

Electromagnetic Emission

FCC MEASUREMENT REPORT

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT : Set top box
MODEL/Serial No. : IPH3004HDM / NONE
MULTIPLE MODEL : IPH3004HDM, DMS3004HDM, DMT-1434
FCC ID : PFNIPH3004HDM
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 Guan jie Industrial Park, Guihua Community,
Guanlan Street, Bao'an District, Shenzhen City, Guangdong Province,
China, 518-110
EQUIPMENT CLASS : DTS (Part 15 Digital Transmission System)
TYPE OF MODULATION : DSSS
FREQUENCY CHANNEL : Zigbee: 2 425 MHz, 2 450 MHz, 2475 MHz (3 Ch)
ANTENNA TYPE : Internal Antenna (Integral)
ANTENNA GAIN : 3.25 dBi max
RF POWER : 0.469 mW
RULE PART(S) : FCC Part 15 Subpart C
FCC PROCEDURE : ANSI C63.10-2013
TEST REPORT No. : ETLT180205.0018
DATES OF TEST : Feb 12, 2018 to Feb 21, 2018
REPORT ISSUE DATE : February 27, 2018
TEST LABORATORY : ETL Inc. (FCC Designation Number : KR0022)

The Set top box, Model IPH3004HDM 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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February 27, 2018

Reviewed by:

Kug Kyoung, Yoon (Chief Engineer)

February 27, 2018

ETL Inc.

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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
- **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: (14.9 ± 9.3) °C
: Humidity: (38 ± 4) % R.H.
: Atmospheric Pressure: (102.1 ± 0.2) 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.** : ETLT180205.0018

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

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.

In addition, the EUT has two types of AC/DC Adapter. And each has been tested. (Type 1: ETLT151109.0089 issued on December 22, 2015, Type 2: ETLT171124.0140 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 ETLT180205.0018 issued on February 27, 2018 to previously published test report ETLT171124.0140 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	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
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-band EAS
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

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 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 1.0 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.

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.

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
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 - 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 - 1 427	8.025 - 8.5
4.177 25 - 4.177 75	37.5 - 38.25	1 435 - 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 - 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 - 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 - 1 722.2	13.25 - 13.4
6.311 75 - 6.312 25	123 - 138	2 200 - 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 - 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525 25	2 483.5 - 2 500	17.7 - 21.4
8.376 25 - 8.386 75	156.7 - 156.9	2 690 - 2 900	22.01 - 23.12
8.414 25 - 8.414 75	162.012 5 - 167.17	3 260 - 3 267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3 332 - 3 339	31.2 - 31.8
12.519 75 - 12.520 25	240 - 285	3 345.8 - 3 358	36.43 - 36.5
12.576 75 - 12.577 25	322 - 335.4	3 600 - 4 400	(²)
13.36 - 13.41			

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

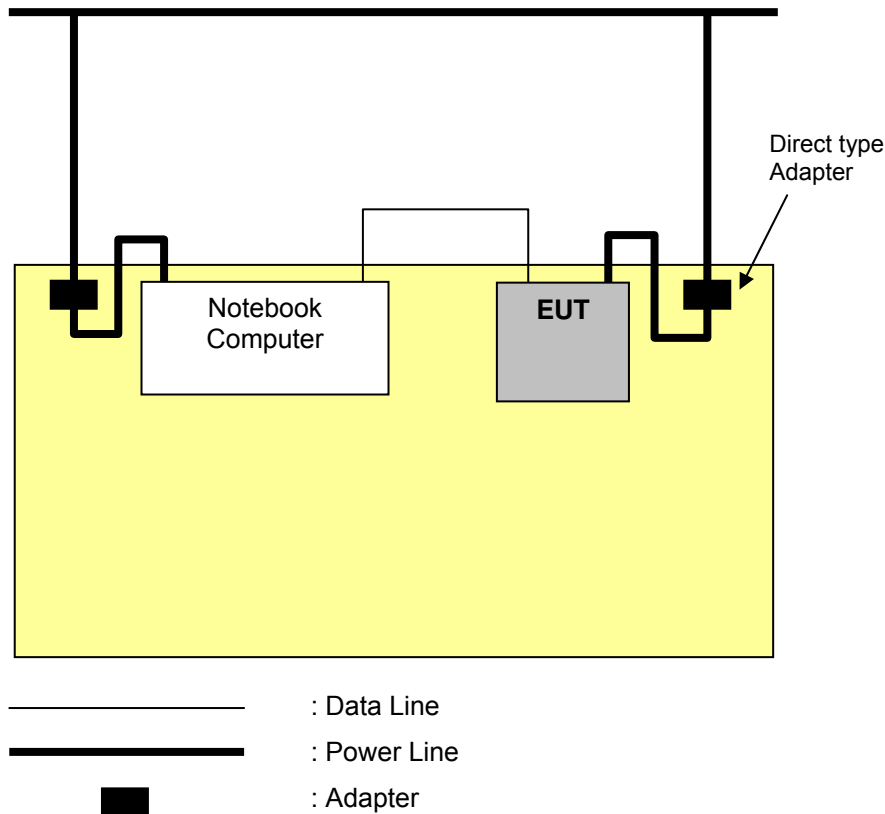
4.1 Test Configuration

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.

