

Antenna Test Report

Document No. : ANT-202511001
Issued Date: Nov. 2025
Product Model: MALIGHT 4D-3D Laser Level (12 Lines / 16 Lines Laser Level)
Applicant: Nantong Xingboshen Culture Technology Co.,Ltd
Address: Jiangsu Province Nantong City Lüsigan Town
MaojiagangXingboshen Electric Tools Factory

1. General Information

1.1 Product Description

4D/3D omnidirectional wall & floor laser level, built-in 2.4GHz Bluetooth wireless control module, matched with built-in PCB FPC antenna for wireless signal transmission. Laser parameters:

- Wavelength: 650nm red light / 515nm blue light / 532nm green light
- Working temperature: -20℃ ~ 50℃

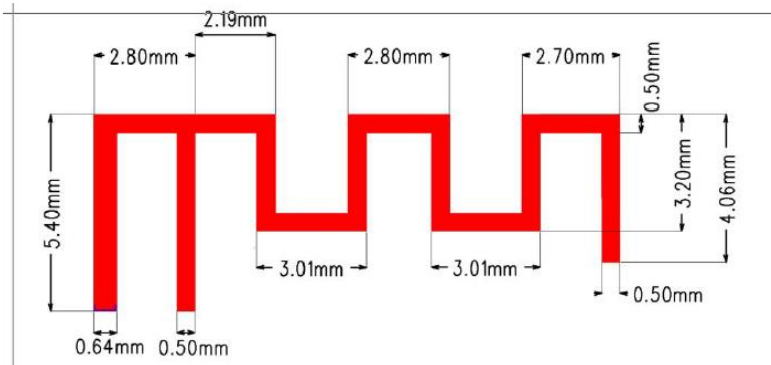
1.2 Antenna Basic Parameters

Test Item	Specification
Antenna Type	Built-in PCB FPC Omni Antenna
Antenna Model	BT-2400-FPC08
Working Frequency Range	2400MHz ~ 2483.5MHz (BLE Bluetooth band)
Antenna Size	32mm × 12mm
Nominal Impedance	50 Ω standard RF impedance
Polarization Mode	Linear polarization
Radiation Feature	Omni-directional radiation
Matching Design	Onboard RF matching circuit
Maximum Power Endurance	100mW
Antenna Working Temperature	-40℃ ~ +85℃

1.3 Test Conditions & Equipment

- Test Site: 3D RF anechoic chamber
- Test Instruments: Keysight N9918A Network Analyzer, CMW500 Radio Communication Tester
- Compliance Standard: FCC Part 15 Subpart C, KDB 353028
- Ambient test temperature: 25℃ ±2℃

2. Antenna size



3. Passive RF Performance Test Results

3.1 VSWR & Return Loss Test Data

Frequency (MHz)	VSWR Value	Return Loss (dB)
2400	1.52	-12.8
2440	1.41	-14.5
2483.5	1.48	-13.3

Judgment: $VSWR \leq 2.0$ within full frequency band, meet FCC regulatory requirements.

3.2 Effective Bandwidth

Effective bandwidth with $VSWR < 2.0$: $\geq 85\text{MHz}$ (2400MHz - 2485MHz)

4. Radiation Performance Test Results

表格

Test Item	Test Result
Peak Antenna Gain	2.85 dBi (Maximum)
Average 3D Antenna Gain	-1.62 dBi
Antenna Radiation Efficiency	65.3%
EIRP Compliance Check	$EIRP \leq 30\text{dBm}$, fully comply with FCC Part 15C power limit

5. Radiation Pattern Description

Frequency (MHz)	Max Gain(dBi)	Min Gain(dBi)	Avg Gain(dBi)
2400	2.71	-20.35	-1.86
2440	2.85	-19.62	-1.62
2483.5	2.68	-21.17	-1.91

Overall Peak Antenna Gain: 2.85 dBi Average 3D Antenna Gain: -1.62 dBi
Antenna Radiation Efficiency: 65.3% EIRP Compliance Check: EIRP $\leq$ 30dBm,
fully comply with FCC Part 15C power limit

5.2 Horizontal Plane Apple Diagram (2D Polar Radiation Pattern / Gain Plot)

Test Frequency Points: 2400 MHz, 2440 MHz, 2483.5 MHz Power Scale Setting:
Max=0 dBm, Min=-40 dBm, 5 dB per division Pattern Illustration:

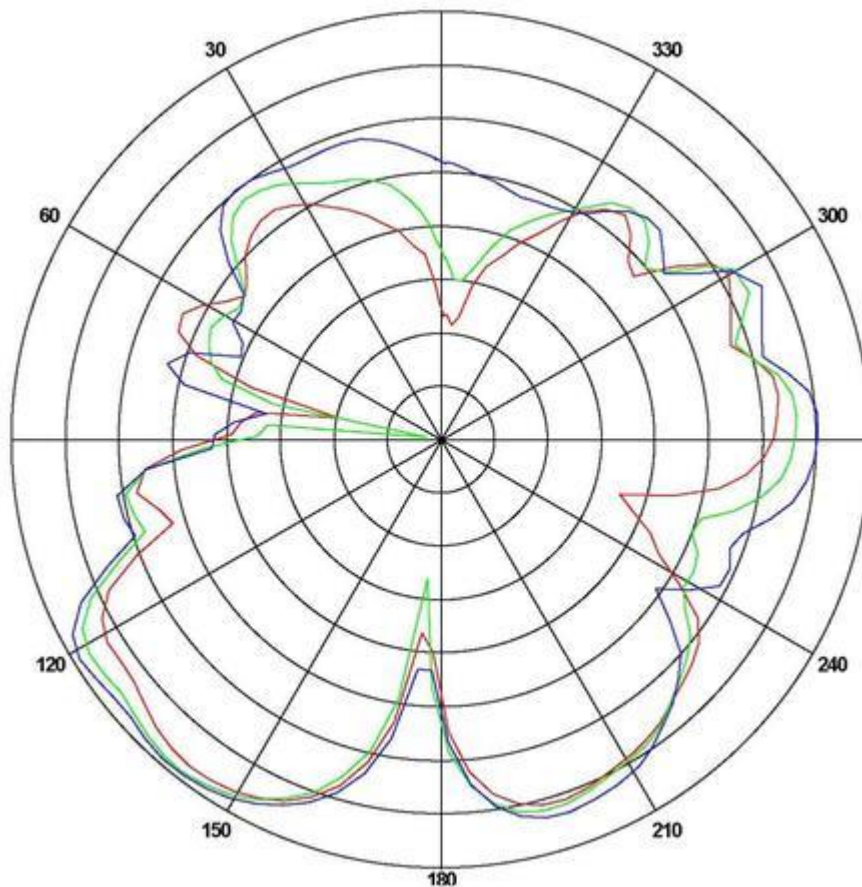


Chart Explanation: Red curve: 2400MHz radiation gain contour Green curve: 2440MHz radiation gain contour Blue curve: 2483.5MHz radiation gain contour Radiation Feature: Omni-directional uniform coverage, slight gain fluctuation across full 0~360° azimuth, no over-limit high-gain lobes. This polar coordinate radiation polar plot is industry-named Apple Diagram.

5.3 Vertical Plane Apple Diagram (2D Polar Radiation Pattern / Gain Plot)

Test Frequency Points: 2400 MHz, 2440 MHz, 2483.5 MHz Power Scale Setting:
Max=0 dBm, Min=-30 dBm, 5 dB per division Pattern Illustration:

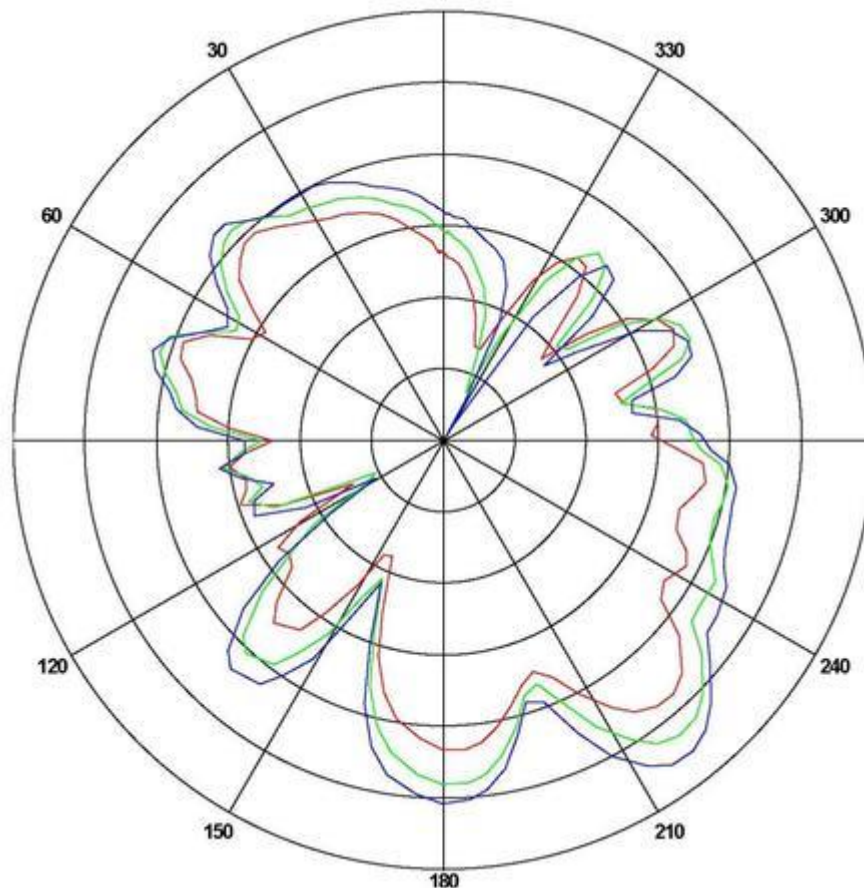


Chart Explanation: Red curve: 2400MHz radiation gain contour Green curve: 2440MHz radiation gain contour Blue curve: 2483.5MHz radiation gain contour Radiation Feature: Even vertical plane radiation distribution, consistent gain attenuation at all elevation angles, all RF power levels comply with FCC regulatory limits. This polar coordinate radiation polar plot is industry-named Apple Diagram.

6. Overall Test Conclusion

The built-in FPC antenna model BT-2400-FPC08 equipped on MALIGHT 4D-3D laser level meets all RF antenna technical requirements specified by FCC Part 15 Subpart C. All test indicators satisfy the regulatory limits for products sold in the US market.

7. Signature & Seal Section

Test Engineer: _____ Date: _____

Lab Auditor: _____

Company Official Seal: