FCC Test Report

APPLICANT	:	HMD Global Oy
EQUIPMENT	:	Smart Phone
BRAND NAME	:	NOKIA
MODEL NAME	:	TA-1004
FCC ID	:	2AJOTTA-1004
STANDARD	:	FCC 47 CFR FCC Part 15 Subpart B
CLASSIFICATION	:	Certification

The product was received on Jan. 21, 2017 and testing was completed on Mar. 29, 2017. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI C63.4-2014 and has been in compliance with the applicable technical standards.

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

Louis Wu

Reviewed by: Louis Wu / Manager

Jones Tsai

Approved by: Jones Tsai / Manager

Testing Laboratory 1190

SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FC712102	Rev. 01	Initial issue of report	May 25, 2017

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.107	AC Conducted Emission	< 15.107 limits	PASS	Under limit 11.50 dB at 0.598 MHz
3.2	15.109	Radiated Emission	< 15.109 limits	PASS	Under limit 5.41 dB at 34.590 MHz for peak

1. General Description

1.1. Applicant

HMD Global Oy
Karaportti 2, 02610 Espoo, Finland

1.2. Manufacturer

HMD Global Oy
Karaportti 2, 02610 Espoo, Finland

1.3. Product Feature of Equipment Under Test

GSM/WCDMA/LTE, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n, Wi-Fi 5GHz 802.11a/n/ac, NFC, and GPS.

Product Specification subjective to this standard	
Antenna Type	WWAN: PIFA Antenna WLAN: PIFA Antenna Bluetooth: PIFA Antenna GPS/Glonass/Beidou: Monopole Antenna NFC: Loop Antenna

1.4. Modification of EUT

No modifications are made to the EUT during all test items.

1.5. Test Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	**Sporton Site No.**	
	CO05-HY	03CH07-HY

1.6. Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC 47 CFR FCC Part 15 Subpart B
- ANSI C63.4-2014

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2. Test Configuration of Equipment Under Test

2.1. Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2014 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

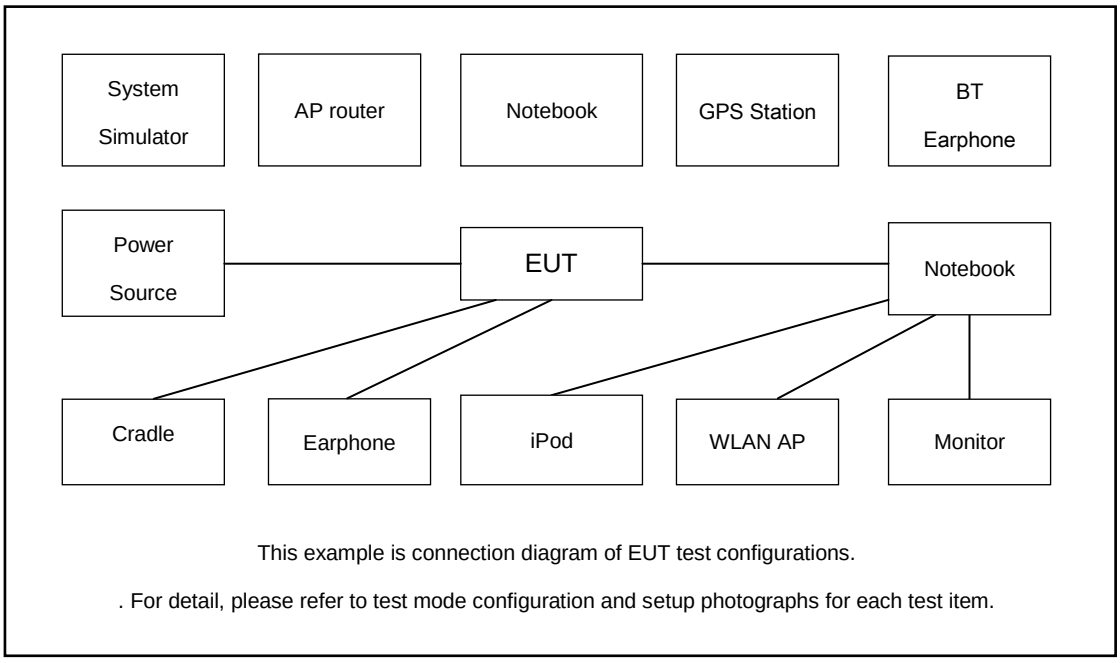
Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (30MHz to the 5th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

