

Satellite Communication



Learn About Satellites

At

Pushpa Gujral Science City

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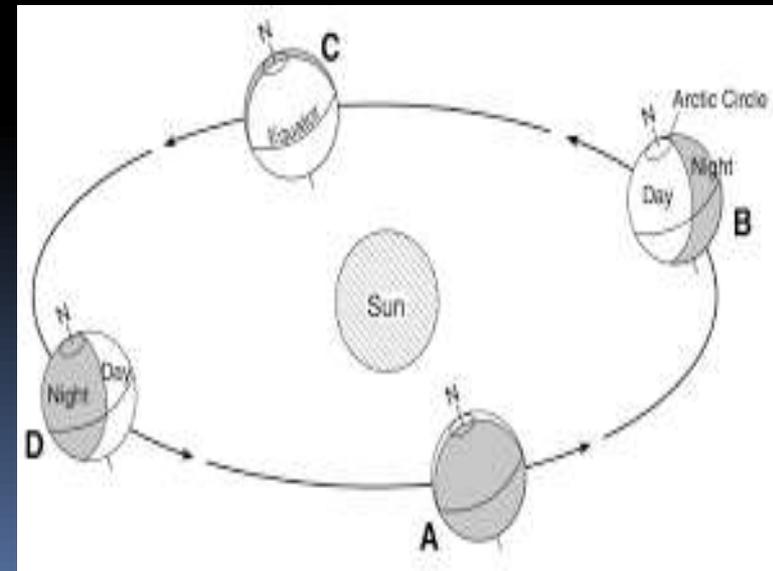
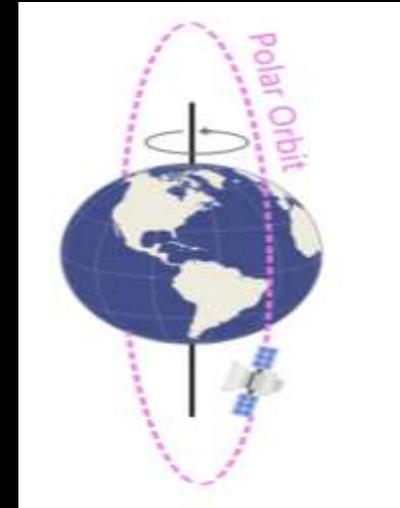
What is a Satellite ?

- In astronomy, a satellite is an object that orbits (goes around) a planet.
- There are several hundred natural satellites in our Solar System.
- Moon is a natural Satellite of the Earth.
- Thousands of man-made satellites have also been launched. These have different uses, like, taking pictures of the Sun and planets, Studying about black holes, stars and galaxies. Some satellites are also used for communication, studying weather , etc.
- The International Space Station is also a Satellite.



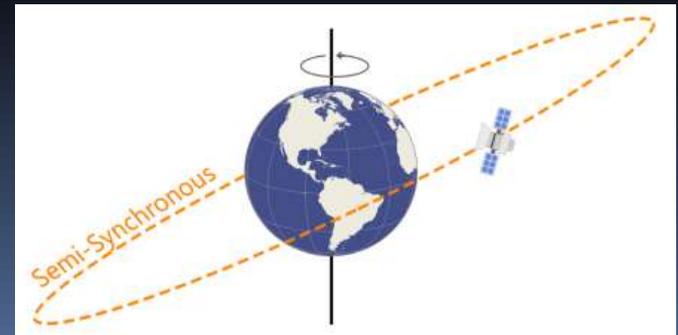
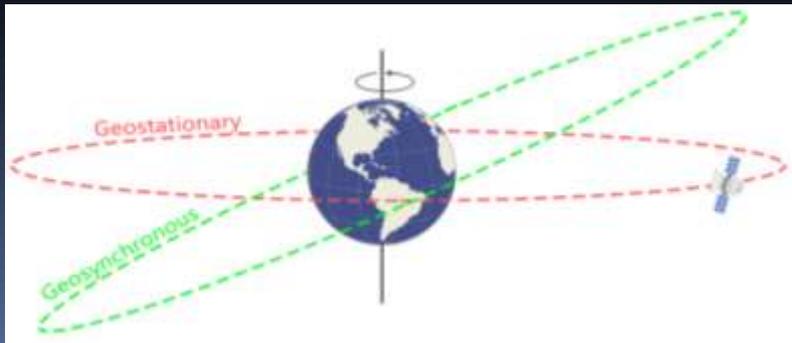
Path of A Satellite

- ❑ The path followed by a satellite is referred to as its **orbit**.
- ❑ Based on orbit types Satellites can be :
 - **Polar:** In a polar orbit the satellite travels north-south over the poles taking 90 min for a full rotation. As the Earth is rotating beneath, it can observe the entire Earth's surface in about 24 hours. These are used in measuring ozone concentrations in the stratosphere or temperatures in the atmosphere
 - **Sun Synchronous:** These satellites get constant sun light through inclination and altitude and pass over any given point on Earth's surface at the same local solar time. Because of consistent lighting these are used in remote sensing applications, like, infrastructure development, crop assessment, biodiversity studies, etc.

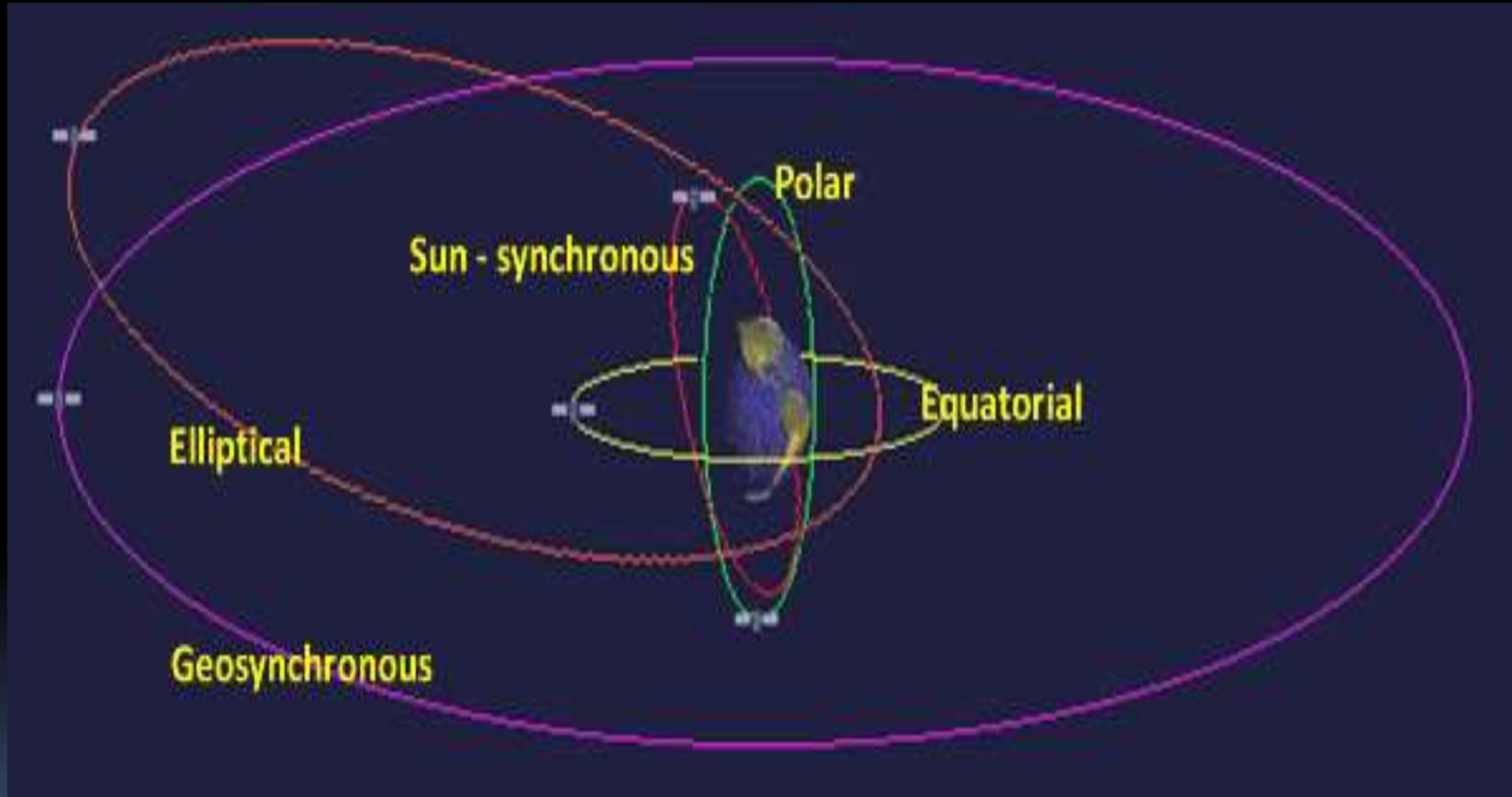


Path Of A Satellite

- **Geo Synchronous** : These satellites circle the Earth at the same rate as the Earth spins and are used in communication and to study hurricanes & cyclones. These are placed about 35,786 kilometers above the Earth's surface
- **Geostationary** : These orbits are same as geosynchronous , except that the satellite is positioned over the equator. These are used in weather observation, oceanography and atmospheric tracking.
- **Semi-Synchronous Orbits**
While geosynchronous orbits match the rotation of Earth (24 hours), semi-synchronous orbits take 12 hours to complete an orbit. These are approximately 20,200 kilometers above the surface and are used in GPS (Global Positioning System) applications.



Relative Paths Of Satellites



More about Satellites

- ❑ Sputnik 1 was the first artificial satellite launched in 1957. It was very simple. A small aluminum ball with four long antennas, powered by batteries, with radio transmitters inside that sent out a distinctive beep sound which was heard all over the world.
- ❑ The launch of this small satellite marked the beginning of the space age.
- ❑ Modern satellites are much more complicated. They are strong but light in weight, with a platform to hold batteries, computer and thrusters. Antennas, solar arrays and payload instruments (such as cameras, telescopes and communications equipment) are attached.
- ❑ Satellites power themselves through solar energy

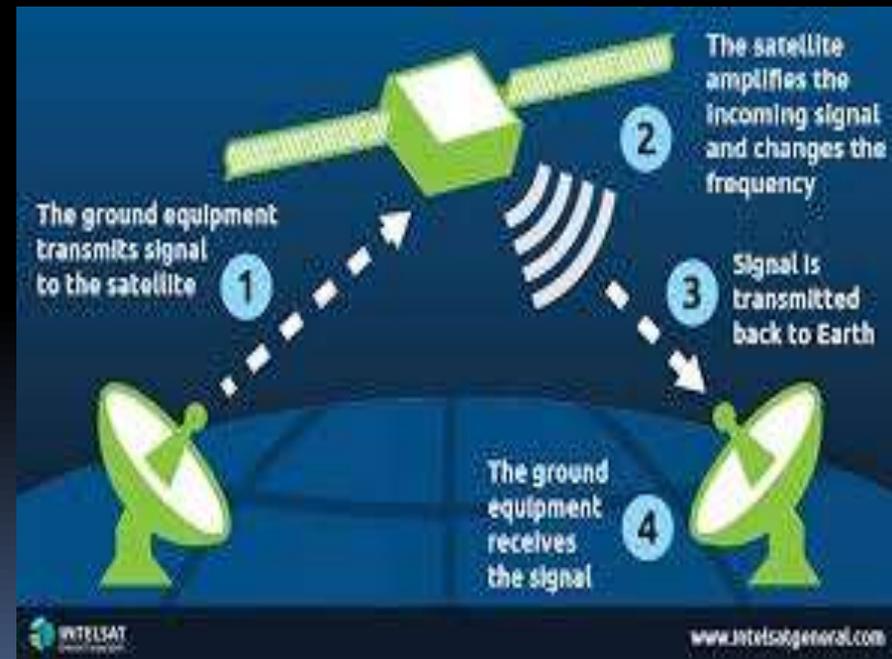


Satellite communication

At Science Voyage Hall of Science City, one can learn easily about how satellites communicate

Satellites communicate by using radio waves to send signals to the antennas on the Earth. The antennas then capture those signals and process the information coming from those signals.

Radio waves are the basic building block of radio communications.



Satellite communication...

- A radio wave is generated by a transmitter and then detected by a receiver by the process of modulation and demodulation. An antenna allows a radio transmitter to send energy into space and a receiver to pick up energy from space. Transmitters and receivers are typically designed to operate over a limited range of frequencies.



Modulation is the process of varying one or more properties of a periodic waveform called the carrier signal with a modulating signal that typically contains information to be transmitted.

Demodulation is inverse of modulation.

Global Positioning System

The **Global Positioning System (GPS)**, is a satellite-based radio navigation system.

It is one of the global navigation satellite system (GNSS) that provides geo-location and time information to a GPS receiver anywhere on/ near the Earth.

It is claimed that with the help of GPS an object can be located with accuracy of 10 ft anywhere on the globe.



At science voyage hall of science city, one can learn how the GPS works

Global Positioning System Operation

- The GPS project was started by the America's Department of Defence.
- A full constellation of 24 satellites became operational in 1993.
- As shown in the pic. These 24 satellites, four in each orbit (total 6 orbits) communicate with each other (at least four satellites need to communicate with each other) to give a location.



INSAT Series Of Satellites

- The **Indian National Satellite System** or **INSAT**, is a series of multipurpose geostationary satellites launched by ISRO. These satellites have been launched for the purpose of telecommunications, broadcasting, meteorology, and search and rescue operations.



INSAT 1A

Displayed at science city

INSAT Series Of Satellites

- INSAT was commissioned in 1983.
- It is the largest domestic communication system in the Indo-Pacific Region.

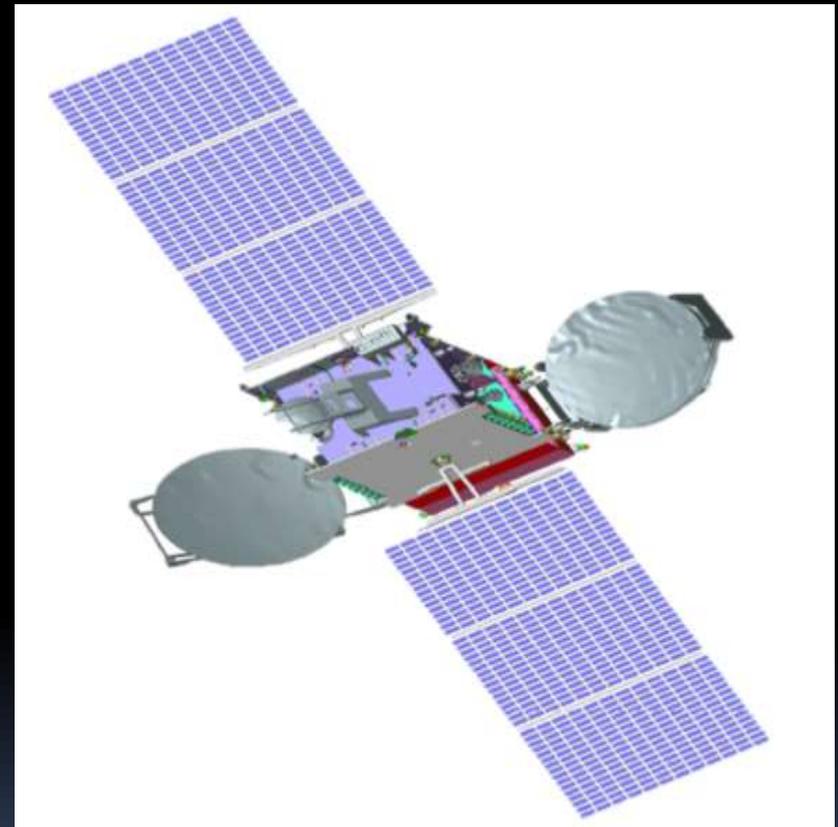


INSAT 3A

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INSAT Series Of Satellites

- Some of the satellites also have the Very High Resolution Radiometer (VHRR), CCD cameras for meteorological imaging.



GSAT 30

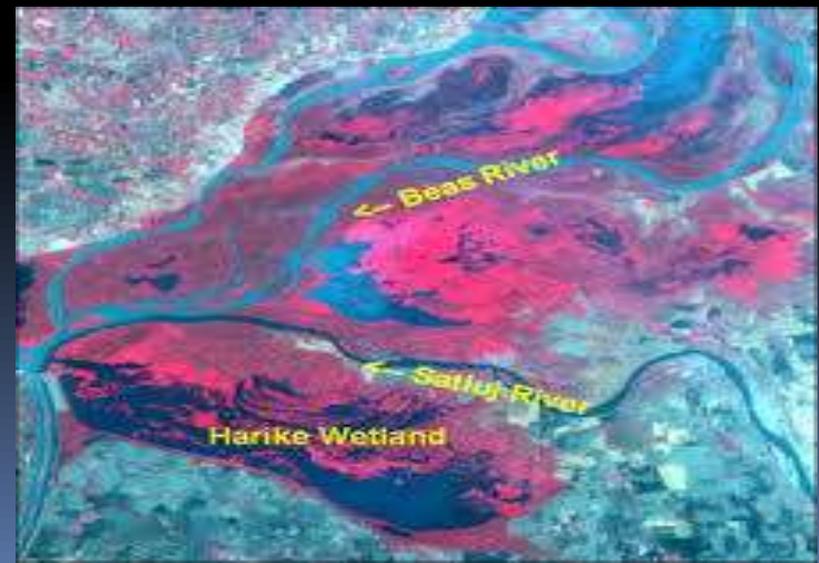
Remote Sensing Satellites Launched By ISRO

ISRO has launched many operational remote sensing satellites since 1988. Today, India has one of the largest constellations of remote sensing satellites in operation. There are thirteen operational satellites in Sun-synchronous orbit. Among these **IRS 1A** has been displayed at science city.

A remote sensing image showing Satluj & Beas Rivers



IRS 1A Displayed at science city





To learn more about satellites visit
Pushpa Gujral Science City

Thank you

