

243 Jubug-Ri, Yangji-Myeon, Yongin-Si, Gyeonggi-Do, Korea 449-822 Tel: +82-31-323-6008 Fax: +82-31-323-6010 <a href="http://www.ltalab.com">http://www.ltalab.com</a>



Dates of Tests: Dec 27~31, 2010 Test Report S/N: LR500111012M Test Site: LTA CO., LTD.

# **CERTIFICATION OF COMPLIANCE**

FCC ID.

YI7IHD2E100T0W

**APPLICANT** 

eZEX Corporation

Equipment Class : Digital Transmission System (DTS)

**Manufacturing Description** : Color In-home Display

Manufacturer : eZEX Corporation

Brand name General Electric (GE)

Model name : IHD2E100T0WW

Test Device Serial No.: : Identical prototype

Rule Part(s) : FCC Part 15.247 Subpart C; ANSI C-63.4-2003

Frequency Range : 2405MHz ~ 2480MHz

Max. Output Power : Max 20.04dBm – Conducted

Data of issue : January 5, 2011

This test report is issued under the authority of:

The test was supervised by:

Kyung-Taek LEE, Technical Manager

Hyun-Chae You, Test Engineer

This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. This report must not be used by the applicant to claim product endorsement by any agency.

NVLAP

NVLAP LAB Code.: 200723-0

# TABLE OF CONTENTS

1. GENERAL INFORMATION'S	3
2. INFORMATION'S ABOUT TEST ITEM	4
3. TEST REPORT	5
3.1 SUMMARY OF TESTS	5
3.2 TECHNICAL CHARACTERISTICS TEST	6
3.2.1 6dB BANDWIDTH	6
3.2.2 PEAK OUTPUT POWER	9
3.2.3 POWER SPECTRAL DENSITY	12
3.2.4 BAND – EDGE & SPURIOUS	15
3.2.5 FIELD STRENGTH OF HARMONICS	21
3.2.6 AC CONDUCTED EMISSIONS	25
APPENDIX	
APPENDIX TEST EQUIPMENT USED FOR TESTS	30

# 1. General information's

# 1-1 Test Performed

Company name : LTA Co., Ltd.

Address : 243, Jubug-ri, Yangji-Myeon, Youngin-Si, Kyunggi-Do, Korea. 449-822

Web site : <a href="http://www.ltalab.com">http://www.ltalab.com</a>
E-mail : <a href="mailto:chahn@ltalab.com">chahn@ltalab.com</a>
Telephone : +82-31-323-6008
Facsimile +82-31-323-6010

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the "General requirements for the competents of calibration and testing laboratory".

# 1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

Agency	Country	Country Accreditation No. Validity		Reference	
NVLAP	U.S.A	200723-0	2011-09-30	ECT accredited Lab.	
RRL	KOREA	KR0049	2011-09-01	EMC accredited Lab.	
FCC	U.S.A	610755	2011-04-22	FCC filing	
VCCI	JAPAN	R2133, C2307 2011-06-21		VCCI registration	
IC	CANADA	IC5799	2012-05-14	IC filing	

# 2. Information's about test item

# 2-1 Applicant & Manufacturer

Company name : eZEX Corporation

Address : Rm 508, Ssangyong IT Twin-tower 2, 442-5, Sangdaewon-dong, Jungwon-gu,

Seongnam-si, Gyeonggi-do, South Korea

Tel / Fax : TEL No: +82-31 - 608 - 4700 / FAX No: +82-31-608 - 4701

## 2-2 Equipment Under Test (EUT)

Trade name : Color In-home Display
FCC ID : Y17IHD2E100T0W

Brand name : General Electric (GE)

Model name : IHD2E100T0WW

Serial number : Identical prototype

Date of receipt : December 24, 2010

EUT condition : Pre-production, not damaged

Antenna type : Chip antenna with Max. 4.37dBi gain

Frequency Range : 2405MHz ~ 2480MHz (DSSS) RF output power : Max 20.04dBm - Conducted

Number of channels : 16

Type of Modulation : O-QPSK Channel spacing : 5MHz

Power Source : 5Vdc by adapter

Power Source for Adapter : DC 5V, 0.7A (M/N : GELVPS-1)

# **2-3 Tested frequency**

	LOW	MID	HIGH
Frequency (MHz)	2405	2445	2480

### **2-4 Ancillary Equipment**

Equipment	Model No.	Serial No.	Manufacturer
PC	HP Compaq dx7400 Microtower	CNG8330J9R	НР
MONITOR	MONITOR HPL1710 CNC816QH92		HP
KEYBOARD	SK-8115	68A-04Q6	DELL
MOUSE	MO56UOA	LNB33130022	DELL
PRINTER	STYLUS C65	FXSY002205	EPSON

