RF TEST REPORT

Test item	:	Notebook Computer
Model No.	:	LG13Z95, 13Z950, 13ZB950, 13ZD950, 13ZV950, LG13Z94, 13Z940, 13ZB940, 13ZD940, 13ZV940
Order No.	:	DTNC1503-01165
Date of receipt	:	2015-03-17
Test duration	:	2015-04-23 ~ 2015-05-06
Date of issue	:	2015-07-06
Use of report	:	FCC Original Grant

Applicant : LG Electronics USA, Inc.
1000 Sylvan Avenue, Englewood Cliffs, New Jersey 07632

Test laboratory : DT&C Co., Ltd.
42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935

Test specification : FCC Part 15 Subpart C 247

Test environment : See appended test report

Test result : ☒ Pass ☐ Fail

Tested by:

Engineer
Jaejin Lee

Reviewed by:

Technical Manager
Geunki Son

Test Report Version

Test Report No.	Date	Description
DRTFCC1507-00160	Jul. 06, 2015	Initial issue

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1. EUT DESCRIPTION

FCC Equipment Class	Digital Transmission System(DTS)
Product	Notebook Computer
Model Name	LG13Z95
Add Model Name	13Z950, 13ZB950, 13ZD950, 13ZV950, LG13Z94, 13Z940, 13ZB940, 13ZD940, 13ZV940
Serial Number	Identical prototype
Hardware version	1.0
Software version	1.0
Power Supply	AC 120 V
Frequency Range	**2.4 GHz Band** ▪ 802.11b/g/n(HT20): 2412 MHz ~ 2462 MHz ▪ 802.11n(HT40): 2422 MHz ~ 2452 MHz
Modulation Type	▪ 802.11b: CCK/DSSS ▪ 802.11g/n: OFDM
Transmissions category	Completely uncorrelated signal
Antenna Specification	**Antenna type**: Internal Antenna **Antenna gain** ▪ 2.4 GHz Band: ANT 1 : 2.26 dBi & ANT 2 : 0.83 dBi **Antenna configuration** ▪ 802.11b/g: Single Transmitting (ANT 1 or ANT 2) ▪ 802.11n(MCS 0 ~ 7): Single Transmitting (ANT 1 or ANT 2) ▪ 802.11n(MCS 8 ~ 15): Multiple Transmitting (ANT 1 and ANT 2)

2. INFORMATION ABOUT TESTING

2.1 Test mode

Test mode	Worst case data rate	Tested Frequency(MHz)		
		Lowest	Middle	Highest
TM 1	802.11b 1 Mbps	2412	2437	2462
TM 2	802.11g 54 Mbps	2412	2437	2462
TM 3	802.11n(HT20) MCS 7, MCS 15	2412	2437	2462
TM 4	802.11n(HT40) MCS 7, MCS 15	2422	2437	2452

Note 1: The worst case data rate is determined as above test mode according to the power measurements. And radiated spurious emission was performed at the worst case data rate.

2.2 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

2.3 Tested environment

Temperature	:	21 ~ 24 °C
Relative humidity content	:	42 ~ 49 % R.H..
Details of power supply	:	AC 120 V

2.4 EMI suppression Device(s) / Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. SUMMARY OF TESTS

FCC Part Section(s)	Parameter	Limit	Test Condition	Status Note 1
15.247(a)	6 dB Bandwidth	> 500 kHz	Conducted	**NT** Note 2
15.247(b)	Transmitter Output Power	< 1 Watt		**C**
15.247(d)	Out of Band Emissions / Band Edge	20 dBc in any 100 kHz BW		**NT** Note 2
15.247(e)	Transmitter Power Spectral Density	< 8 dBm / 3 kHz		**NT** Note 2
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	FCC 15.209 limits	Radiated	**C** Note 3
15.207	AC Conducted Emissions	FCC 15.207 limits	AC Line Conducted	**C**
15.203	Antenna Requirements	FCC 15.203 limits	-	**C**

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

Note 2: These test items were not performed because this device uses the granted module.
FCC ID: PD97260NG, PD97260NGU
IC: 1000M-7260NG
Please refer to the test report of the granted module.
The module test report number: 12121201.fcc01

Note 3: This test item was performed in each axis and the worst case data was reported.

4. TEST METHODOLOGY

Generally the tests were performed according to the KDB 558074 D01 DTS Meas. Guidance v03r2 and KDB 662911 D01 v02r01 for the measure-and-sum technique. And ANSI C63.10-2009 was used to reference appropriate EUT setup and maximizing procedures of radiated spurious emission and AC line conducted emission testing

4.1 EUT configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT exercise

The EUT was operated in the test mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

4.3 General test procedures

Conducted Emissions

The power-line conducted emission test procedure is not described on the KDB 558074 D01 DTS Meas. Guidance v03r2. So this test was fulfilled with the requirements in Section 6.2 of ANSI C63.10.
The EUT is placed on a wooden table, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and Average detector.

Radiated Emissions

Basically the radiated tests were performed with KDB 558074 D01 DTS Meas. Guidance v03r2. But some requirements and procedures like test site requirements, EUT setup and maximizing procedure were fulfilled with the requirements in Section 5 and 6 of the ANSI C63.10 as stated on section 12.1 of the KDB 558074 D01 DTS Meas. Guidance v03r2.
The EUT is placed on a non-conductive table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the highest emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section6.3 of ANSI C63.10

4.4 Description of test modes

A test program is used to control the EUT for staying in continuous transmitting mode.

5. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

6. FACILITIES AND ACCREDITATIONS

6.1 Facilities

The open area test site(OATS) or semi anechoic chamber and conducted measurement facility used to collect the radiated and conducted test data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935. The site is constructed in conformance with the requirements.

- Semi anechoic chamber registration Number: 165783 (FCC)

6.2 Equipment

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and peak, quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements. All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

7. ANTENNA REQUIREMENTS

7.1 According to FCC 47 CFR §15.203

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The EUT used two non standard antenna connectors.

