

Electromagnetic Emission

FCC MEASUREMENT REPORT

CERTIFICATION OF COMPLIANCE FCC Part 15 Certification Measurement

| | |
|---------------------------|---|
| PRODUCT | : Set top box |
| MODEL/TYPE NO | : IPH3004HDM / NONE |
| FCC ID | : PFNIPH3004HDM |
| MULTIPLE MODEL | : IPH3004HDH, DMS3004HDH, 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. | : ETLE180205.0117 |
| DATES OF TEST | : February 21, 2018 to February 23, 2018 |
| REPORT ISSUE DATE | : February 27, 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)

February 27, 2018

Reviewed by:

Hyung Min, Choi (Chief Engineer)

February 27, 2018

ETL Inc.

Head office: #371-51, Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea

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).

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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 :** NONE
- 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 :** February 21, 2018 to February 23, 2018
- Environmental of Tests:**
 - Temperature: (12.7 ± 9.4) °C
 - Humidity: (39 ± 4) % R.H.
 - Atmospheric Pressure: (102.1 ± 1.0) 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. :** ETLE180205.0117

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.

In addition, the EUT has two types of AC/DC Adapter. And each has been tested. (Type 1: ETLE151027.1272 issued on December 14, 2015, Type 2: ETLE171130.1128 issued on January 17, 2018)
AC/DC Adapter types may be used the one of two type selected by manufacturer.

| Model name of AC/DC Adapter type & Model name | View of AD/DC Adapter | | |
|---|---|--|---|
| Type 1 / S015AAU0500300 |  |  |  |
| Type 2 / V03G0500300HU |  |  |  |

The main board (PCB version) and top shield cover of the EUT have been changed. And, it was tested again. (Add test report ETL180205.0117 issued on February 27, 2018 to previously published test report ETL171130.1128 on January 17, 2018.)

| Main board (PCB version) | DMT-1434 V1.0 (Before) | DMT-1434 V1.1 (After) |
|-----------------------------|---|--|
| View of Main board |  |  |

| Top shield cover | Before | After |
|--------------------------|---|--|
| View of Top shield cover |  |  |

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 |

| 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 |

| 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) |

| 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 |
| Moca | |
| 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 |

| 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 | |

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 Ω/50 μH 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.

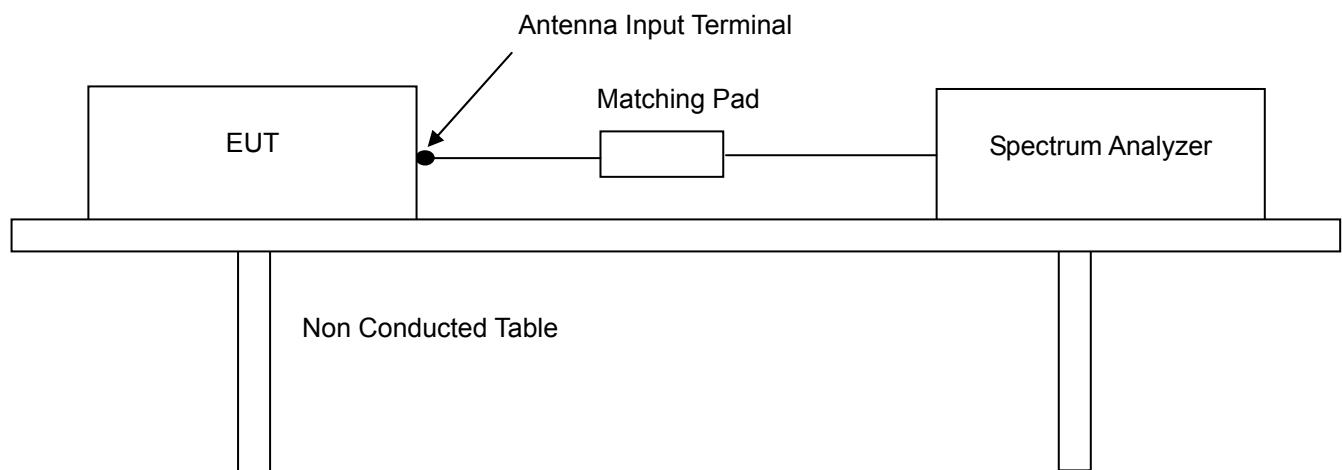
Preliminary measurements were made at 3 m using broadband antennas, and spectrum analyzer to determined the frequency producing the maximum emission in shielded room. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode 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 dB μ V.

