



Multiple Input
Multiple Output

MIMO

A rough guide to understanding the system and benefits

MIMO vs. SISO

SISO Interference

Before we can understand Multiple Input Multiple Output (MIMO) we need to understand what Single Input Single Output (SISO) is and the limitations of that system. Then we can appreciate the benefits delivered by MIMO.

SISO is a system using a single antenna at both transmit and receive. In this example let's think about a whip antenna on the roof of a car communicating to a single antenna on a tower. The signal from the tower to the car in this SISO system could be reflected or bounced off obstacles in its way. Like buildings, other towers or even the ground. In very simplistic terms this is what is known as multipath interference. The transmitted signal from the tower is received by the car antenna at an angle because it's bounced off so many obstacles.

That results in a reduction of data speed, and other losses all impairing the system quality of service. If this was an LTE system, the data speeds would certainly be reduced. WiFi also suffers from the same issues the obstacles might be different, like ceilings and walls but the problem is the same.

MIMO Benefits

MIMO exploits multipath phenomena with the transmission of multiple signals to overcome this problem.

It will use multiple antennas at both transmit and received. In our example the car would now have more than one antenna on the roof and there would be more than one antenna on the tower sending the same signal.



Increased Data Speed

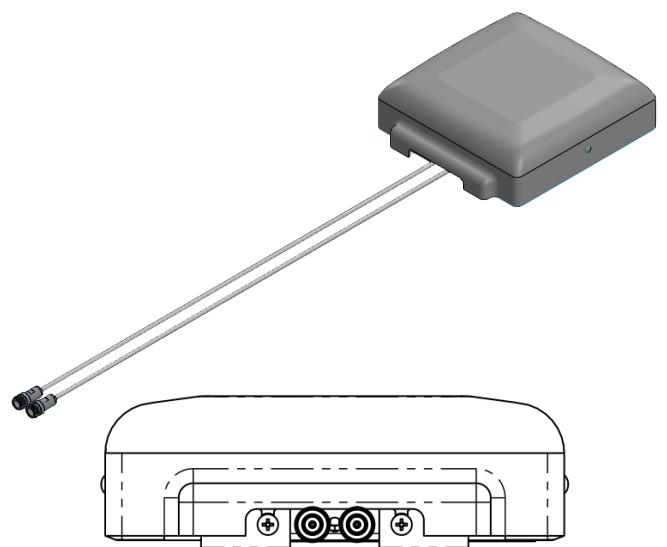
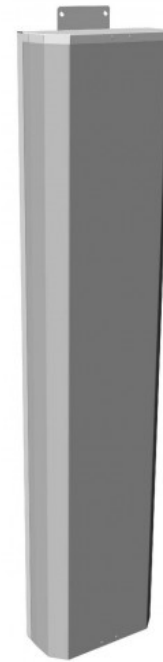
Multiplied data rates

The system explained on previous page works on three underpinning techniques to manage beamforming, spatial multiplexing, and space-time coding. In very simple terms it's how the data stream is used / copied over several transmit antennas split into streams then received by the cars antenna that will see a signal coming at it from many angles.

XPOL antennas are ideal for this because they feature both a vertical and horizontal element to receive signals on. **MIMO system allows data rates to be multiplied without requiring additional bandwidth or increasing the overall transmit power.**

2x2 technology

Every pair of MIMO antennas used will increase the throughput (data speed) of the system. Going back to the car that is now configured for MIMO. Manufactures will offer a 2x2 MIMO system for LTE and 2X2 for Wi-Fi. It simply means that there are two antennas for each technology and usually 2 cables to connect for LTE and the same qty of cables for Wi-Fi.



Future Proof

ProNexus - The Data King

Today Amphenol Procom offers the [ProNexus](#) mobile vehicle antenna that has 4x4 MIMO LTE and 6x6 MIMO Wi-Fi. Therefore 4 LTE antennas and 6 Wi-Fi. Having more antennas further increases the data speeds. In theory 4X4 should have double the speed of 2x2.

Telekom has done a rudimentary but effective user test comparing a 2x2 mobile phone to a 4x4 enable one. The article states the previous maximum LTE speed for 2x2 of 300 megabits per second (Mbit/s) will thus become 480 Mbit/s on a 4x4 system. It also says the that the benefit of 4x4 by network legislation should offer an uplift on average of 60 percent faster data speeds.

You can read about their findings here (set your browser to auto translate to English):

<https://telekom.com/de/blog/netz/artikel/4x4-mimo-hintergrund-532302>

MIMO is the future

In conclusion MIMO is a technique used in LTE and Wi-Fi networks to increase data speeds.

Adding additional pairs of MIMO antennas will substantially increase the throughput.

In mobile application the use of data for mission success is critical. Live video streaming or surveillance, for example or just being able to quickly download information to your portable devices to aid the user in their daily operations quickly and efficiently.

As technology and applications improve, the need for faster data speeds is a must. MIMO enabled products will help deliver.



Here to help

At antennaPRO we take a consultative approach to our customers' requests.

If you have a question, need some support or cannot find what you are looking for, we are here to help.



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