DATASHEET




# NanoBeam® ac

## High-Performance airMAX® ac Bridge

Models: NBE-5AC-16, NBE-5AC-19

Uniform Beamwidth Maximizes Noise Immunity

Innovative Mechanical Design

High-Speed Processor for Superior Performance

UBIQUITI® NETWORKS

# Overview

Ubiquiti Networks launches the latest generation of airMAX® CPE (Customer Premises Equipment), the NanoBeam® ac.

## Improved Noise Immunity

The NanoBeam ac directs RF energy in a tighter beamwidth. With the focus in one direction, the NanoBeam ac blocks or spatially filters out noise, so noise immunity is improved. This feature is especially important in an area crowded with other RF signals of the same or similar frequency.

## Integrated Design

The radio and antenna are combined to create a more efficient and compact CPE. The NanoBeam ac gets maximum gain out of the smallest footprint.

Providing high performance and an innovative form factor, the NanoBeam ac is versatile and cost-effective to deploy.

# Software

airOS® 7

Sporting an all-new design for improved usability, airOS® v7 is the revolutionary operating system for Ubiquiti® airMAX ac products.

## Powerful Wireless Features

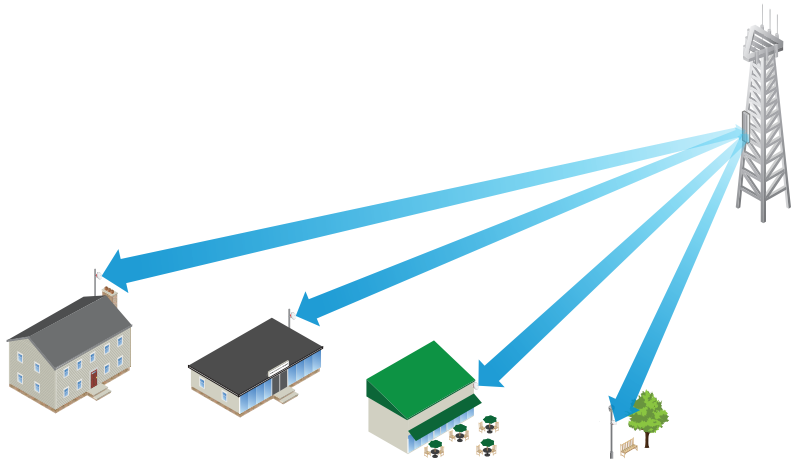
- airMAX ac Protocol Support
- Long-Range Point-to-Point (PtP) Link Mode
- Selectable Channel Width
  - PtP: 10/20/30/40/50/60/80 MHz
  - PtMP: 10/20/30/40 MHz
- Automatic Channel Selection
- Transmit Power Control: Automatic/Manual
- Automatic Distance Selection (ACK Timing)
- Strongest WPA2 Security

## Usability Enhancements

- Dynamic Configuration Changes
- Instant Input Validation
- HTML5 Technology
- Optimization for Mobile Devices
- Detailed Device Statistics
- Diagnostic Tools, including Ethernet Cabling Test, RF Diagnostics, and airView® Spectrum Analyzer

## Application Examples

### PtMP Client Links



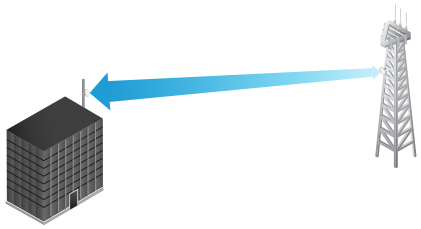
*The NanoBeam ac used as a CPE device for each client in an airMAX PtMP network.*