# 3. Test Report

# 3.1 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Conditio n	Status (note 1)		
15.247(a)	6 dB Bandwidth	> 500kHz		С		
15.247(b)	Transmitter Peak Output Power	< 1Watt		С		
15.247(d)	Transmitter Power Spectral Density	< 8dBm @ 3kHz	Conducted	С		
15.247(d)	Band Edge & Spurious	> 20 dBc		С		
15.209	Field Strength of Harmonics	Emission	Radiated	С		
15.207	AC Conducted Emissions	Emissions	Conducted	С		
15.203	Antenna requirement	-	-	С		
Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable						

<u>Note 2</u>: The data in this test report are traceable to the national or international standards.

# → Antenna Requirement

This unit complies with the requirement of §15.203.

The antenna is connected to inside of EUT. And type is Chip antenna.

The sample was tested according to the following specification:

FCC Parts 15.247; ANSI C-63.4-2003

### 3.2 Technical Characteristics Test

### 3.2.1 6 dB Bandwidth

### **Procedure:**

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

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 6dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is ( as close as possible to ) even with the reference marker level. The marker-delta reading at this point is the 6 dB bandwidth of the emission.

### The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 100 kHz Span = 30 MHz

 $VBW = 100 \text{ kHz} (VBW \ge RBW)$  Sweep = auto

Trace = max hold Detector function = peak

#### **Measurement Data:**

Frequency	Test Res	sults
(MHz)	Measured Bandwidth (MHz)	Result
2405	1.662	Complies
2445	1.599	Complies
2480	1.570	Complies

<sup>-</sup> See next pages for actual measured spectrum plots.

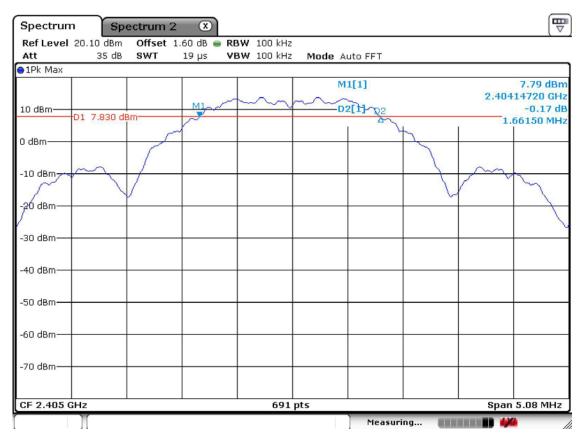
### **Minimum Standard:**

6 dB Bandwidth > 500kHz

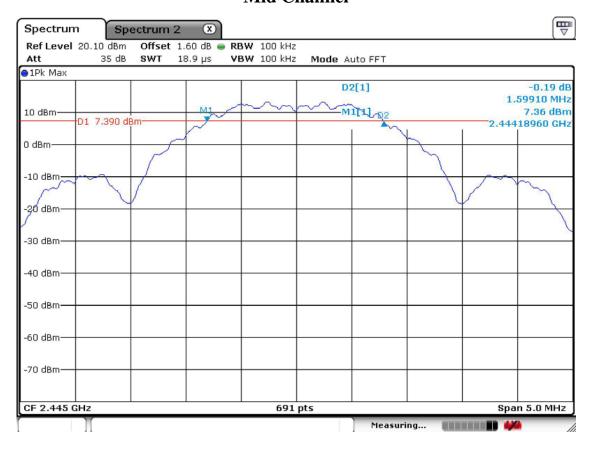
### **Measurement Setup**

Same as the Chapter 3.2.1 (Figure 1)

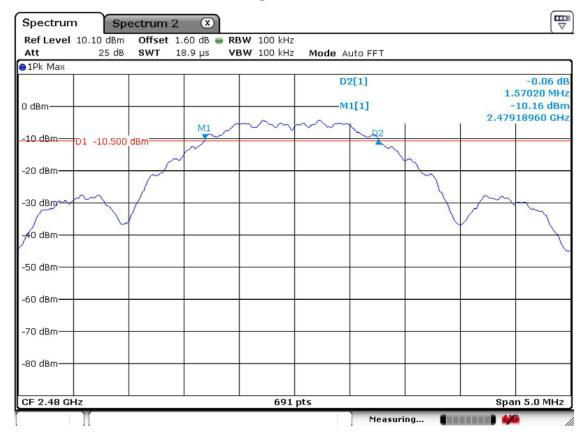
# **Low Channel**



# **Mid Channel**



# **High Channel**



# 3.2.2 Peak Output Power Measurement

### **Procedure:**

The maximum peak output power was measured with the spectrum analyzer connected to the antenna output of the EUT. The spectrum analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth. The EUT was operating in transmit mode at the appropriate center frequency.

