# TEST REPORT

| | |
|---|---|
| **Applicant:** | Hanhua Digital Drinking Water Appliance Technology (Shenzhen) Co., LTD |
| **Address:** | Room 911, Building T4, Fangcheng City, Taoyuan Street, Nanshan District, Shenzhen City, Guangdong Province, China |
| **Equipment Type:** | Bluetooth module |
| **Model Name:** | BM1032 |
| **Brand Name:** | N/A |
| **Test Standard:** | ANSI/IEEE Std 149-1979 |
| **Test Date:** | Jul. 25, 2022 |
| **Date of Issue:** | Aug. 01, 2022 |

**Tested by:** Li Zhixiang

**Checked by:** Zhu Xusen

**Approved by:** Han tong

(Chief Engineer)

**Revision History**

| Version | Issue Date | Revisions Content |
|---|---|---|
| Rev. 01 | Aug. 01, 2022 | Initial Issue |

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# 1 GENERAL INFORMATION

## 1.1 Identification of the Testing Laboratory

| | |
|---|---|
| Company Name | Hanvor digital drinking water appliance technology (shenzhen) co. LTD |
| Address | 911, building 4, Fangda Plaza, No. 20, Gaofa West Road, Taoyuan community, Taoyuan Street, Nanshan District, Shenzhen |
| Phone Number | +86 755 2662 6909 |

## 1.2 Identification of the Responsible Testing Location

| | |
|---|---|
| Test Location 1 | Hanvor digital drinking water appliance technology (shenzhen) co. LTD |
| Address | 911, building 4, Fangda Plaza, No. 20, Gaofa West Road, Taoyuan community, Taoyuan Street, Nanshan District, Shenzhen |
| Description | All measurement facilities used to collect the measurement data are located at 911, building 4, Fangda Plaza, No. 20, Gaofa West Road, Taoyuan community, Taoyuan Street, Nanshan District, Shenzhen |

## 1.3 Test Environment Condition

| | |
|---|---|
| Ambient Pressure | 100 to 102 KPa |
| Ambient Temperature | 19 to 25 °C |
| Ambient Relative Humidity | 45 to 55 % |

# 2 PRODUCT INFORMATION

## 2.1 Applicant Information

| | |
|---|---|
| Applicant | Hanvor digital drinking water appliance technology (shenzhen) co. LTD |
| Address | 911, building 4, Fangda Plaza, No. 20, Gaofa West Road, Taoyuan community, Taoyuan Street, Nanshan District, Shenzhen |

## 2.2 Manufacturer Information

| | |
|---|---|
| Manufacturer | Hanvor digital drinking water appliance technology (shenzhen) co. LTD |
| Address | 911, building 4, Fangda Plaza, No. 20, Gaofa West Road, Taoyuan community, Taoyuan Street, Nanshan District, Shenzhen |

## 2.3 Factory Information

| | |
|---|---|
| Factory | N/A |
| Address | N/A |

## 2.4 General Description for Equipment under Test (EUT)

| | |
|---|---|
| Bluetooth Core Specification Version | Bluetooth Core Version 5.0 |
| Product Type | End Product |
| Model Name Under Test | BM1032 |
| Serial Model Name | BM1032 |
| Hardware Version | V01 |
| Software Version | V1.0 |
| Brief Description | This is a Low power Bluetooth module. |

## 2.5 Ancillary Equipment

N/A

# 3 SUMMARY OF TEST RESULTS

## 3.1 Test Standards

| No. | Identity | Document Title |
|---|---|---|
| 1 | ANSI/IEEE Std 149-1979 | IEEE Standard Test Procedures for Antennas |

## 3.2 Summary of Test Results

| Report Section | Description | Remark |
|---|---|---|
| ANNEX A.1 | Gain and Efficiency | -- |
| ANNEX B | Radiation Pattern | -- |