Test Items	Function Type
AC Conducted Emission	Mode 1 : GSM850 Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + Earphone + USB Cable (Charging from Adapter) + NFC On + SIM 1 Mode 2 : WCDMA Band II Idle + Bluetooth Idle + WLAN (5GHz) Idle + Earphone + USB Cable (Charging from Adapter) + MPEG4 + SIM 2 Mode 3 : LTE Band 4 Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + Earphone + USB Cable (Charging from Adapter) + Camera (Front) + SIM 1 Mode 4 : GSM1900 Idle + Bluetooth Idle + WLAN (5GHz) Idle + Earphone + USB Cable (Charging from Adapter) + Camera (Rear) + SIM 2 Mode 5 : WCDMA Band V Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + Earphone + USB Cable (Charging from Adapter) + GPS Rx + SIM 1 Mode 6 : LTE Band 7 Idle + Bluetooth Idle + WLAN (5GHz) Idle + Earphone + USB Cable (Data Link with Notebook) + Beidou Rx + SIM 1
Radiated Emissions	Mode 1 : GSM850 Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + Earphone + USB Cable (Charging from Adapter) + NFC On + SIM 1 Mode 2 : WCDMA Band II Idle + Bluetooth Idle + WLAN (5GHz) Idle + Earphone + USB Cable (Charging from Adapter) + MPEG4 + SIM 2 Mode 3 : LTE Band 4 Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + Earphone + USB Cable (Charging from Adapter) + Camera (Front) + SIM 1 Mode 4 : GSM1900 Idle + Bluetooth Idle + WLAN (5GHz) Idle + Earphone + USB Cable (Charging from Adapter) + Camera (Rear) + SIM 2 Mode 5 : WCDMA Band V Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + Earphone + USB Cable (Charging from Adapter) + GPS Rx + SIM 1 Mode 6 : LTE Band 7 Idle + Bluetooth Idle + WLAN (5GHz) Idle + Earphone + USB Cable (Data Link with Notebook) + Beidou Rx + SIM 1

Remark:

1. The worst case of AC is mode 3; only the test data of this mode was reported.
2. The worst case of RE is mode 4; only the test data of this mode was reported.
3. Data Link with Notebook means data application transferred mode between EUT and Notebook.

2.2. Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

. For detail, please refer to test mode configuration and setup photographs for each test item.

2.3. Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	GPS Station	Pendulum	GSG-54	N/A	N/A	Unshielded, 1.8 m
3.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
4.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
5.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A
6.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
7.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.4. EUT Operation Test Setup

The EUT was in GSM or WCDMA idle mode during the testing. The EUT was synchronized to the BCCH, and is in continuous receiving mode by setting system simulator's paging reorganization.

At the same time, the EUT was attached to the Bluetooth earphone or WLAN AP, and the following programs installed in the EUT were programmed during the test.

1. Execute "GPS test" to make the EUT receive continuous signals from GPS station.
2. Turned on NFC function.
3. Turned on Camera (Front and Rear) function.
4. Data application is transferred between Laptop and EUT via USB cable.
5. Execute "Windows Media Player" to play MPEG4 files.

3. Test Result

3.1. Test of AC Conducted Emission Measurement

3.1.1 Limits of AC Conducted Emission

For equipment 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.

Frequency of emission (MHz)	Conducted limit (dBuV)	
	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.

