

Ultimems, Inc.

TEST REPORT

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EMC TEST REPORT

Applicant:	Ultimems, Inc. 11F., No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan.
Product:	Anybeam Laser Scanning Pico Projector
Model No.:	HD301M1-H2, HD301M1-H2-BLA, HD301M1-H2-DBR, HD301M1-H2-LBR, HD301M1-H2-GRA, HD301M1-H2-W, HD301M1-H2-R, HD301M1-H2-Y, HD301M1-H2-GRE, HD301M1-H2-BL
Brand Name:	Anybeam
Test Method/ Standard:	47 CFR FCC Part 15 Subpart B (2016) FCC Procedure ANSI C63.4 (2014)
Test By:	Intertek Testing Services Taiwan Ltd., Hsinchu Laboratory No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li, Shiang-Shan District, Hsinchu City, Taiwan



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Revision History

Report No.	Issue Date	Revision Summary
180300419TWN-001	May 25, 2018	Original report

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1. General Information

1.1 Identification of the EUT

Product:	Anybeam Laser Scanning Pico Projector
Model No.:	HD301M1-H2
Brand Name:	Anybeam
Rated Power:	DC 5 V
Power Cord:	N/A
Sample receiving date:	May 11, 2018
Sample condition:	Workable
Testing date:	May 23, 2018

1.2 Additional information about the EUT

The customer confirmed the models listed as below were series model to model HD301M1-H2 (EUT), the difference between main model and series model are listed as below.

Trade Name	Model Number	Different
Anybeam	HD301M1-H2-BLA	Changes in appearance color and printing
	HD301M1-H2-DBR	
	HD301M1-H2-LBR	
	HD301M1-H2-GRA	
	HD301M1-H2-W	
	HD301M1-H2-R	
	HD301M1-H2-Y	
	HD301M1-H2-GRE	
	HD301M1-H2-BL	

For more detail features, please refer to user's Manual.

2. Test Summary

Emission			
Standard	Test Type	Result	Remarks
FCC Subpart B Section 15.107	Conducted Emission Test	PASS	Meet Class B Limit
FCC Subpart B Section 15.109	Radiated Emission Test	PASS	Meet Class B Limit

3. Test Specifications

3.1 Standards

The following standards were applied for testing:

FCC standard: 47 CFR Part 15, Subpart B. Clause 15.107 and 15.109.

ANSI C63.4-2014 : American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

3.2 Test Facility accreditation

Intertek Testing Services Taiwan Ltd., Hsinchu Laboratory is accredited in respect of laboratory and the accreditation criterion is ISO/IEC 17025: 2005.

Certification	Bureau	Code	Accreditation Criteria
Accreditation Certificate	TAF	0597	ISO/IEC 17025
	BSMI	SL2-IS-E-0024 SL2-IN-E-0024 SL2-A1-E-0024 SL2-R2-E-0024 SL2-R1-E-0024 SL2-L1-E-0024	ISO/IEC 17025
Site Filling Code :	FCC	93910	Test facility list & NSA Data
	IC	2042D-1, 2042D-2	Test facility list & NSA Data
	VCCI	R-1534 C-1618 T-1586 G-49	Test facility list & NSA Data

Note: Each certificate is within the valid calibration period.

3.3 Classification of ITE

Class A digital device. A digital device that is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.

Class B digital device. A digital device that is marketed for use in a residential environment notwithstanding use in commercial, business and industrial environments. Examples of such devices include, but are not limited to, personal computers, calculators, and similar electronic devices that are marketed for use by the general public.

3.4 Mode of operation during the test

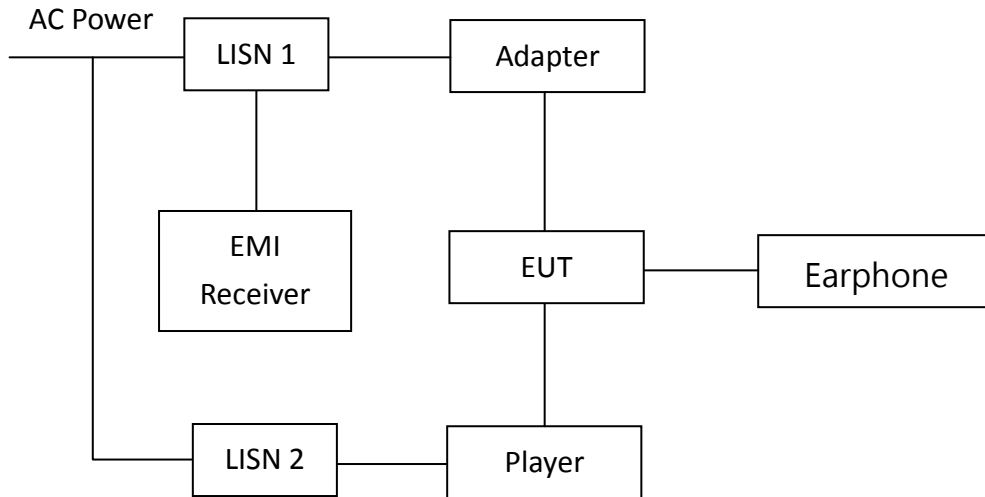
The EUT was powered from USB adaptor, and continue display test signal from DVD player.

3.5 Peripherals equipment

Peripherals	Brand	Model No.	Serial No.	Description of Data Cable
Earphone	HTC	INNOVATION	N/A	N/A
USB power adaptor	apple	A1357	N/A	USB to micro USB shielded cable 1 meter
BD player	Sony	BDP-S380	N/A	HDMI shielded cable 1.5 meter

4. Conducted Emission Test

4.1 Test Procedure



The EUT along with its peripherals were placed on a 1.0 meter(W)×1.5meter(L) and 0.8 meter in height wooden table and the EUT was adjusted to maintain a 0.4meter space from a vertical reference plane. The EUT was connected to power mains through a Artificial Mains Network (LISN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.

The excess power cable between the EUT and the AMN was bundled. All connecting cables of EUT and peripherals were moved to find the maximum emission

4.2 Test Equipment

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Receiver	R&S	ESCI	100059	2017/11/13	2018/11/12
Two-Line V-Network	R&S	ENV216	101159	2017/06/03	2018/06/02
Artificial Mains Network (LISN)	SCHAFFNER	MN2050D	1586	2017/05/31	2018/05/30
CON-1 Shielded Room	N/A	N/A	N/A	NCR	NCR
CON-1 Cable	SUHNER	SUCOFLEX-104	26438414	2018/05/03	2019/05/02
Test software	Audix	e3	4.20040112L	NCR	NCR

Note: No Calibration Required (NCR).

