

Electromagnetic Emission

FCC MEASUREMENT REPORT

CERTIFICATION OF COMPLIANCE


FCC Part 15 Certification Measurement


PRODUCT : SET-TOP BOX
MODEL/Serial No. : DMS2004UHD / NONE
FCC ID : PFNDMS2004UHD
APPLICANT : Digital Multimedia Technology Co., Ltd.
8th Floor, 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
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 : 1.129 mW
RULE PART(S) : FCC Part 15 Subpart C
FCC PROCEDURE : ANSI C63.10-2013
TEST REPORT No. : ETLT171102.0135
DATES OF TEST : Nov 17, 2017 to Nov 27, 2017
REPORT ISSUE DATE : Dec 27, 2017
TEST LABORATORY : ETL Inc. (FCC Designation Number : KR0022)

The SET-TOP BOX, Model DMS2004UHD 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: 
Seok Lyong, Choi (Test Engineer)
December 27, 2017

Reviewed by: 
Kug Kyoung, Yoon (Chief Engineer)
December 27, 2017

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
Tel: 82-2-858-0786 Fax: 82-2-858-0788

*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.*

Table of Contents

FCC Measurement Report

- 1. Introduction**
- 2. Product Information**
- 3. Description of Tests**
- 4. Test Condition**
- 5. Test Results**
 - 5.1 Summary of Test Results**
 - 5.2 Spurious Emissions**
 - 5.3 Conducted Emissions Test**
- 6. Sample Calculation**
- 7. List of test Equipment used for Measurement**

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	: 8th Floor, 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** : DMS2004UHD
- **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** : 1.129 mW
- **Environmental of Tests** : Temperature: (11.8 ± 12.1) °C
: Humidity: (49 ± 10) % R.H.
: Atmospheric Pressure: (102.0 ± 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.** : ETLT171102.0135

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: DMS2004UHD

2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the SET-TOP BOX (model: DMS2004UHD).

The model DMS2004UHD is basic model that was tested.

The AC/DC Adapter was added. And, it was tested again.
(Add test report ETLT171102.0135 issued on December 27, 2017 to previously published test report ETLT160513.0054 on June 13, 2016.)

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

Model name of AC/DC Adapter	View of AD/DC Adapter		
EDF0500150A1BA (Efficiency level: V) (Before)			
EDF0500150A1BB (Efficiency level: VI) (Before)			
EDF0500150A1BB-3 (Efficiency level: V) (Before)			
V03J0500150HU (Efficiency level: VI) (Addition)			

2.2 General Specification

Favorite channel, Parental Lock
Automatic search for newly added transponder (Network Auto Search)
Stores up to 5 000 channels
Plug-and-play data transfer system (DSR to DSR)
Timer function, automatically turns On/Off by setting function (daily, weekly, monthly and one time)
Automatic reserved channel moving system
Provide Electronic program Guide (EPG)
PAL/NTSC automatically conversion
Last channel automatically saving
Support RF4CE application
RF4CE Frequency range: 2 425 MHz ~ 2 475 MHz
Support for various video output: HDMI, RF 3/4 Mod.
HDMI 1.3a with HDCP 1.1
US3/4 Channel
MPEG-2 / MPEG-4 Part 10 / H.264
Video Display format with NTSC/480p/576p/720p/1 080i
Dolby Digital AC3
RF input frequency range: 105 MHz to 1 002 MHz
High Internal Frequency: CPU Clock → 432 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

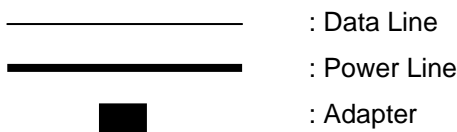
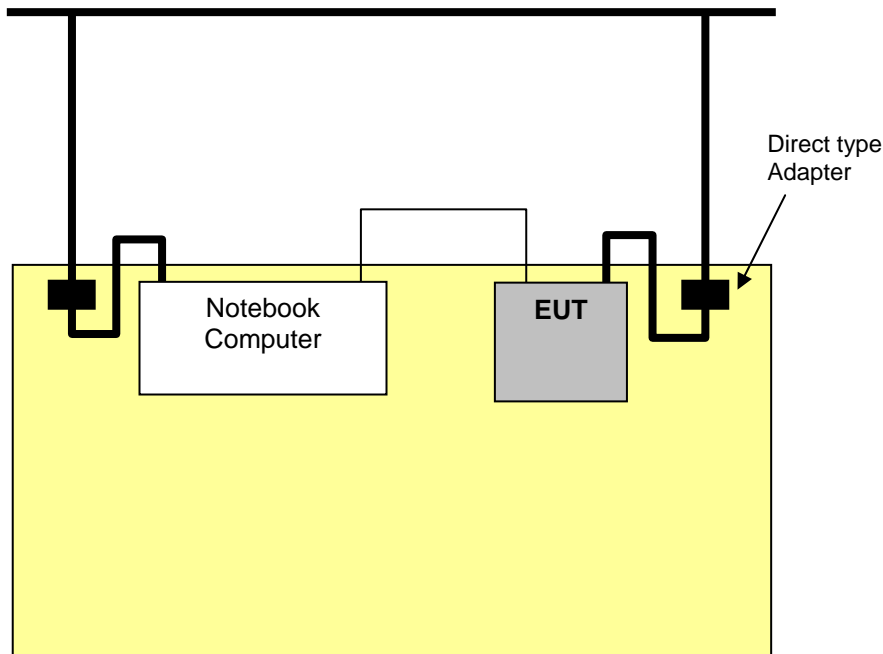
4.1 Test Configuration

