



## SGS-CSTC Standards Technical Services Co., Ltd Shenzhen Branch

Report No.: SZOA2407000165AT01  
Rev.: 01  
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# ANTENNA PASSIVE TEST REPORT

Application No. SZOA2407000165AT  
Applicant Janus International Group LLC  
Manufacturer Huizhou Zecheng Electronics Co.,Ltd.  
Product Name NOKĒ LV Repeater  
Model No. RPT-LV1  
Standards ANSI/IEEE Std 149-2021  
Date Initial Sample(s) Received July 23, 2024  
Testing Start Date July 25, 2024  
Testing Finish Date August 5, 2024  
Report Issue Date September 9, 2024

\* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Yuanyu Luo

Prepared by: Yuanyu Luo/ Test  
Engineer

Ervin Li

Approved by: Ervin Li/ Technical  
Manager



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Revision History

| Revision | Issue Date        | Description                |
|----------|-------------------|----------------------------|
| 01       | September 9, 2024 | Initial creation of report |



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## 1 General Information

### 1.1 Testing Laboratory

|          |                                                                                                                      |
|----------|----------------------------------------------------------------------------------------------------------------------|
| Test Lab | SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch                                                      |
| Address  | No. 1 Workshop, M-10, Middle section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China 518057 |
| Contact  | Ervin Li                                                                                                             |
| Tel.     | +86 18823369694                                                                                                      |
| Fax      | +86-755-25328600                                                                                                     |
| E-mail   | Ervin.Li@sgs.com                                                                                                     |

### 1.2 Details of Applicant

|                     |                                                |
|---------------------|------------------------------------------------|
| Applicant's Name    | Janus International Group LLC                  |
| Applicant's Address | 135 Janus International Blvd. Temple, GA 30179 |
| Contact             | Kathrine Cao                                   |
| Tel.                | 0086 13592732924                               |
| Fax                 | N/A                                            |
| E-mail              | kathrine.cao@janusintl.com                     |

### 1.3 Details of Manufacturer

|                        |                                                                                                    |
|------------------------|----------------------------------------------------------------------------------------------------|
| Manufacturer's Name    | Huizhou Zecheng Electronics Co.,Ltd.                                                               |
| Manufacturer's Address | No.18,Weigang Rd, Qibu District, Zhonghan Chanye Yuan, Zongkai Gaoxinqu, Huizhou, Guangdong, China |
| Contact                | Ruby Zhang                                                                                         |
| Tel.                   | 0086 13410786201                                                                                   |
| Fax                    | N/A                                                                                                |
| E-mail                 | ruby.zhang@flexiblecircuit.cn                                                                      |



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### 1.4 General Description of EUT

|                      |                                            |
|----------------------|--------------------------------------------|
| Device Description:  | NOKĒ LV Repeater                           |
| Device Manufacturer: | Huizhou Zecheng Electronics Co.,Ltd.       |
| Device Model:        | RPT-LV1                                    |
| Hardware Version:    | N/A                                        |
| Software Version:    | N/A                                        |
| Antenna Dimensions:  | 29.50 x 1.60x1.60 mm                       |
| Antenna Type:        | BLE NRF52840: Wire , WIRPAS NRF52832: Wire |

### 1.5 Test Procedure

Testing is performed according to the **ANSI/IEEE Std 149-2021**.



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### 1.6 Test Specification

| Identity               | Document Title                             |
|------------------------|--------------------------------------------|
| ANSI/IEEE Std 149-2008 | IEEE Standard Test Procedures for Antennas |

### 1.7 Laboratory Environment

|                   |                          |         |
|-------------------|--------------------------|---------|
| Temperature       | Min. =19°C , Max. = 25°C |         |
| Relative humidity | Min. =40% , Max. =72%    |         |
| Shield effect     | 0.7-6GHz                 | > 100dB |
| Ground resistance | <0.5Ω                    |         |



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## 2 OTA Measurements System Configuration

