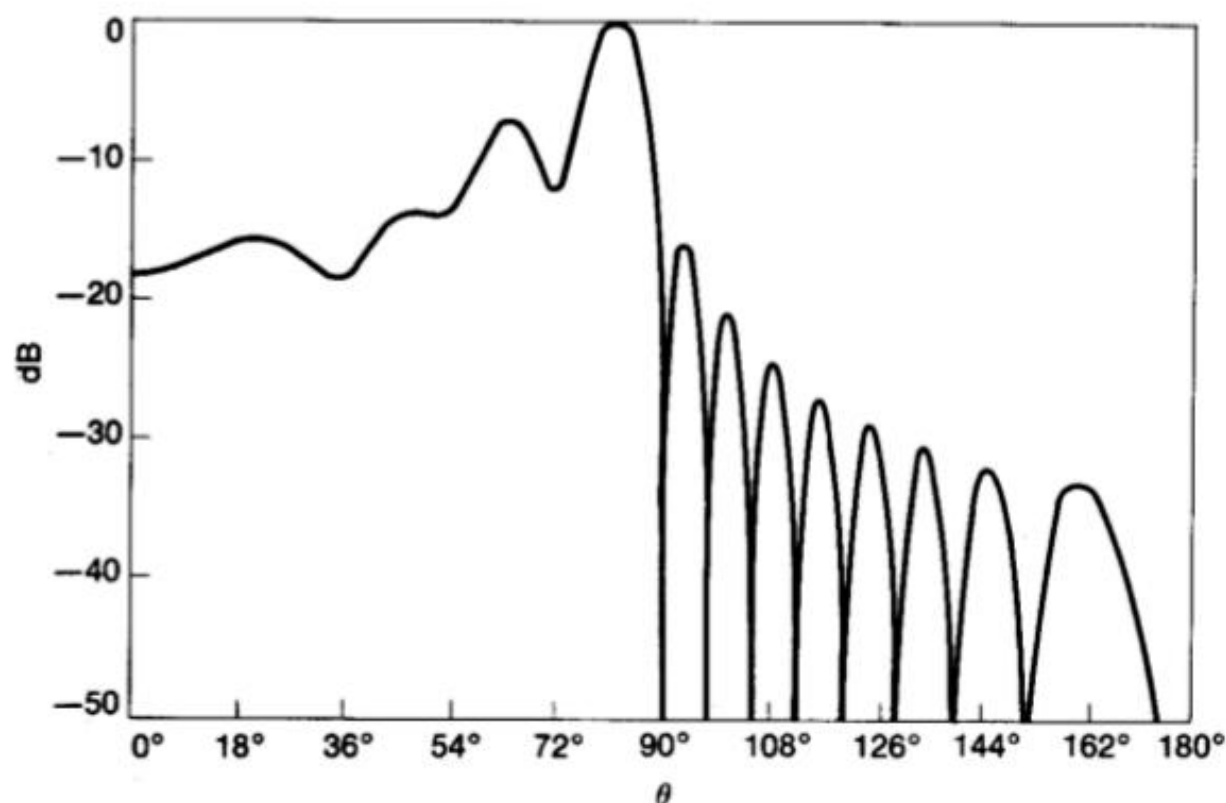
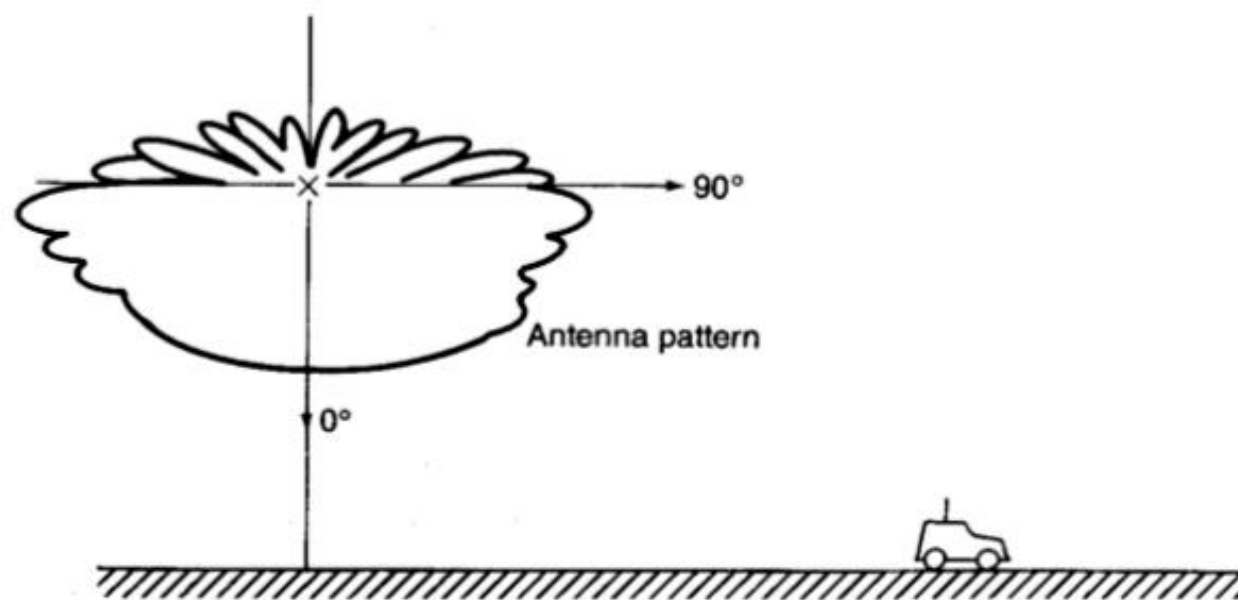


5.4.1 For coverage use— omnidirectional antennas

High-gain antennas. There are standard 6-dB and 9-dB gain omnidirectional antennas. The antenna patterns for 6-dB gain and 9-dB gain are shown in Fig. 5.7.



