

TEST REPORT

of

FCC Part 15 Subpart B&C §15.249/RSS-210 Issue 7, RSS-Gen Issue 2

FCC ID/IC Certification: A3LWEP460/649E-WEP460

Equipment Under Test : Bluetooth Mono Headset
Model Name : WEP460
Serial No. : N / A
Applicant : SAMSUNG ELECTRONICS CO.,LTD.
Manufacturer : SAMSUNG ELECTRONICS CO.,LTD.
Date of Test(s) : 2008.09.16 ~ 2008.09.18
Date of Issue : 2008.09.19

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

Tested By:



Date

2008.09.19

Duke Ko

Approved By



Date

2008.09.19

Jim Kim

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1. General Information

1.1. Testing Laboratory

SGS Testing Korea Co., Ltd.
- 705, Dongchun-Dong Sooji-Gu, Yongin-Shi, Kyungki-Do, South Korea.
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Telephone : +82 +31 428 5700
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1.2. Details of Applicant

Applicant : SAMSUNG ELECTRONICS CO.,LTD.
Address : 416, Maetan-dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea
Contact Person : Jo, Jonghyuk
Phone No. : +82 +31 301 5705
Fax No. : +82 +31 301 7609

1.3. Description of EUT

Kind of Product	Bluetooth Mono Headset
Model Name	WEP460
Serial Number	N / A
Power Supply	DC 3.7 V (Li-poly Battery)
Adapter's Information	Input : AC 100~240 V / Output : DC 4.75 V
Frequency Range	2402 ~ 2480 MHz
Modulation Technique	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channels	79
Operating Conditions	-20 ~ 60 °C
Antenna Type	Integral Type (Chip Antenna)
Antenna Gain	-0.63 dBi
H/W Version	REV1.0
S/W Version	WEP460_SW01

1.4. Details of modification

-N/A

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1.5. Information about the FHSS characteristics:

1.5.1. Pseudorandom Frequency Hopping Sequence

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1600 hops/s.

1.5.2. Equal Hopping Frequency Use

All Bluetooth units participating in the piconet are time and hop-synchronized to the channel.

1.5.3. System Receiver Input Bandwidth

Each channel bandwidth is 1MHz

1.6. Test Equipment List

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Bluetooth Tester	TESOM	TC-3000B	Dec. 11, 2008
Two-Line V-Network	R & S	ENV216	Jan. 17, 2009
Test Receiver	Rohde & Schwarz	ESVS10	Mar. 21, 2009
Test Receiver	ESHS 10	Rohde & Schwarz	Jul. 21, 2009
Preamplifier	Agilent	8449B	May 09, 2009
High Pass Filter	Wainwright Instrument GmbH	WHK3.0/18 G-11SS	Dec. 06, 2008
Ultra-Broadband Antenna	Rohde & Schwarz	HL562	Oct. 11, 2008
Horn Antenna	Electro-Metrics	HF906	Nov. 13, 2009
Anechoic Chamber	SY Corporation	L x W x H 6.5 m x 3.5 m x 3.5 m	Feb. 15, 2009

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1.7. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD:FCC Part15, RSS-210,RSS-Gen			
Section in FCC 15	Section in RSS-210 RSS-Gen	Test Item	Result
15.207	RSS-Gen 7.2.2	Transmitter AC Power Line Conducted Emission	Complied
15.107	RSS-Gen 7.2.2	Receiver AC Power Line Conducted Emission	Complied
15.205(a) 15.209 15.247(d)	A8.5	Transmitter Radiated Spurious Emissions	Complied
15.109(a)	RSS-Gen 6	Receiver Radiated Spurious Emission	Complied

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1.8. Conclusion of worst-case and operation mode

The EUT has three type of modulation (GFSK, $\pi/4$ DQPSK and 8DPSK). Each output power as following:

Modulation Type	Ouput power(dBm)	Output power(mW)	Symbol rate
GFSK(2480 MHz)	2.83	1.92	1Mbps
$\pi/4$ DQPSK(2480 MHz)	3.12	2.05	2Mbps
8DPSK(2480 MHz)	3.16	2.07	3Mbps

Therefore all applicable requirements were tested to the two type of higher output power modulation (GFSK and 8DPSK) at high channel (2480 MHz).

