



FCC Test Report

APPLICANT : HMD Global Oy
EQUIPMENT : Smart Phone
BRAND NAME : Nokia
MODEL NAME : TA-1046
FCC ID : 2AJOTTA-1046
STANDARD : FCC 47 CFR FCC Part 15 Subpart B
CLASSIFICATION : Certification

The product was received on Dec. 07, 2017 and testing was completed on Mar. 05, 2018. 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.

Reviewed by: Louis Wu / Manager

Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

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FCC ID : 2AJOTTA-1046

Page Number : 1 of 20

Report Issued Date : Mar. 13, 2018

Report Version : Rev. 01

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FC7D0706	Rev. 01	Initial issue of report	Mar. 13, 2018



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 6.45 dB at 0.191 MHz
3.2	15.109	Radiated Emission	< 15.109 limits	PASS	Under limit 2.65 dB at 40.800 MHz for Quasi-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 GNSS

Product specification subjective to this standard	
Antenna Type	WWAN: PIFA Antenna WLAN: PIFA Antenna Bluetooth: PIFA Antenna NFC: Single Loop Antenna GPS/GLONASS/BDS: PIFA 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. TW1093 and TW1098 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 1 st 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

Test Site	SPORTON INTERNATIONAL INC.
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Test Site No.	Sporton Site No. 03CH10-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

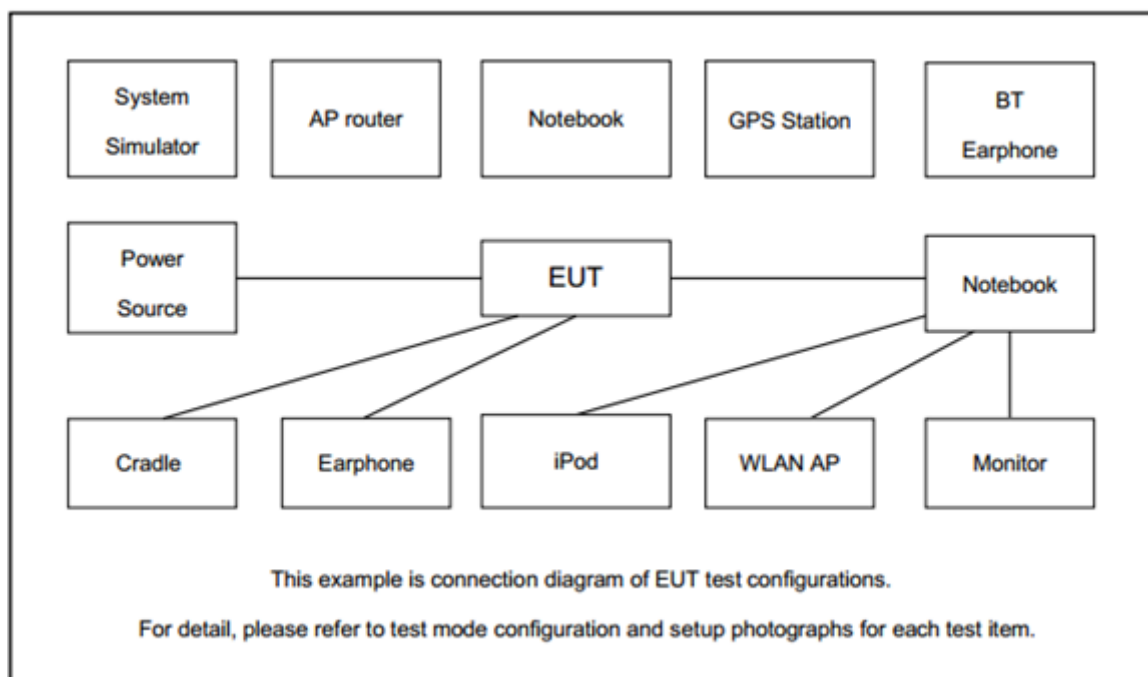
The EUT has been associated with peripherals pursuant to ANSI C63.4-2014 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