## The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 1MHz Span = auto

 $VBW = 1MHz (VBW \ge RBW)$  Sweep = auto

Detector function = peak

### **Measurement Data:**

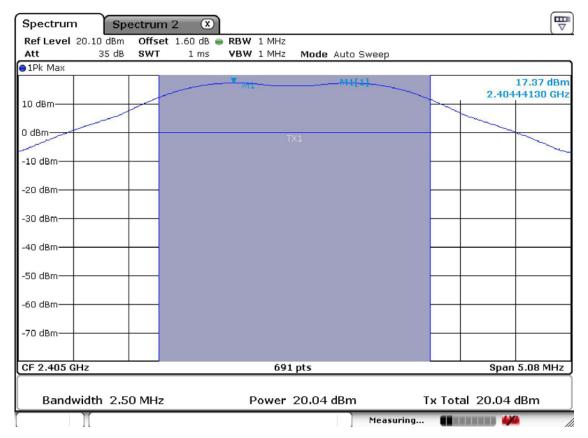
Frequency		Test Results	
(MHz)	dBm	mW	Result
2405	20.04	100.93	Complies
2445	19.59	90.99	Complies
2480	1.19	1.32	Complies

<sup>-</sup> See next pages for actual measured spectrum plots.

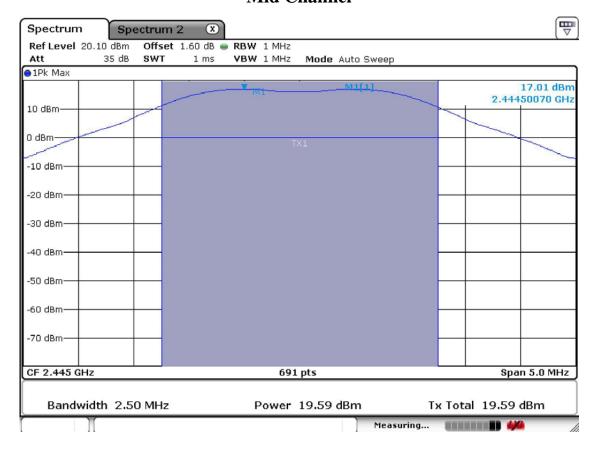
### **Minimum Standard:**

Peak output power	< 1W

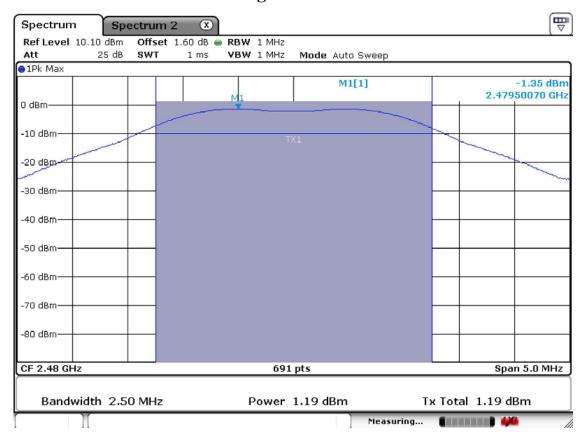
# **Low Channel**



# **Mid Channel**



# **High Channel**



# 3.2.3 Power Spectral Density

### **Procedure:**

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

## The spectrum analyzer is set to:

RBW = 3 kHz Span = 300 kHz VBW = 10 kHz Sweep = 100 sec Sweep

### **Measurement Data:**

Frequency	Test Res	ults
(MHz)	dBm	Result
2405	3.16	Complies
2445	2.37	Complies
2480	-16.23	Complies

<sup>-</sup> See next pages for actual measured spectrum plots.

