

2017.07.25

RA-N0726-4

# APPROVAL SHEET

**MODEL : 30K**  
**Antenna layout**

| Review | Consent | Approval |
|--------|---------|----------|
|        |         |          |
|        |         |          |

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|                                                                                   |                        |     |             |     |      |        |
|-----------------------------------------------------------------------------------|------------------------|-----|-------------|-----|------|--------|
|  | PRODUCT APPROVAL SHEET |     | GRSNT001DP1 |     |      |        |
|                                                                                   | MODEL NAME             | 30K | REV.        | 1.0 | Page | 2 / 10 |

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## 1. Revision History

| NO. | Before | After | Reason | Date |
|-----|--------|-------|--------|------|
| 1   |        |       |        |      |
| 2   |        |       |        |      |
| 3   |        |       |        |      |
| 4   |        |       |        |      |
| 5   |        |       |        |      |
| 6   |        |       |        |      |
| 7   |        |       |        |      |
| 8   |        |       |        |      |
| 9   |        |       |        |      |
| 10  |        |       |        |      |
| 11  |        |       |        |      |
| 12  |        |       |        |      |
| 13  |        |       |        |      |

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## 2.Product Information

### 2.1 General Features

|              |                     |
|--------------|---------------------|
| PART NUMBER  | GradiANT            |
| ANTENNA TYPE | PCB Pattern Antenna |
| APPLICATIONS | Bluetooth           |

### 2.2 Electrical Specifications

|                       |    |                  |         |
|-----------------------|----|------------------|---------|
| Frequency Range1 (TX) |    | 2400MHz~2485MHz  |         |
| Frequency Range1 (RX) |    | 2400MHz~2485MHz  |         |
| IMPEDANCE             |    | 50 Ω             |         |
| V.S.W.R               | TX | 2400MHz          | 2485MHz |
|                       |    | 3 ↓              | 3 ↓     |
|                       | RX | 2400MHz          | 2485MHz |
|                       |    | 3 ↓              | 3 ↓     |
| RADIATION PATTERN     |    | Omni-directional |         |
| POLARIZATION          |    | Linear           |         |

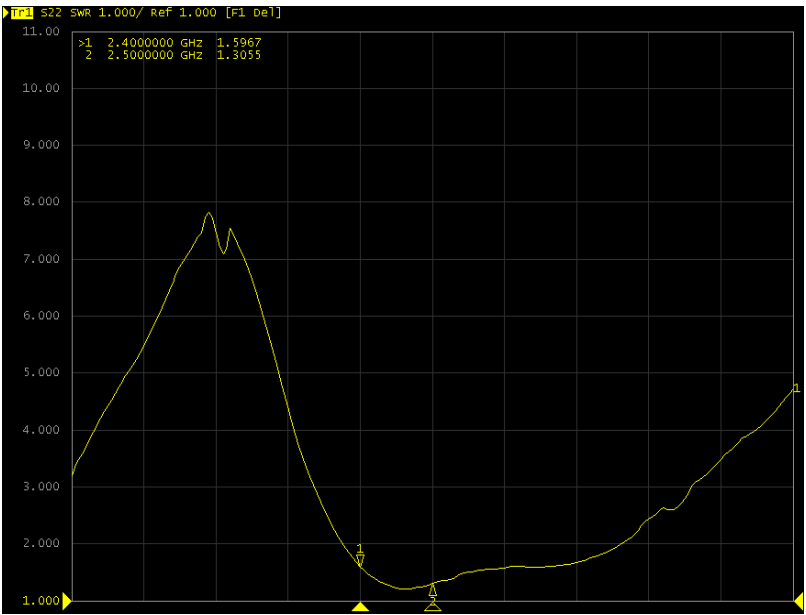
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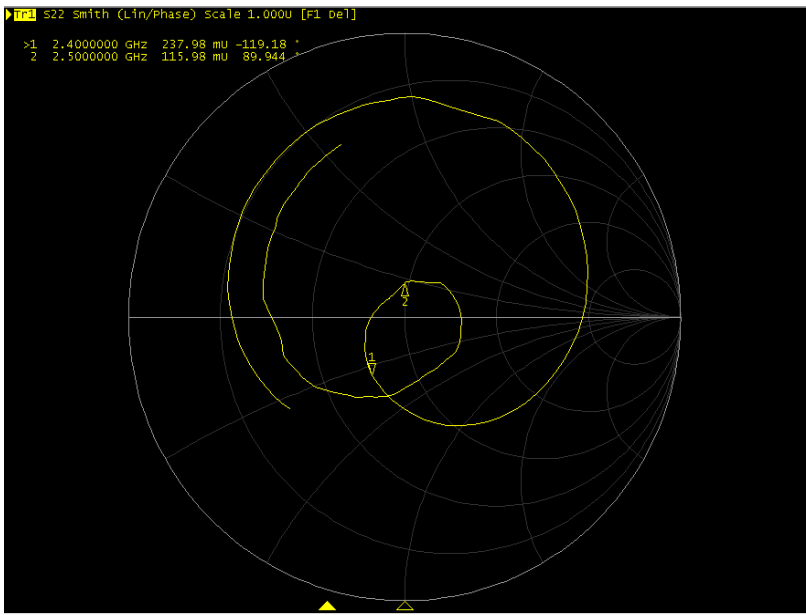
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3. Electrical Characterristics