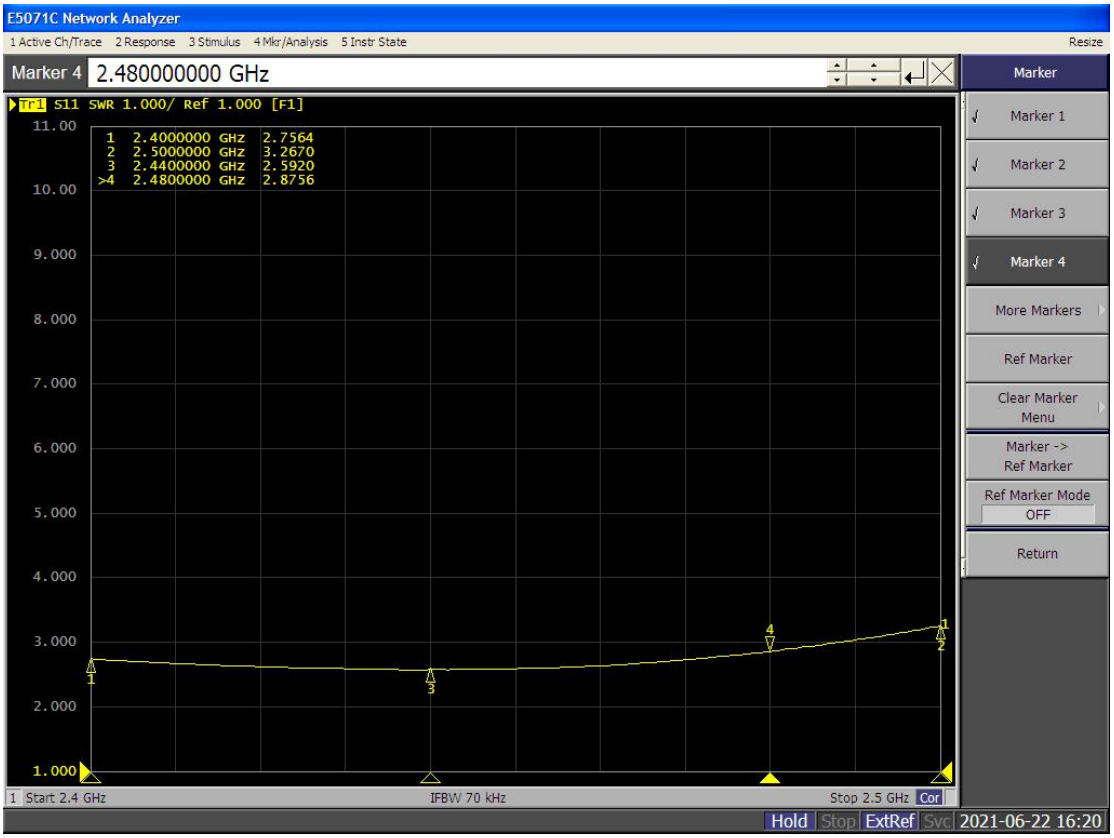
### 3.3 ANNEX A TEST RESULTS

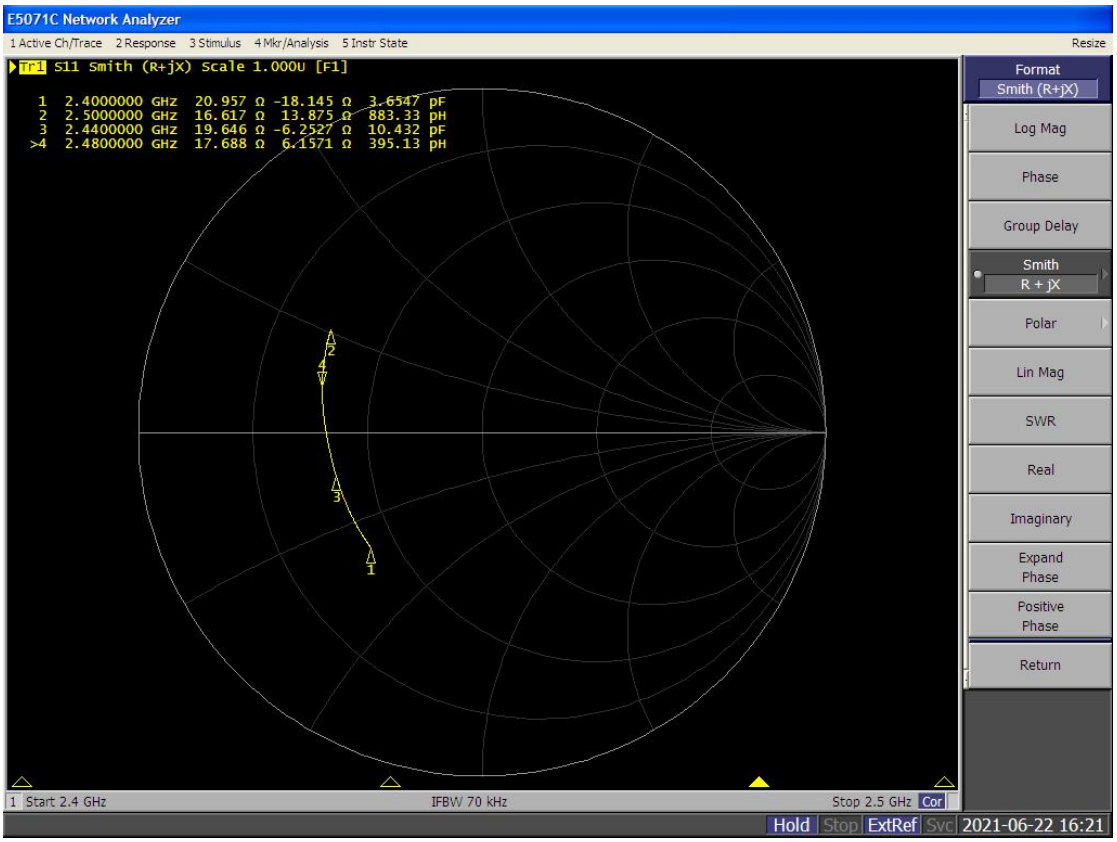
## A.1 Gain and Efficiency

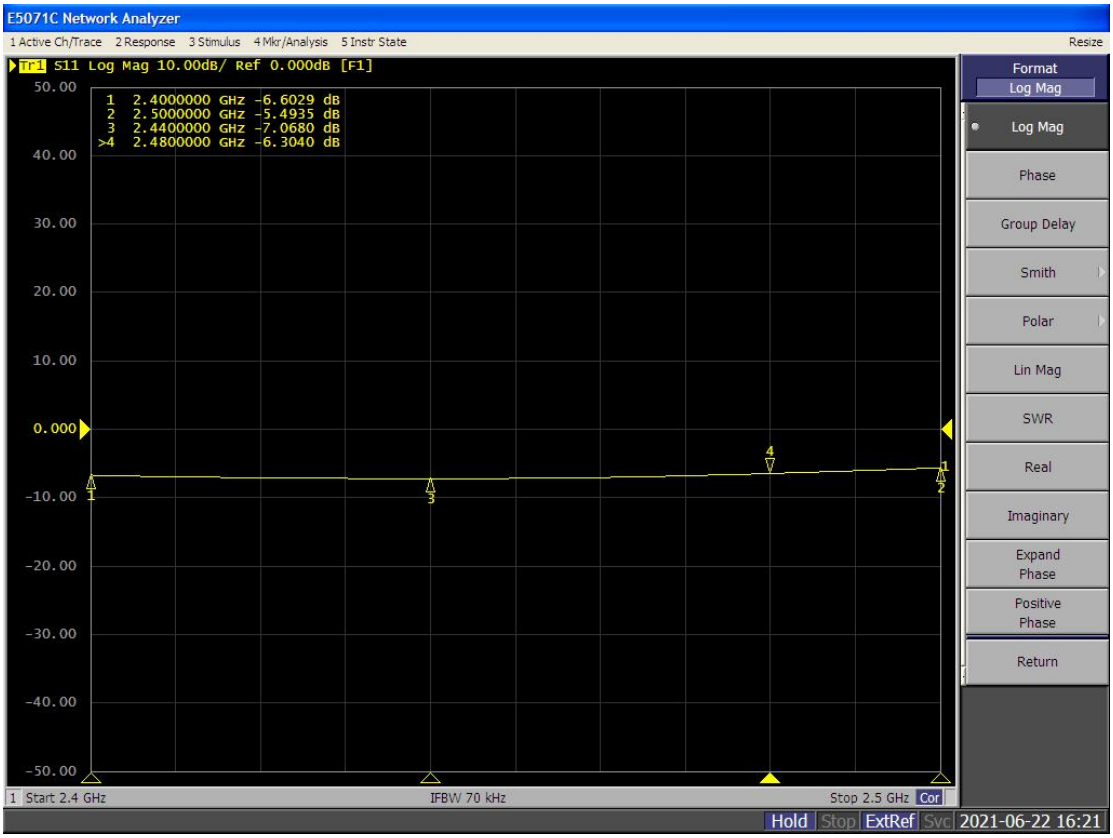
| Frequency | Gain (dBi) | Efficiency (%) |
|---|---|---|
| 2400MHz | 1.39 | 17.12% |
| 2410MHz | 1.4 | 17.30% |
| 2420MHz | 1.55 | 17.70% |
| 2430MHz | 0.98 | 14.89% |
| 2440MHz | 0.98 | 14.92% |
| 2450MHz | 0.44 | 13.22% |
| 2460MHz | 0.84 | 15.12% |
| 2470MHz | 1.59 | 18.48% |
| 2480MHz | 1.62 | 19.01% |
| 2490MHz | 0.18 | 13.82% |
| 2500MHz | -0.65 | 11.72% |

