



RADIO TEST REPORT

For

KHADAS TECHNOLOGY CO., LTD

VIM1S

Test Model: VIM1S

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

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample : August 27, 2022
Number of tested samples : 2
Sample No. : A082522150-1, A082522150-2
Serial number : Prototype
Date of Test : August 27, 2022 ~ September 19, 2022
Date of Report : September 19, 2022





| | |
|---|--|
| RADIO TEST REPORT MIC Notice No.88 Appendix No. 43 Second-Generation Low-Power Data Communication System/Wireless LAN System | |
| Report Reference No. : LCSA082522150EA | |
| Date of Issue : September 19, 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..... : VIM1S | |
| Trade Mark..... : Khadas | |
| Test Model : VIM1S | |
| Ratings..... : Type-C Power Input: DC 5V, 2A USB1 Output: DC 5V, 500mA/ USB2 Output: DC 5V, 750mA | |
| Result : Positive | |

Compiled by:

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Scan code to check authenticity



RADIO -- TEST REPORT

| | |
|--|--|
| Test Report No. : LCSA082522150EA | <u>September 19, 2022</u> Date of issue |
|--|--|

| | |
|--------------------------|--|
| Test Model..... | : VIM1S |
| EUT..... | : VIM1S |
| Applicant..... | : KHADAS TECHNOLOGY CO., LTD |
| Address..... | : 2709 QIANCHENG CENTER, HAICHENG ROAD, XIXIANG STREET, BAO'AN DISTRICT, SHENZHEN, CHINA. 518101 |
| Telephone..... | : / |
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| Manufacturer..... | : KHADAS TECHNOLOGY CO., LTD |
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| 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.





Revision History

| Report Version | Issue Date | Revision Content | Revised By |
|----------------|--------------------|------------------|------------|
| 000 | September 19, 2022 | Initial Issue | --- |
| | | | |
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1. GENERAL INFORMATION

1.1. Description of Device (EUT)

| | |
|------------------|---|
| EUT | : VIM1S |
| Test Model | : VIM1S |
| Power Supply | : Type-C Power Input: DC 5V, 2A USB1 Output: DC 5V, 500mA/ USB2 Output: DC 5V, 750mA |
| 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): 1.0mW |
| 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, 2.47dBi(Max.) |

WIFI (2.4G Band)

| | |
|------------------------|--|
| Frequency Range | : 2412-2472MHz for 802.11b/g/n(HT20) |
| Channel Spacing | : 5MHz |
| Channel Number | : 13 Channel for 802.11b/g/n(HT20)(2412~2472MHz) |
| Modulation Type | : 802.11b: DSSS; 802.11g/n: OFDM |
| Declared Antenna Power | : 802.11b: 1.0mW/MHz 802.11g: 1.0mW/MHz 802.11n(HT20): 0.5mW/MHz |
| Antenna Description | : FPC Antenna, 2.47dBi (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) |





Declared Antenna Power : 802.11a: 0.5mW/MHz
802.11n(HT20): 0.5mW/MHz
802.11n(HT40): 0.05mW/MHz
802.11ac(VHT20): 0.5mW/MHz
802.11ac(VHT40): 0.05mW/MHz
802.11ac(VHT80): 0.01mW/MHz
Antenna Description : FPC Antenna, 1.71dBi(Max.)





1.2. Host System Configuration List and Details

| Manufacturer | Description | Model | Serial Number | Certificate |
|--------------|-------------|--------------------|---------------|-------------|
| --- | ADAPTER | RCL-PD30WL U50K | --- | --- |

Note: Auxiliary equipment is provided by the laboratory.

1.3. External I/O Cable

| I/O Port Description | Quantity | Cable |
|----------------------|----------|-------|
| Type-C Port | 1 | N/A |
| USB Port | 2 | N/A |
| HDMI Port | 1 | N/A |
| LAN 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 (BDR/EDR)

| Channel | Frequency(MHz) | Channel | Frequency(MHz) |
|---------|----------------|---------|----------------|
| 1 | 2402 | 41 | 2442 |
| 2 | 2403 | 42 | 2443 |
| -- | -- | -- | -- |
| 38 | 2439 | 78 | 2479 |
| 39 | 2440 | 79 | 2480 |
| 40 | 2441 | | |



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2. TEST METHODOLOGY

2.1. EUT Exercise

The EUT was tested while in a continuous transmitter/receiver mode.

The EUT was tuned to a low, middle, and high channel for the purpose of the measurements.

