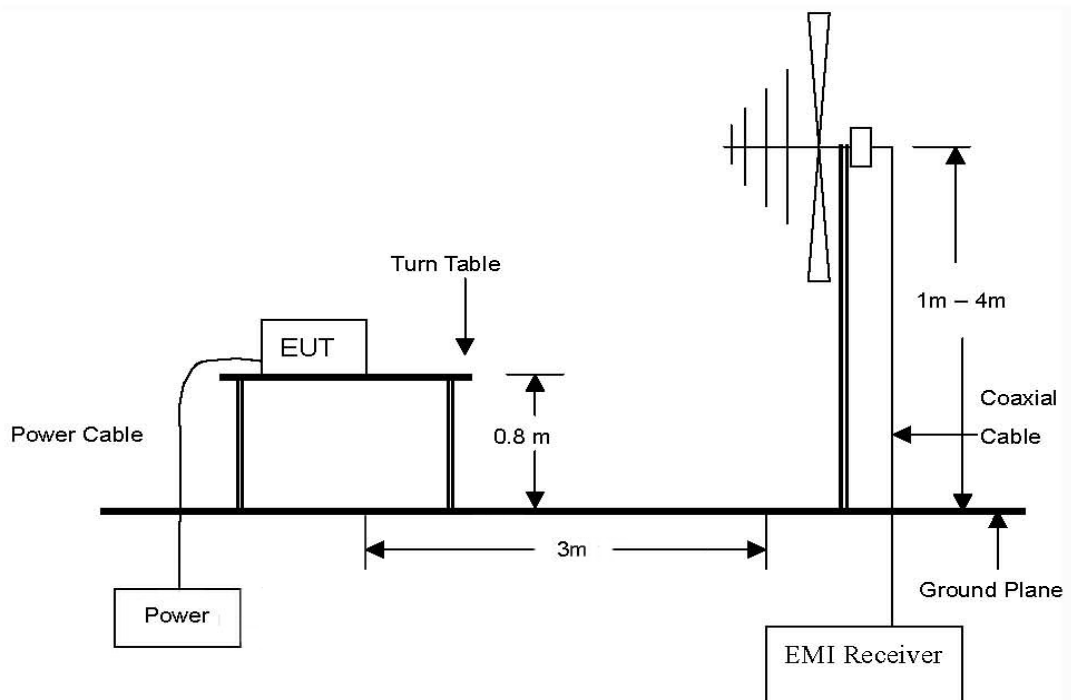
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2. Transmitter radiated spurious emissions and conducted spurious emission

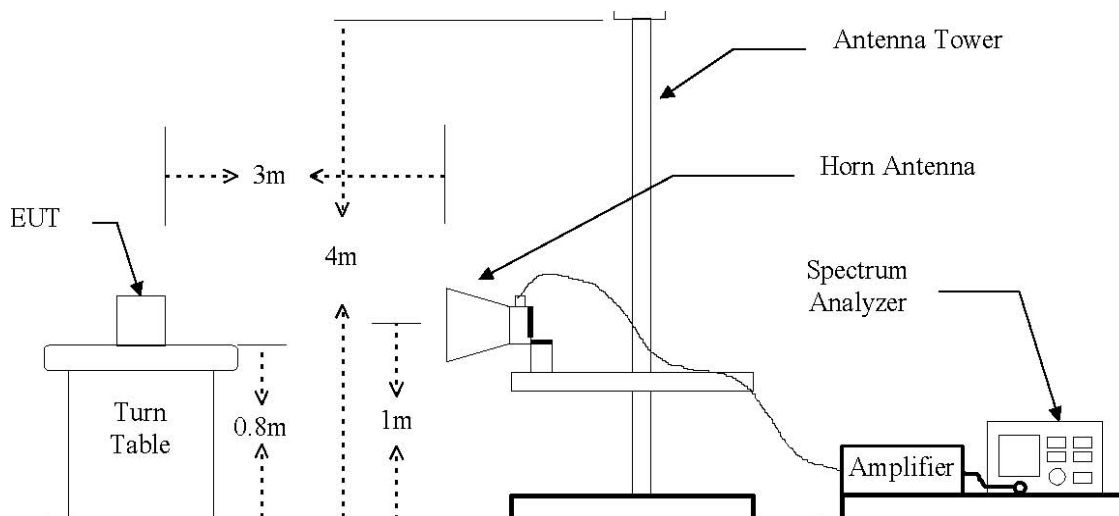
2.1. Test setup

2.1.1. Transmitter radiated spurious emissions

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

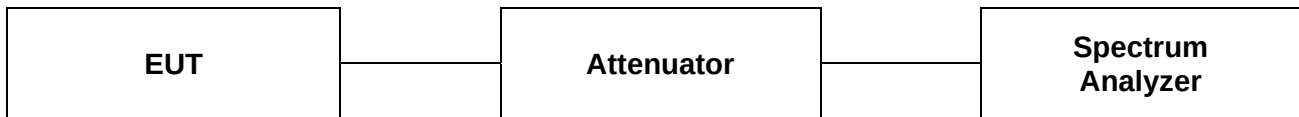


The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 40 GHz Emissions.



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2.1.2. Conducted spurious emissions



2.2. Limit

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph(b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

According to § 15.109(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 (dB µV/m)	Radiated (µV/m)
30 - 88	3	40.0	100
88 – 216	3	43.5	150
216 – 960	3	46.0	200
Above 960	3	54.0	500

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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 radiated spurious emissions

1. 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.
2. 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.
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 polarizations 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.
6. 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 120 kHz for Peak detection (PK) or Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.
3. 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.
4. When Average result is different from Peak result over 20 dB (over-averaging), we find an appropriate video bandwidth as an inverse of duty cycle period and is used for Average detection (AV) at frequency above 1 GHz.