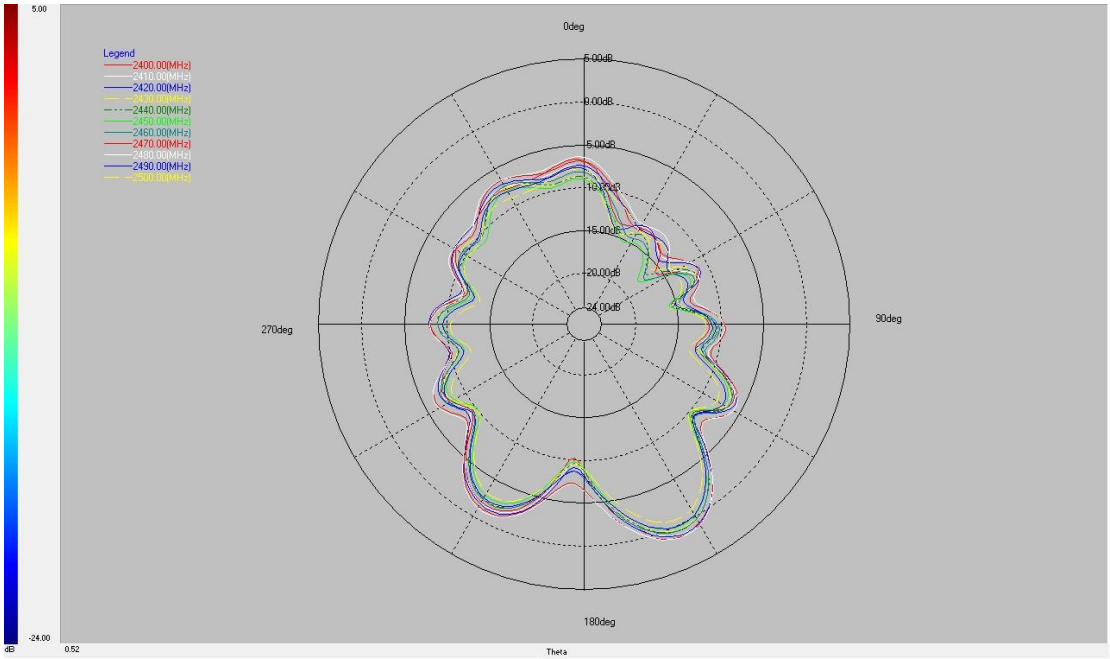
# ANNEX B RADIATION PATTERN

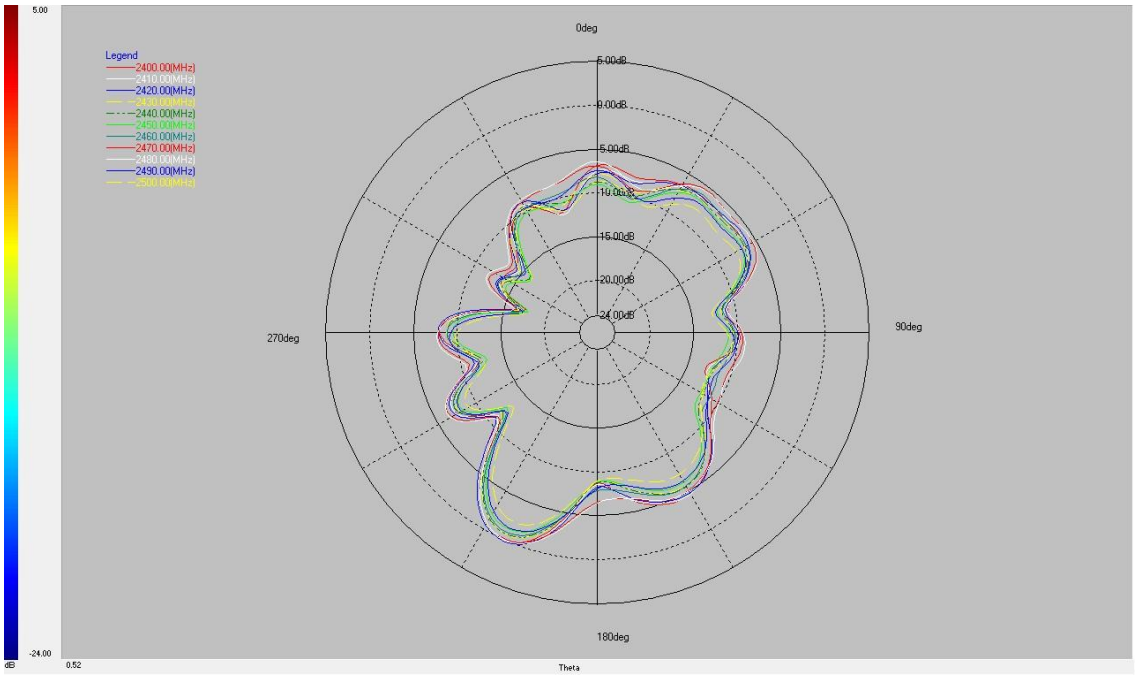
| Frequency | Return Loss | Standing wave | impedance |
|---|---|---|---|
| 2400MHz | -6.60 | 2.75 | 20.95 |
| 2440MHz | -7.06 | 2.59 | 19.64 |
| 2480MHz | -6.30 | 2.87 | 19.68 |
| 2500MHz | -5.49 | 3.26 | 16.61 |

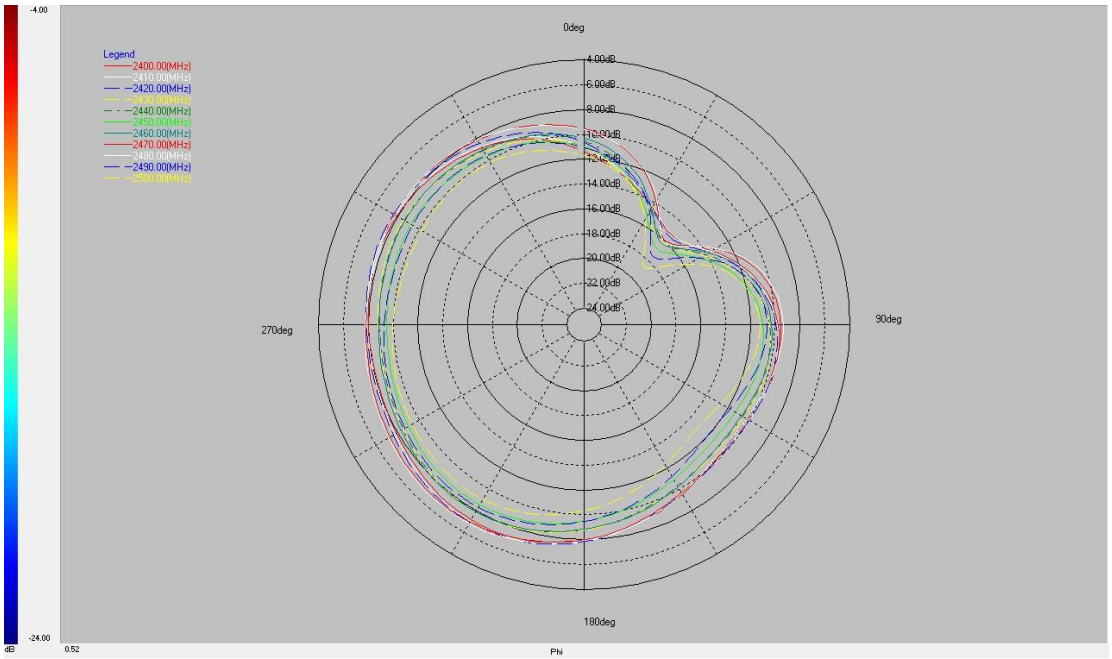

E5071C Network Analyzer
1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State
Resize
Marker 4 2.480000000 GHz
Tr1 S11 SWR 1.000/ Ref 1.000 [F1]
1 2.4000000 GHz 2.7564
2 2.5000000 GHz 3.2670
3 2.4400000 GHz 2.5920
>4 2.4800000 GHz 2.8756
11.00
10.00
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
1 Start 2.4 GHz
IFBW 70 kHz
Stop 2.5 GHz
Cor
Marker
Marker 1
Marker 2
Marker 3
Marker 4
More Markers
Ref Marker
Clear Marker Menu
Marker -> Ref Marker
Ref Marker Mode OFF
Return
Hold Stop ExtRef Svc 2021-06-22 16:20