4.3 Conducted Emission Limit

Frequency (MHz)	Maximum RF Line Voltage	
	Class B Equipment (dB μ V)	
	Q.P.	Avg.
0.15~0.50	66~56	56~46
0.50~5.00	56	46
5.00~30.0	60	50

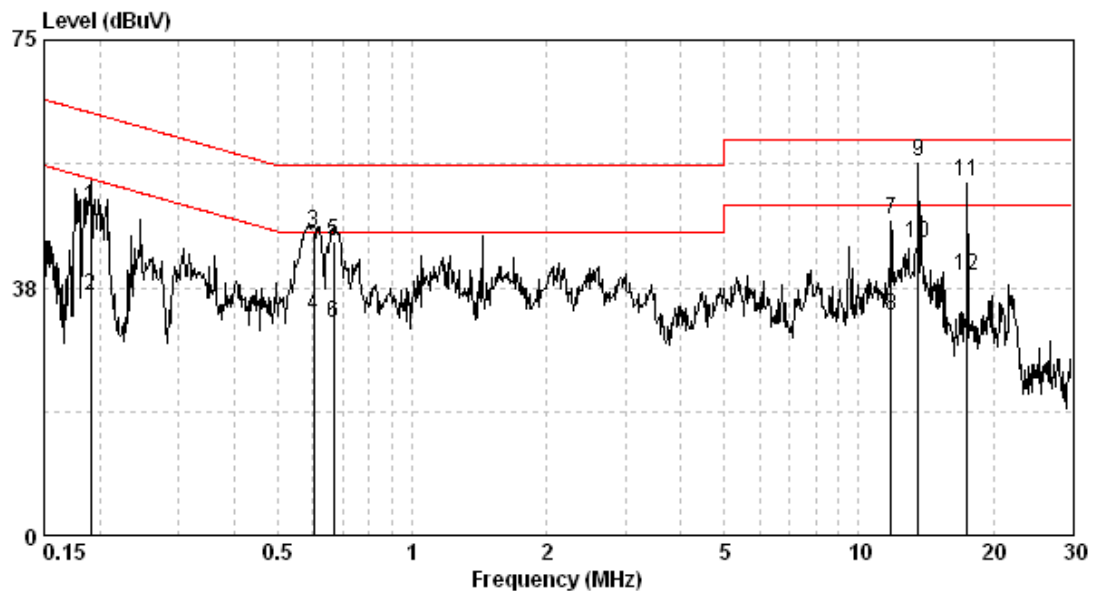
4.4 Conducted Emission Data

Phase:	Live Line			
Temperature:	26	°C	Model No.:	HD301M1-H2
Relative Humidity:	65	%	Test Date:	May 23, 2018
Atmospheric Pressure:	1003	hPa	Remark:	N/A

Frequency (MHz)	Corr. Factor (dB)	Reading QP (dBuV)	Level QP (dBuV)	Limit QP (dBuV)	Reading AV (dBuV)	Level AV (dBuV)	Limit AV (dBuV)	Margin QP (dB)	Margin AV (dB)
0.190	9.34	40.35	49.69	64.02	27.03	36.37	54.02	-14.33	-17.65
0.601	9.38	36.46	45.84	56.00	23.99	33.38	46.00	-10.16	-12.62
0.668	9.39	35.21	44.60	56.00	22.69	32.08	46.00	-11.40	-13.92
11.786	9.55	38.29	47.83	60.00	23.65	33.19	50.00	-12.17	-16.81
13.563	9.54	47.08	56.62	60.00	34.64	44.18	50.00	-3.38	-5.82
17.485	9.53	43.93	53.46	60.00	29.83	39.36	50.00	-6.54	-10.64

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBuV) = Corr. Factor (dB) + Reading (dBuV)
3. Margin (dB) = Level (dBuV) – Limit (dBuV)



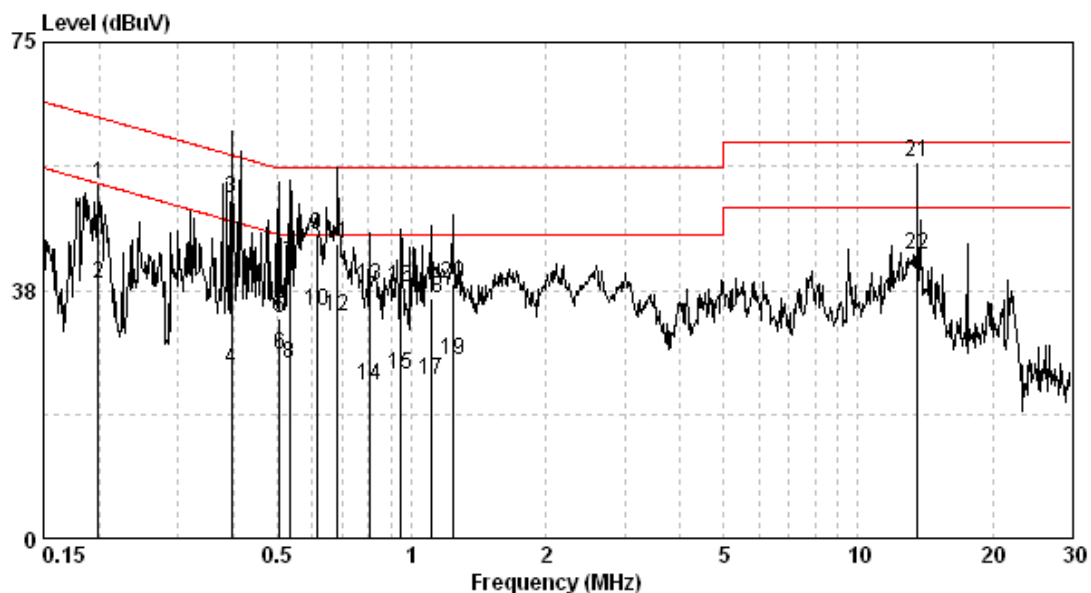
TEST REPORT

Phase:	Neutral Line			
Temperature:	26	°C	Model No.:	HD301M1-H2
Relative Humidity:	65	%	Test Date:	May 23, 2018
Atmospheric Pressure:	1003	hPa	Remark:	N/A

Frequency (MHz)	Corr. Factor (dB)	Reading QP (dBuV)	Level QP (dBuV)	Limit QP (dBuV)	Reading AV (dBuV)	Level AV (dBuV)	Limit AV (dBuV)	Margin QP (dB)	Margin AV (dB)
0.199	9.60	44.02	53.62	63.67	28.91	38.51	53.67	-10.05	-15.16
0.396	9.61	41.73	51.35	57.95	15.92	25.54	47.95	-6.60	-22.41
0.507	9.62	23.73	33.35	56.00	18.07	27.69	46.00	-22.65	-18.31
0.532	9.62	31.73	41.35	56.00	16.83	26.46	46.00	-14.65	-19.54
0.614	9.63	36.19	45.82	56.00	24.60	34.24	46.00	-10.18	-11.76
0.683	9.63	34.94	44.57	56.00	23.76	33.39	46.00	-11.43	-12.61
0.804	9.64	28.44	38.09	56.00	13.35	22.99	46.00	-17.91	-23.01
0.948	9.65	28.37	38.01	56.00	15.01	24.66	46.00	-17.99	-21.34
1.106	9.66	26.68	36.34	56.00	14.28	23.94	46.00	-19.66	-22.06
1.236	9.67	28.75	38.42	56.00	17.20	26.87	46.00	-17.58	-19.13
13.560	9.84	46.99	56.83	60.00	33.05	42.89	50.00	-3.17	-7.11

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBuV) = Corr. Factor (dB) + Reading (dBuV)
3. Margin (dB) = Level (dBuV) – Limit (dBuV)