2.3.2. Test procedures for conducted spurious emissions

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW=100 kHz, VBW=100 kHz.

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2.4. Test result

Ambient temperature : $(24 \pm 2) ^\circ\text{C}$
Relative humidity : 49 % R.H.

2.4.1. Spurious radiated emission

The frequency spectrum from 30 MHz to 1000 MHz was investigated. All emissions are not reported much lower than the prescribed limits.

Radiated emissions			Ant	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	Amp gain+CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
36.51	44.0	Peak	V	12.9	-26.3	30.6	40.0	9.4
160.02	46.3	Peak	H	8.9	-25.2	30.0	43.5	13.5
480.04	42.0	Peak	H	15.5	-24.4	33.1	46.0	12.9
719.02	37.5	Peak	H	19.7	-23.9	33.3	46.0	12.7
Above 800.00	Not detected	-	-	-	-	-	-	-

▣ Remark:

1. All spurious emission at channels are almost the same below 1 GHz, so that the channel was chosen at representative in final test.
2. Actual = Reading + AF + AMP + CL
3. To get a maximum emission level from the EUT, the EUT was moved throughout the x-axis, y-axis and z-axis. The worst case is z-axis.

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2.4.2. Spurious radiated emission for above 1 GHz

The frequency spectrum above 1000 MHz was investigated. Emission levels are not reported much lower than the limits by over 30 dB.

ANT B+C

A. Low Channel (5 755 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
5 755.00	58.50	Peak	V	34.42	8.42	101.34	-	-
5 755.00	45.37	Average	V	34.42	8.42	88.21	-	-
5 755.00	62.27	Peak	H	34.42	8.42	105.11	-	-
5 755.00	49.50	Average	H	34.42	8.42	92.34	-	-

Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain +CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
*11 509.87	41.72	Peak	H	38.22	-32.65	47.29	74.00	26.71
Above *11 600.00	Not detected	-	-	-	-	-	-	-

B. High Channel (5 795 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
5 795.00	58.15	Peak	V	34.48	8.52	101.15	-	-
5 795.00	45.36	Average	V	34.48	8.52	88.36	-	-
5 795.00	61.98	Peak	H	34.48	8.52	104.98	-	-
5 795.00	49.81	Average	H	34.48	8.52	92.81	-	-

Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain +CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
*11 581.75	41.13	Peak	H	38.21	-32.32	47.02	74.00	26.98
Above *11 600.00	Not detected	-	-	-	-	-	-	-

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■ Remarks

1. "*" means the restricted band.
2. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental Frequency.
3. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using peak/average detector mode.
4. Average test would be performed if the peak result were greater than the average limit.
5. Actual = Reading + AF + AMP + CL+Dis
6. To get a maximum emission level from the EUT, the EUT was moved throughout the x-axis, y-axis and z-axis. The worst case is z-axis..

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2.4.3. Spurious RF Conducted Emissions: Plot of Spurious RF Conducted Emission

ANT B

Low Channel



Antenna	Frequency (MHz)	Measured (dB m)	Add 10log(2) at the Result (dB m)	Limit (dB m)
ANT B	5 724	-39.87	-36.86	-31.44

It has 2 outputs and $10\log(2) = 3.01$ dB

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ANT B

High Channel



Antenna	Frequency (MHz)	Measured (dB m)	Add 10log(2) at the Result (dB m)	Limit (dB m)
ANT B	5 827	-35.79	-32.78	-29.37

It has 2 outputs and $10\log(2)$ is $10\log(2) = 3.01$ dB

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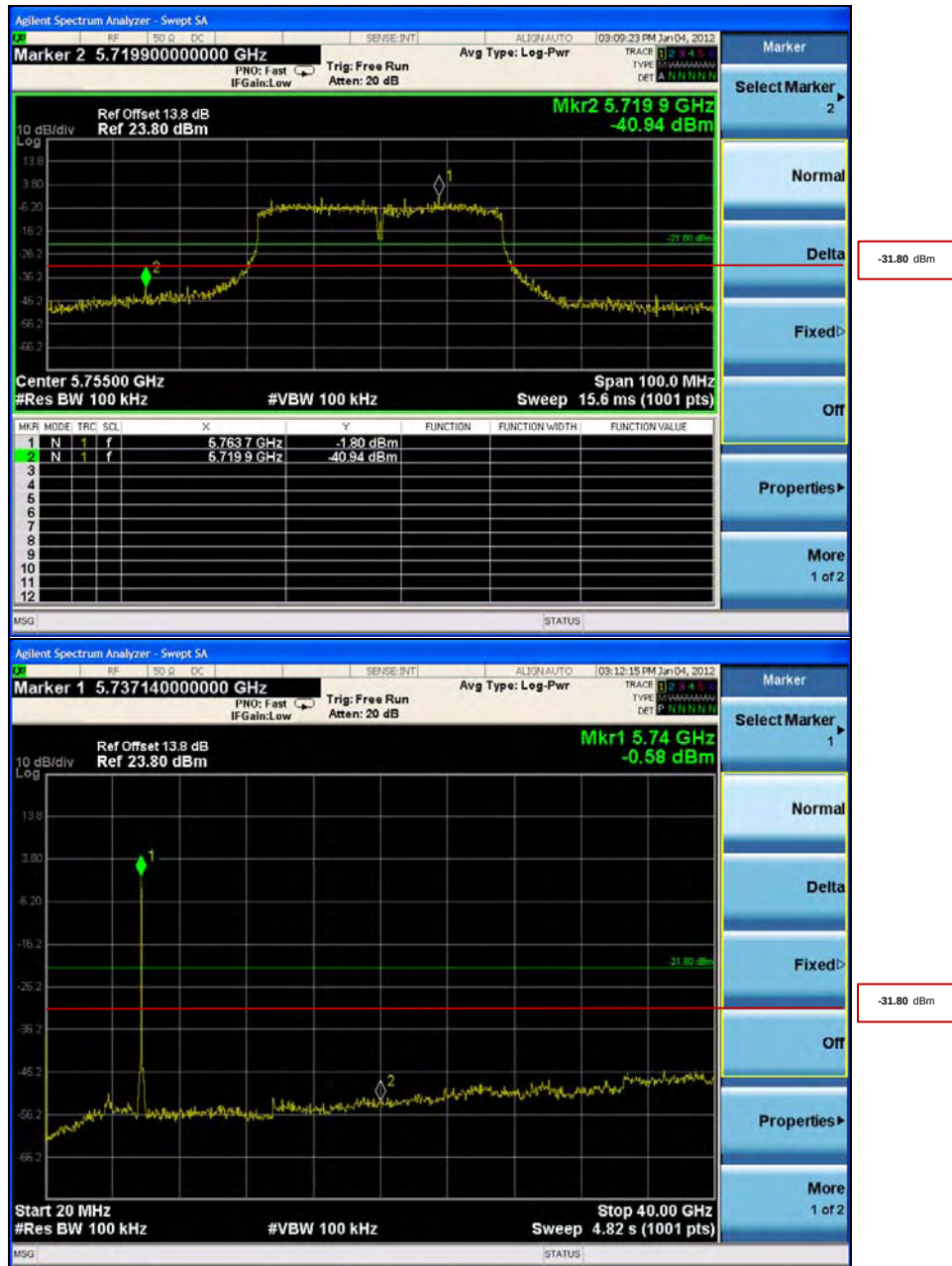
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ANT C

