



Electromagnetic Emission

FCC MEASUREMENT REPORT **CERTIFICATION OF COMPLIANCE** FCC Part 15 Certification Measurement

PRODUCT : Set top box : IPH3004HDM / NONE MODEL/Serial No. IPH3004HDH, DMS3004HDH, DMT-1434 MULTIPLE MODEL FCC ID PFNIPH3004HDM : Digital Multimedia Technology Co., Ltd. APPLICANT 8F Seongam Bldg, 710 Eonju-ro, Gangnam-gu, Seoul, 06058, South Korea Attn.: Jung Hwan Lee / Senior Research Engineer : WOOJEON&HANDAN VINA CO.,LTD. **MANUFACTURER 1** 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 DTS (Part 15 Digital Transmission System) EQUIPMENT CLASS : TYPE OF MODULATION DSSS : Zigbee: 2 425 MHz, 2 450 MHz, 2475 MHz (3 Ch) FREQUENCY CHANNEL ANTENNA TYPE Internal Antenna (Integral) : 3.25 dBi max ANTENNA GAIN : 0.469 mW **RF POWER** RULE PART(S) FCC Part 15 Subpart C : ANSI C63.10-2013 FCC PROCEDURE : ETLT171124.0140 TEST REPORT No. : December 04, 2017 to December 19, 2017 DATES OF TEST REPORT ISSUE DATE : January 17, 2018 : ETL Inc. (FCC Designation Number : KR0022) TEST LABORATORY

The Set top box, Model IPH3004DHM has been tested in accordance with the measurement procedures specified in ANSI C63.10-2013 at the ETL Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart C section 15.247.

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:

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January 17, 2018

Reviewed by:

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January 17, 2018

ETL Inc.

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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 : D	: Digital Multimedia Technology Co., Ltd.		
Address : 8	: 8F Seongam Bldg, 710 Eonju-ro, Gangnam-gu,		
S	Seoul, 06058, South Korea		
Attention : Jung Hwan Lee / Senior Research Engineer			
		Sat tan bay	
EOT Type Model Number	:		
	:	NONE	
Modulation Technique	:	DSSS	
Frequency Channel		Zigbee: 2 425 MHz 2 450 MHz 2 475 MHz (3 Ch)	
Antenna Type		Internal Antenna (Integral)	
Antenna Gain	:	3.25 dBi max	
• RF Power	:	0.469 mW	
• Environmental of Tests	:	Temperature: (12.4 ± 13.8) °C	
	:	Humidity: (39 ± 18) % R.H.	
	:	Atmospheric Pressure: (102.8 ± 0.5) kPa	
• FCC Rule Part(s)	:	FCC Part 15 Subpart C	
Test Procedure	:	ANSI C63.10-2013	
• Equipment Class	:	DTS (Part 15 Digital Transmission System)	
• 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.	:	ETLT171124.0140	

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1. INTRODUCTION

The measurement test for radiated and conducted emission test was conducted at the ETL Inc. The site is constructed in conformance with the requirements of the ANSI C63.10-2013 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 FCC Rules according to the ANSI C63.10-2013 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 C63.10-2013) was used in determining radiated and conducted emissions from the Digital Multimedia Technology Co., Ltd. Model: IPH3004HDM

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2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the Set top box (model: IPH3004DHM).

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 ETLT171124.0140 issued on January 17, 2018 to previously published test report ETLT151109.0089 on December 22, 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)	δ δ δ δ CHINA CHINA Control Control Control CHINA CHINA CHINA Control Control China China CHINA CHINA CHINA Control Control China		
V03G0500300HU (Addition)	Constant of the second of the		

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2.2 General Specification

Item	Specification		
System & Memory			
CPU	BCM7437CVKFEBA1G - 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		
BCM7437 Features			
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		

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Item	Specification	
ROM (NOR)		
Component	Serial flash: KH25L3235E	
Size	4 MB	
Package	SOP-8L 209MIL	
ROM (NAND)		
Component	eMMC: SDIN7DP2-4G	
Size	4 GB - MLC	
Package	WFBGA153	
RAM		
Component	DDR3: NT5CC256M16DP-DI	
Size	1 GB 2 x 16 bit	
Package	VFBGA96	
Video Decoding		
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	
Audio Decoding		
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	
Remote Control		
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	

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Item	Specification	
General Features		
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-bandEAS	
Front of DTA		
Display	2 x Dual color LED (Green& Amber)	
IR	1 x IR 38 kHz of data trans receiving	
Rear Connections		
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	
RF Interface		
Interface	MTSIF	
Component	BCM3144 - Full band capture (4 in-band QAM demodulators)	

