FCC EMI TEST REPORT

Filing Type	:	Certificate
FCC ID	:	MAD-MSB400AG1
Equipment	:	OTT BOX
Model Name	:	MSB400-A-G1
Applicant	:	Microelectronics Technology Inc No. 1, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan.
Manufacturer	:	CyberTAN Technology,Inc No. 99, Park Avenue III Science-based Industrial Park Hsinchu Taiwan 308
Standard	:	47 CFR FCC Rules and Regulations Part 15 Subpart B Class B Digital Device ICES-003, Issue 6, Class B

The product was received on Apr. 03, 2018, and testing was started from Apr. 10, 2018 and completed on Apr. 13, 2018. We, SPORTON INTERTIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2014 and shown compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERTIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Sin Chang

SPORTON INTERTIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issued Date
FC832852-01	01	Initial issue of report	May 09, 2018

Summary of Test Result

Report Clause	Ref Std. Clause (FCC Part 15 Subpart B)	Test Items	Result (PASS/FAIL)	Remark
4	15.107	AC Power Port Conducted Emission	PASS	Under limit 13.98 dB at 0.4564 MHz
5	15.109	Radiated Emission below 1GHz	PASS	Under limit 3.19 dB at 190.05 MHz
5	15.109	Radiated Emission above 1GHz	PASS	Under limit 7.61 dB at 1781.95 MHz

Reviewed by: Sin Chang

Report Producer: Sandy Chuang

1. General Description of Equipment under Test

Product Detail	
Equipment Name	OTT BOX
Model Name	MSB400-A-G1
Power Supply	From Power Adapter

1.1. Feature of Equipment under Test

1. The EUT supports WLAN 2.4GHz/5GHz/Bluetooth wireless function.

2. Accessories

Power	Brand holder	Model	Rating
Adapter	DEE VAN ENTERPRISE CO., LTD.	DSA-12PFU-05 FUS 050200	Input: 100-240V~50/60Hz, 0.5A Output: +5V, 2A

3. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

1.2. Modification of EUT

Please refer to the technical specifications of EUT.

2. Test Configuration of Equipment under Test

2.1. Test Mode

The following table is a list of the test modes shown in this test report.

Conducted Emissions	
Test Mode	Description
1	Normal Link (Bluetooth work+WLAN 5GHz work+USB Port with load+LAN Port with load)

Radiated Emissions	
Test Mode	Description
1	Normal Link (Bluetooth work+WLAN 5GHz work+USB Port with load+LAN Port with load)

Note: The configuration and test mode were written in this test report are designated by the applicant.

2.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

For Conducted Emissions Test:

Support Unit	Brand	Model	FCC ID
AP router	ASUS	RP-N53	MSQ-RPN53
Bluetooth speaker	MARUS	MSK06C-RD	2AJ7PXMYX02
LCD monitor	LG	27UD68	N/A
Fiber speaker	PLANK	FIDA 2100 M-Series	N/A
Flash disk3.0	Transcend	JetFlash-700	N/A

For Radiated Emissions Test:

Support Unit	Brand	Model	FCC ID
LCD TV	LG	KLV-32U300A	N/A
WLAN AP	D-LINK	DIR860L	KA2IR860LA1
Fiber speaker	PLANK	FIDA 2100 M-Series	N/A
Flash disk3.0	Transcend	JF700	N/A
Bluetooth speaker	MI	MI Bluetooth Speaker mini	2AJ7PXMYX02