3.1 VSWR



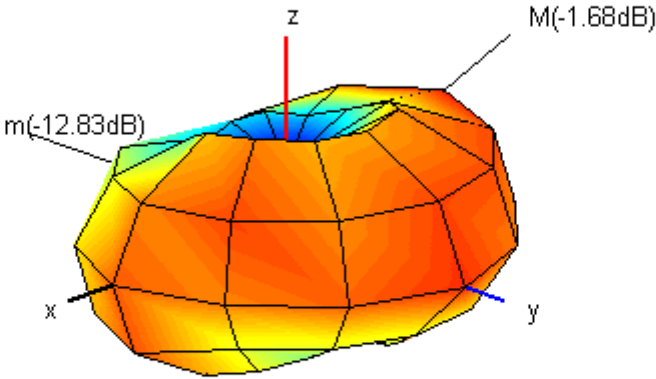
3.2 SMITH CHART



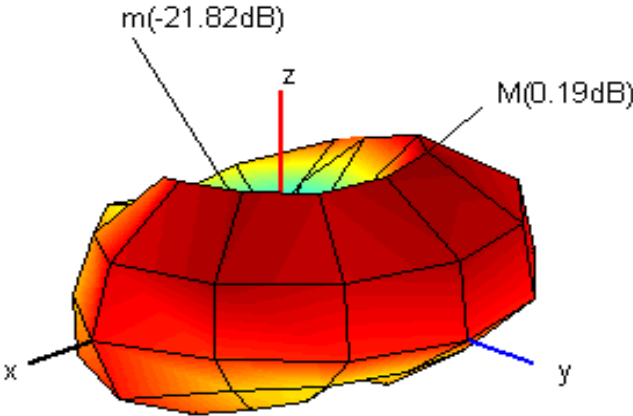
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3.3 3D-PLOTs

