



كلية المستقبل الجامعة
قسم الفيزياء الطبية
المرحلة الثانية

Medical Physics

Optics

Lecture 6

Lecturer: Mohammed Salih

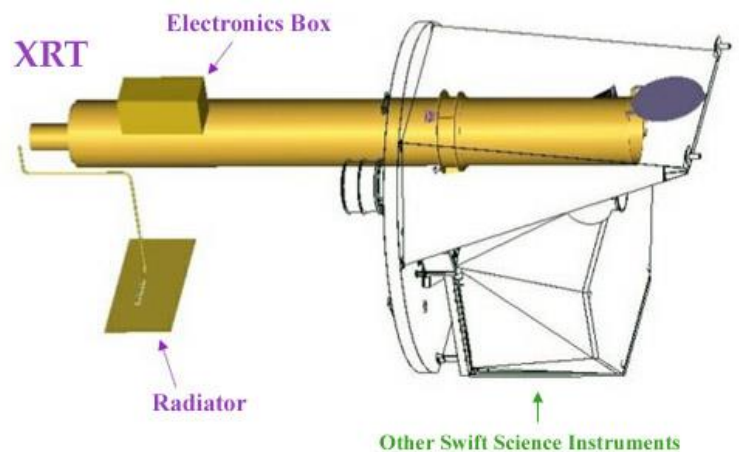
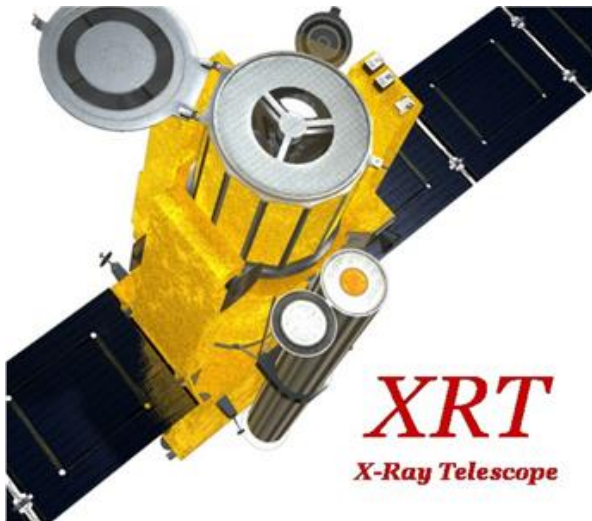
Types of Telescope :

Telescopes may be classified by the wavelengths of light they detect :

1- X-ray Telescope (XRT) :

using shorter wavelengths than ultraviolet light, An X-ray telescope (XRT) is a telescope that is designed to observe remote objects in the X-ray spectrum. In order to get above the Earth's atmosphere, which is opaque to X-rays, X-ray telescopes must be mounted on high altitude .

The basic elements of the telescope are the optics (focusing or collimating), that collects the radiation entering the telescope, and the detector, on which the radiation is collected and measured. A variety of different designs and technologies have been used for these elements.

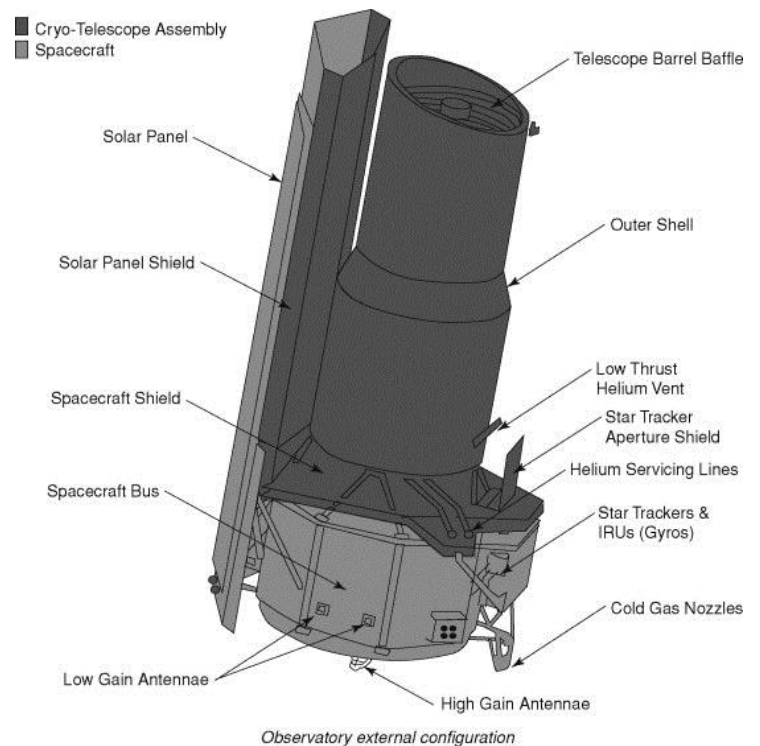


X-rays are much harder to collect and focus than electromagnetic radiation of longer wavelengths, X-ray optics is the branch of optics that manipulates X-rays instead of visible light. It deals with focusing .