Low Channel



Antenna	Frequency (MHz)	Measured (dB m)	Add 10log(2) at the Result (dB m)	Limit (dB m)
ANT C	5 720	-40.94	-37.93	-31.80

It has 2 outputs and $10\log(2)$ is $10\log(2) = 3.01$ dB

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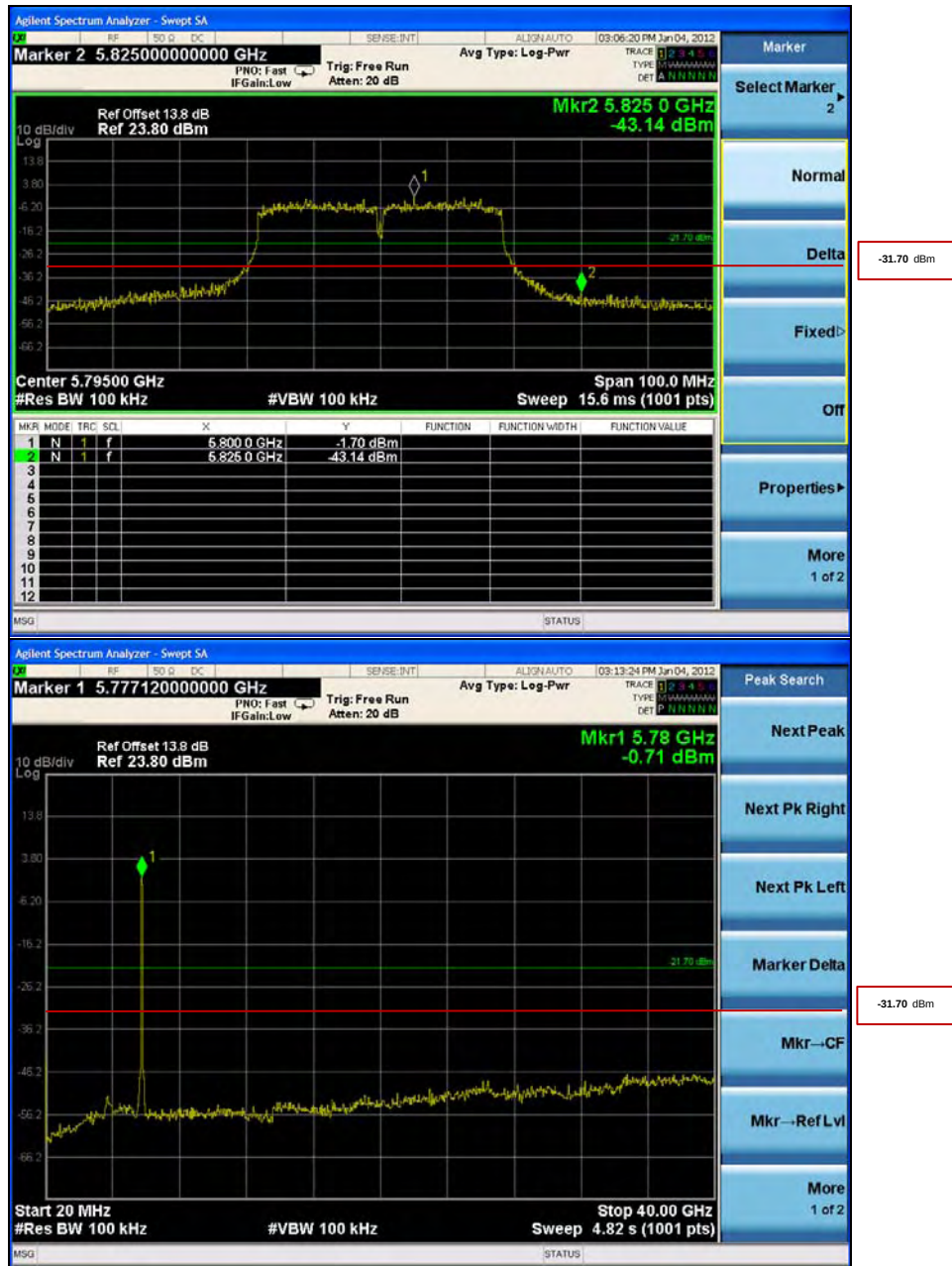
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ANT C

