

# Electromagnetic Emission

## FCC MEASUREMENT REPORT

### CERTIFICATION OF COMPLIANCE

### FCC Part 15 Certification Measurement

**PRODUCT** : Set top box  
**MODEL/TYPE NO** : IPH3004HDM / EVY743H02340  
**FCC ID** : PFNIPH3004HDM  
**MULTIPLE MODEL** : IPH3004HDM, DMS3004HDM, DMT-1434  
**BRAND NAME** : -  
**APPLICANT** : Digital Multimedia Technology Co., Ltd.  
8F Seongam Bldg, 710 Eonju-ro, Gangnam-gu,  
Seoul, 06058, South Korea  
Attn.: Jung Hwan Lee / Senior Research Engineer  
**MANUFACTURER 1** : WOOJEON&HANDAN VINA CO.,LTD  
F2 - Que Vo Industrial Park expansion, Phuong Lieu Commune,  
Que Vo district, Bac Ninh province, VietNam  
**MANUFACTURER 2** : Hengdi Digital Technology (Shen Zhen) Co.,Ltd  
A.B Building, Xin Shi Qiao Guanjie Industrial Park, Guihua Community,  
Guanlan Street, Bao'an District, Shenzhen City, Guangdong Province,  
China, 518-110  
**FCC CLASSIFICATION** : JBP - Part 15 Class B Personal computers and peripherals  
**RULE PART(S)** : FCC Part 15 Subpart B  
**TEST PROCEDURE** : ANSI C63.4-2014  
**TEST REPORT No.** : ETLE171130.1128  
**DATES OF TEST** : December 18, 2017 to December 22, 2017  
**REPORT ISSUE DATE** : January 17, 2018  
**TEST LABORATORY** : ETL Inc. (FCC Designation Number: KR0022)

This Set top box, Model IPH3004HDM has been tested in accordance with the measurement procedures specified in ANSI C63.4-2014 at the ETL/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart B:

I attest to the accuracy of data. All measurement herein was performed by me or was made under my supervision and is correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Prepared by:

Chul Min, Ji (Test Engineer)

January 17, 2018

Reviewed by:

Hyung Min, Choi (Chief Engineer)

January 17, 2018

#### ETL Inc.

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Open site: #499-1, Sagot-ri, Seosin-myeon, Hwaseong-si, Gyeonggi-do, 445-882, Korea

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*The test report merely corresponds to the test sample(s).*

*This report shall not be reproduced, in whole or in part without the written approval of ETL Inc.*

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## FCC MEASUREMENT REPORT

**Scope** – Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)

### General Information

**Applicant Name :** Digital Multimedia Technology Co., Ltd.

**Address :** 8F Seongam Bldg, 710 Eonju-ro, Gangnam-gu,  
Seoul, 06058, South Korea

**Attention :** Jung Hwan Lee / Senior Research Engineer

- **EUT Type :** Set top box
- **Model Number :** IPH3004HDM
- **S/N :** EVY743H02340
- **Rule Part(s) :** FCC Part 15 Subpart B
- **Test Procedure :** ANSI C63.4-2014
- **FCC Classification :** JBP - Part 15 Class B Personal computers and peripherals
- **Dates of Tests :** December 18, 2017 to December 22, 2017
- **Environmental of Tests:**
  - Temperature: (14.7 ± 6.7) °C
  - Humidity: (51 ± 10) % R.H.
  - Atmospheric Pressure: (101.8 ± 0.6) kPa
- **Place of Tests :** ETL Inc. Testing Lab. (FCC Designation Number : KR0022)
  - Radiated Emission test 1;  
#499-1, Sagot-ri, Seosin-myeon, Hwaseong-si,  
Gyeonggi-do, 445-882, Korea
  - Radiated Emission test 2 and Conducted Emission test;  
#371-51, Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea
- **Test Report No. :** ETLE171130.1128

## 1. INTRODUCTION

The measurement tests for radiated and conducted emission test were conducted at the ETL Inc. The site is constructed in conformance with the requirements of the ANSI C63.4-2014 and CISPR Publication 16. The ETL has site descriptions on file with the FCC for 3 m and 10 m site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-2014 and registered to the Federal Communications Commission (FCC Designation Number : KR0022).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2014) was used in determining radiated and conducted emissions from the Digital Multimedia Technology Co., Ltd., Model: IPH3004HDM.

## 2. PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the Set top box (model: IPH3004HDM).

The model IPH3004HDM is basic model that was tested.

The multi models IPH3004HDH, DMS3004HDH and DMT-1434 are identical to basic model, except for model designation.

The AC/DC Adapter was added. And, it was tested again.

(Add test report ETLE171130.1128 issued on January 17, 2018 to previously published test report ETLE151027.1272 on December 14, 2015.)

AC/DC Adapter types may be used the one of two type selected by manufacturer.

Model name of AC/DC Adapter	View of AD/DC Adapter		
S015AAU0500300 (Before)			
V03G0500300HU (Addition)			

## 2.2 General Specification

Item	Specification
<b>System &amp; Memory</b>	
CPU	BCM7437CVKFEB1G - Macrovision
ROM	4 MByte - NorFlash / SPI 4 GByte - eMMC NAND Flash / EBI
RAM	2 x 16 bit DDR3 1 600 MHz/1 866 MHz
Hardware ID (GPIO- General Purpose IO)	N/A
<b>BCM7437 Features</b>	
CPU	5250 DMIPS
DRAM Controller	32-bit wide DDR3 memory interface
Video Decoder	H.265/HEVC Main profile H.264/AVC Main and High profile to Level4.2, 1080p60 fps MPEG-1, MPEG-2, MPEG-4 Part2 SVC HP@L4.2 and MVC@L4.1 VC-1 AP@L3, VC-1 Simple and Main profile DivX 3.11, 4.1, 5.X, 6.X
Audio Decoder	AAC LC, AAC HE Level 2, AAC HE Level4 Dolby Digital 5.1, Dolby Digital Plus, Dolby True HD, DTS MA MPEG-1 Layer 1 & 2, MP3, WMA, WMA Pro, DTS-HD Master Audio, PCM audio, Dolby Digital to PCM Conversion, Dolby MS-11
I/O Interface	1 x external USB 2.0 Host 3 x UART 1 x integrated 10/100/1000 MACs and 10/100 PHY HDMI v.1.4a with 3D standards

