



FCC RF Test Report

Product Name: Smart Phone

Model Number: NEN-LX3

Report No.: SYBH(Z-RF)20201128017001-2002

FCC ID: 2ATEYNEN-LX3

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MODIFICATION RECORD

No.	Report No	Modification Description
1	SYBH(Z-RF)2020112801 7001-2002	First release.

DECLARATION

Type	Description
Multiple Models Applications	<input checked="" type="checkbox"/> The present report applies to single model. <input type="checkbox"/> The present report applies to several models. The practical measurements are performed with the model The present report only presents the worst test case of all modes, see relevant test results for detailed.

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2 General Information

2.1 Test standard/s

Applied Rules :	47 CFR FCC Part 2, Subpart J 47 CFR FCC Part 15, Subpart C
Test Method :	FCC KDB 558074 D01 DTS Meas Guidance v05r02 ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices.

2.2 Test Environment

Temperature :	TN	15 to 30	°C during room temperature tests
Ambient Relative Humidity:	25 to 75 %		
Atmospheric Pressure:	Not applicable		
Power supply :	VN	3.87	V DC by Battery

NOTE 1: 1) VN= nominal voltage, VL= low extreme test voltage, VH= High extreme test voltage;

TN= normal temperature, TL= low extreme test temperature, TH= High extreme test temperature.

NOTE 2: The values used in the test report may be stringent than the declared.

2.3 Test Laboratories

Test Location 1 :	RELIABILITY LABORATORY OF HUAWEI TECHNOLOGIES CO., LTD.
Address of Test Location 1 :	No.2, New City Avenue, Songshan Lake Sci. & Tech. Industry Park, Dongguan, 523808, P.R.C
Temperature of Test Location 1 :	25°C
Relative humidity of Test Location 1 :	55 %

2.4 Applicant and Manufacturer

Company Name :	Huawei Device Co., Ltd.
Address :	No.2 of Xincheng Road, Songshan Lake Zone, Dongguan, Guangdong 523808, People's Republic of China

2.5 Application details

2.5.1 Current Test Project/Report

Date of Receipt Sample:	2021-01-18
Start of test:	2021-01-19
End of test:	2021-03-02

3 Test Summary

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Testing location
20dB Emission Bandwidth (EBW)	15.247(a)(1)	No limit.	Appendix A	Pass	Test Location 1
Carrier Frequency Separation	15.247(a)(1)	$\geq \text{MAX} \{25\text{kHz}, \text{IIF}\{\text{output power} \leq 125\text{mW}, 2/3 * 20\text{dB EBW}, 20\text{dB EBW}\}\}$.	Appendix B	Pass	Test Location 1
Number of Hopping Channel	15.247(a)(1) (iii)	≥ 15 channels.	Appendix C	Pass	Test Location 1
Time of Occupancy (Dwell Time)	15.247(a)(1) (iii)	$< 0.4\text{s}$ within a period of $(0.4\text{s} * \text{hopping number})$.	Appendix D	Pass	Test Location 1
Maximum Peak Output Power	15.247(b)(1)	FCC: Conducted $< 1\text{ W}$ if using ≥ 75 non-overlapping channels.	Appendix E	Pass	Test Location 1
Band edge spurious emission	15.247(d)	$< -20\text{ dBc}/100\text{ kHz}$ if total peak power \leq power limit.	Appendix F	Pass	Test Location 1
Conducted RF Spurious Emission			Appendix G	Pass	Test Location 1
Radiated Emissions in the Restricted Bands	15.247(d) 15.209	FCC Part 15.209 field strength limit;	Appendix H	Pass	Test Location 1
AC Power Line Conducted Emissions	15.207	FCC Part 15.207 conducted limit;	Appendix I	Pass	Test Location 1
NOTE: The transmitter has an integral PCB loop antenna that is enclosed within the housing of the EUT and meets the requirements of FCC 15.203					

4 Description of the Equipment under Test (EUT)

4.1 General Description

NEN-LX3 is subscriber equipment in the GSM/WCDMA/LTE system. The GSM frequency bands include GSM850, GSM900, DCS1800 and PCS1900. The UMTS frequency band includes band I, band II, band IV, band V and band VIII. The LTE frequency bands include band 1,band 2,band 3,band 4,band 5,band 7,band 8,band 12,band 17,band 26,band 28 and band 66. The Mobile Phone implements such functions as RF signal receiving/transmitting, LTE/UMTS and GSM/GPRS/EDGE protocol processing, voice, video MMS service, GPS, AGPS, Wi-Fi etc. Externally it provides earphone port (to provide voice service), and dual SIM/single SIM card interface. NEN-LX3 is dual/single SIM smart phone. It also provides Bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

Note1: Only Bluetooth test data included in this report.