E5071C Network Analyzer
1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State
Resize
Tr1 S11 Smith (R+jX) Scale 1.000U [F1]
1 2.4000000 GHz 20.957 Ω -18.145 Ω 3.6547 pF
2 2.5000000 GHz 16.617 Ω 13.875 Ω 883.33 pH
3 2.4400000 GHz 19.646 Ω -6.2527 Ω 10.432 pF
>4 2.4800000 GHz 17.688 Ω 6.1571 Ω 395.13 pH
1 Start 2.4 GHz
IFBW 70 kHz
Stop 2.5 GHz
Cor
Format Smith (R+jX)
Log Mag
Phase
Group Delay
Smith R + jX
Polar
Lin Mag
SWR
Real
Imaginary
Expand Phase
Positive Phase
Return
Hold Stop ExtRef Svc 2021-06-22 16:21


E5071C Network Analyzer
1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State
Resize
Tr1 S11 Log Mag 10.00dB/ Ref 0.000dB [F1]
1 2.4000000 GHz -6.6029 dB
2 2.5000000 GHz -5.4935 dB
3 2.4400000 GHz -7.0680 dB
>4 2.4800000 GHz -6.3040 dB
50.00
40.00
30.00
20.00
10.00
0.000
-10.00
-20.00
-30.00
-40.00
-50.00
1 Start 2.4 GHz
IFBW 70 kHz
Stop 2.5 GHz
Format
Log Mag
Log Mag
Phase
Group Delay
Smith
Polar
Lin Mag
SWR
Real
Imaginary
Expand Phase
Positive Phase
Return
Hold
Stop
ExtRef
Svc
2021-06-22 16:21


5.00
-24.00
dB
0.52
Theta
Legend
2400.00(MHz)
2410.00(MHz)
2420.00(MHz)
2430.00(MHz)
2440.00(MHz)
2450.00(MHz)
2460.00(MHz)
2470.00(MHz)
2480.00(MHz)
2490.00(MHz)
2500.00(MHz)
0deg
90deg
180deg
270deg
5.00dB
10.00dB
15.00dB
20.00dB
24.00dB


5.00
-24.00
dB
0.52
Theta
0deg
90deg
180deg
270deg
Legend
2400.00(MHz)
2410.00(MHz)
2420.00(MHz)
2430.00(MHz)
2440.00(MHz)
2450.00(MHz)
2460.00(MHz)
2470.00(MHz)
2480.00(MHz)
2490.00(MHz)
2500.00(MHz)
5.00dB
9.00dB
5.00dB
10.00dB
15.00dB
20.00dB
24.00dB


-4.00
-24.00
dB
0.52
Phi
0deg
90deg
180deg
270deg
Legend
2400.00(MHz)
2410.00(MHz)
2420.00(MHz)
2430.00(MHz)
2440.00(MHz)
2450.00(MHz)
2460.00(MHz)
2470.00(MHz)
2480.00(MHz)
2490.00(MHz)
2500.00(MHz)
4.00dB
6.00dB
8.00dB
10.00dB
12.00dB
14.00dB
16.00dB
18.00dB
20.00dB
22.00dB
24.00dB

# 4 Test Equipment & Conditions

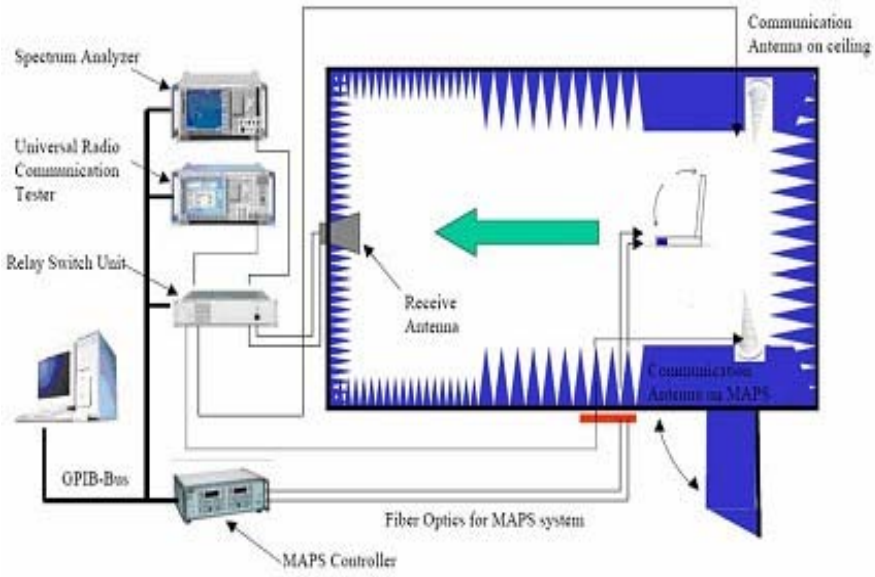
## 1. Network Analyzers :

Agilent 8753D 5071C

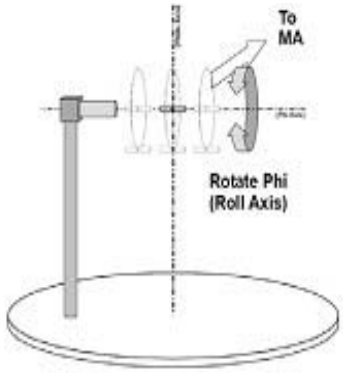
## 2. Communications Test Set:

Agilent E5515C CMW500

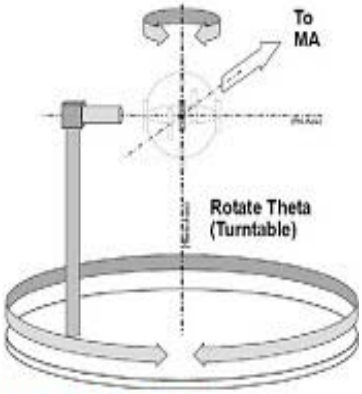
## 3. 3D Chamber Test System




(Testing by 3D anechoic chamber)

