

Electromagnetic Emission

FCC MEASUREMENT REPORT

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT : HDuDTA
MODEL/Serial No. : DMS2344UHDW / ENY444W07169
MULTIPLE MODEL : WX10HD
FCC ID : PFNDMS2344UHDW
APPLICANT : Digital Multimedia Technology Co., Ltd.
2nd Fl., 926 Gwanyang-Dong, Dongan-Gu, Anyang-Si,
Gyeonggi-Do, 431-060 Korea
Attn.: Kee-Chul Lee / General Manager
MANUFACTURER : 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,
People's Republic of China
FCC CLASSIFICATION : 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 : -2.30 dBi max
RF POWER : 0.187 mW
RULE PART(S) : FCC Part 15 Subpart C
FCC PROCEDURE : ANSI C63.4-2009
TEST REPORT No. : ETLE141125.1690
DATES OF TEST : November 27, 2014 to November 28, 2014
REPORT ISSUE DATE : December 11, 2014
TEST LABORATORY : ETL Inc. (FCC Designation Number : KR0022)

The HDuDTA, Model DMS2344UHDW has been tested in accordance with the measurement procedures specified in ANSI C63.4-2009 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:

Jeong Hwan, Pyo (Test Engineer)

December 11, 2014

Reviewed by:

Kug Kyoung, Yoon (Chief Engineer)

December 11, 2014

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).

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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	: 2nd Fl., 926 Gwanyang-Dong, Dongan-Gu, Anyang-Si, Gyeonggi-Do, 431-060 Korea
Attention	: Kee-Chul Lee / General Manager

- **EUT Type** : HDuDTA
- **Model Number** : DMS2344UHDW
- **S/N** : ENY444W07169
- **Modulation Technique** : DSSS
- **Frequency Channel** : Zigbee: 2 425 MHz, 2 450 MHz, 2475 MHz (3 Ch)
- **Antenna Type** : Internal Antenna (Integral)
- **Antenna Gain** : -2.30 dBi max
- **RF Power** : 0.187 mW
- **Environmental of Tests** : Temperature: (16.8 ± 4.6) °C
Humidity: (53 ± 14) % R.H.
Atmospheric Pressure: (102.1 ± 0.3) kPa
- **FCC Rule Part(s)** : FCC Part 15 Subpart C
- **Test Procedure** : ANSI C63.4-2009
- **FCC Classification** : 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

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 C63.4-2009 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 C63.4-2009 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 C63.4-2009) was used in determining radiated and conducted emissions from the Digital Multimedia Technology Co., Ltd. Model: DMS2344UHDW

2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the HDuDTA (model: DMS2344UHDW).

The model DMS2344UHDW is basic model that was tested.

The multi model WX10HD is identical to basic model, except for model designation.

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: X-tal → 54 MHz

3. DESCRIPTION OF TESTS

The tests documented in this report were performed in accordance with ANSI C63.4-2009 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 C63.4-2009 "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 C63.4-2009 "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.

