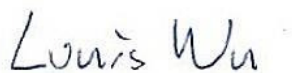


FCC Test Report

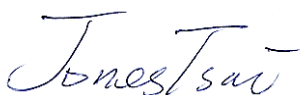
APPLICANT : HMD Global Oy
EQUIPMENT : Smart Phone
BRAND NAME : NOKIA
MODEL NAME : TA-1044
MARKETING NAME : Nokia 5
FCC ID : 2AJOTTA-1044
STANDARD : FCC 47 CFR FCC Part 15 Subpart B
CLASSIFICATION : Certification

The product was received on Jan. 20, 2017 and testing was completed on Mar. 08, 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.



Reviewed by: Louis Wu / Manager



Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

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SPORTON INTERNATIONAL INC.

TEL : 886-3-327-3456

FAX : 886-3-328-4978

FCC ID : 2AJOTTA-1044

Page Number : 1 of 24

Report Issued Date : Mar. 24, 2017

Report Version : Rev. 01

Report Template No.: BU5-FC15B Version 2.0



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FC712016	Rev. 01	Initial issue of report	Mar. 24, 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 13.40 dB at 0.190 MHz
3.2	15.109	Radiated Emission	< 15.109 limits	PASS	Under limit 3.22 dB at 200.100 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, Ant.+, FM Receiver, NFC, and GPS.

Product Specification subjective to this standard	
Antenna Type	WWAN: PIFA Antenna WLAN: PIFA Antenna Bluetooth: PIFA Antenna Ant.+ : 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 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	03CH07-HY

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 30-2, Dingfu Tsuen, Linkou District, New Taipei City, Taiwan 244, R.O.C. TEL: +886-2-2603-5367 / +886-2-2601-1640 FAX: +886-2-2601-1695	
Test Site No.	Sporton Site No.	FCC/IC Registration No.
	OS03-LK	TW1095

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

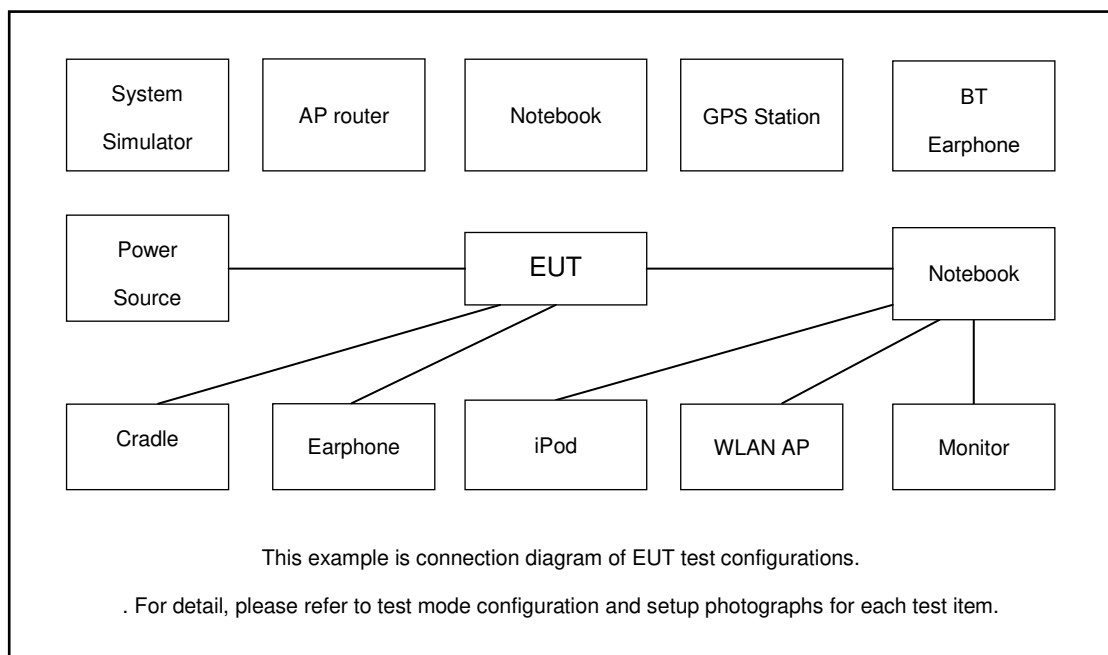
2.1. Test Mode

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) + FM Rx + SIM 1
	Mode 6 : LTE Band 7 Idle + Bluetooth Idle + WLAN (5GHz) Idle + Earphone + USB Cable (Charging from Adapter) + GPS Rx + SIM 2
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) + FM Rx + SIM 1
	Mode 6 : LTE Band 7 Idle + Bluetooth Idle + WLAN (5GHz) Idle + Earphone + USB Cable (Charging from Adapter) + GPS Rx + SIM 2
Remark: - The worst case of AC is mode 6; only the test data of this mode was reported. - The worst case of RE is mode 6; only the test data of this mode was reported. - 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	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	System Simulator	Anritsu	MT8820C	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	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
5.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
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.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
8.	iPod	Apple	A1285	FCC DoC	Unshielded, 1.2 m	N/A
9.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A
10.	SD Card	Transcend	microSDHC 16GB Class 10 UHS-I	FCC DoC	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.

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. Execute "Windows Media Player" to play MPEG4 files.
4. Turn on camera to capture images.
5. EUT links with Notebook and execute ping.

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.