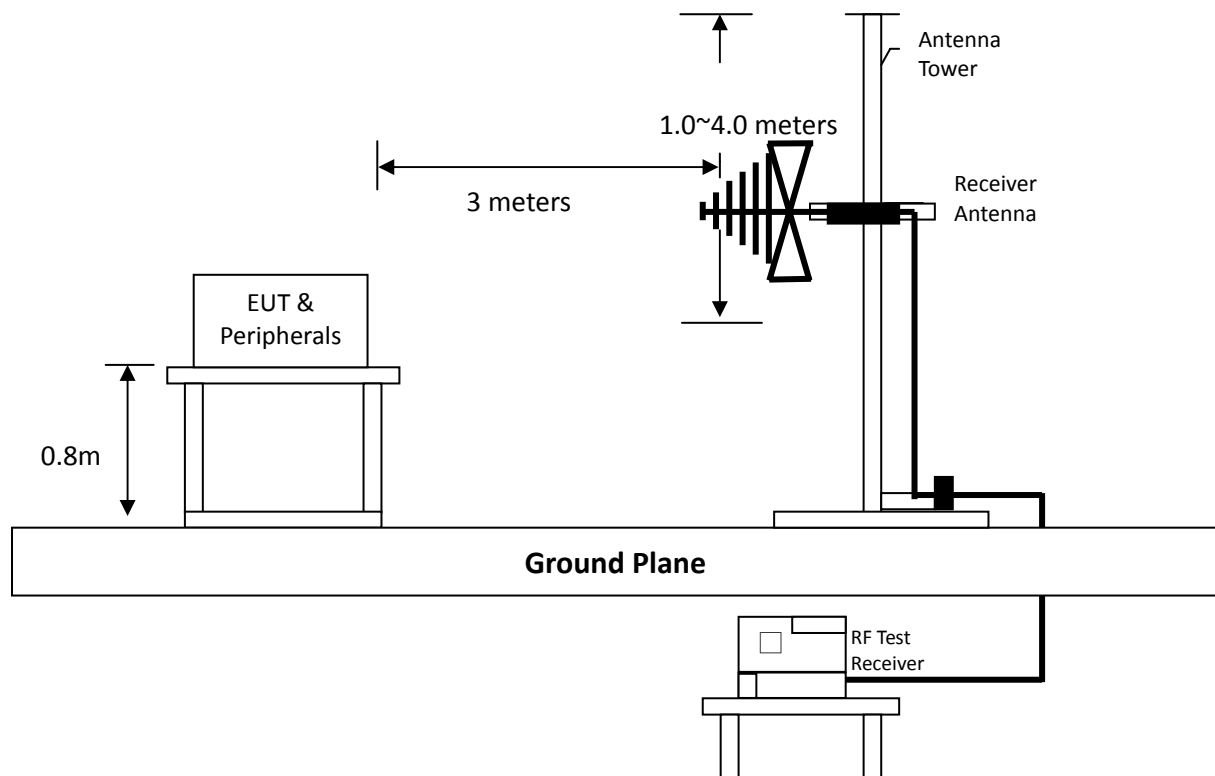


5. Radiated Emission Test

5.1.1 Test Procedure from 30 MHz to 1000 MHz

The figure below shows the test setup, which is utilized to make these measurements.

Side View



Radiated testing was performed at a 3 meters semi-anechoic chamber. The equipment under test were placed on a turntable top 0.8 meter above ground. The table was 360 degrees to determine the position of the highest radiation. EUT is set 3 meters from the EMI receiving antenna, which is mounted on a variable height mast. The antenna height is varied between one meter and four meters above ground to find the maximum value of the field strength. Both horizontal polarization and vertical polarization of the antenna was set to conduct the measurement.

The bandwidth was set on the EMI meter 120 kHz.

The levels are quasi peak value readings. The frequency spectrum from 30 MHz to 1000 MHz was investigated.

5.1.2 Test Equipment

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Receiver	R&S	ESU40	100381	2017/05/31	2018/05/30
Bi-log Hybrid Antenna	ETC	MCTD2786	BL13S03017	2018/05/09	2019/05/08
966-1(A) Cable	SUHNER	SMA / SUCOFLEX 104	29510614	2018/04/17	2019/04/16
966-1(B) Cable	JUNFLON	SMA / J12J100880-00	AUG-26-08-001	2018/04/17	2019/04/16
966-1_3m Semi-Anechoic Chamber	966_1	CEM-966_1	N/A	2018/03/05	2019/03/04
Test software	Audix	e3	4.20040112L	NCR	NCR

Note: No Calibration Required (NCR).

5.1.3 Radiated Emission Limit

According to FCC 15.109, except for Class A digital device, the field strength of radiated emission from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Class B Radiated Emission Limits:

Frequency MHz	Field Strength dBμV/m
30-88	40.0
88-216	43.5
216-960	46.0
Above 960	54.0

TEST REPORT

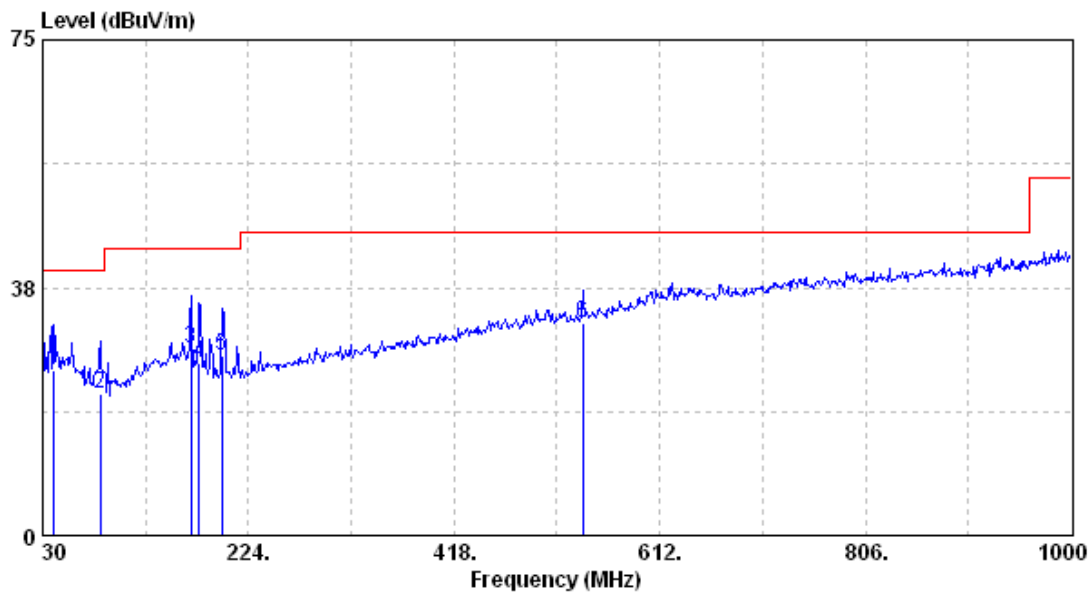
5.1.4 Radiated Emission Test Data from 30 MHz to 1000 MHz

Polarity:	Vertical			
Temperature:	26	°C	Model No.:	HD301M1-H2
Relative Humidity:	65	%	Test Date:	May 23, 2018
Atmospheric Pressure:	1003	hPa	Remark:	N/A

Freq	Pol/Phase	Factor	Read Level	Level	Limit Line	Over Limit	Remark
MHz		dB	dBμV	dBμV/m	dBμV/m	dB	
40.670	VERTICAL	13.77	11.14	24.91	40.00	-15.09	QP
84.320	VERTICAL	9.58	11.80	21.38	40.00	-18.62	QP
169.680	VERTICAL	14.53	13.76	28.29	43.50	-15.21	QP
177.440	VERTICAL	13.62	12.50	26.12	43.50	-17.38	QP
198.780	VERTICAL	11.94	15.28	27.22	43.50	-16.28	QP
539.250	VERTICAL	21.10	10.93	32.03	46.00	-13.97	QP

