(iii) Enable a fixed number of channels to serve an arbitrarily large number of users by reusing the channel throughout the coverage region.

(iv) Communication is always between mobile and base station (not directly between mobiles).

(v) Keeping interference levels within tolerable limits.

Disadvantages:

The disadvantages of cellular systems are,

(i) It offers less data rate compare to wired networks.

(ii) It requires higher cost in order to setup cellular network infrastructure.

(iii) Additional training needs:

Staff may need instructions and training on how to use new technology.

(iv) More security needed.

3.2 GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS (GSM)

3.2.1 Introduction

- The ***Global System for Mobile Communications (GSM)*** is an ETSI standard for 2G PAN(Personal Area Network) – European digital cellular with international roaming.
- GSM is the most successful digital mobile telecommunication system in the world today. It is used by over 800 million people in more than 190 countries.
- This is a typical second generation (2G) system, replacing the first generation (1G) analog systems.

(1) GSM Logical Channels:

GSM specifies two basic groups of logical channels i.e.

(i) Traffic channels, and

(ii) Control channels.

(a) Traffic Channels (TCH):

- GSM uses TCH to transmit user data (e.g. voice, tax). Two type have been defined,
  - (i) Full rate TCH (TCH/F).
  - (ii) Half rate TCH (TCH/H).
- ***TCH/F*** has data rate of ***22.8 kbps*** where as ***TCH/H*** has 11.4 k transmission in GSM is possible at many different data rates.

Example: TCH/F4.8 for 4.8 kbps.

TCH/F9.6 for 9.6 kbps.

TCH/F14.4 for 14.4 kbps.

(b) Control Channels (CCH):

These are used to control medium access and allocation of traffic channe

Synchronization Need in GSM

Synchronization channel is a downlink only control channel used i cellular telephone systems. It is a part of the U_m air interface specificati purpose of the ***Synchronization Control Channel (SCHH)*** *is to all mobile station (handset) to quickly identify a nearby cell (a BT synchronize to that BTS's TDMA structures.*

When mobile turns on after getting ***Frequency Correction Channel*** *(FC waits for getting SCCH which is to synchronize mobile's oscillator freq with the frequency of the Base channel.*

3.2.2 GSM Services

- GSM permits the integration of different voice and data services an interworking with existing networks.
- GSM has defined three different categories of services as,
  - *(i) Telephone (or) Tele services,*

(ii) *Bearer (or) data services,* and

(iii) *Supplementary services.*

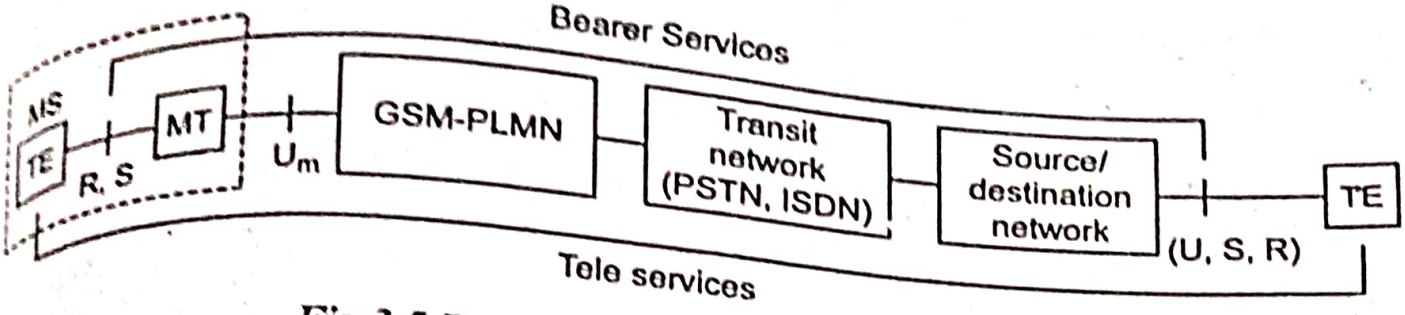

Fig 3.5 Reference model for GSM services

- Fig 3.5 shows a reference model for GSM services. A ***Mobile Station (MS)*** is connected to the GSM ***Public Land Mobile Network (PLMN)*** via the U_m interface.
- This network is now connected to transit networks, e.g., ***Integrated Services Digital Network (ISDN)*** or traditional ***Public Switched Telephone Network (PSTN).***
- An additional network ***terminal (TE)*** is connected at both the source and destination networks. Now bearer services comprise all services that enable the transparent transmission of data between the interfaces on the network. U, S, and R are the interfaces that are used based on the networks.
- Within the mobile station, the ***Mobile Termination (MT)*** performs all network specific tasks such as TDMA, FDMA, coding etc and also offers an interface for the data transmission (S) to the TE.

(1) Tele Services

- GSM mainly focuses on ***voice-oriented*** tele services. These comprises encrypted voice transmission, message services, and basic data communication with PSTN or ISDN.
- The primary goal of GSM was the provision of ***high quality digital voice transmission*** and offering bandwidth of 3.1 kHz for analog phone systems.

- Another service offered by GSM an ***emergency number***. The same nu be used throughout the country with free of charge.
- Another useful service is the ***Short Message Service (SMS)*** which o transmission of message upto ***160 characters***.
- The successor of SMS, the ***Enhanced Message Service (EMS)*** offers message size (i.e., 760 characters) and used to transfer small images a ring tones.
- It also offers ***Multimedia Message Service (MMS)*** which is transmission of larger pictures (GIF, JPG), short video clips etc.
- Another ***non-voice*** tele service is ***group 3 fax*** which is available worldw this service, fax data is transmitted as digital data over an analog tel network according to the ITU-T standards.

2) Bearer (or) Data Services

- Bearer services provide capabilities to transmit an information among network – interfaces or Access Points (APs).
- Bearer services permit both ***transparent*** and ***non – transparent,*** synchro or ***asynchronous*** data transmission.
- ***Transparent bearer services*** (i.e., GSM provides standard channel coding the user data) only use the functions of the ***physical layer (layer1)*** to tran data.
- Non-transparent bearer services (i.e., GSM offers special coding efficien based on the particular data interface) use protocols of layers ***two (data l layer) and three (network layer)*** to implement an ***error correction*** and f ***control.***
- Data transmission can be full duplex, synchronous with data rates 1.2, 2.4 and 9.6 kbits/s and for asynchronous from 300 to 9,600 bit/s.