4.2 EUT Identity

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

4.2.1 Board

Board		
Description	Software Version	Hardware Version
Main Board	11.0.1.103(C900E48R1P2)	HL1NTNM

4.2.2 Sub-Assembly

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
Adapter	HW-110600E02	Huawei Device Co., Ltd.	Input voltage: 100-240Vac, 50/60Hz,1.8A Output voltage: 5V2A/10V4A/11V6A max
Adapter	HW-110600B02	Huawei Device Co., Ltd.	Input voltage: 100-240Vac, 50/60Hz,1.8A Output voltage: 5V2A/10V4A/11V6A max
Adapter	HW-110600U02	Huawei Device Co., Ltd.	Input voltage: 100-240Vac, 50/60Hz,1.8A Output voltage: 5V2A/10V4A/11V6A max
Adapter	HW-110600A02	Huawei Device Co., Ltd.	Input voltage: 100-240Vac, 50/60Hz,1.8A Output voltage: 5V2A/10V4A/11V6A max
Battery	HB466589EFW	Huawei Device Co., Ltd.	Rated capacity: 4200mAh Nominal Voltage:  +3.87V Charging Voltage:  +4.45V

4.3 Technical Description

NOTE: For the detailed technical descriptions, see the applicant/manufacture’s specifications or user manual.

Characteristic	Description
Operating Mode	Bluetooth 3.0
Occupied Channel Bandwidth	1 MHz.
Operating Frequency / Channel	2402 MHz + N * 1 MHz, N = 0 ... 78.
Data Rate	1Mbps(GFSK), 2Mbps($\pi/4$ -DQPSK), 3Mbps(8DPSK)
Baseband Modulation	GFSK, $\pi/4$ -DQPSK, 8DPSK
Bluetooth EDR Supported	<input checked="" type="checkbox"/> Supported, <input type="checkbox"/> Not Supported

Characteristics	Description	
TX/RX Operating Range (BT3.0)	2400-2483.5 MHz band	
Modulation Type	Carrier	Frequency Hopping Spread Spectrum (FHSS)
	Digital	GFSK, $\pi/4$ -DQPSK, 8DPSK
Emission Designator for BT3.0	GFSK: 957KF1D $\pi/4$ -DQPSK: 1M35G1D 8DPSK: 1M35G1D	
Bluetooth Power Class	Class 1	
Antenna	Description	Isotropic Antenna
	Type	<input checked="" type="checkbox"/> Integral (permanent fixed antenna, which may be built-in, designed as an indispensable part of EUT) <input type="checkbox"/> Dedicated (removable antenna supplied with EUT, designed as an indispensable part of EUT)
	Ports	<input checked="" type="checkbox"/> Ant 1, <input type="checkbox"/> Ant 2, <input type="checkbox"/> Ant 3
	Gain	-2.2 dBi (per antenna port, max.)
	Remark	When the EUT is put into service, the practical maximum antenna gain should NOT exceed the value as described above.
Power Supply	Type	<input type="checkbox"/> External DC mains, <input checked="" type="checkbox"/> Battery, <input type="checkbox"/> AC/DC Adapter, <input type="checkbox"/> Powered over Ethernet (PoE). <input type="checkbox"/> USB <input type="checkbox"/> Other _____

5 General Test Conditions / Configurations

5.1 EUT Configurations

5.1.1 General Configurations

Configuration	Description
Test Antenna Ports	Until otherwise specified, - All TX tests are performed at all TX antenna ports of the EUT, and - All RX tests are performed at all RX antenna ports of the EUT.
Multiple RF Sources	Other than the tested RF source of the EUT, other RF source(s) are disabled or shutdown during measurements.
Sensors and Antenna	Sensors and Antenna optimization function should be disabled during testing by software method to get the stable maximum power and avoid the influence of uncertain conditions