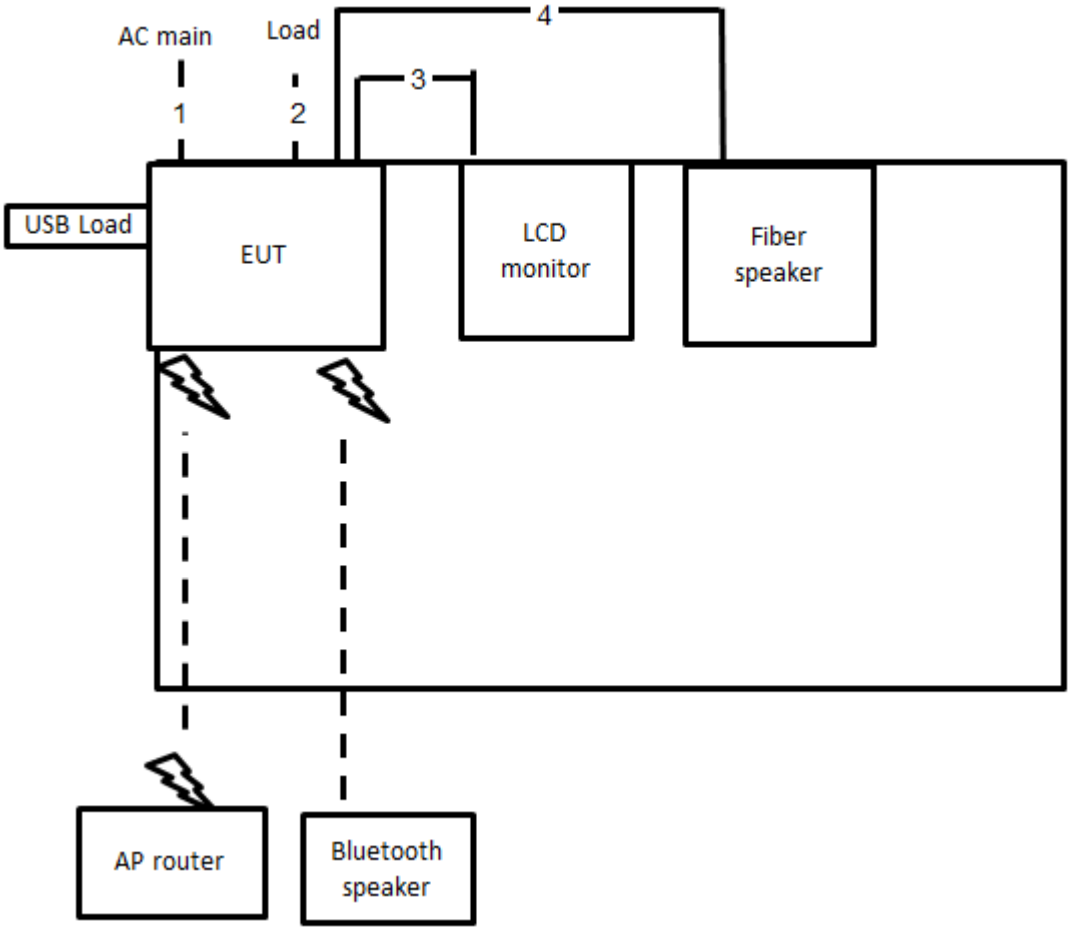
2.3. EUT Operation Condition

EUT connect with Bluetooth Speaker.

EUT turn on the WiFi function and connect with the AP Router. After connecting successes can play the video.

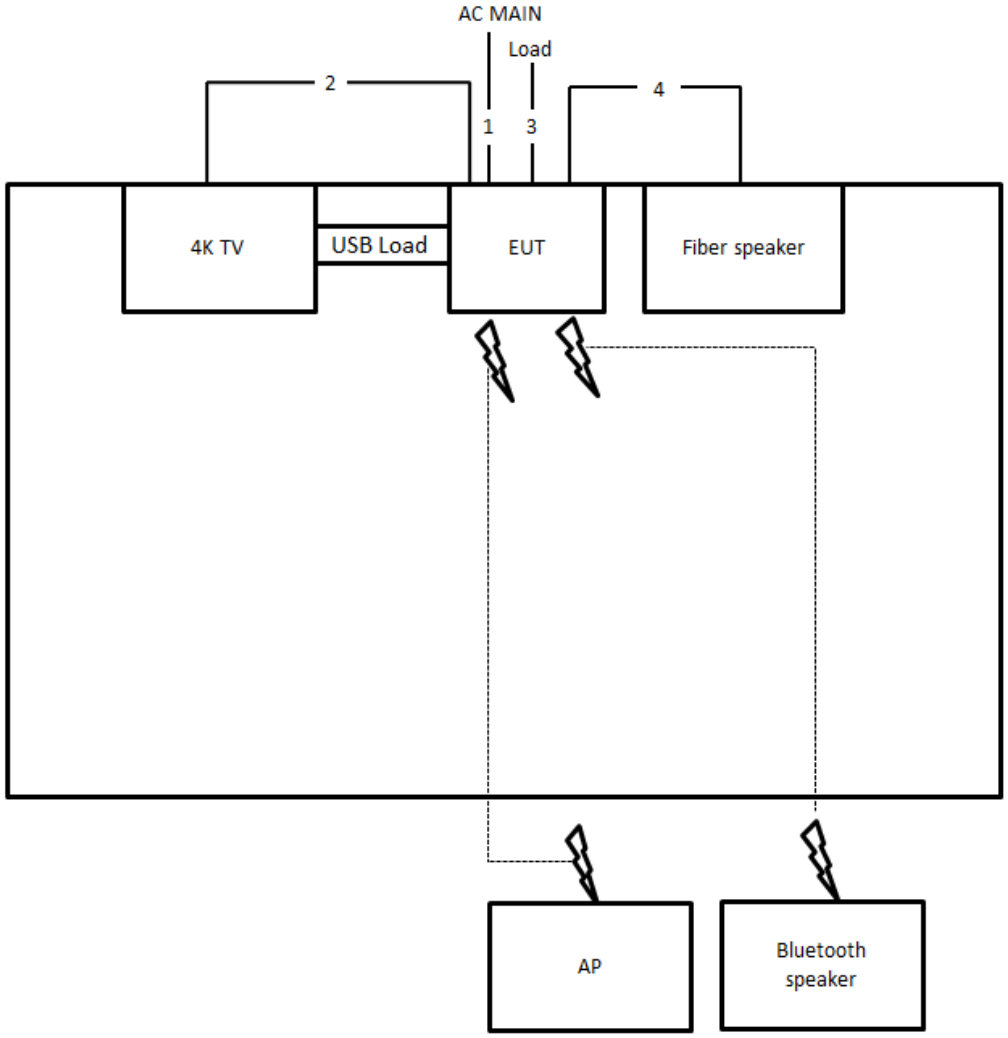
2.4. Connection Diagram of Test System

2.4.1. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	RJ-45 cable	No	1.2m
3	HDMI cable	Yes	2m
4	Fiber cable	No	1.5m

2.4.2. Radiation Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	HDMI cable	Yes	2m
3	RJ-45 cable	No	1.5m
4	Fiber cable	No	1.5m