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 / DMS2004UHD** 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 / DMS2004UHD
Limit apply to	FCC Part 15.209
Test Date	November 17, 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 [μ V/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

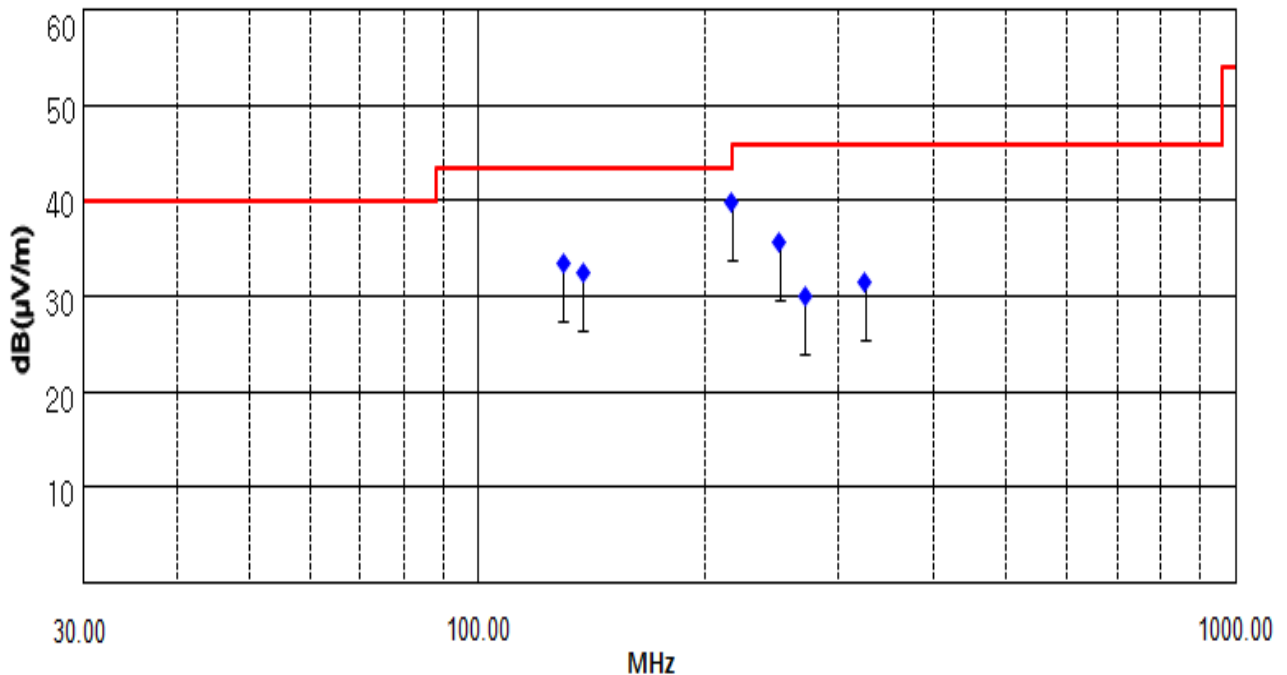
Test Date	November 17, 2017
Environmental of Test	(4.8 ± 3.9) °C, (53 ± 4) % R.H., (101.6 ± 0.1) kPa

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]
130.12	55.27	V	8.48	-30.27	100	33.48	43.50	10.02
137.55	54.79	V	7.88	-30.23	105	32.44	43.50	11.06
215.97	57.47	H	12.08	-29.76	370	39.79	43.50	3.71
249.70	52.17	H	12.91	-29.58	369	35.50	46.00	10.50
270.00	46.33	V	13.23	-29.47	114	30.09	46.00	15.91
323.84	46.85	V	14.24	-29.20	130	31.89	46.00	14.11

NOTES:

- * H : Horizontal polarization, ** V : Vertical polarization
- The cable loss value was included the Amp. Gain.
- Result = Reading + Antenna factor + Cable loss
- Margin value = Limit - Result
- 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	November 17, 2017
Environmental of Test	(5.4 ± 5.7) °C, (53 ± 5) % R.H., (101.7 ± 0.1) 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
5 312.48	50.28	37.18	H	31.70	-43.35	150	38.63	25.53	73.97	53.97	35.34	28.44
14 377.44	44.31	30.69	V	42.34	-34.29	150	52.36	38.74	73.97	53.97	21.61	15.23
17 865.19	42.14	29.09	V	47.21	-30.17	150	59.18	46.13	73.97	53.97	14.79	7.84
18 671.41	43.14	29.84	V	35.95	-31.23	150	47.86	34.56	73.97	53.97	26.11	19.41
20 631.58	47.66	29.43	V	36.94	-30.36	150	54.24	36.01	73.97	53.97	19.73	17.96
24 188.45	42.58	29.71	H	38.29	-27.73	150	53.14	40.27	73.97	53.97	20.83	13.70

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
5 324.59	50.48	37.22	V	31.71	-43.36	150	38.83	25.57	73.97	53.97	35.14	28.40
14 578.94	44.22	30.74	V	42.28	-34.11	150	52.39	38.91	73.97	53.97	21.58	15.06
17 812.46	42.04	29.11	V	46.68	-30.10	150	58.62	45.69	73.97	53.97	15.35	8.28
18 684.53	42.77	29.48	H	35.96	-31.23	150	47.50	34.21	73.97	53.97	26.47	19.76
21 443.18	43.16	29.88	H	37.65	-29.85	150	50.96	37.68	73.97	53.97	23.01	16.29
24 199.65	42.41	29.55	H	38.27	-27.72	150	52.96	40.10	73.97	53.97	21.01	13.87

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
5 341.41	51.11	37.25	V	31.72	-43.36	150	39.47	25.61	73.97	53.97	34.50	28.36
13 435.94	43.64	30.95	H	41.88	-34.79	150	50.73	38.04	73.97	53.97	23.24	15.93
17 892.56	42.31	29.23	V	47.49	-30.20	150	59.60	46.52	73.97	53.97	14.37	7.45
18 934.15	42.51	29.37	V	36.15	-31.12	150	47.54	34.40	73.97	53.97	26.43	19.57
21 184.69	42.95	29.76	H	37.40	-30.06	150	50.29	37.10	73.97	53.97	23.68	16.87
24 185.40	42.40	29.77	H	38.29	-27.73	150	52.96	40.33	73.97	53.97	21.01	13.64

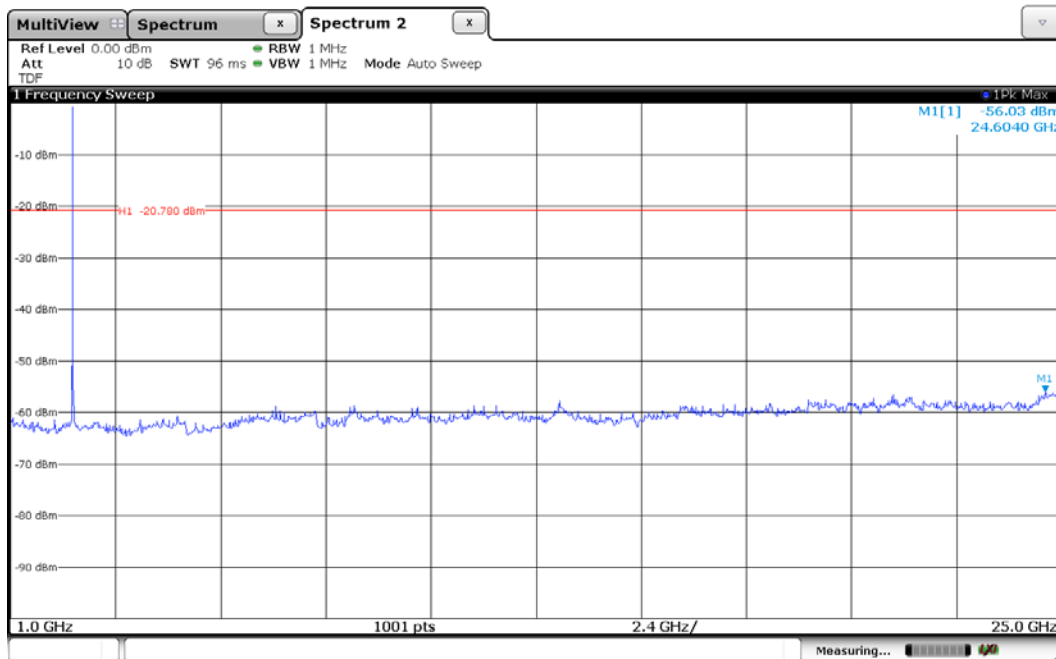
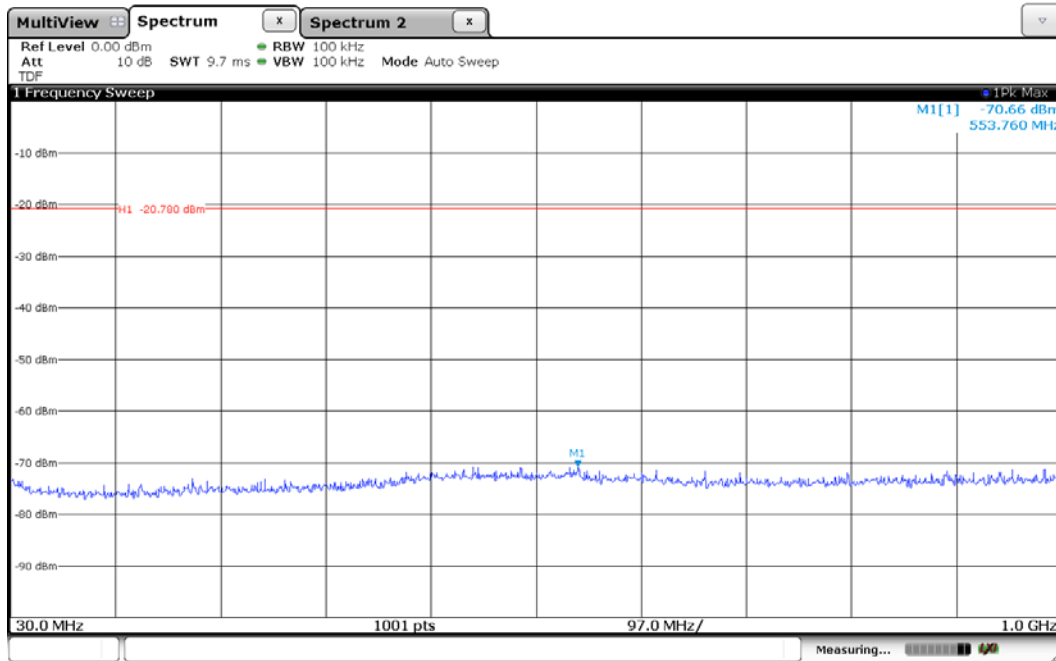
NOTES:

- * 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

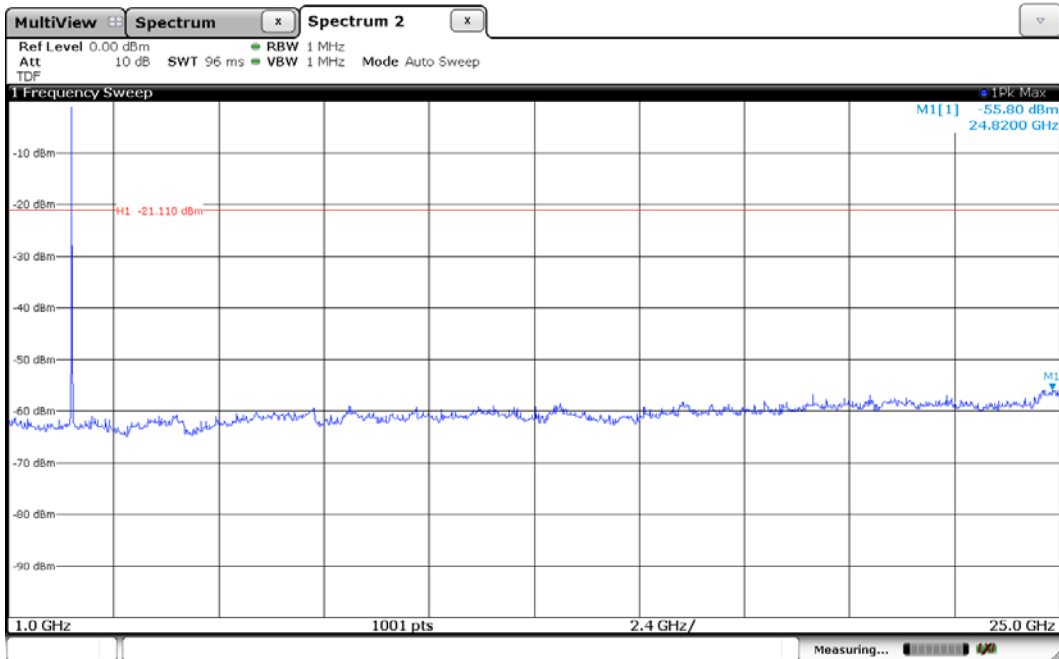
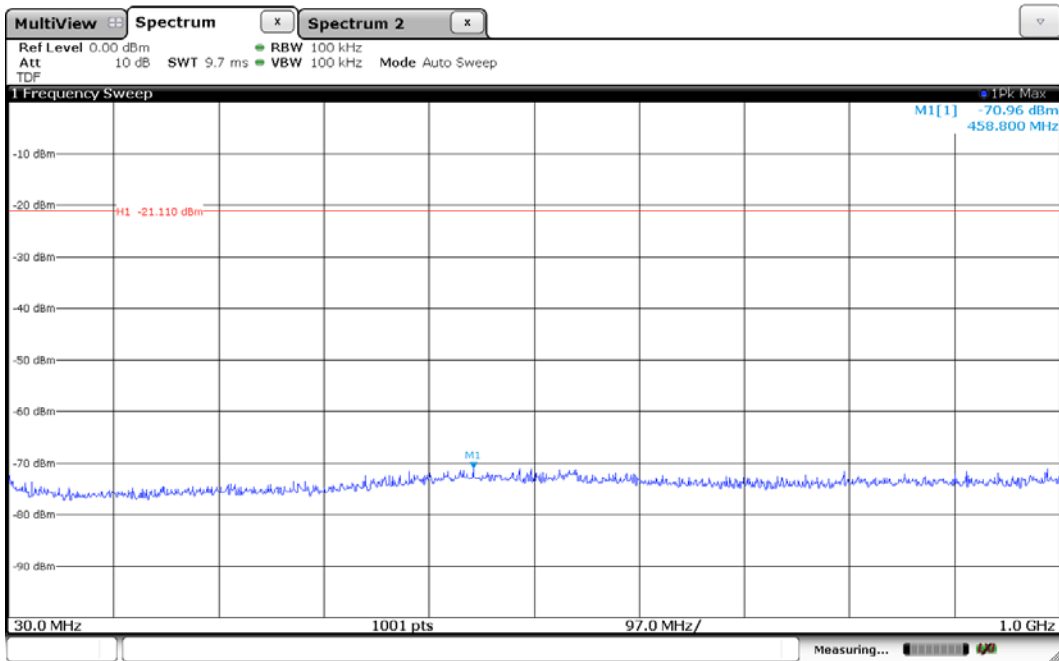
Plots of Spurious Emissions (Conducted Measurement)