2- Infrared Telescope :

An infrared telescope is a telescope that uses infrared light to detect celestial bodies. Infrared light is one of several types of radiation present in the electromagnetic spectrum. using longer wavelengths than visible light .

All celestial objects with a temperature above absolute zero emit some form of electromagnetic radiation. In order to study the universe, scientists use several different types of telescopes to detect these different types of emitted radiation in the electromagnetic spectrum. Some of these are gamma ray, x-ray, ultra-violet, regular visible light (optical), as well as infrared telescopes .



Optical Telescope :

An optical telescope is a telescope that gathers and focuses light mainly from the visible part of the electromagnetic spectrum, to create a magnified image for direct visual inspection, to make a photograph, or to collect data through electronic image sensors

There are three primary categories of optical telescope :

Refracting telescopes : which use lenses .

Reflecting telescopes : which use mirrors .


Catadioptric telescopes : which combine lenses and mirrors .

An optical telescope's ability to resolve small details is directly related to the diameter (or aperture) of its objective (the primary lens or mirror that collects and focuses the light), and its light-gathering power is related to the area of the objective. The larger the objective, the more light the telescope collects and the finer detail it resolves .


OPTICAL TELESCOPES

Optical telescopes gather the visible light to observe distant objects.


A. Refracting
B. Reflecting
C. Catadioptric



Type: Reflector
Advantage: Least expensive per inch of aperture
Disadvantages: Requires frequent collimation; long cooldown time



Type: Refractor
Advantage: Very sharp images possible
Disadvantage: Most expensive per inch of aperture



Type: Compound Telescope (catadioptric)
Advantages: Long focal length in short tubes can make use of compact "fork" style equatorial mount
Disadvantages: Narrow field of view; long cooldown time; susceptible to dewing
*Most commonly a Schmidt-Cassegrain or Maksutov

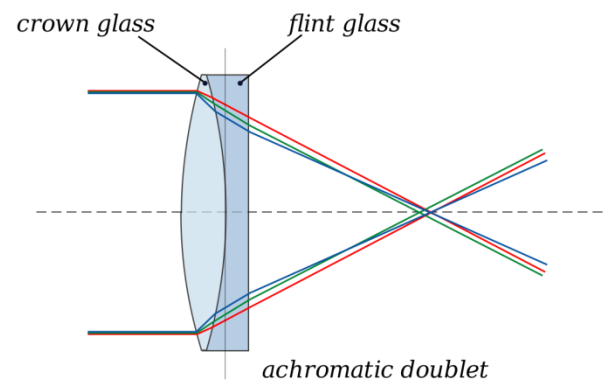
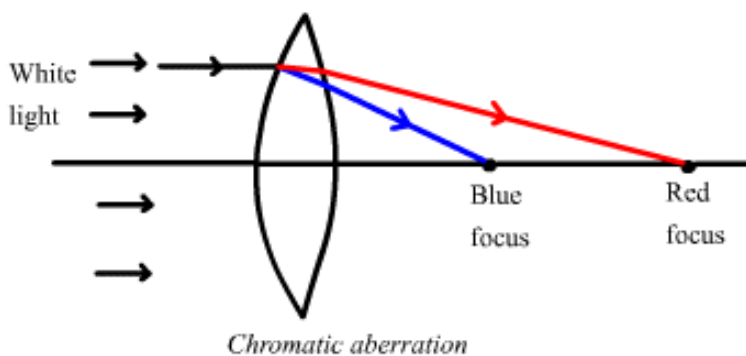
Advantages of Telescope :

Mainly five advantages are found in astronomical telescope :

- 1- It creates large magnification .
- 2- Its field of view is wide .
- 3- Superior performance in inferior conditions – image steadier .
- 4- Long focal ratios can mean the use of longer focus, eyepieces .
- 5- The image is free from aberration, and interruption of the light path not found .

Disadvantages of Telescope :

- 1- Restricted field .
- 2- Reduced light gathering.
- 3- Limited depth of focus.
- 4- Requires co-ordination .
- 5- Cost factor .



Function of Telescope :

- 1- Collect light from celestial object .
- 2- Focus light to create image or spectrum of the object .
- 3- Use larger aperture than the human eye .
- 4- Expose for longer than human eye .
- 5- Achieve better resolution than human eye .
- 6- Examine spectral information in detail .
- 7- Observe at wavelengths the eye is not sensitive to (i.e. beyond 400-700nm) .

Types of Mount :

A telescope mount is a mechanical structure which supports a telescope. Telescope mounts are designed to support the mass of the telescope and allow for accurate pointing of the instrument. Many sorts of mounts have been developed over the years, with the majority of effort being put into systems that can track the motion of the stars as the Earth rotates. The two main types of tracking mount are :

- 1- Altazimuth Mount .
- 2- Equatorial Mount .

Telescope Mounts