The field strength of spurious emission was measured in three orthogonal EUT positions(X-axis, Y-axis and Z-axis). Worst case is Z-axis.

1.9 Test report revision

Revision	Report number	Description
0	F690501/RF-RTL002679	Initial

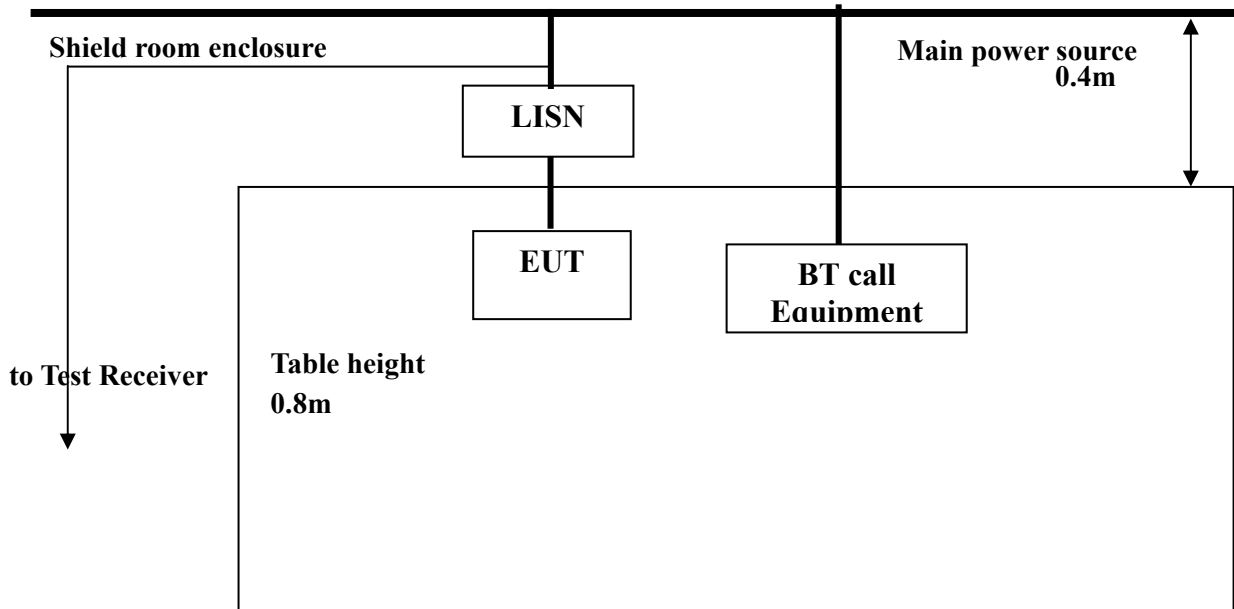
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2. Transmitter AC Power Line Conducted Emission

2.1. Test Setup



2.2. 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 (dBμV)	
	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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2.3. 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 6.5m × 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.
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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2.4. Test Results(Worst case configuration_8DPSK mode)

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

Ambient temperature : 24 °C Relative humidity : 47 % R.H.

Frequency range : 0.15 MHz – 30 MHz

Measured Bandwidth : 9 kHz

FREQ. (MHz)	LEVEL(dBuV)		LINE	LIMIT(dBuV)		MARGIN(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.16	35.40	18.10	H	65.46	55.46	30.06	37.36
0.20	23.50	23.50	H	63.61	53.61	40.11	30.11
0.24	34.00	19.50	H	62.10	52.10	28.10	32.60
0.26	33.30	18.60	H	61.43	51.43	28.13	32.83
0.50	33.50	21.50	H	56.00	46.00	22.50	24.50
0.67	32.90	20.60	H	56.00	46.00	23.10	25.40
0.15	35.00	16.50	N	66.00	56.00	31.00	39.50
0.19	33.50	16.80	N	64.04	54.04	30.54	37.24
0.22	32.80	16.20	N	62.82	52.82	30.02	36.62
0.42	32.20	19.90	N	57.45	47.45	25.25	27.55
0.49	32.00	19.40	N	56.17	46.17	24.17	26.77
0.76	29.30	17.70	N	56.00	46.00	26.70	28.30

Note ;

