

# Product Specification

---

## **2.4G Dipole ant**

EXTERNAL Fixed ANTENNA

**Confidential**

|                        |                                                           |           |                    |                              |
|------------------------|-----------------------------------------------------------|-----------|--------------------|------------------------------|
| <b>Eta Electronics</b> | Description<br><b>2.4Ghz ANT    Product Specification</b> |           |                    |                              |
|                        | Specification No.<br><b>Dipole</b>                        | Customer. | Rev.<br><b>1.0</b> | Date<br><b>Jun 01 . 2025</b> |

# Antenna Approval sheet

|                      |                                   |
|----------------------|-----------------------------------|
|                      | <b>External   Fixed   Antenna</b> |
| <b>Product Name</b>  | <b>2.4GHz band</b>                |
| <b>Part No.</b>      | <b>TE-2402TO-C3</b>               |
| <b>Customer code</b> |                                   |
| <b>Customer</b>      | <b>Eta Electronics</b>            |
| <b>Provider</b>      |                                   |

|          |                |          |             |                                                                                       |
|----------|----------------|----------|-------------|---------------------------------------------------------------------------------------|
| APPROVAL | Classification | DIRECTOR | EXAMINATION | APPROVAL                                                                              |
|          | RF             |          |             |  |
|          | MECHANICAL     |          |             |  |
| APPROVAL | Classification | DIRECTOR | EXAMINATION | APPROVAL                                                                              |
|          | RF             |          |             |                                                                                       |
|          | MECHANICAL     |          |             |                                                                                       |



|                        |                                                           |           |                              |
|------------------------|-----------------------------------------------------------|-----------|------------------------------|
| <b>Eta Electronics</b> | Description<br><b>2.4Ghz ANT    Product Specification</b> |           |                              |
|                        | Specification No.<br><b>Dipole</b>                        | Customer. | Rev.<br><b>1.0</b>           |
|                        |                                                           |           | Date<br><b>Jun 01 . 2025</b> |

## Table of Contents

|                                                  |    |
|--------------------------------------------------|----|
| 1 .Approval Sheet Check List .....               | 4  |
| 2.Revision List .....                            | 5  |
| 3.Specification.....                             | 6  |
| 3-1 General Standard .....                       | 6  |
| 3-2   Electrical Standard .....                  | 6  |
| 3-3 Mechanical Standard .....                    | 6  |
| 4 Test Procedure & Measurement .....             | 7  |
| 4-1 External Test.....                           | 7  |
| 4-2Electrical Feature Inspection.....            | 7  |
| 4-2-1 <i>Materials</i> .....                     | 7  |
| <i>Inspection</i> .....                          | 7  |
| 4-3 .Radiation Pattern .....                     | 9  |
| 4-3-1 <i>Chamber Materials (KTM Korea)</i> ..... | 9  |
| 4-3-2 <i>Inspection</i> .....                    | 9  |
| 5 .Packing, Shipping, Handling .....             | 11 |
| 5-1.Exterior Option.....                         | 11 |
| 5-2   .Packing.....                              | 11 |
| 6.Antenna PHOTO.....                             | 12 |
| 7. QUALITY STANDARD AND TEST METHOND .....       | 13 |
| 8 Electrical data.....                           | 15 |
| 8-1   V.S.W.R .....                              | 15 |
| 8-2   Radiation Pattern   3D Data .....          | 17 |



|                        |                                                           |           |                    |                              |
|------------------------|-----------------------------------------------------------|-----------|--------------------|------------------------------|
| <b>Eta Electronics</b> | Description<br><b>2.4Ghz ANT    Product Specification</b> |           |                    |                              |
|                        | Specification No.<br><b>Dipole</b>                        | Customer. | Rev.<br><b>1.0</b> | Date<br><b>Jun 01 . 2025</b> |