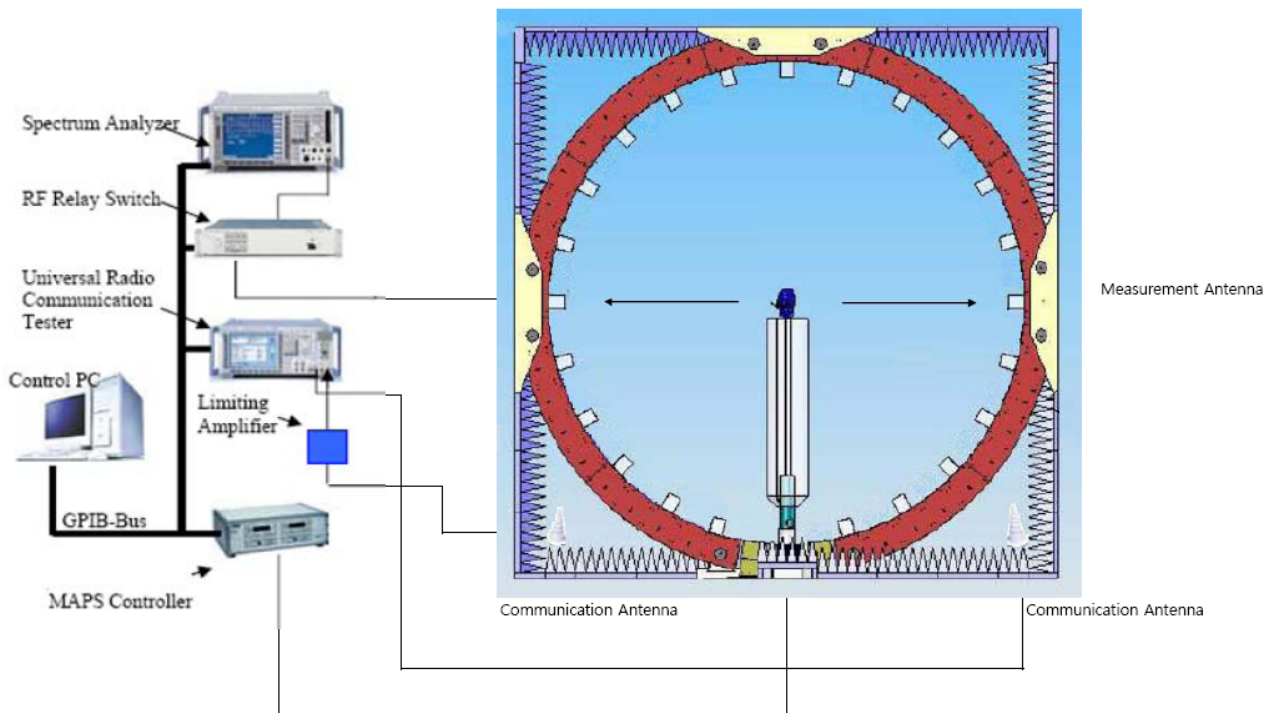
### 2.1 Test Configuration

#### Testing Condition:

- Temperature:  $22 \pm 3^{\circ}\text{C}$
- Humidity:  $< 80\%$

#### Measurement Facility:

Great-Circle-Cut method is used to measure the antenna 3D GAIN of EUT in OTA qualified anechoic chamber. Equipment Under Test (EUT) geometry centre vertical projection at the centre of platform, the distance from EUT to measurement antenna is 5m



F-1. OTA Measurement System Configuration



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3 Test Equipment List

| Type of Equipment                         | Model Number               | Manufacture       | Calibration Date | Valid Period |
|-------------------------------------------|----------------------------|-------------------|------------------|--------------|
| Network Analyzer                          | E5071C<br>S/N MY46523591   | Keysight          | 2024/01/30       | 2025/01/29   |
| Quad-Ridge Horn Antenna<br>700 MHz-10 GHz | EMCO 3164-08<br>S/N 161915 | ETS-Lindgren L.P. | N/A              | N/A          |
| MAPS Controller                           | EMCENTER<br>S/N 160485     | ETS-Lindgren L.P. | N/A              | N/A          |
| SAM V4.5BS Head Phantom                   | Head Phantom<br>S/N 3609   | SPEAG             | NCR              | NCR          |

Definition of Acronyms:  
NCR: No Calibration Requirement.



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### 4 Measurement Uncertainty

| Item                                                  | 2400-2500 MHz (dB) |
|-------------------------------------------------------|--------------------|
| Gain                                                  | 0.88               |
| Efficiency                                            | 0.88               |
| Measurement Uncertainty (95% CONFIDENCE INTERVAL) K=2 |                    |



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## 5 Test Results

| BLE NRF52840    |                 |                |            |
|-----------------|-----------------|----------------|------------|
| Frequency (MHz) | Efficiency (dB) | Efficiency (%) | Gain (dBi) |
| 2350            | -9.67           | 10.79          | -2.05      |
| 2355            | -9.74           | 10.63          | -2.35      |
| 2360            | -9.47           | 11.30          | -2.08      |
| 2365            | -9.56           | 11.06          | -2.12      |
| 2370            | -9.51           | 11.20          | -2.49      |
| 2375            | -9.56           | 11.06          | -2.88      |
| 2380            | -9.53           | 11.15          | -2.97      |
| 2385            | -9.38           | 11.54          | -2.43      |
| 2390            | -9.35           | 11.61          | -2.13      |
| 2395            | -9.13           | 12.21          | -1.69      |
| 2400            | -9.35           | 11.62          | -1.47      |
| 2402            | -9.45           | 11.36          | -1.79      |
| 2405            | -9.51           | 11.19          | -1.89      |
| 2410            | -9.59           | 10.99          | -2.17      |
| 2415            | -9.66           | 10.83          | -2.32      |
| 2420            | -9.45           | 11.35          | -2.41      |
| 2425            | -9.43           | 11.40          | -2.49      |
| 2430            | -9.51           | 11.21          | -2.39      |
| 2435            | -9.49           | 11.25          | -1.94      |
| 2440            | -9.32           | 11.68          | -1.57      |
| 2441            | -9.23           | 11.93          | -1.58      |
| 2445            | -8.83           | 13.10          | -1.04      |

| WIRPAS NRF52832 |                 |                |            |
|-----------------|-----------------|----------------|------------|
| Frequency (MHz) | Efficiency (dB) | Efficiency (%) | Gain (dBi) |
| 2350            | -9.18           | 12.07          | -2.63      |
| 2355            | -9.21           | 11.99          | -2.70      |
| 2360            | -8.95           | 12.73          | -2.45      |
| 2365            | -9.07           | 12.40          | -2.54      |
| 2370            | -8.95           | 12.73          | -2.69      |
| 2375            | -9.02           | 12.54          | -2.73      |
| 2380            | -8.87           | 12.97          | -3.06      |
| 2385            | -8.69           | 13.53          | -2.44      |
| 2390            | -8.58           | 13.87          | -2.04      |
| 2395            | -8.29           | 14.83          | -1.43      |
| 2400            | -8.42           | 14.38          | -1.13      |
| 2402            | -8.44           | 14.33          | -1.30      |
| 2405            | -8.44           | 14.33          | -1.19      |
| 2410            | -8.45           | 14.28          | -1.14      |
| 2415            | -8.41           | 14.43          | -1.59      |
| 2420            | -8.23           | 15.04          | -1.82      |
| 2425            | -8.43           | 14.34          | -2.13      |
| 2430            | -8.91           | 12.86          | -3.22      |
| 2435            | -9.70           | 10.72          | -4.72      |
| 2440            | -10.07          | 9.85           | -5.53      |
| 2441            | -10.04          | 9.91           | -5.56      |
| 2445            | -10.19          | 9.58           | -6.27      |



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|------|--------|-------|-------|
| 2450 | -8.48  | 14.20 | -0.53 |
| 2455 | -8.12  | 15.43 | -0.47 |
| 2460 | -8.02  | 15.78 | -0.40 |
| 2465 | -7.90  | 16.23 | -0.58 |
| 2470 | -8.03  | 15.76 | -0.90 |
| 2475 | -8.23  | 15.04 | -1.80 |
| 2480 | -8.70  | 13.48 | -2.15 |
| 2485 | -9.25  | 11.88 | -3.13 |
| 2490 | -9.86  | 10.34 | -4.60 |
| 2495 | -10.21 | 9.53  | -5.42 |
| 2500 | -10.52 | 8.87  | -6.08 |
| 2505 | -10.54 | 8.83  | -6.37 |
| 2510 | -10.56 | 8.80  | -6.23 |
| 2515 | -10.62 | 8.66  | -6.04 |
| 2520 | -10.63 | 8.65  | -5.80 |
| 2525 | -10.67 | 8.57  | -5.78 |
| 2530 | -10.53 | 8.84  | -5.51 |
| 2535 | -10.40 | 9.11  | -5.18 |
| 2540 | -10.15 | 9.66  | -4.88 |
| 2545 | -9.81  | 10.45 | -4.25 |
| 2550 | -9.55  | 11.10 | -3.81 |
| 2555 | -9.39  | 11.51 | -3.60 |
| 2560 | -9.35  | 11.62 | -3.69 |
| 2565 | -9.26  | 11.84 | -3.13 |
| 2570 | -9.21  | 12.01 | -3.02 |
| 2575 | -9.03  | 12.49 | -3.39 |
| 2580 | -8.94  | 12.77 | -3.26 |

|      |        |       |       |
|------|--------|-------|-------|
| 2450 | -10.13 | 9.69  | -6.35 |
| 2455 | -9.97  | 10.06 | -6.08 |
| 2460 | -10.06 | 9.85  | -5.94 |
| 2465 | -9.96  | 10.09 | -5.87 |
| 2470 | -10.16 | 9.65  | -5.34 |
| 2475 | -10.09 | 9.79  | -5.27 |
| 2480 | -10.14 | 9.67  | -5.21 |
| 2485 | -10.08 | 9.83  | -4.84 |
| 2490 | -9.98  | 10.04 | -4.53 |
| 2495 | -9.80  | 10.47 | -4.27 |
| 2500 | -9.79  | 10.49 | -4.06 |
| 2505 | -9.69  | 10.75 | -3.76 |
| 2510 | -9.71  | 10.70 | -3.59 |
| 2515 | -9.83  | 10.41 | -3.87 |
| 2520 | -9.93  | 10.17 | -4.08 |
| 2525 | -10.04 | 9.91  | -3.98 |
| 2530 | -9.96  | 10.10 | -3.79 |
| 2535 | -9.86  | 10.32 | -3.47 |
| 2540 | -9.65  | 10.83 | -3.35 |
| 2545 | -9.35  | 11.61 | -3.14 |
| 2550 | -9.11  | 12.29 | -3.32 |
| 2555 | -8.92  | 12.83 | -2.63 |
| 2560 | -8.83  | 13.08 | -2.35 |
| 2565 | -8.70  | 13.49 | -2.05 |
| 2570 | -8.59  | 13.83 | -2.09 |
| 2575 | -8.37  | 14.54 | -2.17 |
| 2580 | -8.24  | 15.00 | -2.07 |



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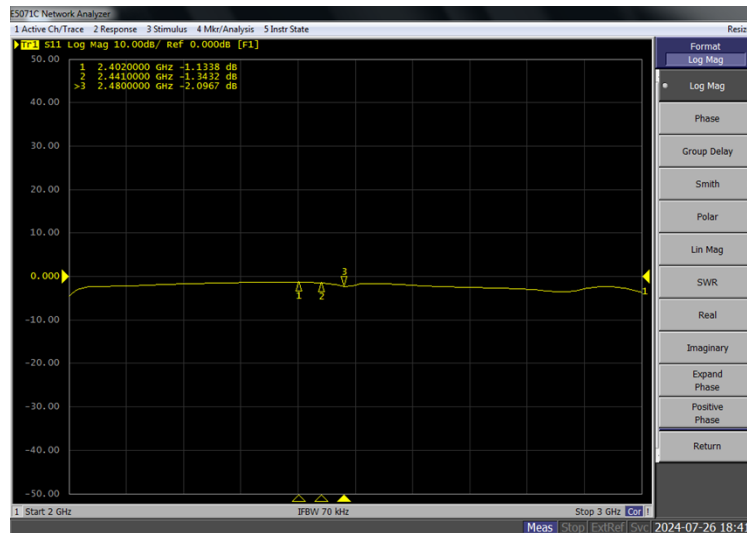
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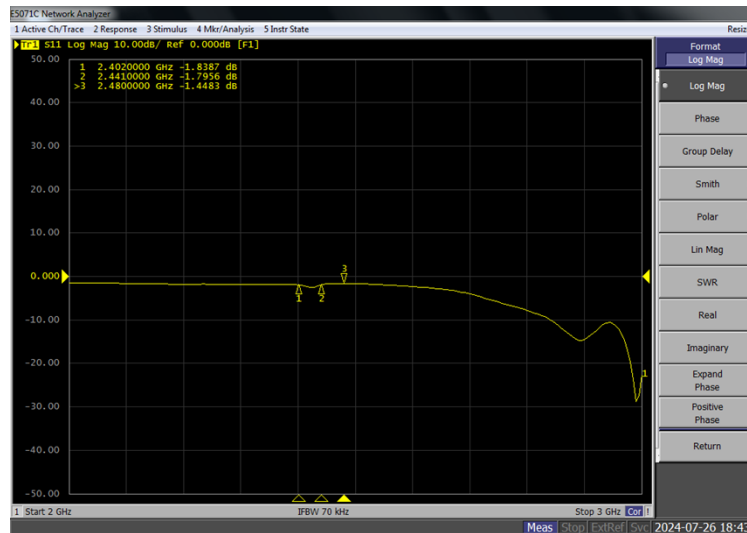
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## 6 Pattern Plots

### 6.1 Return Loss



Free Space (BLE NRF52840)



Free Space (WIRPAS NRF52832)



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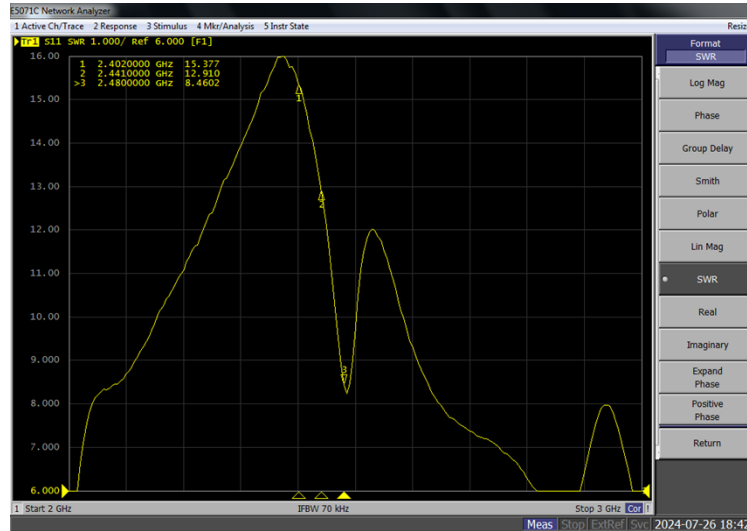
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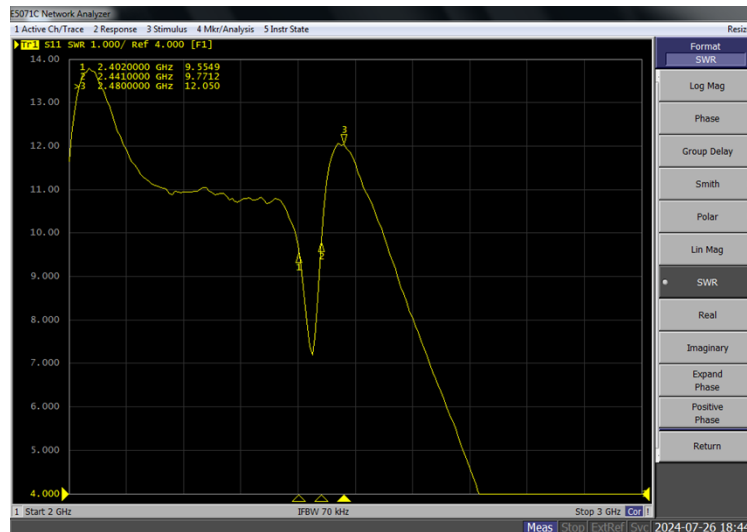
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### 6.2 VSWR