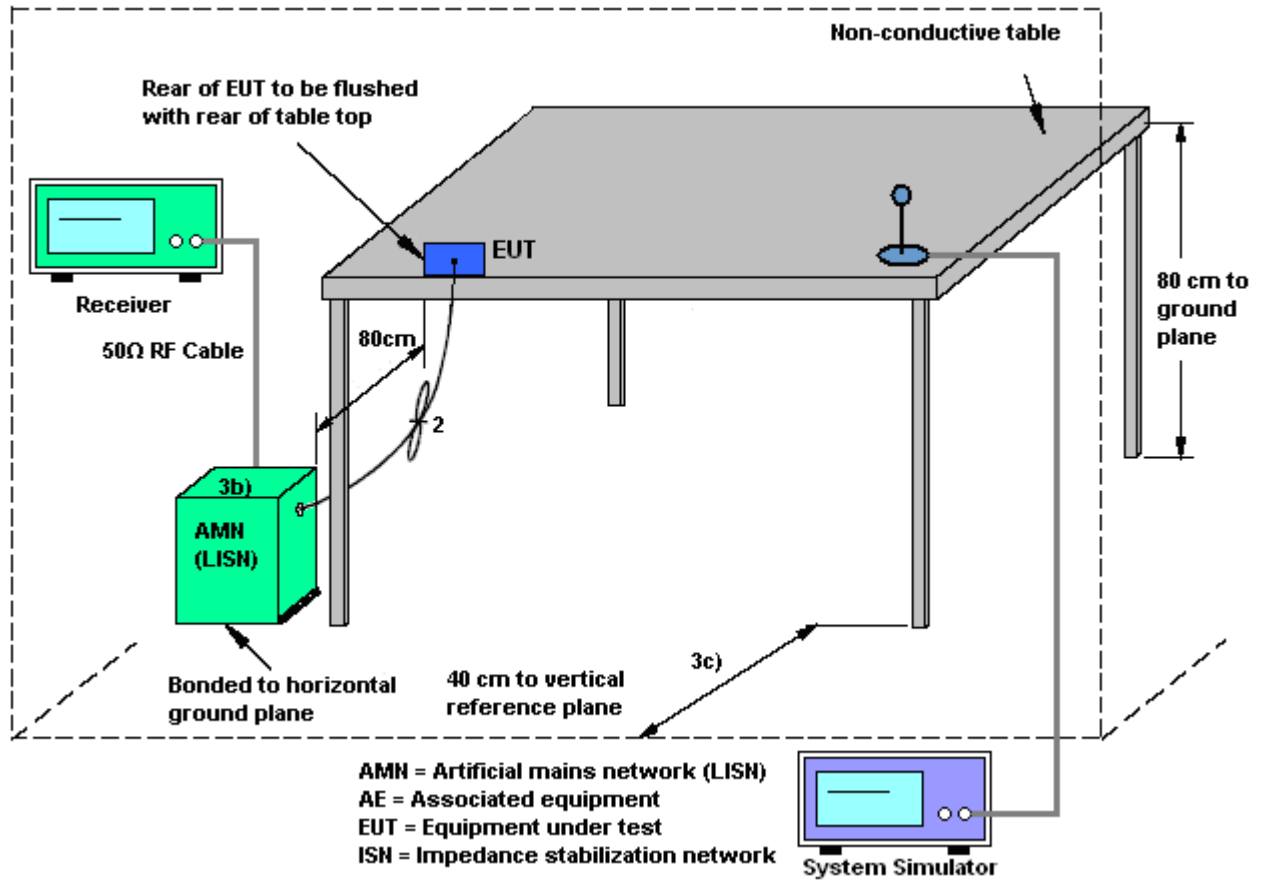
3.1.2 Measuring Instruments

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

3.1.3 Test Procedure

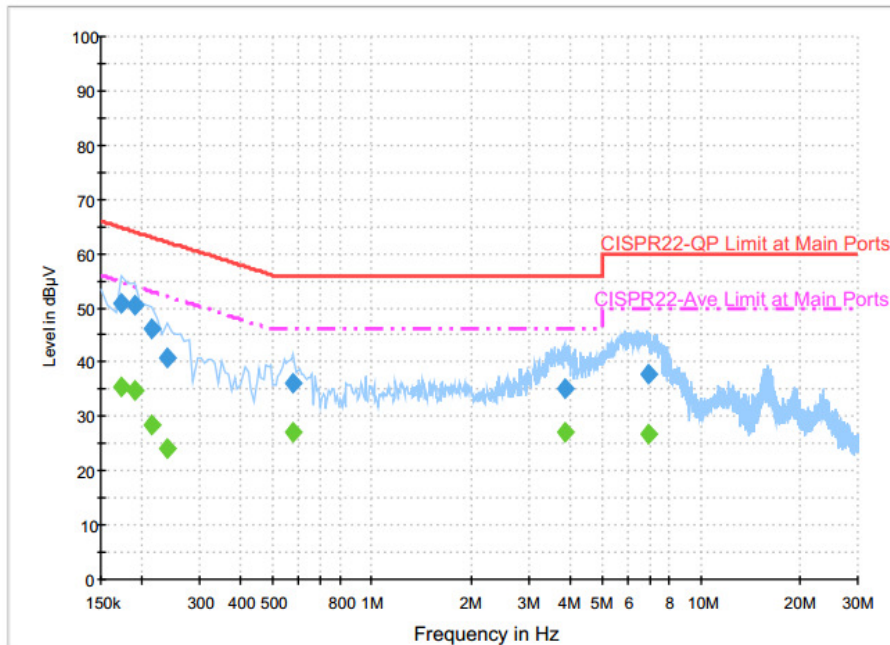
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
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 :	21~22°C
		Relative Humidity :	58~60%
Test Voltage :	120Vac / 60Hz	Phase :	Line