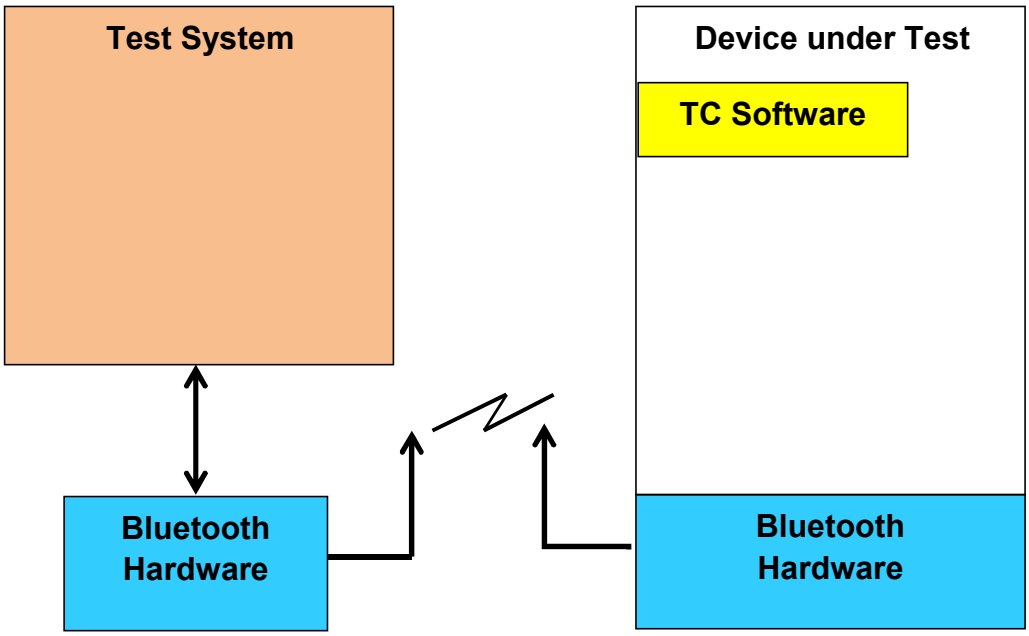



Phi axis test




Theta axis test

### 4.3.2 Profile Test System



# 5 RF-PHY CONFORMANCE TEST RESULTS

## 5.1 RF-PHY ICS /IXIT (Bluetooth Low Energy)

| Bluetooth LE RF-PHY Capabilities | | | | |
|---|---|---|---|---|
| Item | Capability | System Spec Reference | Status | Support [Yes] or [No] |
| 1 | LE Transmitter (Non-connectable, Broadcaster) | [1], 3 | C.1 | Yes |
| 2 | LE Receiver (Non-connectable, Observer) | [1], 4 | C.1 | Yes |
| 3 | LE Transceiver (Connectable, Peripheral/Central) | [1], 3, 4 | C.1 | Yes |
| 4 | LE 2M PHY | [3], 3, 4 | C.2 | No |
| 5 | Stable Modulation Index - Transmitter | [3], 3.1.1 | C.3 | No |
| 6 | Stable Modulation Index - Receiver | [3], 3.1.1 | C.4 | No |
| 7 | LE Coded PHY | [3], 3, 4 | C.2 | No |
| 8 | Transmitting Constant Tone Extensions | [4], 5 | C.3 | No |
| 9 | 2 µs Antenna Switching During Constant Tone Extension Transmission (AoD) | [4], 5 | C.5 | No |
| 10 | 1 µs Antenna Switching During Constant Tone Extension Transmission (AoD) | [4], 5 | C.6 | No |
| 11 | 2 µs Antenna Sampling During Constant Tone Extension Reception (AoD) | [4], 5 | C.4 | No |
| 12 | 2 µs Antenna Switching and Sampling During Constant Tone Extension Reception (AoA) | [4], 5 | C.7 | No |
| 13 | 1 µs Antenna Sampling During Constant Tone Extension Reception (AoA) | [4], 5 | C.7 | No |
| 14 | 1 µs Antenna Switching and Sampling During Constant Tone Extension Reception (AoA) | [4], 5 | C.8 | No |

*C.1: Mandatory to support at least one of these capabilities.*

*C.2: Optional IF (SUM ICS 21/16 "Core 5.0" OR SUM ICS 21/18 "Core 5.1") AND RFPHY 1/3 "LE Transceiver" are supported, otherwise Excluded.*

*C.3: Optional IF (SUM ICS 21/16 "Core 5.0" OR SUM ICS 21/18 "Core 5.1") AND (RFPHY 1/1 "LE Transmitter" OR RFPHY 1/3 "LE Transceiver") are supported, otherwise Excluded.*

*C.4: Optional IF (SUM ICS 21/16 "Core 5.0" OR SUM ICS 21/18 "Core 5.1") AND (RFPHY 1/2 "LE Receiver" OR RF PHY 1/3 "LE Transceiver") are supported, otherwise Excluded.*

*C.5: Optional IF RF PHY 1/8 "Transmitting Constant Tone Extensions" is supported, otherwise Excluded.*

*C.6: Optional IF 1/9 "2 µs Antenna Switching During Constant Tone Extension Transmission (AoD)" is supported, otherwise Excluded.*

*C.7: Optional IF RF PHY 1/11 "2 µs Antenna Sampling During Constant Tone Extension Reception (AoD)" is supported, otherwise Excluded.*

*C.8: Mandatory IF RF PHY 1/12 "2 µs Antenna Switching and Sampling During Constant Tone Extension Reception (AoA)" and RF/PHY 1/13 "1 µs Antenna Sampling During Constant Tone Extension Reception (AoD)" are supported, otherwise Excluded.*

| Bluetooth LE Test Interface Capabilities | | | | |
|---|---|---|---|---|
| Item | Capability | System Spec Reference | Status | Support [Yes] or [No] |
| 1 | HCI Test Interface | [2], 2 | C.1 | Yes |
| 2 | UART Test Interface | [2], 3 | C.1 | No |
| *C.1: At least one of the capabilities shall be supported.* | | | | |