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 + NFC On + Earphone 1 + USB Cable 1 (Charging from Adapter 1)
	Mode 2: WCDMA Band II Idle + Bluetooth Idle + WLAN (5GHz) Idle + Camera (Rear) + Earphone 2 + USB Cable 2 (Charging from Adapter 2)
	Mode 3: LTE Band 7 Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + Camera (Front) + Earphone 1 + USB Cable 3 (Charging from Adapter 1)
	Mode 4: LTE Band 38 Idle + Bluetooth Idle + WLAN (5GHz) Idle + Color Bar + Earphone 2 + USB Cable 1 (Charging from Adapter 2)
	Mode 5: WCDMA Band V Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + GPS Rx + Earphone 1 + USB Cable 1 (Data Link with Notebook)
	Mode 6: GSM1900 Idle + Bluetooth Idle + WLAN (5GHz) Idle + Glonass Rx + Earphone 2 + USB Cable 2 (Data Link with Notebook)
	Mode 7: WCDMA Band II Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + GPS Rx + Earphone 1 + USB Cable 3 (Data Link with Notebook)
	Mode 8: LTE Band 38 Idle + Bluetooth Idle + WLAN (5GHz) Idle + Color Bar + Earphone 2 + USB Cable 1 (Charging from Adapter 3)

Test Items	Function Type
Radiated Emissions	Mode 1 : GSM850 Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + NFC On + Earphone 1 + USB Cable 1 (Charging from Adapter 1)
	Mode 2 : WCDMA Band II Idle + Bluetooth Idle + WLAN (5GHz) Idle + Camera (Rear) + Earphone 2 + USB Cable 2 (Charging from Adapter 2)
	Mode 3 : LTE Band 7 Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + Camera (Front) + Earphone 1 + USB Cable 3 (Charging from Adapter 1)
	Mode 4 : LTE Band 38 Idle + Bluetooth Idle + WLAN (5GHz) Idle + Color Bar + Earphone 2 + USB Cable 1 (Charging from Adapter 2)
	Mode 5 : WCDMA Band V Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + GPS Rx + Earphone 1 + USB Cable 1 (Data Link with Notebook)
	Mode 6 : GSM1900 Idle + Bluetooth Idle + WLAN (5GHz) Idle + Glonass Rx + Earphone 2 + USB Cable 2 (Data Link with Notebook)
	Mode 7 : WCDMA Band II Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + GPS Rx + Earphone 1 + USB Cable 3 (Data Link with Notebook)
	Mode 8 : GSM850 Idle + Bluetooth Idle + WLAN (2.4GHz) Idle + NFC On + Earphone 1 + USB Cable 1 (Charging from Adapter 3)
Remark: 1. The worst case of AC is mode 8; only the test data of this mode was reported. 2. The worst case of RE is mode 1; 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



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-5	N/A	N/A	Unshielded, 1.8 m
3.	GPS Station	Pendulum	GSG-54	N/A	N/A	Unshielded, 1.8 m
4.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
5.	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
6.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
7.	iPod	Apple	A1199	FCC DoC	Shielded, 1.0 m	N/A
8.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A
9.	SD Card	SanDisk	MircoSD HC	FCC DoC	N/A	N/A
10.	NFC Card	Metro Taipei	Easy Card	N/A	N/A	N/A



2.4. EUT Operation Test Setup

The EUT was in GSM or WCDMA or LTE 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. Data application is transferred between Laptop and EUT via USB cable.
2. Execute "GPS Test" to make the EUT receive continuous signals from GPS station.
3. Turn on camera to capture images.
4. Turn on the NFC function.
5. Turn on the Color Bar function.

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.