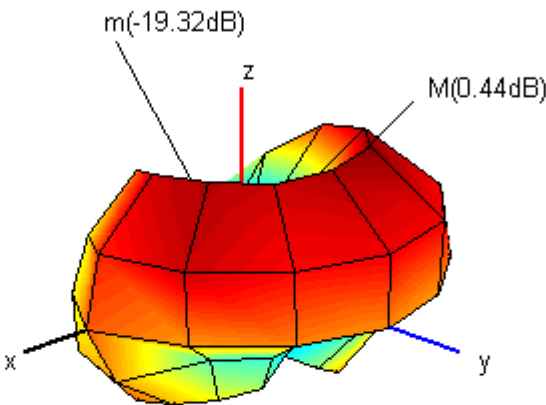
2400MHZ



2445MHZ



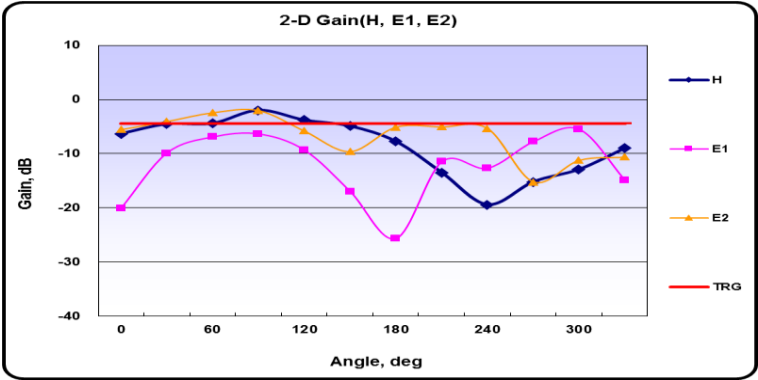
2485MHZ



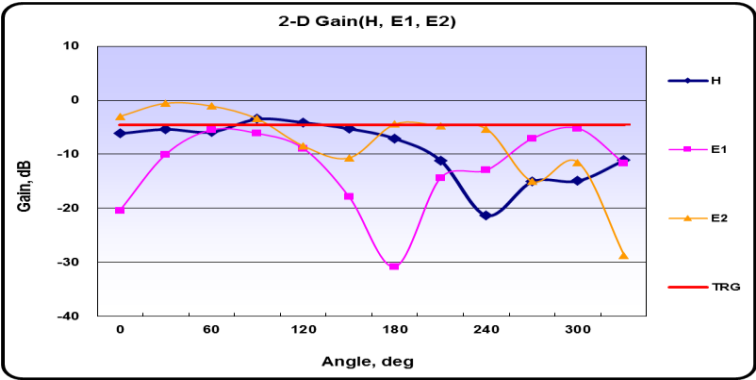
|                                                                                   |                        |     |             |     |      |        |
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3.4 2D-GAIN

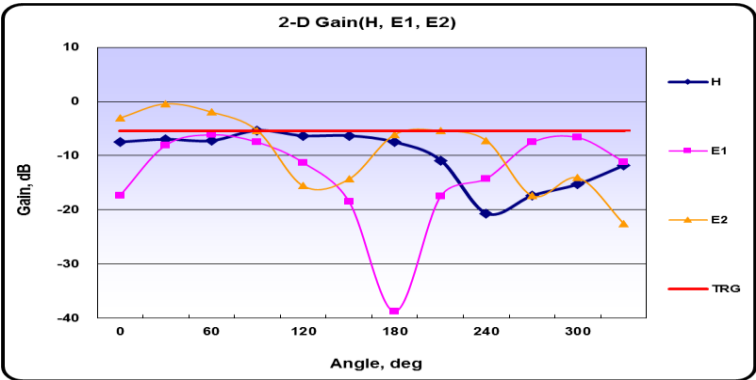
2400MHZ



2445MHZ



2485MHZ



|                                                                                   |                        |     |  |  |             |     |      |        |
|-----------------------------------------------------------------------------------|------------------------|-----|--|--|-------------|-----|------|--------|
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#### 4. Passive Measurement

|                           | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     |
|---------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Frequency(MHz)            | 2400   | 2405   | 2410   | 2415   | 2420   | 2425   | 2430   | 2435   | 2440   | 2445   |
| Efficiency(dB)            | -4.43  | -4.50  | -4.38  | -4.16  | -3.97  | -3.89  | -3.76  | -4.59  | -4.52  | -4.53  |
| Efficiency(%)             | 36.09  | 35.46  | 36.49  | 38.39  | 40.04  | 40.81  | 42.10  | 34.74  | 35.35  | 35.25  |
| TRG(dB)                   | -4.43  | -4.50  | -4.38  | -4.16  | -3.97  | -3.89  | -3.76  | -4.59  | -4.52  | -4.53  |
| TRG <sub>Theta</sub> (dB) | -7.19  | -7.17  | -6.99  | -6.73  | -6.49  | -6.40  | -6.16  | -6.98  | -6.91  | -6.92  |
| TRG <sub>Phi</sub> (dB)   | -7.70  | -7.89  | -7.83  | -7.66  | -7.54  | -7.47  | -7.48  | -8.33  | -8.25  | -8.25  |
| UHRG(dB)                  | -7.54  | -7.56  | -7.34  | -7.06  | -6.79  | -6.60  | -6.36  | -7.08  | -6.93  | -6.87  |
| UHRG/TRG(%)               | 48.86  | 49.48  | 50.62  | 51.28  | 52.34  | 53.57  | 54.91  | 56.37  | 57.33  | 58.30  |
| H-Plane                   | -6.40  | -6.50  | -6.34  | -6.18  | -6.02  | -5.99  | -5.93  | -6.91  | -6.97  | -7.06  |
| E1-Plane, AVG(dB)         | -9.66  | -9.64  | -9.46  | -9.18  | -8.99  | -8.92  | -8.53  | -9.38  | -9.22  | -9.23  |
| E2-Plane, AVG(dB)         | -5.52  | -5.42  | -5.18  | -4.93  | -4.54  | -4.50  | -4.20  | -5.01  | -4.84  | -4.84  |
| Peak Gain(dB)             | -1.68  | -1.81  | -1.78  | -1.42  | -0.89  | -0.79  | -0.33  | -0.64  | -0.33  | -0.19  |
| Directivity(dB)           | 2.74   | 2.69   | 2.60   | 2.73   | 3.09   | 3.10   | 3.43   | 3.95   | 4.19   | 4.34   |
| Minimum Gain(dB)          | -12.83 | -12.96 | -13.69 | -14.26 | -15.40 | -16.17 | -16.48 | -18.51 | -19.78 | -21.83 |

