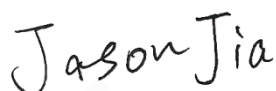


# FCC Test Report


APPLICANT : Nokia Shanghai Bell Co., Ltd.  
EQUIPMENT : Nokia WiFi Beacon 2  
BRAND NAME : Nokia  
MODEL NAME : Beacon 2  
FCC ID : 2ADZRBEACON2  
STANDARD : 47 CFR Part 15 Subpart B  
CLASSIFICATION : Certification

The product was received on Sep. 30, 2020 and testing was completed on Oct. 28, 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.



Reviewed by: Jason Jia / Supervisor



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



## TABLE OF CONTENTS

REVISION HISTORY .....	3
SUMMARY OF TEST RESULT .....	4
1. GENERAL DESCRIPTION .....	5
1.1. Applicant.....	5
1.2. Manufacturer .....	5
1.3. Product Feature of Equipment Under Test .....	5
1.4. Product Specification of Equipment Under Test .....	6
1.5. Modification of EUT .....	6
1.6. Test Location .....	6
1.7. Test Software .....	7
1.8. Applicable Standards .....	7
2. TEST CONFIGURATION OF EQUIPMENT UNDER TEST .....	8
2.1. Test Mode .....	8
2.2. Connection Diagram of Test System .....	9
2.3. Support Unit used in test configuration and system .....	9
2.4. EUT Operation Test Setup .....	10
3. TEST RESULT .....	11
3.1. Test of AC Conducted Emission Measurement .....	11
3.2. Test of Radiated Emission Measurement .....	15
4. LIST OF MEASURING EQUIPMENT .....	20
5. UNCERTAINTY OF EVALUATION .....	21
APPENDIX A. SETUP PHOTOGRAPHS	



## REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FC093003	Rev. 01	Initial issue of report	Dec. 07, 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 1.83 dB at 0.417 MHz
3.2	15.109	Radiated Emission	< 15.109 limits	PASS	Under limit 8.55 dB at 60.070 MHz

**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.

No.388, Ningqiao Rd, Pilot Free Trade Zone Shanghai, 201206 P.R. China

### 1.2. Manufacturer

Nokia Shanghai Bell Co., Ltd.

No.388, Ningqiao Rd, Pilot Free Trade Zone Shanghai, 201206 P.R. China

### 1.3. Product Feature of Equipment Under Test

Product Feature	
Equipment	Nokia WiFi Beacon 2
Brand Name	Nokia
Model Name	Beacon 2
FCC ID	2ADZRBEACON2
EUT supports Radios application	WLAN 2.4GHz 802.11b/g/n (HT20/HT40) WLAN 2.4GHz 802.11ax (HE20/HE40) WLAN 5GHz 802.11a/n/ac (HT20/HT40/VHT20/VHT40/ VHT80) WLAN 5GHz 802.11ax (HE20/HE40/HE80)
HW Version	V1.0
SW Version	3FE49334
EUT Stage	Identical Prototype

**Remark:**

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. There are two types of EUT sample 1 and sample 2, the differences between two samples are only for Antenna.

## 1.4. Product Specification of Equipment Under Test

Standards-related Product Specification	
<b>Tx Frequency</b>	802.11b/g/n/ax: 2412 MHz ~ 2462 MHz 802.11a/n/ac/ax: 5180 MHz ~ 5240 MHz; 5260 MHz ~ 5320 MHz; 5500 MHz ~ 5720 MHz 5745 MHz ~ 5825 MHz
<b>Rx Frequency</b>	802.11b/g/n/ax: 2412 MHz ~ 2462 MHz 802.11a/n/ac/ax: 5180 MHz ~ 5240 MHz; 5260 MHz ~ 5320 MHz; 5500 MHz ~ 5720 MHz 5745 MHz ~ 5825 MHz
<b>Antenna Type</b>	WLAN : Dipole Antenna
<b>Type of Modulation</b>	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11a/g/n/ac/ax: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM)