Line (H) : Hot

Line (N) : Neutral

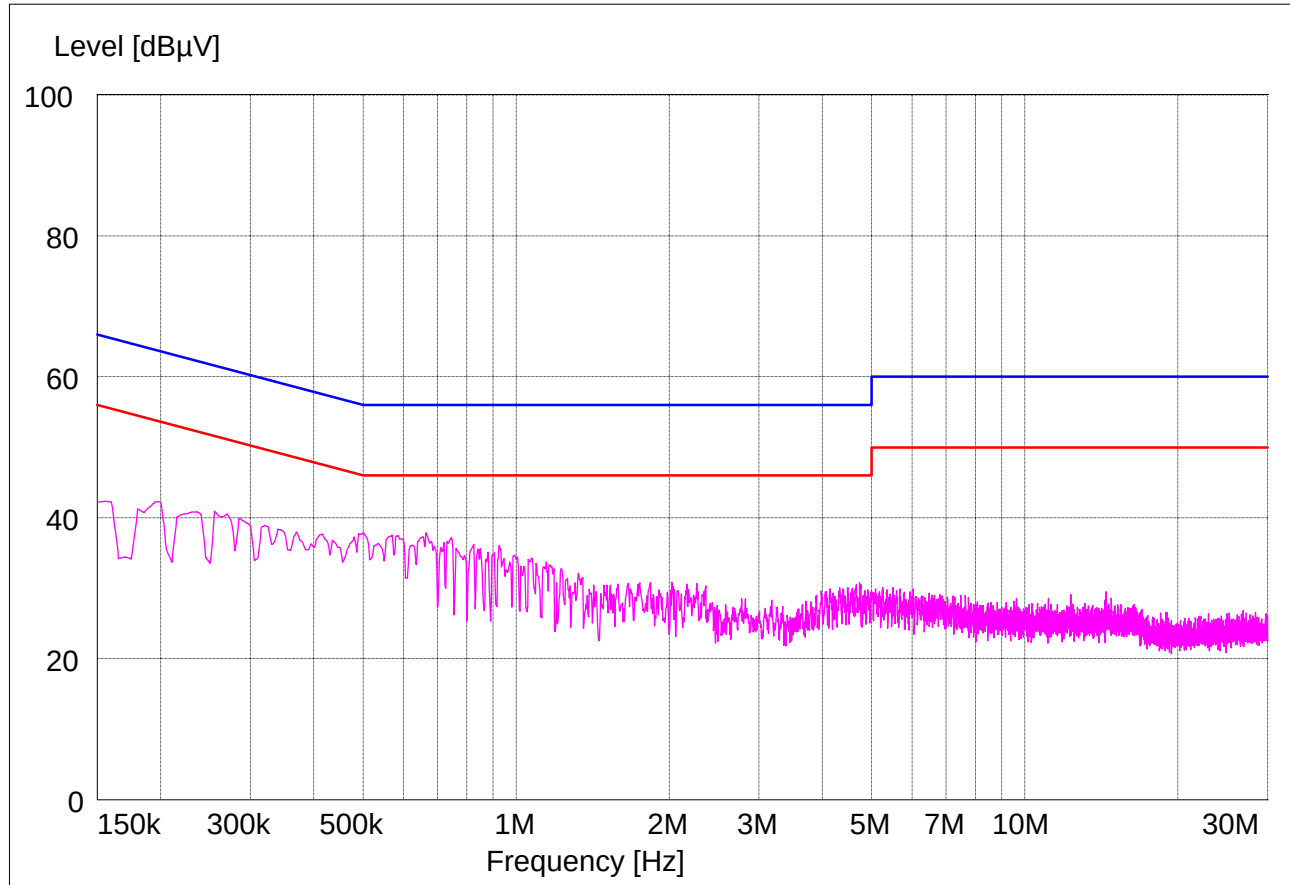
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Plot of Conducted Power line

Test mode : (Hot)

