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零件承认书




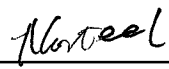
SPECIFICATION FOR APPROVAL

P/N of Galtronics

P/N of SerComm

02102073-04501

TBD

| <u>APPROVED BY</u> | <u>SIGNATURE</u> | <u>DATE</u> |
|--------------------------------|--|---|
| Engineering Department Manager |  |  |
| Mechanical Engineer |  | 2010/06/30 |
| RF Engineer |  | 2010.6.30 |
| Customer Approval | | |

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2. Drawing

3. Field Plotting

ANTENNA SPECIFICATION

| <u>REV NO.</u> | <u>DATE</u> | <u>DESCRIPTION</u> |
|---|-------------------------|--------------------|
| S1 | 6-30-2010 | Initial Draft |
| <u>DISTRIBUTION LIST:</u> | | 3. |
| 1. | | |
| 2. | | |
| <u>APPROVED BY</u> | <u>SIGNATURE</u> | <u>DATE</u> |
| Engineering Department Manager | | |
| Mechanical Engineer Gary Wannagot | | |
| RF Engineer Randy Cozzolino | | |
| <u>Approved By Customer</u> (as required): | | |

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ANTENNA SPECIFICATION**Preliminary Design Specification****2.4 GHz Antennas
For
Cisco RMN302 Cable Modem
with Wireless Router****Galtronics P/N:****02102073-04501****Sercomm P/N:****TBD**

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ANTENNA SPECIFICATION

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ANTENNA SPECIFICATION

1.0 PURPOSE AND SCOPE:

The purpose of this document is to establish a **design** specification for the antenna product that Galtronics is producing for Cisco. Any changes or additions to this specification can affect schedule and/or cost of the product and should be negotiated between Galtronics and Cisco before being incorporated into the specification. Upon agreement of this specification, Galtronics will make no changes without written approval from Cisco. Any changes requested by Cisco will be given to Galtronics with sufficient time frame to evaluate the cost impact and react as required. The development of this product within Galtronics is conducted according to the Design Control Procedure SOP-006E.

2.0 RELATED DOCUMENTS:

| | |
|-------------|--|
| SOP006E | Product Launch Procedure (Design Control) |
| EN006E | Reliability Guidelines |
| EIA-STD-556 | Outer Shipping Container Bar Code Label Standard |

3.0 ABBREVIATIONS AND DEFINITIONS

| | |
|----------|------------------------------|
| Ω | Ohm |
| ° | Degree |
| °C | Celsius (degrees Centigrade) |
| cm | Centimetre |
| g | Grams |
| GHz | Gigahertz |
| Hz | Hertz |
| kg | Kilograms |
| MHz | Megahertz |
| m | Metre |
| mm | Millimetre |
| N | Newton |
| PCB | Printed Circuit Board |
| RH | Relative Humidity |
| W | Watt |

Design Specification: A preliminary target specification to guide the design process.
Product Specification: A final specification for the qualified product.

4.0 DESCRIPTIONS AND PART NUMBER:

4.1 DESCRIPTION

The antennas are referred to as Galtronics' Compact Balanced Antennas. The Compact Balanced Antenna design consists of a single-piece high performance balanced antenna with coaxial cable. The cable is stripped and pre-tinned for soldering to device PCB. The Compact Balance Antennas have mounting features allowing for alignment and attachment to the upper plastic enclosure and are held in place by using press-fit methods. There are two antennas installed per unit.

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ANTENNA SPECIFICATION

4.2 PART NUMBER

| Galtronics P/N | Sercomm P/N | Frequency Band | Location in Wireless Router |
|----------------|-------------|----------------|-----------------------------|
| 02102073-04501 | TBD | 2.4 - 2.5 GHz | Right Front & Left Front |

5.0 ELECTRICAL SPECIFICATIONS:

5.1 FREQUENCY BAND

Unlicensed ISM2400 Band: 2.4 – 2.5 GHz

5.2 IMPEDANCE - Nominal impedance: 50Ω

5.3 MATCHING REQUIREMENTS.

The antennas do not require additional impedance matching circuitry.

5.4 VSWR REQUIREMENTS

5.4.1 VSWR Maximum

Maximum VSWR allowed is 2.0:1

5.4.2 TEST METHOD (ENGINEERING)

The antennas are tested while mounted in the cable modem. The cable modem is positioned in free space. (Free space means the device is placed on a non-conductive surface away from any conductive objects.)

5.4.3 TEST METHOD (PRODUCTION)

In mass production it is not practical to use the device supplied by customer. Galtronics will designate reference antennas that meet VSWR requirements when installed in the wireless cable modem. The reference antennas will then be measured in free space on production test equipment. Production antennas will be measured on the same production test equipment, and are thereby correlated to the reference antennas.

5.5 EFFICIENCY

5.5.1 MINIMUM VALUES OF ANTENNA EFFICIENCY

The efficiency of the antennas shall be a minimum of 50%.

5.5.2 TEST METHOD

The antennas are tested while mounted inside the wireless cable modem. The cable modem is then tested mounted horizontally in an anechoic chamber in free space. The efficiency of each antenna is measured at a minimum of three frequency points across the band of interest. The antennas shall meet the minimum efficiency requirements.

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ANTENNA SPECIFICATION

5.6 MINIMUM PEAK AND AVERAGE GAIN

5.6.1 MINIMUM PEAK AND AVERAGE GAIN VALUES

| Azimuth Cut | | | | |
|---------------------|----------------------|---------------------|----------------------|---------------------|
| Right Front Antenna | | | Left Front Antenna | |
| Frequency (GHz) | Power Sum Peak (dBi) | Power Sum Avg (dBi) | Power Sum Peak (dBi) | Power Sum Avg (dBi) |
| 2.40 | 0.00 | -4.50 | -0.50 | -4.50 |
| 2.45 | -0.50 | -4.50 | 0.00 | -4.50 |
| 2.50 | -0.50 | -4.50 | -0.50 | -4.50 |

| Elevation Cut (Front to Back) | | | | |
|-------------------------------|----------------------|---------------------|----------------------|---------------------|
| Right Front Antenna | | | Left Front Antenna | |
| Frequency (GHz) | Power Sum Peak (dBi) | Power Sum Avg (dBi) | Power Sum Peak (dBi) | Power Sum Avg (dBi) |
| 2.40 | 0.75 | -2.50 | 1.50 | -3.00 |
| 2.45 | 0.25 | -2.50 | 1.50 | -3.00 |
| 2.50 | 0.25 | -3.00 | 1.00 | -3.00 |

| Elevation Cut (Side to Side) | | | | |
|------------------------------|----------------------|---------------------|----------------------|---------------------|
| Right Front Antenna | | | Left Front Antenna | |
| Frequency (GHz) | Power Sum Peak (dBi) | Power Sum Avg (dBi) | Power Sum Peak (dBi) | Power Sum Avg (dBi) |
| 2.40 | 1.00 | -3.50 | 0.75 | -4.00 |
| 2.45 | 1.00 | -3.50 | 0.50 | -4.00 |
| 2.50 | 0.50 | -4.00 | 0.00 | -4.00 |

5.6.2 PEAK GAIN LIMITATION

The peak gain of the antennas shall be limited to the following values:

| | Max Peak Gain |
|---------------------|---------------|
| Right Front Antenna | 3.0 dBi |
| Left Front Antenna | 3.0 dBi |

5.6.3 TEST METHOD

The cable modem with antennas installed is mounted horizontally in an anechoic chamber in free space. The peak and average gain values are recorded for each antenna at the frequencies indicated. The antennas shall meet the minimum peak gain, maximum peak gain, and average gain values.