## 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.

<b>Test Firm</b>	Sporton International (Kunshan) Inc.		
<b>Test Site Location</b>	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		
<b>Test Site No.</b>	<b>Sporton Site No.</b>	<b>FCC Designation No.</b>	<b>FCC Test Firm Registration No.</b>
	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

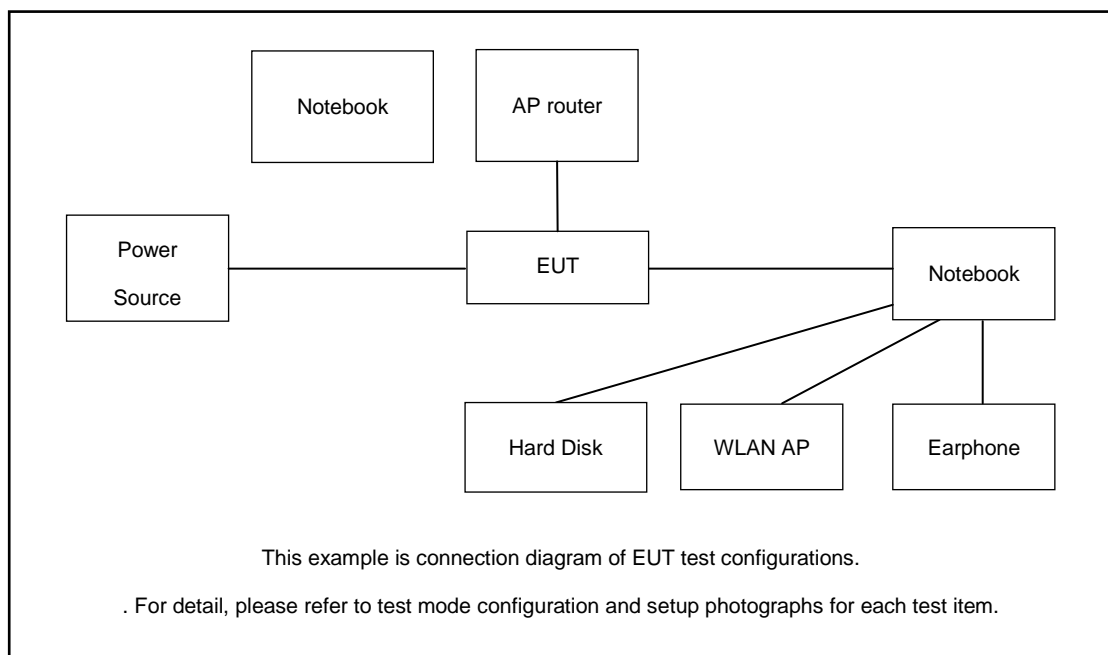
The EUT has been associated with peripherals pursuant to ANSI C63.4-2014 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

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: LAN Link + WAN Link + Adapter 1 for sample 1 Mode 2: LAN Link + WAN Link + Adapter 2 for sample 1
Radiated Emissions	Mode 1: LAN Link + WAN Link + Adapter 1 for sample 1 Mode 2: LAN Link + WAN Link + Adapter 2 for sample 1 Mode 3: LAN Link + WAN Link + Adapter 2 for sample 2
<b>Remark:</b> <ol style="list-style-type: none"><li>1. The worst case of AC is mode 1; only the test data of this mode is reported.</li><li>2. The worst case of RE is mode 2; only the test data of this mode is reported.</li></ol>	



## 2.2.Connection Diagram of Test System



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.	WLAN AP	D-link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m
2.	Notebook	Lenovo	V130-141K B001	N/A	N/A	shielded cable DC O/P 1.8m , Unshielded AC I/P cable 1.8m
3.	Notebook	Lenovo	V130-15IKB005	N/A	N/A	shielded cable DC O/P 1.8m , Unshielded AC I/P cable 1.8m
4.	Hard Disk	Lenovo	F310	DoC	Shielded, 1.2m	N/A
5.	Earphone	Lenovo	P121	N/A	N/A	Unshielded,1.2m



## **2.4. EUT Operation Test Setup**

The EUT was set in engineer test mode by software controlled via Notebook, and make the LAN/WLAN in Link mode.