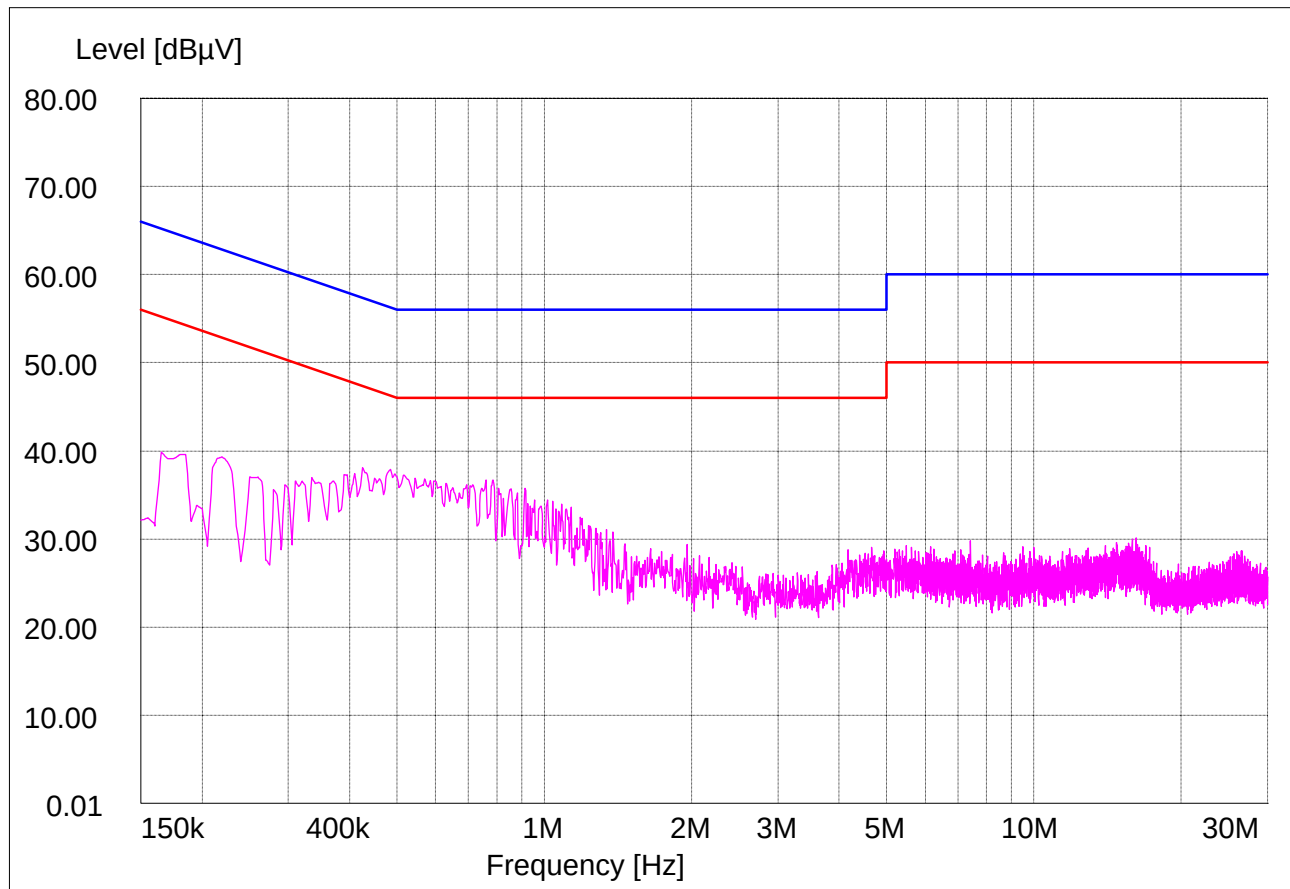


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Test mode : (Neutral)



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3. Receiver AC Power Line Conducted Emission

3.1. Test Setup- Same as clause 2.1.

3.2. Limit

According to §15.107(a) Except for Class A digital devices, for equipment 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 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

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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3.3. Test Procedures- Same as clause 2.3.

3.4. Test Results (Worst case configuration_8DPSK mode)

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

Ambient temperature : 24 °C Relative humidity : 47 % R.H.

