

The 9630-9110 radio module, manufactured by SEL, will be installed in host devices that are marketed by SEL to utility customers to provide a wireless fault and load monitoring system. These host devices will not be sold to ordinary consumers and will only be installed by professionals. In the case of an external antenna configuration, these professional installers will mount the devices and provide any necessary power, route RF feed lines (often with lightening protection), erect towers and install the antennas. Due to the wide variety of installation situations, installation by a professional using standard RF connectors is necessary.

| Antenna Mfg. | Mfg. Part # | SEL Part # | Antenna Type | Antenna Gain |
|--------------|-------------|------------|--------------------|--------------|
| Pulse | W3113 | 235-0305 | SMD Helical (Omni) | 0.8 dBi |
| PCTEL | BMOY8903 | 235-0221 | Yagi | 8.55 dBi |
| PCTEL | BMVD890M | 235-0222 | Yagi | 14.15 dBi |
| PCTEL | MFB9157NF | 235-0233 | Omni | 9.15 dBi |

The data sheets provided by the manufacturer of the antennas can be found at the links provided below. The relevant pages are also reproduced below. Note that the datasheets from PCTel state the antenna gains in dB over a dipole.

Link for data on SMD helical antenna:

https://productfinder.pulseeng.com/doc_type/WEB301/doc_num/W3113/doc_part/W3113.pdf

Links for data on yagi antennas:

http://www.antenna.com/artifacts/2016121BMOYSeries_SPECr2.pdf

<http://www.antenna.com/artifacts/2017518BMVD-700-800-900MHz.pdf>

Link for data on omni antenna:

<http://www.antenna.com/artifacts/2017822MFBSeries.pdf>

ISM 900MHz Helical SMD-Antenna

Ground cleared under antenna, clearance area 8.00 x 40.00 mm. Pulse Part Number: W3113



Features

- Low profile (2.5mm, embedded to board)
- Compact size W x L x H (12.4 x 8 x 2.5 mm)
- Low weight (400 mg)
- Lead Free materials
- Fully SMD compatible
 - Glue needed between antenna and PWB
- Lead free soldering compatible
- Tape and reel packing
- RoHS Compliant Product

Applications

- 900MHz ISM Band Systems

Engineering samples available

Electrical specifications @ +25 °C

Note: Electrical characteristics depend on test board (GP) size and antenna positioning on GP and Ground Clearance area size.

ISM 900MHz

Typical performance (testboard size 100 x 40 mm, PWB ground clearance area 8.00 x 40.00 mm)

| Frequency Range [MHz] | Max Gain [dBi] | Efficiency [%] / [dB] | Return loss min. [dB] | Impedance [Ω] | Operating Temperature [°C] |
|--------------------------|---------------------------------|--|--------------------------|------------------|-------------------------------|
| 902 – 928 | 0.8 (peak) -0.3 (band edges) | 66 / -1.8 (peak) 51 / -2.9 (band edges) | -10 | 50 | -40 to +85 |

Pulse Finland Oy

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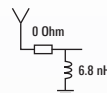


ISM 900MHz Helical SMD-Antenna

Ground cleared under antenna, clearance area 8.00 x 40.00 mm. Pulse Part Number: W3113

Typical Electrical Characteristics (T=25 °C)

Typical Return Loss S11/ impedance,
measured on the 100 x 40 mm test board with matching circuit