### 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.

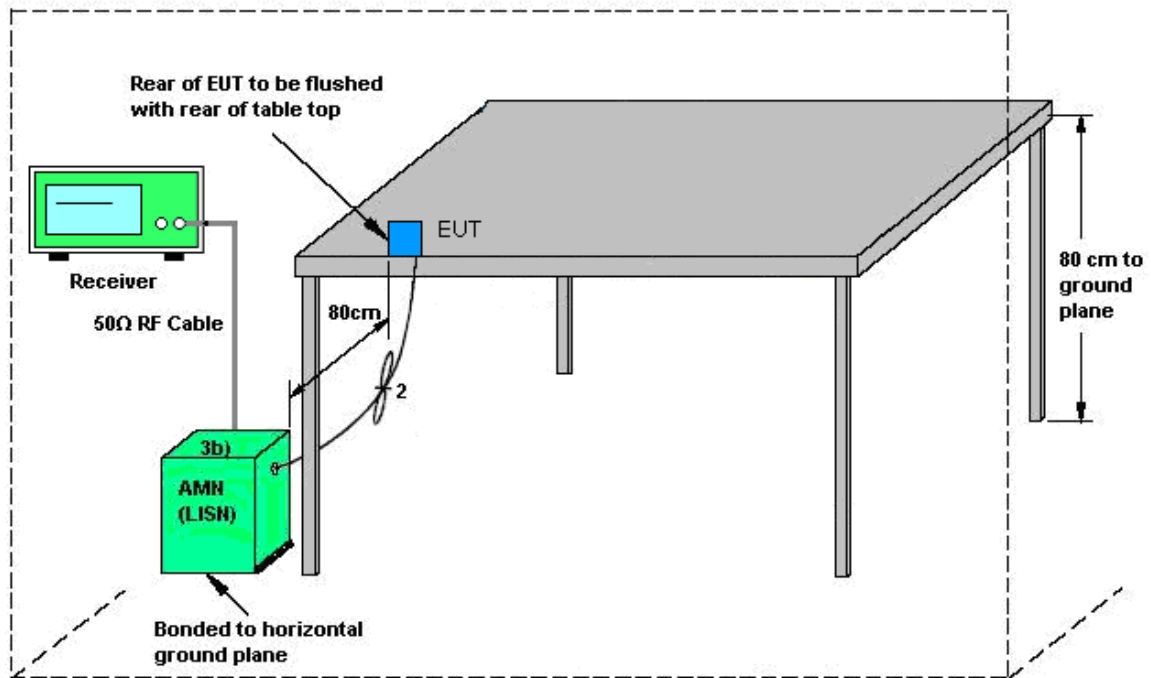
##### 3.1.2 Measuring Instruments

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.