Frequency range : 0.15 MHz – 30 MHz

Measured Bandwidth : 9 kHz

FREQ. (MHz)	LEVEL(dBuV)		LINE	LIMIT(dBuV)		MARGIN(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.24	37.60	35.20	H	62.10	52.10	24.50	16.90
0.36	32.20	29.80	H	58.73	48.73	26.53	18.93
0.47	33.10	30.60	H	56.51	46.51	23.41	15.91
0.71	38.80	36.60	H	56.00	46.00	17.20	9.40
0.83	37.30	35.10	H	56.00	46.00	18.70	10.90
1.19	33.60	27.90	H	56.00	46.00	22.40	18.10
0.24	30.70	21.30	N	62.10	52.10	31.40	30.80
0.36	24.80	17.90	N	58.73	48.73	33.93	30.83
0.47	24.10	19.10	N	56.51	46.51	32.41	27.41
0.71	25.30	19.50	N	56.00	46.00	30.70	26.50
1.90	24.60	17.20	N	56.00	46.00	31.40	28.80
2.49	24.30	16.40	N	56.00	46.00	31.70	29.60

Note ;

Line (H) : Hot

Line (N) : Neutral

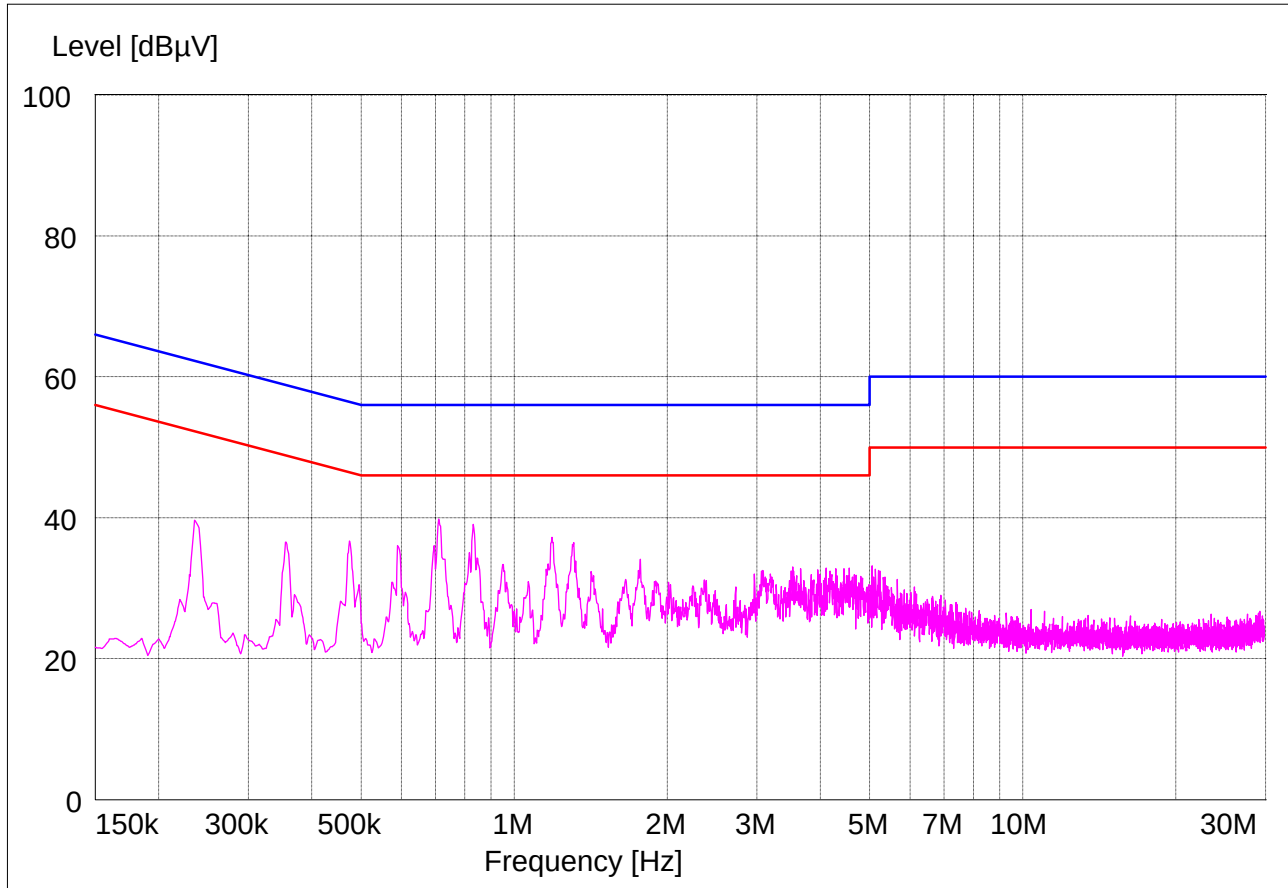
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Plot of Conducted Power line