For all test case pre/scans were completed in all Modes to determine worst case levels. 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 | 2441MHz | 2480MHz |
| Bluetooth V5.0 | Default | Default | Default |

2.4. Description of Test Modes

| Tested channel, Frequency and Modulation Information | | |
|--|---------|---|
| CH1 | 2402MHz | GFSK(1Mbps), $\pi/4$ -DQPSK(2Mbps), 8-DPSK(3Mbps) |
| CH40 | 2441MHz | GFSK(1Mbps), $\pi/4$ -DQPSK(2Mbps), 8-DPSK(3Mbps) |
| CH79 | 2480MHz | GFSK(1Mbps), $\pi/4$ -DQPSK(2Mbps), 8-DPSK(3Mbps) |
| Hopping Mode | | GFSK(1Mbps), $\pi/4$ -DQPSK(2Mbps), 8-DPSK(3Mbps) |
| Note: According exploratory test, EUT has maximum output power for GFSK modulation, All the test modes were tested, but only the worst case was recorded in this report. | | |





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 5V | DC 5.5V | DC 4.5V |
| Output To RF Module | DC 3.3V | DC 3.3V | DC 3.3V |
| Voltage Variation (%) | -- | -- | -- |

Note: As the EUT was powered by DC 5V, 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 a typical fashion.

3.2. EUT Exercise Software

N/A.

3.3. Special Accessories

N/A.

3.4. Block Diagram/Schematics

Please refer to the report.

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 | PASS |
| 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 |
| (1) N/A is an abbreviation for Not Applicable. | | |





5. TEST RESULT

5.1. Frequency Tolerance

5.1.1. Standard Applicable

Tolerance of frequency shall be $\pm 50\text{ppm}$.

5.1.2. Test Procedures

a. Set EUT work in test mode as described in clause 2.4.

b. 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.

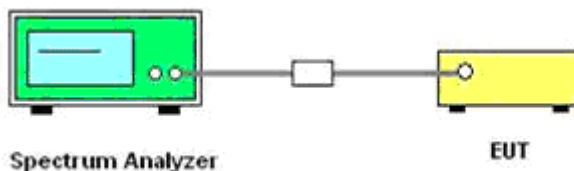
Span: 1MHz.

Detector: Peak.

Trace Mode: Max Hold.

c. 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 A.1 for BT Test Data.





5.2. Antenna Power

5.2.1. Standard Applicable

| Type | Limit |
|---------------|-----------|
| Antenna Power | 3mW/MHz |
| Tolerance | +20%,-80% |

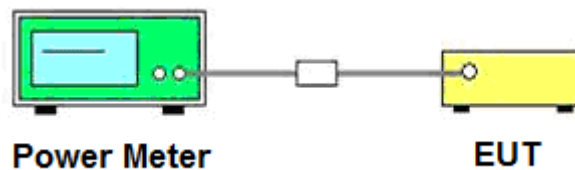
5.2.2. Measuring Instruments

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 A.2 for BT 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.

Resolution BW: 1MHz.

Video BW: 1MHz.

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

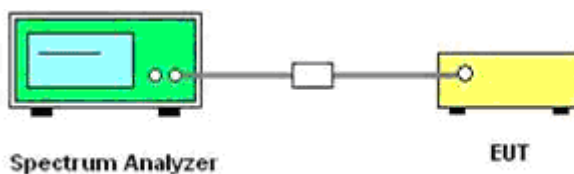
Sweep mode: Continuous sweeping.

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 Occupied Bandwidth

Please refer to the Appendix A.3 for BT 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.

The OFDM system shall have one or more carriers per 1 MHz bandwidth.

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.

Resolution BW: 1MHz.

Video BW: 1MHz.

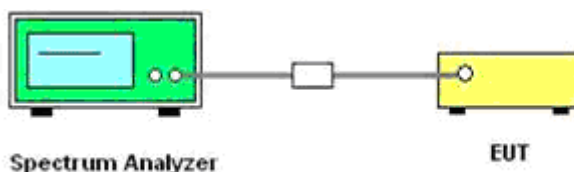
Span: Wide enough to cover the complete power envelope of the signal of the EUT.

Detector: Peak.

Trace Mode: Max Hold.

- When the trace is complete, measure the spread 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 Spectrum Bandwidth

Please refer to the Appendix A.4.1 for BT Test Data.

5.4.6. Test Result of Spread Spectrum Factor

Please refer to the Appendix A.4.2 for BT 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:

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

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

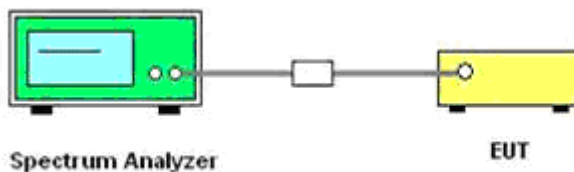
Above 1GHz: RBW/VBW= 1MHz / 1MHz.