Remark:

1. Factor = Antenna Factor (dB/m) + Cable Loss (dB)
2. Level (dBμV/m) = Factor (dB) + Read Level (dBμV)
3. Over Limit (dB) = Level (dBμV/m) – Limit Line (dBμV/m)



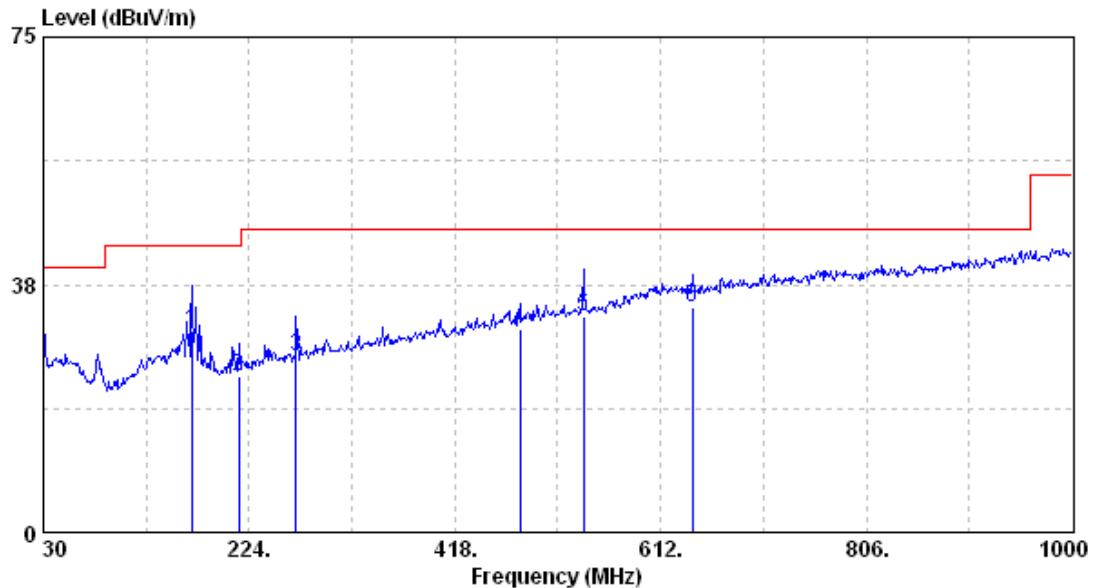
TEST REPORT

Polarity:	Horizontal			
Temperature:	26	°C	Model No.:	HD301M1-H2
Relative Humidity:	65	%	Test Date:	May 23, 2018
Atmospheric Pressure:	1003	hPa	Remark:	N/A

Freq	Pol/Phase	Factor	Read Level	Level	Limit Line	Over Limit	Remark
MHz		dB	dBμV	dBμV/m	dBμV/m	dB	
169.680	HORIZONTAL	14.53	15.84	30.37	43.50	-13.13	QP
214.300	HORIZONTAL	12.83	10.75	23.58	43.50	-19.92	QP
268.620	HORIZONTAL	14.57	12.06	26.63	46.00	-19.37	QP
479.110	HORIZONTAL	19.99	10.73	30.72	46.00	-15.28	QP
539.250	HORIZONTAL	21.10	11.64	32.74	46.00	-13.26	QP
642.070	HORIZONTAL	23.10	10.86	33.96	46.00	-12.04	QP

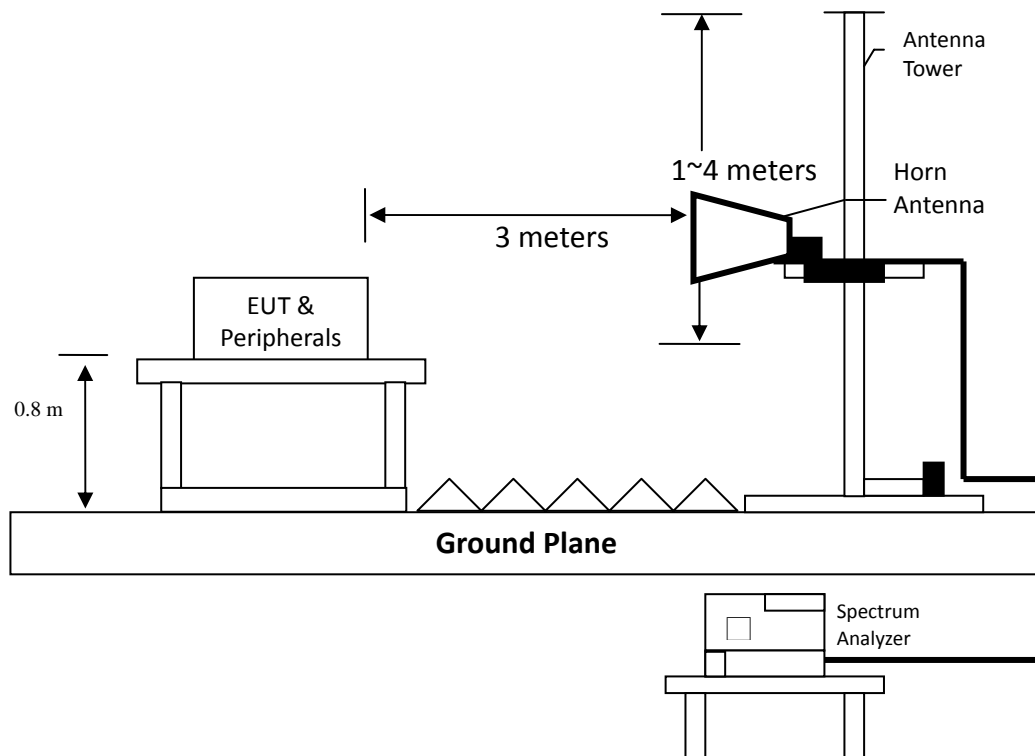
Remark:

1. Factor = Antenna Factor (dB/m) + Cable Loss (dB)
2. Level (dBμV/m) = Factor (dB) + Read Level (dBμV)
3. Over Limit (dB) = Level (dBμV/m) – Limit Line (dBμV/m)



5.2.1 Test Procedure above 1 GHz

The figure below shows the test setup, which is utilized to make these measurements.



Radiated testing was performed at a 3 meters semi-anechoic chamber. The equipment under test were placed on a turntable top 0.8 meter above ground. The table was 360 degrees to determine the position of the highest radiation. EUT is set 3 meters from the EMI receiving antenna, which is mounted on a variable height mast. The antenna height is varied between one meter and four meters above ground to find the maximum value of the field strength. Both horizontal polarization and vertical polarization of the antenna was set to conduct the measurement.

The bandwidth was set on the EMI meter 1 MHz.

The levels are peak and average value readings. The frequency spectrum above 1 GHz was investigated.

5.2.2 Test Equipment

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Receiver	R&S	ESU40	100381	2017/05/31	2018/05/30
Horn Antenna	EMCO	3115	9906-5822	2018/05/03	2019/05/02
Pre-Amplifier	AML	AML0120L3401	0419-114	2018/05/18	2019/05/17
966-1(A) Cable	SUHNER	SMA / SUCOFLEX 104	29510614	2018/04/17	2019/04/16
966-1(B) Cable	JUNFLON	SMA / J12J100880-00	AUG-26-08-00 1	2018/04/17	2019/04/16
966-1_3m Semi-Anechoic Chamber	966_1	CEM-966_1	N/A	2018/03/05	2019/03/04
Test software	Audix	e3	4.20040112L	NCR	NCR

Note: No Calibration Required (NCR).