2.Revision List

| No | Date       | Before change | After change | Reason | Rev |
|----|------------|---------------|--------------|--------|-----|
| 1  | 2017-11-20 |               |              | DATA   | 1.0 |
| 2  |            |               |              |        |     |
| 3  |            |               |              |        |     |
| 4  |            |               |              |        |     |
| 5  |            |               |              |        |     |
| 6  |            |               |              |        |     |
| 7  |            |               |              |        |     |
| 8  |            |               |              |        |     |
| 9  |            |               |              |        |     |
| 10 |            |               |              |        |     |
| 11 |            |               |              |        |     |
| 12 |            |               |              |        |     |
| 13 |            |               |              |        |     |
| 14 |            |               |              |        |     |
| 15 |            |               |              |        |     |
| 16 |            |               |              |        |     |
| 17 |            |               |              |        |     |
| 18 |            |               |              |        |     |
| 19 |            |               |              |        |     |
| 20 |            |               |              |        |     |
| 21 |            |               |              |        |     |
| 22 |            |               |              |        |     |
| 23 |            |               |              |        |     |
| 24 |            |               |              |        |     |
| 25 |            |               |              |        |     |
| 26 |            |               |              |        |     |
| 27 |            |               |              |        |     |
| 28 |            |               |              |        |     |
| 29 |            |               |              |        |     |
| 30 |            |               |              |        |     |
| 31 |            |               |              |        |     |

|                 |                                                           |           |                    |                              |
|-----------------|-----------------------------------------------------------|-----------|--------------------|------------------------------|
| Eta Electronics | Description<br><b>2.4Ghz ANT    Product Specification</b> |           |                    |                              |
|                 | Specification No.<br><b>Dipole</b>                        | Customer. | Rev.<br><b>1.0</b> | Date<br><b>Jun 01 . 2025</b> |

## 3.Specification

### 3-1 General Standard

| General Specification |                           |
|-----------------------|---------------------------|
| Model name            | 2.4G Dipole               |
| Antenna type          | External Fixed    Antenna |

### 3-2   Electrical Standard

| Electrical Specification |                  |
|--------------------------|------------------|
| Frequency range          | 2400~2485 MHz    |
| V.S.W.R                  | 3.0:1.           |
| Gain(dBi) MAX            | 4.01dBi          |
| Radiation pattern        | Omni-Directional |
| Polarization             | Vertical         |
| Max Power(W)             | 2W Max.          |
| Impedance                | 50ohms           |

### 3-3 Mechanical Standard

| Mechanical Specification |                                      |
|--------------------------|--------------------------------------|
| Connector type           | RP-SMA Male    &    IPEX CABLE 150mm |
| Material                 | CU                                   |
| Color                    | BALCK Type                           |
| Resin                    | TPEE , PC                            |
| Temperature range        | -30℃ ~ 80℃                           |
| Weight                   | 9,4 ± 2g                             |
| Bending                  | NO                                   |

### 3-4 Operating Conditions

| Specification         |                                                       |
|-----------------------|-------------------------------------------------------|
| Operating Environment | Temperature    : -30~70℃<br>Humidity        : ~85% RH |
| Storage Environment   | Temperature    : -20~60℃<br>Humidity        : ~65% RH |

|                 |                                                           |           |                    |                              |
|-----------------|-----------------------------------------------------------|-----------|--------------------|------------------------------|
| Eta Electronics | Description<br><b>2.4Ghz ANT    Product Specification</b> |           |                    |                              |
|                 | Specification No.<br><b>Dipole</b>                        | Customer. | Rev.<br><b>1.0</b> | Date<br><b>Jun 01 . 2025</b> |

## 4 Test Procedure & Measurement

### 4-1 External Test

To check the unity Antenna’s exterior, size, connector and etc. with the exterior indicated

### 4-2Electrical Feature Inspection

#### 4-2-1 Materials

| Equipment        | Model                                      | Quantity | Standard                                                                                                                                     |
|------------------|--------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Network Analyzer | E5071C<br>equipment with the<br>equivalent | 1EA      | ·Freq. Range : 9KHz ~ 8.5GHz<br>· Accuracy : <5ppm<br>·Dynamic Range : 105dB<br>· Trace at ±200dB<br>· Resolution : 1Hz<br>· Impedance : 50Ω |
| Adaptor          |                                            | 1EA      | · N(F)-SMA(M)                                                                                                                                |
| Calibration Kit  | HP85033D                                   | 1Set     | · DC ~ 8.5GHz (SMA-Type)                                                                                                                     |