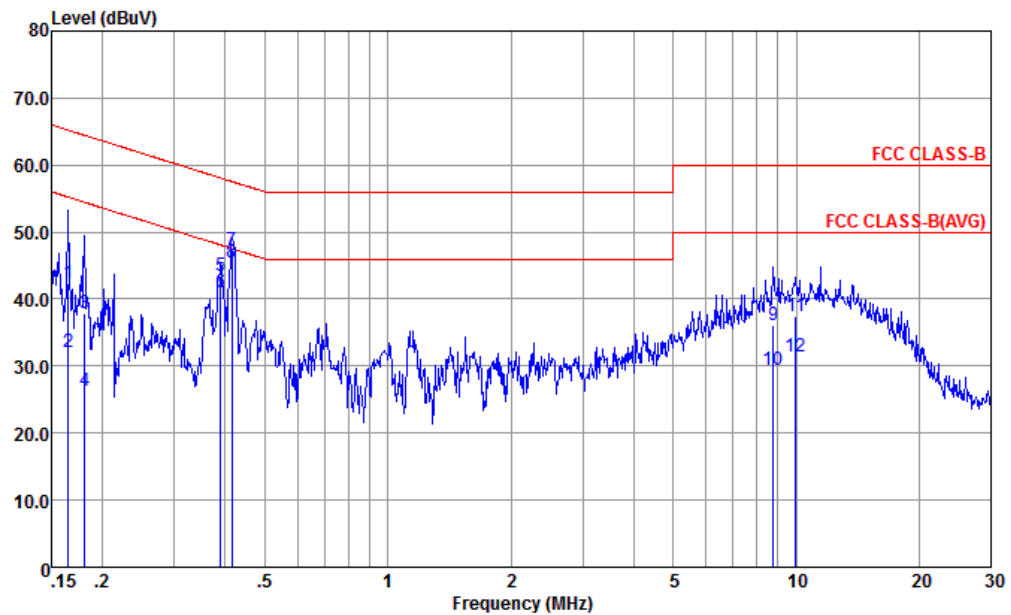
### 3.1.4 Test Setup



AMN = Artificial mains network (LISN)  
 AE = Associated equipment  
 EUT = Equipment under test  
 ISN = Impedance stabilization network

### 3.1.5 Test Result of AC Conducted Emission

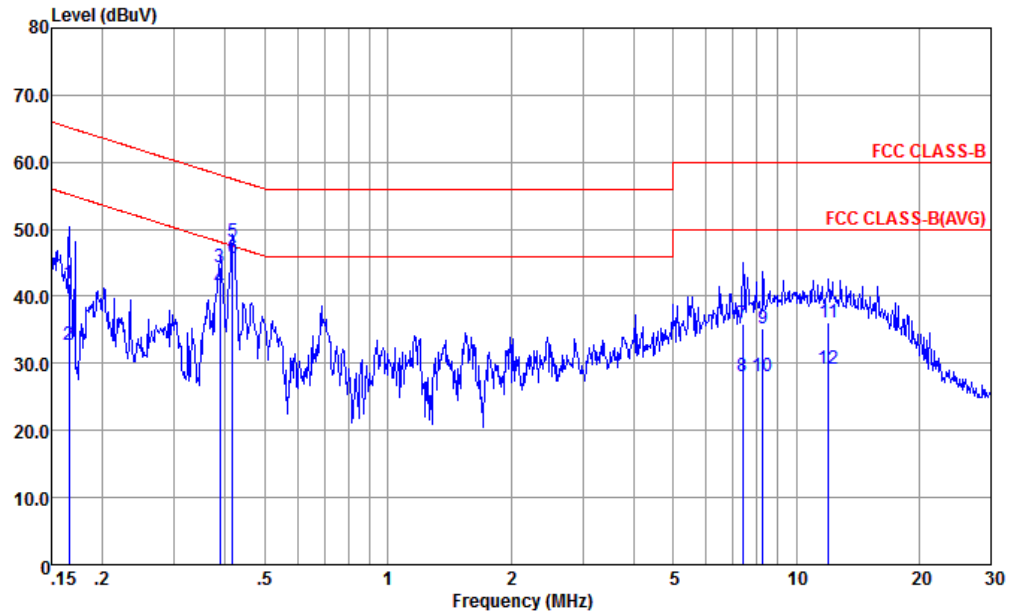
<b>Test Engineer :</b>	Amos Zhang	<b>Temperature :</b>	25.3 ~26.2°C
		<b>Relative Humidity :</b>	38~40%
<b>Test Voltage :</b>	120Vac / 60Hz	<b>Phase :</b>	Line
<b>Remark :</b>	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS  
Condition : FCC CLASS-B LISN-L-191028-CN02 LINE

