



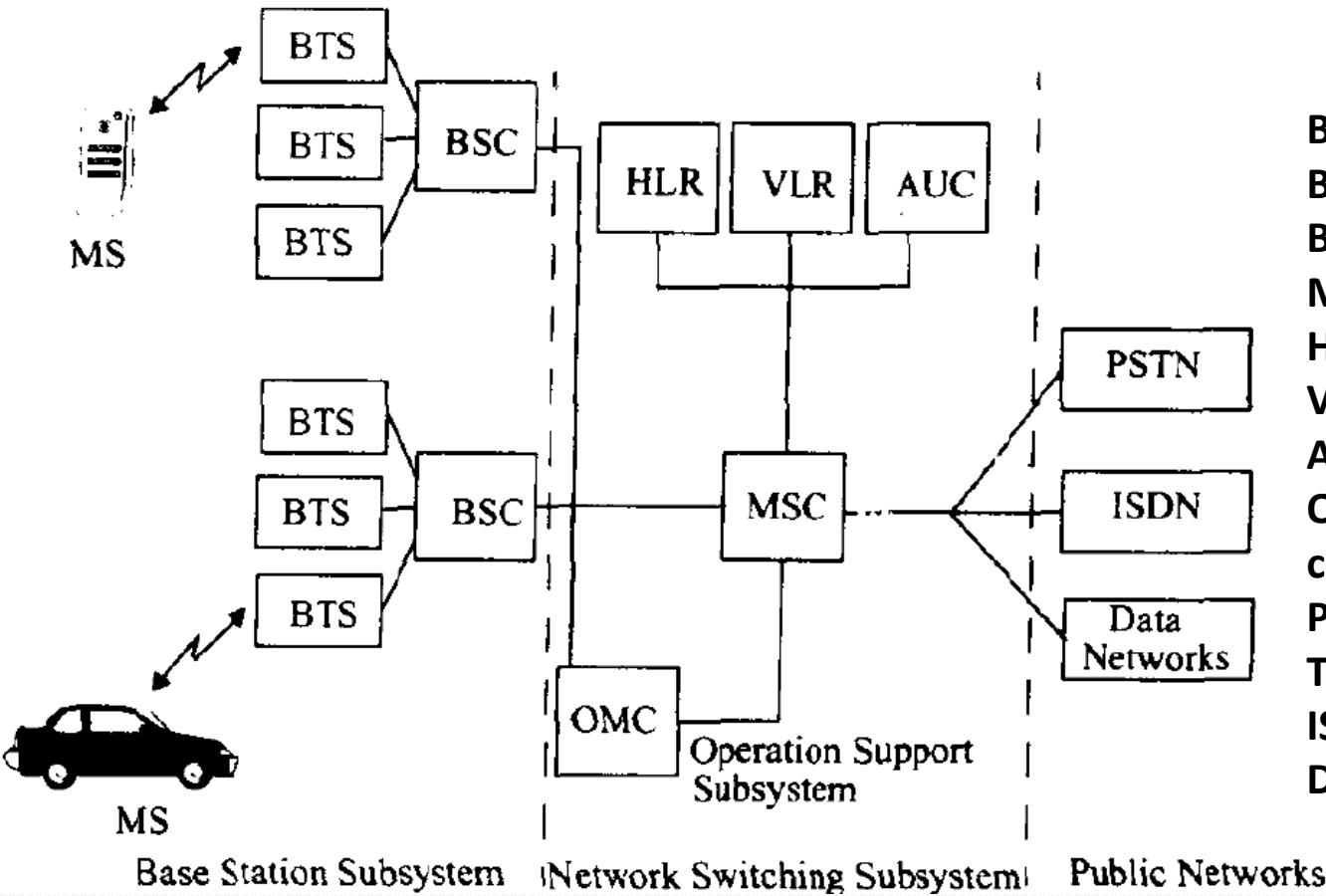
**GSM**

# Global System for Mobile Communication (GSM)

- First introduced in 1991 in Europe
- Radiolinja Oy was the first commercial company to offer services to the user in Finland in 1992.
- In 1992, GSM got its new name from the previous French name Groupe Special Mobile !