3. General Information of Test

3.1. Test Facility

Test Site Location	:	No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.
TEL	:	886-3-656-9065
FAX	:	886-3-656-9085
Test Site No.	:	Conduction: CO01-CB Radiation: 03CH01-CB

3.2. Test Voltage

Power Type	Test Voltage
AC Power Supply	120 V / 60 Hz

3.3. Standard for Methods of Measurement

ANSI C63.4-2014

3.4. Frequency Range Investigated

Test Items	Frequency Range
Conducted emission test	150 kHz to 30 MHz
Radiated emission test	30 MHz to 30,000 MHz

3.5. Test Distance

Test Items	Test Distance
Radiated emission test below 1 GHz (30 MHz to 1,000 MHz)	3 m
Radiated emission test above 1 GHz (1,000 MHz to 18,000 MHz)	3 m
Radiated emission test above 1 GHz (18,000 MHz to 30,000 MHz)	1 m

4. Test of Conducted Emission

4.1. Limit

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

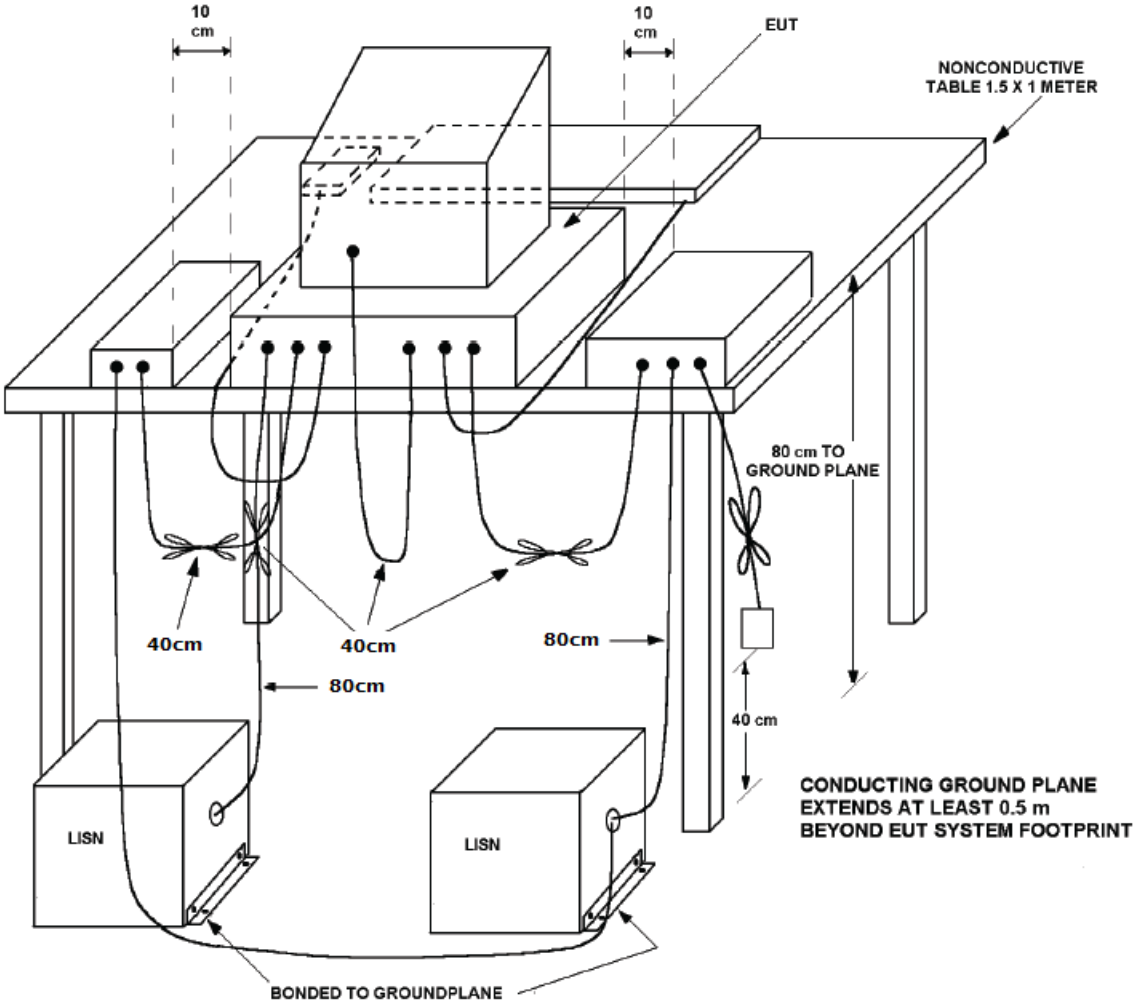
4.2. Description of Major Test Instruments

Test Receiver	Setting
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

4.3. Test Procedures

a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
c. All the support units are connect to the other LISN.
d. The LISN provides 50 Ω coupling impedance for the measuring instrument.
e. The FCC states that a 50 Ω, 50 uH LISN should be used.
f. Both sides of AC line were checked for maximum conducted interference.
g. The frequency range from 150 kHz to 30 MHz was searched.
h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

