Detection of gravitational waves:-

Gravitational waves are "ripples" in space time caused by some of the most violent and energetic processes in the Universe.

Albert Einstein predicted the existence of gravitational waves in 1916 in general theory of relativity.

The strongest gravitational waves are produced by cataclysmic events such as colliding black holes, supernovae. and colliding neutron stars.

Einstein predicted the existence of gravitational waves in 1916, the first proof of their existence did not arrive until 1974.

In that year two astronomers, Russell Hulse and Joseph Taylor using the Arecibo Radio observatory in Puerto Rico discovered a binary pulsar 21000 light years from Earth.

⇒ The interferometers act as "antennae" to detect gravitational waves.

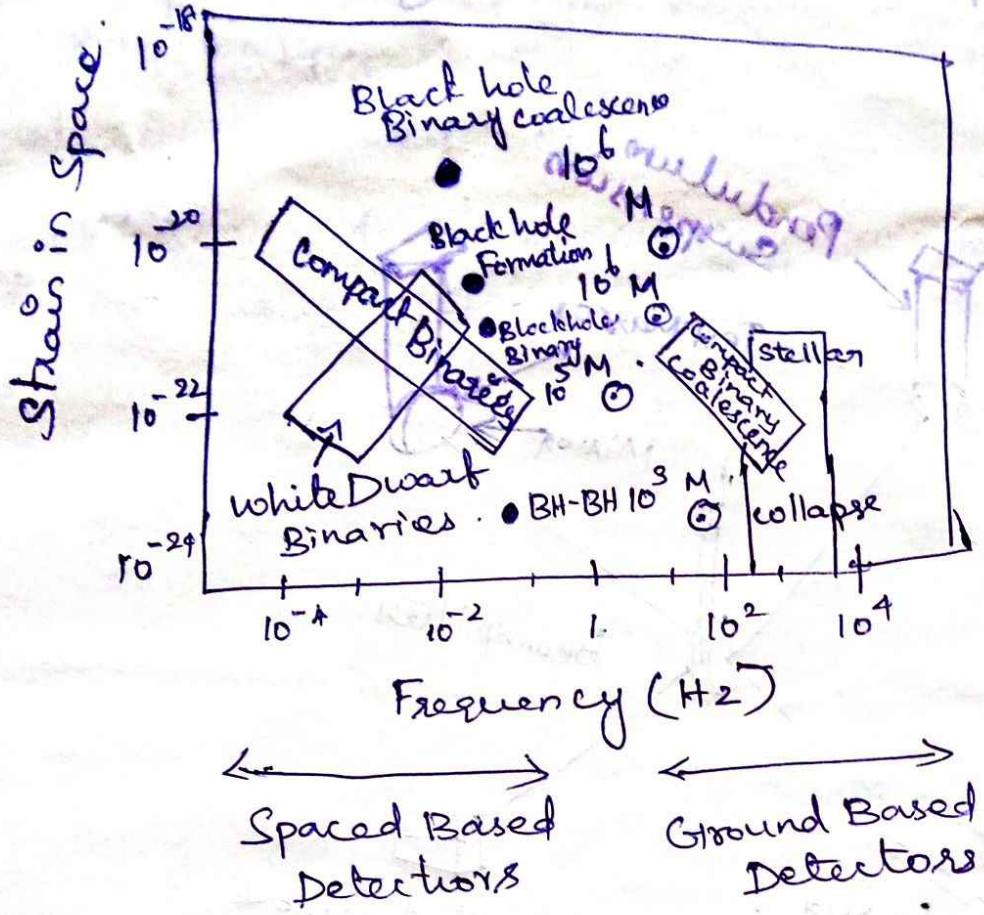
⇒ Gravitational wave can be detected indirectly by observing celestial phenomena caused by gravitational waves.

Gravitational waves are most simply thought of as ripples in the curvature of space time, their effect being to change the separation of adjacent masses on earth or space. this tidal effect is the basis of all present detectors.

The problem for the experimental physicist is that the predicted magnitudes of the strains in space caused by gravitational waves are of the order of 10^{-21} or lower.

Indeed current theoretical models suggest that in order to detect a few events per year - from coalescing Neutron star binary system for Example - sensitivity close to 10^{-22} is required.

signal strengths at the earth for a number of sources.



The small signal levels means that limiting noise source resulting from the thermal motion of molecules in the detector (thermal noise), from seismic or other mechanical disturbance and from noise associated with the detector readout electronic or optical must be reduced to a very low level.

For signals above ~10Hz ground based experiments are possible, but for lower frequencies where local fluctuating gravitational gradients and seismic noise on earth become a problem it is best to consider developing detectors to be used in space.

gravitational wave detector using Laser interferometry