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ANTENNA SPECIFICATION

6.0 MECHANICAL SPECIFICATIONS

6.1 MECHANICAL CONFIGURATION

The appearance of the antennas is in accordance with drawing 02102073-04501

6.2 CABLE PULL TEST

The antenna cable and solder joint shall withstand a 3 N axial pull force. The antenna element is fixed in an appropriate fixture and a 3 N axial force is slowly applied. The force is maintained for 10 seconds. There shall be no permanent damage to the antenna after the test.

7.0 ENVIRONMENTAL SPECIFICATIONS

7.1 OPERATING TEMPERATURE

Operating temperature range shall be 0° C to +60° C.

7.2 OPERATING HUMIDITY

Operating humidity range shall be 10% to 85%, non-condensing.

7.3 STORAGE TEMPERATURE

Storage temperature range shall be -20° C to +60° C.

7.2 STORAGE HUMIDITY

Storage humidity range shall be 5% to 90%, non-condensing.

ANTENNA SPECIFICATION

8.0 QUALIFICATION

The mechanical and environmental tests mentioned above are performed according to the flow chart shown in Figure 1 below. The entire testing procedure will be conducted according to EN006E.

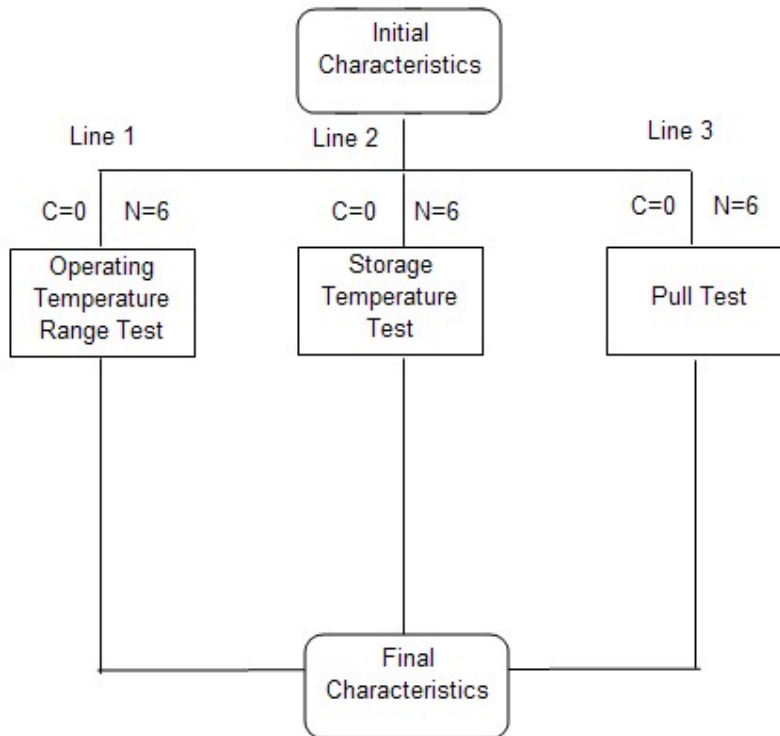


Figure 1. Property Verification Test Flow Chart

Note: n - sample size; c - allowable amount of critical failures

9.0 PACKAGING

02102073-04501 will be packed in trays. 55 antennas are packed in one tray, and 1,100 antennas are packed in one shipping box.

DWG No
02102073-04501



GALTRONICS

DRAWING COVER SHEET

| REV | ISSUE DATE | ECO # | DESCRIPTION |
|-----|------------|-------|-----------------|
| S-1 | 6/30/2010 | | Initial Release |

APPLICABLE SPEC'S:

SURFACE FINISH, MICROMETERS, CLA (UNLESS STATED) 0.8
 TOLERANCES UNLESS OTHERWISE SPECIFIED:
 NO PLACE (X) ±1 TWO PLACE (X.XX) ±0.1
 ONE PLACE (X.X) ±0.2 THREE PLACE (X.XXX) ±0.05

INTERNAL DISTRIBUTION

- PROCESS
- PURCHASING
- PRODUCTION
- PLASTICS
- QUALITY
- INCOMING INSPECTION
- FINAL INSPECTION
- MARKETING

METRIC SCREW THREAD TO ISO STANDARDS 724, 2861, 965-1 AND 965-2 INCHES SCREW THREAD TO ANSI/ASME B1.1. ALL ANGLES TO BE 90° UNLESS OTHERWISE STATED. TOLERANCE ON ANGLES ±1/4°. ALL TOLERANCES APPLY AFTER FINISHING. MACHINE CORNER RADS, 0.25 MAX., TO BE FREE FROM BURRS, SHARP EDGES AND ALL FOREIGN MATERIALS. FLASH ALLOWANCE FOR PLASTIC MOLDED PARTS TO BE 0.1mm UNLESS OTHERWISE STATED. DIAMETER MUST BE CONCENTRIC WITHIN 0.08 T.I.R.. ENVIRONMENTAL REQUIREMENTS: COMPLIANCE WITH GALTRONICS STANDARD "SUPPLIER ENVIRONMENTAL DECLARATION PROCEDURE" (SOPG002E).