Null-Filled Cosecant Squared Pattern



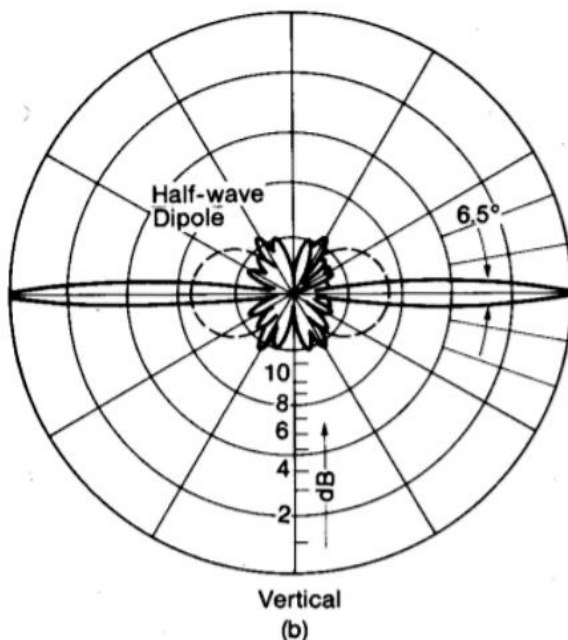
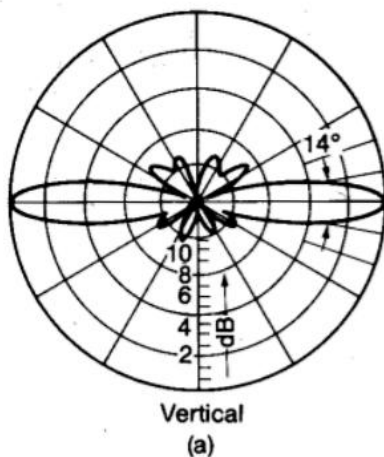


Figure 5.7 High-gain omnidirectional antennas (reprinted from *Kathrein Mobile Communications Catalog*). Gain with reference to dipole: (a) 6 dB; (b) 9 dB.

Start-up system configuration. In a start-up system, an omniscell, in which all the transmitting antennas are omnidirectional, is used. Each transmitting antenna can transmit signals from 16 radio transmitters simultaneously using a 16-channel combiner. Each cell normally can have three transmitting antennas which serve 45 voice radio transmitters* simultaneously. Each sending signal is amplified by its own channel amplifier in each radio transmitter, then 16 channels (radio signals) pass through a 16-channel combiner and transmit signals by means of a transmitting antenna (see Fig. 5.8a).

* The combiner is designed for combining 16 voice channels. However, the cellular system divides its 312 voice channels into 21 sets; each set consists of only about 15 voice channels. Therefore the dummy loads have to be put on some empty ports of a 16-channel combiner.

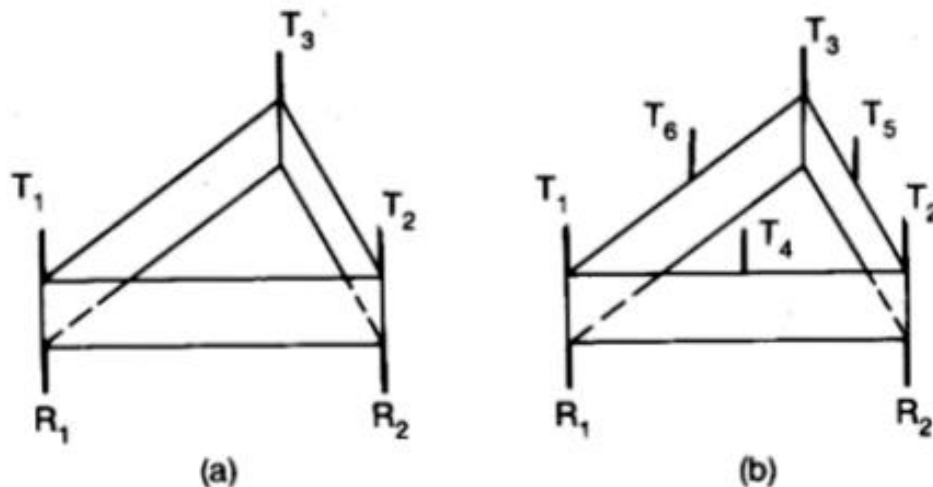


Figure 5.8 Cell-site antennas for omniceils: (a) for 45 channels; (b) for 90 channels

Two receiving antennas commonly can receive all 45 voice radio signals simultaneously. Then in each channel, two identical signals received by two receiving antennas pass through a diversity receiver of that channel. The receiving antenna configuration on the antenna mast is shown in Fig. 5.8. The separation of antennas for a diversity receiver is discussed in Sec. 5.5.

Abnormal antenna configuration. Usually, the call traffic in each cell increases as the number of customers increases. Some cells require a greater number of radios to handle the increasing traffic. An omnicell site can be equipped with up to 90 voice radios. In such cases six transmitting antennas should be used as shown in Fig. 5.8b. In the meantime, the number of receiving antennas is still two. In order to reduce the number of transmitting antennas, a hybrid ring combiner which can combine two 16-channel signals is found.¹⁰ This means that only three transmitting antennas are needed to transmit 90 radio signals. However, the ring combiner has a limitation of handling power up to 600 W with a loss of 3 dB.