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.

5.2 Spurious Emissions

EUT	Set top box / IPH3004HDM
Limit apply to	FCC Part 15.209
Test Date	February 13, 2018 to February 21, 2018
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.

Radiated Emissions Test data

- 9 kHz to 1 GHz

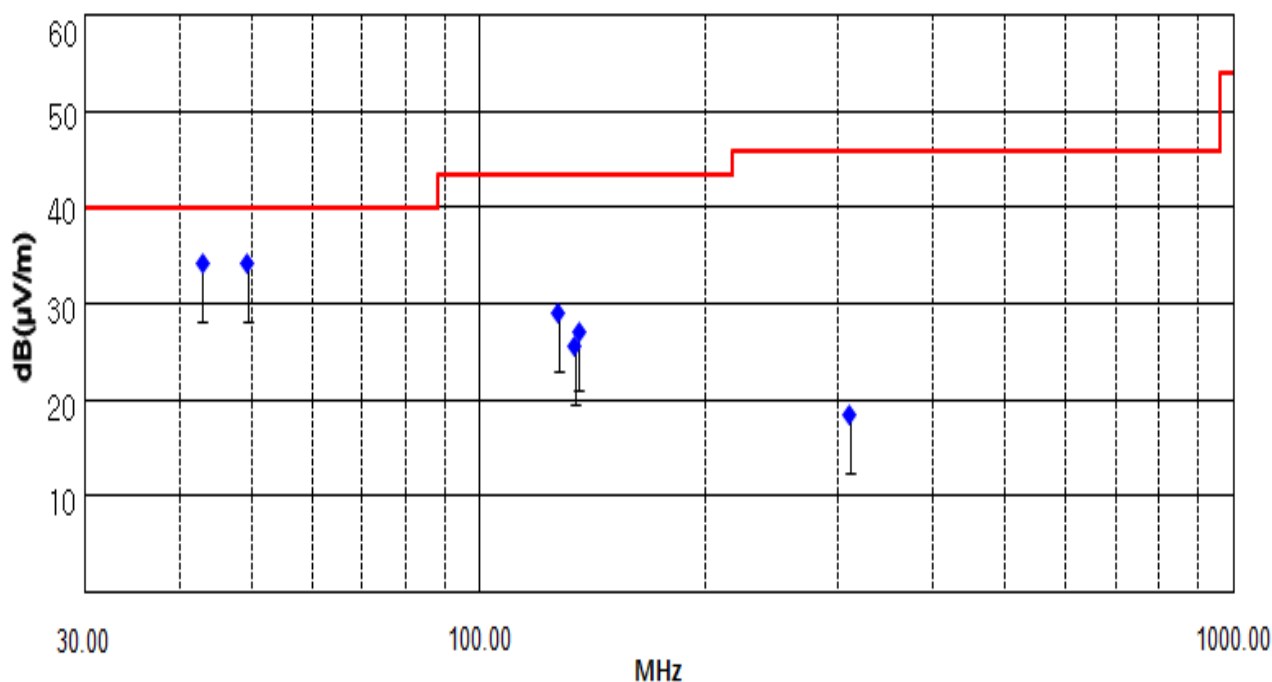
Test Date	February 21, 2018
Environmental of Test	(6.3 ± 0.7) °C, (40 ± 1) % R.H., (102.0 ± 0.1) kPa

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]
42.86	53.74	V	12.88	-32.48	100	34.14	40.00	5.86
49.24	53.44	V	13.19	-32.53	101	34.10	40.00	5.90
127.23	52.23	V	8.71	-32.04	107	28.90	43.50	14.60
133.80	49.42	V	8.18	-31.98	107	25.62	43.50	17.88
135.41	50.94	V	8.05	-31.96	107	27.03	43.50	16.47
309.84	36.05	V	13.92	-31.65	121	18.32	46.00	27.68

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.