Inspection

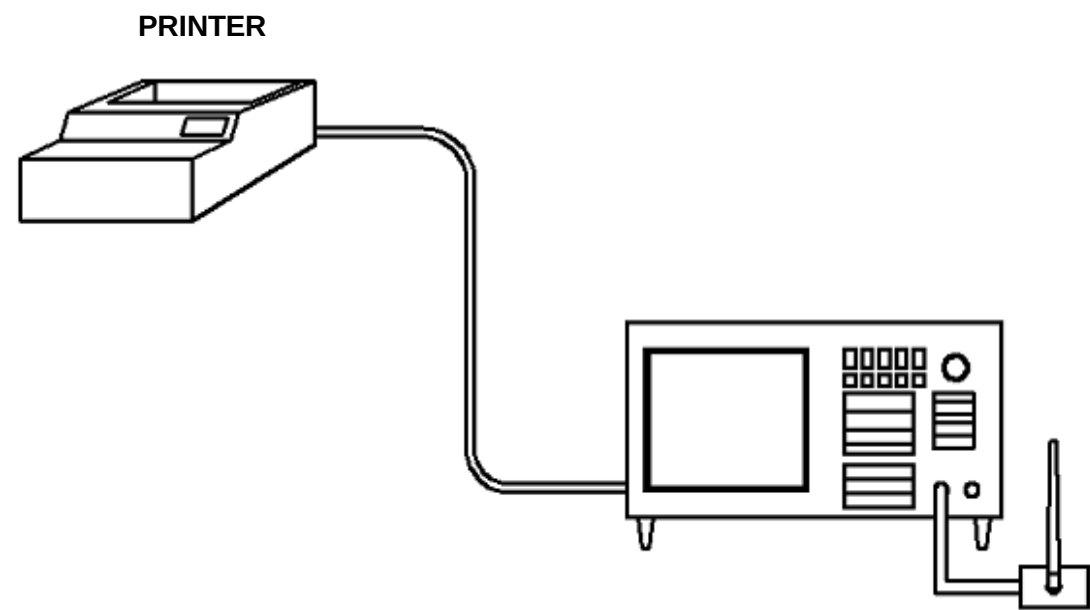


Figure 1. (Network Analyzer) Electrical Characteristic Measurement

|                 |                                                        |           |                    |                              |
|-----------------|--------------------------------------------------------|-----------|--------------------|------------------------------|
| Eta Electronics | Description<br><b>2.4Ghz ANT Product Specification</b> |           |                    |                              |
|                 | Specification No.<br><b>Dipole</b>                     | Customer. | Rev.<br><b>1.0</b> | Date<br><b>Jun 01 . 2025</b> |

#### 4-2-2 Inspection

##### 가. Equipment Setting and Calibration

###### ㉠ Equipment Setting

㉡ Bandwidth: 2400~2500MHz

㉢ Source Power: 0dBm,

###### ㉣ Calibration

Using N-Type CalKit Applying O.S.L. Method, Calibrate Port number 1.

㉤ S<sub>11</sub>Calibration: Open Port #1, Calibrate after connecting the Load short.

###### ㉥ Calibration Check

㉦ Connect Load to Port #1 to check S<sub>11</sub>'s V.S.W.R is less than 1.02:1

㉧ Connect Load to Port #1 to check S<sub>21</sub> is less than -80.0dB.

If not Satisfied with the Result, Repeat Procedure ㉣ Calibration.

##### 나. Inspection Method and Contents

| Item      | Inspection Method                                                                                                                                | Standard   |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| V.S.W.R   | Connect ANT to the Positioner and Measure the S <sub>11</sub> within Operating Band, as Shown above on Figure 1.                                 | 2.0:1 Max. |
| Impedance | Connect ANT to the Positioner and Measure the S <sub>11</sub> VALUE that's on Smith Chart within the Operating Band, as shown above on Figure w. | 50Ω        |

|                 |                                                        |           |                    |                              |
|-----------------|--------------------------------------------------------|-----------|--------------------|------------------------------|
| Eta Electronics | Description<br><b>2.4Ghz ANT Product Specification</b> |           |                    |                              |
|                 | Specification No.<br><b>Dipole</b>                     | Customer. | Rev.<br><b>1.0</b> | Date<br><b>Jun 01 . 2025</b> |

## 4-3 .Radiation Pattern

### 4-3-1 Chamber Materials (KTM Korea)

| Name of the Equipment | Model | Quantity | Standard                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------|-------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Far Field Chamber     | KTM   | 1EA      | <ul style="list-style-type: none"> <li>· Freq. Range: 400MHz~8.5GHz</li> <li>· Measurement Speed :<br/>Radiation Pattern Cuts: Real Time<br/>Full sphere far-field : &lt;600 sec</li> <li>· Measurement Accuracy :<br/>Dynamic Range: 70 dB<br/>Cross-polar isolation &lt; -45 dB</li> <li>· Gain Accuracy : MTG<br/>1 - 6GHz &lt; <math>\pm 0.75\text{dB}</math></li> </ul> |
| Adaptor               |       | 1EA      | · SMA(M)-SMA(F)                                                                                                                                                                                                                                                                                                                                                              |
| Computer              |       | 1EA      | · Data for Measurement                                                                                                                                                                                                                                                                                                                                                       |

### 4-3-2 Inspection

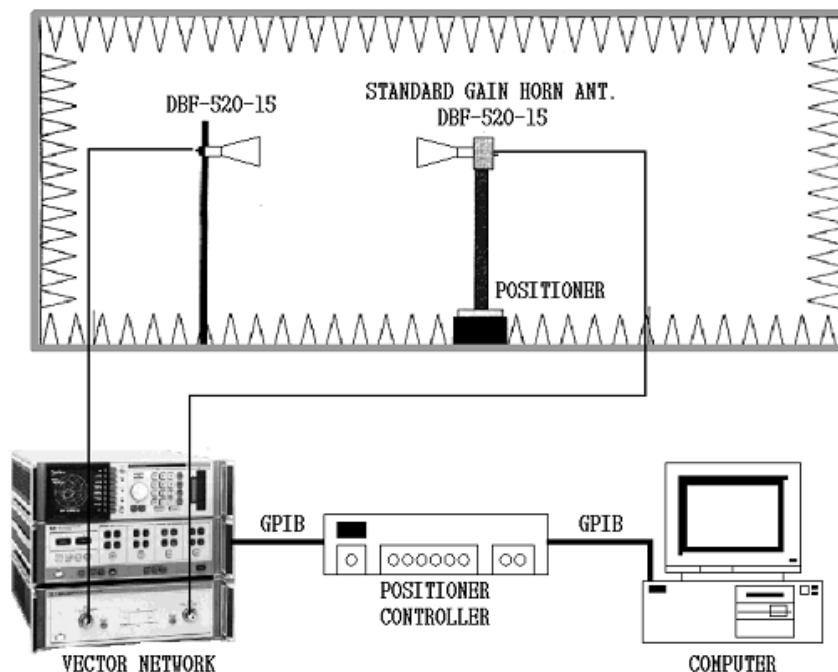
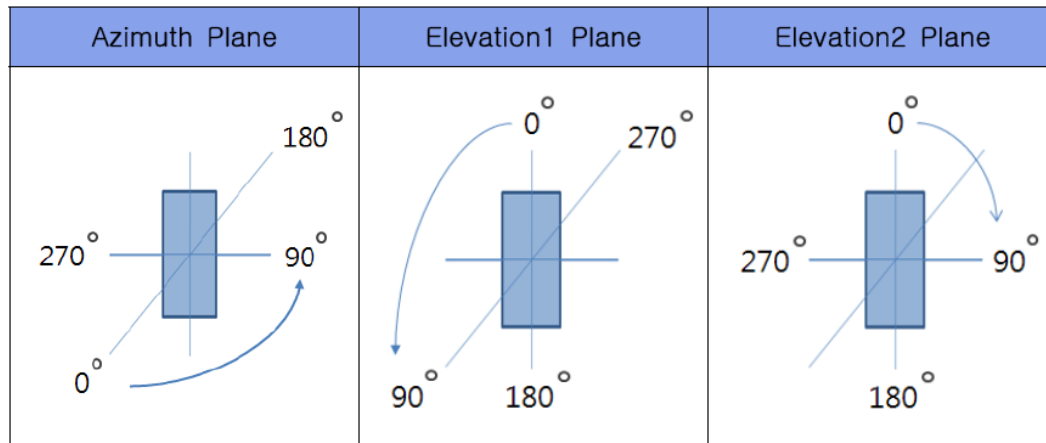


Figure2. Radiation Patten Test Construction

|                 |                                                        |           |                    |                              |
|-----------------|--------------------------------------------------------|-----------|--------------------|------------------------------|
| Eta Electronics | Description<br><b>2.4Ghz ANT Product Specification</b> |           |                    |                              |
|                 | Specification No.<br><b>Dipole</b>                     | Customer. | Rev.<br><b>1.0</b> | Date<br><b>Jun 01 . 2025</b> |



## A. Equipment Setting and Measurement

### ⓐ Network Analyzer Setting

ⓐ Calibrate Chamber System for Gain Measurement using KTM. At the Same Time set up Software Program fir Chamber System Control.