# GSM Architecture

Three basic subsystems – BSS, NSS, OSS



**BS=Base Station**

**BTS=Base Transceiver Station**

**BSC=Base Station Controller**

**MSC=Mobile Switching Center**

**HLR=Home Location Register**

**VLR=Visitor Location Register**

**AUC=Authentication Center**

**OMC=Operation Maintenance center**

**PSTN=Public Switched Telephone Network**

**ISDN=Integrated Services Digital Network**

**Data Networks**

# BSS

- BSS manages the radio interface between the mobile station and the other subsystem. It consists of radio transmitters, receivers and the antenna system required to provide the coverage area for one cell.
- Each BSS consists of many BSCs and each BSC in turn can control hundreds of BTSSs.
- Records and passes the Signal strength measurements to the BSC

# MS

- The Mobile Equipment is said to be a Mobile Station if the Subscriber Identity Module ( SIM Card ) is added to it.

$$\mathbf{MS = ME + SIM}$$



+



- The SIM card contains a processor and memory that stores
  - International Subscriber Identity Module (IMSI)
  - The Authentication and ciphering keys
  - Message and phone numbers

# BSC

- Manages the Radio Communication with the mobile station over the air interface
- Controls the handover of calls in progress Between BTSs
- Supervises the transmission network and the operation of each BTS

# NSS

- NSS manages the switching functions of the system and allows the MSCs to communicate with other networks like PSTN, ISDN
- MSC is the central unit of NSS and controls the traffic among all the BSCs
- NSS has three major databases
  - HLR
  - VLR
  - AUC

# MSC

- Supervises Base Station Controller(s) BSC(s).
- Switches calls to/from mobile subscribers.
- Records charging and accounting details
- Provides the gateway functionality to other networks.

# HLR

- The HLR is a centralized network database that stores and manages all mobile subscriptions belonging to a specific operator.
- It acts as a permanent store for a person's subscription information until that subscription is canceled. The information stored includes:
  - Subscriber identity
  - Subscriber supplementary services
  - Subscriber location information
  - Subscriber authentication information

# VLR

- The VLR temporarily stores subscription information so that the MSC can service all the subscribers currently visiting that MSC service area.
- When a subscriber roams into a new MSC service area, the VLR connected to that MSC requests information about the subscriber from the subscriber's HLR.
- The HLR sends a copy of the information to the VLR and updates its own location information. When the subscriber makes a call, the VLR will already have the information required for call set-up.