QUALITY ASSURANCE NOTES:

NO CHANGE SHALL BE ALLOWED ON PRODUCTION. MATERIAL WITHOUT PRIOR EXPLICIT WRITTEN APPROVAL BY GALTRONICS ENGINEERING AND PURCHASING DEPARTMENTS FOR SPECIAL REQUIREMENTS SEE FMI49

- XR PROCESS CONTROL CHART REQUIRED WITH EACH SHIPMENT
- CRITICAL DIMENSION AFFECTS FORM FIT OR FUNCTION

| SUFFIX # | DESCRIPTION |
|----------|-----------------------------------|
| 04501 | Linksys BHR3 (with UFL Connector) |
| | |
| | |

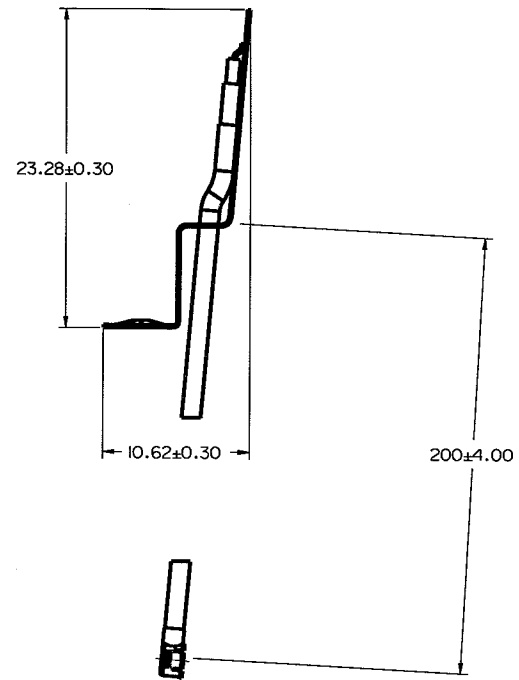
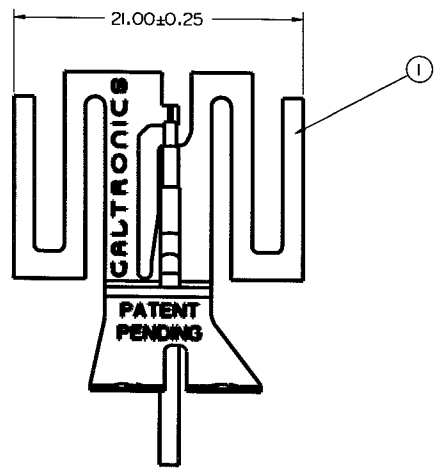
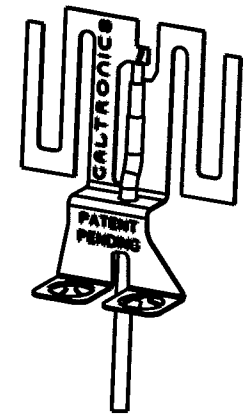
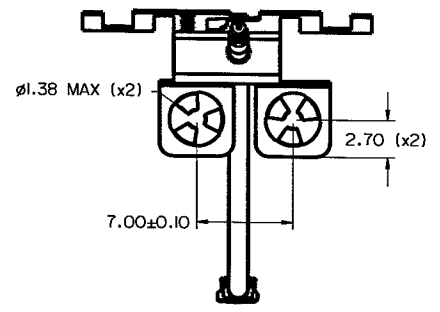
| | |
|----------|-------------|
| MATERIAL | See Note(s) |
| FINISH | See Note(s) |

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TITLE:
**ANTENNA, HORIZONTAL
 2.4 GHZ
 ASSEMBLY**

CHKD: *Mark 2010*
 APRVD: *[Signature]*
 DATE: *2010.08.01*

DWG. No. **02102073-04501**
 REV. **S1** PAGE 1 OF 2



| ITEM | DESCRIPTION | MATERIAL | FINISH |
|------|-----------------------------|------------------------------------|----------------|
| 2 | COAX CABLE W/ UFL CONNECTOR | Ø1.37 O.D., COLOR GRAY | |
| 1 | ELECTRICAL ELEMENT | STAINLESS STEEL THICKNESS 0.200 MM | NICKEL PLATING |



| | | | |
|----------|-------------|----------|--------------------|
| ENGINEER | JEDIDJAH K. | CHECKED | <i>Mark</i> |
| DRAWN | JEDIDJAH K. | APPROVED | <i>[Signature]</i> |
| DATE | 6/30/2010 | DATE | <i>6/30</i> |

ANTENNA, HORIZONTAL
2.4 GHZ
ASSEMBLY

Cisco RMN302 Wireless Cable Modem Antenna Performance Report

- Antennas are press-fit onto upper enclosure using antenna mounting posts.
- Antenna1 is in front right corner of device. Antenna2 is in left front corner of device.