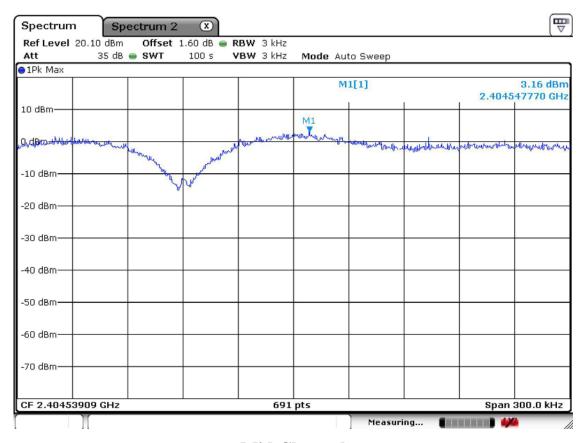
### **Minimum Standard:**

Power Spectral Density	< 8dBm @ 3kHz BW

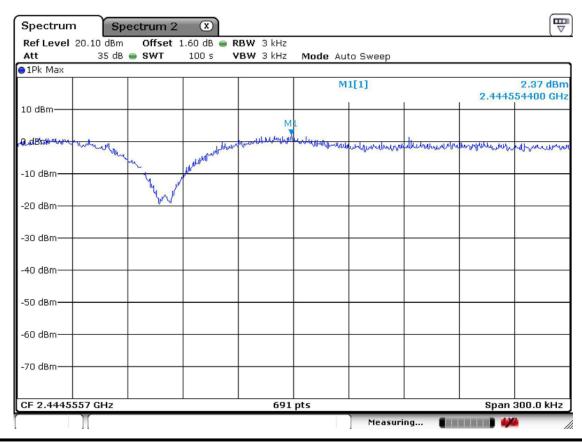
### **Measurement Setup**

Same as the Chapter 3.2.1 (Figure 1)

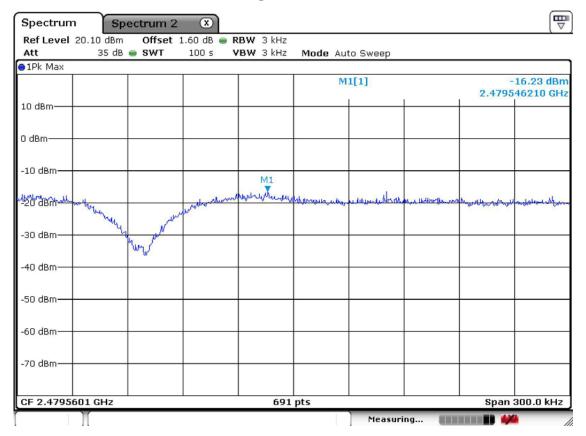
# **Power Density Measurement Low Channel**



# **Mid Channel**



# **High Channel**



# 3.2.4 Band - edge & Spurious

#### **Procedure:**

The bandwidth at 20dB down from the highest inband spectral density is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate frequencies.

After the trace being stable, Use the marker-to-peak function to measure 20 dB down both sides of the intentional emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 100 kHz VBW = 100 kHz

Span = 50 MHz Detector function = peak

Trace =  $\max$  hold Sweep = auto

Radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a)

The spectrum analyzer is set to:

Center frequency = the highest, the lowest channels

PEAK: RBW = VBW = 1MHz, Sweep=Auto

Average: RBW = 1MHz, VBW=10Hz, Sweep=Auto

Measurement Distance: 3m

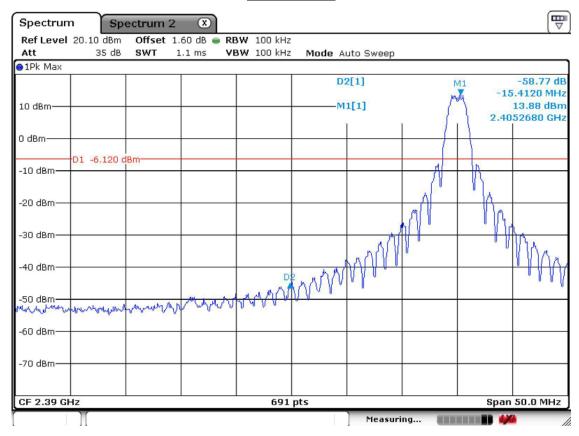
Polarization: Horizontal / Vertical

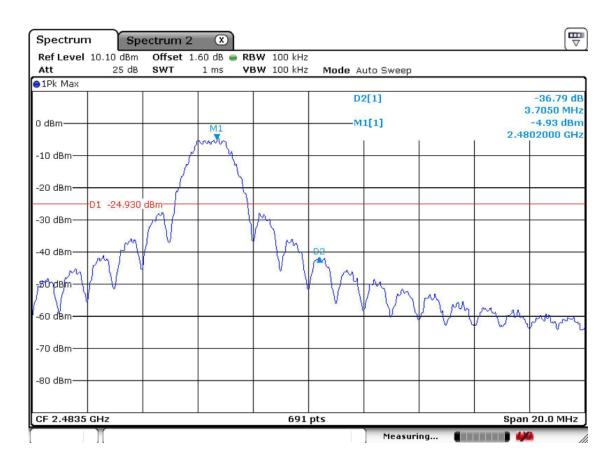
### **Measurement Data: Complies**

- All conducted emission in any 100kHz bandwidth outside of the spread spectrum band was at least 20dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.
- See next pages for actual measured spectrum plots.