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.165	42.42	-22.79	65.21	31.90	0.08	10.44	QP
2	0.165	32.02	-23.19	55.21	21.50	0.08	10.44	Average
3	0.181	37.99	-26.47	64.46	27.51	0.08	10.40	QP
4	0.181	26.39	-28.07	54.46	15.91	0.08	10.40	Average
5	0.389	43.49	-14.59	58.08	33.10	0.12	10.27	QP
6	0.389	40.99	-7.09	48.08	30.60	0.12	10.27	Average
7	0.415	47.18	-10.37	57.55	36.80	0.12	10.26	QP
8 *	0.415	45.48	-2.07	47.55	35.10	0.12	10.26	Average
9	8.776	36.12	-23.88	60.00	24.90	0.89	10.33	QP
10	8.776	29.42	-20.58	50.00	18.20	0.89	10.33	Average
11	9.966	37.39	-22.61	60.00	26.10	0.95	10.34	QP
12	9.966	31.49	-18.51	50.00	20.20	0.95	10.34	Average

<b>Test Engineer :</b>	Amos Zhang	<b>Temperature :</b>	25.3 ~26.2°C
		<b>Relative Humidity :</b>	38~40%
<b>Test Voltage :</b>	120Vac / 60Hz	<b>Phase :</b>	Neutral
<b>Remark :</b>	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS  
Condition : FCC CLASS-B LISN-N-191028-CN02 NEUTRAL

	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1	0.166	41.80	-23.36	65.16	31.20	0.16	10.44	QP
2	0.166	32.70	-22.46	55.16	22.10	0.16	10.44	Average
3	0.387	44.28	-13.84	58.12	33.80	0.21	10.27	QP
4	0.387	41.28	-6.84	48.12	30.80	0.21	10.27	Average
5	0.417	48.08	-9.43	57.51	37.60	0.22	10.26	QP
6 *	0.417	45.68	-1.83	47.51	35.20	0.22	10.26	Average
7	7.407	35.83	-24.17	60.00	24.50	1.02	10.31	QP
8	7.407	28.03	-21.97	50.00	16.70	1.02	10.31	Average
9	8.279	35.20	-24.80	60.00	23.80	1.08	10.32	QP
10	8.279	28.00	-22.00	50.00	16.60	1.08	10.32	Average
11	11.996	35.99	-24.01	60.00	24.09	1.53	10.37	QP
12	11.996	29.19	-20.81	50.00	17.29	1.53	10.37	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.

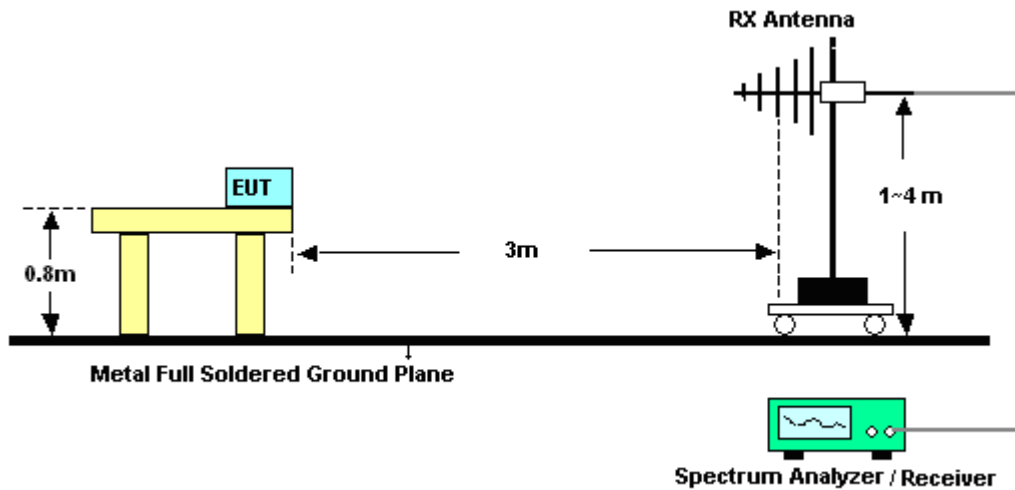
### 3.2.3. Test Procedures

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 (dB $\mu$ V/m) = 20 log Emission level ( $\mu$ V/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