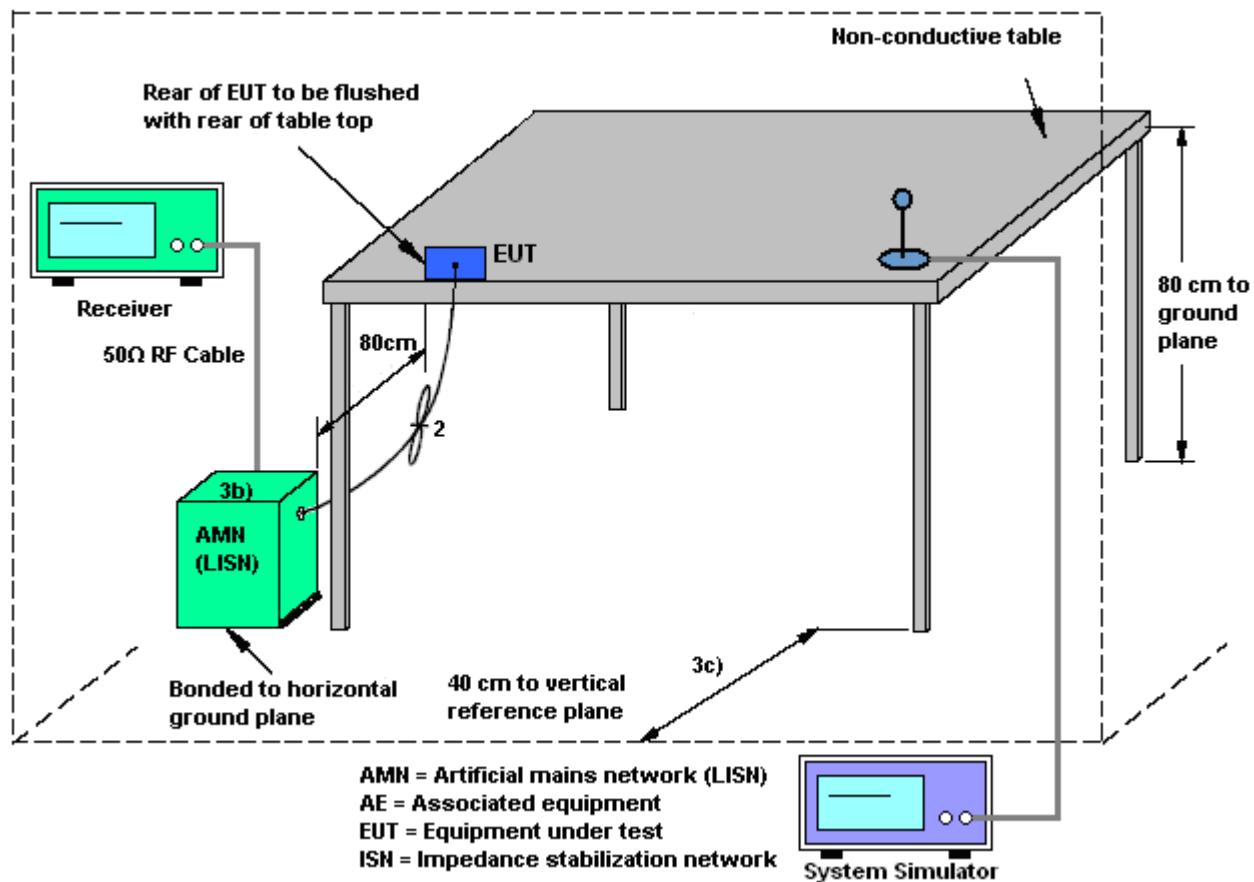
3.1.2 Measuring Instruments

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.

