FCC Test Report

APPLICANT	:	**Nokia Shanghai Bell Co., Ltd.**
EQUIPMENT	:	**FastMile 4G Receiver**
BRAND NAME	:	**Nokia**
MODEL NAME	:	**4G01-C**
FCC ID	:	**2ADZR4G01C**
STANDARD	:	**47 CFR Part 15 Subpart B**
CLASSIFICATION	:	**Certification**

The product was received on Aug. 06, 2020 and testing was completed on Sep. 18, 2020. We, Sporton International (Kunshan) 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 (Kunshan) Inc., the test report shall not be reproduced except in full.

Jason Jia

Reviewed by: Jason Jia / Supervisor

James Huang

Approved by: James Huang / Manager

Sporton International (Kunshan) Inc.
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FC982810-01	Rev. 01	Initial issue of report	Dec. 01, 2020

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 8.46 dB at 0.346 MHz
3.2	15.109	Radiated Emission	< 15.109 limits	PASS	Under limit 6.80 dB at 60.070 MHz for quasi-peak

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1. General Description

1.1. Applicant

Nokia Shanghai Bell Co., Ltd.
388#, Ningqiao Road, China (Shanghai) Pilot Free Trade Zone, Shanghai 201206, China

1.2. Manufacturer

Nokia Shanghai Bell Co., Ltd.
388#, Ningqiao Road, China (Shanghai) Pilot Free Trade Zone, Shanghai 201206, China

1.3. Product Feature of Equipment Under Test

Product Feature	
Equipment	FastMile 4G Receiver
Brand Name	Nokia
Model Name	4G01-C
FCC ID	2ADZR4G01C
EUT supports Radios application	LTE Bluetooth BR/EDR/LE
POE injector	G1344A-530-030 PSE1000
IMEI Code	N/A
HW Version	3TG 01454 AA
SW Version	FASTMILE2_D020107B65T0101M01E0270S
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4. Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	LTE Band 48 : 3552.5 MHz ~ 3697.5 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Rx Frequency	LTE Band 48 : 3552.5 MHz ~ 3697.5 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Antenna Type	WWAN : Patch Antenna Bluetooth : PIFA Antenna
Type of Modulation	LTE: QPSK / 16QAM / 64QAM Bluetooth LE : GFSK Bluetooth (1Mbps) : GFSK Bluetooth (2Mbps) :π/4-DQPSK Bluetooth (3Mbps) : 8-DPSK

1.5. Modification of EUT

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

1.6. Test Location

Sporton International (Kunshan) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International (Kunshan) Inc.		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-KS 03CH02-KS	CN1257	314309

1.7. Test Software

Item	Site	Manufacture	Name	Version
1.	03CH02-KS	AUDIX	E3	6.2009-8-24a
2.	CO01-KS	AUDIX	E3	6.2009-8-24

