



RADIO TEST REPORT

For

KHADAS TECHNOLOGY CO., LTD

Edge2 Maker Kit

Test Model: Edge2 Basic

Additional Model No.: Please Refer to Page 6

Prepared for
Address: KHADAS TECHNOLOGY CO., LTD
: 2709 QIANCHENG CENTER, HAICHENG ROAD,
XIXIANG STREET, BAO'AN DISTRICT, SHENZHEN,
CHINA. 518101Prepared by
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Date of receipt of test sample

: August 27, 2022

Number of tested samples

: 2

Sample No.

: A082522109-1, A082522109-2

Serial number

: Prototype

Date of Test

: August 27, 2022 ~ September 28, 2022

Date of Report

: September 28, 2022



Shenzhen LCS Compliance Testing Laboratory Ltd.

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**RADIO TEST REPORT**
MIC Notice No.88 Appendix No. 43

Second-Generation Low-Power Data Communication System/Wireless LAN System

Report Reference No. : LCSA082522109EB

Date of Issue : September 28, 2022

Testing Laboratory Name : Shenzhen LCS Compliance Testing Laboratory Ltd.

Address : Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China

Testing Location/ Procedure ... : Full application of Harmonised standards ■
Partial application of Harmonised standards □
Other standard testing method □**Applicant's Name : KHADAS TECHNOLOGY CO., LTD**

Address : 2709 QIANCHENG CENTER, HAICHENG ROAD, XIXIANG STREET, BAO'AN DISTRICT, SHENZHEN, CHINA. 518101

Test Specification

Standard..... : MIC Notice No.88 Appendix No.43

Test Report Form No..... : LCSEMC-1.0

TRF Originator : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF : Dated 2011-03

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Test Item Description..... : Edge2 Maker Kit

Trade Mark..... : Khadas

Test Model : Edge2 Basic

Ratings : Type-C Power Input: DC 5V, 3A/ DC 9V, 2.67A/ DC 12V, 2A
USB1 Output: DC 5V, 1300mA/ USB2 Output: DC 5V, 1500mAResult : **Positive****Compiled by:**

Vera Deng/ Administrator

Supervised by:

Cary Luo/ Technique principal

Approved by:

Gavin Liang/ Manager



Shenzhen LCS Compliance Testing Laboratory Ltd.

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RADIO -- TEST REPORT

Test Report No. : LCSA082522109EB	<u>September 28, 2022</u> Date of issue
--	--

Test Model.....	: Edge2 Basic
EUT.....	: Edge2 Maker Kit
Applicant.....	: KHADAS TECHNOLOGY CO., LTD
Address.....	: 2709 QIANCHENG CENTER, HAICHENG ROAD, XIXIANG STREET, BAO'AN DISTRICT, SHENZHEN, CHINA. 518101
Telephone.....	: /
Fax.....	: /
Manufacturer.....	: KHADAS TECHNOLOGY CO., LTD
Address.....	: 2709 QIANCHENG CENTER, HAICHENG ROAD, XIXIANG STREET, BAO'AN DISTRICT, SHENZHEN, CHINA. 518101
Telephone.....	: /
Fax.....	: /
Factory.....	: KHADAS TECHNOLOGY CO., LTD
Address.....	: 2709 QIANCHENG CENTER, HAICHENG ROAD, XIXIANG STREET, BAO'AN DISTRICT, SHENZHEN, CHINA. 518101
Telephone.....	: /
Fax.....	: /

Test Result	Positive
--------------------	-----------------

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.