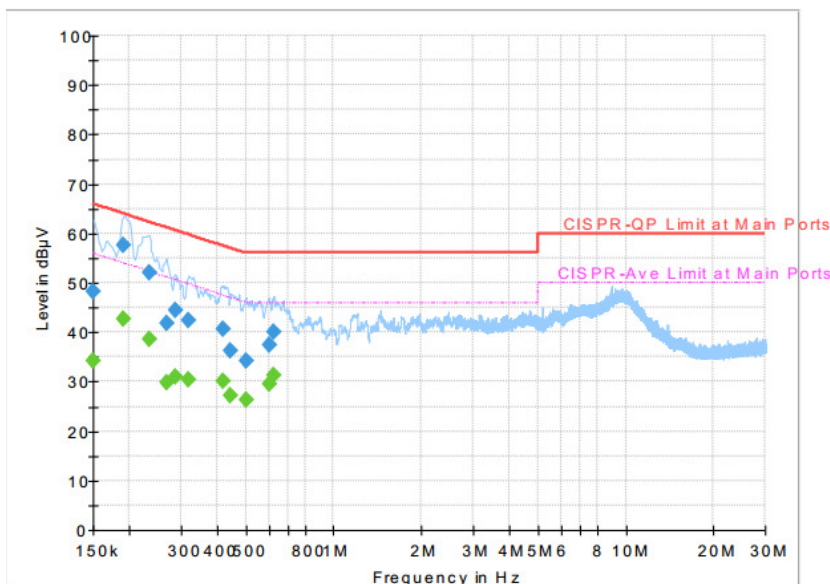
3.1.4 Test Setup





3.1.5 Test Result of AC Conducted Emission

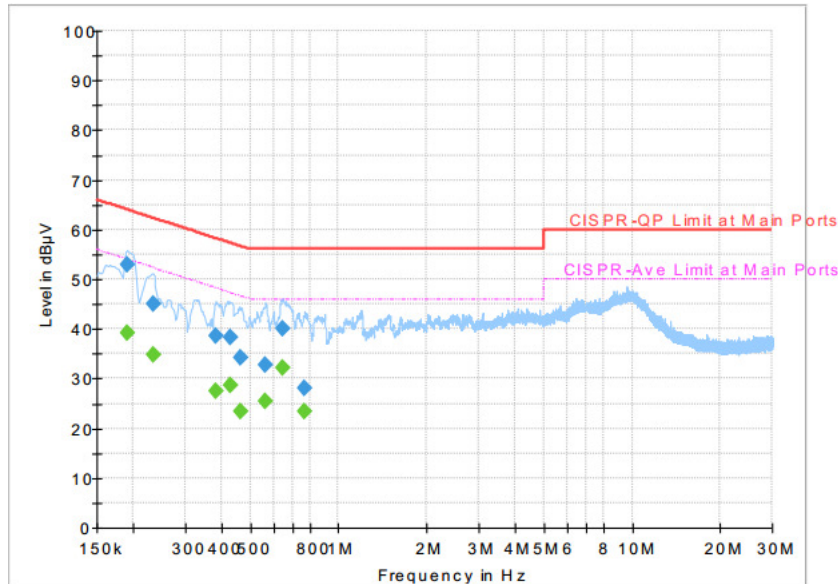
Test Engineer :	Shareef Yu	Temperature :	21~23°C
		Relative Humidity :	53~56%
Test Voltage :	120Vac / 60Hz	Phase :	Line



Final Result :

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.150000	---	34.20	56.00	21.80	L1	OFF	19.5
0.150000	48.14	---	66.00	17.86	L1	OFF	19.5
0.190500	---	42.63	54.02	11.39	L1	OFF	19.5
0.190500	57.57	---	64.02	6.45	L1	OFF	19.5
0.233250	---	38.45	52.33	13.88	L1	OFF	19.5
0.233250	52.05	---	62.33	10.28	L1	OFF	19.5
0.267000	---	29.95	51.21	21.26	L1	OFF	19.5
0.267000	41.93	---	61.21	19.28	L1	OFF	19.5
0.287250	---	31.05	50.60	19.55	L1	OFF	19.5
0.287250	44.34	---	60.60	16.26	L1	OFF	19.5
0.318750	---	30.35	49.74	19.39	L1	OFF	19.5
0.318750	42.46	---	59.74	17.28	L1	OFF	19.5
0.420000	---	30.01	47.45	17.44	L1	OFF	19.5
0.420000	40.79	---	57.45	16.66	L1	OFF	19.5
0.444750	---	27.26	46.97	19.71	L1	OFF	19.5
0.444750	36.38	---	56.97	20.59	L1	OFF	19.5
0.501000	---	26.27	46.00	19.73	L1	OFF	19.5
0.501000	34.33	---	56.00	21.67	L1	OFF	19.5
0.602250	---	29.40	46.00	16.60	L1	OFF	19.5
0.602250	37.33	---	56.00	18.67	L1	OFF	19.5
0.622500	---	31.35	46.00	14.65	L1	OFF	19.5
0.622500	40.20	---	56.00	15.80	L1	OFF	19.5

