



## 2.4GHZ & 5GHZ ANTENNA APPLICATIONS

WIFI | WLAN | BLUETOOTH | BLE | WIFI 6 | ZIGBEE | 802.11a / b / g / n / ac / ax



**KYOCERA AVX is a worldwide leading supplier of passive electronic components, connectors, passive and active antennas, and sensing and control units.** Together with continuous quality improvement process, our components manufactured to the highest quality and reliability standards for a wide variety of demanding application needs.

Our worldwide manufacturing capabilities include facilities located in seventeen countries on four continents, allowing us to continue meeting customer needs on a global basis. By continuing to invest heavily in R&D and submitting several new patent applications every year, KYOCERA AVX continues to further expand the company's strong technology base with newly innovative, next-generation product solutions.

As a technology leader, KYOCERA AVX will continue to add to its product portfolio on a regular basis. Details of new devices being offered and their specifications can be found on the KYOCERA AVX website: [www.kyocera-avx.com](http://www.kyocera-avx.com)

## ANTENNA PORTFOLIO

	SMT ON BOARD			OFF BOARD			EXTERNAL
	FR4	STAMPED METAL	LTCC	FR4	FPC	STAMPED METAL	INDOOR
<b>2.4 GHz Single Band</b> Bluetooth; BLE WIFI Single Band 802.11b/g/n; Zigbee	1001013	1002295 1002427	M830320 M310220 1001312	W1P Series 1003893PT	W1F Series 1003893FT		
<b>2.4 &amp; 5 GHz Dual Band</b> WLAN 802.11/n/ac		1000146 1002298	M830520 1001312	W3P Series WAP WBP WCP 1001932FT	W3F Series 1001932PT 1001893PT	1000418 1000423 1001435	X9001091- W3DSMW  X9000294- W3DRMB
<b>5 GHz</b> 802.11 a/n WIFI Single Band		1001388 1001430		W2P Series 1004292PT 1004369PT	W2F Series		
<b>WIFI 6</b> 802.11ax				W2P Series W3P Series	W2F Series W3F Series		

## APPLICATIONS

- Consumer
- Industrial
- Telecommunication
- Optical Communications
- Internet of Things (IoT)
- Safety & Security
- Wireless Network
- Healthcare
- Data Processing
- Medical
- Broadband Receivers
- Commercial



## ACTIVE ANTENNAS



Ethertronics Active Steering™ antenna systems portfolio boosts wireless connectivity significantly. The patented technology continually optimizes the antenna's direction in real-time on a per millisecond basis, creating multiple radiation patterns around the same antenna and then selects the ideal pattern to hit its targeted device with best signal.

The result is a major increase in range, reliability and speed between devices living on the fringes of a network or hidden behind walls and hard-to-reach spaces. Connection dead spots are reduced as the KYOCERA AVX processor, the active steering chip and the antenna are designed together, which allows a more flexible antenna system placement.

The link optimization is in real time based on the WIFI radio link performance. A 3dB improvement can be rapidly observed on the radio link using a low latency adaptation patented algorithm. Its Data-Over-Coax (DOC) interface drives the whole system and allow any combination of active and passive antennas in the system design.

### EC624 | ACTIVE STEERING ANTENNA SWITCH



The EC624 supports the DOC interface, which allows active steering signaling on the same physical cable as the primary RF feed without impacting the main WIFI radio signal. The DOC interface eliminates the need for custom connectors and cables, which reduces the system bill of materials, enables easier placement of off-PCB antennas and provides seamless integration of any combination of active and passive antennas into the device designs. EC624 can support up to 8x8 MIMO systems.

### EC477 | PROCESSOR



The Ethertronics EC477 combines a high-performance processor with a cost-optimized antenna control interface to deliver the proven "2X" performance and coverage benefits of WIFI Active Steering in a flexible and cost reduced system offering. The EC477 works in conjunction with the EC624 Active Steering Switch to provide greater throughput and longer range for access points, gateways, smart appliances, extenders, bridges, streaming devices, set top boxes and more.