High Channel



Antenna	Frequency (MHz)	Measured (dB m)	Add 10log(2) at the Result (dB m)	Limit (dB m)
ANT C	5 825	-43.14	-40.13	-31.70

It has 2 outputs and $10\log(2)$ is $10\log(2) = 3.01$ dB

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3. 6 dB Bandwidth measurement

3.1. Test setup



3.2. Limit

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 ~928 MHz , 2 400 ~ 2 483.5 MHz, and 5 725 ~ 5 825 MHz bands. The minimum of 6 dB Bandwidth shall be at least 500 kHz

3.3. Test procedure

3.3.1. 6 dB bandwidth

1. The 6 dB band width was measured with a spectrum analyzer connected to RF antenna connector(conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency. The analyzer center frequency was set to the EUT carrier frequency, using the analyzer. Display Line and Marker Delta functions, the 6 dB band width of the emission was determined.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer
RBW = 100 kHz, VBW = 100 kHz, Sweep = auto.

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3.4. Test result

Ambient temperature : (24 ± 2) °C
Relative humidity : 49 % R.H.

ANTENNA	Frequency (MHz)	6 dB Bandwidth (MHz)
ANT B	5 755	36.1
	5 795	36.2
ANT C	5 755	35.8
	5 795	36.0

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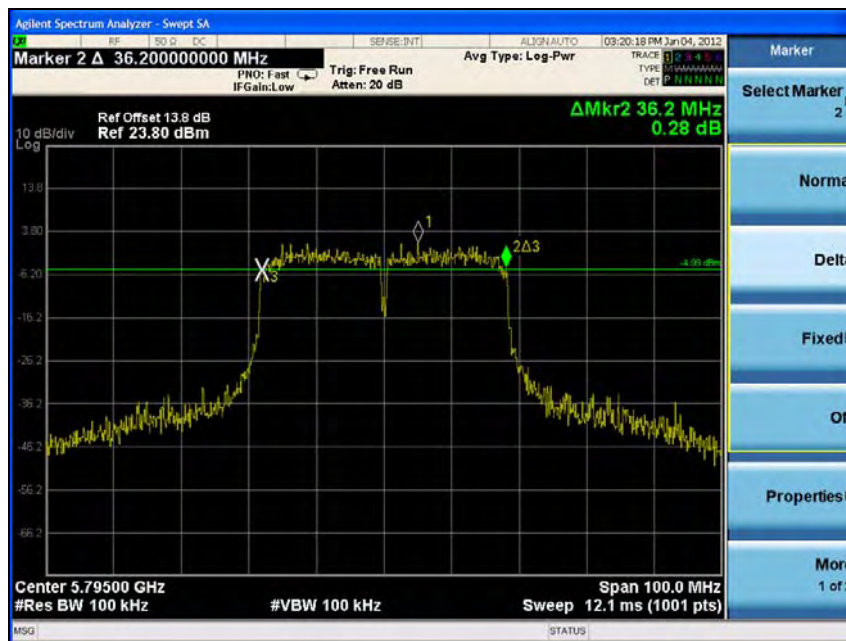
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ANT B

Low channel



High channel



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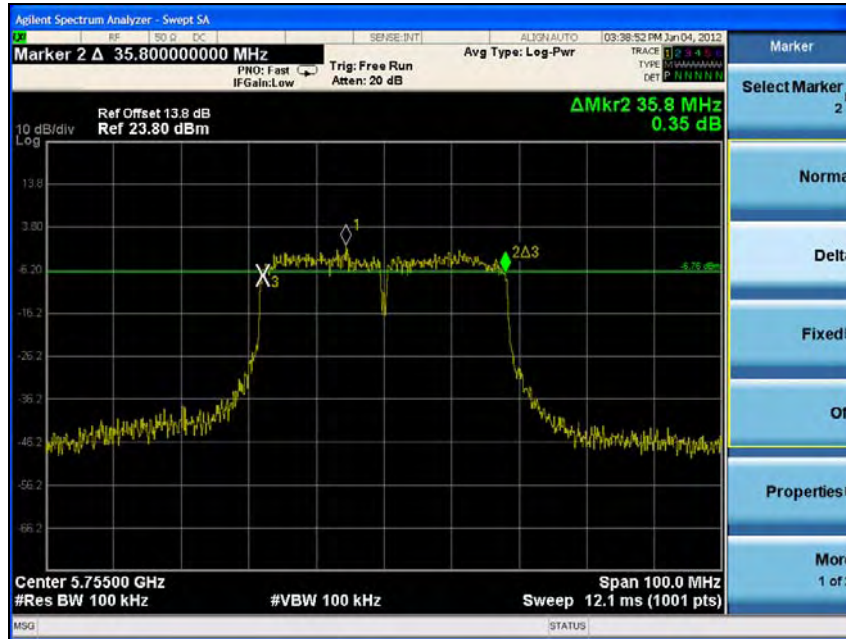
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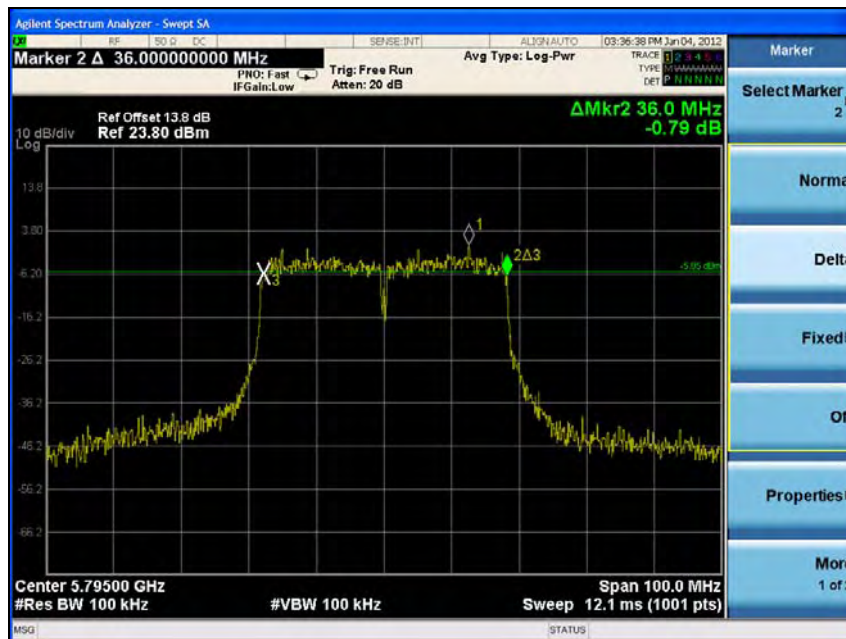
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ANT C

