Multiple Access Techniques for Wireless Communication

FDMA
TDMA
SDMA
PDMA

A Presentation by Schäffner Harald

Space Division Multiple Access

- Controls radiated energy for each user in space
- using spot beam antennas
- base station tracks user when moving
- cover areas with same frequency:
- TDMA or CDMA systems
- cover areas with same frequency:
- FDMA systems

Space Division Multiple Access

- primitive applications are "Sectorized antennas"

- in future adaptive antennas simultaneously steer energy in the direction of many users at once
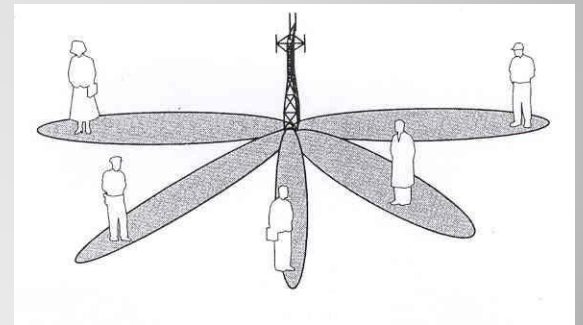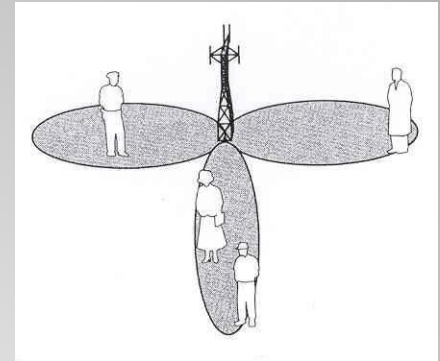
Reverse link problems

- general problem
- different propagation path from user to base
- dynamic control of transmitting power from each user to the base station required
- limits by battery consumption of subscriber units
- possible solution is a filter for each user

Solution by SDMA systems

- adaptive antennas promise to mitigate reverse link problems
- limiting case of infinitesimal beamwidth
- limiting case of infinitely fast track ability
- thereby unique channel that is free from interference
- all user communicate at same time using the same channel

Disadvantage of SDMA

- perfect adaptive antenna system: infinitely large antenna needed
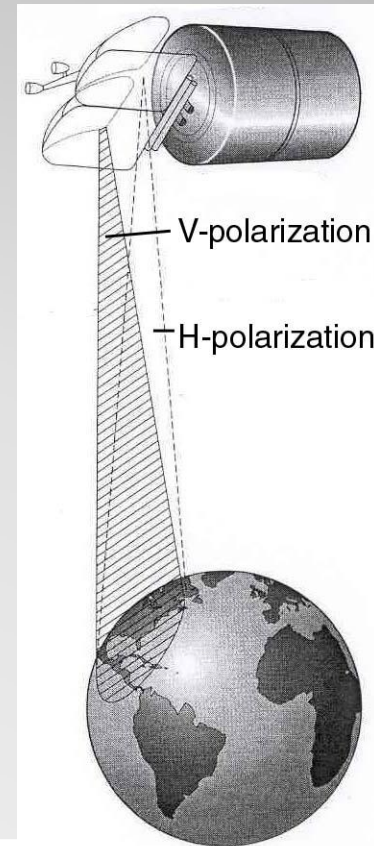- compromise needed

SDMA and PDMA in satellites

- INTELSAT IVA
- SDMA dual-beam receive antenna
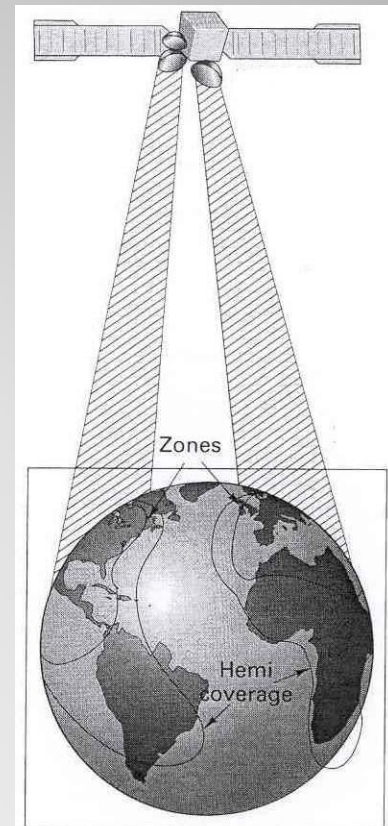- simultaneously access from two different regions of the earth
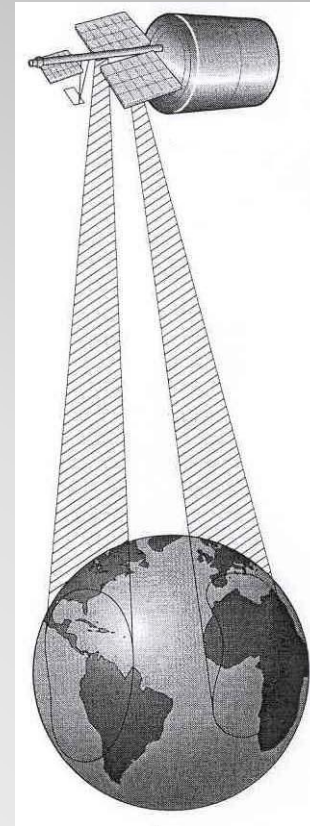
SDMA and PDMA in satellites

- COMSTAR 1
- PDMA
- separate antennas
- simultaneously access from same region

V-polarization
H-polarization

SDMA and PDMA in satellites

- INTELSAT V
- PDMA and SDMA
- two hemispheric coverages by SDMA
- two smaller beam zones by PDMA
- orthogonal polarization

Capacity of Cellular Systems

- channel capacity: maximum number of users in a fixed frequency band
- radio capacity : value for spectrum efficiency
- reverse channel interference
- forward channel interference
- How determine the radio capacity?