4.4. Typical Test Setup Layout of Conducted Emission

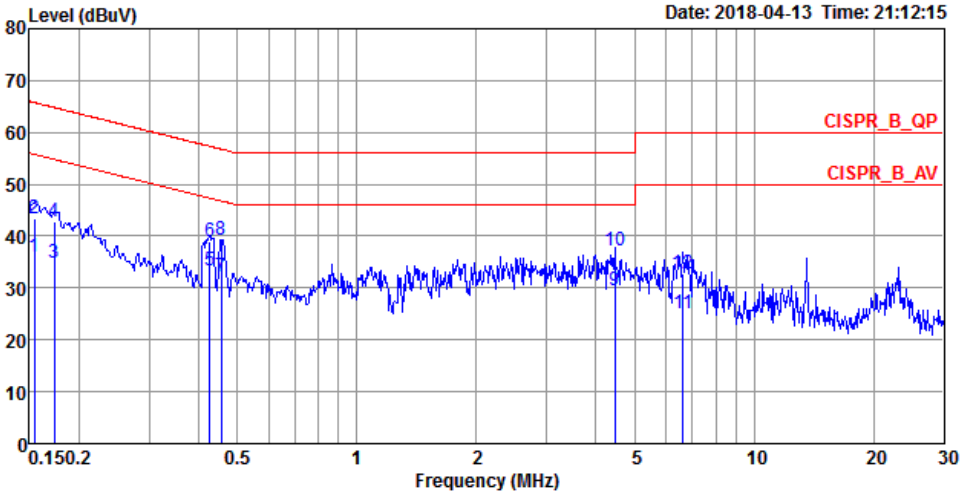


4.5. Test Result of AC Power Ports

Temperature	24℃	Humidity	62%
Test Engineer	Rick Yeh	Frequency Range	0.15 MHz to 30 MHz
Test Mode	Mode 1		

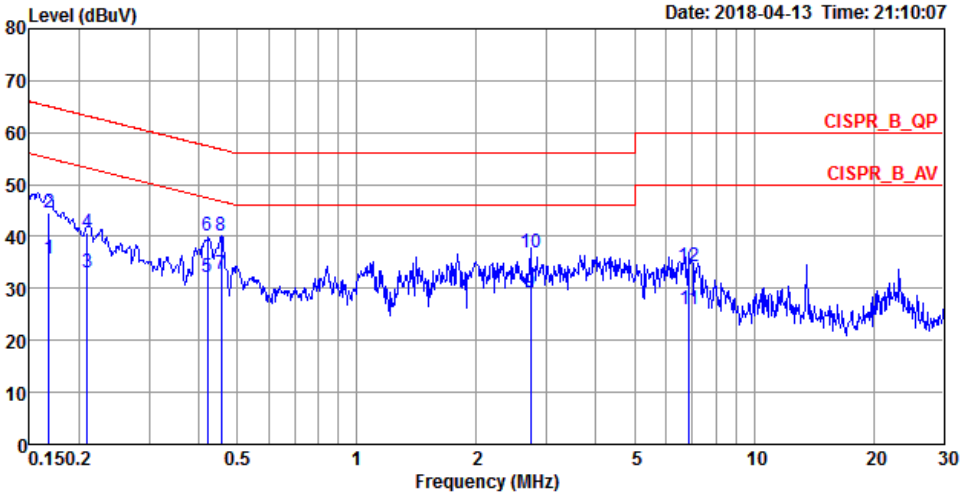
- Corrected Reading (dBuV) = LISN Factor + Cable Loss + Read Level = Level
- Margin = - Limit + (Read Level + LISN Factor + Cable Loss)
- All emissions not reported here are more than 10 dB below the prescribed limit.
- The test was passed at the minimum margin that marked by a frame in the following table

Line



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1540	35.92	-19.86	55.78	25.85	9.91	0.16	Average	LINE
2	0.1540	43.51	-22.27	65.78	33.44	9.91	0.16	QP	LINE
3	0.1731	34.90	-19.91	54.81	24.85	9.91	0.14	Average	LINE
4	0.1731	42.88	-21.93	64.81	32.83	9.91	0.14	QP	LINE
5	0.4260	33.23	-14.10	47.33	23.30	9.91	0.02	Average	LINE
6	0.4260	38.91	-18.42	57.33	28.98	9.91	0.02	QP	LINE
7	0.4564	32.26	-14.50	46.76	22.32	9.91	0.03	Average	LINE
8	0.4564	39.28	-17.48	56.76	29.34	9.91	0.03	QP	LINE
9	4.4540	29.59	-16.41	46.00	19.48	10.00	0.11	Average	LINE
10	4.4540	37.13	-18.87	56.00	27.02	10.00	0.11	QP	LINE
11	6.6272	25.14	-24.86	50.00	14.94	10.07	0.13	Average	LINE
12	6.6272	32.91	-27.09	60.00	22.71	10.07	0.13	QP	LINE

Neutral



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1677	35.77	-19.31	55.08	25.70	9.92	0.15	Average	NEUTRAL
2	0.1677	44.43	-20.65	65.08	34.36	9.92	0.15	QP	NEUTRAL
3	0.2094	33.10	-20.13	53.23	23.06	9.92	0.12	Average	NEUTRAL
4	0.2094	40.81	-22.42	63.23	30.77	9.92	0.12	QP	NEUTRAL
5	0.4215	32.30	-15.12	47.42	22.36	9.92	0.02	Average	NEUTRAL
6	0.4215	40.08	-17.34	57.42	30.14	9.92	0.02	QP	NEUTRAL
7	0.4564	32.78	-13.98	46.76	22.83	9.92	0.03	Average	NEUTRAL
8	0.4564	40.26	-16.50	56.76	30.31	9.92	0.03	QP	NEUTRAL
9	2.7356	29.13	-16.87	46.00	19.00	9.97	0.16	Average	NEUTRAL
10	2.7356	36.93	-19.07	56.00	26.80	9.97	0.16	QP	NEUTRAL
11	6.8776	25.92	-24.08	50.00	15.74	10.05	0.13	Average	NEUTRAL
12	6.8776	34.13	-25.87	60.00	23.95	10.05	0.13	QP	NEUTRAL