Item	Specification
<b>ROM (NOR)</b>	
Component	Serial flash: KH25L3235E
Size	4 MB
Package	SOP-8L 209MIL
<b>ROM (NAND)</b>	
Component	eMMC: SDIN7DP2-4G
Size	4 GB - MLC
Package	WFBGA153
<b>RAM</b>	
Component	DDR3: NT5CC256M16DP-DI
Size	1 GB 2 x 16 bit
Package	VFBGA96
<b>Video Decoding</b>	
Standards Supported	MPEG-2: MP@ML, MP@HL, H.264: MP@L3, HP@L4
Formats Supported	HD and SD for all supported encoding standards
Output Resolutions	480i 30 fps, 480p 60 fps, 720p 60 fps, 1080i 30fps
Output Format Type	NTSC
<b>Audio Decoding</b>	
Standard Supported	AAC LC, AAC HE Level 2, AAC HE Level4 Dolby Digital, Dolby Digital Plus, Dolby True HD, DTS MA MPEG-1 Layer 1 & 2, MP3, WMA, WMA Pro DTS-HD Master Audio
Formats Supported	AC3 up to 5.1 ProLogic
<b>Remote Control</b>	
RF4CE	Supported, 38 kHz of data trans receiving
Line of Sight Distance	up to 100 ft.
Non Line of Sight Distance	up to 50 ft.
Component	GP501 - Greenpeak
Function	2.4 GHz
Package	40 pin 6.0 mm x 6.0 mm



Item	Specification
<b>General Features</b>	
Mute Function	Yes
On Screen Graphic	Channel Name and Number
Closed Captioning / VBI	EIA-708 and EIA 608, SCTE-20, SCTE-21, SCTE-127
Emergency Alert	SCTE 18, In-band EAS
<b>Front of DTA</b>	
Display	2 x Dual color LED (Green & Amber)
IR	1 x IR 38 kHz of data trans receiving
<b>Rear Connections</b>	
Cable / MOCA input	1 x Connector - F type connector - Female (75 ohm)
AV connector	1 x 3 RCA jack - Composite, Audio-L, Audio-R
S/PDIF	1 x Connector - Optical jack
HDMI output	1 x Type A - 19 pin, V1.4b
ETHERNET	1 x RJ45 - 10 Mbps/100 Mbps
USB	1 x Type A - USB 2.0 Host
Power jack	1 x DC jack - For External Adaptor - specifies as EPS-2
<b>RF Interface</b>	
Interface	MTSIF
Component	BCM3144 - Full band capture (4 in-band QAM demodulators)



Item	Specification
<b>RF Input</b>	
Input Connector	F-Type Female
Input Frequency	54 - 1 002 MHz - No Mid Split filter
Input Impedance	75 Ohm
Digital Input Signal Level	64 QAM: -15 dBmV to +15 dBmV 256 QAM: -12 dBmV to +15 dBmV
Modulation Schemes Supported	QAM 256/128/64
Channel Plan	IRC/HRC/Standard
ITU_T J.83Support	Annex A/B/C
Symbol rate	64 QAM: 5.057 MHz 256 QAM: 5.36 1MHz
Max Transport Stream Throughput	40 Mbps
<b>Moca</b>	
Modulation	OFDM
Component	Built-in
Version	2.0
LAN/PA	BCM3451 (LAN & PA)
Bandwidth	100 MHz
Data Throughput	400 Mbps on the coax, 500 Mbps 2-node
<b>USB</b>	
Component	Built-in Inside BCM7437
Function	1 x USB 2.0 - 0.5 A/5 V
Package	Host / 4 pin - Type A
<b>Ethernet</b>	
Component	Built-in Inside BCM7437
Function	10 Mbps/100 Mbps
Package	RJ45
LED	None

Item	Specification
<b>Electrical Specifications</b>	
External Adaptor	Wall Mount
Input Voltage	90-135 Vac
Input Frequency	57 Hz ~ 63 Hz
Output Voltage	+5 V (EPS 2) Min +4.85 V/Max +5.15 V
Output Current	Max 3.0 A
Short Circuit Protection	Auto Recovery
Over Current Protection	Auto recovery
Cable length	1.8 m
<b>Digital Output</b>	
Connector	HDMI, version1.4a
CEC	Supported
Component	Built-in Inside 7437
Package	19 pin Type A
<b>Graphics Resolution</b>	
Max Resolution	1 920 x 1 080 @ 60 Hz
Simultaneous HD and SD User Interface	Supported
Picture in Guide	Supported
<b>Copy Protection</b>	
Digital	HDCP version1.4
<b>Conditional Access</b>	
Content Protection	Motorola/Cisco- CAL, DRM, CGMSA
<b>Mechanical Specifications</b>	
Size (W x H x D)	186 mm x 188 mm x 45 mm
Color	Main case - Gloss Black, End Cap - MSO Specified
High Internal Frequency: CPU Clock → 514 MHz	

## 3. DESCRIPTION OF TESTS

### 3.1 AC Power line Conducted Emission Measurement

AC Power line Conducted emissions measurements were made in accordance with section 12, "Measurement of unintentional radiators other than ITE" of ANSI C63.4-2014. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50  $\Omega$ /50  $\mu$ H LISN as the input transducer to a Spectrum Analyzer or a Test Receiver. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 9 kHz or for "quasi-peak" within a bandwidth of 9 kHz.

The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1 m x 1.5 m x 0.8 m wooden table which is placed 40 cm away from the vertical wall and 1.5 m away from the side wall of the chamber room. Two LISN are bonded to the shielded room. The EUT is powered from the LISN and the support equipment is powered from the other LISN. Powers to the LISNs are filtered by a noise cut power line filters. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the LISN.

Non-inductive bundling to a 1 m length shortened all interconnecting cables more than 1 m. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the EMI Test Receiver to determine the frequency producing the maximum emission from the EUT. The frequency producing the maximum level was reexamined using to set Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 MHz to 30 MHz. The bandwidth of the spectrum analyzer was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission.

Photographs of the worst-case emission can be seen in photographs of conducted emission test setup in Appendix B.

## 3.2 Radiated Emission Measurement

Radiated emission measurements were made in accordance with section 12, "Measurement of unintentional radiators other than ITE" of ANSI C63.4-2014. The measurements were performed over the frequency range of 30 MHz to 40 GHz (or 5th harmonic of the highest frequency) in using antenna as the input transducer to a spectrum analyzer or a field intensity meter. The measurements below 1 GHz were made with the detector set for "Quasi-peak" within a bandwidth of 120 kHz. The measurements above 1 GHz were made with the detector set for "Peak and Average" within a bandwidth of 1 MHz.