Minimum Standard:	> 20 dBc

# **Band-edge**





# Band-edges in the restricted band 2310-2390 MHz measurement

Frequency	Reading		Correction		Limits	Result	Margin	
	[dBuV/m]	Pol.		Factor		[dBuV/m]	[dBuV/m]	[dB]
[MHz]	AV / Peal		Antenna	Amp. Gain	Cable	AV / Peak	AV / Peak	AV / Peak
2390	52.9 64.5	V	26.0	36.0	8.2	54.0 74.0	51.1 62.7	2.9 11.3

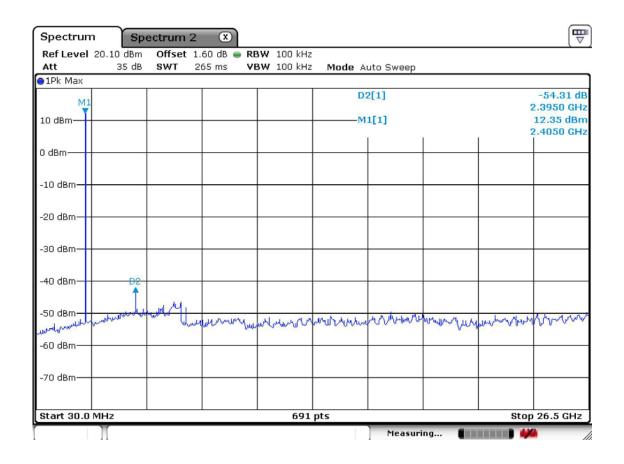
# Band-edges in the restricted band 2483.5-2500 MHz measurement

Fraguanay	Reading		Correction			Limits	Result	Margin	
Frequency	[dBuV/m]	Pol.		Factor		[dBuV/m]	[dBuV/m]	[dB]	
[MHz]	AV / Peak	Poi.	Antenna	Amp. Gain	Cable	AV / Peak	AV / Peak	AV / Peak	
2483.5	54.1 65.3	V	26.0	36.0	8.2	54.0 74.0	52.3 63.5	1.7 10.5	

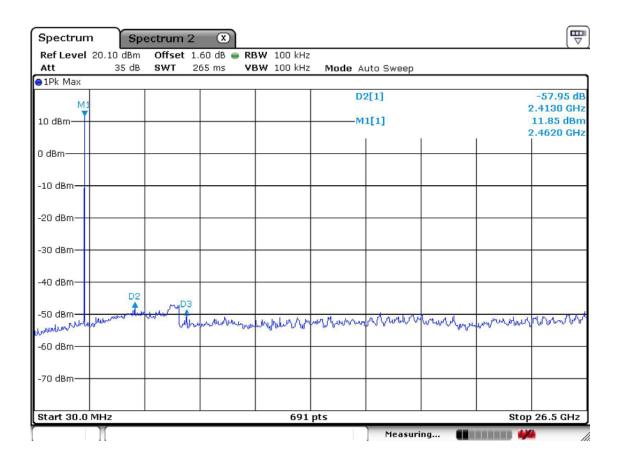
Note: This EUT was tested in 3 orthogonal positions and the worst-case data was presented.

# Low channel

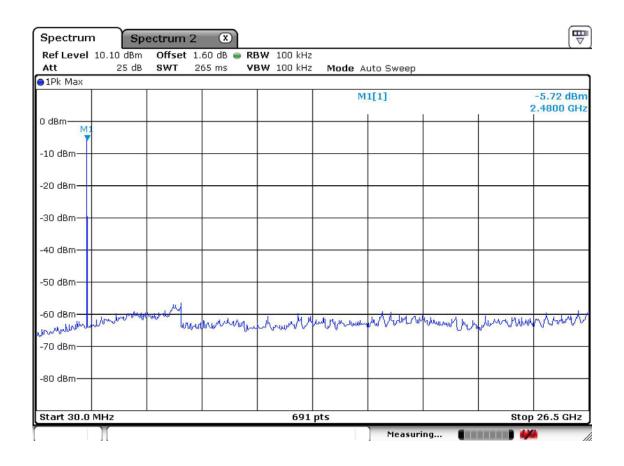
# Frequency Range = $30 \text{ MHz} \sim 10^{\text{th}}$ harmonic.