Therefore this module complies with the requirement of §15.203.

7.2 Directional antenna gain(worst case):

Bands	ANT 1 [dBi]	ANT 2 [dBi]	Directional Gain [dBi]
2.4 GHz	2.26	0.83	1.60 Note 2.

Note 1. Directional gain(correlated signal with unequal antenna gain and equal transmit power)

$$10 \log [(10^{G_1/20} + 10^{G_2/20} + \ldots + 10^{G_N/20})^2 / N^{ANT}] \text{ dBi}$$

Note 2. Directional gain(completely uncorrelated signal with unequal antenna gain and equal transmit power)

$$10 \log [(10^{G_1/10} + 10^{G_2/10} + \ldots + 10^{G_N/10}) / N^{ANT}] \text{ dBi}$$

Note 3. Directional gain(spatial multiplexing)

$$G_{ANT\,MAX} + 10 \log (N_{ANT} / N_{SS}) \text{ dBi}$$

8. TEST RESULT

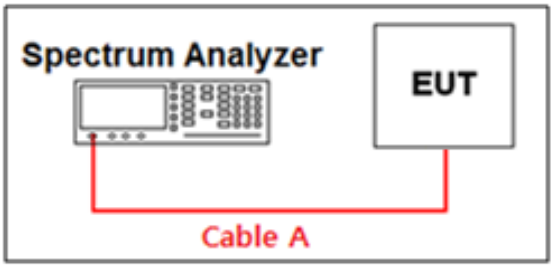
8.1 6dB bandwidth

▣ **Test Requirements and limit, §15.247(a)**

The bandwidth at 6 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

The minimum permissible 6 dB bandwidth is 500 kHz.

▣ **Test Configuration**



▣ **Test Procedure:** *KDB 558074 D01 DTS Meas. Guidance v03r2*

1. Set resolution bandwidth (RBW) = 100 kHz & video bandwidth (VBW) ≥ 3 x RBW.
   (RBW: 100 kHz & VBW: 300 kHz)
2. Detector = **Peak**.
3. Trace mode = **max hold**.
4. Sweep = **auto couple**.
5. Allow the trace to stabilize.
6. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

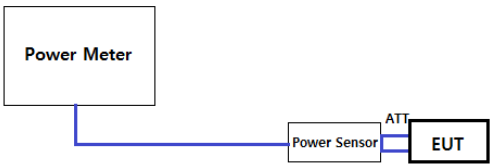
▣ **Test Results:** NT

8.2 Maximum peak conducted output power

▣ Test Requirements and limit, §15.247(b)

The maximum permissible conducted output power is **1 Watt**.

▣ Test Configuration



▣ Test Procedure: *KDB 558074 D01 DTS Meas. Guidance v03r2*

1. **PKPM1 Peak power meter method**

   The maximum conducted output powers were measured using a broadband peak RF power meter which has greater video bandwidth than DUT's DTS bandwidth and utilize a fast-responding diode detector.

2. **Method AVGPM-G (Measurement using a gated RF average power meter)**

   The average conducted output powers were measured using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

Note: The measure-and-sum technique is used for test mode with multiple transmitting.

▣ Test Results: Comply

- **Single transmitting mode**
  - **Single transmitting**

ANT	Freq. (MHz)	Det.	Maximum Peak Conducted Output Power (dBm) for *802.11b*			
			Data Rate [Mbps]			
			1	2	5.5	11
ANT 1	2412	PK	14.78	14.70	14.72	14.77
		AV	12.19	12.15	12.06	12.13
	2437	PK	14.98	14.96	14.94	14.97
		AV	12.71	12.60	12.53	12.66
	2462	PK	**15.30**	15.22	15.25	15.28
		AV	13.29	13.21	13.13	13.27
ANT 2	2412	PK	13.32	13.06	13.26	13.24
		AV	10.64	10.42	10.61	10.53
	2437	PK	13.56	13.32	13.48	13.50
		AV	11.06	10.91	11.01	10.94
	2462	PK	**13.58**	13.44	13.51	13.47
		AV	11.14	10.93	11.07	10.90

ANT	Freq. (MHz)	Det.	Maximum Peak Conducted Output Power (dBm) for *802.11g*							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
ANT 1	2412	PK	14.78	14.87	14.78	14.71	15.43	15.84	16.73	17.83
		AV	9.37	9.23	9.24	9.29	9.35	9.25	9.22	9.15
	2437	PK	18.92	18.87	18.82	18.91	19.42	19.45	19.51	**19.92**
		AV	13.53	13.41	13.37	13.40	13.39	13.29	13.38	13.43
	2462	PK	15.50	15.53	15.43	15.62	16.27	16.30	17.24	18.59
		AV	10.13	10.09	9.98	10.07	9.91	9.88	10.00	9.97
ANT 2	2412	PK	14.26	14.14	14.20	14.34	14.62	15.10	16.16	17.36
		AV	8.84	8.68	8.82	8.58	8.70	8.67	8.56	8.72
	2437	PK	17.48	17.56	17.43	17.56	17.91	18.18	18.43	**19.01**
		AV	12.07	11.86	12.06	11.94	11.81	11.92	11.93	12.04
	2462	PK	16.18	16.11	15.88	15.94	16.72	16.90	18.06	18.77
		AV	10.69	10.57	10.41	10.56	10.54	10.53	10.51	10.63