- Above 1 GHz (1 GHz to 25 GHz)

Test Date	February 21, 2018
Environmental of Test	(7.4 ± 0.5) °C, (38 ± 4) % R.H., (102.0 ± 0.0) kPa

1. Low CH (2 425 MHz)

Frequency [MHz]	Reading [dB(μV)]		Polarity (*H/**V)	Ant. Factor [dB/m]	Cable - Amp. Gain [dB]	Height [cm]	Result [dB(μV/m)]		Limit [dB(μV/m)]		Margin [dB]	
	Peak	Average					Peak	Average	Peak	Average	Peak	Average
1 997.18	71.80	51.35	V	26.07	-47.49	150	50.38	29.93	73.97	53.97	23.59	24.04
3 500.32	51.78	37.82	V	28.50	-44.45	150	35.83	21.87	73.97	53.97	38.14	32.10
4 767.52	50.69	37.65	V	31.01	-44.10	150	37.60	24.56	73.97	53.97	36.37	29.41
10 518.26	45.39	32.15	V	40.07	-38.70	150	46.76	33.52	73.97	53.97	27.21	20.45
21 181.52	42.88	29.75	H	37.71	-30.78	150	49.81	36.68	73.97	53.97	24.16	17.29
23 161.18	42.83	29.99	v	38.07	-29.45	150	51.45	38.61	73.97	53.97	22.52	15.36

2. Middle CH (2 450 MHz)

Frequency [MHz]	Reading [dB(μV)]		Polarity (*H/**V)	Ant. Factor [dB/m]	Cable - Amp. Gain [dB]	Height [cm]	Result [dB(μV/m)]		Limit [dB(μV/m)]		Margin [dB]	
	Peak	Average					Peak	Average	Peak	Average	Peak	Average
1 996.51	70.15	50.87	V	26.06	-47.49	150	48.72	29.44	73.97	53.97	25.25	24.53
3 501.48	51.81	37.89	V	28.50	-44.45	150	35.86	21.94	73.97	53.97	38.11	32.03
4 791.12	50.64	37.70	V	31.05	-44.06	150	37.63	24.69	73.97	53.97	36.34	29.28
10 517.70	45.38	32.14	V	40.07	-38.70	150	46.75	33.51	73.97	53.97	27.22	20.46
21 146.15	42.84	29.72	H	37.69	-30.80	150	49.73	36.61	73.97	53.97	24.24	17.36
23 196.52	42.80	29.95	v	38.06	-29.42	150	51.44	38.59	73.97	53.97	22.53	15.38

3. High CH (2 475 MHz)

Frequency [MHz]	Reading [dB(μV)]		Polarity (*H/**V)	Ant. Factor [dB/m]	Cable - Amp. Gain [dB]	Height [cm]	Result [dB(μV/m)]		Limit [dB(μV/m)]		Margin [dB]	
	Peak	Average					Peak	Average	Peak	Average	Peak	Average
1 993.22	71.36	51.83	V	26.06	-47.50	150	49.92	30.39	73.97	53.97	24.05	23.58
3 506.29	51.76	37.86	V	28.51	-44.47	150	35.80	21.90	73.97	53.97	38.17	32.07
4 779.31	50.68	37.66	V	31.03	-44.08	150	37.63	24.61	73.97	53.97	36.34	29.36
10 518.44	45.42	32.15	V	40.07	-38.70	150	46.79	33.52	73.97	53.97	27.18	20.45
21 063.71	42.85	29.72	V	37.65	-30.84	150	49.66	36.53	73.97	53.97	24.31	17.44
23 432.18	42.84	30.10	V	38.01	-29.27	150	51.58	38.84	73.97	53.97	22.39	15.13

