1. Direct Broadcast satellites (DBS):

Satellites provide *broadcast* transmissions in the fullest sense of the word, because antenna footprints can be made to cover large areas of the earth.

The idea of using satellites to provide direct transmissions into the home has been around for many years, and the services pro- vided are known generally as *direct broadcast satellite* (DBS) services.

Broadcast services include audio, television, and Internet services.

1.1 Power Rating and Number of Transponders:

From will be seen that satellites primarily intended for DBS have a higher [EIRP] than for the other categories, being in the range 51 to 60 dBW. At a *Regional Administrative Radio Council* (RARC) meeting in 1983, the value established for DBS was 57 dBW (Mead,2000). Transponders are rated by the power output of their high-power amplifiers.

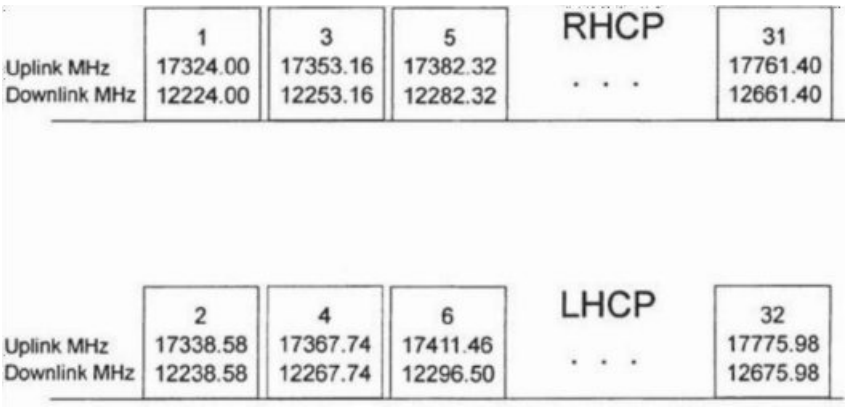
Typically, a satellite may carry 32 transponders. If all 32 are in use, each will operate at the lower power rating of 120 W.

The available bandwidth (uplink and downlink) is seen to be 500 MHz. A total number of 32 transponder channels, each of bandwidth 24 MHz, can be accommodated.

The bandwidth is sometimes specified as 27 MHz, but this includes a 3MHz guardband allowance. Therefore, when calculating bit-rate capacity, the 24 MHz value is used.

The total of 32 transponders requires the use of both *right- hand circular polarization* (RHCP) and *left-hand circular polarization* (LHCP) in order to

permit frequency reuse, and guard bands are inserted between channels of a given polarization.



1.2 Bit Rates for Digital Television:

The bit rate for digital television depends very much on the picture format. One way of estimating the uncompressed bit rate is to multiply the number of pixels in a frame by the number of frames per second, and multiply this by the number of bits used to encode each pixel.

1.3 MPEG Compression Standards:

MPEG is a group within the *International Standards Organization and the International Electrochemical Commission* (ISO/IEC) that undertook the job of defining standards for the transmission and storage of moving pictures and sound. The MPEG standards currently available are MPEG-1, MPEG-2, MPEG-4 , and MPEG-

2. Direct to home Broadcast (DTH):

DTH stands for Direct-To-Home television. DTH is defined as the reception of satellite programmes with a personal dish in an individual home.

- ✓ DTH Broadcasting to home TV receivers take place in the ku band(12 GHz). This service is known as Direct To Home service.
- ✓ DTH services were first proposed in India in 1996.
- ✓ Finally in 2000, DTH was allowed.

- ✓ The new policy requires all operators to set up earth stations in India within 12 months of getting a license. DTH licenses in India will cost $2.14 million and will be valid for 10 years.

Working principal of DTH is the satellite communication. Broadcaster modulates the received signal and transmit it to the satellite in KU Band and from satellite one can receive signal by dish and set top box.

2.1 DTH Block Diagram:

- ✓ A DTH network consists of a broadcasting centre, satellites, encoders, multiplexers, modulators and DTH receivers

- ✓ The encoder converts the audio, video and data signals into the digital format and the multiplexer mixes these signals.

It is used to provide the DTH service in high populated area A Multi Switch is basically a box that contains signal splitters and A/B switches. A outputs of group of DTH LNBs are connected to the A and B inputs of the Multi Switch.