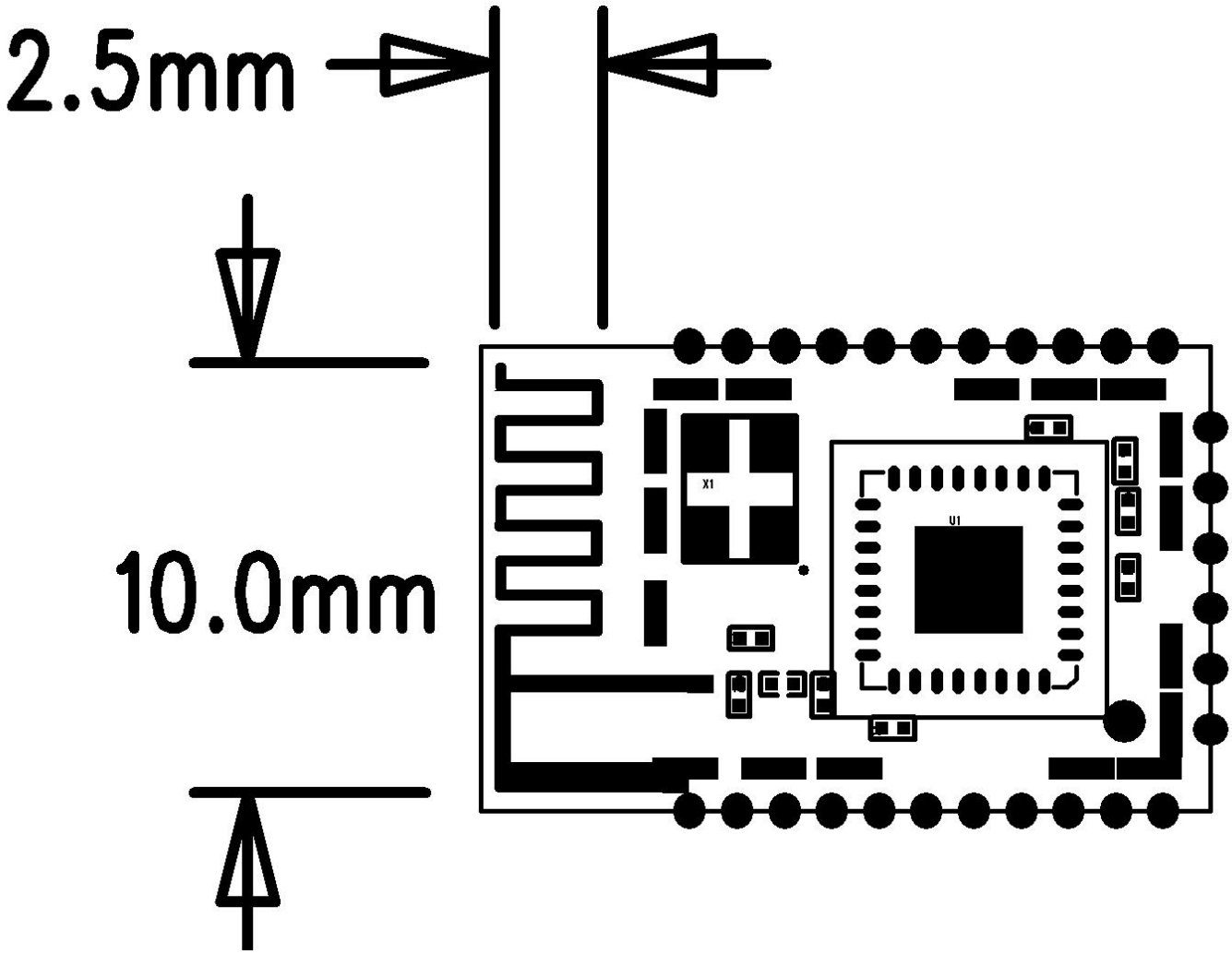
| RF-PHY PIXIT | | | | |
|---|---|---|---|---|
| PIXIT Reference | Identifier | Sub-Identifier (Optional) | Value | Units |
| RF-PHY:P1:1 | In-band Image frequency | Low frequency | 0 | MHz |
| RF-PHY:P1:2 | | Middle frequency | 0 | MHz |
| RF-PHY:P1:3 | | High frequency | 0 | MHz |
| RF-PHY:P2:1 | Value n for Intermodulation test | Low frequency | 5 | Integer |
| RF-PHY:P2:2 | | Middle frequency | 5 | Integer |
| RF-PHY:P2:3 | | High frequency | 5 | Integer |
| RF-PHY:P4 | Power source voltage | Nominal (NOC) | 3.3 | V |
| RF-PHY:P5 | Operating temperature | Nominal (NOC) | 25 | °C |
| RF-PHY:P6:1 | Operating air humidity range (relative) | Maximum (EOC) | 95 | % |
| RF-PHY:P6:2 | | Minimum (EOC) | 40 | % |
| RF-PHY:P6:3 | | Air humidity level for NOC/EOC tests | 40 to 95 | % |
| RF-PHY:P7:1 | Test interface implementation | HCI or 2-wire UART | HCI | -- |
| RF-PHY:P7:2 | | Data Rate | 115200 | bps |
| RF-PHY:P9:1 | Maximum TX packet length (MAX_TX_LENGTH) | -- | 37 | Bytes |
| RF-PHY:P9:2 | Maximum RX packet length (MAX_RX_LENGTH) | -- | 37 | Bytes |
| RF-PHY:P9:3 | Maximum TX packet length (MAX_TX_LENGTH) 2M | -- | N/A | Bytes |
| RF-PHY:P9:4 | Maximum TX packet length (MAX_TX_LENGTH) S=2 | -- | N/A | Bytes |
| RF-PHY:P9:5 | Maximum TX packet length (MAX_TX_LENGTH) S=8 | -- | N/A | Bytes |
| RF-PHY:P9:6 | Maximum RX packet length (MAX_RX_LENGTH) 2M | -- | N/A | Bytes |
| RF-PHY:P9:7 | Maximum RX packet length (MAX_RX_LENGTH) S=2 | -- | N/A | Bytes |
| RF-PHY:P9:8 | Maximum RX packet length (MAX_RX_LENGTH) S=8 | -- | N/A | Bytes |
| RF-PHY:P10:1 | Maximum TX mode output power | -- | 10 | dBm |
| RF-PHY:11:1 | Inband Image Frequency (2Ms/s) | Low frequency | N/A | MHz |
| RF-PHY:11:2 | | Middle frequency | N/A | MHz |
| RF-PHY:11:3 | | High frequency | N/A | MHz |
| RF-PHY:12:1 | Value n for Intermodulation test (2Ms/s) | Low frequency | N/A | Integer |
| RF-PHY:12:2 | | Middle frequency | N/A | Integer |
| RF-PHY:12:3 | | High frequency | N/A | Integer |
| RF-PHY:13:1 | Inband Image Frequency (Stable Modulation Receiver) | Low frequency | N/A | MHz |
| RF-PHY:13:2 | | Middle frequency | N/A | MHz |
| RF-PHY:13:3 | | High frequency | N/A | MHz |
| RF-PHY:14:1 | Value n for Intermodulation | Low frequency | N/A | Integer |

| | | | | |
|---|---|---|---|---|
| RF-PHY:14:2 | test (Stable Modulation Receiver) | Middle frequency | N/A | Integer |
| RF-PHY:14:3 | | High frequency | N/A | Integer |
| RF-PHY:15:1 | Inband Image Frequency (Stable Modulation Receiver, 2Ms/s) | Low frequency | N/A | MHz |
| RF-PHY:15:2 | | Middle frequency | N/A | MHz |
| RF-PHY:15:3 | | High frequency | N/A | MHz |
| RF-PHY:16:1 | Value n for Intermodulation test (Stable Modulation Receiver, 2Ms/s) | Low frequency | N/A | Integer |
| RF-PHY:16:2 | | Middle frequency | N/A | Integer |
| RF-PHY:16:3 | | High frequency | N/A | Integer |
| RF-PHY:17 | IQ Report Rate | -- | N/A | -- |
| RF-PHY:18 | The length of the Constant Tone Extension(1Ms/s) | -- | N/A | bits |
| RF-PHY:19 | The length of the Constant Tone Extension(2Ms/s) | -- | N/A | bits |
| RF-PHY:20 | The number of antennae | -- | 1 | -- |