ANT	Freq. (MHz)	Det.	Maximum Peak Conducted Output Power (dBm) for ***802.11n(HT20)***							
			Data Rate [MCS]							
			0	1	2	3	4	5	6	7
ANT 1	2412	PK	14.80	14.86	14.77	15.48	15.55	16.42	18.41	18.54
		AV	9.34	9.27	9.22	9.18	9.29	9.26	9.09	9.31
	2437	PK	18.63	18.67	18.68	18.72	19.15	19.30	19.76	**20.12**
		AV	13.09	13.06	12.95	12.97	13.02	12.96	12.98	12.85
	2462	PK	15.44	15.40	15.41	16.31	16.27	16.99	18.94	19.09
		AV	10.07	10.02	9.98	9.93	9.79	10.01	10.03	9.82
ANT 2	2412	PK	13.99	14.07	13.94	14.80	14.73	15.52	17.88	17.59
		AV	8.58	8.54	8.48	8.40	8.45	8.47	8.41	8.52
	2437	PK	18.22	18.05	18.11	18.22	18.47	18.52	19.24	**19.76**
		AV	12.07	12.03	11.99	11.93	11.98	11.89	11.95	11.92
	2462	PK	16.04	16.21	15.91	16.88	16.90	17.39	18.02	19.51
		AV	10.71	10.69	10.45	10.60	10.53	10.57	10.55	10.63

ANT	Freq. (MHz)	Det.	Maximum Peak Conducted Output Power (dBm) for ***802.11n(HT40)***							
			Data Rate [MCS]							
			0	1	2	3	4	5	6	7
ANT 1	2422	PK	13.60	13.65	13.70	14.74	14.87	16.00	18.64	18.76
		AV	8.21	8.09	8.03	8.10	8.16	8.19	8.13	8.17
	2437	PK	18.12	18.25	18.05	18.96	19.18	19.44	20.01	**20.10**
		AV	12.91	12.83	12.74	12.75	12.82	12.72	12.71	12.89
	2452	PK	15.27	15.36	15.40	16.27	16.73	17.88	19.14	19.16
		AV	10.28	10.14	10.22	9.97	10.09	10.12	10.16	10.13
ANT 2	2422	PK	12.49	12.56	12.82	13.65	13.82	15.03	17.66	17.84
		AV	6.86	6.77	6.72	6.83	6.80	6.82	6.79	6.81
	2437	PK	16.18	16.10	16.12	16.70	17.02	17.37	18.17	**18.46**
		AV	10.59	10.41	10.45	10.47	10.56	10.53	10.51	10.40
	2452	PK	14.35	14.54	14.37	15.75	16.05	16.91	18.19	18.24
		AV	9.37	9.23	9.32	9.28	9.21	9.30	9.19	9.31

- **Multiple transmitting**

ANT	Freq. (MHz)	Det.	Maximum Peak Conducted Output Power (dBm) for ***802.11n(HT20)***							
			Data Rate [MCS]							
			8	9	10	11	12	13	14	15
ANT 1	2412	PK	11.30	10.94	11.34	11.95	12.53	13.29	16.23	16.71
		AV	5.85	5.81	5.75	5.71	5.62	5.69	5.80	5.83
	2437	PK	14.22	14.38	14.59	14.77	15.31	15.58	16.84	18.60
		AV	9.06	9.01	8.92	8.96	8.88	8.90	8.98	8.93
	2462	PK	11.90	11.98	12.05	12.02	12.67	14.01	16.76	16.84
		AV	6.34	6.27	6.08	6.15	6.13	6.28	6.25	6.10
ANT 2	2412	PK	10.54	10.02	10.49	11.14	11.59	12.75	15.33	15.88
		AV	5.06	5.01	4.80	4.87	4.85	5.00	4.98	4.82
	2437	PK	13.37	13.70	13.69	13.90	14.66	15.07	15.86	17.56
		AV	8.28	8.20	8.17	8.19	8.06	8.22	8.14	8.03
	2462	PK	10.59	10.50	10.87	10.99	11.67	12.96	15.70	15.81
		AV	5.21	4.95	5.07	5.05	5.02	5.16	5.08	5.18
Sum (ANT 1+2)	2412	PK	13.95	13.52	13.95	14.58	15.10	16.04	18.81	19.33
	2437	PK	16.83	17.06	17.17	17.37	18.01	18.34	19.39	**21.12**
	2462	PK	14.31	14.31	14.51	14.55	15.21	16.53	19.27	19.37

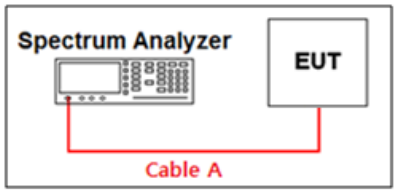
ANT	Freq. (MHz)	Det.	Maximum Peak Conducted Output Power (dBm) for ***802.11n(HT40)***							
			Data Rate [MCS]							
			8	9	10	11	12	13	14	15
ANT 1	2422	PK	9.14	9.21	9.27	10.15	10.20	11.16	14.18	15.32
		AV	4.11	3.98	4.02	3.97	3.87	4.06	3.94	4.07
	2437	PK	12.50	12.55	12.52	13.46	14.15	14.68	17.36	18.54
		AV	7.28	7.13	6.98	7.17	7.11	6.95	7.18	7.14
	2452	PK	12.86	12.51	12.68	13.65	13.79	15.21	18.21	18.97
		AV	7.38	7.26	7.23	7.12	7.34	7.31	7.20	7.32
ANT 2	2422	PK	8.62	8.74	8.60	9.13	9.13	10.38	13.12	15.53
		AV	3.29	3.27	3.16	3.01	2.97	3.13	3.24	3.14
	2437	PK	11.77	11.92	12.02	12.59	13.45	14.27	16.83	17.97
		AV	6.62	6.45	6.51	6.38	6.56	6.47	6.46	6.59
	2452	PK	12.37	11.94	12.27	13.14	13.39	14.83	17.57	18.16
		AV	6.78	6.71	6.65	6.62	6.75	6.64	6.58	6.54
Sum (ANT 1+2)	2422	PK	11.90	11.99	11.96	12.68	12.71	13.80	16.69	18.44
	2437	PK	15.16	15.26	15.29	16.06	16.83	17.49	20.11	21.28
	2452	PK	15.63	15.25	15.49	16.41	16.61	18.04	20.91	**21.60**

8.3 Maximum power spectral density

▣ Test requirements and limit, §15.247(e)

