

Unlicensed Transmitters: Approved Antennas List

<i>Manufacturer</i>	<i>Antenna</i>	<i>Description</i>	<i>Type</i>	<i>Peak Gain (dBi)</i>	<i>Min Cable loss (dB)</i>	<i>Ω</i>	<i>Connector Type</i>	<i>Notes</i>
PCTEL, Inc.	MFB9153	Single Band	Monopole	5.15	0	50	N-Type	1, 2
Linx Technology	ANT-916-CW-QW	Single Band	Monopole	1.8	0	50	RPSMA	
Pulse Electronics, Inc.	W1063	Single Band	Dipole	1.2	0	50	RPSMA	3
World Products, Inc.	WPANT30026-S5A	Dual Band	Puck	4	0	50	RPSMA	
Laird Inc.	PC906N	Single Band	Yagi	10.65	0	50	N-Type	1,2
Linx Technology	ANT-916-CW-HW	Single Band	Dipole	1.2	0	50	RPSMA	

Notes:

- 1) Antenna will use permanent adhesive such as epoxy or permanent Loc-Tite at the N-Type connections on the N-Type to RPSMA cable assemblies
- 2) Antenna gain declared in linear terms converted to dBi using dBd + 2.15dB
- 3) Antenna gain determined by gain graph

Fiberglass Base Station Omnidirectional Antennas

ISM/LoRa/LPWAN Antennas – Base Station

MFB Series



Description

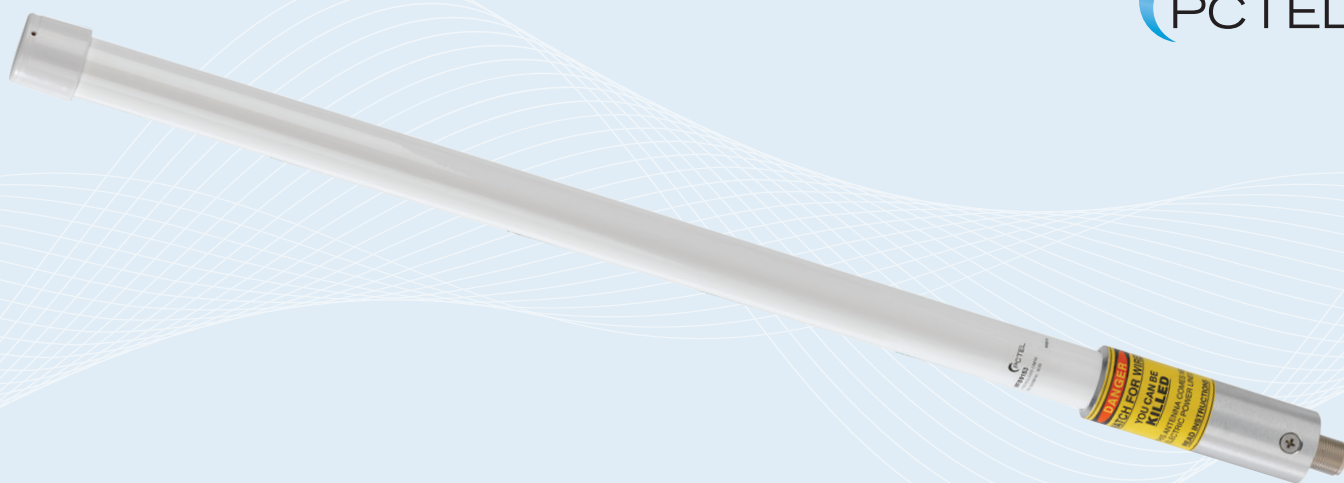
Heavy duty, base matched, half wave antennas for industrial wireless applications.

Technologies

- ISM
- LoRa
- LPWAN

Features

- Unity, 3 dB, 5 dB, 7 dB models
- Rugged, UV-resistant fiberglass housing
- Easy to install
- Withstands extreme weather conditions



Fiberglass Base Station Omnidirectional Antennas

ISM/LoRa/LPWAN Antennas – Base Station

PCTEL's 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

- Rugged – White UV-resistant pultruded fiberglass radome, thick-walled aluminum mounting base
- Multiple options – Unity, 3 dB, 5 dB, 7 dB models
- Withstands weather extremes – Temperature range -40°C to +85°C
- Installs fast – Factory tuned, DC grounded, UPS shippable

Certifications



Fiberglass Base Station Omnidirectional Antennas

ISM/LoRa/LPWAN Antennas – Base Station

Standard Configuration

Model	Cables	Connector	Mount
MFBW7463	N/A	N Female	Mast or wall mounted. Mount options for all models: (sold separately) 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
MFB8133	N/A	N Female	
MFB8583	N/A	N Female	
MFB8965NF	2 ft RG213	N Female	
MFB9153	N/A	N Female	
MFB9155(NF)*	2 ft RG213	N Male	
MFB9157(NF)*	2 ft RG213	N Male	

Electrical Specifications - RF Antenna

Model	Frequency Range	Gain	Elevation Half Power Beamwidth	Average Power	Nominal Impedance
MFBW7463	746 - 869 MHz	3 dB	40°	150 watts	50 ohms
MFB8133	806 - 866 MHz	3 dB	40°	150 watts	50 ohms
MFB8583	806 - 866 MHz	3 dB	40°	150 watts	50 ohms
MFB8965NF	896 - 940 MHz	5 dB	22°	150 watts	50 ohms
MFB9153	902 - 928 MHz	3 dB	40°	150 watts	50 ohms
MFB9155(NF)	902 - 928 MHz	5 dB	22°	150 watts	50 ohms
MFB9157(NF)	902 - 928 MHz	7 dB	17°	150 watts	50 ohms

Mechanical and Environmental Specifications

Model	Weight	Height	Bending Moment at Rated Wind	Lateral Thrust at Rated Wind	Equivalent Flat Plate Area	Rated Wind
MFBW7463	1.50 lbs (0.68 kg)	27 in (68.5 cm)	16.9 lbf	13.5 lbf-ft	.17 sq ft	125 mph
MFB8133	1.25 lbs (0.57 kg)	28 in (71.0 cm)	14.5 lbf	12.5 lbf-ft	.12 sq ft	125 mph
MFB8583	1.25 lbs (0.57 kg)	28 in (71.0 cm)	14.5 lbf	12.5 lbf-ft	.12 sq ft	125 mph
MFB8965NF	1.75 lbs (0.79 kg)	50.7 in (128.9 cm)	48.5 lbf	23.0 lbf-ft	.23 sq ft	125 mph
MFB9153	1.25 lbs (0.57 kg)	23 in (58.4 cm)	8.3 lbf	8.6 lbf-ft	.12 sq ft	125 mph
MFB9155(NF)	1.75 lbs (0.79 kg)	50.7 in (128.9 cm)	48.5 lbf	23.0 lbf-ft	.23 sq ft	125 mph
MFB9157(NF)	4.00 lbs (1.81 kg)	94.7 in (240.67 cm)	164.8	41.8 lbf-ft	.42 sq ft	125 mph

* (NF) indicates optional N Female connector.

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this product contact your
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> pctel.com/antenna-products**

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PCTEL is a leading global provider of wireless technology, including purpose-built Industrial IoT devices, antenna systems, and test and measurement solutions. Trusted by our customers for over 25 years, we solve complex wireless challenges to help organizations stay connected, transform, and grow.



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ANT-916-CW-QW

Data Sheet

Product Description

CW Series ¼-wave antennas deliver outstanding performance in a rugged and cosmetically attractive package. These antennas are available with standard SMA or FCC Part 15 compliant RP-SMA connectors. RP-SMA connectors allow for easy field replacement while complying with FCC requirements. A wide variety of matching connectors permit numerous mounting options.

Features

- Low cost
- Excellent performance
- Omni-directional pattern
- Wide bandwidth
- Very low VSWR
- Fully weatherized
- Flexible main shaft
- Rugged & damage-resistant
- SMA or Part 15 compliant RP-SMA connector
- Use with plastic* or metal enclosures

*Requires proximity ground plane

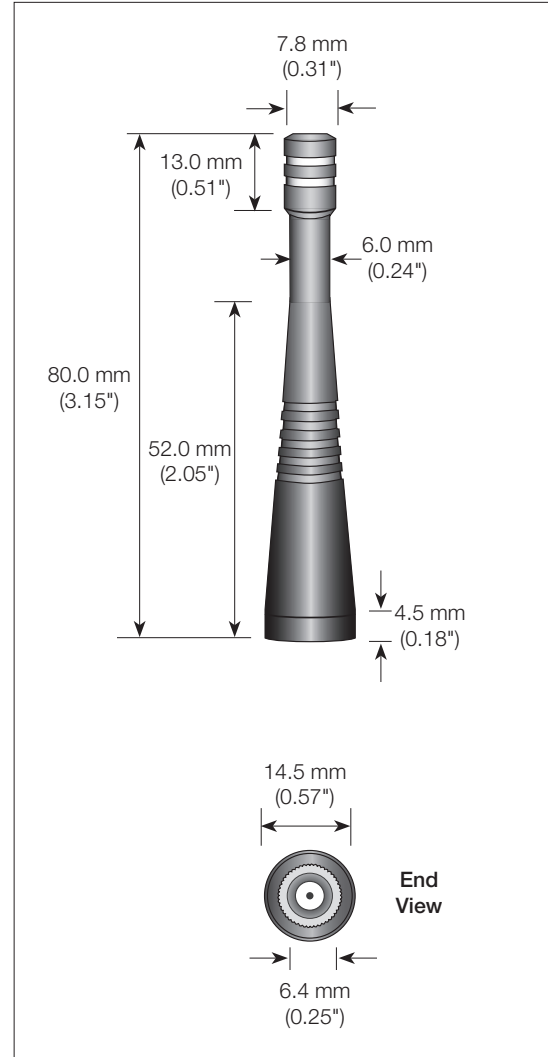
Electrical Specifications

Center Frequency:	916MHz
Recom. Freq. Range:	865–965MHz
Wavelength:	¼-wave
Peak Gain:	1.8dBi
VSWR:	<1.9 typ. at center
Impedance:	50-ohms
Connector:	RP-SMA or SMA
Oper. Temp. Range:	–40°C to +90°C

Electrical specifications and plots measured on 10.16 cm x 10.16 cm (4.00" x 4.00") reference ground plane

Ordering Information

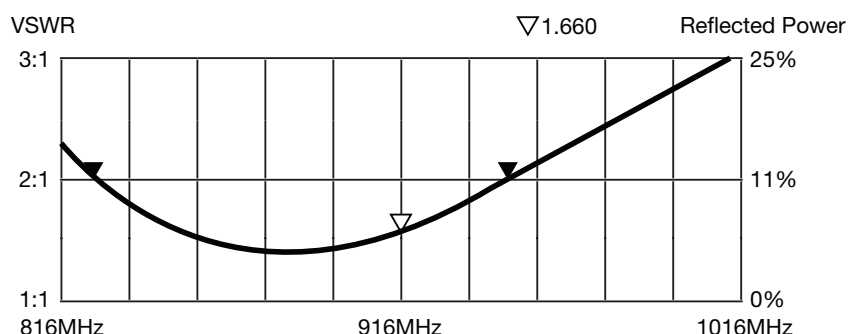
ANT-916-CW-QW (with RP-SMA connector)
ANT-916-CW-QW-SMA (with SMA connector)



Counterpoise

Quarter-wave or monopole antennas require an associated ground plane counterpoise for proper operation. The size and location of the ground plate relative to the antenna will affect the overall performance of the antenna in the final design. When used in conjunction with a ground plane smaller than that used to tune the antenna, the center frequency typically will shift higher in frequency and the bandwidth will decrease. The proximity of other circuit elements and packaging near the antenna will also affect the final performance. For further discussion and guidance on the importance of the ground plane counterpoise, please refer to Linx Application Note AN-00501: Understanding Antenna Specifications and Operation.

