

APPROVAL NUMBER

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SPECIFICATION FOR APPROVAL

LEETEK

DESIGNATION	LORA Internal Pattern Antenna
Part Number	Leetek IN-Ant-04
Model Number	LFW2939-01

R&D			
ISSUE	CHECKED	PM	APPROVED
			

47, Ojeong-ro, Ojeong-gu, Bucheon-si, Gyeonggi-do, Republic of Korea

[TEL:82-32-324-9838](tel:82-32-324-9838), FAX:82-32-324-9840

Contents

1. General
 - 1.1. Product Description
 - 1.2. Product Number
 - 1.3. Units, Definitions, and Abbreviations
 - 1.4. Interface
 - 1.5. Conditions
 - 1.6. Coordinate System
2. Electrical Properties
 - 2.1. Frequency Bands
 - 2.2. Impedance
 - 2.3. VSWR
 - 2.4. Gain
 - 2.5. Power Rating
3. Antenna Drawing
4. Radiation Gain

1. General

1.1. Product Description

LORA Internal antenna for use in a portable unit for wireless communication (referred to as a radio).

1.2. Product Number

LEETEK Product Name : Leetek IN-Ant-04

1.3. Units, Definitions, and Abbreviations

Unless otherwise stated, SI units are used.

TX Transmit Band

RX Receiver Band

PCB Printed Circuit Board

RH Relative Humidity

dBi Antenna gain in Db (isotropic)

CW Continuous Wave

1.4. Interface

All properties are guaranteed under the conditions that antenna/radio interface is designed in accordance with instructions provided by Leetek. Functionality with other equipment (such as couplers etc.) is not guaranteed unless this has been agreed upon separately.

1.5. Conditions

Unless otherwise stated all temperature tolerances are $\pm 3^{\circ}\text{C}$ and all RH tolerances are ± 5 percentage units.

Unless otherwise stated all values are valid at 20°C and 50% RH.

1.6. Coordinate System

The coordinate system for the radio is defined as follows;

- . Origin in center of gravity.
- . Positive X axis is perpendicular to, and directed from, front plane.
- . Positive Y axis is perpendicular to, and directed from, right side plane(as seen from front).
- . Positive Z axis is perpendicular to, and directed from, top plane.

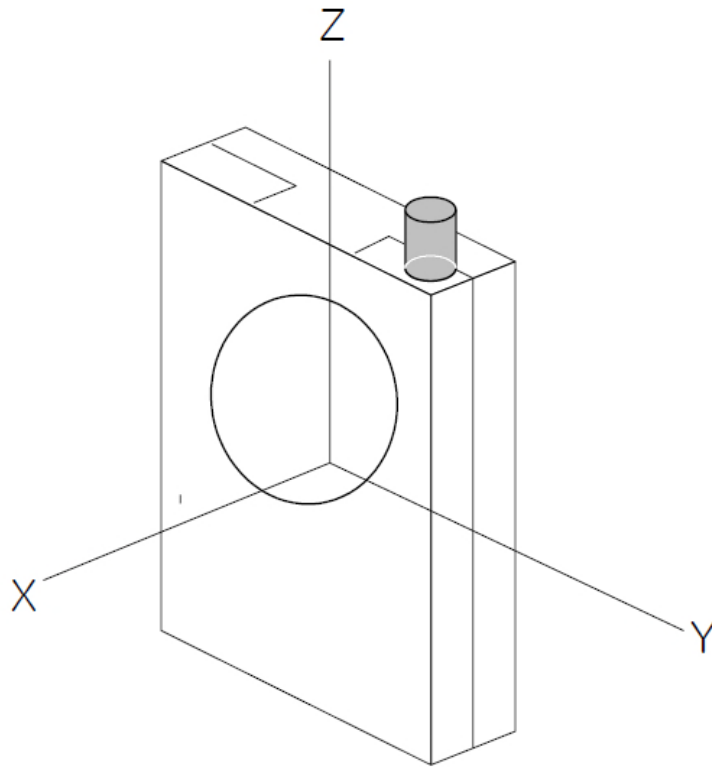


Figure 1.6.1 Coordinate system for the radio.

2. Electrical Properties

2.1. Frequency Band

2.1.1 LORA Band : 902 ~ 928MHz

2.2. Impedance

2.2.1 Nominal Value

50 Ohms

2.2.2 Method

Leetek will supply engineering assistance to ensure that the impedance over the frequency bands is as close to 50 ohms as possible after matching. Both free space and talk position are considered, with priority given to talk position.

2.3. VSWR

Below are listed the maximum values of the worst matched frequency within each band including production variation influences.

2.3.1 VSWR at Free Space

902MHz : 2.3, 915MHz : 2.2, 928MHz : 2.2

2.3.2 Tolerance of Center Frequency

Center Frequency at Lora Band : Standard ± 15 MHz

2.3.3 Method of Measurement

A 50 ohms coaxial cable is connected(soldered) to the 50 ohm feeding point on the PCB. The connection of the coaxial cable is done so as to introduce a minimum of mismatch. In the other end, the coaxial cable is connected to a network analyzer. The analyzer is

calibrated so that the reference plane is at the 50 ohms feeding point.. The radio, including the PCB must not in any significant way differ from the mass produced radio, e.g. the antenna feeding parts have to be equivalent to the parts in mass production. Free space means that the radio is attached to a nonconductive surface.

2.3.3 Electrical Performance Assurance

Sampling Plan

2.4. Gain

Below are average gain values of the frequency with the lowest peak gain within each band including production variation influences.