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Item	Specification
RF Input	·
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
Моса	
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
USB	
Component	Built-in Inside BCM7437
Function	1 x USB 2.0 - 0.5 A/5 V
Package	Host / 4 pin - Type A
Ethernet	
Component	Built-in Inside BCM7437
Function	10 Mbps/100 Mbps
Package	RJ45
LED	None

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Item	Specification	
Electrical Specifications		
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	
Digital Output		
Connector	HDMI, version1.4a	
CEC	Supported	
Component	Built-in Inside 7437	
Package	19 pin Type A	
Graphics Resolution		
Max Resolution	1 920 x 1 080 @ 60 Hz	
Simultaneous HD and SD User Interface	Supported	
Picture in Guide	Supported	
Copy Protection		
Digital	HDCP version1.4	
Conditional Access		
Content Protection	Motorola/Cisco– CAL, DRM, CGMSA	
Mechanical Specifications		
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		

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3. DESCRIPTION OF TESTS

The tests documented in this report were performed in accordance with ANSI C63.10-2013 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209 and 15.247.

3.1 Radiated Emission Measurement

Radiated emission measurements were made in accordance with § 13 in ANSI C63.10-2013 "Measurement of Intentional radiators" The measurements were performed over the frequency range of 30 MHz to 40 GHz using antenna as the input transducer to a Spectrum analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak, Quasi-peak, Average" within a bandwidth of 120 kHz and above 1 GHz is 1 MHz.

Preliminary measurements were made at 3 m using broadband antennas, and spectrum analyzer to determine 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 prescan 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 1.0 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.

Varying the mode of operating frequencies of the EUT maximized each emission. The system was tested in all the three orthogonal planes and changing the polarity of the antenna. The worst-case emissions are recorded in the data tables. If necessary, the radiated emission measurement could be performed at a closer distance to ensure higher accuracy and the results were extrapolated to the specified distance using an inverse linear distance extrapolation factor (20 dB/decade) as per section 15.31(f).

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

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3.2 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with section § 13 in ANSI C63.10-2013 "measurement of intentional radiators" The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω /50 μ 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 0.4 m 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. Power 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 the worst-case emission test setup can be seen in Appendix B.

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3.3 FCC Part 15.205 Restricted Bands of Operations

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
$\begin{array}{c} 0.090 - 0.110 \\ {}^{1}0.495 - 0.505 \\ 2.173 5 - 2.190 5 \\ 4.125 - 4.128 \\ 4.177 25 - 4.177 75 \\ 4.207 25 - 4.207 75 \\ 6.215 - 6.218 \\ 6.267 75 - 6.268 25 \\ 6.311 75 - 6.312 25 \\ 8.291 - 8.294 \\ 8.362 - 8.366 \\ 8.376 25 - 8.386 75 \\ 8.414 25 - 8.414 75 \\ 12.29 - 12.293 \\ 12.519 75 - 12.520 25 \end{array}$	$\begin{array}{c} 16.42 - 16.423 \\ 16.694 \ 75 - 16.695 \ 25 \\ 16.804 \ 25 - 16.804 \ 75 \\ 25.5 - 25.67 \\ 37.5 - 38.25 \\ 73 - 74.6 \\ 74.8 - 75.2 \\ 108 - 121.94 \\ 123 - 138 \\ 149.9 - 150.05 \\ 156.524 \ 75 - 156.525 \ 25 \\ 156.7 - 156.9 \\ 162.012 \ 5 - 167.17 \\ 167.72 - 173.2 \\ 240 - 285 \end{array}$	$\begin{array}{r} 399.9 - 410 \\ 608 - 614 \\ 960 - 1 240 \\ 1 300 - 1 427 \\ 1 435 - 1 626.5 \\ 1 645.5 - 1 646.5 \\ 1 660 - 1 710 \\ 1 718.8 - 1 722.2 \\ 2 200 - 2 300 \\ 2 310 - 2 390 \\ 2 483.5 - 2 500 \\ 2 690 - 2 900 \\ 3 260 - 3 267 \\ 3 332 - 3 339 \\ 3 345 8 - 3 358 \end{array}$	$\begin{array}{c} 4.5 - 5.15 \\ 5.35 - 5.46 \\ 7.25 - 7.75 \\ 8.025 - 8.5 \\ 9.0 - 9.2 \\ 9.3 - 9.5 \\ 10.6 - 12.7 \\ 13.25 - 13.4 \\ 14.47 - 14.5 \\ 15.35 - 16.2 \\ 17.7 - 21.4 \\ 22.01 - 23.12 \\ 23.6 - 24.0 \\ 31.2 - 31.8 \\ 36 43 - 36 5 \end{array}$
12.57675 - 12.57725 13.36 - 13.41	322 - 335.4	3 600 - 4 400	(²)

¹ Until February 1, 1999, this restricted band shall be 0.490 MHz - 0.510 MHz.

² Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1 000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1 000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3.4 Antenna connection requirement

(1) According to §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.



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 following conditions and configurations were used.

4.2 Description of Test modes

Set top box that has the control software.

4.3 The setup drawing(s)



4.4 Support Equipment Used

Description	Model Name	Serial No.	Manufacturer
Notebook Computer	6550b	CNU1240QRZ	HEWLET-PACKARD COMPANY
Adapter (for Notebook Computer)	Series PPP014H-S	F12941120222701	Hipro electronics(Dongguan) Co., Ltd.

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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.

47 CFR Part 15, Subpart C	Measurement Required	Result
15.209(a)	Spurious Emissions	Pass
15.207	Conducted Emissions	Pass
15.203	Antenna connection requirement	Integral antenna which is permanently attached and cannot be replaced.

The data collected shows that the **Digital Multimedia Technology Co., Ltd. / Set top box / IPH3004HDM** with technical requirements of above rules part 15.207, 209 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.

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5.2 Spurious Emissions

EUT	Set top box / IPH3004HDM
Limit apply to	FCC Part 15.209
Test Date	December 05, 2017 to December 19, 2017
Operating Condition	Low CH, Middle CH, High CH Transmission
Result	Passed

Limit

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequencies [MHz]	Field Strength [µV/m]	Measurement Distance [m]
0.009 - 0.490	2 400/F(kHz)	300
0.490 - 1.705	24 000/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 paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 MHz - 72 MHz, 76 MHz - 88 MHz, 174 MHz - 216 MHz or 470 MHz - 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

Test Results

- Refer to see the measured plot in next page.

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Radiated Emissions Test data

- 9 kHz to 1 GHz

Test Date	December 19, 2017
Environmental of Test	(6.3 ± 7.7) °C, (39 ± 18) % R.H., (103.0 ± 0.0) kPa

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical. Detector mode: CISPR Quasi-Peak mode (100 Hz, 9 kHz) (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]
52.88	53.12	V	12.80	-30.87	110	35.05	40.00	4.95
125.15	55.00	V	8.87	-30.29	126	33.58	43.50	9.92
252.12	38.42	V	12.95	-29.57	140	21.80	46.00	24.20
375.17	29.09	Н	15.43	-28.96	150	15.56	46.00	30.44
392.35	51.62	Н	15.82	-28.88	115	38.56	46.00	7.44
554.64	40.42	V	18.74	-28.10	230	31.06	46.00	14.94

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 above 9 kHz according to FCC Part 15.209.



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- Above 1 GHz (1 GHz to 25 GHz)

Test Date	December 19, 2017
Environmental of Test	(6.7 ± 3.0) °C, (31 ± 4) % R.H., (103.1 ± 0.1) kPa

1. Low CH (2 425 MHz)

Frequency	Rea [dB(iding (μV)]	Polarity	Ant. Factor	Cable - Amp.	Height	Re [dB(µ	sult ıV/m)]	Li [dB(µ	mit ıV/m)]	Ma [d	rgin B]
[MHZ]	Peak	Average	(^H/^^V)	[dB/m]	[dB]	[cm]	Peak	Average	Peak	Average	Peak	Average
2 150.43	64.38	53.33	V	26.57	-46.16	150	44.79	33.74	73.97	53.97	29.18	20.23
3 199.99	67.37	65.80	V	28.45	-44.94	150	50.88	49.31	73.97	53.97	23.09	4.66
3 978.67	60.60	46.27	V	29.50	-44.99	150	45.11	30.78	73.97	53.97	28.86	23.19
4 768.67	60.36	52.74	V	31.01	-43.51	150	47.86	40.24	73.97	53.97	26.11	13.73
21 417.82	43.07	29.85	Н	37.63	-29.87	150	50.83	37.61	73.97	53.97	23.14	16.36
24 469.01	42.19	29.47	Н	37.94	-27.54	150	52.59	39.87	73.97	53.97	21.38	14.10