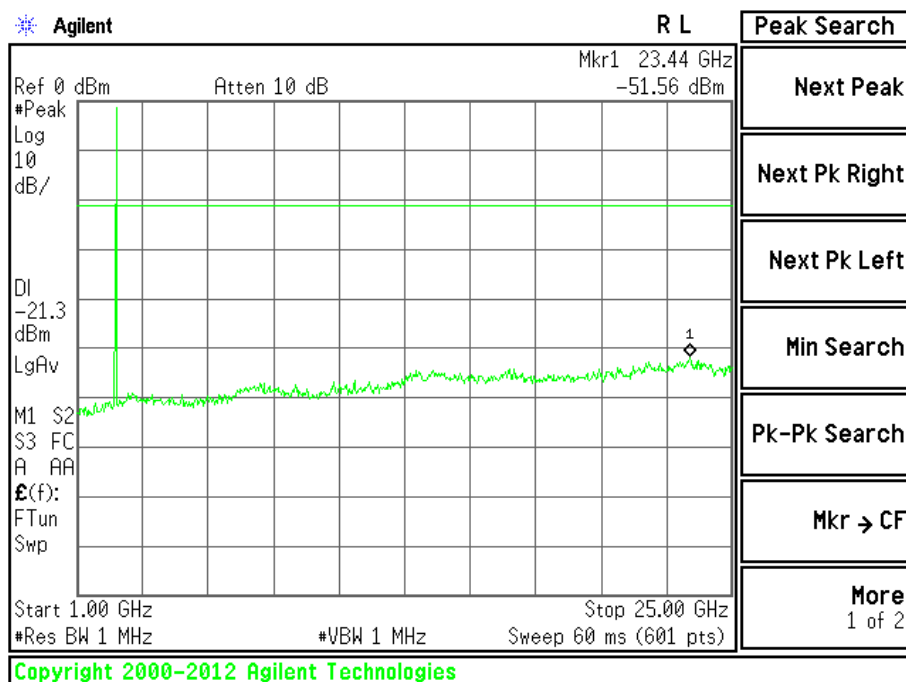
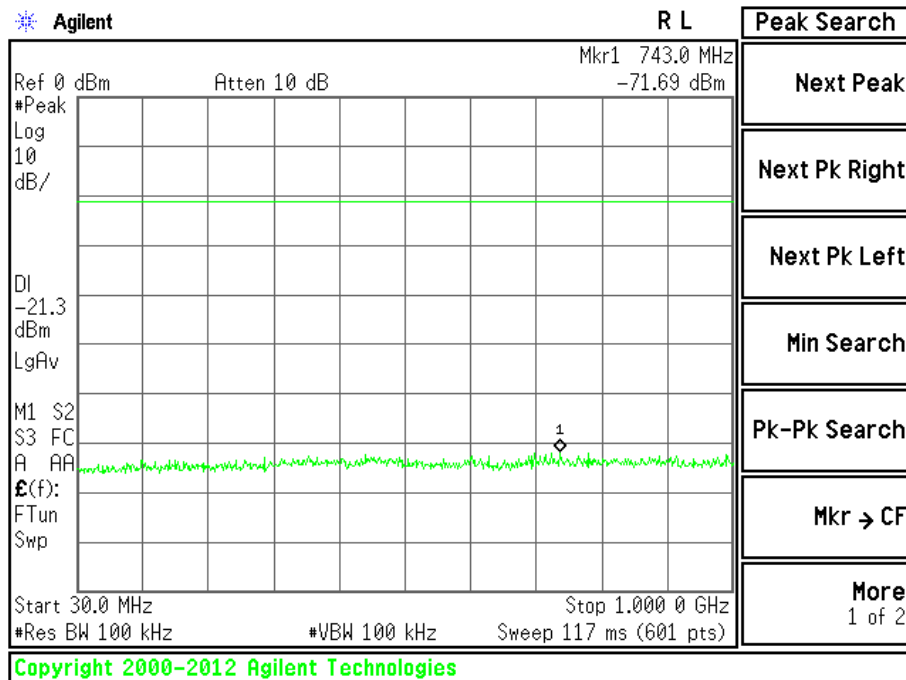
NOTES:

- * H : Horizontal polarization, ** V : Vertical polarization
- Factor = Antenna factor + Cable loss - Amp. Gain
- Result = Reading + Factor
- Margin value = Limit - Result
- 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.
- Spectrum setting:
 - Peak Setting 1 GHz to 10th harmonics of fundamental, RBW = 1 MHz, VBW = 1 MHz, Sweep = Auto
 - AV Setting 1 GHz to 10th harmonics of fundamental, RBW = 1 MHz, VBW = 10 kHz, Sweep = Auto

