

433.92 MHz Remote Control Antenna Specification Sheet

Document Version History

Edition	Date of issue	Revised Content	Planning Department
V1.0	2026-07-31	Initial version development	Engineering department
V1.1	2026-08-28	Add Figure 7-1	Engineering department

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1 Product Overview

This specification document applies to the PCB curved single-pole antenna equipped with an integrated ISM 433.92 MHz handheld wireless remote control. The main control hardware incorporates an encoding chip and a CMT2110A RF transmission chip, utilizing OOK/ASK modulation scheme. This antenna serves as the sole RF radiation unit for the entire device and is compatible with the product's original schematic diagram, bill of materials (BOM), and hardware block diagram; it meets the requirements for civilian short-range wireless remote control communication applications and can be directly used for product certification testing, mass production compliance filing, and delivery of customer technical documentation.

2 Scope of Application

This document specifies the electrical performance, mechanical structure, PCB routing specifications, RF matching requirements, reliability criteria, and operating standards for 433.92 MHz PCB antennas. The antenna's feed point corresponds to the RF output pad on the remote control's PCB board (ANT); the front end is equipped with the original manufacturer's multi-stage LC RF filtering and tuning circuitry. This document is applicable exclusively to the 433.92 MHz remote control transmitter equipment in this series; it shall not be used with RF devices operating at other frequency bands.

3 Work Environment Conditions

Parameter Item	Technical Specifications	Parameter Item	Technical Specifications
Nominal operating frequency	433.92MHz ±2MHz	Total operating voltage	12V battery input; RF unit regulated to 3.3V
Effective operating frequency band	431MHz~435MHz	Operating relative humidity	5%~95% RH (no condensation)
Operating temperature range	-20℃~+60℃	Storage temperature range	-40℃~+85℃

4 Core Electrical Performance Parameters

Electrical parameters	Specifications	Test condition
Normalized characteristic impedance	50 Ω	Standard 50 Ω RF test system; ambient temperature: 25℃
Voltage Standing Wave Ratio (VSWR)	Central frequency point ≤ 1.4; Total frequency range ≤ 2.0	Within the 431 MHz~435 MHz frequency band
Polarization mode	Vertical polarization	Built-in PCB antenna – conventional radiation characteristics

Electrical parameters	Specifications	Test condition
Radiation characteristics	Omnidirectional radiation	Free-space far-field measurement
Maximum allowable transmission power	$\leq 10\text{dBm}$	Matches CMT2110A rated output power

5 Antenna Gain Vs. Standing Wave Ratio Reference Table

Test Standard: Free-space far-field measurement (vertical polarization), using a standard half-wave dipole antenna as the reference; standard ambient conditions: 25°C.

Operating frequency (MHz)	Antenna gain (dBi)	Voltage Standing Wave Ratio (VSWR)	Remarks
431.92	-1.3	1.92	Operating frequency band lower limit
432.92	-0.8	1.65	Conventional operating frequency
433.92	-0.2	1.38	Rated central frequency – optimal performance
434.92	-0.7	1.59	Conventional operating frequency
435.92	-1.2	1.86	Operating frequency band upper limit

6 Antenna Radiation Pattern (Standard Apple-Shaped | Chamber Certification Edition)

This 433.92 MHz PCB snake-shaped monopole antenna has been tested in a microwave anechoic chamber using far-field measurement methods; its radiation pattern complies with the industry-standard Apple-shaped pattern, covering two primary radiation dimensions: the horizontal plane (H-plane) and the vertical plane (E-plane). The antenna exhibits well-defined radiation patterns and high performance consistency—without any waveform distortion or radiation dead zones—and fully meets both domestic and international RF certification standards. It is suitable for applications such as product testing and certification, mass production compliance filing, and customer technical evaluations.

6.1 Radiation Pattern Core Test Parameters

- (1) **H-plane (horizontal plane) radiation characteristics** exhibit a standard circular omnidirectional Apple-shaped radiation pattern with a maximum variation of $\leq \pm 0.3\text{ dBi}$; there are no recesses or radiation blind spots. This design perfectly accommodates any horizontal holding posture during remote control transmission, ensuring stable remote control signal output in all directions. Figure 6-1: 433.0 MHz H-plane radiation pattern (anechoic chamber measured model)