Test Engineer :	Shareef Yu	Temperature :	21~23°C
		Relative Humidity :	53~56%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral


Final Result :

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.190500	---	39.15	54.02	14.87	N	OFF	19.5
0.190500	52.79	---	64.02	11.23	N	OFF	19.5
0.233250	---	34.90	52.33	17.43	N	OFF	19.5
0.233250	45.04	---	62.33	17.29	N	OFF	19.5
0.384000	---	27.57	48.19	20.62	N	OFF	19.5
0.384000	38.57	---	58.19	19.62	N	OFF	19.5
0.429000	---	28.53	47.27	18.74	N	OFF	19.5
0.429000	38.21	---	57.27	19.06	N	OFF	19.5
0.465000	---	23.28	46.60	23.32	N	OFF	19.5
0.465000	34.21	---	56.60	22.39	N	OFF	19.5
0.561750	---	25.52	46.00	20.48	N	OFF	19.5
0.561750	32.77	---	56.00	23.23	N	OFF	19.5
0.647250	---	32.11	46.00	13.89	N	OFF	19.5
0.647250	40.05	---	56.00	15.95	N	OFF	19.5
0.768750	---	23.38	46.00	22.62	N	OFF	19.5
0.768750	28.00	---	56.00	28.00	N	OFF	19.5

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

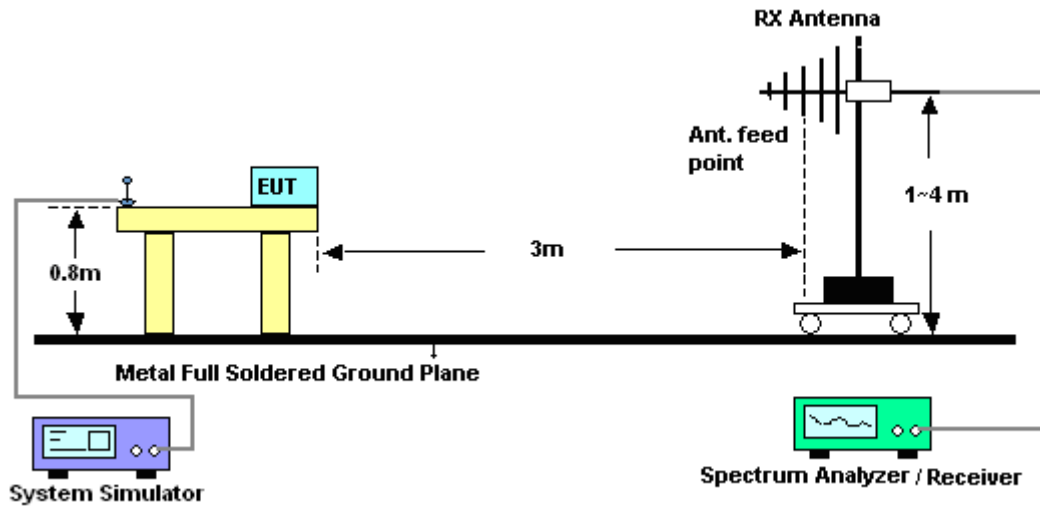
The measuring equipment is listed in the section 4 of this test report.