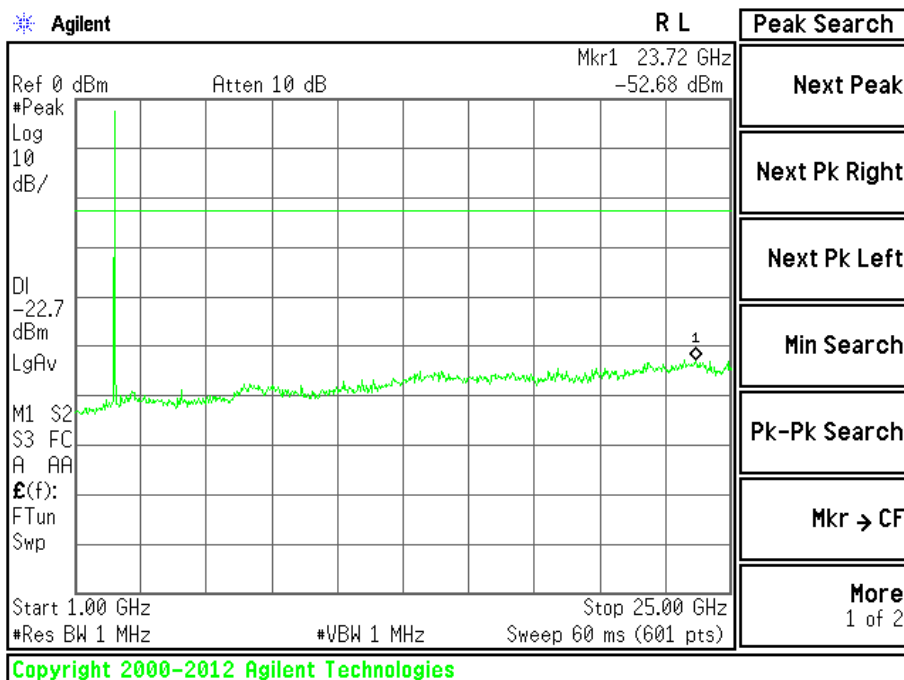
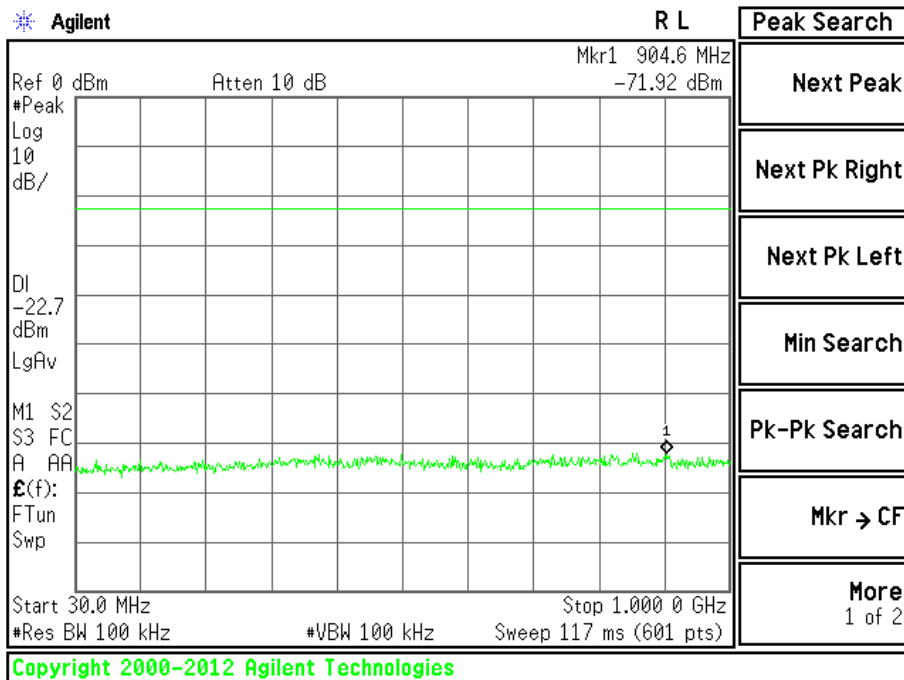
Plots of Spurious Emissions (Conducted Measurement)

Test Date	February 13, 2018
Environmental of Test	(23.5 ± 0.0) °C, (40 ± 0) % R.H., (102.1 ± 0.0) kPa