5.1.2 Customized Configurations

5.1.2.1 Worst case Configurations

Test Mode	Packet type	Test Modes Description
TM1	DH5	GFSK
TM2	2DH5	Pi/4-DQPSK
TM3	3DH5	8DPSK

5.1.2.2 Frequencies under Test

Test Mode	RF Channel	Channel No. / Frequency
TM1/TM2/TM3	Lowest (L)	Ch No. 0 / 2402 MHz
	Middle (M)	Ch No. 39 / 2441 MHz
	Highest (H)	Ch No. 78 / 2480 MHz

5.2 Antenna requirements

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

The antennas of the **NEN-LX3** are **permanently attached**.

There are no provisions for connection to an external antenna.

Conclusion:

The **EUT** unit complies with the requirement of §15.203.

BT3.0: Ch. Frequency (MHz)

Ch.	Frequency (MHz)
00	2402
.	.
.	.
39	2441
.	.
.	.
78	2480

Frequency/ Channel Operations

5.3 Description of tests

5.3.1 Bandwidth measurement

- (a) Connect EUT test port to universal communication tester.
- (b) Set the EUT to transmit maximum output power at 2.4GHz and switch off frequency hopping function, then set the measuring frequency number, finally test the bandwidth with universal communication tester.

5.3.2 Carrier frequency separation measurement

- (a) Connect EUT test port to spectrum analyzer and universal communication tester.
- (b) Set the EUT to transmit maximum output power at 2.4GHz and switch off frequency hopping function, then set the measured frequency number to two adjacent channels separately and test the carrier frequency separation with spectrum analyzer.

5.3.3 Number of hopping channel

- (a) Connect EUT test port to spectrum analyzer and universal communication tester.
- (b) Set the EUT to transmit maximum output power at 2.4GHz and switch on frequency hopping function, then set enough count time (larger than 5000 times) to get all the hopping frequency channel displayed on the screen of spectrum analyzer.
- (c) Count the quantity of peaks to get the number of hopping channels.

5.3.4 Time of occupancy

- (a) Connect test port of EUT to spectrum analyzer and universal communication tester.
- (b) Set the EUT to transmit maximum output power at 2.4GHz and switch on frequency hopping function.
- (c) Set the span of spectrum analyzer to 0 Hz, and set the resolution bandwidth to 1 MHz and the video bandwidth to 1 MHz, then get the time domain measured diagram. and set sweep time to 2 times of one burst occupancy time, and measure the time of occupancy of one burst.
- (d) Set the resolution bandwidth to 1 MHz and the video bandwidth to 3 MHz, and set the sweep time to a period (0.4 seconds multiplied by the number of hopping channels employed), and count the number of the bursts.
- (e) Calculate the time of occupancy in a period with time occupancy of a burst and quantity of bursts

5.3.5 Peak output power

- (a) Connect EUT test port to spectrum analyzer and universal communication tester.
- (b) Set the EUT to transmit maximum output power at 2.4GHz and switch off frequency hopping function.
- (c) Then set the EUT to transmit at high, middle and low frequency and measure the conducted output power separately.

5.3.6 Band edge spurious emission

- (a) Connect EUT test port to spectrum analyzer and universal communication tester
- (b) Set the EUT to transmit maximum output power at 2.4GHz and switch off frequency hopping function.
- (c) Then set the EUT to transmit at high, low frequency and measure the conducted band edge spurious separately.
- (d) Switch on the frequency hopping function, and repeat above measurement.

5.3.7 Conducted RF Spurious

- (a) Connect EUT test port to spectrum analyzer and universal communication tester
- (b) Set the EUT to transmit maximum output power at 2.4GHz and switch off frequency hopping function.
- (c) Then set the EUT to transmit at high, middle and low frequency and measure the conducted spurious separately.
- (d) Switch on the frequency hopping function, and repeat the above measurement.

5.3.8 Radiated spurious emission & spurious in restricted band

For frequency below 1GHz, the test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10 (2013). The EUT was set-up on insulator 80cm above the Ground Plane. For frequency above 1GHz, the test site full-anechoic chamber has met the requirement of ANSI C63.10 (2013). The EUT was set-up on insulator 150cm above the Ground Plane.

The set-up and test methods were according to ANSI C63.10:2013. The Radiated Disturbance measurements were made using a Rohde and Schwarz Test Receiver and control software.

A preliminary scan and a final scan of the emissions were made by using test script of software; the emissions were measured using a Quasi-Peak Detector below 1GHz, Peak Detector and AV detector above 1GHz. The maximal emission value was acquired by adjusting the antenna height, polarisation and turntable azimuth in accordance with the software setup. Normally, the height range of antenna was 1m to 4m, and the azimuth range of turntable was 0° to 360°. The receive antenna has two polarizations V and H.

A portable or small unlicensed wireless device shall be placed on a non-metallic test fixture or other nonmetallic support during testing. The supporting fixture shall permit orientation of the EUT in each of three orthogonal (x, y, z) axis positions such that emissions from the EUT are maximized.

The EUT communicates with the BTS simulator through Air interface. The EUT transmits maximum output power at 2.4GHz and switch off frequency hopping function.

Measurement bandwidth: 30 MHz - 1000 MHz: 120 kHz

Measurement bandwidth: 1000 MHz - 10th Carrier Frequency: 1 MHz

5.3.9 Conducted Emission at Power Port

The Table-top EUT was placed upon a non-metallic table 0.8 m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10: 2013.

Conducted Disturbance at AC Port measurements were undertaken on the L and N Lines. The emissions were measured using a Quasi-Peak Detector and Average Detector.

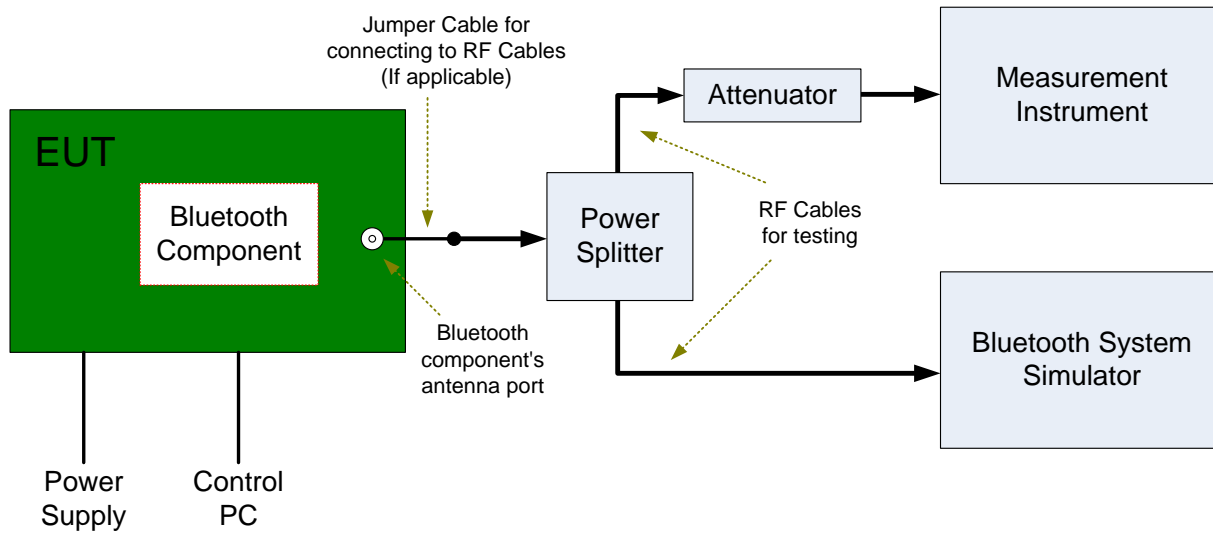
The EUT communicates with the BTS simulator through Air interface, the BTS simulator controls the EUT to transmitter the maximum power which defined in specification of product. The EUT operated on the typical channel.

Measurement bandwidth (RBW) for 150kHz to 30 MHz: 9 kHz;

5.4 Test Setups

5.4.1 Test Setup 1

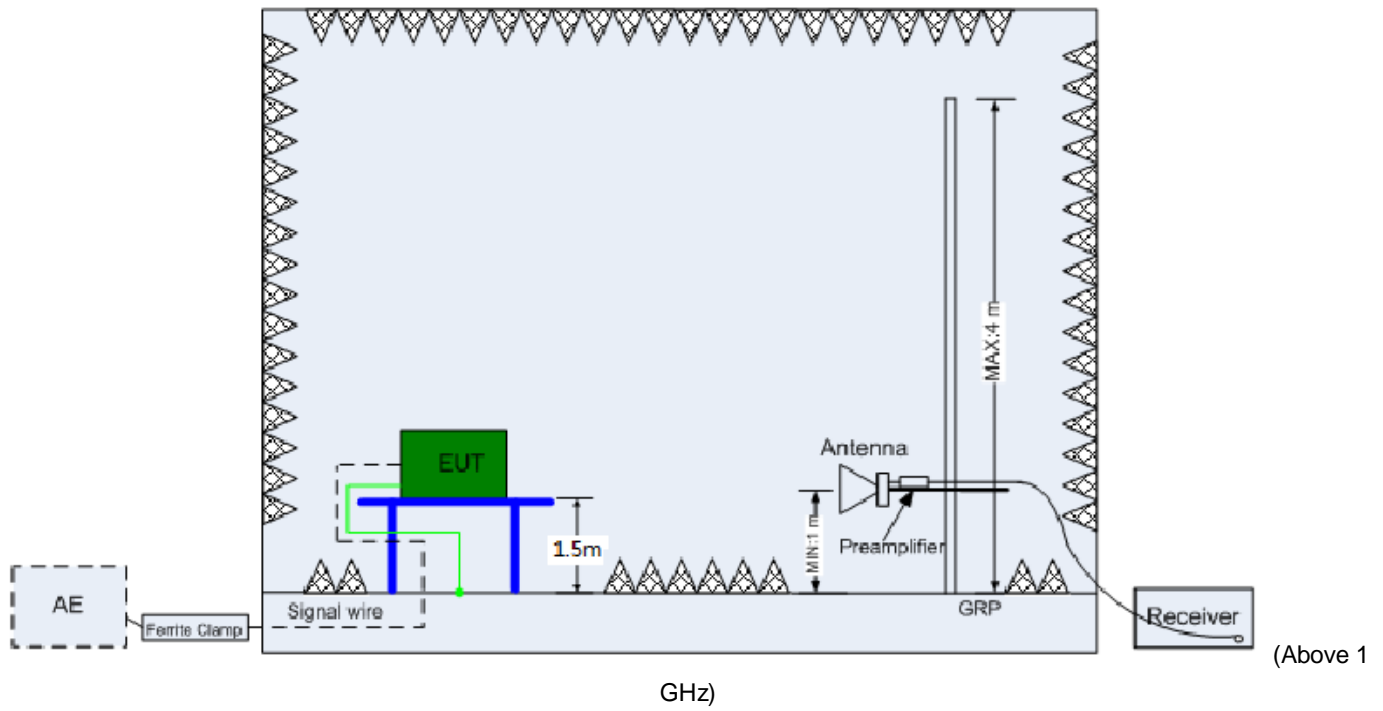
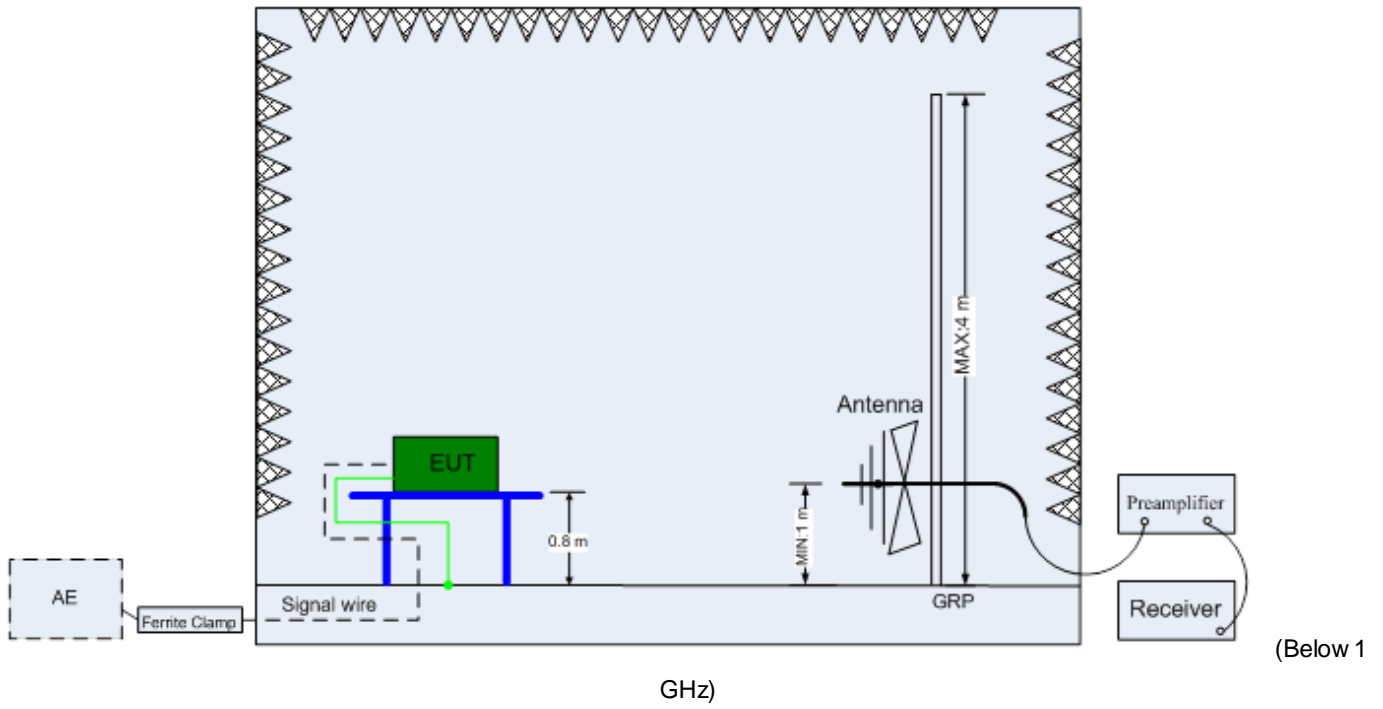
The Bluetooth component's antenna port(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by Bluetooth System Simulator and/or PC/software to emit the specified signals for the purpose of measurements.