Test Date	November 24, 2017
Environmental of Test	(23.3 ± 0.0) °C, (41 ± 0) % R.H., (102.4 ± 0.0) kPa

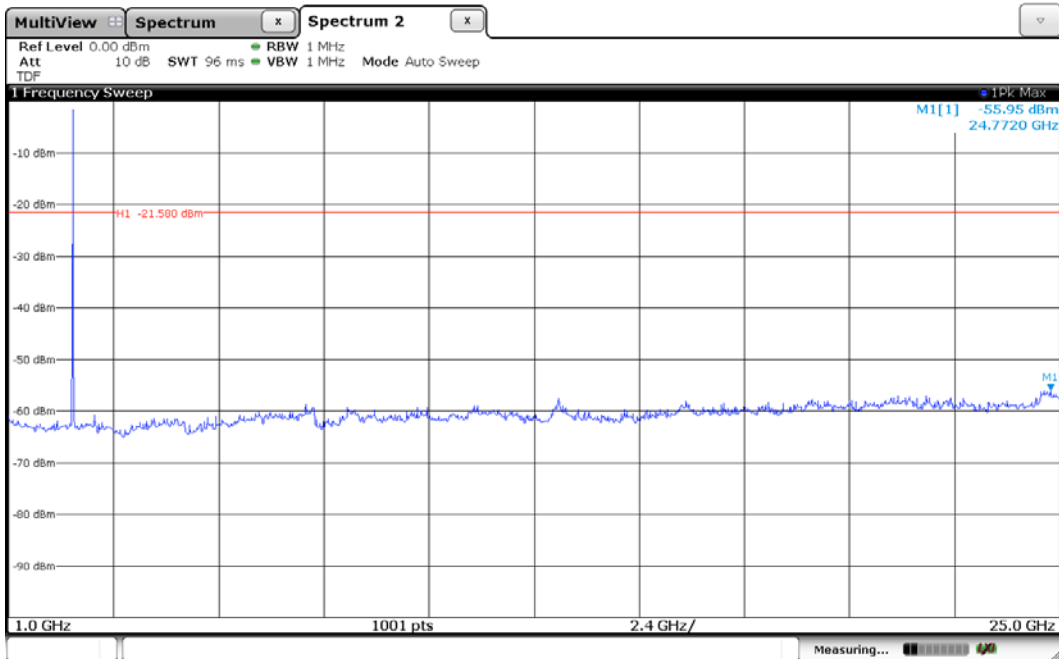
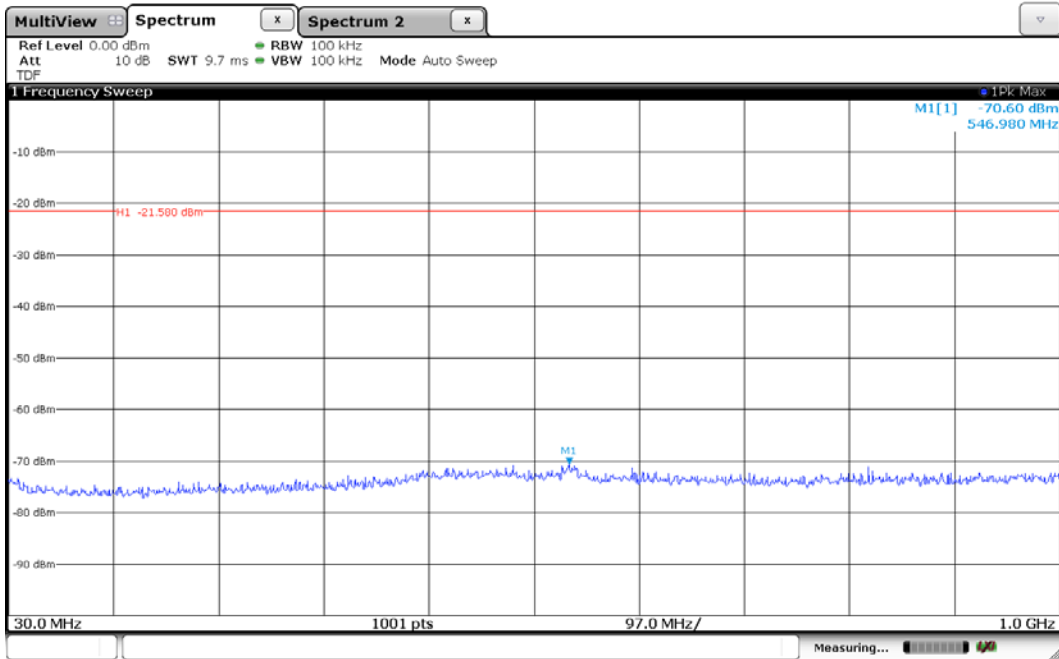
[CH Low]



