

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR FCC CLASS B CERTIFICATION

Test Report No. : E12NR-038
Applicant : HUMAX Co., Ltd.
Address : Humax Bldg., 212-1, Yubang-Dong, Yongin-City, Gyeonggi-Do, Korea
Manufacturer : HUMAX Co., Ltd.
Address : Humax Bldg., 212-1, Yubang-Dong, Yongin-City, Gyeonggi-Do, Korea
Type of Equipment : IP Client STB
FCC ID : O6ZXI3-H
Model Name : XI3-H
Serial number : 19 1990092 00007
Total page of Report : 25 pages (including this page)
Date of Incoming : October 25, 2012
Date of Issuing : November 20, 2012

SUMMARY

The equipment complies with the requirement of *FCC CFR 47 PART 15 SUBPART B, Section 15.101, and 15.115.*

This test report contains only the results of a single test of the sample supplied for the examination.

It is not a general valid assessment of the features of the respective products of the mass-production.

Prepared by: 

Eung-Chan, Kim / Senior Engineer
ONETECH Corp.

Approved by: 

Gea-Won, Lee / Managing Director
ONETECH Corp.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
E12NR-038	November 20, 2012	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

- . APPLICANT : HUMAX Co., Ltd.
- . ADDRESS : Humax Bldg., 212-1, Yubang-Dong, Yongin-City, Gyeonggi-Do, Korea
- . CONTACT PERSON : Mr. INSEOK, SEO / Engineer
- . TELEPHONE NO : +82-31-776-6400
- . FCC ID : O6ZXI3-H
- . MODEL NAME : XI3-H
- . BRAND NAME : HUMAX
- . SERIAL NUMBER : 19 1990092 00007
- . DATE : November 20, 2012

EQUIPMENT CLASS	JBP: Part 15 Class B Computing Device Peripheral HID: Part 15: TV Interface Device
E.U.T. DESCRIPTION	IP Client STB - Unintentional Radiator
THIS REPORT CONCERNS	ORIGINAL GRANT
MEASUREMENT PROCEDURES	ANSI C63.4: 2009
TYPE OF EQUIPMENT TESTED	PRE-PRODUCTION
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	CERTIFICATION
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15, SECTION 15.101, and 15.115
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	No
FINAL TEST WAS CONDUCTED ON	3m Semi Anechoic Chamber

- . The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. GENERAL INFORMATION

2.1 Product Description

The HUMAX Co., Ltd., Model XI3-H (referred to as the EUT in this report) is an IP Client STB that has two kinds of memory types, SD CARD, USB Memory, and has a RF modulator for TV interfacing and IP Client STB functions. Also the EUT has Zigbee function and the report for the function shall be issued with another test report, so the EUT shall be submitted as composite device simultaneously. Product specification described herein was obtained from product data sheet or user's manual.

CHASSIS TYPE	Metal & Plastic
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1MHz)	CPU: 50MHz, RF4CE: 16MHz, MoCA: 50MHz, DDR: 800MHz
NUMBER OF LAYERS	6 Layers
TUNER M/N / MFR	On board type
EXTERNAL TERMINALS	Rear : Cable in(MoCA), TV out, Digital audio out (SPDIF), HDMI input, HDMI output, Ethernet, USB, dc jack (5V) Front : SD Card
USED AC/DC ADAPTER	Input: 100-120 V~, 1.2 A, 60 Hz, Output: 5 V, 3 A, 15 W Manufacturer : WEIHAI SUNGHU ELECTRONICS CO., LTD Model No: SH530UWUS1A

2.2 Model Differences

-. None

2.3 Related Submittal(s) / Grant(s)

-. Original submittal only

2.4 Test System Details

The model numbers for all the equipments that were used in the tested system is:

Model	Manufacturer	FCC ID	Description	Connected to
XI3-H	HUMAX Co., Ltd.	O6ZXI3-H	IP Client STB (EUT)	-
XPS 14z	DELL	DoC	Notebook PC	EUT
M2362DL	LG	DoC	LCD TV	EUT
CRUZER 8GB	SanDisk	DoC	USB Memory	EUT
N/A	Transcend	DoC	SD Card	EUT
ECB4M-L3-MMX	Entropic c.LINK	N/A	Coax Bridge	EUT

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4: 2009. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Electromagnetic compatibility measurement facilities are located on at 301-14, Daessangryung-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862, Korea. The Onetech Corp. has been accredited as a Conformity Assessment Body (CAB) with designation Number, KR0013.

3. SYSTEM TEST CONFIGURATION

3.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
CPU BOARD	HUMAX Co., Ltd.	XI3-H CPU B/D REV.0.2	N/A
USB BOARD	HUMAX Co., Ltd.	XI3-H USB B/D REV.0.2	N/A

3.2 Mode of operation during the test

The EUT has PC peripheral device and TV interfacing function, so 2 modes were played simultaneously during the following operating mode.