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

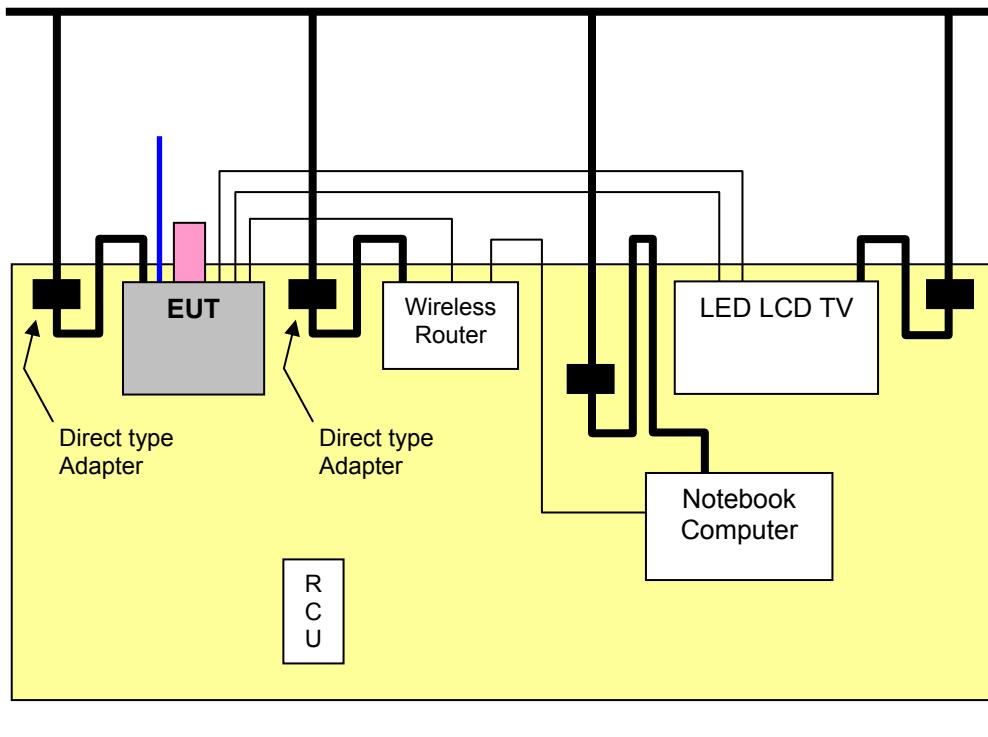
4.3 Support Equipment Used

| 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 | EFM 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)



: USB Drive

_____ : Data Line

 : Cable Ant.

 : Power Line



: Adapter

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 9.38 dB |
| 15.109(a) | Radiated Emission Measurement (Below 1 GHz) | Passed by 4.24 dB |
| 15.109(a) | Radiated Emission Measurement (Above 1 GHz) | Passed by 6.55 dB |
| 15.111(a) | Antenna Power Conduction Measurement | Passed by 12.20 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: N/A) |
| Limit apply to | FCC Part 15 Subpart B Section 15.107(a) Class B |
| Test Date | February 22, 2018 |
| Environmental of Test | (21.4 ± 0.0) °C, (41 ± 0) % R.H., (101.1 ± 0.0) kPa |
| Operating Condition | A standard signal with vertical moving color bar pattern with sound carrier and PING test mode |
| Result | Passed by 9.38 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: ETLE180205.0117

Manuf:

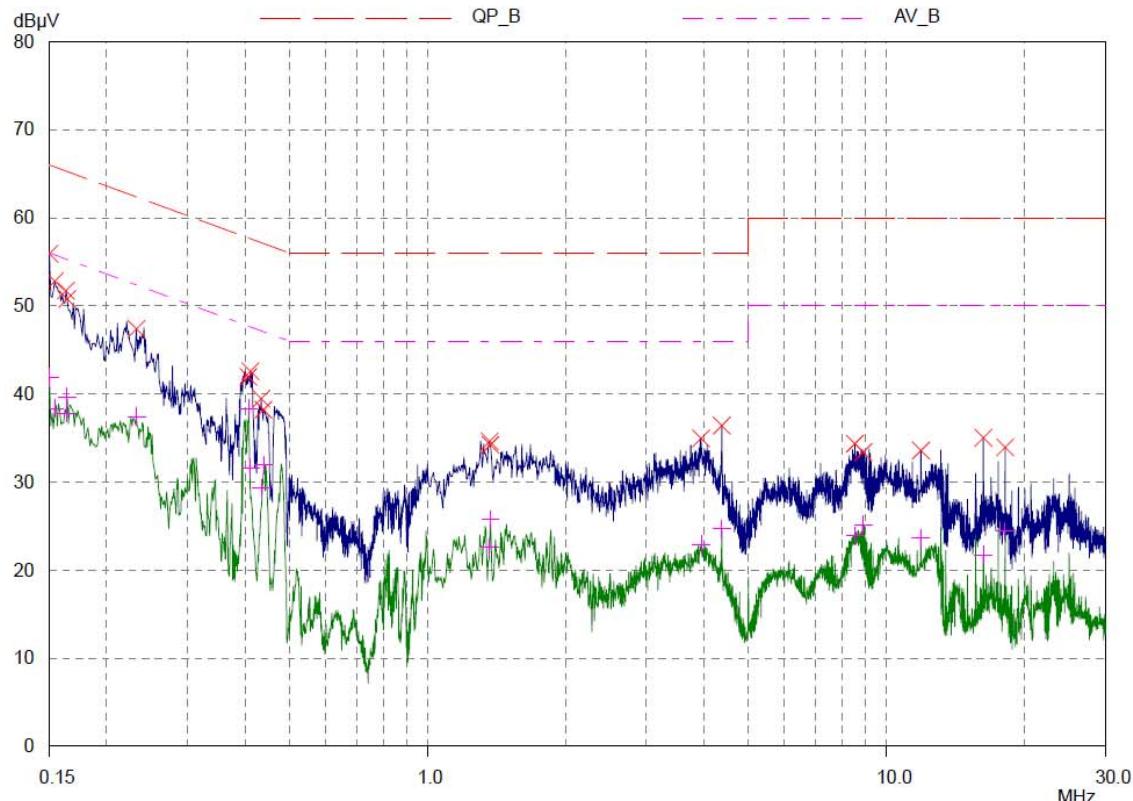
Op Cond:

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: ETLE180205.0117

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 dB μ V | PK Limit dB μ V | PK Delta dB |
|------------------|------------------------|------------------------|----------------|
| 0.15 | 55.91 | 66.00 | 10.09 |
| 0.154 | 52.80 | 65.78 | 12.98 |
| 0.163 | 51.73 | 65.31 | 13.58 |
| 0.164 | 50.78 | 65.26 | 14.48 |
| 0.232 | 47.36 | 62.38 | 15.02 |
| 0.407 | 41.94 | 57.71 | 15.77 |
| 0.411 | 42.57 | 57.63 | 15.06 |
| 0.434 | 39.46 | 57.18 | 17.72 |
| 0.439 | 38.21 | 57.08 | 18.87 |
| 1.365 | 34.62 | 56.00 | 21.38 |
| 1.37 | 34.22 | 56.00 | 21.78 |
| 3.945 | 34.95 | 56.00 | 21.05 |
| 4.375 | 36.40 | 56.00 | 19.60 |
| 8.525 | 34.34 | 60.00 | 25.66 |
| 8.905 | 33.41 | 60.00 | 26.59 |
| 11.88 | 33.58 | 60.00 | 26.42 |
| 16.25 | 35.02 | 60.00 | 24.98 |
| 18.12 | 33.94 | 60.00 | 26.06 |

| Frequency MHz | AV Level dB μ V | AV Limit dB μ V | AV Delta dB |
|------------------|------------------------|------------------------|----------------|
| 0.15 | 41.88 | 56.00 | 14.12 |
| 0.154 | 38.36 | 55.78 | 17.42 |
| 0.163 | 37.81 | 55.31 | 17.50 |
| 0.164 | 39.68 | 55.26 | 15.58 |
| 0.232 | 37.45 | 52.38 | 14.93 |
| 0.407 | 38.33 | 47.71 | 9.38 |
| 0.411 | 31.65 | 47.63 | 15.98 |
| 0.434 | 29.28 | 47.18 | 17.90 |
| 0.439 | 31.95 | 47.08 | 15.13 |
| 1.365 | 22.53 | 46.00 | 23.47 |