Low channel



High channel



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4. Maximum peak output power measurement

4.1. Test setup



4.2. Limit

According to §15.247(b)(3), for systems using digital modulation in the 902 ~ 928 MHz, 2 400 ~2 483.5 MHz, and 5 725 ~ 5 850 MHz band: 1 Watt. As an alternative to a peak power measurement, compliance with the one watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antenna elements. The average must not include any intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to §15.247(b)(4), the conducted output power limit specified in paragraph(b) of this section is based on the use of antenna with directional gains that do not exceed 6 dBi. Except as shown in paragraph(c) of this section, if transmitting antenna of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2), and (b)(3) of this section , as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.3. Test procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the Spectrum analyzer as RBW = 1 MHz, VBW ≥ 3 MHz, Span = Auto, Channel BW = 26 dB BW.
4. Use sample detector mode and trace average 100 traces in power averaging mode.

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4.4. Test result

Ambient temperature : $(24 \pm 2) ^\circ\text{C}$
Relative humidity : 49 % R.H.

Antenna	Channel	Channel Frequency (MHz)	Attenuator + Cable offset (dB)	Peak Power Limit (dB m)	Peak Power Limit (dB m)
ANTB	Low	5 755	12.24	12.11	30
	High	5 795		14.26	
ANTC	Low	5 755		10.49	
	High	5 795		12.75	
ANTB+ANTC (Calculated)	Low	5 755		14.39	
	High	5 795		16.58	

ANTB+ANTC (Calculated) = $10\log\{10^{(\text{ANTB}/10)} + 10^{(\text{ANTC}/10)}\}$

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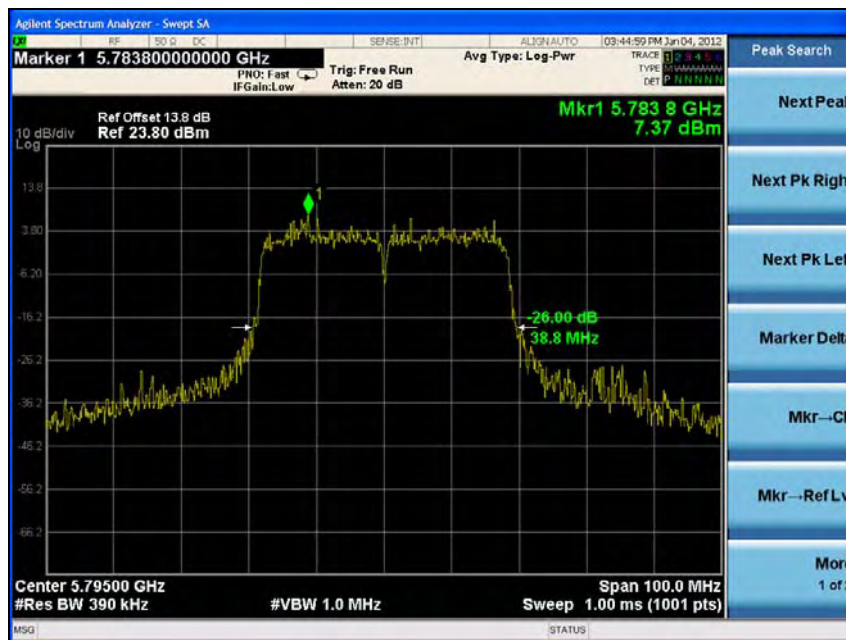
ANT B

26 dB Bandwidth

5 755 MHz



5 795 MHz



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Peak Power

5 755 MHz



5 795 MHz



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ANT C

26 dB Bandwidth

5 755 MHz



5 795 MHz



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Peak Power

5 755 MHz



5 795 MHz



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5. Power spectral density measurement

6.1. Test setup



5.2. Limit

According to §15.247(e), For digitally modulated system, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph(b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density

5.3. Test procedure

1. Place the EUT on the table and set it in transmitting mode
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3 kHz, VBW = 10 kHz, Span = 300 kHz, Sweep = 100 s
3. Record the max reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

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5.4. Test result

Ambient temperature : (24 ± 2) °C
Relative humidity : 49 % R.H.