Free Space (BLE NRF52840)



Free Space (WIRPAS NRF52832)



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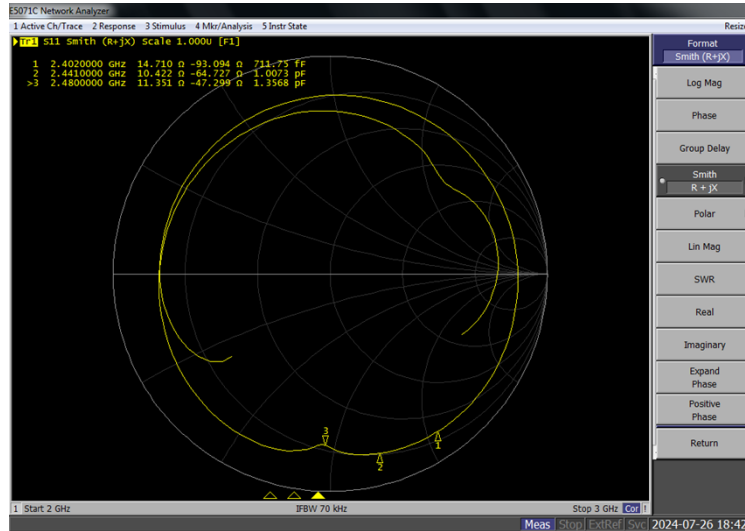
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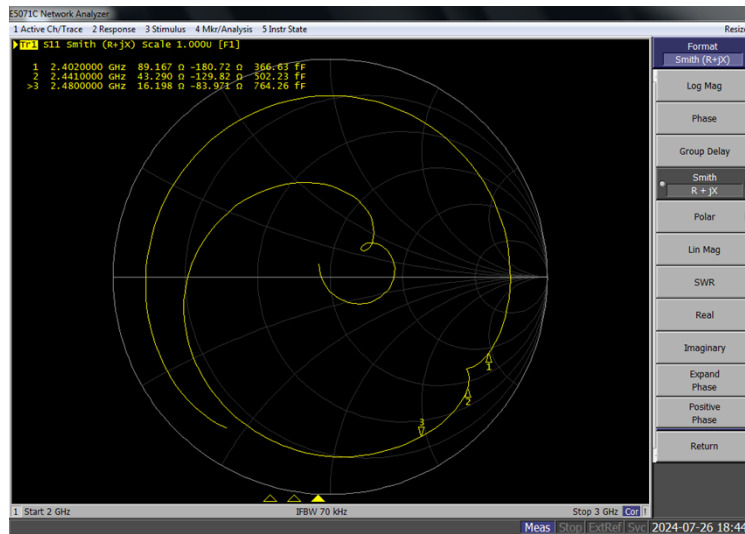
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### 6.3 Stimulus



Free Space (BLE NRF52840)



Free Space (WIRPAS NRF52832)

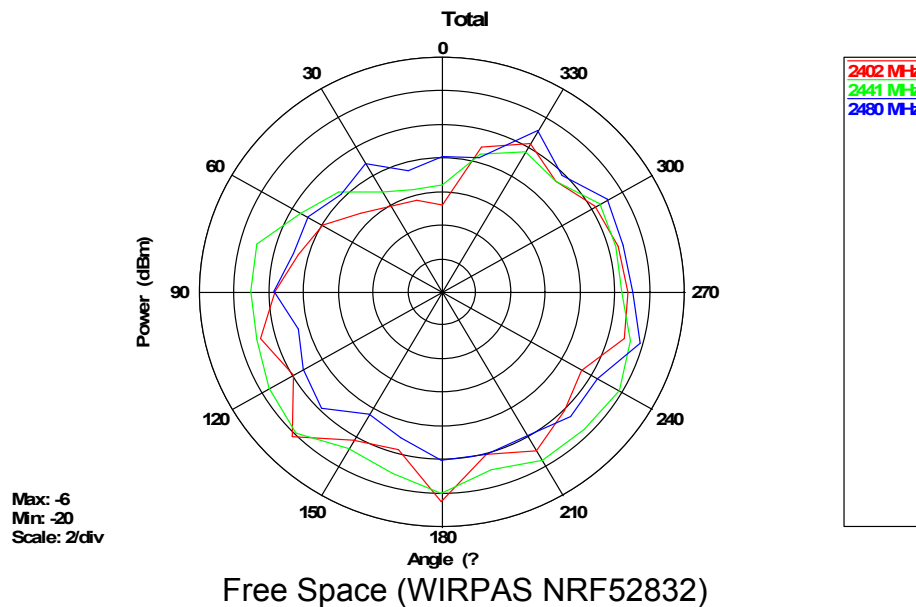
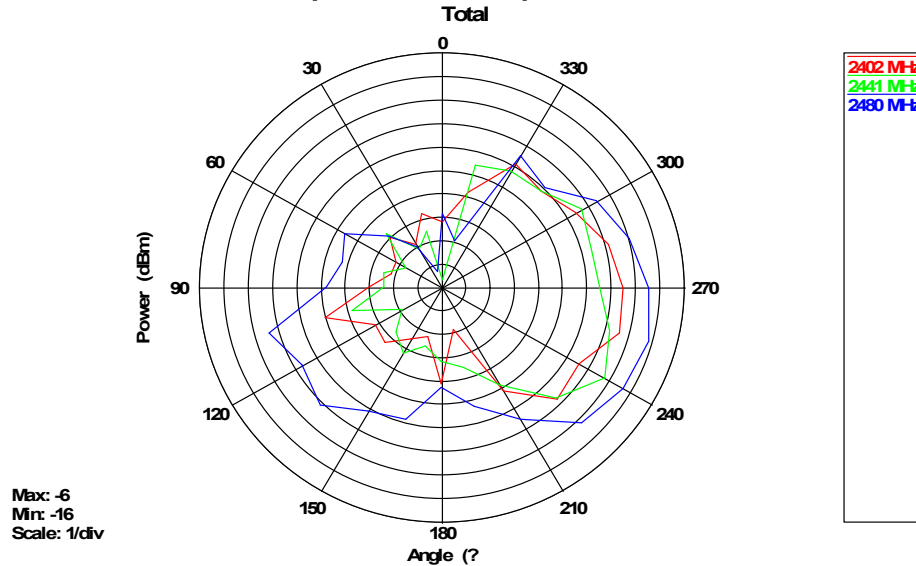