5.4.2 Test Setup 2

The semi-anechoic chamber and full-anechoic chamber has met the requirement of ANSI C63.4. The test distance is 3m. The setup is according to ANSI C63.4 and CAN/CSA-CEI/IEC CISPR 22.

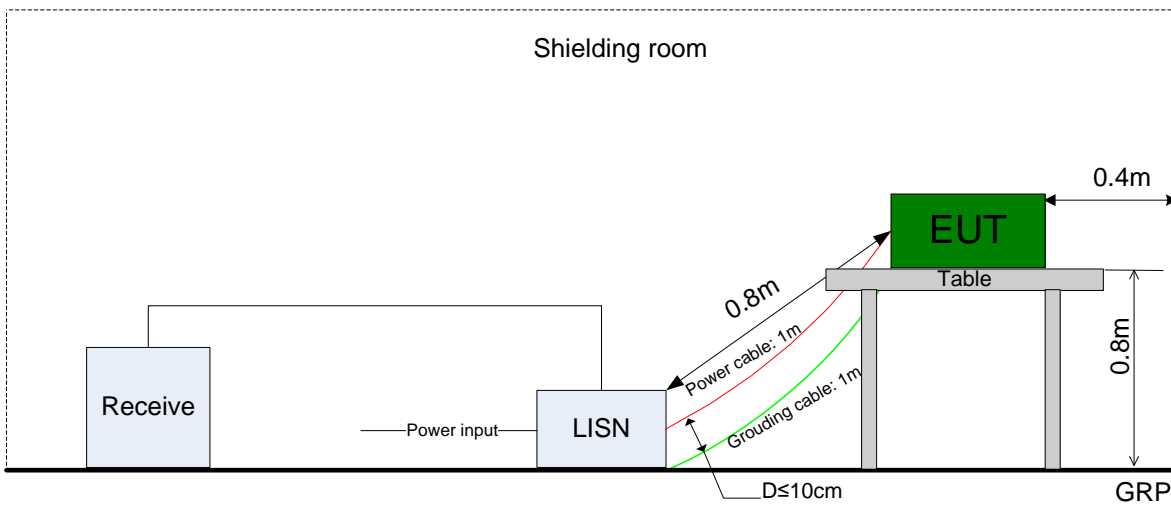
The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).