# $\label{eq:midchannel} Mid \ channel$ $Frequency \ Range = 30 \ MHz \sim 10^{th} \ harmonic.$



# $High \ channel$ $Frequency \ Range = 30 \ MHz \sim 10^{th} \ harmonic.$



# 3.2.5 Field Strength of Harmonics

#### **Procedure:**

The EUT was placed on a 0.8m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions. In case of the air temperature of the test site is out of the range is 10 to 40°C before the testing proceeds the warm-up time of EUT maintain adequately

## The spectrum analyzer is set to:

Center frequency = the worst channel

Frequency Range =  $30 \text{ MHz} \sim 10^{\text{th}} \text{ harmonic.}$ 

 $RBW = 100 \text{ kHz} (30 \text{MHz} \sim 1 \text{ GHz})$   $VBW \geq RBW$ 

= 1 MHz  $(1 \text{ GHz} \sim 10^{\text{th}} \text{ harmonic})$ 

Span = 100 MHz Detector function = peak

Trace =  $\max \text{ hold}$  Sweep = auto

### **Measurement Data: Complies**

- See next pages for actual measured data.

- The warm-up time of the EUT is 20min.

### Minimum Standard: FCC Part 15.209(a)

Frequency (MHz)	Limit (uV/m) @ 3m
30 ~ 88	100 **
88 ~ 216	150 **
216 ~ 960	200 **
Above 960	500

<sup>\*\*</sup> 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, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

# **Measurement Data:**

Frequency	Reading [dBuV/m]  AV / Peak		Pol.	Correction			Limits		Result		Margin	
				Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]			1 01.	Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
4810.0	46.2	58.3	V	31.4	34.6	8.7	54.0	74.0	51.7	63.8	2.3	10.3
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
Frequency	Reading			Correction			Limits [dBuV/m]		Result [dBuV/m]		Margin	
Frequency	[dBuV/m]		Pol.	Factor							[dB]	
[MHz]	AV / Peak		Antenn		Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
4890.0	45.8	57.6	V	31.4	34.6	8.7	54.0	74.0	51.3	63.1	2.8	11.0
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	_
-	ı	-	-	-	-	-	ı	-	-	-	-	-
Frequency	Reading  [dBuV/m]  Po  AV / Peak			Correction			Limits		Result		Margin	
rrequericy			Dol	Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]			POI.	Antenna	Amp. Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

No other emissions were detected at a level greater than 20dB below limit.

### Radiated Emissions - Firmware update mode

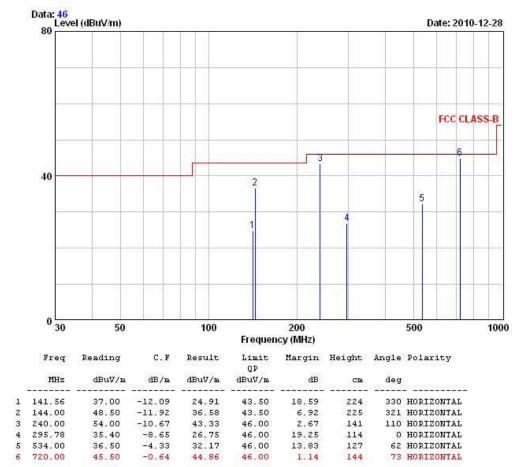


720.00

45.50

243 Jubug-ri, yangji-Myeon, Youngin-si, Gyeonggi-do 449-822 Korea Tel:+82-31-3236008,9 Fax:+82-31-3236010

EUT/Model No.: IHD2E100T0WW TEST MODE: Firmware Update mode Temp Humi : 6 / 32 Tested by: PARK.H.W



Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

46.00

44.86

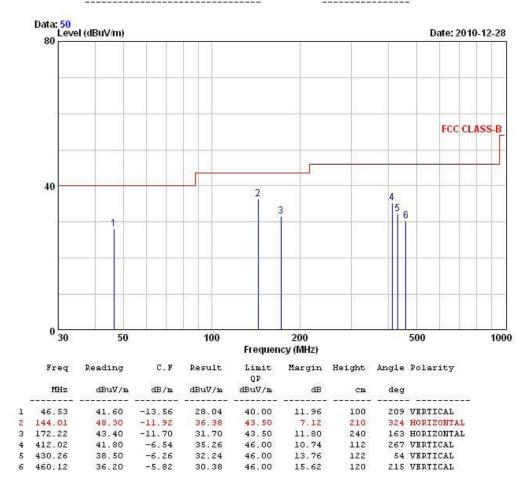
-0.64

### Radiated Emissions - Zigbee mode



243 Jubug-ri, yangji-Myeon, Youngin-si, Gyeonggi-do 449-822 Korea Tel:+82-31-3236008,9 Fax:+82-31-3236010

EUT/Model No.: IHD2E100TOWW TEST MODE: Zigbee mode
Temp Humi : 6 / 32 Tested by: PARK.H.W



Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

# 3.2.6 AC Conducted Emissions

### **Procedure:**

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its hopping function disabled at the middle channels in line with Section 15.31(m). Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

## **Measurement Data: Complies**

- See next pages for actual measured spectrum plots.
- No emissions were detected at a level greater than 20dB below limit.