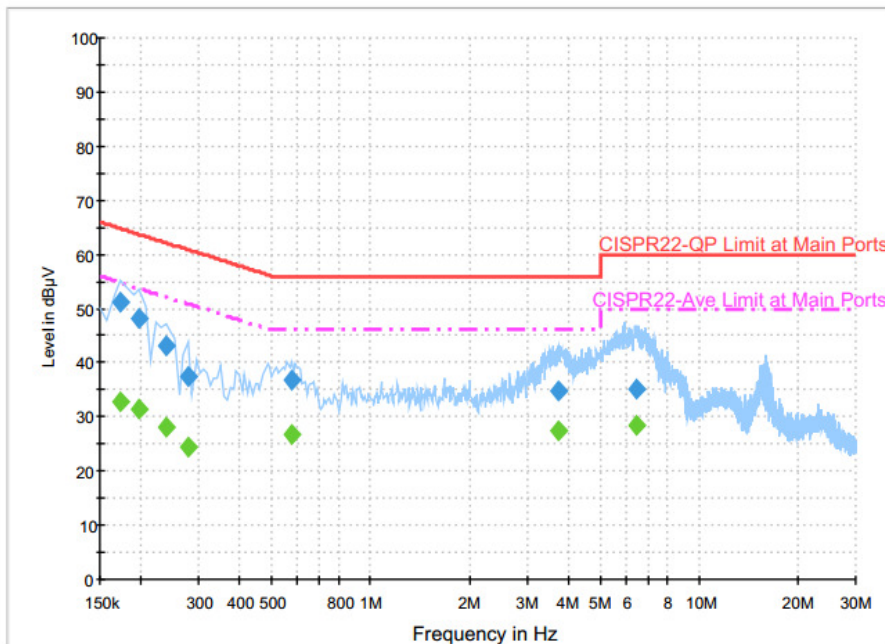
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.174000	50.8	Off	L1	19.5	14.0	64.8
0.190000	50.6	Off	L1	19.5	13.4	64.0
0.214000	46.3	Off	L1	19.5	16.7	63.0
0.238000	40.7	Off	L1	19.5	21.5	62.2
0.574000	36.1	Off	L1	19.5	19.9	56.0
3.854000	35.1	Off	L1	19.6	20.9	56.0
6.910000	37.7	Off	L1	19.6	22.3	60.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.174000	35.3	Off	L1	19.5	19.5	54.8
0.190000	34.9	Off	L1	19.5	19.1	54.0
0.214000	28.4	Off	L1	19.5	24.6	53.0
0.238000	24.1	Off	L1	19.5	28.1	52.2
0.574000	27.0	Off	L1	19.5	19.0	46.0
3.854000	27.1	Off	L1	19.6	18.9	46.0
6.910000	26.8	Off	L1	19.6	23.2	50.0

Test Engineer :	Arthur Hsieh	Temperature :	21~22°C
		Relative Humidity :	58~60%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral


Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.174000	51.1	Off	N	19.5	13.7	64.8
0.198000	48.3	Off	N	19.5	15.4	63.7
0.238000	43.0	Off	N	19.5	19.2	62.2
0.278000	37.3	Off	N	19.5	23.6	60.9
0.574000	36.6	Off	N	19.5	19.4	56.0
3.742000	34.9	Off	N	19.6	21.1	56.0
6.494000	35.2	Off	N	19.6	24.8	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.174000	32.7	Off	N	19.5	22.1	54.8
0.198000	31.6	Off	N	19.5	22.1	53.7
0.238000	28.0	Off	N	19.5	24.2	52.2
0.278000	24.5	Off	N	19.5	26.4	50.9
0.574000	26.7	Off	N	19.5	19.3	46.0
3.742000	27.3	Off	N	19.6	18.7	46.0
6.494000	28.3	Off	N	19.6	21.7	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)
Above 960	500	3

Note: Measurement below 1GHz follows the CISPR 22 limit line as below :

15.109 (g) As an alternative to the radiated emission limits shown in paragraphs (a) and (b) of this section, digital devices may be shown to comply with the standards contained in Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, "Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement"

Frequency (MHz)	Field Strength (dBuV/meter)	Measurement Distance (meters)
30 – 230	30	10
230 – 1000	37	10

3.2.2. Measuring Instruments

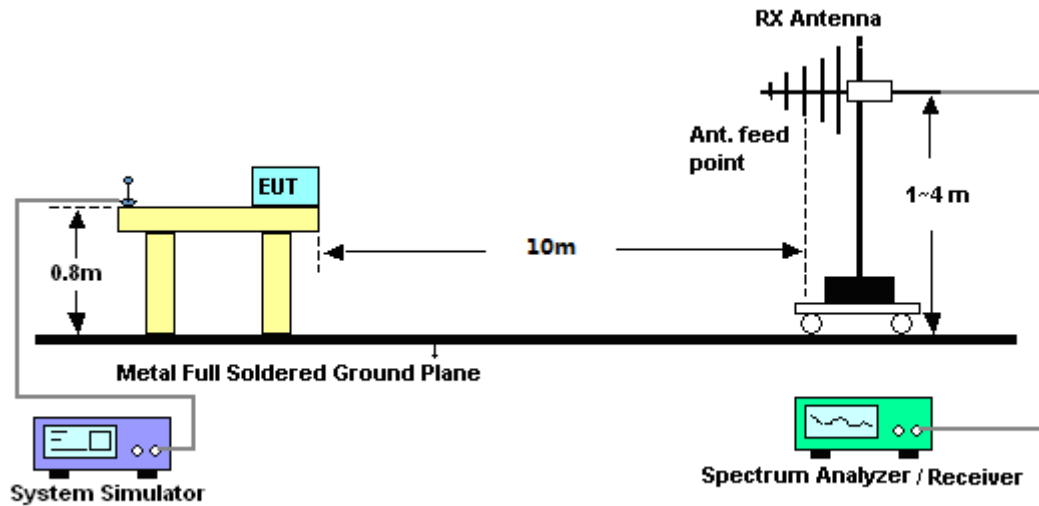
The measuring equipment is listed in the section 4 of this test report.