5.4.3 Test Setup 3

The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.



5.5 Test Conditions

Test Case	Test Conditions	
	Configuration	Description
20dB Emission Bandwidth (EBW)	Meas. Method	C63.10 §7.8.7
	Test Env.	TN/VN
	Test Setup	Test Setup 1
	EUT Conf.	TM1_DH5_Ch0, TM1_DH5_Ch39, TM1_DH5_Ch78, TM2_2DH5_Ch0, TM2_2DH5_Ch39, TM2_2DH5_Ch78, TM3_3DH5_Ch0, TM3_3DH5_Ch39, TM3_3DH5_Ch78.
Carrier Frequency Separation	Meas. Method	C63.10 §7.8.2
	Test Env.	TN/VN
	Test Setup	Test Setup 1
	EUT Conf.	TM1_DH5_Hop, TM2_2DH5_Hop, TM3_3DH5_Hop.
Number of Hopping Channel	Meas. Method	C63.10 §7.8.3
	Test Env.	TN/VN
	Test Setup	Test Setup 1
	EUT Conf.	TM1_DH5_Hop, TM2_2DH5_Hop, TM3_3DH5_Hop.
Time of Occupancy (Dwell Time)	Meas. Method	C63.10 §7.8.4
	Test Env.	TN/VN
	Test Setup	Test Setup 1
	EUT Conf.	TM1_DH5_Hop, TM2_2DH5_Hop, TM3_3DH5_Hop.
Maximum Peak Conducted Output Power	Meas. Method	C63.10 §7.8.5
	Test Env.	TN/VN
	Test Setup	Test Setup 1
	EUT Conf.	TM1_DH5_Ch0, TM1_DH5_Ch39, TM1_DH5_Ch78, TM2_2DH5_Ch0, TM2_2DH5_Ch39, TM2_2DH5_Ch78, TM3_3DH5_Ch0, TM3_3DH5_Ch39, TM3_3DH5_Ch78.
Band edge spurious emission	Meas. Method	C63.10 §7.8.6
	Test Env.	TN/VN
	Test Setup	Test Setup 1
	EUT Conf.	TM1_DH5_Ch0, TM1_DH5_Ch78, TM2_2DH5_Ch0, TM2_2DH5_Ch78, TM3_3DH5_Ch0, TM3_3DH5_Ch78.
Conducted RF Spurious Emission	Meas. Method	C63.10 §7.8.8
	Test Env.	TN/VN
	Test Setup	Test Setup 1

Test Case	Test Conditions		
	Configuration	Description	
	EUT Conf.	TM1_DH5_Ch0, TM1_DH5_Ch39, TM1_DH5_Ch78, TM2_2DH5_Ch0, TM2_2DH5_Ch39, TM2_2DH5_Ch78, TM3_3DH5_Ch0, TM3_3DH5_Ch39, TM3_3DH5_Ch78.	
Radiated Emissions in the Restricted Bands	Meas. Method	C63.4, C63.10. (1) 30 MHz to 1 GHz: Pre: RBW = 100 kHz; VBW = 300 kHz; Det. = Peak. Final: RBW = 120 kHz; Det. = CISPR Quasi-Peak. (2) 1 GHz to 26.5 GHz: Average: RBW = 1 MHz; VBW = 10 Hz; Det. = Peak; Sweep-time = Auto; Trace = Single. Peak: RBW = 1 MHz; VBW = 3 MHz; Det. = Peak; Sweep-time = Auto; Trace ≥ Max Hold * 100.	
	Test Env.	TN/VN	
	Test Setup	Test Setup 2	
	EUT Conf.	30 MHz -1 GHz	TM1_DH5_Ch78 (Worst Conf.).
		1-3 GHz	TM1_DH5_Ch0, TM1_DH5_Ch78, TM2_2DH5_Ch0, TM2_2DH5_Ch78, TM3_3DH5_Ch0, TM3_3DH5_Ch78.
		3-18 GHz	TM1_DH5_Ch78 (Worst Conf.).
18-26.5 GHz		TM1_DH5_Ch78 (Worst Conf.).	
AC Power Line Conducted Emissions	Meas. Method	AC mains conducted. Pre: RBW = 10 kHz; Det. = Peak. Final: RBW = 9 kHz; Det. = CISPR Quasi-Peak & Average.	
	Test Env.	TN/VN	
	Test Setup	Test Setup 3	
	EUT Conf.	TM1_DH5_Ch78.(Worst Conf.).	