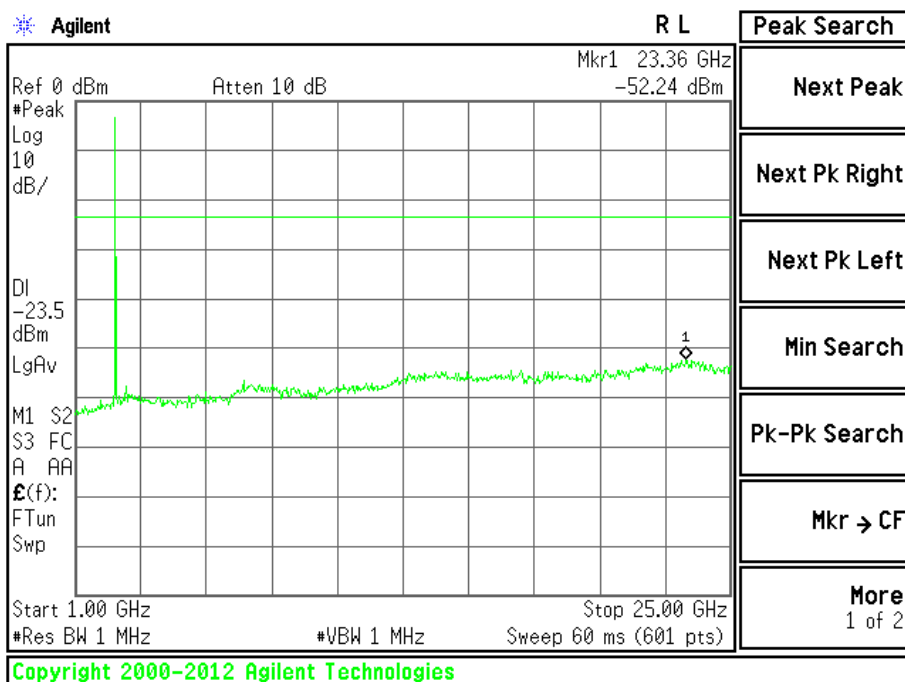
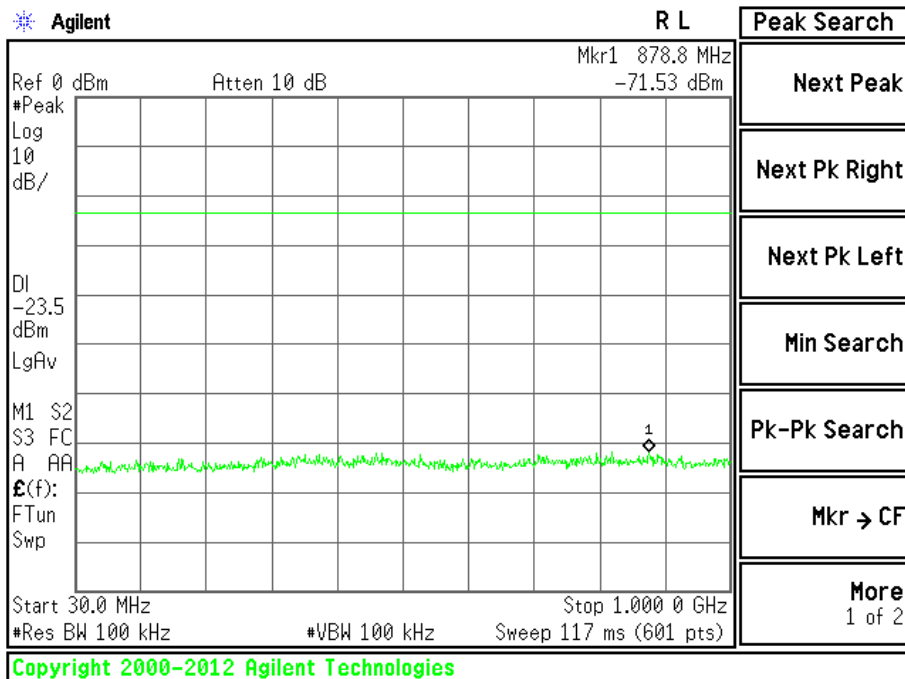
[CH Low]



[CH Mid]



[CH High]



5.3 Conducted Emissions Measurement

EUT	Set top box / IPH3004HDM
Limit apply to	FCC Part 15.207
Test Date	February 12, 2018
Environmental of Test	(22.4 ± 1.7) °C, (38 ± 1) % R.H., (102.3 ± 0.0) kPa
Operating Condition	RF transmitting continuously during the tested.
Result	Passed by 9.56 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 [MHz]	Conducted limit [dB(μ V)]	
	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.

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)

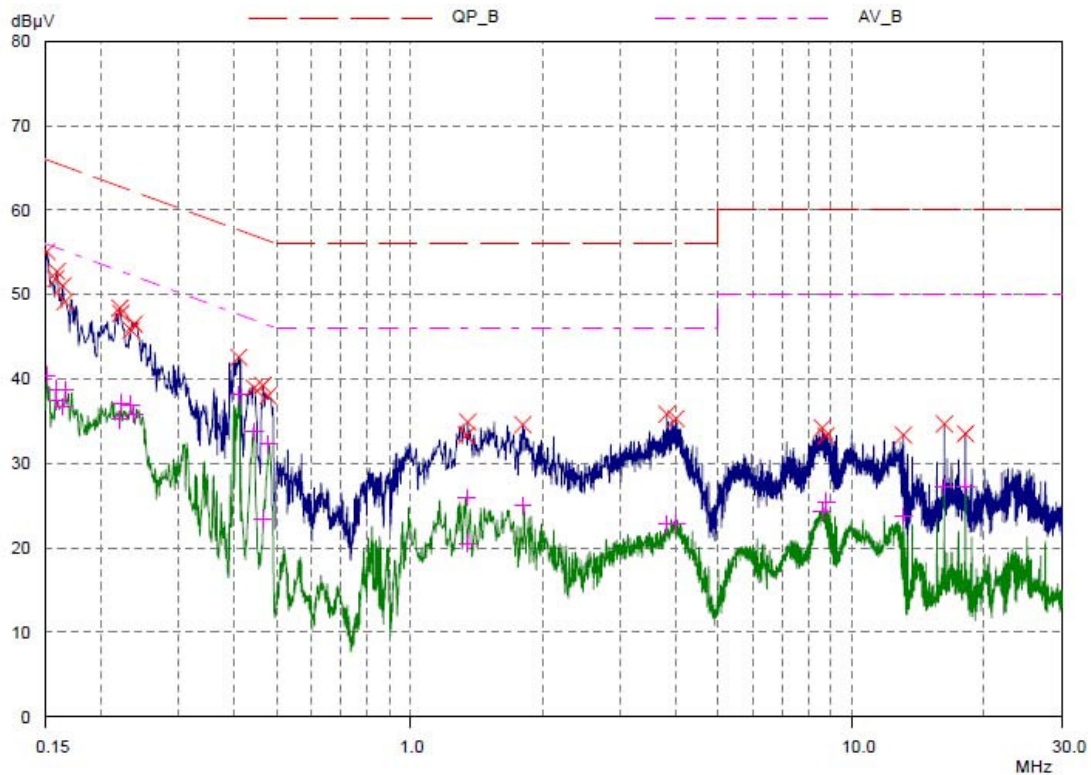
NOTES:

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.

Line: HOT

ETL EMC Laboratory
Conducted Emission Test Result
EUT: ETLT180205.0018
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: ETLT180205.0018

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
0.151	55.04	65.94	10.90
0.158	51.84	65.57	13.73
0.159	52.70	65.52	12.82
0.164	51.00	65.26	14.26
0.166	49.12	65.16	16.04
0.221	48.39	62.78	14.39
0.222	47.77	62.74	14.97
0.234	45.75	62.31	16.56
0.238	46.47	62.17	15.70
0.411	42.55	57.63	15.08
0.445	38.93	56.97	18.04
0.466	39.23	56.58	17.35
0.478	37.99	56.37	18.38
1.345	33.32	56.00	22.68
1.355	34.88	56.00	21.12
1.805	34.57	56.00	21.43
3.825	35.82	56.00	20.18
4.01	35.29	56.00	20.71
8.605	34.18	60.00	25.82
8.765	33.25	60.00	26.75
13.13	33.34	60.00	26.66
16.25	34.64	60.00	25.36
18.13	33.50	60.00	26.50

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB
0.151	40.39	55.94	15.55
0.158	38.77	55.57	16.80
0.159	37.35	55.52	18.17
0.164	36.69	55.26	18.57
0.166	38.62	55.16	16.54

* limit exceeded

Peak Search Results (continued)

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB
0.221	35.16	52.78	17.62
0.222	37.15	52.74	15.59
0.234	36.93	52.31	15.38
0.238	35.81	52.17	16.36
0.411	38.07	47.63	9.56
0.445	33.74	46.97	13.23
0.466	23.33	46.58	23.25
0.478	32.27	46.37	14.10
1.345	25.96	46.00	20.04
1.355	20.50	46.00	25.50
1.805	24.94	46.00	21.06
3.825	22.80	46.00	23.20
4.01	22.87	46.00	23.13
8.605	24.35	50.00	25.65
8.765	25.46	50.00	24.54
13.13	23.77	50.00	26.23
16.25	27.21	50.00	22.79
18.13	27.29	50.00	22.71

