Nokia AirScale Active Antennas
Make an active investment in your network
The future of your business will be active

Demand for mobile services continues to climb rapidly. That growth will accelerate as 4.5G Pro\(^1\), 4.9G\(^2\) and 5G enable new, exciting services. Providing sufficient capacity to meet rising demand is a constant focus for operators.

While passive antennas have evolved and served the industry well for many years, they will not meet future needs. Instead, active antennas will become the norm, delivering substantially higher capacity and energy efficiency.

**Integrated components for higher performance**

A passive antenna system comprises radiating elements and separate radio electronics and ancillaries, such as power amplifiers, linked by coaxial cables. An active antenna combines all these components into a single unit. This integration eliminates feeder cables and their losses, for a more compact, more energy-efficient installation.

Nokia AirScale Active Antennas are founded on five decades of antenna research by Nokia Bell Labs. This unrivalled commitment has led to the creation of advanced antennas that deliver outstanding performance and complement the mobile infrastructure breakthroughs of our AirScale Radio Access solution.

AirScale Active Antennas help to ensure your network’s credentials on the path to 5G. Deploy them to boost your network capacity without the need to build costly new base station sites, which is especially difficult in dense urban and megacity environments. They also allow you to squeeze the most return from your existing spectrum assets, a limited resource that could otherwise hinder your growth.

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\(1\) 4.5G Pro increases initial 4G networks speeds ten times to gigabit data rates

\(2\) 4.9G will support future service continuity with 5G network fabric
Active Antennas for any need

- Nokia AirScale Compact Active Antenna
- Nokia AirScale massive MIMO Adaptive Antenna
When space is limited, but demand is boundless

Nokia AirScale Compact Active Antenna (CAA) is, as the name suggests, a compact antenna solution that enables you to add capacity where it’s most often needed – in dense urban areas. Its minimal footprint allows rapid installation on the most crowded base station sites, eliminating the time-consuming search for new sites and the costly need to build out backhaul. Now you can solve capacity bottlenecks where even small cells may be hard to deploy.

Unravelling antenna terminology

- **Passive antenna**: Comprises only radiating elements, but may also include phase shifters to enable remote tilting
- **Active antenna**: Radio and antenna parts are integrated into one physical unit
- **Adaptive antenna**: One that adaptively controls its pattern response while it operates in response to the signal environment
- **Multiple Input Multiple Output (MIMO)**: Refers to any transmission scheme involving multiple transmit and multiple receive antennas. This encompasses all implementations, e.g. radio frequency, baseband, and encompasses all transmit/receive processing methodologies, such as diversity, spatial-multiplexing, beamforming
- **Massive-MIMO (M-MIMO)**: Is the extension of traditional MIMO technology to antenna arrays having a large number (>8) of controllable elements
- **Multi-User MIMO (MU-MIMO)**: Dedicates a sub-set of the available MIMO streams to either individual subscribers or to groups of subscribers, enhancing overall capacity
- **3D beamforming or Full Dimension (FD) beamforming**: The ability of an adaptive antenna to horizontally and vertically direct radio signals to provide both increased capacity (e.g. for hotspots) and extended coverage

Despite its small size, the antenna packs in a dual-band radio for high capacity. Its tightly integrated design eliminates connecting cables and the need for ancillary equipment such as combiners and mast-head amplifiers. This leads to minimal system losses, high power efficiency and easier installation.
Capacity focused on where it’s needed, coverage that goes everywhere

Nokia AirScale massive MIMO Adaptive Antenna (MAA) delivers significantly higher capacity and coverage by simultaneously running several transmit and receive antenna elements. The adoption of massive MIMO technology means you do not need to build more cell sites to increase capacity; an especially important consideration in already crowded megacities.

Initially available for TD-LTE bands, these antennas deliver substantial benefits even with legacy mobile devices. For additional performance 3D or Full Dimension (FD) beamforming can be enabled via software and the AirScale System Module. This is an excellent enhancement to increase capacity for hotspots and improve indoor penetration, while also providing extended coverage.

With improved spectral efficiency, superior energy efficiency, huge cell capacity and high cell edge performance, AirScale MAA helps you meet the future demands of extreme mobile broadband.

Massive MIMO is a 5G-enabling technology

5G networks will take advantage of licensed frequency bands and unlicensed spectrum previously unused by mobile networks. This will provide additional capacity to serve data-hungry enterprises and vertical industries. However, high frequency radio signals are susceptible to their operating environments and prone to high propagation path losses. The result is coverage (cell size) measured in meters rather than kilometers. To help overcome these issues, massive MIMO antennas further develop the MIMO techniques that are currently used to improve reliability and throughput capacity in some networks.

Defined by Nokia Bell Labs in 2010, massive MIMO increases throughput and extends coverage. Massive MIMO is delivered by flat panel antenna element arrays that result in neat form factors. Nokia’s long experience of base station and active antenna design enables us to create seamlessly integrated antennas that deliver superb performance.
Nokia first deployed active antennas in field trials as early as 2008, pre-emptively acquiring valuable experience and expertise in the technology. Since then we have run multiple trials, as well as commercial deployments of active antennas worldwide.

In 2015 we launched Flexi Radio Antenna System (RAS) on our widely-deployed Flexi Radio Access platform. This integrates up to two 4-pipe radio modules within the antenna to deliver commercial benefits of active antenna technology to many operators already using Flexi Radio Access.

AirScale Active Antennas move these developments into the 5G era by taking advantage of our innovative, cloud-based, highly scalable AirScale Radio Access solution.

We have deployed massive MIMO Adaptive Antennas in a TD-LTE based trial. Similarly, we have also worked with a number leading operators to explore the benefits of active antennas in different types of 5G deployment scenario.

To date, Nokia Active Antennas have been put through extensive field trials with operators worldwide, with more being added.

Nokia AirScale Active Antennas are ready to help you meet growing mobile broadband demand, at the lowest total cost of ownership.
About Nokia

Nokia is a global leader in the technologies that connect people and things. Powered by the innovation of Bell Labs and Nokia Technologies, the company is at the forefront of creating and licensing the technologies that are increasingly at the heart of our connected lives.

With state-of-the-art software, hardware and services for any type of network, Nokia is uniquely positioned to help communication service providers, governments, and large enterprises deliver on the promise of 5G, the Cloud and the Internet of Things. [http://nokia.com](http://nokia.com)

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