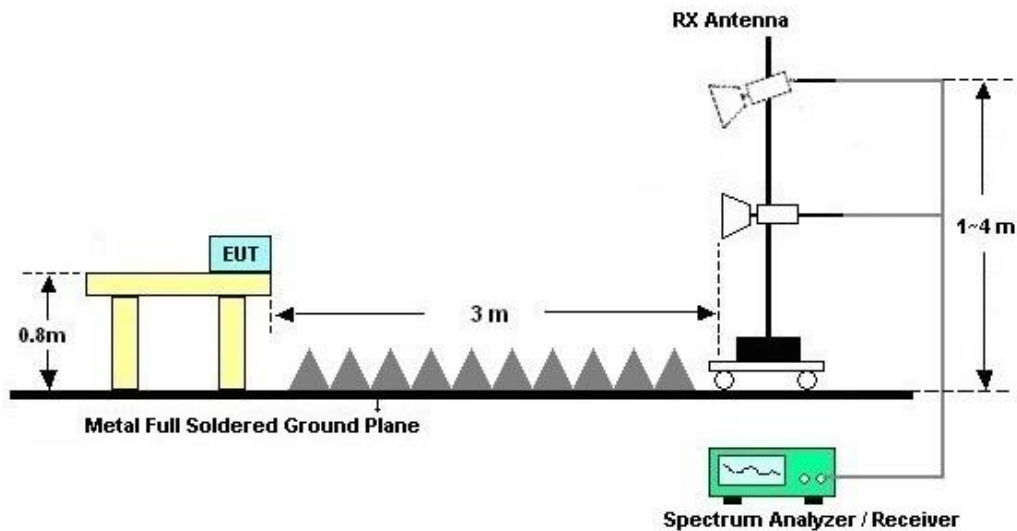


### 3.2.4. Test Setup of Radiated Emission

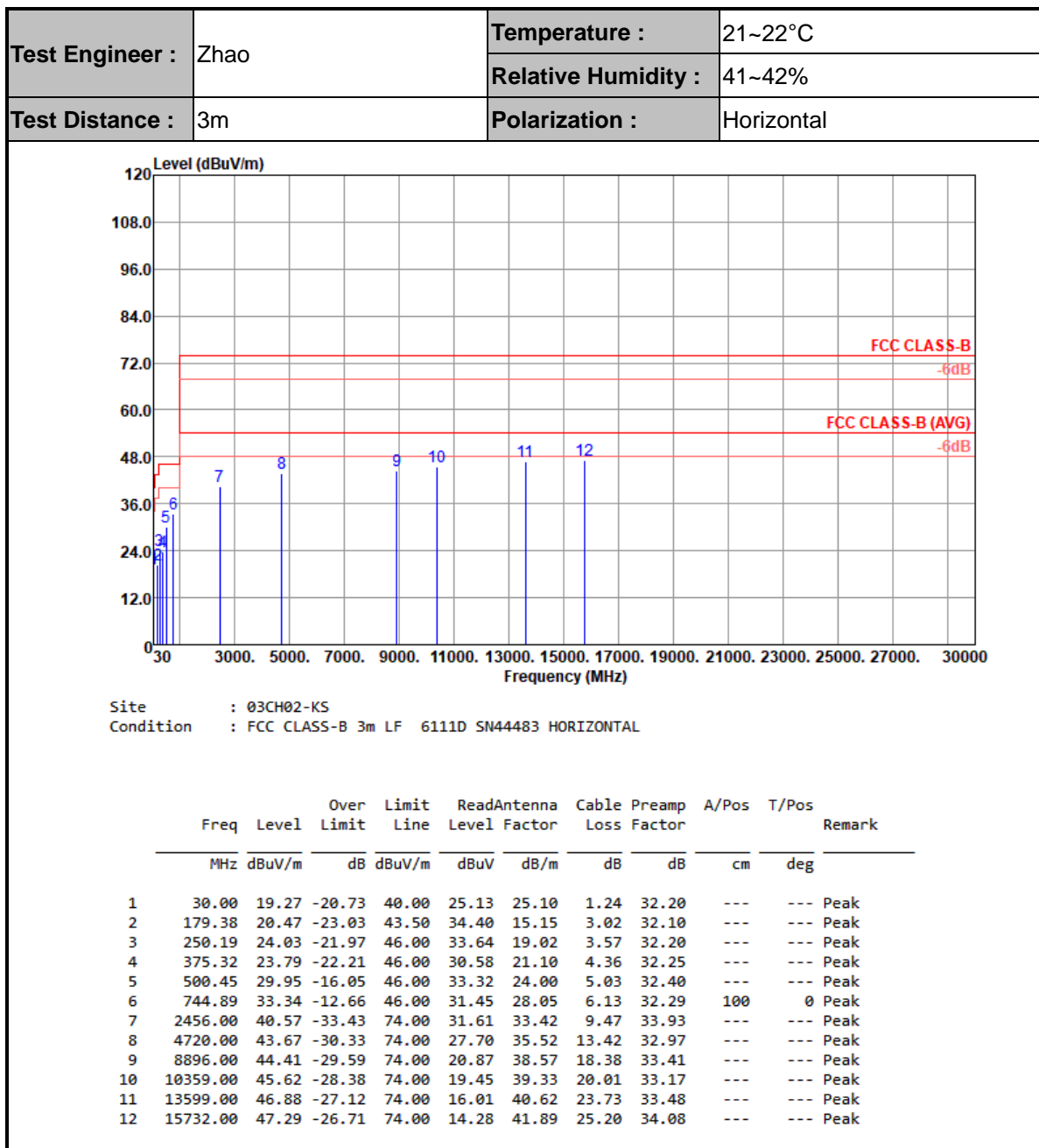
For radiated emissions from 30MHz to 1GHz