5.2.3 Radiated Emission Limit

According to FCC 15.109, except for Class A digital device, the field strength of radiated emission from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Class B Radiated Emission Limits:

Frequency MHz	Field Strength dBμV/m (Average)	Field Strength dBμV/m (Peak)
Above 1000	54.0	74.0

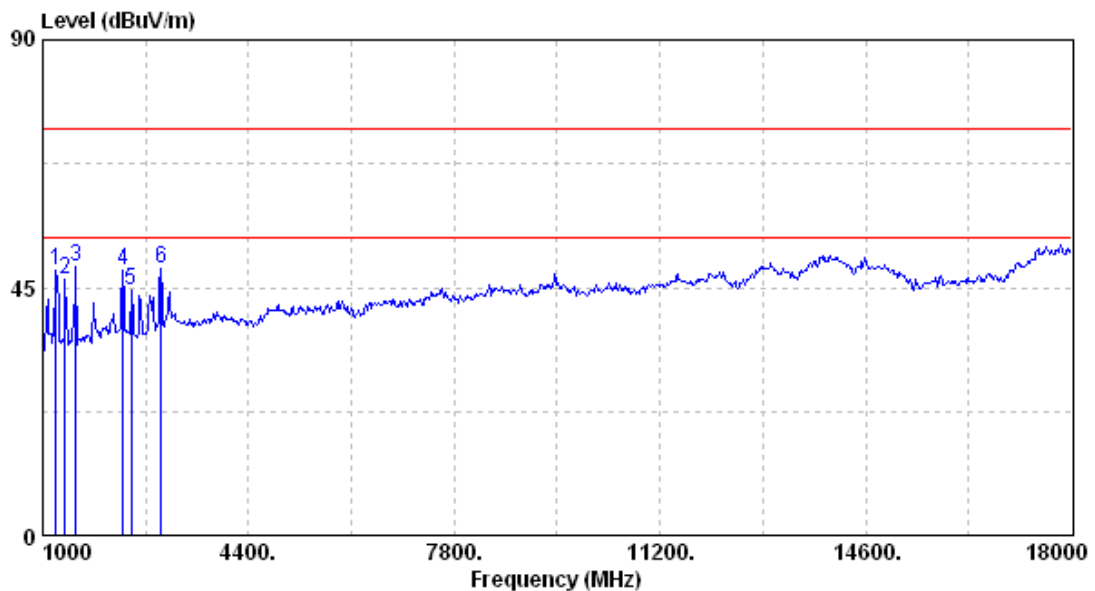
5.2.4 Radiated Emission Test Data above 1 GHz

Polarity:	Vertical			
Temperature:	26	°C	Model No.:	HD301M1-H2
Relative Humidity:	65	%	Test Date:	May 23, 2018
Atmospheric Pressure:	1003	hPa	Remark:	N/A

Freq	Pol/Phase	Factor	Read Level	Level	Limit Line	Over Limit	Remark
MHz		dB	dBμV	dBμV/m	dBμV/m	dB	
1221.000	VERTICAL	-10.61	58.58	47.97	74.00	-26.03	Peak
1374.000	VERTICAL	-9.57	56.03	46.46	74.00	-27.54	Peak
1544.000	VERTICAL	-8.45	57.15	48.70	74.00	-25.30	Peak
2326.000	VERTICAL	-5.05	53.07	48.03	74.00	-25.97	Peak
2462.000	VERTICAL	-4.89	49.32	44.42	74.00	-29.58	Peak
2955.000	VERTICAL	-3.47	52.05	48.57	74.00	-25.43	Peak

Remark:

1. Level (dBμV/m) = Factor (dB) + Read Level (dBμV)
2. Factor = Antenna Factor (dB/m) + Cable Loss (dB) – Amplifier Gain (dB)
(*The Amplifier Gain depended on measure equipment, see test equipment list.)
3. Over Limit (dB) = Level (dBμV/m) – Limit Line (dBμV/m)



TEST REPORT

Polarity:	Horizontal			
Temperature:	26	°C	Model No.:	HD301M1-H2
Relative Humidity:	65	%	Test Date:	May 23, 2018
Atmospheric Pressure:	1003	hPa	Remark:	N/A

Freq	Pol/Phase	Factor	Read Level	Level	Limit Line	Over Limit	Remark
MHz		dB	dBμV	dBμV/m	dBμV/m	dB	
1085.000	HORIZONTAL	-11.58	53.95	42.37	74.00	-31.63	Peak
1374.000	HORIZONTAL	-9.57	55.66	46.08	74.00	-27.92	Peak
1544.000	HORIZONTAL	-8.45	56.04	47.59	74.00	-26.41	Peak
2326.000	HORIZONTAL	-5.05	48.60	43.55	74.00	-30.45	Peak
2462.000	HORIZONTAL	-4.89	46.83	41.93	74.00	-32.07	Peak
2768.000	HORIZONTAL	-4.04	50.13	46.09	74.00	-27.91	Peak

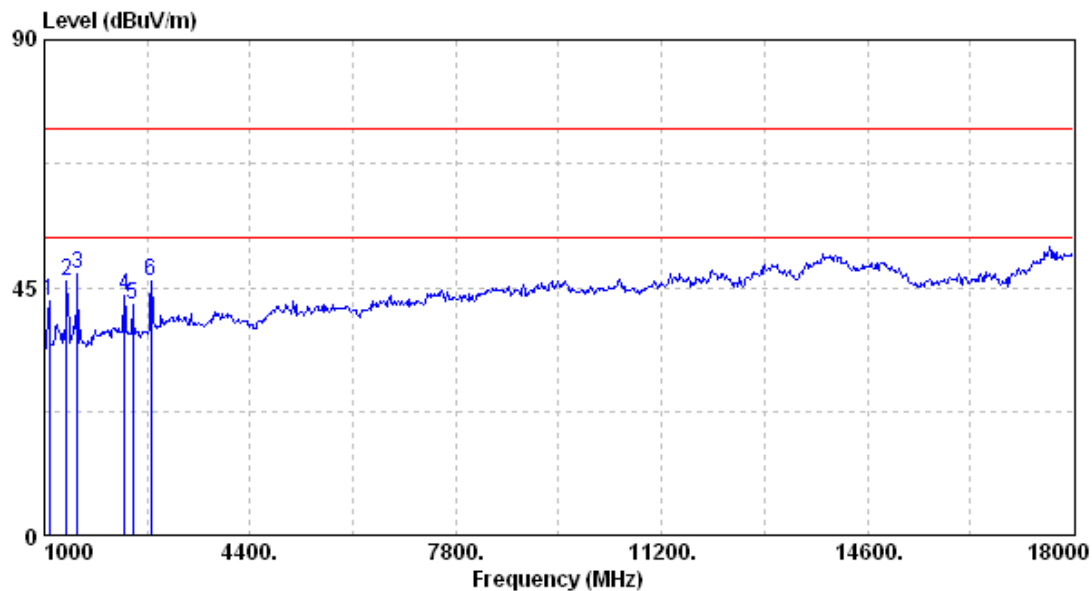
Remark:

1. Level (dBμV/m) = Factor (dB) + Read Level (dBμV)

2. Factor = Antenna Factor (dB/m) + Cable Loss (dB) – Amplifier Gain (dB)

(*The Amplifier Gain depended on measure equipment, see test equipment list.)