5. Test of Radiated Emission

5.1. Limit

Radiated Emission below 1 GHz test at 3 m:

Frequency (MHz)	QP (dBuV/m)
30~88	40
88~216	43.5
216~960	46
Above 960	54

Radiated Emission 1~18 GHz test at 3 m:

Frequency (MHz)	PK (dBuV/m)	AV (dBuV/m)
1,000 to 18,000	74	54

Radiated Emission 18~30 GHz test at 1 m:

Frequency (MHz)	PK (dBuV/m)	AV (dBuV/m)
18,000 to 30,000	83.54	63.54

5.2. Description of Major Test Instruments

5.2.1. 30 MHz ~ 1,000 MHz

Receiver Parameter	Setting
Start Frequency	30 MHz
Stop Frequency	1000 MHz
RBW	120 kHz for QP

5.2.2. Above 1 GHz

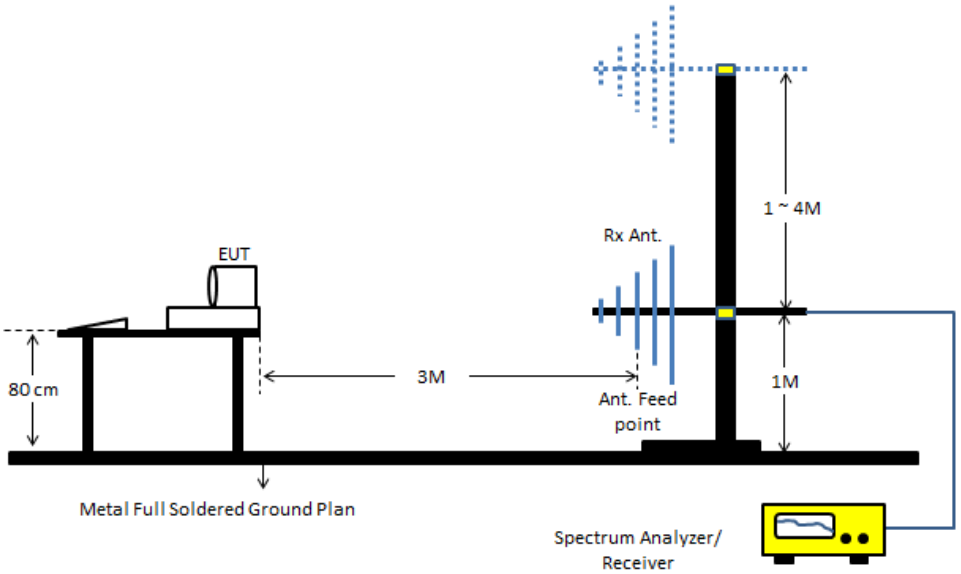
Spectrum Parameter	Setting
Start Frequency	1000 MHz
Stop Frequency	30 GHz
RBW / VBW	1 MHz / 3 MHz for Peak ; 1 MHz / 1 Hz for Average

5.3. Test Procedures

a. The EUT was placed on a rotatable table top 0.8 meter above ground.
b. The EUT was set 3m (below 1GHz) / 3m (1GHz-18GHz) / 1m (18GHz-30GHz) meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
c. The table was rotated 360 degrees to determine the position of the highest radiation.
d. 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 are set to make the measurement.
e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
f. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
h. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

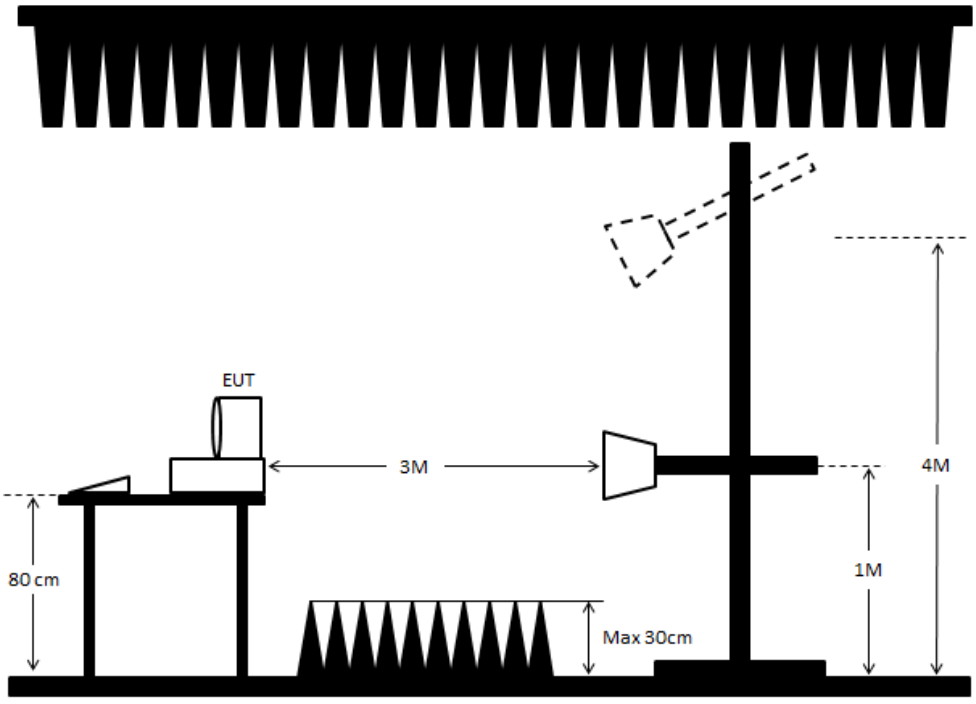
5.4. Typical Test Setup Layout of Radiated Emission