* limit exceeded

Peak Search Results (continued)

| Frequency MHz | AV Level dB μ V | AV Limit dB μ V | AV Delta dB |
|------------------|------------------------|------------------------|----------------|
| 1.37 | 25.73 | 46.00 | 20.27 |
| 3.945 | 22.92 | 46.00 | 23.08 |
| 4.375 | 24.65 | 46.00 | 21.35 |
| 8.525 | 23.92 | 50.00 | 26.08 |
| 8.905 | 25.15 | 50.00 | 24.85 |
| 11.88 | 23.64 | 50.00 | 26.36 |
| 16.25 | 21.70 | 50.00 | 28.30 |
| 18.12 | 24.45 | 50.00 | 25.55 |

* limit exceeded

Line: Neutral

ETL EMC Laboratory

Conducted Emission Test Result

EUT: ETLE180205.0117

Manuf:

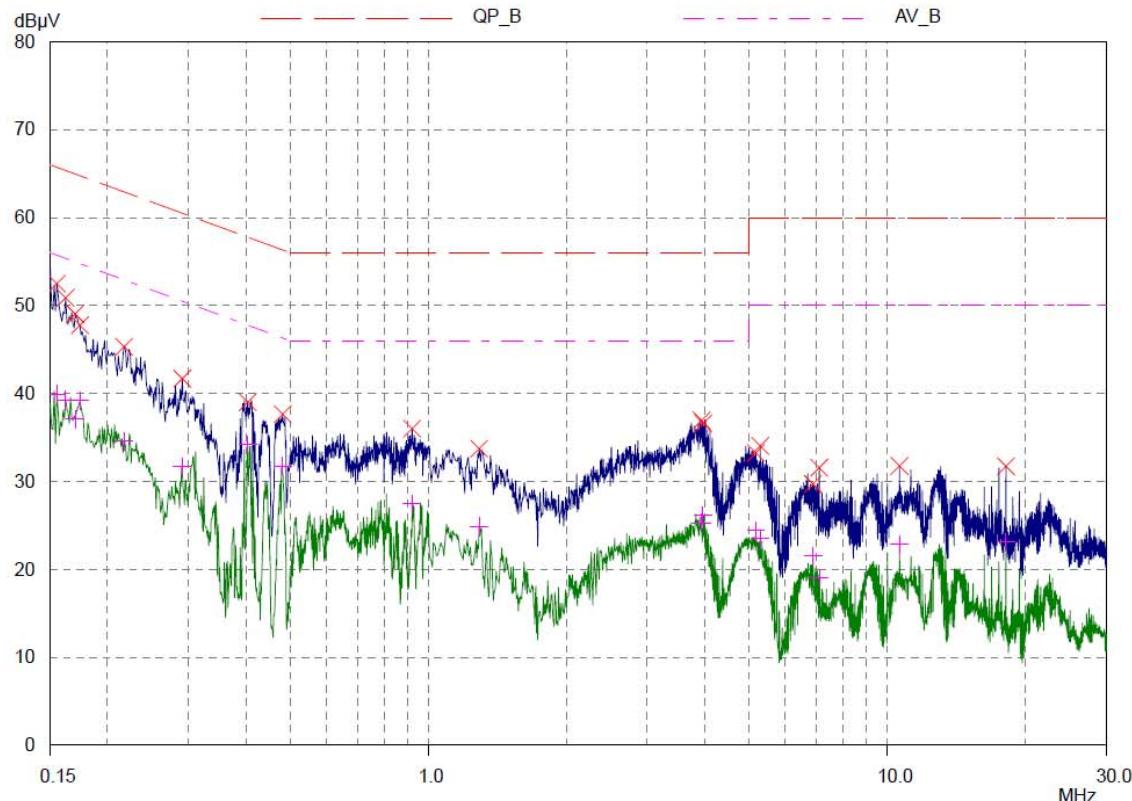
Op Cond:

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: ETLE180205.0117

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 dB μ V | PK Limit dB μ V | PK Delta dB |
|------------------|------------------------|------------------------|----------------|
| 0.155 | 52.49 | 65.73 | 13.24 |
| 0.162 | 50.88 | 65.36 | 14.48 |
| 0.17 | 49.05 | 64.96 | 15.91 |
| 0.174 | 47.75 | 64.77 | 17.02 |
| 0.217 | 45.31 | 62.93 | 17.62 |
| 0.291 | 41.69 | 60.50 | 18.81 |
| 0.404 | 39.00 | 57.77 | 18.77 |
| 0.481 | 37.63 | 56.32 | 18.69 |
| 0.922 | 36.00 | 56.00 | 20.00 |
| 1.29 | 33.73 | 56.00 | 22.27 |
| 3.935 | 36.94 | 56.00 | 19.06 |
| 3.965 | 36.59 | 56.00 | 19.41 |
| 5.17 | 33.24 | 60.00 | 26.76 |
| 5.285 | 34.04 | 60.00 | 25.96 |
| 6.885 | 29.70 | 60.00 | 30.30 |
| 7.105 | 31.55 | 60.00 | 28.45 |
| 10.63 | 31.77 | 60.00 | 28.23 |
| 18.13 | 31.71 | 60.00 | 28.29 |