VSWR Graph



What is VSWR?

The Voltage Standing Wave Ratio (VSWR) is a measurement of how well an antenna is matched to a source impedance, typically 50-ohms. It is calculated by measuring the voltage wave that is headed toward the load versus the voltage wave that is reflected back from the load. A perfect match will have a VSWR of 1:1. The higher the first number, the worse the match, and the more inefficient the system. Since a perfect match cannot ever be obtained, some benchmark for performance needs to be set. In the case of antenna VSWR, this is usually 2:1. At this point, 88.9% of the energy sent to the antenna by the transmitter is radiated into free space and 11.1% is either reflected back into the source or lost as heat on the structure of the antenna. In the other direction, 88.9% of the energy recovered by the antenna is transferred into the receiver. As a side note, since the “:1” is always implied, many data sheets will remove it and just display the first number.

How to Read a VSWR Graph

VSWR is usually displayed graphically versus frequency. The lowest point on the graph is the antenna's operational center frequency. In most cases, this will be different than the designed center frequency due to fabrication tolerances. The VSWR at that point denotes how close to 50-ohms the antenna gets. Linx specifies the recommended bandwidth as the range where the typical antenna VSWR is less than 2:1.

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04/23 Original



Features:

- Frequency 868-928MHz
- Gain 1dBi
- Efficiency 70%
- Length 195mm straight
- Connectors:
 - W1063 RP-SMA Male
 - W1063M SMA Male
- RoHS Compliant

Applications:

- Indoor use
- 868MHz and 915MHz ISM band radios
- IoT devices
- Security
- Sensors
- Monitoring

All dimensions are in mm

Issue: 1837

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Suzhou New District
Jiangsu Province, Suzhou 215009 PR China
Tel: 86 512 6807 9998



Series: Stick Antenna

Description: 868-928MHz Swivel Type
dipole antenna

PART NUMBER: W1063/ W1063M

ELECTRICAL SPECIFICATIONS

Frequency	863-928 MHz
Nominal Impedance	50 Ω
VSWR	2 Maximum
Radiation Pattern	Omni
Gain	1 dBi
Efficiency	70 %
Polarization	Linear
Power Withstanding	1 W

MECHANICAL SPECIFICATIONS

Overall Length	195+/-2 mm
Weight	23.5 g
Antenna Color / Material	Black
Connector type	W1063 RP SMA Male W1063M SMA Male
IP Rating	IP20, Indoor use

ENVIRONMENTAL SPECIFICATIONS

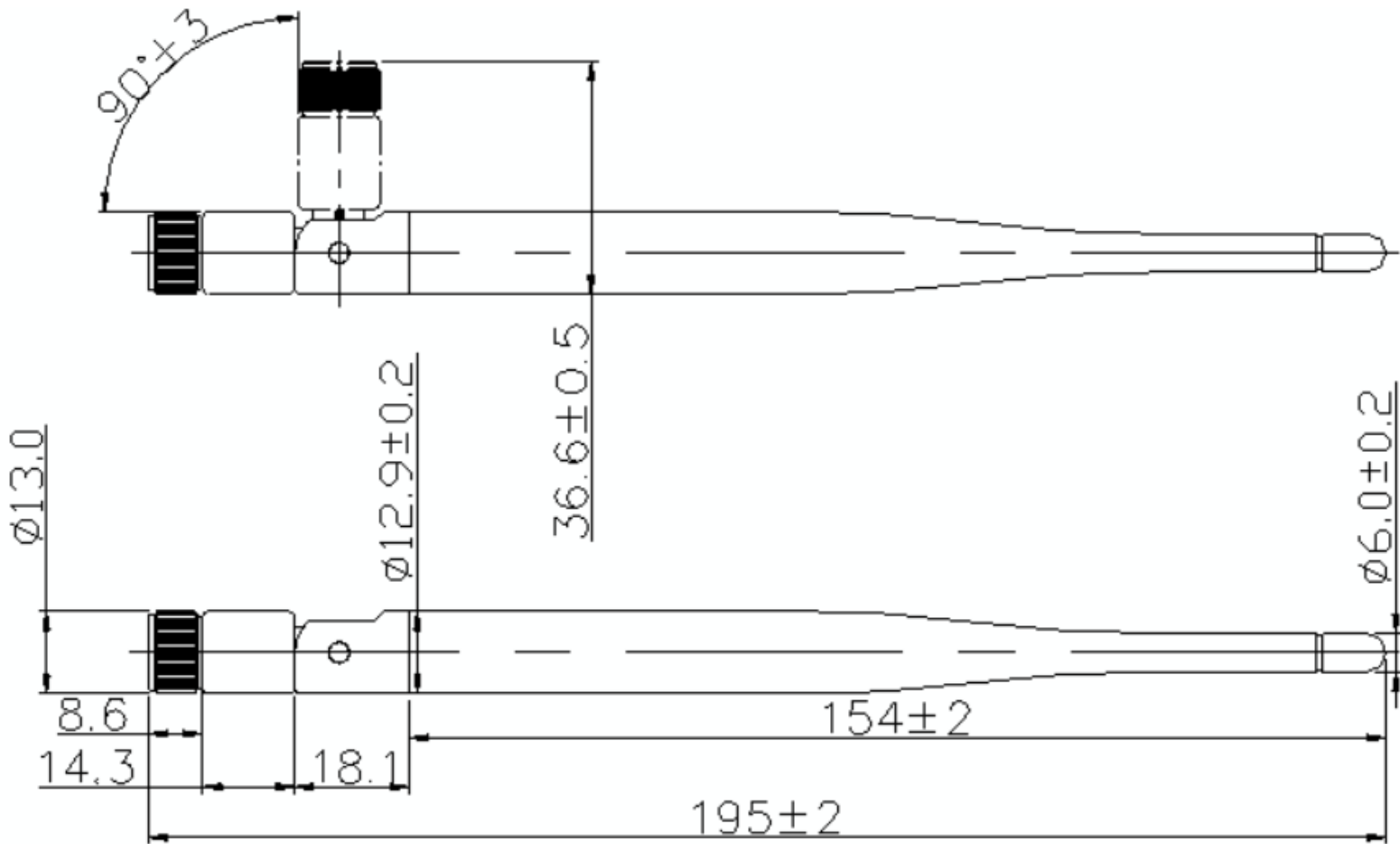
Operating Temperature	-20 °C /+65 ° C
Storage Temperature	-30 °C /+75 ° C

Series: Stick Antenna

Description: 868-928MHz Swivel Type
dipole antenna

PART NUMBER: W1063/ W1063M

MECHANICAL DRAWING



All dimensions are in mm

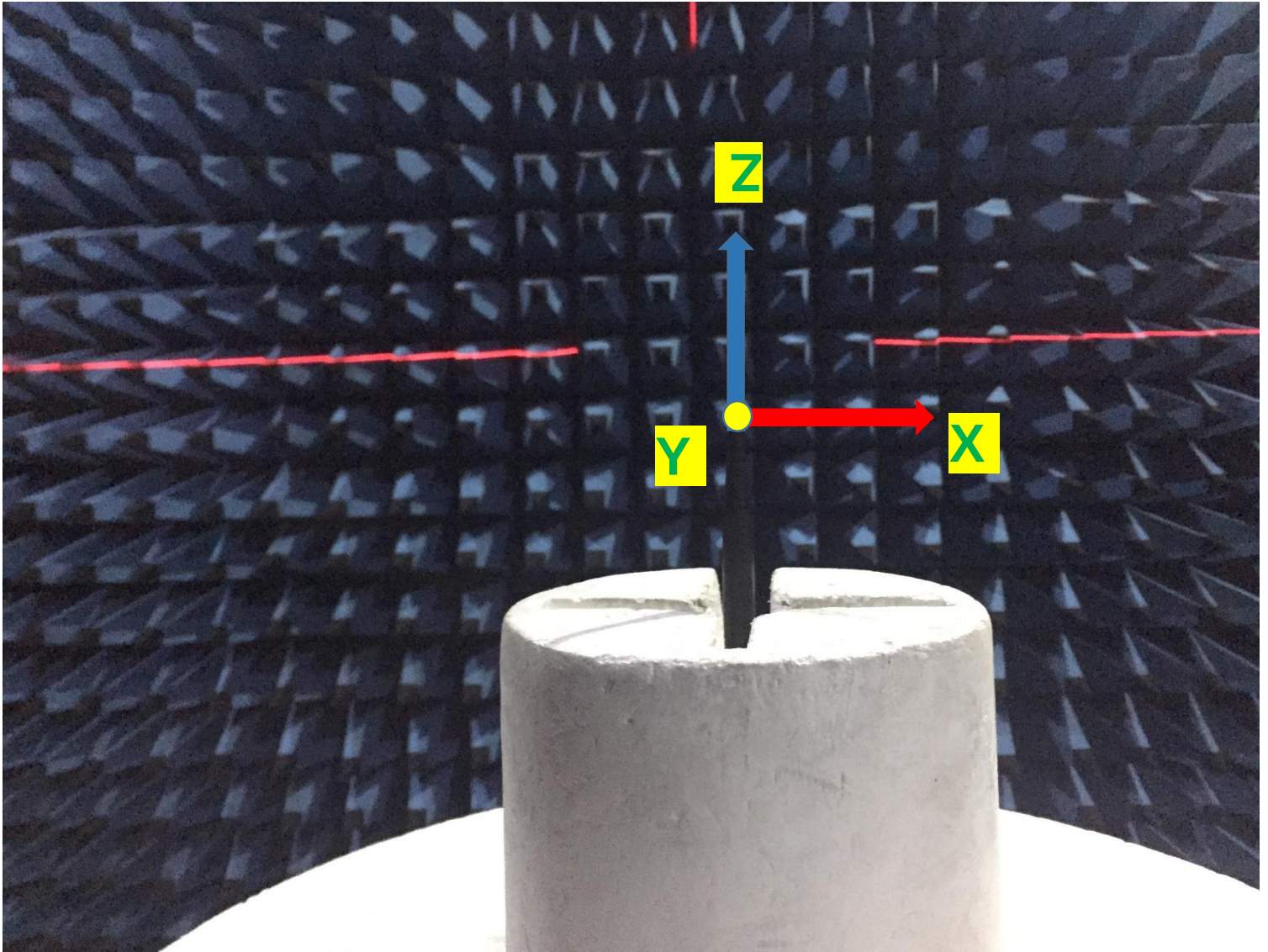
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TEST SETUP