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Revision History

Report Version	Issue Date	Revision Content	Revised By
000	September 28, 2022	Initial Issue	---



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1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	: Edge2 Maker Kit
Test Model	: Edge2 Basic
Additional Model No.	: Edge2 Pro
Model Declaration	: PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Power Supply	: Type-C Power Input: DC 5V, 3A/ DC 9V, 2.67A/ DC 12V, 2A USB1 Output: DC 5V, 1300mA/ USB2 Output: DC 5V, 1500mA
Hardware Version	: V11
Software Version	: OOWOW V1.0

Bluetooth

Frequency Range	: 2402-2480MHz for Bluetooth (79 channels for Bluetooth V5.0(BDR/EDR) Channel Frequency=2402+(K-1), K=1, 2, 379 40 channels for Bluetooth V5.0(BT LE/BT 2LE) Channel Frequency=2402+2(K-1), K=1, 2, 340
Declared Antenna Power	: Bluetooth V5.0(BDR/EDR): 0.02mW/MHz Bluetooth V5.0(BT LE/BT 2LE): 0.5mW
Modulation Technology	: Bluetooth V5.0(BDR/EDR): GFSK, $\pi/4$ -DQPSK, 8-DPSK Bluetooth V5.0(BT LE/BT 2LE): GFSK
Data Rate	: Bluetooth V5.0(BDR/EDR): 1/2/3Mbps Bluetooth V5.0(BT LE/BT 2LE): 1/2Mbps
Antenna Description	: FPC Antenna, 3.45dBi(Max.)

WIFI (2.4G Band)

Frequency Range	: 2412-2472MHz for 802.11b/g/n/ax(HT20)
Channel Spacing	: 5MHz
Channel Number	: 13 Channel for 802.11b/g/n/ax(HT20)(2412~2472MHz)
Modulation Type	: IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK); IEEE 802.11g/n: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ax(HT20): OFDMA(64QAM, 16QAM, QPSK, BPSK)
Declared Antenna Power	: 802.11b: 2.0mW/MHz 802.11g: 2.0mW/MHz 802.11n(HT20): 2.0mW/MHz 802.11ax(HT20): 2.0mW/MHz MIMO:





Antenna Description	802.11n(HT20): 3.0mW/MHz
	802.11ax(HT20): 3.0mW/MHz
Antenna Description	: Antenna 0: FPC Antenna, 3.45dBi (max.)
	Antenna 1: FPC Antenna, 3.45dBi (max.)
WIFI (5.2G Band)	
Frequency Range	: 5180-5240MHz
Channel Number	: 4 Channel for 20MHz bandwidth(5180-5240MHz) 2 Channel for 40MHz bandwidth(5190-5230MHz) 1 Channel for 80MHz bandwidth(5210MHz)
Modulation Type	: 802.11a/n/ac: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK) 802.11ax: OFDMA(256QAM, 64QAM, 16QAM, QPSK, BPSK)
Declared Antenna Power	: 802.11a: 2.0mW/MHz 802.11n(HT20): 2.0mW/MHz 802.11n(HT40): 1.0mW/MHz 802.11ac(VHT20):2.0mW/MHz 802.11ac(VHT40): 1.0mW/MHz 802.11ac(VHT80): 0.5mW/MHz 802.11ax(VHT20): 2.0mW/MHz 802.11ax(VHT40): 1.0mW/MHz 802.11ax(VHT80): 0.5mW/MHz MIMO: 802.11n(HT20): 3.0mW/MHz 802.11n(HT40): 2.0mW/MHz 802.11ac(VHT20): 3.0mW/MHz 802.11ac(VHT40): 2.0mW/MHz 802.11ac(VHT80): 0.5mW/MHz 802.11ax(VHT20): 3.0mW/MHz 802.11ax(VHT40): 2.0mW/MHz 802.11ax(VHT80): 0.5mW/MHz
Antenna Description	: Antenna 0: FPC Antenna, 1.1dBi(Max.) Antenna 1: FPC Antenna, 1.1dBi(Max.)





1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
---	ADAPTER	RCL-PD30WLU50K	---	---

1.3. External I/O Cable

I/O Port Description	Quantity	Cable
Type-C Port	2	N/A
USB Port	2	N/A
HDMI Port	1	N/A

1.4. Description of Test Facility

FCC Registration Number is 254912.

NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

Industry Canada Registration Number is 9642A.