3. Over Limit (dB) = Level (dBμV/m) – Limit Line (dBμV/m)

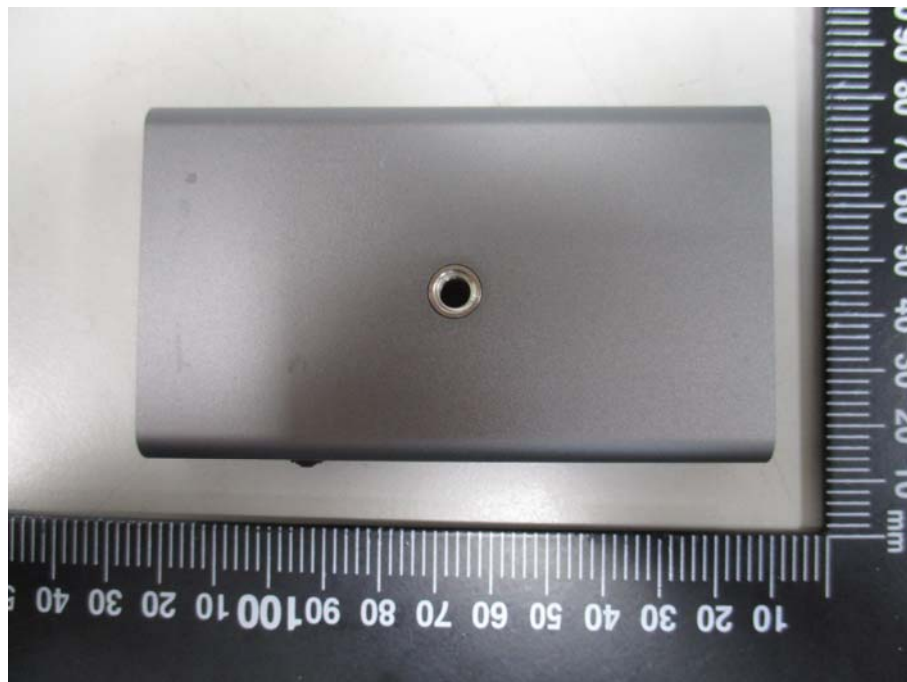


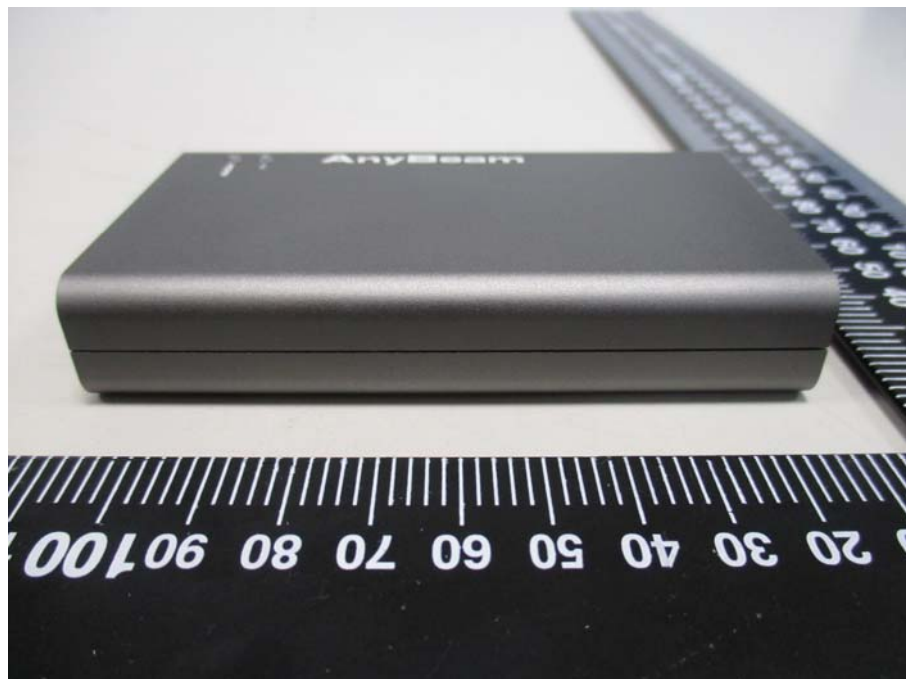
Appendix A: Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Item	Uncertainty
Conducted disturbance measurements at a mains port from 9 kHz to 30 MHz using a 50 Ω /50 μ H +5 Ω artificial mains network (AMN)	2.48 dB
Vertically polarized radiated disturbances from 30 MHz~1 GHz in an open area test site at a distance of 10 m	4.96 dB
Horizontally polarized radiated disturbances from 30 MHz~1 GHz in an open area test site at a distance of 10 m	4.95 dB
Vertically polarized radiated disturbances from 30 MHz~1 GHz in a semi-anechoic chamber at a distance of 3 m	5.14 dB
Horizontally polarized radiated disturbances from 30 MHz~1 GHz in a semi-anechoic chamber at a distance of 3 m	5.22 dB
Vertically polarized Radiated disturbances from 1 GHz~18 GHz in a semi-anechoic chamber at a distance of 3 m	3.64 dB
Horizontally polarized Radiated disturbances from 1 GHz~18 GHz in a semi-anechoic chamber at a distance of 3 m	3.64 dB