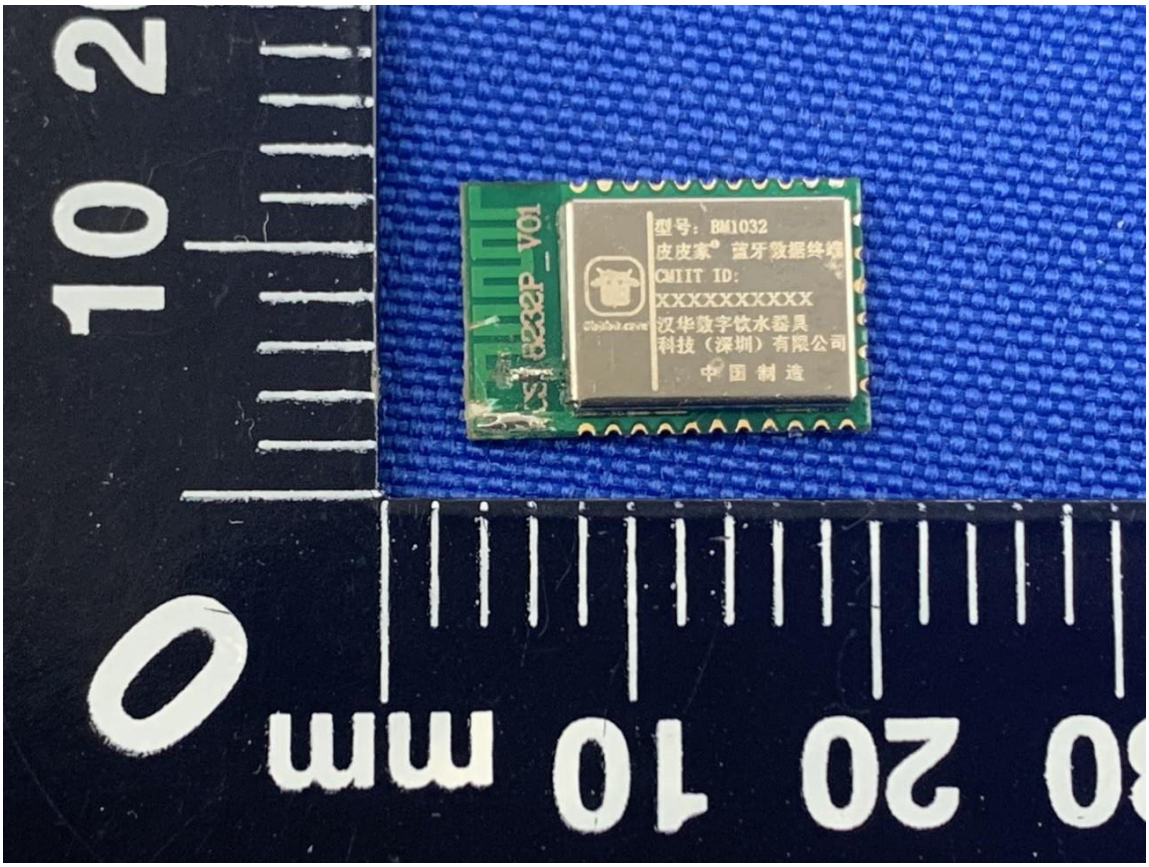
## 5.2 Test Results List

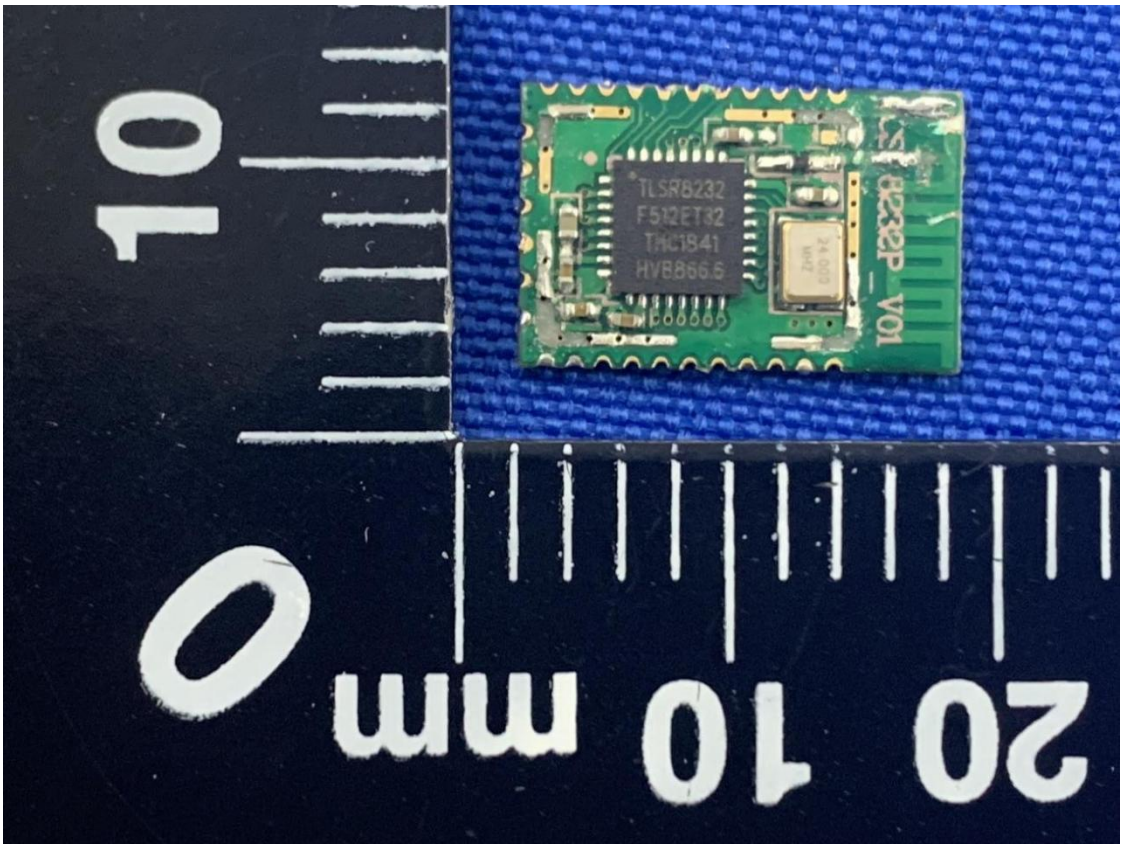
| Bluetooth Low Energy | | | | | |
|---|---|---|---|---|---|
| TC. Identifier | Description | Cat. | Verdict | Test Condition | Test Equipment |
| TRM-LE/CA/BV-01-C | Output power | A | Pass | NTNV | 7Layers Systems |
| TRM-LE/CA/BV-03-C | In-band emissions | A | Pass | NTNV | 7Layers Systems |
| TRM-LE/CA/BV-05-C | Modulation characteristics | A | Pass | NTNV | 7Layers Systems |
| TRM-LE/CA/BV-06-C | Carrier frequency offset and drift | A | Pass | NTNV | 7Layers Systems |
| RCV-LE/CA/BV-01-C | Receiver sensitivity | A | Pass | NTNV | 7Layers Systems |
| RCV-LE/CA/BV-03-C | C/I and receiver selectivity performance | A | Pass | NTNV | 7Layers Systems |
| RCV-LE/CA/BV-04-C | Blocking performance | A | Pass | NTNV | 7Layers Systems |
| RCV-LE/CA/BV-05-C | Intermodulation performance | A | Pass | NTNV | 7Layers Systems |
| RCV-LE/CA/BV-06-C | Maximum input signal level | A | Pass | NTNV | 7Layers Systems |
| RCV-LE/CA/BV-07-C | PER Report Integrity | A | Pass | NTNV | 7Layers Systems |