<Below 1 GHz>:

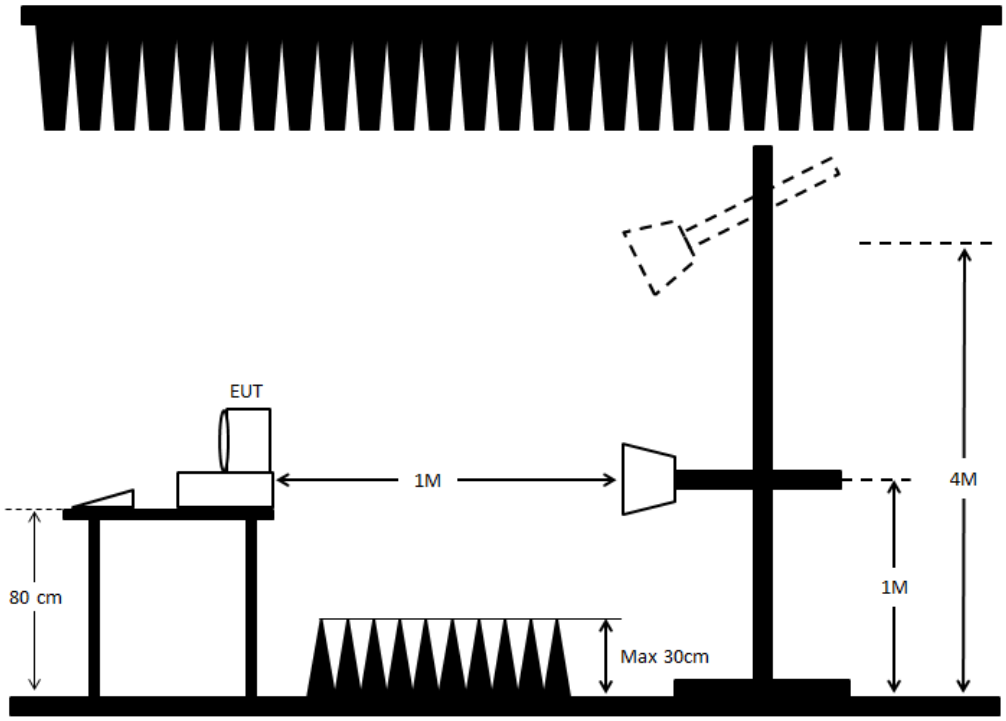


<Above 1 GHz>:

1,000~18,000 MHz



18,000~30,000 MHz

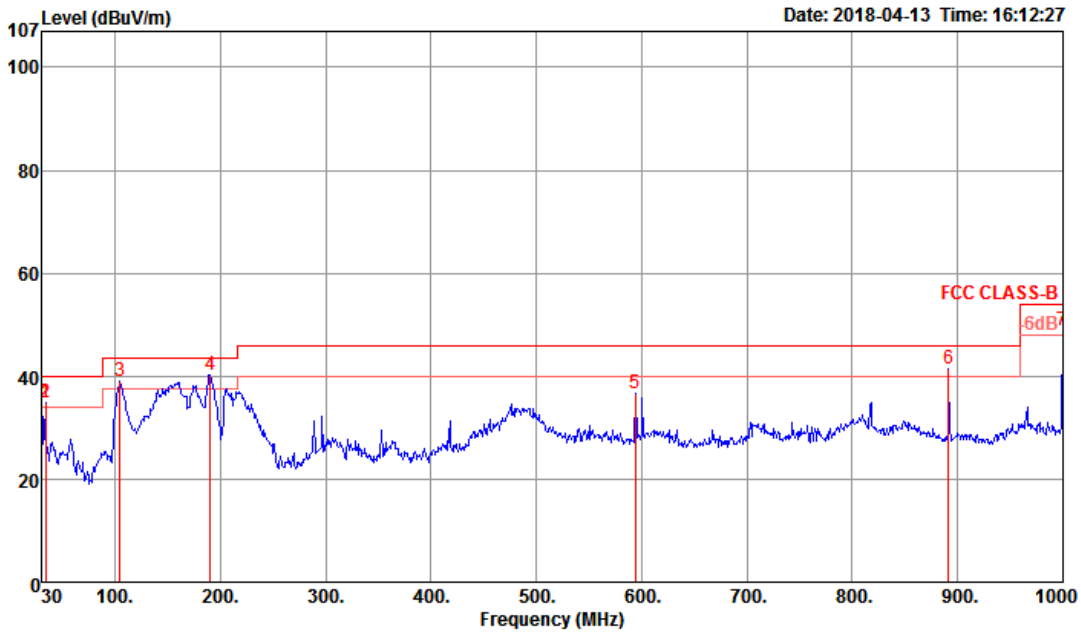


5.5. Test Result of Radiated Emission below 1 GHz

Temperature	23.5℃	**Humidity**	49%
Test Engineer	Ekko Hsieh / Gino Huang	**Frequency Range**	30 MHz to 1,000 MHz
Test Mode	Mode 1		