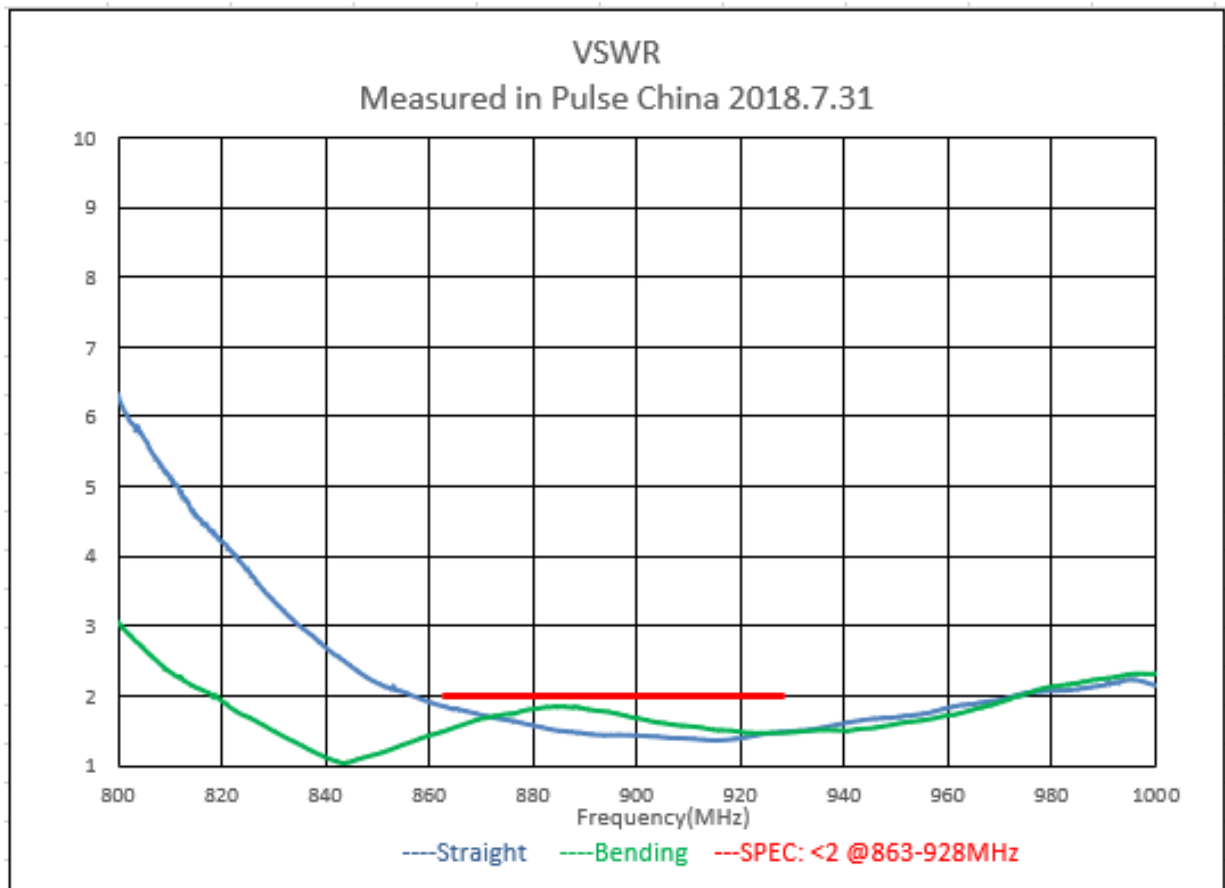
Series: Stick Antenna

Description: 868-928MHz Swivel Type dipole antenna

PART NUMBER: W1063/ W1063M

CHARTS

VSWR



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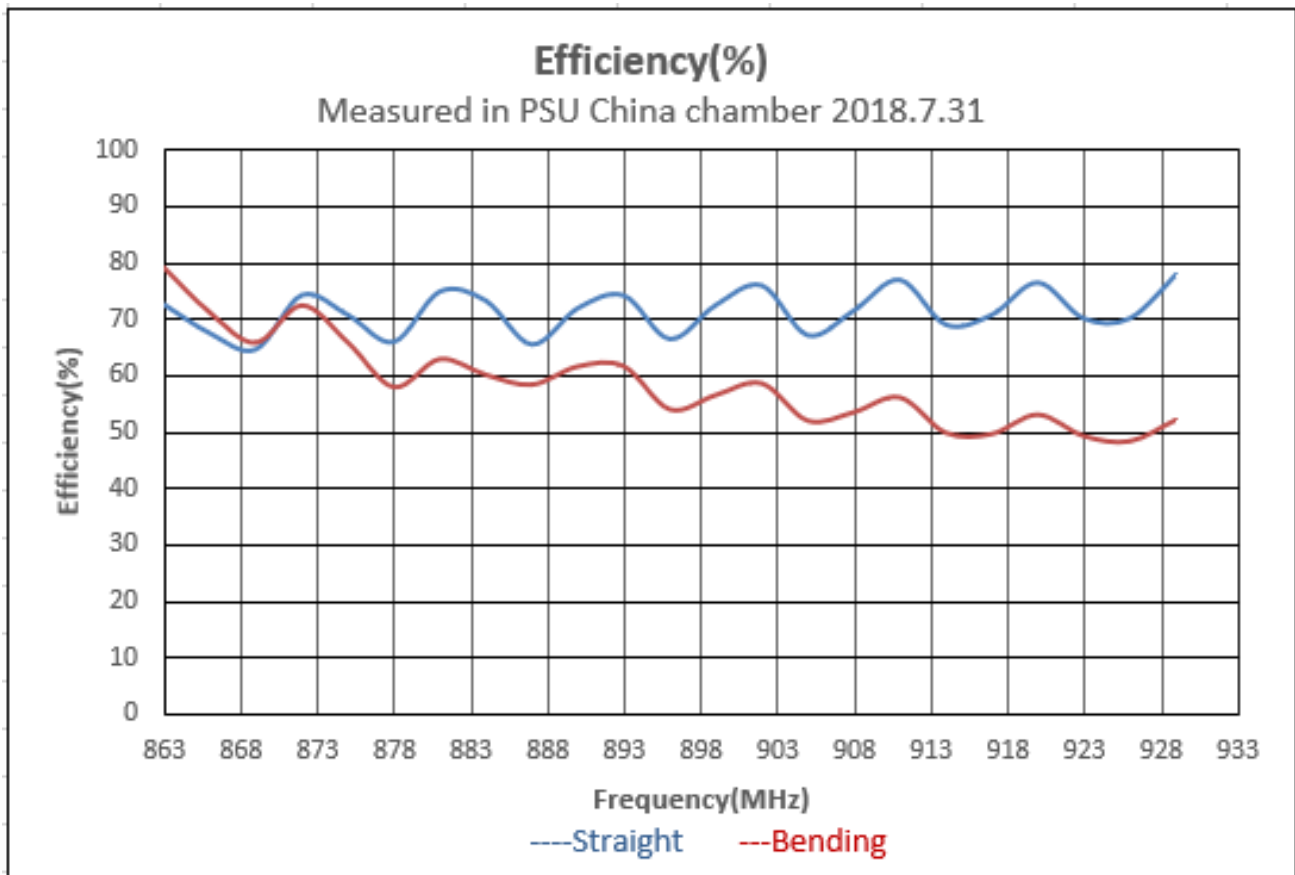
Series: Stick Antenna

Description: 868-928MHz Swivel Type dipole antenna

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CHARTS

Efficiency(%)



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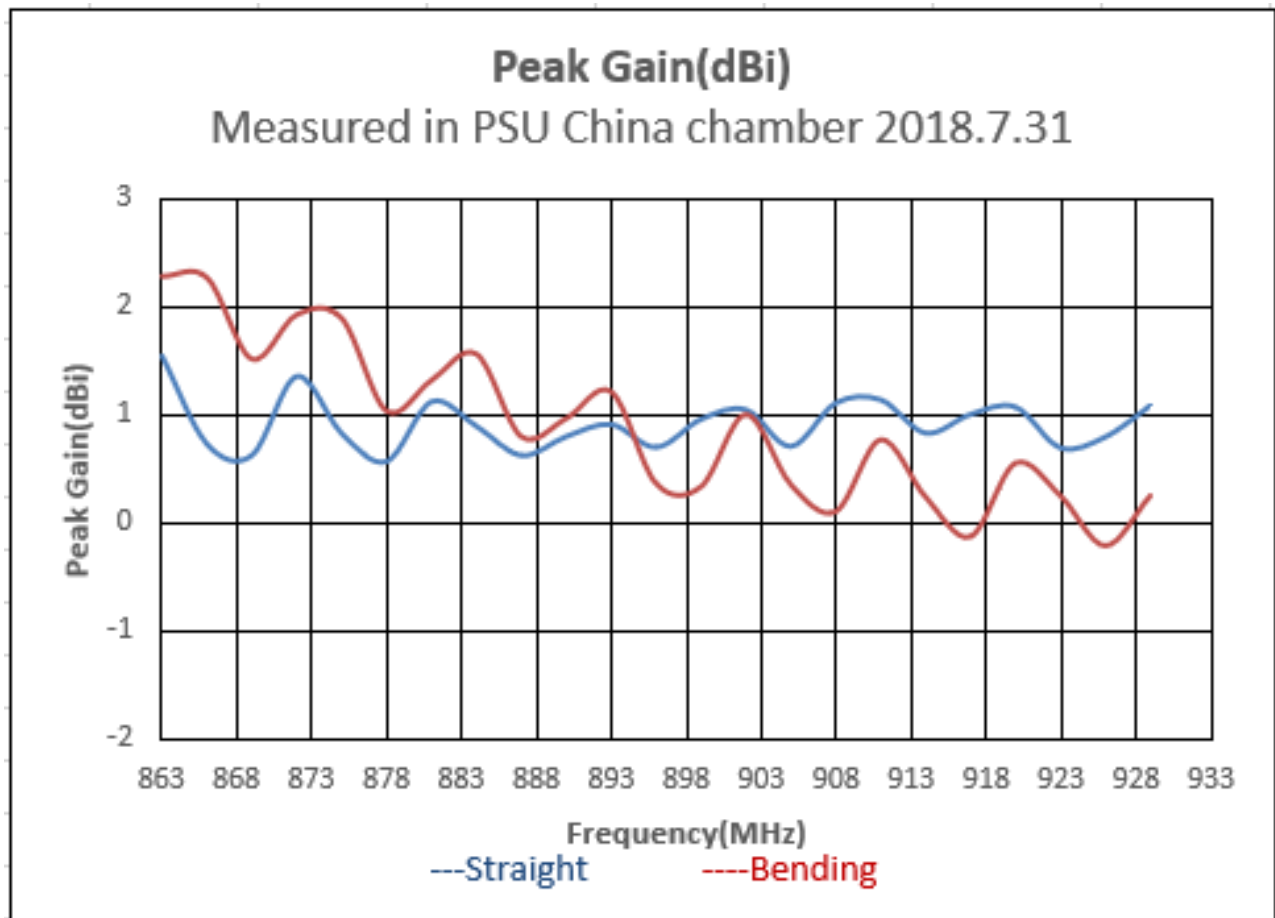
Series: Stick Antenna