### TUNABLE ANTENNAS

Tunable antennas are ideal for prototyping with last minute tuning or tuning on-the-fly and consists of cutting or soldering golden pads/defined areas on the antenna pattern, and shifting the low or high frequency response of each antenna.

The antennas can be mounted onto any housing for versatile positioning. This allows for, flexibility in antenna placement and cabling used, the ability to source cabling directly from KYOCERA AVX or through other means, and the ability to source the antenna only for direct placement into a product

#### 1004369PT | 5GHz MIXED POLARIZATION HP/VP



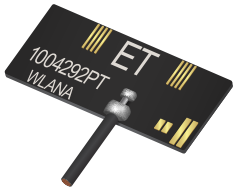
A versatile off board PCB antenna ideal for 5GHz WIFI applications where off board implementation is advantageous & necessary. Offers easy on-the-go tuning capability right on the antenna face.

#### 1001932PT & 1001932FT | DUAL BAND TUNABLE



Higher functionality & performance in a smaller & thinner design. Utilizes patented Isolated Magnetic Dipole (IMD) technology to deliver a unique size & performance combination.

#### 1004292PT | 5GHz TUNABLE



A versatile off-board PCB antenna ideal for 5GHz WIFI applications where off-board implementation is advantageous & necessary. Ideal for systems requiring a multiple antenna solutions.

#### 1003893FT & 1003893PT | 2.4GHz TUNABLE



Higher functionality & performance in a smaller & thinner design. Utilizes patented Isolated Magnetic Dipole (IMD) technology to deliver a unique size & performance combination.

### W SERIES ANTENNAS

The **W1 / W2 / W3 Families** of antennas include an embedded design with the option to have foam on the back side to minimize the detuning of the antenna on different surfaces.

These antenna families deliver on the needs of today's wireless product designers, miniaturized design and superior signal sensitivity, by eliminating whip & stub antennas.

#### W1 FAMILY | 2.4GHz



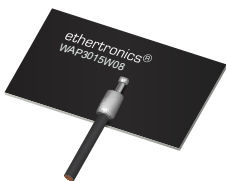
#### W2 FAMILY | 5GHz & 6GHz



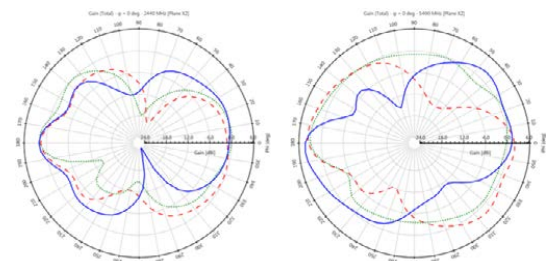
#### W3 FAMILY | 2.4 / 5.0 / 6.0GHz



#### WX FAMILY | DUAL BAND DIPOLE – MULTIPLE RADIATION PATTERNS



The WX Family antennas include an embedded WIFI dipole design that delivers on the key needs of today's wireless product designers: miniaturized design and superior signal sensitivity. This antenna is ideal to rotate the radiation patterns with a single mechanical outline, slightly to the left (WA), to the right (WB) and straight aligned with Z axis (WC), which allows to maximize system throughput and migrate peak gain issues.



### VERTICAL POLARIZED ANTENNAS

Stamped metal antennas with small form factor that provide the flexibility in antenna placement and the ability to source antenna only for direct placement on customer's PCB. These innovative antennas offer compelling advantages as they are mounted on ground and provide vertical polarization on the horizontal plane for 2.4GHz and 5GHz, enhancing the polarization diversity in a large range of applications: WLAN enabled devices, repeaters, routers, set-top boxes and other wireless devices.

#### 1002295 | 2.4Ghz OMNI-DIRECTIONAL



Single band 2.4GHz vertical. Provides an omni-directional pattern on the horizontal plane, high performance & isolation characteristics, & better connectivity & minimal interference.