– Test Frequency Setting : 2.4GHz Band

ⓑ Change Over from a TX to the RX on Target Positioner.

ⓒ Start a Software Program for Chamber System Control & Measuring.

ⓓ Measurement Data.

## B. Inspection Method and Contents

| Item              | Inspection Method                                                                                                           | Standard    |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------|-------------|
| Radiation Pattern | Connect ANT' to the Positioner and measure the Radiation Pattern within the Far Field Chamber, as shown above, on Figure 2. | Normal: dBi |

|                 |                                                           |           |                    |                              |
|-----------------|-----------------------------------------------------------|-----------|--------------------|------------------------------|
| Eta Electronics | Description<br><b>2.4Ghz ANT    Product Specification</b> |           |                    |                              |
|                 | Specification No.<br><b>Dipole</b>                        | Customer. | Rev.<br><b>1.0</b> | Date<br><b>Jun 01 . 2025</b> |

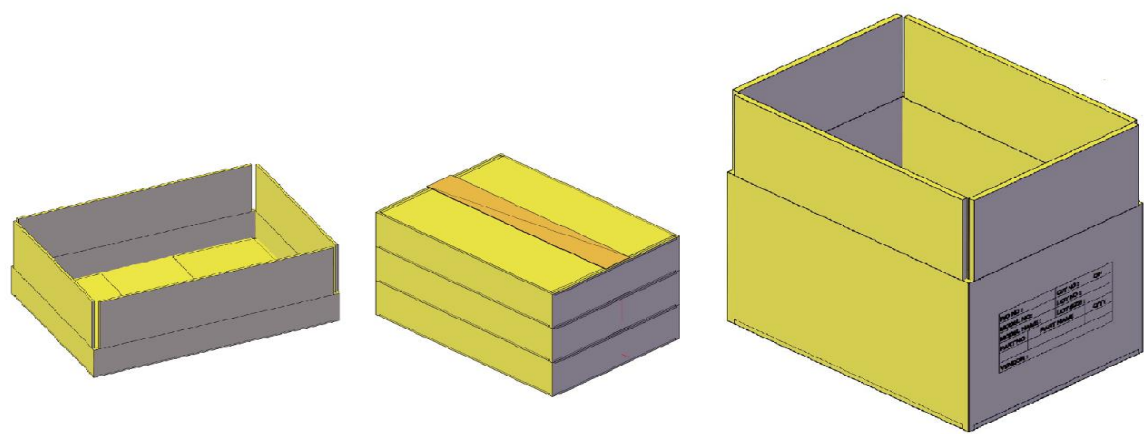
## 5 .Packing, Shipping, Handling

### 5-1.Exterior Option

- 1) Both ordering enterprise and producer’s names should be indicated.
- 2) Name, Serial number and quantity of the Model should be indicated.

### 5-2 .Packing

**manufacturer**



|                        |                                                           |           |                    |                              |
|------------------------|-----------------------------------------------------------|-----------|--------------------|------------------------------|
| <b>Eta Electronics</b> | Description<br><b>2.4Ghz ANT    Product Specification</b> |           |                    |                              |
|                        | Specification No.<br><b>Dipole</b>                        | Customer. | Rev.<br><b>1.0</b> | Date<br><b>Jun 01 . 2025</b> |