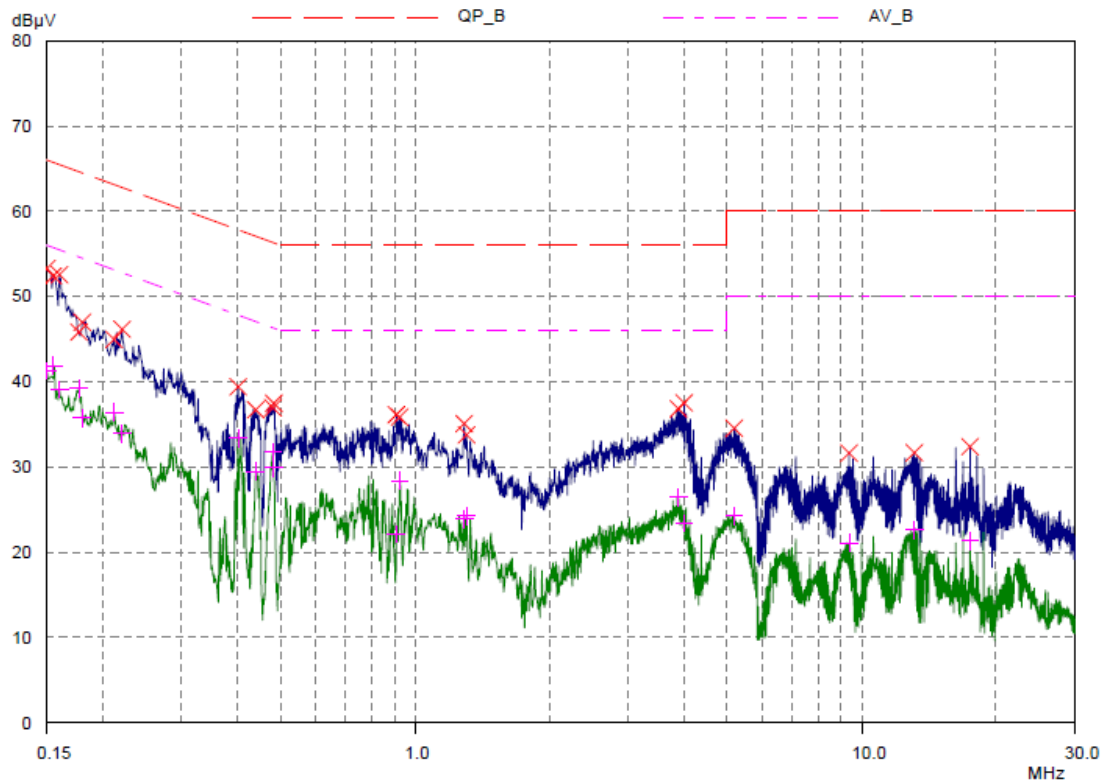
* limit exceeded

Line: Neutral

ETL EMC Laboratory Conducted Emission Test Result

EUT: ETLT180205.0018
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: ETLT180205.0018

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	53.28	66.00	12.72
0.155	52.41	65.73	13.32
0.16	52.55	65.46	12.91
0.177	45.82	64.63	18.81
0.18	46.98	64.49	17.51
0.212	44.95	63.13	18.18
0.221	46.14	62.78	16.64
0.402	39.38	57.81	18.43
0.44	36.71	57.06	20.35
0.481	36.91	56.32	19.41
0.483	37.45	56.29	18.84
0.909	36.12	56.00	19.88
0.925	35.84	56.00	20.16
1.29	35.07	56.00	20.93
1.305	33.75	56.00	22.25
3.89	36.80	56.00	19.20
4.005	37.51	56.00	18.49
5.185	34.54	60.00	25.46
9.375	31.62	60.00	28.38
13.11	31.66	60.00	28.34
17.5	32.37	60.00	27.63

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB
0.15	41.26	56.00	14.74
0.155	41.87	55.73	13.86
0.16	39.04	55.46	16.42
0.177	39.18	54.63	15.45
0.18	35.73	54.49	18.76
0.212	36.40	53.13	16.73
0.221	33.89	52.78	18.89

* limit exceeded

Peak Search Results (continued)

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB
0.402	33.39	47.81	14.42
0.44	29.49	47.06	17.57
0.481	31.75	46.32	14.57
0.483	29.87	46.29	16.42
0.909	22.12	46.00	23.88
0.925	28.36	46.00	17.64
1.29	23.87	46.00	22.13
1.305	24.23	46.00	21.77
3.89	26.44	46.00	19.56
4.005	23.38	46.00	22.62
5.185	24.21	50.00	25.79
9.375	21.09	50.00	28.91
13.11	22.60	50.00	27.40
17.5	21.35	50.00	28.65

* limit exceeded

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: @ 42.86 MHz

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

$$\text{Reading} = 53.74 \text{ dB}(\mu V)$$

$$\text{Antenna Factor} + (\text{Cable Loss} - \text{Amp Gain}) = 12.88 + (-32.48) = -19.60 \text{ dB}(\mu V/m)$$

$$\text{Total} = 53.74 + (-19.60) = 34.14 \text{ dB}(\mu V/m)$$

$$\text{Margin} = 40.00 - 34.14 = 5.86 \text{ dB}$$

$$= 5.86 \text{ dB below Limit}$$

7. List of test equipments used for measurements

	Test Equipment	Model	Mfg.	Serial No.	Cal. Date	Cal. Due Date
☒	EMI Test Receiver	ESCI7	R&S	100851	17.08.31	18.08.31
☒	EMI Test Receiver	ESCS30	R&S	100087	17.03.13	18.03.13
☒	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	BBHA9170440	17.12.04	19.12.04
☒	AMPLIFIER	TK-PA18	TESTEK	120020	17.09.01	18.09.01
☒	AMPLIFIER	TK-PA18H	TESTEK	170010-L	17.06.07	18.06.07
☒	AMPLIFIER	BLWA 0310-1	BONN Elektronik	045672	18.01.31	19.01.31
☒	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
☒	Antenna Master	MA4000	AUDIX	N/A	N/A	N/A