Antenna	Frequency (MHz)	Final RF Power Level in 3 kHz BW (dB m)	Add 10log(2) at the Result (dB m)	Limit (dB m)
ANT B	5 755	-13.13	-10.12	8
	5 795	-12.33	-9.32	
ANT C	5 755	-14.41	-11.40	
	5 795	-13.83	-10.82	

It has 2 outputs and 10log (2) is **10log(2) = 3.01 dB**

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ANT B

Low channel



High channel



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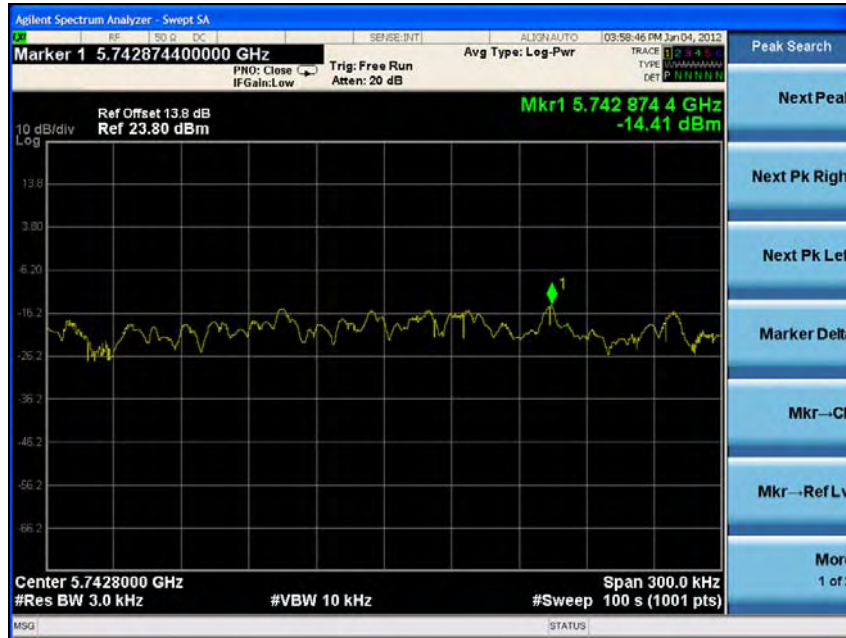
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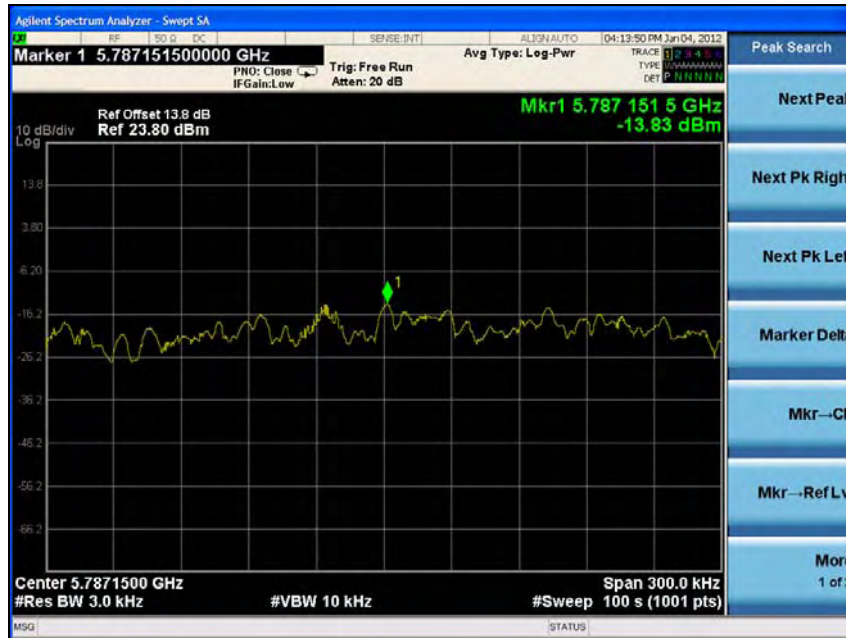
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ANT C

Low channel



High channel



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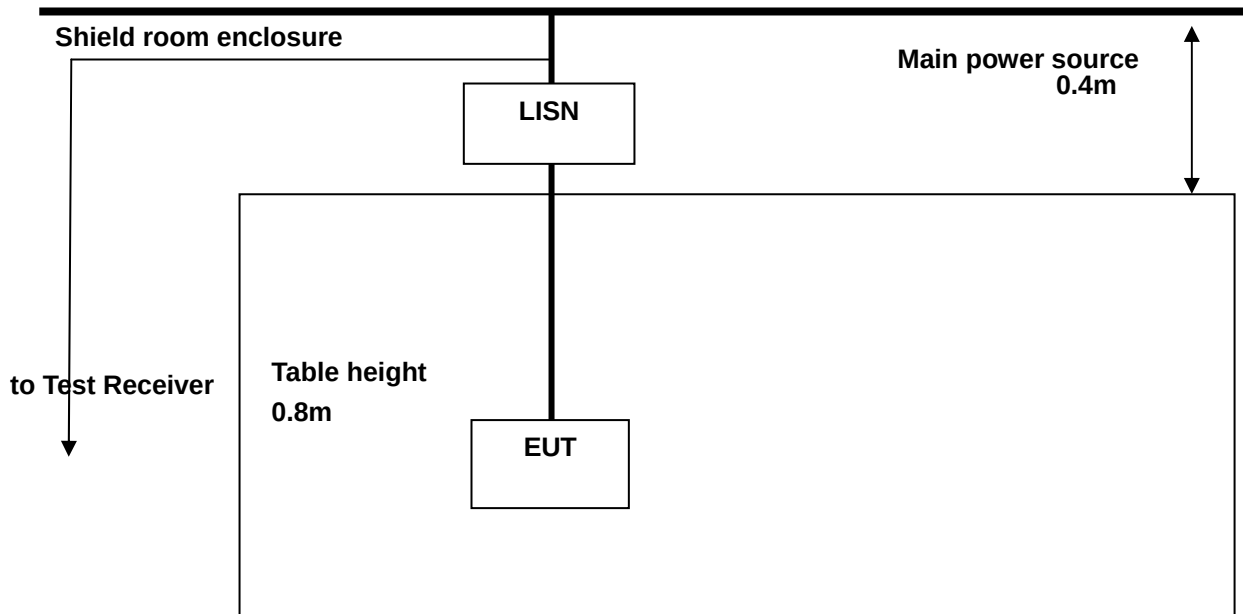
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6. Transmitter AC Power Line Conducted Emission