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

▣ Test Configuration



▣ Test Procedure: *KDB 558074 D01 DTS Meas. Guidance v03r2*

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to **1.5 times** the DTS bandwidth.
3. Set the RBW to: **3 kHz** ≤ RBW ≤ **100 kHz**
4. Set the VBW ≥ **3 x RBW**
5. Detector = **peak**
6. Sweep time = **auto couple**
7. Trace mode = **max hold.**
8. Allow trace to fully stabilize.
9. Use the **peak marker function** to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

▣ Test Results: NT

8.4 Out of band emissions at the band edge / conducted spurious emissions

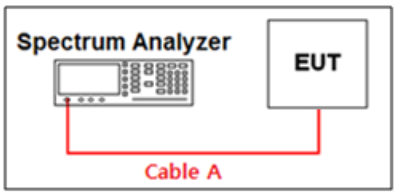
▣ Test requirements and limit, §15.247(d)

§15.247(d) specifies that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:

If **the peak output power procedure** is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated **by at least 20 dB** relative to the maximum measured in-band peak PSD level.

If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in band average PSD level.
In either case, attenuation to levels below the general emission limits specified in **§15.209(a)** is not required.

▣ Test Configuration



▣ Test Procedure: *KDB 558074 D01 DTS Meas. Guidance v03r2*

- Measurement Procedure 1 – Reference Level

1. Set instrument center frequency to DTS channel center frequency.
2. Set the span to ≥ 1.5 times the DTS bandwidth.
3. Set the RBW = 100 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum PSD level

- Measurement Procedure 2 - Unwanted Emissions

1. Set the center frequency and span to encompass frequency range to be measured.
2. Set the RBW = **100 kHz for below 1 GHz, 1 MHz for above 1 GHz(Actual 1 MHz , See below note)**
3. Set the VBW ≥ **3 x RBW (Actual 3 MHz, See below note)**
4. Detector = **peak**.
5. Ensure that the number of measurement points ≥ span/RBW
6. Sweep time = **auto couple.**
7. Trace mode = **max hold.**
8. **Allow the trace to stabilize** (this may take some time, depending on the extent of the span).
9. Use the peak marker function to determine the maximum amplitude level.

Note: The conducted spurious emission was tested with below settings.

Frequency range: 9 kHz ~ 30 MHz
RBW = 100 kHz, VBW = 300 kHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT:40001

Frequency range: 30 MHz ~ 10 GHz, 10 GHz ~ 25 GHz
RBW = 1MHz, VBW = 3 MHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT: 40001

If the emission level with above setting was close to the limit(less than 3 dB margin) then zoom scan is required using RBW = 100 kHz, VBW = 300 kHz, SPAN = 100 MHz and BINS = 2001 to get accurate emission level within 100 kHz BW.

▣TEST RESULTS: NT

8.5 Radiated spurious emissions

▣ **Test Requirements and limit, §15.247(d), §15.205, §15.209**

In any 100 kHz bandwidth outside the operating frequency band, 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. In case the emission fall within the restricted band specified on 15.205(a) and (b), then the 15.209(a) limit in the table below has to be followed

▪ **FCC Part 15.209(a) and (b)**

Frequency (MHz)	Limit (uV/m)	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

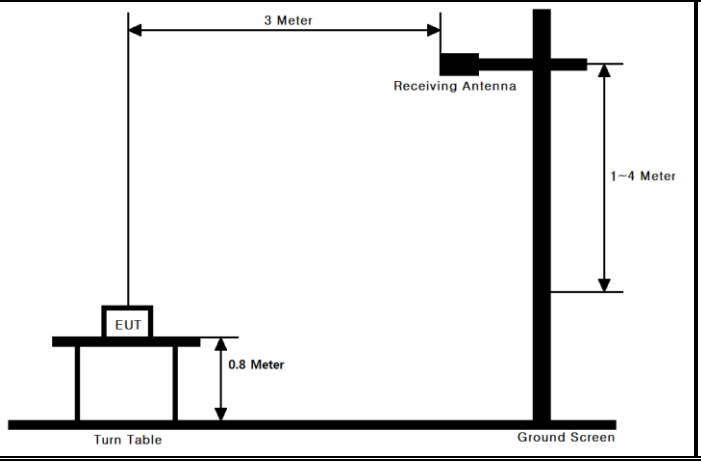
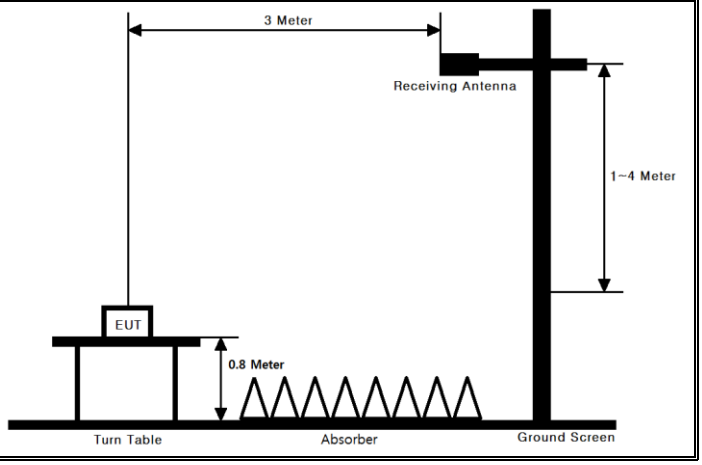
** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ **FCC Part 15.205 (a):** Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.52525	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	156.7 ~ 156.9	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	162.0125 ~ 167.17	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	167.72 ~ 173.2	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	240 ~ 285	2655 ~ 2900		
8.291 ~ 8.294	37.5 ~ 38.25	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	608 ~ 614	3345.8 ~ 3358		
		960 ~ 1240	3600 ~ 4400		

▪ **FCC Part 15.205(b):** The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

▣ Test Configuration

Below 1GHz	Above 1GHz
	

▣ Test Procedure

1. The EUT is placed on a non-conductive table, which is 0.8 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4 m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

▣ Measurement Instrument Setting for Radiated Emission Measurements.