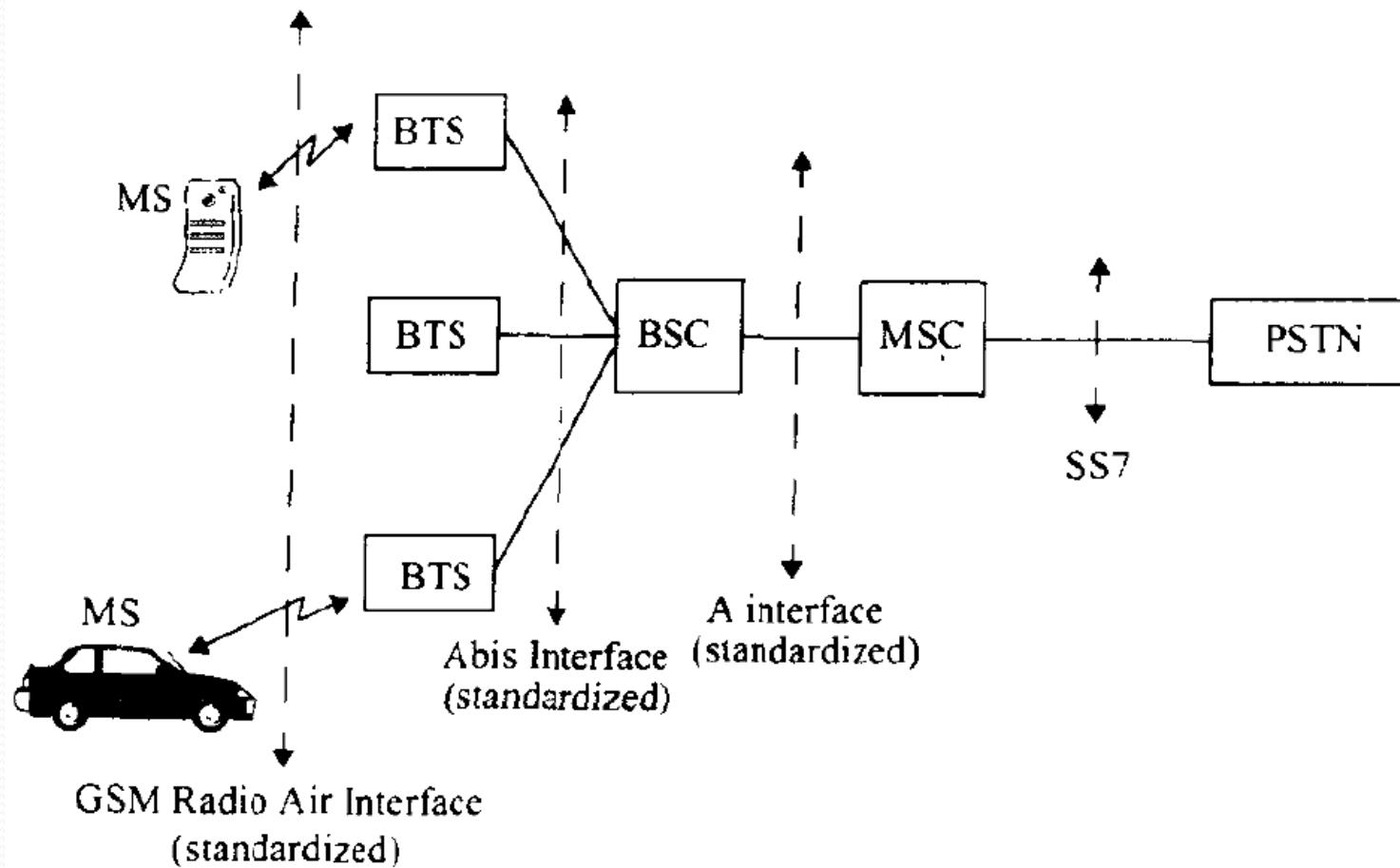
# AUC

- The main function of AUC is to authenticate the subscribers attempting to use the network. In this way, it is used to protect network operators against fraud.
- The AUC is a database connected to the HLR which provides it with the authentication parameters and ciphering keys used to ensure network security.