- . The input signal of the EUT was supported from a Coax Bridge and then the output signal of the EUT was transferred to a TV continuously during the test.
- . The Notebook PC was connected to the EUT in order to the ping test via the Ethernet port.

3.3 Cable Description for the EUT

	Power Cord Shielded (Y/N)	I/O cable Shielded (Y/N)	Length (M)
IP Client STB	N	N	1.5(P), 1.5(D)
Notebook PC	N	N	1.5(P), 1.5(D)
LCD TV	N	N	1.5(P), 1.5(D)
Coax Bridge	N	Y	1.5(P), 5.0(D)

* The marked "(P)" means the Power Cable and "D" means the I/O Cable.

3.4 Equipment Modifications

- . None

3.5 Configuration of Test System

Line Conducted Test : The EUT was connected to adaptor and the power of adaptor was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.4: 2009 7.3.3 to determine the worse operating conditions.

Radiated Emission Test : Preliminary radiated emission test was conducted using the procedure in ANSI C63.4: 2009 8.3.1.1 to determine the worse operating conditions. Final radiated emission test was conducted at 3 m semi anechoic chamber.

3.6 Output Signal Level Test

The output voltage of video carrier frequency at the RF-output terminal of the EUT was measured at 3 and 4 channel connecting directly to a spectrum analyzer with 50ohm input impedance via 75-to-50ohm matching pad. Indicated voltage on screen of measuring instrument was converted to the voltage of 75ohm system.

Data conversion method is as follows.

$$V_{75}[\text{uV}] = 10^{(V_r + CF)/20}[\text{uV}]$$

where, V_{75} : Voltage at the RF-out terminal of 75ohm in uV,
 V_r : Voltage read at analyzer with 50ohm input-impedance in dBuV,
 CF : Conversion Factor of the matching pad in dB.

3.7 Output Terminal Conducted Spurious Emission test

Any other spectrum at RF-output terminal appearing on frequencies removed by more than 4.6 MHz below or 7.4 MHz above the video carrier frequency of EUT was searched at 3 and 4 channel.

Data conversion method is as follows.

$$V_{75}[\text{uV}] = 10^{(V_r + CF + AT)/20}[\text{uV}]$$

where, V_{75} : Voltage at the RF-out terminal of 75ohm in uV,
 V_r : Voltage read at analyzer with 50ohm input-impedance in dBuV,
 CF : Conversion Factor of the matching pad in dB,
 AT : Attenuation of attenuator in dB.

3.8 Transfer Switch Isolation Test

As a transfer switch was equipped with EUT as an antenna-in, measurement of isolation were made at RF-input terminal with rated input impedance.

The maximum voltage of video carrier frequency of the EUT at the antenna input (RF-in) terminal of the switch was measured for both channels.

Data conversion method is as follows.

$$V_{75}[\text{uV}] = 10^{(V_r + CF - PG + AT)/20}[\text{uV}]$$

- here,
- V_{75} : Voltage at the RF-out terminal of 75ohm in uV,
 - V_r : Voltage read at analyzer with 50ohm input-impedance in dBuV,
 - CF : Conversion Factor of the matching pad in dB,
 - PG : Gain of pre-amplifier in dB,
 - AT: Attenuation of attenuator in dB.

4. PRELIMINARY TEST

4.1 AC Power line Conducted Emission Test

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
Ping test and TV interfacing operating mode with Channel 3	
Ping test and TV interfacing operating mode with Channel 4	X

4.2 Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated.

Operation Mode	The Worse operating condition (Please check one only)
Ping test and TV interfacing operating mode with Channel 3	
Ping test and TV interfacing operating mode with Channel 4	X

5. FINAL RESULT OF MEASUREMENT

Preliminary test was done in normal operation mode. And the final measurement was selected for the maximized emission level

5.1 Conducted Emission Test

Humidity Level : 41 % Temperature: 26 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART B, SECTION 15.107 (a)

Type of Test : CLASS B

Result : PASSED BY - 3.92 dB at 0.15 MHz under Peak mode

EUT : IP Client STB Date: November 02, 2012

Operating Condition : CH. 3 & Ping test

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)

Frequency (MHz)	Line	Peak (dBuV)		Margin (dB)
		Emission level	Q.P Limits	
0.15	N	62.08	66.00	- 3.92
0.20	N	54.39	63.82	- 9.43
0.22	N	49.51	62.82	- 13.31
0.25	N	46.28	61.92	- 15.64
9.43	H	42.59	60.00	- 17.41
25.45	H	42.22	60.00	- 17.78
Frequency (MHz)	Line	Average (dBuV)		Margin (dB)
		Emission level	Limits	
0.15	N	44.29	56.00	- 11.71
0.20	N	38.05	53.82	- 15.77
9.63	N	31.59	50.00	- 18.41
25.45	H	32.24	50.00	- 17.76