6.1. Test Setup



6.2. 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 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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6.3. 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 × 3.5 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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6.4. Test Results

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 μ V)		LINE	LIMIT(dB μ V)		MARGIN(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.15	45.3	32.4	H	66.0	56.0	20.7	23.6
0.21	52.5	40.5	H	63.4	53.4	10.9	12.9
0.27	46.5	36.2	H	61.1	51.1	14.6	14.9
0.41	37.2	32.1	H	57.7	47.7	20.4	15.5
0.48	36.9	35.8	H	56.3	46.3	19.4	10.5
0.55	37.1	34.7	H	56.0	46.0	18.9	11.3
0.15	46.7	33.8	N	66.0	56.0	19.4	22.3
0.21	52.9	41.0	N	63.4	53.4	10.6	12.5
0.27	45.1	36.1	N	61.1	51.1	16.0	15.0
0.48	37.7	35.5	N	56.3	46.3	18.6	10.8
0.55	34.2	31.9	N	56.0	46.0	21.9	14.2
0.97	28.4	26.3	N	56.0	46.0	27.6	19.7

Note ;

Line (H) : Hot

Line (N) : Neutral

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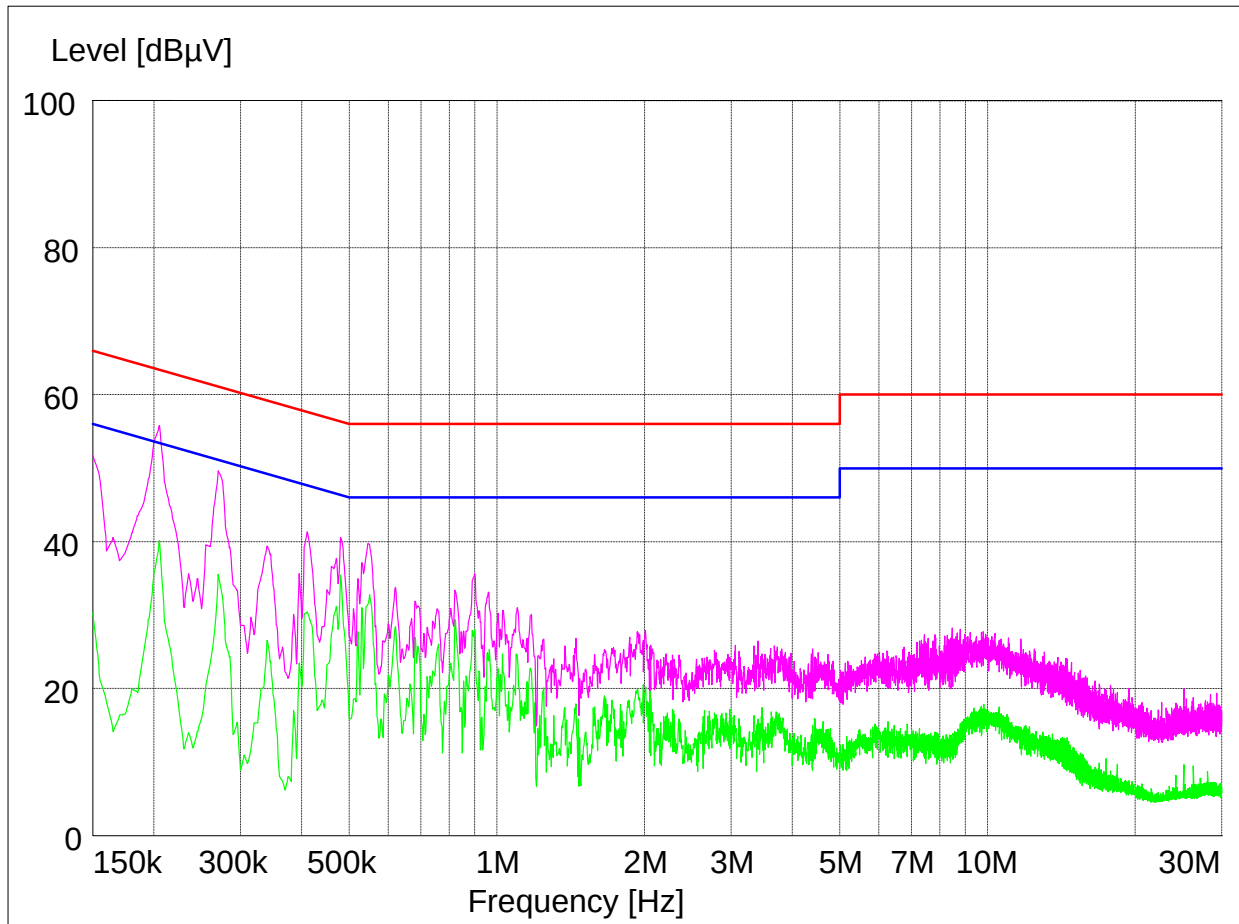
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Plot of Conducted Power line

Test mode : (Hot)