Test mode : (Hot)

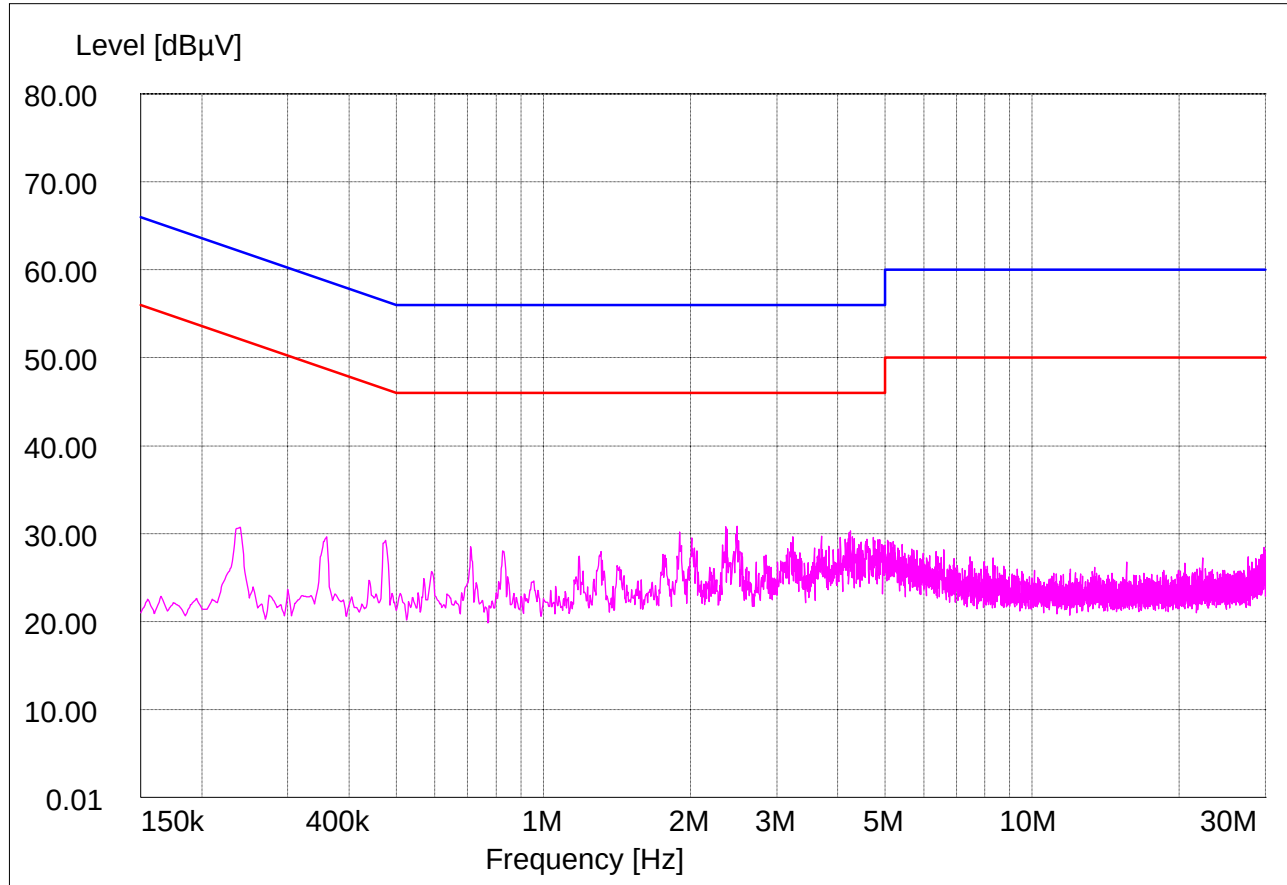


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Test mode : (Neutral)