|                           | 11     | 12     | 13     | 14     | 15     | 16     | 17     | 18     | 19     | 20     |
|---------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Frequency(MHz)            | 2450   | 2455   | 2460   | 2465   | 2470   | 2475   | 2480   | 2485   | 2490   | 2497   |
| Efficiency(dB)            | -4.65  | -4.60  | -5.07  | -5.21  | -5.35  | -5.35  | -5.47  | -5.42  | -5.47  | -5.59  |
| Efficiency(%)             | 34.25  | 34.71  | 31.11  | 30.16  | 29.18  | 29.20  | 28.39  | 28.68  | 28.40  | 27.62  |
| TRG(dB)                   | -4.65  | -4.60  | -5.07  | -5.21  | -5.35  | -5.35  | -5.47  | -5.42  | -5.47  | -5.59  |
| TRG <sub>Theta</sub> (dB) | -7.05  | -6.96  | -7.47  | -7.61  | -7.72  | -7.74  | -7.90  | -7.87  | -7.94  | -8.09  |
| TRG <sub>Phi</sub> (dB)   | -8.38  | -8.37  | -8.80  | -8.92  | -9.11  | -9.07  | -9.14  | -9.08  | -9.09  | -9.18  |
| UHRG(dB)                  | -6.91  | -6.77  | -7.20  | -7.24  | -7.32  | -7.26  | -7.33  | -7.24  | -7.22  | -7.27  |
| UHRG/TRG(%)               | 59.51  | 60.67  | 61.24  | 62.61  | 63.46  | 64.38  | 65.19  | 65.89  | 66.79  | 67.85  |
| H-Plane                   | -7.41  | -7.29  | -7.89  | -8.08  | -8.29  | -8.25  | -8.52  | -8.48  | -8.65  | -8.72  |
| E1-Plane, AVG(dB)         | -9.35  | -9.29  | -9.74  | -9.86  | -10.00 | -9.85  | -10.00 | -9.97  | -10.01 | -10.11 |
| E2-Plane, AVG(dB)         | -4.93  | -4.78  | -5.26  | -5.43  | -5.48  | -5.56  | -5.70  | -5.76  | -5.80  | -6.02  |
| Peak Gain(dB)             | 0.13   | 0.41   | 0.10   | 0.24   | 0.32   | 0.34   | 0.30   | 0.44   | 0.46   | 0.34   |
| Directivity(dB)           | 4.79   | 5.01   | 5.17   | 5.45   | 5.67   | 5.69   | 5.77   | 5.87   | 5.93   | 5.93   |
| Minimum Gain(dB)          | -22.75 | -20.93 | -21.43 | -21.33 | -20.36 | -19.45 | -20.44 | -19.33 | -18.27 | -17.34 |

|                    |           |        |
|--------------------|-----------|--------|
| Average Efficiency | -4.71dBi, | 33.82% |
| Peak Gain          | 0.46dBi   |        |