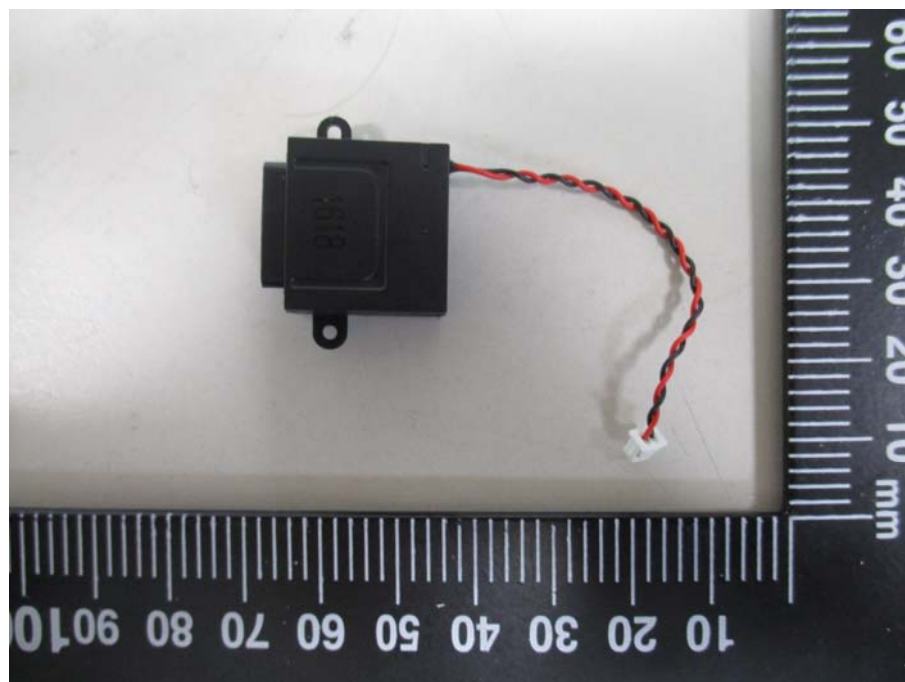
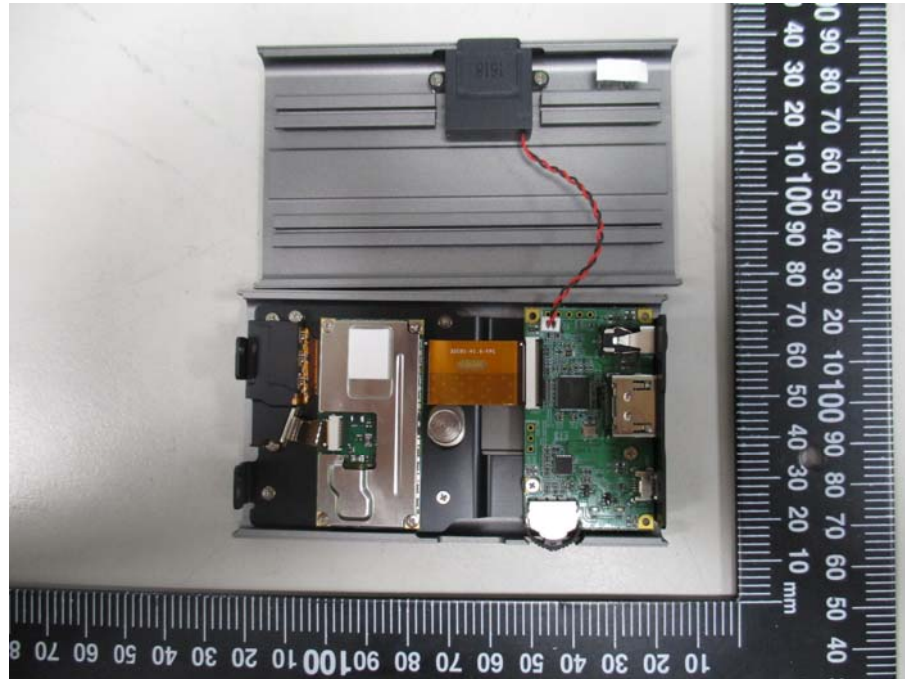
Appendix B1: External photo of EUT

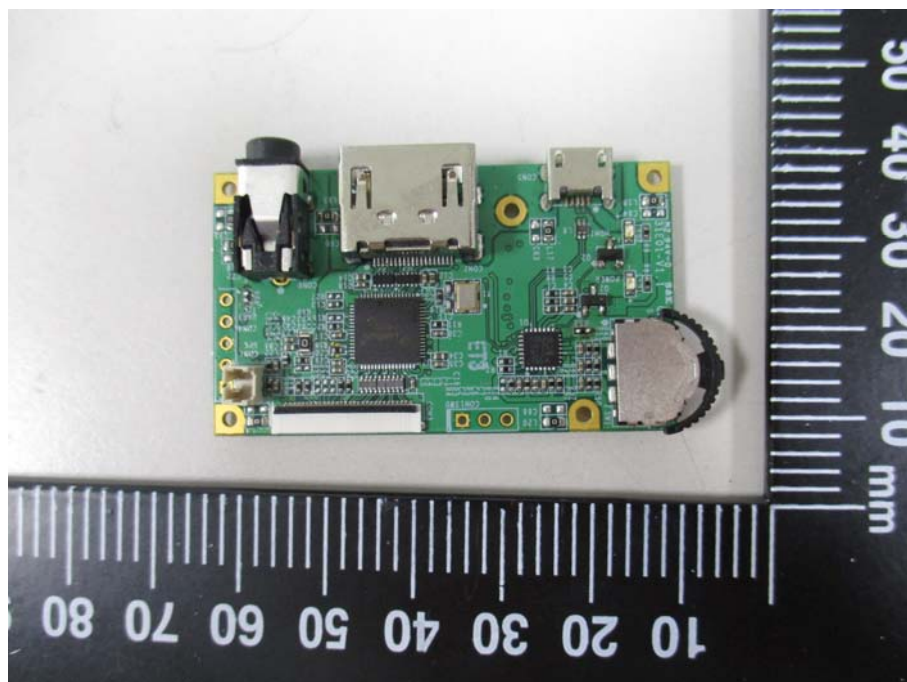
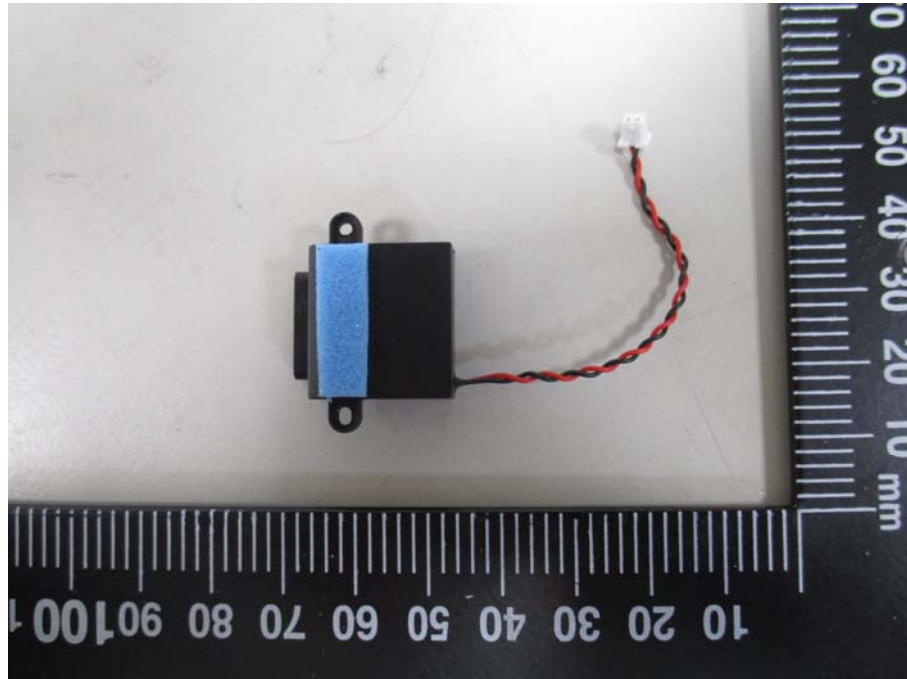