2. Middle CH (2 450 MHz)

Frequency	Rea [dB(iding (μV)]	Polarity	Ant. Factor	Cable - Amp.	Height	Re [dB(µ	sult ıV/m)]	Li [dB(µ	mit ıV/m)]	Ma [d	rgin IB]
[MHZ]	Peak	Average	(*H/**V)	[dB/m]	Gain [dB]	[cm]	Peak	Average	Peak	Average	Peak	Average
2 150.43	64.45	53.38	V	26.57	-46.16	150	44.86	33.79	73.97	53.97	29.11	20.18
3 200.04	68.53	66.45	V	28.45	-44.94	150	52.04	49.96	73.97	53.97	21.93	4.01
3 989.25	60.50	46.53	V	29.52	-45.01	150	45.01	31.04	73.97	53.97	28.96	22.93
4 773.83	60.33	52.89	V	31.02	-43.50	150	47.85	40.41	73.97	53.97	26.12	13.56
21 182.16	42.88	29.80	V	37.40	-30.07	150	50.21	37.13	73.97	53.97	23.76	16.84
24 964.86	42.18	29.50	V	38.69	-27.19	150	53.68	41.00	73.97	53.97	20.29	12.97

3. High CH (2 475 MHz)

Frequency	Rea [dB(iding (μV)]	Polarity	Ant. Factor	Cable - Amp.	Height	Re [dB(µ	sult ıV/m)]	Lii [dB(µ	mit ıV/m)]	Ma [d	rgin B]
[MHZ]	Peak	Average	(^H/^^V)	[dB/m]	[dB]	[cm]	Peak	Average	Peak	Average	Peak	Average
2 150.43	64.53	53.48	V	26.57	-46.16	150	44.94	33.89	73.97	53.97	29.03	20.08
2 528.40	53.56	45.93	V	27.77	-44.83	150	36.50	28.87	73.97	53.97	37.47	25.10
3 199.89	69.49	66.53	V	28.45	-44.94	150	53.00	50.04	73.97	53.97	20.97	3.93
3 971.17	60.65	47.41	V	29.48	-44.97	150	45.16	31.92	73.97	53.97	28.81	22.05
4 767.00	61.02	53.26	V	31.01	-43.51	150	48.52	40.76	73.97	53.97	25.45	13.21
24 469.89	42.24	29.36	V	37.94	-27.54	150	52.64	39.76	73.97	53.97	21.33	14.21

NOTES:

- 1. * H : Horizontal polarization, ** V : Vertical polarization
- 2. Factor = Antenna factor + Cable loss Amp. Gain
- 3. Result = Reading + Factor
- 4. Margin value = Limit Result
- 5. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded(ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
- 7. Spectrum setting:
 - a. Peak Setting 1 GHz to 10th harmonics of fundamental, RBW = 1 MHz, VBW = 1 MHz, Sweep = Auto b. AV Setting 1 GHz to 10th harmonics of fundamental, RBW = 1 MHz, VBW = 10 kHz, Sweep = Auto

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Plots of Spurious Emissions (Conducted Measurement)

Test Date	December 05, 2017
Environmental of Test	(26.1 ± 0.0) °C, (28 ± 0) % R.H., (102.3 ± 0.0) kPa



 ∇ MultiView 🕀 Spurious Ref Level 10.00 dBm Mode Auto Sweep Count 10/10 Spurious Emissions 1 Max D2[1] -55.75 dB 22.41640 GHz 0.76 dBm 2.42460 GHz M1[1] dB 10 dBm 20 dBm 30 dBn 40 dBm 50 dBr 60 dBr 70 d .0 GHz 4001 pts 2.4 GHz/ 25.0 GHz Measuring...

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[CH Low]



[CH Mid]





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[CH High]





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5.3 Conducted Emissions Measurement

EUT	Set top box / IPH3004HDM
Limit apply to	FCC Part 15.207
Test Date	December 04, 2017
Environmental of Test	(22.3 ± 0.0) °C, (36 ± 0) % R.H., (102.3 ± 0.0) kPa
Operating Condition	RF transmitting continuously during the tested.
Result	Passed by 7.93 dB

Limit

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission	Conducted limit [dB(µV)]				
[MHz]	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.

Test Results

- Refer to see the measured plot in next page.

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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 15.207.
- 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.