| Frequency MHz | AV Level dB μ V | AV Limit dB μ V | AV Delta dB |
|------------------|------------------------|------------------------|----------------|
| 0.155 | 39.93 | 55.73 | 15.80 |
| 0.162 | 39.24 | 55.36 | 16.12 |
| 0.17 | 37.10 | 54.96 | 17.86 |
| 0.174 | 39.18 | 54.77 | 15.59 |
| 0.217 | 34.58 | 52.93 | 18.35 |
| 0.291 | 31.69 | 50.50 | 18.81 |
| 0.404 | 34.22 | 47.77 | 13.55 |
| 0.481 | 31.75 | 46.32 | 14.57 |
| 0.922 | 27.44 | 46.00 | 18.56 |
| 1.29 | 24.91 | 46.00 | 21.09 |

* limit exceeded

Peak Search Results (continued)

| Frequency MHz | AV Level dB μ V | AV Limit dB μ V | AV Delta dB |
|------------------|------------------------|------------------------|----------------|
| 3.935 | 25.30 | 46.00 | 20.70 |
| 3.965 | 26.16 | 46.00 | 19.84 |
| 5.17 | 24.42 | 50.00 | 25.58 |
| 5.285 | 23.48 | 50.00 | 26.52 |
| 6.885 | 21.50 | 50.00 | 28.50 |
| 7.105 | 19.06 | 50.00 | 30.94 |
| 10.63 | 22.81 | 50.00 | 27.19 |
| 18.13 | 23.11 | 50.00 | 26.89 |

* limit exceeded

5.3 Radiated Emissions Measurement

5.3.1 Radiated Emissions Data

- Below 1 GHz

| | |
|-----------------------|--|
| EUT | Set top box / IPH3004HDM (S/N: N/A) |
| Limit apply to | FCC Part 15 Subpart B Section 15.109(a) Class B |
| Test Date | February 21, 2018 |
| Environmental of Test | (4.6 ± 1.3) °C, (40 ± 2) % R.H., (103.0 ± 0.0) kPa |
| Operating Condition | A standard signal with vertical moving color bar pattern with sound carrier and PING test mode |
| Result | Passed by 4.24 dB |