1.8. Applicable Standards

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

- 47 CFR 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

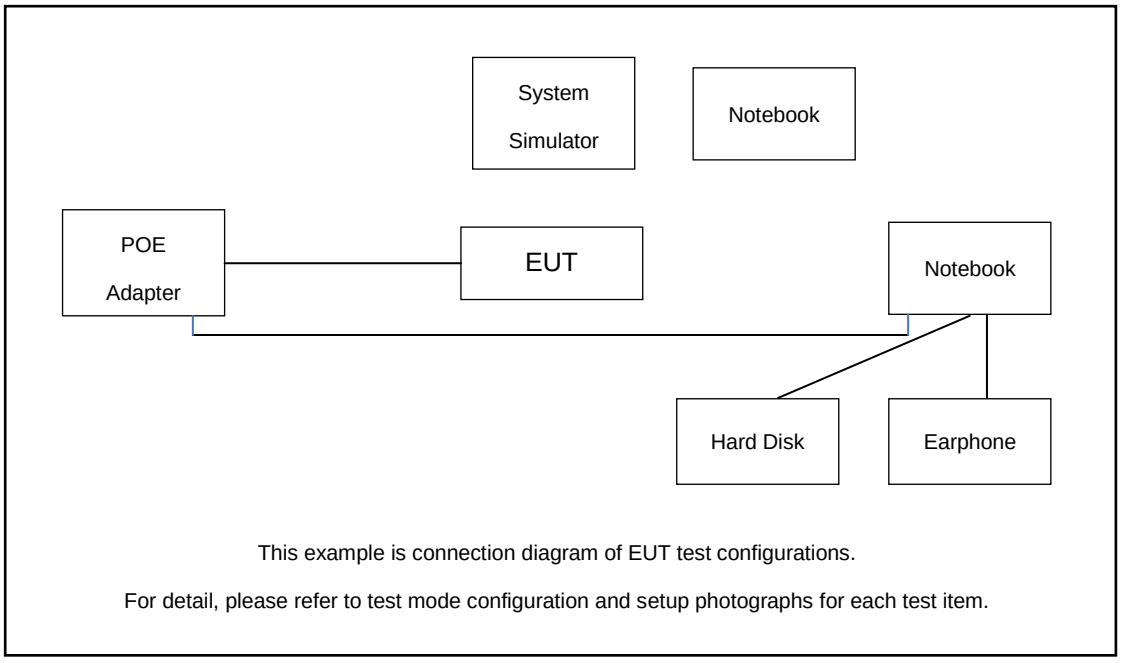
2.1. Test Mode

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: LTE Band 48 Rx (Middle CH) + Bluetooth Idle + POE Charge + POE Data only RJ45 Link with Notebook
Radiated Emissions	Mode 1: LTE Band 48 Rx (Middle CH) + Bluetooth Idle + POE Charge + POE Data only RJ45 Link with 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.

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

2.3. Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	LTE Base Station	Anritsu	MT8821C	N/A	N/A	Unshielded, 1.8m
2.	Notebook	Dell	S730-13IWL	N/A	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
3.	Notebook	Lenovo	V130-15IKB005	N/A	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
4.	Hard Disk	KINGSHARE	KSP6120G	Fcc DoC	Shielded, 1.2m	N/A
5.	Hard Disk	Lenovo	F310	DoC	Shielded, 1.2m	N/A
6.	Earphone	Lenovo	P121	N/A	Unshielded, 1.2m	N/A

2.4. EUT Operation Test Setup

The EUT was in 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.

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.

<Class B Limit>

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.