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### 7 2-D Antenna Pattern(Theta=90°)

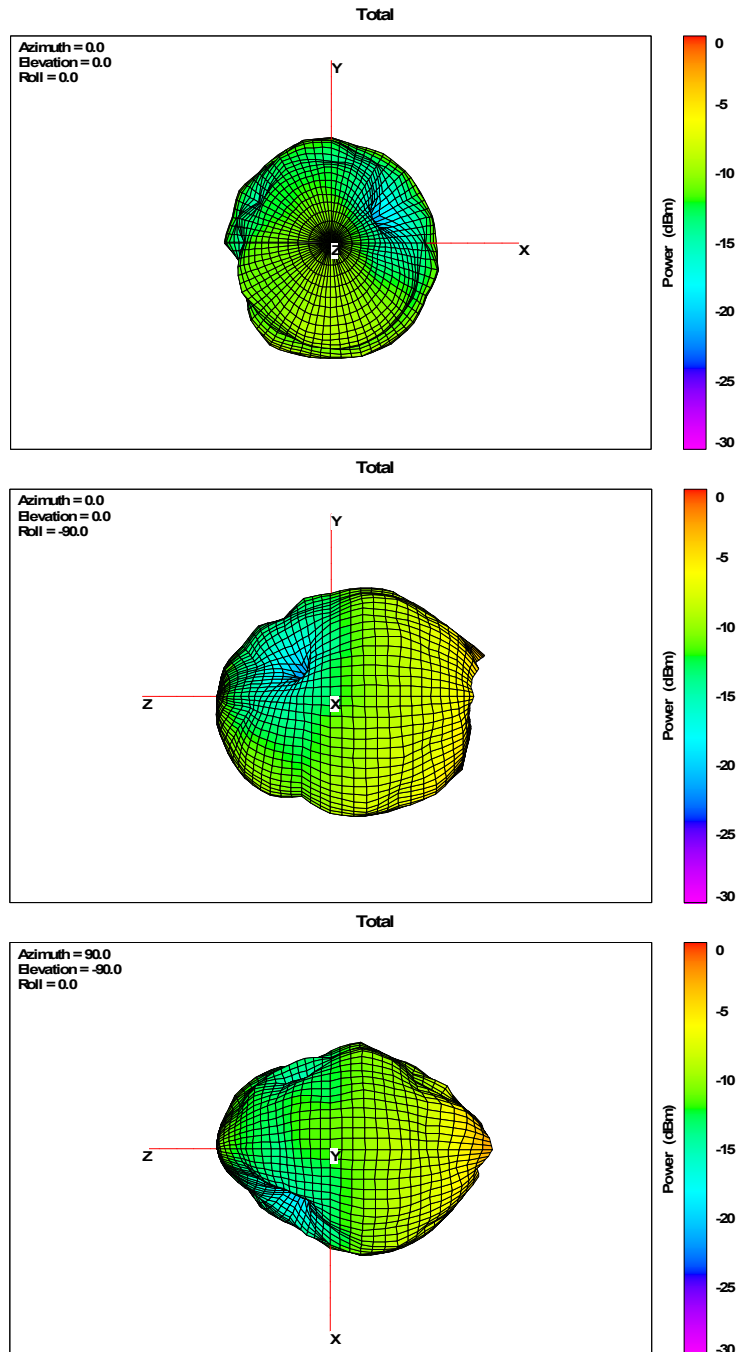


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### 8 3-D Antenna Pattern



Free Space (BLE NRF52840)