Description: 868-928MHz Swivel Type dipole antenna

PART NUMBER: W1063/ W1063M

CHARTS

Peak Gain (dBi)



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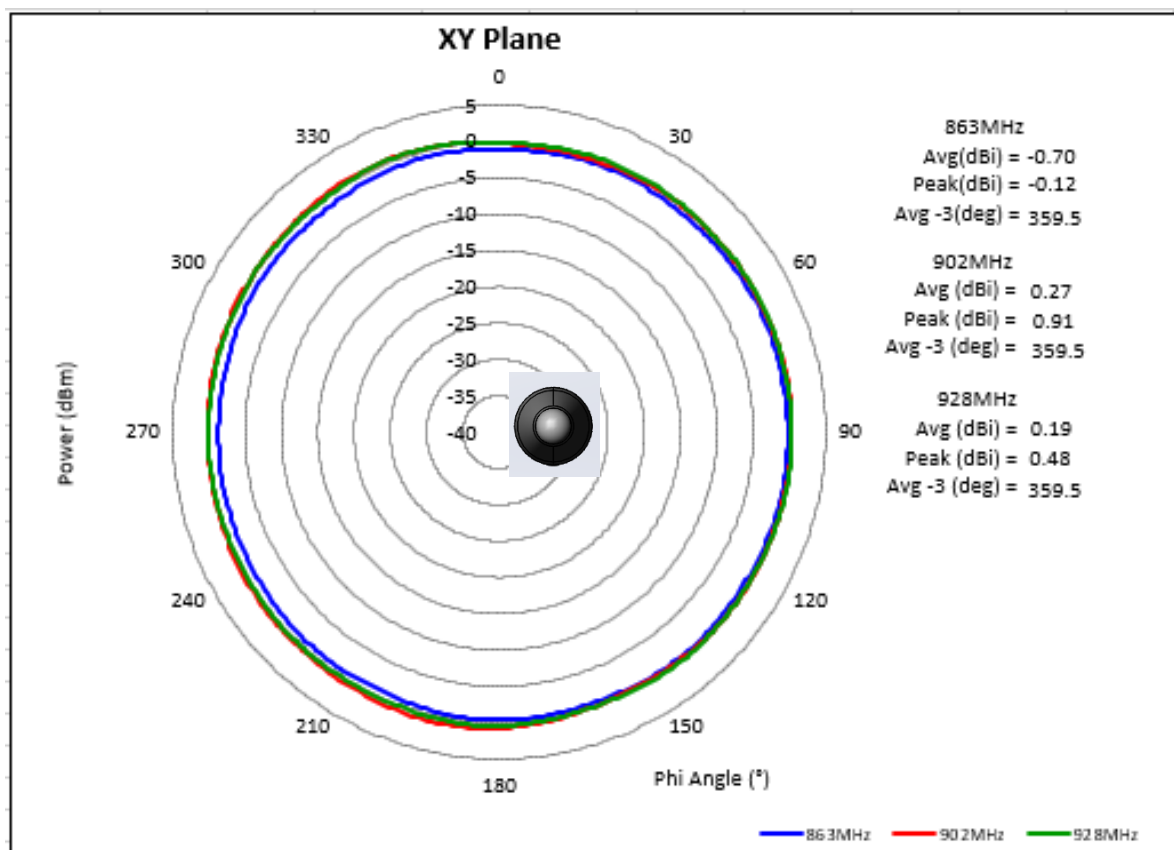
Series: Stick Antenna

Description: 868-928MHz Swivel Type dipole antenna

PART NUMBER: W1063/ W1063M

CHARTS

Free space radiation pattern



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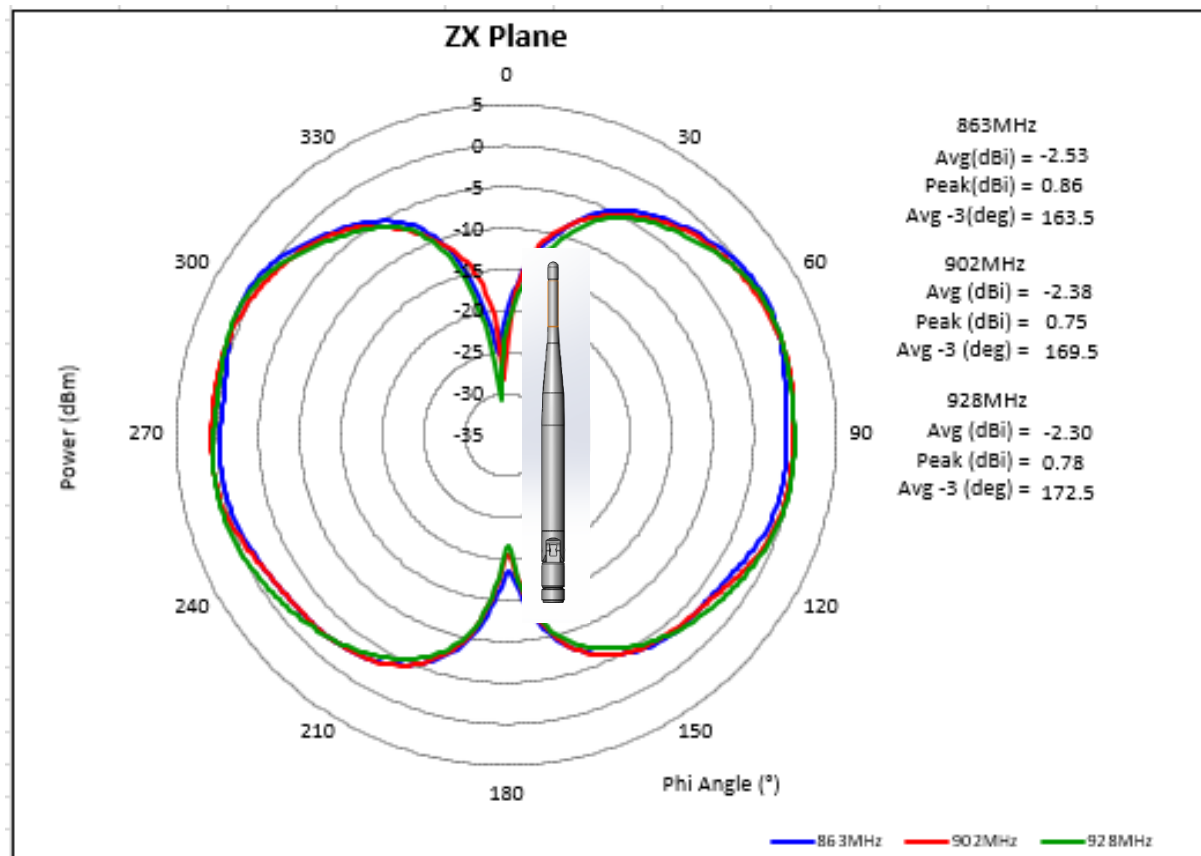
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CHARTS

Free space radiation pattern



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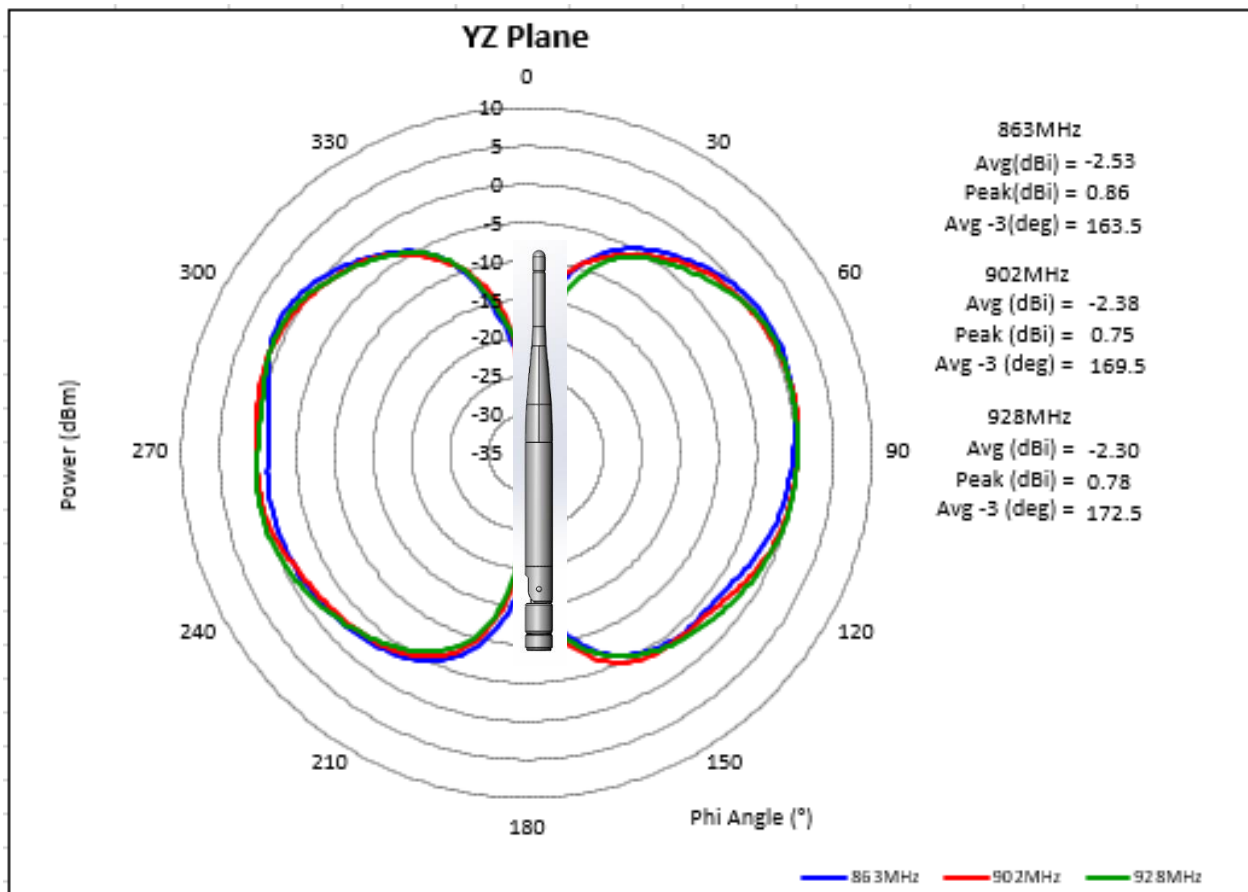
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CHARTS