Line Conducted Emission Tabulated Data

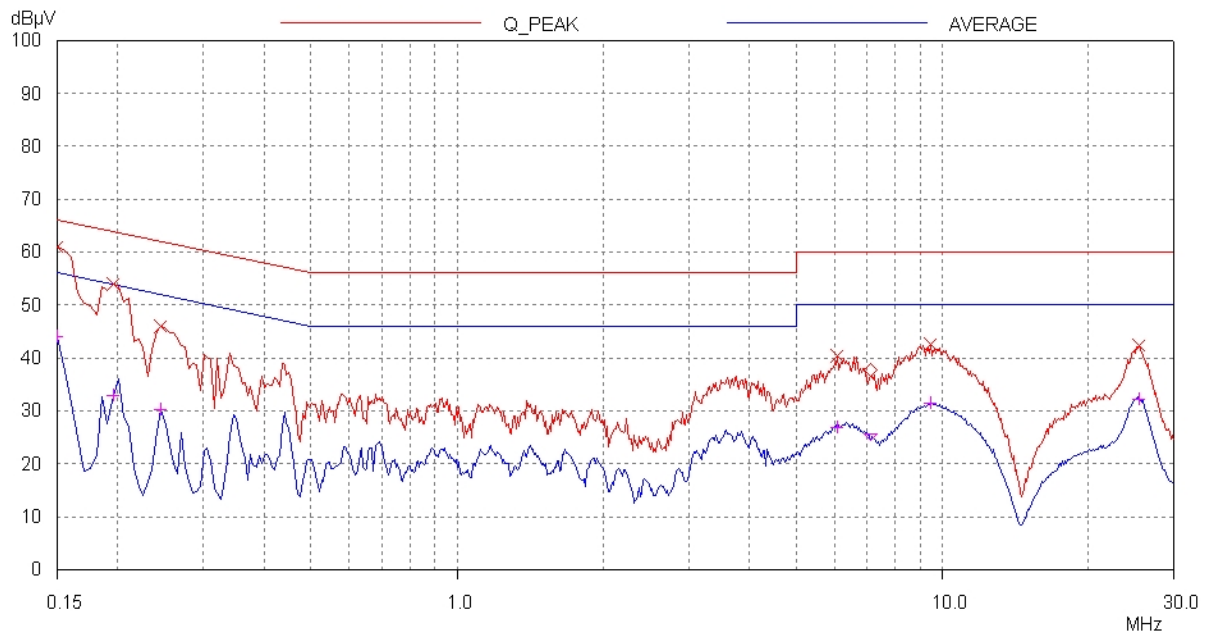
Remark: "H": Hot Line, "N": Neutral Line.

See next page for an overview sweep performed with peak and average detector.