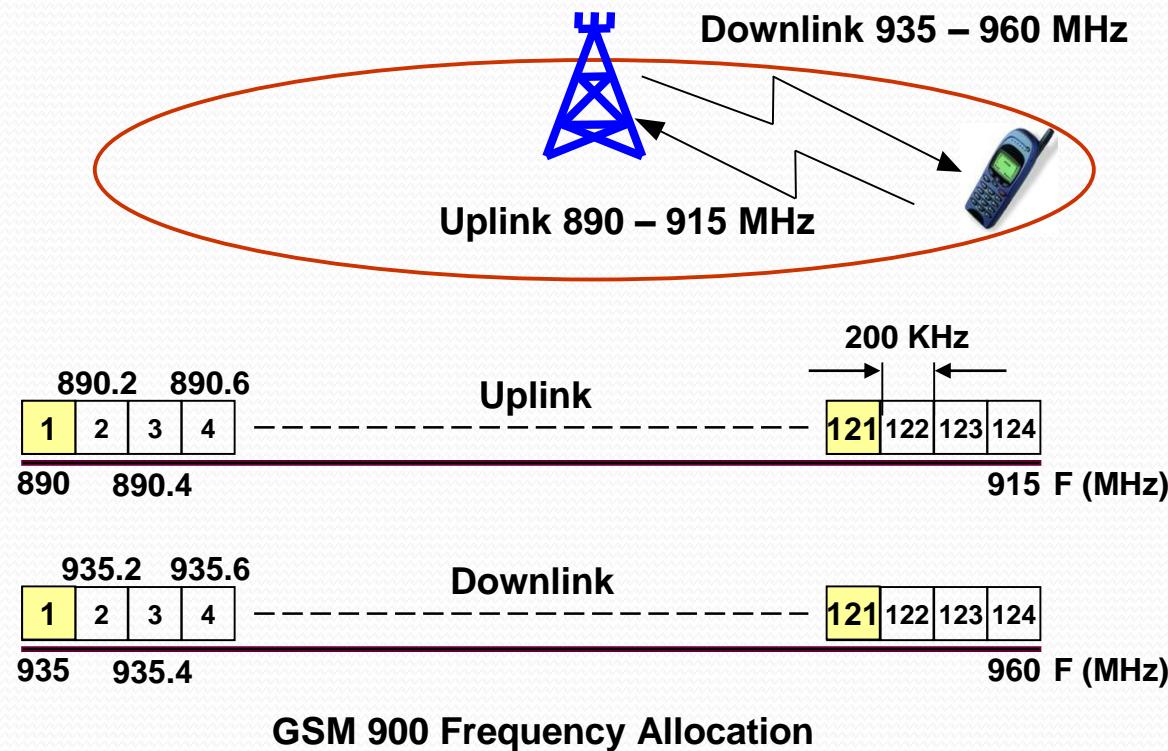
# OSS

- OSS supports the operation and maintenance of the system and allows the system engineers to monitor, diagnose and troubleshoot all aspects of GSM systems
- It maintains the performance of MS, BTS, BSC and MSC. It has three main functions:
  - Maintain all network operation
  - Manage the charging and billing procedures
  - Manage all mobile stations in the system