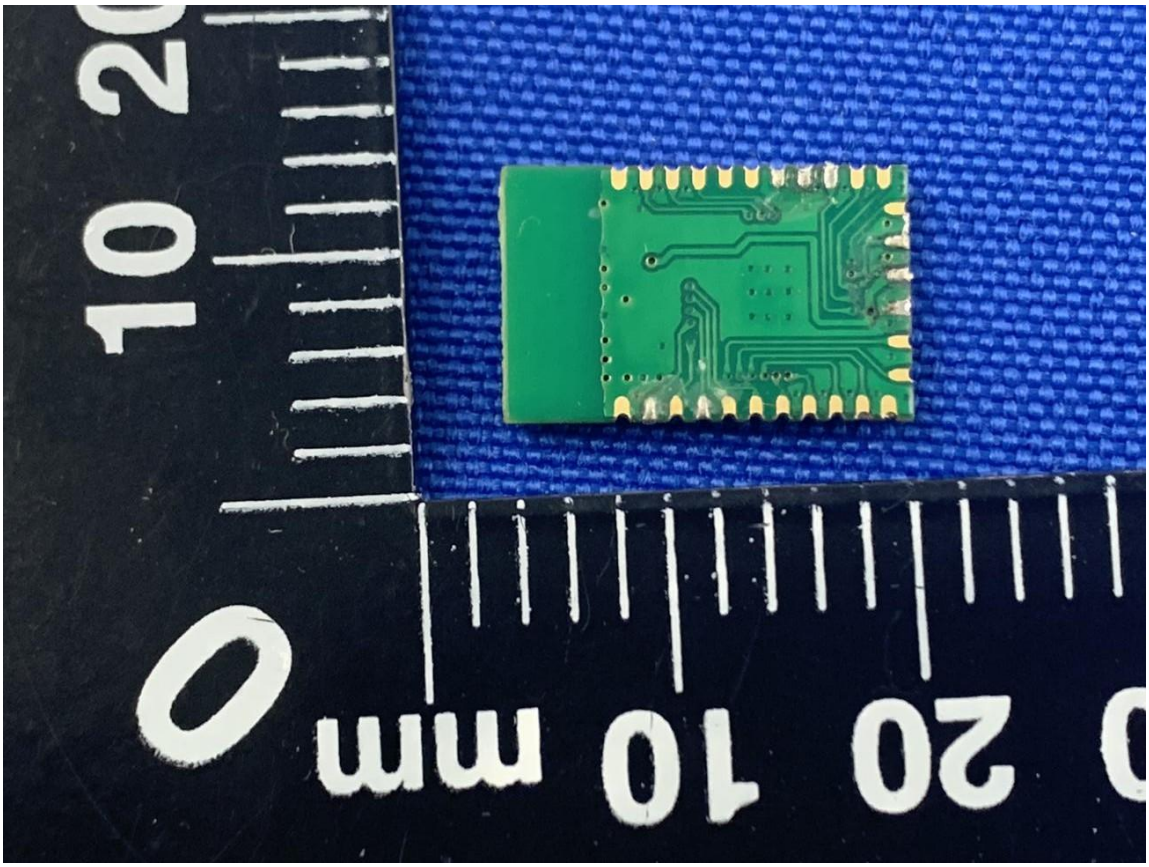
## 6. Product Drawing

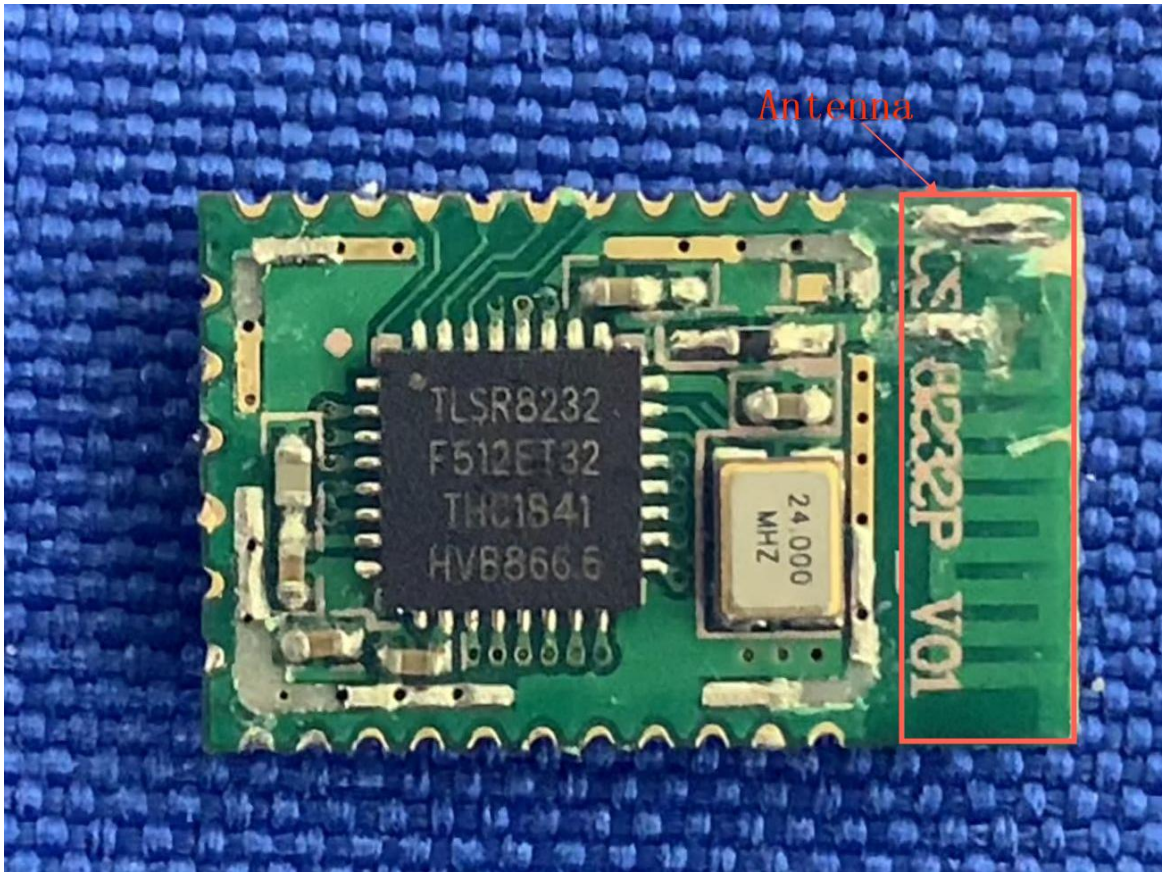


# ANNEX A EUT PHOTOS




0
10
20
mm
0
10
20


Antenna
TLSR8232
F512ET32
THC1841
HV8866.6
24.000
MHZ
V01