3.2.3. Test Procedures

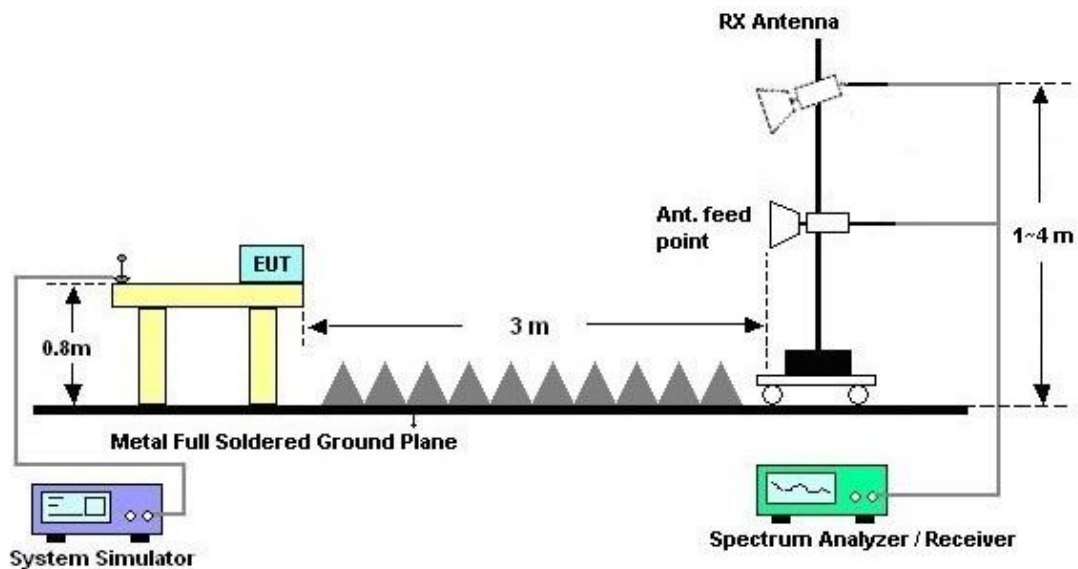
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna 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 - Preamplifier Factor = Level.