Cisco RMN302 Wireless Cable Modem

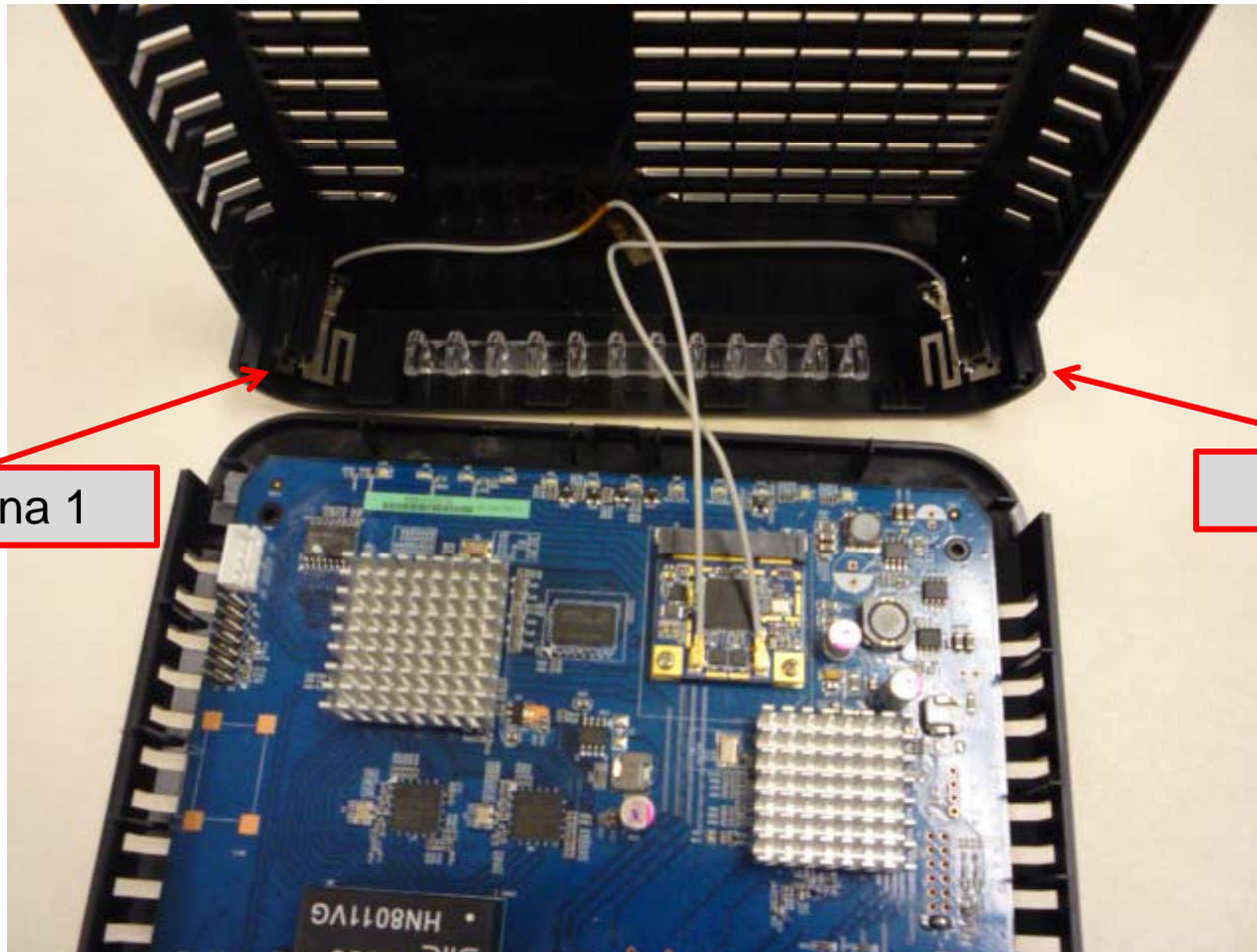


Antenna 2

Antenna 1



Cisco BHR3 Wireless Cable Modem Antenna Test Configuration

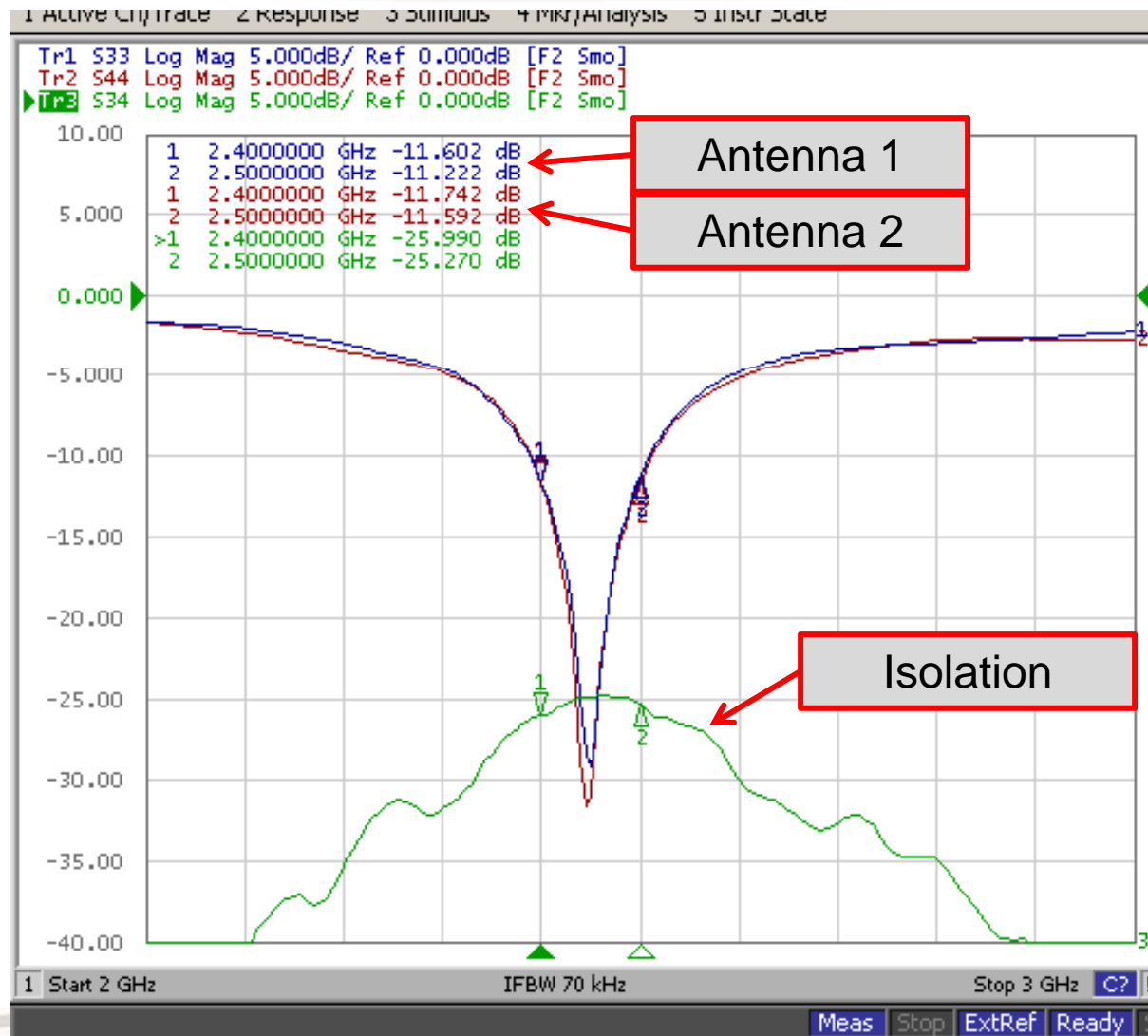


Antenna 1

Antenna 2



Antenna Return Loss and Isolation



Antenna Efficiency

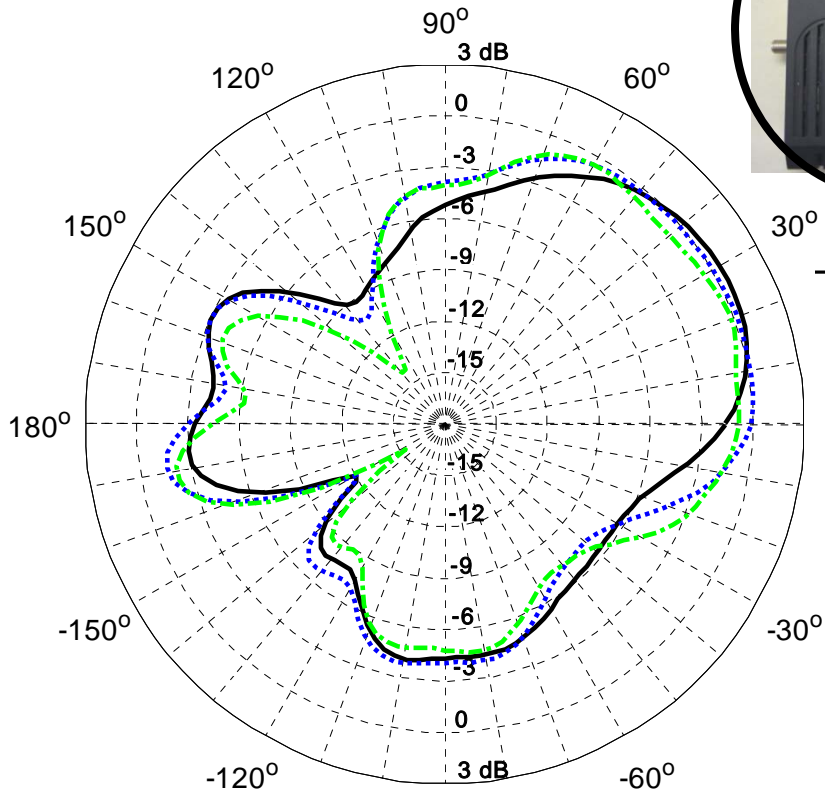
| | Frequency (GHz) | Directivity | Peak Gain | S11 | Terminal Efficiency |
|-----------|-----------------|-------------|-----------|--------|---------------------|
| Antenna 1 | 2.400 | 4.83 | 2.47 | -13.94 | 58.07% |
| | 2.450 | 4.73 | 2.64 | -22.15 | 61.85% |
| | 2.500 | 4.77 | 2.04 | -9.69 | 53.37% |
| | AVERAGE | | | | 57.77% |
| Antenna 2 | 2.400 | 5.00 | 2.38 | -12.15 | 54.64% |
| | 2.450 | 4.73 | 2.64 | -27.62 | 61.82% |
| | 2.500 | 4.69 | 2.15 | -11.33 | 55.63% |
| | AVERAGE | | | | 57.36% |



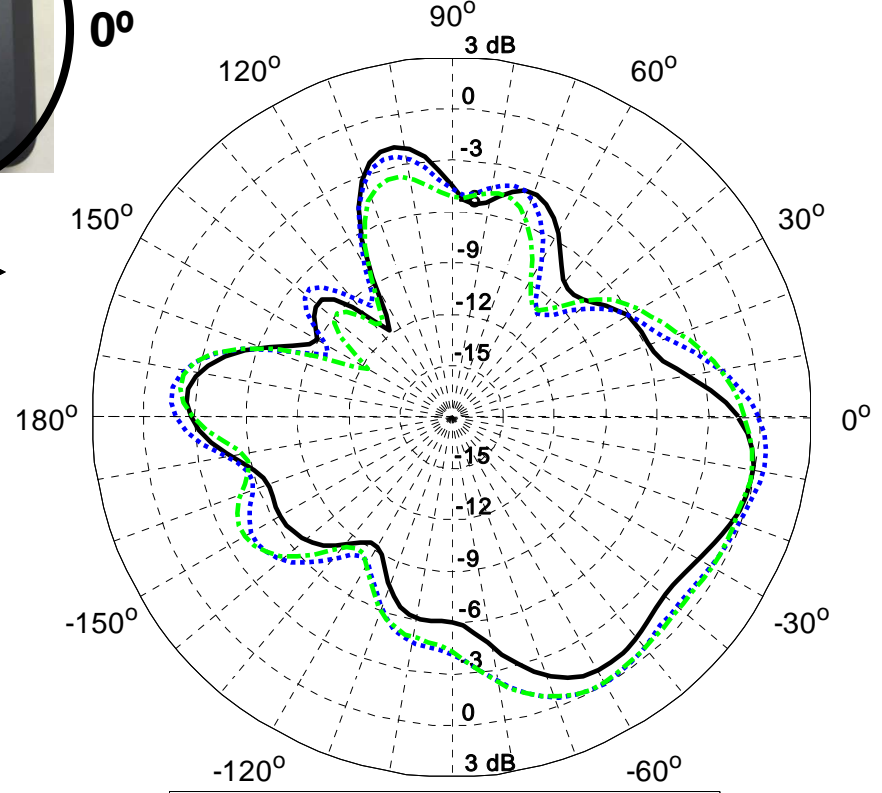
Azimuth Cut – Power Sum

Antenna1

Antenna2



- Beam₁ = 2400 MHz : Max Gain₁ = 0.55 dBi at 27°
- Beam₂ = 2450 MHz : Max Gain₂ = 0.2 dBi at 21°
- - - Beam₃ = 2500 MHz : Max Gain₃ = -0.16 dBi at 24°

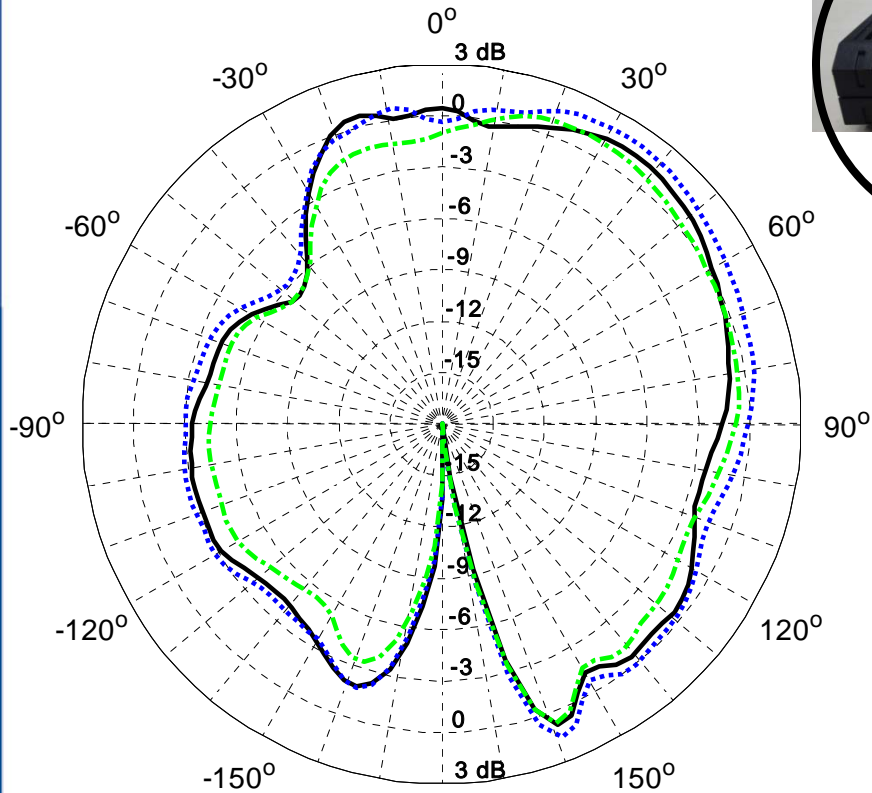


- Beam₁ = 2400 MHz : Max Gain₁ = -0.11 dBi at -12°
- Beam₂ = 2450 MHz : Max Gain₂ = 0.46 dBi at -9°
- - - Beam₃ = 2500 MHz : Max Gain₃ = -0.15 dBi at -63°

RONICS

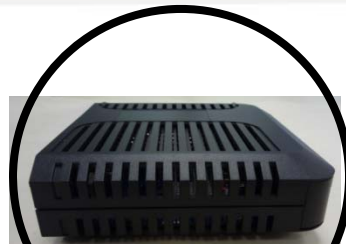
Elevation (Front to Back) Cut – Power Sum