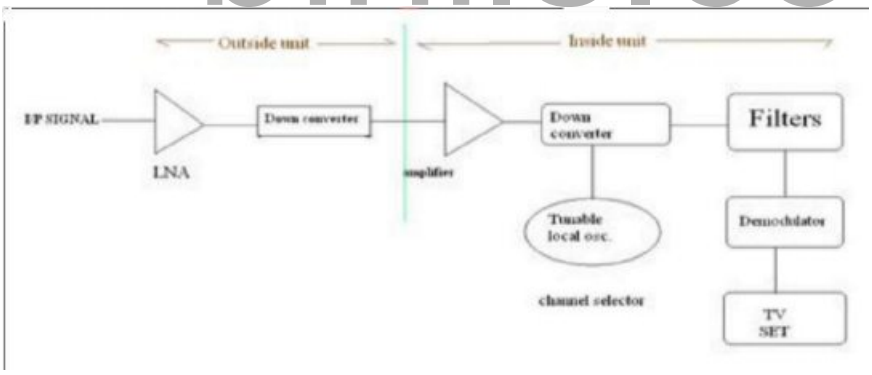


Figure DTH Service

2.2 Advantage:

- ✓ DTH also offers digital quality signals which do not degrade the picture or sound quality.

- ✓ It also offers interactive channels and program guides with customers having the choice to block out programming which they consider undesirable

- ✓ One of the great advantages of the cable industry has been the ability to provide local channels, but this handicap has been overcome by many DTH providers using other local channels or local feeds.
- ✓ The other advantage of DTH is the availability of satellite broadcast in rural and semi urban areas where cable is difficult to install.

3. Digital audio broadcast (DAB):

DAB Project is an industry-led consortium of over 300 companies

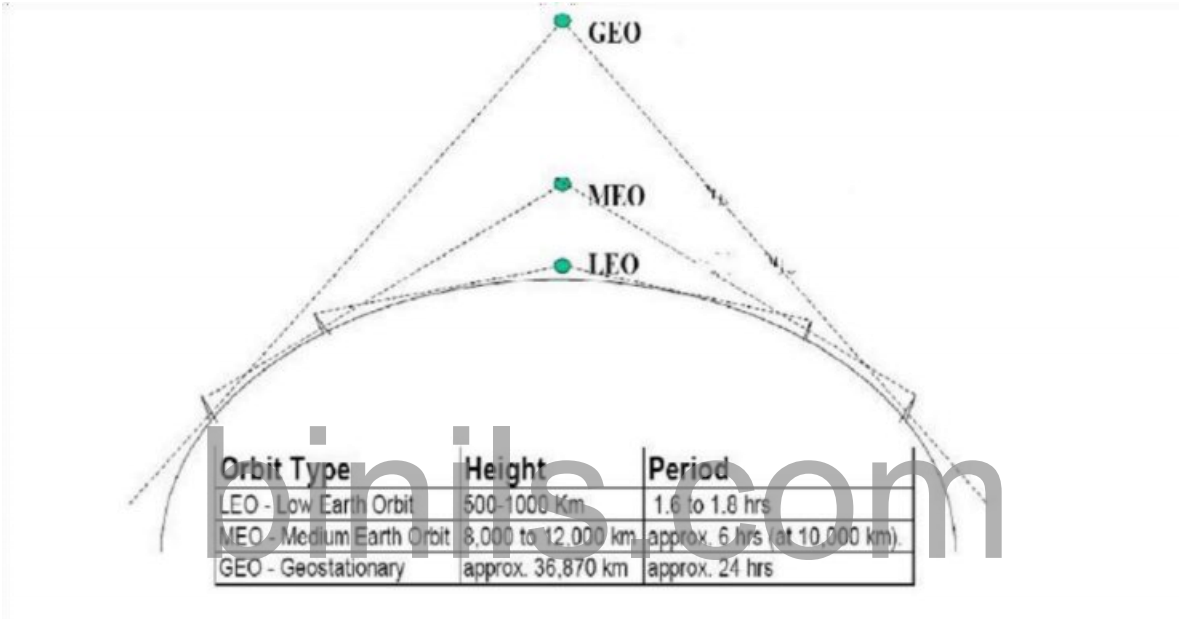
- ✓ The DAB Project was launched on 10th September, 1993
- ✓ In 1995 it was basically finished and became operational
- ✓ There are several sub-standards of the DAB standard
  - DAB-S (Satellite) – using QPSK – 40 Mb/s
  - DAB-T (Terrestrial) – using QAM – 50 Mb/s
  - DAB-C (Cable) – using OFDM – 24 Mb/s

- ✓ These three sub-standards basically differ only in the specifications to the physical representation, modulation, transmission and reception of the signal.
- ✓ The DAB stream consists of a series of fixed length packets which make up a Transport Stream (TS). The packets support ‘streams’ or ‘data sections’.
- ✓ Streams carry higher layer packets derived from an MPEG stream & Data sections are blocks of data carrying signaling and control data.
- ✓ DAB is actually a support mechanism for MPEG.& One MPEG stream needing higher instantaneous data can ‘steal’ capacity from another with spare capacity.