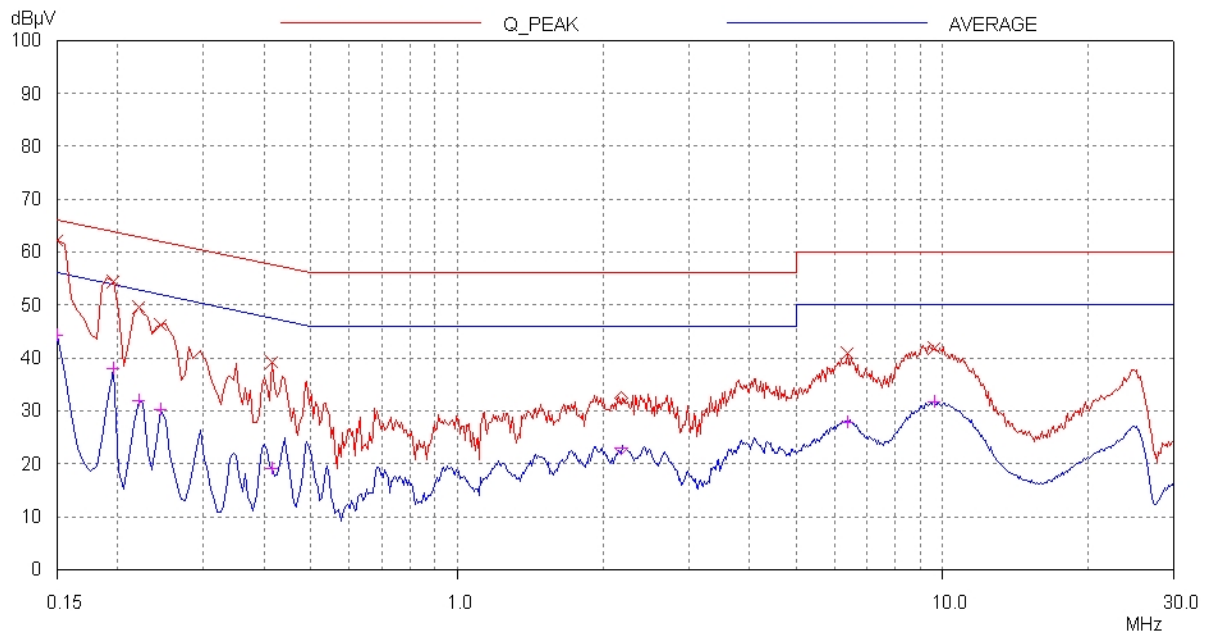


Tested by: Hyun-Haeng, Lee / Engineer

Graphical representation of Conducted Emission



HOT LINE



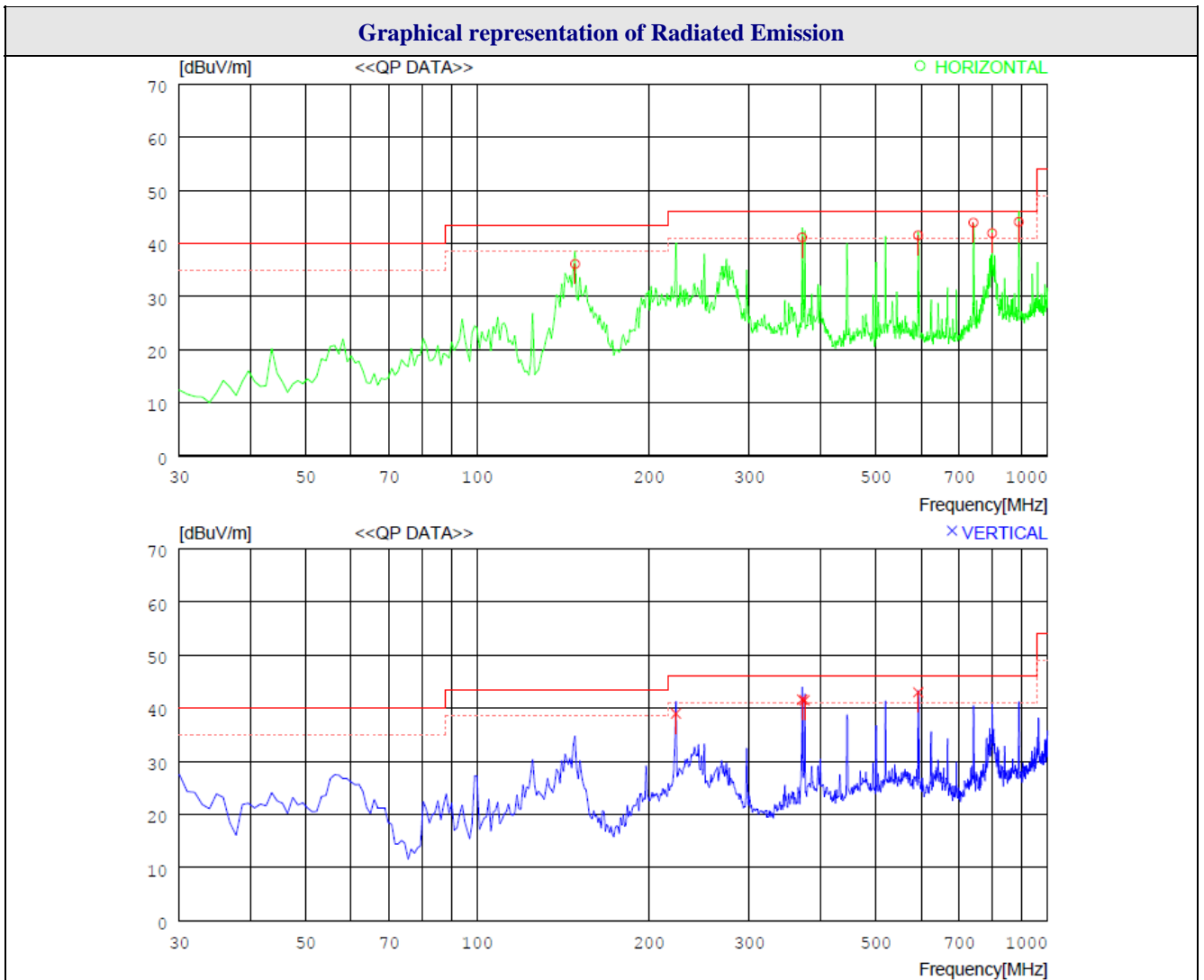
NEUTRAL LINE

5.2 Radiated Emission Test

5.2.1 Test Data for under 1 GHz

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level	: <u>37 %</u>	Temperature: <u>25 °C</u>
Limits apply to	: <u>FCC CFR 47, PART 15, SUBPART B, SECTION 15.109 (a)</u>	
Type of Test	: <u>CLASS B</u>	
Result	: <u>PASSED BY 2.00 dB at 890.957 MHz under Quasi peak detector mode</u>	
EUT	: <u>IP Client STB</u>	Date: <u>October 25, 2012</u>
Detector	: <u>CISPR Quasi peak (6 dB Bandwidth: 120 kHz)</u>	
Distance	: <u>3 Meter</u>	



