Mobile Satellite Notes for SDMA

If we talk about a common medium, where multiple signals are present at the same time. It is very difficult to provide **interference free** transmission.

Interference: When two or more signals have the same frequency & they are present at the same time in the same medium, they will overlap with each other. This will change their signal strength abruptly.

So, how can we provide interference free transmission?

Solution is **multiple access technique.**

The main idea is to provide the interconnection of multiple users which are present in the common medium at the same time in the interference free environment.

We can use channelization.

Channelization is to divide common physical medium, so that we can provide interference free environment for multiple users.

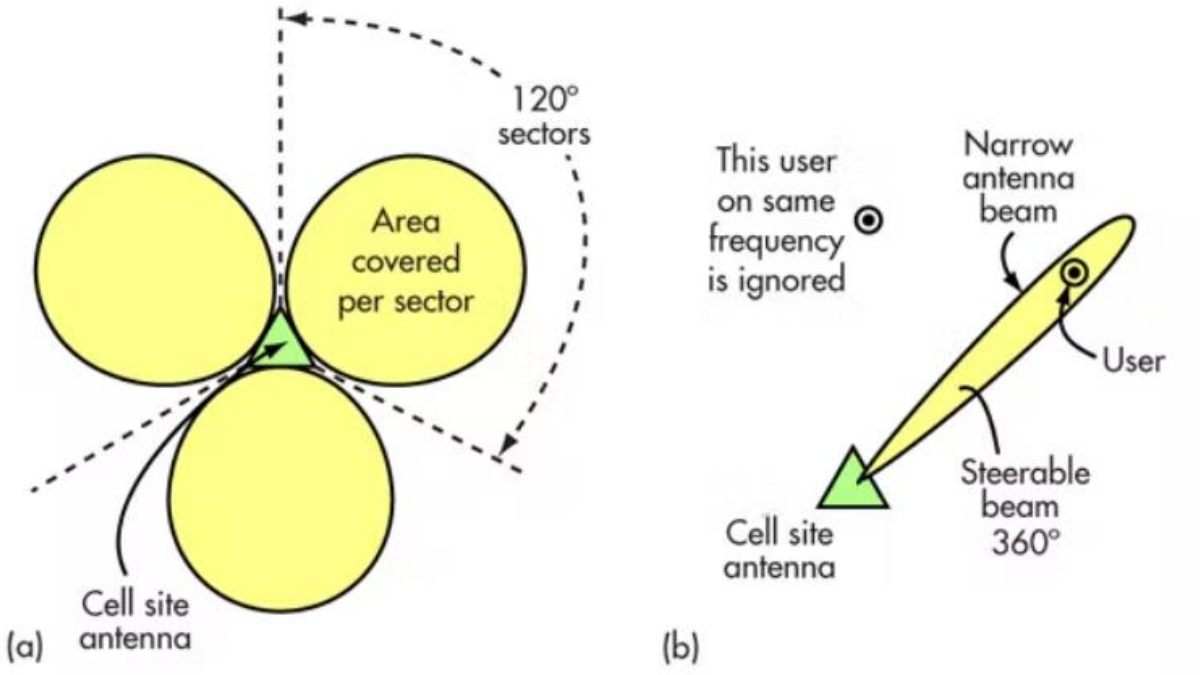
Types of channelization.

- FDMA (Frequency Division Multiple Access)
- TDMA (Time Division Multiple Access)
- CDMA (Code Division Multiple Access)
- **SDMA (Space Division Multiple Access)**

SDMA (Space Division Multiple Access)

- No two user should transmit in the same space.
- It depends on the user position information and provides users access to the communication channel based on their spatial locations.
- A single channel may be used simultaneously, if the users are spaced far enough from one another to avoid interference. This is known as frequency reuse.
- Traditionally cellular base stations radiate power in all directions, because they have no information about where the mobile device is located. This wastes power and causes interference to adjacent cells, as well as making it harder to distinguish weaker incoming signals from among the noise and interference.

- By using smart antenna technology to track the spatial location of mobile devices, the radiation pattern of the base station can be adjusted to optimize both transmission & reception for each user device.
- By rapidly adjusting the phase of signals from several antennas, the base signals from several antennas, the base station can effectively steer a beam or spot of RF power to or from each user.



6. SDMA separates users on shared frequencies by isolating them with directional antennas. Most cell sites have three antenna arrays to separate their coverage into isolated 120° sectors (a). Adaptive arrays use beamforming to pinpoint desired users while ignoring any others on the same frequency (b).

Features of SDMA

- It is completely free from interference.
- Can control the medium access for a wireless network.
- Controlled radiated energy for each user in space.
- All user can communicate at the same time using the same channel.
- It can track the moving user.
- It is never used in isolation.

Advantages of SDMA

- Increases the capacity and speed of the system.
- Increases transmission quality by focusing the signal into narrow transmission beams.
- Free from interference.
- All users can communicate at the same time using the same channel.
- Two different signals can use the same frequency.
- It minimizes system cost.
- Increases the range.

Disadvantages of SDMA

- Very expensive
- Complicated to construct and design.
- Perfect adaptive antenna system: infinitely large antenna needed.