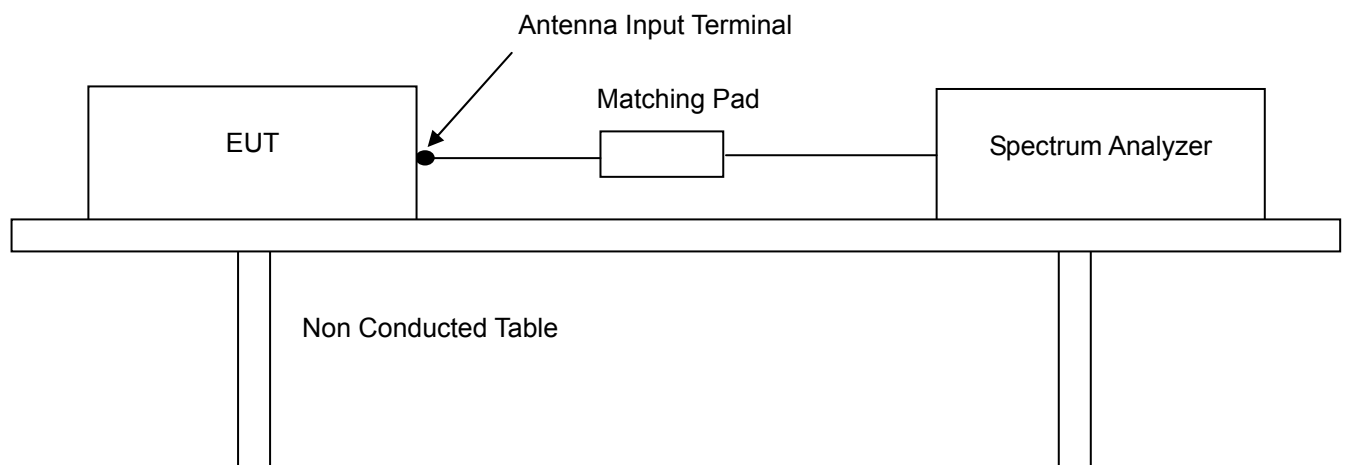
Preliminary measurements were made at 3 m using broadband antennas, and spectrum analyzer to determined the frequency producing the maximum emission in shielded room. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 MHz to 1 000 MHz using Log-Bicon antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used. Final measurements were made open site or SVSWR chamber at 3 m. The test equipment was placed on a styrofoam table. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8 m high nonmetallic 1 m x 1.5 m table. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 m to 4 m and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation to the EUT and/or support equipment and changing the polarity of the antenna, whichever determined the worst-case emission.

Photographs of the worst-case emission can be seen in Photographs of the worst-case emission test setup can be seen in Appendix B.

## 3.3 Antenna Power Conducted Measurements

Power on the receive antenna terminals was to be determined by measurement of the voltage present at these terminals. An antenna-conducted power measurement is performed with the EUT antenna terminals connected directly to a spectrum analyzer, if the antenna impedance matches the impedance of the measuring instrument. Otherwise, use an impedance-matching network to connect the measuring instrument to the antenna terminals of the EUT. Losses in decibels in any impedance-matching network used are added to the measured value in dBμV.

With the EUT tuned to one of the frequency over which device operates, measure both the frequency and voltage present at the antenna input terminals over the frequency range specified in the individual equipment requirements. Repeat this measurement with the receiver tuned to another frequency until the numbers of frequencies specified have been successively measured. Power on the receive antenna terminals is the ratio of  $V^2/R$ , where  $V$  is the loss-corrected voltage measured at the antenna terminals, and  $R$  is the impedance of the measuring instrument.



## 4. TEST CONDITION

### 4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the EUT and the supported equipments were installed to meet FCC requirement and operated in a manner which tends to maximize its emission level in a typical application.

### 4.2 EUT operation

- A standard signal with vertical moving color bar pattern with sound carrier and PING test mode

### 4.3 Support Equipment Used

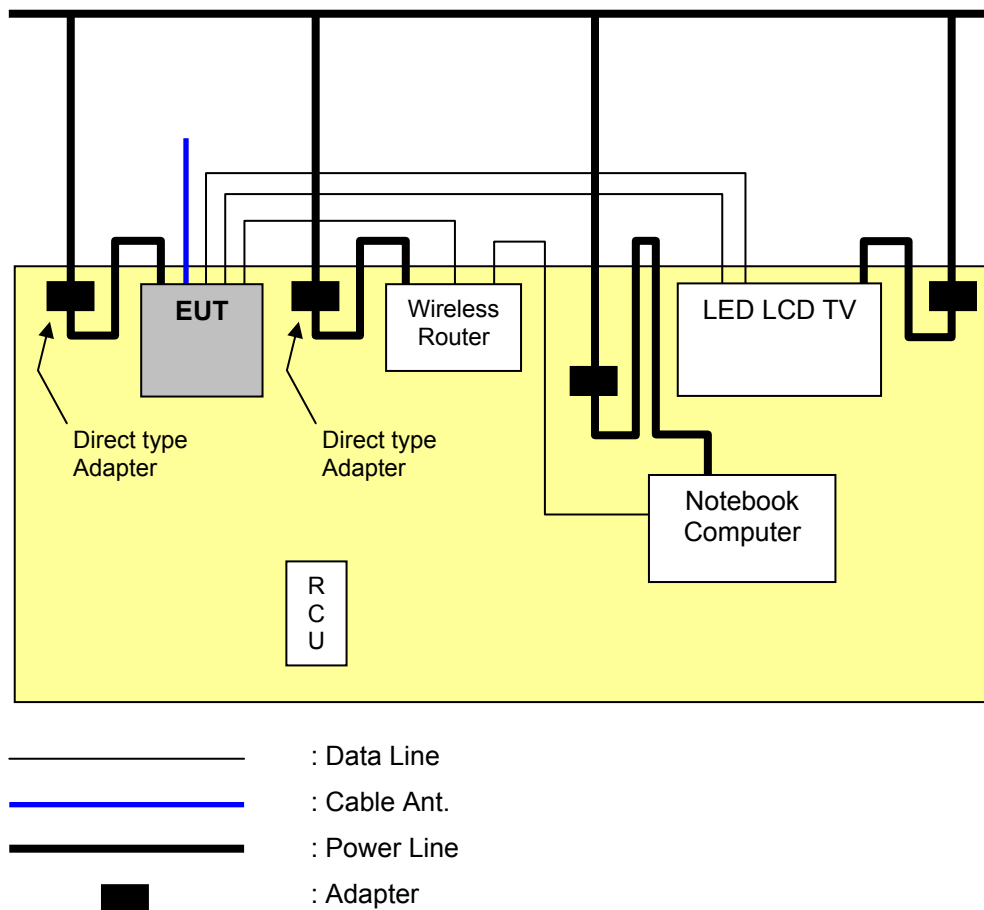
Description	Model Name	Serial No.	Manufacturer	FCC
Adapter (for EUT)	V03G0500300HU	NONE	Vere Technologies Corporation Limited	Ver
Remote Control Unit (for EUT)	NONE	NONE	NONE	-
Notebook Computer	LGS53	303QCPY568288	LG Electronics	-
Adapter (for Notebook Computer)	PA-1900-14	L9130B10004794	Lite On Technology (Changzhou) Co., Ltd.	-
LED LCD TV	M235IPSM	203KCHE3X649	LG Electronics	-
Adapter (for LED LCD TV)	PA-1650-68	OC28N61231403 1239	Lite-On Technology Corporation	-
Wireless Router	ipTIME N604+	NONE	EMF Networks Co.	-
Adapter (for Wireless Router)	DCP005C09050K	NONE	Zioncom Electronics (Shenzhen) Ltd.	-
USB Drive (8 GB)	NONE	NONE	NONE	-