3.2.3. Test Procedures

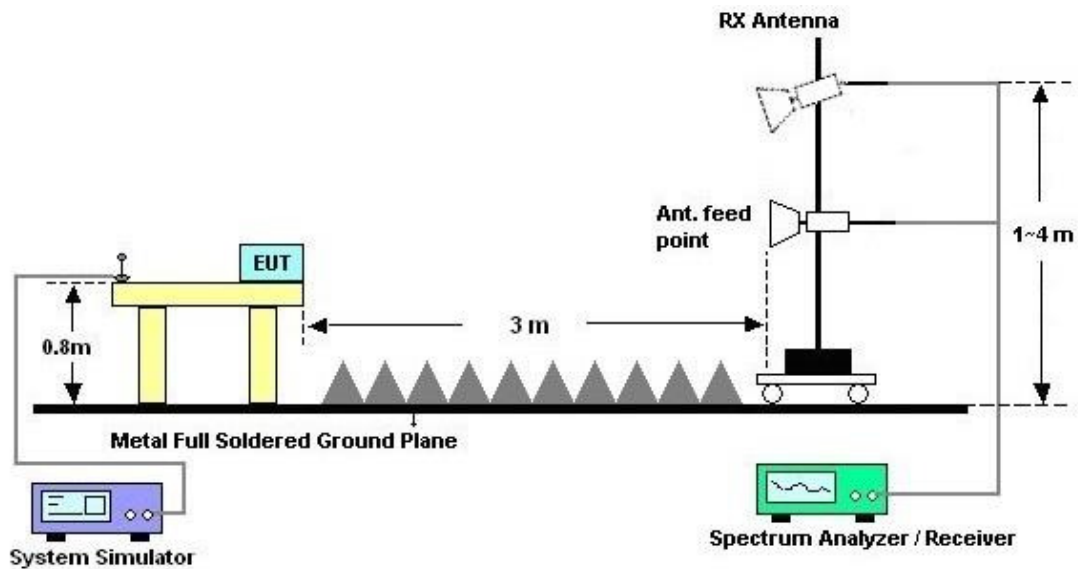
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The EUT was set 10 meters (30M~1G) and 3 meters (1G~ 13G) from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest radiation.
5. 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.
6. 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.
7. 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).
8. 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.
9. Emission level (dB μ V/m) = 20 log Emission level (μ V/m)
10. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