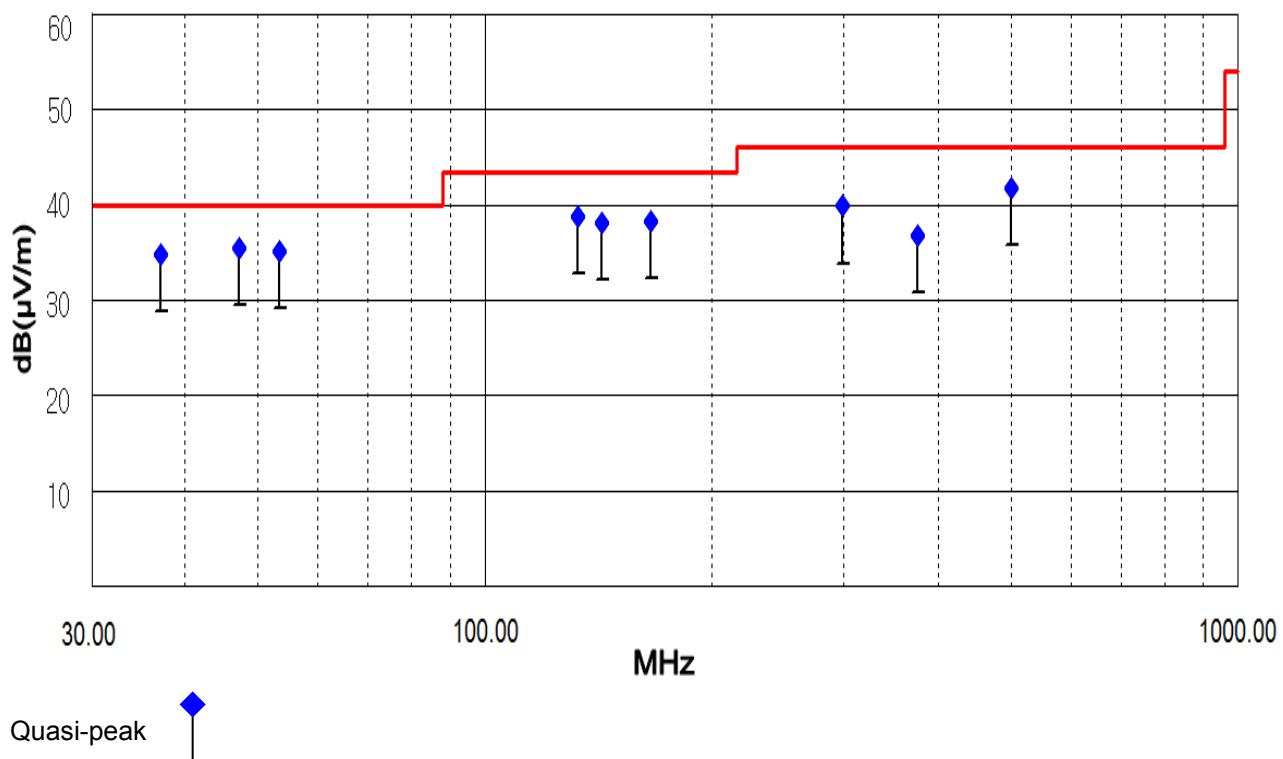
Radiated Emission Test Data

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] |
|-----------------|------------------|-----------------------|--------------------|---------------------|-------------|-------------------|------------------|-------------|
| 37.12 | 56.45 | V | 11.14 | -32.83 | 100 | 34.76 | 40.00 | 5.24 |
| 47.25 | 54.64 | V | 13.28 | -32.46 | 100 | 35.46 | 40.00 | 4.54 |
| 53.31 | 54.98 | V | 12.75 | -32.62 | 100 | 35.11 | 40.00 | 4.89 |
| 133.02 | 62.51 | V | 8.24 | -31.99 | 128 | 38.76 | 43.50 | 4.74 |
| 143.03 | 62.23 | V | 7.78 | -31.89 | 134 | 38.12 | 43.50 | 5.38 |
| 166.04 | 61.55 | V | 8.57 | -31.78 | 158 | 38.34 | 43.50 | 5.16 |
| 298.35 | 57.89 | V | 13.66 | -31.68 | 284 | 39.87 | 46.00 | 6.13 |
| 376.01 | 52.88 | H | 15.45 | -31.46 | 185 | 36.87 | 46.00 | 9.13 |
| 501.02 | 55.04 | H | 17.65 | -30.93 | 141 | 41.76 | 46.00 | 4.24 |

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.

— : Limit

- Above 1 GHz

| | | | | | | | |
|-----------------------|--|--|--|--|--|--|--|
| EUT | Set top box / IPH3004HDM (S/N: N/A) | | | | | | |
| Limit apply to | FCC Part 15 Subpart B Section 15.109(a) Class B | | | | | | |
| Test Date | February 21, 2018 | | | | | | |
| Environmental of Test | $(6.5 \pm 2.0) ^\circ\text{C}$, $(38 \pm 3) \%$ R.H., $(103.0 \pm 0.0) \text{ kPa}$ | | | | | | |
| Operating Condition | A standard signal with vertical moving color bar pattern with sound carrier and PING test mode | | | | | | |
| Result | Passed by 6.55 dB | | | | | | |