## 4.4 Type of Cables Used

Device from	Device to	Type of I/O port	Length [m]	Type of shield	Used ferrite core
EUT	LED LCD TV	HDMI	1.5	Shielded	X
EUT	LED LCD TV	RCA	1.5	Shielded	X
EUT	Wireless Router	Ethernet	> 3.0	Unshielded	X
EUT	USB Drive	USB	-	-	-
EUT	Cable ANT.	Cable Tuner	> 3.0	Shielded	X
EUT	Adapter	DC Input	1.2	Shielded	X
Notebook Computer	Wireless Router	LAN	> 3.0	Unshielded	X
Notebook Computer	Adapter	DC Input	1.2	Shielded	O
LED LCD TV	Adapter	DC Input	1.2	Shielded	O
Wireless Router	Adapter	DC Input	1.2	Shielded	X



## 4.5 The setup drawing(s)



## 5. TEST RESULTS

### 5.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

FCC Rule	Measurement Required	Result
15.107(a)	AC Power line Conducted Emission Measurement	Passed by 8.01 dB
15.109(a)	Radiated Emission Measurement (Below 1 GHz)	Passed by 4.59 dB
15.109(a)	Radiated Emission Measurement (Above 1 GHz)	Passed by 7.03 dB
15.111(a)	Antenna Power Conduction Measurement	Passed by 9.10 dB

The data collected shows that the **Digital Multimedia Technology Co., Ltd. / Set top box / IPH3004HDM** complied with technical requirements of above rules part 15.107(a) and 15.109(a) and 15.111(a) Limits.

The equipment is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified during testing.

## 5.2 AC Power line Conducted Emissions Measurement

### 5.2.1 AC Power line Conducted Emissions Data

EUT	Set top box / IPH3004HDM (S/N: EVY743H02340)
Limit apply to	FCC Part 15 Subpart B Section 15.107(a) Class B
Test Date	December 19, 2017
Environmental of Test	(20.3 ± 0.0) °C, (41 ± 0) % R.H., (101.2 ± 0.0) kPa
Operating Condition	A standard signal with vertical moving color bar pattern with sound carrier and PING test mode
Result	Passed by 8.01 dB

### Conducted Emission Test Data

The following data and graph shows the highest levels of conducted emissions on both polarizations of hot and neutral line.

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

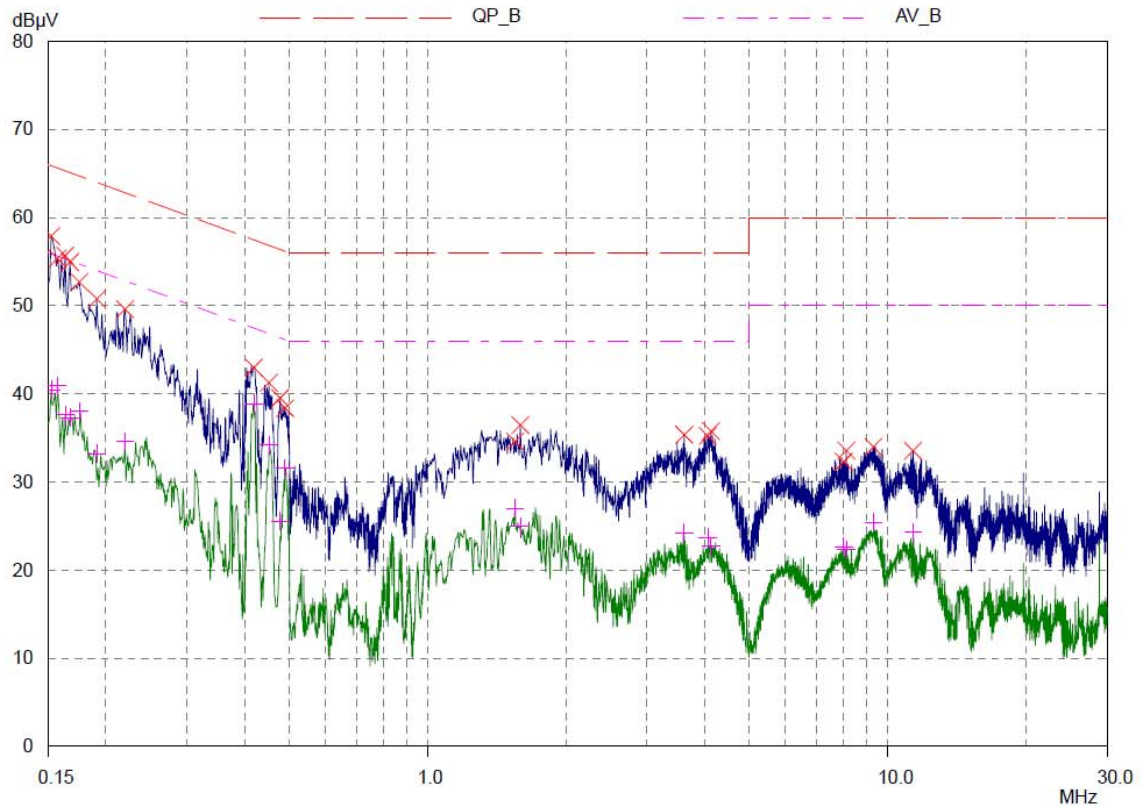
#### NOTES:

1. Please see the measured data and graph in next page.
2. The Level (Result) value was included the reading, LISN factor and cable loss.
3. Delta (Margin) value = Limit - Level (Result)
4. Measurement were performed at the AC Power Inlet in the frequency band of 150 kHz ~ 30 MHz according to the FCC Part 15.107(a) Class B.
5. If the Quasi-Peak limit is met when using a Peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the Quasi-Peak detector receiver is unnecessary.
6. If the average limit is met when using a Quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

Line: HOT

ETL EMC Laboratory  
Conducted Emission Test Result  
EUT: ETLE171130.1128  
Manuf:  
Op Cond:  
Operator:  
Test Spec:  
Comment: HOT

Prescan Measurement: Detectors: X PK / + AV  
Meas Time: see scan settings  
Peaks: 16  
Acc Margin: 10 dB



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## ETL EMC Laboratory

### Conducted Emission Test Result

EUT: ETLE171130.1128

Manuf:

Op Cond:

Operator:

Test Spec:

Comment: HOT

Prescan Measurement:	Detectors:	X PK / + AV
	Meas Time:	see scan settings
	Peaks:	16
	Acc Margin:	10 dB

#### Peak Search Results

Frequency MHz	PK Level dBμV	PK Limit dBμV	PK Delta dB
0.152	57.88	65.89	8.01
0.157	55.35	65.62	10.27
0.163	55.68	65.31	9.63
0.167	54.94	65.11	10.17
0.175	52.68	64.72	12.04
0.191	50.76	63.99	13.23
0.22	49.60	62.82	13.22
0.419	42.97	57.47	14.50
0.452	41.26	56.84	15.58
0.478	39.53	56.37	16.84
0.49	38.36	56.17	17.81
1.55	34.58	56.00	21.42
1.59	36.44	56.00	19.56
3.61	35.34	56.00	20.66
4.06	35.20	56.00	20.80
4.13	35.76	56.00	20.24
8.02	32.29	60.00	27.71
8.125	33.54	60.00	26.46
9.31	33.99	60.00	26.01
11.35	33.53	60.00	26.47

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB
0.152	40.45	55.89	15.44
0.157	40.88	55.62	14.74
0.163	37.62	55.31	17.69
0.167	37.28	55.11	17.83
0.175	37.99	54.72	16.73
0.191	33.16	53.99	20.83
0.22	34.62	52.82	18.20
0.419	38.89	47.47	8.58

\* limit exceeded

## Peak Search Results (continued)

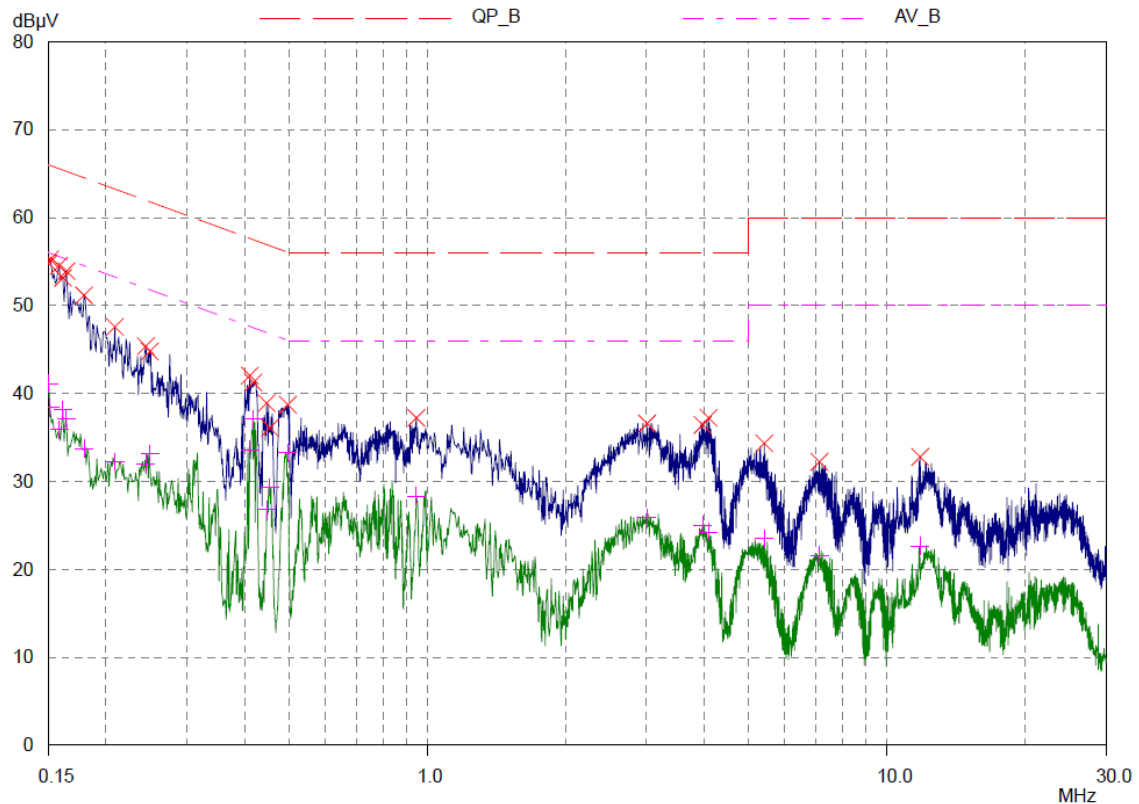
Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB
0.452	34.16	46.84	12.68
0.478	25.57	46.37	20.80
0.49	31.56	46.17	14.61
1.55	26.98	46.00	19.02
1.59	24.97	46.00	21.03
3.61	24.22	46.00	21.78
4.06	23.68	46.00	22.32
4.13	22.71	46.00	23.29
8.02	22.67	50.00	27.33
8.125	22.35	50.00	27.65
9.31	25.39	50.00	24.61
11.35	24.30	50.00	25.70

\* limit exceeded

## Line: Neutral

ETL EMC Laboratory  
Conducted Emission Test Result  
EUT: ETLE171130.1128  
Manuf:  
Op Cond:  
Operator:  
Test Spec:  
Comment: N

Prescan Measurement: Detectors: X PK / + AV  
Meas Time: see scan settings  
Peaks: 16  
Acc Margin: 10 dB





## ETL EMC Laboratory

### Conducted Emission Test Result

EUT: ETLE171130.1128

Manuf:

Op Cond:

Operator:

Test Spec:

Comment: N

Prescan Measurement: Detectors: X PK / + AV  
Meas Time: see scan settings  
Peaks: 16  
Acc Margin: 10 dB

#### Peak Search Results

Frequency MHz	PK Level dBμV	PK Limit dBμV	PK Delta dB
0.15	54.79	66.00	11.21
0.151	55.25	65.94	10.69
0.158	54.52	65.57	11.05
0.161	53.14	65.41	12.27
0.164	53.91	65.26	11.35
0.179	51.16	64.53	13.37
0.209	47.57	63.24	15.67
0.244	45.37	61.96	16.59
0.249	44.79	61.79	17.00
0.411	42.04	57.63	15.59
0.418	41.24	57.49	16.25
0.447	38.90	56.93	18.03
0.454	36.09	56.80	20.71
0.497	38.72	56.05	17.33
0.946	37.22	56.00	18.78
3.005	36.58	56.00	19.42
3.97	36.42	56.00	19.58
4.09	37.21	56.00	18.79
5.41	34.33	60.00	25.67
7.125	32.24	60.00	27.76
11.81	32.79	60.00	27.21

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB
0.15	41.10	56.00	14.90
0.151	38.43	55.94	17.51
0.158	35.88	55.57	19.69
0.161	38.15	55.41	17.26
0.164	37.17	55.26	18.09
0.179	33.74	54.53	20.79
0.209	32.23	53.24	21.01

\* limit exceeded

Peak Search Results (continued)

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB
0.244	32.02	51.96	19.94
0.249	33.15	51.79	18.64
0.411	33.61	47.63	14.02
0.418	37.08	47.49	10.41
0.447	26.79	46.93	20.14
0.454	29.34	46.80	17.46
0.497	33.25	46.05	12.80
0.946	28.29	46.00	17.71
3.005	25.88	46.00	20.12
3.97	25.03	46.00	20.97
4.09	24.23	46.00	21.77
5.41	23.47	50.00	26.53
7.125	21.56	50.00	28.44
11.81	22.66	50.00	27.34

\* limit exceeded

## 5.3 Radiated Emissions Measurement

### 5.3.1 Radiated Emissions Data

- Below 1 GHz

EUT	Set top box / IPH3004HDM (S/N: EVY743H02340)
Limit apply to	FCC Part 15 Subpart B Section 15.109(a) Class B
Test Date	December 18, 2017
Environmental of Test	(9.7 ± 0.8) °C, (57 ± 4) % R.H., (102.4 ± 0.0) kPa
Operating Condition	A standard signal with vertical moving color bar pattern with sound carrier and PING test mode
Result	Passed by 4.59 dB

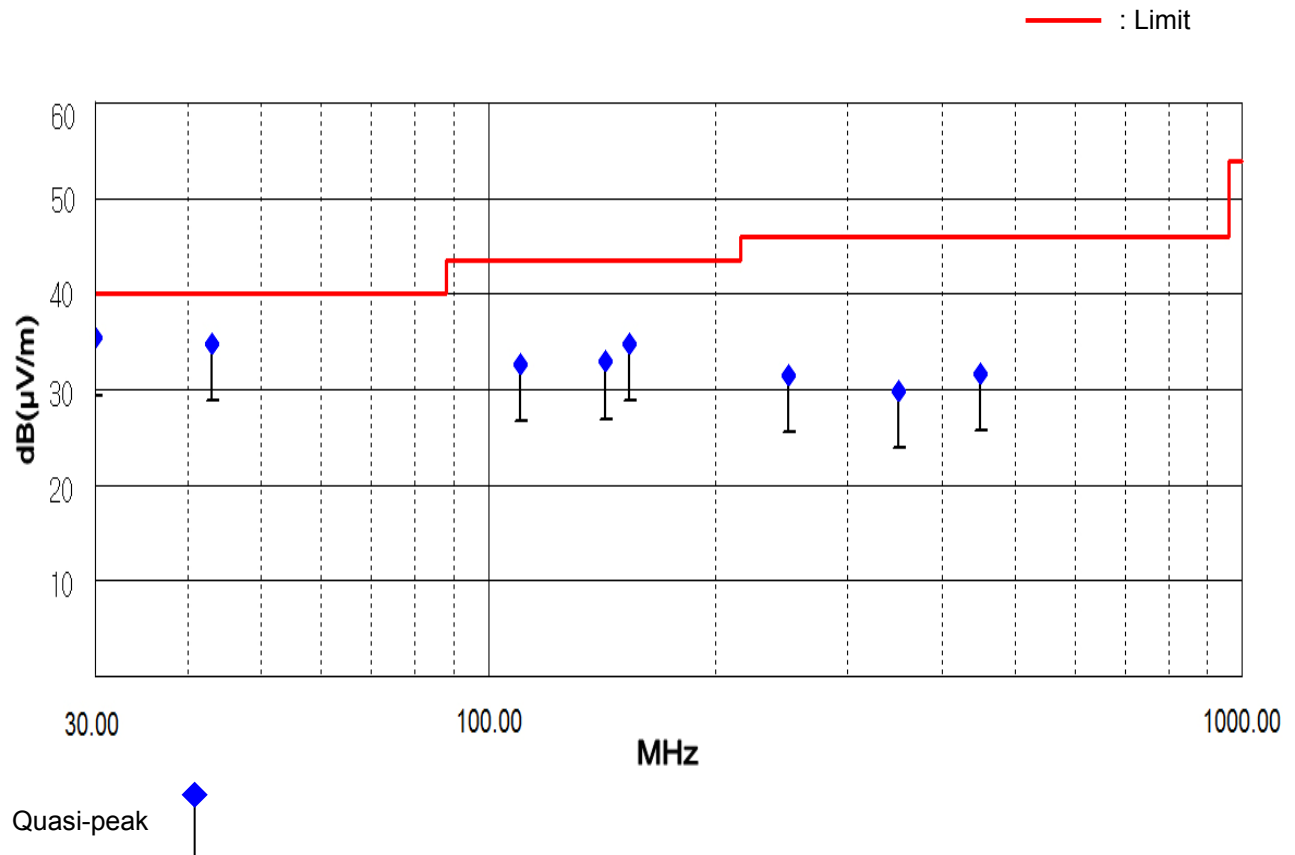
### Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.  
Detector mode: CISPR Quasi-Peak mode (6 dB Bandwidth: 120 kHz)

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB(μV)]	Height [cm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
30.12	56.39	V	10.20	-31.18	100	35.41	40.00	4.59
43.04	52.88	V	12.92	-30.97	100	34.83	40.00	5.17
110.23	52.37	V	10.69	-30.39	109	32.67	43.50	10.83
143.02	55.37	V	7.78	-30.20	138	32.95	43.50	10.55
153.68	56.84	V	8.11	-30.14	142	34.81	43.50	8.69
250.03	48.22	V	12.92	-29.58	241	31.56	46.00	14.44
350.02	44.08	H	14.85	-29.07	208	29.86	46.00	16.14
450.02	43.46	H	16.82	-28.60	142	31.68	46.00	14.32

#### NOTES:

1. \* H : Horizontal polarization , \*\* V : Vertical polarization
2. The cable loss value was included the Amp. Gain.
3. Result = Reading + Antenna factor + Cable loss
4. Margin value = Limit - Result
5. The measurement was performed for the frequency range 30 MHz ~ 1 000 MHz according to the FCC Part 15.109(a) Class B.