[CH Mid]



[CH High]



5.3 Conducted Emissions Measurement

EUT	SET-TOP BOX / DMS2004UHD
Limit apply to	FCC Part 15.207
Test Date	November 27, 2017
Environmental of Test	(23.7 ± 0.2) °C, (39 ± 0) % R.H., (102.5 ± 0.0) kPa
Operating Condition	RF transmitting continuously during the tested.
Result	Passed by 5.91 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 μH/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(μV)]	
	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:

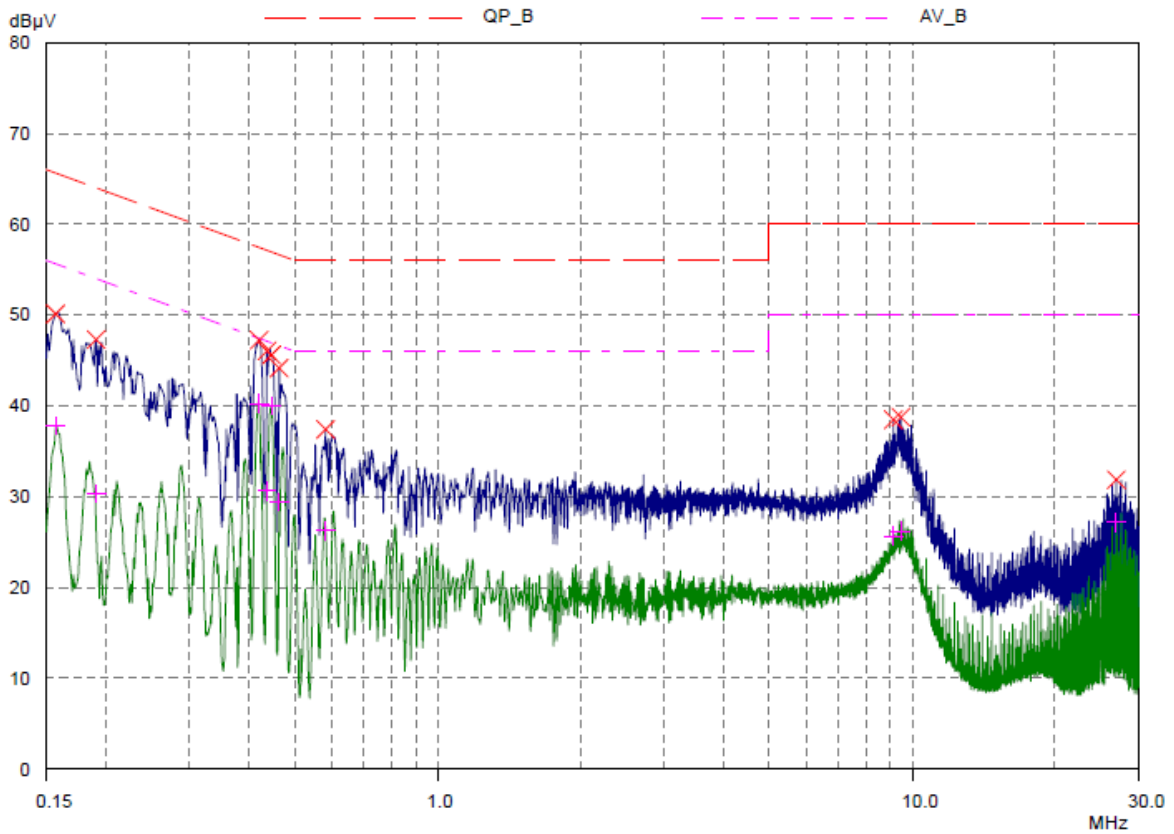
1. Please see the measured data and graph in next page.
2. The Level (Result) value was included the reading, LISN factor and cable loss.
3. Delta (Margin) value = Limit - Level (Result)
4. Measurement were performed at the AC Power Inlet in the frequency band of 150 kHz ~ 30 MHz according to the FCC 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: ETLT171102.0135
Manuf:
Op Cond:
Operator:
Test Spec:
Comment: H