Radiated Emission Test Data

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

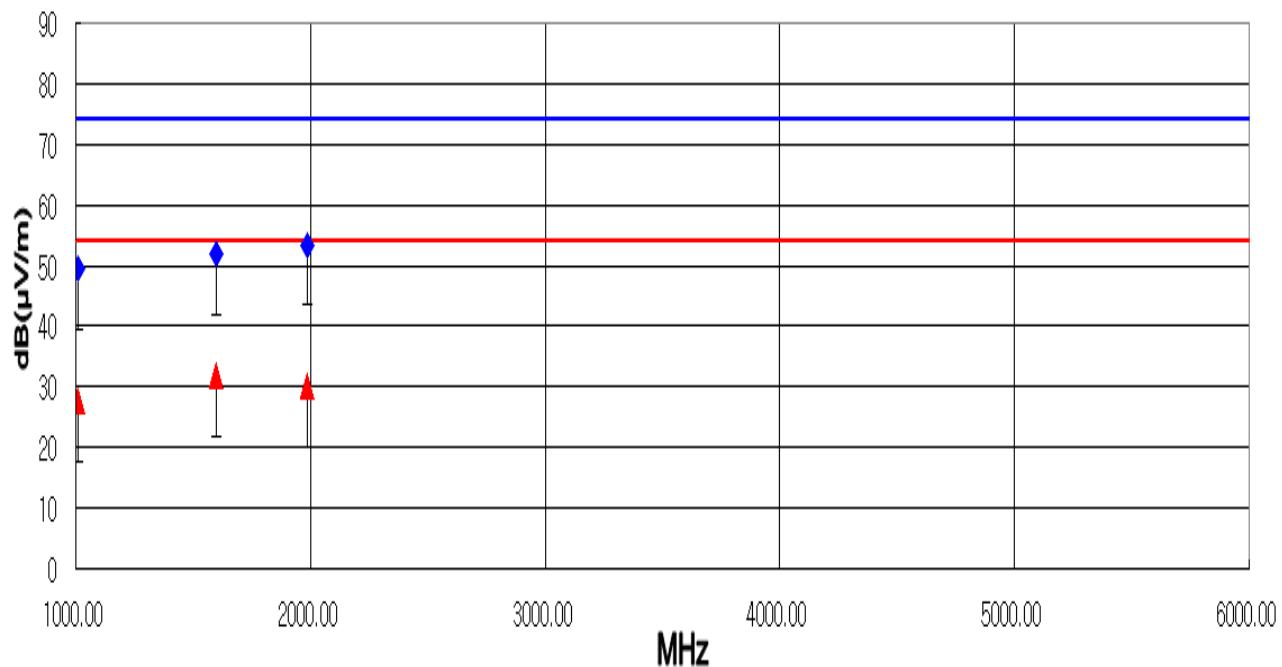
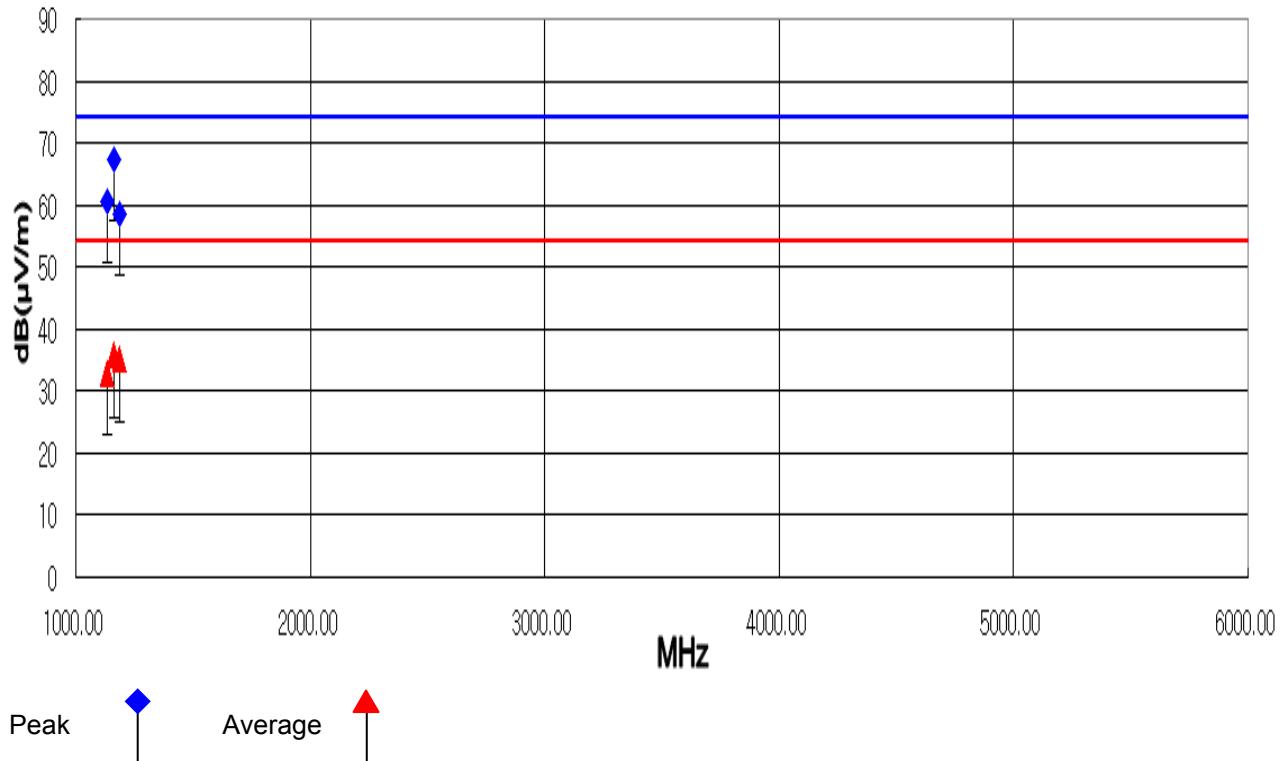
Detector mode: CISPR Peak mode, Average mode