Peak Measurement: *12.2.4 of KDB 558074 D01 DTS Meas Guidance v03r2*

RBW = As specified in below table, VBW ≥ 3 x RBW, Sweep = Auto, Detector = Peak, Trace mode = Max Hold until the trace stabilizes.

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

Average Measurement: *12.2.5.2 of KDB 558074 D01 DTS Meas. Guidance v03r2*

1. RBW = 1MHz (unless otherwise specified)
2. VBW ≥ 3 X RBW
3. Detector = RMS, if span / sweep point ≤ (RBW/2)
4. Averaging type = Power
5. Sweep time = auto
6. Trace average = At least 100 traces
7. A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:

1) If power averaging (RMS) mode was used in step 4, then the applicable correction factor is 10 log(1/x), where x is the duty cycle.
2) If linear voltage averaging mode was used in step 4, then the applicable correction factor is 20 log(1/x), where x is the duty cycle.
3) If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

Test Mode	Date rate	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
TM 1	1 Mbps	98.78	-
TM 2	54 Mbps	89.21	0.50
TM 3	MCS 7	88.67	0.53
	MCS 15	82.32	0.85
TM 4	MCS 7	82.58	0.84
	MCS 15	74.77	1.27

Note: Please refer to Appendix I for detailed information.

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : ***Test Mode 1(TM 1)***

Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance F (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Test Ant of Worst data Note2
Lowest	38.01	V	Z	QP	50.10	-16.10	N/A	N/A	34.00	40.00	6.00	2
	2389.94	H	Y	PK	54.92	2.88	N/A	N/A	57.80	74.00	16.20	2
	2389.44	H	Y	AV	46.17	2.88	N/A	N/A	49.05	54.00	4.95	2
	4824.00	H	Z	PK	51.03	3.20	N/A	N/A	54.23	74.00	19.77	2
	4823.97	H	Z	AV	46.78	3.20	N/A	N/A	49.98	54.00	4.02	2
Middle	38.08	V	Z	QP	50.90	-16.10	N/A	N/A	34.80	40.00	5.20	2
	4873.92	H	Y	PK	49.80	3.33	N/A	N/A	53.13	74.00	20.87	2
	4873.94	H	Y	AV	45.06	3.33	N/A	N/A	48.39	54.00	5.61	2
Highest	37.93	V	Z	QP	50.10	-16.10	N/A	N/A	34.00	40.00	6.00	2
	2484.09	H	Y	PK	51.57	3.38	N/A	N/A	54.95	74.00	19.05	2
	2484.20	H	Y	AV	42.26	3.38	N/A	N/A	45.64	54.00	8.36	2
	4924.26	H	Z	PK	50.67	3.69	N/A	N/A	54.36	74.00	19.64	2
	4924.05	H	Z	AV	45.94	3.69	N/A	N/A	49.63	54.00	4.37	2

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. This device was tested under single transmitting (Ant 1, 2) and the worst case data are reported in the table above.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCCF + DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
4. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
   Therefore Distance Correction Factor(DCF) : - 9.54 dB = 20*log(1 m/3 m)

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : ***Test Mode 2(TM 2)***

Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance F (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Test Ant of Worst data Note2
Lowest	37.94	V	Z	QP	50.50	-16.10	N/A	N/A	34.40	40.00	5.60	2
	2389.84	H	Y	PK	56.67	2.88	N/A	N/A	59.55	74.00	14.45	2
	2389.98	H	Y	AV	43.45	2.88	0.50	N/A	46.83	54.00	7.17	2
	4823.36	H	Z	PK	44.21	3.20	N/A	N/A	47.41	74.00	26.59	2
	4822.43	H	Z	AV	34.36	3.20	0.50	N/A	38.06	54.00	15.94	2
Middle	38.02	V	Z	QP	50.50	-16.10	N/A	N/A	34.40	40.00	5.60	2
	4872.30	H	Z	PK	45.30	3.33	N/A	N/A	48.63	74.00	25.37	2
	4871.90	H	Z	AV	36.29	3.33	0.50	N/A	40.12	54.00	13.88	2
Highest	38.02	V	Z	QP	51.60	-16.10	N/A	N/A	35.50	40.00	4.50	2
	2483.64	H	Y	PK	57.21	3.36	N/A	N/A	60.57	74.00	13.43	2
	2483.50	H	Y	AV	44.81	3.36	0.50	N/A	48.67	54.00	5.33	2
	4925.36	H	Z	PK	44.45	3.69	N/A	N/A	48.14	74.00	25.86	2
	4925.86	H	Z	AV	34.89	3.69	0.50	N/A	39.08	54.00	14.92	2

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. This device was tested under single transmitting (Ant 1, 2) and the worst case data are reported in the table above.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCCF + DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
4. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
   Therefore Distance Correction Factor(DCF) : - 9.54 dB = 20*log(1 m/3 m)

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : ***Test Mode 3(TM 3)***

Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance F (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Test Ant of Worst data Note2
Lowest	38.08	V	Z	QP	51.30	-16.10	N/A	N/A	35.20	40.00	4.80	1+2
	2389.08	H	Y	PK	60.09	2.88	N/A	N/A	62.97	74.00	11.03	1+2
	2389.52	H	Y	AV	44.24	2.88	0.53	N/A	47.65	54.00	6.35	1+2
	4825.64	H	Z	PK	44.66	3.20	N/A	N/A	47.86	74.00	26.14	1+2
	4826.12	H	Z	AV	35.01	3.20	0.85	N/A	39.06	54.00	14.94	1+2
Middle	38.04	V	Z	QP	50.30	-16.10	N/A	N/A	34.20	40.00	5.80	1+2
	4872.70	H	Z	PK	46.35	3.33	N/A	N/A	49.68	74.00	24.32	1+2
	4873.85	H	Z	AV	36.47	3.33	0.85	N/A	40.65	54.00	13.35	1+2
Highest	37.92	V	Z	QP	50.80	-16.10	N/A	N/A	34.70	40.00	5.30	1+2
	2483.56	H	Y	PK	58.24	3.36	N/A	N/A	61.60	74.00	12.40	2
	2483.58	H	Y	AV	45.29	3.36	0.53	N/A	49.18	54.00	4.82	2
	4924.67	H	Z	PK	45.31	3.69	N/A	N/A	49.00	74.00	25.00	1+2
	4924.63	H	Z	AV	35.23	3.69	0.85	N/A	39.77	54.00	14.23	1+2