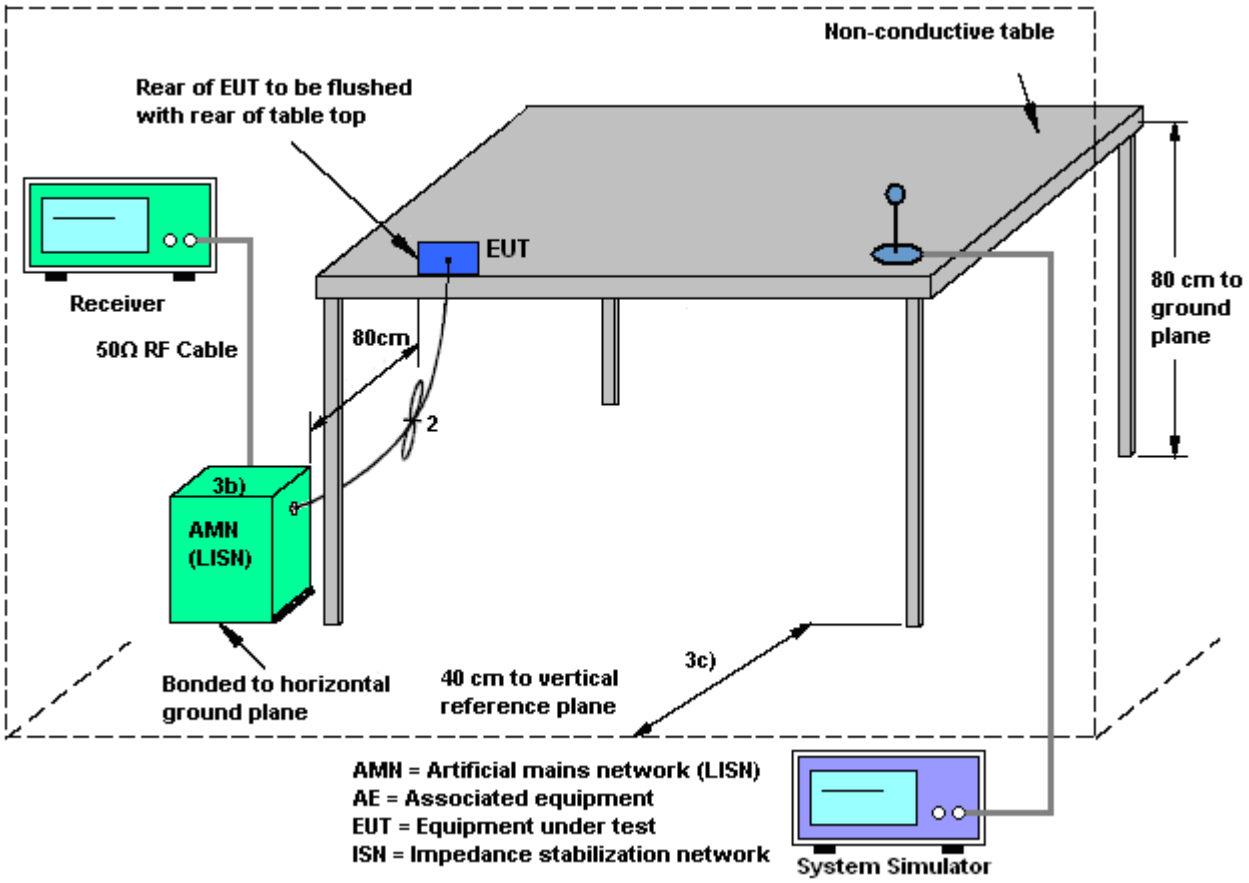
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedure

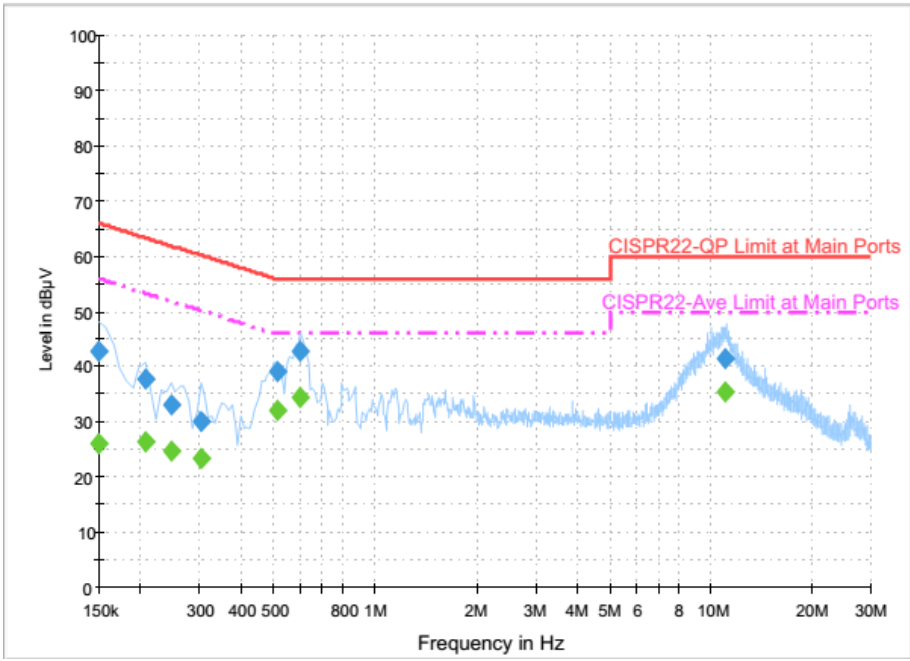
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.1.4 Test Setup



3.1.5 Test Result of AC Conducted Emission

Test Engineer :	Arthur Hsieh	Temperature :	23~24℃
		Relative Humidity :	51~55%
Test Voltage :	120Vac / 60Hz	Phase :	Line



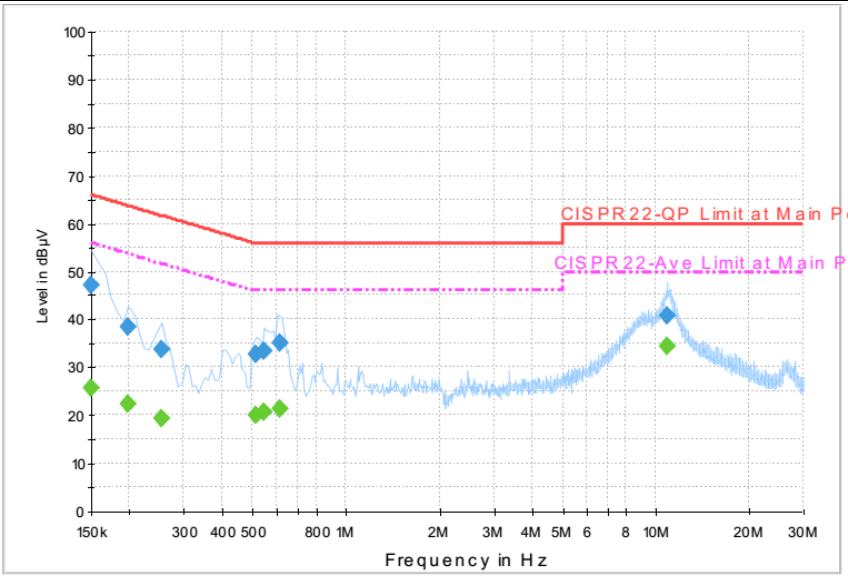
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	42.7	Off	L1	19.6	23.3	66.0
0.206000	37.9	Off	L1	19.6	25.5	63.4
0.246000	33.2	Off	L1	19.6	28.7	61.9
0.302000	30.1	Off	L1	19.6	30.1	60.2
0.510000	39.2	Off	L1	19.6	16.8	56.0
0.598000	42.9	Off	L1	19.6	13.1	56.0
11.006000	41.5	Off	L1	20.1	18.5	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	26.1	Off	L1	19.6	29.9	56.0
0.206000	26.5	Off	L1	19.6	26.9	53.4
0.246000	24.7	Off	L1	19.6	27.2	51.9
0.302000	23.6	Off	L1	19.6	26.6	50.2
0.510000	32.2	Off	L1	19.6	13.8	46.0
0.598000	34.5	Off	L1	19.6	11.5	46.0
11.006000	35.6	Off	L1	20.1	14.4	50.0