2.4.1 Values

Unit	Lora		
	902MHz	915MHz	928MHz
(dBi)	-8.47	-9.02	-9.63

2.4.2 Method of Measurement

The connection is done according to 2.3.2, Radiation patterns are measured at the TX and RX band edges for each band defined in 2.1.1 and 2.1.2. The measurements are Performed so as to minimize the influence of the cables. Only the coplanar polarization component is measured.

The antenna is measure in 2 orthogonal E-planes in free space, according to figure 2.4.1. The antenna is also measured in talk position. Calibration for absolute measurements is done with a reference antenna, which is in turn calibrated by a certified calibration company.

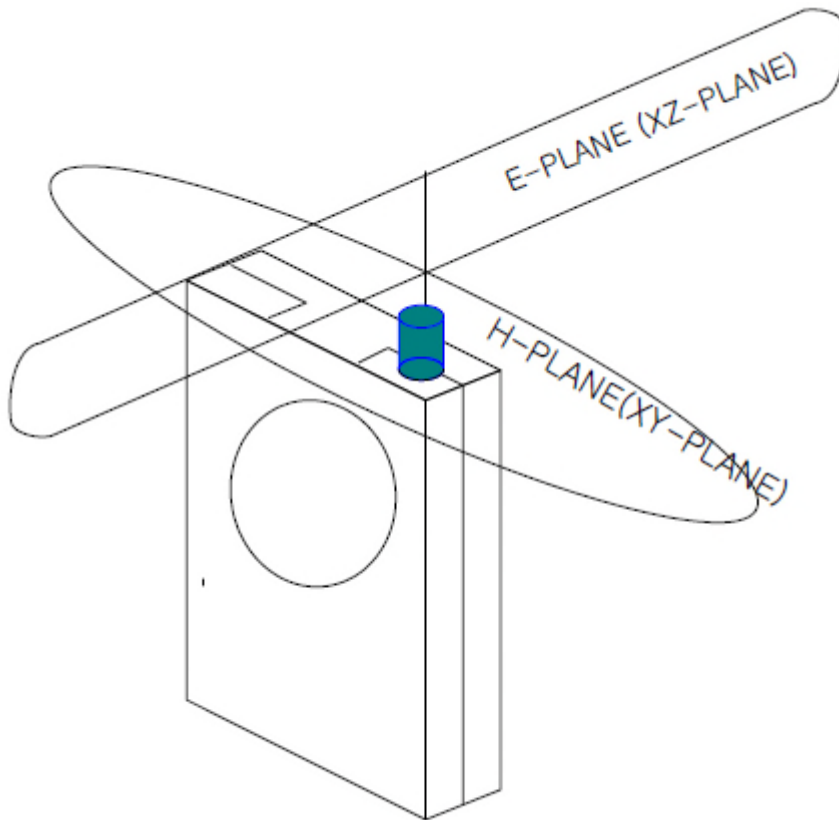


Figure 2.4.1

2.5 Power Rating

2.5.1 Maximum Value

$$P = 100\text{mW (CW)}$$

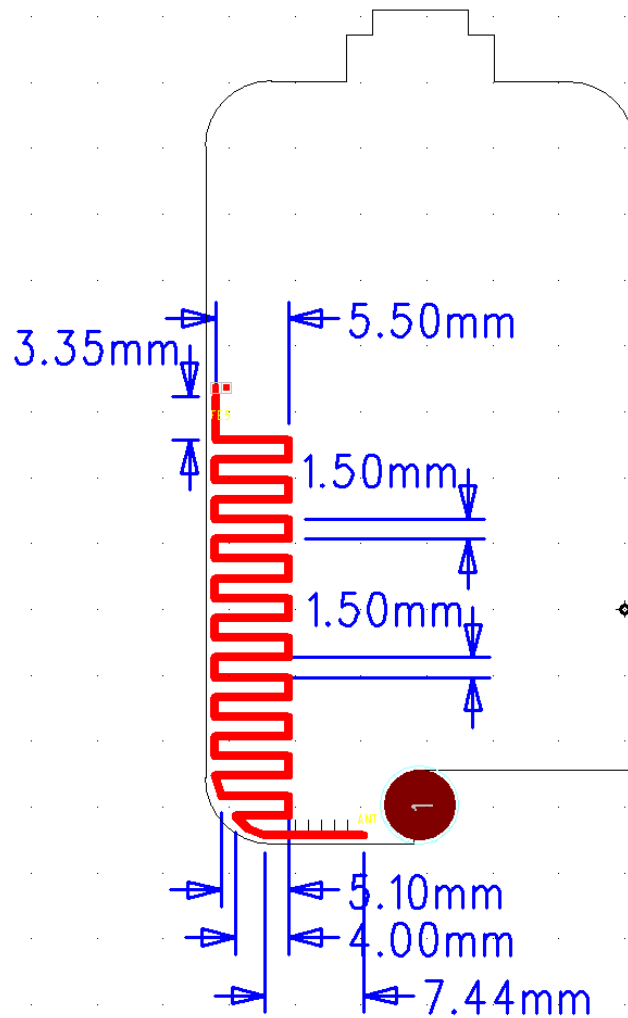
2.5.2 Post Test requirements

Without mechanical damage and electrical performance according to 2.3.1 and 2.4.1, after the test.

2.5.3 Method of Measurement

The connection is done according 2.31. The specified power, P , is applied for 10 minutes at the middle frequency of each TX band defined in 2.1.1. Immediately after the test the VSWR is measured.

3. Antenna Drawing



4. Radiation Gain