### Minimum Standard: FCC Part 15.207(a)/EN 55022

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

<sup>\*</sup> Decreases with the logarithm of the frequency

## AC Conducted Emissions - Firmware update - Line

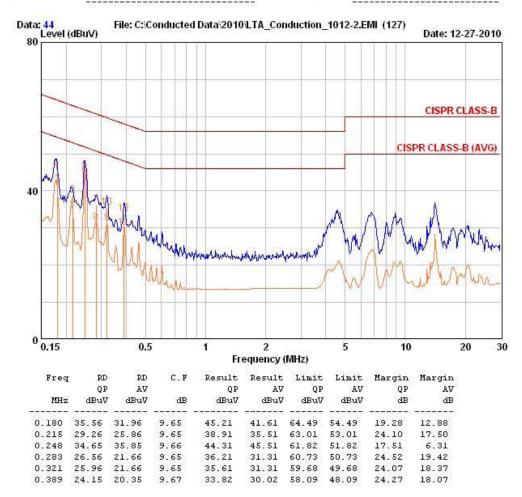


243 Jubug-ri, yangji-Myeon, Youngin-si, Gyeonggi-do 449-822 Korea Tel:+82-31-3236008,9 Fax:+82-31-3236010

EUT / Model No. : IHD2E100TOWW Phase : LINE

Test Mode : Firmware Update mode Test Power : 120 / 60

Temp./Humi. : 18 / 37 Test Engineer : PARK.H.W



## AC Conducted Emissions – Firmware update – Neutral

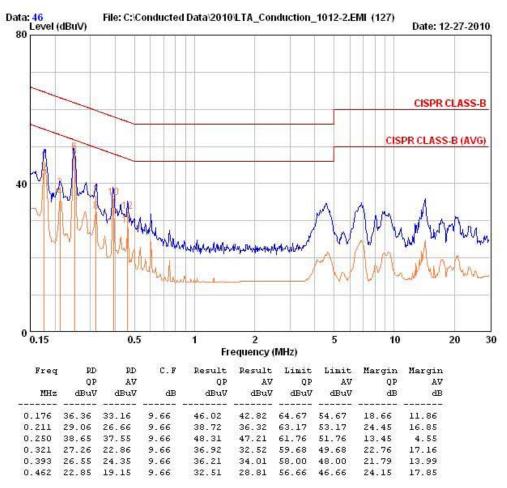


243 Jubug-ri, yangji-Myeon, Youngin-si, Gyeonggi-do 449-822 Korea Tel:+82-31-3236008,9 Fax:+82-31-3236010

EUT / Model No. : IHD2E100T0WW Phase : NEUTRAL

Test Mode : Firmware Update mode Test Power : 120 / 60

Temp./Humi. : 18 / 37 Test Engineer : PARK.H.W



### AC Conducted Emissions - Zigbee - Line

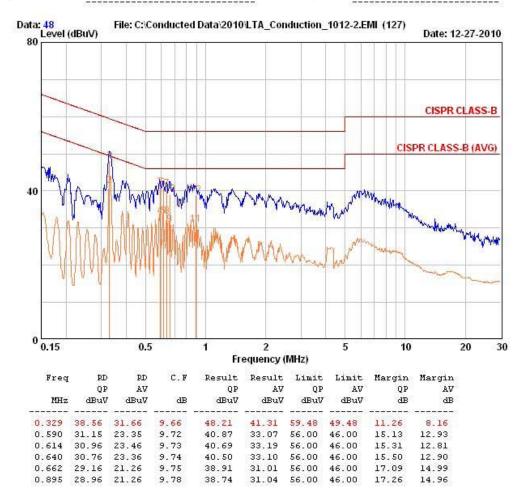


243 Jubug-ri, yangji-Myeon, Youngin-si, Gyeonggi-do 449-822 Korea Tel:+82-31-3236008,9 Fax:+82-31-3236010

EUT / Model No. : IHD2E100T0WW Phase : LINE

Test Mode : Zigbee mode Test Power : 120 / 60

Temp./Humi. : 18 / 37 Test Engineer : PARK.H.W



### **AC Conducted Emissions – Zigbee – Neutral**

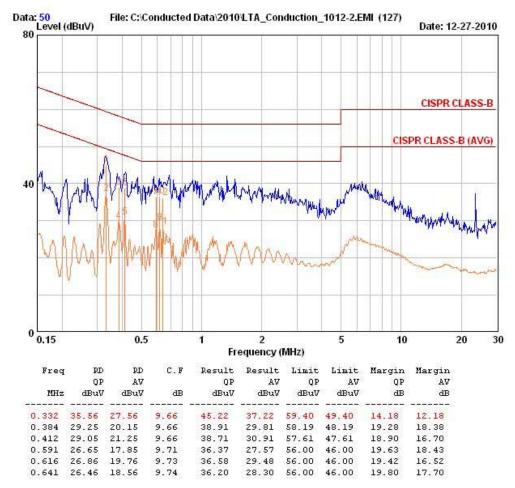


243 Jubug-ri, yangji-Myeon, Youngin-si, Gyeonggi-do 449-822 Korea Tel:+82-31-3236008,9 Fax:+82-31-3236010

EUT / Model No. : IHD2E100T0WW Phase : NEUTRAL

Test Mode : Zigbee mode Test Power : 120 / 60

Temp./Humi. : 18 / 37 Test Engineer : PARK.H.W



# **APPENDIX**

# TEST EQUIPMENT USED FOR TESTS

	Description	Model No.	Serial No.	Manufacturer	Interval	Last Cal. Date
1	Spectrum Analyzer	FSV-30	100757	R&S	1 year	2010-02-01
2	Spectrum Analyzer	8563E	3425A02505	НР	1 year	2010-03-29
3	Spectrum Analyzer	8594E	3710A04074	НР	2 year	2009-10-12
4	Signal Generator	8648C	3623A02597	HP	1 year	2010-03-30
5	Signal Generator	83711B	US34490456	HP	1 year	2010-03-30