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. This device was tested under single transmitting (Ant 1, 2) and multiple transmitting (Ant 1+2) and the worst case data are reported in the table above.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCCF + DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
4. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
   Therefore Distance Correction Factor(DCF) : - 9.54 dB = 20*log(1 m/3 m)

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : ***Test Mode 4(TM 4)***

Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance F (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Test Ant of Worst data Note2
Lowest	38.04	V	Z	QP	51.20	-16.10	N/A	N/A	35.10	40.00	4.90	1+2
	2390.00	H	Y	PK	60.63	2.88	N/A	N/A	63.51	74.00	10.49	1
	2389.26	H	Y	AV	44.41	2.88	0.84	N/A	48.13	54.00	5.87	1
	4842.36	H	Z	PK	44.12	3.25	N/A	N/A	47.37	74.00	26.63	1+2
	4843.12	H	Z	AV	33.99	3.25	1.27	N/A	38.51	54.00	15.49	1+2
Middle	38.09	V	Z	QP	51.50	-16.10	N/A	N/A	35.40	40.00	4.60	1+2
	4873.80	H	Y	PK	45.45	3.33	N/A	N/A	48.78	74.00	25.22	1+2
	4874.20	H	Y	AV	35.83	3.33	1.27	N/A	40.43	54.00	13.57	1+2
Highest	38.02	V	Z	QP	51.40	-16.10	N/A	N/A	35.30	40.00	4.70	1
	2483.89	H	Y	PK	63.05	3.36	N/A	N/A	66.41	74.00	7.59	1
	2484.06	H	Y	AV	47.12	3.36	1.27	N/A	51.75	54.00	2.25	1
	4906.63	H	Z	PK	44.64	3.62	N/A	N/A	48.26	74.00	25.74	1+2
	4905.56	H	Z	AV	34.21	3.62	1.27	N/A	39.10	54.00	14.90	1+2

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. This device was tested under single transmitting (Ant 1, 2) and multiple transmitting (Ant 1+2) and the worst case data are reported in the table above.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCCF + DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
4. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
   Therefore Distance Correction Factor(DCF) : - 9.54 dB = 20*log(1 m/3 m)

8.6 Power-line conducted emissions

▣ Test Requirements and limit, §15.207

For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range are listed as follows:

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

▣ Test Procedure:

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to the test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

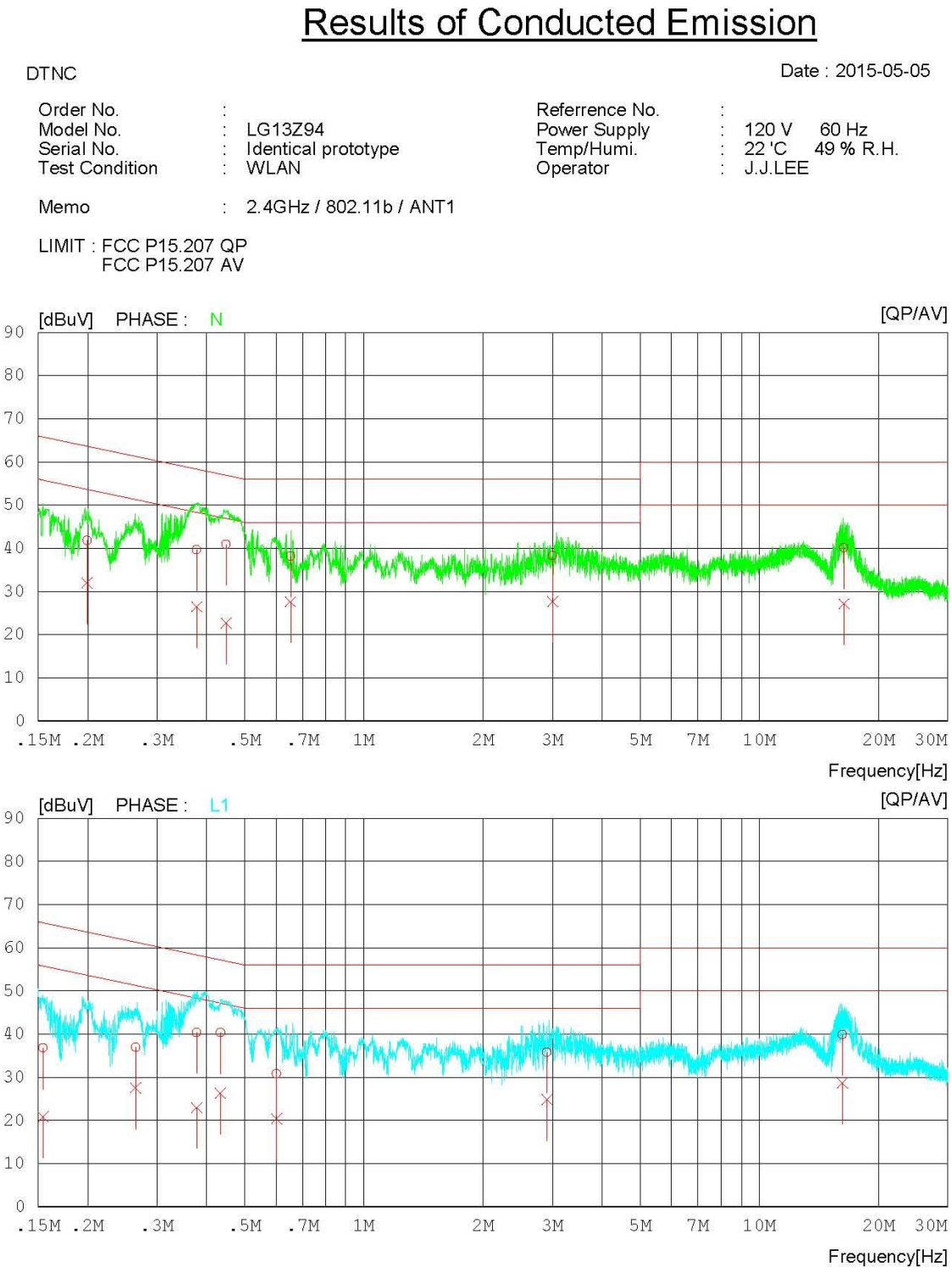
▣ Test Results: **Comply**(Refer to next page.)