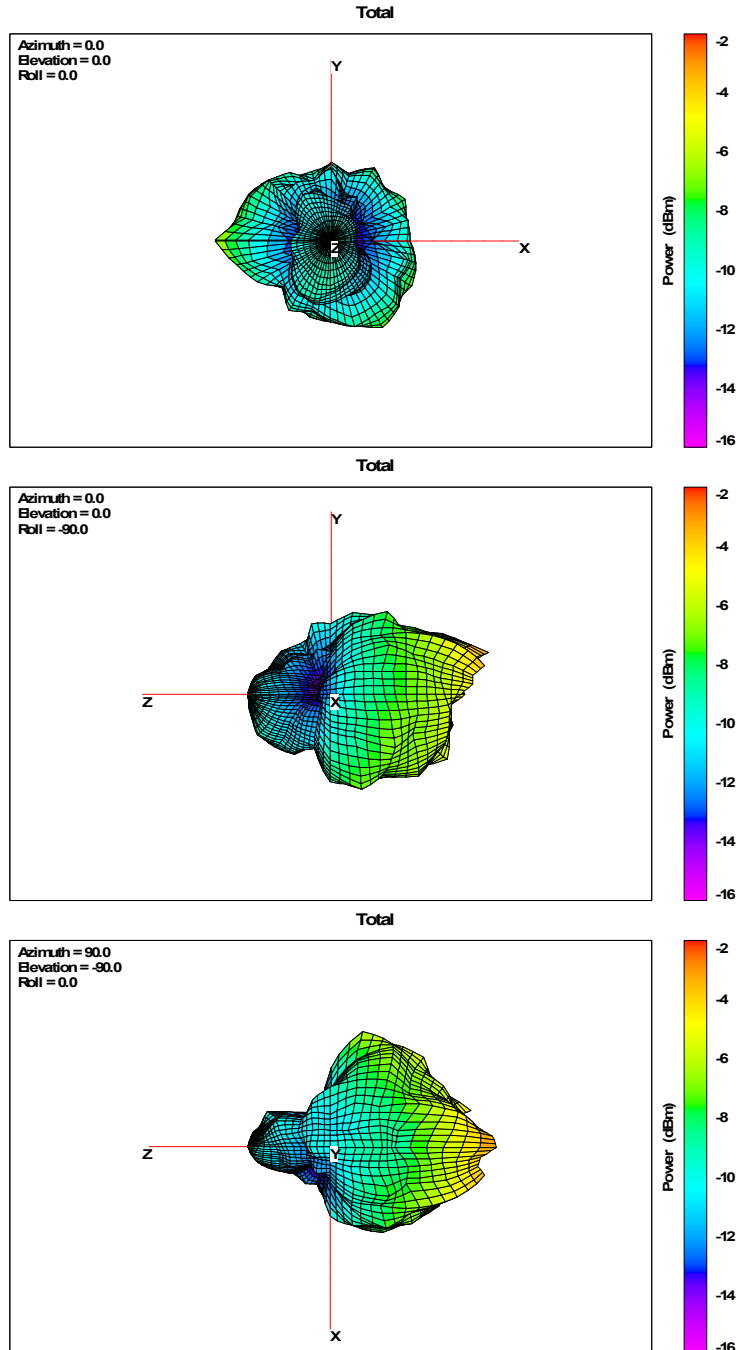


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Free Space (WIRPAS NRF52832)



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### 9 The EUT and Test Configuration

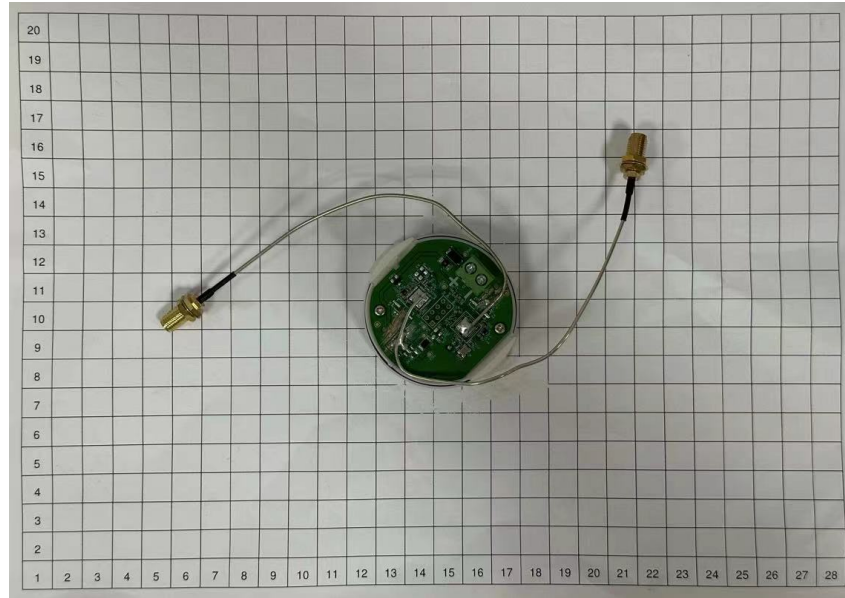
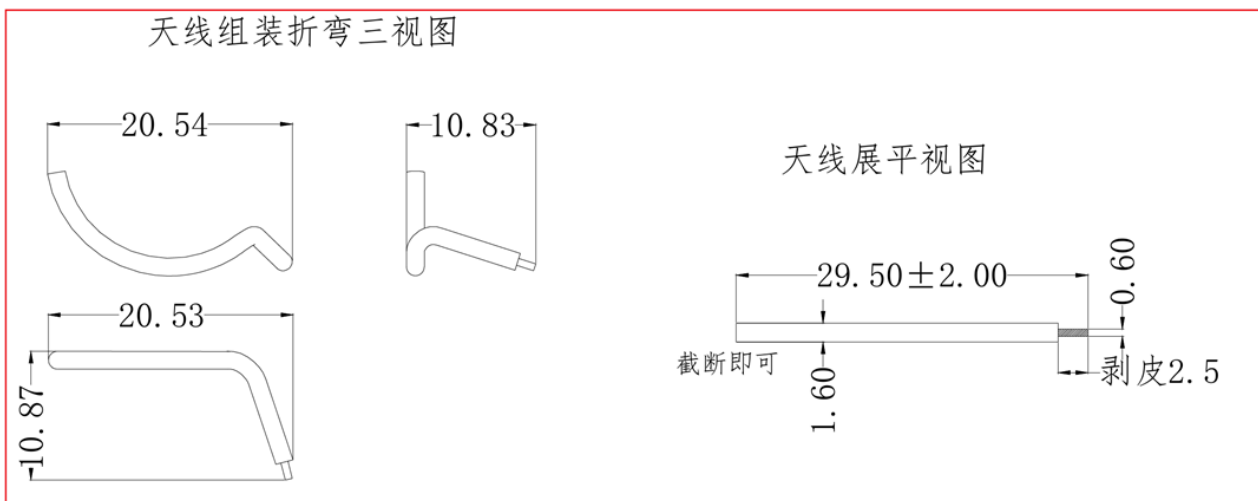