1.5. Test Conditions

Temperature Range	:	21-25℃
Humidity Range	:	45-85%
Pressure Range	:	86-106kPa

1.6. Frequency of Channels

Bluetooth V5.0 (BT LE/ BT 2LE)

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2402	21	2442
2	2404	---	---
3	2406	---	---
---	---	38	2476
---	---	39	2478
19	2438	40	2480
20	2440		





2. TEST METHODOLOGY

2.1. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of MIC Notice No.88 Appendix No. 43.

2.2. Measurement Uncertainty

Test Item		MU	Remark
Bandwidth	:	+/- 0.2 E-6	/
Antenna Power	:	+/-0.33dB	/
Frequency Tolerance	:	+/- 0.3 E-6	/
Conducted spurious emission	:	+/-0.13dB	/
DC Power	:	+/-1%	/

- (1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2.3. Table for Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Power Parameters:

Test Software Version	FCC Test Tool		
Frequency	2402MHz	2440MHz	2480MHz
Bluetooth V5.0(DTS)	Default	Default	Default

2.4. Description of Test Modes

Tested mode, channel, and data rate information				
Mode	Preliminary Test Data Rate (Mbps)	Final Test Data Rate (Mbps) (see Note)	Channel	Frequency (MHz)
Bluetooth V5.0 (BT LE/ BT 2LE)	1/2	1/2	Low :CH1	2402
	1/2	1/2	Middle: CH20	2440
	1/2	1/2	High: CH40	2480
Note: According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test.				





2.5. Test Voltage

POWER SUPPLY VOLTAGE FLUCTUATION TEST

Voltage Fluctuation Test	Normal Voltage	High Voltage +10% of Normal Voltage	Low Voltage -10% of Normal Voltage
Input To EUT	DC 12V	DC 13.2V	DC 10.8V
Output To RF Module	DC 3.3V	DC 3.3V	DC 3.3V
Voltage Variation (%)	--	--	--

Note: As the EUT was powered by DC 12V, and with the voltage stabilizing circuit used, the chip voltage received floating not exceed $\pm 1\%$ of nominal condition when working on extreme voltage, so all test performed at nominal voltage only.





3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in engineering mode.

3.2. EUT Exercise Software

N/A

3.3. Special Accessories

N/A.

3.4. Block Diagram/Schematics

Please refer to the related document.

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.





4. SUMMARY OF TEST RESULTS

MIC Notice No.88 Appendix No.43 Article 2 Paragraph 1 Item 19		
Clause	Description of Test (Transmitter Parameters)	Result
3	Frequency Tolerance	PASS
6	Antenna Power	PASS
6	Tolerances for Antenna Power	PASS
4	Transmission Rate	PASS
4	Occupied Frequency Bandwidth	PASS
4	Spread Bandwidth	PASS
13	Dwell Time	N/A
5	Spurious Emissions	PASS
10	Transmission Antenna Gain (EIRP Antenna Power)	PASS
11	Transmission Radiated Angle Width (3dB Beam width)	N/A
12	Interference prevention function	PASS
8	Carrier Sensing function	N/A
Receiver Parameters		
7	Secondary Radiated Emissions	PASS
<i>Note: (1) N/A is an abbreviation for Not Applicable. (2) N/T means this test item is not tested.</i>		





5. TEST RESULT

5.1. Frequency Tolerance

5.1.1. Standard Applicable

Tolerance of frequency shall be $\pm 50 \times 10^{-6}$.

5.1.2. Test Procedures

- Set EUT work in test mode as described in clause 2.4.
- Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

Centre Frequency: The centre frequency of the channel under test.

Resolution BW: 10 KHz.

Video BW: 10 KHz.

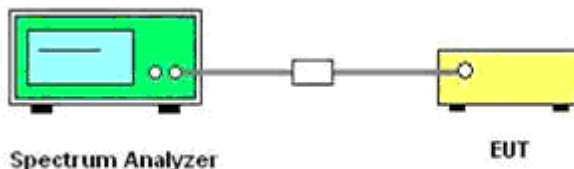
Span: 1MHz.

Detector: Peak.

Trace Mode: Max Hold.

- When the trace is complete, find the peak value of the power envelope and record.

5.1.3. Test Setup Layout



5.1.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.1.5. Test Result

Please refer to the Appendix B.1 for BT LE RF Test Data.