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: ETLT171102.0135
 Manuf:
 Op Cond:
 Operator:
 Test Spec:
 Comment: H

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
0.157	50.10	65.62	15.52
0.191	47.28	63.99	16.71
0.421	47.23	57.43	10.20
0.437	46.02	57.12	11.10
0.447	45.58	56.93	11.35
0.464	44.16	56.62	12.46
0.581	37.38	56.00	18.62
9.13	38.46	60.00	21.54
9.475	38.75	60.00	21.25
26.92	31.83	60.00	28.17

Frequency MHz	AV Level dB μ V	AV Limit dB μ V	AV Delta dB
0.157	37.80	55.62	17.82
0.191	30.33	53.99	23.66
0.421	40.20	47.43	7.23
0.437	30.64	47.12	16.48
0.447	39.97	46.93	6.96
0.464	29.38	46.62	17.24
0.581	26.23	46.00	19.77
9.13	25.64	50.00	24.36
9.475	26.16	50.00	23.84
26.92	27.18	50.00	22.82

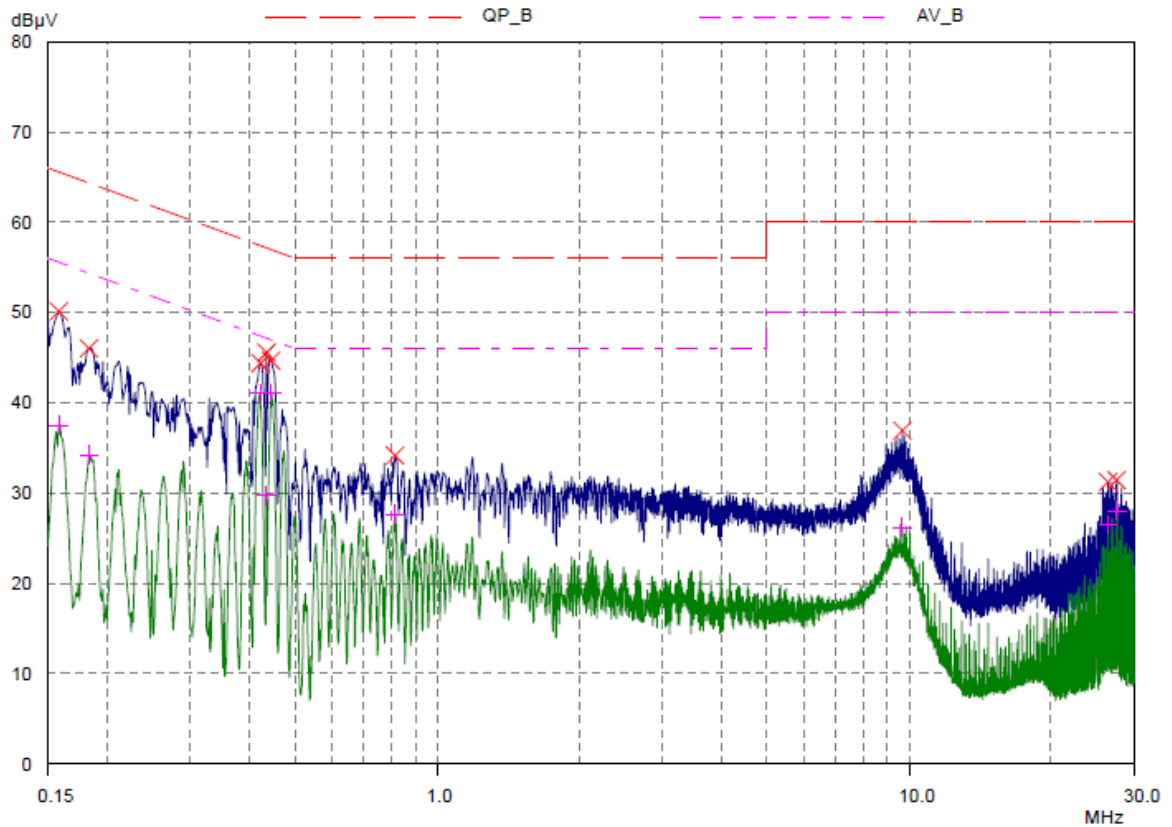
* limit exceeded

Line: Neutral

ETL EMC Laboratory
 Conducted Emission Test Result

EUT: ETLT171102.0135
 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: ETLT171102.0135
 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
0.158	50.09	65.57	15.48
0.183	46.00	64.35	18.35
0.423	44.36	57.39	13.03
0.435	45.53	57.16	11.63
0.445	44.65	56.97	12.32
0.815	34.14	56.00	21.86
9.68	36.90	60.00	23.10
26.39	31.21	60.00	28.79
27.51	31.42	60.00	28.58