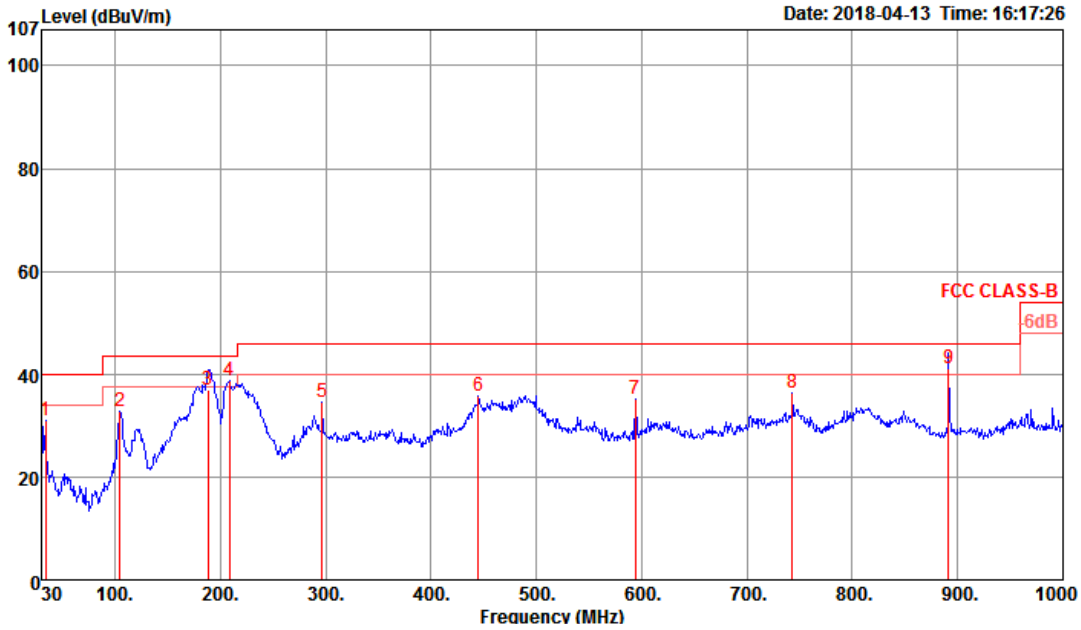
- Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
- Margin = - Limit + (Read Level + Antenna Factor + Cable Loss - Preamp Factor)
- The test was passed at the minimum margin that marked by the frame in the following test record

Vertical 30 MHz to 1,000 MHz



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	33.88	34.91	40.00	-5.09	43.62	0.66	22.18	31.55	300	0	Peak	VERTICAL
2	33.88	34.91	40.00	-5.09	43.62	0.66	22.18	31.55	300	0	Peak	VERTICAL
3	104.69	39.07	43.50	-4.43	52.33	1.27	17.35	31.88	300	0	Peak	VERTICAL
4	190.05	40.31	43.50	-3.19	55.45	1.70	15.09	31.93	300	0	Peak	VERTICAL
5	593.57	36.80	46.00	-9.20	42.00	3.00	24.18	32.38	300	0	Peak	VERTICAL
6	891.36	41.53	46.00	-4.47	43.80	3.88	26.26	32.41	300	0	Peak	VERTICAL
7	1000.00	48.94	54.00	-5.06	50.47	4.04	26.91	32.48	300	0	Peak	VERTICAL

Horizontal 30 MHz to 1,000 MHz



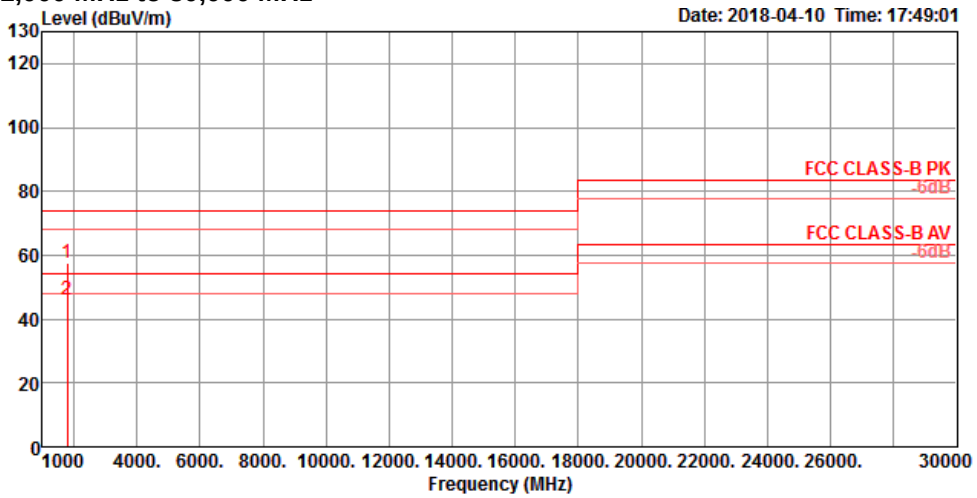
	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	33.88	31.11	40.00	-8.89	39.82	0.66	22.18	31.55	100	0	Peak	HORIZONTAL
2	104.69	32.86	43.50	-10.64	46.12	1.27	17.35	31.88	100	0	Peak	HORIZONTAL
3	188.11	36.97	43.50	-6.53	52.10	1.69	15.11	31.93	149	357	QP	HORIZONTAL
4	208.48	38.60	43.50	-4.90	53.85	1.79	14.88	31.92	100	0	Peak	HORIZONTAL
5	296.75	34.56	46.00	-11.44	45.88	2.09	18.62	32.03	100	0	Peak	HORIZONTAL
6	445.16	35.82	46.00	-10.18	43.11	2.61	22.29	32.19	100	0	Peak	HORIZONTAL
7	593.57	35.30	46.00	-10.70	40.50	3.00	24.18	32.38	100	0	Peak	HORIZONTAL
8	742.95	36.44	46.00	-9.56	40.24	3.39	25.35	32.54	100	0	Peak	HORIZONTAL
9	891.36	41.13	46.00	-4.87	43.40	3.88	26.26	32.41	101	170	QP	HORIZONTAL