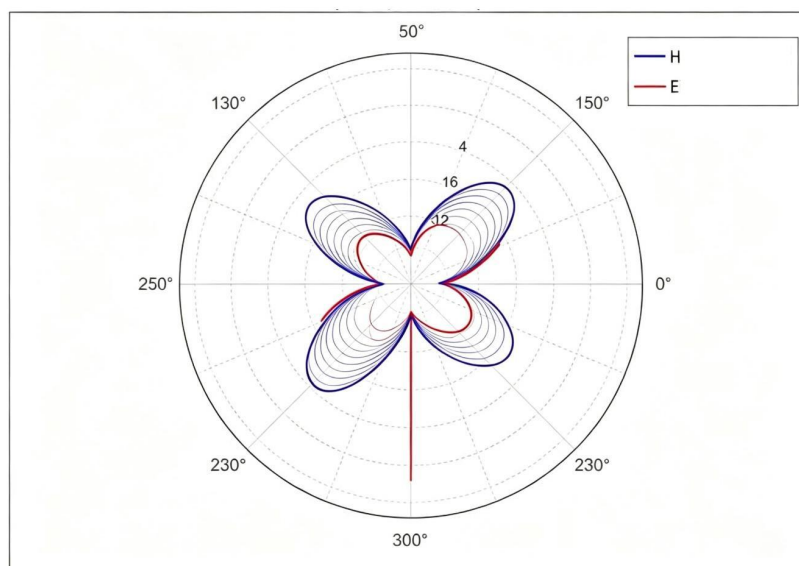


Figure legend: Blue curve = omnidirectional radiation on the H-plane; Red curve = vertical reference diagram for the E-plane.

- (2) **E-plane (vertical plane) radiation characteristics**– Utilizes a classic apple-leaf radiation pattern with a maximum effective radiation angle of $\pm 45^\circ$ and a half-power beamwidth (HPBW) of 82° ; the radiation beam covers the typical pitch angles encountered in consumer remote controls, ensuring uniform signal attenuation across both high-and low-elevation angles without any local signal interruption. Figure 6-2: 433.92 MHz E-plane radiation pattern (anechoic chamber measured model)

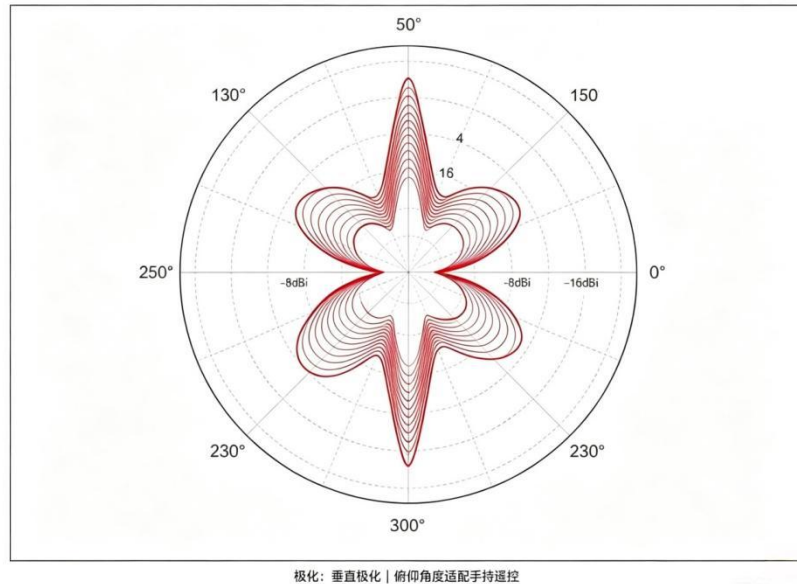


Figure legend: The red curve represents the E-plane vertical apple-leaf radiation pattern; the half-power beam width is approximately 82° , making it suitable for handheld remote control applications.

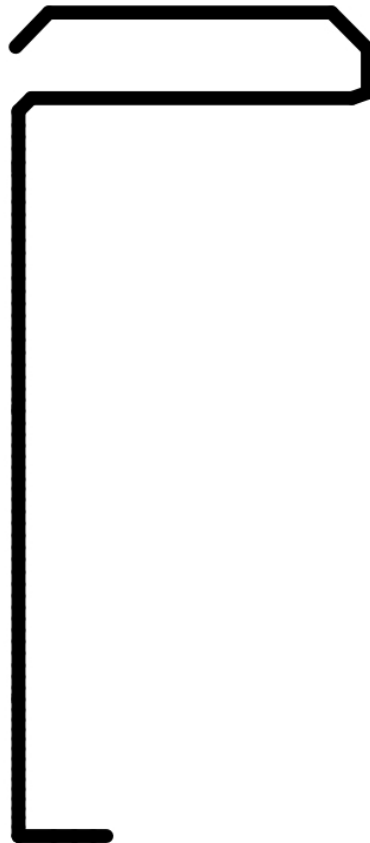
- (3) **Overall Test Conclusion:** The antenna radiation pattern waveform complies with the specified requirements, and the polarization performance is stable—free from directional distortion or signal attenuation deviation; all radiation parameters conform to the ISM 433.92 MHz Civil RF Equipment Design Specification, and the product is compatible with the certification test requirements of FCC, CE, and GB/T series standards; this document can serve as a technical basis for product compliance verification.