6 Main Test Instruments

6.1 Current Test Project/Report

Main Test Equipments(BT/WIFI test system)					
Equipment Name	Manufacturer	Model	Serial Number	Cal Date	Cal-Due
JS1120-3 BT/WIFI test system	JS Tonscend	JS0806-2	188060102	2020/11/10	2021/11/09
Spectrum Analyzer	Agilent	N9020A	MY52090652	2020/11/09	2021/11/08
Universal Radio Communication Tester	R&S	CMW500	164698	2020/07/02	2021/07/01

Main Test Equipments(RE test system)					
Equipment Name	Manufacturer	Model	Serial Number	Cal Date	Cal-Due
Test receiver	R&S	ESU26	100150	2020/11/06	2021/11/05
LOOP Antennas(9kHz-30MHz)	R&S	HFH2-Z2	100262	2019/07/05	2021/07/04
LOOP Antennas(9kHz-30MHz)	R&S	HFH2-Z2	100263	2019/03/15	2021/03/14
Trilog Broadband Antenna (30M~3GHz)	SCHWARZB ECK	VULB 9163	9163-1330	2020/08/10	2022/08/09
Trilog Broadband Antenna (1GHz~18GHz)	SCHWARZB ECK	HF907	100305	2019/03/15	2021/03/14
Trilog Broadband Antenna (18GHz~40GHz)	SCHWARZB ECK	BBHA 9170	BBHA9170644	2019/10/29	2021/10/28
Software Information					
Test Item	Software Name		Manufacturer	Version	
RE	EMC32		R&S	V9.25.0	

Main Test Equipments(CE test system)					
Equipment Name	Manufacturer	Model	Serial Number	Cal Date	Cal-Due
Test receiver	R&S	ESU26	100150	2020/11/06	2021/11/05
Line Impedance Stabilization Network	R&S	ENV216	101176	2020/7/13	2021/07/12
Software Information					
Test Item	Software Name		Manufacturer	Version	
CE	EMC32		R&S	V9.25.0	

7 Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Test Item		Extended Uncertainty
Transmit Output Power Data	Power [dBm]	U = 0.39 dB
Bandwidth	Magnitude [%]	U=7%
Band Edge Compliance	Disturbance Power [dBm]	U = 0.9 dB
Spurious Emissions, Conducted	Disturbance Power [dBm]	20MHz~3.6GHz: U=0.88dB 3.6GHz~8.4GHz: U=1.08dB 8.4GHz~13.6GHz: U= 1.24dB 13.6GHz~22GHz: U= 1.34dB 22GHz~26.5GHz: U= 1.36dB
Field Strength of Spurious Radiation	ERP/EIRP [dBm]	For 3 m Chamber: U = 3.868 dB (9 kHz to 150 kHz) U = 3.872 dB (150 kHz to 30 MHz) U = 5.24 dB (30 MHz-1 GHz) U = 4.84 dB (1 GHz-18 GHz) U = 4.62 dB (18 GHz-26.5 GHz)
Frequency Stability	Frequency Accuracy [Hz]	U=41.58Hz
AC Power Line Conducted Emissions	Disturbance Voltage[dBμV]	U=2.3 dB
Duty Cycle	Duty Cycle [%]	U=±2.06 %

8 Appendixes

Appendix No.	Description
SYBH(Z-RF)20201128017001-2002-A	Appendix for Bluetooth

END