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Line: HOT

ETL EMC Laboratory

Conducted Emission Test Result EUT: ETLT171124.0140 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		







ETL EMC Laboratory

Conducted Emission Test Result

EUT:	ETLT171124.0140
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 PK Delta dBµV dB		
0.15	58.07	66.00	7.93	
0.155	56.32	65.73	9.41	
0.162	55.60	65.36	9.76	
0.183	53.40	64.35	10.95	
0.205	50.64	63.41	12.77	
0.227	46.22	62.56	16.34	
0.281	44.27	60.79	16.52	
0.433	42.11	57.19	15.08	
0.846	35.46	56.00	20.54	
2.755	35.60	56.00	20.40	
3.73	37.83	56.00	18.17	
6.905	33.49	60.00	26.51	
12.78	29.03	60.00	30.97	
21.36	28.29	60.00	31.71	
23.0	27.76	60.00	32.24	
Frequency	AV Level	AV Limit	AV Delta	
MHz	dBµV	dBµV	dB	
0.15	38.63	56.00	17.37	
0.155	37.09	55.73	18.64	
0.162	36.08	55.36	19.28	
0.183	33.58	54.35	20.77	
0.205	33.59	53.41	19.82	
0.227	32.55	52.56	20.01	
0.281	30.72	50.79	20.07	
0.433	34.25	47.19	12.94	
0.846	27.56	46.00	18.44	
2.755	26.74	46.00	19.26	
3.73	26.91	46.00	19.09	
6.905	21.95	50.00	28.05	
12.78	19.90	50.00	30.10	

* limit exceeded

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Peak Search Results (continued)

Frequency	AV Level	AV Limit	AV Delta
MHz	dBµV	dBµV	dB
21.36	19.33	50.00	30.67

* limit exceeded

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Line: Neutral

ETL EMC Laboratory Conducted Emission Test Result EUT: ETLT171124.0140 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



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ETL EMC Laboratory

Conducted Emission Test Result

EUT:	ETLT171124.0140
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	PK Level	PK Limit	PK Delta
MHz	dBµV	dBµV	dB
0.16	55.05	65.46	10.41
0.236	47.28	62.24	14.96
0.305	38.93	60.11	21.18
0.431	45.13	57.23	12.10
0.669	32.52	56.00	23.48
1.195	36.58	56.00	19.42
3.005	35.43	56.00	20.57
3.785	38.15	56.00	17.85
6.905	35.38	60.00	24.62
13.75	27.79	60.00	32.21
27.95	28.42	60.00	31.58
Frequency	AV Level	AV Limit	AV Delta
Frequency MHz	AV Level dBµV	AV Limit dBµV	AV Delta dB
Frequency MHz	AV Level dBµV	AV Limit dBµV	AV Delta dB
Frequency MHz 0.16	AV Level dBµV 38.99	AV Limit dBµV 55.46	AV Delta dB 16.47
Frequency MHz 0.16 0.236	AV Level dBµV 38.99 34.22	AV Limit dBμV 55.46 52.24	AV Delta dB 16.47 18.02
Frequency MHz 0.16 0.236 0.305	AV Level dBμV 38.99 34.22 31.09	AV Limit dBµV 55.46 52.24 50.11	AV Delta dB 16.47 18.02 19.02
Frequency MHz 0.16 0.236 0.305 0.431	AV Level dBμV 38.99 34.22 31.09 37.69	AV Limit dBµV 55.46 52.24 50.11 47.23	AV Delta dB 16.47 18.02 19.02 9.54
Frequency MHz 0.16 0.236 0.305 0.431 0.669	AV Level dBμV 38.99 34.22 31.09 37.69 24.03	AV Limit dBµV 55.46 52.24 50.11 47.23 46.00	AV Delta dB 16.47 18.02 19.02 9.54 21.97
Frequency MHz 0.16 0.236 0.305 0.431 0.669 1.195	AV Level dBμV 38.99 34.22 31.09 37.69 24.03 26.78	AV Limit dBμV 55.46 52.24 50.11 47.23 46.00 46.00	AV Delta dB 16.47 18.02 19.02 9.54 21.97 19.22
Frequency MHz 0.16 0.236 0.305 0.431 0.669 1.195 3.005	AV Level dBμV 38.99 34.22 31.09 37.69 24.03 26.78 23.99	AV Limit dBμV 55.46 52.24 50.11 47.23 46.00 46.00 46.00	AV Delta dB 16.47 18.02 19.02 9.54 21.97 19.22 22.01
Frequency MHz 0.16 0.236 0.305 0.431 0.669 1.195 3.005 3.785	AV Level dBμV 38.99 34.22 31.09 37.69 24.03 26.78 23.99 26.37	AV Limit dBμV 55.46 52.24 50.11 47.23 46.00 46.00 46.00 46.00	AV Delta dB 16.47 18.02 19.02 9.54 21.97 19.22 22.01 19.63
Frequency MHz 0.16 0.236 0.305 0.431 0.669 1.195 3.005 3.785 6.905	AV Level dBμV 38.99 34.22 31.09 37.69 24.03 26.78 23.99 26.37 24.03	AV Limit dBμV 55.46 52.24 50.11 47.23 46.00 46.00 46.00 46.00 50.00	AV Delta dB 16.47 18.02 19.02 9.54 21.97 19.22 22.01 19.63 25.97
Frequency MHz 0.16 0.236 0.305 0.431 0.669 1.195 3.005 3.785 6.905 13.75	AV Level dBµV 38.99 34.22 31.09 37.69 24.03 26.78 23.99 26.37 24.03 18.64	AV Limit dBμV 55.46 52.24 50.11 47.23 46.00 46.00 46.00 46.00 50.00 50.00	AV Delta dB 16.47 18.02 19.02 9.54 21.97 19.22 22.01 19.63 25.97 31.36