6	Attenuator (3dB)	8491A	37822	НР	1 year	2010-10-08
7	Attenuator (10dB)	8491A	63196	НР	1 year	2010-10-08
8	EMI Test Receiver	ESCI7	100722	R&S	1 year	2010-10-08
9	Horn Antenna(18 ~ 40GHz)	SAS-574	154	Schwarzbeck	2 year	2010-11-25
10	Horn Antenna(18 ~ 40GHz)	SAS-574	155	Schwarzbeck	2 year	2010-11-25
11	RF Amplifier	8447D	2949A02670	НР	2 year	2009-10-12
12	RF Amplifier	8449B	3008A02126	НР	1 year	2010-03-29
13	Test Receiver	ESHS10	828404/009	R&S	1 year	2010-03-29
14	TRILOG Antenna	VULB 9160	9160-3212	SCHWARZBECK	2 year	2009-04-02
15	Log Periodic Antenna	VULP 9118	9118 A 401	SCHWARZBECK	2 year	2009-04-13
16	Biconical Antenna	BBA 9106	VHA 9103-2315	SCHWARZBECK	2 year	2009-04-13
17	Horn Antenna	3115	00055005	ETS LINDGREN	2 year	2009-03-16
18	Horn Antenna	BBHA 9120D	9120D122	SCHWARZBECK	2 year	2010-12-24
19	Dipole Antenna	VHA9103	2116	SCHWARZBECK	2 year	2010-11-25
20	Dipole Antenna	VHA9103	2117	SCHWARZBECK	2 year	2010-11-25
21	Dipole Antenna	VHA9105	2261	SCHWARZBECK	2 year	2010-11-25
22	Dipole Antenna	VHA9105	2262	SCHWARZBECK	2 year	2010-11-25
23	Hygro-Thermograph	THB-36	0041557-01	ISUZU	1 year	2010-04-12
24	Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	-	-
25	Power Divider	11636A	6243	НР	1 year	2010-10-08
26	DC Power Supply	6622A	3448A03079	НР	1 year	2010-10-08
27	Frequency Counter	5342A	2826A12411	HP	1 year	2010-03-30
28	Power Meter	EPM-441A	GB32481702	HP	1 year	2010-03-29
29	Power Sensor	8481A	US41030291	HP	1 year	2010-10-08
30	Audio Analyzer	8903B	3729A18901	HP	1 year	2010-10-08
31	Modulation Analyzer	8901B	3749A05878	НР	1 year	2010-10-08
32	TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	1 year	2010-10-08
33	LOOP-ANTENNA	FMZB 1516	151602/94	SCHWARZBECK	2 year	2009-03-02
34	Stop Watch	HS-3	601Q09R	CASIO	2 year	2010-03-31
35	LISN	ENV216	100408	R&S	1 year	2010-10-08
36	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	106243	R&S	2 year	2010-05-13
37	Attenuator (30dB)	8498A	3318A10929	НР	1 year	2011-01-05