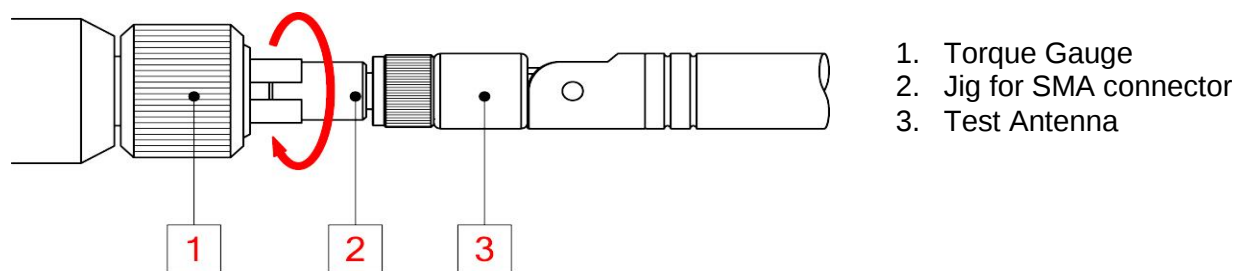
**6.Antenna PHOTO**



|                 |                                                        |           |                    |                              |
|-----------------|--------------------------------------------------------|-----------|--------------------|------------------------------|
| Eta Electronics | Description<br><b>2.4Ghz ANT Product Specification</b> |           |                    |                              |
|                 | Specification No.<br><b>Dipole</b>                     | Customer. | Rev.<br><b>1.0</b> | Date<br><b>Jun 01 . 2025</b> |

## 7. QUALITY STANDARD AND TEST METHOND

### 7-1 Torque



350~750g/cm AT ALL DIRECTION

### 7-2 Flatness of body

### 7-3 Gap between holder and connector

### 7-4 White dot and pollutions

≤ 0.3mm , 5 EA

### 7-5 Burr and scratch

Antenna doesn't have burr or scratch on following conditions.

- Verification method : Should verify by naked eyes at distance with 30Cm and 300Lux

### 7-7 Appearance and dimensions

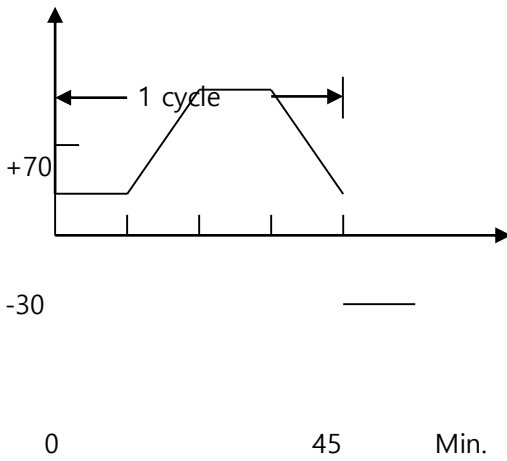
DRAWING

### 7-8 Color

Reference color chip

|                 |                                                        |           |                    |                              |
|-----------------|--------------------------------------------------------|-----------|--------------------|------------------------------|
| Eta Electronics | Description<br><b>2.4Ghz ANT Product Specification</b> |           |                    |                              |
|                 | Specification No.<br><b>Dipole</b>                     | Customer. | Rev.<br><b>1.0</b> | Date<br><b>Jun 01 . 2025</b> |