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Series: Stick Antenna

Description: 868-928MHz Swivel Type
dipole antenna

PART NUMBER: W1063/ W1063M

PACKAGING

1PCS/PE BAG

250PCS/ carton box

Carton box dimensions (MM): 460x235x140

Mouser Electronics

Authorized Distributor

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Pulse:

W1063

Picture of the Part



Application

The WPANT30026-SE antenna is a high performance Omni directional, body mount Industrial grade antenna that operates at both 915 MHz and 2.4 GHz Bands. It can be configured with different Cable / Connector styles & lengths. This antenna works well on any mounting surface, metal or non-metal. The antenna is at DC ground to ensure protection against lightning.

WP Wireless can assist your engineers to optimize mounting positions for these antennas in your specific application and can further assist to trouble shoot system integration issues such as TRP/TIS and FCC requirements. WP Wireless specializes in developing customized Antenna solutions. Please contact sales@wp-wireless.com with your specific application requirements.

Electrical Properties

Parameter	Antenna Performance	
Operating Frequency	902 – 928 MHz	2.4 – 2.5 GHz
Recommended Impedance of the customer Radio Module[Ω]	50Ω	50Ω
VSWR – Typical*	<2:1	<3:1
Peak Gain [dBi] (Typical)*	3 – 4 dBi	2.5 – 3.5 dBi
Efficiency [%] (Typical)*	80%	65%
Polarization	Linear	Linear
Pattern	Omni Directional	Omni Directional
Accepted Power [W] (Max)	2 Watts	2 Watts
Lightning Protection	DC ground	

*Note: These performance metrics were recorded with the antenna placed on top of a WP Test Fixture (Metal plate / metal box), which was developed keeping customer's application in perspective.

Mechanical / Environmental Properties

Item	Value
Antenna Height	1.32"
Antenna Base	5.5" Diameter
Antenna Color	Cool Grey (The prototype shown below is similar in color. Customer may provide specific color)
Cable	1 meter long RG58 (Black)
Connector	Right Angle SMA Male
Plastic Screw	M14x2.00 Hex Nut (Nylon material) 22.23mm Width
Antenna Plastic Radome	PC+ABS
Operating / Storage Temperature	-40°C to +90°C
Hazardous Materials	RoHS compliant

Pictures of the Antenna



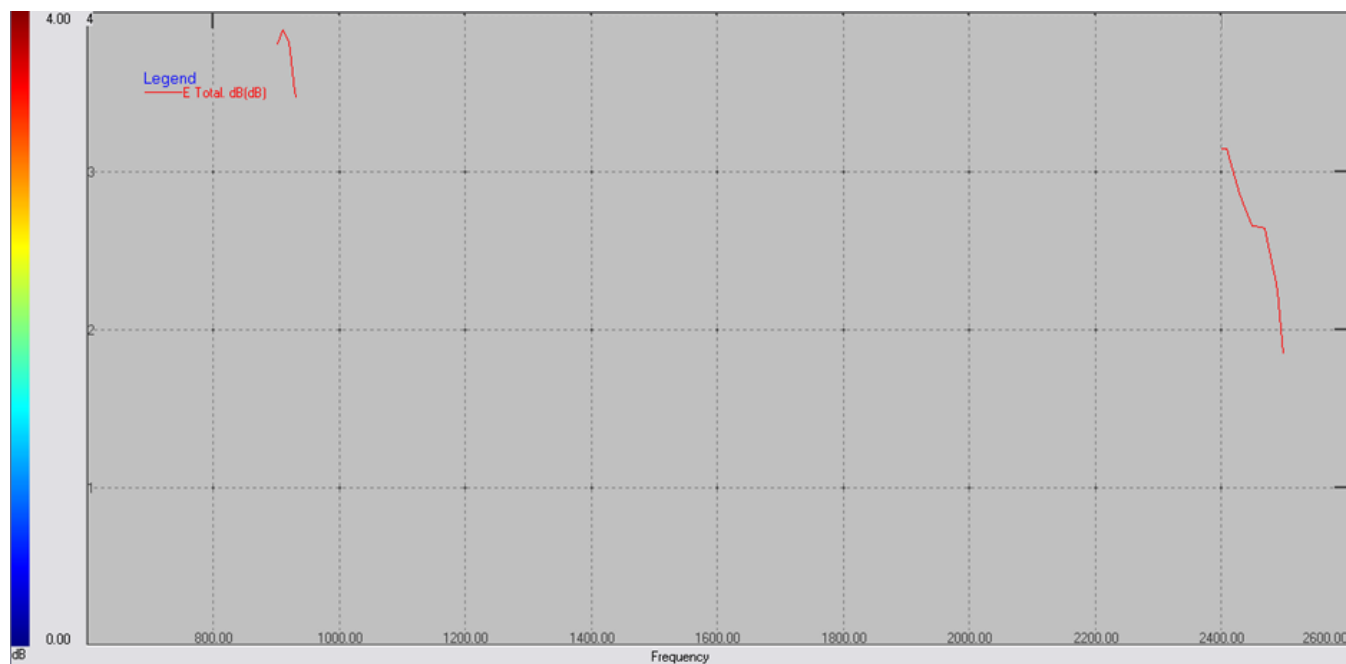


VSWR of the Antenna



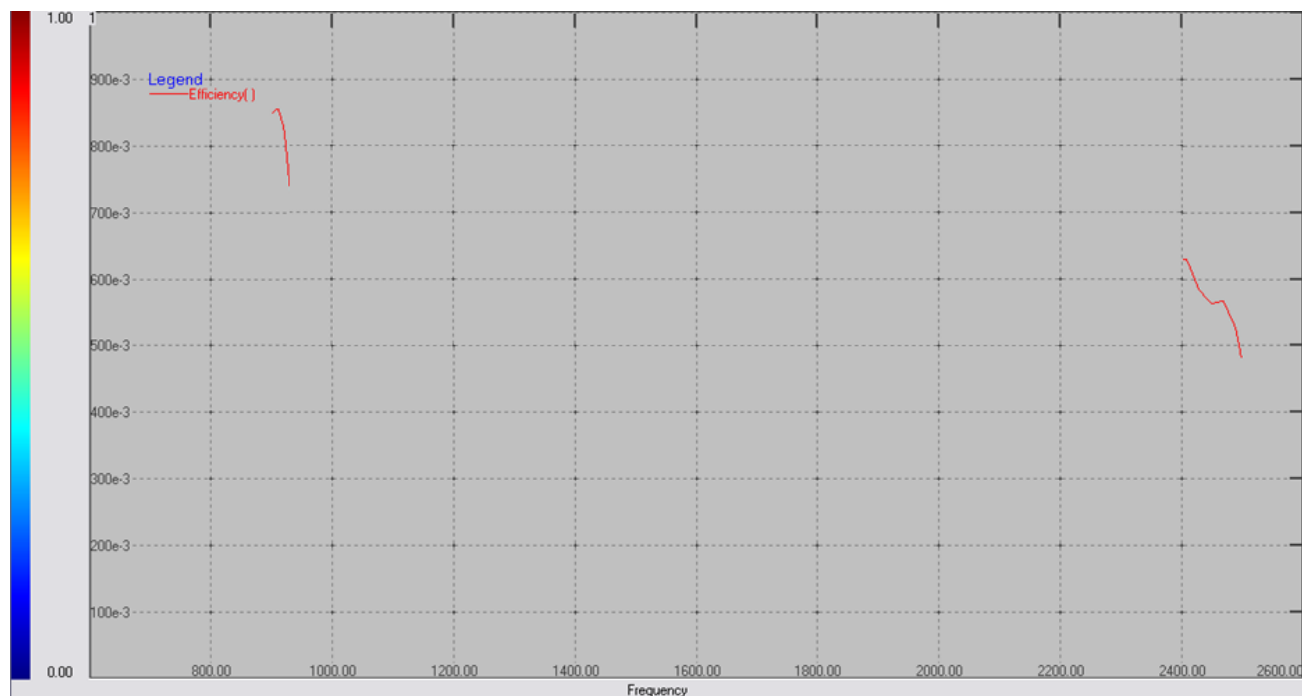


Peak Gain in dBi

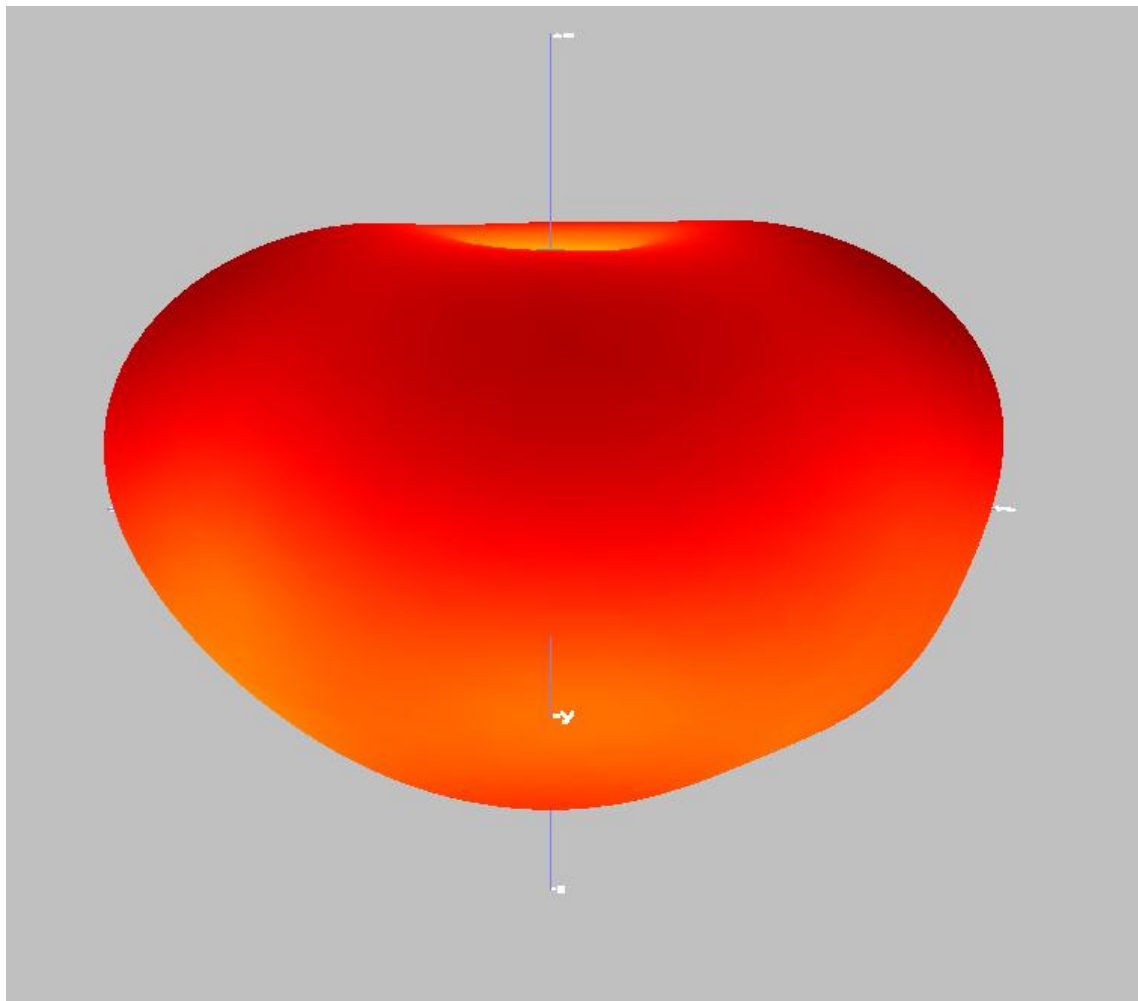




Antenna Total Radiation Efficiency in % (including VSWR losses)



3D Radiation Pattern (Antenna installed on top of a metal plate)





YAGI ANTENNAS

800/900 MHz

For 800 MHz ESMR and SMR or conventional applications, choose the 4-element PC804N, 6-element PC806N, or 10-element PC8010N. The Laird Connectivity PC804N, PC826N, and PC8210N are also available in the 900 MHz GSM frequency band.

FEATURES AND BENEFITS

- All-welded unit construction
- No adjustments ever needed
- Waterproof design
- Stainless steel hardware
- Pigtail mounted N-female connector

APPLICATIONS

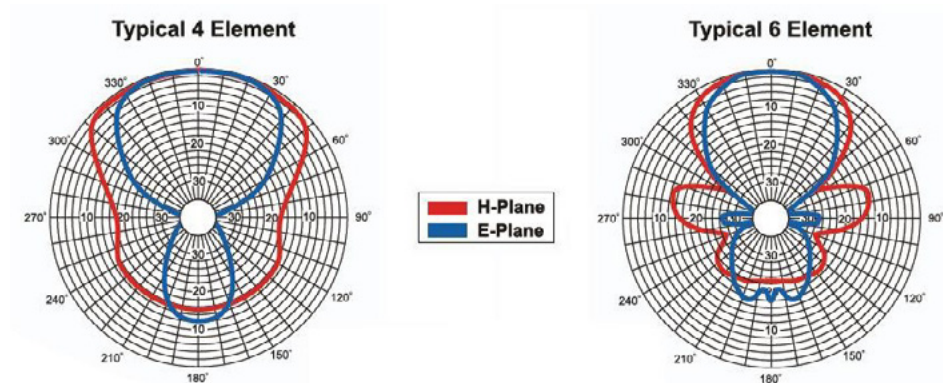
- LoRa/ISM
- Public Safety
- Utilities/Smart Grid
- Smart Cities

COMMON SPECIFICATIONS

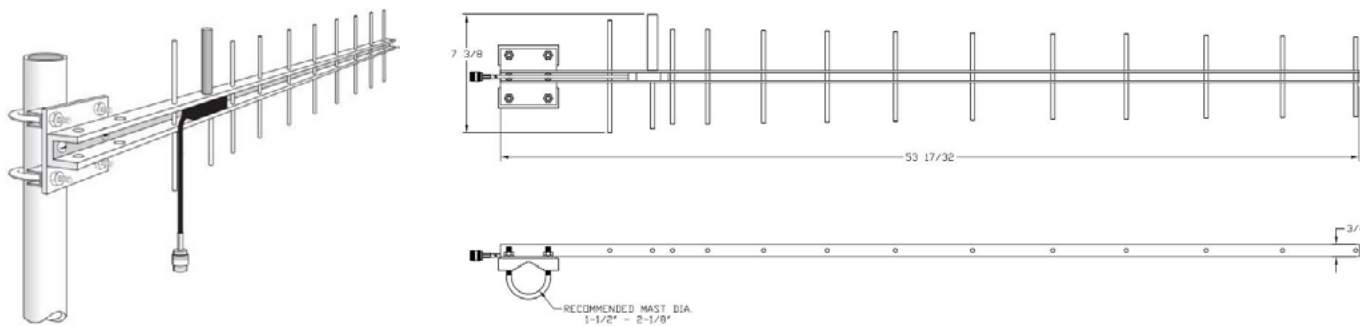
Power Handling (W)	200
Elements	6061T6 aluminum rod: 0.63 cm (1/4 in.)
Boom	6061T6 aluminum channel: 1.9 cm (3/4 in.)
Mounting Style	U-bolt
Mounting Size	Maximum mast diameter: 5.4 cm (2-1/8 in.) Pigtail: 48.3 cm (19.0 in.)
Connectivity Type	N-female
Wind Survival - kph (mph)	200 (125)
Wind Survival - ½" ice - kph (mph)	161 (100)

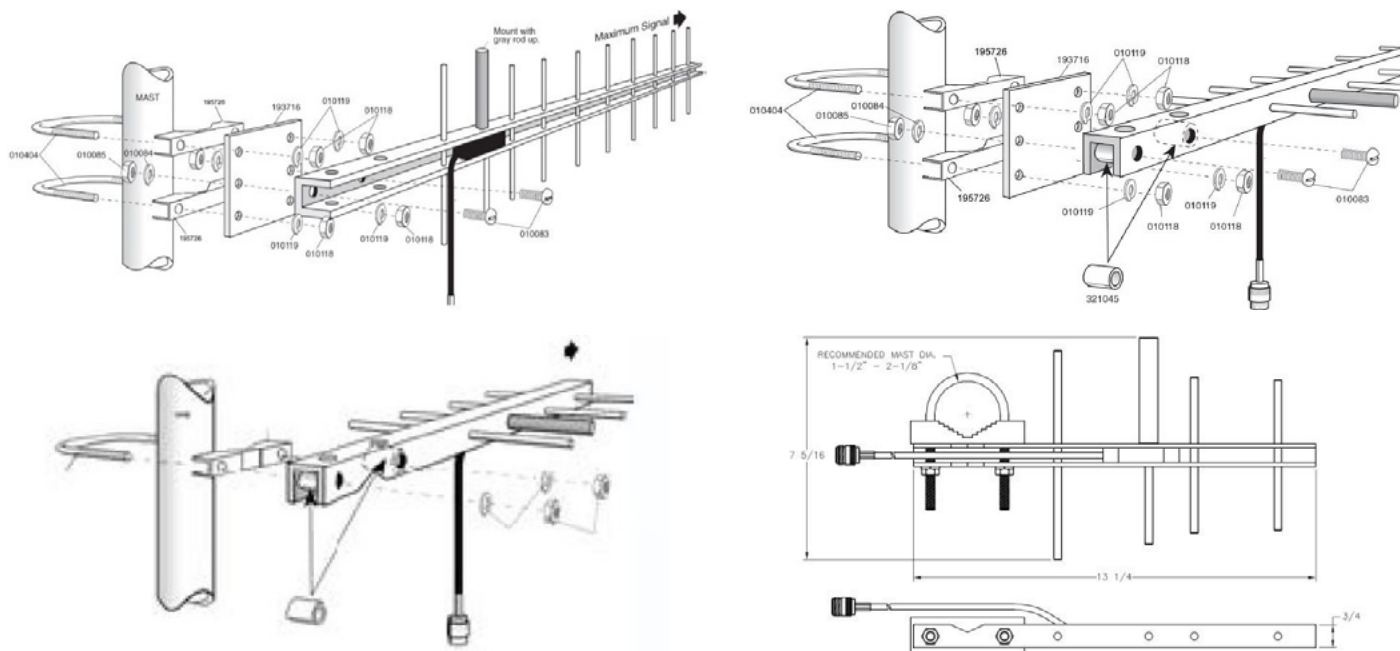
MODEL	FREQ. (MHz)	GAIN (dBd)	NO. OF ELEMENTS	FRONT- TO- BACK RATIO (dB)	-3 dB BEAMWIDTH		WIND SURFACE AREA m ² (ft ²)	LENGTH cm (in.)	WEIGHT lb (kg.)
					E-PLANE	H-PLANE			
PC9013N	902-928	13	13	20	35°	40°	0.043 (0.46)	135.9 (53-1/2)	1.40 (3.12)
PC9010N	928-960	12	10	20	40°	45°	0.035 (0.38)	105.2 (41-7/16)	1.04 (2.31)
PC904N	896-980	6	4	15	70°	100°	0.01 (0.11)	33 (13)	0.50 (1.12)
PC906N	896-940	8.5	6	18	55°	65°	0.024 (0.26)	62.9 (24-3/4)	0.73 (1.62)
PC8910N	896-940	11	10	20	40°	45°	0.035 (0.38)	105.2 (41-7/16)	1.04 (2.31)
PC8010N	806-869	11	10	20	40°	45°	0.035 (0.38)	116.8 (46)	1.10 (2.44)
PC804N	806-902	6	4	15	70°	90°	0.01 (0.11)	33 (13)	0.50 (1.12)
PC806N	806-866	8.5	6	18	55°	65°	0.024 (0.26)	62.9 (24-3/4)	0.76 (1.69)

RADIATION PATTERN



MECHANICAL DRAWINGS





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08/22 Original

ANT-916-CW-HW

Data Sheet

Product Description

HW Series ½-wave center-fed dipole antennas deliver outstanding performance in a rugged and cosmetically attractive package. The antenna contains a helical element and internal counterpoise which eliminates external ground plane dependence and maximizes performance. HW Series antennas attach via a standard SMA or Part 15 compliant RP-SMA connector. Custom colors and connectors are available for volume OEM customers.

