

## **Wireless Communications Antenna Sites**

A Motorola Report on the Importance of Infrastructure in the Information Age

June 2006

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Since the beginning of commercial mobile phone services in the early 1980s, dramatic growth in the use of wireless communications has exceeded all expectations.

At the dawn of the cellular wireless age, experts at a leading telecommunications company forecasted 900,000 users by the year 2000. As it turned out, that milestone was reached 13 years before its predicted time. Today, there are estimated to be more than two billion wireless phone subscribers around the world.

As impressive as those numbers may be, subscriber statistics alone do not accurately reflect the extent to which wireless voice and data networks have become indispensable tools of everyday life, whether serving public safety, personal convenience or other needs for mobility in today's fast-paced world. As demonstrated time and again in place after place around the world, wireless communications technologies provide a crucial electronic lifeline in emergency situations where conventional phone service is disrupted or overloaded. At a more personal level, wireless devices offer an important level of comfort for families.

The public benefits are indisputable. But whether they come from wireless phones, police radios, emergency medical systems, pagers or mobile offices, those benefits can be enjoyed only if adequate network infrastructure – consisting of base stations and antenna sites that transmit, receive and relay radio signals – is in place to assure that vital communications services are provided on a reliable basis to meet consumer or public needs.

More infrastructure is a consequence of more demand for wireless services. More base station sites are needed to accommodate new systems, improve coverage areas and provide quality service to more users at the same time. Smaller service areas permit reductions in the size and operating power levels of these transmission facilities. That, in turn, results in reductions in the operating (emitted) power levels of handheld mobile phones with implications for extended battery life and enhanced network capacity.

In high-density/slow-moving traffic areas such as commercial premises, convention centers and hospitals, lower-power "microcells" and "picocells" provide efficient localized service while reducing handset operating powers by as much as one hundred times. Microcells and picocells are small base stations designed to provide capacity and coverage to specific areas. They can accommodate demand for service in hospitals, airports, shopping centers, office buildings and other locations or to prevent service gaps in such hard-to-reach places as underground transit systems, traffic tunnels, parking garages and urban canyons.

Future demand for wireless communications services will require more base station sites. Network operators have adopted various practices in some countries to minimize the visual and other impacts of these transmission facilities.

Motorola supports cooperative solutions to public questions that could impede the deployment of wireless communications networks.

### **Wireless Telephone Systems Operate at Low Power Levels**

Wireless telephony, like two-way radio and other portable wireless systems, relies on relatively low-power radio waves to communicate over networks that receive and relay their signals over wireless and conventional (landline) telephone systems. "Cellular phones" were so named because their service networks were divided into distinct coverage areas – known as 'cells' –

that depend in geographic size on the local terrain and capacity needs of the system.

In dense urban areas, individual cell sites may be quite small. As described above, microcell and picocell systems – operating at even lower power levels, often to meet the specific needs of smaller, dedicated service areas – can be used to assure coverage in office buildings, hospitals or other locations.

Each cell is served by a low-power radio transmitter and receiver, usually located near the center of each area. When a call is made from a mobile phone, its radio signal reaches the nearest base station for routing to another phone or back into the regular landline (wireline) telephone system. As the user moves from cell to cell, the call automatically is transferred from one coverage area to the next. This "hand off" from one cell to another provides seamless service to the user and helps meet design and performance demands to keep power levels as low as effectively possible.

### **Safety Standards Protect the Public**

Most wireless communications networks receive and broadcast their signals from rooftop or tower-mounted antennas. RF exposure, as expressed by power density, decreases rapidly with distance. Because these transmitters operate at relatively low power, a distance of 10 feet (3 meters) or more in front of an operating rooftop antenna often can assure compliance with established safety guidelines. This separation distance will vary depending on the number of antennas at the site and the strength of their transmitted signals. Signage, physical restrictions or other measures typically prevent direct access to operating antennas located atop towers or rooftops and help ensure that established exposure limits are respected.

Exposures at ground level and in public areas are far lower. Measurements have shown that public exposures near wireless phone antenna sites often are hundreds if not thousands of times below the limits established by independent international organizations for safe human exposure to radio waves.

The establishment of safety guidelines is carried out by different entities linked by common judgment of what science has shown about the possible health effects of radio waves. The process begins with agreement on an intensity level below which exposure to radio waves has not been shown to cause adverse health effects. This evaluation considers all published research on thermal (heating) effects, as well as studies of possible non-thermal effects. After the establishment of the presumed threshold for effects, additional 10- to 50-fold reductions are applied to set exposure limits assumed to assure safety for workers and the public. The protection afforded by existing safety guidelines has been affirmed time and again by government agencies, public health authorities and scientific expert panels around the world.

## **Conclusion**

The information revolution is improving our quality of life and extending new opportunities to people around the world. It will continue to do so only if the necessary facilities are in place to deliver these life-saving and life-improving services to the public, for the benefit of users and non-users alike. As wireless communications networks expand around the world, the public can be confident that compliance with rigorous, science-based standards supports the safety of these systems and the benefits they provide.

## **For more information:**

International Commission on Non-Ionizing Radiation Protection  
<http://www.icnirp.de>

World Health Organization -- International EMF Project  
<http://www.who.int/inf-fs/en/fact193.html>

U.S. Federal Communications Commission  
<http://www.fcc.gov/oet/rfsafety>

Dr. John E. Moulder  
Medical College of Wisconsin  
<http://www.mcw.edu/gcrc/cop/cell-phone-health-FAQ/toc.html>

June 2006

## **About Motorola**

*Motorola is known around the world for innovation and leadership in wireless and broadband communications. Inspired by our vision of Seamless Mobility, the people of Motorola are committed to helping you get and stay connected simply and seamlessly to the people, information, and entertainment that you want and need. We do this by designing and delivering "must have" products, "must do" experiences and powerful networks -- along with a full complement of support services. A Fortune 100 company with global presence and impact, Motorola had sales of US \$36.8 billion in 2005. For more information about our company, our people and our innovations, please visit [www.motorola.com](http://www.motorola.com).*