5.2. Antenna Power

5.2.1. Standard Applicable

Type	Limit
DTS	10mW
OFDM OBW<26MHz, DS	10mW/MHz
OFDM OBW 26-40MHz	5mW/MHz
Tolerance	+20%,-80%

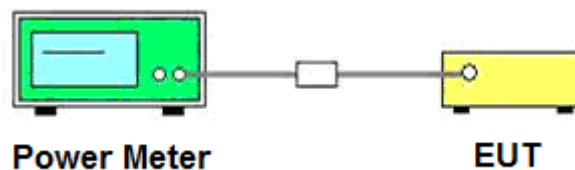
5.2.2. Measuring Instruments

Please refer to section 6 of equipments list in this report.

5.2.2. Test Procedures

- EUT have transmitted continuous maximum power
- Antenna Power Error is definition that actual measure antenna power tolerance between +20% to -80% power range that base on manufacturer declare the conducted power density.

5.2.3. Test Setup



5.2.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.5. Test Result

Please refer to the Appendix B.2 for BT LE RF Test Data.





5.3. Occupied Frequency Bandwidth

5.3.1. Standard Applicable

Permissible value for occupied bandwidth using the FH system, a hybrid system combining DS and FH systems, or a hybrid system combining FH and OFDM systems shall be 83.5 MHz or less, while necessary bandwidth (minimum occupied bandwidth sufficient to ensure information transmission of required quality at a required transmission rate for the system used under specified conditions for a given emission type) using a system other than any of the above shall be 26 MHz or less.

5.3.2. Test Procedures

- Set EUT work in test mode as described in clause 2.4.
- Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

Centre Frequency: The centre frequency of the channel under test.

RBW/VBW= 30KHz/30KHz

Span: Wide enough to cover the complete power envelope of the signal of the EUT.

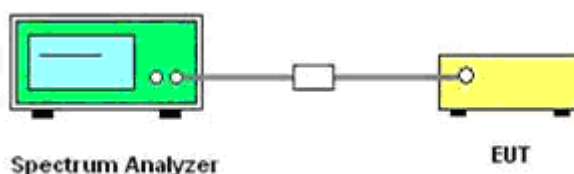
Sweep mode: Continuous sweeping.

Detector: Peak.

Trace Mode: Max Hold.

- When the trace is complete, measure the occupied bandwidth (99% bandwidth) with spectrum analyzer's bandwidth measure function.

5.3.3. Test Setup Layout



5.3.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.3.5. Test Result of 99% Spectrum Bandwidth

Please refer to the Appendix B.3 for BT LE RF Test Data.





5.4. Spread Bandwidth

5.4.1. Standard Applicable

In spread spectrum systems, spread bandwidth (which refers to a frequency bandwidth with an upper limit and lower limit such that each of the mean powers radiated above the upper frequency limit and below the lower frequency limit is equal to 5 % of the total mean power radiated; this also applies hereafter) shall be 500 kHz or more.

5.4.2. Test Procedures

- Set EUT work in test mode as described in clause 2.4.
- Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

Centre Frequency: The centre frequency of the channel under test.

RBW/VBW= 30KHz/30KHz

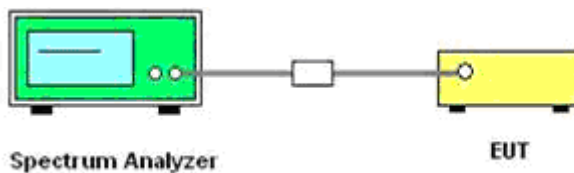
Span: Wide enough to cover the complete power envelope of the signal of the EUT.

Detector: Peak.

Trace Mode: Max Hold.

- When the trace is complete, measure the occupied bandwidth (90% bandwidth) with spectrum analyzer's bandwidth measure function.

5.4.3. Test Setup Layout



5.4.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.4.5. Test Result of 90% Occupied Bandwidth.

Please refer to the Appendix B.4 for BT LE RF Test Data.