Features

- Low cost
- Internal counterpoise
- Bandwidth covers entire ISM 900MHz band
- Excellent performance
- Omni-directional pattern
- Outstanding VSWR
- Rugged & damage-resistant
- Standard SMA or Part 15 compliant RP-SMA connector
- Internal O-ring seal on connector

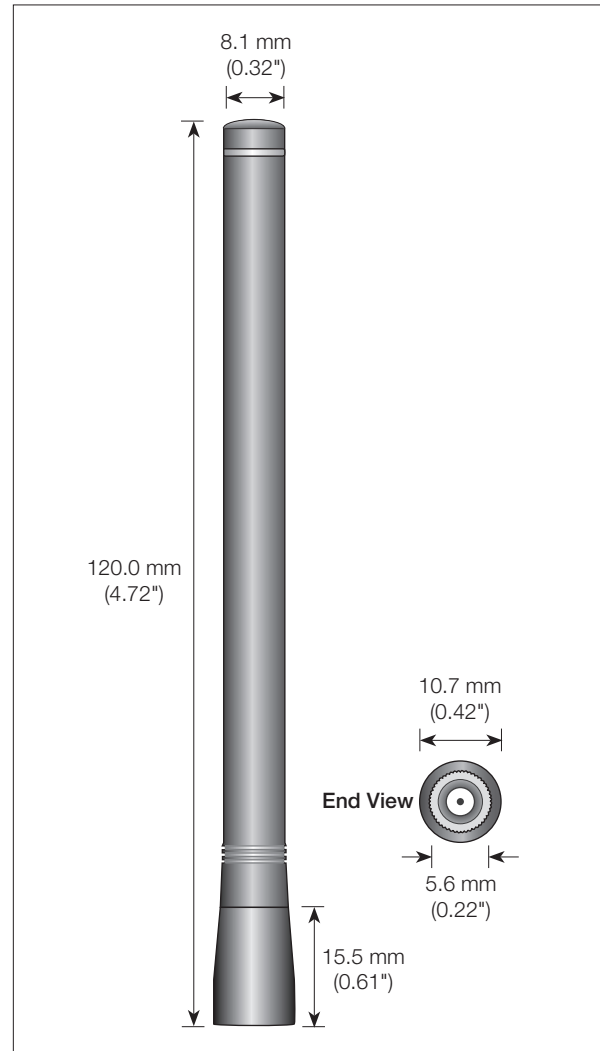
Electrical Specifications

Center Frequency:	916MHz
Recmd. Freq. Range:	900–930MHz
Wavelength:	½-wave
VSWR:	≤ 2.0 typical at center
Peak Gain:	1.2dBi
Impedance:	50-ohms
Connection:	SMA or RP-SMA
Oper. Temp. Range:	–20°C to +85°C

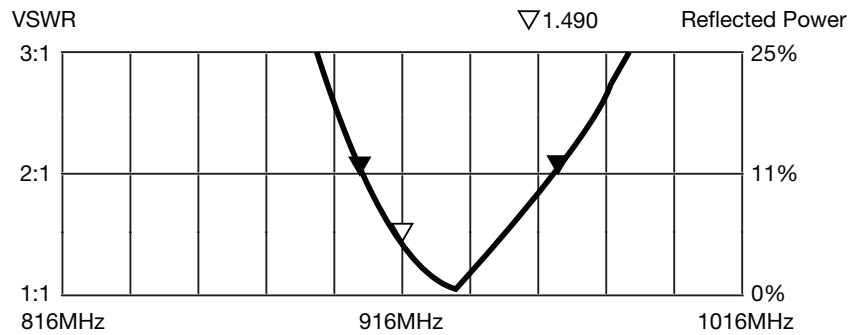
Electrical specifications and plots measured with a 10.16 cm x 10.16 cm (4.00" x 4.00") reference ground plane.

Ordering Information

ANT-916-CW-HW (with RP-SMA connector)
ANT-916-CW-HW-SMA (with SMA connector)



VSWR Graph



What is VSWR?

The Voltage Standing Wave Ratio (VSWR) is a measurement of how well an antenna is matched to a source impedance, typically 50-ohms. It is calculated by measuring the voltage wave that is headed toward the load versus the voltage wave that is reflected back from the load. A perfect match will have a VSWR of 1:1. The higher the first number, the worse the match, and the more inefficient the system. Since a perfect match cannot ever be obtained, some benchmark for performance needs to be set. In the case of antenna VSWR, this is usually 2:1. At this point, 88.9% of the energy sent to the antenna by the transmitter is radiated into free space and 11.1% is either reflected back into the source or lost as heat on the structure of the antenna. In the other direction, 88.9% of the energy recovered by the antenna is transferred into the receiver. As a side note, since the “:1” is always implied, many data sheets will remove it and just display the first number.

How to Read a VSWR Graph

VSWR is usually displayed graphically versus frequency. The lowest point on the graph is the antenna’s operational center frequency. In most cases, this will be different than the designed center frequency due to fabrication tolerances. The VSWR at that point denotes how close to 50-ohms the antenna gets. Linx specifies the recommended bandwidth as the range where the typical antenna VSWR is less than 2:1.

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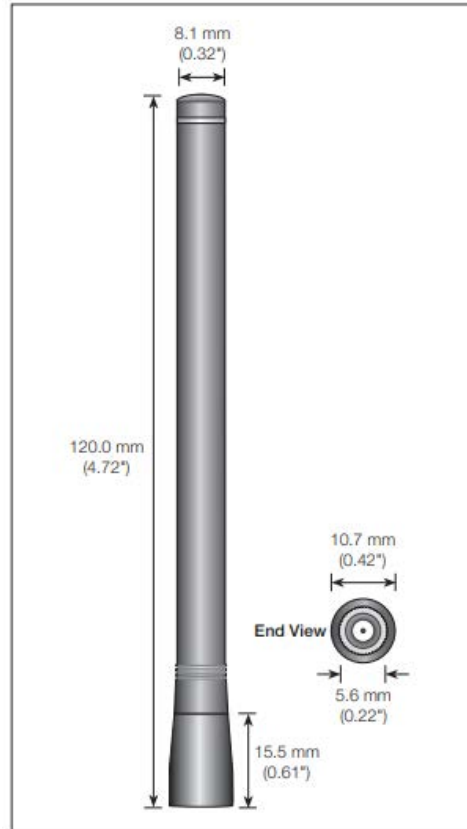
ANT-916-CW-HW-SMA Radiation Pattern