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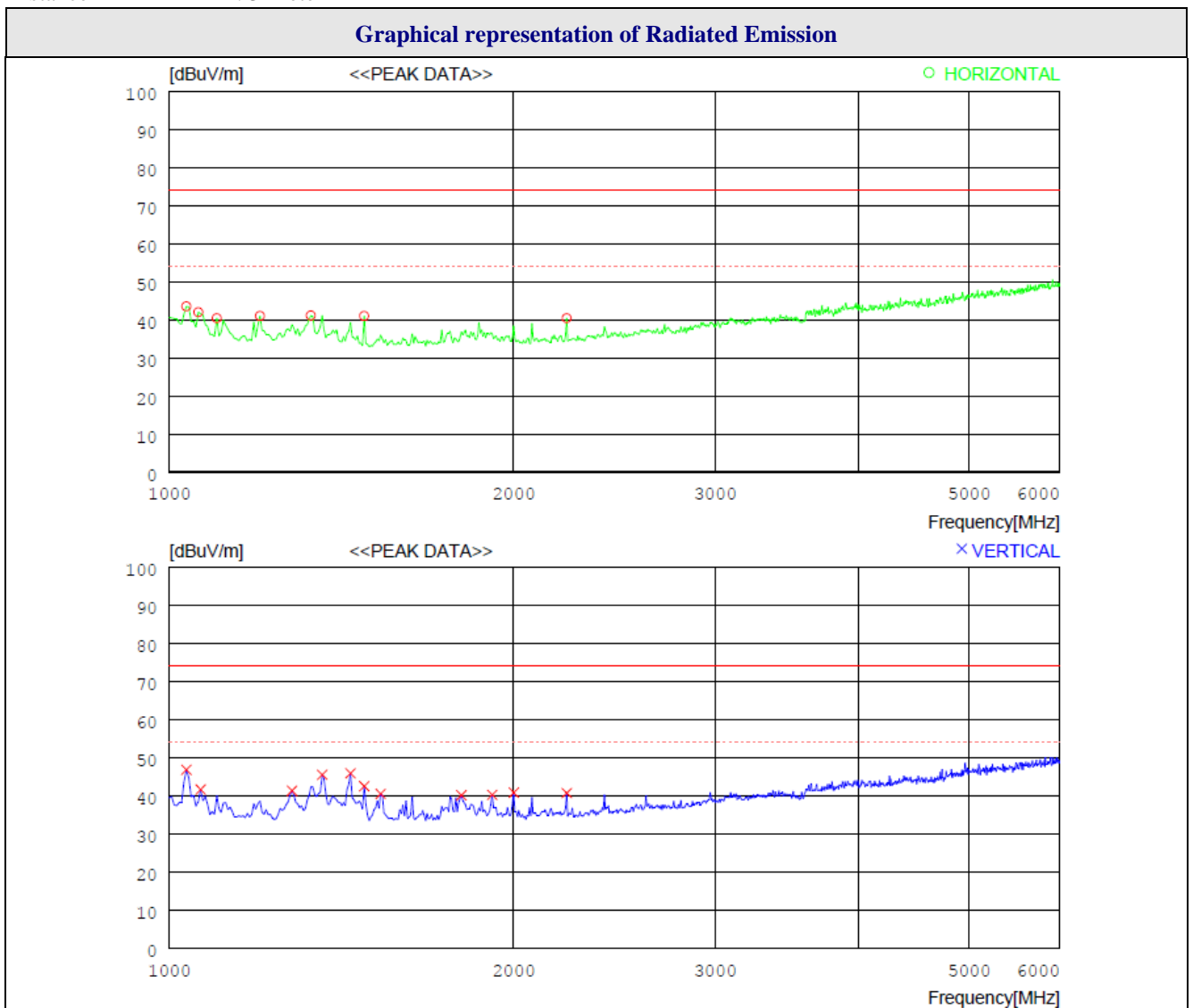
HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
EMC Testing Div. : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

Tabulated Results for Radiated Emission										
No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	741.768	50.0	21.4	5.2	32.7	43.9	46.0	2.1	100	115
2	890.957	46.7	23.3	6.1	32.1	44.0	46.0	2.0	189	223
3	148.494	57.6	9.3	2.2	33.0	36.1	43.5	7.4	200	321
4	800.172	46.4	22.2	5.8	32.5	41.9	46.0	4.1	100	163
5	371.440	54.2	16.3	3.6	33.0	41.1	46.0	4.9	200	341
6	593.568	49.6	20.2	4.8	33.1	41.5	46.0	4.5	334	79
----- Vertical -----										
7	374.996	54.4	16.4	3.7	33.0	41.5	46.0	4.5	100	123
8	593.401	51.1	20.2	4.8	33.1	43.0	46.0	3.0	100	257
9	371.440	54.7	16.3	3.6	33.0	41.6	46.0	4.4	100	266
10	223.030	56.3	12.9	2.8	33.0	39.0	46.0	7.0	100	336
Remark: Margin (dB) = Limit – Result and Result = Reading Average - Antenna Factor - Loss - Gain Loss and Gain in above table means Cable Loss and Pre-amplifier gain.										