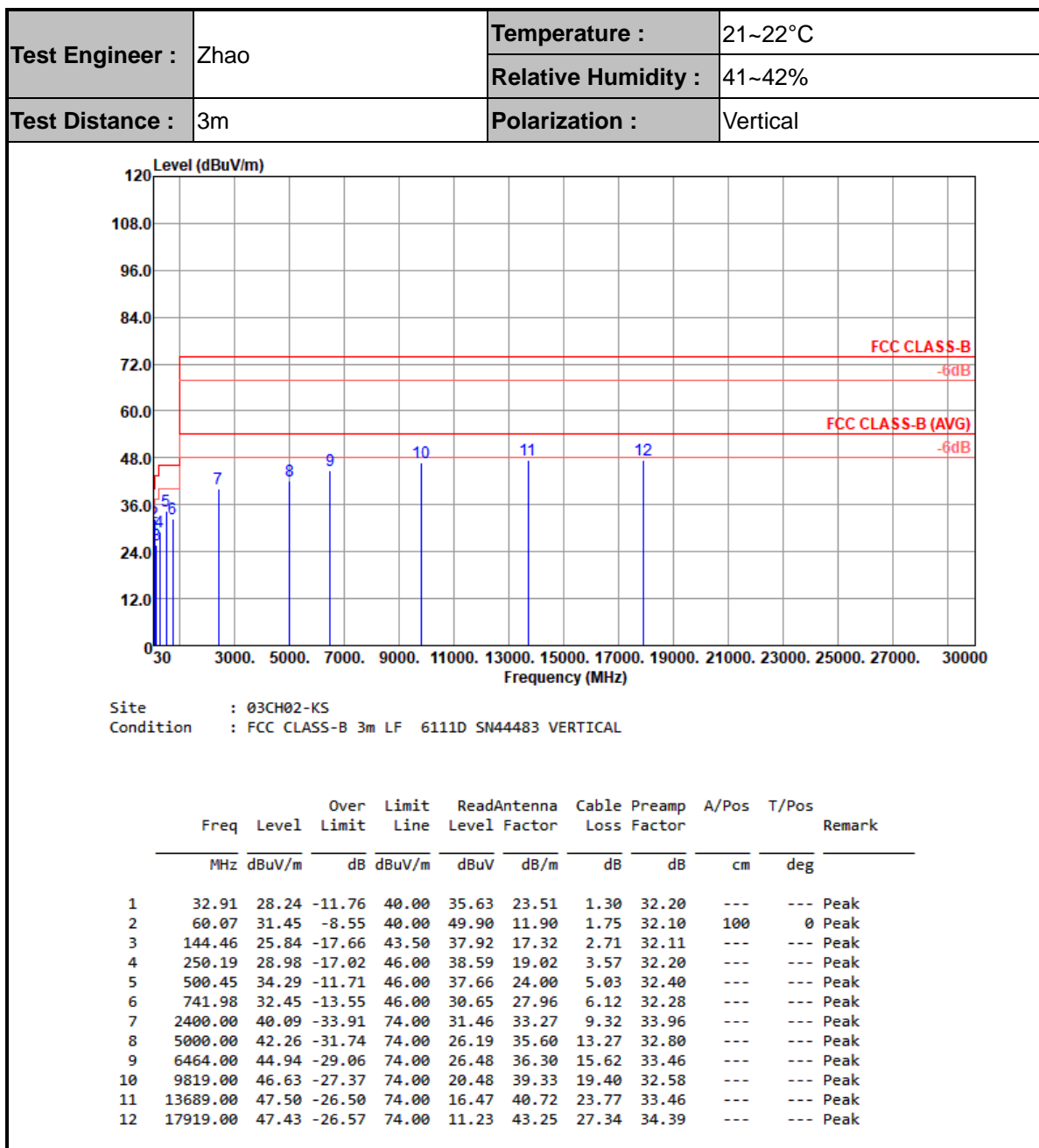


For radiated emissions above 1GHz



### 3.2.5. Test Result of Radiated Emission





Note:

- Level(dBμV/m) = Read Level(dBμV) + Antenna Factor(dB/m) + Cable Loss(dB) - Preamp Factor(dB)
- 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 Receiver	R&S	ESC17	100768	9kHz~7GHz;	Apr. 14, 2020	Oct. 22, 2020	Apr. 13, 2021	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 17, 2020	Oct. 22, 2020	Oct. 16, 2021	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	Oct. 28, 2019	Oct. 22, 2020	Oct. 27, 2020	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP0000008 11	AC 0V~300V, 45Hz~1000Hz	Oct. 17, 2020	Oct. 22, 2020	Oct. 16, 2021	Conduction (CO01-KS)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz;Ma x 30dBm	Oct. 17, 2020	Oct. 28, 2020	Oct. 16, 2021	Radiation (03CH02-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55370528	10Hz~44G,MAX 30dB	Oct. 17, 2020	Oct. 28, 2020	Oct. 16, 2021	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz~1GHz	Dec. 30, 2019	Oct. 28, 2020	Dec. 29, 2020	Radiation (03CH02-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Nov. 10, 2019	Oct. 28, 2020	Nov. 09, 2020	Radiation (03CH02-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Nov. 10, 2019	Oct. 28, 2020	Nov. 09, 2020	Radiation (03CH02-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 08, 2020	Oct. 28, 2020	Jan. 07, 2021	Radiation (03CH02-KS)
Amplifier	SONOMA	310N	187289	9KHz~1GHz	Jan. 02, 2020	Oct. 28, 2020	Jan. 01, 2021	Radiation (03CH02-KS)
Amplifier	Keysight	83017A	MY53270316	500MHz~26.5G Hz	Oct. 17, 2020	Oct. 28, 2020	Oct. 16, 2021	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	61601000247 3	N/A	NCR	Oct. 28, 2020	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Oct. 28, 2020	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Oct. 28, 2020	NCR	Radiation (03CH02-KS)

## 5. Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	2.94dB
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.9dB
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.0dB
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### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

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