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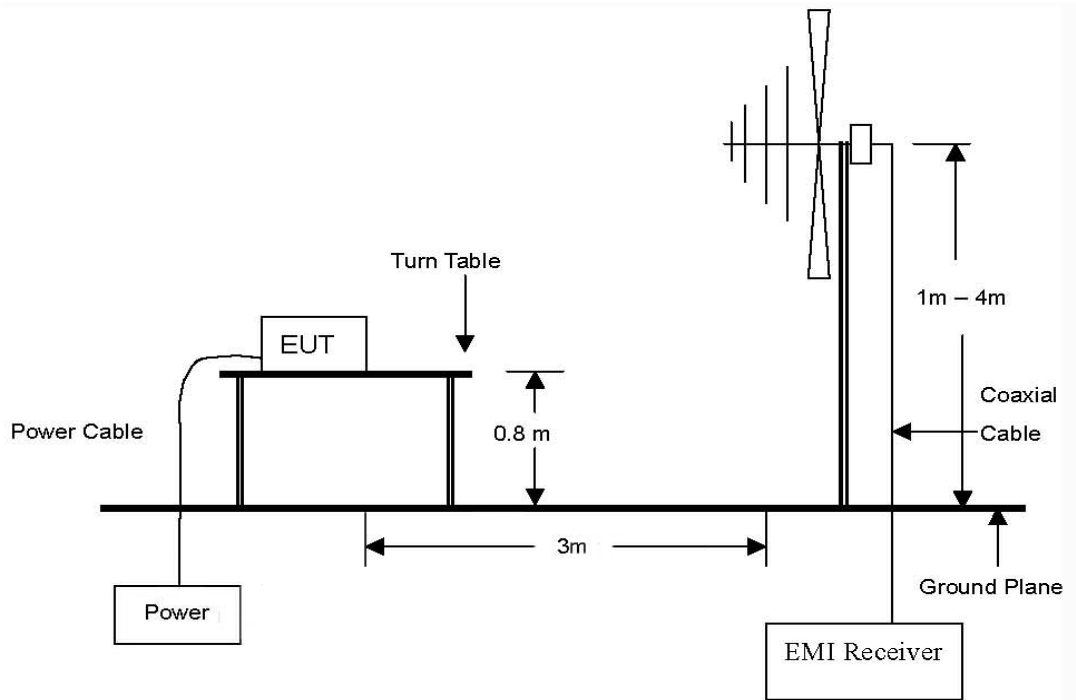
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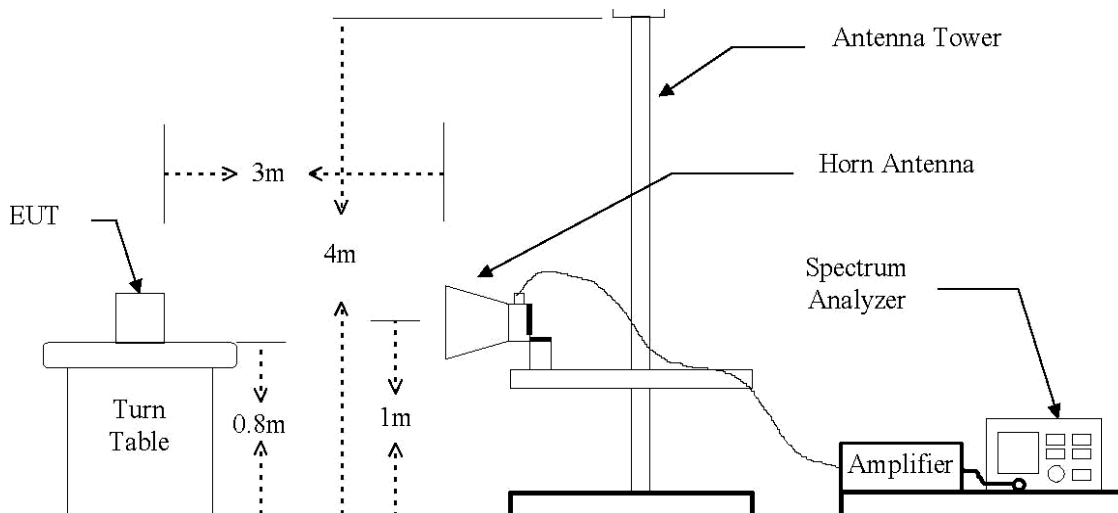
4. Transmitter Radiated Spurious Emissions

4.1. 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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4.2. 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 § 15.209(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)	Distance (Meters)	Field Strength (dBμV/m)	Field Strength (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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4.3. 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 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) and Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz 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.

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4.4. Test result

Ambient temperature : 24 °C Relative humidity : 47 % R.H.