#### 1002298 | DUAL BAND OMNI-DIRECTIONAL



Dual band 2.4 & 5GHz. Provides an omni-directional pattern on the horizontal plane, high performance & isolation characteristics, & better connectivity & minimal interference.

### WIRELESS PRODUCT DEVELOPMENT PROCESS



#### 1 | CONSULTATION

- Definition of critical electrical/mechanical performance requirements
- Feasibility study and CAD/board layout review
- Recommendations on antenna technology, placement and orientation



#### 2 | DESIGN

- Antenna Selection: Standard vs. Custom, Active vs. Passive, etc.
- Reference design integration experience
- Mechanical engineering optimization
- RF simulations
- Design for industrialization



#### 3 | PROTOTYPING

- Prototyping tools (3D printers, LPKF machines, fully equipped workshops)
- Mock-ups to validate technical offering
- Samples



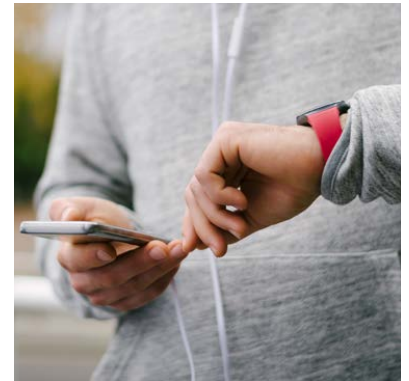
#### 4 | TEST & OPTIMIZATION

- Pre-Certification testing reports for FCC, PTCRB, EMI, Noise issues
- Available tests: VNA & Anechoic Chamber Testing, Octobox Chamber Measurements, Device Simulation, WIFI Test House Measurements, Benchmark Testing & Competitive Analysis



#### 5 | MANUFACTURING

- Quality documentation available
- 4 antenna manufacturing locations
- More than 2.5Bn antennas in the market

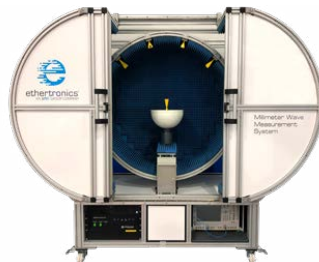


TEST	MEASUREMENT	OUTPUT
<b>WTS-001</b> VNA & Anechoic Chamber Testing	Full passive characterization, measurement & analysis of device antenna performance	2D & 3D Radiation Pattern Plots & Composite Maps: <ul style="list-style-type: none"> <li>• Efficiency</li> <li>• Return Loss</li> <li>• ECC</li> <li>• Peak Gain</li> <li>• Composite Gain</li> <li>• Isolation</li> </ul>
<b>WTS-002</b> Octobox Chamber Measurements	Throughput system characterization in a controlled lab environment	Rate vs Range Plots (One device configuration, two bands)
<b>WTS-003</b> Device Simulation	Indoor propagation simulations for WIFI	Propagation model using a full 3D Ray Tracing Engine Analyze spatial heat maps showing device performance in an indoor environment: <ul style="list-style-type: none"> <li>• Coverage</li> <li>• Throughput</li> <li>• MCS</li> <li>• RSSI</li> </ul>
<b>WTS-004</b> WIFI Test House Measurements	Real-world OTA WIFI system & throughput measurements within one of 3 fully furnished test houses located in France & USA	Benchmark Testing Throughput Testing (One device configuration, two house positions, two bands)
<b>WTS-005</b> Benchmark Testing & Competitive Analysis	Wireless performance analyzed based on throughput data rates, RSSI, spectral efficiency (bps/Hz)	Rate vs Range Analysis Benchmark Testing Comparative Analysis Mapping of Performance across Test Locations

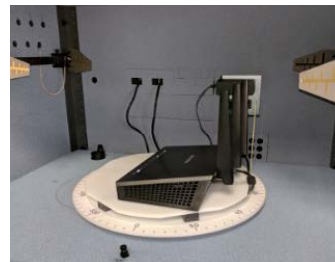
Passive Testing



Anechoic Chamber



Octobox Chamber



Test House (USA)



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