The worst data was reported.

▣ RESULT PLOTS

AC Line Conducted Emissions (Graph)

Test mode 1(TM 1) & ANT 1 & Middle



AC Line Conducted Emissions (List)

Test mode 1(TM 1) & ANT 1 & Middle

Results of Conducted Emission

DTNC Date : 2015-05-05

Order No.	:		Referrence No.	:	
Model No.	:	LG13Z94	Power Supply	:	120 V 60 Hz
Serial No.	:	Identical prototype	Temp/Humi.	:	22 'C 49 % R.H.
Test Condition	:	WLAN	Operator	:	J.J.LEE

Memo : 2.4GHz / 802.11b / ANT1

LIMIT : FCC P15.207 QP
FCC P15.207 AV

NO	FREQ	READING QP	READING AV	C.FACTOR	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.19945	31.9	22.1	9.9	41.8	32.0	63.6	53.6	21.8	21.6	N
2	0.37750	29.5	16.4	10.1	39.6	26.5	58.3	48.3	18.7	21.8	N
3	0.44830	30.9	12.6	10.1	41.0	22.7	56.9	46.9	15.9	24.2	N
4	0.65247	28.1	17.5	10.1	38.2	27.6	56.0	46.0	17.8	18.4	N
5	3.00280	28.3	17.7	10.0	38.3	27.7	56.0	46.0	17.7	18.3	N
6	16.37800	29.7	16.7	10.5	40.2	27.2	60.0	50.0	19.8	22.8	N
7	0.15453	26.7	10.8	10.0	36.7	20.8	65.8	55.8	29.1	35.0	L1
8	0.26450	26.9	17.5	10.0	36.9	27.5	61.3	51.3	24.4	23.8	L1
9	0.37742	30.3	12.8	10.1	40.4	22.9	58.3	48.3	17.9	25.4	L1
10	0.43379	30.3	16.2	10.0	40.3	26.2	57.2	47.2	16.9	21.0	L1
11	0.60197	20.7	10.3	10.0	30.7	20.3	56.0	46.0	25.3	25.7	L1
12	2.90200	25.6	14.6	10.2	35.8	24.8	56.0	46.0	20.2	21.2	L1
13	16.23920	29.1	17.9	10.8	39.9	28.7	60.0	50.0	20.1	21.3	L1

9. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	14/08/21	15/08/21	MY49060056
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2495A/ MA2411B	14/10/21	15/10/21	1338004/ 1306053
Thermohygrometer	BODYCOM	BJ5478	15/02/26	16/02/26	1209
Digital Multimeter	FLUKE	17B	14/05/12	15/05/12	26030065WS
Signal Generator	Rohde Schwarz	SMF100A	14/07/01	15/07/01	102341
Vector Signal Generator	Rohde Schwarz	SMBV100A	15/01/06	16/01/06	255571
3dB Attenuator	SMAJK	SMAJK-2-3	14/10/21	15/10/21	3
High-pass filter	Wainwright	WHKX12-2580-3000-18000-80SS	14/09/11	15/09/11	3
Low Noise Pre Amplifier	TSJ	MLA-010K01-B01-27	15/04/09	16/04/09	1844538
Amplifier	Agilent	8449B	14/11/06	15/11/06	3008A02108
Loop Antenna	Schwarzbeck	FMZB1513	14/04/29	16/04/29	1513-128
TRILOG Broadband Test-Antenna	SCHWARZBECK	VULB 9160	14/04/04	16/04/04	3357
HORN ANT	ETS	3117	14/05/12	16/05/12	140394
HORN ANT	ETS-Lindgren	3160-09	13/10/13	15/10/13	00158433
HORN ANT	Custom Microwave, Inc.	CMI/HO28S	13/11/14	15/11/14	Ka100224-1
EMI TEST RECEIVER	R&S	ESR7	14/10/21	15/10/21	101109
Thermohygrometer	BODYCOM	BJ5478	15/02/26	16/02/26	1209
EMI TEST RECEIVER	R&S	ESCI	15/02/25	16/02/25	100364
FREQUENCY CONVERTER	Taejin Electronic	CVCF	14/09/11	15/09/11	ZU0033
ARTIFICIAL MAINS NETWORK	Narda S.T.S. / PMM	PMM L2-16B	14/06/26	15/06/26	000WX20305

APPENDIX I

Duty cycle information

▣ Test Procedure

Duty cycle measured using **section 6.0 b) of KDB 558074 D01 DTS Meas. Guidance v03r2 :**

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal.