3.2.4. Test Setup of Radiated Emission

For radiated emissions from 30MHz to 1GHz

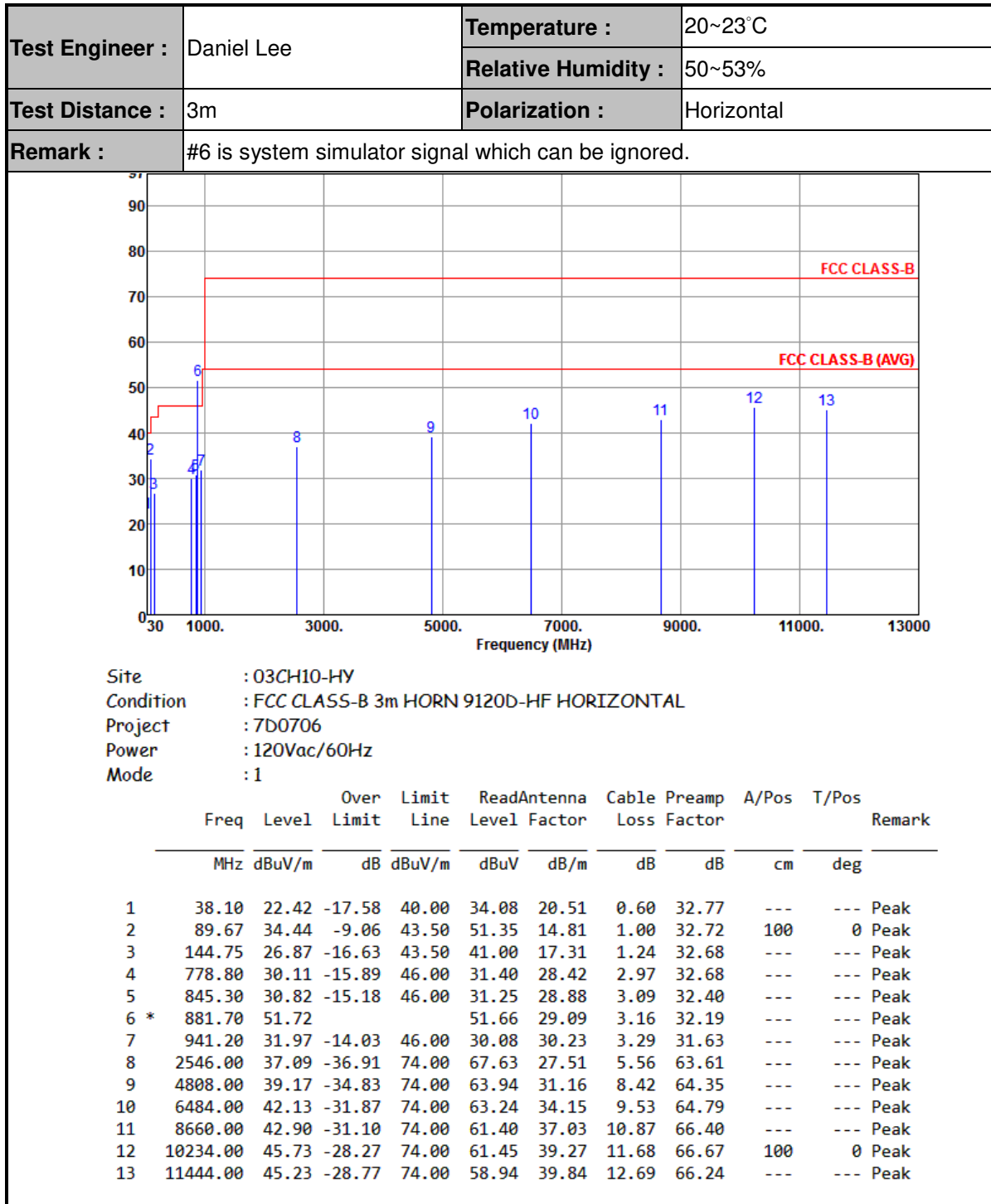


For radiated emissions above 1GHz



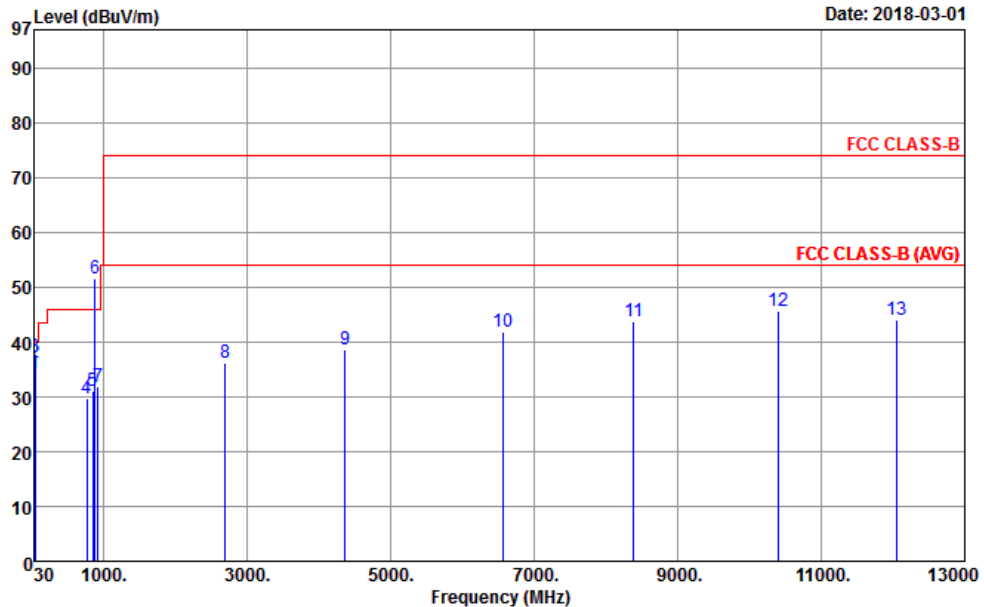


3.2.5. Test Result of Radiated Emission





Test Engineer :	Daniel Lee	Temperature :	20~23°C
		Relative Humidity :	50~53%
Test Distance :	3m	Polarization :	Vertical
Remark :	#6 is system simulator signal which can be ignored.		