# Interfaces used in GSM

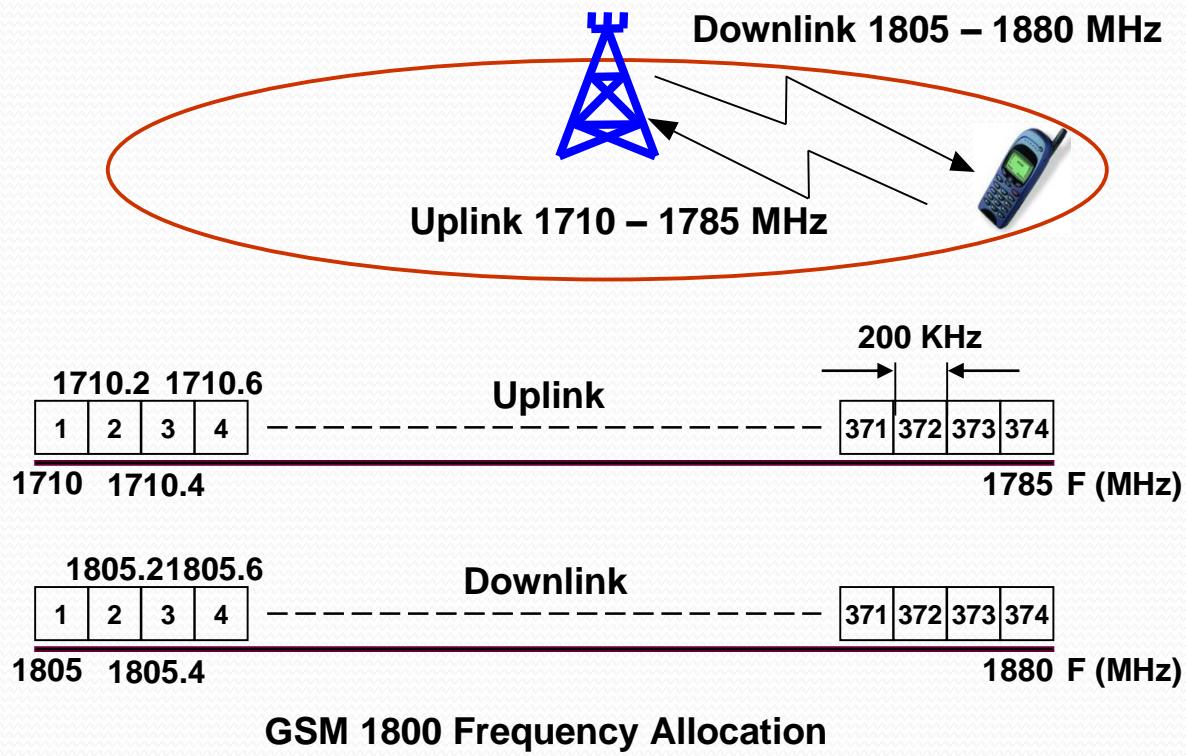


# Spectrum Allocation (GSM 900)

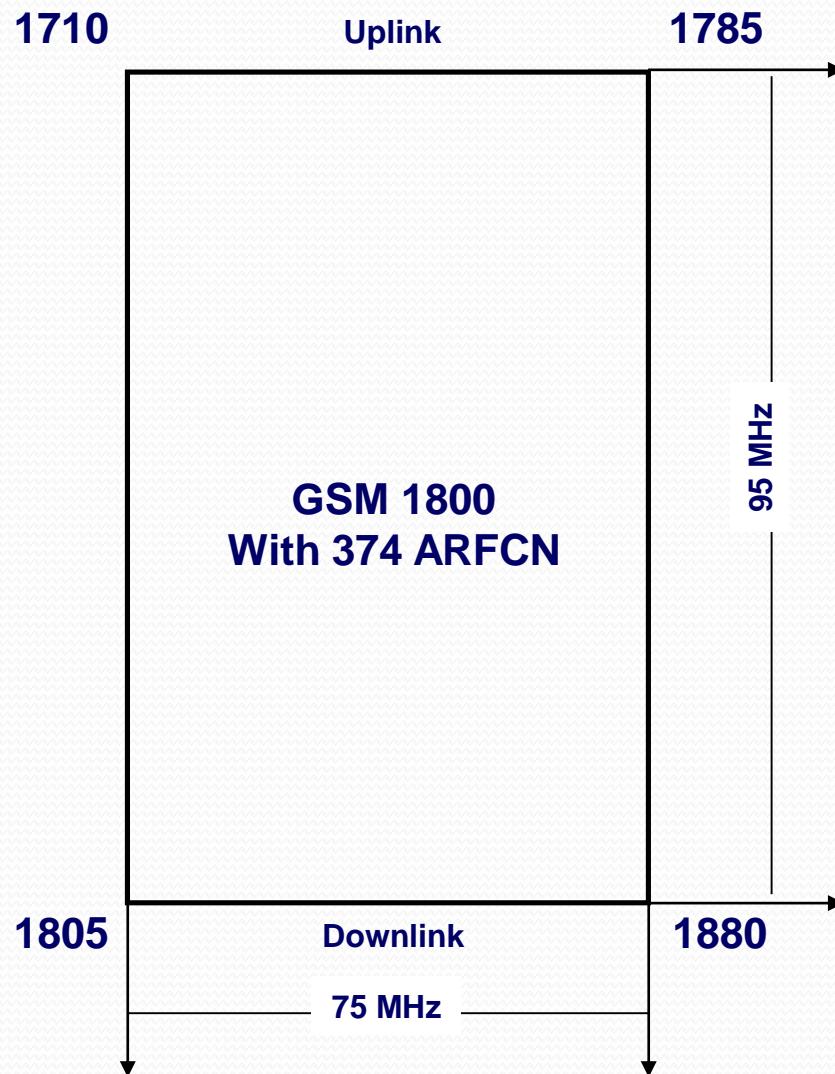
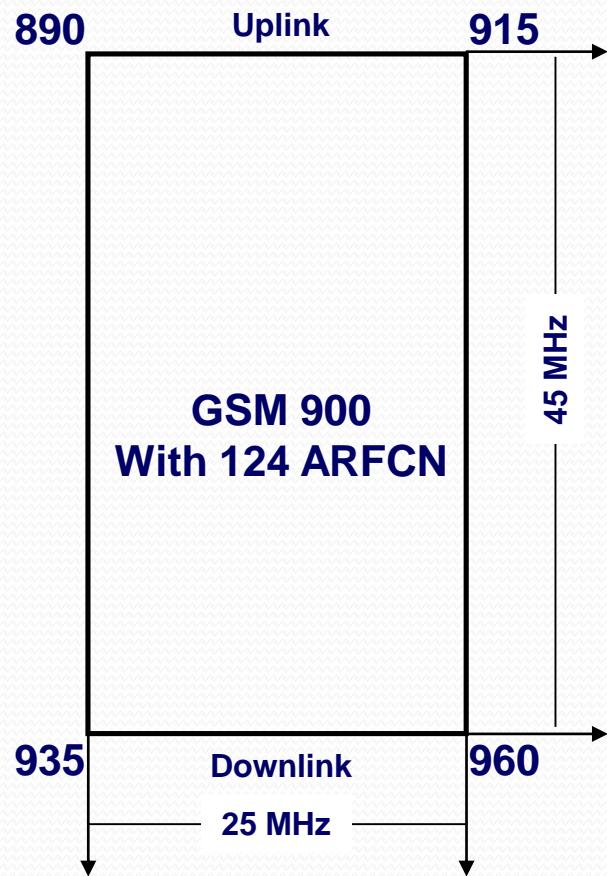


**ARFCN** Absolute Radio Frequency Channel Number

# Spectrum Allocation (GSM 1800)



# Comparison



# Reference

- Wireless Communication Principles and Practice
  - Theodore S. Rappaport