Photo of EUT (BLE NRF52840& WIRPAS NRF52832)



Antenna Dimensions (BLE NRF52840& WIRPAS NRF52832)

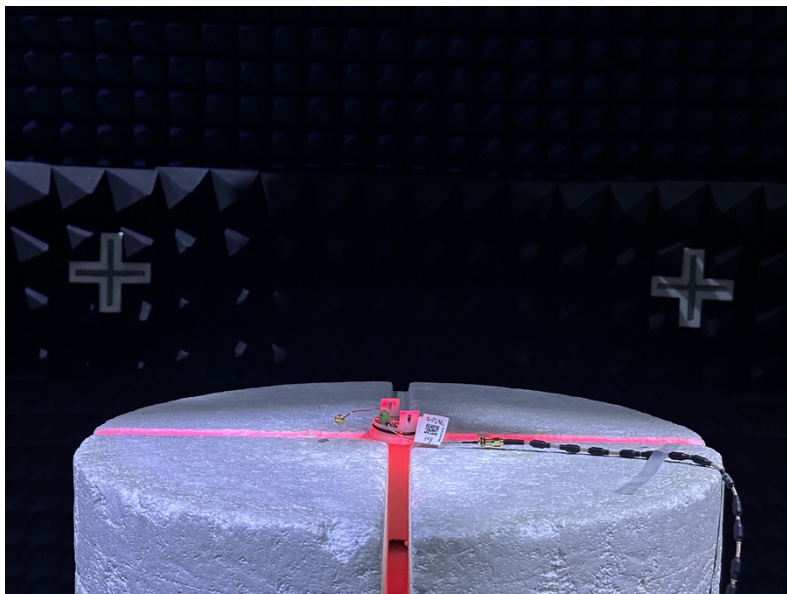


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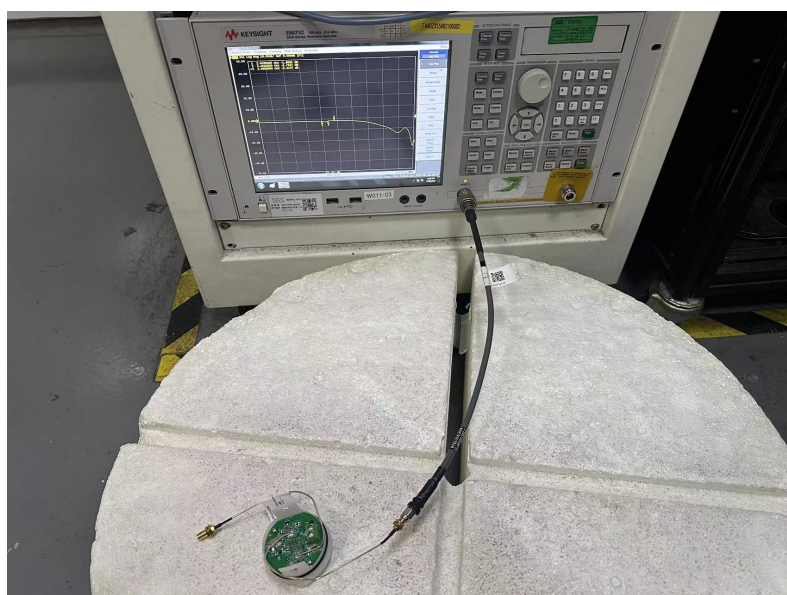
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Free Space View (BLE NRF52840& WIRPAS NRF52832)



Free Space Setup (BLE NRF52840& WIRPAS NRF52832)

---END---



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