| Frequency [MHz] | Reading [dB(μ V)] | | Polarity (*H/**V) | Height [cm] | Ant. Factor [dB/m] | Cable Loss [dB] | Result [dB(μ V/m)] | | Limit [dB(μ V/m)] | | Margin [dB] | |
|--------------------|---------------------------|---------|----------------------|----------------|--------------------------|-----------------------|----------------------------|---------|---------------------------|---------|----------------|---------|
| | Peak | Average | | | | | Peak | Average | Peak | Average | Peak | Average |
| 1 008.05 | 64.81 | 42.97 | H | 100 | 24.76 | -40.21 | 49.36 | 27.52 | 74.00 | 54.00 | 24.64 | 26.48 |
| 1 133.25 | 75.78 | 48.08 | V | 100 | 24.89 | -40.03 | 60.64 | 32.94 | 74.00 | 54.00 | 13.36 | 21.06 |
| 1 161.56 | 82.52 | 50.90 | V | 110 | 24.92 | -39.99 | 67.45 | 35.83 | 74.00 | 54.00 | 6.55 | 18.17 |
| 1 185.81 | 73.62 | 50.20 | V | 110 | 24.95 | -39.96 | 58.61 | 35.19 | 74.00 | 54.00 | 15.39 | 18.81 |
| 1 597.83 | 65.85 | 45.70 | H | 120 | 25.45 | -39.37 | 51.93 | 31.78 | 74.00 | 54.00 | 22.07 | 22.22 |
| 1 985.71 | 66.20 | 42.97 | H | 110 | 26.05 | -38.77 | 53.48 | 30.25 | 74.00 | 54.00 | 20.52 | 23.75 |

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


5.4 Antenna Power Conduction Measurement

5.4.1 Antenna Power Conduction Measurement

| | |
|-----------------------|---|
| EUT | Set top box / IPH3004HDM (S/N: N/A) |
| Limit apply to | FCC Part 15 Subpart B Section 15.111(a) |
| Test Date | February 23, 2018 |
| Environmental of Test | (22.1 ± 0.0) °C, (40 ± 0) % R.H., (101.3 ± 0.0) kPa |
| Operating Condition | Signal tuning mode |
| Result | Passed by 12.20 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 | 32.710 | 9.80 | 23.70 | 33.50 | 50.00 | 16.50 |
| | 162.840 | 7.10 | 23.90 | 31.00 | 50.00 | 19.00 |
| | 241.680 | 12.40 | 23.90 | 36.30 | 50.00 | 13.70 |
| | 381.210 | 9.10 | 23.90 | 33.00 | 50.00 | 17.00 |
| | 638.810 | 13.80 | 24.00 | 37.80 | 50.00 | 12.20 |
| | 858.010 | 8.30 | 24.40 | 32.70 | 50.00 | 17.30 |

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 mW 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 : @ 501.02 MHz

$$\text{Class B Limit} = 46.00 \text{ dB}(\mu V/m)$$

$$\text{Reading} = 55.04 \text{ dB}(\mu V)$$

$$\text{Antenna Factor + (Cable Loss - Amp. Gain.)} = 17.65 + (-30.93) = -13.28 \text{ dB}(\mu V/m)$$

$$\text{Total} = 41.76 \text{ dB}(\mu V/m)$$

$$\text{Margin} = 46.00 - 41.76 = 4.24 \text{ dB}$$

$$= 4.24 \text{ dB below Limit}$$

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 | BLWA 0310-1 | BONN Elektronik | 045672 | 18.01.31 | 19.01.31 |
| <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 | 277 | 16.10.12 | 18.10.12 |
| <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 Ω 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 |