5.5. Transmitter Spurious Emissions (conducted)

5.5.1. Standard Applicable

Permissible mean power of spurious emission of each frequency supplied to a feeder, that is, mean power of spurious emission in the 1 MHz bandwidth at frequency f other than frequency band used shall be as follows:

- | | |
|--|----------------------|
| a. 30MHz - 1,000MHz | 0.25 μ W or less |
| b. 1,000MHz - 2,387MHz | 2.5 μ W or less |
| c. 2,387MHz - 2,400MHz and 2,483.5MHz - 2,496.5MHz | 25 μ W or less |
| d. 2,496.5MHz - 13GHz | 2.5 μ W or less |

5.5.2. Test Procedures

- Set EUT work in test mode as described in clause 2.4.
- Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

Below 1GHz: RBW/VBW= 100KHz/ 100KHz

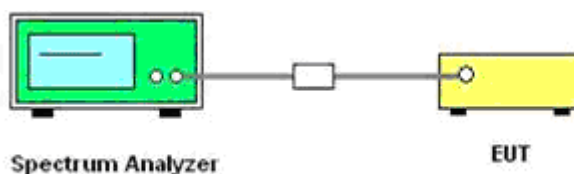
Above 1GHz: RBW/VBW= 1MHz / 1MHz.

Detector: Peak.

Trace Mode: Max Hold.

- All the emissions from 30MHz to 13GHz were measured and record.

5.5.3. Test Setup Layout



5.5.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.5.5. Test Results

Please refer to the Appendix B.5 for BT LE RF Test Data.

-Note:SA set to from 2.4965GHz to 13GHz, plot shows from 2.497GHz to 13GHz as of SA's default format.





5.6. Carrier sensing function

5.6.1. Standard Applicable

Item	Limits
Carrier Sense	Good – EUT stop RF transmission signal after carrier inject to EUT. (On $22.79 + Gr - 20 \cdot \log(f)$ [dBm] (Gr: dBi; f: MHz) or 100mV/m)

5.6.2. Instruments Setting

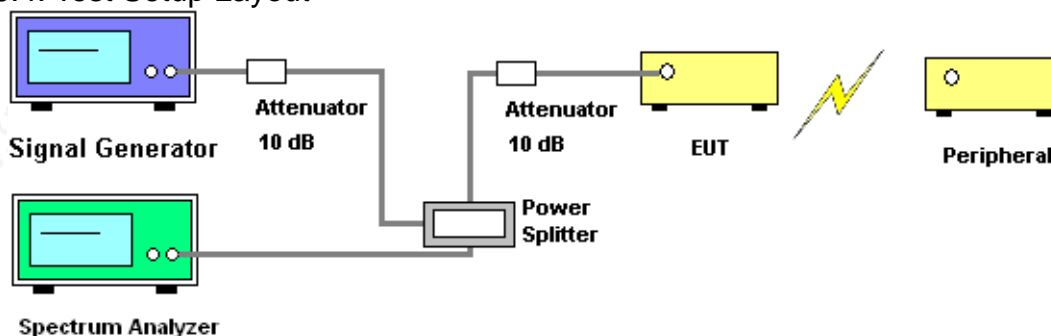
The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
RB / VB	1 MHz
Span	0 MHz
Sweep	Continuous
Detector	Peak
Trigger mode	Video

5.6.3. Test Procedures

1. SSG adjusted the frequency as same as the EUT transmitted signal and emitted the absence of modulation from SSG and power level is (On $22.79 + Gr - 20 \cdot \log(f)$ [dBm] (Gr: dBi; f: MHz). Then turn off the RF signal of SSG.
2. EUT have transmitted the maximum modulation signal and fixed channelize.
3. Setting of SA is following as: RB: 1MHz / VB: 1MHz / SPAN: 50MHz / AT: 10dB / Ref: 0dBm / Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak.
4. SSG RF Signal On.
5. EUT shall be stop the transmitted any signal and SSG RF Signal Off. Then EUT will be continuous transmitted signal.

5.6.4. Test Setup Layout



5.6.5. EUT Operation during Test

The EUT was programmed to be in normal transmitting mode.