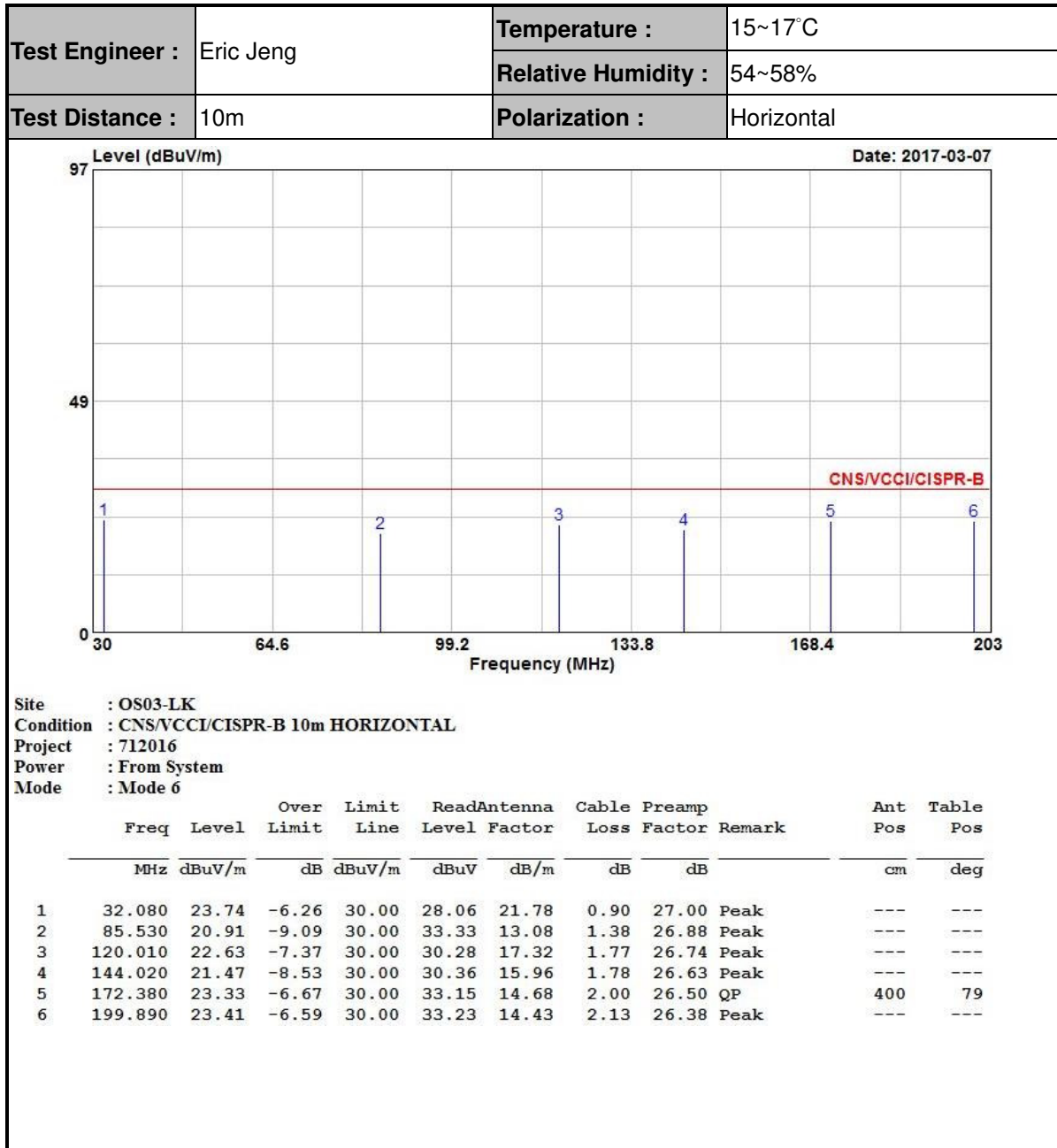
3.2.4. Test Setup of Radiated Emission

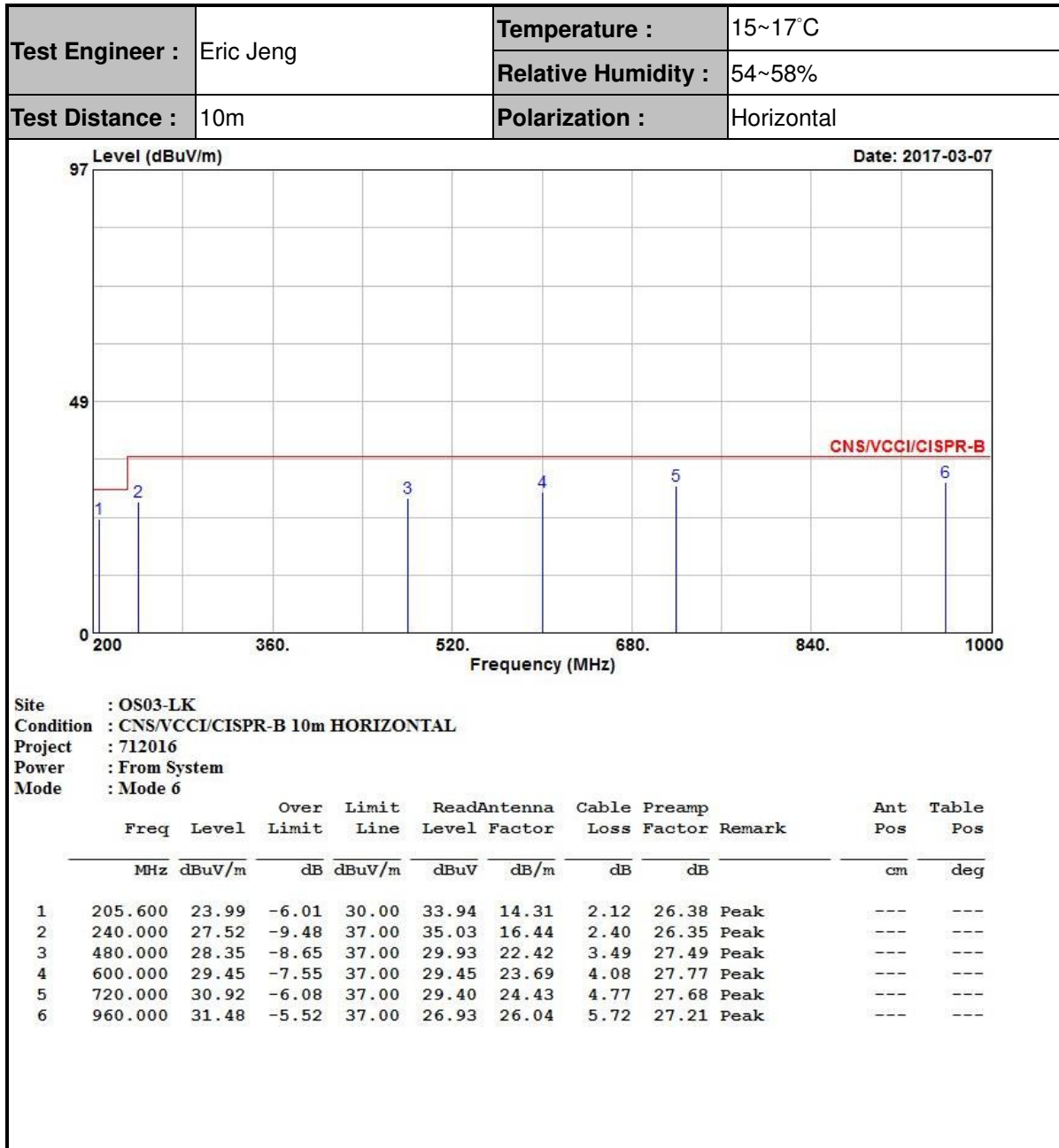
For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz

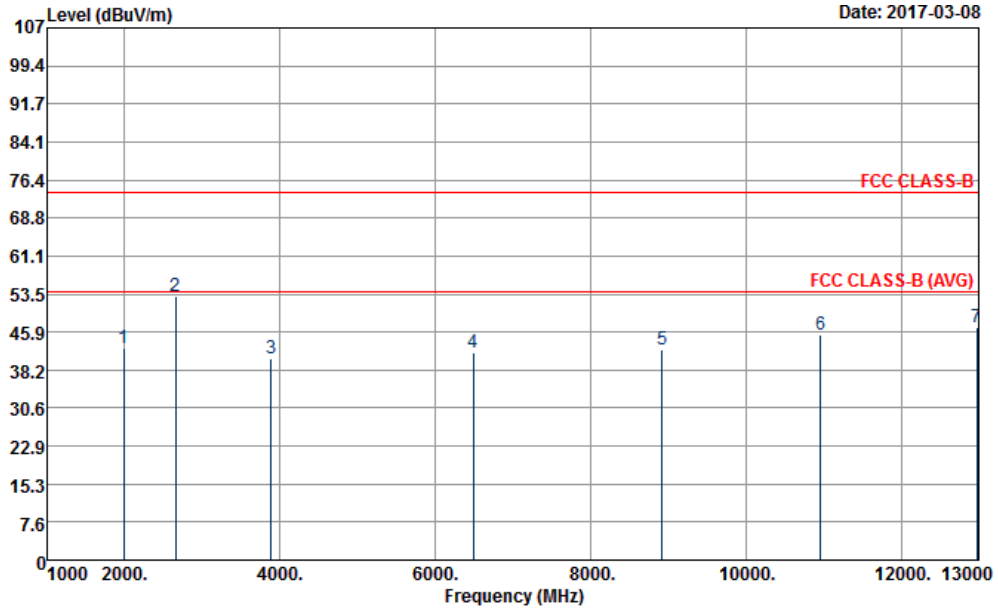


3.2.5. Test Result of Radiated Emission




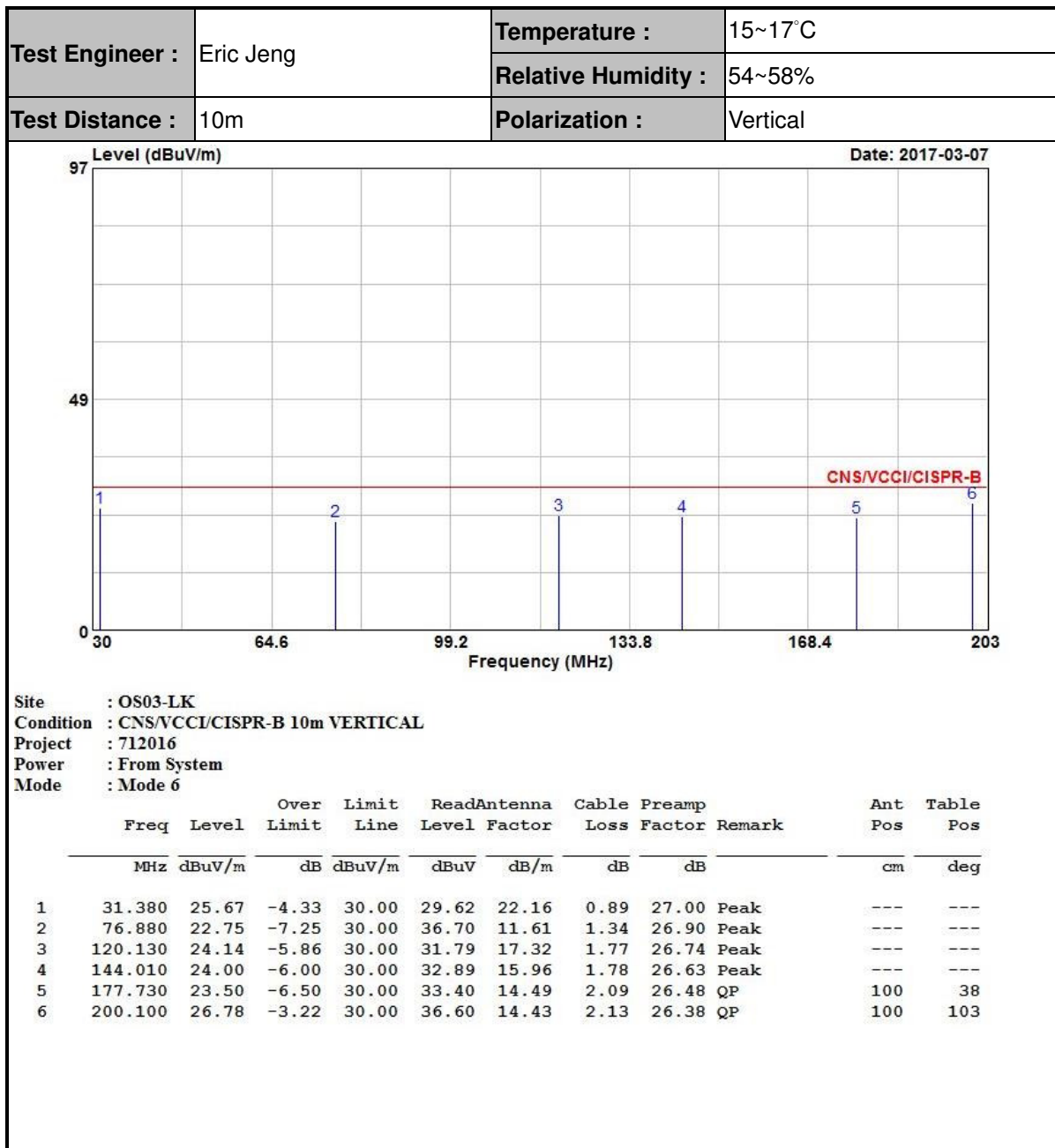


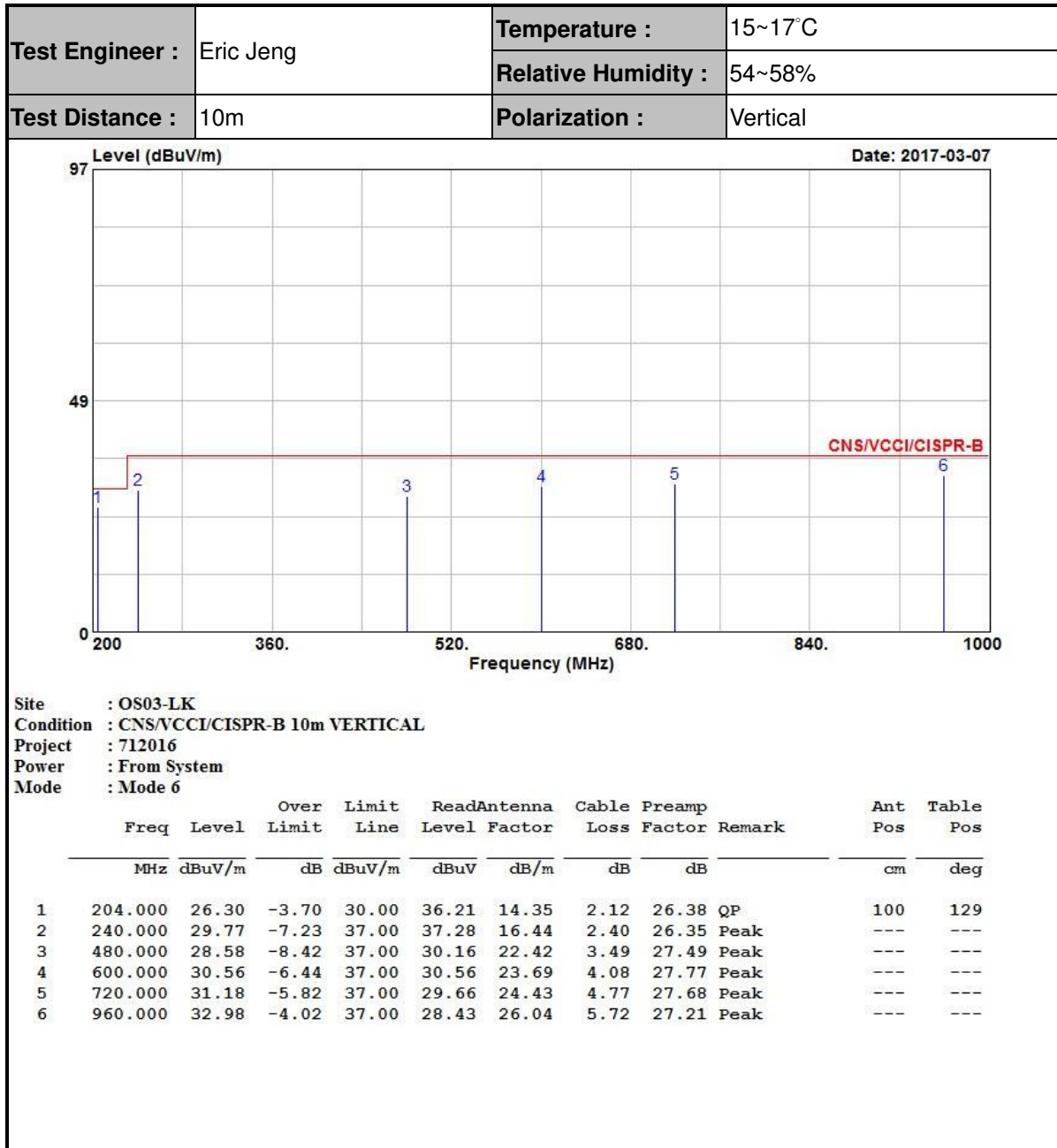
Test Engineer :	Daniel Lee	Temperature :	19~21°C
		Relative Humidity :	47~49%
Test Distance :	3m	Polarization :	Horizontal
Remark :	#2 is system simulator signal which can be ignored.		



Site : 03CH07-HY
 Condition : FCC CLASS-B 3m HF-ANT_130829 HORIZONTAL
 Project : 712016
 Power : FromSystem
 Mode : 6