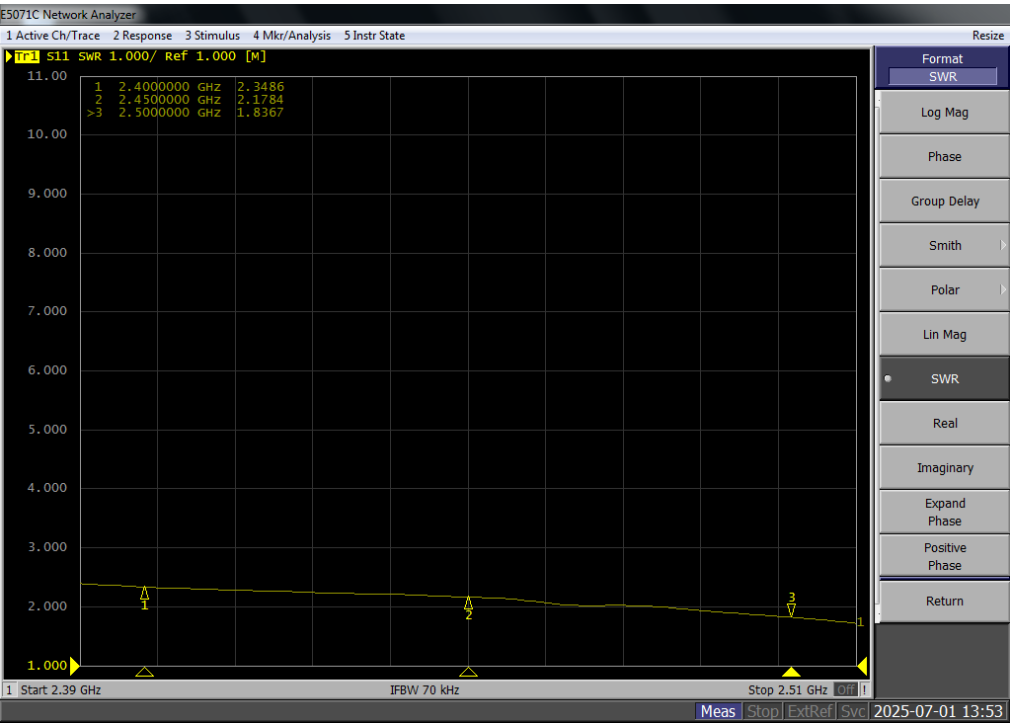
## 7-10 Reliability Test

| NO  | Items                  | Specifications                                                                                                                                                                                                         |                                                                                                       |
|-----|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| 9-1 | LOW TEMP EXPOSURE TEST | TEMPERATURE : -30°C<br>TIME : 48 HOURS                                                                                                                                                                                 | AFTER 2HOURS EXPOSURE IN ORDINARY FROM TEST , ANTENNAS SHALL BE APPROVED AS SPECIFIED IN ITEM 5 AND 6 |
| 9-2 | HIGHTEMP EXPOSURE TEST | TEMPERATURE : 70°C<br>TIME : 48 HOURS                                                                                                                                                                                  |                                                                                                       |
| 9-3 | HUMIDITY EXPOSURE TEST | TEMPERATURE : 60°C±2°C<br>HUMIDITY : 85%RH<br>TIME : 48 HOURS                                                                                                                                                          |                                                                                                       |
| 9-4 | THERMAL SHOCK          | <div><p>Temperature(°C)</p><p>0 45 Min.</p><p>Test cycle : 10cycles</p></div>                                                       |                                                                                                       |
| 9-5 | DROP TEST              | SET THE MOTOR ON THE HEAVY BLOCK ABOUT 100g WEIGHT (INCLUDE THE NOTOR) AND DROP THE MOTOR ON THE CONCRETE FLOOR.<br>HEIGHT : 1.5m<br>DIRCCTION : ±X , ±Y , ±Z<br>TIMES : THREE DROPS PER PLANE FOR A TOTAL OF 5 DROPS. |                                                                                                       |

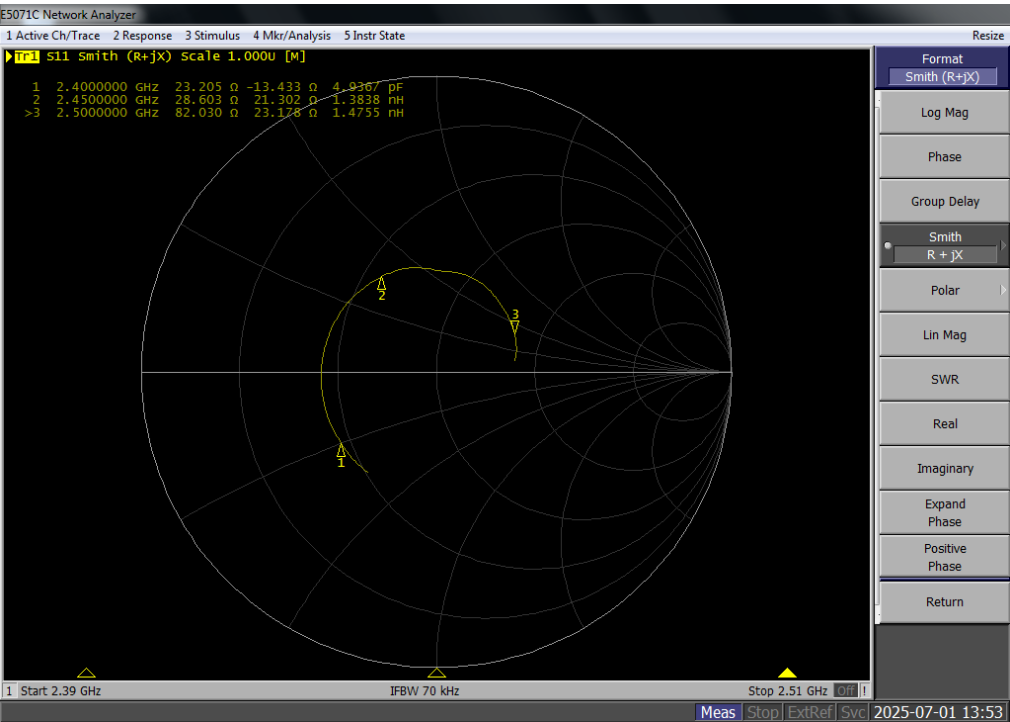
|                 |                                                           |           |                    |                              |
|-----------------|-----------------------------------------------------------|-----------|--------------------|------------------------------|
| Eta Electronics | Description<br><b>2.4Ghz ANT    Product Specification</b> |           |                    |                              |
|                 | Specification No.<br><b>Dipole</b>                        | Customer. | Rev.<br><b>1.0</b> | Date<br><b>Jun 01 . 2025</b> |