### Wireless Client

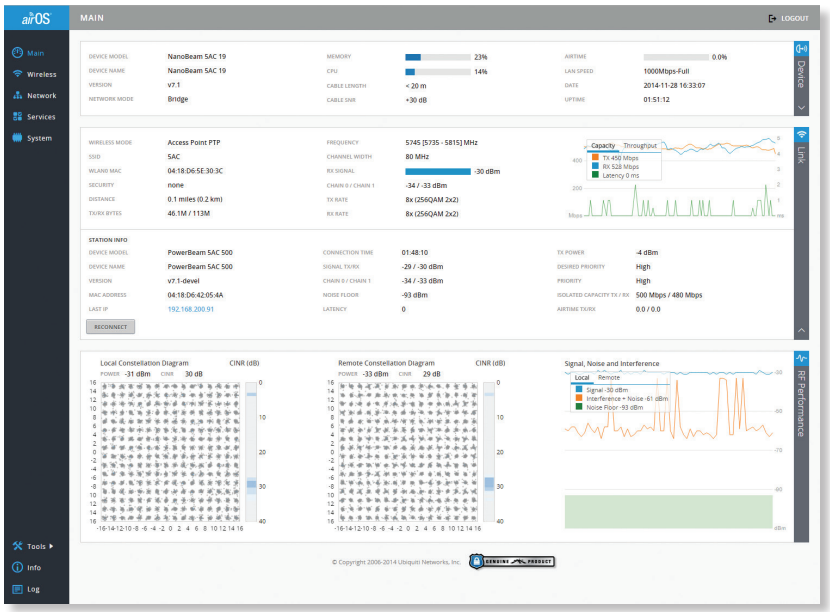


*The NanoBeam ac as a powerful wireless client.*

### PtP Link



*Use a NanoBeam ac on each side of a PtP link.*



## Advanced RF Analytics

airMAX ac devices feature a multi-radio architecture to power a revolutionary RF analytics engine.

An independent processor on the PCBA powers a second, dedicated radio, which persistently analyzes the full 5 GHz spectrum and every received symbol to provide you with the most advanced RF analytics in the industry.

Data from the spectrum analysis and RF performance monitoring is displayed on the *Main* tab and airView Spectrum Analyzer.

## Real-Time Reporting

The *Main* tab displays the following RF information:

- Persistent RF Error Vector Magnitude (EVM) constellation diagrams
- Carrier to Interference-plus-Noise Ratio (CINR) histograms
- Signal-to-Noise Ratio (SNR) time series plots

## Spectral Analysis

airView allows you to identify noise signatures and plan your networks to minimize noise interference. airView performs the following functions:

- Constantly monitors environmental noise
- Collects energy data points in real-time spectral views
- Helps optimize channel selection, network design, and wireless performance

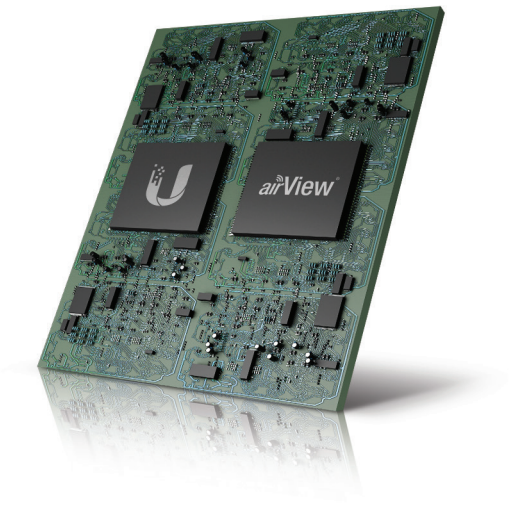
airView runs in the background without disabling the wireless link, so there is no disruption to the network.

In airView, there are three spectral views, each of which represents different data.

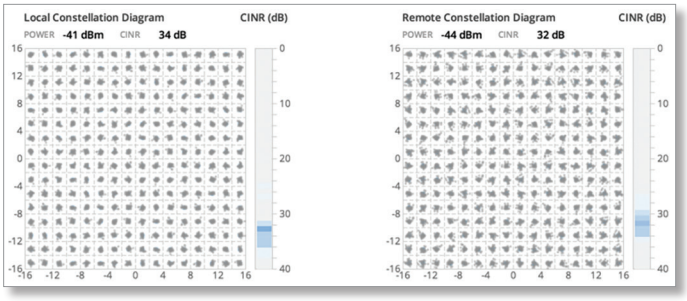
- **Waterfall** Aggregate energy collected for each frequency
- **Waveform** Aggregate energy collected
- **Ambient Noise Level** Background noise energy shown as a function of frequency

Available with a firmware upgrade to airOS v7.1, airView provides powerful spectrum analyzer functionality, eliminating the need to rent or purchase additional equipment for conducting site surveys.

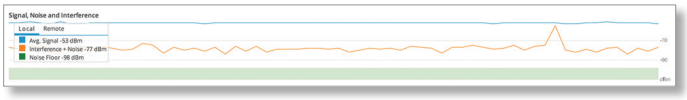
## Multi-Radio Architecture




## Constellation Diagrams and CINR Histograms




## SNR Time Series Plots




## Dedicated Spectral Analysis



# Technology

airMAX ac

Unlike standard Wi-Fi protocol, Ubiquiti's Time Division Multiple Access (TDMA) airMAX protocol allows each client to send and receive data using pre-designated time slots scheduled by an intelligent AP controller.

This time slot method eliminates hidden node collisions and maximizes airtime efficiency, so airMAX technology provides performance improvements in latency, noise immunity, scalability, and throughput compared to other outdoor systems in its class.

**Intelligent QoS** Priority assigned to voice/video for seamless streaming.

**Scalability** High capacity and scalability.

**Long Distance** Capable of high-speed, carrier-class links.

## Superior Performance

The next-generation airMAX ac technology boosts the advantages of our proprietary TDMA protocol.

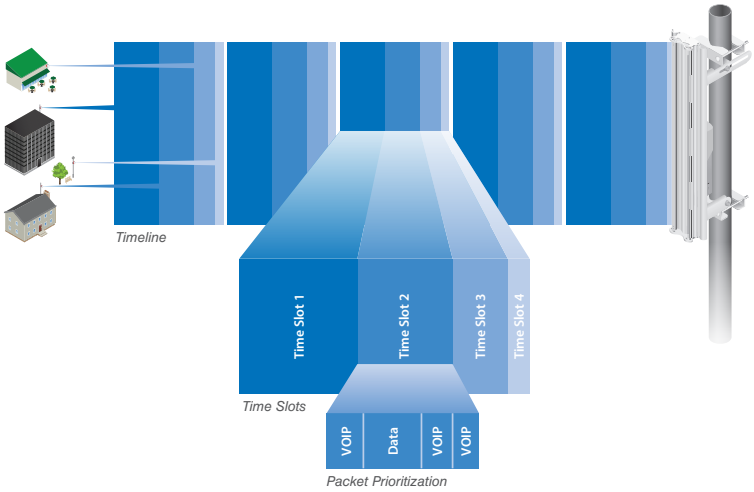
Ubiquiti's airMAX engine with custom IC dramatically improves TDMA latency and network scalability. The custom silicon provides hardware acceleration capabilities to the airMAX scheduler, to support the high data rates and dense modulation used in airMAX ac technology.

## Throughput Breakthrough

airMAX ac supports high data rates, which require dense modulation: 256QAM – a significant increase from 64QAM, which is used in airMAX.

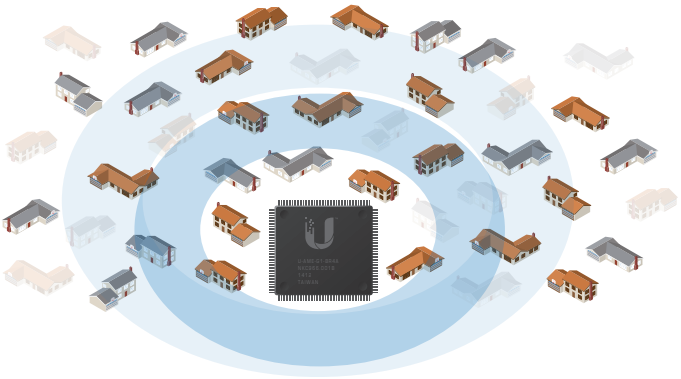
With their use of proprietary airMAX ac technology, airMAX ac products supports up to 450+ Mbps real TCP/IP throughput – up to triple the throughput of standard airMAX products.

### airMAX ac TDMA Technology

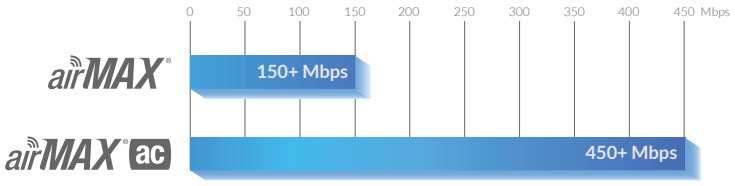



*Up to 100 airMAX ac stations can be connected to an airMAX ac Sector; four airMAX ac stations are shown to illustrate the general concept.*

### airMAX Network Scalability



### Superior Throughput Performance



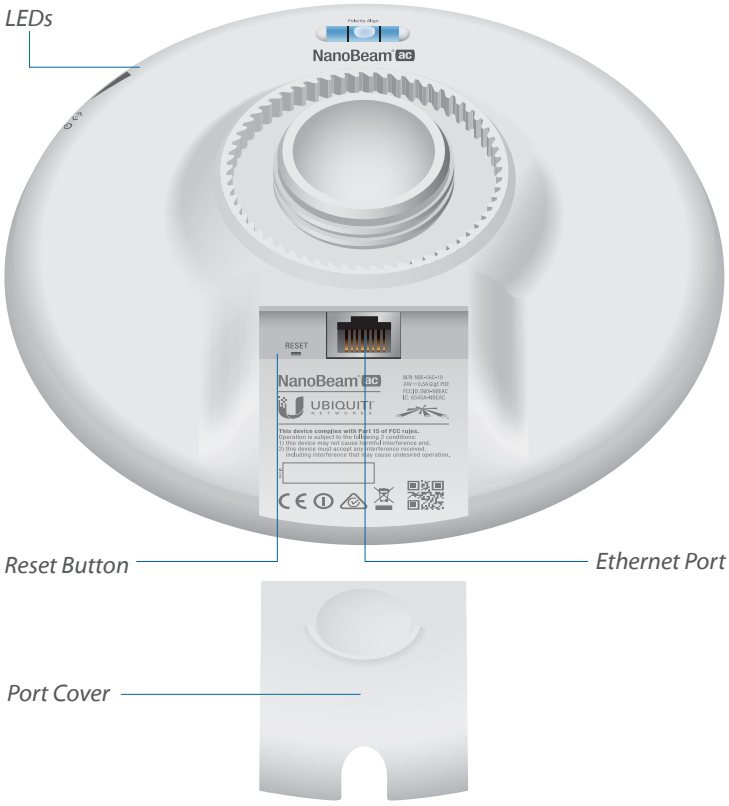
# Hardware Overview

## Innovative Mechanical Design

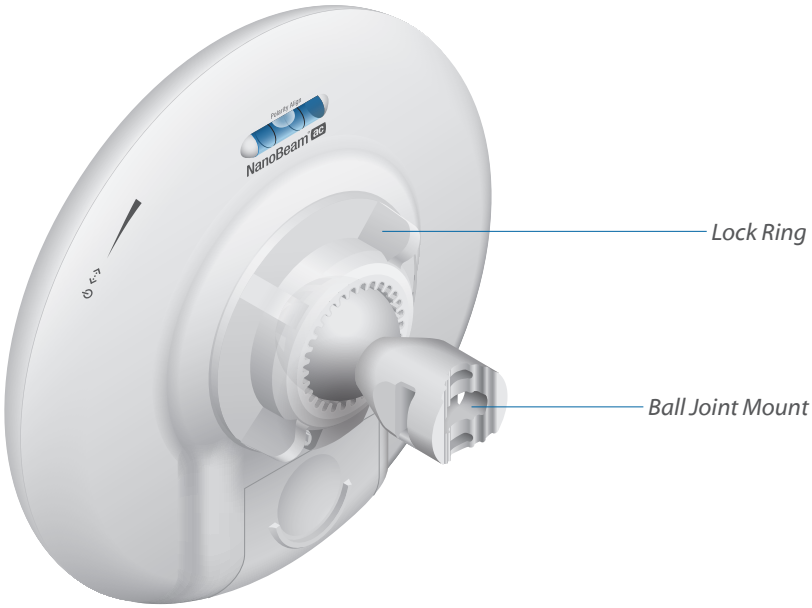
- **Efficient Footprint** The radio and antenna are combined into a single body that takes up minimal space.
- **Aesthetics** The NanoBeam ac is small enough to blend discreetly into the background at a customer's location.
- **Versatile Mounting** The NanoBeam ac can be mounted in almost any position needed for line of sight.

## Ease of Installation

- **Quick Installation** No fasteners are required for pole-mounting, and a single wall fastener (not included) is required for wall-mounting.
- **Convenient Alignment** The NanoBeam ac pivots on its ball joint for easy aiming.




NBE-5AC-19




NBE-5AC-19 with Mounting Hardware

# Models

Using airMAX ac technology, the NanoBeam ac supports up to 450+ Mbps real TCP/IP throughput.



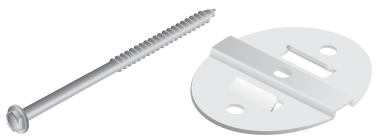
NanoBeam ac

| Model | Frequency | Gain |
|---|---|---|
| NBE-5AC-16 | 5 GHz | 16 dBi |



NanoBeam ac

| Model | Frequency | Gain |
|---|---|---|
| NBE-5AC-19 | 5 GHz | 19 dBi |



NanoBeam
Wall Mount Kit

| Model | NBE-5AC-19 | NBE-M5-19 | NBE-M5-16 |
|---|---|---|---|
| NBE-WMK | ✓ | ✓ | ✓ |

A wall mount kit is available as an optional accessory to enhance stability for wall-mounting.



*Installation Using the NanoBeam Wall Mount Kit*

# Specifications

| NBE-5AC-16 System and Regulatory/Compliance | |
|---|---|
| Processor Specs | Atheros MIPS 74Kc, 720 MHz |
| Memory | 128 MB DDR2, 8 MB Flash |
| Networking Interface | (1) 10/100/1000 Ethernet Port |
| Wireless Approvals | FCC, IC, CE |
| RoHS Compliance | Yes |

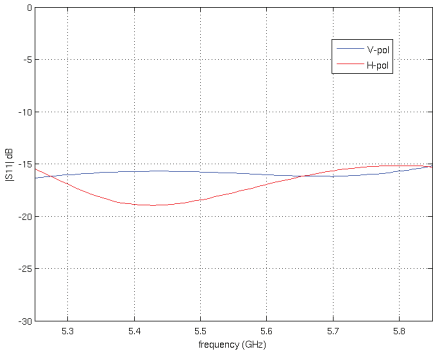
| NBE-5AC-16 Physical/Electrical/Environmental | |
|---|---|
| Dimensions | 140 x 140 x 54 mm (5.51 x 5.51 x 2.13") |
| Weight | 0.320 kg (0.71 lb) |
| Power Supply | 24V, 0.5A Gigabit PoE |
| Power Method | Passive PoE (Pairs 4, 5+; 7, 8 Return) |
| Max. Power Consumption | 6W |
| Gain | 16 dBi |
| Operating Frequency<br>Worldwide<br>USA | <br>5150 - 5875 MHz<br>5725 - 5850 MHz |
| Wind Loading | 21.4 N @ 200 km/h (4.8 lbf @ 125 mph) |
| Wind Survivability | 200 km/h (125 mph) |
| LEDs | (1) Power, (1) LAN, (4) WLAN |
| Signal Strength LEDs | Software-Adjustable to Correspond to Custom RSSI Levels |
| Channel Sizes<br>PtP Mode<br>PtMP Mode | <br>10/20/30/40/50/60/80 MHz<br>10/20/30/40 MHz |
| Polarization | Dual Linear |
| Enclosure | Outdoor UV Stabilized Plastic |
| Mounting | Pole-Mount (Kit Included), Wall-Mount |
| ESD/EMP Protection | Air: ± 24 kV, Contact: ± 24 kV |
| Operating Temperature | -40 to 70° C (-40 to 158° F) |
| Operating Humidity | 5 to 95% Noncondensing |
| Salt Fog Test | IEC 68-2-11 (ASTM B117), Equivalent: MIL-STD-810 G Method 509.5 |
| Vibration Test | IEC 68-2-6 |
| Temperature Shock Test | IEC 68-2-14 |
| UV Test | IEC 68-2-5 at 40° C (104° F), Equivalent: ETS 300 019-1-4 |
| Wind-Driven Rain Test | ETS 300 019-1-4, Equivalent: MIL-STD-810 G Method 506.5 |

# Specifications

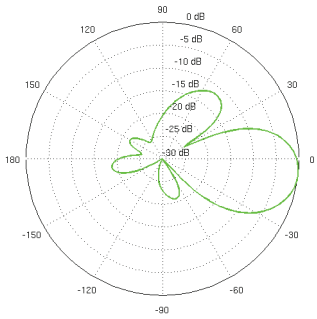
| NBE-5AC-16 Output Power: 26 dBm | | | | | | | |
|---|---|---|---|---|---|---|---|
| **TX Power Specifications** | | | | **RX Power Specifications** | | | |
| Modulation | Data Rate | Avg. TX | Tolerance | Modulation | Data Rate | Sensitivity | Tolerance |
| **airMAX ac** | 1x BPSK (½) | 26 dBm | ± 2 dB | **airMAX ac** | 1x BPSK (½) | -96 dBm | ± 2 dB |
| | 2x QPSK (½) | 26 dBm | ± 2 dB | | 2x QPSK (½) | -95 dBm | ± 2 dB |
| | 2x QPSK (¾) | 26 dBm | ± 2 dB | | 2x QPSK (¾) | -92 dBm | ± 2 dB |
| | 4x 16QAM (½) | 26 dBm | ± 2 dB | | 4x 16QAM (½) | -90 dBm | ± 2 dB |
| | 4x 16QAM (¾) | 26 dBm | ± 2 dB | | 4x 16QAM (¾) | -86 dBm | ± 2 dB |
| | 6x 64QAM (⅔) | 25 dBm | ± 2 dB | | 6x 64QAM (⅔) | -83 dBm | ± 2 dB |
| | 6x 64QAM (¾) | 25 dBm | ± 2 dB | | 6x 64QAM (¾) | -77 dBm | ± 2 dB |
| | 6x 64QAM (⅚) | 24 dBm | ± 2 dB | | 6x 64QAM (⅚) | -74 dBm | ± 2 dB |
| | 8x 256QAM (¾) | 22 dBm | ± 2 dB | | 8x 256QAM (¾) | -69 dBm | ± 2 dB |
| | 8x 256QAM (⅚) | 22 dBm | ± 2 dB | | 8x 256QAM (⅚) | -65 dBm | ± 2 dB |

| NBE-5AC-16 Antenna Information | |
|---|---|
| Gain | 16 dBi |
| Max. VSWR | 1.5:1 |

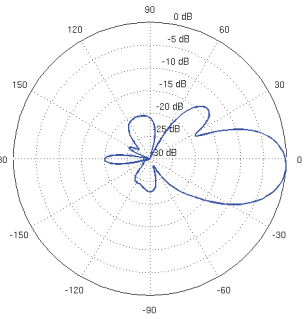
*Return Loss*



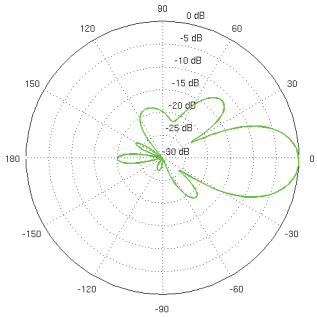

*Vertical Azimuth*



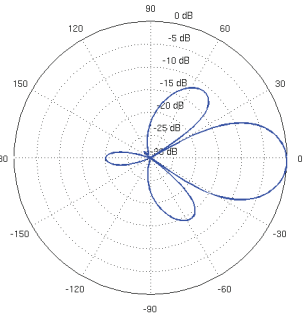
*Vertical Elevation*



*Horizontal Azimuth*



*Horizontal Elevation*



# Specifications

| NBE-5AC-19 System and Regulatory/Compliance | |
|---|---|
| Processor Specs | Atheros MIPS 74Kc, 720 MHz |
| Memory | 128 MB DDR2, 8 MB Flash |
| Networking Interface | (1) 10/100/1000 Ethernet Port |
| Wireless Approvals | FCC, IC, CE |
| RoHS Compliance | Yes |