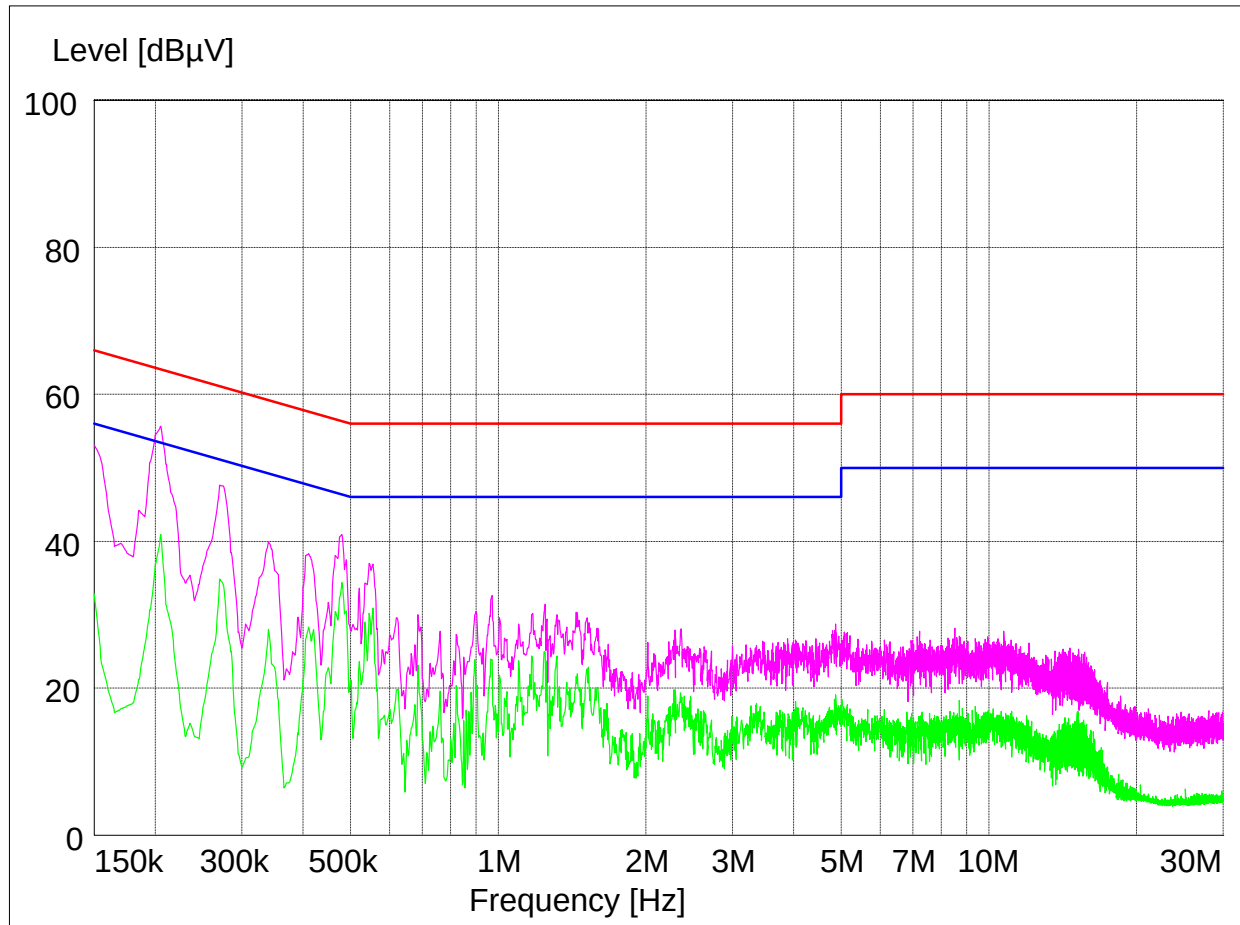
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Test mode : (Neutral)



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7. RF Exposure Evaluation

7.1. 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 ²)	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
<u>1 500 – 100 000</u>	<u>--</u>	<u>--</u>	<u>1</u>	<u>30</u>

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

Where P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

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

P_d the limit of MPE, 1 mW/cm². 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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7.1.2. Test Result of RF Exposure Evaluation

Test Item : RF Exposure Evaluation Data

Test Mode : Normal Operation

7.1.3. Output Power into Antenna & RF Exposure Evaluation Distance

Antenna	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
ANT B	5 755	12.11	3.03	0.006 497	1
	5 795	14.26	2.57	0.009 588	
ANT C	5 755	10.49	3.05	0.004 495	
	5 795	12.75	3.22	0.007 866	
ANT B +ANT C (Calculated)	5 755	14.39	6.05	0.022 016	
	5 795	16.58	5.91	0.035 296	

Note :

The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below each limits.

7.1.4. The highest MPE power density of bands respectively

Band (MHz)	Operation Mode	Antenna	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)
5 755 - 5 795	11n-HT40	ANTB+ANTC (Calculated)	5 795	16.58	100	5.91	0.035 3
5 190 - 5 230	11n-HT40	ANTB+ANTC (Calculated)	5 230	15.06	100	5.77	0.025 2
Combined							0.060 5

N1 : The highest output average power to antenna of 5 755 - 5 795 MHz band

N2 : The highest output average power to antenna of 5 190 - 5 230 MHz band

Formula

ANTB+ANTC (Calculated)

Power : $10\log\{10^{(ANTB/10)}+10^{(ANTC/10)}\}$

Gain : $10\log\{[10^{(ANTB/20)}+10^{(ANTC/20)}]^2/2\}$

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8. Antenna Requirement

8.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section § 15.247 (b), if transmitting antennas of directional gain greater than 6 dB i are used, the power shall be reduced by the amount in dB that the gain of the antenna exceeds 6 dB i.

8.2. Antenna Connected Construction

The antenna used of this product is PIFA antenna.

The peak max gain of each antennas ANT B & ANT C and calculated antenna gain of ANT B+ANT C are as below :

Antenna	5 755 MHz	5 795 MHz	5 190 MHz	5 230 MHz
ANT B	3.03 dB i	2.57 dB i	2.53 dB i	3.06 dB i
ANT C	3.05 dB i	3.22 dB i	2.54 dB i	2.45 dB i
ANT B +ANT C (Calculated)	6.05 dB i	5.91 dB i	5.55 dB i	5.77 dB i

- $ANTB+ANTC \text{ (Calculated)} = 10\log\left[\frac{10^{(ANTB/20)} + 10^{(ANTC/20)}}{2}\right]$
- For 5 755 MHz, the gain of the antenna exceeds 6 dB i is 0.05 dB.
- Calculated peak power of ANT B + ANT C at 5 755 MHz is 14.39 dBm and the worst case.

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