* limit exceeded

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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

$$\label{eq:B} \begin{split} dB(\mu V) &= 20 \mbox{ log}_{10} \ (\mu V) : Equation \\ dB(\mu V) &= dBm + 107 \end{split}$$

Example: @ 3 199.89 MHz

Limit	= 53.97 dB(µV/m) (Ave	53.97 dB(μV/m) (Average)			
Reading	= 66.53 dB(µV)				
Antenna Factor + (Cable Loss - Amp Gain)		= 28.45 + (-44.94) = -16.49 dB(µV/m)			
	Total	= 66.53 + (-16.49) = 50.04 dB(µV/m)			
Margin	= 53.97 – 50.04 = 3.93 dl	В			
	= 3.93 dB below Limit				

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7. List of test equipments used for measurements

	Test Equipment	Model	Mfg.	Serial No.	Cal. Date	Cal. Due Date
	EMI Test Receiver	ESCI7	ROHDE & SCHWARZ	100851	17.08.31	18.08.31
	EMI Test Receiver	ESCS30	ROHDE & SCHWARZ	100087	17.03.13	18.03.13
	Spectrum Analyzer	FSW43	ROHDE & SCHWARZ	103794	17.09.05	18.09.05
	PSA Series Spectrum Analyzer	E4440A	Agilent	US40420382	17.09.01	18.09.01
	EMI Test Receiver	ESPI3	R&S	100478	17.08.31	18.08.31
	Two-Line V-Network	ENV216	R&S	101715	17.03.14	18.03.14
	Two-Line V-Network	ENV216	R&S	102055	17.03.13	18.03.13
	Attenuator	BW-S10-2W263+	Mini-Circuits	NONE	17.03.15	18.03.15
	Bi-Log Antenna (FCC)	VULB9163	Schwarzbeck	01069	17.02.17	19.02.17
	Loop Antenna	6502	EMCO	00033743	16.09.05	18.09.05
	Horn Antenna (FCC)	BBHA 9120D	Schwarzbeck	277	16.10.12	18.10.12
	Horn Antenna	BBHA 9170	Schwarzbeck	766	17.07.28	19.07.28
	Amplifier	TK-PA18	TESTEK	120020	17.09.01	18.09.01
	Amplifier	TK-PA18H	TESTEK	170010-L	17.06.07	18.06.07
	Amplifier	310N	SONOMA INSTRUMENT	284750	17.08.31	18.08.31
	Amplifier	JS44-18004000-45- 8P	MITEQ Inc.	1568695	17.09.05	18.09.05
	Highpass Filter	WHKX3.0 /18G-6SS	Wainwright Instrument	15	17.03.14	18.03.14
	Highpass Filter	WHNX6-4740-6000 -26500-40CC	WAINWRIGHT INSTRUMENT GmbH	1	17.09.04	18.09.04
	Band Reject Filter	WRCGV 2402/2480- 2382/2500-52/10SS	Wainwright Instrument	2R	17.08.31	18.08.31
	Turn-Table	TT 1.35 SI	SES	-	N/A	N/A
	Antenna Master	AM 4.5	SES	-	N/A	N/A
	Turn-Table	DS1200-S	Innco Systems Gmbh	2740311	N/A	N/A
	Controller	HD 2000	HD GmbH	C/125	N/A	N/A
\boxtimes	Antenna Master	MA4000	AUDIX	N/A	N/A	N/A

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