## 8 Electrical data

### 8-1 V.S.W.R

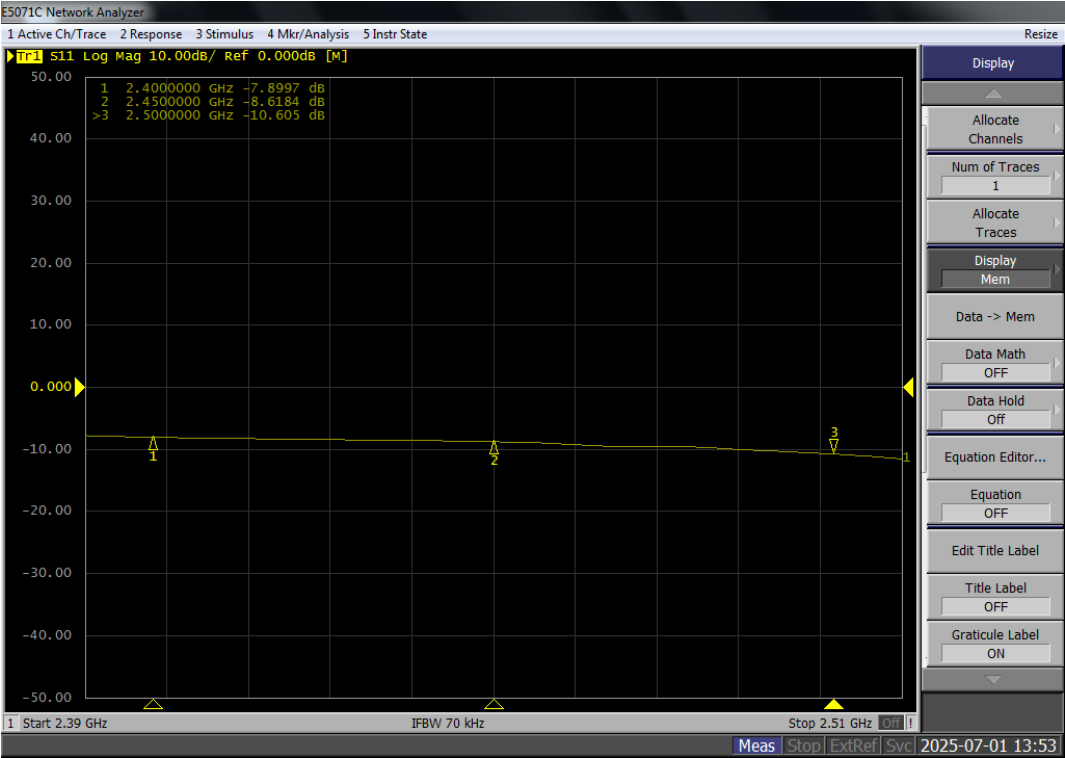


### Smith Chart



|                 |                                                           |           |                    |                              |
|-----------------|-----------------------------------------------------------|-----------|--------------------|------------------------------|
| Eta Electronics | Description<br><b>2.4Ghz ANT    Product Specification</b> |           |                    |                              |
|                 | Specification No.<br><b>Dipole</b>                        | Customer. | Rev.<br><b>1.0</b> | Date<br><b>Jun 01 . 2025</b> |

Return Loss



|                 |                                                |           |             |                       |
|-----------------|------------------------------------------------|-----------|-------------|-----------------------|
| Eta Electronics | Description2.4Ghz ANT    Product Specification |           |             |                       |
|                 | Specification No.<br>Dipole                    | Customer. | Rev.<br>1.0 | Date<br>Jun 01 . 2025 |

8-2 Radiation Pattern    3D Data