Dualband WLAN

3 Aug 2006 12:20:14

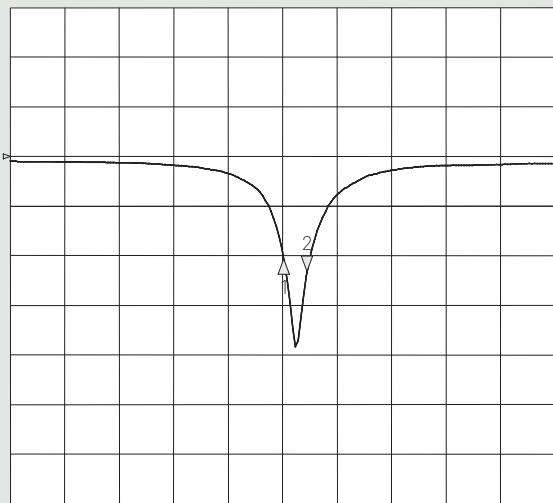
CH1Markers

- 1. -10.315 dB 902.000 MHz
- 2. -11.610 dB 928.000 000 MHz

CH1 S11 LOG

5 dB/REF 0 dB

PRM
Del
Cor



START 600.000 000 MHz

STOP 1 200.000 000 MHz

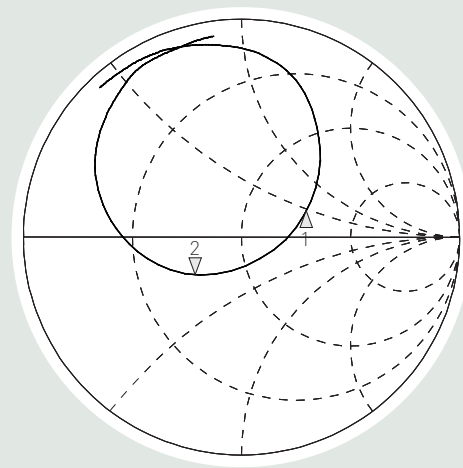
Dualband WLAN

3 Aug 2006 12:23:32

- 1. 88.223 Ω 24.625 Ω 902.000 MHz
- 2. 30.870 Ω -11.444 Ω 928.000 000 MHz

CH1 S11 1 U FS

PRM
Del
Cor

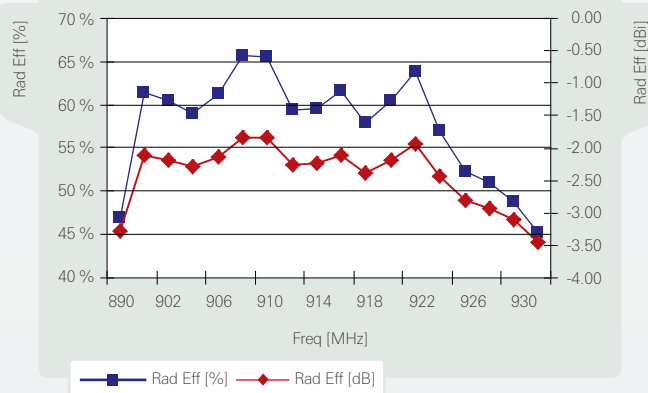


START 600.000 000 MHz

STOP 1 200.000 000 MHz

Free space efficiency and maximum gain, PWB ground clearance area 8.00 x 40.00 mm

ISM 900 MHz Hor Helical Antenna



ISM 900 MHz Hor Helical Antenna



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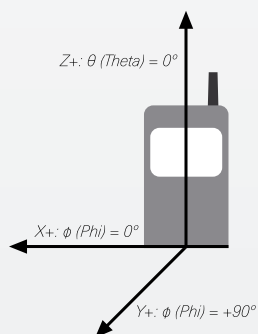
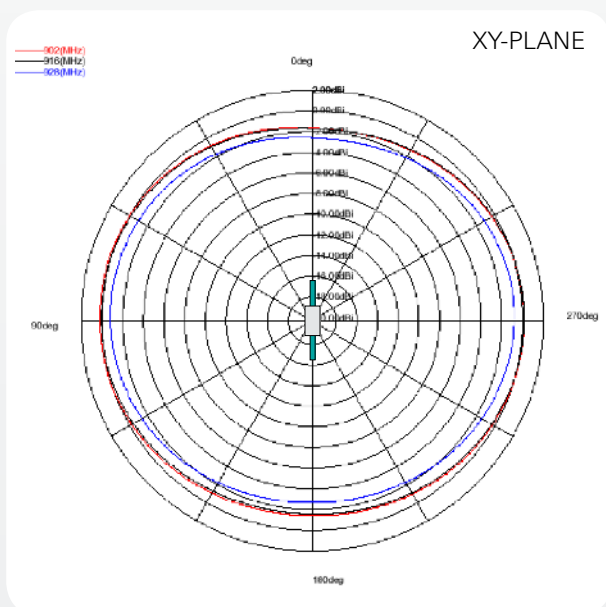
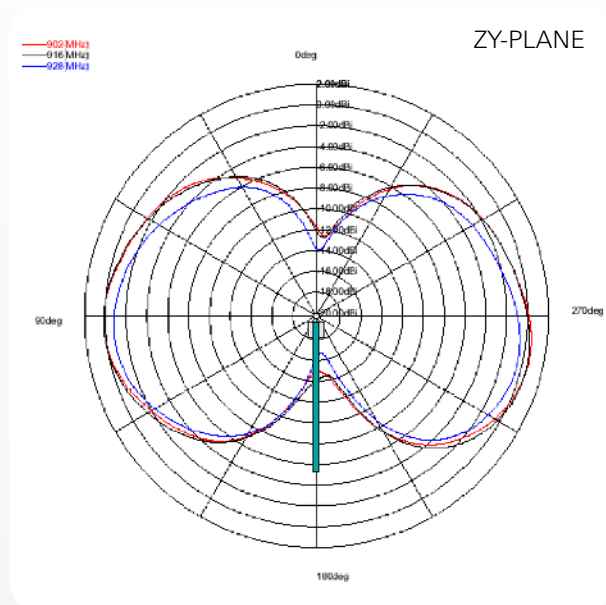
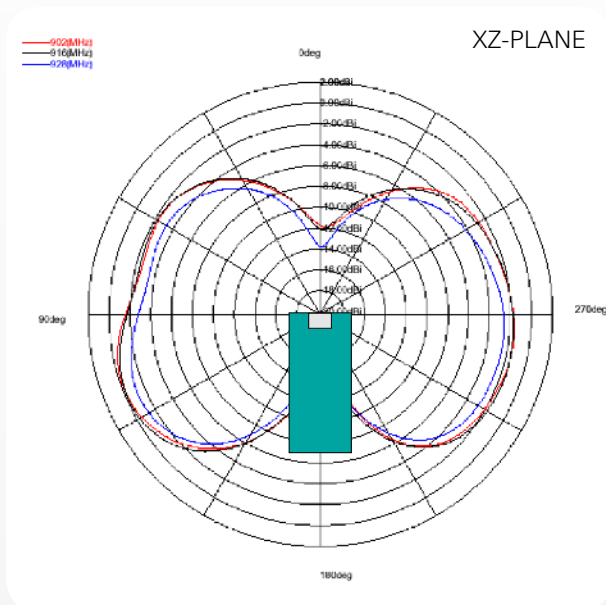


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ISM 900MHz Helical SMD-Antenna

Ground cleared under antenna, clearance area 8.00 x 40.00 mm. Pulse Part Number: W3113

Typical Free space Radiation Patterns



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 **Pulse**
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Black Optimized Yagi Antennas

The BMOY yagis have been optimized using a genetic algorithm to achieve superior performance over the entire 800/900 MHz and UHF frequency bands. These antennas feature solid 3/8" elements attached to a seamless aluminum boom with 360° welds, and are finished with a black polyester powder coating. Each antenna has a type N termination located at the end of the boom, with a fully sealed driven element for complete protection against humidity, acid rain, or salt spray. A solid aluminum mounting bracket allows for either vertical or horizontal polarization. The BMOY's sturdy construction and advanced engineering design provides outstanding durability and superior performance in all weather conditions.

Features

- Broadband performance covering all 800/900 MHz frequencies with only three models, and no tuning required. Provides optimal performance, minimizes inventory requirements, and reduces installation time.
- Single wideband model (BMOYW8063) available in a 3-element configuration, covering 806-896 MHz frequencies with no tuning required.
- 360° welds at element and boom interface provide complete protection of the antenna's internal mechanism against moisture.
- Solid aluminum mounting clamps with stainless steel hardware. Ensures a robust installation and allows the antenna to be mounted for horizontal or vertical polarization.
- End-fed type N connector. Makes connector accessible for easier installations and protects the electrical connection from moisture and other extreme weather influences.
- Fully enclosed low loss feed system. No exposed gamma match to corrode or deteriorate.
- Black polyester powder-coated finish. Provides an added layer of protection, maximizing performance and durability under the toughest weather conditions.
- No tuning required. Allows faster, more reliable installations (UHF models).

MAXRAD

Technical Data

| |
|--|
| Maximum Power: 150 watts |
| Nominal Impedance: 50 ohms |
| Radiator Material: 3/8" solid 6061-T6 aluminum |
| Lightning Protection: DC grounded |
| Wind Survival: 200 mph with no ice. It will survive up to 110 mph with 0.5" radial ice build-up. |
| Termination: N female |
| Maximum Mounting Pipe Diameter: 1.9" OD (with MYK17 factory supplied mount) 2.68" OD (with MYK14 optional heavy duty mount) |
| Mounting Method: MYK17 mast mount bracket (included) MYK14 heavy duty mast mount is also available |

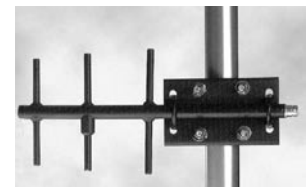
For detailed specifications, visit <http://antenna.pctel.com>.



The BMOY UHF models are available in 3 element and 5 element versions. Each version includes models covering 406-440 MHz, 430-460 MHz, and 440-480 MHz. The line also includes a 5 element model covering 470-512 MHz.



BMOY8905



BMOY8903



End fed connector facilitates installation



360° welded elements and black powder coating provide maximum durability

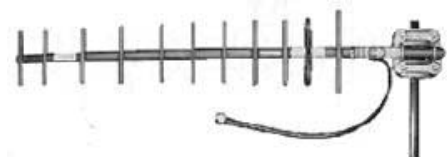
Yagi Base Station Antennas

Antenna Electrical Specifications

| Model | Frequency Range | Gain | Bandwidth @ 1.5:1 VSWR | Horizontal Beamwidth @ 1/2 Power | Vertical Beamwidth @ 1/2 Power | Front-to-Back Ratio |
|----------|-----------------|---------|------------------------|----------------------------------|--------------------------------|---------------------|
| BMOY4065 | 406-440 MHz | 9.0 dBd | 34 MHz | 52° | 45° | > 15 dB |
| BMOY4063 | 406-440 MHz | 6.5 dBd | 34 MHz | 71° | 62° | > 15 dB |
| BMOY4405 | 440-480 MHz | 9.0 dBd | 40 MHz | 52° | 45° | > 15 dB |
| BMOY4403 | 440-480 MHz | 6.5 dBd | 40 MHz | 71° | 62° | > 15 dB |
| BMOY4705 | 470-512 MHz | 9.0 dBd | 42 MHz | 52° | 45° | > 15 dB |
| BMOY8065 | 806-869 MHz | 9.0 dBd | 60 MHz | 52° | 45° | 15 dB |
| BMOY8905 | 890-960 MHz | 9.0 dBd | 70 MHz | 52° | 45° | 15 dB |
| BMOY8903 | 890-960 MHz | 6.4 dBd | 70 MHz | 100° | 54° | 20 dB |

Mechanical Specifications

| Model | Weight (Mass) | Elements | Bending Moment @ 125 mph Wind | Lateral Thrust @ 125 mph Wind | Equivalent Flat Plate Area | Boom Length | Boom Diameter |
|----------|---------------|----------|-------------------------------|-------------------------------|----------------------------|-------------|---------------|
| BMOY4065 | 2 lbs | 5 | 32.4 ft-lbs | 24.2 lbs | .31 ft ² | 34" | .75" |
| BMOY4063 | 1.2 lbs | 3 | 12.7 ft-lbs | 14.8 lbs | .19 ft ² | 22" | .75" |
| BMOY4405 | 2 lbs | 5 | 32.4 ft-lbs | 24.2 lbs | .31 ft ² | 34" | .75" |
| BMOY4403 | 1.2 lbs | 3 | 12.7 ft-lbs | 14.8 lbs | .19 ft ² | 22" | .75" |
| BMOY4705 | 2 lbs | 5 | 32.4 ft-lbs | 24.2 lbs | .31 ft ² | 34" | .75" |
| BMOY8065 | 0.9 lbs | 5 | 9.5 ft-lbs | 12.6 lbs | .16 ft ² | 20.5" | .75" |
| BMOY8905 | 0.9 lbs | 5 | 9.5 ft-lbs | 12.6 lbs | .16 ft ² | 20.5" | .75" |
| BMOY8903 | 0.7 lbs | 3 | 3.9 ft-lbs | 7.9 lbs | .10 ft ² | 14" | .75" |



BMYD890M antenna
(top) with BWC1001
mount (left)

Bluewave Yagi Antennas, 890-960 MHz, 12 dBd Gain

The BMYD890M series has been engineered to meet the requirements of a high gain, broadband, premium quality antenna. This antenna has 12 dBd gain and operates in the 890-960 MHz range. The BMYD890M is manufactured using high strength 6061-T6 aluminum to withstand heavy ice, high wind and other harsh conditions. All elements are welded to the boom and the dipole design has an integral feed line welded to the boom for extra strength and electrical conductivity. This eliminates misalignment or fastener problems. The entire antenna is anodized for appearance and corrosion resistance. A heavy duty clamp is supplied which easily permits horizontal or vertical polarization.

Features

- Elements and boom are manufactured from aircraft quality 6061-T6 aluminum for optimum strength
- Antenna is anodized for corrosion resistance
- Antenna is supplied with a 2' pigtail (RG213) and N female connector.



Technical Data

| |
|--|
| Maximum Power: 200 watts |
| Nominal Impedance: 50 ohms |
| Radiator Material: Aluminum 6061-T6 |
| Mounting Method: Includes mounting hardware BWC1001 |

Antenna Electrical Specifications

| Model | Frequency Range | -3 dB Horizontal Beamwidth | -3 dB Vertical Beamwidth | Front to Back Ratio | Nominal Gain |
|----------|-----------------|----------------------------|--------------------------|---------------------|--------------|
| BMYD890M | 890-960 MHz | 40° | 34° | 20 dB | 12 dBd |

Mechanical Specifications

| Model | Antenna Dimensions* (L x W) | Weight (Mass) | Cross Sectional Area | Lateral Thrust @ 100 mph | Rated Wind Velocity** |
|----------|-----------------------------|---------------|----------------------|--------------------------|-----------------------|
| BMYD890M | 37" x 6.6" | 2.5 lbs | 0.35 ft ² | 8.75 lbs | 125 mph |

| Model | Elements | Cable Type | Cable Length | Connector Type |
|----------|----------|------------|--------------|----------------|
| BMYD890M | 11 | RG213 | 2 ft | N female |

* Dimension does not include antenna cable

**120 mph with 1/2" radial ice (mph)

800/900 MHz MAXRAD Fiberglass Base Station (MFB) Omnidirectional Antennas

The MFB 900/800 MHz series are base matched half wave antennas encapsulated in heavy duty fiberglass radomes with a thick walled aluminum mounting base for reliable long term use. All models are DC grounded and UPS shippable.

Features

- White ultra-violet resistant pultruded fiberglass radome
- Thick walled aluminum mounting base
- Unity/3 dB/5 dB/7 dB models
- UPS shippable
- Factory tuned



Technical Data

| |
|---|
| Maximum Power: 150 watts |
| Normal Impedance: 50 ohms |
| Radome Material: 1.0" OD pultruded white fiberglass |
| Radiator Material: Coated steel wire |
| ESD Protection: DC grounded |
| Wind Survival: 100 mph |
| Termination: Unity and 3 dB models, N Female |
| Mounting Base Diameter: 1-5/16" |
| Mounting Method: Mast or wall mounted. Mounting hardware is sold separately. MMK1: light duty mast mount for antennas under 30" MMK3: light duty mast mount for antennas over 30" MMK4: heavy duty mast mount MMK9: Aluminum mast mount for 1-5/16" OD antennas MBSWM: wall mounting bracket for antennas over 30" (two are required) MMK12: heavy duty mount bracket |