4. TEST CONDITION

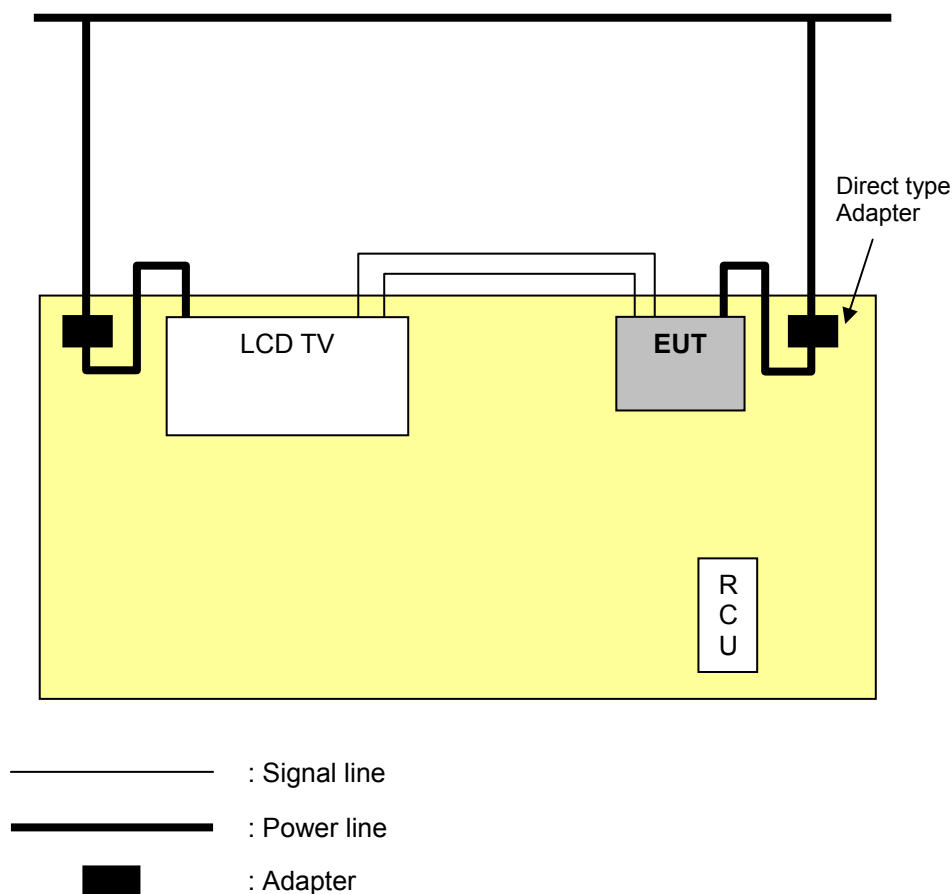
4.1 Test Configuration

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

HDuDTA that has the control software.

4.3 The setup drawing(s)



5. TEST RESULTS

5.1 Summary of Test Results

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

47 CFR Part 15, Subpart C	Measurement Required	Result
15.209(a)	Spurious Emissions	Pass

The data collected shows that the **Digital Multimedia Technology Co., Ltd. / HDuDTA / DMS2344UHDW** complied with technical requirements of above rules part 15.209 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	HDuDTA / DMS2344UHDW
Limit apply to	FCC Part 15.209
Test Date	November 27, 2014 to November 28, 2014
Environmental of Test	(16.8 ± 4.6) °C, (53 ± 14) % R.H., (102.1 ± 0.3) kPa
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 30 MHz

Test Date	November 27, 2014
Environmental of Test	(13.7 ± 0.2) °C, (65 ± 1) % R.H., (102.1 ± 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)

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
	Emission attenuated more than 20 dB below the limit are not reported.						

Result: All emissions below noise floor of 20 dB(μV/m).

NOTES:

- * H : Horizontal polarization , ** V : Vertical polarization
- Result = Reading + Antenna factor + Cable loss
- Margin = Limit - Result
- The measurement was performed for the frequency range 9 kHz to 30 MHz according to FCC Part 15.209.

- Below 1 GHz (30 MHz to 1 GHz)

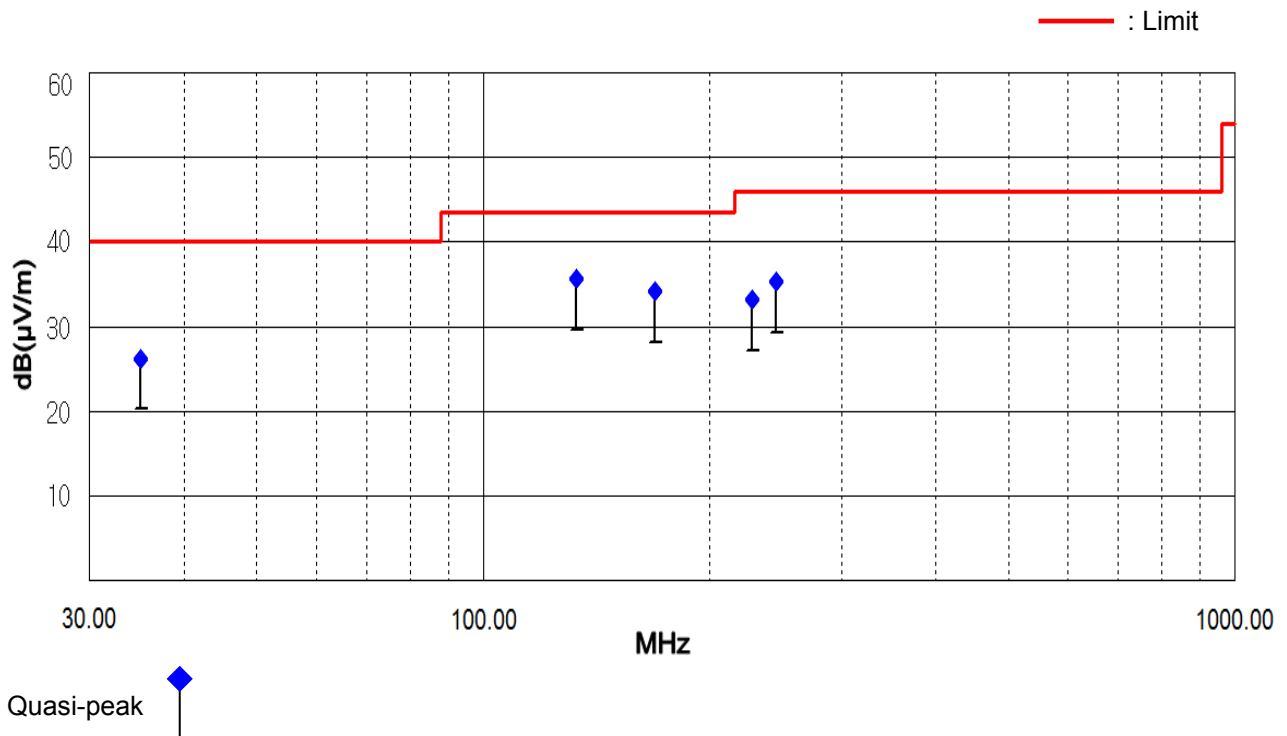
Test Date	November 27, 2014
Environmental of Test	(12.4 ± 0.2) °C, (62 ± 2) % R.H., (102.1 ± 0.1) kPa