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 A.5 for BT 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. Secondary Radiated Emissions

5.6.1. 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 20nW or less at a frequency of 1 GHz or higher as measured using the circuit

5.6.2. 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

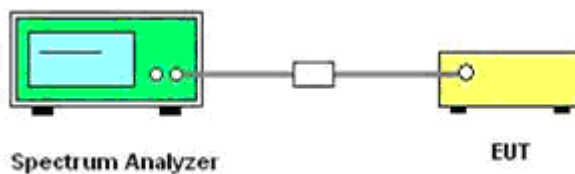
Video BW: 100 KHz for frequency below 1GHz and
1MHz for frequency above 1GHz

Detector: Peak.

Trace Mode: Max Hold.

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

5.6.3. Test Setup



5.6.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.6.5. Test Results

Please refer to the Appendix A.6 for BT Test Data.





5.7. Dwell Time

5.7.1. Standard Applicable

Frequency dwell time (time during which radio waves continue to be emitted at a specified

frequency) of a transmitting equipment using the FH system shall be 0.4 seconds or less.

5.7.2. Test Procedures

a. Set EUT work in test mode as described in clause 2.4.

b. 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: 1MHz.

Video BW: 1MHz.

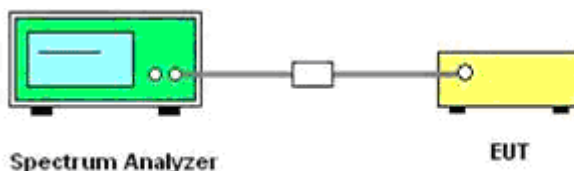
Span: Zero MHz

Detector: Peak.

Trace Mode: Max Hold.

c. When the trace is complete, measure the sending time of 1 burst and the duty cycle of 1 burst cycle.

5.7.3. Test Setup Layout



5.7.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.7.5. Test Results

Please refer to the Appendix A.7 for BT Test Data.





5.8. Carrier sensing function

5.8.1. 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) |

5.8.2. Instruments Setting

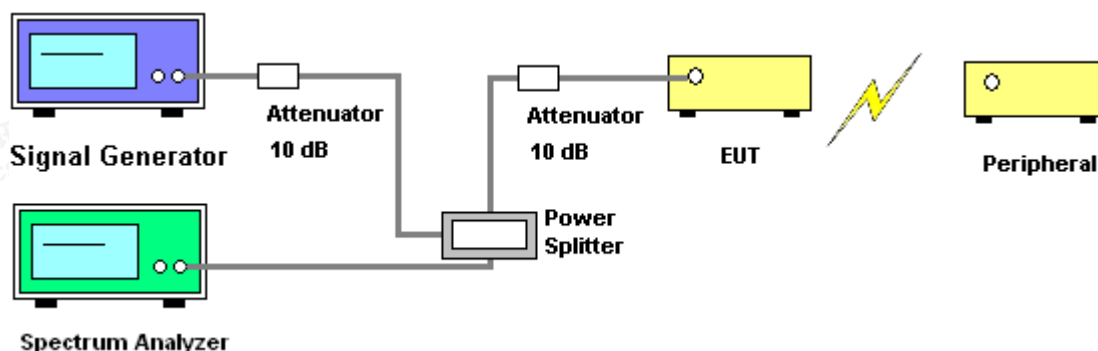
The following table is the setting of spectrum analyzer and receiver.

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

5.8.3. 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.

5.8.4. Test Setup Layout



5.8.5. EUT Operation during Test

The EUT was programmed to be in normal transmitting mode.

5.8.6. Test Result

Not Applicable.





5.9. Interference prevention function

5.9.1. Standard Applicable

| Item | Limits |
|---------------------|----------------|
| Identification code | ≥ 48 bits |

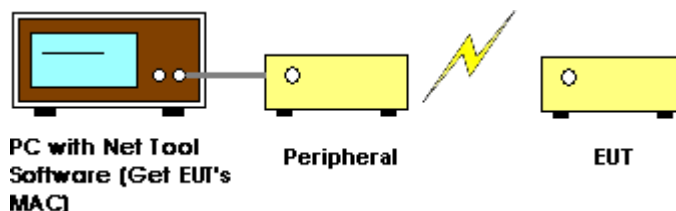
5.9.2. Measuring ID Code Software

| PC with NetTool | Setting |
|-----------------|----------|
| MAC IP List | MAC Scan |

5.9.3. 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.

5.9.4. Test Setup Layout



5.9.5. EUT Operation during Test

The EUT was programmed to be in normal transmitting mode.

5.9.6. Test Result

| EUT ID | Performance index |
|-------------------|-------------------|
| 60:ab:67:f0:90:fc | Good |





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 |

-----THE END OF REPORT-----