Frequency MHz	AV Level dB μ V	AV Limit dB μ V	AV Delta dB
0.158	37.50	55.57	18.07
0.183	34.22	54.35	20.13
0.423	40.99	47.39	6.40
0.435	29.69	47.16	17.47
0.445	41.06	46.97	5.91
0.815	27.65	46.00	18.35
9.68	26.18	50.00	23.82
26.39	26.49	50.00	23.51
27.51	28.00	50.00	22.00

* 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

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

$$\text{dB}(\mu\text{V}) = \text{dBm} + 107$$

Example: @ 215.97 MHz

$$\text{Limit} = 43.50 \text{ dB}(\mu\text{V}/\text{m})$$

$$\text{Reading} = 57.47 \text{ dB}(\mu\text{V})$$

$$\text{Antenna Factor} + (\text{Cable Loss} - \text{Amp Gain}) = 12.08 + (-29.76) = -17.68 \text{ dB}(\mu\text{V}/\text{m})$$

$$\text{Total} = 57.47 + (-17.68) = 39.79 \text{ dB}(\mu\text{V}/\text{m})$$

$$\text{Margin} = 43.50 - 39.79 = 3.71 \text{ dB}$$

$$= 3.71 \text{ dB below Limit}$$

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	ESCI7	ROHDE & SCHWARZ	100851	17.08.31	18.08.31
<input checked="" type="checkbox"/>	EMI Test Receiver	ESCS30	ROHDE & SCHWARZ	100087	17.03.13	18.03.13
<input checked="" type="checkbox"/>	Spectrum Analyzer	FSW43	ROHDE & SCHWARZ	103794	17.09.05	18.09.05
<input checked="" type="checkbox"/>	PSA Series Spectrum Analyzer	E4440A	Agilent	US40420382	17.09.01	18.09.01
<input checked="" type="checkbox"/>	EMI Test Receiver	ESPI3	R&S	100478	17.08.31	18.08.31
<input checked="" type="checkbox"/>	Two-Line V-Network	ENV216	R&S	101715	17.03.14	18.03.14
<input checked="" type="checkbox"/>	Two-Line V-Network	ENV216	R&S	102055	17.03.13	18.03.13
<input checked="" type="checkbox"/>	Attenuator	BW-S10-2W263+	Mini-Circuits	NONE	17.03.15	18.03.15
<input checked="" type="checkbox"/>	Bi-Log Antenna (FCC)	VULB9163	Schwarzbeck	01069	17.02.17	19.02.17
<input checked="" type="checkbox"/>	Loop Antenna	6502	EMCO	00033743	16.09.05	18.09.05
<input checked="" type="checkbox"/>	Horn Antenna (FCC)	BBHA 9120D	Schwarzbeck	277	16.10.12	18.10.12
<input checked="" type="checkbox"/>	Horn Antenna	BBHA 9170	Schwarzbeck	766	17.07.28	19.07.28
<input checked="" type="checkbox"/>	Amplifier	TK-PA18	TESTEK	120020	17.09.01	18.09.01
<input checked="" type="checkbox"/>	Amplifier	TK-PA18H	TESTEK	170010-L	17.06.07	18.06.07
<input checked="" type="checkbox"/>	Amplifier	310N	SONOMA INSTRUMENT	284750	17.08.31	18.08.31
<input checked="" type="checkbox"/>	Amplifier	JS44-18004000-45-8P	MITEQ Inc.	1568695	17.09.05	18.09.05
<input checked="" type="checkbox"/>	Highpass Filter	WHKX3.0 /18G-6SS	Wainwright Instrument	15	17.03.14	18.03.14
<input checked="" type="checkbox"/>	Highpass Filter	WHNX6-4740-6000 -26500-40CC	WAINWRIGHT INSTRUMENT GmbH	1	17.09.04	18.09.04
<input checked="" type="checkbox"/>	Band Reject Filter	WRCGV 2402/2480-2382/2500-52/10SS	Wainwright Instrument	2R	17.08.31	18.08.31
<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
<input checked="" type="checkbox"/>	Turn-Table	DS1200-S	Innco Systems GmbH	2740311	N/A	N/A
<input checked="" type="checkbox"/>	Controller	HD 2000	HD GmbH	C/125	N/A	N/A
<input checked="" type="checkbox"/>	Antenna Master	MA4000	AUDIX	N/A	N/A	N/A