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.
Detector mode: CISPR Quasi-Peak mode (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]
35.00	14.20	V	11.03	0.97	100	26.20	40.00	13.80
132.90	22.22	V	11.85	1.53	106	35.60	43.50	7.90
169.50	20.57	V	11.84	1.69	110	34.10	43.50	9.40
228.40	20.96	H	10.42	1.82	364	33.20	46.00	12.80
245.50	22.28	H	11.14	1.88	320	35.30	46.00	10.70

NOTES:

- * H : Horizontal polarization , ** V : Vertical polarization
- Result = Reading + Antenna factor + Cable loss
- Margin value = Limit - Result
- The measurement was performed for the frequency range above 30 MHz according to FCC Part 15.209.



- Above 1 GHz (1 GHz to 25 GHz)

Test Date	November 27, 2014
Environmental of Test	(21.2 ± 0.1) °C, (60 ± 1) % R.H., (102.3 ± 0.1) kPa

1. Low CH (2 425 MHz)

Frequency [MHz]	Reading [dB(μV)]		Polarity (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB(μV/m)]		Limit [dB(μV/m)]		Margin [dB]	
	Peak	Average				Peak	Average	Peak	Average	Peak	Average
4 850.00	60.09	50.79	V	31.96	-34.65	57.40	48.10	73.97	53.97	16.57	5.87

2. Middle CH (2 450 MHz)

Frequency [MHz]	Reading [dB(μV)]		Polarity (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB(μV/m)]		Limit [dB(μV/m)]		Margin [dB]	
	Peak	Average				Peak	Average	Peak	Average	Peak	Average
4 900.00	60.62	51.72	V	32.14	-34.66	58.10	49.20	73.97	53.97	15.87	4.77

3. High CH (2 475 MHz)

Frequency [MHz]	Reading [dB(μV)]		Polarity (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB(μV/m)]		Limit [dB(μV/m)]		Margin [dB]	
	Peak	Average				Peak	Average	Peak	Average	Peak	Average
4 950.00	61.95	51.15	V	32.32	-34.67	59.60	48.80	73.97	53.97	14.37	5.17

Result: No signal detect above second harmonic.