Antenna1



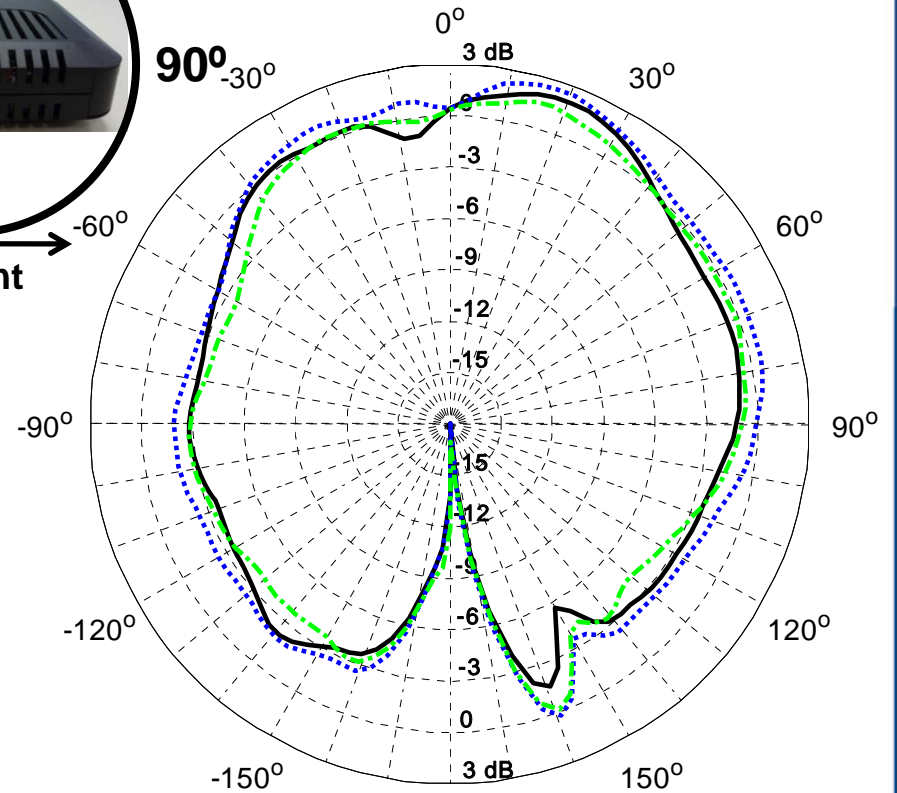
- Beam₁ = 2400 MHz : Max Gain₁ = 1.35 dBi at 36°
- Beam₂ = 2450 MHz : Max Gain₂ = 1.99 dBi at 36°
- - - - Beam₃ = 2500 MHz : Max Gain₃ = 0.97 dBi at 30°

0°



Front

Antenna2

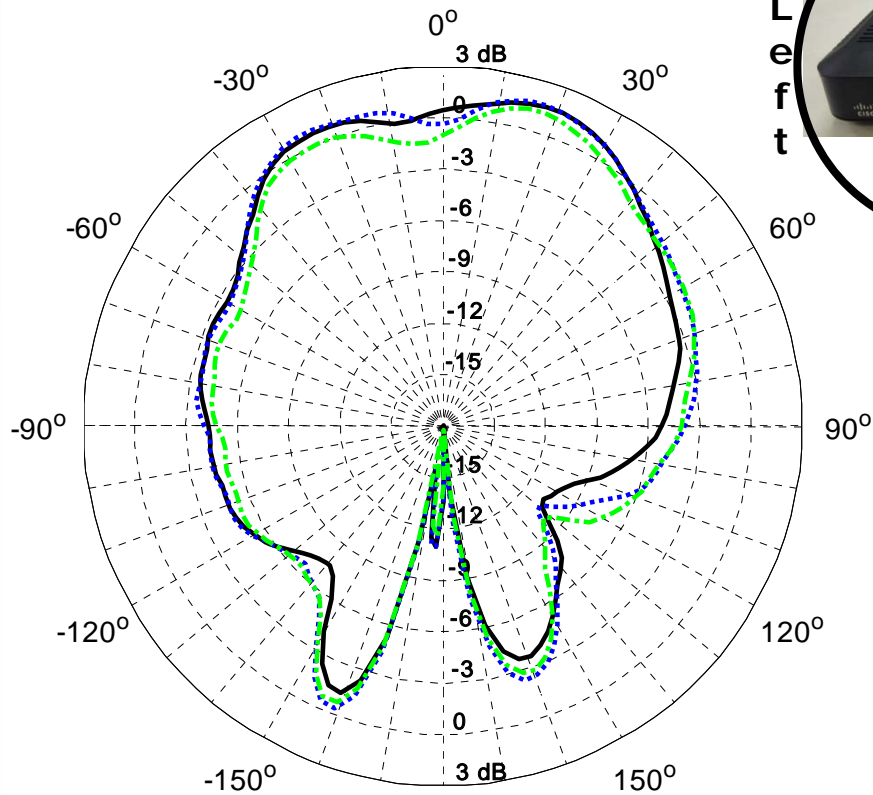


- Beam₁ = 2400 MHz : Max Gain₁ = 2.04 dBi at 18°
- Beam₂ = 2450 MHz : Max Gain₂ = 2.53 dBi at 18°
- - - - Beam₃ = 2500 MHz : Max Gain₃ = 1.5 dBi at 15°

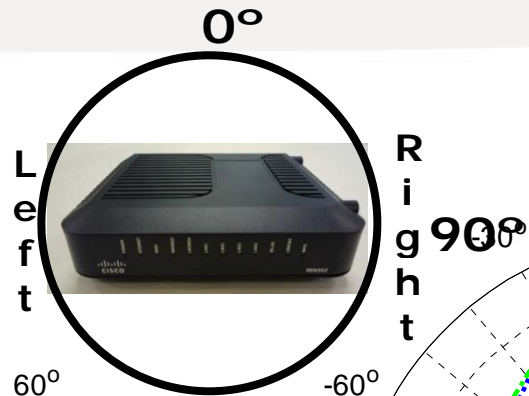
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Elevation (Side to Side) Cut – Power Sum