- Above 1 GHz

EUT	Set top box / IPH3004HDM (S/N: EVY743H02340)
Limit apply to	FCC Part 15 Subpart B Section 15.109(a) Class B
Test Date	December 22, 2017
Environmental of Test	(10.3 ± 2.3) °C, (49 ± 5) % R.H., (102.3 ± 0.0) kPa
Operating Condition	A standard signal with vertical moving color bar pattern with sound carrier and PING test mode
Result	Passed by 7.03 dB

## Radiated Emission Test Data

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

Detector mode: CISPR Peak mode, Average mode

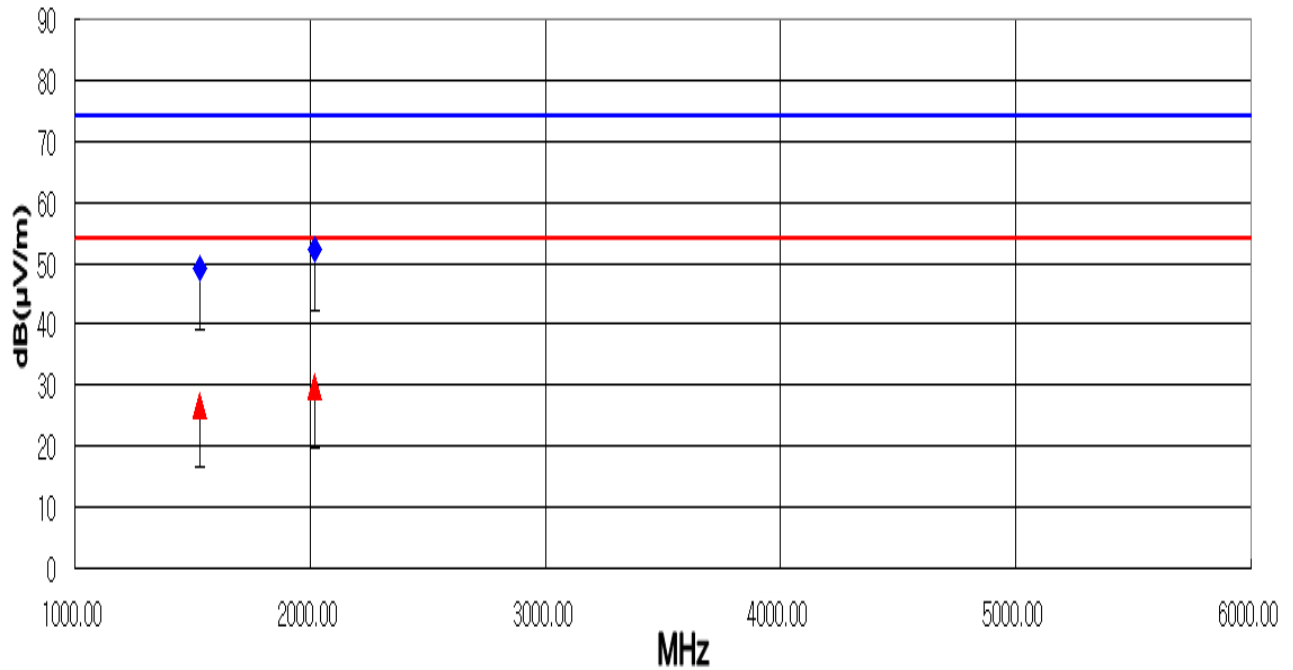
Frequency [MHz]	Reading [dB(μV)]		Polarity (*H/**V)	Height [cm]	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB(μV/m)]		Limit [dB(μV/m)]		Margin [dB]	
	Peak	Average					Peak	Average	Peak	Average	Peak	Average
1 004.02	64.30	41.44	V	100	25.18	-40.73	48.75	25.89	74.00	54.00	25.25	28.11
1 133.15	78.11	53.13	V	100	25.29	-40.56	62.84	37.86	74.00	54.00	11.16	16.14
1 157.21	82.18	57.16	V	110	25.32	-40.53	66.97	41.95	74.00	54.00	7.03	12.05
1 533.04	63.51	40.95	H	120	25.65	-40.03	49.13	26.57	74.00	54.00	24.87	27.43
2 021.76	65.43	42.82	H	110	26.15	-39.23	52.35	29.74	74.00	54.00	21.65	24.26
3 181.34	55.51	36.58	V	120	28.59	-36.81	47.29	28.36	74.00	54.00	26.71	25.64

