

# Cell site

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A **cell site** is a site where antennae and electronic communications equipment are placed to create a cell in a cellular network for the use of mobile phones. A cell site is composed of a tower or other elevated structure for mounting antennae, and one or more sets of transmitter/receivers transceivers, digital signal processors, control electronics, a GPS receiver for timing (for CDMA2000 or IS-95 systems), regular and backup electrical power sources, and sheltering.

Cell sites are connected via copper facilities, optical fiber, or microwave. Copper facilities deliver (T1s or E1s), while microwave and optical fiber can offer T3s or Ethernet in addition to T1s or E1s. While copper facilities and optical fiber are usually provided usually as part of a service from the incumbent telephone company, microwave can be self-built by the mobile telephone company. Whatever the connection, the next elements in the mobile telephone network are Base Station Controllers (BSCs) and Radio Network Controllers (RNCs) at the mobile telephone switching office (MTSO). The base station controller is connected to a telephone switch, which is connected to the public switched telephone network (PSTN), while the Radio Network Controller handles 3G service, and is connected to Serving GPRS Support Node (SGSN), which is in turn connected to a data network, a telephone switch, or both.

Synonyms for "cell site" include "cell tower" (although many cell site antennae are not mounted on towers), and "mobile phone mast" (British English). "Base station" is sometimes used as a synonym as well, but this overlooks the increasing co-location of multiple mobile operators, and therefore multiple base stations, at a single cell site. Depending on an operator's technology choices, even a cell site hosting one mobile operator may house multiple base stations, each to serve a different air interface technology (TDMA or GSM, for example).

A controversial issue is whether there is a correlation between radio transmission and the risk of cancer. Safety regulations exist to protect the public from extensive exposure to radio waves emitted by cell sites.

## Cell Site Range

The working range of a cell site - the range within which mobile devices can connect to it reliably is not a fixed figure. It will depend on a number of factors, including

- The type of signal in use (i.e. the underlying technology), similarly to the fact that AM radio waves reach further than FM radio waves.
- The transmitter's rated power.
- The transmitter's height.
- It may also be limited by local geographical or regulatory factors and weather conditions.

Generally, in areas where there are enough cell sites to cover a wide area, the range of each one will be set to:



A cleverly mounted base station on top of a Electricity pylon.

- Ensure there is enough overlap for "handover" to/from other sites (moving the signal for a mobile device from one cell site to another, for those technologies that can handle it - e.g. making a GSM phone call while in a car or train).
- Ensure that the overlap area is not too large, to minimise interference problems with other sites.

The *maximum* range of a site (where it is not limited by interference with other sites nearby) depends on the same circumstances. Some technologies, such as GSM, have a fixed maximum range of 35 km, which is imposed by technical limitations. CDMA and iDEN have no built-in limit, but the real limiting factor is really the ability for a low-powered personal cell phone to transmit back to the cell site. As a rough guide, based on a tall site and flat terrain, it is possible to get between 50 and 70 kilometers. When the terrain is hilly, the maximum distance can vary from as little as 5 to 10 km to about 40 km. [1] (<http://www.arcx.com/sites/faq.htm>)

In practice, cell sites are grouped in areas of high population density, with the most potential users. Cell phone traffic through a single cell site is limited by the site's capacity (there is a finite number of calls that a site can handle at once), and this limitation is another factor affecting the spacing of cell sites. In suburban areas, sites are commonly spaced 2-3 km apart, and in dense urban areas, sites may be as close as 500-1000 meters apart.

## External link

- FCC: Information On Human Exposure To Radio frequency Fields From Cellular and PCS Radio Transmitters (<http://www.fcc.gov/oet/rfsafety/cellpcs.html>)

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