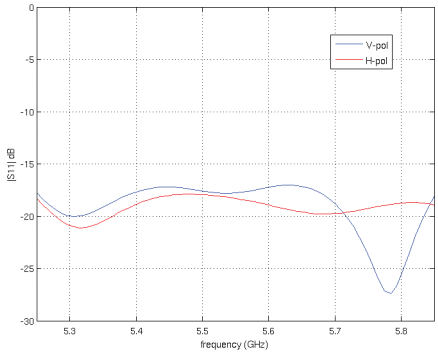
| NBE-5AC-19 Physical/Electrical/Environmental | |
|---|---|
| Dimensions | 189 x 189 x 125 mm (7.44 x 7.44 x 4.92 in) |
| Weight | 0.530 kg (1.17 lb) |
| Power Supply | 24V, 0.5A Gigabit PoE |
| Power Method | Passive PoE (Pairs 4, 5+; 7, 8 Return) |
| Supported Voltage Range | 20-26VDC |
| Max. Power Consumption | 8W |
| Gain | 19 dBi |
| Operating Frequency<br>Worldwide<br>USA | <br>5150 - 5875 MHz<br>5725 - 5850 MHz |
| Wind Loading | 45.4 N @ 200 km/h (10.2 lbf @ 125 mph) |
| Wind Survivability | 200 km/h (125 mph) |
| LEDs | (1) Power, (1) LAN, (4) WLAN |
| Signal Strength LEDs | Software-Adjustable to Correspond to Custom RSSI Levels |
| Channel Sizes<br>PtP Mode<br>PtMP Mode | <br>10/20/30/40/50/60/80 MHz<br>10/20/30/40 MHz |
| Polarization | Dual Linear |
| Enclosure | Outdoor UV Stabilized Plastic |
| Mounting | Pole-Mount (Kit Included), Wall-Mount |
| ESD/EMP Protection | Air: ± 24 kV, Contact: ± 24 kV |
| Operating Temperature | -40 to 70° C (-40 to 158° F) |
| Operating Humidity | 5 to 95% Noncondensing |
| Salt Fog Test | IEC 68-2-11 (ASTM B117), Equivalent: MIL-STD-810 G Method 509.5 |
| Vibration Test | IEC 68-2-6 |
| Temperature Shock Test | IEC 68-2-14 |
| UV Test | IEC 68-2-5 at 40° C (104° F), Equivalent: ETS 300 019-1-4 |
| Wind-Driven Rain Test | ETS 300 019-1-4, Equivalent: MIL-STD-810 G Method 506.5 |

# Specifications

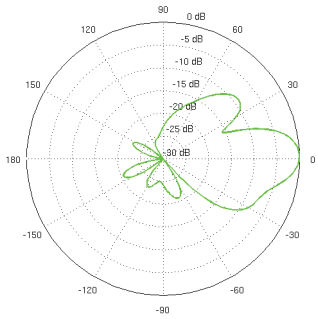
| NBE-5AC-19 Output Power: 26 dBm | | | | | | | |
|---|---|---|---|---|---|---|---|
| **TX Power Specifications** | | | | **RX Power Specifications** | | | |
| Modulation | Data Rate | Avg. TX | Tolerance | Modulation | Data Rate | Sensitivity | Tolerance |
| **airMAX ac** | 1x BPSK (½) | 26 dBm | ± 2 dB | **airMAX ac** | 1x BPSK (½) | -96 dBm | ± 2 dB |
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| | 8x 256QAM (¾) | 22 dBm | ± 2 dB | | 8x 256QAM (¾) | -69 dBm | ± 2 dB |
| | 8x 256QAM (⅚) | 22 dBm | ± 2 dB | | 8x 256QAM (⅚) | -65 dBm | ± 2 dB |

| NBE-5AC-19 Antenna Information | |
|---|---|
| Gain | 19 dBi |
| Max. VSWR | 1.5:1 |

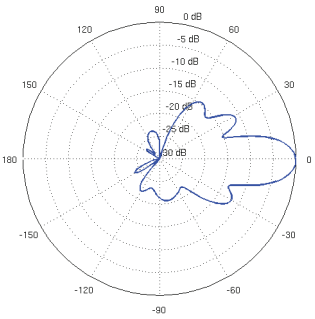
*Return Loss*



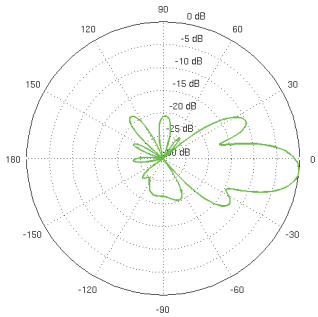

*Vertical Azimuth*



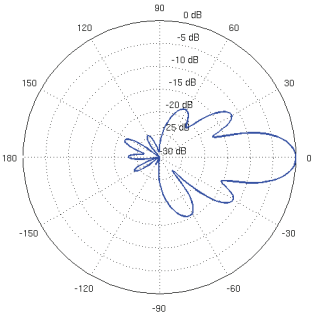
*Vertical Elevation*



*Horizontal Azimuth*



*Horizontal Elevation*



Specifications are subject to change. Ubiquiti products are sold with a limited warranty described at: www.ubnt.com/support/warranty
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