5.6. Test Result of Radiated Emission above 1 GHz

Temperature	23.5℃	**Humidity**	49%
Test Engineer	Ekko Hsieh / Gino Huang	**Frequency Range**	1,000 MHz to 30,000 MHz
Test Mode	Mode 1		

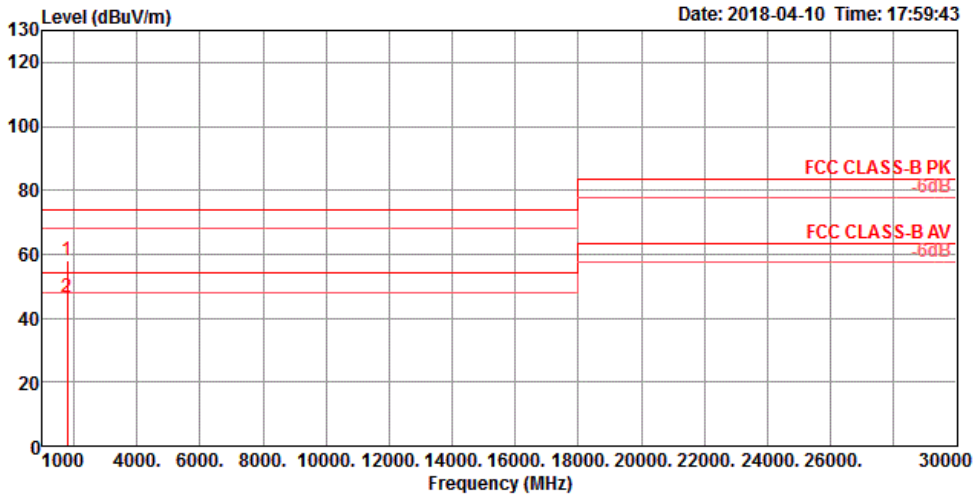
- Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
- Margin = - Limit + (Read Level + Antenna Factor + Cable Loss - Preamp Factor)
- The test was passed at the minimum margin that marked by the frame in the following test record

Vertical 1,000 MHz to 30,000 MHz



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	1781.67	57.67	74.00	-16.33	60.74	5.96	25.76	34.79	100	186	Peak	VERTICAL
2	1781.98	46.08	54.00	-7.92	49.15	5.96	25.76	34.79	100	186	Average	VERTICAL

Horizontal 1,000 MHz to 30,000 MHz



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	1781.58	57.90	74.00	-16.10	60.97	5.96	25.76	34.79	100	240	Peak	HORIZONTAL
2	1781.95	46.39	54.00	-7.61	49.46	5.96	25.76	34.79	100	240	Average	HORIZONTAL

6. List of Measuring Equipment Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Jan. 31, 2018	Jan. 30, 2019	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 20, 2017	Dec. 19, 2018	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 29, 2017	Dec. 28, 2018	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	May 23, 2017	May 22, 2018	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 30, 2017	Aug. 29, 2018	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Nov. 20, 2017	Nov. 19, 2018	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 05, 2017	Jul. 04, 2018	Radiation (03CH01-CB)
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	May 02, 2017	May 01, 2018	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 09, 2018	Jan. 08, 2019	Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jul. 10, 2017	Jul. 09, 2018	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Nov. 23, 2017	Nov. 22, 2018	Radiation (03CH01-CB)
EMI Test	R&S	ESCS	100355	9kHz ~ 2.75GHz	May 06, 2017	May 05, 2018	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16+17	N/A	1 GHz ~ 18 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#1	N/A	18GHz ~ 40 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)

※ Calibration Interval of instruments listed above is one year.

※ N.C.R. means Non-Calibration required.

7. Uncertainty of Test Site

Test Items	Uncertainty	Remark
Conducted Emissions	3.2 dB	Confidence levels of 95%
Radiated Emissions below 1GHz	3.6 dB	Confidence levels of 95%
Radiated Emissions 1GHz ~ 18GHz	3.7 dB	Confidence levels of 95%
Radiated Emissions 18GHz ~ 40GHz	3.5 dB	Confidence levels of 95%