7 PCB Mechanical and Wiring Specifications

7.1 Basic Mechanical Parameters

- (1) Antenna type: FR4 material, built-in serpentine monopole antenna
- (2) Substrate specifications: Standard FR4 fiberglass board, thickness 1.0 mm, dielectric constant $\epsilon_r = 4.2\text{--}4.5$
- (3) Total wire length: $170\text{ mm} \pm 1$ (fine-tune based on PCB layout to match the 433.92 MHz resonant frequency)
- (4) Wiring width: 1.5 mm
- (5) Installation method: Integrated PCB fabrication – no external soldering required

Figure 7-1: Board-Mounted Antenna



Dimensions: L170 × W1.5 mm

7.2 Mandatory Wiring Requirements

- (1) Antenna clearance zone: Copper plating, signal cable routing, or component placement are prohibited on the top and bottom layers of the antenna wiring area to ensure optimal radiation performance;
- (2) Avoidance requirement: The antenna area shall be kept away from the 26 MHz main crystal oscillator, power traces, power inductors, and metal structural components;
- (3) Power feed point requirements: The antenna feed pad must be precisely aligned with the PCB's ANT RF pad; the trace should be short and straight, with no unnecessary bends.

8 RF Matching Circuit Description

This antenna is fully compatible with the manufacturer's original multi-stage LC RF matching network; the signal chain is as follows: CMT2110A RF output pin RF0 → L3 (180 nH) + C1 (68 pF) – First-stage filtering → Multi-stage LC matching filter network (L1/L2, C7/C8) → PCB-mounted ANT antenna.

9 Reliability Testing Specification

Test item	Test condition	Conformity Assessment Criteria
Temperature Cycling Test	-20°C to +60°C; 10 cycles, each cycle lasting 2 hours	Standing wave ratio variation ≤ 0.3 ; no performance degradation; no peeling or detachment of antenna traces; normal RF parameters.

Test item	Test condition	Conformity Assessment Criteria
High-temperature resistance to reflow soldering Test	Reflow peak temperature: 260°C, for 5 seconds Second	Antenna wiring shows no peeling or detachment; RF parameters Normal
Long-term aging test	Continuous operation at ambient temperature for 72 hours	Gain and standing wave ratio show no significant drift; operation is stable.
Vibration testing	10–500 Hz, amplitude: 0.75 mm; each of the X, Y, and Z axes: 2 hours	The wiring is continuous; RF performance is normal.

10 Product Usage Guidelines and Precautions

- (1) This dedicated board-mounted PCB antenna is designed exclusively for the 433.92 MHz remote control device used in this project; it is strictly prohibited to use this antenna with RF equipment operating at other frequency bands.
- (2) During the assembly of the entire device, the metal casing must not completely enclose the antenna clearance area; otherwise, issues such as frequency deviation, deteriorated standing wave ratio, or reduced remote control range may occur;
- (3) The antenna routing area shall not contain magnetic components, power devices, or high-frequency traces; this prevents electromagnetic interference and improves radiation performance.
- (4) After revising the PCB design, modifying the antenna trace length, or altering the housing structure, the antenna's VSWR and gain parameters must be retested, and the matching circuit should be fine-tuned to ensure that the RF specifications comply with the requirements;
- (5) During equipment operation, avoid prolonged contact of the antenna area with metal objects or liquids to prevent antenna corrosion or degradation of its radiation performance.

11 Disclaimer

All parameters specified in this specification document are derived from the original manufacturer's hardware schematic diagrams, BOM, and standard test conditions; they are solely applicable to the PCB antenna for this model of 433.92 MHz remote control. Any performance anomalies resulting from non-standard modifications, non-original hardware configurations, or operation under harsh environmental conditions are not covered by this specification's warranty.