### NOTES:

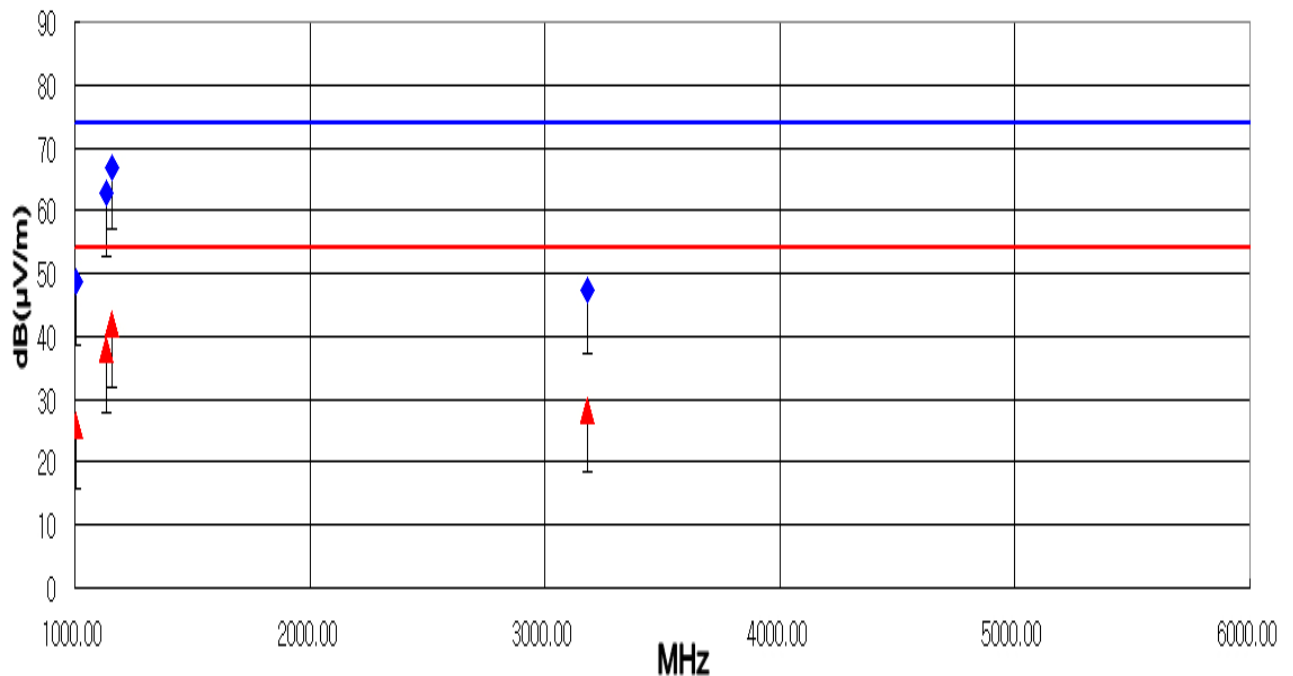
1. H : Horizontal polarization , V : Vertical polarization
2. The cable loss value was included the Amp. Gain.
3. Result = Reading + Antenna factor + Cable loss
4. Margin value = Limit - Result
5. The measurement was performed for the frequency range 1 GHz ~ 6 GHz according to FCC Part 15.109(a) Class B.
6. Upper frequency of measurement range: 5th harmonic of the highest frequency.



**Polarization: Horizontal**

Limit : — Peak  
— Average



**Polarization: Vertical**



Peak  Average 

## 5.4 Antenna Power Conduction Measurement

### 5.4.1 Antenna Power Conduction Measurement

EUT	Set top box / IPH3004HDM (S/N: EVY743H02340)
Limit apply to	FCC Part 15 Subpart B Section 15.111(a)
Test Date	December 20, 2017
Environmental of Test	(21.4 ± 0.0) °C, (41 ± 0) % R.H., (101.3 ± 0.0) kPa
Operating Condition	Signal tuning mode
Result	Passed by 9.10 dB

### Antenna Power Conduction Test Data

Test port	Tuned Frequency [MHz]	Meter Reading [dB(μV)]	Correction Factor [dB]	Result [dB(μV)]	Limit [dB(μV)]	Margin [dB]
CABLE IN	38.100	7.50	23.70	31.20	50.00	18.80
	85.620	6.60	23.80	30.40	50.00	19.60
	171.480	8.60	23.90	32.50	50.00	17.50
	381.200	7.40	23.90	31.30	50.00	18.70
	514.200	11.90	24.00	35.90	50.00	14.10
	2 053.400	16.00	24.90	40.90	50.00	9.10

#### NOTES:

1. Result = Meter Reading + Correction Factor (Matching Loss + Cable loss)
2. Margin value = Limit - Result
3. Measurements using the CISPR Quasi-peak mode in the frequency range 30 MHz to 6 GHz and measurements using the CISPR peak mode in the frequency range above 1 GHz.
4. The limits is 2.0 μW in the frequency range section 15.33(b)(1) of FCC Part 15.



## 6. SAMPLE CALCULATION

### Sample Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor.  
The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

Where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor - Preamplifier Factor

$$dB(\mu V) = 20 \log_{10} (\mu V) : \text{Equation}$$

$$dB(\mu V) = dBm + 107$$

Example : @ 30.12 MHz

$$\text{Class B Limit} = 40.00 \text{ dB}(\mu V/m)$$

$$\text{Reading} = 56.39 \text{ dB}(\mu V)$$

$$\text{Antenna Factor} + (\text{Cable Loss} - \text{Amp. Gain.}) = 10.20 + (-31.18) = -20.98 \text{ dB}(\mu V/m)$$

$$\text{Total} = 35.41 \text{ dB}(\mu V/m)$$

$$\text{Margin} = 40.00 - 35.41 = 4.59 \text{ dB}$$

$$= 4.59 \text{ dB below Limit}$$

## 7. List of test equipments used for measurements

	Test Equipment	Model	Mfg.	Serial No.	Cal. Date	Cal. Due Date
<input checked="" type="checkbox"/>	EMI Test Receiver	ESPI3	R&S	100478	17.08.31	18.08.31
<input checked="" type="checkbox"/>	EMI Test Receiver	ESCS30	R&S	100087	17.03.13	18.03.13
<input checked="" type="checkbox"/>	EMI Test Receiver	ESCI7	R&S	100851	17.08.31	18.08.31
<input checked="" type="checkbox"/>	Amplifier	310N	Sonoma Instrument	284750	17.08.31	18.08.31
<input checked="" type="checkbox"/>	Two-Line V-Network	ENV216	R&S	102055	17.03.13	18.03.13
<input checked="" type="checkbox"/>	Two-Line V-Network	ENV216	R&S	101715	17.03.14	18.03.14
<input checked="" type="checkbox"/>	Horn Antenna	BBHA 9120D	Schwarzbeck	826	16.03.23	18.03.23
<input checked="" type="checkbox"/>	Amplifier	TK-PA18	TESTEK.	120020	17.09.01	18.09.01
<input checked="" type="checkbox"/>	Bi-Log Antenna	VULB9163	Schwarzbeck	01069	17.02.17	19.02.17
<input checked="" type="checkbox"/>	Matching Pad (RAM)	358.5414.02	R&S	101841	17.09.01	18.09.01
<input checked="" type="checkbox"/>	75 $\Omega$ Directional Bridge	86207A	Agilent	3140A00678	17.09.01	18.09.01
<input checked="" type="checkbox"/>	Turn-Table	TT 1.35 SI	SES	-	N/A	N/A
<input checked="" type="checkbox"/>	Antenna Master	AM 4.5	SES	-	N/A	N/A