4.4.1. Spurious Radiated Emission (Worst case configuration_8DPSK mode)

The frequency spectrum from 30 MHz to 1000 MHz was investigated. Emission levels are not reported much lower than the limits by over 30 dB. All reading values are quasi-peak values.

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
32.425	44.7	Q.P.	V	18.04	-27.80	34.94	40.0	5.06
37.275	42.3	Q.P.	V	15.47	-27.72	30.05	40.0	9.95
49.400	52.9	Q.P.	V	8.18	-27.55	33.54	40.0	6.46
54.250	57.2	Q.P.	V	6.02	-27.51	35.70	40.0	4.30
71.225	42.9	Q.P.	V	6.78	-27.32	22.36	40.0	17.64
112.450	33.9	Q.P.	V	9.40	-26.94	16.36	43.5	27.14
Above 200.000	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. “*” means the restricted band.
3. Actual = Reading + AF + AMP + CL
4. The emission levels above 200 MHz are very lower than the limit by over 30 dB.

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4.4.2. Spurious Radiated Emission

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

Operating Mode: GFSK

A. Low Channel (2402 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2390.00*	47.17	Peak	H	28.05	-28.19	47.03	74.00	26.97
4803.91	43.86	Peak	H	32.95	-24.77	52.04	74.00	21.96
Above 4900.00	Not detected	-	-	-	-	-	-	-

B. Middle Channel (2441 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4882.03	42.52	Peak	H	33.17	-25.07	50.62	74.00	23.38
Above 4900.00	Not detected	-	-	-	-	-	-	-

C. High Channel (2480 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2483.50*	46.11	Peak	H	28.18	-28.14	46.15	74.00	27.85
4959.84	42.37	Peak	H	33.39	-24.95	50.81	74.00	23.19
Above 5000.00	Not detected	-	-	-	-	-	-	-

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Operating Mode: 8DPSK

A. Low Channel (2402 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2390.00*	45.55	Peak	H	28.05	-28.19	45.41	74.00	28.59
4803.89	42.01	Peak	H	32.95	-24.77	50.19	74.00	23.81
Above 4900.00	Not detected	-	-	-	-	-	-	-

B. Middle Channel (2441 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4881.55	42.42	Peak	H	33.17	-25.07	50.52	74.00	23.48
Above 4900.00	Not detected	-	-	-	-	-	-	-

C. High Channel (2480 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2483.50*	46.47	Peak	H	28.18	-28.14	46.51	74.00	27.49
4960.73	41.79	Peak	H	33.39	-24.95	50.23	74.00	23.77
Above 5000.00	Not detected	-	-	-	-	-	-	-

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 1000 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 Gain + CL

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5. Receiver Radiated spurious emissions

5.1. Test setup - Same as clause 4.1.

5.1.1. Receiver Radiated Spurious Emissions - Same as clause 4.1.1.

5.2. Limit

According to §15.109(a), Except for Class A digital devices, the field strength of radiated emission from unintentional radiator at a distance of 3 m shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/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

5.3. Test Procedures - Same as clause 4.3.

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

5.3.1. Test Procedures for Radiated Spurious Emissions- Same as clause 4.3.1.

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5.4. Test Results

Ambient temperature : 24 °C Relative humidity : 47 % R.H.

3.4.1. Spurious Radiated Emission (Worst case configuration_8DPSK mode)

The frequency spectrum from 30 MHz to 1000 MHz was investigated. Emission levels are not reported much lower than the limits by over 30 dB. All reading values are quasi-peak values.

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
39.700	41.4	Q.P.	H	14.16	-27.68	27.88	40.0	12.12
51.825	50.0	Q.P.	V	7.03	-27.53	29.51	40.0	10.49
59.100	45.9	Q.P.	V	3.98	-27.48	22.40	40.0	17.60
71.225	42.8	Q.P.	V	6.78	-27.32	22.26	40.0	17.74
112.450	33.2	Q.P.	V	9.40	-26.94	15.66	40.0	24.34
122.150	33.0	Q.P.	H	9.52	-26.84	15.67	43.5	27.83
Above 200.000	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. “*” means the restricted band.
3. Actual = Reading + AF + AMP + CL

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Appendix A-1. Photo of Spurious Emission Test

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Appendix A -2. Photos of Conducted Power Line Test



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