5.2.2 Test Data for over 1GHz (Peak detector mode)

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level	: <u>37 %</u>	Temperature: <u>25 °C</u>
Limits apply to	: <u>FCC CFR 47, PART 15, SUBPART B, SECTION 15.109 (a)</u>	
Type of Test	: CLASS B	
Result	: PASSED BY 27.20 dB at 1035.000 MHz under peak detector mode	
EUT	: IP Client STB	Date: October 25, 2012
Detector	: CISPR Peak (6 dB Bandwidth: 1 MHz)	
Distance	: 3 Meter	



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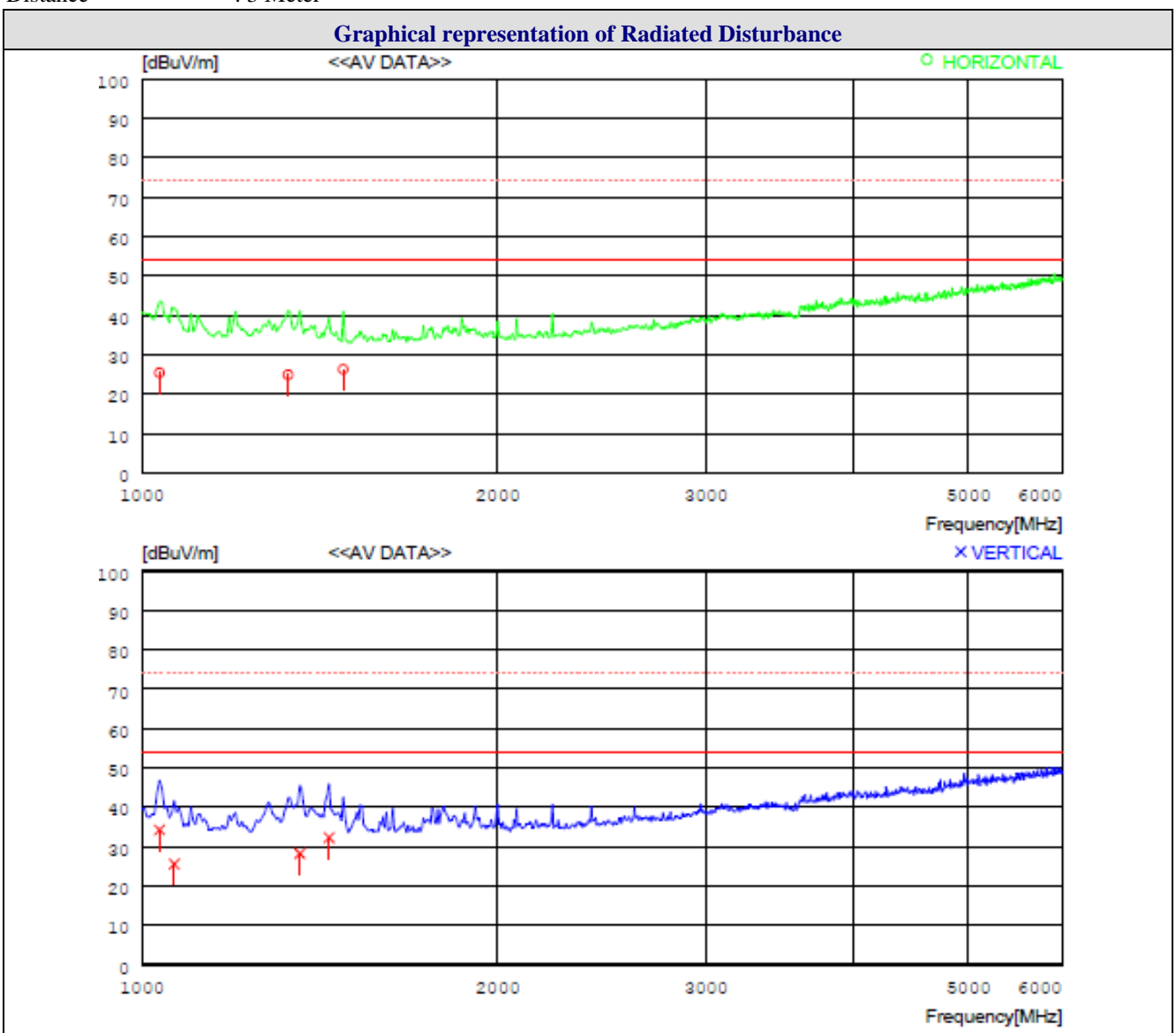
HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
EMC Testing Div. : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