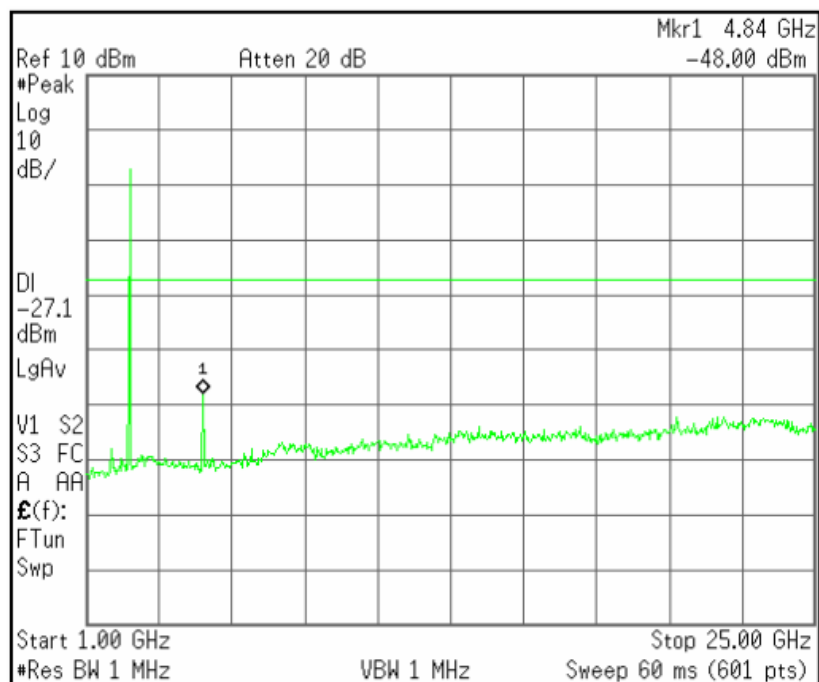
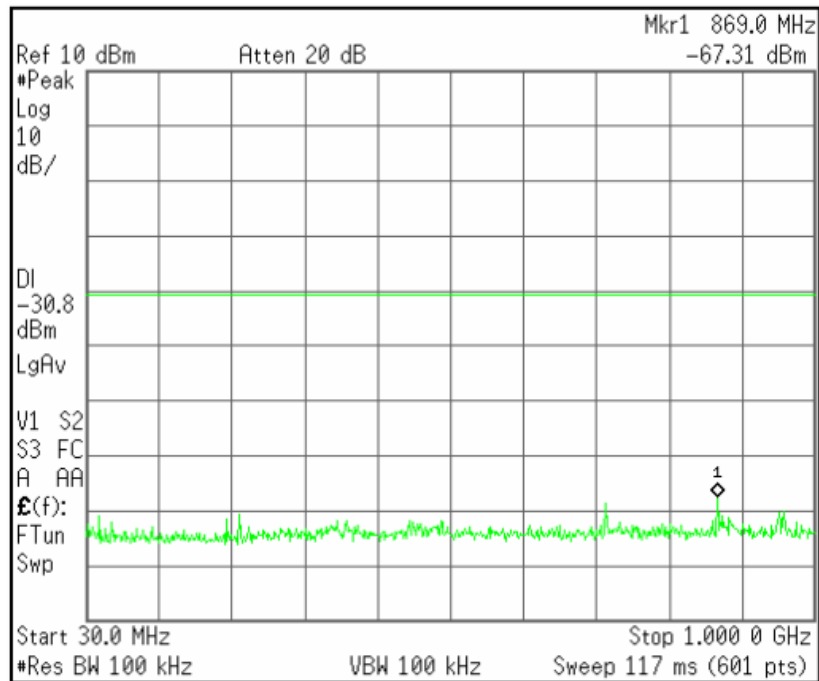
NOTES:

- * H : Horizontal polarization , ** V : Vertical polarization
- Factor = Antenna factor + Cable loss + Preamp
- Result = Reading + Factor
- Margin = Limit - Result
- Measuring frequencies from 1GHz 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 Hz, Sweep = Auto