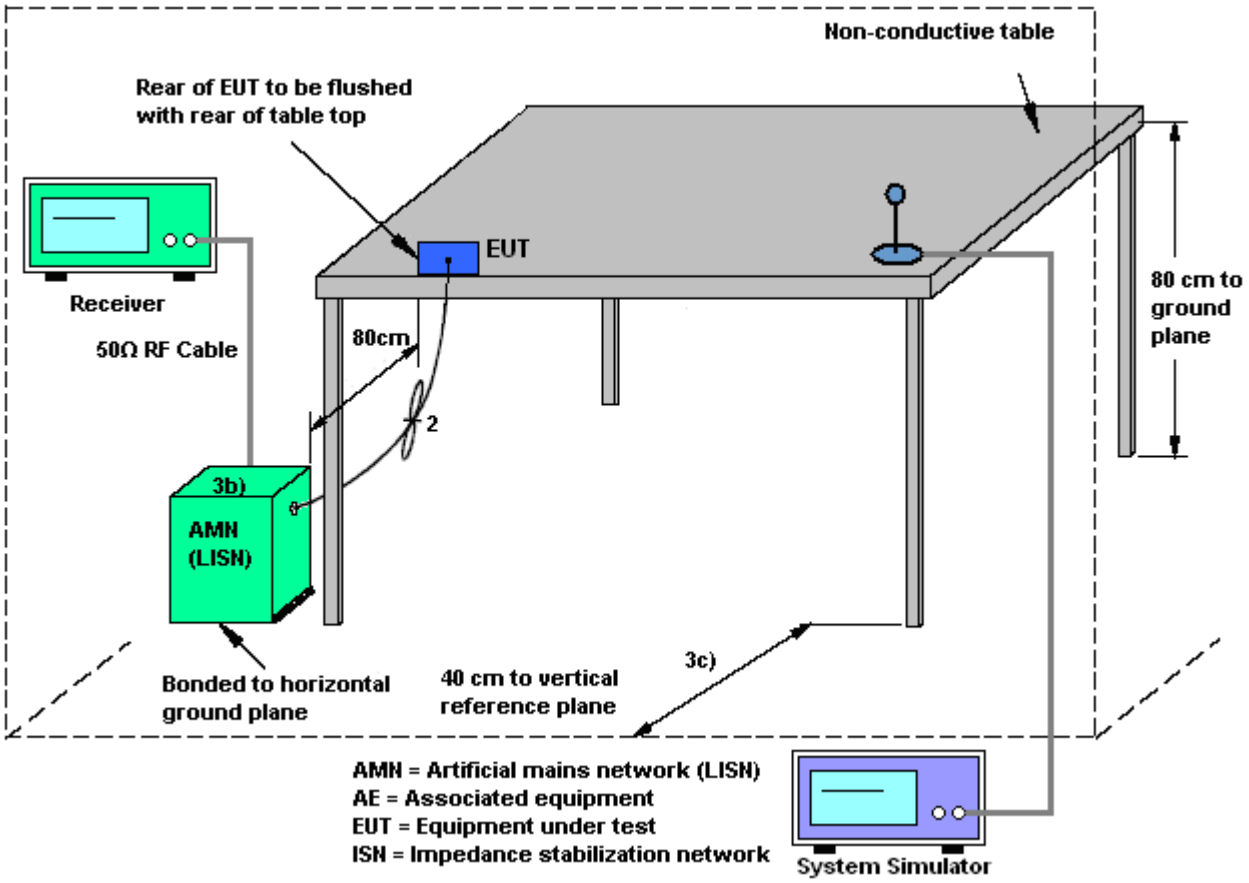
3.1.2 Measuring Instruments

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

3.1.3 Test Procedure

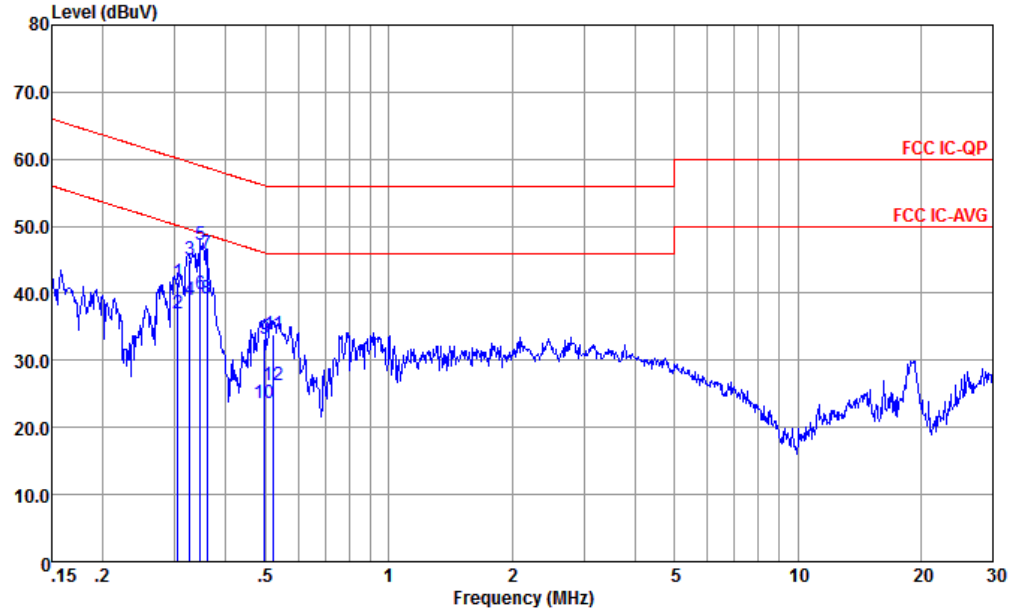
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
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