MFB9155



MMK3



MMK1



MMK4



MMK9



MBSWM



MMK12

RF/Electrical Specifications

| Model | Frequency Range | Factory Tuned Frequency | Gain | Bandwidth @ 1.5:1 VSWR | Vertical Beamwidth @ 1/2 Power |
|--------------|-----------------|-------------------------|------|------------------------|--------------------------------|
| MFB8133 | 806-866 MHz | 813 MHz | 3 dB | 30 MHz | 40° |
| MFB8135 | 806-866 MHz | 813 MHz | 5 dB | 20 MHz | 22° |
| MFB8583 | 806-866 MHz | 858 MHz | 3 dB | 30 MHz | 40° |
| MFB8585 | 806-866 MHz | 858 MHz | 5 dB | 20 MHz | 22° |
| MFB8353 | 824-896 MHz | 835 MHz | 3 dB | 30 MHz | 40° |
| MFBW8903 | 890-960 MHz | N/A | 3 dB | 70 MHz | 40° |
| MFBW8905 | 890-960 MHz | N/A | 5 dB | 70 MHz | 22° |
| MFB8963 | 896-940 MHz | 898 MHz | 3 dB | 30 MHz | 40° |
| MFB8965(NF) | 896-940 MHz | 898 MHz | 5 dB | 20 MHz | 22° |
| MFB9387 | 896-940 MHz | 938 MHz | 7 dB | 20 MHz | 17° |
| MFB8967(NF) | 896-940 MHz | 898 MHz | 7 dB | 20 MHz | 17° |
| MFB9153 | 902-928 MHz | 915 MHz | 3 dB | 20 MHz | 40° |
| MFB9155(NF) | 902-928 MHz | 915 MHz | 5 dB | 20 MHz | 22° |
| MFB9155RPC | 902-928 MHz | 915 MHz | 5 dB | 20 MHz | 22° |
| MFB9157(NF)* | 902-928 MHz | 915 MHz | 7 dB | 20 MHz | 17° |

Mechanical Specifications

| Model | Height | Weight (Mass) | Bending Moment at Rated Wind | Lateral Thrust at Rated Wind | Equivalent Flat Plate Area |
|---------------|--------|---------------|------------------------------|------------------------------|----------------------------|
| MFB8133 | 26" | 1.25 lbs | 4.7 ft-lbs | 4.3 lbs | .12 sq ft |
| MFB8135* | 48" | 1.75 lbs | 14.2 ft-lbs | 8.0 lbs | .22 sq ft |
| MFB8583 | 26" | 1.25 lbs | 4.7 ft-lbs | 4.3 lbs | .12 sq ft |
| MFB8585* | 48" | 1.75 lbs | 14.2 ft-lbs | 8.0 lbs | .22 sq ft |
| MFB8353 | 26" | 1.25 lbs | 4.7 ft-lbs | 4.3 lbs | .12 sq ft |
| MFBW8903 | 23" | 1.25 lbs | 4.7 ft-lbs | 4.3 lbs | .12 sq ft |
| MFBW8905 | 48" | 1.75 lbs | 14.2 ft-lbs | 8.0 lbs | .22 sq ft |
| MFB8963 | 26" | 1.25 lbs | 4.7 ft-lbs | 4.3 lbs | .12 sq ft |
| MFB8965* | 48" | 1.75 lbs | 14.2 ft-lbs | 8.0 lbs | .22 sq ft |
| MFB9387* | 96" | 4.00 lbs | 62.5 ft-lbs | 15.8 lbs | .44 sq ft |
| MFB8967* | 96" | 4.00 lbs | 62.5 ft-lbs | 15.8 lbs | .44 sq ft |
| MFB9153 | 23.25" | 1.25 lbs | 4.7 ft-lbs | 4.3 lbs | .12 sq ft |
| MFB9155(NF)** | 48" | 1.75 lbs | 14.2 ft-lbs | 8.0 lbs | .22 sq ft |
| MFB9155RPC | 48" | 1.75 lbs | 14.2 ft-lbs | 8.0 lbs | .22 sq ft |
| MFB9157 (NF)* | 96" | 4.00 lbs | 62.5 ft-lbs | 15.8 lbs | .44 sq ft |