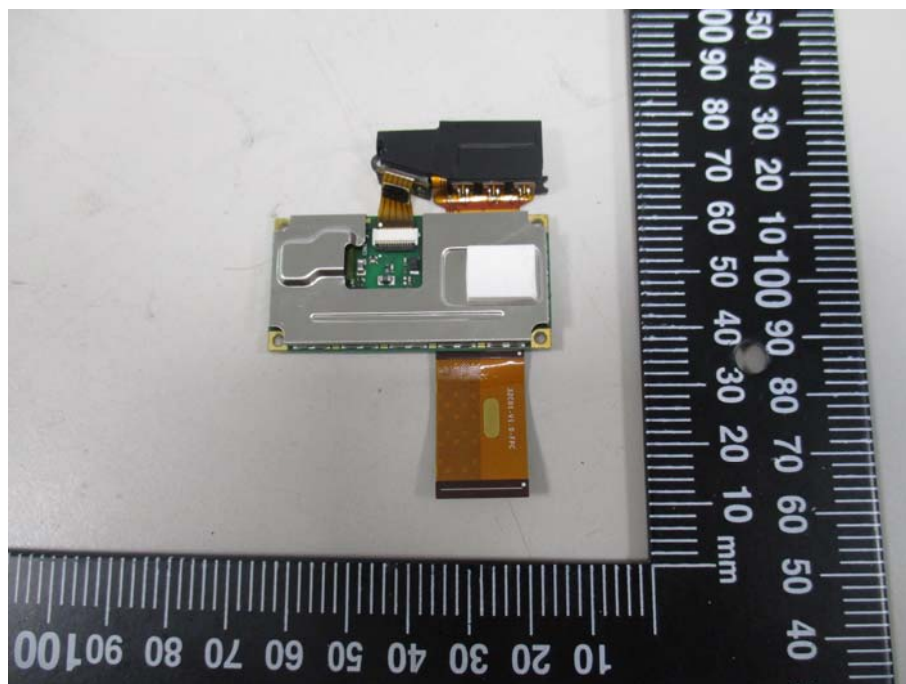
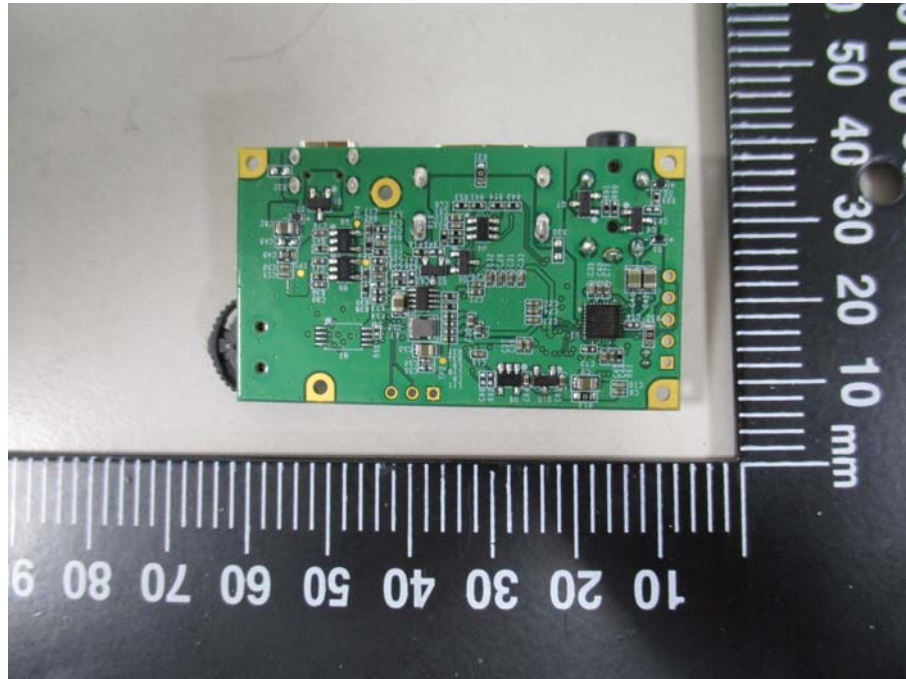


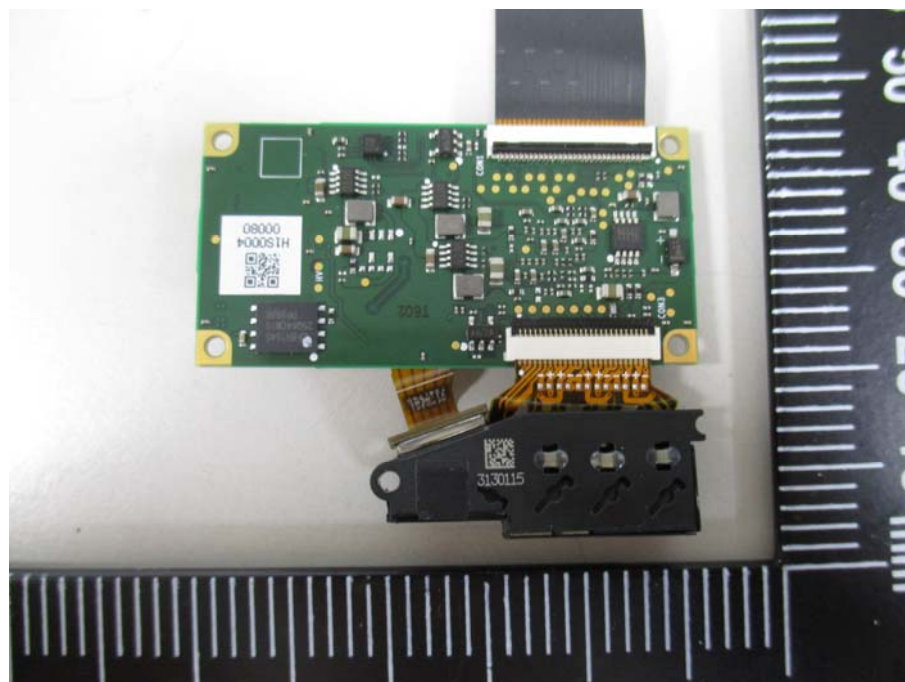
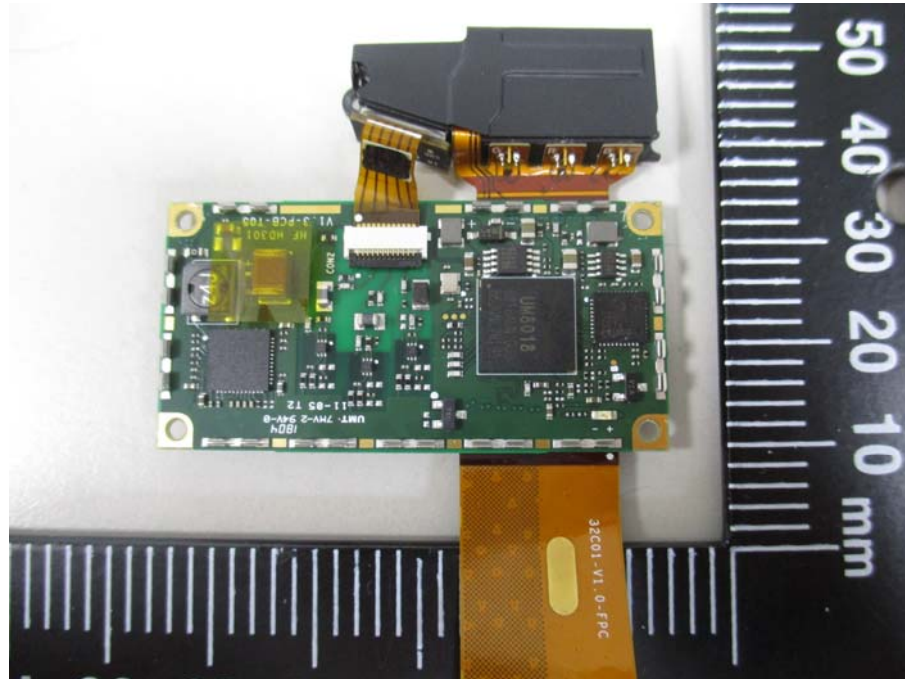


Appendix B2: Internal photo of EUT









Appendix C1: Conducted Emission Test Set-up



Appendix C2: Radiated Emission Test Set-up (Below 1 GHz)

Appendix C3: Radiated Emission Test Set-up (Above 1 GHz)