Tabulated Results for Radiated Emission										
No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1035.000	55.5	25.9	4.4	42.3	43.5	74.0	30.5	100	359
2	1060.000	54.1	25.9	4.4	42.4	42.0	74.0	32	100	359
3	1100.000	52.3	25.9	4.6	42.4	40.4	74.0	33.6	100	359
4	1200.000	52.9	25.9	4.7	42.5	41.0	74.0	33	100	359
5	1330.000	52.7	26.0	5.0	42.6	41.1	74.0	32.9	100	268
6	1480.000	52.4	26.1	5.3	42.8	41.0	74.0	33	100	333
7	2225.000	49.9	26.8	6.7	43.0	40.4	74.0	33.6	100	359
----- Vertical -----										
8	1035.000	58.8	25.9	4.4	42.3	46.8	74.0	27.2	100	0
9	1065.000	53.7	25.9	4.4	42.4	41.6	74.0	32.4	100	358
10	1280.000	53.0	26.0	4.9	42.6	41.3	74.0	32.7	100	342
11	1360.000	57.1	26.0	5.1	42.7	45.5	74.0	28.5	100	133
12	1440.000	57.4	26.0	5.2	42.7	45.9	74.0	28.1	100	166
13	1480.000	53.9	26.1	5.3	42.8	42.5	74.0	31.5	100	2
14	1530.000	51.7	26.1	5.5	42.8	40.5	74.0	33.5	100	149
15	1800.000	50.8	26.2	5.9	42.8	40.1	74.0	33.9	100	0
16	1915.000	50.7	26.2	6.1	42.8	40.2	74.0	33.8	100	22
17	2000.000	51.0	26.3	6.3	42.8	40.8	74.0	33.2	100	0
18	2225.000	50.2	26.8	6.7	43.0	40.7	74.0	33.3	100	0
Remark: Margin (dB) = Limit – Result and Result = Reading Average - Antenna Factor - Loss - Gain Loss and Gain in above table means Cable Loss and Pre-amplifier gain.										

5.2.3 Test Data for over 1GHz (Average detector mode)

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level	: <u>37 %</u>	Temperature: <u>25 °C</u>
Limits apply to	: <u>FCC CFR 47, PART 15, SUBPART B, SECTION 15.109 (a)</u>	
Type of Test	: CLASS B	
Result	: PASSED BY 19.8 dB at 1035.0 MHz under average detector mode	
EUT	: IP Client STB	Date: October 25, 2012
Detector	: CISPR Average (6 dB Bandwidth: 1 MHz)	
Distance	: 3 Meter	



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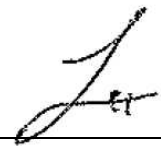
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EMC Testing Div. : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

Tabulated Results for Radiated Disturbance										
No.	FREQ [MHz]	READING AV [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1035.000	37.3	25.9	4.4	42.3	25.3	54.0	28.7	100	236
2	1330.000	36.3	26.0	5.0	42.5	24.8	54.0	29.2	100	117
3	1480.000	37.4	26.1	5.3	42.6	26.2	54.0	27.8	100	358
----- Vertical -----										
4	1035.000	46.2	25.9	4.4	42.3	34.2	54.0	19.8	100	156
5	1065.000	37.5	25.9	4.4	42.3	25.5	54.0	28.5	100	332
6	1360.000	39.6	26.0	5.1	42.5	28.2	54.0	25.8	100	174
7	1440.000	43.5	26.0	5.2	42.5	32.2	54.0	21.8	100	152

Remark: Margin (dB) = Limit – Result and Result = Reading Average - Antenna Factor - Loss - Gain

Loss and Gain in above table means Cable Loss and Pre-amplifier gain.



Tested by: Hyun-Haeng, Lee / Engineer

5.3 Output Terminal Signal Level Test

The following table shows that the all modes of operation and worst-case emissions were investigated

Humidity Level : 36 % Temperature : 23 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART B (Section 15.115)

EUT : IP Client STB Date: November 14, 2012
Detector : Span : 10 MHz SWP : 2 sec
RBW : 100 kHz VBW : 300 kHz

Output Impedance of RF-Output Terminal: 75ohm

-. Video signal

CH	Freq.(MHz)	Reading(dBuV)	M/P Loss(dB)	Total Level (uV)	Limit (uV)	Margin (dB)
3	61.25	44.98	7.5	420.73	3 000	- 17.06
4	67.27	45.7	7.5	457.09	3 000	- 16.34

-. Audio signal

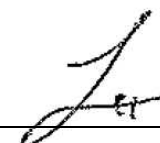
CH	Freq.(MHz)	Reading(dBuV)	M/P Loss (dB)	Total Level (uV)	Limit (uV)	Margin (dB)
3	56.70	34.57	7.5	126.91	671	- 14.46
	65.79	38.38	7.5	196.79	671	- 10.65
4	62.73	36.40	7.5	156.68	671	- 12.63
	71.82	39.00	7.5	211.35	671	- 10.03

MP = Impedance Matching Pad

*Sample Calculation at 61.25MHz = $10^{[(44.98 + 7.5)/20]} = 420.73 \text{ uV}$

*Margin [dB] = $20 \log (R/L) = 20 \log (420.73/3\ 000) = - 17.06 \text{ (dB)}$

Where, R : Total Level, [uV] , L : Corresponding Limit, [uV].