Site : 03CH10-HY
Condition : FCC CLASS-B 3m HORN 9120D-HF VERTICAL
Project : 7D0706
Power : 120Vac/60Hz
Mode : 1

	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	cm	deg
1	32.97	34.20	-5.80	40.00	43.29	23.08	0.60	32.77	---	Peak
2	37.02	36.11	-3.89	40.00	47.24	21.04	0.60	32.77	---	Peak
3	40.80	37.35	-2.65	40.00	50.40	18.94	0.78	32.77	100	207 QP
4	771.80	29.83	-16.17	46.00	31.19	28.40	2.93	32.69	---	Peak
5	845.30	31.15	-14.85	46.00	31.58	28.88	3.09	32.40	---	Peak
6 *	881.70	51.48			51.42	29.09	3.16	32.19	---	Peak
7	918.10	31.93	-14.07	46.00	31.31	29.29	3.22	31.89	---	Peak
8	2696.00	36.20	-37.80	74.00	66.28	27.84	5.72	63.64	---	Peak
9	4366.00	38.63	-35.37	74.00	64.51	30.36	7.78	64.02	---	Peak
10	6568.00	41.82	-32.18	74.00	62.76	34.38	9.55	64.87	---	Peak
11	8386.00	43.86	-30.14	74.00	62.56	36.87	10.76	66.33	---	Peak
12	10396.00	45.67	-28.33	74.00	60.76	39.54	11.81	66.44	100	0 Peak
13	12052.00	44.12	-29.88	74.00	58.06	38.94	13.20	66.08	---	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	Feb. 26, 2018~ Mar. 05, 2018	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	3.6GHz	Dec. 08, 2017	Feb. 26, 2018~ Mar. 05, 2018	Dec. 07, 2018	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 30, 2017	Feb. 26, 2018~ Mar. 05, 2018	Nov. 29, 2018	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Dec. 08, 2017	Feb. 26, 2018~ Mar. 05, 2018	Dec. 07, 2018	Conduction (CO05-HY)
Test Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Feb. 26, 2018~ Mar. 05, 2018	N/A	Conduction (CO05-HY)
Amplifier	SONOMA	310N	187311	9kHz~1GHz	Oct. 19, 2017	Feb. 26, 2018~ Mar. 01, 2018	Oct. 18, 2018	Radiation (03CH10-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	35413&02	30MHz~1GHz	Dec. 18, 2017	Feb. 26, 2018~ Mar. 01, 2018	Dec. 17, 2018	Radiation (03CH10-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1325	1GHz ~ 18GHz	Sep. 27, 2017	Feb. 26, 2018~ Mar. 01, 2018	Sep. 26, 2018	Radiation (03CH10-HY)
Preamplifier	Jet-Power	JAP00101800- 30-10P	16011855000 4	1GHz~18GHz	Apr. 13, 2017	Feb. 26, 2018~ Mar. 01, 2018	Apr. 12, 2018	Radiation (03CH10-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200485	10Hz ~ 44GHz	Oct. 31, 2017	Feb. 26, 2018~ Mar. 01, 2018	Oct. 30, 2018	Radiation (03CH10-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Feb. 26, 2018~ Mar. 01, 2018	N/A	Radiation (03CH10-HY)
Turn Table	EMEC	TT 2200	N/A	0~360 Degree	N/A	Feb. 26, 2018~ Mar. 01, 2018	N/A	Radiation (03CH10-HY)
Test Software	Audix	E3 6.2009-8-24	RK-001042	N/A	N/A	Feb. 26, 2018~ Mar. 01, 2018	N/A	Radiation (03CH10-HY)
EMI Test Receiver	Agilent	N9038A(MXE)	MY53290053	20Hz to 26.5GHz	Jan. 16, 2018	Feb. 26, 2018~ Mar. 01, 2018	Jan. 15, 2019	Radiation (03CH10-HY)

5. Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.70
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.60
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.90
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