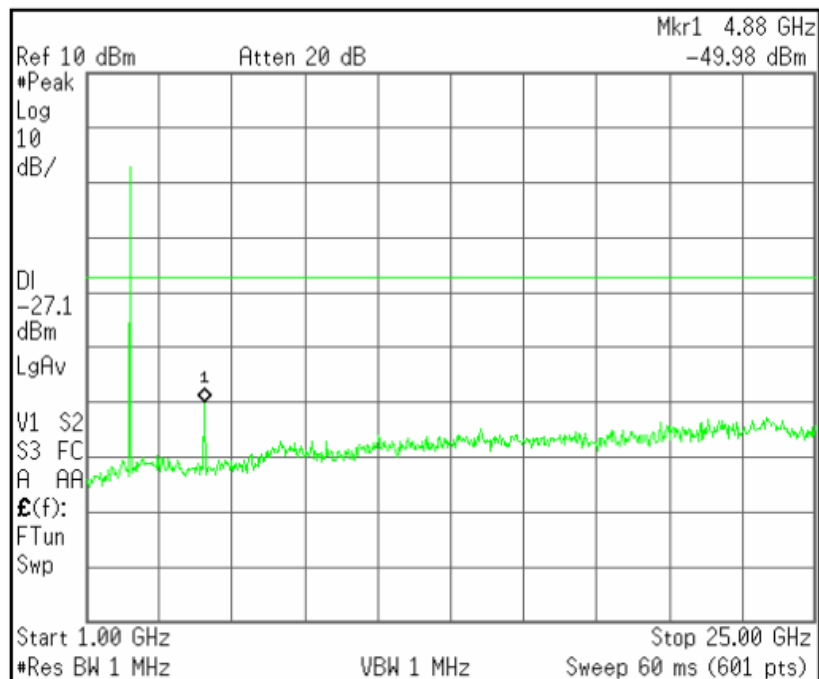
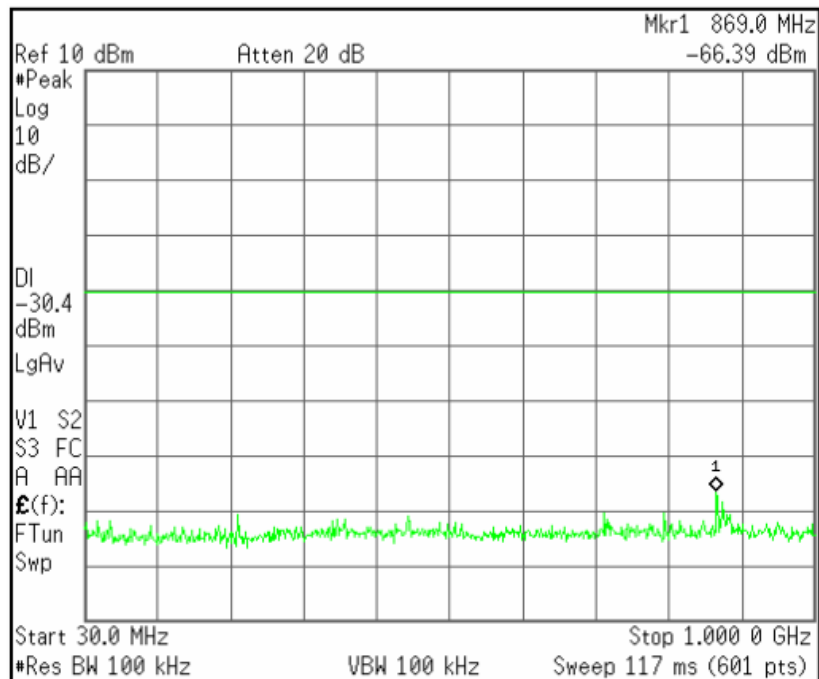
Plots of Spurious Emissions (Conducted Measurement)

Test Date	November 28, 2014
Environmental of Test	(20.9 ± 0.2) °C, (40 ± 1) % R.H., (101.8 ± 0.0) kPa