Test Engineer :	Arthur Hsieh	Temperature :	23~24℃
		Relative Humidity :	51~55%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral



Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	47.0	Off	N	19.5	19.0	66.0
0.198000	38.5	Off	N	19.5	25.2	63.7
0.254000	33.9	Off	N	19.5	27.7	61.6
0.510000	32.8	Off	N	19.5	23.2	56.0
0.542000	33.5	Off	N	19.5	22.5	56.0
0.614000	35.2	Off	N	19.5	20.8	56.0
10.854000	40.7	Off	N	20.1	19.3	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	25.9	Off	N	19.5	30.1	56.0
0.198000	22.4	Off	N	19.5	31.3	53.7
0.254000	19.5	Off	N	19.5	32.1	51.6
0.510000	20.1	Off	N	19.5	25.9	46.0
0.542000	20.8	Off	N	19.5	25.2	46.0
0.614000	21.3	Off	N	19.5	24.7	46.0
10.854000	34.4	Off	N	20.1	15.6	50.0

3.2. Test of Radiated Emission Measurement

3.2.1. Limit of Radiated Emission

The emissions from an unintentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.2.2. Measuring Instruments

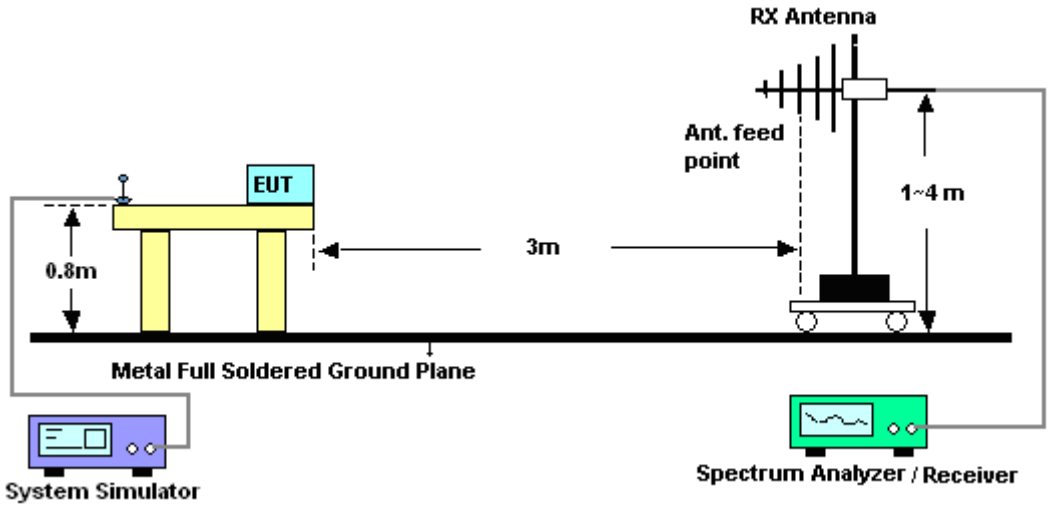
The measuring equipment is listed in the section 4 of this test report.