1. LEO: Low Earth Orbit satellites have a small area of coverage. They are positioned in an orbit approximately 3000km from the surface of the earth

- They complete one orbit every 90 minutes
- The large majority of satellites are in low earth orbit
- The Iridium system utilizes LEO satellites (780km high)

The satellite in LEO orbit is visible to a point on the earth for a very short time



Orbit Type	Height	Period
LEO - Low Earth Orbit	500-1000 Km	1.6 to 1.8 hrs
MEO - Medium Earth Orbit	8,000 to 12,000 km	approx. 6 hrs (at 10,000 km)
GEO - Geostationary	approx. 36,870 km	approx. 24 hrs

Figure LEO, MEO & GEO range

MEO: *Medium Earth Orbit* satellites have orbital altitudes between 3,000 and 30 ,000 km.

- They are commonly used used in navigation systems such as GPS

GEO: *Geosynchronous (Geostationary) Earth Orbit* satellites are positioned over the equator. The orbital altitude is around 30,000-40 ,000 km

- There is only one geostationary orbit possible around the earth
- Lying on the earth's equatorial plane.
- The satellite orbiting at the same speed as the rotational speed of the earth on its axis.

- They complete one orbit every 24 hours. This causes the satellite to appear stationary with respect to a point on the earth, allowing one satellite to provide continual coverage to a given area on the earth's surface
- One GEO satellite can cover approximately 1/3 of the world's surface

They are commonly used in communication systems

- Advantages:
  - Simple ground station tracking.
  - Nearly constant range • Very small frequency shift
- Disadvantages:
  - Transmission delay of the order of 250 msec. • Large free space loss.
  - No polar coverage

- Satellite orbits in terms of the orbital height:
- According to distance from earth:
  - Geosynchronous Earth Orbit (GEO) ,
  - Medium Earth Orbit (MEO),
  - Low Earth Orbit (LEO)

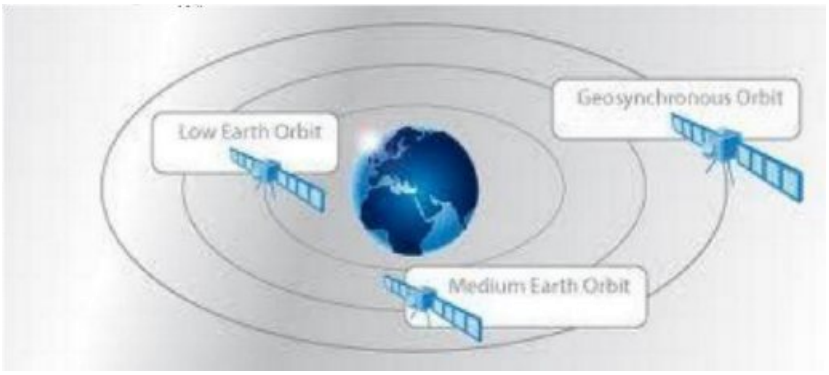
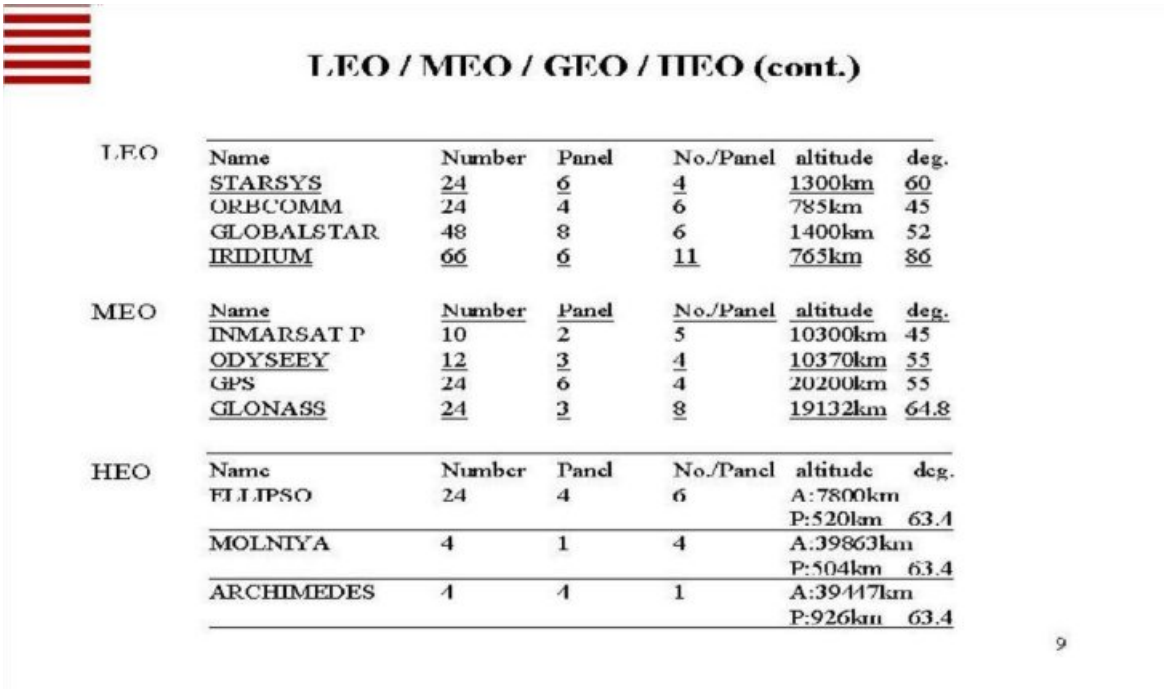