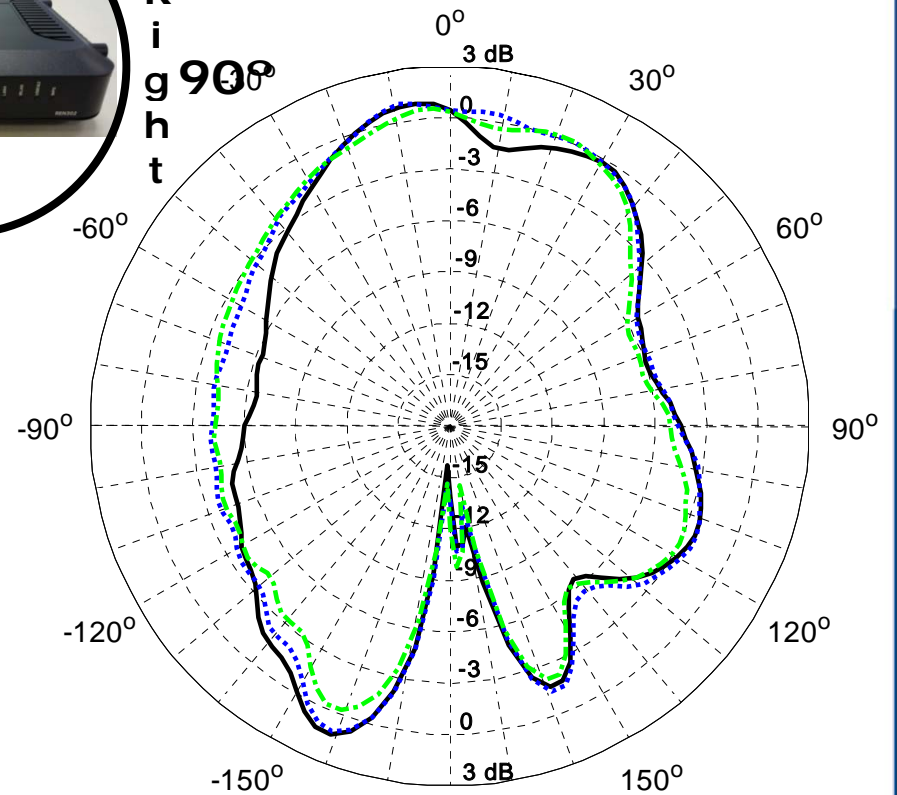
Antenna1



- Beam₁ = 2400 MHz : Max Gain₁ = 1.59 dBi at 18°
- Beam₂ = 2450 MHz : Max Gain₂ = 1.67 dBi at 18°
- - - Beam₃ = 2500 MHz : Max Gain₃ = 1.19 dBi at 18°

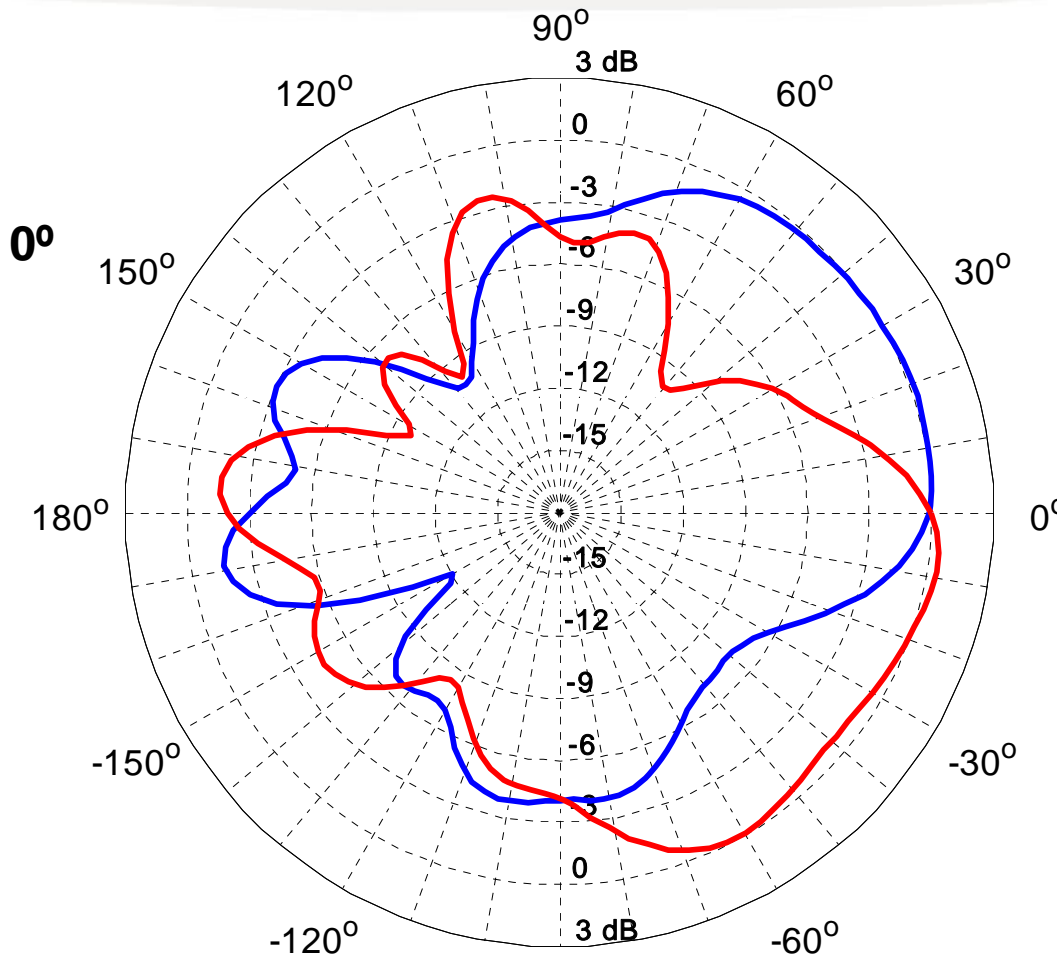


Antenna2



- Beam₁ = 2400 MHz : Max Gain₁ = 1.29 dBi at -159°
- Beam₂ = 2450 MHz : Max Gain₂ = 1.06 dBi at -159°
- - - Beam₃ = 2500 MHz : Max Gain₃ = 0.56 dBi at -3°