Tested by: Hyun-Haeng, Lee / Engineer

5.4 Output Terminal Conducted Spurious Emissions Test

The following table shows that frequency range of 30MHz to 1000MHz removed by more than 4.6 MHz below or 7.4 MHz above the video carrier frequency of EUT was investigated at each channel.

Humidity Level : 36 % Temperature : 23 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART B (Section 15.115)

EUT : IP Client STB Date: November 14, 2012
Detector : Span : 10 MHz SWP : 2 sec
RBW : 100 kHz VBW : 300 kHz

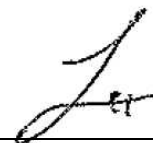
Output Impedance of RF-Output Terminal: 75ohm

CH.	Freq. (MHz)	Reading (dBuV)	M/P Loss (dB)	Output Level (uV)	Limit (uV)	Margin (dB)
3	233.75	25.45	7.5	44.41	94.80	- 6.58
	285.83	28.52	7.5	63.24	94.80	- 3.51
	289.71	26.54	7.5	50.35	94.80	- 5.49
	388.65	26.07	7.5	47.70	94.80	- 5.96
4	242.40	26.20	7.5	48.42	94.80	- 5.83
	334.67	28.40	7.5	62.37	94.80	- 3.63
	452.63	29.23	7.5	68.63	94.80	- 2.80
	465.78	28.59	7.5	63.75	94.80	- 3.44

* Sample Calculation at 121.2MHz = $10^{(25.45 + 7.5)/20} = 44.41 \text{ uV}$

*Margin [dB] = $20 \log (R/L) = 20 \log (44.41/94.8) = - 6.58 \text{ dB}$

Where, R : Output Level, [uV], L : Corresponding Limit, [uV]



Tested by: Hyun-Haeng, Lee / Engineer

5.5 Transfer Switch Isolation Test

The following table shows that the maximum voltage of video carrier frequency of the EUT at the antenna input (RF-in) terminal of the switch was measured for both channels.

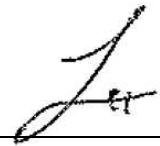
Humidity Level : 36 % Temperature : 25 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART B (Section 15.115)

EUT : IP Client STB Date: November 14, 2012
Detector : Span : 1 MHz SWP : 30 msec
RBW : 10 kHz VBW : 30 kHz

Output Impedance of RF-Output Terminal: 75ohm

CH.	Freq. (MHz)	Meter Reading (dBuV)	M/P Loss (dB)	Preamp Gain(dB)	Attn. (dB)	Signal Level (uV)	Limit (uV)	Margin (dB)
"It was not observed any emissions from the EUT during the above test"								

Note : To clarify the emissions emanated from RF output terminal the EUT, RF pre-amplifier was utilized.
The gain of pre-amplifier at each frequency measured from the EUT was obtained after sufficient warm-up for stabilization of gain.



Tested by: Hyun-Haeng, Lee / Engineer

6. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses

	+ Meter reading	(dBuV)
	+ Cable Loss	(dB)
	+ Antenna Factor (Loss)	(dB/meter)
	= Corrected Reading	(dBuV/meter)
	- Specification Limit	(dBuV/meter)
	= dB Relative to Spec	(+/- dB)

7. LIST OF TEST EQUIPMENT

No.	Equipment	Manufacturer	Model Name	Serial No.	Last Cal.	Interval Cal.	Used
1.	Test receiver	Rohde & Schwarz	ESCI	101013	Oct. 21, 2011	One Year	
2.			ESU	100261	Sep. 24, 2012	One Year	■
3.			ESiB26	100296	Apr. 13, 2012	One Year	
4.			ESHS 10	834467/007	Jun. 21, 2012	One Year	■
5.	Amplifier	Sonoma Instrument	310N	312544	May 30, 2012	One Year	■
6.			310N	312545	May 30, 2012	One Year	
7.		Rohde & Schwarz	SCU 18	10041	Apr. 11, 2012	One Year	■
8.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-255	Apr. 24, 2012	Two years	■
9.			VULB9163	9163-420	Mar. 27, 2012	Two years	
10.	Horn Antenna	Schwarzbeck	BBHA9120D	294	Aug. 23, 2011	Two years	■
11.	LISN	EMCO	3825/2	9109-1867	May 30, 2012	One Year	■
12.				9109-1869	May 30, 2012	One Year	
13.		Schwarzbeck	NSLK 8126	8126-404	Jun. 11, 2012	One Year	■
14.			NSLK 8128	8128-216	Jun. 11, 2012	One Year	
15.	Controller	Innco System	CO2000	619/27030611/L	N/A	N/A	■
16.	Turn Table	Innco System	DT3000	930611	N/A	N/A	■
17.	Antenna Master	Innco System	MA4000-EP	3320611	N/A	N/A	■
18.			MA4000-EP	3350611	N/A	N/A	
19.	Tripod	EMCO	N/A	N/A	N/A	N/A	■