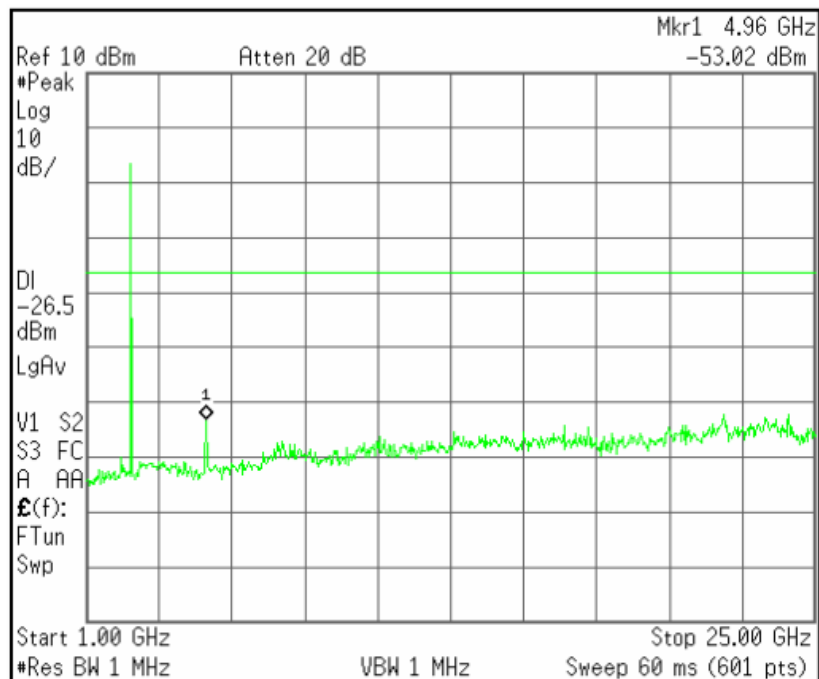
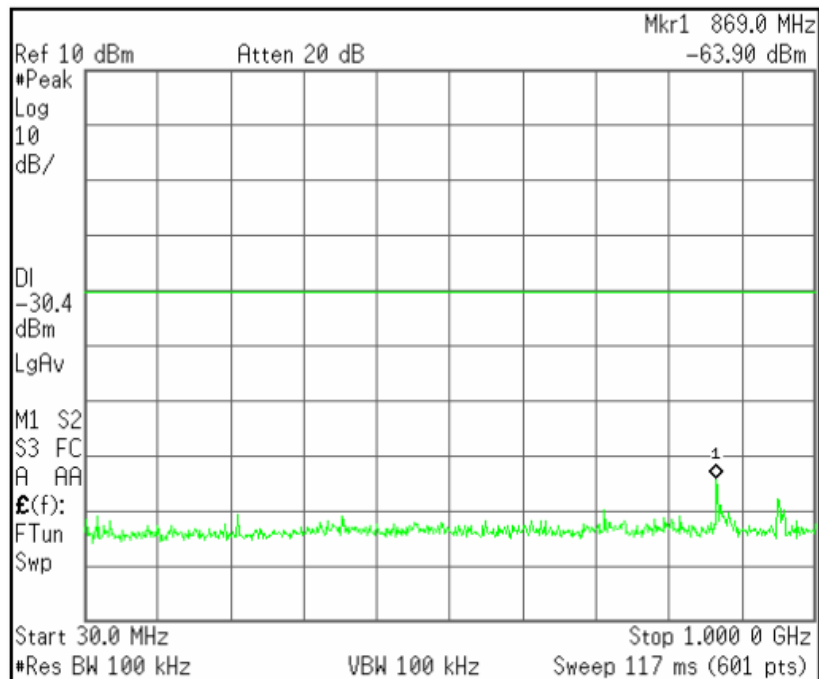
[CH Low]



[CH Mid]



[CH High]



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:

$$FS = RA + AF + CF - PA$$

Where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

PA* = Preamplifier Factor

* PA is only be used for the measuring frequency above 1 GHz.

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

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

Example : @ 4 901.15 MHz

$$\text{Class B Limit} = 53.97 \text{ dB}(\mu V/m) \text{ (Average)}$$

$$\text{Reading} = 51.72 \text{ dB}(\mu V)$$

$$\text{Antenna Factor} + (\text{Cable loss} + \text{Amp. Gain}) = 32.14 + (-34.66) = -2.52 \text{ dB}(\mu V/m)$$

$$\text{Total} = 49.20 \text{ dB}(\mu V/m)$$

$$\text{Margin} = 53.97 - 49.20 = 4.77 \text{ dB}$$

$$= 4.77 \text{ dB below Limit}$$

7. List of test equipments used for measurements

	Test Equipment	Model	Mfg.	Serial No.	Cal. Date	Cal. Due Date
☒	EMI Test Receiver	ESVS 10	R&S	835165/001	14.03.18	15.03.18
☒	EMI Test Receiver	ESCI7	R&S	100851	14.09.03	15.09.03
☒	Loop Antenna	AL-130	COM-POWER	121025	14.04.08	16.04.08
☒	LogBicon Antenna	VULB9160	Schwarzbeck	3082	13.07.25	15.07.25
☒	Horn Antenna	BBHA 9120D	Schwarzbeck	826	14.04.02	16.04.02
☒	PSA Series Spectrum Analyzer	E4440A	Agilent	US40420382	14.09.13	15.09.13
☒	Amplifier	TK-PA18	TESTEK	120020	14.09.04	15.09.04
☒	AC Power Source	6405-12230-3	Extech Electronics	1390168	N/A	N/A
☒	Band Reject Filter	WRCGV 2402/2480-2382/2500-52/10SS	Wainwright Instrument	2	14.09.03	15.09.03
☒	Highpass Filter	WHKX3.0 /18G-6SS	Wainwright Instrument	15	14.03.18	15.03.18
☒	Turn-Table	DS1200-S	Innco Systems GmbH	2740311	N/A	N/A
☒	Turn-Table	TT 1.35 SI	SES	-	N/A	N/A
☒	Antenna Master	AM 4.5	SES	-	N/A	N/A