3.2.3. Test Procedures

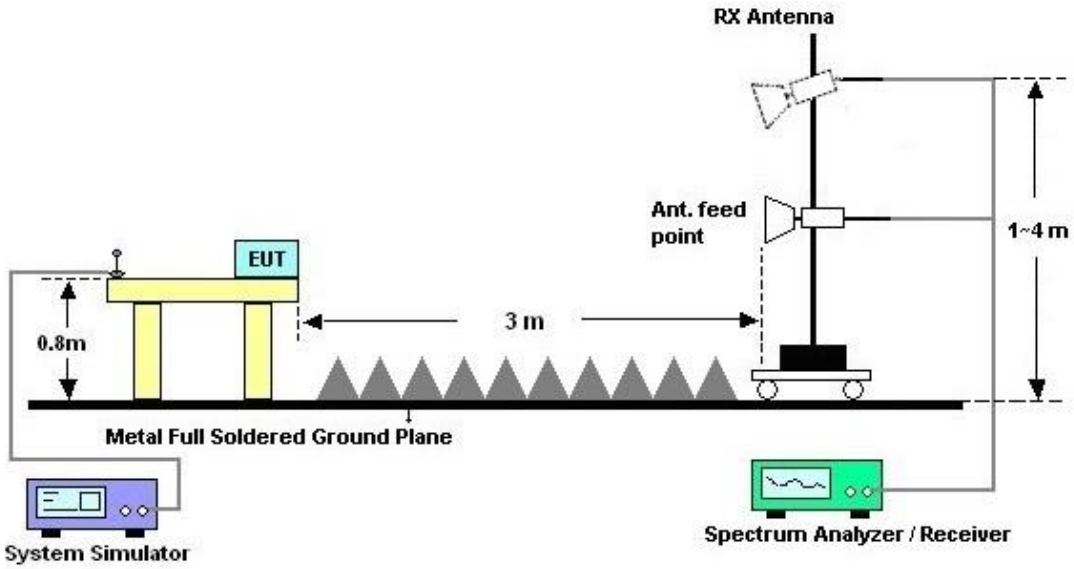
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one to four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. 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 turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode (RBW=120kHz/VBW=300kHz for frequency below 1GHz; RBW=1MHz VBW=3MHz (Peak), RBW=1MHz/VBW=10Hz (Average) for frequency above 1GHz).
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported.
8. Emission level (dBμV/m) = 20 log Emission level (μV/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