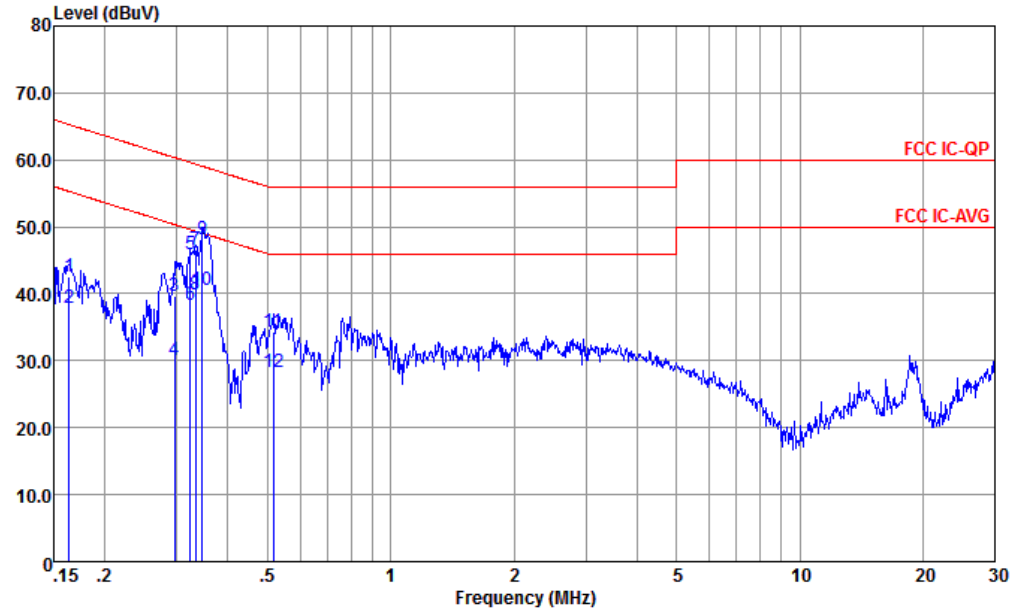
Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line



Site : CO01-KS
Condition : FCC IC-QP LISN-L-191028-CN02 LINE

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.305	41.71	-18.39	60.10	31.29	0.11	10.31	QP
2		0.305	36.91	-13.19	50.10	26.49	0.11	10.31	Average
3		0.327	44.91	-14.62	59.53	34.51	0.11	10.29	QP
4		0.327	39.01	-10.52	49.53	28.61	0.11	10.29	Average
5		0.346	47.20	-11.85	59.05	36.80	0.11	10.29	QP
6	*	0.346	39.80	-9.25	49.05	29.40	0.11	10.29	Average
7		0.360	45.90	-12.84	58.74	35.51	0.11	10.28	QP
8		0.360	39.20	-9.54	48.74	28.81	0.11	10.28	Average
9		0.497	33.17	-22.88	56.05	22.80	0.13	10.24	QP
10		0.497	23.67	-22.38	46.05	13.30	0.13	10.24	Average
11		0.524	33.97	-22.03	56.00	23.60	0.13	10.24	QP
12		0.524	26.27	-19.73	46.00	15.90	0.13	10.24	Average

Test Engineer :	Amos Zhang	Temperature :	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral



Site : CO01-KS
Condition : FCC IC-QP LISN-N-191028-CN02 NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.163	42.50	-22.80	65.30	31.90	0.15	10.45	QP
2	0.163	37.80	-17.50	55.30	27.20	0.15	10.45	Average
3	0.296	39.70	-20.67	60.37	29.20	0.19	10.31	QP
4	0.296	30.10	-20.27	50.37	19.60	0.19	10.31	Average
5	0.323	45.80	-13.82	59.62	35.30	0.20	10.30	QP
6	0.323	38.40	-11.22	49.62	27.90	0.20	10.30	Average
7	0.334	46.59	-12.76	59.35	36.10	0.20	10.29	QP
8	0.334	39.89	-9.46	49.35	29.40	0.20	10.29	Average
9	0.346	48.19	-10.86	59.05	37.70	0.20	10.29	QP
10 *	0.346	40.59	-8.46	49.05	30.10	0.20	10.29	Average
11	0.516	34.37	-21.63	56.00	23.90	0.23	10.24	QP
12	0.516	28.27	-17.73	46.00	17.80	0.23	10.24	Average

Note:

1. Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
2. Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)

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:

<Class B Limit>

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

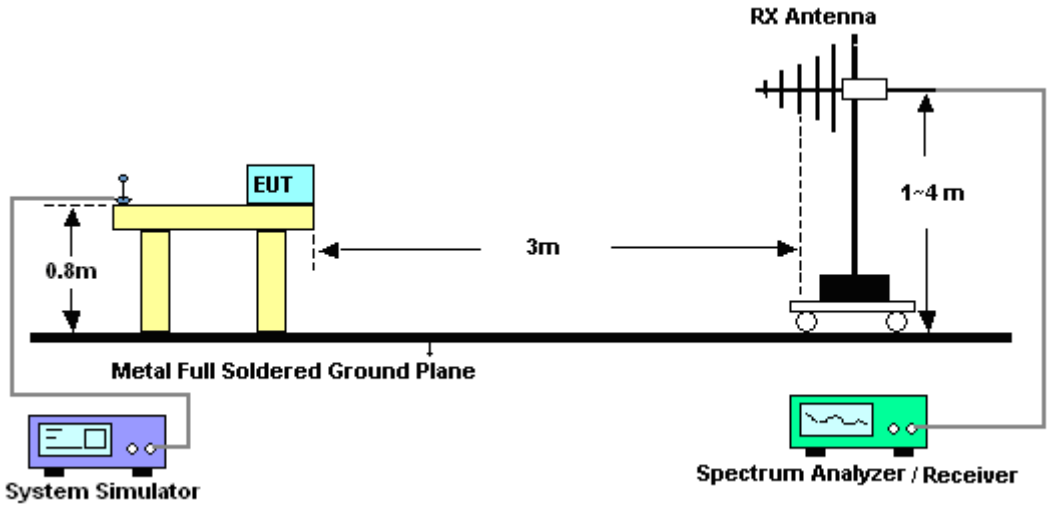
The measuring equipment is listed in the section 4 of this test report.

3.2.3. Test Procedures

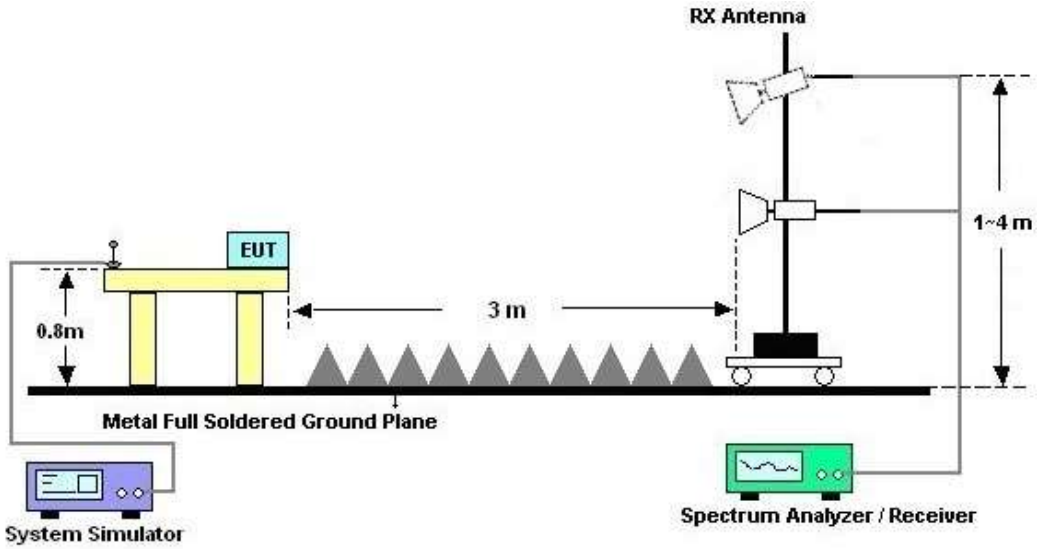
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna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