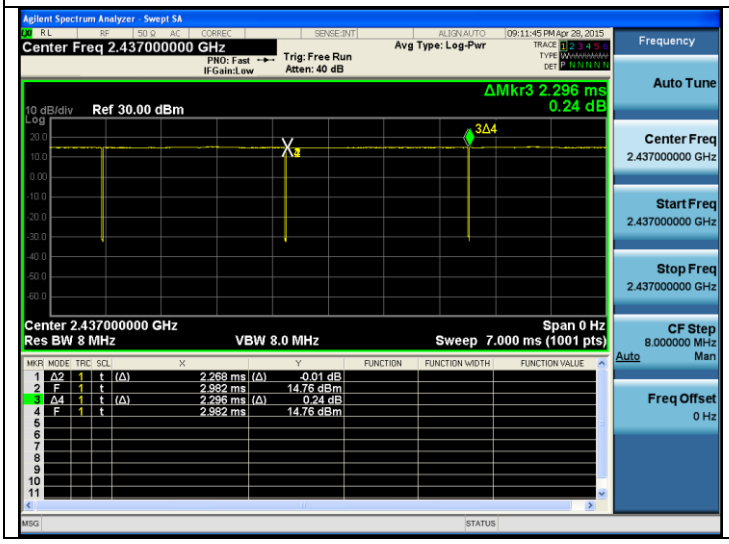
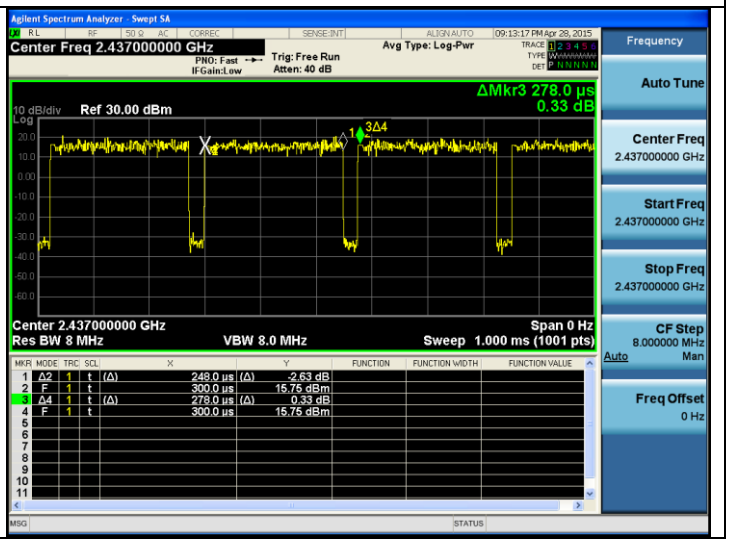
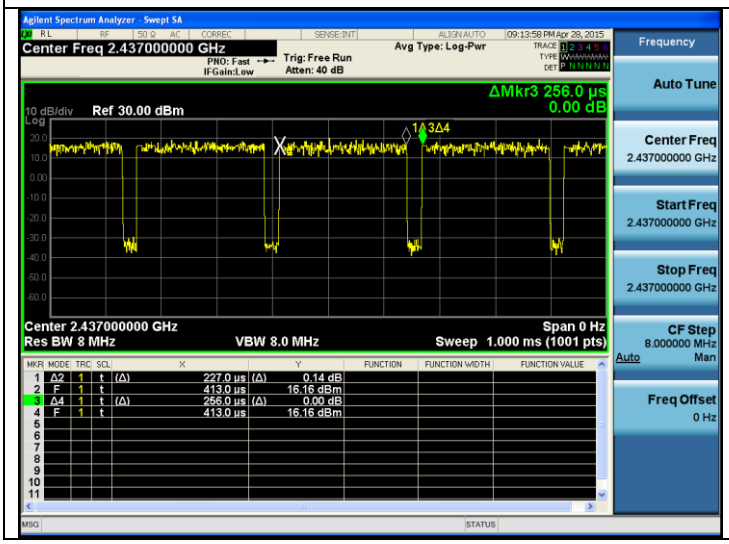
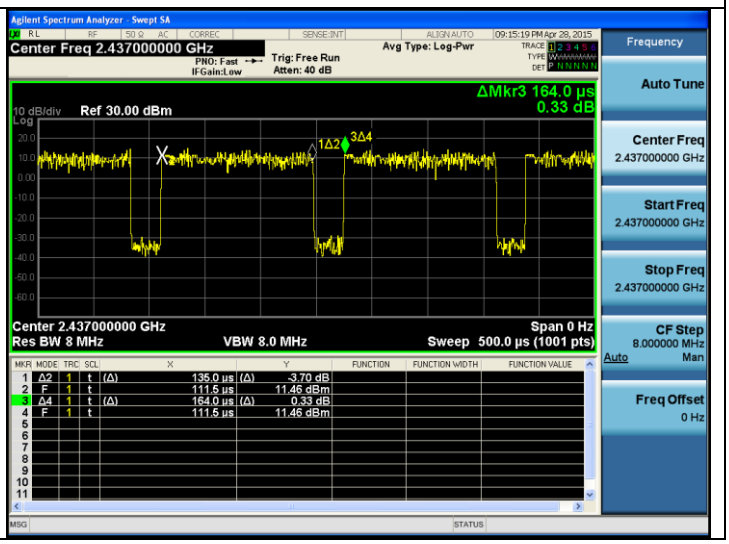
Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average.

The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

▣ Test Data

Test Mode	Date rate	Tested frequency	T_{ON} (ms)	T_{ON+OFF} (ms)	Duty Cycle (%)	Duty Cycle Correction Factor(dB)
TM 1	1 Mbps	Middle	2.268	2.296	98.78	-
TM 2	54 Mbps	Middle	0.248	0.278	89.21	0.50
TM 3	MCS 7	Middle	0.227	0.256	88.67	0.53
	MCS 15	Middle	0.135	0.164	82.32	0.85
TM 4	MCS 7	Middle	0.128	0.155	82.58	0.84
	MCS 15	Middle	0.083	0.111	74.77	1.27

▣ Result Plots

Duty cycle data : **TM 1** & **1 Mbps** & **Middle**	Duty cycle data : **TM 2** & **54 Mbps** & **Middle**
	
Duty cycle data : **TM 3** & **MCS 7** & **Middle**	Duty cycle data : **TM 3** & **MCS 15** & **Middle**
	
Duty cycle data : **TM 4** & **MCS 7** & **Middle**	Duty cycle data : **TM 4** & **MCS 15** & **Middle**