3.2.4. Test Setup of Radiated Emission

For radiated emissions from 30MHz to 1GHz

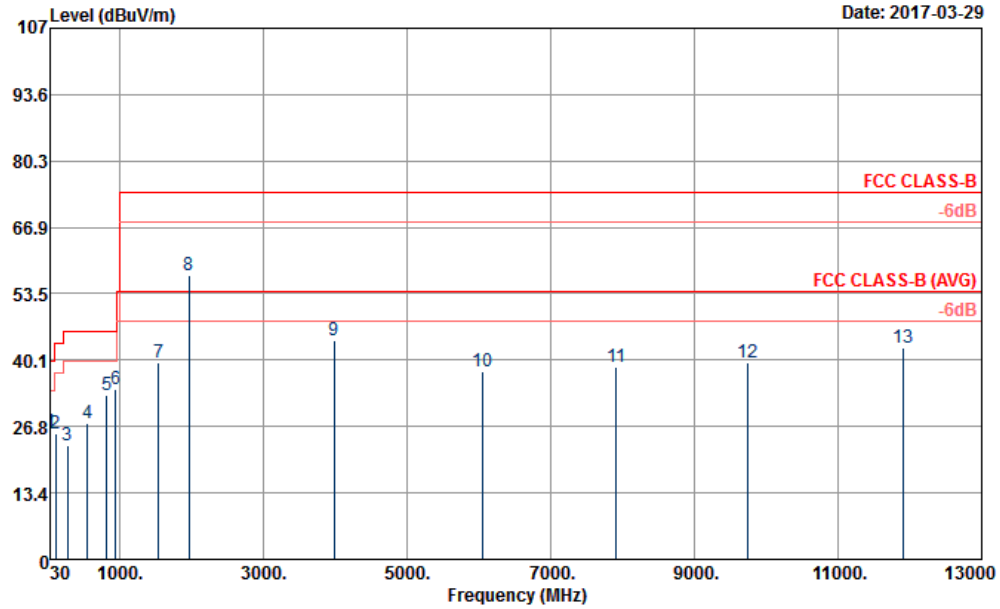


For radiated emissions above 1GHz



3.2.5. Test Result of Radiated Emission

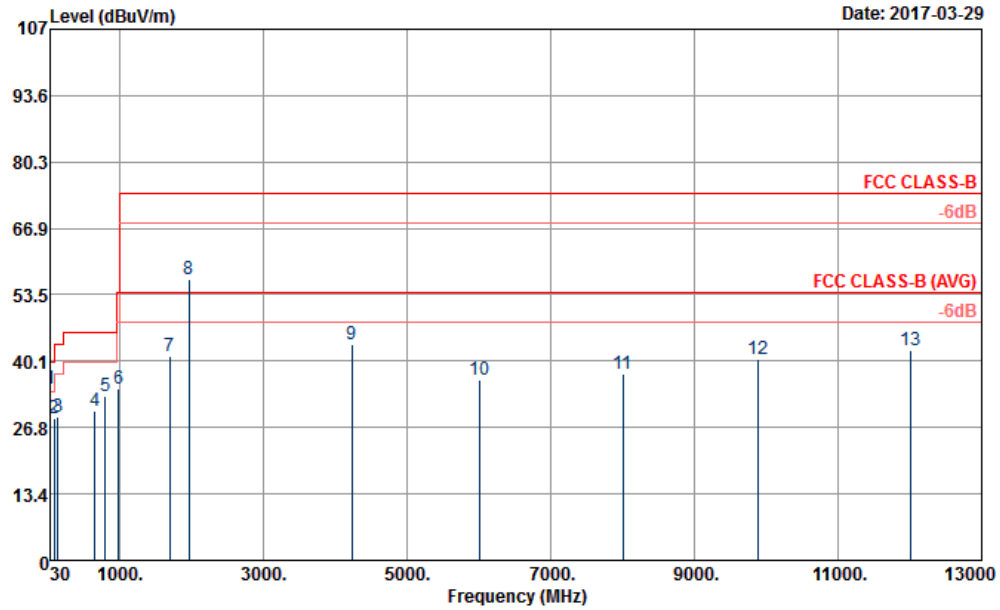
Test Engineer :	Jesse Wang and James Chou	**Temperature :**	23~24°C
		Relative Humidity :	51~55%
Test Distance :	3m	**Polarization :**	Horizontal
Remark :	#8 is system simulator signal which can be ignored.		



Site : 03CH07-HY
Condition : FCC CLASS-B 3m HF-ANT_130829 HORIZONTAL
Project : 712102
Power : 120Vac/60Hz
Mode : 4

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	30.00	25.60	-14.40	40.00	28.08	26.00	1.71	30.19	---	---	Peak
2	106.95	25.29	-18.21	43.50	36.30	17.03	2.34	30.38	---	---	Peak
3	276.24	23.09	-22.91	46.00	30.63	19.34	3.28	30.16	---	---	Peak
4	548.50	27.29	-18.71	46.00	28.23	24.59	4.20	29.73	---	---	Peak
5	818.00	33.14	-12.86	46.00	29.41	28.05	4.98	29.30	---	---	Peak
6	946.10	34.21	-11.79	46.00	27.73	30.11	5.40	29.03	100	51	Peak
7	1540.00	39.74	-34.26	74.00	39.08	28.93	6.81	35.08	---	---	Peak
8	1960.00	57.33			53.52	30.77	7.91	34.87	---	---	Peak
9	3987.00	44.07	-29.93	74.00	35.62	32.90	10.60	35.05	100	221	Peak
10	6054.00	37.81	-36.19	74.00	46.07	34.70	13.34	56.30	---	---	Peak
11	7910.00	38.76	-35.24	74.00	45.35	35.80	15.57	57.96	---	---	Peak
12	9732.00	39.58	-34.42	74.00	44.59	37.40	17.25	59.66	---	---	Peak
13	11908.00	42.69	-31.31	74.00	41.32	38.72	19.29	56.64	---	---	Peak