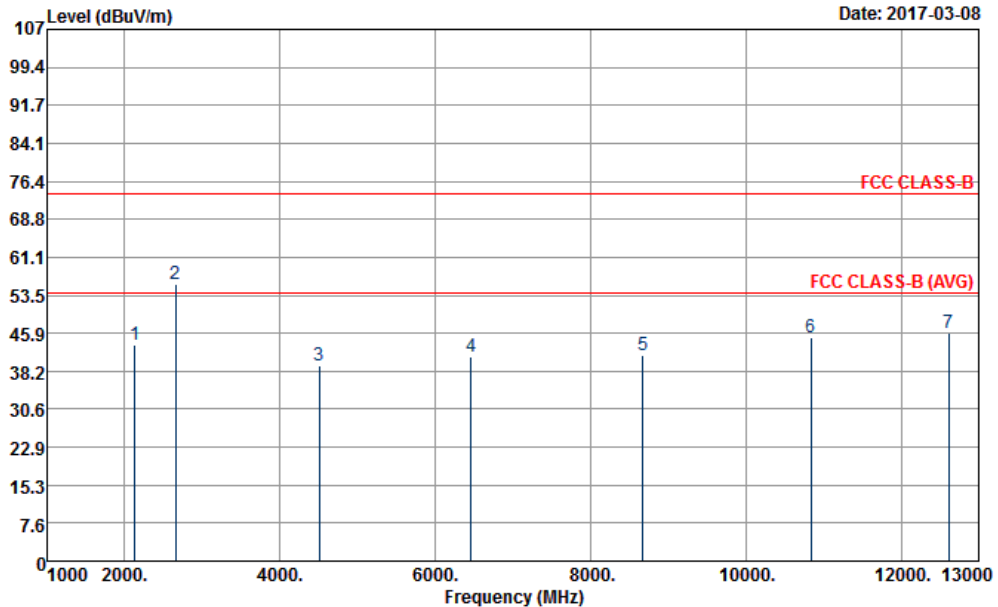
	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	cm	deg
1	1992.00	42.70	-31.30	74.00	62.90	30.92	7.99	59.11	---	---
2	2656.00	52.98			70.97	32.65	8.46	59.10	---	---
3	3884.00	40.65	-33.35	74.00	57.24	32.96	10.27	59.82	---	---
4	6486.00	41.87	-32.13	74.00	48.87	35.57	13.73	56.30	---	---
5	8924.00	42.20	-31.80	74.00	48.02	36.33	16.48	58.63	---	---
6	10962.00	45.20	-28.80	74.00	46.71	38.55	18.39	58.45	---	---
7	12978.00	46.73	-27.27	74.00	45.33	39.20	19.97	57.77	100	0







Test Engineer :	Daniel Lee	Temperature :	19~21°C
		Relative Humidity :	47~49%
Test Distance :	3m	Polarization :	Vertical
Remark :	#2 is system simulator signal which can be ignored.		



Site : 03CH07-HY
 Condition : FCC CLASS-B 3m HF-ANT_130829 VERTICAL
 Project : 712016
 Power : FromSystem
 Mode : 6

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2132.00	43.50	-30.50	74.00	63.00	31.41	8.19	59.10	---	---	Peak
2	2656.00	55.76			73.75	32.65	8.46	59.10	---	---	Peak
3	4510.00	39.28	-34.72	74.00	54.07	34.30	10.61	59.70	---	---	Peak
4	6460.00	41.08	-32.92	74.00	48.26	35.50	13.62	56.30	---	---	Peak
5	8672.00	41.31	-32.69	74.00	46.97	36.13	16.34	58.13	---	---	Peak
6	10844.00	44.93	-29.07	74.00	46.55	38.72	18.28	58.62	---	---	Peak
7	12612.00	46.04	-27.96	74.00	44.21	39.20	19.74	57.11	100	0	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. 09, 2017	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 30, 2016	Feb. 09, 2017	Aug. 29, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 29, 2016	Feb. 09, 2017	Nov. 28, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Dec. 06, 2016	Feb. 09, 2017	Dec. 05, 2017	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 05, 2017	Feb. 09, 2017	Jan. 04, 2018	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 05, 2017	Feb. 09, 2017	Jan. 04, 2018	Conduction (CO05-HY)
Open Area Test Site	SPORTON	OATS-10	OS03-LK	30 MHz ~ 1 GHz 10m, 3m	May 21, 2016	Mar. 07, 2017	May 20, 2017	Radiation (OS03-LK)
Amplifier	HP	8447D	2944A09068	0.1MHz ~ 1.3GHz	Dec. 12, 2016	Mar. 07, 2017	Dec. 10, 2018	Radiation (OS03-LK)
Spectrum Analyzer	R&S	FSP 7	100641	9 kHz ~ 7 GHz	Jun. 23, 2016	Mar. 07, 2017	Jun. 22, 2017	Radiation (OS03-LK)
Test Receiver	R&S	ESCS 30	836858/024	9 kHz ~ 2.75 GHz	Jun. 24, 2016	Mar. 07, 2017	Jun. 23, 2017	Radiation (OS03-LK)
Bilog Antenna with 5dB Attenuator	TESEQ & WOKEN	CBL6112D & 00800N1D01N-05	25236 & 007	30 MHz ~ 1 GHz	Jul. 30, 2016	Mar. 07, 2017	Jul. 29, 2017	Radiation (OS03-LK)
Turn Table	EMCO	2080	9711-2021	0 ~ 360 degree	N/A	Mar. 07, 2017	N/A	Radiation (OS03-LK)
Antenna Mast	EMCO	2075	9711-2115	1 m ~ 4 m	N/A	Mar. 07, 2017	N/A	Radiation (OS03-LK)
RF Cable-R10m	MVE	CFD400E-LW	OS03-2500	30 MHz ~ 1 GHz	Jun. 02, 2016	Mar. 07, 2017	Jun. 01, 2017	Radiation (OS03-LK)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 19, 2016	Mar. 08, 2017	Aug. 18, 2017	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590075	1GHz ~ 18GHz	Apr. 15, 2016	Mar. 08, 2017	Apr. 14, 2017	Radiation (03CH07-HY)
Antenna Mast	Max-Full	MFA520BS	N/A	1m~4m	N/A	Mar. 08, 2017	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Mar. 08, 2017	N/A	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9030A	MY52350276	3Hz~44GHz	Mar. 21, 2016	Mar. 08, 2017	Mar. 20, 2017	Radiation (03CH07-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 30, 2016	Mar. 08, 2017	Aug. 29, 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% ($U = 2U_c(y)$)	2.7
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.1
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.5
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