Azimuth Cut – Power Sum System Coverage



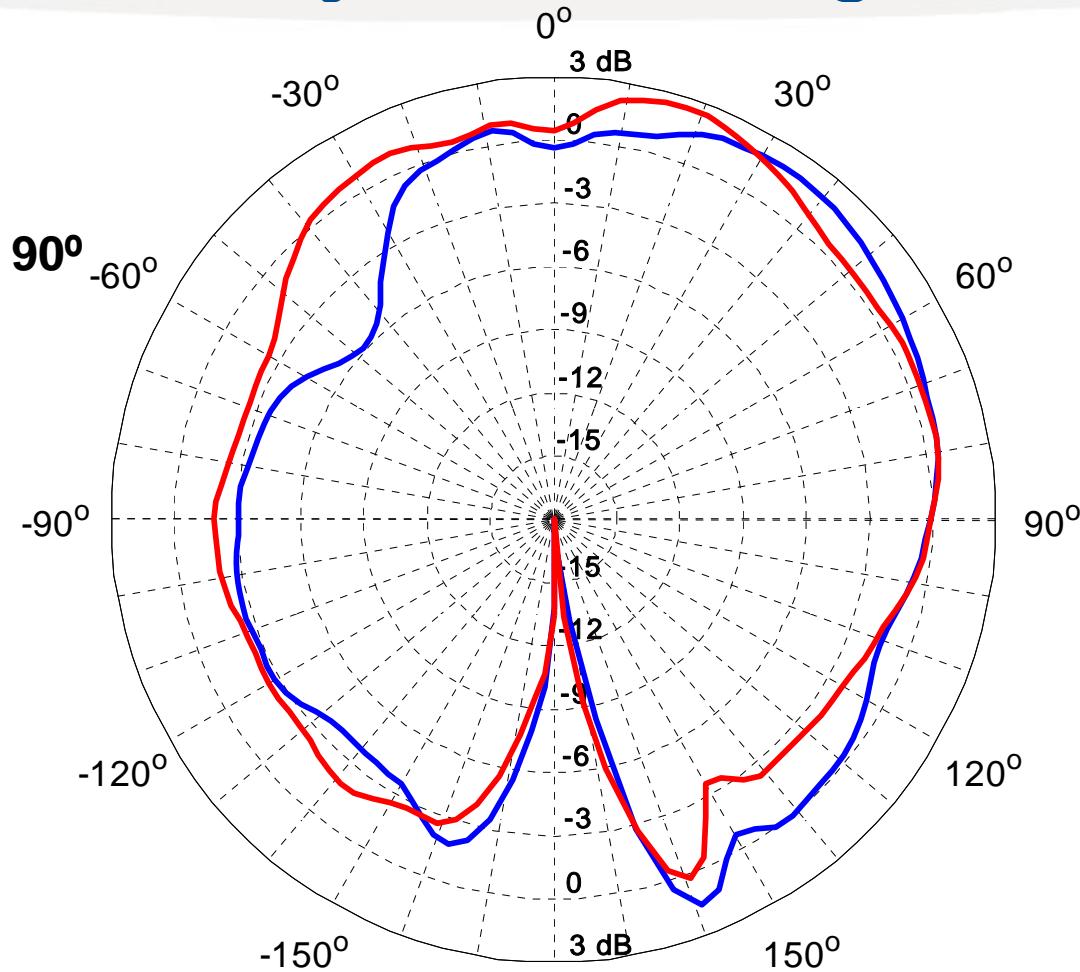
Antenna1

Antenna2

— Antenna₁ @ 2450 MHz : Max Gain₁ = 0.2 dBi at 21°
 — Antenna₂ @ 2450 MHz : Max Gain₂ = 0.46 dBi at -9°



Elevation (Front to Back) Cut – Power Sum System Coverage



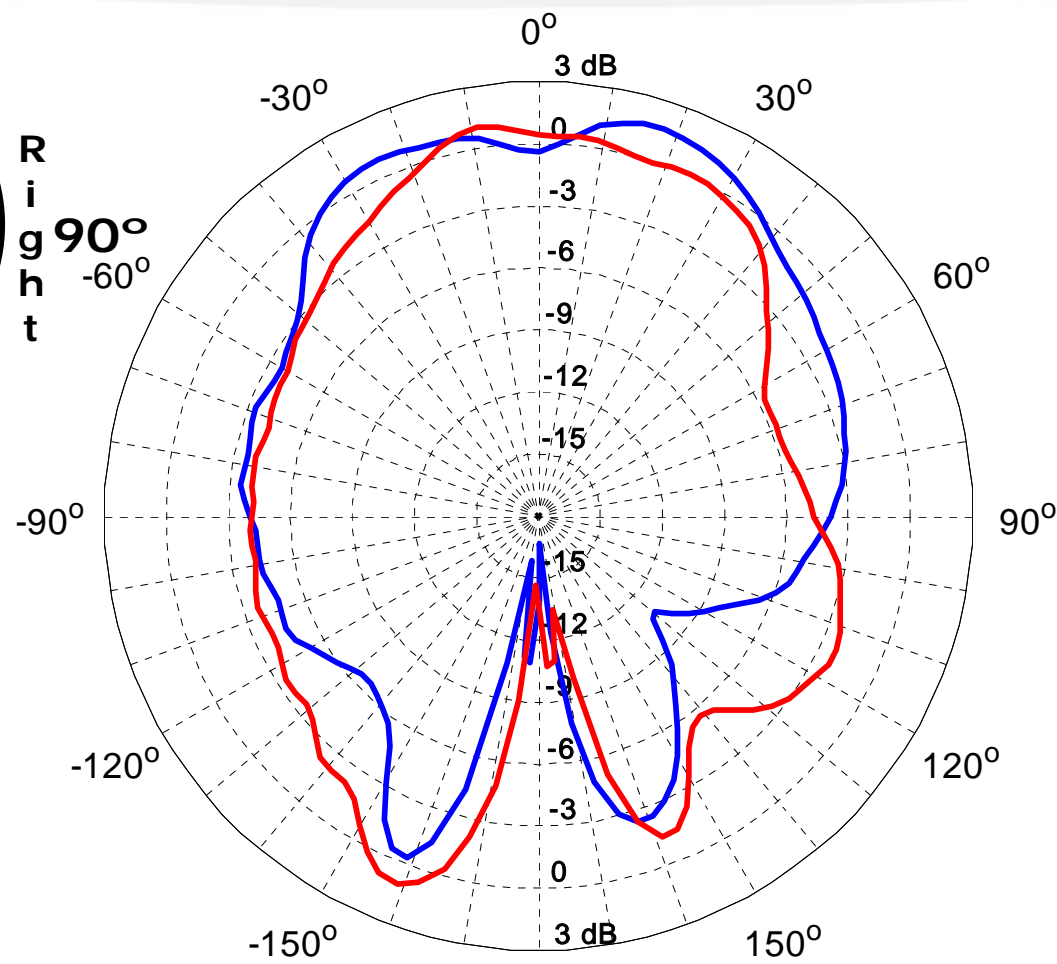
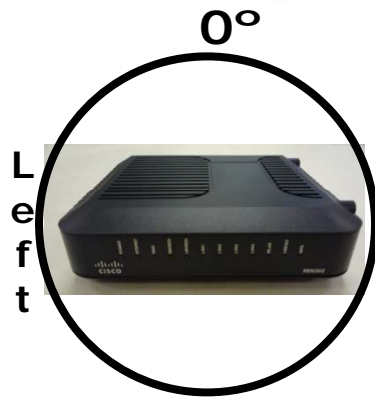
Antenna1

Antenna2

— Antenna₁ = 2450 MHz : Max Gain₁ = 1.99 dBi at 36°
— Antenna₂ = 2450 MHz : Max Gain₂ = 2.53 dBi at 18°



Elevation (Side to Side) Cut – Power Sum System Coverage



Antenna1
Antenna2

— Antenna₁ = 2450 MHz : Max Gain₁ = 1.67 dBi at 18°
— Antenna₂ = 2450 MHz : Max Gain₂ = 1.06 dBi at -159°



Updated Antenna Performance Report

Summary of Results

- Antennas exhibit good return loss, excellent isolation, and good efficiency.
- Antenna configuration offers good 3D spatial coverage compatible with either vertical or horizontal mounting.