Test Engineer :	Jesse Wang and James Chou	**Temperature :**	23~24°C
		Relative Humidity :	51~55%
Test Distance :	3m	**Polarization :**	Vertical
Remark :	#8 is system simulator signal which can be ignored.		



Site : 03CH07-HY
Condition : FCC CLASS-B 3m HF-ANT_130829 VERTICAL
Project : 712102
Power : 120Vac/60Hz
Mode : 4

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	34.59	34.59	-5.41	40.00	39.84	23.30	1.71	30.26	100	0	Peak
2	91.02	28.71	-14.79	43.50	41.77	15.23	2.11	30.40	---	---	Peak
3	138.27	28.88	-14.62	43.50	38.87	18.03	2.34	30.36	---	---	Peak
4	658.40	30.16	-15.84	46.00	29.14	25.99	4.59	29.56	---	---	Peak
5	794.20	32.99	-13.01	46.00	29.72	27.64	4.98	29.35	---	---	Peak
6	988.10	34.61	-19.39	54.00	27.73	30.28	5.54	28.94	---	---	Peak
7	1690.00	41.24	-32.76	74.00	39.38	29.62	7.25	35.01	---	---	Peak
8	1960.00	56.52			52.71	30.77	7.91	34.87	---	---	Peak
9	4230.00	43.64	-30.36	74.00	34.44	33.55	10.74	35.09	100	158	Peak
10	6000.00	36.38	-37.62	74.00	44.79	34.60	13.29	56.30	---	---	Peak
11	8000.00	37.49	-36.51	74.00	43.51	36.20	15.68	57.90	---	---	Peak
12	9892.00	40.56	-33.44	74.00	44.48	38.24	17.40	59.56	---	---	Peak
13	12020.00	42.28	-31.72	74.00	40.81	38.62	19.36	56.51	---	---	Peak

4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Mar. 27, 2017	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 30, 2016	Mar. 27, 2017	Aug. 29, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 29, 2016	Mar. 27, 2017	Nov. 28, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Dec. 06, 2016	Mar. 27, 2017	Dec. 05, 2017	Conduction (CO05-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	35419&03	30MHz to 1GHz	Jan. 07, 2017	Mar. 20, 2017 ~ Mar. 29, 2017	Jan. 06, 2018	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 19, 2016	Mar. 20, 2017 ~ Mar. 29, 2017	Aug. 18, 2017	Radiation (03CH07-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY54130085	20Hz ~ 8.4GHz	Oct. 26, 2016	Mar. 20, 2017 ~ Mar. 29, 2017	Oct. 25, 2017	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~ 26.5GHz	Oct. 12, 2016	Mar. 20, 2017 ~ Mar. 29, 2017	Oct. 11, 2017	Radiation (03CH07-HY)
Antenna Mast	Max-Full	MFA520BS	N/A	1m~4m	N/A	Mar. 20, 2017 ~ Mar. 29, 2017	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Mar. 20, 2017 ~ Mar. 29, 2017	N/A	Radiation (03CH07-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz ~ 44GHz	Oct. 12, 2016	Mar. 20, 2017 ~ Mar. 29, 2017	Oct. 11, 2017	Radiation (03CH07-HY)

5. Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.70**

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.70**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.50**