Figure LEO, MEO & GEO Orbits



LEO / MEO / GEO / HEO (cont.)

	Name	Number	Panel	No./Panel	altitude	deg.
LEO	STARSYS	24	6	4	1300km	60
	ORBCOMM	24	4	6	785km	45
	GLOBALSTAR	48	8	6	1400km	52
	IRIDIUM	66	6	11	765km	86
MEO	Name	Number	Panel	No./Panel	altitude	deg.
	INMARSAT P	10	2	5	10300km	45
	ODYSEEY	12	3	4	10370km	55
	GPS	24	6	4	20200km	55
	GLONASS	24	3	8	19132km	64.8
HEO	Name	Number	Panel	No./Panel	altitude	deg.
	ELLIPSO	24	4	6	A:7800km P:520km	63.4
	MOLNIYA	4	1	4	A:39863km P:504km	63.4
	ARCHIMEDES	4	4	1	A:39447km P:926km	63.4

9

Figure Diff b/w LEO, MEO & GEO Orbits GEO: 35,786 km above the earth, MEO: 8,000-20,000 km above the earth & LEO: 5002 ,000 km above the earth.

Satellite Navigational System:

Benefits:

- Enhanced Safety
- Increased Capacity
- Reduced Delays

Advantage:

- Increased Flight Efficiencies
- Increased Schedule Predictability
- Environmentally Beneficial Procedures

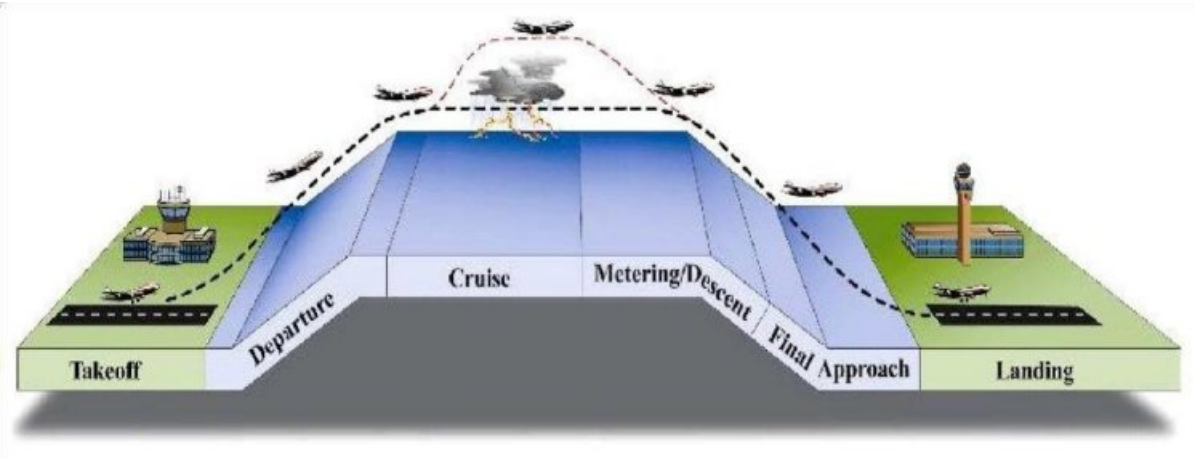


Figure LEO, MEO & GEO Orbits

- Using ICAO GNSS Implementation Strategy and ICAO Standards and Recommended Practices
- GPS Aviation Use Approved for Over a Decade
  - Aircraft Based Augmentation Systems (ABAS) – (e.g. RAIM)
  - Space Based Augmentation System (SBAS) since 2003
    - Wide Area Augmentation System (WAAS) augmenting GPS
- Development of GNSS Ground Based Augmentation System (GBAS) Continues
  - Local Area Augmentation System (LAAS)
    - CNSS is Cornerstone for National Airspace System