Antenna and IoT
DND

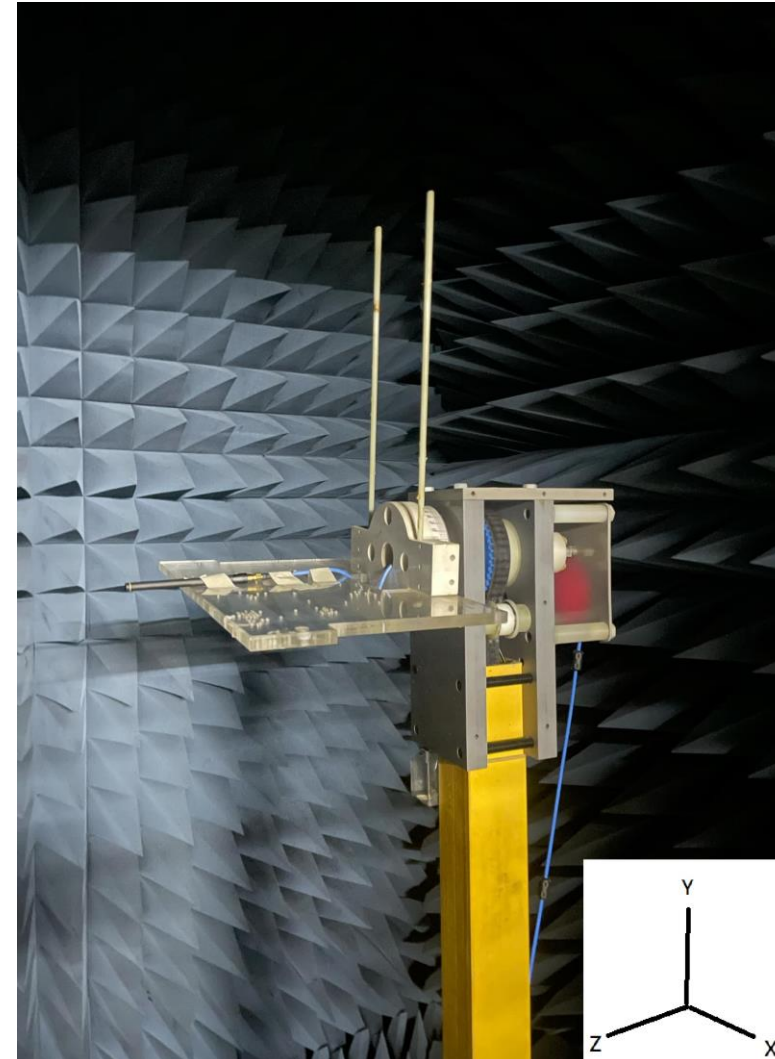
EVERY CONNECTION COUNTS



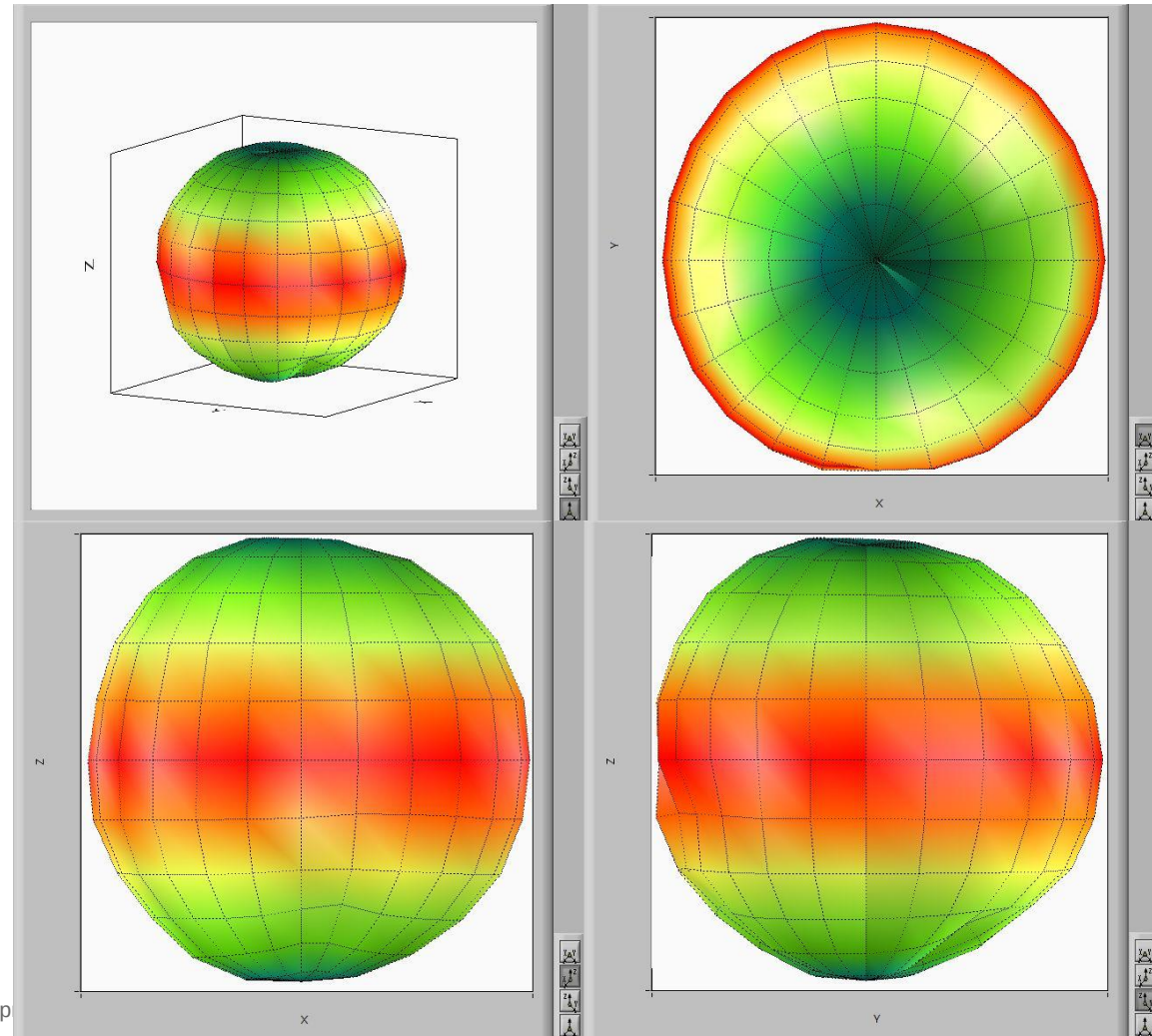
Test Setup Radiation Performance



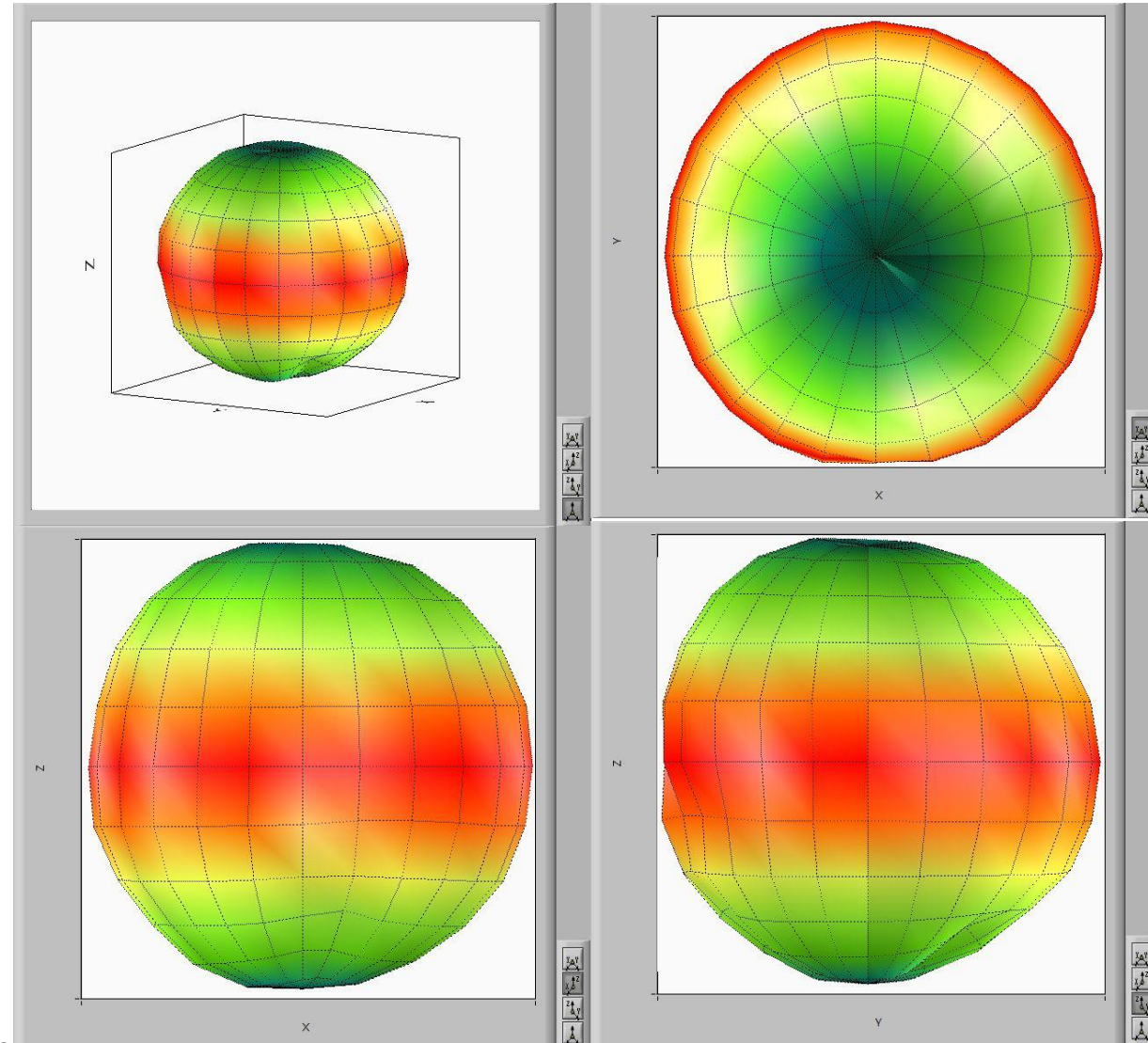
DUT: ANT-916-CW-HW-SMA



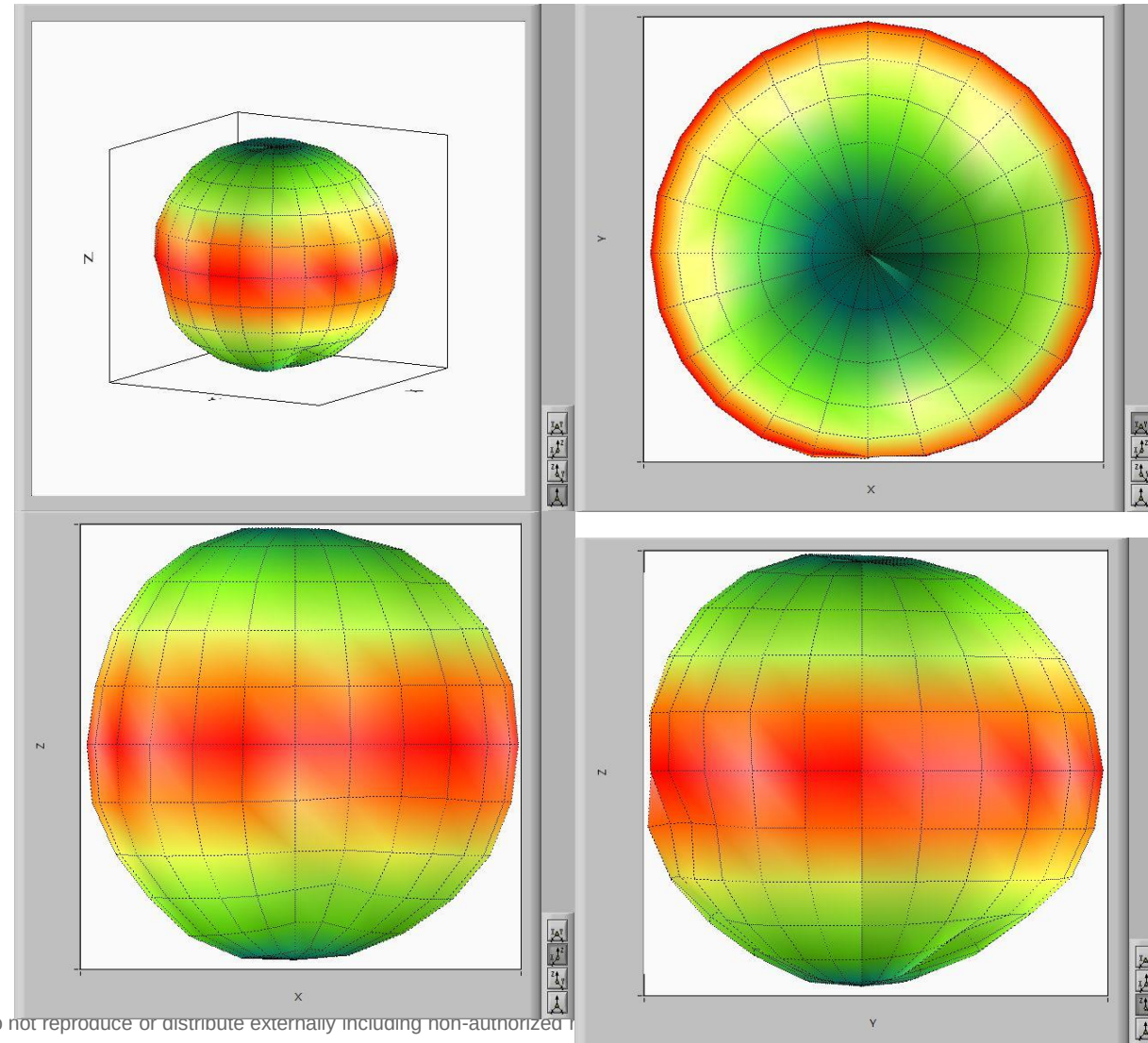
Radiation Pattern for 915MHz Total



Radiation Pattern for 916MHz Total



Radiation Pattern for 917MHz Total



2D Cut Pattern

