

# FACT SHEET NO. 2

## CELLULAR TELEPHONES

### 1. How Cell Phones Work

A cell phone is really a very sophisticated two-way radio which uses assigned radio frequencies in the Electromagnetic Spectrum to communicate. It gets its name from the fact that the cellular service provider divides a city, or a country such as Barbados, into small sections called cells. Each cell has a base station which consists of an antenna mounted on a tower and a small building which contains the radio equipment. Since cell phones and base stations use low-power transmitters, the same frequencies can be reused in non-adjacent cells. This makes for a much more efficient use of the radio spectrum.

The Telecommunication Unit, in the Ministry responsible for Telecommunications, allocates frequencies in the radio spectrum. It also has the responsibility to ensure that the communication channels are free of interference and the radio frequency (RF) emissions do not surpass the acceptable standards for public safety.

### **Moving from Cell to Cell**

Both the cell phone and the base station have low power transmitters, hence the transmission from the phone in a particular cell does not go very far outside of the cell. When a phone user turns on his cell phone, the receiver listens for a System Identification Code (SID) on the control channel. The control channel is a special frequency that the phone and base station use to talk to one another about things like call set up and channel changing. If the phone cannot find any control channel, it knows that it is out of range and displays a "no service" message. When it receives the correct SID, it knows that it is in its home system and sends a signal to the Mobile Telephone Switching Office (MTSO). This signal updates the database at the MTSO and allows the MTSO to know which cell the phone user is in when it wants to call the user.

When the MTSO receives a call for the user, it looks into its database to find out which cell he is in and selects the pair of frequencies that it will communicate with the cell phone and sends this information via the control channel to the user's cell phone. The tower and the phone switch to these frequencies. The user is talking on the cell phone – as if it were a sophisticated two-way radio.

As the user approaches the edge of the cell, the base stations which are constantly monitoring the signal strength on all the frequencies, will notice that the signal strength is diminishing in one cell and increasing in the cell that the user is approaching. At some predetermined signal strength level, the MTSO coordinates the hand-off from the weaker

cell to the stronger cell by sending a signal via the control channel to tell the cell phone to switch to the new frequencies for that cell. As the user drives through several cells, the process is repeated seamlessly.

## **2. Cellular Access Technologies**

The three most common technologies used by cell phones networks to transmit information are: -

**FDMA – Frequency Division Multiple Access.** This is FDMA is the least efficient and is hardly used in today's spectrum-scarce world.

**TDMA – Time Division Multiple Access.** TDMA is a technology and which is mainly used with digital transmission. It splits the band into three time slots and assigns each call a certain portion of time on the designated frequency. TDMA forms the backbone of the Global System for Mobile Telecommunications.

**CDMA – Code Division Multiple Access.** CDMA makes the most efficient use of the spectrum. It digitizes voice signal, gives a unique code to each call and spreads it over the available frequencies. In effect, everyone can talk at the same time.

## **3. Latest Features of Cell Phones**

**Roaming** is a service that allows customers to use cellular service while traveling outside their home service area. Roaming requires an agreement between cellular operators in different countries.

**Wireless Internet** enables users to access the Internet content via their cell phones. It is also known as "Wireless Web".

**E-mail Capability** the ability for a mobile phone to send and receive e-mail.

**GPS (Global Positioning System).** This service added to the phone allows the user to determine his latitude and longitude. By triangulation of signals from three of the satellites, the phone unit can pinpoint its current location anywhere on earth to within a few meters.

**SMS (Short Message Service)** A messaging service that allows short text messages, typically in the region of 120 characters, to be sent between mobile devices.

**3G (Third Generation Wireless)** a term used to describe the next generation of wireless technology which will provide users with high speed data transmissions.

**GSM (Global System for Mobile Telecommunications)** is the Pan European system used by over 179 countries worldwide. This system will be used by Cable and Wireless and the new entrants. GSM provides a platform for roaming.

**GPRS (General Packet Radio System)** is an enhancement to GSM which enable high speed Internet Access. This is known as 2.5G cellular.

#### **4. Future**

The International Telecommunications Union (ITU) has not yet determined the technology to be used for cellular service beyond 3G. Some operators are using GSM and some CDMA. A decision is expected soon.

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