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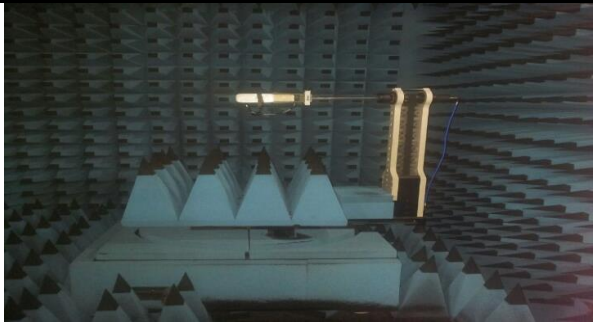
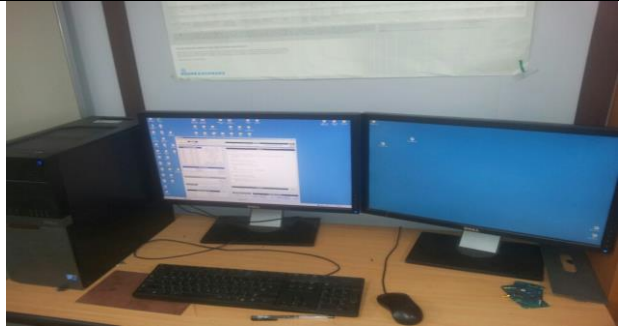
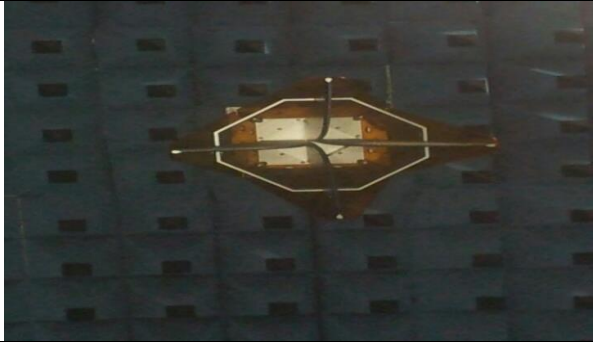
5.Measurement Process

5.1 SWR / Return loss

|                  |                                                                                     |
|------------------|-------------------------------------------------------------------------------------|
|                  | Set Condition                                                                       |
| Network Analyzer | Agilent 8753ES                                                                      |
| Cable            | Semi-ridid (40mm, 60mm)                                                             |
| Test condition   |  |

5.2 Gain

Antenna gain is measured in the anechoic chamber of this company.

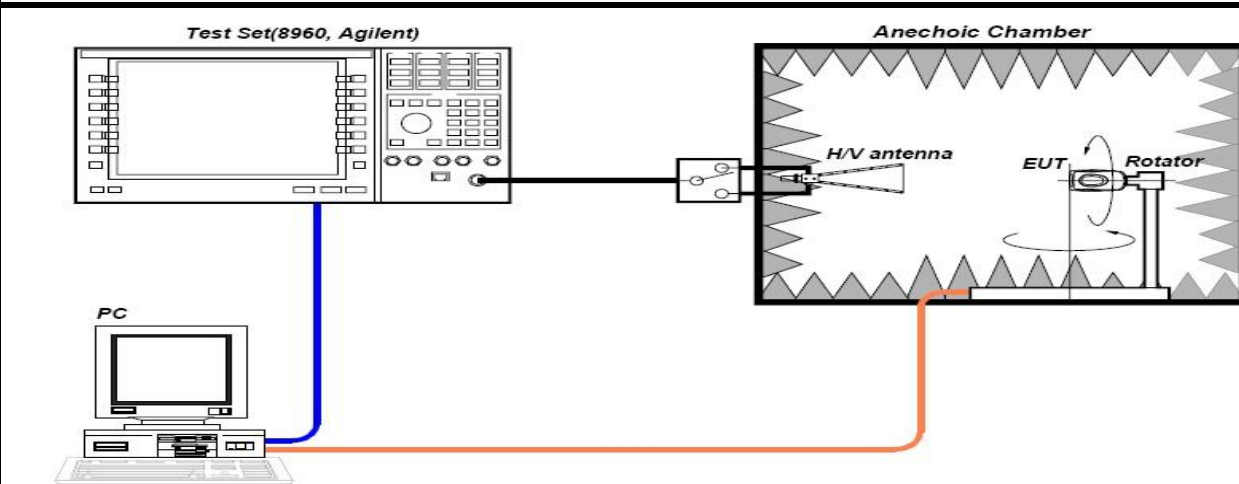
|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Anechoic Chamber for Antenna Gain Measurement                                       |                                                                                      |
|  |  |
|  |  |

|                                                                                   |                        |     |             |     |      |         |
|-----------------------------------------------------------------------------------|------------------------|-----|-------------|-----|------|---------|
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### 5.3 Gain test block diagram

#### Active test Sysetm

- TRP, NHPRP, UHRP
- TIS, NHPIS, UHIS
- Relative Sensitivity



#### Passiver test Sysetm

- Efficiency
- Peak Gain, Avg, Gain
- Min, Max PWR