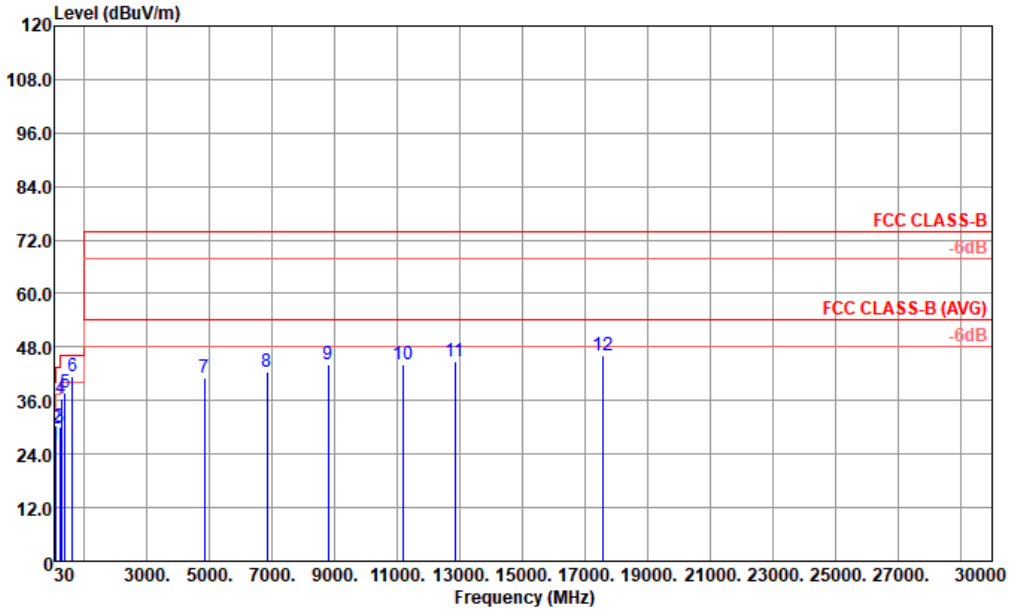


For radiated emissions above 1GHz



3.2.5. Test Result of Radiated Emission

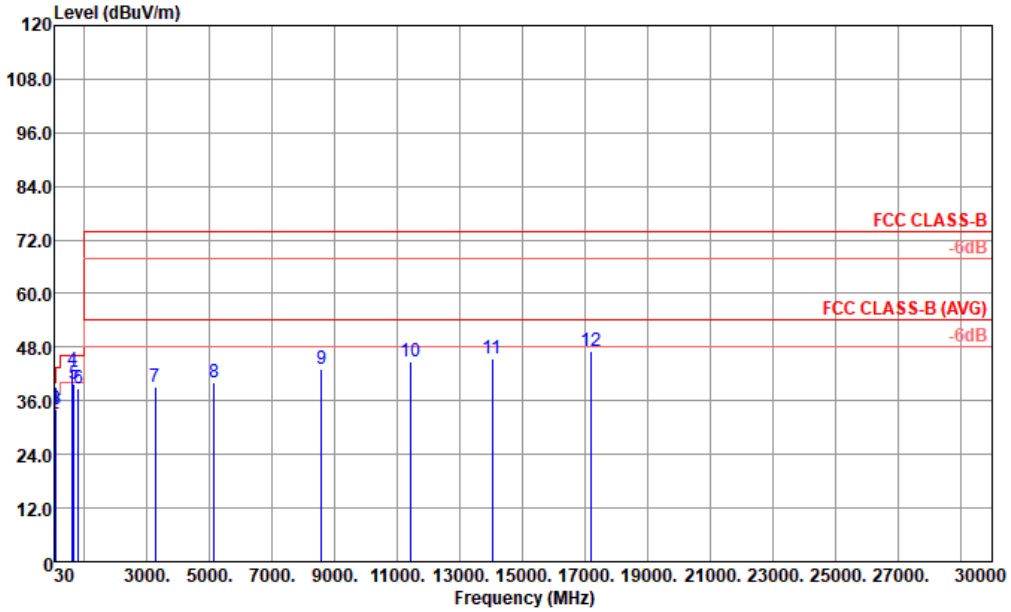
Test Engineer :	Winter Zhang	Temperature :	21~22°C
		Relative Humidity :	41~42%
Test Distance :	3m	Polarization :	Horizontal