5.6.6. Test Result

Not Applicable.





5.7. Interference prevention function

5.7.1. Standard Applicable

Item	Limits
Identification code	≥ 48 bits

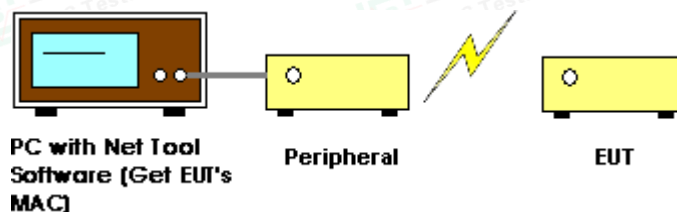
5.7.2. Measuring ID Code Software

PC with NetTool	Setting
MAC IP List	MAC Scan

5.7.3. Test Procedures

1. In the case that the EUT has the function of automatically transmitting the identification code: a. Transmit the predetermined identification codes from EUT. b. Check the transmitted identification codes with the demodulator.
2. In the case of receiving the identification code: a. Transmit the predetermined identification codes from the counterpart. b. Check if communication is normal. c. Transmit the other signals than predetermined ID codes from the counterpart. d. check if the EUT stops the transmission, or if it displays that identification codes are different from the predetermined ones.

5.7.4. Test Setup Layout



5.7.5. EUT Operation during Test

The EUT was programmed to be in normal transmitting mode.

5.7.6. Test Result

EUT ID	Performance index
32:7F:A9:F1:11:DA	Good





5.8. Secondary Radiated Emissions

5.8.1. Standard Applicable

The limit on secondary emissions radiated from the receiving equipment within which the function of other radio equipment will not be impaired shall be, in terms of the power of a dummy antenna circuit that has the same electrical constant as the receiving antenna, 4nW or less at a frequency below 1 GHz and 20 nW or less at a frequency of 1 GHz or higher as measured using the circuit

5.8.2. Test Procedures

- Set EUT work in test mode as described in clause 2.4.
- Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

Resolution BW: 100 KHz for frequency below 1GHz and

1MHz for frequency above 1GHz

Video BW: 100 KHz for frequency below 1GHz and

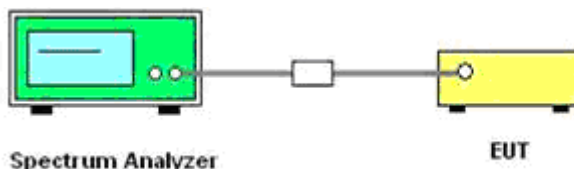
1MHz for frequency above 1GHz

Detector: Peak.

Trace Mode: Max Hold.

- All the emissions from 30MHz to 13GHz were measured and record.

5.8.3. Test Setup



5.8.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.8.5. Test Results

Please refer to the Appendix B.6 for BT LE RF Test Data.





6. PHOTOGRAPHS OF TEST SETUP

Please refer to separated files Appendix E for Test Setup Photographs

7. EXTERNAL PHOTOGRAPHS OF THE EUT

Please refer to separated files Appendix F for External Photos of EUT

8. INTERNAL PHOTOGRAPHS OF THE EUT

Please refer to separated files Appendix G for Internal Photos of EUT

9. LIST OF MEASURING EQUIPMENTS

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Power Meter	Rohde & Schwarz China	NRVS	100444	2022-06-16	2023-06-15
2	Power Sensor	Rohde & Schwarz China	NRV-Z81	100458	2022-06-16	2023-06-15
3	Power Sensor	Rohde & Schwarz China	NRV-Z32	10057	2022-06-16	2023-06-15
4	MXA Signal Analyzer	Agilent Technologies Inc.	N9020A	MY49100060	2021-11-15	2022-11-14
5	DC Power Supply	Agilent Technologies Inc.	E3642A	N/A	2021-11-15	2022-11-14
6	Oscilloscope	Tektronix	46084A/4609A	140920	2022-08-16	2023-08-15
7	Signal Generator	Agilent	N5182A	MY47071151	2022-06-16	2023-06-15

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