Site : 03CH02-KS
Condition : FCC CLASS-B 3m LF 6111D SN44483 HORIZONTAL

	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	60.07	26.20	-13.80	40.00	44.65	11.90	1.75	32.10	---	---	Peak
2	100.81	29.71	-13.79	43.50	43.45	16.19	2.27	32.20	---	---	Peak
3	199.75	29.98	-13.52	43.50	43.79	15.10	3.19	32.10	---	---	Peak
4	250.19	36.30	-9.70	46.00	45.91	19.02	3.57	32.20	---	---	Peak
5	375.32	37.67	-8.33	46.00	44.46	21.10	4.36	32.25	---	---	Peak
6	624.61	41.52	-4.48	46.00	42.01	26.14	5.62	32.25	100	0	Peak
7	4840.00	40.97	-33.03	74.00	24.10	35.55	13.71	32.39	---	---	Peak
8	6832.00	42.30	-31.70	74.00	22.22	36.89	16.03	32.84	---	---	Peak
9	8792.00	43.96	-30.04	74.00	21.64	38.29	18.16	34.13	---	---	Peak
10	11196.00	44.02	-29.98	74.00	18.79	39.54	20.93	35.24	---	---	Peak
11	12834.00	44.63	-29.37	74.00	16.60	40.43	23.16	35.56	---	---	Peak
12	17541.00	46.22	-27.78	74.00	11.02	43.48	26.94	35.22	---	---	Peak

Test Engineer :	Winter Zhang	Temperature :	21~22°C
		Relative Humidity :	41~42%
Test Distance :	3m	Polarization :	Vertical



Site : 03CH02-KS
Condition : FCC CLASS-B 3m LF 6111D SN44483 VERTICAL

	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	32.91	34.78	-5.22	40.00	42.17	23.51	1.30	32.20	---	---	Peak
2	60.07	33.20	-6.80	40.00	51.65	11.90	1.75	32.10	100	56	QP
3	96.93	34.16	-9.34	43.50	48.43	15.71	2.22	32.20	---	---	Peak
4	624.61	42.74	-3.26	46.00	43.23	26.14	5.62	32.25	---	---	Peak
5	649.83	39.90	-6.10	46.00	39.86	26.50	5.74	32.20	---	---	Peak
6	806.97	38.93	-7.07	46.00	36.50	28.35	6.39	32.31	---	---	Peak
7	3248.00	39.01	-34.99	74.00	27.98	33.79	10.88	33.64	---	---	Peak
8	5152.00	40.17	-33.83	74.00	23.16	35.57	13.67	32.23	---	---	Peak
9	8568.00	43.19	-30.81	74.00	21.75	37.69	18.02	34.27	---	---	Peak
10	11430.00	44.87	-29.13	74.00	19.31	39.59	21.25	35.28	---	---	Peak
11	14022.00	45.50	-28.50	74.00	15.57	41.08	23.96	35.11	---	---	Peak
12	17163.00	46.97	-27.03	74.00	12.18	43.30	26.55	35.06	---	---	Peak

Note:

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

4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz;Max 30dBm	Oct. 18, 2019	Sep. 18, 2020	Oct. 17, 2020	Radiation (03CH02-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55370528	10Hz-44G,MAX 30dB	Oct. 18, 2019	Sep. 18, 2020	Oct. 17, 2020	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz-1GHz	Dec. 30, 2019	Sep. 18, 2020	Dec. 29, 2020	Radiation (03CH02-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Nov. 10, 2019	Sep. 18, 2020	Nov. 09, 2020	Radiation (03CH02-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Nov. 10, 2019	Sep. 18, 2020	Nov. 09, 2020	Radiation (03CH02-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Jan. 03, 2020	Sep. 18, 2020	Jan. 02, 2021	Radiation (03CH02-KS)
Amplifier	Keysight	83017A	MY53270316	500MHz~26.5GHz	Oct. 18, 2019	Sep. 18, 2020	Oct. 17, 2020	Radiation (03CH02-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 08, 2020	Sep. 18, 2020	Jan. 07, 2021	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	616010002473	N/A	NCR	Sep. 18, 2020	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Sep. 18, 2020	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Sep. 18, 2020	NCR	Radiation (03CH02-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 14, 2020	Sep. 10, 2020	Apr. 13, 2021	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 18, 2019	Sep. 10, 2020	Oct. 17, 2020	Conduction (CO01-KS)
AC LISN	R&S	ENV216	100334	9kHz~30MHz	Oct. 28, 2019	Sep. 10, 2020	Oct. 27, 2020	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 18, 2019	Sep. 10, 2020	Oct. 17, 2020	Conduction (CO01-KS)

NCR: No Calibration Required.

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))	**2.9dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.9dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.1dB**